A SYSTEMATIC REVIEW OF THE INDO-AUSTRALIAN ZOSTEROPIDAE (PART II)

by

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With Plates I-IV, and text-figs. 1-13

INTRODUCTION

In this, the second part of my revision of the Zosteropidae, 26 species are dealt with, all belonging to the genus *Zosterops*. The remaining 12 species of the genus and all the other genera, will be treated in the third part, the preparation of which is in progress.

Unfortunately, it becomes more and more clear that no revision of the Pacific forms of the Zosteropidae can be really satisfactory without a visit to the American Museum of Natural History, where all the material of the Tring Museum and of the Whitney South Sea Expedition is assembled. Even though the co-operation of the authorities of that museum is above praise, I have usually been able to examine part of their series only, and no type specimens at all. More important is that the American Museum has the field-notes of the various collectors of the Whitney South Sea Expedition, probably the only extant notes on many species. These notes have not been accessible to me, so that I am not able to present anything new concerning habitat, abundance, nidification, etc. of the species concerned.

Circumstances in Perth, without a basic reference collection and with insufficient literature, are difficult, and were it not for the fact that nearly all the comparative work, and also the survey of literature, had been done before I left Europe, it would have been impossible to complete this part. As it is, however, I feel satisfied that it is not far below the standard of the first part.

Inevitably, partly as a result of recently published work, additions and corections to part one of this review have become necessary. Rather than include them here, I intend to publish them at the end of the third part.

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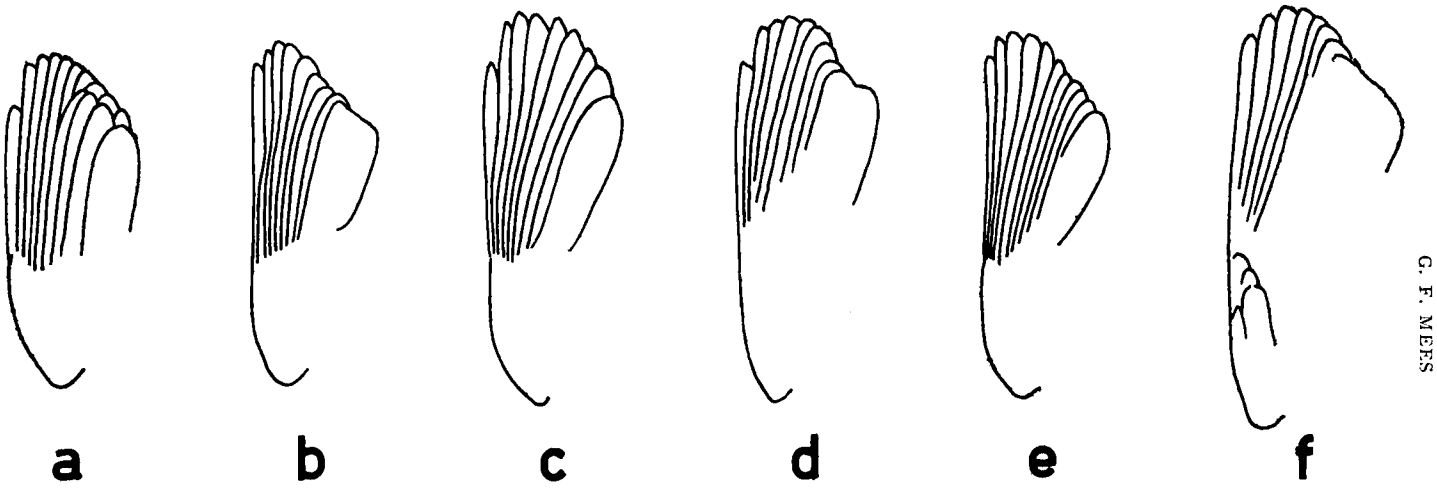

Fig. 1. Wings of some species of *Zosterops*, showing differences in wing-formula; a, *Z. wallacei* (RMNH cat. nr. 2); b, *Z. lutea balstoni* (WAM nr. A21); c, *Z. griseotincta rennelliana* (AMNH nr. 226511); d, *Z. kulambangrae paradoxa* (Mus. Vert. Zool. nr. 90335); e, *Z. metcalfii floridana* (AMNH nr. 218123); f, *Z. stesemanni* (AMNH nr 227370).

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Zosterops chloris group

(species 12 to 14)

Besides *Z. chloris* (in which I include the pale-bellied forms previously known as *Z. citrinella*), this group embraces *Z. grayi* and *Z. uropygialis*. Hitherto the grey-bellied *Z. grayi* has usually been associated with the *citrinella* group of subspecies and the yellow-bellied *uropygialis* with *chloris*. Recently (Mees, 1953) I have tried to show that this is misleading as doubtless *grayi* and *uropygialis* are closer related to each other than to any other form. Nevertheless they are sufficiently close to *Z. chloris* — *citrinella* to make it likely that they are derivatives of that species which have, however, apparently reached the level of specific distinction.

It is likely that previous to the recent expansion of *Z. chloris* (which is suggested in the introduction to that species), *grayi* and *uropygialis* were peripherical subspecies of *chloris* on the isolated Kei Islands, where they underwent differentiation to a degree that it is now doubtful whether or not *grayi* and *uropygialis* should be regarded as conspecific. Probably quite recently, certainly in postglacial times, *Z. chloris* has again colonized the Kei Islands (Soa, Noeniai), and though *chloris* probably keeps to small islands and therefore does not actually come into contact with the older established forms, the existence of this ecological difference in itself is an additional argument for recognising the latter as specifically distinct.

Zosterops consobrinorum is very similar to *citrinella*, but it is difficult to decide if this similarity stems from relationship. However, to indicate the

possibility of affinity I have placed *consobrinorum* next to the *Z. chloris* group.

Species 12. **Zosterops chloris** Bonaparte

Characters. A species of small to fairly large size of the typical *Zosterops*-pattern. There are two distinct groups of subspecies, one (*chloris* group) with entirely yellow under parts, one (*citrinella* group) with pale grey flanks and belly, which it seems better to describe separately.

The *chloris* group.

A group of small to fairly large races, most readily distinguished from the *citrinella* group by their all-yellow under surface.

Upper parts ranging from Warbler Green to Pyrite Yellow; a narrow region on the anterior part of the forehead, and the supra loral line, almost pure yellow; upper tail coverts often more yellowish than the back; a complete white eye-ring of average width; lores and a streak under the eye-ring black or dusky (in one race, *flavissima*, the lores are yellow); primaries, secondaries, and rectrices blackish brown; primaries and secondaries broadly edged with the colour of the mantle, rectrices usually distinctly, but only on their anterior halves broadly, edged with the same colour.

Under parts all yellow, varying from somewhat Pale Lemon Yellow with greenish flanks to all Lemon Chrome; basal portions of the body feathers dark grey.

The *citrinella* group.

A group of three subspecies (*citrinella, albiventris,* and *harterti*) of average to fairly large size.

Upper parts between Warbler Green and Pyrite Yellow, in fresh skins closer to Pyrite Yellow; rump very slightly to definitely more yellowish; forehead and supra loral region distinctly yellow; loral line blackish, extending under the eye-ring; white eye-ring of average width, interrupted in front by the usual blackish spot of the loral line; primaries, secondaries, and rectrices blackish brown, broadly edged with the greenish colour of the mantle.

Under parts. Chin, throat, upper breast and under tail coverts between Strontian Yellow and Lemon Chrome, with or without a more or less distinct mesial longitudinal streak of the same colour over the abdomen. Remainder of under parts pale greyish, darkest on the flanks, almost pure satin white towards the centre of the belly.

In both groups the irides are brown, bills and legs are variable in size and coloration, according to race.

Measurements are shown in table I.

TABLE I

Zosterops chloris

	number of specimens	wing	tail	av. wing	av. tail	tail : wing index
chloris	39	57-63	36-41½	60.14	38.96	64.78%
albiventris	55	56-64	36-45	60.05	40.20	66.94%
harterti	5	56½-61	37½-43	58.20	39.50	67.87%
citrinella (Timor)	13	55½-59	35-41	56.88	37.40	65.75%
citrinella (Soemba, Sawoe)	9	55-58	35-39	57.00	37.50	65.79%
flavissima	8	53½-59	35-39	56.13	37.16	66.20%
mentoris	19	52-54½	36½-40	53.26	38.21	71.44%
ssp.	2	55-56	38-41	55.5	39.5	71.2 %
intermedia (Celebes)	28	53-58	34-40	55.32	37.15	67.17%
intermedia (Moena, Boeton)	8	56-59	37½-40	57.31	38.57	67.25%
intermedia (Djampea, Kalao, etc.)	15	54-60	36-41	57.60	38.53	66.90%
intermedia (Flores, Soembawa)	11	54-59	35½-41	56.36	37.50	66.53%
maxi (East)	32	56-61	36-42½(45)	58.39	39.23	67.20%
maxi (west)	90	53-58½	35-41	56.26	37.96	67.47%

Structure. 2nd primary in length between the 6th and the 9th, tail relatively fairly long (see indices in table), plumage in some races fairly soft, and therefore often abraded.

Distribution (fig. 2). Islets in the Java Sea, as far west as Dwars in de Weg, islets near Billiton and the Karimata Islands; South and Central Celebes; Lesser Soenda Islands from Lombok to the east; Moena, Boeton, islands in the Banda Sea, southern Moluccas, some small islets in the northern Moluccas, near Misool and in the Aroe Islands, small islands off the northern and eastern coast of the Cape York Peninsula, Queensland.

Ecology. Varies with the different races; in the western part of the range of the species, and again in the eastern part, there are races which are more or less confined to small islands, never being found on the larger islands, whereas in the central part of the range forms occur on larger islands, where they may be found from sea-level up to an altitude of about 1200 m. Generally speaking the species must be considered a lowland-species.

Though I reserve a full discussion of these problems for the concluding part of this revision, knowledge of the ecology and also of the present-day distribution of the species leads to some interesting theoretical considerations. As far as the geographical distribution is concerned, it is well known and generally accepted that during the last glacial — the end of which is put back about 15000 years — the map of this part of the world looked entirely different. Almost the whole range of *maxi* is on the Soenda Shelf, and therefore constituted an extension of the Asiatic mainland. Evidently the expansion of *maxi* must have taken place after the last glacial period. In the east the same

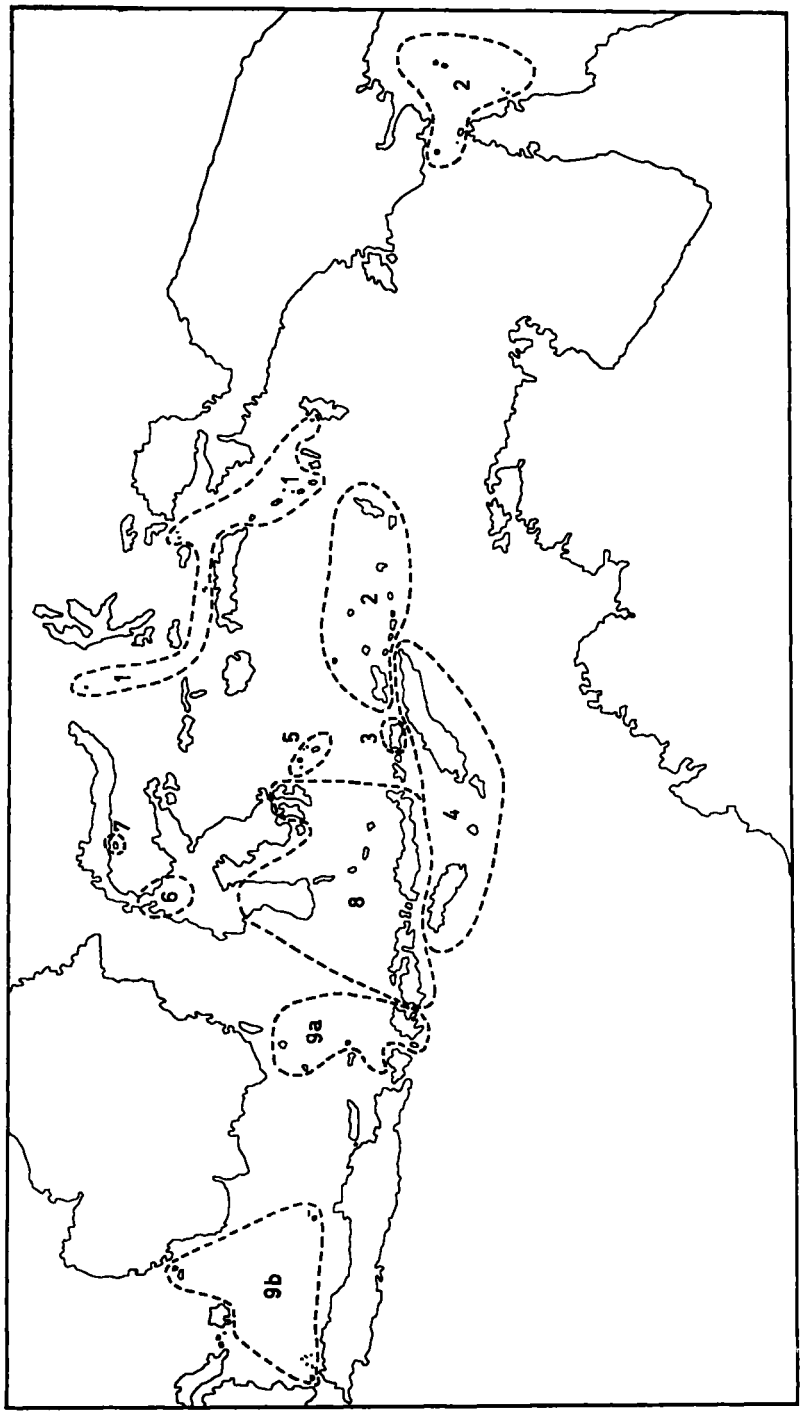

Fig. 2. The distribution of *Zosterops chloris* and races: 1, *chloris*; 2, *albiventris*; 3, *harterti*; 4, *citrinella*; 5, *flavissima*; 6, *mentoris*; 7, subsp.; 8, *intermedia*; 9a, *maxi* (eastern group); 9b, *maxi* (western group).

happened, a great part of the range of *albiventris* lies on the Sahoel Shelf, which was land until the recent past.

With *Z. chloris chloris* the evidence is not so clear, but here again we may suspect a comparatively very recent expansion of range as a result of the flooding by sea of the continental shelves just mentioned (smaller Kei Islands, Aroe Islands). Therefore it is safe to assume that the species, as a consequence of climatic changes in the late Pleistocene and even in the early Holocene, has been able to greatly expand its range. The same pertains of course to other forms partial to small islands; in this connection it may be worth drawing attention to Stresemann's (1939, p. 334, fig. 9) explanation of the distribution of *Dicrurus hottentottus leucops* Wallace and *D. hottentottus jentinki* (Vorderman) [1]).

There is, however, a second series of changes that has probably assisted *Z. chloris* in gaining its present-day distribution, and is probably still assisting it in its expansion, and that is human cultivation. At least in the western part of its range the species is a culture-follower. Heinrich (in Stresemann, 1940) puts it quite clearly when he writes: "Ueber die ganze süd-celebesische Ebene ist die Art verbreitet, und in den entwaldeten Gebirgen steigt sie bis zu etwa 1000 m Höhe, d.h. bis zum Rande der geschlossenen Wälder empor". According to Coomans de Ruiter (1951): „..... is *chloris* voornamelijk te vinden in de nabijheid van menschelijke nederzettingen". Again, Hoogerwerf (in litt., 17-III-1955) was surprised to find the species on the Kangean Islands nowhere but on the heavily populated islet of Sepekan. There it was so common that ten specimens could be collected within an hour.

These considerations fail to explain why the species (presumably assisted by man) successfully colonised the large islands of Celebes, Lombok, Soembawa, Flores, Soemba and Timor whereas the also densely populated (by man) and highly cultivated islands of Bali and Java remained entirely free from settlement, though the tiny islets off the coasts of these islands were readily colonised. It is difficult to visualise why this is so. Admittedly Stresemann (1940) discussing the expansion of range of *Dicrurus hottentottus* speaks about: ".....einer ökologischen Umstellung zur Kleininselform.....", but this, though it may be a reason why *Z. chloris maxi* does not colonise Java from the islands off Batavia, certainly does not explain why this form failed to colonise Bali from Lombok, though it is common on Noesa Penida

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1) Vorderman (1893) described this bird as *Chibia jentincki* and in recent literature (Delacour, 1947; Vaurie, 1949; Hoogerwerf, 1949) it is usually referred to as *Dicrurus hottentottus jentincki*. As the bird was named after F. A. Jentink, at the time director of the Leiden Museum, automatic emendation is permissible.

and on Poeloe Mendjangan (a tiny island very close to the northern coast of Bali).

Stresemann (1939, p. 161) suggested that: "Die relativ beträchtliche Vertikalverbreitung von *Z. chloris* auf Lombok, Sumbawa and Flores ist vermutlich daraus zu erklären, dass diese Insel weniger niederschlagleich sind als ihre westlichen Nachbarn und daher die Strandkasuarinen (*Casuarina equisetifolia*) weiter aufwärts reichen". This again does hardly explain the abrupt difference between Bali and Lombok. Here remains a fascinating field for further investigations.

Geographical variation. Fairly large; to begin with there are the grey-bellied *citrinella*-group, which inhabits in three races the south-eastern part of the range of the species, and the yellow-bellied *chloris*-group, which inhabits the northern and western part of the range. Whereas the grey-bellied races differ mainly in size and are morphologically close to each other, the yellow-bellied forms show a greater amount of geographic variation, the eastern forms being brighter, more yellowish than the western forms, which become paler as regards yellow coloration, and greener on the upper parts; the variation, taken as a whole, is somewhat irregular.

In the first part of this revision, in the check-list, I recognised ten races. Thanks to the large amount of material in the Bartels collection that became available after this valuable collection had been acquired by the Leiden Museum, and to the skins recently taken by Hoogerwerf on various islands in the Java Sea, I was able to ascertain that *periplecta* is identical with *solombensis,* and that the latter is insufficiently differentiated from *maxi* to deserve a name of its own. On the other hand a possible additional race was found to inhabit an island in the gulf of Tomini, Celebes, so that the recognizable races now are:

1. *Zosterops chloris chloris* Bonaparte
2. *Zosterops chloris albiventris* Reichenbach
3. *Zosterops chloris harterti* Stresemann
4. *Zosterops chloris citrinella* Bonaparte
5. *Zosterops chloris flavissima* Hartert
6. *Zosterops chloris mentoris* Meise
7. *Zosterops chloris* subsp.
8. *Zosterops chloris intermedia* Wallace
9. *Zosterops chloris maxi* Finsch

Related species. About hardly any group of forms has there been so much difference of opinion as to their relationships; particularly as far as the *citrinella* group is concerned.

The confusion started with the discovery of several neighbouring forms

which are morphologically very close to *citrinella,* the first to come into consideration being Seebohm's *Zosterops neglecta* (= *Zosterops montana montana*), described in 1893 from the mountains of Eastern Java. Hartert (1896) commented that these birds were identical with *citrinella* from Timor and that, therefore, *neglecta* became a synonym. Finsch (1901) did not agree, and separated the two forms; as Finsch did not use ternary nomenclature, he did not otherwise contribute to the understanding of the relations of *citrinella.* Stresemann (1912) agreed with Finsch that *neglecta* is different from *citrinella*; both forms he considered to be subspecies of *palpebrosa,* thus calling them *Zosterops palpebrosa neglecta, Zosterops palpebrosa citrinella* and *Zosterops palpebrosa harterti.* Previously Madarász (1911) had suggested a close affinity between his *Zosterops egregia* and *Z. citrinella*; he considered *egregia* (now *Z. palpebrosa egregia*) closer related to *citrinella* than to *Z. palpebrosa.*

Hellmayr (1914) again considered the problem according to modern ideas of nomenclature; he came to the same conclusions as Stresemann (1912) quoted above in making the *citrinella* group with *neglecta,* races of *palpebrosa.* The yellow-bellied subspecies were not considered until 1920 when Hartert described *Z. intermedia periplecta.* Meise (1929 and subsequent papers) united the western yellow-bellied forms under the specific name of *intermedia*; true *chloris* remained out of discussion though Meise already suggested that *chloris* would ultimately become the specific name of this group of races. Mathews's (1930) uncritical compilation did not contribute anything new to the understanding of the species, but Stresemann's (1931) paper meant a big step forward. Stresemann recognised for the grey-bellied forms the species *citrinella,* which he considered closely related to *Z. montana* (*Z. chlorates* in his revision) in the west. The yellow-bellied forms he united as *Z. chloris,* pointing out, however, that *chloris* is closely related to *citrinella.* Subsequently Stresemann (1939) returned to Hellmayr's view, and united the *citrinella*-group with *palpebrosa,* leaving the yellow bellied forms as the separate species *Z. chloris.* Mayr (1944), however, did not agree with this classification, and proposed a new one, uniting both *citrinella* and *chloris* with the Australian mangrove-inhabiting species *Z. lutea.* Mayr's argument for removing *citrinella* from the *Z. palpebrosa* relationship reads as follows: "The *melanura* group differs from *citrinella* by such an array of characters that I consider the two groups as not even closely related. In *citrinella* the bill is heavier and straighter, bill and feet are lighter, wings and tail are not so blackish, the belly is white, not greenish, the plumage is softer and duller, the size is larger, and the tail is proportionately much larger (index 69.5-75.2 as against 62.0-64.5 in *gallio* and *unica*)". Mayr included several other nominal species

(*Z. natalis*) with his greatly enlarged *Zosterops lutea* concept, and suggested affinity to *Z. griseotincta* and other species from the islands east of New Guinea.

Mayr's classification was generally followed until Stresemann (1951) remarked that: "Ernst Mayr judges *Zosterops lutea* Gould to be the Australian representative of the "*citrinella*" group. He may be right. The differences are, however, so very considerable that I am not willing to follow him when he treats them as races of the same species".

Later, I (Mees, 1953, 1954, 1955) took several forms out of the species as limited by Mayr.

As far as my present view is concerned, having examined large series of true *Zosterops lutea* from Australia and equally good material of the *chloris* and *citrinella* groups, I fully agree with Stresemann, that they are not conspecific. Not only is the coloration rather different, but structurally there are also differences which, though each in itself might well occur between races of one species, add up to necessitating specific separation. The differences I mean are in the wing-formula, which is with a small second primary (6>2, and generally 7>2 or even 8>2) in all races of *chloris* (as here defined), and with an average larger second primary (in length between the 5th and the 7th, generally about equal to the 6th primary) in all races of *lutea*. Moreover the race *albiventris*, which would be expected to be closest to *lutea*, differs from it by its larger bill; especially the southern races are all white-bellied.

The supposed affinity between *Z. chloris* and *Z. palpebrosa*, though rejected by Mayr (1944), must also be reconsidered. Whereas Mayr was perfectly right in stating that there are many differences between the *melanura*-group of *Zosterops palpebrosa*, and *citrinella* from Timor, differences which he correctly listed as quoted above, there is the curious fact that the western races of *Z. palpebrosa*, geographically remote from *citrinella*, morphologically approach closer and closer to the Timor species, and *Zosterops palpebrosa nilgiriensis* from the Nilghiri and Travancore hills in the extreme southwestern part of India, at last, is so close to *Z. chloris citrinella*, that I have been unable to separate these two on account of differences in colour or measurements except for the fact that *citrinella* differs slightly in average measurements, particularly in having a tarsus which averages about one mm longer: certainly a very slender ground for basing a s p e c i f i c difference on! Nevertheless, as the eastern races of *palpebrosa* become progressively more different from both *Z. p. nilgiriensis* and *Z. chloris citrinella*, and as moreover *citrinella* is situated in an area where several evidently related forms and even species (*Z. grayi*) occur, indicating that it must have been settled in the region for a long period, I am inclined to ascribe this striking

similarity to convergence and not to a particularly close relationship. Also there is, as Mayr correctly pointed out, the ecological difficulty to overcome, for *palpebrosa* is in the eastern part of its range a typical foothill-bird, ascending the mountains to a considerable altitude (even up to 2500 m on Java), and avoiding the true lowlands, whereas *citrinella* and related forms, though occasionally occurring as high as 1200 m, generally prefer the lowlands and even settle on small islands. Of course *Zosterops palpebrosa auriventer,* of which the specific identity with *palpebrosa* is beyond doubt, inhabits mangroves and is rarely found more than a few miles inland, whereas its close relative *Z. palpebrosa buxtoni* has the habitat described above. Therefore differences in habitat alone should not be considered an insurmountable barrier for uniting otherwise similar-looking forms found in the same geographical area.

What remains of Mayr's (1944) classification is the union of the yellow-bellied *Z. chloris* and the grey-bellied *Z. citrinella* which by earlier revisors (Stresemann, 1931) had been considered distinct, though related, species. It is not without hesitation that I follow Mayr in this on the basis of the following argument. If *chloris* and *citrinella* are conspecific, particularly the races that are geographically close to each other, e.g. *citrinella* (Timor, Soemba), *harterti* (Alor) and *intermedia* (Flores, Soembawa) must be morphologically close to each other too. This condition is fulfilled: *intermedia "sumbavensis"* differs from *citrinella* in its having on the average a paler, more yellowish upper surface, slightly larger and usually more brownish, less blackish bill, and, of course, the all-yellow under surface. These differences are slight enough to be considered of subspecific value only.

The problem of the relation of the forms concerned might well be solved by collecting on the small islands between Flores (*intermedia*) and Alor (*harterti*): Solor, Adonara, Lomblen, Pantar. These small but high and mountainous islands have been neglected by collectors, but it would be extremely interesting to know if and where the forms just mentioned occur on any of them.

As I explained above, ecological differences alone need not be a reason to keep similar looking forms as different species. But the same applies also to the reverse. There is no real reason why ecologically more or less similar forms which are apparently mutually exclusive (vicariate), should necessarily be conspecific. In the concluding part of this revision I hope to be able to give a survey of this kind of problem in relation to the Zosteropidae.

1. **Zosterops chloris chloris** Bonaparte

Z[osterops] chloris Bonaparte, Consp. Gen. Av. I, 1850, p. 398 — Banda.

Zosterops rufifrons Salvadori, Ann. Mus. Civ. Genova 6, 1874, p. 79 — Gesser, Seram Laut.

Zosterops brunneicauda Salvadori, Ann. Mus. Civ. Genova 16, 1880, p. 82 — nomen emendatum for *Zosterops rufifrons* Salvadori.

Zosterops tudjuensis van Oort, Notes Leyden Mus. 34, 1911, p. 65 — Noesa Touloen (also called Poeloe Ajer), Poeloe Toedjoe-group in the Ceram Sea, north of Ceram.

Zosterops chloris majauensis Jany, Journ. f. Orn. 96, 1955 (Jan.), p. 102 — im Wald des Gunung Pasir (200 m), Insel Majau.

Zosterops chloris; Reichenbach, Handb. spec. Orn., Merop., 1852, p. 96 (Banda); Bleeker, Reis Minahassa en Mol. Arch. II, 1856, p. 241 footnote 1 (Banda); Hartlaub, Journ. f. Orn. 13, 1865, p. 24 (Banda); (pt.) G. R. Gray, Hand-List Birds I, 1869, p. 162 (Banda); (pt.) Giebel, Thes. Orn. III, 1877, p. 774 (Banda); Salvadori, Proc. Zool. Soc. London, 1878, p. 84 (Banda); Salvadori, Ann. Mus. Civ. Genova 16, 1880, p. 82 (Banda); Salvadori in Sclater, Zool. Challenger Exp. VIII, 1880, p. 66 (Banda); Salvadori, Orn. Pap. II, 1881, p. 370 (Banda); Sharpe, Cat. Birds Brit. Mus. 9, 1884, p. 184 (Banda); H. O. Forbes, Naturalist's Wand. Eastern Arch., 1885, p. 287 (Banda); Tristram, Cat. Coll. Birds, 1889, p. 210 (Groot Banda); Salvadori, Agg. Orn. Pap. II, 1890, p. 131 (no locality); Meyer & Wiglesworth, Birds Celebes, 1898, p. 487 (Banda); Hartert, Nov. Zool. 7, 1900, p. 237 (Banda); Hartert, Nov. Zool. 7, 1900, p. 551, 552 (Great Banda, Banda Neira); Finsch, Tierreich 15, 1901, p. 27 (Banda, Ceram-Laut, Gisser, Koor, Pulu Babi); Dubois, Syn. Av. I, 1902, p. 709 (Banda, Céram-Laut, Gisser, Key, Arou); Hartert, Nov. Zool. 10, 1903, p. 249 (Ceram-Laut, Manggoer, Kilsoein, Taam, Teniai, Soa); Rothschild & Hartert, Nov. Zool. 10, 1903, p. 453 (Pulu Babi); McClymont, Zoologist (4) 11, 1907, p. 348, 350 (Banda); Sharpe, Hand-List Birds 5, 1909, p. 10 (Banda, Ceram-laut, Kisser, Key Is., Pulo Babi); van Oort, Notes Leyden Mus. 34, 1911, p. 65 (Banda Islands); van Balen, Dierenw. Insulinde II, 1915, p. 483 (Molukken); Low, List Vertebr. Anim. Zool. Soc. London II, Birds, 1929, p. 175 (Moluccas, Ceram, Ceram-Laut and the Aru Islands); Mathews, Syst. Av. Australas. II, 1930, p. 702 (Banda and Ceram); Iredale, Birds New Guinea II, 1956, p. 167 (Banda, Schildpad Islands).

Zosterops rufifrons; Giebel, Thes. Orn. III, 1877, p. 777 (Ceram); Sharpe, Hist. Coll. Brit. Mus. II, 1906, p. 413 (no locality).

Zosterops brunneicauda; Reichenow & Schalow, Journ. f. Orn. 29, 1881, p. 94 (no locality); Salvadori, Orn. Pap. II, 1881, p. 373 (Gesser, Pulo-Babi, Choor); Sharpe, Cat. Birds Brit. Mus. 9, 1884, p. 190, 293 (Choor); Sharpe in Gould, Birds New Guinea III, pt. XIX, 1885 (Ceram Laut, Choor, Pulo-babi); Tristram, Cat. Coll. Birds, 1889, p. 210 (Choor); Salvadori, Agg. Orn. Pap. II, 1890, p. 132 (no locality); Meyer & Wiglesworth, Birds Celebes, 1898, p. 487 (Ceram-Laut, Choor, and Aru); van Balen, Dierenw. Insulinde II, 1915, p. 483 (Ceram-laut- en Aroe-eilanden).

Zosterops chloris rufifrons; von Berlepsch, Abh. Senckenb. Naturf. Ges. 34, 1911, p. 70 (Pulo-Babi, Aru-Inseln).

Zosterops tudjuensis; van Dedem, Jaarboekje N. O. V. 8, 1912, p. 109 (Noesa Touloen); Mathews, Syst. Av. Australas. II, 1930, p. 703 (Toedjoe Group); Snouckaert, Alauda (2) 3, 1931, p. 21 (Iles Tudju).

Zosterops chloris chloris; Stresemann, Mitt. Zool. Mus. Berlin 17, 1931, p. 218 (Pulu Babi bei Aru, Soa bei Klein Kei, Inselkette von Kei bis Gissar, Banda); Chasen, Bull. Raffl. Mus. 11, 1935, p. 266 (Banda Island); Stresemann, Journ. f. Orn. 87, 1939, p. 161 (Klein Kei); Mayr & de Schauensee, Proc. Ac. Nat. Sc. Philad. 91, 1939, p. 153 (Kam Wa I., Lophon I., Schildpad Is.); Mayr, List New Guinea Birds, 1941, p. 217 (distribution).

Zosterops chloris tudjuensis; Stresemann, Mitt. Zool. Mus. Berlin 17, 1931, p. 218 (Pulu Tudju nördlich von Seran); Mathews, Ibis (13) 2, 1932, p. 154 (name only).

Zosterops lutea chloris; Mayr, Bull. Am. Mus. Nat Hist. 83, 1944, p. 194, fig. 4;

van Bemmel, Treubia 19, 1948, p. 330 (distribution); Mees, Zool. Med. 32, 1953, p. 29 (distribution).

Zosterops lutea tudjuensis; Mayr, Bull. Am. Mus. Nat. Hist. 83, 1944, p. 194, fig. 4; van Bemmel, Treubia 19, 1948, p. 331 (P. Tudju); Mees, Zool. Med. 32, 1953, p. 30 (doubts validity).

Zosterops chloris subsp.; Jany, Journ. f. Orn. 95, 1954, p. 429 (Eiland Majau).

Subspecific characters. Characterized by large size, large bill, and dark coloration, with particularly an entirely deep yellow under surface.

Unmeathered parts. Iris bright chocolate brown, or chocolate brown or bright brown or chocolate or greyish coffee brown or ochreous or reddish brown, bill black or blackish or brownish black or black, mandible bright grey or ash grey with black tip, legs ash grey or dark ash grey or grey or plumbeous (Kühn); iris red brown, legs light blue (Stalker); iris cinnamon, outwards paler, bill black, legs greenish lead colour (van Dedem: types of *tudjuensis*); iris light brown, bill black, legs light blue (Saan: type material of *majauensis*).

Measurements. Wing 18 ♂, 57-63 (60.39); 18 ♀, 57-63 (59.92); 39 specimens, 57-63 (60.14); tail 18 ♂, 36-41½ (39.19); 18 ♀, 37-41½ (38.81); 39 specimens, 36-41½ (38.96); tarsus 38 specimens 17¼-20 (18.77); entire culmen 34 specimens, 13½-16 (14.67); exposed culmen 35 specimens, 10-12 (11.04); culmen from anterior point of nostril 35 specimens, 7¾-9½ (8.42).

Weights. ♂: 10, 13½, 15 g; ♀: 11, 15 g; —: 10 g (Saan, Ripley).

Distribution. An inhabitant of small islands throughout the Moluccan area; its centre of distribution seems to be the chain of islets connecting the eastern tip of Ceram with the Key Islands. Outside that area found on Poeloe Babi (Aroe Islands), Banda Islands, Misool (I have already commented on this locality, cf. Mees, 1953; I do not suggest that the specimen in question was collected on Misool itself, doubtless it originates from one of the small islands off its coast), Schildpad Eilanden between Misool and the western extremity of New Guinea, Poeloe Toedjoeh off the northern coast of Ceram, and Majau half way between Celebes (Minahassa) and Halmaheira.

In the previous paper referred to above I stated that in the Aroe Islands the race is known from one specimen only, but I overlooked that Kühn collected a series of eight on Poeloe Babi (cf. Rothschild & Hartert, 1903), several of which I had an opportunity to examine since.

First collector. Salomon Müller on Banda in 1828 (the types).

Figure. Gould's (1885) plate 59 is not quite as good as the majority of the plates in this work; the yellowish longitudinal stripes on head and neck, depicted, do not occur in the species, the legs of the lower bird are in an unnatural position, and the white eye-ring is too narrow.

Types. The two cotypes, ♂ and ♀, are RMNH cat. nrs. 1 and 2 (both examined); the two cotypes of *tudjuensis* are RMNH reg. nrs. 14921 and 14922 (both examined); the type of *majauensis* is Museum Buitenzorg nr. 21471 (specimen examined).

Moult. Not checked in the majority of specimens. Two specimens collected in September and one taken in October are not in moult, they are in abraded plumage.

Nidification. Though the list of literature references pertaining to this race is, at first sight, rather impressive, nearly all these records are just faunal lists, or at best descriptions of skins, and literature on habits and nidification of the form is apparently non-existent.

Habits, etc. Apparently not recorded (see remark in preceding paragraph).

Discussion. Some years ago, without giving particulars or supporting evidence, I remarked (Mees, 1953) that: "The proposed race *Z. l. tudjuensis* van Oort probably cannot be upheld". This was because the "very yellow" male of *chloris* from Kam Wa in the Schildpad Islands recorded by Mayr & de Schauensee (1939), which specimen at the time I had on loan, appeared in every respect identical with the two cotypes of *tudjuensis*. This made me suspect that there are two colour phases, a bright one and a dull one, in the subspecies. Since then I have examined much additional material and found the question to be much simpler. All the specimens of the Leiden Museum at the time available to van Oort for comparison with *tudjuensis* are old (taken by Salomon Müller, von Rosenberg, Hoedt, and other early collectors) and have been mounted and been exposed to sunlight for a long time. Therefore they are dull and faded. The description of *tudjuensis* is based on specimens in fresh plumage as compared with old and faded specimens. Several specimens collected by Kühn on islands in the range of *chloris* (Soa, Kilsoein, Poeloe Babi), specimens which are in good condition as they have always been kept as study skins, are indistinguishable from the types of *tudjuensis*.

Recently, one more subspecies has been described that needs consideration, it is *majauensis*. I have examined all three specimens on which this name was based, and though they differ from *chloris* in the way indicated in their diagnosis, I found notes on their labels saying that they had been preserved in alcohol previous to being skinned. The differences in colour noted are exactly those that one would expect to occur as a consequence of preservation in alcohol (see the discussion of the same topic in part I of this revision, p. 187). I wrote to Mr. Wegner, leader of the expedition that collected the Majau birds, and he kindly informed me as follows (in litt., 8-I-1955):

"Wat betreft de hier nog in het Museum zich bevindende 2 ex. van *Zos-*

terops chloris majauensis, ook dezen hebben een tijd lang in alcohol gelegen, zoals al het ornithologisch materiaal dat ik van Majau meebracht, aangezien wij bij ons vertrek van Obi het prepareer-bestek hadden ingepakt, zodat wij gedurende de reis niet meer eraan konden komen".

And in a later letter (25-II-1955): "... zal ik heden de twee balgen van *Z. chloris* opzenden. De vogels hebben ± 1 maand in alcohol gelegen en volgens Saan, de opzichter van onze werkplaats en ook volgens mij maakten de dieren een ietwat verbleekten indruk toen zij uit de alcohol genomen werden".

Particularly the second letter is conclusive. Though it is perhaps not relevant to comment on this, I am somewhat surprised that Jany (1955) entirely omits mentioning that all Majau specimens have been preserved in spirits. Apparently he was not aware of the disastrous effect this liquid has on the colours of some birds. Therefore several of the races described by Jany must remain doubtful until their distinctness has been confirmed by additional material.

As regards *Z. chloris majauensis*, in all characters except coloration the specimens agree with *chloris* and therefore I am obliged to place the name in synonymy with *chloris*. Notwithstanding the great distance of Majau from the nearest previously known locality inhabited by *chloris*, the occurrence of this widely distributed inhabitant of small islands is perhaps less surprising than it may seem at first sight. The very small islands in the northern Moluccas have usually been considered uninteresting from the collector's point of view, and it is quite likely that *chloris* occurs on some of the small islands off Obi and Batjan [1]).

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1) I take this opportunity to add some remarks on discoloration by alcohol in other species. Moreau (1957, p. 409 note 2) states that *Zosterops hovarum* Tristram "has been universally accepted as naturally grey". That may be so, but it is certainly no proof that the specimen actually was naturally grey. With knowledge of what kind of discoloration alcohol causes I am extremely reluctant to accept as natural specimens with a plumage exactly similar to what one would expect as a result of discoloration by spirits. The published plate (Ibis, 1887, pl. XI fig. 2) is strongly suggestive of alcohol.

In the case of the type specimens of *Zosterops obsoleta* Büttikofer and *Zosterops demeryi* Büttikofer I can be more positive, as I have carefully examined both type specimens in connection with Sclater's (1920) and Bannerman's (1949) curious refusal to accept *demeryi* as the valid name for the form named *Zosterops senegalensis leoninas* by Sclater. Rand (1951) has since corrected the error, but Finsch (1901, p. 25, footnote) and subsequent authors, for example Hartert (1924), all knew and agreed that both specimens had lost colour as a result of soaking in alcohol. *Z. demeryi* has apparently been in the fluid for a shorter time than *obsoleta*, as it retains some yellow pigment in the form of greenish coloration, whereas *obsoleta* is entirely grey and whitish, without any traces of carotenoid. Büttikofer's specimens are so generally known to have been preserved in alcohol that it is difficult to visualize why Moreau (1957) classed the type of *obsoleta* as probably an "individual variation".

Since writing the preceding lines I have re-read some of the literature concerning *Z.*

Zosterops chloris was originally described by Bonaparte (1850) and given Müller's manuscript name. Hartert (1900) erroneously took Müller to be the author of the name, but I am not aware that Müller has ever even so much as mentioned the species in any of his published papers.

2. **Zosterops chloris albiventris** Reichenbach

Z[osterops] albiventris Reichenbach, Handb. spec. Orn., Merop., 1852 (1 March), p. 92, t. 451 fig. 3298 — Oceanien = Ins. Warrior, Torres Straits (based on Zosterops à ventre blanc, Hombron & Jacquinot, Voy. Pôle Sud, Planch., 1844; cf. *Jacquinot & Pucheran, 1853).

Zosterops albiventer * Pucheran, Voy. Pôle Sud, Zool. III, 1853, p. 95 — Warrior's Island.

Zosterops flavogularis Masters, Proc. Linn. Soc. N. S. W. 1, 1876, p. 56 — Cape Grenville, Sue Island, Bet Island, Warrior Island, Darnley Island. Common at Cape Grenville = Islands off Cape Grenville, North Queensland, restricted by Mathews.

Zosterops griseiventris Sclater, Proc. Zool. Soc. London, 1883, p. 199 — Larat et Moloe insulas Tenimberenses.

Zosterops Bassetti Sharpe, Ann. Mag. Nat. Hist. (6) 14, 1894, p. 57 — Damma (= Damar).

Zosterops lettiensis Finsch, Notes Leyden Mus. 20, 1898, p. 136 — Letti.

Zosterops albiventris cairncrossi Mathews, Austral Av. Rec. 3, 1916, p. 62 — Cairncross Island, Queensland.

Zosterops luteus; (pt.) J. Macgillivray, Narr. Voy. Rattlesnake II, 1852, p. 357 (islands of Torres Strait); W. A. Forbes, Proc. Zool. Soc. London, 1878, p. 125 (Booby Island); Moseley, Notes Naturalist Challenger, 1879, p. 365 (Booby Island); W. A. Forbes, Collected Sc. Pap., 1885, p. 35, 40 (Booby Island); Moseley, Notes Naturalist Challenger, rev. ed., 1892, p. 314 (Booby Island).

Zosterops albiventer; Hartlaub, Journ. f. Orn. 2, 1854, p. 164 (Warrior's Island in der Torresstrasse); Bleeker, Reis door de Minahassa en den Molukschen Archipel I, 1856, p. 277, footnote (Nieuw-Guinea); von Rosenberg, Nat. Tijdschr. Ned. Ind. 25, 1863, p. 237; von Rosenberg, Journ. f. Orn. 12, 1864, p. 123 (W. coast New Guinea); G. R. Gray, Hand-List Birds I, 1869, p. 163 (Warrior's I.); Sharpe, Cat. Birds Brit. Mus. 9, 1884, p. 164 (Eagle Islet, Murray Island, Booby Island, West Isl.); Sharpe, Rep. Zool.

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hovarum. Moreau writes: "It is curious that while the Newtons stigmatize the plate of *hovarum* in *Ibis*, 1887, as inaccurate (they do not say in what respect), Delacour comments that "la planche de l'*Ibis* le represente très exactement"". What the Newtons actually wrote is: "..... that the colouring of the figure of this species, as well as the so-called *Z. praetermissa*, is so incorrect, that recognition from the plate would be impossible". Though they do not express themselves very clearly, there is in my mind no doubt that they tried to imply that the plates of both *hovarum* and *praetermissa* had been taken from discoloured specimens, and therefore are of little use as an aid to recognition of the birds in nature.

Later Finsch (1901) called *Z. hovarum* a "Vielleicht ausgebleichtes Spiritus-Stück von *Z. maderaspatana*". Therefore Moreau's statement that it has been universally accepted as naturally grey is incorrect.

Though there is, as far as I can judge, nothing inherently impossible in a specimen naturally lacking carotenoid though having melanins, I have never seen such a thing, among several thousands of *Zosterops*-skins I have handled, though I have seen albinos (lacking both yellow and black pigments). Lutinos, on the other hand, lacking the black pigments but not the yellow, have been recorded to occur in *Zosterops japonica simplex* (Pereira, 1935) and in *Zosterops lateralis gouldi* (Jones, 1958; Sporn, 1958).

Coll. Voy. Alert 1881-2, 1884, p. 17 (West Island, Torres Straits); Ramsay, Tab. List Austr. Birds, 1888, p. 14 (Pt. Darwin & Pt. Essington, Gulf of Carpentaria, Cape York); Tristram, Cat. Coll. Birds, 1889, p. 210 (West Island); Oustalet, Ann. Sc. Nat., Zool. 12, 1891, p. 289 (no locality); Oustalet, Nouv. Arch. Mus. Hist. Nat. Paris (3) 5, 1893, p. 142 (Iles des détroits de Torres); A. J. Campbell et al., Rep. 7th Meeting Australas. Ass. Adv. Sc., Sydney, 1898, p. 138 (no locality); Hall, Key Birds Austr., 1899, p. 38 (Northern Territory, North Queensland); Woodward in Fraser, W. Austr. Year-Book for 1898-99, 1900, p. 181 (Western Australia); A. J. Campbell, Nests Eggs Austr. Birds, 1901, p. 351 (descr. nest ex North, 1887); Broadbent, Queensl. Geogr. Journ. N. S. 17, 1902, p. 82 (N. Aus., Q'land); Woodward in Fraser, Notes Nat. Hist. W. Austr., 1903, p. 133 (N. Western Australia); A. G. Campbell, Emu 5, suppl., 1905 (Oct.), p. 40 (no locality); Hall, Key Birds Austr. 2nd ed., 1906, p. 38 (Northern Territory, North Queensland); North, Nests Eggs Birds Austr. Tasm. II, 1907, p. 213 (descr. nest); Sharpe, Hand-List Birds 5, 1909, p. 6 (N. Australia, Torres Straits Is.); W. Macgillivray, Emu 17, 1917, p. 66 (Quoin Island, Forbes Group).

Zosterops albiventris; Hartlaub, Journ. f. Orn. 13, 1865, p. 21 (Warrior-Island); Giebel, Thes. Orn. III, 1877, p. 774 (Nov. Guinea, Mysol, Jobi); Salvadori, Ann. Mus. Civ. Genova 16, 1880, p. 81 (Ins. Warrior); Salvadori, Orn. Pap. II, 1881, p. 366 (Ins. Warrior); Salvadori, Agg. Orn. Pap. II, 1890, p. 130 (no locality); Meyer & Wiglesworth, Birds Celebes, 1898, p. 495 (Cape Grenville and the Islands in the Torres Straits); Hartert, Nov. Zool. 7, 1900, p. 16 (Torres Straits); Finsch, Tierreich 15, 1901, p. 21 (Nordküste von Australien, Inseln der Torres-Strasse und höchst wahrscheinlich auch die benachbarte Südküste von Neu-Guinea); Dubois, Syn. Av. I, 1902, p. 708 (Australie N. et iles voisines); Mathews, Emu 7, suppl., 1908, p. 89 (N. Queensland, Is. of Torres Strait, Central Australia); Hull, List Birds Austr., 1909, p. 25 (no locality); Lucas & Le Souëf, Birds Austr. 1911, p. 364 (Central Australia, North Queensland, and Islands of Torres Strait); A. J. Campbell et al., Emu 12, suppl., 1913, p. 84 (Northern Territory, N. Queensland, interior New South Wales); W. Macgillivray, Emu 13, 1914, p. 175 (Cairncross Island, Wednesday Island, York Island, Darnley); W. Macgillivray, Emu 17, 1918, p. 203 (Haggerstone Island, Forbes Group, breeding); Mathews & Iredale, Austral Av. Rec. 4, 1920, p. 101 (no locality); Mathews, Birds Austr., suppl. no. 2, 1923, p. 180 (North Queensland); Mathews, Birds Austr. XI, 1924, p. 161 (North Queensland, never on the mainland); Wolstenholme, Emu 24, 1925, p. 249 (Byfield and Yeppoon); Ashby, Emu 24, 1925, p. 112 (Islands North Queensland); W. MacGillivray, Emu 25, 1926, p. 230 (upper end of the Barrier Reef); Bangs & Peters, Bull. M. C. Z. 67, 1926, p. 432 (Deliverance Island); Leach, An Austr. Bird Book, 1926, p. 223 (Torres St. Is.); Porsch, Biol. Generalis 5, 1929, p. 163; Mathews, Syst. Av. Australas. II, 1930, p. 699 (North Queensland); Mathews, List Birds Australas., 1931, p. 373 (North Queensland); Cayley, What bird is that?, 1931 (Dec.) (repr. 1951), p. 101, pl. XV fig. 5 (Islands off the coast of northern Queensland and Torres Strait Islands); Mack, Emu 31, 1932, p. 300 (Forbes and Haggerstone Islands); A. G. Campbell, Emu 32, 1932, p. 93 (Darnley Island, Murray Island, York Island); Mathews, Working List Austr. Birds, 1946, p. 121 (North Queensland); Whittell, Hist. Austr. Orn., 1954, p. 113, 114 (Low Isles in the northern part of Trinity Bay, Eagle Island); Barrett, An Austr. Animal Book, 2nd ed., 1955, p. 219 (on islands off the coast of north Queensland and on others in Torres Strait); Iredale, Birds New Guinea II, 1956, p. 166 (Torres Straits); Cayley, What bird is that?, 2nd ed., 1958, p. 113 (Islands off the coast of northeastern Queensland and in Torres Strait).

Zosterops flavogularis; Ramsay, Proc. Linn. Soc. New South Wales 2, 1877, p. 191 (Islands in Torres Straits, Rockingham Bay); North, Proc. Linn. Soc. New South Wales (2) 2, 1887, p. 408 (Warrior Island, nest); Ramsay, Tab. List Austr. Birds, 1888, p. 14 (Islands in Torres Straits and Cape Grenville); North, Descr. Cat. Nests & Eggs of Birds, 1889, p. 235 (Cape York, Islands of Torres Straits); Mathews, Austral Av. Rec. 3, 1917, p. 97 (note on type).

Zosterops griseiventris; Meyer, Zeitschr. ges. Orn. 1, 1884, p. 194 (Timorlaut); Meyer, Sitzungsber. Abh. Ges. Isis, 1884, Abh. 1, p. 42 (Babbar, Timorlaut); H. O. Forbes, Proc. Zool. Soc. London, 1884, p. 432 (Tenimber); Reichenow & Schalow, Journ. f. Orn. 34, 1886, p. 114 (no locality); Salvadori, Agg. Orn. Pap. II, 1890, p. 130 (Ins. Tenimberensibus; Babbar); Hartert, Nov. Zool. 3, 1896, p. 567 (Timor Laut); Robinson, Bull. Liverpool Mus. 2, 1899, p. 48, pl. I fig. 3 (Larat); Finsch, Notes Leyden Mus. 22, 1901 (March), p. 222, 224, 229, 234, 236, 269 (Kisser, Babber, Wetter, Letti, Timorlaut); Finsch, Tierreich 15, 1901 (March), p. 21 (Tenimber-Inseln, Kisser, Wetter, Babber, Letti); Hartert, Nov. Zool. 8, 1901 (July), p. 172 (Larat, Selaru); Dubois, Syn. Av. I, 1902, p. 707 (Iles Ténimber, Kisser, Wetter, Babber, Letti); Meyer, Notes Leyden Mus. 24, 1904, p. 234 (Timorlaut usw.); van Oort, Mus. d'Hist. Nat. Pays-Bas 10, pt. 1, 1907, p. 261 (Kisser); Sharpe, Hand-List Birds 5, 1909, p. 6 (Tenimber Is.); Mathews, Syst. Av. Australas. II, 1930, p. 699 (Tenimber Group).

Zosterops; Coppinger, Cruise of the Alert, 2nd. ed., 1884, p. 201 (Booby Island).

Zosterops griseiventer; Sharpe, Cat. Birds Brit. Mus. 9, 1884, p. 174 (Loetoer, Moloe, Larat); Tristram, Cat. Coll. Birds, 1889, p. 211 (Larat, Timor Laut); Tristram, Ibis (6) 6, 1894, p. 29 (no locality).

Zosterops lettiensis; Finsch, Syst. Uebers. Thätigk., 1899, p. 112 (Insel Letti); Hartert, Nov. Zool. 7, 1900, p. 16 (Lettie); Hartert, Nov. Zool. 11, 1904, p. 213 (Moa, Letti, Kisser, Wetter); Sharpe, Hand-List Birds 5, 1909, p. 6 (Kisser, Wetter, Babber, Letti); Hartert, Nov. Zool. 18, 1911, p. 16 (Sermatta).

Zosterops bassetti; Hartert, Nov. Zool. 7, 1900, p. 12, 16 (Dammer); Finsch, Tierreich 15, 1901, p. 22 (Damma = Dammer); Dubois, Syn. Av. I, 1902, p. 708 (Ile Dammer); Hartert, Nov. Zool. 13, 1906, p. 300, 304 (Babber, Luang, Dammer, Roma); Sharpe, Hand-List Birds 5, 1909, p. 6 (Dammar Isl., Roma Isl.); Mathews, Syst. Av. Australas. II, 1930, p. 699 (Dammer and Roma Islands).

Zosterops Bassetti; Finsch, Notes Leyden Mus. 22, 1901, p. 230, 236, 270 (Dama).

Zosterops albiventris albiventris; Mathews, Nov. Zool. 18, 1912, p. 384 (Torres Straits); Mathews, List Birds Austr., 1913, p. 253 (North Queensland) [1]).

Zosterops palpebrosa griseiventris; Hellmayr, Avif. Timor, in Haniel, Zool. Timor I, 1914, p. 53 (Tenimber); Stresemann, Journ. f. Orn. 87, 1939, p. 161, scheme (Tenimber).

Zosterops palpebrosa bassetti; Hellmayr, Avif. Timor, in Haniel, Zool. Timor I, 1914, p. 53 (Dammer).

Zosterops palpebrosa lettiensis; Hellmayr, Avif. Timor, in Haniel, Zool. Timor I, 1914, p. 9, 53 (Wetter, Roma, Kisser, Letti, Moa, Luang, Sermatta, Babber); Mathews, Syst. Av. Australas. II, 1930, p. 698 (Wetter, Roma, Kisser, Letti, Moa, Luang, Sermatta, and Babber Islands); van Bemmel, Treubia 17, 1940, p. 472 (Goenoeng Api).

Zosterops citrinella lettiensis; Stresemann, Mitt. Zool. Mus. Berlin 17, 1931, p. 218 (Wetar, Kisar, Letti, Moa); Mathews, Ibis (13) 2, 1932, p. 153 (no locality); Hoogerwerf, Trop. Nat. 28, 1939, p. 32 (Goenoeng Api); Hoogerwerf in 3 Jaren Indisch Natuurleven, 1939, p. 332 (Goenoeng Api).

Zosterops citrinella bassetti; Stresemann, Mitt. Zool. Mus. Berlin 17, 1931, p. 218 (Romah, Damar); Mathews, Ibis (13) 2, 1932, p. 153 (no locality); Stresemann, Zool. Med. 17, 1934, p. 19 (Teun).

Zosterops citrinella griseiventris; Stresemann, Mitt. Zool. Mus. Berlin 17, 1931, p. 218 (Tenimber); Mathews, Ibis (13) 2, 1932, p. 153 (no locality).

Zosterops citrinella albiventris; Stresemann, Mitt. Zool. Mus. Berlin 17, 1931, p. 218 (Inseln der Torres-Strasse); Mathews, Ibis (13) 2, 1932, p. 153 (no locality).

Zosterops citrinella subsp.; Hoogerwerf, Limosa 12, 1939, p. 49 (Goenoeng Api).

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1) It is obscure why Mathews used ternary nomenclature, as at the time he did not recognise subspecies.

Zosterops palpebrosa albiventris; Mayr, List New Guinea Birds, 1941, p. 217 (Islands of Torres Straits (Warrior, Deliverance, Cairncross) and small islands on the coast of Cape York).

Zosterops lutea albiventris; Mayr, Bull. Am. Mus. Nat. Hist. 83, 1944, p. 194, fig. 4.

Zosterops lutea griseiventris; Mayr, Bull. Am. Mus. Nat. Hist. 83, 1944, p. 194, fig. 4.

Zosterops lutea bassetti; Mayr, Bull. Am. Mus. Nat. Hist. 83, 1944, p. 194, fig. 4.

Zosterops lutea lettiensis; Mayr, Bull. Am. Mus. Nat. Hist. 83, 1944, p. 194, fig. 4.

Subspecific characters. A representative of the grey-bellied *citrinella*-group, of fairly large size. From the other two grey-bellied races this form differs by its slightly larger average size, and particularly by its longer and heavier bill. The bill may sometimes be as short as it is in *citrinella*, but is always heavier, less slender (pl. I and II).

There is no difference in colour between freshly moulted specimens of *albiventris* and *citrinella*, but the plumage of *albiventris* is apparently softer than that of the other race, and as abrasion makes specimens duller, series of *albiventris* usually look duller than series of *citrinella*.

Unfeathered parts. Iris light brown, bill black, base of mandible light blue-grey, legs blue-grey (Hoogerwerf: Goenoeng Api); iris dull bright brown, or bright coffee-brown, bill black, ash-grey base below, feet ash-grey (Kühn: Wetar); iris chocolate or pale chocolate, bill blackish with grey base below or black, grey below, feet dark ash-grey or ash-grey or bluish ash-grey (Kühn: Kisser); iris dull bright coffee or dull brown or dull bright coffee brown or dull chocolate, bill blackish, bright grey with black tip below or black, grey with black tip below, or black, ash-grey base with black below or dull black/pale grey with black tip, feet ash-grey or dark ash-grey, or yellowish grey (Kühn: Romah); iris dull coffee-brown, bill black with grey base below or black, ash-grey with black tip below, or black, ash-grey base below, legs yellowish ash-grey or ash-grey with a yellow shine (Kühn: Letti); iris dull brown, or dull brown (ochreous brown) or dull bright brown (ochreous) or dull bright brown, bill black, ash-grey below, or black, ash-grey base below, or black, bright grey base below, legs ash-grey or bright ash-grey (Kühn: Moa); iris bright brown or brown, bill brownish or dull greyish brown, legs plumbeous, or ash-grey, or dark grey (Kühn: Damar); iris brown (dark), bill and legs grey (reddish) (Kopstein: Teoen); iris burnt sienna red or chocolate, bill brownish, legs ash-grey or slate (Kühn: Babber); iris bright chocolate or chocolate brown, bill brown, colour-less base below, or greyish brown nearly colour-less below or brownish, grey below, legs bright plumbeous grey or pale ash-grey or bright grey (Kühn: Larat, Tenimber Islands); irides reddish brown, upper mandible pale corneous, or pale horn colour, lower corneous (H. O. Forbes: Larat, Tenimber Islands); iris greyish brown, bill dark brown, legs and feet greyish brown (H. M. S. Alert: West Island,

Torres Strait); iris silvery brown, upper mandible black, tip of lower mandible black, rest greyish black, legs bluish grey (McLennan: Cairncross Island).

Measurements. Wing 27 ♂, 56-64 (60.20), 25 ♀, 56-63 (59.80), 55 specimens, 56-64 (60.05), tail 27 ♂, 36-44 (40.70); 25 ♀, 37½-44 (39.46); 55 specimens, 36-45 (40.20); tarsus 53 specimens, 16½-20 (18.61); entire culmen 53 specimens, 13-17 (14.70); exposed culmen 53 specimens, 9½-12 (11.00); culmen from anterior point of nostril 53 specimens, 7½-10 (8.36).

Distribution. Zuid Wester Islands and Tenimber (Timor Laoet) Islands, where recorded as follows: Goenoeng Api, Wetar, Kisser, Roma, Letti, Moa, Damar, Teoen, Babber, Larat and Selaroe (specimens from all these islands examined), Moloe (Sclater, 1883), Loeang and Sermatta (Hartert, 1906; Mathews, 1930), and islands in the Torres Strait and near the eastern coast of the Cape York Peninsula (including islets of the Great Barrier Reef), in which area I have examined material from West Island, Booby Island, Eagle Islet, Cairncross Island, Forbes Island and Haggerstone Island, whereas it has been recorded from many more islets in the region, the majority of which do not appear on ordinary maps. The names of these islands can be found in the bibliography of the race.

The alleged occurrence of the form in continental Australia is based on a field observation only; according to Wolstenholme (1925): "In the scrubs at Byfield and also at Yeppoon . . . Mr. Alexander had good views of them . . . this species has only been found hitherto on islands off the Queensland coast. It is a pity that no specimens were obtained to settle the identity of these birds". I share Wolstenholme's regret that no specimens were secured at the time to settle the identity of these birds, and until evidence to the contrary becomes available it seems better to discard the record. The records for Central Australia (Mathews, 1908) and the interior of New South Wales (A. J. Campbell et al., 1913) go apparently back on A. J. Campbell (1901, p. 351): "In examining the collection of Mr. S. A. White, Fulham (South Australia), I came across a *Zosterops* with a rather stout bill and conspicuous yellow throat, which I believe is referable to this species. It was shot by the late Mr. Samuel White in the Barrier ranges, New South Wales. It is singular how this northern White Eye came so far south". Unless the specimen was misidentified, I presume that this is a case of misinterpretation of a locality. Samuel White is known to have collected on the islands of the Barrier Reef (cf. Whittell, 1954) and a label with the note Barrier R. may well have been interpreted subsequently as meaning Barrier Ranges. I have been unable to trace the specimen.

First collectors. Hombron & Jacquinot on Warrior Island, Torres Strait,

about 1839. According to Finsch (1901) the form would already have been mentioned from Wetar by Dampier. In the edition of Dampier here available I have been unable to find the relevant passage and I do not consider Dampier's description as quoted by Finsch very convincing.

Figures. Hombron & Jacquinot (1844, pl. 19, fig. 3) (coloured, natural size, good); Reichenbach (1852, t. 451 fig. 3298) (a small and primitive copy of Hombron & Jacquinot's figure); Robinson (1899, pl. 1 fig. 3) (coloured, natural size, by J. Smit, good); Mathews (1924, pl. opposite p. 156, coloured, natural size, by Grönvold); Cayley (1931, pl. XV fig. 5, bad, whole under surface yellowish green).

Type. The type is in the Muséum National d'Histoire Naturelle in Paris, from Dr. Jouanin (in litt., 28-V-1959) the following information was received concerning this specimen: „Le type de *Zosterops albiventer* porte le no. 10295-391 (des oiseaux montés). Il est étiqueté comme provenant de l'île Warrior. Sur la liste originale de la collection rapportée par Hombron et Jacquinot, il est marqué "Détroit de Torrès, Wavao" (Pourquoi Wavao?). Mais dans cette liste il est fait mention de deux spécimens de cette espèce. Aucune date n'est mentionnée". The type of *flavogularis* is in the Macleay Museum (cf. Mathews, 1917); cotypes of *griseiventris* which I examined are: BM nr. 85.4.14.18, BM nr. 88.7.1.762, and Kon. Belg. Inst. Natuurw. nr. I.G. 5559, reg. 9244; type of *bassetti* is BM nr. 92.4.4.11 (specimen examined); type of *lettiensis* is RMNH cat. nr. 10 (specimen examined).

Moult. Specimens collected in February (1), April (1), May (1), July (1), August (2), September (1), November (1), and December (1) are not in moult; a specimen collected in April is moulting primaries, two specimens collected in September are moulting rectrices, one specimen collected in October is moulting feathers of the forehead, but shows no main moult.

Nidification. North (1887), under the name *Z. flavogularis*, gave a full description of a nest taken by Masters on Warrior Island, the type locality of *albiventris*, on 27th June. The nest was the usual neat cup-like structure with the rim attached to the thin branches of a shrub, about five feet from the ground. Though the nest contained but two eggs of a uniform pale bluish-grey colour, four eggs is, according to North, the full complement. The measurements of the eggs are given as 0.72 by 0.5 inch (about 18.1 × 12.5 mm).

Later accounts (A. J. Campbell, 1901; North, 1907) are largely copied from North's 1887 description and do not contribute anything new, but Mathews (1924) records a clutch of four eggs taken at Cape York (not a very exact locality!) on the 22nd of December, 1909, the eggs being pale bluish green, rounded ovals in shape, surface of shell smooth and almost

quite free of gloss; measurements 16-17 by 13 mm. Macgillivray (1918) found two empty nests, one just started, the other ready to be occupied, on Haggerstone Island in December 1913. This would seem to be all that has been published concerning the nidification of the subspecies; months in which nests have been found are December and June.

Habits, etc. This species, normally a typical inhabitant of small islands, though also found on some larger ones (Tenimber, Wetar) is very common wherever it occurs in places as wide apart as Goenoeng Api (Hoogerwerf, 1939) and the islands on the Barrier Reef east of Queensland (Macgillivray, 1914). Hoogerwerf, in his various publications, gives good photographs of their habitat on Goenoeng Api. He observed them in small groups of from two to four specimens.

Macgillivray (1918) found as stomach contents remains of insects and berries, whereas Hoogerwerf found in some stomachs the small fruits of *Trema virgata.*

Voice. According to Macgillivray (1914), when at anchor off York Island, the singing of these birds seemed to come from hundreds of throats. Unfortunately he did not describe the song.

Discussion. Though Sclater (1883) remarked that *griseiventris* "belongs to the group of *Z. albiventris*", Stresemann (1931) was the first to recognise *albiventris,* which up to that time had always been considered a separate species, as a race of *citrinella.* However, no critical comparison between topotypical *albiventris* and the East Indian populations described under the various names here reduced to synonymy, has apparently ever been carried out.

About the validity of the three alleged subspecies *griseiventris, bassetti,* and *lettiensis,* there has been some controversy. *Z. lettiensis* was described by Finsch (1898), who a short time afterwards (Finsch, 1901a) having received additional material, reduced his new species to a synonym of *griseiventris.* But Hartert (1904) commented: "I cannot, however, agree with Dr. Finsch, who unites *Zosterops lettiensis* with *griseiventris* from Tenimber, which is smaller (if correctly measured, *males* being compared with *males* and *females* with *females*) and greyish on the sides". Remarks made two years later show that Hartert (1906) at least partially altered his previous views, for he wrote: "The specimens from Babber and Luang appear to be quite similar to each other, and I cannot distinguish them from examples from Dammer and Roma...".

Later Hartert (1911) again changed his mind, he wrote: "In *Nov. Zool.* 1906, p. 300, I erroneously called the birds from Babber, Luang and Roma "*Zosterops bassetti*" but now I come to the conclusion that the Dammer

form (*bassetti*) is darker green above and somewhat more brownish underneath, the form from Babber, Sermatta, Luang, Moa, Letti, and Kisser being of a more yellowish green, especially on the head, and more whitish below.

The specimens from Roma agree also with *lettiensis,* though it almost appears as if most of them were still more yellowish on the head, this latter colour extending all over the back; they will probably have to be named one day: The five Wetter specimens are somewhat variable, and I can hardly say if they agree better with the Roma form or with typical *lettiensis*".

All later authors, apparently following Hartert (1904) without renewed investigation (Sharpe, 1909; Hellmayr, 1914; Mathews, 1930; Stresemann, 1931; Mayr, 1944), continued to recognise four different races.

Personally I have not been able to confirm any of the alleged colour differences (brownish flanks in *bassetti,* greyish flanks in *griseiventris,* whitish flanks in *albiventris*), and as regards the differences in size emphasised by Hartert (1904) I refer to table II where the wing-measurements of all specimens examined are arranged geographically.

TABLE II

Comparative wing-measurements of *Zosterops chloris albiventris*

locality	males	females	sex unknown
Goenoeng Api	58, 62	59½	
Wetar	56½, 57	56, 58	59
Kisser	58½, 60½, 61, 61½, 64	58, 59, 61	
Romah	61, 63, 63	58, 62, 63	
Letti	60, 60, 60		60
Moa	57½, 61	58, 62	
Damar	63	61, 62, 62½	63
Teoen		61	
Babber	59½, 61, 63	59, 59, 59½	
Tenimber	56, 58, 60, 61, 61	59, 59	
Torres Straits	59	56½, 60, 60, 60, 62	

The variation is size of all populations combined of 8 mm is hardly in excess of the 10% that is normally found in homogeneous populations.

Perhaps the Tenimber specimens tend to have slightly smaller bills than those from other parts of the range, but the type specimen of *lettiensis* has the shortest bill of all, as short as in *citrinella* though deeper and heavier (pl. I fig. 2, pl. II fig. 2). Other specimens from Letti have large bills, thus showing that there exists a considerable amount of individual variation.

However, in one character, hitherto apparently overlooked, there does exist geographical variation. It is in colour of the bill. In the skins, and also in fresh specimens as can be gathered from the notes on the unfeathered parts which for this reason have been given in extenso, specimens from the

western part of the range (Goenoeng Api, Wetar, Kisser, Romah, Letti, Moa) and from the eastern part of the range (Torres Strait, islets off Queensland) have the bills black with pale grey or blue-grey base. Specimens from the central part of the range (Damar, Babber, Tenimber), on the other hand, have brownish bills. There is no clear cut dividing line between the different bill colours, actually intergradation exists on Babber, some specimens having darker bills than others. Moreover, when specimens from the extreme ends of the range: Goenoeng Api and eastern Queensland, are compared, there are no differences whatever, they are absolutely identical. Because of the slightness of the difference between the brown and black-billed populations, because of their smooth intergradation, and because of the undesirability of giving a separate name to the central populations whereas the eastern and western populations would have to remain united, I consider it inadvisable to lay stress on this minute point of difference by nomenclatorial separation.

Apparently the situation with *albiventris* is the same as with *maxi* in the west: after a period of expansion the first signs of subspeciation begin to appear, but they are as yet too slight to warrant any nomenclatorial splitting.

This period of expansion has already been discussed in the chapter Ecology of the species, but it is worth drawing attention to the fact that the relations of *albiventris* are evidently with the West. *Z. c. citrinella* and *Z. c. harterti* from Timor, Soemba and Wetar are very close relatives and it is evident that *albiventris* originated somewhere in the same region which, at the time, was close to the western border of the Pleistocene Sahoelland. Subsequently, following the receding borders of the Sahoelland as the sea-level rose, and probably assisted by the temporary appearance of small islands on the flooding shelf, *albiventris* was drawn eastwards as far as the islets on the Great Barrier Reef. There it must be a very recent arrival, as is confirmed by its morphological identity with the western populations.

3. **Zosterops chloris harterti** Stresemann

Zosterops palpebrosa harterti Stresemann, Nov. Zool. 19, 1912, p. 347 — Alor (Küstenzone?).

Zosterops citrinella; Hartert, Nov. Zool. 5, 1898, p. 456 (Alor).

Zosterops neglecta; (pt.) Finsch, Tierreich 15, 1901, p. 16 (Allor); (pt.) Dubois, Syn. Av. I, 1902, p. 707 (Allor); (pt.) Sharpe, Hand-List Birds 5, 1909, p. 4 (Alor).

Zosterops palpebrosa harterti; Hartert, Nov. Zool. 27, 1920, p. 435 (Alor); Hartert, Vögel paläarkt. Fauna, Nachtrag I, 1923, p. 33 (Alor); Rensch, Journ. f. Orn., Ergänzungsb. II, 1929, p. 202 (Alor); Mathews, Syst. Av. Australas. II, 1930, p. 698 (Alor Island); Snouckaert, Alauda (2) 3, 1931, p. 16 (Alor); Stresemann, Journ. f. Orn. 87, 1939, p. 161, scheme (Alor).

Zosterops citrinella harterti; Stresemann, Mitt. Zool. Mus. Berlin 17, 1931, p. 217 (Alor); Mathews, Ibis (13) 2, 1932, p. 153 (no locality).

Zosterops lutea harterti; Mayr, Bull. Am. Mus. Nat. Hist. 83, 1944, p. 194 fig. 4 (Alor).

Subspecific characters. This race is extremely close to *citrinella* from which it differs only by having a definitely brighter yellow rump. Between fresh specimens of both races there is no difference in brightness or extent of yellow on the foreheads and under tail coverts, nor in general coloration.

Unfeathered parts. Apparently not recorded.

Measurements of five specimens (3 ♂, 2 ♀); wing 56½-61 (58.20), tail 37½-43 (39.50), tarsus 17-17½ (17.25), entire culmen 13-13½ (13.25), exposed culmen 9½-10 (9.75), culmen from anterior point of nostril 7-8 (7.40).

Distribution. As far as at present known confined to Alor, but the subspecies may conceivably occur on Pantar and perhaps on other islands in the region.

First collector. A. H. Everett or one of his native collectors in March, 1897.

Not figured.

Type. AMNH nr. 700173.

Moult. Three specimens collected in March (of which, however, two are juveniles) are not in moult, two specimens collected in April are not in moult, two specimens collected in August are both undergoing their main moult: primaries, secondaries, and rectrices.

Nidification. Unknown (apart from the fact that the two male specimens referred to above, and collected in March, are juveniles).

Habits, etc. Unrecorded. Stresemann (1912) suggested that the race might be confined to the "Küstenzône", but a specimen was collected by von Plessen at 1000 m. altitude and the fact that the very similar and presumably ecologically identical race *citrinella* is of common occurrence at an altitude of 1100 to 1200 m., makes it likely that *harterti* has a similarly large vertical range.

Discussion. The ornithological exploration of Alor has been far less complete than that of the larger Lesser Soenda Islands, and this is reflected in the fact that no field observations concerning *harterti* have been published. Though Alor must evidently support a fauna poorer in species than the surrounding larger and higher islands, its mountains rise to over 1700 metres and would be well worth a thorough zoological exploration.

4. **Zosterops chloris citrinella** Bonaparte

Z[osterops] citrinella Bonaparte, Consp. Gen. Av. I, 1850, p. 398 — Timor.

? Sylvia Australasiae Vieillot, in Nouv. Dict. d'Hist. Nat. XI, 1817, p. 235 — l'Australasie (indeterminate, see discussion).

Zosterops citrinella intercalata Stresemann, Mitt. Zool. Mus. Berlin 17, 1931, p. 217 — Kambera in Mittel-Sumba.

Zosterops citrinella; Reichenbach, Handb. spec. Orn. Merop., 1852, p. 96 (Timor); Wallace, Proc. Zool. Soc. London for 1863, 1864, p. 494 (Timor); Hartlaub, Journ. f. Orn. 13, 1865, p. 22 (Timor); Finsch, Neu-Guinea, 1865, p. 164 (Port Essington, Timor); G. R. Gray, Hand-List Birds I, 1869, p. 163 (Timor); Giebel, Thes. Orn. III, 1877, p. 774 (Timor); Salvadori, Orn. Pap. II, 1881, p. 366 (Timor); Sharpe, Cat. Birds Brit. Mus. 9, 1884, p. 168 (Timor); Tristram, Cat. Coll. Birds, 1889, p. 210 (Timor); Heine & Reichenow, Nomencl. Mus. Hein. Orn., 1890, p. 72, (Timor) [1]); Büttikofer, Notes Leyden Mus. 13, 1891, p. 214 (Kupang and Amarassi); Oustalet, Ann. Sc. Nat., Zool. 12, 1891, p. 289 (Timor); Oustalet, Nouv. Arch. Mus. Hist. Nat. Paris (3) 5, 1893, p. 142 (Timor); Hartert, Nov. Zool. 3, 1896, p. 582 (Sumba); Hartert, Nov. Zool. 4, 1897, p. 265 (Savu); Hartert, Nov. Zool. 5, 1898, p. 117, 468 (Atapupu, Waingapo); Meyer & Wiglesworth, Birds Celebes, 1898, p. 492, 493 (Timor); Hartert, Nov. Zool. 7, 1900, p. 16 (Timor group); Finsch, Tierreich 15, 1901, p. 16 (Timor); Dubois, Syn. Av. I, 1902, p. 707 (Timor); Meyer, Notes Leyden Mus. 24, 1904, p. 234 (Timor und Savu); van Oort, Mus. Hist. Nat. Pays-Bas 10, (1), 1907, p. 261 (Timor); Sharpe, Hand-List Birds 5, 1909, p. 3 (Timor to Java); van Balen, Dierenw. Insulinde I, 1915, p. 483 (Kleine Soenda-eilanden).

Zosterops neglecta; (pt.) Finsch, Tierreich 15, 1901, p. 16 (Timor, Rotti, Savu, Sumba); (pt.) Dubois, Syn. Av. I, 1902, p. 707 (Rotti, Savu, Sumba, Timor); (pt.) Sharpe, Hand-List Birds 5, 1909, p. 4 (Timor, Rotti, Saro, Sumba).

Zosterops palpebrosa citrinella; Stresemann, Nov. Zool. 19, 1912, p. 346 (Timor, Savu, Sumba); Hellmayr, Avif. Timor, in Haniel, Zool. Timor I, 1914, p. 52, 53 (Bonleo); Hartert, Vögel paläarkt. Fauna, Nachtrag I, 1923, p. 33 (Timor, Savu, Sumba); Mathews, Syst. Av. Australas. II, 1930, p. 698 (Timor); Stresemann, Journ. f. Orn. 87, 1939, p. 161 scheme (Timor).

Zosterops citrinella citrinella; Stresemann, Mitt. Zool. Mus. Berlin 17, 1931, p. 218 (Timor); Kuroda, Birds Isl. Java II, 1936, p. 736 (Timor).

Zosterops citrinella intercalata; Rensch, Treubia 13, 1931, p. 386, 390 (Sumba: Kambera, Pajeti, Mao Marroe, Kananggar); Mathews, Ibis (13) 2, 1932, p. 153 (Sumba, Sawu); Kuroda, Birds Isl. Java II, 1936, p. 732 (Sumba).

Zosterops lutea citrinella; Mayr, Bull. Am. Mus. Nat. Hist. 83, 1944, p. 137, 143, 168, 194 (Timor: Tjamplong, Noilmina, Niki Niki, Nenas 1200 m; Soemba: Waingapu, Langgaliru, Mao Marru, Melolo).

Zosterops australasiae; Stresemann, Emu 51, 1951, p. 69, 70 (Timor); Condon et al., Emu 55, 1955, p. 189 (some of the Lesser Sunda Islands).

Subspecific characters. A grey-bellied subspecies which differs from *albiventris* and *harterti* in characters given under those races; see also plates I and II.

Unfeathered parts. Iris brown, bill black or blackish grey, legs blue-grey (Haniel: Timor); iris greyish yellow or pale sandbrown or dark sandcolour,

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1) On its front page this work is dated 1882-1890, thus suggesting that it has been issued in parts, and in the Ibis (6) 3, 1891, p. 278 we find: "Messrs. Heine & Reichenow have now finished their catalogue of the birds in the celebrated "Museum Heineanum" at Halberstadt, the first portion of which was printed in 1882". Mathews (1925), however, concluded that the whole was published in 1890 and I am convinced that he is right. Whittell (1954) erroneously refers to the publication as written by Reichenow & Heine instead of Heine & Reichenow.

bill black, legs grey (bluish) or dark blue-grey (Stein: Timor); iris brown (Stein: Soemba).

Measurements. Timor: wing of 6 ♂, 56-59 (57.00); 6 ♀, 55½-57 (56.42); 13 specimens, 55½-59 (56.88); tail 6 ♂, 36½-41 (38.08); 6 ♀, 35-37¾ (36.63); 13 specimens, 35-41 (37.40); tarsus 12 specimens, 16½-18 (17.10); entire culmen 13 specimens, 12-13¼ (12.75); exposed culmen 13 specimens, 9-10¼ (9.60); culmen from anterior point of nostril 13 specimens, 6½-7½ (7.06).

Soemba and Sawoe, 9 specimens (5 ♂, 4 ♀): wing 55-58 (57.00), tail 35-39 (37.50), tarsus 16¾-18 (17.34), entire culmen 12¼-14 (13.25), exposed culmen 9¾-11½ (10.31), culmen from anterior point of nostril 7¼-9 (7.88).

Distribution. Timor, Rotti, Sawoe and Soemba. The occurrence on Rotti was first reported by Finsch (1901) under the name *Z. neglecta*. Probably because of this misidentification, Rotti has not been included in the range of the subspecies by later revisors, but the record was based on a single individual still present in the Leiden Museum, leg. Ten Kate, which for some reason was not mentioned by Büttikofer (1892). On the other three islands *citrinella* is apparently common in cultivated regions from sea-level to at least 1200 m.

First collector. Salomon Müller on Timor in May, 1829.

Not figured.

Types. Two cotypes, RMNH cat. nrs. 1 and 2, labelled by Finsch as "types"; several more individuals in the same collection are labelled as "typical specimens" (all specimens examined).

Moult. Specimens collected in March (1), May (1), June (3) and July (1) are not in moult, they are in somewhat abraded plumage. Specimens taken in May (2), June (2) and July (1) and undergoing their main moult.

Nidification. Apparently not recorded. A laying female was collected by Dammerman on Soemba on 19-V-1925.

Habits, etc. Apparently common, but published information is non-existent.

Discussion. This form was described by Bonaparte (1850) from material collected by Salomon Müller in Timor, and for just over a century the name *citrinella* has been exclusively used for it.

Recently, Stresemann (1951), however, argued that the name *Sylvia australasiae* Vieillot, which had been brought into use by Mathews (1923) and applied by that author to the white-eye of south-western Australia, is really an older name for *citrinella* and ought to replace it, in which action he has been followed by Condon et al. (1955). Though normally I am in favour of strict adherence to the rules of priority, it is obviously undesirable to shift a name that has been used literally hundreds of times for one species

(*Z. l. gouldi*), to an entirely different species that for over a century had the name *citrinella* and moreover belongs to a widely distributed polytypic species in which all names are younger than Vieillot's *australasiae*. I believe that, fortunately, the transfer can be avoided. By an exceptional stroke of good luck, the type specimen seems to have disappeared (cf. Stresemann, 1951), so that we are entirely dependent on Vieillot's (1817) description, which reads as follows:

"Le Pouillot de l'Australasie, *Sylvia Australasiae,* Vieill., est d'un vert-olive tirant au jaune sur la tête; de cette dernière couleur sur le bord du front, la gorge et le devant du cou; blanc sur les parties postérieures; noirâtre sur les pennes des ailes et de laqueue, dont les bords sont d'un vert jaune; le bec brun; les pieds couleur de chair rembrunie. Taille du *pouillot fitis*".

Two questions can be raised as regards this description; the first is: is it certain that it pertains to a *Zosterops* at all; the second: if it is a *Zosterops*, can the species or subspecies be identified with certainty. As regards the first question, I believe that, notwithstanding certain omissions — no mention is made of a white eye-ring — it can be answered in the affirmative. As regards the second question, in attempting to identify the species we are assisted by the locality "l'Australasie" and the knowledge that the specimen must have been secured by one of the early French expeditions.

Even with these restrictions it is impossible to for certain identify Vieillot's description as to species. The fact that Mathews unhesitatingly applied it to *gouldi* (he wrote: "This description..... is a good one of the West Australian *Zosterops*.....") and Stresemann just as decidely transferred the name to Timor, is in this connection highly significant. Doubtless Stresemann's opinion was mainly based on Vieillot's remark that the frontal area is yellow. Whereas *citrinella* has a yellow forehead, the forehead of *gouldi* is usually of the same green colour as the back. In some specimens of *gouldi,* however, there is a certain amount of yellow just above the base of the bill on the forehead. Therefore it is scarcely possible to reject Mathews's choice for certain. But there are more complications. Timor has two species of *Zosterops*: *Z. chloris citrinella* in the lowlands, and *Z. montana steini* in the mountains with a lower limit of about 1200 m. These two species are virtually indistinguishable except by colour of the iris. However, I agree that the latter form can be ruled out because there is no evidence that members of the French expedition (the Expédition Baudin) ever ascended the mountains.

But another possibility cannot be ruled out. As is well known, Vieillot also described material from eastern Java collected by the botanist Leschenault de la Tour — which the fork-tailed thrush *Enicurus leschenaulti* (Vieillot) forms a lasting memorial — and in the mountains of eastern Java occurs

Z. montana montana, again a form very close to *citrinella* and perfectly fitting Vieillot's description.

Professor Stresemann, to whom I suggested this alternate possibility, answered me as follows (in litt., 28-IX-1955):

"Ich schliesse mich Ihrer Ansicht an, dass man den Namen *Z. australasiae* nach Möglichkeit als undeutbar verwerfen und den Namen *Z. citrinella* wieder einführen sollte. Soweit ich urteilen kann, ist freilich Leschenault auf Java nicht im Gebirge gewesen, er hat also dort schwerlich *Z. montana* sammeln können, aber man kann diese Vermutung nicht entscheidend widerlegen, und daher würde ich mich Ihnen anschliessen, wenn Sie den Namen *australasiae* ganz verwerfen".

Actually, there is ample evidence that Leschenault did visit the mountains; he published a report on a trip to Mt. Idjen (Leschenault, 1811), which shows that he visited the very summit and the crater of this volcano in September 1805. *Zosterops montana* is abundant on this mountain (I have examined a series of specimens).

The conclusion is that *Sylvia australasiae* Vieillot is entirely indeterminate as it could equally well apply to at least three different species. In the absence of a type specimen the only way in which the name might be saved would be by designating a neotype for it. The circumstances being what they are, I consider that such an action would be very undesirable, even if the name were restricted to the white-eye of south-western Australia that has already been known under the name *australasiae* for some time. The excavation of obscure and doubtful names, to replace with them well-founded names, is always objectionable and in a case like the present one ample opportunity exists to reject the name as indeterminate. As will be seen from the quotation above, Professor Stresemann, who was the first to query Mathews's identification, agrees with me.

Stresemann (1931) described the population from Soemba as distinct from *citrinella* on the basis of colour characters. The race *intercalata* was already discarded by Mayr (1944), and there is no need to reopen the discussion of its validity, as my findings entirely agree with Mayr's. Nevertheless, a certain amount of geographical variation seems to exist in the subspecies *citrinella.* As can be seen from the figures, there is a fairly considerable variation in bill-size (pl. I and II). I found in fairly large series that the Timor birds always have small bills. On Soemba and Savoe, on the contrary, a number of individuals have decidedly longer bills, though many have them an short as Timor specimens.

5. **Zosterops chloris flavissima** Hartert

Zosterops flavissima Hartert, Nov. Zool. 10, 1903, p. 29 — Binongka.

Zosterops flavissima; Dubois, Syn. Av. II, suppl., 1903, p. 1113 (Ile Tukang-Besi); Sharpe, Hand-List Birds 5, 1909, p. 10 (Tukan Bessi Is.); Hartert, Nov. Zool. 27, 1920, p. 434 (Binungku, Tukang Besi Islands); Mathews, Syst. Av. Australas. II, 1930, p. 703 (Tukang Besi (Binongka), Wantjee, Tomia, Kalidupea); Snouckaert, Alauda (2) 3, 1931, p. 20 (Iles Tukang Besi).

Zosterops chloris flavissima; Stresemann, Mitt. Zool. Mus. Berlin 17, 1931, p. 219 (Binungku, Tomia, Kalidupa, Wangi-Wangi).

Zosterops lutea flavissima; Mayr, Bull. Am. Mus. Nat. Hist. 83, 1944, p. 194, fig. 4.

Subspecific characters. The yellowest race; upper parts yellower than even in fresh specimens of *chloris* and much yellower than *intermedia*; rump and upper tail coverts distinctly more yellow than the back; the subspecies moreover differs from all other races of the species by its yellow (not dusky or black) lores, under which, however, there is a dusky-black stripe, continued backwards under the eye-ring; yellowish edges along the rectrices prominent.

Under parts bright yellow as in fresh specimens of *chloris*, definitely brighter than the rather pale yellow under surface of *intermedia*.

Unfeathered parts. Iris chocolate or dull chocolate or bright chocolate or pale chocolate or dull bright brown or bright coffee, bill black or blackish, colourless below, or dull brown, colourless below, or pale brown, colourless below, or brownish, pale yellowish below, legs yellowish grey or pale yellowish grey or bright yellowish grey or ash-grey (Kühn).

Measurements of 8 specimens (6 ♂, 2 ♀): wing 53½-59 (56.13), tail 36-39 (37.16), tarsus 16-17½ (16.59), entire culmen (6 specimens only) 12¾-13¾ (13.52), exposed culmen (6 specimens only) 9¾-10 (9.96), culmen from anterior point of nostril (6 specimens only) 7¼-8 (7.71).

Distribution. Confined to the Toekang Besi Islands, where known from Binongka or Binoengkoe, Kalidoepa, Tomia (specimens examined) and Wantjee (Hartert, 1903).

First collector. Heinrich Kühn on Binoengkoe, early December 1901. Kühn is not only the first collector, but also the only collector; at least I am not aware that anybody else has ever taken specimens and the eight I examined, though belonging to three different institutions and one private collection, were all collected by Kühn.

Not figured.

Type. AMNH nr. 700315.

Moult. Specimens collected in December (7) and January (1) are not in moult.

Nidification. Not recorded.

Habits, etc. Not recorded.

6. **Zosterops chloris mentoris** Meise

Zosterops intermedia mentoris Meise, Journ. f. Orn. 93, 1952, p. 365 — nomen novum for *Zosterops intermedia erwini* Meise, nec *Zosterops palpebrosa erwini* Chasen, 1934.

Zosterops intermedia erwini Meise, Journ. f. Orn. 89, 1941, p. 363 — Rano Lindoe, Zentral-Celebes.

Zosterops intermedia; Hartert, Nov. Zool. 4, 1897, p. 161 (Tawaya); Riley, Proc. U. S. Nat. Mus. 64, art. 16, 1924, p. 87 (Koelawi, Rano Lindoe).

Zosterops intermedia intermedia; (pt.) Mathews, Syst. Av. Australas. II, 1930, p. 702 (Celebes (Middle)).

Zosterops chloris intermedia; (pt.) Stresemann, Mitt. Zool. Mus. Berlin 17, 1931, p. 219 (Palu-Bai); (pt.) Stresemann, Ibis (13) 6, 1936, p. 360 (C. Celebes).

Subspecific characters. Differs from *intermedia,* to which this race is very close, by its darker, richer yellow under surface (which is as yellow as in the much larger race *chloris*), and its on the average smaller size of wing and bill but apparently relatively longer tail. Meise (1941) does not mention differences in coloration of the under parts, but diagnoses this race as having the upper parts: "wesentlich dunkler grün (obwohl ebenso golden grün)" as *intermedia*; but I do not think this character will be found to be valid when fresh specimens are compared.

Unfeathered parts. Iris brown (Kaudern).

Measurements of 19 specimens (12 ♂, 6 ♀, 1-): wing 52-54½ (53.26), tail 36½-40 (38.21), tarsus 16-17¼ (16.62), entire culmen 11¾-13 (12.17), exposed culmen 9¼-10½ (9.33), culmen from anterior point of nostril 6½-7½ (7.00).

Structure. Though this is a small race the tail is, surprisingly, relatively long.

Distribution (fig. 3). Northern Central Celebes, where known from Koelawi, Rano Lindoe, and Tawaya (specimens examined).

First collector. W. Doherty at Tawaya in September 1896.

Not figured.

Type. Destroyed in February, 1945 (Gaffrey, in litt., 8-I-1960).

Moult. Five specimens collected in February are not in moult, some are in abraded plumage, others in very fresh plumage; nine specimens collected in March are not in moult and are in fresh to fairly fresh plumage; one specimen collected in February and two collected in March are undergoing their main moult.

Nidification. Nothing has been recorded except that Riley (1924) mentioned a young bird not long from the nest from Rano Lindoe, collected on 4 March 1917. I have examined this specimen, a female, and found that it has a soft and weak bill, and a paler under surface than any other skin of the series. Wing 51, tail 31, tarsus 16¾, entire culmen 10½, exposed culmen 7½, culmen from anterior point of nostril 5½.

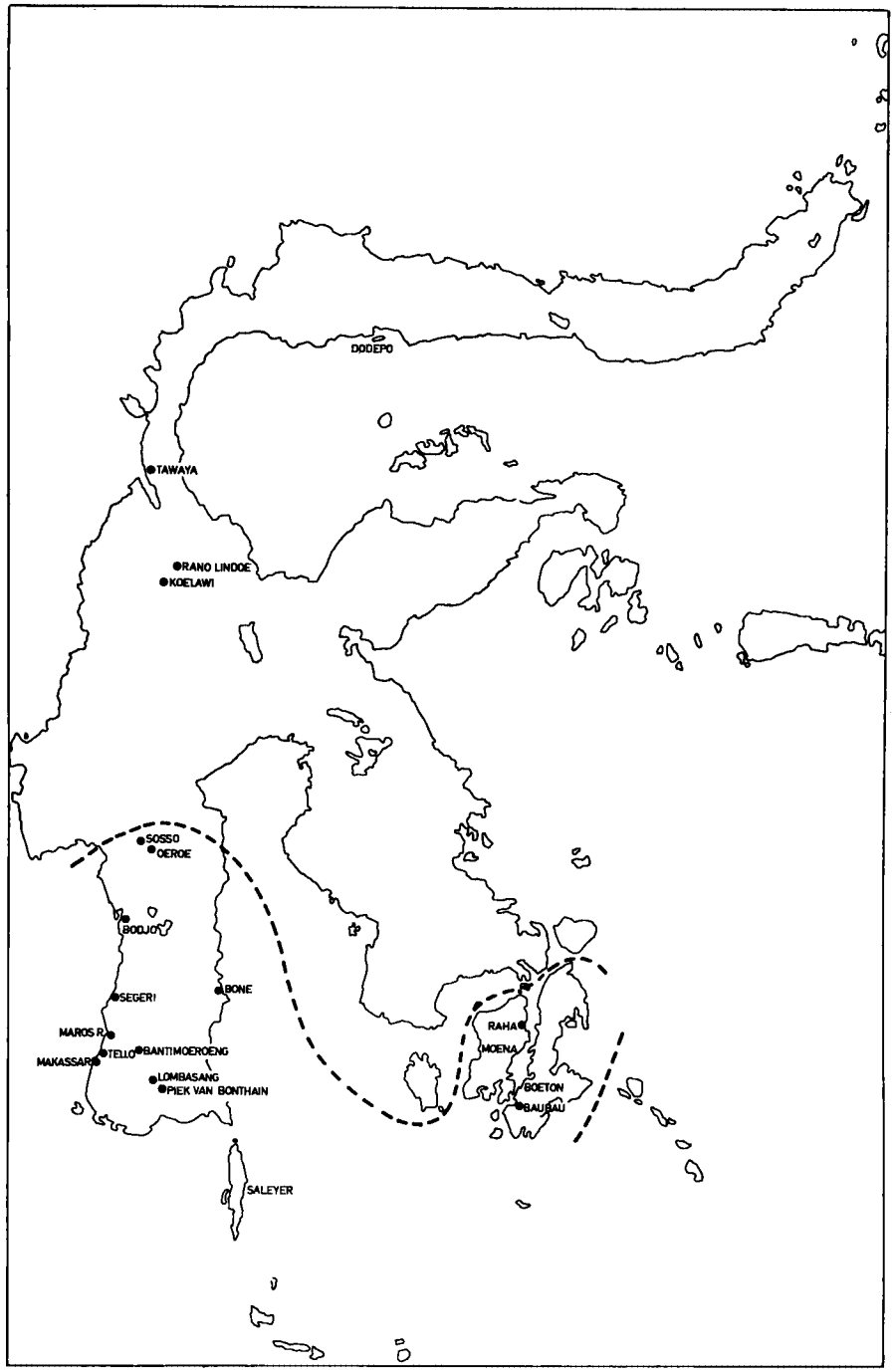

Fig. 3. The distribution of *Zosterops chloris* in Celebes; *intermedia* in South Celebes; *mentoris* in North-Central Celebes; subsp. on Dodepo Island.

Habits, etc. Apparently not recorded.

Discussion. Riley's (1924) remark that: ".....this species has not been reported from north-central Celebes before ....." is erroneous, he seems to have overlooked Hartert's paper.

7. **Zosterops chloris** subsp.

Zosterops intermedia; (pt.) Riley, Proc. U. S. Nat. Mus. 64, art. 16, 1924, p. 87 (Dodepo Island, Gulf of Tomini).

Subspecific characters. See discussion.

Unfeathered parts. Not recorded.

Measurements of two male specimens, wing 55, 56, tail 38, 41, tarsus 17, 17¾, entire culmen 13, 15, exposed culmen 10¼, 11, culmen from anterior point of nostril 7½, 8½.

Distribution. Only known from Dodepo Island in the Gulf of Tomini, Celebes [1]).

First collector. R. C. Andrews on 16 November 1909.

Not figured.

Moult. The two specimens, both collected on 16 November 1909, do not show moult.

Nidification. Not recorded.

Discussion. Riley (1924) discussed two specimens from Dodepo Island which did not agree with a series from central Celebes called *intermedia* by him but actually referable to *mentoris,* a race not yet described at the time. He wrote:. "Two specimens in the United States National Museum from Dodepo Island, Gulf of Tomini, are much lighter above and below with the loral streak less well defined and have larger bills than the series taken by Raven".

This record of the species' occurrence in the Gulf of Tomini seems to have been overlooked by later revisers (Stresemann, 1940; Mayr, 1944) and constitutes a very interesting extension of the known range. I have received these same two specimens on loan, and found them to differ from central Celebesian material (*mentoris*) as described by Riley. On the other hand

1) As the island of Dodepo does not appear on any readily available map, and as it appears as a collecting locality not only in ornithological but also in ichthyological literature, it may be worth while to quote a few particulars about it supplied to me by the director of the Topografische Dienst (in litt., 25-III-1960).

The geographical position of the island is approximately 0° 27′, 5 N. and 121° 32′, 2 E. of Greenwich. It is a small and insignificant coral islet situated off the South coast of the northern peninsula of Celebes. The islet is about five nautical miles from the coast. It is longer than wide, the longest axis, which has a N. N. W. direction, is about 500 m, and the greatest width is about 200 m.

they are very close to the four skins of *intermedia* from Makassar here (Western Australian Museum) available to me. The specimens from Dodepo are a bit darker above, and somewhat yellower below, but the difference is negligible. The tails are long as in *mentoris,* but tail-length in my opinion is a character of very doubtful validity where small series are concerned. As regards the yellow of the under surface the Dodepo specimens give an impression of being somewhat discoloured and on the whole they are so close to *intermedia* that on the material at present available I consider it inadvisable to separate them.

On the other hand, their geographic position, separated as they are from *intermedia* by the small-billed *mentoris,* makes it most unlikely that they are identical with the former. Many ornithologists would name specimens in a case like this, in order to draw attention to them, but I do not agree with such practice, and instead of helping a future revisor by already naming anything that might possibly be distinct (one of Mathews's arguments for flooding the market with synonyms), I think naming would considerably diminish the satisfaction of the future investigator who may find the true diagnostic characters of the population. Moreover naming, far from focussing attention on the specimens, would probably result in their conveniently slipping into nomenclature without renewed investigation for a long time to come.

Their labels show that these two USNM specimens have been received from the AMNH and in the latter institution no skins from the locality remain (Vaurie, in litt., 9-II-1959).

8. **Zosterops chloris intermedia** Wallace

Zosterops intermedia Wallace, Proc. Zool. Soc. London for 1863, 1864 (April), p. 493 — Macassar and Lombock, restricted to Makassar by Walden (1872).

Zosterops sumbavensis Guillemard, Proc. Zool. Soc. London, 1885 (October), p. 508 — Bima, E. Sumbawa.

Zosterops intermedia kalaotuae Meise, Journ. f. Orn. 77, 1929, p. 446 — Kalao tua.

Zosterops intermedia; Hartlaub, Journ. f. Orn. 13, 1865, p. 16 (Macassar und Lombock); (pt.) G. R. Gray, Hand-List Birds I, 1869, p. 162 (Celebes); Walden, Trans. Zool. Soc. London 8, 1872 (May), p. 72, pl. IX fig. 2 (Macassar); (pt.) Giebel, Thes. Orn. III, 1877, p. 776 (Celebes); von Rosenberg, Malayische Archipel, 1878, p. 272 (Celebes); Meyer, Ibis (4) 3, 1879, p. 132 (Makassar, Tello); (pt.) Salvadori, Ann. Mus. Civ. Genova 16, 1880, p. 81 (Macassar); (pt.) Wallace, Island Life, 1880, p. 437 (Celebes); Sharpe, Cat. Birds Brit. Mus. 9, 1884, p. 185 (Makassar); Guillemard, Proc. Zool. Soc. London, 1885, p. 555 (Maros River, S. Celebes); von Rosenberg, Mitth. Orn. Ver. Wien 11, 1887, p. 181 (Celebes); (pt.) Wallace, Island Life, 2nd ed., 1892, p. 467 (Celebes); Büttikofer in Weber, Zool. Erg. Reise Nied. Ost-Indien III, 1894, p. 303 (Insel Rusa Radja und Maumeri); Meyer & Wiglesworth, Abh. Mus. Dresden 6, 1896/97, nr. 1, 1896 (13 Jan.), p. 12 (Makassar, Sosso); Hartert, Nov. Zool. 3, 1896 (June), p. 153 (Indrulaman and Bonthain Peak); Hartert, Nov. Zool. 3, 1896 (June), p. 166, 168

(Bonerate, Saleyer, Djampea, and Kalao); Hartert, Nov. Zool. 3, 1896 (Dec.), p. 567 (Tambora, Soembawa); Hartert, Nov. Zool. 4, 1897, p. 157 (Bonthain Peak to about 3000 ft); Vorderman, Nat. Tijdschr. Ned. Ind. 58, 1898, p. 86 (Makassar); (pt.) Meyer & Wiglesworth, Birds Celebes, 1898, p. 486 (many particulars); (pt.) Finsch, Tierreich 15, 1901, p. 28 (Süd- und West Celebes (nebst den benachbarten Inseln Saleijer, Djampea und Kalao), Sumbawa, Insel Rusa Radja an der Nordküste von Flores); (pt.) P. & F. Sarasin, Mat. Naturg. Insel Celebes III, 1901, p. 97, 102 (Celebes, Sumbawa); (pt.) Dubois, Syn. Av. I, 1902, p. 709 (Celebes, Sumbawa, Flores N.); Hartert, Nov. Zool. 10, 1903, p. 30 (S. W. Buton); van Oort, Mus. d'Hist. Nat. Pays-Bas 10, pt. 1, 1907, p. 261 (Makassar); Sharpe, Hand-List Birds 5, 1909, p. 10 (S. & W. Celebes, Lesser Sunda Is.); van Balen, Dierenw. Insulinde II, 1915, p. 483 (Celebes en Kleine Soenda-eilanden).

Zosterops intermedius; (pt.) Finsch, Neu-Guinea, 1865, p. 164 (Celebes).

Zosterops chloris; (pt.) von Rosenberg, Malayische Archipel, 1878, p. 272 (Celebes); Hoogerwerf, Limosa 28, (1955), 1956 (March), p. 107, 108 (Komodo, Rintja).

Zosterops brunneicauda; Guillemard, Proc. Zool. Soc. London, 1885, p. 508 (Bima, Sumbawa); von Rosenberg, Mitth. Orn. Ver. Wien 11, 1887, p. 181 (Sumbawa).

Zosterops sumbavensis; Guillemard, Cruise of the Marchesa II, 1886, p. 149 (Bima); von Rosenberg, Mitth. Orn. Ver. Wien 11, 1887, p. 181 (Sumbawa); Finsch, Tierreich 15, 1901, p. 28 (Sumbawa); Sharpe, Hand-List Birds 5, 1909, p. 10 (Sumbawa); Stresemann, Nov. Zool. 20, 1913, p. 387 (Sumbawa); Mathews, Syst. Av. Australas. II, 1930, p. 701 (Sumbawa) [1]).

Zosterops sumbawensis; Hartert, Nov. Zool. 3, 1896, p. 567 (Bima); Dubois, Syn. Av. I, 1902, p. 709 (Ile Sumbawa).

Zosterops (chloris?) sumbavensis; Stresemann, Nov. Zool. 20, 1913, p. 381 (Sumbawa).

Zosterops intermedia sumbavensis; Hartert, Nov. Zool. 27, 1920, p. 433 (Bima, Sumbawa); Meise, Journ. f. Orn. 77, 1929, p. 448 (Sumbawa); Mathews, Syst. Av. Australas. II, 1930, p. 702 (Sumbawa) [1]).

Zosterops intermedia inornata; Meise, Journ. f. Orn. 77, 1929, p. 447 (Celebes; the name is evidently a lapsus).

Zosterops intermedia intermedia; Meise, Journ. f. Orn. 77, 1929, p. 446, 447 (Djampea, Kalao, Bonerate); Meise, Journ. f. Orn. 78, 1930, p. 199, 208, 210 (Djampea, Kalao, Bonerate); Mathews, Syst. Av. Australas. II, 1930, p. 702 (Celebes (South and Middle)).

Zosterops intermedia kalaotuae; Meise, Journ. f. Orn. 78, 1930, p. 199 (Djampea Archipelago); Mathews, Syst. Av. Australas. II, 1930, p. 703 (Kalaotua, Madu, (Buton?)); Snouckaert, Alauda (2) 3, 1931, p. 21 (Kalaotua et Madu).

Zosterops chloris intermedia; Stresemann, Mitt. Zool. Mus. Berlin 17, 1931, p. 219 (Südhalbinsel von Celebes, nördlich bis Zentral-Celebes (Palu-Bai)); Mathews, Ibis (13) 2, 1932, p. 154 (no locality); (pt.) Stresemann, Ibis (13) 6, 1936, p. 360 (S. Celebes); Stresemann, Journ. f. Orn. 87, 1939, p. 318 (Celebes); Stresemann, Journ. f. Orn. 88, 1940, p. 66 (Makassar, Lombasang 1100 m, Oeroe 800 m); Coomans de Ruiter, Ardea 36, 1948 (June), p. 66 (Bodjo, Zuid-Celebes); Coomans de Ruiter & Maurenbrecher, Ardea 36, 1948 (December), p. 171, 179, 194 (Makassar); Coomans de Ruiter, Ardea 39, 1951 (December), p. 265, 271, 277-281 (dal van de Bodjo-rivier, Zuid-Celebes); van Bemmel in Kalshoven, Plagen Cultuurgewassen Ind. II, 1951, p. 970 (Celebes en de Kleine Soenda Eilanden); Kuroda Jr., Misc. Rep. Yamashina's Inst. 10, 1957 (June), p. 394 (Celebes).

Zosterops chloris sumbawensis; Stresemann, Mitt. Zool. Mus. Berlin 17, 1931, p. 219 (Flores, Sumbawa); Stresemann, Journ. f. Orn. 87, 1939, p. 161 scheme (Sumbawa, Flores).

Zosterops chloris kalaotuae; Stresemann, Mitt. Zool. Mus. Berlin 17, 1931, p. 219

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1) Mathews (1930) lists this form twice, once as a species, once as a subspecies!

(Kalao Tua, Madu, Djampea, Kalao, Bonerate); Mathews, Ibis (13) 2, 1932, p. 154 (name only).

Zosterops chloris sumbavensis; Rensch, Mitt. Zool. Mus. Berlin 17, 1931 (Sept.), p. 459, 621, 632, 636 (Sumbawa: Bima, Poeloe Cambing; Flores; Endeh, Badjawa); Rensch, Treubia 13, 1931 (Dec.), p. 400 (Laboean Badjo); Mathews, Ibis (13) 2, 1932, p. 154 (no locality).

Zosterops lutea intermedia; Mayr, Bull. Am. Mus. Nat. Hist. 83, 1944, p. 194, fig. 4; van Bemmel & Voous, Treubia 21, 1951 (25 April), p. 45 (Muna and Buton); R. H. Baker, Univ. Kansas Publ., Mus., Nat. Hist. 3, 1951 (12 June), p. 325 (Makassar area); Mees, Sarawak Mus. Journ. 6, 1954 (1955), p. 135 (no locality = Boeton).

Zosterops lutea sumbawensis; Mayr, Bull. Am. Mus. Nat. Hist. 83, 1944, p. 194, fig. 4.

Zosterops lutea kalaotuae; Mayr, Bull. Am. Mus. Nat. Hist. 83, 1944, p. 194, fig. 4.

Zosterops chloris intermedius; Coomans de Ruiter, Ardea 38, 1950, p. 46 (Bodjo).

Subspecific characters. A yellow-bellied form of variable size, which differs from *chloris* in the following points: under surface paler, flanks less dark greenish, bill smaller and finer, wings and tail slightly to considerably shorter. From *citrinella* it differs, besides in having an entirely yellow under surface, by its slightly duller, greener mantle and a more brownish (not blackish as in *citrinella* and *harterti*) bill. Differences from *flavissima, mentoris,* and *harterti* are indicated in the descriptions of those races.

Unfeathered parts. Iris brown, maxilla dark brown, edges of maxilla and mandible light horn colour, tip of mandible dark brown; legs leaden, soles greyish yellow, nails dark horn colour (Vorderman, 1898: Makassar); iris dark brown or black, bill dark grey, legs dark grey (Heinrich); iris chocolate, bill black, grey below, or black, dull brownish grey below, feet ash grey (Kühn: Boeton); iris zinnober, bill blue-black, legs blue-grey (Elbert: Moena); iris light brown, bill, maxilla dark grey, mandibula horny white with dark tip, or pale brown-grey, or pale grey, legs blue-grey, or leaden (Rensch: Soembawa and Flores).

Measurements. Celebes: wing of 13 ♂, 53-58 (55.46); 7 ♀, 54½-57 (55.57); 28 specimens, 53-58 (55.32); tail 11 ♂, 34-40; 7 ♀, 35-37 (36.21); 26 specimens, 34-40 (37.15); tarsus 25 specimens 16-18½ (17.01); entire culmen 25 specimens, 12½-14 (13.26); exposed culmen 25 specimens, 9¼-11 (10.11); culmen from anterior point of nostril 25 specimens, 7-8¼ (7.56).

Moena and Boeton, 8 specimens (6♂, 2 ♀), wing 56½-59 (57.31), tail (7 specimens only) 32½-40 (38.57), tarsus 16½-18 (17.22), entire culmen 14-15 (14.25), exposed culmen 10½-11¼ (10.83), culmen from anterior point of nostril 8-9 (8.25).

Djampea, Kalao Toea, etc.: wing of 6 ♂, 54-59 (57.67), 8 ♀, 54½-60 (57.38), 15 specimens, 54-60 (57.60), tail of 6 ♂, 36-41 (38.42), 8 ♀, 36-40½ (38.44), 15 specimens, 36-41 (38.53), tarsus 14 specimens 17-19 (18.34), entire culmen 14 specimens 13¼-15½ (14.23), exposed culmen 13

specimens, 10-12¼ (11.10), culmen from anterior point of nostril 14 specimens, 7-9 (8.04).

Flores, Soembawa, Roesa Radja, 11 specimens (5 ♂, 3 ♀ -), wing 54-59 (56.36), tail 35½-41 (37.50), tarsus 17-18 (17.52), entire culmen 13¼-15 (13.93), exposed culmen 10-11 (10.36), culmen from anterior point of nostril 7½-8 (7.84).

Distribution (fig. 2, 3). The southern arm of Celebes, north at least to Oeroe where Heinrich collected a juvenile specimen (Stresemann, 1940), Moena and Boeton, Djampea, Madoe, Bonerate, Kalao, Kalao Toea, Roesa Radjah (near Flores), Flores, Komodo, Rintja, Soembawa, Poeloe Kambing (Bima Baai, Soembawa). I have seen material from all these islands with the exception of Komodo and Rintja, whence the species was recorded by Hoogerwerf (1956). Vertical range from sealevel to (on the larger islands) at least 1200 m (Badjawa, Flores, and Bonthain Peak, Celebes, specimens examined), and perhaps even 1800 m (6000 ft) (Hartert, 1896).

The race may well occur on Kabaena but no serious ornithological collecting has apparently ever been carried out on the island. It is somewhat surprising to find that Moena and Boeton have been comparatively well worked by collectors, whereas the more promising island of Kabaena, with its mountains rising to over 1500 m, and actually farther from the Celebes coast, has been almost entirely neglected.

First collector. A. R. Wallace at Makassar, Celebes, in 1856 [1]).

Figure. Walden (1872), plate IX fig. 2 (coloured, natural size, by J. Smit, drawn after the lectotype).

Type. This subspecies was originally described from "Macassar and Lombock". The populations inhabiting these two localities are no longer regarded as consubspecific and Walden's (1872) statement that the name was originally given to a bird from Makassar may conveniently be considered a restriction of type locality to that town. Subsequently Salvadori (1881) called the Makassar specimen "tippo della *Z. intermedia*". This type specimen, also listed by Sharpe (1884), is still present in the British Museum, where I examined it. It is a male, and its label is inscribed "♂, 1856, Macassar, A. R. Wallace, subject of Pl. 9 Tr. Z. S. vol. VIII, BM no. 73.5.12.111". Its measurements are: wing 58, tail 39, tarsus 17½ mm; in wing length the

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1) In the Leiden collection there is a specimen identified as *intermedia*, which bears the locality Java, and the name *Zosterops sibilans* Temminck M. S. It has no original label, the present one, with the notes mentioned above, being written by Finsch about 1900. It seems to agree with *intermedia* but perhaps it is an early individual of the very similar *maxi* which does occur in Java. The wing-length of 58 mm makes it unlikely that it comes from Celebes proper.

specimen is larger than any other individual from Celebes I have ever seen. It is in fresh plumage, having almost completed its main moult; the 2nd primary on both sides is not yet full grown and has its base in a sheath. This is Wallace's only specimen from Makassar I have seen, but there are in the British Museum three specimens from Lombok, collected by Wallace in 1856. Though originally cotypes, these specimens have lost their nomenclatorial significance as a consequence of the restriction of the type locality to Makassar.

Moult. Not checked in the majority of specimens. Of two specimens collected in June, one is moulting, the other one not; one specimen collected in September is moulting.

Nidification. Nest and eggs were already described in Meyer & Wiglesworth's (1898) classical work, but the most valuable contributions to the nidification of the subspecies are those by Coomans de Ruiter (1948, 1951) and Coomans de Ruiter & Maurenbrecher (1948). In these publications the nest is described as cup-shaped with an outside diameter of 6-7 cm, inside diameter 4.8 to 5 cm, depth of cup 2.2 to 2.5 cm, outside depth 2.5 to 4 cm; the outsides of the nest consisted mainly of small fibres, the cups were lined with fibres of *Arenga saccharifera* Labillardière. For the attachment of the nests to the branches, cobweb and fibres were used. Though the authors do not especially say so, the photographs (Coomans de Ruiter, 1951, pl. 5 fig. 4 and 5) show that the nest is suspended between two twigs in the usual way.

At Bodjo Coomans de Ruiter found nests from December to March inclusive, whereas at Makassar fledglings were seen in April, May, and October, and at Pare-Pare a fledgling was picked up dead on 18th September, 1944. The race may well breed throughout the year and the data are as yet insufficient to show if there is a peak period.

Coomans de Ruiter and collaborators found during their period of internment at Bodjo not less than 24 nests; they record the clutch size as two or three eggs, once four eggs, three apparently being the most common number. Coomans de Ruiter was very surprised to find, besides normal pale blue eggs, clutches of white eggs, both apparently being about equally common. Of the eight nests, containing eggs, which were examined, four contained blue eggs, and four white eggs (this was at the Bodjo-river, there may quite conceivably be geographic variation in the proportion of white versus blue eggs). Though Coomans de Ruiter stated that he had not been able to find any record of white eggs in Zosteropidae in literature, they are not of uncommon appearance in other species of *Zosterops*. Eggs of one clutch always seem to be of the same colour, so that presumable a genetic factor of the laying female is involved.

The measurements of seven eggs, as recorded by Coomans de Ruiter, are 15 to 16 × 11.9 to 12.4 mm. Interesting is the observation that nesting success at Bodjo was only 33% (though the samples are much too small to be of any statistic significance) and that many nests, for no evident reason, remained empty.

Habits, etc. In the cultivated regions, from sea-level to at least 1200 m, to the edges of the mountain forests, this is one of the most common bird species; it is plentiful in the gardens of Makassar (Heinrich in Stresemann, 1940; Coomans de Ruiter & Maurenbrecher, 1948).

The food, according to Coomans de Ruiter & Maurenbrecher, is very varied and includes both insects (among which are small white cicadas and aphids), and fruits: *Lantana camara* and *Ficus benjamina.* The same authors mention having observed a specimen that in woodpeckerfashion clung to the trunk of a tree, moving upwards with small jumps. De Haan (in van Bemmel & Voous, 1951) mentioned as food insects and fruits of *Ficus* and *Eugenia* (*Syzygium*).

Sometimes the birds, for apparently trifling reasons, gather in large flocks, uttering an agitated chirp. The presence of a a barn-owl, *Tyto rosenbergii* (Schlegel) would arouse them to feverish scolding activities.

Voice. Heinrich (in Stresemann, 1940) states that the call, which he renders as "schilp" is confusingly similar to that of a Sparrow, whereas Coomans de Ruiter & Maurenbrecher (1948) and Coomans de Ruiter (1951) write it as: "tjiuu-tjiuu-tjiuu". The same authors agree that the song is melodious or even rich and beautiful. According to Heinrich it is reminiscent of the song of *Sylvia communis* Latham (on me the song of this species never made a great impression!); Maurenbrecher found it a combination and mixture of the songs of *Phylloscopus trochilus* (L.), *P. collybita* (Vieillot), *Sylvia atricapilla* (L.) and *Sylvia borin* (Boddaert), but closest to *Phylloscopus trochilus,* and Coomans de Ruiter also found the song very similar to that of *P. trochilus.* Von Plessen (in Meise, 1929, p. 448) described the song as: "ein Pfeifton, der in tiefer Lage beginnt und sehr hoch hinaufgezogen wird. Dann folgt ein recht angenehmes Zwitschern".

The sparrow-like call is apparently shared by several species which are unlikely to be closely related (cf. *Zosterops ceylonensis,* this revision, part I, p. 25, and *Z. kulambangrae kulambangrae,* postea, p. 149).

Discussion. Within the fairly extensive range of the subspecies as here delimited, there is a considerable amount of geographic variation in size. The specimens from southern Celebes are small (average wing-length 55.32), those from the Lesser Soenda Islands larger (average 56.36), and those from the small islands in between still larger (average 57.60). These differences

were already noticed by Meise (1929). On an average the bills of the specimens from Kalao, Kalao Toea, etc. are also somewhat larger than in Celebes specimens, but there is much overlap.

The populations of Moena and Boeton were kept out of discussion by Meise; my scanty data (average 57.31), and the list of measurements given by van Bemmel & Voous (1951) show that they are identical with the Djampea-Kalao Toea populations. This fact is of considerable historic interest, as it shows that Moena and Boeton have been colonized from these islands and not from the mainland of south Celebes. Here we again meet with the enigmatic fact that on Moena and Boeton these white-eyes are numerous (cf. van Bemmel & Voous, l.c.), whereas they seem to be absent from the adjacent S. E. arm of Celebes. Perhaps the explanation is that Moena and Boeton are fairly densely populated by men, whereas the S. E. arm of Celebes is not.

As regards differences in coloration, particularly of the under surface, supposed to exist between Celebes *intermedia* and the other pupulations, I cannot confirm Meise's (1929, p. 446-448) findings in this respect. There is a strong individual variation, due to wear, and perhaps also to age and sex, but no geographic variation. Previously Rensch (1931) already wrote that: "*Z. ch. sumbavensis* hat etwa die gleiche Färbung wie *intermedia* ist aber etwas grösser". Hartert (1920) reached the same conclusion, writing: "Our specimens ... are very closely allied to *Z. intermedia* from South Celebes, but their wings are 2 to 3 mm. longer, the bills larger. This is therefore a very close subspecies of *intermedia*."

Therefore there is no reason to retain either *sumbavensis* or *kalaotuae* on colour characters (*sumbavensis* was based on aberrant specimens, cf. Hartert, 1920; Rensch, 1931), so that the only differences that remain are those in size. In my opinion the figures presented above convincingly show that these differences in average size, not supported by colour-differences, are much too small to be used as the sole basis for subspecific discrimination. Again I want to stress the fact that statistical differences in size and other characters are of the greatest evolutionary and historical significance. They should be fully studied, and one of my aims with this revision is to ascertain such differences by measuring series of specimens from various localities. Such differences should not, however, be expressed in nomenclature for the simple reason that, as material amasses and methods become more refined, there will be no lower limit to such splitting. Both *sumbavensis* and *kalaotuae* fall far short of the accepted standards (the "75% rule").

9. **Zosterops chloris maxi** Finsch

Zosterops Maxi Finsch, Journ. f. Orn. 55, 1907, p. 302 — Pulu Pangan, Duizend Eilanden.

Zosterops solombensis Oberholser, Proc. U. S. Nat. Mus. 54, 1917, p. 188 — Solombo Besar Island, Java Sea.

Zosterops solombensis zachlora Oberholser, Proc. U. S. Nat. Mus. 54, 1917, p. 199 — Pulo Kalambau, Laurot Islands, Java Sea.

Zosterops intermedia periplecta Hartert, Nov. Zool. 27, 1920, p. 434 — Lombok, 1500 feet.

Zosterops intermedia; (pt.) Wallace, Proc. Zool. Soc. London for 1863, 1864, p. 493 (Lombock); (pt.) Hartlaub, Journ. f. Orn. 13, 1865, p. 16 (Lombock); (pt.) G. R. Gray, Hand-List Birds I, 1869, p. 162 (Lombock); Giebel, Thes. Orn. III, 1877, p. 776 (Lombock); (pt.) Salvadori, Ann. Mus. Civ. Genova 16, 1880, p. 81 (Lombock); (pt.) Sharpe, Cat. Birds Brit. Mus. 9, 1884, p. 185 (Lombock); Vorderman, Nat. Tijdschr. Ned. Ind. 54, 1895, p. 330, 341 (Laboean-hadji, Lombok); Hartert, Nov. Zool, 3, 1896, p. 557, 594 (Lombok, 1000 to 5000 ft.); (pt.) Finsch, Tierreich 15, 1901, p. 28 (Lombok); (pt.) P. & F. Sarasin, Mat. Naturg. Ins. Celebes III, 1901, p. 97, 102 (Lombok); (pt.) Dubois, Syn. Av. I, 1902, p. 709 (Lombok); (pt.) Sharpe, Hand-List Birds 5, 1909, p. 10 (Lombok); Berlioz, Ois. & Rev. Fr. d'Orn. N. S. 6, 1936, p. 385 (Lombok).

Zosterops intermedius; (pt.) Finsch, Neu-Guinea, 1865, p. 164 (Lombok).

Zosterops flava; (pt.) Vorderman, Nat. Tijdschr. Ned. Ind. 42, 1883, p. 215-216 (Leiden, Baai van Batavia); Vorderman, Nat. Tijdschr. Ned. Ind. 54, 1895, p. 321 (Noordwachter, Java Zee).

Zosterops Maxi; Bartels, Journ. f. Orn. 56, 1908, p. 474 (Pulu Sakit, Pulu Pangang, Pulu Tjina, Pulu Paniki, Onrust).

Zosterops solombensis solombensis; Oberholser, Proc. U. S. Nat. Mus. 54, 1917, p. 199, 200 (Solombo Besar Island); Snouckaert, Alauda (2) 3, 1931, p. 20 (Ile Solombo Besar).

Zosterops masci; W. M. Docters van Leeuwen, Flora 118/119, 1925, p. 82 (Leiden).

Zosterops maxi; von Plessen, Journ. f. Orn. 74, 1926, p. 552 (Pulu Mendjangan); Verwey, Fourth Pacific Sc. Congr., Exc. Coral Reefs Bay of Batavia, 1929, p. 16 (islands in Bay of Batavia); Dammerman, Treubia 11, 1929, p. 63 (Java Sea); Snouckaert, Alauda (2) 3, 1931, p. 21 (Poulou-Pangang, Archipel des Mille îles; Bali); van Lummel, Trop. Nat. 21, 1932, p. 222 (Onrust).

Zosterops intermedia periplecta; Meise, Journ. f. Orn. 77, 1929, p. 448 (Lombok); Mathews, Syst. Av. Australas. II, 1930, p. 703 (Lombok); Rensch, Eine biol. Reise Kl. Sunda-Inseln, 1930, p. 5 (Lombok); Snouckaert, Alauda (2) 3, 1931, p. 21 (Lombock); Meise, Journ. f. Orn. 89, 1941, p. 363, 370 (Noesa Penida).

Zosterops intermedia maxi; Meise, Journ. f. Orn. 77, 1929, p. 448 (Bali = P. Mendjangan); Meise, Journ. f. Orn. 89, 1941, p. 370, footnote 8 (Tausend-Inseln).

Zosterops chloris maxi; Bartels Jr. & Stresemann, Treubia 11, 1929, p. 143 (Java); Stresemann, Mitt. Zool. Mus. Berlin 17, 1931, p. 219 (Pulu Mendjangan, Tausend Inseln); Kuroda, Birds Isl. Java I, 1933, p. 125 (Pulu Pangang, Pulu Mendjangan); Chasen & Kloss, Treubia 14, 1933, p. 163 (Boeroeng, Karimata Isl.); Chasen & Kloss, Treubia 14, 1933, p. 171 (Karimoen Djawa, Poeloe Keleang); Chasen, Bull. Raffl. Mus. 11, 1935, p. 266 (Thousand Islands, Karimon-Java Islands); Kuroda, Birds Isl. Java II, 1936, p. 704, 723, 727 (Thousand Is., Pulu Mendjangan); Stresemann, Journ. f. Orn. 85, 1937, p. 169 (no locality); Hoogerwerf & Siccama, Ardea 27, 1938, p. 208 (elk bezocht eiland in de Baai van Batavia); Stresemann, Journ. f. Orn. 87, 1939, p. 161, scheme (West-Java, ? Ost-Java); Bartels Jr., Ardea 28, 1939, p. 23 (bij Batavia gelegen eilandjes); Lonsain, Holl. namen vogels van Java, 1941, p. 12 (Java); Hoogerwerf, Treubia 19, 1948 (May), p. 134 (Batavia a. s.); Coomans de Ruiter, Ardea 36, 1948

(June), p. 65 (no locality); Mees, Ardea 39, 1951, p. 206 (kleine eilandjes voor de kust van Java).

Zosterops masii; Ridley, Dispersal of Plants, 1930, p. 470 (no locality = Leiden).

Zosterops solombensis zachlora; Snouckaert, Alauda (2) 3, 1931, p. 21 (Ile Kalambau).

Zosterops chloris solombensis; Stresemann, Mitt. Zool. Mus. Berlin 17, 1931, p. 219 (Solombo), Chasen, Bull. Raffl. Mus. 11, 1935, p. 266 (Solombo Besar Island); Chasen, Treubia 16, 1937, p. 230 (Islet of Keramiah, off the south coast of Billiton).

Zosterops chloris zachlora; Stresemann, Mitt. Zool. Mus. Berlin 17, 1931, p. 219 (Pulu Kalambau); Chasen, Bull. Raffl. Mus. 11, 1935, p. 266 (Kalambau Island).

Zosterops chloris periplecta; Stresemann, Mitt. Zool. Mus. Berlin 17, 1931, p. 219 (Lombok); Rensch, Mitt. Zool. Mus. Berlin 17, 1931, p. 457, 458, 621, 622, 628 (Lombok: Narmada); Mathews, Ibis (13) 2, 1932, p. 154 (no locality); Kuroda, Birds Isl. Java II, 1936, p. 727 (Lombok); Stresemann, Journ. f. Orn. 87, 1939, p. 161 (Bali, Lombok).

Zosterops flava flava; (pt.) Chasen, Bull. Raffl. Mus. 11, 1935, p. 265 (North Watcher Islands).

Zosterops chloris; Rensch, Gesch. des Sundabogens, 1936, p. 113 (Sunda Bogen, Celebes, nicht Borneo); Sody, Madj. Ilmu Alam (= Nat. Tijdschr. Ned. Ind.) 111, 1955, p. 179, 182, 183, 191 (no locality = islands in Bay of Batavia).

Zosterops lutea maxi; Mayr, Bull. Am. Mus. Nat. Hist. 83, 1944, p. 194, fig. 4; Delacour, Birds Malaysia, 1947, p. 320 (Karimon-Java and the Thousand Islands); Voous, Limosa 21, 1948, p. 100 (Purmerend, Kerkhof); Hoogerwerf, Bijdr. Oöl. Eil. Java, 1949, p. 249 (nidification); Hoogerwerf, Limosa 22, 1949, p. 249 (nidification); Wynne, North W. Nat. N. S. 2, 1954, p. 625 (no locality); Mees, Sarawak Mus. Journ. 6, 1954, p. 135, 136 (distribution).

Zosterops lutea periplecta; Mayr, Bull. Am. Mus. Nat. Hist. 83, 1944, p. 194; Mees, Sarawak Mus. Journ. 6, 1954, p. 135 (no locality = Lombok).

Zosterops lutea solombensis; Mayr, Bull. Am. Mus. Nat. Hist. 83, 1944, p. 194 fig. 4; Delacour, Birds Malaysia, 1947, p. 320 (Solombo Besar); Wynne, North W. Nat. N. S. 2, 1954, p. 625 (no locality); Mees, Sarawak Mus. Journ. 6, 1954, p. 137 (systematic discussion).

Zosterops lutea zachlora; Mayr, Bull. Am. Mus. Nat. Hist. 83, 1944, p. 194 fig. 4; Delacour, Birds Malaysia, 1947, p. 320 (Kalambau Island); Wynne, North W. Nat. N. S. 2, 1954, p. 625 (no locality).

Subspecific characters. The dullest of the yellow-bellied forms; close to *intermedia,* but upper surface slightly more greenish, and under surface somewhat paler yellow. The colour of the under parts, however, is rather variable in both races.

Unfeathered parts. Iris light brown, bill, upper light grey-brown, lower light wine colour, or upper dark grey, lower light grey, legs bluish grey (Rensch: Lombok); iris olive brown, bill and feet dusky (Wallace: Lombok); iris greenish yellow, bill grey, legs grey (Elbert's native collectors: Lombok); iris light to medium brown, bill nearly black, below light grey with dark tip, feet slate (Hoogerwerf: Sepekan); eyes warm grey, or light grey, bill dark grey, mandible light grey with dark tip, or bill blackish, mandible flesh colour, legs light slate (Hoogerwerf: Karimoendjawa); iris pale brown or blackish brown (Rosier: Eiland Kerkhof); iris light brownish grey, maxilla light sepia brownish, mandible whitish grey, feet light leaden, soles yellow,

nails whitish brown (Bartels: Poeloe Pangang, type of the race); iris light grey, bill maxilla grey or dark grey, mandible light grey, legs slaty grey (Hoogerwerf: Dwars in de Weg); iris light grey to very pale grey (Kuiper: Poelau Kramiah).

Measurements (fig. 4). Western group: wing of 46 ♂, 54-58½ (56.34); 34 ♀, 53-58 (56.22); 90 specimens, 53-58½ (56.26); tail 46 ♂, 35-41 (38.02); 33 ♀, 35-41 (37.85); 89 specimens, 35-41 (37.96); tarsus 87 specimens, 16¼-19 (17.28); entire culmen 73 specimens, 11-15 (13.43);

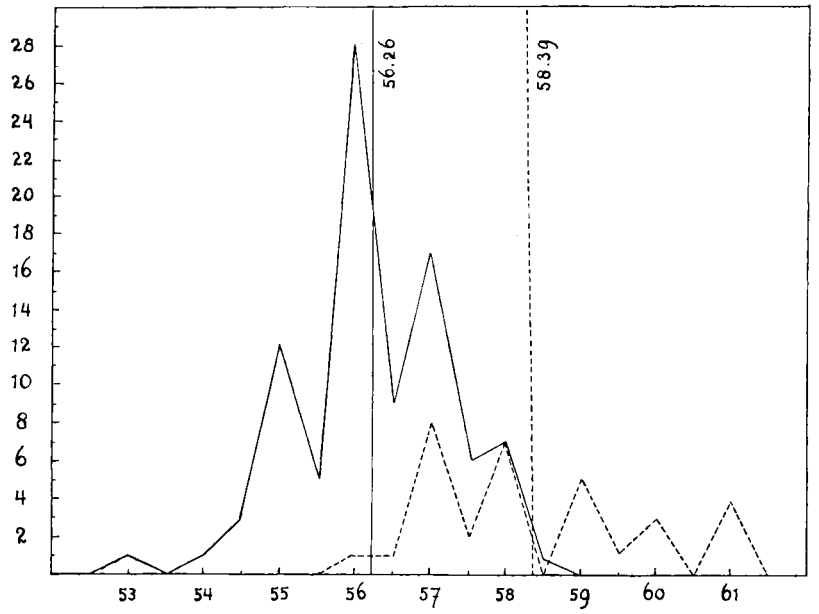

Fig. 4. The wing-length of 90 specimens of *Z. chloris maxi*, western group (drawn line) and 32 specimens of *Z. chloris maxi*, eastern group (broken line). The averages of each population are indicated by vertical lines. Horizontal: wing-length in millimetres, vertical: number of individuals with a certain wing-length.

exposed culmen 75 specimens, 8-12 (10.23), culmen from anterior point of nostril 73 specimens, 6-9 (7.66).

Eastern group: wing of 23 ♂, 56½-61 (58.52); 7 ♀, 56-60 (57.93); 32 specimens, 56-61 (58.39); tail 22 ♂, 37½-42½, 45 (39.52); 7 ♀, 36-39½ (38.29); 31 specimens, 36-42½, 45 (39.23); tarsus 32 specimens, 17½-19 (18.02); entire culmen 26 specimens, 13-15 (13.88); exposed culmen 26 specimens, 9½-11 (10.31); culmen from anterior point of nostril 26 specimens, 6½-8½ (7.69).

Weights. Western group, ♂: 9, 9, 9, 9, 9, 10, 10, 10, 10, 10, 12, 12, 12, 12 g., ♂ ?: 8 g., ♀: 8, 8, 9, 9, 10, 10, 10, 11, 11 g., —: 9, 10, 11, 12 g.

Eastern group: ♂: 9, 10, 10, 10, 11 g., ♀: 10, 10 g.

Distribution. Lombok and small islands in the Java Sea. More specifically the distribution of the subspecies as at present known is:

Western group. Karimoendjawa Islands (Karimon-Djawa, P. Gleang, P. Bengkoang, P. Sambangan, P. Seruni, P. Sintoel, P. Parang, P. Kamadjan, P. Tjendikian, P. Mendjangan Besar, P. Genting, P. Mendjangan Ketjil); islands in the Bay of Batavia (Hoorn, Amsterdam, Kerkhof, Leiden, Edam, Onrust); Duizend Eilanden (Poeloe Pangang, P. Noesi, P. Sakit, P. Tjina), Noordwachter, Dwars in de Weg, small islands near Billiton (P. Kramiah 8 km S. of Billiton, Manggar), Karimata Islands (P. Boeroeng).

Eastern group. Lombok from sea level to about 5000 feet (Hartert, 1896, personally I have not seen material from above 4000 ft.), Noesa Penida, Poeloe Mendjangang (off the northern coast of Bali), Sepekan (Kangean Islands), Solombo (= Salemboe), Poeloe Kalambau (Laoet Ketjil or Laurot Islands).

Specimens from all the localities listed here were examined, except Salemboe and Kalambau (types of *solombensis* and *zachlora*), and Noordwachter (Vorderman, 1895).

First collector. Probably A. R. Wallace on Lombok in 1856, but see footnot on p. 39.

Not figured.

Type. Coll. Bartels nr. 4295, now in RMNH (type examined); the type of *periplecta* is AMNH nr. 700349; the types of *solombensis* and *zachlora* are USNM nrs. 181588 and 181589.

Moult. The good series available of this subspecies, largely originating from the Bartels collection, but also including material recently collected by Hoogerwerf, enables me to discuss the moult in more detail than has been possible with any other form. The results are shown in table III.

Many of the specimens collected in March and June (not moulting) are in a strongly abraded plumage, whereas nearly all August specimens (not moulting) are in fresh plumage, those from October to November in fresh plumage or slightly abraded, those from December somewhat stronger abraded. It is evident that the main moult normally takes place from June to September.

Nidification. Nearly all published particulars on the nidification of *maxi* (Hoogerwerf & Siccama, 1938; Hoogerwerf, 1949) are based on van Lummel's (1932) observations made on the island Onrust in the Bay of Batavia. According to van Lummel the nests are small cradles, suspended from the

TABLE III

Moult in *Zosterops chloris maxi* Finsch

						no moult							
month	J.	F.	M.	A.	M.	J.	J.	A.	S.	O.	N.	D.	
Western group				3		9		8	5	8	9	7	
Eastern group			10		1				4				
combined			10	3	1	9		8	9	8	9	7(64)	
						moult							
month	J.	F.	M.	A.	M.	J.	J.	A.	S.	O.	N.	D.	
Western group				1		9		4	1	2	2	1	
Eastern group							2		4				
combined				1		9	2	4	5	2	2	1(26)	

fork of a twig, and the clutch size is two, the eggs being smooth bluish green.

Rensch (1931, p. 622), who erroneously calls the species *Z. chlorates* in his discussion, mentions a half naked young obtained at Narmada, Lombok, on 21 March and, from dissected specimens, suggests that the period of reproduction lasts at least from March to the first half of June.

Habits, etc. On Lombok the ecology of the subspecies apparently agrees with that of *intermedia* (cf. Rensch, l.c., who treats the two subspecies together). Rensch found as stomach contents of specimens from Lombok, Soembawa and Flores (*maxi* and *intermedia*) remains of fruits. The same author describes the call as a sparrow-like chirp.

Discussion. In a previous contribution (Mees, 1954) I provisionally accepted *solombensis* as a valid race (with *zachlora* as a synonym) because a comparison of the type-specimens by Mr. Deignan led to the conclusion that: "...*Zosterops lutea solombensis* is much like *maxi* in colouration, but differs by slightly greater size, which appears especially in the bill, and so far as one may judge from only two skins, *solombensis* is a valid race" (Deignan, in litt., 6-VI-1951).

In the mean time more, and partly freshly collected material from Sepekan (Kangean Islands), Poeloe Mendjangan, and Noesa Penida has become available, in addition to more specimens from Lombok, and it was found that all these populations are identical and range slightly larger than typical *maxi* from the western Java Sea. Actually larger series of *maxi* show that as regards wing length both *solombensis* and *zachlora* fall in the range of variation of topotypical *maxi*.

Meise (1929) and Rensch (1931) found that *maxi* is somewhat greener above than *periplecta* from Lombok, though the fact that two specimens from P. Mendjangan were first identified as *maxi* (von Plessen, 1926) and subsequently as *periplecta* (Meise, 1929; Rensch, 1931) shows that the dif-

ference must be slight. Later I (Mees, 1954) noted the same differences, stating that: ".....the difference between *maxi* and *periplecta* is extremely slight, the latter being somewhat yellower above and possibly a little larger...".

With the fresh material mentioned above at hand it proved hardly possible to confirm those alleged colour differences; if the eastern birds really are yellower, the difference is so slight as to be negligible, so that only the size-difference remains to differentiate between the two races. Figure 4, however, shows that the difference in size alone, though it is a real one, is not sufficient to separate the majority of specimens.

On the basis of the facts presented here it appears justified to sink both *solombensis* and *periplecta* in the synonymy of *maxi*. Meise (1941) already remarked that *maxi* was "vielleicht nicht unterscheidbar" from *periplecta*. Admittedly, there is hardly any difference in size of bill between the eastern and western populations, whereas *solombensis* apparently has a larger bill. One of the two known specimens of *solombensis* (the type), has, however, a damaged bill and the published length of the bill of the type of *zachlora* of 11½ mm (Oberholser, 1917) does not suggest that this specimen has an exceptionally long culmen.

Consequently, those who — perhaps for zoogeographic reasons — want to stress the difference between the eastern and the western populations, should use for the eastern populations, including those of Lombok, the name *solombensis*, which has priority over *periplecta*. Though in the eastern group I found a culmen length of only up to 11 mm, in western *maxi* it is up to 12 mm, so that there is no reason to believe that the type of *zachlora* falls outside the range of normal variation as regards bill-size.

In a previous paper (Mees, 1954) I gave in a key to the Bornean members of the genus *Zosterops* as a differential character between *Z. flava* and "*Z. lutea*" (*Z. chloris maxi*) that the former has greenish edges along the rectrices, the latter not. This is incorrect for, whereas the edges are very distinct in *flava*, they are also present in the species *Z. chloris* and the race *maxi*. This error was caused by the fact that many of the specimens of *maxi* I originally examined were in a somewhat abraded plumage, so that these greenish edges were less conspicuous than they normally are.

Species 13. **Zosterops grayi** Wallace

Zosterops grayi Wallace, Proc. Zool. Soc. London for 1863, 1864 (April), p. 494 — Ké Island.

Zosterops citrinella; Wallace, Ann. Mag. Nat. Hist. (2) 20, 1857, p. 473 (Ké Islands); G. R. Gray, Proc. Zool. Soc. London 26, 1858, p. 175 (Ké Island); *G. R. Gray, Cat. Mamm. Birds New Guinea, 1859, p. 56; G. R. Gray, Proc. Zool. Soc. London for 1861,

1862, p. 434 (Ke); von Rosenberg, Nat. Tijdschr. Ned. Ind. 25, 1683, p. 237 (van de Aroe eilanden tot Noord-Australië); von Rosenberg, Journ. f. Orn. 12, 1864, p. 123 (Von den Aru-Inseln bis Nord-Australian); von Rosenberg, Reis naar de Zuidoostereilanden. Werken Kon. Inst. Ned. Ind. Tweede Afd., 1867, p. 80 (Kei).

Zosterops Grayi; Hartlaub, Journ. f. Orn. 13, 1865, p. 23 (Ke-Inseln); Finsch, Neu-Guinea, 1865, p. 16 (Ke-Inseln); Giebel, Thes. Orn. III, 1877, p. 775 (Ins. Kee); Oustalet, Ann. Sc. Nat., Zool. 12, 1891, p. 289; Maitland, Tijdschr. Kon. Ned. Aardr. Gen. (2) 10, 1893, p. 224 (Iles de Kei); Oustalet, Nouv. Arch. Mus. Hist. Nat. Paris (3) 5, 1893, p. 142 (Moluques); Merton, Abh. Senckenb. Naturf. Ges. 33, 1910, p. 187 (Kei Eil).

Zosterops grayi; G. R. Gray, Hand-List Birds I, 1869, p. 163 (Ké); Salvadori, Ann. Mus. Civ. Genova 14, 1879, p. 654 (Kei Bandan, Kei Weri); Salvadori, Ann. Mus. Civ. Genova 16, 1880, p. 81 (Ins. Kei); Salvadori, Orn. Pap. II, 1881, p. 366 (Kei Bandan, Kei Werij); Sharpe, Cat. Birds Brit. Mus. 9, 1884, p. 162 (Ké Islands); Tristram, Cat. Coll. Birds, 1889, p. 211 (Bandan, Kei); Salvadori, Agg. Orn. Pap. II, 1890, p. 130 (no locality); Meyer & Wiglesworth, Birds Celebes, 1898, p. 495 (Kei Islands); Hartert, Nov. Zool. 7, 1900, p. 16 (Key); Finsch, Tierreich 15, 1901, p. 23 (Kei- und Aru-Inseln); Dubois, Syn. Av. I, 1902, p. 708 (Iles Key et Arou); Hartert, Nov. Zool. 10, 1903, p. 250 (Add islet, north of Great Key; Elat on Great Key Island); Sharpe, Hand-List Birds 5, 1909, p. 7 (Key Is.); von Berlepsch, Abh. Senckenb. Naturf. Ges. 34, 1913, p. 493 (Gross Kei: bei Ohilim); Mathews, Syst. Av. Australas. II, 1930, p. 700 (Key Islands); Mees, Zool. Med. 32, 1953, p. 27 (Great Key only).

Acanthiza (Gerygone) Grayi; G. R. Gray, Hand-List Birds I, 1869, p. 220 (Ké).

Gerygone citrinella; von Rosenberg, Malayische Archipel, 1878, p. 365 (Kei, Khoor).

Zosterops citrinella grayi; Stresemann, Mitt. Zool. Mus. Berlin 17, 1931, p. 218 (Gross-Kei und Add); Mathews, Ibis (13) 2, 1932, p. 154 (no locality).

Zosterops palpebrosa grayi; Stresemann, Journ. f. Orn. 87, 1939, p. 161 scheme (Gross Kei).

Zosterops lutea grayi; Mayr, Bull. Am. Mus. Nat. Hist. 83, 1944, p. 194, fig. 4; van Bemmel, Treubia 19, 1948, p. 331 (Add isl., Elat & Gng. Daab: Gr. Kei).

Characters. A large, bright coloured species with whitish belly, not very different from the basic *Zosterops*-pattern.

Upper parts generally bright yellowish citrine; anterior part of crown darker, brownish; frontal area yellow; eye-ring wide, white, interrupted in front by a blackish spot; primaries and rectrices blackish brown with broad yellowish citrine edges.

Under parts. Throat, upper breast, and under tail coverts Lemon Chrome, upper breast somewhat greener; a broad yellow streak connecting the yellow of throat and crissum; remainder of under parts satin white.

Unfeathered parts. Iris bright chocolate, bill black, mandible with grey base, feet grey with a yellow shine, or yellowish plumbeous (Kühn); iris brown, bill black, base of mandible white, legs silver grey (Merton).

Measurements of 22 specimens (11 ♂, 3 ♀, 8 —): wing 60-66 (62.98), tail 40-46 (42.66), tarsus 18-20 (18.86), entire culmen (18 specimens only) 14-17 (14.97), exposed culmen (18 specimens only) 11-12¾ (11.65), culmen from anterior point of nostril 8½-9½ (8.90).

Structure. Wing formula normal, with a 2nd primary in length between 7th and 8th; tail: wing index of 22 specimens 67.74%.

Distribution. Confined to Groot Kei, where it is known from the following localities: Gng. Daab, Elat, Ohilim, Ad, negory Soengie Tjoei (specimens from all localities examined). The record of the occurrence of this species on the Aroe Islands, brought in the literature by von Rosenberg, is certainly erroneous. The supposed occurrence on "Add Islet, north of the main island" is based on a geographical error (Mees, 1953); moreover I have now examined several specimens collected by Kühn at this locality, and their labels are inscribed: "Add N. of Great Key". Admittedly this is somewhat ambiguous, but certainly it can mean Add, Northern part of Great Kei.

First collector. A. R. Wallace in the first week of January, 1857 (cf. Wallace, 1857).

Figure. Mees, 1953, pl. I right hand figure (photograph of skin).

Type. BM nr. 73.5.12.90 (type examined).

Moult. Specimens collected in January (1), February (1), July (4) and August (1) do not show moult. One specimen collected in June shows moult in its rectrices, no certain wing-moult.

Nidification. Apparently not recorded.

Habits, etc. Evidently the species is fairly common in its restricted range, for von Rosenberg (1867) found it "zeer menigvuldig", and Merton refers to it as being fairly common. It has been taken by all collectors who visited the island, but notwithstanding this, nothing of any importance seems to have been recorded about the habits of this bird. Von Rosenberg (1867) records as native name Singwăk.

Discussion. The affinities of this species have been discussed in a previous paper (Mees, 1953), and also in the discussion of the species-group to which I believe it to belong.

Species 14. **Zosterops (grayi) uropygialis** Salvadori

Zosterops uropygialis Salvadori, Ann. Mus. Civ. Genova 6, 1874, p. 78 — Piccola Kei,

Zosterops uropygialis; Giebel, Thes. Orn. III, 1877, p. 777 (Ceram); Salvadori, Ann. Mus. Civ. Genova 14, 1879, p. 655 (Tual); Salvadori, Ann. Mus. Civ. Genova 16, 1880, p. 82 (Ins. Kei); Salvadori, Orn. Pap. II, 1881, p. 373 (Tual (Piccola Kei)); Sharpe, Cat. Birds Brit. Mus. 9, 1884, p. 190, 293 (Little Ké Island); Sharpe in Gould, Birds New Guinea III, pt. XIX, 1885, pl. 58 (Little Ké Island); Tristram, Cat. Coll. Birds, 1889, p. 212 (Little Ké); Salvadori, Agg. Orn. Pap. II, 1890, p. 132 (no locality); Maitland, Tijdschr. Kon. Ned. Aardr. Gen. (2) 10, 1893, p. 224 (Kei); Hartert in Webster, Through New Guinea and the Cannibal Countries, (Appendix I), 1898, p. 365 (Key-Islands); Finsch, Tierreich 15, 1901, p. 35 (Kei-Inseln); Dubois, Syn. Av. I, 1902, p 711 (Iles Kei); Hartert, Nov Zool. 10, 1903, p. 250 (Toeal only); Sharpe, Hist. Coll. Brit. Mus. II, 1906, p. 413 (no locality); Sharpe, Hand-List Birds 5, 1909, p. 15 (Key

Is.); Merton, Abh. Senckenb. Naturf. Ges. 33, 1910, p. 187 (Kei Eil.); von Berlepsch, Abh. Senckenb. Naturf. Ges. 34, 1913, p. 493 (Kei Dulah).

Zosterops fuscicapilla uropygialis; Mathews, Syst. Av. Australas. II, 1930, p. 707 (Key Islands).

Zosterops chloris uropygialis; Stresemann, Mitt. Zool. Mus. Berlin 17, 1931, p. 218 (Tual).

Zosterops chloris uropygialia; Mathews, Ibis (13) 2, 1932, p. 155 (no locality).

Zosterops lutea uropygialis; Mayr, Bull. Am. Mus. Nat. Hist. 83, 1944, p. 194, fig 4; Mayr, Am. Mus. Nov. 1269, 1944, p. 7 (no locality); van Bemmel, Treubia 19, 1948, p. 331 (Tual (Kei), Kei-dulah).

Zosterops (grayi) uropygialis; Mees, Zool. Med. 32, 1953, p. 29 (Little Key).

Characters. A large species, greenish above, all yellow below, with a fuscous cap and no eye-ring.

Upper parts bright yellowish citrine, indistinguishable from those of *grayi*; cap fuscous, anteriorly extending over front and loral region; consequently no yellow frontal area; wings and tail as in *grayi*; eye-ring reduced to a number of very small, scaly feathers, not giving the impression of a ring; on account of this reduction skin round the eye partly bare.

Under parts. Whole under surface bright yellow, Lemon Chrome on throat and centre of belly, more olive tinged on the flanks.

Unfeathered parts. Iris light brown or bright brown or brown, bill black or brownish or brownish black, legs lead colour or plumbeous or plumbeous grey (Kühn); iris light brown, maxilla brown, mandible light grey, legs leaden grey (Merton). In all skins examined the bill is brownish.

Measurements. Wing 11 ♂, 59-63 (61.41); 7 ♀, 59-63 (61.29), 19 specimens, 59-63 (61.29); tail 11 ♂, 40-43½ (41.41); 7 ♀, 38, 40½-43½ (41.21); 19 specimens, 38-43½ (41.16); tarsus 19 specimens, 18-20 (18.91); entire culmen 18 specimens, 13½-15½ (14.75); exposed culmen 18 specimens, 10¾-12½ (11.68); culmen from anterior point of nostril 18 specimens, 8-9 (8.50).

Structure. Wing formula normal with 2nd primary in length between 7th and 9th; tail: wing index of 19 specimens 67.15%.

Distribution. Confined to Klein Kei (Toeal or Noehoe Rowa). Actually Klein Kei consists of two islands, a larger one and a smaller one on which the town of Toeal is situated. Apparently these two islands do not have separate names with the natives (Planten, 1892), though on later maps (Zwierzycki, 1927) the smaller island is called Toeal, the larger Klein Kai or Noehoe Roa, and therefore it is impossible to decide from published evidence if the species occurs on both islands (which seems almost certain because they are so close together) or on one of them only.

First collector. C. B. H. von Rosenberg in 1866 (several specimens in RMNH).

Figures. Gould's (1885) on the whole excellent coloured plate of natural size shows a mistake in that the specimen is depicted with a rather narrow but distinct white eye-ring, though Sharpe in the text quite correctly states that the eye-ring is absent. A photograph of a skin was given by Mees (1953, pl. I left hand figure).

Type. Holotype in the Genoa Museum.

Moult. Specimens collected in January (1), May (1), June (1), August (2), October (1), November (2) and December (1) are not in moult. The specimens from May and August are in fresh plumage, those from November and December somewhat abraded, the specimens from January strongly abraded, which suggests that the main moult takes place in the early months of the year.

Nidification. Apparently nothing recorded.

Habits, etc. The fact that it was brought home in series by all collectors who visited the Kei Islands, shows that the species must be common, but practically nothing has been recorded about it.

Discussion. Previously I have discussed the relationship of this species or subspecies (Mees, 1953). There is no reasonable doubt that it is closely related to *Z. grayi,* from which it differs by the extent of fuscous coloration on the crown (which also covers forehead and lores), the reduced eye-ring, the entirely yellow under parts, the slightly smaller wing and tail, and the brownish instead of black bill. The bird presents one of these cases where I find it very difficult to decide whether to consider it a full species or a race of *grayi* and the course here taken is admittedly but a half hearted attempt at a compromise. The problem is one of nomenclature only, and therefore not of very great interest; biologically the situation is perfectly clear. The close vicinity of Groot Kei and Klein Kei, inhabited by *grayi* and *uropygialis* respectively, on which I have already commented (Mees, 1953) brings these two forms on one line with the *Z. griseotincta* group in the Solomon Islands as a textbook example of how narrow stretches of water can suffice to create a perfect geographical isolation and subsequent differentiation into very distinct forms.

Species 15. **Zosterops consobrinorum** Meyer

Zosterops consobrinorum Meyer, Notes Leyden Mus. 24, 1904, p. 234 — Ostkette der Südosthalbinsel, Celebes.

Zosterops consobrinorum; P. & F. Sarasin, Reisen in Celebes I, 1905, p. 370 (S.O. Celebes); Sharpe, Hand-List Birds 5, 1909, p. 5 (S. E. Celebes); van Balen, Dierenw. Insulinde II, 1915, p. 483 (no locality); Stresemann, Mitt. Zool. Mus Berlin 17, 1931, p. 221 (Südost-Halbinsel von Celebes); Mathews, Ibis (13) 2, 1932, p. 153 (no locality); Stresemann, Ibis (13) 6, 1936, p. 360 (S. E. Celebes); Stresemann, Journ. f. Orn. 87, 1939, p. 307, 314, 356 385 (Südost-Halbinsel von Celebes); Stresemann, Journ. f. Orn. 88, 1940, p. 61, 65 (Lalolei, 300 m).

Zosterops sarasinorum consobrinorum; Mathews, Syst. Av. Australas. II, 1930, p. 697 (Celebes (South-East)); Snouckaert, Alauda (2) 3, 1931, p. 21 (la partie Sud-Est de Célèbes).

Characters. A small, pale bellied species thoroughly agreeing with the ordinary *Zosterops*-pattern.

Upper parts generally Warbler Green; upper tail coverts very slightly more yellowish; forehead and supra loral region green as the mantle or slightly more yellowish, but never yellow; eye-ring white, comparatively narrow, interrupted in front by the usual blackish dusky spot; lores and a streak under the eye-ring blackish; primaries, secondaries, and rectrices blackish, the rectrices entirely devoid of greenish outer edges or with only the faintest traces of them on their anterior parts.

Under parts. Chin, throat, upper breast and under tail coverts yellow, close to Lemon Chrome; remainder of under parts white, more greyish on flanks and breast; no trace of a yellow longitudinal streak.

Unfeathered parts. Iris brown or light brown, bill black, base of mandible pale grey, legs grey or dark grey (Heinrich).

Measurements. Wing of 8 ♂, 52½-56 (53.56); 8 ♀, 51-55 (52.88); 18 specimens, 51-56 (53.19); tail 8 ♂, 33-37 (35.94); 8 ♀, 33-37½ (35.88); 18 specimens, 33-37½ (35.83); tarsus 17 specimens, 14¼-16 (14.94); entire culmen 17 specimens, 11¾-13½ (12.53); exposed culmen 17 specimens 9-10¾ (9.90); culmen from anterior point of nostril 6¾-8¼ (7.41).

Structure. Normal in every respect. Length of 2nd primary between 6th and 9th; average tail:wing index of 18 specimens 66.32 %.

Distribution (fig. 5). The southeastern arm of Celebes, where it is apparently known from three localities only: Laloumera, Lalolei at 300 m, and Wawo at 50 m. Stresemann (1940) lists the Heinrich-specimens as coming from Lalolei only, but among the material received on loan from the Berlin Museum I found one skin from Wawo, taken by Heinrich (Mus. Berlin nr. 34.2478). Though the species is likely to be more generally distributed, the Wawo record means a considerable extension of the known range.

First collectors. P. & F. Sarasin at Laloemera in 1903. Meyer & Wiglesworth (1898, p. 494) mention that the Sarasins obtained a specimen of a white-eye which at the time they believed was *anomala*, at Kendari, S. E. Celebes, but the specimen was not preserved. It is likely that it belonged to *Z. consobrinorum*.

Not figured.

Type. "Bei *Z. consobrinorum* lagen A. B. Meyer 2 Exemplare vor, 1 ♂ und 1 ♀, von denen nur das ♀ nach Basel kam. Die Vermutung liegt also nahe, dass das von Meyer als eigentlicher Typus betrachtete Exemplar in

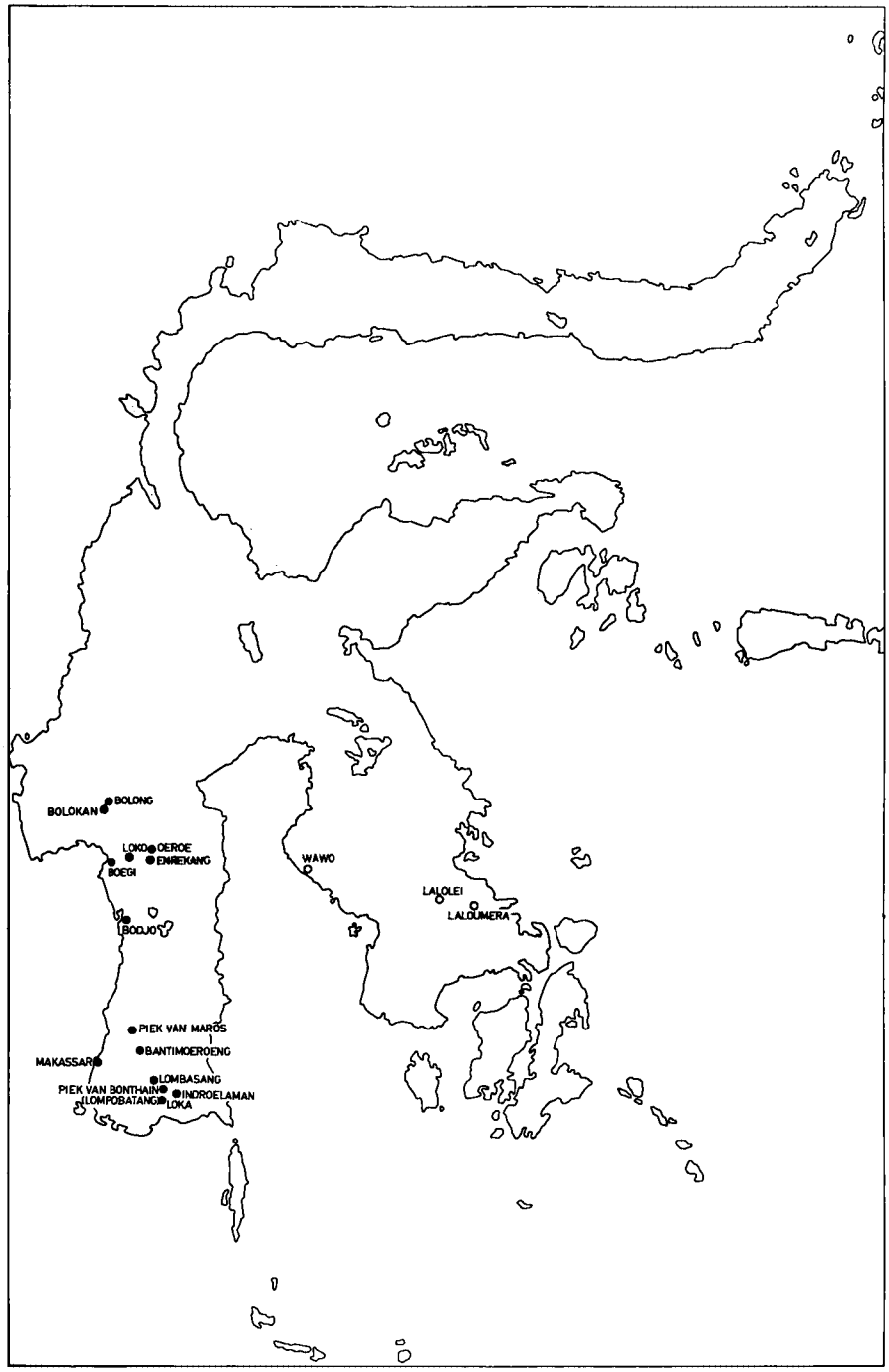

Fig. 5. The distribution of *Zosterops consobrinorum* (South-Eastern peninsula of Celebes) and of *Zosterops anomala* (Southern peninsula of Celebes).

Dresden blieb. Immerhin ist aus der Beschreibung darüber gar kein Anhaltspunkt zu gewinnen, so dass wohl einer Erhebung des Basler Exemplars zum Lectotypus nichts entgegenstehen dürfte" (Sutter, in litt., 17-IX-1959). Since the Dresden specimen was destroyed during the bomber attack of 13-II-1945 (Gaffrey, in litt., 8-I-1969), I select, following Dr. Sutter's suggestion, the specimen in the Basel Museum as lectotype. Its registered number in that institute is no. 3178.

Moult. Three specimens collected in February and seven collected in December do not show moult; one specimen taken in February and one taken in December show moult on the foreheads, no main moult. Specimens taken in January (1), February (4), and December (1) show moult in primaries and/or rectrices.

Nidification. Not recorded.

Habits, etc. The only field notes that have been published on this little known species are those of Heinrich (in Stresemann, 1940), who reported it to be ecologically similar to *Z. chloris intermedia* and *Z. anomala.* He states that it inhabits bushes, gardens and small pieces of forest left in the deforested lowlands.

Voice. According to Heinrich the species has a very attractive pretty and characteristic loud, almost "pearling" song-strophe. It lacks the trill of *Z. anomala* and *Z. atrifrons.*

Discussion. Stresemann (1940) suggested that *Z. consobrinorum* might be related to *Z. anomala* and *Z. atrifrons,* whereas he also drew attention to the close morphological agreement between *Z. consobrinorum* and *Z. montana.* Heinrich (in Stresemann, l. c.) found that *consobrinorum* has the same ecology as *atrifrons* and *anomala,* but at the same time noted that *consobrinorum* has a different song and lacks the police-whistle call of the other species.

Z. anomala differs from *consobrinorum* by its larger size and relatively longer tail, the larger and heavier bill, the lighter yellow throat (in this character *anomala* is identical with *citrinella*), the reduced eye-ring and the amount of black round the eye. As explained under *anomala,* I am not too happy about attaching that species or *consobrinorum* to *Z. atrifrons.* Perhaps *consobrinorum* and *anomala* are really related, but Heinrich's notes on the voice of the two do not lend support to this hypothesis, and morphologically they are also rather distinct.

Personally I am impressed by the similarity between *Z. consobrinorum* and *Z. chloris citrinella*; *consobrinorum* differs from *citrinella* in the following points: size somewhat smaller, though with practically identical proportions; upper parts deeper, richer, yellowish green; eye-ring perhaps slightly narrower; no or hardly any yellow on forehead and supra loral region (*citrinel-*

la has usually a distinct yellow forehead, only in an occasional individual the yellow is more restricted); primaries, secondaries, and rectrices darker, more blackish, the latter with but the faintest greenish edges (greenish edges distinct in *citrinella*); throat and under tail coverts slightly darker yellow; remainder of under parts perhaps slightly darker, greyer. Though this list of differences may at first sight look rather impressive, it actually boils down to very little.

However, as I have accepted that *intermedia* is conspecific with *citrinella,* this would mean that *consobrinorum* is also closely related to *intermedia.* Whereas the ranges of *intermedia* and *consobrinorum* are complementary (particularly the occurrence of *intermedia* on Moena and Boeton is noteworthy), Heinrich's notes on the voice of *intermedia* seem to disprove such a connection. While similarity of voice in Zosteropidae is, apparently, not necessarily an indication of close relationship, I consider it dangerous to reason the other way round and unite forms with strongly different voices.

I am well aware that, in this revision, I fail almost everywhere in the synthesis, for here, again, the conclusion is that no theory of the affinities of the species can be put forward except on a speculative basis, and that there are no arguments in favour of uniting *consobrinorum* with neighbouring forms, which are not outweighed by counterarguments. The truth is that *Z. consobrinorum,* being of the basic pattern, agrees in coloration with a number of species, some geographically near by, others remote, without this being an indication of a particularly close genetical affinity.

Species 16. **Zosterops anomala** Meyer & Wiglesworth

Zosterops anomala Meyer & Wiglesworth, Abh. Ber. Mus. Dresden 6, (1), 1896 (13 Jan.), p. 12 — Peninsula meridionali insulae Celébes, here restricted to Makassar by selection of a lectotype from that place.

Zosterops anomala; Hartert, Nov. Zool. 3, 1896 (March), p. 69 (Southern Celebes); Hartert, Nov. Zool. 3, 1896 (June), p. 149, 153 (Indrulaman); Hartert, Nov. Zool. 4, 1897, p. 157 (Bonthain Peak at 3000 and 4000 feet); Meyer & Wiglesworth, Birds Celebes, 1898, p. 100, 114, 116, 128, 492, 493, 494, pl. XXX fig. 3 (distribution, particulars); Finsch, Tierreich 15, 1901, p. 21 (Süd-Celebes); Dubois, Syn. Av. I, 1902, p. 707 (Célèbes S.); P. & F. Sarasin, Reisen in Celebes II, 1905, p. 314 (Lokka-Berg); Sharpe, Hand-List Birds 5, 1909, p. 6 (S. Celebes); van Balen, Dierenw. Insulinde II, 1915, p. 482 (Celebes); Mathews, Syst. Av. Australas. II, 1930, p. 697 (Celebes (South and South-West)); Stresemann, Mitt. Zool. Mus. Berlin 17, 1931, p. 221 (distribution); Stresemann, Ibis (13) 6, 1936, p. 360 (S. Cs. Celebes); Stresemann, Journ. f. Orn. 87, 1939, p. 307, 314, 356, 387, 390 (zoogeography); Heinrich in Stresemann, Journ. f. Orn. 87, 1939, p. 377 (Celebes); Stresemann, Journ. f. Orn. 88, 1940, p. 64-65 (Makassar, Bantimoeroeng, Lombasang 1100 m, Oeroe 800 m); Dupond, Verh. Kon. Natuurh. Mus. België (2) 23, 1942, p. 111 (Lompo Battang 400 m); Coomans de Ruiter, Ardea 38, 1950, p. 46 (Quarles Gebergte 1350 m, Bodjo); Coomans de Ruiter, Ardea 39, 1951, p. 265, 268, 276 (dal Bodjo-rivier); Mees, Sarawak Mus. Journ. 6, (1955), 1956, p. 645 (Celebes).

Characters. An average sized species with greenish upper parts, yellow throat and under tail coverts, pale grey remainder of under parts, and as outstanding feature a broad black loral line which is continued as a black ring encircling the eye. At the same time the white eye-ring usually present in the genus is absent, so that the result is a bird with a black instead of with a white eye-ring.

Upper parts generally Warbler Green; upper tail coverts slightly brighter (more yellowish), forehead and supra loral region yellow; the small feathers on the eye-rim which in other species form the eye-ring, are greatly reduced, being visible as tiny spots, shafts without webs; a broad and dull black loral line is present, which is continued backwards so as to include the whole eye. It must be realized that here not the circumorbital feathers which normally are white, have turned black, but that the white feathers have become vestigial whereas the black feathers — in most species present in front of and below the eye — have extended so as to encircle the whole eye. Primaries, secondaries, and rectrices brownish black, all broadly edged with Warbler Green on the outer margins.

Under parts. Chin, throat, and upper breast between Lemon Yellow and Lemon Chrome, usually deeper in tone than the first, but never as deep as the second; under tail coverts of the same colour, but somewhat paler; remainder of under parts pale grey, turning into whitish on the centre of the belly; no trace of a yellow longitudinal streak.

Unfeathered parts. Iris brown of light brown, bill black, or black, pale underneath, legs grey (Heinrich); iris pale red-brown or pale sepia, bill black, tip and base of mandible pale, feet pale grey or pale bluish grey (Doherty).

Measurements. Wing 25 ♂, 52½, 56-60½ (57.64); 18 ♀, 55½-59 (56.89); 43 specimens, 52½, 55½-60½, (57.33); tail 25 ♂, 34½, 36-43 (39.16); 18 ♀, 32, 36½-42 (39.33); 43 specimens, 32, 34½, 36-43 (39.23); tarsus 42 specimens, 15½-18 (16.54); entire culmen 42 specimens, 13-15¾ (13.96); exposed culmen 42 specimens, 9¾-12 (10.95); culmen from anterior point of nostril 42 specimens, 7¼-9½ (8.18) [1].

Structure. Wing rounded, 2nd primary short, never longer than 8th primary, and often even shorter than 10th. Tail:wing index of 43 specimens, 68.44 %.

1) The specimen with wing 52½, tail 34½ (RMNH cat. no. 1: Indroelaman) is remarkably small, so small indeed that I began to doubt the correctness of my measurements. At my request Dr. Junge re-examined the specimen and informed me (in litt., 12-III-1959) that the measurements as I took them are correct, and that the bird seems adult and is not in moult or damaged in any other way that might have influenced its size. It is therefore not possible to exclude this specimen from the series.

Distribution (fig. 5). The southern arm of Celebes, north at least to the dale of the Bolong near Bolokan in the Quarles Mountains (Coomans de Ruiter, 1950). Locality records are: Makassar, Bantimoeroeng, Lombasang, Piek van Bonthain (Lompobatang), Indroelaman, Oeroe (specimens examined), Bodjo (Coomans de Ruiter, 1951), Bolokan (Coomans de Ruiter, 1950), Loka (P. & F. Sarasin, 1905), and Boengi (Stresemann, 1940); Marangka, Maros Peak; Enrekang, and Mt. Loko near Bungi (Meyer & Wiglesworth, 1898). At Bolokan the species is presumably close to its northern limit of distribution, as it has never been taken by any of the collectors who visited central Celebes. The vertical distribution is from sea-level to at least 1350 m (Bolong dale).

First collectors. P. and F. Sarasin near Makassar in 1895.

Figure. Meyer & Wiglesworth, 1898, pl. XXX fig. 3 (coloured, on natural size, by Geisler).

Type. Four out of the five specimens on which this species was based are in the Naturhistorisches Museum, Basel. Following the advice of Dr. Sutter (given in litt., 17-IX-1959) I select as lectotype the specimen registered under nr. 4910, ♂, Makassar, S. Celebes, 21-VII-1895, leg. P. & F. Sarasin nr. 468. This specimen is already marked as type on its label, whereas other specimens bear the note cotype (in this case a synonym of paratype). The fifth specimen was in the Dresden Museum, but is now no longer present.

Moult. Specimens collected in May (2), July (2), August (20), September (1) and October (4) are not in moult. Specimens taken in April (1), August (10), and October (1) show moult in primaries and rectrices. Though the high proportion of moulting birds in August is significant, more material from other months is needed to establish the period in which the main moult takes place.

Nidification. Coomans de Ruiter (1951) described an empty nest, from which the young probably had fledged already, as being of the usual *Zosterops*-type; the outer part was entirely constructed of thorny *Mimosa*-twigs.

Habits, etc. According to Heinrich (in Stresemann, 1940) this species is ecologically similar to *Z. chloris intermedia,* but more plentiful in the deforested hills, whereas *intermedia* is particularly common in the lowlands. Coomans de Ruiter, however, found *Z. anomala* common at the Bodjo River near sea-level, where it inhabitated light secondary forest and low trees in the hills, but avoided open cultivated country (the biotope in which *intermedia* apparently finds its optimum). Coomans de Ruiter (1950) called *anomala* „talrijk" (plentiful) at Bodjo, but in 1951 said it was „vrij algemeen" (fairly common).

Voice. P. & F. Sarasin (1905) compare the song of the species with a slow singing *Fringilla coelebs* L. Heinrich states that: „Der Lockruf besteht in einem eigenartigen Trillern, einer Art „rollenden" Pfeifens", and Coomans de Ruiter (1950, 1951) gives a description of what is evidently the same call, which he likens to a policeman's whistle. He also mentions a song not unlike that of *intermedia,* but of shorter duration.

Discussion. But for the absence of the white eye-ring and the amount of black round the eye, this species agrees with the ordinary *Zosterops*-pattern, which makes it difficult to ascertain its affinities. Heinrich (in Stresemann, 1940, p. 64) found that *Z. atrifrons* and *Z. anomala* agree ecologically, whereas *atrifrons,* moreover, has the same quivering whistle, and Stresemann (l. c.) remarked that *Z. atrifrons, Z. anomala,* and *Z. consobrinorum* apparently geographically replace each other and therefore, notwithstanding the important differences in coloration existing between them, may be closely related.

Nothwithstanding the fact that they have the police-whistle-call in common, I doubt that *atrifrons* has much to do with *anomala*; as regards coloration these two species are too different. And as Moreau (1957, p. 418-419) has pointed out, song is apparently not a trustworthy criterion for judging relationships in Zosteropidae. Evidently much ethological and ecological work must be done before the relations of the Celebesian white-eyes may be established on more than a speculative basis. See also the discussion of *Z. consobrinorum.*

Species 17. **Zosterops wallacei** Finsch

Z[osterops] wallacei Finsch, Tierreich 15, 1901 (March), p. 23 — nomen novum for *Zosterops aureifrons* Wallace and for *Zosterops aurifrons* Hartlaub nec *Zosterops aurifrons* Heuglin, 1863, type locality hereby restricted to Bima, East Soembawa.

Zosterops aureifrons Wallace, Proc. Zool. Soc. London for 1863, 1864 (April), p. 493 — Flores.

Z[osterops] aurifrons Hartlaub (ex Temminck, M. S.), Journ. f. Orn. 13, 1865 (Jan), p. 24 — Sumbawa und Flores.

Zosterops aurifrons; Finsch, Neu-Guinea, 1865, p. 164 (Timor, Flores); G. R. Gray, Hand-List Birds I, 1869, p. 162 (Timor, Flores); Giebel, Thes. Orn. III, 1877, p. 774 (Timor, Flores).

Zosterops aureifrons; Sharpe Cat. Birds Brit. Mus. 9, 1884, p. 159 (Flores); Büttikofer, Notes Leyden Mus. 14, 1892, p. 199 (Sumba or Sandelwood); Büttikofer in Weber, Zool. Erg. Reise Nied. Ost-Ind. III, 1894, p. 303 (Endeh, Kotting); Hartert, Nov. Zool. 3, 1896, p. 582 (Sumba); Hartert, Nov. Zool. 4, 1897, p. 520 (South Flores); Hartert, Nov. Zool. 5, 1898, p. 456, 468 (Lomblen, Soemba); Sharpe, Hist. Coll. Brit. Mus. II, 1906, p. 492 (Flores); van Balen, Dierenw. Insulinde II, 1915, p. 482 (Flores en Soembawa); Rensch, Eine biol. Reise Kl. Sunda-Inseln, 1930, p. 171-172.

Zosterops wallacei; Dubois, Syn. Av. I, 1902, p. 708 (Sumbawa, Flores, Sumba, Lomblen); van Oort, Mus. Hist. Nat. Pays-Bas 10, pt. 1, 1907, p. 261 (Sikka, Flores); Sharpe, Hand-List Birds 5, 1909, p. 7 (Flores, Sumbawa, Sumba, Lomblen); Stresemann, Nov. Zool. 20, 1913, p. 387 (Sumbawa); Mathews, Syst. Av. Australas. II, 1930, p. 699

(Lesser Sunda Islands); Stresemann, Mitt. Zool. Mus. Berlin 17, 1931, p. 214 (Sumbawa, Flores, Lomblen, Sumba); Rensch, Mitt. Zool. Mus. Berlin 17, 1931, p. 459, 620 (Batoe Doelang, Dompoe, Wawó; Flores: Endeh, Mborong); Rensch, Treubia 13, 1931, p. 386, 390, 400 (Sumba: Kambera, West Soemba, Laora, Waikelo, Mao Marroe; W. Flores: Mboera, Wai Sano); Rensch, Gesch. des Sundabogens, 1936, p. 139 (no locality); Kuroda, Birds. Isl. Java II, 1936, p. 729, 732, 734 (Sumbawa, Sumba, Flores); Mayr, Bull. Am. Mus. Nat. Hist. 83, 1944, p. 143 (Soemba: Langgaliru, Mao Marru, Melolo); Hoogerwerf, Rapport over een naar Komodo, Padar en Rintja (Kleine Sunda Eilanden) gemaakte dienstreis van 21 Mei-6 Juli 1953, 1954, p. 227 (Komodo, Rintja); Hoogerwerf, Limosa 28, (1955), 1956, p. 107, 108 (Komodo, Rintja); Gilliard, Living Birds of the World, 1958, p. 350 (Lesser Sunda Islands).

Zosterops Wallacei; Hoogerwerf, Limosa 28, (1955), 1956, p. 112 (Komodo, Rintja).

Characters. A fairly small species, characterized by its orange forehead and yellow eye-ring.

Upper parts. Mantle darker and at the same time yellower than Warbler Green — different from the normal *Zosterops*-colour by its brownish yellow wash. Crown and nape distinctly more yellowish than the remainder of the upper parts, becoming even more yellow on the ear-coverts; also traces of a yellow superciliary stripe; forehead yellow, towards the front becoming true Cadmium Yellow; eye-ring fairly narrow, yellow, not white!, a spot in front of each eye on the lores black, but anterior part of the lores yellow. Primaries, secondaries, and rectrices, blackish brown, all broadly margined with the colour of the mantle; bastard wings Lemon Chrome, more strongly contrasting with the remainder of the wings than in other species of the genus.

Under parts. Chin, throat, upper breast (not extending far down), and under tail coverts Lemon Chrome; remainder of under parts Grey, pure grey without admixture of brownish or buff, with the exception of a longitudinal streak extending from the anterior part of the belly to the under tail coverts, which is white.

Unfeathered parts. Iris dark brown, eye-rim black, bill dark greyish brown, legs and toes greyish blue, nails greyish brown (Madzoed); iris yellow-brown, or brown, or reddish brown, or pale brown; bill black and horny white, or greyish black and horny white; feet lead colour (Rensch); irides orange-brown; bill dusky black, basal half of lower mandible plumbeous; legs pale grey (Everett). Rensch (1931) states that adult specimens of both sexes have a brown iris, young specimens a light brown iris.

Measurements of 6 specimens from Soembawa (4 ♂, 1 ♀, 1 —); wing 53-56 (54.42), tail 36½-38½ (37.67), tarsus 16½-17¾ (17.08), entire culmen 12¾-14¼ (13.50), exposed culmen 9½-10¾ (10.20), culmen from anterior point of nostril 7¼-8 (7.70) (measurements of bills of 5 specimens only).

Soemba, 14 specimens (♂, 4 ♀, 2 —); wing 54-58 (55.82), tail 36-40

(38.32), tarsus 16¾-19 (17.60), entire culmen 12-14¼ (13.37), exposed culmen 9¼, 10-11¾ (10.29), culmen from anterior point of nostril, 7-8½ (7.69).

Flores, 10 specimens (2 ♂, 4 ♀, 4 —: wing 53-57 (54.80), tail 36-42 (39.10), tarsus 16¾-18½ (17.43), entire culmen 12½-14½ (13.48), exposed culmen 9½-11 (10.15), culmen from anterior point of nostril 7-8½ (7.68).

Rintja (♀) and Komodo (♂), one specimen each (the Rintja specimen is listed first): wing 53½, 55, tail 40, 42, tarsus 17, 18, entire culmen 13, 14, exposed culmen 10, 11, culmen from anterior point of nostril 7½, 7¾.

Structure. A very distinct species; the only species with a yellow eye-ring and with an orange forehead. These orange feathers, moreover, are of a peculiar stiff structure [1]). The wing-formula, with its short 2nd primary, is sharply distinct from that of all other species of this region; the 2nd primary is as small as, or smaller than, the 10th in all specimens examined (fig. 1a).

Weights (according to Rensch, 1931), 13 ♂: 10.2-11.6 (11.1) 2 ♀: 10.5-10.7 (10.6) g.

Distribution. An endemic species of the Lesser Soenda Islands, where it has been found on the islands of Soembawa, Soemba and Flores, and on the smaller islands of Lomblen (Hartert, 1898), Komodo and Rintja (Hoogerwerf, 1954, 1956). The old records for Timor are erroneous.

First collector. E. A. Forsten at Bima, Soembawa, in 1842. There is in the Leiden Museum a collection of birds from Bima, ascribed to Forsten; nevertheless, as far as can be deduced from his letters and notes in the archives of the museum, Forsten never personally visited the Lesser Soenda Islands, though on his outward voyage to the Moluccas, he passed in sight of them. However, the species in this collection show that their locality of provenance is correctly assigned (cf. also Junge, 1954).

Not figured.

Type. When Finsch (1901) named *wallacei,* he proposed it as a new name for both *Z. aureifrons* Wallace and *Z. aurifrons* Hartlaub; the type-specimen of the latter he has examined personally, that of the former almost certainly not. As Hartlaub's specimen is actually the first specimen collected of the species, as it is in a better condition that Wallace's specimen, as it bears an exact locality, and as moreover, I have been able to examine this specimen at leisure, I prefer to select this specimen as lectotype; it is RMNH cat. nr. 1. This fixes the type-locality of *Z. wallacei* as Bima, East Soembawa.

The type of *Z. aureifrons* Wallace is BM nr. 73.5.12.898, I have also examined this specimen, it is in abraded plumage.

1) Compare Moreau's (1957, p. 322) remarks on carotenoid coloration.

Moult. Specimens collected in March (1), April (3), May (5), June (1), July (1), September (2), October (1), are not in moult; one specimen collected in April is moulting primaries and rectrices, two specimens collected in May are moulting primaries and rectrices, one specimen collected in May is moulting its tail, one specimen collected in May shows moult on its forehead, no moult in wings and tail; one specimen taken in June shows moult on its forehead, no moult in wings or tail; one specimen collected in September is moulting primaries; one specimen collected in October is moulting primaries, perhaps rectrices, and shows much moult on head and forehead; one specimen collected in October is moulting primaries; two specimens collected in November are moulting primaries.

Perhaps the main moult, if any season for it exists, is about September-October.

Nidification. Apparently unrecorded. Rensch (1931) found that specimens collected in May and June all had enlarged gonads.

Habits, etc. Rensch (1931) observed this species in the lowlands, with a vertical range from sea-level to about 800 m, where it occurred in light monsoon forest and in half open shrub country; he met with specimens solitary and in pairs. Hoogerwerf (1954, 1956) agrees with Rensch as far as the habitat of the birds is concerned, but noted them moving about in flocks of about 10 to 15 individuals.

About the voice of *Z. wallacei* nothing seems to have been published.

Discussion. A strongly marked species that stands wide apart from all other members of the genus. It is doubtless an old endemic element in the fauna of the Lesser Soenda Islands, and the fact that it was not listed as such by Mayr (1944, p. 174), was probably only an oversight by that author.

Within its range, the species shows no appreciable geographic variation (I have not seen specimens from Lomblen), though the figures presented in the list of measurements suggest that the Soemba population averages slightly larger than the populations from Soembawa and Flores.

Zosterops atrifrons group

(species 18 to 22).

Stresemann (1931) was apparently the first to recognise the relationship between a great number of morphologically in some cases very distinct forms ranging from Celebes to the Bismarck Archipelago, which seem to replace each other geographically and roughly speaking have the same habitat requirements, i.e. from the foothills up to the mid-mountain regions.

In this "Artenkreis" Stresemann included as species the following forms: *Z. atrifrons* (with *surda, subatrifrons,* and *nehrkorni*), *Z. consobrinorum, Z. anomala, Z. buruensis, Z. kühni, Z. stalkeri, Z. atriceps* (with *fuscifrons*), *Z. fuscicapilla, Z. mysorensis, Z. delicatula* (with *pallidogularis* and *meeki*), and *Z. hypoxantha* (with *admiralitatis*).

Subsequently Mayr (1933, 1944) recognised that not *Z. fuscicapilla,* but *Z. minor* is the representative of the group on New Guinea. In later publications Mayr (1944, 1945, 1955) gradually expanded his species-concept and reduced several of the forms of the New Guinea area given specific rank by Stresemann to subspecies. He united all these forms under the specific name *minor.* He apparently did not study the forms of Celebes and the Moluccas, but in this region van Bemmel (1948) included *Z. stalkeri* and, with some hesitation, *Z. kühni* in the species *atrifrons.* On the other hand van Bemmel was not prepared to accept *Z. buruensis* as belonging to the species-group, but suggested its affinity to *Z. montana.*

In 1953 I discussed some of the Moluccan forms, showing that the supposed form of the Aroe Islands was based on wrongly labelled specimens of nominate *atrifrons,* thus restoring to validity Stresemann's (1931) observation that members of the group do not occur on low and flat islands. At the same time I expressed doubt about the correctness of assigning *Z. kühni* to the *atrifrons-minor* relationship, a doubt partly raised by the morphological distinctness of this form, but also by the fact that, besides on Ambon, *Z. kühni* apparently occurs on Ceram, where *stalkeri* is found. As I agreed with van Bemmel that *stalkeri* should be considered a subspecies of *atrifrons, Z. kühni* could not be a geographical representative of the same species, and I suggested that it might be related to *Z. novaeguineae.*

Further investigations, the results of which are here presented, have convinced me that notwithstanding apparent — but not very well established — geographical representation, *Z. anomala* and *Z. consobrinorum* should also be excluded from the *Z. atrifrons* relationship (for a further discussion, see under those species). Generally speaking, however, I accept the arrangement as proposed by Stresemann and modified by Mayr.

The fact that, contrary to Mayr, I prefer to give *Z. meeki* and *Z. hypoxantha* specific rank, does not mean that I disagree with this distinguished ornithologist, but is the logical consequence of my somewhat narrower species concept. In this train of thought it may seem inconsequent that in uniting *atrifrons* and *minor* I go further than Mayr. The reason for doing so is the following: the New Guinea forms *minor* and *delicatula* are very different from each other, and without intermediates I would not hesitate in considering them to be not even closely related. However, *chrysolaema* is both

morphologically and geographically intermediate between them, though closer to *delicatula,* and the morphological gap between *chrysolaema* and *minor* is bridged by *rothschildi,* which seems a perfect intermediate and may even be a hybrid. Therefore there can be no doubt about the close relationship between these forms. But *delicatula,* though geographically the most distant form, is morphologically virtually indistinguishable from some races of *atrifrons* in the Celebes region. Particularly I found that *delicatula* and *sulaensis* are practically identical (for particulars, see the discussion of these races). In this connection I want to draw attention to the fact that several earlier workers stressed the similarity of "*sharpei*" (supposedly from the Aroe Islands, but actually based on specimens of nominate *atrifrons*) and *delicatula.*

In the genus *Zosterops* it is not unusual to find that geographically distant species morphologically approach each other very closely, and in itself this needs not be an argument for assuming a close relationship, as I myself have pointed out repeatedly. However, such cases usually concern forms of a very generalised type (the basic pattern), whereas *sulaensis* and *delicatula,* with their bright throats, wide eye-rings and black foreheads are of a fairly specialized type. Moreover all contemporary systematists since Stresemann (1931) agree that *atrifrons* and *delicatula* are related, and it seems only logical to make use of the possibility of expressing this affinity in nomenclature.

The distribution of the five species which I retain in the group is shown in fig. 6.

Related species. The marked difference between the various species, and between subspecies of some of these, shows that this group must be of considerable antiquity on the islands where it occurs. I do not think that it is possible to expand the group to include more species without sacrificing the solidity of its base — which is the evident relationship of its members.

Species 18. **Zosterops atrifrons** Wallace

Characters. In view of the great difference between the various subspecies, a general description is hardly possible, but all forms are of small to average size.

The extremes are the rather dull *Z. atrifrons surda* from Celebes, which has greenish upper parts, black forehead, a fairly narrow white eye-ring, greenish yellow throat and under tail coverts, and grey remainder of under parts, and on the other hand *Z. atrifrons minor* with very bright citrine-yellow upper parts, no black on the forehead, no eye-ring, orange-yellow throat, yellow under tail coverts, and greyish white remainder of under parts. In other races the eye-ring is wide (*sulaensis, delicatula*). Because of these

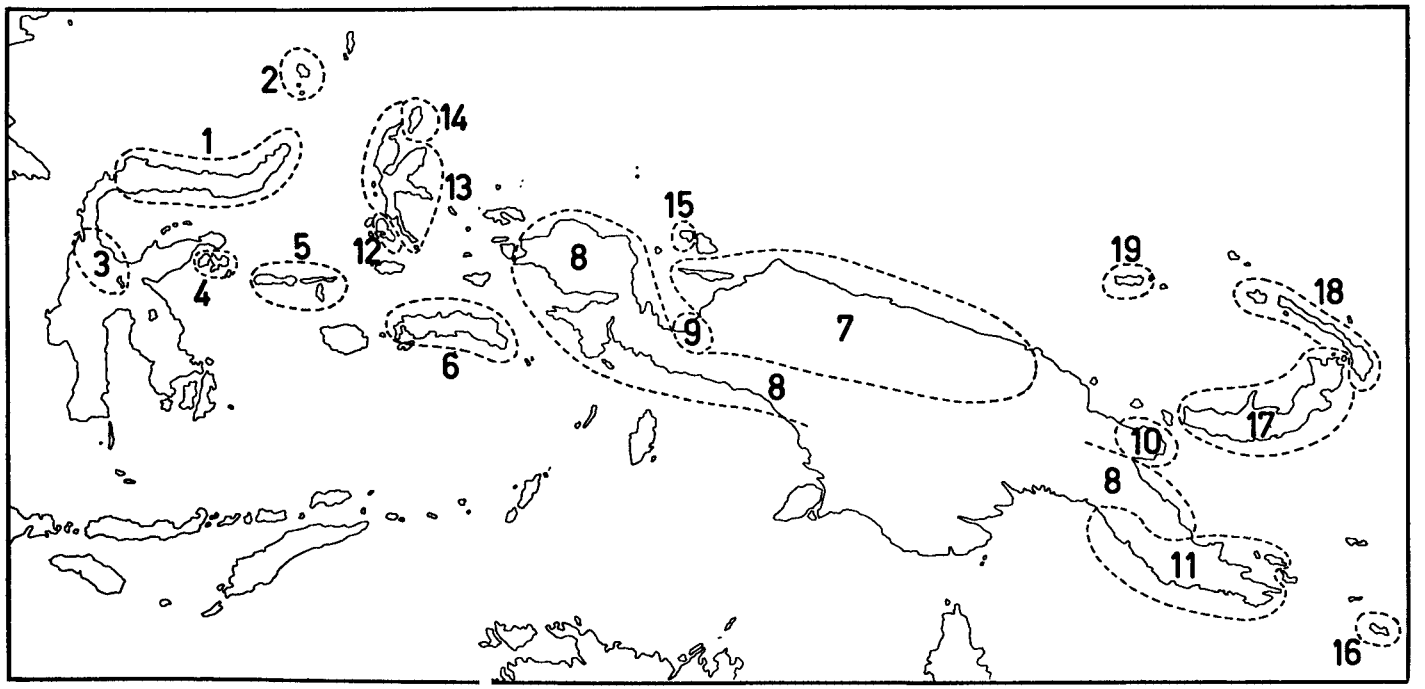

Fig. 6. The distribution of the *Zosterops atrifrons* group: *Zosterops atrifrons* and races; 1, *atrifrons*; 2, *nehrkorni*; 3, *surda*; 4, *subatrifrons*; 5, *sulaensis*; 6, *stalkeri*; 7, *minor*; 8, *chrysolaema*; 9, *rothschildi*; 10, *gregaria*; 11, *delicatula*; *Zosterops atriceps* and races; 12, *atriceps*; 13, *fuscifrons*; 14, *dehaani*; 15, *Zosterops mysorensis*; 16, *Zosterops meeki*; *Zosterops hypoxantha* and races; 17, *hypoxantha*; 18, *ultima*; 19, *admiralitatis*.

differences, the descriptions of the separate subspecies are somewhat more elaborate than has been necessary in other cases, especially those of the nominate race and *minor* which have been used as bases for comparison with the other races.

Unfeathered parts. The eye-colour in the various races, as far as it has been recorded, varies from light brown and red-brown to dark sepia brown, bill grey to black, usually with paler base of mandible, legs light bluish or grey.

Measurements are given in Table IV.

TABLE IV

Zosterops atrifrons

	number of specimens	wing	tail	av. wing	av. tail	tail: wing index
atrifrons	14	54-56½	34½-38	54.79	36.18	66.04%
nehrkorni	not examined					
surda	16	55-62	37½-42	57.50	39.50	68.70%
subatrifrons	3	53-56	37-38	54.17	37.50	69.23%
sulaensis	4	55-59	36-44	56.38	39.38	69.84%
stalkeri	10	53-57	32½-36½	54.80	34.25	62.50%
minor	7	54½-59	35-37½	57.07	36.21	63.45%
chrysolaema	15	56-60	34½-39	58.00	36.57	63.05%
rothschildi	not examined					
gregaria	7	57-60	36-38	58.57	37.67	64.20%
delicatula	14	55-59	34-39	57.29	35.93	62.72%

Structure. Generally speaking, the species is rather short-tailed, only the race *surda* has a fairly long tail, and perhaps *sulaensis* but in this case the number of specimens is so small that the tail: wing index might be affected considerably when more specimens are measured.

Distribution (figs. 6 and 7). Great Sanghir Island, North and Central Celebes, Peling, Soela Islands, Ceram, all New Guinea and the d'Entrecasteaux Archipelago.

Ecology. As Stresemann (1931) has pointed out, the species occurs in hilly or mountainous islands only. It is not found on low islands or in the big flats of New Guinea. On hilly islands, however, it occurs down to sea-level, whereas in the mountains of New Guinea it ascends to about 1800 m.

Geographical variation. Very pronounced, as already set forth in the discussion of the species-group, to which I refer for particulars.

1. **Zosterops atrifrons atrifrons** Wallace

Zosterops atrifrons Wallace, Proc. Zool. Soc. London for 1863, 1864 (April), p. 493 — Menado (North Celebes).

Z[osterops] nigrifrons Hartlaub (ex Temminck MS), Journ. f. Orn. 13, 1865 (Jan.), p. 22 — Gorontalo, Celebes.

Zosterops frontalis Salvadori, Ann. Mus. Civ. Genova 12, 1878, p. 342 — Ins. Aru (errore!) = Minahassa, N. Celebes (cf. Mees, Zool. Med. 32, 1953, p. 27).

Z[osterops] sharpei Finsch, Tierreich 15, 1901, p. 34 — nomen novum for *Zosterops frontalis* Salvadori, nec *Zosterops frontalis* Reichenbach, 1852, nec *Zosterops frontalis* Schlegel, 1857.

Zosterops atrifrons; Finsch, Neu-Guinea, 1865, p. 164 (Celebes); G. R. Gray, Hand-List Birds I, 1869, p. 162 (Celebes); Walden, Trans. Zool. Soc. London 8, 1872, p. 72, pl. IX fig. 3 (Menado); Salvadori, Ann. Mus. Civ. Genova 7, 1875, p. 662 (Menado); Brüggemann, Abh. naturwiss. Ver. Bremen 5, 1876, p. 74 (Menado-Minahassa); Lenz, Journ. f. Orn. 25, 1877, p. 375 (Nord-Celebes); von Rosenberg, Malayische Archipel, 1878, p. 272 (Celebes); Wallace, Island Life, 1880, p. 437 (Celebes); Salvadori, Orn. Pap. II, 1881, p. 369 (Celebes); W. Blasius, Journ. f. Orn. 31, 1883, p. 138 (Celebes); Sharpe, Cat. Birds Brit. Mus. 9, 1884, p. 176 (Menado, Tondano); W. Blasius, Zeitschr. ges. Orn. 3, 1886, p. 197, 207 (Nord-Celebes); *Platen, Gefied. Welt, 1887, p. 206 (Rurukan); W. Blasius, Ornis 4, 1888, p. 594 (Rurukan, Nord-Celebes); Tristram, Cat. Coll. Birds, 1889, p. 210 (Menado); Wallace, Island Life, 2nd ed., 1892, p. 467 (Celebes); Meyer, Abb. Vogel-Skeletten II, 1892, p. 48, Taf. CLXXIII (Manado); Meyer & Wiglesworth, Abh. Ber. Mus. Dresden 5 (8), 1895, p. 12 (Tomohon, Buol); Meyer & Wiglesworth, Abh. Ber. Mus. Dresden 6 (2), 1896, p. 3, 4 (Celébes); *W. Blasius, Festschr. Herzogl. Techn. Hochschule Braunschweig, 1897, p. 352 (Rurukan); Vorderman, Nat. Tijdschr. Ned. Ind. 58, 1898, p. 85 (Tondano, Tomohon); (pt.) Meyer & Wiglesworth, Birds Celebes, 1898, p. 100, 116, 128, 487, 488, 490, 491, 493 (Minahassa, Buol, Gorontalo); Nehrkorn, Kat. Eiersamml., 1899, p. 80 (Celebes); (pt.) Finsch, Tierreich 15, 1901, p. 34 (Nord-Celebes, Aru-Inseln); (pt.) Dubois, Syn. Av. I, 1902, p. 710 (Célèbes, Arou); Hose, Ornis 12, 1904, p. 111 (Menado, Tondano, Mount Masarang 3000 and 4000 ft.); P. & F. Sarasin, Reisen in Celebes I, 1905, p. 57 (Empung, Minahassa); (pt.) Sharpe, Hand-List Birds 5, 1909, p. 14 (N. Celebes, Aru Is.); Nehrkorn, Kat. Eiersamml., 2nd ed., 1910, p. 270 (Minahassa); van Balen, Dierenw. Insulinde II, 1915, p. 483 (Celebes); Gardner, Proc. U. S. Nat. Mus. 67, art. 19, 1925, p. 26, fig. 135 (tongue); Porsch, Biol. Generalis 5, 1929, p. 160, 161.

Zosterops nigrifrons; Finsch, Neu-Guinea, 1865, p. 164 (Timor, this species?); G. R. Gray, Hand-List Birds I, 1869, p. 163 (Timor); Giebel, Thes. Orn. III, 1877, p. 776 (Celebes); Heine & Reichenow, Nomencl. Mus. Hein. Orn., (1882-1890) 1890, p. 72 (Celebes).

Zosterops frontalis; Salvadori, Ann. Mus. Civ. Genova 16, 1880, p. 81 (Ins. Aru); Salvadori, Orn. Pap. II, 1881, p. 369 (Isole Aru); Sharpe in Gould, Birds New Guinea III, pt. XIV, 1883 (Aru Islands); W. Blasius, Ornis 4, 1888, p. 594 (Aru Inseln); Meyer & Wiglesworth, Birds Celebes, 1898, p. 489 (Aru).

Zosterops delicatula; (pt.) Sharpe, Cat. Birds Brit. Mus. 9, 1884, p. 177 (Aru Islands).

Zosterops sp.; Salvadori Agg. Orn. Pap. II, 1890, p. 131 (no locality).

Zosterops sharpei; Dubois, Syn. Av. I, 1902, p. 170 (Iles Arou); Sharpe, Hand-List Birds 5, 1909, p. 14 (Aru Is.); Mathews, Syst. Av. Australas. II, 1930, p. 707 (Aru Islands).

Zosterops delicatula?; von Berlepsch, Abh. Senckenb. Naturf. Ges. 34, 1911, p. 69 (Aru-Inseln).

Zosterops atrifrons atrifrons; Riley, Proc. U. S. Nat. Mus. 64, art. 16, 1924, p. 88 (Paleleh River, Toli Toli, Kampa, Ayermadidi, Manembo Nembo, Toemaratas); Mathews, Syst. Av. Australas. II, 1930, p. 706 (Celebes (North)); Stresemann, Mitt. Zool. Mus. Berlin 17, 1931, p. 220 (Nordhalbinsel von Celebes); Stresemann, Ibis (13) 6, 1936, p. 360 (N. Celebes); Kuroda, Tori 10, 1938, p. 385 (N. Celebes: Modaya, Mongondo); Stresemann, Journ. f. Orn. 88, 1940 (15 Jan.), p. 63 (Rurukan 800 m, Kumarsot 250 m,

Paleleh, Matinan-Gebirge 600 m); van Marle, Limosa 13, 1940 (Aug.), p. 66 (Minahasa); Kuroda Jr., Misc. Rep. Yamashina's Inst. 10, 1957 (June), p. 394 (Mongondo).

Zosterops minor sharpei; Mayr, Orn. Monatsber. 41, 1933, p. 54 (Aru-Inseln); Mayr, List New Guinea Birds, 1941, p. 217 (Aru Islands).

Zosterops sharpei = *Zosterops atrifrons atrifrons*; Mees, Zool. Med. 32, 1953, p. 27 (Minahassa).

Zosterops chrysolaema sharpei; Iredale, Birds New Guinea II, 1956, p. 169 (Aru Islands).

Characters. A small or fairly small form, with green upper parts, blackish forehead, eye-ring of average size, yellow throat and under tail coverts, and greenish white remainder of under surface without traces of a yellow streak down the centre.

Upper parts slightly yellower than Warbler Green, forehead and anterior part of crown black, posteriorly gradually merging into the green of the back; rump and upper tail coverts at most but very slightly more yellowish than the back; eye-ring fairly wide, white, interrupted in front by the usual black spot; black also continued half way down under the eye-ring; primaries, secondaries and rectrices brownish black; primaries and secondaries in the ordinary way edged with Warbler Green, the rectrices with at most but traces of such edges.

Under parts. Chin, throat and under tail coverts Lemon Yellow, Wax Yellow in older skins, remainder of under surface greyish white; no yellow streak down the centre of the under parts.

Unfeathered parts. Iris light brown, bill black, legs pale horn colour (Coomans de Ruiter); iris brown, bill black, legs green (Heinrich).

Measurements of 14 specimens (9 ♂, 1 ♀, 4 —): wing 54-56½ (54.79), tail 34½-38 (36.18), tarsus (10 specimens only) 14-16 (14.95), entire culmen 12-13½ (12.86), exposed culmen 9½-11 (10.23), culmen from anterior point of nostril 6¾-8¼ (7.46).

Structure. Second primary usually in length between 7th and 8th.

Distribution (fig. 6). The northern peninsula of Celebes. Stresemann (1940) wrote: "...auf der Nordhalbinsel westwarts mindestens bis Paleleh". but previously specimens (which I have no doubt belong to this race, though I have not examined them) had been recorded from Buol (Meyer & Wiglesworth, 1895) and Tolitoli (Riley, 1924). Within its range it seems well distributed and common. Material personally examined came from: meer van Lahendong (Tomohon) 700 m, weg Airmadidi-Tomohon, Mapanget (Tonsea), Menado, Tondano, Mt. Masarang, Rurukan, and Gorontalo.

First collector. E. A. Forsten. Hitherto the species was believed to have been discovered in 1841 naar Gorontalo (cf. Stresemann, 1940). Among

Forsten's notes, sent home by other members of the Natuurkundige Commissie after his death, I found the following:

Sylvia No. 1

geheele lengte 0.1 bek 0.013 staart 0.04
bek zwart voorhoofd zwart, kruin en rug olijfgroen, keel en aarssteek geel, borst en buik grijs, schouders slag en staartpennen zwartachtig pooten bruin, oogen blaauwachtig zwart, eene witte ring rond de oogen.
Tondano April vier 1840 Forsten.

This note fixes both locality and date of discovery.

Figure. Walden (1872) plate IX fig. 3 (coloured, on natural size, by J. Smit).

Type. BM nr. 73.5.12.113 (type examined); this is the specimen figured by Walden. The types of *nigrifrons* are in the Leiden Museum.

Moult. Many of the specimens examined are not properly dated; specimens collected in January (1), July (2), September (1) and October (1) do not show moult.

Nidification. Meyer & Wiglesworth (1895, 1898) record a nest with two eggs taken at Tomohon on 15-IV-1894 and one with three young found at Tomohon on 2-V-1894. The nest as described by these authors is the usual cup-shaped structure, suspended in the fork of a twig by means of fibres, cob-web, etc. The eggs are uniform blue.

Habits, etc. Platen (1887) and the Sarasins (1905) record large flocks of up to a hundred specimens in the Minahassa. The behaviour as described by these authors is typical of the genus. Coomans de Ruiter (on labels of specimens) found seeds as stomach contents.

2. **Zosterops atrifrons nehrkorni** W. Blasius

Zosterops Nehrkorni *W. Blasius, Braunschweig. Anzeiger vom 11. Januar 1888, nr. 9, p. 86 — Gross-Sanghir.

Zosterops Nehrkorni; W. Blasius, Isis, Zeitschr. naturw. Liebh. 13, nr. 10, 1888 (8 March), p. 78 (bei Manganitu auf Gross-Sanghir); W. Blasius, Ornis 4, 1888, p. 593-594, Taf. IV fig. 1 (Gross-Sanghir).

Zosterops nehrkorni; Meyer & Wiglesworth, Birds Celebes, 1898, p. 488, 490 (Great Sangi); Finsch, Tierreich 15, 1901, p. 34 (Gross-Sanghi); Dubois, Syn. Av. I, 1902, p. 710 (Iles Sangir); Sharpe, Hand-List Birds 5, 1909, p. 14 (Sangi Is.); Mathews, Syst. Av. Australas. II, 1930, p. 706 (Great Sangi Island).

Zosterops atrifrons nehrkorni; Stresemann, Mitt. Zool. Mus. Berlin 17, 1931, p. 221 (Gross Sangi); Mathews, Ibis (13) 2, 1932, p. 155 (no locality); Stresemann, Journ. f. Orn. 88, 1940, p. 60 (Gross Sangir).

Subspecific characters. According to its describer (Ornis, 1888), this form differs from *atrifrons* as follows: slightly larger size; upper surface, and particularly rump and upper tail coverts paler and brighter greenish yellow, bright golden yellow coloration of chin, throat and under tail coverts; dif-

ferent and paler coloration of bill and legs which is conspicuous even in skins. The measurements given by Blasius for *nehrkorni* are: total length 120, wing 59, tail 42.5, culmen 12, tarsus 16 mm, whereas for "zahlreiche Exemplare" from Rurukan, Minahassa he found: total length circa 90, wing 51-54.5, tail 35-38.5, culmen c. 11, tarsus c. 14.6 mm.

Meyer & Wiglesworth (1898, p. 489, 491) discussed the type specimen again, confirming Blasius's diagnosis and adding that *atrifrons* has the black of the forehead carried a little further towards the crown than *nehrkorni*.

I have not seen this form of which, unless the type specimen turns up, no material exists in collections, but published descriptions leave no doubt in my mind that it is a fairly well marked race. Only the difference in size would seem to be not quite as big as Blasius surmised, as Stresemann (1940) mentions a wing-length of up to 58 mm for the nominate race.

Distribution. As will be evident from preceding remarks, known from the type locality only (Manganitu on Great-Sanghir).

First collector. C. C. Platen.

Figure. W. Blasius (1888), Ornis 4, pl. IV fig. 1, coloured on natural size. Meyer & Wiglesworth (1898), pl. XXXI, lower figure, coloured, on natural size by Geisler.

Type. The type specimen should be in the Braunschweig Museum, but it cannot be found now and may have got lost in the unsettled conditions prevailing during and just after the war (von Frisch, in litt., 19-XI-1959).

Moult. Unknown.

Nidification. Unknown.

Habits, etc. Unknown.

3. **Zosterops atrifrons surda** Riley

Zosterops atrifrons surda Riley, Proc. Biol. Soc. Washington 32, 1919, p. 95 — Rano Lindoe, Celebes.

Zosterops atrifrons; Meyer & Wiglesworth, Abh. Ber. Mus. Dresden 6, 1896/97, Nr. 1, 1896, p. 12 (Poso See); Hartert, Nov. Zool. 4, 1897, p. 161 (Tawaya); (pt.) Meyer & Wiglesworth, Birds Celebes, 1898, p. 487 (Tawaya, Lake Posso).

Zosterops atrifrons surda; Riley, Proc. U. S. Nat. Mus. 64, art. 16, 1924, p. 3, 88 (Koelawi; Rano Lindoe; Doda, Besoa; Toewo Mountain, Besoa); Mathews, Syst. Av. Australas. II, 1930, p. 706 (Celebes (Central)); Snouckaert, Alauda (2) 3, 1931, p. 22 (Rano Lindoe); Stresemann, Mitt. Zool. Mus. Berlin 17, 1931, p. 221 (Nördlicher Teil von Central-Celebes, südwarts bis zum Posso-See); Stresemann, Ibis (13) 6, 1936, p. 360 (Cn. Celebes); Stresemann, Journ. f. Orn. 88, 1940, p. 63, 64 (im Tal des Paloe-Flusses und am Posso-See); Kuroda, Misc. Rep. Yamashina's Inst. 10, 1957, p. 394 (central Celebes).

Subspecific characters. Close to the nominate race but differs, as stated in the original description, by somewhat larger size, greener upper parts,

and more greenish yellow, less yellow throat; the eye-ring is comparatively narrow; greenish edges along rectrices faint or absent.

Unfeathered parts. Apparently not recorded.

Measurements. Wing 6 ♂, 55-62 (58.50); 9 ♀, 55-58½ (56.56); 16 specimens, 55-62 (57.50); tail 6 ♂, 38-42 (40.00); 9 ♀, 37½-40 (38.90); 16 specimens, 37½-42 (39.50); tarsus 16 specimens, 15-17 (15.92); entire culmen 16 specimens, 12¼-14¾ (13.39); exposed culmen 16 specimens, 9-12 (10.59); culmen from anterior point of nostril, 16 specimens, 7-8½ (7.77).

Structure. Several specimens have a rather short 2nd primary, which in length equals the 10th; in the material examined the 2nd primary was always in length between the 8th and the 10th.

Distribution. Northern Central Celebes, where known from Toewo Mountain (Besoa), Doda (Besoa), Rano Lindoe, Koelawi, Lake Poso (specimens examined), and Tawaya (Hartert, 1897).

First collectors. P. and F. Sarasin in 1895 at Lake Poso.

Not figured.

Type. USNM nr. 251158.

Moult. Specimens collected in February (2), March (5), October (4) and November (2) do not show moult; two other November specimens are moulting primaries, one specimen collected in March is in full moult of rectrices, though not showing wing moult.

Nidification. Not recorded.

Habits, etc. Not recorded.

Discussion. The colour characters of this race as opposed to *atrifrons,* as given under the heading Subspecific characters, are based in the material collected in 1917 by Raven. A specimen from Lake Posso, collected in 1898 (Dresden, Mus. nr. C 16278), however, has its throat just as yellow as specimens of the nominate race collected in the same period. More material, collected in different seasons, may show, therefore, that the colour distinctions are not so clear cut as here suggested.

4. **Zosterops atrifrons subatrifrons** Meyer & Wiglesworth

Zosterops subatrifrons Meyer & Wiglesworth, Abh. Ber. Mus. Dresden 6, Nr. 2, 1896, p. 3, 4, 6 (nom. nud.), 17 — Insula Peling prope peninsulam orientalem insulae Celébes.

Zosterops subatrifrons; Meyer & Wiglesworth, Birds Celebes, 1898, p. 490 (Peling Island); (pt.) P. & F. Sarasin, Mat. Naturgesch. Insel Celebes III, 1901, p. 100 (Banggi Archipel); Riley, Proc. U. S. Nat. Mus. 64, art. 16, 1924, p. 89 (Peling Island).

Zosterops atrifrons; (pt.) Finsch, Tierreich 15, 1901, p. 34 (Peling); (pt.) Dubois, Syn. Av. I, 1902, p. 710 (Peling); (pt.) Sharpe, Hand-List Birds 5, 1909, p. 14 (Peling Is.).

Zosterops atrifrons subatrifrons; Mathews, Syst. Av. Australas. II, 1930, p. 706 (Peling Island); (pt.) Stresemann, Mitt. Zool. Mus. Berlin 17, 1931, p. 221 (Peling);

Neumann, Bull. B. O. C. 59, 1939, p. 156 (no locality); Stresemann, Journ. f. Orn. 88, 1940, p. 60 (Peling); Kuroda, Misc. Rep. Yamashina's Inst. 10, 1957, p. 394 (Peling I).

Subspecific characters. I have examined but a single individual, which was probably discoloured, but according to its describers this subspecies differs from the nominate race by being larger and having the cheeks and throat pure yellow. The larger size, however, is not apparent from the figures given by Meyer & Wiglesworth for a series of eight: wing 53-55, tail circa 41, tarsus 16, bill from nostril 8 mm.

Measurements of one unsexed and undated specimen: wing 53½, tail 37, tarsus 14¾, entire culmen 13¼, exposed culmen 10¼, culmen from anterior point of nostril 7½.

Distribution. Peling Island, Banggai Archipelago.

First collector. Unknown to me.

Types. Three cotypes are in the Dresden Museum (nr. C 14537). The single specimen examined, BM nr. 96.4.16.4, is also marked as a cotype, it was received in exchange from the Dresden Museum.

Moult. Not checked.

Nidification. Not recorded.

Habits, etc. Not recorded.

Discussion. The single specimen in the British Museum which I examined, unsexed and undated, is in a bad condition, it gives an impression of being decolorized and probably juvenile. Therefore I am not able to discuss the characters of the subspecies.

Addendum. Just before mailing the typescript of this paper I received two specimens of *subatrifrons* on loan from the Museum of Comparative Zoölogy, which I could compare with two specimens of *sulaensis*. It appeared that *sulaensis* definitely differs by its brighter, purer yellow, not greenish yellow throat. On the other hand I failed to find any difference in coloration between *subatrifrons* and some skins of the nominate race. It is evident that there is no difference in size either between *atrifrons* and *subatrifrons*, as the measurements of these two additional specimens of *subatrifrons* are: wing 53, 56; tail 37½, 38; tarsus 15¼, 15¼, entire culmen 13, 12; exposed culmen 10½, 10; culmen from anterior point of nostril 8, 7. Perhaps Finsch (1901) was right in synonymising *subatrifrons* with *atrifrons*, though it is possible that the former has a wider eye-ring. An ultimate decision on the validity and the diagnostic characters of the various races described from Celebes and neighbouring islands, must await the collecting of fresh and well-prepared material.

5. **Zosterops atrifrons sulaensis** Neumann

Zosterops atrifrons sulaensis Neumann, Bull. B. O. C. 59, 1939, p. 156 — Taliaboe, Soela Islands.

Zosterops atrifrons; (pt.) Salvadori, Orn. Pap. II, 1881, p. 369 (Isole Sulla); (pt.) Finsch, Tierreich 15, 1901, p. 34 (Sula Bessi, Sula Mangoli); (pt.) P. & F. Sarasin, Mat. Naturgesch. Insel Celebes III, 1901, p. 100 (Sula Inseln); (pt.) Dubois, Syn. Av. I, 1902, p. 710 (îles Soula): (pt.) Sharpe, Hand-List Birds 5, 1909, p. 14 (Sula Isl.).

Zosterops subatrifrons; Hartert, Nov. Zool. 5, 1898, p. 133 (Sula Besi and Sula Mangoli); [Koningsberger in] van Hulstijn, Mem. Soela-Eilanden, Med. Encyclop. Bureau 15, 1918, p. 28 (Soela Eilanden).

Zosterops atrifrons subatrifrons; (pt.) Stresemann, Mitt. Zool. Mus. Berlin 17, 1931, p. 221 (Sula Mangoli).

Zosterops atrifrons sulaensis; Stresemann, Journ. f. Orn. 88, 1940, p. 60 (Taliabu und Sula Mangoli); van Bemmel, Treubia 19, 1948, p. 330 (Sula-Mangoli, Taliabu).

Subspecific characters. Close to the nominate race, but differs by its darker yellow throat, which is Lemon Chrome, and even wider eye-ring, which is interrupted in front by the usual black spot; the black on the crown seems to extend farther backwards. The differences from the more greenish throated and generally duller forms *surda* and *stalkeri* are such, that comparison is unnecessary. Extremely close to *delicatula* from which race *sulaensis* apparently only differs in the slightly greater extent of black on the crown. Lack of material of that race prevented me from comparing *sulaensis* with *subatrifrons*, and the two must be very similar. As competent an ornithologist as Hartert (1898) stated that specimens from the Soela Islands did not seem to differ from the Peling form, but Neumann (1939) called: "...the yellow of the throat finer and darker, not so pale as in *Z. a. subatrifrons*, perhaps also slightly larger". On zoogeographical grounds I consider it likely that the populations inhabiting Peling and the Soela Islands really are morphologically different, but *sulaensis* must be considered in need of confirmation until actual comparison of good series has been made.

Unfeathered parts. Iris sepia-brown, bill black with the base of the mandible whitish, legs leaden grey (Hartert, 1898, ex Doherty); iris brown, bill black, legs grey (de Haan).

Measurements of four specimens (3 ♂, 1 ♀): wing 55-59 (56.38), tail 36-44 (39.38), tarsus (three specimens only) 16¼-16½ (16.33), entire culmen 13-14 (13.25), exposed culmen 10¼-11 (10.69), culmen from anterior point of nostril 7½-8 (7.88).

Weight of one male 10 g (de Haan).

Distribution. Soela Islands, where known from the three main islands: Taliaboe, Soela Mangoli, and Soela Besi (Sanana). It is curious that Stresemann (1931, 1940) and van Bemmel (1948) do not include Sanana in the

range of the race as it was already recorded from there by Hartert (1898) and Finsch (1901), and actually the first specimens collected were from that island. I have examined material from Soela Besi and from Wai Kaboeta on Taliaboe.

First collector. A. H. Bernstein on Soela Besi in January, 1864 (two specimens in RMNH); Hoedt took a specimen on the same island in December, 1864 (specimen in RMNH).

Type. Not traced. Contrary to expectation there is no material of the race in the Museum of Comparative Zoölogy, and the type specimen is not in the collections of the Berlin Museum, the Chicago Museum, or the American Museum of Natural History either.

Moult. Two specimens collected in January, and one collected in December, do not show moult. One January specimen is moulting primaries.

Nidification. Unrecorded. A male collected on 21-I-1955 had large testes: 5 × 8 mm.

Habits, etc. Not recorded. The specimen collected in 1955 by de Haan has on the label the note that the species is common (on Taliaboe); the specimen was taken at sea-level.

Discussion. I have already called attention to the remarkable similarity between this race and *delicatula,* which was the cause of my uniting the species *atrifrons* and *minor* of recent authors.

6. **Zosterops atrifrons stalkeri** Ogilvie-Grant

Zosterops stalkeri Ogilvie-Grant, Bull. B. O. C. 25, 1910, p. 96 — Marsela [= Manusela], 2500 ft., Ceram.

Zosterops stalkeri; van Dedem, Jaarboekje N. O. V. 8, 1911, p. 100 (Ahiolo); Stresemann, Nov. Zool. 20, 1913, p. 367 (no locality); Stresemann, Nov. Zool. 21, 1914, p. 32, 139 (Manusela 2000-3000 ft., Apio 2000 ft., Hatu Saka, Pasahari sea-level); Mathews, Syst. Av. Australas. II, 1930, p. 708 (Ceram); Snouckaert, Alauda (2) 3, 1931, p. 22 (Céram); Stresemann, Mitt. Zool. Mus. Berlin 17, 1931, p. 221 (Seran); Stresemann, Journ. f. Orn. 88, 1940, p. 61 (Seran).

Zosterops atrifrons stalkeri; van Bemmel, Treubia 19, 1948, p. 330 (M. & W. Ceram); Mees, Zool. Med. 32, 1953, p. 26 (Ceram).

Subspecific characters. A well-marked form, characterized by the extent of black on the head, the black not being confined to the forehead, but extending over the whole crown and the sides of the head; eye-ring of average width (narrower than in *sulaensis*); throat Pyrite Yellow, not yellow as in the nominate race and *sulaensis.* In colour of the throat somewhat similar to *surda* but slightly darker and if anything a bit more yellowish. The coloration of the throat seems to extend slightly farther downwards than in the western races of the species.

Unfeathered parts. Iris light brown, bill, maxilla grey, mandible pale leaden, legs pale blue-grey (van Dedem); iris chestnut (L. F. de Beaufort); iris brown, or red brown, or brown-red, bill bluish, feet pale blue or light purple (Stalker); iris red-brown or vivid brown, or dark red-brown, bill, maxilla black, mandible grey-brown or pale grey with black tip, legs blue-grey (Stresemann).

Measurements of 10 specimens (9 ♂, 1 ♀): wing 53-57 (54.80), tail 32½-36½ (34.25), tarsus 16-17¼ (16.70), entire culmen 12¼-14 (13.08) exposed culmen 9½-11 (10.28), culmen from anterior point of nostril 7¼-8 (7.75) [1]).

Weights. ♂: 9, 11, 12 g.

Distribution. Known from West- and Middle Ceram only, where it has been recorded from the following localities: Ahiolo 700 m, Honiteloe, Manusela (specimens examined), Apio 2000 ft., Hatu Saka, and Pasahari (Stresemann, 1914). The known vertical distribution is from sea-level (apparently not common) to about 900 m (3000 ft.).

First collector. W. Stalker in October 1909. The only subsequent collectors I know of are L. F. de Beaufort (February 1910), van Dedem (May 1910) and Stresemann (June-July 1911).

Not figured.

Type. BM nr. 1910.12.28.289.

Moult. One specimen taken in February is not in moult; of two specimens collected in May, one is in fresh plumage, no moult, the other is in the last stage of primary moult, the 3rd primary on both sides being short; two specimens taken in June are not in moult; out of three specimens collected in October, two are not moulting, and are in very abraded plumage, one is moulting primaries.

Nidification. Unknown.

Habits, etc. Apparently most abundant in the mid-mountain regions where Stresemann (1914) found the subspecies quite common in the undergrowth of secondary forest near Manusela, often associating with *Tephrozosterops stalkeri* (Ogilvie-Grant), *Dicaeum vulneratum* Wallace, *Rhipidura dedemi* van Oort, and other small birds. Specimens collected by Stalker and van Dedem had small seeds as stomach contents.

Discussion. Stresemann (1931) treated *stalkeri* as a full species within the *atrifrons*-group; with van Bemmel (1948) I prefer to reduce it to subspecific rank.

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1) Several specimens in very abraded plumage have influenced the average and minimum measurements of wing and tail.

7. **Zosterops atrifrons minor** Meyer

Zosterops albiventer minor Meyer, Sitzungsber. Akad. Wissensch. Wien 70, 1874, p. 115 — Jobi [1]).

Zosterops aureigula Salvadori, Ann. Mus. Civ. Genova 12, 1878, p. 340 — Jobi (redescription as a species of Meyer's specimen).

Zosterops aureigula; Salvadori, Ann. Mus. Civ. Genova 16, 1880, p. 81 (Jobi); Salvadori, Orn. Pap. II, 1881, p. 368 (Jobi); Sharpe, Cat. Birds Brit. Mus. 9, 1884, p. 176 (Island of Jobi); Salvadori, Agg. Orn. Pap. II, 1890, p. 131 (no locality).

Zosterops minor; Finsch, Tierreich 15, 1901, p. 22 (Insel Jobi); Dubois, Syn. Av. I, 1902, p. 708 (Ile Jobi); Rothschild & Hartert, Nov. Zool. 10, 1903, p. 452 (Jobi: Ansus, Marai); Sharpe, Hand-List Birds 5, 1909, p. 6 (Jobi Is.); Stresemann, Arch. f. Naturgesch. 89, A, Heft 7, 1923, p. 18, 68 (Maeanderberg, Lordberg); Mathews, Syst. Av. Australas. II, 1930, p. 699 (Jobi Island, North-West New Guinea); Hartert, Nov. Zool. 36, 1930 (Nov.), p. 53 (Cyclops Mountains); Iredale, Birds New Guinea II, 1956, p. 168 (Jobi, Cyclops and Sepik Mountains).

Zosterops novaeguineae; de Beaufort, Nova Guinea 5, 1909, p. 418 (Cyclop Mts.).

Zosterops minor minor; Rothschild, Nov. Zool. 36, 1931 (April), p. 259 (Jobi); Stresemann, Mitt. Zool. Mus. Berlin 17, 1931 (1 June) p. 223 (Jobi, Cyclopen-Gebirge, Schraderberg im Sepik); Stresemann & Paludan, Nov. Zool. 38, 1932, p. 211, 225 (Japen (Jobi)); Mayr, Orn. Monatsber. 41, 1933, p. 54 (Japen Insel, Cyclopen-Gebirge, Sepik Gebirge); Dupond, Verh. Kon. Natuurh. Mus. België, B. R. 5 (4) 1, 1937, p. 62 (Jobi, monts Cyclopes, Schraderberg); Mayr, List New Guinea Birds, 1941, p. 218 (Japen Island and mountains of northern New Guinea (Cyclops and Sepik Mountains)); Rand, Bull. Am. Mus. Nat. Hist. 79, 1942, p. 513 (Bernhard Camp, found at 850 and 1200 meters altitude).

Subspecific characters. An extremely bright and beautiful form of average size. Upper parts, including head, forehead, and ear-coverts, very bright citrine-yellow (yellower and much brighter than Ridgway's Yellowish Citrine); upper tail coverts slightly more yellow. Eye-ring practically absent, some white dots on the eye-rim probably only represent shafts of reduced feathers; no black loral line.

Under parts. Throat and upper breast orange-yellow, between Light Cadmium and Lemon Chrome, but closer to the former and brighter than either; under tail coverts yellow, without admixture of green; remainder of under parts greyish white (bases of feathers grey, tips white).

Unfeathered parts. Iris red-brown, bill blackish, legs bluish-grey (Rothschild & Hartert, 1903, ex Doherty).

Measurements of 7 specimens (6 ♂, 1 ♀): wing 54½-59 (57.07), tail 35-37½ (36.21) tarsus 15½-16½ (15.68), entire culmen 12¼-14 (13.03), exposed culmen 9-11 (10.18), culmen from anterior point of nostril 7-8¼ (7.68).

Weights: ♂, 10, 10.4, 10.5 g (Stein).

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1) As Brisson's species names (contrary to his genera) are not recognised, this name is not preoccupied by *Ficedula madagascariensis minor* Brisson, Ornithologie III, 1760, p. 498, Pl. XXVIII, Fig. 2 (= *Zosterops maderaspatana* (Linnaeus)).

Distribution (fig. 7). Japen (Jobi) and Northern New Guinea, where known from Bernhard Camp at 850 and 1200 m, Cyclops Mountains, Lordberg and Meanderberg in the Sepik-area.

First collector. A. B. Meyer in April 1873 on Japen. The honour of the discovery on the New Guinea mainland goes to Lorentz and de Beaufort who collected a specimen on 15 April 1903, which specimen was subsequently recorded as *Z. novaeguineae* by de Beaufort (1909).

Not figured.

Type. Was in the Dresden Museum, destroyed in 1945.

Moult. Not checked in the material examined.

Nidification. Not recorded.

Habits, etc. According to Rand (1942) this is a bird of the treetops, travelling in small parties of its own kind or in mixed flocks.

Discussion. According to Rand (1942) specimens from Bernhard Camp differ from Japen birds by being on an average slightly greener above and by having slightly blacker lores. I have been unable to detect the differences described by Rand and presume that they were caused by differences in wear or freshness (of skin).

The specimen listed as *Z. novaeguineae* by de Beaufort (1909) is in the Leiden Museum, where I examined it. It is almost entirely decolorized as a consequence of preservation in alcohol, but the throat still has an orangeish tinge, and there is no trace of an eye-ring. Hence I do not hesitate to bring it to *minor*. *Z. novaeguineae* is not known from the Cyclops Mountains.

8. **Zosterops atrifrons chrysolaema** Salvadori

Zosterops chrysolaema Salvadori, Ann. Mus. Civ. Genova 7, 1875, p. 954 — Monte Arfak.

Zosterops minor tenuifrons Greenway, Proc. New England Zoöl. Club 14, 1934, p. 3 — Wau, Morobe District, 3700 ft. altitude.

Zosterops chrysolaema; Salvadori, Ann. Mus. Civ. Genova 16, 1880, p. 81 (Monte Arfak); Salvadori, Orn. Pap. II, 1881, p. 368 (Profi (Arfak, 3400 p.), Mansema (Arfak)); Sharpe, Cat. Birds Brit. Mus. 9, 1880, p. 177 (Arfak Mountains); W. Blasius, Ornis 4, 1888, p. 594 (von den Arfak-Bergen); Tristram, Cat. Coll. Birds, 1889, p. 210 (Arfak); Salvadori, Agg. Orn. Pap. II, 1890, p. 131 (no locality); Meyer & Wiglesworth, Birds Celebes, 1898, p. 491 (Arfak Mountains); (pt.) Finsch, Tierreich 15, 1901, p. 34 (Arfak-Gebirge); Dubois, Syn. Av. I, 1902, p. 710 (Monts Arfak); Rothschild & Hartert, Nov. Zool. 10, 1903, p. 452 (Kapaur); Sharpe, Hand-List Birds 5, 1909, p. 14 (New Guinea); Ogilvie-Grant in Wollaston, Pigmies and Papuans, 1912, p. 278 (Iwaka River); Ogilvie-Grant, Ibis (10) 1, 1913, p. 90 (Iwaka River); Ogilvie-Grant, Ibis (10) Jub. Suppl. 2, 1915, p 85 (Iwaka River); Ogilvie-Grant, Rep. Coll. Dutch New Guinea I, 1916, Birds, p. 65 (Iwaka River, reprint of preceding); Mathews, Syst. Av. Australas. I, 1930 (July), p. 706 (New Guinea (N.W.)); Hartert, Nov. Zool. 36, 1930 (November), p. 53 (Siwi).

Zosterops minor chrysolaema; (pt.) Stresemann, Mitt. Zool. Mus. Berlin 17, 1931,

p. 223 (Arfak-Gebirge, Schneegebirge, Gebirge von SO-Neuguinea); Mayr, Mitt. Zool. Mus. Berlin 17, 1931, p. 715 (Herzoggebirge: Dawong); Mayr, Orn. Monatsber. 41, 1933, p. 53 (Arfakgebirge und Onin-Halbinsel); Greenway, Proc. New England Zoöl. Club 14, 1934, p. 3 (northwest New Guinea); Dupond, Verh. Kon. Natuurh. Mus. België, B. R. 5 (4), 1, 1937, p. 61 (Sakoemi, presqu'île Berau); Mayr, List New Guinea Birds, 1941, p. 218 (Arfak Mountains and Onin Peninsula); Gyldenstolpe, Arkiv f. Zool. 8, 1955, p. 204 (Vogelkop).

Zosterops minor tenuifrons; Greenway, Proc. New England Zoöl. Club 14, 1935, p. 105 (Wau, Morobe district, 3800 ft); Mayr & Rand, Bull. Am. Mus. Nat. Hist. 73, 1937, p. 242 (Mt. Misim, Herzog Mts); Mayr, List New Guinea Birds, 1941, p. 218 (from the Herzog to the Hydrographer Mountains); Peters, Bull. M. C. Z. 92, 1943, p. 90 (Wau, Morobe District).

Zosterops minor subspecies; Mayr & de Schauensee, Proc. Ac. Nat. Sc. Philad. 91, 1939, p. 144 (Mt. Bandji, 3300 ft.).

Zosterops minor (*tenuifrons*?); Gyldenstolpe, Arkiv f. Zool. 8, 1955, p. 204 (Vogelkop).

Zosterops delicatula tenuifrons; Iredale, Birds New Guinea II, 1956, p. 168 (Huon Peninsula).

Zosterops chrysolaema chrysolaema; Iredale, Birds New Guinea II, 1956, p. 169 (Arfak Mountains).

Zosterops atrifrons; Brongersma & Venema, Het witte hart van Nieuw-Guinea, 1960, p. 177 (Ok Tsjop (Digoel, bivak 34a, 800 m)).

Subspecific characters. An average sized race. Upper parts distinctly greener than in *minor*; on forehead a variable amount of fuscous black; also a somewhat variable amount of black on lores and under the eye; eye-ring wide, interrupted in front by a fairly large black spot. Greenish edges along rectrices very conspicuous.

Under parts. Throat more Lemon Chrome, rather less orange, than in *minor*; under tail coverts as in *minor*; remainder of under parts greyish white as in *minor*.

Unfeathered parts. Iris red-brown (Rothschild & Hartert, 1903, ex Doherty: Kapaur); irides light hazel, bill black, legs and toes bluish..... (C. H. B. Grant: Iwaka River); iris pale cocoa brown, bill black, feet grey (Mayr: Siwi); iris brown, feet grey (Ripley: Bandji); iris light brown, tarsus pale plumbeous (H. Stevens: Morobe and Upper Watot); iris brown, bill black, feet slaty blue (Eichhorn: Hydrographer Range).

Measurements. Wing 8 ♂, 56-59 (57.88); 6 ♀, 56½-60 (58.00); 15 specimens, 56-60 (58.00); tail 8 ♂, 34½-39 (36.75); 6 ♀, 35½-38 (36.42); 15 specimens, 34½-39 (36.57); tarsus 15 specimens, 15-16¾ (15.88); entire culmen 12 specimens, 12¼-14¼ (13.27); exposed culmen 12 specimens, 10-11¼ (10.71); culmen from anterior point of nostril 12 specimens, 7-8 (7.83).

Structure. Length of 2nd primary between 6th and 8th in the specimens where this was checked.

Weight of one female from Mt. Bandji, 10½ gram.

Distribution (fig. 7). Western New Guinea: Tamrau Mountains (Mt. Bandji), Arfak Mountains (Profi, Mansema, Sakoemi, and Siwi), Onin Penisula (Kapaur), Iwaka River, Ok Tsjop. Eastern New Guinea: Morobe District (Wau 3200 to 3800 ft., Upper Watot 2300 ft., Surprise Creek 3000 ft.), Herzog Mountains (Dawang, Mt. Misim), Hydrographer Range 2500 ft.

First collector. A. A. Bruijn, on 12th May 1875 (cf. Salvadori, 1881), Beccari obtained his first specimen two weeks later.

Not figured.

Type. The subspecies was described from five cotypes. One of these was exchanged with Tristram (Tristram, 1889) and has been destroyed during the 1939-1945 war; the other cotypes remain in the Genoa Museum. One cotype, Salvadori's cotypus a, examined. It has been collected by Beccari on 7 July 1875 at Trafi (or Profi?), 3400 ft., and is registered under C. E. 11529.

Moult. Two specimens collected in March, and one collected in July, are not in moult. A specimen taken in April is moulting rectrices.

Nidification. Not recorded.

Habits, etc. The known vertical distribution is from about 2300 ft. to 3800 ft. Mayr (1931) mentions song, but gives no particulars.

Discussion. The race *tenuifrons* was according to its describer: "...very close to *Zosterops minor chrysolaema* Salvadori... they differ in having more black on the forehead and ear coverts. In other respects, such as the general color and the eye ring, they are closer to *chrysolaema* than to *gregaria* of the Huon Peninsula".

I have compared ten specimens ascribed to *tenuifrons,* with several skins from various localities in Western New Guinea, among them a series of paratypes of *tenuifrons* and a cotype of *chrysolaema,* and found the following: Out of nine specimens of topotypical *tenuifrons,* four (MCZ nrs. 167777, 167778, 167779, 167785) do not have more black on the heads than Iwaka and Arfak specimens. The cotype of *chrysolaema* seemed to have slightly more black on its forehead than other specimens from the Arfak Mountains examined. Previous authors already stated the specimen from Mt. Bandji to be inseparable from *tenuifrons*; actually it agrees with the specimen of *tenuifrons* which has the black on the crown most extended (MCZ nr. 167782).

Apparently there is a fairly great individual variation as regards extent of black on the forehead (which may be partly connected with age or with some other factor I have been unable to check). Though it may be true

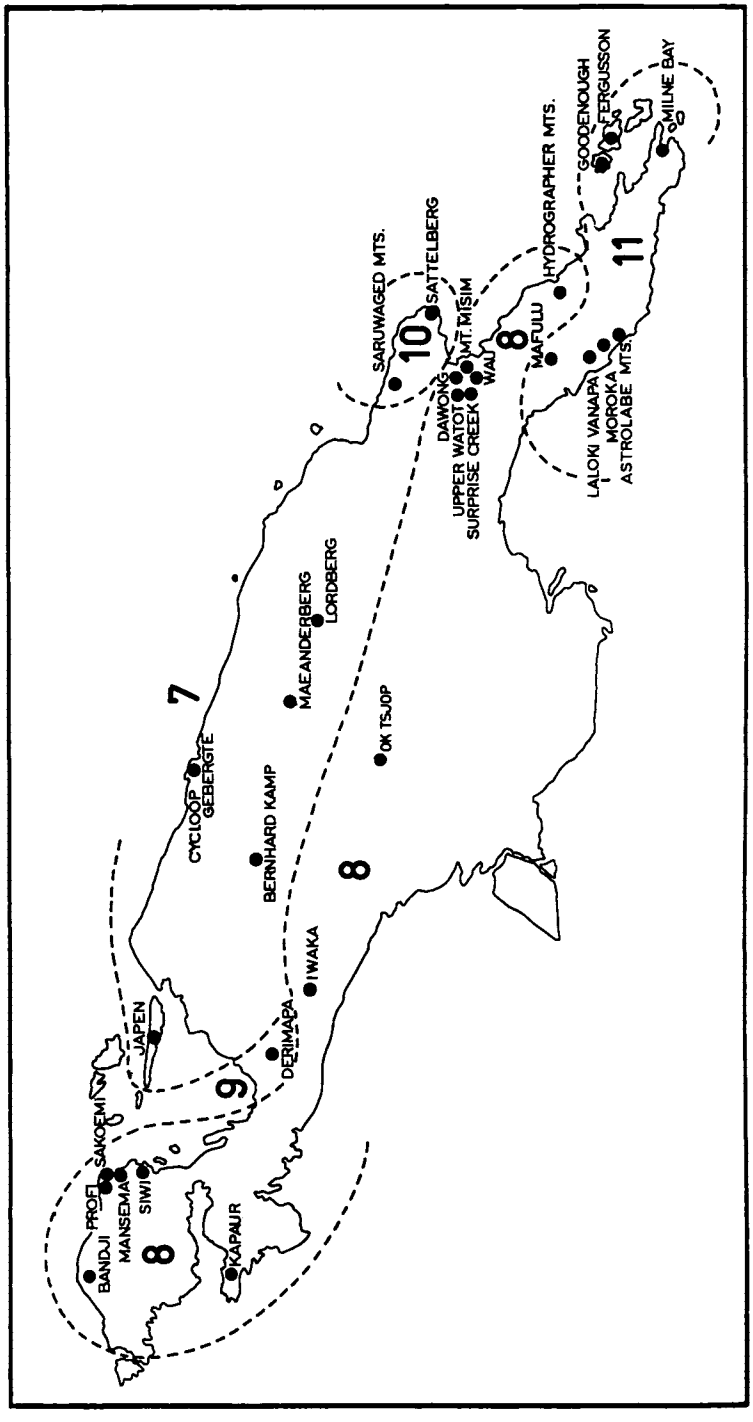


Fig. 7. The distribution of *Zosterops atrifrons* in New Guinea; 7, *minor*; 8, *chrysolaema*; 9, *rothschildi*; 10, *gregaria*; 11, *delicatula*.

The localties Kotoi and mt. Gayata in the Owen Stanley Mountains, whence *delicatula* has been recorded, could not be found.

that specimens from eastern New Guinea tend to have on the average more black on the foreheads than those from the Arfak Mountains, the specimen from Mt. Bandji shows that this trend, if it really exists, is irregular and should not be used for subspecific distinction.

9. **Zosterops atrifrons rothschildi** Stresemann & Paludan

Zosterops minor rothschildi Stresemann & Paludan, Orn. Monatsber. 42, 1934, p. 44 — Derimpa, Gebroeders, Weyland Geb.

Zosterops minor subsp.; Rothschild, Nov. Zool. 36, 1931, p. 259 (Mt. Derimpa, 5000 ft.); Mayr, Orn. Monatsber. 41, 1933, p. 54 (Weylandgebirge).

Zosterops minor rothschildi; Hartert, Paludan, Rothschild & Stresemann, Mitt. Zool. Mus. Berlin 21, 1936, p. 174 (Derimapa); Mayr, List New Guinea Birds, 1941, p. 218 (Weyland Mountains).

Zosterops chrysolaema rothschildi; Iredale, Birds New Guinea II, 1956, p. 169 (Weyland Mountains).

Subspecific characters. I have not been able to examine material of this subspecies, which is hitherto known from the type specimen only, but according to its describers it is "Wie *Z. m. minor* von Japen, aber mit deutlichem Augenring aus weissen Federchen; in dieser Beziehung an *Z. m. chrysolaema* sich anschliessend, bei dem der Augenring indessen noch deutlicher ausgeprägt ist und der zudem eine schwärzliche Stirn hat" (Stresemann & Paludan, 1934).

Unfeathered parts. Iris red brown, bill black, feet blue grey (Rothschild, 1931, ex Shaw Mayer).

Distribution. Known from the type locality only.

First collector. F. Shaw Mayer on 29 June 1930.

Not figured.

Type. AMNH nr. 303041.

Moult. Not checked.

Nidification. Unknown.

Habits, etc. Contents of stomach berries (Rothschild, 1931).

Discussion, This race is hitherto known from the unique type specimen only. As I have intimated in the discussion of the species, in characters it seems more or less intermediate between *minor* and *chrysolaema,* but without additional material it is impossible to know if it represents a stable somewhat intermediate race, or comes from a zone of hybridization between these two forms. In the latter case, there would be no justification for the name *rothschildi* to be maintained, but until further evidence is forthcoming, the name will assist in attracting attention to the individual it has been based on.

Mayr (1941, p. 218) suggested that the specimen from the Iwaka River, Nassau Mountains, might belong to the present race, but on examination of

the specimen in question I found it to be a typical *chrysolaema* (under this name it was already recorded by Ogilvie-Grant, 1912, 1913, 1915, 1916) and shows no approach to *rothschildi* or *minor*.

10. **Zosterops atrifrons gregaria** Mayr

Zosterops minor gregaria Mayr, Orn. Monatsber. 41, 1933, p. 53 — Sattelberg.

Zosterops chrysolaema; Madarász, Orn. Monatsber. 8, 1900, p. 3 (Sattelberg); (pt.) Finsch, Tierreich 15, 1901, p. 34 (Kaiser-Wilhelms-Land); Madarász, Termés. Füz. 24, 1901, p. 73, 77 (Sattelberg); Stresemann, Arch. f. Naturgesch. 89, A, Heft 7, 1923, p. 18, 68 (Sattelberg).

Zosterops minor chrysolaema; (pt.) Stresemann, Mitt. Zool. Mus. Berlin 17, 1931, p. 223 (Saruwaged-Gebirge); Mayr, Mitt. Zool. Mus. Berlin 17, 1931, p. 671 (Sattelberg, Junzaing, Kulungtufu).

Zosterops minor gregaria; Greenway, Proc. New England Zoöl. Club 14, 1935, p. 105 (no locality); Mayr & Rand, Bull. Am. Mus. Nat. Hist. 73, 1937, p. 242 (no locality); Mayr, List New Guinea Birds, 1941, p. 218 (Mountains of the Huon Peninsula).

Zosterops delicatula gregaria; Iredale, Birds New Guinea II, 1956, p. 168 (Morobe district).

Subspecific characters. This form was described as follows: "Sehr ähnlich *Zosterops minor chrysolaema* Salvadori, aber weisser Augenring im Durchschnitt schwächer entwickelt; Oberseite mehr gelblich-oliv, besonders auf Bürzel, Oberschwanzdecken und Flügelsäumen; Stirn und Zügel nicht so reinschwarz, mehr bräunlich oliv; die vordere Hälfte des Scheitels meist bräunlich-schwarz verwachsen, diese Region ist viel reiner oliv bei *chrysolaema*; Schnabel anscheinend länger".

My own examination fully confirmed these characters; on their upper parts these birds are slightly yellower and also duller than *chrysolaema*; eye-ring perhaps somewhat narrower; bill apparently slightly longer; throat slightly more orangeish yellow than in *chrysolaema*; in colour of rump and under tail coverts I do not see much difference.

In several of these characters it would seem that *gregaria* shows a slight approach to *minor* (e.g. the more yellowish upper parts, the more orange-yellow throat, and the narrow eye-ring).

Unfeathered parts. "Iride fusca" (Madarász, 1901); iris brown or dark brown, bill black, legs grey (Mayr).

Weights. ♂: 11g, ♀: 11, 12, 12, 12 g (Mayr).

Distribution. Mountains of the Huon Peninsula. Locality records are Sattelberg, Zakaheme (material examined), Junzaing, Kalungtufu (Mayr, 1931), Wareo, Hompua (Mayr, 1933).

First collector. Biró on the Sattelberg in 1899 (Madarász, 1900 and 1901).

Not figured.

Type. Mus. Berlin nr. 30.2835.

Moult. Not checked.

Nidification. Not recorded, but Mayr (1931) obtained laying females at the end of December and early January.

Habits, etc. Apparently not recorded.

Discussion. Iredale (1956) has reversed the ranges of *gregaria* and *tenuifrons*. Such a slip might happen to anybody, but knowing how Iredale would react when somebody else made such a mistake, I cannot help expressing my opinion that Iredale's work would easily be the most amazing ornithological publication of the last decade but for the fact that the same author's "Birds of Paradise and Bower Birds" has appeared in the same period.

11. **Zosterops atrifrons delicatula** Sharpe

Zosterops delicatula Sharpe, Journ. Linn. Soc. London, Zool. 16, 1882 (6 April), p. 318 — Astrolabe Range, S. E. New Guinea (= Morocco district, cf. Sharpe, 1882, p. 440).

Zosterops delicatula pallidogularis Stresemann, Mitt. Zool. Mus. Berlin 17, 1931, p. 222 — Fergusson-Insel (type) und Berge der Goodenough-Insel.

Zosterops delicatula; Sharpe, Journ. Linn. Soc. London, Zool. 16, 1882 (31 July), p. 440 (Morocco district); Sharpe in Gould, Birds New Guinea, pt. XIV, 1883 (Astrolabe range); Sharpe, Cat. Birds Brit. Mus. 9, 1884, p. 177 (Astrolabe Mountains); Reichenow & Schalow, Journ. f. Orn. 32, 1884, p. 417 (S. E. New Guinea); W. Blasius, Ornis 4, 1888, p. 594 (von dem südostlichen Neu-Guinea); Tristram, Cat. Coll. Birds, 1889, p. 210 (Astrolabe Mountains); Salvadori, Agg. Orn. Pap. II, 1890, p. 131 (no locality); Meyer & Wiglesworth, Birds Celebes, 1898, p. 489 (S. E. Guinea[!]); Hartert, Nov. Zool. 5, 1898 (Dec.), p. 528 (no locality); Finsch, Tierreich 15, 1901, p. 34 (Astrolabe-Gebirge); Dubois, Syn Av. I, 1902, p. 710 (Monts Astrolabes); Rothschild & Hartert, Nov. Zool. 10, 1903, p. 452 (Kotoi district; Moroka district 3000-6000 ft.; between rivers Laroki and Vanapa; Mt. Gayata, 2000-4000 ft.; Milne Bay; Fergusson Island); Sassi, Journ. f. Orn. 57, 1909 (July), p. 376 (Astrolabe Geb.); Sharpe, Hand-List Birds 5, 1909 (after August), p. 14 (Astrolabe Mts.); Rothschild & Hartert, Nov. Zool. 21, 1914, p. 8 (Mts. of Goodenough Island); Mathews, Syst. Av. Australas. II, 1930, p. 706 (New Guinea (S.E.)).

Zosterops delicatula delicatula; Stresemann, Mitt. Zool. Mus. Berlin 17, 1931, p. 222 (Südost-Neuguinea); Iredale, Birds New Guinea II, 1956, p. 168 (eastern portion of New Guinea).

Zosterops delicatula pallidogularis; Mathews, Ibis (13) 2, 1932, p. 155 (Fergusson Island and Goodenough Island); Iredale, Birds New Guinea II, 1956, p. 167, 168, pl. XXVII fig. 4 (Goodenough, Fergusson Island).

Zosterops minor delicatula; Mayr, Orn. Monatsber. 41, 1933, p. 54 (Gebirge von Südost Neu-Guinea); Greenway, Proc. New England Zoöl. Club 14, 1934, p. 3 (south coast); Mayr & Rand, Bull. Am. Mus. Nat. Hist. 73, 1937, p. 242 (Mafulu at 1250 m); Mayr, List New Guinea Birds, 1941, p. 218 (Mountains of southeastern New Guinea (southern slopes)); Gilliard, Am. Mus. Nov. 1453, 1950, p. 39 (Koitaki plantation, 2600 ft., S. E. Papua).

Zosterops minor pallidogularis; Mayr, Orn. Monatsber. 41, 1933, p. 54 (Fergusson

und Goodenough-Insel); Mayr, List New Guinea Birds, 1941, p. 218 (Fergusson and Goodenough Islands).

Subspecific characters. Upper parts slightly greener again than in *chrysolaema*; whole forehead, loral line, and space under the eye, black; eye-ring very wide, wider than in *chrysolaema;* throat distinctly more yellow, les orange, than in *chrysolaema,* about Lemon Yellow, but slightly more yellow (less greenish) and distinctly brighter; under tail coverts as in *chrysolaema*; indistinct greenish edges along the rectrices. The resemblance of this form to *sulaensis* has already been commented upon under that form, and in the introduction to the species.

Unfeathered parts. Iris chocolate or brown; bill black, mandible lighter at base, or black, base of mandible slate, or black and slaty blue (Meek: Fergusson Island and Goodenough Island); iris brown, bill black, feet slate (Rothschild & Hartert, 1903, ex Meek: Milne Bay).

Measurements of 14 specimens (5 ♂, 6 ♀, 3 —): wing 55-59 (57.29), tail 34-39 (35.93), tarsus 15-16½ (16.04), entire culmen (11 specimens only) 12½-14¾ (13.52), exposed culmen (11 specimens only) 10-11½ (10.57), culmen from anterior point of nostril (11 specimens only) 7¼-8½ (7.89).

Structure. 2nd primary in length between 6th and 8th.

Distribution (fig. 7). Mountains of southeastern New Guinea, Fergusson, and Goodenough Island. Locality records on the New Guinea mainland are: Moroka district 3000-6000 ft. (called Morocco by Sharpe, 1882), Kotoi district; between rivers Laroki and Vanapa; Mt. Gayata 2000-4000 ft.; Astrolabe Mountains; Milne Bay; Mafulu 1250 m.

First collector. A. Goldie before March, 1882, when his specimens were registered in the British Museum, in the Astrolabe Mountains.

Figure. A beautiful coloured plate of natural size is given in Gould's Birds of New Guinea III, pt. XIV, 1883, plate 62; Iredale, 1956, pl. XXVII fig. 4 (coloured, by Mrs. Iredale, about two-thirds natural size).

Type. The two cotypes are BM nrs. 82.3.8.82 and 82.3.8.81 (specimens examined). Both are undated and their locality reads Astrolabe Mountains only, though Sharpe (1882) later restricted their place of provenance to Morocco district (with which he doubtless means Moroka of modern maps).

Moult. Specimens collected in March (1), May (1), and June (2) are moulting primaries and/or rectrices. Two October specimens show no moult, and according to Mayr & Rand (1937) none of the eight specimens collected in October and November show moult.

Nidification. Mayr & Rand (1937) mention the taking of "breeding individuals" in October and November.

Discussion. Stresemann (1931) described *pallidogularis* with the diag-

nosis: "Kehle mehr zitrongelb, weniger goldgelb als bei *Z. d. delicatula*". A comparison of three specimens from New Guinea with seven from the d'Entrecasteaux Archipelago showed that as far as coloration is concerned these populations are identical. There is no difference in measurements either:

New Guinea, wing: ♂, 59 ♀, 55½ —, 56½, 57, 59.

Fergusson and Goodennough Islands:

♂, 57, 58, 58, 59 ♀, 55, 55, 57, 57, 58.

I presume that the difference in coloration of the throat found by Stresemann (l.c.) was due to fading of part of his series.

Species 19. **Zosterops atriceps** G. R. Gray

Characters. A species of average to fairly large size, characterized by (but for the under tail coverts) the carotenoid-free under parts, and the rather dull upper parts with a more or less fuscous crown and forehead. Moreover sharply distinguished from related species by the yellow basal half of the mandible.

Upper parts. Mantle slightly darker than Warbler Green; rump very little more yellowish; nape of the same colour as the mantle, or definitely more greyish; crown Warbler Green or citrine, mixed with fuscous, the green gradually disappearing anteriorly, which results in an entirely fuscous black forehead; eye-ring rather narrow to wide, interrupted in front by a dusky spot; lores in the different races varying from pale greyish to blackish; ear coverts light fuscous washed with citrine; primaries and rectrices blackish brown, widely margined with the colour of the mantle.

Under parts. Under tail coverts Lemon Yellow; remainder of under parts whitish, almost pure white on throat and centre of belly, slightly more greyish on breast and flanks.

Unfeathered parts. Iris brown or light brown; bill black with in all races the basal half of the mandible yellow.

Measurements are given in table V.

TABLE V

Zosterops atriceps

	number of specimens	wing	tail	av. wing	av. tail	tail: wing index
atriceps	9	57-61	34-39	59.06	37.17	62.94%
fuscifrons	11	56-59½	35½-38	57.55	36.30	63.08%
dehaani	3	61-62½	41	61.50	41.00	66.67%

Structure. Wing-formula typical with the 2nd primary of about the same length as the 7th.

Distribution (fig. 6). Islands of Batjan, Halmaheira, and Morotai, in the Northern Moluccas. Found in the lowlands.

Geographical variation. Fairly strong, the three islands whence the species is known each possess their own, sharply defined, endemic race.

Related species. For a discussion of the general affinities of the species I refer to what has been written under the heading of the *Zosterops atrifrons*-group.

1. **Zosterops atriceps atriceps** G. R. Gray

Zosterops (?) atriceps G. R. Gray, Proc. Zool. Soc. London 28, 1860 (published between August 1860 and March 1861), p. 350 — Batchian.

Zosterops atriceps; Hartlaub, Journ. f. Orn. 13, 1865, p. 22 (Batschian); Finsch, Neu-Guinea, 1865, p. 164 (Batjan); G. R. Gray, Hand-List Birds I, 1869, p. 163 (Batchian I.); Giebel, Thes. Orn. III, 1877, p. 774 (Batjan); Salvadori, Ann. Mus. Civ. Genova 16, 1880, p. 80 (Batcian); Salvadori, Orn. Pap. II, 1881, p. 364 (Batcian); Sharpe, Cat. Birds Brit. Mus. 9, 1884, p. 200 (Batchian); Salvadori, Agg. Orn. Pap. II, 1890, p. 130 (no locality); Nehrkorn, Journ. f. Orn. 42, 1894, p. 159 (Batjan); Finsch, Tierreich 15, 1901, p. 36 (Batjan); Dubois, Syn. Av. I, 1902, p. 711 (Ile Batjan); Hartert, Nov. Zool. 10, 1903, p. 57 (Batjan); Sharpe, Hand-List Birds 5, 1909, p. 15 (Batchian); van Balen, Dierenw. Insulinde II, 1915, p. 483 (Molukken); Mathews, Syst. Av. Australas. II, 1930, p. 707 (Batjan).

Zosterops atriceps atriceps; Stresemann, Mitt. Zool. Mus. Berlin 17, 1931, p. 221 (Batjan); Mathews, Ibis (13) 2, 1932, p. 155 (no locality); van Bemmel, Treubia 19, 1948, p. 330 (Batjan).

Subspecific characters. As the species. Fuscous wash over the whole head; crown fuscous citrine; nape fuscous grey; eye-ring rather narrow; lores dusky grey; supra loral region blackish; bill small.

Unfeathered parts. Eyes brown, or light brown, or yellow, or light yellow; bill black or blackish; legs grey (Wegner); iris brown, bill black/yellow, legs yellowish grey (de Haan); iris deep brown, feet pale leaden grey (flesh-colour, tinged with purplish), bill black, basal half of lower mandible yellow (Hartert, 1903, ex Doherty).

Measurements of 9 specimens (6 ♂, 3 ♀): wing 57-61 (59.06), tail 34-39 (37.17), tarsus 16¼-17 (16.75), entire culmen 12-15 (13.61), exposed culmen 9¼-12 (10.68), culmen from anterior point of nostril 7-9 (8.21) (measurements of culmen of 7 specimens only).

Distribution. Batjan, where it is found in low country (Hartert, 1903). It is reported to be common (de Haan, note on label).

First collector. A. R. Wallace in 1858.

Not figured.

Type. BM nr. 73.5.12.897 (type examined).

Moult. Two specimens collected in May are not in moult, one specimen collected in June is moulting rectrices. Other specimens, moult not checked.

Nidification. Not recorded.

Habits, etc. Not recorded.

2. **Zosterops atriceps fuscifrons** Salvadori

Zosterops fuscifrons Salvadori, Ann. Mus. Civ. Genova 12, 1878, p. 339 — Halmahera prope Galela.

Zosterops hypoleuca Salvadori, Ann. Mus. Civ. Genova 12, 1878, p. 340 — Nova Guinea (errore!) = Halmaheira.

Zosterops fuscifrons; Salvadori, Ann. Mus. Civ. Genova 16, 1880, p. 80; Salvadori, Orn. Pap. II, 1881, p. 365 (Halmahera, prope Galela); Sharpe, Cat. Birds Brit. Mus. 9, 1884, p. 201 (Island of Gilolo or Halmahera); Sharpe in Gould, Birds New Guinea III, pt. XVIII, 1884, plate (Gilolo or Halmahera); Salvadori, Agg. Orn. Pap. II, 1890, p. 130; Finsch, Tierreich 15, 1901, p. 36 (Batjan); Dubois, Syn. Av. I, 1902, p. 711 (Batjan, Nouv.-Guinée); Sharpe, Hand-List Birds 5, 1909, p. 15 (Halmahéra); van Balen, Dierenw. Insulinde II, 1915, p. 484 (Halmahera); Mathews, Syst. Av. Australas. I, 1930, p. 708 (Halmahera).

Zosterops hypoleuca; Salvadori, Ann. Mus. Civ. Genova 16, 1880, p. 81 (Nova Guinea); Salvadori, Orn. Pap. II, 1881, p. 365 (Nova Guinea); Sharpe, Cat. Birds Brit. Mus. 9, 1884, p. 202 (New Guinea); Salvadori, Agg. Orn. Pap. II, 1890, p. 130 (no locality); Sharpe, Hand-List Birds 5, 1909, p. 15 (New Guinea); Mathews, Syst. Av. Australas II, 1930, p. 700 (New Guinea (locality?));

Zosterops atriceps fuscifrons; Stresemann, Mitt. Zool. Mus. Berlin 17, 1931, p. 221 (Halmahera); Mathews, Ibis (13) 2, 1932, p. 155 (no locality); van Bemmel, Treubia 19, 1948, p. 330 (Halmahera); de Haan, Amsterdam Nat. 1, 1950, p. 60 (Nucifera, Halmahera).

Subspecific characters. Similar to the nominate race, but differs in having the nape and crown Warbler Green as the mantle, the fuscous wash being restricted to the anterior part of the crown; moreover the present race averages slightly smaller.

Unfeathered parts. Iris brown, or pale brown, or brownish grey; bill black/yellow; legs grey, or bluish grey, or yellowish grey (de Haan).

Measurements of 10 specimens (5 ♂, 2 ♀, 3 —): wing 56-59½ (57.55), tail 35½-38 (36.30), tarsus 16-77½ (16.61), entire culmen 13¾-15 (14.30), exposed culmen 10¾-12 (11.20); culmen from anterior point of nostril 8-9 (8.38).

Weights, ♂ ad., 11, 12, 12, 14 g; ♀ ad., 12 g; sex?, 11. 12 g; ♂ juv., 10 g (de Haan).

Distribution. Confined to Halmaheira, where it is found in the lowlands and appears to be rather scarce (de Haan). Records of localities are Galela (Bernstein) and Nucifera (de Haan).

First collector. H. A. Bernstein in August 1861 at Galela.

Figure. An excellent coloured plate of natural size, drawn after cotype RMNH cat. nr. 2 is given by Gould (1884, plate 60).

Types. The three cotypes are RMNH cat. nrs. 1 (sex ?), 2 (♂), and 3 (♀), collected in August 1861. The type specimen of *hypoleuca* is BM nr. 66.2.13.7 (all type specimens examined).

Moult. Out of two April specimens one is moulting primaries and also upper wing coverts, the other specimen is not in moult and is in fairly fresh plumage.

Nidification. A juvenile specimen (wing 50, tail 21) was taken by de Haan on 21 November 1949.

Habits, etc. Unrecorded apart from what already has been noted under the heading Distribution.

Discussion. Finsch (1901) records this form from Batjan instead of Halmaheira, which is evidently but a slip, though faithfully copied by Dubois (1902).

3. **Zosterops atriceps dehaani** van Bemmel

Zosterops dehaani van Bemmel, Treubia 17, 1939, p. 125 — Kpg. Pilowo, Morotai.
Zosterops atriceps dehaani; Zimmer & Mayr, Auk 60, 1943, p. 260 (Morotai); van Bemmel, Treubia 19, 1948, p. 330 (Morotai).

Subspecific characters. For reasons stated in the discussion it is not possible to give colour characters with certainty; the crown and ear coverts seem darker and the black more extended than in the other two races, the eye-ring is wider, lores pale, size larger and bill also larger and thicker.

Unfeathered parts. Eyes bright brown, bill dark grey, basal half of mandible light grey, legs light grey (van Bemmel, 1939, ex de Haan). I presume that some error has been made in the description of the colour of the bill (no notes appear on the labels of the specimens) as the basal parts of the mandibles in the three skins are yellow just as in the other races of the species.

Measurements of three specimens (2 ♂, 1 ♀): wing 61, 61, 62½, tail 41, 41, 41; tarsus 18½, 18¾, 19; entire culmen 14, 15¼, 16; exposed culmen 12, 12¼, 12½; culmen from anterior point of nostril 9, 9, 9.

Distribution. Morotai, where known from the type-locality only.

First collector. G. A. L. de Haan at the type locality on 29 March, 1938.

Not figured.

Type. RMNH nr. 14061 (type examined).

Moult. One specimen collected in March is moulting primaries, the two other specimens are not in moult.

Nidification. Not recorded.

Habits, etc. Lowlandform (van Bemmel, 1939).

Discussion. Originally this form was described as a full species by van Bemmel (1939), partly because of important differences in colour from *atriceps* and *fuscifrons*, with: "...graubraune, nicht olivgrüne Oberseite, fast völlig lipochromfreie Unterschwanzdecken,.....".

The type, at the time the only specimen available to me, gave a strong impression of having been preserved in spirits, and the differences in colour between *dehaani* and the two forms *fuscifrons* and *atriceps* are exactly those that might be expected to have developed after preservation in alcohol (bleaching out of yellow, greyish instead of green mantle). Attempting to obtain certainty concerning this point, I wrote to Dr. van Bemmel, who kindly replied (in litt., 20-III-1953) that the typical series of *dehaani* indeed has been preserved in alcohol for a short time previous to being skinned, a fact of which, unfortunately, he was not yet aware when he published the description.

If we assume that *dehaani* has the same colour of mantle as the two other races, and that the under tail coverts are yellow in life, it is evident that it is only a race of *atriceps*; this is the reason why van Bemmel (1948) without comment followed Zimmer & Mayr (1943) who, on other grounds, had decided to reduce *dehaani* to subspecific status. Nevertheless, on the characters noted above, *dehaani* is a very fine subspecies and is probably the most distinct form discovered in the family during the last twenty-five years.

The form is still known from the original three spirit-specimens only, all collected on the same day at the type-locality.

Species 20. **Zosterops mysorensis** Meyer

Zosterops mysorensis Meyer, Sitzungsber. Ak. Wissensch. Wien 70, 1874, p. 116 — Insel Mysore im Norden Neu-Guinea's (Kordo).

Zosterops mysorensis; Sclater, Ibis (3) 4, 1874, p. 418 (Mysore); Rowley, Ornith. Misc. 2, 1877, p. 324 (Kordo); Giebel, Thes. Orn. III, 1877, p. 776 (Mysore); Salvadori, Ann. Mus. Civ. Genova 16, 1880, p. 81 (Mysori); Salvadori, Orn. Pap. II, 1881, p. 365 (Korido (Misori)); Tristram, Cat. Coll. Birds, 1889, p. 211 (Korido, Misori); Salvadori, Agg. Orn. Pap. II, 1890, p. 130 (no locality); Finsch, Tierreich 15, 1901, p. 24 (Insel Mysore); Dubois, Syn. Av. I, 1902, p. 708 (Ile Mysory); de Beaufort, Nova Guinea 5, 1909, p. 395, 419 (Supiori); Wichmann, Nova Guinea 4, 1917, p. 324 (Supiori); Mathews, Syst. Av. Australas. II, 1930, p. 700 (Misori Island); Stresemann, Mitt. Zool. Mus. Berlin 17, 1931, p. 203, 222 (Biak (= Misori)); Stresemann & Paludan, Nov. Zool. 38, 1932, p. 192 (Biak); Mayr & de Schauensee, Proc. Ac. Nat. Sc. Philad. 91, 1939, p. 6, 7, 9, 36 (Biak); Mayr, List New Guinea Birds, 1941, p. 217 (Biak Island); Iredale, Birds New Guinea II, 1956, p. 167 (Biak); Brongersma, The animal world of Neth. New Guinea, 1958, p. 66 (Biak and Soepiori).

Zosterops mysoriensis; Sharpe, Cat. Birds Brit. Mus. 9, 1884, p. 201 (Island of Misori); Lister, Proc. Zool. Soc. London for 1888, 1889, p. 519 (Mysori).

Zosterops misoriensis; Sharpe, Hand-List Birds 5, 1909, p. 7 (Misori Isl.).

Characters. A fairly large species characterised by rather dull appearance, the absence of yellow on the throat, and reduction of eye-ring.

Upper parts. Entire upper surface between Warbler Green and Olive, though somewhat brighter than either; forehead and supra loral region of the same colour as remainder of upper parts; eye-ring reduced; loral line, continued as a streak under the eye, greyish black; primaries, secondaries and rectrices brownish black all widely edged with the colour of the mantle.

Under parts, particularly on breast and flanks, rather greyish, under tail coverts pale yellow, no yellow on throat.

Unfeathered parts. Iris dull brownish red, feet pale (Ripley).

Measurements of one male: wing 60, tail 37, tarsus 16¾, entire culmen 14½, exposed culmen 11¼, culmen from anterior point of nostril 8.

Structure. Bill comparatively heavy; tail index of one specimen 61.7 %.

Weight of one male, 15 g.

Distribution. Only known from the island of Soepiori, Schouten Islands. No certain records seem to exist for Biak, though the proximity of Biak and Soepiori makes it likely that the species occurs on both islands.

First collector. A. B. Meyer or his native collectors in 1873.

Not figured.

Type. Was in the Dresden Museum, destroyed in 1945.

Moult. A specimen collected in December is moulting rectrices.

Nidification. Unknown.

Habits, etc. A specimen collected by Ripley was secured in a high tree over secondary growth on a river bank, where it associated with a small flock of warblers and flower-peckers.

Discussion. Though only two specimens have been secured in this century there is no reason to believe that the species is very rare on Soepiori, for all collectors who visited the island have obtained it. It is probably confined to jungle and old secondary growth.

The interior of Soepiori is known to be rather inaccessible; Ripley (in Mayr & de Schauensee, 1939, p. 3, also p. 7) thought that he had reached about the highest point of the island at an altitude of 2,200 feet. When at Seroei, Japen, in January, 1957, I had the pleasure of meeting Dr. ten Haaft, Ripley's companion on the trip to the interior of Soepiori, who told me that at the time he had been rather surprised to read Ripley's report, as they had not nearly reached the highest point of the island. Actually recent maps show that the island reaches an altitude of 1034 m, or 3400 feet, which means that its higher regions remain biologically unexplored.

Species 21. **Zosterops meeki** Hartert

Zosterops meeki Hartert, Nov. Zool. 5, 1898, p. 528 — Sudest, Louisiade Archipelago.
Zosterops meeki; Finsch, Tierreich 15, 1901, p. 37 (Tagula (Südost-Insel)); Dubois, Syn. Av. I, 1902, p. 711 (Ile Sudest); Rothschild & Hartert, Nov. Zool. 10, 1903, p. 452 (Sudest Island); Sharpe, Hand-List Birds 5, 1909, p. 15 (Sudest Isl.); Hartert, Nov. Zool. 27, 1920, p. 435 (Sudest Island); Mathews, Syst. Av. Australas. II, 1930, p. 708 (Sudest Island); Iredale, Birds New Guinea II, 1956, p. 169 (Sudest I.).
Zosterops delicatula meeki; Stresemann, Mitt. Zool. Mus. Berlin 17, 1931, p. 222 (Sudest Insel (Berg Riu)).
Zosterops minor meeki; Mayr, Orn. Monatsber. 41, 1933, p. 54 (Südost-Insel); Mayr, List New Guinea Birds, 1941, p. 218 (Tagula (Sudest) Island).

Characters. Upper parts (colour of mantle) very similar to those of *Z. atrifrons delicatula*; eye-ring wide, interrupted in front by the usual black spot; black cap extended as in *Z. h. hypoxantha*. Under parts, sharply distinguished from neighbouring populations of the *atrifrons*-group by the almost lipochrome-free throat (only traces of yellow are present at the border of the throat); under tail coverts yellow, remainder of under parts whitish, much whiter, less grey, than in other pale throated related species (*Z. mysorensis, Z. atriceps*).

Unfeathered parts. Iris brown or dark brown, bill black, slaty blue or dark slate at base, legs slate blue or slate brown (Meek).

Measurements of 3 specimens (1 ♂, 2 ♀): wing 56-59½ (57.83), tail 35½-37 (36.17), tarsus 16-17 (16.67), entire culmen 13-14 (13.67), exposed culmen 11-12 (11.50), culmen from anterior point of nostril 8½ (8.50).

Structure. In the only specimen in which this could be checked, the 2nd primary was relatively long (5>2>6) but the plumage was abraded, and I do not consider this to be of great significance. Tail relatively short, 61.0-63.8 % in the three specimens examined.

Distribution. Only known from Sudest Island, perhaps more correctly called Tagula, in the Louisiade Archipelago. Probably most numerous in the hills, though I am not aware of the existence of any published information concerning the ecology of the species.

First collector. A. S. Meek in April, 1898.

Not figured.

Type. AMNH nr. 700582.

Moult. Two specimens collected in February are in abraded plumage, but show no moult; one specimen collected in April is moulting primaries.

Nidification. Not recorded.

Habits, etc. Not recorded. It is a pity that Hartert, in his various contributions about the species, never included any field-notes. Though his systematic work was of a high standard, he rarely published any field-

notes notwithstanding the fact that it must have been easy for him to encourage Meek and other collectors to supply such notes.

Discussion. For particulars about the relationships of this species or if one likes subspecies, I refer to what has been written under the heading Characters and to the general discussion of the species-group.

Species 22. **Zosterops hypoxantha** Salvadori

Characters. A fairly small species with green upper parts, all yellow underparts, and a black forehead. This species is in general appearance close to the preceding one (*Z. meeki*), but differs by its distinctly yellower upper parts and all yellow under surface. From the nominate race of *Zosterops fuscicapilla* this species differs by somewhat brighter, more yellowish, colour on rump and abdomen, usually more extended black on the head, and perhaps somewhat smaller size.

Unfeathered parts. Iris brown to reddish brown, bill black, basal two thirds of mandible bluish, legs slaty blue.

Structure. Length 2nd primary between 5th and 8th; tail index from 58.5 to 69.5 %.

Distribution (fig. 6). The larger islands of the Bismarck Archipelago: New Britain (Neu Pommern), Vuatom, Mioko and Neu-Lauenburg (Duke of York Islands), New Ireland (Neu Mecklenburg), and Neu Hannover; and Manus in the Admiralty Islands.

Geographical variation. Rather slight. Of the three races described the one from Manus (*admiralitatis*) differs by its pale, dirty yellowish, not bright yellow throat. Lack of material has prevented me from working out the differences between the other two races (*hypoxantha* and *ultima*), but it is certain that they are very similar.

Related species. The subject of the relationships of *Z. hypoxantha* has already been discussed in the introduction to the *Z. atrifrons*-group.

1. **Zosterops hypoxantha hypoxantha** Salvadori

Zosterops hypoxantha Salvadori, Atti R. Acc. Sc. Torino 16, 1881, p. 623 — Nova Britannia.

Zosterops; Finsch, Ibis (5) 4, 1881, p. 533 (New Britain).

Zosterops hypoxantha; Salvadori, Ann. Mus. Civ. Genova 18, 1882 (2 Oct.), p. 425 (Nova Britannia); Salvadori, Orn. Pap. III, 1882 (Dec.), p. 545 (Nuova Britannia, Baja Blanche); Reichenow & Schalow, Journ. f. Orn. 32, 1884, p. 417 (Nova Britannia); Sharpe, Cat. Birds Brit. Mus. 9, 1884, p. 178 (New Britain); Tristram, Cat. Coll. Birds, 1889, p. 211 (Blanche Bay, N. Britain); Salvadori, Agg. Orn. Pap. II, 1890, p. 132 (no locality); Reichenow, Mitt. Zool. Mus. Berlin 1, 1899, p. 98 (Neupommern: Ralum); Dahl, Mitt. Zool. Mus. Berlin 1, 1899, p. 210 (Ralum); Nehrkorn, Kat. Eiersamml., 1899, p. 80 (Neu-Britannien); Finsch, Tierreich 15, 1901, p. 35 (Neu-

Pommern, Neu-Lauenburg); Dubois, Syn. Av. I, 1902, p. 711 (Iles Bismarck); Sharpe, Hand-List Birds 5, 1909, p. 14 (Neu Pomerania, Neu Lauenberg); Nehrkorn, Kat. Eiersamml., 2nd ed., 1910, p. 270 (Neu-Pommern); Ogilvie-Grant, Cat. Bird's Eggs Brit. Mus. 5, 1912, p. 6 (New Pomerania); Reichenow, Die Vögel II, 1914, p. 469 (Bismarckinseln); (pt.) Rothschild & Hartert, Bull. B. O. C. 33, 1914, p. 109 (New Britain); O. Meyer, Journ. f. Orn. 77, 1929, p. 28 (Vuatom).

Zosterops fuscicapilla hypoxantha; O. Meyer, Journ. f. Orn. 78, 1930, p. 33, 36 (Vuatom); Mathews, Syst. Av. Australas. II, 1930, p. 707 (New Britain).

Zosterops hypoxantha hypoxantha; (pt.) Stresemann, Mitt. Zool. Mus. Berlin 17, 1931, p. 222 (Neu-Britannien, Vuatom); Mathews, Ibis (13) 2, 1932, p. 155 (no locality).

Zosterops fuscicapilla (hypoxantha); O. Meyer, Journ. f. Orn. 82, 1934, p. 308 (not on Lihir).

Zosterops minor hypoxantha; Mayr, Bull. Am. Mus. Nat. Hist. 83, 1944, p. 169 (no locality); Mayr, Am. Mus. Nov. 1707, 1955, p. 45 (New Britain).

Subspecific characters. As those of the species. Differences from *ultima* and *admiralitatis* are set forth under those races.

Unfeathered parts. Iris light chestnut, bill black, basal part of mandible pale, legs greenish grey (Dahl).

Measurements of six specimens (2 ♂, 2 ♀, 2 —): wing 55-59 (56.58), tail 32-40 (35.25), tarsus 16-17¼ (16.63), entire culmen (5 specimens only), 13-13½ (13.15), exposed culmen (5 specimens only) 10-11 (10.45), culmen from anterior point of nostril (5 specimens only) 7½-8¼ (7.95), tail index of 6 specimens 62.3 %.

Distribution. New Britain (Neu Pommern) and some smaller adjacent islands: Vuatom (or Watom) and Mioko (Duke of York Islands, or Neu Lauenburg).

First collector. T. Kleinschmidt about 1880.

Not figured.

Type. Not traced (was in the Museum Turati, Milano).

Moult. Not checked.

Nidification. Dahl (1899) gives particulars, from which it is apparent that the nest is of the usual type. Altogether he received nine nests, brought to him by natives: four in October, two in November, two in December, and one in March. Moreover a fledgling was received in January. Dahl suggests from this evidence that the main breeding period may coincide with the wet season. The number of eggs in a clutch was two or three, the colour of the eggs is reported by Reichenow (1899) to be dull pale blue, green by O. Meyer (1930). Meyer mentions that the nests are built in low bushes and have been found in most months of the year, mainly, however, during April, May and November.

Measurements were given by Reichenow (l.c.) and Ogilvie-Grant (1912).

Habits, etc. A common species of the edges of forests, ranging from sea-level to at least 1000 m (specimen examined). As stomach contents Dahl

found a scale, fragments of caterpillars, and some unidentifiable seeds. During the whole year, but especially in the dry season, one can observe small flocks of 4-8 birds moving through the low bushes and uttering a short, twittering "cheet" (Meyer 1930).

2. **Zosterops hypoxantha ultima** Mayr

Zosterops minor ultima Mayr, Am. Mus. Nov. 1707, 1955 (19 Febr.), p. 45 — New Hanover.

Zosterops hypoxantha; Rothschild & Hartert, Nov. Zool. 10, 1903, p. 453 (New Ireland, New Hanover); (pt.) Rothschild & Hartert, Bull. B. O. C. 33, 1914, p. 109 (New Ireland).

Zosterops fuscicapilla hypoxantha; Hartert, Nov. Zool. 31, 1924 p. 211 (New Hanover); Hartert, Nov. Zool. 32, 1925, p. 133 (New Ireland (Neu Mecklenburg)).

Zosterops hypoxantha hypoxantha; (pt.) Stresemann, Mitt. Zool. Mus. Berlin 17, 1931, p. 222 (Neu-Irland).

Subspecific characters. According to its describer this subspecies is: "Similar to *hypoxantha* but upper parts of a brighter, clearer citrine-green. Black of crown not extending so far back onto the nape; white eyering broader; under parts brighter yellow; less of a greenish wash on sides of breast and flanks". For some further notes about its characters, see the discussion.

Unfeathered parts. Iris brown, bill black and slaty blue, legs slate blue or pale slate blue (A. F. Eichhorn).

Measurements of two males (one from New Hanover, of which the measurements are given first, one from New Ireland): wing 58, 57½, tail 38, 37½, tarsus 16¾, 17¼, entire culmen 14, 14, exposed culmen 11, 11½, culmen from anterior point of nostril 8½, 8, average tail: wing index of these two specimens 65.4 %.

Distribution. New Hanover and New Ireland (Neu Mecklenburg).

First collector. Probably Capt. C. Webster on New Hanover in February 1897 (Rothschild & Hartert, 1903).

Not figured.

Type. AMNH nr. 700443.

Moult. The two specimens examined, collected in January and April respectively, do not show moult. Hartert (1925) mentions that seven specimens from New Ireland collected in January and February, are either juvenile or moulting.

Nidification. Not recorded.

Habits, etc. Not recorded.

Discussion. Having examined but a single specimen from New Ireland, I am evidently not in a position to discuss the characters of this subspecies

at any great length. The specimen I examined (AMNH nr. 700441), probably a paratype of *ultima,* agreed with Mayr's diagnosis as regards brightness of the plumage, but the black on the crown seemed not less, but more, extended than in *hypoxantha.* At my request Dr. Vaurie re-examined the material in the American Museum, and informed me as follows (in litt., 9-II-1959): "The specimens of *Zosterops hypoxantha ultima,* called *Z. minor ultima* by Mayr, show a certain amount of individual variation. Mayr is correct in stating that in *ultima* the black area on the crown is less extensive than in *hypoxantha,* but in specimen 700441 that you mention, the black area is about the same in extent as in birds from New Britain (*hypoxantha*)". With reference to the variation in extent of black on the crown I would like to draw attention to Hartert's (1925) remarks, based on the same material from New Ireland, that: "these specimens do not have the top and sides of the head so deep and extensively black-brown as our New Hanover specimens, but this is probably due to their being moulting or juvenile . . .". In another black-crowned species, *Zosterops atricapilla,* juveniles certainly have the black on the crown reduced in extent.

3. **Zosterops hypoxantha admiralitatis** Rothschild & Hartert

Zosterops admiralitatis Rothschild & Hartert, Bull. B. O. C. 33, 1914, p. 108 — Manus, Admiralty Islands.

Zosterops admiralitatis; Rothschild & Hartert, Nov. Zool. 21, 1914, p. 298 (Manus); Reichenow, Die Vögel II, 1914, p. 469 (Admiralitätsinseln); Snouckaert, Alauda (2) 3, 1931, p. 22 (Manus).

Zosterops fuscicapilla admiralitatis; Hartert, Nov. Zool. 27, 1920, p. 435 (Manus); Mathews, Syst. Av. Australas. II, 1930, p. 707 (Admiralty Islands).

Zosterops hypoxantha admiralitatis; Stresemann, Mitt. Zool. Mus. Berlin 17, 1931, p. 222 (Manus); Mathews, Ibis (13) 2, 1932, p. 155 (no locality).

Zosterops minor admiralitatis; Mayr, Am. Mus. Nov. 1707, 1955, p. 45 (Manus).

Subspecific characters. Close to the other races but differs by the duller yellow under parts, particularly the throat, and by the narrower eye-ring.

Unfeathered parts. Iris reddish brown, bill black and slaty blue, legs slaty blue (Meek).

Measurements of 5 specimens (2 ♂, 3 ♀): wing 53-56 (54.70), tail 31-34½ (32.50), tarsus 16-17¼ (16.45) entire culmen (4 specimens only) 13-14½ (13.75), exposed culmen (4 specimens only) 10-12 (11.00), culmen from anterior point of nostril (4 specimens only) 7½-8¼ (7.93), average tail:wing index of 5 specimens 59.5 %.

Distribution. Only known from Manus, the largest of the Admiralty Islands.

First collector. A. S. Meek in September 1913.

Not figured.
Type. AMNH nr. 700448.
Moult. Not checked.
Nidification. Not recorded.
Habits, etc. Not recorded.
Discussion. I do not know if the relatively very short tail in the material examined is a good subspecific character, at present I am disinclined to regard it as such.

Species 23. **Zosterops fuscicapilla** Salvadori

Characters. An average sized to fairly large species, characterized by an entirely yellow under surface and in one race a black forehead; in the other race the forehead is of the same colour as the back. Tail relatively short.

As the two races of which the species consists are rather different from each other, and as I have been able to examine specimens of one form only, it is difficult to compile a species diagnosis, therefore fuller descriptions are given under each race separately.

Distribution (fig. 8). Mountains of Dutch New Guinea from 1200 to 2200 m, and mountains of Goodenough Island, d'Entrecasteaux Archipelago.

Ecology. As about the subspecies *crookshanki* nothing is known, particulars are given under the nominate race.

Geographical variation. Great, as already said above, the two subspecies apparently being very different.

Related species. There is a striking similarity between the nominate race of this species and *Z. hypoxantha,* and as able an ornithologist as Hartert (1920 and later publications, also Rothschild & Hartert, 1914), followed by Mathews (1930), and O. Meyer (1934), placed *hypoxantha* and *admiralitatis* as subspecies of *fuscicapilla,* whereas Stresemann (1931) also considered them to be closely related. Before having examined enough material I was inclined to agree with Hartert because *fuscicapilla* is superficially much closer to *hypoxantha* than is *minor* with which Mayr (1944, 1955) associated *hypoxantha.* After examination of forms as *delicatula, meeki,* etc., however, I fully agree with the last-mentioned author that *hypoxantha* is a geographical representative of the *atrifrons-minor*-group, with which it also agrees ecologically. On the other hand I find it difficult to believe that the noted similarities between *fuscicapilla* and *hypoxantha* would be altogether accidental. Perhaps *fuscicapilla* represents an older offshoot of the *atrifrons*-group.

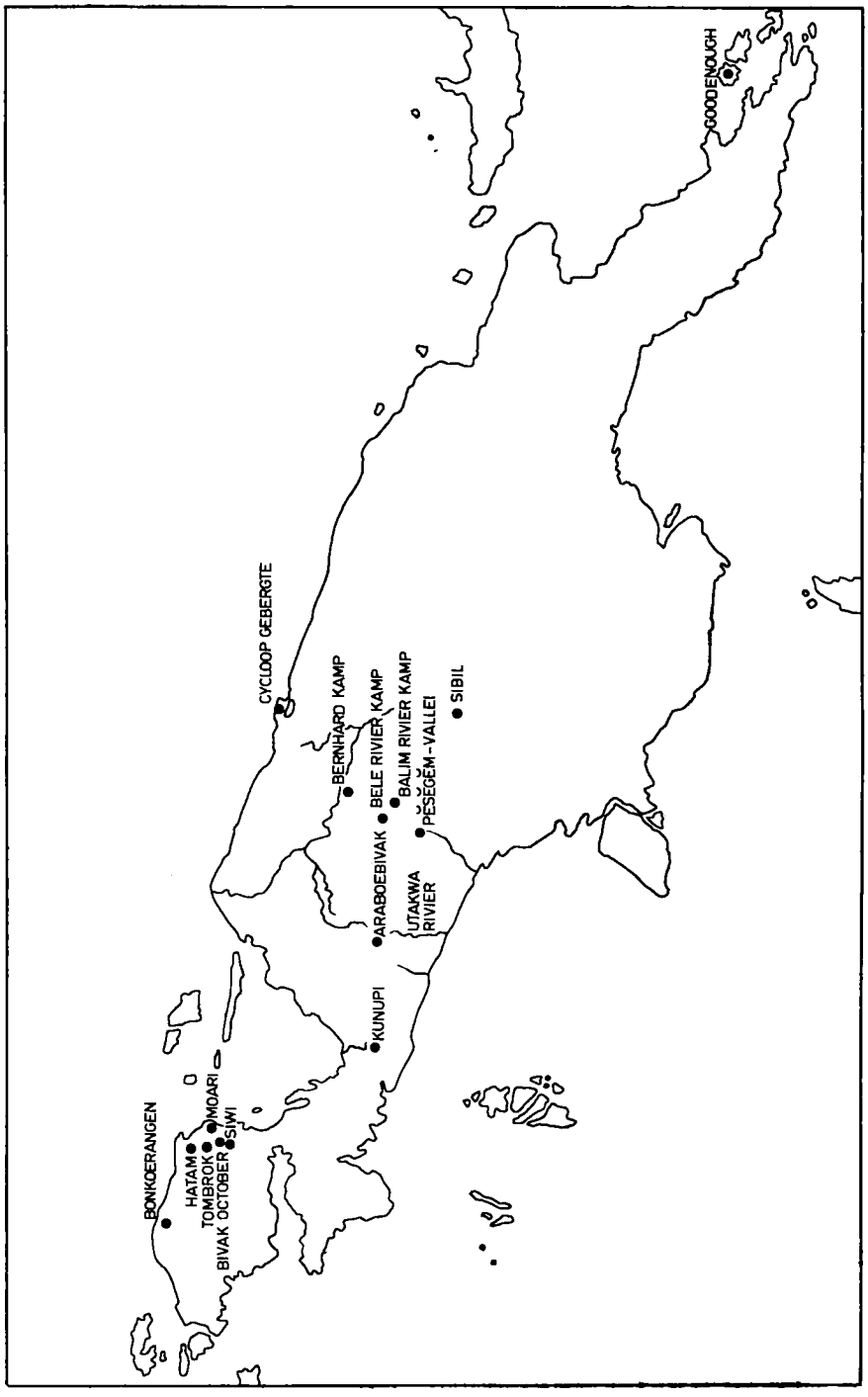


Fig. 8. The distribution of *Zosterops fuscicapilla*; the race *crookshanki* on Goodenough Island, the nominate race in New Guinea (all other localities; the locality Wamai, Arfak Mountains, could not be traced).

1. **Zosterops fuscicapilla fuscicapilla** Salvadori

Zosterops fuscicapilla Salvadori, Ann. Mus. Civ. Genova 7, 1875, p. 955 — Monte Arfak.

Zosterops fuscicapilla; Giebel, Thes. Orn. III, 1877, p. 775 (Arfak); Salvadori, Ann. Mus. Civ. Genova 16, 1880, p. 82 (Monte Arfak); Salvadori, Orn. Pap. II, 1881, p. 372 (Mori, Hatam (Arfak)); Salvadori, Atti R. Acc. Sc. Torino 16, (1880-1881), 1881, p. 624 (Monti Arfak); Sharpe, Cat. Birds Brit. Mus. 9, 1884, p. 178 (Atam, Arfak Mountains); Tristram, Cat. Coll. Birds, 1889, p. 211 (Arfak); Salvadori, Agg. Orn. Pap. II, 1890, p. 132 (no locality); Finsch, Tierreich 15, 1901, p. 35 (Arfak-Gebirge); Dubois, Syn. Av. I, 1902, p. 711 (Monts Arfak); Rothschild & Hartert, Nov. Zool. 10, 1903, p. 453 (Hatam, Arfak Mts.); Sharpe, Hand-List Birds 5, 1909, p. 15 (Arfak Mts.); Rothschild & Hartert, Bull. B. O. C. 33, 1914, p. 109 (Arfak); Ogilvie-Grant, Ibis (10), Jub. Suppl. 2, 1915, p. 85 (Camp 9, Utakwa River, 5500 ft.); Ogilvie-Grant, Rep. Coll. Dutch New Guinea I, 1916, Birds p. 65 (Camp 9, Utakwa River, 5500 ft.); Hartert, Nov. Zool. 36, 1930, p. 53 (Siwi, Arfak; Cyclops Mountains); Stresemann, Mitt. Zool. Mus. Berlin 17, 1931, p. 221 (Arfak-Gebirge, Cyclopen-Gebirge, Südhang des Schneegebirges); Hartert, Paludan, Rothschild & Stresemann, Mitt. Zool. Mus. Berlin 21, 1936, p. 174, 201 (Kunupi 1000-1500 m); Junge, Nova Guinea N. S. 3, 1939, p. 47 (Pěsěgěmvallei); Iredale, Birds New Guinea II, 1956, p. 167 (western New Guinea); Brongersma in Het witte hart van Nieuw Guinea, 1960, p. 95 (Sibil).

Zosterops fuscicapilla; Rothschild & Hartert, Nov. Zool. 21, 1914, p. 298 (Arfak).

Zosterops fuscicapilla fuscicapilla; Mathews, Syst. Av. Australas. II, 1930, p. 707 (New Guinea (N.W.)); Mayr & de Schauensee, Proc. Ac. Nat. Sc. Philad. 91, 1939, p. 97 (Bon Kourangan 4500 ft); Mayr, List New Guinea Birds, 1941, p. 217 (distribution); Rand, Bull. Am. Mus. Nat. Hist. 79, 1942, p. 513 (Bernhard Camp, Balim River Camp, Bele River Camp, 1200-2200 m); Junge, Zool. Verh. 20, 1953, p. 75 (Araboebivak); Gyldenstolpe, Arkiv f. Zool. 8, 1955, p. 204, 324 (Tombrok Anggi Gita, Bivak October).

Zosterops fuscicapillus; Stein, Journ. f. Orn. 81, 1933, p. 282 (Kunupi, Weylandgebirge); Stein, Journ. f. Orn. 84, 1936, p. 34 (Weylandgebirge: Kunupi).

Subspecific characters. A race of average size with entirely yellow under surface and black forehead.

Upper parts. Mantle somewhat darker and brighter than Warbler Green; upper tail coverts slightly more yellowish; forehead, lores and a streak under the eye-ring black; this black extends over the anterior part of the crown, where it gradually merges with the green of the back; eye-ring white, rather narrow, interrupted in front by the usual black spot; primaries, secondaries, and rectrices brownish black; primaries and secondaries edged with the same colour as the mantle, rectrices narrowly edged with the same.

Under parts. Throat, breast and flanks greenish yellow; this colour becoming almost pure Lemon Yellow, without notable admixture of green, on centre of belly and under tail coverts.

Unfeathered parts. Iris light brown, legs light green (blue) (Stein); iris light brown (Versteeg); iris brown, bill black, base of mandible grey, legs

grey (Archbold, Rand & Richardson); iris light yellow ("mata koening moeda" — perhaps this might be translated as light brown), bill upper black, lower grey (Exp. K. N. A. G. 1939, nat. coll.).

Measurements of 17 specimens (13 ♂, 4 ♀); wing 57-61 (58.62), tail 35-39½ (36.81), tarsus (15 specimens only) 15, 16-17½ (16.30), entire culmen (15 specimens only) 12-14 (12.95), exposed culmen (15 specimens only) 9½-11 (10.00), culmen from anterior point of nostril (15 specimens only) 7-8 (7.43).

Structure. Length of 2nd primary normal, about equal to the 7th. Tail relatively short for a species of this size, average tail:wing index of 17 specimens 62.10%.

Weights, ♂: 10½, 11, 11 g (Ripley).

Distribution (fig. 8). Mountains of Dutch New Guinea, where known from: Tamrau Mountains (Bon Kourangan 4500 ft. (1350 m)), Arfak Mountains (locality records are: Mori, Hatam, Siwi, Wamai, Tombrok Anggi Gita, Bivak October), Weyland Mountains (Kunupi 1200 m), Wisselmeren District (Araboebivak 1750 m), Utakwa River (Camp 9 5500 ft), Balim River 1600 m, Idenburg River (Bernhard Camp 1200 m), Bele River, Pĕsĕgĕmvallei ca. 2000 m, Cycloop Mountains, Sibil. I have examined material from all major localities. According to Rand (1942) the vertical range is from 1200 to 2200 m.

First collector. O. Beccari on 13 May 1875 at Mori, Arfak Mountains (cf. Salvadori, 1881).

Not figured.

Type. In the Genoa Museum.

Moult. One specimen collected in February is moulting both primaries and rectrices, a second specimen collected in the same month shows only moult of its forehead feathers, a third one no moult at all. One specimen taken in April and two taken in October do not show moult. A third October specimen is moulting primaries. The evidence, therefore, is altogether insufficient for any conclusions to be based on it.

Nidification. Apparently unrecorded.

Habits, etc. Apparently not uncommon within its range as Stein (1936) called it, with *Phylloscopus trivirgatus albigularis* Hartert & Paludan, one of the most common birds at about 1500 m in the Weyland Mountains, whereas Rand (1942) also found it common.

According to Stein (l. c.) the birds never live in closed jungle, but occur always in second growth (abandoned cultivations and bushes in the gardens of the natives). Rand (1942), on the other hand, found them both in the forest, where flocks of often considerable size would move from treetop to

treetop, and in the low second growth and even in isolated shrubs in the highly cultivated Balim Valley.

The habits as described by Rand (l. c.) and Ripley (in Mayr & de Schauensee, 1939), are thoroughly typical of the genus; both these observers mention flocks moving from tree to tree, and Ripley likens them to flocks of migrating warblers in their sudden movements and in the bursts of twittering as they flew off to another tree.

Discussion. The Malay name "Boeroeng Pipit" mentioned by Ripley is not of much value. When asked for a name, a Malay will call any unfamiliar bird with a high call-note "boeroeng pipit", and it seems highly unlikely that a small bird species without economic (trade) value and inhabiting the mountains of New Guinea would have a Malay name.

Several authors (Stresemann & Paludan, 1936; Junge, 1939; Rand, 1942; Junge 1953) have commented on slight differences between Arfak birds and specimens from more eastern localitites. I am fully satisfied that all these alleged differences are entirely due to fading. Fairly fresh specimens from the Tamrau Mountains (collected in 1938), Araboebivak (collected in 1939) and Balim River and Bernhard Camps (collected in 1938/39) are all identical. Much of the Arfak material existing in collections was taken eighty years ago by early collectors as Bruijn and Beccari, and is faded: upper and under surface are yellower, less green, and the black of the forehead and crown, truly black in fresh specimens, has faded to brown. The same kind of colour changes with age of skin are known to occur in other species of Zosteropidae (*Chlorocharis emiliae*, cf. Mees, 1956).

2. **Zosterops fuscicapilla crookshanki** Mayr & Rand

Zosterops fuscicapilla crookshanki Mayr & Rand, Am. Mus. Nov. 814, 1935, p. 16 — Goodenough Island, d'Entrecasteaux Archipelago.

Zosterops fuscicapilla crookshanki; Mayr, List New Guinea Birds, 1941, p. 217 (Mountains of Goodenough Island); Mayr & van Deusen, Ann. Mus. Nov. 1792, 1956, p. 5 (Goodenough Island).

Zosterops crookshanki; Iredale, Birds New Guinea II, 1956, p. 167 (mountains of Goodenough Island).

Subspecific characters. No specimens of this race were examined by me, but according to its describers it differs strikingly from the nominate race by the absence of black on forehead and crown, the very wide white eye-ring, and the more greenish yellow, less yellow, under parts, particularly the flanks and under tail coverts being very greenish.

Unfeathered parts. Not recorded.

Measurements of two females according to Mayr & Rand (1935): wing

60½, 60½, tail 41, 43½, tarsus 17, 17½, culmen (presumably entire culmen) 15, 15. These measurements show that Mayr & Rand's (1935) statement that this race is larger than the nominate race needs confirmation by larger series, as most measurements fall within the range of variation of the latter. Only the tails seem longer, but tail length is always a somewhat tricky character in small samples as it is apparently influenced to some extent by the way the specimens have been prepared.

Distribution. Only known from Goodenough Island, d'Entrecasteaux Archipelago, where presumably confined to the mountains.

First collector. H. Hamlin in November 1928.

Not figured.

Type AMNH nr. 222112. There is a mistake in the diagnosis, where the type specimen is stated to be an adult male, whereas subsequent lines show that only two females were available. Actually the type is a female (Vaurie, in litt., 29-II-1960).

Moult. Not recorded.

Nidification. Unknown.

Habits, etc. Unknown.

Discussion. This race is only known from the two specimens taken by Hamlin; the fact that Hamlin was the only collector to obtain it, makes it likely that it is a mountain form, as the mountains of Goodenough Island have been but rarely and insufficiently explored (Mayr & van Deusen, 1956). Therefore the subspecies seems to agree ecologically with the nominate race.

Iredale (1956) listed *crookshanki* as a separate species, but as he has not examined material it is difficult to visualise how he arrived at a conclusion so different from that of the competent ornithologists who described it as a subspecies.

Species 24. **Zosterops buruensis** Salvadori

Zosterops buruensis Salvadori, Ann. Mus. Civ. Genova 12, 1878, p. 341 — Buru.

Zosterops chloris; (pt.) Wallace, Proc. Zool. Soc. London, 1863, p. 31 (Bourou); (pt.) Hartlaub, Journ. f. Orn. 13, 1865, p. 24 (Banda); (pt.) Finsch, Neu-Guinea, 1865, p. 163 (Bouru); (pt.) G. R. Gray, Hand-List Birds I, 1869, p. 162 (Bourou); (pt.) Giebel, Thes. Orn. III, 1877, p. 774 (Buru); H. O. Forbes, Naturalist's Wand. Eastern Arch., 1885, p. 410 (Buru); (pt.) McClymont, Zoologist (4) 11, 1907, p. 350 (Buru).

Zosterops buruensis; Salvadori, Ann. Mus. Civ. Genova 16, 1880, p. 82 (Buru); Salvadori, Orn. Pap. II, 1881, p. 371 (Bouru); Sharpe, Cat. Birds Brit. Mus. 9, 1884, p. 184 (Bouru); Salvadori, Agg. Orn. Pap. II, 1890, p. 131 (no locality); Meyer & Wiglesworth, Birds Celebes, 1898, p. 487 (Buru); Hartert, Nov. Zool. 7, 1900, p. 237 (Mount Mada); Finsch, Tierreich 15, 1901, p. 28 (Buru); Dubois, Syn. Av. I, 1902, p. 790 (Ile Bouru); Sharpe, Hand-List Birds 5, 1909, p. 10 (Buru); Stresemann,

Nov. Zool. 20, 1913, p. 367 (no locality); Stresemann, Nov. Zool. 21, 1914, p. 364, 370, 371, 374, 391 (Buru); Siebers, Treubia 7, suppl., 1930, p. 295 (Wai 'Eno, Nal'Besi, Rana, Efrarat); Mathews, Syst. Av. Australas. II, 1930, p. 703 (Buru Island); Stresemann, Mitt. Zool. Mus. Berlin 17, 1931, p. 221 (Buru); Stresemann, Journ. f. Orn. 88, 1940, p. 61 (Buru); van Bemmel, Treubia 19, 1948, p. 330 (Buru (Mountains)).

[*Zosterops atriceps*] ***buruensis***; Mayr, Bull. Am. Mus. Nat. Hist. 83, 1944, p. 169 (no locality).

Characters. A fairly large species of the ordinary *Zosterops*-pattern, with entirely yellow under surface.

Upper parts generally Citrine, rump slightly more yellowish and a limited, not sharply defined, area on the forehead and over the lores inclining to Light Cadmium; eye-ring of slightly less than average width, white, interrupted in front by the black loral line which is continued under the eye-ring as a narrow dusky stripe; primaries and rectrices blackish brown, edged with the colour of the mantle; the Citrine edges to the tail feathers are narrow and on the posterior parts of the feathers very inconspicuous.

Under parts all yellow. Throat, centre of belly, and under tail coverts Lemon Chrome; towards sides of breast and belly and on the flanks this colour gradually changes into the colour of the upper parts.

Unfeathered parts. Iris black, brown, or bright brown ("helderbruin"); bill black, or black, base of mandible silver grey or light grey; legs black, light grey, or silver grey (Toxopeus); iris reddy brown, bill grey, feet grey (Pratt).

Measurements of 9 specimens (8 ♂, 1 ♀): wing 56½-61 (59.17), tail 37-42½ (39.72), tarsus 15¾, 17-18 (17.42), entire culmen 12, 13½-14½ (13.63), exposed culmen 8½, 10¼-11 (10.42), culmen from anterior point of nostril 7-8¼ (7.88).

Structure. Wing formula normal. 2nd primary perhaps slightly shorter than usual in the genus, in length between the 7th and the 9th primary, tail index 65 to 70 %, average of 9 specimens, 67.14 %. Weights 11-13 g (Stresemann, 1914).

Distribution. Confined to the island of Boeroe, where it seems well distributed in the lower and middle montane zone up to about 1500 m. Locality records are: Mt. Mada 3000 ft., Wa Fehat 2700 ft., Nal' Besi, Ranameer, Efrarat S. of Fakal, Wai Eno (specimens from all localities examined).

Fist collector. A. R. Wallace in 1861.

Not figured.

Type. BM nr. 73.5.12.910, bearing in Salvadori's handwriting the note: "Zosterops buruensis, Salvad. M. S. Tipe" (specimen examined).

Moult. Specimens collected in April (2), May (1), June (1), and Sep-

tember (1) are not in moult; one specimen collected early March is in heavy moult (primaries and rectrices), one specimen collected in June shows on one side one primary which is short and with its base in a sheath, but there is no indication of general moult.

Nidification. Apparently unrecorded.

Habits, etc. According to Stresemann (1914): "Ein gemeiner Vogel im Mittelgebirge, zumal im sekundären Urwald nahe bei den Ortschaften". Toxopeus (note on label of specimen) described the voice as: "tjewiet, tjewiet, tjewiet". Toxopeus did not observe the species in wandering flocks of Muscicapidae, but Stresemann (1914, p. 374) especially mentions it as a participant of such flocks.

Discussion. After its discovery, this species has been confused with *Z. chloris* until Salvadori recognised its distinctness and described it. Stresemann (1931), though allowing it specific rank, believed it to be the Boeroe representative of the "Artenkreis" *Zosterops atriceps — anomala — delicatula,* which more or less agrees with the *Z. atrifrons*-group in this review, and in 1940 he again expressed this opinion. Van Bemmel (1948), on the other hand, was much impressed by the close similarity between this species and the Moluccan yellow-bellied races of *Z. montana* and suggested that *Z. buruensis* might owe its existence to an earlier colonization of Boeroe by *Z. montana,* where now *Z. buruensis* and *Z. montana montana* (grey-bellied) apparently co-exist. Whereas I agree with van Bemmel that *Z. buruensis* is very distinct from the neighbouring forms of *Z. atrifrons,* with which it probably solely agrees in general vertical range, the differences from *Z. montana* are also too great in my opinion, to make a close affinity seem likely. *Z. buruensis* differs from *Z. montana* in ecology, its upper limit of distribution about agreeing with the lower limit of *Z. montana,* in having a brown iris (white, or at least pale coloured, in *montana*), and also very considerably in colour of the mantle. The Citrine upper parts of *buruensis* are a striking feature, not found in any other species that might possibly be related to it. This colour has a distinct tinge of yellowish or even brownish, entirely absent in the vivid green *montana.* I have also compared it with *Z. kühni* and with *Z. novaeguineae aruensis,* but these species too, though appreciably darker and less bright than *Z. montana,* do not nearly approach, in the coloration of their upper parts, the Citrine of *Z. buruensis.* Apparently *Z. buruensis* has no close relatives, and such similarities as it shows with other species are entirely due to its being very close to the basic pattern shared by the majority of its congeners.

Species 25. **Zosterops kühni** Hartert

Zosterops kühni Hartert, Bull. B. O. C. 16, 1906, p. 82 — Amboina.

Zosterops novae guineae; (pt.) Salvadori, Orn. Pap. II, 1881, p. 368 (Amboina and Ceram); (pt.) Sharpe, Cat. Birds Brit. Mus. 9, 1884, p. 175 (Amboina and Ceram); (pt.) Salvadori, Agg. Orn. Pap. II, 1890, p. 130 (no locality); (pt.) Sharpe, Hand-List Birds 5, 1909, p. 3 (Ceram, Amboina); (pt.) van Balen, Dierenw. Insulinde II, 1915, p. 483 (Ceram, Amboina).

Zosterops novae-guineae; (pt.) Tristram, Cat. Coll. Birds, 1889, p. 211 (Amboyna).

Zosterops novaeguineae; (pt.) Finsch, Tierreich 15, 1901, p. 16 (Ceram, Amboina); (pt.) Dubois, Syn. Av. I, 1902, p. 707 (Céram, Amboine); (pt.) Reichenow, Die Vögel II, 1914, p. 469 (Molukken).

Zosterops kühni; Sharpe, Hand-List Birds 5, 1909, p. 631 (Amboina); Hartert, Nov. Zool. 27, 1920, p. 436 (Amboina); Mathews, Syst. Av. Australas. II, 1930, p. 696 (Amboyna); Snouckaert, Alauda (2) 3, 1931, p. 21 (Amboina); Stresemann, Mitt. Zool. Mus. Berlin 17, 1931, p. 221 (Ambon); Stresemann, Zool. Med. 17, 1934, p. 15 (Ambon); Stresemann, Journ. f. Orn. 88, 1940, p. 61 (Ambon); Mees, Zool. Med. 32, 1953, p. 26 (Ambon, Ceram: Wahai).

Zosterops (*atrifrons*) *kühni*; van Bemmel, Treubia 19, 1948, p. 330 (Ambon).

Characters. A fairly small species of the ordinary *Zosterops*-type.

Upper parts. Mantle, including forehead, supra loral region, upper tail coverts and rump, near to Citrine, but darker and at the same time brighter, more yellowish; centres of the feathers on the anterior part of the crown dusky; lores and a distinct streak under the eye dull black; eye-ring of average width, white, interrupted in front by the blackish loral-line; primaries, secondaries, and rectrices blackish brown, all broadly margined with the colour of the mantle.

Under parts. Chin, throat, and under tail coverts Lemon Chrome, remainder of under parts greyish white; no yellow median streak.

Unfeathered parts. Iris brown or sienna, bill black, greyish below, feet dark grey or ash grey (Kühn).

Measurements of 7 specimens (1 ♂, 1 ♀, 5 —): wing 53-57 (55.07), tail 33½-39 (35.50), tarsus 15-16½ (15.75), entire culmen 11½-14¼ (13.00), exposed culmen 8½-11 (10.07), culmen from anterior point of nostril 6-8 (7.04).

Structure. Wing shape normal, with 2nd primary in length between 7th and 9th; tail:wing index of seven specimens 64.46 %.

Distribution. Ambon (no precise localities known) and Wahai on the northern coast of Ceram.

First collector. C. Bernelot Moens at Wahai in 1862. On Ambon it was first collected by Hoedt (February 1867) and subsequently by Teysmann (1877) and Kühn (1906).

Not figured.

Type. AMNH nr. 700396.

Moult. Three specimens collected in February do not show moult, they are in a somewhat abraded plumage.

Nidification. Unknown.

Habits, etc. Unknown.

Discussion. The sole evidence of this species' occurrence on Ceram rests on the specimen taken by Moens at Wahai in 1862. Dr. van Bemmel (oral communication) has expressed in his doubt about the provenance of the specimen in question and suggested that it might have been wrongly labelled. However, in the Leiden Museum there are letters from Moens about a collection of birds from Wahai, and the locality Ambon is not even mentioned in any of Moens's letters. The original label of the specimen has been removed by Finsch (about 1900), but Salvadori's (1881) work makes it evident that long before, the specimen was labelled as having been collected by Moens at Wahai, and it seems impossible to reject the record, though confirmation of the occurrence of the species on Ceram would be particularly welcome.

As I have pointed out previously (Mees, 1953) the occurrence of the species in Ceram is of much zoogeographical interest, as it shows that *Z. kühni* and *Z. atrifrons stalkeri* are not as closely related as suggested by Stresemann (1931) and van Bemmel (1948). I am still inclined to look at *Z. noveaeguineae* as a possible close relative, the main difference between *kühni* and the darker and smaller races of that species being the broad greenish edges along the whole length of the rectrices and the relatively slightly longer tail of the former.

It is somewhat surprising — and is to be regretted — that absolutely nothing has been published on the ecology of *Z. kühni*. Ambon has always been the most important town of the Moluccan Islands, and must have served as a base for several collecting expeditions. It seems likely that *kühni* is an inhabitant of the hill forest, for if it occurred in the town of Ambon it would hardly have been missed by so many ornithologists visiting the place.

The fact that there are no endemic species of birds, and only a few not very marked races on Ambon, makes it, in my mind, more likely that *Z. kühni* indeed does occur on Ceram. If not, *kühni* would be the only endemic species of bird of Ambon.

Species 26. **Zosterops novaeguineae** Salvadori

Characters. An average-sized species of the ordinary *Zosterops*-pattern.

Upper parts varying from distinctly brighter than Warbler Green to between Warbler Green and Dark Citrine, though always brighter and more yellowish than either (some races cannot be distinguished, as regards

coloration of upper parts, from the greener specimens of *Z. palpebrosa palpebrosa*); upper tail coverts slightly to fairly distinctly more yellow; frontal area and supra loral region of the same colour as the remainder of the upper parts, or more or less distinctly more yellowish; eye-ring present, varying from average sized to fairly wide, white, except in one race (*oreophila*) in which the dorsal half is greyish, always interrupted in front by the usual, in this case large and grey or blackish, spot; lores dull dark grey or black; the grey or black continued under the eyes. Primaries, secondaries, and rectrices blackish in fresh specimens, rather more brownish in old skins which have been exposed to the influence of sunlight; primaries and secondaries broadly bordered with the colour of the mantle; anterior half of rectrices narrowly edged with the same colour.

Under parts. Chin, throat — and sometimes also upper chest — and under tail coverts yellow, varying from Strontian Yellow and Lemon Yellow to very close to Lemon Chrome; a more or less distinct longitudinal streak of the same colour over the middle of the belly present in some races; remainder of under parts satin white in the centre, more greyish on flanks and breast.

Unfeathered parts. Iris brown (as far as recorded), bill black, or at least always dark.

Measurements are given in table VI.

TABLE VI

Zosterops novaeguineae

	number of specimens	wing	tail	av. wing	av. tail	tail : wing index
novaguinea	3	55-58	31½-35½	56.67	33.67	59.41%
aruensis	10	51-55	29½-33½	53.35	31.30	58.67%
wuroi	4	51½-54	30-34	53.38	32.63	61.12%
wahgiensis	14	60-64	37½-42	61.89	39.86	64.40%
crissalis	14	56-61½	32-40	58.14	36.11	62.10%
oreophila	7	60-64	36-40	62.21	38 50	61.88%
magnirostris	1	54½	—	—	—	—

Distribution (fig. 9). Aroe islands and New Guinea. In New Guinea the species has been recorded from the Arfak Mountains only in Dutch New Guinea and from many localities in Australian New Guinea. The distribution of the species seems patchy and it is likely that some of the gaps in its known range will be gradually closed when more collecting is done. On the other hand the fact that the species can be divided in so many races on the New Guinea mainland, indicates the existence of isolations of some kind between the various populations.

Geographical variation. This species can conveniently be divided in two

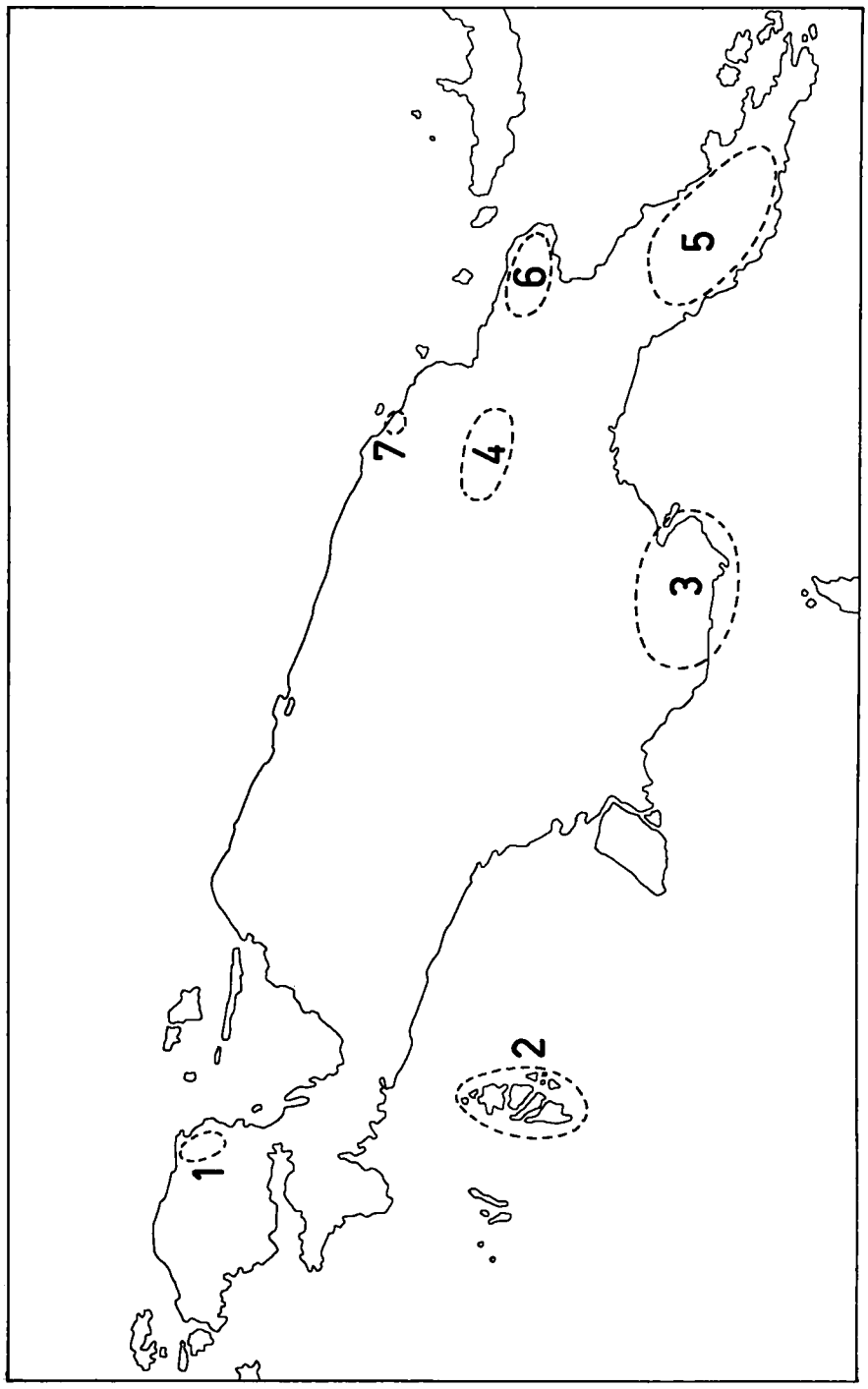


Fig. 9. The distribution of *Zosterops novaeguineae* and races; 1, *novaeguineae*; 2, *aruensis*; 3, *aurei*; 4, *wahgiensis*; 5, *crissalis*; 6, *oreophila*; 7, *magnirostris*.

groups of races: one group embracing the subspecies *aruensis, wuroi,* and *magnirostris,* which is confined to the lowlands, and a second group, consisting of the other four races, which is apparently confined to the mountains, where it occurs at altitudes varying between 1250 and 2400 m (cf. Mayr, 1941). The lowland subspecies, though very similar in coloration and general appearance, can easily be separated from the montane forms by their smaller measurements, none having a wing-length of over 55 mm. Individuals of the montane forms have but rarely a wing as small as 55 or 54 mm (only in the nominate race), and are generally much larger. These two groups have probably no phylogenetic significance; it is well known that lowland and mountain populations of the same species usually differ in size, and it is not clear yet how important ecological factors are in the species.

Though the races here recognised are all rather similar they differ in clear-cut morphological characters.

Mayr (1944) has suggested affinity between this species and *Zosterops montana,* but I cannot find arguments in support of this hypothesis. Even the montane forms of *Z. novaeguineae* do not live as high up as *Z. montana,* notwithstanding the fact that the mountains of New Guinea attain a much greater height than those on which *Z. montana* is found. Moreover *Z. montana* has as fairly trustworthy specific character a pale iris, whereas the iris of *Z. novaeguineae,* like in many other similar-looking species, is brown.

Previously Mayr & Rand (1935) hinted at a relationship with *Z. lateralis,* but there are many points of difference and moreover *Z. lateralis* is absent from the northern extremity of the Cape York Peninsula so that the ranges of the two species are not even contiguous.

1. **Zosterops novaeguineae novaeguineae** Salvadori

Zosterops novae guineae Salvadori, Ann. Mus. Civ. Genova 12, 1878, p. 341 — Nova Guinea, Montibus Arfak.

Zosterops ..... sp.; Salvadori, Ann. Mus. Civ. Genova 7, 1875, p. 954 (Monte Arfak).

Zosterops novae guineae; Salvadori, Ann. Mus. Civ. Genova 16, 1880, p. 81 (Montibus Arfak); (pt.) Salvadori, Orn. Pap. II, 1881, p. 367 (Mori, Profi (Arfak)); (pt.) Sharpe, Cat. Birds Brit. Mus. 9, 1884, p. 175 (New Guinea); Guillemard, Proc. Zool. Soc. London, 1885, p. 643 (Arfak); Salvadori, Agg. Orn. Pap. II, 1890, p. 130 (no locality); (pt.) Sharpe, Hand-List Birds 5, 1909, p. 3, 631 (New Guinea); (pt.) van Balen, Dierenw. Insulinde II, 1915, p. 483 (N. Guinea).

Zosterops novae-guineae; (pt.) Tristram, Cat. Coll. Birds, 1889, p. 211 (Arfak); Tristram, Ibis (6) 6, 1894, p. 29 (no locality).

Zosterops novaeguineae; (pt.) Finsch, Tierreich 15, 1901, p. 16 (Neu-Guinea (Nordküste)); (pt.) Dubois, Syn. Av. I, 1902, p. 707 (Nouv.-Guin.); (pt.) Rothschild & Hartert, Nov. Zool. 10, 1903, p. 451 (Hatam, Arfak); Meyer, Notes Leyden Mus. 24, 1904, p. 234 (Neuguinea); (pt.) Reichenow, Die Vögel II, 1914, p. 469 (Neuguinea); (pt.) Mathews, Syst. Av. Australas. II, 1930 (July), p. 696 (New Guinea); Hartert, Nov. Zool. 36, 1930 (November), p. 53 (Siwi, Arfak).

Zosterops novaeguineae novaeguineae; (pt.) Stresemann, Mitt. Zool. Mus. Berlin 17, 1931, p. 223 (Arfak-Gebirge); Mayr & Rand, Am. Mus. Nov. 814, 1935, p. 17 (Arfak); Mayr, List New Guinea Birds, 1941, p. 218 (Arfak Mountains); Mees, Zool. Med. 32, 1953, p. 25 (Arfak Mountains); Gyldenstolpe, Arkiv f. Zool. 8, 1955, p. 204 (Vogelkop).

Subspecific characters. The smallest of the larger mountain races; upper parts fairly bright, without yellow above lores or on forehead; eye-ring comparatively narrow; lores dark grey; throat and under tail coverts between Lemon Yellow and Lemon Chrome, but not very bright; no yellow streak down the centre of the under parts, though sometimes traces of yellow present.

Unfeathered parts. Apparently not recorded.

Measurements of three specimens (2 ♂, 1 —): wing 55-58 (56.67), tail 31½-35½ (33.67), tarsus (two specimens) 15½, 16, entire culmen 12-13 (12.67), exposed culmen 9-10 (9.58), culmen from anterior point of nostril 7-7½ (7.17).

Distribution. Known from the Arfak Mountains only, where recorded from the fillowing localities: Hattam (Atam), Siwi, Trafi 3400 ft. (specimens examined).

First collector. A. A. Bruijn in June, 1874 (cf. Salvadori, 1881).

Not figured.

Type. The cotypes are in the Genova Museum; one of them, cotypus g, Genova Museum C. E. 11527, examined.

Moult. Not checked.

Nidification. Unknown.

Habits, etc. Unrecorded.

2. **Zosterops novaeguineae aruensis** Mees

Zosterops novaeguineae aruensis Mees, Zool. Med. 32, 1953, p. 26 — Aroe Islands.

Zosterops novae guineae; (pt.) Salvadori, Orn. Pap. II, 1881, p. 367-368 (Isole Aru); (pt.) Sharpe, Cat. Birds Brit. Mus. 9, 1884, p. 175 (Aru Islands); (pt.) Sharpe, Hand-List Birds 5, 1909, p. 3 (Aru Is.); (pt.) van Balen, Dierenw. Insulinde II, 1915, p. 483 (Aroe Eilanden).

Zosterops Novae Guineae; Meyer, Zeitschr. ges. Orn. 1, 1884, p. 271, 291 (Waniembai, Aru).

Zosterops novae-guineae; (pt.) Tristram, Cat. Coll. Birds, 1889, p. 211 (Aru); Nehrkorn, Kat. Eiersamml., 2nd ed., 1910, p. 269 (eggs, Aru-Inseln).

Zosterops novaeguineae; (pt.) Finsch, Tierreich 15, 1901, p. 16 (Aru-Inseln); (pt.) Dubois, Syn. Av. I, 1902, p. 707 (îles Arou); Hartert, Nov. Zool. 10, 1903, p. 250 (Wokan); (pt.) Rothschild & Hartert, Nov. Zool. 10, 1903, p. 451 (Wokan, Aru Is.); Berlepsch, Abh. Senckenb. Naturf. Ges. 34, 1911, p. 69 (Aru Inseln); (pt.) Hartert, Nov. Zool. 36, 1930, p. 53 (Wokan, Aru Islands); (pt.) Mathews, Syst. Av. Australas. II, 1930, p. 696 (Aru Islands).

Zosterops novaeguineae novaeguineae; (pt.) Stresemann, Mitt. Zool. Mus. Berlin 17, 1931, p. 223 (Wokan).

Zosterops novaeguineae (subsp.); Mayr, List New Guinea Birds, 1941, p. 219 (Aru Islands).

Zosterops novaeguineae aruensis; Mees, Zool. Med. 34, 1955, p. 153 (no locality).

Subspecific characters. A small form. Upper parts entirely similar to those of the nominate race; loral line dark grey; eye-ring fairly wide.

Under parts. Throat deeper yellow than in the nominate race, almost pure Lemon Chrome, sharply defined against greyish remainder of under parts. Differs in the dark coloration of the throat from all other forms. No trace of a yellow longitudinal streak over the under parts; centre of belly therefore in well-made skins almost pure satin white.

Unfeathered parts. Iris greyish brown, bill black, feet ash-grey (Rothschild & Hartert, 1903, ex Kühn).

Measurements of ten specimens (2 ♂, 1 ♀, 7 —); wing 51-55 (53.55), tail 29½-33½ (31.30), tarsus (4 specimens only) 15-15½ (15.19), entire culmen (4 specimens only) 11½-13¼ (12.31), exposed culmen (4 specimens only) 9½-10¼ (9.69), culmen from anterior point of nostril (4 specimens only) 6¾-7¾ (7.06).

Distribution. Aroe Islands. Locality records are: Waniembai = Wanoembai on Kobroor (Meyer, 1884), Wokan = Wokam (Rothschild & Hartert, 1903), and Silbattabatta = Salabatabata on Kobroor (Goodfellow).

First collector, C. B. H. von Rosenberg in 1866.

Not figured.

Type. RMNH cat. nr. 2 (type examined).

Moult. Several specimens show moult, but as they are not dated, it is of little use to report it here. Out of two specimens collected in February, 1904, one is in fresh plumage, the other is in the last stage of moult, from the second primary only the shaft being present, whereas the 3rd primary is about two thirds the normal length. A specimen collected in March, 1904, is not in moult.

Nidification. Nehrkorn (1910) records an egg from the Aroe Islands. Professor Stresemann (in litt., 12-XII-1955) supplied me with the following particulars concerning this egg, now with the Nehrkorn collection in the Berlin Museum: "Das in der Nehrkorn-Sammlung befindliche Ei von Z. novaeguineae ist beschriftet: "Z. nov. g. Aru Is." und stammt nach der Etikette von der Insel Kobroor. Wahrscheinlich ist es von Heinrich Kühn dort gesammelt worden und seine Herkunft zuverlässig. Es ist weiss, mit leichtem bläulichen Ton, ganz ungefleckt".

Habits, etc. Unknown, apart from the fact that this form must of

necessity be entirely confined to the lowlands, the highest point of the Aroe Islands reaching an elevation of 90 metres only. Meyer (1884) found seeds in a stomach and records as native name Manbinung.

Discussion. The material on which this subspecies was based is rather old and not in a very good condition. Hence it is fortunate that in the British Museum I found three specimens, collected by Goodfellow in 1904, in fine condition. This fresh material shows that the character of the alleged darker grey flanks of the subspecies, in comparison with *novaeguineae* and *wuroi,* does not hold. On the other hand my suspicion that the deep yellow tone of the throats might also be due to postmortem discoloration, proved incorrect, for the fresh specimens have even deeper yellow throats than the old material, and the whole series can be separated from *novaeguinea* and *wuroi,* to which *aruensis* is nearest, by this character without difficulty. Iredale (1956) overlooked the fact that the Aroe Islands population has been named and therefore missed a wonderful chance of criticising its validity.

3. **Zosterops novaeguineae wuroi** Mayr & Rand

Zosterops novaeguineae wuroi Mayr & Rand, Am. Mus. Nov. 814, 1935 (1 Aug.), p. 16 — Wuroi, Oriomo River.

Zosterops novaeguineae wuroi; Mayr & Rand, Bull. Am. Mus. Nat. Hist. 73, 1937, p. 241 (Wuroi); Mayr, List New Guinea Birds, 1941, p. 219 (South New Guinea at the Wuroi River); Rand, Bull. Am. Mus. Nat. Hist. 79, 1942, p. 365 (Penzara, Tarawa, Gaima); Mees, Zool. Med. 32, 1953, p. 25 (no locality); Mees, Zool. Med. 34, 1955, p. 153 (no locality); Iredale, Birds New Guinea II, 1956, p. 169 (Oriomo River).

Subspecific characters, One of the three small races. Greener above than any of the other described forms, with a rather pale yellow throat. No median longitudinal yellow streak over the belly. Eye-ring wide as in *aruensis,* wider than in the nominate form; loral line blackish grey.

Unfeathered parts. Iris brown, bill black, base of mandible bluish grey, feet bluish grey (Archbold & Rand).

Measurements of four specimens (3 ♂, 1 ♀?): wing 51½-54 (53.38), tail 30-34 (32.63), tarsus 14½-16 (14.94), entire culmen 11-12¾ (12.13), exposed culmen 8¾-10 (9.63), culmen from anterior point of nostril 6¼-7¼ (6.94).

Distribution. Known from Wuroi, Penzara, Tarara, and Gaima, all in the southern lowlands of New Guinea in the Fly River region.

First collectors. R. Archbold and A. L. Rand in January 1934 at Wuroi.

Not figured.

Type AMNH nr. 422406.

Moult. Two specimens taken towards the end of January show moult in

primaries and rectrices, one specimen taken early January is not in moult, it is in abraded plumage; a specimen taken in December is not in moult, it is probably a juvenile.

Nidification. Unknown.

Habits, etc. Not recorded apart from the fact that this is a lowland form.

4. **Zosterops novaeguineae wahgiensis** Mayr & Gilliard

Zosterops novaeguineae wahgiensis Mayr & Gilliard, Am. Mus. Nov. 1524, 1951, p. 14 — Nondugl, Wahgi Valley, Central Highlands, Mandated Territory of New Guinea.

Zosterops novaeguineae shaw-mayeri Mayr & Gilliard, Am. Mus. Nov. 1524, 1951, p. 14 — Yandara, north slope of Mt. Wilhelm, Central Highlands, Mandated Territory of New Guinea.

Zosterops novaeguineae shaw-mayeri; Mayr & Gilliard, Bull. Am. Mus. Nat. Hist. 103, 1954, p. 318, 319, 372 (Nondugl); Gyldenstolpe, Arkiv f. Zool. 8, 1955 (31 May), p. 176 (Nondugl); Mees, Zool. Med. 34, 1955 (12 Dec.), p. 153 (no locality); Sims, Bull. Brit. Mus. (Nat. Hist.), Zool. 3, 1956 (March), p. 435 (Wahgi River 5200 ft.); Iredale, Birds New Guinea II, 1956, p. 169, 170 (Wahgi Valley).

Zosterops novaeguineae shaw-mayeri; Mayr & Gilliard, Bull. Am. Mus. Nat. Hist. 103, 1954, p. 372 (Yandara); Gyldenstolpe, Arkiv f. Zool. 8, 1955 (31 May), p. 177 (Dagie); Mees, Zool. Med. 34, 1955 (12 Dec.), p. 153 (no locality); Iredale, Birds New Guinea II, 1956, p. 169 (northern slope of Mount Wilhelm).

Zosterops novaeguineae crissalis; Mayr & Gilliard, Am. Mus. Nov. 1524, 1951, p. 15 (Mt. Orata, Kubor Mts.); Mayr & Gilliard, Bull. Am. Mus. Nat. Hist. 103, 1954, p. 372 (no locality = Mt. Orata); Gyldenstolpe, Arkiv f. Zool. 8, 1955, p. 176 (Nondugl).

Zosterops novaeguineae; Gilliard, Exotic Birds South Pacific, 1956, p. 14, photograph.

Zosterops novaeguineae shawmayeri; Iredale, Birds New Guinea II, 1956, p. 170 (northern slope of Mount Wilhelm).

Subspecific characters. A large subspecies. Differs from the nominate race by being slightly greener above, like in that form without a more yellowish forehead or supra loral region; eye-ring comparatively narrow as in the nominate form; yellow of throat rather bright, between Lemon Yellow and Lemon Chrome, extending over the upper breast and not as sharply defined against the remainder of the under parts as in the nominate race; sometimes an indication of a yellow streak down the centre of the under parts.

Unfeathered parts. Iris light brown, dark brown, brownish, blackish brown, or black; bill black, or black with plumbeous base at mandible; legs blackish, blackish brown, black or brown (Gyldenstolpe); iris yellow-brown, bill dark horn paler at base, legs grey (Sims, 1956, ex Shaw Mayer).

Measurements. Wing 7 ♂, 60½-64 (62.14); 7 ♀, 60-63½ (61.64); 14 specimens, 60-64 (61.89); tail 7 ♂, 37½-42 (40.00); 7 ♀, 38½-41½ (39.71); 14 specimens, 37½-42 (39.86); tarsus 14 specimens, 16-17½ (16.59); entire culmen 14 specimens, 11¾-13½ (12.41); exposed culmen 14 spec-

imens, 9-10 (9.57); culmen from anterior point of nostril 14 specimens, 6¾-7¼ (6.91).

Distribution. Known from the Wahgi Valley, where it is reported to be common, and surrounding mountains: Mt. Wilhelm, Mt. Orata.

First collector. E. T. Gilliard in April 1950 at Nondugl, Wahgi Valley.

Figure. A photograph, showing the heads of two specimens, is given by Mayr & Gilliard (1954, pl. 31 fig. 1), and again by Gilliard (1956).

Type. AMNH nr. 348223. The type of *shaw-mayeri* is AMNH nr. 348224.

Moult. "Some April and May birds were in fresh plumage. However, five males (April 4, 7, 8, 26) were in advanced stages of molt" (Mayr & Gilliard, 1954). From the same lot of skins I had some specimens on loan; one specimen, collected April 26th, bears on its label the note: "moult, secondaries", but I failed to find traces of moult; it may be the specimen recorded by Mayr & Gilliard. The two specimens I received, taken on April 24th, however, are both moulting primaries. As this date is not recorded by the above-mentioned authors, it seems likely that more specimens of their collection show moult than they were aware of, so that I consider April as the month in or about which the main moult takes place. Two specimens collected in August, four collected in September, one taken in October, and two from November, do not show moult.

Nidification. Two nestlings were brought in to Kup on April 24, 1952 (Mayr & Gilliard, 1954).

Habits, etc. Common in flocks in wild fig trees in gardens and in trees of the forest edge between 5000 and 6000 feet (Mayr & Gilliard, 1954).

"White-eyes were often seen in patches of secondary-growth on the grass-land-areas around Nondugl. The birds generally occurred in small flocks. Now and then also met with at the outskirts of the native cultivations and along the forest-edge.

When observed the White-eyes were busily gleaning through the foliage in search of those small insects which evidently constitute their principal food" (Glydenstolpe, 1955).

Discussion. In its diagnosis, Mayr & Gilliard (1951) compare their unique specimen of *shaw-mayeri* with *oreophila* but not with *wahgiensis*, though their table of measurements shows that *shaw-mayeri* has a longer bill than *wahgiensis*. In the complete white eye-ring *shaw-mayeri* agrees with *wahgiensis* and not with *oreophila*.

Not having examined the type specimen, I am hardly qualified to judge the validity of *shaw-mayeri*, but I have collected some circumstantial evidence that strongly points to this name being a synonym. First of all there is the

locality. I am indebted to Mr. Sims for drawing my attention to the fact that the type locality of *shaw-mayeri* is only ten miles away from the type locality of *wahgiensis* (on the published maps it seems further), and this was confirmed by Dr. Amadon (in litt., 15-XI-1955): "It is true that the type locality is only ten miles from that of *wahgiensis*, but Gilliard tells me that a main ridge of the Bismarck range separates the two localities. The type of *shaw-mayeri* came from the drainage of the Raimu River and was given to Gilliard by Mr. Shaw Mayer in the field. The types do seem to differ in the manner described, but, of course, one would like to see more material in order to be sure of all the differences".

Since then, however, a second specimen ascribed to *shaw-mayeri* has been reported upon by Gyldenstolpe. This specimen originates from Dagie, which is on the southern slope of the Wahgi Divide. Together with other material collected by Gyldenstolpe I received this specimen on loan, and found on the label the notes: "very near *shaw-mayeri*, but more dusky above and back, E. Mayr & T. Gilliard det.". The only difference from *wahgiensis* I can see is the very slightly greener upper surface. The loral line looks darker than it is, as the feathers on both sides of the head are somewhat sticky. Interesting is that the bill (entire culmen 12½, exposed culmen 9¾, culmen from anterior point of nostril 6¾) is not longer than in *wahgiensis*. There is no reason to suppose that the greener upper parts just mentioned fall outside the normal range of variation of *wahgiensis*, and as this specimen does not show the longer bill, the only difference between *shaw-mayeri* and *wahgiensis* given in the original description, I feel safe in assigning it to *wahgiensis*. At the same time, the fact that it is so extremely close to the type of *shaw-mayeri*, and that the difference in bill-length was not even mentioned by Gyldenstolpe, has convinced me that the latter also must be united with *wahgiensis*, at least until more material from the northern slopes of the Bismarck Mountains becomes available.

Gyldenstolpe (1955) records not less than three subspecies of *Z. novaeguineae* from the Wahgi Valley among them a specimen of *crissalis* from Nondugl, the type locality of *wahgiensis*. This specimen I have also examined; it bears the note "E. Mayr det.". The main differences between the races *wahgiensis* and *crissalis* are the yellow forehead and the smaller size of the latter. I found that the specimen from Nondugl has no yellow on its forehead, and that its size is large (wing 63½, Gyldenstolpe even records the wing as 64 mm). Besides the slightly chamois tinged colour of the belly (which I do not know if is natural or the result of staining of some sort), the specimen is identical with *wahgiensis*.

I have not seen the specimen from the Kubor mountains ascribed to

crissalis by Mayr & Gilliard (1951, 1954) but Dr. Vaurie has compared it for me with series of both *wahgiensis* and *crissalis* and concluded (in litt., 9-II-1959): "The specimen from Mount Orata is perfectly identical with *wahgiensis,* in my opinion, and the fact that it was identified as *crissalis* by Mayr and Gilliard may be an error".

It is clear, therefore, that from the Western Highlands one and only one subspecies of *Z. novaeguineae* is known, as opposed to the three admitted by Mayr & Gilliard and Gyldenstolpe.

The names *wahgiensis* and *shaw-mayeri* were proposed simultaneously in the same publication. As first revisor, in compliance with Article 28, § 124 sub (b) and the "Recommandation" given in § 125 of the "Copenhagen Decisions", I select *wahgiensis* as the valid name of the subspecies on the basis of line priority.

5. **Zosterops novaeguineae crissalis** Sharpe

Zosterops crissalis Sharpe, Cat. Birds Brit. Mus. 9, 1884, p. 165 — Astrolabe Mountains, S. E. New Guinea.

Zosterops crissalis; Salvadori, Agg. Orn. Pap. II, 1890, p. 130 (no locality); Oustalet, Ann. Sc. Nat., Zool. 12, 1891. p. 289 (Nouv.-Guinée S.-E.); Oustalet, Nouv. Arch. Mus. Hist. Nat. Paris (3) 5, 1893, p. 142 (Sud-est de la Nouvelle-Guinée); Salvadori, Ann. Mus. Civ. Genova 36, 1896, p. 98 (Moroka); Meyer & Wiglesworth, Birds Celebes, 1898, p. 495 (New Guinea); Finsch, Tierreich 15, 1901, p. 22 (Astrolabe-Gebirge); Dubois, Syn. Av. I, 1902, p. 708 (Nouv.-Guinée S.-E.); Rothschild & Hartert, Nov. Zool. 10, 1903, p. 452 (Mt. Cameron; Kotoi district 4000 ft.; Moroka district 3000-6000 ft.; Avera, Aroa River); Rothschild & Hartert, Nov. Zool. 14, 1907, p. 483 (Owgarra, Angabunga River); Sharpe, Hand-List Birds 5, 1909, p. 6 (Astrolabe Mts.); Sassi, Journ. f. Orn. 57, 1909 (July), p. 376 (Astrolabe Geb.); Mathews, Syst. Av. Australas. II, 1930, p. 700 (Astrolabe Mts.).

Zosterops novaeguineae crissalis; Stresemann, Mitt. Zool. Mus. Berlin 17, 1931, p. 220 (Gebirge von SO-Neugea); Mayr, Mitt. Zool. Mus. Berlin 17, 1931, p. 671 (Süd-Ost-Neuguinea); Mathews, Ibis (13) 2, 1932, p. 154 (no locality); Mayr & Rand, Am. Mus. Nov. 814, 1935, p. 17 (southeast New Guinea); Mayr & Rand, Bull. Am. Mus. Nat. Hist. 73, 1937, p. 241 (Mafulu, Mt. Tafa, Ononge, found from 1250 to 2400 meters); Mayr, List New Guinea Birds, 1941, p. 219 (mountains of southeastern New Guinea); Gilliard, Am. Mus. Nov. 1453, 1950, p. 39 (Horseshoe Mountain (= Mt. Maguli) at 4200 to 4400 ft.); Mees, Zool. Med. 34, 1955, p. 153 (no locality); Iredale, Birds New Guinea II, 1956, p. 169 (Southeastern Mountains).

Subspecific characters. Differs from all other races by its definitely more yellowish, less dark green upper parts; forehead and supra loral region distinctly yellow.

Unfeathered parts. Eye light brown blue (Anthony); iris brown or light brown, bill black and slate, feet blue slate (Meek); iris brown or hazel brown, bill black and slate blue, legs slate blue (Eichhorn Bros.).

Measurements of 14 specimens (10 ♂, 2 ♀, 2 —): wing 56-61½ (58.14),

tail 32-40 (36.11), tarsus 14, 15¾-17½ (16.27), entire culmen 12-14 (12.93), exposed culmen 9-10½ (9.73), culmen from anterior point of nostril 6½-8¼ (7.48).

Distribution. Mountains of Southeastern New Guinea at altitudes from about 1250 to 2400 metres, apparently widely distributed. Locality records are: Kotoi District 4000 ft.; Owgarra, Angabunga River, not less than 6000 ft.; Mafulu; Astrolabe Mts.; Bihagi, Mambare River; Hydrographer Mountains W. of Dyke Acland Bay (specimens from all these localities examined); Moroka District (Salvadori, 1896; Rothschild & Hartert, 1903); Mt. Cameron and Avera, Aroa River (Rothschild & Hartert, 1903); Mt. Tafa and Ononge (Mayr & Rand, 1937); Horseshoe Mountain (Gilliard, 1950).

First collector. A. Goldie before March, 1882.

Not figured.

Type. Two-cotypes (both examined). One is BM nr. 82.3.8.114. This specimen is undated, it bears on its label only the indication: "Astrolabe Mts., A. Goldie". Its registered number shows that it was received at the British Museum on or before 8 March, 1882. The second Goldie specimen: "ex coll. Goldie", BM nr. 83.6.5.3, does not even bear a locality.

Moult. Not checked in the majority of specimens, one specimen taken in February is not in moult. One of the Goldie specimens shows moult in the primaries, but the specimen is undated.

Nidification. Mayr & Rand (1937) mention the taking of a laying female on September 13 and state that the breeding season probably starts in August and lasts at least until November. Their opinion is apparently based on the examination of the gonads of specimens collected in this season, but it is not evident from their publication that they collected series all the year round so that it is difficult to visualize how they ascertained that the breeding season starts in September.

Habits, etc. According to Mayr & Rand (1937) this form is very common at Mafulu and Ononge, where it was usually found in patches of forest and secondary growth, moving about in small parties and feeding on small fruits. In one stomach a large spider was found.

Discussion.With its yellowish green upper surface and yellow forehead this form is rather closer to *Zosterops montana* (and other western species) with which it has been associated by Mayr (1944) than any of the other races of *Z. novaeguineae*. Geographically, however, it is the most distant race which makes it unlikely that the similarity noted is a sign of close relationship. Moreover it has again the basic pattern that is found in so many species.

6. **Zosterops novaeguineae oreophila** Mayr

Zosterops novaeguineae oreophila Mayr, Mitt. Zool. Mus. Berlin 17, 1931, p. 671 — Junzaing, Saruwaged Geb.

Zosterops novaeguineae subsp.; Stresemann, Mitt. Zool. Mus. Berlin 17, 1931, p. 223 (Saruwaged-Gebirge).

Zosterops novaeguineae oreophila; Mayr & Rand, Am. Mus. Nov. 814, 1935, p. 17 (Huon Peninsula); Mayr, List New Guinea Birds, 1941, p. 219 (Saruwaged Mountains); Mayr & Gilliard, Am. Mus. Nov. 1524, 1951, p. 14 (no locality); Mees Zool. Med. 34, 1955, p. 153 (no locality); Iredale, Birds New Guinea II, 1956, p. 169 (Saruwaged Mountains).

Zosterops novaeguineae oreophilia; Mayr & Gilliard, Am. Mus. Nov. 1524, 1951, p. 15 (no locality).

Subspecific characters. In coloration of upper parts similar to *wahgiensis*, hence slightly greener than the nominate race, but unlike these forms some yellow is present on the forehead and above the lores; eye-ring white below, but the upper half is grey, in which peculiarity *oreophila* differs from all other races; loral line greyish; yellow of throat extending over the upper breast as in *wahgiensis* but moreover there is some yellow on various places down the middle of the belly, though not to such an extent that it can be called a streak.

Unfeathered parts. Iris brown or grey-brown, bill black or blackish, feet grey (Mayr).

Measurements of seven species (2 ♂, 4 ♀, 1 —): wing 60-64 (62.21), tail 36-40 (38.50), tarsus 16-18 (17.11), entire culmen 12½-14 (13.14), exposed culmen 9-10½ (9.79), culmen from anterior point of nostril 7-7½ (7.14).

Weights of two females 11, 11 g (Mayr).

Distribution. Saruwaged Mountains on the Huon Peninsula, whence it has been recorded as follows: Junzaing, Ogeramorang (Mayr), Sevia and Zakaheme (Beck). Collected at 4000 and 5000 feet.

First collector. E. W. Mayr in January 1929.

Not figured.

Type. Mus. Berlin nr. 302830.

Moult. One specimen collected in March and one collected in April are undergoing their main moult.

Nidification. Mayr (1931) records that females shot in late December and early January all contained developing eggs.

Habits, etc. Not recorded.

7. **Zosterops novaeguineae magnirostris** Mees

Zosterops novaeguineae magnirostris Mees, Zool. Med. 34, 1955 (12 December), p. 153 — Awar, N. E. New Guinea.

Zosterops novaeguineae magnirostris; Iredale, Birds New Guinea II, 1956, p. 170 (Awar).

Subspecific characters. One of the small lowland races. Differs from all other races by its large bill (pl. III and IV). As the plates show, the largest-billed specimen of *aruensis* has the bill almost as long as *magnirostris,* but in lateral view the latter has a heavier and appreciably deeper bill. Differs from *wuroi* in the more yellowish, less greenish, tone of the upper parts; colour of throat identical. Differs from *aruensis,* to which race the colour of the mantle is similar, by the much paler and more greenish yellow coloration of its throat, and from both these other small races by the prominent streak of yellow down the centre of the belly.

Unfeathered parts. Not recorded.

Measurements of one male: wing 54½, tail damaged, tarsus 16, entire culmen 14¼, exposed culmen 11, culmen from anterior point of nostril 8.

Distribution. Known from the type locality only.

First collector. Viscount A. Moyne Chaplin in January, 1936.

Not figured.

Type. BM nr. 1936.4.20.94 (type examined).

Moult. The specimen examined is in fresh plumage. There is only one tail feather, the others presumably having been shot away.

Nidification. Unknown.

Habits, etc. Unknown, apart from the fact that this apparently is a lowland race.

Discussion. This form is known from the type specimen only. Iredale (1956) has expressed doubt about the validity of this and other recently described subspecies (without having examined specimens). Perhaps his remarks need not be taken seriously and certainly it is to be regretted that this author has found so much to criticize in the work of others, usually without even properly reading their papers and in most cases without material of the species he discusses.

Species 27. **Zosterops lutea** Gould

Characters. A fairly small to average-sized yellow-bellied species of the usual pattern. Coloration, especially the yellow of the under surface, rather duller than in other species.

Upper parts. Mantle Yellowish Citrine; rump of the same colour or scarcely slightly more yellowish; forehead and supra loral region yellow, close to Lemon Chrome, but duller; eye-ring of average size, white, interrupted in front by the blackish dusky loral stripe which is continued to half

way under the eye-ring; primaries, secondaries, and rectrices blackish brown, all distinctly edged with Yellowish Citrine.

Under parts all yellow, close to Lemon Yellow or even dull Lemon Chrome on the throat, paler elsewhere, and on the flanks with a distinct greenish grey admixture.

Structurally the species is characterised by its fairly long 2nd primary which is of about the same length as the 6th (always 5>2>7 in 28 specimens of all races, fig. 16). Tail-index about 68%.

Note. As regards coloration the material examined is very heterogeneous, evidently skins fade badly in collections (more so than the majority of other Zosteropidae); old material becomes more greyish, yellowish, and even brownish on the dorsal surface, losing much of the freshness of the green, whereas the ventral surface also becomes discoloured.

Distribution (fig. 10). The coastal region of tropical Australia from the Péron Peninsula and Dirk Hartog Island in the west, to the Edward River, western coast of Cape York Peninsula, in the east.

Ecology. A purely coastal species which as a breeding bird is probably confined to mangroves, but wanders inland outside the breeding season, though never far from the coast.

Geographical variation. Slight. Birds from Western Australia are slightly smaller (particularly as regards bill-size) and duller in colour than those from the Northern Territory and Queensland.

Related species. The suggested relationships of *Z. lutea* with *Z. flava. Z. natalis, Z. chloris* and *Z. griseotincta* have been discussed under those species.

1. **Zosterops lutea lutea** Gould

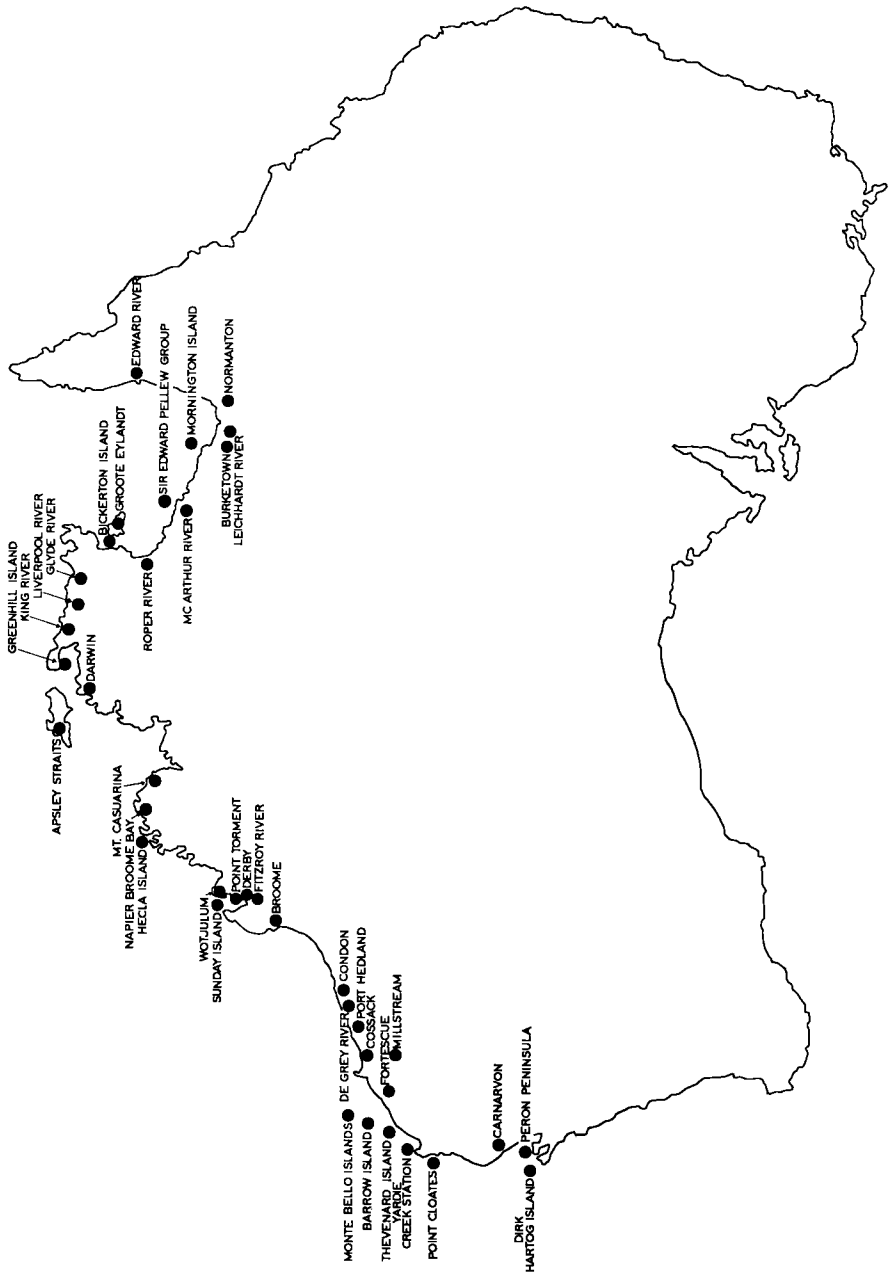
Zosterops luteus Gould, Birds Austr. IV, 1843, pl. 83, text — Greenhill Island, Van Diemen's Gulf.

Zosterops (*Tephras*?) *gulliveri* de Castelnau & Ramsay, Proc. Linn. Soc. N. S. W. 1, 1876, p. 383 — Norman River, Queensland.

Zosterops lutens; Reichenbach, Die vollst. Naturgesch. des In- und Auslandes. Die neuentdeckten Vögel Neuhollands, 1845, p. 84 (Nord-Australien).

Zosterops luteus; Gould in Stokes, Discoveries in Austr. I, 1846, p. 480 (no locality); Gould, Introd. Birds Austr., 8°, 1848, p. 128 (Northern Australia); Reichenbach, Die vollst. Naturg. der Vögel Neuhollands, 1850, p. 309 (no locality); Finsch, Neu-Guinea, 1865, p. 164 (Port Essington); Gould, Handb. Birds Austr. I, 1865, p. 590 (Greenhill Island, van Diemen's Gulf); Masters, Proc. Linn. Soc. N. S. W. 1, 1876, p. 57 (no locality); F. G. Waterhouse in Harcus, South Austr., 1876, p. 291 (tropical portion of South Australia [included Northern Territory at the time]); Ramsay, Proc. Linn. Soc. N. S. W. 2, 1877, p. 191 (Pt. Dar. & Pt. Essing., Gulf of Carpentaria, Cape York); Masters, Proc. Linn. Soc. N. S. W. 2, 1877, p. 274 (Port Darwin); Stone & Mathews, Austral Av. Rec. 1, 1913, p. 170 (Port Essington).

Zosterops lutea; G. R. Gray, Gen. Birds I, 1848, p. 198 (no locality); Bonaparte,


EDWARD RIVER
NORMANTON
MORNINGTON ISLAND
SIR EDWARD PELLEW GROUP
BICKERTON ISLAND
GROOTE EYLANDT
BURKETOWN
LEICHHARDT RIVER
MC ARTHUR RIVER
ROPER RIVER
GREENHILL ISLAND
KING RIVER
LIVERPOOL RIVER
GLYDE RIVER
DARWIN
APSLEY STRAITS
MT. CASUARINA
NAPIER BROOME BAY
HECLA ISLAND
WOTJULUM
SUNDAY ISLAND
POINT TORMENT
DERBY
FITZROY RIVER
BROOME
CONDON
PORT HEDLAND
COSSACK
DE GREY RIVER
MILLSTREAM
PORT SMITH
MONTE BELLO ISLANDS
BARROW ISLAND
THEVENARD ISLAND
CREEK STATION
POINT CLOATES
CARNARVON
PERON PENINSULA
DIRK HARTOG ISLAND

Consp. Gen. Av. I, 1850, p. 398 (Austr. occ.); Reichenbach, Handb. spec. Orn., Merop., 1852, p. 95, Taf. 493, fig. 3312-13 (Nord-Australien); Hartlaub, Journ. f. Orn. 13, 1865, p. 25 (Nordaustralien); G. R. Gray, Hand-List Birds 1, 1869, p. 163 (N. Australia); Giebel, Thes. Orn. III, 1877, p. 776 (Australia sept.); Sharpe, Cat. Birds Brit. Mus. 9, 1884, p. 183 (Cape York, Port Darwin); Sharpe, Rep. Zool. Coll. Alert, 1884, p. 18 (Port Darwin); De Vis, Proc. R. Soc. Queensl. 1, 1885, p. 156 (Kimberley, at the mouth of the Norman River, Gulf of Carpentaria); Ramsay, Tab. List Austr. Birds, 1888, p. 14 (Pt. Darwin, Pt. Essington, Gulf of Carpentaria, Cape York); Tristram, Cat. Coll. Birds, 1889, p. 211 (Cape York); A. J. Campbell et al., Rep. 7th Meeting Australas. Ass. Adv. Sc., Sydney, 1898, p. 138 (no locality); Hall, Key Birds Austr., 1899, p. 38 (Northern Territory, North Queensland); Finsch, Tierreich 15, 1901, p. 26 (Nord-Australian); (pt.) A. J. Campbell, Nests Eggs Austr. Birds, 1901, p. 351 (Northern Territory and North Queensland); Dubois, Syn. Av. I, 1902, p. 709 (Australia N.); Broadbent, Queensl. Geogr. Journ. N. S. 17, 1902, p. 82 (N. Aus., Q'land); A. G. Campbell, Emu 5, suppl., 1905, p. 40 (no locality); Hall, Key Birds Austr., 2nd ed., 1906, p. 38 (Northern Territory, North Queensland); Mathews, Emu 7, suppl., 1908, p. 89 (N. and N.W. Australia); Hull, List Birds Austr., 1909, p. 25 (no locality); Lucas & Le Souëf, Birds Austr., 1911, p. 365 (North and North-west Australia); (pt.) A. J. Campbell et al., Emu 12, suppl., 1913 (January), p. 84 (Northern Territory, N. Queensland); Hill, Emu 12, 1913 (1 April), p. 262 (Sir Edward Pellew Islands: a low, waterless, island ..... between Vanderlin's Island and Observation Island); H. L. White, Emu 15, 1915, p. 64 (Northern Territory, Western Australia); H. L. White, Emu 16, 1917, p. 120, 121, 134, 145, 146, 147 (Mornington Island Mission Station, Macarthur River, King River); H. L. White, Emu 16, 1917, p. 226 (Mornington Island, Macarthur River, Bickerton Island, Glyde River, King River, Liverpool River Island, Roper River); A. J. Campbell, Emu 18, 1919, p. 185 (Northern Territory); Mathews & Iredale, Austral Av. Rec. 4, 1920, p. 101 (no

Fig. 10. The distribution of *Zosterops lutea* and its races: *lutea, hecla,* and *balstoni.* Localities from material examined and from reliable literature.

balstoni

1. Dirk Hartog Island
2. Peron Peninsula
3. Carnarvon
4. Point Cloates
5. Yardie Creek Station
6. Thevenard Island
7. Barrow Island
8. Monte Bello Islands
9. Millstream
10. Fortescue
11. Cossack
12. Port Hedland
13. De Grey River
14. Condon
15. Broome
16. Fitzroy River
17. Derby
18. Point Torment
19. Sunday Island
20. Wotjulum

hecla

21. Hecla Island
22. Napier Broome Bay
23. Mt. Casuarina

lutea

24. Darwin
25. Apsley Straits
26. Greenhill Island
27. King River
28. Liverpool River
29. Glyde River
30. Bickerton Island
31. Groote Eylandt
32. Roper River
33. Sir Edward Pellow Group
34. McArthur River
35. Mornington Island
36. Burketown
37. Leichhardt River
38. Normanton
39. Edward River

locality); A. J. Campbell, Emu 21, 1922, p. 193 (Groote Eyland); Porsch, Biol. Generalis 2, 1926, p. 232 (Australien); W. B. Alexander, The Austr. Encycl. II, 1926, p. 465 (all round the north coast of the continent); Leach, An Austr. Bird Book, 1926, p. 223, (trop. N. A. — W. Q. (Norman R.)); Porsch, Biol. Generalis 5, 1929, p. 163 (Australien); (pt.) Cayley, What bird is that?, 1929, p. 161, pl. XXIII fig. 13 (tropical northern Australia to western Queensland); Thomson, Birds Cape York Peninsula, 1935, p. 66 (Lower Edward River); Condon, South Austr. Nat. 23, 1945, p. 10 (Northern Territory); Mathews, Working List Austr. Birds, 1946, p. 121 (Northern Territory); Thomas, South Austr. Orn. 18, 1947, p. 63 (Ludmilla Creek near Darwin, N. T.); Whittell, List Birds North Queensl., N. Queensl. Nat. Club Publ. 5, 1949, p. 10 (North Queensland); Barrett, An Austr. Animal Book, 2nd ed., 1955, p. 219 (tropical northern Australia and western Queensland (the Gulf country)); Seaton, N. Queensl. Nat. 24, 1956, p. 23 (Edge Hill (Cairns)); (pt.) Cayley, What bird is that?, 2nd ed., 1958, p. 177, pl. 23 fig. 13 (coastal northern Australia... to the Norman River (Qld.)); W. B. Alexander & Chisholm, The Austr. Encycl. VIII, 1958, p. 129 (the tropical coastline).

Zosterops gulliveri; Ramsay, Proc. Linn. Soc. N. S. W. 2, 1877, p. 191 (Gulf of Carpentaria); Sharpe, Cat. Birds Brit. Mus. 9, 1884, p. 188 (Norman River, Gulf of Carpentaria); Ramsay, Tab. List Austr. Birds, 1888, p. 14 (Gulf of Carpentaria); A. J. Campbell et al., Rep. 7th Meeting Australas. Ass. Adv. Sc., Sydney, 1898, p. 138 (no locality); Hall, Key Birds Austr., 1899, p. 38 (Northern Territory, North Queensland); Finsch, Tierreich 15, 1901, p. 43 (Nord-Australien (Norman River am Golf von Carpentaria)); A. J. Campbell, Nests Eggs Austr. Birds, 1901, p. 352 (Northern Territory and North Queensland); Dubois, Syn. Av. I, 1902, p. 712 (Australie N.); D. Le Souëf, Emu 2, 1903, p. 146 (Port Darwin District); A. G. Campbell, Emu 5, suppl., 1905, p. 40 (no locality); Hall, Key Birds Austr., 2nd ed., 1906, p. 38 (Northern Territory); Mathews, Emu 7, suppl., 1908, p. 90 (Northern Territory, N. Queensland); Hull, List Birds Austr., 1909, p. 25 (no locality); Sharpe, Hand-List Birds 5, 1909, p. 18 (Norman River, Gulf of Carpentaria); Lucas & Le Souëf, Birds Austr., 1911, p. 365 (Northern Territory and North Queensland); A. J. Campbell et al., Emu 12, suppl., 1913, p. 85 (Northern Territory, N. Queensland); W. Macgillivray, Emu 13, 1914, p. 175 (Leichhardt River, Burketown, Norman River); H. L. White, Emu 15, 1915, p. 64 (no locality).

Zosterops iuteus; Ramsay, Proc. Linn. Soc. N. S. W. 4, 1880, p. 94 (no locality).

Zosterops; Coppinger, Cruise of the Alert, 2nd ed., 1884, p. 207 (Port Darwin).

Zosterops Luteus; Broinowski, Birds Austr. IV, 1890, pl. VIII fig. 2 (northern portions of Australia).

Zosterops lutea lutea; Mathews, Nov. Zool. 18, 1912, p. 384 (Northern Territory); Mathews, List Birds Austr., 1913, p. 254 (Northern Territory); Mathews, Ibis (10) 2, 1914, p. 126 (near Apsley Straits, Melville Island); Mathews, Syst. Av. Australas. II, 1930, p. 700 (Northern Territory); Mathews, List Birds Australas., 1931, p. 373 (Northern Territory); Mack, Emu 31, 1932, p. 298 (revision); (pt.) Whittell & Serventy, Syst. List Birds W. Austr., 1948, p. 90 (from King Sound in the Kimberley Division, east to western Queensland); Wynne, North W. Nat. N. S. 2, 1954, p. 625 (no locality); de Schauensee, Proc. Ac. Nat. Sc. Philad. 109, 1957, p. 233 (Port Essington, types).

Zosterops lutea gulliveri; Mathews, Nov. Zool. 18, 1912, p. 384 (North Queensland); Mathews, List Birds Austr., 1913, p. 254 (North Queensland); Mathews, Syst. Av. Australas. II, 1930, p. 700 (Western Queensland (Gulf Country)); Mathews, List Birds Australas., 1931, p. 373 (Western Queensland (Gulf Country)); Mathews, Working List Austr. Birds, 1946, p. 121 (North Queensland, Norman River).

Subspecific characters. Differs from the other subspecies by its slightly brighter colour both above and below, and as decribed under those subspecies.

Unfeathered parts. Iris brown or chestnut, bill grey or lead grey, legs grey or lead grey (R. Kemp); iris brown, bill black, basal two thirds of mandible leaden, legs leaden blue (Rogers); iris light brown, bill and legs bluish grey (G. F. Hill).

Measurements of 16 specimens (7 ♂, 5 ♀, 4 —): wing 54-60 (56.66), tail 36-40½ (38.57), tarsus 16-18 (17.17), entire culmen 12¾-14 (13.27), exposed culmen 9½-11 (10.16), culmen from anterior point of nostril 7-8¼ (7.47), average tail:wing index of 15 specimens 68.1%.

Distribution (fig. 10). Coastal northern Australia from the Lower Edward River (western coast of Cape York Peninsula) to Port Darwin. There is little doubt that Seaton's (1956) record of the species' occurrence at Cairns is erroneous.

First collector. J. Gilbert on Greenhill Island, van Diemen's Gulf, in August, 1940 (cf. Gould, 1843; Whittell, 1954).

Figures. Gould (1843), plate 83 (coloured, natural size, good); Broinowski (1890), plate VIII fig. 2 (not very good); small coloured figures of limited value are given by Cayley (1929 and 1958, plate XXIII fig. 13, not good).

Types. Two cotypes, labelled Port Essington, in the Academy of Natural Sciences of Philadelphia, nrs. 18264 and 18265 (de Schauensee, 1957), of which I examined one, nr. 18265.

Moult. Not checked in the majority of specimens. One specimen collected in February is moulting primaries, one collected in July and one collected in October do not show moult.

Nidification. D. Le Souëf (1903) recorded a nest containing three eggs found near Port Darwin on January 17th (the year of collecting is not given); he described the eggs as of a delicate bluish-green, slightly darker than those of *Z. lateralis*, and glossy. Mathews (1914) mentioned a nest found on the 6th of November (apparently 1911) at Apsley Straits, Melville Island, with two eggs on the point of hatching. White (1917) found a nest with two fresh eggs on 29-X-1915 at King River in a small-leaved mangrove tree overhanging the river, and on 9-I-1916 another nest, six feet above the water in a narrow-leaved mangrove; on the 11th the number of eggs in this nest had increased to three.

The meagre evidence available points to a breeding season lasting from the end of October till the end of January. Clutch-size two or three. The nest is apparently normally built in mangrove trees (what one would expect),

and perhaps usually overhanging water. The nest seems not to differ from that of other species of the genus.

Habits, etc. Apparently typical of the genus, Gould (1843), from Gilbert's notes, recorded already that it usually moves about in parties of seven or eight in mangroves and thickets. Examination of stomach contents revealed as food small beetles and other insects (Macgillivray, 1914; White, 1917; Thomson, 1935; also notes on labels of several specimens I examined).

Voice. Gilbert (according to Gould, 1843) found the note very different from that of *Z. lateralis*, it being a pretty canary-like song instead of the long drawn-out note of *Z. lateralis*. Thomas (1947) described a sweet tuneful song, uttered very softly.

Discussion. Within the range of this race, only one additional subspecies, *gulliveri*, has sometimes been admitted. In agreement with Mack (1932) and other revisers I found that specimens from the Norman River, the type locality of *gulliveri*, are identical with topotypical *lutea*.

From the Academy of Natural Sciences of Philadelphia I received a specimen on loan, labelled Australia, 1876, coll. Walter Chamberlain, regd. nr. 53076. This specimen is fairly large (wing 58, tail 40½, tarsus 17, entire culmen 14½, exposed culmen 11, culmen from anterior point of nostril 8 mm); it agrees in colour of the upper part with *lutea*, but the entire under surface is much greener than in any specimen of *lutea* I have seen. As the specimen is without locality I cannot place it. However, there is a lot of individual variation. Chamberlain is known to have collected in the Fiji Islands and in Australia (Sharpe, 1906; Whittell, 1954), but apart from King George Sound, no localities are given in the literature consulted.

2. **Zosterops lutea hecla** [1]) Mathews

Zosterops lutea hecla Mathews, Austral Av. Rec. 1, 1912, p. 48 — Hecla Island, North-west Australia.

Zosterops lutea; (pt.) Hill, Emu 10, 1911, p. 282 (Hecla Island).

Zosterops lutea hecla; Mathews, List Birds Austr. 1913, p. 254 (Hecla Island); Mathews, List Birds Austr., Birds Austr., suppl. no. 3, 1924, p. 181 (Hecla Island);

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1) In June and July, 1960, I collected five specimens of *Zosterops lutea* near Kalumburu along the lower course of the King Edward River, just south of the Napier Broome Bay, and three at Wyndham. The measurements of these are, Kalumburu, ♂ : 55, 58, 59; ♀ : 57, 58, and Wyndham, ♂ : 54, 57; sex? : 56.

All specimens are in moult and in very worn plumage, their bills are hardly longer than in *balstoni*, but they seem to average slightly brighter in colour (contrary to my description of *hecla* in the text above!). To me it seems now absurd to recognize an intermediate between the rather ill-defined subspecies *lutea* and *balstoni*, and I would sink *hecla*, on account of its fairly large size and bright colour, as a synonym of the nominate race.

Mathews, Syst. Av. Australas. II, 1930, p. 701 (North-West Australia, Hecla Island); Snouckaert, Alauda (2) 3, 1931, p. 22 (Ile Hecla, Parry Harbour); Mathews, List Birds Australas., 1931, p. 373 (North-West Australia, Hecla Island); Mathews, Working List Austr. Birds, 1946, p. 122 (Hecla Island).

Zosterops lutea lutea; (pt.) Whittell & Serventy, Syst. List Birds W. Austr., 1948, p. 40 (from King Sound ... east ...).

Subspecific characters. Agrees in its pale coloration with *balstoni,* but in bill-size with *lutea*; moreover apparently a trifle larger than both other subspecies.

Unfeathered parts. Iris dark buff, bill blackish, slate grey at base, tarsus dark grey (Hill).

Measurements of two males: wing 57, 59; tail 37½, 40½; tarsus 16¾, 18; entire culmen (one specimen only) 14; exposed culmen (one specimen only) 10; culmen from anterior point of nostril (one specimen only) 7½. Average tail:wing index of these two specimens 67.2%.

Distribution. Hecla Island and adjacent mainland of the northern Kimberley Division. Specimens examined from Napier Broome Bay and Mt. Casuarina.

First collector. G. F. Hill on Hecla Island in November, 1909.

Not figured.

Type. ♂, AMNH nr. 700495.

Moult. One specimen collected in June and one collected in November are both undergoing their main moult.

Nidification. Hill's (1911) notes probably refer to the present subspecies. He states that the nesting season appears to be from the beginning of February to April, and describes the nest, but not the eggs.

Habits, etc. Apparently unrecorded, but probably similar to those of the other subspecies.

Discussion. The validity of this subspecies needs confirmation. It is from an intermediate area between *lutea* and *balstoni,* and in colour characters and bill size is an intermediate too. I would not have recognised it (Mack, 1932, already placed *hecla* as a synonym) if it were not that both specimens I have examined are rather large. Dr. Amadon kindly sent me the measurements of the type specimen of *hecla* (in litt., 9-VIII-1954): wing 58, tail 41, entire culmen 13¾, exposed culmen 10. This, again, is large, and though certainly one would like to see more material, it seems justified to provisionally accept *hecla* on the characters listed.

3. **Zosterops lutea balstoni** Ogilvie-Grant

Zosterops balstoni Ogilvie-Grant, Ibis (9) 3, 1909, p. 663 — Carnarvon.

Zosterops lutea tribulationis Mathews, Nov. Zool. 18, 1912, p. 384 — North-West Australia (Point Torment).

Zosterops lutea headlandi Mathews, Austral Av. Rec. 5, 1923, p. 36 — Point Headland, North Mid-west Australia (recte: Port Hedland).

Zosterops lutea montebelloensis Ashby, Emu 25, 1925, p. 116 — Monte Bello Is.

Zosterops Gouldi; North & Keartland, Trans. R. Soc. South Austr. 22, 1898, p. 182 (near the Fitzroy River).

Zosterops luteus; Carter, Zoologist (4) 3, 1899, p. 140 (Point Cloates).

Zosterops lutea; Carter, Zoologist (4) 4, 1900, p. 418 (Point Cloates: common); Woodward in Fraser, W. Austr. Year-Book for 1898-99, 1900, p. 181 (Western Australia); Woodward, Guide W. Austr. Mus., 1900, p. 57 (Western Australia); Hall, Victorian Nat. 18, 1901, p. 31 (Derby); (pt.) A. J. Campbell, Nests Eggs Austr. Birds, 1901, p. 351 (North-west Cape); Hall, Emu 2, 1902, p. 49 (Fitzroy River); Carter, Emu 2, 1902, p. 80 (North-West Cape); Carter, Emu 3, 1903, p. 91 (North-West Cape); Woodward in Fraser, Notes Nat. Hist. W. Austr., 1903, p. 133 (N. and N.W. Western Australia); Carter, Emu 7, 1907, p. 100 (N.W. Cape); Whitlock, Emu 8, 1909, p. 173, 183 (Port Hedland; Condon); (pt.) Sharpe, Hand-List Birds 5, 1909, p. 9 (Derby to Point Cloates); Crossman, Emu 9, 1910, p. 150 (Broome, N. W. A.: very common); (pt.) Hill, Emu 10, 1911, p. 282 (from Derby northwards); (pt.) A. J. Campbell et al., Emu 12, suppl., 1913, p. 84 (W. and N.W. Australia); Whitlock, Emu 25, 1925, p. 85 (Derby); (pt.) Cayley, What bird is that?, 1929, p. 161 (Carnarvon); Whitlock, W. Austr. Nat. 1, 1947, p. 54, 55 (Condon; Barrow Island: numbers); Serventy & Whittell, Birds W. Austr., 1948, p. 312 (as far south as Sharks Bay); Serventy & Whittell, Birds W. Austr., 2nd ed., 1951, p. 329 (as far south as Sharks Bay); Warham, Emu 57, 1957 (31 Aug.), p. 230 (Sunday Island, not seen on Cockatoo Island); (pt.) Cayley, What bird is that?, 2nd ed., 1958, p. 177, pl. 23 fig. 13 (Sharks Bay).

Zosterops gulliveri; Woodward in Fraser, W. Austr. Year-Book for 1898-99, 1900, p. 181 (Western Australia); Woodward in Fraser, Notes Nat. Hist. W. Austr., 1903, p. 33 (N. Western Australia).

Zosterops balstoni; Mathews, Emu 10, 1910, p. 57 (Carnarvon); Carter, Ibis (9) 4, 1910, p. 651 (North-West Cape); Lucas & Le Souëf, Birds Austr., 1911, p. 365 (Carnarvon); A. J. Campbell et al., Emu 12, suppl., 1913, p. 104 (W. Australia); A. J. Campbell, Emu 18, 1918, p. 7 (Barrow Island).

Zosterops lutea balstoni; Mathews, Nov. Zool. 18, 1912, p. 384 (Carnarvon); Mathews, List Birds Austr., 1913, p. 254 (Mid-West Australia); Montague, Proc. Zool. Soc. London, 1914, p. 635 (Monte Bello Group: numerous); Carter, Ibis (10) 5, 1917, p. 571 (Carnarvon); Carter, Ibis (11) 3, 1921, p. 69 (Carnarvon; North-West Cape); Whitlock, Emu 22, 1923 (April) p. 265 (Mill Stream); Mathews, Syst. Av. Australas. II, 1930, p. 700 (Mid-West Australia (South)); Snouckaert, Alauda (2) 3, 1931, p. 22 (Carnarvon); Mathews, List Birds Australas., 1931, p. 373 (Mid-West Australia (South)); Mack, Emu 31, 1932, p. 299 (King Sound, south to Carnarvon); Mathews, Working List Austr. Birds, 1946, p. 121 (Mid-West Australia (South)); Whittell & Serventy, Syst. List Birds W. Austr., 1948, p. 90 (from King Sound to the Shark Bay).

Zosterops lutea tribulationis; Mathews, List Birds Austr., 1913, p. 254 (North-west Australia); Mathews, Syst. Av. Australas. II, 1930, p. 701 (North-West Australia (Point Torment)); Snouckaert, Alauda (2) 3, 1931, p. 22 (Pointe Torment); Mathews, List Birds Australas., 1931, p. 373 (North-West Australia (Point Torment)); Mathews, Working List Austr. Birds, 1946, p. 121 (North West Australia (Point Torment, Derby District)).

Zosterops lutea gulliveri; Söderberg, Kung. Sv. Vet. Ak. Handl. 52, (17), 1918, p. 99 (Sunday Island, King Sound: many particulars).

Zosterops (lutea) balstoni; A. J. Campbell, Emu 18, 1919, p. 263 (Dirk Hartog).

Zosterops lutea headlandi; Mathews, Syst. Av. Australas. II, 1930, p. 701 (Mid-West

Australia (North)); Snouckaert, Alauda (2) 3, 1931, p. 22 (Pointe Headland); Mathews, List Birds Australas., 1931, p. 373 (Mid-West Australia (North)).

Zosterops lutea montebelloensis; Mathews, Birds Austr. XII, 1927, p. 431 (Monte Bello Islands); Mathews, Syst. Av. Australas. II, 1930, p. 701 (Monte Bello Island, Mid-West Australia); Snouckaert, Alauda (2) 3, 1931, p. 22 (Ile Monte Bello); Mathews, List Birds Australas., 1931, p. 374 (Monte Bello Island, Mid-West Australia).

Subspecific characters. Similar to the nominate race, but differs by its slightly paler yellow under parts, the less greenish, more greyish, upper parts, and by its on the average one mm shorter bill. As regards other measurements, this subspecies seems to average slightly smaller than the nominate form, though the range of variation is about the same.

Unfeathered parts. Iris bright hazel, bill black, basal half of lower mandible light bluish steel, legs steel (Shortridge); iris hazel or crimson, or straw colour with little red, bill dark horn or dark purple, base fleshy, legs dark purplish or blue lead or brownish purple (Carter); iris brown, bill brown or pale brown or brown horn, legs grey or dark grey (Buller); iris brown, bill blackish brown, base of mandible blue grey, legs leaden blue or leaden grey (Rogers); iris light brown, bill black, grey at base of lower mandible, legs grey (Hill); iris brown, bill black, basal two-thirds of mandible pale blue-grey, legs plumbeous (Mees).

Measurements. Wing 31 ♂, 53-57½ (55.10); 15 ♀, 53-56½ (54.30); 58 specimens, 53-57½ (54.91); tail 31 ♂, 35-42 (37.85); 14 ♀, 33-39 (36.25); 57 specimens, 33-42 (37.52); tarsus 55 specimens, 16-18½ (17.36); entire culmen 53 specimens, 10¼-13 (12.28); exposed culmen 54 specimens, 8-10½ (9.10); culmen from anterior point of nostril 54 specimens, 6-9 (6.98); average tail:wing index of 57 specimens 68.3%.

Distribution (fig. 10). North-western Australia from Dirk Hartog Island (where it is perhaps only a straggler), Péron Peninsula (breeding, see under nidification) and Carnarvon to the western Kimberley Division (King Sound, Wotjulum); also on practically all islands off the coast. Normally confined to the coastal mangroves, but Whitlock (1923) observed specimens at Millstream Homestead more than hundred kilometres from the coast as the crow flies. More about the distribution is said in the paragraphs on habits and in the discussion.

First collector. Probably T. Carter, who collected a specimen at Point Cloates on 17 May 1898 (AMNH nr. 700470). This is the oldest skin I have seen and there are no earlier references in literature either, though Keartland (in North & Kearthland, 1898 observed specimens which he misidentified as *gouldi,* at the Fitzroy River in 1896/97.

Figure. Mathews (1923), plate opposite p. 156, two bottom figures,

coloured, natural size, by Grönvold, one figure good, the other drawn after a discoloured specimen (type of *headlandi*).

Types. The two cotypes are in the British Museum; I have examined one of them, BM nr. 1905.12.26.92. I have also examined an unsexed specimen from Port Hedland, October 1907, from the Mathews Collection, now AMNH nr. 700479, which bears in pencil the note: "Type of *headlandi*", and has a special yellow label with the word "figured".

Moult. Specimens collected in January (3), February (1), March (2), June (7), July (4), August (1), September (8) and October (2) are not in moult. One specimen collected in September shows moult on the forehead, no main moult; specimens collected in February (1), March (1), April (1), and September (5) are undergoing their main moult of primaries or rectrices or both.

Nidification. When A. J. Campbell (1901) published his monumental work on the nests and eggs of Australian birds, he was forced to state that nothing was yet known about the nidification of *Zosterops lutea,* but in the same year Hall (1901) described two nests found by Rogers near Derby, the first found on 17 March 1901, containing a clutch of three eggs, the second found on 18 March 1901, which contained one large nestling, one bird recently hatched, and one egg. The eggs were uniform pale bluish green. In the Western Australian Museum there is a single egg ascribed to the species collected by J. T. Tunney on Barrow Island in 1900; unfortunately being without exact date of collecting, it is not of much value, but this egg probably is the first ever taken of the species.

Subsequently Söderberg (1918) contributed much interesting information on the building process. On Sunday Island in King Sound he found three nests, on 5 January, 24 January and 23 February 1911 respectively. The first contained two white eggs, the second three big young, the third was empty. The nests as described by Söderberg, suspended between two twigs, cup shaped, and lined with cobweb and pieces of bark, are typical. Mathews (1911) mentions that Rogers found several nests at Derby in February 1911, and that a nest with two incubated eggs was found at Point Torment on 6 November 1911. Montague (1914) found a half-constructed nest towards the end of August, and thought that breeding would commence in October.

On 28 January 1959, Mr. J. R. Ford (in litt., 5-III-1959) observed, together with Mr. D. Bathgate, specimens at Guichenault Point, Péron Peninsula. I quote from his letter: "Three pairs of the Yellow Silvereye were seen carrying nesting material, and a nest in the middle stages of construction was found in a mangrove, some ten feet above the ground.....

Bathgate also informed me that he has observed *Z. lutea* in a small mangrove patch just north of Denham".

To summarize the scanty information available: known nesting season January, February, March, and November; clutch size two or three, three being perhaps the more common number; colour of eggs either pale bluish green or white. It is interesting to find that two colours of eggs have been recorded in this race.

Habits, etc. This species is said to be largely confined to mangroves in the breeding season, but according to Carter (1910) in the winter months flocks of considerable size spread over the scrubby coast-sandhills and more open country. It was also in winter that Whitlock (1923) observed them at Millstream. Montague (1914) found them on the Monte Bello Islands in all kinds of scrub, but never far away from mangroves. Recorded food consists of berries, seeds, and insects which are searched for in the foliage of the mangrove trees (Montague, 1914).

Very recently (July-August 1959) I had an opportunity of observing individuals of this subspecies at Carnarvon and Yardie Creek Station (North-West Cape). In both places I saw them flying from tree to tree in the mangroves (at Carnarvon also in *Acacia* scrub near the edge of the mangrove) in small, loose flocks of which the members kept contact by their continuous chirp (described below under the heading Voice). It was remarkable how the colour of the birds would blend with the yellowish green colour of the mangrove leaves and notwithstanding its continuous movements a bird once alighted amongst the foliage of a tree would become almost invisible. Whitlock (1909) already commented on the inconspicuousness of the birds in their natural surroundings. Their general behaviour did not seem to differ from that of other species of *Zosterops* known to me.

Though *Z. lutea balstoni* and *Z. lateralis gouldi* are known to occur occasionally in mixed flocks at Carnarvon I observed the former only near the mangroves, and very close to the coast, the latter only in bushes about a mile inland from the town.

Voice. Like the nominate race, with which it is presumably identical as regards habits and voice, *balstoni* is reported to be a good songster. Söderberg (1918) wrote that it delivers a high, sonorous, and variable strophe somewhat reminiscent of the song of a Siskin, *Carduelis spinus* (L.), whereas the call-note is also not unlike that of the Siskin. Whitlock (1909) stated that *balstoni* will: "pour forth a marvellous volume of song". Montague (1914) heard "full song" in August, but did not describe it.

At Carnarvon I described the loud chirp with which the members of a flock called to each other as: "plēēwee... plēēwee...", not or hardly

different from the chirp uttered by *Zosterops lateralis gouldi* in similar circumstances.

Discussion. Mack (1932), in his excellent revision of the Australian Zosteropidae, has already referred the several alleged races described by Mathews and Ashby to the synonymy, whereas earlier Campbell (1918, 1921) questioned the validity of some of Mathews's creations. Apart from the provisional recognition of *hecla* — which is a doubtful race anyway — my conclusions do hardly differ from those of Mack. There are just some minor points: Mack had very few specimens of the nominate race, and included King Sound into the range of that form. On the other hand he also mentioned King Sound as part of the range of *balstoni.* I have seen much more material than Mack, and find birds from the western Kimberley Division identical with *balstoni.* I can not see that birds from Barrow Island are brighter than those of the mainland as Mack (l.c.) suggests; perhaps his specimens were in fresher plumage than the mainland ones he compared them with, or he may have been influenced by Mathews's unfounded opinion that the populations inhabiting the small islands off the coast are always brighter than the mainland populations.

I have examined good series of topotypical material of all the described subspecies (*balstoni, montebelloensis, headlandi, tribulationis*) and find them all identical and referable to *balstoni.* So there would be no need to reopen the discussion if here were not an illuminating example of the way Mathews used to work. *Zosterops lutea headlandi* Mathews (it ought to have been *hedlandi,* because the type locality is not Point Headland, as Mathews consistently wrote, but Port Hedland, as any good map could have told him) was described as differing from *hecla:* "in being smaller generally and in being greenish-yellow on the under surface and greyish green above". Apparently Mathews considered comparison with *balstoni* or his *tribulationis* (with type-locality half-way between the type-localities of *hecla* and *headlandi*) superfluous. Examination of the type specimen of *headlandi* revealed that this specimen actually is, as Mathews stated, very grey (perhaps preserved in spirits for a short time?); the fact that other specimens from the same locality, several of which must at the time have been available to Mathews, are less grey and perfectly agree with *balstoni,* did not discourage him from naming this single aberrant individual.

A. J. Campbell (1918, 1921) apparently considered West-Kimberley birds identical with topotypical *lutea,* but as stated above I fail to distinguish specimens from that area from *balstoni.* Zoogeographically the identity of the West Kimberley birds with *balstoni,* whereas the northeastern Kimberley Division and the Northern Territory have different races, is unexpected,

as usually racial boundaries in the northern part of Western Australia are found in the area known as the Eighty Mile Beach where the desert reaches the sea. This is where Campbell thought that the boundary between *lutea* and *balstoni* had to be drawn.

Zosterops griseotincta group

(species 28-32)

The five species combined in this group occupy a contiguous range on the Louisiades and the Solomon Islands, the majority of the species and several subspecies inhabiting but one single island. The various species differ to a marked degree in coloration, and to a lesser extent in size and external morphology. They agree in their fairly large to large size, in their comparatively large and heavy bills, and also in their rounded wings with a comparatively short 2nd primary (fig. 1 c and d).

Measurements are given in tables VII and VIII.

TABLE VII

The *Zosterops griseotincta* group except *Zosterops griseotincta*

	number of specimens	wing	tail	av. wing	av. tail	tail : wing index
vellalavella	9	61-65	37-41½	63.22	39.61	62.65%
luteirostris	7	58-63	34½-38	60.64	36.36	59.95%
splendida	6	60-62	40-42	61.25	40.75	66.53%
kulambangrae	7	60½-66	36-41	62.93	39 71	63.11%
paradoxa	6	63½-67	41-47	65.75	43.67	66.41%
tetiparia	5	63-65	41-44	63.90	42.40	66.35%

Some species of the group, for example *Z. luteirostris,* have weak but distinct bristles at the gape. Unfortunately I became aware of this too late to make a general survey of the presence of this character, but it is certainly not of general occurrence in the genus *Zosterops.*

Notwithstanding the (for *Zosterops*) very great differences between some of the forms, the fact that they all geographically replace each other, together with the intermediate morphological position of some of them (*Z. vellalavella,* for example, was united with *Z. kulambangrae* and the other Solomon Islands forms by Mayr, 1945, but in general appearance is closer to *Z. griseotincta*), has convinced me that they form a natural group.

The apparent affinity between some of these forms was already rightly noted by Stresemann (1931) and Mayr (1940, 1944, 1945). Whereas Mayr in his earlier publications (1940, 1942) calls the different forms of the Central Solomon Islands a superspecies, dividing them in three full species:

1. *Zosterops rendovae* and subspecies (= *Zosterops kulambangrae* in this review), 2. *Zosterops luteirostris* and subspecies, 3. *Zosterops vellalavella* — very much the same division here used by me — he later reduced all forms to subspecific rank (Mayr, 1945). However, I presume that this strong reduction was more a sacrifice by Mayr to the practical need of simplification in a book that was in the first place meant as a field-guide, than that it expressed his actual views on their systematic position.

My own opinion, here as in similar cases, is that where forms inhabiting neighbouring islands are clearly related, but have at the same time diverged strongly, it is better to allow them specific rank. In such cases proof of their status is difficult to obtain. However, it goes against my feelings to unite such strikingly dissimilar forms as *Z. kulambangrae, Z. vellalavella,* and *Z. splendida* into one species, whereas elsewhere I am forced, because of biological evidence being available, to place *Z. montana steini, Z. chloris citrinella* and *Z. palpebrosa nilgiriensis* in different species. In other words, in a genus where morphological differences between good species are often so slight as to be hardly noticeable, it is likely that where strong morphological differences have evolved, genetical affinity has been reduced or ceased to exist. It would go against the grain to for the sake of simplicity deny these facts by reducing such forms to subspecific status, though this is of course exactly what some of the more extreme "lumpers" have been doing recently (Meinertzhagen, 1954, with his "rejungent species").

An additional, practical, argument is that by recognising several species in the group, it becomes possible to express in nomenclature the close relationship between the subspecies of *Z. griseotincta* and *Z. kulambangrae* as opposed to the more remote relationships between the forms given specific status.

It is curious that Mayr never did actually include *Z. griseotincta* in his species or superspecies "*Zosterops rendovae*", for, as stated above, *Z. vellalavella* certainly more or less bridges the morphological gap between the species from the Central Solomon Islands and *Z. griseotincta,* so that there is no need to exclude the latter from the species group. It is true, however, that he (Mayr, 1944, p. 194) hinted in this direction. Also, in his discussion of the affinities of *rennelliana* (quoted on p. 143), Mayr (1931) already acknowledged the possibility of affinity between that form and the species from the Solomon Islands. The reason probably is that Mayr considered all these birds to belong to his "Superspecies *Zosterops lutea*" (cf. Mayr, 1945, p. 272). With this opinion I cannot agree, as will be explained hereafter.

A discussion of the alleged relationships between *Z. griseotincta* and some more western species, is given under that species.

Species 28. **Zosterops griseotincta** G. R. Gray

Characters. A large dull species with a proportionately large and heavy brownish or white, never black, bill. General dullness in appearance caused by the fact that hardly any pure yellow appears in the plumage.

Upper parts. Warbler Green, forehead and supra loral region of the same colour or, in some races, more yellow; white eye-ring well developed to wide, entirely absent in one race, when present interrupted in front by a pale dusky or a pale yellowish spot; loral line and a streak to half way under the eye pale dusky or pale yellowish; primaries, secondaries, and rectrices blackish brown, broadly margined with Warbler Green; outer pair of rectrices washed with the same colour.

Under parts. Flanks and sides of the breast much of the same colour as the upper parts, but slightly to considerably paler; remainder of under parts more yellowish, less greenish, gradually becoming almost pure Lemon Yellow towards the centre of the abdomen, and especially on the throat.

Unfeathered parts. Bill comparatively heavy, though varying in size according to race, pale or dark horn colour, but never black; legs variable; iris brownish, yellowish or greyish.

Measurements are given in table VIII.

TABLE VIII

Zosterops griseotincta

	number of specimens	wing	tail	av. wing	av. tail	tail : wing index
griseotincta	14	60-64½	40-44	62.89	41.36	65.76%
longirostris	3	63	39-40	63.00	39.33	62.43%
pallidipes	13	62-66½	38-43½	64.23	40.65	63.29%
eichhorni	14	60-63½	36-41½	61.69	38.32	62.22%
rennelliana	3	63-65	38½-39½	64.00	38.83	60.68%

Structure. Wing-formula normal, but 2nd primary perhaps slightly shorter than usual, though normal for the species-group; 2nd primary in length between 7th and 10th; tail, for the general size of the species, rather short (see table VIII). Plumage usually soft and often much abraded; specimens in abraded plumage are conspicuously duller and rather paler than those in fresh dress.

Distribution (fig. 11). Islands off the eastern tip of New Guinea, including nearly all visited islands of the Louisiade Archipelago; Long Island; Nauna in the Admiralty Group; Nissan (northernmost of the Solomon Islands), and Rennell Island.

Geographical variation. Though there is a distinct geographical variation

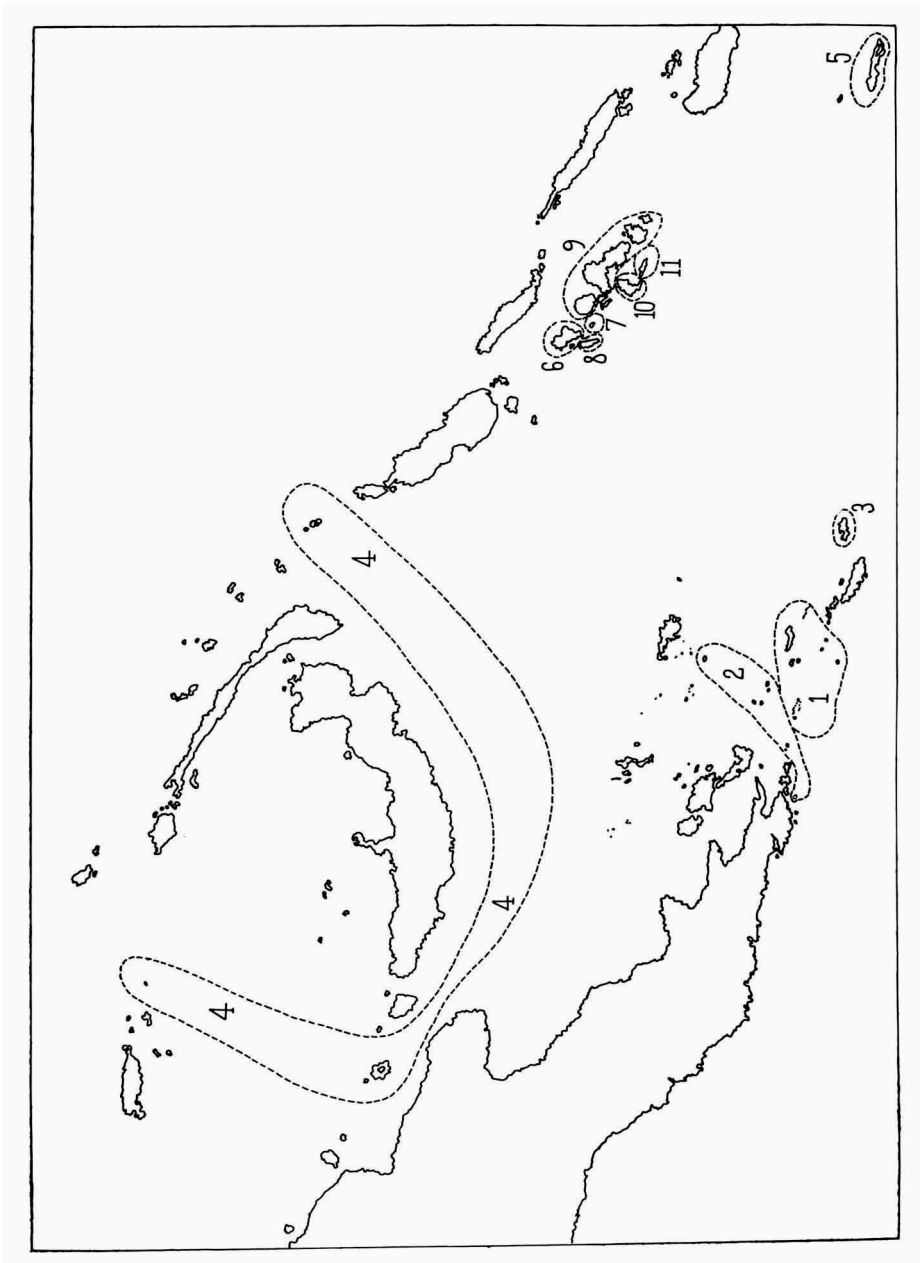

Fig. 11. The distribution of the *Zosterops griseotincta* group: *Zosterops griseotincta* and races; 1, *griseotincta*; 2, *longirostris*; 3, *pallidipes*; 4, *eichhorni*; 5, *rennelliana*; 6, *Zosterops vellalavella*; 7, *Zosterops luteirostris*; 8, *Zosterops splendida*; *Zosterops kulambangrae* and races; 9, *kulambangrae*; 10, *paradoxa*; 11, *tetiparia*.

(as already indicated under the heading Characters), the variation is not extreme and there are but three distinct types: *rennelliana* without white eye-ring, confined to Rennell Island; *pallidipes,* with pale legs, confined to Rossell Island; and the *griseotincta*-type, in three thin races distributed over the whole remainder of the range of the species. The fact that the widely ranging subspecies are so similar to each other forms a strong pointer to the way this extensive area has been colonized. My theory is that the colonisation of the outlying islets has taken place after the last glacial period and from Misima (St. Aignan) Island. It can be imagined, but of course not proved, that with the rising of the sea-level after the last glacial period, populations of *griseotincta* occupying the then large Misima Island, were gradually cut off from the main island, and were subsequently transformed into small-island inhabitants. After this ecological transformation these populations were able to colonize islands elsewhere. The consequence of this theory is, of course, that at the time of the last glacial period only three races had yet been differentiated: those on Rennell, Rossel, and Misima, and that the last mentioned one subsequently gave birth to the similar forms *longirostris* and *eichhorni* which, therefore, are of postglacial, postpleistocene age. This point of view is in accordance with that of Mayr (1955) who wrote that: "Northern Melanesia was clearly invaded from the area of the Louisiades...", but I do not agree with the last part of this sentence" ...and ultimately from Torres Strait". Previously Mayr (1944) already suggested a very close relation between this species and his *lutea*-group (including the species *lutea* and *chloris*). As I have tried to show in the discussion of that form, *Z. chloris albiventris* is of Moluccan origin and must have colonized the eastern part of its range, linking the ranges of *chloris* and *griseotincta,* only recently, e.g. in postglacial times, so that the original ranges of the two species are widely separated. Of course there may have been a connection in even more remote times, but there we get far beyond the point where hypothesis changes into altogether unfounded speculation. Moreover, the suggested relationship of the species with forms inhabiting the Solomon Islands, links its relations with the East, not with the West. As the forms of the Central Solomon Islands must be of considerable antiquity on the islands where they occur, as shown by their great morphological distinctness, it seems most likely that *Z. griseotincta* is originally an eastern species that, for this reason alone already, can not be particularly closely related to either *Z. lutea* or *Z. chloris.*

1. **Zosterops griseotincta griseotincta** G. R. Gray

Zosterops griseotincta G. R. Gray, Proc. Zool. Soc. London 26, 1858 (13 July), p. 175 — Louisiade Archipelago (without exact locality).

Zosterops aignani Hartert, Nov. Zool. 6, 1899, p. 210 — St. Aignan.

Zosterops griseotincta; *G. R. Gray, Cat. Mamm. Birds New Guinea, 1859, p. 25 (Louisiades); G. R. Gray, Proc. Zool. Soc. London for 1861, 1862 (April), p. 434 (Louisiade); Hartlaub, Journ. f. Orn. 13, 1865, p. 25 (Louisiade-Gruppe); Finsch, Neu-Guinea, 1865, p. 164 (Port Essington); G. R. Gray, Hand-List Birds 1, 1869, p. 162 (Louisiade arch.); Giebel, Thes. Orn. III, 1877, p. 775 (Lusciadae); Salvadori, Ann. Mus. Civ. Genova 16, 1880, p. 82 (Ins. Ludovicianis); Salvadori, Orn. Pap. II, 1881, p. 371 (Ins. Ludovicianis); Salvadori, Agg. Orn. Pap. II, 1890, p. 131 (no locality); De Vis, Ann. Queensl. Mus. 2, 1892, p. 8, 10 (Renard Island, a small island adjacent to St. Aignan); Finsch, Tierreich 15, 1901, p. 29 (Louisiade-Archipel bei Neu-Guinea (ohne genauere Angabe der Insel)); Dubois, Syn. Av. I, 1902, p. 709 (Louisiades); Sharpe, Hand-List Birds 5, 1909, p. 11 (Louisiade Is.); Mathews, Syst. Av. Australas. II, 1930, p. 704 (Louisiade Islands).

Zosterops griseitincta; Sharpe, Cat. Birds Brit. Mus. 9, 1884, p. 189 (Louisiade archipelago); Hartert, Nov. Zool. 6, 1899, p. 210 (Louisiade group: probably from Teste or one of the other small islands).

Zosterops aignani; Finsch, Tierreich 15, 1901, p. 29 (Misima (oder St. Aignan)); Dubois, Syn. Av. I, 1902, p. 710 (Ile St-Aignan); Rothschild & Hartert, Nov. Zool. 10, 1903, p. 453 (St. Aignan); Sharpe, Hand-List Birds 5, 1909, p. 11 (St. Aignan); Ogilvie-Grant, Cat. Birds' Eggs Brit. Mus. 5, 1912, p. 5, Pl. I fig. 1 (eggs from St. Aignan); Hartert, Nov. Zool. 27, 1920, p. 436 (St. Aignan); Mathews, Syst. Av. Australas II, 1930, p. 704 (Louisiade Islands (St. Aignan Island)).

Zosterops griseitincta griseitincta; Stresemann, Mitt. Zool. Mus. Berlin 17, 1931, p. 225 (Eine Insel des Louisiade-Archipels, vielleicht eine der zur Duchâteau-Gruppe gehörigen Inseln).

Zosterops griseitincta aignani, Stresemann, Mitt. Zool. Mus. Berlin 17, 1931, p. 225 (St. Aignan).

Zosterops griseotincta aignani; Mathews, Ibis (13) 2, 1932, p. 154 (no locality); Mayr, List New Guinea Birds, 1941, p. 219 (Misima (= Aignan) and Deboyne group, Louisiade Archipelago); Iredale, Birds New Guinea II, 1956, p. 170 (Misima and the Deboyne Group).

Zosterops griseotincta griseotincta; Mayr, List Guinea Birds, 1941, p. 219 (Duchâteau Island and Conflict group, Louisiade Archipelago).

Subspecific characters. As the species; the specimens examined are, with a few exceptions, rather dull, which is caused by the fact that they are in abraded plumage; eye-ring well developed.

Unfeathered parts. Iris light grey, grey or naples yellow; bill light brown; feet green tinted slate, or greenish slate, or green slate, or transparent slate (Meek, St. Aignan).

Measurements. Wing 10 ♂, 61-64½ (63.20); 4 ♀, 60-63 (62.25), 14 specimens, 60-64½ (62.89); tail 10 ♂, 40-43 (41.60), 4 ♀, 40-41 (40.75), 14 specimens, 40-44 (41.36); tarsus 14 specimens, 18-20 (19.09), entire culmen 14 specimens, 15-16¾ (16.07); exposed culmen 14 specimens, 12-13½ (12.64); culmen from anterior point of nostril 14 specimens, 8½-9¾ (9.19).

Structure. This race has a soft plumage, 2nd primary in length between 7th and 8th.

Distribution. Louisiades, where known from the following islands:

Misima (= St. Aignan), Conflict Group (Panasesa Is.), Deboyne Group (Pane-pompom Is.), Renard Is.

First collector. John Macgillivray before 1851.

Not figured.

Type. BM nr. 51.10.11.13 (type examined).

Moult. Specimens collected in April (3), July (2), November (1) and December (7) are not in moult, the April specimens are in fairly fresh plumage, several of the December specimens are strongly abraded.

Nidification. Meek, who visited the island of Misima (St. Aignan) from September to near the end of the year 1897 sent home a number of nests and eggs of this race, showing that breeding takes place in these months. "The nests hang in the fork of a twig, and are loosely woven together of rootlets, fibres and fine grasses, not specially lined, but sparsely covered outside with small pieces of wool, bark or parts of insects' cocoons. The eggs are very pale blue, without gloss and without markings. They measure 19 by 13, 17.3 by 13.3, 19.6 by 13.1, 18 by 14 or 19 by 13.1 mm." (Hartert, 1899). These same eggs were later recorded and depicted by Ogilvie-Grant (1912), whose figures show that the clutch-size is 3.

Habits, etc. Apparently not recorded.

Discussion. Hitherto the population of St. Aignan was generally accepted as belonging to a distinct subspecies *(aignani* Hartert), and Hartert in the original description of this alleged race emphatically claimed it to be different from the type — at that time the only specimen available in Europe — of *griseotincta.* I have compared series of both, including the type specimen of *griseotincta,* and find them identical.

2. **Zosterops griseotincta longirostris** Ramsay

Zosterops longirostris Ramsay, Proc. Linn. Soc. New South Wales 3, 1878, p. 288 — Heath Island (off the Eastern tip of New Guinea).

Zosterops longirostris; Salvadori, Ibis (4) 3, 1879, p. 325 (Heath Island); Ramsay, Proc. Linn. Soc. New South Wales 4, 1879 (1880?), p. 94, 100 (Heath Island); Salvadori, Ann. Mus. Civ. Genova 16, 1880, p. 82 (Ins. Heath); Salvadori, Orn. Pap. II, 1881, p. 372 (Ins. Heath); Sharpe in Gould, Birds New Guinea III pt. XVII, 1884, plate (Heath Island); Sharpe, Cat. Birds Brit. Mus. 9, 1884, p. 189 (Heath Island); Salvadori, Agg. Orn. Pap. II, 1890, p. 132 (no locality); Reichenow, Mitt. Zool. Mus. Berlin 1, 1899, p. 98 (Insel Heath); Finsch, Tierreich 15, 1901, p. 29 (Heath Island (oder Rogia)); (pt.) Dubois, Syn. Av. I, 1902, p. 709 (Ile Rogia); (pt.) Sharpe, Hand-List Birds 5, 1909, p. 11 (Heath Isl.); (pt.) Mathews, Syst. Av. Australas. II, 1930, p. 704 (New Guinea (S. E.)).

Zosterops griseitincta longirostris; Stresemann, Mitt. Zool. Mus. Berlin 17, 1931, p. 225 (Heath-Island an der Südost-Spitze von Neu-Guinea).

Zosterops griseotincta longirostris; Mathews, Ibis (13) 2, 1932, p. 154 (no locality); Mayr, List New Guinea Birds, 1941, p. 219 (Heath Island (Rogeia), East and Hastings Islands (Bonvouloir group) and Alcester Island); Mayr, Am. Mus. Nov. 1707, 1955, p. 44 (no locality); Iredale, Birds New Guinea II, 1956, p. 170 (Heath Island).

Subspecific characters. Entirely similar to the nominate race, from which this form only differs in having a slightly longer bill on the average.

Unfeathered parts. Apparently not recorded. According to Ramsay (1879) the feet are olive grey; presumably, however, this is the colour they had in the skin, not in the living bird.

Measurements of three specimens (2 ♂, 1 ♀): wing 63, 63, 63, tail 39-40 (39.33), tarsus (two specimens only) 18¾, 19¾ (19.25), entire culmen 16¼-18½ (17.50), exposed culmen 12¾-14¼ (13.67), culmen from anterior point of nostril 9¼-10½ (10.08).

Distribution. Heath Island (Rogeia) off the eastern tip of New Guinea, East and Hastings Islands in the Bonvouloir group, and Alcester Island.

First collector. Kendal Broadbent on Heath Island in 1877 or 1878 (cf. Ramsay, 1878, p. 241-242).

Figure. An excellent coloured plate of the type, on natural size, is given by Gould (1884), plate 61.

Type. Australian Museum, Sydney, here it is registered under no. 018736.

Moult. The three specimens examined, collected in October, do not show traces of moult.

Nidification. Unrecorded.

Habits, etc. Not recorded.

Discussion. No topotypical specimens were available, but from the American Museum of Natural History I received three specimens on loan collected on Alcester Island. Two of these have a somewhat longer, and perhaps also more slender bill than any specimen of the nominate race I could compare them with. The third bird, however, falls, as regards this character, well within the range of variation of the nominate race. On these grounds, and also because no topotypical material was available to me, I tentatively recognise this poorly defined race.

The conclusion that *longirostris* is closest to the nominate race deviates from Mayr's (1955) opinion that *longirostris* differs from *eichhorni* in its light brown, not yellow, bill, but otherwise is closest to that race. Actually this apparent difference of opinion only confirms that *eichhorni* is also very close to the nominate race.

3. **Zosterops griseotincta pallidipes** De Vis

Zosterops pallidipes *De Vis in Rep. Brit. New Guinea 1888/89, 1890, p. 60 — Rossel Island.

Zosterops pallidipes; De Vis, Ibis (6) 3, 1891, p. 35 (Rossel Island); Salvadori, Agg. Orn. Pap. III, 1891 (30 July), p. 233 (Insula Rossel); Hartert, Nov. Zool. 6, 1899, p. 210 (Rossel Island); Finsch, Tierreich 15, 1901, p. 29 (Duba (oder Rossel)); Dubois Syn. Av. I, 1902, p. 709 (Ile Rossel); Rothschild & Hartert, Nov. Zool. 10, 1903, p. 453

(Rossel Island); Sharpe, Hand-List Birds 5, 1909, p. 11 (Rossel Isl.); Mathews, Syst. Av. Australas. II, 1930, p. 704 (New Guinea).

Zosterops griseotincta pallidipes; Mayr, Mitt. Zool. Mus. Berlin 16, 1930, p. 914 (Rossel-Insel); Mathews, Ibis (13) 2, 1932, p. 154 (name only); Mayr, List New Guinea Birds, 1941, p. 219 (Rossel Island); Iredale, Birds New Guinea II, 1956, p. 170, pl. XXVII fig. 3 (Rossel Island).

Zosterops griseitincta pallidipes; Stresemann, Mitt. Zool. Mus. Berlin 17, 1931, p. 225 (Rossel-Insel).

Subspecific characters. A fairly distinct subspecies that differs from the nominate race by its pale legs, darker maxilla, on an average somewhat longer bill, slightly darker, more dusky coloration of the lores and under the eye-ring, and generally paler, more greyish, under surface. One of the specimens examined even shows definitely grey flanks, only the throat and the under tail coverts, connected by a wide streak down the belly, being yellow.

Unfeathered parts. Iris brown, bill brown on top, light brown underneath, feet dark dirty yellow (Meek); iris nut brown, bill slate and straw, feet dull yellowish (Meek).

Measurements of thirteen specimens (9 ♂, 4 ♀): wing 62-66½ (64.23), tail 38-43½ (40.65), tarsus 19½-20¾ (19.90), entire culmen 16¾-18½ (17.62), exposed culmen 13½-15 (13.96), culmen from anterior point of nostril 10-11 (10.33).

Distribution. Confined to Rossel Island, Louisiade Archipalago.

First collector. W. Macgregor in the second half of 1889. The type specimen is not dated, but Macgregor's visit to the Louisiades took place at the time indicated (Macgregor, 1889).

Figure. Iredale (1956, pl. XXVII fig. 3) (coloured, about two-thirds natural size, by Mrs. Iredale, poor).

Type. Queensland Museum, Brisbane, nr. M 7112 (type examined).

Moult. Eight out of eleven specimens collected between 25 January and 5 March are undergoing their main moult; three other specimens, collected on 27 and 28 February, have apparently completed their moult and are in fresh plumage; one specimen taken in October is not in moult. Evidently the main moult takes place in the early part of the year (January-March).

Nidification. Not recorded.

Habits, etc. Not recorded, apart from the fact that on Rossel Island this bird is common (Hartert, 1899).

Discussion. For particulars see the general discussion of the species.

4. **Zosterops griseotincta eichhorni** Hartert

Zosterops eichhorni Hartert, Nov. Zool. 33, 1926, p. 48 — Nissan.

Zosterops longirostris ottomeyeri Stresemann, Orn. Monatsber. 38, 1930, p. 90 — Nauna, östlich von Rambutjo (= Lambutso), Manus Archipel.

Zosterops longirostris; (pt.) Reichenow, Mitt. Zool. Mus. Berlin 1, 1899 (6 July), p. 98-99 (Nissaninseln); (pt.) Finsch, Tierreich 15, 1901, p. 29 (Nissan); (pt.) Dubois, Syn. Av. I, 1902, p. 709 (île Nissan); Thilenius, Zool. Jahrb. 17, 1902 (18 December), p. 431 (Nissan); (pt.) Sharpe, Hand-List Birds 5, 1909, p. 11 (Nissan); (pt.) Mathews, Syst. Av. Australas. II, 1930, p. 704 (Solomon Islands).

Zosterops spec.?; Hartert, Nov. Zool. 33, 1926, p. 46 (Nissan).

Zosterops (*longirostris*?) *eichhorni*; Hartert, Nov. Zool. 34, 1928 (July), p. 208 (Nissan).

Zosterops eichhorni; Mathews, Syst. Av. Australas. II, 1930, p. 704 (Nissau Island); Snouckaert, Alauda (2) 3, 1931 p. 21 (Nissan).

Zosterops longirostris ottomeyeri; Mathews, Syst. Av. Australas. II, 1930, p. 920 (Nauna Island); Snouckaert, Alauda (2) 3, 1931, p. 21 (Nauna).

Zosterops griseitincta ottomeyeri; Stresemann, Mitt. Zool. Mus. Berlin 17, 1931, p. 225 (Nauna (Manus-Archipel)).

Zosterops griseitincta eichhorni; Stresemann, Mitt. Zool. Mus. Berlin 17, 1931, p. 225 (Nissan).

Zosterops griseotincta ottomayeri; Mathews, Ibis (13) 2, 1932, p. 154 (Nauna Island).

Zosterops griseotincta eichhorni; Mathews, Ibis (13) 2, 1932, p. 154 (no locality); Mayr, Birds Southwest Pacific, 1945, p. 273 (Nissan); Ripley, Journ. Washington Ac. Sc. 37, 1947, p. 98 (Nissan); Mayr, Am. Mus. Nov. 1707, 1955, p. 44 (Nissan); Braestrup, Nat. Hist. Rennell Isl. I, 1956, p. 141 (Nissan).

Zosterops griseotincta ottomeyeri; Mayr, Am. Mus. Nov. 1707, 1955, p. 44 (Nauna, Long Island).

Subspecific characters. The differences between *eichhorni* and specimens in fresh plumage of *griseotincta* appear largely imaginary, though usually *eichhorni* can be distinguished from the nominate race on the following grounds: upper surface slightly brighter Warbler Green (bright specimens of *griseotincta,* however, are identical in this respect), under surface slightly more yellow, bill generally rather paler. All these characters are variable, and single specimens are often impossible to assign on colour characters. However, besides averaging slightly smaller in wing and tail length, *eichhorni* differs from the nominate race by its stronger, harder, plumage. As a consequence of this *eichhorni* never looks so abraded as the soft-plumed *griseotincta.* This structural difference indicates that the genetical distance between the two subspecies is perhaps greater than one would assume on the basis of colour characters only.

Unfeathered parts. Iris grey or light grey, bill pale straw yellow or dull yellowish brown, feet greyish or slate colour (A. F. Eichhorn: Nissan); iris pale grey, bill golden yellow tip maxilla darker, feet yellow-grey-green (Coultas: Nauna).

Measurements of 14 specimens (5 ♂, 8 ♀, 1 —): wing 60-63½ (61.69), tail 36-41½ (38.32), tarsus 18½-21½ (19.86), entire culmen 15-16¾

(15.82), exposed culmen 11-13½ (12.34), culmen from anterior point of nostril 8-10 (8.70).

Structure. As regards the plumage, a remark has been made above. In the specimens in which this was checked, the 2nd primary was in length equal to the 8th, or between the 8th and the 9th.

Distribution. Nissan or Green Island (Solomon Islands), Nauna (Admiralty Islands), and Long Island.

First collector. Dr. Thilenius on Nissan in May, 1897.

Not figured.

Type AMNH nr. 700705. The type of *ottomeyeri* is Berlin nr. 29.848 (specimen examined).

Moult. Specimens from Nissan, taken in July and August, are partly in freshly moulted plumage, partly in the last stages of primary moult. Specimens from Nauna, taken in March and September, are not in moult.

Nidification. Not recorded.

Habits, etc. Evidently an inhabitant of small coral islands, etc. The inhabitants of such habitats always seem to have a good facility for colonisation and expansion, so that it is not surprising that this form occupies a fairly large range without showing geographical variation.

Discussion. Mayr (1955) recently enumerated the differences that, according to him, exist between *eichhorni* and "*ottomeyeri*" as follows: "In the extensive material before me there is very little difference in general coloration, but the lores of the Nauna birds are indeed distinctly yellower. The upper throat is also clearer yellow. On the upper parts there is very little difference, but if anything it is the Nissan series which is more citrine-green". Together with Dr. Junge I compared four specimens from Nauna (including the type of *ottomeyeri*) with a good series of fresh skins from Nissan, especially checking the points of difference enumerated by Mayr, and we agreed that in coloration there is no difference whatever between the two populations. As regards the original diagnosis (Stresemann, 1930), it may be said that the type of *ottomeyeri,* and therefore without doubt the other specimen also, is in such a poor condition that comparison of colours is hardly possible. As regards the alleged difference in measurements, perhaps the Nauna birds average slightly smaller, but the difference is certainly not sufficient to uphold the race on these grounds alone (wings 60, 60, 61, 61 mm, as against 61-63½ in specimens from Nissan). In my material the Nauna birds have a shorter tarsus (18½, 18¾, 18¾, 19 as against 19½-21½ in birds from Nissan), but this point of difference should be verified by measuring large series before any conclusion different from the one reached here — e.g. that the populations are identical

— may be drawn. No previous investigator has ever claimed the existence of a difference in tarsus length, so that the odds are in favour of the difference being inconsequential.

5. **Zosterops griseotincta rennelliana** Murphy

Zosterops rennelliana Murphy, Am. Mus. Nov. 365, 1929, p. 10 — Rennell Island, Solomon Group.

Zosterops rennelliana; Mathews, Syst. Av. Australas. II, 1930, p. 697 (Rennell Island); Snouckaert, Alauda (2) 3, 1931, p. 19 (Ile Rennell); Mayr, Am. Mus. Nov. 486, 1931 (29 Aug.), p. 28 (Rennell Island); Mayr & Hamlin, Am. Mus. Nov. 488, 1931, p. 4, 7 (Rennell Island); Mayr, Am. Mus. Nov. 1269, 1944, p. 7; Mayr, Birds Southwest Pacific, 1945, p. 282 (Rennell Island); Wolff, Nat. Hist. Rennell Isl. I, 1955, p. 61 (Rennell Island); Mees, Sarawak Mus. Journ. 6, (1955), 1956, p. 645 (no locality); Bradley & Wolff, Nat. Hist. Rennell Isl. I, 1956, p. 112, 115, 116 (Rennell Island. Lavanggu, Hutuna, Te-Uhungango); Braestrup, Nat. Hist. Rennell Isl. I. 1956, p. 141 (Rennell Island); M. Laird & E. Laird, Nat. Hist. Rennell Isl. II, 1959 (15 Feb.) p. 218, 225, 226, 227, 231 (Rennell Island: haematozoa); M. Laird, Journ. Parasitol. 45, 1959 (Feb.), p. 47, 49, 52 (Te-Uhungango, Rennell: haematozoön *Atoxoplasma*).

Zosterops griseitincta rennelliana; Stresemann, Mitt. Zool. Mus. Berlin 17, 1931, p. 225 (Rennell-Insel).

Zosterops griseotincta rennelliana; Mathews, Ibis (13) 2, 1932, p. 154 (name only).

Subspecific characters. Differs from the other races in being slightly more green on the upper parts, without, or with hardly any yellow on forehead and above the lores; lores greenish dusky; no eye-ring; under parts more and darker green than in the other forms, with much less yellow.

Unfeathered parts. Iris red-brown, bill old ivory yellow, feet pale ivory yellow (Bradley); iris brown, bill yellow, legs and feet yellow (Murphy, 1929, ex Hamlin).

Measurements of 3 specimens (1 ♂, 2 ♀): wing 63-65 (64.00), tail 38½-40 (38.83), tarsus 19½-20¼ (19.92), entire culmen 16¼-16½ (16.42), exposed culmen 12½-13 (12.75), culmen from anterior point of nostril 9¼-9¾ (9.42).

Weight of one female 14 g.

Distribution. Confined to Rennell Island.

First collector. H. Hamlin in August, 1928.

Not figured.

Type. AMNH nr. 222138.

Moult. Specimens collected in May (1), August (1), and November (2) do not show moult.

Nidification. The nest as described and figured by Bradley & Wolff (1956) is thoroughly typical of the genus. According to the same authors the clutch is "said to be two" (apparently information received from natives).

Habits, etc. Bradley & Wolff recorded as stomach contents small insects,

a spider, locusts, and small seeds. They described the song as a pleasant twittering, rather strong and resembling that of *Sylvia atricapilla.*

Laird & Laird (1959) recorded as parasites of *Z. g. rennelliana* the protozoa *Haemoproteus johnstoni* M. Laird & E. Laird (in erythrocytes) and *Atoxoplasma paddae* (Aragão) (in lymphocytes and monocytes). According to M. Laird (1959), *Atoxoplasma paddae* is a benign to mildly pathogenic parasite; it apparently occurs in many species of Zosteropidae.

Discussion. This bird, originally, though with some hesitation, described as a full species by Murphy (1929), was reduced to a subspecies by Stresemann (1931), but Mayr (1931) restored it to specific rank, with the following comment: "Stresemann considers *rennelliana* a subspecies of *griseotincta* in his recent revision of the genus. There is no doubt that *rennelliana* is related to *griseotincta,* but the relationship to the species *rendovae* seems to be just as close or even closer. On the other hand, *rennelliana* differs from *griseotincta* (of which I have series of most of the subspecies) by several characters. But the bird from Nissan Island (*eichhorni*) is somewhat intermediate. However, even *eichhorni* has a well-developed eye-ring which seems to be a substantial character in this species. Besides that, *rennelliana* is characterized by the different shape of the bill, the entirely yellow feet, and the structure of the plumage which is intermediate between the soft one of the Louisiade Archipelago species (*griseotincta, aignani,* and *pallidipes*) and the strong, almost shiny plumage of *eichhorni.* As there is no other species of Rennell birds which has a similar distribution to *Zosterops griseotincta* in Stresemann's arrangement, and as there are undoubtedly some characters (as mentioned above) which distinguish the Rennell white-eye from the other ones, I prefer for the present to keep *Z. rennelliana* as a distinct species. Possibly it is quite closely related to *rendovae*".

In this case I go farther than Mayr and consider it justified to unite *rennelliana* with *griseotincta,* with the races of which it agrees in general size, coloration and proportions, including the comparatively heavy pale bill. There is no reason to regard the absence of the white eye-ring as a very important character (sufficient to merit specific separation) in this particular species.

Species 29. **Zosterops vellalavella** Hartert

Zosterops vellalavella Hartert, Bull. B. O. C. 21, 1908, p. 106 — Vella Lavella I., Central Group of Solomon I.

Zosterops vellalavella; Rothschild & Hartert, Nov. Zool. 15, 1908, p. 358 (Vella Lavella); Hartert, Nov. Zool. 27, 1920, p. 436 (Vella Lavella); Hartert, Am. Mus. Nov. 364, 1929, p. 12 (Bagga Island); Murphy, Am. Mus. Nov. 365, 1929, p. 8 (Vella Lavella (Veka Vekalla), Bagga Island); Snouckaert, Alauda (2) 3, 1931, p. 20 (Vella Lavella, Bagga); Stresemann, Mitt. Zool. Mus. Berlin 17, 1931, p. 225 (Vella Lavella

und Bagga); Mayr, Am. Nat. 74, 1940, p. 266, fig. 3 (Vella Lavella); Mayr, Systematics and the Origin of Species, 1942, p. 170, 227 (Vella Lavella).

Zosterops vella-lavella; Mathews, Syst. Av. Australas. II, 1930, p. 696 (Vella Lavella).

Zosterops rendovae vella-vella; Mayr, Bull. Am. Mus. Nat. Hist. 83, 1944, p. 169 (no locality).

Zosterops rendovae vellalavellae; Mayr, Birds Southwest Pacific, 1945, p. 273 (Vella Lavella, Bagga).

Characters. With its pale bill, greenish upper parts, and greenish yellow under parts (though with whitish belly), this large species is rather close to *Z. griseotincta.*

Upper parts, including rump, brighter and yellower than Warbler Green; also slightly brighter and yellower than even the brightest specimens of the probably fairly closely related species *Z. griseotincta* (*eichhorni*); frontal area perhaps slightly more yellow, distinctly so in a specimen from Bagga; eye-ring of average width, interrupted in front by a dusky spot; primaries, secondaries, and rectrices blackish brown, broadly edged with the colour of the mantle; loral line pale dusky, continued under the eye.

Under parts. An indistinct breast band of the same colour as the upper parts, gradually becoming Lemon Chrome without any admixture of green, on throat and chin; gradually becoming greyish white on lower breast; under tail coverts Lemon Chrome; a weak yellow stripe down the middle of the belly; remainder of under parts, including the flanks, greyish white.

Unfeathered part. Iris chocolate, bill yellow or dull yellow or cadmium, feet dull yellow or dull dirty yellow or yellow tinted horn colour (Meek); iris brown, bill yellow, feet yellow (Beck); iris brown, bill yellow, feet yellow (Drowne); iris brown, bill yellow, feet yellow (Hicks).

Measurements of 9 specimens (6 ♂, 3 ♀): wing 61-65 (63.22), tail 37-41½ (39.61), tarsus 17-18½ (17.50), entire culmen 14½-17 (16.00), exposed culmen 12-14 (13.28), culmen from anterior point of nostril 8¾-10 (9.50).

Distribution. Vellalavella and Bagga Islands, northernmost of the Central Solomon Islands.

First collector. A. S. Meek in February, 1908.

Not figured.

Type. AMNH nr. 700719.

Moult. Three specimens collected in February are moulting primaries and rectrices; one specimen collected in October and four collected in November are not in moult.

Nidification. A nestling was taken on Vella Lavella on November 8, 1927 (cf. Murphy, 1929), which means that eggs must have been laid in October.

Habits, etc. Apparently not recorded.

Discussion. For a discussion of the general affinities of the species I refer to the notes on a previous page. The measurements given by Rothschild & Hartert (1908), wing 92-94 mm, are obviously erroneous; presumably they should read 62-64 mm.

Species 30. **Zosterops luteirostris** Hartert

Zosterops luteirostris Hartert, Bull. B. O. C. 14, 1904, p. 61 -- Gizo.

Zosterops luteirostris; Rothschild & Hartert, Nov. Zool. 12, 1905, p. 266 (Gizo); Sharpe, Hand-List Birds 5, 1909, p. 14 (Gizo Isl.); Hartert, Nov. Zool. 27, 1920, p. 436 (Gizo); Hartert, Am. Mus. Nov. 364, 1929, p. 12 (Gizo); Murphy, Am. Mus. Nov. 365, 1929, p. 9 (Gizo); Mathews, Syst. Av. Australas. II, 1930, p. 707 (Solomon Islands); Snouckaert, Alauda (2) 3, 1931, p. 20 (Gizo); Stresemann, Mitt. Zool. Mus. Berlin 17, 1931, p. 203 (no locality).

Zosterops luteirostris luteirostris; Stresemann, Mitt. Zool. Mus. Berlin 17, 1931, p. 225 (Gizo); Mathews, Ibis (13) 2, 1932, p. 155 (no locality).

Zosterops rendovae luteirostris; Mayr, Birds Southwest Pacific, 1945, p. 273 (Gizo).

Characters. A fairly large species characterized by yellow bill and legs and a blackish forehead (fig. 12).

Upper parts. Mantle, including the rump, slightly brighter and yellower

Fig. 12. Heads of *Zosterops luteirostris* (right) and *Zosterops splendida* (left), illustrating differences in bill colour and extent of black on the head. × 2.

than Warbler Green, indistinguishable from those parts in *Z. vellalavella*; frontal area, lores, supra loral region, and a streak to half way under the eye black, the black merging into the green of the upper parts on about one third of the head from the base of the bill; eye-ring white, of slightly less than average width, interrupted in front by a black spot; primaries, secondaries, and rectrices blackish brown, broadly edged with the colour of the mantle.

Under parts. All Lemon Yellow; approaching to Lemon Chrome on throat and chin; mixed with greenish on sides of breast and on the flanks.

Unfeathered parts. Iris plum red or dark red, bill dark straw yellow, feet straw yellow (Meek); iris brown, bill yellow, feet yellow (Hicks); iris reddish brown, bill yellow, feet yellow (Drowne).

Measurements of seven specimens (4 ♂, 3 ♀): wing 58-63 (60.64), tail 34½-38 (36.36), tarsus 16¾-17¾ (17.18), entire culmen 15-16½ (15.57), exposed culmen 12½-13¼ (12.96), culmen from anterior point of nostril 9-10 (9.31).

Structure. 2nd primary very short, equal to or shorter than 10th.

Distribution. Confined to Gizo, Central Solomon Islands.

First collector. A. S. Meek in October 1903.

Not figured.

Type. AMNH nr. 700727.

Moult. Two specimens collected in October and three collected in November, do not show moult; a fourth November specimen is moulting primaries and probably also rectrices.

Nidification. Not recorded.

Habits, etc. Not recorded.

Discussion. In mantle colour and bill colour this species shows an approach to *Z. vellalavella,* whereas its black forehead and yellow under surface are reminiscent of *Z. splendida.*

Species 31. **Zosterops splendida** Hartert

Zosterops splendida Hartert, Am. Mus. Nov. 364, 1929 (29 July), p. 12 — Island of Ganonga, Solomon Islands.

Zosterops splendida; Murphy, Am. Mus. Nov. 365, 1929 (30 July), p. 9 (Ganonga); Mathews, Syst. Av. Australas. II, 1930, p. 696 (Ganonga Island); Snouckaert, Alauda (2) 3, 1931, p. 20 (Ganonga); Stresemann, Mitt. Zool. Mus. Berlin 17, 1931, p. 203 (no locality).

Zosterops luteirostris splendida; Stresemann, Mitt. Zool. Mus. Berlin 17, 1931, p. 225 (Ganonga); Mathews, Ibis (13) 2, 1932, p. 155 (no locality).

Zosterops rendovae splendida; Mayr, Birds Southwest Pacific, 1945, p. 273 (Ganonga).

Characters. A large species with black forehead and crown, Citrine upper parts and dark yellow under parts, black bill and yellow legs (fig. 12).

Upper parts. Citrine with a golden wash; anterior part of the crown, with forehead, loral region, and area under the eye-ring, black, backwards gradually merging into the colour of the back; eye-ring fairly wide, interrupted in front by a big blackish spot; primaries, secondaries, and rectrices blackish brown, the primaries and secondaries broadly margined with golden Citrine, the rectrices margined with the same colour on their anterior halves only. The colour of the upper parts is at the sides of the head comparatively sharply defined against the colour of the under parts, on the sides of the breast, however, gradually merges into it.

Under parts entirely golden yellow, about intermediate between Lemon Chrome and Light Cadmium (nearer to the latter), but much brighter and more beautiful.

Unfeathered parts. Iris brown, bill black, legs yellow (Beck, Drowne Hicks).

Structure. 2nd primary short, in length between 8th and 10th.

Measurements of 6 males: wing 60-62 (61.25), tail 40-42 (40.75), tarsus 16¾-18 (17.33), entire culmen 15-17 (16.21), exposed culmen 12-13½ (12.83), culmen from anterior point of nostril 9-10¼ (9.75).

Distribution. Confined to Ganonga, Central Solomon Islands.

First collectors. Collectors of the Whitney South Sea Expedition (R. H. Beck, F. P. Drowne, Hicks) in October 1927.

Not figured.

Type. AMNH nr. 220020.

Moult. None of the specimens examined, collected in October, shows moult.

Nidification. Unknown.

Habits, etc. Unrecorded.

Discussion. This species is very close to *Z. luteirostris* from which it differs conspicuously by its black instead of yellow bill, and also by being brighter and more intensely coloured, by having the black extending farther backwards on the crown, and by its apparently relatively longer tail. Stresemann (1931) expressed this morphological affinity by uniting *luteirostris* and *splendida* to one species and I am more or less inclined to agree with him.

Species 32. **Zosterops kulambangrae** Rothschild & Hartert

Characters. A fairly large species with a long black bill, bright yellowish green on mantle, throat and breast, and with only the belly and under tail coverts pure yellow, or belly white.

Upper parts, including rump, distinctly brighter and more yellow than Warbler Green; in two races in coloration very near to *Z. vellalavella,* in the third race slightly greener; frontal area and supra loral region similar to remainder of upper parts, or fuscous; eye-ring fairly narrow to absent, in the former case interrupted in front by a blackish spot, in the latter case skin round the eye bare; loral patch of variable size, blackish; primaries and rectrices brownish black, the former broadly edged with a colour slightly brighter and more yellow than the colour of the mantle, the latter anteriorly broadly, posteriorly narrowly, edged with the colour of the mantle.

Under parts. Sides of head, breast, throat, and in two races also the flanks, of the same colour as the back, but slightly paler; throat of the same colour, or more yellowish; remainder of under parts, especially on the centre of the belly and on the under tail coverts, gradually becoming pure yellow, Le-

mon Chrome to Lemon Yellow, in two races; in the third race heels and under tail coverts are of the same yellow, but belly almost pure white and flanks pale grey.

Unfeathered parts. Bill fairly long, black; legs and feet yellow.

Measurements are given in table VII.

Structure. Like other species of the group, *Z. kulambangrae* has a short 2nd primary, which is in length between the 8th and 10th primaries.

Distribution (fig. 11). In three races distributed over a number of islands of the Central Solomon Islands, whence it is known from Kulambangra, New Georgia, Vanungu, Gatukai, Rendova, and Tetipari.

Ecology. Apparently the species has a great ecological tolerance, see Sibley's (1951) field-notes quoted under the nominate race.

Related species. As mentioned above, in colour of the mantle this species shows affinity to *Z. vellalavella,* whereas the strong black bill is reminiscent of *Z. splendida*; the yellow legs (a rare character generally speaking) also form a link with *splendida, luteirostris* and some races of *griseotincta.*

Geographic variation. The three forms here ascribed to the species are fairly similar and evidently related, though well differentiated.

1. **Zosterops kulambangrae kulambangrae** Rothschild & Hartert

Zosterops kulambangrae Rothschild & Hartert, Nov. Zool. 8, 1901, p. 180 — Kulambangra.

Zosterops kulambangrae; Dubois, Syn. Av. II, suppl., 1903, p. 1113 (Kulambangra); Sharpe, Hand-List Birds 5, 1909, p. 9 (Kulambangra Isl.); Hartert, Am. Mus. Nov. 364, 1929, p. 11 (Kulambangra).

Zosterops rendovae kulambangrae; Hartert, Nov. Zool. 27, 1920, p. 436 (Kulambangra); Murphy, Am. Mus. Nov. 365, 1929, p. 7 (Kulambangra, New Georgia, Vanungu, Gatukai); Mathews, Syst. Av. Australas. II, 1930, p. 702 (Kalumbangra Island); Snouckaert, Alauda (2) 3, 1931, p. 19 (Kulambangra); Stresemann, Mitt. Zool. Mus. Berlin 17, 1931, p. 226 (Kulambangra, New Georgia, Vanungu); Mayr, Birds Southwest Pacific, 1945, p. 273 (Kulambangra, New Georgia, Vanungu, Gatukai); Sibley, Condor 53, 1951, p. 83, 92 (Munda on New Georgia).

Zosterops kulambangrae kulambangrae; Mees, Zool. Med. 33, 1955, p. 300 (Kulambangra, New Georgia, Vanungu, and Gatukai).

Subspecific characters. Slightly greener, less yellow, on the upper parts than the two other races; feathers behind nostril, wide lores, and stripe under the eye, continued to behind the eye, blackish; forehead slightly tinged with fuscous; eye-ring fairly narrow, white, interrupted in front by the usual black spot. Under parts as described for the species; centre of belly, like the under tail coverts, yellow; flanks greenish as the back.

Unfeathered parts. Iris brown, bill black, feet yellow (David: Kulambangra); iris brown, bill black, feet straw yellow (Rothschild & Hartert, 1901, ex Meek: Kulambangra).

Measurements of seven males: wing 60½-66 (62.93), tail 36-41½ (39.71), tarsus 18-19¼ (18.54), entire culmen 16-17 (16.54), exposed culmen 13-14½ (13.82), culmen from anterior point of nostril 9-10¼ (9.96).

Distribution. Islands of Kulambangra, New Georgia, Vanunga, and Gatukai in the Central Solomon Islands.

First collector. A. S. Meek on Kulambangra in January 1901.

Not figured.

Type. AMNH nr. 700752.

Moult. Specimens taken in June (2), September (1), October (2), and November (2) do not show moult. The October and November specimens were the ones already recorded by Sibley (1951).

Nidification. Apparently unrecorded.

Habits, etc. Sibley (1951) found this white-eye abundant at Munda, where it occurred in foraging flocks in all habitats and at all heights, equally numerous in virgin jungle and in secondary growth. White-eyes were often found to associate in loosely organized "pockets" composed of several species, particularly *Myiagra ferrocyanea* Ramsay, *Monarcha castaneiventris* Verreaux, *Monarcha barbata* Ramsay, *Rhipidura cockerelli* Ramsay, and *Rhipidura rufifrons granti* Hartert.

Voice. Sibley (1951) remarked that members of a flock seem to maintain contact with a series of light "tsit" tones when foraging. Another call much heard was loud "chirp" which sounded much like that of a Sparrow, *Passer domesticus* Linnaeus. Compare this with calls described from *Z. ceylonensis* and *Z. chloris intermedia.*

2. **Zosterops kulambangrae paradoxa** Mees

Zosterops kulambangrae paradoxa Mees, Zool. Med. 33, 1955 (12 Augustus), p. 300 — Rendova, Solomon Islands.

Zosterops rendovae; Auctorum, nec Tristram 1882.

Zosterops rendovae; Salvadori, Ann. Mus. Civ. Genova 18, 1882 (2 Oct.), p. 425 (Ins. Salomonis, Rendova); Salvadori, Orn. Pap. III, 1882 (Dec.), p. 546 (Rendova); Sharpe, Cat. Birds Brit. Mus. 9, 1884, p. 188 (Island of Rendova); Sharpe in Gould, Birds New Guinea III, pt. XXIII, 1887 (Island of Rendova); Tristram, Cat. Coll. Birds, 1889, p. 212 (Rendova Island); Salvadori, Agg. Orn. Pap. II, 1890, p. 131 (no locality); Tristram, Ibis (6) 6, 1894, p. 30, pl. III fig. 2 (Rendova Island); (pt.) Finsch, Tierreich 15, 1901, p. 26 (Rendova); (pt.) Dubois, Syn. Av. I, 1902, p. 709 (Rendova); (pt.) Sharpe, Hand-List Birds 5, 1909, p. 9 (Rendova); Mayr, Mitt. Zool. Mus. Berlin 19, 1933, p. 320 (Rendova); Galbraith, Bull. B. O. C. 77, 1957, p. 10-16 (Rendova).

Zosterops rendovae rendovae; Murphy, Am. Mus. Nov. 365, 1929, p. 2, 6 (Rendova); Mathews, Syst. Av. Australas. II, 1930, p. 702 (Rendova Island); Stresemann, Mitt. Zool. Mus. Berlin 17, 1931, p. 203, 225 (Rendova); Mayr, Birds Southwest Pacific, 1945, p. 273 (Rendova); Sibley, Condor 53, 1951, p. 83 (Rendova Island).

Subspecific characters. As the species; differs from the nominate race

in being slightly more yellowish above; in having frontal area and supra loral region of the same colour as the remainder of the upper parts (without fuscous coloration); in having the blackish loral patch narrower, and in the absence of a white eye-ring, the skin round the eye being bare.

Unfeathered parts. Iris dull red, or bright chocolate or hazel, bill black, feet straw yellow (Meek).

Measurements of six specimens (4 ♂, 2 ♀): wing 63½-67 (65.75), tail 41-47 (43.67), tarsus 18-18¾ (18.29), entire culmen 16-18 (17.04), exposed culmen 13¼-14¾ (14.21), culmen from anterior point of nostril 9½-10½ (10.08).

Distribution. Confined to Rendova Island, Central Solomon Islands.

First collector. Lieut. G. E. Richards, apparently in 1880.

Figure. Tristram (1894), plate III fig. 2 (good coloured plate on natural size by J. G. Keulemans, under the name *Zosterops rendovae*); Mayr (1945), plate III fig. 39 (small coloured figure, under the name of *Z. r. rendovae*).

Type. BM nr. 1905. 11. 25-26 (type examined).

Moult. None of the specimens examined, collected in February (3), August (1), and November (2) shows moult.

Nidification. Not recorded.

Habits, etc. According to Sibley (1951), this form is in voice and habits identical with the nominate race from New Georgia.

Discussion. The nomenclature of this race is discussed under *Z. rendovae rendovae*.

3. **Zosterops kulambangrae tetiparia** Murphy

Zosterops rendovae tetiparia Murphy, Am. Mus. Nov. 365, 1929, p. 3, 7 — Tetipari Island, Solomon Group.

Zosterops rendovae tetiparia; Mathews, Syst. Av. Australas. II, 1930, p. 702 (Tetiparia Island); Snouckaert, Alauda (2) 3, 1931, p. 19 (Ile Tetipari); Stresemann, Mitt. Zool. Mus. Berlin 17, 1931, p. 225 (Tetipari); Mayr, Birds Southwest Pacific, 1945, p. 273 (Tetipari).

Zosterops kulambangrae tetiparia; Mees, Zool. Med. 33, 1955, p. 300 (Tetipari).

Subspecific characters. Very close to *paradoxa*, but flanks and belly whitish, sharply demarcated against the greenish breast. According to Murphy (1929) traces of an eye-ring are sometimes present.

Unfeathered parts. Not recorded on the labels of the material examined.

Measurements of five specimens (4 ♂, 1 ♀): wing 63-65 (63.90), tail 41-44 (42.40), tarsus 17¼-18 (17.55), entire culmen 16-16¾ (16.30), exposed culmen 12½-13¾ (13.15), culmen from anterior point of nostril 9¼-10 (9.85).

Distribution. Confined to Tetipari Island, Central Solomon Islands.

First collector. H. Hamlin, of the Whitney South Sea Expedition, in August, 1928.

Not figured.

Type. AMNH nr. 222074.

Moult. The five specimens examined, collected on 7 and 8 August, 1928, are all in fairly fresh plumage.

Nidification. Not recorded.

Habits, etc. Not recorded.

Species 33. **Zosterops murphyi** Hartert

Zosterops murphyi Hartert, Am. Mus. Nov. 364, 1929 (29 July), p. 11 — Kulambangra.

Zosterops murphyi; Murphy, Am. Mus. Nov. 365, 1929 (30 July), p. 8 (Kulambangra); Mathews, Syst. Av. Australas. II, 1930, p. 696 (Kulambangra Island); Snouckaert, Alauda (2) 3, 1931, p. 20 (Kulambangra); Stresemann, Mitt. Zool. Mus. Berlin 17, 1931, p. 226 (Kulambangra); Mayr, Birds Southwest Pacific, 1945, p. 273 (Kulambangra); Cain, Animal Species and their Evolution, 1954, p. 89 (Kulambangra); Greenway, Extinct Birds, 1958, p. 67 (Kolombangara).

Characters. A very large species, characterized by green upper parts, yellowish green under surface, and a wide white eye-ring.

Upper parts, including lateral edges of primaries, secondaries and rectrices, all uniform bright Warbler Green; lores pale greyish-yellow; a faint dusky streak under the eye-ring; eye-ring very wide, interrupted in front by the loral line; primaries, secondaries and rectrices brownish black, margined as already mentioned.

Under parts of the same colour as the upper parts but paler, and more yellowish, especially on the throat and middle of breast, abdomen and under tail coverts, where close to Pyrite Yellow. All colour changes are gradual, there are no sharp lines of demarcation.

Unfeathered parts. Iris brown, bill black, yellow below, feet grey (Hicks, Beck, Drowne); in the skins the bill is black with the basal two-thirds of the mandible yellowish.

Measurements of five specimens (4 ♂, 1 ♀): wing 65-67½ (66.30), tail 42-46 (44.30), tarsus 19-20¼ (19.40), entire culmen 16½-18¾ (17.80), exposed culmen (two specimens only) 14, 14, culmen from anterior point of nostril 10-11¾ (10.60).

Structure. Wing formula normal, 2nd primary in length between 6th and 8th, average tail: wing index of five specimens 66.82%.

Distribution. Confined to Kulambangra or Kolombangara Island in the central group of the Solomon Islands.

First collectors. The collectors of the Whitney South Sea Expedition (Beck, Drowne, Hicks).

Not figured.

Type AMNH nr. 220087.

Moult. The five specimens examined, collected from 30 September to 13 October 1927, do not show moult and are in reasonably fresh plumage.

Nidification. Not recorded. The sexual organs of the specimens examined are given as large on their labels.

Habits, etc. Not recorded, except that Mayr (1945) states that the species is confined to the mountains.

Discussion. *Zosterops kulambangrae kulambangrae* is always regarded as the representative of the *Z. griseotincta*-group on Kulambangra Island, and with the connecting links *Z. luteirostris* and *Z. vellalavella* there is little doubt that this is correct. On the other hand the fact must be acknowledged that morphologically *Z. murphyi* is extremely close to *Z. griseotincta,* much more so than is *Z. k. kulambangrae.* At the moment of writing these notes, only a few specimens of *Z. griseotincta* are available for comparison, but in general appearance, including the colour of the back and of the under surface, and also in the presence of a wide eye-ring, *Z. murphyi* is very similar to them, whereas *Z. kulambangrae* differs conspicuously by its brighter coloration both above and below, orange legs, etc. With *Z. stresemanni,* another species of uncertain affinities, *Z. murphyi* has only the shape and coloration of the bill in common. I do not believe that these two are closely related. Unfortunately nothing is known about the ecology of *Z. murphyi,* not even its vertical range, though it is said to be an inhabitant of the mountains, contrary to *Z. griseotincta* which is a lowland species. Nevertheless the morphological evidence is so suggestive that I believe the two to be very closely related. The occurrence of two species of the *Zosterops griseotincta*-group on Kulambangra Island forms an additional argument for allowing the various representatives of this group specific status.

Species 34. **Zosterops metcalfii** Tristram

Characters. An average sized to fairly large species of the ordinary *Zosterops*-pattern, greenish above, whitish below, with yellow throat and under tail coverts.

Upper parts, including forehead and supra loral region, bright yellowish citrine (darker, brighter, and yellower than the Yellow Citrine of Ridgway); eye-ring narrow or absent; loral region dusky, not really black; primaries and rectrices brownish black, edged with bright yellowish citrine.

Under parts. Throat and upper breast Lemon Chrome; under tail coverts

of the same colour, but slightly paler; remainder of under parts greyish white.

Unfeathered parts. Iris light brown to brown, bill either entirely black, or mandible horn colour.

Measurements are given in Table IX. The samples are small, but they suggest that no significant differences in size or relative proportions exist between the subspecies.

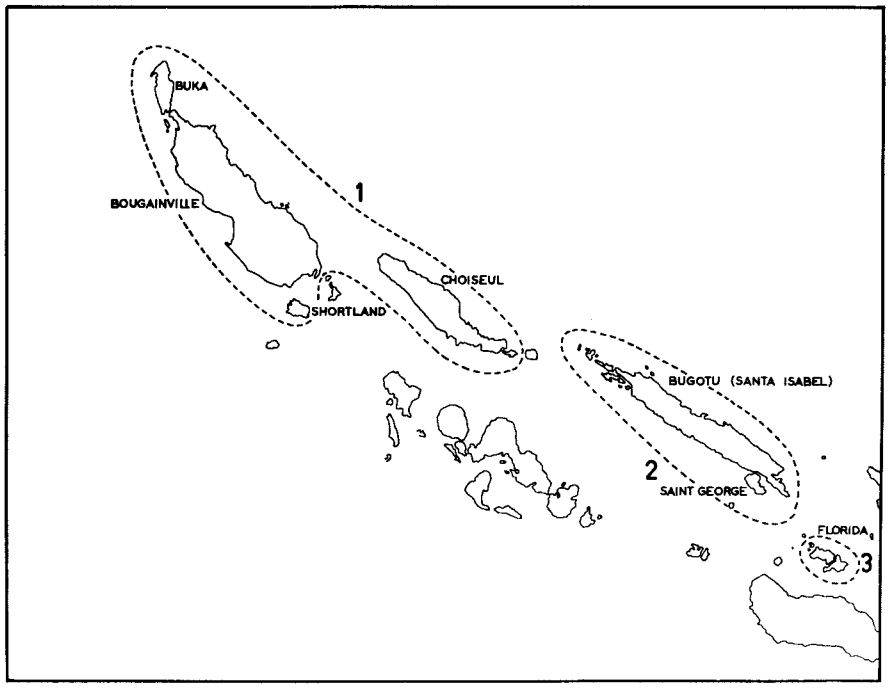

Fig. 13. The distribution of *Zosterops metcalfii* and races; 1, *exigua*; 2, *metcalfii*; 3, *floridana*.

TABLE IX

Zosterops metcalfii

	number of specimens	wing	tail	av. wing	av. tail	tail : wing index
exigua	18	55-61	34-40½	58.83	37.78	64.26%
metcalfii	4	59-60	37-39	59.38	38.38	64.63%
floridana	8	58½-61	36-40	59.38	37.75	63.58%

Structure. The species has no structural peculiarities, the 2nd primary is in length between the 7th and the 9th in all three races (fig. 1e).

Ecology. Published information is extremely scanty, but according to Mayr (1945) this is a common species of forest and secondary growth reaching from the coast (sea-level) to the hills. These particulars were probably taken from the field-notes of the collectors of the Whitney expeditions, a source of information not accessible to me.

Distribution (fig. 13). Known from Buka, Bougainville, Shortland, Choiseul, Bugotu or Ysabel, and Florida Islands in the Solomon Islands.

Geographical variation. The species can be divided in three subspecies that vary in the presence or absence of the white eye-ring, and in slight differences in shade of plumage and bill. Geographical variation is not very pronounced.

Related species. Mayr (1955) suggested that: "*Zosterops metcalfei* may be another representative of *minor,* which is particularly probable for zoogeographic regions [apparently a misprint for reasons]. Yet the possibility of relationship with *novaeguineae* cannot be disproved". While, of course, *Z. metcalfii* is more or less closely related to all the species of its genus, its separation from possible living relatives has taken place so long ago that it is, on present morphological evidence, quite impossible to single out a species as being closer to it than any other species. *Z. metcalfii* has the typical *Zosterops*-pattern that may appear in any part of the range of the family, without being of help as evidence of relations.

Note. This species was named *metcalfii* in honour of Dr. P. H. Metcalfe, who sent the type material to Tristram. Later authors have usually emended this to *metcalfei,* but *metcalfii* is a correct latinization of the name Metcalfe and therefore there is no need to change it.

1. **Zosterops metcalfii exigua** Murphy

Zosterops metcalfii exigua Murphy, Am. Mus. Nov. 365, 1929 (30 July), p. 5 — Shortland Island, Solomon Group.

Zosterops metcalfei; Rothschild & Hartert, Nov. Zool. 12, 1905, p. 266 (Choiseul, Bougainville); Virtue, Emu 46, 1947, p. 331 (Torokina on Bougainville).

Zosterops metcalfei metcalfei; (pt.) Hartert, Am. Mus. Nov. 364, 1929, p. 11 (Shortland Islands).

Zosterops metcalfii exigua; Mathews, Syst. Av. Australas. II, 1930, p. 698 (Shortland, Choiseul, Bougainville, and Buka Islands).

Zosterops metcalfei exigua; Snouckaert, Alauda (2) 3, 1931, p. 19 (Ile Shortland); Stresemann, Mitt. Zool. Mus. Berlin 17, 1931, p. 223 (Bougainville, Choiseul, Shortland Isl., Buka); Mayr, Birds Southwest Pacific, 1945, p. 271 (Buka, Bougainville, Shortland Isl., and Choiseul); R. H. Baker, Smiths. Misc. Coll. 107, no. 15, 1948, p. 21 (Bougainville Island: Cape Torokina).

Subspecific characters. Differs from the nominate race, to which it is very close, by its pale mandible (as stated by Murphy in the original description),

and also by its definitely paler yellow throat and upper breast. Perhaps the Choiseul population shows a very slight approach to the nominate race as in one specimen the colour of the mandible is given as dark horn, though in another it is horn. Birds from Shortland may run very slightly heavier in the bills than those of Bougainville, but I examined only three specimens from Shortland and there is no reason to suppose that they fall outside the normal range of variation of the Bougainville population.

Unfeathered parts. Iris hazel, bill black and dark horn, or horn, feet slate (Meek: Choiseul); iris chocolate, or brown or light brown or chocolate brown, bill black and horn colour or dark horn, feet slate (Meek: Bougainville); iris brown, bill black, horn below, feet grey (Beck: Shortland).

Measurements. Wing 11 ♂, 55, 59-61½ (59.68); 7 ♀, 55-60 (57.50); 18 specimens, 55-61½ (58.83); tail 11 ♂, 36-41 (38.73); 7 ♀, 34-38 (36.36); 18 specimens, 34-41 (37.78); tarsus 18 specimens, 16-17½ (16.93); entire culmen 17 specimens, 13-15½ (14.41) exposed culmen 17 specimens, 11-12¾ (11.90), culmen from anterior point of nostril 17 specimens, 8-9 (8.56) [1]).

Distribution. Shortland, Choiseul, Bougainville, and Buka Island, at the northwestern end of the Solomon Islands chain.

First collector. A. S. Meek on Choiseul in December, 1903 and on Bougainville in April, 1904.

Not figured.

Type. AMNH nr. 220057.

Moult. Specimens collected in January (2), April (1), September (1), October (3), and December (4) are not in moult. Two specimens collected in October are moulting forehead-feathers, no main moult, five specimens taken in December are in heavy moult. The October specimens are all in abraded plumage, so that it is probable that the main moult takes place about December.

Nidification. Unknown. Murphy (1929) mentions several fledglings among his series taken in November, December, January, and April, which suggests reproduction in that period, but Dr. Vaurie, who examined the AMNH series for me wrote (20-IV-1959): "I have not found any fledgling of *Z. metcalfii exigua* or *Z. k. kulambangrae*. Perhaps Murphy was satisfied that some of his specimens were not adult, but I would not know, short of making a study of the plumages ... At any rate, there are no fledglings".

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1) Many of the specimens are in a very abraded plumage or in moult, among them the small male with a wing of 55 mm, and several females. These have influenced the figures and averages of wing- and tail-length.

Habits, etc. On Bougainville, Virtue (1947) found the birds in pairs or small flocks in the lowland forest.

2. **Zosterops metcalfii metcalfii** Tristram

Zosterops metcalfii Tristram, Ibis (6) 6, 1894, p. 29, pl. III fig. 1 — Bugotu, Solomon Islands.

Zosterops metcalfii; Tristram, Ibis (7) 1, 1895, p. 374 (Bugotu).

Zosterops metcalfei; Finsch, Tierreich 15, 1901, p. 21 (Bugotu); Rothschild & Hartert, Nov. Zool. 9, 1902, p. 581 (Bugotu); Dubois, Syn. Av. I, 1902, p. 708 (Bugotu); Sharpe, Hand-List Birds 5, 1909, p. 6 (Bogotu).

Zosterops metcalfei metcalfei; (pt.) Hartert, Am. Mus. Nov. 364, 1929, p. 11 (Ysabel); Stresemann, Mitt. Zool. Mus. Berlin 17, 1931, p. 223 (Ysabel und Tulagi); Mayr, Birds Southwest Pacific, 1945, p. 272 (Ysabel).

Zosterops metcalfii metcalfii; Murphy, Am. Mus. Nov. 365, 1929, p. 4 (Ysabel, Tulagi or St. George); Mathews, Syst. Av. Australas. II, 1930, p. 698 (Bugotu).

Subspecific characters. As the species; a narrow white eye-ring is present; bill black with only the base of the mandible paler.

Unfeathered parts. Iris light brown, bill black or dark brown, feet slate or pale blue slate (Meek).

Measurements of four specimens (3 ♂, 1 ♀): wing 59-60 (59.38), tail 37-39 (38.38), tarsus 16¼-17¼ (16.75), entire culmen 14 (14.00), exposed culmen 11-12 (11.56), culmen from anterior point of nostril 8-9¼ (8.50).

Distribution. Ysabel (Santa Isabel or Bugotu) and San Jorge (Saint George or Tulagi).

First collector. The Rev. Dr. Welchman before 1894 on Bugotu.

Figure. A coloured plate, of natural size, by Keulemans, is given by Tristram (1894, pl. III fig. 1). As Rothschild & Hartert (1902) already pointed out, the specimen depicted has evidently been preserved in spirits, so that the yellow is much too pale and the back shows paler and greener as a result of extraction of yellow lipochromes. The plate therefore is of limited value only.

Type. Was in the Liverpool Museum; destroyed during the 1939-1945 war.

Moult. One specimen taken in June is moulting primaries, one other June specimen, and two from July, are not in moult.

Nidification. Not recorded.

Habits, etc. Not recorded. According to Tristram (1895) the native name is "Kuukudu".

3. **Zosterops metcalfii floridana** Rothschild & Hartert

Zosterops floridana Rothschild & Hartert, Nov. Zool. 8, 1901, p. 180 — Florida Island.

Zosterops floridana; Rothschild & Hartert Nov. Zool. 9, 1902, p. 582 (no locality), Dubois, Syn. Av. II, Suppl., 1903, p. 1113 (Ile Florida); Sharpe, Hand-List Birds 5, 1909, p. 6 (Florida Isl.); Hartert, Nov. Zool. 27, 1920, p. 436 (Florida Island); Snouckaert, Alauda (2) 3, 1931, p. 19 (Ile Florida).

Zosterops metcalfei floridana; Hartert, Am. Mus. Nov. 364, 1929, p. 11 (Florida); Stresemann, Mitt. Zool. Mus. Berlin 17, 1931, p. 203, 223 (Florida); Mayr, Birds Southwest Pacific, 1945, p. 272 (Florida, Tulagi).

Zosterops metcalfii floridana; Murphy, Am. Mus. Nov. 365, 1929, p. 5 (Florida Island); Mathews, Syst. Av. Australas. II, 1930, p. 698 (Florida).

Subspecific characters. Differs from the other races in the absence of a white eye-ring, the eye-lid being nude, and by its being slightly lighter and more yellowish on the upper parts, particularly on the head.

Unfeathered parts. Iris brownish, bill blackish, grey below, legs grey (Hicks, Beck).

Measurements of eight specimens (4 ♂, 4 ♀): wing 57-61 (59.38), tail 36-40 (37.75), tarsus 16-17¼ (16.56), entire culmen 14-15 (14.56), exposed culmen 11-12¾ (11.59), culmen from anterior point of nostril 7¾-9½ (8.66).

Distribution. Confined to Florida Island. Some confusion may result from the fact that on Florida Island there is the town Tulagi, whereas according to Murphy Tulagi is also an alternate name for the island San Jorge off the southern end of Ysabel. San Jorge is inhabited by the nominate race.

First collectors. A. S. Meek's men in December, 1900 (cf. Rothschild & Hartert, 1901).

Not figured.

Type AMNH nr. 700653.

Moult. Of eight specimens collected in May, three are moulting primaries, one secondaries, the others have evidently completed their moult and are in fresh plumage.

Nidification. Not recorded.

Habits, etc. Not recorded.

Species 35. **Zosterops rendovae** Tristram

Characters. A very large species characterised by fairly dull citrine upper parts (less bright and yellow than in the majority of the other species) and the absence of yellow on most of the under parts; altogether a rather dull species.

Upper parts Citrine, forehead in two of the three races tinged with sepia; eye-ring narrow to entirely absent, in the latter case there is a nude space round the eye; primaries and rectrices blackish brown with broad Citrine edges on the outer margins.

Under parts. Throat dirty white or dirty light citrine; breast grey-white or dirty brownish grey; flanks greyish white; belly almost pure satin white; under tail coverts almost pure satin white with but the faintest trace of yellow in one race, yellow (between Empire Yellow and Pale Lemon Yellow) in the other forms.

Unfeathered parts. Iris light brown or brown, bill black, basal part of mandible paler, legs grey.

Measurements are given in table X.

TABLE X

Zosterops rendovae

	number of specimens	wing	tail	av. wing	av. tail	tail : wing index
rendovae	7	66-71	40-45	68.00	42.86	63.03 %
oblita	19	64½-69	41-50	66.79	45.68	68.40 %
hamlini	2	66-69	42, 45½	67.5	43.75	64.8 %

Distribution. The forests of the higher parts of Bougainville, Guadalcanar, and San Christobal (Bauro), with a lower limit of about 400 metres.

Geographical variation. Each of the three islands where the species is known to occur has its own fairly distinct endemic race. The main variation exists in the colour of the forehead, throat, and under tail coverts, and development of the eye-ring.

Related species. Mayr & Schauensee (1939) stated that "unquestionably" this species is related to the *atrifrons*-group (*atriceps* and *minor* being specifically mentioned). Yet, in 1955, without referring to this earlier paper, Mayr advanced the opinion (as quoted under that species) that *Z. metcalfii* is a geographical representative of *atrifrons* (*minor*). Since *Z. metcalfii exigua* and *Z. rendovae hamlini* co-occur on Bougainville and look as different as any two species of the genus, it is evident that Mayr's two theories are conflicting. It is safe to state that on the basis of present-day knowledge any hypothesis about the affinities of *Zosterops rendovae* is pure speculation. The species is probably an old endemic of the Solomon Islands, and I regard any resemblance it shows to other species (for example *Zosterops mysorensis*) as purely superficial.

1. **Zosterops rendovae rendovae** Tristram

Zosterops rendovae Tristram Ibis (4) 6, 1882 (January), p. 135 — nomen novum for *Tephras olivaceus* Ramsay, nec *Zosterops olivacea* (Linnaeus), 1766.

Tephras olivaceus Ramsay, Proc. Linn. Soc. New South Wales 6, 1881, p. 180 — Solomon Islands = San Christobal.

Tephras (Zosterops) ugiensis Ramsay, Proc. Linn. Soc. New South Wales 7, 1882 (after January), p. 28 — nomen novum for *Tephras olivaceus* Ramsay.

Zosterops ramsayi Salvadori, Ann. Mus. Civ. Genova 18, 1882 (2 October), p. 425 — nomen novum for *Tephras olivaceus* Ramsay.

Z[osterops] salomonensis Finsch, Tierreich 15, 1901, p. 42 — nomen novum for *Zosterops ramsayi* Salvadori, nec *Zosterops ramsayi* Masters, 1876.

Zosterops alberti Rothschild & Hartert, Nov. Zool. 15, 1908, p. 364 — San Christoval, Solomon Islands (type from Yanuta).

Zosterops (Tephras?) olivacens; Anonymus, Nature 21, 1881 (21 July), p. 277 (Solomon Islands).

Zosterops ramsayi; Salvadori, Orn. Pap. III, 1882 (Dec.), p. 546 (no locality).

Tephras olivaceus; Reichenow & Schalow, Journ. f. Orn. 32, 1884, p. 416. (Salomon Islands).

Zosterops rendovae; (pt.) Sharpe, Cat. Birds Brit. Mus. 9, 1884, p. 188 (in synonymy); (pt.) Salvadori, Agg. Orn. Pap. II, 1890, p. 131 (no locality); (pt.) Finsch, Tierreich 15, 1901, p. 26 (Ugi); (pt.) Dubois, Syn. Av. I, 1902, p. 709 (Ugi); (pt.) Sharpe, Hand-List Birds 5, 1909, p. 9 (Ugi); Mees, Zool. Med. 33, 1955, p. 300 (no locality).

Zosterops salomonensis; Dubois, Syn. Av. I, 1902, p. 712 (Iles Salomon); Sharpe, Hand-List Birds 5, 1909, p. 18 (Solomon Is.); Murphy, Am. Mus. Nov. 365, 1929, p. 4 (a bird of unknown source in the Solomon Archipelago).

Zosterops alberti; Sharpe, Hand-List Birds 5, 1909, p. 632 (San Christoval); Hartert, Nov. Zool. 27, 1920, p. 437 (San Christoval).

Zosterops alberti alberti; Hartert, Am. Mus. Nov. 364, 1929, p. 10 (Bauro = San Christobal); Murphy, Am. Mus. Nov. 365, 1929, p. 3 (Bauro); Mathews, Syst. Av. Australas. II, 1930, p. 708 (San Christobal or Bauro Island); Snouckaert Alauda (2) 3, 1931, p. 19 (San Christoval).

Nesozosterops olivaceus; Mathews, Syst. Av. Australas. II, 1930, p. 713 (Solomon Islands).

Zosterops ugiensis ugiensis; Stresemann, Mitt. Zool. Mus. Berlin 17, 1931, p. 224 (Ugi); Mathews, Ibis (13) 2, 1932, p. 155 (Ugi); Mayr, Birds Southwest Pacific, 1945, p. 272 (San Christobal); Cain & Galbraith, Ibis 98, 1956, p. 291 (San Christobal).

Zosterops ugiensis alberti; Stresemann, Mitt. Zool. Mus. Berlin 17, 1931, p. 224 (Bauro (= San Christoval)); Mathews, Ibis (13) 2, 1932, p. 155 (San Christobal).

Zosterops ugiensis; Cain & Galbraith, Ibis 98, 1956, p. 104, 110 (San Christobal, not seen on Ugi); Galbraith, Bull. B. O. C. 77, 1957, p. 10-16 (San Christobal, discussion of nomenclature).

Subspecific characters. Forehead tinged with sepia; no eye-ring; throat dirty white; under tail coverts almost pure satin white with but the faintest trace of yellow.

Unfeathered parts. Iris hazel, bill black, feet slate (Meek); iris light brown, bill black, sides of mandible dull fuscous basally, feet dark bluish grey, patchily washed with greenish (Galbraith).

Measurements of 7 specimens (3 ♂, 4 ♀): wing 66-71 (68.00), tail 40-45 (42.86), tarsus 19¼-20½ (20.04), entire culmen (6 specimens only) 14-17 (15.92), exposed culmen (6 specimens only) 12-13 (12.50), culmen from anterior point of nostril (6 specimens only) 9-9¾ (9.13).

Weights. ♂, 18.5, 19.0; ♀, 17.5, 19.0, 21.5 g (Galbraith).

Distribution. Confined to San Christobal, where, according to Mayr (1945) it is most common in the mountains, but also reaches the lowlands. Galbraith (in Cain & Galbraith, 1956), however, could not confirm the occurrence of this subspecies in the lowlands, so that its vertical range is apparently not different from that of the other subspecies.

First collector. Lieutenant G. E. Richards, R.N., of H.M.S. "Renard", about 1880.

Not figured.

Type. Australian Museum no. A9798.

Moult. Specimens collected in April (2) and November (5) do not show moult; the November specimens are in slightly to fairly strongly abraded plumage.

Nidification. Not recorded. Murphy (1929) mentions a juvenile not long out of the nest collected on April 8, 1927. The five specimens collected in November have the gonads varying from small to large.

Habits, etc. Apparently not different from *oblita* (Cain & Galbraith, 1956).

Discussion. As I have shown (Mees, 1955), the name *rendovae,* which has been used for the species from Rendova Island in this paper listed as *Z. kulambangrae paradoxa,* should correctly be applied to the form from San Christobal. Recently Galbraith (1957) has written a fairly lengthy and comprehensive paper on the nomenclature of these birds, in which he concluded that: "The action proposed by Mees (1955), transferring the name *Zosterops rendovae* Tristram to the form at present known as *Zosterops ugiensis* (Ramsay), is... entirely unjustifiable, and the nomenclature adapted by Mayr (1945) may stand. *Zosterops kulambangrae paradoxa* Mees is a synonym of *rendovae*".

I hope that my good friend Mr. Galbraith will not mind if I continue to disagree with him. In Galbraith's paper two lines of thought appear: the first is that the transfer of names as effectuated by me is invalid, and contrary to the Règles, the second is that if the transfer were dictated by the Règles, action should be taken to prevent any change. Against the last-mentioned argument I can say little: whether or not the present case would cause so much confusion as to make action of the Commission desirable is a matter of personal opinion, and bears no relation to the case as such. Presently I shall give the reasons why I did not apply to the Commission.

The first argument, stressed in Galbraith's paper, is based on an incorrect interpretation of the Règles. Before publishing my note I discussed the problem with Professor Boschma and Dr. Holthuis, both members of the Commission, and they both agreed that without the slightest doubt the name

Zosterops rendovae as published by Tristram (1882) is a nomen novum for *Tephras olivaceus* Ramsay. Notwithstanding Galbraith's statement to the contrary, § 142 of the Copenhagen Decisions perfectly covers this particular case. Actually Galbraith condemns his own conclusion when he writes (p. 11): "Tristram should either have proposed a substitute name for *T. olivaceus,* or have made his specimen from Rendova the type of a new species. What he did do was to erect a composite species.....". And this is where Galbraith slips, as far as nomenclature is concerned, because he says that Salvadori (1882) as first reviser restricted the application of *rendovae* to Tristram's specimens and that his action as first reviser should stand. For this is not a matter in which the first reviser principle can be applied at all, because § 142 mentioned before explicitly deals with it in a different way. Also Galbraith's statement (p. 15) that: "the Copenhagen decision of 1953..... should not be applied retrospectively to reverse the decision made by Salvadori in 1882....." shows a misunderstanding of the meaning of these rules, which are drawn up to be applied retrospectively to January 1st, 1758.

Galbraith's second argument is that the change of names is undesirable. Before discussing this I would like to comment on some of his remarks: that the name *ugiensis* for a species from San Christobal neither occurring on Ugi nor on Rendova, is more suitable than that of *rendovae,* because Ugi: "belongs avifaunally to the San Christobal group of islands" — personally I think that this might as well be considered an argument in favour of the name *rendovae,* for the more remote a bird is from a wrong locality of provenance indicated by its name, the less likely it is that confusion will be caused. Anyway nobody complains about *Sakesphorus canadensis* in tropical South America, *Zenaida asiatica* in Mexico, or *Dicrurus hottentottus* in the Moluccas. Galbraith suggests lack of courtesy from my side when he writes (p. 15) that I consider Mayr's (1945) book: "irrelevant to nomenclatural discussion". What I actually wrote is that Mayr's field-guide is not, and has never been intended by its author to be, a kind of nomenclator which should be used as an unchangeable basis for future systematic work.

Anyway, the change of name from *Z. rendovae rendovae* to *Z. kulambangrae paradoxa* of a bird inhabiting the island of Rendova will hardly cause inconvenience. Though Galbraith is right in stating that the name *rendovae* has been used for this form for 73 years (during the greater part of this period, however, this was a composite name, also embracing Ramsay's *Tephras olivaceus*), only four collectors have obtained specimens, and only one of them (Sibley, 1951) has published the name; all other references in literature are in systematic treatises and check-lists, as the bibliography

given under the race (which I believe to be practically complete) shows. Therefore I do not think that the change will cause much inconvenience, and many similar changes, proposed in recent years by a number of well known systematists have been unhesitatingly accepted by their colleagues.

A shift of a name from one species to a different one is a more serious matter, and if I correctly understand, it is the transfer of the name *rendovae* from one species to a different one, of which Galbraith especially disapproves; I thoroughly agree that such a transfer might cause confusion, and it was only after I had made a search of literature of the bird from San Christobal originally described as *Tephras olivaceus* Ramsay, that I ventured to effectuate it. The reason is that the name *Z. ugiensis ugiensis* which Mayr (1945) gave this bird, was introduced into literature for the San Christobal race by Mayr at the place mentioned, and had not been used before or since, when I published my note (it is hardly fair of Galbraith to use as an argument against me the fact that Cain & Galbraith, 1956, used the name *ugiensis,* as their paper appeared a year later). The name *Z. ugiensis ugiensis* had been used previously on two occasions; it was introduced by Stresemann (1931) for an alleged subspecies supposed to occur on Ugi, whereas the same author gives the San Christobal race the name *Z. ugiensis alberti.* To me it seemed ridiculous to apply to the Commission for conservation of a name that since its introduction had only once been correctly used in literature. And as this form too, had been collected only four times (including Cain and Galbraith's expedition of which at the time I was not yet aware), I did not feel that the transfer would involve much inconvenience. The transfer only affects museum workers, whose duty it is to know literature, and to whom it will cause no more inconvenience than the alteration of a few names on labels. Galbraith's consideration for field-naturalists who might get confused is very commendable, but I am not aware of the existence of published results of observations of even one field naturalist on the islands involved, and such people, if they exist at all, must be very rare. However, I am not dogmatic on this point, and contrary to the preservation of the name *rendovae* for the Rendova Island race, which would induce reversal of a very explicit ruling and require the designation of a neotype, the transfer could be made undone by simple suppression of the name *rendovae.* If somebody wishes to apply to the Commission to exercise its powers in the way indicated I will raise no objection, though I am not prepared to do so myself.

2. **Zosterops rendovae oblita** Hartert

Zosterops alberti oblita Hartert, Am. Mus. Nov. 364, 1929 (29 July), p. 10 — Guadalcanar.

Zosterops alberti oblita; Murphy, Am. Mus. Nov. 365, 1929 (30 July), p. 3 (Guadalcanar); Mathews, Syst. Av. Australas. II, 1930, p. 708 (Guadalcanar Island); Snouckaert, Alauda (2) 3, 1931, p. 19 (Guadalcanar).

Zosterops ugiensis oblita; Stresemann, Mitt. Zool. Mus. Berlin 17, 1931, p. 224 (Guadalcanar); Mathews, Ibis (13) 2, 1932, p. 155 (no locality); Mayr & Schauensee, Proc. Ac. Nat. Sc. Philad. 91, 1939, p. 36 (Guadalcanar Island); Mayr, Birds Southwest Pacific, 1945, p. 272 (Guadalcanal); Cain & Galbraith, Ibis 98, 1956, p. 291 (Guadalcanal).

Subspecific characters. Forehead similar in coloration to the mantle, without any trace of brown or sepia; no white eye-ring, though, as Murphy (1929) already stated, some specimens show an obsolescent but perfectly discernible ring of minute white feathers round the eye; throat dirty white; under tail coverts yellow. This form differs from the nominate race in the absence of a sepia wash on the forehead, in the somewhat brighter tinge of the upper parts and in the yellow under tail coverts.

Unfeathered parts. Iris reddish brown, bill black, feet bluish (Drowne); iris brown, bill black, feet greyish (Beck); iris light brown, bill black, basal half of mandible whitish, feet blue-grey (Cain & Galbraith).

Measurements of 19 specimens (14 ♂, 5 ♀): wing 64½-69 (66.79), tail 41-50 (45.68), tarsus (18 specimens only) 17-19¼ (17.57), entire culmen (12 specimens only) 14¼-16 (15.04), exposed culmen (13 specimens only) 11½-13 (12.12), culmen from anterior point of nostril 8-9½ (8.87).

Weights. ♂, 13.5, 14.5, 14.5, 14.5, 15.0, 15.0, 15.0, 15.0, 15.0, 16.0, 16.0, 16.5; ♀, 13.5, 15.0, 16.0, 16.0, 16.5, 16.5, 17.0; ♂ juv., 14.5; unsexed juv., 15.5 g (Cain and Galbraith).

Distribution. Confined to Guadalcanar Island, where it is common in the higher parts of the island, but is absent from the lowlands.

First collectors. Collectors of the Whitney South Sea Expedition (R. H. Beck), on May 30, 1927.

Not figured.

Type. AMNH nr. 218110.

Moult. Specimens collected in May (1), July (7) and August (5) do not show moult; with the exception of one August specimen they are in fairly fresh plumage. Specimens collected in June (1), July (3) and August (4) show moult in primaries or rectrices or both.

Nidification. Not recorded, but all the specimens collected by Cain and Galbraith in July and August, 1953, with the exception of a few birds which are evidently juvenile, are marked as having the gonads much enlarged.

Habits, etc. According to Cain & Galbraith (1956) this subspecies is very abundant in mist forest, and less common in open canopy and substage in broken places. The birds are usually seen in parties of up to a dozen,

moving rapidly from tree to tree. As gut contents the same authors found fruit and seeds.

Voice. Cain & Galbraith (l.c.) record the flock-babble of foraging parties as a monotonous cheeping: "peep..... peep..... peep.....". From birds chasing one another a very rapid "tk tk tk tk..." was heard.

3. **Zosterops rendovae hamlini** Murphy

Zosterops alberti hamlini Murphy, Am. Mus. Nov. 365, 1929, p. 3 — Bougainville Island, Solomon Group.

Zosterops alberti hamlini; Mathews, Syst. Av. Australas. II, 1930, p. 708 (Bougainville Island); Snouckaert, Alauda (2) 3, 1931, p. 19 (Bougainville).

Zosterops ugiensis hamlini; Stresemann, Mitt. Zool. Mus. Berlin 17, 1931, p. 224 (Bougainville), Mathews, Ibis (13) 2, 1932, p. 155 (no locality); Mayr, Birds Southwest Pacific, 1945, p. 272 (Bougainville).

Subspecific characters. Forehead washed with sepia as in the nominate race; a narrow but complete white eye-ring; throat dirty citrine; breast and flanks rather darker brownish grey than in the other races; under tail coverts yellow; bill slightly heavier than in the other races.

Unfeathered parts. Iris brown, bill black or blackish, legs grey (Drowne).

Measurements of two females: wing 66, 69, tail 42, 45½, tarsus 20½, 20¼, entire culmen 16½, 15½, exposed culmen 13¼, 12½, culmen from anterior point of nostril 9, 9.

Distribution. Confined to Bougainville.

First collector. F. P. Drowne, of the Whitney South Sea Expedition, on 31 December, 1927.

Not figured.

Type. AMNH nr. 222098.

Moult. The two specimens examined, collected on 31 December and 25 January respectively, both show primary moult, and the first mentioned one also moult in the upper wing coverts.

Nidification. Not recorded.

Habits, etc. Like the other subspecies apparently mainly a bird of the hills and mountains; not found in the coastal area (Mayr, 1945).

Species 36. **Zosterops stresemanni** Mayr

Zosterops stresemanni Mayr, Am. Mus. Nov. 504, 1931 (11 November), p. 26 — Malaita Island, British Solomon Islands.

Zosterops malaitae Mayr, Linsley & Usinger, Methods and Principles of Systematic Zoology, 1953, p. 225 — nomen nudum.

Zosterops stresemanni; Snouckaert, Alauda (2) 4, 1932, p. 459 (Malaita); Mayr, Am. Mus. Nov. 1269, 1944, p. 7 (no locality); Mayr, Birds Southwest Pacific, 1945, p. 274 (Malaita); Cain, Animal Species and their Evolution, 1954, p. 89 (Malaita); Greenway, Extinct Birds, 1958, p. 67 (Malaita).

Characters. A very large species, characterised by the absence of an eye-ring, and by a dull greenish-yellow under surface without any sharp demarcation lines.

Upper parts. Whole upper surface, including rump and forehead, between Warbler Green and Serpentine Green; feathers on crown of the same colour, but with a very slight fuscous tinge; lores ash grey; primaries, secondaries and rectrices blackish brown, particularly the primaries broadly margined with Pyrite Yellow; no eye-ring, but space round the eye naked.

Under parts. Nowhere colours are strongly demarcated; the colour of the upper parts is continued on the cheeks and the sides of the breast, and becomes paler on the throat, the middle of the breast and on the flanks, where it becomes strongly suffused with Picric Yellow, which colour entirely replaces the green on the centre of the belly and the under tail coverts.

Unfeathered parts. Iris light brown, bill maxilla greyish, mandible pale yellow with a greyish tip, legs greenish grey (Mayr, 1931).

Measurements of 9 specimens (6 ♂, 3 ♀): wing 67-70 (68.72), tail 42-45 (43.56), tarsus 19½-21¼ (20.42), entire culmen 16¼-18¼ (17.44), exposed culmen 14-15 (14.39), culmen from anterior point of nostril 10-11¼ (10.61).

Structure. Wing rounded, with the primaries 3, 4, 5, 6 and 7 all approaching each other very closely in length, 2nd primary in length between 8th and 9th (fig. 1f); tail index of nine specimens 63.38%.

Weights. ♂ ad, 20, 22, 22½, 22½, 23, 23 g, ♂ juv. 21 g, ♀ 21, 21, 23 g.

Distribution. Confined to Malaita Island, Solomon Islands.

First collectors. Collectors of the Whitney South Sea Expedition (W. F. Coultas, W. J. Eyerdam, H. Hamlin, E. Mayr) in January, 1930.

Not figured.

Type. AMNH nr. 227362.

Moult. Specimens collected in February (3) and March (3) are moulting either primaries or rectrices, or both, three other February specimens do not show moult and are in abraded plumage, one other March specimen is not in moult and is in fresh plumage. This suggests that the main moult takes place from January till March.

Nidification. Not recorded.

Habits, etc. Not recorded. Mayr (1945) calls the species a common bird from the seacoast to the mountains.

Species 37. **Zosterops sanctae-crucis** Tristram

Zosterops sanctae-crucis Tristram, Ibis (6) 6, 1894, p. 31 — Santa Cruz Island.
Zosterops sanctae-crucis; Finsch, Tierreich 15, 1901, p. 42 (Santa-Cruz-Inseln); Du-

bois, Syn. Av. I, 1902, p. 712 (Ile Sta-Cruz); Murphy & Mathews, Am. Mus. Nov. 356, 1929, p. 12-13 (Santa Cruz); Stresemann, Mitt. Zool. Mus. Berlin 17, 1931 (1 June), p. 226 (Santa Cruz-Insel); Mayr, Am. Mus. Nov. 504, 1931 (11 November), p. 26 (no locality); Mayr, Birds Southwest Pacific, 1945, p. 210 (Santa Cruz Isl.).

Zosterops sanctae crucis; Sharpe, Hand-List Birds 5, 1909, p. 18 (Santa Cruz Is.).

Zosterops sanctaecrucis; Mathews, Syst. Av. Australas. II, 1930, p. 711 (Santa Cruz); Mayr, Mitt. Zool. Mus. Berlin 19, 1933, p. 317 (Santa Cruz-Inseln); Mayr, Am. Mus. Nov. 1269, 1944, p. 7 (no locality); Greenway, Extinct Birds, 1958, p. 69 (Santa Cruz).

Characters. A very large and very dull species, Dull Citrine above, greenish yellow below, without any sharp boundary lines between the colours; eye-ring rudimentary.

Upper parts generally Dull Citrine; wide lores, and a narrow region round the eyes rather pale dusky; primaries, secondaries, and rectrices blackish brown, all broadly edged on the outer borders with a citrine that is rather brighter than the colour of the remainder of the upper parts.

Under parts. Throat, breast, and flanks of the same colour as the upper parts, but slightly paler and with an admixture of yellow. Towards the centre of the belly and the vent, the green becomes reduced, leaving an almost pure Barium Yellow on these parts.

Unfeathered parts. Iris brown, bill black, feet greyish, grey, or bluish (Drowne, Beck).

Measurements of six specimens (5 ♂, 1 ♀): wing (5 specimens only) 66-69 (68.30), tail 40-44 (42.33), tarsus 21½-23 (22.00), entire culmen 14¼-16¼ (15.54), exposed culmen 12-13 (12.54), culmen from anterior point of nostril 9-10 (9.38).

Structure. The wing in this species is rounded, the primaries 3, 4, 5 and 6 being all close to the same length; tail comparatively short for a species of this size, average index of 5 specimens 62.7 %, plumage fairly soft.

Distribution. Apparently confined to Santa Cruz Island. I am not aware that the species has ever been recorded from other islands of the Santa Cruz Group.

First collector. Mr. Forrest of Bishop Selwyn's Melanesian Mission, before January 1894.

Not figured.

Type. Lost.

Moult. One specimen collected in February shows heavy wing moult, four other specimens collected in February do not show moult and are in abraded plumage. One specimen collected in October is in fresh plumage.

Nidification. Not recorded; according to Murphy & Mathews (1929) specimens collected in the months October and February had the gonads either small or enlarged.

Habits, etc. Unknown.

Discussion. Murphy & Mathews (1929) drew attention to the extraordinary resemblance between this species and *Z. samoensis,* but found that the two have different relative proportions, and in a group where many obviously only distantly related species can look to confusingly similar, I am disinclined to attach much importance to this resemblance.

PLATE I

Racial differences and variation in bill-size in *Zosterops chloris albiventris* and *Z. chloris citrinella,* shown in lateral view. Upper left, *albiventris* (specimen from Teoen, RMNH, large bill); upper right, *albiventris* (type of *lettiensis,* from Letti, RMNH cat. nr. 10, short bill); lower left, *citrinella,* (specimen from Soemba, AMNH nr. 347031, long bill); lower right, *citrinella* (cotype from Timor, RMNH cat. nr. 5, small bill) × 5.

PLATE II

Same specimens as shown in plate I, in dorsal view. Upper left, *albiventris* (from Teoen); upper right, *albiventris* (from Letti); lower left, *citrinella* (from Soemba); lower right, *citrinella* (from Timor) × 5.

PLATE III

Variation in bill-size in races of *Zosterops novaeguineae.* Left, *aruensis* (type RMNH cat. nr. 2); middle, *wuroi* (AMNH nr. 428409, large bill); right, *wuroi* (AMNH nr. 428411, small bill) × 5.

PLATE IV

Variation in bill-size in races of *Zosterops novaeguineae.* Left, *wahgiensis* (AMNH nr. 705998); middle, *magnirostris* (type BM nr. 1936. 4. 20. 94); right, *magnirostris* (same specimen in lateral view) × 5.