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NOTES ON THE FISHES OF WESTERN NEW GUINEA III. THE FRESH WATER SHARK OF JAMOER LAKE

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Introduction

In 1954, during a visit to Hollandia, western New Guinea, it was rumoured that sharks had been observed in the fresh water of Jamoer Lake, at a distance by effluent river of about 130 km from the Arafoera Sea. For further information on the locality, including a map of the area, I refer to the first note in the present series (Boeseman, 1963: 231, fig. 6). With eagerness we welcomed an opportunity provided by Rear Admiral (at the time Captain) G. B. Fortuyn, then Commander-in-Chief Naval Forces Netherlands New Guinea, to pay a short visit to the isolated lake. All necessary facilities, including transportation and maintenance, were kindly furnished by the Royal Netherlands Naval Air Service and the Royal Marines. Accompanied by my colleagues Drs. Brongersma and Holthuis, I visited Jamoer Lake from 7 to 13 December 1954, while Dr. Brongersma revisited the lake from 22 to 26 March 1955.

Sharks in fresh water

The occurrence of sharks in tropical and subtropical fresh water is not as rare as usually presumed, though the number of species involved seems limited. It is strange to find that even zoologists often are surprised to learn that sharks occur in fresh water, while the principal facts gradually have penetrated even into popular and semi-popular literature (e.g., Budker, 1947: 167-169; Schultz & Stern, 1948: 56-57; Le Danois, 1949: 148-150, 164; Herald, 1961: 26, 28, 31). As the principal summaries on the subject are outdated (Engelhardt, 1913; Scheuring, 1929, map!) or usually over-

looked (Smith, 1936), it seems useful to give here a general idea of the frequency of the phenomenon in Carcharhinid sharks and of the species involved. Therefore, the following review is given, based mainly on data provided by Bigelow & Schroeder (1948), Whitley (1940), and Fowler (1941); however, it should not be considered complete.

America: Chesapeake Bay (*Carcharhinus leucas*); Atchafalaya River, Louisiana (*C. platyodon* = *C. leucas*); Pascagoula River, Mississippi (*C. terraenovae*); Lake Yzabal, Guatamala (*C. leucas*); Patuca River, Honduras (*C. leucas*); Lake Nicaragua, San Juan River, and Rio Frio, three localities in Nicaragua (*C. leucas*); Miraflores Locks, Panama (*C. leucas*); Lago de Maracaibo, Venezuela (?); Amazon River near Iquitos, Peru (*?C. leucas*); rivers of South America between the La Plata River and the Rio Magdalena, Amazon River mouth (*C. brevirostris*).

Africa: Sénégal (river), Sénégal (*C. longimanus* = *?C. leucas*); Gambia River, Gambia (*C. zambezensis* = *?C. leucas*); Ogooué River, Gabon (*C. leucas*); Zwartkops River, Limpopo River, both South Africa (*C. zambezensis* = *?C. leucas*); Zambesi River, Mozambique (*C. zambezensis* = *?C. leucas*).

Asia: Tigris River, Iraq (*C. gangeticus* = *?C. leucas*); Karun River, Iran (?); rivers of India and Pakistan (*C. gangeticus, C. hemiodon*); Perak River at Teluk Anson, Malaya (four species including *C. melanopterus*); Dôngnai, Cochinchina (*C. gangeticus* = *?C. leucas*); Saigon River, Vietnam (*C. hemiodon*); Sarawak, northern Borneo (?); Sumatra, Borneo, northern Java, in rivers (*C. muelleri*); Laguna de Bay, Agusan River, Saug River, Lake Naujan, all in the Philippines (*C. gangeticus* = *?C. leucas*).

Australia: lake on Japen (island), unconfirmed local information (?); Mamberamo River near Pioniersbivak, northern New Guinea (?); Jamoer Lake, western New Guinea (*C. leucas*); Liverpool River, Northern Territory (?); Victoria River, Northern Territory (*C. gangeticus* = *?C. leucas*); Swan River, Western Australia (*C. greyi mckaili* = *?C. leucas*); several rivers, outlets, and lakes in eastern Queensland and New South Wales, e.g., Ross River (?), Burnett River (*C. jordani, C. palasorrah*), Brisbane River (*C. spenceri*), Macleay River(?), Lake Macquarie (*C. macrurus, C. stevensi*), Parramatta River (?), Georges River (?), etc. (most specimens recorded apparently "Whalers", part of which seem identical with *C. leucas*).

It should be remarked that this review also includes several localities with, in a varying degree, brackish water. Furthermore, that the recorded identifications do not always seem reliable; in several cases therefore I tentatively added the more likely name *C. leucas*. Finally, if we accept the suggested identifications, the fresh water Carcharhinid with the widest distri-

bution and by far the most frequently encountered is *Carcharhinus leucas*.

Identification

The specimens collected in Jamoer Lake evidently belong to the genus *Carcharhinus* Blainville, sensu Bigelow & Schroeder (1948: 320), but unfortunately the name *Carcharhinus* is not validly applicable in this sense while there are also serious objections against using the alternative names *Glyphis* Agassiz, *Galeolamna* Owen, or *Eulamia* Gill (see Boeseman, 1960). In the present paper I anticipate a decision by the International Commission on Zoological Nomenclature legalizing the use of *Carcharhinus* Blainville, as proposed by White, Tucker & Marshall (1961) or Garrick (1962a).

Judging by Fowler's compilation on Indo-Pacific sharks (1941), the Jamoer specimens would belong to *Carcharhinus lamia* (Blainville), but unfortunately Fowler's *C. lamia* is an example of extremely inconsiderate lumping. In fact, considerable lumping seems warranted in blunt-nosed Carcharhinid sharks, but the numerous nominal species, often inadequately described and based on limited or deformed stuffed material, make responsible lumping impossible without a re-examination of the types. An additional difficulty is the usual scarcity of reasonably preserved material which has hitherto prevented an exact determination of the variability (e.g., with age) of the crucial characters, and thus a delimitation of the closely related species. Though this problem is now being studied by Dr. Garrick, temporarely associated with the U.S. National Museum at Washington, a few of the principal items in Fowler's compilation may be discussed here.

Blainville's *Squalus lamia* appears to have been based on Duhamel's "Canis carcharias". I have not seen Blainville's opus, but I had the opportunity to consult Duhamel's "Traité Général des Pesches, ...", in which I found the interesting chapter "Des Requins ou Lamies, Canis Carcharias; par quelques-uns Touille" in part II vol. III section IX chapter IV article 1 on page 297, and the accompanying plate 19. The composite text does not provide any pertinent information, but evidently includes some remarks on *Cetorhinus maximus* (Gunnerus). Of more interest is plate 19 fig. 1, which, though showing a shark with distinct teeth, is named "Grand Chien bleu sans dents" and, considering the wide gill slits, must represent *Cetorhinus maximus*; fig. 2 also represents *Cetorhinus maximus*, this time correctly drawn without teeth; fig. 3 may tentatively be identified as *Prionace glauca* (Linnaeus), head and pectoral fins in lower view; figs. 4 und 5 unmistakably represent teeth of *Galeocerdo cuvier* (Lesueur). Summarizing, no Carcharhinid species seem to have been recorded by Duhamel and, provided Bigelow & Schroeder (1948: 272) correctly interpreted Blainville's reference to Duhamel, *Squalus*

(or *Carcharhinus*) *lamia* Blainville must be considered identical with, and a junior synonym of, *Galeocerdo cuvier*. I may add that in Bigelow & Schroeder's reference to Duhamel "fig. 3" is an evident misprint for figs. 4 & 5.

Subsequent references to *C. lamia* as listed by Fowler may, at least for a considerable part, concern the separate species *C. longimanus* Poey, a species also erroneously lumped by Fowler as a synonym of *C. lamia*. I re-examined two stuffed specimens in the collection of the Leiden Museum, identified as *Carcharias (Prionodon) lamia* by Müller & Henle (1841: 37), but doubtlessly belonging to *C. longimanus* (reg.nos. 2519 & 2544).

Squalus carcharias Linnaeus appears to be based on both *Carcharodon carcharias* (Linnaeus) and *Carcharhinus longimanus* (Poey), but Bigelow & Schroeder (1948: 142, 354 footnote 51, 362) consider the *Carcharodon* elements by far preponderant. *Squalus carcharias* Lacépède is a composite species which can not be identified, but its figure by Lacépède (1798: pl. 8 fig. 1) is the type of *Carcharhinus commersonii* Blainville and appears to represent *Carcharhinus melanopterus* (Quoy & Gaimard) (Garrick, 1962, 1962a). Subsequent references to *C. commersonii*, as listed by Fowler, usually seem to concern either *C. longimanus* or *C. leucas*.

The holotype of *Carcharias amboinensis* Müller & Henle (Leiden Museum collection, reg.no. 2582) is stuffed and as a consequence shrunk and deformed. Taking these facts into account, I am unable to find any arguments to separate *C. amboinensis* from *C. leucas*. But Bleeker's *C. amboinensis* (1854: 507) (reg.no. 7281) appears to represent an entirely different species, and will presumably be discussed by Dr. Garrick.

I re-examined a Bleeker specimen of *Carcharias fasciatus* Bleeker (1852: 37; 1853: 510) (reg.no. 7379), apparently representing the second specimen Bleeker described. It proved to be a juvenile specimen of *Galcocerdo cuvier* (Lesueur). As both Bleeker's descriptions are almost verbally the same, with only a few slight additions in the second version, we may take that the original specimen which Bleeker was unable to preserve on account of its size (286 cm) also belonged to *Galeocerdo cuvier*, of which species *C. fasciatus* Bleeker thus becomes a junior synonym.

I vainly searched the various descriptions of *C. zambezensis* Peters (for references see Smith, 1952: 859) for characters distinguishing it from *C. leucas*. Actually, Svensson (1933: 17) identified a specimen from the Gambia River, western Africa, as *C. zambezensis*, while I found during a visit to the British Museum in 1957 a specimen thus identified from the Ogooué River, Gabon, which I was unable to distinguish from *C. leucas*.

Finally, it seems interesting to note that *C. lamiella* Jordan & Gilbert and

C. platyrhynchus Gilbert, both of which Fowler put in the synonymy of his *C. lamia,* were recently recognized as valid species by Rosenblatt & Baldwin (1958: 150, 157).

Some more restricted and rather carefully formulated synonymies within the present group have been suggested by Smith (1952: 857), Fourmanoir (1961: 38), and Davies (1962: 257), the discussed nominal species being *C. leucas, C. nicaraguensis, C. zambezensis, C. gangeticus,* and *C. greyi* (presumably the subspecies *mckaili* Whitley, 1945). Bigelow & Schroeder (1961: 359) definitely synonymized *C. nicaraguensis* with *C. leucas.*

During visits to the British Museum (Natural History) in London (1957) and the Muséum National d'Histoire Naturelle in Paris (1958) I had an opportunity to examine two types of *C. leucas* (Paris, reg.no. A. 9650, coll. Plée, Puerto Rico, ♂, stuffed, 165 cm; reg.no. A. 9652, coll. Plée, Antilles, ♀, stuffed, 190 cm), a syntype of *C. gangeticus* (Paris, reg.no. 1141, coll. Bélanger, Ganges River, ♂, in spirits, approximately 58 cm), two specimens identified as *C. gangeticus* from Iraq (B.M., reg.no. 1874.4.28.9, don. Sharpy, Tigris River near Baghdad, ♀, in spirits, 86 cm) and from northern Borneo (B.M., reg.no. 1894.8.3.72, coll. Hose, mouth of Baram River, Sarawak, ♂, in spirits, 77.5 cm), and a specimen identified as *C. zambezensis* from Atlantic Africa (B.M., reg.no. 1913.7.12.?, purchased from Schneider, Ogooué River, Gabon, ♂, in spirits, 85.5 cm). Furthermore, I received from the Western Australian Museum in Perth two fine specimens of *C. greyi* (subsp. *mckaili*) (Leiden Museum, reg.no. 24271, Swan River, E. end Causeway, Western Australia, ♂, in spirits, 108.5 cm; reg.no. 24612, coll. Fooks, Crawley Bay, Swan River near Nedlands, Western Australia, ♂, in spirits, 71.5 cm). A small embryo of the Swan River shark, sent on loan by the Western Australian Museum, is omitted from the present discussion; presumably it will be discussed in a forthcoming paper by Dr. Garrick.

The principal measurements taken were the same as those used by Bigelow & Schroeder, but I must add that both of the more or less deformed stuffed examples and of those since long preserved in too small jars, and therefore contorted, really trustworthy measurements are seldom obtainable, and wishful measuring may become a danger. Still, comparing the data from the material listed above and from my specimens of the Jamoer shark, the following conclusions seem sufficiently well-founded: with a single exception (the type of *C. gangeticus*) all specimens appear to be conspecific, a fact strongly suggesting that *C. zambezensis, C. greyi mckaili,* and most of the recorded *C. gangeticus* from outside the Indo-Pakistan peninsula [1]), are

1) Excepting those from Japan and, possibly, from Viti-Levu, Fiji Islands.

identical with *C. leucas* Müller & Henle. The real *C. gangeticus* appears to differ mainly by having, besides a series of 13 teeth on each side of both jaws, as may be found in *C. leucas,* a continuation of 4 or 5 small irregular teeth toward the angle of the mouth, bringing the total for each jaw up to at least 35, against 25 to 27 in *C. leucas.* As Dr. Garrick (in litt., 22 April 1963) informed me to have found two specimens showing the same characteristics in the collections at Copenhagen and Vienna, the possibility that the Paris example would be merely an aberrant specimen must be ruled out. As a result, *C. gangeticus* must definitely stand as a separate species.

Presumably, several further Australian nominal species of whaler sharks beside *C. greyi* (*mckaili*) will also prove identical with *C. leucas.*

Carcharhinus leucas (Müller & Henle) (fig. 1 a-e; pl. 1, 2) [2]

Material. — 1 ♂, Jamoer Lake, 11 December 1954, total length 1480 mm, RMNH reg.no. 24698; 1 ♂, Jamoer Lake, 22 March 1955, total length 1460 mm, RMNH reg.no. 24699; 2 ♀♀, Jamoer Lake, 24 March 1955, total length 730 mm, RMNH reg.no. 24611 and (presumably) about 1250 mm, RMNH reg.no. 24697. Both ♂♂ have the middle part skinned and the internal organs removed; of the large ♀ only the jaws could be preserved.

Description. — The principal proportional characters, with percentage of total length, are given separately in the accompanying table. To simplify a comparison, most proportional dimensions were taken in the same way as those given by Bigelow & Schroeder (1948) for Atlantic species; moreover, the descriptive part closely follows the scheme used by these authors.

Trunk rather stout, its height and width at origin of first dorsal fin about 5 in length to precaudal pits; the dorsal profile gently convex, but not much more so than the ventral. Midline of back without a dermal ridge. Anterior outline of upper precaudal pit broadly rounded to subangular, the lower pit less developed but similar in shape. Skin rough when stroked towards head, densely covered with slightly raised and overlapping denticles. Dermal denticles a little broader than long, with 3 or (generally) 5 distinct ridges, with 3 prominent teeth directed backwards (the axial by far the largest), separated by rounded notches; the outermost pair of the five teeth little developed.

Head remarkably wide, flattened above, the interorbital area but slightly convex, the width at eyes only a little less than at origins of pectoral fins. Snout broadly rounded, short, almost semi-circular in dorsal view, narrowly

2) The Jamoer shark has already previously been recorded (Brongersma, 1955, 1956, 1956a, 1957, 1958, 1959, 1959a, 1961; Boeseman, 1956, 1956a, 1956b, 1959), but without an identification.

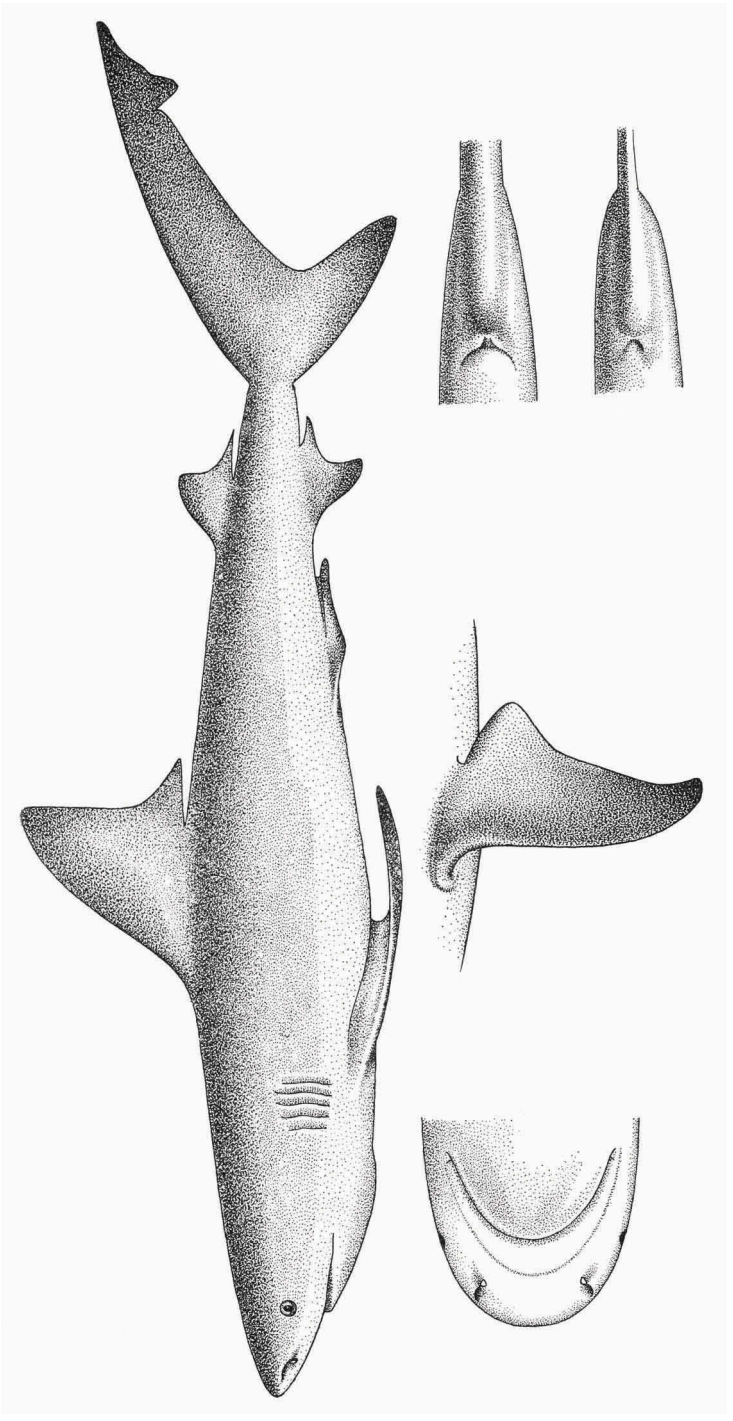

Fig. 1. The Jamoer shark, *Carcharhinus leucas* (Müller & Henle), Leiden Mus. reg.no. 24611. a, lateral view; b, head in ventral view; c, left pectoral fin; d, e, upper and lower caudal notches. a-c, × about 0.25; d, e, × 0.6.

convex along border; length in front of a line connecting outer ends of nostrils about one-third (39.5, 34.0, 33.0, 31.5% successively with increasing size) of distance between inner ends of nostrils; length in front of mouth slightly less than one-third (32.0, —, 29.5, 30.0%) of length of head to origin of pectoral fins. Eye about circular, of rather small size, the diameter strongly varying with the increasing size of the specimens, 24.0, 21.5, 17.5, and 15.5% of distance between inner ends of nostrils; it is so situated that the tip of the lower jaw reaches to below the anterior half of the eye. No spiracles. First gill openings 2.0, —, 3.3, 3.7 diameter of eye, 2.1, —, 1.7, 1.75 in distance between inner ends of nostrils; third gill openings successively 2.15, —, 3.6, 4.0, and 1.95, —, 1.6, 1.65; fifth gill openings 1.4, —, 2.8, 3.1, and 3.0, —, 2.05, 2.1; all openings about evenly spaced, fourth and fifth above insertion of pectoral fin. Nostrils strongly oblique, the inner ends about half way between tip of snout and mouth or slightly closer to mouth (especially in small ♀); the anterior (inner) margins slightly expanded, forming an obtusely triangular flap with a rounded corner, the anterior margin of the flap slightly sinuate. Mouth wide, ovate in ventral view, its height about 2 in width; upper labial furrows very short, indistinct, at approximately a right angle with jaw or obliquely (though slightly) rostrad.

Teeth $\frac{13\text{-}1\text{-}13}{(11)12/13\text{-}1\text{-}(11)12/13}$; on upper jaw broadly triangular with both edges somewhat coarsely serrate from base to tip, the anterior teeth nearly symmetrical with both sides slightly concave, the lateral teeth increasingly asymmetrical with the anterior (inner) margins gradually straightening, the posterior (outer) margins increasingly concave, becoming notched near corners of mouth; lower jaws with teeth more narrowly triangular on broad bases, more finely serrate along both margins, becoming oblique towards corners of mouth; a small triangular tooth at symphysis in each jaw.

First dorsal fin large, its origin above or slightly behind axil of pectoral fins, its vertical height about half the distance from tip of snout to origin of pectoral fins or slightly more, slightly less in small ♀; its base, including posterior flap, somewhat less than the slightly convex anterior margin, equally long in the small ♀; the apex narrowly rounded, the posterior margin almost straight except for a concave lower part; length of free posterior flap variable, 2 to 3 (3.5 in small ♀) in length of base; midpoint of base at least twice as far from origin of ventrals as from pectoral axil.

Second dorsal fin much smaller, its base about two-fifths to one-half of base of first dorsal fin (39 to 47%), its height relatively slightly less, the origin slightly (though distinctly) anterior to that of anal fin, the anterior

outline hardly convex, the apex rounded, the posterior outline concave, the free rear corner sharp, length of free flap 1.3 to 1.6 in length of base, the rear tip distinctly anterior to that of anal fin and separated from dorsal precaudal pit by a distance about 1.4 to 1.6 in second dorsal base.

Caudal with upper margin slightly or hardly convex, the tip narrowly rounded, the triangular apical sector about 4 in total length of fin; the lower lobe almost half length of upper, with a convex anterior outline and an almost straight posterior outline, the tip narrowly rounded; the corner between both lobes more broadly rounded.

Anal fin subequal to second dorsal fin, situated slightly more backwards, with the anterior margin distinctly longer and generally more convex, the posterior outline deeper concave, the apex more narrowly rounded, the free rear flap 1.4 to 1.6 in length of base, the distance between rear tip and lower precaudal pit 2.0 to 2.3 in base of anal fin.

Pelvic fins with nearly straight anterior margins, slightly concave distal margins, their bases distinctly longer than base of anal fin; distance from tips of pelvics to anal origin only about 1.0 to 1.4 in base of anal fin. Myxopterygia elongately conical, reaching along almost three-fifths of free inner margin of pelvics.

Pectoral fins nearly as long as head to origin of pectorals in small ♀, slightly longer in larger specimens, about half as broad as long, the outer margin nearly straight except moderately convex near tip, the distal margin about straight except a concave part towards inner angle, which is moderately rounded; tip much more narrowly rounded.

Colour. — Slaty-grey above, pale below, the distal parts of most fins more or less conspicuously darker.

Occurrence and habits. — After some offal of a slaughtered pig had been thrown into the water, a few sharks soon appeared, even venturing into the hardly knee-deep water near the shore before the native village of Gariau. This happened to be the place where the local population was accustomed to bathe, but bathing continued even after the sharks had been observed. Consequently, it may safely be assumed that the species rather frequently occurs in the lake and is known by the local population to be inoffensive. The species is locally known by the vernacular name "manenne".

It remains difficult to explain why the same species, apparently inoffensive in Jamoer Lake, is known elsewhere to be aggressive and dangerous to human beings. The theory that a frequent occurrence of human bodies started them on this disagreeable habit may be applicable to the Ganges shark, *Carcharhinus gangeticus* (Müller & Henle), but seems unlikely for *C. leucas* in regions with different ceremonial habits (Le Danois, 1949:

TABLE 1

Measurements of *Carcharhinus leucas* (Müller & Henle)

Reg.nos.	24611	24699	24698
Locality	Lake Jamoer W. New Guinea	Lake Jamoer W. New Guinea	Lake Jamoer W. New Guinea
Date	24 III 1955	22 III 1955	11 XII 1954
Sex	♀	♂	♂
Total length (mm)	730	1460	1480
Breadth trunk at origin of pectorals	100/13.6	220/15.0	240/16.1
Height trunk at origin of pectorals	90/12.4	175/12.0	170/11.5
Length snout in front of outer nostrils	19/2.6	33.5/2.3	32.0/2.2
Length snout in front of mouth	48/6.6	88/6.0	88/5.9
Horizontal diameter of eye	11.5/1.6	18/1.25	16/1.1
Breadth of mouth	67/9.1	155/10.5	170/11.5
Height of mouth	34/4.7	85/5.8	80/5.4
Distance between inner ends of nostrils	48/6.6	102/7.0	105/7.1
Length of 1st gill openings	23/3.15	60/4.1	60/4.05
Length of 3rd gill openings	24.5/3.35	65/4.4	65/4.4
Length of 5th gill openings	16/2.2	50/3.4	50/3.4
Vertical height of 1st dorsal fin	70/9.6	170/11.6	185/12.5
Length of base of 1st dorsal fin	90/12.4	180/12.3	165/11.1
Vertical height of 2nd dorsal fin	29/4.0	70/4.8	70/4.7
Length of base of 2nd dorsal fin	42/5.75	70/4.8	75/5.0
Vertical height of anal fin	32/4.4	80/5.5	75/5.0
Length of base of anal fin	38/5.2	72/4.9	70/4.7
Upper margin of caudal fin	200/27.5	410/28.0	420/28.0
Lower anterior margin of caudal fin	92/12.6	205/14.0	205/13.8
Outer margin of pectoral fin	140/19.2	335/23.0	345/23.5
Inner margin of pectoral fin	39/5.3	85/5.8	105/6.8
Distal margin of pectoral fin	110/15.0	310/21.0	335/22.5
Distance from snout to 1st dorsal fin	205/28.0	415/28.5	425/28.5
Distance from snout to 2nd dorsal fin	445/61.0	915/62.5	890/60.0
Distance from snout to upper caudal fin	540/74.0	1050/72.0	1080/73.0
Distance from snout to pectoral fins	150/20.5	300/20.5	295/20.0
Distance from snout to pelvic fins	350/48.0	720/49.0	725/49.0
Distance from snout to anal fin	450/61.5	930/63.5	920/62.0
Interspace between 1st and 2nd dorsal fins	153/21.0	325/22.0	300/20.0
Interspace between 2nd dorsal and caudal fin	52/7.1	100/6.85	115/7.75
Interspace between anal and caudal fin	42/5.75	80/5.5	80/5.4
Dist. betw. origins of pect. and pelvic fins	200/27.5	430/29.5	430/29.0
Dist. betw. origins of pelv. and anal fins	100/13.7	200/13.7	195/13.2
Distance from tip of snout to vent	380/52.0	780/53.5	775/52.0
Distance from tip of snout to 1st gill op.	135/18.5	270/18.5	280/19.0
Interorbital width	88/12.0	180/12.3	200/13.2
Teeth in upper jaws	13-1-13	13-1-13	13-1-13
Teeth in lower jaws	13-1-13	12-1-12	11-1-11

164; Coppleson, 1958: 10). I am inclined to prefer the suggestion put forward by Blegvad & Løppenthin (1944: 40) that the food situation is primarily responsible. Anyhow, the density of the fish population in Jamoer

Lake makes it easy for sharks to appease their appetites without having to attack a more risky human prey in the shallow inshore waters.

The size of the smallest female example indicates a length at birth not surpassing 65 to 70 cm, which agrees with the data for *C. leucas* given by Bigelow & Schroeder (1948: 341). As no specimens with young were collected, it remains for the moment undecided whether reproduction takes place in the lake.

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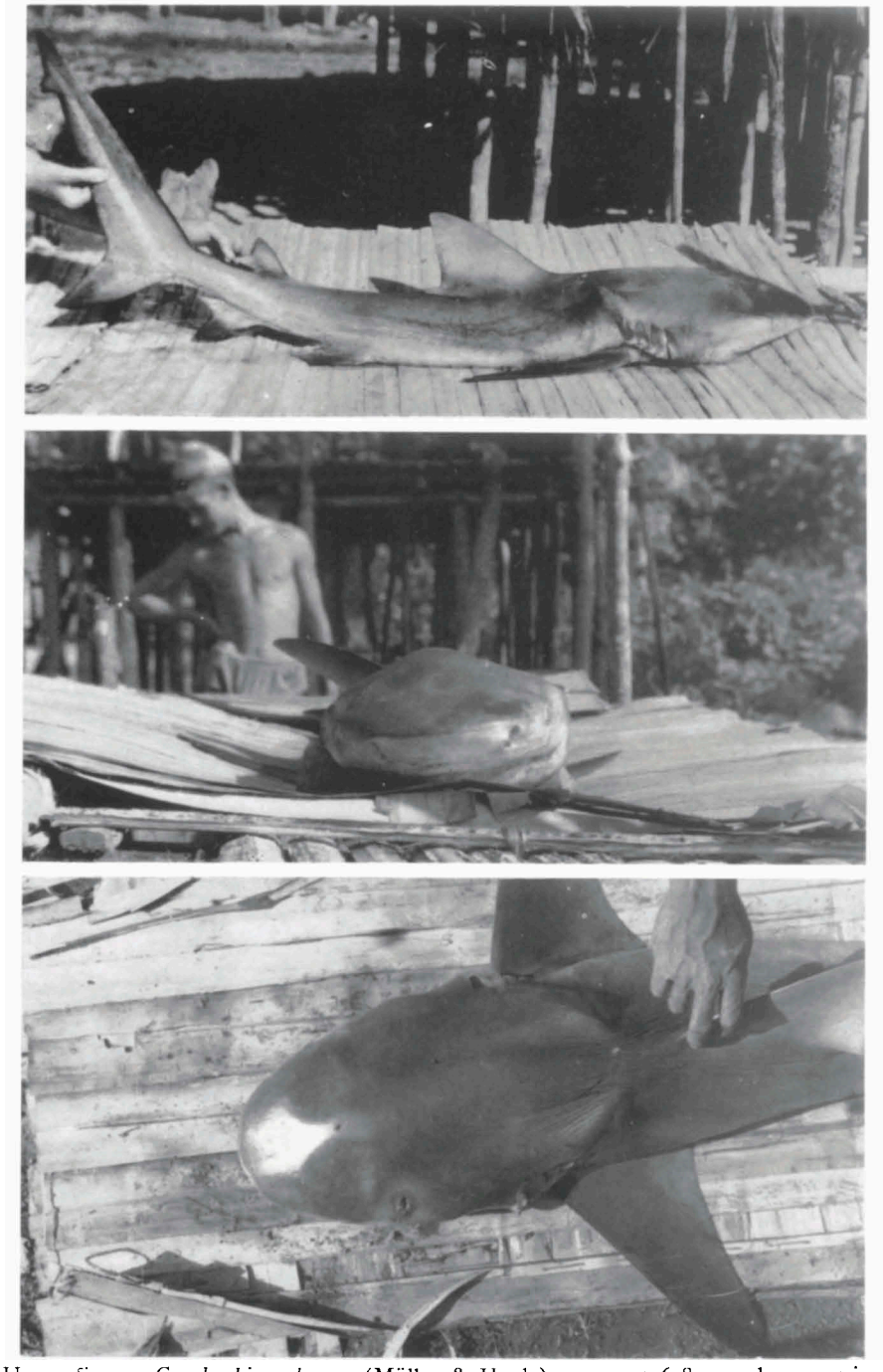
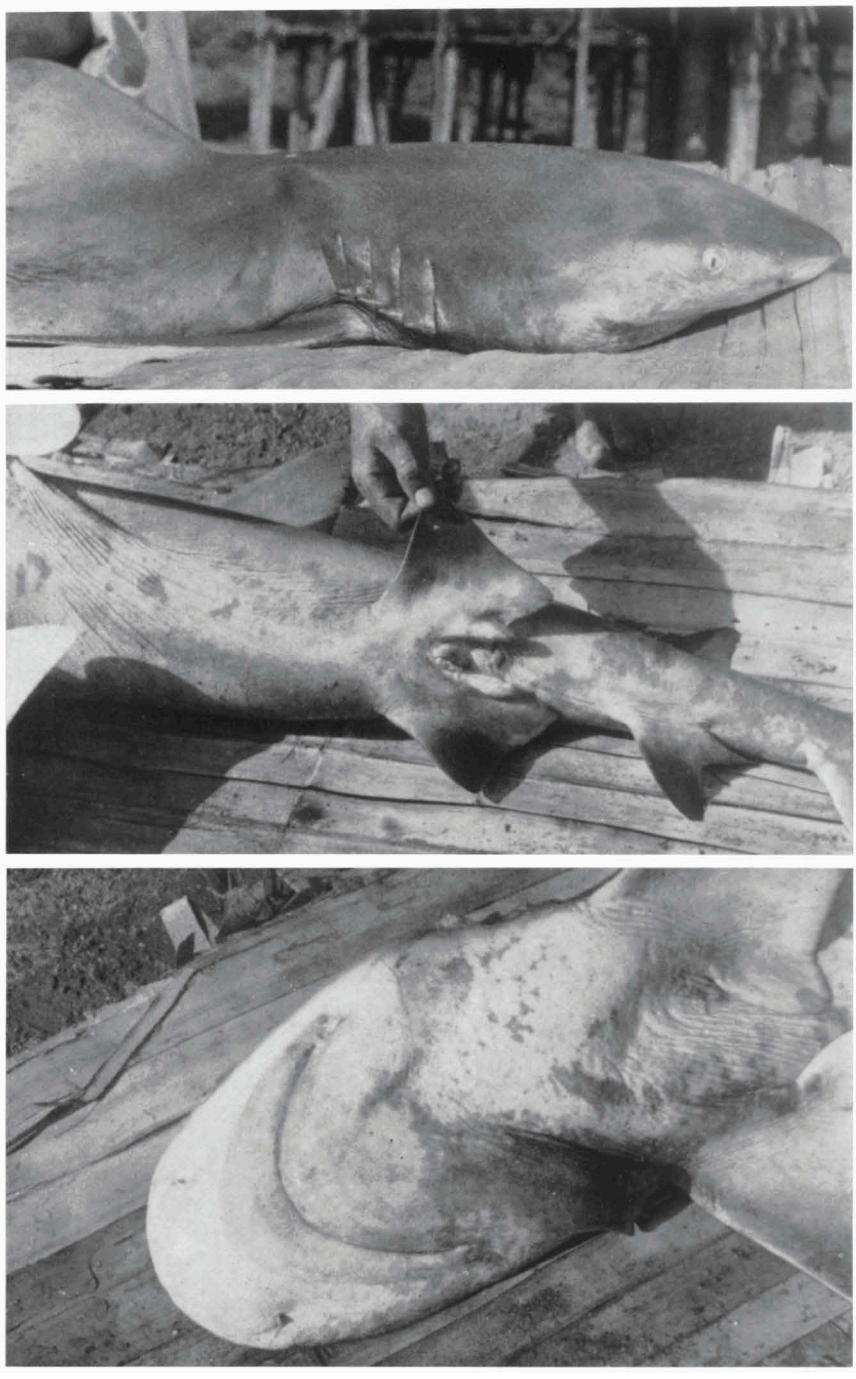


Upper figure: *Carcharhinus leucas* (Müller & Henle), reg.no. 24698, a male measuring 148 cm in total length; middle figure: same specimen in rostral view, showing the strongly flattened head; lower figure: same specimen, anterior part in dorsal view.



Upper figure: *Carcharhinus leucas* (Müller & Henle), reg.no. 24698, lateral close-up of head and anterior part of body; middle figure: same specimen, ventral view of abdominal portion; lower figure: same specimen, ventral view of head with distinct (reddish) post-mortem blotches.