THE DESCRIBED SPECIES OF THE FAMILY SACCULINIDAE

by

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I. INTRODUCTION AND KEYS OF GENERA AND SPECIES

The present paper contains the data concerning the synonymy and the figures of the Sacculinidae, compiled from the various publications dealing with species of the family, to bring the scattered data together in a general survey. The keys contain all the species that are sufficiently known to be considered distinct; unfortunately a number of described species could not be incorporated in these keys for want of definite data concerning their structure. The keys are highly artificial, they do not give an idea of the natural subdivisions of the genera, but are only meant to show that the characters of the recognized species allow of an arrangement leading to a ready identification. If these keys are being used the preliminary identification to which they give occasion should afterwards be checked by the supplementary characters contained in the more elaborate descriptions referred to in the next chapter.

Not all the described species could be inserted into the keys. In this connexion especially a number of Kossmann's (1872) species were omitted, chiefly on account of lack of definite characters. In the cited paper Kossmann described 19 species of the genus *Sacculina*; in connexion with the data of the present paper these may be commented upon as follows.

Sacculina corculum, a well defined species, now the type of the genus *Loxothylacus.*

Sacculina papilio, a well defined species of the family Lernaeodiscidae, placed by Van Baal (1937) in the genus *Triangulus.*

Sacculina carinata, identified by Van Kampen & Boschma (1925) with two specimens on crabs different from the original host; this identification is probably correct. At present the species is placed in the genus *Loxothylacus.*

Sacculina hians, now the type of the genus *Heterosaccus*; specific characters unknown.

Sacculina flexuosa, a well defined species, the originally described material without any doubt conspecific with later described specimens.

Sacculina pilosa, identified by Van Kampen & Boschma (1925) with the parasites of many different hosts; the name at present restricted to a parasite of *Actaea tomentosa* (H. Milne Edwards), an identification which is, however, far from certain.

Sacculina bipunctata and *S. margaritifera,* identified by Van Kampen & Boschma (1925) with specimens on crabs different from the original hosts; these identifications remain uncertain.

Sacculina exarcuata, identified by Boschma (1933a, 1950a) with specimens on crabs different from the original host; this identification remains uncertain.

Sacculina dentata, S. bursa pastoris, S. pisiformis, S. pomum, S. ales, S. captiva, S. cartieri, and *S. cavolinii* for the present are species incertae based on Kossmann's diagnoses only. In later papers no specimens have been described that could be identified with one of these species.

Sacculina crucifera, based on a specimen in which the external cuticle had not yet obtained its definite shape; for the present its specific status must remain undecided.

Sacculina benedeni, a synonym of *S. carcini.*

Besides *Sacculina carcini,* Guérin-Ganivet (1911) examined eight other species of the genus. Of three of these, *S. carpiliae, S. leptodiae,* and *S. gonoplaxae,* the specific characters now are sufficiently known to regard these as distinct species. The species *S. gibsii* now is placed in the synonymy of *S. carcini,* the species *S. gerbei* is regarded as a probable synonym of *S. carcini.* The species *S. phalangi* without any doubt is conspecific with *Drepanorchis neglecta.* The remaining two, *S.* (?) *actaeae* and *S. abyssicola,* in all probability are distinct species, the characters noted by Guérin-Ganivet, however, do not suffice to distinguish these from other species of the genus.

The description of *Sacculina ostracotheris* by Pérez (1920) does not contain specific characters of the parasite, so that this species cannot be considered sufficiently defined.

Sacculina calappae could not be enlisted in the key of the species because a large part of the male organs had become lost. On the other hand *S. leptothrix* and *S. microthrix* occur in the key of the species, notwithstanding the fact that in all probability the specimens on which these species are based are immature and have not yet obtained their definite characters.

In a previous paper (Boschma, 1950a) the species *Sacculina vieta* was placed in the synonymy of *S. exarcuata*; it remains, however, doutbful whether the two are conspecific. The two forms differ especially in the

number of canals of the colleteric glands, in *S. exarcuata* up to 40 to 60 in a longitudinal section, in *S. vieta* about 10 in a transverse section. In the key of the species of the genus *Sacculina* the two forms provisionally are listed separately.

The species belonging to the family Sacculinidae can be arranged in six genera.

Sacculina Thompson, 1836. Type species, by monotypy, *Sacculina carcini* Thompson, 1836.

Heterosaccus Smith, 1906. Type species, by monotypy, *Sacculina hians* Kossmann, 1872.

Sesarmaxenos Annandale, 1911. Type species, by monotypy, *Sesarmaxenos monticola* Annandale, 1911.

Drepanorchis Boschma, 1927a. Type species, by monotypy, *Sacculina neglecta* Fraisse, 1877.

Loxothylacus Boschma, 1928a. Type species, selected by Boschma, 1928a, *Sacculina corculum* Kossmann, 1872.

Ptychascus Boschma, 1933a. Type species, by monotypy, *Ptychascus glaber* Boschma, 1933a.

The designation of the type species of *Heterosaccus* by Smith (1906) is rather unsettled. Smith (l.c., p. 113) gives the following diagnosis of the genus *Heterosaccus*: "Similar to *Sacculina,* save that the mesentery is confined to the surface of the visceral mass immediately round the ring of attachment, and does not stretch to the mantle opening. Mantle opening, in consequence, widely gaping. Parasitic on Brachyura. Solitary." Only one species was placed in the genus (l.c., p. 114): "*H. hians.* Host, *Charybdis* (*Goniohellenus*) *ornata* (M. Edw.), from Suez Canal 5 fathoms (CROSSLAND). Remarks. I think it probable that KOSSMANN's species *Sacculina hians* parasitic on *Thalamita* sp. from the Philippine Islands belongs here." Apparently Smith was in doubt whether Kossmann's *Sacculina hians* was specifically identical with his parasite from the Suez Canal, but because he indicated this parasite with the name *hians,* the designation of *hians* as the type of the genus *Heterosaccus* is nomenclatorially correct.

Key to the genera of the family Sacculinidae

1. Testes globular or cylindrical, with a more or less straight course in a dorsoventral direction 2
— Testes more or less crescentic, curved along the dorsal region of the visceral mass 4
2. Internal surface of the mantle with septa extending into the mantle cavity. *Ptychascus*
— Internal surface of the mantle without septa 3
3. Mesentery wide, forming broad folds . . . . . *Sesarmaxenos*
— Mesentery narrow, directly connecting the visceral mass with the mantle *Sacculina*

4. Mesentery complete, visceral mass attached to the mantle at some distance from the stalk . . . . . *Loxothylacus*
— Mesentery incomplete or absent, visceral mass attached directly to the stalk 5
5. Mesentery present . . . . . *Drepanorchis*
— Mesentery absent . . . . . *Heterosaccus*

It must be kept in mind that next to numerous species that show the generic characters as contained in this key there are a few that possess some of the characters of one genus and some of another, the place of these species in the system then becoming more or less arbitrary. Variations of this kind may even occur in a single species, e.g., in *Loxothylacus variabilis,* in which generally the testes show a distinct curvature, while as an exception they may have a more or less straight course (Boschma, 1940). A similar difficulty was met with by Shiino (1943, p. 25) when describing his species *Sacculina upogebiae*: "In having the elongate and curved testes which are embedded within the visceral mass, *upogebiae* is different from other species of *Sacculina,* but resembles those of *Drepanorchis, Heterosaccus* and *Loxothylacus.* It cannot be placed, however, in the genera *Drepanorchis* and *Heterosaccus,* on account of its complete mesentery, nor in *Loxothylacus,* for the visceral mass is directly attached to the muscular region which forms the base of the stalk. The combination of these characters may be sufficient to warrant the consideration of a new genus. For the present, however, it shall be kept in the genus *Sacculina.*" In this connexion attention may be drawn to a peculiar structure of the testes in two species of the genus *Sacculina, S. anomala* and *S. confragosa* (cf. Boschma, 1937, figs. 5 and 22; Shiino, 1943, figs. 15 and 17); here these organs do not have an entirely straight course, but the closed extremities have a curvature posteriorly in a ventral direction. On account of this peculiarity the two species might be regarded as together forming a genus distinct from *Sacculina.* On the other hand there are a fairly large number of species of the genus *Sacculina* in which the testes towards their closed ends show a slight curvature in an anterior direction, e.g., *S. angulata, S. flexuosa, S. glabra, S. margaritifera, S. scabra,* and *S. schmitti* (cf. figures in Boschma, 1937), these species showing thereby a tendency towards a curvature in a less pronounced manner than occurring in *S. upogebiae.*

Key to the species of the genus *Sacculina*

1. Male genital organs completely or for the greater part in the visceral mass 2
— Male genital organs in the posterior part of the body, outside the visceral mass 27
2. Cavities of the male organs of the two sides of the body completely separated 3
— Male genital organs of the two sides of the body at least partly united, so that the cavities in at least one part communicate 17
3. Vasa deferentia rather abruptly passing into the testes 4
— Vasa deferentia more or less gradually passing into the testes . . . 8

4. Excrescences of the external cuticle consisting of a hyaline kind of chitin, different from that of the main layers of the cuticle. 5
— Structure of the excrescences of the external cuticle not different from that of the main layers of the cuticle 6
5. Lumen of the vasa deferentia divided by numerous ridges. Canal system of the colleteric glands strongly branched (more than 40 canals in longitudinal sections of the most strongly branching region) . . . . . *duracina*
— Lumen of the vasa deferentia very little divided by ridges. Canal system of the colleteric glands moderately branched (not over 30 canals in a longitudinal section) *pilosa*
6. External cuticle with hairs 7
— External cuticle with small papillae covered with minute hairs *teretiuscula*
7. External cuticle densely covered with small hairs of a length of 3 to 8 μ *microthrix*
— External cuticle rather sparsely covered with hairs of a length of 10 to 30 μ. *sinensis*
8. Vasa deferentia wide . . . . . *confragosa*
— Vasa deferentia comparatively narrow 9
9. External cuticle with well developed excrescences 10
— External cuticle with insignificant excrescences or without excrescences . 12
10. Excrescences consisting of a hyaline kind of chitin . . . . *cuspidata*
— Excrescences consisting of chitin not differing from that of the main layers 11
11. External cuticle with hairs . . . . . *muricata*
— External cuticle with papillae or small globular excrescences . *margaritifera*
12. Colleteric glands with numerous canals (more than 40 in a longitudinal section of the most strongly branching region) 13
— Colleteric glands with a moderate number of canals (between 15 and 30 in a longitudinal or transverse section of the most strongly branching region). 15
— Colleteric glands with less than 10 canals in longitudinal sections of the most strongly branching region . . . . . *rathbunae*
13. Testes curved in an anterior direction . . . . . *upogebiae*
— Testes more or less straight in a ventro-dorsal direction 14
14. Testes closely joining . . . . . *pugettiae*
— Testes distinctly separate . . . . . *bucculenta*
15. Dorsal extremities of the testes completely separated 16
— Dorsal extremities of the testes close together . . . . . *calva*
16. Ventral region of the male genital organs with numerous ridges, so that the cavities are more or less irregular. External cuticle without excrescences of any kind *glabra*
— Ventral region of the male genital organs without ridges. External cuticle with minute ridges (height 1 to 2 μ) . . . . . *caelata*
17. Dorsal extremities of the two testes united 18
— Dorsal extremities of the two testes separated 19
18. Vasa deferentia wide . . . . . *fabacea*
— Vasa deferentia narrow . . . . . *pertenuis*
19. External cuticle with distinct excrescences 20
— Surface of the external cuticle more or less rough and uneven, but without distinct excrescences . . . . . *scabra*
20. Excrescences consisting of a hyaline kind of chitin, differing in structure from that of the main layers of the cuticle . . . . . *bipunctata*
— Structure of the excrescences not different from that of the main layers of the cuticle 21
21. Excrescences flat-topped . . . . . *angulata*
— Excrescences hairs or papillae, not with flat tops 22

22. The cavities of the two male genital organs communicating in one region only 23
— The cavities of the two male genital organs as a rule communicating in two different regions . . . . . *lata*
23. Parts of the male genital organs with well developed ridges on their inner walls 24
— Male genital organs without distinct ridges on their inner walls . . . 26
24. Excrescences of the external cuticle with stiff minute spines 25
— Excrescences of the external cuticle with soft minute lateral hairs or without these; length of the excrescences not exceeding 15 μ. . . . . *carcini*
25. Excrescences about 18 μ long, pointed, with minute spines, especially in their basal part . . . . . *weberi*
— Excrescences about 6 to 7 μ long, with minute spines on the whole of their surface. *granulosa*
26. Colleteric glands with numerous canals. External cuticle with hairs (length 20 to 35 μ), which are beset with minute lateral hairs . . . . . *nodosa*
— Colleteric glands with few canals. External cuticle with papillae (length 3 to 9 μ), which are beset with minute spines . . . . . *striata*
27. Cavities of the male organs of the two sides of the body completely separated 28
— Male genital organs of the two sides of the body at least partly united, so that their cavities communicate 81
28. Closed extremities of the male genital organs curved back in a posterior and ventral direction. Testes very small in comparison to the wide vasa deferentia *anomala*
— Closed extremities of the male genital organs not curved back in a posterior and ventral direction 29
29. Vasa deferentia rather abruptly passing into the testes 30
— Vasa deferentia more or less gradually passing into the testes . . . 73
30. Vasa deferentia comparatively wide 31
— Vasa deferentia comparatively narrow 47
31. External cuticle with excrescences consisting of a hyaline kind of chitin, different from that of the main layers; excrescences composed of spines which are more or less united into groups 32
— External cuticle without excrescences or covered with excrescences which are not composed of groups of spines 44
32. Excrescences divided into a few branches each, which at their extremities bear numerous spines 33
— Spines of the excrescences directly attached to the basal part (at least no distinct branches), or spines in groups without common basal part 35
33. Excrescences of large size (75 to 100 μ). . . . . *cordata*
— Excrescences of smaller size (15 to 38 μ) 34
34. External cuticle of the mantle comparatively thick (50 to 75 μ); retinacula probably absent . . . . . *compressa*
— External cuticle of the mantle comparatively thin (10 to 15 μ); retinacula consisting of single spindles, arranged in groups on the internal cuticle . . *pilosella*
35. Spines of the excrescences short (as a rule not longer than 12 μ) . *gracilis*
— Spines of the excrescences longer (as a rule longer than 15 μ). . . . 36
36. Excrescences with well developed basal parts 37
— Basal parts of the excrescences absent or little developed 42
37. Excrescences with numerous long spines; length of the excrescences 80 to 190 μ 38
— Excrescences with comparatively few spines; length of the excrescences as a rule less than 80 μ 40
38. Basal part of excrescences cup-shaped . . . . . *spectabilis*
— Basal part of excrescences with rather flat upper surface. 39
39. Colleteric glands with numerous canals (more than 40 canals in longitudinal sections of the most strongly branching region) . . . . . *rotundata*

— Colleteric glands with few canals (less than 20 canals in longitudinal sections of the most strongly branching region) . . . . . *carpiliae*
40. External cuticle very thick (120 to 130 μ) . . . . . *beauforti*
— External cuticle much thinner, as a rule not over 50 μ 41
41. Spines of the excrescences in small numbers, rather robust . . *vankampeni*
— Spines of the excrescences in larger numbers, rather slender . . . *leptodiae*
42. Colleteric glands with 13 to 30 canals in longitudinal sections of the most strongly branching region . . . . . *yatsui*
— Colleteric glands with up to 10 canals in longitudinal sections of the most strongly branching region 43
43. Retinacula each with 3 to 5 spindles . . . . . *phacelothrix*
— Retinacula each with a single spindle . . . . . *ignorata*
44. External cuticle without excrescences. Surface layer of external cuticle with pigment. *nigra*
— External cuticle as a rule without excrescences, sometimes with small papillae (height 2 to 6 μ); external cuticle without pigment 45
— External cuticle with distinct excrescences 46
45. Colleteric glands with numerous canals . . . . . *punctata*
— Colleteric glands with less than 10 canals in longitudinal sections of the most strongly branching region . . . . . *ternatensis*
46. External cuticle with minute spines. Inner walls of the vasa deferentia with a few ridges only . . . . . *micracantha*
— External cuticle with hairs. Inner walls of the vasa deferentia with numerous ridges. *echinulata*
47. External cuticle with distinct excrescences 48
— External cuticle without distinct excrescences 67
48. Excrescences consisting of a hyaline kind of chitin, different from that of the main layers of the cuticle 49
— Excrescences consisting of approximately the same kind of chitin as that of the main layers of the cuticle 51
49. Excrescences with spur-like projections extending over the surface of the cuticle; top of excrescences with numerous small spines . . . . . *pulchella*
— Excrescences without spur-like projections; top of excrescences with a central blunt papilla 50
50. Papillae of the excrescences not surrounded by spines . . . *semistriata*
— Papillae of the excrescences surrounded by a row of spines . . . *pistillata*
51. Excrescences hairs or spines 52
— Excrescences papillae. 64
52. Colleteric glands with numerous canals (more than 30 in longitudinal sections of the most strongly branching region) 53
— Colleteric glands with comparatively few canals (less than 30 in longitudinal sections of the most strongly branching region) 56
53. Length of the excrescences not exceeding 40 μ 54
— Length of the excrescences up to 70 μ . . . . . *hispida*
54. The two testes of approximately equal size . . . . . *exarcuata*
— The two testes of considerably different size 55
55. Retinacula each with a single spindle of a length of about 20 μ . . *hirta*
— Retinacula with many spindles of a length of up to 30 μ . . . . *eriphiae*
56. Canal system of the colleteric glands forming a rather broad mass . *inflata*
— Canal system of the colleteric glands more or less flattened 57
57. Testes of conspicuously different size and shape . . . . . *gordonae*
— Testes of not strongly different size and shape 58

58. Basal parts of the excrescences of the external cuticle noticeably swollen . 59
— Basal parts of the excrescences of the external cuticle not conspicuously swollen 60
59. Excrescences with stiff minute spines, especially on their basal parts. Length of the excrescences 25 to 30 μ . . . . . *spinosa*
— Excrescences sometimes with a few soft lateral hairs, not with spines. Length of the excrescences 12 to 24 μ . . . . . *elongata*
60. Length of the excrescences up to 70 μ . . . . . *comosa*
— Length of the excrescences less than 40 μ, but over 10 μ 61
— Length of the excrescences from 2 to 10 μ . . . . . *leptothrix*
61. Colleteric glands with about 20 canals in longitudinal sections of the most strongly branching region 62
— Colleteric glands with about 10 canals in longitudinal sections of the most strongly branching region 63
62. Excrescences of the external cuticle with numerous minute lateral hairs, tops of the excrescences not swollen . . . . . *gonoplaxae*
— Excrescences of the external cuticle without minute lateral hairs, tops of the excrescences slightly swollen . . . . . *leopoldi*
63. External cuticle about 25 μ thick . . . . . *hirsuta*
— External cuticle about 50 μ thick . . . . . *vieta*
64. Papillae with a smooth surface, without spines or hairs . . . . . *flacca*
— Papillae with spines or hairs 65
65. Papillae with a central cavity; spines small in comparison to the papillae *teres*
— Papillae without central cavity; spines long in comparison to the papillae . 66
66. Papillae with flat tops, the tops beset with spines . . . . . *senta*
— Papillae with rounded tops, the spines in a row around the middle of the papillae. *hystrix*
67. Colleteric glands with numerous canals (more than 40 canals in longitudinal sections of the most strongly branching region); gregarious . . . . *gregaria*
— Colleteric glands with a smaller number of canals (less than 30 canals in longitudinal sections of the most strongly branching region); as a rule solitary . . 68
68. External cuticle consisting of one kind of chitin only 69
— External cuticle consisting of two different kinds of chitin 72
69. One of the testes well developed, the other rudimentary . . . . *pustulata*
— Both testes well developed 70
70. One testis extending towards the dorsal region much farther than the other 71
— Dorsal ends of the two testes in approximately the same region . . *rugosa*
71. Canals in the colleteric glands in two or three rows . . . . . *gibba*
— Canals in the colleteric glands in a single row . . . . . *pinnotherae*
72. Hyaline parts of the cuticle in its upper half only . . . . . *irrorata*
— Hyaline parts extending through the cuticle from the basal region to the upper layers. *sulcata*
73. Vasa deferentia comparatively wide 74
— Vasa deferentia comparatively narrow 75
74. Vasa deferentia with numerous ridges, reducing the cavities to narrow slits. *flexuosa*
— Vasa deferentia practically without ridges . . . . . *infirma*
75. External cuticle with distinct excrescences 76
— External cuticle without distinct excrescences 78
76. External cuticle with small hairs or elongate papillae 77
— External cuticle with short papillae beset with minute spines . . *verrucosa*
77. Length of the excrescences about 7 μ . . . . . *atlantica*
— Length of the excrescences 15 to 25 μ . . . . . *zariquieyi*

78. Extreme dorsal part of the testes rather tortuous . . . . . *curvata*
— Testes more or less straight 79
79. Vasa deferentia straight, testes with a comparatively thin wall . . . 80
— Vasa deferentia slightly tortuous, testes with a comparatively thick wall *bicuspidata*
80. Canals of colleteric glands in two or three rows . . . . . *anceps*
— Canals of colleteric glands practically in one row . . . . . *imberbis*
81. Vasa deferentia rather abruptly passing into the testes 82
— Vasa deferentia more or less gradually passing into the testes 87
82. External cuticle with excrescences 83
External cuticle without excrescences 84
83. Excrescences comparatively short spines (about 15 μ long) . . . *brevispina*
— Excrescences long hairs (about 70 μ long) . . . . . *setosa*
84. Vasa deferentia entering the testes in the central part of the anterior surface of the male genital complex . . . . . *robusta*
— Vasa deferentia entering the testes in their ventral parts . . . 85
85. Colleteric glands with a large number of canals 86
— Colleteric glands with a very small number of canals . . . . *schmitti*
86. Testes completely united to form one globular mass . . . . *plana*
— Dorsal and ventral parts of the testes separate . . . . . *serènei*
87. External cuticle with more or less flat-topped papillae, which at their upper surface bear numerous small spines 88
— External cuticle with small papillae, without lateral spines or hairs, varying in length from 3 to 9 μ . . . . . *reniformis*
88. Colleteric glands with about 50 canals in longitudinal sections of the most strongly branching region . . . . . *ornatula*
— Colleteric glands with up to 20 canals in longitudinal sections of the most strongly branching region 89
89. Height of the papillae of the external cuticle up to 10 μ . . . *inconstans*
— Height of the papillae of the external cuticle about 20 μ . . . *papposa*

The present key differs from that in a previous paper (Boschma, 1937) by the insertion of the species described since that time. The characters used in the key are largely those of the excrescences of the external cuticle, so that in the key the species are mentioned more or less at random, without taking account of questions of probable affinities. It must be emphasized that this key may lead only to a strictly provisional identification of a specimen.

It is impossible to give a reliable key to the two species of the genus *Sesarmaxenos*. The characters of the type species, *S. monticola*, are not sufficiently known, the generic characters, as used in the key to the genera, are taken from the description of *S. gedehensis* by Feuerborn (1931). The wide mesentery with its broad folds as occurring in this species constitutes a character of generic value. It is not certain that *S. monticola* has a mesentery of a similar shape, so that it remains an open question whether *S. gedehensis* indeed belongs to the genus *Sesarmaxenos*. The fact that the hosts of the two species of the genus *Sesarmaxenos* both are crabs of the genus *Sesarma* does not prove that the two parasites must belong to the same genus,

for two other species of the genus *Sesarma* are known as hosts of the species *Ptychascus glaber* and *Sacculina curvata.*

The genus *Ptychascus* up till now contains but one species, *Ptychascus glaber.*

Key to the species of the genus *Drepanorchis*

1. External cuticle with excrescences consisting of a hyaline kind of chitin, different from that of the main layers . . . . . *fabacea*
— External cuticle consisting of one kind of chitin only 2
2. External cuticle without excrescences . . . . . *tenuicutis*
— External cuticle with excrescences 3
3. Excrescences papillae of a height of 6 μ, which at their tops bear stiff little spines *strigulosa*
— Excrescences hairs or slender papillae of a length of 10 to 15 μ, beset with soft minute lateral hairs 4
4. Male organs narrowly curved, testes wide sacs . . . . . *villosa*
— Male organs widely curved, testes rather thick-walled . . . . . *neglecta*

The key shows that there is but one species of the genus that has an external cuticle without excrescences, the remaining four have distinct excrescences.

Key to the species of the genus *Heterosaccus*

1. External cuticle with hyaline parts of a structure different from the chitin of the main layers 2
— External cuticle consisting of one kind of chitin 3
2. Upper surface of the external cuticle consisting of a hyaline layer, its upper part divided into small areas of a diameter of 6 to 12 μ . . . . . *tessellatus*
— External cuticle with small columns of hyaline chitin, surface of the external cuticle with small conical spines . . . . . *sibogae*
3. External cuticle with papillae of a length of 3 to 9 μ . . . . *papillosus*
— External cuticle without distinct excrescences 4
4. Vasa deferentia rather tortuous . . . . . *californicus*
— Vasa deferentia more or less straight 5
5. The two male organs closely united (the cavities remaining separate) *setoensis*
— The two male organs entirely separate 6
6. Colleteric glands with more than 30 canals in longitudinal sections of their most strongly branching region 7
— Colleteric glands with less than 25 canals in longitudinal sections of their most strongly branching region 8
7. Mantle opening on the top of a short tube . . . . . *ruginosus*
— Mantle opening not protruding over the surface of the mantle. . *pellucidus*
8. Testes with comparatively thick walls . . . . . *occidentalis*
— Testes with comparatively thin walls . . . . . *distortus*

Heterosaccus hians, the type species of the genus, could not find a place in the key because the specific characters remain unknown. For the rest the key is highly artificial because the greater part of the described species of *Heterosaccus* have an external cuticle without excrescences, while often the structure of the internal organs do not easily yield characters for a

specific distinction. Moreover, a complication presents itself because occasionally excrescences occur in a species which is generally devoid of these, e.g., the presence of small papillae on the surface of the cuticle of a specimen of *Heterosaccus ruginosus* (Boschma, 1955b, fig. 5*b*), on account of which the specimen has all the salient characters of the species *H. papillosus*.

Key to the species of the genus *Loxothylacus*

1. External cuticle partly consisting of a hyaline kind of chitin, different from that of the main layers 2
— External cuticle consisting of one kind of chitin only 12
2. Hyaline parts of the external cuticle very little protruding over the surface. 3
— Hyaline parts of the external cuticle distinctly protruding over the surface . 4
3. Hyaline parts of the external cuticle each with five or more lateral extensions, so that their contour is sinuous . . . . . *torridus*
— Hyaline parts of the external cuticle each with three or four lateral extensions. *musivus*
4. Excrescences not composed of groups of rather long spines 5
— Excrescences composed of groups of rather long spines 7
5. Excrescences more or less cylindrical, top beset with small spines . . 6
— Excrescences of rather irregular shape, beset with comparatively long spines pointing in all directions . . . . . *murex*
6. Colleteric glands with up to 60 canals in longitudinal sections of their most strongly branching region; retinacula with spindles of a length of 10 to 14 μ. *carinatus*
— Colleteric glands with more than 150 canals in longitudinal sections of their most strongly branching region; retinacula with spindles of a length of 20 to 26 μ. *ihlei*
7. Excrescences divided into a few branches, each of which again is divided into a number of spines 8
— Excrescences consisting of undivided spines, united in groups on a common basal part 9
8. Testes not very wide . . . . . *desmothrix*
— One of the testes rudimentary, the other enlarged into a wide sac . *auritus*
9. Testes with comparatively thick walls 10
— One or both of the testes enlarged into a wide sac 11
10. Vasa deferentia wide, testes with a distinct curvature . . . . *aristatus*
— Vasa deferentia narrow, testes with an indistinct curvature . . . *vepretus*
11. One of the testes rudimentary, the other enlarged into a wide sac of more or less globular shape . . . . . *setaceus*
— The two testes enlarged into wide sacs, which are laterally compressed *strandi*
12. External cuticle without excrescences . . . . . *bicorniger*
— External cuticle with excrescences 13
13. At least part of the excrescences of a size of over 100 μ 14
— Excrescences of a size of less than 100 μ 16
14. The larger excrescences conical 15
— The larger excrescences in the shape of blunt spines . . . . *variabilis*
15. Besides the conical excrescences no excrescences of a smaller size . *corculum*
— Larger excrescences and surface of the cuticle densely beset with hairs. *echioides*
16. Excrescences comparatively long hairs, 30 to 85 or 35 to 45 μ long. . . 17
— Excrescences as a rule not over 25 μ long, exceptionally to 35 μ long . . 18
17. Male organs distinctly curved, colleteric glands with more than 60 canals in longitudinal sections of the most strongly branching region . . *tomentosus*
— Male organs with indistinct curvature, colleteric glands with about 20 canals in longitudinal sections of the most strongly branching region . *longipilus*

18. Terminal parts of the male organs united, the cavities communicating . 19
— Male organs separate 20
19. Colleteric glands with less than 50 canals in longitudinal sections of the most strongly branching region; retinacula with numerous spindles of a length of 4 to 8 μ. *sclerothrix*
— Colleteric glands with more than 100 canals in longitudinal sections of the most strongly branching region; retinacula with a lesser number of spindles, which have a length of 14 to 18 μ . . . . . *texanus*
20. Retinacula with 20 to 35 spindles . . . . . *armatus*
— Retinacula with 3 to 10 spindles. 21
— Retinacula with 1 or 2 spindles. . . . . *spinulosus*
21. Testes with comparatively thick walls and narrow cavities . . . *panopaei*
— Testes with comparatively thin walls and wide cavities 22
22. Excrescences papillae with a crown of hairs on their tops . . *brachythrix*
— Excrescences papillae with minute hairs scattered on their surfaces . . *amoenus*

Loxothylacus torridus and *L. musivus* differ in characters of minor importance, it is uncertain whether the two are really distinct species. The same holds for *L. brachythrix* and *L. amoenus*. In the description of these two species (Boschma, 1940) attention was drawn to the different shape of the retinacula in the two forms, in *L. brachythrix* with spindles of a length of 9 to 15 μ, in *L. amoenus* with small chitinous knobs of a diameter of about 1.5 μ. It is highly probable that these small chitinous knobs represent the adumbrations of spindles which during further growth would have become of the normal size.

II. LIST OF SYNONYMS AND FIGURES

In the following pages the species of the six genera of the Sacculinidae are arranged alphabetically according to their specific names. The synonymies generally are restricted to the data of occurrence of the parasites on different hosts and of records of different names of the parasites; the lists of synonyms, therefore, do not aim at a complete bibliography of the parasites. The list of figures of each of the species is fairly complete as far as are concerned those which appeared in papers dealing with the systematics of the parasites; figures in textbooks or in papers in the field of general biology were not taken into account, because as a rule these are reproduced from figures appearing in the lists.

Homonyms which eventually proved to belong to other species are listed in brackets in the synonymy of the species, the definite name of the parasite then is added at the end.

Among the species enumerated in the following pages there are two that originally were described as species of the genus *Sacculina* (*S. galatheae* and *S. papilio*), but later proved to belong to the family Lernaeodiscidae, these are listed with their present names only, without further synonymy.

In a similar manner the species *Sacculina purpurea* (at present classified in the family Peltogastridae) has been mentioned.

In the following pages an attempt has been made to record the hosts of the parasites with their nomenclatorially correct names, often differing from those used in previous papers. The author is greatly indebted to Dr. L. B. Holthuis who spent a great deal of time in checking the various names. Though some of the names of crabs at present may appear rather uncommon (e.g., *Macropipus* instead of *Portunus* or *Liocarcinus* for the common European swimming crabs) it was thought expedient to make use of the correct names in preference to names that eventually will become definitely established as synonyms.

In the present list the species are enumerated according to their status in the literature of the group. At the end of the list remarks are added on species occurring as a parasite of two or more hosts with indications concerning probable or established errors in the identification of several specimens. The nomenclatorial changes in the names of the parasites to be brought about as a result of these errors have not been effected in the present paper that was largely meant as a review of our actual knowledge of the systematics of the family Sacculinidae.

Sacculina **abyssicola** Guérin-Ganivet, 1911.

Type specimen on *Ethusina abyssicola* S. I. Smith; type locality Cape Verde Islands.

Guérin-Ganivet, 1911, *Sacculina abyssicola* on *Ethusina abyssicola* S. I. Smith, Azores.
Figures: Guérin-Ganivet, 1911, text-fig. 9 (general anatomy), Pl. I figs. 10, 11 (external shape).

Sacculina? **actaeae** Guérin-Ganivet, 1911.

Type specimen on *Actaea rufopunctata* (H. Milne Edwards); type locality Canary Islands.

Holthuis, 1953, Rhizocephalan on *Actaea rufopunctata* (H. Milne Edwards), Onotoa, Gilbert Islands, = *S. actaeae*?
Figure: Guérin-Ganivet, 1911, fig. 8 (general anatomy).

Sacculina **aculeata** Boschma, 1928c.

Type specimen on *Carupa laeviuscula* Heller; type locality Jiddah, Red Sea.

= *S. leptodiae* Guérin-Ganivet?
Figures: Boschma, 1928c, fig. 1*a, b* (external shape), fig. 4 (male organs, colleteric gland, external cuticle); Krüger, 1940, fig. 186 (external cuticle).

Sacculina **ales** Kossmann, 1872.

Type specimen on *Macrophthalmus* spec.; type locality Cavite, near Manila, Philippine Islands.

Figure: Kossmann, 1872, Pl. I fig. 9 (external shape).

Loxothylacus **amoenus** Boschma, 1940.

Type specimen on *Phymodius granulatus* (Targioni Tozzetti); type locality near Kupang, Timor, East Indies.

Figures: Boschma, 1940, fig. 59 (male organs), fig. 60 (colleteric gland), fig. 61 (external cuticle, retinacula); Boschma, 1947d, fig. 5*c* (external shape).

Sacculina **anceps** Boschma, 1931a.

Type specimen on *Albunea symnista* (Linnaeus); type locality Java(?).

Figures: Boschma, 1931a, fig. 33*c* (external shape), fig. 38 (male organs, colleteric gland), fig. 39 (external cuticle); Boschma, 1937, fig. 1 (male organs), fig. 2 (colleteric gland).

Sacculina **andersoni** Giard, 1887.

Type specimen on *Macropipus holsatus* (Fabricius); type locality Wimereux, Atlantic coast of France.

= *Sacculina carcini* Thompson.

Sacculina **angulata** Van Kampen & Boschma, 1925.

Type specimen on *Portunus* (*Hellenus*) *longispinosus* (Dana); type locality Waigeu, East Indies.

Haswell, 1888, *Sacculina* on *Thalamita sima* H. Milne Edwards, Sydney, =*S. angulata*?

Krüger, 1912, *Sacculina carcini* on *Thalamita sima* H. Milne Edwards, Japan, = *S. angulata*?

Boschma, 1931a, *Sacculina angulata* on *Thalamita sima* H. Milne Edwards, Koh Kam, Thailand.

Figures: Van Kampen & Boschma, 1925, Pl. I fig. 17 (external shape), Pl. III fig. 5 (male organs, colleteric gland), text-fig. 34 (external cuticle); Boschma, 1931a, fig. 7*c* (external shape), fig. 14 (male organs, colleteric gland), fig. 15 (external cuticle, retinacula); Boschma, 1937, fig. 3 (male organs), fig. 4 (colleteric gland); Krüger, 1940, fig. 174*c* (external shape).

Sacculina **anomala** Boschma, 1933b.

Type specimen on *Thalamita cooperi* Borradaile; type locality Amirante, Western Indian Ocean.

Rathbun, 1925, Rhizocephalid parasite on *Thalamita cooperi* Borradaile, Amirante.

Shiino, 1943, *Sacculina anomala* on *Charybdis* (*Gonioneptunus*) *bimaculata* (Miers), Toyama Bay and Momotori, Japan.

Figures: Boschma, 1933b, fig. 6 (external cuticle, retinacula); Boschma, 1937, fig. 5 (male organs), fig. 6 (colleteric gland); Shiino, 1943, fig. 2*C* (external shape), fig. 15 (male organs, colleteric gland, external cuticle, retinacula); Boschma, 1950a, fig. 1*f* (external shape), fig. 4*b* (male organs).

Loxothylacus **aristatus** Boschma, 1931c.

Type specimen on *Atergatis floridus* (Linnaeus); type locality Beo, Karakelong, Talaud Islands, East Indies.

Van Kampen & Boschma, 1925, *Sacculina pilosa* (p.p.).

(Boschma, 1933a, *Loxothylacus aristatus* on *Parthenope* (*Rhinolambrus*) *contraria* (Herbst), Macclesfield Bank, China Sea, = *Loxothylacus strandi* Boschma, 1936c).

Figures: Van Kampen & Boschma, 1925, Pl. I fig. 4 (external shape), text-fig. 5 (external cuticle); Boschma, 1931c, fig. 3*d* (external cuticle), fig. 39 (male organs, colleteric gland); Boschma, 1936c, fig. 1*a* (external shape), fig. 2 (male organs), fig. 3 (colleteric gland), fig. 4 (external cuticle); Boschma, 1948a, fig. 1*a* (external shape), fig. 3*a* (external cuticle); Krüger, 1940, fig. 192 (external cuticle).

Loxothylacus **armatus** Boschma, 1949e.

Type specimen on *Paraxanthus barbiger* (Poeppig); type locality Talcahuano, Chile.

Figures: Boschma, 1949e, text-fig. 1 (external shape), text-fig. 2 (colleteric gland), text-figs. 3, 4, fig. on plate (male organs), text-fig. 5 (external cuticle, retinacula).

Sacculina **atlantica** Boschma, 1927a.

Type specimen on *Dorhynchus thomsoni* Norman; type locality Southwest of Ireland.

Smith, 1906, *Sacculina carcini* on *Dorhynchus thomsoni* Norman.

Figures: Boschma, 1927a, fig. 2*d-g* (external shape), fig. 4*h* (external cuticle), fig. 12 (male organs and colleteric gland); Boschma, 1928b, fig. 6 (external cuticle); Boschma, 1937, fig. 7 (male organs, colleteric gland).

Loxothylacus **auritus** Boschma, 1954b.

Type specimen on *Calappa philargius* (Linnaeus); type locality Bay of Nhatrang, Indo-China.

Figures: Boschma, 1954b, fig. 1*a* (external shape), fig. 2 (male organs), fig. 3 (anatomy, colleteric gland), fig. 4 (colleteric gland), fig. 5 (external cuticle, retinacula).

Sacculina **beauforti** Boschma, 1949b.

Type specimen on *Scylla serrata* (Forskål); type locality Sandakan Bay, Borneo.

Figures: Boschma, 1949b, fig. 1*a* (external shape), fig. 2 (male organs, colleteric gland), fig. 3 (external cuticle).

Sacculina **belli** Giard, 1888.

Type specimen on *Macropipus marmoreus* (Leach); type locality Wimereux, Atlantic coast of France.

= *Sacculina carcini* Thompson.

Grapsisaccus benedeni (Kossmann, 1872).

= *Sacculina carcini* Thompson.

Sacculina **benedeni** Kossmann, 1872.

Type specimen on *Pachygrapsus marmoratus* (Fabricius); type locality Palma, Balearic Islands.

= *Sacculina carcini* Thompson.

Sacculina **betencourti** Giard, 1887.

Type specimen on *Portumnus latipes* (Pennant); type locality Wimereux, Atlantic coast of France.

= *Sacculina carcini* Thompson.

Sacculina **biangularis** Kossmann, 1872.

= *Sacculina inflata* Leuckart.

Loxothylacus **bicorniger** Boschma, 1933b.

Type specimen on *Portunus* (*Portunus*) *ventralis* (A. Milne Edwards); type locality Hog Island, Nassau, Bahamas, British West Indies.

Figures: Boschma, 1933b, fig. *22* (external cuticle, retinacula); Boschma, 1950a, fig. *2l* (external shape), fig. 35 (male organs, colleteric gland).

Sacculina **bicuspidata** Boschma, 1931a.

Type specimen on *Microphrys bicornutus* (Latreille); type locality Tobago, British West Indies.

Figures: Boschma, 1931a, fig. *7l* (external shape), fig. 31 (male organs, colleteric gland), fig. 32 (external cuticle); Boschma, 1937, fig. 8 (male organs, colleteric gland); Krüger, 1940, fig. *174l* (external shape).

Sacculina **bipunctata** Kossmann, 1872.

Type specimen on *Portunus* spec.; type locality Kreiangel, Palao, Philippine Islands.

Van Kampen & Boschma, 1925, *Sacculina bipunctata* on *Pilumnus* spec., Kei Islands.

Figures: Kossmann, 1872, Pl. I fig. 14 (external shape), Pl. I fig. 24 (external cuticle); Van Kampen & Boschma, 1925, Pl. I fig. 13 (external shape), Pl. III fig. 1 (male organs, colleteric gland), text-fig. 26 (external cuticle); Boschma, 1931c, fig. 7 (male organs).

Loxothylacus **brachythrix** Boschma, 1940.

Type specimen on *Xantho sanguineus* (H. Milne Edwards); type locality Ternate, East Indies.

Boschma, 1940, *Loxothylacus brachythrix* on *Xantho sanguineus* (H. Milne Edwards), Tidore; on *Lybia tesselata* (Latreille), near Kupang, Timor.

Boschma, 1947d, *Loxothylacus brachythrix* on *Xantho exaratus* (H. Milne Edwards), Una Island, Mergui Archipelago; on *Phymodius ungulatus* (H. Milne Edwards), Tering Bay, Lombok Strait.

Boschma, 1954e, *Loxothylacus brachythrix* on *Xantho exaratus* (H. Milne Edwards) and on *Xantho gracilis* Dana, Nhatrang, Indo-China.

Boschma, 1955c, *Loxothylacus brachythrix* on *Xantho gracilis* Dana, Nhatrang, Indo-China; on *Phymodius ungulatus* (H. Milne Edwards), Tering Bay, Lombok Strait.

Figures: Boschma, 1940, figs. 48, 51, 54, 56 (male organs), figs. 49, 52, 57 (colleteric gland), figs. 50, 53, 55, 58 (external cuticle, retinacula); Boschma, 1947d, fig. *2* (external shape); Boschma, 1954e, fig. *1a-h, j-r, t, u, w-b'*, fig. *2a-d, f-z*, fig. *3c-f* (external shape), fig. 4 (male organs), fig. 5 (colleteric gland), fig. 6 (external cuticle, retinacula); Boschma, 1955c, figs. 2, 3 (male organs, colleteric gland), fig. 4 (external cuticle, retinacula).

Sacculina **brevispina** Van Kampen & Boschma, 1925.

Type specimen on *Actaea hirsutissima* (Rüppell); type locality Sanguisiapo, Sulu Archipelago.

Figures: Van Kampen & Boschma, 1925, Pl. I fig. 6 (external shape), text-fig. 16 (external cuticle, retinacula); Boschma, 1931c, fig. 22 (male organs, colleteric gland); Boschma, 1937, fig. 9 (male organs, colleteric gland).

Sacculina **bucculenta** Boschma, 1933a.

Type specimen on *Micippa philyra* (Herbst); type locality Martaban, Lower Burmah.

Figures: Boschma, 1933a, fig. 7*d* (external shape), figs. 21, 22 (male organs, colleteric gland), fig. 23 (external cuticle, retinacula); Boschma, 1937, fig. 10 (male organs, colleteric gland).

Sacculina **bursa pastoris** Kossmann, 1872.

Type specimen on *Parthenope* (*Rhinolambrus*) *turriger* (Adams & White); type locality Philippine Islands.

Figure: Kossmann, 1872, Pl. I fig. 3 (external shape).

Sacculina **caelata** Boschma, 1931a.

Type specimen on *Typhlocarcinus nudus* Stimpson; type locality South of Koh Bidang, Thailand.

Figures: Boschma, 1931a, fig. 7*e* (external shape), fig. 19 (male organs, colleteric gland), fig. 20 (external cuticle, retinacula); Boschma, 1937, fig. 11 (male organs); fig. 12 (colleteric gland); Krüger, 1940, fig. 174*e* (external shape), fig. 187*a* (external cuticle).

Sacculina **calappae** Van Kampen & Boschma, 1925.

Type specimen on *Calappa pustulosa* Alcock; type locality Java Sea.

Figures: Van Kampen & Boschma, 1925, Pl. I fig. 14 (external shape), text-fig. 29 (external cuticle, retinacula); Boschma, 1931c, fig. 28 (male organs, colleteric gland); Boschma, 1937, fig. 13 (colleteric gland).

Heterosaccus **californicus** Boschma, 1933b.

Type specimen on *Pugettia producta* (Randall); type locality Santa Cruz, California.

Rathbun, 1925, Rhizocephalid parasites on *Pugettia producta* (Randall), Santa Cruz, California, and on *Loxorhynchus crispatus* Stimpson, Monterey Bay, California.

Rathbun, 1925, Rhizocephalid parasite on *Pelia tumida* (Lockington), Magdalena Bay, Lower California, = *H. californicus* ?

Boschma, 1933b, *Heterosaccus californicus* on *Loxorhynchus crispatus* Stimpson, Monterey Bay, California.

Ricketts & Calvin, 1948, *Heterosaccus californicus* on *Pugettia producta* (Randall), California.

MacGinitie & MacGinitie, 1949, *Sacculina* on *Loxorhynchus grandis* Stimpson, California, = *H. californicus* ?

Boschma, 1950a, *Heterosaccus californicus* on *Taliepus nuttallii* (Randall), San Diego, California.

Figures: Boschma, 1933b, fig. 19 (external cuticle, retinacula); Krüger, 1940, fig. 189*d* (retinacula), fig. 194*a* (external cuticle); MacGinitie & MacGinitie, 1949, fig. 117 (external shape); Boschma, 1950a, figs. 2*h*, 3*d*, *g*, *i* (external shape), figs. 21, 23, 25 (male organs), fig. 22 (colleteric gland), figs. 24, 26 (external cuticle, retinacula).

Sacculina **calva** Boschma, 1933b.

Type specimen on *Menaethius monoceros* (Latreille); type locality Saya de Malha, Western Indian Ocean.

Rathbun, 1911, Rhizocephalid on *Menaethius monoceros* (Latreille), Saya de Malha.

Figures: Boschma, 1933b, fig. 3 (external cuticle; Boschma, 1937, fig. 14 (male organs), fig. 15 (colleteric gland); Krüger, 1940, fig. 208, 6 (male organs); Boschma, 1950a, fig. 1*c* (external shape), fig. 6*a* (male organs, colleteric gland).

Sacculina **captiva** Kossmann, 1872.

Type specimen on *Myra fugax* (Fabricius); type locality Bohol, Philippine Islands.

Figure: Kossmann, 1872, Pl. I fig. 11 (external shape).

Pachybdella carcini Lilljeborg, 1859.

= *Sacculina carcini* Thompson.

Pachybdella carcini Stuxberg, 1873.

= *Drepanorchis neglecta* (Fraisse).

Peltogaster carcini Rathke, 1843.

= *Sacculina carcini* Thompson.

Sacculina **carcini** Thompson, 1836.

Type specimen on *Carcinus maenas* (Linnaeus); type locality coast of England.

Rathke, 1843, *Peltogaster carcini* on *Carcinus maenas* (Linnaeus), Norway.

Diesing, 1850, *Pachybdella rathkei* on *Carcinus maenas* (Linnaeus).

Bell, 1853, parasite on *Macropipus marmoreus* (Leach) and on *Carcinus maenas* (Linnaeus).

Steenstrup, 1854, *Sacculina* on *Pilumnus hirtellus* (Linnaeus), Mediterranean = *S. carcini*?

Lilljeborg, 1859, *Pachybdella carcini* on *Carcinus maenas* (Linnaeus) and on *Macropipus marmoreus* (Leach).

Lilljeborg, 1859, *Pachybdella carcini* on *Pilumnus hirtellus* (Linnaeus), = *S. carcini*?

Van Beneden, 1861, *Sacculina carcini* on *Carcinus maenas* (Linnaeus) and on *Macropipus marmoreus* (Leach), Belgian coast; on *Pachygrapsus marmoratus* (Fabricius), Balearic Islands.

Gerbe, 1862, *Sacculina* on *Xantho incisus* (Leach), = *S. carcini*?

Hesse, 1867, *Sacculinidia gibbsii* on *Pisa armata* (Latreille), Atlantic coast of France.

Kossmann, 1872, *Sacculina gibsii* on *Pisa armata* (Latreille); *Sacculina benedeni* on *Pachygrapsus marmoratus* (Fabricius), Balearic Islands.

Kossmann, 1873, *Sacculina benedeni* on *Xantho incisus* (Leach), = *S. carcini*?

Van Ankum, 1873, *Sacculina carcini* on *Carcinus maenas* (Linnaeus) (?), Heligoland.

Richiardi, 1875, *Sacculina* on *Macropipus corrugatus* (Pennant), = *S. carcini*?; *Sacculina* on *Xantho incisus* (Leach), = *S. carcini*?; Mediterranean.

Hoek, 1878, *Sacculina pisae* on *Pisa armata* (Latreille), Naples; *Sacculina* on *Macropipus depurator* (Linnaeus), North Sea, = *S. carcini*?

(Malm, 1881, *Sacculina carcini* on *Cancer pagurus* Linnaeus, Bohuslän, = *S. inflata* Leuckart).

Delage, 1884, *Sacculina carcini* on *Macropipus pusillus* (Leach), Atlantic coast of France.

(Delage, 1884, *Sacculina carcini* on *Macropodia longirostris* (Fabricius), = *Drepanorchis neglecta* (Fraisse)).

Giard, 1887, *Sacculina betencourti* on *Portumnus latipes* (Pennant); *Sacculina priei* on *Macropipus puber* (Linnaeus); *Sacculina andersoni* on *Macropipus holsatus* (Fabricius); Atlantic coast of France.

Giard & Bonnier, 1887, *Sacculina similis* on *Macropipus arcuatus* (Leach), Atlantic coast of France.

Bonnier, 1887, *Sacculina gerbei* on *Xantho incisus* Leach, Atlantic coast of France, = *S. carcini*?

Giard, 1888, *Sacculina belli* on *Macropipus marmoreus* (Leach), Atlantic coast of France.

Sars, 1890, *Sacculina carcini* on *Carcinus maenas* (Linnaeus), South and West coast of Norway.

Giard & Bonnier, 1890, *Grapsisaccus benedeni* on *Pachygrapsus marmoratus* (Fabricius); *Portunascus corrugatus* on *Macropipus corrugatus* (Pennant), = *S. carcini*?

Stebbing, 1893, *Grapsisaccus benedeni* on *Pachygrapsus marmoratus* (Fabricius); *Portunascus corrugatus* on *Macropipus corrugatus* (Pennant), = *S. carcini*?

Giard, 1899, *Sacculina carcini* on *Carcinus maenas* (Linnaeus); *Sacculina betencourti* on *Portumnus latipes* (Pennant); *Sacculina andersoni* on *Macropipus holsatus* (Fabricius); *Sacculina belli* on *Macropipus marmoreus* (Leach); *Sacculina gibsi* on *Pisa armata* (Latreille); Atlantic coast of France.

Scott, 1901, *Sacculina carcini* on *Carcinus maenas* (Linnaeus), Clyde area, Scotland.

Smith, 1906, *Sacculina carcini* on *Herbstia condyliata* (Herbst), = *S. carcini*?; on *Macropipus holsatus* (Fabricius); on *Macropipus corrugatus* (Pennant), = *S. carcini*?; on *Brachynotus sexdentatus* (Risso); on *Pachygrapsus marmoratus* (Fabricius).

(Smith, 1906, *Sacculina carcini* on *Macropodia rostrata* (Linnaeus) and on *Inachus dorsettensis* (Pennant), = *Drepanorchis neglecta* (Fraisse)).

(Smith, 1906, *Sacculina carcini* on *Dorhynchus thomsoni* Norman, = *Sacculina atlantica* Boschma).

(Smith, 1906, *Sacculina carcini* on *Hyas araneus* (Linnaeus) and on *Hyas coarctatus* Leach, = *Sacculina inflata* Leuckart).

(Smith, 1906, *Sacculina carcini* on *Eriphia spinifrons* (Herbst), = *Sacculina eriphiae* Smith).

(Smith, 1906, *Sacculina carcini* on *Goneplax angulata* (Pennant), = *Sacculina goneplaxae* Guérin-Ganivet).

Stephensen, 1910, *Sacculina carcini* on *Macropipus pusillus* (Leach), Denmark.

Guérin-Ganivet, 1911, *Sacculina pirimelae* on *Pirimela denticulata* (Montagu), Atlantic coast of France.

Pesta, 1918, *Sacculina* (and ? *Peltogaster*) on *Carcinus maenas* (Linnaeus), *Sacculina* on *Macropipus arcuatus* (Leach) and on *Pachygrapsus marmoratus* (Fabricius), Adriatic.

(Gruvel, 1920, *Sacculina benedeni* on *Geryon affinis* A. Milne Edwards & Bouvier, Atlantic Ocean, West of Canary Islands, = ?).

Boschma, 1927a, *Sacculina carcini* on *Bathynectes longipes* (Risso), Mediterranean.

Boschma, 1928b, *Sacculina carcini* on *Carcinus maenas* (Linnaeus) and on *Macropipus holsatus* (Fabricius), Denmark, Netherlands.

Popov, 1929, *Sacculina pauli* on *Brachynotus sexdentatus* (Risso), Bay of Sevastopol.

Stephensen, 1933, *Sacculina carcini* on *Carcinus maenas* (Linnaeus) and on *Macropipus holsatus* (Fabricius), Denmark.

Boschma, 1933a, *Sacculina carcini* on *Macropipus arcuatus* (Leach), Falmouth Harbour; on *Macropipus pusillus* (Leach), Starcross, Devon (not noted, l.c., in list of material, but referred to in the text).

Bulgurkov, 1938, *Sacculina carcini* on *Carcinus maenas* (Linnaeus), *Sacculina carcini* and *Sacculina benedeni* on *Pachygrapsus marmoratus* (Fabricius), Black Sea.

(Bulgurkov, 1938, *Sacculina carcini* on *Eriphia spinifrons* (Herbst), Black Sea, = *Sacculina eriphiae* Smith).

Antipa, 1941, *Sacculina carcini* on *Carcinus maenas*, Black Sea.

Popovici, 1942, *Sacculina carcini* on *Pachygrapsus marmoratus* (Fabricius), Black Sea.

Veillet, 1945, *Sacculina carcini* on *Carcinus maenas* (Linnaeus), Mediterranean coast of France.

Boschma, 1947f, ***Sacculina carcini*** on *Carcinus maenas* (Linnaeus) and on *Macropipus holsatus* (Fabricius), Belgian coast.

Williams, 1954, *Sacculina carcini* on *Carcinus maenas* (Linnaeus), Northeast Ireland.

Figures: Rathke, 1843, Pl. XII figs. 18, 19 (external shape); Van Beneden, 1861, Pl. XXX figs. 2, 3, 11 (external shape); Anderson, 1862, Pl. I figs. 3, 10, 12, 13 (external shape, anatomy); Kossmann, 1872, Pl. I fig. 18 (external shape), Pl. II figs. 3, 7, 10, 13 (anatomy, male organs); Fraisse, 1877, Pl. XII fig. 12 (external shape); Delage, 1884, Pls. XXII-XXX (larval and embryonic development, external shape, anatomy, male organs, colleteric gland, external cuticle, retinacula); Smith, 1906, Pl. I fig. 5 (external shape); Guérin-Ganivet, 1911, Pl. I figs. 1, 2 (external shape); Van Kampen & Boschma, 1925, text-fig. 2 (external cuticle); Boschma, 1927a, figs. *1a-h, j-l, 2a, b* (external shape), figs. 3, *4a-c, e-g, i-l* (external cuticle), fig. *7c-l* (retinacula), figs. 9, 13, 15, 18, 19 (male organs, colleteric gland); Popov, 1929, Pl. I figs. 1, 2 (external shape); Stephensen, 1933, fig. 50, *3* (external shape); Boschma, 1937, figs. 16-19 (male organs), fig. 20 (colleteric gland); Bulgurkov, 1938, Pl. I figs. 3, 4 (external shape); Krüger, 1940, fig. 206 (colleteric gland).

Drepanorchis carinata Boschma, 1928c.

= *Loxothylacus carinatus* (Kossmann).

Sacculina carinata Kossmann, 1872.

= *Loxothylacus carinatus* (Kossmann).

Loxothylacus **carinatus** (Kossmann, 1872).

Type specimen on *Portunus* aff. *hastatus*; type locality Lapinig Canal, Philippine Islands.

Kossmann, 1872, *Sacculina carinata.*

Van Kampen & Boschma, 1925, *Sacculina carinata* on *Caphyra levis* (A. Milne Edwards), Binongko, = *Loxothylacus carinatus,* Boschma, 1931c.

Van Kampen & Boschma, 1925, *Sacculina carinata* on *Thalamita prymna* (Herbst), Banda, = *Drepanorchis carinata,* Boschma, 1928c, = *Loxothylacus carinatus,* Boschma, 1931c.

Boschma, 1931a, *Loxothylacus carinatus* on *Portunus* (*Hellenus*) *hastatoides* (Fabricius), East Asia; on *Lissocarcinus polybioides* Adams & White, off Jolo, Sulu Islands.

Boschma, 1949d, 1950b, *Loxothylacus carinatus* on unknown host, Hongkong; on unidentified Portunid crab, Obi latu; on *Thalamita admeta* (Herbst), Amboina.

Figures: Kossmann, 1872, Pl. I fig. 12 (external shape), Pl. I fig. 20 (external cuticle); Van Kampen & Boschma, 1925, Pl. I fig. 12 (external shape), text-figs. 24, 25 (external cuticle, retinacula); Boschma, 1931a, fig. 33*k-m* (external shape), fig. 50 (male organs, colleteric gland), fig. 51 (external cuticle, retinacula); Boschma, 1931c, fig. 38 (male organs, colleteric gland); Boschma, 1949d, fig. *1c-e* (external shape), figs. 6-8 (male organs, colleteric gland); Boschma, 1950b, figs. 1, 3, 5, 7 (male organs, colleteric gland), figs. 2, 4, 6 (external cuticle, retinacula).

Sacculina **carpiliae** Guérin-Ganivet, 1911.

Type specimen on *Carpilius convexus* (Forskål); type locality Red Sea.

Klunzinger, 1913, *Sacculina* on *Carpilius convexus* (Forskål), Red Sea, = *S. carpiliae?*

Boschma, 1936b, *Sacculina carpiliae,* type specimen.

Boschma, 1949a, *Sacculina carpiliae* on *Carpilius convexus* (Forskål), Red Sea, Zanzibar, and Madagascar; on *Xanthias lamarcki* (H. Milne Edwards), Manin Island; on *Lybia tesselata* (Latreille), Gilbert Islands; on *Glyptoxanthus vermiculatus* (Lamarck), Indian Ocean.

Figures: Guérin-Ganivet, 1911, Pl. I figs. 3-5 (external shape), text-figs. 5, 6 (mantle opening); Klunzinger, 1913, Pl. V fig. 1*f* (external shape); Boschma, 1936b, fig. *a* (external cuticle); Boschma, 1949a, fig. 1 (external shape), figs. 2, 3, 7*a*, *b*, 9*a-c*, 11 (male organs), figs. 4, 7*c*, *d*, 9*d*, 12*b-d* (colleteric gland), figs. 5, 6, 8, 10, 12*a* (external cuticle).

Sacculina **cartieri** Kossmann, 1872.

Type specimen on *Pilumnus vespertilio* (Fabricius); type locality Bohol, Philippine Islands.

Figure: Kossmann, 1872, Pl. I fig. 13 (external shape).

Sacculina **cavolinii** Kossmann, 1872.

Type specimen on *Parthenope* (*Aulacolambrus*) *hoplonotus* Adams & White; type locality Philippine Islands(?).

Figure: Kossmann, 1872, Pl. I fig. 16 (external shape).

Sacculina **comosa** Boschma, 1931c.

Type specimen on *Heteropanope glabra* Stimpson; type locality Madura, East Indies.

Van Kampen & Boschma, 1925, *Sacculina setosa* (p.p.).

Figures: Van Kampen & Boschma, 1925, text-fig. 22 (external cuticle); Boschma, 1931c, fig. 5*k* (external shape), fig. 26 (male organs, colleteric gland); Boschma, 1937, fig. 21 (male organs, colleteric gland).

Sacculina **compressa** Boschma, 1931c.

Type specimen on *Ozius tuberculosus* H. Milne Edwards; type locality Merak, West Java.

Van Kampen & Boschma, 1925, *Sacculina pilosella* (p.p.).

Boschma, 1931c, *Sacculina compressa* on *Eriphia sebana* (Shaw & Nodder), Merak, West Java.

Figures: Van Kampen & Boschma, 1925, text-fig. 15 (external cuticle); Boschma, 1931c, fig. 3*w-z* (external cuticle), fig. 5*i*, *j* (external shape), figs. 17, 18 (male organs, colleteric gland).

Sacculina **confragosa** Boschma, 1933a.

Type specimen on *Pachygrapsus crassipes* Randall; type locality Misaki, Japan.

Krüger, 1912, *Sacculina carcini* on *Pachygrapsus crassipes* Randall, Sagami Bay, Japan, = *S. confragosa*?

Boschma, 1935, *Sacculina confragosa* on *Pachygrapsus crassipes* Randall, Misaki and Sagami Bay, Japan.

Boschma, 1937, *Sacculina levis* on unknown host, Japan.

Shiino, 1943, *Sacculina confragosa* on *Pachygrapsus crassipes* Randall and on *Goetice depressus* (De Haan), various localities in Japan.

Anonymus, 1949, *Sacculina confragosa* on *Pachygrapsus crassipes* Randall and on *Goetice depressus* (De Haan), Japan.

Figures: Boschma, 1933a, fig. 7*b* (external shape), figs. 16, 17 (male organs, colleteric gland), fig. 18 (external cuticle, retinacula); Boschma 1933b, fig. 14 (external cuticle, retinacula); Boschma, 1937, fig. 22 (male organs), fig. 23 (colleteric gland); Shiino, 1943, fig. 2*E* (external shape), fig. 17 (male organs); Anonymus, 1949, fig. on p. 867 (external shape, external cuticle); Boschma, 1950a, fig. 2*b* (external shape).

Loxothylacus **corculum** (Kossmann, 1872).

Type specimen on *Atergatis floridus* (Linnaeus); type locality Bohol, Philippine Islands.

Kossmann, 1872, *Sacculina corculum.*

Zehntner, 1894, *Sacculina corculum* on *Atergatis floridus* (Linnaeus), Amboina.

Van Kampen & Boschma, 1925, *Sacculina corculum* on *Atergatis floridus* (Linnaeus), Beo, Talaud Islands, = *Loxothylacus corculum,* Boschma, 1931c.

Boschma, 1950d, *Loxothylacus corculum* on *Xantho sanguineus* (H. Milne Edwards), Mozambique and Zanzibar.

Figures: Kossmann, 1872, Pl. I fig. 1 (external shape), Pl. I fig. 21 (external cuticle), Pl. II figs. 5, 9 (anatomy, male organs, colleteric gland); Van Kampen & Boschma, 1925, Pl. I fig. 11 (external shape), Pl. II fig. 3 (male organs), text-fig. 23 (external cuticle, retinacula); Boschma, 1950d, figs. 6, 7 (male organs, colleteric gland), fig. 8 (external cuticle, retinacula).

Sacculina corculum Kossmann, 1872.

= *Loxothylacus corculum* (Kossmann).

Sacculina **cordata** Shiino, 1943.

Type specimen on *Tylocarcinus styx* (Herbst); type locality Yaeyama Islands, Japan.

(Boschma, 1928c, *Sacculina pilosa* on *Tiarinia gracilis* Dana, Halmaheira, = *Sacculina rotundata,* Boschma, 1931c, = *Sacculina synaptothrix* Boschma, 1948b).

Boschma, 1948b, *Sacculina synaptothrix* on *Tylocarcinus styx* (Herbst), Obi latu, East Indies.

Boschma, 1952b, *Sacculina cordata* on *Tiarinia gracilis* Dana and on *Tylocarcinus styx* (Herbst).

Figures: Boschma, 1928c, fig. 2*c* (external cuticle); Shiino, 1943, fig. 1*G* (external shape), fig. 9 (male organs, colleteric gland, external cuticle); Boschma, 1948b, fig. 3 (external shape), figs. 4, 7, 8 (male organs), fig. 5 (colleteric gland), figs. 6, 9 (external cuticle).

Portunascus **corrugatus** Giard.

Type specimen on *Macropipus corrugatus* (Pennant); type locality Gulf of Naples(?).

=*Sacculina carcini* Thompson?

Sacculina **crucifera** Kossmann, 1872.

Type specimen on *Actaea savignyi* (H. Milne Edwards); type locality Lapinig Canal, Bohol, Philippine Islands.

Figures: Kossmann, 1872, Pl. I fig. 6 (external shape), Pl. I fig. 22 (external cuticle).

Sacculina **curvata** Boschma, 1933b.

Type specimen on *Sesarma* (*Sesarma*) *edwardsii philippinense* Rathbun; type locality Pangauran River, Port Caltum, Busuanga Island, Philippine Islands.

Rathbun, 1914, Rhizocephalid parasite on *Sesarma* (*Sesarma*) *edwardsii philippinense* Rathbun, Pangauran River, Port Caltum, Busuanga Island, Philippine Islands.

Boschma, 1928c, *Sacculina flexuosa* (p.p.).

Boschma, 1933b, *Sacculina curvata* on *Uca dussumieri* (H. Milne Edwards), Sebatic Island, Borneo.

Boschma, 1953a, *Sacculina curvata* on *Varuna litterata* (Fabricius), Bay of Batavia, and on *Macrophthalmus erato* De Man, Madura, East Indies.

Figures: Boschma, 1928c, fig. 1*c, d* (external shape), fig. 5*a, b* (male organs), fig. 6*e-g, i-k* (external cuticle); Boschma, 1933b, fig. 13 (external cuticle); Boschma, 1937, fig. 24 (male organs), fig. 25 (colleteric gland); Krüger, 1940, fig. 190*e-g, i, k* (external cuticle); Boschma, 1950a, figs. 2*a,* 3*h* (external shape), figs. 9*d,* 13 (male organs, colleteric gland); Boschma, 1953a, fig. 1*b, c, e, g* (external shape), figs. 6-8 (male organs), fig. 9*a, b* (colleteric gland).

Sacculina **cuspidata** Boschma, 1949d.

Type specimen on *Pseudozius caystrus* (Adams & White); type locality Tidore, East Indies.

Boschma, 1949d, *Sacculina cuspidata* on *Chlorodopsis* spec., Mamudju, Celebes.

Figures: Boschma, 1949d, fig. 1*a, b* (external shape), figs. 2, 4 (male organs, colleteric gland), figs. 3, 5 (external cuticle, retinacula).

Sacculina **dentata** Kossmann, 1872.

Type specimen on *Portunus* spec.; type locality Lapinig Canal, Bohol, Philippine Islands.

Figures: Kossmann, 1872, Pl. I fig. 2 (external shape), Pl. II fig. 6 (anatomy, male organs, colleteric gland).

Loxothylacus **desmothrix** Boschma, 1931a.

Type specimen on *Pilumnus normani* Miers; type locality Banda Neira, East Indies.

Van Kampen & Boschma, 1925, *Sacculina pilosa* on *Pilumnus* spec., Kei Islands, = *Loxothylacus desmothrix* Boschma, 1931c.

De Man, 1928, *Sacculina* on *Pilumnus normani* Miers.

Figures: Van Kampen & Boschma, 1925, text-fig. 11 (external cuticle); Boschma, 1931a, fig. 33*n, o* (external shape), fig. 52 (male organs), fig. 53 (external cuticle); Boschma, 1931c, fig. 3*r-t* (external cuticle), fig. 5*l* (external shape), fig. 41 (male organs, colleteric gland); Boschma, 1936c, fig. 1*b, c* (external shape), figs. 9, 12 (male organs), fig. 10 (colleteric gland), figs. 11, 13 (external cuticle); Krüger, 1940, fig. 187*k* (external cuticle).

Heterosaccus **distortus** Boschma, 1933b.

Type specimen on *Schizophrys aspera* (H. Milne Edwards); type locality vicinity of Jolo, Philippine Islands.

Figures: Boschma, 1933b, fig. 18 (external cuticle, retinacula); Boschma, 1950a, fig. 2*g* (external shape), fig. 20 (male organs, colleteric gland).

Sacculina **duracina** Boschma, 1933a.

Type specimen on *Parthenope* (*Parthenope*) *longimanus* (Leach); type locality Port Molle, Queensland.

Figures: Boschma, 1933a, fig. 7*a* (external shape), figs. 8-10 (male organs, colleteric gland), fig. 11 (external cuticle); Krüger, 1940, fig. 187*h* (external cuticle).

Sacculina **echinulata** Van Kampen & Boschma, 1925.

Type specimen on *Actumnus setifer* (De Haan) (not *Acanthophrys longispinus* (De Haan); type locality South of Salawati.

Figures: Van Kampen & Boschma, 1925, text-fig. 18 (external cuticle, retinacula); Boschma, 1931c, fig. 5*o* (external shape), fig. 23 (male organs, colleteric gland); Boschma, 1937, fig. 26 (male organs, colleteric gland); Krüger, 1940, fig. 189*b* (retinacula), fig. 194*b* (external cuticle).

Loxothylacus **echioides** Boschma, 1940.

Type specimen on *Euxanthus exsculptus* (Herbst); type locality Mamudju, Celebes.

Figures: Boschma, 1940, fig. 26 (male organs), fig. 27 (colleteric gland), figs. 28, 29 (external cuticle, retinacula); Boschma, 1947d, fig. 5*a* (external shape).

Sacculina **elongata** Boschma, 1933a.

Type specimen on *Ethusina gracilipes* (Miers) var. *robusta* Miers; type locality Challenger Expedition, Sta. 191 (West of Aru Islands, East Indies).

Figures: Boschma, 1933a, fig. 7*g* (external shape), fig. 31 (male organs, colleteric gland), fig. 32 (external cuticle); Boschma, 1937, fig. 27 (male organs), fig. 28 (colleteric gland).

Sacculina **eriphiae** Smith, 1906.

Type specimen on *Eriphia spinifrons* (Herbst); type locality Gulf of Naples.

Richiardi, 1875, *Sacculina* on *Eriphia spinifrons* (Herbst), Mediterranean.

Smith, 1906, *Sacculina carcini* on *Eriphia spinifrons* (Herbst), Gulf of Naples.

Smith, 1906 (explanation of Plate I), *Sacculina eriphiae* on *Eriphia spinifrons* (Herbst), Gulf of Naples.

Boschma, 1927a, *Sacculina eriphiae* on *Eriphia spinifrons* (Herbst), Naples and Constantinople.

Bulgurkov, 1938, *Sacculina carcini* on *Eriphia spinifrons* (Herbst), Black Sea.

Figures: Smith, 1906, Pl. I fig. 6 (external shape); Boschma, 1927a, fig. 2*c* (external shape), fig. 6 (external cuticle), fig. 7*a, b* (retinacula), fig. 16 (male organs, colleteric gland); Boschma, 1937, figs. 29, 30 (male organs), fig. 31 (colleteric gland); Bulgurkov, 1938, Pl. I fig. 1 (external shape); Krüger, 1940, fig. 207*a* (colleteric gland).

Sacculina **exarcuata** Kossmann, 1872.

Type specimen on *Cancer* spec.; type locality Lapinig Canal, Bohol, Philippine Islands.

Richiardi, 1875, *Sacculina* on *Actaea savignyi* (H. Milne Edwards), Red Sea, = *S. exarcuata*?

Smith, 1906, *Sacculina carcini* on *Actaea savignyi* (H. Milne Edwards), Suez, Red Sea, = *S. exarcuata*?

Rathbun, 1911, Rhizocephalid parasite on *Actaea savignyi* (H. Milne Edwards), Seychelles.

Boschma, 1933a, *Sacculina exarcuata* on *Parthenope* (*Parthenope*) *valida* De Haan, Shanghai, China.

Boschma, 1933b. *Sacculina vieta* on *Actaea savignyi* (H. Milne Edwards), Seychelles, = *Sacculina exarcuata*, Boschma, 1950a.

Boschma, 1950a, *Sacculina exarcuata* on *Actaea savignyi* (H. Milne Edwards), Hongkong.

Figures: Kossmann, 1872, Pl. I fig. 15 (external shape); Boschma, 1933a, fig. 7*e* (external shape), fig. 26 (male organs, colleteric gland), fig. 27 (external cuticle, retinacula); Boschma, 1933b, fig. 8 (external cuticle, *S. vieta*); Boschma, 1937, fig. 32 (male organs), fig. 33 (colleteric gland), fig. 94 (male organs, colleteric gland, *S. vieta*); Boschma, 1950a, fig. 1*h* (external shape, *S. vieta*), 3*a* (external shape), fig. 9*a* (male organs, *S. vieta*), fig. 10 (male organs, colleteric gland), fig. 11 (external cuticle, retinacula).

Drepanorchis **fabacea** Boschma, 1931a.

Type specimen on *Achaeopsis pugnax* De Man; type locality off Misaki, Japan.

De Man, 1928, *Sacculina* on *Achaeopsis pugnax* De Man.

Boschma, 1931a, *Drepanorchis fabacea* on *Achaeus japonicus* (De Haan)?, Misaki, on *Achaeopsis pugnax* De Man, Sagami Sea, on *Achaeopsis superciliaris* Ortmann, Sagami Sea.

Figures: Boschma, 1931a, fig. 33*e* (external shape), fig. 40 (male organs, colleteric gland), fig. 41 (external cuticle).

Sacculina **fabacea** Shiino, 1943.

Type specimen on *Percnon planissimum* (Herbst); type locality Seto, Japan.

Figures: Shiino, 1943, fig. 2*B* (external shape), fig. 14 (male organs, colleteric gland, external cuticle, retinacula).

Sacculina **flacca** Boschma, 1931a.

Type specimen on *Galathea* spec.; type locality Banda, East Indies.

Figures: Boschma, 1931a, fig. 33*f* (external shape), fig. 36 (male organs, colleteric gland), fig. 37 (external cuticle); Boschma, 1937, fig. 34 (male organs, colleteric gland); Krüger, 1940, fig. 187*b* (external cuticle).

Sacculina **flexuosa** Kossmann, 1872.

Type specimen on *Grapsus strigosus* (Herbst); type locality Digollorin, Luzon, Philippine Islands.

Van Kampen & Boschma, 1925, *Sacculina flexuosa* on *Grapsus strigosus* (Herbst), Nusa Laut.

Boschma, 1928c, *Sacculina flexuosa* on *Grapsus strigosus* (Herbst), Haruku and unknown locality.

(Boschma, 1928c, *Sacculina flexuosa* on *Grapsus strigosus* (Herbst), "Indian Ocean", = *Sacculina infirma* Boschma, 1953).

(Boschma, 1928c, *Sacculina flexuosa* on *Varuna litterata* (Fabricius), Island Alkmaar, Bay of Batavia, = *Sacculina curvata* Boschma, 1953).

(Boschma, 1928c, *Sacculina flexuosa* on *Macrophthalmus erato* De Man, Madura, = *Sacculina curvata* Boschma, 1953).

(Boschma, 1928c, *Sacculina flexuosa* on *Plagusia depressa* (Fabricius), locality unknown, = *Sacculina punctata* Boschma, 1953).

(Boschma, 1931a, *Sacculina flexuosa* on *Plagusia depressa* (Fabricius), Caroline Islands and locality unknown, = *Sacculina punctata* Boschma, 1953).

Boschma, 1931c, *Sacculina flexuosa* on *Grapsus strigosus* (Herbst) (including specimens later (1953a) identified with *S. punctata, S. curvata,* and *S. infirma*).

Boschma, 1933a, *Sacculina flexuosa* on *Grapsus tenuicrustatus* (Herbst), Amboina.

Figures: Kossmann, 1872, Pl. I fig. 10 (external shape), Pl. II fig. 1 (anatomy, male organs, colleteric gland); Van Kampen & Boschma, 1925, Pl. I fig. 22 (external shape), text-fig. 37 (external cuticle, retinacula); Boschma, 1928c, fig. 6*b-d* (external cuticle, retinacula); Boschma, 1933a, fig. 41 (male organs, colleteric gland), fig. 42 (retinacula); Boschma, 1937, fig. 35 (male organs), fig. 36 (colleteric gland); Krüger, 1940, fig. 190*b-d* (external cuticle, retinacula), fig. 208, 3 (male organs); Boschma, 1953a, fig. 1*a, d* (external shape), fig. 2 (general anatomy), fig. 3 (male organs, colleteric gland).

Sacculina **formosa** Boschma, 1931c.

Type specimen on *Lithocheira setosa* (A. Milne Edwards); type locality Banda, East Indies.

= *Sacculina gracilis* Boschma.

Sacculina **fraissei** Giard, 1886.

Type specimen on *Macropodia rostrata* (Linnaeus); type locality Atlantic coast region of France.

= *Drepanorchis neglecta* (Fraisse).

Sacculina fraissei var. *aegyptia* Giard, 1887.

Type specimen on *Macropodia aegyptia* (H. Milne Edwards); type locality Algiers.

= *Drepanorchis neglecta* (Fraisse).

Sacculina **galatheae** Norman & Scott, 1906.

= *Triangulus galatheae* (Norman & Scott).

Sesarmaxenos **gedehensis** Feuerborn, 1931.

Type specimen on *Sesarma noduliferum* De Man; type locality Tjibodas region, Mount Gedeh, West Java.

Figures: Feuerborn, 1931, fig. 1 (external shape), fig. 2 (general anatomy), fig. 3 (male organs, colleteric gland); Krüger, 1940, fig. 202 (male organs, colleteric gland).

Sacculina **gerbei** Bonnier, 1887.

Type specimen on *Xantho incisus* (Leach); type locality Concarneau, Atlantic coast of France(?).

= *Sacculina carcini* Thompson?

Sacculina **gibba** Boschma, 1933b.

Type specimen on *Eriocheir rectus* Stimpson; type locality Nuiwha, near Foochow, China.

Figures: Boschma, 1933b, fig. 12 (external cuticle); Boschma, 1937, fig. 37 (male organs, colleteric gland); Boschma, 1950a, fig. 1*l* (external shape), fig. 12*b* (male organs, colleteric gland).

Sacculinidia **gibbsii** Hesse, 1867.

Type specimen on *Pisa armata* (Latreille); type locality Brest, Atlantic coast of France.

= *Sacculina carcini* Thompson.

Sacculina gibsii Kossmann, 1872.

= *Sacculina carcini* Thompson.

Ptychascus **glaber** Boschma, 1933a.

Type specimen on *Sesarma* (*Holometopus*) *benedicti* Rathbun; type locality Marajo Island, Brazil.

Boschma, 1933a, *Ptychascus glaber* on *Aratus pisonii* (H. Milne Edwards), Marajo Island.

Figures: Boschma, 1933a, fig. 43, fig. 44 (on Pl. 7) (external shape), fig. 45 (male organs, colleteric gland), fig. 47 (external cuticle).

Sacculina **glabra** Van Kampen & Boschma, 1925.

Type specimen on *Hyastenus subinermis* Zehntner; type locality Damar Island, East Indies.

Boschma, 1948b, *Sacculina glabra* on *Tiarinia gracilis* Dana, Beo, Talaud Islands.

Figures: Van Kampen & Boschma, 1925, Pl. I fig. 23 (external shape), text-fig. 38 (external cuticle); Boschma, 1931c, fig. 10 (male organs); Boschma, 1937, fig. 38 (male organs, colleteric gland); Boschma, 1948b, fig. 10 (external shape, retinacula), fig. 11 (male organs, colleteric gland).

Sacculina **gonoplaxae** Guérin-Ganivet, 1911.

Type specimen on *Goneplax angulata* (Pennant); type locality Gulf of Cadiz.

Richiardi, 1875, *Sacculina* on *Goneplax angulata* (Pennant), Mediterranean.

Marion, 1883, *Peltogaster* on *Goneplax angulata* (Pennant), Mediterranean.

Smith, 1906, *Sacculina carcini* on *Goneplax angulata* (Pennant).

Boschma, 1927a, 1927b, *Sacculina gonoplaxae* on *Goneplax angulata* (Pennant), Gulf of Naples.

Boschma, 1933a, *Sacculina gonoplaxae* on *Goneplax angulata* (Pennant), Atlantic coast of Morocco and Naples.

Figures: Guérin-Ganivet, 1911, Pl. I fig. 9 (external shape); Boschma, 1927a, fig. 1*i* (external shape), fig. 4*d* (external cuticle), fig. 17 (male organs, colleteric gland); Boschma, 1937, fig. 39 (male organs, colleteric gland).

Sacculina **gordonae** Boschma, 1933c.

Type specimen on *Atergatis floridus* (Linnaeus); type locality Sultan Shoal, Singapore.

Figures: Boschma, 1933c, fig. 1 (external shape), figs. 2-4 (male organs, colleteric gland), fig. 5 (external cuticle), fig. 6 (retinacula); Boschma, 1937, fig. 40 (male organs, colleteric gland); Krüger, 1940, fig. 208, 5 (male organs).

Sacculina **gracilis** Boschma, 1931a.

Type specimen on *Portunus* spec. (probably *Portunus* (*Hellenus*) *longispinosus* Dana var. *obtusidentata* Miers); type locality Koh Kahdat, Thailand.

Haswell, 1888, *Sacculina* on *Thalamita sima* H. Milne Edwards, Sydney, = *S. gracilis*?

Krüger, 1912, *Sacculina carcini* on *Thalamita sima* H. Milne Edwards, Japan, = *S. gracilis*?

Rathbun, 1929, Rhizocephalid parasite on *Ser fukiensis* Rathbun, China.

Boschma, 1931a, *Sacculina gracilis* on *Thalamita sima* H. Milne Edwards, Koh Kam, Thailand.

Boschma, 1931c, *Sacculina formosa* on *Lithocheira setosa* (A. Milne Edwards), Banda.

Boschma, 1951a, *Sacculina gracilis* on *Thalamita investigatoris* Alcock, Sissie near Misool; on *Thalamita stimpsoni* A. Milne Edwards, Siglap, Singapore; on *Thalamita sima* H. Milne Edwards, Siglap, Singapore; on *Thalamita* spec., South of Salawati.

Boschma, 1951c, *Sacculina gracilis* on *Ser fukiensis* Rathbun, China; on *Notonyx vitreus* Alcock, Tawi Tawi Group, Sulu Islands.

Figures: Boschma, 1931a, fig. 7*h* (external shape), fig. 23 (male organs, colleteric gland), fig. 24 (external cuticle); Boschma, 1931c, fig. 5*h* (external shape), fig. 20 (male organs, colleteric gland), fig. 21 (external cuticle); Krüger, 1940, fig. 174*h* (external shape), fig. 187*i* (external cuticle); Boschma, 1951a, fig. 1 (external shape), figs. 2-5 (external cuticle), fig. 6 (male organs), fig. 7 (colleteric gland); Boschma, 1951c, fig. 1 (external shape), fig. 2 (male organs), fig. 3 (colleteric gland), figs. 4, 5 (external cuticle).

Sacculina **granulosa** Boschma, 1931c.

Type specimen on *Phalangipus longipes* (Linnaeus); type locality between Ceram and New Guinea.

Van Kampen & Boschma, 1925, *Sacculina verrucosa* (p.p.).

Figures: Van Kampen & Boschma, 1925, Pl. I fig. 15 (external shape), text-fig. 30 (external cuticle, retinacula); Boschma, 1931c, fig. 8 (male organs, colleteric gland); Boschma, 1937, fig. 41 (male organs), fig. 42 (colleteric gland).

Sacculina **gregaria** Okada & Miyashita, 1935.

Type specimen on *Eriocheir japonicus* (De Haan); type locality River Yura, Japan.

Figures: Okada & Miyashita, 1935, figs. 1, 2, 12-14, 17 (external shape), fig. 3 (retinacula), fig. 4 (male organs, colleteric gland); Boschma, 1937, fig. 43 (male organs), fig. 44 (colleteric gland); Krüger, 1940, fig. 176 (external shape), fig. 199 (male organs, colleteric gland).

Sacculina herbstiae Kossmann, 1872.

= *Sacculinida Herbstia nodosa* Hesse.

Sacculinida **Herbstia nodosa** Hesse, 1867.

Type specimen on *Herbstia condyliata* (Herbst); type locality Brest, Atlantic coast of France.

Heterosaccus **hians** (Kossmann, 1872).

Type specimen on *Thalamita* spec.; type locality Java.

Kossmann, 1872, *Sacculina hians*.

(Smith, 1906, *Heterosaccus hians* on *Charybdis (Goniohellenus) truncata* (Fabricius), = ?).

(Krüger, 1912, *Heterosaccus hians* on *Charybdis japonica* (A. Milne Edwards), Tsingtao, China, = *Heterosaccus papillosus* (Boschma)).

(Van Kampen & Boschma, 1925, *Heterosaccus hians* on *Thalamita admeta* (Herbst), Siau, = *Heterosaccus sibogae* Boschma, 1931c).

Figures: Kossmann, 1872, Pl. I fig. 17 (external shape), Pl. II fig. 2 (anatomy, male organs, colleteric gland).

Sacculina hians Kossmann, 1872.

= *Heterosaccus hians* (Kossmann).

Sacculina **hirsuta** Boschma, 1925.

Type specimen on *Pilumnus dasypodus* Kingsley; type locality Caracas Bay, Curaçao.

Smith, 1906, *Sacculina carcini* on *Pilumnus* spec., Venezuela and West Indies, = *S. hirsuta*?

Rathbun, 1930, Rhizocephalid parasites on *Pilumnus dasypodus* Kingsley, Cuba, St. Thomas, and Curaçao.

Boschma, 1931a, *Sacculina hirsuta* on *Pilumnus dasypodus* Kingsley, St. Thomas, West Indies.

Pearse, 1951, *Sacculina hirsuta* on *Pilumnus dasypodus* Kingsley, North Carolina.

Figures: Boschma, 1925, Pl. II fig. 1 (external shape), Pl. II fig. 5 (male organs, colleteric gland), text-fig. 1 (external cuticle); Boschma, 1931a, fig. 7*j* (external shape), fig. 30 (external cuticle, retinacula); Boschma, 1937, fig. 45 (male organs, colleteric gland); Krüger, 1940, fig. 174*j* (external shape).

Sacculina **hirta** Boschma, 1933a.

Type specimen on *Cryptopodia fornicata* (Fabricius); type locality Japan.

Figures: Boschma, 1933a, fig. 7*f* (external shape), figs. 28, 29 (male organs, colleteric

Figures: Boschma, 1928c, fig. 1*f, g* (external shape), fig. 7 (male organs), fig. 8 colleteric gland); Krüger, 1940, fig. 189*c* (retinacula).

Sacculina **hispida** Boschma, 1928c.

Type specimen on *Zosimus aeneus* (Linnaeus); type locality Amboina, East Indies.

Boschma, 1928c, *Sacculina hispida* on *Zosimus aeneus* (Linnaeus), Sula Sanana.

Figures: Boschma, 1928c, fig. 1*f, g* (external shape), fig. 7 (male organs), fig. 8 (external cuticle, retinacula); Boschma, 1937, fig. 47 (male organs), fig. 48 (colleteric gland).

Sacculina **hyadis** Malm, 1881.

Type specimen on *Hyas araneus* (Linnaeus); type locality Bohuslän, Sweden.

= *Sacculina inflata* Leuckart.

Sacculina **hystrix** Van Kampen & Boschma, 1925.

Type specimen on *Carpilodes bellus* (Dana); type locality Kur, Kei Islands, East Indies.

Figures: Van Kampen & Boschma, 1925, Pl. I fig. 25 (external shape), text-fig. 32 (external cuticle); Boschma, 1931c, fig. 29 (male organs, colleteric gland); Boschma, 1937, fig. 49 (male organs, colleteric gland).

Sacculina **ignorata** Boschma, 1947c.

Type specimen on *Actaea hirsutissima* (Rüppell); type locality Ghardaqa, Red Sea.

Van Kampen & Boschma, 1925, *Sacculina pilosa* on *Actaea hirsutissima* (Rüppell), Jiddah, Red Sea, = *Sacculina rotundata*, Boschma, 1931c, = *S. ignorata.*

Figures: Van Kampen & Boschma, 1925, text-fig. 12 (external cuticle); Boschma, 1928c, fig. 2*d* (external cuticle); Boschma, 1931c, fig. 3*p, q* (external cuticle), fig. 5*d* (external shape), fig. 11*d* (male organs), fig. 13 (external cuticle); Boschma, 1947c, fig. 1 (male organs), fig. 2 (colleteric gland), fig. 3 (external cuticle), fig. 4 (retinacula).

Loxothylacus **ihlei** Boschma, 1949b.

Type specimen on *Scylla serrata* (Forskål); type locality Aru Islands.

Figures: Boschma, 1949b, fig. 1*b* (external shape), fig. 4 (male organs, colleteric gland), fig. 5 (external cuticle), fig. 6 (retinacula).

Sacculina **imberbis** Shiino, 1943.

Type specimen on *Pachygrapsus crassipes* Randall; type locality Seto, Japan.

Krüger, 1912, *Sacculina carcini* on *Pachygrapsus crassipes* Randall, Sagami Bay, Japan, = *S. imberbis*?

Boschma, 1949c, *Sacculina imberbis* on *Metopograpsus quadridentatus* Stimpson, Japan.

Figures: Shiino, 1943, fig. 1*I* (external shape), fig. 11 (male organs, colleteric gland, external cuticle); Boschma, 1949c, fig. 7 (external shape, external cuticle, retinacula), fig. 8 (male organs, colleteric gland).

Sacculina **inconstans** Boschma, 1952a.

Type specimen on *Carpilodes bellus* (Dana); type locality Aranuka, Gilbert Islands.

Figures: Boschma, 1952a, fig. 1 (external shape), fig. 2 (male organs, colleteric gland), fig. 3 (external cuticle).

Sacculina **infirma** Boschma, 1953a.

Type specimen on *Grapsus strigosus* (Herbst); type locality "Indian Ocean".

Boschma, 1928c, *Sacculina flexuosa* (p.p.).

Figures: Boschma, 1928c, fig. 5*c* (male organs), fig. 6*a* (external cuticle); Krüger, 1940, fig. 190*a* (external cuticle); Boschma, 1953a, fig. 1*k* (external shape), fig. 9*c* (colleteric gland), fig. 10 (male organs).

Sacculina **inflata** Leuckart, 1859.

Type specimen on *Hyas araneus* (Linnaeus); type locality Heligoland, North Sea.

Anderson, 1862, *Sacculina triangularis* on *Cancer pagurus* Linnaeus, Firth of Forth.

Kossmann, 1872, *Sacculina biangularis* (misprint for *triangularis*).

Malm, 1881, *Sacculina hyadis* on *Hyas araneus* (Linnaeus); *Sacculina carcini* on *Cancer pagurus* Linnaeus; Bohuslän.

Smith, 1906, *Sacculina carcini* on *Hyas araneus* (Linnaeus), on *Hyas coarctatus* Leach, on *Cancer pagurus* Linnaeus.

Boschma, 1931b, *Sacculina inflata* on *Cancer pagurus* Linnaeus, Firth of Forth.

Boschma, 1933a, *Sacculina inflata* on *Cancer pagurus* Linnaeus, Firth of Forth and Devon.

Stephensen, 1933, *Sacculina inflata* on *Hyas* and on *Cancer pagurus* Linnaeus, Denmark.

Figures: Leuckart, 1859, Pl. VI fig. 1*a* (external shape); Anderson, 1862, Pl. I figs. 2, 4-6, 11, 14, 15 (external shape, anatomy), Pl. I figs. 7-9 (male organs); Boschma, 1927a, fig. 1*m, n* (external shape), fig. 5*a* (external cuticle), fig. 14 (male organs, colleteric gland); Boschma, 1931b, fig. 1 (external shape), figs. 2-4 (male organs), fig. 5 (colleteric gland); fig. 6 (external cuticle); Stephensen, 1933, fig. 50, *4-5* (external shape); Boschma, 1937, figs. 50-52 (male organs), fig. 53 (colleteric gland).

Sacculina **irrorata** Boschma, 1934b.

Type specimen on *Trapezia cymodoce* (Herbst); type locality Banda Neira, East Indies.

Figures: Boschma, 1934b, fig. 1 (external shape), fig. 2 (male organs, colleteric gland), figs. 3, 4 (external cuticle); Boschma, 1937, fig. 54 (male organs, colleteric gland); Krüger, 1940, fig. 208, 9 (male organs).

Sacculina **lata** Boschma, 1933b.

Type specimen on *Charybdis miles* (De Haan); type locality Misaki, Japan.

Krüger, 1912, *Sacculina carcini* on *Charybdis miles* (De Haan), Misaki, Japan, = *S. lata*?

Boschma, 1954c, *Sacculina lata* on *Podophthalmus vigil* (Fabricius), Nhatrang, Indo-China, and Singapore.

Figures: Boschma, 1933b, fig. 1 (external cuticle, retinacula); Boschma, 1937, fig. 55 (male organs), fig. 56 (colleteric gland); Boschma, 1950a, fig. 1*a* (external shape), fig. 4*a* (male organs); Boschma, 1954c, fig. 1 (external shape), figs. 2-5, 8 (male organs, colleteric gland), figs. 6, 7, 9, 10 (external cuticle, retinacula).

Sacculina **leopoldi** Boschma, 1931d.

Type specimen on *Cymo andreossyi* (Audouin); type locality between Banda Neira and Gunung Api, East Indies.

Figures: Boschma, 1931d, Pl. I fig. 1 (external shape), Pl. I fig. 2 (male organs, colleteric gland), Pl. I fig. 3 (external cuticle); Boschma, 1937, fig. 57 (male organs), fig. 58 (colleteric gland).

Sacculina **leptodiae** Guérin-Ganivet, 1911.

Type specimen on *Xantho exaratus* (H. Milne Edwards); type locality Jibuti, Gulf of Aden.

Smith, 1906, *Sacculina carcini* on *Xantho exaratus* (H. Milne Edwards), Red Sea, = *S. leptodiae*?

Guérin-Ganivet, 1911, *Sacculina leptodiae* on *Xantho* spec. ("un jeune individu femelle du *Xantho hydrophilus* (Herbst) passant à l'espèce *X. distinguindus* de H.", l.c., p. 59), Grande Comore, Mozambique Channel.

Van Kampen & Boschma, 1925, *Sacculina pilosa* on *Camposcia retusa* Latreille, between Nusa Besi and Timor, = *Sacculina rotundata,* Boschma, 1931c, = *S. leptodiae*?

Boschma, 1928c, *Sacculina aculeata* on *Carupa laeviuscula* Heller, Jiddah, Red Sea, = *Sacculina rotundata,* Boschma, 1931c, = *S. leptodiae*?

Boschma, 1936b, *Sacculina leptodiae* on *Xantho exaratus* (H. Milne Edwards), type specimen; on *Xantho* spec., Grande Comore.

Stephensen, 1945, *Sacculina* on *Xantho exaratus* (H. Milne Edwards), Iranian Gulf, = *S. leptodiae*?

Boschma, 1947a, *Sacculina leptodiae* on *Thalamita stimpsoni* A. Milne Edwards, Aru Islands and Singapore.

Boschma, 1948c, *Sacculina leptodiae* on *Xantho exaratus* (H. Milne Edwards), Zanzibar, Suez, Red Sea, Jibuti, and Grande Comore; on *Thalamita stimpsoni* A. Milne Edwards, Aru Islands; on *Pseudozius caystrus* (Adams & White), Ternate, Tidore, Morotai, Leti, Amboina, and Gulf of Tadjourah.

Boschma, 1950c, *Sacculina leptodiae* on *Xantho exaratus* (H. Milne Edwards), Tomberua, Fiji Islands.

Boschma, 1954e, *Sacculina leptodiae* on *Xantho exaratus* (H. Milne Edwards) and on *Xantho gracilis* Dana, Nhatrang, Indo-China.

Boschma, 1955c, *Sacculina leptodiae* on *Xantho gracilis* Dana and on *Xantho exaratus* (H. Milne Edwards), Nhatrang, Indo-China.

Figures: Guérin-Ganivet, 1911, Pl. I figs. 6-8 (external shape), text-fig. 7 (general anatomy); Van Kampen & Boschma, 1925, text-fig. 9 (external cuticle); Boschma, 1931c, fig. 3*g, h* (external cuticle), fig. 5*c, e* (external shape), figs. 12, 14 (male organs, colleteric gland), fig. 15 (external cuticle); Boschma, 1936b, figs. *b, c* (external cuticle); Boschma, 1947a, figs. 1-4 (external cuticle); Boschma, 1948c, figs. 1, 2 (external shape), figs. 3, 4, 8-10, 11*a-d*, 16-19 (male organs), figs. 5, 11*e-i*, 12, 20 (colleteric gland), figs. 6, 7, 13-15, 21 (external cuticle); Boschma, 1950c, fig. 1 (external cuticle); Boschma, 1954e, fig. 1*i, s, v*, fig. 2*e*, fig. 3*a, b* (external shape); Boschma, 1955c, fig. 1 (external cuticle).

Sacculina **leptothrix** Boschma, 1933b.

Type specimen on *Xenocarcinus tuberculatus* White; type locality vicinity of Jolo, Philippine Islands.

Figures: Boschma, 1933b, fig. 7 (external cuticle); Boschma, 1937, fig. 59 (male organs, colleteric gland); Krüger, 1940, fig. 187*c* (external cuticle); Boschma, 1950a, fig. 1*g* (external shape), fig. 9*b* (male organs).

Sacculina **levis** Boschma, 1933b.

Type specimen on unknown host; type locality Yenosima, mouth of Bay of Jeddo, Japan.

= *Sacculina confragosa* Boschma.

Sacculina longipila Boschma, 1933b.

= *Loxothylacus longipilus* (Boschma).

Loxothylacus **longipilus** (Boschma, 1933b).

Type specimen on *Micropanope lobifrons* A. Milne Edwards; type locality Barbados, British West Indies.

Rathbun, 1930, Rhizocephalid on *Micropanope lobifrons* A. Milne Edwards, Barbados.

Rathbun, 1930, Rhizocephalid parasite on *Micropanope pusilla* A. Milne Edwards, Florida, St. Thomas, = *L. longipilus*?

Boschma, 1933b, *Sacculina longipila.*

Boschma, 1950a, *Loxothylacus longipilus.*

Figures: Boschma, 1933b, fig. 2 (external cuticle); Boschma, 1937, fig. 60 (male organs, colleteric gland); Krüger, 1940, fig. 187*d* (external cuticle), fig. 208, *4* (male organs); Boschma, 1950a, fig. 1*b* (external shape), fig. 5 (male organs).

Sacculina **margaritifera** Kossmann, 1872.

Type specimen on *Thalamita* spec.; type locality Lapinig Canal, Bohol, Philippine Islands.

Van Kampen & Boschma, 1925, *Sacculina margaritifera* on *Oncinopus araneus* (De Haan), Sailus ketjil, Paternoster Islands.

Figures: Van Kampen & Boschma, 1925, Pl. I fig. 24 (external shape), Pl. III fig. 5 (male organs), text-fig. 33 (external cuticle); Boschma, 1937, fig. 61 (male organs, colleteric gland).

Sacculina **micracantha** Boschma, 1931c.

Type specimen on *Percnon planissimum* (Herbst); type locality Ternate, East Indies.

Figures: Boschma, 1931c, fig. 5*n* (external shape), fig. 30 (male organs, colleteric gland), fig. 31 (external cuticle); Boschma, 1937, fig. 62 (male organs, colleteric gland).

Sacculina **microthrix** Boschma, 1931d.

Type specimen on *Actaea hirsutissima* (Rüppell); type locality Banda Neira, East Indies.

Figures: Boschma, 1931d, Pl. I fig. 4 (external shape), Pl. I fig. 5 (male organs, colleteric gland), Pl. I fig. 6 (external cuticle); Boschma, 1937, fig. 63 (male organs, colleteric gland).

Sesarmaxenos **monticola** Annandale, 1911.

Type specimen on *Sesarma (Sesarma) thelxinoë* De Man; type locality Mount Harriet near Port Blair, Andaman Islands.

De Man, 1908, *Sacculina* on *Sesarma (Sesarma) thelxinoë* De Man.
Figure: Annandale, 1911, fig. 1 (external shape).

Loxothylacus **murex** Boschma, 1950d.

Type specimen on *Xanthias lamarcki* (H. Milne Edwards); type locality Benkulen, Sumatra.

Boschma, 1950d, *Loxothylacus murex* on *Cymo andreossyi* (Audouin), Kupang, Timor.
Figures: Boschma, 1950d, fig. 1 (external shape), fig. 2 (male organs, colleteric gland), figs. 3, 5 (external cuticle, retinacula).

Sacculina **muricata** Boschma, 1931a.

Type specimen on *Sphenocarcinus stimpsoni* (Miers); type locality Sagami Sea, Japan.

Figures: Boschma, 1931a, fig. 7*f* (external shape), fig. 10 (male organs, colleteric gland), fig. 11 (external cuticle, retinacula); Boschma, 1937, fig. 64 (male organs), fig. 65 (colleteric gland); Krüger, 1940, fig. 174*f* (external shape).

Loxothylacus **musivus** Boschma, 1940.

Type specimen on *Cymo andreossyi* (Audouin); type locality near Kupang, Timor, East Indies.

Boschma, 1940, *Loxothylacus musivus* on *Phymodius ungulatus* (H. Milne Edwards), near Kupang, Timor.
Figures: Boschma, 1940, figs. 41, 45 (male organs), figs. 42, 46 (colleteric gland), figs. 43, 44, 47 (external cuticle, retinacula); Boschma, 1947d, fig. 4 (external shape).

Drepanorchis **neglecta** (Fraisse, 1877).

Type specimen on *Inachus dorsettensis* (Pennant); type locality Naples.

Stuxberg, 1873, *Pachybdella carcini* on *Macropodia rostrata* (Linnaeus), Scandinavian seas.

Richiardi, 1875, *Sacculina* on *Macropodia rostrata* (Linnaeus) and on *Macropodia longirostris* (Fabricius), Mediterranean.

Hoek, 1878, *Sacculina phalangi* on *Macropodia rostrata* (Linnaeus), Heligoland, North Sea.

Malm, 1881, *Sacculina stenorhynchi* on *Macropodia rostrata* (Linnaeus), Bohuslän.

Marion, 1883, *Peltogaster* on *Inachus dorsettensis* (Pennant), Mediterranean.

Delage, 1884, *Sacculina carcini* on *Macropodia longirostris* (Fabricius).

Giard, 1886, *Sacculina fraissei* on *Macropodia rostrata* (Linnaeus), Atlantic.

Giard, 1887, *Sacculina fraissei* var. *aegyptia* on *Macropodia aegyptia* H. Milne Edwards, Algeria.

Sars, 1890, *Sacculina* spec. on *Inachus dorsettensis* (Pennant), Norway.

Metzger, 1891, *Sacculina* sp. dubia on *Macropodia rostrata* (Linnaeus), North Sea.

Scott, 1901, *Sacculina* spec. on *Inachus dorsettensis* (Pennant) and on *Macropodia rostrata* (Linnaeus), Clyde area, Scotland.

Norman & Scott, 1906, *Sacculina phalangi* on *Macropodia longirostris* (Fabricius), Plymouth.

Smith, 1906, *Sacculina carcini* on *Macropodia rostrata* (Linnaeus), Scandinavian seas, and on *Inachus dorsettensis* (Pennant), Mediterranean.

Smith, 1909, *Sacculina neglecta* on *Inachus mauretanicus* Lucas, Mediterranean.

Boschma, 1927a, *Drepanorchis neglecta* on *Inachus dorhynchus* Leach, off Cadiz.

Boschma, 1928b, *Drepanorchis neglecta* on *Macropodia rostrata* (Linnaeus) and on *Inachus dorsettensis* (Pennant), Denmark.

Stephensen, 1933, *Drepanorchis* (*Sacculina*) *neglecta* on *Macropodia rostrata* (Linnaeus), on *Macropodia longirostris* (Fabricius), and on *Inachus* spp., Denmark.

Boschma, 1933a, *Drepanorchis neglecta* on *Inachus mauretanicus* Lucas, Naples, on *Macropodia rostrata* (Linnaeus), Dalmatia, and on *Macropodia longirostris* (Fabricius), Plymouth.

Boschma, 1947f, *Drepanorchis neglecta* on *Macropodia rostrata* (Linnaeus), Southern part of North Sea.

Dahl, 1949, *Drepanorchis neglecta* on *Macropodia rostrata* (Linnaeus), Northern Norway.

Williams, 1954, *Sacculina carcini* on *Macropodia longirostris* (Fabricius), Northeast Ireland.

Figures: Fraisse, 1877, Pl. XII fig. 4 (external shape); Smith, 1906, text-fig. 6, Pl. I figs. 3, 4, Pl. VII fig. 30 (external shape), Pl. II figs. 6, 8, 10, 12, 14 (male organs), Pl. V figs. 1-18 (endoparasitic development); Boschma, 1927a, fig. *2h-p* (external shape), fig. *5b-e* (external cuticle), fig. *7m-p* (retinacula), figs. 10, 11 (male organs, colleteric gland); Boschma, 1928b, fig. 7 (male organs); Stephensen, 1933, fig. 50, 6 (external shape).

Sacculina neglecta Fraisse, 1877.

= *Drepanorchis neglecta* (Fraisse).

Loxothylacus **nierstraszi** Boschma, 1938.

Type specimen on *Charybdis* (*Goniohellenus*) *truncata* (Fabricius); type locality Java Sea (?).

= *Heterosaccus papillosus* (Boschma).

Sacculina **nigra** Shiino, 1943.

Type specimen on *Brachynotus sanguineus* (De Haan); type locality Japan (exact locality unknown).

Krüger, 1912, *Sacculina carcini* on *Brachynotus sanguineus* (De Haan), Yokohama, Japan, = *S. nigra*?

Figures: Shiino, 1943, fig. 2*A* (external shape), fig. 13 (male organs, colleteric gland, external cuticle, retinacula).

Sacculina **nodosa** Boschma, 1931a.

Type specimen on *Parthenope* (*Rhinolambrus*) *cybelis* (Alcock); type locality Kei Islands, East Indies.

Figures: Boschma, 1931a, fig. 7*a, b* (external shape), fig. 8 (male organs, colleteric gland), fig. 9 (external cuticle); Boschma, 1937, fig. 66 (male organs, colleteric gland); Krüger, 1940, fig. 174*a, b* (external shape).

Drepanorchis occidentalis Boschma, 1928a.

= *Heterosaccus occidentalis* (Boschma).

Heterosaccus **occidentalis** (Boschma, 1928).

Type specimen on *Mithrax* (*Mithraculus*) *forceps* (A. Milne Edwards); type locality Deadman's Bay, West coast of Florida.

Rathbun, 1925, Rhizocephalid parasites on *Pitho lherminieri* (Schramm), Cuba; on *Pitho anisodon* (Von Martens), Florida; on *Mithrax* (*Mithraculus*) *forceps* (A. Milne Edwards), Florida; on *Macrocoeloma camptocerum* (Stimpson), Florida and Gulf of Mexico; on *Macrocoeloma diplacanthum* (Stimpson), Cuba, Jamaica; on *Microphrys bicornutus* (Latreille), Florida.

Rathbun, 1925, Rhizocephalid parasite on *Microphrys interruptus* Rathbun, Cuba, = *H. occidentalis*?

Boschma, 1928a, *Drepanorchis occidentalis* on *Macrocoeloma camptocerum* (Stimpson), off Florida; on *Macrocoeloma diplacanthum* (Stimpson), Cuba; on *Microphrys bicornutus* (Latreille), off Florida, Cuba, Bahamas; on *Mithrax* (*Mithraculus*) *coryphe* (Herbst), Bahamas; on *Mithrax* (*Mithraculus*) *forceps* (A. Milne Edwards), West coast of Florida; on *Mithrax* (*Mithraculus*) *sculptus* (Lamarck), Jamaica; on *Pitho anisodon* (Von Martens), off Florida; on *Pitho lherminieri* (Schramm), Key West or West coast of Florida; on *Stenocionops furcata coelata* (A. Milne Edwards), off Florida.

Boschma, 1931a, *Heterosaccus occidentalis* on *Microphrys bicornutus* (Latreille), S. Croix, West Indies.

Boschma, 1931c, *Heterosaccus occidentalis* on *Stenocionops spinosissima* (Saussure), locality unknown.

Figures: Boschma, 1928a, fig. 1 (external shape), fig. 2 (male organs, colleteric gland), fig. 3 (external cuticle, retinacula); Boschma, 1931a, fig. 43 (external cuticle, retinacula); Boschma, 1931c, fig. 35 (external shape), fig. 36 (male organs, colleteric gland), fig. 37 (external cuticle, retinacula).

Sacculina **ornatula** Boschma, 1951b.

Type specimen on *Mursia armata* De Haan; type locality off Misaki, Japan.

Krüger, 1912, *Sacculina carcini* on *Mursia armata* De Haan, off Misaki, Japan.

Figures: Boschma, 1951b, fig. 1 (external shape), fig. 2 (male organs, colleteric gland), fig. 3 (external cuticle).

Sacculina **ostracotheris** Pérez, 1920.

Type specimen on *Ostracotheres spondyli* Nobili; type locality Persian Gulf.

Loxothylacus **panopaei** (Gissler, 1884).

Type specimen on *Panopeus herbstii* H. Milne Edwards; type locality Tampa, coast of Florida.

Gissler, 1884, *Sacculina panopaei.*

Boschma, 1928a, *Loxothylacus panopaei* on *Panopeus occidentalis* Saussure, Porto Rico; on ***Eurypanopeus depressus*** (Smith), Florida(?), Texas; on *Panopeus herbstii* H. Milne Edwards, Jamaica, Cuba.

Rathbun, 1930, Peltogastrid parasite on *Panopeus herbstii* H. Milne Edwards, Cuba.

Rathbun, 1930, *Sacculina* on *Panopeus occidentalis* Saussure, Porto Rico.

Rathbun, 1930, Rhizocephalid on *Lophopanopeus diegensis* Rathbun, Southern California, = *L. panopaei*?

Boschma, 1931a, *Loxothylacus panopaei* on *Tetraplax quadridentata* (Rathbun), Venezuela, on *Panopeus occidentalis* Saussure, S. Croix, West Indies, on *Lophopanopeus bellus* (Stimpson), Nanaimo, British Columbia.

Figures: Gissler, 1884, figs. 1, 2 (external shape); Boschma, 1928a, fig. 4 (external shape), fig. 5 (male organs, colleteric gland), fig. 6 (external cuticle, retinacula); Boschma, 1931a, fig. 33*i, j* (external shape), fig. 48 (male organs, colleteric gland), fig. 49 (external cuticle, retinacula).

Sacculina panopaei Gissler, 1884.

= *Loxothylacus panopaei* (Gissler).

Sacculina **papilio** Kossmann, 1872.

= *Triangulus papilio* (Kossmann).

Drepanorchis papillosa Boschma, 1933b.

= *Heterosaccus papillosus* (Boschma).

Heterosaccus **papillosus** (Boschma, 1933b).

Type specimen on *Charybdis* (*Gonioneptunus*) *bimaculata* (Miers); type locality vicinity of Marindugue Island, Philippine Islands.

Krüger, 1912, *Heterosaccus hians* on *Charybdis japonica* (A. Milne Edwards), Tsingtao, China.

Boschma, 1933b, *Drepanorchis papillosa* on *Charybdis* (*Gonioneptunus*) *bimaculata* (Miers), Philippine Islands, and on *Charybdis japonica* (A. Milne Edwards), Tokyo.

Boschma, 1938, *Loxothylacus nierstraszi* on *Charybdis* (*Goniohellenus*) *truncata* (Fabricius), Java Sea(?).

Shiino, 1943, *Heterosaccus papillosus* on *Charybdis japonica* (A. Milne Edwards), Kasaoka, Japan.

Boschma, 1954a, *Heterosaccus papillosus* on *Charybdis* (*Charybdis*) *anisodon* (De Haan), Nhatrang, Indo-China; on *Charybdis japonica* (A. Milne Edwards), Tsingtao, China.

Figures: Krüger, 1912, Pl. I fig. 3 (external shape); Boschma, 1933b, fig. 16 (external cuticle, retinacula); Boschma, 1938, fig. 1 (external shape), fig. 2 (male organs), fig. 3 (colleteric gland), fig. 4 (external cuticle), fig. 5 (retinacula); Shiino, 1943, fig. 2*H* (external shape), fig. 20 (general anatomy, male organs, colleteric gland, external cuticle, retinacula); Boschma, 1950a, fig. 2*d, e* (external shape), figs. 15, 16 (male organs), fig. 17 (colleteric gland), fig. 18 (external cuticle, retinacula); Boschma 1954a, fig. 1 (external shape), fig. 2 (male organs, colleteric gland), figs. 3, 4 (external cuticle, retinacula).

Sacculina **papposa** Van Kampen & Boschma, 1925.

Type specimen on *Thalamita admeta* (Herbst); type locality Banda, East Indies.

Boschma, 1952b, *Sacculina papposa* on *Thalamita* spec., Banda Islands.

Figures: Van Kampen & Boschma, 1925, text-fig. 28 (external cuticle); Boschma, 1931c, fig. 5*m* (external shape), fig. 27 (male organs, colleteric gland); Boschma, 1937, fig. 67 (male organs, colleteric gland); Krüger, 1940, figs. 187*l*, 188*a* (external cuticle); Boschma, 1952b, fig. 1 (male organs, colleteric gland), fig. 2 (external cuticle, retinacula).

Sacculina **pauli** Popov, 1929.

Type specimen on *Brachynotus lucasi* H. Milne Edwards; type locality Azof Sea.

= *Sacculina carcini* Thompson.

Heterosaccus **pellucidus** Shiino, 1943.

Type specimen on *Thalamita integra* Dana; type locality Isigakisima, Japan.

Figures: Shiino, 1943, fig. 2*K* (external shape), fig. 23 (general anatomy, male organs, colleteric gland, external cuticle, retinacula).

Sacculina **pertenuis** Boschma, 1933a.

Type specimen on *Pinnotheres* spec.; type locality Gulf of Suez.

Figures: Boschma, 1933a, fig. 7*c* (external shape), figs. 19, 20 (male organs, colleteric gland); Boschma, 1937, fig. 68 (colleteric gland).

Sacculina **phacelothrix** Boschma, 1931a.

Type specimen on *Chlorodiella nigra* (Forskål); type locality Trincomalee, Ceylon.

Smith, 1906, *Sacculina carcini* on *Chlorodiella nigra* (Forskål), Trincomalee.

Figures: Boschma, 1931a, fig. 7*g* (external shape), fig. 21 (male organs, colleteric gland), fig. 22 (external cuticle, retinacula); Krüger, 1940, fig. 174*g* (external shape); Boschma, 1947b, fig. 8 (male organs).

Sacculina **phalangi** Hoek, 1878.

Type specimen on *Macropodia rostrata* (Linnaeus); type locality Heligoland, North Sea.

= *Drepanorchis neglecta* (Fraisse).

Sacculina **pilosa** Kossmann, 1872.

Type specimen on "*Pisa*" spec.; type locality Bohol, Philippine Islands.

(Van Kampen & Boschma, 1925, list as synonyms: ? *Sacculina dentata* Kossmann, 1872, *Sacculina crucifera* Kossmann, 1872, *Sacculina rotundata* Miers, 1880).

(Van Kampen & Boschma, 1925, *Sacculina pilosa* on *Eriphia sebana* (Shaw & Nodder), Beo, Talaud Islands, = *Sacculina rotundata*, Boschma, 1931c).

(Van Kampen & Boschma, 1925, *Sacculina pilosa* on *Atergatis floridus* (Linnaeus), Beo, Talaud Islands, = *Loxothylacus aristatus* Boschma, 1931c).

(Van Kampen & Boschma, 1925, *Sacculina pilosa* on *Acanthophrys longispinus* (De Haan) (not *Actumnus setifer* (De Haan)), South of Salawati, = *Sacculina rotundata,* Boschma, 1931c, = *Sacculina spectabilis* Boschma, 1948b).

Van Kampen & Boschma, 1925, *Sacculina pilosa* on *Actaea tomentosa* (H. Milne Edwards), West New Guinea, = *Sacculina pilosa,* Boschma, 1931c, = *S. pilosa* Kossmann?

(Van Kampen & Boschma, 1925, *Sacculina pilosa* on *Eriphia sebana* (Shaw & Nodder), Banda, = *Sacculina rotundata,* Boschma, 1931c).

(Van Kampen & Boschma, 1925, *Sacculina pilosa* on *Pilumnus* spec., Kei Islands, = *Loxothylacus desmothrix* Boschma, 1931c).

(Van Kampen & Boschma, 1925, *Sacculina pilosa* on *Camposcia retusa* Latreille, between Nusa Besi and Timor, = *Sacculina rotundata,* Boschma, 1931c, = *Sacculina leptodiae* Guérin-Ganivet, 1911 ?).

(Van Kampen & Boschma, 1925, *Sacculina pilosa* on *Calappa hepatica* (Linnaeus), Celebes (?), = *Loxothylacus setaceus* Boschma, 1931c).

(Van Kampen & Boschma, 1925, *Sacculina pilosa* on *Ozius rugulosus* Stimpson, Humboldt Bay, New Guinea, = *Sacculina vankampeni* Boschma, 1931c).

(Van Kampen & Boschma, 1925, *Sacculina pilosa* on *Actaea hirsutissima* (Rüppell), Jiddah, Red Sea, = *Sacculina pilosa,* Boschma, 1928c, = *Sacculina rotundata,* Boschma, 1931c, = *Sacculina ignorata* Boschma, 1947c).

(Boschma, 1928c, lists as synonyms: *Sacculina dentata* Kossmann, 1872, *Sacculina crucifera* Kossmann, 1872, *Sacculina rotundata* Miers, 1880).

(Boschma, 1928c, *Sacculina pilosa* on *Eriphia sebana* (Shaw & Nodder), Moluccas and Sula Sanana, = *Sacculina rotundata,* Boschma, 1931c).

(Boschma, 1928c, *Sacculina pilosa* on *Tiarinia gracilis* Dana, Halmaheira, = *Sacculina rotundata,* Boschma, 1931c, = *Sacculina synaptothrix* Boschma, 1948b, = *Sacculina cordata* Shiino, 1943).

(Boschma, 1928c, *Sacculina pilosa* on *Eurycarcinus natalensis* (Krauss), Nossi Faly near Madagascar, = *Sacculina vankampeni* Boschma, 1931c).

Figures: Kossmann, 1872, Pl. I fig. 5 (external shape), Pl. I fig. 23 (external cuticle); Van Kampen & Boschma, 1925, Pl. I fig. 5 (external shape), text-fig. 10 (external cuticle); Boschma, 1931c, fig. 3*i-n* (external cuticle), fig. 4 (male organs, colleteric gland).

Sacculina **pilosella** Van Kampen & Boschma, 1925.

Type specimen on *Quadrella coronata* Dana; type locality off Segli, North coast of Sumatra.

(Van Kampen & Boschma, 1925, *Sacculina pilosella* on *Ozius tuberculosus* H. Milne Edwards and on *Eriphia sebana* (Shaw & Nodder), Merak, West Java = *Sacculina compressa* Boschma, 1931c).

Shiino, 1943, *Sacculina pilosella* on *Pugettia quadridens* (De Haan) and on *Menaethius monoceros* (Latreille), Seto, Japan.

Anonymus, 1949, *Sacculina pilosella* on *Pugettia quadridens* (De Haan), Japan.

Figures: Van Kampen & Boschma, 1925, text-fig. 14 (external cuticle, retinacula); Boschma, 1931c, fig. 3*u, v* (external cuticle), fig. 5*g* (external shape), fig. 19 (male organs, colleteric gland); Krüger, 1940, fig. 187*j* (external cuticle); Shiino, 1943, fig. 1*E* (external shape), fig. 7 (male organs, external cuticle); Anonymus, 1949, fig. on p. 867 (external shape, external cuticle).

Sacculina **pinnotherae** Shiino, 1943.

Type specimen on *Pinnotheres parvulus* Stimpson; type locality Genzan, Korea.

Shiino, 1943, *Sacculina pinnotherae* on *Pinnotheres parvulus* Stimpson, Kasaoka, Japan.

Figures: Shiino, 1943, fig. 1*J, K* (external shape), fig. 12 (male organs, colleteric gland, external cuticle).

Sacculina **pirimelae** Guérin-Ganivet, 1911.

Type specimen on *Pirimela denticulata* (Montagu); type locality Point à Zoie, Atlantic coast of France.

= *Sacculina carcini* Thompson.

Sacculina **pisae** Hoek, 1878.

Type specimen on *Pisa armata* (Latreille); type locality Gulf of Naples.

= *Sacculina carcini* Thompson.

Sacculina **pisiformis** Kossmann, 1872.

Type specimen on *Hyastenus aries* (Latreille); type locality Lapinig Canal, Bohol, Philippine Islands.

Figure: Kossmann, 1872, Pl. I fig. 4 (external shape).

Sacculina **pistillata** Boschma, 1952b.

Type specimen on *Atergatis integerrimus* (Lamarck); type locality Sultan Shoal, off Singapore Island.

Figures: Boschma, 1952b, fig. 3 (external shape), fig. 4 (male organs, colleteric gland), fig. 5 (external cuticle).

Sacculina **plana** Boschma, 1933a.

Type specimen on *Grapsus strigosus* (Herbst); type locality Takao, South Formosa.

Boschma, 1949c, *Sacculina plana* on *Metopograpsus messor* (Forskål), Takao, South Formosa.

Figures: Boschma, 1933a, fig. 7*i* (external shape), figs. 36-39 (male organs, colleteric gland), fig. 40 (external cuticle, retinacula); Boschma, 1937, fig. 69 (male organs), fig. 70 (colleteric gland); Krüger, 1940, fig. 208, *8* (male organs); Boschma, 1949c, fig. 5 (external shape, external cuticle, retinacula), fig. 6 (male organs, colleteric gland).

Sacculina **pomum** Kossmann, 1872.

Type specimen on *Chlorodopsis areolata* (H. Milne Edwards); type locality Manila, Philippine Islands.

Smith, 1906, *Sacculina carcini* on *Chlorodopsis areolata* (H. Milne Edwards), Shabuk, Red Sea, = *S. pomum*?

Figure: Kossmann, 1872, Pl. I fig. 8 (external shape).

Sacculina **priei** Giard, 1887.

Type specimen on *Macropipus puber* (Linnaeus); type locality Atlantic coast of France.

= *Sacculina carcini* Thompson.

Sacculina **pugettiae** Shiino, 1943.

Type specimen on *Pugettia quadridens* (De Haan); type locality Seto, Japan.

Figures: Shiino, 1943, fig. 2*D* (external shape), fig. 16 (male organs, colleteric gland, external cuticle, retinacula).

Sacculina **pulchella** Boschma, 1933b.

Type specimen on *Huenia proteus* (De Haan); type locality Seychelles, Western Indian Ocean.

Rathbun, 1911, Rhizocephalid parasites on *Huenia proteus* (De Haan), Amirante and Seychelles.

Boschma, 1933b, *Sacculina pulchella* on *Huenia proteus* (De Haan), Amirante, Western Indian Ocean.

Boschma, 1950e, *Sacculina pulchella* on *Hyastenus brockii* De Man, Amboina, and on *Phalangipus longipes* (Linnaeus), Chittagong coast, India.

Figures: Boschma, 1933b, fig. 5 (external cuticle); Boschma, 1937, fig. 71 (male organs, colleteric gland); Krüger, 1940, fig. 188*b* (external cuticle); Boschma, 1950a, fig. 1*e* (external shape), fig. 7 (male organs, colleteric gland), fig. 8 (external cuticle); Boschma, 1950e, figs. 1, 4, 6 (external cuticle, retinacula), fig. 2 (external shape), figs. 3, 5, 7 (male organs, colleteric gland).

Sacculina **punctata** Boschma, 1934a.

Type specimen on *Plagusia dentipes* De Haan; type locality Kaseda, Satuma, Japan.

Krüger, 1912, *Sacculina carcini* on *Plagusia dentipes* De Haan, Sagami Bay, Japan.

Boschma, 1928c, *Sacculina flexuosa* (p.p.).

Boschma, 1931a, *Sacculina flexuosa* (p.p.).

Shiino, 1943, *Sacculina punctata* on *Plagusia dentipes* De Haan, Tomioka, Japan.

Boschma, 1953a, *Sacculina punctata* on *Plagusia depressa immaculata* Lamarck, unknown locality; on *Plagusia depressa* (Fabricius), Caroline Islands and unknown locality.

Boschma, 1955a, *Sacculina punctata* on *Plagusia depressa immaculata* Lamarck, Nhatrang, Indo-China; on *Plagusia dentipes* De Haan, Sagami Bay, Japan.

Figures: Boschma, 1928c, fig. 1*e* (external shape), fig. 5*d* (male organs), fig. 6*h* (external cuticle); Boschma, 1931a, fig. 33*d* (external shape), fig. 34 (male organs, colleteric gland), fig. 35 (external cuticle); Boschma, 1934a, fig. 1 (male organs), fig. 2 (external cuticle, retinacula); Boschma, 1937, fig. 72 (male organs, colleteric gland); Krüger, 1940, fig. 190*h* (external cuticle), fig. 208, 2 (male organs); Shiino, 1943, fig. 1*H* (external shape), fig. 10 (male organs, external cuticle); Boschma, 1953a, fig. 1*f*, *h-j* (external shape), figs. 4, 5 (male organs, colleteric gland); Boschma, 1955a, fig. 1 (external shape), figs. 2, 6 (male organs, colleteric gland), fig. 3 (external cuticle), fig. 4 (retinacula), fig. 5 (external shape, external cuticle).

Sacculina **purpurea** Müller, 1862.

= *Peltogaster purpureus* (Müller).

Sacculina **pustulata** Boschma, 1925.

Type specimen on *Hemus cristulipes* A. Milne Edwards; type locality Spanish Water, Curaçao.

Figures: Boschma, 1925, Pl. II fig. 2 (external shape), Pl. II figs. 6, 7 (male organs, colleteric gland), text-figs. 2, 3 (external cuticle); Boschma, 1937, fig. 73 (male organs, colleteric gland).

Sacculina **rathbunae** Boschma, 1933b.

Type specimen on *Arachnopsis filipes* Stimpson; type locality off West coast of Florida.

Rathbun, 1925, Rhizocephalids on *Arachnopsis filipes* Stimpson, off Barbados.

Figures: Boschma, 1933b, fig. 4 (external cuticle); Boschma, 1937, fig. 74 (male organs, colleteric gland); Krüger, 1940, fig. 208, *1* (male organs); Boschma, 1950a, fig. 1*d* (external shape).

Pachybdella **rathkei** Diesing, 1850.

= *Sacculina carcini* Thompson.

Sacculina **reniformis** Boschma, 1933b.

Type specimen on *Podochela riisei* Stimpson; type locality off Cape Sable, Florida.

Rathbun, 1925, Rhizocephalid parasite on *Podochela riisei* Stimpson, Florida.

Figures: Boschma, 1933b, fig. 9 (external cuticle); Boschma, 1937, fig. 75 (male organs, colleteric gland); Boschma, 1950a, fig. 1*i* (external shape), fig. 6*b* (male organs, colleteric gland).

Sacculina **robusta** Boschma, 1948a.

Type specimen on *Atergatis floridus* (Linnaeus); type locality Maratua Island, East of Borneo.

Boschma, 1948a, *Sacculina robusta* on *Atergatis floridus* (Linnaeus), Kafal Island near Misool.

Figures: Boschma, 1948a, fig. 1*c* (external shape), figs. 4-6 (male organs), fig. 7 (colleteric gland).

Sacculina **rotundata** Miers, 1880.

Type specimen on *Eriphia sebana* (Shaw & Nodder); type locality Malaysia.

Rathbun, 1910, Rhizocephalid parasite on *Eriphia scabricula* Dana, Amboina = *Sacculina rotundata*?

(Boschma, 1931c, lists as synonyms: *Sacculina pilosa,* Van Kampen & Boschma, 1925 (p.p.), Boschma, 1928c (p.p.), *Sacculina aculeata* Boschma, 1928c).

Boschma, 1931c, *Sacculina rotundata* on *Eriphia sebana* (Shaw & Nodder), Talaud Islands, Banda, Moluccas, and Sula Sanana.

(Boschma, 1931c, *Sacculina rotundata* on *Acanthophrys longispinus* (De Haan), South of Salawati, = *Sacculina spectabilis* Boschma, 1948c).

(Boschma, 1931c, *Sacculina rotundata* on *Camposcia retusa* Latreille, between Nusa Besi and Timor, = *Sacculina leptodiae* Guérin-Ganivet, 1911?).

(Boschma, 1931c, *Sacculina rotundata* on *Actaea hirsutissima* (Rüppell), Jiddah, Red Sea, = *Sacculina ignorata* Boschma, 1947c).

(Boschma, 1931c, *Sacculina rotundata* on *Tiarinia gracilis* Dana, Halmaheira, = *Sacculina synaptothrix* Boschma, 1948b, = *Sacculina cordata* Shiino, 1943).

(Boschma, 1931c, *Sacculina rotundata* on *Pseudozius caystrus* (Adams & White), Ternate, = *Sacculina leptodiae,* Boschma, 1948c).

Boschma, 1933a, *Sacculina rotundata,* type specimen.

Boschma, 1933a, *Sacculina rotundata* on *Eriphia? scabricula* Dana, Goram Islands.

(Boschma, 1935, *Sacculina rotundata* on *Pachygrapsus crassipes* Randall, Misaki and Sagami Bay, Japan, = *Sacculina yatsui* Boschma, 1936a).

Boschma, 1936a, *Sacculina rotundata* on *Eriphia sebana* (Shaw & Nodder).

Figures: Miers, 1880, fig. 18 (external shape), fig. 19 (external cuticle); Van Kampen & Boschma, 1925, Pl. I fig. 3 (external shape), text-figs. 3, 4 (external cuticle); Boschma, 1928c, fig. 2*a, b,* fig. 3 (external cuticle); Boschma, 1931c, fig. 3*c* (external cuticle), fig. 5*b* (external shape), fig. 11*a, b* (male organs, colleteric gland); Boschma,

1933a, figs. 24, 25 (external cuticle); Boschma, 1936a, figs. 8-10 (male organs), figs. 11, 12 (colleteric gland), figs. 13, 14 (external cuticle); Krüger, 1940, fig. 191 (external cuticle).

Heterosaccus **ruginosus** Boschma, 1931a.

Type specimen on *Lissocarcinus orbicularis* Dana; type locality Amboina.

Boschma, 1931a, *Heterosaccus ruginosus* on *Thalamita prymna* (Herbst), Singapore.

Shiino, 1943, *Heterosaccus ruginosus* on *Thalamita prymna* (Herbst), Tanabe Bay, Japan.

Boschma, 1955b, *Heterosaccus ruginosus* on *Thalamita crenata* Latreille, Nhatrang, Indo-China; on *Lissocarcinus orbicularis* Dana, Amboina (selected as type); on *Thalamita prymna* (Herbst), Singapore.

Figures: Boschma, 1931a, fig. 33*a, b, g, h* (external shape), figs. 44, 46 (male organs, colleteric gland), figs. 45, 47 (external cuticle, retinacula); Shiino, 1943, fig. 2*l* (external shape), fig. 21 (male organs, external cuticle, retinacula); Boschma, 1955b, fig. 1 (external shape), figs. 2, 3, 6 (male organs), fig. 4 (colleteric gland), fig. 5 (external cuticle, retinacula).

Sacculina **rugosa** Van Kampen & Boschma, 1925.

Type specimen on *Cryptodromia bullifera* Alcock; type locality Sailus ketjil, Paternoster Islands, East Indies.

(Van Kampen & Boschma, 1925, *Sacculina rugosa* on *Thalamita investigatoris* Alcock, Pulu Sebangkatan, Borneo Bank, = *Sacculina scabra* Boschma, 1931c).

Figures: Van Kampen & Boschma, 1925, Pl. I fig. 20 (external shape), Pl. III fig. 2 (male organs), text-fig. 35 (external cuticle, retinacula); Boschma, 1937, fig. 76 (male organs), fig. 77 (colleteric gland); Krüger, 1940, fig. 185 (external cuticle).

Sacculina **scabra** Boschma, 1931c.

Type specimen on *Thalamita investigatoris* Alcock; type locality Pulu Sebangkatan, Borneo Bank, East Indies.

Van Kampen & Boschma, 1925, *Sacculina rugosa* (p.p.).

Figures: Van Kampen & Boschma, 1925, Pl. I fig. 19 (external shape), text-fig. 36 (external cuticle); Boschma, 1931c, fig. 9 (male organs); Boschma, 1937, fig. 78 (male organs, colleteric gland).

Sacculina **schmitti** Boschma, 1933b.

Type specimen on *Anomalothir furcillatus* (Stimpson); type locality Gulf of Mexico.

Rathbun, 1925, Rhizocephalid on *Anomalothir furcillatus* (Stimpson), Gulf of Mexico.

Figures: Boschma, 1933b, fig. 11 (external cuticle); Boschma, 1937, fig. 79 (male organs, colleteric gland); Boschma, 1950a, fig. 1*k* (external shape), fig. 12*a* (male organs, colleteric gland).

Loxothylacus **sclerothrix** Boschma, 1933b.

Type specimen on *Actaea boletaria* Rathbun; type locality Amirante, Western Indian Ocean.

Rathbun, 1911, Rhizocephalid parasites on *Actaea boletaria* Rathbun, and on *Carpilodes pediger* Alcock, Amirante.

Boschma, 1933b, *Loxothylacus sclerothrix* on *Carpilodes pediger* Alcock, Amirante, Western Indian Ocean.

Boschma, 1940, *Loxothylacus sclerothrix* on *Xantho sanguineus* (H. Milne Edwards), Amboina.

Figures: Boschma, 1933b, fig. 21 (external cuticle, retinacula); Boschma, 1940, fig. 62 (male organs), fig. 63 (colleteric gland), fig. 64 (external cuticle), fig. 65 (retinacula); Krüger, 1940, fig. 187*g* (external cuticle); Boschma, 1947d, fig. 5*b* (external shape); Boschma, 1950a, figs. 2*k*, 3*f* (external shape), figs. 32, 33 (male organs, colleteric gland), fig. 34 (external cuticle).

Sacculina **semistriata** Van Kampen & Boschma, 1925.

Type specimen on *Conchoecetes andamanicus* Alcock; type locality South of Salawati, East Indies.

Figures: Van Kampen & Boschma, 1925, Pl. I fig. 18 (external shape), Pl. III fig. 3 (male organs, colleteric gland), text-fig. 27 (external cuticle); Boschma, 1937, fig. 80 (male organs, colleteric gland).

Sacculina **senta** Boschma, 1933b.

Type specimen on *Brachynotus sanguineus* (De Haan); type locality Rikuoku, Japan.

Krüger, 1912, *Sacculina carcini* on *Brachynotus sanguineus* (De Haan), Yokohama, Japan, = *S. senta*?

Figures: Boschma, 1933b, fig. 10 (external cuticle); Boschma, 1937, fig. 81 (male organs), fig. 82 (colleteric gland); Boschma, 1950a, fig. 1*j* (external shape), fig. 9*c* (male organs).

Sacculina **serènei** Boschma, 1954d.

Type specimen on *Charybdis feriata* (Linnaeus); type locality Cauda, Nhatrang, Indo-China.

Figures: Boschma, 1954d, fig. 1 (external shape), figs. 2-5 (male organs), fig. 6 (colleteric gland), figs. 7, 8 (external cuticle, retinacula).

Loxothylacus **setaceus** Boschma, 1931c.

Type specimen on *Calappa hepatica* (Linnaeus); type locality Celebes (?).

Van Kampen & Boschma, 1925, *Sacculina pilosa* (p.p.).

Boschma, 1954b, *Loxothylacus setaceus* on *Calappa hepatica* (Linnaeus), Banda and Haruku.

Figures: Van Kampen & Boschma, 1925, text-fig. 6 (external cuticle, retinacula); Boschma, 1931c, fig. 3*e*, *f* (external cuticle), fig. 5*p* (external shape), fig. 40 (male organs, colleteric gland); Boschma, 1936c, fig. 1*d* (external shape), fig. 5 (male organs), fig. 6 (colleteric gland), fig. 7 (external cuticle), fig. 8 (retinacula); Boschma, 1954b, fig. 1*b*, *c* (external shape), figs. 6, 7 (male organs, colleteric gland), fig. 8 (external cuticle, retinacula).

Heterosaccus **setoensis** Shiino, 1943.

Type specimen on *Thalamita wakensis* Edmondson; type locality Seto, Japan.

Figures: Shiino, 1943, fig. 2*J* (external shape), fig. 22 (general anatomy, male organs, colleteric gland, external cuticle, retinacula).

Sacculina **setosa** Van Kampen & Boschma, 1925.

Type specimen on *Xanthias lamarcki* (H. Milne Edwards); type locality Talaud Islands, East Indies.

(Van Kampen & Boschma, 1925, *Sacculina setosa* on *Heteropanope glabra* Stimpson, Madura, = *Sacculina comosa* Boschma, 1931c).

Figures: Van Kampen & Boschma, 1925, Pl. I fig. 10 (external shape), text-fig. 21 (external cuticle, retinacula); Boschma, 1931c, fig. 25 (male organs, colleteric gland); Boschma, 1937, fig. 83 (male organs), fig. 84 (colleteric gland); Krüger, 1940, fig. 207, 7 (male organs).

Heterosaccus **sibogae** Boschma, 1931c.

Type specimen on *Thalamita admeta* (Herbst); type locality Siau, East Indies.

Van Kampen & Boschma, 1925, *Heterosaccus hians.*

Figures: Van Kampen & Boschma, 1925, Pl. I figs. 27, 28 (external shape), Pl. III fig. 7 (male organs), text-fig. 41 (external cuticle, retinacula).

Sacculina **similis** Giard & Bonnier, 1887.

Type specimen on *Macropipus arcuatus* (Leach); type locality Concarneau, Atlantic coast of France.

= *Sacculina carcini* Thompson.

Sacculina **sinensis** Boschma, 1933a.

Type specimen on *Xantho exaratus* (H. Milne Edwards); type locality Hongkong, China.

Figures: Boschma, 1933a, fig. 12 (on Pl. 7) (external shape), figs. 13, 14 (male organs, colleteric gland), fig. 15 (external cuticle); Boschma, 1937, fig. 85 (male organs), fig. 86 (colleteric gland).

Sacculina sp. dubia Metzger, 1891.

= *Drepanorchis neglecta* (Fraisse).

Sacculina **spectabilis** Boschma, 1948c.

Type specimen on *Acanthophrys longispinus* (De Haan); type locality South of Salawati, East Indies.

Van Kampen & Boschma, 1925, *Sacculina pilosa* (p.p.).

Boschma, 1931c, *Sacculina rotundata* (p.p.).

Figures: Van Kampen & Boschma, 1925, Pl. I fig. 8 (external shape), text-fig. 7 (external cuticle); Boschma, 1931c, fig. 3*a, b* (external cuticle), fig. 11*c* (male organs); Boschma, 1948b, fig. 1 (male organs), fig. 2 (external cuticle).

Sacculina **spinosa** Van Kampen & Boschma, 1925.

Type specimen on *Actaea hystrix* Miers; type locality Aru Islands.

(Van Kampen & Boschma, 1925, *Sacculina spinosa* on *Atergatis floridus* (Linnaeus), Celebes (?), = *Sacculina weberi* Boschma, 1931c).

De Man, 1928, *Sacculina* on *Heteropanope hilarulus* (De Man).

Boschma, 1931a, *Sacculina spinosa* on *Pleistacantha sancti-johannis* Miers, Misaki and Sagami Sea, Japan.

Boschma, 1931a, *Sacculina spinosa* on *Heteropanope hilarulus* (De Man), Kei Islands.

Figures: Van Kampen & Boschma, 1925, Pl. I fig. 9 (external shape), text-fig. 20 (external cuticle); Boschma, 1931a, fig. 7*k* (external shape), figs. 25, 26, 28 (male organs, colleteric gland), figs. 27, 29 (external cuticle); Boschma, 1931c, fig. 24 (male organs, colleteric gland); Boschma, 1937, fig. 87 (male organs, colleteric gland); Krüger, 1940, fig. 174*i, k* (external shape).

Loxothylacus **spinulosus** Boschma, 1928c.

Type specimen on *Pilumnopeus serratifrons* (Kinahan); type locality "Pacific Ocean".

Boschma, 1933a, *Loxothylacus spinulosus* on *Glabropilumnus seminudus* (Miers), Hongkong, China.

Figures: Boschma, 1928c, fig. 1*h* (external shape), fig. 9 (male organs, colleteric gland), fig. 10 (external cuticle); Boschma, 1933a, fig. 49*b* (external shape), fig. 52 (male organs, colleteric gland), fig. 53 (external cuticle, retinacula).

Sacculina **stenorhynchi** Malm, 1881.

Type specimen on *Macropodia rostrata* (Linnaeus); type locality Bohuslän.

= *Drepanorchis neglecta* (Fraisse).

Loxothylacus **strandi** Boschma, 1936c.

Type specimen on *Parthenope* (*Rhinolambrus*) *contraria* (Herbst); type locality Macclesfield Bank, China Sea.

Boschma, 1933a, *Loxothylacus aristatus* (p.p.).

Figures: Boschma, 1933a, fig. 49*a* (external shape), fig. 50 (male organs, colleteric gland), fig. 51 (external cuticle); Boschma, 1936c, fig. 1*e* (external shape), fig. 14 (male organs), fig. 15 (colleteric gland), fig. 16 (external cuticle).

Sacculina **striata** Boschma, 1931a.

Type specimen on *Calocarcinus africanus* Calman; type locality Kei Islands, East Indies.

De Man, 1928, *Sacculina* on *Calocarcinus africanus* Calman.

Figures: Boschma, 1931a, fig. 7*d* (external shape), fig. 12 (male organs, colleteric gland), fig. 13 (external cuticle); Boschma, 1937, fig. 88 (male organs), fig. 89 (colleteric gland); Krüger, 1940, fig. 174*d* (external shape).

Drepanorchis **strigulosa** Boschma, 1933b.

Type specimen on *Pleistacantha moseleyi* Miers; type locality Eastern Sea, Japan.

Figures: Boschma, 1933b, fig. 15 (external cuticle, retinacula); Boschma, 1950a, fig. 2*c* (external shape), fig. 14 (male organs, colleteric gland).

Sacculina **sulcata** Van Kampen & Boschma, 1925.

Type specimen on *Ethusina gracilipes* (Miers) var. *robusta* Miers; type locality Makassar Strait.

Figures: Van Kampen & Boschma, 1925, Pl. I fig. 21 (external shape), text-fig. 39 (external cuticle); Boschma, 1931c, fig. 32 (male organs); Boschma, 1937, fig. 90 (male organs, colleteric gland).

Sacculina **synaptothrix** Boschma, 1948c.

Type specimen on *Tiarinia gracilis* Dana; type locality Halmaheira.

= *Sacculina cordata* Shiino.

Drepanorchis **tenuicutis** Boschma, 1933b.

Type specimen on *Aepinus indicus* (Alcock); type locality Amirante, Western Indian Ocean.

Rathbun, 1911, Rhizocephalid parasite on *Aepinus indicus* (Alcock), Amirante.

Figures: Boschma, 1933b, fig. 17 (external cuticle, retinacula); Boschma, 1950a, fig. *2f* (external shape), fig. 19 (male organs, colleteric gland).

Sacculina **teres** Boschma, 1933a.

Type specimen on *Notopoides latus* Henderson; type locality Kei Islands, East Indies.

Figures: Boschma, 1933a, fig. *7h* (external shape), figs. 33, 34 (male organs, colleteric gland), fig. 35 (external cuticle); Boschma, 1937, fig. 91 (male organs, colleteric gland); Krüger, 1940, fig. *187f* (external cuticle), fig. *207b* (colleteric gland).

Sacculina **teretiuscula** Boschma, 1931a.

Type specimen on *Scalopidia spinosipes* Stimpson; type locality Koh Chang, Thailand.

Figures: Boschma, 1931a, fig. 16 (external shape), fig. 17 (male organs, colleteric gland), fig. 18 (external cuticle); Boschma, 1937, fig. 92 (male organs, colleteric gland); Krüger, 1940, fig. *187e* (external cuticle).

Sacculina **ternatensis** Boschma, 1950f.

Type specimen on *Ptychognathus barbatus* (A. Milne Edwards); type locality Ternate, East Indies.

Figures: Boschma, 1950f, figs. 1-3 (external shape), fig. 4 (male organs, colleteric gland), fig. 5 (external cuticle).

Sacculina tessellata Boschma, 1925.

= *Heterosaccus tessellatus* (Boschma).

Heterosaccus **tessellatus** (Boschma, 1925).

Type specimen on *Mithrax* (*Mithraculus*) *ruber* (Stimpson); type locality Caracas Bay, Curaçao.

Boschma, 1925, *Sacculina tessellata.*

Boschma, 1931c, *Heterosaccus tessellatus.*

Figures: Boschma, 1925, Pl. II fig. 3 (external shape), Pl. II figs. 8-10 (male organs, colleteric gland), text-figs. 4, 5 (external cuticle); Boschma, 1931c, fig. 34 (male organs).

Loxothylacus **texanus** Boschma, 1933b.

Type specimen on *Callinectes sapidus* Rathbun; type locality Metagorda Bay, near Indianola, Texas.

Rathbun, 1895, *Peltogaster* on *Callinectes sapidus* Rathbun, Indianola, Texas.

Rathbun, 1930, Rhizocephalid on *Callinectes marginatus* (A. Milne Edwards), Panama region.

Boschma, 1933b, *Loxothylacus texanus* on *Callinectes marginatus* (A. Milne Edwards), Canal Zone and other localities in Panama.

Boschma, 1950a, *Loxothylacus texanus* on *Callinectes sapidus* Rathbun, San Antonio Bay and Galveston, Texas.

Reinhard, 1951, *Loxothylacus texanus* on *Callinectes sapidus* Rathbun, Aransas Bay and Mud Island, Texas.

Figures: Boschma, 1933b, fig. 20 (external cuticle, retinacula); Boschma, 1950a, figs. *2i, j, 3b, c, e* (external shape), figs. 27-31 (male organs, colleteric gland); Reinhard, 1951, fig. on pp. 16/17 (external shape).

Loxothylacus **tomentosus** Shiino, 1943.

Type specimen on *Actaea savignyi* (H. Milne Edwards); type locality Sakinosima near Onomiti, Japan.

Figures: Shiino, 1943, fig. *2G* (external shape), fig. 19 (general anatomy, male organs, colleteric gland, external cuticle, retinacula).

Loxothylacus **torridus** Boschma, 1940.

Type specimen on *Actaea tomentosa* (H. Milne Edwards); type locality Kera near Timor, East Indies.

Figures: Boschma, 1940, figs. 30, 33, 36, 38 (male organs), figs. 31, 34, 37, 39 (colleteric gland), figs. 32, 35, 40 (external cuticle, retinacula); Boschma, 1947d, fig. 3 (external shape).

Sacculina **triangularis** Anderson, 1862.

Type specimen on *Cancer pagurus* Linnaeus; type locality Firth of Forth, Scotland.

= *Sacculina inflata* Leuckart.

Sacculina **upogebiae** Shiino, 1943.

Type specimen on *Upogebia major* (De Haan); type locality Tanabe Bay, Japan.

Shiino, 1943, *Sacculina upogebiae* on *Upogebia major* (De Haan), Hirosima Bay and Hakata Bay, Japan.

Figures: Shiino, 1943, fig. *2F* (external shape), fig. 18 (general anatomy, male organs, colleteric gland, external cuticle, retinacula).

Sacculina **vankampeni** Boschma, 1931c.

Type specimen on *Ozius rugulosus* Stimpson; type locality Humboldt Bay, North New Guinea.

Van Kampen & Boschma, 1925, *Sacculina pilosa* (p.p.).

Boschma, 1931c, *Sacculina vankampeni* on *Eurycarcinus natalensis* (Krauss), Nossi Faly near Madagascar.

Figures: Van Kampen & Boschma, 1925, text-fig. 8 (external cuticle); Boschma, 1928c, fig. *2e* (external cuticle); Boschma, 1931c, fig. *3o* (external cuticle), fig. *5f* (external shape), fig. 16 (male organs, colleteric gland).

Loxothylacus **variabilis** Boschma, 1940.

Type specimen on *Chlorodiella nigra* (Forskål); type locality near Kupang, Timor, East Indies.

Boschma, 1940, *Loxothylacus variabilis* on unidentified Xanthid crab, Kafal near Misool; on *Actaea rüppellii* (Krauss), Mamudju, Celebes.

Boschma, 1947c, *Loxothylacus variabilis* on *Actaea hirsutissima* (Rüppell), Taliabu, Sula Islands.

Figures: Boschma, 1940, figs. 1, 6, 8, 10, 11, 15, 19, 22 (male organs), figs. 2, 16, 23 (colleteric gland), figs. 3, 4, 5, 7, 9, 12, 13, 14, 17, 18, 20, 21, 24, 25 (external cuticle, retinacula); Boschma, 1947c, fig. 5 (external cuticle); Boschma, 1947d, fig. 1 (external shape).

Loxothylacus **vepretus** Boschma, 1947b.

Type specimen on *Chlorodiella nigra* (Forskål); type locality Red Sea.

Boschma, 1947b, *Loxothylacus vepretus* on *Chlorodiella nigra* (Forskål), Obi latu, East Indies.

Boschma, 1948a, *Loxothylacus vepretus* on *Atergatis floridus* (Linnaeus), Talisay, Cebu, Philippine Islands.

Figures: Boschma, 1947b, figs. 1-4 (male organs), fig. 5 (colleteric gland), fig. 6 (external cuticle), fig. 7 (retinacula); Boschma, 1948a, fig. 1*b* (external shape), fig. 2 (male organs, colleteric gland), fig. 3*b-f* (external cuticle, retinacula).

Sacculina **verrucosa** Van Kampen & Boschma, 1925.

Type specimen on *Achaeus cadelli* Alcock; type locality Labuan Badjo, Flores, East Indies.

(Van Kampen & Boschma, 1925, *Sacculina verrucosa* on *Phalangipus longipes* (Linnaeus), between Ceram and New Guinea, = *Sacculina granulosa* Boschma, 1931c).

Figures: Van Kampen & Boschma, 1925, Pl. I fig. 16 (external shape), Pl. II fig. 5 (male organs), text-fig. 31 (external cuticle); Boschma, 1937, fig. 93 (male organs, colleteric gland).

Sacculina **vieta** Boschma, 1933b.

Type specimen on *Actaea savignyi* (H. Milne Edwards); type locality Seychelles, Western Indian Ocean.

= *Sacculina exarcuata* Kossmann (Boschma, 1950a).

Figures: Boschma, 1933b, fig. 8 (external cuticle); Boschma, 1937, fig. 94 (male organs, colleteric gland); Boschma, 1950a, fig. 1*h* (external shape), fig. 9*a* (male organs).

Drepanorchis **villosa** (Van Kampen & Boschma, 1925).

Type specimen on *Chlorodiella nigra* (Forskål); type locality Jiddah, Red Sea.

Van Kampen & Boschma, 1925, *Sacculina villosa*.

Boschma, 1931c, *Drepanorchis villosa*.

Figures: Van Kampen & Boschma, 1925, Pl. I fig. 7 (external shape), Pl. II fig. 4 (male organs), text-fig. 17 (external cuticle, retinacula); Boschma, 1931c, fig. 33 (male organs, colleteric gland).

Sacculina villosa Van Kampen & Boschma, 1925.

= *Drepanorchis villosa* (Van Kampen & Boschma).

Sacculina **weberi** Boschma, 1931c.

Type specimen on *Atergatis floridus* (Linnaeus); type locality Celebes(?).

Van Kampen & Boschma, 1925, *Sacculina spinosa* (p.p.).

Boschma, 1948a, *Sacculina weberi* on *Atergatis floridus* (Linnaeus), Mamudju, Celebes.

Figures: Van Kampen & Boschma, 1925, text-fig. 19 (external cuticle, retinacula); Boschma, 1931c, fig. 5*a* (external shape), fig. 6 (male organs, colleteric gland); Boschma, 1937, fig. 95 (male organs), fig. 96 (colleteric gland); Boschma, 1948a, fig. 1*d-f* (external shape).

Sacculina **yatsui** Boschma, 1936a.

Type specimen on *Pachygrapsus crassipes* Randall, type locality Misaki, Japan.

Krüger, 1912, *Sacculina carcini* on *Pachygrapsus crassipes* Randall, Sagami Bay, Japan.

Boschma, 1935, *Sacculina rotundata* on *Pachygrapsus crassipes* Randall, Misaki and Sagami Bay.

Shiino, 1943, *Sacculina yatsui* on *Pachygrapsus crassipes* Randall, Okonosima, Ryukyu Islands.

Boschma, 1949c, *Sacculina yatsui* on *Metopograpsus messor* (Forskål), Kambang near Timor and Tukang Besi Islands; on *Metopograpsus oceanicus* Jacquinot & Lucas, Tanah Djampea; on *Metopograpsus quadridentatus* Stimpson, Halmaheira and Japan.

Figures: Boschma, 1936a, fig. 1 (external shape), figs. 2, 3 (male organs), figs. 4, 5 (colleteric gland), figs. 6, 7 (external cuticle); Shiino, 1943, fig. 1*F* (external shape), fig. 8 (male organs, external cuticle); Boschma, 1949c, fig. 1 (external shape), fig. 2 (male organs), fig. 3 (colleteric gland), fig. 4 (external cuticle).

Sacculina **zariquieyi** Boschma, 1947e.

Type specimen on *Xantho couchi* Bell; type locality Catalonian region of Mediterranean.

Figures: Boschma, 1947e, fig. 1 (external shape), fig. 2 (external cuticle), fig. 3 (male organs, colleteric gland).

The greater part of the recognized species of the family Sacculinidae are known as parasites of one species of host only; some remarks are here added concerning the species reported to occur as a parasite of different hosts.

When a certain parasite is known to infest two or more species of one genus of crabs, the characters of the parasites of these various hosts always proved to correspond in every detail. This holds for the following species.

Sacculina flexuosa; hosts two species of the genus *Grapsus* (Grapsidae): *Grapsus strigosus* and *G. tenuicrustatus.*

Heterosaccus papillosus; hosts four species of the genus *Charybdis* (Portunidae): *Charybdis bimaculata, Ch. japonica, Ch. truncata,* and *Ch. anisodon.*

Sacculina papposa; hosts two species(?) of the genus *Thalamita* (Portunidae): *Thalamita admeta* and *Thalamita* spec.

Sacculina punctata; hosts two species and one subspecies of the genus *Plagusia* (Grapsidae): *Plagusia dentipes, P. depressa,* and *P. depressa immaculata.*

Sacculina rotundata; hosts two species of the genus *Eriphia* (Xanthidae): *E. sebana* and *E.*(?) *scabricula.*

Loxothylacus texanus; hosts two species of the genus *Callinectes* (Portunidae): *Callinectes sapidus* and *C. marginatus.*

Quite a number of species are known to infest two or more crabs belonging to one family but classified in different genera. As far as the here following parasites are concerned it is practically certain that in every instance the specimens on the various hosts are conspecific.

Loxothylacus brachythrix; hosts five species of the family Xanthidae: *Xantho sanguineus, X. exaratus, X. gracilis, Lybia tesselata,* and *Phymodius ungulatus.* Probably *Loxothylacus amoenus,* a parasite of the Xanthid crab *Phymodius granulatus,* is not specifically distinct from *L. brachythrix.*

Heterosaccus californicus; hosts three (or five?) species of the family Majidae: *Pugettia producta, Loxorhynchus crispatus, Taliepus nuttallii,* and probably *Pelia tumida* and *Loxorhynchus grandis.*

Loxothylacus carinatus; hosts one unidentified crab and seven species of the family Portunidae: *Portunus* aff. *hastatus, P. hastatoides, Caphyra levis, Thalamita prymna, Th. admeta, Lissocarcinus polybioides,* and unidentified Portunid. It is probable that the host of the type specimen, *Portunus* aff. *hastatus,* is conspecific with *P. hastatoides.*

Sacculina carpiliae; hosts four species of the family Xanthidae: *Carpilius convexus, Xanthias lamarcki, Lybia tesselata,* and *Glyptoxanthus vermiculatus.*

Sacculina confragosa; hosts two species of the family Grapsidae: *Pachygrapsus crassipes* and *Goetice depressus.*

Loxothylacus corculum; hosts two species of the family Xanthidae: *Atergatis floridus* and *Xantho sanguineus.*

Sacculina cordata; hosts two species of the family Majidae: *Tylocarcinus styx* and *Tiarinia gracilis.*

Sacculina cuspidata; hosts two species of the family Xanthidae: *Pseudozius caystrus* and *Chlorodopsis* spec.

Drepanorchis fabacea; hosts three species of the family Majidae: *Achaeopsis pugnax, Achaeus japonicus,* and *Achaeopsis superciliaris.*

Ptychascus glaber; hosts two species of the family Grapsidae: *Sesarma benedicti* and *Aratus pisonii.*

Sacculina glabra; hosts two species of the family Majidae: *Hyastenus subinermis* and *Tiarinia gracilis.*

Sacculina imberbis; hosts two species of the family Grapsidae: *Pachygrapsus crassipes* and *Metopograpsus quadridentatus.*

Sacculina lata; hosts two species of the family Portunidae: *Charybdis miles* and *Podophthalmus vigil.*

Loxothylacus murex; hosts two species of the family Xanthidae: *Xanthias lamarcki* and *Cymo andreossyi.*

Drepanorchis neglecta; hosts five species of the family Majidae: *Inachus dorsettensis, I. mauretanicus, I. dorhynchus, Macropodia rostrata,* and *M. longirostris.*

Heterosaccus occidentalis; hosts ten (or eleven?) species of the family Majidae: *Mithrax forceps, M. coryphe, M. sculptus, Pitho lherminieri, P. anisodon, Macrocoeloma camptocerum, M. diplacanthum, Microphrys bicornutus, Stenocionops furcata coelata, S. spinosissima,* and probably *Microphrys interruptus.*

Sacculina plana; hosts two species of the family Grapsidae: *Grapsus strigosus* and *Metopograpsus messor.*

Sacculina pulchella; hosts three species of the family Majidae: *Huenia proteus, Hyastenus brockii,* and *Phalangipus longipes.*

Loxothylacus sclerothrix; hosts three species of the family Xanthidae: *Actaea boletaria, Carpilodes pediger,* and *Xantho sanguineus.*

Loxothylacus torridus; host *Actaea tomentosa* (family Xanthidae); the species is placed here because *L. musivus* probably is a synonym; the hosts of *L. musivus* are the Xanthid crabs *Cymo andreossyi* and *Phymodius ungulatus.*

Loxothylacus variabilis; hosts four species of the family Xanthidae: *Chlorodiella nigra, Actaea rüppellii, A hirsutissima,* and unidentified Xanthid crab.

Loxothylacus vepretus; hosts two species of the family Xanthidae: *Chlorodiella nigra* and *Atergatis floridus.*

Sacculina yatsui; hosts four species of the family Grapsidae: *Pachygrapsus crassipes, Metopograpsus messor, M. oceanicus,* and *M. quadridentatus.*

In some instances it is doubtful whether parasites of two or three species of crabs of one family indeed are representatives of one species. These instances are the following.

Sacculina angulata; hosts two species of the family Portunidae: *Portunus longispinosus* and *Thalamita sima.* In the specimen on *Portunus longispinosus* in a part of the male organs the cavities are communicating, in the specimen on *Thalamita sima* the cavities of the male organs remain separate; the two forms, therefore, probably are specifically different.

Sacculina anomala; hosts two species of the family Portunidae: *Thalamita cooperi* and *Charybdis bimaculata.* In the specimen on *Thalamita cooperi* the excrescences of the external cuticle are short thick hairs of 10 to 16 μ,

beset with numerous minute lateral hairs, the retinacula have a single barbed spindle of a length of about 12 μ; in the specimens on *Charybdis bimaculata* the excrescences of the external cuticle are "small mammiform, non-barbed papillae" (Shiino, 1943, p. 21, measured after Shiino's figure the papillae have a length of about 6 μ), the retinacula consist "of several large spindles arising from a common basal disc" (l.c., measured after Shiino's figure the spindles have a length of 20 to 35 μ, while no barbs have been drawn).

Sacculina compressa; hosts two species of the family Xanthidae: *Ozius tuberculosus* and *Eriphia sebana*. Shiino (1943, p. 14, footnote) remarks: "It is almost certain that the parasites of *Ozius* and *Eriphia* are specifically distinct from each other, for they are quite different in the constitution of the male gonads".

Heterosaccus ruginosus; hosts three species of the family Portunidae: *Lissocarcinus orbicularis, Thalamita prymna,* and *Thalamita crenata.* The supposed conspecifity of the specimens on the three different hosts must be regarded as provisional, the specimens are united in one species on account of lack of distinctive characters.

Loxothylacus spinulosus; hosts two species of the family Xanthidae: *Pilumnopeus serratifrons* and *Glabropilumnus seminudus*. In the specimen on *Pilumnopeus* the curvature of the testes is wider than in the specimens on *Glabropilumnus,* moreover, in the former the testes are not as widely enlarged as in the latter. A further difference, though of perhaps minor importance, is that of the shape of the excrescences of the external cuticle, which in the specimen on *Pilumnopeus* are more or less prismatical, in the specimen on *Glabropilumnus* more or less conical.

Sacculina vankampeni; hosts two species of the family Xanthidae: *Ozius rugulosus* and *Eurycarcinus natalensis*. The colleteric glands of the specimen on *Ozius* have a small number of canals, in the specimen on *Eurycarcinus* this number is large.

When parasites on hosts belonging to different families of crabs are considered representatives of one species the identification in many instances remains doubtful, though lack of distinctive characters often must lead to a decision to unite the parasites of the different hosts in one species. The known instances of occurrence of a parasite on hosts of different families are the following.

Sacculina bipunctata; hosts *Portunus* spec. (Portunidae) and *Pilumnus* spec. (Xanthidae). The male organs and the excrescences of the external cuticle of the specimen on *Pilumnus* spec. correspond with those of the type specimen on *Portunus* spec. In the specimen on *Pilumnus* spec. the colleteric glands are found at the anterior extremity of the visceral mass;

in the original description of the species (Kossmann, 1872) the colleteric glands of the specimen on *Portunus* spec. are mentioned as occurring in the central region of the visceral mass; it is, therefore, doubtful whether the two specimens are conspecific.

Sacculina carcini; hosts eight (or nine?) species of the family Portunidae: *Carcinus maenas, Macropipus marmoreus, M. depurator, M. pusillus, M. holsatus, M. arcuatus, Portumnus latipes, Bathynectes longipes,* and probably *Macropipus corrugatus,* one species of the family Pirimelidae: *Pirimela denticulata,* two species of the family Grapsidae: *Pachygrapsus marmoratus* and *Brachynotus sexdentatus,* one species of the family Majidae: *Pisa armata,* and possibly two species of the family Xanthidae: *Pilumnus hirtellus* and *Xantho incisus.* The parasites of the several hosts are regarded as specifically identical on account of entirely corresponding characters.

Sacculina curvata; hosts two species of the family Grapsidae: *Sesarma edwardsii* and *Varuna litterata,* and two species of the family Ocypodidae: *Uca dussumieri* and *Macrophthalmus erato.* The peculiar character of the dorsal parts of the testes indicates that the specimens occurring on the four different hosts are specifically identical.

Sacculina exarcuata; hosts "*Cancer* spec." (Cancridae, the family name perhaps used in a wider sense than at present), *Actaea savignyi* (Xanthidae), and *Parthenope valida* (Parthenopidae). The characters of the specimen on *Actaea savignyi* from shallow water correspond with those of the specimen on *Parthenope valida.* The specimen on *Actaea savignyi* from 31 fathoms (Seychelles, Western Indian Ocean) originally was made the type of the species *Sacculina vieta,* which later was united with *S. exarcuata.* It is not altogether certain that the two specimens from different depths are identical, because the colleteric glands of the type of *S. vieta* have a much smaller number of canals than those of the specimens of *S. exarcuata* from shallow water. Moreover, it is doubtful whether the parasites of *Actaea savignyi* and of *Parthenope valida* really belong to the species described as *Sacculina exarcuata* by Kossmann, for this author remarks that the male organs correspond with those of his species *S. dentata,* in which the vasa deferentia are conspicuously swollen in their ventral parts. In the specimens which were later identified with *S. exarcuata* the vasa deferentia are narrow tubes without enlarged ventral parts.

Sacculina gracilis; hosts four species of the family Portunidae: *Portunus longispinosus, Thalamita sima, Th. investigatoris,* and *Th. stimpsoni,* and three species of the family Goneplacidae: *Lithocheira setosa, Ser fukiensis,* and *Notonyx vitreus.* The characters of the several specimens are sufficiently

uniform to regard the parasites of the seven different hosts as specifically identical.

Sacculina inflata; hosts two species of the genus *Hyas, H. araneus* and *H. coarctatus* (Majidae), and *Cancer pagurus* (Cancridae). The species was described after a parasite of *Hyas araneus*; the parasite of *Cancer pagurus* was originally described as a separate species, *Sacculina triangularis*. The characters of the parasite of *Cancer pagurus* are well known, of *Sacculina inflata* sensu stricto in later times only one specimen on *Hyas coarctatus* could be examined, leading to the conclusion that *S. triangularis* and *S. inflata* are forms of one species. Examination of additional specimens parasitic on the species of the genus *Hyas* is highly desirable for a definite proof concerning the status of the two described species.

Sacculina leptodiae; hosts four species of the family Xanthidae: *Xantho exaratus, Xantho* spec., *X. gracilis,* and *Pseudozius caystrus,* one Portunid crab: *Thalamita stimpsoni,* and possibly *Camposcia retusa* (Majidae) and *Carupa laeviuscula* (Portunidae). The specific identity of the parasites of the various Xanthid crabs and of *Thalamita stimpsoni* is practically certain, the status of the parasites of *Camposcia retusa* and *Carupa laeviuscula* needs further corroboration.

Sacculina margaritifera; hosts, *Thalamita* spec. (Portunidae) and *Oncinopus araneus* (Majidae). The parasites of the two species of crabs have excrescences of the external cuticle of a similar shape, in their anatomical characters they are, however, strikingly different. The testes of the specimen on *Thalamita* spec. are united to form a single cavity with two vasa deferentia, while in the specimen on *Oncinopus araneus* the male organs are separate. Consequently, the two specimens belong to different species, and the real *Sacculina margaritifera* is not the species figuring under this name in the key.

Loxothylacus panopaei; hosts four (or five?) species of the family Xanthidae: *Panopeus herbstii, P. occidentalis, Eurypanopeus depressus, Lophopanopeus bellus,* and probably *L. diegensis,* one species of the family Goneplacidae: *Tetraplax quadridentata.* The specimens on the three first named crabs certainly belong to the species, the type came from Florida, other specimens from various localities in the West Indies and from Texas. The specimens on *Lophopanopeus bellus* came from British Columbia, they differ from typical specimens in having the excrescences of the external cuticle covered with minute lateral hairs; this may be an indication of a specific difference. The specimen from *Lophopanopeus diegensis* was not examined, it came from Southern California, and may correspond with the specimens on *L. bellus.* The parasite of *Tetraplax quadridentata* came from

Venezuela, in this specimen the excrescences of the external cuticle are much longer than those of typical specimens, so that the identification with *Loxothylacus panopaei* remains uncertain.

Sacculina pilosa; hosts "*Pisa* spec." (Majidae) and *Actaea tomentosa* (Xanthidae). Of the numerous specimens on various hosts included in the species *Sacculina pilosa* by Van Kampen & Boschma (1925) in later papers all except the parasites of *Actaea tomentosa* were identified with other species or described as new. It is, however, fairly certain that the parasites of *Actaea tomentosa* that have excrescences similar to those of *Sacculina pilosa* belong to a different species. Kossmann's (1872) specimen on "*Pisa* spec." had excrescences of the external cuticle of a height of 85 μ, in the specimens on *Actaea tomentosa* the height of the excrescences is from 20 to 60 μ. A further difference is that of the male organs in the two forms. In the type specimen of *Sacculina pilosa* the male organs are stated to correspond with those of *S. dentata,* of which Kossmann (l.c.) remarks: "Die paarigen kugelförmigen Hoden liegen dicht am Rüssel", which apparently means that the male organs occur in the posterior part of the body, outside the visceral mass. In the specimens on *Actaea tomentosa* the male organs are contained in the visceral mass.

Sacculina pilosella; hosts *Quadrella coronata* (Xanthidae) and two species of the family Majidae: *Pugettia quadridens* and *Menaethius monoceros.* It is not absolutely certain that the parasites of the two crabs of the family Majidae are specifically identical with the parasites of *Quadrella coronata.* In the specimens on the last named crab the excrescences of the external cuticle bear small spines especially on their tops, in the specimens on the Majid crabs the small spines are more or less regularly distributed over the whole of the surface of the excrescences (Shiino, 1943, fig. 7).

Sacculina spinosa; hosts two species of the family Xanthidae: *Actaea hystrix* and *Heteropanope hilarulus,* and one species of the family Majidae: *Pleistacantha sancti-johannis.* The specimens on *Heteropanope* and on *Pleistacantha* were identified with the parasite on *Actaea* chiefly on account of the similarity of the excrescences of the external cuticle in the three forms. In the specimens on *Pleistacantha sancti-johannis* the colleteric glands have a much larger number of canals than in the parasites of the Xanthid crabs, this points to a specific difference. As far as the parasites of the Xanthid crabs are concerned there is a difference in the structure of the male organs: in the specimen on *Actaea hystrix* the testes have rather wide cavities, while in the specimen on *Heteropanope hilarulus* the cavities of the testes are rather narrow; this again may point to a specific difference.

Many of the errors referred to above were caused by a tendency to avoid

the erection of a new species for specimens which showed certain characters peculiar to already existing species, this especially applies to the identification of specimens with species described by Kossmann (1872) on account of an apparently striking similarity in the peculiarities of the external cuticle. Especially in the first report on the Rhizocephala of the Siboga Expedition (Van Kampen & Boschma, 1925) many identifications were made based on the structure of the external cuticle (and the characters of the retinacula) only, so that in a revision of the material (Boschma, 1931c), in which the structure of the male organs and of the colleteric glands was taken into account, many changes proved necessary. Though at present most of the errors have been rectified, there are still a few remaining, especially in connexion with Kossmann's species.

From the list of species in the present chapter results that the species of the Sacculinidae in general occur as parasites of hosts of systematically restricted groups; exceptionally there are well founded instances of parasites of one species occurring on crabs of different families. When we started our investigations on Rhizocephala (Van Kampen & Boschma, 1925) our leading principle was the firm belief that Giard was entirely wrong when in several of his papers he advocated the theory of the "spécificité parasitaire" (meaning that each species of crab would have a separate species of parasite), so that we examined only the differences in structure of the various parasites and did not pay attention to the systematic position of the hosts. With an increasing familiarity with the systematics of the group it became evident that apparently altogether similar parasites occurring on crabs of a widely different systematic position need to be examined with great care before they may be considered specifically identical. Consequently a number of conclusions in this respect afterwards had to be corrected, leading to the rather complicated synonymies as they occur under many of the species in the list.

III. PARASITES ARRANGED UNDER HOSTS.

The following list is an alphabetical enumeration of the hosts of the various Sacculinidae. The hosts are listed with their nomenclatorially correct names, while in many instances synonyms, chiefly those that were used in the description of the parasites, are added in square brackets. Preceding the names of the hosts the names of the families to which these belong are mentioned, these indications are not repeated when two or more species of one genus are listed. Behind the name of each of the hosts the parasites are mentioned known to occur on these hosts, when described with their scientific name, when undescribed with a bibliographic reference. The species

of the genera *Sesarmaxenos* and *Ptychascus* are recorded with their full names, the species of the genera *Sacculina, Heterosaccus, Drepanorchis,* and *Loxothylacus* with the initial letter of their generic name followed by the specific name.

(Calappidae) *Acanthocarpus alexandri* Stimpson: Sacculinid mentioned by Rathbun (1937).

(Majidae) *Acanthophrys longispinus* (De Haan) [*Paramithrax longispinus*]: *S. spectabilis.*

(Majidae) *Achaeopsis pugnax* De Man: *D. fabacea.*

Achaeopsis superciliaris Ortmann: *D. fabacea.*

(Majidae) *Achaeus cadelli* Alcock: *S. verrucosa.*

Achaeus japonicus (De Haan): *D. fabacea.*

(Xanthidae) *Actaea areolata* Dana: Sacculinid mentioned by Rathbun (1924).

Actaea boletaria Rathbun: *L. sclerothrix.*

Actaea hirsutissima (Rüppell): *S. brevispina, S. ignorata, S. microthrix, L. variabilis.*

Actaea hystrix Miers: *S. spinosa.*

Actaea rufopunctata (H. Milne Edwards): *S. actaeae,* Sacculinid mentioned by Holthuis (1953).

Actaea rüppellii (Krauss): *L. variabilis.*

Actaea savignyi (H. Milne Edwards) [*A. granulata* (Audouin)]: *S. crucifera, S. exarcuata, L. tomentosus,* Sacculinid mentioned by Richiardi (1875), Sacculinid mentioned by Smith (1906).

Actaea tomentosa (H. Milne Edwards): *S. pilosa, L. torridus.*

(Xanthidae) *Actumnus setifer* (De Haan) [*Actumnus tomentosus* Dana]: *S. echinulata.*.

(Majidae) *Aepinus indicus* (Alcock): *D. tenuicutis.*

(Albuneidae) *Albunea symnista* (Linnaeus): *S. anceps.*

(Majidae) *Anomalothir furcillatus* (Stimpson): *S. schmitti.*

(Majidae) *Arachnopsis filipes* Stimpson: *S. rathbunae.*

(Grapsidae) *Aratus pisonii* (H. Milne Edwards): *Ptychascus glaber.*

(Xanthidae) *Atergatis floridus* (Linnaeus): *L. aristatus, L. corculum, S. gordonae, S. robusta, L. vepretus, S. weberi.*

Atergatis integerrimus (Lamarck): *S. pistillata.*

(Portunidae) *Bathynectes longipes* (Risso): *S. carcini.*

(Grapsidae) *Brachynotus penicillatus* De Haan [*Heterograpsus penicillatus*]: Sacculinid mentioned by Krüger (1912).

Brachynotus sanguineus (De Haan) [*Hemigrapsus sanguineus, Hetero-*

grapsus sanguineus]: *S. nigra, S. senta,* Sacculinid mentioned by Krüger (1912).

Brachynotus sexdentatus (Risso) [*B. lucasi* H. Milne Edwards, *Heterograpsus lucasi*]: *S. carcini.*

(Calappidae) *Calappa hepatica* (Linnaeus): *L. setaceus.*

Calappa philargius (Linnaeus): *L. auritus.*

Calappa pustulosa Alcock: *S. calappae.*

(Portunidae) *Callinectes marginatus* (A. Milne Edwards): *L. texanus.*

Callinectes sapidus Rathbun: *L. texanus.*

(Xanthidae) *Calocarcinus africanus* Calman: *S. striata.*

(Majidae) *Camposcia retusa* Latreille: *S. leptodiae?*

(Cancridae) *Cancer pagurus* Linnaeus [*Platycarcinus pagurus*]: *S. inflata.*

Cancer spec.: *S. exarcuata.*

(Portunidae) *Caphyra levis* (A. Milne Edwards): *L. carinatus.*

(Portunidae) *Carcinus maenas* (Linnaeus) [*Carcinides maenas*]: *S. carcini.*

(Xanthidae) *Carpilius convexus* (Forskål): *S. carpiliae.*

(Xanthidae) *Carpilodes bellus* (Dana) [*C. vaillantianus* A. Milne Edwards]: *S. hystrix, S. inconstans.*

Carpilodes monticulosus A. Milne Edwards [*C. cariosus* Alcock]: Sacculinid mentioned by Rathbun (1911).

Carpilodes pediger Alcock: *L. sclerothrix.*

Carpilodes virgatus Rathbun: Sacculinid mentioned by Rathbun (1911).

(Portunidae) *Carupa laeviuscula* Heller: *S. aculeata.*

(Portunidae) *Charybdis anisodon* (De Haan): *H. papillosus.*

Charybdis (*Gonioneptunus*) *bimaculata* (Miers): *S. anomala, H. papillosus.*

Charybdis feriata (Linnaeus) [*Ch. cruciata* (Herbst)]: *S. serènei.*

Charybdis (*Goniohellenus*) *hoplites* (Wood Mason): Sacculinid mentioned by Stephensen (1945).

Charybdis japonica (A. Milne Edwards) [*Goniosoma japonicum*]: *H. papillosus.*

Charybdis miles (De Haan): *S. lata.*

Charybdis (*Goniohellenus*) *truncata* (Fabricius) [*Ch. ornata* (A. Milne Edwards)]: *H. hians, H. papillosus.*

Charybdis spec.: Sacculinid mentioned by Annandale (1911).

(Xanthidae) *Chlorodiella nigra* (Forskål) [*Chlorodius niger*]: *S. phacelothrix, L. variabilis, L. vepretus, D. villosa.*

(Xanthidae) *Chlorodopsis areolata* (H. Milne Edwards) [*Chlorodius areolatus*] : *S. pomum,* Sacculinid mentioned by Smith (1906).

Chlorodopsis spec.: *S. cuspidata.*

(Dromiidae) *Conchoecetes andamanicus* Alcock: *S. semistriata.*

(Dromiidae) *Cryptodromia bullifera* Alcock: *S. rugosa.*

(Parthenopidae) *Cryptopodia fornicata* (Fabricius): *S. hirta.*

(Grapsidae) *Cyclograpsus intermedius* Ortmann: Sacculinid mentioned by Krüger (1912).

(Xanthidae) *Cymo andreossyi* (Audouin) [*C. melanodactylus* De Haan]: *S. leopoldi, L. murex, L. musivus.*

(Cymopoliidae) *Cymopolia alternata* (Rathbun): Sacculinid mentioned by Rathbun (1918).

(Majidae) *Doclea ovis* (Herbst): Sacculinid mentioned by Annandale (1911).

(Majidae) *Dorhynchus thomsoni* Norman [*Lispognathus thomsoni, Achaeopsis thomsoni*]: *S. atlantica.*

(Grapsidae) *Eriocheir japonicus* (De Haan): *S. gregaria.*

Eriocheir rectus Stimpson: *S. gibba.*

(Xanthidae) *Eriphia scabricula* Dana: *S. rotundata.*

Eriphia sebana (Shaw & Nodder) [*E. laevimana* Latreille]: *S. compressa, S. rotundata.*

Eriphia spinifrons (Herbst): *S. eriphiae.*

(Dorippidae) *Ethusina abyssicola* S. I. Smith [*Ethusa abyssicola*]: *S. abyssicola.*

Ethusina gracilipes (Miers) [*Ethusa gracilipes*]: *S. elongata, S. sulcata.*

(Xanthidae) *Eurycarcinus natalensis* (Krauss) [*Eurycarcinus grandidieri* A. Milne Edwards, *Galene natalensis*]: *S. vankampeni.*

(Xanthidae) *Eurypanopeus depressus* (Smith) [*Panopeus depressus*]: *L. panopaei.*

(Xanthidae) *Euxanthus exsculptus* (Herbst) [*E. melissa* (Herbst)]: *L. echioides.*

Euxanthus fragarius Hilgendorf [*Melissa fragaria*]: Sacculinid mentioned by Gerstaecker (1866-1879).

(Galatheidae) *Galathea* spec.: *S. flacca.*

(Goneplacidae) *Geryon affinis* A. Milne Edwards & Bouvier: *S. carcini?*

(Xanthidae) *Glabropilumnus seminudus* (Miers) [*Pilumnus seminudus*]: *L. spinulosus.*

(Xanthidae) *Glyptoxanthus vermiculatus* (Lamarck): *S. carpiliae.*

(Grapsidae) *Goetice depressus* (De Haan): *S. confragosa.*

(Goneplacidae) *Goneplax angulata* (Pennant) [*Gonoplax angulata, G. rhomboides* Desmarest]: *S. gonoplaxae.*

(Grapsidae) *Grapsus strigosus* (Herbst): *S. flexuosa, S. infirma, S. plana.*

Grapsus tenuicrustatus (Herbst) [*G. grapsus* (Linnaeus), *G. maculatus* (Catesby]: *S. flexuosa.*

(Majidae) *Hemus cristulipes* A. Milne Edwards: *S. pustulosa.*

(Majidae) *Herbstia condyliata* (Herbst) ["*H. nodosa*"]: *S. carcini*?

(Xanthidae) *Heteropanope glabra* Stimpson [*Eurycarcinus maculatus* (A. Milne Edwards)]: *S. comosa.*

Heteropanope hilarulus (De Man) [*Pilumnus hilarulus*]: *S. spinosa.*

(Homolidae) *Homola barbata* (Fabricius): Sacculinid mentioned by Krüger (1912).

(Majidae) *Huenia proteus* (De Haan): *S. pulchella.*

(Majidae) *Hyas araneus* (Linnaeus): *S. inflata.*

Hyas coarctatus Leach: *S. inflata.*

(Majidae) *Hyastenus aries* (Latreille) [*Chorinus aries*]: *S. pisiformis.*

Hyastenus brockii De Man: *S. pulchella.*

Hyastenus subinermis Zehntner: *S. glabra.*

Hyastenus tenuicornis Pocock [*Halimus tenuicornis*]: Sacculinid mentioned by Rathbun (1911).

(Majidae) *Inachus dorhynchus* Leach: *D. neglecta.*

Inachus dorsettensis (Pennant) [*I. scorpio* (Fabricius)]: *D. neglecta.*

Inachus mauretanicus Lucas: *D. neglecta.*

(Xanthidae) *Liocarpilodes integerrimus* (Dana): Sacculinid mentioned by Klunzinger (1913).

(Portunidae) *Lissocarcinus orbicularis* Dana [*L. pulchellus* Müller]: *H. ruginosus.*

Lissocarcinus polybioides Adams & White: *L. carinatus.*

(Goneplacidae) *Lithocheira setosa* (A. Milne Edwards): *S. gracilis.*

(Xanthidae) *Lophopanopeus bellus* (Stimpson): *L. panopaei.*

Lophopanopeus diegensis Rathbun: *L. panopaei*?

(Majidae) *Loxorhynchus crispatus* Stimpson: *H. californicus.*

Loxorhynchus grandis Stimpson: *H. californicus*?

(Xanthidae) *Lybia tesselata* (Latreille) [*Melia tesselata*]: *L. brachythrix, S. carpiliae.*

(Majidae) *Macrocoeloma camptocerum* (Stimpson): *H. occidentalis.*

Macrocoeloma diplacanthum (Stimpson): *H. occidentalis.*

(Ocypodidae) *Macrophthalmus erato* De Man: *S. curvata.*

Macrophthalmus spec.: *S. ales.*

(Portunidae) *Macropipus arcuatus* (Leach) [*Portunus arcuatus, Liocarcinus arcuatus*]: *S. carcini.*

Macropipus corrugatus (Pennant) [*Portunus corrugatus, Liocarcinus corrugatus*]: *S. carcini?*

Macropipus depurator (Linnaeus) [*Portunus depurator, Liocarcinus depurator*]: *S. carcini?*

Macropipus holsatus (Fabricius) [*Portunus holsatus, Liocarcinus holsatus*]: *S. carcini.*

Macropipus marmoreus (Leach) [*Portunus marmoreus, Liocarcinus marmoreus*]: *S. carcini.*

Macropipus puber (Linnaeus) [*Portunus puber, Liocarcinus puber*]: *S. carcini.*

Macropipus pusillus (Leach) [*Portunus pusillus, Liocarcinus pusillus*]: *S. carcini.*

(Majidae) *Macropodia aegyptia* H. Milne Edwards [*Stenorhynchus aegyptius*]: *D. neglecta.*

Macropodia longirostris (Fabricius) [*Stenorhynchus longirostris*]: *D. neglecta.*

Macropodia rostrata (Linnaeus) [*Stenorhynchus rostratus, S. phalangium* (Pennant)]: *D. neglecta.*

(Majidae) *Menaethius monoceros* (Latreille): *S. calva, S. pilosella.*

(Xanthidae) *Menippe rumphii* (Fabricius): Sacculinid mentioned by Annandale (1911).

(Grapsidae) *Metopograpsus messor* (Forskål): *S. plana, S. yatsui.*

Metopograpsus oceanicus (Jacquinot & Lucas): *S. yatsui.*

Metopograpsus quadridentatus Stimpson: *S. imberbis, S. yatsui.*

(Majidae) *Micippa philyra* (Herbst) [*M. mascaronica* Kossmann]: *S. bucculenta.*

Micippa thalia (Herbst) [*M. aculeata* Bianconi]: Sacculinid mentioned by Richiardi (1875).

(Xanthidae) *Micropanope lobifrons* A. Milne Edwards: *L. longipilus.*

(Majidae) *Microphrys bicornutus* (Latreille): *S. bicuspidata, H. occidentalis.*

Microphrys interruptus Rathbun: *H. occidentalis?*

(Majidae) *Mithrax* (*Mithraculus*) *coryphe* (Herbst): *H. occidentalis.*

Mithrax (*Mithraculus*) *forceps* (A. Milne Edwards): *H. occidentalis.*

Mithrax (*Mithraculus*) *ruber* (Stimpson): *H. tessellatus.*

Mithrax (*Mithraculus*) *sculptus* (Lamarck): *H. occidentalis.*

(Calappidae) *Mursia armata* De Haan: *S. ornatula.*

(Leucosiidae) *Myra fugax* (Fabricius): *S. captiva.*

(Portunidae) *Nectocarcinus integrifrons* (Latreille): Sacculinid mentioned by Haswell (1888).

(Goneplacidae) *Notonyx vitreus* Alcock: *S. gracilis.*

(Raninidae) *Notopoides latus* Henderson: *S. teres.*

(Majidae) *Oncinopus aranea* (De Haan) [*O. neptunus* Adams & White]: *S. margaritifera.*

(Pinnotheridae) *Ostracotheres spondyli* Nobili: *S. ostracotheris.*

(Xanthidae) *Ozius rugulosus* Stimpson: *S. vankampeni.*

Ozius tuberculosus H. Milne Edwards: *S. compressa.*

(Grapsidae) *Pachygrapsus crassipes* Randall [*Leptograpsus crassipes*]: *S. confragosa, S. imberbis, S. yatsui.*

Pachygrapsus marmoratus (Fabricius) [*Grapsus varius* Latreille]: *S. carcini.*

(Xanthidae) *Panopeus herbstii* H. Milne Edwards: *L. panopaei.*

Panopeus occidentalis Saussure: *L. panopaei.*

(Xanthidae) *Paraxanthus barbiger* (Poeppig): *L. armatus.*

(Parthenopidae) *Parthenope (Rhinolambrus) contraria* (Herbst) [*Lambrus contrarius*]: *L. strandi.*

Parthenope (Aulacolambrus) hoplonotus Adams & White [*Lambrus hoplonotus*]: *S. cavolinii.*

Parthenope (Parthenope) longimanus (Leach) [*Lambrus longimanus*]: *S. duracina.*

Parthenope (Rhinolambrus) turriger (Adams & White) [*Lambrus turriger*]: *S. bursa pastoris.*

Parthenope (Parthenope) valida (De Haan) [*Lambrus validus, L. laciniatus* (De Haan)]: *S. exarcuata.*

(Majidae) *Pelia tumida* (Lockington): *H. californicus*?

(Grapsidae) *Percnon planissimum* (Herbst) [*Liolophus planissimus, Acanthopus planissimus*]: *S. fabacea, S. micracantha.*

(Majidae) *Phalangipus longipes* (Linnaeus) [*Egeria arachnoides* Latreille]: *S. granulosa, S. pulchella.*

(Xanthidae) *Phymodius granulatus* (Targioni Tozzetti): *L. amoenus.*

Phymodius ungulatus (H. Milne Edwards): *L. brachythrix, L. musivus.*

(Xanthidae) *Pilumnopeus serratifrons* (Kinahan) [*Heteropanope serratifrons*]: *L. spinulosus.*

(Xanthidae) *Pilumnus dasypodus* Kingsley: *S. hirsuta.*

Pilumnus hirtellus (Linnaeus): *S. carcini*?

Pilumnus minutus (De Haan) [*P. hirsutus* Stimpson]: Sacculinid mentioned by Rathbun (1911).

Pilumnus normani Miers: *L. desmothrix.*

Pilumnus sayi Rathbun: Sacculinid mentioned by Rathbun (1930).

Pilumnus vespertilio (Fabricius) [*P. ursulus* Adams & White]: *S. cartieri.*

Pilumnus spec.: *L. desmothrix.*

(Pinnotheridae) *Pinnotheres parvulus* Stimpson: *S. pinnotherae.*

Pinnotheres spec.: *S. pertenuis.*

(Pirimelidae) *Pirimela denticulata* (Montagu): *S. carcini.*

(Majidae) *Pisa armata* (Latreille) [*Pisa gibbsii* Leach]: *S. carcini.*

Pisa triquetra Semper: *S. pilosa.*

(Majidae) *Pitho anisodon* (Von Martens): *H. occidentalis.*

Pitho lherminieri (Schramm): *H. occidentalis.*

(Grapsidae) *Plagusia dentipes* De Haan: *S. punctata.*

Plagusia depressa (Fabricius): *S. punctata.*

Plagusia depressa immaculata (Lamarck) [*P. immaculata*]: *S. punctata.*

(Majidae) *Pleistacantha moseleyi* Miers [*P. oryx* Ortmann]: *D. strigulosa.*

Pleistacantha sancti-johannis Miers: *S. spinosa.*

(Majidae) *Podochela riisei* Stimpson: *S. reniformis.*

(Portunidae) *Podophthalmus vigil* (Fabricius): *S. lata.*

(Portunidae) *Portumnus latipes* (Pennant) [*Platyonychus latipes*]: *S. carcini.*

(Portunidae) *Portunus* (*Hellenus*) *hastatoides* (Fabricius) [*Neptunus hastatoides*]: *L. carinatus.*

Portunus (*Hellenus*) *longispinosus* [*Neptunus longispinosus*]: *S. angulata, S. gracilis.*

Portunus (*Portunus*) *ventralis* (A. Milne Edwards): *L. bicorniger.*

Portunus spec.: *S. dentata.*

Portunus spec. [*Lupea* spec.]: *S. bipunctata.*

Portunus spec.: Sacculinid mentioned by Smith (1906).

(Xanthidae) *Pseudozius caystrus* (Adams & White): *S. cuspidata, S. leptodiae.*

(Grapsidae) *Ptychognathus barbatus* (A. Milne Edwards): *S. ternatensis.*

(Majidae) *Pugettia producta* (Randall) [*Epialtus productus*]: *H. californicus.*

Pugettia quadridens (De Haan): *S. pilosella, S. pugettiae.*

(Xanthidae) *Quadrella coronata* Dana: *S. pilosella.*

(Goneplacidae) *Scalopidia spinosipes* Stimpson: *S. teretiuscula.*

(Majidae) *Schizophrys aspera* (H. Milne Edwards): *H. distortus.*

(Portunidae) *Scylla serrata* (Forskål): *S. beauforti, L. ihlei.*

(Goneplacidae) *Ser fukiensis* Rathbun: *S. gracilis.*

(Grapsidae) *Sesarma* (*Holometopus*) *benedicti* Rathbun: *Ptychascus glaber.*

Sesarma (*Sesarma*) *edwardsii philippinense* Rathbun: *S. curvata.*

Sesarma (*Sesarma*) *noduliferum* De Man: *Sesarmaxenos gedehensis.*

Sesarma (*Sesarma*) *thelxinoë* De Man: *Sesarmaxenos monticola.*

(Majidae) *Sphenocarcinus stimpsoni* (Miers) [*Oxypleurodon stimpsoni*]: *S. muricata.*

(Majidae) *Stenocionops furcata caelata* (A. Milne Edwards): *H. occidentalis.*

Stenocionops spinosissima (Saussure): *H. occidentalis.*

(Majidae) *Taliepus nuttallii* (Randall): *H. californicus.*

(Goneplacidae) *Tetraplax quadridentata* (Rathbun): *L. panopaei.*

(Portunidae) *Thalamita admeta* (Herbst): *L. carinatus, S. papposa, H. sibogae.*

Thalamita cooperi Borradaile: *S. anomala.*

Thalamita crenata H. Milne Edwards: *H. ruginosus,* Sacculinid mentioned by Anderson (1871).

Thalamita integra Dana: *H. pellucidus.*

Thalamita investigatoris Alcock: *S. gracilis, S. scabra.*

Thalamita iranica Stephensen: Sacculinid mentioned by Stephensen (1945).

Thalamita prymna (Herbst): *L. carinatus, H. ruginosus.*

Thalamita sima H. Milne Edwards: *S. angulata, S. gracilis,* Sacculinid mentioned by Haswell (1888), Sacculinid mentioned by Krüger (1912).

Thalamita stimpsoni A. Milne Edwards: *S. gracilis, S. leptodiae.*

Thalamita wakensis Edmondson: *H. setoensis.*

Thalamita spec.: *S. gracilis.*

Thalamita spec.: *H. hians.*

Thalamita spec.: *S. margaritifera.*

Thalamita spec.: *S. papposa.*

(Majidae) *Tiarinia gracilis* Dana: *S. cordata, S. glabra.*

(Xanthidae) *Trapezia cymodoce* (Herbst) [*T. ferruginea* Latreille]: *S. irrorata.*

(Majidae) *Tylocarcinus styx* (Herbst): *S. cordata.*

(Goneplacidae) *Typhlocarcinus nudus* Stimpson: *S. caelata.*

(Ocypodidae) *Uca brevifrons* (Stimpson): Sacculinid mentioned by Crane (1941).

Uca dussumieri (H. Milne Edwards): *S. curvata.*

(Callianassidae) *Upogebia major* (De Haan): *S. upogebiae.*

(Grapsidae) *Varuna litterata* (Fabricius): *S. curvata.*

(Xanthidae) *Xanthias lamarcki* (H. Milne Edwards) [*Xanthodes lamarcki*]: *S. carpiliae, L. murex, S. setosa.*

(Xanthidae) *Xantho couchi* Bell: *S. zariquieyi.*

Xantho exaratus (H. Milne Edwards) [*Leptodius exaratus, Chlorodius exaratus, Xanthodius exaratus*]: *L. amoenus, L. brachythrix, S. leptodiae, S. sinensis,* Sacculinid mentioned by Stephensen (1945).

Xantho gracilis (Dana): *L. brachythrix, S. leptodiae.*

Xantho incisus (Leach) [*X. floridus* (Montagu)]: *S. carcini?*

Xantho poressa (Olivi) [*X. hydrophilus* (Herbst)]: Sacculinid mentioned by Richiardi (1875).

Xantho sanguineus (H. Milne Edwards) [*Chlorodius sanguineus*]: *L. brachythrix, L. corculum, L. sclerothrix.*

Xantho spec.: *S. leptodiae.*

(Majidae) *Xenocarcinus tuberculatus* White: *S. leptothrix.*

(Xanthidae) *Zosimus aeneus* (Linnaeus) [*Zozymus aeneus*]: *S. hispida.*

Among the numerous hosts listed above there are only three species not belonging to the Brachyura, viz., *Albunea symnista, Galathea* spec., and *Upogebia major.*

Leaving out of consideration the undescribed parasites that were mentioned as occurring on a certain host, it appears that twenty-five species of Brachyura are known as hosts of two different species of Sacculinidae, seven as hosts of three different parasites, three as hosts of four different parasites, and one (*Atergatis floridus*) as the host of six species of Sacculinidae. In many instances of the occurrence of two or more species of parasites on one crab the discrimination of the parasites is easily obtained by an examination of a small fragment of the external cuticle. Sometimes, however, the external cuticle has a similar structure in two or more species of parasites infesting the same host; then sections are needed to arrive at a distinct identification. A few examples are here given.

Loxothylacus aristatus and *L. vepretus,* two species occurring on the crab *Atergatis floridus,* both have excrescences consisting of groups of spines united on common basal parts. *Sacculina gordonae* and *S. weberi,* parasites of the same crab, both have excrescences consisting of hairs or elongated papillae of similar shape and size.

The type specimen of *Heterosaccus papillosus* and the specimens of *Sacculina anomala* described by Shiino (1943) are parasites of crabs of the species *Charybdis bimaculata*; these parasites correspond in having excrescences of the external cuticle in the shape of small papillae of about equal size.

Sacculina phacelothrix and *Loxothylacus vepretus,* both occurring as parasites of the crab *Chlorodiella nigra,* have excrescences of the external

cuticle (groups of hyaline spines) of a strongly similar shape and size; the retinacula (which, however, are not always easily to be found) are distinctly different in the two species.

Three species of the genus *Sacculina, S. flexuosa, S. infirma,* and *S. plana,* are known as parasites of the crab *Grapsus strigosus*; the three species all have a smooth external cuticle, without excrescences. If retinacula are found the parasite probably belongs to *S. flexuosa,* for in the two other species no retinacula were found, though this does not imply that these structures definitely do not occur in the two species.

Sacculina bicuspidata and *Heterosaccus occidentalis,* two species infesting the crab *Microphrys bicornutus,* both have a smooth external cuticle without excrescences.

The crab *Pachygrapsus crassipes* is the host of a species with hyaline spines united in groups, *Sacculina yatsui,* and of two species with a smooth external cuticle without excrescences, *S. confragosa* and *S. imberbis.* The retinacula of the two last named species are of a similar shape, so that specific identification is dependent upon examination of sections.

In studies on Rhizocephala the effect of the parasites on their hosts repeatedly formed an object of investigation; Giard (1886, 1887) was the first to direct attention to the phenomenon of parasitic castration, and Smith (1906) devoted a whole chapter to the effects of the parasites on their hosts. On the other hand it has never been a subject of discussion whether the hosts might have an influence on the parasites, leading to certain modifications. As far as the size of the parasites is concerned there is generally a correlation with the size of the hosts. When an extensive material of a Sacculinid parasite on crabs of one species is examined, always the larger parasites prove to occur on the hosts of a larger size, apparently because the conditions of growth are favoured by a larger supply of food. Still more striking is the difference in size when a certain parasite infests crabs of various species which among each other show distinct differences in size. An example is *Sacculina carcini,* which generally is of fairly large size when infesting *Carcinus maenas,* but remains much smaller when occurring as a parasite of *Macropipus arcuatus* or of *M.pusillus,* two crabs of much smaller dimensions than the first named. As far as the Grapsid hosts of *Sacculina carcini* are concerned there is a similar difference in size between the parasites of *Pachygrapsus marmoratus* and those of *Brachynotus sexdentatus,* the former as a rule being much larger than the latter, in correlation with the size of the hosts. In these instances the parasites of different dimensions closely correspond in all their peculiarities of structure with the exception of the colleteric glands, in which the number of

canals becomes distinctly larger with an increase in size of the parasites. Growth of the colleteric glands does not result in the formation of distinctly wider canals, but leads to a stronger branching of the existing system of canals. Consequently the number of canals in longitudinal sections of the region in which they reach their maximum of density is variable within certain limits.

For two reasons the systematics of the Sacculinidae are rather complicated, in the first place because a certain species may occur as a parasite of different species of hosts, and in the second place because a certain species of crab may be infested by two or more species of parasites. These peculiarities indicate, however, that the characters of the Sacculinidae which are regarded as specific indeed are innate to the parasites, and are not brought about on account of influences of the hosts. When, e.g., specimens of *Sacculina leptodiae* on the Xanthid crab *Xantho exaratus* prove to correspond in all their characters with specimens on the Portunid crab *Thalamita stimpsoni,* there is no reason to believe that any of the characters of these parasites might be induced in an entirely similar manner by hosts belonging to widely different families. Moreover, if anything could be observed concerning a modifying influence of the host on the characters of the parasites, it would become altogether incomprehensible that parasites with so strikingly different characters as *Sacculina leptodiae* and *Loxothylacus brachythrix* occur on the same host *Xantho exaratus.* As another example the crab *Pachygrapsus crassipes* may be here mentioned with its parasites *Sacculina confragosa, S. imberbis,* and *S. yatsui,* the two first named without excrescences but differing in the structure of the male organs, the last named with distinct excrescences of a hyaline kind. Numerous other examples are listed above.

The systematic arrangement of the Sacculinidae is entirely independent of that of the hosts. Species of the four larger genera of Sacculinidae occur on hosts of widely different families of crabs, while the different species occurring on one crab may belong to various genera of Sacculinidae. Even the parasites of hosts that do not belong to the Brachyura are not strikingly different from other Sacculinidae. *Sacculina anceps,* the parasite of *Albunea symnista,* and *Sacculina flacca,* the parasite of *Galathea* spec., have the usual characters of the genus, while *Sacculina upogebia,* the parasite of *Upogebia major,* is a *Sacculina* with certain characters of transition towards the genera with curved testes.

IV. NOTES ON DISTRIBUTION.

In the list of synonyms (Chapter II) the localities have been noted in which the species were found to occur. If now these localities are arranged

in geographical regions it appears that some of these regions have a much greater number of species of Sacculinidae than others, as shown in the following list.

European waters, including Mediterranean and Black Sea, 8 species.

Northwest Africa (Morocco, Canary Islands, Cape Verde Islands), 3 species; not a single species is known from the West coast region of Africa farther towards the South.

East Africa, including Madagascar and Western Indian Ocean, 10 species.

Red Sea, including Gulf of Suez and Gulf of Aden, 7 species.

Arabian Sea, Gulf of Iran, Bay of Bengal, Burmah, 6 species.

Malay Peninsula and Singapore, 6 species.

Thailand, 4 species.

Indo-China, 8 species.

(South East Asia, the three last mentioned regions taken together, 15 species).

China, Formosa, Korea, 8 species.

Japan and Ryukyu Islands, 26 species.

Philippine Islands, 23 species.

Java, Sumatra, Borneo, and Celebes, 18 species.

Lesser Sunda Islands, Moluccas, Kei Islands, Aru Islands, 46 species.

New Guinea, Waigeu, Salawati, 7 species.

Australia, 1 species.

Gilbert Islands, 2 species.

Fiji Islands, 1 species.

Caroline Islands, 1 species.

West coast of North America, 2 species.

West coast of South America, 1 species.

East coast of South America, 1 species.

West Indies, Gulf of Mexico, Caribbean Sea, 12 species.

East coast of North America, 1 species.

As far as the last record is concerned attention must be drawn to a remark in a previous paper (Boschma, 1953b, p. 190): "it is true that not a single Sacculinid is known from the North American coast south to Florida"; when writing this sentence it was overlooked that Pearse (1951) reported the species *Sacculina hirsuta* from the Black Rocks off the coast of North Carolina.

The number of species mentioned as occurring in the various regions are only those that were reported with their specific names, many records of unidentified Sacculinids indicate that to all appearances in some instances the number must be somewhat larger.

In a few instances only the number of species known to occur in the various regions give an idea of the really existing conditions. Most of the species of Sacculinidae occurring in European waters now are known, to a minor degree this holds for Japan, for the West coast of North America, for the West Indian region, and for the East coast of North America. In all other regions with one to three records the fauna is too little known to conclude that Sacculinidae are as poorly represented as it seems at present. On the other hand in all the regions of the Indo-Pacific which have a moderate to a very large number of species further research will undoubtedly lead to numerous discoveries of species of the group. The known range of distribution of a great number of species shows still too many gaps proving that the available data are as yet far from complete. Even the number of 46 species known to occur in the Moluccas and the surrounding islands does not indicate that this region is one of the best known, for up to the present time the collecting of material has been restricted to a few localities of the region only.

In some instances the Sacculinidae of a certain region have a distribution not beyond the limits of this region, this holds for the European waters, and to a certain degree for the West coast of North America and for the West Indian region. One of the species from the West Indies, *Sacculina hirsuta,* extends its range somewhat farther to the North along the Atlantic coast, while another, *Loxothylacus panopaei,* was reported from the West coast of North America, though it is not absolutely certain that this record is positively correct.

In connexion with the distribution of the Sacculinidae in the Indo-Pacific area the division into regions is altogether artificial, because many species occur in two or more of these regions. Some instances of species with a wide range of distribution are the following.

Loxothylacus brachythrix: Mergui Archipelago, Indo-China, Lombok Strait, Ternate, Tidore, Timor.

Sacculina carpiliae: Madagascar, Zanzibar, Red Sea, "Indian Ocean", Gilbert Islands.

Loxothylacus corculum: Mozambique, Zanzibar, Amboina, Talaud Islands, Philippine Islands.

Sacculina gracilis: Thailand, Singapore, China, Sulu Islands, Banda, Misool, South of Salawati.

Sacculina lata: Singapore, Indo-China, Japan.

Sacculina leptodiae: Mozambique Channel, Zanzibar, Red Sea, Gulf of Aden, Indo-China, various islands in the Moluccas, between Nusa Besi and Timor, Fiji Islands.

Heterosaccus papillosus: Indo-China, Java Sea, Philippine Islands, China, Japan.

Sacculina pulchella: Western Indian Ocean (Seychelles, Amirante), coast of India, Amboina.

Loxothylacus vepretus: Red Sea, Philippine Islands, Obi latu.

Nearly all the species of Sacculinidae are marine, a few only are living in fresh water, viz., *Sesarmaxenos gedehensis, Ptychascus glaber, Sacculina gregaria,* and *Sesarmaxenos monticola.* Some species may occur in sea as well as in brackish or fresh water, e. g., *Sacculina curvata*; primarily this depends upon the conditions of existence of the host.

The majority of the species of Sacculinidae are inhabitants of shallow water, a few only have been collected in depths of over 50 meters: *S. abyssicola* (3655 and 3975 m), *S. anomala* (55 m), *S. atlantica* (1275-1180 m), *S. bipunctata* (90 m), *S. calappae* (82 m), *H. californicus* (84-102 m), *S. calva* (52 m), *L. carinatus* (35-55 m), *L. desmothrix* (90 m), *S. elongata* (1463 m), *D. fabacea* (140-540 m), *S. flacca* (70-90 m), *S. gonoplaxae* (233 m), *S. granulosa* (95 m), *S. muricata* (720 m), *S. nodosa* (85 m), *S. ornatula* (100 m), *H. papillosus* (193 m), *S. pilosella* (125-540 m), *S. pulchella* (45-146 m), *L. sclerothrix* (45-146 m), *S. spinosa* (90-540 m), *L. strandi* (77-84 m), *S. striata* (385 m), *D. strigulosa* (173 m), *S. sulcata* (1300 m), and *S. vieta* (56 m). Quite a number of these species must be regarded as real deep sea forms, others, however, seem to have their normal habitat in much shallower water; this holds for *H. californicus, L. carinatus, H. papillosus, S. pulchella, L. sclerothrix,* and probably for some other species of which a too small number of specimens are known. As far as the structure of species that seem to be confined to the deep sea is known (*S. atlantica, S. elongata, S. sulcata*) there are no striking differences from species inhabiting shallow water. Moreover the characters of the species from depths of over 3000 meters (*S. abyssicola,* cf. Guérin-Ganivet, 1911, p. 64, fig. 9) indicate that this species undoubtedly belongs to the genus *Sacculina,* though its exact place in the system at present remains uncertain.

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