NEW SPECIES OF SACCULINIDAE IN THE COLLECTION OF THE UNITED STATES NATIONAL MUSEUM

BY

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The extensive collection of Rhizocephala in the United States National Museum contains numerous interesting specimens. Previously two papers have appeared dealing with a part of the material of this museum. In the first (BOSCHMA, 1928) I described the species *Heterosaccus occidentalis* (then erroneously placed in the genus *Drepanorchis*) and gave an account of the characters of *Loxothylacus panopaei*. The second paper (BOSCHMA, 1930) contains a description of *Briarosaccus callosus*, a parasite of gigantic size living on *Lithodes agassizii* Smith.

In the course of further work on the collection several specimens proved to be the types of new species. Diagnoses of these are given in the present paper, while nearly all other particulars of the specimens have been omitted. These particulars will be published in a future paper dealing with the whole of the material.

In the descriptions of the species the anatomical characters as well as the peculiarities of the chitinous coverings of the mantle have been taken into account. The figures refer to the structure of the external and internal cuticle of the mantle. In regard to these structures a simple figure often gives more information than a lengthy description.

To Dr. MARY J. RATHBUN, Associate in Zoology of the United States National Museum, and Dr. WALDO L. SCHMITT, Curator of Marine Invertebrates of the same museum, I am indebted for much information concerning the hosts of the parasites.

Sacculina lata n. sp. (fig. 1).

Male genital organs in the visceral mass. Testes nearly completely united, only the extreme dorsal parts separated. Colleteric glands in the anterior half of the visceral mass, containing a large number of tubes. External cuticle covered with short thick hairs or elongate papillae, which have a length of 4 to 14 μ and are covered with minute lateral hairs. Internal cuticle with retinacula which consist of a basal part and 5 to 7 barbed spindles with a length of 11 to 16 μ.

Type specimen on *Charybdis miles* (de Haan), Misaki, Japan, A. S. PEARSE don., 1930.

The dimensions of the only known specimen are: breadth 21, height 11, and thickness 7.5 mm. It is therefore nearly twice as broad as high, hence the name *Sacculina lata*. The size of the

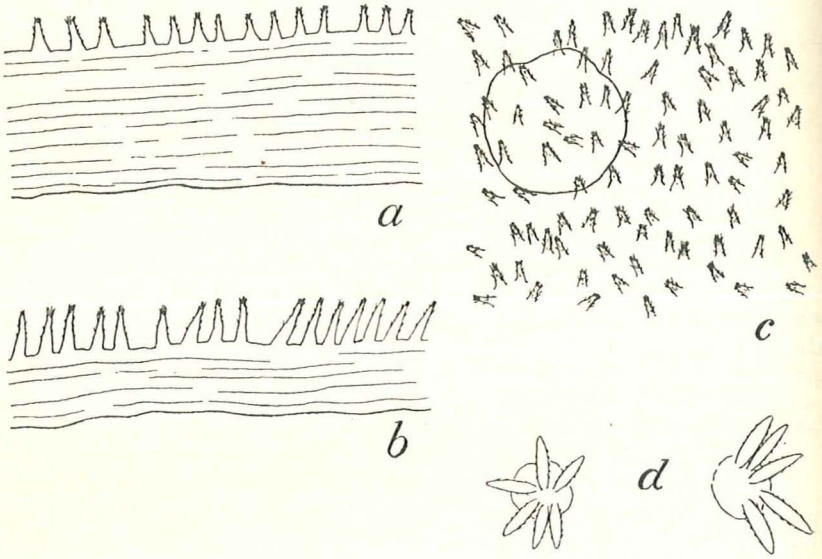

Fig. 1. *Sacculina lata*. *a*, and *b*, sections of two different parts of the external cuticle. *c*. excrescences as they are distributed on the surface of the cuticle, with the contour of a lime corpuscle. *d*, two retinacula. × 530.

excrescences of the external cuticle varies in different parts of the mantle. In the external cuticle a number of lime corpuscles are found.

Sacculina longipila n. sp. (fig. 2).

Male genital organs in the visceral mass. Testes completely separated, the one of much larger size than the other. Colleteric glands approximately in the central part of the lateral surfaces of the visceral mass, with a comparatively small number of tubes. External cuticle of the mantle covered with long, slender hairs, which in different parts of this cuticle vary in length between 25 and 85 μ. These hairs are covered with a few minute lateral hairs. Retinacula have not been found.

Type specimen on *Micropanope lobifrons* A. Milne-Edwards, Barbados Antigua Expedition, Barbados, British West Indies, June 5, 1918.

The only available specimen has a small size, its dimensions are: breadth 2.75, height 2, and thickness 1.5 mm approximately. It is, however, not immature, for the mantle cavity contains numerous

eggs. On the greater part of the mantle the excrescences of the external cuticle have a length of about 30 μ, in some regions they reach a size of 85 μ.

RATHBUN (1930) mentions five specimens *Micropanope lobifrons* from the Barbados Antigua Expedition with Rhizocephala. They

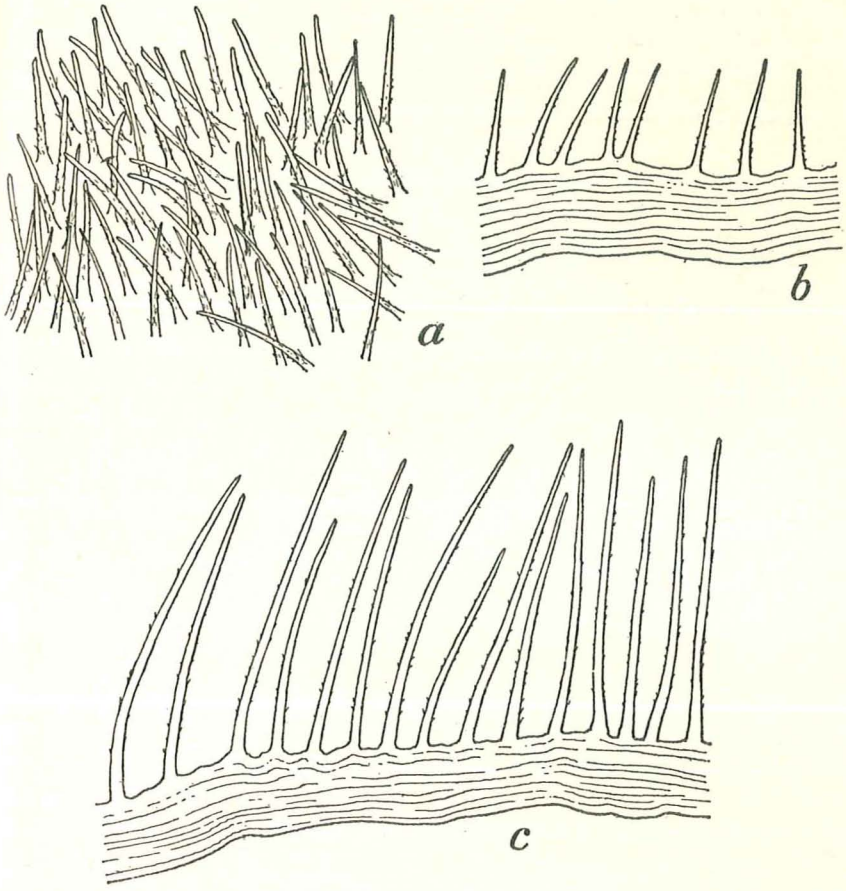

Fig. 2. *Sacculina longipila*. *a*, excrescences as they occur on the surface of the external cuticle. *b*, and *c*, sections of two different parts of the cuticle. × 530.

are in the collection of the Museum of the State University of Iowa, with the exception of the crab bearing the type specimen of *Sacculina longipila*, which has been transferred to the collection of the United States National Museum.

Sacculina calva n. sp. (fig. 3).

Male genital organs in the visceral mass. Testes close together for the whole of their extent, ventral parts of the two testes sepa-

rated only by a thin septum, dorsal parts surrounded by a common muscular layer. Colleteric glands approximately in the central region of the lateral surfaces of the visceral mass, with a comparatively small number of tubes. External cuticle of the mantle smooth, its surface divided into small irregularly polygonal areas with a diameter of 6 to 14 μ. This cuticle has a thickness of about 25 μ. Retinacula have not been found.

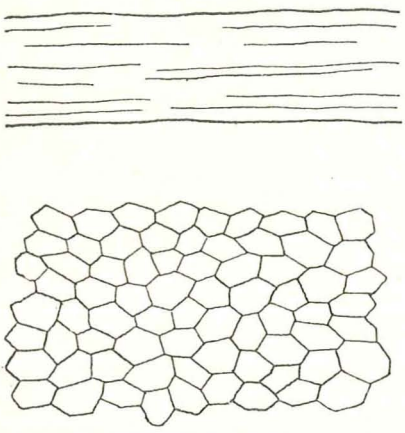

Fig. 3. *Sacculina calva*. Section of the external cuticle, and surface view of this cuticle. × 530.

Type specimen on *Menaethius monoceros* (Latreille), Saya de Malha, Western Indian Ocean, H. M. S. „Sealark", Station C 19, 29 fms.

The only known specimen has a breadth of 3.5 mm, a height of 3.5 mm, and a thickness of nearly 2 mm. The mantle cavity contains a large quantity of eggs. The areas of the surface of the external cuticle are neatly polygonal. In other species of Sacculinidae in which the cuticle shows these areas they usually have an irregularly sinuous contour.

The occurrence of this parasite on *Menaethius monoceros* has already been mentioned by RATHBUN (1911).

Sacculina rathbuni n. sp. (fig. 4).

Male genital organs in the visceral mass. Testes more or less cylindrical, completely separated. Colleteric glands in the central region of the lateral surfaces of the visceral mass, with a small

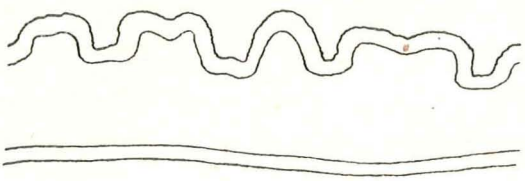

Fig. 4. *Sacculina rathbuni*. Sections of two different parts of the external cuticle. × 530.

number of tubes. External cuticle of the mantle smooth, very thin (thickness from 3 to 6 μ). Retinacula have not been found.

Type specimen on *Arachnopsis filipes* Stimpson, United States Fish Commission, Schooner „Grampus", 1889, Station 5076 (25° 34′ N., 83° 28′ W., West coast of Florida).

The only specimen examined has the following dimensions: breadth 4. 5, height 3, and thickness 1.5 mm. The surface of the external cuticle does not show the small areas which usually are found in Sacculinidae with a smooth external cuticle. The external cuticle is very thin (thickness 3—5 μ).

RATHBUN (1925) mentions besides the specimen referred to above a parasite of *Arachnopsis filipes* from another locality at the West coast of Florida („Grampus", Station 5104), and two specimens on the same host from off Barbados in the collection of the Museum of Comparative Zoölogy at Cambridge, Mass.

Sacculina pulchella n. sp. (fig. 5).

Male genital organs in the posterior part of the body, outside the visceral mass. Testes completely separated, more or less globular. Colleteric glands approximately in the central region of the lateral surfaces of the visceral mass, with a moderate number of tubes. External cuticle of the mantle covered with excrescences which consist of a kind of chitin differing from that of the main layers.

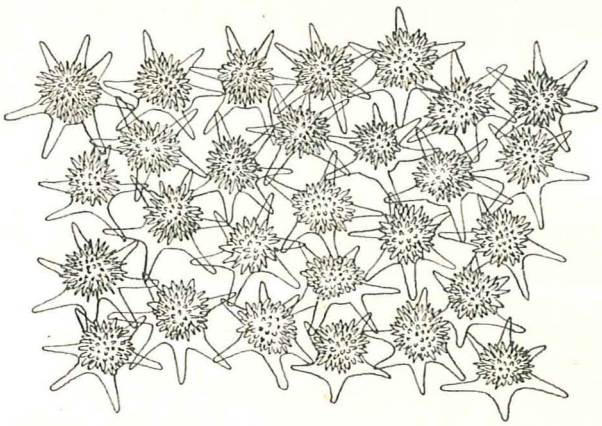

Fig. 5. *Sacculina pulchella*. Surface view of the excrescences on the external cuticle. × 530.

The excrescences are short papillae with numerous spines at their tops and with a small number of root-like expansions at their bases. The height of the excrescences varies from 12 to 18 μ. Retinacula have not been found.

Type specimen on *Huenia proteus* (de Haan), Seychelles, Western Indian Ocean, H. M. S. „Sealark", Station F 8, 34 fms., Oct. 20, 1905.

Besides the type specimen the United States National Museum possesses another specimen of *S. pulchella*, like the former a parasite of *Huenia proteus*, collected by H. M. S. „Sealark" at Amirante, Western Indian Ocean, Station E 11, 25—80 fms, November 10,

1905. The figured excrescences of the external cuticle are from the latter specimen, those of the type specimen do not differ in any respect from these. The dimensions of the type specimen are: breadth nearly 5, height nearly 2.5, and thickness less than 2 mm.

As stated by RATHBUN (1911) the Percy Sladen Trust Expedition (H. M. S. „Sealark") collected four specimens of *Huenia proteus* with Rhizocephalid parasites.

Sacculina anomala n. sp. (fig. 6).

Male genital organs in the posterior part of the body, outside the visceral mass. Testes of approximately equal size, more or less

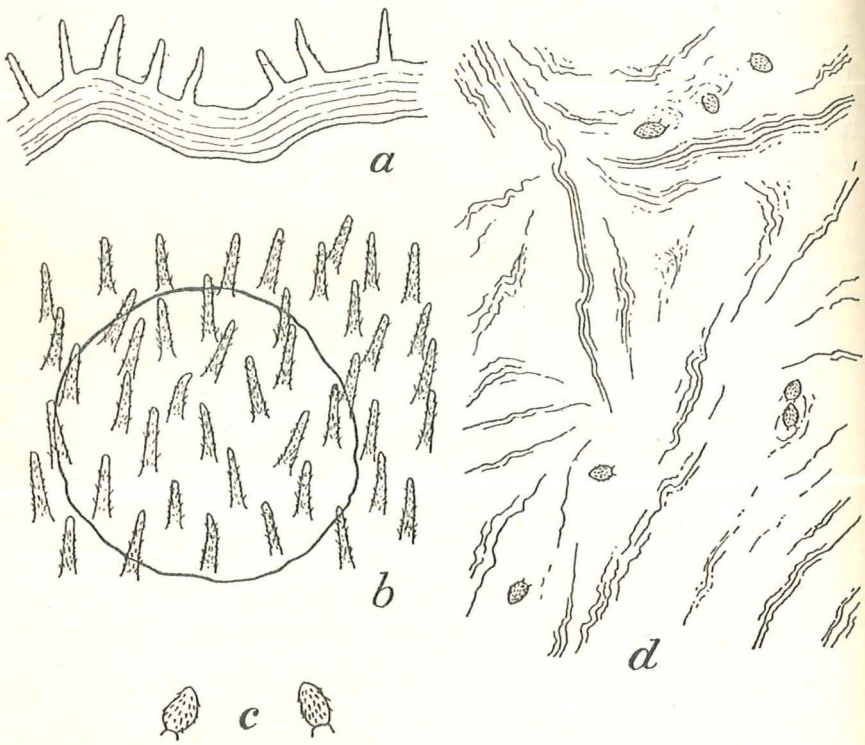

Fig. 6. *Sacculina anomala*. *a*, section of the external cuticle. *b*, excrescences as they occur on the external cuticle, and the contour of a lime corpuscle. *c*, two retinacula. *d*, retinacula as they are distributed on the internal cuticle. *a*, *b*, and *c*, × 530. *d*, × 290.

cylindrical, completely separated, their extreme dorsal part curved back in posterior and ventral direction. Colleteric glands in the anterior half of the visceral mass, not far from the centre of the lateral surfaces, with a moderate number of tubes. External cuticle

of the mantle with short thick hairs, which vary in length between 10 and 16 μ, and which possess numerous minute lateral hairs. Internal cuticle of the mantle with numerous retinacula, each of which consists of a single barbed spindle with a length of 12 μ approximately.

Type specimen on *Thalamita cooperi* Borradaile, Amirante, Western Indian Ocean, H. M. S. „Sealark", Station E 21, 30 fms., Oct. 17, 1905.

The only available specimen has an irregular shape, hence the name *Sacculina anomala*. The ventral part of the mantle is extended into a long blunt conical prominence, whilst the dorsal part is more evenly rounded. The dimensions are: breadth 8, height 4, and thickness 2.75 mm. In the external cuticle of the mantle a number of lime corpuscles occur, which may attain a comparatively large size.

The occurrence of this parasite on *Thalamita cooperi* has already been mentioned by RATHBUN (1911).

Sacculina leptothrix n. sp. (fig. 7).

Male genital organs in the posterior part of the body, outside the visceral mass. Testes completely separated, more or less globular, of approximately equal size. Colleteric glands in the anterior half of the visceral mass, with a small number of tubes. External cuticle of the mantle with thin hairs or little spines, which at their basal part have a thickness of 1.5 μ or less, and which vary in length from 2 to 10 μ. Retinacula have not been found.

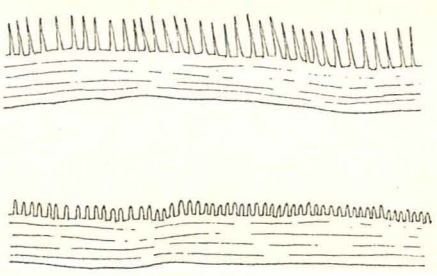

Fig. 7. *Sacculina leptothrix*. Sections of two different parts of the external cuticle. × 530.

Type specimen on *Xenocarcinus tuberculatus* White, United States Bureau of Fisheries Philippine Expedition 1907—1910, „Albatross" Station 5145, vicinity of Jolo, February 15, 1908.

The only known specimen is a small animal, its dimensions are: breadth and height 2 to 2.5 mm, thickness about 1.5 mm. The mantle cavity does not yet contain eggs. In some parts of the mantle the excrescences of the external cuticle are comparatively long (10 μ), then they terminate into rather sharp points. In other parts of the mantle the surface of the cuticle is covered with short, blunt papillae which have a length of 2 μ approximately.

Sacculina vieta n. sp. (fig. 8).

Male genital organs in the posterior part of the body, outside the visceral mass. Testes of approximately equal size, more or less

globular, completely separated. Colleteric glands approximately in the central region of the lateral surfaces of the visceral mass, not projecting above their surroundings, with a small number of tubes. External cuticle of the mantle rather thick (about 60 μ), its surface covered with comparatively long hairs (length of these hairs

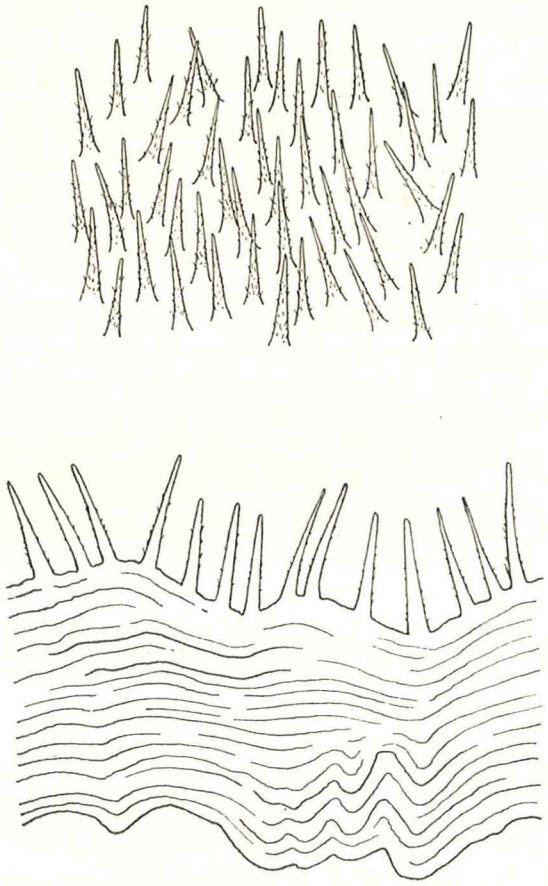

Fig. 8. *Sacculina vieta*. Excrescences as they are distributed on the surface of the external cuticle, and section of this cuticle. × 530.

20 to 30 μ), which bear minute lateral hairs. Retinacula have not been found.

Type specimen on *Actaea savignyi* (Milne-Edwards), Seychelles, Western Indian Ocean, H. M. S. „Sealark", Station F 2, 31 fms., Oct. 20, 1905.

In the only specimen the mantle is strongly wrinkled and shrivelled, hence the name *Sacculina vieta*. The dimensions are:

breadth and height slightly more than 5 mm, thickness 3 mm approximately.

RATHBUN (1911) already mentioned the occurrence of this parasite on *Actaea savignyi*.

Sacculina reniformis n. sp. (fig. 9).

Male genital organs in the posterior part of the body, outside the visceral mass. Testes of about equal size, united in their dorsal part. Colleteric glands approximately in the centre of the lateral surfaces of the visceral mass, more or less protruding above their surroundings, with comparatively few tubes. External cuticle covered with small pointed papillae which have a smooth surface and vary in length between 3 and 9 μ. Retinacula have not been found.

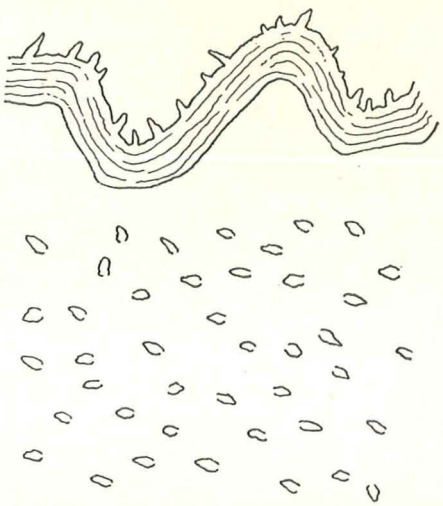

Fig. 9. *Sacculina reniformis*. Section of the external cuticle, and excrescences as they are distributed on the surface of this cuticle. × 530.

Type specimen on *Podochela riisei* Stimpson, United States Bureau of Fisheries, „Fish Hawk", Station 7351 (25° 09′ 04½″ N., 81° 18′ 35″ W., off Cape Sable, Florida, December 16, 1912, 3½ fms).

The type specimen is neatly kidney-shaped, its dimensions are: breadth 4.5, height nearly 3, and thickness about 1.5 mm. In the collection of the United States National Museum there are two more specimens on *Podochela riisei*, collected at localities in the neighbourhood of that of the type specimen („Fish Hawk", Stations 7147 and 7216, both off the coast of Florida).

The occurrence of these three parasites on specimens of *Podochela riisei* has already been mentioned by RATHBUN (1925).

Sacculina senta n. sp. (fig. 10).

Male genital organs in the posterior part of the body, outside the visceral mass. Both testes well developed, completely separated, more or less globular, so that the vasa deferentia rather abruptly pass into the testes. Colleteric glands not far from the centre of the lateral surfaces of the visceral mass, nearer to the anterior than to the posterior region, with a moderate number of tubes. External cuticle covered with small papillae which possess numerous

stiff little spines. These spines occur on the apices of the papillae only and diverge in lateral direction. The length of the excrescences varies between 3 and 8 μ, the spines may attain a length of 8 μ.

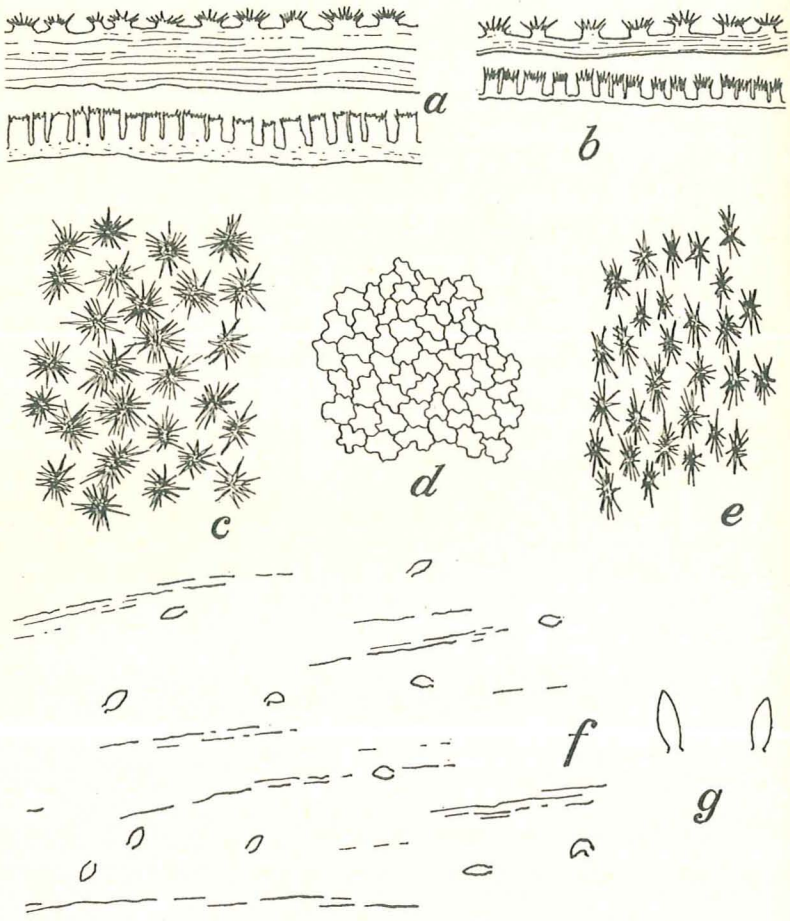

Fig. 10. *Sacculina senta*. *a*, section of the two layers of the external cuticle of one specimen. *b*, the same of another specimen. *c*, surface view of the excrescences as they occur on the outer layer of the external cuticle in the specimen of fig. *a*. *d*, surface view of the inner layer of the external cuticle of the same specimen. *e*, surface view of the excrescences of the outer layer of the external cuticle of the third specimen. *f*, retinacula on the internal cuticle. *g*, two retinacula. *a-e*, and *g*, × 530. *f*, × 280.

On the internal cuticle of the mantle numerous retinacula are found, consisting of single spindles which have a length of approximately 13 μ.

Type specimen on *Hemigrapsus sanguineus* (de Haan), Rikuoku, Japan, „Albatross", 1906.

Besides the type specimen the United States National Museum possesses two more specimens from the same locality, both on one specimen of *Hemigrapsus sanguineus*. The dimensions of the type specimen are: breadth 8.5, height 6, and thickness 2.5 mm, the other two have a similar size. In each of the three the external cuticle of the mantle consists of two separate layers. The chitin of the inner layer is weaker than that of the outer, consequently the excrescences of the former are less conspicuous than those of the latter. Usually the excrescences of the inner layer are more crowded than those of the outer layer, sometimes they form such a compact mass that in surface view they appear as drawn in fig. 10, *d*.

Sacculina schmitti n. sp. (fig. 11).

Male genital organs in the posterior part of the body, outside the visceral mass. Testes more or less globular, nearly completely united, their extreme dorsal parts only separated. Colleteric glands in the anterior half of the visceral mass, with a small number of tubes. External cuticle of the mantle smooth. Retinacula have not been found.

Type specimen on *Anomalothir furcillatus* (Stimpson), United

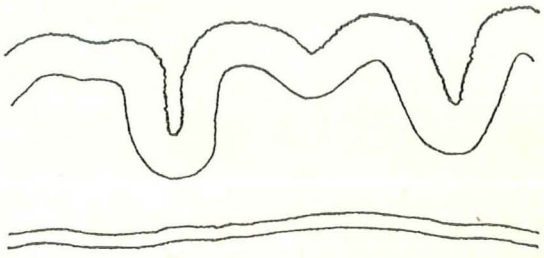

Fig. 11. *Sacculina schmitti*. Sections of two different parts of the external cuticle. × 530.

States Fish Commission, Steamer „Albatross", 1885, Station 2401 (28° 38′ 30″ N., 85° 52′ 30″ W., Gulf of Mexico).

The type specimen has a breadth of 5 mm, a height of 5 mm, and a thickness of 1 mm approximately. Besides this specimen there are seven more from the same locality on the same species of crab. The external cuticle of the mantle does not show the small areas which usually occur in Sacculinidae with a smooth cuticle. In different parts of the mantle this cuticle varies in thickness from 4 to 16 μ.

Rathbun (1925) mentions the occurrence of a Rhizocephalid on one of the specimens of *Anomalothir furcillatus* from Station 2401 of the „Albatross".

Sacculina gibba n. sp. (fig. 12).

Male genital organs in the posterior part of the body, outside the visceral mass. Testes more or less globular, rather abruptly passing into the vasa deferentia. Both testes well developed, completely separated, the one nearer to the dorsal part of the body than the other. Colleteric glands approximately in the central part of the lateral surfaces of the visceral mass, with a few tubes only. External cuticle of the mantle smooth or somewhat rough or covered with irregular minute spines, which may reach a length of 4 μ. The surface of the external cuticle is divided into areas with an average diameter of 12 μ, which have an irregular sinuous contour. Retinacula have not been found.

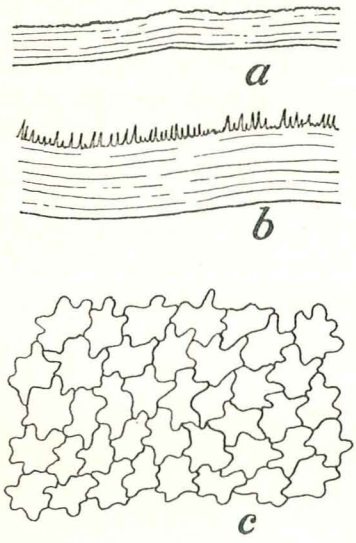

Fig. 12. *Sacculina gibba*. *a*, and *b*, sections of two different parts of the external cuticle. *c*, surface view of the external cuticle. × 530.

Type specimen on *Eriocheir rectus* Stimpson, Nuiwha, near Foochow, China, S. F. Light coll., August 1923.

The only specimen is bilobate, the dorsal and ventral part are stronger developed than the central region. Its dimensions are: breadth 6, height (in the centre) 2.5, and thickness 2 mm approximately. The little spines, which occur in some parts of the external cuticle, are very irregular, even in restricted areas they vary strongly in shape and size.

Sacculina curvata n. sp. (fig. 13).

Male genital organs in the posterior part of the body, outside the visceral mass. Testes completely separated, more or less cylindrical. Extreme dorsal part of the testes slightly curved in anteroposterior direction. Colleteric glands in the anterior half of the visceral mass, with a moderate number of tubes. External cuticle of the mantle smooth, its surface divided into small areas with an irregularly sinuous contour, which have a diameter of 6 to 14 μ. Retinacula have not been found.

Type specimen on *Sesarma (Sesarma) edwardsii philippinense* Rathbun, United States Bureau of Fisheries, „Albatross" Philippine Expedition, 1907—1909, Pangauran River, Port Caltom, Busuanga Island, Philippine Islands, seine, December 16, 1908.

The type specimen has an elongate curved shape, it has a breadth

of 9.5 mm, a height of 4 mm (in the central region), and a thickness of 3 mm. In the external cuticle of the mantle there occur a number of lime corpuscles, which may attain a comparatively large size.

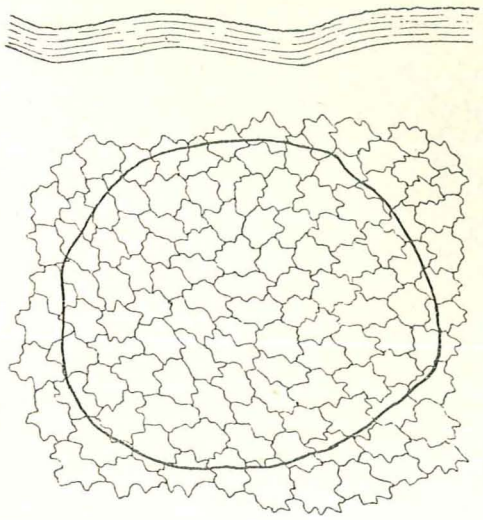

Fig. 13. *Sacculina curvata*, type specimen. Section of the external cuticle, and surface view of this cuticle, with the contour of a lime corpuscle. × 530.

In the collection of the United States National Museum there is a specimen on *Uca dussumieri* (Milne-Edwards) from Sebatic Island, Borneo, U. S. Bureau of Fisheries „Albatross" Philippine Expedition, October 1, 1909. In every important detail this specimen agrees with that on *Sesarma*.

Sacculina levis n. sp. (fig. 14).

Male genital organs in the posterior part of the body, outside the visceral mass. Testes completely separated, more or less cylindrical. Vasa deferentia with a distinct curve in antero-posterior direction. Colleteric glands in the anterior half of the visceral mass, with a moderate number of tubes. External cuticle of the mantle without excrescences, its surface divided into small areas with an irregularly sinuous contour, varying in diameter between 6 and 15 μ. Internal cuticle of the mantle with retinacula which consist of a basal part and 3 or 4 barbed spindles. The spindles have a length of 9 to 12 μ.

Type specimen detached from unknown host, Yenosima, mouth of Bay of Jeddo, Japan, E. S. Morse coll.

The only specimen has the following dimensions: breadth 14 mm,

height 9 mm, and thickness 2.5 mm. The surface of the external cuticle in general has a more less rough appearance, but in many

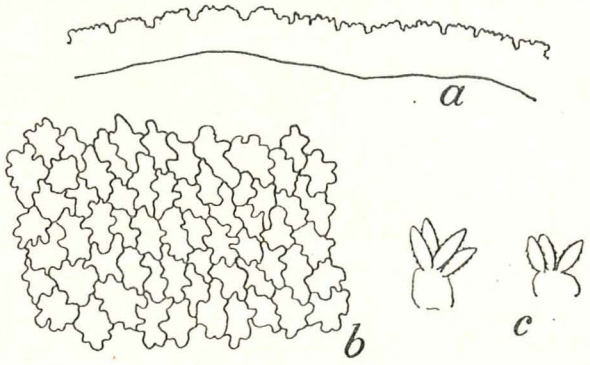

Fig. 14. *Sacculina levis*. *a*, section of the external cuticle. *b*, surface view of the external cuticle. *c*, two retinacula. × 530.

parts of this cuticle the surface is less uneven than in the figured section.

Drepanorchis strigulosa n. sp. (fig. 15).

Male genital organs in the posterior half of the visceral mass.

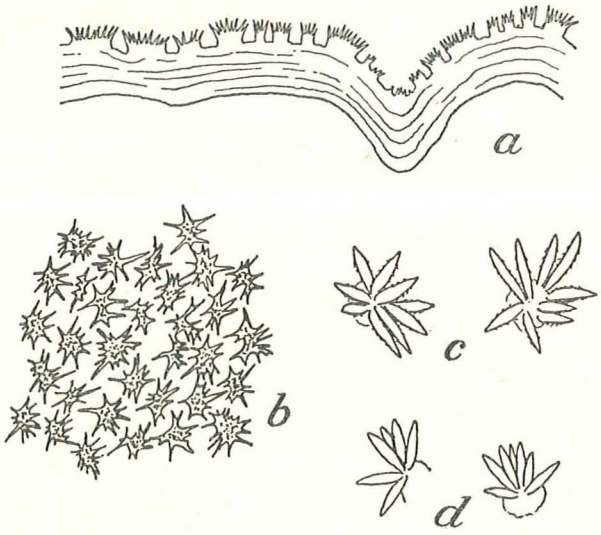

Fig. 15. *Drepanorchis strigulosa*. *a*, section of the external cuticle. *b*, surface view of the excrescences as they are distributed on the external cuticle. *c*, and *d*, retinacula of two different specimens. × 530.

Testes completely separated, of approximately equal size. Colleteric glands in the anterior half of the visceral mass (not far from the

centre of the lateral surfaces), with a fairly large number of tubes. External cuticle of the mantle with short papillae which have a length of 6 μ approximately. The papillae bear at their top numerous spines which extend chiefly in a lateral direction. Internal cuticle of the mantle with retinacula which consist of a basal part and 8 to 10 barbed spindles. The latter have a length of 10 to 15 μ.

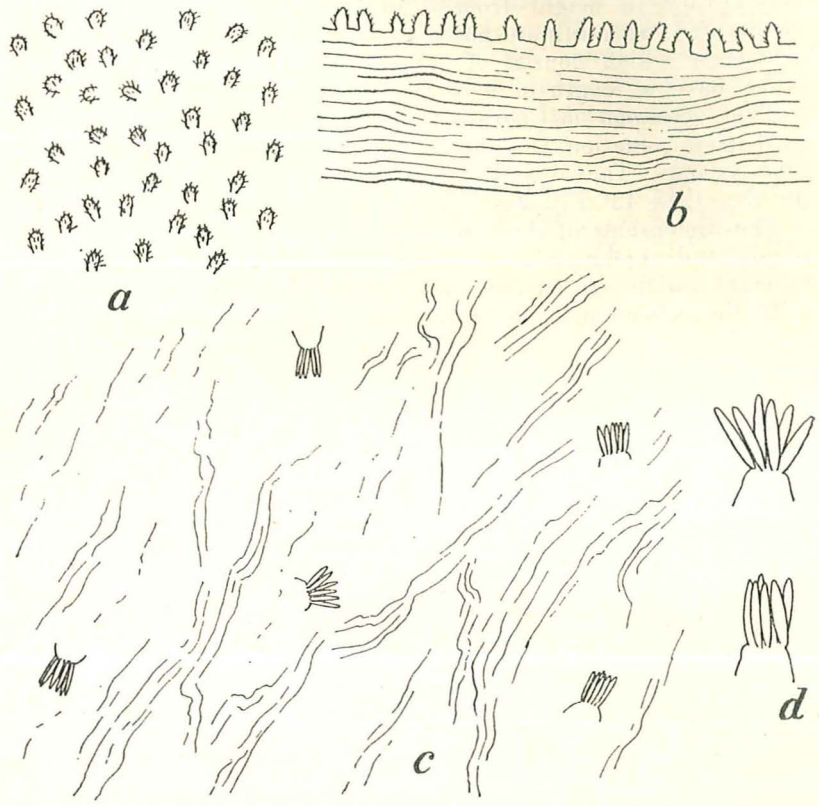

Fig. 16. *Drepanorchis papillosa*, type specimen. *a*, excrescences as they occur on the external cuticle. *b*, section of the external cuticle. *c*, retinacula on the internal cuticle. *d*, retinacula. *a*, *b*, and *d*, × 530. *c*, × 280.

Type specimen on *Pleistacantha oryx* Ortmann, „Albatross", Station 4895 (Eastern Sea, Ose Saki Light N. 42° E., 4.7 miles: 32° 33′ 10″ N., 128° 32′ 10″ E.), August 9, 1906, 95 fms.

The type specimen has a breadth of 5.5, a height of 5, and a thickness of 2.5 mm. Besides this specimen there is another of about the same size, which was also living on *Pleistacantha oryx* and has been collected in the same region as the type specimen (the second animal is from Station 4839 of the „Albatross").

Drepanorchis papillosa n. sp. (fig. 16).

Male genital organs in the posterior half of the visceral mass. Testes not strongly curved, the closed ends extending more or less in anterior direction. Colleteric glands approximately in the central region of each side of the visceral mass, with a fairly large number of tubes. External cuticle of the mantle covered with small papillae, which vary in height from 3 to 9 μ. These papillae are smooth or covered with minute hairs. Internal cuticle of the mantle with retinacula which consist of a basal part and 5 to 7 spindles. The latter have a length of 9 to 18 μ, they seem to possess no barbs.

Type specimen on *Charybdis* (*Gonioneptunus*) *bimaculatus* (Miers), „Albatross", Station D 5369 (vicinity of Marindugue Island, Philippine Islands, Tanyabas Light (outer) N. 50° W., 8.8 miles: 13° 48′ N., 121° 43′ E.), February 24, 1909, 106 fms.

The dimensions of the type specimen are: breadth 14 mm, height 9 mm, and thickness 3 mm. In this specimen the papillae of the external cuticle are covered with minute hairs.

In the collection of the United States National Museum there is a specimen of *Charybdis japonica* (A. Milne-Edwards) from Tokyo, collected by JORDAN and SNYDER in 1900, which bears four parasites. The anatomical characters of these correspond closely with those of the type specimen. Moreover, they have similar excrescences on the external and internal cuticle. They differ from the type specimen in one detail: the excrescences of the external cuticle are smooth, not covered with hairs. This character is of minor importance, so that these specimens safely may be identified as *Drepanorchis papillosa*. The larger of these four has a greater diameter of 15 mm.

Drepanorchis tenuicutis n. sp. (fig. 17).

Male genital organs in the posterior half of the visceral mass. One of the testes well developed, forming a comparatively wide sac, the other more or less rudimentary. Colleteric glands in the anterior half of the visceral mass, with a small number of tubes. External cuticle of the mantle extremely thin (approximately 2 μ), smooth. Internal cuticle of the mantle with retinacula which consist of a basal part and a few barbed spindles. The latter have a length of about 6 μ.

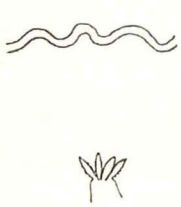

Fig. 17. *Drepanorchis tenuicutis*. Section of the external cuticle, and retinaculum. × 530.

Type specimen on *Aepinus indicus* (Alcock), Amirante, Western Indian Ocean, H. M. S. „Sealark", Station E 10, Oct. 11, 1905.

The specimen is very small, but not immature, for the mantle cavity contains eggs. The dimensions are: breadth nearly 2.5, height nearly 1.5, and thickness nearly 1 mm. On the surface of the external cuticle no areas are visible like those of many other Sacculinidae with a

smooth external cuticle. The retinacula are much smaller than those of other species.

The occurrence of this parasite on *Aepinus indicus* has already been mentioned by RATHBUN (1911).

Heterosaccus distortus n. sp. (fig. 18).

Testes forming wide sacs which extend chiefly in postero-anterior direction. Closed extremities of the testes in the anterior half of the visceral mass. Collecteric glands in the anterior part of the visceral mass, with a moderate number of tubes. External cuticle of the mantle smooth, very thin (3 to 5 μ). Internal cuticle of the

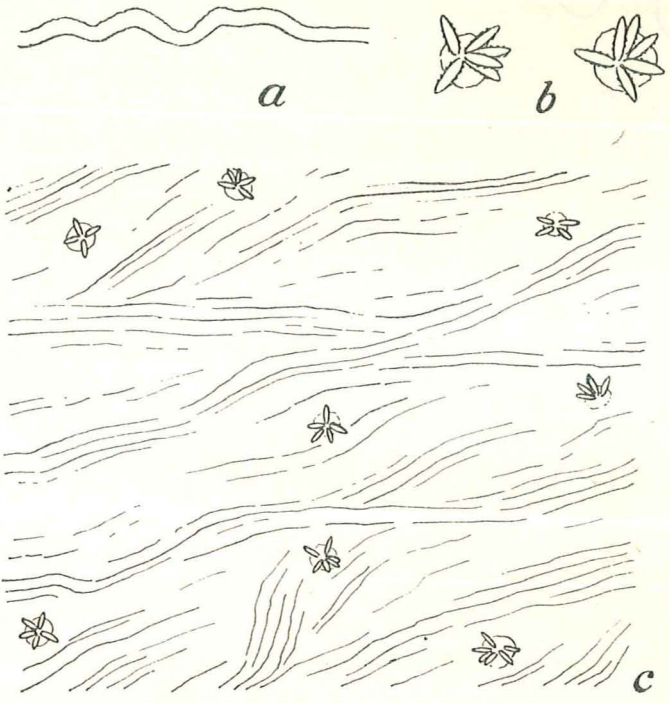

Fig. 18. *Heterosaccus distortus*. *a*, section of the external cuticle. *b*, retinacula. *c*, retinacula on the surface of the internal cuticle. *a*, and *b*, × 530. *c*, × 280.

mantle with retinacula which consist of a basal part and a small number of barbed spines. The latter have a length of 9 to 10 μ.

Type specimen on *Schizophrys aspera* (Milne-Edwards), United States Bureau of Fisheries Philippine Expedition 1907—1910, „Albatross", Station 5145, vicinity of Jolo, February 15, 1908.

The only available specimen has an irregular shape, caused by a Bopyrid parasite which occupies the greater part of the mantle

cavity. The dimensions are: breadth 7, height 6, and thickness 3 mm. The external cuticle is extremely thin (thickness about 3.5 μ), probably as a result of the distortion of the mantle by the parasite. The retinacula have a very short basal part.

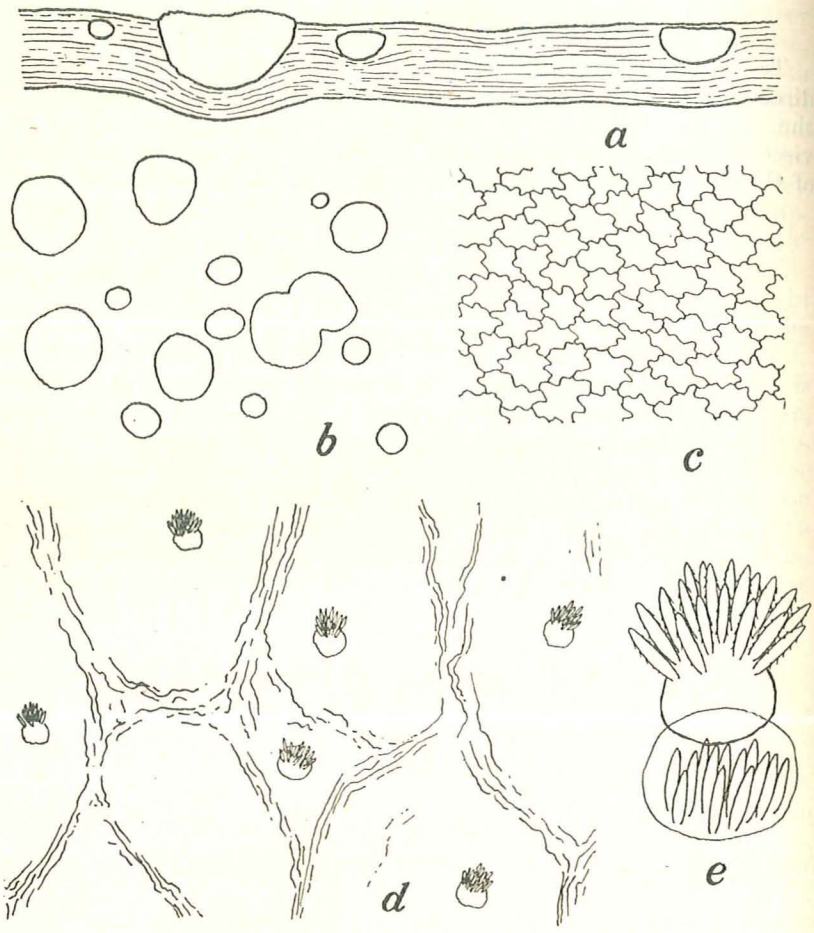

Fig. 19. *Heterosaccus californicus*, type specimen. *a*, section of the external cuticle, showing the position of the lime corpuscles. *b*, lime corpuscles as they appear in surface view of the external cuticle. *c*, surface view of the external cuticle. *d*, retinacula on the internal cuticle. *e*, retinaculum. *a*, and *d*, × 130. *b*, × 70. c, and *e*, × 530.

Heterosaccus californicus n. sp. (fig. 19).

Male genital organs in the posterior half of the visceral mass. Testes completely separated, their closed ends directed ventrally. Vasa deferentia markedly tortuous. Colleteric glands approximately in the central part of the lateral surfaces of the visceral mass, with

a large number of tubes. External cuticle of the mantle smooth or somewhat rough, its surface with small areas with an irregularly sinuous contour, which have a diameter of 6 to 16 μ. Internal cuticle of the mantle with retinacula, which consist of a basal part and several barbed spindles. The latter have a length of 12 to 15 μ.

Type specimen on *Pugettia producta* (Randall), Santa Cruz, California, J. L. KINGSLEY coll. (From Boston Society of Natural History).

The type specimen has a breadth of 31, a height of 22, and a thickness of 9 mm. Other specimens on *Pugettia producta* (from Monterey Bay) even attain a larger size. The United States National Museum possesses also a specimen on *Loxorhynchus crispatus* Stimpson from Monterey Bay, collected by the „Albatross" at Station 4551, 46—56 fms., June 7, 1904. This specimen does not differ from the type in any important detail.

In all these specimens the mantle opening is very wide.

The external cuticle of the mantle of the type specimen contains several lime corpuscles. Under each retinaculum the internal cuticle of this specimen shows a small vesicle in which spindles of another retinaculum are developing.

The occurrence of parasites on the specimens of *Pugettia producta* and *Loxorhynchus crispatus* from the localities given above has already been mentioned by RATHBUN (1925).

Loxothylacus texanus n. sp. (fig. 20).

Male genital organs in the posterior half of the visceral mass. Testes (at least in full-grown specimens) partially united into a common wide sac. Colleteric glands in the anterior half of the visceral mass, not far from the centre of the lateral surfaces, with a large number of tubes. External cuticle of the mantle with excrescences (short hairs or papillae), which have a length of 4 to 9 μ. Internal cuticle of the mantle with numerous retinacula, which consist of a basal part and several barbed spindles. The latter have a length of 14 to 18 μ.

Type specimen on *Callinectes sapidus* Rathbun, Metagorda Bay, near Indianola, Texas, J. D. MITCHELL coll.

The species is represented in the collections of the United States National Museum by some specimens on *Callinectes sapidus* from two different localities in Texas, and several on *Callinectes marginatus* (A. Milne-Edwards) from the Canal Zone and other localities in Panama. As a rule the specimens are of fairly large size, the dimensions of one of them are: breadth 23, height 14.5, and thickness 8 mm. The size of the excrescences of the external cuticle is different, not only in different specimens, but also in different parts of the mantle of each animal.

Several specimens of *Callinectes marginatus* with parasites have been mentioned by RATHBUN (1930).

Loxothylacus sclerothrix n. sp. (fig. 21).

Male genital organs in the posterior half of the visceral mass. Closed extremities of the two testes united into a common wide

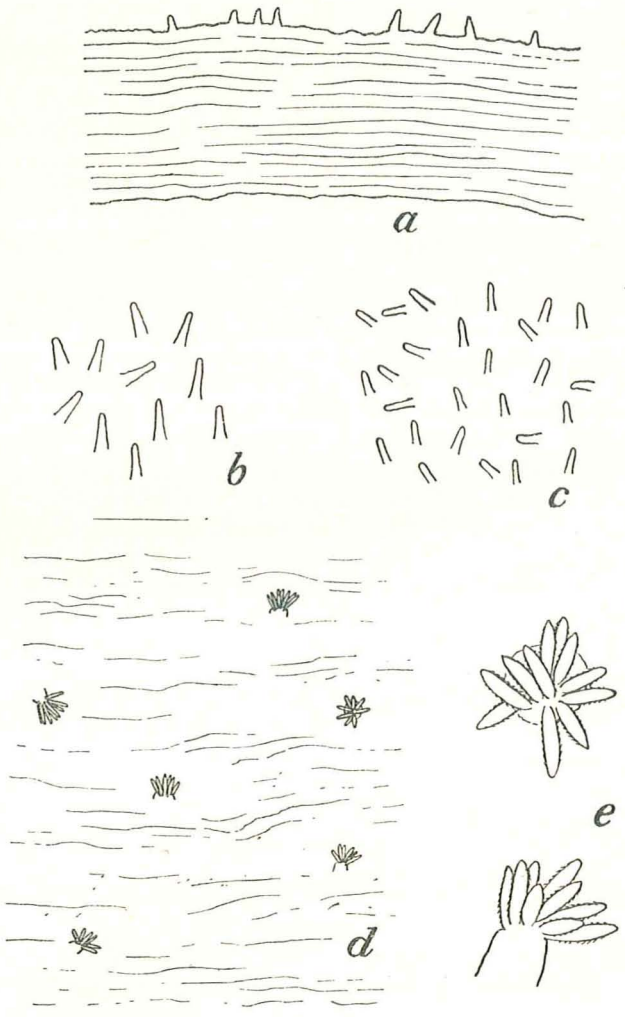

Fig. 20. *Loxothylacus texanus*. Parts of the cuticle of specimens on *Callinectes sapidus*. *a*, section of the external cuticle. *b*, excrescences as they occur on the external cuticle. *c*, excrescences from another specimen. *d*, retinacula on the surface of the internal cuticle. *e*, two retinacula. *a*—*c*, and *e*, × 530. *d*, × 130.

sac. Colleteric glands in the anterior half of the visceral mass, with a moderate number of tubes. External cuticle of the mantle crowdedly covered with papillae which at their extremity bear a number

of minute stiff spines and laterally are covered with minute hairs. The length of the excrescences varies from 10 to 25 μ. Internal cuticle of the mantle with retinacula consisting of a flat

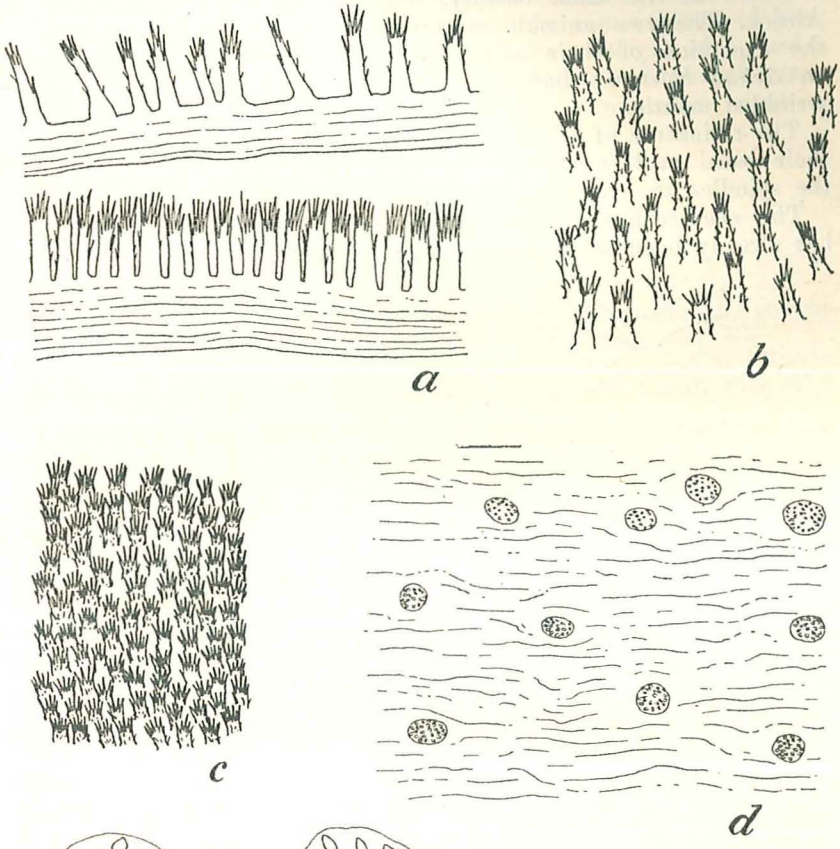

Fig. 21. *Loxothylacus sclerothrix*, type specimen. *a*, section of the two layers of the external cuticle. *b*, excrescences as they occur on the outer layer of the external cuticle. *c*, surface view of the excrescences on the inner layer of the external cuticle (basal parts of the excrescences not drawn). *d*, retinacula on the surface of the internal cuticle. *e*, two retinacula. *a*—*c*, and *e*, × 530. *d*, × 130.

basal plate and numerous small spindles which have a length of 4 to 5 μ. These spindles seem to be completely devoid of barbs.

Type specimen on *Actaea boletaria* Rathbun, Amirante, Western Indian Ocean, H. M. S. „Sealark", Station E 11, 25—80 fms., Oct. 11, 1905.

The type specimen has the following dimensions: breadth 4 mm, height nearly 3.5 mm, and thickness 1.5 mm. Its surface does not show any pronounced grooves. Besides this there is another specimen, collected at the same locality, but attached to *Carpilodes pediger* Alcock. The two animals correspond closely in every detail with the exception of their external appearance. Unlike the specimen on *Actaea boletaria* that on *Carpilodes pediger* has a very strongly wrinkled mantle.

The retinacula of *Loxothylacus sclerothrix* have an unusual shape: their basal part is much larger than that of other species, whilst the spindles are extremely small.

The occurrence of parasites on the two crabs mentioned above has already been stated by RATHBUN (1911).

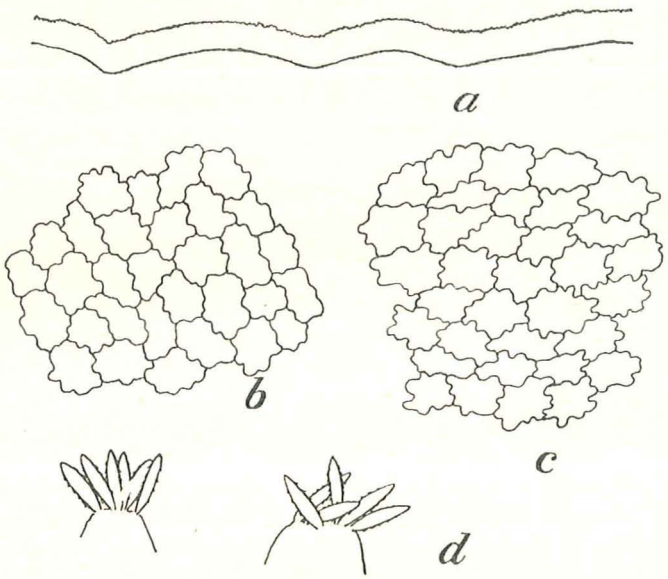

Fig. 22. *Loxothylacus bicorniger*. *a*, section of the external cuticle of one of the specimens. *b*, surface view of the external cuticle of the same specimen. *c*, surface view of the external cuticle of the other specimen, *d*, retinacula of the first specimen. × 530.

Loxothylacus bicorniger n. sp. (fig. 22).

Male genital organs in the posterior half of the visceral mass. One of the testes narrowly curved, the other more or less rudimentary. Colleteric glands near the centre of the lateral surfaces of the visceral mass, with a comparatively small number of tubes. External cuticle of the mantle smooth, its surface divided into small irregular areas which have a diameter of 6 to 20 μ. Internal cuticle of the mantle with retinacula which consist of a basal part and about 6 barbed spindles. The latter have a length of 14 to 17 μ.

Type specimen on *Portunus ventralis* (A. Milne-Edwards), Hog Island, Nassau, Bahamas, June 20, 1903, B. A. BEAN coll. (Geographical Society of Baltimore don.).

In the United States National Museum collection there are two specimens from the same locality and on the same species of host. The larger specimen has a breadth of 8, a height of 5, and a thickness of 2.5 mm approximately. Its dorsal and ventral extremities are elongated into somewhat pointed prominences, more or less like blunt horns.

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