

New and interesting Malaysian species of *Sesarma* and *Utica* (Crustacea, Brachyura)

By M. W. F. TWEEDIE, M.A.

(Plate XXIV)

The material described in this paper has been collected mainly during the last two years from the coasts and tidal rivers of Singapore and the Malay Peninsula; mention is also made of specimens from Labuan and comparative material from Celebes and the Philippine Islands has been lent by various museums.

Acknowledgements and thanks for these loans are due to the Directorates of the United States National Museum, the s'Rijks Museum van Natuurlijke Historie of Leiden and the Bureau of Science, Manila. To Dr. Isabella Gordon of the British Museum and Prof. Dr. H. Balss of Munich thanks are also due for their kindness in comparing material with types and authentic specimens in their respective museums, and to Dr. T. Sakai for sending specimens of the Japanese species *Sesarma bidens* de Haan.

In referring to species of *Sesarma* I have deemed it best not to recognise the four subgenera proposed by de Man and amended taxonomically by Rathbun.¹ This classification has its practical uses but is almost entirely artificial. Moreover the presence or absence of an epibranchial tooth is not a reliable character. Several species are variable in this respect and it has been used to separate subgenerically species which are very closely allied, e.g. *S. granosimana* and *S. crassimana*.

The terminology used in describing the structure and orientation of the first pleopod of the male is based on that employed by Gordon (1937, p. 152, 154) and refers to the position of the pleopod *in situ*, i.e. before it is removed for examination and figuring. The concave surface that lies against the thoracic sternal segments is called the sternal surface, a figure showing which is said to be drawn from the sternal aspect. The opposite side, lying against the abdomen, is referred to as the abdominal surface; in most species of *Sesarma* the pleopod is triangular in cross section and an outer and inner abdominal facet can be distinguished. When *in situ* the outer facet lies against the inner surface of the abdominal segments and the inner facet

1. *Sesarma* s.s. *Parasesarma*, *Cheiomantes* and *Holometopus*.

MALAYSIAN SPECIES OF SESARMA AND UTICA

against the hinder part of the alimentary canal. The most important feature systematically is the distal chitinous projection which is normally very constant in shape and relative size in any given species and sometimes affords the most reliable means of distinguishing closely similar forms.

For the sake of uniformity the right pleopod has been extracted and figured in every case and, unless otherwise stated, has been drawn resting on the outer abdominal facet with the distal end upwards and the chitinous projection pointing towards the right. In most cases the pleopod rests naturally on a flat surface in this position and the chitinous projection is seen in profile.

Systematic.—

Sesarma versicolor sp.n.

Sesarma sediliensis sp.n.

Sesarma johorensis sp.n.

Sesarma penangensis sp.n.

Sesarma bidens indiarum nom. nov. for *Sesarma bidens indica* de Man preoccupied by *Sesarma indica* H. Milne Edwards.

Sesarma edwardsi var. *crassimana* de Man is raised to specific rank and the males of *Sesarma pontianacensis*, *S. palawanensis* and *Utica borneensis* are described for the first time.

The types of the new species will be deposited in the British Museum.

Sesarma andersoni de Man.

DE MAN 1887, p. 657; 1887-88, p. 172, Mergui.

TESCH 1917, p. 129.

KEMP 1918, p. 234.

Material.—A good series from Kuantan, Pahang, on the east coast of the Peninsula and a smaller series from Prai, opposite Penang Island on the west coast.

Remarks.—Kemp (1915 p. 239) mentions a "short ridge on either side of the carapace, strictly transverse in direction, situated close behind the middle of the orbit". This feature was not mentioned in de Man's original description and I am unable to find it in any of the present series.

The species is recorded previously from Mergui and Trang on the west coast of Peninsular Siam. Its occurrence at Penang affords, therefore, merely a slight southward extension of the known range, but its presence at Kuantan is hard to explain unless a fairly recent marine or palustrine connection across the Isthmus of Kra is postulated, since intensive collecting has not revealed the species at Singapore or at more southern localities on the coasts of the Peninsula.

Sesarma batavica Moreira. Fig. 1.

DE MAN 1890, p. 104 (*S. barbimana*), Batavia.
MOREIRA 1903, p. 117.
KEMP 1915, p. 238.
TESCH 1917, p. 132.
TWEEDIE 1936, p. 63.



Fig. 1. *Sesarma batavica*. Antero-lateral region of carapace of specimens showing (a) the normal condition and (b) a well developed epibranchial tooth.

Material.—Localities in addition to those listed in Tweedie, 1936 are Kuantan, Pahang; and Prai, opposite Penang Island.

Remarks.—The condition of the lateral margin behind the antero-lateral angle is very variable. Sometimes the margin is quite unbroken; usually a trace of an epibranchial tooth is present and occasionally a definite tooth is found. This condition is illustrated in fig. 1b and the normal condition in a.

Sesarma bocourti A. Milne Edwards.

A. MILNE EDWARDS 1869, p. 28, Bangkok.
DE MAN 1895, p. 169.
TESCH 1917, p. 135.
ROUX 1933, p. 13.

Material.—A good series from fresh-water swamp near Kota Tinggi, Johore.

Remarks.—In his description of specimens from Borneo and Sumatra Tesch (l.c.) records a variation in the proportions of the abdominal segments of the male, describing a single specimen from Balikpapan, in Borneo in which they are unusually broad, the hind margin of the penultimate segment being 2.8 times its length. In the present series this ratio varies from 2.08 to 2.34, the tendency being for the segments to be broader in small specimens. In the two specimens described by de Man (1895, p. 169–171) from Pontianak, Borneo and Condore Island the ratio falls within this range.

None of the specimens in the present series exhibits the row of granules on the inner surface of the palm observed by Tesch in examples from Balikpapan, East Borneo; and Deli, Sumatra.

MALAYSIAN SPECIES OF SESARMA AND UTICA

If *Sesarma cheirogona* Targioni Tozzetti from Yokohama (1877, p. 141) is really identical with *bocourti*, I am inclined to think that the specimen was wrongly localised. It was collected during the world cruise of the "Magenta", which included visits to Borneo and Sumatra.

Sesarma pontianacensis de Man. Fig. 2.

DE MAN 1895, p. 178, Pontianak, W. Borneo.
NOBILI 1903, p. 27.

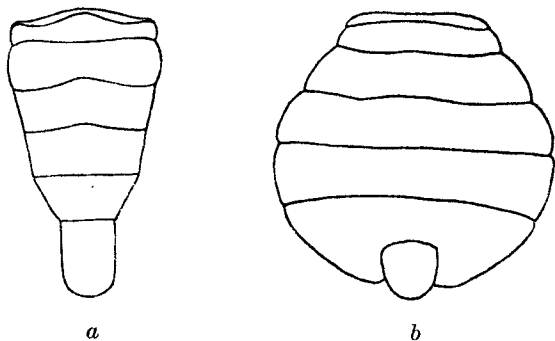


Fig 2. *Sesarma pontianacensis*. Outlines of abdominal segments of (a) male and (b) female.

Material.—A series of both sexes from Singapore; Tanjong Balai, Karimon Islands; and Prai, Province Wellesley, 12/1938.

Remarks.—Previous records of this species are confined to the single female from which the species was described and a female recorded by Nobili (l.c.) from Samarinda, south-east Borneo.

In the male the form of the carapace is similar to that of the female. The chelæ are somewhat larger, the palms being considerably inflated. The outer surface of the hand, except the tips of the fingers, is coated with woolly hair; the inner surface of the palm is naked or sparsely hairy and carries no granules or raised ridge. The upper surface of the dactylus carries a longitudinal ridge which, under strong magnification, can be seen to be very finely milled. Near the base and external to this ridge the upper surface of the dactylus is hairy but elsewhere it is naked.

The male abdomen (fig. 2a) is narrow and its terminal segment very long. The female abdomen (fig. 2b) is very broad and almost circular in shape.

The largest female is 4.5 mm. in anterior carapace breadth and 5.3 mm. long; a much smaller specimen is ovigerous. The corresponding measurements of the largest male are 3.8 mm. and 4.5 mm.

Sesarma granosimana Miers.

MIERS 1880, p. 312, Indo-Malayan Seas.

TESCH 1917, p. 155.

ROUX 1933, p. 10.

Material.—A good series from fresh-water swamp-forest near the river Sedili, Johore. A single specimen from among nipah palms beside the river Sedili, where the water is slightly saline.

Remarks.—The species has been recorded from Pontianak, Borneo by de Man and from Palembang, Sumatra by Roux.

Sesarma crassimana de Man.

DE MAN 1887, p. 649, Bay of Bengal, 1887–88, p. 188; 1895, pp. 143, 174 (*Sesarma edwardsi* var. *crassimana*).

TESCH 1917, p. 148 (*S. edwardsi crassimana*).

Material.—An adult male and female and a smaller male from among nipah palms beside the river Sedili, Johore.

Remarks.—I prefer to regard this crab as a separate species rather than as a variety of *S. edwardsi* de Man. That author has remarked on its resemblance to *S. granosimana* Miers (l.c. 1895, p. 143) and in my opinion it is more closely related to that species than to *edwardsi*. As de Man points out the form, details of dentition and even the colour of the chelæ, and also the shape of the abdominal segments, are almost identical in *granosimana* and *crassimana*, the only conspicuous difference between them being the presence of an epibranchial tooth in the latter. I find also that the meri of the walking legs are differently shaped in these two species. In *crassimana* those of the penultimate pair are, as de Man says, a little more than half as broad as long. In the specimens of *granosimana* that I have before me they are broader still, the ratio of breadth to length being about 1:1.7 as against 1:1.9 in *crassimana*. In the table of measurements given by de Man in 1895, p. 148, three *granosimana* give a ratio of 1:1.7 and one of 1:1.8. In the single *crassimana* measured the ratio is 1:1.8.

Sesarma moeschii de Man. Fig. 3; Plate xxiv, 1.

DE MAN 1887–88, p. 182 (*S. intermedia*), Mergui; 1892, p. 331; Deli, Sumatra.

TESCH 1917, p. 177.

Material.—One adult male from among nipah palms beside the river Sedili, Johore, measuring 16.2 mm. in anterior carapace breadth.

Remarks.—By courtesy of Prof. Dr. H. Boschma, Director of the Leiden Museum, I have been able to examine the specimen recorded by Tesch (l.c.) from Celebes. It appears to agree with the Malayan specimen in every respect except for the proportions of the abdominal segments (fig. 3a, b), the penultimate segment being much broader in the Celebes specimen. If sufficient

MALAYSIAN SPECIES OF SESARMA AND UTICA

material were available from both localities to prove this difference to be constant, it would be sufficient for sub-specific distinction.

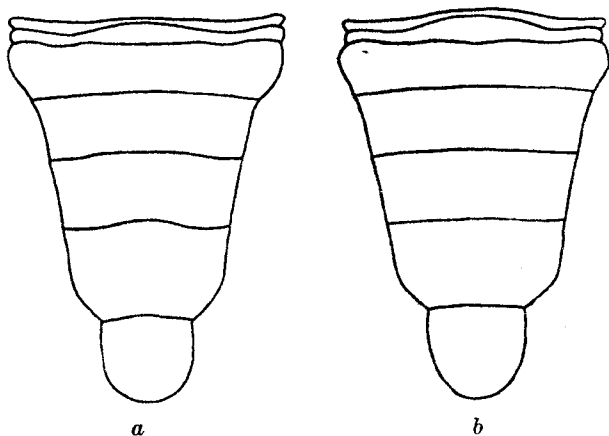


Fig. 3. *Sesarma moeschii*. Outlines of abdominal segments of males from (a) Johore and (b) Celebes.

***Sesarma polita* de Man.**

DE MAN 1887, p. 654; 1887-88, p. 189, Mergui.

TESCH 1917, p. 190.

Material.—A single male from among nipah palms beside the river Sedili, Johore.

Remarks.—This distinctive species was known hitherto only from the Mergui archipelago.

***Sesarma bidens indiarum* nom. nov.**

DE MAN 1902, p. 541 (*Sesarma bidens* var. *indica*), Amboina and Ternate. nec *Sesarma indica*, H. Milne-Edwards, 1837, p. 74.

TESCH, 1917, p. 135 (*Sesarma bidens indica*).

Material.—Specimens from Singapore; Kuantan, Pahang; Prai, Province Wellesley; Simalur Island, West Sumatra.

Remarks.—I have compared examples from Japan, kindly provided by Dr. T. Sakai, with Malaysian material, and agree with previous authors that the two forms are geographical races of a single species. It seems most probable that typical *bidens* is restricted to the Japanese area.

S. b. indiarum may be distinguished from *S. b. bidens* by its narrower abdomen; the sharper and more outwardly directed antero-lateral teeth and more oblique orbits; and the longer and more slender walking legs. The breadth: length ratio of the meri of the penultimate legs is about 1:2 in *bidens* and 1:2.1-2.2 in *indiarum*.

The male pleopods are not significantly different.

Sesarma mederi H. Milne Edwards. Fig. 4.

WHITE 1847, p. 38 (*S. taeniolata* nom. nud.), Philippine Islands.

H. MILNE-EDWARDS 1853, p. 185, Batavia.

TESCH 1917, p. 201 (*S. taeniolata*).

TWEEDIE 1936, p. 53. (*S. taeniolata*).

Material.—Two males from Muar, Johore; one female (juv.) from Singapore; two males, two females from Prai, Province Wellesley; four males and two females from Labuan; one male from Iloilo Province, Philippine Islands (on loan from the Bureau of Science, Manila). A male from Labuan was compared with the type of *S. taeniolata* in the British Museum by Dr. I. Gordon and found to be the same. The largest specimen is a male from Labuan measuring 40 mm. in anterior breadth.

Remarks.—This species may be taken as representative of a series of closely allied, large species of *Sesarma* which also includes *S. palawanensis* Rathbun, *S. lafondi* Jacq. et. Luc., *S. tetragona* Fabr., *S. singaporensis* Tweedie and *S. versicolor* sp.n. (*infra*). Of these all except *lafondi* and *tetragona* are in the present collection. The discrimination of some of the species is by no means easy. In the males the most useful characters are the form of the first pleopod and the number of tubercles on the dactylus of the chela.

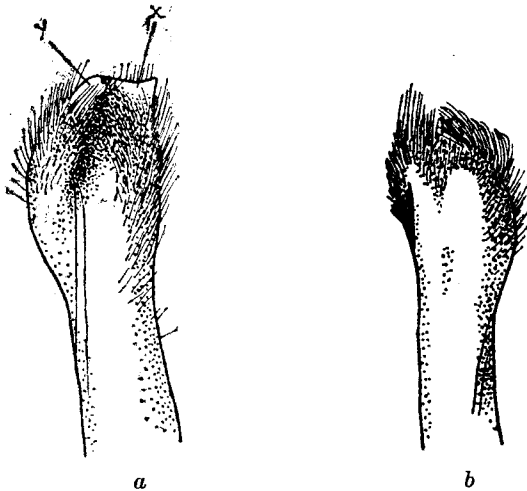


Fig. 4. *Sesarma mederi*. Right first pleopod of male from (a) sternal and (b) abdominal aspect.
x, laminar chitinous projection; y, supplementary chitinous projection.

In the present species the number of tubercles on the dactylus seems from the available series to be about 50–55 in males measuring 35–40 mm. in anterior carapace breadth. The type of *taeniolata* White from the Philippines is exceptionally

MALAYSIAN SPECIES OF SESARMA AND UTICA

large (45 mm. in anterior breadth) and has 62-64 tubercles; the specimen from Iloilo Province has 55 equalling the maximum observed in the Malaysian series.

The first male pleopod (fig. 4a, b) is expanded at the tip and bears a broad laminar chitinous projection, pointed or angular at its outer distal extremity (fig. 4a, x). On the inner margin of the expanded tip of the pleopod a lobe arises which curves over the sternal surface and bears at the tip another narrow chitinous projection (fig. 4a, y) which, in sternal aspect, overlaps the inner end of the first.

The curved granular ridge on the inner surface of the palm is present in both sexes and in old males is extremely prominent. The epibranchial teeth are prominent and project outwards distinctly more than the antero-lateral teeth, the distance between them from side to side being about 1-2 mm. more than the anterior breadth in large specimens.

The female is immediately distinguished from all the other closely similar members of the group by the presence of a pectinated ridge on the palm of the chela, like that of the male.

Sesarma palawanensis Rathbun. Fig. 5.

RATHBUN 1914, p. 72, Palawan Island, Philippines.

TESCH 1917, p. 183.

TWEEDIE 1936, p. 53 (*S. taeniolata*, part) and p. 54 (*S. palawanensis*, part).

Material.—Two adult and three sub-adult males from Singapore; Two adult and one sub-adult females from Singapore; One adult female from Kuantan, Pahang; one female paratype from Nakoda Bay, Palawan Island, Philippines (on loan from the U.S. National Museum).

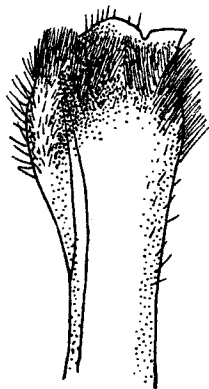


Fig. 5. *Sesarma palawanensis*. Right first pleopod of male from sternal aspect.

Remarks.—Up to the present the male of this species has not been described, all the males and some of the females recorded under the name *palawanensis* by myself (1936, p. 54) being referable to *S. versicolor* sp.n. *infra*. Comparison of recently collected adult males of *palawanensis* with *mederi* also revealed that three sub-adult males from the Johore Straits and Singapore, referred by me previously to *S. taeniolata* (= *mederi*) belong to the present species.

In the two large males of *palawanensis* the dactylar tubercles number 66, 67 and 69, 70, their anterior carapace breadth being respectively 38.8 mm. and 36.5 mm. in two smaller males, about 30 mm. in breadth the tubercles number 63, 64 and 67, 68. The maximum and average is therefore significantly higher than in *mederi*.

The first male pleopod (fig. 5) is similar at first sight to that of *mederi*. The laminar chitinous projection is, however, more prominent and the inner margin of the expanded tip is slightly inflated, is not produced into a lobe and bears no supplementary chitinous projection. This affords the most reliable means of distinguishing between the males of the two species. The edge of the laminar chitinous projection in *palawanensis* is more or less emarginate, but the sharp notch in that of the figured specimen may be due to an injury.

As stated in the original description the carapace is narrower than in *S. mederi*, its median length being usually 95–97% of the anterior breadth. The front and the outer post-frontal lobes are also relatively narrower, all characters which also distinguish the species from *S. singaporensis*. Another characteristic feature of *palawanensis* is that in both sexes the epibranchial teeth are less prominent laterally than the antero-lateral teeth, so that the distance between them is less than the anterior breadth. The tufts of hair on the surface of the carapace are smaller and finer than in the allied species and the walking legs are considerably longer and more slender.

In the original description it is stated that there is no granular ridge on the inner surface of the palm, an observation based on a series of females only. In the males this ridge is present, though it is rather shorter and less prominent than in *S. mederi*. Traces of it exist, moreover, in the largest females from Singapore. There is no pectinated ridge on the palm of the female.

Measurements of largest male from Singapore.

Carapace.—

Anterior breadth	..	..	..	38.8 mm.
Breadth between epibranchial teeth	..	..	..	38 "
Posterior breadth	..	..	..	17 "
Median length	..	..	..	37.2 "
Breadth of front	..	..	..	19 "

MALAYSIAN SPECIES OF SESARMA AND UTICA

Abdomen.—

Length (segments measured serially) ..	30.8 mm.
Breadth at third segment ..	19.4 "
Length of penultimate segment ..	7.4 "
Basal breadth of penultimate segment ..	14.1 "
Length of last segment ..	6.5 "
Basal breadth of last segment ..	6 "

Right Chela.—

Total length of chela ..	34 "
Height of palm ..	19 "
Length of dactylus ..	23.8 "

Penultimate Walking Leg.—

Length of merus ..	33.5 "
Greatest breadth of merus ..	13.5 "
Combined length of carpus and propodus ..	37.7 "
Length of dactylus ..	17.1 "

Sesarma singaporensis Tweedie. Fig. 6.

TWEEDIE 1936, p. 53, Singapore.

Material.—Ten adult and sub-adult males and six females from Singapore, in addition to the original series; three males and a female from Prai, Province Wellesley.

Remarks.—Subsequent collecting has shown that the specimens from which this species was originally described were not fully adult. The anterior breadth of the carapace of the type is 32 mm. Several larger males have now been collected, the largest measuring 38.5 mm. in breadth. In these larger specimens the number of tubercles on the dactylus of the chela is greater than was first recorded, the maximum observed being 46 as opposed to 37 in the type. From the present series it appears that in males ranging from 30 to 38 mm. in breadth the dactylar tubercles normally range from about 36 to 46; none of the specimens of 33 mm. or over have less than 40 tubercles.

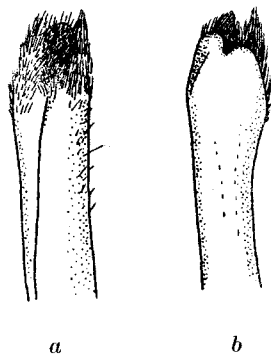


Fig. 6. *Sesarma singaporensis*. Right first male pleopod from (a) sternal and (b) abdominal aspect.

Examination of this series has also revealed some further characters distinguishing the species from *S. mederi* and *S. palawanensis*. In those species the dactylar tubercles are almost the same length (measured along the axis of the finger) throughout, but in *singaporensis* they increase gradually in length, those near the tip being more than twice as long as those near the base.

The first male pleopod (fig. 6a, b) is very slightly expanded at the tip and quite distinct from that of any of the allied species.

In both sexes the carapace is considerably broader than in *palawanensis*, the median length being usually about 92% of the anterior breadth; the front is more than half the anterior breadth which is equal to or slightly less than that between the epibranchial teeth. The meri of the walking legs are very broad, sometimes nearly half as broad as long. The absence of a pectinated ridge on the palm distinguishes the female from that of *mederi*.

In both average and maximum size the available series of *singaporensis* is smaller than those of *mederi* and *palawanensis*.

Sesarma versicolor sp. n. Fig. 7.

TWEEDIE 1936, p. 54 (*S. palawanensis*, part).

Cotypes.—An adult male and female from Singapore Island, February 1939.

Material.—Four adult and sub-adult males and seven females, in addition to the types, from Singapore, 1934, 1935, 1939; Six adult males and two females from Prai, Province Wellesley, 12/1938; a male and female from Kuantan, Pahang, 1935.

Description.—A species of *Sesarma* related to *S. mederi*, *S. palawanensis* and *S. singaporensis*, and characterised by the following features: the carapace is broader than long, the median length being usually 93–95% of the anterior breadth; the greatest breadth is between the epibranchial teeth. The surface is beset with rather large tufts of hair. The breadth of the front is half or less than half the anterior breadth of the carapace and the inner post-frontal lobes are one and a half or more times as broad as the outer, features in which the species resembles *S. palawanensis*. The abdomen of the male (fig. 7a and Tweedie, 1936, fig. 1b) is narrow, the length of the penultimate segment being 60% or more of its basal breadth. This character alone is sufficient to distinguish the male from that of any of the three allied species, in which the percentage is about 50–53.

The tip of the first male pleopod (fig. 7b) is less expanded than that of *mederi* and *palawanensis*. The chitinous projection is laminar, but its outer distal extremity is low and rounded,

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MALAYSIAN SPECIES OF SESARMA AND UTICA

not acutely angular. Its inner margin curves sharply round on itself, so that in end view the distal edge of the projection is hook-shaped. The short, reflexed part stands on the distal portion of the inflated inner margin and is homologous with the detached supplementary chitinous projection on the pleopod of *mederi*.

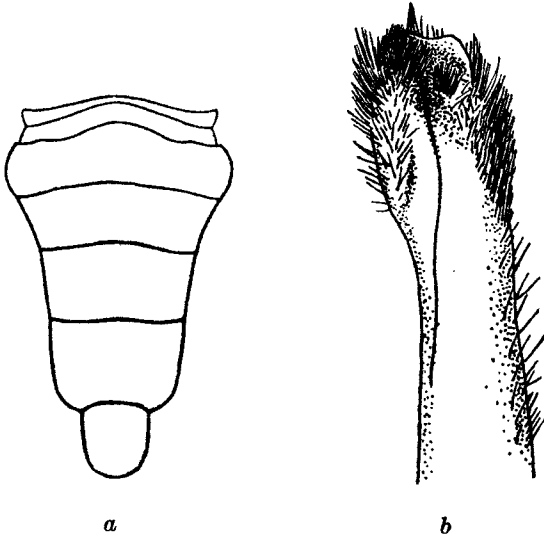


Fig. 7. *Sesarma versicolor*. a, outline of male abdominal segments; b, right first pleopod of male in sternal aspect.

In fresh specimens the coloration of the chelæ is the most conspicuous specific feature, and is common to both sexes. Externally the palm is purple on its basal two-thirds and on its upper part this colour extends distally to the dactylar articulation and in a tapering strip along the upper surface of the dactylus. The rest of the palm, the immovable finger and the outer surface of the dactylus are white. The purple coloured surfaces are granular-rugose and the white are smooth and sparsely punctate. The granular ridge on the inner surface of the palm is less prominent and rather longer than in the allied species and is developed in both sexes. In adult males the basal part of the biting edge of the immovable finger is expanded into a broad molariform process. In the male cotype the number of tubercles on the dactyli is 53, 53. Other specimens of 35-37 mm. in anterior breadth have 45-50 tubercles and the number does not fall below 40 in adults. As in *singaporensis* the tubercles increase in length from base to tip of the finger, the increase

being gradual up to the last three or four tubercles and then becoming very marked. The last one is greatly elongated, equalling as many as four or five of the most proximal ones. In the female the tubercles are fewer in number and are confined to about the proximal half of the dactylus. A pectinated ridge is present on the palm of the male but not on that of the female.

The walking legs are intermediate in their proportions between *mederi* and *palawanensis*.

Measurements of the male cotype.

Carapace.—

Anterior breadth	38.6 mm.
Breadth between epibranchial teeth	39.5 "
Posterior breadth	15.5 "
Median length	36.4 "
Breadth of front	19 "

Abdomen.—

Length (segments measured serially)	31.3 "
Breadth at third segment	19 "
Length of penultimate segment	6.7 "
Basal breadth of penultimate segment	11 "
Length of last segment	6.1 "
Basal breadth of last segment	5.9 "

Right Chela.—

Total length of chela	32 "
Height of palm	20.2 "
Length of dactylus	22.5 "

Penultimate Walking Leg.—

Length of merus	31 "
Greatest breadth of merus	13.8 "
Combined length of carpus and propodus	35 "
Length of dactylus	12.5 "

Sesarma sediliensis sp. n. Fig. 8; Plate xxiv, 2.

Cotypes.—An adult male and female collected on the bank of the river Sedili in east Johore by the writer in March, 1938.

Material.—The types and a series of sub-adult specimens from the type locality.

Description.—The carapace is distinctly convex longitudinally and slightly so from side to side. The breadth between the antero-lateral angles is always slightly more than the median length; in adult males the length averages 91–92% of the breadth and in females in which the carapace is slightly broader about 88%. The lateral margins carry a tooth behind the antero-lateral angle and an indication of a second epibranchial tooth is present in the form of a notch behind the first; they are nearly parallel, diverging backwards only slightly from a point behind the first epibranchial teeth, between which lies the greatest breadth of the carapace. The front is moderately prominent and is not concealed by the post-frontal lobes; it is emarginated in the middle, the emargination occupying between a third and a quarter of its total breadth. The surface of the carapace is

MALAYSIAN SPECIES OF SESARMA AND UTICA

distinctly sculptured; the groove separating the inner post-frontal lobes being deep and that bounding the mesogastric region well defined. Of the post-frontal lobes the inner project slightly farther forward than the outer and are about one and a half times as broad; the anterior margins of all four lobes are indented and setose. Small setiferous punctæ are scattered sparsely all over the carapace, being most numerous on the branchial regions.

In the abdomen of the adult male the shape of the penultimate segment is peculiar (fig. 8a). Its distal margin embraces the last segment more than is usual in *Sesarma*, and the lateral margins are notched where they curve round to join the distal margin on each side; in sub-adult specimens the notches are scarcely perceptible. The greatly produced, tubular chitinous projection of the first male pleopod (fig. 8b) is highly characteristic of the species.

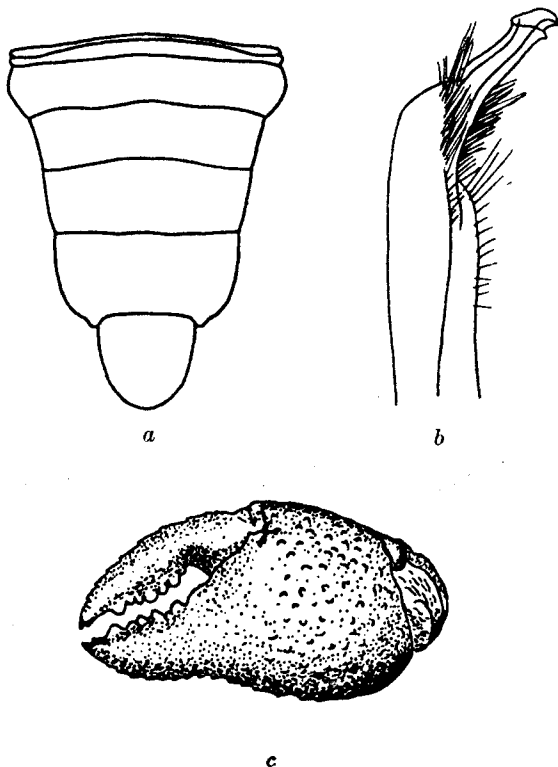


Fig. 8. *Sesarma sediliensis*. a, outline of male abdominal segments; b, right first pleopod of male; c, left (larger) chela of male cotype.

In the chelipeds the upper border of the arm ends in a sharp tooth, the outer border is granular and the lower is denticulate, the denticles being blunt and expanded to form a flattened lacinate projection near the distal end. The carpus bears a flattened tooth on its inner surface, entire in the sub-adult specimens, but broken up into several small denticles in the type. The upper surface of the carpus is granular, the granules becoming squamiform towards the meral articulation. The upper margin of the palm of the chela (fig. 8c) is bounded by a granular ridge; its outer surface is uniformly granular, the granules being small and low. The under surface of the palm and immovable finger is beset with larger granules. The inner surface is sparsely granular and in the type a few larger granules are arranged in a vertical series, but do not form a definite ridge. The upper margin of the dactylus carries in the male 8-12 small, blunt, distally directed teeth in a series extending nearly to the tip; interior to this row of teeth are a few scattered granules, similar in form to the teeth but rather smaller. In the female the granulation of the chelæ is reduced to a fine rugosity and the ornamentation of the dactylus to two or three small granules near the articulation. Both fingers end in sharp, horny points. The dentition of the inner margins of the fingers shows no unusual characters; the teeth on the dactylus tend to form a group towards the middle of the finger, especially in large specimens.

In the male type the chelipeds are very unequal, the left being much the larger. About half the sub-adult specimens show a slight inequality and it seems probable that this is a natural condition, being emphasised with age, and not the result of mutilation and subsequent regeneration.

The walking legs are short and stout; the meri are broad, their maximum breadth being near the distal end and decreasing rapidly towards the proximal.

In life the chelipeds are bright red and the carapace dark brown, more or less variegated with greenish.

S. sediliensis comes down to category 41 in Tesch's key to *Sesarma* s.s. (1917, p. 248). It is distinguished from *S. modesta* de Man (1902, p. 511, Pl. xix, fig. 8) by the shape of its carapace, the sides of which are less divergent backwards, and by the broader and deeper grooves separating the post-frontal lobes; those separating the inner and outer lobes extend much further back in *sediliensis*. The shape of the male abdomen is very different in the two species (c.f. fig. 8a and de Man l.c. Pl. xix, fig. 8b), and the outer surface of the palm of the chela lacks the confluent wrinkles characteristic of *modesta*.

From the very variable *S. impressa* H.M.E. *S. sediliensis* is distinguished by the absence of the concavity on the immovable

MALAYSIAN SPECIES OF SESARMA AND UTICA

finger characteristic of that species and by its much shorter and stouter walking legs. In *sediliensis* the total length of the penultimate leg is less than twice the anterior breadth of the carapace; in *impressa* (c.f. de Man, 1902, p. 531) it is always more than twice and usually more than two and a half times the breadth. The meri in *sediliensis* are less than twice as long as broad but distinctly more in *impressa*. The usual (but apparently not invariable) strong backward divergence of the lateral borders of the carapace in *impressa* is not seen in *sediliensis*.

Remarks.—These crabs were found among the stems of nipah palms (*Nipah fruticans*) growing in mud on the banks of the river Sedili. The water in the part of the river where the palms grow is slightly brackish with incursions of fresh water when the river floods. Its salinity never approaches that of the open sea.

Measurements of the male cotype—

Carapace.—

Anterior breadth	25.5 mm.
Breadth between epibranchial teeth ..	26.6 "
Posterior breadth	13 "
Length	23.5 "
Breadth of front	15.4 "

Abdomen.—

Length (segments measured serially) ..	19.2 "
Breadth at third segment ..	13.4 "
Length of penultimate segment ..	3.8 "
Basal breadth of penultimate segment ..	9.4 "
Length of last segment ..	5.0 "
Basal breadth of last segment ..	5.0 "

Larger (Left) Chela.—

Total length of chela	21.0 "
Height of palm	11.0 "
Length of dactylus	12.2 "

Penultimate Walking Leg.—

Length of merus	16.7 "
Breadth of merus	9.0 "
Combined length of carpus and propodus ..	18.4 "
Length of dactylus	8.5 "

Sesarma johorensis sp.n. Fig. 9; Plate xxiv, 3.

Cotypes.—An adult male and a sub-adult female from mangrove swamp near the river Pendas in south Johore, taken by the writer in February, 1937.

Material.—Two sub-adult males and two females in addition to the types from the same locality.

Description.—The carapace is shallow and rather flat, its surface smooth with a few widely scattered punctæ. The median length is less than the anterior breadth (87% in the male type). The lateral margins are nearly parallel and slightly concave; there is a small epibranchial tooth just behind each external

orbital angle, and the breadth of the carapace between these teeth is a trifle less than the anterior breadth; no trace of a second epibranchial tooth is present. The front is prominent and very broad with a shallow median emargination, the orbits being correspondingly short and oblique. The post-frontal lobes are rounded and well defined anteriorly, the inner pair a little broader than the outer and projecting rather further forward. The grooves separating the inner and outer lobes are short, extending backwards for a distance about equal to the breadth of the outer lobes. Those that diverge from the division between the inner lobes and define the anterior part of the mesogastric region are also short and do not extend backwards to enclose the mesogastric region. The hepatic region is slightly rugose and carries a low, transverse tubercle.

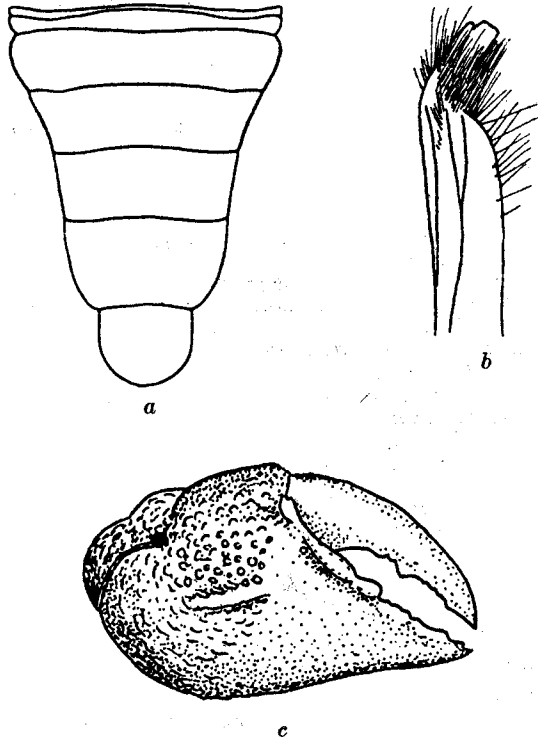


Fig. 9. *Sesarma johorensis*. *a*, outline of male abdominal segments; *b*, right first pleopod of male; *c*, right chela of male.

The male abdomen (fig. 9*a*) is rather narrow and the first pleopod (fig. 9*b*) shows no remarkable features.

MALAYSIAN SPECIES OF SESARMA AND UTICA

The chelipeds (fig. 9c) are equal. The borders of the merus are unarmed and the inner angle of the carpus is rounded. The outer surface of the carpus and of the lower half of the proximal part of the palm carry squamiform markings; there are some low, smooth granules on the upper part of the palm and in the middle of its outer surface is a short longitudinal ridge, developed just as in *S. moeschii* de Man. The rest of the outer surface of the palm and of both the fingers is smooth. That part of the palm bordering the lower half of the dactylar articulation is raised into a smooth rim externally and internally into two unequal elongated tubercles. The inner surface of the palm also bears a prominent curved granular ridge. The upper border of the palm carries a number of irregular, finely beaded lines which converge towards the carpal articulation to form a ridge. The upper surface of the dactylus is ornamented with small, irregularly arranged granules in its proximal half only.

In the walking legs the meri carry the usual anterior distal spine and all except the last have, on their upper surface, short, transverse squamiform markings. The proportions of the penultimate leg are indicated in the table of measurements.

The colour of the carapace is very dark greenish brown and of the chelæ, pale yellow.

S. johorensis appears to be allied to *S. moeschii* de Man. In that species the carapace is more vaulted and deeper than in *johorensis* and the inter-regional grooves are more deeply incised; in particular those separating the post-frontal lobes are deeper and extend further back and that surrounding the mesogastric region is not interrupted. The carapace of *johorensis* is uniform dark brown; that of *moeschii* is conspicuously marbled. The chelipeds are similar in the two species but in *johorensis* the fingers are rather shorter; they also differ markedly in colour, those of *johorensis* being pale yellow in life and of *moeschii* orange-red. The walking legs are rather more slender in *johorensis*.

The species can be traced in Tesch's key to *Sesarma* s.s. (1917) as far as category 15 (p. 242). In the proportions of the meri of its walking legs it is intermediate between 16 and 32. If it is referred to the latter its characters lead it to *S. moeschii*, from which it differs as stated above. Referred to category 16 it comes down to the Chinese and Japanese *S. intermedia* de Haan and *S. sinensis* H.M.E., (now regarded as identical) with which it does not appear to have any close affinity.

Measurements of the male cotype—

Carapace.—

Anterior breadth .. .. .	.. .. .	13.5 mm.
Breadth between epibranchial teeth .. .. .	.. .. .	13.0 "
Posterior breadth .. .. .	.. .. .	6.5 "
Length .. .. .	.. .. .	11.7 "
Breadth of front .. .. .	.. .. .	8.4 "

<i>Abdomen.</i> —		
Length (segments measured serially) ..	9.4	mm.
Breadth of third segment ..	6.6	"
Length of penultimate segment ..	2.1	"
Basal breadth of penultimate segment ..	4.0	"
Length of last segment ..	2.1	"
Basal breadth of last segment ..	2.25	"
<i>Left Chela.</i> —		
Total length of chela ..	10.6	"
Height of palm ..	6.3	"
Length of dactylus ..	7.2	"
<i>Penultimate Walking Leg.</i> —		
Length of merus ..	8.5	"
Breadth of merus ..	3.75	"
Combined length of carpus and propodus ..	9.0	"
Length of dactylus ..	4.5	"

Sesarma penangensis sp. n. Fig. 10; Plate xxiv, 4.

Kemp, 1918, p. 240 (*Sesarma* sp.?).

Type.—A male from a stream on Penang Hill in the island of Penang, April, 1935.

Material.—The type and eight sub-adult and juvenile specimens from the type locality.

Description.—The carapace is slightly convex both transversely and longitudinally and is distinctly broader than long. The front is vertically deflexed but the margin is just visible when the carapace is viewed from directly above, as it is turned outwards and produced into two rounded lobes separated by a shallow median excavation; just inside the edge of each of the lobes is a transverse, rugulose ridge. Of the post-frontal lobes the outer are very small and, when viewed from the front can be seen to have their exterior portions turned downwards following the lateral margins of the front. The inner post-frontal lobes are fairly broad and separated by a wide median groove. The lateral margins are slightly divergent posteriorly. The tooth

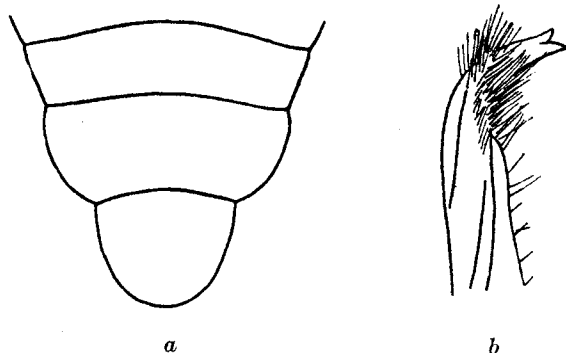


Fig. 10. *Sesarma penangensis*. *a*, outline of distal segments of male abdomen; *b*, right first pleopod of male.

MALAYSIAN SPECIES OF SESARMA AND UTICA

at the antero-lateral angle is slender and sharp and separated by a rather deep gap from the epibranchial tooth, which is blunt and prominent and is raised distinctly above the level of the antero-lateral angle. Behind the epibranchial tooth the margin in the type is only slightly sinuous, but in the two largest paratypes this feature is sufficiently developed to be termed a rudimentary second epibranchial tooth, such as Kemp described in his specimen. The surface of the carapace is pitted but not granular or rugose. Apart from the triangular gastric area and a low, transverse eminence across the cardiac region, tubercles and ridges are distributed over the carapace as follows: a pair of tubercles just behind the outer post-frontal lobes, and another pair of smaller tubercles a little further back behind the inner post-frontal lobes; a ridge running obliquely inwards and backwards from a point just behind the rudimentary second epibranchial tooth; a short isolated ridge parallel to the last mentioned and situated behind its inner extremity; a strong oblique ridge just over the base of each of the last pair of legs.

The outline of the distal segments of the male abdomen is figured (fig. 10a); the anterior portion of the median impression in the sternal plate, which embraces the seventh abdominal segment (the sternal arch, c.f. Gordon, 1937, p. 152 and fig. 2) is bounded by a ridge which extends back to the anterior pair of sternal sutures, as in *S. maculata* de Man (Gordon, op. cit., fig. 2, d). In the male pleopod (fig. 10b) the chitinous projection is bifurcated at the tip.

In the chelipeds the merus and carpus are unarmed and the upper surface of the latter finely and sparsely granular. The chelæ are slender and have possibly not reached their full development in any of the available specimens. The outer surface of the palm is finely and sparsely granular and there are a few small granules at the base of the upper surface of the dactylus, which is otherwise smooth.

The proportions of the walking legs are not remarkable in any way; those of the penultimate leg are given in the table of measurements, the three distal segments of all the legs carrying fairly numerous long setæ and there are a few setæ at the distal end of the merus. The meri carry a blunt anterior sub-distal spine.

Although no females carrying the characteristic large eggs have been found, it is almost certain that *S. penangensis* belongs to the group of small, terrestrial species separated by de Man as a subgenus *Geosesarma*. Of these this is the third to be recorded from the Malay Peninsula. It differs from *S. foxi* as pointed out by Kemp (l.c.s.) and also in the form of the male pleopod (figs. 10b, 11). From the other Malayan species, *S. ocypoda* Nob. it differs by its much broader and less granular carapace, the presence of the definitely disposed tubercles and ridges

described and its broader and less deeply emarginate front. The walking legs in *penangensis* are stouter than in *ocypoda* and the row of spines on the dactylus of the chela of that species are absent in *penangensis*. The male pleopod also differs in the two species. That of *S. ocypoda gracillima* is figured by Gordon (1937, p. 154, fig. 4) and does not differ significantly from that of the typical form.

S. penangensis is nearest to *S. thelxinoë* de Man from the Andaman Islands, but differs conspicuously in the groove between the inner post frontal lobes, which is wide in *penangensis* and very narrow in *thelxinoë*.

Measurements of the type—

<i>Carapace</i> .—			
Anterior breadth .. .. .	..	..	9 mm.
Posterior breadth .. .. .	..	..	5 "
Length .. .. .	..	..	8 "
Breadth of front .. .. .	..	..	4.7 "
<i>Abdomen</i> .—			
Length (segments measured serially) ..	..	..	6.4 "
Breadth at third segment ..	..	..	5.2 "
Length of penultimate segment ..	..	..	1.3 "
Basal breadth of penultimate segment ..	..	..	3.2 "
Length of last segment ..	..	..	1.5 "
Basal breadth of last segment ..	..	..	1.75 "
<i>Right Chela</i> .—			
Total length of chela .. .. .	..	..	5.7 "
Height of palm .. .. .	..	..	2.5 "
Length of dactylus .. .. .	..	..	3.2 "
<i>Penultimate Walking Leg</i> .—			
Length of merus .. .. .	..	..	6.75 "
Breadth of merus .. .. .	..	..	2.5 "
Combined length of carpus and propodus ..	..	..	7.3 "
Length of dactylus .. .. .	..	..	3.9 "

Sesarma foxi Kemp. Fig. 11.

KEMP 1918, p. 238, Langkawi Islands.
 LANCHESTER 1901, p. 550 (*S. maculata*).
 TWEEDIE 1936, p. 52.

Material.—A male and an ovigerous female from the Larut Hills, Perak, 3,700 feet; two adult males, two females and two juveniles from Lacom, Peninsular Siam, collected by the 'Skeat' Expedition of 1899–1900 and erroneously determined as *S. maculata* de Man by Lanchester (l.c.). The two largest specimens of this series measure 11.7 (♂) and 11.0 (♀) mm. in anterior carapace breadth, and are the largest specimens of *S. foxi* so far recorded. For the opportunity of examining them I am indebted to the Directorate of the Cambridge Museum of Zoology.

Remarks.—The locality "Lacom" given by Lanchester is difficult to interpret precisely. It probably refers to Lakon, which is an alternative name for Nakon Sritamarat. Other records indicate that the species is montane in habit and the

MALAYSIAN SPECIES OF SESARMA AND UTICA

'Skeat' specimens probably came from the hills a short distance inland from Nakon Sritamarat, which range up to a height of over 5,000 feet.

The right pleopod of the male from Perak is figured.



Fig. 11. *Sesarma foxi*. Right first pleopod of male.

Sesarma (*Sarmatium*) *inermis* (de Man), Cochin China and Condore Island.

DE MAN 1887, p. 660, 687.

TESCH 1917, p. 221.

Material.—One adult male, one sub-adult female and two juveniles from among nipah palms beside the river Sedili.

Remarks.—This appears to be a rare species and has not been recorded since de Man described the original series.

Measurements of the adult male.—

Anterior breadth	..	..	..	17	mm.
Greatest breadth	..	..	..	20	"
Breadth of front	..	..	..	10.2	"
Posterior breadth	..	..	..	10	"
Length	..	..	..	17.2	"
Length of chela	..	..	..	13.5	"

Sesarma (*Sarmatium*) *punctata* (A. Milne Edwards).

HELLER 1865, p. 64 (*Sesarma indica*), Ceylon, Nicobars.

A. MILNE-EDWARDS 1873, p. 308, New Caledonia.

TESCH 1917, p. 221.

Material.—Two adult males and seven females from a brackish swamp on Aor Island in the South China Sea.

Remarks.—A series of sketches of the type in the Paris Museum kindly made by Dr. I. Gordon leave no doubt of the identity of these specimens.

They were living in deep holes in the banks of a small stream near its entry into the sea and could only be collected at night; even then they were wary and difficult to catch.

In life the carapace is dark purplish brown irregularly marked with light brown near the posterior border. The legs are light brown with dark spots and the chelæ bright red.

The species is recorded from Ceylon, the Nicobar Islands, Sumatra, New Caledonia, and Japan.

Genus *Utica* White

Utica borneensis de Man. Fig. 12.

DE MAN 1895, p. 118, Pontianak, Borneo.

TESCH 1918, p. 95.

Material.—Three adult males and eleven sub-adult and juvenile specimens of both sexes from mangrove swamp near the mouth of the river Jurong, Singapore, July, 1934; one female from Prai, Province Wellesley, December, 1938.

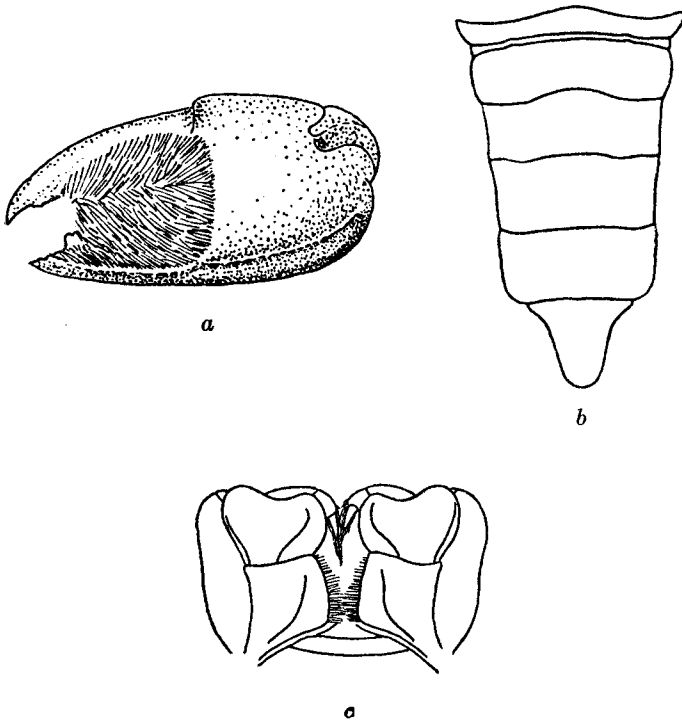


Fig. 12. *Utica borneensis*. a, left chela of male; b, outline of male abdominal segments; c, external maxillipeds.

Remarks.—This species was described from a single female from Pontianak, Borneo and has not been recorded since. As is usual in this and the allied genus *Ptychognathus* the male chela is very different from that of the female. In the present species the chelipeds of the male are equal and the length of the chela (fig. 12a) is about $\frac{2}{3}$ the breadth of the carapace. The dactylus is rather strongly arched and the greater part of the

MALAYSIAN SPECIES OF SESARMA AND UTICA

space between the fingers, both externally and internally, is filled with a mat of hair. On the propodus the extent of the hair is sharply bounded by a continuous curved ridge extending from near the dactylar articulation to the tip of the immovable finger. In addition a low, faint ridge runs along the lower part of the outer surface of the palm joining the curved ridge at the base of the finger. The upper surface of the dactylus is smooth and the outer surface of the palm slightly rugulose.

When the hair is removed from the chela the fingers are seen to be dentate distally, behind their horny tips, and at the base of the immovable finger, just below the dactylar articulation a curious, white fleshy protuberance is exposed. I can make no guess at its purpose, but it seems likely that it is connected with the presence of the dense mat of hair in the cleft of the fingers, as males of *Ptychognathus pusillus* have a similar protuberance that is quite invisible unless the hair is removed or parted.

The outline of the male abdominal segments is shown in fig. 12b.

The distinction between this genus and *Ptychognathus* is rather artificial, being based on the relative breadth of the ischium and exognath and the form of the merus of the external maxillipeds. In the present species the meri are distinctly auriculate and the exognaths only slightly narrower than the ischia (fig. 12c). It is thus intermediate between *Ptychognathus* and the more typically developed species of *Utica* such as *U. nausithoë* de Man and *U. gracilipes* White in which the exognath is very narrow and the merus more quadrate than auriculate in shape.

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Sesarma spp. from the Malay Peninsula.

MALAYSIAN SPECIES OF SESARMA AND UTICA

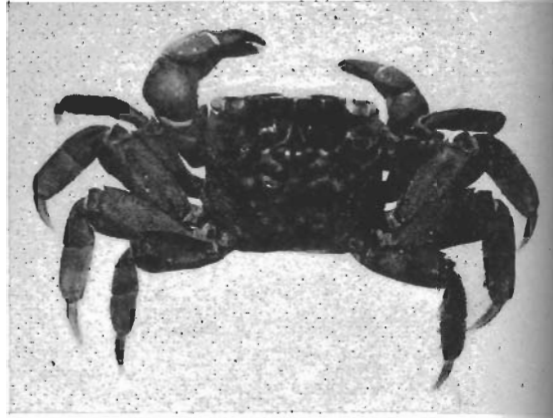
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EXPLANATION OF PLATE XXIV

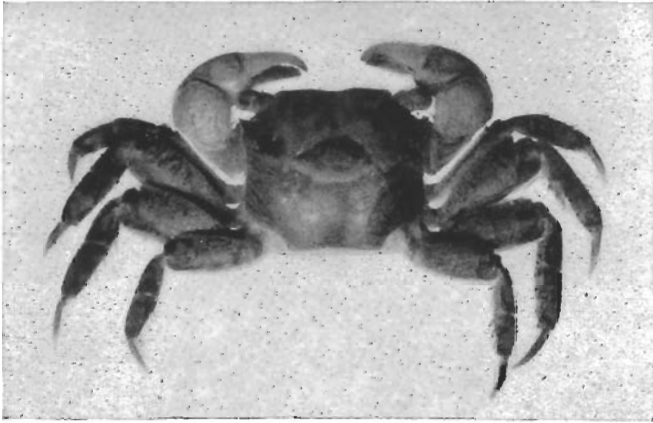
1. *Sesarma moeschii* de Man, male from Johore.
2. *Sesarma sediliensis* sp. n., male cotype.
3. *Sesarma johorensis* sp. n., male cotype, x 2.
4. *Sesarma penangensis* sp. n., type, x 2½.



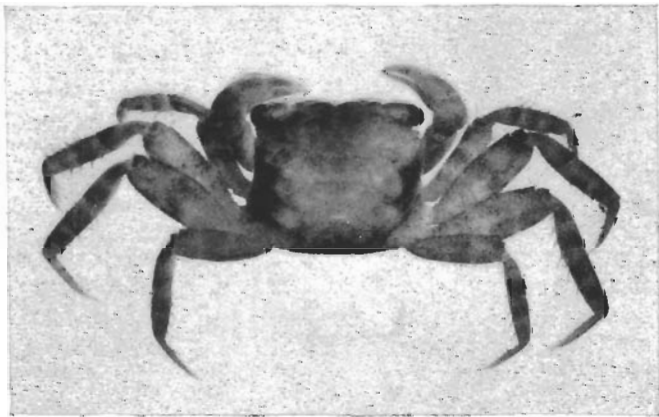
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Sesarma spp. from the Malay Peninsula.