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TWO NEW SPECIES OF SCYLLARID LOBSTERS (CRUSTACEA DECAPODA, PALINURIDEA) FROM AUSTRALIA AND THE KERMADEC ISLANDS, NEW ZEALAND

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(With two text-figures and two plates)

During the preparation of a revision of the family Scyllaridae, two species from Australian and New Zealand waters were received that proved to be new to science. One belongs to the genus *Ibacus*, the other to *Scyllarus*. In order to make the names available to other zoologists working with the species, their descriptions are provided herewith.

I want to express my sincere thanks to Dr. A. J. Bruce, Director, Heron Island Research Station, Queensland, for the holotype and a paratype of *Ibacus brucei* new species, with which he provided me. Dr. D. J. G. Griffin, Director, Australian Museum, Sydney, not only allowed me to study the Scyllaridae of his Museum, but also provided me with information on and coloured photographs of additional material of *Ibacus brucei* seen by him. I am likewise most indebted to Dr. Torben Wolff, Universitetets Zoologiske Museum, Copenhagen, for making material collected by the Galathea Expedition available to me. Furthermore Dr. Griffin graciously allowed me to publish the description of *Ibacus brucei*, although he also had discovered the species to be new, and he gave permission to publish his coloured photographs.

The abbreviation cl. is used for carapace length. AM, stands for Australian Museum; RMNH, for Rijksmuseum van Natuurlijke Historie; and UZM, for Universitetets Zoologiske Museum.

Ibacus brucei new species (pls. 1, 2)

Material examined:

Off southern Queensland, 26°31'S 153°43'E; 100-102 fathoms (= 183-187 m); 20 July 1968; "Nimbus" Sta.11; A. J. Bruce. - 1 male (RMNH).

Due east of Point Lookout, North Stradbroke Island, Queensland; 86 fathoms (= 157 m); otter trawl; 1 August 1967; commercial vessel "Sadie III"; A. J. Bruce. - 1 male holotype (RMNH).

Off Raoul Island, Kermadec Islands, New Zealand, 29°13'S 177°57'W; 83-90 m; bottom: stones; trawled; 3 March 1952; "Galathea" Sta.676. - 1 male (UZM).

Description. — The carapace is minutely pitted, with a very short hair in each pit. The hairs are so small and inconspicuous, that to the naked eye the carapace gives the impression of being naked. The inner angle of the orbit bears two sharp distal teeth, which are of about equal size. The outer angle is a strong tooth, which is minutely denticulate on the anterior margin. The posterior margin of the orbit shows a rather broad quadrangular incision, which carries no tubercle. The orbital margin bears no teeth or denticles apart from the above mentioned ones. Between the orbit and the anterolateral tooth the anterior margin of the carapace bears about 12 to 14 small blunt teeth, of which the inner 6 to 10 are distinct. The cervical incision of the carapace is deep and wide. The anterior margin of the incision forms the posterior margin of the slender anterolateral tooth, it bears no teeth. There is no true lateral margin of the carapace left between the anterolateral angle and the cervical incision. Behind the incision there are seven or eight posterolateral teeth on the margin of the carapace; these teeth become smaller posteriorly. The anterior branchial carinae are short and indistinct, they diverge somewhat posteriorly. The posterior branchial carinae lie in the same line as the anterior and are straight, they diverge also. The postrostral carina is vaguely visible in the anterior part, being distinct more posteriorly. The pregastric, cardiac and intestinal teeth are hardly noticeable, the pregastric being the most distinct. The area between the postrostral and branchial carinae is somewhat concave, with the branchiocardiac groove distinct, although shallow; the cervical and postcervical grooves are also vaguely visible.

The surface structure and setation of the abdomen is like that of the carapace. The second to fifth somites bear a longitudinal median carina, which is not very high. An oblique groove extends from the posterior end of the base of the pleura of all somites medially and forward; from the same point a transverse groove runs medially. The pleura end in a strong and sharp point with an acute horny tip, which is directed outward or slightly forward, the tip sometimes being curved somewhat posteriorly. The anterior margin of the first pleuron bears a large and wide triangular tooth which shows a bluntly rounded lobe on its inner margin. The anterior margin of the second pleuron is slightly concave, that of the third and fourth is sinusoid, and of the fifth slightly convex; only that of the second shows some indistinct

tubercles. The posterior margin of the second to fifth pleura is convex and tuberculate; in the fifth it shows in addition to the tubercles 2 strong spine-tipped teeth. The dorsal surface of the sixth somite is tuberculate.

The surface of the antennal segments is similar to that of the carapace, only the hairs are somewhat longer. The anterior margin of the sixth segment bears 7 to 9 teeth; the inner three of these teeth are large and very sharp. The fifth segment ends in a strong anteriorly directed sharp tooth. The fourth is much longer than in *I. alticrenatus*. Its anterior margin bears about 10 to 14 small sharp teeth, the anterolateral tooth is strong and directed forward; the lateral margin is quite long and bears 2 or 3 distinct sharply topped teeth.

The epistome ends anteriorly in two triangular sharply pointed or blunt teeth. Posteriorly the epistome ends in a blunt median posteriorly directed tooth, before which there are two low blunt submedian elevations.

The merus of the third maxilliped has the ventral surface slightly convex in the inner half, concave in the outer. The inner margin shows no incisions, but has in its basal part a few low tubercles with tufts of short hair. The outer margin has a high wing-like keel in the basal half, this keel stops abruptly and ends in a blunt tooth; the upper margin of the keel is feebly serrate. The outer margin of the ischium is formed by a wing-like keel without teeth; the inner margin of the ventral surface is somewhat crenulate, the inner margin of the lower surface bears distinct teeth.

The pereopods are slender. There is no spine on the ischium.

Size. — The holotype is an adult male with cl. 35 mm. The paratype from off southern Queensland (coll. A. J. Bruce) has the carapace 50 mm long, and the paratype from the Kermadec Islands only 20 mm. The three male paratypes in the Australian Museum have carapace lengths of 23.5 to 53 mm (Griffin in litt.).

Colour. — The following notes are made from a colour slide of a male specimen from south-east of Broken Bay, New South Wales, which Dr. D. J. G. Griffin kindly placed at my disposal, and which is published here as pl. 2.

The dorsal surface of the body has a pale yellowish brown background colour, overlaid by brick red. The median area of the carapace is covered by numerous brick red spots, which in the lateral areas merge to a solid brick red colour, in which only the pits are somewhat lighter. The entire abdomen, both in the median and lateral regions, shows such a solid brick red colour with lighter pits. In both the thorax and the abdomen the margins of the segments are slightly lighter than the rest, while the tips of the larger lateral teeth are white. Also the anterior margin of the distal segment of the antenna, and the lateral margin of the fourth segment are white, as is also the outer margin of the uropodal exopod.

The ophthalmic peduncles, and the entire antennular peduncle are spotted with brick red, as is also the basal and inner part of the antennae. The greater part of the fourth and sixth segments of the antennae, however, are solid brick red.

The entire ventral surface of the animal is whitish with a reddish tinge in the lateral parts. The basal two segments of the antennular peduncle have the ventral surface whitish, in the third this surface is spotted with red. The third maxilliped and the first pereopod are pale brownish in colour, in the more posterior legs the colour becomes more reddish. The pleopods are uncoloured. The soft parts of the uropods and telson are reddish brown ventrally, being only slightly paler than they are dorsally.

Distribution. — Apart from the above listed specimens from Queensland and the Kermadec Islands, the species is also known from south-east of Broken Bay, New South Wales, $33^{\circ}40'S$ $151^{\circ}46'E$ — $33^{\circ}35'S$ $151^{\circ}52'E$, depth 167 - 172 m (edge of shelf; 2 November 1976) and from east of Moreton Bay, Queensland, 162 m (July 1972, leg. N. Ruello). Of a male from the first mentioned locality (Broken Bay) coloured photographs were sent to me by Dr. Griffin, who also gave me the information on two males from the second locality (east of Moreton Bay). The known range of the species thus includes the east coast of Australia from southern Queensland ($26^{\circ}31'S$) to central New South Wales ($33^{\circ}40'S$), and the Kermadec Islands, New Zealand. The depths at which the species has been taken are between 83 and 187 m (83-90 m, 157 m, 162 m, 167-172 m, and 183-187 m).

Disposition of the types. — The holotype from off North Stradbroke Island, Queensland, forms part of the collection of the Rijksmuseum van Natuurlijke Historie, Leiden, with reg. no. Crust. D.24744. The paratype from off South Queensland collected by Dr. A. J. Bruce forms part of the same collection, reg. no. Crust. D.25524. The paratype from the Kermadec Islands is the property of Universitetets Zoologiske Museum, Copenhagen. The paratype from Broken Bay, New South Wales, is deposited in the collection of the Australian Museum, Sydney (no. P.25056), which also holds the two paratypes from east of Moreton Bay (no. P.25072). All six type specimens are males.

Remarks. — The shape of the third maxilliped of this new species is similar to that of *Ibacus alticrenatus* Bate, 1888, and *I. ciliatus* (Von Siebold, 1824), differing from the other three species of the genus (*Ibacus peronii* Leach, 1815, *I. novemdentatus* Gibbes, 1850, and *I. brevipes* Bate, 1888) by having the merus not swollen, without incisions on the inner margin and not coloured differently from the rest of the appendage. *I. brucei* resembles *I. alticrenatus* and differs from *I. ciliatus* (1) by that the anterior margin of

the cervical incision merges gradually with the posterior margin of the anterolateral tooth of the carapace, so that there is no true lateral margin in front of the incision, (2) by the small number of posterolateral teeth on the carapace margin. The new species clearly is closest to *Ibacus alticrenatus*, in which, however, the upper surface is woolly pubescent, the orbital margin possesses a tooth on the outer half behind the two distal teeth, and the fourth segment of the antenna is very short and slender, showing no teeth on the lateral margin.

Scyllarus umbilicatus new species

Material examined:

Due east of Jumpinpin bar, Stradbroke Island, southern Queensland; 47 fathoms (= 86 m); among fan corals; 1 July 1961; W. Stephenson. — 2 juveniles (AM, no. P.14045).

Off mouth of Manning River, New South Wales, 45-50 fathoms (= 82-91 m). — 1 male (AM, no. P.11405).

Off Brighton Island, Port Stephen, New South Wales; 48-57 fathoms (= 88-104 m); bottom, mud; July 1959; trawler "Challenge"; A. A. Racek. — 1 female (RMNH, no. Crust.D.20143).

North-east of Newcastle, New South Wales; about 46 fathoms (= 84 m), inside 50 fathom (= 91 m) reef; 28 September 1967; N. Ruello. — 1 ovigerous female (AM).

Off Newcastle, New South Wales; trawled; December 1953; A.d'Ombraïn. — 1 ovigerous female (AM, no. P.12326).

South-east of Sydney, New South Wales, 33°45'S 151°30'E; 75-80 fathoms (= 137-146 m); June 1971; Fisheries Research Vessel "Kapala". — 1 male (AM, no. P.18012).

Two to three miles north of Green Cape, southern New South Wales; 30-40 fathoms (= 55-73 m); July 1925; trawler S.S. "Bar ea nuel", W. Boardman. — 1 male holotype (AM, no. P.8232).

Description. — The rostrum is rather broad and constricted behind the top. Dorsally it bears a large sharp rostral tooth, which reaches over the anterior margin of the rostrum. There is no pregastric tooth. The gastric tooth is very high, sharp and compressed, its upper margin is convex. A row of about 8 to 10 squamiform tubercles extends over the dorsal margin of the gastric tooth, being single distally and becoming double more proximally; at the base of the tooth there are several rows of these squames. Behind the cervical groove the cardiac tooth is replaced by two low, sharply pointed submedian teeth, which are followed by a double or treble row of about 7 squamae. The branchial carina is rather widely interrupted by the cervical groove; there is no tubercle in the gap caused by the groove, although a few may be found obliquely behind the inner opening of the gap. The branchial carina ends anteriorly in two sharp teeth which are of about equal size and stand on the inner margin of the orbit. Behind these teeth, the anterior part of the carina bears about 12 indistinct squamae. The posterior part of the branchial carina ends anteriorly in a sharp tooth, which is followed by a double row of 10 to

12 broad squamae. The posterior submedian carina bears a group of 8 to 10 blunt tubercles, while at either side of it there is a smaller group of 3 to 5 tubercles; the three groups form a transverse tubercular band across the carapace. The intermediate row consists of 6 tubercles; between it and the

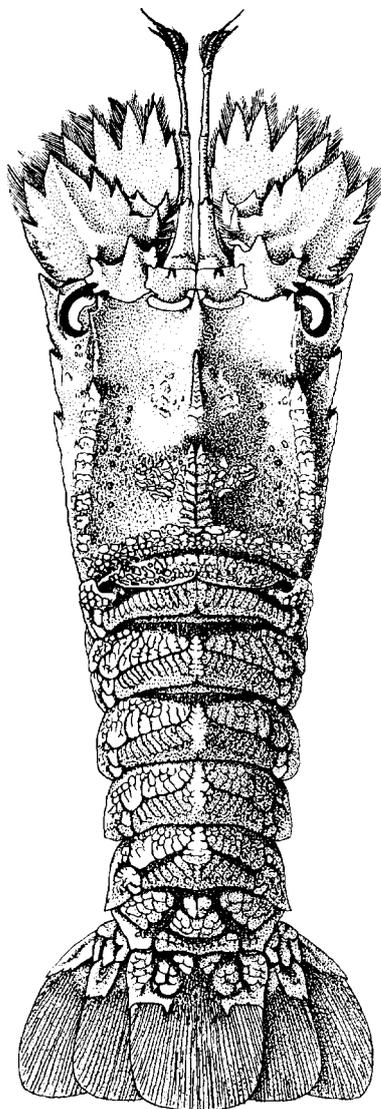
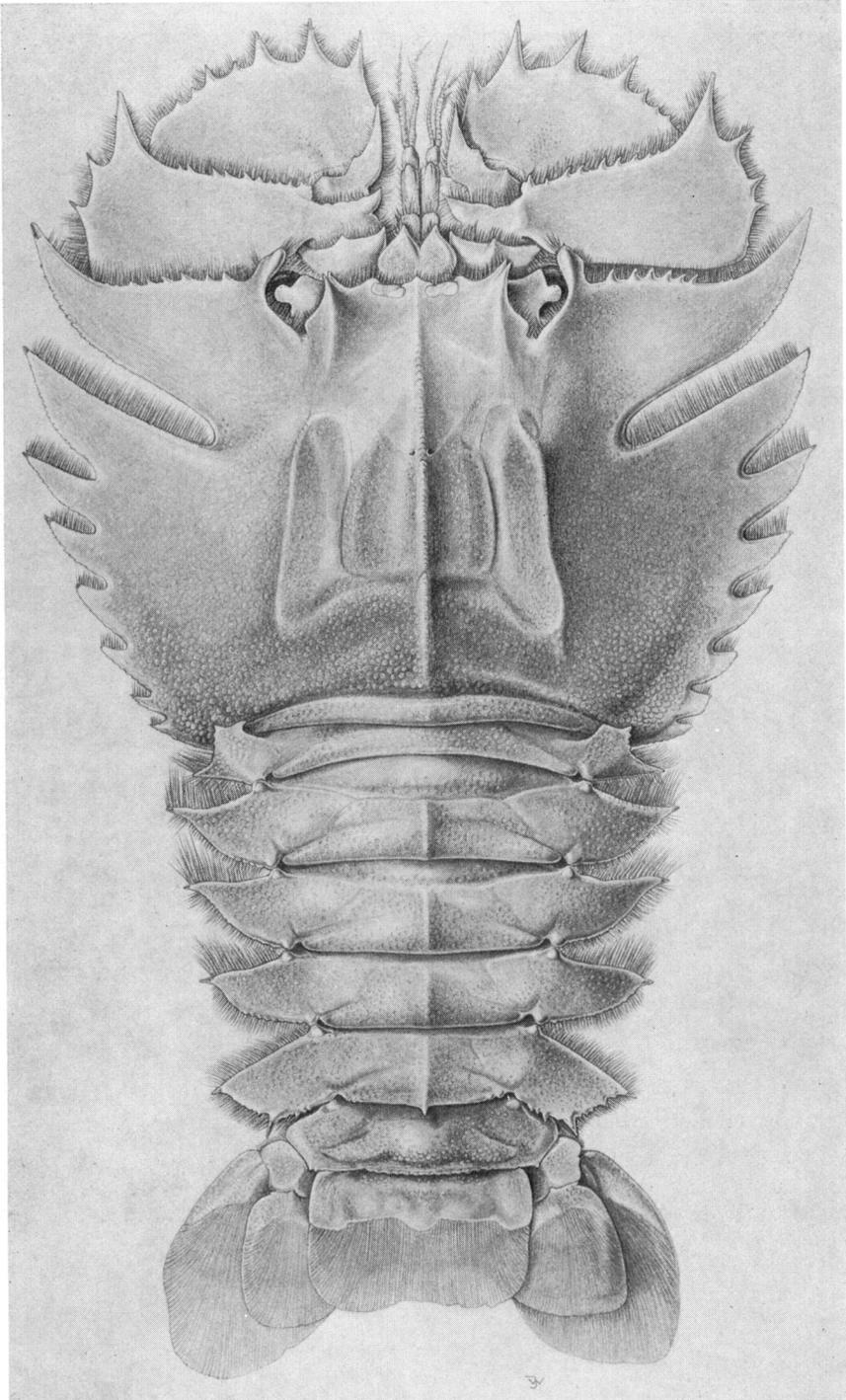


Fig. 1. *Scyllarus umbilicatus* new species. Holotype male, in dorsal view. $\times 2$.
H. Heyn del.



Ibacus brucei new species. Holotype male, in dorsal view. $\times 1.7$. J. Wessendorp del.



Ibacus brucei new species, paratype male from Broken Bay, New South Wales, AM,
no. P. 25056. Photograph Gregory Millen, courtesy Australian Museum, Sydney.

posterior branchial carina a 7th tubercle is present. The anterior submedian carina bears about 8 squamiform tubercles; a few scattered tubercles are present between it and the branchial carina. The lateral margin of the carapace ends in a strong sharp anterolateral tooth. There are 5 to 7 anterolateral, 2 to 4 mesolateral and about 9 to 12 posterolateral tubercles on the lateral margin; these tubercles are inconspicuous and often subdivided by grooves. The intercervical ridge bears three small tubercles. A post-orbital tubercle is present. The anterolateral end of the orbital margin ends in a sharp tooth. The marginal groove of the carapace is rather narrow and deep; before and behind it there are about three rows of tubercles. The posterior margin of the carapace is broadly triangularly incised in the middle.

The first abdominal somite has a complete and distinct transverse groove extending over the full width of the somite; there is a smaller and interrupted transverse groove in the median part of the anterior half of the somite, occupying less than half its width. The posterior half of the first somite shows 25 to 27 longitudinal grooves, which reach practically to the posterior margin; the lateral longitudinal grooves are branched near their tip, those placed more medially are branched over their whole length. The following somites bear no median longitudinal carinae, although they may be slightly elevated in the middle. The anterior half of these sometimes shows some 2 or 3 transverse, usually crenulated grooves and some rounded grooves, which provide a squamiform pattern. The posterior part of the somites shows the usual arborescent pattern; the median figure of this pattern is lobulated. The posterior margin of the first to third somites is deeply and sharply incised in the middle; in the fourth somite the incision is small, although distinct. The posterior margin of the fifth and sixth abdominal somites is produced in the middle in an inconspicuous, shallow angular tooth. The pleura of the first somite are bilobed, those of the second to fourth somites end in a sharp, posteriorly directed tooth, while those of the fifth somite end in a bluntly angular tip. The anterior margin of the pleura of the second to fourth somites is serrate, but often indistinctly so. The arborescent pattern of the dorsal surface of the somites continues on the pleura; a similar pattern is found on the sixth somite and the anterior part of the telson. The four teeth at the posterior margin of the hard part of the telson are of equal size, they are slender and sharply pointed.

The anterior margin of the antennular somite is slightly sinuous and bears an often indistinct tooth in the middle of each half.

The last segment of the antenna has the anterior margin convex and provided with 5 teeth, which regularly taper to the sharply pointed tips, the inner margin bears one tooth. The antero-internal angle of the fifth segment

of the antenna bears a sharp tooth, the anterior margin of this segment bears another strong tooth, which is placed at the articulation with the last segment; a smaller third tooth is present at the external end of the anterior margin. The anterior margin of the fourth segment bears a strong inner tooth at its base and two large teeth between the articulation and the tip of the segment; the outer margin bears also two large teeth; on the dorsal surface of this segment a single oblique, curved carina is visible: there are no additional carinae or tubercles on the outer half of the upper surface of the segment.

The anterior margin of the epistome has a rather wide median incision.

The first pereiopod is more robust than the second. The dactylus of the second is slightly longer than either that of the first or the third. The dactylus of the fourth leg is again slightly shorter than that of the third. None of the dactyli shows a fringe of hairs. Such a fringe is present on the dorsal margin

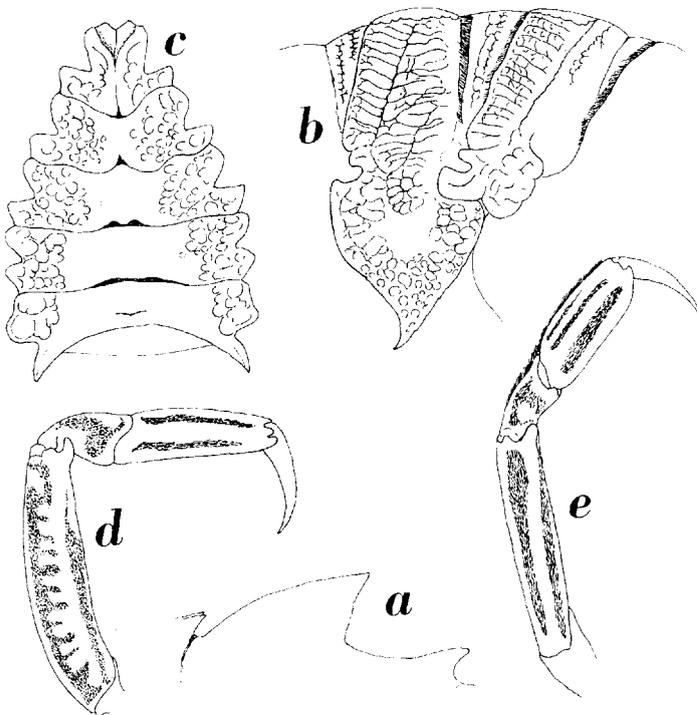


Fig. 2. *Scyllarus umbilicatus* new species. a, b, d, c, ovigerous female paratype from N.E. of Newcastle (AM); c, paratype male from S.E. of Sydney (AM, no. P. 18012). a, cardiac, gastric and rostral teeth of carapace in lateral view; b, first and second abdominal somites in lateral view; c, thoracic sternum in ventral view; d, second pereiopod; e, third pereiopod. a - e, $\times 3$.

of the propodus of the third leg, but not on that of the other legs; none of the propodi shows a fringe of hairs or any other pubescence on the ventral margin. The outer surface of the propodus of the first leg has three longitudinal hairy grooves, two in the upper part and one in the lower; sometimes the outer surface also shows some shorter grooves arranged in a squamiform pattern. The middle of the longitudinal grooves is widest and the most distinct, the others are narrower and partly interrupted; in the juveniles all grooves are indistinct. The second and fourth legs have two wide hairy grooves on the outer surface of the propodus, the third leg three (the upper of which is narrow the others wide), and the fifth leg one. The propodus of the third leg is distinctly broader and more compressed than that of the second leg, it resembles the propodus of the third leg in *Scyllarus cultrifer* (Ortmann, 1897), but has the antero-ventral angle rounded and not produced into a tooth. The propodi of the fourth and fifth legs are still more slender than that of the second. The carpus of the first leg bears a longitudinal ridge, behind the basal part of which there is a distinct groove which forms two blunt proximally directed knobs in its proximal portion. The carpus of the third, but not of the other legs, has a dorsal fringe of hairs. The carpus of the second to fifth legs has two dorsal ridges and an outer hairy groove; these ridges and grooves are less distinct in the posterior legs. The merus of none of the legs shows either a dorsal or a ventral fringe of hairs. The outer surface of the merus of the first leg has two rather indistinct and wide hairy grooves; the other legs show only one such groove, but a second groove is present on the lower surface. A distinct and narrow anteroventral tooth is present on the outer surface of the merus of the first leg, reaching beyond the articulation with the carpus.

The anterior margin of the thoracic sternum is anteriorly produced in the middle, with a narrow median fissure; around and behind this fissure the sternum is triangularly sunken. Between the first and second sternites a median pit is visible, which is very narrow and is more in the shape of a longitudinal slit. Between the second and third sternite a similar pit is triangular, while between the other sternites this depression becomes more and more wide. The fourth sternite shows a distinct median tubercle. The posterior margin of the fifth sternite is not tuberculate. In the males a sharp, posteriorly directed tooth is present on the posterior margin of the sternum below the base of the fifth leg.

The first pleopods of the male (those of the second abdominal somite) have the exo- and endopod well developed and ending in a narrow top. In the following male pleopods the exopod is well developed, the endopod rudimental.

Size. — The male holotype has cl. 21 mm, in the other males it is 11 and 21 mm. The ovigerous females have cl. 22, 23, and 24 mm. The non-ovigerous female has the cl. 21 mm, the juveniles 8 and 10 mm.

Distribution. — The species so far is known from the east coast of Australia between southern Queensland and southern New South Wales. It has been reported from depths between 55 and 146 m (55-73 m, 82-91 m, 86 m, 88-104 m, 91 m, and 137-146 m). In only one sample the nature of the bottom was mentioned, viz., mud. The juveniles were found "among fan corals".

Remarks. — The new species belongs to the group containing *Scyllarus cultrifer* (Ortmann, 1897), *S. aureus* Holthuis, 1963, and *S. timidus* Holthuis, 1960. It resembles *S. timidus* and differs from the other two species by the shape of the third pereopod, which does not show an antero-ventral tooth at the propodus, and thus is not subchelate. The differences from *S. timidus* shown by *S. umbilicatus* are few, but constant. They are the following: (1) The upper margin of the gastric tooth in *S. umbilicatus* is convex, in *S. timidus* it is straight or even slightly concave. (2) The dorsal surface of the anterior half of the abdominal somites in *S. timidus* shows one or two straight single grooves, in *S. umbilicatus* these grooves show a squamiform pattern. (3) The teeth of the last antennal segment in *S. umbilicatus* are more slender than in *S. timidus*. (4) The propodi of the first, second, and fifth pereopods in *S. timidus* are smooth and without grooves, while grooves filled with a short pubescence are present there in *S. umbilicatus*. (5) In *S. umbilicatus* the thoracic sternum is narrower and more deeply sunken in the median area than in *S. timidus*. (6) The lateral part of the thoracic sternum in *S. umbilicatus* bears a more extensive sculpturation of squamiform tubercles than in *S. timidus*. (7) The median or submedian pits between the segments of the thoracic sternum are far more distinct in *S. umbilicatus* than in *S. timidus*. (8) The fifth segment of the thoracic sternum in *S. umbilicatus* shows a tubercle in the middle, in *S. timidus* this tubercle is completely lacking.