

REVISION OF THE SPINY LOBSTER GENUS *PALINURUS*, IN THE
SOUTH-WEST INDIAN OCEAN

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(With 1 text-figure and 2 plates)

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SUMMARY

It is proposed that the two varieties of *Palinurus gilchristi*, namely var. *natalensis* and var. *delagoae*, should be merged and the latter raised to specific rank. A description is given of the neotype of *P. delagoae* as well as the diagnostic criteria of *P. gilchristi* and the main differences between the two are enumerated.

INTRODUCTION

Four extant species are currently recognized in the genus *Palinurus*, three of which occur in the north-eastern Atlantic; namely *P. mauretanicus* Gruvel, *P. charlestoni* Forest & Postel and *P. elephas* Fabricius. (The latter species also extends into the Mediterranean.) The fourth species, *P. gilchristi* Stebbing, was described from the south coast of the Cape Province (Stebbing, 1900) and later Barnard (1926) recognized two further varieties of this species; *P. gilchristi* var. *delagoae* from Moçambique and var. *natalensis* from Natal. However, Barnard states that he at first almost gave his var. *delagoae* specific rank, but finally decided against this after examining material from Natal which appeared to be intermediate between the specimens from Moçambique and those from the Cape. The material on which Barnard based his two varieties comprised only two specimens from each region and he made the comment that 'the examination of a large amount of material might show that *natalensis* should be merged into *delagoae* and the latter raised to specific rank'.

Examination of large samples of *Palinurus* from Natal and Moçambique by P. F. Berry during the course of a life-history study has now shown that the features on which Barnard distinguished his varieties are variable, no distinguishing morphological differences being found between the populations sampled in these regions. In addition, morphologically similar specimens have recently been obtained by R. Plante from off the south and south-east coasts of Madagascar. In view of the close affinity between the south-east African and Malagasy populations and their distinctiveness from *P. gilchristi* from the south coast of the Cape Province, we propose that they warrant specific recognition, in which case the name *P. delagoae* should be applied.

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Barnard (1926, 1950) made no mention of the size of his two *natalensis* specimens and described his *delagoae* specimens as males with carapace lengths of 94 and 108 mm. Although there is a specimen labelled as the 'type' of *delagoae* in the South African Museum, this is a female with a carapace length of 64 mm, which therefore cannot be regarded as conforming with the specimens originally described. As all attempts to locate these have been unsuccessful a neotype for *P. delagoae* has been selected and is described. In addition, a description of *P. gilchristi* is given for comparative purposes.

***Palinurus delagoae* Barnard, 1926 (fig. 1; pl. XIX).**

P. gilchristi var. *delagoae* and *natalensis* Barnard, 1926: 123, 1950: 543 (gives full synonymy, including locality records); Forest & Postel, 1964: 114; Holthuis, 1946: 112.

P. delagoae Berry, 1971: 17.

P. vulgaris Koyama, 1971: 17.

Material examined

Moçambique and Natal—several thousand specimens obtained by commercial trawlers. The following specimens are representative of this material: 1 ♂ neotype c. l. 123 mm*, South African Museum No. A13179, 1 ♂ c. l. 73 mm, 3 ♀ c. l. 111, 88 and 80 mm; loc. off Tongaat, Natal, 324 m; S.A.M. No. A13180. 1 ♂ c. l. 62 mm, 1 ♀ c. l. 66 mm; loc. between Tongaat and Durban; Rijksmuseum van Natuurlijke Historie No. D.28906. 1 ♂ c. l. 75 mm, 2 ♀ c. l. 120 and 72 mm; loc. east of the Limpopo River, Moçambique 330 m; S.A.M. No. A13181. 1 ♀ labelled 'type' c. l. 64 mm; loc. Moçambique; S.A.M. No. A6811. 2 ♂ c. l. 67 and 85 mm, 1 ♀ c. l. 71 mm, loc. Moçambique; Museum d'Histoire Naturelle de Paris. 1 ♀ c. l. 109 mm, loc. Tongaat, Natal; Station Marine d'Endoume Marseille. 1 ♀ c. l. 83 mm; loc. off Umvoti R. Natal; British Museum (Natural History) No. 1928.12.1.322 (*ex* Stebbing collection). 1 ♂ c. l. 60 mm; loc. off Natal; B.M. No. 1925.8.18.88 (*ex* University of Cape Town).

South-east Madagascar—thirty-three specimens obtained during experimental fishing, represented by the following: 1 ♂ c. l. 145 mm, 1 ♀ c. l. 117 mm; loc. continental slope off southern coast of Madagascar 200–400 m; S.A.M. No. A13182. 1 ♂ c. l. 155 mm, 2 ♀ c. l. 95 and 100 mm; same loc.; Museum d'Histoire Naturelle de Paris. 12 ♂ c. l. 145, 139, 134, 132, 156, 156, 150, 136, 167, 134, 155, 138 mm; 8 ♀ c. l. 95, 92, 137, 115, 110, 110, 134, 136 mm; Centre ORSTOM, Nosy Bé.

DESCRIPTION OF NEOTYPE

(*sec pl. XIX*)

The supra-orbital horns are almost triangular, widely splayed and terminate in a sharp horny point. Between them the frontal margin of the carapace is concave with a prominent median spine and on either side of this is a series of four spines, the outermost spine being enlarged. Posterior to each supra-orbital horn is a row of three spines which decrease in size posteriorly; the posterior of these is almost on the edge

* Carapace lengths were measured between the tip of the anterior median tooth (rostrum) and the posterior margin.

of the cervical groove. In the dorsal precervical region are three pairs of large submedian spines, in front of which are numerous small spines and tubercles which converge, although indistinctly, to terminate anteriorly in an enlarged median spine. Laterally in the precervical region there are two rows of spines. The uppermost begins at the cervical groove and consists of three closely spaced spines which increase in size anteriorly and a single, rather small, anterior spine set apart from the others and displaced slightly dorsally. Below this row is another consisting of three spines; the anterior one is very large, flattened and projects antero-laterally below the eye.

In the dorsal postcervical region there are two rows of enlarged submedian spines which converge posteriorly. The remainder of the dorsal postcervical region of the carapace is covered with small blunt spines and tubercles, some of which are slightly enlarged posteriorly and also antero-laterally adjacent to the cervical groove.

The entire dorsal surface of the carapace is shiny, smooth and devoid of setae except towards the posterior end where some of the smaller tubercles have fringes of short setae around their anterior bases.

Abdominal segments 2 to 5 each have a shallow but distinct posterior transverse groove which is interrupted in the midline by a low median keel. The groove is sparsely setose. Anterior to the median keel is a shallow median depression bearing a few setae which corresponds to the well-developed anterior transverse groove of *P. gilchristi*. The pleura terminate in a single sharp, recurved spine; posterior to this are 2 to 4 small spines. The pleura of the 2nd abdominal somite each bears a single small spine on its anterior margin.

The sternum of the cephalothorax is smooth, except for a few indistinct tubercles, shiny and completely devoid of setae.

The legs are subcylindrical and completely devoid of setae on the merus.

Colour pattern: Good colour plates are given by Koyama (1971). Basically the colour is reddish-mauve with contrasting irregular patches of ivory white. The legs and antennae are banded.

Variation: One of the most variable features is the shape of the supra-orbital horns which range from being widely splayed, short and rather broad as in the holotype, to narrow, elongate and anteriorly directed. In Natal and Moçambique the entire range of variation occurs, although the widely splayed arrangement is most common, whereas in the specimens obtained from south-east Madagascar only the elongate, anteriorly directed arrangement was found (see fig. 1).

The number and size of the spines on the frontal margin of the carapace is very variable.

Degree of spination on the dorsal surface of the carapace is variable; generally small specimens are more spiny than large ones. Again the entire range of variation in degree of spination is found in specimens from Natal and Moçambique but the specimens from Madagascar were all very spiny, even in large ones.

Degree of banding of the legs and antennae is variable and some specimens with very little white on the legs and entirely unbanded antennae occur. Once again

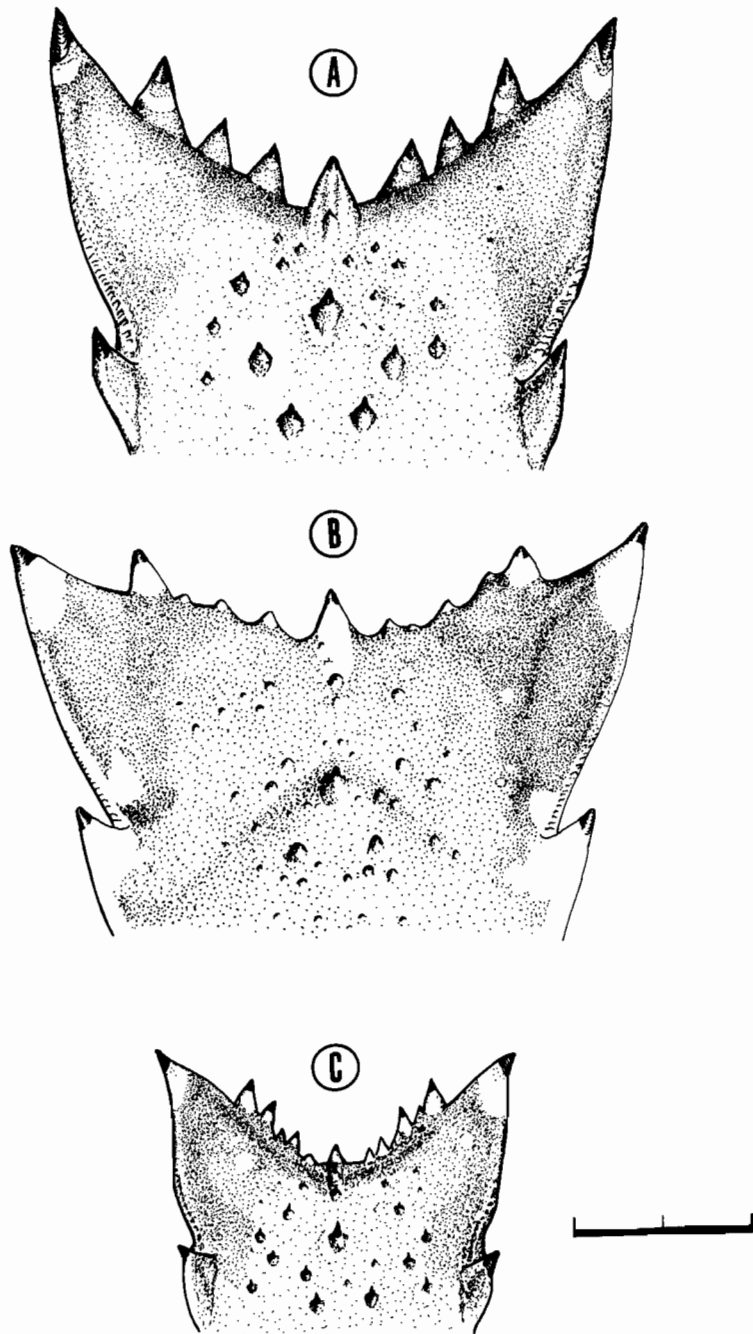


FIG. 1. Variation of the supra-orbital horns in *Palinurus delagoae* (scale = 20 mm).

A: Male from Madagascar with forward directed horns (c. l. 125 mm). B: Male neotype from Natal with laterally splayed horns (c. l. 123 mm). C: Female from Natal with forward directed horns (c. l. 109 mm).

specimens from Madagascar all had this extreme in variation, whereas the entire range of variation was observed in specimens from Natal and Moçambique.

The usual sexual dimorphism found in the Palinuridae is present except that allometric elongation of the legs in males, as has been recorded in some *Panulirus* species, does not occur.

Ecological notes: Differences in distribution, ecology and behaviour between *P. gilchristi* from off the south Cape coast and *P. delagoae* from Natal and Moçambique have been described in a previous publication (Berry, 1971), in which it was stated that on the basis of information obtained by trawling and observations of captive specimens, *P. delagoae* seemed to favour open areas with substrata composed of organic mud, sand and coral fragments and that it avoided rocks. Subsequently French fishing vessels have made small catches of *P. delagoae* off Natal and Moçambique on rocky areas using traps. The smallness of catches probably reflects difficulties of trap fishing at a depth of about 260 m in the Agulhas Current and *P. delagoae* may well be present in large quantities on rocky, untrawlable areas at certain times. This would be in keeping with the previously expressed view that the large aggregations which are trawled on open grounds in Natal and Moçambique waters are migrating or breeding shoals.

Off Madagascar, *P. delagoae* was obtained in traps on the edge of the continental shelf off the south and south-east coasts, as far north as Fort Dauphin. The drop-off of the shelf is extremely steep and the bottom consists of anfractuons rock completely devoid of mud, making trawling impossible. In fact no mud substratum was found at a depth suitable for *P. delagoae* anywhere off the south of Madagascar and conditions therefore differ considerably from those off the south-east African coast.

No lobsters were caught between 0 and 250 m and the deepest they were obtained was at 400 m which was at the deepest operational limit of the gear used. At this depth the temperature ranged between 15° and 18°C, which is higher than off the south-east African coast where *P. delagoae* occurs at between 12° and 14°C.

***Palinurus gilchristi* Stebbing, 1900**

(pl. XX)

P. gilchristi Stebbing, 1900: 31; Holthuis, 1946: 112; Barnard, 1950: 542 (gives synonymy including early locality records); Forest & Postel 1964: 113; Day *et al.*, 1970: 56; Berry, 1971: 18.

Material Examined

7 ♂ c. l. 33, 37, 37, 39, 40, 49, 53 mm, 7 ♀ c. l. 31, 35, 37, 38, 38, 66, 79 mm; loc. off False Bay, Nanquas Pk., Fish Point Lighthouse, Cape Infante, Cradock Bay and Mossel Bay fishing grounds; South African Museum Nos. A970–A980. 1 ♂ c. l. 72 mm; loc. off Skoenmakers Kop, Algoa Bay; S.A.M. No. A13183. 3 ♂ c. l. 69, 73, 120 mm, 1 ♀ c. l. 129 mm; loc. Rocky Bank, False Bay; S.A.M. No. A13184. 1 ♂ c. l. 68 mm, 1 ♀ c. l. 65 mm; loc. Rocky Bank, False Bay; Rijksmuseum van Natuurlijke Historie No. D. 28907d. 2 ♂ c. l. 46 and 36 mm; loc. N. E. Bird Island and Cape St. Blaize resp.; British Museum (Natural History) Nos. 1917.6.19.2 and 1928.12.1.323.

DESCRIPTION

(see pl. XX)

Stebbing's description is inadequate in some respects, considering the small morphological differences between species in this genus and a complementary description of the chief diagnostic features of *P. gilchristi* is given below:

The supra-orbital horns are sharply hooked and are quite highly elevated in a vertical plane; the points are rather blunt and seldom project far beyond the level of the median rostral spine. The surface of the carapace is covered in sharp spinules, each of which bears a fringe of setae around its antero-lateral margin; this makes the carapace densely pilose.

The proximal segments of the antennal peduncles bear a dorsal, elevated, sharp spine adjacent to the stridulating process. The lateral spines on all the antennal peduncular segments tend to be flattened dorso-ventrally.

The legs are angular in cross-section and the outer surface of the merus, and to a lesser extent the ventral surface also, is covered in a mat of dense setae. The sternum and ventral surface of the coxae are strongly tuberculate and also bear numerous setae.

Abdominal segments 2–5 each have well-developed anterior and posterior transverse grooves which extend on to, and meet on, the pleura. These grooves, which are densely pilose throughout, are also linked on either side of a low median keel, thus producing a distinct H-shaped arrangement.

Colour pattern: The basic overall colour is pinkish-orange with irregular white patches. Both the legs and antennae bear alternating bands of pinkish-orange and white.

Variation: The most variable features are the shape of the supra-orbital horns, which show a tendency to become blunt and almost rounded at the points, and the number of spines on the anterior margin of the carapace.

Ecology: *P. gilchristi* appears to be confined to the south coast of the Cape Province and has been recorded at depths from 55–102 m (see Berry, 1971, for a more detailed account).

The main differences between *P. delagoae* and *P. gilchristi* are summarized below (see plates XIX and XX).

In *P. gilchristi*, abdominal segments 2 to 5 each have well-developed anterior and posterior grooves both filled with short, dense setae. Anterior and posterior grooves are linked on either side of the median keel to give a distinct H-shape. In *P. delagoae* the anterior transverse groove is virtually non-existent and is represented by a shallow depression which is *not* linked to the posterior groove on either side of the median keel. Setae in the grooves of *P. delagoae* are sparse and inconspicuous.

The merus of the walking legs of *P. gilchristi* is more or less triquetral in cross-section and the flattened outer surface in these legs is covered in a conspicuous strip of short, dense setae. In *P. delagoae* the merus is subcylindrical and perfectly smooth with no trace of setae.

The entire dorsum of the cephalothorax of *P. gilchristi* is covered in a dense mat of short setae between the spines. In *P. delagoae* the precervical region is completely devoid of setae and is shiny; only towards the very posterior region of the carapace

are there a few setae clustered around the bases of some of the tubercles.

The cephalothoracic sternum of *P. gilchristi* is strongly tuberculate and covered in short setae. In *P. delagoae* the sternum bears a few traces of tubercles but is basically smooth, shiny and devoid of setae.

Within the genus *Palinurus* the degree of morphological difference, even between the Atlantic and Indian Ocean species is very small. We nevertheless agree with the conclusion of Forest & Postel (1964) that three species are represented in the north-east Atlantic and are satisfied that they are distinct from the two species we recognize in the Indian Ocean. However it must be pointed out that in view of the variability of *P. delagoae*, some of the criteria on which the above authors separate it from the Atlantic species are not valid. The range of variation of the shape, curve and spination of the supra-orbital horns includes the variations of the three Atlantic species. Forest & Postel also state that *P. delagoae* is clearly distinguished from *P. mauritanicus* and *P. charlestoni* by the relative lengths of carapace and abdomen. '*La longueur de la carapace, reportee en arriere de son bord posterieur, n'atteint pas le bord posterieur du 5eme segment abdominal (P delagoae) alors que chez des specimens de même taille (P mauritanicus and P charlestoni) cette longueur atteint le milieu du 6eme segment.*' They point out that they make this observation from only a single photograph of *P. delagoae* published by Barnard. In fact, this length can exceed the beginning and even reach the middle of the 6th abdominal segment in *P. delagoae*.

Because of the small degree of morphological difference, even between the Atlantic and Indian Ocean species of *Palinurus*, it might be argued that on the grounds of differences in colour, morphology and geographical isolation of adults, the Malagasy population should be regarded as a separate species from *P. delagoae* of the south-east African coast, particularly if the latter is to be considered distinct from *P. gilchristi*. However, even on morphological grounds the Malagasy and south-east African populations certainly have closer affinity than either has with *P. gilchristi* from the Cape. Moreover, there is no evidence of any intergradation between *P. gilchristi* and *P. delagoae* from Natal, whereas the Natal and Moçambique population of *P. delagoae* exhibits a range of variation which includes, at one extreme, individuals which are morphologically indistinguishable from those of the Malagasy population. This situation would suggest that there is gene flow from the Malagasy population to the south-east African one and not to any great extent in the opposite direction. This could be accounted for by transport of phyllosoma larvae in the westward flowing current from southern Madagascar to Africa but further information on the ecology of the larvae is required to substantiate this hypothesis. It is interesting to note that the shallow-water rock lobster, *Panulirus homarus*, has virtually an identical range of geographical distribution in the south-west Indian Ocean with *P. delagoae* and that there is also evidence of affinity between the Malagasy and the south-east African populations of *P. homarus* (Berry, in press).

In conclusion we recognize five species within the genus *Palinurus* all of which are very similar morphologically. The fossil material and relationships between the Atlantic and Indian Ocean species requires further investigation in a zoogeographic study of this genus.

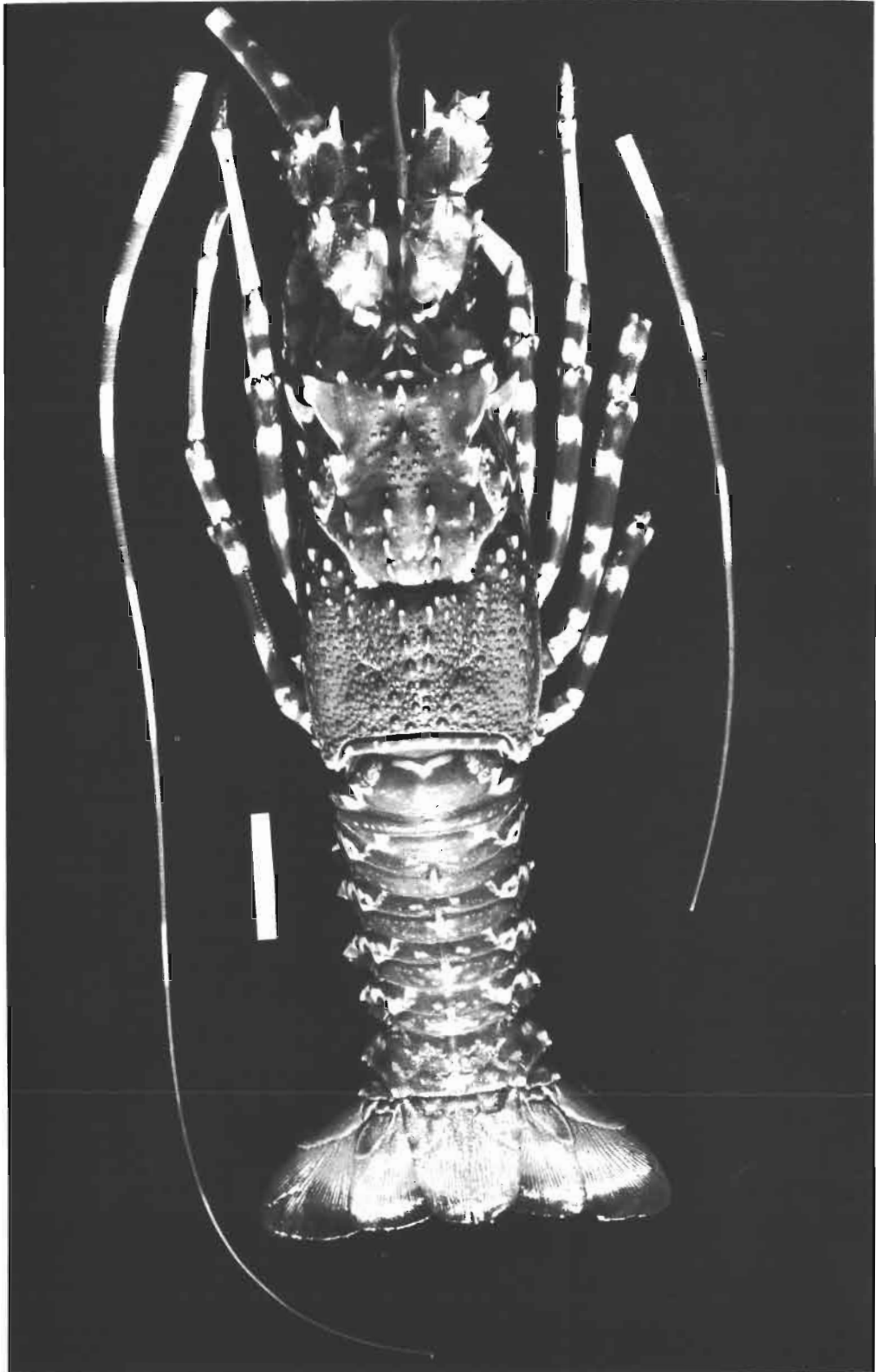
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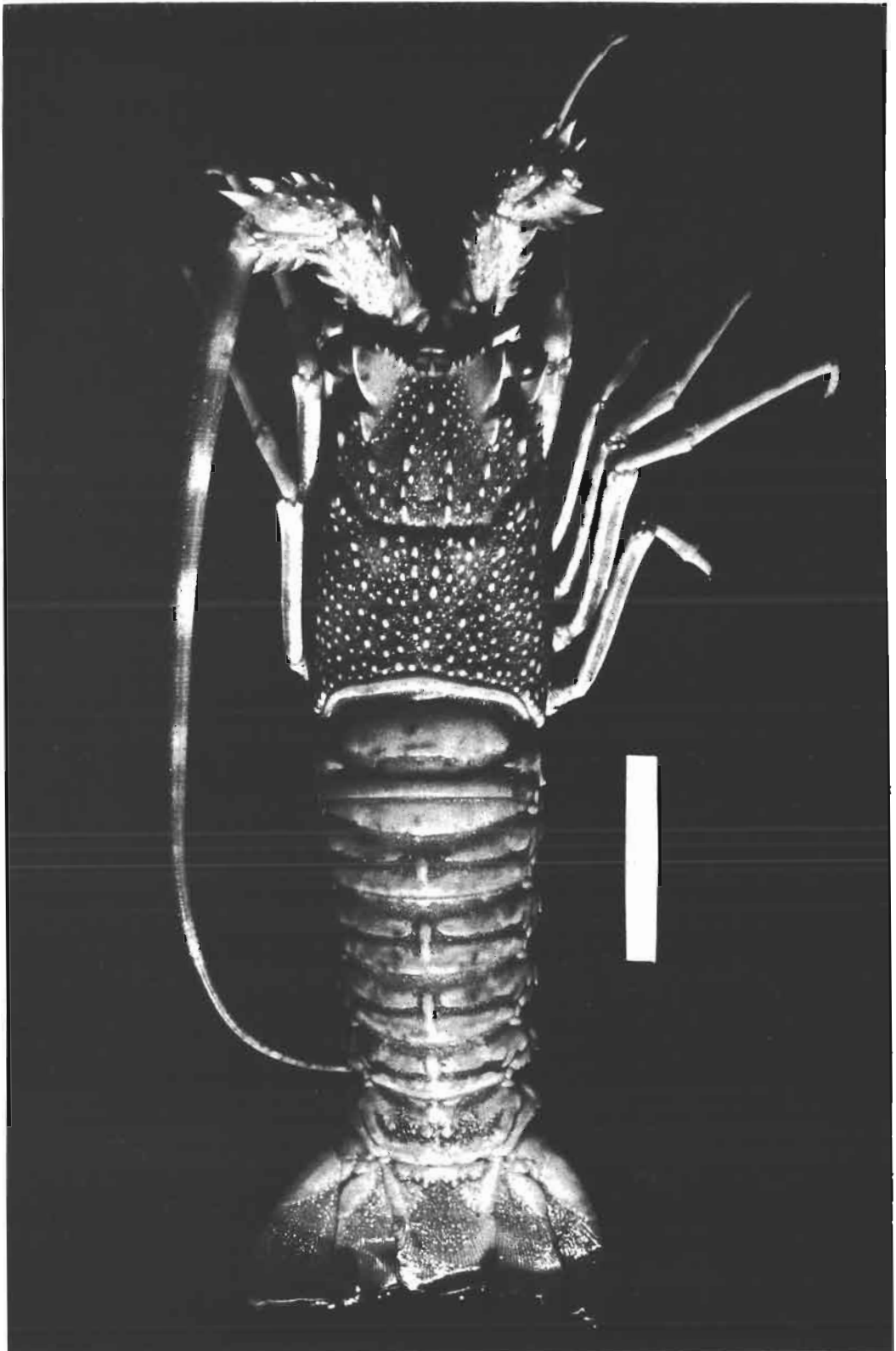
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Dorsal view of male neotype of *Palinurus delagoae* (preserved by freezing). Scale = 50 μ m.



Dorsal view of male *Palinurus gilchristi*, S.A. Museum No. A13183 (preserved in spirit). Scale = 50 mm.