Journal of Natural History
Publication details, including instructions for authors and subscription information:
http://www.informaworld.com/smpp/title~content=t713192031

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Online Publication Date: 01 June 1995
To cite this Article: Ng, P. K. L., Števčić, Z. and Pretzmann, G. (1995) 'A revision of the family Deckeniidae Ortmann, 1897 (Crustacea: Decapoda: Brachyura: Potamoidea), with description of a new genus (Gecarcinucidae: Gecarcinucoidea) from the Seychelles, Indian Ocean', Journal of Natural History, 29:3, 581 - 600
To link to this article: DOI: 10.1080/00222939500770201
URL: http://dx.doi.org/10.1080/00222939500770201

JOURNAL OF NATURAL HISTORY, 1995, **29**, 581–600

A revision of the family Deckeniidae Ortmann, 1897 (Crustacea: Decapoda: Brachyura: Potamoidea), with description of a new genus (Gecarcinucidae: Gecarcinucoidea) from the Seychelles, Indian Ocean

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(*Accepted 14 March 1993*)

The family Deckeniidae Ortmann, 1897, is revised and only 2 East African species are recognised, *D. imitatrix* Hilgendorf, 1869, and *D. mitis* Hilgendorf, 1898. The identity of the poorly known species from Seychelles, Indian Ocean, *Deckenia alluaudi* A. Milne Edwards and Bouvier, 1893, is clarified. This species is redescribed, assigned to a new genus (*Seychellum* gen. nov.), removed from the Deckeniidae *sensu stricto* and transferred to the family Gecarcinucidae Rathbun, 1904.

KEYWORDS: Crustacea, Brachyura, Deckeniidae, *Deckenia*, Gecarcinucidae, *Seychellum* gen. nov., taxonomy, revision, Seychelles.

Introduction

The genus *Deckenia* was established by Hilgendorf (1869) for a new species, *D. imitatrix*, from Zanzibar, East Africa. Later, A. Milne Edwards and Bouvier (1893) described *D. alluaudi* from Praslin, Seychelles (Indian Ocean). Rathbun (1894), unaware of Milne Edwards and Bouvier's paper (1893), described *D. cristata* from the Seychelles. Hilgendorf (1898) described *D. mitis* from Africa. Rathbun (1906) subsequently synonymized *D. cristata* under *D. alluaudi*. The genus *Deckenia* was characterized mainly by the ovate carapace and triangular mouthparts, the exhalant apertures being tubiform, features which led Ortmann (1897) to establish a new subfamily, Deckeniinae, for the genus. Rathbun (1906) followed this classification.

Bott (1955), apparently unaware of Ortmann's work (1897), referred *D. imitatrix*, *D. alluaudi* and *D. mitis* to a new family, Deckeniidae, provided a key to all 3 species, and reviewed the 2 East African *Deckenia*, with details of their male first pleopod structures. Deckeniidae Bott, 1955, is thus an objective junior synonym of Deckeniinae Ortmann, 1897. Bott (1955) distinguished 2 groups within *Deckenia*, 1 with a simple terminal segment of the mandibular palp and smooth carapace (*D. imitatrix* and *D. mitis*) and the 2nd with a bilobed terminal segment of the mandibular palp and a rough carapace with a distinct epigastric cristae (*D. alluaudi*). Bott (1955) incorrectly stated

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that the type locality of *D. imitatrix* was the island of Socotra off northeast Africa (where a potamonautid species is found). In his last major publication on freshwater crabs however, Bott (1970) made no reference to the family Deckeniidae, although it was recognized by Bowman and Abele (1982), Abele and Felgenhauer (1982) and Hartnoll (1988) in their classification of the Brachyura.

The differences between the East African and Seychelles species, however, are so significant that they cannot be congeneric or even confamilial. Therefore, a revision of the genus was undertaken. A new genus (*Seychellum*) is here erected for *Deckenia alluaudi*. A reappraisal of the taxonomic position of the genera *Deckenia sensu stricto* and Deckeniidae *sensu stricto* is provided. The present study indicates that while Deckeniidae is placed within the superfamily Potamoidea, near the family Potamonautidae; *Seychellum* belongs to the family Gecarcinucidae Rathbun, 1904, superfamily Gecarcinucoidea instead.

The abbreviations G1 and G2 are used for the male first and second pleopods respectively. Measurements are of the carapace width (cw) and length (cl). Material is deposited in the Humboldt Museum of Zoology (ZMB), Berlin, Germany; National Natural History Museum (USNM), Smithsonian Institution, Washington, DC; Senckenberg Museum (SMF), Frankfurt, Germany; Muséum national d'Histoire naturelle (MNHN), Paris, France; and the National Naturhistorisch Museum (NHMW), Vienna, Austria.

Systematics

Superfamily **POTAMOIDEA** Ortmann, 1896
Family **DECKENIIDAE** Ortmann, 1897

Type genus. *Deckenia* Hilgendorf, 1869, by original designation.

Diagnosis. Carapace egg-shaped; antennae lateral in position, hardly visible from frontal view, hidden by front and base of orbits, peduncle on endostome; antennules folding almost vertically; mandibulary palp 2-segmented, terminal segment simple; endopod of 1st maxilliped and lateral surface of endostome forming elongate tubiform, chimney-like efferent funnel; sternite 4 narrow; abdomen appears to have only 6 segments, segment 1 completely concealed by carapace.

Remarks. This subfamily contains only 1 East African genus, *Deckenia*. The closest relatives of deckeniids are probably the potamonautids with which they share a similar mandibular palp, gonopod and male abdomen. The differences between deckeniids and *Seychellum* (Gecarcinucidae) are discussed under the *Remarks* for *Seychellum*.

Deckenia Hilgendorf, 1869

Type species. *Deckenia imitatrix* Hilgendorf, 1869, by monotypy.

Diagnosis. Carapace smooth, rounded, regions not defined, cristae very weak (barely discernible when carapace dry, appears absent when carapace moist); orbits very wide; front vaguely trilobate with median lobe triangular, projecting forwards, lateral lobes low, rounded. Antennae extremely compressed by frontal margin and infraorbital margin, laterally positioned, not visible from dorsal view, barely visible from frontal

view, peduncle on upper edge of endostome adjacent to infraorbital angle. Antennules folding almost vertically; epistome barely discernible, being compressed by extreme endostomial expansion, median part of interantennular septum and proepistome highly compressed laterally, appears keeled. Mandibulary palp 2-segmented, basal segment slender, terminal segment simple; endopod of 1st maxilliped elongate, lateral margins gently convex, chimney-like; outer surface of ischium of 3rd maxilliped distinctly convex, sulcus absent. Propodus and dactylus of ambulatory legs distinctly flattened laterally, blade-like; suture between sternites 3 and 4 interrupted medially, sternite 4 narrow. Male abdomen reaching beyond half the length of sternite 4. Male abdomen broadly triangular, appears 6-segmented, segment 1 totally hidden by carapace. Terminal and subterminal segments of G1 clearly demarcated; G2 long, distal segment distinctly longer than elongate basal segment, tip sharp.

Remarks. The genus *Deckenia* as presently conceived, contains only 2 species, *D. imitatrix* Hilgendorf, 1869, and *D. mitis* Hilgendorf, 1898, both East African in distribution.

Little is known about the ecology and biology of *Deckenia*, and the swollen carapace seems to either associated with terrestrial habits or life in stagnant, poorly oxygenated waters (Ng, 1988). The form of the mouthparts and flattened ambulatory segments, usually associated with burrowers in the Brachyura, seem to suggest against their having a terrestrial mode of life. Marco Vannini informs us (P.K.L. Ng, personal communication) that the locals have told him that *Deckenia* lives in the soft mud of pools. In this respect, the ecology of the genus *Deckenia* seems to parallel that of the Asian genus *Somanniathelphusa* Bott, 1968 (see Ng, 1988; Ng and Naiyanetr, 1993).

Distribution. Known only from Kenya, Tanzania, Malawi and Somalia in East Africa.

Deckenia imitatrix Hilgendorf, 1869

Deckenia imitatrix Hilgendorf, 1869: 2; Ortmann, 1902: 306; Bott, 1955: 219, Fig. 6, pl. I fig. 1a–d (see Bott, 1955: 219, for rest of synonymy).

Material examined. 1 ♀, cw 35·4 mm, cl 29·2 mm (lectotype, designated by Bott, 1955: 220), ZMB 3216, Zanzibar, **Tanzania**, coll. c. c. von der Decken.1 ♂ (very poor condition), (paralectotype), ZMB 3215, Zanzibar, Tanzania, coll. c. c. von der Decken. 2 ♂, 2 ♀, ZMB 3287, Zanzibar, Tanzania, coll. c. c. von der Decken. 1 ♂, ZMB 20149, Pokomonie, Witu-Land, **Kenya** (as British East Africa), coll. Gustave Denhardt, 1896. 2 ♂ (larger cw 46·1 mm, cl 38·8 mm), 1 ♀, ZMB 9441, Taro (c. 3°41'S 39°E), Kenya, coll. O. Neumann, c. 1895. 2 ♂, cl 35·0 mm, NHMW 4369, Giohar, **Somalia**, coll. Lanza, 1968. 1 ♂, SMF 2877, East Africa, no other data.

Remarks. Bott (1955: 221) separated *Deckenia imitatrix* from *D. mitis* by means of 5 characters: the form of the exo-orbital angle, smoothness and armature of the ischium merus and carpus of the cheliped, and shape of the G1 terminal segment. These and other differences are listed in Table 1.

Deckenia mitis Hilgendorf, 1898

(Figs 1B, 2, 3)

Deckenia mitis Hilgendorf, 1898: 24, fig. 8; Ortmann, 1903: 306; Bott, 1955: 221, Fig. 5, pl. I fig. 2a–d (see Bott, 1955: 221, for rest of synonymy).

Table 1. Differences between *Deckenia imitatrix* and *D. mitis*.

	D. imitatrix	*D. mitis*
Exo-orbital tooth	acutely triangular, tip sharp	broadly triangular, tip more rounded
Infraorbital margin	lined with very sharp spines	line with low granules
Epibranchial cristae	very sharp, prominent	low to almost undiscernible
Ischium of cheliped	with strong, sharp spine	with low but sharp, sometimes indistinct tooth
Merus of cheliped	lower margin lined with very sharp spines; upper margin strongly serrated with long spines, with 1 large terminally bifurcated distal spine	lower margin lined with low spines; upper margin uneven but entire, not serrated, distal edge rounded, without any trace of spine
Carpus of cheliped	outer margin with 2 distinct spines; distal margin serrated with distinct sharp spines	outer margin with 2 low lobes, often undiscernible; distal margin entire
Carpus of first ambulatory leg	inner and outer surfaces with a well developed, sharp subdistal spine each	inner and outer surfaces with a low, blunt subterminal projection each
Merus of ambulatory legs	dorsal margin with well developed, very sharp subdistal spine	dorsal margin with weak, blunt subdistal spine
Propodus of ambulatory legs	dorsal margin distinctly serrated	dorsal margin uneven but not serrated
Male abdomen	abdomen more acutely triangular, segment 7 distinctly triangular in shape	abdomen broadly triangular, segment 7 broadly triangular in shape
G1	subconical, distal part cylindrical	conical, distal part distinctly tapering

Material examined. 1 ♂, cw 48·0 mm, cl 38·0 mm (lectotype, designated by Bott, 1955: 221), 1 ♂, cw 46·4 mm, cl 37·0 mm (paralectotype), ZMB 9444, Wembere Steppe, near Tabora (5°02′S 32°50′E), Tanzania, coll. F. Stuhlmann, 6–7 June 1892. 1 ♂, ZMB 13505, Kilimantinde (5°52′S 34°55′E), Tanzania (as Deutsch Ost Afrika), coll. Turu Expedition, Claus. 1 ♀ (ovigerous), ZMB 5017, Mombasa (as Mombassa), coll. J. M. Hildebrandt. 1 ♂ (paralectotype), ZMB 9445, Dar Es Salaam, Tanzania, no other data. 1 ♂, ZMB 12492, Mombasa (as Mombassa), Kenya, coll. K. Schauer. 1 ♂, ZMB 15703, ? Mombasa (as Mombassa), Kenya, coll.

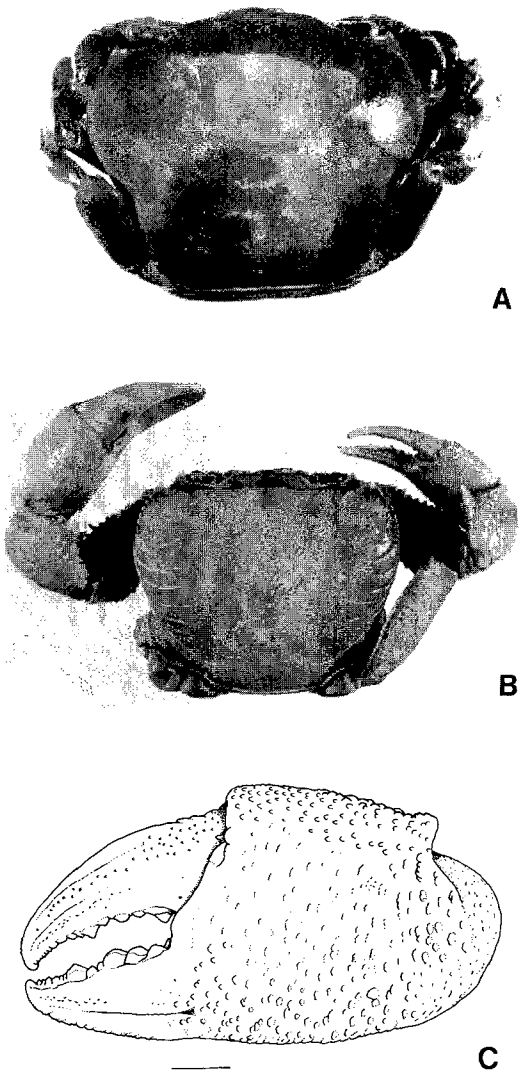

FIG. 1. (A) *Deckenia mitis*, male, cw 40·0 mm, cl 33·1 mm, MNHN-BP 298; (B), (C), *Seychellum alluaudi*, lectotype male, cw 42·8 mm, cl 36·2 mm, MNHN-BP 152. (A), (B), dorsal views of carapace; (C), left chela. Scale = 5·0 mm.

Biedermann. 1 ♂, cw 40·0 mm cl 33·1 mm, 1 ♀, cw 32·3 mm cl 26·3 mm, MNHN-BP 298, Mombasa (as Mombassa), Kenya, coll. C. Alluaud, 1904. 1 ♂, ZMB 15425, Lake Malawai (as Nyassa Lake), Malawi, coll. II East Africa, Goetze. 1 ♂, 1 ♀, 4 juveniles, ZMB 17846, coll. II East Africa, R. Methner and G. Zenker, March 1914. 2 ♂, cl 21·0 mm, 23·2 mm, 7 ♀, cl 19·8–28·5 mm, NHMW 2886, Ukambasin, Sumpf, East Africa, coll. F. Thomas, 11 May 1903.

Remarks. This species was described as a variety of *D. imitatrix* but there is sufficient reason to regard it as a separate species despite its external similarity to *D. imitatrix* (type locality Zanzibar, Tanzania) (Bott, 1955; Table 1).

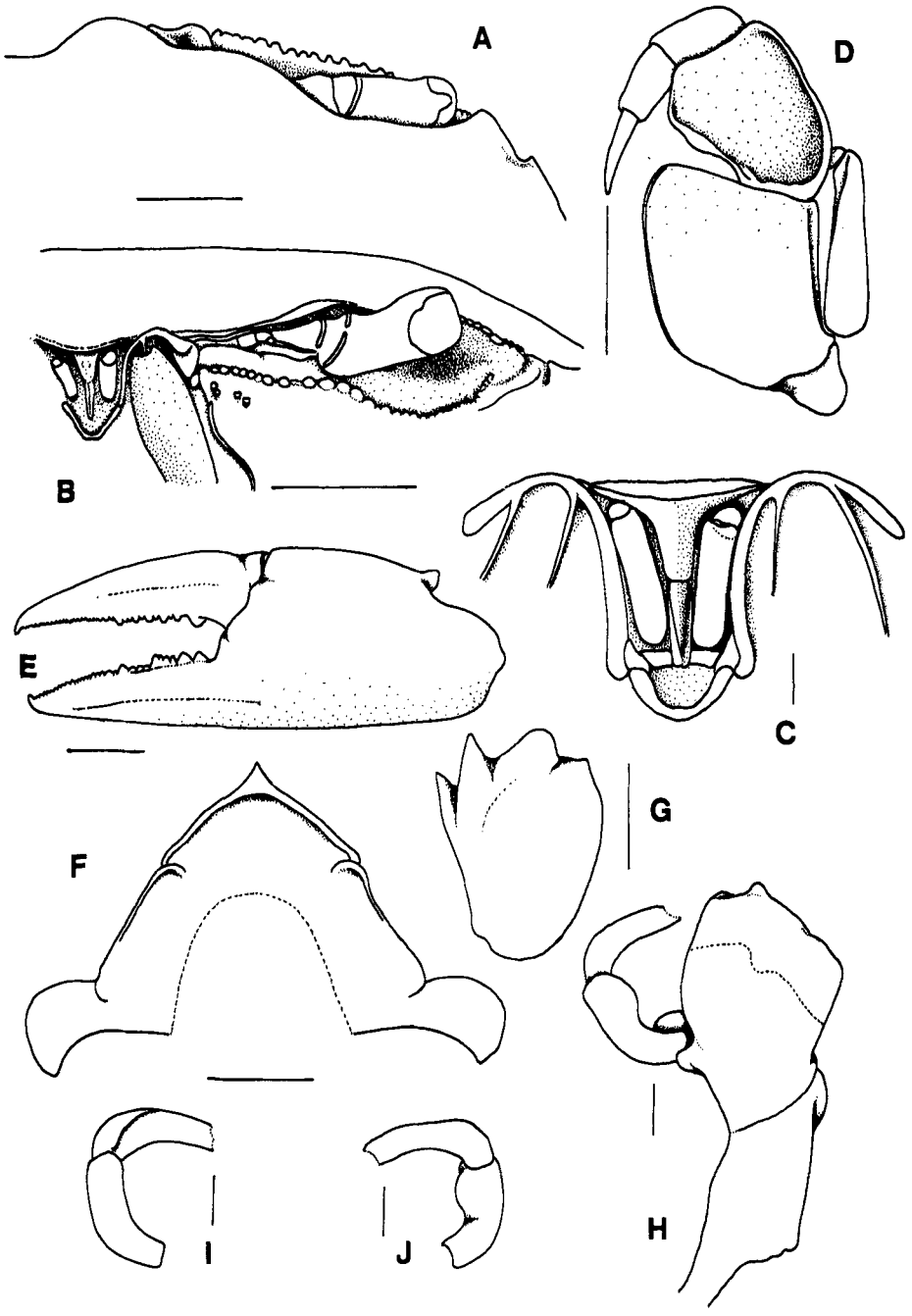

FIG. 2. *Deckenia mitis*. Male, cw 40·0 mm, cl 33·1 mm, MNHN-BP 298. (A) frontal and orbital regions (dorsal view); (B) frontal and orbital regions (frontal view); (C) epistome, endostome and antennules; (D) left third maxilliped; (E) left chela; (F) anterior sternal plastron; (G) right carpus of cheliped (dorsal view); (H) right mandible, with palp; (I) (J) palp of mandible. Scales: A, B, D–G = 5·0 mm; C, H–J = 1·0 mm.

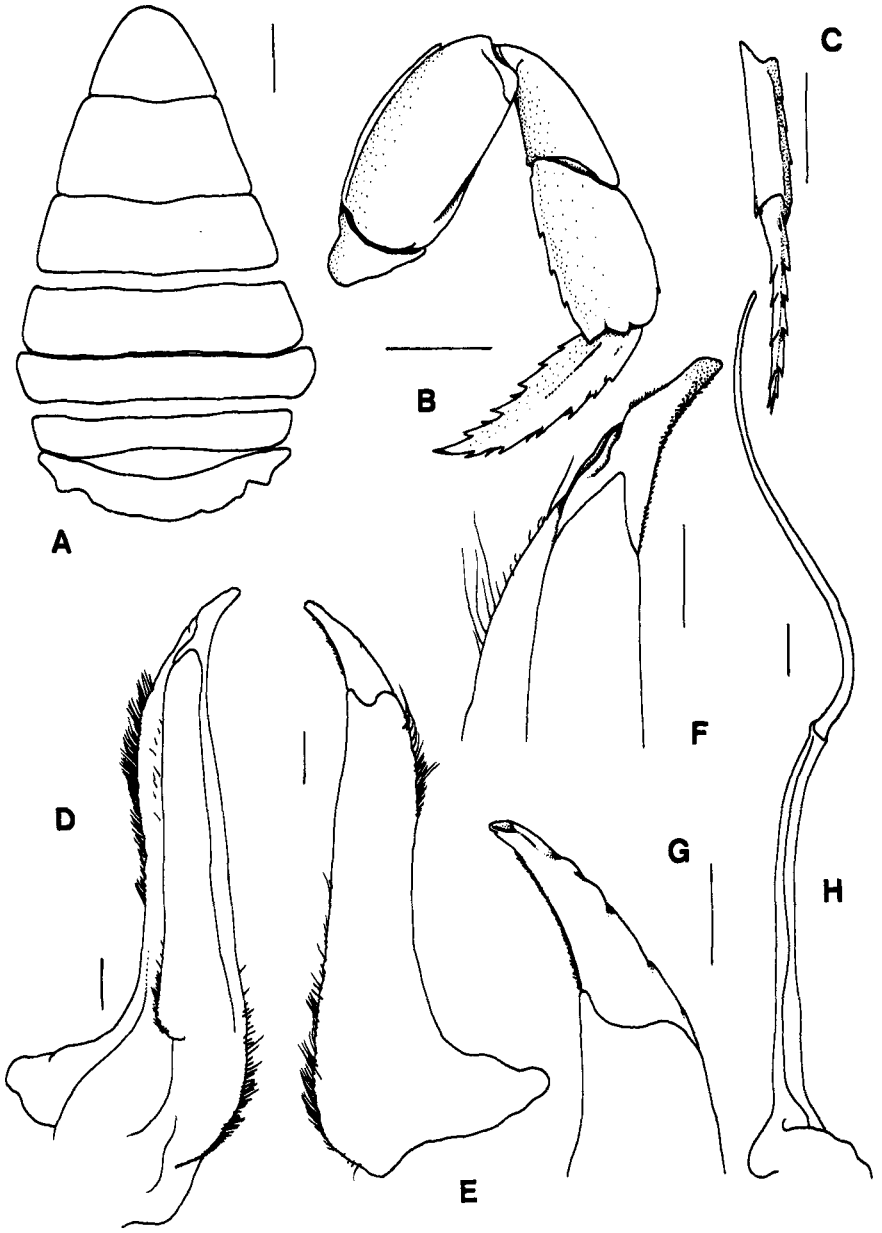

FIG. 3. *Deckenia mitis*. Male, cw 40·0 mm, cl 33·1 mm, MNHN-BP 298. (A) abdomen; (B) right last ambulatory leg; (C) right last ambulatory propodus and dactylus (dorso-marginal view); (D) (E) left G1; (F) (G) left G1 terminal segment; (H) left G2. (D) (F) ventral view; (E) (G) dorsal view. Scales: A–C = 5·0 mm; D–H = 1·0 mm.

Table 2. Differences between the genera *Deckenia* and *Seychellum* (those marked by an † are regarded as especially significant).

	Deckenia	*Seychellum*
Carapace shape	nearly ovate	nearly quadrangular
Carapace depth	very deep	not deep, dorso-ventrally flattened
Carapace convexity (dorsal surface)	very convex laterally and longitudinally	nearly flat
Carapace surface	glabrous, smooth	rough, with scattered obtuse tubercles
Carapace regions	not visible	distinct
Epigastric cristae	absent	sharp, distinct
Postorbital cristae	absent	sharp, distinct
Cervical grooves	very shallow, not discernible	distinct
Anterolateral margins	arcuate	weakly arcuate
Posterolateral margins	distinctly converging	subparallel
Posterior carapace margin	wide	very wide
Carapace lateral striae	indistinct	distinct
Orbits	very wide, distinctly longer than 0·5 width of frontal margin	normal, $<0{\cdot}5$ width of frontal margin
†Proepistome and interantennulary septum	laterally flattened, appears strongly keeled	not laterally flattened or keeled
Antennae	highly compressed by frontal and supraorbital margins, not visible from dorsal view, barely visible from frontal view; structure appears lateral in position	compressed by frontal and supraorbital margins but basal segment still clearly visible from dorsal and frontal views, structure oblique in position
†Antennules	fossae almost vertical, basal segment of antennules elongate, folding almost vertically	fossae oblique (*c.* 45°), basal segment of antennules normal, folding obliquely
Endopod of first maxilliped	elongate, distinctly cylindrical in shape, chimney-like	relatively, short, sinuous, appears somewhat twisted
Third maxilliped	ischium without sulcus	ischium with shallow but distinct sulcus
†Mandibular palp	terminal palp simple, basal segment slender	terminal palp distinctly bilobed, basal segment very stout

Table 2.—*Continued*

	Deckenia	*Seychellum*
Ambulatory legs	propodus and dactylus laterally flattened, blade-like	propodus and dactylus normal, not distinctly flattened laterally
Carpus of cheliped	surfaces smooth, inner distal angle with 2 sharp spines	surfaces very rugose inner distal angle with 1 sharp spine and several smaller sharp granules
Sternum	sternite 4 narrow, male abdomen reaching $>0{\cdot}5$ length of sternite	sternite 4 broad, male abdomen reaching about $0<33$ length of sternite
Male abdomen	distinctly triangular, lateral margins of segments 4–6 forming a gently convex line; segment 6 partly hidden by carapace, segment 7 hidden, not visible; articulation between segments stiff, abdomen usually moves as one piece	Lateral margins of segments 4–6 distinctly concave, not straight; segment 6 completely exposed, distal part of segment 7 visible articulation between segments flexible segments freely movable
Female abdomen	articulation between segments stiff, abdomen moves as one piece	articulation between segments flexible, segments on abdomen freely movable
†G2	distal segment very long, distinctly longer than elongate basal segment, tip sharp	distal segment distinctly shorter than elongate basal segment, tip rounded

Superfamily **GECARCINUCOIDEA** Rathbun, 1904
Family **GECARCINUCIDAE** Rathbun, 1904, *sensu lato*
Seychellum gen. nov.

Type species. *Deckenia alluaudi* A. Milne Edwards and Bouvier, 1893, by present designation.

Diagnosis. Carapace quadrangular, rugose, regions well defined, cristae sharp, prominent; orbits normal; front vaguely trilobate with median lobe subtruncate, projecting slightly forwards, lateral lobes very low, rounded. Antennae compressed by frontal margin and infraorbital margin, obliquely positioned, clearly visible from frontal and dorsal views, peduncle on upper edge of endostome adjacent to infraorbital angle. Antennules folding obliquely, *c.* 45° from horizontal; epistome barely discernible, interantennular septum triangular, not laterally compressed. Mandibulary palp 2-segmented, basal segment stout, terminal segment distinctly bilobed, with smaller fold exceeding half the length of larger one; endopod of 1st maxilliped slender, lateral

margins sinuous; outer surface of ischium of 3rd maxilliped gently convex, sulcus shallow but distinct. Suture between sternites 3 and 4 interrupted medially, sternite 4 broad, male abdomen reaching to about one-third of sternite. Male abdomen triangular, segment 1 partially hidden by carapace, lateral margins of segments 4–6 distinctly concave. Terminal and subterminal segments of G1 clearly demarcated; G2 long, distal segment shorter than elongate basal segment, tip rounded.

Etymology. The genus is named after the Seychelles islands. Gender neuter.

Remarks. Although *Deckenia* and *Seychellum* are very different in appearance externally, they share very similar mouthparts, as well as epistomal and endostomal structures. The highly compressed antennae and epistome, and lateral expansion of the endostome, as well as the tubiform endopods of the 1st maxilliped seem be apomorphic characters and suggest the close affinities of the 2 genera. Consideration of other morphological characters such as the mandibular palp however, suggest a different interpretation (see *Familial position of Seychellum*).

The structures of the epistome, endostome and 1st maxilliped are all clearly associated with respiration, and the similar condition in *Deckenia* and *Seychellum* could have arisen via convergence. While the carapace and general features of *Seychellum* (structure of chelipeds and legs) are typical for freshwater crabs, those of *Deckenia* are not, and all appear to be highly derived, notably the smooth and rounded carapace, slender chelipeds and laterally flattened legs. The 1st male abdominal segment of *Seychellum*, although concealed in part by the carapace, is still clearly visible from dorsal view, with the edges and part of the median part clearly discernible. In the case of *Deckenia*, the entire 1st abdominal segment (in both sexes) is completely hidden by the carapace, which covers part of the 2nd segment as well. This gives *Deckenia* the appearance of having only 6 abdominal segments. The G2 of *Deckenia* however, appears to be more plesiomorphic in structure compared to *Seychellum*, with the distal segment being very long and whip-like.

The genus *Seychellum* is regarded as monotypic for the moment.

Distribution. Known only from the granitic islands of the Seychelles.

Familial position of Seychellum. The mandibular palp of *Deckenia* is similar to those of potamonautids (especially to the hydrotelphusines), being 2-segmented, with a simple terminal segment which is not bilobed. In contrast, the terminal segment of *Seychellum* is bilobed. This requires that the two genera be referred to separate families, and by the system of classification proposed by Bott (1970), into separate superfamilies. *Seychellum* however, possesses so many unusual features that it cannot be accommodated within any of the extant subfamilies in the Gecarcinucidae and a new subfamily will probably have to be established for it eventually. The problem with the Gecarcinucidae however, is that the subfamilies as recognised by Bott (1970) are probably artificial taxa and few of them can be clearly defined as yet (Ng, 1988).

The position of *Seychellum* in the Gecarcinucidae seems to be rather isolated. In the form of its epistome, endostome and 1st maxillipeds, it is like no other. It affinities appear to be closer to the West African Globonautinae, and South African and south African/Madagascan Gecarcinucinae.

Zoogeographical implications. The evolution of freshwater crabs is poorly known and as a result, their zoogeography is also a matter of some uncertainty. Ortmann (1902) suggested that freshwater crabs first evolved in and radiated from India on the basis of the species richness in the area. Rodriguez (1986: 55) however, based on work mainly with the Neotropical Pseudothelphusidae, noted that the bilobed terminal segment of the mandibular palp was a character present both in pseudothelphusids as well as the

Palaeotropical Gecarcinucoidea. The present discovery that *Seychellum* is a gecarcinucoid helps put some of the problems of freshwater crab evolution and zoogeography into perspective.

The interesting point about the distribution of freshwater crabs which have a bilobed terminal segment of the mandibular palp is their distribution. The Pseudothelphusidae are found only in Central and South America. In Africa, one group of gecarcinucoid species is isolated in West Africa (Globonautinae, Gecarcinuidae) (Bott, 1970), with another in South Africa and Madagascar (Gecarcinucidae) (Bott, 1960, 1965). Most of the Gecarcinucoidea (Gecarcinucidae, Parathelphusidae (includes Sundathelphusidae; Ng, 1988)) are Asian, occurring from east of northwestern India, ranging through South and Southeast Asia, and into the Sunda and Sahul Shelves, northern Australia and Solomon Islands. They are present in southern China but are absent from Japan (Ng, 1988). Gecarcinucoids are especially abundant on the main Indian subcontinent (where potamoids are absent). Crabs with a bilobed terminal segment of the mandibular palp thus essentially have a Gondwanan distribution.

Freshwater crab fossils are known only from the Upper Tertiary from northern India and Europe (Bott, 1955, 1969; Glaessner, 1969). This absence however, cannot be used as evidence that the freshwater crabs evolved in India or Europe during the late Tertiary. The rarity and difficulty of forming (and finding) freshwater fossils is well known. On the basis of the published fossil data, there seems to have been an 'explosion' of brachyuran groups in the Eocene some 55 million years ago (P.K.L. Ng, unpublished data), but the Brachyura are certainly much older than this. Bott (1955) postulated that the Potamonautidae (as African Potamonidae) evolved from marine ancestors between the end of the Cretaceous and beginning of the Tertiary in the Tethys Sea about 65 million years ago. The bilobed terminal segment of the mandibular palp is present in only 2 taxa of freshwater crabs, and it does appear to be a synapomorph for the wholly freshwater Palaeotropical Gecarcinucoidea and Neotropical Pseudothelphusidae (see Rodriguez, 1986). Both groups have however, diverged considerably in carapace morphology, 3rd maxilliped and G1 structures. Since Africa and South America separated some 120 million years ago as Gondwanaland disintegrated (Audley-Charles, 1981; Audley-Charles *et al.*, 1981; Rage, 1988), crabs with a bilobed mandibular palp condition must have been present then, before the 2 continents separated, if the palp structure is indeed a synapomorph.

The presence of a gecarcinucoid genus (*Seychellum*) in the Seychelles, a group of islands which straddles the area between East Africa/Madagascar and India, both of which contain gecarcinucoids, supports the theory that Africa, Madagascar, Seychelles and India had been connected in the past. The Seychelles is unusual because it is the only group of isolated oceanic islands which are composed of continental rocks rather than limestone or oceanic basalts, and this is supposedly the result of continental drift (Braithwaite, 1984). Audley-Charles *et al.* (1981), Braithwaite (1984) and Tarling (1988) indicate that India had separated from Madagascar and moved progressively northeastwards some 100 million years ago. The Seychelles Bank was almost certainly a *de facto* 'micro-continent' and has been separated from the India and Madagascar/Africa for some 65 million years (Stoddart, 1984; Braithwaite, 1984). Stoddart (1984: 3) commented that '...it is possible that the granitic islands [of Seychelles] also possess elements of a much older biota, with ancestral links to both Madagascar and India'. The presence of *Seychellum* in the Seychelles Bank strongly supports this supposition.

The evidence for the evolution of crabs with a bilobed terminal segment of the

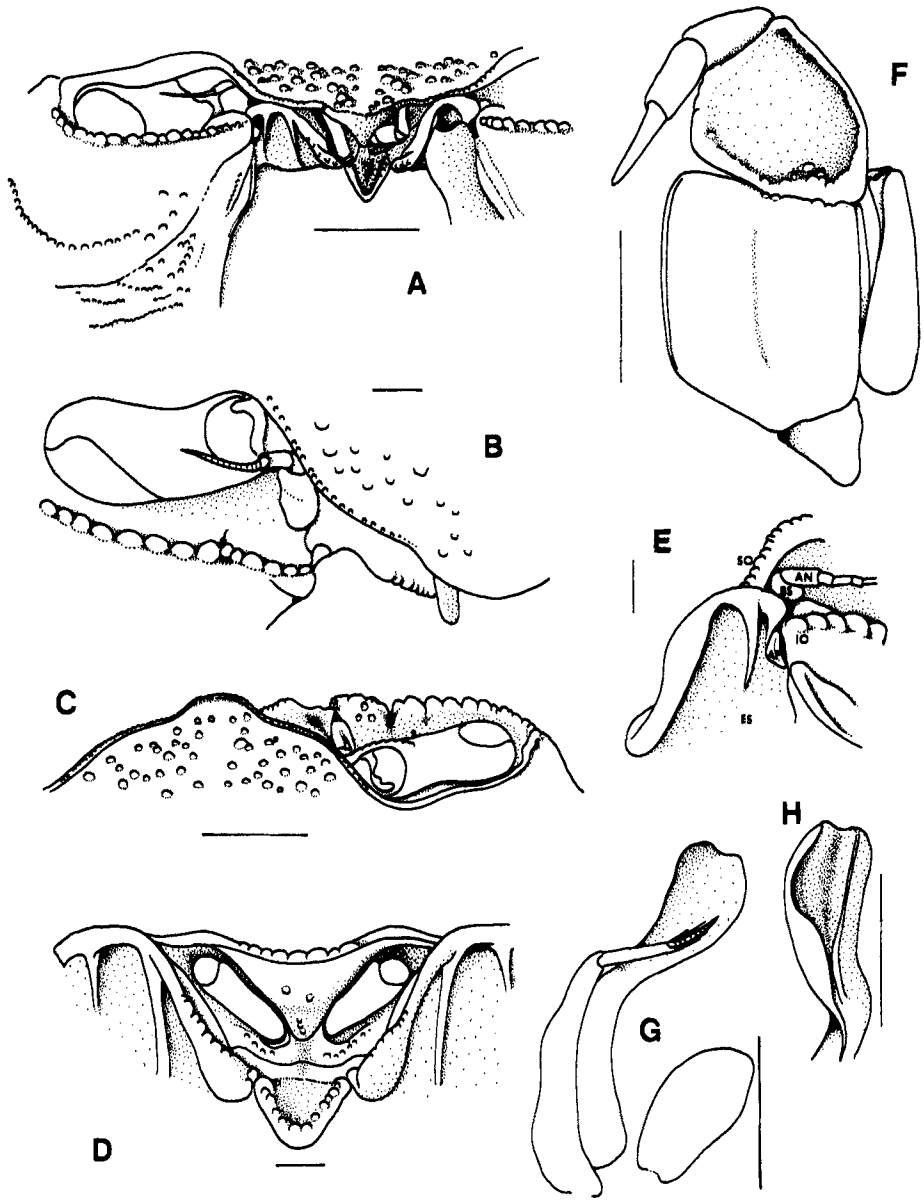

FIG. 4. *Seychellum alluaudi*. Lectotype male, cw 42·8 mm, cl 36·2 mm, MNHN–BP 152, Praslin. (A) frontal and orbital regions (frontal view); (B) frontal and orbital regions (sub-dorsal view); (C) frontal and orbital regions (dorsal view); (D) epistome, endostome and antennules; (E) ventral view of left endostome (EN) showing edge of infraorbital margin (IO), edge of supraorbital margin (SO), antennal peduncle (AP), basal segment of antenna (BS), antenna (AN); (F) left third maxilliped; (G) endopod and exopod of right 1st maxilliped (outer view); (H) endopod of right 1st maxilliped (inner view). Scales: A, C, F–H = 5·0 mm; B, D, E = 1·0 mm.

mandibular palp from those with a simple terminal segment is partially supported by transitional forms being observed in the Hydrothelphusinae (Potamonautidae) (Madagascar). This would imply that the potamoids (Potamidae and Potamonautidae)

FIG. 5. *Seychellum alluaudi*. (A–D) (I–K) lectotype male, cw 42·8 mm, cl 36·2 mm, MNHN-BP 152, Praslin; (E–G) (H) female paralectotype, estimated cw 30 mm, MNHN-BP 19, Praslin. (A) right 2nd maxilliped; (B) right mandible (inner view); (C) right mandible (outer view); (D–G) various views of right palp of mandible; (H) right 3rd maxilliped; (I) left carpus of cheliped; (J) anterior sternal plastron; (K) male abdomen (segment 1 shown in entirety). Scales: A–C, H–K = 5·0 mm; D–G = 1·0 mm.

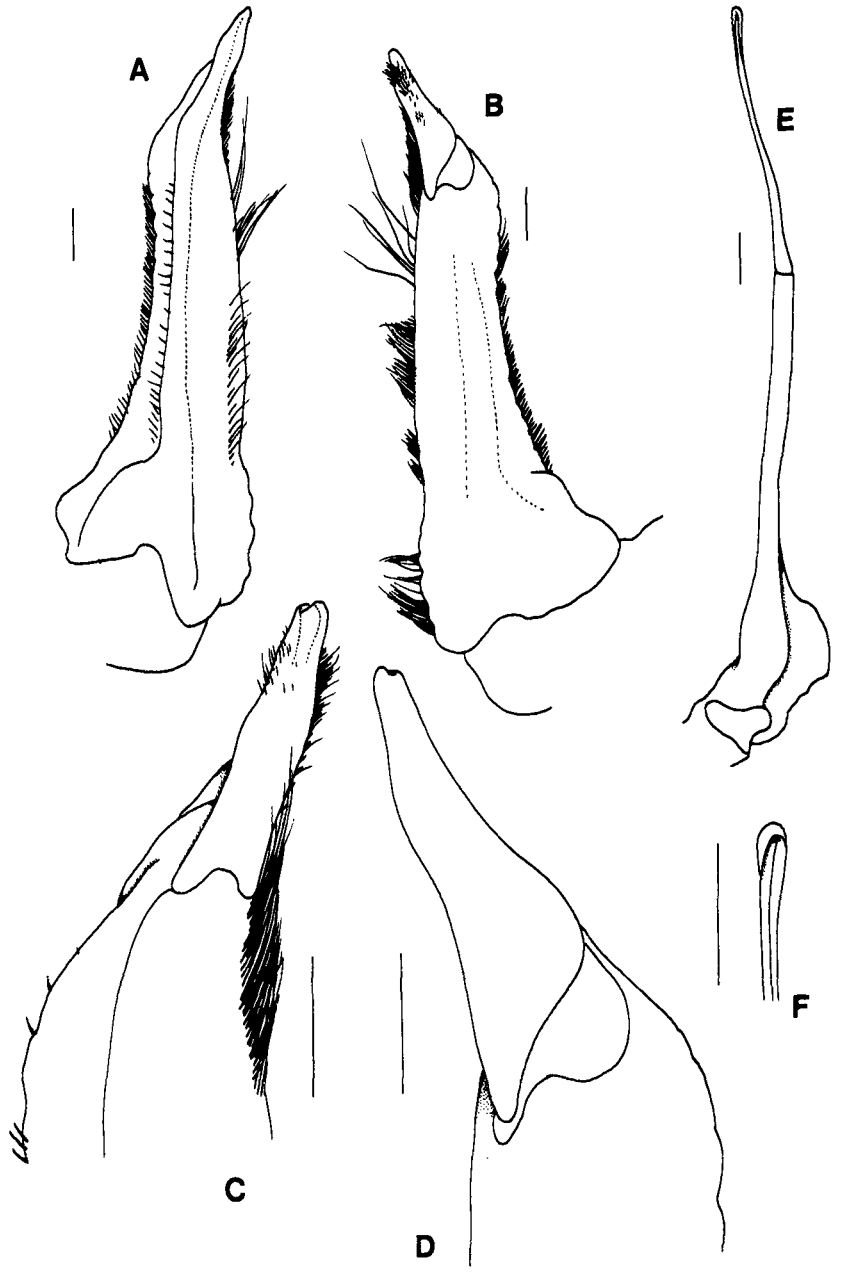

FIG. 6. *Seychellum alluaudi*. Lectotype male, cw 42·8 mm, cl 36·2 mm, MNHN-BP 152, Praslin. (A) (B) left G1; (C) (D) left G1 terminal segment; (E) left G2; (F) tip of G2 distal segment. (A) (C) ventral view; (B) (D) dorsal view. Scales = 1·0 mm.

evolved well over 120 million years ago as crabs with bilobed terminal segments of the mandibular palp (Gecarcinucoidea and Pseudothelphusidae) and were already present then in Gondwanaland, before the separation of Africa and South America.

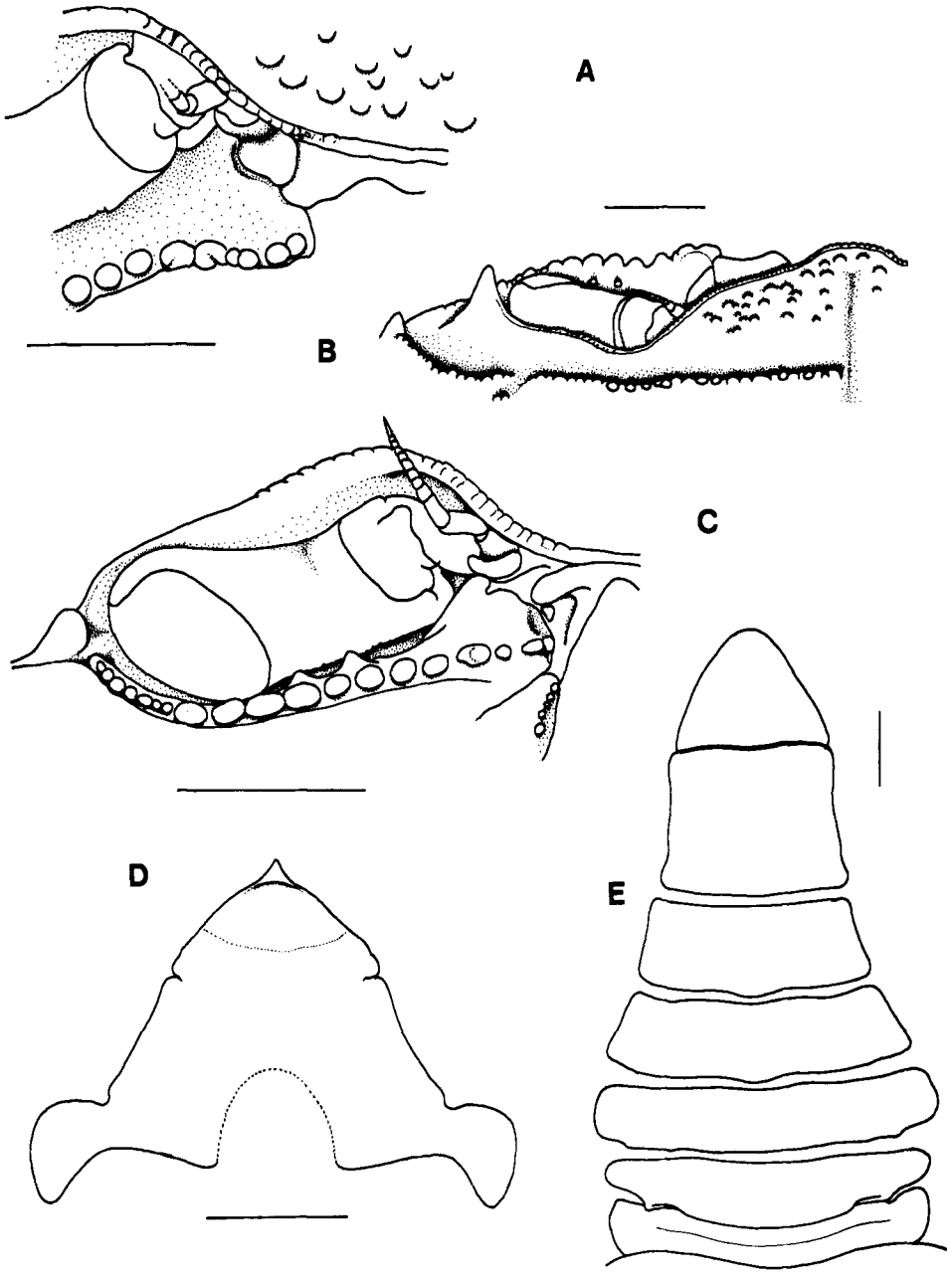

FIG. 7. *Seychellum alluaudi*. Male, cw 51·8 mm, cl 43[10]4 mm, SMF 12926, La Digue. (A) infraorbital margin and antenna (sub-dorsal view); (B) frontal and orbital regions (frontal view); (C) orbital regions (sub-dorsal view); (D) anterior sternal plastron; (E) abdomen (segment 1 partially covered by carapace). Scales = 5·0 mm.

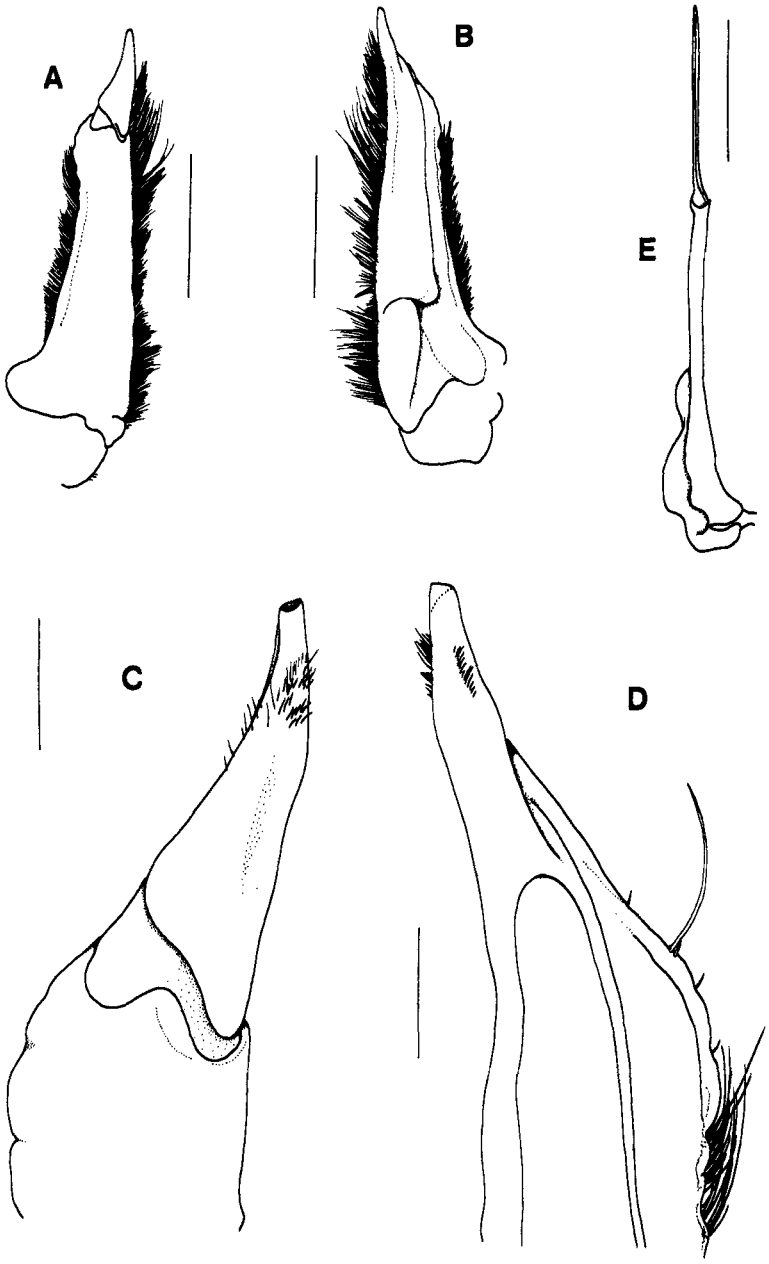

FIG. 8. *Seychellum alluaudi*. Male, cw 51·8 mm, cl 43·4 mm, SMF 12926, La Digue. (A) (B) right G1; (C) (D) right G1 terminal segment; (E) right G2. (A) (C) dorsal view; (B) (D) ventral view. Scales A, B, E = 5·0 mm; C, D = 1·0 mm.

Seychellum alluaudi (A. Milne Edwards and Bouvier, 1893) comb. nov.
(Figs 1B, C, 4–8)

Deckenia Alluaudi A. Milne Edwards and Bouvier, 1893: 325, fig.??; Ortmann, 1897: 314; Ortmann, 1902: 306; Rathbun, 1905: pl. 29 fig. 5; Rathbun, 1906: 72, Fig. 124, Bott, 1955: 219; Borradaile, 1907: 63; Haig, 1984: 125, 132.

Deckenia cristata Rathbun, 1894: 23.

Material examined. LECTOTYPE ♂ of *D. alluaudi* (present designation), cw 42·8 mm, cl 36·2 mm, MNHN-BP 152, Praslin island, **Seychelles**, coll. c. Alluaud, no. 535·92. ♀ PARALECTOTYPE of *D. alluaudi*, carapace crushed, estimated cw 30 mm, MNHN-BP 19, same data as lectotype. 2 SYNTYPE ♀ of *D. cristata*, cw 34·2, cl 28·5 mm (ovigerous, egg size *c.* 3·0 mm), cw 20·2 mm, cl 17·2 mm (juvenile), USNM 8064, Seychelles, Indian Ocean, coll. W. Abbott, Acc. 27085. 1 juvenile ♂, cw 7·9 mm, cl 6·8mm (NHMW 7518), Montagne Brulee, Seychelles, coll. Hadl, 27 October 1991. 1 young ♂, cw 15·0 mm, cl 12·0 mm; 1 young ♀, cw 24·0 mm, cl 20·5 mm, SMF 12925, La Digue, 4°20′S 55°50′E, mountain, *c.* 250 m, coll. M. Ackermann, 12 May 1979.1 ♂, cw 51·8 mm, cl 43·4 mm, SMF 12926, La Digue, 4°20′S 55°50′E, mountain, *c.* 250 m, coll. M. Ackermann, 12 May 1979.

Description. Carapace quadrangular, broader than long, high but dorsal surfaces gently convex on the margins and almost flat medially, not swollen; frontal, postorbital, anterolateral, pterygostomial, subhepatic and sub-branchial regions covered with large and small sharp and flattened granules, posterolateral regions lined with 6–7 oblique striae on each side, other areas pitted or gently rugose; regions defined, demarcated by distinct grooves, cervical grooves shallow but distinct, running almost longitudinally towards H-shaped gastric groove; epigastric and postorbital cristae sharp, well defined, running subparallel and close to frontal margin, frontal and postorbital regions narrow, cristae separated by distinct notch marking beginning of cervical grooves, epigastric cristae separated by deep Y-shaped groove, postorbital cristae continuous with epibranchial teeth; frontal margin finely granulated, appears broadly triangular, median part projecting forwards of truncate lateral lobes; supraorbital margin finely granulated, ending as sharp, acutely triangular exo-orbital tooth; infraorbital margin sublamelliform, lined with large rounded granules, clefted medially; anterolateral margin arcuate, cristate, lined with small, sharp granules, appears serrated, epibranchial tooth distinct, sharp, acutely triangular, not distinctly separated from gently convex and gradually converging posterolateral margins; posterior margin of carapace very wide, almost straight.

Orbits, eyestalk and cornea well developed. Antennae compressed by frontal margin and infraorbital margin, obliquely positioned, clearly visible from frontal and dorsal views but basal segment partially hidden by roof of frontal margin, peduncle located on upper edge of endostome adjacent to infraorbital angle, not clearly visible; flagellum short. Interantennular septum broadly triangular. Antennular fossa oblique, set at an angle of *c.* 45° from horizontal, basal antennular segment stout. Epistome narrow, compressed by expansion of endostome, lateral parts folded upwards and inwards; proepistome narrow but distinct; lateral parts of posterior margin of epistome twisted upwards, median part triangular, margins cristate. Endostomial ridges well developed, with 2 longitudinal ridges on each aide, the outer one being weaker and shorter. Mandibulary palp 2-segmented, basal segment stout; terminal segment distinctly bilobed, smaller fold exceeding half length of larger one. Endopod of 1st maxilliped

slender, lateral margins sinuous, inner surface deeply concave, outer surface strongly convex, forming funnel-like exhalant structure with concave endostome, efferent opening just below base of antennae (covering and just beyond antennal peduncle), near lateral edge of front. Third maxillipeds forming vaguely triangular structure when closed; merus approximately hexagonal; ischium rectangular, outer surface gently convex, median sulcus shallow but distinct; exopod stout, long flagellum present.

Male chelipeds asymmetrical, outer surfaces granulose to rugose. Margins of merus lined with sharp granules. Carpus with 1 large spine on inner distal angle and row of consecutively smaller sharp granules posterior to it. Palm of larger chela swollen; fingers longer than palm, lined with numerous teeth and denticles.

Ambulatory legs relatively long, segments not distinctly flattened or blade-like, 2nd pair longest. Dorsal margin of merus cristate, gently serrate, with short but sharp subdistal spine. Propodus and dactylus ventrally and dorsally keeled, serrated, dactylus long.

Sternal plastron broad. Sternites 1 and 2 completely fused, sternites 2 and 3 separated by distinct groove; sternites 3 and 4 fused, medially interrupted, laterally clefted; sternite 4 broad, male abdomen reaching to about one-third of sternite, just reaching an imaginary line joining the posterior part of the base of the chelipeds; suture between sternites 4 and 5, and 6 and 7 medially interrupted, sternite 7 with median furrow on 7th sternite. Male gonopores coxal.

Male abdomen triangular, lateral margins of segments 4–6 distinctly concave; segment 7 triangular, lateral margins almost straight, tip rounded; anterior part of segment 1 concealed by carapace, but posterior and lateral parts clearly visible.

Terminal and subterminal segments of G1 clearly demarcated; subterminal segment almost straight; distal segment sharply bent outwards, gently tapering to rounded tip. G2 long; distal segment elongate, but shorter than basal segment, tip rounded.

Distribution. The species is known only from the Seychelles, from the islands of Praslin (A. Milne Edwards and Bouvier, 1893), Mahé (Borradaile, 1907; present record) and La Digue (present record).

Remarks. The species described as *D. cristata* by Rathbun, 1894, was synonymized with *S. alluaudi* by Rathbun (1906), who examined the types of both species. The exact locality from which Rathbun's material (1894) of *D. cristata* were collected is not known, the only available information being 'Seychelles'. A re-examination of the types of *D. cristata* confirm Rathbun's synonymy (1906). Both of Rathbun's types are females, and the important male gonopods are not available for comparison with *S. alluaudi*, but there does not appear to be any major differences between *D. cristata* and *S. alluaudi*. Compared to the types of *S. alluaudi, D. cristata* differs in having smoother sub-branchial and suborbital regions, the infraorbital shelf without any tubercles (against 3 distinct tubercles present), the region between the epibranchial and exo-orbital teeth being smooth (not granulated) and only the anterior half of the frontal region is granulated (against entirely granulated). These differences are regarded as size-related. The larger female of *D. cristata*, although ovigerous, is still substantially smaller than the types of *S. alluaudi*.

It is difficult to ascertain if the young male (NHMW 7518) from Mahé belongs to *S. alluaudi*, a species previously known only from the neighbouring island of Praslin. The similarities however, are evident, and it is tentatively assigned there until adult males of *Seychellum* from Mahé become available and compared with those from Praslin. The young male agrees with *S. alluaudi* in most the key aspects, including the form of the antennae, antennules, epistome, endostome and mouthparts. The

mandibular palp of the specimen is almost identical to that of the much larger types. Borradaile (1907: 63) noted that *S. alluaudi* '...was obtained on Morne Seychellois, Mahé, 2200 feet, and Cascade River, Mahé, 800 feet'.

The SMF specimens from La Digue resemble *S. alluaudi* but differ in several aspects: the exo-orbital tooth is more acutely triangular (Fig. 7E), the infraorbital margin lacks a distinct cleft (Fig. 7A–C) and the shelf has 2 distinct median rounded tubercles (Fig. 7B, C) (against 3), the sub-branchial regions are more inflated, the median part of the basal antennal segment is more concave (Fig. 7A), the G1 is straighter, with the tip of the terminal segment directed distinctly upwards (Fig. 8A–D) (not obliquely outwards) and the outer margin of the G2 basal segment has a distinct cleft and appears bilobed (Fig. 8E) (not entire). However, the adult male from La Digue is somewhat larger than the lectotype male from Praslin (cw 51·8 versus 42·8 mm) and the differences observed may be due to size and age. Characters like the degree of inflation of the sub-branchial region of the carapace, strength of the exo-orbital angle, granulation on the infraorbital margin and shelf, and shape of the basal antennal segment are almost certainly size-related. The differences in the G1 (and especially the G2) are more difficult to dismiss. Once more specimens from La Digue and Praslin become available for studies on infraspecific variation, the differences observed between the 2 populations will probably prove to be of specific significance.

Colour. The carapace surface of the small specimen (NHMW 7518) is dark brown, the ventral surface and chelipeds being white with small dark flecks.

Acknowledgements

The authors are grateful to Danièle Guinot for loan of the types of *D. alluaudi* and her hospitality during their visit to the MNHN. Raymond Manning (USNM) kindly sent the types of *D. cristata* for comparison. Hans Gruner (ZMB) and Michael Türkay (SMF) allowed us access to their collections and kindly helped with our many queries. Marco Vannini kindly shared his knowledge of *Deckenia* with the first author. Lipke Holthuis' and Paul Clark's helpful comments regarding the manuscript are gratefully acknowledged. H.K. Yip (National University of Singapore) took the photographs. The study has been partially supported by RP900360 to the first author from the National University of Singapore.

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