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Resurrection of the Genus *Jonesius* and Establishment of a New Genus: Commensal Crabs Associated with Corals from the Indo-Pacific Ocean

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Abstract *Palmyria* n. gen. (Xanthoidea: Trapeziidae) is established. *Jonesius triunguiculatus* (BORRADAILE, 1902) and *Palmyria palmyrensis* (RATHBUN, 1923) are redefined and their synonymies are discussed.

Minute size and superficial similarity have obscured the taxonomic status of species of trapeziid crabs collected from corals throughout the tropical Indo-Pacific Ocean. A study of extensive collections with the purpose of reviewing the genus *Maldivia* BORRADAILE, 1902, revealed the presence of two distinct genera: *Jonesius* SANKARANKUTTY, 1962 and *Palmyria* n. gen.

The specimens upon which this study is based are deposited in the following museums: Allan Hancock Foundation, University of Southern California (AH), Bernice P. Bishop Museum (BPBM), National Science Museum, Tokyo (NSMT), Muséum National d'Histoire Naturelle, Paris (PM), University Museum of Zoology, Cambridge (UMZ), National Museum of Natural History, Smithsonian Institution (USNM).

Family Trapeziidae

Genus *Jonesius* SANKARANKUTTY, 1962

Diagnosis. A commensal crab associated with corals (GARTH, 1939; COLES, 1982). Carapace suboval, wide, convex, regions poorly marked. Anterolateral margin of carapace bearing an intermediate tooth in addition to epibranchial tooth. Posterolateral margin arched, longer than anterolateral. Thoracic sternum oval, first three sternites forming an arcuate triangle (Fig. 1).

Frontal margin horizontal, imperfectly divided into two obsolescent lobes. Orbit occupying anterolateral angle; orbital margin forming a wide arc; inferior internal

orbital angle effaced. Eye with stout calcareous stalk and hemispherical cornea.

Basal antennal segment cylindrical, lying between antennular groove and inferior orbital angle. Anterior margin of buccal frame medially incised, each lobe crested at termination of efferent ridge. Exognath of external maxilliped columnar, its internal distal margin with rounded tooth. Lateral margins of ischium of endognath parallel, distal margin concave; merus obliquely excavate at internal distal angle, external distal angle rounded; internal lateral margins of both ischium and merus fringed with setae; endognathal palp triarticulate, stocky, setose (Fig. 2).

Figs. 1, 2. *Jonesius triunguiculatus* (BORRADAILE), male from Society Is. Anterior sternites (1) and left 3rd maxilliped (2).

Chelipeds markedly unequal. Front margin of cheliped ischium straight. Merus barely projecting beyond carapace. Carpus globose. Manus of large chela robust, inflated, outer surface tuberculate. Manus of smaller chela subcylindrical, outer surface similarly tuberculate, dactyl "blaneiform". Ambulatory legs laterally compressed, sparsely setose, curved; tapered dactyl bearing three curved spines preapically on anterior margin.

First male pleopod slightly sinuous, distally tapered, incurved.

Remarks. BORRADAILE (1902) placed *triunguiculatus* in the genus *Pseudozius*; however, BALSS (1938) had his doubts as to its placement: "*P. triunguiculatus* BORRADAILE 1902 (Hawai, Laccadiven) muss wegen seiner ganz anderen Carapaxform aus dieser Gattung entfernt werden; nach der characteristischen Ausbildung der kleinen Schere glaube ich, dass er in die Nähe von *Domoecia* gehört." GUINOT (1964) transferred it to *Maldivia* BORRADAILE. On comparing the type specimen of *Pseudozius triunguiculatus* with *Maldivia symbiotica*, both deposited in the University Museum of Zoology in Cambridge, we found it bears only a superficial resemblance to the gorgonacean-inhabiting *Maldivia*. SANKARANKUTTY (1962) erected *Jonesius minuta* n. gen., n. sp. for a single specimen collected from Aberdeen Bay (Andaman I.). He evidently failed to realize that the identical species was described as *Pseudozius triunguiculatus* by BORRADAILE (1902). SERÈNE (1984: 295) recognized that *Pseudozius triunguiculatus*

is a synonym of *Jonesius minuta* but differs from *Maldivia symbiotica*: "Par ses chélipèdes éguax et les bords épineux de sa carapace, aussi bien que par le fait qu'elle soit symbiote d'une gorgone, *symbiotica* diffère de la conception que les autres espèces, rapportées sans doute à tort par la suite au genre, donnent aujourd'hui de *Maldivia*. ... l'utilisation du nom du genre de SANKARANKUTTY, avec l'espèce de BORRADAILE comme espèce-type, serait sans doute mieux justifiée ..." SERÈNE failed to act on this: "Cette rectification de nomenclature n'est ici que suggérée et la présent travail utilise *Maldivia* au sens de RATHBUN (1911, 1923)...."

Jonesius may be distinguished from *Maldivia* by the following features: (a) The carapace is suboval, wider than long in *Jonesius* and hexagonal and lenticular in *Maldivia*. (b) The distal margin of maxilliped merus is widely sulcate in *Jonesius* and straight in *Maldivia*. (c) The chelipeds are considerably unequal and dissimilar in *Jonesius* and equal in *Maldivia*.

Jonesius triunguiculatus (BORRADAILE, 1902)

(Figs. 1–4)

Pseudozius triunguiculatus BORRADAILE, 1902, 243, fig. 44; RATHBUN, 1906, 861; BALSS, 1938, 64.
Maldivia gardineri RATHBUN, 1911, 233, pl. 19, figs. 5, 6.
Maldivia galapagensis GARTH, 1939, 22, pl. 8, figs. 1–6; SERÈNE, 1984, 296 (in key). **Syn. nov.**
Pseudozius trianguiculatus: EDMONDSON 1962, 284, figs. 24 b, c, 25 c.
Jonesius minutus SANKARANKUTTY, 1962, 141, figs. 42–45.
Maldivia triunguiculata: GUINOT, 1964, 102, pl. 4, figs. 1–3, pl. 12, fig. 2; 1967, 271; MIYAKE & TAKEDA, 1967, 301, fig. 4; SAKAI, 1967, 73, 82; 1976, 480, pl. 173, fig. 4; SERÈNE *et al.*, 1976, 18; DAI *et al.*, 1983, 250, pl. 4, fig. 5; SERÈNE, 1984, 297, figs. 206, 207.

Material examined. Laccadives. Minikoi I., 20 June 1900, 1 ♀ (UMZ), holotype, on *Leptoria tenuis*, coll. J. S. GARDINER.

Gilbert Islands. Onotoa I., 13 August 1951, 3 ♀ (USNM 195327), coll. P. E. CLAUD.

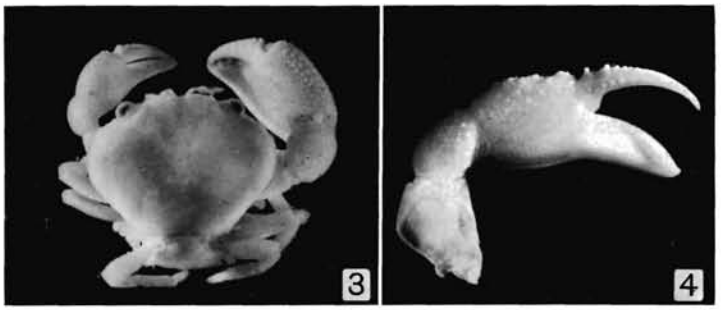
Ryukyu Islands. Kuroshima I., 15 April 1976, 1 ♂ infested by *Sacculina*, 1 ♀, coll. M. TAKEDA.

Ogasawara Islands. Chichi-jima I., Miyanohama, 26 July—8 August 1976, 1 ovig. ♀ (NSMT-Cr 7044), coll. M. TAKEDA.

Izu Islands. Hachijo I., Mitsune, 17 April 1976, 3 ♀, 2 juv. (NSMT-Cr 6636), coll. M. ASAI.

Caroline Islands. Aulong Reef, 1 m, 28 June 1984, 1 ♀ on *Psammocora digitata*, coll. R. KROPP; Babeldaob I., 1 m, 29 July 1984, 1 ♀ on *Psammocora digitata*, coll. R. KROPP; Ponape I., Sokehs Pass, 1 m, 16 November 1984, 1 ♀ on *Goniastrea retiformis*, 1 ♀ on *Fungia*, coll. R. KROPP; Ant Atoll, 5 m, 23 November 1984, 1 ♀ on *Leptastrea purpurea*, coll. R. KROPP.

Mariana Islands. Guam, Cocos Lagoon, 1 m, 6 March 1984, 1 ♂ on *Favites*, 3 March 1984, 1 ♂, 1 ♀ on *Platygyra*, coll. R. KROPP; Cocos I., 15 m, 30 October 1984,



Figs. 3, 4. *Jonesius triunguiculatus* (BORRADAILE), female from Gilbert Is. Carapace with chelipeds and ambulatory legs (3), and small cheliped (4).

1 ♀ on *Pavona*, coll. R. KROPP; Pugua Patch Reef, 1.5 m, 7 February 1984, 1 ovig. ♀ on *Goniastrea retiformis*, coll. R. KROPP; Agat Bay, 2 m, 29 March 1984, 1 ♀ on *Platygyra daedalea*, coll. R. KROPP; Luminao Reef, 1 m, 13 October 1984, 1 ♀ on *Goniastrea retiformis*, 1 ♀ on *Leptoria phrygia*, 27 October 1984, 2 ♂ on *Cyphastrea serialia*, coll. R. KROPP; Agana Bay, 7 m, 25 April 1984, 3 ♂, 2 ♀ on *Leptoria phrygia*, coll. R. KROPP; Pago Bay, 3 m, 18 September 1984, 1 ♀ on *Platygyra pini*, coll. R. KROPP; Piti Bay, 1 m, 6 October 1984, 2 ♂ on *Leptoria phrygia*, coll. R. KROPP; Pagan I., Liyan, 5 m, 9 March 1981, 2 ♂, 2 ♀ on *Goniastrea retiformis*, coll. R. KROPP; Palapala Bay, 1 m, 8 March 1981, 1 ♂, 4 ♀ on *Porites murrayensis*, 14 March 1981, 1 ♂, 1 ovig. ♀ on *Psammocora diagitata*, coll. R. KROPP.

Hawaiian Islands. Molokai I., 1 ♀ (USNM 19583), 'Albatross'.

Pearl and Hermes reef, 23 July 1930, 1 ♂ (USNM 112570), coll. P. SALTSTOFF.

Society Islands. Tetaro I., Raiatea, 29 April 1957, 1 ♂ (USNM 213821), coll. J. S. GARTH.

Galapagos Islands. Onslow I., near Charles I., 27 January 1934, 2 ♂, 2 ♀ (AH) on *Pavona*, coll. J. S. GARTH; Seymour I., 18 April 1937, 1 ♂ (USNM) coll. Woodbridge WILLIAMS.

Description. Carapace feebly shagreened, granules immediately behind front larger, arranged in almost parallel lines. Frontal margin medially concave, sinuous. Postorbital angle inconspicuous. Inferior orbital angle developed into rounded tooth, microscopically tuberculate. Anterolateral margin rounded, bearing two effaced teeth (Fig. 3). Posterolateral margin strongly convergent. Anterior margin of buccal frame horizontal, minutely notched medially.

Exognath of external maxilliped columnar, somewhat tapered; small rounded tooth on inner margin. Lateral margins of ischium of endognath subparallel, proximal margin obliquely truncate, distal margin evenly concave. Inner distal angle of merus truncate, outer distal angle rounded.

Chelipeds markedly unequal. Ischial anterior margin straight. Merus feebly granulate, anterior margin rounded. Carpus tuberculate, globose. Manus of large chela massive, tuberculate, on upper margin tubercles arranged in longitudinal rows;

largest tubercles on superior external surface. Entire upper and outer surfaces covered with fine down-like setae. Dactyl and immovable finger bearing prominent granules, their cutting edges conspicuously toothed. Manus of smaller chela less tuberculate, dactyl with three rows of pointed tubercles proximally on upper margin; cutting edges sharply carinate, smooth, furnished with long setae interiorly, meeting throughout (Fig. 4). Upper margin of ambulatory legs carinate, minutely granulate, sparsely setose. Dactyl with five pairs of curved, cornute spines on interior surface; large cornute tooth on dactylar tip; anterior margin with three curved preapical spines.

First male pleopod somewhat flattened, a row of setae on inner margin, distally curved.

Remarks. BORRADAILE (1902) erected *Pseudozius triunguiculatus* for a single female taken on *Leptoria tenuis* in Minikoi lagoon. The characteristic features—"front ... with a wide shallow bight... the anterolateral edge with three low, blunt teeth, the hindermost of which is hardly distinguishable... no spines on the arm or wrist... the fingers... in the small hand these edges blade-like"—are all apparent in the accompanying illustration.

Maldivia gardineri was described by RATHBUN (1911) in excellent detail—"Two denticles on the antero-lateral margin... Front very broad, slightly deflexed, divided into two subtruncate lobes... Larger palm much swollen, covered with granules which increase in size towards the upper surface where they become tubercles and are arranged in rows... Fingers of small claw... prehensile edges sharp, entire." Description and photographs leave virtually no doubt that it is identical with BORRADAILE's species. GUINOT (1964) recognized this similarity and placed *Maldivia gardineri* as a junior synonym of *Maldivia triunguiculata.* It was thus accepted by most subsequent authors (MIYAKE & TAKEDA, 1967; SERÈNE *et al.*, 1976; SAKAI, 1976; DAI *et al.*, 1983; SERÈNE 1984).

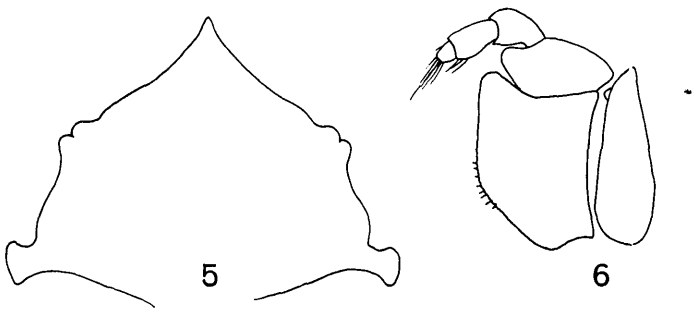
GARTH (1939) erected *galapagensis* for specimens collected from *Pavona* near Charles Island in the Galapagos. However, the description and the attendant illustrations provide distinctive features that leave no doubt that it is identical with *triunguiculata*: "Two denticles on anterolateral margin... front broad, slightly deflexed, but faintly divided into lobes... Fingers of small hand long, narrow, thin, curved... a single row of setae lining the inner surface"—and remarkably, an illustration of the distinctive third maxilliped. On examining the paratypes kindly sent by Prof. GARTH, we were able to confirm our observation as to their synonymic status.

SANKARANKUTTY (1962) described *Jonesius minuta*—"The front is straight... slightly emarginate in the middle... The anterolateral border carries two teeth... The dorsal and outer surfaces of the wrist and palm are covered with granules, which towards the outer ventral side become flattened, indistinguishable"—unaware of the presence of *triunguiculata.* SERÈNE realized that SANKARANKUTTY's *Jonesius minutus* is *P. triunguiculatus*: "... l'espèce *Jonesius minutus* SANKARANKUTTY, 1962, qui est identique au *Pseudozius triunguiculatus* BORRADAILE, 1902." However, he synonymized it with *Maldivia triunguiculata.*

Distribution. Indo-Pacific Ocean from Aldabra to the Sociely Is., the Galapagos, and Japan.

Genus ***Palmyria*** nov.

Diagnosis. A commensal trapeziid crab, associated with corals (SERÈNE, 1984). Carapace subhexagonal, slightly convex, shagreened, regions of carapace poorly defined. Frontal margin medially grooved, bilobed. Epibranchial tooth separating anterior and posterior lateral margin. Anterolateral margins rounded, bearing two intermediate teeth. Posterolateral margin strongly convergent. Thoracic sternum oval, first three sternites forming an ogive (Fig. 5).



Figs. 5, 6. *Palmyria palmyrensis* (RATHBUN), male from Aldabra. Anterior sternites (5) and left 3rd maxilliped (6).

Orbit too shallow to conceal eye, cut out of anterolateral angle of carapace. Postorbital tooth acute, directed obliquely outward. Inferior internal orbital angle spiniform, incurved, prominent beyond frontal margin. Crests of endostome defining efferent canals well developed. Anterior margin of buccal frame sinuous, medially notched. Exognath of external maxilliped columnar, strongly tapering distally, quadrate tooth distally at its inner margin. Ischium of endognath with lateral margins parallel, distal margin obliquely sulcate, anterior and exterior internal angles produced; merus ovoid, its inner angle excavate, outer angle produced. Inner margin of both ischium and merus setose (Fig. 6). Chelipeds markedly unequal. Anterior margin of cheliped ischium with arcuate tooth. Merus short, its anterior margin crested, denticulate. Carpus spinose at inner angle. Chela prominently tuberculate on exterior surface. Fingers denticulate; dactyl curved, fitting closely upon immovable finger, curved tip crossing. Ambulatory legs laterally compressed, their upper margins cristate. Dactyl with curved, cornute tip. Superior distal surface of dactyl behind tip with three long chitinous spinules.

First male pleopod stout, sinuous, subtruncate.

Type species. Maldivia palmyrensis RATHBUN, 1923.

Remarks. The new genus *Palmyria* is closely related to the coral-dwelling *Jonesius*. The following features are important in distinguishing the new genus from the latter:

(a) The first three sternites of thoracic sternum forms an ogive; in *Jonesius* the first sternite forms an arcuate triangle. (b) The ischium of the third maxilliped has its anterior angles produced; in *Jonesius* the anterior margin is concave. (c) Fingers of smaller chella are armed with few unequal teeth on cutting edges; in *Jonesius* fingers with knife-like edges, their inner surface lined with a row of stiff setae. (d) The first pleopod of the male is stout, sinuous and subtruncated at the tip, while in *Jonesius* the pleopod is strongly tapering and curved distally.

Examination of these features led to a reevaluation of the generic status: *Palmyria* sufficiently distinct from *Jonesius* is to be considered a distinct genus.

Palmyria palmyrensis (RATHBUN, 1923)

(Figs. 5–8)

Maldivia palmyrensis RATHBUN, 1923, 38; EDMONDSON 1923, 19; GUINOT, 1964, 103, figs. 53, 54, pl. 4, figs. 4, 5, pl. 12, fig. 1; 1967, 271; SAKAI, 1967, 82; 1976, 481; SERÈNE *et al.*, 1976, 18; SERÈNE 1984, 296, figs. 203–205.

Material examined. Aldabra Island. 15 May 1954, 12 m, 1 ♂ (MPB7487), 'Calypso' Expedition.

Palmyra Island. 1913, 1 ♀ (BPBM S312), holotype, 1 ♀ (USNM 90400), coll. C. MONTAGUE COOKE Jr.

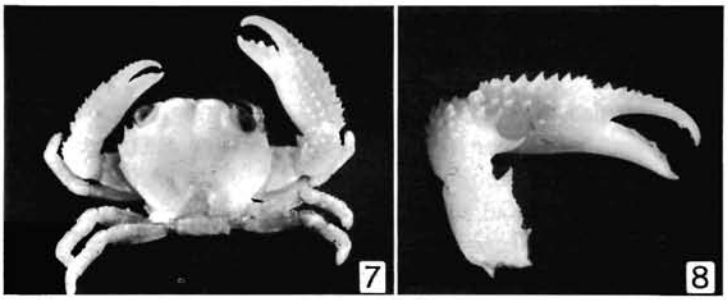
Description. Carapace shagreened, tubercles prominent near front and anterolateral margins. Frontal margin medially grooved, finely dentate. Anterolateral margin with three well developed acute teeth. Postorbital angle conspicuously spinose, curved (Fig. 7). Inferior internal orbital tooth visible beyond frontal margin.

Anterior margin of buccal frame sinuous, scalloped. Anterior margin of efferent canal noticeably raised, rounded.

Chelipeds considerably developed, markedly unequal. Anterior margin of ischium crenate, prominently spinose. Anterior margin of merus crested, serrate, distal angle produced into pronounced spine. Carpus tuberculate, tubercles of outer surface prominent, conical; a small spine distally at inner angle, a larger spine subdistally. Manus with outer surface armed with conical tubercles, serially arranged in alternate rows of small and large tubercles. Tubercles smaller, effaced near lower margin. Immovable finger of chela with toothed crest; dactyl armed with few shallow teeth. Proximal half of upper margin of dactyl with three rows of conical tubercles (Fig. 8). Upper margins of meral, carpal and propodal articles of ambulatory legs carinate, minutely serrate. Curved tapered dactyl. Dactylar tip cornute, elongate, preapically on superior margin two spines, half as long as tip. A few short bristles proximally on superior margin, two longitudinal rows of four bristles each on posterior surface.

First male pleopod arcuate, subdistally setose, tip truncate.

Remarks. RATHBUN erected *M. palmyrensis* for a single female found on Palmyra Island. The characteristic features—three-spined anterolateral margin, pronounced



Figs. 7, 8. *Palmyria palmyrensis* (RATHBUN), male from Aldabra. Carapace with chelipeds and ambulatory legs (7) and small cheliped (8).

posterior orbital tooth, prominently spinose merus, carpus and chela—are enumerated in RATHBUN's original description.

In her well illustrated description GUINOT (1964: 103, figs. 53, 54, pl. 4, figs. 4, 5, pl. 12, fig. 1) wrote of her material from Aldabra: "Chez *M. palmyrensis*, la carapace est plus convexe,... plus granuleux, avec une encoche médiane marquée... Le bord antéro-latéral, granuleux, porte quatre dents aiguës dont une située à l'angle orbitaire externe... Sur la main du petit chèlipéde, les tubercules sont plus pointus; les doigts du petit chèlipéde... sont moins larges, à bord préhensile armé de quelques dents basses et irrégulières..." Excellent notes are thus provided for recognition of the species, that leave no doubt as to its identity and have been followed by subsequent authors (SAKAI, 1967, 1976; SERÈNE, 1968, 1984; SERÈNE *et al.*, 1976).

Distribution. Aldabra, Palmyra I., and Japan.

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