



## Scientific Note

# Morphological considerations and range extensions for species of the superfamily Squilloidea (Crustacea: Stomatopoda) in the southwest Atlantic

RODRIGO T. BENTO<sup>1,2</sup> & GUSTAVO A. S. DE MELO<sup>1</sup>

<sup>1</sup>Museu de Zoologia da Universidade de São Paulo – Caixa Postal 42594, CEP 04299-970, São Paulo, SP, Brasil.

<sup>2</sup>E-mail: canideos@yahoo.com.br

**Abstract.** The superfamily Squilloidea, found on the coasts of Brazil, Uruguay, and Argentina, is represented by 18 species, arranged in 6 genera. Analysis of material obtained from major projects carried out in South America made it possible to obtain data on morphological variations and for range extensions within the limits of the Brazilian coast.

**Key words:** Squillidae, Brazil, Uruguay, Argentina, morphological variation

**Resumo. Considerações morfológicas e faixas de distribuição para espécies da superfamília Squilloidea (Crustacea: Stomatopoda) no Atlântico Sudoeste.** A superfamília Squilloidea, encontrada no litoral brasileiro, uruguaio e argentino é representada por 18 espécies, distribuídas em 6 gêneros. A análise de material proveniente de importantes projetos realizados na América do Sul possibilitou a obtenção de dados referentes às variações morfológicas e aumento distribucional dentro dos limites da costa brasileira.

**Palavras-chave:** Squillidae, Brasil, Uruguai, Argentina, variação morfológica

The order Stomatopoda Latreille, 1817, includes the crustaceans that are popularly known in Brazil as “camarão louva-a-deus,” “pitu louva-a-deus,” “tamburutaca,” “tamarutaca,” and “lagosta-gafanhoto,” among others. Some species of considerable size are exploited commercially: *Squilla empusa* Say, 1818 in the North Atlantic, *Hemisquilla braziliensis* (Moreira, 1903) in the South Atlantic, *Squilla mantis* (Linnaeus, 1758) in the Mediterranean, and *Oratosquilla oratoria* (De Haan, 1844) in the Indo-Pacific.

Manning (1980), basing his analysis on morphological characters and behavioral studies, divided the order Stomatopoda into 4 superfamilies and 12 families. Ahyong & Harling (1997) proposed a new classification for the group, based on phylogenetic aspects, in which they divided the order Stomatopoda into 7 superfamilies and 18 families, and retained two families, Squillidae Latreille, 1802 and Harpiosquillidae Manning, 1980, within the superfamily Squilloidea. The results of the cladistical analyses of Ahyong (2001)

culminated in the taxonomic alteration of the family Harpiosquillidae, which became a single genus, *Harpiosquilla* Holthuis, 1964, within the Squillidae. This family was then composed of 46 genera, and is the only family belonging to the superfamily Squilloidea.

According to Bento (2009), the representatives of the family Squillidae in the southwest Atlantic (Brazil, Uruguay, and Argentina) consist of 18 species, arranged in 6 genera. Analysed specimens of Squillidae were deposited in the collections of the Museu de Zoologia da Universidade de São Paulo (MZUSP) and in Museu Nacional do Rio de Janeiro (MNRJ), Brazil. Most of them were collected in the course of three major projects: Grupo Executivo de Desenvolvimento da Indústria da Pesca do Governo do Rio Grande do Sul (GEDIP); Programa de Avaliação do Potencial Sustentável dos Recursos Vivos da Zona Econômica Exclusiva (REVIZEE); Rio Doce; and Sardinhas, Ovos e Larvas (SOL). Previous knowledge of distributions was based on the reports of Manning

(1969a) and Gomes-Corrêa (1998). The abbreviations used are: m, meters; Fig., Figure; Proj., Project; ST., Station; TL., Total Length.

### Taxonomy

#### Order Stomatopoda Latreille, 1817

#### Superfamily Squilloidea Latreille, 1802

#### Family Squillidae Latreille, 1802

#### Genus *Cloridopsis* Manning, 1968

*Cloridopsis dubia* (H. Milne Edwards, 1837)

**Material examined.** Brazil: *Pará* – 1 ♂ and 1 ♀ (MNRJ – 5869). *Paraíba* – 1 ♂ (MNRJ – 5861). *Pernambuco* – Pedra Point, 1 ♀ (MZUSP – 4969). *Bahia* - Itaparica Island, 2 ♂ (MNRJ – 5866). *Rio de Janeiro* – Governador Island, 2 ♂ (MNRJ –

5862); Guanabara Bay, 2 ♂ and 3 ♀ (MNRJ – 5870). *São Paulo* – Santos, 1 ♂ (MZUSP – 564); 1 ♀ (MZUSP – 566). *Santa Catarina* – São Francisco do Sul, 1 ♀ (MZUSP – 4757).

**Remarks.** Morphological characteristics that showed variations: the rostral plate is generally elongate and subtriangular, with a short or long apex, without a point; the mandibular palp may be present or absent. The ornamentation of the telson varies widely, as reported by Manning (1969a), with marginal, tuberculate or undulate carinae, denticles, and teeth (Fig. 1). Specimens longer than 100 millimeters have the denticles and teeth of the telson bilobate.



**Figure 1.** Ornamentation of the telson of *Cloridopsis dubia*, male, TL. 120 mm, scale bar = 10 mm, MZUSP (564).

The species has an amphi-American geographical distribution, occurring in the western Atlantic and eastern Pacific. It is thermophilic stenothermal, and does not reach those regions influenced by sub-antarctic (cold-temperate) waters on both sides of the American continent. According to Manning (1969a), some specimens analyzed from the eastern Pacific showed differences in the arrangement of the carinae and in the size of the cornea, which is larger in relation to those of specimens from the Atlantic. These characteristics are not sufficient to separate the species into subspecies, but they demonstrate that the elevation of the Isthmus of Panama at the end of the Pliocene and the beginning of the Pleistocene, separating the faunas of the western Atlantic and eastern Pacific, allowed the occurrence of a certain degree of differentiation between the populations. The presence of the Panama Canal does not change this relationship, because it is a freshwater passage and forms an effective barrier for the entire marine fauna, with the exception of a few euryhaline species

(Briggs, 1974).

#### Genus *Pterygosquilla* Hilgendorf, 1890

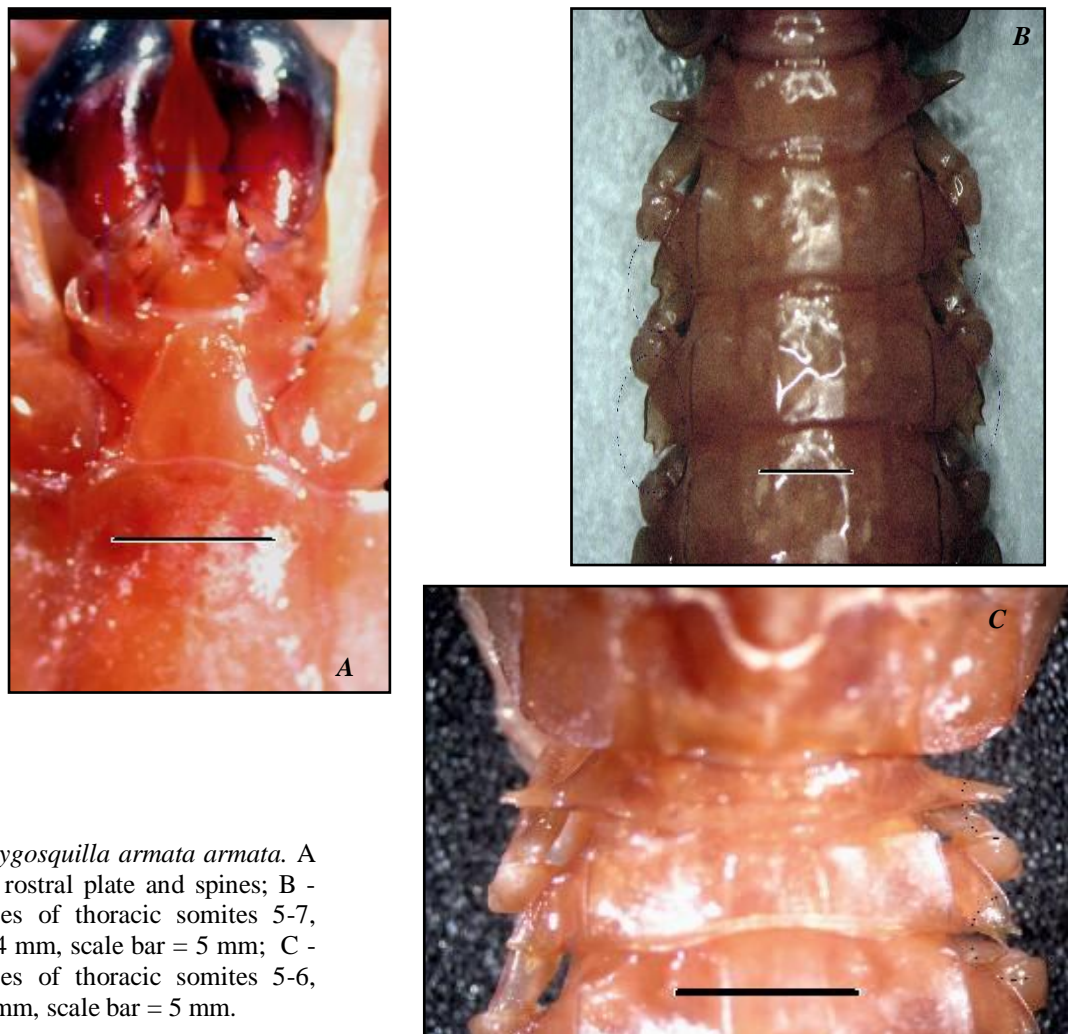
*Pterygosquilla armata armata* (H. Milne Edwards, 1837)

**Material examined.** Argentina: *Gulf of São Jorge*, 76 m, 10 ♀ and 10 ♂ (MZUSP – 18005).

**Remarks.** Richardson (1953) described the following meristic and morphological variations in *Squilla armata* H. Milne Edwards (= *Pterygosquilla armata armata*), found in specimens from New Zealand: change in the number of intermediate and submedian denticles of the telson, asymmetry and wide variation in the number (6-8) of teeth on the dactylus of the raptorial claw, in addition to bearing denticles on the telson with the apex subdivided in up to 3 parts. He thus proposed the validation of a subspecies with the name *S. armata* var. *schizodontia*. Manning (1966), comparing the differences found in specimens from New Zealand with material from Chile, noted that regional variations also existed, such as the number (6-9) of teeth of the dactylus of the raptorial claw in Chilean

specimens, the number of accessory spines on each side of the fifth abdominal somite, 0-7 in those from Chile and 2-10 in those from New Zealand; in addition to the number of intermediate denticles varying from 7-11 in the specimens from New Zealand and from 7-13 in those from Chile; and some bifurcations of the teeth in specimens from Chile. Comparing these differences with material from South Africa, Manning (1966) proposed a division into 3 subspecies, one for each area: Chile, South Africa, and New Zealand. Analyzing a large number of specimens of *Pterygosquilla armata* from South Africa, Manning (1969b) divided it into subspecies, as he had previously proposed in 1966, noting that an endemic subspecies occurs on the African coast. Comparing the division between the corneal lobes, the submedian carinae of abdominal somites 1-5, the accessory spinules of the fifth abdominal somite, and the lobe between the spines of the basal prolongation of the uropod, he established a regional division for each subspecies, *P. armata armata* for South America, *P. a. capensis* for South Africa, and *P. a. schizodontia* for New Zealand. Manning also presented a key for the

subspecies, based on adults of 100 millimeters in length, thus geographically fragmenting the former Gondwana distribution of *Squilla armata sensu* Manning (1966) into isolated subspecies. Variations in the number of denticles of the telson are very common at the species level in the family Squillidae. However, the wide numerical variation in the teeth of the raptorial claw is peculiar to the species of the genus *Pterygosquilla*, as is the tendency for division found in the teeth and spines. According to this tendency, two specimens found in Argentina showed a close similarity to those from Chile; between the western Atlantic and the eastern Pacific species of this genus, there is a tendency to bear teeth and spines with a bifurcate apex. The differential characters of these two specimens consist of the shape of the rostral plate and the lateral processes of thoracic somites 5-7, together with the division of teeth and spines (Figs. 2a-c). Comparing data from the literature on the 3 regional subspecies of *P. armata*, the incidence of bifurcation of denticles of the telson is very common, as in these two specimens, but the bifurcation of the lateral processes had not yet been recorded.



**Figure 2.** *Pterygosquilla armata armata*. A - shape of the rostral plate and spines; B - lateral processes of thoracic somites 5-7, female, TL. 6,4 mm, scale bar = 5 mm; C - lateral processes of thoracic somites 5-6, female, TL. 7 mm, scale bar = 5 mm.

The subspecies *P. armata armata* has a Magellanic geographical distribution, occurring in the extreme south of the American continent between the western Atlantic and the eastern Pacific, in the so-called Magellanic Province. It is cryophilic and does not reach those regions influenced by warm-temperate waters on both sides of the American continent.

**Genus *Squilla* Fabricius, 1787**

*Squilla empusa* Say, 1818

**Material examined.** United States - *Massachusetts* - 1 ♀ (MNRJ - 19954); *South Carolina* - 1 ♂ (MNRJ - 19955). French Guiana - "Oregon," ST. 4171, 06°16'N; 55°56'W, 1 ♀ and 2 ♂ (MZUSP - 8360); 3 ♀ and 1 ♂ (MZUSP - 8359).

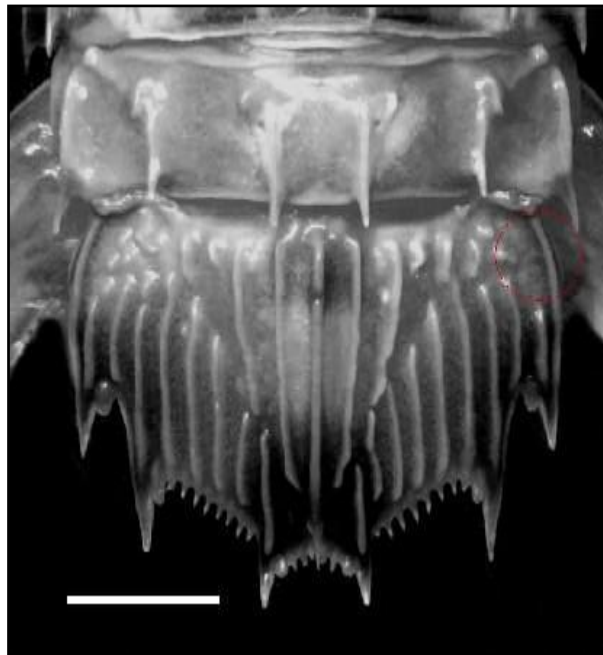
**Remarks.** Manning (1969a), comparing specimens from the Americas, pointed out some intra-specific differences between the specimens that reach a limit in the North Atlantic, such as: (1) rostral plate more slender and elongate, with subparallel lateral margins; (2) anterior margin of the ocular somite provided with an apical tubercle;

(3) postero-lateral apices of the lateral processes of thoracic somites 6-7 acute, spiniform; (4) submedian carinae of the fourth abdominal somite may be spinous; (5) telson with more-elongated marginal spines and longer post-anal quill. However, these differences are not sufficient for the separation of this population into possible species or subspecies. In the material examined, numerical variation in the intermediate denticles (6-9) and submedian denticles (3-5) of the telson, on both sides, was observed.

*Squilla grenadensis* Manning, 1969

**Material examined.** Brazil: *Bahia* - REVIZEE, ST. 4, 13°04'S; 38°23'W, 91 m, 1 ♂ (MNRJ - 17104).

**Remarks.** The material examined shows 6 moveable spines on the proximal segment of the uropodal exopodite, but according to Manning (1969a) and Fausto-Filho (1975) there are 7. The species has, according to the original description and the material examined, a small pre-lateral lobe on the telson (Fig. 3), but this observation was not corroborated by Rodrigues & Young (2005).



**Figure 3.** Pre-lateral lobe on the telson of *Squilla grenadensis*, male, TL. 60 mm, scale bar = 10 mm.

**Genus *Meiosquilla* Manning, 1968**

*Meiosquilla quadridens* (Bigelow, 1893)

**Previous distribution.** Western Atlantic: North Carolina, Florida, Bahamas, Gulf of Mexico, Colombia, Venezuela, Guiana, Surinam, and Brazil (Maranhão, Rio Grande do Norte, Paraíba, and Pernambuco).

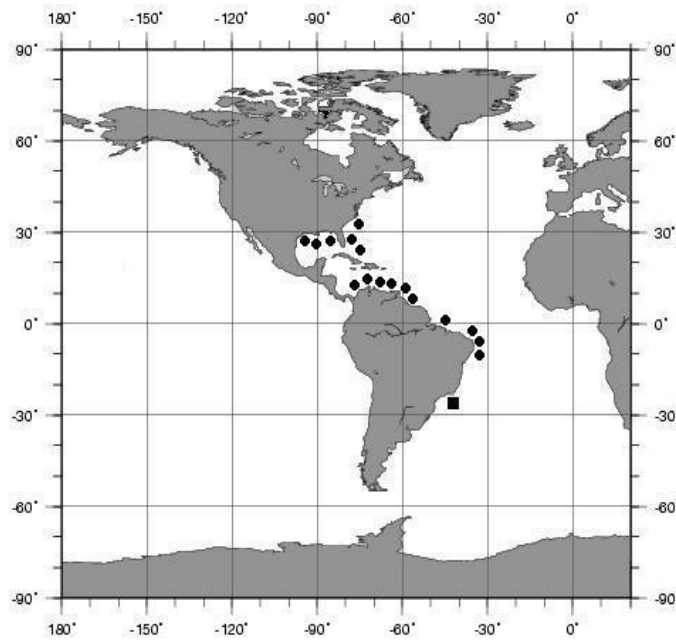
**Material examined.** Brazil: *Rio de Janeiro* - Itacuruça, 1 ♂ (MNRJ - 6012); Guanabara Bay, 1 ♂ (MZUSP - 20145); 1 ♀ (MZUSP - 20148) (Fig.

4).

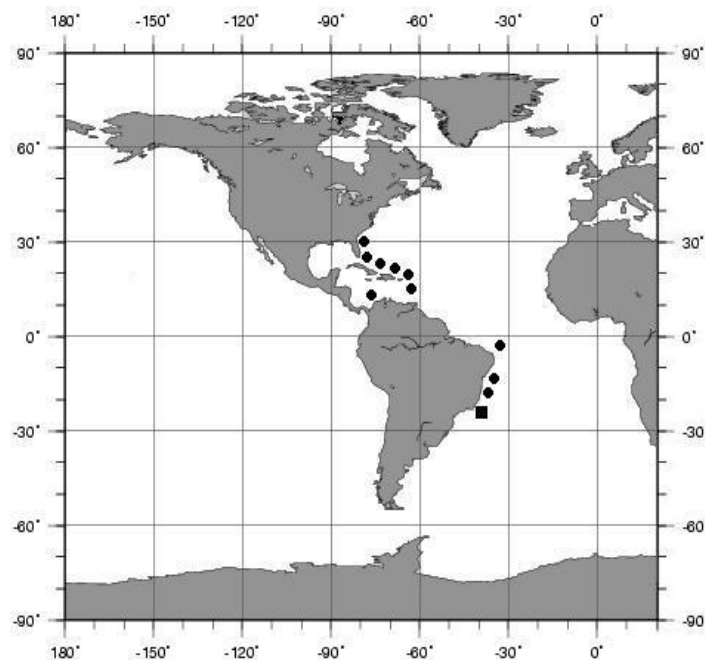
*Meiosquilla tricarinata* (Holthuis, 1941)

**Previous distribution.** Western Atlantic: Bahamas, Florida, Virgin Islands, Lesser Antilles, Colombia, and Brazil (Fernando de Noronha, Pernambuco, and Bahia).

**Material examined.** Brazil: *Espírito Santo* - Proj. Rio Doce, ST. 43, 19°17'S; 38°18'W, 50 m, 1 ♂ (MZUSP - 9299); ST. 54, 18°54'S; 39°15'W, 41 m, 3 ♂ (MZUSP - 9303) (Fig. 5).



**Figure 4.** Distribution of *Meiosquilla quadridens*. The previously known distribution of species is indicated by black circles and the present distribution by black squares.



**Figure 5.** Distribution of *Meiosquilla tricarinata*. The previously known distribution of species is indicated by black circles and the present distribution by black squares.

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### References

Ahyong, S. T. 2001. Revision of the Australian Stomatopod Crustacea. **Records of the Australian Museum**, 26 (Supplement): 1-326.

- Ahyong, S. T. & Harling, C. 1997. The phylogeny of the Stomatopod Crustacea. **Australian Journal of Zoology**, 48(6): 607-642.
- Bento, R. T. 2009. A família Squillidae (Crustacea: Hoplocarida: Stomatopoda) no Atlântico sul ocidental. Master Thesis. Instituto de Biociências, Universidade Estadual Júlio de Mesquita Filho, Rio Claro, Brazil, 193 p.
- Briggs, J. C. 1974. **Marine zoogeography**. McGraw Hill, New York, 475 p.
- Fausto-Filho, J. 1975. Sobre a ocorrência de *Squilla grenadensis* Manning, 1969 no litoral brasileiro (Stomatopoda-Squillidae). **Arquivos de Ciências do Mar**, 15(2): 133-135.
- Gomes-Corrêa, M. M. 1998. Malacostraca. Hoplocarida. Pp. 289-298. *In*: Young, P. S. (Ed.). **Catalogue of crustacea of Brazil**. Museu Nacional, Rio de Janeiro, série livros 6, 717 p.
- Manning, R. B. 1966. Notes on some Australian and New Zealand stomatopod Crustacea, with an account of the species collected by the Fisheries Investigation Ship Endeavour. **Records of the Australian Museum**, 27(4): 79-137, figs. 1-10.
- Manning, R. B. 1969a. Stomatopod Crustacea of the western Atlantic. **Studies in Tropical Oceanography**, 8: 1-380, figs. 1-91.
- Manning, R. B. 1969b. Notes on some Stomatopoda Crustacea from Southern Africa. **Smithsonian Contributions to Zoology**, (1): 1-17, figs. 2-3.
- Manning, R. B. 1980. The superfamilies, families, and genera of Recent Stomatopod Crustacea, with diagnoses of six new families. **Proceedings of the Biological Society of Washington**, 93(2): 362-372.
- Richardson, L. R. 1953. Variation in *Squilla armata* M. Edw. (Stomatopoda) suggesting a distinct form in New Zealand waters. **Transactions of the Royal Society of New Zealand**, 81(2): 315-317, figs. 1-3,
- Rodrigues, C. & Young, P. S. 2005. Stomatopoda (Crustacea, Stomatopoda) coletados pelo REVIZEE. **Arquivos do Museu nacional, Rio de Janeiro**, 63(2): 233-245.

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