AN ILLUSTRATED KEY FOR DENDROBRANCHIATA SHRIMPS FROM THE NORTHERN COAST OF SÃO PAULO STATE, BRAZIL.

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Abstract

This study aimed to provide an illustrated identification key to distinguish Dendrobranchiata marine shrimps which, occur in the littoral north São Paulo State as deep as to 40m. A total of 13 species were captured using a shrimp fishery boat with two double-rig nets. Monthly trawlings were carried out from 1995 to 2000 in the region of Ubatuba, SP. This key includes the commercial value of species such as the penaeids *Xiphopenaeus kroyeri, Farfantepenaeus brasiliensis, F. paulensis, Litopenaeus schmitti, Artemesia longinaris* and the solenocerids *Pleoticus muelleri*. In addition to these species, shrimps that are not of commercial interest were also include such as *Rimapenaeus constrictus, Acetes americanus, Peisos petrunkevitchi* and the sicionids *Sicyonia dorsalis, S. typica, S. laevigata* and *S. parri*. The key proposed here might facilitate the identification of Dendrobranchiata shrimps by a variety of users, including scientific researchers as well as people responsible for making the laws that regulate fisheries, principally in the protection period.

Key words: *Identification key, Dendrobranchiata, shrimps, São Paulo.*

Resumo

O presente estudo teve como objetivo a elaboração de uma chave de identificação ilustrada para diferenciar as espécies de camarões marinhos Dendrobranchiata, com ocorrência no litoral do Estado de São Paulo até a profundidade de 40m. As 13 espécies apresentadas neste trabalho foram obtidas mediante coletas mensais durante os anos de 1995 a 2000 na região de Ubatuba, SP . Nesta chave estão incluídas as espécies de interesse econômico, como os peneídeos *Xiphopenaeus kroyeri, Farfantepenaeus brasiliensis, F. paulensis, Litopenaeus schmitti, Artemesia longinaris* e o solenocerídeo *Pleoticus muelleri.* Além destas espécies, também foram adicionados os camarões que não são alvos das frotas pesqueiras, entre eles, *Rimapenaeus constrictus, Acetes americanus, Peisos petrunkevitchi* e os sicionídeos *Sicyonia dorsalis, S. typica, S. laevigata* e *S. parri*. A chave proposta servirá como uma ferramenta no auxílio da identificação dos camarões Dendrobranchiata, quer seja por pesquisadores ligados à área científica, como também por pessoas relacionadas aos órgãos responsáveis pelo controle da pesca, principalmente, na época do defeso.

Palavras-chave: *Chave de identificação, Dendrobranchiata, camarões, São Paulo.*

Introduction

Seven families, 56 genera and approximately 500 species of Dendrobranchiata shrimps are recognized in the world (Pérez-Farfante & Kensley 1997). Based on specimens from specific collections, D'Incao (1995) related 26 genera and 61 species from Brazilian coast. In São Paulo State 20 species pertaining to 14 genera of Dendrobranchiata are recognized (D'Incao 1995, Costa *et al*. 2000, Costa 2002).

The species correct identification is essential as a background for basic biological research like ecological investigations, studies on population dynamics, fisheries impact and statistical analyses of landings (Pérez Farfante 1998). In spite of their economic value and abundance in the estuarine and marine ecosystems of São Paulo State, these peneids have been poorly studied.

The shrimps have a thin integument and the body has two regions: the cephalotorax and the abdomen. Many of them have a prominent rostrum with dorsal teeth and some genera witch ventral teeth. The eyes are stalked. The head bears a pair of antenna, a pair of antennules, a pair of mandibles and two pairs of maxillae. The thorax has three pairs of maxillipeds and five pairs of pereopods (legs). The first five abdominal segments bears swimming appendages (pleopods) and the sixth segment a tail fan formed by the terminal telson and the uropods pair (Fig. 1).

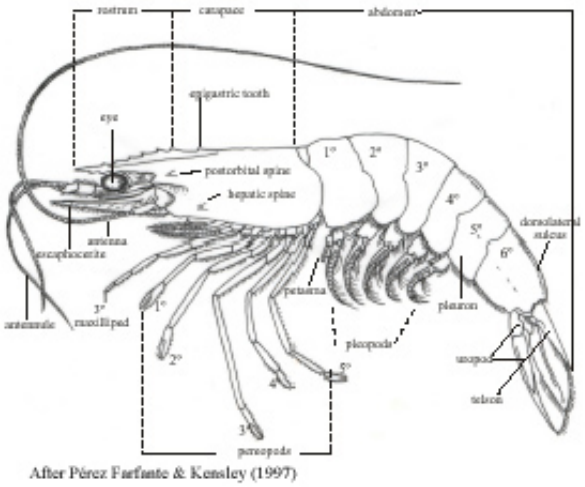

Fig. 1 - Schematic drawing of a penaeidean shrimp in lateral view (Pérez Farfante & Kensley – 1997)

There are three major groups of shrimps: Dendrobranchiata, Stenopodidea and Caridea.

The Dendrobranchiata (with two superfamilies: Penaeoidea and Sergestoidea) are characterized by the first three pairs of pereopods usually chelate with similar size and shape (Fig. 4), the pleura of the second abdominal segment overlapping the third but not the first (Fig. 1) and dendrobranchia type gills (Pérez Farfante 1988). The male copulatory structure (petasma) is located on the first abdominal pleopod, while the female (thelycum,) is found between the fourth and fifth pair of pereopods. The thelycum (Fig. 2) can be closed (spermatic mass are internally placed on thelycum plates) or opened (spermatic mass is exposed on thelycum region) (Dall *et al*. 1990). Females release eggs directly into the water.

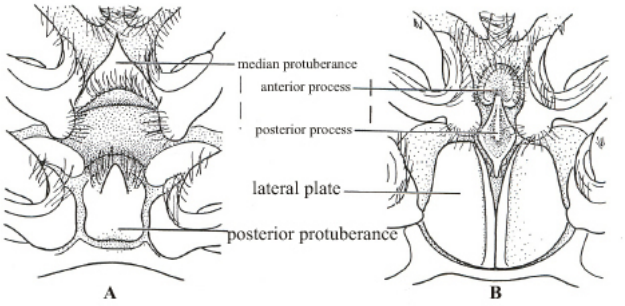

Fig. 2 - Some features of the female external genitalia. (A) Opened thelycum and (B) Closed thelycum. (Pérez- Farfante & Kensley, 1997)

A second group of shrimps, the Stenopodidea, exhibit an arrangement of the abdominal pleura similar to the Dendrobranchiata, but differ by having the third of first three pairs of chelate pereopods considerably elongate and trichobranchia type gills. Males lack a petasma and females carry the eggs on the pleopods.

The Caridea is characterized by the third pair of pereopods never being chelate, by the pleura of the second abdominal somite overlapping those of both the first and third somites (Fig. 3A and 3B) and phyllobranchia type gills. Males lack a petasma and females also carry the eggs on the pleopods (Pérez-Farfante 1988).

In order to contribute for a better assessment of local biodiversity and to easy shrimp identification by a variety of users, this study aimed to provide an illustrated identification key to distinguish Dendrobranchiata marine shrimps which occur on São Paulo State coast as deep as 40m deep.

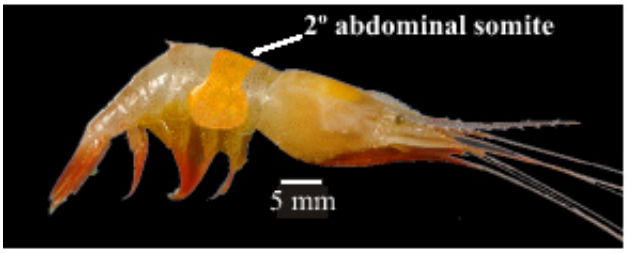

Fig 3A - Lateral view of a Caridea specimen

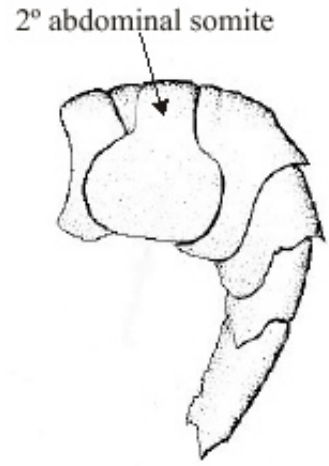

Fig 3B - Lateral view of Caridea abdome evidencing the second abdominal pleura.

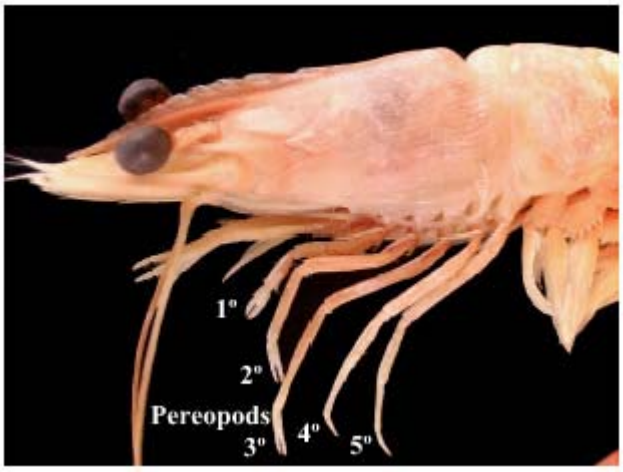

Fig. 4 - Lateral view of Dendrobranchiata carapace, evidencing the pereopods.

Material and Methods

All the species were collected along north littoral of São Paulo State, Brazil (23°26'S / 44°47'W and 23°55'S / 45°35'W), using a shrimp fishery boat equipped with a double rig net system. Monthly trawling was carried out from 1995 and 2000. Samples were taken along transects near the island and continental rocky coast, as well as bay regions until 40m deep. Dendrobranchiata shrimps were identified according to D'Incao (1995) and Pérez Farfante & Kensley (1997).

General geographical and bathymetrical distribution were obtained from literature (Pérez Farfante 1988, Boschi *et al.* 1992, D'Incao 1995, Pérez Farfante & Kensley 1997). The species bathymetrical distribution for the studied area was obtained by monthly collections (1998 to 2000). Details about the environmental factors characterization can be found in Bertini *et al*. (2001).

Results and discussion

The captures of shrimps show the presence of 4 families, 9 genera and 13 species. The Sergestoidea were represented by 2 species, while the Penaeoidea by 11 species belonging to the families Penaeidae, Sicyoniidae and Solenoceridae.

DENDROBRANCHIATA SPECIES
Superfamily SERGESTOIDEA Dana, 1852
Family Sergestidae Dana, 1852
Peisos petrunkevitchi Burkenroad, 1945: Western Atlantic - Brazil (Rio de Janeiro to Rio Grande do Sul, except on Parana State), Uruguay and Argentina (Chubut).
Depth registered in the present study: pelagic to 30m
Depth maximum mentioned in the literature: pelagic to 50m

Acetes americanus Ortmann, 1893: Western Atlantic - Guyana, Puerto Rico to Brazil (Pará to Rio Grande do Sul).
Depth registered in the present study: pelagic to 25m
Depth maximum mentioned in the literature: pelagic to 40m

Superfamily PENAEOIDEA Rafinesque-Schmaltz, 1815
Family Penaeidae Rafinesque-Schmaltz, 1815
Farfantepenaeus brasiliensis (Latreille, 1817) (pink-shrimp): Western Atlantic - USA (Cape Hatteras, North Carolina) to Brazil (Amapá to Rio Grande do Sul).
Depth registered in the present study: from 2m to 40m
Depth maximum mentioned in the literature: shallow water to 366m

Farfantepenaeus paulensis (Pérez Farfante, 1967) (pink-shrimp): Western Atlantic - Brazil (Bahia to Rio Grande do Sul), Uruguay and Argentina (Mar del Plata).
Depth registered in the present study: from 2m to 40m.
Depth maximum mentioned in the literature: shallow water to 150m

Litopenaeus schmitti (Burkenroad, 1936) (white shrimp legitime): Western Atlantic - Cuba (Baia de Matanzas) to Brazil (Amapá to Rio Grande do Sul).
Depth registered in the present study: from 2m to 25m
Depth maximum mentioned in the literature: shallow water to 50m

Artemesia longinaris Bate, 1888: Western Atlantic - Brazil (Rio de Janeiro to Rio Grande do Sul), Uruguay and Argentina (province of Chubut).
Depth registered in the present study: from 5m to 30m
Depth maximum mentioned in the literature: 2 to 125m

Rimapenaeus constrictus (Stimpson, 1874): Western Atlantic - Canada (Nova Scotia) to Brazil (Amapá to Santa Catarina).
Depth registered in the present study: from 2m to 40m
Depth maximum mentioned in the literature: 1 to 127m

Xiphopenaeus kroyeri (Heller, 1862) (seven-bob shrimp): Western Atlantic - USA (Virginia) to Brazil (Amapá to Rio Grande do Sul). Eastern Pacific - Mexico (Sinaloa) to Peru (Paita).
Depth registered in the present study: from 2m to 25m
Depth maximum mentioned in the literature: shallow water to 70m

Family Solenoceridae Wood-Mason, 1891
Pleoticus muelleri (Bate, 1888): Western Atlantic - Brazil (Espírito Santo to Rio Grande do Sul), Uruguai and Argentina (Santa Cruz).
Depth registered in the present study: from 10m to 40m
Depth maximum mentioned in the literature: shallow water to 600m

Family Sicyoniidae Ortmann, 1898 (called rock shrimps)
Sicyonia dorsalis Kingsley, 1878: Western Atlantic - USA (Cape Hatteras, North Carolina) to Brazil (Amapá to Santa Catarina).
Depth registered in the present study: from 2m to 25m
Depth maximum mentioned in the literature: 3 to 420

Sicyonia typica (Boeck, 1864): Western Atlantic - USA (North Carolina) to Brazil (Amapá to Rio Grande do Sul).
Depth registered in the present study: from 2m to 40m
Depth maximum mentioned in the literature: from shallow water to 100m

Sicyonia laevigata Stimpson**,** 1871: Western Atlantic - USA (Beaufort, North Carolina) to Brazil (Amapá to Rio Grande do Sul). Eastern Pacific – Panama (Gulf of Panamá) to Mexico (Mazatlan).
Depth registered in the present study: only in sheltered shore in each bay, i.e. 8 to 10m
Depth maximum mentioned in the literature: from shallow water to 100m

Sicyonia parri (Burkenroad, 1934): Western Atlantic - USA (North Carolina) to Brazil (Maranhão to São Paulo).
Depth registered in the present study: only in sheltered shore in Ubatuba bay, i.e. 8 to 10m
Depth maximum mentioned in the literature: from shallow water to 87m.

Acknowledgements

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Title: An illustrated key for dendrobranchiata shrimps from the northern coast of São Paulo State, Brazil.

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Key to Dendrobranchiata species from the northern coast of São Paulo State

1 - Reduction in size or lack of the fourth and fifth pairs of pereopods; rostrum shorter than eyestalk (Fig. 5) (Superfamily SERGESTOIDEA) 2

- The fourth and fifth pairs of pereopods well developed; rostrum usually longer than eyestalk (Fig. 4) (Superfamily PENAEOIDEA)..... 3

2 - Rostrum with 1 dorsal tooth; lack of the fourth and fifth pairs of pereopods .....***Acetes americanus*** (Fig. 6)

- Rostrum with 2 dorsal teeth; reduction in size of the fourth and fifth pairs of pereopods.....***Peisos petrunkevitchi*** (Fig. 7)

3-Postorbital spine present (exclusively of the Family Solenoceridae) (Fig. 8A and Fig.1).....***Pleoticus muelleri*** (Fig. 8B)

- Postorbital spine absent.....4

4 - Rostrum with dorsal and ventral teeth (Fig. 9).....5

- Rostrum with dorsal teeth only.....7

5 - Adrostral sulcus short ending at level of epigastric tooth (Fig.10A).....***Litopenaeus schmitti*** (Fig. 10B)

- Adrostral sulcus long, surpassing epigastric tooth, reaching almost to posterior margin of carapace (Fig. 11).....6

6 - Thelycum with anterior portion of lateral plates not covering posterior process, i.e. posterior process exposed (Fig. 12A); petasma with distomedial projection short with dorsal part little curved (Fig. 12B and Fig. 12C); dorsolateral sulcus of sixth abdominal somite narrow (Fig. 12D).....***Farfantepenaeus paulensis*** (Fig. 12E)

- Thelycum with anterior portion of lateral plates covering posterior process, i.e. posterior process not exposed (Fig. 12A); petasma with distomedial projection long with dorsal part more curved (Fig. 12B); dorsolateral sulcus of sixth abdominal somite without narrowing (Fig. 12D); dark spot at juncture of third and fourth abdominal somites.....***Farfantepenaeus brasiliensis*** (Fig. 12F).

7 - Rostrum long, sinuous and with teeth joined only up to eyestalk (Fig. 13A and Fig. 13B).....8

- Rostrum short, with dorsal teeth only (Fig. 13C and Fig. 13D).....9

8 -Rostrum with 5 unlike teeth (Fig. 13A).....***Xiphopenaeus kroyeri*** (Fig. 14A)

- Rostrum with teeth well similars in size and shape and limited to base, and bearing 7 to 14 teeth (Fig. 13B).....***Artemesia longinaris*** (Fig. 14B)

9 - Teeth of dorsal region of carapace present on variable number; rostrum bearing less than 5 dorsal teeth; rigid carapace (Fig. 13D).....10

- Teeth of dorsal region of carapace absent; rostrum usually with 9 dorsal teeth (Fig. 13C).....***Rimapenaeus constrictus*** (Fig. 15)

10 - Carapace with 1 dorsal tooth. (Fig. 13D)..... ***Sicyonia dorsalis*** (Fig. 16)

- Carapace with 2 or more dorsal teeth 11

11 - Carapace with 2 dorsal teeth (Fig. 17A)..... ***Sicyonia typica*** (Fig. 17 B)

- Carapace with 3 dorsal teeth (Fig. 18A and Fig. 18B).....12

12 -Rostrum with 2 dorsal teeth (Fig. 18A).....***Sicyonia laevigata*** (Fig. 19A)

- Rostrum with 3 dorsal teeth. (Fig. 18B).....***Sicyonia parri*** (Fig. 19B)

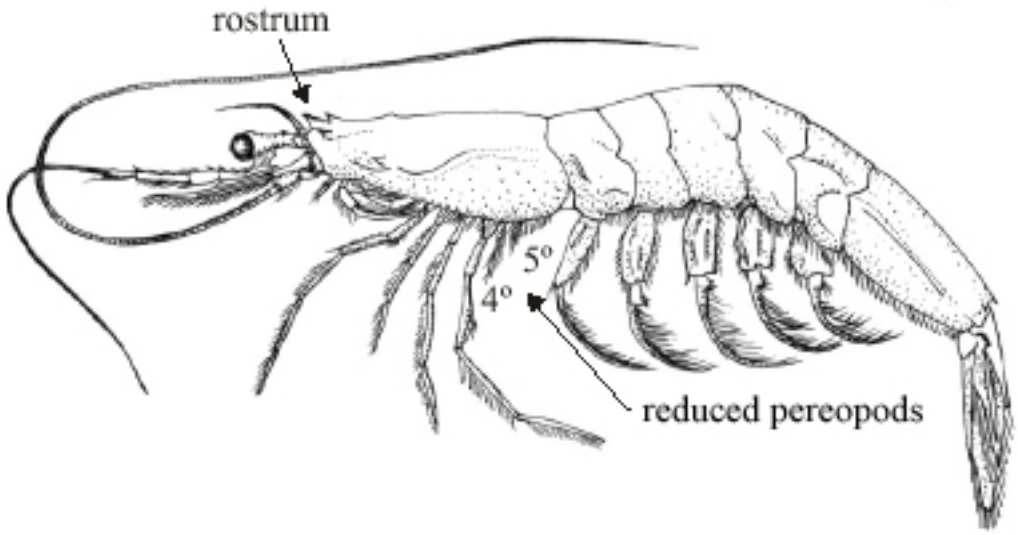

Fig. 5 - Lateral view of Sergestoidea, evidencing a rostrum short and 4º and 5º pereopods reduced. (Pérez- Farfante & Kensley, 1997)

Fig. 6 - Acetes americanus

Fig. 7 - Peisos petrunkevitchi

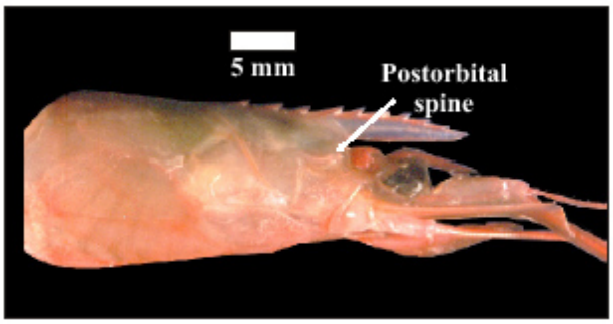

Fig. 8A - Lateral view of Penaeoidea carapace, evidencing of the postorbital spine.

Fig. 8B - Pleoticus muelleri

Fig. 9 - Lateral view of Penaeoidea rostrum, evidencing of the teeth ventral.

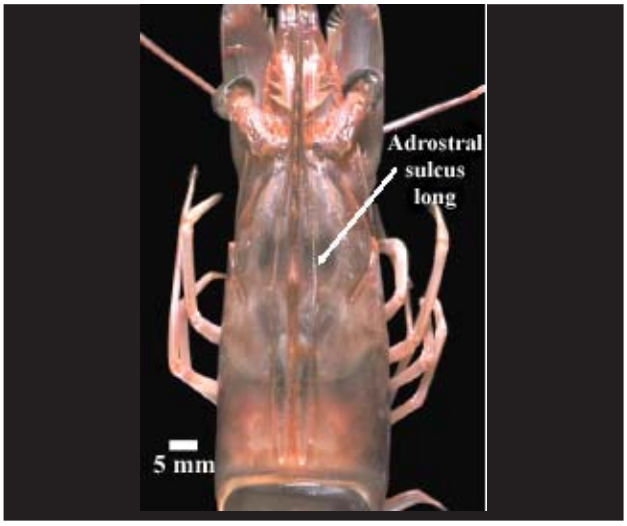

Fig. 11 – Dorsal view of Penaeoidea carapace, evidencing the adrostral sulcus long.

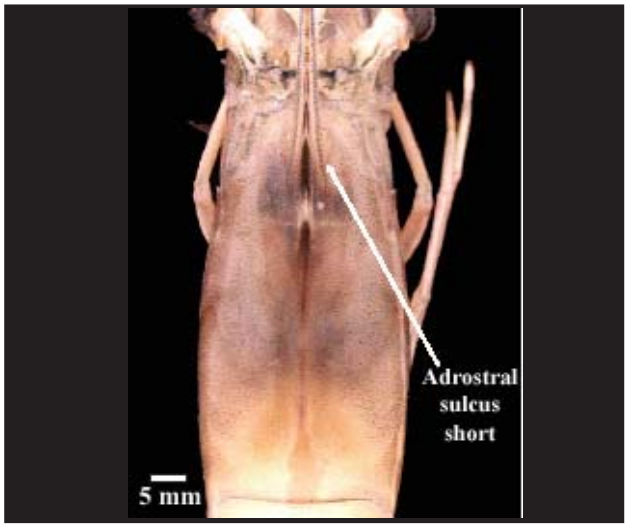

Fig. 10A - Dorsal view of Penaeoidea carapace, evidencing the adrostral sulcus.

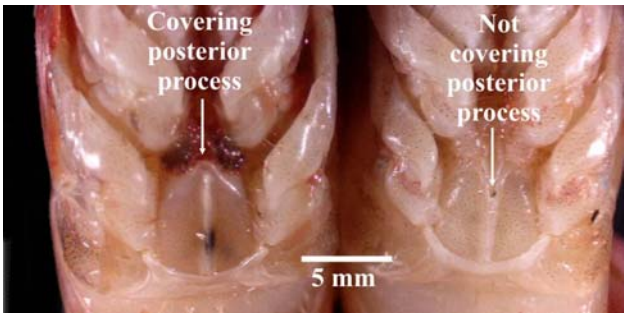

Fig. 12A - Thelycum. Posterior process in detail.

Fig. 10B - Litopenaeus schmitti

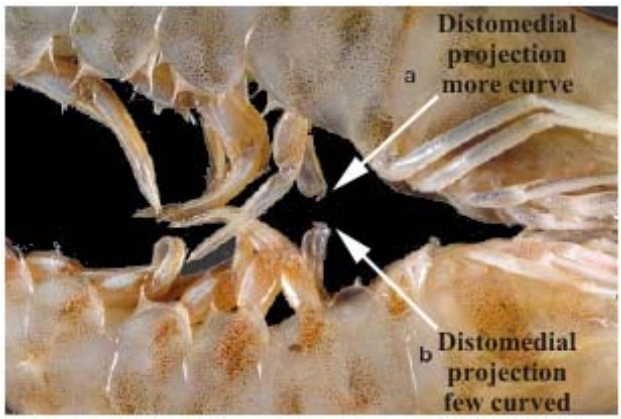

Fig. 12B - Petasma. Distomedial projection in detail.

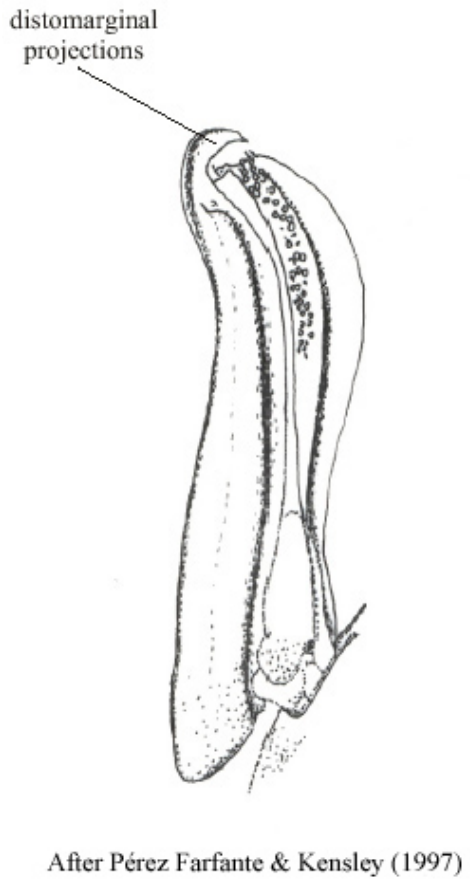

Fig. 12C Some features of the male external genitalia. Petasma. (Pérez Farfante & Kensley, 1997)

Fig. 12E - Farfantepenaeus paulensis

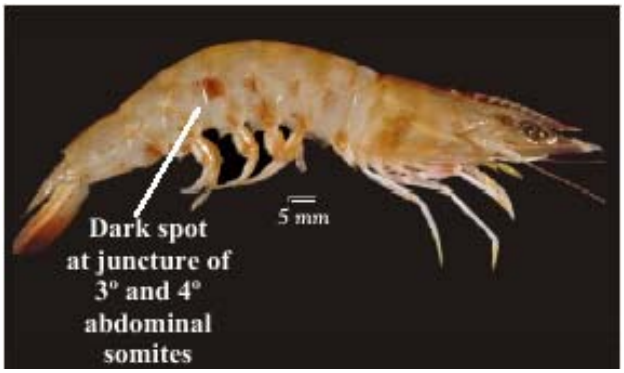

Fig. 12F - Farfantepenaeus brasiliensis

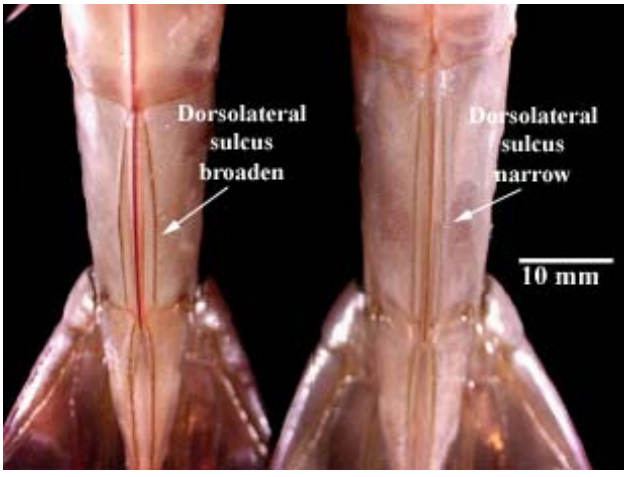

Fig. 12D – Dorsal view of sixth abdominal somite. Detail of the dorsolateral sulcus.

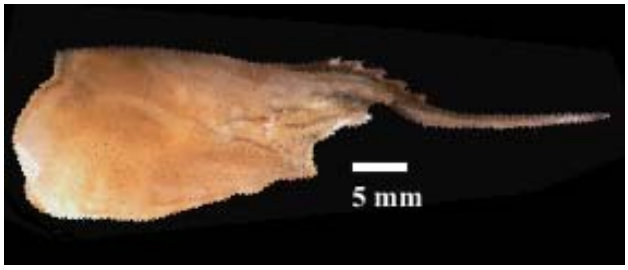

Fig. 13A – Xiphopenaeus kroyeri. Lateral view of rostrum.

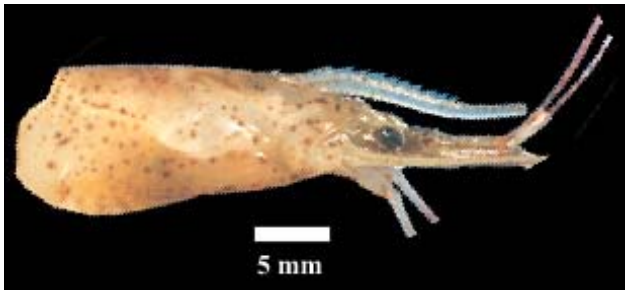

Fig. 13B – Artemesia longinaris. Lateral view of rostrum.

Fig. 13C – Rimapenaeus constrictus. Lateral view of rostrum.

Fig. 13D – Sicyonia dorsalis.Lateral view of rostrum.

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Fig. 14A - Xiphopenaeus kroyeri

Fig. 14B - Artemesia longinaris

Fig. 15 - Rimapenaeus constrictus

Fig. 16 - Sicyonia dorsalis

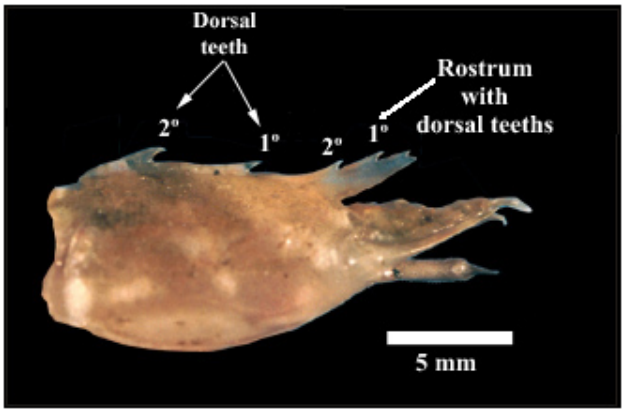

Fig. 17A – Lateral view of Sicyonia carapace

Fig. 17B - Sicyonia typica

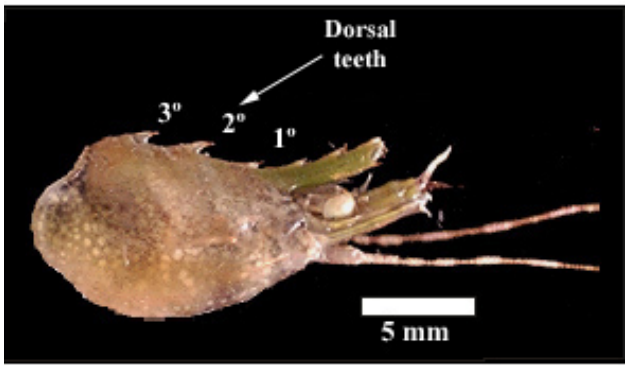

Fig. 18A – Lateral view of Sicyonia carapace. Detail of number dorsal teeth on the carapace.

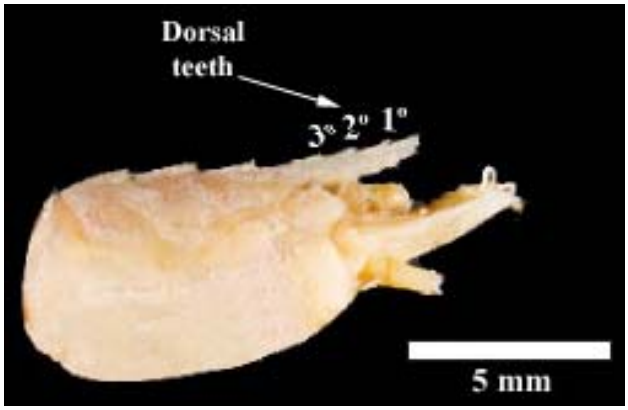

Fig. 18B – Lateral view of Sicyonia carapace. Detail of number dorsal teeth on the rostrum.

Fig. 19A - Sicyonia laevigata

Fig. 19B - Sicyonia parri