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KEY TO THE LARVAE AND DECAPODIDS OF GENERA OF THE INFRAORDER PENAEIDEA FROM THE SOUTHERN BRAZILIAN COAST.

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ABSTRACT

An ilustrated key with criteria for differentiating phases and stages of fifteen genera of penaeid larvae and megalopa of the Southtern Brazilian coast was constructed entirely from planktonic samples and published larval descriptions. The key identifies the genera *Aristeomorpha; Gennadas; Pleoticus; Solenocera; Mesopenaeus; Sicyonia; Xiphopenaeus; Trachypenaeus; Artemesia; Parapenaeus; Penaeus; Sergestes; Acetes; Peisos* and *Lucifer.*

Keywords: Key, Penaeids, Larvae.

INTRODUCTION

Studies on larval abundance and distribution and their relations with biotic and abiotic factors are important in fisheries management. These studies, however, can be hampered by the difficulty of correctly identifying the species. The larval stages of the majority of known shrimp species are as yet poorly described.

Twenty-five species of shrimps from twenty genera of the Infraorder Penaeidea are reported by D'Incao (personal communication) to occur off the Southern Brazilian coast. The larval phases of only four of these species have been fully described. These are: *Penaeus schmitti* (Garcia-Pinto and Ewald, 1974), *Penaeus brasiliensis* (Lares, 1974), *Penaeus paulensis* (Iwai, 1978) and *Pleoticus muelleri* (Iorio et al., 1990). The larval phases of another seven species have been partially described: *Aristeomorpha foliacea* (Heldt, 1955), *Artemesia longinaris* (Boschi and Scelzo, 1977), *Trachypenaeus constrictus* (Pearson, 1939; Kurata, 1970), *Xiphopenaeus kroyeri* (Renfro and Cook, 1962; Kurata, 1970), *Sergestes atlanticus* (Gurney and Lebour, 1940), *Acetes americanus* (Kurata, 1970) and *Lucifer faxoni* (Brooks, 1882). Subrahmanyam (1971) described briefly six genera (*Penaeus, Parapenaeus, Xiphopenaeus, Trachypenaeus, Solenocera* and *Sicyonia*) from the Mississippi coast, but did not attempt to identify these to species.

Cook (1966) constructed the most comprehensive identification key for identifying larvae of the six most commercially important shrimp genera of the Gulf of Mexico (*Penaeus, Parapenaeus, Trachypenaeus, Xiphopenaeus,* *Sicyonia* and *Solenocera*). This key is useful for separating penaeid larvae from those of other crustacean groups and to identify the different developmental stages. Cook's (1966) use of the setal formulae of the protopod and endopod of the antenna for the protozoea phase, and the spine patterns on the body for the mysis phase and decapodids has since been followed by other authors.

Boschi and Scelzo (1969), in their study of decapod larvae of the Argentinean coast, constructed an identification key which included three penaeidean genera of the region (*Artemesia, Pleoticus* and *Peisos*).

A preliminary key for the larvae of fifteen genera reported to occur off the Southern Brazilian coast is given here. A main feature of this key is the identification of criteria useful in recognizing the larval stages of these shrimps.

MATERIALS AND METHODS

This key is based chiefly on plankton collected material. However, larvae of *Artemesia longinaris, Penaeus paulensis, Pleoticus muelleri* and *Peisos petrunkevitchi* were compared with larvae reared in the laboratory from known parents. Larvae of *Acetes americanus* were compared with those of *A. japonicus* similarly reared in the laboratory. Larvae of the genera *Gennadas, Aristeomorpha, Trachypenaeus, Parapenaeus* and *Solenocera* were compared with specimens in the Natural History Museum, London, originally taken from the Atlantic Ocean and identified by Gurney.

As already mentioned, during their life cycles decapods grow through a series of ecdyses where morphological changes are either radical (metamorphosis) between phases, or small when the general appearance remains almost the same between stages.

External characters, such as the carapace and abdomen surface and the telson are easy to observe and can be used satisfactorily in a key to generic level. Length comparisons must be avoided as much as possible because of their subjectivity. For the mysis phase and decapodid it is possible to devise a single key for all stages because most of the important characters remain constant.

In the protozoea phase however, external characters are so variable between stages that it is necessary to construct a separate key for each stage. The only conservative character in this phase is the antenna.

Identification Key to Larval Stages

1.-Body pear-shaped or oval; single median eye usually present; three pairs of appendages present (most anterior pair unbranched); caudal furca bearing at least 3 pairs of setae .... **Nauplius phase** (Not included in key).

-Not as above 2

2.(1)-Anterior portion larger, partially covered by carapace with 2 pairs of appendages (most anterior pair unbranched); posterior portion formed by slender segmented thorax and an abdomen which may or may not be segmented with rudimentary or absent pereiopods, ending as caudal furca ....3(**Protozoea phase)**

-Carapace apposed to body, covering all functional cephalothoracic appendages; abdomen six-segmented followed by telson and biramous uropods...5

3.(2)-Eyes not mobile, covered by carapace; abdomen unsegmented; pereiopods absent..**Protozoea I**

-Eyes mobile (covered by carapace in *Lucifer*); abdomen segmented; pereiopods present at least as buds...4

4.(3)-Uropods absent...**Protozoea II**

-Uropods present...**Protozoea III**

5.(2)-Thoracic appendages with exopods well developed and setose; pleopods if present, rudimentary and non-functional..........................6 (**Mysis Phase)**

-Thoracic appendages with exopods rudimentary or absent; pleopods well developed and setulose..**Decapodid**

6.(5)-Antennal scaphocerite without spine on distal outer margin; pleopods usually absent or bud-like structures...**Mysis I**

-Antennal scaphocerite with spine on distal outer margin; pleopods present 7

7.(6)-Pleopods small and unjointed...**Mysis II**

-Pleopods long and jointed.......................................**Mysis III** (or late mysis)

Identification Key to Genera

Protozoea I

1.-Rostrum present (Fig. 1o); setal formula of antennal protopod and endopod is 0+1+2 (Fig.2o)...*Lucifer*

-Rostrum absent; setal formula of antennal protopod and endopod is not 0+1+2 2

2.(1)-Spine present on anterior portion of carapace...3

-Spine absent on anterior portion of carapace..8

3.(2)-Spine on anterior portion of carapace not bifurcated................................4

-Spine on anterior portion of carapace bifurcated.......................................6

4.(3)-Spine on anterior portion of carapace with row of spine-like outgrowths (Fig. 1M); setal formula of antennal protopod and endopod 1+2+3 (Fig. 2M) ....*Acetes*

-Spine on anterior portion of carapace smooth..5

5.(4)-Posterior region of carapace with two dorsal spines (Fig . 1I); setal formula of antennal protopod and endopod is 2+2+3 (Fig. 2I) ....*Pleoticus*

-Posterior region of carapace with one dorsal spine (Fig. 1N); setal formula of antennal protopod and endopod is 1+2+3 (Fig. 2N) ....Peisos

6.(3)-Spine on anterior portion of carapace with more than two branches (Fig. 1L); setal formula of antennal protopod and endopod is 2+2+3 (Fig. 2L); telson wider than long, with 5+5 spines (Fig. 3L)...........................*Sergestes*

-Spine on anterior portion of carapace with no more than two branches 7

7.(6)-Inner branch of spine on anterior portion of carapace smaller than outer branch; 7 paired spines on margin of carapace (Fig. 1J); setal formula of antennal protopod and endopod is 2+2+2 (Fig. 2J) telson not wider than long, bearing 7+7 setae (Fig. 3J) .... *Solenocera*

-Inner branch of spine on anterior portion of carapace same size as outer branch; 3 paired spines on margin of carapace (Fig. 1K); setal formula of antennal protopod and endopod is 2+2+2 (Fig. 2K); telson wider than long, bearing 7+7 setae (Fig. 3K) ....*Mesopenaeus*

8.(2)-Frontal organ present..9

-Frontal organ absent..13

9.(8)-Antennule and antenna of equal length..10

-Antennule and antenna of different lengths..11

10.(9)-Setal formula of antennal protopod and endopod is 2+2+2 (Fig. 2B) ....*Gennadas*

-Setal formula of antennal protopod and endopod is 1+2+3 (Fig. 2G) ....*Parapenaeus*

11.(9)-Antennule about twice as long as antenna; setal formula of antennal protopod and endopod is 1+2+3 (Fig. 2C)....................................*Sicyonia*

-Antennule about one and a half times as long as antenna........................12

8.(2)-Frontal organ present..9

-Frontal organ absent..13

9.(8)-Antennule and antenna of equal length..10

-Antennule and antenna of different lengths..11

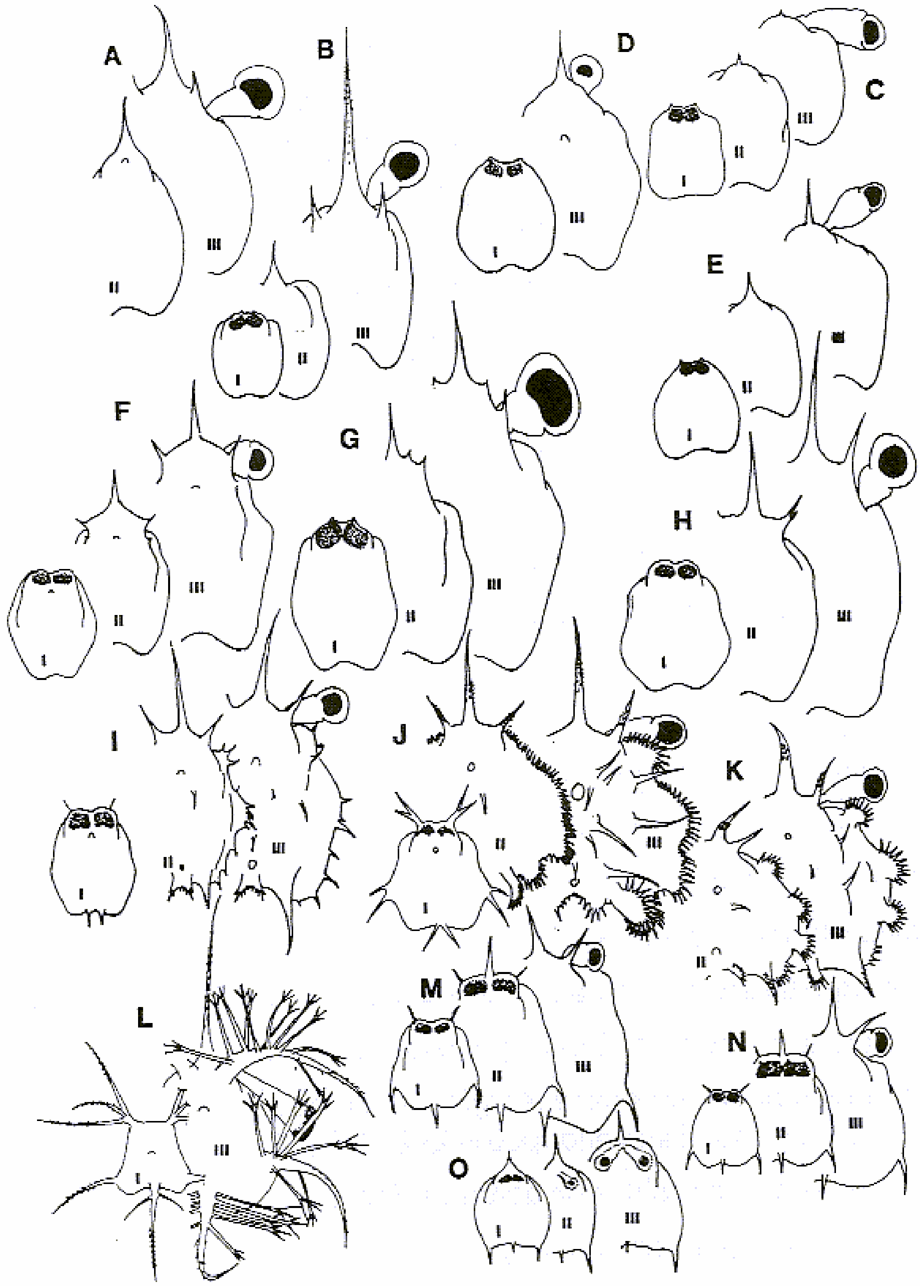

Fig. 1. Carapace. Protozoeae I-III. A, *Aristeomorpha*; B, *Gennadas*; C, *Sicyonia*; D, *Xiphopenaeus*; E, *Trachypenaeus*; F, *Artemesia*; G, *Parapenaeus*; H, *Penaeus*; I, *Pleoticus*; J, *Solenocera*; K, *Mesopenaeus*; L, *Sergestes*; M, *Acetes*; N, *Peisos*; O, *Lucifer*.

10.(9)-Setal formula of antennal protopod and endopod is 2+2+2 (Fig. 2B) .... *Gennadas*

-Setal formula of antennal protopod and endopod is 1+2+3 (Fig. 2G) .... *Parapenaeus*

11.(9)-Antennule about twice as long as antenna; setal formula of antennal protopod and endopod is 1+2+3 (Fig. 2C) .... *Sicyonia*

-Antennule about one and a half times as long as antenna 12

12.(11)-Antennal endopod with 5 terminal setae (Fig. 2D) .... *Xiphopenaeus*

-Antennal endopod with 4 terminal setae (Fig. 2E) .... *Trachypenaeus*

13.(8)-Carapace with small hump (Fig. 1F); setal formula of antennal protopod and endopod is 0+1+3 (Fig. 2F) .... *Artemesia*

-Carapace smooth (Fig. 1H); setal formula of antennal protopod and endopod is 1+1+2 (Fig. 2H) .... *Penaeus*

Protozoea II

1.-Carapace margin with spines 2

-Carapace margin smooth 8

2.(1)-Frontal organ present 3

-Frontal organ absent 4

3.(2)-Endopod of maxilla 3-segmented .... *Acetes*

-Endopod of maxilla 4-segmented .... *Peisos*

4.(2)-Eyestalk covered by carapace (Fig. 1o) .... *Lucifer*

-Eyestalk free from carapace 5

5.(4)-Supraorbital spine on carapace absent .... *Sergestes*

-Supraorbital spine on carapace present 6

6.(5)-Rostrum smooth; carapace margin with processes (Fig. 1I); setal formula of antennal protopod and endopod is 2+2+3 (Fig. 2I) .... *Pleoticus*

-Rostrum with small spines on dorsal surface 7

7.(6)-Carapace margin serrulate (Fig. 1J) .... *Solenocera*

-Carapace margin with processes (Fig. 1K) .... *Mesopenaeus*

8.(1)-Supraorbital spine on carapace absent 9

-Supraorbital spine on carapace present 13

9.(8)-Rostrum equal in length to or longer than eyestalk 10

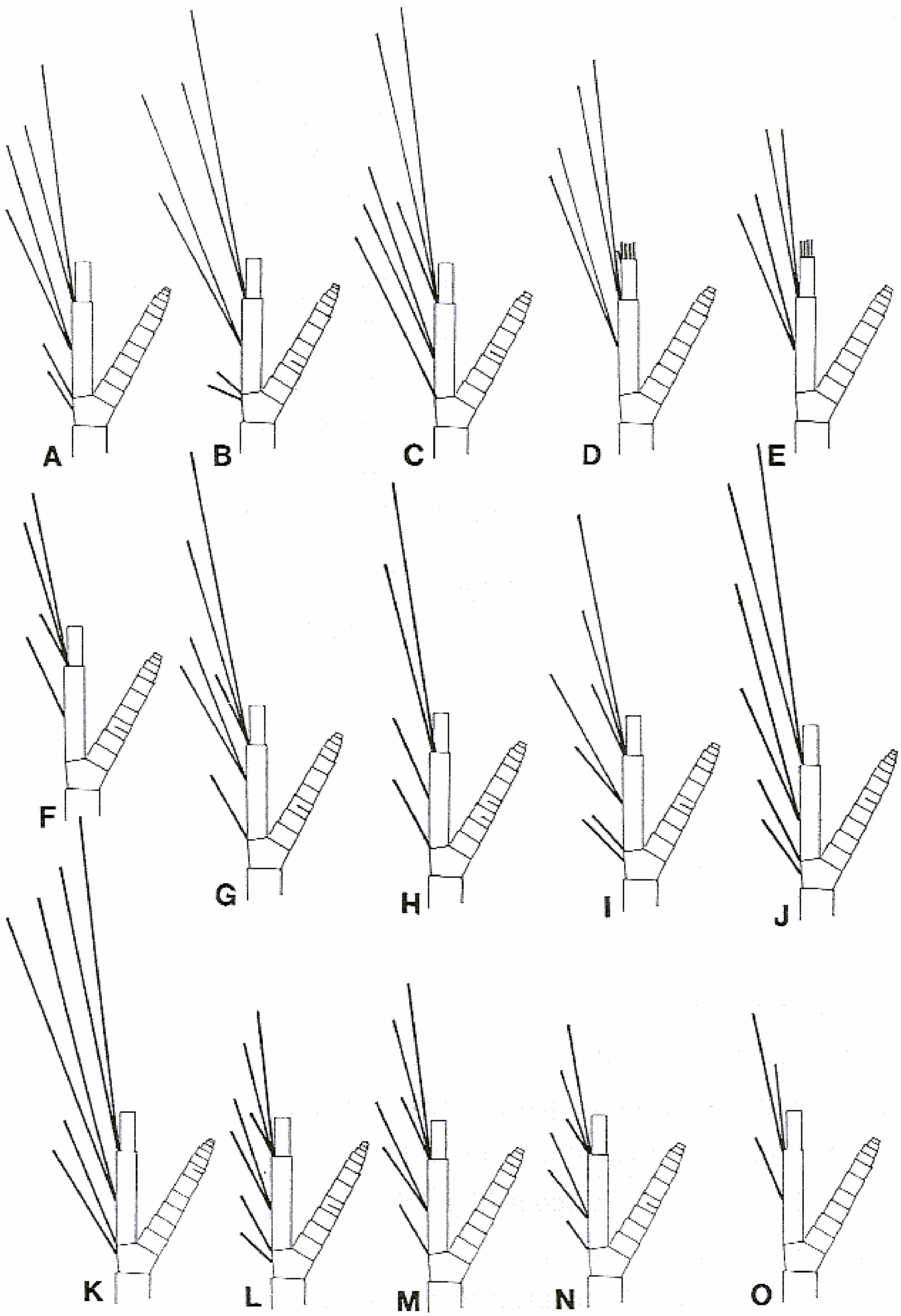

Fig. 2. Antenna. Prrotozoea I-III. A, *Aristeomorpha*; B, *Gennadas*; C, *Sicyonia*; D, *Xiphopenaeus;* E, *Trachypenaeus*; F, *Artemesia*; G, *Parapenaeus*; H, *Penaeus*; I, *Pleoticus*; J, *Solenocera*; K, *Mesopenaeus;* L, *Sergestes*; M, *Acetes*; N, *Peisos*; O, *Lucifer*.

-Rostrum smaller than eyestalk..11

10.(9)-Telson with median notch (Fig. 3A)..................................*Aristeomorpha*

-Telson with deep notch (Fig. 3B)..*Gennadas*

11.(9) -Rostrum minute (Fig. 1C); antennule twice as long as antenna; setal formula of antennal protopod and endopod is 1+2+3 (Fig. 2C).........*Sicyonia*

-Rostrum almost same size as eyestalk; antennule less than twice as long as antenna 12

12.(11)-Antennal endopod with 5 terminal setae (Fig. 2D)...........*Xiphopenaeus*

-Antennal endopod with 4 terminal setae (Fig. 2E)................*Trachypenaeus*

13.(8)-Two pairs of supraorbital spines on carapace (Fig.1G); setal formula of antennal protopod and endopod is 1+2+3 (Fig. 2G).............*Parapenaeus*

-One pair of supraorbital spines on carapace..14

14.(13)-Supraorbital spine on carapace with secondary spine medially (Fig. 1H); posterior margin of carapace smooth; setal formula of antennal protopod and endopod is 1+1+2 (Fig. 2H).....................................*Penaeus*

-Supraorbital spine on carapace unbranched (Fig. 4.1F); posterior margin of carapace with obtuse denticles; setal formula of antennal protopod and endopod is 0+1+3 (Fig. 2F)..Artemesia

Protozoea III

1-Carapace margin with spines or processes..2

-Carapace margin smooth..8

2(1)-Supraorbital spine on carapace absent..3

-Supraorbital spine on carapace present..4

3.(2)-Eyestalk covered by carapace (Fig. 1o)..*Lucifer*

-Eyestalk free from carapace..*Sergestes*

4.(2)-Dorsal organ absent; dorsal spine on first 5 abdominal somites absent ..5

-Dorsal organ present; dorsal spine on first 5 abdominal somites present ..6

5.(4)-Ventral spine on sixth abdominal somite shorter than telson notch; endopod of maxilla 3-segmented ....*Acetes*

-Ventral spine on sixth abdominal somite longer than telson notch; endopod of maxilla 4-segmented...*Peisos*

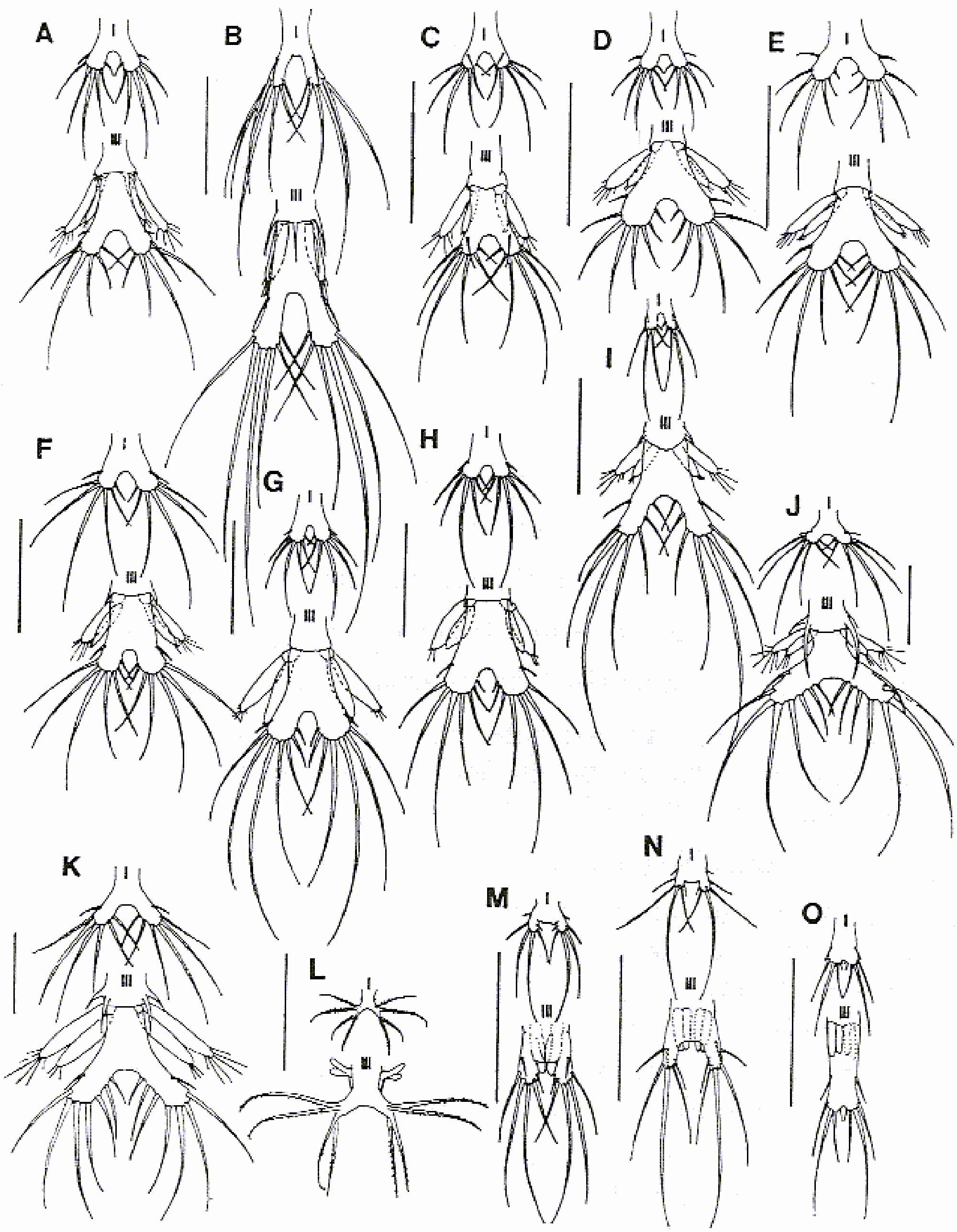

Fig. 3. Telson. Protozoea I-III. A, *Aristeomorpha*; B, *Gennadas*; C, *Sicyonia*; D, *Xiphopenaeus*; E, *Trachypenaeus*; F, *Artemesia*; G, *Parapenaeus*; H, *Penaeus*; I, *Pleoticus*; J, *Solenocera*; K, *Mesopenaeus*; L, *Sergestes*; M, *Acetes*; N, *Peisos*; O, *Lucifer*.

6(4)-Dorsal spine shorter than abdominal somite; setal formula on antennal protopod and endopod is 2+2+3 (Fig.2I); telson with deep notch (Fig. 3I) .... *Pleoticus*

-Dorsal spine longer than abdominal somite; telson wider than long with narrow notch; setal formula of antennal protopod and endopod is 2+2+2 7

7(6)-Carapace surface with 6 pairs of setae (Fig.1J); lateral setae on sixth abdominal somite longer than uropod (Fig. 3J)........................... *Solenocera*

-Carapace surface with 3 pairs of setae (Fig. 1K); lateral setae on sixth abdominal somite shorter than uropod (Fig. 3K)...................... *Mesopenaeus*

8.(1)-Supraorbital spine on carapace absent..9

-Supraorbital spine on carapace present..11

9(8)-Rostrum minute (Fig. 1C); antennule twice as long as antenna; setal formula of antennal protopod and endopod is 1+2+3 (Fig. 2C); telson bearing 7+7 setae (Fig. 3C) .... *Sicyonia*

-Rostrum of almost same size as eyestalk; setal formula of antennal protopod and endopod is 0+2+2; telson bearing 8+8 setae.......................10

10(9)-Antennal endopod with 5 terminal setae (Fig.2D).............. *Xiphopenaeus*

-Antennal endopod with 4 terminal setae (Fig. 2E)............... *Trachypenaeus*

11(8)-Dorsal spines on abdominal somites absent..................... *Aristeomorpha*

-Dorsal spines on abdominal somites present...12

12(11)-Two pairs of supraorbital spines present on carapace (Fig. 1G); lateral spines present on fifth or sixth abdominal somite; setal formula of antennal protopod and endopod is 1+2+3 (Fig. 2G)............................... *Parapenaeus*

-One pair of supraorbital spines present on carapace...............................13

13(12)-Dorsal spine of second somite longer than other spines; lateral spine present on first 5 abdominal somites; rostrum serrulated, curved, 3 times longer than eyestalk (Fig. 1A); setal formula on antennal protopod and endopod is 2+2+2 (Fig. 2A)... *Gennadas*

-Dorsal spine of second abdominal somite same size as other spines; rostrum smooth, straight, one and a half times longer than eyestalk 14

14.(13)-Carapace with small hump (Fig. 1F); dorsal spines of different sizes present from second to fifth abdominal somites; setal formula of antennal protopod and endopod is 0+1+3 (Fig. 2F).................................... *Artemesia*

-Carapace smooth (Fig. 1H); dorsal spines of equal size present from first to fifth abdominal somites; setal formula of antennal protopod and endopod is 1+1+2 (Fig. 2H)... *Penaeus*

Mysis

1.-Carapace and abdomen with spines or spinule-like outgrowths on surface; dorsal organ present; telson fork-shaped (e.g.Fig.5I) 2

-Carapace and abdomen without spinule-like outgrowths on surface; dorsal organ absent; telson plate-shaped (e.g. Fig. 5F) 5

2.(1)-Spines armed with spinules (Fig. 4L); telson bearing only spines (no setae)(Fig. 5L) .... *Sergestes*

-Spines on margin of carapace unarmed; telson bearing spines on outer margin and setae on inner margin 3

3.(2)-Setulose setae present on fifth and sixth abdominal somites (Fig. 4J) .... Solenocera

-Setulose setae absent from fifth and sixth abdominal somites 4

4.(3)-Posterior region of carapace with process; pterygostomial region of carapace serrate; rostrum twice as long as eyestalk (Fig. 4K) .... *Mesopenaeus*

-Posterior region of carapace with spine; pterygostomial region of carapace with separated individual spines; rostrum four times longer than eyestalk (Fig. 4I) .... *Pleoticus*

5.(1)-Abdominal somites with ventral spine 6

-Abdominal somites without ventral spine 8

6.(5)-Ventral spine minute; epigastric spine absent; antero-lateral portion of first abdominal somite with hook-like spine (Fig. 4o) .... *Lucifer*

-Ventral spines same size as abdominal somite 7

7.(6)-Dorsal spine present on fourth and fifth abdominal somites; rostrum same size as eyestalk (Fig. 4M) .... *Acetes*

-Dorsal spine absent on abdominal somites; rostrum shorter than eyestalk (Fig. 4N) .... *Peisos*

8.(5)-Dorsal spine absent on abdominal somites (Fig. 4C) .... *Sicyonia*

-Dorsal spine present on abdominal somites 9

9.(8)-Rostrum not longer than eyestalk 10

-Rostrum longer than eyestalk 11

10.(9)-Third abdominal somite with dorsal spine; hump-like structure present on middle line of carapace surface (Fig. 4D) .... *Xiphopenaeus*

-Third abdominal somite without dorsal spine; hump-like structure absent on middle line of carapace surface (Fig. 4E) .... *Trachypenaeus*

11.(9)-Abdominal somites with dorsal spines of different sizes 12

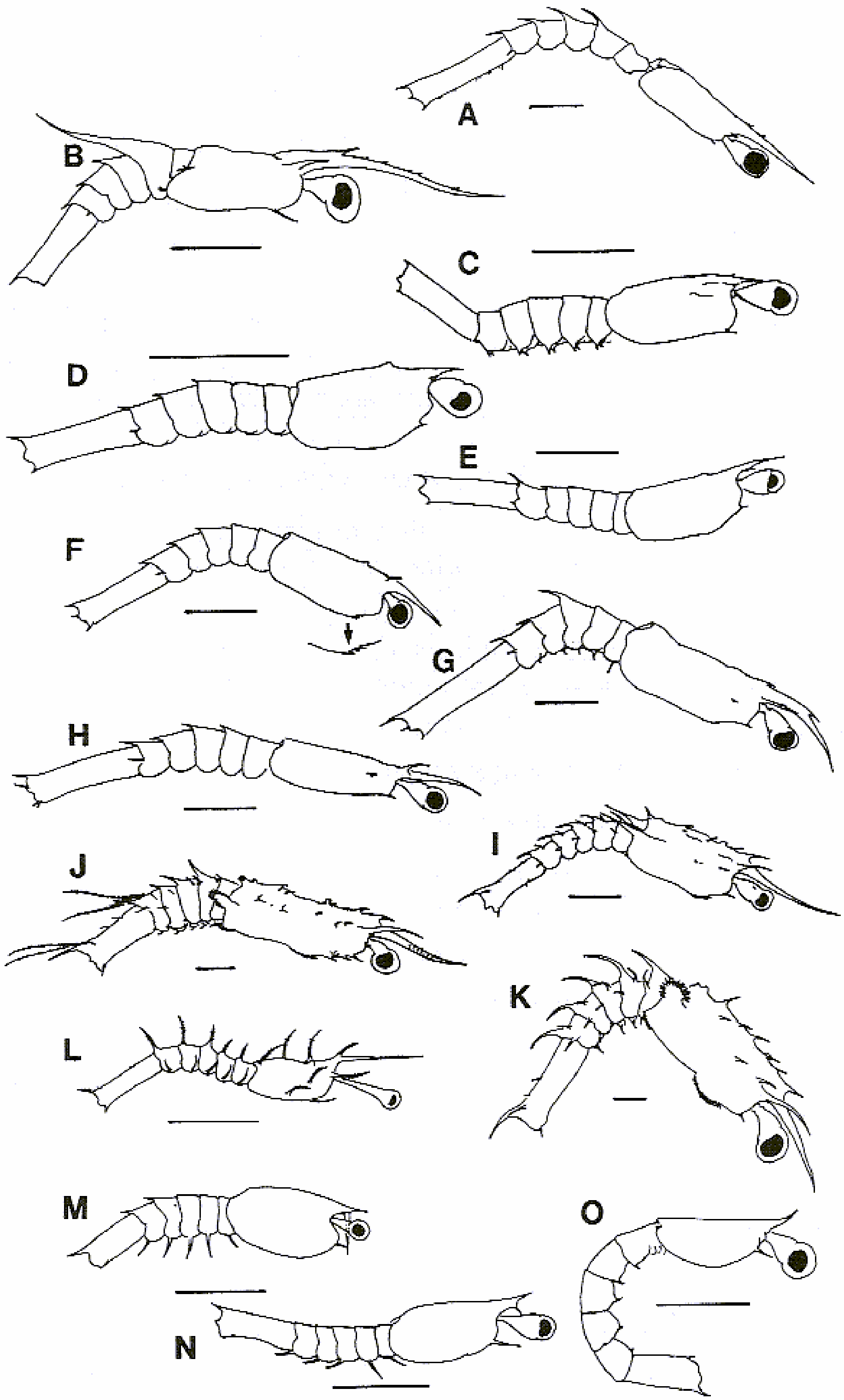

Fig. 4. Carapace. Mysis. A, *Aristeomorpha*; B, *Gennadas*; C, *Sicyonia*; D, *Xiphopenaeus*; E, *Trachypenaeus*; F, *Artemesia*; G, *Parapenaeus*; H, *Penaeus*; I, *Pleoticus*; J, *Solenocera*; K, *Mesopenaeus*; L, *Sergestes*; M, *Acetes*; N, *Peisos*; O, *Lucifer*.

-Abdominal somites with dorsal spines of same size 13

12.(11)-Second abdominal somite with prominent dorsal spine (Fig. 4B); telson bearing 4+4 spines (Fig. 5B) .... *Gennadas*

-Third abdominal somite with prominent dorsal spine (Fig. 4G); rostrum flattened; telson bearing 1+1 spines and 8+8 setae (Fig.5G) .... *Parapenaeus*

13.(11)-Second abdominal somite without dorsal spine; pterygostomial region of carapace serrulate (Fig. 4F) .... *Artemesia*

-Second abdominal somite with dorsal spine; pterygostomial region with dorsal spine 14

14.(13)-Dorsal spine same length as corresponding abdominal somite; hepatic spine absent (Fig.4A) .... *Aristeomorpha*

-Dorsal spine shorter than corresponding abdominal somite; hepatic spine present (Fig. 4H) .... *Penaeus*

Decapodid

1.-Anterior portion of carapace developed as neck; antennule with one flagellum (Fig. 6L) .... *Lucifer*

-Anterior portion of carapace not developed as neck; antennule with inner and outer flagella 2

2.(1)-All abdominal somites without dorsal spine (Fig. 6A) .... *Sicyonia*

-At least one abdominal somite with dorsal spine 3

3.(2)-Ventral spine on abdominal somite present 4

-Ventral spine on abdominal somite absent 6

4.(3)-Hepatic spine of carapace absent (Fig. 6K) .... *Peisos*

-Hepatic spine of carapace present 5

5.(4)-Rostrum with serrules; eyestalk long, about same length as rostrum; dorsal spine present on all abdominal somites (perhaps minute on first somite); telson fork-shaped (Fig.6I) .... *Sergestes*

-Rostrum smooth; eyestalk short, about same length as rostrum; first 3 abdominal somites without dorsal spines; telson plate-shaped (Fig.6J) .... *Acetes*

6.(3)-Third abdominal somite with prominent dorsal spine (Fig. 6E) .... *Parapenaeus*

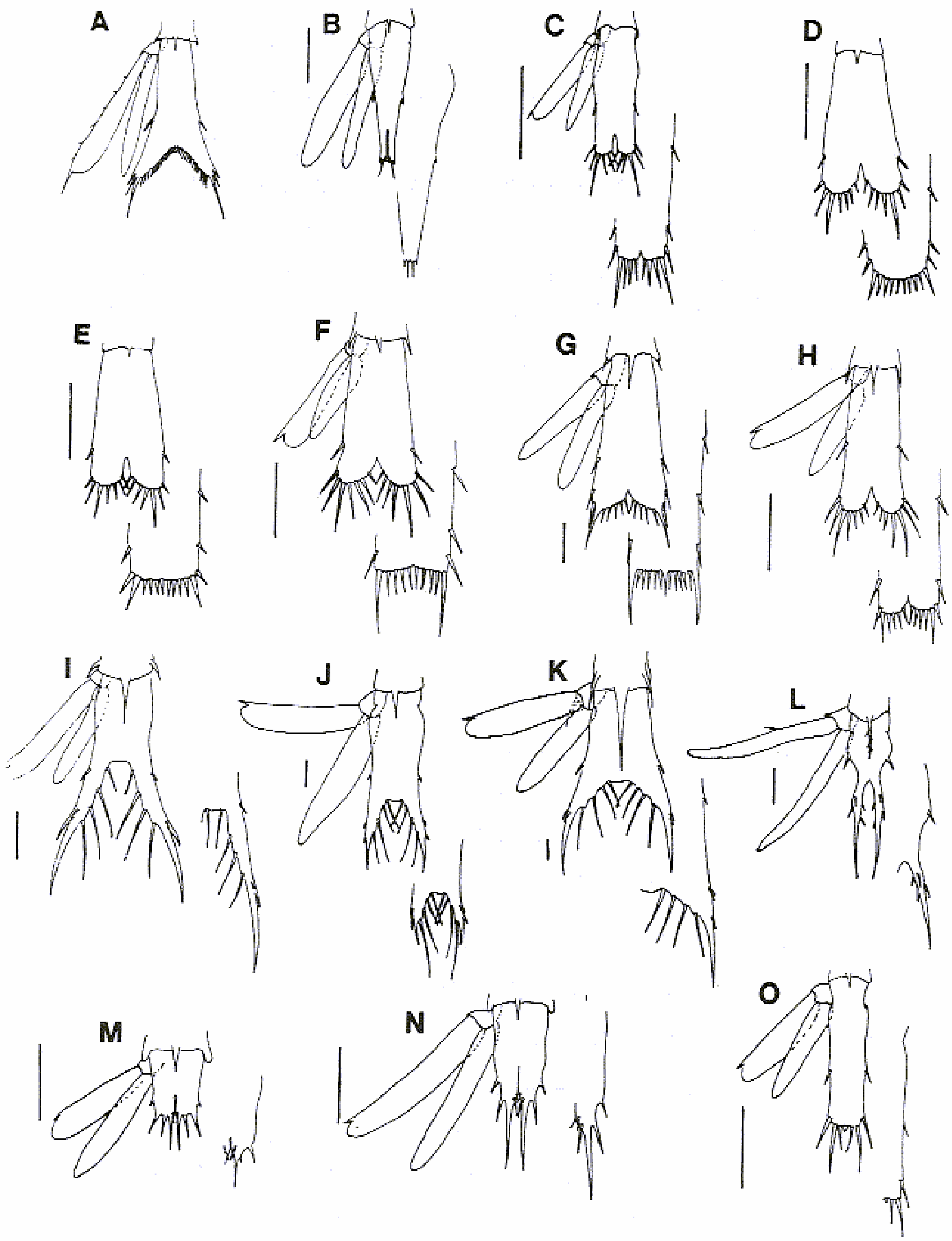

Fig. 5. Telson. Mysis. A, *Aristeomorpha*; B, *Gennadas*; C, *Sicyonia*; D, *Xiphopenaeus*; E, *Trachypenaeus*; F, *Artemesia*; G, *Parapenaeus*; H, *Penaeus*; I, *Pleoticus*; J, *Solenocera*; K, *Mesopenaeus*; L, *Sergestes*; M, *Acetes*; N, *Peisos*; O, *Lucifer*.

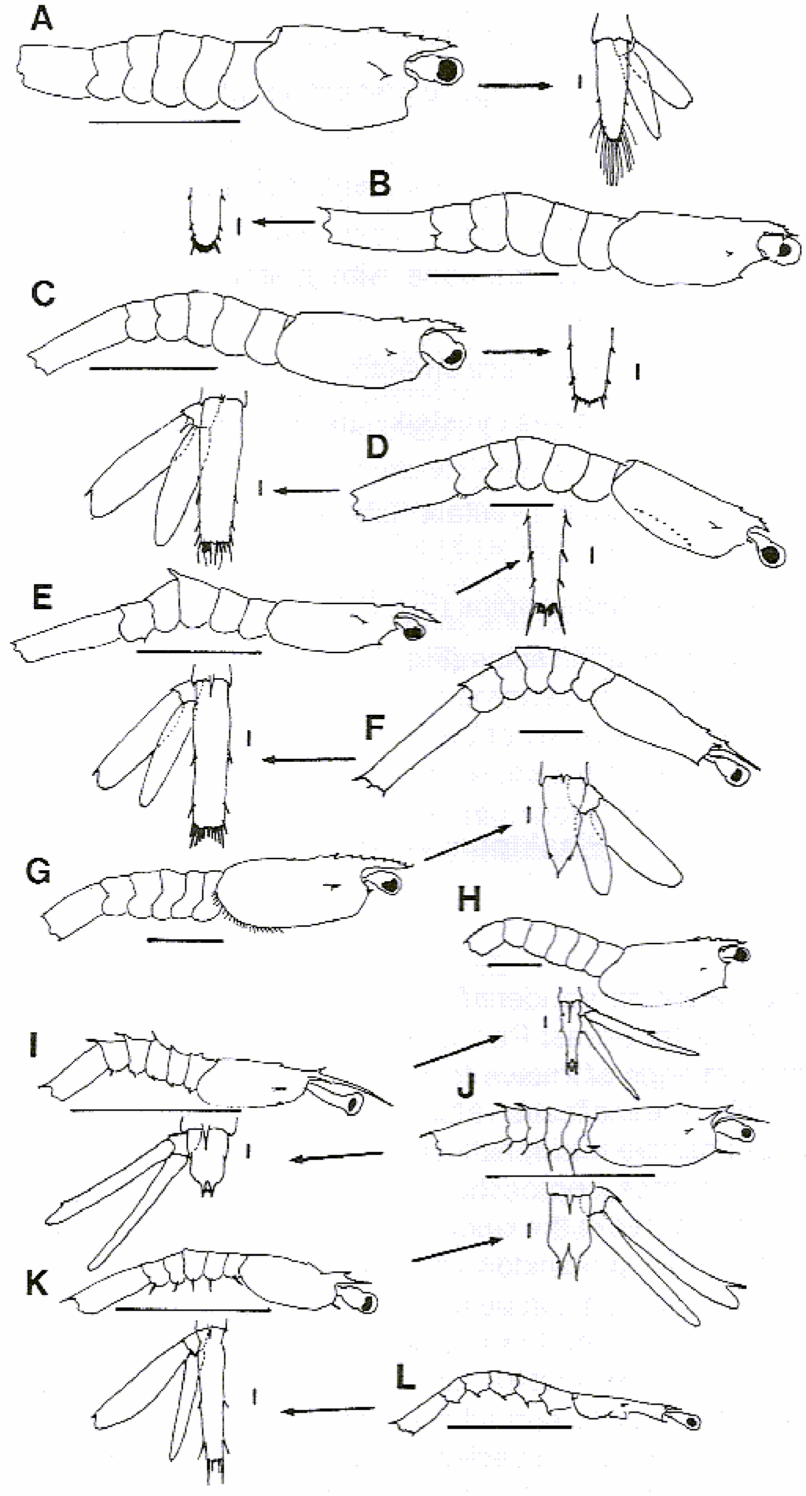

Fig. 6. Carapace and Telson. Decapodid. A, *Sicyonia*; B, *Xiphopenaeus*; C, *Trachypenaeus*; D, *Artemesia*; E, *Parapenaeus*; F, *Penaeus*; G, *Pleoticus*; H, *Solenocera*; I, *Sergestes*; J, *Acetes*; K, *Peisos*; L, *Lucifer*.

-Third abdominal somite without dorsal spine..7

7.(6)-Pterygostomial region of carapace serrate (Fig.6H)................*Solenocera*

-Pterygostomial region of carapace smooth...8

8.(7)-Supraorbital spine of carapace present; fourth and fifth abdominal somites with dorsal spine (Fig.6F)..*Penaeus*

-Supraorbital spine of carapace absent; fourth and fifth abdominal somites without dorsal spine...9

9.(8)-Branchial region of carapace with marginal row of setae (Fig. 6G) ....*Pleoticus*

-Branchial region of carapace smooth..10

10.(9)-Rostrum same size as eyestalk; lateral spine present on fifth abdominal somite (Fig. 6B)...*Xiphopenaeus*

-Rostrum shorter than eyestalk; lateral spine absent on fifth abdominal somite 11

11.(10)-Telson with median spine (Fig. 6C)............................*Trachypenaeus*

-Telson without median spine (Fig. 6D).......................................*Artemesia*

Planktonic vs Reared Material

In their work on an identification key for the penaeid larvae and early postlarvae of the Indo-west Pacific region, Jackson et al. (1989) used reared specimens from eggs of known females to ensure correct identification. They criticized previous identification studies limited to planktonic material, because of dangers of possible misidentification.

There are three approaches to identifying larval stages of decapods: 1) from specimens reared in the laboratory from eggs of known parentage; 2) from specimens taken from plankton and reared in the laboratory through stages until correct identification can be confirmed; and 3) from specimens taken from the plankton and identified from comparative literature studies.

It is well accepted that the use of specimens reared from known females is the best way to ensure correct identification. Despite recent improvements in rearing techniques, only species of the commercially important genera like *Penaeus* and *Metapenaeus* have been succesfully reared, but in many cases with poor attention to larval descriptions. Other genera of littoral penaeids with potential commercial importance like *Artemesia, Pleoticus, Acetes* and *Peisos*, as well as some offshore ones like *Sergestes* and *Gennadas*, have been recently reared with success and totally or partially described providing useful features for identification. Nevertheless some littoral and the offshore species have proved very difficult to rear in the laboratory because of the resorption of the ovum by the female caused by stress during catching or transportation.

The process of taking live larvae from the plankton and rearing them in the laboratory until they reach a size for correct identification is also difficult, because of problems of keeping them alive for an extended periods.

In both the above cases however, artificial conditions such as small compartments, controlled temperature and salinity, and laboratory food can cause morphological deformations or even delayed development, as noted for *Artemesia longinaris* (Boschi and Scelzo, 1971) and *Pandalus jordani* (Rothlinsberg 1980).

To identify correctly the larval stages of shrimps in one area it is important to know the temporal and spatial distributions of the adults. This criterion has been met in this study for the South Brazilian coast when sampling for adult and larval stages has carried out simultaneously. Moreover the presence of a single species of each genus (except three for *Penaeus*, two for *Sicyonia* and two for *Lucifer*) has aided the correct identification of larval stages.

Specimens taken from planktonic samples are morphologically more conservative than laboratory reared material, and so are more useful in devising an identification key. Here again, however, the larvae might have natural morphological variation as result of differences in temporal and spatial distributions. Therefore the best specimens to be used in a generic key are those from planktonic samples from the same area, if possible with a complete sequence of larval development. These larvae should then be compared with larvae reared in the laboratory to confirm identification.

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