

Some Penaeid Shrimp Species from the Red Sea and the Arabian Gulf

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ABSTRACT. A total of 12 species of Penaeid shrimp, belonging to five genera, have been identified from the Saudi Arabian Red Sea and the Arabian Gulf. Keys and diagnostic features for each species are presented. Information on geographical distribution and commercial value is brought together for each species.

Penaeid shrimp species are widely distributed in the Red Sea and in the Arabian Gulf. Their economic importance has made them the subject of considerable research, especially in the Gulf waters (Enomoto 1971, Lewis *et al.* 1973, Al-Attar and Ikenoue 1974, Badawi 1975, and Farmer 1981). However, literature reveals the presence of some confusion regarding the identity and geographical distribution of shrimp species of the mentioned regions.

Both *Penaeus mondon* and *P. indicus* obtained from Riyadh fish market have been identified, described and referred to the Gulf waters (Al-Ogilly and Hussain 1982). These species have not been recorded from the Gulf (Motoh 1975, Price and Jones 1975, Mohamed *et al.* 1981, and Farmer 1981).

Trachypenaeus granulosus and *Metapenaeus stebbigni* have been dealt with as important species in the Saudi Arabian Gulf waters (Badawi 1975). Price and Jones (1975) working in the same water for one year did not recognize these species as economic. The economic value of these two species is not recognized as well in Kuwaiti waters (Mohamed *et al.* 1981).

Keys are provided in this study for the identification of some shrimp of the sub-family Penaeinae. The materials on which the study is based have been obtained from the Saudi Red Sea and from the Arabian Gulf.

It is hoped that the present paper will be of some use for future ecological and biological studies on shrimp of the mentioned waters.

Materials and Methods

The Gulf materials were collected from Saudi and Kuwaiti commercial catches. Those of the Red Sea were collected mainly from commercial catches at Gizan.

For identification and construction of keys various papers were consulted. The most important of these are: Kishinouye 1900, Alcock 1906, de Man 1911, Kubo 1949, Dall 1957, and Tirmizi 1972.

Taxonomic Criteria

Distinguishing features providing the main criteria of Penaeidae sub-families, genera and species are most related to difference in the morphology of their body parts (Fig. 1). The carpace (Figs. 1&2) has a number of grooves, carinae and spines

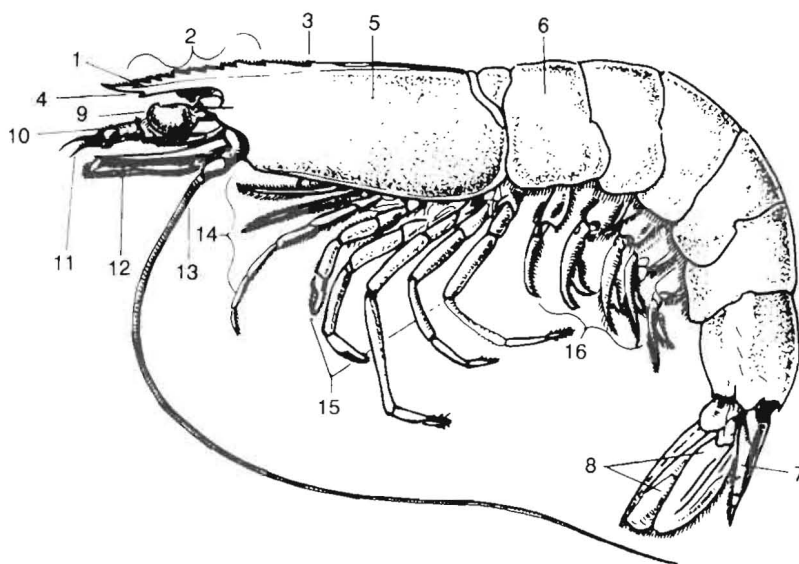


Fig. 1. Diagrammatic view of a penaeid prawn showing taxonomic characters. (1) rostrum, (2) rostral teeth, (3) epigastric tooth, (4) ventral tooth, (5) carapace, (6) abdomen, (7) telson, (8) uropods, (9) eye, (10) antennule, (11) antennular flagellum, (12) antennal scale, (13) antennal flagellum, (14) maxillipeds 1-3, (15) pereopods 1-5, and (16) pleopods 1-5.

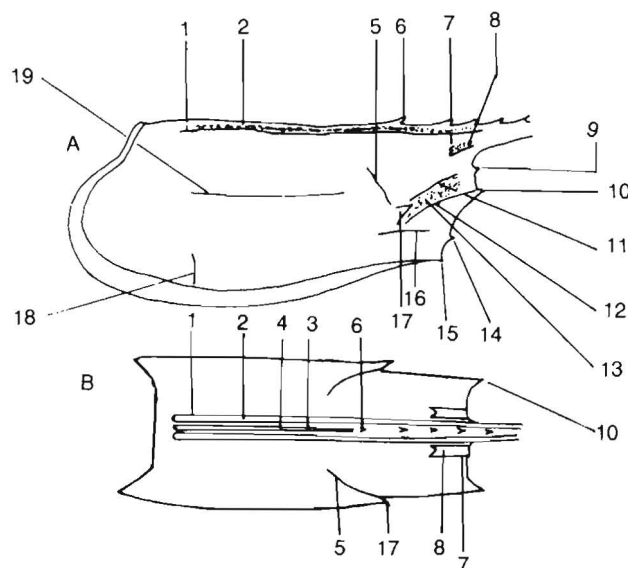


Fig. 2. Diagrammatic views of (A) lateral and (B) dorsal views of carapace showing characters of taxonomic importance. (1) adrostral carina, (2) adrostral groove, (3) post-rostral carina, (4) post-rostral groove, (5) cephalic carina, (6) epigastric tooth, (7) gastro-frontal groove, (8) gastro-frontal carina, (9) orbital spine, (10) antennal spine, (11) gastro-orbital carina, (12) gastro-antennal carina, (13) orbito-antennal groove, (14) branchiostegal spine, (15) pterygostomian spine, (16) sub-hepatic carina, (17) hepatic spine, (18) transverse carina, and (19) longitudinal carina.

which vary considerably in the different genera and species. The rostrum (Figs. 1&2) may be toothed dorsally and ventrally or toothed only dorsally. The number of rostral teeth as well as the shape, elevation and length are of some diagnostic value. Abdominal carination or presence of tubers on certain abdominal segments as well as the degree and pattern of pubescence are of some taxonomic value. The telson (Fig. 1) may be unarmed or armed laterally with movable or fixed spines or a combination of both. It may also possess a dorsal groove. The thelycum (seminal receptacle) is made up of a number of plates with shapes and structures of which are excellent identification features. the structure and shape of the petasma (male first abdominal appendages modified for sperm transmission), is also of great diagnostic value. The length of certain pereopods and the length of the antennular flagella relative to the antennular peduncle are distinguishing characters of some penaeids. The presence or absence of exopodites and epipodites on some thoracic appendages as well as the presence or absence of spines on certain podomeres are of diagnostic value.

Taxonomy

The shrimp specimens of the author's collection consist of five genera belonging to the sub-family Penaeinae: *Penaeus*, *Metapenaeopsis*, *Metapenaeus*, *Trachypenaeus* and *Parapenaeopsis*.

Key to the Genera of Sub-family Penaeinae

1. Rostrum without ventral teeth 2
 Rostrum with ventral teeth *Penaeus*
- 2(1). Petasma symmetrical; third maxilliped without a basial spine 3
 Petasma asymmetrical; third maxilliped with a basial spine *Metapenaeopsis*
- 3(2). Exopod on fifth pereopod absent *Metapenaeus*
 Exopod on fifth pereopod present 4
- 4(3). Third pereopod with epipodite *Trachypenaeus*
 Third pereopod without epipodite *Parapenaeopsis*

The following are keys to the species of each genera. Each will be followed with additional diagnostic features of each species. Species of genus *Penaeus* are seperated into three groups. The features seperating these groups are given in Table 1. Remarks on species distribution in local waters and their commercial value are tabulated at the end of the paper (see Table 4).

Key to *Penaeus* Species

1. Rostrum armed with one ventral tooth; adrostral (lateral) groove extending to posterior margin of carapace; gastro-frontal groove present 2
 Rostrum armed with more than one ventral teeth; adrostral groove extending to or just beyond epigastric tooth; gastrofrontal groove absent 3
- 2(1). Thelycum pouch-like, anterior piece of thelycal protruberance with rounded apex *P. japonicus*, Bate 1888.
 Thelycum made of two lateral plates, thelycal proturberance with two anterioventrally directed horns *P. latisulcatus* Kishinouye. 1900.
- 3(1). Sub-hepatic carina present 4
 Sub-hepatic carina absent. *P. indicus* H. Milne Edwards, 1837.
- 4(3). Sub-hepatic carina inclined anterioventrally; fifth pereioiped with a small exopod; antenular flagella shorter than peduncle
 *P. semisulcatus*, de Haan, 1844.

Sub-hepatic carina horizontal; fifth pereopod without an exopod; antennular flagella equal to or slightly longer than antennular peduncle

P. mondon, Fabricius 1798.

***Penaeus* Groups**

Penaeus species of the present study could be separated into three groups:

1. *P. japonicus* - *P. latisulcatus* group.
2. *P. indicus* group.
3. *P. semisulcatus* - *P. mondon* group.

Table 1. Main characters of genus *Penaeus* groups

Features	Group 1	Group 2	Group 3
adrostral carina	reach to posterior margin of carapace	reach to or just beyond epigastric tooth	reach to epigastric tooth
gastro-frontal groove	present	absent	absent
sub-hepatic carina	present	absent	present

P. japonicus (Fig. 3.1, A-C) and *P. latisulcatus* (Fig. 3.2, A-C) are morphologically very similar, particularly in regard to numbers and position of spines, grooves and carinae of the carapace. Features separating these species are given in Table 2.

Table 2. Diagnostic features separating *P. japonicus* and *P. latisulcatus*

Species features	<i>P. japonicus</i>	<i>P. latisulcatus</i>
Petasma	disto-median lobes overhanging distolateral lobes (Fig. 3.1,B).	disto-median lobes short slightly bent over, not overhanging distolateral lobes (Fig. 3.2,B).
Telson	with 3 small lateral movable spines	with 3 big lateral movable spines
Colour in life	yellow to pink with red-brown to dark brown transverse bands	light yellow

P. indicus (Fig. 3.3,A-C) is the only species in its group. It is characterized by a crested, abruptly thinned and anteriorly tapering rostrum. This rostrum is unique in having more than 3 (4-6) ventral teeth.

P. semisulcatus (Fig. 4.1,A-C) and *P. mondon* (Fig. 4.2, A-C) are similar but readily distinguishable as separate species by their features given in Table 3.

Table 3. Some Features separating *P. semisulcatus* and *P. mondon*

Species features	<i>P. semisulcatus</i>	<i>P. mondon</i>
rostrum	extends to tip of antennular peduncle	extends beyond tip of antennular peduncle
antennular flagellum	as long as antennular peduncle	longer than antennular peduncle
adorstral carina	extends beyond epigastric tooth	extends to epigastric tooth
sub-hepatic carina	inclined at an angle of 15° to horizontal	horizontal
fifth pereopod	with exopod	without exopod

Genus *Metapenaeopsis*

Metapenaeopsis is represented in the collection by a single species *M. stridulans* (Alcock 1906) (Fig. 4.3, A-C).

Carapace: densely pubescent; stridulating organs [longitudinal row of very strong ridges (5-12)], situated on either sides of posterior end of carapace.

Rostrum: narly straight, uptilted, armed with 1+5-7 teeth.

Petasma: asymmetrical, left lobe longer than right lobe; left lobe crowned with 5-12 stiffish apical processes.

Thelycum: consists of a subquadrate anterior plate and a posterior transverse plate.

Key to *Metapenaeus* species.

1. Longitudinal carina distinct in at least posterior third of carapace, disto-median petasml lobe without a ventrally serrated styliform process 2

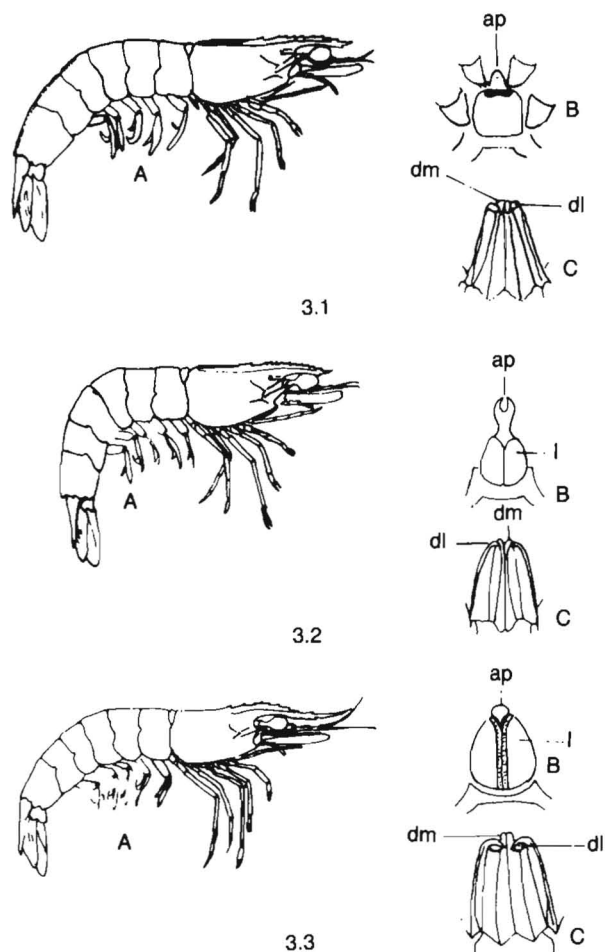


Fig. 3. (3.1-3.3): A, lateral view; B, thelycum; C, petasma of *P. japonicus*, *P. latisulcatus* and *P. indicus* respectively. ap, anterior protuberance; l, lateral plate; dm, disto-median lobe; and dl, disto-lateral lobe.

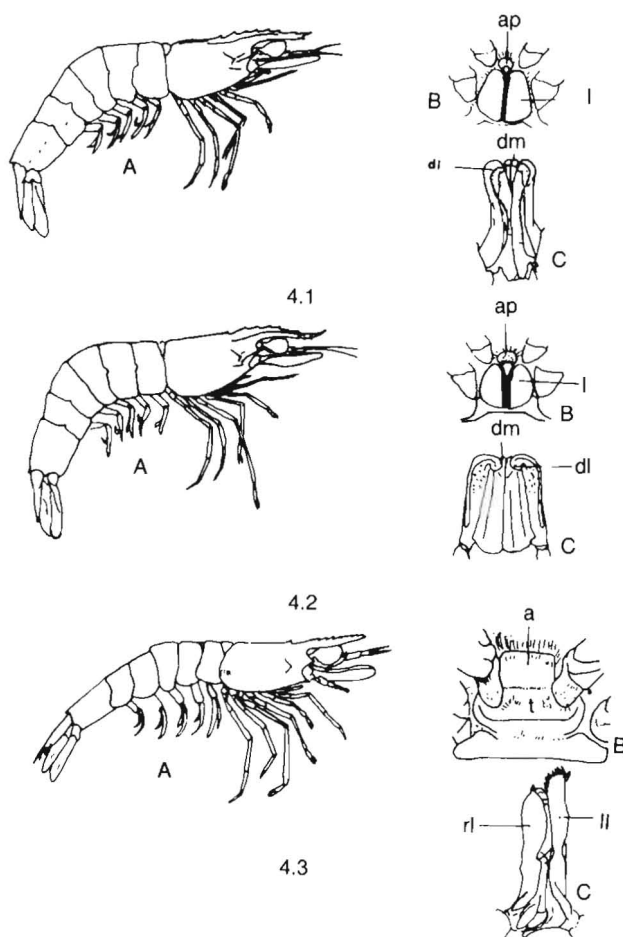


Fig. 4. (4.1-4.3): A. lateral view; B. thelycum; C. petasma of *P. semisulcatus*, *P. monodon* and *M. stridulans* respectively. ll, left lobe; rl, right lobe; a, anterior plate; and t, transverse plate. Other letterings as in Fig. (3.1-3.3).

Longitudinal carina absent, disto-median petasml lobe with elongated and ventrally serrated styliform process *M. stebbingi*, Nobili, 1904.

- 2(1). Last pair of pereopods seldom reaching to tip of antennal scale; disto-median petasml lobes greatly swollen *M. monoceros*, Fabricius, 1798

Last pair of pereopods surpassing tip of antennal scale; distomedian petasml lobes crescent-shaped *M. affinis*, (H. Milne Edwards 1837).

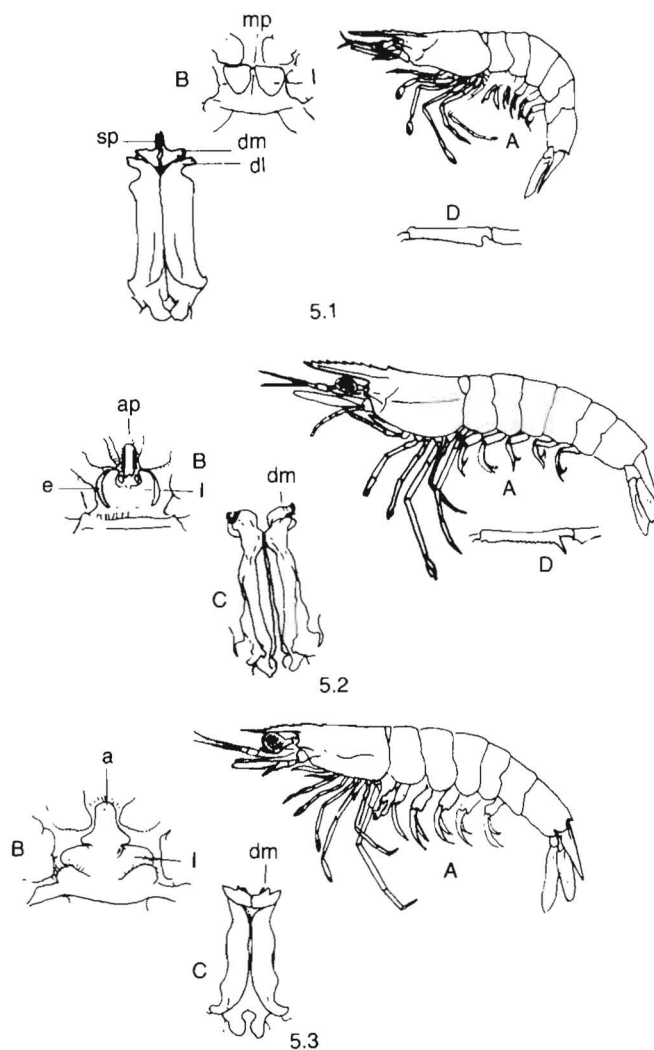


Fig. 5. (5.1-5.3): A, lateral view; B, thelycum; C, petasma of *M. stebbingi*, *M. monoceros* and *M. affinis* respectively; D, merus of 5th male pereiopod. mp, median plate; 3, ear-shaped lateral margins; and sp, serrated apical projection. Other letterings as in Figs. (3.1-3.3) and (6.1-6.3).

1. *Metapenaeus stebbingi* Nobili (Fig. 5.1, A-D)

Carapace: smooth, with well developed gastro-antennal, cervical and sub-hepatic arinae; gastro-orbital carina ridge-like, longitudinal carina absent.

Rostrum: armed with 1+6–9 teeth; post-rostral carina restricted to anterior 1/2 of carapace.

Thorax appendages: first pereopod without ischial spine, merus of 5th male pereopod with a proximal notch followed by tubercle.

Telson: with a median groove, armed laterally with a row of numerous spinules.

Petasma: with a pair of serrated apical projections.

Thelycum: lateral plates triangular, median plate hollowed within lateral plates.

2. *Metapenaeus monoceros* Fabricius (Fig. 5.2, A-D).

Carapace: densely pubescent, antennal and orbital spines pronounced, gastro-antennal carina faint, cervical carina almost straight, sub-hepatic arina curves anteriorly to end before pterogostomian margin; longitudinal carina sinuous, reach posterior extension of hepatic spine.

Rostrum: straight, armed with 1+7–10 teeth; adrostral carina extends beyond epigastric tooth, post-rostral carina extends to end of carapace.

Thorax appendages: first pereopod with a small ischial spine, merus of 5th pereopod of adult male with a proximal notch followed by a spine and a row of conical tubercles.

Abdomen: dorsal carina usually present on 1st and 2nd segments, becoming progressively more prominent to the 6th.

Telson: with a median groove, armed laterally with a row of numerous spinules.

Petasma: resembles a rigid compressed tube, distomedian lobes greatly swollen and resembles a pair of horny hood-like processes.

Thelycum: lateral plates bounded laterally by a pair of ear-shaped lobes and enclosing a pair of small plates; anterior protuberance long and deeply grooved.

3. *Metapenaeus affinis* H. Milne Edwards. (Fig. 5.3, A-C).

Carapace: densely pubescent; very similar to that of *M. monoceros*. The diagnostic features separating *M. affinis* from *M. monoceros*. are as follows: first pereopod with or without an ischial spine; merus of 5th pereopod of adult males with a proximal notch followed by a twisted, keeled tubercle; petasma tubular, distally ending in crescent shape formed by disto-median lobes; thelycal lateral plates small C-shaped; thelycal anterior plate long considerably wider posteriorly.

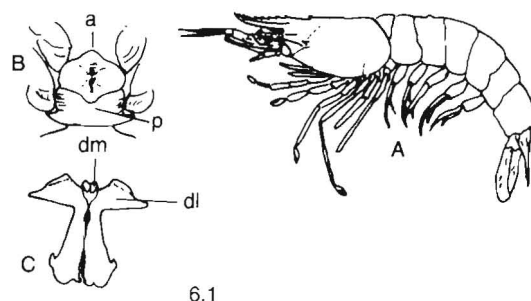
Key to *Trachypenaeus* Species

Epipod present on first and second pereiopods	<i>T. curvirostris</i> (Stimpson 1860).
Epipod absent on first and second pereiopods	<i>T. granulatus</i> (Haswell 1879).

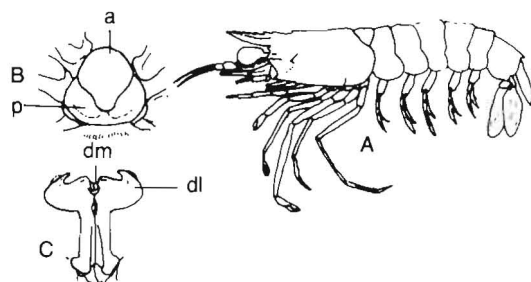
1. *Trachypenaeus curvirostris* (Stimpson Fig. 6.1, A-C).

Carapace: densely pubescent, with well developed antennal, supra-orbital and orbital spines; gastro-antennal carina faint, exceeding 1/2 way between antennal and hepatic spine; hepatic spine below or slightly in advance of epigastric tooth, cervical, sub-hepatic, longitudinal and transverse carinae usually obscured by dense pubescence.

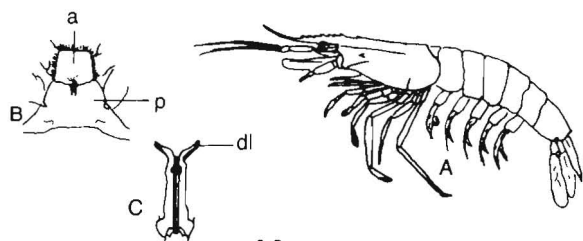
Rostrum: armed with 1+8-10 teeth, adorostral carina feeble, ending before epigastric tooth; post-rostral carina feeble, reaching to middle of carapace.



6.1



6.2



6.3.

Fig. 6. (6.1-6.3): A, lateral view; B, thelycum; C, pectopod of *T. curvirostris*, *T. granulosus* and *P. stylifera* respectively. a, anterior plate; and p, posterior plate. Other lettering as in Figs. (3.1-3.3).

Abdomen: second segment bearing dorsally a small elongated tubercle.

Telson: armed laterally with 3 pairs of spines.

Petasma: distolateral lobes broad, wing-like.

Thelycum: anterior plate sub-rhombic, concave, with a longitudinal groove; posterior plate notched anteriomedially.

2. *Trachypenaeus granulosus* (Haswell) (Fig. 6.2, A-C).

Carapace: densely pubescent; similar to that of *T. curvirostris*. The diagnostic features separating *T. granulosus* from *T. curvirostris* are as follows: hepatic spine slightly in advance of epigastric tooth; gastro-antennal carina occupying 1/3 distance between antennal and hepatic spine; adrostral carina reaching to 1st rostral tooth; post-rostral carina distinct, ending at posterior end of carapace; petasmas disto-lateral lobes broad, tips curved, ending in inwardly directed mucronate tips; thelycal anterior plate rounded distally, with a posterior rounded convex projection fused to posterior plate.

Genus *Parapenaeopsis*

Parapenaeopsis is represented in the collection by a single species. *P. stylifera* (H. Milne Edwards, 1837) (Fig. 6.3, A-C).

Carapace: finely punctate; longitudinal carina distinct, runs from orbital margin backward for 2/3 of carapace length.

Rostrum: with a strong double curve; armed with 1+5-9 teeth, armation restricted to proximal 1/2.

Antennule: flagella about as long as carapace, the outer slightly the longer.

Thoracic appendages: a basal spine present on the 1st two pereopods.

Telson: [with a median groove; armed laterally with 4 pairs of fixed spines.]

Petasma: disto-lateral lobes slender, horn-like, directed anteriomedially at 45° to petasmas axis.

Thelycum: anterior plate squarish; posterior plate deeply notched anteriomedially.

Table 4. The distribution and commercial value of penaeids of the present study.

Species	Distribution in regional waters	Commercial value
<i>P. japonicus</i>	A.G. (Motoh 1975); R.S. (de Man 1911); M. (Dowidar and Ramadan 1973).	small numbers in A.G. and R.S. (Mohamed <i>et al.</i> 1981 and P.O.).
<i>P. latisulcatus</i>	A.G. (Motoh 1975); R.S. (de Man 1911).	small numbers in A.G. and R.S. (Price and Jones 1975 and P.O.)
<i>P. indicus</i>	R.S. (Balls 1915).	small numbers in R.S. (P.O.)
<i>P. semisulcatus</i>	A.G. (Lewis <i>et al.</i> 1973); R.S. (de Man 1911); M. (Dowidar & Ramadan 1973).	main commercial species in A.G. and R.S. (Price and Jones 1975; Mohamed <i>et al.</i> 1981 and P.O.).
<i>P. monodon</i>	R.S. (de Man 1911).	small numbers (P.O.).
<i>M. stridulans</i>	A.G. (Motoh 1975).	small numbers (Mohamed <i>et al.</i> 1981).
<i>M. stebbingi</i>	A.G. (Motoh 1975); R.S. (Alcock 1906); M. (Dowidar & Ramadan 1973).	small numbers in A.G. and R.S. (Price and Jones 1975 and P.O.).
<i>M. monoceros</i>	A.G. (Price & Jones 1975); R.S. (Dall 1957) M. (Dowidar & Ramadan 1973).	small numbers in A.G. (Mohamed <i>et al.</i> 1981), 2nd commercial species in Jizan (P.O.).
<i>M. affinis</i>	A.G. (Price & Jones 1975).	small numbers in Saudi A.G. waters (Price & Jones 1975); constitutes 28-30% of relatively shallow water catch of Kuwait. (Mohamed <i>et al.</i> 1981).
<i>T. curvirostris</i>	A.G. (Motoh 1975); R.S. (Holthius 1956); M. (Dowidar & Ramadan 1973).	small quantities in A.G. and R.S. (Price & Jones 1975 and P.O.); discarded due to its small size.
<i>T. granulatus</i>	A.G. (Price & Jones 1975).	small numbers (Price & Jones 1975).
<i>P. stylifera</i>	A.G. (Motoh 1975).	constitute a significant portion of Kuwaiti catches (Mohamed <i>et al.</i> 1981).

P.O. (Personal observation); A.G. (Arabian Gulf); R.S. (Red Sea); M. (Mediterranean)

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بعض أنواع الجمبري عائلة البنييدي من البحر الأحمر والخليج العربي

مصطفى سعد غمراوي

كلية علوم البحار - جامعة الملك عبدالعزيز - جدة - المملكة العربية السعودية

تنتشر أصناف الجمبري من عائلة البنييدي في مياه البحر الأحمر والخليج العربي، حيث تمثل مورداً من الموارد البحرية الحية الهامة.

رغم ذلك تحتوي الأبحاث المنشورة على بعض التناقض فيما يخص تصنيف أنواع الجمبري، وكذا توزيعها وأهميتها الاقتصادية. في هذه الدراسة تم تصنيف اثني عشر نوعاً من أنواع الجمبري تضمنتها عينات جمعت من الخليج العربي والبحر الأحمر. كذلك حصرت بعض المعلومات الخاصة بالتوزيع الجغرافي والقيمة الاقتصادية للأنواع المصنفة. استخدمت مواصفات الشكل الخارجي لأجزاء الجسم المختلفة كخصائص تصنيفية لتصنيف العينات إلى الأجناس والأنواع المختلفة. رغم استخدام أجزاء الجسم المختلفة في عملية التصنيف فقد تم التركيز على مواصفات الدرقة والأعضاء التناسلية الثانوية. تمتلك الدرقة عدداً من التجاويف والحيود والأشواك التي تختلف من حيث العدد أو الشكل اختلافاً بيناً فيما بين الأجناس والأنواع المختلفة. أما الأعضاء التناسلية الثانوية فهي الستارة الخاصة بالذكر والأنثى الخاصة بالأنثى وتختلف تلك الأعضاء في الأنواع المختلفة وتعامل صفاتها كخصائص تصنيفية هامة قد تفرق بين الأنواع شديدة التشابه. من الأجناس المصنفة جنس بنيس والذي تتفوق أنواعه عددياً على أنواع الأجناس الأخرى في عينات الدراسة. يختلف هذا الجنس عن الأجناس الأخرى بامتلاك المنقار لأسنان على سطحية الظهر والبطني بينما يختصر وجود الأسنان على السطح الظهرى للمنقار في أنواع الأجناس الأخرى. يمكن تقسيم جنس بنيس إلى ثلاث مجموعات: مجموعة بنيس جابونيكس - بنيس لاتيسلكاتس ومجموعة بنيس سيميسلكاتس - بنيس مونودون ومجموعة بنيس انديكس. الأنواع الأخرى المصنفة هي: ميتابنيوبس سترایدولنز - ميتابنيوس

ستينجى - ميتابنيس مونوسيروس - ميتابنيس أفينيس . تراكينيس كيرفيروسترس - وتراكينيس جرانولوسس وبارابنيوبسس ستايلفرا . زود البحث برسم تخطيطي نموذجي للجمبري من عائلة البنيدي مبنياً عليه كل خصائص الشكل الخارجي للجسم وكذلك رسوم تخطيطية لكل نوع من الأنواع المصنفة . ويأمل الباحث أن تمكن هذه الرسوم علاوة على مفاتيح التصنيف من تسهيل عملية تصنيف هذه الكائنات من قبل أي باحث في المجالات البيولوجية أو البيئية للجمبري في منطقة الدراسة . تنتشر بعض أنواع الجمبري التي تم تصنيفها في كل من البحر الأحمر والخليج العربي بينما يقتصر توزيع البعض على أحدهما . من الجدير بالذكر أن بعض الأنواع قد تمكن من استيطان البحر الأبيض المتوسط بعد شق قناة السويس . يمثل النوع بنيس سيميسلكاتس النوع التجاري الرئيسي في كل من البحر الأحمر والخليج العربي . الأنواع الهامة الأخرى في الخليج العربي هي ميتابنيس أفينيس وبارابنيوبسس ستايلفرا . في منطقة جيزان والتي تمثل المنطقة الوحيدة لصيد الجمبري تجارياً في البحر الأحمر يحتل النوع ميتابنيس مونوسيروس المركز الثاني إقتصادياً . معظم الأنواع الأخرى المذكورة في البحث لا تمتلك قيمة اقتصادية عالية في مياه البحر الأحمر والخليج العربي نظراً لوجودها بأعداد قليلة أو إلى صغر حجم أفرادها .