

A PRELIMINARY KEY TO THE MALACOSTRACAN
FAMILIES (CRUSTACEA) FOUND IN AUSTRALIAN
INLAND WATERS

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Cover Drawing: The freshwater isopod *Heterias* sp. from a subterranean aquatic system near
Yanchep, Western Australia. Drawn by Edyta Jasinska.

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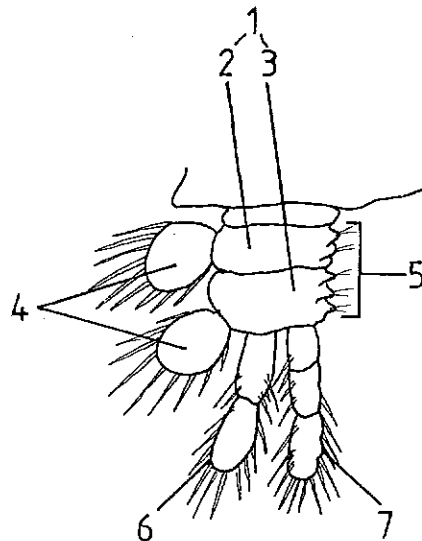
1. General Introduction

1.1 What is a malacostracan crustacean?

Unlike other arthropodous groups, which exploit essentially one body plan ... when you've seen one insect or arachnid, you've seen them all, the crustaceans exhibit a greater degree of diversity in form than that seen in any other animal phylum. (Schram 1986, p. 3.)

The bewildering variety of body forms and shapes are basically built on an elongate body divided into body segments, each of which may bear a pair of segmented appendages of some kind. Blocks of segments and appendages may form a functional group: head, thorax, abdomen; the locomotory section of thorax = pereon.

The basic crustacean appendage (shown below) consists of a protopod, an exopod (outer branch) and an endopod (inner branch). The protopod may bear epipodites laterally and endites mesially; the protopod generally has two segments (the coxa, proximally and the basis, distally).



Hypothetical crustacean appendage, showing protopodite (1) composed of coxa (2) and basis (3), epipodites (4), endites (5), exopod (6) and endopod(7) (Adapted from Schram (1986)).

Fortunately the true malacostracan, which is the subject of this key, is reasonably stable regarding basic body structure:

- 14 trunk segments (8 thoracic, 6 abdominal);
- all trunk segments bearing appendages (unless subsequently lost or reduced);
- female gonopore on 6th segment, male gonopore on 8th;
- gills are modified thoracic epipodites;
- first antenna (antennules) biramous;
- second antenna (antennae) with an exopodite fashioned as a scale.

1.2 Notes on Key

This key is derived from published material (listed below). Key characters to higher order classification should not be interpreted as necessarily diagnostic for that taxon. Rather, the key uses a combination of characters which will enable (hopefully) inland aquatic malacostracan crustaceans to be classified quickly and reliably to family level. In doing so short cuts across diagnostic characters have been taken, using character states which hold true for known taxa in inland waters, but not necessarily for terrestrial and marine/estuarine taxa.

In fact, there is a recognition by many aquatic carcinologists that:

- i) taxa classically understood to be terrestrial appear frequently in aquatic samples and some may be considered truly aquatic, or to have derived an aquatic habit secondarily ("fall-ins");
- ii) taxa classically deemed as marine or estuarine have fresh water or inland water representatives (and indeed the inland water/estuarine water boundary is becoming increasingly blurred). Such taxa may represent multiple invasions into inland aquatic habitats ("crawl-outs"); and
- iii) there are undoubtedly malacostracan taxa in inland waters (including those from i and ii above) that have yet to be documented in Australia.

Given these current perceptions, the pragmatic approach taken renders the key somewhat artificial in places. Thus, if a specimen does not key easily it may belong to one of these categories and the reader is referred to taxonomic authorities or more detailed taxonomic texts.

This key attempts to remove difficulties associated with using key characters which make specific reference to one or other of the sexes, often in breeding condition. In such cases the user of the key is reliant on having access to this material. For this reason characters such as pleopods of the male, oöstegites, penial stylets, gonopores, brood pouches etc. have not been used. The effect of removing these characters is to (again) render the key somewhat artificial since the best diagnostic characters are the most conservative ones (ie. reproductive features).

1.3 Reference material

Characters used for the key are derived from the following sources. Recent variations in the generic-level taxonomy of Australian inland aquatic malacostracans can also found in this material.

Decapoda: Williams (1980); Hobbs (1992); Chace (1992); Bruce (1993); Bruce and Short (1993); Chace and Bruce (1993).

Syncarida: Knott and Lake (1980); Williams (1980); Schminke (1981).

Isopoda: Williams (1980).

Phreatoicoidea: Knott (1975; 1986).

Cirolanidae: Bruce (1986), Bruce and Humphreys (1993).

Sphaeromatidae: Harrison and Ellis (1991); Bruce (1992).

Janiroidea (Microparasellidae, Janiridae): Stock (1977); Brusca and Wilson (1991); Wilson (1994); Wilson and Wägele (1994).

Oniscoidea: Green (1961)

Amphipoda: Williams (1980); Richardson, unpubl.; Barnard and Barnard (1983); Williams and Barnard (1988); Zeidler (1988a, 1991); Barnard and Drummond (1992).

Thermosbaenacea: Poore and Humphreys (1992); Schram (1986).

1.4 Glossary of some selected terms

ambulatory - adapted for walking (in the case of pereopods); adapted for anchoring then moving body (in the case of phreatoicoid uropods).

calceolus (pl. *calceoli*): minute sensory structures sometimes present on the antennae (usually second antenna of males)(see Lincoln and Hurley 1981).

gnathopod - pereopod modified for grasping functions, usually by opposing the dactylus with part of the propodus, but variations on this theme can occur, such as opposing the carpus with the dactylus. The degree of opposition can vary too (ie. gnathopods can be sub-chelate, where the dactyl is reflexed back onto a palm of the propodus, or chelate). The eusirid gnathopod has the propodus attached to the carpus by a narrow neck allowing great flexibility, and appearing hammer-shaped.

oöstegites - plates associated with the pereopodal coxae in female amphipods and isopods, and together expanded to form a brood pouch.

pereon - group of free thoracic segments (numbering seven in the Pericarida)

pereonite - one segment of thorax bearing locomotory appendages

pleon - group of abdominal segments bearing the pleopods

pleonite - one abdominal segment bearing pair of pleopods

pleotelson - body segment formed by the fusion of terminal abdominal segment(s) to telson

rugosities - granulations or minute projections (occurring over a surface)

somite - segment, used in reference to trunk or body

tritulating - grinding

urosome - group of abdominal segments bearing uropods; in the case of the amphipods the terminal two abdominal segments have their pleopods modified into uropodal structures, thus the urosome is composed of the last three segments, the most terminal of which bears the telson and third uropods (the "real" uropods).

urosomite - a body segment of the urosome

**1.5 PRELIMINARY SYNOPSIS OF THE TAXONOMY OF THE AUSTRALIAN
INLAND AQUATIC MALACOSTRACAN CRUSTACEANS**

(with the genera recognised in most families)

Classifications to family adapted from Bowman and Abele (1982).

- Phylum, Subphylum, or Superclass Crustacea
 (Class Branchiopoda)
 (Class Cephalocarida)
 (Class Maxillopoda)
 (Class Ostracoda)
 (Class Remipedia)
 Class Malacostraca
 Subclass Eumalacostraca
 Superorder Syncarida
 Order Anaspidacea
 Suborder Anaspidinea
 Family Anaspididae
 Genera *Anaspides*, *Allanaspides*, *Paranaspides*
 Family Koonungidae
 Genera *Koonunga*, *Micraspides*
 Suborder Stygocaridinea
 Family Stygocarididae
 Family Psammaspididae
 Genera *Psammaspides*, *Eucrenonaspides*
 Order Bathynellacea
 Family Bathynellidae
 Genus *Bathynella*
 Family Parabathynellidae
 Genera *Notobathynella*, *Chilibathynella*, *Atopobathynella*,
Hexabathynella
 Superorder Peracarida
 Order Thermosbaenacea
 Family Monodellidae or Halosbaenidae
 Genus *Halosbaena*
 Order Amphipoda
 Suborder Gammaridea
 Family Talitridae
 Family Ceinidae or Hyaellidae
 Genera *Austrochiltonia*, *Phreatochiltonia*
 Family Eusiridae
 Genus *Pseudomoera*, *Paraleptamphopus*
 Family Paracalliopidae
 Genus *Paracalliope*
 Family Corophiidae
 Genus *Paracorophium*
 Superfamily Crangonyctoidea
 Family Paramelitidae
 Genera *Austrogammarus*, *Austrocrangonyx*, *Antipodeus*,
Hurleya, *Uroctena*, *Giniphargus*, *Protocrangonyx*
 Family Neoniphargidae
 Genera *Tasniphargus*, *Neoniphargus*, *Yulia*, *Wesniphargus*
 Family Perthiidae
 Genus *Perthia*

2. Preliminary key to the orders and families of inland malacostracan crustaceans

2.1 Key to Orders

1. Carapace present; covering only part or all of the dorsal and lateral sides of the thorax (Figs. 1, 2, 3)

2

Crustaceans without carapace

3

2 (1). Carapace completely covering dorsal and lateral parts of thorax

Order Decapoda.....5

Carapace reduced in size, fused to 1st thoracic segment, free above all others as a dorsal pouch in females (Figs 2, 3)

Order Thermosbaenacea.....

MONODELLIDAE or HALOSBAENIDAE

[Only one species known from Australian inland waters, taken from a cave, North West Cape Peninsula, Western Australia, 1-1.5 mm in total length (Poore and Humphreys 1992)]

3 (1). Exopodites present on walking legs (Fig. 4); no limbs modified as gnathopods

Superorder Syncarida (Figs 10, 11, 11A).....10

Exopodites not present on walking legs (Fig 5); 1 or 2 pairs of limbs modified as gnathopods, or if not then animal either dorsoventrally flattened, or with segmentation reduced in the abdomen

4

4 (3). Typically, laterally flattened; 3 pairs of uropods, rarely 2; 3 pairs of pleopods all slender and not plate-like (Fig. 6)

Order Amphipoda.....26

Typically dorso-ventrally flattened; 1 pair of uropods; 5 pairs of pleopods, not slender, often plate-like, sometimes reduced (Fig. 7, 8, 9)

Order Isopoda.....15

2.2 Decapoda

- 5 (2). Abdomen not folded tightly beneath thorax and bearing tail-fan (Fig 12); rostrum conspicuous. (Abdomen and rostrum may be reduced in relative size, for instance in the land crayfish and the subterranean shrimps, respectively.)
.....6
- Abdomen folded tightly under cephalothorax, without tail fan (Fig 13); rostrum markedly reduced or absent
.....8
- 6 (5). First 3 pairs of pereopods chelate (third pair of pereopods bearing chelae); rostrum compressed dorsoventrally
.....PARASTACIDAE
- First 2 pairs of pereopods chelate (third pair of pereopods never bearing chelae); rostrum compressed laterally (but may be reduced or absent in subterranean forms)
.....7
- 7 (6). Second pair of pereopods markedly different to first pair; fingers of chelae never with tufts of long setae (Fig. 14). All pereopods always lacking exopodite
.....PALAEMONIDAE
- Second pair of pereopods similar to first pair; fingers of chelae with tufts of long setae (Fig 15). Pereopods may have exopodite
.....ATYIDAE
- 8 (5). Body shape rounded; orbits absent or very incomplete; rostrum present but short (Fig. 16)
.....HYMENOSOMATIDAE
- Body shape more or less square; orbits conspicuously developed; rostrum absent or inconspicuous (Figs. 17, 18)
.....9

9 (8). Carapace tending to be broader anteriorly than posteriorly, without a squarish carapace; branchial region of carapace swollen over lateral half of carapace anteriorly (Fig. 17)

.....SUNDATHELPUSIDAE

["Freshwater crabs" often living at a considerable distance from marine conditions]

Carapace tending to be of equal width anteriorly and posteriorly, and with squarish outline; branchial region of carapace not swollen, or if so over lateral two thirds of carapace posteriorly (Fig. 18)

.....GRAPSIDAE

["Shore crabs" occasionally found in fresh or brackish water not far from marine conditions; the family is very diverse and any crab suspected of belonging to it might be identified using a key such as Wescott (1977). In general the two most likely crab contenders for freshwater existence in Australia are *Leptograpsodes octodentatus* (which is recognised by the presence of anterolateral dentition on the carapace, principally four teeth on each side), and *Sesarma erythroductyla* which, like all species belonging to the Sesarminae, can be identified by the presence of an oblique line of setae positioned across the third maxilliped.]

2.3 Syncarida

10 (3). Trunk with 14 body segments (8 free thoracic segments)(Fig. 10)
Order Bathynellacea.....11

Trunk with 13 body segments (7 free thoracic segments) (Fig. 11, 11A)
Order Anaspidae.....12

11 (10). First pleopod 2 - segmented; exopodite of second antennae 1-segmented
BATHYNELLIDAE
 (interstitial crustaceans; up to 1 mm total length)

First pleopod 1 - segmented or absent; exopodite of second antennae absent (may be replaced
 by a seta)
PARABATHYNELLIDAE
 (interstitial crustaceans; up to about 3 mm total length, usually much smaller)

12 (10). Rostrum a simple lobe (Fig. 19); maxillula with palp; telson rounded, and with
 uropods forming a flattened tail fan (Fig. 11A)
13

Rostrum bilobed (Fig. 19); maxillula without palp; telson not necessarily rounded, but not
 forming a flattened tail fan with uropods
14

13 (12). Stalked eyes present (Fig. 11A)
 ANASPIDIDAE

Eyes absent or sessile
KOONUNGIDAE

14 (12). Third and fourth abdominal segments with pleopods (but greatly reduced); exopodite
 of uropod 2 - segmented
PSAMMASPIDIDAE
 (interstitial crustaceans; up to 10 mm total length)

Third and fourth abdominal segments without pleopods; exopodite of uropod 1 - segmented
 (Fig. 11)
STYGOCARIDIDAE
 (interstitial crustaceans, specimens up to 2 mm in length known)

2.4 Isopoda

15 (4). Abdomen six segmented with pleotelson; body circular in cross-section (often appearing laterally compressed due to extension of abdominal pleura); uropoda ambulatory (ie. can be used to flick or push the animal forward when disturbed), not forming a tail fan with the telson (Figs. 20, 21, 22)

.....Sub-order Phreatoicoidea.....16

[Sub-order entirely inland aquatic, predominantly fresh. The family designations given here are those changes proposed by Knott (1975) to the scheme of Nicholls (1943, 1944); key characters are taken from diagnoses for the families (Poore, pers. comm., authors given)]

Abdominal somites and telson (sometimes fused with terminal pereonite) forming six segments or less; body usually dorsoventrally compressed; uropods forming a tail fan, or positioned laterally or terminally, or non-ambulatory

.....20

16 (15). Both mandibles with a *lacinia mobilis* (see Fig. 23)

.....17

lacinia mobilis on left mandible only (pleon laterally compressed; head long, generally without a posterior process; cervical groove well-developed (Fig. 24); pereonite 1 not usually fused to head)

.....PHREATOICIDAE

17 (16). Eyeless; unpigmented; body vermiform (attenuated, generally without without abdominal pleura); trunk truncated (terminates abruptly), without pleotelsonic projections; generally subterranean

.....(Fig. 8)....HYPSIMETOPIDAE

With sessile eyes (Phreatoicopsidae have small eyes and in one species lack eyes, but as with all other phreatoicoids in this couplet they are coloured, epigean forms); body robust or sub-cylindrical; pleotelsonic pleura or lobe present (Fig. 25); epigean

.....18

18 (17). Head moderately long without cervical groove, with small ridge at posteroventral corner; pereonite 1 not overlapping head; pleotelsonic pleura paired (lateral, never on posteriorly central); posterior coxae movable; eyes small or absent

.....PHREATOICOPSIDAE

Head short with or without cervical groove, without small ridge at posteroventral corner; pereonite 1 overlaps head; never with paired pleotelsonic pleura; posterior coxae fused to tergites; eyes prominent

.....19

19 (18). Pleopodal endopods without plumose setae; pleotelson rounded lobe or emarginate (Fig. 25)AMPHISOPIDAE

Pleopodal endopods with setae on margins of endites; pleotelson with 1 upturned lobe (Fig. 25)MESAMPHISOPIDAE

20 (15). Uropods positioned laterally and/or forming a tail fan complex with the pleotelson (Figs 26, 27)21

Uropods neither positioned laterally, nor forming a tail fan complex with the pleotelson23

21 (20). Body more or less dorsoventrally flattened; telson fused with last abdominal segment; outer ramus of uropod not folding dorsally over pleotelson (both rami of uropod inserted ventrolaterally in position)Suborder Flabellifera.....22

Body elongate and more or less cylindrical in cross-section; telson not fused with last abdominal segment; outer ramus of uropod folding dorsally over pleotelsonSuborder Anthuridea.....(Fig. 28).....ANTHURIDAE
[Family predominantly marine; undescribed material found in a coastal freshwater lake in Victoria (Timms, cited in Williams 1980)]

22 (21). Pleon of six segments including pleotelson(Fig. 26).....CIROLANIDAE
[Predominantly marine family. Inland aquatic forms are generally ectoparasitic on *Macrobrachium* and *Paratya*; a subterranean form has recently been described (Bruce and Humphreys 1992)]

Pleon (abdomen + telson) apparently 2-segmented(Fig. 27).....SPHAEROMATIDAE
[Predominantly marine; some estuarine forms may be found in lower parts of river systems]

23 (20). Pleonites 1-5 usually separate, and less wide than posterior pereonites (body widest over anterior pereonites); mandible without palpSuborder Oniscidea.....24

Pleon 1-segmented (or rarely 2-segmented), and nearly as wide, or wider than, posterior pereonites (body widest over pereonites 6-7, pleotelson); mandible with palpSuborder Asellota.....25

24 (23). Flagellum of antenna 2 with 3 articles; mandible bearing setose tuft (Fig. 32), without grinding (trituration) surface

.....(Superfamily Oniscoidea).....(Fig. 29).....ONISCIDAE
[Family includes both terrestrial and aquatic forms; *Haloniscus searli* for instance, is regularly found in inland saline waters across southern Australia]

Flagellum of antenna 2 with 3-10 articles (Fig. 31); mandible with trituration molar process (Fig. 33)

.....(Superfamily Styloniscoidea).....(Fig. 30).....STYLONISCIDAE
[Family classically deemed to include only terrestrial forms; persistent observations of styloniscids in water bodies in southern Australia at least have made this assessment less certain]

25 (23). Uropod with thin, subequal protopod and rami; pereopods 2-7 with 1 or 2 distal claws on dactyl (except for *Iais* which has 3); antennal scale present; head broader than long; body broadens posteriorly so that pleotelson and/or pereonites 6-7 are broader than anterior pereonites

.....(Fig. 9).....JANIRIDAE

Uropod with elongate, robust protopod that is longer than rami; pereopods 2-7 with 3 distal claws on dactyl; antennal scale absent; minute crustaceans with head longer than broad; body not broadening posteriorly

.....(Fig. 28A).....MICROPARASELLIDAE
[Very small (up to 1.5 mm?) interstitial crustaceans, known from one locality in southern Queensland nearly 30 km from the coast; otherwise members of this family are interstitial in sandy beaches or sublittoral habitats]

2.5 Amphipoda

“True” inland aquatic amphipods are found in the southern half of Australia, and most of them will conform to be keyed correctly using this key, or by using modifications which can be made following descriptions of new species, genera and even families currently being prepared for publication. Occasionally, however, amphipods will be found which don't conform to these generalisations. Amphipods which have a high likelihood of being incorrectly keyed here may have the following characteristics:

- found in northern Australia;
- found in subterranean conditions;
- found in freshwater habitats close to the coast (see, for example Zeidler 1988b).

Amphipods with these characteristics should be referred to a specialist.

26 (4). Mandible with palp (Fig. 23)	28
.....	
Mandible without palp (third uropod markedly reduced, uniramous or with rami absent)	27
.....	
27 (26). Third uropodal rami always absent; second antenna shorter than first antenna; clumsy swimmer or walks underwater; tending not to be green coloured when alive.	
.....	TALITRIDAE
[Terrestrial forms which may be found in aquatic samples where moist leaf litter occurs close to streams, or close to samphire flats or salt marshes]	
Third uropodal rami present but reduced, uniramous or absent; first antenna not longer than second antenna; swims quickly and well; often greenish when alive.	
.....	CEINIDAE or HYALELLIDAE
[Zeidler (1991) recommended that on the basis of similar mandibular, third uropodal, and telsonic characters, amphipods of the "Chiltonia" group should be moved into the Hyalellidae.]	
28 (26). Body slightly dorso-ventrally flattened, urosome markedly so; merus of second gnathopod conspicuously elongate (Fig. 34)(also second gnathopod of male with forward extension of merus); telson fleshy and entire (Fig. 35)	
.....	COROPHIIDAE
Without the above combination of characters	
.....	29
29 (28). Rami of third uropod unequal (Fig. 36); accessory flagellum of first antenna conspicuous, often 2+ articulate; calceoli (when present) lobed and linear, not cup-shaped (Fig. 37)	
.....	crangonyctoids.....31
Rami of third uropod equal or nearly so (Fig. 36); accessory flagellum of first antenna very small (1-segmented) or absent; calceoli (when present) variably cup-shaped (Fig. 37)	
.....	30

- 30 (29). Urosomites 2-3 fused (Fig. 38)
.....PARACALLIOPIIDAE
[Although referred to as amphipods of 'shorelines' in Barnard and Drummond (1992), the genus *Paracalliope* is very widely distributed in inland waters of southern Australia, particularly Victoria and Tasmania]
- Urosomites 2 and 3 separate
.....EUSIRIDAE
- 31 (29). Sternal gills sausage shaped or absent (Fig. 39)
.....PARAMELITIDAE
- Sternal gills dendritic or lumped
.....32
- 32 (31). Gnathopods large (Fig. 40), without rugosities; posterior lobes of coxae 5-7 not dominant; antenna 1 not significantly longer than antenna 2
.....PERTHIIDAE
- Gnathopods small, with rugosities; posterior lobes of coxae 5-7 dominant (Fig. 41); antenna 1 significantly longer than antenna 2
.....NEONIPHARGIDAE

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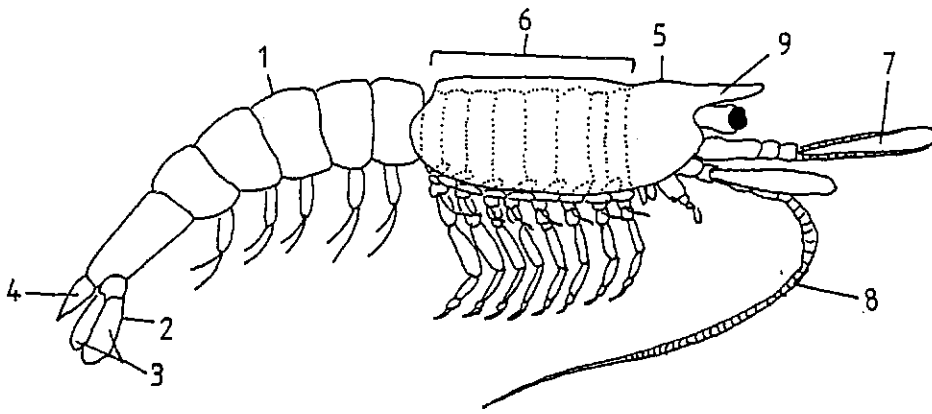


FIGURE 1: Generalized caridean crustacean

1. Abdomen
2. Uropod
3. Uropodal rami (inner=endopod, outer=exopod)
4. Telson
5. Carapace
6. Thoracic segments (1 - 8)
7. Antenna 1 (antennules)
8. Antenna 2 (antennae)
9. Rostrum

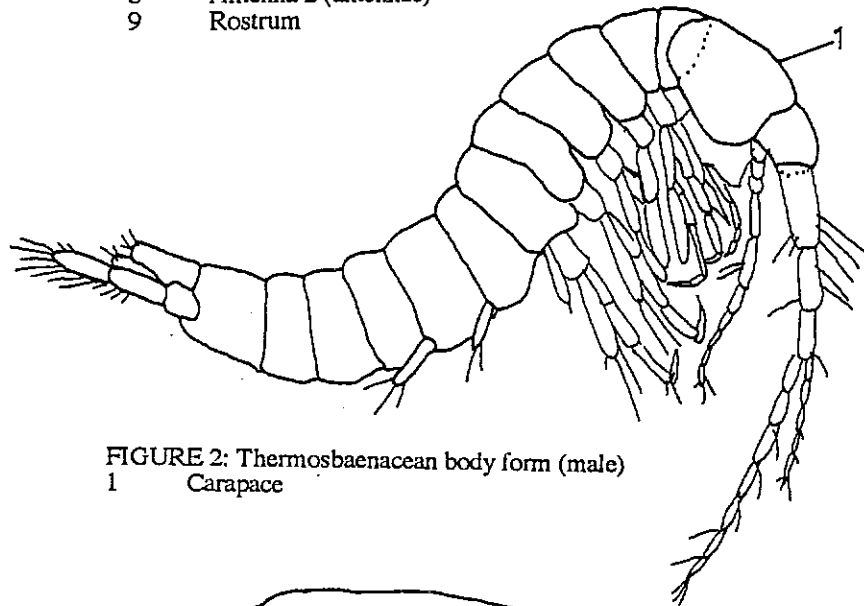


FIGURE 2: Thermosbaenacean body form (male)
1 Carapace

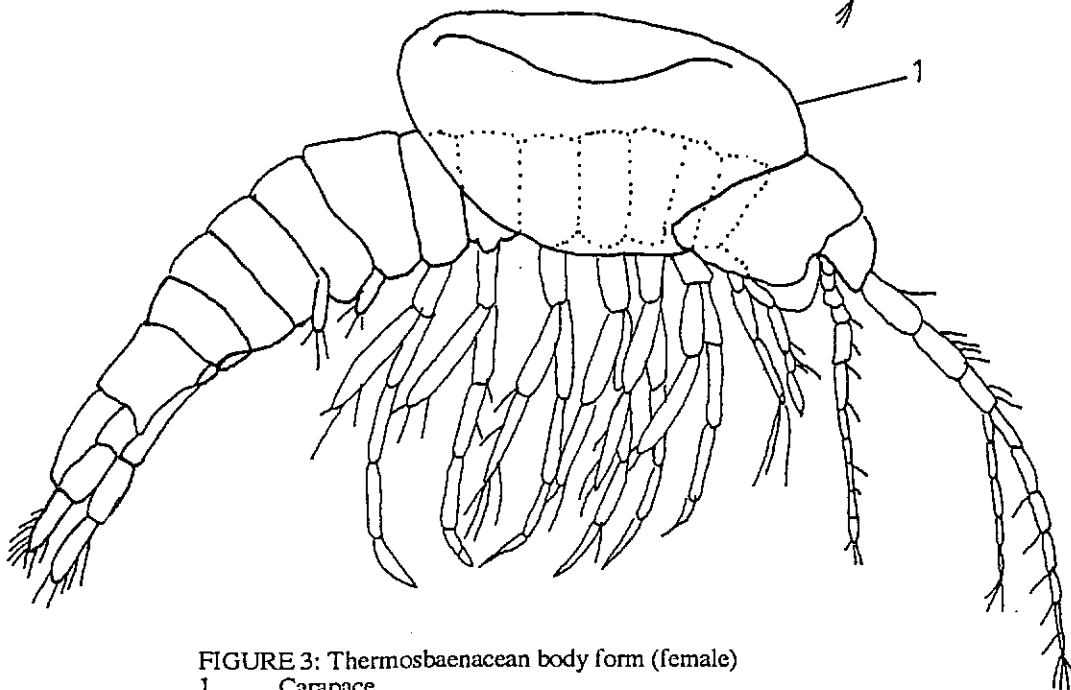


FIGURE 3: Thermosbaenacean body form (female)
1 Carapace

FIGURE 5: Generalised malacostracan limb without exopod

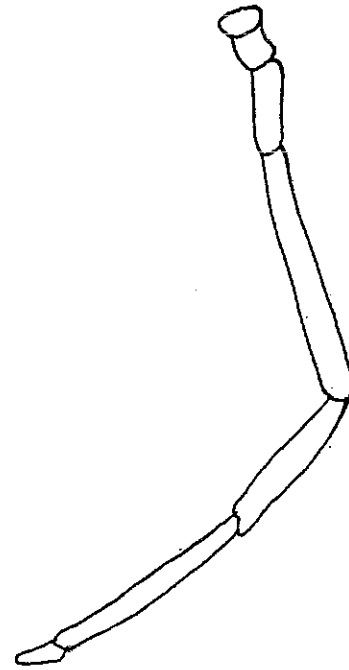


FIGURE 4: Generalized malacostracan limb

- 1 Exopod (2-segmented)
- 2 Endopod
- 2a Coxa
- 2b Basis
- 2c Ischium
- 2d Merus
- 2e Carpus
- 2f Propodus
- 2g Dactylus

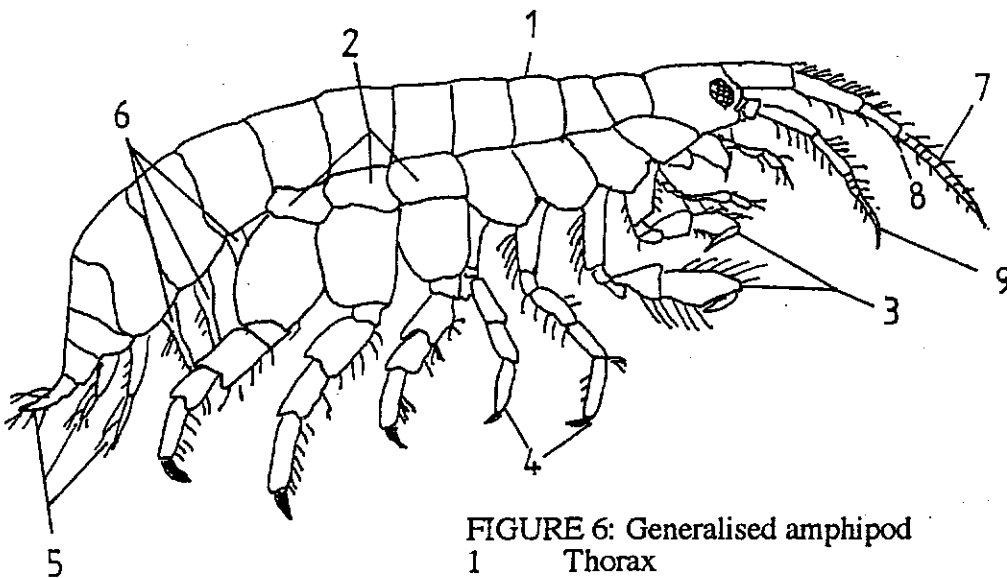
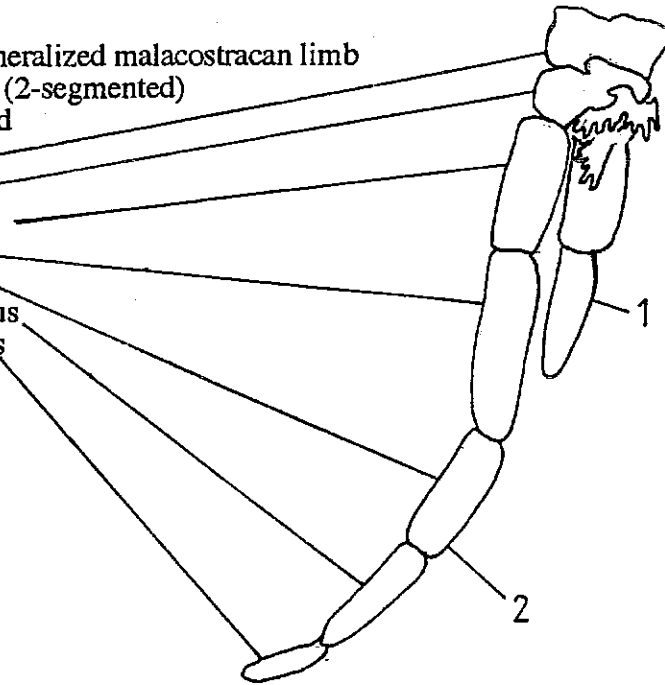


FIGURE 6: Generalised amphipod

- 1 Thorax
- 2 Coxae
- 3 Gnathopods
- 4 Pereopods
- 5 Uropods (1st, 2nd, 3rd pairs)
- 6 Pleopods
- 7 Antenna 1
- 8 Accessory flagellum
- 9 Antenna 2

FIGURE 7: Generalised isopod form, showing dorsal and ventral surfaces

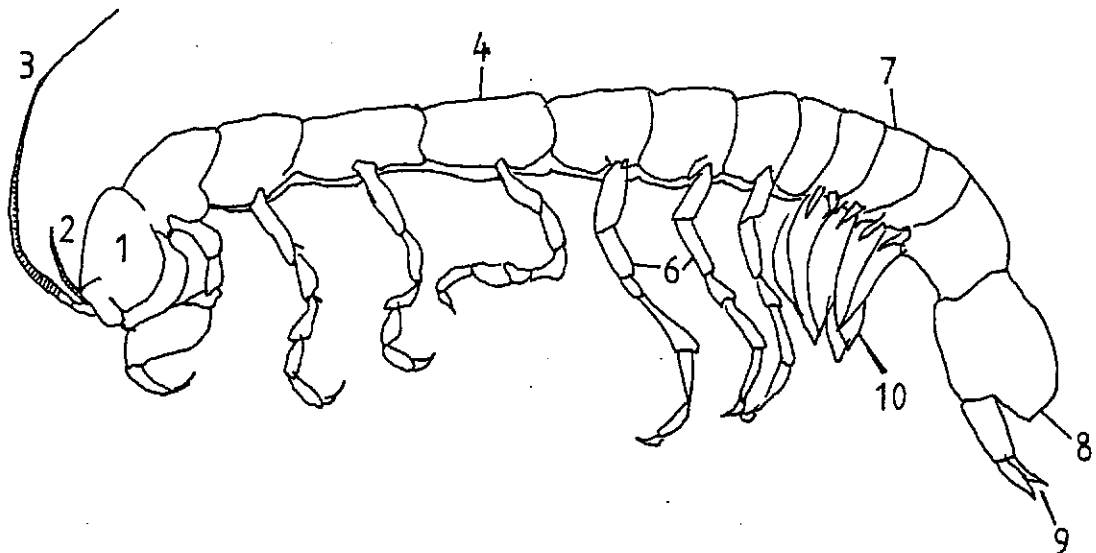
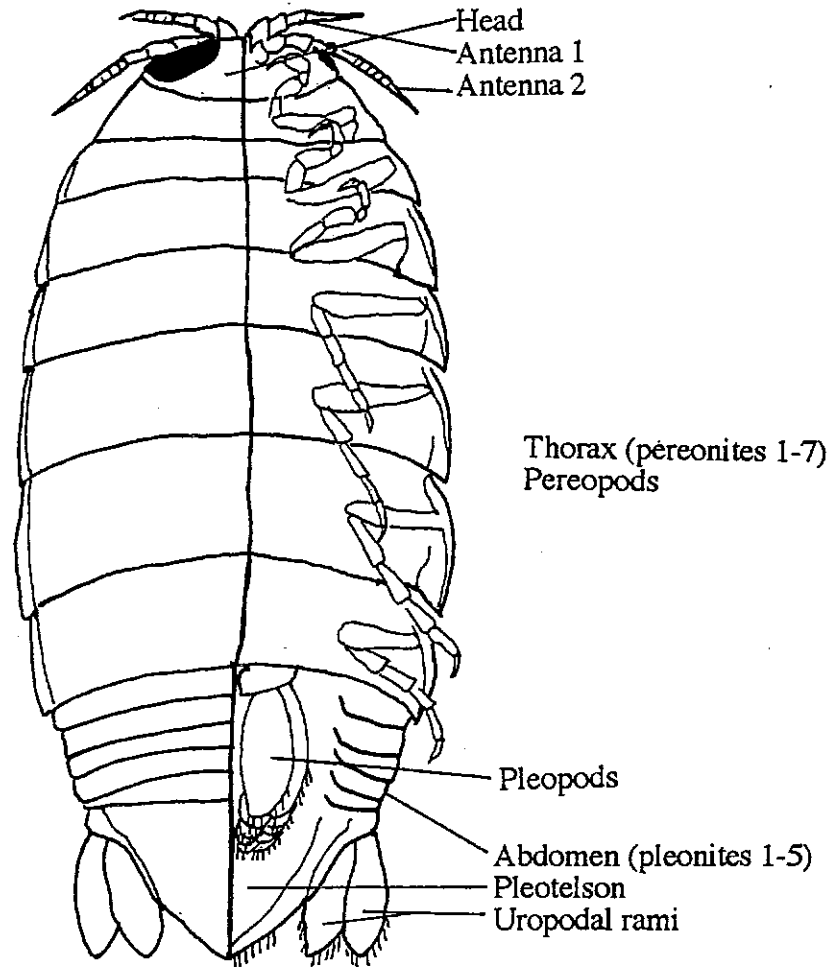


FIGURE 8: Generalised isopod form (phreatoicoid)

- 1 Head
- 2 Antenna 1
- 3 Antenna 2
- 4 Thorax (pereonites 1-7)
- 6 Pereopods
- 7 Abdomen (pleonites 1-5)
- 8 Telson
- 9 Uropodal rami
- 10 Pleopods

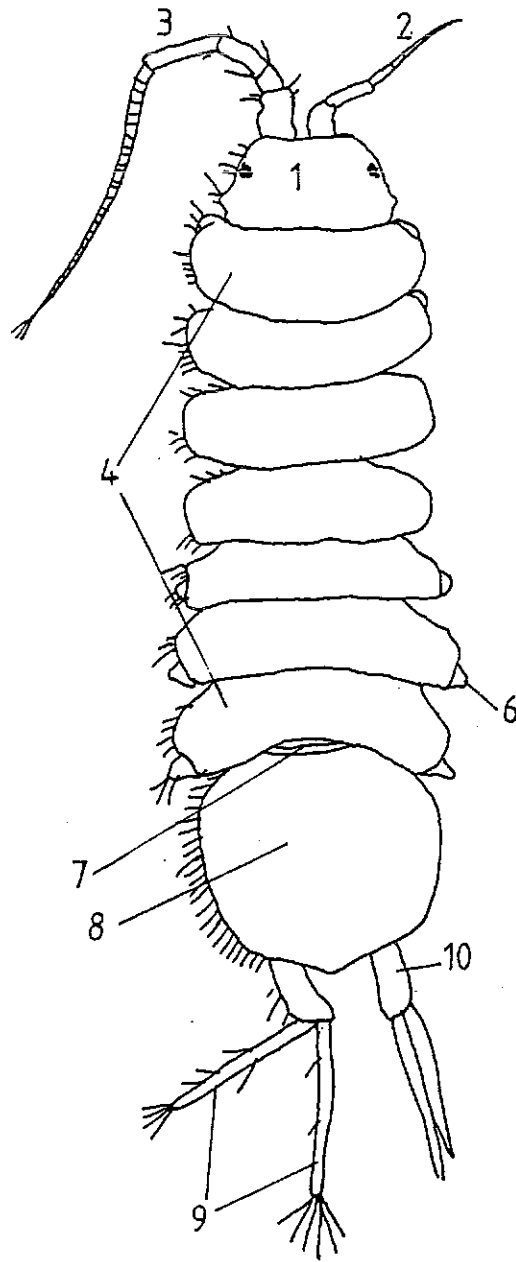
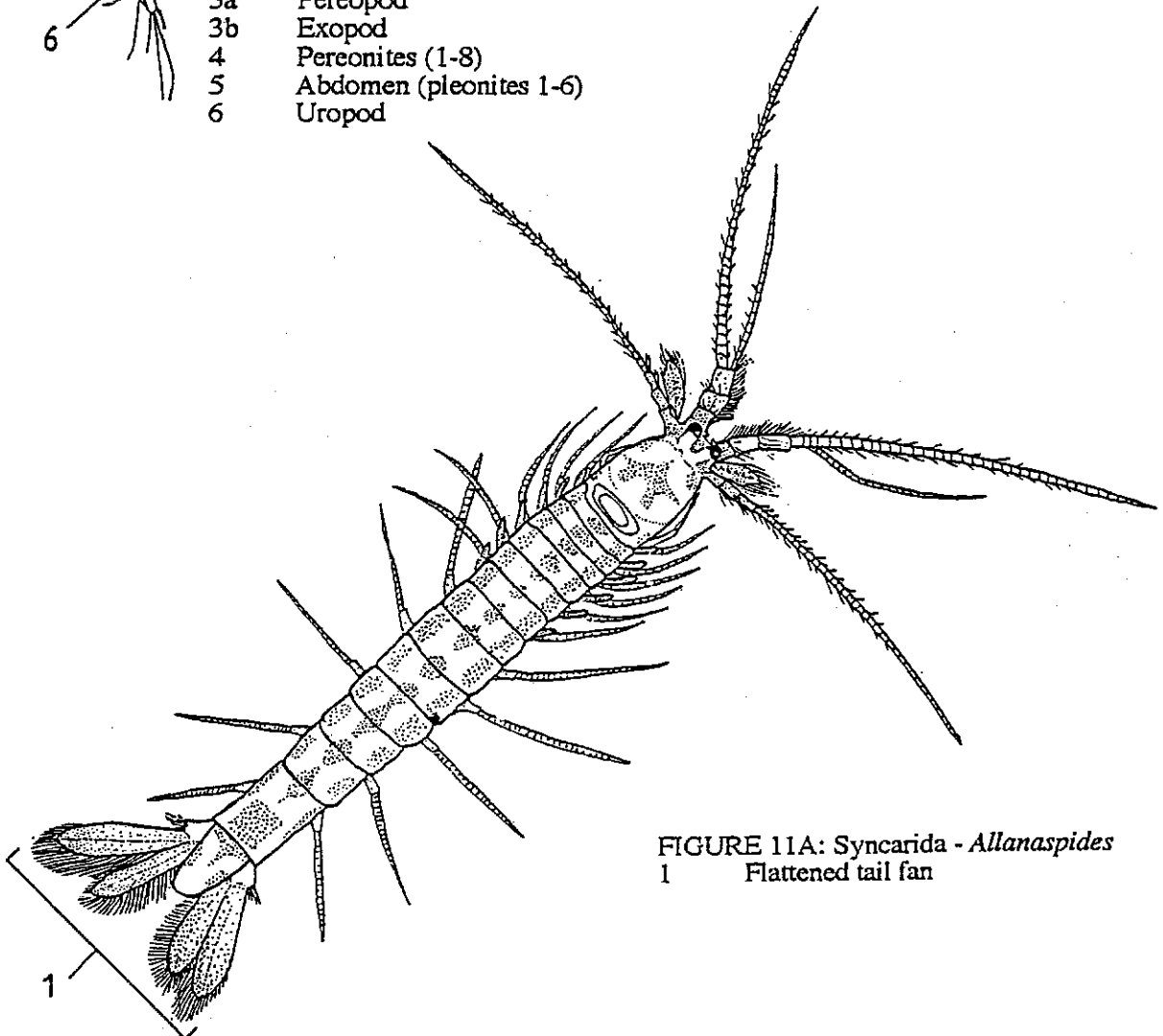
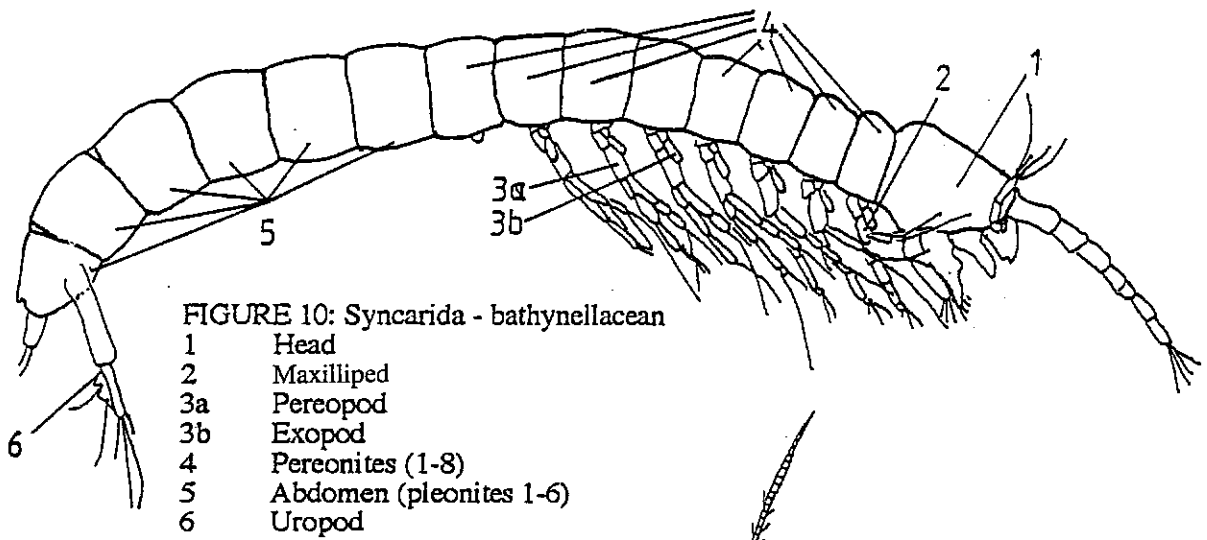
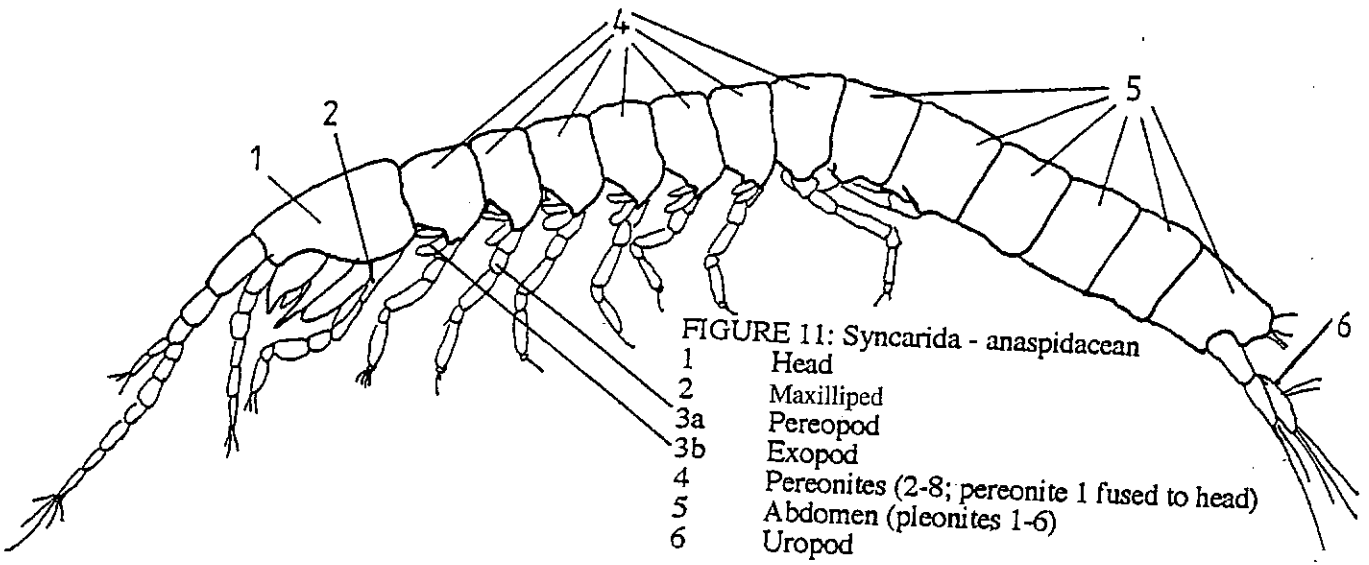


FIGURE 9: Generalised isopod form (janirid)

- 1 Head
- 2 Antenna 1
- 3 Antenna 2
- 4 Thorax (pereonites 1-7)
- 6 Pereopods
- 7 Abdomen (pleonite)
- 8 Pleotelson
- 9 Uropodal rami (tail fan not formed)
- 10 Uropodal protopodite



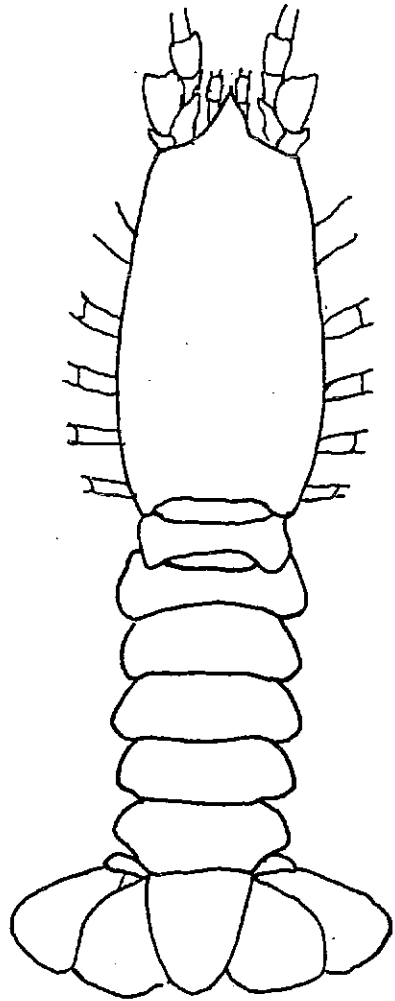


FIGURE 12: Crayfish showing extended abdomen and tail fan

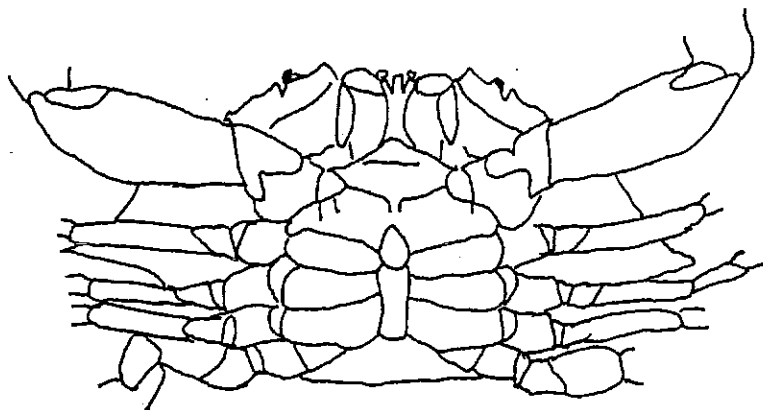


FIGURE 13: Crab form, showing ventral surface with abdomen tightly folded underneath

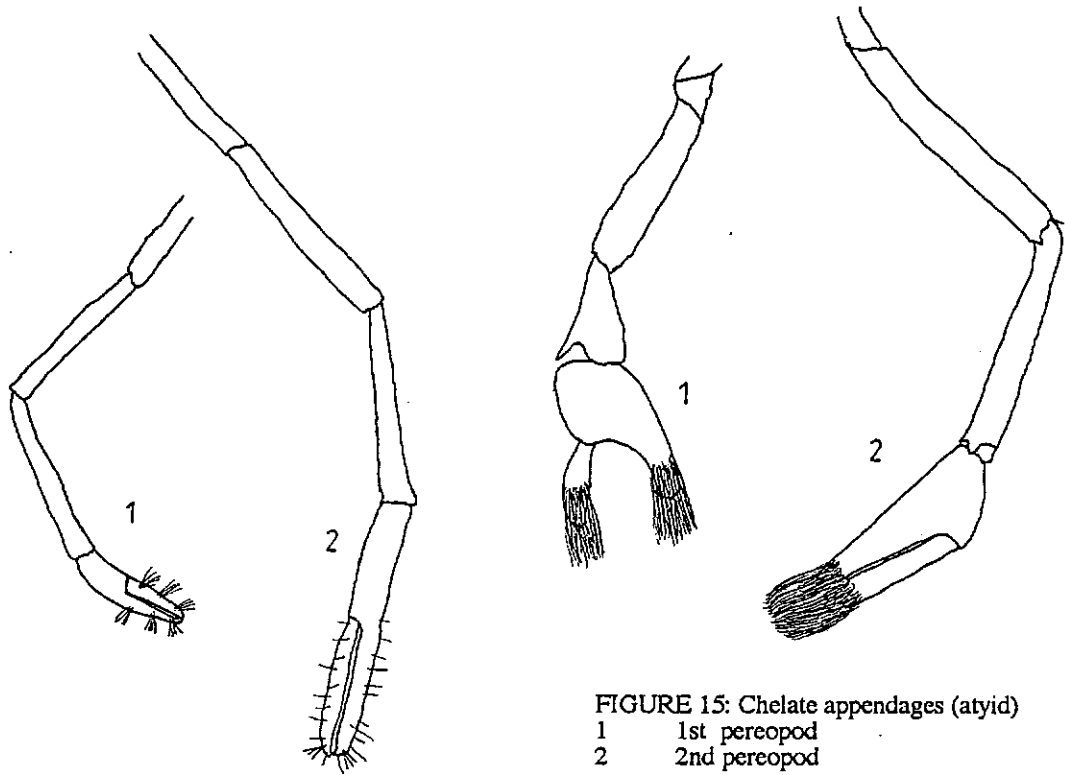


FIGURE 15: Chelate appendages (atyid)
 1 1st pereopod
 2 2nd pereopod

FIGURE 14: Chelate appendages (palaemonid)
 1 1st pereopod
 2 2nd pereopod

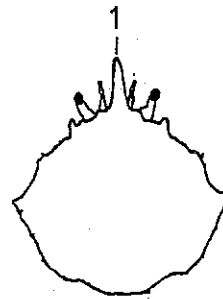


FIGURE 16: Hymenosomatidae, carapace shapes
 1 Rostrum

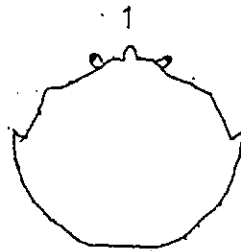


FIGURE 17: Sundathelphusidae, carapace shape (*Holhuisana transversa*)

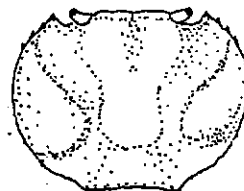


FIGURE 18: Grapsidae, carapace shape (*Leptograpsodes octodentatus*)
 1 Anterolateral dentition



FIGURE 19: Rostrum condition of anaspidaceans
 1 single lobe
 2 bi-lobed

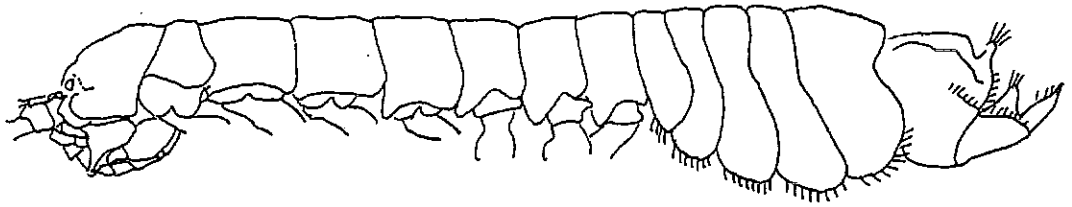


FIGURE 20: Phreatoicoid body form (Phreatoicidae)

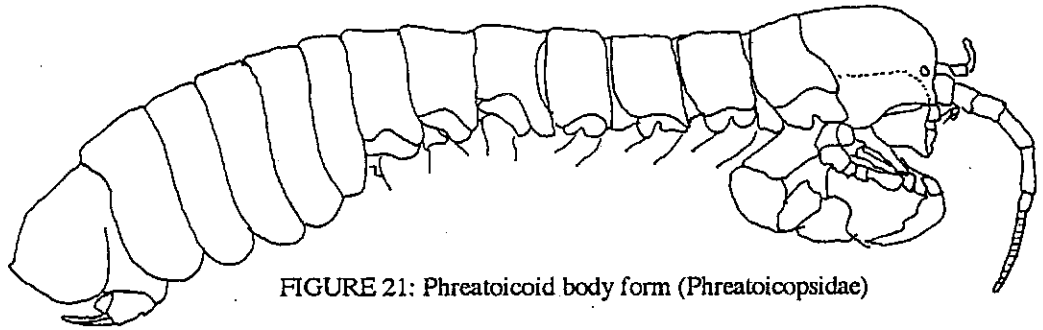


FIGURE 21: Phreatoicoid body form (Phreatoicopsidae)

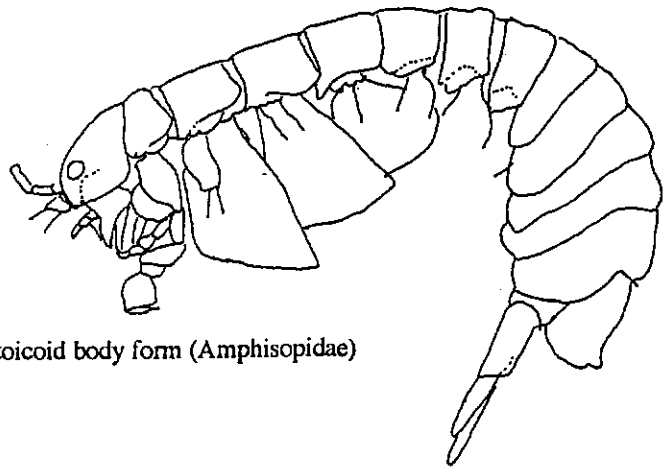


FIGURE 22: Phreatoicoid body form (Amphisopidae)

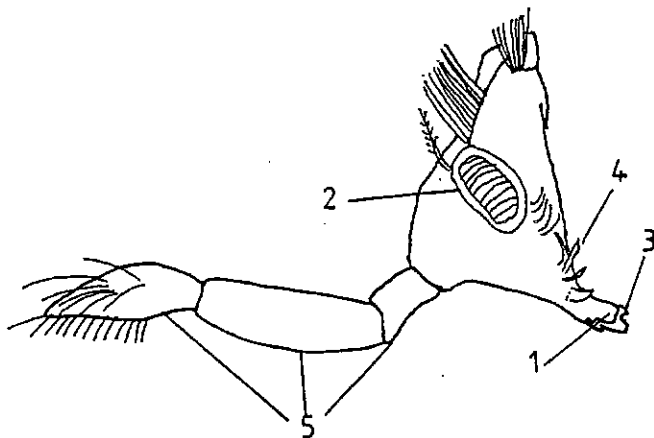


FIGURE 23: Mandible
 1 Lacinia mobilis
 2 Molar process
 3 Incisor process
 4 Setal fringe
 5 Mandibular palp (articles 1-3)

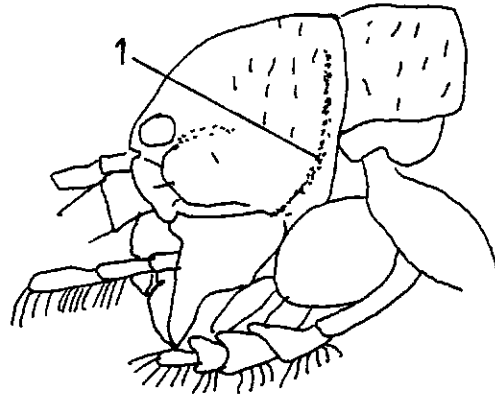


FIGURE 24: Phreatoicoid head
1 Cervical groove

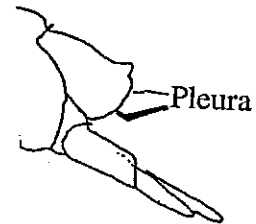
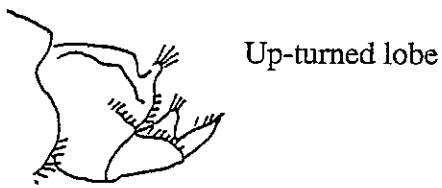
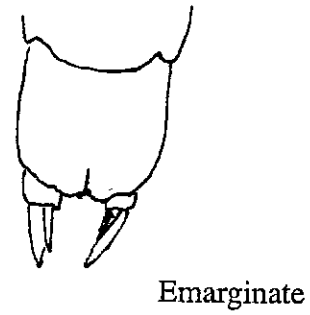
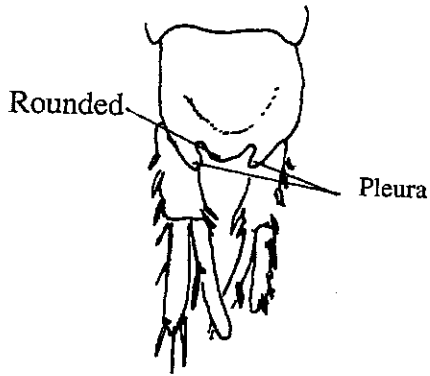


FIGURE 25: Phreatoicoid pleotelson
Rounded
Emarginate
With one up-turned lobe
Lateral pleura

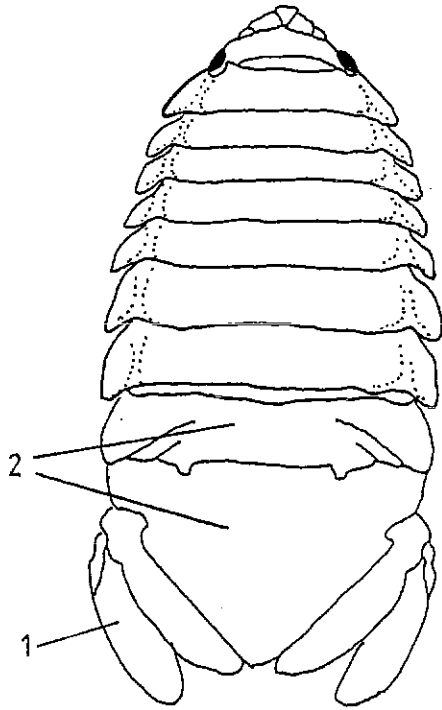


FIGURE 27: Sphaeromatidae
 1 Uropods positioned laterally, tail fan formed
 2 Pleon apparently 2-segmented

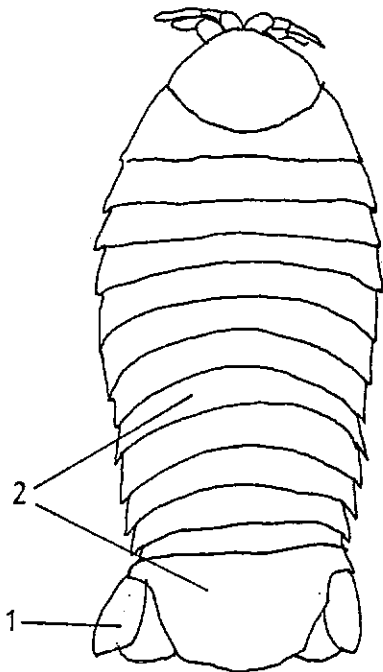


FIGURE 26: Cirolanidae
 1 Uropods positioned laterally, tail fan formed
 2 Pleon six-segmented.

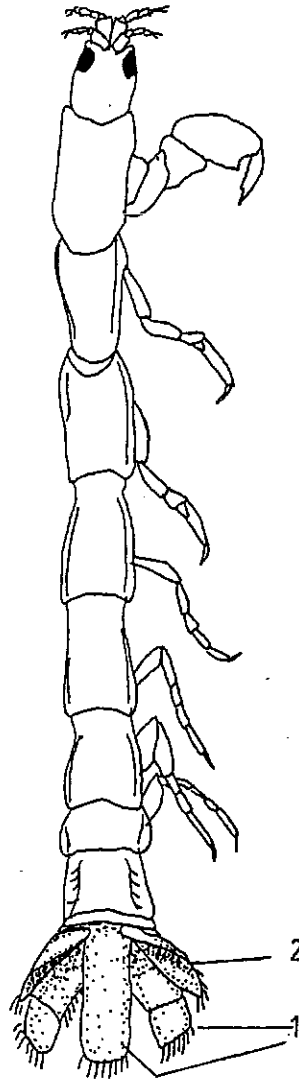


FIGURE 28: Anthuridae
 1 Uropods positioned laterally, tail fan formed
 2 Outer ramus of uropod arching over pleotelson

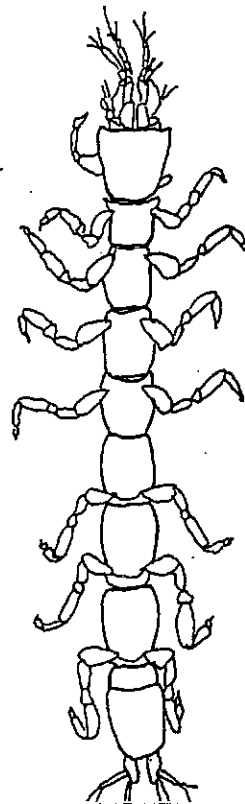


FIGURE 28A: Microparasellidae

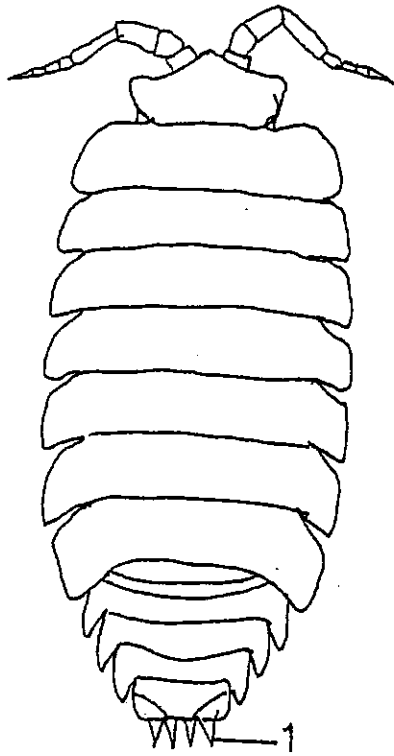


FIGURE 30: Styloniscidae

1 Uropods positioned terminally, tail fan not formed

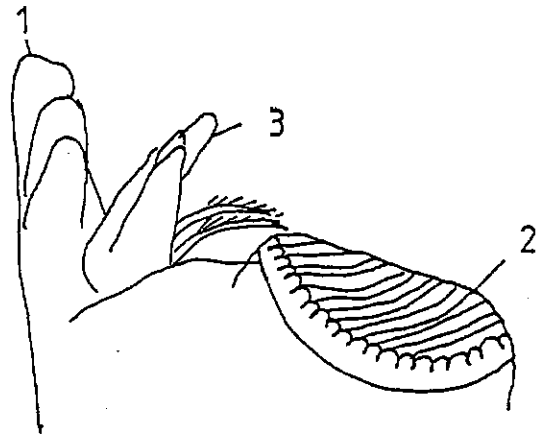


FIGURE 33: Styloniscid mandible

1 Incisor process
2 Molar process (tritulating)
3 Lacinia

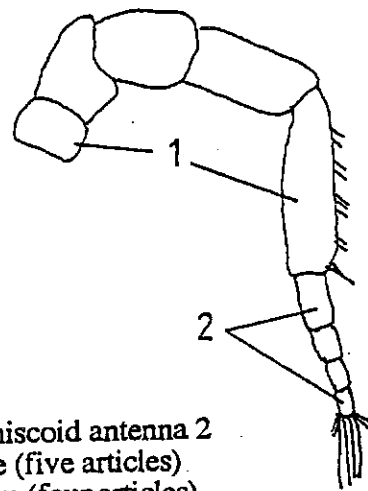


FIGURE 31: Oniscoid antenna 2

1 Peduncle (five articles)
2 Flagellum (four articles)

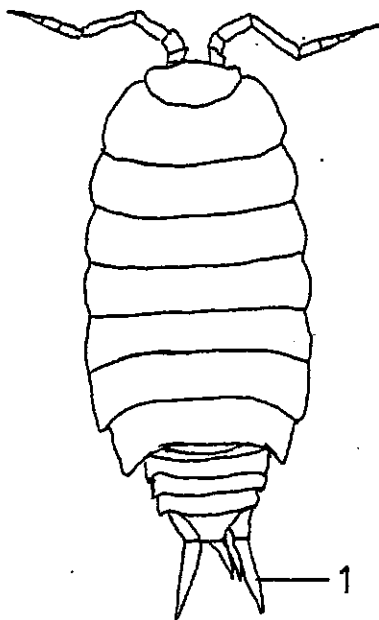


FIGURE 29: Oniscidae

1 Uropods positioned terminally, tail fan not formed

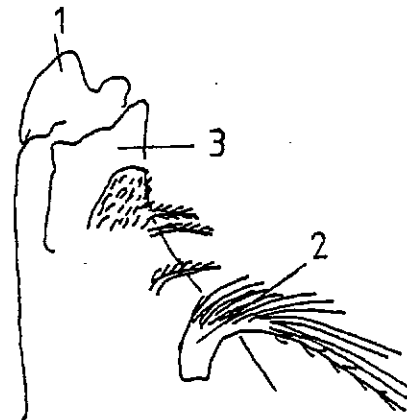


FIGURE 32: Oniscid mandible

1 Incisor process
2 Setose tuft
3 Lacinia

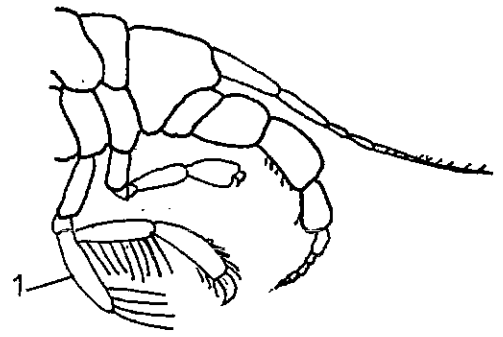


FIGURE 34: Corophiid gnathopod
1 Elongate merus, second gnathopod

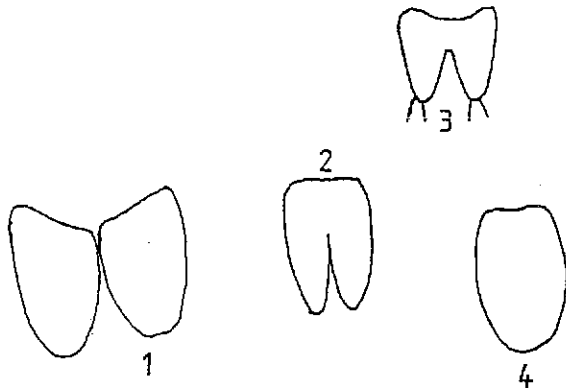


FIGURE 35: Range of conditions exhibited on telson

- 1 Completely cleft
- 2 Cleft
- 3 Cleft
- 4 Entire

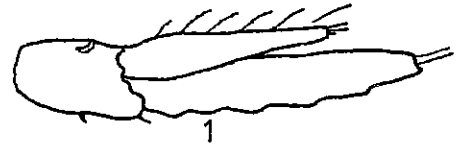
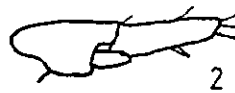


FIGURE 36: Uropodal rami (3rd uropod)
1 Rami subequal
2 Rami unequal

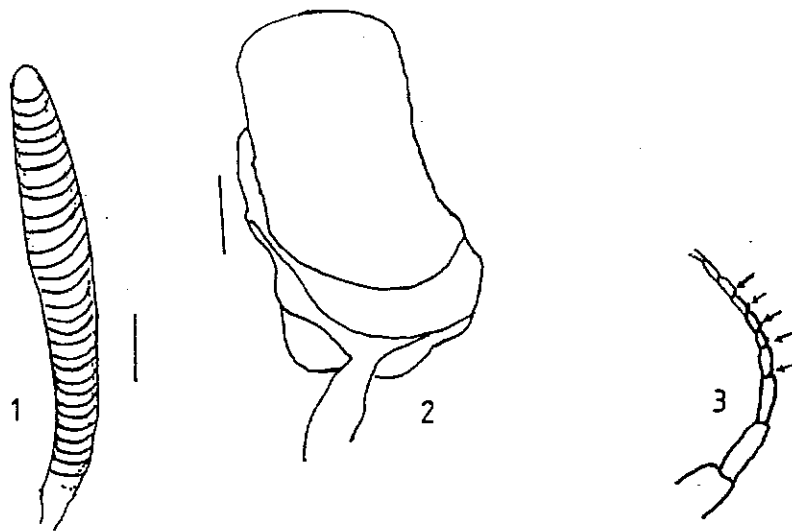


FIGURE 37: Calceoli (scale bar = 10µm)
1 Linear (series of crescent-shaped plates)
2 Cup-shaped
3 General location on flagellum of antenna

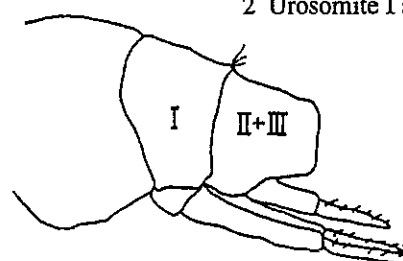
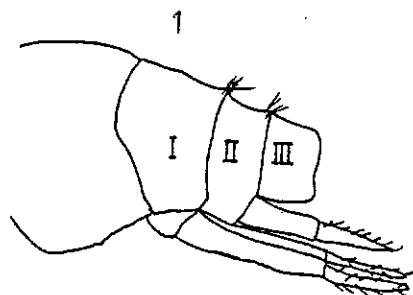


FIGURE 38: Amphipod urosomites
1 Urosomites I, II and III separate
2 Urosomite I separate, II and III fused

FIGURE 39: Gills of amphipods

- 1 Coxal gill
- 2 Coxa
- 3 Sternal gill
- 4 Oöstegite
- 5 Dendritic gill

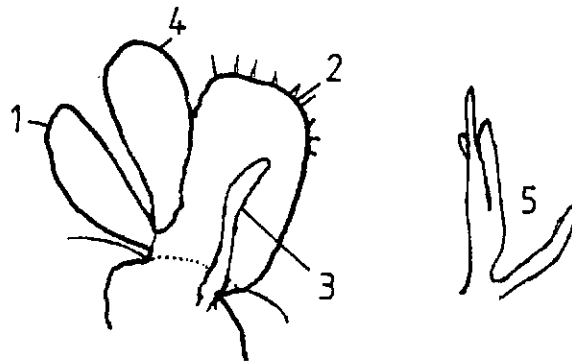


FIGURE 40: Generalized shape of a large gnathopod

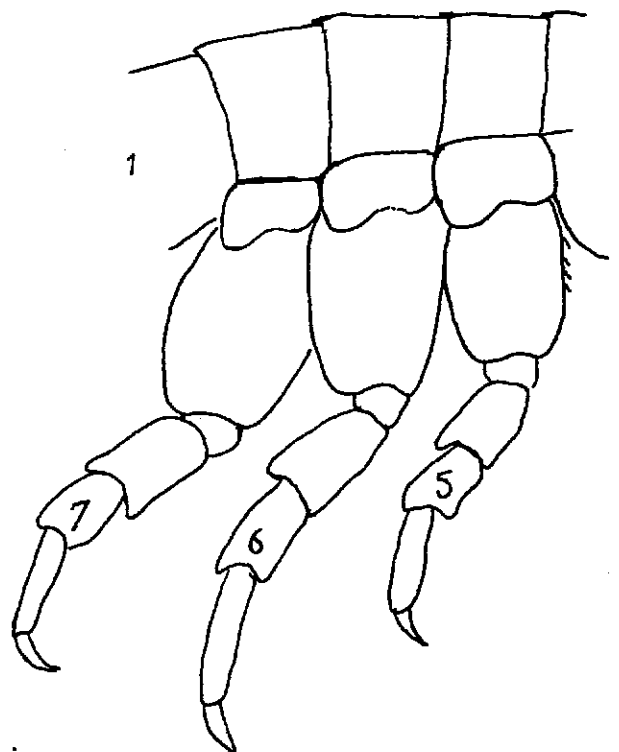
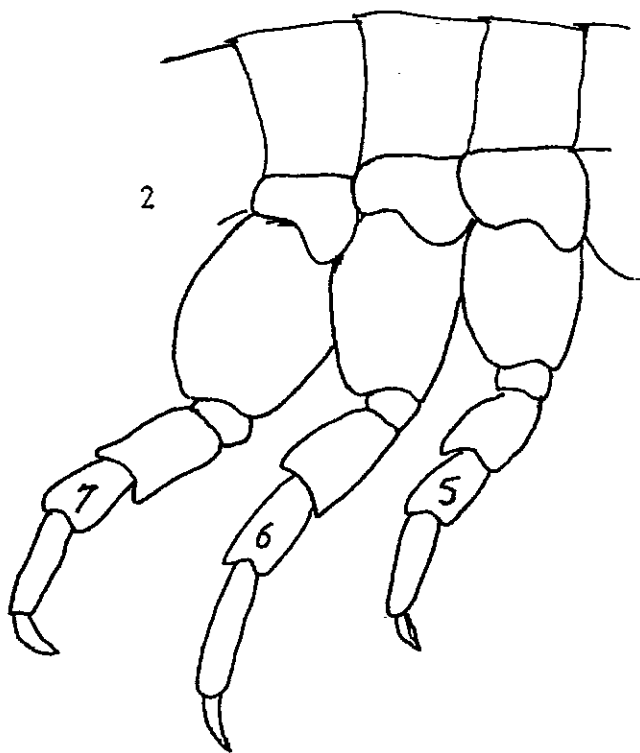
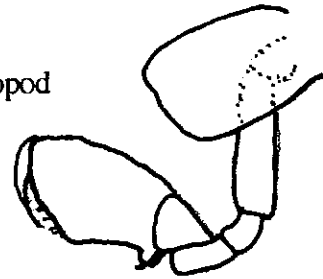
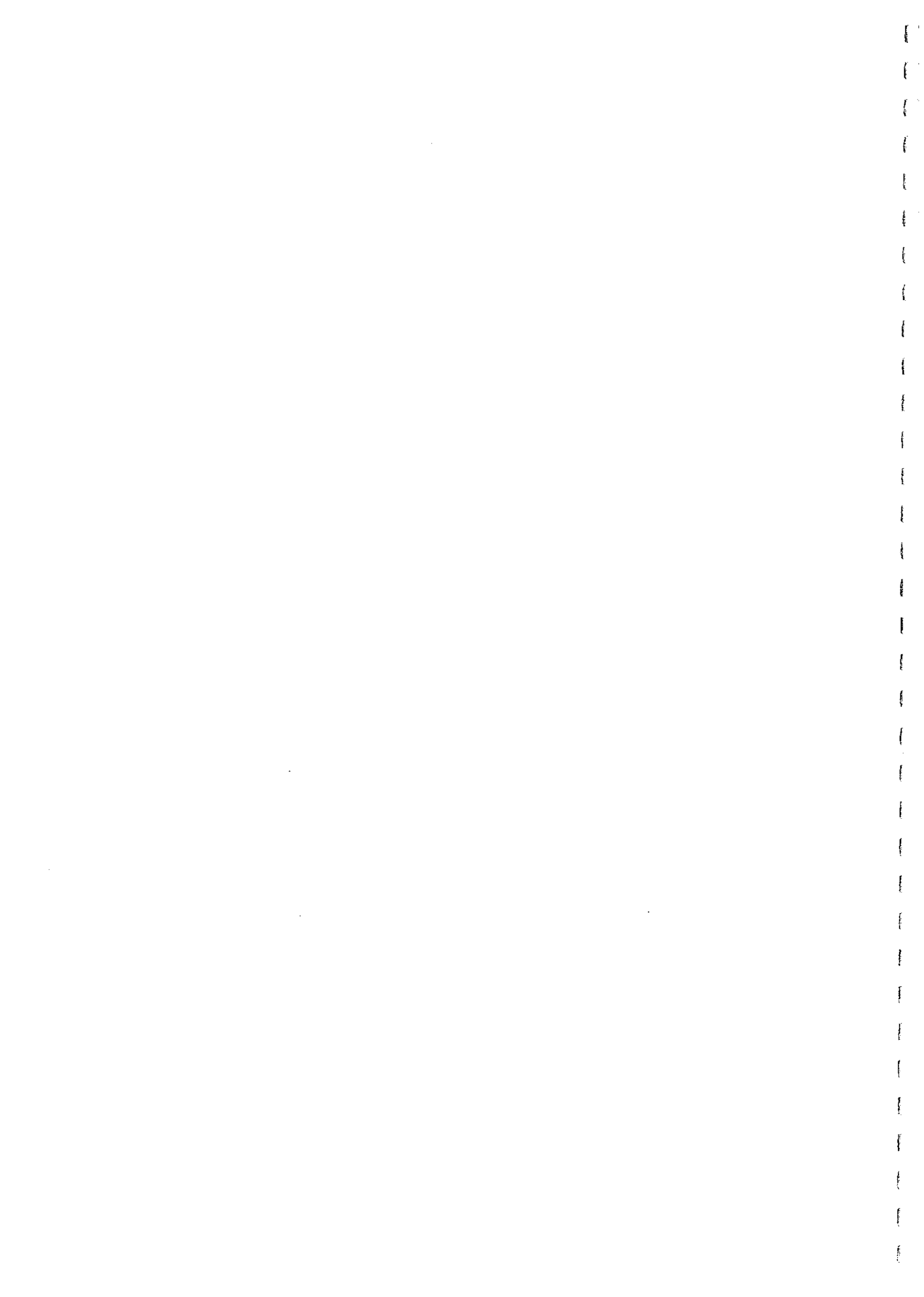


FIGURE 41: Amphipod coxae 5-7

- 1 Posterior lobes of coxae 5-7 dominant
- 2 Posterior lobes of coxae 5-7 not dominant



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