

CONSEIL INTERNATIONAL POUR L'EXPLORATION DE LA MER

Zooplankton

Sheet 67

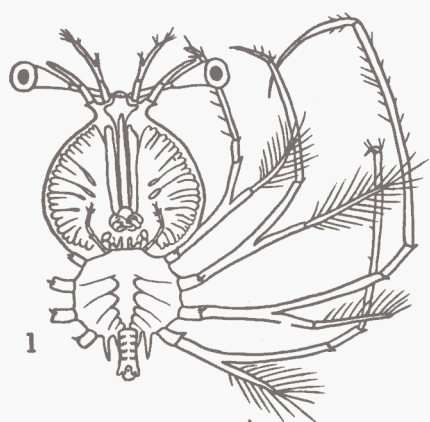
**CRUSTACEA,
DECAPODA: LARVAE**

I. General

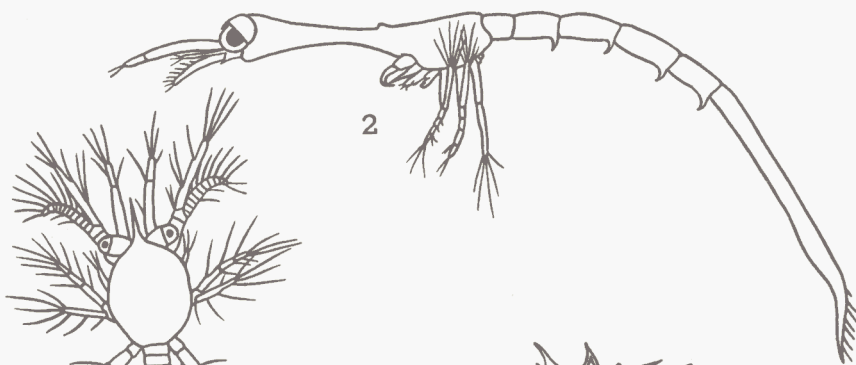
(By D. I. Williamson)

1957

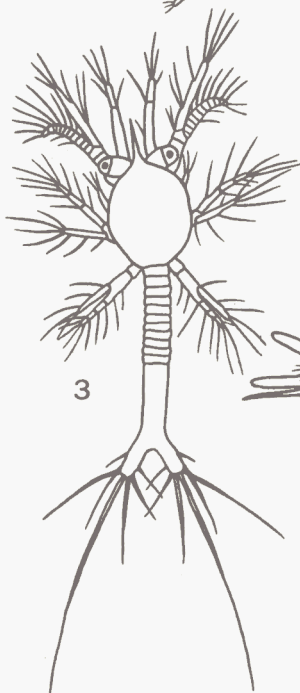
Geographical limits considered: 20°W.—60°E.
40°N.—80°N.



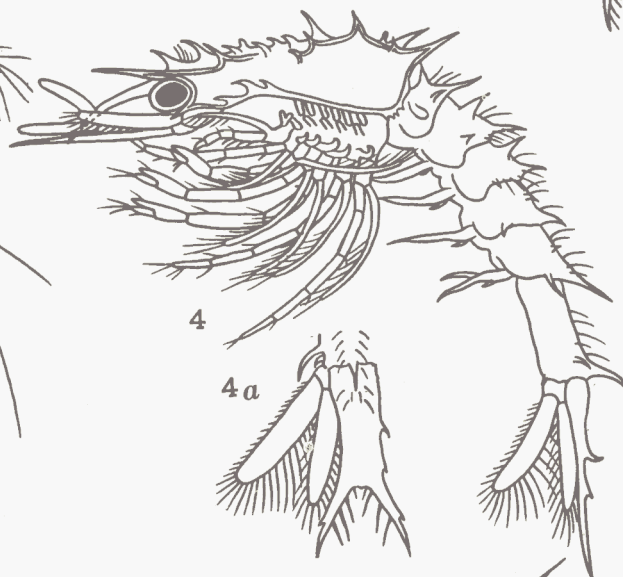
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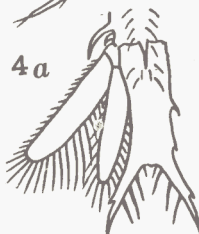
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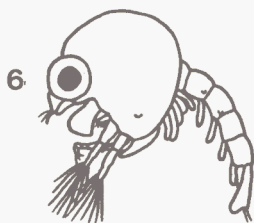
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4a



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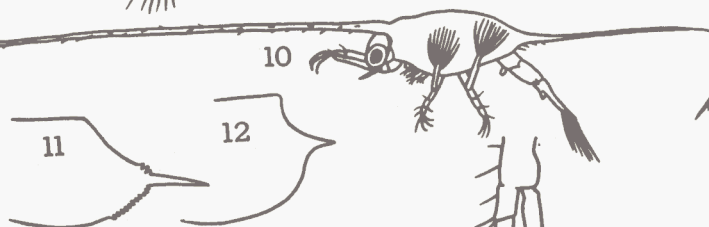


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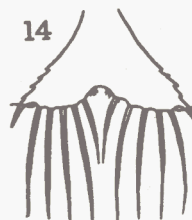
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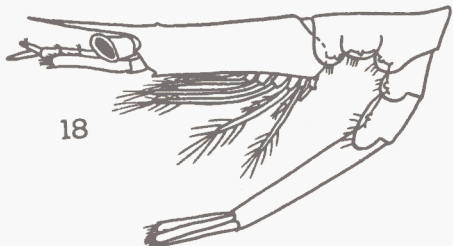
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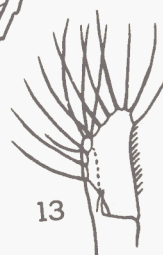
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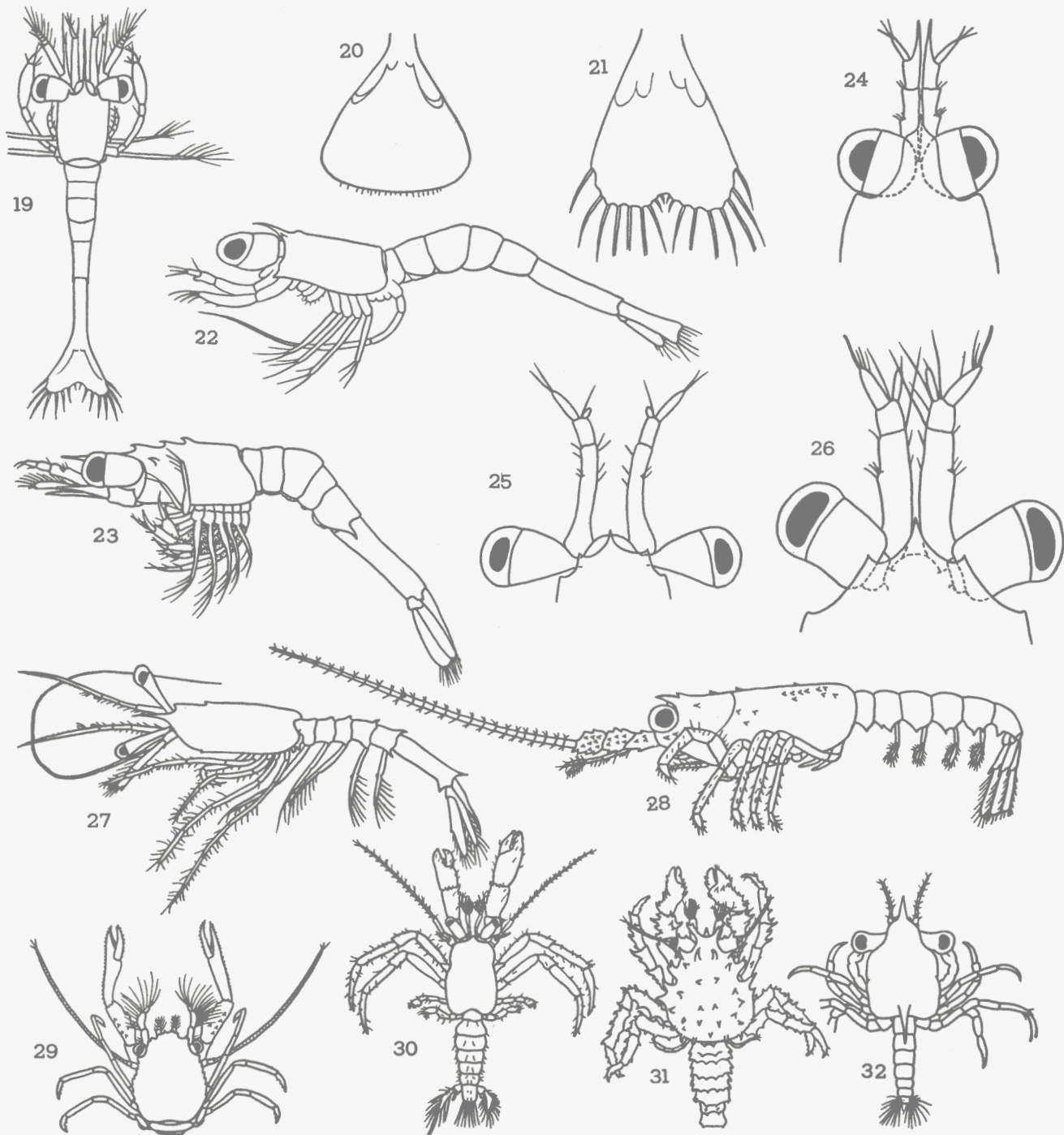
17



18



13



Figures 1—26, Zoeae. (Roman numerals refer to the zoeal stage.)

- 1, *Palinurus* III (Scyllaridea). 2, *Jaxea* II (Thalassinidea). 3, *Gennadas* II (Penaeidea). 4, *Solenocera* V; 4a, its telson (Penaeidea). 5, *Eryoneicus* III(?) (Eryonidea). 6, *Ebalia* III (Brachyura). 7, *Atelecyclus* IV (Brachyura). 8, *Nephrops* I (Nephropsidea). 9, *Callinassa* II, telson (Thalassinidea). 10, *Porcellana* II (Galatheaidea). 11, *Galathea*, posterior part of carapace (Galatheaidea). 12, *Anapagurus*, posterior part of carapace (Paguridea). 13, *Dromia* I, antenna (Dromiidea). 14, *Stenopus* I, telson (Stenopidea). 15, *Upogebia* I, antenna (Thalassinidea). 16, *Upogebia* IV, maxilliped 3 (Thalassinidea). 17, *Caridion* I, maxilliped 3 (Hippolytidae).

18, *Nematocarcinus* (?) V(?) (Nematocarcinidae).

- 19, *Caridion* II (Hippolytidae). 20, *Parapasiphae* II, telson (Pasiphaeidae). 21, *Hymenodora* II, telson (Oplophoridae). 22, *Athanas* III (Alpheidae). 23, *Palaemon* IV (Palaemonidae). 24, *Philocheras* V, eyes and antennules (Crangonidae). 25, *Pandalina* IV, eyes and antennules (Pandalidae). 26, *Eualus* VII, eyes and antennules (Hippolytidae).

Figures 27—32, Megalopae.

- 27, *Sergestes* (Penaeidea). 28, *Palinurus* (Scyllaridea). 29, *Porcellana* (Galatheaidea). 30, *Pagurus* (Paguridea). 31, *Lithodes* (Paguridea). 32, *Atelecyclus* (Brachyura).

[After Gurney (1—4, 6, 9—13, 14, 16, 22, 23, 27), Lebour (7, 29, 32), Santucci (8, 28), Sars (17, 19, 24), Selbie (5), Stephensen (20, 21) and Webb (15). 18, 25, 26, 30, 31 original.]

Phases in the Development of Decapoda

First 3 pairs cephalic appendages setose; other appendages absent or rudimentary	NAUPLIUS (including meta-nauplius) (Penaeidea only).
Setose exopods on some or all of thoracic appendages; pleopods absent or rudimentary	ZOEAE (including protozoa, metazoea, acanthosoma, mysis or schizopod stages, etc.)
Pleopods setose and functional	MEGALOPA (including mastigopus, glaucothoë, natant stage, post-larva, etc.)

ZOEAE: Key to Sections, Subsections, or Families

1. Dorso-ventrally flattened, transparent: a phyllosoma (Fig. 1) SCYLLARIDEA
Not a phyllosoma 2
2. With long "neck" between antenna and mouth: a trachelifer (Fig. 2) *Jaxea* (THALASSINIDEA)
Not a trachelifer 3
3. Antennal exopod segmented throughout its length;
telson with two cylindrical rami (Fig. 3) stages I—III (=protozoa) of PENAEIDEA
Antennal exopod unsegmented or segmented near distal end only; telson flat or with tapering rami 4
4. Carapace almost spherical, usually with spines; rostrum pointing ventrally or absent (Figs. 5—7) 5
Length of carapace considerably greater than breadth or depth;
rostrum pointing forwards (or absent in stage I only) 6
5. Carapace with more than 20 spines; legs 1 and 2 chelate and with exopods (Fig. 5) ERYONIDEA
Carapace with not more than 4 spines; leg 2 not chelate; no exopods on legs (Figs. 6, 7) BRACHYURA
6. Telson with a median spine (Fig. 9); carapace with postero-lateral margins smooth (Fig. 8) 7
Telson without a median spine (Figs. 4a, 14, 19—21), or with small median spine and carapace
with postero-lateral margins denticulate 8
7. Legs 1—3 chelate; legs 1—5 with setose exopods in all stages (Fig. 8);
2nd telson spine not, or not greatly, reduced NEPHROPSIDEA
Leg 3 not chelate; setose exopods on legs in late stages only, probably never on leg 5;
2nd telson spine reduced to a hair, at least in early stages (Fig. 9) THALASSINIDEA (part)
8. Postero-lateral margins of carapace produced into a spine on either side, or denticulate,
or with both spine and denticles; no spines on surface of carapace (Figs. 10—12) 9
Carapace without posterior spines or denticles except in some cases in which surface of carapace is spiny also 12
9. Rostrum much longer than body; posterior carapace spines reaching to or beyond
end of telson (Fig. 10) *Porcellana* (GALATHEIDEA)
Rostrum shorter than body; posterior carapace spines, if present, not reaching as far as telson 10
10. Postero-lateral margins of carapace denticulate, usually with spine (Fig. 11) Galatheidæ (GALATHEIDEA)
Postero-lateral margins of carapace with spine but no denticles (Fig. 12) 11
11. Antennal scale with setae on outer margin (Fig. 13); setose exopod on leg 1
and rudiments on legs 2 and 3 in late stages DROMIIDEA
Antennal scale without setae on outer margin; no exopods on legs PAGURIDEA
12. 2nd telson spine represented by a fine hair (Fig. 14) or absent (late stages of Stenopidea);
in stages I and II (i.e., stages without uropods) antennal endopod ends in 2 or 3 prominent setae
of similar length (Fig. 15); endopod of maxilliped 3, or legs 1—3, or all these limbs
arising from proximal half of basis (Fig. 16) 13
2nd telson spine not hair-like (Figs. 4a, 19—21); in stages I and II antennal endopod ends in a spine,
or a spine and a seta, or unarmed; thoracic endopods all terminally situated on basis (Fig. 17) 15

13. Rostrum longer than carapace; large supra-orbital spines except in stage I; antennal scale segmented in stage I;
lateral margins of telson serrated in early stages in some spp. (Fig. 14) STENOPIDEA
Rostrum shorter than carapace; no supra-orbital spines; antennal scale not segmented;
lateral margins of telson not serrated 14
14. Rostrum extending beyond antennule and antennal scale;
exopods confined to maxillipeds Diogenidae (COENOBITIDEA)
Rostrum much shorter than antennule and antennal scale;
legs 1—3 represented by biramous buds *Upogebia*, stage I (THALASSINIDEA)
(subsequent stages have small median telson spine: see 6, above)
15. Telson terminating in 2 sharp prongs (Fig. 4a), or legs 1—3 chelate (Fig. 4),
or with both these characters; setose exopods on maxillipeds and legs 1—5 in all stages
(except *Gennadas*, stage IV) stage IV — last of PENAEIDEA
Telson not terminating in 2 sharp prongs; leg 3 never chelate;
setose exopods confined to maxillipeds in early stages, usually also developed on some or all legs
in later stages (Figs. 19—26) CARIDEA 16
16. One or more of thoracic endopods expanded (oar-shaped) (Figs. 17, 19);
carapace with dorsal horns in one sp. HIPPOLYTIDAE (part)
None of thoracic endopods expanded; carapace without horns 17
17. Setose or rudimentary exopods on legs 1—5 (except *Hymenodora*, stage I, in which legs 4 and 5
are uniramous); eyes small in several spp. (including *Hymenodora*) 18
Leg 5 without exopod (or with minute rudiment in late stages: Nematocarcinidae); eyes well developed 19
18. Telson in stages I—III very broad, terminating in 20 or more very short spines or setae (Fig. 20);
later stages with slender chelae on legs 1 and 2; abdominal somite 3 never humped PASIPHAETIDAE
Telson in stages I—III not very broad (Fig. 21); terminal spines well developed,
not usually exceeding 16 in number (but up to 20 in *Hymenodora*); chelae poorly developed or absent;
abdominal somite 3 with hump in several spp. (as in Fig. 18) OPLOPHORIDAE
19. Abdominal somite 3 with prominent hump (Fig. 18) NEMATOCARCINIDAE
Abdominal somite 3 without hump (Figs. 22, 23) 20
20. Leg 5 much longer than leg 4 (Fig. 22); endopod of maxilliped 1 very small and unsegmented ALPHEIDAE
Leg 5 about equal to leg 4 or shorter than it; endopod of maxilliped 1 well developed or only slightly reduced 21
21. Carapace with 1—3 large medio-dorsal spines (except in stage I in some spp.) (Fig. 23);
rostrum without spines; posterior margin of telson straight in all stages PALAEMONIDAE
Carapace without medio-dorsal spines or with small spines near base of rostrum; rostrum may be spiny
in late stages; posterior margin of telson with median invagination in stages I and II 22
22. Eye-stalks hemispherical, almost touching in mid line (Fig. 24); antennules touching at base;
no supra-orbital spine; often with either broad rostrum or very broad telson CRANGONIDAE
Eye-stalks (except in stage I) tapering or cylindrical, well separated (Figs. 25, 26);
antennules separated at base; supra-orbital spine present except in stage I;
rostrum tapering from base or absent; telson not very broad 23
23. Bases of antennules separated by more than width of one of them, peduncles often slender and curved;
eye-stalks usually tapering (Fig. 25) 24
Bases of antennules separated by not more than width of one of them, peduncles stout and almost straight;
eye-stalks cylindrical (Fig. 26) HIPPOLYTIDAE (part)
24. Rostrum usually long (but rather short in *Pandalina*), toothed in late stages;
antennal scale usually segmented at tip in early stages; exopods on legs 1—3 in late stages,
except in *Plesionika* which has exopods on legs 1—4 PANDALIDAE
Rostrum small (absent in stage I), never toothed; antennal scale never segmented;
exopods on legs 1—4 in late stages PROCESSIDAE

The following families are represented in the area, but their zoeae are undescribed:
BRESILIDAE, GLYPHOCRANGONIDAE.

MEGALOPAE: Key to Sections, Subsections, or Families

1. Uropods lateral, forming a fan with telson 2
Uropods ventral, resembling pleopods 12
2. Carapace domed, with many prominent spines (as in Fig. 5) ERYONIDEA
Carapace not domed, with few or no spines or with many very small spines 3
3. Legs 4 and 5 greatly reduced or absent (Fig. 27) Sergestidae (PENAEIDEA)
Legs 4 and 5 not greatly reduced 4
4. Legs 1—3 without chelae (Fig. 28) SCYLLARIDEA
Chelae on one or more of first 3 pairs legs 5
5. Chelae on legs 1—3 6
No chela on leg 3 7
6. 1st pair chelae much larger than 2nd or 3rd pairs NEPHROPSIDEA
One or both of 3rd pair chelae much larger than 1st or 2nd pairs STENOPIDEA
Chelae not differing greatly in size Penaeidae (PENAEIDEA)
7. Antennal scale large and setose CARIDEA
(may be further identified on adult characters)
Antennal scale reduced or absent 8
8. Carapace and legs covered with numerous very small spines; rostrum bent downwards DROMIIDEA
Carapace and legs with few spines or smooth; rostrum pointing forwards or absent 9
9. Leg 5, or legs 4 and 5, considerably smaller than legs 2 and 3 10
Legs 2—5 not differing greatly in size THALASSINIDEA
10. Carapace with lateral row of spines (Fig. 29); uropods with exopod and endopod of similar size GALATHEIDEA
Carapace smooth laterally; uropods with endopod much smaller than exopod (Fig. 30) 11
11. Right cheliped (= leg 1) larger than left Paguridae (PAGURIDEA)
Left cheliped larger than right or of similar size Diogenidae (COENOBITIDEA)
12. Carapace very spiny; leg 5 much shorter than legs 2—4 (Fig. 31) Lithodidae (PAGURIDEA)
Carapace with few or no spines; leg 5 as long or almost as long as legs 2—4 (Fig. 32) BRACHYURA

Identification sheets on the following groups of decapod larvae are planned, but are likely to appear in irregular order:

II	Penaeidea	Sheet No.
III	Caridea, Families Oplophoridae, Nematocarcinidae and Pasiphaeidae	Sheet No.
IV	Caridea, Families Pandalidae and Alpheidae	Sheet No.
V	Caridea, Family Hippolytidae	Sheet No. 68
VI	Caridea, Families Palaemonidae and Processidae	Sheet No.
VII	Caridea, Family Crangonidae. Stenopidea	Sheet No.
VIII	Nephropsidea. Eryonidea. Scyllaridea	Sheet No.
IX	Thalassinidea	Sheet No.
X	Galatheaidea	Sheet No.
XI	Paguridea. Coenobitidea. Dromiidea	Sheet No.
XII	Brachyura: zoeae	Sheet No.
XIII	Brachyura: megalopae	Sheet No.

A space is given to insert the number of each sheet when it is issued.

Publications Covering All or Several Groups of Decapod Larvae

Bibliography

Gurney, R., 1939. Bibliography of the Larvae of Decapod Crustacea. Ray Soc. London.

—, 1942. Larvae of Decapod Crustacea. Ray Soc. London. (Including revue and bibliography of behaviour, vertical distribution etc.)

Identification

Gurney, R., 1942. (See above.) (Characters of families or larger groups.)

Webb, G. E., 1921. J. mar. biol. Ass. U.K., **12**, p. 385. (Species, excluding Brachyura, in W. English Channel.)

Williamson, H. C., 1915. Nordisches Plankton, Lief. 18, Decapoden, 1 Teil (Larven), p. 315.

Geographical Distribution, Breeding of Adults, and Seasonal Occurrence of Larvae

Balss, H., 1926. Die Tierwelt der Nord- und Ostsee. **10**, 2, Decapoda. (N. Sea and Baltic: chiefly adults.)

Bouvier, E. L., 1940. Faune de France. **37**. Décapodes Marcheurs. (Coasts of France: chiefly adults.)

Jackson, H. G., 1913, 1914. Proc. L'pool biol. Soc., **27**, p. 430; **28**, p. 420. (Irish Sea: larvae.)

Jorgensen, O. M., 1923. Rep. Dove mar. Lab., **12**, p. 112. (N. E. England: larvae.)

Kemp, S. W., 1910. Sci. Invest. Fish. Br. Ire., 1908, No. 1. (Irish Sea and Atlantic: Natantia; adults, some larvae.)

Marine Biological Association, 1931. Plymouth Marine Fauna. (W. English Channel: adults and larvae.)

Moore, H. B., 1935. The Marine Fauna of the Isle of Man. Liverpool. (Irish Sea: adults and some larvae.)

Rees, C. B., 1952. Hull Bull. mar. Ecol., **3**, 22, p. 157. (N. Sea: larvae.)

Selbie, C. M., 1914, 1921. Sci. Invest. Fish. Br. Ire., 1914, No. 1; 1921, No. 1. (Irish Sea and Atlantic: Reptantia excluding Brachyura; adults and *Eryoneicus*.)

Stephensen, K., 1935. Medd. Grønland, **80**, 1. (Arctic waters: adults and larvae.)

Thorson, G., 1936. Medd. Grønland, **100**, 6. (Arctic waters: adults and larvae.)

—, 1946. Medd. Komm. Danmarks Fisk.- og Havunders., Ser. Plankton, **4**, 1. (Øresund: adults and larvae.)

Webb, G. E., 1921. (See above.)

Williamson, D. I., 1956. Bull. mar. Ecol., **4**, 31, p. 87. (Irish Sea: larvae.)

Wollebæk, A., 1908. Bergens Mus. Aarb., 1908, No. 12. (Norwegian waters: Natantia; adults and larvae.)

[With grateful acknowledgements to the late Dr. C. B. Rees]