

NEW RECORDS OF AMPHIPODS AND LEPTOSTRACANS FROM THE FORTH SEA AREA, WITH NOTES ON THEIR COPEPOD PARASITES (SIPHONOSTOMATOIDA: NICOTHOIDAE)

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INTRODUCTION

In 1986 the Forth River Purification Board (FRPB) commenced monitoring of Lothian Region Council sewage disposal grounds, 17.5km north of St. Abbs Head and 13.5km east of Bell Rock, in the Forth Sea area. Part of the programme included establishing a reference collection of benthic invertebrates as an aid to gauging impact on the biodiversity of benthic fauna. Between 1986 and 1989 a variety of crustaceans were recovered which included species of amphipods and leptostracans new to the Forth Sea area. In view of the current interest in biodiversity, details of the newly recorded species are now provided, along with notes on other species present from the same families and any observed incidences of parasitism by copepods.

AMPHIPODS

The Order Amphipoda comprises small crustaceans such as the familiar shore "shrimps" (*Gammarus spp.*) and beach "sandhoppers" (*Talitrus spp.*) but includes many additional species within the marine realm. There are four sub-orders; Gammaridea, Caprellidea, Hyperiidea, and Ingolfiellidea. The Caprellidea (skeleton shrimps) contains twelve British species which generally lead an epifaunal existence clambering over rocks, stones and hydroids, although they do also turn up in sediment grab samples. *Caprella linearis* (Linnaeus, 1767), *Pariambus typicus* (Kroyer, 1844), and *Phtisica marina* Slabber, 1769, were regularly recovered at both disposal grounds while *Pseudoprotella phasma* (Montagu, 1804) also occurred at Bell Rock. An identification key to British caprellids is provided by Harrison (1944). The only other caprellid species ever identified in FRPB surveys is *Caprella tuberculata* Bate & Westwood, 1868, of which a single female was collected at Hound Point in 1996. The Hyperiidea contains around 50 British species all of which are planktonic. Although these would not be expected in benthic samples, a number of *Parathemisto gaudichaudi* (Guerin-Meneville, 1825) were recovered at St. Abbs - presumably derived from sea-water hoses used to sieve the sediment samples. The Cyamidea (whale lice) are all ectoparasites of cetaceans. Some recent Forth Sea area records from stranded whales are provided by O'Reilly (1998). The Ingolfiellidea is represented

by a single British species which burrows in coarse sediments and is restricted to the English Channel.

The Gammaridea is the largest amphipod sub-order and contains over 270 British species most of which occur in marine waters. The British Gammarideans were studied in detail in a monograph by Lincoln (1979) which has become the standard work for their identification. The amphipods from the Clyde Sea area were reviewed by Moore (1984a). Only gammaridean amphipods are discussed further here. A total of 38 gammaridean amphipods new to the Forth Sea area were recorded at the disposal grounds and included both common species and rare ones. Other benthic faunal studies (Parker, 1984; Dewarumez, *et al.* 1992) have also revealed amphipods new to their respective areas indicating that much remains to be learned regarding local inventories of biodiversity. The amphipods new to the Forth Sea area include the first British record of *Paradulichia typica* Boeck, 1870, and in addition two rare species; *Metopa robusta* Sars, 1892, which had been recorded from the Forth by Scott (1906) but seems to have been overlooked by Lincoln (1979), and *Acanthonotozoma serratum* (Fabricius, 1780) first recorded in the UK from St. Abbs, by Moore (1984b).

LEPTOSTRACANS AND NICOTHOID COPEPODS

The Order Leptostraca comprises small marine crustaceans superficially similar in appearance to brine shrimps. Four species are cited from "British" waters by Mauchline (1984) but only one of these is known from waters less than 200m deep. The taxonomy of leptostracans from the European shelf was revised by Dahl (1985) with the recognition of additional British species.

The Nicotoidae is a family of minute copepods which parasitise other crustaceans including amphipods (Gotto, 1993) and also leptostracans (Gotto, 1984). A number of amphipods from British waters are infested by *Sphaeronella* species which inhabit the brood pouch of females. They are generally overlooked on account of their small size and published records are few and far between (Green, 1958; Gotto & McGrath, 1980; Moore, 1984a; Moore &

Wong, 1996; O'Reilly & Geddes, 2000). The records of these parasites in the amphipods *Ampelisca tenuicornis* Lilljeborg, 1855, *Amphilochus neapolitanus* Della Valle, 1893, *Perioculodes longimanus* (Bate & Westwood, 1868) and *Corophium crassicorne* Bruzelius, 1859, from the Forth Sea area were briefly cited in Costello & Myers (1989) and included in Gotto (1993) under "south-east Scotland" but further details are provided here along with an additional record from *Bathyporeia pelagica* (Bate, 1856).

SAMPLING

The benthic surveys were carried out at St. Abbs in June 1986, '87, '88, & '89 and at Bell Rock in Jan. & Nov. '87, and April & Oct. '89. At St. Abbs the same eleven stations were sampled each year and at Bell Rock the same nine stations (Fig. 1). The grabbing stations lie within a radius of 2 nautical miles of the disposal ground centres (St. Abbs Stn.13 - 56°04.50'N, 02°07.27'W, and Bell Rock Stn.13 - 56°25.00'N, 02°10.00'W). Trawls were carried out at both stn.13's and a single control station, "C", just outside the Bell Rock disposal area. The depths at both disposal grounds varied between 50 - 60m. At each grabbing station 2 van Veen grabs (0.1m²) of sediment were collected and sieved on 0.5mm mesh. All material was fixed on site with formalin prior to identification in the laboratory.

NOTES ON NEW AMPHIPODS AND LEPTOSTRACANS AND PARASITIC COPEPODS

The order below follows Lincoln (1979), though the nomenclature has been updated to that in Howson & Picton (1997). For brevity the full authorities and dates are only provided for the species new to the area. Only families which include species new to the Forth Sea area are discussed. Notes on the new species include for each survey the total number of specimens observed, along with the station numbers if recorded at four or fewer stations, or, if found at more than four stations, the total number of specimens and the number of stations at which they were observed.

Order: AMPHIPODA
Sub-order: GAMMARIDEA
Family **Lysianassidae**

Acidostoma obesum (Bate & Westwood, 1861)

Bell Rock, Jan.'87 - 2 at stns. 11,13, Nov.'87 - 3 at stns.11,17,23.

Euonyx chelatus Norman, 1867

Bell Rock, Jan.'87 - 2 trawled at stn.13 & stn.C.

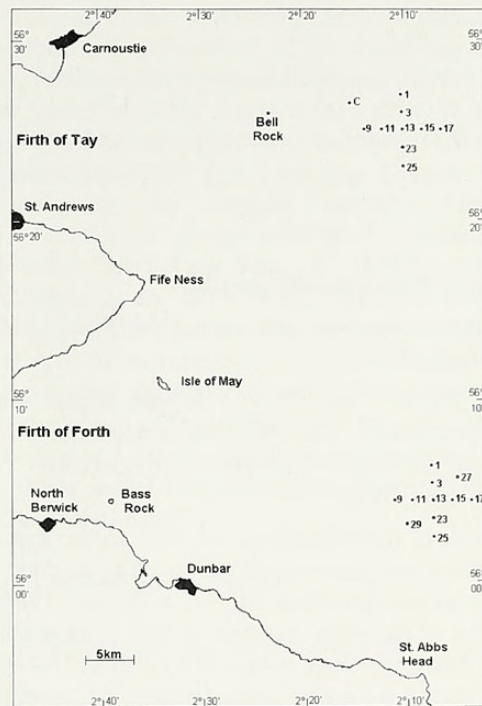


Figure 1: Location of disposal ground sampling stations at St. Abbs, and Bell Rock.

A family of robust amphipods, many of which have a peculiar hirsute gnathopod 2 superficially resembling a "cat's paw". *Acidostoma nodiferum* (= *A. sarsi* in Lincoln), *Hippomedon denticulatus*, and *Tryphosites longipes* also occurred at St. Abbs, while at Bell Rock *A. nodiferum*, *H. denticulatus*, *Lepidopereum longicorne*, *Orchomene nanus*, and *Scopelocheiros hopei* were observed.

Family Ampeliscidae

Ampelisca diadema (Costa, 1853)

St. Abbs - Jun.'86 - 1 at stn.17, Jun.'87 - 3 at stn.13, Bell Rock Jan.'87 - 4 at stn.13, Nov.'87 - 2 at stn.23.

Ampelisca tenuicornis Lilljeborg, 1855

St. Abbs - Jun.'86 - 197 at all 11 stns., Jun. '87 - 243 at all 11 stns., Jun.'88 - 232 at all 11 stns., Jun.'89 - 277 at all 11 stns., Bell Rock - Jan.'87 - 130 at all 9 stns., Nov.'87 - 86 at all 9 stns., Apr.'89 - 18 at 6 stns., Oct.'89 - 176 at all 9 stns.

Ampelisca typica (Bate, 1856)

Bell Rock, Jan.'87 - 3 at stns.3,9,13.

The genus *Ampelisca* was reviewed by Dauvin & Bellan-Santini (1988). These are generally large amphipods, strongly laterally compressed, with distinct cuticular lens eyes. *A. brevicornis* and *A. macrocephala* were both common at St. Abbs and Bell Rock but *A. tenuicornis* was by far the most abundant and was usually found at all the stations. Nine of the *A.*

tenuicornis from St. Abbs (5 in '86, 2 in '87, 2 in '88) were found to be harbouring the copepod, *Sphaeronella longipes* Hansen, 1897, in their brood pouch. In each case a single juvenile female was observed. Two *A. brevicornis* from Bell Rock (stn.9, Jan.'87 and stn.9 Apr.'89) were hosts to immature "pupal stages" of *Sphaeronella* copepods.

Family Acanthonotozomatidae

Acanthonotozoma serratum (Fabricius, 1780)
[see Figure 2a]

Bell Rock - Jan.'87 - 1 female (6mm long) trawled at stn.13. The specimen is deposited in the National Museum of Scotland (Registration No. NMSZ 2001.012.1)

The only British record of this arctic species comprised two specimens collected by a diver at Coldringham Bay, near St. Abbs (Moore 1984a). In view of its rarity the new record is mentioned here. The genus was reviewed by Just (1978) who also included notes and figures of copepod parasites.

Family Amphilochidae

Amphilochus neapolitanus Della Valle, 1893

St. Abbs Jun.'87 - 2 at stns.3,13, Jun.'88 - 1 at stn.1, Jun.'89 - 3 at stns.9,27, Bell Rock Jan.'87 - 6 at stns.9,15,17,25, Nov.'87 - 8 at stns.3,9,11,13.

This is regarded as a Mediterranean species at the northern limit of its distribution. Parker (1984) claimed the most northerly British record from Belfast Lough. However, Sheader (1983) cited a single specimen collected from Blyth on the Northumberland coast in 1952. Although Sheader considered this record questionable the present finds from the Forth Sea area suggest *A. neapolitanus* may be widespread in the North Sea. In fact, it has since been found even further north in the Gullmarfjord in western Sweden (Buhl-Jensen & Fossa, 1991).

One of the amphipods collected at Bell Rock, stn.11, Nov.'87 contained a mature female and 2 male copepods in its brood pouch, tentatively identified as *Sphaeronella amphilochii* Hansen, 1897.

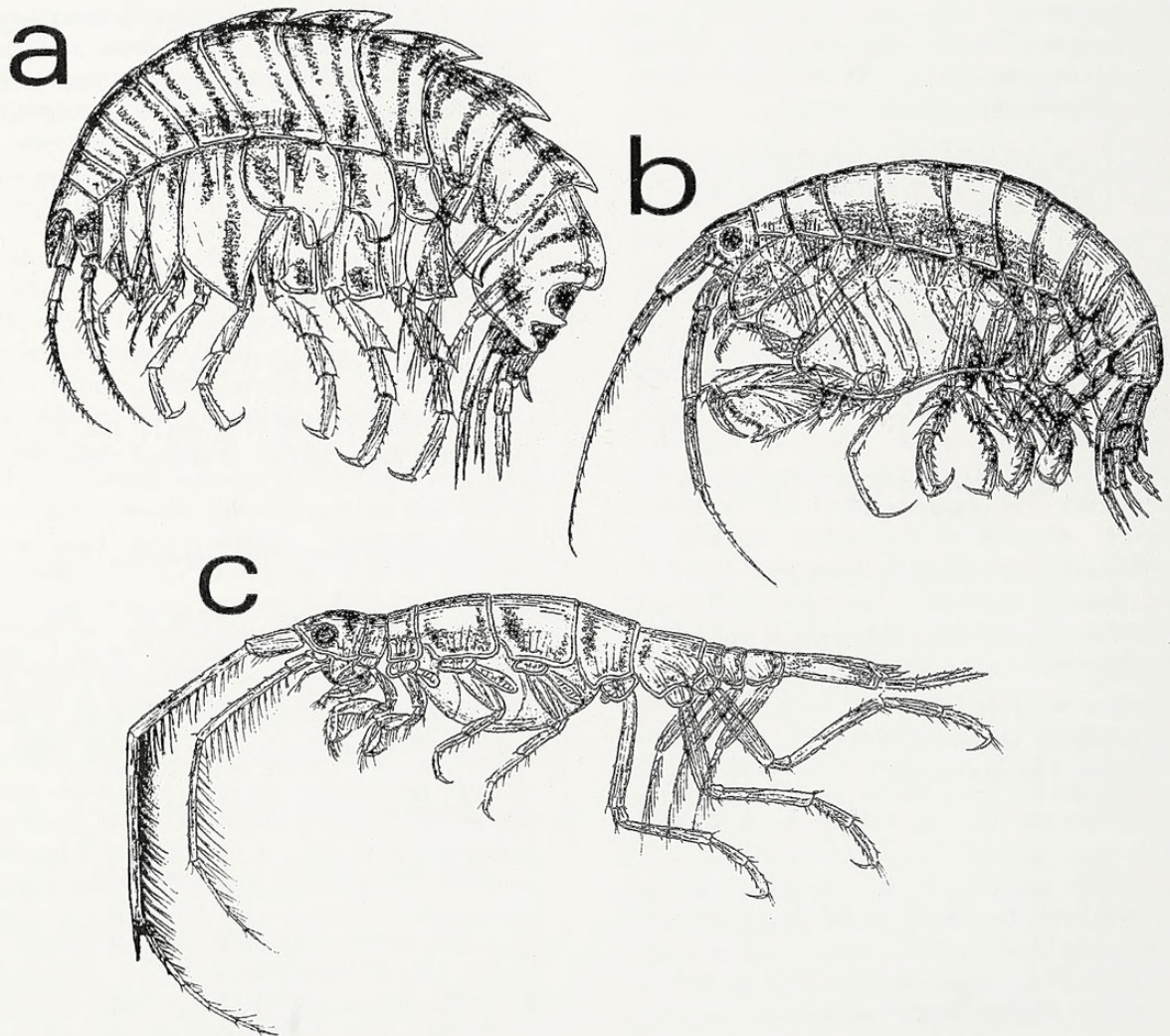


Figure 2: a) *Acanthonotozoma serratum*, length up to 12mm. b) *Metopa robusta*, length up to 6mm. c) *Paradulichia typica*, length up to 5mm. (All after Sars, 1890-95)

Amphilocheids are small amphipods and identification requires careful examination of the gnathopods. *Gitana sarsi*, *Paramphilocheoides odontonyx* and *Amphilocheus manudens* were recorded at both St. Abbs and Bell Rock.

Family **Stenothoidae**

Metopa latimana Hansen, 1887

St. Abbs Jun.'88 - 3 at stns. 1,17,27, Jun.'89 - 1 at stn.15, Bell Rock Jan.'87 - 1 at stn.1, Oct.'89 - 2 at stn.1.

Metopa tenuimana Sars, 1892

Bell Rock Jan.'87 - 2 at stn.3

Metopa robusta Sars, 1892 [see Figure 2b]

St. Abbs Jun.'89 - 6 at stn.17, Bell Rock Nov.'87 - 4 at stns.1,9,13. The 3 adult females, and 3 juvs., from stn.17 have been deposited in the National Museum of Scotland (Registration No. NMSZ 2001.012.2-7). Material has also been deposited in the British Museum (Natural History), London.

The key features of *M. robusta* include the gnathopod structure, telson armature and sinuous ventral border of coxal plate 4. It was in fact recorded from the Forth by Scott (1906) but was not included in Lincoln's monograph. It was also recorded off the Northumberland coast by Shearer (1983).

Stenothoids are also rather small amphipods but with conspicuous large coxal plates. The gnathopods and armature of the telson are important aids for identification. *Metopa bruzelii*, *M. pusilla* and *Stenula rubrovittata* were recorded at St. Abbs and additionally *M. norvegica* and *Stenothoe marina* were found at Bell Rock.

Family **Melitidae**

Cheirocratus assimilis (Lilljeborg, 1852)

Bell Rock Jan.'87 - 9 at stn.1, Nov.'87 - 2 at stn.1, 3, Oct.'89 - 1 at stn.3.

Cheirocratus intermedius G.O.Sars, 1894

St. Abbs Jun.'87 - 1 at stn.23.

Melita dentata (Kroyer, 1842)

St. Abbs Jun.'87 - 1 at stn.27, Jun.'88 - 2 at stn.15.

Melita hergensis Reid, 1939

St. Abbs Jun.'87 - 1 at stn.3, Bell Rock Jan.'87 - 5 at stn.15.

Melitids are large amphipods usually with elongated uropod 3 and, in males, enlarged gnathopod 2, the latter being diagnostic for each species. The genus *Cheirocratus* exhibits a relatively unusual feature with the first antennae being shorter than the second. *Maera loveni*, *M. othonis*, and *Abludomelita obtusata* (*Melita obtusata* in Lincoln, 1979), were recovered from St. Abbs and *Cheirocratus sundevallii* was also found at Bell Rock.

Family **Pontoporeiidae**

Bathyporeia elegans Watkin, 1938

Bell Rock Jan.'87 - 23 at 7 stns., Nov.'87 - 50 at 7 stns., Apr.'89 - 19 at 7 stns., Oct.'89 - 9 at 5 stns.

The genus *Bathyporeia* contains a number of species which are abundant in intertidal and sublittoral sandy sediments. They all have a distinctive geniculate first antennae. The species can be quite difficult to distinguish and although several species were tentatively identified from the disposal grounds only the record of *B. elegans* was confirmed by P.G. Moore. However additional *Bathyporeia* species have been identified in the Clyde Sea area (Barclay, 1982) and it is likely that further species may also exist in the Forth Sea area. None of the *B. elegans* from the disposal grounds were parasitised by copepods. However a single female of *B. pelagica* collected intertidally from Belhaven Bay, Dunbar in June '88 was infested by a large mature female of *Sphaeronella paradoxa* Hansen, 1897. While the copepod exhibited the typical angular ventrum of this species, the diagnostic umbilical attachment filament was absent.

Family **Urothoidae**

Urothoe elegans (Bate, 1856)

St. Abbs Jun.'87 - 2 at stn.17, Jun.'88 - 1 at stn.27, Jun.'89 - 8 at stn.1,17, Bell Rock Jan.'87 - 78 at 7 stns., Nov.'87 - 63 at 7 stns., Apr.'89 - 91 at 5 stns., Oct.'89 - 70 at 6 stns.

Family **Oedicerotidae**

Pontocrates arenarius (Bate, 1858)

St. Abbs Jun.'87 - 1 at stn.27, Jun.'89 - 1 at stn.27, Bell Rock Apr.'89 - 1 at stn.3, Oct.'89 - 8 at 5 stns.

St. Abbs Jun.'87 - 1 at stn.3, Bell Rock Jan.'87 - 4 at stn.11,13,23, Apr.'89 - 2 at stns.1,11.

Oedicerotids are characterised by their helmet-shaped heads. Five species have previously been recorded from the Forth Sea area of which two, *Periiculodes longimanus* and *Westwoodilla caecula* were common at St. Abbs and Bell Rock. An additional species, *Pontocrates arcticus* Sars, 1893 has only recently been recognised from British waters from the Firth of Clyde (Moore & Beare, 1993) and may well also occur in the Forth Sea area. *Periiculodes longimanus* was a particularly abundant species at the disposal grounds and was frequently parasitised by the copepod *Sphaeronella minuta* Scott, 1904. Eight amphipods from St. Abbs were infested (1 in '86, 3 in '87, 2 in '88, 2 in '89), mostly with juvenile parasites but also one mature, and two ovigerous, females. More infested amphipods were observed at Bell Rock (24 in Jan.'87, 1 in Apr.'89). Again most of the copepods appeared to be juveniles but included two ovigerous females. A single mature female copepod was also recovered from a *P. longimanus* collected at Dunbar in 1988. Scott (1904) figured this species with a short umbilical attachment thread similar to that of *S. paradoxa* (which parasitises *Bathyporeia* spp.). However, none of the Forth specimens appeared to have such a thread.

Family Melphidippidae

Megaluropus agilis (Hoek, 1889)

Bell Rock Nov.'87 - 1 at stn.11, Apr.'89 - 1 at stn.3.

Family Calliopiidae

Apherusa bispinosa (Bate, 1856)

St. Abbs Jun.'88 - 3 at stns. 1, 27.

Family Pleustidae

Parapleustes bicuspis (Kroyer, 1838)

St. Abbs Jun.'87 - 1 at stn.17, Bell Rock Jan.'87 - 1 at stn.1.

Stenopleustes latipes (G.O.Sars, 1858)

St. Abbs Jun.'86 - 14 at stn.17, Bell Rock Jan.'87 - 3 at stn.13, Nov.'87 - 2 at stn.13.

Stenopleustes nodifer (G.O.Sars, 1882)

St. Abbs Jun.'86 - 1 at stn.17.

A small family with only 5 British species. Only *Parapleustes assimilis* is previously recorded from the Forth Sea area, and was also found at St. Abbs.

Family Paramphithoidae

Epimeria cornigera (Fabricius, 1779)

St. Abbs Jun.'86 -10 at stn.13. None of these were recovered from grab samples but were found among debris in a fish trawl undertaken at the centre of the disposal ground as an additional part of the monitoring programme.

Family Dexaminidae

Guernea coalita (Norman, 1868)

Bell Rock Apr.'89 - 1 at stn.3. A small species, easily overlooked. In addition to plumose setae on leg 7, the urosome has a knobby appearance dorsally.

Family Aoridae

Aora gracilis (Bate, 1857) [Lincoln, 1979 as *A. typica* Kroyer, 1845]

St. Abbs Jun.'87 - 1 at stn.15, Bell Rock Nov.'87 - 32 at stn.13, Apr.'89 - 1 at stn.23.

Autonoe longipes (Lilljeborg, 1852) [Lincoln, 1979 as *Lembos longipes*]

St. Abbs Jun.'86 - 19 at 7 stns., Jun.'87 - 33 at 6 stns., Jun.'89 - 10 at 6 stns., Bell Rock Jan.'87 - 96 at 8 stns., Nov.'87 - 63 at all 9 stns., Apr.'89 - 4 at stn.23, Oct.'89 - 80 at 8 stns.

Leptocheiros hirsutimanus (Bate, 1862)

Bell Rock Jan.'87 - 7 at stns. 1, 3, Nov.'87 - 15 at stn.3, Apr.'89 - 3 at stn.3, Oct.'89 - 7 at stns.1, 3.

Females of this family are often difficult to distinguish, even at generic level. Mature males however have sexually dimorphic gnathopods which are generally diagnostic. The genus *Aora* in British waters was reviewed by Myers & Costello (1984). *Aora typica* is a southern ocean species and does not occur in Britain. Records of *A. typica* from British waters probably refer, for the most part, to *A. gracilis*. However a new species *A. spinicornis* was described by Myers & Costello (1984) from south west Ireland and may be present in other localities.

Family Isaedidae

Gammaropsis maculata (Johnston, 1828)

St. Abbs Jun.'87 - 3 at st.13,15, Jun.'88 - 49 at 9 stns., Jun.'89 - 10 at 5 stns., Bell Rock Nov.'87 -30 at stns.1,3,9,13, Apr.'89 - 8 at 5 stns., Oct.'89 - 3 at stns.17,25.

Gammaropsis palmata (Stebbing & Robertson, 1891)

St. Abbs Jun.'86 - 29 at 9 stns., Jun.'87 - 25 at

8 stns., Jun.'88 - 37 at all 11 stns., Jun.'89 - 20 at 7 stns., Bell Rock Nov.'87 - 39 at 6 stns., Apr.'89 - 6 at stns.1,25, Oct.'89 - 8 at stns.3,13.

Gammaropsis nitida (Stimpson, 1853)

St. Abbs Jun.'87 - 21 at stn.15, Bell Rock Apr.'89 - 1 at stn.9.

Gammaropsis cornuta (Norman, 1869)
[Lincoln, 1979, as *Megamphopus cornutus*]

St. Abbs Jun.'88 - 2 at stn.25, Bell Rock Nov.'87 - 1 female, Apr.'89 - 2 at stn.1.

Photis longicaudata (Bate & Westwood, 1862)

St. Abbs Jun.'87 - 13 at stn.17, Jun.'88 - 9 at stns.11,17,29, Jun.'89 - 1 at stn.25, Bell Rock Jan.'87 - 37 at stns.1,3,13,15, Nov.'87 - 46 at stns.1,13,23,25, Oct.'89 - 1 at stn.13.

Photis reinhardi Kroyer, 1842

Bell Rock Jan.'87 - 2 at stn.1. Confirmed by P.G. Moore on basis of female Gnathopod 1.

Although only two Isaeid species are previously recorded from the Forth Sea area, seven species were identified at the disposal grounds of which, only *Protomedea fasciata*, was already known. The genus *Gammaropsis* is readily recognised by the acute eye lobes. In *Photis longicaudata* the inner ramus of uropod 3 is so small that the uropods appear to be uniramous. Moreover the uropod 3 rami in this species are frequently upturned. The genera *Photis* and *Gammaropsis* in British waters are reviewed by Myers & McGrath (1981, 1982).

Family Corophiidae

Corophium crassicorne Bruzelius, 1859

Bell Rock Jan.'87 - 18 at 5 stns., Nov.'87 - 13 at 6 stns., Oct.'89 - 10 at 5 stns.

Three of the amphipods collected in Jan.'87 (stns.3,9,25) harboured single copepods in their brood pouch, identified as juvenile female *Sphaeronella danica* Hansen, 1897.

Siphonocetes striatus Myers & McGrath, 1979

Bell Rock Nov.'87 - 9 at 5 stns, Apr.'89 - 1 at stn.1. This species is difficult to distinguish from *S. kroyeranus*. Ideally mature specimens are required which retain their pigmentation patterns on the rostrum and antennae (see Myers & McGrath, 1979). In view of the apparent occurrence of *S. striatus* from the area, previous records of *S. kroyeranus* may be mistaken and the presence of

both species in the Forth now requires confirmation.

Corophiids are one of the best known amphipod families, especially "mud shrimps" of the genus *Corophium*. The dorso-ventrally flattened body, huge second antennae and brush of long setae on the gnathopods are characteristic. *Corophium volutator* is often extremely abundant in intertidal sediments where it forms an important food source for birds and fish. It occurs on the mudflats of the Forth Estuary (eg. FRPB surveys at Kinneil) but surprisingly is not cited from the Forth by Lincoln (1979), who only mentions *Corophium affine*, *Siphonocetes kroyeranus*, and *Unciola planipes* from the area. *C. affine* was recorded from St. Abbs and Bell Rock and *U. planipes* also from Bell Rock.

Family Ischyroceridae

Microjassa cumbrensis (Stebbing & Robertson, 1891)

St. Abbs Jun.'89 - 1 at stn.23. One of the smallest species of the family and difficult to identify. The single specimen collected appears to be the first record from the east coast of Britain.

Erichthonius rubricornis (Stimpson, 1853)

St. Abbs Jun.'86 - 71 at stn.1, Jun.'87 - 15 at stns.3,9, Jun.'88 - 10 at stn.1, Bell Rock Jan.'87 - 12 at stns.1,13. The genus *Erichthonius* was revised by Myers & McGrath (1984) who recognised four species from British waters. Of the species cited by Lincoln (1979), *E. brasiliensis* does not occur in British waters and records of this species probably refer to *E. punctatus* (Bate, 1857). *E. difformis* is present in British waters though the previous records of *E. difformis* from the Forth Sea area may possibly refer to *E. rubricornis* which has already been recorded in the Forth area by Moore (1984b).

Family Podoceridae

Paradulichia typica Boeck, 1870 [see Fig. 2c]

St. Abbs Jun.'87 - 3 at stns.11,13,23, Jun.'88 - 1 at stn.29, Jun.'89 - 1 at stn.15. Three specimens have been deposited in the National Museum of Scotland (Registration No. NMSZ 2001.012.8-10); immature female (1.75mm) St. Abbs, stn.23, Jun.'87, mature female (3.5mm) St. Abbs, stn.29, Jun.'88, immature female (2.5mm) St. Abbs, stn.15, Jun.'89. Some material has also been deposited in the British Museum (Natural History), London.

Dyopedos porrectus (Bate, 1857)

St. Abbs Jun.'87 - 2 at stns.11,15, Bell Rock Jan.'87 - 1 at stn.13., Bell Rock Oct.'89 - 1 at stn.13.

The family is generally recognised by the elongated urosomal 1 segment and the presence of only 1 or 2 pairs of uropods. *Dyopedos monacanthus* was also recorded from both St. Abbs and Bell rock. The two *Dyopedos* species are distinguished by the second gnathopods and by spines on coxal plates 1 or 2 of the males. However some small males of *D. monacanthus* were observed at St. Abbs without the characteristic coxal 1 spine. The discovery of *Paradulichia typica* above represents the first British record of this species which has an Arctic distribution in waters up to 550m deep. The genera *Dulichia* and *Paradulichia* were reviewed by Laubitz (1977).

Order: LEPTOSTRACA

Family Nebaliidae

Nebalia herbstii Leach, 1814 [Mauchline, 1984, as *Nebalia bipes* (Fabricius, 1780)]

St. Abbs Jun.'86 - 1 at stn.15, Jun.'87 - 4 at stns. 15,17,23, Jun.'89 - 1 at stn.11, Bell Rock Oct.'89 - 5 at stns.1,9. (Identity confirmed for 1989 specimens only)

Nebalia borealis Dahl, 1985

Bell Rock - 1 at stn.15, 1999.

Sarsinebalia typhlops (G.O.Sars, 1870) [Mauchline, 1984, as *Nebalia typhlops*]

Bell Rock Jan.'87 - 4 at stns.1,3, Nov.'87 - 2 at stns. 1,3, Apr.'89 - 2. stn? Four specimens, all from Bell Rock Jan.87, have been deposited in the National Museum of Scotland (Registration No. NMSZ 2001.012.11-14); 3 immature (2mm) stn.1, 1 mature (5mm) stn.3.

The only leptostracan noted by Mauchline (1984) in inshore waters was *Nebalia bipes* (Fabricius, 1780). Although this species is widely recorded around the British coast, even intertidally, the review by Dahl (1985) indicated that it is an arctic species and the only confirmed European records are from Iceland and northern Norway. It seems probable that most of the British records of *N. bipes* should in fact refer to *N. herbstii* Leach, 1814. Indeed of the *N. herbstii* records from the disposal grounds, all were originally identified as *N. bipes* and only the specimens from 1989 have been re-examined and confirmed as *N. herbstii*. However, Dahl (1985), also described a new species, *N. borealis* Dahl 1985, with a more southern boreal distribution which includes southern Norway, Sweden, and the Shetland Isles. It is distinguished from *N. herbstii* by the acutely pointed (rather than rounded) denticles on the dorsal margin of sixth and seventh pleon segments. *N. borealis* has also now been found at the disposal grounds with a single specimen identified at Bell Rock, stn.15, in 1999, so it is possible some of the unconfirmed *N. herbstii* cited above may be *N. borealis*.

The occurrence of *Sarsinebalia typhlops* at the disposal grounds, with maximum depths around 60m, is somewhat surprising as Mauchline suggests it is restricted to deeper waters from 220-2900m. *S. typhlops* is readily recognisable by its minute unpigmented eyes and by its rostrum which is surmounted by a small, but distinct, apical spine.

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