

ON THE OCCURRENCE OF THALASSINIDEA (DECAPODA) IN NORWEGIAN WATERS

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A B S T R A C T

This paper surveys occurrence of five thalassinidean species recorded from the Norwegian coast. All five species occur along the coast of Southern Norway. *Calocaris macandreae*, the most abundant of the species, and *Calocarides coronatus* are found north to Northern Norway (69°30.1'N and 70°20'N respectively). *Upogebia deltaura* is recorded north to Sognefjorden (61°04'N), whereas the known ranges of *U. stellata* and *Callianassa subterranea* extend to the fjords around Bergen (just north of 60°N). The study is based on both published and unpublished data.

Five species of Thalassinidea are known from the Norwegian coast. Although marine life along the coast has been investigated by many scientists during the last 150 years, it was 126 years before complete records of all five species in Norway were published. M. Sars (1857) was the first to publish records of Thalassinidea from Norway. He referred to specimens of *Calocaris macandreae* Bell collected by Mr. Asbjørnsen and himself in Christianiafjorden (= Oslofjorden on the southeast coast of Norway) at 100–140 fathoms and 50–70 fathoms depth (= 183–256 m and 91–128 m). Danielssen (1859) wrote that *C. macandreae* was first found by Koren and himself in Fanefjorden near Bergen at 40–80 fathoms (= 73–146 m) and later by Sars in Christianiafjorden. More than twenty years later the first Norwegian records of *Upogebia deltaura* Leach were published by G. O. Sars (1883) as *Gebia littoralis* Risso. He collected some specimens on the southern coast (in Oslofjorden and at Flekkefjord, Vest-Agder county) and mentioned that Professor Esmark had also found the same species near Farsund (Vest-Agder county) in 1862. Appellöf (1906) published the first Norwegian records of *Calocarides coronatus* (Trybom) (as *Eiconaxius crassipes* Trybom). In 1901 ten specimens had been caught on the west coast at 424-m depth near Ålesund (Møre og Romsdal county). A record of *Upogebia stellata* (Montagu) from Norway was made by the zoologist Friele in 1870 on the west coast near Bergen, but this find was not published until 1927 by Grieg. M. E. Christiansen and Greve (1982)

published the first record of *Callianassa subterranea* (Montagu) from Norway. This was a juvenile specimen recorded in 1950 between 60- and 100-m depths on the south coast (58°15'N, 08°35'E).

Investigations of the fauna in Norwegian waters have been greatly expanded during the last 50 years. Therefore, it is now possible to summarize distributions of different animal groups. Many records are scattered in small notes and local papers and are difficult and time-consuming to find. Thus, a survey of what is presently known on the distribution of Thalassinidea in Norway seems desirable. The records in this paper are based on both published and unpublished data. Those published finds from Norway that are not quoted are all within the limits of distribution indicated for each species.

I am indebted to Dr. Raymond B. Manning who, several years ago, captured my interest in the Thalassinidea which lead me to clarify their history and the confusing records of this group in Norwegian waters.

Family Calocaridae Ortmann

Calocaris macandreae Bell, 1846

Calocaris Macandreae Bell, 1846: 233, fig.

Published Norwegian records: M. Sars, 1857: 175.—Danielssen, 1859: 105.—M. Sars, 1861: 247.—G. O. Sars, 1872: 259.—Storm, 1880: 111.—G. O. Sars, 1883: 6.—G. O. Sars, 1884: 166, pl. 2 (not pls. 6, 7).—Wollebæk, 1900: 10.—Appellöf, 1906: 132.—Wollebæk, 1909: 251.—Nordgaard,

1912: 30.—Runnström, 1925: 83, pl. 1, figs. 1, 2.—Grieg, 1927: 34.—Soot-Ryen, 1955: 1.—M. E. Christiansen, 1972: 40, fig. 46.—Brattegard and M. E. Christiansen, 1997: 215.

Calocaris macandreae is the most common of the thalassinidean species in Norwegian waters. The species is rather common on soft bottoms along the whole coast from Oslofjorden in the southeast to the northernmost known locality in Malangen (69°30.1'N, 18°16.3'E) in Northern Norway (Fig. 1). It is recorded in depths between 15 and 580 m, but seems to be most abundant below 50–100 m. One record in The Natural History Museum, London, from Sognefjorden, indicates the species was taken at 1,000-m depth. Between 1856 (M. Sars) and 1909 (Wollebæk) many records of *C. macandreae* were published from Southern Norway north to Trondheimsfjorden, and Runnström (1925) made a compilation of known records of the species, including some finds from Kattegat. Soot-Ryen (1955) published the first records of *C. macandreae* from north of Trondheimsfjorden from some fjords between 64°43.9'N, 11°23'40"E and Malangen. According to Brattegard and M. E. Christiansen (1997), Brattegard (personal communication), Sneli (personal communication), and museum collections in Oslo, Bergen, Trondheim, and Tromsø, a great number of specimens of *C. macandreae* have been collected along most of the coast northwards to Malangen.

Wollebæk (1909) recognized that the species is hermaphroditic, whereas Runnström (1925) has given a more comprehensive treatment of the hermaphroditism.

According to Bull (1933), G. O. Sars' (1884) description of *C. macandreae* larvae is in part erroneous. Bull referred to Webb (1921) who had already demonstrated indirectly that Sars' tables 6 and 7 of the two "earlier" stages represent larvae of *Callianassa*. Webb supposed that the "intermediate" stage of Sars is truly a larva of *C. macandreae*, of which a younger and a postlarval stage are figured by Björck (1913).

General Distribution.—*Calocaris macandreae* is recorded from south of western Iceland at 62°40'N, 22°17'W in 589 fathoms depth (= 1,077 m) (Hansen, 1908); from the Faroe Islands (Brattegard, personal communication); from 69°30.1'N in Northern Norway southwards along the coast between 15- and 580-m

depths; and according to Noël (1992) along the East Atlantic coast to Gulf of Guinea, West Africa, between 35- and 1,400-m depths (but most common from 50 to 600 m), and in the Mediterranean from 300 to 400 m.

Family Axiidae Huxley

Calocarides coronatus (Trybom, 1904)

Euconaxius coronatus Trybom, 1904: 384, pl. 20, figs. 1–10, 13, 14, pl. 21, figs. 1–8.

Euconaxius crassipes Trybom, 1904: 390, pl. 20, figs. 11, 12.

Calocarides crassipes: Wollebæk, 1908: 3, pls. 1–7.

Calocarides coronatus: Wollebæk, 1908: 3.

Eiconaxius coronatus: Lagerberg, 1908: 48, pl. 2, fig. 7.

Published Norwegian records: Appellöf, 1906: 132.—Wollebæk, 1908: 3, pls. 1–7.—Grieg, 1927: 34.—E. N. Christiansen, 1955: 1.—M. E. Christiansen, 1972: 40, fig. 45.—Brattegard and M. E. Christiansen, 1997: 215.

This species is found along the Norwegian coast between Oslofjorden in the southeast and Finnmark county in the north. The northernmost records are from northwest of Stjernøy at 70°20'N where three specimens were collected at 500- and 525-m depths in 1954 (E. N. Christiansen, 1955) (Fig. 1). *Calocarides coronatus* is not nearly as abundant along the coast as *Calocaris macandreae* and lives in greater depths. Although there is at least one record at 80 m in southern Norway, the majority of the records are from below 300 m on the west coast, with the deepest capture at 855 m (Brattegard, personal communication; Sneli, personal communication; museum collections in Bergen, Oslo, and Trondheim).

The first finds of *C. coronatus* in Norwegian waters were made in 1902 at Brevik (southeast coast) and in Bømmelfjord (west coast) (see E. N. Christiansen, 1955). Appellöf (1906) published records of *C. coronatus* (as *Eiconaxius crassipes*) from Norway and mentioned ten specimens from 424-m depth at Hjörundfjord near Ålesund on the west coast. Wollebæk (1908) erected *Calocarides* as a subgenus of "*Calocaris* (?)" for the two species *Euconaxius coronatus* and *E. crassipes* described by Trybom (1904). Wollebæk pointed out that he had only studied material of *C. crassipes* (specimens deposited in Bergen Museum). At about the same time Lagerberg (1908), who had studied Trybom's material, concluded that *E. coronatus* and *E. crassipes* belong to the same species and that

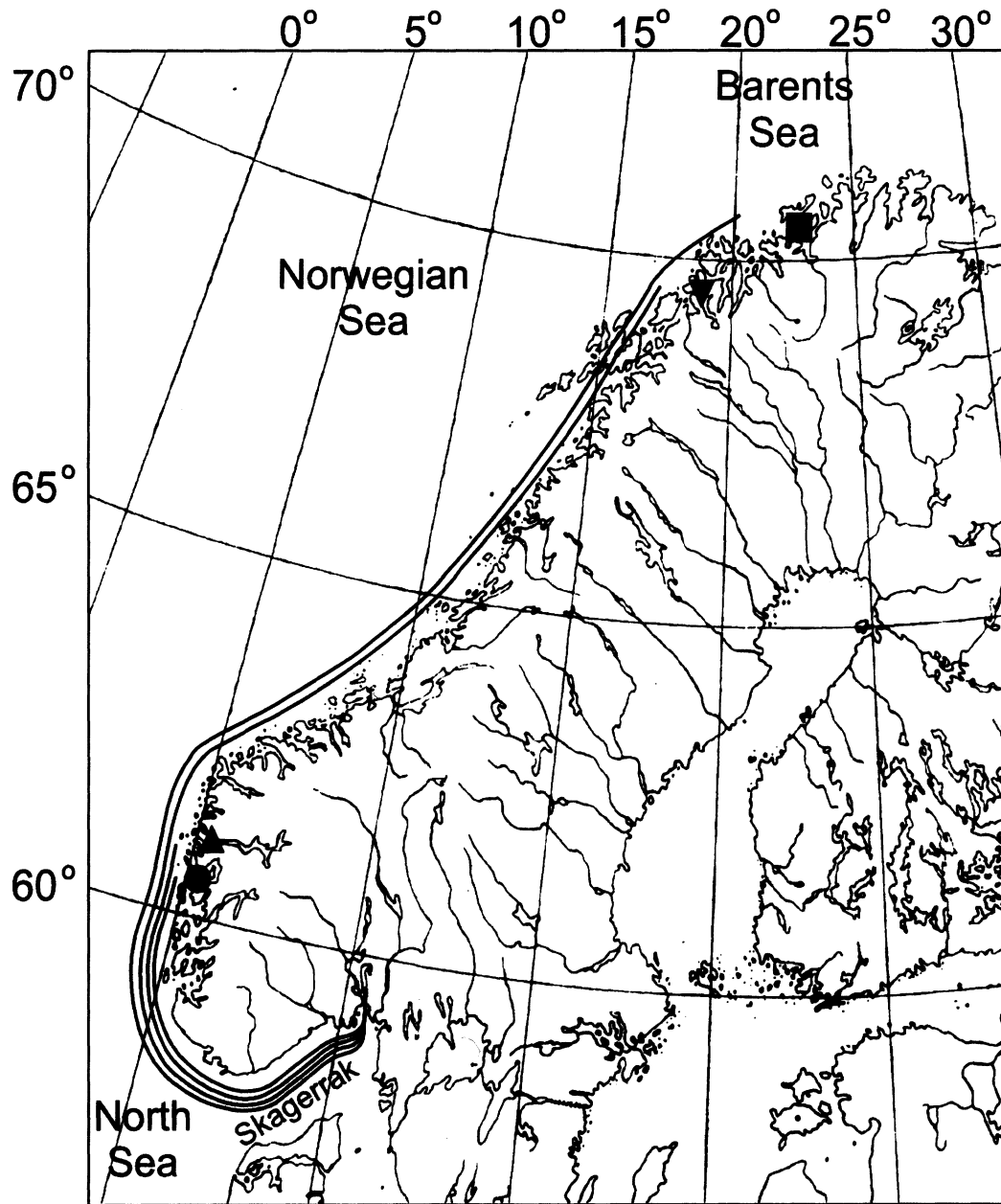


Fig. 1. Distributional ranges of five Thalassinidea species along the Norwegian coast. The symbols show the northernmost record for each species. \blacktriangledown , *Calocaris macandreae*; \blacksquare , *Calocarides coronatus*; \blacktriangle , *Upogebia deltaura*; \bullet , *U. stellata* and *Callianassa subterranea*.

the name *coronatus* had priority. Grieg (1927) reported that ovigerous females were obtained in March, April, and May. E. N. Christiansen (1955) published a list of 14 known records from Norwegian waters (and some records from the Swedish west coast and Skagerrak). According to Brattegard and M. E. Chris-

tiansen (1997) and Brattegard (personal communication), a number of specimens were collected along the coast in later years with the northernmost record at 69°32.9'N.

General Distribution.—*Calocarides coronatus* is recorded from 70°20'N in Northern

Norway and southward along the Norwegian coast in depths between 80 and 855 m, from the Swedish west coast and Skagerrak; and according to Noël (1992) also from the North Sea and Great Britain; western Mediterranean and tropical West African coast (see d'Udekem d'Acoz, 1999).

Family Upogebiidae

Upogebia deltaura (Leach, 1815)

Gebia Deltaura Leach, 1815: 342.

Gebia littoralis Risso: G. O. Sars, 1883: 44.—G. O. Sars, 1884: 182, pls. 3–5.

Published Norwegian records: G. O. Sars, 1883: 44.—G. O. Sars, 1884: 182, pls. 3–5.—Grieg, 1927: 35 (some specimens as *U. stellata*, see Tambs-Lyche, 1958).—Tambs-Lyche, 1958: 12, fig. 2.—M. E. Christiansen, 1972: 41, fig. 48.—Samuelsen, 1974: 131.—Brattegard and M. E. Christiansen, 1997: 219.—M. E. Christiansen and Stene, 1998: 76.

Until 1974 only a few published records of *Upogebia deltaura* existed from Norwegian waters with the northernmost record from Sognefjorden (61°04'N) on the west coast (Tambs-Lyche, 1958). Later the species was recorded at several localities in Southern Norway north to approximately 60°N on the west coast (Fig. 1). *Upogebia deltaura* seems to be most common in shallow waters, but specimens have been found to depths of 118 m.

G. O. Sars (1883) published records of *U. deltaura* (as *Gebia littoralis*) from Bogen near Tønsberg in the outer part of Oslofjorden and Flekkefjord (Vest-Agder county, South Norway), and in 1884 he described the different larval stages of this species from plankton hauls collected in the outer part of Oslofjorden (Hvaler and Hankø). Later there was some discussion as to whether Sars' *Gebia littoralis* larvae really belonged to *U. deltaura* (see Webb, 1919). However, both Poulsen (1940) and later Tambs-Lyche (1958) verified Sars' description which, according to Tambs-Lyche, showed only slight differences from the larvae of *U. deltaura* described by Webb (1919). Tambs-Lyche was of the opinion that the differences between Sars' and Webb's larvae "could be explained by supposing the rate of development at South-England to be slightly higher than at the Oslofjord." In 1978 and 1979 a number of *U. deltaura* larvae were collected in the

plankton from August to October, both in the inner and outer part of Oslofjorden (K. Smedsrud, 1982, unpublished Masters thesis, University of Oslo).

Some specimens from Østre Omø, Ryfylke on the southwest coast published by Grieg (1927) as *U. stellata* were later shown to be *U. deltaura* (Tambs-Lyche, 1958). Tambs-Lyche referred to eight known records of *U. deltaura* on the Norwegian coast, from Oslofjorden in the southeast (including the two records of the larvae described by G. O. Sars, 1884) to Sognefjorden on the west coast as the northernmost record. In the last part of 1960 and early 1970 a number of specimens of both *U. deltaura* and *U. stellata* were collected by diving at various localities south of Bergen, and many *Upogebia* burrows were observed in muddy sand from the littoral zone down to 40 m (Samuelsen, 1974). Some specimens of *U. deltaura* from both the inner and outer part of Oslofjorden were collected between 1963 and 1989. In addition, two specimens were found in Trysfjorden on the south coast (58°05'N, 07°41'E). One female recorded in July had eggs with eyespots (see also M. E. Christiansen and Stene, 1998). Samuelsen (1974) found an ovigerous female in May.

General Distribution.—*Upogebia deltaura* is recorded along the Atlantic coast from the west coast of Norway (61°04'N); according to Noël (1992), it occurs southwards to Togo, West Africa, from shallow water down to 190-m depth (most common above 70 m), and in the Mediterranean and Black Sea.

Upogebia stellata (Montagu, 1808)

Cancer Astacus stellatus Montagu, 1808: 89, pl. 3, fig. 5.
Upogebia stellata: Grieg, 1927: 35.

Published Norwegian records: Grieg, 1927: 35 (part).—Tambs-Lyche, 1958: 14.—M. E. Christiansen, 1972: 41, fig. 47.—Samuelsen, 1974: 132.—Brattegard and M. E. Christiansen, 1997: 219.—M. E. Christiansen and Stene, 1998: 76.

Upogebia stellata is found from the littoral zone to 40-m depth in Southern Norway to the west coast just north of 60°N (Fig. 1). According to Samuelsen (1974) only two records of *U. stellata* from Norwegian waters were published before 1974. The first record was published by Grieg (1927), although the specimen had been obtained near Bergen as

early as 1870. According to Poulsen (1940), the figure by Grieg of *U. stellata* strongly resembles *U. deltaura*, and Tambs-Lyche (1958) showed that the other specimens mentioned by Grieg from Østre Omø in Ryfylke (southwest coast) belong to *U. deltaura*. The second record of *U. stellata* was published by Tambs-Lyche (1958). Between 1965 and 1971, 16 specimens of *U. stellata* were found when diving at various localities south of Bergen, of which four females collected in May were ovigerous (Samuelsen, 1974). Samuelsen frequently observed openings of *Upogebia* burrows from the littoral zone to about 40-m depth. The openings were seen commonly on patches of muddy sand between rocks and stones. Samuelsen mentioned that Gustafson (1934) found the two *Upogebia* species at two strictly limited levels in Gullmarsfjorden (Swedish west coast) with *U. stellata* living at the greater depth. However, the Norwegian records show that at least in shallow water the two species occur side by side.

After 1974 *U. stellata* has been recorded a few times in Southern Norway. One ovigerous female was collected in June in the outer part of Oslofjorden between 30–40-m depths, another ovigerous female was found in January in Trysfjorden on the south coast (58°05'N, 07°41'E) at about 9-m depth (M. E. Christiansen and Stene, 1998). The northernmost record is near Bergen at 60°23.6'N, 05°16.1'E.

General Distribution.—*Upogebia stellata* is recorded from the west coast of Norway (from just north of 60°N); and according to Noël (1992) southwards to the English Channel from shallow water to 40-m depth.

Family Callianassidae Dana

Callianassa subterranea (Montagu, 1808)

Cancer Astacus subterraneus Montagu, 1808: 88, pl. 3, figs. 1, 2.

Published Norwegian records: M. E. Christiansen and Greve, 1982: 213.—Johannessen *et al.*, 1989: 38 (as Callianassidae juv).—Johannessen *et al.*, 1991: 86 (as Callianassidae indet.).—Rygg, 1994: 22 (as *C. tyrrhena*).—Oug and Helland, 1995: 32 (as *C. tyrrhena*).—Brattegard and M. E. Christiansen, 1997: 215.—M. E. Christiansen and Stene, 1998: 75.

Callianassa subterranea is known from several localities in Southern Norway from Oslofjorden in the southeast to near Bergen on the west coast just north of 60°N (Fig. 1). Specimens are found from 5–7 m down to between 60–100-m depths. Except for one locality on the south coast (Trysfjorden, Vest-Agder county), where a number of specimens were collected, individuals from the other localities are all juveniles (see below).

The first record of *C. subterranea* from the Norwegian coast was published by M. E. Christiansen and Greve (1982). This was a juvenile specimen which had been collected in 1950 at approximately 58°15'N, 08°35'E between 60- and 100-m depths. Actually G. O. Sars (1884) was the first to find larvae of *Callianassa* in the outer part of Oslofjorden, but these were described as *Calocaris macandreae* (see above under *C. macandreae*). Larvae of *C. subterranea* were also collected in the plankton in Oslofjorden in September 1978 and 1979 (K. Smedsrud, 1982, unpublished Masters thesis, University of Oslo). In later years some juvenile specimens of the Callianassidae have been reported from the west coast in Hordaland county between 12- and 20-m depths and a few juvenile specimens (published as *C. tyrrhena*) were also found from 50-m depth in the counties Aust-Agder and Vest-Agder. These are probably all young specimens of *C. subterranea* (see M. E. Christiansen and Stene, 1998).

During the winter 1988–89 there was extensive renewal of bottom water in many of the threshold fjords in the southernmost part of Norway (M. E. Christiansen and Stene, 1998). Water containing hydrogen sulphide from the deepest parts of the fjords was raised close to the surface and killed many fish and bottom organisms. During diving in one of the fjords, Trysfjorden, Vest-Agder county (58°05'N, 07°41'E) in January and February 1989, a number of dead *C. subterranea* were observed on the muddy bottom between 5- and 9-m depths. Of nearly 70 collected specimens, two individuals were moribund, and the rest were dead. Forty specimens examined varied in length from tip of rostrum to median posterior margin of carapace from 9 to 12 mm. Thirty-five of these were ovigerous females (eggs without eyspots), and five were males. The burrows of *C. subterranea* are deep, maximally from 21 to 81 cm on the west coast of Scotland (Atkinson and Nash,

Table 1. First Norwegian record and general distribution of Norwegian Thalassinidea.

Species	First Norwegian record	General distribution	Depth range
<i>Calocaris macandreae</i>	M. Sars (1857)	South of western Iceland, Faroe Islands. From Northern Norway along the East Atlantic coast to Gulf of Guinea, West Africa; Mediterranean	15–1400 m, most common from 50 to 600 m
<i>Calocarides coronatus</i>	Appellöf (1906)	From Northern Norway southwards to the North Sea and Great Britain; western Mediterranean; tropical West Africa	80–855 m
<i>Upogebia deltaura</i>	G. O. Sars (1883)	From west coast of Norway southwards to Togo, West Africa; Mediterranean and Black Sea	Shallow water down to 190 m, most common above 70 m
<i>Upogebia stellata</i>	Grieg (1927)	From west coast of Norway southwards to the English Channel	Shallow water down to 40 m
<i>Callianassa subterranea</i>	Christiansen and Greve (1982)	From west coast of Norway southwards to Bay of Biscay; Mediterranean	Shallow water down to 500 m

1990), and account for the infrequency of its collection on the Norwegian coast.

General distribution.—*C. subterranea* is recorded on the coast of Norway to just north of 60°N from 5–7-m to 60–100-m depths. According to Noël (1992) it extends southwards to Bay of Biscay and occurs between 35–500-m depths in the Mediterranean. The species has been reported to be commonest in the northern part of its range (de Saint Laurent and Božić, 1972).

Summary

The distribution of Thalassinidea in Norway is summarized in Fig. 1, and the first Norwegian record and the general distribution of the species are shown in Table 1.

The wide range of both horizontal and vertical distribution of *Calocaris macandreae* indicates that the species may have a high tolerance to different temperatures. *Calocarides coronatus* has a more limited distribution vertically and seems to be most abundant in the boreal region.

Upogebia deltaura, *U. stellata*, and *Callianassa subterranea* are recorded in shallow water in the southern part of the boreal region. *Upogebia stellata* has a limited distribution further south on the Atlantic coast compared to the two other species. Until

1934, the two *Upogebia* species had been considered as rarities in Scandinavian waters, and *Callianassa* was known neither from the Danish nor from the Norwegian coasts (see Gustafson, 1934). The burrowing habit of these animals is probably the main reason for the scattered records of the species in Norwegian waters. By using a "ring-dredge," which digs more deeply than the dredges used before, Gustafson found all three species common in Gullmarsfjorden (Swedish west coast). Similarly, Samuelsen (1974) found both *Upogebia* species common in muddy sand from the littoral zone to 40-m depth when he was diving in a fjord near Bergen on the Norwegian west coast.

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