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NEW RECORDS OF TWO SPECIES OF GNATHIID ISOPODS,
PARAGNATHIA FORMICA (HESSE, 1864) AND *GNATHIA MAXILLARIS*
(MONTAGU, 1804) (ISOPODA, GNATHIIDAE) FROM THE BLACK SEA

BY

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ABSTRACT

During fieldwork on the southeastern Black Sea coast, in October 2009, two gnathiid isopods were found in their free-living stage, *Paragnathia formica* (Hesse, 1864) and *Gnathia maxillaris* (Montagu, 1804). These species are herein reported from the Black Sea for the first time.

RÉSUMÉ

Au cours d'une campagne de terrain sur la côte sud-orientale de la mer Noire, en octobre 2009, deux isopodes Gnathiidae ont été trouvés à leur stade libre, *Paragnathia formica* (Hesse, 1864) et *Gnathia maxillaris* (Montagu, 1804). Ces espèces sont signalées ici de la mer Noire pour la première fois.

INTRODUCTION

Gnathiideans are entirely marine, mostly described from shallow waters (Kensley & Schotte, 1989). Adults are non-feeding and found among sponges, in dead corals, barnacle nests, and in polychaete worm tubes (Seed, 1979; Holdich & Harrison, 1980; Cohen & Poore, 1994; Tanaka & Nishi, 2008). There are three larval stages with each stage having two forms, “praniza” and “zuphea”. The praniza larvae are ectoparasites of fish. After feeding, praniza larvae dwell in the benthic substrata to moult (Smit & Davis, 2004). Collection of gnathiids is often difficult because they spend a great deal of time in cryptic habitats (Tanaka & Nishi, 2008).

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Gnathiids have been found in most parts of the world oceans and have been recorded from the intertidal (Tanaka & Aoki, 1999) to abyssal depths (Cohen & Poore, 1994) and currently there are 182 identified species (Kensley et al., 2005). Though many gnathiids have been recorded from the Mediterranean, the Aegean Sea (Monod, 1926; Geldiay & Kocataş, 1972; Kırkım et al., 2006; Sezgin et al., 2007) and the Black Sea (Reshetnikova, 1954; Kononenko, 1985; Öztürk, 1998; Gönlügür, 2003; Gönlügür-Demirci et al., 2004), little is known of their distribution and habitat preferences. In the present study, two gnathiid species are recorded in their free-living stage from the southeastern Black Sea coast. *Paragnathia formica* (Hesse, 1864) and *Gnathia maxillaris* (Montagu, 1804) are herein reported for the first time from the Black Sea.

MATERIAL AND METHODS

The gnathiid isopods were collected during fieldwork in October 2009 at the southeastern Black Sea coast ($41^{\circ}27'45.00''\text{N}$ $41^{\circ}28'16.08''\text{E}$) (fig. 1). Water depth at the study area was 10-18 m, and most of the coast was covered with gravel interspersed with boulders and rocks. Sea grass beds consisting of *Cystoseira barbata* (Stackhouse) C. Agardh, occurred about 5 m offshore. At this locality, randomly collected stones (both bare and overgrown by tube worms) were scraped with a spatula, and then the scraped matter was preserved in 4% formalin for

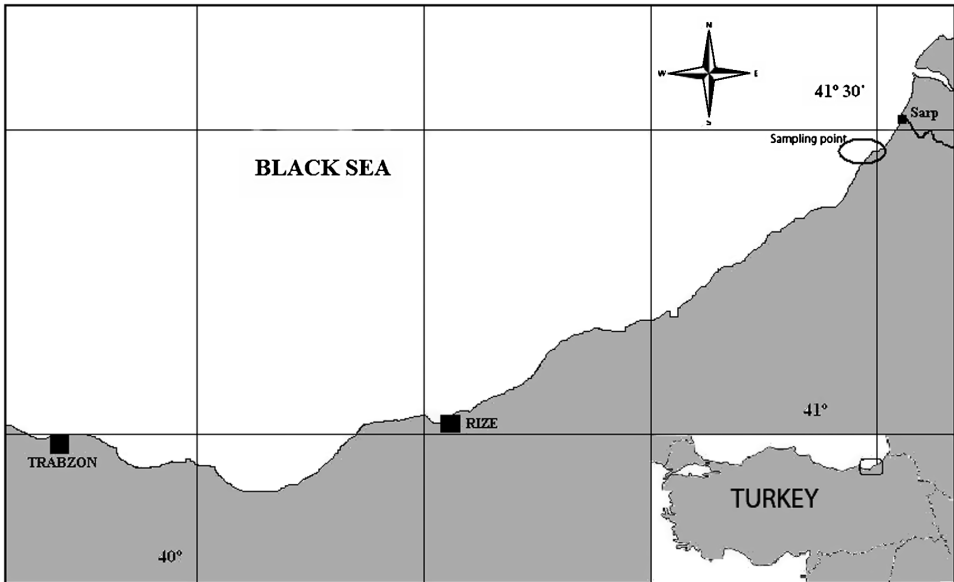


Fig. 1. Map of the southeastern coast of the Black Sea, showing the locations of the new records of *Paragnathia formica* (Hesse, 1864) and *Gnathia maxillaris* (Montagu, 1804).

further analysis. The samples were then washed through a 0.5 mm sieve and the retained fauna was preserved in 70% ethanol. The extracted fauna was separated into taxonomic groups. Specimens of gnathiid isopods were identified and counted. The appendages were separated from the body. Observations were made under a Nikon stereomicroscope and drawings were made with a camera lucida. Identification of gnathiids was done with the aid of Naylor (1972). The material was deposited at the laboratory of the Fisheries Faculty, Rize University (RU-FFR 5001-5002).

RESULTS

Family GNATHIIDAE

Genus *Paragnathia* Omer-Cooper, 1916

Paragnathia formica (Hesse, 1864) (fig. 2b)

Material examined. — Two ♂♂; 41°27'45.00"N 41°28'16.08"E, adult specimens collected from rocky substrates at 18 m depth. No females or praniza larvae were found.

Remarks. — The size of the males was 5.6-6.2 mm. Current taxonomic descriptions of gnathiids are based generally on adult male morphology, but adult males are found only in the benthos and cannot yet be matched with either the juvenile stages that feed on fish or with adult females. Juveniles are also morphologically and ecologically similar across taxa (Smit & Davies, 2004), so there is little concerning their natural history to assist in classifying them. The morphology of the *P. formica* larvae and females is very similar to that of *Gnathia maxillaris*.

In the adult male *P. formica* the pylopod has 5 articles (fig. 2b). The last pereion somite is reduced and without limbs; this is indeed best seen in males, which are slender, and that last pereonite is equal in width to the pleon somites. The male has large mandibles that project in front of the cephalon and are forceps-like.

Ecology. — Juvenile praniza specimens of this species can be observed in both the buccal cavity and body of fishes, but mature male and female specimens inhabit muddy substrates of estuaries (Naylor, 1972; Upton, 1987b).

Distribution. — From the northwest of Morocco to southern Britain, including the Mediterranean (Upton, 1987a) and the Aegean Sea (Kırkım et al., 2008). *Paragnathia formica* is here reported for the first time from the Black Sea.

Genus *Gnathia* Leach, 1814

Gnathia maxillaris (Montagu, 1804) (fig. 2a)

Material examined. — 2 ♂♂, 4 ♀♀; 13 m, 14 ♂♂, 2 ♀♀, 12 praniza's, 4 zuphea's (18 m); 41°27'45.00"N 41°28'16.08"E, adult *G. maxillaris* specimens collected from rocky substrates at 13 and 18 m depth.

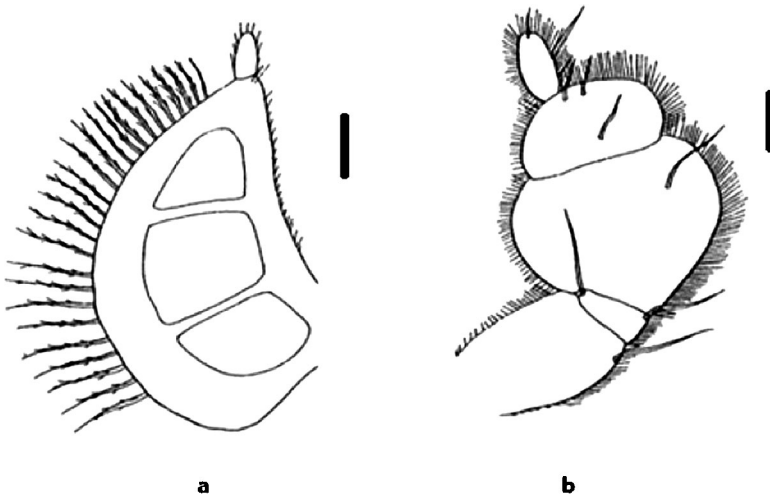


Fig. 2. Pylopods of: a, *Gnathia maxillaris* (Montagu, 1804), adult ♂, southeastern Black Sea coast of Turkey; b, *Paragnathia formica* (Hesse, 1864), adult ♂, southeastern Black Sea coast of Turkey. Scale bars: 100 μ m.

Remarks. — The size range of the males was 5.6–7.2 mm (mean \pm SD; 6.46 ± 0.54 mm, $n = 16$), the size range of the females was 5.6–6.6 mm (6.05 ± 0.37 mm, $n = 6$), the size range of the praniza larvae was 5.4–6.5 mm (5.81 ± 0.34 mm, $n = 12$) and the size range of the zuphea larvae was 5.8–6.2 mm (5.9 ± 0.17 mm, $n = 4$).

The adult male of *G. maxillaris* can be easily distinguished from that of *Paraguathia formica* by its pylopod (fig. 2a, b). The *G. maxillaris* adult male pylopod has 2 or 3 articles, that of *P. formica* has. In the *G. maxillaris* male the front of the cephalon has a shallow central concavity, with only a slightly rounded median forward projection; the lateral corners square, and the cephalon is wider than long.

Ecology. — *G. maxillaris* has been reported as the most common intertidal gnathiid in open marine localities, the adults are well hidden in rock crevices and crevice-like structures such as dead barnacle shells and *Laminaria* holdfasts (cf. Naylor, 1972; Isaac, 1990).

Distribution. — This species is recorded from the southern North Sea, southern England and Wales, the Irish Sea, and Ireland (Naylor, 1972; Isaac, 1990), and also from the Aegean Sea (Sezgin et al., 2007). *Gnathia maxillaris* is here reported for the first time from the Black Sea.

DISCUSSION

Paragnathia formica and *Gnathia maxillaris* were recorded for the first time in the Aegean Sea by Kirkim et al. (2006) and Sezgin et al. (2007), respectively. In

the present study, these species are reported for the first time from the Black Sea. *P. formica* and *G. maxillaris* are not host-specific and were described from a number of hosts worldwide (Smit & Davies, 2004). *P. formica* parasitizes a variety of hosts, but the common goby (*Pomatoschistus microps* (Krøyer, 1838)) is frequently used (Upton, 1987a). There is no information available as to which fish species these gnathiids parasitize in the Black Sea during their larval pranzia stage.

These species occur in high densities in shallow estuarine waters and feed benthically. The adults, however, occur in cryptic, benthic habitats (coral reefs, mud borrows, sponges, dead barnacle shells, sea anemones, and bottom cavities) (Monod, 1926; Upton, 1987a, b; Klitgaard, 1997) to a depth of nearly 4000 m. In this study, the biotope where the sample was collected consisted of broken bedrock covered with small boulders, dead bivalve shells, and tube worms, and the habitat is affected by drainage from the Coruh River. Some gnathiid species occupy only one or a few particular habitats (e.g., sponges or mud borrows) and use them as resting or moulting places between ectoparasitism for the larvae, or as breeding habitats for non-feeding adults (Upton, 1987b; Klitgaard, 1997; Tanaka & Aoki, 1999). There have been reports that gnathiid isopods were found in tubes of terebellid polychaetes in northeastern Japan (Tanaka & Aoki, 1999). Our investigation shows that these species of gnathiids may use dead bivalve shells or worm tubes for moulting throughout the larval period.

The geographical distribution that may be expected in marine organisms such as gnathiids, that have live birth and non-planktonic larval stages, has two aspects. On the one hand, these organisms rarely leave their natal area (Bohonak, 1999), while on the other, host migration plays an important role in the parasite's distribution. Gnathiid larvae actively swim to attach to their host fish (Monod, 1926; Wägele, 1988) and the host fishes' movement or migration is considered to increase the distribution range of the gnathiids (Tanaka, 2007).

P. formica and *G. maxillaris* are here reported for the first time from the Black Sea. Further research will be needed to understand the habitat and host preference in the region. Determination of the potential host(s) of these species may be of use in explaining their probable route(s) to have entered the Black Sea.

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