

Description of two new species of *Myersinella* (Rotifera: Monogononta: Dicranophoridae) from the Mediterranean

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Two new species of rotifers belonging to the Dicranophoridae are described from marine psammon collected at a depth of 30–40 m in the Mediterranean near the island of Elba, Italy. *Myersinella uncodonta* sp. nov. is characterized by two colourless eyespots; single, incurved acute apical rami teeth; two needle-shaped, slightly incurved elongate unci; manubria with forked head and crutched cauda; outer margin of rami angular postero-laterally. *Myersinella longiforceps* sp. nov. is characterized by two large red eyespots; a pair of extremely elongated, gouge-shaped apical rami teeth; two short, needle-shaped unci; manubria with forked head and double-crutched cauda; outer margin of rami rounded laterally, tapering towards fulcrum. This is the first report of the genus *Myersinella* from marine environments.

INTRODUCTION

The rotifer fauna from marine habitats world-wide is very incompletely known, with only 254 reported species belonging to 47 genera and 23 families (Fontaneto et al., 2006) out of the about 2030 species, 124 genera and 34 families considered valid (Segers, 2002, 2007). Some 90 rotifer species have been listed from the Mediterranean (Ahlrichs, 2003; Ricci & Fontaneto, 2003; Fontaneto et al., 2006), with only 21 of them being strictly marine, and seven occurring in both marine and inland saline waters.

Amongst the rotifer taxa found in marine habitats, Dicranophoridae constitutes the most diverse family, represented by 7 genera and 61 species. It is also one of the taxa which can develop into considerable numbers in the intertidal psammon, and in the subtidal benthos and periphyton from the littoral. In this paper two new species belonging to the genus *Myersinella* are described from the upper surface layer of subtidal sand, sampled near the island of Elba, Italy.

MATERIALS AND METHODS

Samples were taken during SCUBA diving in the littoral of the island of Elba, 42°46'30"N 10°16'47"E (Figure 1), by scraping the uppermost centimeter of sand at 30–40 m, using 250 ml plankton bottles. Fixation followed by adding 35% formalin up to a final concentration of ~4%. The rotifers were extracted in the laboratory using the multiple swirl-decantation technique: the sand is added to filtered seawater, consequently stirred, and after momentary settling the water is decanted through a 40 µm net. Specimens were examined and drawn using a Leitz Orthoplan microscope equipped with camera lucida. Rotifer trophi were prepared with NaOCl according to De Smet (1998). Scanning electron

microscopy (SEM) of the trophi was performed with a Philips SEM 515, operated at 20 kV.

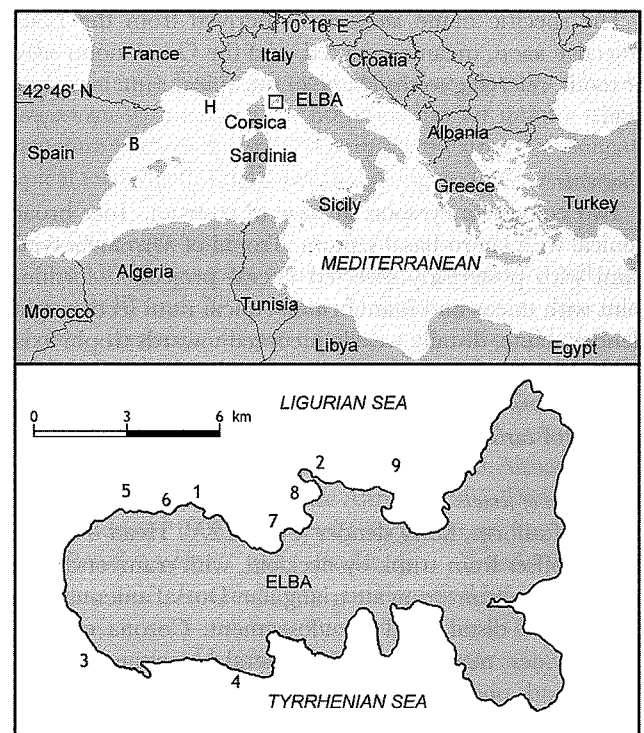


Figure 1. Upper: map of the Mediterranean with sampling sites near Elba Island, Béguar (B) and Hyères (H) indicated. Lower: Elba Island with sampling localities: (1) Punta della Madonna; (2) Scoglio della Nave Enfolà; (3) Il Relitto di Pomonte; (4) La Fonza Esterna; (5) La Formiche di Ponente; (6) Punta della Madonna di Ponente; (7) Picco Giallo; (8) Scoglio Fino; (9) Scoglietto di Portoferraio.

SYSTEMATICS

Phylum ROTIFERA Cuvier, 1812
 Class EUROTATORIA De Ridder, 1957
 Subclass MONOGONONTA Plate, 1889
 Order PLOIMA Hudson & Gosse, 1886
 Family DICRANOPHORIDAE Harring, 1913
 Genus *Myersinella* Wiszniewski, 1936
Myersinella uncodonta sp. nov.
 (Figures 2 & 3)

Type locality

Mediterranean, Elba Island, Italy: Scoglio della Nave Enfolà, depth 40 m, distance from shore ~50 m, 25 September 2006.

Type material

Holotype: a female in a permanent glycerine glass slide mount deposited in the Koninklijk Belgisch Instituut voor Natuurwetenschappen (KBIN), Brussels, Belgium, no. IG 30769, RIR 173.

Paratypes: one female in glycerine glass slide mount, KBIN; 7 mounted females and 5 SEM trophi preparations in the Department of Biology, University of Antwerp.

Additional material: Mediterranean, Elba Island, Italy: Punta della Madonna, depth 30 m, distance from shore ~50 m, 25 September 2006, 3 females; La Formiche di Ponente, depth 40 m, distance from shore ~50 m, 28 September 2006, 2 females.

Etymology

The specific name *uncodonta* is derived from the Latin adjective *uncus*, meaning curved, and the Greek noun *odonts* or tooth, referring to the shape of the apical rami teeth and unci.

Diagnosis

Two colourless eyespots at base of rostrum. Toes broad conical with latero-basal septum. Trophi of *Myersinella*-type: rami with posteriorly directed lateral projection forming joint with uncus and manubrium. Apical rami teeth single, slender, acute, distally weakly incurved towards trophi axis. Unci a single, long and slender, distally incurved tooth. Manubria with forked head and crutched cauda. Outer margin of rami angular postero-laterally.

Description of female

Body fusiform, fairly slender (Figure 2A). Head ~1/4 total length, offset from trunk by neckfold, with transversal fold medially. Rostrum truncate triangular. Dorsal antenna near posterior of distal head pseudosegment. Corona oblique. Trunk widest near anterior 1/4. Lateral antennae not seen. Foot broad, one large pseudosegment. Toes (Figure 2B,C) broad conical, weakly flattened dorso-ventrally and slightly decurved ventrally; with septum latero-basally; tips acute, with opening of duct of pedal glands. Two fairly large colourless eyespots near base of rostrum. Brain saccate, with small retrocerebral sac. Gastric glands tubular without distinct glandular mass on stomach, connected to mastax, filled with light refracting globules (which may be absent in one or both glands). Proventriculus large. Stomach large,

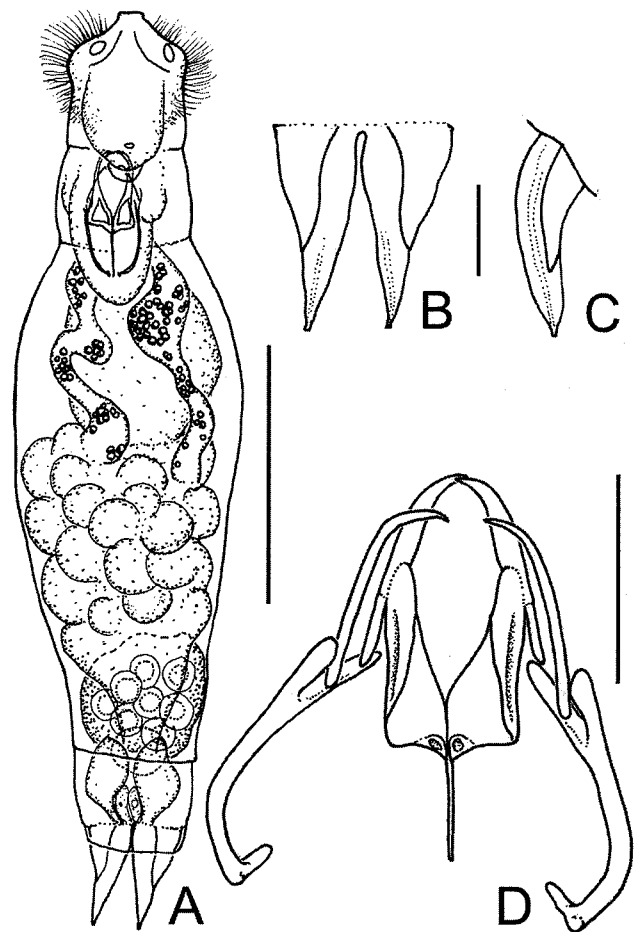


Figure 2. *Myersinella uncodonta* sp. nov.: (A) dorsal view; (B) toes, dorsal view; (C) toe, lateral view; (D) trophi, ventral view. Scale bars: A, 50 µm; B–D, 10 µm.

indistinctly separated from intestine. Bladder normal, spherical. Pedal glands large, extending till trunk, bulbous, with two smaller glands (?) in between. Vitellarium with eight nuclei.

Trophi forcipate (Figures 2D & 3). Rami elongate, each with single, long and acute apical ramus tooth incurving towards trophi axis; postero-lateral margin of rami angular, posterior margin straight; basal chambers with longitudinal, shallow lateral cleft; basifenestrae and sub-basifenestrae oval, small; median rami opening elongate, broadly lanceolate; apical rami teeth with distinct groove laterally, delimiting a dorsal part connected to a rounded demarcation line distally, and a ventral part continuing into the lateral, caudally pointing projection (Figure 3C: p); lateral projection weakly offset from tooth. Fulcrum short, ~1/2 ramus length, thin, in lateral view broadly wedge-shaped and rounded distally. Unci single (Figure 3D,E), long, needle-shaped, incurving distally; demarcation between long head and very short shaft inconspicuous; very weakly asymmetrical, right uncus somewhat shorter and thicker with small slightly offset tip. Manubria short, ~2/3 incus length, rod-shaped, incurved distally, head forked, cauda crutched; caudal crutch with long dorsal part and knob-like ventral part; inner branch of manubrial fork composed of elongate-oval chamber with ventrally reinforced margin (Figure 3G), apparently

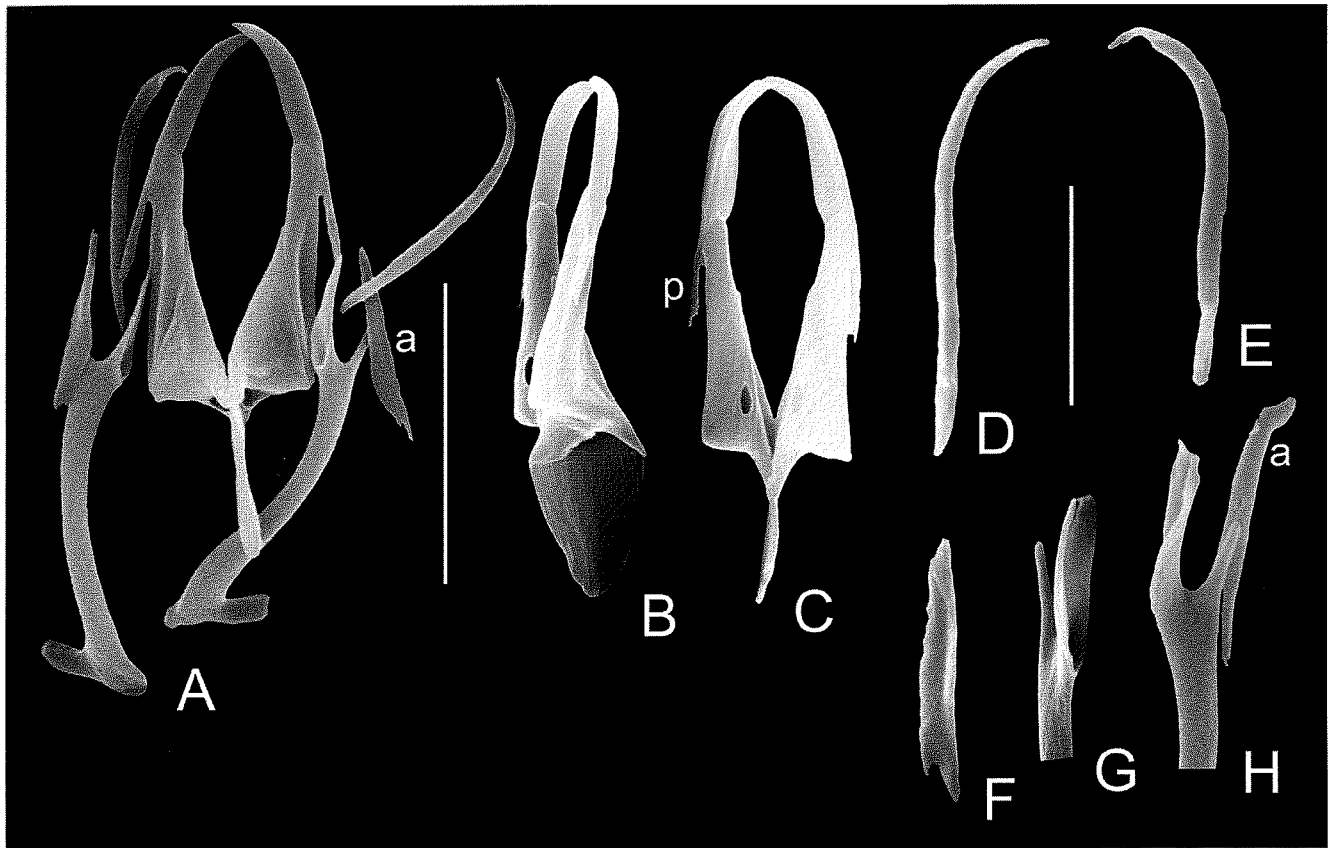


Figure 3. *Myersinella uncodonta* sp. nov., scanning electron microscope photographs of trophi: (A) complete set, ventral view; (B) incus, lateral view; (C) incus, dorsal view; (D) left uncus; (E) right uncus; (F) accessory element of left manubrial head, inner view; (G) left manubrial head, oblique inner view; (H) right manubrial head, dorsal view. a, accessory element of manubrial head; p, lateral ramus projection. Scale bars: A–C, 10 μ m; D–H, 5 μ m.

opposed to lateral longitudinal cleft of basal ramus chamber; outer branch of fork composed of shorter spiniform process (Figure 3G,H), with laterally appressed, narrow gutter-shaped elongate element (Figure 3A,F,H: a). Unci and lateral projections of rami united to joint inside fork of manubrial heads.

Male unknown.

Measurements

Length 178–245 μ m (mean=200 μ m, N=7), toe 19–26 μ m (mean=21, N=13); trophi (N=5): ramus 12.5–15.5 μ m, fulcrum 5.0–6.0 μ m, left uncus 10.0–11.0 μ m, right uncus 9.0–10.0 μ m, manubrium 13.0–17.5 μ m, ramus lateral projection 3.0–4.0 μ m, accessory element of manubrial head 6.0–7.0 μ m.

Comments

Myersinella uncodonta sp. nov. is easily distinguished from *M. belodon* (Harring & Myers, 1928) and *M. tetraglena* (Wiszniewski, 1934) by its broad toes with septum (toes more slender conical, without septum in *M. belodon* and *M. tetraglena*), its manubria with forked head and crutched cauda, and the long curved unci (head not forked, cauda not crutched, and unci short and straight in *M. belodon* and *M. tetraglena*), and its angular postero-lateral margin (postero-lateral margins of rami tapering towards fulcrum in *M. belodon* and *M. tetraglena*). Moreover it differs from *M. tetraglena* by the absence of zoochlorellae in the body cavity. *Myersinella uncodonta* sp. nov. shares broad toes with septum and tubular

gastric glands filled with light refracting globules with *M. longiforceps* sp. nov., which, however, has a unique trophi structure with each ramus bearing two extremely elongate apical teeth (teeth single, not that elongate in *M. uncodonta*).

Distribution and ecology

Out of 25 samples from subtidal psammon collected between 10 and 70 m in the Mediterranean at sites near Hyères (France), Bégur (Spain) and Elba (Figure 1), *Myersinella uncodonta* sp. nov. was only found near the island of Elba between 30 and 40 m, ~50 m out of the coastline; September; water temperature 21–22°C. Accompanying rotifers: *Colurella* spp., *Dicranophorus bulgaricus* Althaus, 1957, *Encentrum* spp., *Lepadella pontica* Althaus, 1957, *Lindia gravitata* (Lie-Pettersen, 1906), *Myersinella longiforceps* sp. nov., *Notholca* sp., *Paradicranophorus* spp., *Proales* spp., *Testudinella obscura* Althaus, 1957, *Testudinella* spp., unidentified bdelloids.

Myersinella longiforceps sp. nov.

(Figures 4 & 5)

Type locality

Mediterranean, Elba Island, Italy: Punta della Madonna, depth 30 m, distance from shore ~50 m, 25 September 2006.

Type material

Holotype: a female in a permanent glycerine glass slide mount deposited in the Koninklijk Belgisch Instituut voor

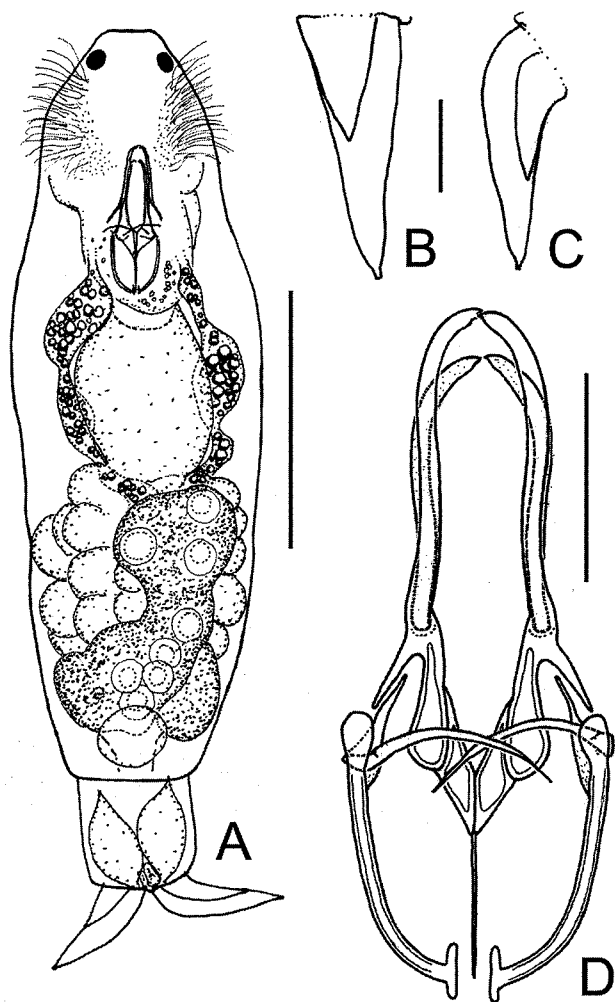


Figure 4. *Myersinella longiforceps* sp. nov.: (A) ventral view; (B) toe, dorsal view; (C) toe, lateral view; (D) trophi, ventral view. Scale bars: A, 50 μm ; B–D, 10 μm .

Natuurwetenschappen (KBIN), Brussels, Belgium, no. IG 30769, RIR 174.

Paratypes: one female in glycerine glass slide mount, KBIN; 4 mounted females and 3 SEM trophi preparations in the Department of Biology, University of Antwerp.

Additional material: Mediterranean, Elba Island, Italy: La Formiche di Ponente, depth 40 m, distance from shore ~50 m, 28 September 2006, 1 female; Punta della Madonna di Ponente, depth 40 m, distance from shore ~50 m, 28 September 2006, 1 female.

Etymology

The specific name *longiforceps* is derived from the Latin adjective *longus*, long, and the noun *forceps*, meaning forceps, and refers to the extremely long apical rami teeth.

Diagnosis

Two large, red eyespots at base of rostrum. Toes broad conical in dorsal view with latero-basal septum. Trophi of *Myersinella*-type: rami with posteriorly directed lateral projection forming joint with unci and manubrium. Each ramus with two extremely long, gouge-shaped apical teeth. Unci a single, long and slender acute tooth with long head

and short shaft. Manubria with forked head and double-crutched cauda. Outer margins of rami rounded and bulging laterally, tapering towards fulcrum.

Description of female

Body fusiform (Figure 4A). Head ~1/5 total length, indistinctly offset from trunk by neckfold, with weak transversal fold medially. Rostrum broadly truncate. Dorsal antenna near middle of head. Corona oblique. Trunk widest near anterior 1/4. Lateral antennae not seen. Foot broad, one large pseudosegment. Toes broad conical (Figure 4B,C), with septum latero-basally; tips acute, with opening of duct of pedal glands; a small papilla between toes. Two very large red eyespots near base of rostrum. Brain saccate, with small retrocerebral sac. Gastric glands tubular without distinct glandular mass on stomach, connected to mastax, filled with light refracting globules (which may be absent in one or both glands). Proventriculus large. Stomach large, indistinctly separated from intestine. Bladder normal, spherical. Pedal glands large, foot length, lemon-shaped, with two smaller glands (?) between. Vitellarium with eight nuclei.

Trophi forcipate (Figures 4D & 5). Rami extremely elongate, with the shape of an obstetrical forceps; each ramus with two, extremely long gouge-shaped apical rami teeth terminating in small acute tip (Figure 5E); in dorsal view apical rami teeth almost straight; in lateral view dorsal and ventral apical rami teeth wide apart, weakly curved near the tips; both dorsal and ventral rami teeth inserted laterally on distal end of basal chambers; ventral teeth continuing into lateral projection pointing caudally (Figure 5A,F: p); outer margin of basal chambers rounded, bulging; outer margin of sub-basal chambers straight, tapering towards fulcrum; dorsal and ventral apical rami teeth with delicate dorsal and ventral seam respectively; basifenestrae and sub-basifenestrae round, small. Fulcrum short, ~1/5 ramus length, thin, in lateral view broadly wedge-shaped, weakly indented near midlength and rounded distally. Unci single (Figure 5G: u), weakly curved, with long needle-shaped tooth and very short triangular shaft, standing at a more or less right angle to the trophi axis in the fixed specimens studied. Manubria short, ~1/2 incus length, rod-shaped, weakly curved, head forked (Figure 5G), cauda with distinct double crutch; ventral branch of manubrial fork composed of a shallow elongate-oval chamber with ventrally reinforced margin; dorsal branch of fork composed of shallow elongate-triangular chamber. Unci and lateral projections of rami united to joint inside fork of manubrial heads.

Male unknown.

Measurements

Length 149–193 μm (mean=171 μm , N=5); trophi (N=3): ramus ~21.5–26.0 μm , ventral apical ramus tooth ~15.5–20.0 μm , dorsal apical ramus tooth ~15.0–15.5 μm , fulcrum 5.5–7.0 μm , unci 8.0–10.0 μm , manubrium ~11.0–17.0 μm , ramus lateral projection 3.0–3.5 μm .

Comments

Myersinella longiforceps sp. nov. cannot be mistaken for any other member of the genus by its highly specialized, obstetrical forceps-shaped trophi.

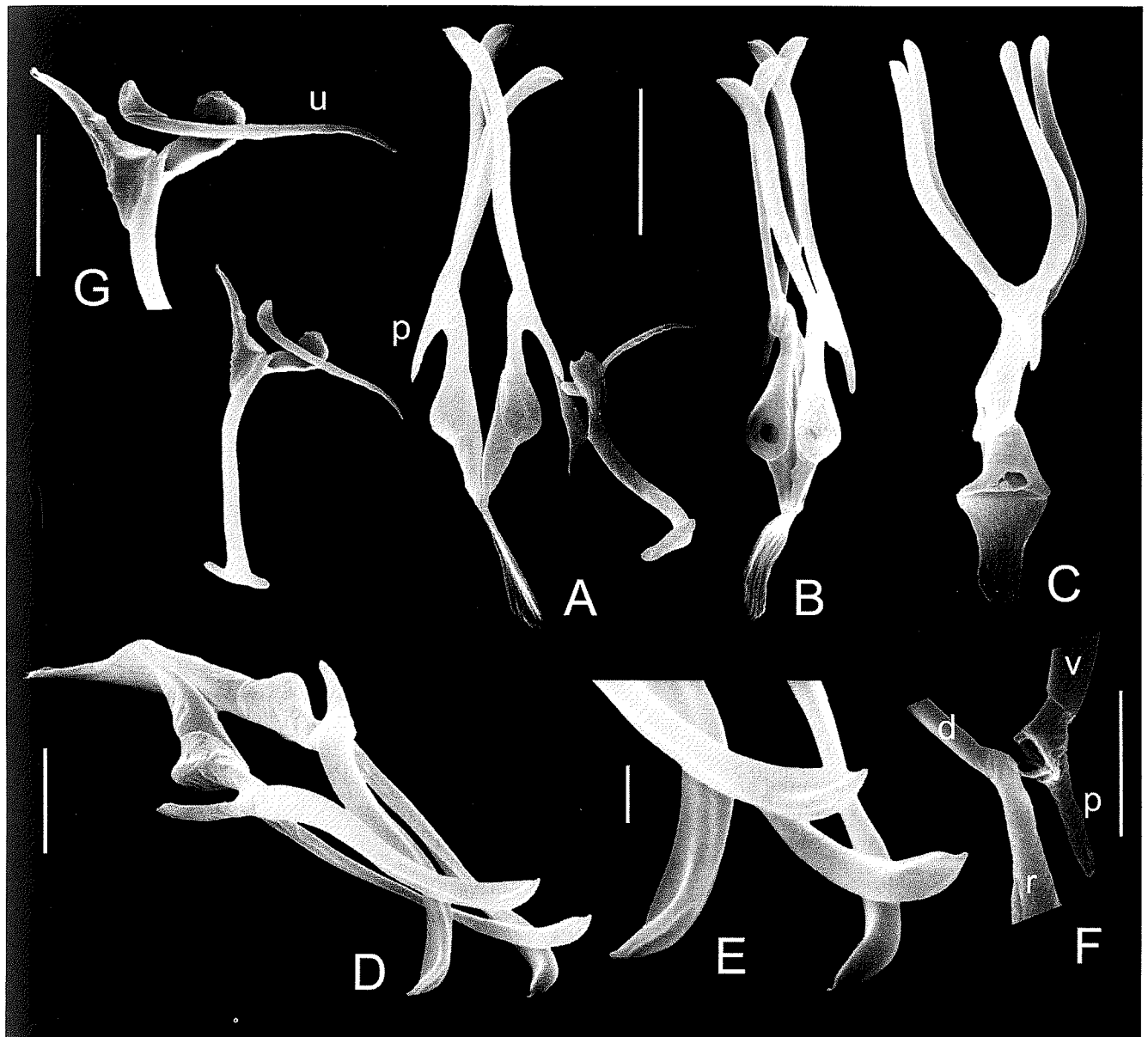


Figure 5. *Myersinella longiforceps* sp. nov., scanning electron microscope photographs of trophi: (A) ventral view; right manubrium outer view; (B) incus, dorsal view; (C) incus, lateral view; (D) incus, oblique frontal view; (E) detail apical rami teeth; (F) detail lateral ramus projection dislodged from ramus; (G) detail head right manubrium and uncus. d, dorsal apical ramus tooth; p, lateral ramus projection; r, ramus; v, ventral apical ramus tooth; u, uncus. Scale bars: A–C, 10 μ m; D, F, G, 5 μ m; E, 1 μ m.

Distribution and ecology

Out of 25 subtidal psammon samples from the Mediterranean, collected between 10 and 70 m at sites near Hyères (France), Bégur (Spain) and Elba (Figure 1), *Myersinella longiforceps* sp. nov. was only found at the type locality between 30 and 40 m, ~50 m out from the coastline; September; water temperature 21–22°C. Accompanying rotifers: *Colurella* spp., *Dicranophorus bulgaricus*, *Encentrum* spp., *Lepadella pontica*, *Lindia gravitata*, *Myersinella uncodonta* sp. nov., *Notholca* sp., *Paradicranophorus* spp., *Proales* spp., *Testudinella obscura*, *Testudinella* spp., unidentified bdelloids. Two specimens contained large (20–25×35–45 μ m), thick-walled ovate algal (?) cells in their proventriculus and stomach. The peculiar shape of the rami could be an adaptation allowing to grasp these cells in the way of an obstetrical forceps, i.e.

by pinching them laterally between the large 'loops' formed by the apical rami teeth.

Remarks on the genus Myersinella

Up till now, only two rare species belonging to *Myersinella* were known from freshwater habitats. *Myersinella belodon* was described by Harring & Myers (1928) sub *Erignatha belodon* from slightly acid ponds in Maine (USA), and later on, only reported from similar biotopes in the same region by Myers (1931). *Myersinella tetraglena* was described sub *Myersina* from brook hydrosammon in Poland by Wiszniewski (1934). The only other records are from the psammolittoral of a river and permanent water bodies in New Jersey, USA (Myers, 1936), Poland (Pawłowski, 1958) and Romania (Rudescu, 1960). Schmid-Araya (1995) reported *Myersinella tetraglena*

from hyporheos of a gravel stream in Austria. However, the figured trophi differ in shape and dimension with those of *M. tetraglena*, and may concern another species.

The diagnosis of the genus (see De Smet, 1997), should be extended to include the features related to the toes, gastric glands, eyes and apical rami teeth. Besides the stout conical toes lacking a septum as found in *M. belodon* and *M. tetraglena*, a septum can be present. In Dicranophoridae the structure interpreted as a septum was to date only reported in *Dicranophorus forcipatus* (Müller, 1786). Instead of small ovate gastric glands, the new species show tubular glands, and instead of four colourless eyes, there may be two eyes, colourless or red-coloured. The apical rami teeth can be single or double.

Trophi structure is the most important feature in Dicranophoridae to establish generic diagnosis. The trophi of *Myersinella* are characterized by slender elongate rami without teeth at their inner margin, single-toothed, needle-shaped unci, and as the most outstanding character the lateral ramus projections hinged to unci and manubria. In *M. longiforceps* each ramus terminates in two apical teeth, whereas in *M. belodon*, *M. tetraglena* and *M. uncodonta* there is only one. However, SEM shows a distinct longitudinal lateral groove on the apical rami teeth in *M. uncodonta*, suggesting that they are composed of two, although fused, teeth as well. The lateral ramus projections in *M. longiforceps* (Figure 5F: p) and *M. uncodonta* are more or less clearly offset from the ventral apical rami teeth (Figure 5F: v). Nevertheless, they are continuous with the elongate ventral apical rami teeth, forming a single trophi element reminiscent of the ventrally located preuncinal teeth in the genera *Encentrum* (at least in the subgenera *Isoencentrum* and *Encentrum*) and *Wierzejskiella*. In these genera, preuncinal teeth usually show a distinct head and shaft, and the ventral apical rami teeth with lateral ramus projections in *Myersinella* are considered homologous to them. In *Encentrum* and *Wierzejskiella* the preuncinal and apical rami teeth form the ramus lock, wherein the well developed and stout unci teeth are interlocking. Unci and preuncinal teeth work together by grasping the prey, which is subsequently pulled back by means of the unci. In *Myersinella* the derived, needle-shaped unci are not pivoting on the ramus tips or bases of the ramus lock, suggesting that they most probably lost their grasping function. Other features of *Myersinella* similar to *Encentrum* and *Wierzejskiella* are the small dorsal and ventral chambers of the manubrial head, the forked shape of this head (especially obvious in *Wierzejskiella*), and the crutched manubrial cauda as often found, but usually less pronounced, in *Encentrum*. The most fundamental differences between *Myersinella* and *Encentrum* or *Wierzejskiella* concern the intramallei and supramanubria which are lacking in *Myersinella*. Leaving out of consideration the lack of these trophi elements, the trophi structure of *Myersinella* shows most pronounced affinities with *Encentrum* and *Wierzejskiella*, of all dicranophorid genera, indicating a close relationship.

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REFERENCES

- Ahlrichs, W.H., 2003. Rotifera (Rädertiere) und Seison (Teleskophalstiere). Chapter 22. In *Das Mittelmeer, Fauna, Flora, Ökologie* (ed. R. Hofrichter), pp. 704–731. Heidelberg, Berlin: Spektrum Akademischer Verlag.
- De Smet, W.H., 1997. The Dicranophoridae. In *De Smet, W.H. and Pourriot, R., Rotifera 5: The Dicranophoridae (Monogononta) and the Ituridae (Monogononta). Guides to the Identification of the Microinvertebrates of the Continental Waters of the World 12* (ed. H.J.F. Dumont and T. Nogrady), pp. 1–325. Amsterdam: SPB Academic Publishing.
- De Smet, W.H., 1998. Preparation of rotifer trophi for light and scanning electron microscopy. *Hydrobiologia*, **387/388**, 117–121.
- Harring, H.K. & Myers, F., 1928. The rotifer fauna of Wisconsin. IV. The Dicranophoridae. *Transactions of the Wisconsin Academy of Sciences, Arts and Letters*, **23**, 667–808, pls 23–49.
- Fontaneto, D., De Smet, W.H. & Ricci, C., 2006. Rotifers in saltwater environments, re-evaluation of an inconspicuous taxon. *Journal of the Marine Biological Association of the United Kingdom*, **86**, 623–656.
- Myers, F.J., 1931. The distribution of Rotifera on Mount Desert Island. *American Museum Novitates*, **494**, 1–12.
- Myers, F.J., 1936. Psammolittoral rotifers of Lenape and Union Lakes, New Jersey. *American Museum Novitates*, **830**, 1–22.
- Pawłowski, L.K., 1958. Wrotki (Rotatoria) rzeki Grabi. Cz. I-Faunistyczna. *Łódzkie Tow. Naukowe*, **3**, 1–439.
- Ricci, C. & Fontaneto, D., 2003. Mediterranean rotifers: a very inconspicuous taxon. *Biogeographia*, **24**, 161–167.
- Rudescu, L., 1960. *Trochelmintes. Rotatoria. Fauna Republicii Populare Romîne*, vol. 2(2). Bucurest: Editura Academiei Republicii Populare Romîne.
- Schmid-Araya, J.M., 1995. New records of rare Bdelloidea and Monogonota rotifers in gravel streams. *Archiv für Hydrobiologie*, **135**, 129–143.
- Segers, H., 2002. The nomenclature of the Rotifera: annotated checklist of valid family- and genus-group names. *Journal of Natural History*, **36**, 631–640.
- Segers, H., 2007. Annotated checklist of the rotifers (Phylum Rotifera), with notes on nomenclature, taxonomy and distribution. *Zootaxa*, in press.
- Wiszniewski, J., 1934. Wrotki psammonowe. Les rotifères psammiques. *Annales Musei Zoologici Polonici*, **10**, 339–399, pls 58–63.

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