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**OSTRACODS (CRUSTACEA, OSTRACODA) FROM
UNDERGROUND WATERS OF PUGLIA (SOUTHERN ITALY),
WITH REDESCRIPTION OF *PSEUDOLIMNOCYTHERE*
HYPOGEA KLIE, 1938**

Summary

During investigation of the underground waters of Apuglia (Southern Italy), carried out by the "Dipartimento di Scienze Ambientali" of the University of L'Aquila, from 1974 to 1983, 11 ostracod species were collected.

The most interesting is *Pseudolimnocythere hypogea* KLIE, 1938, an endemic species of Apuglia. Our record of this stygobiont species is the first after KLIE's (1938) original description. We give a short redescription of it, and provide some notes on all the species collected.

Parole chiave: Ostracoda, acque sotterranee, Puglia.

Riassunto

Viene riportata una lista aggiornata degli ostracodi sotterranei della regione pugliese. Attualmente risultano note 11 specie.

La specie *Pseudolimnocythere hypogea*, incompletamente descritta da KLIE (1938), viene ridescritta sulla base di materiale proveniente dalla località tipica e da un'altra località nella Puglia settentrionale (Foggia). L'areale di questa specie, a tutt'oggi ritenuta rara, viene sensibilmente ampliato. Viene fornita una breve discussione di tutte le altre specie identificate.

Introduction

The ostracod fauna from the subterranean waters of Italy has been poorly studied (KLIE, 1930, 1938; DANIELOPOL, 1981; GHETTI and MCKENZIE, 1981; WAGENLEITNER, 1990). Until now only 8 species are known to inhabit Italian ground waters. *Pseudolimnocythere hypogea* KLIE, 1938 and *Trapezicandona stammeri*

(KLIE, 1938) were first described from southern Italy. *Pseudolimnocythere hypogea* was collected in a few underground localities of Apuglia (KLIE, 1938), while *Trapezicandona stammeri* was described from the cave Castelvita near Naples. *Trapezicandona cottarellii* (DANIELOPOL, 1981) and T. sp. group *laisi-chappuisi* are both known from interstitial environments of Sardinia (DANIELOPOL, 1981). *Sphaeromicola stammeri* KLIE, 1930 and *Cypria cavernae* WAGENLEITNER, 1990 were described from the karst region of north-eastern Italy (KLIE, 1930; WAGENLEITNER, 1990).

According to GHETTI and MCKENZIE (1981), besides the above mentioned species, *Notodromas persica* (GURNEY, 1921) and *Cypria ophthalmica* (JURINE, 1820) were also recorded in Italian underground waters. Both were collected in ground waters of Apuglia (KLIE, 1938); but these species are often more frequent in surficial than subterranean waters.

Although the groundwater fauna of Apuglia has been intensively investigated (CAROLI 1923; 1924; 1937; CHAPPUIS, 1938; KIEFER, 1938; KLIE 1938; PESCE, 1983, 1985; PESCE *et al.*, 1978; PESCE and PAGLIANI, 1997; PESCE and TETE, 1977; RUFFO, 1947; 1949; 1949a; 1968; 1982; VIETZ, 1939), the subterranean ostracods from this region remain poorly known. The present study is based upon the results of the collecting from different groundwater habitats (wells, anchialine caves) in Southern Italy by the "Dipartimento di Scienze Ambientali" of the University of L'Aquila from 1974 to 1983. During this investigation 11 ostracod species were found: *Polycope* sp., *Pseudolimnocythere hypogea* KLIE, 1938, *Eucandona fabaeformis* (FISCHER, 1851), *Pseudocandona pratensis* (HARTWIG, 1901), *Trapezicandona italica* KARANOVIC and PESCE (in press), *Cypria ophthalmica* (JURINE, 1820), *Herpetocypris brevicaudata* (KAUFMANN, 1900), *Notodromas persica* GURNEY, 1921; *Cypridopsis vidua* (O.F. MULLER, 1776), *Plesiocypridopsis newtoni* (BRADY and ROBERTSON, 1870) and *Sarscypridopsis aculeata* (COSTA, 1847).

Trapezicandona italica was described recently from wells in Puglia (KARANOVIC and PESCE, in press). *Polycope* sp. is the only undetermined species, while all the others are already known from Italy (see GHETTI and MCKENZIE, 1981).

The most interesting species is *Pseudolimnocythere hypogea*. This is the first record since its original description (KLIE, 1938), and it also enlarges its area of distribution to the north.

Methods

The samples were collected with a modified Cvetkov net (VIGNA TAGLIANTI *et al.*, 1969). The material was fixed with formaldehyde solution min. 37% z.a. (4%). Ostracods were dissected in a mixture of distilled water and glycerol (1:1), with entomological needles. Dissected appendages and valves were examined with a Leica DMLS microscope with C-plan achromat objectives. All drawings were prepared using a *camera lucida*. All the material we examined is deposited in the working collection of the first author.

Results: locality and abiotic data, Ostracoda, associated fauna

PU/1 – Giuliano, Castrignano del Capo (LE), via Goito (1), freshwater well.
39° 51'07" N, 05° 53'05" E (F° 223: Capo S. Maria di Leuca). Depth: 14.50 m;
H₂O level: 1.5m; H₂O temp.: 14.8 °C; air temp.: 10.1 °C ; pH: 6.7; sediment:
organic sand, rich with organic particles; coll. Argano, Pesce, Silverii, 21. 11. 1974.
Ostracoda: *Cypridopsis vidua*: 6 ♀♀ and 2 juv.
Associated fauna: Copepoda [*Diacyclops crassicaudis* s. l. (SARS, 1863),
Thermocyclops oblongatus (SARS, 1927)], Isopoda, Oniscoidea (Triconiscidae).
Diptera (larvae), Gastropoda, Hidracarina, Oligochaeta, Chilopoda, Coleoptera.

PU/2 – Giuliano, Castrignano del Capo (LE), via Goito (2), freshwater well.
39° 51'07" N, 05° 53'05" E (F° 223°: Capo S. Maria di Leuca). Depth: 11.50 m;
H₂O level: 0,50m; H₂O temp.: 14.4 °C; air temp.: 10 °C; pH 6.9; sediment: sand
with clay and organic particles; coll. Argano, Pesce, Silverii, 21. 11. 1974.
Ostracoda: *Cypria ophthalmica*: 7 ♀♀ , 3 ♂♂ and 1 juv.
Associated fauna: Copepods (*Diacyclops crassicaudis* s. l., *Thermocyclops
oblongatus*); Diptera (larvae); Oligochaeta; Gastropoda.

PU/9 – Acquarica del Capo (LE), freshwater well.
39° 53'23" N, 05° 52'34" E (F° 223: Capo S. Maria di Leuca). Depth: 14.50m;
H₂O level: 0.50m; H₂O temp.: 16 °C; air temp.: 8.9 °C; pH: 6.6; sediment: sand
with clay and organic particles; coll. Argano, Pesce, Silverii, 21. 11. 1974.
Ostracoda: *Cypria ophthalmica*: 17 ♀♀ , 11 ♂♂ and 3 juv.
Associated fauna: Copepoda [*Thermocyclops oblongatus*, *Eucyclops serrulatus*
(FISCHER, 1851)]; Isopoda (*Proasellus coxalis* (DOLLFUS, 1892); Diptera (larvae),
Turbellaria (*Dugesia* sp.); Hidracarina, Acarina.

PU/11 – Acquarica del Capo, via Roma (1) (LE), freshwater well.
39° 54'42" N, 05° 47'34" E (F° 223: Capo S. Maria di Leuca). Depth: 6.0m; H₂O
level: 2.5m; H₂O temp.: 14 °C; air temp.: 10.5 °C ; pH: 6.2; sediment: sand with
clay and organic particles; coll.: Argano, Pesce, Silverii, 22. 11. 1974.
Ostracoda: *Cypria ophthalmica*: 3 ♀♀ ; *Notodromas persica*: 3 ♀♀ , 3 ♂♂ and 1 juv.
Associated fauna: Copepoda (*Thermocyclops oblongatus*, *Eucyclops serrulatus*);
Isopoda (*Proasellus coxalis*); Diptera (larvae); Coleoptera (larvae); Gastropoda.

PU/12 – Acquarica del Capo, via Roma (2), (LE), freshwater well, 50 m from
PU/11.
39° 54'42" N, 05° 47'34" E (F° 223: Capo S. Maria di Leuca).
Depth: 6.00m; H₂O level: 2.00 m; H₂O temp.: 14 °C; air temp.: 10.5 °C; pH: 6.2;
sediment: sand with many organic particles. coll. Argano, Pesce, Silverii, 22. 11.
1974.
Ostracoda: *Cypria ophthalmica* : 6 ♀♀ , 6 ♂♂ and 2 juv.; *Notodromas persica*: 3 ♀♀
and 2 ♂♂ .

Associated fauna: Copepoda (*Thermocyclops oblongatus*), Isopoda (*Proasellus coxalis*); Diptera (larvae); Gastropoda.

PU/13 – S. P. Taurisano – Ugento (LE), freshwater well.

39° 57'16" N, 05° 45'06" E (F° 223 : Capo S. Maria di Leuca). Depth: 5.00 m; H₂O level: 2.000 m; H₂O temp.: 14.5 °C; air temp.: 10.0 °C; pH: 6.2; sediment: fine sand , with organic particles; coll. Argano, Pesce, Silverii, 11. 11. 1974.

Ostracoda: *Cypria ophthalmica* : 4 ♀♀ , 2 ♂♂ and 18 juv.

Associated fauna: Copepoda [*Diacyclops sp.*, *Diacyclops bicuspidatus* (CLAUS, 1857), *Eucyclops serrulatus*]; Isopoda (*Proasellus coxalis*); Hidracarina; Nematoda.

PU/15 – S. P. Ugento – Racale, 1 km from Racale (LE)

39° 57'20" N, 05° 38'38" E (F° 223: Capo S. Maria di Leuca). Depth: 4.50 m; H₂O level: 1.50 m; H₂O temp.: 13.1 °C; air temp.: 9.9 °C; sediment: organic sand; coll. Argano, Pesce, Silverii, 22. 11. 1974.

Ostracoda: *Cypridopsis vidua* : 27 ♀♀ and 36 juv.

Associated fauna: Copepoda [*Diacyclops languidoides* s.l. (LILLJEBORG, 1901), *Thermocyclops oblongatus*]; Cladocera; Isopoda Triconiscidae; Collembola.

PU/16 – Taviano (LE), freshwater well.

39° 58'52" N, 05° 38'05" E (F° 223: Capo S. Maria di Leuca). Depth: 4.00 m; H₂O level: 1.50 m; H₂O temp.: 14.7 °C; air temp.: 11 °C ; pH: 6.9; sediment: sand with clay; coll. Argano, Pesce, Silverii, 22. 11. 1974.

Ostracoda: *Cypria ophthalmica* : 2 ♀♀ , 2 ♂♂ and 4 juv.

Associated fauna: Copepoda (*Eucyclops serrulatus*, *Thermocyclops oblongatus*); Amphipoda (*Niphargus gr. orcinus*); Isopoda (Triconiscidae); Collembola.

PU/19 – S. P. Taviano – Gallipoli, after Taviano (LE), freshwater well.

39° 59'14" N, 05° 37'38" E (F° 223: Capo S. Maria de Leuca). Depth: 5.50 m; H₂O level: 5.00 m; H₂O temp.: 13.5 °C; air temp.: 11.5 °C; pH: 6.3; sediment: organic sand; coll. Argano, Pesce, Silverii, 22. 11. 1974.

Ostracods: *Cypria ophthalmica* : 8 ♀♀ , 4 ♂♂ and 4 juv.; *Notodromas persica*: 3 ♀♀ , 2 ♂♂ and 2 juv.; *Cypridopsis vidua* : 2 ♀♀ and 2 juv.

Associated fauna: Copepoda [*Eucyclops serrulatus*, *Bryocamptus pygmaeus* (SARS, 1863), *Canthocamptus sp.*]; Isopoda (*Proasellus coxalis*); Hidracarina; Turbellaria (*Dugesia sp.*); Collembola.

PU/20 – S. S. 274 Taviano – Gallipoli, km 8.500 (LE), freshwater well.

40° 00'42" N, 05° 36'00" E (F° 214 Gallipoli). Depth: 6.00 m; H₂O level: 14.5 m; H₂O temp: 14.5 °C; air temp: 10.5 °C; pH: 6.6; sediment: organic sand; coll. Argano, Pesce, Silverii, 22. 11. 1974.

Ostracoda: *Cypria ophthalmica* : 1 ♀♀ .

Associated fauna: Copepoda (*Thermocyclops oblongatus*, *Nitocrella sp.*,

Bryocamptus pygmaeus); Amphipoda (*Niphargus gr. orcinus*); Isopoda (*Proasellus coxalis*); Diptera (larvae); Hidracarina; Oligochaeta; Turbellaria (Tricladida); Cladocera; Gastropoda.

PU/22 – S. S. Taviano – Gallipoli, km 8.500 (LE), freshwater well.

40° 00'42''N; 05° 06'00''E (F° 214 Gallipoli). Depth: 5.50 m, H₂O level: 1.50 m; H₂O temp.: 14.1 °C; air temp: 10.1 °C; pH: 6.7; sediment: very fine organic sand; coll. Argano, Pesce, Silverii, 22. 11. 1974.

Ostracoda: *Cypria ophthalmica*: 4 ♀♀ , 1 ♂♂ and 3 juv.

Associated fauna: Copepoda (*Eucyclops serrulatus*, *Nitocra affinis* GURNEY, 1927); Amphipoda (*Niphargus gr. orcinus*); Mysidacea (*Stygiomysis sp.*); Isopoda (*Proasellus coxalis*); Hidracarina.

PU/23 – S. S. 274 Taviano – Gallipoli, km 3.800, Lido Averni (LE), brackish water well.

40° 02'23''N, 05° 34'13''E (F° 214: Gallipoli). Depth: 3.00 m; H₂O level 1.00 m; H₂O temp.: 14.9 °C; air temp.: 11.5 °C; pH: 6.8; sediment: organic sand; coll.: Argano, Pesce, Silverii, 22. 11. 1974.

Ostracoda: *Eucandona fabaeformis* : 2 ♀♀ ; *Cypria ophthalmica* : 3 ♀♀ , 3 ♂♂ and 1 juv.

Associated fauna: Copepoda (*Halicyclops rotundipes* KIEFER, 1935, *Eucyclops serrulatus*, *Thermocyclops oblongatus*, *Bryocamptus pygmaeus*); Amphipoda (*Hadzia minuta* RUFFO, 1947 , *Niphargus gr. orcinus*, *Salentinella gracillima* RUFFO, 1947); Isopoda (Triconiscidae); Mysidacea (*Spelaeomysis bottazzii* CAROLI, 1924, *Stygiomysis hydruntina* CAROLI, 1937); Gastropoda, Nematoda, Oligochaeta, Turbellaria (*Dugesia sp.*); Coleoptera; Collembola.

PU/25 – S. S. 459 Gallipoli – Maglie, between Gallipoli and Alezio (LE), freshwater well.

40° 03'29'' N, 05° 34'25'' E (F° 214: Gallipoli). Depth: 6.00 m; H₂O level: 2.50 m; H₂O temp.: 15 °C; air temp.: 10 °C; pH: 6.6; sediment: organic sand with clay; coll. Argano, Pesce, Silverii, 11. 11. 1974.

Ostracoda: *Cypria ophthalmica* : 7 ♀♀ , 1 ♂♂ and 2 juv.

Associated fauna: Copepoda (*Halicyclops troglodites* KIEFER, 1954, *Eucyclops serrulatus*); Amphipoda (*Niphargus gr. orcinus*); Isopoda (*Proasellus coxalis*); Diptera (larvae); Araneida.

PU/34 – S. P. Supersano – Torrepaduli about 2 km from Supersano (LE), freshwater well.

40° 00'06'' N , 05° 47'37''E (F° 214: Gallipoli). Depth: 8.00 m; H₂O level: 2.50 m; H₂O temp.: 13.5 °C; air temp.: 11.9 °C; pH: 6.9; sediment: organic sand; coll. Argano, Pesce, Silverii, 23. 11. 1974.

Ostracoda: *Eucandona fabaeformis*: 1 ♀♀; *Cypria ophthalmica* : 9 ♀♀ , 8 ♂♂ and 18 juv.

Associated fauna: Copepoda (*Eucyclops serrulatus*, *Bryocamptus pygmaeus*); Diptera (larvae), Turbellaria (*Dugesia* sp.); Collembola.

PU/35 – Torrepaduli (LE), freshwater well.

39° 59'41'' N, 05° 48'23'' E (F° 223 ; Capo S. Maria di Leuca). Depth: 13.00 m; H₂O level: 1.50 m; H₂O temp.: 14 °C; air temp.: 12 °C; pH: 7; sediment: organic sand; coll. Argano, Pesce, Silverii, 23. 11. 1974.

Ostracoda: *Cypria ophthalmica*: 3♀♀ and 5 juv.

Associated fauna: Copepoda [*Eucyclops serrulatus*, *Paracyclops fimbriatus* (FISCHER, 1853), *Bryocamptus pygmaeus*]; Isopoda (*Proasellus coxalis*, Oniscoidea; Triconiscidae).

PU/41 – Otranto, south of the town, toward Maglie (LE), freshwater well.

40° 08'53'' N, 06° 51'01'' E (F° 215: Otranto). Depth: 5.00 m; H₂O level: 3.50 m; H₂O temp.: 18 °C; air temp.: 17.5 °C; pH: 7; sediment: very fine gravel; coll. Pesce, Fusacchia, De Simone, 9. 10. 1974.

Ostracoda: *Cypria ophthalmica*: 10♀♀ and 2♂♂; *Notodromas persica*: 1♀♀ .

Associated fauna: Copepoda (*Thermocyclops oblongatus*, *Eucyclops serrulatus*); Isopoda (*Proasellus coxalis*; Oniscoidea, Triconiscidae).

PU/42 – S. S. Otranto – Maglie, 1 km from Otranto (LE), freshwater well.

40° 08'42'' N, 06° 00'30'' E (F° 215: Otranto). Depth: 10.00 m; H₂O level: 0.50 m; H₂O temp.: 15 °C; air temp.: 17.2 °C; pH: 7; sediment: very fine gravel with organic particles; coll. Pesce, Fusacchia, De Simone, 9. 10. 1974.

Ostracoda: *Cypria ophthalmica*: 30♀♀, 15♂♂ and 27 juv.; *Cypridopsis vidua*: 1♀♀ and 1 juv. Associated fauna: Copepoda (*Thermocyclops oblongatus*); Isopoda (*Proasellus coxalis*); Hidracarina; Nematoda.

PU/43 – S. S. Otranto – Maglie, exit from Palmariggi (1) (LE), freshwater well.

50° 07'52'' N, 05° 55'40'' E (F° 215: Otranto). Depth: 15.00 m; H₂O level: 8.00 m; H₂O temp.: 15.8 °C; air temp.: 16.9 °C; pH: 7; sediment: very fine gravel; coll. Pesce, Fusacchia, De Simone, 9. 10. 1974.

Ostracoda: *Cypria ophthalmica*: 2♀♀, 1♂♂ and 13 juv.

Associated fauna: Copepoda [*Thermocyclops oblongatus*, *Diacyclops bicuspidatus odessanus* (SCHMANKEVITCH, 1875)]; Isopoda (*Proasellus coxalis*); Nematoda; Oligochaeta.

PU/44 – S. S. Otranto – Maglie, exit from Palmariggi (2) (LE), freshwater well.

40° 07'52'' N, 05° 55'40'' E (F° 215: Otranto). Depth: 15.00 m; H₂O level: 8.00 m; H₂O temp.: 15.6 °C; air temp.: 15.9 °C; pH: 7; sediment: very fine gravel; coll. Pesce, Fusacchia, De Simone, 9. 10. 1974.

Ostracoda: *Cypria ophthalmica*: 2♀♀ and 1 juv.

Associated fauna: Copepoda (*Thermocyclops oblongatus*); Isopoda (*Proasellus coxalis*); Oligochaeta.

PU/45 – Aradeo (LE), freshwater well.

40° 07'49''N, 05° 40'42''E (F° 214 ; Gallipoli). Depth: 14.00 m; H₂O level: 4.00 m; H₂O temp.: 17.5 °C; air temp.: 23.5 °C ; pH: 7; sediment: very fine gravel with organic particles; coll. Pesce, Fusacchia, De Simone, 10. 10. 1974.

Ostracoda: *Cypria ophthalmica*: 4 ♀♀ and 1 ♂♂ .

Associated fauna: Copepoda (*Thermocyclops oblongatus*, *Diacyclops antrincola* KIEFER, 1967, *Bryocamptus pygmaeus*); Gastropoda; Hidracarina; Nematoda; Turbellaria (Tricladida).

PU/48 – SP. Aradeo – Cutrofiano, 3 km from Cutrofiano (LE), freshwater well.

40° 07'42'' N, 05° 42'13'' E (F° 214; Gallipoli). Depth: 5.00 m; H₂O level: 1,5 m; H₂O temp.: 17.5 °C; air temp.: 23.5 °C; pH: 6.6; sediment: very fine sand; coll. Fusacchia, De Simone, 10. 10. 1974.

Ostracoda: *Cypria ophthalmica*: 1 juv.

Associated fauna: Copepoda (*Eucyclops serrulatus*, *Diacyclops bicuspidatus odessanus*); Cladocera; Isopoda (*Proasellus coxalis*); Diptera (larvae); Turbellaria (Tricladida).

PU/49 – SP. Martano – Otranto (LE), freshwater well.

40° 08'58'' N, 06° 01'19'' E (F° 215: Otranto). Depth: 10.0 m; H₂O level: 5.00 m; H₂O temp.: 17.8 °C; air temp.: 22 °C; pH: 7; sediment very fine sand; coll. Pesce, Fusacchia, De Simone, 10. 10. 1974.

Ostracoda: *Cypria ophthalmica*; 3 ♀♀ , 2 ♂♂ and 19 juv..

Associated fauna: Copepoda (*Eucyclops serrulatus*, *Diacyclops bicuspidatus odessanus*); Isopoda (*Proasellus coxalis*); Diptera (larvae); Hidracarina; Nematoda.

PU/50 – SS. Otranto – S. Cataldo, south of Otranto (LE), freshwater well.

40° 09'13'' N, 06°01'29'' E (F° 215: Otranto). Depth: 4.00 m; H₂O level: 1.00 m; H₂O temp.: 17.5 °C; air temp.: 19.5 °C; pH: 6.9; sediment: fine sand; coll.: Pesce, Fusacchia, De Simone, 10. 10. 1974.

Ostracoda: *Cypria ophthalmica*: 2 ♀♀ and 1 ♂♂ ; *Herpetocypris brevicaudata*: 2 ♀♀ ; *Notodromas persica*: 1 ♂♂ .

Associated fauna: Copopoda (*Thermocyclops oblongatus*); Isopoda (*Proasellus coxalis*); Diptera (larvae); Turbellaria (Tricladida).

PU/52 – S. S. 497, Sanarica (LE), freshwater well.

40° 05'18'' N, 05° 53'44'' E (F° 214: Gallipoli). Depth: 7.50 m; H₂O level: 1.00 m; H₂O temp.: 15.5 °C; air temp: 28 °C; pH: 7; sediment: fine sand; coll. Pesce, Silverii, 1. 6. 1975.

Ostracoda: *Notodromas persica*: 4 ♀♀ , 5 ♂♂ and 7 juv.

Associated fauna: Copepoda (*Thermocyclops oblongatus*, *Eucyclops serrulatus*); Diptera (larvae); Gastropoda; Oligochaeta.

PU/53 – S. S. 497, crossroad Vitigliano – Poggiardo (LE), freshwater well.

40° 03'09''N, 05° 55'08'' E (F° 214: Gallipoli). Depth: 5.00 m; H₂O level: 1.00 m; H₂O temp.: 14.3 °C; air temp: 28 °C; pH: 6.5; sediment: sand; coll. Pesce, Silverii, 1. 06. 1975.

Ostracoda: *Notodromas persica*: 7♀♀, 2♂♂.

Associated fauna: Copepoda (*Diacyclops bicuspidatus odessanus*, *Eucyclops serrulatus*); Cladocera; Isopoda (Triconiscidae); Diptera; Oligochaeta; Gastropoda.

PU/55 – Sant' Andrea (LE), freshwater well.

40° 15'13'' N, 05° 59'11'' E (F° 214 : Gallipoli). Depth: 5.00 m; H₂O level: 2.00 m; H₂O temp.: 16.5 °C; air temp: 16 °C; pH: 6.8; sediment: gravel; coll. Fusacchia, De Simone, 10. 10. 1974.

Ostracoda: *Pseudocandona pratensis*: 5 juv., *Cypridopsis vidua*: 1♀♀, 2 juv.

Associated fauna: Copepoda (*Thermocyclops oblongatus*, *Bryocamptus pygmaeus*); Isopoda (*Proasellus coxalis*); Diptera (larvae); Nematoda.

PU/56 – S.S. 89, Foggia-Manfredonia, km 23.5 (Foggia), freshwater well.

Depth: 25 m, H₂O level: 3.5 m., H₂O temp.: 17.5 °C, pH: 6.8; sediment: sand; coll. Pesce, Fusacchia, 1.5.1975.

Ostracoda: *Pseudolimnocythere hypogea* (1♀, 2♂♂); *Trapezicandona italica* KARANOVIC and PESCE (in press): 2♂♂, 8 juv.

Associated fauna: Copepoda [*Nitocrella stammeri* CHAPPUIS, 1923; *Halicyclops dalmatinus* PETKOVSKI, 1955, *Diacyclops clandestinus* (KIEFER, 1929), *Diacyclops bisetosus* (REHBERG, 1880), *Diacyclops antrincola*, *Paracyclops fimbriatus* (FISCHER, 1893)]; *Microparasellid isopods* (*Microcharon arganoi* PESCE and TETÈ, 1978); Amphipoda [*Niphargus longicaudatus* (COSTA, 1851), *Pseudoniphargus adriaticus* KARAMANN, 1982]; Oligochaeta; Nematoda; Hidracarina

PU/57 – Freshwater well., 100 m from PU 56; same data as above.

Ostracoda: *Trapezicandona italica*: 2♀♀, 1♂♂, 2 juv.

Associated fauna: Copepoda [*Nitocrella stammeri* CHAPPUIS, 1923, *Diacyclops languidus* (SARS, 1863) *Diacyclops antrincola*, *Eucyclops serrulatus*, *Paracyclops fimbriatus*]; Amphipoda [*Niphargus longicaudatus*, *Hadzia* (*Metahadzia*) *adriatica* PESCE, 1979], Oligochaeta; Hidracarina.

PU/58 – Agro di Veglie, farm Panareo (LE), freshwater well.

40° 19'42'' N, 05° 30'32'' E (F° 214: Gallipoli). Depth: 50.20 m; H₂O level:3.00 m; H₂O temp: 15.6 °C; air temp: 9.8 °C; pH: 6.6; sediment: gravel with organic particles; coll. Pesce, Silverii, 27. 12. 1975.

Ostracoda: *Cypria ophthalmica*: 3♀♀, 1♂♂ and 2 juv.; *Cypridopsis vidua*: 1 44 and 1 juv.; *Plesiocypridopsis newtoni* : 2♀♀, 2♂♂ and 4 juv.

Associated fauna: Copepoda (*Eucyclops serrulatus*, *Diacyclops sp.*); Gastropoda; Turbellaria (Tricladida); Nematoda; Diplopoda.

PU/59 – S. P. Cocumola – Minervino (LE), freshwater well.

40° 05'17" N, 05° 58'00" E (F° 214 : Gallipoli). Depth: 10.00 m; H₂O level: 3.50 m; H₂O temp: 13 °C; air temp: 12.5 °C; pH: 7; sediment: very fine sand with organic particles; coll. Pesce, Silverii, 28. 12. 1975.

Ostracoda: *Cypria ophthalmica*: 7♀♀, 3♂♂, 8 juv.

Associated fauna: Copepoda [*Thermocyclops dybowskii* (LANDÈ, 1890)]; Cladocera; Isopoda (*Proasellus coxalis*); Gastropoda, Oligochaeta.

PU/62 – Monteroni di Lecce (LE), freshwater well.

40° 19'35" N, 05° 08'13" E (F° 214: Gallipoli). Depth: 6.00 m; H₂O level: 2.00 m; H₂O temp.: 11.5 °C; air temp: 11.9 °C; pH: 7.1; sediment: sand with little organic particles; coll. Pesce, Silverii, 28. 12. 1975.

Ostracoda: *Cypria ophthalmica*: 16♀♀, 6♂♂ and 22 juv.

Associated fauna: Copepoda (*Thermocyclops oblongatus*, *Eucyclops serrulatus*); Isopoda (*Proasellus coxalis*); Diptera (larve); Gastropoda.

PU/64 – Palmariggi (LE), freshwater well.

40° 07'52" N, 05° 55'40" E (F° 214: Gallipoli). Depth: 6.00 m; H₂O level: 3.50 m; H₂O temp.: 12.5 °C; air temp: 12.8 °C ; pH: 7; sediment: sand with organic particles; coll. Pesce, Silverii, 28. 12. 1975.

Ostracoda: *Cypria ophthalmica*: 1♀♀ and 1♂♂.

Associated fauna: Copepoda (*Thermocyclops oblongatus*); Isopoda (*Proasellus coxalis*); Turbellaria (Tricladida).

PU/156 - S. Marco in Lamis (Foggia), freshwater well.

41° 43'52" N, 15° 37'40" E. Depth: 14 m; H₂O level: 5.5 m; H₂O temp.: 16.9 °C; pH: 6.5; sediment: sand; coll. Pesce, Tetè, Maggi, 8.10.1976.

Ostracoda: *Sarscypridopsis aculeata*: 1♀♀ (only valves)

Associated fauna: Copepoda [*Eucyclops serrulatus*, *Diacyclops languidus*, *Diacyclops bisetosus* (REHBERG, 1880), *Megacyclops sp.*, *Attheyella crassa* (SARS, 1862)]; Amphipoda (*Niphargus longicaudatus*, *Salentinella angelieri* RUFFO and DELAMARE, 1952); Oligochaeta; Nematoda.

PU/169 – S.S. S. Severo- S. Marco in Lamis, 2.5 km far from S. Severo (Foggia), freshwater well.

41° 43'52" N, 15° 37'40" E. Depth: 15 m; H₂O level: 5.5 m.; H₂O temp.: 16.8 °C; pH: 6.6; sediment: sand; coll. Pesce, Tetè, Maggi, 8.10.1976.

Ostracoda: *Plesicypridopsis newtoni*: 2♀♀

Associated fauna: Copepoda [*Eucyclops serrulatus*, *Diacyclops bisetosus* (REHBERG, 1880), *Paracyclops fimbriatus* (FISCHER, 1853)]; Amphipoda (*Niphargus gr. orcinus*, *Salentinella angelieri*); Oligochaeta; Nematoda.

PU/170-172 – Diso (LE), brackish water wells .

40° 00'29" N, 05° 56'25" E (F° 214 : Gallipoli). Depth: 8.0-8.7 m; H₂O level: 4.5-4.9 m; H₂O temp.: 14.5 °C; air temp.: 17.5 °C; pH: 6.9; sediment: sand with little

organic particles; coll. Pesce, Maggi, 30. 3. 1977.

Ostracoda: *Pseudocandona pratensis*: 1♀♀; *Cypria ophthalmica*: 61♀♀ and 32♂♂, 16 juv. Associated fauna: Copepoda [*Halicyclops rotundipes*, *Thermocyclops oblongatus*, *Diacyclops bicuspidatus odessanus*, *Attheyella crassa*, *Onychocamptus mohammed* (BLANCHARD and RICHARD, 1892)]; Cladocera; Isopoda (*Proasellus coxalis*); Nematoda; Oligochaeta; Turbellaria (Tricladida).

PU/173 – S. S. Lequile, south of Lequile (LE), freshwater well.

40° 18'16'' N, 18° 41'08'' E (F° 214 : Gallipoli). Depth: 7.00 m ;

H₂O level: 4.60 m; H₂O temp.: 13.5°C; air temp.: 17.8 °C; pH: 6.9; sediment: sand with organic particles; coll. Pesce, Maggi, 31. 3. 1977.

Ostracoda: *Cypria ophthalmica*: 8♀♀, 6♂♂ and 13 juv.

Associated species: Copepoda (*Eucyclops serrulatus*, *Canthocamptus sp.*); Isopoda (*Proasellus coxalis*); Oligochaeta.

PU/174-175 –S.S. S. Severo- S. Marco in Lamis, 2 km far from S. Severo (Foggia), two freshwater wells close each other.

41° 43'16'' N, 15° 27'08'' E. Depth: 6 m; H₂O temp.: 17.5 °C; pH: 6.7; sediment: sand; coll. Pesce, Tetè, Maggi, 8.10.1976.

Ostracoda: *Cypria ophthalmica*: 13♀♀, 4♂♂, 3 juv.

Associated fauna: Copepoda (*Eucyclops serrulatus*, *Acanthocyclops sp.*); Amphipoda (*Niphargus longicaudatus*, *Niphargus gr. orcinus*, *Salentinella angelieri*); Oligochaeta; Cladocera.

PU/176 – S. S. S. Severo- S. Marco in Lamis, 2.8 km far from S. Severo (Foggia), freshwater well.

41° 43'16'' N, 15° 27'28'' E. Depth: 15 m; water depth: 5.5 m;. H₂O temp.: 16.8 °C; pH: 6.5; sediment: sand; coll. Pesce, Tetè, Maggi, 8.10.1976.

Ostracoda: *Cypria ophthalmica*: 18♀♀, 3♂♂, 4 juv.; *Plesiocycpridopsis newtoni*: 1♂♂, 1♀♀.

Associated fauna: Copepoda (*Eucyclops serrulatus*, *Paracyclops fimbriatus*, *Canthocamptus sp.*); Amphipoda [*Niphargus longicaudatus*, *Hadzia (Metahadzia) adriatica*]; Oligochaeta; Gastropoda.

Zinzulusa Cave, Il Cocito, Castro Marina (Lecce).

40° 00' 40" N, 5° 58' 44" E. Coll. Pesce, Tetè, Maggi, 8.10.1976

Ostracoda: *Polycope sp.* (1 juv.)

In the same cave live numerous other stygobitic taxa, such as copepods, mysids, amphipod, decapods, gastropods, etc. More information about the biology of the cave can be found in: PESCE *et al.*, 1978; PESCE and PAGLIANI, 1997, and at the web site: <http://www.glpesce.net/caves/zinzul.html>.

L' Abisso cave, Castro Marina (Lecce).

39° 59' 42"N, 5° 57' 58"E. Coll. Pesce, Tetè, Maggi, 8.10.1976

Ostracoda: *Pseudolimnocythere hypogea*: 2♀, 1♂♂; *Plesiocypridopsis newtoni*: 1♀♀, 2♂♂.

In the same cave live numerous other stygobitic taxa, such as copepods, mysids, amphipod, decapods, gastropods, etc. More information about the biology of the cave can be found in: PESCE *et al.*, 1978; PESCE and PAGLIANI, 1997, and at the web site: <http://www.glpesce.net/caves/abisso.html>.

Taxonomy

Class: Ostracoda LATREILLE, 1802
Order: Myodocopida SARS, 1866
Suborder: Cladocopina SARS, 1866
Family: Polycopidae SARS, 1866

Genus: *Polycope* SARS, 1866
Polycope sp.

Remarks

This probably marine species was found only once, in the Zinzulusa Cave (Salentine Peninsula). It was impossible to identify because only a single juvenile was collected.

Order: Podocopida G.W. MULLER, 1894
Suborder: Podocopa SARS 1866
Superfamily: Cytheroidea BAIRD, 1859
Family: Loxoconchidae SARS, 1925
Genus: *Pseudolimnocythere* KLIE, 1938
Pseudolimnocythere hypogea KLIE, 1938
(figs 1-18)

Synonymy

Pseudolimnocythere hypogea n. sp. - KLIE (1938), p. 151, figs 7-16.
Pseudolimnocythere hypogea (KLIE) - DANIELOPOL (1980), p. 246
Pseudolimnocythere hypogea KLIE - GHETTI and MCKENZIE (1981), p. 27, fig. 11;
DANIELOPOL and HARTMANN (1984), p. 277.

Redescription

Male. - Carapace (figs 1-3) elongate, subrectangular. Length of left valve 0.287 mm, right valve 0.292 mm. Greatest height about 57% of length. Greatest width about 43% of length. In dorsal view (fig. 3) anterior and posterior ends mucronate. In lateral view (figs 1-2) the dorsal margin is slightly wavy. anterior and posterior

margins broadly rounded. Ventral margin slightly concave near the mid-length. Generally, asymmetry of valves not markedly distinct. Inner lamella wider anteriorly than posteriorly. Marginal radial pore canals can be simple or ramified, with variable shape. Valve surface covered with round pits. Antennula (figs 11, 18) 5-segmented (fourth fused with fifth). Length ratios of last four segments, from proximal to distal end (measuring to the middle of segments) 2.7 : 1 : 2.2 : 2.5. Second segment with one seta posteriorly, third segment with 1 seta anteriorly, fourth with 2 setae medially and 4 setae distally, terminal segment with 1 free seta and 1 seta fused with aesthetasc. Antenna (fig. 5) 4-segmented (3 endopodal segments). First endopodal segment with 1 seta posteriorly, second endopodal segment with 2 setae anteriorly at the mid-length, posteriorly, slightly below, with 2 seta and aesthetasc (which reaches to the terminal segment), same segment with 1 ventral distal seta. Terminal segment with 2 claws. Exopodite of mandibula (fig. 10) with 2 long and 1 short seta. Second segment internally with 4 ventrodorsal setae and one dorsodorsal seta. Penultimate segment with 5 dorsodorsal setae, 1 strong ventrodorsal seta mediodorsally and 2 ventrodorsal setae. Terminal segment with 2 setae (one of them bifid). Respiratory plate of maxillula with about 14 plumose setae and 1 long "aberrant" (smooth) seta. Penultimate segment of maxillular palp with 4 plumose setae, terminal segment with 2 claws, one of these fused with the segment (fig. 12). All walking legs almost identical (figs 7-9). First leg smaller (fig. 7) and with 4 dorsal setae on protopodite, plus one proximoventral seta. Second leg (fig. 8) only slightly smaller than the third leg (fig. 9). Hemipenis (figs 4, 6) with a whip-like copulatory apparatus. Furca with 3 setae.

Female. - Length 0.285 mm. Greatest height equals 55% of length. In the female variability of the marginal pore canals could not be observed because only immature females were collected (figs 13-14).

From the description given by KLIE (1938) the appearance of these canals is the same as in the male. Antennula with a very thin division on penultimate segment (fig. 16). Genital area below the posterodorsal process of the body (fig. 17). Appearance of carapace, antenna, mandibula, maxillula, and all legs, same as in male.

Remarks

In one male specimen from locality PU/56 a very thin chitinous separation was noticed on one side of the fourth antennular segment (fig. 11). In the male from the cave l'Abisso this feature was not recorded (fig. 9). It is interesting that all females examined had a thin separation of the same segment (fig. 16). In the description by KLIE (1938) this characteristic was not recorded in either sex. Specimens collected by KLIE (1938) were slightly bigger; also, he did not record the following setae on the appendages: a medial seta on the second segment of the mandibular palp; the smallest setae on the exopodite of the same appendage; and a third furcal seta in the male. KLIE (1938) found the species at a few localities: a couple of wells in Bari,

the Cave L'Abisso and the Cave Grotta di Diavoli. We found *Pseudolimnocythere hypogea* in 2 localities: the cave L'Abisso and a well on the road Foggia-Manfredonia. The later is the northernmost point in the distribution known of this species. The species is marked as an endemic of Puglia by PESCE and PAGLIANI (1997). We note here that in the list of the species recorded for Puglia these authors included *Trapezicandona stammeri* (KLIE, 1938) (= *Mixtacandona stammeri* KLIE, 1938) but the fact is that this species was never collected from Puglia, but only in the Cave Castelcivita near Naples (KLIE, 1938).

Pseudolimnocythere hypogea is a stygobitic species found in caves and freshwater and brackish wells. In the genus *Pseudolimnocythere* there is only one other recent species, *Pseudolimnocythere hartmanni*, described from interstitial habitats and wells of Greece (DANIELOPOL, 1979) and one fossil species, *P. hainburgensis*, described from the Miocene of the Vienna Basin (DANIELOPOL *et al.*, 1991).

Pseudolimnocythere hypogea can be distinguished from *P. hartmanni* by the length of aesthetasc on the antenna. In *P. hypogea* this seta extends beyond the end of the distal segment while in *P. hartmanni* it is just slightly longer than the penultimate segment. There is also a slight difference in the appearance of the hemipenis. While the number of ventral setae on the second segment of the mandibular palp is not a feature which could differentiate the two species [according to DANIELOPOL (1979, 1980)], we found 4 setae in *P. hypogea* (as in *P. hartmanni*) instead of 3 marked by KLIE (1938). The appearance of the carapace in all species of the genus is almost identical, so it is very difficult to distinguish them without soft parts. The same is also with the Miocene species *Pseudolimnocythere hainburgensis*. However this species has a distinctly convex ventral carapace margin, while in *P. hypogea* this margin is weakly concave.

Superfamily: Cypridoidea BAIRD, 1845

Family: Candonidae KAUFMANN, 1900

Subfamily: Candoninae KAUFMANN, 1900

Genus: *Eucandona* DADAY, 1900 (= *Fabaejormiscandona* KRSTIC, 1972)

Eucandona fabaeformis (FISCHER, 1851) (figs 19-20)

Synonymy

Candona fabaeformis FISCHER - MULLER (1900), p. 29, Pl. 7, figs 1-7, 12, 13;

KLIE (1938a), p. 60, figs 191-196; BRONSTEIN (1947), p. 242, fig. 146;

MORONI (1967), p. 1, fig. 1 (a-l); GHETTI and MCKENZIE (1981), fig. 16 (a);

MARTENS (1982), p. 126, figs 7-12; HENDERSON (1990), p. 78, fig. 29.

Candona (Eucandona) fabaeformis (FISCHER) - SYWULA (1974), p. 109, Pl. 5 (a-c), fig 33.

Eucandona fabaeformis (FISCHER) - DADAY (1900), p. 252, fig 50, PETKOVSKI and KARANOVIC (in press), figs 20-21.

Fabaejormiscandona fabaeformis (FISCHER) - GHETTI and MCKENZIE (1981), p. 39;

MEISCH (1996), p. 228, fig. 2 (c).

Diagnosis

Candoninae, *Eucandona*. Length between 0.8 and 1.3 mm. Carapace elongate, left valve with postero-distal lobe like expression which overlaps right valve. Greatest height towards posterior (fig. 19). Dorsal margin straight, anterior margin more broadly rounded than the posterior. Ventral margin slightly convex around mid-length. Anterior vestibule wider than posterior one. Marginal pore canals short and numerous. Mandibular palp on inner side of second segment with 3+2 setae, gamma seta on penultimate segment smooth. Cleaning leg 5-segmented, shortest seta on terminal segment 3 times as long as this segment. Female genital lobe with well developed process, directed posteriorly (fig. 20).

Remarks

In the locality PU/34 one untypical female specimen was collected. This individual was extremely small (only 0.623 mm) and had 2 dorsal furcal setae (fig. 20), but because it had all other characteristics of a typical *fabaeformis* we consider those characteristics aberrant. In another locality (PU/23) both female specimens were bigger (0.8 and 0.9 mm) and they had only one seta on the anterior margin of the furcal ramus. *Eucandona fabaeformis* occurs in various types of ecosystems: springs, streams, lakes, temporary puddles and brackish waters. In Italy, apart from the records in Apuglia, the species is also recorded from rice fields of Emilia-Romagna and Toscana (GHETTI and MCKENZIE, 1981). It has a holarctic distribution.

Genus: *Pseudocandona* KAUFMANN, 1900
Pseudocandona pratensis (HARTWIG, 1901)
(figs 21-22)

Synonymy

Candona pratensis HARTWIG - KLIE (1938a), p. 54, figs 163-166; BRONSTEIN (1947), p. 233, fig. 139; PETKOVSKI (1962), p. 121, fig. 2; HENDERSON (1990), p. 92, fig. 36.
Candona (Typhlocypris) pratensis HARTWIG - SYWULA (1974), p. 133, Pl. 9 (a-c), fig. 50.
Pseudocandona pratensis HARTWIG - GHETTI and MCKENZIE (1981), p. 39.
Pseudocandona pratensis (HARTWIG) - MEISCH (1996), p. 223.

Diagnosis

Candoninae, *Pseudocandona*. Length around 1mm. Dorsal margin rounded. Anterior margin more broadly rounded than posterior. Ventral margin straight.

Greatest height at the last third of length, equals 61% of length. Greatest width, around mid-length equals 52% of length. Anterior inner lamella wider than posterior (fig. 21), marginal pore canals short and numerous. Selvage peripheral. Antenna with male bristles, shortest claw on penultimate segment on same appendage in females longer than terminal segment. Mandibular palp with 5+2 setae ventrodistally on the second segment, gamma-seta on penultimate segment of same appendage smooth (fig. 22). Cleaning leg 5-segmented, shortest seta on terminal segment 3 times longer than this segment.

Pseudocandona pratensis belongs to the *compressa* group of species.

Remarks

In Italy, *P. pratensis* is also recorded in temporary waters of Piemonte, in lakes of the northern Apennines and in the basin of the river Timavo (north-eastern Italy) (GHETTI and MCKENZIE, 1981). *Pseudocandona pratensis* generally occurs in springs and temporary waters and is widespread in Europe.

Genus: *Trapezicandona* SCHORNIKOV, 1969

Trapezicandona italica KARANOVIC and PESCE (in press)

Synonymy

Trapezicandona italica n. sp. - KARANOVIC and PESCE (in press), figs 1-20.

Diagnosis

Candoninae, *Trapezicandona*. Carapace trapezoidal. Length 0.621 mm. Greatest height of left valve equals 61%, on right valve 54% of length. Dorsal margin straight in middle (on 53% of length), inclined towards frontal and caudal margins. Anterior margin more broadly rounded than posterior. Ventral margin straight or slightly convex. Inner lamella broader anteriorly. Fused zone narrow with dense and short marginal pore canals. Carapace surface covered with dense hairs and ornamented with short striae. Antenna with male bristles. Aesthetasc on first endopodal segment of the antenna equals 96% of same segment. Cleaning leg 5-segmented, penultimate segment with 1 seta.

Remarks

The only records of *Trapezicandona italica* are from two freshwater wells in Puglia (PU/56, PU/57).

Subfamily: *Cyclocypridinae* KAUFMANN, 1900

Genus: *Cypria* ZENKER, 1854

Cypria ophthalmica (JURINE, 1820)

(figs 23-25)

Synonymy

Cypria ophthalmica (JURINE) - DADAY (1900), p. 225, fig. 41; SARS (1928), p. 97, Pl. 45 (2); KLIE (1938a), p. 84, figs 296-300; BRONSTEIN (1947), Pl. 11 (1), fig. 99; PETKOVSKI (1960), p. 124, fig. 25; SYWULA (1974), p. 157, fig. 67 (a-d, g), Pl. 12 (c, d); PETKOVSKI (1977), p. 68, figs 65-66; GHETTI and MCKENZIE (1981), p. 45, fig. 19 (a-c); MEISCH (1987), p. 103, fig. 5 (c-d), fig. 6 (c); WAGENLEITNER (1990), p. 201, figs 3-13, 16-19, 34; HENDERSON (1990), p. 126, fig. 52 (a-h).

Cypria ophthalmica JURINE - MULLER (1900), p. 43, Pl. 11, figs 1-6.

Cypria ophthalmica var. *lacustris* G. O. SARS - SYWULA (1974), p. 157, fig. 67 (e, f).

Cypria lacustris G. O. SARS - SARS (1928), p. 98, Pl. 45 (2); BRONSTEIN (1947), p. 184, fig. 100; PETKOVSKI (1960), p. 124, figs 26-27; PETKOVSKI (1977), p. 68, figs 56-59, 60-64; MEISCH (1987), p. 100, fig. 5 (a-b), fig. 6 (a, b, d).

Diagnosis

Cyclocypridinae, *Cypria*. Length from 0.5 mm to 0.7 mm. Dorsal margin arched (fig. 23), anterior and posterior margins evenly rounded. Ventral margin slightly concave. Greatest height lies in middle and varies from 65% to 75% of length. Selvage well developed. Valve surface with or without pigmentation. Male antenna with sexual bristles. Natatory setae on antenna very long. Female genital lobe with one (fig. 24) or 2 processes. Hemipenis variable: sometimes with a bigger inner lobe (fig. 25), sometimes with a bigger outer lobe.

Remarks

This is the most abundant species in the wells of Apulia where it has numerous populations. *Cypria ophthalmica* obviously tolerates such habitats as it was found before in the underground localities of Italy (KLIE, 1938; GHETTI and MCKENZIE, 1981). This is cosmopolitan species and can be found in many other freshwater environments.

Family: Cyprididae BAIRD, 1845

Subfamily: Herpetocyprinae KAUFMANN, 1900

Genus: *Herpetocypris* BRADY & NORMAN, 1889

Herpetocypris brevicaudata KAUFMANN, 1900
(figs 26-27)

Synonymy

Herpetocypris brevicaudata n. sp. - KAUFMANN (1900), Pl. 16 (6-7), Pl. 18 (28-31).

Herpetocypris brevicaudata KAUFMANN - KLIE (1938a), p. 126, figs 422-425;

PETKOVSKI (1964), p. 170, figs 56-60; HERBST, (1965), p. 33, figs 1-10; SYWULA (1974), p. 201, Pl. 17 (g-h), fig. 99 (a, b, d-g); GHETTI and MCKENZIE (1981), p. 57;

HENDERSON (1990), p. 170, fig. 73; GONZALEZ MOZO *et al.* (1996), p. 98, figs 2 (c, d), 3-9, 17 (a-i), 19, 20.

Herpetocypris brevicaudata f. lenta ROME - SYWULA (1974), p. 201, fig. 99 (c).

Herpetocypris ghigii n. sp. - MASI (1932), p. 213, figs a-e.

Herpetocypris lenta n. sp. - ROME (1947), p. 213, fig. 2 (a-e).

Herpetocypris flumendosa n. sp. - ANICHINI (1967), p. 17, fig. 4 (a-t), GHETTI and MCKENZIE (1981), p. 57.

Diagnosis

Herpetocyprinae, *Herpetocypris*. Length between 1.6 and 2.2 mm. Dorsal margin convex. Anterior margin more broadly rounded than the posterior (fig. 26). Ventral margin slightly convex before the middle. Inner lamella wider frontally than posteriorly. Natatory setae of antenna short (fig. 27), but the fifth seta always the longest. Posterior furcal seta not reaching the tip of furcal ramus, anterior seta reaching about halfway on the anterior claw.

Remarks

This is a very variable species in appearance of valves, length of natatory setae and number of spines on the posterior margin of the furcal ramus. The range of variability is detailly described by GONZALEZ MOZO *et al.* (1996). *Herpetocypris brevicaudata* is known throughout Europe and North Africa but bisexual populations have been recorded only in the western Mediterranean (Algeria and Portugal). In Italy, the species is not recorded as *Herpetocypris brevicaudata* KAUFMANN and is only generally assigned to the Italian fauna by GHETTI and MCKENZIE (1981). ANICHINI (1967) described *H. flumendosa* from temporary waters in Sardinia, but this is an obvious synonym of *H. brevicaudata*, so we can conclude that in Italy *H. brevicaudata* was known until now only from Sardinia. The species generally occurs in a variety of different habitats: streams, lakes, ponds, springs (GONZALEZ MOZO *et al.*, 1996). *H. brevicaudata* is a characteristic superficial species, so its occurrence in one freshwater well (PU/50) should be considered as accidental.

Subfamily: Notodromatinae KAUFAMNN, 1900

Genus: *Notodromas* LILLJEBORG, 1853

Notodromas persica GURNEY, 1921
(figs 28-29)

Synonymy

Notodromas persica GURNEY - KLIE (1938), p. 150; BRONSTEIN (1947), p. 98, fig. 33, Pl. 2 (4,7); MARGALEF (1954), p. 149, fig. 2 (a-h); FOX (1962), p. 171; STEPHANIDES (1964), p. 3, figs a, b; TRIEBEL (1968), p. 254, figs 15, 16, 26, 40-52; SYWULA (1974), p. 215, fig. 107 (k-m), Pl. 27 (a-c); GHETTI and MCKENZIE

(1981), p. 65.

Notodromas persica persica GURNEY - PETKOVSKI (1959), p. 54, figs 5-8, 16, 17.

Notodromas persica dalmatina n. ssp. - PETKOVSKI (1959), p. 54, figs 9-12, 18-20.

Notodromas persica dalmatina PETKOVSKI - FOX (1962), p. 172; FOX (1966), p. 31, fig. 2 (a-d); GHETTI and MCKENZIE (1981), p. 65, fig. 25 (d-g).

Diagnosis

Notodromatinae, *Notodromas*. Length about 0.8 mm. Dorsal margin rounded. Greatest height around middle, and equals 72% of length. Caudal margin evenly rounded, frontal somehow extended. Ventral margin slightly concave. Females posteroventrally with (fig. 28) or without a spur, males lacking this characteristic (fig. 29). Valve surface covered with hairs. Lateral lobe of hemipenis with very pointed tip.

Remarks

Notodromas persica has been recorded several times in Italy (KLIE, 1938; MARGALEF, 1954; FOX, 1962, 1966; GHETTI and MCKENZIE, 1981). This is obviously a troglodyphyl species because, apart from the underground waters of Italy, it was identified in the same habitats in Slovenia (PETKOVSKI 1959). *N. persica* also occurs in temporary waters and is widely distributed in the Meriterranean region.

Subfamily: Cypridopsinae BRONSTEIN, 1947

Genus: *Cypridopsis* BRADY, 1868

Cypridopsis vidua (O. F. MULLER, 1776)

Synonymy

Cypridopsis vidua O. F. MULLER - MULLER (1900), p. 80, Pl. 19, figs 2-6.

Cypridopsis vidua (O. F. MULLER) - DADAY (1900), p. 188, fig. 29; KLIE (1938a), p. 132, figs 438-441; BRONSTEIN (1947), p. 160, fig. 80, Pl. 9 (8, 10); SYWULA (1974), p.229, fig. 120, Pl. 21 (a, b); GHETTI and MCKENZIE (1981), p. 48; HENDERSON (1990), p. 210, fig. 92; MARTENS *et al.* (1996), p. 33, fig. 2 (n-p).

Cypridopsis vidua ssp. *vidua* (O. F. MULLER) - MORONI (1967), p. 9, fig 9.

Cypridopsis vidua helvetica KAUFMANN - MORONI (1967), p. 11.

Cypridopsis helvetica KAUFMANN - BRONSTEIN (1947), p. 161, fig. 81, Pl. 9 (4,7); GHETTI and MCKENZIE (1981), p. 47.

Diagnosis

Cypridopsinae, *Cypridopsis*. Length from 0.6 mm to 0.7 mm. Globular valve

form with dorsal pigmented patches. Valves with subtriangular shape in lateral view, greatest height medially. Anterior margin more broadly rounded than posterior. External surface of carapace weakly pitted and covered with dense hairs. Swimming setae long. Branchial plate on first thoracic leg with 5, 4 or 3 filaments.

Remarks

This cosmopolitan species is thought to be ubiquitous, often occurring periphytically on submerged macrophytes (MARTENS *et al.*, 1996). In Italy it is a very common species (see GHETTI and MCKENZIE, 1981).

Genus: *Plesioocypridopsis* ROME, 1947

Plesioocypridopsis newtoni (BRADY & ROBERTSON, 1870)

(figs 30-32)

Synonymy

Cypridopsis newtoni BRADY & ROBERTSON - MULLER (1900), p. 83, Pl. 17, figs 5, 7-20; GAUTHIER (1933), p. 15, figs 2, Pl. 4; KLIE (1938a), p. 137, figs 458-460; BRONSTEIN (1947), p. 158, fig 78 (1-5); MORONI (1967), p. 8; SYWULA (1974), p. 224, fig 115, Pl. 20 (e, f).

Potamocypris newtoni BRADY & ROBERTSON - DADAY (1900), p. 193, fig. 31.

Plesioocypridopsis newtoni (BRADY & ROBERTSON) - GHETTI & MCKENZIE (1981), p. 49; HENDERSON (1990), p. 216, fig. 95; MEISCH & BROODBAKKER (1993), p. 21, figs 9, 10.

Diagnosis

Cypridopsinae, *Plesioocypridopsis*. Length from 0.6 mm to 0.85 mm. Valve subtriangular. Greatest height slightly before middle. Selvage peripheral, well developed (fig. 32). Surface of carapace covered with small, shallow pits and dense stiff setae. Natatory setae on antenna extend distinctly beyond tips of terminal claws. Third masticatory process on maxillula with 2 delicately barbed teeth. First thoracic leg with 2 or 3 filaments on the branchial plate.

Remarks

Plesioocypridopsis was found in 4 samples, in 3 wells and in the Cave L'Abisso. In Italy it is also known from thermal waters of Sardinia and ricefields of Toscana (GHETTI and MCKENZIE, 1981). Generally, it prefers temporary waters and can tolerate higher salinities. It occur throughout Europe Asia and Africa.

Genus: *Sarscypridopsis* MCKENZIE, 1977

Sarscypridopsis aculeata (COSTA, 1847) (fig. 33)

Synonymy

Cypridopsis aculeata LILLJEBORG - MULLER (1900), p. 85, Pl. 18, figs 10, 18, 19, Pl. 19, fig. 1.

Potamocypris aculeata (LILLJEBORG) - DADAY (1900), p. 198, fig. 33.

Cypridopsis aculeata (COSTA) - KLIE (1938a), p. 138, figs 461-464; BRONSTEIN (1947), p. 157, figs 77, Pl. 9 (6, 9); SYWULA (1974), p. 219, fig. 109, Pl. 19 (f, g).

Sarscypridopsis aculeata (COSTA) - GHETTI & MCKENZIE (1981), p. 50; MEISCH and BROODBAKKER (1993), p. 26; MARTENS *et al.* (1996), p. 33, figs 4 (a-f).

Plesiocypridopsis aculeata (COSTA) - HENDERSON (1990), p. 214, fig. 94.

Diagnosis

Cypridopsinae, *Sarscypridopsis*. Length around 0.65 mm. Valves highly arched, subtriangular in lateral view (fig. 33). In dorsal view relatively broad medially. Surface pitted and also covered with long hairs and stout spines.

Remarks

We have collected only empty valves of one female in locality PU/156. In Italy, *Sarscypridopsis aculeata* also occur in temporary waters of Sardinia and Lake Rascino (GHETTI and MCKENZIE, 1981). This cosmopolitan species commonly occurs in slightly brackish coastal and inland waters (MEISCH and BROODBAKKER, 1993).

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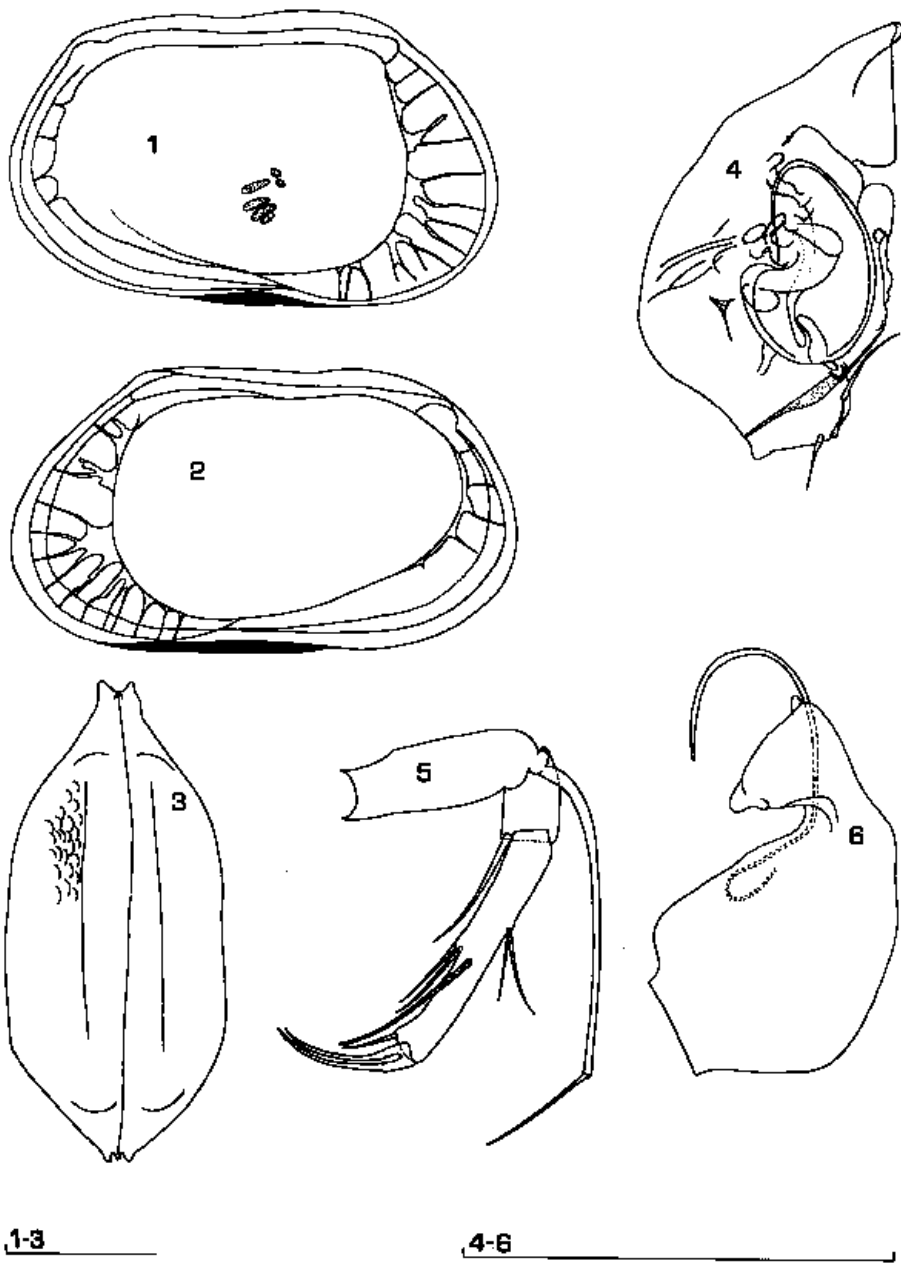
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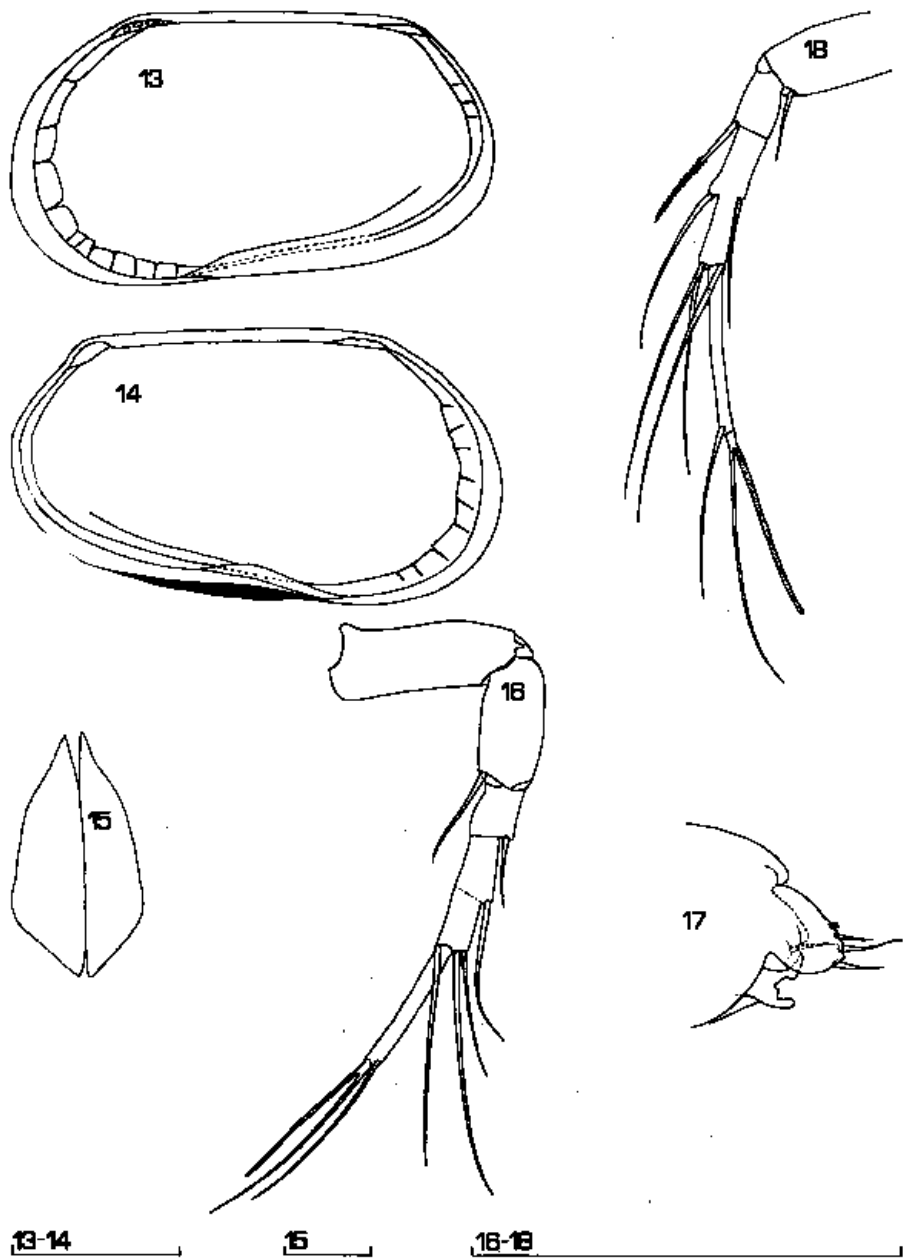
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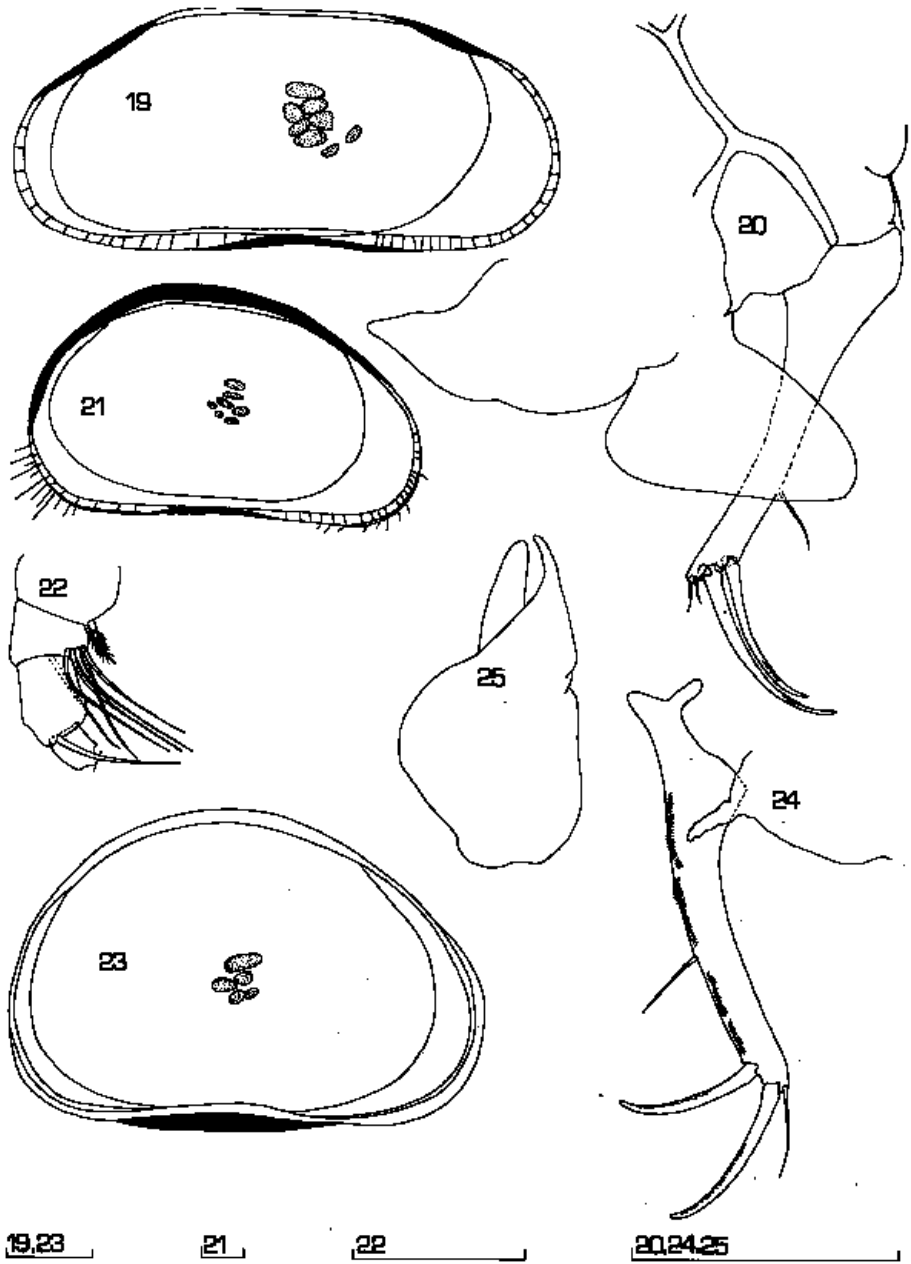
Figs. 1-6 *Pseudolimnocythere hypogea* KLIE, 1938 (locality - PU 56), 1-5 male 0.292 mm, 6 male 0.266 mm: 1 - left valve, internal view; 2 - right valve, internal view; 3 - carapace, dorsal view; 4 - hemipenis; 5 - antenna; 6 - hemipenis in erection. Scales = 0.1 mm.



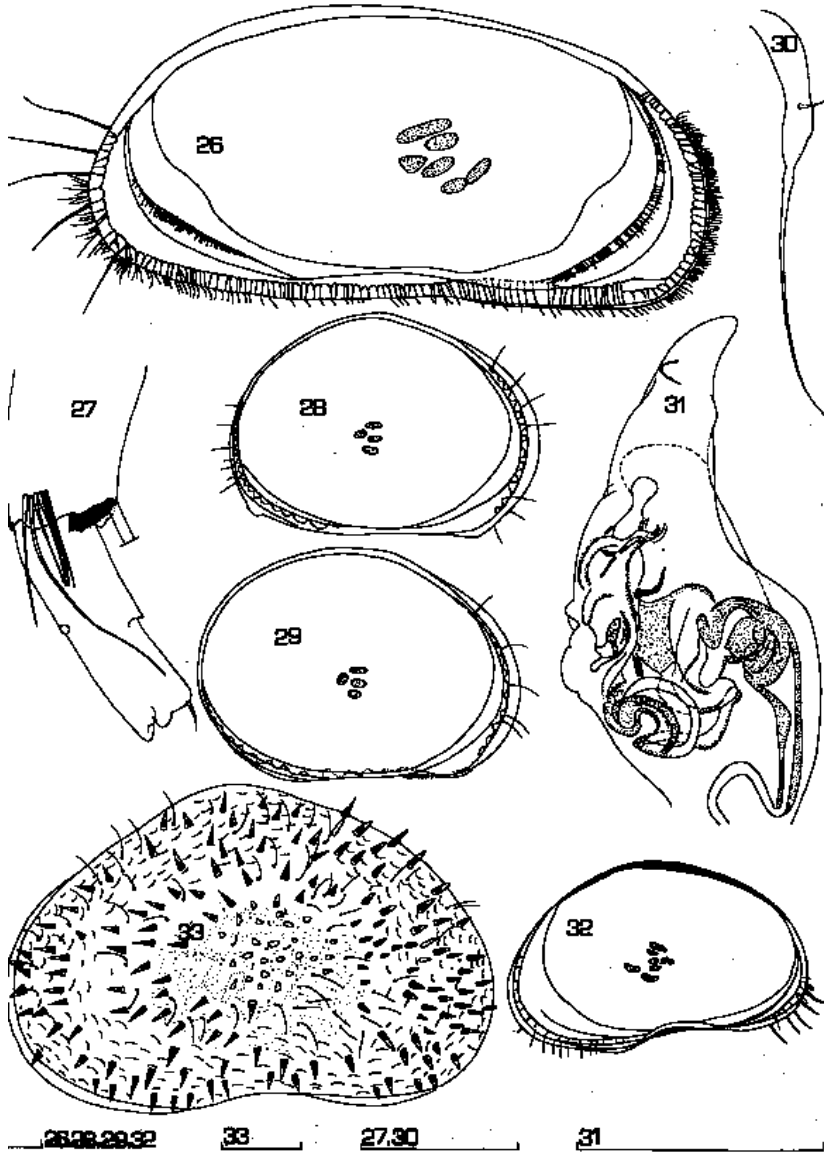
Figs. 7-12 *Pseudolimnocythere hypogea* KLIE, 1938 (locality - PU 56), male 0.266 mm: 7 - first walking leg; 8 - second walking leg; 9 - third walking leg; 10 - mandibula; 11 - antennula; 12 - maxillula. Scale = 0.1 mm.



Figs. 13-18 *Pseudolimnocythere hypogea* KLIE, 1938. (locality - The Cave L'Abisso), 13-17 female 0.285 mm, 18 male 0.328 mm: 13 - right valve, internal view; 14 - left valve, internal view; 15 - carapace, dorsal view; 16 - antennula; 17 - genital area with posterior process of body; 18 - antennula. Scales = 0.1 mm.



Figs. 19-25. 19-20 *Eucandona fabaeformis* (FISCHER, 1851) (locality - PU 34), female 0.623 mm; 21-22 *Pseudocandona pratensis* (HARTWIG, 1901) (locality - PU 170), female 0.923 mm; 23-25 *Cypria ophthalmica* (JURINE, 1820) (locality - PU 171), 23-24 female 0.558 mm, 25 male 0.53 mm: 19- left valve, internal view; 20- furca with genital lobe; 21 - left valve, internal view; 22 - mandibular palp; 23 - left valve, internal view; 24 - furca with genital lobe; 25 - hemipenis. Scales = 0.1 mm.



Figs. 26-32. 26-27 *Herpetocypris brevicaudata* (KAUFMANN, 1900) (locality - PU 50), female 1.61 mm; 28-29 *Notodromas persica* GURNEY, 1921 (locality - PU 53), 28 female 0.8 mm, 29 male 0.83 mm; 30-32 *Plesioocypridopsis newtoni* (BRADY and ROBERTSON, 1870), 30, 32 female 0.769 mm (locality - PU 169), 31 male 0.754 mm (locality - PU 176); 33 *Sarsocypridopsis aculeata* (COSTA, 1847) (locality - PU 156), female 0.628 mm; 26 - left valve, internal view; 27 - detail of antenna; 28 - left valve, internal view; 29 - left valve, internal view; 30 - furca; 31 - hemipenis; 32 - right valve, internal view; 33 - left valve, external view. Scales = 0.1 mm.

