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## FRESHWATER OSTRACODA (CRUSTACEA) COLLECTED IN A STREAM OF THE ISLAND OF MADEIRA

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With 2 figures

**ABSTRACT:** Three species of freshwater ostracods, i.e. *Strandesia obliqua*, *Cypridopsis brincki* and *Potamocypris pallida*, all belonging to the Podocopa-Cypridoidea-Cyprididae, are recorded for the first time from the island of Madeira. The three species are known from the European continent and, except for *Cypridopsis brincki*, also from North Africa. Scanning electron micrographs of the valves of *C. brincki* are given. The previous finding of seven other ostracod species on Madeira by FISCHER (1855) and SCHODDUYN (1927) is commented.

**RESUMO:** OSTRÁCODES DULCIAQUÍCOLAS COLHIDOS NUMA RIBEIRA DA ILHA DA MADEIRA. Três espécies de Ostracodos de água doce, *Strandesia obliqua*, *Cypridopsis brincki* e *Potamocypris pallida*, as quais pertencem ao grupo Podocopa-Cypridoidea-Cyprididae são assinaladas pela primeira vez na ilha da Madeira. As três espécies referidas são conhecidas na Europa e na África do Norte com excepção de *Cypridopsis brincki* a qual só existe na Europa. Foram feitas fotografias com microscópio de varrimento das valvas de *C. brincki*. As sete espécies anteriormente encontradas por FISCHER (1855) e SCHODDUYN (1927) são comentadas.

### INTRODUCTION

During summer 1988 and spring 1989 extensive collecting among the macrozoobenthic fauna was carried out by one of us (STAUDER, 1990) in the Ribeira das Cales, a small stream situated in the southern part of the island of Madeira. Samples were taken at 5 different sites distributed from the area of its source down to 490 m. above

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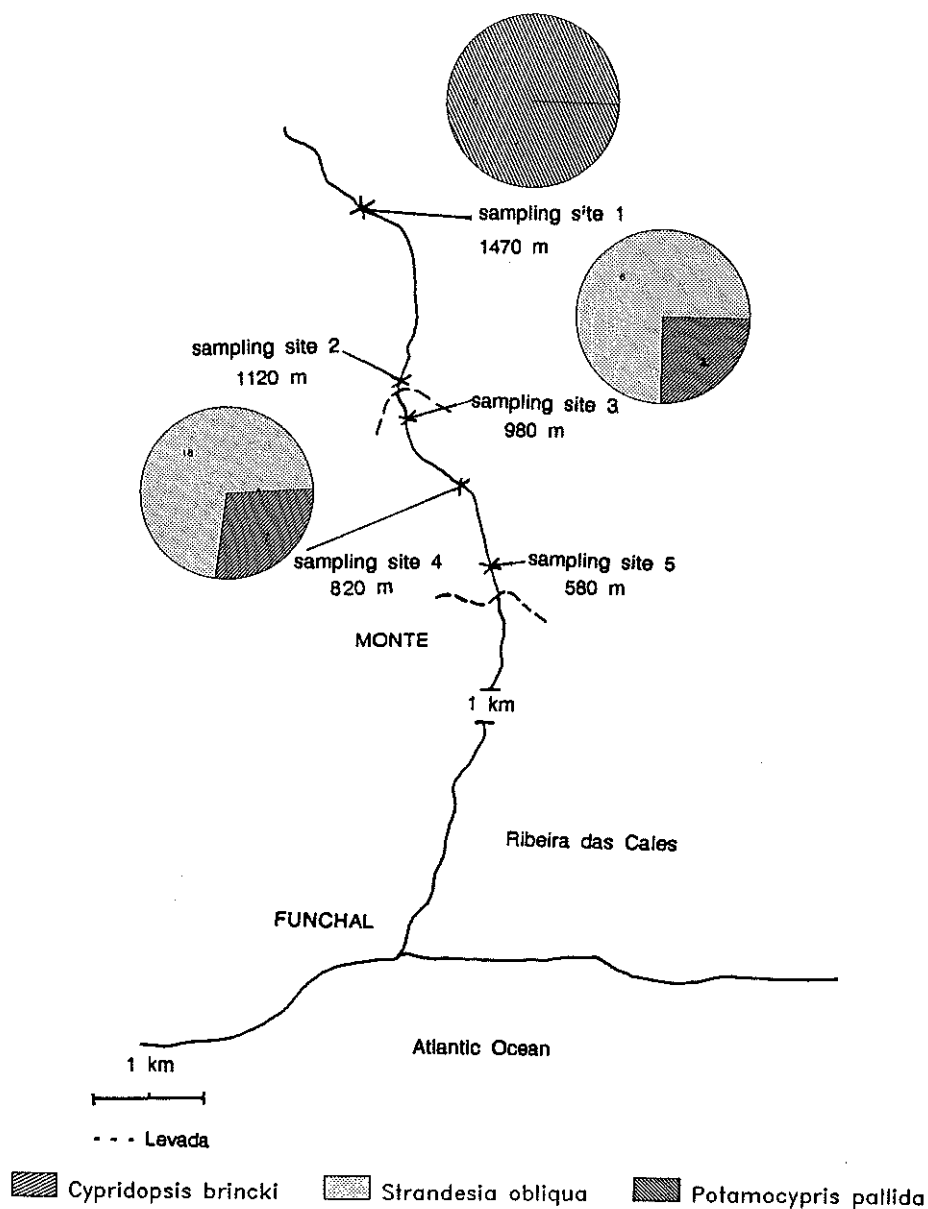


Fig. 1.-The Ribeira das Cales: distribution of the sampling sites and relative abundance of the ostracod species found.

sea level (Fig. 1). The samples collected include ostracods belonging to three species, which present the subject of our account.

The spring of the Ribeira das Cales is located at approximately 1500 m a.s.l., below the Pico do Areeiro which reaches its highest point at 1811 m. The total length of the stream amounts to only 9 km, and its average slope (about 16 m. per 100 m) is consequently of considerable steepness, a feature fairly common to the streams of the island.

From the spring down to about 1400 m a.s.l. (about 1 km. in length) the stream crosses a highland plateau with only a slight inclination. From 1400 m to 1000 m a.s.l., the slope increases noticeably; the stream bed is strewn with rocks up to 2 m. in size and small step-like waterfalls occur. Below 1000 m a.s.l., the height of the waterfalls increases and between them there are calm water basins with rich aquatic vegetation, among which *Nasturtium officinale* is the dominant species.

Irrigation channels, the so-called Levadas, cross the stream bed, diverting water for crop irrigation. The result of this is that in dry summers, the waterflow is mostly interrupted along the lower 4 km of the stream.

The water of the Ribeira das Cales is characterized by low nutrient content, low conductivity (30-70  $\mu\text{S}/\text{cm}$ ) and pH values from 6.7 to 8.2. Water temperature in spring ranges from 8° to 12°C, in summer from 10° to 25°C, with the highest temperatures occurring in slow flowing areas.

Ostracods are small bivalved Crustaceans which live among the aquatic vegetation and, for most of the species, on and in the bottom mud of stagnant or slow flowing waters. Another group of species, not investigated here, dwells in the interstitial underground milieu. Streams, as well as flowing waters, are known to harbour a limited number of ostracod species. The finding of only three species in the Ribeira das Cales confirms this statement.

The specimens found in the Ribeira das Cales in 1988 and 1989 belong to: *Strandesia obliqua*, *Cypridopsis brincki* and *Potamocypris pallida*.

#### NOTES ON THE SPECIES FOUND

*Strandesia (Neocypris) obliqua* (BRADY, 1868)

*Cypricercus obliquus* (BRADY, 1868)

*Cypricercus alacer* MEISCH, 1979

Numerous specimens (only females - about 150 in all) were found in spring and summer at the stations situated from 490 m. to 1120 m a.s.l. The specimens were most abundant in September. This is most certainly due to the fact that reproduction takes

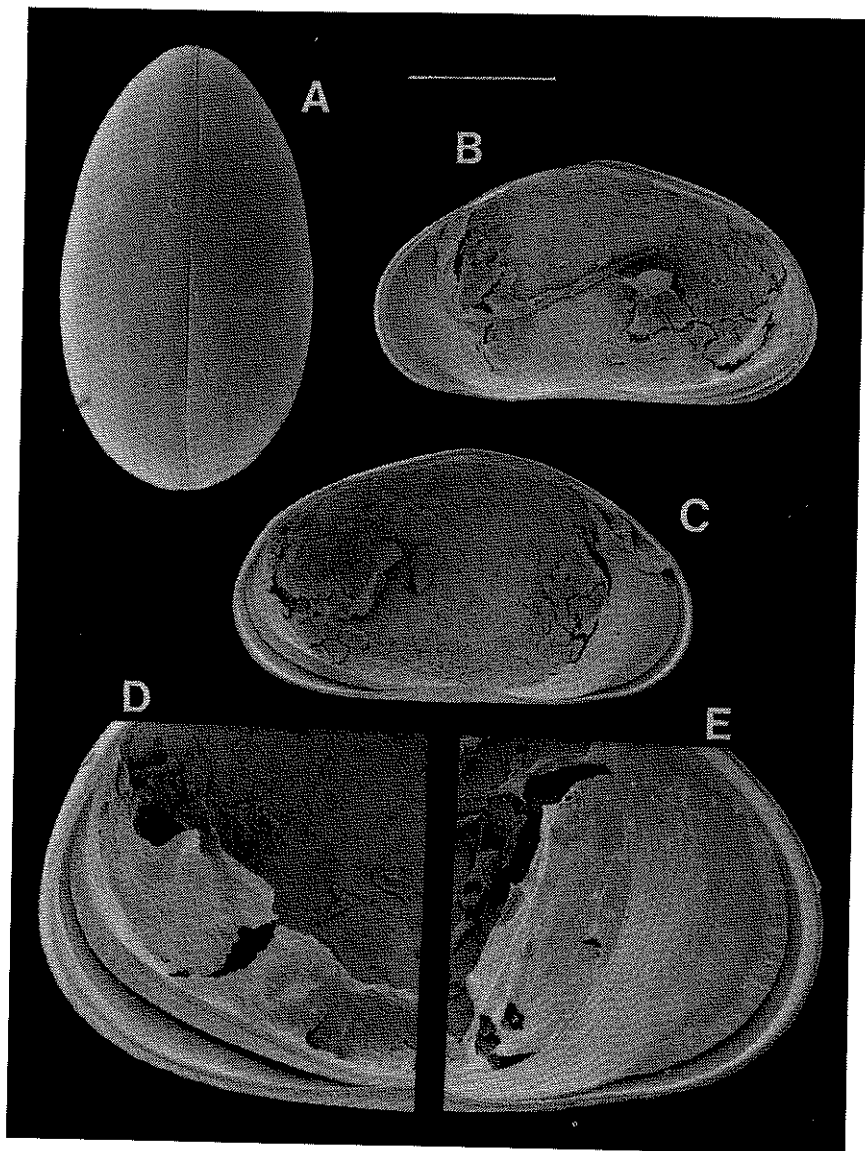


Fig. 2. - *Cypridopsis brincki*. A: Carapace in dorsal view; B: Right valve, internal view; C: left valve, internal view; D: left valve, posterior detail of C; E: left valve, anterior detail of C. Scale bar: 0.20 mm. for A-C.

place in the summer months. The species occurs mostly in pools with slow flowing water and rich aquatic vegetation (mostly *Nasturtium officinale*) or in stagnant pools situated away from the flowing water.

*S. obliqua* inhabits the litoral zone of lakes, ponds, fishponds and other permanent small water areas. Parthenogenetic populations are spread throughout Europe. Bisexual populations are only known from North Africa and Yugoslavia. The species is also known from the Azores (MONIEZ, 1888; PETKOVSKI, 1963), where as on Madeira, only females were found.

*Cypridopsis* s.str. *brincki* PETKOVSKI, 1963

(Fig. 2)

A few specimens (only females) were found at the localities situated at 820 m and 980 m. a.s.l.: 2 specimens belonging to *C. brincki* are of particular interest. This species had hitherto only been known from the Azores and from Portugal (PETKOVSKI, 1963). The taxonomic features of the specimens collected on Madeira are as follows: The colour of the carapace ranges from light green to green (after 6 months of preservation in alcohol). The surface of the valves is smooth. Carapace closure: the left valve overlaps ('embraces') the right valve ventrally when the carapace closes.

Appendages: the swimming setae of the antenna extend to about the middle of the terminal claws. The 3rd masticatory process of the maxillula (Mx1) bears two barbed teeth (these barbs only become clearly visible under high magnification, of about 1000 X). The respiratory plate of the maxilla (Mx2) has 1 branchial filament. Size: 0.60 - 0.63 mm.

We would like to point out that all the taxonomic features of the specimens from Madeira are in perfect agreement with the original description of the species as given by PETKOVSKI (1963). The male of the species is unknown.

*C. brincki* comes close to *C. lusatica* SCHÄFER, 1943, which also has 1 filament on the Mx2 plate. The two species differ above all (a) by the length of the A2 swimming setae: these extend slightly beyond the tips of the terminal claws in *C. lusatica*; and (b) by the teeth on the 3rd masticatory process of the Mx1: according to the original description, these teeth are smooth in *C. lusatica*.

A more detailed redescription of *C. brincki* will be given in a paper in preparation (PETKOVSKI & MEISCH).

*Potamocypris pallida* ALM, 1915

Only six female specimens were found in one locality situated at 1470 m a.s.l., close to the spring. The specimens dwelled among small stones in the stream bed. At

the collecting site, the water flows at medium velocity.

*P. pallida* is known to be a cold stenothermic species that inhabits springs, waters flowing from springs, mountain brooks and the interstitial milieu of brooks (MEISCH, 1984). According to LÖFFLER (1961, 1963), the species is said to only occur in waters with a low calcium carbonate content, i.e. in areas lacking calcareous rocks. The find of the species in question on Madeira does not contradict this hypothesis.

*P. pallida* is found throughout Europe (MEISCH, 1984), but has not yet been recorded from Africa (MARTENS, 1984). All populations hitherto known are parthenogenetic.

## DISCUSSION

1. The island of Madeira is part of the so called Macaronesian biogeographic area, which also comprises the Azores, the Canaries and the Selvagens islands (strictly speaking, the Cabo Verde islands do not belong to the macaronesian region). The fauna and flora of these islands has aroused a lot of interest among biologists, above all because of the evolutionary processes having taken place in the genetically isolated insular populations.

Numerous groups of plants and animals have indeed formed endemic subspecies and species on the Macaronesian islands. Recently, one of us (STAUDER, 1990) made a survey of endemic and non endemic species of insects and other invertebrates on Madeira.

None of the species of ostracods recorded in the present account is endemic to Madeira. Furthermore, none of the previous reports on the ostracod fauna of the remaining Macaronesian islands (especially the Azores and the Canary islands) mention the existence of endemic species. (So far, only *Sarscypridopsis lanzarotensis*, found on the islands of Lanzarote and Tenerife, is only known from these two islands; but most probably this species was introduced from the nearby African continent; see MEISCH & BROODBAKKER, 1990).

The absence of endemic species of ostracods on Madeira, if later confirmed, may be tentatively explained (a) by the strong evolutionary conservatism of parthenogenetically reproducing populations and (b) in the case of sexually reproducing species, by the regular influx of conspecific specimens and hence genes from the neighbouring continents.

Nevertheless it should be noted that the ostracod fauna of the Atlantic islands (as well as that of the African continent) is far from being well known. Thus at present the fact that endemic ostracod species may be discovered in future on Madeira or on other Atlantic islands cannot be excluded.

2. The island of Madeira is situated 620 km east of Casablanca (North-Africa) and 920 km south-west of Lisbon (Europe). The freshwater ostracods were obviously passively introduced on Madeira by migrating birds or by man either from the European or the African continent. At least some of the ostracod species are known to have survived transport on the feet and the plumage of birds. Some species even survive transport through the gut of birds. Furthermore, the colonization of new aquatic biotopes is facilitated by the parthenogenetic reproduction mode that occurs in numerous ostracod species: one single specimen can give rise to a new population! So it is not surprising that the three species recorded here reproduce parthenogenetically on Madeira.

3. To our knowledge, the present paper is so far the third to deal with freshwater ostracods collected on Madeira, the two previous ones having been produced by FISCHER (1855) and SCHODDUYN (1927).

FISCHER (1855) recorded 4 species on Madeira. Unfortunately none of the author's species can be at present identified without ambiguity. The species he records are (a) *Cypris ophthalmica* JURINE: the description and figures given by FISCHER (1855) show that his species actually belongs to the genus *Potamocypris*; it is, however, impossible to tell to which species it should be referred; (b) *Cypris madeirensis* FISCHER, 1855 and (c) *Cypris aspera* FISCHER, 1855 cannot at present be referred to any known species (G.W. MÜLLER (1912) ranked both species among the "*Genera dubia et species dubiae Cyprinarum*"); (d) *Cypris aurantia* JURINE is most likely to belong to *Heterocypris incongruens* (RAMDOHR, 1808).

The species listed by SCHODDUYN (1927) are (a) *Cypris fischeri* LILLJ. (now *Stenocypris fischeri*), (b) *Potamocypris fulva* BRADY and (c) *Candona pubescens* KOCH (now *Pseudocandona pubescens*). As this author obviously founded his determinations on the examination of the carapace only and as the taxonomy of the last two species was not clear at the beginning of the century, his findings, in our opinion, need to be commented on as follows:

(a) *Stenocypris fischeri*: the author relies on the absence of any pigmentation on the valves to rank his specimens in *S. fischeri* rather than in the more common *Herpetocypris reptans*. He writes: "... il n'est pas probable que le formol les (= les marbrures) ait fait disparaître". But contrary to the author's opinion, formalin mostly erases any pigmentation, particularly after preservation for years, as was the case in SCHODDUYN's specimens (according to the author, they were collected in 1910 or even before). We, therefore, are inclined to believe that SCHODDUYN's determination must be considered somewhat dubious; his specimens could well belong to *Herpetocypris reptans*.

(b) *Potamocypris fulva* G.W. MÜLLER comes very close to *Potamocypris pallida*. As the

characters allowing clear distinction between these species were not available in 1927, we suggest that the occurrence of *P. fulva* on Madeira should be re-checked. (For a revision of *P. pallida* and *P. fulva*, see MEISCH, 1984).

(c) SCHODDUYN (1927: 221) writes about the sample he assigns to *Pseudocandona pubescens*: "... se rapproche beaucoup de *C. pubescens* décrite par G.W. MÜLLER". According to KLIE (1938), who clarified the taxonomy of the species group to which the species considered here belongs, *C. pubescens*, *sensu* MÜLLER, is identical with *C. pratensis* (now *Pseudocandona pratensis*). Moreover, as SCHODDUYN himself expresses his uncertainty about the specific assignment, we rather believe that his specimens could either belong to *Ps. albicans*, *Ps. compressa*, *Ps. pratensis* or even to one of the remaining species of the genus *Pseudocandona*.

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