An Holarctic taxon in the Ethiopian region – a first record of *Lathonura* (Crustacea: Cladocera: Macrothricidae) for the Okavango swamps of subtropical Africa

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We report the discovery of a single specimen of an aquatic microcrustacean — *Lathonura* sp. (Crustacea: Cladocera: Macrothricidae) — in samples collected in the lower swamps of the Okavango Delta, Botswana. The finding has considerable zoogeographic significance, since *Lathonura* is generally described as an Holarctic zone taxon. The present discovery revitalizes a previous (rather obscure) record for the Bangweulu swamps (Zambia/Democratic Republic of Congo) of central Africa, adding support to the existence of boreal–tropical disjunctions recently described for other cladoceran taxa.

Introduction

Here we report the discovery of *Lathonura* sp. (Crustacea; Class: Branchiopoda; Superorder: Cladocera: Macrothricidae) from the subtropical Okavango swamps of Botswana. This apparently monotypic cladoceran (‘water-flea’) genus is considered an Holarctic taxon, although its only species, *L. rectirostris* (O.F. Müller, 1785), was recorded at two marginal (acid?) swamp sites from Lake Bangweulu, central Africa. Regrettably, Kořínek’s otherwise profusely illustrated paper simply lists the species, without any comments, and thus the record has not received much attention. The present ‘rediscovery’ of *Lathonura* in the Okavango area in southern Africa now confers credibility on this early record, and complements emerging evidence for boreal–tropical disjunctions in other related taxa, that may represent Cenozoic or Pleistocene age relicts.

The Macrothricidae is a large cosmopolitan family of mostly littoral and benthic cladocerans inhabiting inland waters. At least two subfamilies are distinguished — the well-defined Macrothricinae, and an ill-defined grouping of ‘non-Macrothricinae’ comprising some five genera. One of these, *Lathonura*, is a fairly specialized taxon. Its single Holarctic species, *L. rectirostris*, is widely (though sporadically) distributed in temperate and continental Eurasia. A single specimen representative of this genus was discovered in an extensive series of drift net samples taken in 2002 from the southern Okavango Delta swamps in Botswana. These drift samples were collected during aerial spraying against tsetse fly with deltamethrin in 2002, in an effort to contain an apparent resurgence of the disease trypanosomiasis (sleeping sickness), after its effective absence in Botswana during preceding decades. Effects of the spray programme on non-target biota were monitored, using stream drift as a measure for aquatic invertebrates. Samples were collected during five phased spraying cycles between April and June 2002, in concert with the advancing dry-season flooding behaviour of this region.

Methods and sampling locality

Drift samples were collected using conical nets (300 mm × 300 mm mouth opening; 80-µm pore aperture mesh), staked in current to the channel substrate, with the top of the net at the water surface. Drift nets were deployed for three hours straddling dusk/sunset (17:30 to 20:30) at various localities in Moremi Game Reserve, Botswana (Fig. 1). Drift material collected was preserved with 4–5% formalin. These drift samples yielded an array of aquatic invertebrates, dominated numerically and in diversity by insects and crustaceans, especially micro-crustaceans. The latter mostly comprised familiar littoral cladoceran taxa and copepod copepods, and sporadic harpacticoid copepods and ostracods (e.g. ref. 10). Most notable, however, was the discovery of a single specimen of a bizarre crustacean from a drift sample collected at the site KB-1 on 24 May 2002. This site (19°11’20.2”S, 23°25’40.3”E) was in the main channel of the Khwai River immediately outside Xakanaxa camp (Fig. 1b), where the stream channel was approximately 2 m wide, and lined with an almost impenetrable vegetated margin mostly of the grass *Misanthias junceus* and some sedges. The channel bed was 1–2 m deep, and consisted of very clean, well-washed Kalahari sand with virtually no organic particles.

The specimen reported here superficially resembled a copepod–cladoceran ‘hybrid’, with thoracopod structures and a posterior ‘abdominal’ segment with terminal cerci reminiscent of copepods, and with large antennae and the trunk-enveloping carapace of a cladoceran. Subsequent detailed examination by one of us (H.J.D.) led to the present identification of *Lathonura* (species incertae sedis).

Diagnosis

Micrograph images of the specimen are given in Fig. 2. The whole animal (Fig. 2a) bears relatively large second antennae, a median compound eye, and shows distinctive trunk and post-abdominal regions.

Discussion and future prospects

The limitation of this discovery to a single specimen is
noteworthy. Plausibly, a single specimen was disturbed or dislodged into current from its more typical habitat (see below) by activities of hippopotami (or crocodiles), which are customary and abundant inhabitants of this region. But in addition, it may simply reflect low abundance, as reported for other cladocerans in tropical Africa, and plausibly attributed to high predation pressures.3

*Lathonura* appears to occur in fairly acidic, often humic waters, and commonly associates with stands of *Utricularia* plants;4 like a number of other macrothricids, it seems able to avoid getting trapped by this carnivorous plant, thereby acquiring a selective advantage over other cladocerans. Extensive stands of *Utricularia* occur in the delta (ref. 8; R.C. Hart, pers. obs. during AQUARAP survey11), consistent with the 'exceptionally low' solute content of river water and corresponding low nutrient status (especially of nitrogen) of the Okavango wetland.8,12 It is accordingly probable that focused or diligent sampling will reveal *Lathonura* to be more widely distributed in the Okavango, and perhaps other regions in the palaeo-Zambezi drainage basin.

This discovery requires confirmation in view of its important biogeographical implications. In particular, it accords with emerging evidence for boreal–tropical disjunctions in various related cladocerans — eight taxa — apparent from recent studies of branchiopods in mesic forests of Cameroon.3

The present explanation for these disjunct distributions rests on aridification of world climate during the late Cenozoic or Pleistocene, and slow evolutionary change related to life cycles dominated by parthenogenetic rather than sexual reproduction.3 Confirmation of *Lathonura*'s presence in the Okavango and the discovery of perhaps other 'relict' taxa may facilitate extension and wider generalization of this interpretation to arid savanna inter-tropical zone taxa in addition to mesic tropical forest species.

Further surveys are planned to explore whether and where modern populations of this Okavango-type (or other) species might occur within the palaeo-Zambezi drainage (and elsewhere in Africa). Specimens collected from such locations need to be suitably preserved for genetic probing with modern molecular techniques, especially should further material confirm the apparent conspecific status of the present specimen with Holarctic *L. rectirostris*.

We thank a vigilant reviewer for reminding us of Kotinek’s secluded previous African record for this taxon.