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A molecular phylogeny of African Dainty Frogs, with the description of four new species (Anura: Pyxicephalidae: *Cacosternum*)

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Abstract

We examined specimens from all eleven described species of African Dainty Frogs, *Cacosternum*. Advertisement calls, 16S and *tyr* sequences were obtained from voucher specimens of all known species plus undescribed taxa. A phylogenetic analysis indicated that there were 15 species. We describe four new species from South Africa that can be diagnosed by their advertisement calls: *Cacosternum aggestum* **sp. nov.** from the interior of the south-western Cape, the large *C. nanogularum* **sp. nov.** from KwaZulu-Natal, *C. australis* **sp. nov.** from the Western Cape Province and *C. rhythmum* **sp. nov.** from the KwaZulu-Natal midlands. *Cacosternum schebeni* is confirmed as a junior synonym of *C. boettgeri*, and we agree that *C. poyntoni* is a junior synonym of *C. nanum*. The populations of dainty frogs on the Ethiopian highlands remain to be investigated. Shared *tyr* haplotypes occur between species that are not necessarily closely related, but always sympatric, at least in the recent past. This is evidence for hybridisation that requires further investigation. A provisional identification key to the species is provided.

Key words: Anura, Pyxicephalidae, *Cacosternum*, new species, advertisement call, phylogeny

Introduction

Dainty frogs in the genus *Cacosternum* are found from Ethiopia to South Africa and are presently assigned to 11 species (Frost 2013). Although there are exceptions, the genus consists mostly of cryptic, highly polychromatic species, with green and brown dorsal colouring being a common feature. Most species have small ranges, although "*Cacosternum boettgeri*" which was until recently considered to have an Africa-wide distribution, is now known to consist of many cryptic forms (Poynton *et al.* 2004, Channing *et al.* 2005, Channing & Schmitz 2009).

This study derives from fieldwork associated with the Southern African Frog Atlas Project, additional South African projects and during visits to the Democratic Republic of Congo, Kenya and Tanzania. Here we consider the molecular, morphological and vocal differences between populations, and use these data to delimit the known species, and recognise four new species. Detailed distributions of the known southern African species are available in Minter *et al.* (2004).

Material and methods

Sampling. Tissues were obtained from museums, or from field-collected specimens. An attempt was made to sample widely across the distribution range of the genus, with two or more samples from each locality where possible. Frogs were located by their vocalisations, and by searching along small streams and around ponds. Voucher material, GenBank numbers and locality details are presented in Appendix 1.