

The calls of *Plethodontohyla inguinalis* from eastern Madagascar

(Amphibia, Microhylidae)

Denis Vallan, Frank Glaw & Miguel Vences

Vallan, D., Glaw, F. & M. Vences (2005): The calls of *Plethodontohyla inguinalis* from eastern Madagascar (Amphibia, Microhylidae). – Spixiana 28/1: 91–93

A specimen of the frog species *Plethodontohyla inguinalis* Boulenger, 1882 was identified as the emitter of unknown calls recorded at the rainforest of An'Ala in central eastern Madagascar. The calls remind the barking of a dog and consist of single melodious notes, repeated after regular intervals and at a fundamental frequency of 400–600 Hz. The specimen was found in a tree hole at a height of about 50 cm, indicating some degree of climbing behaviour in this species.

Denis Vallan, Universität Bern, Zoologisches Institut, Baltzerstrasse 6, CH-3012 Bern, Switzerland; e-mail: denis.vallan@zos.unibe.ch

Frank Glaw, Zoologische Staatssammlung, Münchenhausenstr. 21, D-81247 München, Germany; e-mail: Frank.Glaw@zsm.mwn.de

Miguel Vences, Institute for Biodiversity and Ecosystem Dynamics, Zoological Museum, University of Amsterdam, Mauritskade 61, NL-1092 AD Amsterdam, The Netherlands; e-mail: vences@science.uva.nl

Introduction

Bioacoustic studies have proven to be an important tool in anuran taxonomy. In the anuran fauna of Madagascar, a large number of cryptic species have been discovered and identified by analysis of their calls (Glaw & Vences 2000), and most recent species descriptions heavily rely on bioacoustics (e.g. Vallan et al. 2003).

The genus *Plethodontohyla* contains species with tadpoles developing in subterranean jelly nests or in waterfilled tree holes. The latter reproductive mode is known from three species that are also characterized by expanded terminal discs of fingers and toes (Cadle 1996, Vences et al. 2003): *Plethodontohyla inguinalis* Boulenger, 1882, *P. mihanika* Vences, Raxworthy, Nussbaum & Glaw, 2003, and *Plethodontohyla notosticta* (Günther, 1877). In this paper we describe the advertisement calls of the largest of these species, *Plethodontohyla inguinalis*.

Materials and Methods

Calls were recorded using a portable tape recorder with external microphone in the field. They were digitized on a PC using the software Cooledit 96 (Syntrillium Corp.), with a sampling rate of 32 kHz. For visual representation of the sonogram, the following settings were used: Hanning Window (resolution 512 bands) with linear energy plot (0.8 % scaling). Because of a relatively high degree of noise (calls of other frogs and of insects) at higher frequencies, we eliminated frequencies above 1500 Hz (using an FFT filter) before using the oscillogram for temporal measurements and as graphical representation of the relative amplitude of the call. Temporal call parameters are given in milliseconds (ms), as range, followed by mean ± standard deviation, and number of analyzed units in parentheses.

Results and Discussion

The calls were recorded on 16 January 1997, on a cloudy evening at 19:50 h, in slightly disturbed primary rainforest at An'Ala (18°55'S/48°29'E,



Fig. 1. Adult male of *Plethodontohyla inguinalis* from An' Ala, central-eastern Madagascar, observed and photographed on 16 January 1997.

890 m above sea level), central eastern Madagascar. Calls of a single specimen were heard and noticed already from a distance of about 100 m. After carefully approaching the site of the vocalizations, the first author found a specimen of *Plethodontohyla inguinalis* (snout-vent length 91 mm) in a tree-hole (not water filled), about 50 cm high in a tree of about 60 cm trunk perimeter. No water body was seen in about 10 m surrounding of the tree.

The observed specimen (Fig. 1) was not collected, but could unambiguously be determined as *Plethodontohyla inguinalis* by its large size and the expanded terminal of fingers and toes which constitutes a unique combination of characters among Malagasy frogs.

The specimen could not be directly observed calling, but we consider the assignation of the calls to *Plethodontohyla inguinalis* as highly probable because (a) an adult male (Fig. 1) was found in a treehole exactly at the position from which the calls were heard, (b) the calling site was not next to an open water body, while most other Malagasy frogs call next to water, (c) the call was very different from all other calls known from central eastern Madagascar, (d) the general call structure (regularly repeated single melodious notes) is typical for

cophylines and (e) the low frequency of the call agrees with the large size of this species.

The call, recorded at 21 °C air temperature, sounded like the barking of a small dog. It consisted of a single melodious note that was repeated regularly, with a note repetition rate of 0.9 per second. The sonogram (Fig. 2) shows that each note consists of a fundamental frequency band and one harmonic, the harmonic representing the dominant frequency. In both, the frequency increases from the beginning of the note, and then decreases again towards the end. Fundamental frequency is between 400-600 Hz, dominant frequency is between 800-1300 Hz. Note duration is 133-191 ms (148 ± 18 ms, $n=10$), interval between notes is 848-1151 ms (1004 ± 85 ms, $n=10$).

These data provide the first evidence that the call of *P. inguinalis* is similar to that of other cophylines in being regularly repeated melodious notes. Specimens of *P. inguinalis* so far were usually found during the day on the ground, where they are known to feed on large invertebrates such as scorpions (Lourenço et al. 1997). Despite their enlarged terminal disks of fingers and toes, they have not been found climbing so far. Our observations demonstrate that this species is able to climb, but also

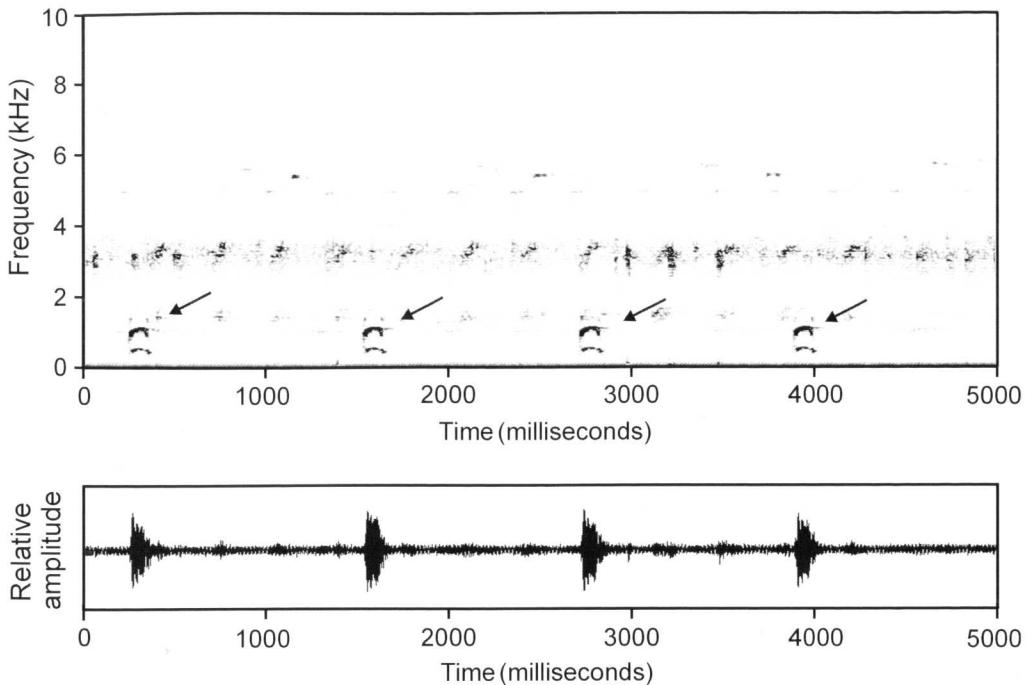


Fig. 2. Sonogram and oscillogram of the advertisement call of *Plethodontohyla inguinalis*, recorded at An' Ala, central-eastern Madagascar, at 21 °C air temperature. Four notes are shown (marked with arrows).

indicate that it might prefer tree holes at lower heights than the other climbing *Plethodontohyla* with expanded finger disks (*P. notosticta* and *P. mihanika*; Vences et al. 2004), confirming the observations of Cadle (1996: p. 380) who found the large eggs of *P. inguinalis* in tree holes, often close to the ground. Eggs probably belonging to this species were regurgitated by a male of the snake *Liopholidophis rhadinaea* (Cadle 1996).

Whether this species uses water filled tree holes for reproduction, or the larvae develop in some kind of nest in a dry tree hole, cannot be assessed without further observations.

Acknowledgements

We are grateful to Donna Marcel Rakotondramanana and Alfred Celestin Razakatiana who accompanied us in the field, and to the Malagasy authorities for research permits. The research in Madagascar was made possible by scientific cooperation with the University of Antananarivo and by the financial support of the Swiss Academy of Natural Sciences (SANS). The analytical work has been in part supported by the Volkswagen Foundation.

References

- Cadle, J. 1996. Snakes of the genus *Liopholidophis* (Colubridae) from eastern Madagascar: new species, revisionary notes, and an estimate of phylogeny. – Bull. Mus. Comp. Zool. **154**: 369-464
- Glaw, F. & M. Vences 2000. Current counts of species diversity and endemism of Malagasy amphibians and reptiles. In: W. R. Lourenço & S. M. Goodman (eds.), Diversité et Endémisme à Madagascar. – Mém. Soc. Biogéographie, Paris: 243-248
- Lourenço, W., F. Glaw, J. L. Cloudsley-Thomson & M. Vences 1997. The Madagascan frog *Plethodontohyla inguinalis* eats scorpions. – Brit. Herpetol. Soc. Bull. **60**: 26-28
- Vallan, D., M. Vences & F. Glaw 2003. Two new species of the *Boophis mandraka* complex (Anura, Mantellidae) from the Andasibe region in eastern Madagascar. – Amphibia-Reptilia **24**: 305-319
- Vences, M., C. J. Raxworthy, R. A. Nussbaum & F. Glaw 2003. A new microhylid frog (*Plethodontohyla*) from Madagascar, with semi-arboreal habits and possible parental care. – J. Herpetol. **37**: 629-636

Buchbesprechungen

17. Makris, C.: Butterflies of Cyprus. – Bank of Cyprus, Cultural Foundation, Nikosia, 2003. Paperback, Großformat, 329 pp., durchgängig farbig bebildert. ISBN 9963-42-817-7

Christodoulos Makris legt mit dieser Neuerscheinung einen prächtigen Bildband über die 53 Tagfalterarten Zyperns vor. Eine schier nicht enden wollende Fülle von hervorragenden Farbfotographien in natürlicher Umgebung und aus Sammlungen vermittelt dem Leser ein umfassendes Bild von Unterscheidungsmerkmalen (Flügeloberseite und -unterseite) und Lebensweise dieser Schmetterlingsgruppe. Die Fotos eignen sich sehr gut zur Bestimmung zypriotischer Tagfalter. Für viele Arten sind auch die Präimaginalstadien Ei, Raupe und Puppe abgebildet. Wunderschöne Landschaftsaufnahmen mit typischen Habitaten runden das Bild ab.

Der englische Text behandelt im Hauptteil alle Arten in informativen, ca. einseitigen Charakteristiken unter den Rubriken "Identification, Range, Phenology, Larval host-plant, Geographical distribution and habitat". Zusätzlich gibt es für jede Art eine Verbreitungskarte und ein Flugzeitdiagramm. Auf den ersten 77 Seiten werden dem Leser in einer reich bebilderten Einleitung wertvolle Informationen zu Geologie, Klima, Ökologie und Vegetation der Insel Zypern sowie zu Metamorphose, Variation, Verhalten und Ökologie der Tagfalter Zyperns vorstellt.

Dem Autor und der Bank of Cyprus Cultural Foundation ist für diesen ästhetisch sehr ansprechenden und preiswerten Bildband herzlich zu danken!

A. Hausmann

18. Hess, H., W. I. Ausich, C. E. Brett & M. J. Simms (eds.): Fossil Crinoids. – Cambridge University Press, 2002. 275 pp + V-XV + 8 colour plates, paperback. ISBN 0-521-52440-7

This volume, written by multiple authors, deals with the "class" of crinoids, the sea lilies and feather stars, a primitive group of echinoderms, which also contain better known taxa like sea urchins or sea stars. As expressed by the title, it focuses on fossil crinoids but in addition pays substantial attention to recent forms.

Following an introductory part including short biographies of the contributors and high quality colour plates with figures of mainly fossils, the first chapter of the general part is devoted to the general morphology of crinoids. This description of all soft and hard part structures provides detailed information on the structures relevant for understanding function and systematics of this highly diverse taxon. The chapter on evolution and phylogeny, however, is disappointing and represents the only weak point of the book: While phylogeny within crinoids is given in detail, it completely lacks information on early evolution of this taxon and on the relationship

to other echinoderms. All the other most interesting palaeozoic primitive pelmatozoan taxa are virtually ignored. Further general chapters deal with fossil occurrence in time, fossil preservation ways ("taphonomy") and ecological interactions of crinoids. The main portion, more than half of the book, is devoted to particular fossil assemblages with crinoids from all parts of the earth. In these chapters, which are arranged by age of assemblages, insight is given into geography, stratigraphy and topics related with crinoids of mostly well-known palaeontological excavation sites. As an example, in the section of the lower jurassic Posidonia shale of southern Germany, the question of pelagic or benthic life of the well-known genus *Seirocrinus* is emphasised. A final chapter deals with distribution and biology of recent crinoids. In addition to all the information given in the text, the value of the book consists of the most attractive partly coloured photographs as well as clear drawings, the extensive bibliography, appendices with time tables and geological explanations and vast general as well as systematic index. Summing up, the present book meets the requirements of a wide range of purposes: The privately interested biologist gains insight into evolution and biology of a very attractive and interesting group of animals. For the hobby palaeontologist it is a guide to excavation sites. For the scientist it is of great help, as it provides comprehensive information, that has not been available before. Therefore and because of the reasonable price, purchase of the book is to be highly recommended.

B. Ruthensteiner

19. Nowotnick, K.: Die Honigbiene, *Apis mellifera* L. Die Neue Brehm-Bücherei, Bd. 31. – Westarp Wissenschaften, Hohenwarsleben, 2004, 191 S. ISBN 3-99432-523-2

Der vorliegende Band vermittelt ein interessantes Bild der Honigbiene, *Apis mellifera* aus imkerlicher Sicht. Es wird ausführlich über die Populationsstruktur des Bienestaates, verschiedene Haltungsweisen sowie die Zucht von Honigbienen berichtet. Auch Themen, wie zum Beispiel die BienenSprache und die wichtigsten Sinnesleistungen der Honigbiene werden ausführlich dargestellt. Die wichtigsten europäischen Unterarten der Honigbiene werden in ihrer Morphologie und ihrem Verhalten verglichen und vorgestellt. Bei der Lektüre wird dem Leser an vielen Stellen deutlich, daß der Autor ein erfahrener Imker ist, dementsprechend ist der Band in weiten Bereichen aus der Sicht der imkerlichen Bedeutung aufgebaut. Leider spürt man auch, daß der Autor die aktuelle entomologische Fachliteratur nicht hinreichend kennt. So entsprechen manche Kapitel, wie zum Beispiel "Evolution des Bienestaates" und die Ausführungen über die Selektion der Bienen nicht dem heutigen Wissensstand. Wichtige Fachliteratur, wie zum Beispiel die Bücher von Charles D. Michener oder Paul Westrich und die Arbeiten von Michael S. Engel sind leider nicht berücksichtigt und zitiert.

K. Schönitzer