Stuttgarter Beiträge zur Naturkunde

Serie A (Biologie)

Herausgeber:

Staatliches Museum für Naturkunde, Rosenstein 1, D-70191 Stuttgart

Stuttgarter Beitr. Naturk.	Ser. A	Nr. 536	4 S.	Stuttgart, 29. 3. 1996

The Tadpole of *Lithodytes lineatus* – with Note on the Frogs Resistance to Leaf-Cutting Ants (Amphibia: Leptodactylidae)

By Andreas Schlüter, Stuttgart and János Regös, Eger

With 2 figures

Summary

The tadpole of the South American "ant frog" *Lithodytes lineatus* (Schneider, 1799) is described and figured. *L. lineatus* is associated with the leaf-cutting ant *Atta cephalotes* (Schlüter, 1980; Schlüter & Regös, 1981). Adult frogs release an aromatic maggi cube like taste when being captured from leaf-cutting ant nests (Schlüter & Regös, 1981). Additional obervations in the field and on captive specimens show, that frogs loosing this taste get killed by the ants within a few minutes.

Keywords: Amphibia, Leptodactylidae, *Lithodytes lineatus*, Hymenoptera, *Atta cephalotes*, ant frog, tadpole, larva, association, resistance, defensive behaviour, Peru.

Resumen

– El renacuajo de *Lithodytes lineatus* – con breve nota sobre la resistencia de la rana contra hormigas cortadoras de hojas (Amphibia, Leptodactylidae) –

Se describe y representa el renacuajo de la "rana hormiguera" sudamericana *Lithodytes lineatus* (Schneider, 1799). *L. lineatus* está asociada con la hormiga cortadora de hojas *Atta cephalotes* (Schlüter, 1980; Schlüter & Regös, 1981). Adultos justamente capturados en las entradas de nidos tienen un olor aromático, que parece a la especia "Maggi" (Schlüter & Regös, 1981). Oberservaciones en el campo y en especímenes cautivos dan por resultado que ejemplares perdiendo este olor son matados por las hormigas entre pocos minutos.

Zusammenfassung

Die Kaulquappe des südamerikanischen „Ameisenfrosches" *Lithodytes lineatus* (Schneider, 1799) wird beschrieben und abgebildet. *L. lineatus* ist assoziiert mit der Blattschneiderameise *Atta cephalotes* (Schlüter, 1980; Schlüter & Regös, 1981). Adulte Tiere, die am Eingang eines Blattschneiderameisen-Nestes gefangen werden, verströmen einen Geruch, der an den der „Maggi-Pflanze" erinnert (Schlüter & Regös, 1981). Beobachtungen im Freiland und an gefangen gehaltenen Exemplaren haben gezeigt, daß Tiere, die diesen Geruch verloren haben, von den Ameisen innerhalb weniger Minuten getötet werden.

1. Introduction

Lithodytes lineatus (Schneider, 1799) occurs from the Peruvian Amazon to Surinam (Cochran & Goin, 1970; Nelson & Miller, 1971; Hoogmoed, 1973; Duellman, 1978; Lynch, 1979; Duellman & Toft, 1979): Ecological data on *L. lineatus* were gathered during several stays in the Peruvian field station Panguana (9°35'S, 74°56'W, about 250m elevation). Foam nest construction is described by Regös & Schlüter (1984). The association of *L. lineatus* with nests of the leaf-cutting ant *Atta cephalotes* was firstly mentioned by Schlüter (1980). Hoogmoed (1986) confirmed its dwelling in *Atta*-nests.

2. Tadpole

Regös & Schlüter (1984) showed different larval stages, discussing abnormal larval development in comparison with normal larvae, but did not describe a tadpole in detail. In October, November 1985 male and female *L. lineatus*, observed (not in amplexus) at the Peruvian field station Panguana, were collected and brought alive to Germany. Under a piece of bark they constructed a big foam nest (29 cm long, ca. 8 cm wide and 6 cm tall), containing unpigmented eggs.

Hatching of the 83 tadpoles occurred between the seventh and fifteenth day after nest construction (water temperature 26°C). Feeding commenced on the second day after hatchig. Three larvae (SMNS 8387: 1–3) were preserved in formalin while the others were reared to metamorphosis for ethological studies on juveniles. The following description is based on specimen No. SMNS 8387: 1 in stage 25 (sensu Gosner, 1960) (Fig. 1).

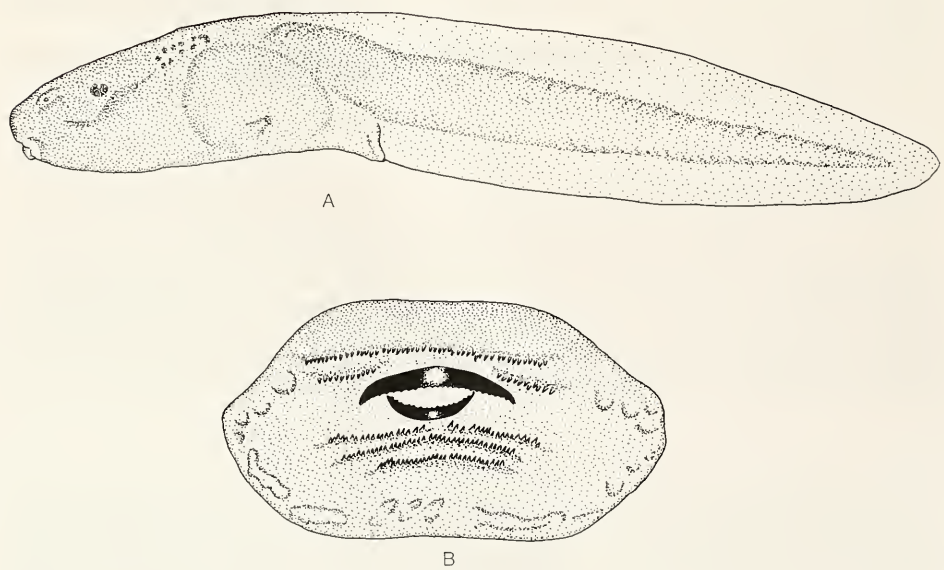

Fig. 1. Tadpole of *L. lineatus* (SMNS 8387: 1) in stage 25. – A. Lateral view (total length: 34 mm); – B. mouthpart (scale: 2 mm).

Measurements [in mm]: total length 34; body length 14; body depth 4,5; body width 7; internostril distance 1,8; eye-nostril distance 2; eye-snout distance 4; interorbital distance 1,6; caudal depth 7.

Body depressed and widest behind the level of the eyes. Snout rounded in dorsal and lateral profiles. Nostrils dorsal and directed laterally. Eyes small, directed dorsolaterally. Spiracle sinistral. Cloacal tube within the ventral fin. Fins equal in height.

Mouth directed anteroventrally. Oral disc not emarginate. Labial teeth in two anterior and three posterior rows [tooth row formula 2(2)/3(1) sensu ALTIG, 1970]. Anterior and posterior jaw slender and with fine serrations; anterior jaw broader than posterior. Posterior labium bordered by an irregularly interrupted row of papillae extending to the lateral margins of the anterior labium.

In life and in preservative (formalin), the tadpole is suffused with small, scattered melanophores on the dorsum and diminishing the venter. Some dark irregular mottling occur on the dorsum. The fins are unpigmented.

The slender tadpoles are very agile and in captivity hide under leaf litter when disturbed. Nothing is known about their natural habitat, but additional field observations on males calling from subterranean tunnels in *Atta*-nests confirm our assumption, that *L. lineatus* constructs its foam nests in water reservoirs of the leaf-cutting ants.

3. Note on resistance to leaf-cutting ants

SCHLÜTER & REGÖS (1981) discussed the coexistence of *L. lineatus* with *Atta cephalotes* and mentioned that all specimens, captured at the entrances of *Atta*-nests, release an aromatic maggi cube like taste (taste of the "maggi plant" *Levisticum officinale*, Apiaceae). In captivity they loose this taste and get killed by the ants. Two

Fig. 2. *L. lineatus*, captured in the field and helt in captivity, were killed by the leaf-cutting ant *Atta cephalotes* within a few minutes.

adult frogs, captured at the entrance of an *Atta*-nest and helt in captivity in Lima for two months were killed by the ants within some minutes, when being brought back to "their" ant nest. A further experiment in the ant exposition of the Muséum d'Histoire Naturelle de Genève showed the same result. Two adult frogs from Panguana and two adults being borne in captivity were also killed by *Atta cephalotes* within a few minutes (Fig. 2). In all cases the frogs did not release any case of aromatic taste.

4. Acknowledgements

Whe thank Dr. Hans-Wilhelm Koepcke (Hamburg) and his daughter Dr. Juliane Diller (München) for providing the possibility to continue our investigations of anuran ecology at Panguana. Unfortunately we cannot express our gratitude to Maria E. Rioloba W. (†) (Lima) who always gave dwelling to our frogs in her house. Dr. Claude Besuchet made possible our experiment in the ant exposition of the Muséum d'Histoire Naturelle of Geneva. We are especially grateful to Dr. W. Ronald Heyer (Washington) and to an unknown referee who made helpful comments on the manuscript. Ing. José Purisaca (Ministerio de Agricultura, Lima) and Dra. Nelly Carrilo de Espinoza (Museo de Historia Natural, Lima) provided us their generous cooperation (collecting permit No. 108-88-AG-DGFF-DFFS-SDAF).

5. References

Altig, R. (1970): A key to the tadpoles of the continental United States and Canada. – Herpetologica **26**: 180–207; Chicago.

Cochran, D. M. & C. J. Goin (1970): The frogs of Colombia. – Bull. U. S. natn. Mus. **288**: 1–655; Washington.

Duellman, W. E. (1978): The biology of an equatorial herpetofauna in Amazonian Ecuador. – Misc. Publ. Mus. nat. Hist. Univ. Kansas **65**: 1–352; Lawrence.

Duellman, W. E. & C. A. Toft (1979): Anurans from Serranía de Sira, Amazonian Perú: Taxonomy and biogeography. – Herpetologica **35** (1): 60–70; Chicago.

Gosner, K. L. (1960): A simplified table for staging anuran embryos and larvae with notes on identification. – Herpetologica **16**: 183–190; Chicago.

Hoogmoed, M. S. (1973): Notes on the herpetofauna of Surinam IV. The lizards and amphisbaenians of Surinam. – Biogeographica **4**: 1–419; The Hague.

– (1986): Ergänzende Beobachtungen an *Lithodytes lineatus* (Schneider, 1799) (Salientia: Leptodactylidae). – Salamandra **22** (2/3): 215–217; Bonn.

Lynch, J. D. (1979): The amphibians of the lowland tropical forests. – *In*: Duellman, W. E. (1979) (ed.): The South American herpetofauna: Its origin, evolution, and dispersal. – Monogr. Mus. nat. Hist. Univ. Kansas **7**: 189–215; Lawrence.

Nelson, C. E. & G. A. Miller (1971): A possible case of mimicry in frogs. – Herpetol. Rev. **3** (6): 109; New York.

Regös, J. & A. Schlüter (1984): Erste Ergebnisse zur Fortpflanzungsbiologie von *L. lineatus* (Schneider, 1799) (Amphibia: Leptodactylidae). – Salamandra **20** (4): 252–261; Bonn.

Schlüter, A. (1980): Bio-akustische Untersuchungen an Leptodactyliden in einem begrenzten Gebiet des tropischen Regenwaldes von Peru (Amphibia: Salientia: Leptodactylidae). – Salamandra **16** (4): 227–247; Frankfurt am Main.

Schlüter A. & J. Regös (1981): *L. lineatus* (Schneider, 1799) (Amphibia: Leptodactylidae) as a dweller in nests of the leaf-cutting ant *Atta cephalotes* (Linnaeus, 1758) (Hymenoptera: Attini). – Amph. Rept. **2** (2): 117–121; Wiesbaden.

Authors' addresses:

Dr. Andreas Schlüter, Staatliches Museum für Naturkunde, Museum Schloss Rosenstein, Rosenstein 1, D-70191 Stuttgart, Germany and

Dr. János Regös, Institute of Zoology, Estarházy, Károly Teacher's College, H-3300 Eger, Hungary.