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The Systematic Status of *Adenomera griseigularis* Henle, with Comments on Systematic Problems in the Genus *Adenomera* (Amphibia: Leptodactylidae)

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Abstract. *Adenomera griseigularis* Henle is a junior synonym of *Leptodactylus wagneri* (Peters). Systematic problems and opportunities are discussed for certain members of the genus *Adenomera*. Researchers are cautioned that resolution of certain taxa will require non-morphological data.

Introduction

Examination of the holotype (and only known specimen) of *Adenomera griseigularis* Henle reveals that it is not a member of the genus *Adenomera*. The main purpose of this paper is to discuss the systematic status of *A. griseigularis*, but certain species problems in *Adenomera* are also discussed.

The Status of *Adenomera griseigularis* Henle, 1981

Henle (1981) described *Adenomera griseigularis* on the basis of a single juvenile specimen, ZMFK Bonn 31800, from Tingo Maria, Peru (fig. 1). The specimen is somewhat dessicated and the posterior sternal region has been destroyed. The holotype differs in two marked respects from all other members of the genus *Adenomera*. The holotype has extensive fringing on the sides of the toes and lacks numerous white tubercles on the sole of the foot and outer tarsus. No other *Adenomera* has toe fringes or webs, and all other *Adenomera* have distinct, white tubercles on the outer tarsus and sole of the foot. Several *Leptodactylus* species have toe fringes and lack distinct white foot and tarsal tubercles, however. *Leptodactylus wagneri* (Peters, 1862) shares these two characters with the holotype of *A. griseigularis* as well as the following characteristics: first finger noticeably longer than second; dorsolateral folds absent; tarsal fold extending almost the full length of tarsus; a broad and diffuse light interorbital band bordered behind by a dark triangular mark extending to the shoulder region; two pairs of symmetrical dark dorsal blotches in addition to a broad dark dorsal band in the sacral region; posterior surface of thigh distinctly mottled; throat region suffused with melanophores (Henle stated this pattern

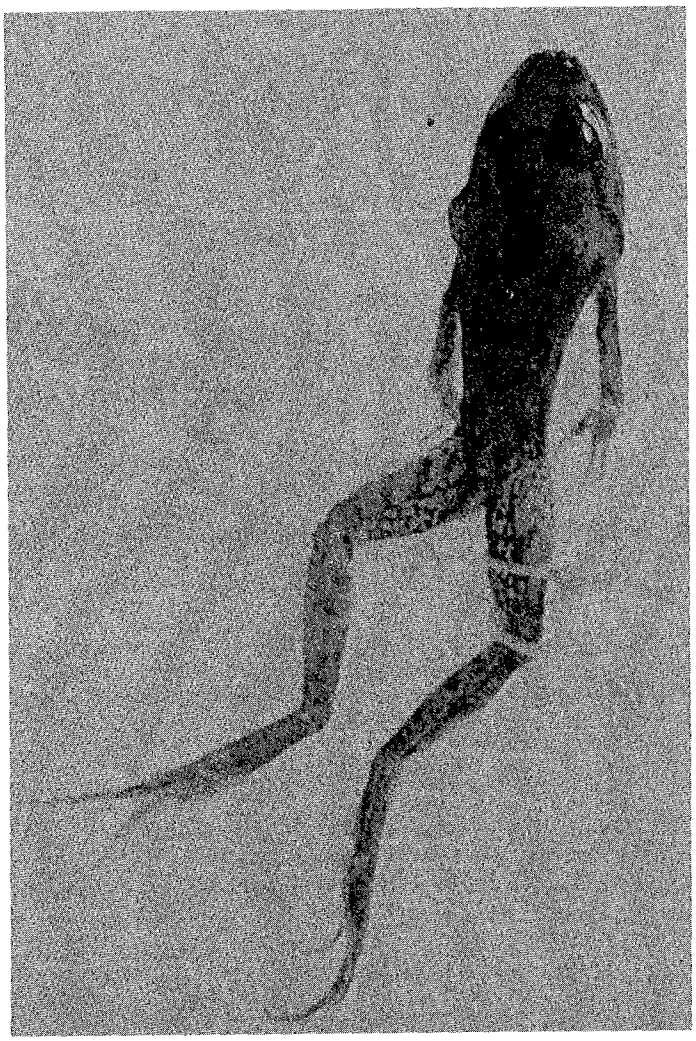

Fig. 1. Holotype of *Adenomera griseigularis* Henle.

was diagnostic in *Adenomera*; the pattern is common in *Leptodactylus*); belly light; 23.7 mm SVL juvenile size (this is adult size for *Adenomera* species).

A major diagnostic feature for differentiation of adult *Adenomera* and *Leptodactylus* is the shape of the terminal phalanges: T-shaped (but not expanded) in *Adenomera* and knobbed in *Leptodactylus*. The terminal phalanges are visible in a couple of the dessicated toe tips of the holotype of *A. griseigularis*: they are knobby and T-shaped, but not expanded. This intermediate condition, although interesting, is not surprising, as there is not a large morphological difference between the knobby and unexpanded T-shaped terminal phalangial states. An ontogenetic series of *Leptodactylus wagneri* should be examined to document the development of the terminal phalangial shape.

The holotype of *A. griseigularis* was taken from a puddle in secondary growth forest. *Leptodactylus wagneri* also occurs at Tingo Maria (USNM 196019-25) and characteristically occurs in this type of habitat.

On the basis of the aforementioned data, together with direct comparison of specimens, *Adenomera griseigularis* Henle, 1981, is considered a synonym of *Leptodactylus wagneri* (Peters, 1862).

Systematics of *Adenomera* Species

The most recent revision of the genus (Heyer, 1973) proposed several systematic changes. Since that revision and prior to Henle's description of *A. griseigularis*, another species of *Adenomera* was proposed as new (Heyer, 1975). As currently understood, there are six described valid species: two with very distinct color patterns (*A. lutzi* and *martinezi*), and four differing from each other by rather subtle differences of color pattern and toe tip shape (*A. andreae, bokermanni, hylaedactyla*, and *marmorata*). Within this latter cluster of species, a few systematic problems remain.

Throughout much of the distribution of *Adenomera*, two species occur sympatrically: a forest associated species with expanded toe disks and an open formation associated species with slender non-expanded toe tips. The data, which have accumulated since the revision of 1973, both in terms of additional specimens and advertisement call recordings, are still consistent with the recognition of two forest associated species: *A. andreae* throughout Amazonia and *A. marmorata* in the Atlantic Forest system. The status of the slender toed, open formation associated species is unresolved, however. As noted earlier (Heyer, 1977), Werner C. A. Bokermann and Eugenio Izecksohn informed me that the species I had defined as *A. bokermanni* in 1973 was a composite of at least two species, clearly differentiated on the basis of advertisement calls. I have since recorded, with voucher specimens, two very distinctive call types (pulsed versus non-pulsed) of morphological "*bokermanni*". After obtaining the recordings and voucher specimens, I reborrowed most of the "*bokermanni*" specimens which I had examined previously. I am able to discern differences between the population samples for which I have voucher recordings when the specimens are placed in a single tray. However, I am unable to associate individuals from localities for which calls are unavailable with the vouchered populations. The various populations of "*bokermanni*" differ in very subtle morphological and pattern characteristics, in ways that I have been unable to associate with species differences. In the case of "*bokermanni*", advertisement calls are necessary to clarify the systematics of the currently recognized composite species. The kind of subtle population variation found in "*bokermanni*" also occurs throughout the range of *A. hylaedactyla*, so *hylaedactyla* may be a composite as well. The available call data are suggestive, but not conclusive, that *A. hylaedactyla* is a composite, but few additional (to those reported in Heyer, 1973) recordings have come to my attention (unpublished recordings from Manaus, Brasil, and those reported from Peru by Schlüter, 1980).

In order for the systematics of *Adenomera* to be resolved, topotypic advertisement call recordings are necessary. This resolution should occur before any further *Adenomera* allied to the *andreae-bokermanni-hylaedactyla-marmorata* clusters are described.

Although the systematics of the *Adenomera andreae, bokermanni, hylaedactyla, marmorata* cluster cannot be clarified on the basis of morphology and color pattern, study of non-morphological characters in this group should be rewarding. The systematics do seem to be resolvable with advertisement call data. *Adenomera* advertisement calls are challenging to record, but given time, patience, and a long microphone cable, they are

obtainable. Usually individuals stop calling when approached, but if not disturbed enough to jump, they will start calling within another half hour. Recordings of several individuals are usually needed before a voucher is captured, as the frogs are small and call from the base of grass or in the leaf litter and are difficult to precisely locate even in a 20 cm area where the calling has been pinpointed. A feature worth detailed study should be the karyotypic evolution of members of this genus. As currently understood, the diploid karyotype ranges from 24 to 26 chromosomes with considerable differentiation in chromosome morphology (Bogart, 1974). Speciation in the genus *Adenomera* may have been by the stasipatric model involving chromosomal changes. If so, this would provide an interesting contrast to the majority of other Neotropical frogs, which show uniformity of karyotypes at the generic level and did not likely speciate via the stasipatric model.

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