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Remarks on the type specimen of *Gonocephalus mjobergi* Smith, 1925 (Sauria: Agamidae)

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Abstract. The type specimen of *Gonocephalus mjobergi* Smith, 1925 has been re-examined. A remarkable character, longitudinal folds in the gular region has been discovered which is unique among agamids of the genus *Gonocephalus* Kaup. *G. mjobergi* has been compared to members of the genera *Ptyctolaemus* and *Mantheyus* and it is concluded that these genera form a monophyletic group and *G. mjobergi* is referred to as “Gen. A.” *mjobergi* until further material becomes available.

Keywords. Agamidae, *Gonocephalus mjobergi*, type specimen.

INTRODUCTION

Historically, the genus *Gonocephalus* Kaup, 1825 included at some stage species from the genera *Acanthosaura* Gray, 1831, *Coryphophylax* Blyth, 1860 and *Hypsilurus* Peters, 1867 (see for example BOULENGER 1885, SMITH 1935 and WERMUTH 1967). MOODY (1980) removed all species belonging to the Melanesian-Australian radiation and Andaman-Nicobar species from its synonymy with *Gonocephalus* Kaup and revived the genera *Coryphophylax* (Blyth) and *Hypsilurus* (Peters) as well as *Arua* (Doria). The *Hypsilurus* and *Arua* species complex has been reviewed in detail more recently by MANTHEY & DENZER (2006).

Most *Gonocephalus* species were reviewed by MANTHEY & DENZER in the early 1990ies and arranged in species groups (MANTHEY & DENZER 1991) on grounds of morphological similarities. There are currently five groups recognised:

- a) *bornensis* group including *beyschlagi*, *liogaster*, *bornensis*, *belli*, (*denzeri*) and the Philippine species *semperi*, *interruptus* and *sophiae* assigned to this group here.
- b) *chamaeleontinus* group comprising *chamaeleontinus*, *doriae* (2 subspecies, *G. d. doriae* and *G. d. abbotti*) and *kuhlii*.
- c) *megalepis* group comprising *megalepis*, *klossi*, *lacunosus*.

- d) *robinsonii* group comprising *robinsonii* and *mjobergi* (tentatively assigned to this group by MANTHEY & DENZER 1991).
- e) *grandis* group comprising only *grandis*.

Overall there are currently 17 species recognised with *G. denzeri* pending further material and verification. MANTHEY & GROSSMANN (1997) synonymised *G. denzeri* with *G. bornensis* because *G. bornensis* reveals a high variability in morphometric characters and pholidodis which includes characters of *G. denzeri*. The examination of additional 55 specimen and images of about 30 living specimen (MANTHEY unpubl.) including the type specimens of both species (RMNH 3043, 3044 and ZFMK 50527, 50528) gives rise to the assumption that *G. bornensis* and *G. denzeri* are conspecific. We note, however, that if just the type specimens are considered there are significant differences in dorsolateral pholidodis. While in *G. bornensis* dorsolateral scalation is homogeneous *G. denzeri* clearly shows clusters of enlarged scales dorsolaterally. Future phylogenetic studies using biomolecular and genetic methods will hopefully resolve this issue.

Morphologically the genus *Gonocephalus* is highly diverse and solely defined by a few characters, i. e. basal scales adjacent to the nuchal and dorsal crests, a transverse gular fold, a sharp canthus rostralis and an “angled” supra-



Fig. 1. Dorsolateral view of the type specimen (BMNH 1946.8.13.87) showing the oblique rows of enlarged dorsolateral scales.



Fig. 2. Ventral view of the type specimen (BMNH 1946.8.13.87); note the clearly discernible longitudinal folds on the gular region.

ciliary ridge. Some of these characters are not well developed in several of the species groups above. The most resemblance to these generic features is exhibited by members of the *G. chamaeleontinus* species group.

Several species such as *G. grandis* and *G. robinsonii* show hardly any resemblance to the remaining species of the genus. An isolated species was described by SMITH (1925) as *Gonocephalus mjobergi* based on a single female specimen collected by Mjöberg on Mt. Murud at an altitude of 7000 feet (2134 m). Until today this has remained the only known adult specimen of the species. Owing to its superficial resemblance and shared ecological niche *G. robinsonii* and *G. mjobergi* were tentatively grouped by MANTHEY & DENZER (1991). In the course of our investigations into high altitude forms of *Gonocephalus* in particular *G. robinsonii* (Boulenger, 1908) we re-examined the type specimen of *G. mjobergi* (Smith, 1925).

RESULTS

Gonocephalus mjobergi was described on the basis of a single female collected on Mount Murud, Sarawak. Several features of type specimen are in poor condition. We re-examined the holotype (BMNH 1946.8.13.87, formerly BMNH 1924.8.28.8) and discovered characteristics not mentioned in the original description. While the gular sac is incomplete (SMITH l. c.: “the tip missing”) it is difficult to determine its actual size. From the original drawings it could already be concluded that it might reach further onto the chest than in any other species of *Gonocephalus* except perhaps *G. robinsonii*. When we examined the holotype we were surprised that despite the incompleteness it was clear that the onset of a complete the gular sac would have reached the clavicular region. A feature clearly distinguishing *G. mjobergi* from all other *Gonocephalus* is the possession of enlarged dorsolateral scales forming oblique rows. The first row is located in the shoulder region and two distinct rows across the back as can be seen in Fig. 1. Dorsolaterally enlarged scales are present in some species of *Gonocephalus* from Sumatra, in particular *G. megalepis* (Bleeker, 1860), *G. klossi* Boulenger, 1920 and *G. lacunosus* Manthey & Denzer, 1991 but never in such a geometrical arrangement as can be found in the type specimen of *G. mjobergi*. Another feature in *G. mjobergi* is the possession of an enlarged platelike scale below the tympanum which is separated from the tympanum by two rows of small scales. Additionally, we discovered that *G. mjobergi* possesses two parallel longitudinal gular folds a feature not mentioned at all by Smith (l.c.). No other *Gonocephalus* species possesses this outstanding character which can clearly be seen in figure 2. Both folds start on the distal part of the gular region approximately bordering the serrated edge in the middle line



Fig. 3. Ventral view of the juvenile *Gonocephalus* sp. collected on Mt. Murud (ZRC 2.5953).

of the pouch. The outer one runs nearly parallel to the centre line of the gular pouch and continues onto the anterior part of the chest. It partially conceals the *Gonocephalus* typical transverse fold. The inner folds are shorter and curve inside towards the centre line. This feature is very similar to the longitudinal gular folds known from species of the genera *Ptyctolaemus* Peters, 1864 and *Mantheyus* Ananjeva & Stuart, 2001. ANANJEVA & STUART (2001) depict the gular region of the latter two genera. The arrangement and colouration in *G. mjobergi* is rather comparable to that in *Ptyctolaemus*. It consists of two rows (grayish white in alcohol) with dark colouration of the skin in between. This indicates that this character independently developed in *Ptyctolaemus*, *Mantheyus* and *Gonocephalus mjobergi* and seems to be an autapomorphy. All three species also lack a transverse gular fold present in *Gonocephalus*.

However, *G. mjobergi* is by no means congeneric with either *Ptyctolaemus* or *Mantheyus*. Both genera *Ptyctolaemus* and *Mantheyus* have scaled tympani as opposed to *G. mjobergi*; additionally, *Mantheyus* has femoral pores. Within this cluster only *G. mjobergi* shows oblique rows

of enlarged dorsolateral scales. Because of the type specimen of *G. mjobergi* being a female we hypothesize that the gular sac will be even larger in male specimens which would distinguish it further from the genera discussed here with the exception of *G. robinsonii*.

As a consequence we propose to combine *Ptyctolaemus*, *Mantheyus* and *G. mjobergi* in a genus group with longitudinal gular folds being an autapomorph character for the cluster constituting a synapomorphy for the three genera, hence pointing towards monophyly of this group.

Owing to the lack of specimens for *G. mjobergi* we prefer to take a conservative view and not define a new monotypic genus until more material becomes available. Here we suggest to refer this species as "Genus A." *mjobergi*.

I. Das (University of Malaya) collected a specimen of a juvenile *Gonocephalus* on Mt. Murud and referred to it as *G. mjobergi*. This specimen has been depicted in DAS (2006: 84) and was deposited in the Singapore Zoological Reference Collection (ZRC 2.5953). The colouration in life is a vivid green with darker reticulate pattern. This is in accordance with SMITH's (l. c.) description of the colouration of the female which has been described as „grass-green in life“. However, several other species of *Gonocephalus* show this kind of colouration. In particular juvenile specimens of *G. liogaster* (Günther, 1872) and *G. bornensis* (Schlegel, 1848) show a large resemblance to the specimen depicted by DAS (l.c.) as can be seen for example in fig. 136 of MANTHEY & GROSSMANN (1997) and fig. 254 of MALKMUS et al. (2002).

Additionally, the juvenile specimen from Mt. Murud does not possess enlarged dorsolateral scales or an enlarged scale below the tympanum as described for the type. Such a feature is, however, not depending on age and should be developed early on in life. A ventral view including details of the gular region is shown in figure 3. As can be seen the gular region of the juvenile specimen does not show any feature resembling parallel longitudinal folds and therefore propose that ZRC 2.5953 should be referred to as *Gonocephalus* sp. until more material for comparison becomes available.

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