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A new species of *Gephyromantis* from Ranomafana National Park, south-eastern Madagascar

(Amphibia, Anura, Mantellidae)

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We describe a new species of mantellid frog from high elevations at Mount Maharira, Ranomafana National Park, in Madagascar. *Gephyromantis runewsweeki,* spec. nov., is assigned to the *Gephyromantis boulengeri* group based on its small size, paired subgular vocal sacs, externally fused lateral metatarsalia, and diurnal emission of advertisement calls independent from water bodies. The new species has only faint morphological differences to other, sympatric species of the group such as *G. enki* and *G. blanci* but differs in advertisement calls, which consist of a continuous series of cricket-like notes, arranged in note groups of 2-4; additionally, the new species shows a substantial genetic differentiation in a fragment of the mitochondrial 16S rRNA gene to all other species in the *G. boulengeri* group. The characteristic calls of the new species have so far not been recorded from other sites in Madagascar, highlighting a possible trend of local endemism and reduced range size in the putatively direct-developing species of this group.

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Introduction

Frogs of the family Mantellidae are an extremely diverse monophyletic radiation endemic to Madagascar and the Comoro island of Mayotte (Blommers-Schlösser & Blanc 1991, Glaw & Vences 2003, Vences et al. 2003b). The largest mantellid genus, *Mantidactylus* sensu lato, was known to be paraphyletic with respect to the genus *Mantella* (e.g. Richards et al. 2000, Vences et al. 2003b) and contained an enormous variety of species, in terms of morphology, ecology and reproductive modes. In a paper currently in progress of publication, Glaw & Vences (in press) consequently propose a partition of *Mantidactylus* into seven genera that correspond to well-defined monophyletic groups. Of these clades, the genus *Gephyromantis* contains those species that were previously classified in two subgenera of *Mantidactylus*, namely *Gephyromantis* and *Phylacomantis*. These frogs are characterized by derived reproductive modes. Some species (subgenus *Phylacomantis* sensu stricto) have specialized tadpoles of carnivorous habits, but other species are known to call from isolated positions far from water bodies, and for two species, records of direct development exist: *Gephyromantis asper* and *G. eiselti* (Blommers-Schlösser 1979, Glaw & Vences 1994).

One subgroup of *Gephyromantis* contains a number of small species of diurnal calling habits. These always call from low perches, independent from water, often dispersed in humid rainforest: *Gephyromantis blanci, G. boulengeri, G. decaryi, G. eiselti, G. enki, G. leucocephalus,* and *G. thelenae* (Glaw & Vences 1994, 2000, 2002, in press). The relationships

among these seven species are not fully clarified, but they constitute a clear monophyletic group based on molecular data (M. Vences, unpublished data). Although being morphologically very similar, most of these species show strong bioacoustic divergence.

During recent fieldwork in Ranomafana National Park in south-eastern Madagascar, we collected a new species of frog belonging to this group of strong morphological similarity to other, sympatric species, but with unique call features. The goal of the present paper is to formally describe this new species.

Materials and methods

Frogs were captured by locating calling males during the day. They were euthanised using chlorobutanol solution, fixed either in 95 % ethanol, and preserved in 70 % ethanol. Voucher specimens were deposited in the herpetological collections of the Museo Nacional de Ciencias Naturales (MNCN), the Zoologische Staatssammlung München (ZSM), and the Zoological Museum Amsterdam (ZMA); a further museum acronym used is MNHN for the Muséum National d›Histoire Naturelle, Paris. Morphometric measurements were taken by M.V. to the nearest tenth of millimeter using a caliper: snout-vent length (SVL); maximum head width (HW); head length from tip of snout to posterior edge of snout opening (HL); horizontal tympanum diameter (TD); horizontal eye diameter (ED); distance between anterior edge of eye and nostril (END); distance between nostril and tip of snout (NSD); distance between both nostrils (NND); forelimb length, from limb insertion to tip of longest finger (FORL); hand length, to the tip of the longest finger (HAL); hindlimb length, from the cloaca to the tip of the longest toe (HIL); tibia length (TIL); foot length including tarsus (FOTL); foot length (FOL); length and width of the femoral gland on one shank in external view (FGL, FGW).

Muscle tissue samples were taken from freshly killed adult and larval specimens in the field and preserved in pure ethanol. DNA was extracted and a fragment of the mitochondrial 16S rRNA gene amplified and sequenced using the primers 16SA-L and 16SB-H (Palumbi et al. 1991) and compared with those of a near-complete database of Madagascan frogs that included homologous sequences of all other species of the *Mantidactylus boulengeri* group. The alignment of these sequences required inclusion of only few single gaps to account for indels and had a total length of 538 base pairs. The sequence of the new species (from paratype MNCN 42085) has been submitted to Genbank and has the accession number AY848308. It was compared with a series of accession numbers of related species, included in the sequence set AY847959-AY848683.

Advertisement calls were recorded using a portable tape recorder (Sony WM D6C) with external microphone (Vivanco). Recordings were processed on an Apple Macintosh computer; they were digitized and edited at a samplig frequency of 44.1 kH and 16 bit resolution with a Delta 66 digitizing board and Peak 3.2 (OSX). Raven 1.1 (Cornell University, Ithaca, New York) software was used to obtain numerical information and to generate audiospectrograms and oscillograms. Frequency information was obtained through fast Fourier transform (FFT; width, 1024 points). Digitized recordings are deposited at the Fonoteca Zoológica, Museo Nacional de Ciencias Naturales, Madrid (track numbers 2765-6).

Gephyromantis runewsweeki, spec. nov.

Figs 1-4, 6

Types. Holotype: ZSM 49/2005, collected by M. Vences, I. De la Riva, E. and T. Rajearison on 25 January 2004 at the top of Maharira mountain, Ranomafana National Park, south-eastern Madagascar (21°20.053' S, 47° 24.787' E), ca. 1350 m above sea level. – **Paratype:** MNCN 42085, adult male with same collecting data as holotype.

Diagnosis. A species of the *Gephyromantis boulengeri* group (as defined by Glaw & Vences in press) based on a combination of the following characters: paired blackish subgular vocal sacs, small body size (SVL 23-24 mm), externally connected lateral metatarsalia, slightly enlarged terminal disks of fingers and toes, diurnal emission of advertisement calls from isolated positions (not concentrated around water). Distinguished from all other species of the group by arrangement of advertisement call notes in distinct note groups (vs. emitted in long or short series, not subdivided into distinct note groups). Furthermore, distinguished from *G. boulengeri* and *G. leucocephalus* by presence of continuous dorsolateral folds (vs. absence), from *G. eiselti, G. enki* and *G. thelenae* by longer hindlimbs (tibiotarsal articulation reaching slightly beyond snout tip vs. usually not reaching snout tip), and from *G. blanci* and *G. decaryi* by relatively small and indistinct femoral glands (vs. larger and distinct glands). Also distinguished from *G. eiselti*, *G. thelenae*, *G. enki* and *G. decaryi* by a more strongly expressed ventral pattern, especially by the presence of dark marbling on ventral surface of hindlimbs (vs. absence). Genetically the new species resulted to be strongly divergent from all other species of the group as revealed

Fig. 1. Holotype of *Gephyromantis runewsweeki*, spec. nov. (ZSM 49/2005) in life, lateral and dorsal view.

Fig. 2. Holotype of *Gephyromantis runewsweeki*, spec. nov. (ZSM 49/2005) in life, ventral view.

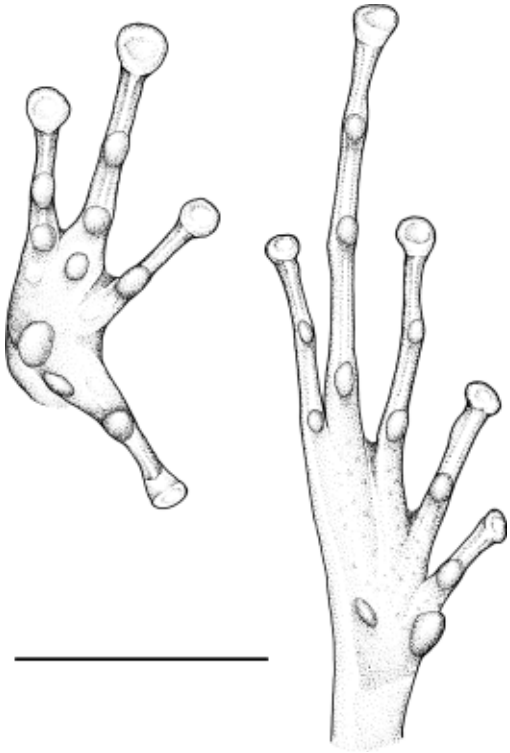

Fig. 3. Drawings of hand and foot (ventral view) of *Gephyromantis runewsweeki*, spec. nov. (holotype ZSM 49/2005). Scale equals 5 mm.

by a comparison of sequences of a fragment of the 16S rRNA gene (>3.5 % uncorrected pairwise sequence divergence).

Etymology. The specific name is derived from the name of the Russian edition of the magazine "Newsweek", in recognition for the financial support to biodiversity research and nature conservation by Russian Newsweek through the BIOPAT program. The name is used as an invariable noun in apposition.

Description of the holotype

Adult male (collected while emitting advertisement calls) in good state of preservation, with extremities of fingers and toes slightly shrunken due to dessication or too intensive fixation, and some tissue from the right thigh removed for DNA extraction (Fig. 1-3). Body slender; head longer than wide, slightly narrower than body; snout rather rounded in dorsal and lateral view; nostrils directed laterally, slightly protuberant, closer to tip of snout that to eye; canthus rostralis distinct, moderately concave; loreal region concave; tympanum distinct, small, its diameter 48 % of eye diameter; supratympanic fold present, slightly curved. Tongue ovoid, distinctly bifid posteriorly; vomerine teeth absent; choanae small and rounded. Forelimbs slender; subarticular tubercles single; inner and outer metacarpal tubercles present, moderately marked; webbing among fingers absent; relative finger length $1<2<4<3$; finger disks slightly enlarged; no nuptial pads on inner side of first finger. Legs slender; when legs are adpressed along body, the tibiotarsal articulation reaches slightly beyond snout tip; lateral metatarsalia connected; inner metatarsal tubercle distinct, small, protruding; outer metatarsal tubercle smaller than inner; webbing of foot vestigial between toes 2-3 and 3-4; relative toe length $1<2<5\leq3<4$. Skin on the dorsum slightly granular, with a pair of dorsolateral dermal ridges. Ventral skin smooth on throat and chest and distinctly granular on belly. Small femoral glands, close to cloaca, internally composed of five granules each.

Colour of the holotype. In preservative, dorsum and dorsal part of head and limbs greyish-brown, with irregular or slightly elongated pale grey spots outlined in dark grey; a brown broad stripe from nostril through the eye and the temporal region to a point of the flank at the level of the insertion of the forelimb; a white line from the rictus to the insertion of the forearm, bordering the lower margin of the temporal stripe; upper lip grey with irregular, small brown blotches, not forming a barred pattern; lower lip brown with cream dots; flanks pale grey with small, irregular dark grey mottling; upper part of vocal sacs dark grey with white diffuse mottling; medial part of vocal sacs grey. Throat brown with cream mottling; a white irregular medial stripe from chin to chest; anterior part of venter greyish-cream with diffuse brown mottling; belly greyish-cream. Ventral surface of limbs and posterior surface of thighs cream with a marked pattern of brown irregular blotches; palmar and plantar surfaces pale brown. In life, dorsal parts of head and body greyish-brown with pale yellow blotches outlined in dark grey; canthal and temporal stripe dark brown, outlined inferiorly by a yellow line; upper lip golden-cream and upper surfaces of feet reddish-brown; gular medial stripe pale cream; ventral surfaces cream with irregular brown blotches. Iris yellowish-green spotted with black flecks (Fig. 1).

Variation. The paratype (Fig. 4) is morphologically similar to the holotype but lacks a marked pattern of pale dorsal spots. It is dark brown dorsally, with dark irregular markings and pale minute flecks scattered on dorsum; the limbs have dark brown bars.

Fig. 4. Paratype of *Gephyromantis runewsweeki*, spec. nov. (MNCN 42085) in life, dorsal view.

Measurements. All given in mm. The first value refers to the holotype, the second value (in parentheses) to the paratype. SVL 23.8 (22.5), HW 7.4 (6.9), HL 8.7 (8.5), TD 1.4 (1.4), ED 2.9 (2.7), END 2.1 (2.0), NSD 1.7 (1.5), NND 2.4 (2.0), FORL 16.5 (13.8), HAL 7.4 (6.7), HIL 44.1 (41.0), FOTL 20.3 (18.4), FOL 12.1 (11.8), TIL 13.6 (12.7), FGL 2.2 (2.0), FGW 1.2 (1.2).

Available earlier names. Considering the revisions of Glaw & Vences (2000, 2002), one name is considered to be a junior synonym of a species in the *Gephyromantis boulengeri* group and needs to be considered as possible earlier name for *G. runewsweeki: Gephyromantis verrucosus* Angel, 1930, which is seen as synonym of *Gephyromantis boulengeri* according to Blommers-Schlösser & Blanc (1991) and subsequent authors. The type locality of *verrucosus* is Fort Carnot (= Ikongo) in south-eastern Madagascar. This site is at an elevation of ca. 600 m above sea level, but it cannot be excluded that the type specimens were collected in forested regions nearby at higher altitudes. Glaw & Vences (2002) have shortly reported on the two syntype specimens of *verrucosus* (MNHN 1930.443-444) which are in a poor state of preservation, but which by morphological features most resemble *G. boulengeri*. This and the probably low elevation of the type locality, which would fit with the distribution pattern of *G. boulengeri*, support current synonymy and argue against using this name for the specimens here described as *G. runewsweeki*.

Natural history. Calls of *G. runewsweeki* were commonly heard on top of Mount Maharira, which is the highest peak within the boundaries of Ranomafana National Park, reaching more than 1350 m (Fig. 5). At Maharira, we heard *G. enki* and *G. decaryi* commonly at lower altitudes (1000-1200 m; no precise elevation data available), but these species became less frequent towards higher elevations. The first calls of *G. runewsweeki* were heard in rainforest on the way towards the summit, but the species did not appear to be common at these sites. The summit is characterized by large bare surfaces of granitic rock, surrounded by heath- and bushland and patches of rainforest. *G. runewsweeki* was intensely calling from perch heights of 10 cm to 1.5 m in these bushes during our visit in the late afternoon (16:00-17:00 h), with misty weather conditions.

Although rarely, we also heard calls reminding those of *G. runewsweeki*, from localities at rather high altitude (probably > 1000 m) along the road leading from Vohiparara to Fianarantsoa, within Ranomafana National Park, indicating that the species is

Fig. 5. Surroundings of Maharira Mountain at Ranomafana National Park, Madagascar.

probably not endemic to Mount Maharira but occurs at other sites in the region as well. However, these acoustic observations require verification.

Although we observed sound production in *G. runewsweeki*, we are unable to make a definitive statement on the shape of the inflated subgular vocal sac, although it seemed to be double or at least bilobate as seen from an unfavorable lateral angle. Each note in the advertisement call corresponded to one expiration, and note repetition rate was fast (see below). Vocal sac movement during sound emission was therefore fast as well, posing additional difficulties for observation.

Advertisement calls. The call of *G. runewsweeki* as recorded on 25 January 2004, 16-17 h, at the type locality, consists of fast repeated cricket-like, moderately high-pitched notes (Fig. 6). Recording temperature could not be measured at the type locality, but based on measurements on the same day in Maharira forest can be estimated at ca. 18 °C. A call is composed of note series, each of which mostly consists of three notes, although exceptionally they can contain two or four notes. The subsequent analyses refer to two calls from two different individuals, of which five and seven note groups were analysed, respectively. The first individual emitted slightly longer calls than the second individual, and they were separated by shorter intervals. Duration of note groups was 171-261 ms (mean 203.8; SD = 37.29; n = 5) in the first individual and 142-158 ms (mean, 148.7; SD = 5.21; n = 7) in the second individual. Duration of notes was 57-73 ms in the first individual (mean 63.6; SD = 6.46; n = 16) and 47.3-50.3 in the second individual (mean 49.0; SD = 1.18; n = 21), with a note repetition rate of 13.7-17.5 notes/s (mean, 15.8; SD = 1.57, n = 16) and 19.9-21.1 notes/s (mean, 20.4; SD = 0.49, n = 21) respectively. Intervals between note groups in the first individual were 278-380 ms (mean, 345,6; SD = 58.6; n = 4) and in the second individual 424-457 ms (mean, 439.4; SD = 10.58; n = 6). The average note group repetition rate was 1.9 note groups/s. Two note groups with two notes each (recorded from a third individual) were 107 and 134 ms in duration (mean, 120.5), and the only one with four notes (from the first individual), 261 ms. Main amplitude was found between 1793-5060 kH, with dominant frequency at 4048-4522 kH (mean, 4234.8; SD = 151.81; n = 12); fundamental frequency was at 1981-2196 kH (mean, 2124.6; SD = 67.04; n = 12). Some harmonics were present around 6000-7000 kH.

Due to the methodological difficulties inherent to call descriptions (e.g. Glaw & Vences 1994) the

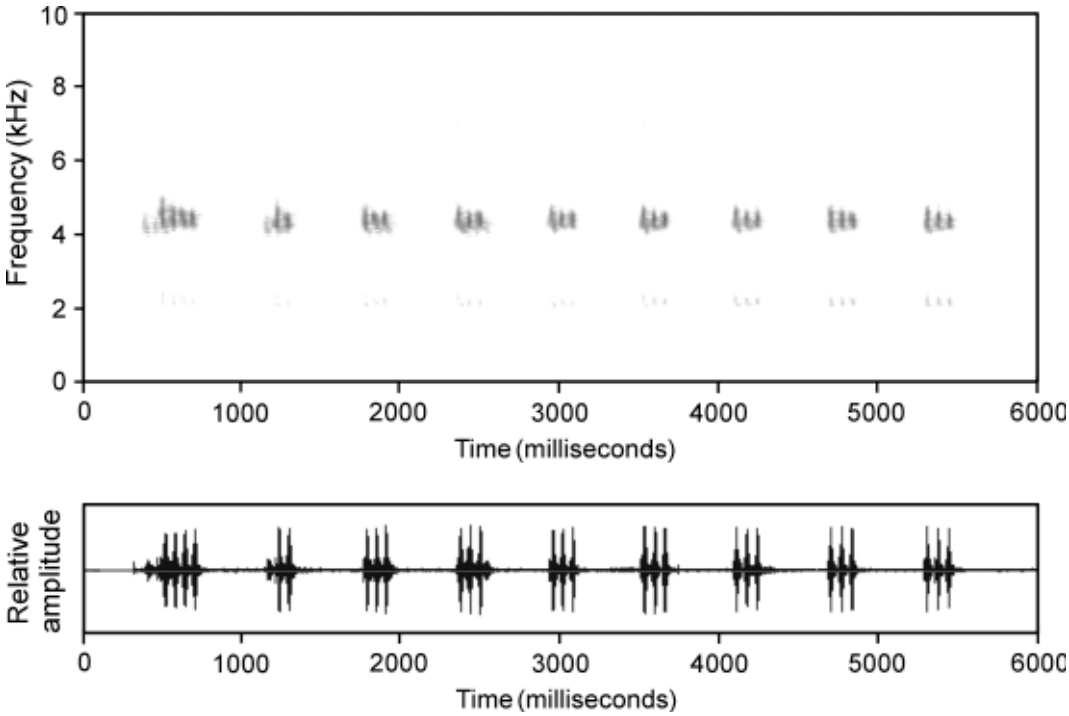

Fig. 6. Sonagram and oscillogram of the advertisement call of *Gephyromantis runewsweeki*, spec. nov., recorded at the summit of Mount Maharira, at an estimated temperature of ca. 18 °C. Following the terminology employed herein, the call is composed of nine note groups, of which the first and second are composed of four and two notes, respectively, and notes groups 3-9 are composed of three notes each.

terminology used in the description above is not fully homologous with that used in some call descriptions, although it agrees with that in descriptions of *Gephyromantis* (Glaw & Vences 1994, 2000, 2002) calls. We here follow a definition of a note as the unit of a call that is emitted during one expiration, in accordance with our observations on the movements of the inflated vocal sac during sound production in *G. runewsweeki*. However, an alternative terminology would view our note groups as notes, and our notes as pulses.

Genetic differentiation. In terms of genetic divergences in the 16S rDNA fragment studied, the lowest genetic distances separated *G. runewsweeki* from *G. blanci* from Andringitra, and from the sympatric *G. enki* (3.6 % and 4.1 % uncorrected pairwise sequence divergence). The divergence from a sympatric specimen of *G. blanci* (from Vohiparara) was 5.6 %, while divergences from other species of the group were higher (6.7-8.7 %).

Comparisons. We compared the two individuals of *G. runewsweeki* with one adult male each of the sympatric and morphologically similar species *G. blanci* and *G. enki* from Ranomafana National Park. These two specimens were collected after emitting their typical advertisement calls, and their identification is therefore reliable. Despite a great morphological similarity, the specimen of *G. blanci* (ZMA 20025; SVL 21.2 mm) can be distinguished by a much larger and more distinct femoral gland on the ventral surface of each shank (FGL 4.1 mm, FGW 1.7 mm), whereas the specimen of *G. enki* (ZMA 20022; SVL 21.6 mm) has a very indistinct and barely recognizable femoral gland as typical for the species (Glaw & Vences 2002). Both specimens, furthermore, have a much more indistinct ventral pattern. Their inner metatarsal tubercle appears to be slightly smaller and less prominent than that of *G. runewsweeki*, but examination of more specimens is ecessary to verify the validity of this latter character.

Gephyromantis runewsweeki is easily distinguishable from *G. blanci* and *G. enki* when considering the advertisement calls. *G. blanci* emits calls consisting of 11-14 notes which are usually not arranged in note groups (Glaw & Vences 2000). *G. enki* has a regular series of short single notes (Glaw & Vences 2002).

Discussion

Recent progress in systematics and phylogenetic knowledge on Malagasy frogs led to recognizing that several clades show distinct centers of diversity and endemism in different parts of the country. In general, most Malagasy frog species are restricted to the eastern rainforest that stretch as a rather narrow band from north to south along the east coast, and probably due to stochastic effects (mid-domain effect) they show a peak of diversity in central eastern Madagascar (Lees et al. 1999). However, several groups such as genera of cophyline microhylids show clear centers of diversity in either northern Madagascar *(Cophyla, Platypelis, Rhombophryne)* or south-eastern Madagascar *(Anodonthyla, Madecassophryne)* (Glaw & Vences 2003). The relationships of the larger nocturnal species assigned by Glaw & Vences (in press) to the genus *Gephyromantis* are not fully clarified. Nevertheless, these taxa that were previously (Glaw & Vences 2003) assigned to the *Mantidactylus granulatus* group and the *Mantidactylus asper* group in the subgenera *Gephyromantis* and *Phylacomantis*, are more diverse in north-eastern and north-western Madagascar, whereas relatively few endemic species are known from the south-east (Vences & Glaw 2001, Glaw & Vences 2000, 2002, Vences et al. 2003a). Considering the new species described herein, and excluding the enigmatic *Gephyromantis klemmeri* from Marojejy in north-eastern Madagascar, of unclarified relationships, the eight small-sized and diurnal species of *Gephyromantis* with blackish subgular vocal sacs *(G. blanci, G. boulengeri, G. decaryi, G. eiselti, G. enki, G. leucocephalus, G. runewsweeki,* and *G. thelenae)* seem to show a trend to be more diverse in the south-east. Indeed, five species (*G. blanci*, *G. enki*, *G. decaryi*, *G. leucocephalus*, and *G. runewsweeki*) are restricted to the south-eastern rainforests and have so far not been recorded north or Ranomafana. In Ranomafana National Park, five species of the group occur sympatrically (*G. blanci, G. boulengeri, G. enki, G. decaryi,* and *G. runewsweeki*), whereas at Andasibe in central-eastern Madagascar only three species are known (*G. boulengeri*, *G. eiselti*, and *G. thelenaei*), and further north, only *G. boulengeri* occurs, without reaching the north-eastern or north-western biogeographic regions, however.

Phylogenetic relationships of *G. runewsweeki* remain unclarified but some hypotheses are possible. Genetically most similar was a representative specimen from the *G. blanci* population at another highland locality, Andringitra, although we here did not perform a thorough phylogenetic analysis to analyse the phylogeny of these forms. It is however relevant that the Andringitra specimens of *G. blanci* have been reported to be able to emit their notes in note groups when highly motivated (Glaw & Vences 1994), and to have a comparatively lower number of notes compared to specimens from Ranomafana (Glaw & Vences 2000). In these two features the Andringitra population of *G. blanci* appears to show some similarity to *G. runewsweeki*, although altogether the two *G. blanci* populations are certainly more similar to each other in general call structure than either of them is to *G. runewsweeki.*

It is remarkable almost all species in the *G. boulengeri* group are characterized by relatively restricted ranges. Except for *G. boulengeri,* which seems to be widely distributed along mainly low-elevational areas of eastern Madagascar, all other species are only known from a few localities within small areas. The new species, *G. runewsweeki,* further confirms this trend. Despite its rather characteristic calls and own intensive fieldwork in many areas of south-eastern and central-eastern Madagascar, the species could not be found or heard at sites other than Ranomafana National Park. More comprehensive modelling of the distribution ranges of these species, including genetical surveys, is needed to understand whether this trend is statistically significant and may be correlated with their reproductive mode (direct development). The fact that *G. blanci* from Andringitra showed distinct genetic divergences and some bioacoustic differentiation to putatively conspecific specimens from Ranomafana (Glaw & Vences 2000) indicates that further cryptic and possibly locally restricted species are to be expected in this group.

Although *G. runewsweeki* was found in a well-protected area, the Ranomafana National Park, the probably small distribution area (or at least discontinuous and patchy distribution) of this species rises some concerns about its conservation status. In line with other, similar Malagasy frogs that are known from a small distribution area despite their relatively easy detectability (Andreone et al. in press) we propose a Red List classification of "Near Threatened" according to IUCN criteria (IUCN, 2001) of a probably small extent of occurrence. The presence of this new possible local endemic, and of other species possibly restricted to south-eastern Madagascar (e.g. Cadle 1995, Glaw & Vences 2005) stresses the importance of Ranomafana National Park and its conservation.

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Buchbesprechungen

19. Mayr, H.: Fossilien. Über 500 Versteinerungen. BLV Bestimmungsbuch. – BLV Buchverlag GmbH & Co. KG, München, 2006. 255 S., über 500 Farbabb. ISBN 3-8354-0120-3

Die Suche nach und das Sammeln von Versteinerungen ist eine der häufigsten naturkundlichen, aber auch naturwissenschaftlichen Liebhabereien oder Hobbys, und es ist nicht nur ein Hobby, denn ohne die Kenntnis der Fossilien wäre die Erforschung der Geschichte des Lebens auf unserer Erde und seiner Evolution sehr erschwert, wenn nicht überhaupt unmöglich. Und der sich damit befassende Wissenschaftszweig, die Paläontologie, hätte nicht die enormen Erfolge aufzuweisen ohne die Mitarbeit der zahlreichen fossiliensammelnden Liebhaber.

Allerdings ist das Sammeln von Fossilien nicht so einfach, wie man sich das vielleicht vorstellt. Es gehört beträchtliche Erfahrung dazu, erst einmal zu wissen, wo man denn überhaupt Fossilien finden kann, dann aber auch, sie dort wirklich zu finden, und schließlich, sie auch als solche zu erkennen. Und dann folgt ja noch die Mühe des Bestimmens. Das ist bei vielen Versteinerungen nicht so einfach wie bei lebenden Pflanzen und Tieren, denn normalerweise sind nur die Hartteile erhalten und recht häufig auch davon wiederum nur Bruchstücke, oder die Fossilien sind gar in schlechtem Erhaltungszustand. Daher braucht derjenige, der dieses sehr interessante Hobby beginnen will, eine Einführung, damit er nicht gleich die Lust daran verliert.

Das vorliegende Büchlein ist also eine derartige Einführung in das Sammeln und Bestimmen von Fossilien. Zwar klingt die Zahl 500 recht groß, doch sind die dargestellten 500 Fossilien nur ein sehr geringer Teil der tatsächlich bereits bekannten Arten, und so ist dieses Buch natürlich auch kein Bestimmungsbuch im eigentlichen Wortsinn, sondern eben eine Einführung. Dies allerdings leistet es in vorzüglicher Weise. Die kurze, aber gehaltvolle Einleitung behandelt verschiedene Begriffe, die auch der Hobbysammler kennen muß, sie behandelt ferner kurz, aber prägnant Fossilbildung, Fossileinbettung und Fossilerhaltung, gibt dann einen kurzen systematischen Überblick über die behandelten Gruppen, eine Zeitskala und schließlich einige wichtige Tips für den Hobbysammler.

Der spezielle Teil ist systematisch angeordnet, also von den Einzellern zu den Wirbeltieren und Pflanzen, und bringt auf jeder Seite mehrere instruktive Abbildungen mit den entsprechenden, kurzen Erklärungen, die sich in Merkmale, (zeitliches) Vorkommen und (geographische) Verbreitung gliedern. Natürlich sind im Abbildungsteil auch einige paläontologische Highlights enthalten, etwa der Schädel von *Tyrannosaurus* oder der *Archaeopteryx*, in der Mehrzahl sind aber Fossilien abgebildet, die auch der etwas erfahrene Sammler oder sogar der Anfänger durchaus finden kann. Ein relativ kurzes Literaturverzeichnis, ein ausführliches Glossar wichtiger paläontologischer Begriffe und ein Namensregister beschließen dieses, dem Fossiliensammler sehr empfehlenswerte und instruktive Büchlein, zumal wenn er noch Anfänger ist. M. Baehr