ISSN : 0082 - 6340
E-ISSN : 2337 - 876X
Accredited : No. 523/AU2/P2MI-LIPI/04/2013

LIPI

TREUBIA

A JOURNAL ON ZOOLOGY
OF THE INDO-AUSTRALIAN ARCHIPELAGO

Vol. 41, pp. 1—90 **December 2014**

MUSEUM ZOOLOGICUM BOGORIENSE
IN SOLITUDINE FORS
1894

Published by

RESEARCH CENTER FOR BIOLOGY
INDONESIAN INSTITUTE OF SCIENCES
BOGOR, INDONESIA

ISSN : 0082 - 6340
E-ISSN : 2337 - 876X
Accredited : No. 523/AU2/P2MI-LIPI/04/2013

TREUBIA

A JOURNAL ON ZOOLOGY OF THE INDO-AUSTRALIAN ARCHIPELAGO
Vol. 41, pp. 1─90, December 2014

Subscription and Exchange

TREUBIA
RESEARCH CENTER FOR BIOLOGY - INDONESIAN INSTITUTE OF SCIENCES (LIPI)
Jl. Raya Jakarta-Bogor Km 46, Cibinong-Bogor 16911, Indonesia
e-mail: treubia@gmail.com

VOL. 41, DECEMBER 2014

CONTENT

TREUBIA

(A JOURNAL ON ZOOLOGY OF THE INDO-AUSTRALIAN ARCHIPELAGO)

ISSN : 0082 - 6340
E-ISSN : 2337 - 876X

Date of issue: DECEMBER 2014

UDC: 597.82(594)

Nia Kurniawan

Genetic divergence and geographic distribution of frogs in genus *Fejervarya* from Indonesia inferred from mitochondrial 16S rRNA gene analysis

TREUBIA, December 2014, Vol. 41, pp. 1–16.

The Indonesian archipelago is an ideal setting for the study of speciation and biogeography. This archipelago is divided into three island groups based on zoogeography: Sundaland, Wallacea and the Australian region. In this paper we used frogs in genus *Fejervarya* (Bolkay) to study biogeography and examine patterns of gene flow across proposed zoogeographic boundaries. Several molecular studies on *Fejervarya* species from Indonesia have been carried out, but comparative studies among members of the genus *Fejervarya* have yet to be performed. In order to elucidate genetic divergence and geographic distribution of these frogs, we conducted a molecular analysis of the mitochondrial 16S rRNA gene using 179 frogs from five *Fejervarya* species. In total we collected from 32 localities in Sumatra, Kalimantan (Indonesian part of Borneo), Java, Bali, Sulawesi and Lesser Sunda Islands in Indonesia. Molecular phylogenetic analysis recovered 35 haplotypes and showed that frogs in the genus *Fejervarya* were divided into two well-supported clades. The first group were of three species, *F. limnocharis*, *F. iskandari* and *F.* cf. *verruculosa* and the other group clade consisted of *Fejervarya cancrivora* and *Fejervarya* sp. (Sulawesi-type). The average sequence divergence among these four species ranged from 1.09 to 16.03% (mean = 11.29± 2.83%). The present results clearly show that there are five *Fejervarya* species in the Indonesian archipelago. *Fejervarya limnocharis* and *F. cancrivora* are widely distributed and sympatric in Sumatra, Borneo and Java. *Fejervarya iskandari* is not endemic to Java and also occurs in the Lesser Sundas. *Fejervarya* cf. *verruculosa* and *Fejervarya* sp. (Sulawesi-type) are endemic to Lesser Sunda and Sulawesi Island, respectively.

(Nia Kurniawan, Tjong Hon Djong, Tesri Maideliza, Amir Hamidy, Mahmudul Hasan, Takeshi Igawa and Masayuki Sumida)

Key words: *Fejervarya*, genetic divergence, geographic distribution, 16S rRNA gene

UDC: 595.78(594.53)

Djunijanti Peggie

Butterflies of Gunung Halimun-Salak National Park, Java, Indonesia, with an overview of the area importance

TREUBIA, December 2014, Vol. 41, pp. 17–30.

Data on the occurrence of butterfly species at Gunung Halimun-Salak National Park is presented based on collections and observations obtained in 2004, 2007, 2009 and 2010. In total, 161 butterfly species (10 Hesperiidae, 23 Lycaenidae, 86 Nymphalidae, 17 Papilionidae, 21 Pieridae, and 4 Riodinidae) were recorded. Of the total number of species, 133 were recorded from Gunung Halimun and 82 were recorded from Gunung Salak. The occurrence of butterflies at this national park was compared with data known from other localities in Java. The significance of Gunung Halimun-Salak NP in terms of the butterfly diversity is discussed.

(Djunijanti Peggie and Harmonis)

Key words: butterflies, endemic species, Gunung Halimun-Salak National Park, Java, occurrence

UDC: 595.34

Mulyadi

Taxonomic problems on four species of *Pontella* (Copepoda, Calanoida) described by A. Scott (1909) in Indo-Malayan waters

TREUBIA, December 2014, Vol. 41, pp. 31–50.

Four species of *Pontella,* i.e., *P. alata, P. cerami, P. denticauda*, and *P. forficula*, which were originally described by A. Scott (1909) were found from Indo-Malayan waters. Some misidentifications resulting in wrong species identity were discovered on *P. cerami* and *P. forficula. Pontella cerami* A. Scott, 1909, described based on two male

specimens from the Banda Sea, Indonesia is here recognised as the male of *P. alata.* Similarly, *P. forficula,* also known from two male specimens from the Sulu Sea, Philippine must be reassigned as the male of *Ivellopsis elephas* (Brady, 1883). Another Indo-Malayan *Pontella*, *i.e.*, *P. denticauda* A. Scott, 1909 must also be moved to the genus *Ivellopsis* Claus 1893, as *Ivellopsis denticauda* (A. Scott, 1909) by its having posterior corners of Pdg5 produced into rounded lobes in both sexes; particularly in the female, by (1) the genital double -somite with a large lateral process, (2) the CR asymmetrical with the right ramus longer than the left, and (3) the Re of P5 with 3 apical spines and with an acuminate Ri. The male has, (1) the CR asymmetrical with right ramus slightly longer than the left, and (2) the thumb of Re2 of right P5 is elongated, and (3) the Re2 of the left P5 bifurcate at apex.

Descriptions, measurements and figures of the four species are given, along with a review of their distribution and that of their species groups over Indo-West Pacific waters, together with taxonomic remarks and synonymies in each case.

(Mulyadi)

Key words: Copepoda, Indo-Malayan, *Pontella*, small islands, taxonomy

UDC: 599.323.4(594.2)

Anang Setiawan Achmadi

New records of two rarely encountered, endemic rats (Rodentia: Muridae: Murinae) from Gunung Gandangdewata, West Sulawesi Province

TREUBIA, December 2014, Vol. 41, pp. 51–60.

We collected specimens of Sommer's Sulawesi shrew-rat, *Sommeromys macrorhinos*, at three sites (1600, 2200, and 2600 m) and the Sulawesi small-bodied shrew-rat, *Crunomys celebensis*, at one site (1600 m) on Gunung Gandangdewata in the western block of the central core of Sulawesi during November 2011 and May 2012. Prior to 2011, *S. macrorhinos* was known only from the holotype, which was taken on 2 August 1973 at 2400 m near the summit of Gunung Tokala (upper montane forest). Previously, *C. celebensis* was known only from tropical lowland evergreen rain forest in the Danau Lindu valley and nearby upper drainage of the Sungai Miu in the northern portion of the west-central mountain block in Sulawesi's central core. The new specimens of *S. macrorhinos* and *C. celebensis* extend their known range of habitats to include the transition between lowland and montane forest. Because the original description of *S. macrorhinos* was based on a single specimen, we describe some external morphological features and provide measurements of new specimens as a supplement to the original description.

(Anang Setiawan Achmadi, Kevin C. Rowe and Jacob A. Esselstyn)

Key words: *Crunomys celebensis,* morphology, shrew-rat, *Sommeromys macrorhinos*

UDC: 598.2(594.25)

Frank E. Rheindt

New and significant island records, range extensions and elevational extensions of birds in eastern Sulawesi, its nearby satellites, and Ternate

TREUBIA, December 2014, Vol. 41, pp. 61-90.

The Wallacean Region continues to be widely unexplored even in such relatively well-known animal groups as birds (Aves). We report the results of an ornithological expedition from late Nov 2013 through early Jan 2014 to eastern Sulawesi and a number of satellite islands (Togian, Peleng, Taliabu) as well as Ternate, providing details on numerous first records of bird species outside their previously known geographic or elevational ranges observed or otherwise recorded during this expedition. We also document what appears to be a genuinely new taxon, possibly at the species level, of kingfisher from Sulawesi that has been overlooked by previous ornithologists. Our results underscore our fragmentary knowledge of the composition of the avifauna of eastern Indonesia, and demonstrate that there continues to be a high degree of cryptic, undescribed avian diversity on these islands.

(Frank E. Rheindt, Dewi M. Prawiradilaga, Suparno, Hidayat Ashari and Peter R. Wilton)

Key words: birds of eastern Sulawesi, elevational extensions, new island records, range extensions

Treubia 41: 51-60, December 2014

NEW RECORDS OF TWO RARELY ENCOUNTERED, ENDEMIC RATS (RODENTIA: MURIDAE: MURINAE) FROM GUNUNG GANDANGDEWATA, WEST SULAWESI PROVINCE

Anang Setiawan Achmadi*[1], Kevin C. Rowe[2] and Jacob A. Esselstyn[3]

[1] Museum Zoologicum Bogoriense, Research Center for Biology, Indonesian Institute of Sciences, Gd. Widyasatwaloka, Jl. Raya Jakarta Bogor Km 46 – Cibinong, West Java, Indonesia;
[2]Sciences Department, Museum Victoria, Melbourne, Australia;
[3]Museum of Natural Science and Department of Biological Sciences, 119 Foster Hall, Louisiana State University, Baton Rouge, LA 70803 USA
*Corresponding author: gudelly@gmail.com

Received: 27 January 2014; Accepted: 2 July 2014

ABSTRACT

We collected specimens of Sommer's Sulawesi shrew-rat, *Sommeromys macrorhinos*, at three sites (1600, 2200, and 2600 m) and the Sulawesi small-bodied shrew-rat, *Crunomys celebensis*, at one site (1600 m) on Gunung Gandangdewata in the western block of the central core of Sulawesi during November 2011 and May 2012. Prior to 2011, *S. macrorhinos* was known only from the holotype, which was taken on 2 August 1973 at 2400 m near the summit of Gunung Tokala (upper montane forest). Previously, *C. celebensis* was known only from tropical lowland evergreen rain forest in the Danau Lindu valley and nearby upper drainage of the Sungai Miu in the northern portion of the west-central mountain block in Sulawesi's central core. The new specimens of *S. macrorhinos* and *C. celebensis* extend their known range of habitats to include the transition between lowland and montane forest. Because the original description of *S. macrorhinos* was based on a single specimen, we describe some external morphological features and provide measurements of new specimens as a supplement to the original description.

Key words: *Crunomys celebensis*, morphology, shrew-rat, *Sommeromys macrorhinos*

INTRODUCTION

The shrew-rat fauna of Sulawesi contains several species with adaptations to feeding on invertebrates (Musser 1992, Musser & Durden 2002, 2014). Sulawesi shrew rats are currently classified into three divisions within the subfamily Murinae (Musser & Carleton 2005). *Sommeromys macrorhinos*, the only species in this unusual genus, is allied with the genus *Crunomys* in the Crunomys Division; *Melasmothrix* and *Tateomys* are placed in the Melasmothrix Division; two species of *Echiothrix* reside alone in the Echiothrix Division; *Paucidentomys vermidax* has not been formally placed in one of these divisions, but Esselstyn *et al.* (2012) and Musser & Durden (2014) suggested a possible relationship with *Echiothrix*. Although these divisions imply a solid foundation of phylogenetic relationships, phylogenetic tests utilising DNA sequences have been lacking because of the nearly complete absence of tissue samples. Hence the extent to which these divisions represent natural groupings remains largely uncertain. One exception to this lack of information is that

Achmadi *et al.* (2013) recently demonstrated that *Crunomys* is nested within *Maxomys* and hence a reassessment of the phylogenetic affinities of these two genera is necessary. In addition to the general lack of phylogenetic resolution among Sulawesi shrew rats, limited information is available on their geographic and habitat distributions as well as their diets and other natural history information due to a paucity of collections from Sulawesi (Musser 1982, Musser & Durden 2002, Esselstyn *et al*. 2012). The Crunomys Division is especially poorly known: both *S. macrorhinos* and *C. celebensis* have been recorded only from a single part of the island, with the former represented only by the holotype (Musser & Durden 2002) and the latter represented by only three specimens taken at two localities separated by ~8 km (Musser 1982).

The holotype of *S. macrorhinos* was collected 2 August 1973 in upper montane forest near the summit of Gunung Tokala in the southern portion of the west-central mountain block in Central Sulawesi (Fig. 1, Musser & Durden 2002). The species is characterised by a unique rostrum, in which the nasal and premaxillary bones form a tube projecting well anterior to the upper incisors (Musser & Durden 2002, Fig. 2). Externally, *Sommeromys* is distinguished from other Sulawesi shrew rats by its small body size, long muzzle, extremely long tail, and a hairless patch on the dorsal surface of the distal end of the tail (Musser & Durden 2002, Musser & Carleton 2005).

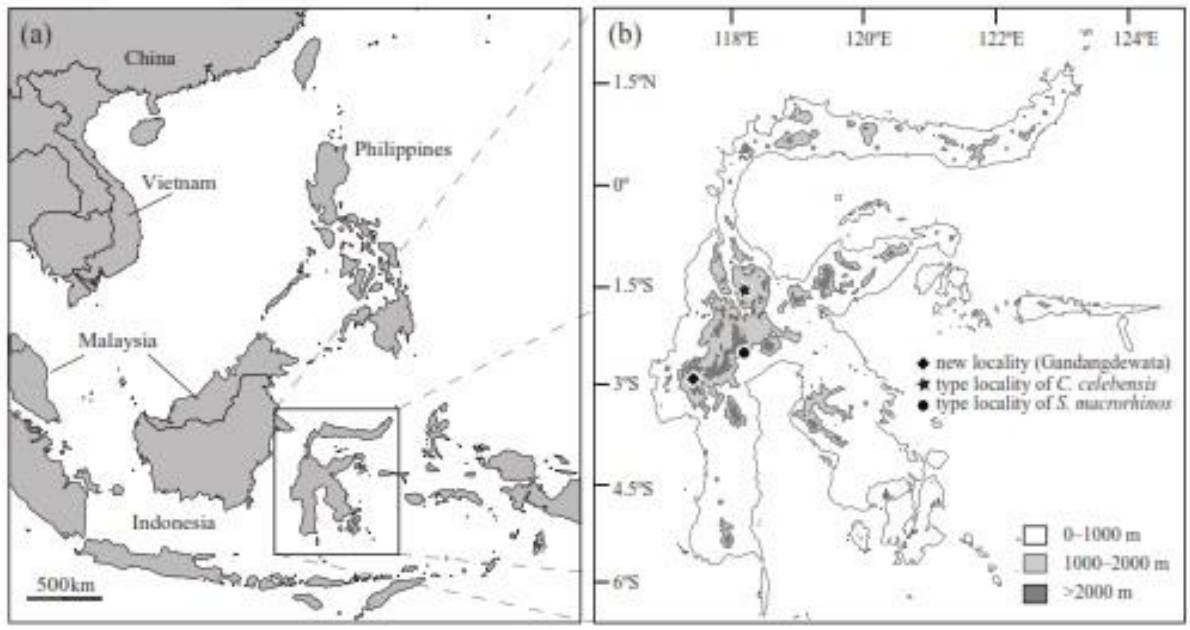

Figure 1. Maps of (a) Southeast Asia, showing the position of Sulawesi Island and (b) Sulawesi, showing the three localities from which *Crunomys celebensis* (holotype from forest near Tomado village [star]) and *Sommeromys macrorhinos* have been collected (holotype from Gunung Tokala [circle] and new specimens from Gunung Gandangdewata [diamond]).

Crunomys celebensis is a terrestrial forest rat with a short and broad head, a stocky body, dark brownish chestnut pelage, small ears, short legs, narrow hind feet, and short tail. It is known only from three specimens taken in the vicinity of Danau Lindu in the northwestern portion of Sulawesi's central core. Neither *S. macrorhinos* nor *C. celebensis* have been collected since the 1970s (Musser 1982, Musser & Durden 2002). The habitat at the type locality of *C. celebensis* is tropical lowland evergreen rainforest. Here we report the first new records of these two species since their discovery and discuss the implications for their geographical, elevational, and habitat distributions.

Figure 2. *Sommeromys macrorhinos*, NMV-C37074.

MATERIAL AND METHODS

We conducted small mammal surveys during November 2011 and May 2012 on Gunung Gandangdewata, in the Quarles Range north of Mamasa, West Sulawesi Province. We surveyed three sites that were centered at approximately 1600, 2200, and 2600 meters elevation (see Appendix 1 and Fig. 1). We identified specimens of *Crunomys* and *Sommeromys*, using a combination of published literature (Musser 1982, Musser & Durden

2002) and direct comparisons with older museum specimens. We took standard external measurements in the field and from the specimen tags of previously collected material. We also measured 16 cranial characters following Musser & Heaney (1992) and Musser & Durden (2002) from new specimens of *Sommeromys* and compared these to the values reported for the type in Musser & Durden (2002): greatest length of skull (GLS), zygomatic breadth (ZB), interorbital breadth (IB), length of the rostrum (LOR), breadth of the rostrum (BOR), breadth of the zygomatic plate (BZP), breadth of the braincase (BBC), height of the braincase (HBC), length of diastema (LD), post-palatal length (PPL), length of incisive foramina (LIF), breadth of incisive foramina (BIF), length of bony palate (LBP), breadth of mesopterygoid fossa (BMF), length of auditory bulla (LB), and length of nasal (LON). We also report standard external measurements collected from freshly caught specimens, including total length (TTL), tail length (Tail), hind-foot length including the claws (HF), ear length (Ear), and mass (Mass) in grams. All specimens were adults, with fully erupted molars and fused cranial sutures. All cranial measurements were taken by K. C. Rowe with digital calipers precise to the nearest 0.01 mm. Museum acronyms are as follows: AMNH (American Museum of Natural History, New York, USA), FMNH (Field Museum of Natural History, Chicago, USA), NMV (Museum Victoria, Australia) and MZB (Museum Zoologicum Bogoriense, Bogor, Indonesia).

Table 1. External and cranial measurements for *Sommeromys macrorhinos*

(All dimensions are in mm, except mass is in grams. Exceptions to stated sample sizes are detailed in the footnote. Means ± standard deviation are shown)

Parameters	Present	Musser & Durden (2002)
	n = 3*	**n = 1♂**
TTL	279.5 ± 12.09	285
TL	175.00 ± 11.33	186
HF	30.33 ± 0.82	31
Ear	18.67 ± 0.82	16
Mass	28.00 ± 5.00	-
GLS	31.76 ± 0.63	31.93
ZB	13.02 ± 0.24	13.28
IB	5.64 ± 0.18	5.50
LR	12.14 ± 0.59	11.65
BR	4.81 ± 0.14	5.16
BZP	1.43 ± 0.04	1.43
BBC	13.4 ± 0.18	12.75
HBC	10.52 ± 0.42	10.15
LD	6.62 ± 0.40	7.16
PPL	9.59 ± 0.45	9.57
LIF	2.69 ± 0.03	3.32

Parameters	Present	Musser & Durden (2002)
	n = 3*	n = 1♂
BIF	1.89 ± 0.26	1.97
LBP	5.96 ± 0.29	6.20
BMF	1.98 ± 0.17	2.10
LB	4.21 ± 0.22	4.47
LON	11.64 ± 0.18	12.32

*n = 6 for external measurements

RESULTS

We caught six specimens of *Sommeromys macrorhinos* at three elevations on Gunung Gandangdewata (1600, 2200 and 2600 m, see Appendix 1, Fig. 1). Two specimens were caught in upper montane forest (2600 m) in which the first specimen (MZB34758) was caught in a pitfall trap. The second specimen was caught in a snap trap placed on a rotten log, three from lower montane forest (2200 m), and one from transitional tropical evergreen lowland-lower montane formations (1600 m) was caught in a pitfall trap. Musser & Durden (2002) speculated that *Sommeromys* might be scansorial or even arboreal to some extent and suggested traps be set on surfaces above the ground. All *Sommeromys* specimens were caught during the night. New specimens of *S. macrorhinos* are characterised by a small body size, dark mask encircling each eye, long hindfeet, extremely long tail (~188% of head and body length), naked patch on distal end of tail, small ears relative to head and body, soft and dense fur, dark brown dorsal fur, and dark grey ventral fur (Figs. 2 & 4). No other species of murine rodent shares this combination of characters. All cranial measurements from the new specimens were similar to those from the holotype (Table 1) and the external features we note are consistent with the original description in the text of Musser & Durden (2002). However, the drawing from the holotype (Fig. 1 in Musser & Durden 2002), a formalin-fixed specimen, exaggerated the length of the limbs and ears, differed from the colouration described in the text, and did not represent the fullness of the soft, dense fur, making the animal appear much more lanky than in life. The recent specimens clarify that *Sommeromys* possesses typically-sized murine ears and limbs relative to length of head and body, a dark circular mask around each eye, and colouration of fur over the head and body that range from dark brown to dark grey.

We caught seven specimens of *Crunomys celebensis* in small a flat area in a transitional habitat between lowland forest and primary lower montane forest on Gunung Gandangdewata at 1600 m (Figs. 3 & 5). Three specimens were caught during November 2011 and four were taken during May 2012, at the same locality. All *Crunomys* specimens were caught in pitfalls during the night. Recent specimens were characterised externally by

the following traits: 1) a small and stocky body size, short muzzle and broad head; 2) ears small, round, and scantily haired; 3) short and narrow hindfeet with short tail (± 75% of head and body length); and 4) dark chestnut fur over entire body. Cranial measurements of the new specimens (Table 2) are very similar to those in the original description (Musser 1982).

Table 2. External measurements of *Crunomys celebensis*
(All dimensions are in mm, except mass is in grams)

Parameters	Present Study N = 7	Musser (1982) N = 3
TTL	190.14 ± 10.61	202 ± 8.19
TL	80.00 ± 4.28	82 ± 2.00
HF	25.14 ± 0.38	26 ± 1.00
Ear	14.29 ± 0.76	14,00
Mass	36.00 ± 6.20	48.67 ± 11.85

Figure 3. *Crunomys celebensis*, FMNH 219003.

These findings indicate that *Sommeromys* inhabits montane forest habitats that, at least in the Quarles range, extends to the transition between lowland and montane forest formations, and *Crunomys* is a lowland forest rat reaching the transitional zone but not extending higher into montane forest habitats.

Musser & Durden (2002) stated that *Sommeromys macrorhinos* is apparently insectivorous with the stomach contents of the holotype consisting of nematodes, eggs of a muscoid fly, and insect fragments (cuticle, long and filamentous antennae, and a leg). R. Marchant (Terrestrial Invertebrates, Museum Victoria) identified the contents of the stomach from one recent specimen (MZB 34759) as containing vascular plant material, legs and other exoskeleton material form Hemiptera, and a plant hopper in the superfamily Fulgaroidea, based on presence of 8 black-tipped distal points on the tarsus (an animal likely to be collected from the leaf surface).

The contents of the stomachs two specimens of *Crunomys celebensis* from Gunung Gandangdewata (MZB 34943 and NMV C36989) were identified as consisting of vascular plant material, seeds, 1 parasitic nematode, 1 antenna of a beetle or Hemiptera. The findings are in contrast to the results of Musser & Durden (2014) who found abundant tracheae in the stomachs of two specimens (AMNH 224316 and AMNH 225042) indicating a diet that includes insects.

We also recorded four additional sympatric shrew rats on Gn. Gandangdewata. We collected a single specimen of *Paucidentomys vermidax* at the 1600 m site (Esselstyn *et al.* 2012), 11 specimens of *Tateomys macrocercus* at the 1600 m (3 specimens) and 2600 m (8 specimens) sites, 16 specimens of *T. rhinogradoides* at the 2200 m (11 specimens) and 2600 m (5 specimens) sites, and four specimens of *Melasmothrix naso* at 2200 m (1 specimen) and 2600 m (3 specimens) sites. These results indicate that small mammal communities on Sulawesi can contain several co-occurring shrew rats.

Figure 4. Sommer's Sulawesi shrew-rat, *Sommeromys macrorhinos* (MZB34758), from Gunung Gandangdewata.

Figure 5. *Crunomys celebensis* (MZB34943) from Gunung Gandangdewata.

DISCUSSION

Sommeromys macrorhinos and *C. celebensis* represent some of the least-known mammal species. Prior to our recent surveys, they had not been encountered by collectors since the middle 1970s. These new records expanded the geographic distribution of *C. celebensis* and *S. macrorhinos* by over 100 km. Our new records of *S. macrorhinos* extend the habitat distribution of the species from upper montane forest to lower montane forest and transitional lower montane-lowland forest at elevations from 1600 m to 2600 m. We also extend the elevational range of *C. celebensis*, previously known only from lowland evergreen forest at 1000 m to transitional lower montane-lowland forest at 1600 m. While previously reported from different habitats and geographic regions, we collected the two species in syntopy at 1600 m including within a few meters on the same trapline. While we collected six *S. macrorhinos* across three sites, they have never been collected from intensively studied areas around Lore Lindu National Park in the east-central region (reviewed in Musser 2014). This suggests that the genus may be restricted to the southern highlands of the west-central mountain block in Sulawesi's central core, but additional surveys are needed.

ACKNOWLEDGEMENTS

We gratefully acknowledge financial support provided by the National Science Foundation (OISE-0965856), National Geographic Society (9025-11), Australia and Pacific Science Foundation (12-6), and Ministry of Research and Technology-KEMENRISTEK (Program Pendidikan Non Gelar). We thank Heru Handika, Mardin Sarkam, Papa Daud, Gherzon, Jhon, Joni, and Pailin for assistance with fieldwork. The staff of AMNH, FMNH, MZB and LSUMZ provided curatorial support and access to specimens. Guy Musser provided helpful suggestions based on an earlier version of this manuscript.

REFERENCES

Achmadi, A.S**,** J.A. Esselstyn, K.C. Rowe, I. Maryanto & M.T. Abdullah 2013. Phylogeny, diversity, and biogeography of the Southeast Asian endemic spiny rats. *Journal of Mammalogy* 94(**6**): 1412-1423

Esselstyn, J. A., A.S. Achmadi, & K.C. Rowe 2012. Evolutionary novelty in a rat with no molars. *Biology Letters* **8**: 990-993.

Musser, G.G. 1982. Results of the Archbold Expeditions.No. 110. *Crunomys* and the small-bodied shrew rats native to the Philippine islands and Sulawesi (Celebes). *Bulletin of the American Museum of Natural History* **174**: 1-95.

Musser, G.G. 2014. A systematic review of Sulawesi *Bunomys* (Muridae, Murinae) with the description of two new species. (*Bulletin of American Museum of Natural History, In press*)

Musser, G.G. & M.D. Carleton 2005. Family Muridae, Rodentia. *In:* D.E. Wilson and Reeder, D. M. (eds). *Mammals Species of the World: A Taxonomic and Geographic Reference*, Smithsonian Institution Press, Washington D.C. pp. 1365-1370.

Musser, G.G. & L.A. Durden 2002. Sulawesi rodents: description of a new genus and species of Murinae (Muridae, Rodentia) and its parasitic new species of sucking louse (Insecta, Anoplura). *American Museum Novitates* **3368**:1-50.

Musser, G.G. & L.A. Durden 2014. Morphological and geographic definitions of the sulawesian shrew rats *Echiothrix leucura and E. centrosa* (Muridae, Murinae), and description of a new species of sucking louse (Phthiraptera: Anoplura). *Bulletin of the American Museum of Natural History* **871**: 1-87.

Musser, G.G., & L.R. Heaney 1992. Philippine rodents: definitions of *Tarsomys* and *Limnomys* plus a preliminary assessment of phylogenetic patterns among native Philippine murines (Murinae, Muridae). *Bulletin of the American Museum of Natural History* **211**:1-138.

Appendix 1. Specimens of *Crunomys celebensis* and *Sommeromys macrorhinos* used in this study.

Crunomys celebensis

Tomado Village (S $1^0$19’ E $120^0$5’, 1000 m): AMNH224316/MZB12153, AMNH240490

Sungai Sadaunta (823 m): AMNH225042

Pos 1, Dapok Batu, Gunung Gandangdewata (S 2.8823º E 119.3878º, 1600 m): MZB34943, MZB34944, MZB34945, and FMNH219003 – FMNH219006.

Sommeromys macrorhinos

Gunung Tokala (S $2^0$13’, E 120^0 04’, 2400 m): AMNH226956

Pos 3, Rano rano, Gunung Gandangdewata (S 2.8453º E 119.3836º, 2600 m): MZB34758 and MZB34759

Pos 1, Dapok Batu, Gunung Gandangdewata (S 2.8823º, E 119.3878º, 1600 m): MZB34903

Pos 5, Confluence of Sungai Naya and Sungai Lepo, Gunung. Gandangdewata (S 2.8181º, E 119.3823º, 2200 m): FMNH218952 – FMNH218954

INSTRUCTIONS FOR AUTHORS

TREUBIA is a peer-reviewed, scientific zoological journal with focus on biosystematic aspects of terrestrial and aquatic fauna in the Indo-Australian region. TREUBIA is published yearly and accepts manuscripts within the scope of the journal. It is accessible online at http: // e-journal.biologi.lipi.go.id/index.php/treubia.

The missions of TREUBIA are to: (1) promote sciences and disseminate information in animal systematics and on the biodiversity of the region; (2) participate in the effort of educating public through good quality of scientific media and available professional researchers; (3) establish linkages among zoologists particularly in the field of systematics.

TREUBIA accepts manuscripts based on original research, taxonomic review or short communication. The manuscript should not be offered for prior or simultaneous publication elsewhere. It must be written in English and must use the British spelling. Manuscripts should be prepared double-spaced in Microsoft Word, using Times New Roman font 12, A4 paper size. To facilitate the reviewing and editing processes, please apply continuous line numbered option. An electronic file of the manuscript along with a formal cover letter – indicating the importance, stating its originality and its approval by all co-authors – should submitted to the editors of TREUBIA through email address: treubia@gmail.com or submitted directly to the editors at Division of Zoology, Research Center for Biology – LIPI, Widyasatwaloka, Jl. Raya Jakarta Bogor Km. 46, Cibinong, Bogor 16911, Indonesia.

Concise writing and omission of unessential material are recommended. All numbers under 10 and any number forming the first word of a sentence must be spelled out, except in the Materials and Methods section of taxonomic papers. Year should be completely written. Names of genera and species should be in italic type. It is recommended to use metric measurements in abbreviation (*e.g*. kg, cm, ml). Please consult and refer to a recent issue of TREUBIA for an acceptable format.

Manuscripts should be presented in the following order (Appendices can be added if necessary):

Title section. This includes the title of the paper (all capitalised), author's full name, author's institution and address (all with first letters capitalised), and e-mail address of the corresponding author. The title should be short, informative and without abbreviation.

Abstract. Except for short communications, articles should be accompanied by an abstract. The abstract consists of no more than 250 words in one paragraph which should clearly state the essence of the paper, with no references cited.

Key words. Following the abstract, list up to 5 key words, all typed in lowercase except a proper noun, separated by commas, presented in alphabetical order.

Introduction. The introduction must briefly justify the research and give the objectives. References related to the justification of the research should be cited in the introduction but extensive and elaborate discussion of relevant literature should be addressed in the Discussion section. References are to be cited in the text by the author's surname and year of publication. When citing multiple sources, place them in chronological order, *e.g*. (Somadikarta 1986, Calder 1996, Carpenter 2005). For two authors, both names should be cited: *e.g*. (Ackery & Vane-Wright 1984). For three authors or more, only the first author is given followed by *et al*., *e.g*. (Foster *et al*. 2002).

Materials and Methods. Provide a clear explanation of materials and methods used in the research. The place of specimen depository must be mentioned here.

Results. The results can be presented in the form of tables and figures when appropriate. The text should explain and elaborate the data presented. Captions of tables, figures, and plates should be inserted where you want them to be inserted. All line drawings, photographs and other figures may be submitted in JPEG format and the image size should be at least 1024 by 768 pixels.

Discussion. The discussion should interpret the results clearly and concisely, and should discuss the findings in relation with previous publications.

Acknowledgements. Acknowledgements of grants, assistance and other matters can be written here in one paragraph.

References. List of references should be in alphabetical order by the first or sole author's surname. Journal references should include author's surname and initials, year of publication, title of the paper, full title of the journal (typed in *italic*), volume number (typed in **bold**) and inclusive page numbers. Book references should include author's surname and initials, year of publication, title of the book (typed in italic) or/and title of the chapter and editor (if part of a book), publisher, city of publication, and page numbers.

For example:

LaSalle, J. & M.E. Schauff 1994. Systematics of the tribe Euderomphalini (Hymenoptera: Eulophidae): parasitoids of whiteflies (Homoptera: Aleyrodidae). *Systematic Entomology* **19**: 235-258.

MacKinnon, J. & K. Phillips 1993. *Field Guide to the Birds of Borneo, Sumatra, Java and Bali*. Oxford Unversity Press, Oxford, 491 pp.

Natural History Museum 2013. Wallace100 - celebrating Alfred Russel Wallace's life and legacy. [Online] <http://www.nhm.ac.uk/nature-online/science-of-natural-history/wallace/index.html> [Accessed 11 October 2013].

Stork, N.E. 1994. Inventories of biodiversity: more than a question of numbers. *In*: Forey, P.L., C.J. Humphries & R.I. Vane-Wright (eds.), *Systematics and Conservation Evaluation*. Clarendon Press (for the Systematics Association), Oxford, pp. 81-100.

Upon receiving a manuscript, a Treubia editor will check the compliance with these instructions and will send the manuscript to two reviewers. Based on comments from the reviewers and the suitability of the manuscript, Treubia editors will decide the acceptance or rejection of the manuscript. The author will be notified of the decision and will receive the manuscript with reviewers' comments.

Following the process of reviewing and revising, a final proof will be sent to the first or sole author for correction and approval. Five reprints are supplied free of charge but delivery cost will be charged. Joint authors will have to divide these copies among them at their discretion. Additional reprints can be provided at cost, the order should be placed before the final printing.