

7

www.biodiversityjournal.com

ISSN 2039-0394 (Print Edition)
ISSN 2039-0408 (Online Edition)

with the support of



Biodiversity Journal

JUNE 2012, 3 (2): 97-156

FOR NATURALISTIC RESEARCH
AND ENVIRONMENTAL STUDIES



Amphidromus (S.) latestrigatus Schepman, 1892 - Sumba, Indonesia

The genus *Amphidromus* Albers, 1850. The camaenid genus *Amphidromus* Albers, 1850 (Gastropoda, Pulmonata, Camaenidae) is a highly speciose genus of colourful-shelled, arboreal pulmonates with a range spanning from northern India to northern Australia, attaining its greatest diversity in the Indonesian archipelago, with occurrences of Pliocene *A. inversus* and *A. palaceus* being known from Java. Variation in shell colour and pattern is considerable, sometimes even intraspecifically, capturing the attention of early taxonomists and leading to a large number of descriptions peaking in the 19th century. The list of over 300 specific epithets that had accumulated since then was consequently reduced to less than its third in 20th century revisions, as faunistic studies made the range and scope of such variation clearer. Populations of the vast majority of *Amphidromus* s. str. include both dextral and sinistral individuals, a rare but evolutionarily persistent phenomenon also known in achatinellids and (rarely) clausiliids.

In such populations, mating between individuals of opposite chirality seems to be preferred. Species assigned to *Amphidromus* s. str. also have large shells (>30 mm) with evident varices and genitalia with a long epiphallic caecum. Rare observations of egg-laying reveal that some 100 eggs are deposited in airtight egg-cases constructed of leaves stuck together with mucus. The subgenus *Syndromus* Pilsbry, 1900, which is probably not monophyletic, contains species with smaller shells (<30 mm), rarely exhibiting varices, and genitalia with a short epiphallic caecum. It is virtually composed of exclusively sinistral species. The subgenus *Goniodromus* Bülow, 1905 contains three poorly known species, two Vietnamese and one Sumatran, historically differentiated from *Amphidromus* s. str.

Through conchological criteria which some authors have regarded as teratological features, jaws and radular teeth of amphidromids and other camaenids such as the New Guinea papuinids reflect adaptation to an arboreal habitat.



David P. Cilia - 29, Triq il-Palazz l-Ahmar, Santa Venera, Malta

John Abbas - 28, Jalan Demaga Baru, Muara Angke, Jakarta Utara Pos 14450, Jakarta, Indonesia

Left: *Amphidromus (Syndromus) sumatranus* von Martens, 1864 - Sumatra, Indonesia. Right: *A.(S.) inconstans wetaranus* Haas, 1912 - Nias, Indonesia; Cover: *A. (S.) latestrigatus* Schepman, 1892 - Sumba, Indonesia.

First report on five species of genus *Onthophagus* Latreille, 1802 (Coleoptera, Scarabaeidae) from Madhya Pradesh, India, and their description of external male genitalia

Kailash Chandra¹ & Devanshu Gupta^{2*}

¹Zoological Survey of India, New Alipore, Kolkata - 700053, West Bengal, India; e-mail: kailash611@rediffmail.com

²Zoological Survey of India, Central Zone Regional Centre, Jabalpur - 482002, Madhya Pradesh, India

*Corresponding author, e-mail: devanshuguptagb4102@gmail.com

ABSTRACT

Onthophagus (*Onthophagus*) *duporti* Boucomont, 1914, *O. (O.) mopsus* (Fabricius, 1792), *O. (O.) orissanus* Arrow, 1931, *O. (O.) truncaticornis* (Schaller, 1783) and *O. (Colobonthophagus) paliceps* Arrow, 1931 are recorded for the first time from Madhya Pradesh (India) with their external male genitalia diagnosed for the first time. A checklist pertaining to Madhya Pradesh including 34 species of *Onthophagus* distributed in six subgenera is also provided.

KEY WORDS

Coleoptera; India; Madhya Pradesh; *Onthophagus*; Scarabaeidae.

Received 24.11.2011; accepted 10.12.2011; printed 30.06.2012

INTRODUCTION

The Subfamily Scarabaeinae currently includes around 5700 valid species united in 227 genera and 12 tribes. Of these, the tribe Onthophagini is the most diverse and includes 2500 species, slightly under half of the described species in the entire Scarabaeinae (Davis et al., 2008). Onthophagini have a worldwide distribution and include about 30 genera, of which the sub-cosmopolitan and mega-diverse genus *Onthophagus* Latreille, 1802 comprises 2300 described species (Schoolmeesters et al., 2008).

The majority of species of the genus are dung feeders but few are also carrion feeder. The Fauna of British India, including Ceylon and Burma volume III devoted to Coprinae (=Scarabaeinae) included 17 species of *Onthophagus* from Madhya Pradesh (Arrow, 1931). Balthasar (1963) listed 551 species of the genus belonging to 16 subgenera from Oriental and Palaearctic region but did not provide much information on the distribution of *Onthophagus* in Madhya Pradesh. Subsequently, Chandra & Ahirwar (2007) reported 23 species of

Onthophagus from Madhya Pradesh and Chhattisgarh. Recently, Chandra & Gupta (2011a, 2011b, 2012) added seven species of the genus from Madhya Pradesh.

While further working on unidentified material from Madhya Pradesh, five species of genus *Onthophagus*, new for Madhya Pradesh i.e. *Onthophagus* (*Onthophagus*) *duporti* Boucomont, 1914, *O. (O.) mopsus* (Fabricius, 1792), *O. (O.) orissanus* Arrow, 1931, *O. (O.) truncaticornis* (Schaller, 1783) and *O. (Colobonthophagus) paliceps* Arrow, 1931 were identified and their external male genitalia studied. Compiling all the published information and current report regarding diversity and distribution of *Onthophagus* in Madhya Pradesh, a checklist constituting 34 species under six subgenera is also prepared (Table 1).

MATERIALS AND METHODS

Specimens studied belong to the unidentified collections of dung beetles present in Central Zone Regional Station, in the Zoological Survey of India

collection (ZSI), Jabalpur, from Singhori Wildlife Sanctuary (Raisen), Morena, Pench Tiger Reserve (Seoni) and Kanha National Park (Mandla) of Madhya Pradesh (India).

Specimens were cleaned and softened in a dish of hot water, the abdomen was separated from the body, and the aedeagus was extracted from the abdomen. The abdomen was then glued to the body to keep the specimens intact.

The aedeagus was cleaned in a hot water solution of 10% KOH and washed in 95% ethanol and after examination stored in a glass vial containing 70% alcohol. Genitalia and whole insects were studied and photographed using Leica M 205 A Binocular Microscope. The specimens were identified with the help of available literature (Arrow, 1931) and compared with reference collection present in ZSI, Jabalpur. Classification adopted in the paper is after Smith (2006).

RESULTS

Altogether five species of genus *Onthophagus* viz. *Onthophagus (Onthophagus) duporti* Boucomont, 1914, *O. (O.) mopsus* (Fabricius, 1792), *O. (O.) orissanus* Arrow, 1931, *O. (O.) truncaticornis* (Schaller, 1783) and *O. (Colobonthophagus) paliceps* Arrow, 1931 were studied and reported for the first time from Madhya Pradesh.

The species were distributed in two subgenera viz. *Onthophagus* and *Colobonthophagus*. Thirty four species of *Onthophagus* under 6 subgenera are so far recorded from Madhya Pradesh (Table 1).

SYSTEMATICS

Order Coleoptera Linnaeus, 1758
 Suborder Polyphaga Emery, 1886
 Family Scarabaeidae Latreille, 1802
 Subfamily Scarabaeinae Latreille, 1802
 Tribe Onthophagini Burmeister, 1846
 Genus *Onthophagus* Latreille, 1802
 Type species: *Scarabaeus taurus* Schreber, 1759

Onthophagus (Onthophagus) duporti Boucomont, 1914

Onthophagus duporti - Boucomont, 1914: 228.

Onthophagus duporti - Arrow, 1931: 353.

Onthophagus (Onthophagus) duporti (Balthasar, 1963: 337).

EXAMINED MATERIAL. Madhya Pradesh, Raisen, Singhori Wildlife Sanctuary, Barna Dam, 04.IV.2011 (1 male, 1 female), leg. S. Sambath and the partners (Reg. no. ZSI/CZRC/A-16272).

DESCRIPTION (Fig. 1). Length 7.0 mm, maximum width 4.5 mm. Chestnut brown, oval and convex. Elytra black with some yellow strips. Head with its sides rounded and clypeus feebly produced and truncate. A short, blunt and conical horn present at the inner margin of each eye near frons. Pronotum bearing a small tubercle just behind front margin in middle and a pair of tubercles present a short distance apart midway between front and hind margins. Male genitalia (Fig. 6). Phallobase almost double in length as parameres. Parameres broad at base, sharply and regularly tapered distally and curved ventrally, tips pointed and with a broad rounded membrane.

DISTRIBUTION. India: Madhya Pradesh, Bihar and South India (Arrow, 1931). Elsewhere: Myanmar (Arrow, 1931), Thailand, Vietnam and Laos (Balthasar, 1963).

Onthophagus (Onthophagus) mopsus (Fabricius, 1792)

Scarabaeus mopsus - Fabricius, 1792: 58.

Onthophagus mopsus - Arrow, 1931: 328-329.

Onthophagus (Onthophagus) mopsus - Balthasar, 1963: 441.

EXAMINED MATERIAL. Madhya Pradesh, Morena, Kheda, 27.IV.2011 (1 male), Sandeep and Devanshu (Reg. no. ZSI/CZRC/A-16271).

DESCRIPTION (Fig. 2). Length 7.5 mm, maximum width 5.4mm. Oval, not very convex, blackish brown with a slight metallic lustre but not very shining. Dorsally, clothed with fairly closely and very minute greyish setae. Head bears an extremely long and slender horn, arising in front of eyes and curving backward beyond hind margin of pronotum. In middle, pronotum is smooth and unpunctured and a little flattened, with a strong tubercle on each side. Male genitalia (Fig. 7): phallobase a little longer than parameres. Parameres broad at base, slightly tapered distally with apical part obliquely placed ventrally, with tips pointed and a membranous plate on dorsal side.

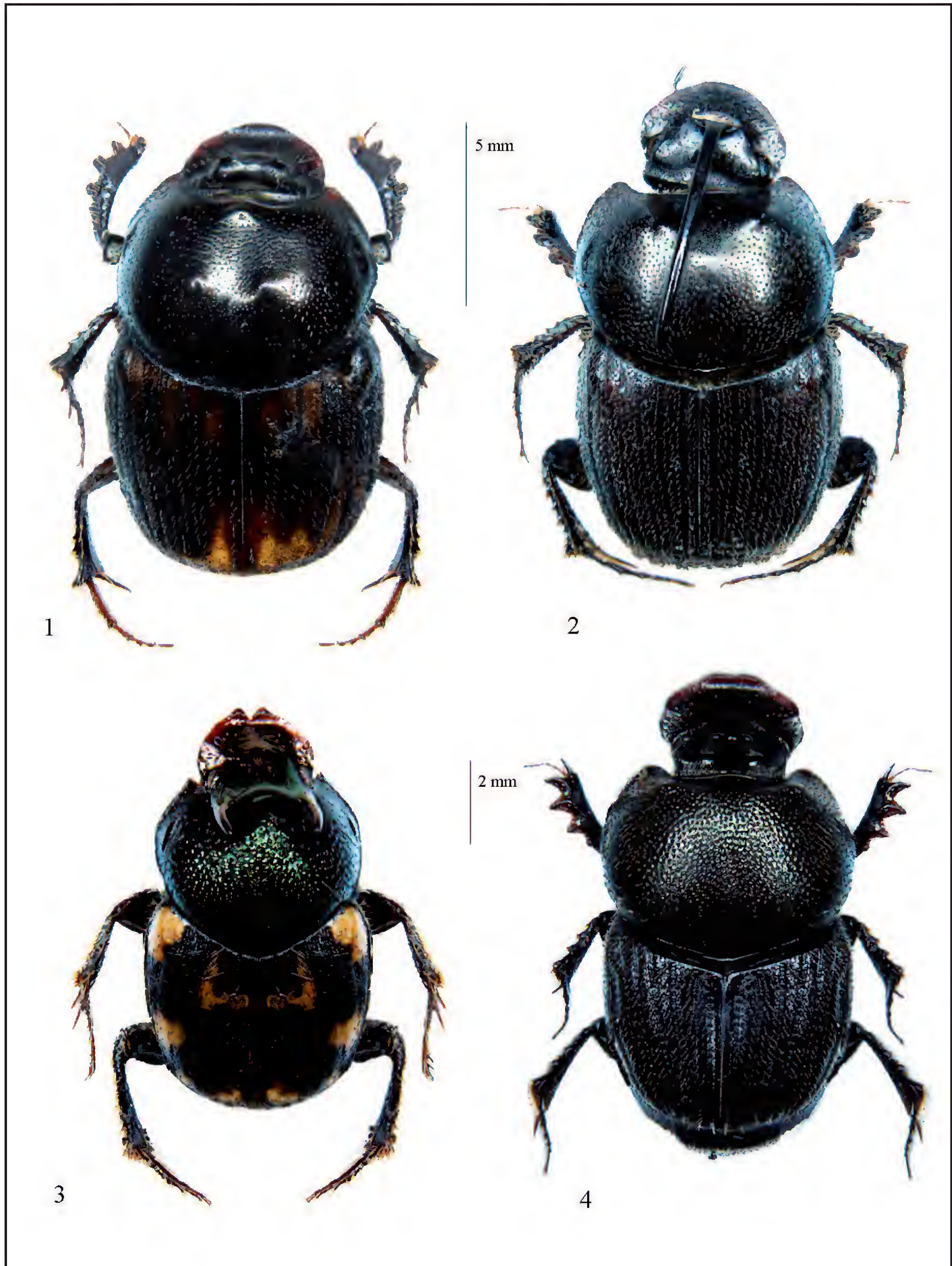


Figure 1. *Onthophagus (Onthophagus) duporti*, male. Figure 2. *Onthophagus (O.) mopsus*, male. Figure 3. *Onthophagus (O.) orissanus*, male. Figure 4. *Onthophagus (O.) truncaticornis*, male.

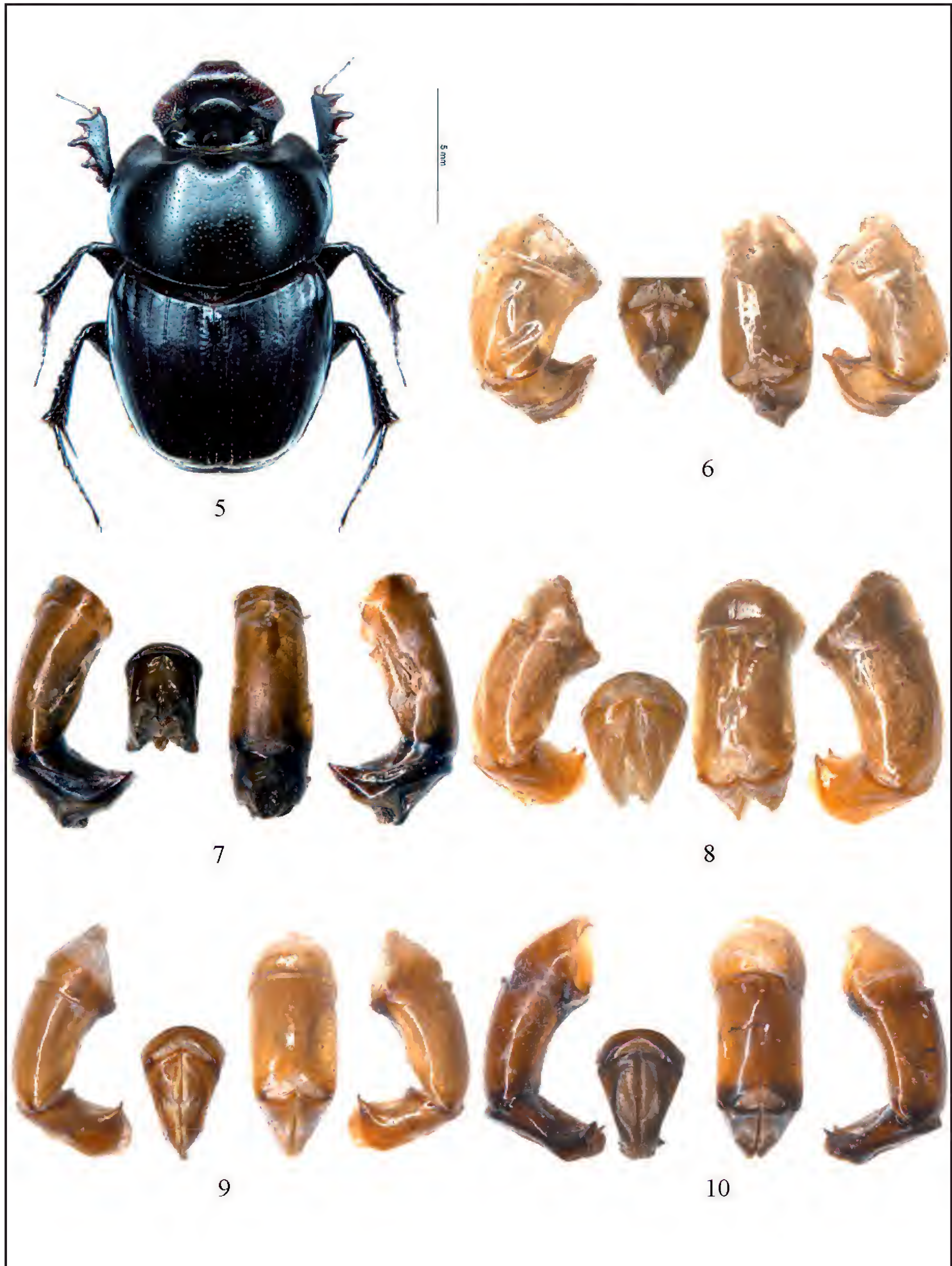


Figure 5. *Onthophagus (Colobonthophagus) paliceps*, male. Figures 6-10. External male genitalia of *Onthophagus (Onthophagus) duporti* (Fig. 6), *Onthophagus (O.) mopsus* (Fig. 7), *Onthophagus (O.) orissanus* (Fig. 8), *Onthophagus (O.) truncaticornis* (Fig. 9), *O. (C.) paliceps* (Fig. 10).

DISTRIBUTION. India: Bihar, Jammu & Kashmir, Madhya Pradesh, Uttar Pradesh, Uttarakhand and West Bengal. Elsewhere: Pakistan (Arrow, 1931).

Onthophagus (Onthophagus) orissanus Arrow, 1931

Onthophagus orissanus - Arrow, 1931: 257.

Onthophagus (Onthophagus) orissanus - Balthasar, 1963: 464.

EXAMINED MATERIAL. Madhya Pradesh, Pench Tiger Reserve, Seoni, Baghdes Bar., 27.VII.2001 (1 male), M.L. Koshta (Reg. no. ZSI/CZRC/A-16270).

DESCRIPTION (Fig. 3). Length 6.50 mm, width 3.0 mm. Oval and moderately convex. Head, pronotum, pygidium and lower surface dark metallic green. Each elytra decorated with a yellow spot upon shoulder, one spot divided into two near suture at base, one near middle of outer margin, and two near posterior margin. Dorsal portion and pygidium closely clothed with long, erect and yellow hairs. Clypeus produced, deeply notched and sharply bilobed in front. Head bears a pair of backwardly directed horns which are moderately broad at base slender at the end and united by a curved carina enclosing a half-circle at its posterior margin. Male genitalia (Fig. 8): phallobase twice as long as parameres. Parameres a little curved broad at base and pointed apically at ventral portion.

DISTRIBUTION. India: Madhya Pradesh, Bihar (Balthasar, 1963), and Orissa (Arrow, 1931).

REMARKS. The species can be differentiated from *O. kchatriya* Boucomont, 1914 by the presence of following two characters; front angles of pronotum pointed and deeply notched and sharply bilobed clypeus in front.

Onthophagus (Onthophagus) truncaticornis (Schaller, 1783)

Scarabaeus truncaticornis - Schaller, 1783: 238.

Onthophagus truncaticornis - Arrow, 1931: 322-323.

Onthophagus (Onthophagus) truncaticornis - Balthasar, 1963: 568.

EXAMINED MATERIAL. Madhya Pradesh, Mandla, Keolari, 13.VII.2008 (8 males, 5 females), coll. Akhilesh (Reg. no. ZSI/CZRC/A-16279).

DESCRIPTION (Fig. 4). Length 8.0 mm, maximum width 2.85 mm. Broadly oval and very convex. Dark

greenish-black, not very shining except upon head, front part of pronotum and lower surface. Dorsally, closely clothed with short reddish setae. Head with clypeal margin strongly reflexed and separated from smooth forehead by a feeble rounded carina. Vertex produced backward as a nearly semicircular plate, which curves upward and rises to a short erect horn which bifurcates at the tip.

Male genitalia (Fig. 9): phallobase twice as long as parameres. Parameres curved and strongly pointed apically the distal end and with a broad plate.

DISTRIBUTION. India: Madhya Pradesh, Kerala (Balthasar, 1963), Karnataka, Maharashtra, and Tamil Nadu (Arrow, 1931).

Onthophagus (Colobonthophagus) paliceps Arrow, 1931

Onthophagus paliceps - Arrow, 1931: 287.

Onthophagus (Colobonthophagus) paliceps - Balthasar, 1963: 467.

EXAMINED MATERIAL. Madhya Pradesh, Mandla, Keolari, 13.VII.2008 (1 male, 1 female), coll. Akhilesh (Reg. no. ZSI/CZRC/A-16273).

DESCRIPTION (Fig. 5). Length 10.5 mm, maximum width 6.0 mm. Oval, moderately convex and black. Clypeus truncate, a little produced and feebly notched at front margin and separated by a semicircular carina from lightly punctured forehead. Head bears a short, slender and upwardly-curved horn at posterior margin. On each side at inner margin of eye, there is a shorter, transversely placed and rectangular erect process. Pronotum minutely and sparsely punctured, little hollowed transversely in front and bears, two blunt angulations placed rather far apart at upper margin of declivity.

Male genitalia (Fig. 10): phallobase almost twice as long as parameres. Parameres a little flattened and not broad with its pointed and curving ventral portion.

DISTRIBUTION. India: Madhya Pradesh and Uttarakhand (Arrow, 1931; Balthasar, 1963).

ACKNOWLEDGMENTS

The authors are thankful to Dr. K. Venkataraman, Director, Zoological Survey of India, Kolkata for providing necessary facilities and encouragement.

S. No.	Species name	District wise distribution in Madhya Pradesh	References
1	<i>Onthophagus (C.) bengalensis</i> Harold, 1886	Damoh	Chandra & Gupta, 2011a
2	<i>Onthophagus (C.) hindu</i> Arrow, 1931	Damoh, Hoshangabad, Jabalpur	Chandra & Gupta, 2011b; Chandra et al., 2011, 2012
3	<i>Onthophagus (C.) paliceps</i> Arrow, 1931	Mandla	new record from Madhya Pradesh
4	<i>Onthophagus (C.) tragus</i> (Fabricius, 1792)	Mandla	Chandra & Ahirwar, 2005b
5	<i>Onthophagus (D.) bonasus</i> (Fabricius, 1775)	Betul, Balaghat, Hoshangabad, Umariya, Mandla	Arrow, 1931; Chandra & Ahirwar, 2005a, 2005b, 2007; Chandra et al., 2011
6	<i>Onthophagus (D.) gazella</i> (Fabricius, 1787)	Indore, Betul, Balaghat, Damoh, Seoni, Hoshangabad, Jabalpur, Umariya, Mandla	Arrow, 1931; Chandra, 2002; Chandra & Ahirwar, 2005a, 2005b, 2007; Chandra & Gupta, 2011a; Chandra et al., 2011, 2012
7	<i>Onthophagus (M.) hystrix</i> Boucomont, 1914	Mandla, Balaghat	Arrow, 1931; Chandra & Ahirwar, 2007
8	<i>Onthophagus (O.) agnus</i> Gillet, 1925	Indore, Seoni	Arrow, 1931; Chandra, 2002; Chandra & Ahirwar, 2007
9	<i>Onthophagus (O.) abacus</i> Boucomont, 1921	Seoni	Chandra & Gupta, 2012
10	<i>Onthophagus (O.) abreui</i> Arrow, 1931	Betul, Seoni	Arrow, 1931; Chandra & Ahirwar, 2007
11	<i>Onthophagus (O.) brevicollis</i> Arrow, 1931	Balaghat, Raigarh	Arrow, 1931; Chandra & Ahirwar, 2007
12	<i>Onthophagus (O.) centricornis</i> (Fabricius, 1798)	Balaghat, Raigarh	Arrow, 1931; Chandra & Ahirwar, 2007
13	<i>Onthophagus (O.) cervus</i> (Fabricius, 1798)	Balaghat, Riwa, Umariya, Jabalpur, Mandla	Arrow, 1931; Chandra & Ahirwar, 2005a & b, 2007; Chandra et al., 2012
14	<i>Onthophagus (O.) dama</i> (Fabricius, 1798)	Balaghat, Hoshangabad, Jabalpur, Umariya, Mandla	Arrow, 1931; Chandra & Ahirwar, 2005a, 2005b, 2007; Chandra et al., 2011, 2012
15	<i>Onthophagus (O.) duporti</i> Boucomont, 1914	Raisen	new record from Madhya Pradesh
16	<i>Onthophagus (O.) fasciatus</i> Boucomont, 1914	Riwa, Shahdol, Umariya	Arrow, 1931; Chandra & Ahirwar, 2005a; Chandra & Ahirwar, 2007
17	<i>Onthophagus (O.) gratus</i> Arrow, 1931	Mandla	Chandra & Gupta, 2012
18	<i>Onthophagus (O.) griseosetosus</i> Arrow, 1931	Mandla, Balaghat, Raigarh, Hoshangabad, Jabalpur	Arrow, 1931; Newton & Malcolm, 1985; Chandra & Ahirwar, 2005b, 2007; Chandra et al., 2011, 2012
19	<i>Onthophagus (O.) laborans</i> Arrow, 1931	M. P.	Arrow, 1931; Chandra & Ahirwar, 2007
20	<i>Onthophagus (O.) mopsus</i> (Fabricius, 1792)	Morena	new record from Madhya Pradesh
21	<i>Onthophagus (O.) orientalis</i> Harold, 1868	Balaghat, Raigarh	Arrow, 1931; Chandra & Ahirwar, 2007
22	<i>Onthophagus (O.) orissanus</i> Arrow, 1931	Seoni	new record from Madhya Pradesh
23	<i>Onthophagus (O.) ramosus</i> (Wiedmann, 1823)	Indore, Jabalpur, Sidhi, Damoh, Mandla, Bhopal, Umariya, Hoshangabad	Arrow, 1931; Chandra & Ahirwar, 2005a, 2005b, 2007; Chandra & Gupta, 2011a; Chandra et al., 2011, 2012
24	<i>Onthophagus (O.) ramosellus</i> Bates, 1891	Betul, Hoshangabad,	Arrow, 1931; Chandra & Ahirwar, 2007; Chandra et al., 2011

S. No.	Species name	District wise distribution in Madhya Pradesh	References
25	<i>Onthophagus (O.) rudis</i> Sharp, 1875	Jabalpur	Chandra & Gupta, 2012; Chandra et al., 2012
26	<i>Onthophagus (O.) quadridentatus</i> (Fabricius, 1798)	Damoh, Riwa, Umaria, Hoshangabad, Jabalpur	Arrow, 1931; Chandra & Ahirwar, 2005, a 2007; Chandra & Gupta, 2011a; Chandra et al., 2011, 2012
27	<i>Onthophagus (O.) spinifex</i> (Fabricius, 1781)	Mandla, Seoni	Chandra & Gupta, 2011b
28	<i>Onthophagus (O.) tarandus</i> (Fabricius, 1792)	Umaria, Seoni, Sidhi, Hoshangabad, Balaghat, Riwa, Mandla	Arrow, 1931; Chandra & Ahirwar, 2005a, 2005b, 2007
29	<i>Onthophagus (O.) truncaticornis</i> (Schaller, 1783)	Mandla	new record from Madhya Pradesh
30	<i>Onthophagus (O.) unifasciatus</i> (Schall., 1783)	Jabalpur	Chandra et al., 2012
31	<i>Onthophagus (O.) zebra</i> Arrow, 1931	Indore	Arrow, 1931; Chandra & Ahirwar, 2007
32	<i>Onthophagus (P.) amplexus</i> Sharp, 1875	Jabalpur	Chandra & Gupta, 2012; Chandra et al., 2012
33	<i>Onthophagus (P.) pactolus</i> (Fabricius, 1787)	Damoh, Hoshangabad, Umaria, Indore, Mandla, Seoni	Arrow, 1931; Newton & Malcolm, 1985; Chandra, 2002; Chandra & Ahirwar, 2005a, 2005b, 2007; Chandra & Singh, 2004; Chandra & Gupta, 2011a; Chandra et al., 2011.
34	<i>Onthophagus (S.) sagittarius</i> (Fabricius, 1775)	Riwa, Umaria, Hoshangabad, Mandla	Arrow, 1931; Chandra & Ahirwar, 2005a, 2005b, 2007; Chandra et al., 2011;

Table 1. Checklist of *Onthophagus* from Madhya Pradesh.

REFERENCES

- Arrow G. J., 1931. The Fauna of British India including Ceylon and Burma. Col. Lamell. III, (Coprinae). Taylor & Francis, London, 428 pp.
- Balthasar V., 1963. Monographie der Scarabaeidae und Aphodiidae der palaearktischen und orientalischen Region, Coleoptera: Lamellicornia, Verlag der Tschechoslowakischen Akademie der Wissenschaften Prag, Vol. 2, 627 pp.
- Boucomont, A. 1914. *Onthophagus* asiatiques nouveaux ou peu connus. Annali del Museo Civico di Storia Naturale di Genova, 46: 210-243.
- Chandra K., 2002. On a collection of Scarabaeid beetles from Pench Tiger Reserve (Seoni, Madhya Pradesh. Journal of Tropical Forestry, 18: 104-107.
- Chandra K. & Ahirwar S.C., 2005a. Scarabaeid Beetles of Bandhavgarh National Park, Madhya Pradesh. Zoos' Print Journal, 20: 1961-1964.
- Chandra K. & Ahirwar S.C., 2005b. Scarabaeid Beetles (Coleoptera) of Kanha Tiger Reserve, Madhya Pradesh. Records Zoological Survey of India, 105: 147-155.
- Chandra K. & Ahirwar S.C., 2007. Insecta: Coleoptera: Scarabaeidae, p. 273-300. In Chandra K. (eds), Fauna of Madhya Pradesh (including Chhattisgarh). State Fauna Series, 15, Zoological Survey of India, p. 1-564.
- Chandra K. & Gupta D., 2011a. Study of Scarabaeid Beetles (Coleoptera) of Veerangana Durgavati Wildlife Sanctuary, Damoh, Madhya Pradesh, India, Deccan. Current Science, 5: 272-278.
- Chandra K. & Gupta, D., 2011b. Two New Records of genus *Onthophagus* Latreille, 1802 (Coleoptera: Scarabaeidae) from Madhya Pradesh, India. Uttar Pradesh Journal of Zoology, 31: 253-255.
- Chandra K. & Gupta D., 2012. New Distributional Record of Five Species of *Onthophagus* (Coleoptera: Scarabaeidae: Scarabaeinae) from Central India. Scholarly Journal of Agricultural Science, 2: 8-12.
- Chandra K. & Singh R. K., 2004. On a collection of Scarabaeid beetles (Coleoptera) from Pachmarhi biosphere reserve, Madhya Pradesh. Records Zoological Survey of India, 102: 43-46.
- Chandra K., Khan, S. & Gupta D., 2012. New Records to the Species Diversity of Family Scarabaeidae and Hybosoridae (Coleoptera: Scarabaeoidea) of Jabalpur, Madhya Pradesh (India). Academic Journal of Entomology, 5: 28-36.
- Chandra K., Khan, S., Gupta D. & Singh, S. P., 2011. Additional Records of Scarab Fauna (Coleoptera:

- Scarabaeidae) of Pachmarhi Biosphere Reserve, Madhya Pradesh, India. *National Journal of Life Sciences*, 8: 65-68.
- Davis A.L.D., Frolov A.V. & Scholtz C.H., 2008. *The African Dung Beetle Genera*. Protea Book House, Pretoria, 272 pp.
- Fabricius J.C., 1792. *Entomologia systematica emendata et aucta, secundum classes, ordines, genera, species adiectis, synonymis, locis, observationibus, descriptionibus*. Tom. I. Hafniae: Christ. Gottl. Proft., xx+330 pp.
- Newton P. N. & Malcolm J.C., 1985. Dung and Dung beetles in Kanha Tiger Reserve, Central Indian Highlands. *Journal of Bombay Natural History Society*, 85: 218-220.
- Schaller J.G., 1783. *Neue Insecten*. *Abhandlungen der Hallischen Naturforschenden Gesellschaft*, 1: 217-328.
- Schoolmeesters P., Davis A.L.D., Edmonds W.D., Gill B., Mann D., Moretto P., Price D., Reid C., Spector S. & Vaz-De-Mello F., 2008. ScarabNet Global Taxon Database, available at: <http://216.73.243.70/scarabnet/results.htm> (last access 30.05.2012).
- Smith A. B. T. 2006. A review of the family-group names for the superfamily Scarabaeoidea (Coleoptera) with corrections to Nomenclature and a current Classification. *Coleopterists Society Monograph*, 5:144-204.

Nomenclatural observations on the *Ercella* Monterosato, 1894 species (Gastropoda, Helicidae) from the “Rocca” of Cefalù (Italy, Sicily)

Riccardo Giannuzzi-Savelli¹, Ignazio Sparacio² & Nunzia Oliva³

¹Via Mater Dolorosa 54 - 90146 Palermo, Italy; e-mail: malakos@tin.it

²Via E. Notarbartolo, 54 - 90145 Palermo, Italy; e-mail: isparacio@inwind.it

³Via Cimbali, 47 - 90142 Palermo, Italy; e-mail: oliva.ina@gmail.com

ABSTRACT

The taxon “*cephalaeditana*” was introduced in 1986 by the authors to indicate an endemic species from the “Rocca” of Cefalù; this species was discovered, named, but never described by E. Pirajno, Sicilian naturalist (1809-1864). The unusual description was accepted under Articles 11d and 13a of the ICZN Code edition in use at that time, but not to create nomenclatural uncertainties that would be obviously aggravated by the possible introduction of other names, different from the one Pirajno wanted to use for this discovery, we proceed here to a formal (re-)description of the taxon in question.

KEY WORDS

Helicidae; *Ercella*; *cephalaeditana*; ICZN; Cefalù.

Received 08.03.2012; accepted 28.04.2012; printed 30.06.2012

INTRODUCTION

During the restoration of Enrico Pirajno of Mandalisca's collection, carried out around 1980, we found the types of species of terrestrial molluscs described by this Sicilian naturalist.

In the paper we later published on this topic (Giannuzzi-Savelli et al., 1986), we introduced the new taxon *Helix cephalaeeditana* using a name that Pirajno had not published but that he had intended to use, as demonstrated by the original labels found in his collection, to an endemic rupicolous species of the “Rocca” of Cefalù. This species was already mentioned by Pirajno (1840), without describing it, as “*Helix mazzulli* var. β ”.

In our work (Giannuzzi-Savelli et al., 1986) it is clearly shown that we are dealing with a distinct species and that this was also the evident intention of Pirajno, in fact we wrote (p. 205): “Appare evidente che il Pirajno ... abbia elevato a rango di buona specie la sua varietà dell’*Helix mazzulli*”.

Sharing Pirajno's taxonomic approach, we conducted a detailed differential analysis between *Helix cephalaeeditana* and the similar *H. mazzulli* (De Cristofori & Jan, 1832) showing the morphological differences between the two taxa (“Infatti i caratteri conchiliari ... dei materiali tipici e topotipici sono peculiari e costanti e non si ritrovano in nessun'altra popolazione da noi esaminata.”). Moreover, talking about its ecology, we characterized *Helix cephalaeeditana* as “specie rupicola”, thus confirming once again our assessment of the taxon in question as a good species.

In the same work (Giannuzzi-Savelli et al., 1986) we designated the type material that we intended to present indeed as holotype and paratypes, respectively, but at that time, acting somewhat like perfecting a taxonomic choice already made by Pirajno and using his original material, we designed those specimens improperly as lectotype and paralectotypes.

We put no condition to the recognition of *H. cephalaeeditana* as valid taxon of species group,



Figures 1-3. Holotypus of *Ercella cephaloeditana* from "Rocca" of Cefalù. Figure 4. Original label from the Pirajno collection. Figures 5-7. *E. mazzulii* from Monte Pellegrino 500 m. s.l.m., 11.VIII.2007, leg. F. Liberto (H: 31 mm, D: 24,6 mm.). Figures 8-10. *E. insolida* from Custonaci, Rocca Rumena, 4.II.2012, leg. F. Liberto (H: 37,4 mm, D: 34,7 mm).

leaving only a margin of uncertainty in the choice between considering this taxon as a distinct species or a subspecies of *H. mazzullii*.

Subsequently, Manganelli et al. (1995) recognized in our work of 1986 the formal extremes for the description of a new species, in accordance with Articles 11d and 13a of the ICZN Code edition in use at that time. Manganelli et al. (1995) regarded "cephalaeditana" as a junior synonym of *Cantareus mazzullii*.

This taxon was later quoted as valid by Cossignani & Cossignani (1995 sub *Helix mazzullii cephaloeditana*), Piazza (2003, sub *Helix mazzullii cephaloeditana* var. *piazzensis*), Colomba et al. (2008, sub *Cornu mazzullii cephaloeditanum*), Liberto et al. (2010, sub *Ercella cephaloeditana*), and Giglio (2002). In this papers, the taxon *cephaloeditana* is only mentioned with reference at Giannuzzi-Savelli et al. (1985); the "var. *piazzensis*" (see Piazza, 2003) has no taxonomic value: it is infrasubspecific rank and the author has expressly used the term "variety".

In the broad debate on the Internet after the publication of this monograph, where this group of endemic and rupicolous terrestrial molluscs from North-Western Sicily is re-evaluated, some colleagues have proposed that the taxon "*cephaloeditana*" should not be considered valid under Article 15.1 of the ICZN Code.

The description of "*cephaloeditana*" in Giannuzzi Savelli et al. (1986), as reported by Manganelli et al. (1995), was certainly unusual, but, surely as well, we placed no condition ("... proposed conditionally ...") on the specific merits of this taxon of whose validity we, like Pirajno, were convinced. As mentioned above, from all the work (Giannuzzi-Savelli et al., 1986) it emerges clearly that we were treating it as a distinct species, without any doubt.

However, to avoid to create nomenclatural uncertainties that would be obviously aggravated by the possible introduction of other names, different from the one Pirajno wanted to use for this discovery, we proceed here to a formal (re-)description of the taxon in question.

Contextually, we are applying to the International Commission on Zoological Nomenclature in order to have all previous uses of *cephaloeditana* for this taxon being suppressed for the purposes of both the Principle of Priority and the Principle of Homonymy.

Ercella cephaloeditana n. sp.

EXAMINED MATERIAL. Holotypus (Lectotipo n. 571/B in Giannuzzi-Savelli et al., 1986) (Figs. 1-3) and 10 paratypi (Paralectotipi n. 571/A, C, D, E e n. 572/A, B, C, D, E, F see Giannuzzi-Savelli et al., 1986).

This material is kept in the malacological collection of the Mandralisca Museum of Cefalù; it is kept in two containers where there are also two labels, referring to Enrico Pirajno, bearing the inscription: "H. Cephaloeditana Mandralisca/Cefalù" (Fig. 4).

DESCRIPTION OF HOLOTYPE. Shell globose-conical; height 28.3 mm; maximum diameter 25.3 mm; aperture height 20 mm; aperture maximum diameter 22 mm; uniformly yellowish; spire elevated; external surface of last two whorls, strongly wrinkled and irregularly reticulated; peristome thickened and well reflected; aperture oval.

VARIABILITY. Paratypes do not show substantial differences from the described holotypus. The length of the shells is between 25 mm and 29.4 mm, the width is between 22.3 mm and 27 mm, the surface of the shell can be more wrinkled and reticulated.

ETYMOLOGY. From the name found on the labels assigned to this species by Enrico Pirajno and referring to the latin name of Cefalù (*Cephaloedium* or *Cephaloedum*), locus typicus of this species.

BIOLOGY AND DISTRIBUTION. Saxicolous and rupicolous species, endemic of the "Rocca" of Cefalù (North Sicily).

COMPARATIVE NOTES. *E. mazzullii* from the mountains of Palermo (Figs. 5-7) differs from *E. cephaloeditana* for the external surface of the shell, especially in the last two whorls, with thin, uniform, and axial wrinkles (more wrinkled, raised and reticulated in *E. cephaloeditana*) and for the peristome simple, little thickened and little reflected.

Another related species, *E. insolida* (Monterosato, 1892) occurs in some localities in the surroundings of Trapani (Figs. 8-10), is characterized by larger shell (height 33-40 mm; maximum diameter 29-35 mm) spire less elevated, external surface with very thin growth lines, peristome thickened, simple or little reflected, and different anatomical and molecular characters. *E. mazzullii* and *E. insolida* differ, also, from *E. cephaloeditana* for other anatomical and molecular characters.

CONCLUSIONS

In conclusion, as maintained by Pirajno, *E. cephaloeditana* appears clearly differentiated from *E. mazzullii*, from which is also geographically well isolated. A detailed analysis of the species of the genus *Erctella* Monterosato, 1894 in Sicily by Liberto et al. (2010) and Colomba et al. (2011) offers additional anatomical features and molecular data for *E. cephaloeditana*.

ACKNOWLEDGEMENTS

We thank M.S. Colomba (Urbino, Italy), F. Liberto and S. Giglio (Cefalù, Italy). In particular, prof. A. Minelli (Padova, Italy) for his help during the preparation of this work.

REFERENCES

- Colomba M.S., Gregorini A., Liberto F., Reitano A., Giglio S. & Sparacio I., 2011. Monographic revision of the endemic *Helix mazzullii* De Cristofori & Jan, 1832 complex from Sicily and re-introduction of the genus *Erctella* Monterosato, 1894 (Pulmonata, Stylommatophora, Helicidae). *Zootaxa* 3134: 1-42.
- Colomba M.S., Liberto F., Reitano A., Gregorini A., Giglio S. & Sparacio I., 2008. Le popolazioni di *Cornu mazzullii* (De Cristofori & Jan, 1832) in Sicilia. (Gastropoda Pulmonata Helicidae). 37 Congresso Nazionale della Società Italiana di Biogeografia, Catania, 7-10 ottobre 2008, 90.
- Cossignani T. & Cossignani V. 1995. Atlante delle conchiglie terrestri e dulciacquicole italiane. L'Informatore Piceno, Ancona, 208 pp.
- Giannuzzi-Savelli, R., Sparacio, I. & Oliva, N., 1986. I tipi di molluschi terrestri della collezione Pirajno del Museo Mandralisca di Cefalù. *Lavori della Società Italiana di Malacologia*, 22: 195-208.
- Giglio S., 2012. Peculiari molluschi della Rocca di Cefalù. In: *Kephalphil 2012. La fotografia a Cefalù nel 50° anniversario di Angelo Varzi*: 14-17.
- International Commission on Zoological Nomenclature (ICZN) 1985. International code of zoological nomenclature, third edition. The International Trust for Zoological Nomenclature, London, xx+338 pp.
- Liberto F., Giglio S., Reitano A., Colomba M.S. & Sparacio I., 2010. I Molluschi terrestri e dulciacquicoli di Sicilia della collezione F. Minà Palumbo di Castelbuono. *Monografie Naturalistiche* 2. Edizioni Danaus, Palermo, 136 pp.
- Manganelli G., Bodon M., Favilli L. & Giusti F., 1995. Gastropoda Pulmonata. In: Minelli, A., Ruffo, S., La Posta, S. (Eds.), *Checklist delle specie della fauna italiana*, 16. Edizioni Calderini, Bologna, 60 pp.
- Piazza I., 2003. Note storiche sulla rara *Helix mazzullii cephaloeditana* e il suo "Locus Typicus" (Rocca di Cefalù). *Cefalù*, 46 pp.
- Pirajno E., 1840. *Catalogo dei Molluschi terrestri e fluviatili delle Madonie e luoghi adiacenti*. Stamperia Oretea, Palermo, 40 pp.

Conserving Biodiversity of Yerramalais of Kurnool District, Andhra Pradesh, India, through People's Biodiversity Registers Program

Shaik Khaleel Basha^{1*}, Gudivada Sudarsanam², Dalazak Parveen³ & Ammnish Verma⁴

¹Associate Professor of Botany, Osmania Degree and PG college, 518001 - Kurnool, India

²Professor, Head of the Department of Botany, S.V University, Tirupati, A.P. India

³Assistant Professor of Botany, Osmania college for Women, Kurnool. A.P. India

⁴Technical Consultant (WHO) Department of AYUSH, Ministry of Health and Family Welfare, Government of India, New Delhi, India

*Corresponding author, e-mail: khaleelbasha24@gmail.com

ABSTRACT

Ecological degradation and its corollary -biodiversity loss- pose a serious threat to development. The program of People's Biodiversity Registers (PBR) is an attempt to promote folk ecological knowledge and wisdom. A program "PBR" for in-situ conservation of biological diversity involving local communities has been initiated in recent years. PBR helps in building an open and transparent information system on biodiversity resources from village level upwards. The register contains comprehensive information on availability and knowledge of local biological resources, their medicinal and other traditional knowledge associated with them. The main objective of this paper is to create awareness in villagers regarding how to preserve, protect biodiversity and equitably make use of TDK of medicinal plants. The process of preparation of PBRs, as well as the resultant documents, could serve a significant role in promoting more sustainable, flexible, participatory systems of management and in ensuring a better flow of benefits from economic use of the living resources to the local communities. Indigenous people (Sugalis) are playing an important role in conservation of TDK of Yerramalais. Knowledge about 38 different types of medicinal plants used by indigenous people for various diseases like leucoderma, snake bite, scorpion sting, jaundice, wounds, rheumatism are recorded.

KEY WORDS

People's Biodiversity Register (PBR); Traditional knowledge (TDK); Yerramalais; Sugali.

Received 11.03.2012; accepted 12.05.2012; printed 30.06.2012

INTRODUCTION

India is known for its rich heritage of biodiversity. Conserving biodiversity is basic to our survival and well-being and using it sustainably, forms part of the Indian culture and lifestyle. The Earth's biological resources are vital to humanity's economic and social development.

As a result, there is a growing recognition that biological diversity is a global asset of tremendous value to present and future generations. At the same time, the threat to species and ecosystems has never

been as great as it is today. Species extinction caused by human activities continues at an alarming rate.

Regrettably, much of this heritage is being rapidly eroded today. We live in exciting times, with technological developments transforming the world around us as never before. Communication has become easy; information in large measures is becoming readily accessible. Yet, in the midst of all these developments, we remain a biomass-based civilization.

Many Indians continue to lead lives as ecosystem people, tied closely to the resources of their environment to fulfill many of their requirements.

India's ecological resource base is under threat, with extensive destruction of natural habitats, widespread degradation of agro-ecosystems and a growing burden of air and water pollution. Simultaneously, India's knowledge base of uses of biodiversity is also being eroded, with the younger generation becoming increasingly alienated from the natural world. This calls for a committed scientific and technical effort, an effort in which all segments of India's population must participate actively. Finally, we need to ensure that the fruits of this progress reach all our people. Ecological problems coupled with unequal access to resources results in human ill-being and threats to the livelihood security of the world's poorest (Pandey, 1996; Balvanera et al., 2001).

The development of modern science and technologies notably biotechnology and information technologies have increased the value of biodiversity and associated knowledge including traditional knowledge (TDK). The growing importance of biodiversity, bio-resources and associated knowledge is fairly well understood. Scientific research on human-environmental interactions is now a budding sustainability science (Kates et al., 2001). The concept recognises that the well-being of human society is closely related to the well-being of natural ecosystems. The intellectual resources on which the sustainability science is building on need to take into account the knowledge of local people as well.

Local knowledge helps in scenario analysis, data collection, management planning, designing of the adaptive strategies to learn and get feedback, and institutional support to put policies into practice (Getz et al., 1999). Traditional knowledge on biodiversity conservation in India is as diverse as 2753 communities (Joshi et al., 1993) and their geographical distribution, farming strategies, food habits, subsistence strategies and cultural traditions.

In spite of the value of traditional knowledge for biodiversity conservation and natural resource management there still is a need to further the cause. The following consideration may be useful in this respect. People's biodiversity registers are a case in point (Gadgil, 1994, 1996; Gadgil et al., 2000). The program of People's Biodiversity Registers promotes folk ecological knowledge and wisdom by devising a formal means for their maintenance and by creating new contexts for their continued practice. PBRs document traditional ecological knowledge

and practices on use of natural resources, with the help of local educational institutions, teachers, students and NGOs working in collaboration with local institutions.

Such a process and the resulting documents could serve a significant role in "promoting more sustainable, flexible, participatory systems of management and in ensuring a better flow of benefits from economic use of the living resources to the local communities" (Gadgil et al., 2000).

People's Biodiversity Register

The "People's Biodiversity Registers (PBR)", a program now mandated by the Biological Diversity Act 2002, was initiated in India in 1995. Preparation of the People's Biodiversity Registers is a novel activity that will involve people at the grass roots in a scientific enterprise.

The Register shall contain comprehensive information on availability and knowledge of local biological resources, their medicinal or any other use or any other traditional knowledge associated with them, along with data about the local people and practitioners using the biological resources. PBR is envisioned as a tool that will facilitate the local bodies in conservation related decision-making.

The process of PBR development itself lets the people explore the biodiversity and related knowledge. This it self helps in imparting 'resource literacy', much needed for the conservation process. Most importantly, the PBR is also a tool for educating the younger mind on conservation education and ethics and the rich heritage. Through the PBR local knowledge only partially disclosed, for instance, a claim that a particular medicine woman knows of a cure for asthma.

It also helps in motivating the community in preparing the community Biodiversity registers for their hamlet, awares of medicinal plants among people, prepares action plan regarding cultivation of endangered and threatened medicinal plants in restricted, protected lands, creates a park exclusively of medicinal plants close to the village.

It also develops local body, to act like a watchdog, to prevent smuggling, excess cutting or collection of medicinal plants. It also passed a resolution that people should take permission and clearance from Gram Panchayat when collecting medicinal plants and also when cutting trees.

MATERIALS AND METHODS

STUDY AREA FOR PBR. Gummitham thanda (Fig. 1) is located in North-Eastern part of Kurnool district. The study area has an undulating and degraded topography. Gummitham thanda is a tribal village present at the foot-hill zone of the Gani reserve forest of Eastern Ghats in Oravakal mandal of Kurnool district, Andhra Pradesh, India.

Gani RF is evergreen forests including rivers, streams and lakes. The village consists of dominant Sugali tribes and other tribal people (languages for primary education: Telugu; spoken languages: Sugali). This thanda is also a hotspot for medicinal plants and home to several traditional healers.

METHODOLOGY. After study areas were selected, field investigators were chosen from among degree college science teachers. Many of these people are from nearby localities, and have considerable previous familiarity with the study sites. PBR of Gummitham thanda was established in December 2008. The preparation of People's Biodiversity Registers (PBRs) involves the active support and cooperation of a large number of people who need to share their common as well as specialized knowledge. One of

the first steps for preparing a PBR is to organize a group meeting to explain the objectives and purpose of the exercise.

Different social groups in the village need to be identified for purpose of data collection from those groups. The documentation process includes information gathered from individuals through detailed questionnaire, focused group discussion with persons having knowledge. The field investigating teams worked closely with, and often included, some of the local residents.

Collecting information on biodiversity and its uses from the local people in this area is a task that needs the person carrying out the documentation to be in the field for a long duration. This is required to win the complete confidence of the local people. Even the most knowledgeable local informant would not be able to explain half his information unless one is out in the field with him and able to see things first hand.

DOCUMENTATION OF TRADITIONAL KNOWLEDGE (TK) RELATED TO BIODIVERSITY. Documentation of knowledge of individuals with regard to biodiversity and its uses is an important part of PBR.



Figure 1. Gummitham thanda (project site), North-Eastern part of Kurnool district, Andhra Pradesh, India.

List of Knowledgeable individuals: Local				
Name	Age group	Sex	User Group	Expertise -related to Biodiversity
D.Gangu Naik	51-60	M	Agriculturist	Agriculture
E.Bharthi Bai	31-50	F	Agriculturist	Folk-Medicine
S.Ramesh Naik	31-50	M	Agricultural labour	Basket weaving
D.Srinivas	51-60	M	Trader	Fish Trading
Smt.Parvathi	51-60	F	Craftsman	Folk-Medicine
Smt. Malathi Bai	31-50	F	Horticultural labour	Basket weaving
List of Knowledgeable Individuals: External				
Name	Age group	Sex	User Group	Expertise -related to Biodiversity
N.Gangu Naik	60 above	M	Researcher	Ecological history
R.Raja Goapl	31-50	M	Researcher	Zoologist
N.Karanakar Reddy	31-50	M	Social Worker	Ecological history
T.Anjaiah	31-50	M	Researcher	Plant specialist
Vara Lakshmi	31-50	F	Researcher	Fish specialist
Sarala Devi	31-50	F	Social Worker	Plant specialist

Table 1. List of Knowledgeable individuals: local and external.

Name of the occupation	12-20 years age	20-50 years age
Pastoralism	50	20
Agriculture	10	25
Liquor-selling	10	20
Fire wood collection	40	20
Casual labour	30	35
Attached agricultural	35	30
Honey -collection	30	40

Table 2. Occupations of the villagers of Gummitham thanda.

Every effort should be made to identify the persons with proven knowledge of local biodiversity; special attention should be given to the elderly persons who can also provide information on the biodiversity which was available in the past

but no longer seen at present. In some cases focus group discussion may be held for the purpose of documentation.

It is important to keep in mind some of the issues related to PBR. It is to be undertaken in a participatory mode involving varying sections of village society. While documenting, the knowledge and views of both genders are to be recorded. Information provided by people need to be collected, analysed and crosschecked by the members. The document should be endorsed by the Biodiversity management committee and later publicized in the Gram Sabha/Gram Panchayat. The document is periodically updated with additional and new information.

The study team (2008-2011) consists of 5 principal investigators two were college teachers, and three school teachers: S. Khaleel Basha (Project Coordinator), C. Santanna (Project Assistant), S. Satis

Naik (Field Assistant), N. Gangadar (Science Teacher), G. Naga Maddeleti (Social Worker).

List of local knowledgeable individuals (six people), List of external knowledgeable individuals (six), external occupational mobility of the villagers and background information of the village are recorded (Tables 1-2). This preparation of PBR has followed the method of Srishtigyan manual (Chhatre et al., 1998).

RESULTS

Many widespread trends are observed in the preparation of Gummitham thanda village PBR, representing the entire spectrum of ecoclimatic and socioeconomic conditions of this diverse village.

SOCIO-ECONOMIC PROFILE OF THE VILLAGE AND ITS PEOPLE. Gummitham thanda is a small village of 100 households. The population is approximately 380 out of which more than 80% are Sugalis and 20% other castes. The study team is headed by Project coordinator and other members. The local knowledgeable group consists of agriculturists, traders, craftsmen etc. The external knowledgeable group consists of research scholars of different branches, social workers. Occupational mobility like Pastoralism is highest between age range 12-20.

The main background information of the village are as follows: total area 4703 hectares, irrigated agricultural area 136 hectares, rainfed agriculture area 500 hectares, total agricultural area 600 hectares, streams (10), roads (100), total forest area 1456 hectares, no. of wells (4), no. of bore wells (6), no of houses (100), total population (380) and total domestic animals like cattle (120), buffaloes (50) and chickens (more than 200).

The total number of plants used for different purpose as fuel wood (80) is highest and least for fencing (2). Knowledge about thirty-eight different types of medicinal plants for various diseases like skin diseases, leucoderma, anti-diabetes, snake bite, jaundice, chronic fevers, rheumatism, cough and cold is recorded.

The medicinal plant species are listed alphabetically along with the scientific and local names, part used, purpose for which they are used (Table 3). The document can also be a very useful teaching tool for teaching environmental studies at schools, colleges and university level.

DISCUSSION

The PBR exercise will have to be an enterprise bringing together knowledge of the local people with scientific knowledge. This knowledge base would undoubtedly enhance our abilities to conserve, sustainably use and equitably share the benefits from our rich heritage of biodiversity resources and associated knowledge, at all levels from individual villages to districts, states and the country as a whole.

Along with science, local technologies (Gandhi, 1982) and people's knowledge systems such as ethno-forestry have an important role to play for biodiversity conservation and sustainability. Village communities and other small-scale societies residing continuously over a territory create, transmit and apply comprehensive knowledge about the resources contained in the territory. In villages where women take active part in natural resource management including agriculture and forestry they develop repositories of local knowledge that is continuously applied, tested and improved over time (Harding, 1998).

By acknowledging and making use of peoples' knowledge we shall also promote the principle of equity of knowledge (Pandey, 1998). Equity of knowledge between local and formal sciences results in empowerment, security and opportunity for local people. If the state and formal institutions incorporate people's knowledge into the resource management decisions, it reduces the social barriers to participation and enhances the capacity of the local people to make choices to solve the problem. Collective wisdom can help in the planning and implementation of suitable programs for managing the agroforests. This results in ecological, economic, and social security.

CONCLUSIONS

Traditional societies have accumulated a wealth of local knowledge, transmitted from generation to generation. Experience has taught them how the water, trees, and other natural resources should be used and managed to last a long time.

Equity of knowledge can also enhance the security in its broadest sense. By capitalizing on the collective wisdom of formal and traditional sciences, we

SNO	SCIENTIFIC NAME	VERY NAME	FAMILY	PART USED	MEDICINAL USE
1	<i>Abutilon indicum</i>	tutturu benda	Malvaceae	Leaves	demulcent, rheumatism
2	<i>Althaea rosea</i>	japali theetham	Malvaceae	Root	astinging
3	<i>Abrus precatorius</i>	guriginja	Fabaceae	Root	cough, cold
4	<i>Aristolochia indica</i>	Nall eswari	Aristolocaceae	Root	sorpion bite, moggotted wounds
5	<i>Ammania buccifer</i>	agnijawal	Lythraceae	Whole plant	snake bite
6	<i>Andrographis paniculata</i>	nelavemu	Acanthaceae	Whole plant	fever, cough, bronchitis, diabetic
7	<i>Argyrea nervosa</i>	samudra pala	Convolvulaceae	Root	rhematism
8	<i>Bauhinia variegata</i>	madapaku	Fabaceae	Flowers	luxative, leucoderma, vaginal discharge
9	<i>Butea monosperma</i>	Moduga	Fabaceae	Seed	anthelminitic, herpis, aphrodisiac
9	<i>Cassia italica</i>	nelavemu	Caesalpinaceae	Whole plant	jaundice, allergy, measles
10	<i>Caesalpinia bonduc</i>	gaccha	Caesalpinaceae	Seed	diabetics, spleen and blood disorders
11	<i>Costus speciosus</i>	Koingi	Costaceae	Rhizome	antiinflammatory, antiarthritic activity
12	<i>Cissampelos pareira</i>	advibanka teega	Menispermaceae	Root	antiperiodic, purgative, snake-bite
13	<i>Cardiospermum halicacabum</i>	buddha kakara	Sapindaceae	Root	laxative, rheumatism, piles
14	<i>Calotropis gigantea</i>	Tella gilledu	Asclepiadaceae	Root	wound healing
15	<i>Capparis sepiaria</i>	nall uppi	Capparaceae	Stem bark	tuberculosis
16	<i>Cassia fistula</i>	rela	Caesalpinaceae	Leaves	bone fracture
17	<i>Cissus vitiginea</i>	adavi draksha	Vitaceae	Stem	repellent
18	<i>Cadaba fruticosa</i>	sekurirhi	Capparaceae	Leaves	oral cortaseptice, antifertility
19	<i>Corallocarpus epigaeus</i>	pamudonda	Cucurbitaceae	Root tuber	smake bite
20	<i>Coldenia procumbens</i>	papavinasanam	Boraginaceae	Leaves	rhematic swellings
21	<i>Decalepis hamiltonii</i>	nannari	Asclepiadaceae	Root powder	antidiabetic, blood purofier, appetizer
22	<i>Gyrocarpus americana</i>	tella poliki	Hernandiaceae	Stem bark	cancer
23	<i>Gymnema sylvestre</i>	podapatri	Asclepiadaceae	Leaves	antidiabetic, livertonc, cardio-tonic
				Flower	diuretic, rheumatism
				Leaves	hoarseness, aphrodisiac

SNO	SCIENTIFIC NAME	VERY NOME	FAMILY	PART USED	MEDICINAL USED
24	<i>Hyptis suaveolens</i>	danti tulasi	Lamiaceae	Leaves	antispasmodic, anti-rheumatic
25	<i>Helicteres isora</i>	gubada	Sterculiaceae	Seed, Root	diabetic,
26	<i>Leonotis nepetifolia</i>	ranaberi	Lamiaceae	Whole plant	febrifuge
27	<i>Justicea adhatoda</i>	addasaram	Acanthaceae	Leaf	antispasmodic, asthma
28	<i>Rhinacanthus nasutus</i>	nagamalle	Acanthaceae	Root	anti tumour
29	<i>Physalis minima</i>	buddha bhusha	Solanaceae	Fruit	diuretic
30	<i>Pterocarpus marsupium</i>	yegi	Fabaceae	Heart wood	leucoderma, urine astringent
31	<i>Strychnos nux-vomica</i>	Mushti	Loganiaceae	Wood, Root	fever, rheumatism
32	<i>Tiliacora acuminata</i>	kappa theega	Menispermaceae	Root	scorpion bite
33	<i>Tragea plukenetii</i>	duradagendaku	Euphorbiaceae	Root	scorpion bite
34	<i>Tinospora cordifolia</i>	tippa teega	Menispermaceae	Stem	jaundice, chronic fever
35	<i>Wrightia tinctoria</i>	palkodisa	Apocynaceae	Stem bark	skin diseases
36	<i>Wattakaka volubilis</i>	peddagurja	Asclepiadaceae	Leaf	snake bite
37	<i>Waltheria indica</i>	nallbenda	Sterculiaceae	Root	internal haemorrhage, thirst
38	<i>Xanthium indicum</i>	shankeswari	Asteraceae	Whole plant	diabetes

Table 3. List of medicinal plants used by Sugalis of Yerramalais forest.

shall be able to help people address the problem of global warming as well as to manage the risks they face because of the destruction of the local resources.

ACKNOWLEDGMENTS

People's Biodiversity Registers has been an extensive, cooperative effort; we are therefore grateful for numerous contributions of a very large number of colleagues from academic institutions and the residents of the Gummitham thanda village. We thank Secretary and Correspondent of Osmania college Madam Azra Javeed for permitting us to carry on this exploration work. We thank the forest personnel for accompanying us in the field.

REFERENCES

Balvanera P., Daily G.C., Ehrlich P.R., Ricketts T.H., Bailey S.A., Kark S., Kremen C. & Pereira H., 2001.

- Conserving biodiversity and ecosystem services. *Science*, 291: 2047.
- Chhatre A., Rao P.R.S., Utkarsh G., Pramod P., Ganguly A. & Gadgil M., 1998. *Srishtigyaan: a methodology manual for people's biodiversity registers*. Centre for Ecological Sciences, Indian Institute of Science, Bangalore.
- Gandhi I., 1982. Scientific endeavor in India. *Science*, 217: 1008-1009.
- Gadgil M., 1994. Inventorying, monitoring and conserving India's biological diversity. *Current Science*, 66: 401-406.
- Gadgil M., 1996. Deploying student power to monitor India's lifescape. *Current Science*, 71: 688-697.
- Gadgil M., Seshagiri Rao P.R., Utkarsh G., Pramod P., Chhatre A., 2000. New meanings for old knowledge: the people's biodiversity registers program. *Ecological Applications*, 10: 1307-1317.
- Getz W.M., Fortmann L., Cumming D., Toit J. du, Hilty J., Martin R., Murphree M., Owen-Smith N., Starfield A.M. & Westphal M.I., 1999. Sustaining natural and human capital: villagers and scientists. *Science*, 283: 1855-1856.

- Harding S., 1998. Women, science, and society. *Science*, 281: 1599-1600.
- Joshi N.V., Gadgil M. & Patil S., 1993. Exploring cultural-diversity of the people of India. *Current Science*, 64: 10-17.
- Kates R.W., Clark W.C., Corell R., Hall J.M., Jaeger C.C., Lowe I., McCarthy J.J., Schellnhuber H.J., Bolin B., Dickson N.M., Faucheux S., Gallopin G.C., Grubler A., Huntley B., Jäger J., Jodha N.S., Kasper-son R.E., Mabogunje A., Matson P., Mooney H., Moore B., O'Riordan T., Svedin U., 2001. Environment and development: sustainability science. *Science*, 292: 641-642.
- Pandey D.N., 1996. Beyond vanishing woods: participatory survival options for wildlife, forests and people. CSD and Himanshu, New Delhi, 222 pp.
- Pandey D.N., 1998. Ethnoforestry: local knowledge for sustainable forestry and livelihood security. Asia Forest Network, New Delhi, 91 pp.

Two new records of freshwater fishes (Cypriniformes, Balitoridae and Atheriniformes, Phallostethidae) from Thailand

Sawika Kunlapapuk^{1*}, Sitthi Kulabtong² & Chirachai Nonpayom³

¹Aquatic Animal Production Technology Program, Faculty of Animal Sciences and Agricultural Technology, Silpakorn University, Phetchaburi IT campus, Sampraya, Cha-am, Petchaburi, 76120 Thailand; e-mail: sawika@su.ac.th

²Save wildlife volunteer Thailand, Wangnoi District, Ayuttaya Province 13170, Thailand; e-mail: Kulabtong2011@hotmail.com

³534/26 Soi Phaholyothin 58 Phaholyothin Rd. Sai Mai, Bangkok, Thailand; e-mail: sorn133@hotmail.com

*Corresponding author, e-mail: sawika@su.ac.th

ABSTRACT

A balitorid fish, *Hemimyzon nanensis* Doi et Kottelat, 1998 (Cypriniformes, Balitoridae) is newly recorded from Ngim River, Yom Basin, North Thailand and a priapium fish, *Neostethus lankesteri* Regan, 1916 (Atheriniformes, Phallostethidae) is newly recorded from the estuary of Petburi Basin, West Thailand. Description and distribution data of the two freshwater fish are provided here.

KEY WORDS

Neostethus lankesteri; *Hemimyzon nanensis*; Balitoridae; Phallostethidae; Thailand.

Received 23.03.2012; accepted 18.05.2012; printed 30.06.2012

INTRODUCTION

Freshwater fish genera *Hemimyzon* Regan, 1911 and *Neostethus* Regan, 1916 are scarcely distributed in Thailand. The balitorid fish genus *Hemimyzon* has been reported for China, Taiwan and Indo-China archipelago (Doi & Kottelat, 1998). According to the current taxonomic status of this genus, it comprises 14 valid species, *H. macroptera* Zheng, 1982, *H. megalopseos* Li et Chen, 1985, *H. pengi* (Huang, 1982), *H. pumilicorpora* Zheng et Zhang, 1987, *H. sheni* Chen et Fang, 2009, *H. taitungensis* Tzeng et Shen, 1982, *H. yaotanensis* (Fang, 1931) from China and Taiwan, *H. confluens* Kottelat, 2000, *H. khonensis* Kottelat, 2000, *H. papilio* Kottelat, 1998 from Laos, *H. ecdyonuroides* Freyhof et Herder, 2002, *H. songamensis* Nguyen, 2005 from Vietnam and Thailand, *H. formosanus* (Boulenger, 1894) from Thaungyin River, Salween Basin, at the boundary between Thailand and Myanmar and *H. nanensis* Doi et Kottelat 1998, reported only from Nan Basin in Nan Province, North Thailand (Doi & Kottelat, 1998).

The priapium fish genus *Neostethus* is distributed in Southeast Asia only (Myers, 1928; Parenti, 1984). First record of *Neostethus* in Thailand was reported by Myers (1937) under the name *N. siamensis* (Siam refers to the old name of Thailand) from the estuary of Chantaburi River, Southeast Basin, Thailand, field collection by Dr. Hugh M. Smith. In 1989, this species was considered a junior synonym of *N. lankesteri* Regan, 1916 (Parenti, 1989). Currently, in Thailand, the genus *Neostethus* comprises only one species, *N. lankesteri* Regan, 1916.

In a survey project involving first and second authors (K.S. and K.S.) in Petburi River, West Thailand during 21-25 April 2012, we found several specimens of *N. lankesteri* Regan, 1916 in the estuary of Petburi River, Banlam District, Petburi Province, West Thailand. This is a new record of *N. lankesteri* Regan, 1916 in Petburi Basin, Thailand.

Moreover, during a survey project, carried out from February to July 2011 on Ngim River, the tributary of Yom Basin, North Thailand, involving the second author (K.S.), it was found one specimen of



1



2



3

Figure 1. *Hemimyzon nanensis*, 31 mm SL from Ngim River, Yom Basin, Thailand.

Figure 2. *Neostethus lankesteri*, 23 mm SL (male) from Petburi Basin, Thailand.

Figure 3. Mangrove area, estuary of Petburi River, West Thailand.

H. nanensis in Ngim River, Ngim Sub-district, Pong District, Phayao Province.

This specimen is a new record of *H. nanensis* in Yom Basin. Currently, the specimens of *N. lankesteri* and *H. nanensis* are deposited into the Reference Collection of Aquatic Ecology, Silpakorn University, Phetchaburi IT campus (RAESUP).

RESULTS

Order Cypriniformes Bleeker, 1859
Family Balitoridae Swainson, 1839

Hemimyzon nanensis Doi & Kottelat 1998

EXAMINED MATERIAL. RAESUP 001, 1 specimen, 31 mm Standard length (SL), Ngim River, Yom Basin, Thailand, 26.II.2011, legit Sitthi Kulabtong and the partners (Fig. 1).

DESCRIPTION. *H. nanensis* is compressed, body depth is 11.3 %SL and body width is 18.1 %SL. Pelvic fin extends nearly to pelvic fin origin. Broad head, head length is 21.6 %SL and head width is 20.6 %SL. Interorbital length is 9.4 %SL, snout length is 11.3 %SL. Dorsal fin origin is close to the anterior pelvic fin origin, predorsal length is 45.8 %SL, prepectoral length is 16.1 %SL and prepelvic length is 42 %SL. Pectoral fin is very large, with 9 simple and 12 branched rays. Anal fin with 4 simple and 8 branched rays. Lateral line complete, with 62 scales.

BIOLOGY AND DISTRIBUTION. *H. nanensis* was found at a small stream in the mountain. The stream is transparent, running slowly, average depth about less than 1 foot, stream ground is made of rough sand and large stones. This species is known only from Yom Basin and Nan Basin, Chaophaya River System, Thailand.

Order Atheriniformes Rosen, 1966
Family Phallostethidae Regan, 1913

Neostethus lankesteri Regan, 1916

EXAMINED MATERIAL. RAESUP 002, 10 specimens, 21.4-25.4 mm Standard length (SL), estuary of Petburi River, Bangkok Subdistrict, Banlam District, Petburi Province, West Thailand,

23.IV.2012, legit Sawika Kunlapapuk, Sitthi Kulabtong (Fig. 2).

DESCRIPTION. *N. lankesteri* is compressed, body depth is 18.5-22.0 %SL, body width is 5.6-7.1 %SL. Scales in lateral series are medium to large, but scales are very thin and fall easily. Head length (HL) is 28.7-30.4 %SL, head depth (HD) is 13.3-16.8 % SL or 44.8-55.4 % HL. The eye is large, eye diameter is 22.2-27.4 % HL (46.7-58.8 % HD or 6.5-7.9 %SL). Post orbital length is 40.3-54.8 %HL (11.9-15.8 %SL), snout length is short, with 14.9-22.2 HL (4.4-6.5 %SL) and interorbital width is 30.0-32.3 % HL (8.7-9.8 %SL), postorbital width is 35.6-41.3 % HL. Prepelvic fin length is 22.1-25.7 % SL and preanal fin length is 51.2-59.3 % SL. Anal fin is long, with 13-17 branched fin rays. One spine on first dorsal fin and 4-5 branched rays in second dorsal fin. The dorsal fin base length is 4.7-7.5 % SL and the anal fin base length is 16.8-20.8 % SL.

VARIABILITY. Priapium, the reproductive organ, was found in males only.

BIOLOGY AND DISTRIBUTION. In this study all specimens of *N. lankesteri* were found in a blackish canal (salinity, 20 ppt; depth about 20-150 cm, width about 5 m, current is running slowly, mud on the bottom) in mangrove area. This canal is a tributary of Peburi River (nearly estuary) and the canal is nearly a marine shrimp farm (Fig. 3). This species is known only from estuary of Chantaburi River, Southeast Basin and estuary of Petburi Basin, Thailand.

ACKNOWLEDGEMENTS

The authors are grateful to reviewers for reviewing this manuscript. We would like to thank the Aquatic Animal Production Technology Program, Faculty of Animal Sciences and Agricultural Technology, Silpakorn University, Phetchaburi IT campus for financial support. Finally, a special thanks to all partners for supporting this survey.

REFERENCES

- Doi A. & Kottelat M., 1998. *Hemimyzon nanensis*, a new balitorid fish from the Chao Phraya basin, Thailand. *Ichthyological Research*, 45: 7-11.

- Myers G.S., 1928. The systematic position of the phallostethid fishes, with diagnosis of a new genus from Siam. *American Museum Novitates*, 295: 1-12.
- Myers G.S., 1937. Notes on phallostethid fishes. *Proceedings of the United States National Museum*, 84: 137-143.
- Parenti L.R., 1984. On the relationships of phallostethid fishes (Atherinomorpha), with notes on the anatomy of *Phallostethus dunckeri* Regan, 1913. *American Museum Novitates*, 2779: 1-12.
- Parenti L.R., 1989. A phylogenetic revision of the phallostethid fishes (Atherinomorpha, Phallostethidae). *Proceedings of the California Academy of Sciences*, 46: 243-277.

A new species of *Petaloconchus* Lea, 1843 from the Mediterranean Sea (Mollusca, Gastropoda, Vermetidae)

Danilo Scuderi

Dipartimento di Biologia Animale, Laboratorio di Biologia Marina, Università di Catania, Via Androne, 81 - 95124 Catania, Italy; e-mail: danscu@tin.it

ABSTRACT

Petaloconchus (Macrophragma) laurae n. sp. is a vermetid here described as new. It is very similar in shell characters to both the species reported for the Mediterranean sea, the fossil *Petaloconchus intortus* (Lamarck, 1818) and the recent *Petaloconchus (Macrophragma) glomeratus* (Linnaeus, 1758), but the peculiar structure of the internal keels and the protoconch distinguish the new species from all the congeners; the external morphology of the soft parts add a new item in the discrimination of the recent species. The holotype of *P. glomeratus* is housed in BMNH and it is here compared with the new species.

KEY WORDS

Vermetidae, new species, *Petaloconchus* n. sp., taxonomy, Mediterranean Sea.

Received 18.04.2012; accepted 19.06.2012; printed 30.06.2012

INTRODUCTION

The species of the genus *Petaloconchus* Lea, 1843 are characterised by the presence in the columellar zone of a series of structures, i.e. internal keels, whose number and arrangement is a character for the first time described and utilised by Carpenter (1856) as a species-specific character. *Petaloconchus* is well represented in tropical waters by numerous species, but in the Mediterranean sea only one recent species is known, *P. (Macrophragma) glomeratus* (Linnaeus, 1758).

The validity of this peculiar character, proper to *Petaloconchus*, and the development and morphology of the earlier tele-whorls in vermetids is here reported as a good species-specific discriminating character on the basis of the study on 10 of the 25 extant species of *Petaloconchus* and is discussed in conclusions.

A second unknown Mediterranean species of *Petaloconchus* is here described as new: the morphology of shell, protoconch and external soft parts are described in detail and compared with the

holotype of *P. glomeratus* and with *P. intortus* (Lamarck, 1818), a fossil congener of the plio-pleistocenic Mediterranean area.

The new species is here distinguished by any other species of *Petaloconchus* mainly on the basis of the internal keel arrangement and the shape of protoconch: additional characters useful to distinguish the new species are here reported. The close related tropical species are here compared to the new species.

MATERIALS AND METHODS

Dry and living materials of both the new species of *Petaloconchus* and *P. glomeratus* were collected by undermining the shells from hard substrates at a depth of 0 to -18 m; empty shells were found among residuals of fishing nets at a depth of 50 to 150 m.

Protoconchs of both species were collected by digging them with a needle from the base of specimens and by extracting them from the brooding females; further empty material was collected

among the shell grit collected handily with ARA. Drawings of the external soft parts were obtained observing the living animals in aquarium. Fossil materials of both *P. glomeratus* and *P. intortus* were studied and compared to the new species.

ACRONYMS. Australian Museum, Sydney, New South Wales, Australia (AMS); Danilo Scuderi collection, Catania, Italy (DSC); Angelo Lugli collection, Carpi, Modena, Italy (ALC); Moscow State University, Moscow, Russia (ZMUM); Museo Civico di Zoologia, Roma, Italy (MCZR); Museo di Zoologia dell'Università, Bologna, Italy (MZUB); Museo del Dipartimento di Biologia Animale dell'Università, Catania, Italy (MBAC); Museo Nacional de Ciencias Naturales, Madrid, Spain (MNMS); Muséum National d'Histoire Naturelle, Paris, France (MNHN); Naturhistorisches Museum Mainz, Mainz, Germany (NHMM); Stefano Palazzi collection, Modena, Italy (SPC); The Natural History Museum, London, UK (BMNH); Alberto Villari malacological collection, Messina, Italy (AVC); Zoologische Staatssammlung, Munich, Germany (ZSMC).

Petalococonchus (Macrophragma) laurae n. sp.

EXAMINED MATERIAL. Holotypus, Catania, E-Sicily, Italy: S. Giovanni Li Cuti, in shallow water, on lava stones. Paratypes, same data as holotypus, 118 empty shells and 20 little cluster (3-10 shells each); Capo Mulini village, in shallow water, on lava stones, 3 empty shells; Acitrezza village, in shallow water, on lava stones, 6 empty shells. Messina, N-E Sicily, Italy: Ganzirri village, in shallow water, on stones, 2 empty shells; Siracusa, S-Sicily, Italy: Vendicari, from beached shell-grit, 6 empty shells. Agrigento, S-Sicily, Italy: Pelagie Is., Lampedusa, from beached shell-grit, 2 empty shells. Palermo, N-W Sicily, Italy: Ustica Is., from shell-grit, 25 m depth, 1 empty shell, AVC. Kosal jun, Croatia: Pag otok, in shallow water, on stones, 5 specimens and a single little cluster with living animals, SPC; Bodrum Harbour, Turkey: in shallow water, on stones, 2 empty shells, ALC.

Holotype, 2 paratypes and a protoconch from the locus typicus in MNHN, (with no reg. number); 1 paratype in AMS, C.474169; 1 paratype in MNMS, n. 34393; 1 paratype in MZUB, MZB45413; 1 paratype in ZMUM, n. Lc 24964; 1 paratype in ZSMC,

n. 20021768; 1 paratype in MBAC, n. MBLMC-CT-78. Other paratypes in DSC.

DESCRIPTION OF HOLOTYPUS. Shell cylindrical, 16 mm in length in adult regularly coiled specimens, composed by 14 rounded, squeeze shaped whorls (Figs. 1-4). The sculpture is regular: 9 spiral lines cross numerous and equally thickened (or slightly stronger) axial ribs, which form rounded and not marked tubercles at the intersection.

True columellar keels are lacking, while a single faint central plait (Fig. 6) is present on the columella, from earlier to the 12-13th tele-whorls of an adult specimen: this columellar chord is not visible in the last whorls. The diameter of the aperture is about 2 mm. Clusters of several specimens were found, even if true vermetid trottoir, like that of some tropical species of the same genus, are not known.

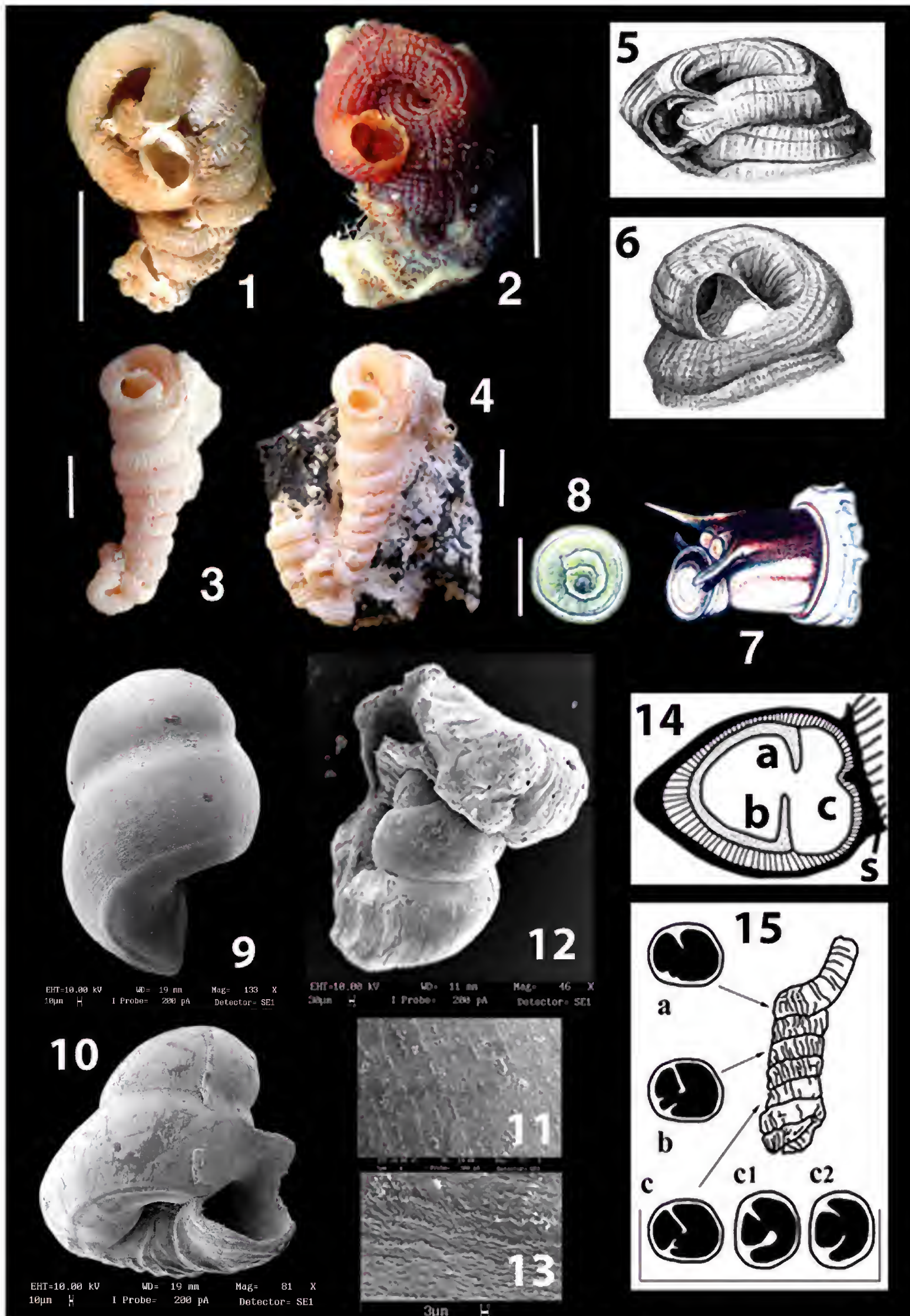
The living animal (Fig. 7) is pale cream in colour in the lower part of the metapodium, the anterior part of the mouth and the cephalic tentacles, the remaining part being dark brown; the podalic tentacles are almost black; the operculum (Fig. 8) is thin, smooth downward, with an internal spiral keel upward: it is wide 2/3 of the total operatural diameter of the tube, and allows to see a darker upper zone of the foot.

VARIABILITY. The shape of the whole shell depends on the morphology of substrate, i.e. stones and their crevices, so specimens may vary from long tricky shaped to more rounded coiled forms. Shell has the length between 12-20 mm, and shows 13-15 whorls; the shell sculpture include from 8 to 11 spiral lines cross. The color of the shell could be dark to amber brown, paler in empty shells. The columellar plait could vary in thickness depending on the shell whorls, as previously reported.

ETYMOLOGY. The specific name of the species is dedicated to my wife Laura.

BIOLOGY AND DISTRIBUTION. As other congenics, the new species inhabits hard substrata of shallow waters. It was never recorded in intertidal zone. The new species has been recorded from Sicily to for the Ionic and Adriatic sea, but its distribution range could be wider.

COMPARATIVE NOTES. Numerous species of *Petalococonchus* are close similar in morphological characters of the shell as well as of the external soft parts. A good character to separate them is represented by the arrangement of the columellar



Figures 1-4, 6-11: *P. laurae* n. sp. Fig. 1: holotype. Fig. 2: paratype, Pag otok. Figs. 3-4: paratypes, S. Giovanni Li Cuti. Scale bar 5 mm. Fig. 6: drawing of columellar arrangement. Fig. 7: external morphology of the soft parts. Fig. 8: upward view of operculum. Scale bar 0,5 mm. Figs. 9,10: protoconchs (0,7x0,75 mm); the black arrow indicates the basal chord. Fig. 11: protoconch sculpture. Figures 5, 12, 13. *P. glomeratus*. Fig. 5: drawing of columellar arrangement. Fig. 12: protoconch (1,1x0,7 mm). Fig. 13: protoconch sculpture. Fig. 14: sketches of columellar keels in different species, from the wall of tube (a), the columella (b), and the central fold (c). Fig. 15: drawing of the columellar keels variation from earlier (c) to middle (b) and older (a) whorls in *P. intortus*.

structures, i.e. the columellar keels, originated from a layer of the upper/lower wall of the tube (Fig. 14a) or from a layer of the columella (Fig. 14b), and the central fold, which seem to originate from another distinct layer (Fig. 14c).

The columellar structures, were proposed by Carpenter (1856) as a species-specific discriminating character for *Petalococonchus*. Subsequently Mörch (1861) utilised this character to distinguish *Petalococonchus* from the morphologically close related *Thylaeodus* Mörch, 1860, currently considered a subgenus of *Vermetus* Cuvier, 1800, which bear a cancellated sculpture of the shell but lack internal structures, as confirmed by Scuderi (1999) for the Mediterranean *Vermetus (Thylaeodus) granulatus* (Gravenhorst, 1831).

The study here conducted on original descriptions of the 25 extant known species of this genus and directly on material of 10 of them confirmed as good the species-specific discriminating character of the columellar keels: no one of these known species show a single columellar plait alone.

Moreover, internal structures in a single specimen of *Petalococonchus* are here observed to vary along the whole length of the tube (Fig. 15), from earlier tele-whorls (Fig. 15c), where they become to grow, being slightly variable (Figs. 15c1, 15c2) the middle trait (fig. 15b), where they are characteristic of the species in number and arrangement, to the last whorl (Fig. 15a), becoming less numerous, more faint or totally absent.

This could cause misunderstandings on the taxonomy of species and on the real taxonomic value of this character: Monterosato (1892), for example, following Mörch (1861), placed "*Serpula*" *glomerata* L. in *Petalococonchus*, but stated: "...this subdivision was founded on species which present longitudinal internal keels, which absolutely lack in all our (Mediterranean) vermetids". The study of the material of the Monterosato collection (MCZR), which was carried out along with the present investigation, revealed on the contrary that all the specimens of *P. glomeratus* had keels in the middle trait of the shell. Pillai & Hove (1994) utilised the presence/absence, number and shape of internal keels as discriminating character for the taxonomy of *Spiraserpula*, a genus of marine sedentary Annelida, which presents analogies with *Petalococonchus* in shell morphology.

P. laurae n. sp. is described as new on the basis of a series of morphological characters, among which the presence of a single columellar plait: no species of *Petalococonchus* are known wanting the columellar keels. The record of Schiaparelli (1995) for the Ligurian sea of *P. glomeratus* with a single internal keel is probably a not complete shell of the Linnean species, not referable to the new species.

The presence of a single columellar keel and the shape and sculpture of protoconch allowed the discrimination of *P. laurae* n. sp. from the two morphologically closest species: the recent Mediterranean *P. glomeratus*, whose holotype housed in

Characters/species	<i>Petalococonchus laurae</i>	<i>Petalococonchus glomeratus</i>	<i>Petalococonchus intortus</i>
TELEOCONCH			
number of whorls	13-15	up to 30	20-22
sculpture	radial equal to the spiral	radial less marked than the spiral	radial less marked than the spiral
columellar keels	1	3	3
opening of tube	rounded	squared	squared
PROTOCONCH			
shape	rather globose	pupoid	pupoid
dimensions (mm)	0,7 x 0,75	1,1 x 0,7	0,65 x 0,4
number of whorls	1 1/2	2 1/2	2 1/2
basal chord	present	absent	present

Table I. Distinguishing characters in *Petalococonchus laurae*, *P. glomeratus* and the fossil *P. intortus*.

BMNH is here compared with the new species, and the fossil *P. intortus*: all the others characteristics are summarised in Table I.

P. glomeratus has a very characteristic protoconch (Fig. 12), never reported before in literature, constituted by 2½ whorls, the apical very inflated, measuring 1,1 x 0,7 mm, with a faint sculpture on the entire surface of few spiral and more numerous axial threads which form a reticulation detectable only after SEM magnifications (Fig. 13). The fossil *P. intortus* has a smaller protoconch, measuring 0,65 x 0,40, with 2½ whorls, the second of which higher than the previous ones: they are almost smooth and bear a single basal chord, similar to that of *P. laurae* n. sp.

P. myrakeenae (Absalão & De Carvalho Rios, 1987), from South-Eastern Brazil, is morphologically related to *P. laurae* n. sp., but shows two internal laminae, even if the original description is not complete, lacking further important characters, i.e. the protoconch and the external soft part morphology. *P. macrophragma* Carpenter, 1857 from Mexico could resemble *P. laurae* n. sp., but shows three columellar structures and a different protoconch.

The protoconch of the Indopacific *P. cereus* Carpenter, 1857 presents a basal chord similar to that of the new species, but is constituted by 2½ whorls, is bigger (0,73 x 0,54 mm) and has a pupoid shape; the adult shell is quite different, being flat, almost smooth except for some very faint spiral lines on the upper zone of the tube, crossed by thin and often dark coloured axial threads.

Two oblivious taxa could be linked to the new species: *Vermetus jonicus* Danilo et Sandri, 1856 is reported as a polychaete by Monterosato (1892), who observed the syntype in the NHMM; *Petalococonchus (Macrophragma) flavescens* (Carpenter, 1857) was reported from Sicily in the original description and Nordsieck (1968) and Parenzan (1970) listed this species among the Mediterranean Vermetidae, although firstly Mörch (1861) and later Keen (1961 e 1971), both having observed the syntype in BMNH (reg. n. 195918), reported the true Mexican distribution of this species, which is extended from Bahia San Luis Gonzaga to Mazatlán, being the Sicilian citation a mistake. Moreover, as could be argued by the original description and figures, this species, unlike *P. laurae* n. sp., have two internal laminae, lacking the central fold.

Further two new species of *Petalococonchus* were recently described from Philippines (Kelly, 2007): *P. apakadikike* Kelly, 2007 and *P. lilandikike* Kelly, 2007 compared to *P. laurae* n. sp. both have two well-developed internal keel and a different protoconch. *P. laurae* n. sp. seems to be distributed from East to West Mediterranean, including the eastern part of the Adriatic sea.

ACKNOWLEDGEMENTS

I am indebted to Ms. Kathie Way (BMNH) who kindly sent photographs of Dunker's type material, photographed by Phil Hurst. Stefano Palazzi (Modena) and Alberto Villari (Messina) loaned biological and bibliographic material. Stefano Schiaparelli (Dip. Te. Ris., University of Genoa) is thanked for interesting comments and suggestions. Philippe Bouchet (MNHN), Yuri Kantor (ZMUM), Enrico Schwabe (ZSMC), Marco Taviani (MZUB), José Templado (MNMS) and Mandy Reid (AMS) are acknowledged for the allocation of the type material of *P. laurae* n. sp., bibliographic, material and suggestions. Many thanks are due to Dr. Francesco Cricione (AMS) for both the English text and the bibliographic assistance.

REFERENCES

- Absalão R.S. & De Carvalho Rios E., 1987. *Petalococonchus myrakeenae*, a new species of Vermetidae from Brazilian waters (Mollusca: Gastropoda). *Revista Brasileira de Biologia*, 47: 415-418.
- Carpenter P., 1857. First steps toward a monograph of the recent species of *Petalococonchus*, a genus of Vermetidae. *Proceedings of the Zoological Society of London*, 24(1856): 313-317.
- Keen A.M., 1961. A proposed reclassification of the Gastropod family Vermetidae. *Bulletin of the British Museum Natural History (Zoology)*, 7: 181-213.
- Keen A.M., 1971. *Sea shells of tropical west America*. Stanford University Press, Stanford, 1064 pp.
- Kelly III W. C., 2007. Three new vermetid gastropod species from Guam. *Micronesica*, 39: 117-140.
- Monterosato T. di Maria di, 1892. *Monografia dei Vermeti del Mediterraneo*. *Bullettino della Società malacologica italiana*, 17: 7-48.
- Mörch O.A.L., 1859. *Etudes sur la famille des vermetes*. *Journal de Conchiliologie*, 7: 342-360.

- Mörch O.A.L., 1860. Etudes sur la famille des vermetes. *Journal de Conchiliologie*, 8: 27-48.
- Mörch O.A.L., 1861-62. Review of the Vermetidae (Part I-II-III), *Proceedings of the Zoological Society of London*, 28 (1861): 145-181; 28 (1861): 326-365; 28 (1862): 54-83.
- Nordsieck, F. 1968. Die europäischen Meeres-Gehäuseschnecken (Prosobranchia). Vom Eismeer bis Kapverden und Mittelmeer. Gustav Fischer Verlag, Stuttgart, 273 pp.
- Parenzan P., 1970. Carta d'identità delle conchiglie del Mediterraneo, vol. I. Bios Taras, Taranto, 283 pp.
- Pillai T.G. & Hove H.A. ten, 1994. On recent species of *Spiraserpula* Regenhardt, 1961, a serpulid polychaete genus hitherto known only from Cretaceous and Tertiary fossils. *Bulletin of the British Museum Natural History (Zoology)*, 60: 39-104.
- Schiaparelli S. 1995. Contributions to the knowledge of Vermetidae (Mollusca, Gastropoda) from the Ligurian Sea. *Bollettino Malacologico*, 31: 267-276.
- Scuderi D., 1999. Contributo alla conoscenza dei Vermetidae mediterranei: *Vermetus granulatus* (Gravenhorst, 1831) e suoi principali morfotipi. *Bollettino Malacologico*, 35: 45-48.

Second record of *Pseudimares aphrodite* H. Aspöck et U. Aspöck, 2009 (Neuroptera, Myrmeleontidae)

Roberto A. Pantaleoni^{1,2}, Gabriel Martínez del Mármol Marín³ & Raúl León Vigara⁴

¹Dipartimento di Agraria, Entomologia, Università degli Studi di Sassari, Via Enrico de Nicola, 07100 Sassari, Italy; e-mail: pantaleo@uniss.it

²Istituto per lo Studio degli Ecosistemi, Consiglio Nazionale delle Ricerche (ISE-CNR), Traversa la Crucca 3, Regione Balduca, 07100 Li Punti (SS), Italy; e-mail: r.pantaleoni@ise.cnr.it

³c/ Pedro Antonio de Alarcon n° 34, 5° A, CP18002 Granada, Spain; e-mail: gabrimtnezmarmol@yahoo.es

⁴c/ Estanislao Cabanillas n° 43, piso 2°, CP13400 Almadén (Ciudad Real), Spain; e-mail: ofidiofobia.inversa@gmail.com

ABSTRACT

Some adults of *Pseudimares aphrodite* H. Aspöck et U. Aspöck, 2009 were observed and photographed while attracted by light in Southern Morocco, in August 2009 and 2011. Only the typus of this species, a male, was known previously from South Morocco too. Moreover the genus *Pseudimares* Kimmins, 1933 is perhaps the most enigmatic taxon among Neuroptera Myrmeleontidae. Its second species *Pseudimares iris* Kimmins, 1933 from Southern Iran is known also only in the type series, a male and a female. What little information we know about *Pseudimares* is reported.

KEY WORDS

Neuroptera; Palparinae; Morocco; *Pseudimares iris*.

Received 17.04.2012; accepted 04.05.2012; printed 30.06.2012

During a herpetological field survey in Southern Morocco, on August 23rd 2009, two of the Authors (GMMM and RLV), just before the midnight, observed an adult of a spectacular species of antlion with very characteristic eye-spotted wings (Figs. 1-3). The specimen was attracted by the lights of a house (Fig. 4) located 6 km North of Aouinet Torkoz (also called Aouinet Lahna) (Assa-Zag, Guelmim-Es Semara, Morocco).

Two years later, during a further herpetological trip in the same place on August 25th 2011, one of the authors (GMMM) observed other adults (3-4 or perhaps more). Despite the fact that no specimen was collected, the identification of the antlion as the recently described species *Pseudimares aphrodite* H. Aspöck et U. Aspöck, 2009 is absolutely sure.

The genus *Pseudimares* Kimmins, 1933 is perhaps the most enigmatic taxon among Neuroptera Myrmeleontidae. Until now only three specimens were known, two of *Pseudimares iris* Kimmins,

1933 from Southern Iran and one of *P. aphrodite* from Morocco. Its aspect is so unusual that, when D. E. Kimmins, at the British Museum, received the first specimen of *P. iris*, he thought it was an artifact (H. Aspöck & U. Aspöck, 2009). Only after receiving a second specimen he decided to describe the new genus and new species.

Currently *Pseudimares* would belong to the tribe Pseudimarini in the subfamily Palparinae but its phylogenetic position is uncertain (Markl, 1954; Stange, 2004). The two species are easily distinguished by the color pattern of the wings.

The specimens of *P. iris* were from “Masjid-i-Sulaimaniah” [Masjed Soleyman, also Masjed-e Soleymān, Masjid-i-Sulaiman, and other transliterations] the capital of Masjed Soleyman County, Khuzestan Province, Iran.

The male was collected with a light by Dr. Jamieson on August 1929, while the female was found dead on a verandah by Dr. S. V. P. Pill on September 7th 1932 (Kimmins, 1933).



Figures 1-3. Specimen of *Pseudimares aphrodite* H. Aspöck et U. Aspöck, 2009 by light 6 km North of Aouinet Torkoz (Assa-Zag, Guelmim-Es Semara, Morocco) August 23rd 2009.

Figure 4. Landscape at the same locality (all photos by Gabriel Martínez del Mármol Marín).

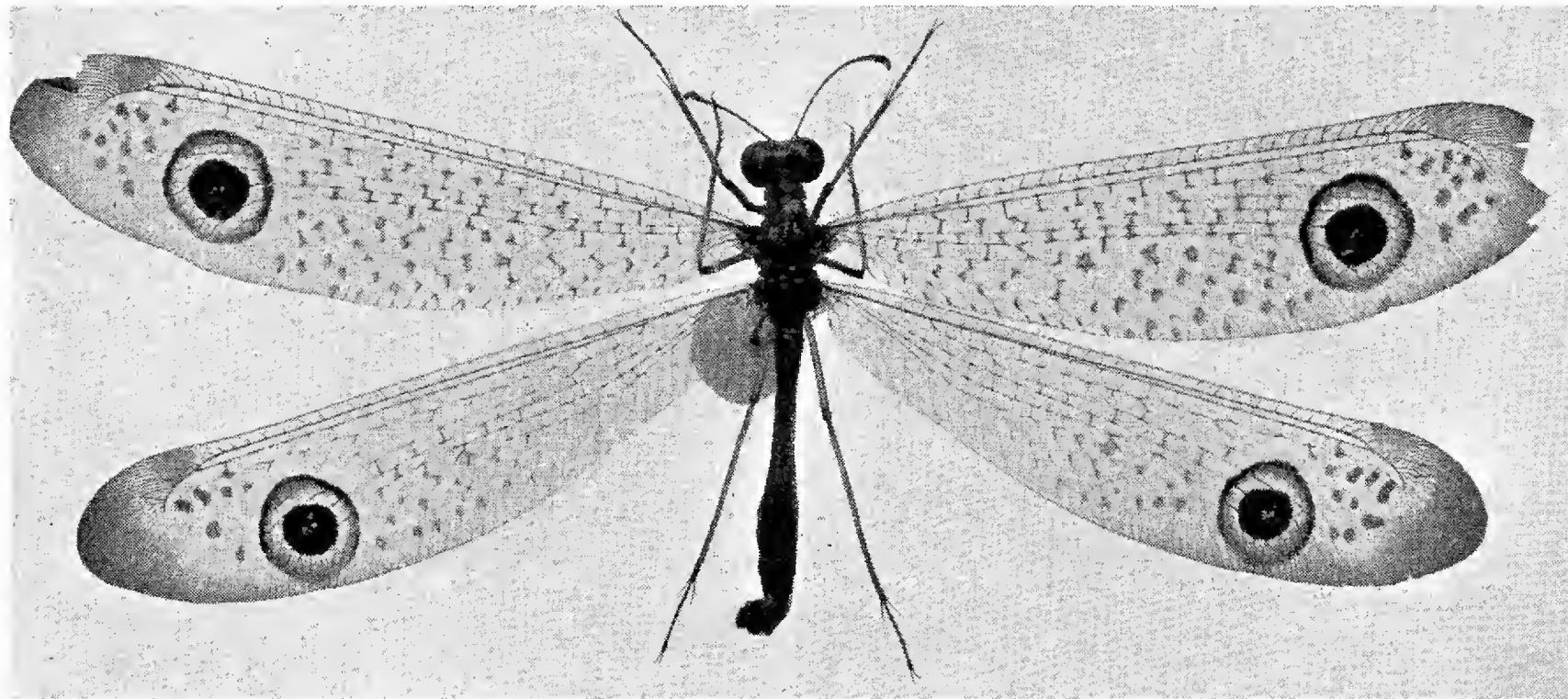


Figure 5. Type of *Pseudimares iris* Kimmins, 1933. Photo by original paper (Kimmins, 1933).

The only known male of *P. aphrodite* is from the Coastal Mountains about 20 miles north of Agadir (Souss-Massa-Draâ, Morocco) (the authors do not provide the exact locality in order to protect a species which is potentially vulnerable).

The collectors, Axel Steiner & Rolf Bläsius, found the specimen with a light, at around 10 pm, on August 6th 2008. The small-scale biotope, 230 m asl, is characterized by relatively lush vegetation, but it is limited by dry, rocky slopes (H. Aspöck & U. Aspöck, 2009).

In light of the discovery of a second locality 200 km South from the locus typicus, our record slightly broadens our knowledge about the genus *Pseudimares*. More important are some common traits in all available data that permit us to put forward some hypotheses. The adults of both species fly in August and are nocturnal or, at least, attracted by light. Also the dead female was found on a date compatible with this statement (beginning of September) and probably, having been found on a verandah, was attracted by light.

Both habitats recorded for the Moroccan species are characterized by relatively rich vegetation biotopes like oases or gardens. There is no information about the habitat of *P. iris*, but the presence of a verandah gives evidence of the presence of a garden. At least in South Morocco oases surrounded by xerophilous slopes seem to host very interesting Neuroptera fauna, see for example Badano & Pantaleoni (2012).

ACKNOWLEDGEMENTS

The authors are very grateful to Davide Badano (ISE-CNR) who discovered the photo of *Pseudimares aphrodite* on the web. They therefore had the opportunity to share their respective data and competences.

REFERENCES

- Aspöck H. & Aspöck U., 2009. Wiederentdeckung des mysteriösen Genus *Pseudimares* Kimmins, 1933, und Beschreibung einer neuen Art aus Marokko, *Pseudimares aphrodite* n. sp. (Neuroptera, Myrmeleontidae). *Entomologische Nachrichten und Berichte*, 53: 41-46.
- Badano D. & Pantaleoni R. A., 2012. *Agadirius trojani* gen. et sp. nov.: a new owlfly (Neuroptera: Ascalaphidae) from Morocco. *Zootaxa*, 3270: 51-57.
- Kimmins D. E., 1933. A new genus and species of the family Myrmeleontidae. *Annals and Magazine of Natural History*, (10)11: 244-246 + pl. VI.
- Markl W., 1954. Vergleichend-morphologische Studien zur Systematik und Klassifikation der Myrmeleontiden (Insecta, Neuroptera). *Verhandlungen der Naturforschenden Gesellschaft in Basel*, 65: 178-263.
- Stange L. A., 2004. A systematic catalog, bibliography and classification of the world antlions (Insecta: Neuroptera: Myrmeleontidae). *Memoirs of the American Entomological Institute*, 74: 1-565.

Zephyr's wings: Tiepolo's imagination or the antlion *Pseudimares Kimmins*, 1933 (Neuroptera, Myrmeleontidae) as his model?

Rinaldo Nicoli Aldini¹ & Roberto A. Pantaleoni^{2,3}

¹Istituto di Entomologia e Patologia vegetale, Facoltà di Agraria, Università Cattolica del Sacro Cuore, via Emilia Parmense 84, 29122 Piacenza, Italy; e-mail: rinaldo.nicoli@unicatt.it

²Dipartimento di Agraria, Entomologia, Università degli Studi di Sassari, Via Enrico de Nicola, 07100 Sassari, Italy; e-mail: pantaleo@uniss.it

³Istituto per lo Studio degli Ecosistemi, Consiglio Nazionale delle Ricerche (ISE-CNR), Traversa la Crucca 3, Regione Balduina, 07100 Li Punti (SS), Italy; e-mail: r.pantaleoni@ise.cnr.it

ABSTRACT

When Giambattista Tiepolo, in his painting 'Triumph of Zephyr and Flora', gave Zephyr dragonfly-like wings with eyespots, was he inspired by pure imagination or did he have an insect he had previously seen in mind: the rare and astonishing *Pseudimares*? It is impossible to be sure. The authors of the present note point out the innovatory characteristic of the pictorial arrangement adopted by Tiepolo for the wings, compared with stylistic elements which were fashionable before and during his epoch, and suggest the reasons why we cannot rule out that the artist could have been inspired by a model, a specimen of *Pseudimares*, two centuries before the scientific discovery of this very rare antlion, at present only known from Iran and Morocco. A short account is provided on the bio-ecological significance of the eyespots found on insect wings.

KEY WORDS

Giambattista Tiepolo; XVIII century; fine arts; science; Neuroptera; antlions; eyespots.

Received 24.05.2012; accepted 26.06.2012; printed 30.06.2012

By "wonder" I mean the power of the object displayed to stop the viewer in his tracks, to convey an arresting sense of uniqueness, to evoke an exalted attention (Greenblatt, 1990: 20).

INTRODUCTION

In the third decade of the XVIII century, Giambattista Tiepolo (Venice, March 5, 1696 - Madrid, March 27, 1770) painted his 'Triumph of Zephyr and Flora' (Fig. 1), a large (225 x 395 cm) oil painting nowadays housed at the Ca' Rezzonico Mu-

seum, Venice. In this work the artist did not adopt a canonical representation of Zephyr.

Indeed, he did not paint Zephyr with the traditional bird wings found in the reference iconological manual of his epoch, the Cesare Ripa's *Iconologia* (published in a great many editions; as examples we cite the second edition, which was the first to be illustrated, and a late posthumous edition in German: Ripa, 1603, 1704) (Fig. 2) (Ashton, 1978).

Tiepolo did not even use butterfly wings, the other symbolic image had been adopted since antiquity for certain winged personifications (Ronchetti, 1922: 986) (1).

(1) It seems fitting to mention Psyche, a mythical character, but first and foremost a word which in ancient Greek indicated both the spirit of life, the soul, and the butterfly (or moth), which recalls the first meaning, with its metamorphosis and flying away.



1



2



3

Figure 1. Giambattista Tiepolo, 'Triumph of Zephyr and Flora' (Ca' Rezzonico Museum, Venice, Italy).
 Figure 2. Some stylistic canons from a posthumous *Iconologia* by C. Ripa (1704). Zephyr, the West Wind, is represented (with bird wings) in picture no. 12. The other three Winds are to be found in pictures no. 11 (East), 13 (South) and 14 (North). Figure 3. The nymphalid *Inachis io* (Linnaeus, 1758) offers one of the most common examples of eyespots on the dorsal surface of the wings (left figure) whilst the ventral surface (right figure), uniformly blackish-brown, disguises the butterfly settled with folded wings on tree-bark and rock (photos by Paolo Mazzei).



Figure 4. Tiepolo's Zephyr and a *Pseudimares*: a close-up comparison of their wings; actual length of the antlion wing approx. 5 cm (the photo of antlion by Gabriel Martínez del Marmol Marín).

A late example of this is to be found in 'Flora and Zephyr' (1875) painted by the French William-Adolphe Bouguereau.

Eyespots and sense of wonder

The Venetian artist made his choice in order to foment a sense of wonder in the observer, giving

Zephyr four dragonfly-like wings, each with a very large apical eyespot (2).

Barcham (1996), one of the principal Tiepolo scholars, outlines the pictorial enchantment of the wings but he does not relate this to biological considerations, which would almost certainly have been alien to him. Eyespots, particularly on the wings, are widespread mainly among Lepidoptera.

(2) The idea of painting Zephyr with delicate, membranous dragonfly-like wings seemed to be the most suitable pictorial arrangement to evoke a light breeze, harbinger of Spring. Probably for this reason the choice of dragonfly wings was followed also in the nineteenth century by a painter from Cremona, Gallo Gallina; this artist, when he frescoed 'Zephyr abducts Flora' (1832) in the Ala-Ponzone palace of his native town, gave Zephyr graceful, uniformly dark-bluish damselfly-wings (see Magri, 2004), clearly inspired by a common calopterygid.

Such spots signal astonishment, amazement, instinct to flee. One of the main hypothesized functions of eyespots is that they deter predators (particularly insectivorous birds) by intimidation, preventing the latter from initiating an attack.

Most discussions of eyespots functioning as intimidation devices generally argue that they function by resembling the eyes of the predators' enemies (Fig. 3), although some recent investigations also present other aspects (Stevens, 2005; Valin et al., 2005; Stevens et al., 2008a, b). On the other hand, neither dragonflies (Anisoptera) nor damselflies (Zygoptera) with eyespots on their wings seem to exist (A. Tabarroni, in litteris).

Zephyr's wings are, therefore, astonishing and peculiar, corresponding perfectly to the definition of "wonder" as proposed by Greenblatt (1990).

Imagination or inspiration?

We do not know what guided Tiepolo's genius when he created such a daring hybrid between a butterfly (or moth), and a dragonfly (or damselfly). Certain commentators assert it was pure imagination (Chiappini & Veneziani, 2003), another (Magri, 2004) thinks that the wings were simply 'stolen' from a dragonfly, but this is not what the neuropterologist Monserrat (2010) believes: he finds a "surprising or casual" similarity with the adult antlion *Pseudimares* (Neuroptera Myrmeleontidae). Only two very rare species are presently known as belonging to this spectacular genus, one found in southern Iran (Kimmins, 1933), the other in Morocco (Aspöck & Aspöck, 2009). The very limited information available on both species, probably living in oases, is summarized by Pantaleoni et al. (2012).

The similarity between the pattern of Zephyr's wings and that of *Pseudimares* is not superficial, as the close-up comparison demonstrates (Fig. 4). If Tiepolo drew only on his imagination for his representation of Zephyr's wings, we are confronted with a very surprising coincidence. But is the hypothesis that the Venetian artist could have observed a *Pseudimares* at all feasible?

Giambattista Tiepolo spent his life principally in the Venice Republic, a seafaring state with a dense network of mercantile exchanges throughout the Mediterranean Sea. He himself was the son of a "mercante di negozi da nave" [merchant trading by ship] (Pallucchini, 1968).

In the late sixteenth century and through the seventeenth century Europe witnessed the spread of the 'Wunderkammern' rich in exotic finds, the forerunners of natural history museums (Westerhoff, 2001). Furthermore, of the European towns, Venice, together with for instance Amsterdam, during his epoch was characterized by a high patrician culture, with a strong interest in art and science (Burke, 1973). We therefore cannot exclude that the Master had the opportunity, for one reason or another, to see a specimen of this remarkable antlion, later being inspired by it.

There is no sure proof in favour of either of the two hypotheses: that of a fortuitous resemblance or that of an inspiring model, in the latter case simply recalled from memory by Tiepolo. However, both hypotheses contain an element of the extraordinary, thus exciting a sense of wonder, at least on the part of the authors of this note.

The former because it would indicate a nearly perfect coincidence between the imagery of a great painter and the true world. The latter because of the amazing trace an unusual and wonderful living being could have left behind, two hundred years before its official discovery and first description.

REFERENCES

- Ashton M., 1978. Allegory, Fact, and Meaning in Giambattista Tiepolo's Four Continents in Würzburg. *The Art Bulletin*, 60: 109-125.
- Aspöck, H. & Aspöck, U., 2009. Wiederentdeckung des mysteriösen Genus *Pseudimares* Kimmins, 1933, und Beschreibung einer neuen Art aus Marokko, *Pseudimares aphrodite* n. sp. (Neuroptera, Myrmeleontidae). *Entomologische Nachrichten und Berichte*, 53: 41-46.
- Barcham W. L., 1996. 13. Trionfo di Zefiro e Flora. In: AA. VV., 1996. Giambattista Tiepolo 1696-1996. Skira Editore, Milano, 118-121.
- Burke P., 1973. Patrician Culture: Venice and Amsterdam in the Seventeenth Century. *Transactions of the Royal Historical Society, Fifth Series*, 23: 135-152.
- Chiappini E. & Veneziani M., 2003. Gli insetti nell'arte figurativa italiana. In: Chiappini E. & Cravedi P., 2003. *Insetti e patrimonio artistico*. [Atti della Giornata di studio tenutasi a Piacenza il 24 ottobre 2003. Università Cattolica del Sacro Cuore, Sede di Piacenza-Cremona]. Tipolito Farnese, Piacenza, 9-43.

- Greenblatt S., 1990. Resonance and Wonder. *Bulletin of the American Academy of Arts and Sciences*, 43: 11-34.
- Kimmins D. E., 1933. A new genus and species of the family Myrmeleonidae. *Annals and Magazine of Natural History*, (10)11: 244-246 + pl. VI.
- Magri F., 2004. L'arte di essere insetto, ovvero: gli insetti nell'arte. Una chiacchierata sull'arte di rappresentare gli insetti. Chi sono e cosa ci raccontano gli insetti nel linguaggio degli artisti cremonesi, italiani e stranieri di ogni epoca. *Tipografia Fantigrafica*, Cremona, 223 pp.
- Monserrat V., 2010. Los Neurópteros (Insecta: Neuroptera) en el arte. *Boletín de la Sociedad Entomológica Aragonesa*, 46: 635-660.
- Pallucchini A., 1968. Analisi dell'opera pittorica di Giambattista Tiepolo. In: Piovene G. & Pallucchini A., 1968. *L'opera completa di Giambattista Tiepolo*. Rizzoli Editore, Milano, 81-139.
- Pantaleoni R. A., del Mármol Marín G. M. & Vigara R. L., 2012. Second record of *Pseudimares aphrodite* H. Aspöck et U. Aspöck, 2009 (Neuroptera, Myrmeleontidae). *Biodiversity Journal*, 3: 129-131.
- Ripa C., 1603. *Iconologia ovvero descrizione di diverse imagini cavate dall'antichità et di propria inventione. Trovate et dichiarate da Cesare Ripa perugino, Cavaliere de Santi Maurizio et Lazaro. Di nuovo rivista et dal medesimo ampliata di 400 et più Imagini. et di figure d'intaglio adornata. Opera non meno utile che necessaria a Poeti, Pittori, Scultori et altri, per rappresentare le Virtù, Viti, Affetti, et Passioni humane.* Appresso Lepido Facii, Roma, 545 pp.
- Ripa C., 1704. *Der Kunst-Göttin Minerva Liebreiche Entdeckung Wie die Virtuosi alle Tugenden und Laster und was die vier Elementa begreifen sambt allen Künsten und Wissenschaften der Welt Kunst-mässig und Hieroglyphisch vorstellen sollen damit die bißherige ignorante Fehler verhütet und die Zeichen- und Mahlerey-Künste in höhern Aufnahm mögen gebracht werden.* Aus Unkosten Kroniger und Göbels Erben, Augsburg, 298 pp.
- Ronchetti G., 1922. *Dizionario illustrato dei Simboli.* Ulrico Hoepli Editore-libraio della Real Casa, Milano, 1009 pp. + 91 pls.
- Stevens M., 2005. The role of eyespots as anti-predator mechanisms, principally demonstrated in the Lepidoptera. *Biological Reviews*, 80: 573-588.
- Stevens M., Hardman C.J. & Stubbins C. L., 2008a. Conspicuousness, not eye mimicry, makes "eyespot" effective antipredator signals. *Behavioral Ecology*, 19: 525-531.
- Stevens M., Stubbins C. L. & Hardman C. J., 2008b. The anti-predator function of 'eyespot' on camouflaged and conspicuous prey. *Behavioral Ecology and Sociobiology*, 62: 1787-1793.
- Vallin A., Jakobsson S., Lind J. & Wiklund C., 2005. Prey survival by predator intimidation: an experimental study of peacock butterfly defence against blue tits. *Proceedings of the Royal Society B Biological Sciences*, 272: 1203-1207.
- Westerhoff J. C., 2001. A World of Signs: Baroque Pansemiotic, the Polyhistor and the Early Modern Wunderkammer. *Journal of the History of Ideas*, 62: 633-650.

A new species of *Hemiplecta* Albers, 1850 (Gastropoda, Pulmonata, Ariophantidae) from Sumatra, Indonesia

David P. Cilia^{1*} & John Abbas²

¹29, Triq il-Palazz l-Ahmar, Santa Venera, Malta

²8, Jalan Demaga Baru, Muara Angke, Jakarta Utara Pos 14450, Jakarta, Indonesia

*Corresponding author, e-mail: dpcilia@gmail.com

ABSTRACT The ariophantid *Hemiplecta belerang* sp. nov. from South Sumatra is described in this paper. It is compared with its closest congeners, from which it is geographically and reproductively isolated.

KEY WORDS Ariophantidae; *Hemiplecta belerang* n. sp.; Sumatra; Indonesia.

Received 03.06.2012; accepted 21.06.2012; printed 30.06.2012

INTRODUCTION

The family Ariophantidae Godwin-Austen, 1888 is nested within the limacoid clade of pulmonates and is native to south-east Asia and India (Hausdorf, 2000).

The family includes the genus *Hemiplecta* Albers, 1850, a group of medium to large-sized ground-inhabiting snails (Boonngam et al., 2008; Schilthuizen, 2008), and the Sumatran representatives include *H. abbasi* Maassen, 2009, *H. goliath* van Benthem Jutting, 1959, *H. humphreysiana* (Lea, 1840), *H. obliquata* (Reeve, 1852) and *H. obliqueundulata* van Benthem Jutting, 1959 (see van Benthem Jutting, 1959; Dharma, 2005; Maassen, 2009).

A new species belonging to the genus collected from a forest boundary west of Mount Sekincau in Lampung (Sumatra) is described in this paper.

ACRONYMS. Depositories: collection of Barna Páll-Gergely, Mosonmagyaróvár, Hungary (BP); collection of David P. Cilia, Santa Venera, Malta (DC); Field Museum of Natural History, Chicago, Illinois (FMNH); Hebrew University of Jerusalem, Israel (HUJ); collection of John Abbas, Jakarta, Indonesia (JA); Muséum National

d'Histoire Naturelle, Paris, France (MNHN); Natural History Museum, London, United Kingdom (NHMUK); National Museum of Natural History, Mdina, Malta (NMNH); Zoological Department of Tel Aviv University, Israel (TAU); Institut für Evolutionsbiologie und Umweltwissenschaften/ Zoologisches Museum Universität Zürich-Irchel, Switzerland (ZMZ).

Morphology and anatomy. DG = dart gland; DGR = dart gland retractor muscle; D = diameter; E = epiphallus; EC = epiphallic caecum; F = flagellum; GA = genital atrium; H = height; ht = holotype; P = penis; PRM = penial retractor muscle; S = spermatheca; sd = standard deviation; U = umbilicus; V = vagina; VD = vas deferens; x = mean value.

MATERIALS AND METHODS

11 specimens of the new species were analyzed for key morphological and biometric features of shells and animals.

The mean value of two readings for height, diameter and umbilical width for adult specimens was taken using a dial caliper of a resolution of 50 µm.

Results were rounded off to the nearest 0.1 mm; the umbilical width was measured by inserting the caliper inside the umbilicus and taking into account only the ultimate whorl. Whorls were counted, including the nucleus.

Statistical data was used and compared with peculiar morphological characteristics of other *Hemiplecta* species to allow for differential analysis. Alcohol-preserved specimens were dissected to allow examination of genitalia; for this, the nomenclature of reproductive anatomical structures follows Maassen (2009) and Schileyko (2003). Systematics in the present paper follow Bouchet & Rocroi (2005).

RESULTS

SYSTEMATICS

Superfamily Helicarionoidea Bourguignat, 1877

Family Ariophantidae Godwin-Austen, 1888

Subfamily Ariophantinae Godwin-Austen, 1888

Genus *Hemiplecta* Albers, 1850

Type species *Helix humphreysiana* Lea, 1840

Hemiplecta belerang n. sp.

EXAMINED MATERIAL. Holotypus, limits of forest on Mount Sekincau, north Lampung, south Sumatra, Indonesia (-05°01'15"N, 104°15'37"E), at an altitude of c. 1000m above sea level, leg. J. Abbas (NHMUK 20120045). Paratypi (10 specimens), same data as holotype: DC RG1828 (1 specimen); HUI 53491 (1 specimen); JA unreg. (1 specimen); NHMUK 20120046 (2 specimens); MNHN 25050 (2 specimens); NMNH unreg. (1 specimen); FMNH 328341 (1 specimen); BP unreg. (1 specimen).

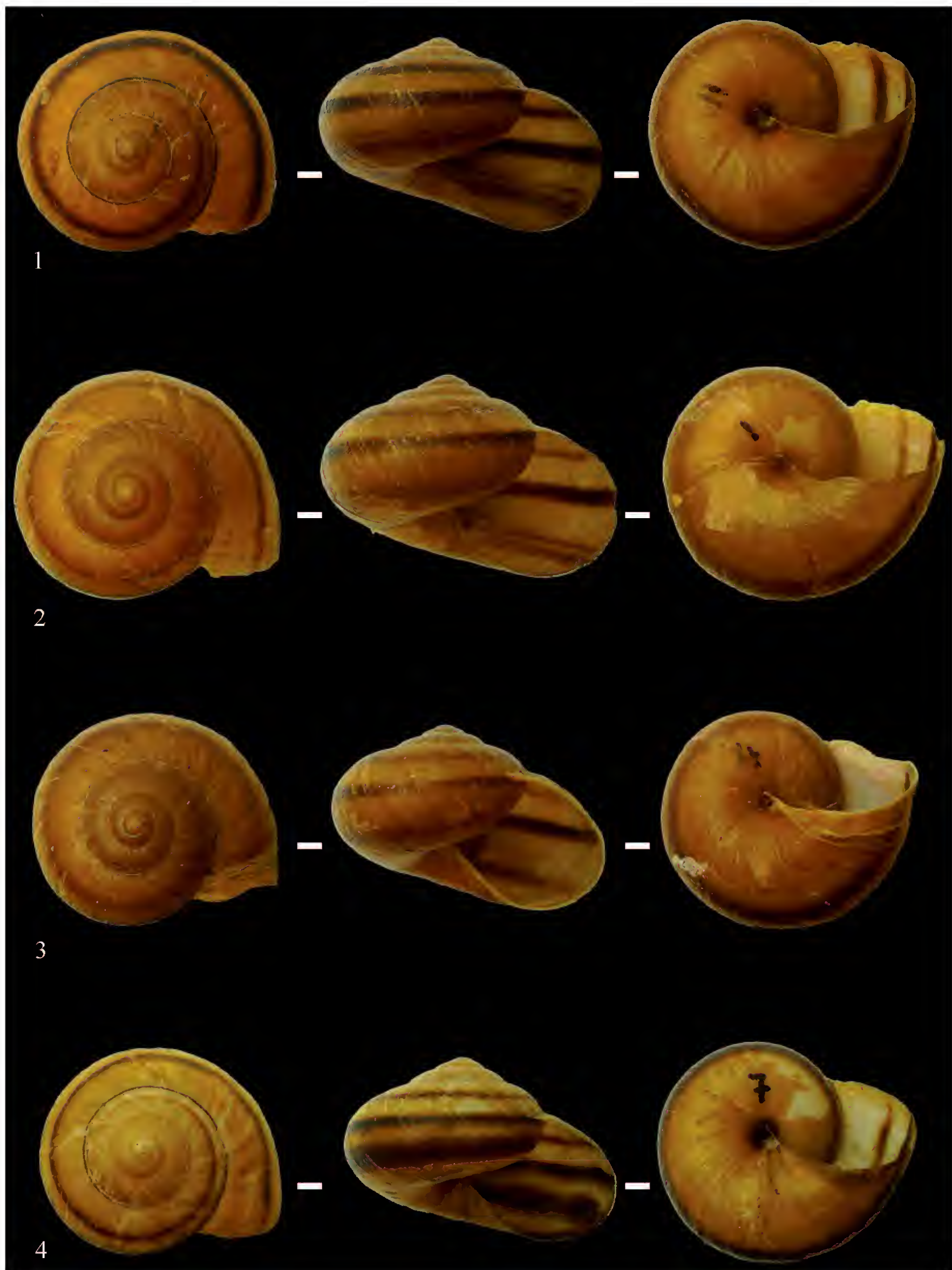
DESCRIPTION OF HOLOTYPE. Shell dextral, 38 mm wide, 26 mm high, well-rounded and thin shell, more wide than tall (Fig. 1). Pale yellow-brown base colour with a beige periostracum, with three narrow dark brown spiral stripes, the middle of which lies at the periphery of the whorls. The upper boundary of the central band coincides with a very slight thickening on the shell, and is concealed within the shell from the penultimate whorl inwards; the uppermost band is only evident on the outer

couple of whorls, beyond which it fades into the base colouration. The lowermost band is the faintest of the three. Whorl number is 5.5, and microsculpture consisting of intricate rugose malleation with a slight emphasis on concentric furrows characterizes the outermost 1.5 whorls. Towards the aperture, especially on the ventral side, faintly impressed growth striae with highly irregular spacing and prominence become more evident than these spiral furrows. Low-profile apex and moderately convex whorls, the suture between which is delineated by a very thin dark brown band mostly discernible on the final whorl. Very small umbilicus, about 4% of the maximum diameter of the shell, containing an insertion of the columellar side of the peristome, flushed with a dark brown that abruptly fades out onto the ventral side. Aperture an oblique oblong except for its columellar attachment, which in apertural view departs in a diagonal straight line from the umbilicus before rounding off sharply. Peristome interrupted, thin, non-reflected and with very slight, homogenous thickening. Internal aspect white with a pearly lustre, the three main brown bands showing through.

Animal. Orange-brown body with dark brown foot, and grey to black tentacles with a very pale pink-orange tip.

Genitalia (Figs. 5-8). The right ommatophoral retractor crosses the genitalia, running between the male and female genital tracts. The penis is cylindrical and much shorter than the epiphallus, with its inner wall featuring several tubercles (Fig. 6).

The penial papilla is very short (Fig. 7). At the distal part of the penis, just before the penial papilla, the tuberculated inner surface is crinkled (Fig. 7). This crinkled structure is not visible from the outside, and the penial sheath remains smooth. The penial retractor inserts at a slender and rather long caecum halfway along the epiphallus. The retractor is about 2.5 times longer than the epiphallic caecum. There are high parallel folds running on the inner wall of the epiphallus, with lower folds in between (Figs. 7, 8). The flagellum is short and conical. The linear folds of the inner surface of the epiphallus became rather irregularly wrinkled in the flagellum (Fig. 8). There is a slender axial thread in the lumen of the flagellum attached at the end of the flagellum (Fig. 8). The vas deferens enters the epiphallus laterally. The vagina is about as long as the penis.



Figures 1-4. Shell of *Hemiplecta belerang* sp. nov., limits of forest on Mount Sekincau, north Lampung, south Sumatra, Indonesia (-05°01'15"N, 104°15'37"E). Fig. 1: holotype (NHMUK 20120045). Fig. 2: paratype 1 (FMNH 328341). Fig. 3: paratype 4 (DC RG1828). Fig. 4: paratype 7 (MNHN 25050).

The spermatheca is long and thin, not conspicuous compared to the rest of the structure, while the dart gland is extremely long and thick, with a short retractor muscle attached at its end.

Radula (Figs. 9-11). Teeth packed in neat, slightly undulating rows. The central teeth are flat and ovate, ending in a blunt “V”-shape, and about 75 μm tall and 25 μm wide (Fig. 10). Marginal teeth are about half as wide and somewhat more pointed, in profile vaguely resembling a very flattened “W”-shape (Fig. 11). Transitional lateral teeth are present in between the two.

VARIABILITY. The specimens examined are 36-41 mm wide and 25-28 mm high (see Tab. 1 for details; Figs 2-4). The lowermost band on the shell may feature blurred edges, in some instances almost extending to and blending with the central band; however, a colour gradient between the two is present without exception. The shade of colour contained in the umbilicus is not a consistent feature, however, it is always darker than the base colour.

ETYMOLOGY. The name is derived from the Belirang-Beriti volcanic complex, within which the known range of the species occurs. ‘Belerang’ also means ‘sulphur’ in Indonesian, reminding one of the pale yellow-brown base colour of the shell.

DISTRIBUTION AND BIOLOGY. This species is hitherto only known from the type locality, where it

is found around or at the base of small bushes in humid and mossy areas. No individuals occur in the more densely forested parts. Similar to congeners (Mienis, 2010), *H. belerang* is a herbivore and a facultative detritivore.

COMPARATIVE NOTES. The shell of the new species is typical *Hemiplecta*, but smaller than all other species yet known from Sumatra. The largest, which is *Hemiplecta goliath* van Benthem Jutting, 1959, together with *Hemiplecta humphreysiana* (Lea, 1840) have smoother surfaces, more obvious carinae and rather flat whorls, not to mention completely different forms. From Collinge (1902) it can also be seen that the vagina and oviduct of *H. humphreysiana* are very long, as are the penis, the epiphallus and the vas deferens. *H. abbasi* Maassen, 2009 is darker-coloured with a larger umbilicus (6% of maximum shell diameter in five topotypes studied); anatomically, the new species has longer epiphallic caecum and vas deferens, thinner spermatheca, a narrower spermoviduct and a relatively larger dart sac. Both shell and genital characters make it clear that *H. belerang* and *H. abbasi* are more closely related to each other than any of them is to *H. humphreysiana*.

H. obliqueundulata van Benthem Jutting, 1959 has two very wide dark brown spiral bands, with the upper one fading towards the suture and lacking clear delineation.

	ht	p1	p2	p3	p4	p5	p6	p7	p8	p9	p10	x
H	26.2	27.5	27.0	24.1	25.0	27.8	27.7	24.7	27.3	25.7	27.2	26.4
D	38.4	39.3	39.0	37.3	37.4	38.7	41.1	37.0	38.9	36.0	39.2	38.4
U	1.7	1.7	1.8	1.3	1.6	1.5	1.5	1.6	1.7	1.5	1.5	1.5
H/D	0.68	0.70	0.68	0.65	0.67	0.72	0.67	0.67	0.70	0.71	0.69	0.69
U/D	0.04	0.04	0.05	0.03	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
U%	4.43	4.33	4.56	3.49	4.28	3.88	3.65	4.32	4.37	4.17	3.83	4.12

Table 1. Dimensions of the type specimens of *Hemiplecta belerang* sp. nov. H, D and U are measured in millimetres.

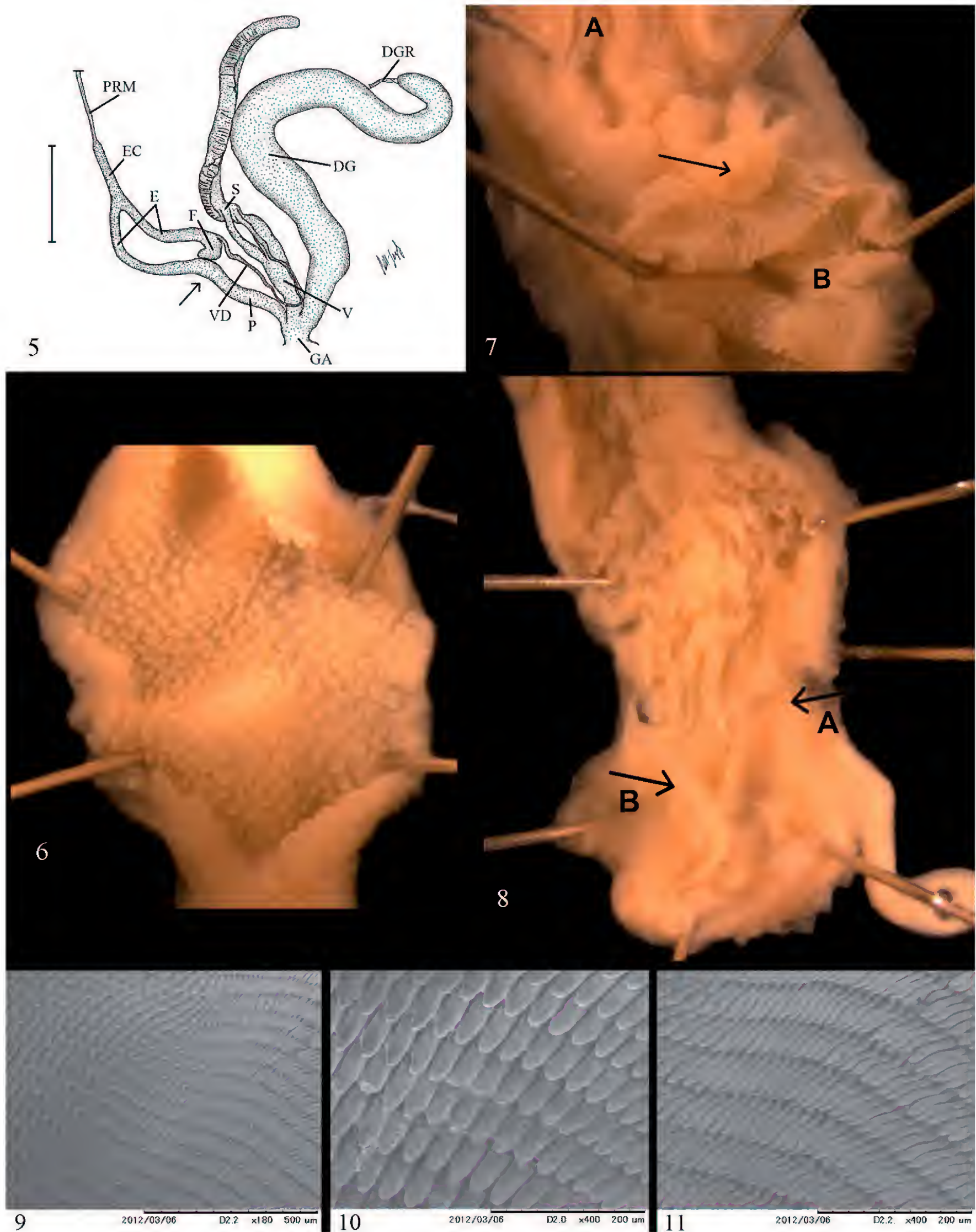


Figure 5. Genital structure of *Hemiplecta belerang* n. sp., arrow indicates of the border between the penis and epiphallus (scale bar represents 10 mm). Figure 6. Inner structure of the penis. Figure 7. Inner structure of the male genital tract at the transition of epiphallus (A) and penis (B), arrow shows the penial papilla. Figure 8. Inner structure of the distal part of the epiphallus and the flagellum, arrow A indicates the border between the two organs, arrow B shows the axial thread. Figures 9-11. Radula of *Hemiplecta belerang* n. sp. Fig. 9. Central teeth and marginal teeth, showing transitional elements. Fig. 10. Central teeth. Fig. 11. Marginal teeth.

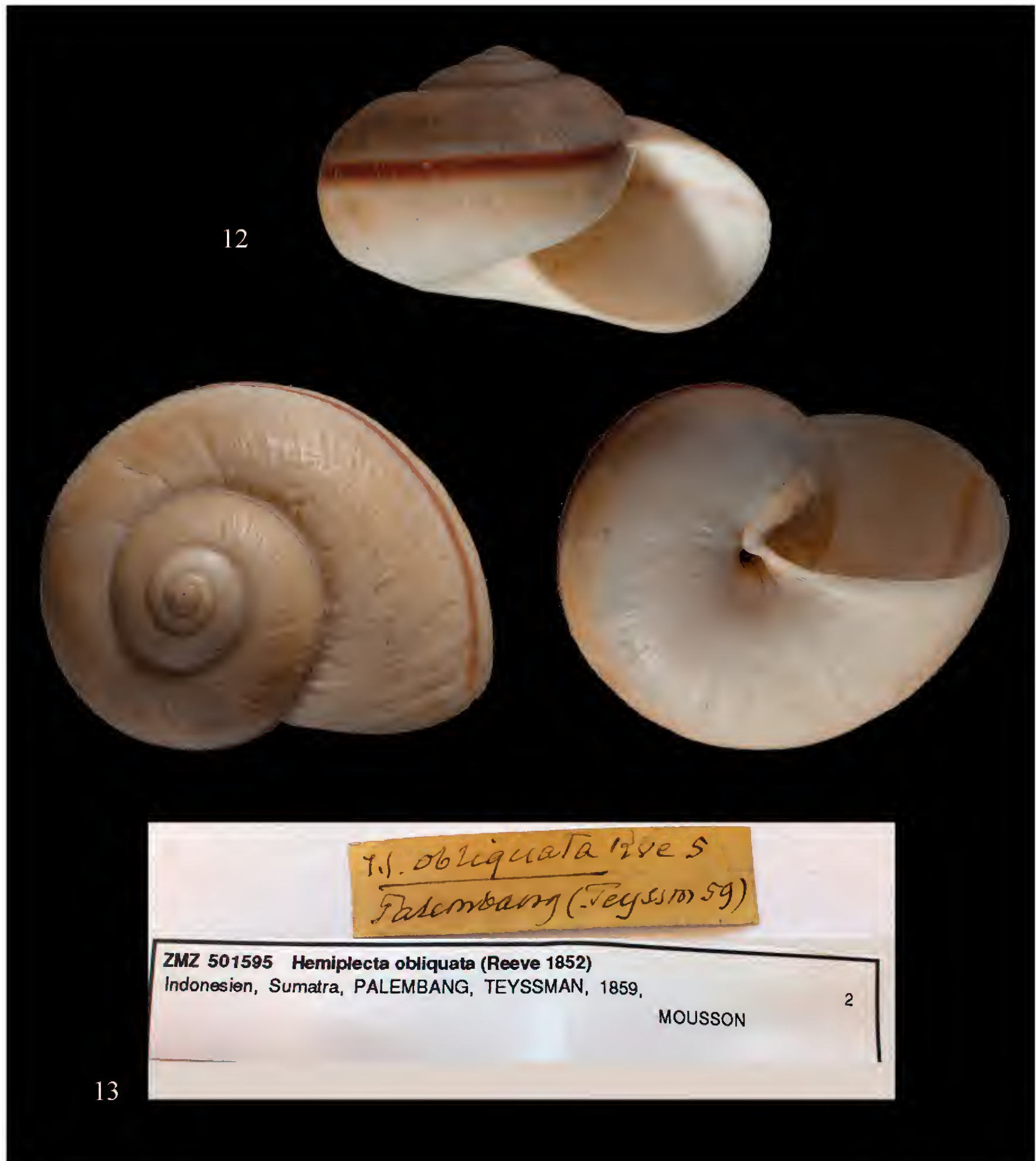


Figure 12. Shell of *Hemiplecta obliquata* (Reeve, 1854), Palembang, Sumatra, Indonesia: the larger specimen from Mousson's collection, collected by Teyssman in 1859 (ZMZ 501595) and (Fig. 13) original and current labels for the specimen.

In this species, the umbilicus is larger (6% of maximum shell diameter in six specimens studied), the apical whorls have a dark colour, and the surface is highly uneven and rough.

The aperture is clearly more elongated laterally than in the new species. *H. belerang* and *H. abbasi*

are not sympatric, with *H. obliqueundulata*'s range commencing 200 km towards the northwest in the same mountain range.

A species with affinities to *H. obliqueundulata* is *H. obliquata* (Reeve, 1854). *H. obliquata* was originally described from Borneo in the genus *Helix*

(Reeve, 1854: pl. 74, fig. 384). The single figure, reproduced by Pilsbry (1886: p.76, pl. 21, fig. 16), shows a pale whitish specimen with a periphery “encircled by a chestnut band pale-edged along the upper side” and a very faint trace of a wide, pale brown band above it, though this is not mentioned in the accompanying text.

Martens (1867: p. 235; 1881: p. 1, pl. 1, figs. 1-3) reiterates this (“flavido-alba, fascia peripherica sat angusta obscure castanea”) and also mentions the pale brown band, from bleached specimens (“Beide Exemplare in Mousson's Sammlung sind etwas verbleicht”) collected from Palembang (Sumatra) by Teysmann in 1859 to be deposited in Mousson’s collection.

In the latter work he also illustrates three aspects of one shell – off-white, with regular ribbing, and a relatively wide umbilicus. These two specimens are to be nowadays found in Mousson’s collection at the Zoological Museum of the University of Zurich; their maximum diameters are of 50.3 mm and 53.8 mm and their heights are of 33.6 mm and 34.2 mm respectively (Figs. 12-13).

A taxon described from a single specimen from Hujung, in south Sumatra at an altitude of 2 km, is *H. hoodjongensis* (Smith, 1887). This species is about as large as *H. obliquata* (10 mm larger than *H. belerang* in any direction) and similarly globose, but with a higher spire and two very-well defined brown peripheral striae, central and adapical. The picture in Kobelt (1905: pl. 261, fig. 1) shows this altogether more globose shell as having regularly spaced axial striae. In any case, van Benthem Jutting (1959) regards this specimen as a synonym of *H. obliquata*.

In the authors’ opinion, *H. abbasi*, *H. belerang*, *H. hoodjongensis*, *H. obliquata* and *H. obliqueundulata* may represent a lineage now restricted to high altitudes as relict populations, descended from a common ancestor that inhabited the Sumatran mountain chain when different abiotic conditions were predominant.

ACKNOWLEDGMENTS

The authors would like to thank Fred Naggs, Jonathan Ablett (NHMUK), Jochen Gerber (FMNH), Philippe Bouchet, Virginie Héros (MNHN), John J. Borg (NMHM), and Henk Mienis (HUI) for their

technical assistance. Barna Páll-Gergely (Shinshu University, Japan) produced the drawing, photos and description of the genital structure.

Eike Neubert (Naturhistorisches Museum der Burgergemeinde Bern, Switzerland), Barbara Oberholzer and Jürg Stauffer (ZMZ) were of great help with the tracing and photography of Mousson’s *H. obliquata* specimens. Last but not least, the authors would like to thank Fabio Liberto (Cefalù, Italy) and anonymous reviewers for their suggestions.

REFERENCES

- Benthem Jutting W. S. S. van, 1959. Catalogue of the non-marine Mollusca of Sumatra and of its satellite islands. *Beaufortia*, 7: 41-191.
- Boonngam P., Dumrongrojwattana P. & Matchacheep S., 2008. The Diversity of Land Snail Fauna in Chonburi Province, Eastern Thailand. *Kasetsart Journal (Natural Science)*, 42: 256-263.
- Bouchet P. & Rocroi J.-P., 2005. Classification and nomenclator of gastropod families. *Malacologia*, 47: 1-397.
- Collinge W. E., 1902. On the non-operculate land and freshwater Molluscs collected by the Members of the ‘Skeat-Expedition’ in the Malay Peninsula, 1899-1900. *The Journal of Malacology*, 9: 71-95.
- Dharma B., 2005. Recent and fossil Indonesian shells. *Conchbooks*, Hackenheim, pp. 1–124 + pls. 1–150.
- Hausdorf B., 2000. Biogeography of the Limacoidea sensu lato (Gastropoda: Stylommatophora): vicariance events and long-distance dispersal. *Journal of Biogeography*, 27: 379-390.
- Kobelt, W., 1905. Die familien der heliceen. *Systematisches conchylien-cabinet von Martini und Chemnitz*, 5: 1-1225.
- Maassen W. J. M., 2009. A new *Hemiplecta* species from a remote mountain in south-east Sumatra, Indonesia (Mollusca: Pulmonata: Ariophantidae). *Basteria*, 73: 77-80.
- Martens, E. von, 1867. Die Landschnecken. Die Preussische Expedition nach Ost-Asien. Nach amtlichen Quellen. *Zoologischer Theil*, Vol. 2. Decker, Berlin, XII + 447 pp.
- Martens E. von, 1881. Erster Band. *Conchologische Mittheilungen als Fortsetzung der Novitates conchologicae*, 1: i-viii + i-iv + 1-101.
- Pilsbry H. A., 1886. Zonitidae. *Manual of Conchology, structural and systematic, with illustrations of the species*. 2 (2): 1-265 + 64 pl.
- Reeve L. A., 1854. *Monograph of the genus Helix. Conchologia iconica or illustrations of the shells of molluscous animals*. 7: 1-408 + 210 pl. + i-xx.

- Schileyko A. A., 2003. Treatise on recent terrestrial pulmonate mollusks. 10. Ariophantidae, Ostracolethaidae, Ryssotidae, Milacidae, Dyakiidae, Staffordiidae, Gastrodontidae, Zonitidae, Daudebardiidae, Parmacellidae. *Ruthenica*, Supplement 2: 1309-1466.
- Schilthuizen M., 2008. *The loom of life: unravelling ecosystems*. Springer, 184 pp.

New records of Heteroptera (Hemiptera) from Campania, Southern Italy

Ivano Adamo¹, Francesco Carandente¹, Camillo Pignataro¹, Paolo Crovato² & Nicola Maio^{1*}

¹Fondazione I.RI.DI.A. - Museo Naturalistico, Via Forese 16 - 84020 Corleto Monforte (SA), Italy

²Via S. Liborio, 1 - 80134 Napoli, Italy

*Corresponding author, e-mail: nicomaio@unina.it

ABSTRACT

During a two-year faunistic research (2010 and 2011) carried out in three different areas of Campania (the Crater of Astroni, the Matese Mountains, and the Alburni Mountains: Site of Community Importance, SCI, - Special Protection Area, SPA) eight species of Heteroptera that are new records for the region were collected.

KEY WORDS

Heteroptera; Campania; Southern Italy; faunistics.

Received 20.06.2012; accepted 26.06.2012; printed 30.06.2012

INTRODUCTION

The level of knowledge of the Heteroptera of Campania (489 species; 13,595 sq Km) is far below that of other regions of Southern Italy, such as Basilicata and Calabria.

This is even more evident when comparing the number of heteropteran species known so far with the surfaces of the respective regions: according to Tamanini (1981) for Basilicata and Calabria, in fact, 422 and 564 species are known on 9,992 and 15,079 sq Km, respectively. The purpose of this paper is, therefore, to help bridge this gap by increasing the knowledge of this group in Campania.

MATERIALS AND METHODS

The field survey was conducted in three different areas of Campania between February 2010 and May 2011, namely: the Crater of Astroni, the Matese Mountain, and the Alburni Mountains.

The Crater of Astroni (SIC-ZPS IT8030007) is a WWF oasis, nature reserve of the state, located between Naples and Pozzuoli and is the biggest crater among thirty craters in Campi Flegrei area.

The Matese Regional Park (33,326.5 ha) was established in 2002 to protect the Matese Mountain (ZPS-SIC IT 722228) range, which marks the border between Campania and Molise, and whose territory, in the former region, includes four provinces (Campobasso, Isernia, Benevento and Caserta).

Alburni Mountains (SIC IT8050033 and ZPS IT8050055) are included in National Park of Cilento and Vallo di Diano. This park is the second largest park in Italy. It stretches from the Tyrrhenian coast to the foot of the Apennines in Campania and Basilicata. All insects from Alburni Mountains were captured through sweep net, vacuum, or dropping them into a large mouth glass containers. The specimens from the Crater of Astroni and from Matese mountain have been temporarily captured for specific determination, photographed and released.

The list of reported species follows the taxonomic order of the Italian Checklist (Faraci & Rizzotti Vlach, 1995).

For each species details of the finding are shown along with a brief note on chorology and biology; moreover, description of the finding station with regard to environmental types to which it relates, according to the classification system of habitats CORINE Biotopes (employed for either Charter of

Nature or EUNIS information system designed to support the “Rete Natura” 2000) is reported. When it was possible to make a parallel between the two systems both of them have been submitted (AA.VV., 1991; APAT, 2003).

If it was not possible to refer to older systems, the Natura 2000 code which is found in “Allegato I”, 92/43/EEC directive, was used.

RESULTS

Family Miridae Hahn, 1831

Oncotylus (Oncotylus) viridiflavus viridiflavus (Goeze, 1778)

CHOROTYPE AND DISTRIBUTION. Turano-European. It is a rather rare and local species, widespread from Europe, Asia Minor and Caucasus to Western Siberia; the subspecies *O. viridiflavus longipes* Wagner, 1954 is restricted to Southern Anatolia. In Italy it was previously reported only for Abruzzo, Apulia (Gargano) and Sicily (Servadei, 1967), but the records for the latter region are considered erroneous (Faraci & Rizzotti Vlach, 1995).

BIOLOGY AND HOST PLANTS. Its host plant is the cornflower (*Centaurea* spp.). The adults can be observed from July to September.

MATERIALS. Alburni (SA), Sant’Angelo a Fasanelle, “Tempa di Don Giovanni”, 760 m a.s.l., 21.VII.2011, 2 specimens, I. Adamo legit.

REMARKS. The site is located in an area with fragmented cropland and fallow (EUNIS code I1.5, Bare tilled, fallow or recently abandoned arable land) surrounded by the shrubberies *Prunetalia spinosae* related to the edges of deciduous forests (code EUNIS F3.1, temperate thickets and scrub; code CORINE Biotopes 31.81, Medio-European rich-soil thickets) and forest stands dominated by oaks (*Quercus pubescens* and *Q. cerris*) (EUNIS code G1.71, woods of *Quercus pubescens*).

Family Coreidae Leach, 1815

Ceraleptus lividus Stein, 1858

CHOROTYPE AND DISTRIBUTION. Turano-European. The species, present in much of the European

continent, is more common in central and northern regions. In Italy it is common in all regions of the Apennine peninsular regions and reaches some xerothermic oases of the Alps (Servadei, 1967; Tamanini, 1981).

BIOLOGY AND HOST PLANTS. It is found on grasses in dry and open lands and is mainly related to some Fabaceae (*Trifolium*, *Lotus*).

MATERIALS. Alburni (SA), Plot Alburni 1, Ottati, “Pozzo della Lavandaia”, 900 m a.s.l., 22.V.2011, 1 specimen, I. Adamo legit (Fig. 1).

REMARKS. The Plot “Alburni 1” is a wet meadow characterized by the presence of wells and springs and by a small portion of riparian vegetation (code EUNIS E1.3, Mediterranean xeric grassland; cod. Nature 2000 6210, Semi-natural dry grasslands and scrubland facies on calcareous substrates, *Festuco-Brometalia*).

Family Lygaeidae Schilling, 1819

Xanthochilus saturnius (Rossi, 1790)

CHOROTYPE AND DISTRIBUTION. Turanian-Mediterranean. Widespread throughout the Mediterranean countries and extending eastwards to Tadzhikistan. In Italy it is present in all regions south of the Po river, including islands (Servadei, 1967) and quite frequent especially in the center-south.

BIOLOGY AND HOST PLANTS. The species is mainly found either on sandy or gravelly soils in dry areas.

MATERIALS. Alburni (SA), Plot Alburni 2, Castelcivita, Celadonna, 405 m a.s.l., 16.X.2010, 1 specimen, I. Adamo legit.

REMARKS. The Plot “Alburni 2” is located at the base of a limestone slope along the road margin and is characterized by sclerophyllous vegetation (code EUNIS F5.5, Thermo-Mediterranean scrub) with typical Mediterranean vegetation formations to *Ampelodesmus mauritanicus* (cod. EUNIS F5.53, with garrigue *Ampelodesmus mauritanicus* dominant. Corine Biotopes 32.23, *Ampelodesmus mauritanicus* garrigue) replaced, where significant events of disturbance occurred, by communities dominated by therophytes (code EUNIS E1.3, Mediterranean xeric grassland, cod. Nature 2000 6220, Pseudo-steppe with grasses and annuals of the Thero-Brachypodieta).

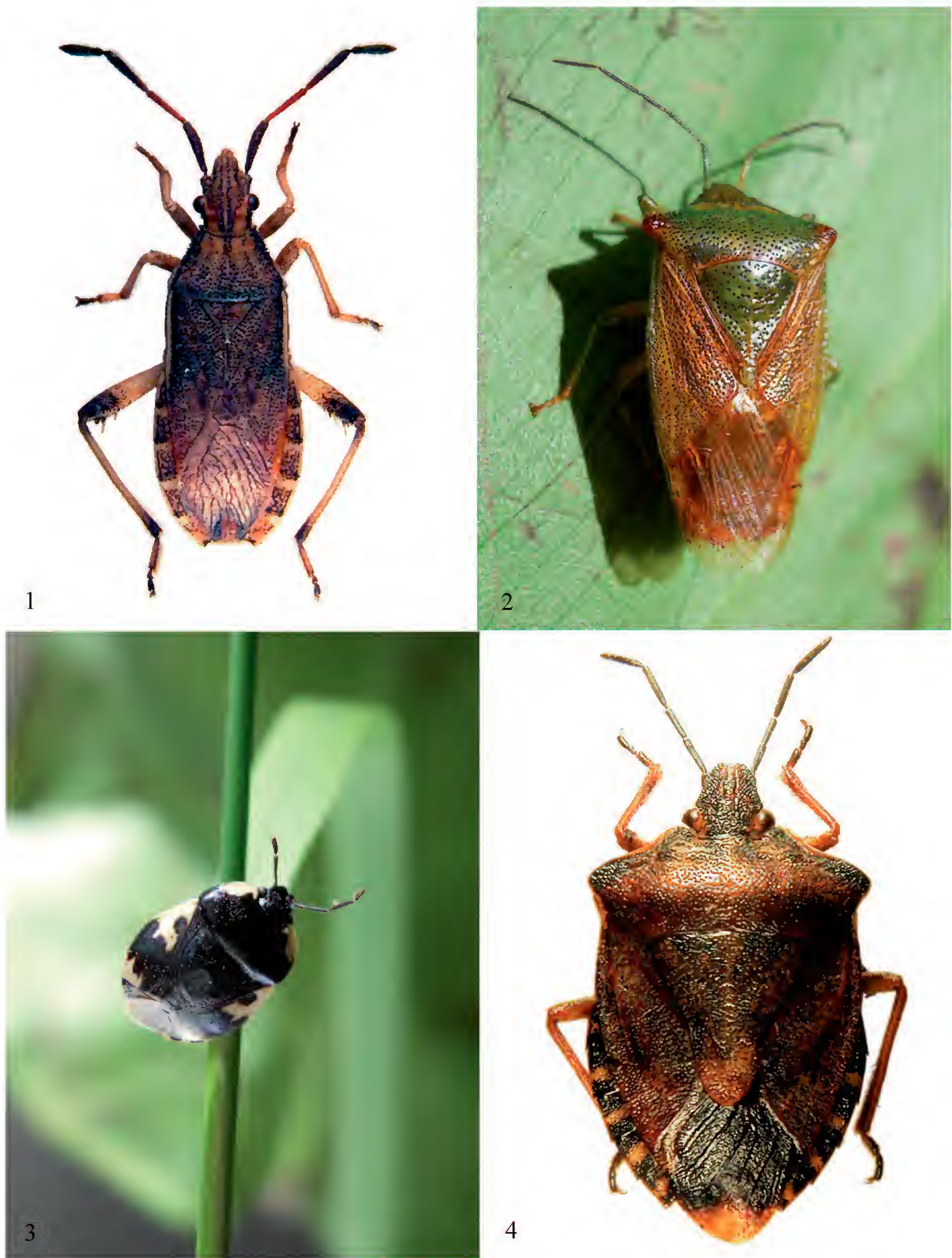


Figure 1. *Ceraleptus lividus* from Alburni Mountains (photo by I. Adamo). Figure 2. *Acanthosoma haemorrhoidale* from “Lago del Matese” (photo by I. Adamo). Figure 3. *Tritomegas rotundipennis* from Crater of Astroni (photo by I. Adamo). Figure 4. *Carpocoris purpureipennis* from Alburni Mountains (photo by I. Adamo).

Family Acanthosomatidae Signoret, 1836

Acanthosoma haemorrhoidale haemorrhoidale
(Linnaeus, 1758)

CHOROTYPE AND DISTRIBUTION. Asian-European. Reported in all regions of northern Italy to Lazio and Abruzzo (Servadei, 1967), in Sicily and Sardinia.

BIOLOGY AND HOST PLANTS. Species mainly mountainous and widespread in mixed woods and clearings where it is linked to various hardwoods such as *Quercus*, *Crataegus*, *Sorbus*, *Corylus*, *Carpinus* and *Betula*. It is often harmful to the crops of hazel.

MATERIALS. Matese (CE), San Gregorio Matese, "Lago del Matese", 1015 m a.s.l., 07.VII.2010, 1 specimen observed on *Crataegus laevigata*, I. Adamo det. (Fig. 2).

REMARKS. This station is located along the southern shore of Matese Lake and at the base of beech trees that stretch along the esplanade south of the basin. The vegetation is typical of populations of hilly-mountain shrub related to the series or the edges of deciduous forests (*Prunetalia spinosae*), with wild species such as hawthorn (*Crataegus laevigata*), wild rose (*Rosa* spp.), privet (*Ligustrum vulgare*) and common laburnum (*Laburnum anagyroides*) (code EUNIS F3.1, temperate thickets and scrub; cod. CORINE Biotopes 31.81, Medio-European rich-soil thickets).

Family Cydnidae Billberg, 1820

Canthophorus melanopterus melanopterus
(Herrich-Schäffer, 1835)

CHOROTYPE AND DISTRIBUTION. Turanian-Mediterranean. Species widespread in central Asia and the Mediterranean region. It is present in all Italian regions (Servadei, 1967).

BIOLOGY AND HOST PLANTS. The species is related to Santalaceae of the genera *Thesium* and *Osyris*.

MATERIALS. Alburni (SA), Plot Alburni 3, Ottati, Vuccolo della Forca, 875 m a.s.l., 22.V.2011, 2 specimens, I. Adamo legit.

REMARKS. The Plot "Alburni 3" is located in a mesomediterranean mountain shrubland characterized by scattered pulvini of *Euphorbia spinosa* (EUNIS code F6.14, western garrigues to *Euphor-*

bia sp.; Cod. CORINE biotopes 32.44, Spurge garrigues, Shrubby formations of the western Mediterranean basin dominated by bushy or robust perennial *Euphorbia*).

Tritomegas rotundipennis (Dohrn, 1862)

CHOROTYPE AND DISTRIBUTION. S-European. Widespread but not very common in various regions of Italy; in the southern part of the peninsula the species was previously known only for Lazio, Abruzzo and Calabria (Servadei, 1967).

BIOLOGY AND HOST PLANTS. Pest. The host plant is *Lamium album* (Lamiaceae).

MATERIALS. Crater of Astroni (NA), Pozzuoli, "Stradone di Caccia" near the "Lago Grande", 25 m a.s.l., 21.II.2010, 2 specimens observed near the edge of the road on *Lamium* sp., I. Adamo det. (Fig. 3).

REMARKS. This station is located on the bottom of the Crater of Astroni, in a clearing along the main highway. The surrounding vegetation is characterized by mixed deciduous subtermophyllous forest with prevalence of English oak (*Quercus robur*) and oak (*Q. petraea*) and other mesophyllous species of submontane type such as hornbeam (*Ostrya carpinifolia*), chestnut (*Castanea sativa* Miller), and approaching to the stretches of water, elm (*Ulmus minor*) (code CORINE Biotopes 41.2, oak-hornbeam forests).

Family Pentatomidae Leach, 1815

Carpocoris (Carpocoris) purpureipennis (De Geer, 1773)

CHOROTYPE AND DISTRIBUTION. Siberian-European -Anatolian. In Italy it is present in all regions of northern and central Apennines up to Abruzzo (Dioli, 1995). The records reported in Servadei (1967) for Southern Italy regions and Sardinia are not correct according to Tamanini (1958).

BIOLOGY AND HOST PLANTS. Pest. Polyphagous species linked to various herbaceous plants such as *Cirsium* spp., *Cardaria draba* and *Asphodelus* spp. It is a xenocoenic and eurytopic element (Rizzotti Vlach & Zerbini, 1989).

MATERIALS. Alburni (SA), Plot Alburni 3, Ottati, Vuccolo della Forca, 875 m a.s.l., 22.V.2011, 1 specimen, I. Adamo leg.; Alburni (SA), Plot Alburni 4,

Ottati, between “Tempa del Tesoro” and “Il Lago”, track n. 315, 925 m a.s.l., 22.V.2011, 7 specimens on leaves of *Asphodelus ramosus* L., I. Adamo leg., (Fig. 4); Alburni (SA), Plot Alburni 5, Ottati, Tempa Pozzillo, track n. 315, 975-978 m a.s.l., 22.V.2011, 1 specimen, I. Adamo leg.

REMARKS. For Plot “Alburni 3” see above. The “Alburni 4” and “Alburni 5” Plot belong to the same type of environment: code EUNIS E1.3, Mediterranean xeric grassland; cod. Nature 2000 6210, Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*).

Family Scutelleridae Leach, 1815

Eurygaster testudinaria (Geoffroy, 1785)

CHOROTYPE AND DISTRIBUTION. Asiatic-European-Mediterranean. Widespread in Italy, the species is present in almost all regions of the peninsula (Servadei, 1967). The historical reports for Sardinia need confirmation.

BIOLOGY AND HOST PLANTS. Pest, it is on *Carex* (Cyperaceae), *Juncus* (Juncaceae) but also on wild and cultivated Poaceae. It is related to wet meadows with tall grass. In Southern Italy it is a mountain species and is found in the plans up to 1500 m a.s.l.

MATERIALS. Alburni (SA), Plot Alburni 1, Ottati, “Pozzo della Lavandaia”, 900 m a.s.l., 22.V.2011, 1 specimen, I. Adamo leg.

REMARKS. For Plot “Alburni 1” see above.

DISCUSSION AND CONCLUSIONS

Up to now, 489 heteropterans species were known in Campania (Cirillo, 1787; O.G. Costa, 1834; Costa A., 1841, 1843, 1846, 1847a, 1847b, 1847c, 1853, 1862, 1874, Filippi, 1947; Tamanini, 1981; Carapezza et al., 1995; Carapezza & Faraci, 2005; Carapezza, 2007), to which we add the eight new species listed in this paper.

Canthophorus melanopterus, *Tritomegas rotundipennis*, *Eurygaster testudinaria*, *Xantochilus saturnius* and *Oncotylus viridiflavus viridiflavus* are species fairly common in Italy, whose absence in the literature for Campania was probably only due to a lack of research. *Ceraleptus lividus* is a predominantly northern species, hence Campania may be part

of the southern limit of its distribution range. Also the report of *Carpocoris purpureipennis* could represent the southern limit of the distribution range of the species in Italy (Tamanini, 1959).

ACKNOWLEDGEMENTS

This work was funded with the support from the National Park of Cilento and Vallo di Diano (PNCVD).

Authors wish to thank: The Regional Park of Campi Flegrei, the Matese Regional Park Authority and the National Park Authority of the Cilento and Vallo di Diano. In particular for the National Park of Cilento and Vallo di Diano: Amilcare Troiano (President), Corrado Matera (Vice-President) and Angelo De Vita (Director). A special thanks goes to Laura De Riso (Technical Area) for collaboration as well as advising on technical and administrative aspects. We want to thank Giuseppe Capozzolo for administrative cooperation (Fondazione I.RI.DI.A. - Museo Naturalistico) and Attilio Carapezza (Palermo).

REFERENCES

- AA.VV., 1991. CORINE biotopes manual. Habitats of European Community. EUR 12587/3 EN. Office for Official Publications of the European Communities, Luxembourg: 300 pp.
- APAT, 2003. Gli habitat secondo la nomenclatura Eunis: manuale di classificazione per la realtà italiana. Rapporti, 39. I.G.E.R., Roma, 160 pp.
- Carapezza A., 2007. Gli Eterotteri (Heteroptera). In: Nardi G. & Vomero V. (eds.), Artropodi del Parco Nazionale del Vesuvio: ricerche preliminari. Conservazione Habitat Invertebrati, 4: 87-97.
- Carapezza A. & Faraci F., 2005. Insecta Heteroptera Leptopodidae, Saldidae, Miridae (partim), Tingidae, pp. 151-153. In: Ruffo S. & Stoch F. (eds.), Checklist e distribuzione della fauna italiana. 10.000 specie terrestri e dele acque interne. Memorie del Museo Civico di Storia Naturale di Verona, 2a serie, Sezione Scienze della Vita, 16: 1-307 + CD-ROM.
- Carapezza A., Faraci F. & Péricart J., 1995. Designation of lectotypes and paralectotypes of Palaearctic Heteroptera in the collection of Achille Costa (Museo di Zoologia dell'Università di Napoli). Il Naturalista siciliano, 19: 279-294.
- Cirillo D., 1787. Entomologiae Neapolitanae specimen primum. Napoli, 13 pp., 12 tavv.

- Costa A., 1841. Mémoire pour servir à l'histoire des Hémiptères Hétéroptères de Deux-Siciles. Annales de la Société Entomologique de France, 10: 279-308.
- Costa A., 1843. Cimicum Regni Neapolitani Centuria. Napoli, 76 pp.
- Costa A., 1846. Osservazioni intorno la entomologia del Matese da servire alla geografia entomologica del Regno. Annali dell'Accademia degli Aspiranti Naturalisti, 3: 81-94.
- Costa A., 1847a. Cimicum Regni Neapolitani. Centuria secunda. Decas prima, secunda, tertia, quarta et quinta. Napoli, 43 pp., 3 tavv. (sep.).
- Costa A., 1847b. Cimicum regni Neapolitani. Centuria secunda. Decas sexta, septima, octava, nona et decima. Napoli, 41 pp., 2 tavv. (sep.).
- Costa A., 1847c. Specie nuove o rare d'insetti delle montagne del Matese. Annali dell'Accademia degli Aspiranti Naturalisti, 1: 89-131.
- Costa A., 1853. Cimicum regni Neapolitani. Centuria tertia et quartae fragmentum. Napoli: 77 pp., 3 tavv. (sep.).
- Costa A., 1862. Additamenta ad centurias Cimicum regni Neapolitani. Napoli, 41 pp., 3 tavv. (sep.).
- Costa A., 1874. Una peregrinazione zoologica su' monti dell'Alburno. Rendiconto dell'Accademia delle Scienze Fisiche e Matematiche (Sezione della Società Reale di Napoli), 13: 129-135.
- Costa O.G., 1834. Cenni zoologici ossia descrizione sommaria delle specie nuove di animali scoperti in diverse contrade del regno nell'anno 1834 con illustrazioni sopra talune altre meno ovvie. Annuario Zoologico, Azzolino e Comp., 90 pp.
- Dioli P. 1995. Eterotteri del ferrarese. 1. La fauna terrestre (Heteroptera Cimicomorpha et Pentatomorpha). Quaderni della Stazione Ecologica del Civico Museo di storia Naturale di Ferrara, 8: 7-49.
- Faraci F. & Rizzotti Vlach M., 1995. Heteroptera, pp. 1-56. In: Minelli A., Ruffo S. & La Posta S. (eds.), Checklist delle specie della fauna italiana, 41. Calderini, Bologna.
- Filippi N., 1947. Primo contributo alla conoscenza della fauna entomologica del Matese. Emitteri Eterotteri. Bollettino della Associazione romana di Entomologia, 2: 24-26.
- Rizzotti Vlach M. & Zerbini C., 1989. Studi sulla palude del Busatello (Veneto-Lombardia). 8. Gli Eterotteri. Memorie del Museo Civico di Storia Naturale di Verona (2 serie), biol. 7:67-88.
- Servadei A., 1967. Rhynchota (Heteroptera, Homoptera, Auchenorrhyncha). Catalogo topografico e sinonimico. Fauna d'Italia, IX. Calderini, Bologna, 851 pp.
- Tamanini L., 1958. Revisione del genere *Carpocoris* Klt. con speciale riguardo alle specie italiane (Hemiptera, Heter., Pentatomidae). Memorie del Museo Civico di Storia Naturale di Verona, 6: 333-388.
- Tamanini L., 1959. I *Carpocoris* della Regione Palearctica. Tabella per la determinazione delle entità e loro distribuzione (Hem., Heteroptera, Pentatomidae). Memorie della Società Entomologica Italiana, 38: 120-142.
- Tamanini L., 1981. Gli Eterotteri della Basilicata e della Calabria (Italia Meridionale) (Hemiptera Heteroptera). Memorie del Museo civico di Storia naturale di Verona, 3: 1-164.

New report of *Neolepton discriminatum* Palazzi et Villari, 2001 for Ustica island (Bivalvia, Veneroida, Neoleptonidae)

Pasquale Micali¹ & Alberto Villari²

¹Via Papiria, 17 - 61032 Fano (PU), Italy; e-mail: lino.micali@virgilio.it

²Via Villa Contino, 30 - 98124 Messina, Italy; e-mail: villaria@tiscali.it

ABSTRACT

A complete specimen and two loose valves of *Neolepton discriminatum* Palazzi et Villari, 2001 were found in Ustica island, at Punta Spalmatore at a depth of about 30 m. Up to now, this species was known only for the original description, based on specimens collected inside submarine caves of the coast near Taormina (North-Eastern Sicily). In the same sample of shell grit it was encountered also a specimen of *Skeneoides digeronimoi* La Perna, 1998, a species the description of which is based on material collected inside a cave of Ustica, on the opposite side of the island, about four miles away from Punta Spalmatore.

KEY WORDS

Neolepton discriminatum; submarine caves; Ustica; Mediterranean Sea.

Received 18.04.2012; accepted 19.06.2012; printed 30.06.2012

Neolepton discriminatum Palazzi et Villari, 2001 was described on three intact individuals and eight valves found in sediment collected inside a few caves located along the coastal stretch between Capo S. Andrea and Capo Taormina (North-Eastern Sicily) with the entrance at a depth ranging from about 15 to 30 m.

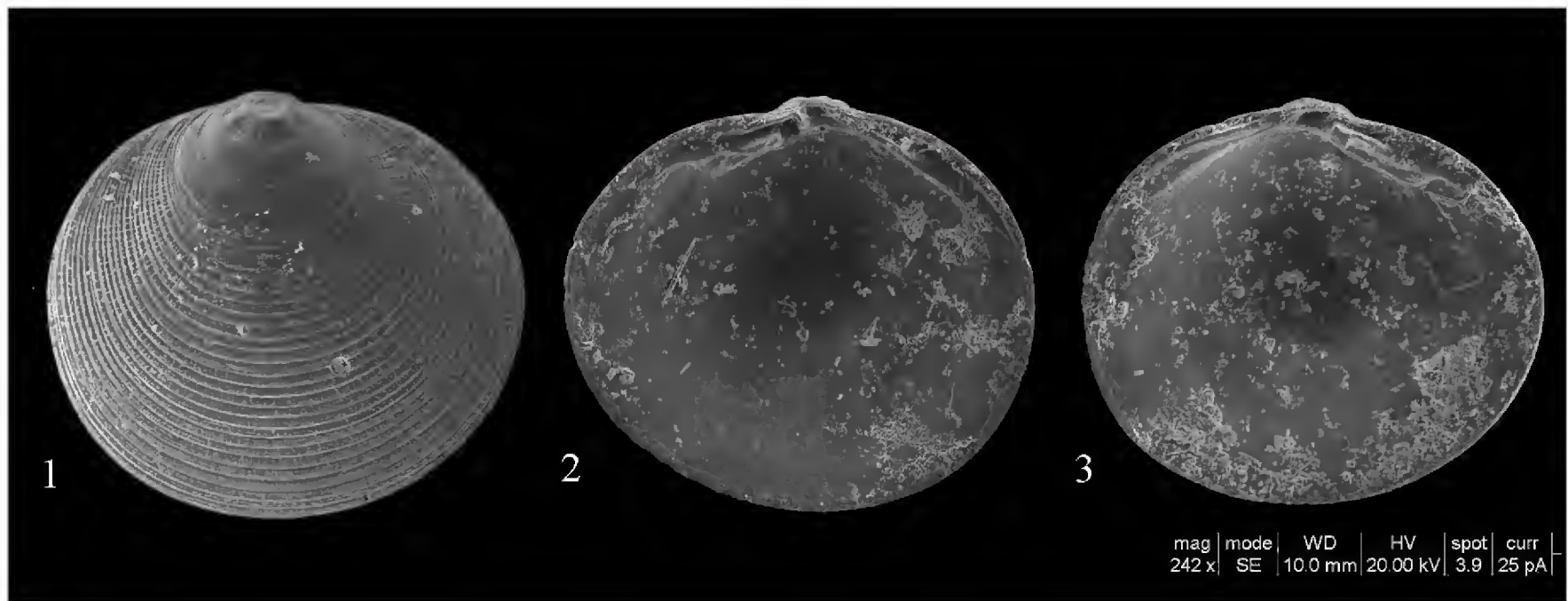
The malacofauna found in these particular and isolated environments was very interesting and, in addition to the species reported in this note, *Puncturella picciridda* Palazzi et Villari, 2001, *Muricopsis glutinosa* Palazzi et Villari, 2001 and *Lucinoma spelaeum* Palazzi et Villari, 2001 were described as new species. Out of the four species, *Lucinoma spelaeum* has been reported by Micali (2004) also in the Strait of Messina, a few tens of kilometers from Taormina.

The material in which the *N. discriminatum* specimens were found consisted of about 2 kg of debris picked up by hand while diving with Scuba diving, in the early 80's, at Ustica, Punta Spalmatore, at a depth of about 30 m (Figs. 1-3). The bottom is kind of debris, near a small submarine slope, with little mud. The malacofauna found is very rich in species, generally in a good state of freshness.

Original diagnosis of *N. discriminatum* was based only on comparisons with similar species (Palazzi & Villari, 2001: p. 25): "Si distingue da *N. sulcatulum* (Jeffreys, 1859) nel profilo orbicolare e non veneriforme come in quest'ultimo, per essere molto più appiattito e provvisto di una scultura radiale divergente, più marcata lateralmente. Ricorda un poco il genere *Arculus* (*omissis*) ma la cerniera ne è molto diversa. Dimensioni: intorno al millimetro."

In the same work (Palazzi & Villari, 2001) *N. discriminatum* was illustrated with photos taken by scanning microscopy. *Neolepton sulcatulum* (Jeffreys, 1859) is a species particularly well known, reported and figured by various authors (Tebble, 1966: 86, fig. 39; Terreni, 1981: 89, pl. 9 fig. 8; Aartsen et al., 1984: 66, fig. 331; Aartsen, 1996: 34, fig. E; Aartsen, 1997: 31, fig. 6L and R).

Aartsen (1997: 30) defines the shell outline "almost round", but this is not correct because in illustrations by the author it is clearly seen as veneriforme. The specimen drawn by Tebble (1976: 86, fig. 39) has a profile much more sub-circular; however there is a difference between figure A, which shows the external view, and figures B and D



Figures 1-3. *Neolepton discriminatum* Palazzi & Villari, 2001, Ustica -30m. Fig. 1: external shell. Fig. 2: inside of the left shell valve. Fig. 3: inside of the right shell valve.

showing the internal view. From a comparative analysis of the figures reported by several authors, it is obtained, for *N. sulcatulum*, a height/width ratio between 0.86 and 0.9, while in *N. discriminatum* the ratio is about 1.

DESCRIPTION OF THE *N. DISCRIMINATUM* SPECIMENS. Shell rather solid, equivalve, almost equilateral, sub-central umbones, eroded in the examined specimens. Color greyish-white. Sculpture concentric consisting of about 27 concentric fine ribs and divergent fine threads, passing over the ribs, more marked on the sides. Periostracus not detected. Internal ligament located behind the umbones. Right valve with an anterior tooth "hook-like", forming a right angle; a stout cardinal tooth, placed in the hollow of this but separated by a deep groove; and an elongated lateral tooth. Left valve with a stout cardinal tooth, joined to anterior tooth that appears elongated, and an elongated posterior tooth. Dimensions: height about 0.71 mm, width about 0.75 mm.

In the same sample of debris it was found a specimen of *Skeneoides digeronimoi* La Perna, 1998; this specie was described on material collected a few meters deep in the Grotta dell'Accademia, located on the opposite side of Ustica island, about four miles away from Punta Spalmatore.

This discovery, as in the case of *L. spelaeum*, evidences that the specie is not limited only to a specific cave or restricted locations, supporting the hypothesis, expressed by Palazzi & Villari (2001),

that an accumulation of large boulders can allow the formation of sciaphilous conditions similar to a proper cave. Probably the species described for submerged caves (rare, small and frequently known only for the place of description) have a geographic distribution much wider than previously known.

ACKNOWLEDGEMENTS

We thank Dr. Claudio Gentile for taking scanning electron microscope (SEM) pictures.

REFERENCES

- Aartsen J.J. van, 1996. Galeommatacea e Cyamiacea. *La Conchiglia*, 28: 31-36.
- Aartsen J.J. van, 1997. Galeommatacea e Cyamiacea. Parte II. *La Conchiglia*, 28: 27-53.
- Aartsen J.J. van, Menkhorst H.P.M.G. & Gittenberger E., 1984. The marine Mollusca of the Bay of Algeciras, Spain, with general notes on *Mitrella*, Marginellidae and Turridae. *Basteria*, Suppl. 2: 1-135.
- Micali P., 2004. Segnalazione di *Lucinoma spelaeum* Palazzi & Villari, 2001 nello Stretto di Messina. *Notiziario S.I.M.*, 21: 27-28
- Palazzi S. & Villari A., 2001. Molluschi e Brachiopodi delle grotte sottomarine del Taorminese. *La Conchiglia*, Suppl. 297: 1-56.
- Tebble N., 1976. *British bivalve seashells*. Second Edition. Her Majesty's Stationery Office, 212 pp.
- Terreni G., 1981. *Molluschi conchiferi del mare antistante la costa Toscana*. Tipografia Benvenuti & Cavaciocchi, Livorno, 106 pp.

A new record of cream coloured morph of *Naja kaouthia* Lesson, 1831 (Reptilia, Serpentes, Elapidae) from Hazaribag, Jharkhand, India

Satya Prakash¹, Anil Kumar Mishra² & Mohammad Raziuddin^{1*}

¹University Department of Zoology, Vinoba Bhave University Hazaribag 825 301, Jharkhand, India

²Divisional Forest office, Wildlife Division, Hazaribag, 825 301, Jharkhand, India

*Corresponding author: e-mail: mrazi.vbu@gmail.com

ABSTRACT

A rare cream coloured morph of monocellate cobra, *Naja kaouthia* Lesson, 1831 without hood mark has been recorded for the first time from Hazaribag town residential area (Jharkhand state), outside the known range of the snake extant distribution.

KEY WORDS

New record; Cream coloured morph; *Naja kaouthia*; Hazaribag; Jharkhand.

Received 17.05.2012; accepted 05.06.2012; printed 30.06.2012

INTRODUCTION

Asiatic cobra complex comprises 10 species (Wuster, 1998). However, only four species, namely *Naja naja* (Linnaeus, 1758), *N. kaouthia* Lesson, 1831, *N. oxiana* (Eichwald, 1831) and *N. sagittifera* Wall, 1913 occur in India; and out of them only *N. naja* shows a fairly wide distribution.

N. kaouthia has been reported from Gangiatic plain, Bengal, Orrisa, Sikkim, and Assam in northern and eastern India where it occurs sympatrically with *N. naja* (Wuster, 1998) but, up to now, has never been reported from any part of Jharkhand state (India), outside its extant geographic distribution range (Fig. 1).

Besides India, it occurs in Nepal, Bangladesh, Burma, Malaysia, Cambodia, Thailand, southern Vietnam and south western China. It inhabits a wide range of habitats particularly those associated with water but also occurs in agricultural land and human settlements including cities.

It occurs up to 1000 m elevation but is mainly found below 700 m in a broad range of habitat types. *N. kaouthia* is specified in schedule-II, of Part-II of WPA, 1972 and listed in CITES Appen-

dix-2. The IUCN status of this snake is under category of least concern.

Prakash & Raziuddin (2009) have recently reported 19 species of snakes from Hazaribag district of Jharkhand which does not include *N. kaouthia*.

Further, a report on the reptilian fauna of Bihar (including Jharkhand) published by Dasgupta & Raha (2004) also does not mention this species of cobra in their list. We report here for the first time the occurrence of *N. kaouthia* ("Suphan"/cream colour morph) from Hazaribag town of Jharkhand state.

Hazaribag district of Jharkhand forms a part of Chotanagpur Plateau lying between extent 84°27'E longitude to 85°55'32"E longitude and 23°25'29"N latitude to 24°49'24" N latitude with an average elevation of 604 m. It is a region of undulating terrain with residuary hills and intermountain valleys and is predominantly a forest district with about 36.05% forest area.

The average annual rainfall is 1234.5 mm. During peak summer (May) maximum temperature shoots up to more than 40°C and from December to early part of January average temperature is 4°C to 5°C or less.

DISCUSSION AND CONCLUSIONS

On 15 June 2011, during day time a single live adult, 208 cm long, cream-coloured, acellate cobra, hitherto unreported from any part of Jharkhand state, was rescued live (Fig. 2) from the store house of a cafeteria in “Swarnajayanti Park” of Hazaribag town (24° 00' 21.5" N; 85° 22' 04.0" E) which is situated adjacent to "Hazaribag Lake" at an elevation of 610.5 m. It was temporarily released in a big play field and photographed using Canon PowerShot SX 300IS camera.

The dorsal surface of the cobra was cream coloured while the ventral surface was lighter than the dorsal. It was not observed to spit venom but hissed explosively and only occasionally protruded tongue. On the basis of absence of any hood mark (Fig. 3) the specimen was initially suspected to be

N. oxiana which is reported only from extreme north-west regions of India (Murthy et al., 1979; Wuster, 1998).

A closer examination of morphological characters of the rescued atypical cream coloured cobra however, revealed that it was *N. kaouthia* Lesson, 1831. Although *N. kaouthia* typically has a monocellate hood mark which may vary in shape, the rescued specimen lacked the hood mark but had distinct throat pattern characteristic of *N. kaouthia*.

It had a pair of darker spots on the ventral side of hood, each surrounded by a distinctly lighter ring (or a half-circle, or “D-shaped”) with its flat side towards ventral body midline and the fairly wide distinctly darker cross band farther back (i.e. farther posterior) on the ventral side (Fig. 4). Number of ventral and subcaudal scales was 186 and 48 respectively, less than those described for *N. oxiana*

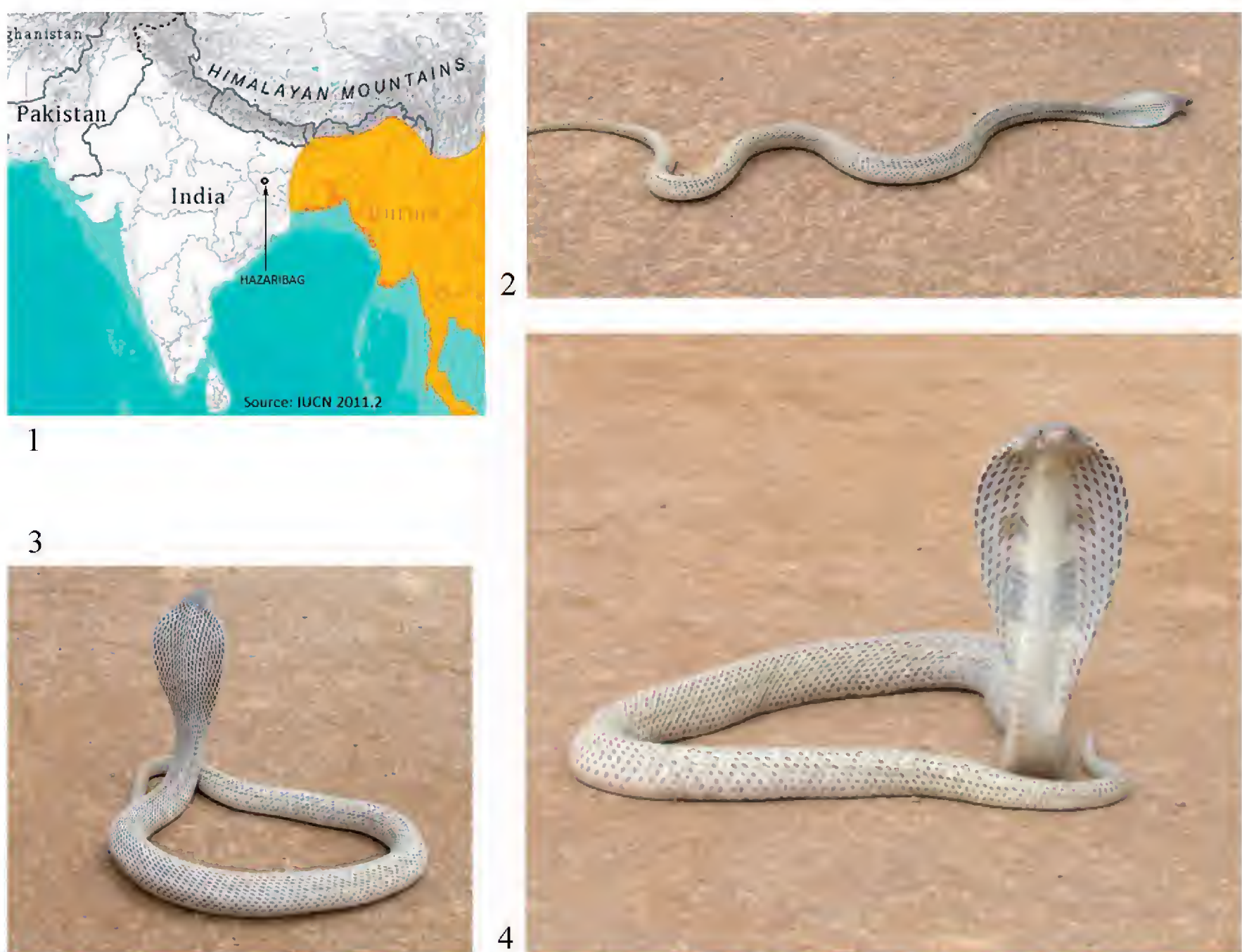


Figure 1. Rescue site of *Naja kaouthia* in Jharkhand state (India). Extant distribution of the species is shown in yellow (modified from IUCN, 2011). Figure 2. *Naja kaouthia*, cream coloured morph. Figure 3. Absence of hood mark in the rescued *Naja kaouthia*. Figure 4. Ventral surface of hood of *Naja kaouthia* showing distinct throat pattern.

(Wuster, 1998). This cobra resembled very much a relatively rare cobra *N. kaouthia suphanensis* Nutaphand, 1986, the so called "Suphan cobra", a light coloured snake reported from central Thailand by Nutaphand (1986) which has been regarded as a rare taxon with a restricted distribution (Cox, 1991).

Multivariate analysis of morphometry and comparative sequencing of cytochrome oxidase sub unit I (COI) gene of typical monocellate *N. kaouthia* and "Suphan cobra" made by Wuster et al. (1995) have, however, confirmed that the latter is just a colour variety of *N. kaouthia*. On the basis of the colour and absence of hood mark we believe that the rescued cobra was the "suphan"/cream colour morph of *N. kaouthia*, a species of cobra reported here for the first time from Jharkhand state.

Since it is an uncommon species of cobra in the state, it warrants special conservation measures which should be addressed separately from those reserved for the commonly occurring venomous snakes. The rescued specimen was handed over to the Hazaribag Wildlife Division office whence it was subsequently sent to snake park of Bhagwan Birsa Biological Garden, Ormanjhi, Ranchi, Jharkhand for conservation.

ACKNOWLEDGEMENTS

We wish to thank David Hill, Armed Forces Pest Management Board, U. S. Army, for his valuable help in the identification of snake. We also gratefully acknowledge the help received from the vo-

lunteers of Neo Human Foundation, Hazaribag Mr. Murari Singh and Mr. Banaras Singh and the Forest Department, Hazaribag Wildlife Division.

REFERENCES

- Cox M. J., 1991. The snake of Thailand and their husbandry. Krieger, Malabar, Florida. xxxviii +526 pp.
- Dasgupta G. & Raha S., 2004. Reptilia, In: Director, Zoological Survey (ed.), Fauna of Bihar (Including Jharkhand). Part 1: Kolkata, Zoological Survey of India, State Fauna Series, 11: 143-179.
- GOI, 1972. The Wildlife (Protection) Act, (1972), Ministry of Forest and Environment, Govt. of India, New Delhi.
- IUCN, 2011. IUCN Red List of Threatened Species (ver. 2011.2). Available at: <http://www.iucnredlist.org>. (Accessed: 12 April 2012).
- Murthy T.S.N., Sharma B.D. & Sharma T., 1979. Second report on the herpetofauna of Jammu and Kashmir, India. The Snake, 11: 234-241.
- Nutaphand W., 1986. Cobra. Bangkok: Thai Zoological Centre (unnumbered, unpaginated, in Thai).
- Prakash S. & Raziuddin M., 2009. Report on the snake fauna of Hazaribag district, Jharkhand, India. Columban Journal of Life Sciences, 10: 9-14.
- Wuster W., Thorpe R.S., Cox M.J., Jintakune P. & Nabhitabhata J., 1995. Population systematic of the snake genus *Naja* (Reptilia: Serpentes: Elapidae) in Indochina: Multivariate morphometrics and comparative mitochondrial DNA sequencing (cytochrome oxidase I). Journal of Evolutionary Biology, 8: 493-510.
- Wuster W., 1998. The cobras of the genus *Naja* in India. Hamadryad, 23: 15-32.