A Revision of the Philippine Coroebine Genus
Obenbergerula Strand (Coleoptera: Buprestidae: Agrilinae)

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Abstract
The Philippine coroebine genus Obenbergerula Strand is revised for the first time with four species recognised: O. paradoxa (Hoscheck) (the type species), O. horni (Hoscheck), O. bakeri (Fisher) and one new species, O. confusa. The species are separated in a key, illustrated, and the known distribution is shown on a map. Brief comments on the phylogeny of a cladogram for the genus are given.

Introduction
Among the genera of the Coroebini, the Philippine Obenbergerula Strand stands alone as one of the most beautiful groups of species anywhere in the world. Despite the distinctive colours and relatively large size, this taxon is known from only a few specimens. The loan of a small collection of these beetles from my colleague Masao Toyama has allowed me to consider the entire genus for the first time since the original description under the preoccupied generic name Bottcheria Hoscheck, 1931. This preoccupation was discovered and reported by Strand (1932) with the name Obenbergerula selected to replace Bottcheria. Obenberger (1942) erected Sibuyanella for Cissicoraebus bakeri Fisher, which I have recently (Bellamy 1990) reduced to a junior synonym of Obenbergerula.

In the preceding paper (Bellamy 1990), I speculated that the colouring of the species of Obenbergerula is mimetic and perhaps modelled on a group of scutellerids, possibly Poecilocoris Dallas or Chrysocoris Hahn.

Materials and Methods
Material was borrowed from the following collections, with these abbreviations used in the text.

BMNH The Natural History Museum, London
CLBC My research collection
HMCG H. Mühle collection, Pfaffenhofen, West Germany
MGFT Museum Georg Frey, Tatzing, West Germany
MTCJ M. Toyama collection, Nishinomyia, Japan
USNM National Museum of Natural History, Washington, D.C.
NMPC National Museum, Prague
NSMT National Science Museum, Tokyo

The morphometric measurements are taken as follows: overall body proportion (L/W): maximum length, dorsal from midpoint of frontovertex to elytral apex; maximum width, taken at widest point of pronotum; pronotal proportion (PN): length from a midpoint of anterior margin to midpoint of posterior margin; maximum width, taken at widest point. Some specimens were received late in the study or were examined in a situation or location where dissection was impossible. Thus, material not sexed is not included in the morphometric data.

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Label data are listed verbatim for the type specimens and in a decreasing order of magnitude (e.g. country, island, district, etc.) from the exact ordering on the labels. Orthographic corrections and coordinates have been determined, where possible, and are listed only at the first usage. These are enclosed in parentheses with (p) = printed data and (h) = handwritten data; for brevity and where not so noted, all label data are printed. A solidus (/) separates data from individual labels. Placename orthography and coordinates were determined using the gazetteer series of the United States Board of Geographic Names, Defense Mapping Agency Topographic Center and the Times Atlas of the World (7th edition, 1988).

The phylogenetic commentary was developed partially from studies of Coroebini in general (e.g. Bellamy 1988a, 1988b, 1988c, unpublished data) and benefits from the use of the parsimony software package HENNIG98 (Farris 1988). Comments on character states and polarity, and the specific routines and computed values, are discussed below.

Genus *Obenbergerula* Strand

*Bottcheria* Hoscheck, 1931: 737 (name preoccupied).


*Obenbergerula* Fisher.—Bellamy 1990: 691 (lapsus). Type species: *Bottcheria paradoxa* Hoscheck (from original designation, see comments below).

**Diagnosis**

Elongate, attenuate to posterior; subcylindrical to flattened; iridescent green, sometimes with cupreous reflections; surface shagreened, sparsely setose.

**Head** (Fig. 9). Frontovertex feebly convex between eyes; eyes large, inner margins feebly divergent dorsally; antennal cavities widely separated; frontoclypeus with medial plate between antennae and dorsal to margin; genae with large acute lobe ventral to eyes; labrum with apex convex, setose; mandibles large, robust, lateral portion iridescent, coarsely punctate; antennae (Fig. 10) serrate from antennomere 5.

**Pronotum.** Wider than long; strongly declivous anterolaterally; disc flattened.

**Elytra.** Blue-bordered purple maculations; sides subparallel then attenuate to apex; margins finely serrate along apical $\frac{1}{2}$; disc transversely convex; pygidium not visible past apex.

**Thoracic sternites** (Fig. 12). Prosternum with mentonniere bilobed; process contracted between procoxae then widening before roundly attenuate apex; suture between abdominal sternites 1 and 2 feebly indicated; last visible sternite with premarginal groove.

**Legs.** Femora subfusiform, ventral surface slightly excavate to receive tibiae; tibiae 4-sided, with 2 spines apically; metatibiae (Fig. 12) with dorsal side having gibbous elevation and 'comb' of stout setae; tarsomeres 1–4 subequal, each with ventral pulvillus; 5 with claws sexually dimorphic (Figs 13, 14); male with inner claw bifid, outer claw appendiculate; female with both claws appendiculate.

**Wing** (Fig. 15). Radial cell (R) subpentagonal; radiomedial crossvein from R cell to shortened median vein; 1st A free; 2nd $A_1$ and 2nd $A_2$ fused basally.

**Genitalia.** Male (Figs 16–19), parameres with lateral portion membranous along apical $\frac{1}{2}$; female ovipositor of normal type (see Bellamy 1988c), without striking dorsoventral differentiation or stout setal brushes.

**Remarks**

*Obenbergerula* is a small genus of striking species known only from certain of the Philippine Islands (Fig. 20). The configuration of the prosternum and presence of the plesiomorphic ovipositor indicate that this genus belongs to the *Coroebus* genus-group, i.e. *Coroebus* Gory & Laporte, *Vanroonia* Obenberger, *Cisseicoraebus* Kerremans and...
Coraebosoma Obenberger. With the Coroebini of the Philippines, Indo-Malayan, Asian and Indian regions poorly studied and in need of, at least, generic revision, natural groupings are speculative at best (see Phylogeny below). The sexually dimorphic tarsal claws are synapomorphic within this group of genera. Obenbergerula is defined as monophyletic based on its mimetic colouring and the distinctive frontoclypeal plate (Fig. 9).

Hoscheck (1931) started his description of Bottcheria by designating B. 'paradisea' as the 'genotype'. However, the first species described was instead named B. paradoxa. The second species described was B. horni and it was discussed in comparison to 'paradisea'. Hoscheck labelled the holotype as paradoxa. Obenberger (1935) catalogued these species as B. paradoxa and B. horni, with 'paradisea' listed in parentheses after paradoxa. While it might seem worth seeking a formal ruling, I will accept paradoxa as the correct epithet since it preceded the description and was the name that Hoscheck used to label the holotype; paradisea should be considered a nomen nudum.

Since the three described species were very adequately described originally, I have only added morphometric measurements and diagnostic comments. The new species, O. confusa, is fully described. The species of Obenbergerula may be separated as follows:

**Key to the Species of Obenbergerula**

1. Surface punctation fine, shallow; elytra with 1 pair of spots and 2 pairs of transverse fasciae (Fig. 7); male genitalia as in Fig. 19 (Cebu, Samar, Mindanao) ...... O. horni (Hoscheck)
   Surface punctation more coarsely shagreened; elytra with blue spots and fasciae more numerous ............................... 2

2. Slender, L/W ≥2.96; blue elytral maculations consisting of 5 pairs of spots and 3 pairs of fasciae partially connected by narrow blue sutural band (Fig. 5); male genitalia as in Fig. 18 (Sibuyan, Romblon) .................................................. O. bakeri (Fisher)
   More robust, L/W ≤2.87; blue elytral maculations consisting of 3 pairs of large spots and 2 pairs of fasciae without connecting sutural spots ................................................ 3

3. Pronotum with emargination at basolateral angle; more slender, L/W ≥2.87; male genitalia as in Fig. 17 (Mindanao) ............................................................. O. confusa, sp. nov.
   Pronotum without basolateral emargination; more robust, L/W ≤2.73; male genitalia as in Fig. 19 (Polillo, Samar) .............................................................. O. paradoxa (Hoscheck)

Obenbergerula paradoxa (Hoscheck)  
(Figs 1, 2, 9–16)

Bottcheria paradoxa Hoscheck, 1931: 739.
Bottcheria paradisea Hoscheck, 1931: 737, nomen nudum.

Material Examined

**Holotype.** ♂ (MGFT): 1897 (blue)/Coll. Dr A. Frh. v. Hoscheck Philippinen (p) 12.viii.1915 Polillo (h)/TYPUS/Böttcheria m.n.g. (Genotypus) paradoxa m.n.sp. Typus (h) Det. Hoscheck 19(p)31(h); 1 ex. (NMPC): Polillo I., W. Schultze.


**Diagnosis**

Holotype, male, 4 males and 6 females: males, 14.94–16.60 × 5.64–6.08 mm, females, 16.76–18.42 × 6.14–7.13 mm: L/W, males 2.64–2.73, females, 2.58–2.72. PN 1.85.

There is an apparent allometric colour shift with the larger specimens, particularly females, showing an increasing cupreous reflection on the elytral disc.

**Male genitalia.** As in Fig. 16.

**Remarks**

This species is quite distinct from O. bakeri and is most probably the sister species to O. confusa, sp. nov. and O. horni. In overall morphology it is most similar to O. confusa,
with *O. paradoxa* differing by being generally more robust, with the L/W values lower, by the differences in the male genitalia and being from localities on more northerly islands.

**Obenbergerula confusa**, sp. nov.

*(Figs 3, 4, 17)*

*Material Examined*

**Holotype.** ♀ (NSMT): NE. Mindanao, Tandag (9°04′N, 126°12′E), Surigao (9°45′N, 125°30′E.).

*Description of Holotype Male*

Size 14.7 x 5.14 mm; surface bright green with slight golden reflections at base of pronotum and elytra; elytral maculations of 3 pairs of spots and 2 fasciae distributed as indicated in Fig. 3, each maculation deep purple with greenish blue border; dorsal surface with head and pronotum irregularly, sparsely, shallowly punctate with a single fine recumbent testaceous seta from each puncture; elytra more deeply, densely rugosely punctate, especially rugose on basolateral $\frac{1}{2}$; setae more stout, white beginning before midpoint of disc and on green band between 2 purple fasciae; underside punctation and vestiture more dense than pronotum with hypomera, anteromedial portions of metathorax and 1st abdominal sternite imbricate.

**Head.** Frontovertex feebly convex between, with finely impressed longitudinal groove on dorsal $\frac{1}{4}$; transversely punctatostriate above preantennal groove; eyes large, inner margins slightly diverging dorsally; circumocular groove deep around dorsal portion of eyes; frontoclypeal margin broadly concave; antennae: left, missing antennomere 2; right, 4–6 x longer than wide, 7–11 x wider than long.

**Pronotum.** PN 1.9 x as wide as long, widest just past base; anterior margin feebly convex; posterior margin bisinuate; posterolateral angles obtuse, widening past base to subcrenulate arcate lateral margin; disc strongly convex laterally, flattened medially; prelateral areas explanate with small broad gibbosity on anterior $\frac{1}{2}$; scutellum subcordiform, anterior margin convex, lateral angles rounded to accumulate apex.
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**Figs 3-4.** Dorsal and lateral aspects of *Obenbergerula confusa*, sp. nov. (scale line = 5 mm).

_Elytra._ Sinuate basal depression on either side; humeri moderately elevated; epipleuron extends to opposite basal abdominal sternites; lateral margins subparallel, costate, entire to about apical $\frac{1}{3}$, then attenuate, serrate to separately angulately rounded apices.

_Male genitalia._ As in Fig. 17.

_Female._ Unknown.

**Etymology**

The specific epithet was chosen to highlight the fact that this new species might very well be confused with *O. paradoxa*. These two species may be separated as discussed above and in the key.

*Obenbergerula bakeri* (Fisher)

(Figs 5, 6, 18)


_Sibuyanella bakeri._—Obenberger 1942: 60.


**Material Examined**

_Holotype._ ♀ (USNM 25948): Island Sibuyan, Baker.

_Paratypes._ 11♂, 4♀ (14 USNM, 1 CLBC), same data as holotype; 3♂, 1♀ (MTCJ), Sibuyan I., Romblon Prov., Philippines, iii–vii.1980; 5 specimens, Romblon, 1981, coll. Witzgall (HMCG, CLBC); 3 specimens, Sibuyan I., Romblon Prov. iii.1981, D. Dacasin (CLBC); 1♀ (CLBC), Romblon, vi.1985; 1♂, 1♀ (CLBC), Philippines, R. M. Lumawig. One specimen (BMNH) from the type locality was not measured nor was the sex determined.

**Diagnosis**

Holotype female: 13·61×4·48 mm; males (n = 15), 11·62–13·61×3·81–4·48 mm; females (n = 7), 14·27–14·77×4·81; L/W, males 3·04, females 2·96; PN 1·87. The elytral maculations vary in shape and placement, especially those along the suture. The specimens from Romblon I. show a cupreous or roseocupreous reflection.
Male genitalia. As in Fig. 18.

Remarks

This species is distinguished by its more slender form, the most complicated elytral maculations, the bilobed parameres (Fig. 18) and its restriction to two small isolated islands within the Philippine archipelago (Fig. 20).

When Fisher (1924) described *Cissseicoraebebus bakeri*, he compared it to the other described species of *Cisseicoraebus* and *Polyonychus nigropictus* Gory & Laporte. When Hoscheck (1931) erected *Bottcheria* and described the two species, he compared *bakeri* to *paradoxa*. However, when Obenberger (1942) erected *Sibuyanella* for *bakeri*, he did not discuss the species in relation to Hoscheck's taxa.

*Obenbergerula horni* (Hoscheck)
(Figs 7, 8, 19)

*Bottcheria horni* Hoscheck, 1931: 740.

Material Examined

_Holotype._ ♀ (MGFT): S. Böttcher 9.vi.1915 Philippinen Mindanao Butuan (8°54’N., 125°35’E.)/ TYPUS/Böttcheria horni m.n.sp..

_Paratypes._ 1 ♀ (BMNH): Cebu (10°20’N., 125°45’E.)/Fry coll. 1905.1001 ♂ (MTCJ), Samar I., Sohoton nr Rawis, 4–5.vii.1983, Minora Tao leg.; 1 ♂, 2 ♀ (MTCJ, CLBC): same data. The specimen from BMNH was not measured, nor was the sex determined.

Diagnosis

_Holotype female:_ 15·77 × 5·97 mm; _male (n = 1), 15·43 × 5·81_ ; _female (n = 2), same as holotype; *L/W*, _male 2·65, female 2·64; PN 2·02_. There is only a slight hint of cupreous reflection on the female specimens.

_Male genitalia._ As in Fig. 19.
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Remarks

This species is very distinctive in comparison with its three congeners and may be separated by the reduced elytral maculations, fine punctuation, sparse vestiture and the shape of the male genitalia (Fig. 19).

Phylogeny of *Obenbergerula*

The phylogeny of the four species of *Obenbergerula* is preliminary due to the paucity of material from only a select few islands within the Philippine archipelago. It is expected that further species will be collected and that the relationships to sister taxa will be developed and this will affect the decisions made herein on polarity.

As earlier stated, I consider *Obenbergerula* to be a monophyletic group based upon the autapomorphic structure of the frontoclypeus and the putative mimetic coloration. With the relationships within the Asian Coroebini almost totally undeveloped, the choice for outgroup(s) was rather arbitrary but was limited to other Philippine taxa. I selected *Coroebus coelestis* Saunders as the primary taxon for comparison but also referred to other species of *Coroebus* and *Cisseicoraebus* to effect logical decisions in defining character state polarity. The species of *Obenbergerula* form a monophyletic group in comparison with the outgroup by virtue of synapomorphies of character states 10, 14 and 15 and the outgroup is isolated from *Obenbergerula* with the autapomorphic states 11 and 13.

Character State Polarity

The following characters were examined, with the states defined as plesio- or apomorphic as listed in Table 1.

1. Proportions. The robust form is primitive in this context with a trend to narrow being apomorphic.
2. Dorsoventral compression. The two states present in the in- and outgroups represent a reversal with the flattened morphology being derived in this situation.
3. Dorsal punctuation. The less rugose to smooth dorsal surface is more common within *Obenbergerula* and the outgroup; therefore, the rugose situation of *O. bakeri* is apomorphic.
Figs 9–19. Key characters of *Obenbergerula*: 9–16, *O. paradoxa*; 17, *O. confusa*; 18, *O. bakeri*; 19, *O. horni*. 9, head, frontal aspect; 10, right antenna, dorsal aspect; 11, thoracic sternites, ventral aspect; 12, metatibia, tarsus, dorsal aspect; 13, 14, tarsal claws: 13, male; 14, female; 15, left wing, ventral aspect; 16–19, male genitalia, dorsal aspects (scale lines = 1 mm, Figs 9, 10, 12–14, 16–19; 5 mm, Figs 11, 15).
4. *Dorsal vestiture*. The transformation series follows a logical progression from glabrous to most hirsute.

5. *Frontal depression*. A simple plesiomorphic absence is replaced by the derived presence.

6. *Ocular groove*. The deep groove is primitive and the subsequent loss is derived.

7. *Preantennal grooves on frons*. In context with other examined coroebines, the separate grooves transform to the derived state of confluence.

8. *Pronotal base*. An entire margin is primitive with the emarginate state apomorphic.

9. *Pronotal depressions*. Following the same logic as 5 and 6.

Fig. 20. Distribution of *Obenbergerula*. 
10. Elytral maculations. The progression within the transformation series leading to the most successful mimetic pattern, which is thought to be apomorphic.

11. Elytral apex. Following the logic of 8.

12. Epipleural carina. The loss of the epipleural carinae is apomorphic.

13. Inner margin of metepisternum. From the outgroup comparison, the parallel sides of this sclerite are the plesiomorphic state.


15. Tarsal claws. Sexual dimorphism is the derived state.

16. Male genitalia. Increasing complexity in this character implies that the bilobed parameres are the most derived.

The establishment of the character state polarities permitted the creation of the character state matrix (Table 2). The matrix data were read into HENNIG86 and run through the implicit enumeration (ie) tree calculating routine. The initial values yielded one tree of length \( L = 23 \), consistency index \( CI = 82 \) and retention index \( ri = 50 \). One pass through the a posteriori weighting \( (xs w) \) routine produced a single tree \( L = 150 \), \( CI = 100 \) and \( ri = 100 \). The index values for the individual character states are listed in Table 1. The single tree is shown in Fig. 21.

**Table 1. Adult characters examined**

<table>
<thead>
<tr>
<th>Character Description</th>
<th>Consistency index</th>
<th>Retention index</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Proportions: robust (P); slender (A); narrow (A2)</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>2. Dorsoventral compression: subcylindrical (P); flattened (A)</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>3. Dorsal punctation: fine to glabrous (P); coarse to rugose (A)</td>
<td>0.50</td>
<td>0.00</td>
</tr>
<tr>
<td>4. Dorsal vestiture: glabrous or minute (P); moderate (A); more dense (A2)</td>
<td>0.66</td>
<td>0.00</td>
</tr>
<tr>
<td>5. Frontal depression: absent (P); present (A)</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>6. Ocular groove: deeply excavated (P); shallow or absent (A)</td>
<td>0.50</td>
<td>0.00</td>
</tr>
<tr>
<td>7. Preantennal grooves on frons: separate (P); confluent (A)</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>8. Pronotal base: entire (P); emarginate laterally (A)</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>9. Pronotal depressions: absent (P); present (P)</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>10. Elytral maculations: absent (P); confused pattern (A); well defined pattern (A2)</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>11. Elytral apex: entire (P); spinose (A)</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>12. Epipleural carina: present (P); absent (A)</td>
<td>1.00</td>
<td>1.00</td>
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<tr>
<td>13. Inner margin of metepisternum: parallel to outer margin (P); oblique (A)</td>
<td>1.00</td>
<td>1.00</td>
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<tr>
<td>14. Metafemoral gibbosity: absent (P); present (A)</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>15. Tarsal claws: sexually equal (P); sexually dimorphic (A)</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>16. Male genitalia: parameres unilobed (P); bilobed (A)</td>
<td>1.00</td>
<td>1.00</td>
</tr>
</tbody>
</table>

**Fig. 21.** Cladogram for species of *Obenbergerula* (length 150, \( CI = 100 \), \( \eta = 100 \)).
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Table 2. Matrix of character states of *Obenbergerula* species and outgroup
*(Coroebus coelestis)*

<table>
<thead>
<tr>
<th>Taxon</th>
<th>Character</th>
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<td></td>
<td>1  2  3  4  5  6  7  8  9  10  11  12  13  14  15  16</td>
</tr>
<tr>
<td><em>Coroebus coelestis</em></td>
<td>1 1 0 1 1 0 0 0 1 1 0 0 0 1 0 0</td>
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<td><em>O. baker</em></td>
<td>2 1 1 2 1 0 0 0 1 1 0 0 0 0 1 1</td>
</tr>
<tr>
<td><em>O. paradoxa</em></td>
<td>0 6 1 1 0 0 1 0 2 0 0 0 1 1 0</td>
</tr>
<tr>
<td><em>O. confusa</em></td>
<td>1 0 1 1 1 0 0 1 1 0 2 0 0 0 1 1 0</td>
</tr>
<tr>
<td><em>O. hori</em></td>
<td>1 0 0 0 0 1 1 1 0 2 0 1 0 1 1 0</td>
</tr>
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</table>

Acknowledgments

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References

Bellamy, C. L. 1985. A catalogue of the higher taxa of the family Buprestidae (Coleoptera). *Navorsinge van die Nasionale Museum Bloemfontein* 4, 405-72.
Bellamy, C. L. 1988c. The classification and phylogeny of the Australian Coroebini, Bedel, with a revision of the genera *Paracephala*, *Melibeithon* and *Dinocephalia* (Coleoptera: Buprestidae: Agrilinae). *Invertebrate Taxonomy* 2, 413-53.
Farris, J. S. 1988. 'HENNIGS Reference. Documentation for Version 1.5.'

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