

On the rediscovery of *Phalilus oberthuri* (GUIGNOT, 1935) in New Caledonia (Coleoptera: Haliplidae)

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Abstract

Phalilus oberthuri (GUIGNOT, 1935) (Coleoptera: Haliplidae) was rediscovered in New Caledonia after more than 130 years. In the years 2015, 2016 and 2020, seven specimens (six adults and one larva) were collected in three adjacent dolines (sinkholes) in the very southern tip of New Caledonia (Grande Terre). These three dolines are briefly characterized, including also some physico-chemical data. The known distribution of *P. oberthuri* in New Caledonia and Australia is mapped. A remarkable, hitherto unrecognized, secondary sexual character of *P. oberthuri* is described and illustrated. The variability of the elytral maculation is briefly discussed. Four habitus photographs are provided, two of which were taken from a living specimen.

Key words: Coleoptera, Haliplidae, *Phalilus oberthuri*, New Caledonia, rediscovery, distribution, sexual dimorphism.

Introduction

Until recently, *Phalilus* GUIGNOT, 1935 was considered as a subgenus of *Halipilus* LATREILLE, 1802, but it was raised to genus level by VONDEL (2019).

Phalilus oberthuri (GUIGNOT, 1935), the only known New Caledonian haliplid species, was originally described from New Caledonia (Grande Terre), based on specimens collected in the 19th century. After its discovery (before 1883), it has not been found again in New Caledonia for more than 130 years. The original collecting site, the Marais de l'Anse Vata (in the southern part of Nouméa), does not exist anymore, and *P. oberthuri* was thus thought to be extinct in New Caledonia (HENDRICH & VONDEL 2010). This species occurs also in Australia, where it is obviously very rare as well.

Very surprisingly, a hydrobiological survey on dolines (sinkholes), carried out by Christine Pöllabauer in 2015 for a nickel and cobalt mining project in the southernmost part of Grande Terre, revealed a single female specimen of *P. oberthuri*.

Soon after this discovery, a second specimen was collected in an other nearby doline by Heliott Touron-Poncet (Bioeko Consultants, Nouméa, New Caledonia) in July 2016 while monitoring seven dolines (BARGIER et al. 2018). The specimen was sent to Jean-François Parpet (Asconit SAS Laboratory, Lyon, France), who confirmed its identity. But eventually, the specimen was lost (probably thrown away) before it could be deposited in a museum following the bankruptcy of Asconit SAS in 2018. However, the rediscovery of *P. oberthuri* and a photograph of the specimen collected during this survey were published in BARGIER et al. (2018).

Very recently, *Phalilus oberthuri* was found again in the same doline sampled by Touron-Poncet and in a third nearby doline. These specimens were collected during a hydrobiological survey carried out by Nathalie Mary and N. Charpin in June 2020, which aims to improve the knowledge on the fauna of dolines, particularly in terms of endemicity and sub-endemicity, in order to enable decision-makers to implement appropriate management measures to protect these fragile ecosystems. During this survey, 25 dolines were sampled.

Material and methods

Methods and taxonomic terms are according to VONDEL (1997). Examined and recorded material is deposited in the following collections:

CNM	Collection N. Mary, ETHYCO (Étude des Hydrosystèmes Continentaux Tropicaux), Nouméa, New Caledonia
IRSNB	Institut royal des Sciences naturelles de Belgique, Brussels, Belgium (P. Limbourg)
MNHN	Muséum national d'histoire naturelle, Paris, France (A. Mantillieri)
NMW	Naturhistorisches Museum Wien, Vienna, Austria (M.A. Jäch)
SAM	South Australian Museum, Adelaide, Australia (P. Hudson)

Phalilus oberthuri (GIGNOT, 1935)

TYPE MATERIAL: **Lectotype** ♂ (MNHN) and **paralectotype** ♂ (MNHN) (see HENDRICH & VONDEL 2010; the paralectotype was erroneously regarded as “paratype” by VONDEL 1995).

For additional historical material (1 ♂, 2 ♀♀, all deposited in the IRSNB), probably collected together with the type specimens, see HENDRICH & VONDEL (2010).

SUMMARY OF THE REDISCOVERY IN NEW CALEDONIA: The rediscovery of this species in New Caledonia is based on seven specimens (six adults and one larva), collected in the years 2015, 2016 and 2020 from three adjacent dolines (sinkholes) in the southern tip of Grande Terre (Figs. 11–18):

1 ♀ (NMW) (Fig. 1): “DOL-11” (Figs. 11, 12–13), doline about 9 km east of Prony near Kadji River, 22°19'15.3"S 166°54'23.3"E, 1.IV.2015 (end of rainy season), leg. C. Pöllabauer. The region is characterized by ultramafic rocks and soils and a maquis vegetation. The water and substrates of this region are nutrient poor, but rich in heavy metals (Mg, Fe, Cr, Co and Ni) and ultrabasic. The doline “DOL-11” is sometimes drying out and receives some nutrient effluent from a sewage and wastewater treatment station of the nearby mining site. The doline is ca. 44 m long and ca. 27 m wide, 1.0–1.2 m at deepest point. Bottom mostly rock, some zones with pebbles and mud. Macrophytes cover nearly 60% of the doline. The presence of green algae on the surface seems to indicate an organic pollution.

1 ♂ (lost) (Fig. 2): “Doline Pilote” (Figs. 11, 15), doline about 8 km east of Prony, 22°20'13.0"S 166°54'17.4"E, 7.VII.2016, a stagnant and permanent round pool a few hundred meters west of the nickel plant “Vale NC (Goro-Nickel)” [from February 2000 to June 2002, this plant discharged the supernatant fluids from the sedimentation basins (effluents from nickel extraction in an acid medium) into the “Doline Pilote”, and an impact study had been conducted until 2004 (PÖLLABAUER 2003, BARGIER & PÖLLABAUER 2004); a list of animals (incl. *Phalilus oberthuri*) collected in this sample was published in BARGIER et al. (2018: 123)]. The doline has a surface of 1,418 m² and a maximum depth of 6.2 m. The specimen was collected on *Eriocaulon neocaledonicum* (Eriocaulaceae) by Dr. Heliott Touron-Poncet; it was subsequently identified by Jean-François Parpet (Asconit SAS Laboratory, Lyon, France). Unfortunately, this specimen was lost after the survey, only a photograph (Fig. 2) remained.

1 ♀ (CNM): Same locality as above (“Doline Pilote”, Figs. 11, 16), about 8 km east of Prony, 22°20'13.6"S 166°54'17.2"E, 22.VI.2020, leg. N. Mary & N. Charpin.

1 ♂, 2 ♀♀, 1 larva (CNM) (Figs. 3–4): Doline “DT-73” (Figs. 11, 17–18), about 7 km east of Prony, 22°20'13.0"S 166°54'17.4"E, 26.VI.2020, leg. N. Mary & N. Charpin.

Physico-chemical data of the three different dolines are listed in Tab. 1. The water beetle assemblages of “Doline Pilote” and “DT-73” are presented in Tab. 2.

Tab. 1: Physico-chemical data of the sampling stations.

Sampling stations	“DOL-11”	“Doline Pilote”	“DT-73”
Sector	near factory	near factory	near factory
Latitude	22°19'15.3"S	22°20'13.6"S	22°18'44.6"S
Longitude	166°54'23.3"E	166°54'17.2"E	166°53'41.5"E
Date	1.IV.2015	22.VI.2020	26.VI.2020
Time	12:30	9:00	13:50

Temperature (°C)	26.5	27.1	20.8
pH	6.57	6.65	5.70
Conductivity (µS/cm)	216	200	62
Dissolved oxygen (mg/l)	11.99	7.53	8.99
Dissolved oxygen (%)	151	87	103
Turbidity (NTU)	2.00	3.45	1.92

Tab. 2: List of water beetles collected at “Doline Pilote” and “DT-73” in 2020. The number of specimens comprises adults as well as larvae.

Families	Species	Sampling stations	
		“Doline Pilote” 22.VI.2020	“DP-73” 26.VI.2020
		Number of specimens	
Gyrinidae	<i>Dineutus australis</i> (FABRICIUS, 1775)	1	-
Dytiscidae	<i>Hydaticus quadrivittatus</i> BLANCHARD, 1843	1	-
	<i>Limbodessus compactus</i> (CLARK, 1862)	-	6
	<i>Megaporus feryi</i> WEWALKA et al., 2010	20	31
Haliplidae	<i>Phalilus oberthuri</i> (GUIGNOT, 1935)	1	4
Hydrophilidae	<i>Berosus distigma</i> FAUVEL, 1883	9	-
	<i>Limnoxenus zealandicus</i> (BROUN, 1880)	4	-
Scirtidae	? <i>Contacyphon</i> sp.	2	92

VARIABILITY: The elytral maculation does not always have connecting dark marks between the primary puncture rows (Fig. 1).

SECONDARY SEXUAL DIMORPHISM: At first sight the female specimen collected in 2015 appeared to be somewhat different from *Phalilus oberthuri* based on the descriptions of VONDEL (1995) and HENDRICH & VONDEL (2010), mainly because of the lack of a sharp ridge on the last sternite. To be sure about the identity, all adult specimens of *P. oberthuri* available to the first author (2 ♂♂, 5 ♀♀) were re-examined and compared with the newly discovered female specimen. While both males have a sharp ridge on the last sternite, the last sternite of the females is only weakly elevated (roof-like) or provided with a trace of a weak ridge (Figs. 5–10). This kind of sexual difference had so far been overlooked.

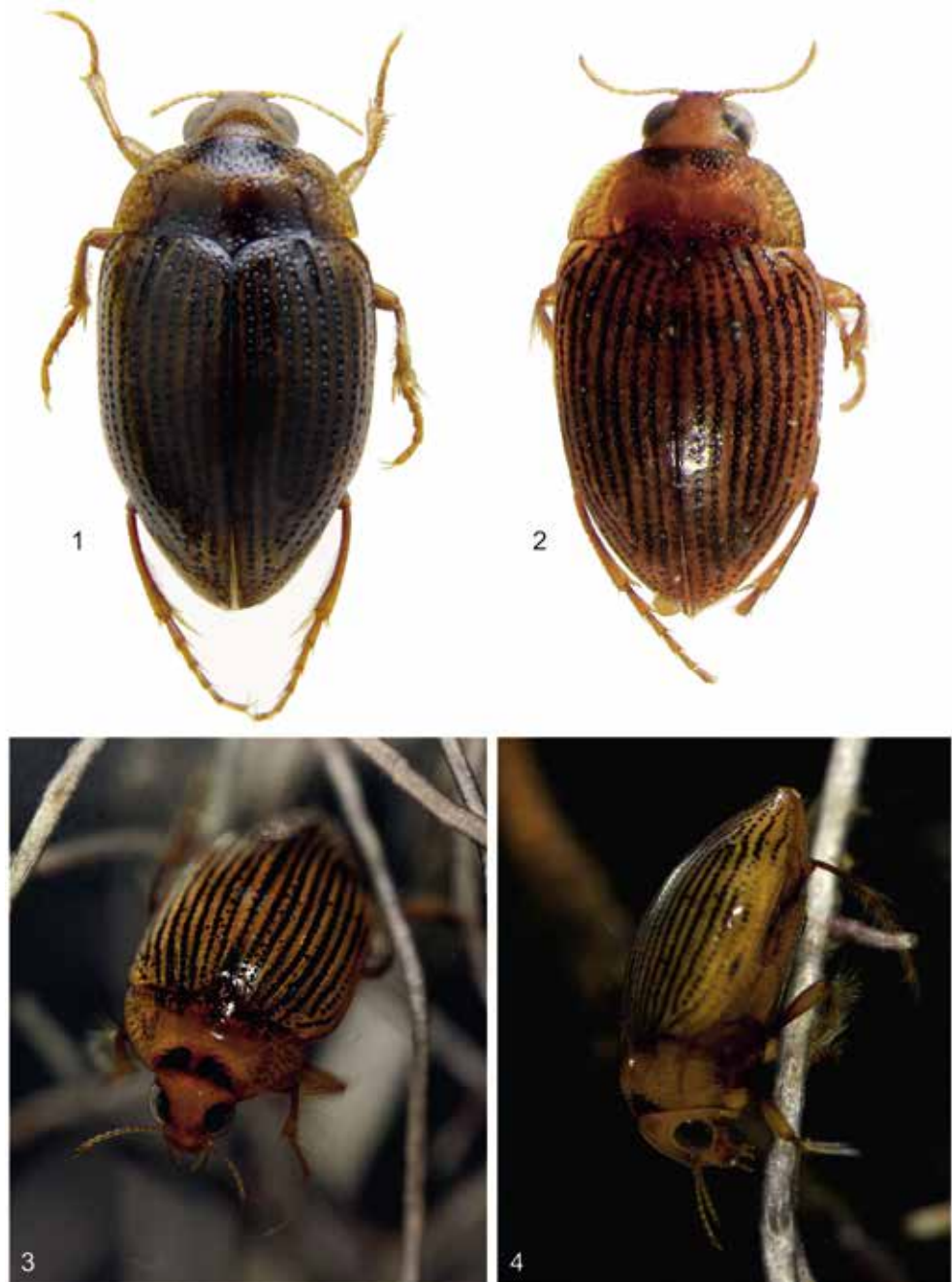
DISTRIBUTION: New Caledonia (Figs. 11, 20): Southern part of the South Province; Australia (Fig. 19): New South Wales, Queensland, Northern Territory.

Apart from the four Australian specimens with precise label data listed in HENDRICH & VONDEL (2010), three additional specimens, deposited in the SAM, were reported by C.H.S. Watts in the online Atlas of Living Australia:

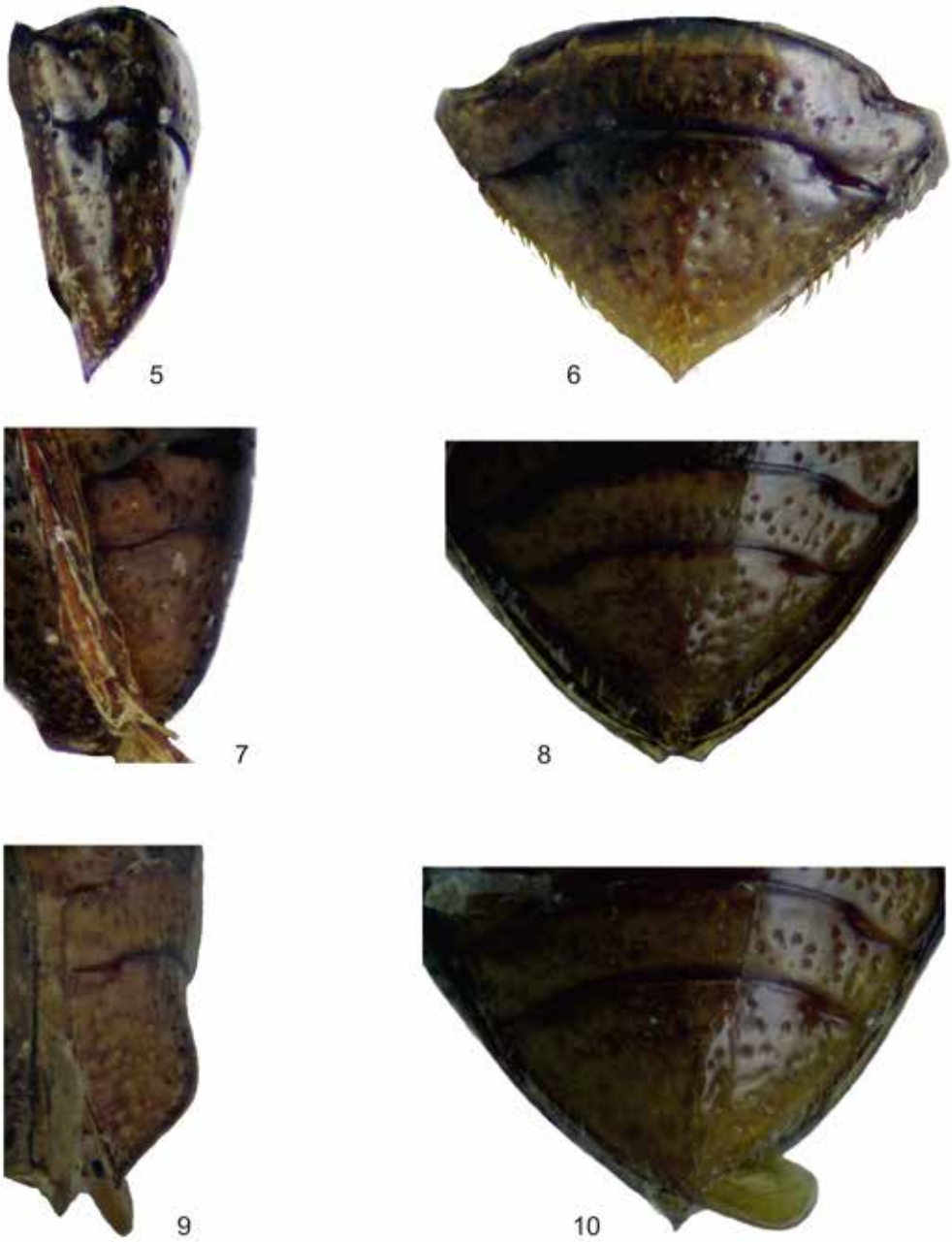
Queensland: 1 ex., Cassowary Coast, Cardwell, 146°1'E 18°21'S, 7.II.1997.

Northern Territory: 1 ex., West Arnhem, Jabiru, 133°10'E 12°40'12"S, 19.III.1998; 1 ex., Kakadu National Park, Barramundie Creek, 132°25'E 13°4'S, 21.III.1998.

For other detailed Australian locality data, see VONDEL (2021: Tab. 2).



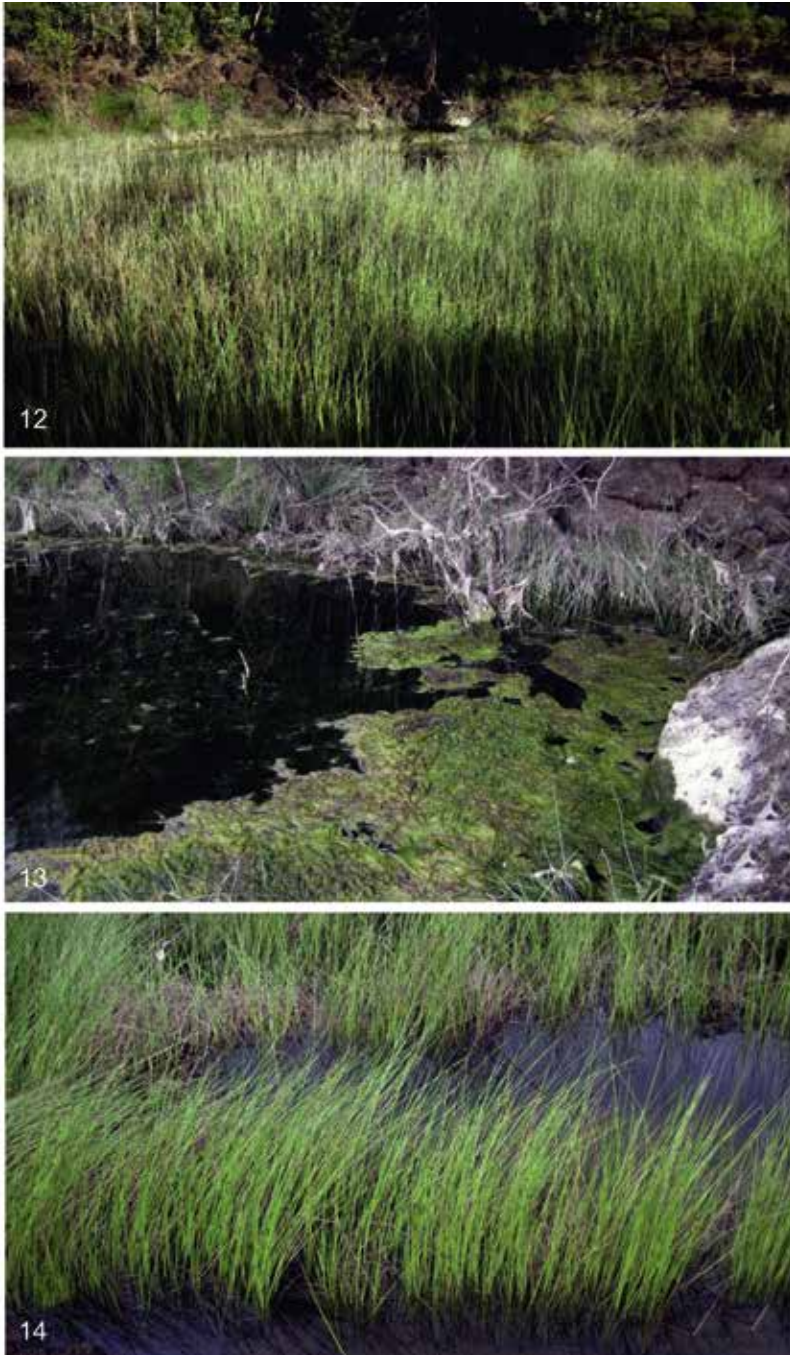
Figs. 1–4: Habitus of three specimens of *Phalilus oberthuri* from New Caledonia; 1) female from “DOL-11” (photograph by B.J. van Vondel), 2) male from “Doline Pilote” (photograph by J.-F. Parpet), specimen lost, 3–4) male from “DT-73” (photographs by N. Charpin).



Figs. 5–10: *Phalilus oberthuri*; last sternite in ventral and lateral view; 5–6) female from “DOL-11”, 7–8) female from Anse Vata, 9–10) male from Anse Vata.



Fig. 11: Satellite map showing position of dolines in which *Phalilus oberthuri* was collected.



Figs. 12–14: Doline “DOL-11” (photographs by C. Pöllabauer).



Figs. 15–16: “Doline Pilote” (photographs by H. Touron-Poncet (15) and by N. Mary (16)).

Discussion

In total, only 22 specimens (21 adults and one larva) of *Phalilus oberthuri* are known so far. Eight of these specimens originate from Australia, 12 from New Caledonia, and two historical specimens listed in VONDEL (1995) have unclear or no label data.

The seven specimens (six adults and one larva) recently collected in New Caledonia are treated in this paper; only one of these specimens has previously been published in a project report (BARGIER et al. 2018).

The rediscovery of *P. oberthuri* in New Caledonia after so many years is most remarkable. The “Doline Pilote” was sampled in the years 1999–2004 (PÖLLABAUER 2003, BARGIER & PÖLLABAUER 2004), but *P. oberthuri* could not be found. The use of the doline by the mining company was ended in 2002 – surprisingly, 14 years later (2016), *P. oberthuri* has been discovered there.



Figs. 17–18: “Doline DT-73” (photographs by N. Mary).



Figs. 19–20: Distribution of *Phalilus oberthuri*; 19) total distribution, 20) distribution in New Caledonia (enlarged).

The localities “DOL-11” and “Doline Pilote” are close to the sewage and wastewater installation of a nearby mining site and are highly endangered.

It is not clear, whether *P. oberthuri* is an autochthonous element, living in New Caledonia for a long time, or whether its occurrence is based on one or more recent introductions (e.g., by birds) from Australia. Thorough molecular studies would certainly cast some light on the actual distribution of this truly enigmatic species.

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