A new species of *Xylophion* Gauld, 1979 (Insecta, Hymenoptera, Ichneumonidae) from Vanuatu

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KEY WORDS
Insecta,
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new species.

ABSTRACT
Xylophion sevrapek Villemant n. sp. (Insecta, Hymenoptera, Ichneumonidae) is described from Espiritu Santo, Vanuatu and compared to the two other described species of the genus, *X. xylus* (Gauld, 1977) and *X. ketus* (Gauld, 1977).

MOTS CLÉS
Insecta,
Hymenoptera,
Ichneumonidae,
Ophioninae,
Vanuatu,
espèce nouvelle.

RÉSUMÉ
Une nouvelle espèce de Xylophion *Gauld, 1979 (Insecta, Hymenoptera, Ichneumonidae) originaire du Vanuatu.*
Une nouvelle espèce, *Xylophion sevrapek* Villemant n. sp. (Insecta, Hymenoptera, Ichneumonidae, Ophioninae), est décrite de l'île d'Espiritu Santo au Vanuatu et comparée aux deux autres espèces décrites du genre : *X. xylus* (Gauld, 1977) et *X. ketus* (Gauld, 1977).

INTRODUCTION

The genus *Xylophion* was described by Gauld (1979) who isolated inside the *Ophion* genus-group two Australian species he previously described in *Ophion* Fabricius, 1798 (Gauld 1977). Until now only three *Xylophion* species have been recognised: *X. xylus* (Gauld, 1977), *X. ketus* (Gauld, 1977) and another undescribed species in the Natural History Museum, London (BNHM) collections (Gauld 1984). They all occur in southeastern Australia; *X. xylus* however is more widespread throughout Australia and has also been found in the New Guinea highlands (Gauld 1984). The new species we describe here was collected during the SANTO 2006 expedition, in the northwest of Espiritu Santo Island, Vanuatu (Villemant 2011). For a narrative and background of the expedition, see Bouchet *et al.* (2011a), and for a review of the geography and natural history of Santo, see Bouchet *et al.* (2011b).

MATERIAL AND METHODS

Specimens used in this study are preserved in the Natural History Museum, London (BMNH) and Muséum national d'Histoire naturelle, Paris (MNHN).

A series of traps designed to capture Hymenoptera was placed by the senior author between 10 and 30 November 2006 in the forest area near the Penaoru village (northwest of Santo), where the base camp of the theme "Forests, Mountains, Rivers" of the SANTO 2006 expedition was installed (Villemant 2011). 28 Malaise traps were set out, on the ground or in the canopy, at predetermined altitudes (100, 300, 600, 900 and 1200 m a.s.l.) following the IBISCA (Investigating the Biodiversity of Soil and Canopy Arthropods) protocol (Corbara 2011). Sweep netting and yellow pan trapping were also deployed to collect Hymenoptera on the undergrowth around the IBISCA sampling plots.

The four specimens of the new *Xylophion* species were collected at the highest sampling sites (900 and 1200 m) in ground Malaise traps placed in montane Kauri-Tamanu (*Agathis, Calophyllum*) forest (Munzinger *et al.* 2011). They are all deposited in the MNHN.

Santo's *Xylophion* specimens were compared to representatives of the two described species of the genus:
– *Xylophion xylus* (Gauld, 1977): Camberra ACT, 5.III.1958, EF Riek, O. Xylus det. I. D. Gauld, 1977; ♂ (BMNH), Tasmania: GT Pine Tier, 13 km N.N.W. Bronte Pk, I-II.1983. I. Gauld, ♀ paratype (BMNH);
– *Xylophion ketus* (Gauld, 1977): Tasmania, Collins Vale, Fairy Glen, I-II.1983, 300 m, Williams & Gauld, ♀♂ (BMNH).

Measurements of the body, forewing and ovipositor lengths of the female paratypes are given in brackets after that of the holotype. Morphological terminology follows Gauld (1991) though Fitton *et al.* (1988) was consulted for microsculpture descriptions.

Several morphological ratios of head and wing used in the description refer to Gauld (1977) and Gauld & Mitchell (1981). Wing indices are as follow:
– WA1 (alar index of forewing): length of *1m-cu* between *2m-cu* and bulla/length of *3rs-m*;
– WB1 (brachial index of forewing): shortest distance between base of *1m-cu* and bulla/shortest distance between *Cu1* and 1*A* adjacent to *cu-a*;
– WC1 (cubital index of forewing): length of *CU1* between *1m-cu* and *Cu1a*/length of *Cu1b*;
– WSD1 (second discoidal index of forewing): length of *Cu1a* between *Cu1b* and *2m-cu*/length of *Cu1* between *Rs*&*M* and *1m-cu*;
– WIC1 (intercubital index of forewing): length of *3rs-m*/length of *M* between *3rs-m* and *2m-cu*;
– WN2 (nervellar index of hind wing): length of *Cu1* between *cu-a* and *M*/length of *cu-a*.

A digital camera (Canon Eos 50D) was used for the preparation of images. Several partially focused images were combined using CombineZM software and edited using Adobe Photoshop Elements® 6.0. SEM images were taken by using a fieldemission scanning electron microscope (Tescan VEGA II LSU).

In order to obtain DNA barcode sequences of the new species, we removed the dried right middle leg of the holotype (MNHN EY6344) and of two paratypes (MNHN EY2039 and EY6343). Total DNA was extracted using QIAmp DNA Micro Kit (Qiagen) according to the manufacturer's specifications. Sequences represent a 648-bp fragment of the

mitochondrial COI gene (the COI 5' region). This sequence was amplified using the following primer pair: LEP-F1, 5'-TTCAACCAATCATAAAGATAT-3'; and LEP-R1, 5'-TAAACTTCTGGATGTCC AAAAA-3' (Hebert *et al.* 2004).

Sequences were edited and aligned using CodonCode Aligner (3.7.1.1, CodonCode Corporation) and the original chromatograms are available on the BoLD web site (http://www.barcodinglife.com/) in a project file entitled HYSAN/Hymenoptera of Santo, ICHSA/Ichneumonidae of Santo.

SYSTEMATICS

Order HYMENOPTERA Linnaeus, 1758
Family ICHNEUMONIDAE Latreille, 1802
Subfamily OPHIONINAE Shuckard, 1840

Genus *Xylophion* Gauld, 1979

Xylophion may be distinguished from *Ophion* by the combination of a reduced fore tibial spur flange, forewing with broadened vein *Rs+2r* and short vein *3rs-m*. A particularly striking autapomorphy of the genus is the form of the male tarsal claw (Fig. 2): instead of having a sinuous row of pectinal teeth (as is normal for ophionines), *Xylophion* males have a marked discontinuity in the centre of the row between the teeth on the apical and basal parts of the claw (Gauld 1984).

Xylophion sevrapek Villemant n. sp.

TYPE MATERIAL. — **Vanuatu**. SANTO 2006, île de Santo, Penaoru 1200 m, 14°58'2.35"S, 166°40'43.4"E, 18-30.XI.2006, piège Malaise, montane forest, rec. C. Villemant MG12A2, ♀ holotype (MNHN EY6344).
Paratypes: same data as holotype, ♀ (MNHN EY6342). — SANTO 2006, Vanuatu, île de Santo, Penaoru 900 m, 14°58'0.17"S, 166°39'21.69"E, 18-30.IX.2006, piège Malaise, montane forest, rec. C. Villemant MG09A2, ♀ (MNHN EY2039), ♂ (MNHN EY6343).

ETYMOLOGY. — The specific epithet is a noun in apposition and refers to "Sevrapek City" the name given by the Penaoru villagers to the base camp of the "Forests, Mountains, Rivers" theme of the SANTO 2006 expedition, from the eponymous river (Tzérikiantz 2008).

DIAGNOSIS. — *Xylophion sevrapek* Villemant n. sp. is a brownish red species easily distinguished from the other described *Xylophion* species by its dorsally angled occipital carina (Fig. 1C) with the ventral extremities becoming obsolescent far from the hypostomal carina (Fig. 1D). *Xylophion xylus* is a smaller (forewing: 6-11 mm) yellow orange species with 49-59 flagellomeres while *X. ketus* is larger (forewing: 10-13 mm), more reddish orange, and has very long antennae with 70-72 flagellomeres (Gauld 1977). Male tarsal claws of *X. sevrapek* Villemant n. sp. have a shape similar to that of *X. xylus*, while in *X. ketus* the inner and outer rows of teeth of the claw extend laterally, so that there is a central overlap between the two parallel ends of the rows (Gauld 1984). The third *Xylophion* species recognised by Gauld (1984) is a male from Tasmania (*Xylophion* sp. BNHM) considered by this author as the sister-species of *X. xylus*; in this species there is only a central gap in the pectination of male claws.

DESCRIPTION
Female (Fig. 1A)
Body length 11.4 mm (11.1, 13.3), forewing 9.2 mm (9.6, 11.4), ovipositor 1.1 mm (1.0, 1.2).

Head. Transverse, distinctly constricted behind eyes, with occipital width about 2× diameter of median ocellus (Fig. 1B); ocelli large, close to eyes, posterior ocelli separated from each other by 0.4× their own maximum diameter and from nearest eye by 0.1× this diameter; occipital carina angled dorsally (Fig. 1C), its ventral extremities becoming obsolescent far from hypostomal carina (Fig. 1D); gena short, weakly rounded posteriorly, maximum breath of eye in profile about 3× breath of gena in same line; frons and vertex impunctate; face slightly larger than high, convex medially, shining and sparsely hairy, moderately and shallowly punctate centrally; clypeus about 2× as broad as high, moderately convex, its apical margin impressed and truncate; malar space about 0.5× basal width of mandible; mandible of moderate length, weakly tapered apically, with two sub-equal teeth. Antenna very long and slender with 54 (54, 56) flagellomeres. First flagellomere about 6×, second 4×, third 3× and twentieth 2× as long as wide.

Mesosoma. Pronotum alutaceous; mesopleuron polished with sparse minute punctation; mesoscutum in profile abruptly rounded, with anterior margin

Fig. 1. — *Xylophion sevrapek* Villemant n. sp. paratype ♀ MNHN EY6344: **A**, habitus; **B**, head in front view; **C**, head in dorsal view; **D**, dorso-lateral view of head showing basal interruption of occipital carina; **E**, paratype ♂ MNHN EY6343, habitus. Scale bars: A, E, 2 mm; B-D, 0.2 mm.

slightly out-turned; notauli absent; mesoscutum shining and covered with rather dense short hair, centrally with minute punctures separated by about 2-3× their diameter; scutellum subtriangular, moderately convex with sparse minute punctures and rather long hair; propodeum in profile abruptly declivous, with anterior carina more or less complete, lateral carinae of area superomedia partly distinct centrally. Fore tibial spur with a vestigial membranous flange at base behind macrotrichial comb; inner mid tibial spur 1.3× as long as outer one; hind trochantelli dorsally as long as broad; outer hind tarsal claw with 8-9 long stout pectinae; inner mid tibial spur 1.4× outer spur. Forewing with *cu-a* slightly basad to *Rs&M*; *Rs* slightly sinuous; second discal cell uniformely hirsute with hairs separated by about their length; first subdiscal cell with scattered hairs, sub-basal cell almost hair-

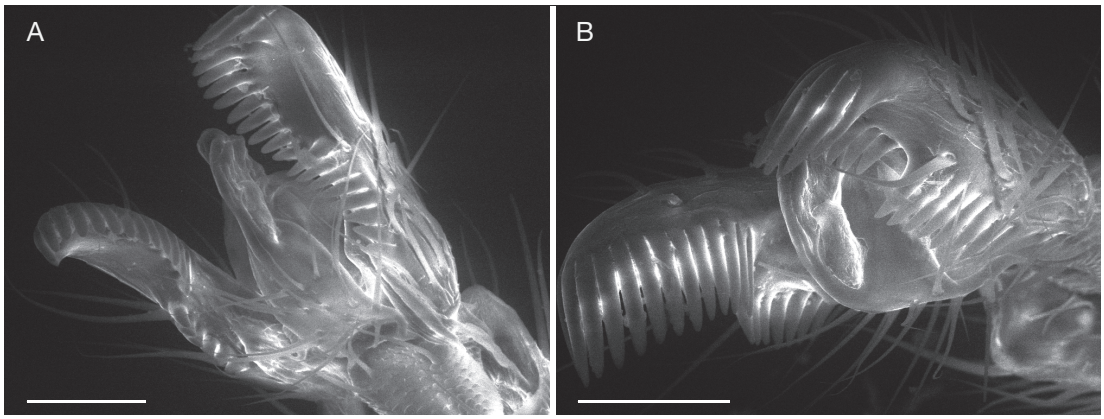

Fig. 2. — *Xylophion sevrapek* Villemant n. sp. paratype ♂ MNHN EY6343, right hind tarsal claw: **A**, ventral view; **B**, lateral view. Scale bars: 50 µm.

less. Alar indices (mean values, three specimens): WA1 = 3.8; WB1 = 2.8; WC1 = 0.6; WSD1 = 1.2; WIC1 = 0.3; WN2 = 1.3.

Metasoma elongate; segment 1 with posterior margin of sternite posterior to inter-spiracular line by 3.6× interspiracular distance; tergite 2 in profile 3.7× as long as deep, when viewed dorsally with a slight constriction at base. Tergite 1 smooth, following tergites covered with fine rather dense adpressed pilosity.

Colour. body entirely dark brownish-red with fine silver pubescence on mesosoma. Antenna, fore and mid tibia and tarsi slightly paler. Ocellar triangle black.

Male (Fig. 1E)

Body length 9.8 mm, forewing 8.6 mm.

Similar to female. Posterior ocelli separated from each other by 0.6× their own maximum diameter and from nearest eye by 0.2× this diameter. Antenna with 51 flagellomeres.

Tarsal claws with inner and outer marginal rows of teeth extended laterally without a central overlap between the two parallel ends of the rows. The distal portion of the claw is flattened and the pectinal inner row of teeth forms a "fence" around the distal end of the claw (Fig. 2A).

Alar indices: WA1 = 4.0; WB1 = 3.0; WC1 = 0.5; WD1 = 1.3; WIC1 = 0.3; WN2 = 1.4.

Barcode

Two barcode sequences have been obtained, from the holotype (MNHN EY6344: Bold no. ICHSA002-12) and the male paratype (MNHN EY6343: Bold no. ICHSA001-12).

The barcode of the holotype is as follows:
AATTTTATATTTTATTTTTGGAATAT
GATCAGGAATATTAGGATCATCACTAAG
TATTTTAATTCGAATAGAATTAGGAAACC
CAGGATTTCTAATTAATAATGATCAAATT
TATAATTCTATTATTACCTCTCATGCTTT
TATTATAATTTTCTTTATAGTTATAC
CAATTATAATTGGAGGATTTGGAAACT
GAATAATTCCATTAATATTAGGAGCACCA
GATATAGCTTTCCCTCGCATAAATAACAT
AAGATTCTGACTTCTTCCCCCCTCAAT
TAATTTATTAATTATAAGTAATATAAT
TAATCAAGGTGTAGGAACTGGATGAA
CAGTATATCCTCCTCTTTCATTGAATT
TAAATCATGAAGGTATAGCATTAGATATAG
CAATTTTTTCTTTACATATAGCAGGAT
TATCTTCAATTATAGGAGCAATCAATTT
TATTACAACAATTATAAATATAAAAAATT
TAAACACAAATTTAGAAAAATTAACTT
TATTTAGATGATCAATTTTAATCACTA
CAATTTTATTACTATTAGCAGTCCCAGTAC
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GATCGTAATTTAAATACAACTTTTTTTGAC
CCTTGTGGAGGAGGGGATCCAATTTTATAT
CAACATTTATTT.

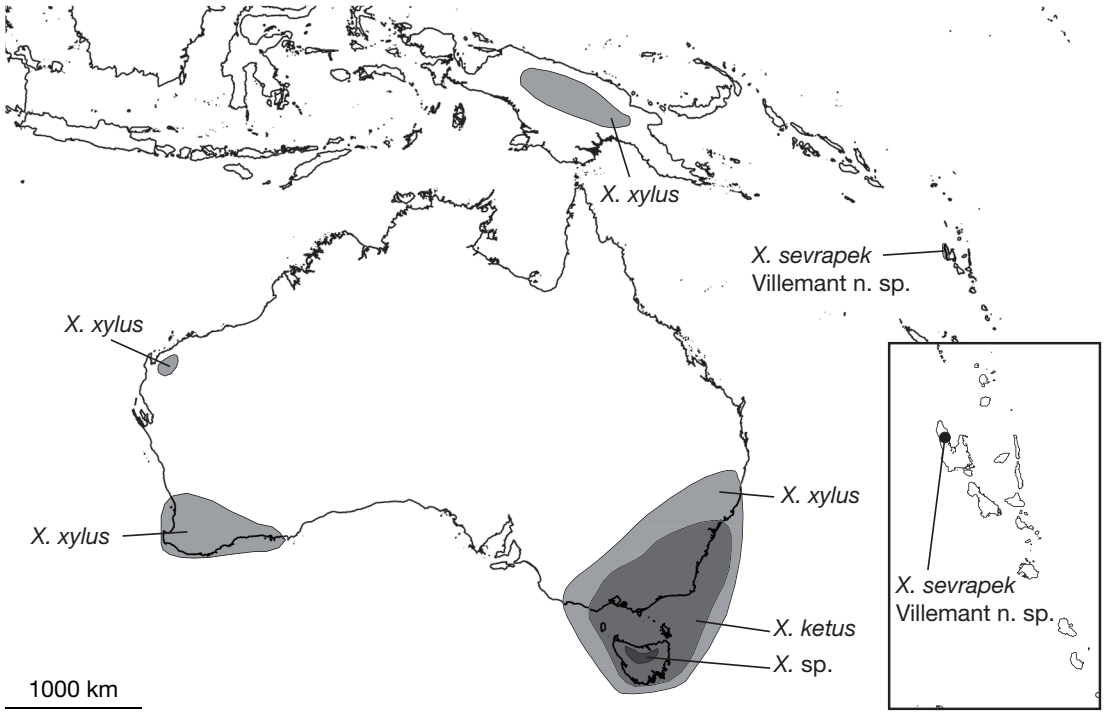

Fig. 3. — Collection area of *Xylophion sevrapek* Villemant n. sp. and approximative distribution of the three other known species of *Xylophion* Gauld, 1979 (modified from Gauld 1984).

DISCUSSION

To date, with *Xylophion sevrapek* Villemant n. sp. and the new Chrysididae Latreille, 1802 species described in this volume (Villemant *et al.* 2012), the SANTO 2006 expedition has already resulted in seven Hymenoptera species new to science, including two Pompilidae Latreille, 1805 (Wahis *et al.* 2009), two Halictidae Thomson, 1869 (Pauly & Villemant 2009) and one Dryinidae Haliday, 1833 (Olmi & Villemant 2009).

After *Eniscopilus* Stephens, 1835 and *Leptophion* Cameron, 1901, first reported from Vanuatu by Cheesman (1936), *Xylophion* is the third ophionine genus recorded from this archipelago. Restricted to the Australian tectonic plate, *Xylophion* occupies an important systematic position, as it appears to be annectent between the *Ophion* genus group and some genera in the *Enicospilus* genus group (Gauld 1984, 1985). Hosts of the genus are unknown though they are expected to be lepidopterous larvae as it is almost always the case for other genera of the subfamily.

The genus *Xylophion* is confined to the Australian plate, with a discontinuous distribution (Fig. 3). Three species are restricted to separate highland regions: *X. ketus* to the Australian Bassian region, *Xylophion* sp. to "alpine plateau" in Tasmania, and *X. sevrapek* Villemant n. sp. to montane forest of Santo, while *X. xylus* has a wider distribution in montane Papua-New Guinea as well as in Bassian and Eyrean Australia (Fig. 3). Other thorough investigations of the different Vanuatu islands as well as in neighbouring archipelagos would probably produce other representatives of this interesting genus.

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