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The Aculeata of French Polynesia. III. Sphecidae, with the record of three new species for the Society Islands (Hymenoptera)

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Abstract. – The sphecid fauna of French Polynesia, limited until now to *Sceliphron caementarium* (Drury), is increased by three species recently introduced in the Society Islands: *Sceliphron laetum* (Smith), *S. curvatum* (Smith) and *Chalybion bengalense* (Dahlbom). The presence of *S. curvatum* in French Polynesia considerably broadens the known distribution of this species which is native to Asia and introduced into Europe and both North and South America. *Chalybion bengalense* is also reported from New Caledonia for the first time, as well as *Sceliphron laetum* from Wallis and Futuna. The distribution, biology and potential impact of each species on the arachnofauna are discussed. An identification key to the Sphecidae of French Polynesia is provided.

Résumé. – Les Aculéates de Polynésie française. III. Les Sphecidae, avec le premier signalement de trois espèces pour les îles de la Société (Hymenoptera). La faune des Sphecidae de Polynésie française, limitée jusqu'à présent à *Sceliphron caementarium* (Drury), est ici augmentée de trois espèces récemment introduites dans les îles de la Société : *Sceliphron laetum* (Smith), *S. curvatum* (Smith) et *Chalybion bengalense* (Dahlbom). La présence de *S. curvatum* en Polynésie française agrandit considérablement la répartition connue de cette espèce originaire d'Asie et introduite en Europe comme aux Amériques. *Chalybion bengalense* est également cité de Nouvelle-Calédonie pour la première fois, de même que *Sceliphron laetum* de Wallis-et-Futuna. La distribution, la biologie, ainsi que l'impact potentiel de chaque espèce sur l'arachnofaune sont précisés. Une clé d'identification est proposée, permettant de distinguer l'ensemble des espèces présentes sur le territoire.

Keywords. – *Sceliphron*, *Chalybion*, identification key, French Polynesia, New Caledonia, Wallis and Futuna.

The sphecid fauna of French Polynesia has been sporadically reviewed for more than a century (CAMERON, 1886; WILLIAMS, 1932; PULAWSKI, 2013b) and here we add to the known fauna (*Sceliphron caementarium*) three introduced species that we recently collected. These new wasps, due to their habits of building nests on man-made structures, must have been introduced through international trade, like other recently recorded Aculeata species (RAMAGE *et al.*, 2015b). One of these three species, *Sceliphron curvatum* (Smith, 1870), seems to be restricted to urban areas for now.

Sceliphron laetum (Smith, 1856) was collected on Moorea, Huahine, Raiatea and Taha'a (Society Islands), *S. curvatum* on Tahiti and Bora Bora (Society Islands) and *Chalybion bengalense* (Dahlbom, 1845) on Moorea and Huahine. The latter is also reported for the first time from New Caledonia and *S. laetum* from Wallis and Futuna.

These sphecid wasps are all spiders predators and may have an impact on the arachnofauna of French Polynesia. The biology and potential impact of each species are discussed below.

Abbreviations. – CS, Symbiocode collection, Lyon (Sylvain Charlat); CTR, Thibault Ramage's personal collection; MNHN, Muséum national d'Histoire naturelle, Paris.

Chresonymy. – Under each taxa, the original combination and the synonymies and combinations used in the bibliography relative to French Polynesia are listed.

Family **Sphecidae** Latreille, 1802
 Subfamily **Sceliphrinae** Ashmead, 1899
 Tribe **Sceliphринi** Ashmead, 1899
 Genus **Sceliphron** Klug, 1801
Sceliphron caementarium (Drury, 1773)

Sphex caementarius Drury, 1773: 105.

Pelopoeus tahitensis Saussure, 1867: 27.

Sceliphron tahitensis (Saussure, 1867).

Sphex economicus Curtiss, 1938: 154.

Material examined. – FRENCH POLYNESIA: 1 ♀, Tahiti (MNHN); 1 ♀, Raiatea, Muséum Paris, coll. R. du Buysson 1900 (MNHN); 3 ♀, Tahiti, Muséum Paris, coll. J. de Gaulle 1919 (MNHN); 1 ♂, Tahiti: Punaauia, 1-7.VII.1959, *J. Rageau*, Muséum Paris, collection ORSTOM (MNHN); 1 ♀, Tahiti: Papeete, (Patutoa), VI.1959, *J. Rageau*, Muséum Paris, collection ORSTOM (MNHN); 1 ♀, Moorea, Pihaena, 2.VI.2007, *S. Charlat* (CS); 6 ♀, Nuku Hiva, Muséum Paris, îles Marquises, *P. Siméon Delmas*, 1924 (MNHN); 2 ♀, îles Marquises, Taiohaé, *P. Siméon Delmas*, 1928 (MNHN); 2 ♂, I. Rurutu, 11.X.1962, (MNHN); 1 ♀, Makatea, Vaitepaua, 19.IV.2007, *F. Jacq* (CTR); 1 ♀, Fakahina, Hokikakika, 17.II.2011, *F. Jacq* (CTR); 1 ♀, archipel des Gambier, île Mangaréva, Rikitea, *G. Seurat*, 1905 (MNHN). NEW CALEDONIA: 1 ♂, Nouméa, N^{elle} Calédonie, 15.II.1948 (MNHN). WALLIS AND FUTUNA: 1 ♀, I. F. O. Wallis Mata-utu, *J. Rageau*, 20.X.1958 (MNHN); 1 ♀, *idem*, 12.XI.58 (MNHN); 1 ♂, *idem*, 20.X.1958 (MNHN).

Diagnosis. – Tall species (about 2.5 cm), black and yellow with infuscated wings. Although its color pattern is variable throughout its wide distribution (VAN DER VECHT & VAN BREUGEL, 1968), the French Polynesian populations have the same color pattern, with complete yellow markings on the mesosoma, propodeum declivity more or less yellow, black petiole and a yellow posterior band on the first gastric tergite. *Sceliphron caementarium* can be separated from *S. laetum* by the color of the petiole (black for *S. caementarium*, yellow for *S. laetum*) (HARRIS, 1992) and from *S. curvatum* by the shape of the petiole (straight for *S. caementarium*, curved for *S. curvatum*).

Distribution. – North America (native range); Central America, Antilles, Peru, Europe, Madeira, Canary Islands, Iran, China, Japan, Australia, Fiji, Micronesia, New Zealand, New Caledonia, Wallis and Futuna Islands, Hawaiian Islands, Samoa, Cook Islands, French Polynesia (introduced).

Biology. – In its native range, *Sceliphron caementarium* is known to prey mostly upon spiders of the families Araneidae (*Acanthepeira* Marx, 1883, *Araneus* Clerck, 1757, *Araniella* Chamberlin & Ivie, 1942, *Argiope* Audouin, 1826, *Eustala* Simon, 1895, *Neoscona* Simon, 1864), Salticidae (*Platycryptus* Hill, 1979, *Phidippus* Koch, 1846) and Thomisidae (*Misumena* Latreille, 1804, *Misumenoides* Cambridge, 1900, *Misumenops* Cambridge, 1900, *Xysticus* Koch, 1835) with a few prey in the Tetragnathidae (*Meta* Koch, 1836), Oxyopidae (*Oxyopes* Latreille, 1804) and Lycosidae (*Schizocosa* Chamberlin, 1904) (RAU, 1935).

In French Polynesia, the preys of *S. caementarium* have been documented to be *Frigga crocuta* (Taczanowski, 1878), *Plexippus paykulli* (Audouin, 1826) (Salticidae) and *Neoscona theisi* (Walckenaer, 1842) (Araneidae) (BERLAND, 1945). In its native range in the USA, Araneidae are the most frequent preys, whereas in French Polynesia Salticidae were preyed upon more numerousously than Araneidae (RAU, 1935).

The nests of *Sceliphron caementarium* are mostly composed of two to six cells, each containing an average of nine spiders (RAU & RAU, 1916).

Sceliphron laetum (Smith, 1856)

Pelopaeus laetus Smith, 1856: 229.

Material examined. – FRENCH POLYNESIA: 1 ♀, Moorea, Vaiare, 18.IV.2007, *S. Charlat* (CS); 1 ♀, Huahine, vallée de Parea, 3.VII.2007, *S. Charlat* (CS); 2 ♀, Taha'a, vallée de Vaipihae, 30 m,

16°35'20.29"S - 151°31'47.16"W, 29.IX.2012, *Th. Ramage* (CTR); 1 ♀, Taha'a, vallée de Patio, 65 m, 16°36'7.92"S - 151°30'8.21"W, 29.IX.2012, *Th. Ramage* (CTR); 1 ♀, Raiatea, Tepua, 20 m, 16°44'57.26"S - 151°26'31.56"W, 14.VII.2013, *F. Jacq* (CTR). WALLIS AND FUTUNA: 2 ♀, Wallis-et-Futuna, III.1994, *Parage rec.* (MNHN).

Diagnosis. – Tall species (about 3 cm), black and yellow with somewhat yellow wings. *Sceliphron laetum* can be easily confused with *S. caementarium*, but in French Polynesia *S. laetum* has a yellow petiole, whereas *S. caementarium* has a black petiole. *S. laetum* can be distinguished from *S. curvatum* by having a straight rather than curved petiole (fig. 1).

Distribution. – Australia, Papua New Guinea, Indonesia (native range); Guam, Vanuatu, New Zealand, Wallis and Futuna, French Polynesia (introduced).

Biology. – In Papua New Guinea, *Sceliphron laetum* preys almost exclusively upon spiders of the family Araneidae (genera *Argiope*, *Cyclosa*, *Cyrtarachne*, *Gasteracantha*, *Neoscona*, *Polys*, *Cyrtophora* and *Phonognatha*) but one species each of Salticidae, Oxyopidae and Thomisidae have also been found in nests (ELGAR & JEBB, 1999). The nest cells of *S. laetum* contain an average of five spiders (ELGAR & JEBB, 1999).

Comments. – *S. laetum* is new to the entomofauna of Wallis and Futuna and French Polynesia and seems to be currently restricted to the Society Islands. *S. laetum* has probably been introduced to French Polynesia and Wallis and Futuna through international trade from other Pacific islands.

No nests of *S. laetum* have yet been studied from French Polynesia but the preyed spiders are probably of the families Araneidae and Salticidae, similar to *S. caementarium*. Seven species of Araneidae (*s. str.*) and 23 species of Salticidae are known from French Polynesia (DIERKENS & CHARLAT, 2011; PLATNICK, 2014).

Sceliphron curvatum (Smith, 1870)

Pelopaeus curvatus Smith, 1870: 187.

Material examined. – FRENCH POLYNESIA: 1 ♀, Tahiti, Pirae, 25 m, 17°32'2.86"S - 149°32'34.46"W, 27.XII.2007, *F. Jacq* (CTR); 1 ♀, Tahiti, Arue, 200 m, 17°32'8.26"S - 149°31'6.74"W, V.2012, *F. Jacq* (CTR); 1 ♀, Bora Bora, Faanui, 50 m, 16°28'06.89"S - 151°45'10.53"W, 6.XI.2013, *F. Jacq* (CTR); 1 ♀, Tahiti, Papeete, Sainte-Amélie, 60 m, 17°33'01.80"S - 149°33'55.97"W, 19.I.2014, *F. Jacq* (CTR); 1 ♀, *idem*, 2.III.2014, *F. Jacq* (CTR); 1 ♂, *idem*, 19.III.2014, *F. Jacq* (CTR); 1 ♂, *idem*, 23.III.2014, *F. Jacq* (CTR); 1 ♀, Tahiti, Punaauia, Vaiopu, 200 m, 17°37'46.5"S - 149°35'44.6"W, IV.2014, *C. Peyterman* (CTR).

Diagnosis. – Medium-sized species (1.5-2 cm), smaller than the two other *Sceliphron* species from French Polynesia. Black and yellow, legs reddish except the coxae and first half of femora being black, wings yellowish (fig. 3). *Sceliphron curvatum* can be confused with the two other *Sceliphron* species from French Polynesia but can be distinguished by its curved rather than straight petiole (HENSEN, 1987) (fig. 2).

Distribution. – Iraq, Afghanistan, Tajikistan, Pakistan, Uzbekistan, Kyrgyzstan, Kazakhstan, India, Nepal (native range); Europe, South America, North America, French Polynesia (introduced).

Biology. – In Europe, *Sceliphron curvatum* is known to prey mostly upon spiders in the families Araneidae and Salticidae. Some Thomisidae, Philodromidae, Theridiidae, Sparassidae, Anyphaenidae and Oxyopidae are also preyed upon (RAHOLA, 2005). A cricket, *Arachnocephalus vestitus* Costa, 1855 (Orthoptera, Mogoplistidae), in the south of France, is the only Orthopteran recorded to be preyed upon by a *Sceliphron* (RAHOLA, 2007).

Five to 20 spiders are placed in each *S. curvatum* nest cell, with a mean of 13 spiders: 7 spiders per cell for future males, 16 spiders per cell for future females (RAHOLA, 2005).

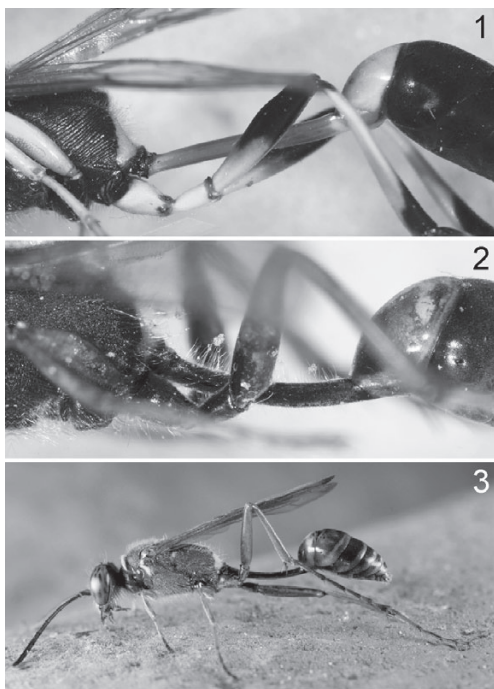


Fig. 1-3. - *Sceliphron* spp. – 1, *Sceliphron laetum* (Smith), petiole, side view. – 2, *Sceliphron curvatum* (Smith), petiole, side view. – 3, *Sceliphron curvatum* (♂), side view. (Photos 1-2, Th. Ramage; photo 3, F. Jacq).

Comments. – *Sceliphron curvatum* has been recorded in Europe since 1979 and in France since 1998 (BITSCH & BARBIER, 2006; ČETKOVIĆ *et al.*, 2011). Recently it has also been recorded from the South American countries of Chile and Argentina (PULAWSKI, 2013b) and the North American countries of Canada and the USA (EATON, 2014). *S. curvatum* is a new record for French Polynesia and the Pacific.

The origin of the population of *Sceliphron curvatum* introduced to French Polynesia is probably from Europe, most likely from France, through international trade. The introduction of *S. curvatum* to French Polynesia may have occurred after 1998 when this species was introduced to France because trade between French Polynesia and this species' native range or its other exotic locations are practically non-existent. In 2007, *S. curvatum* was well established on Tahiti and in 2013 it was also found on Bora Bora of the Society Islands. Its rapid spread in this archipelago suggests a pre-adaptation or rapid adaptation to tropical conditions. Its progression in the Society Islands appears to be faster than that

of other recently introduced Aculeata such as *Anoplius toluca* (Cameron, 1893) (Pompilidae) or *Micromeriella marginella modesta* (Smith, 1855) (Scoliidae) (RAMAGE *et al.*, 2015a, b).

No nest of *S. curvatum* has yet been studied from French Polynesia but its spider preys are probably of the families Araneidae and Salticidae, as these are its preys in Europe and are also the preys of *S. caementarium* and *S. laetum*. It would be interesting to study its nests to see if it preys upon the Mogoplistidae (Orthoptera) species of French Polynesia, *Ornebius novarae* (Saussure, 1877).

Genus *Chalybion* Dahlbom, 1843

Chalybion bengalense (Dahlbom, 1845)

Pelopoëus bengalensis Dahlbom, 1845: 433.

Material examined. – FRENCH POLYNESIA : 1 ♀, Moorea, Motu Temae, XI.2006, *S. Charlat* (CS); 1 ♂, Huahine, pointe Tiva, 2 m, yellow pan trap, 16°49'15.11"S - 150°59'0.61"W, 21.IX.2012, Th. Ramage (CTR); NEW CALEDONIA : 1 ♂, Muséum Paris, Nouvelle-Calédonie, coll. O. Sichel 1867, N. Caléd 63 (MNHN).

Diagnosis. – Medium-sized species (1.0-1.8 cm), metallic blue with infuscated wings. This species can't be confused with any other species of Sphecidae in French Polynesia due to its colour. It could be confused with another recently introduced metallic blue Aculeata species (*Chrysis* sp., RAMAGE & KIMSEY, 2015) but the latter is stouter and does not have the long and tubular petiole between the mesosoma and the metasoma.

Distribution. – Oriental region, New Guinea, Australia (native range); Africa, Malagasy region, Pacific Islands, New Caledonia, French Polynesia (introduced).

Biology. – Little is known about the biology of *Chalybion bengalense*, but it may resemble the well known biology of *C. californicum* (Saussure, 1867). According to LANDES *et al.* (1987), the temporal variation of both prey species and numbers taken by *C. californicum* suggests that the wasps capture spiders not only according to size and habitat but also to relative and seasonal abundances. Mostly Araneidae and Theridiidae were chosen as preys in the USA, but spiders of the families Clubionidae, Mimetidae, Oxyopidae, Pisauridae, Salticidae, Tetragnathidae and Thomisidae were also preyed upon in smaller numbers.

C. californicum is an inquiline of other Sphecidae genera, with females not building their own nests but instead re-using nest cells of other mud dauber species (LANDES *et al.*, 1987)

Comments. – *Chalybion bengalense* is new to New Caledonia and French Polynesia (HENSEN, 1988; JENNINGS *et al.*, 2013; PULAWSKI, 2013a).

No nests of *C. bengalense* have yet been studied from French Polynesia but the preyed spiders are probably of Araneidae and Theridiidae families, as in its native range.

IDENTIFICATION KEY TO THE SPHECIDAE OF FRENCH POLYNESIA

1. Metallic blue species *Chalybion bengalense* (Dahlbom)
– Black and yellow species 2 (Genus *Sceliphron*)
2. Petiole curved (fig. 2) *Sceliphron curvatum* (Smith)
– Petiole straight (fig. 1) 3
3. Petiole black *Sceliphron caementarium* (Drury)
– Petiole yellow *Sceliphron laetum* (Smith)

For all of these species the antennae of females have 12 segments, whereas males have 13 segments.

CONCLUSION

Although *Sceliphron caementarium* has been present in French Polynesia since at least the 1860s and is currently present in all five archipelagoes, the three newly introduced sphecid species *Sceliphron laetum*, *S. curvatum* and *Chalybion bengalense* are recent introductions and seem to be restricted to the Society Islands.

The newly recorded pompilid species *Anoplius toluca* (Cameron, 1893) (RAMAGE *et al.*, 2015a), the four sphecid species and seven species of Crabronidae (six *Pison* and one *Trypoxylon*) (MENKE, 1979) all prey upon spiders. The spider fauna of French Polynesia, especially those of Araneidae, Salticidae, Thomisidae and Theridiidae families, seems to be heavily hunted by aculeate wasps, and it would be interesting to study the possible impact of these Hymenoptera on the diversity and distribution of spiders along altitudinal transects.

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