

PROCEEDINGS
OF THE
CALIFORNIA ACADEMY OF SCIENCES
FOURTH SERIES

VOL. II, Pt. II, No. 15, pp. 299-308

JUNE 16, 1919

EXPEDITION OF THE CALIFORNIA ACADEMY OF
SCIENCES TO THE GALAPAGOS ISLANDS,
1905-1906

XV

THE ANTS OF COCOS ISLAND¹

BY

WILLIAM MORTON WHEELER

Cocos Island, owing to its isolated position some 300 miles off the west coast of Costa Rica, is of unusual interest in connection with the origin of the fauna and flora of the Galapagos Archipelago, a problem which, in turn, according to Scharff², "presents the key to the solution of the most complex and intricate questions concerning the American fauna with which we are confronted." While in charge of the Hopkins-Stanford Galapagos Expedition, Snodgrass and Heller³ explored the island June 30 to July 3, 1899, and gave such an interesting and succinct account of its topography and biota that it seems

¹ Contribution from the Entomological Laboratory of the Bussey Institution, Harvard University, No. 138.

² Scharff, R. F. *Distribution and Origin of Life in America*. New York, Macmillan Co., 1912.

³ Snodgrass, R. E., and Heller, E. *The Birds of Clipperton and Cocos Islands. Papers from the Hopkins-Stanford Galapagos Expedition. 1898-1899, XI.* Proc. Wash. Acad. Sci. 4, 1902, pp. 501-520.

June 16, 1919

appropriate to quote most of their remarks by way of introduction to the present paper :

"Cocos Island lies in latitude $5^{\circ} 33'$ north and longitude $87^{\circ} 2'$ west. It is about four miles long in its longest diameter, which is east and west, and has a circumference of about thirteen miles. Its highest part, on its western side, is visible from a distance of sixty miles. The island is mountainous, presenting on all sides perpendicular cliffs, and above these steep slopes and canyons. The northern side, however, has several indentations. * * * Streams of fresh water flow down on all sides of the island, in most places pouring over the cliffs into the ocean. * * *

"The rock composing Cocos Island is volcanic, but is not made up of layers of lava as is the case with the Galapagos, Rivillagigido and Guadalupe Islands, but, at least about Chatham Bay, forms one solid mass as does the volcanic rock on Clipperton Island. The surface is greatly eroded, there being everywhere, as before stated, numerous deep canyons, and the rock is almost everywhere covered by a rich shallow soil.

"The climate resembles that of Clipperton, being extremely humid. The island lies in the warm counter equatorial current which flows past Cocos in an easterly direction towards Panama Bay, where its waters are deflected to the north and south. With the currents flowing as they now do, it is apparently impossible for plants or animals to be carried by them from the mainland to Cocos Island.

"The vegetation is extremely rich, though the number of plant species is few. Everywhere a dense covering of tall trees and smaller undergrowth clothes the irregular mountain slopes and ridges. In this respect Cocos strongly contrasts with any other island of the eastern tropical Pacific. Guadalupe Island, the Rivillagigido and Galapagos archipelagos are for the most part dry and barren, even the wettest parts of the Galapagos being far less humid and less thickly covered with vegetation than is Cocos.

"Animal life on Cocos Island is very scarce. Besides the birds there is present a rat, *Mus norvegicus*, brought hither by vessels that have touched here for wood and water. A lizard, *Anolis townsendi*, is rather numerous. With the exception of a

snake reported by Townsend this lizard and the birds are the only native land vertebrates known. Hogs have been introduced and now run wild on the island. Insects are very scarce. One *Cicada* occurs but is rare. We obtained one nymph of it in July but saw no adults. A fly, *Leucomelina pica*, is somewhat plentiful. There is one ant, *Tetramorium auropunctatum*, that is extremely numerous, occurring in great numbers on the leaves of all the vegetation. It is minute but its bite is excessively annoying, causing an almost unendurable irritation of the skin. Its presence makes traveling on the island exceedingly disagreeable."

Forel in 1892⁴ published the first and up to the present time the only account of the ants of Cocos Island. Among the specimens collected for him by Mr. P. Biolley he recognized only four forms: *Tetramorium guineëse* Fabr., *Wasmannia auropunctata* Roger., *Prenolepis guatemalensis* var. *cocoënsis* Forel and *Camponotus biolleyi* Forel; the latter two being peculiar to the island.

Several months ago Dr. E. C. Van Dyke, at the request of Dr. F. X. Williams, sent me for study the Cocos Island ants which he collected during November, 1905, while a member of the California Academy Expedition to the Galapagos. The specimens comprise seven forms, four of which are identical with those recorded by Forel, but the three others, *Euponera* (*Trachymesopus*) *stigma* Fabr., *Odontomachus hæmatoda* L. subsp. *insularis* and a new *Camponotus* (*C. cocosensis*) constitute a significant addition to the ant-fauna of the island. With the exception of the tropicopolitan "tramp", *Tetramorium guineëse*, of Old World origin, none of the forms is known to occur in the Galapagos Islands and all are neotropical or have strongly neotropical affinities. *Camponotus biolleyi* and *cocosensis* are related to *C. lindigi* Mayr and *C. novogrenadensis* Mayr respectively of Central and South America. The *Wasmannia*, *Euponera* and *Odontomachus* are well known species abundant and widely distributed through the neotropical region, and the var. *cocoënsis* is merely a form of *Prenolepis vividula* Nyl., which is also widely distributed in the American tropics and occurs even in the hot-houses of North America and

⁴ Forel, A. Quatre Notices Myrmécologiques. II Fourmis de l'île de Coco, etc. Ann. Soc. Ent. Belg. 46, 1902, pp. 176-178.

Europe. Hence the only forms really endemic and characteristic of Cocos Island are the two species of *Camponotus*.

The ants, therefore show the same relation as the diurnal Lepidoptera to the Galapagos fauna of which Williams says⁵: "Only two species of butterflies were taken on Cocos Island, and neither of them occurs in the Galapagos." It is evident that the Cocos ants are decidedly tropical whereas those of the Galapagos are mainly such as belong to subtropical or temperate regions or at any rate to the cooler or subalpine regions in the New World tropics. Williams calls attention to this difference in the climates of the two island regions. It comes out strongly also in the Cocos plants which have been recently studied by Stewart.⁶ This author records 77 species of vascular plants from Cocos Island, 20 of which are ferns. There are only eight endemic species, one of which is a *Cecropia* (*C. pittieri*). Thus only 8.69 percent of the plants are endemic, whereas the percentage of endemism in the Galapagos is 40.9. There are, however, 27 species common to the two regions, although 11 of them are ferns. Botanists have repeatedly called attention to the great difference between the Cocos and Galapagos plants, but this would be expected as a result of the pronounced climatic differences. The data derived from a study of the ants are too meager to enable me either to accept or to reject Stewart's view that Cocos is a true oceanic island of more recent origin than the Galapagos and that it has received its biota as "flotsam and jetsam" from the Central American mainland.

Family FORMICIDÆ

Subfamily PONERINÆ

1. *Euponera* (*Trachymesopus*) *stigma* (Fabricius)

Formica stigma Fabricius, System. Piez. 1804, p. 400 ♀.

Ponera quadridentata Roger, Berl. Ent. Zeitschr. 4, 1860, p. 285 ♀.

⁵ Williams, F. X. The Butterflies and Hawk-Moths of the Galapagos Islands. Expedition of the California Academy of Sciences to the Galapagos Islands, 1905-1906, III. Proc. Cal. Acad. Sci. (4) 1, 1911, pp. 289-322, 2 pls.

⁶ Stewart, A. Notes on the Botany of Cocos Island. Expedition of the California Academy of Sciences to the Galapagos Islands, 1905-1906, V. Proc. Calif. Acad. Sci. (4) 1, 1912, pp. 375-383.

Ponera americana Mayr, Verh. zool. bot. Ges. Wien, 13, 1862, p. 722 ♀; *ibid* 28, 1878, p. 663, ♀ ♀.

Ponera stigma Roger. Verzeich. Formicid. 1863, p. 16; Emery, Ann. Mus. Civ. Genoa, 25, 1887, p. 434 ♀; Dalla Torre, Catalog. Hymen. 7, 1893, p. 42.

Pachycondyla (Pseudoponera) stigma Emery. Ann. Soc. Ent. Belg. 45, 1901, p. 46.

Euponera (Trachymesopus) stigma Emery, Gen. Insect. Ponerinæ, Fasc. 118, 1911, p. 85.

Dr. Williams took a dozen workers which are indistinguishable from specimens from various parts of the American tropics (Southern Florida, West Indies, Mexico, Central and South America) in my collection. A variety of the species, *quadridentata* F. Smith, occurs in the East Indies.

2. *Odontomachus hæmatoda insularis* Guérin

Odontomachus insularis Guérin, Icon. Règne Anim. 7. 1845, p. 423 ♀; Lucas, in Ramon, Hist. Fis. Cuba, 7, 1857, p. 757, pl. 18, Fig. 7 ♀ ♀ ♂.

Odontomachus hæmatodes subsp. *insularis* Emery, Bull. Soc. Ent. Ital. 22, 1890, p. 44, *nota*.

? *Atta brunnea* Patton, Amer. Natural. 1894, p. 618.

Odontomachus hæmatoda subsp., *insularis* Emery, Gen. Insect. Ponerinæ, Fasc. 118, 1911, p. 115.

Fifteen workers agreeing in all respects with specimens from Georgia, Florida, West Indies and Central America in my collection.

Subfamily MYRMICINÆ

3. *Tetramorium guineëse* (Fabricius)

Seven workers and three dealated females. This is a very common tropicopolitan species, which occurs also in the Galapagos Islands and even in hot-houses of temperate regions as it is frequently introduced with plants from the West Indies and the adjacent mainland. A portion of the rather extensive synonymy of this ant is given in my "Ants of the Galapagos Islands," p. 274.

4. *Wasmannia auropunctata* (Roger)

Tetramorium? *auropunctatum* Roger, Berl. Ent. Zeitschr. 7, 1863, p. 182 ♀ ♀ ♂.

Tetramorium auropunctatum Forel, Bull. Soc. Vaud. Sc. Nat. (2) 20, 1884, p. 375 ♀; Mayr, Verh. zool. bot. Ges. Wien, 37, 1887, p. 623; Dalla Torre, Catalog. Hymen. 7, 1893, p. 130.

Ochetomyrmex auropunctatus Forel, Ann. Soc. Ent. Belg. 30, 1886, C. R. p. XLIX.

Tetramorium (Xiphomyrmex) auropunctatum Forel, Mitth. Schweiz. Ent. Ges. 7, 1887, p. 385.

Wasmannia auropunctata Forel, Trans. Ent. Soc. London, 1893, p. 383 ♀ ♀ ♂.

Seven deälated females and numerous workers taken by Dr. Williams in November, 1905, and seven workers taken by the "Albatross" in 1899 (U. S. Nat. Mus.). The females are considerably darker than West Indian specimens but of about the same color as Brazilian and Colombian specimens in my collection. This is the ant to which Snodgrass and Heller refer (*supra* p. 301) under the old name *Tetramorium auropunctatum* as occurring in great numbers on the leaves on Cocos Island and as making "traveling on the island exceedingly disagreeable." It is not the bite, however, but the sting which is so irritating. There is also a note on Dr. Williams' label to the effect that his specimens were found on rocks and vines and had a "fiery sting." This ant is well known in Porto Rico under the name of "albayerde". Mr. R. H. Van Zwalenberg wrote me from Mayaguez: "In regard to *Wasmannia auropunctata* Roger I would say that as a rule this species is not pugnacious even when handled under ordinary collecting circumstances. It has a burning sting, however, though not so severe as that of *Solenopsis geminata*. The ferocity of the "albayerde" is proverbial among the natives; when present during the coffee picking it gets under the workers' clothes and then gives a good account of itself." This difference in behavior is easily explained. When one opens the populous nests under stones or logs the minute workers are unable to penetrate the thick skin of one's hands with their stings, but can easily thrust them into the thinner skin of the covered parts of the body.

Subfamily CAMPONOTINÆ

5. *Prenolepis vividula guatemalensis cocoënsis* Forel.

Prenolepis guatemalensis Forel var. *cocoënsis* Forel, Ann. Soc. Ent. Belg. 46, 1902, p. 178 ♀.

This variety is very close to the var. *itinerans* Forel, the worker being "of the same form and stature, but the color is a little duller, the legs, especially the tibiae are brownish, the surface is more opaque, and the hairs are a little longer and more abundant than in *itinerans* or the typical *guatemalensis*. The epinotum is also a little more elevated and more gibbous than in the type of *itinerans*, with deeper mesoëpinotal suture. The legs and hairs are dark-colored, strikingly contrasting with the yellowish body."

Thirteen workers taken by Dr. Williams agree with Forel's description, except that the legs are concolorous with the body. Three females from the same colony are of the same color as the workers but distinctly paler than females of *itinerans* from the Galapagos Islands and have the head smaller, with much more rounded occipital corners and the hairs on the thorax shorter and less abundant. The specimens of *cocoënsis* were taken by Dr. Williams in rotten logs. Forel's name '*cocoënsis*' should probably be amended to read "*cocosensis*".

6. *Camponotus* (*Myrmobrachys*) *biolleyi* Forel

Camponotus biolleyi Forel, Ann. Soc. Ent. Belg. 46, 1902, p. 177 ♀ ♂.

Camponotus (*Myrmobrachys*) *biolleyi* Forel, Rev. Suisse Zool. 22, 1914, p. 270.

Forel's description and four worker cotypes in my collection show that this species is very closely related to *C. lindigi* Mayr of Central and South America. Two minor workers taken by Dr. Williams agree perfectly with the cotypes. Biolley found the species nesting in dead branches and abundant on the ferns which form the undergrowth on Cocos Island.

7. *Camponotus* (*Myrmamblys*) *cocosensis*, new species

Worker major. Length 6.5–7 mm.

Head large, subrectangular, about 1.2 times as long as broad, a little narrower in front than behind, with straight sides

and broadly excised occipital border, and rather convex dorsal surface, not truncated anteriorly. Eyes moderately large, flat, their anterior orbits at the median transverse diameter of the head. Mandibles rather small, convex, 4-toothed. Clypeus trapezoidal, longer than broad and distinctly broader in front than behind, rather flat, sharply carinate behind, with entire, feebly rounded anterior border. Frontal area very distinct, transverse, triangular. Frontal carinæ rapidly diverging in front, subparallel behind. Frontal groove distinct but not very deeply impressed. Antennæ slender, scapes not flattened, curved at the base, extending a little beyond the posterior corners of the head. Thorax decidedly narrower than the head, laterally compressed behind, evenly arcuate above in profile, with distinct promesonotal and feeble mesoëpinotal sutures. Pronotum somewhat broader than long, slightly convex, indistinctly marginate in the humeral region; epinotum with distinct base and declivity meeting at a very obtuse angle, the former sloping and straight, the latter more abrupt, marginate on the sides and longitudinally concave in the middle. Petiole rather low and thick, not as high as the epinotum, narrower than the posterior end of the epinotum, flat behind, rather strongly and evenly convex in front, with blunt, rounded and entire superior border. Gaster somewhat larger than the head, elliptical, slightly flattened dorsoventrally. Legs moderately long, anterior femora somewhat enlarged.

Subopaque; mandibles, posterior corners of the head and legs more shining. Surface of body distinctly shagreened and with piligerous punctures, which are small and shallow on the head, coarser, deeper and sparser on the thorax and gaster, finer, sharper and more numerous on the mandibles.

Hairs pale yellow, rather glistening, abundant, erect and rather long on the dorsal surface of the head, thorax, petiole and gaster, absent on the legs and antennæ. Pubescence yellowish, short, very dilute, distinct and appressed on the sides of the head, slightly longer and subappressed on the legs, extremely short and inconspicuous on the antennal scapes.

Dull yellowish ferruginous, mandibles, petiole and gaster and in some specimens the epinotum or whole thorax, brown; tips of mandibles and their teeth blackish, legs paler and more yel-

lowish than the thorax, knees slightly infuscated, posterior borders of the gastric segments very narrowly yellowish.

Worker minor. Length 4.5–5 mm.

Differing from the worker major mainly in the structure of the head and in coloration. The head is somewhat longer than broad but the posterior corners are more rounded and the occipital border is straight, the clypeus is broader than long, the antennal scapes extend half their length beyond the occipital border, the eyes are large and distinctly convex. Thorax much like that of the worker major but higher and somewhat more gibbous in the mesonotal region and with the epinotal angle less distinct and more rounded and the declivity more sloping.

Sculpture and pilosity much as in the worker major but the surface of thorax, petiole and gaster and of the head behind the clypeus decidedly more shining and the puncturation of all these parts finer, denser and more indistinct.

The erect hairs are glistening white, somewhat more abundant and conspicuous than in the worker major and the pubescence longer and distinct on the whole dorsal surface of the head.

Head between and behind the eyes, thorax, petiole and gaster dark brown, the antennal funiculi beyond the first joint and the knees distinctly infuscated, anterior portion of the head, including the mandibles yellowish, tips and teeth of the mandibles brown.

Worker media. Length 5.5–6 mm.

Intermediate in structure between the major and minor worker but with the coloration, sculpture and pilosity of the former.,

Described from six major workers, three mediæ and six minor workers taken in November, 1905, by Dr. Williams. The worker major resembles the corresponding phase of *C. novogrenadensis* Mayr in size and in the structure of the head and body, but the sculpture, pilosity and color are very different, the eyes are much larger, the antennal scapes somewhat longer, the thorax longer and less convex in the mesoëpinotal region, etc. The worker minor bears a strange resemblance to the worker minor of *C. biolleyi* but can be distinguished by its

greater size, somewhat paler color, longer and lower epinotum, the more extensive infuscation of the antennal funiculi, the fuscous knees and the longer and somewhat less abundant erect hairs on the dorsal surface of the body.

Cotypes, 8 specimens, No. 461, Museum California Academy of Sciences, and 9 specimens in author's collection.



Wheeler, William Morton. 1919. "The ants of Cocos Islands." *Proceedings of the California Academy of Sciences*, 4th series 2, 299–308.

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