On the Entomology of the Aru Islands.

By Alfred R. Wallace, Esq.

Almost all that is known of the insects inhabiting New Guinea and the adjacent islands is due to the French naturalists attached to the numerous discovery ships which have visited that part of the world. Many fine things have thus been made known to entomologists, although the total number of species collected is very small; and it may, perhaps, be considered as one of the least known and most promising regions that remain, now that the most remote parts of the earth are ransacked by enterprising collectors. These considerations induced me to make a voyage to Aru in one of the native prows which trade there annually, going with the west monsoon in December, and returning with the east in June. I expected that these islands lying so near New Guinea, and known to have some of their most interesting animal productions (the birds of paradise for example) identical, would yield me many New Guinea forms, and probably some identical species, and my expectations in this respect have been fully realized. The Entomology, the Ornithology, and certain peculiarities in the physical geography of these islands, prove to me that at no distant period (geologically) they formed a portion of the southern peninsula of that great island, and have been separated from it by a depression of the intervening portion (now a shallow sea), they themselves remaining almost or quite undisturbed. I believe, therefore, that the insects of Aru and New Guinea are as closely related as those of Great Britain and the Continent of Europe.

It was with considerable anxiety that, on January 8th, 1857, I took my first walk into the forest. The first insect I saw was not a very encouraging one: it was the common Diadema Ange, found over the whole Archipelago. A little further, however, and I was rewarded by Idea d'Urvillei, a beautiful Hyades, the lovely Damis Coritus, *Guér.*, and that superb insect Cocytia d'Urvillei. Two or three pretty Lycenidæ of genera unknown in the western parts of the Archipelago, Tricondyla aptera, and two species of the longicorn genus Tmesisternus, with several smaller insects, composed my first day's sport; and a very satisfactory one it was, for it assured me there was work to be done, and that I was really in the midst of a New Guinea Fauna.

I collected steadily for two months in this jungle, situated in the small island of Wamma, at one end of which is the Bugis settlement of Dobbo, where I resided. I got a great many nice things, but the

species were very limited in number, and a new one began to be a rarity. With all my exertions I could only muster 90 species of butterflies and 235 Coleoptera at the end of one month, which had increased to 108 and 340 in two months, with 150 Hymenoptera, 120 Diptera, and other orders scanty, making a total of 850 species of insects. Even this I believe is considerably more than all the New Guinea species yet known. Among my butterflies the finest thing was a superb Ornithoptera, differing very slightly from O. Poseidon of Doubleday. Females of this were abundant, some measuring 9½ inches across, the males scarcer and much more difficult to capture, so that I hardly got a really perfect specimen. The excitement of chasing this glorious insect may be imagined. The fine Papilio Euchenor, *Guér.*, was also by no means uncommon, but very difficult to take, having a wild zigzag moth-like flight. P. Ormenus, *Guér.*, was also often seen, but as rarely taken. Of a new species, near Ægistus, I got but a single specimen, and never saw another, and the rare and magnificent P. Ulysses I saw almost daily, without even a chance of obtaining a specimen. A Hamadryas, perhaps H. Zoilus, is one of the commonest of the forest butterflies, and, from its weak flight, most easily taken: It has all the appearance and habits of the Ithomiæ of S. America. Five or six species of Euplœa, and as many of Pieris, are abundant, some pretty little Satyridæ, and from 20 to 30 species of Lycenidæ and Erycinidæ, many of which will bear comparison with the loveliest gems of the Amazonian forests.

Among the Coleoptera the most remarkable things were six or seven species of Tmesisternus, a fine Gnoma, and a new genus allied to Golsinda, the males of which have the anterior coxæ armed with a long acute spine. The Curculionidæ contained several very fine Anthribidæ, one, the giant of the family, being near an inch and a half long, with very long legs and rather short antennæ; some singular Brenthidæ, the curious Arachnobos Gazella (Bois. Voy. de l'Astrolabe, t. 7, fig. 22), and a beautiful blue and black banded Curculio. Lamellicornes are almost absent from this region: nine species of the whole tribe were all that two months' work produced, and of these half were single specimens only. There is probably no other country where this extensive group is so near to being altogether absent. Two fine species of Lomaptera, however, are among this little lot,—I think both new: they fly about in the jungle near the ground, with a loud humming noise, and settle on rotten wood, never on flowers, except at the opening spathes of the cocoa nut: they are very shy, and take flight so suddenly, keeping among thickets and rotten branches of

fallen trees, that it is very difficult to capture them. Almost all the other interesting groups are very scarce: Buprestidæ, 12 species; Lucanidæ, 1 species; Geodephaga, 12 species; each producing one or two good things, the rest small and obscure.

Having at length, with the greatest difficulty, procured a boat and men, I went to the great island of Aru, in which I visited two localities and remained two months. Here were numbers of species not found on the smaller islands, and I increased my collection considerably. In the Lamellicornes and Buprestidæ, however, I did not get a single new species, almost all my increase being confined to the Longicornes and Rhyncophora. I doubled my species of Tmesisternus, which is quite a characteristic of the New Guinea Fauna, and I was delighted to obtain T. mirabilis, the largest and most beautiful of the group, in tolerable plenty. I also added some nice butterflies to my collection, and at length succeeded in obtaining two nearly perfect males of Papilio Ulysses. Mosquitoes and minute ticks here attacked me so perseveringly, that my feet and ankles refused to submit, and, breaking out into inflamed ulcers, confined me to the house during a month of the very finest weather, when I had hoped to obtain and preserve a host of fine insects, for the incessant rain and damp sea air at Dobbo had rendered it impossible properly to dry my first collections, a great part of which was, I afterwards found, completely spoiled. In no part of the tropics have I suffered so much from damp, or found it so absolutely impossible to preserve my collections, though exposing them to every gleam of sunshine, and even to fire heat, which, however, is of little use in bamboo houses which freely admit the damp air in every direction. Returning to Dobbo I remained a prisoner for another month, before I could again reach the forest. I then worked hard for the remainder of my stay, adding many fine Hymenoptera and Lepidoptera to my collections.

Arriving safe at Macassar, and taking up my old quarters, I had a most fatiguing task,—to open out, clean and pack my collections (more than seven thousand specimens), which occupied my whole time for three weeks. I was now able to ascertain my total number of species in each order, and to determine the identity of many with those described by Guérin and Boisduval from the French voyages. These are very numerous, so much so that I think at least half of the known insects from New Guinea will be found in my Aru collections, which is not a little remarkable, considering that they have been obtained from various and distant localities in that extensive country: for instance, nineteen species of Tmesisternus are known, all from

New Guinea and the adjacent islands. I have obtained exactly the same number in Ké and Aru: ten of these I can identify, the other nine being, I think, new. About twenty other Coleoptera peculiar to New Guinea I can also easily identify, and no doubt many others among the small and obscure ones will also be found to be already known from that country. In Lepidoptera I have four of the New Guinea Papilios, Pieris Celestina, *Bois.*, Satyrus Osiris, *Bois.*, Emesis Leosida, *Bois.*, Damis Coritus, *Guér.*, D. Sebæ, *Bois.*, and four or five other species, besides many beautiful Lycenidæ, which will be, I think, quite new. In Hymenoptera and Diptera I am very rich, having bestowed much attention on these orders. Fifty-nine species of ants, collected in Aru, will add much to our knowledge of the distribution of this interesting family. Of other Hymenoptera there are 155 species, many of them large and fine. The flies contain many brilliant and many curious things, and I am rather proud, amid the attractions of Ornithopteræ, Lomapteræ, and Paradise birds, of having collected 185 species of this much-neglected order; and there are yet, I am sure, many more of moderate size, and hundreds too minute for any but a professed dipterist to attend to.

Deducting the time lost by illness and in travelling, I had about four months' clear collecting; and I think I cannot do better than give a list of the number of species obtained in the principal groups, so that English entomologists may see what a New Guinea island does really produce.

Coleoptera, 572 species, viz.:—

Geodephaga	20	Prionidæ	2
Hydradephaga	3	Cerambycidæ	35
Brachyelytra	6	Curculionidæ	92
Xylophaga, &c.	20	Bruchidæ and Anthribidæ	35
Lamellicornes	18	Brenthidæ	18
Lucani	3	Heteromera	42
Passali	6	Cleridæ	16
Buprestidæ	23	Malacoderma	45
Elateridæ	30	Cyclica	68
Lamiidæ	77	Trimera	13

Lepidoptera, 229 species, viz.:—

Papilionidæ	16	Erycinidæ	2
Pieridæ	12	Lycenidæ	57
Satyridæ	9	Hesperidæ	18
Nymphalidæ	33	Moths	72
Danaidæ	10		

And of the following, 563 species, viz.:—

Hemiptera . . .	80	Orthoptera	18
Homoptera . . .	50	Neuroptera	10
Hymenoptera . . .	214	Forficula, Blatta, &c. .	6
Diptera	185		
Total species of insects . . .	1364		

In the Lepidoptera and Coleoptera it will be seen there is a striking deficiency of species. In both Singapore and Borneo I obtained, in the same time, more than twice as many beetles, while in South America either of the families of Erycinidæ or Hesperidæ far outnumber the whole amount of the Aru butterflies. Such poverty is a great drawback in this otherwise interesting country, and, were it not that there are a few remarkably fine things, and a considerable proportion of the species are either new or very rare, it would not be worth a collector's while to remain in it. There are scarcely twenty butterflies of which I have been able to obtain tolerable series of good specimens. I am now convinced that the number of species of butterflies diminishes from continental India, as you go eastward. In Java and Borneo there are less than in India and Borinah, in the Moluccas and New Guinea still less, and in the Islands of the Pacific scarcely any. The same rule probably holds in Coleoptera, though of that I am not so sure till I have seen more of the country, as peculiar circumstances of station and locality make a great difference in that order.

I should mention that, in the above list, I have included about 90 species of various orders taken in a few days at Ké Island, 60 miles west of Aru. In no part of the tropics I have visited has so much care been required to preserve my collections as in the eastern portions of the Indian Archipelago. Three or four distinct species of ants are ever on the watch for soft insects, which they find out and attack with the most astonishing celerity: two of these are very minute and will *not* be banished. They struggle over water, drop from the roof, and lurk in cracks and crannies where it is impossible to dislodge them; and again and again have my specimens of minute Diptera and Lepidoptera been destroyed by them. The larger species are more easily kept out, but far more destructive when they do effect an entrance, and they never miss an opportunity. A hanging shelf isolated by oil had kept my drying box more than a month in safety, when one morning I found it swarming with red ants, and several fine butterflies taken the day before being carried away piecemeal. Searching for the bridge by which they had reached my fortress, I found that my Malay boy had carelessly thrown a palm-leaf mat behind the shelf, the corner of which just touched it, and now presented

a double line of entering and returning ants. I called him to see the mischief he had done, and then, putting all right, went into the forest, and had a successful day, obtaining several fine and some new butterflies. At night, before going to bed, I carefully examined all round my shelf, but the next morning the enemy had again entered; again my fine insects were being carried away piecemeal, and I was only just in time to save one lovely and unique butterfly from total destruction: again I searched,—for a ladder I knew there must be,—and found my unlucky boy had again done the mischief: he had been roasting coffee for our return voyage, packed it in a jar, and tied to it a long slender rattan, by which to secure it on board; this he had placed on the floor under the shelf, with other sundries, and the rattan sticking up its extreme point just touched the shelf beneath. One would think the ants must every night explore and wander everywhere, for they never fail to discover even a hanging thread by which to ascend. In no other place have they attacked my birds as well as my insects. In all parts of South America, in Malacca, in Borneo, *they* at least were safe on a table or in a box; but in Macassar and at Aru they are attacked as voraciously as the insects, and even greater precautions are necessary, for the ants establish colonies inside the skins, whence they sally out to devour the eyelids, the base of the beak, &c., and completely destroy the beauty of the specimens. Here, too, it is impossible to keep the insect-boxes free from minute spiders which make webs over and under the specimens, and often gnaw them. Then there are some minute larvæ which attack large-bodied Lepidoptera, mining out their bodies, and reducing them to a mass of dust which dirties every specimen in the box; and lastly are the mites, which the damp sea air of these islands seems especially adapted to develope. Long and sad experience of this pest has convinced me that there is but one preventative, viz. to dry the specimens rapidly, which it is often impossible to do, and then neither camphor, arsenic, nor cajeput oil, have any effect whatever. Add to this that everything must be shut up at night in closely fitting boxes, or the insects will be eaten by cockroaches and the bird-skins by rats, and some little idea may be formed of a collector's troubles in the damp climate of Aru, while living in a half-open bamboo shed, surrounded by his daily increasing stores of beautiful objects, which the most incessant vigilance can hardly preserve from destruction.

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