Noona Dan Papers No. 24.

The Noona Dan Expedition, 1961-62. Insects and other land arthropods.

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From August 1961 to September 1962 a Danish natural history expedition investigated several areas in the Philippines and the Bismarck and Solomon Islands. The operations took place from a motor ketch, "Noona Dan", offered to our disposal by the Lauritzen Line, Copenhagen. The work was especially devoted to zoology and botany, but studies in geography, ethnology, and social anthropology were also undertaken. A general report on the purpose and progress of the expedition is given by Wolff (1966).

Studies in entomology was one of the major activities of the expedition, and the first results are now published in the present journal (Spencer 1965, Browne 1966, Drake 1966, and Petersen 1966). As an aid to readers of these entomological "Noona Dan Papers" and others, which are also planned to be published in "Entomologiske Meddelelser", various maps and an annotated locality list would appear to be of interest, together with some remarks on the collecting and the main results which could not be incorporated in the general report by Wolff.

Equipment and methods.

It can not be claimed that new collecting methods were used during the expedition, but the mere fact of being equipped by a ship is unusual for entomologists. The "Noona Dan" was a very important part of the equipment as it not only permitted the expedition to explore remote and therefore interesting localities, but also because with the ship as a mean of transportation it was possible to carry more collecting equipment from place to place, and particularly, the preservation and the storing of the collected material was considerably facilitated.

Five entomologists participated in the investigations at various times. Mr. Romualdo Alagar, National Museum, Manila, and the author worked in the Philippines only, whereas Mr. William Buch took part in the entire expedition. In the Bismarck and Solomon Islands the latter was joined by Leif Lyneborg, Ph.D and Torben Wolff, D. Sc., in the periods 25 Feb.—15 July and 26 April—29 Aug., respectively.

A large part of the material was, of course, taken by hand by various ordinary methods, but relatively extensive use of traps was particularly successful in obtaining the rather good results in difficult collecting terrain. In most places one to three large insect traps (modified Malaise traps) were operated, and mercury vapour light were used on a Robinson trap. During the second part of the expedition Berlese funnels were used for collecting minor arthropods living in ground litter. Terrestrical arthropods were the main objective, especially insects, but in the Bismarck and Solomon Islands much time of one of the collectors (Wolff) was devoted to freshwater investigations.

The Malaise Traps were of a type with only two openings, separated by a median wall, which forces the insects to crawl upwards into the collecting chamber (Fig. 3). This design (from Zoologiska Institutionen, University of Lund, Sweden) was apparently working successfully, especially when set up in the right places, e.g., across narrow pathways or close to the margin of higher vegetation, where flying insects are often found in greater numbers than elsewhere. Unfortunately the collecting and killing chamber of the traps was rather bulky, designed as it was for much larger catches than ours.

The traps were extremely good for collecting flying insects, although on occasion daily catches could be astonishingly poor, e.g., less than 25 specimens; but on the other hand daily catches of more than 500 specimens were not unusual with the aid of two traps. The results were dependent on weather conditions and operating places. Rain and strong winds decreased the captures considerably.

Countings show that the traps, when operated for long enough periods, were able to catch a very high percentage of the flying species that are normally caught by sweeping in the vegetation or in the air. Moreover, the traps collected a fair number of species not caught by ordinary methods. They were, thus, super-

ior to collecting by hand in case of certain insects, but on the other hand, it must be admitted that they have their limitations as some flying species were only collected by hand, never by the trapping method. This of course especially applies to species that remain in the darkness of the vegetation or seldom take to the wing, and naturally, the traps very seldom take non-flying insects apart from ants and a few other very active crawling arthropods. Some insects are often able to avoid the traps, e.g., larger wasps and some butterflies. Taken as a whole, however, traps are remarkably efficient, and the use of Malaise traps can save much time for collectors whose efforts can be spent on other type of collecting. One drawback is the inferior condition of material caught, but when the traps are emptied often enough this problem is not very serious.

The Robinson Trap proved efficacious and apparently caught a large percentage of the insects drawn to the trap by the light from a high pressure mercury vapour lamp (125 or 160 watt) which is situated in the centre of the inverted cone-shaped entrance to the large cylindrical container. The electric power (220 volts) was produced by a portable generator.

The size of the catches by the Robinson trap varied greatly, dependent as they are upon external factors such as weather

Table 1.

The composition of a sample of insects caught by mercury vapour light. Five hours trapping from 7 p.m. to 12 p.m. Pinigisan, Palawan, 600 m a.s.l. 3 Sept. 1961.

	Number of specimens	Number of species
Lepidoptera	719	405
Coleoptera	31	21
Orthoptera	18	10
Hymenoptera	10	7
Heteroptera	12	5
Homoptera	4	4
Diptera	4	4
Trichoptera	20	2
Blattodea	3	2
Dermaptera	3	1
Mantodea	1	1
Phasmida	1	1
	826	463

conditions, and particularly the intensity of moonlight. On good nights (often in the mountains) about 2,000 specimens of moths were collected, but normally the catches were much smaller. In the Philippines mercury light trapping was used for about 200 hours, and the method gave about 100 specimens on average per hour. More specimens were actually caught, but these were not preserved as they belonged to common species. However, the number in this category was by no means high, because only very few species occurred in large numbers. This is a well known feature of tropical regions, where collections are often composed of many species in few specimens (clearly illustrated by the result of five hours trapping in Palawan, given in Table 1).

Table 1 also illustrates the division of different orders of insects of a randomly chosen catch made by mercury light on a Robinson trap, although this example can not be said to be fully representative; too few Diptera and e.g., only a very low number of Homoptera caught.

Berlese Funnels were mainly used in the Bismarck and Solomon Islands; in all, 128 samples were examined. This method was only used in order to catch minor arthopods living in ground litter, and the samples were not taken accurately enough to give any kind of quantitative information about the fauna of various biotopes. Most of the samples consisted of dead, dry or rotting leaves, grass, moss etc. on the ground mixed with some surface soil. The samples contained about 12,000 specimens, of which about 5,500 are Acari and about 4,000 Collembola. All Thysanura and almost all Diplura were caught by the Berlese funnels.

Localities.

The localities of the expedition, as well as the length of time to be spent at each locality, were not always chosen with the best entomological results in mind. In addition, the schedule had to be altered after the work had started owing to unforeseen circumstances. Nevertheless, the "Noona Dan" brought the entomologists to various collecting places of great interest, mostly localities in remote islands or in mountain areas where no or only very little collecting had been attempted.

In the Philippines work was concentrated in the two island bridges connecting the main Philippine islands with Borneo; 1) the Palawan-Balabac chain (including the small Ursula Island),

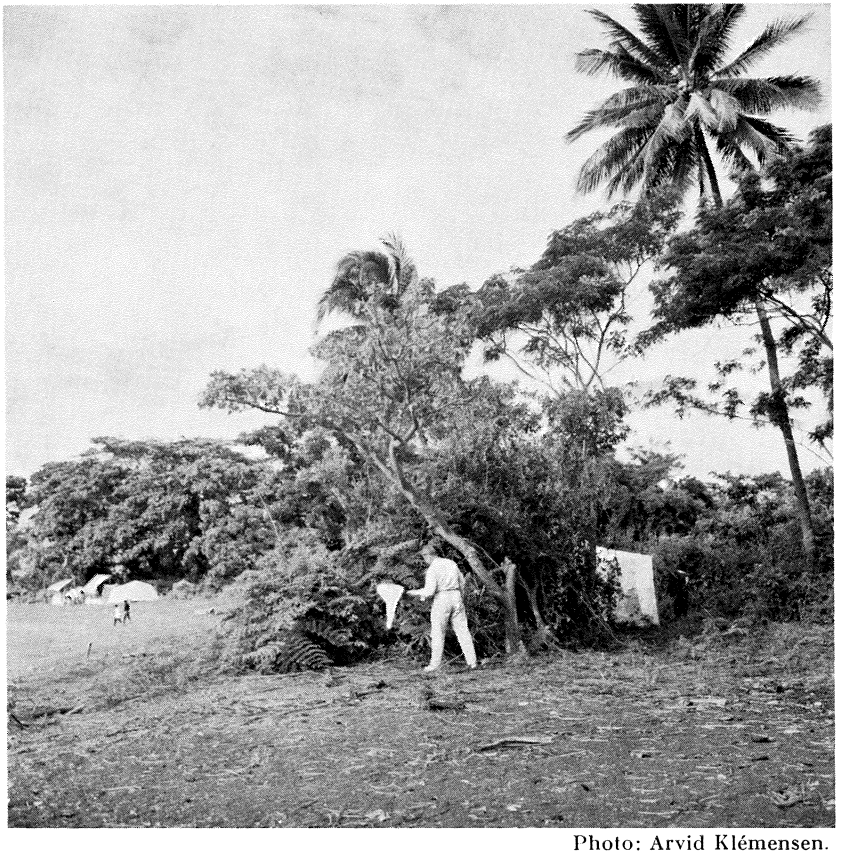

Photo: Arvid Klémensen.

Fig. 1. Uring Uring, Palawan. Camp at the shore of Ipolote Bay. Malaise trap at a patch of shrub.

Fig. 2. Pinigisan, Palawan. 600 m a.s.l. View from the camp house towards the rain forest. In the background the Mantalingajan Range.

Fig. 3. Dalawan Bay, Balabac. Malaise trap across a path in dense forest.

Fig. 4. Dalawan Bay, Balabac. View from the forest across the small cleared area towards the bay.

Fig. 5. Sapamoro, Zamboanga Peninsula, Mindanao. View from the farm across slightly cultivated grassland to poor remains of forest.

Photo: W. Buch.

Fig. 6. Tarawakan, Tawi Tawi. One of the newly cleared fields of the agricultural highschool. Primary forest in the background.

and 2) the Sulu Islands represented by the island Tawi Tawi. In Palawan both lowland and mountain areas were investigated. The expedition later made a short stay in the Zamboanga peninsula of Mindanao in place of a cancelled visit to a third island chain (the more easterly, made up of the Sangihe and Talaud Islands between Mindanao and Celebes). Most of the places investigated are of utmost interest in the study of relations between the faunas of the Philippine and Malayan subregions,

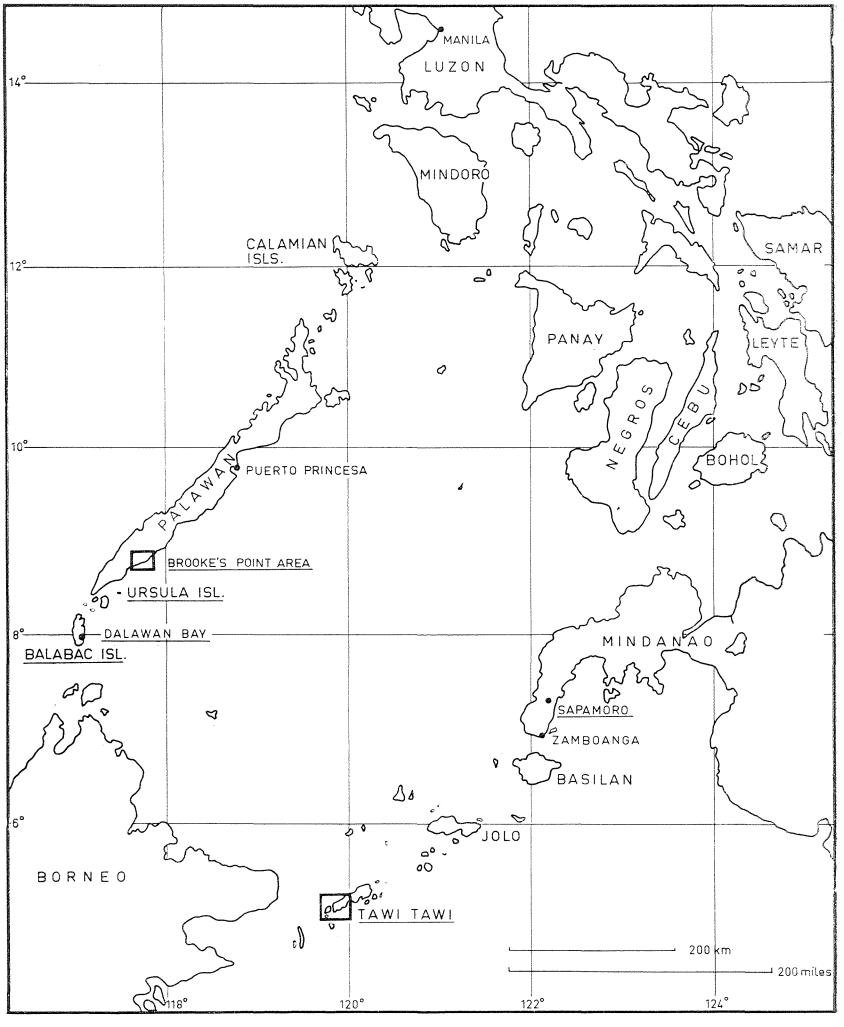

Fig. 7. The southwestern Philippine Islands.

located, as they are, on the border between these zoogeographical areas.

In the Bismarck Islands investigations took place both in the lowland and mountain areas of the larger islands of New Britain and New Ireland in order to compare the fauna at different altitudes. Further, several smaller islands were visited: Duke of York, Dyaul, Lavongai (New Hanover) and the more remote and little examined islands of Mussau, Manus, and Luf. The very outlying Mussau was visited on two occasions.

The small island of Dyaul, separated from New Ireland by a sound only about 14 km wide, and probably very deep, calls for special attention; its insect fauna might contain striking characters. Examination of birds collected by the Noona Dan Expedition showed the presence of an unexpectedly high number of endemics and a rich general fauna (Salomonsen, 1964). The same might be the case for insects. After a special study of the situation, and partly as an explanation of it, Salomonsen set forth the theory that Dyaul must have been a separate island without connection with New Ireland presumably before the main islands in the Bismarck Archipelago were isolated from each other.

In the Solomon Islands only the remote islands of Rennell and Bellona were on the schedule, but circumstances made a short stay at Honiara, Guadalcanal, necessary, and some collecting took place there by Wolff.

In the following list of localities some notes on vegetation and general surroundings are added, but the notes are very brief in most cases. In lowland localities, in particular, the main tropical vegetation comprises a mixture of native gardens, coconut plantings, grassland, secondary shrub and forest, and sometimes remains of original forest. Repetition of these general conditions are generally omitted from the list or replaced by "mixed vegetation". More detailed notes may be found in the general report by Wolff (1966).

Dates given are only those in which land arthropods were collected. The same applies to the localities. For further information on the freshwater investigations see Wolff (l.c.).

The Philippine localities were visited in 1961, the other localities in 1962.

I. **The Philippines.** (Figs. 7—9).

A. PALAWAN. (Fig. 8).

1. U r i n g U r i n g. 12 Aug.—29 Sept.

Camp at the shore of Ipolote Bay (Fig. 1). Mixed vegetation with slight remains of primary forest. A small stream behind the camp, a few ditches.

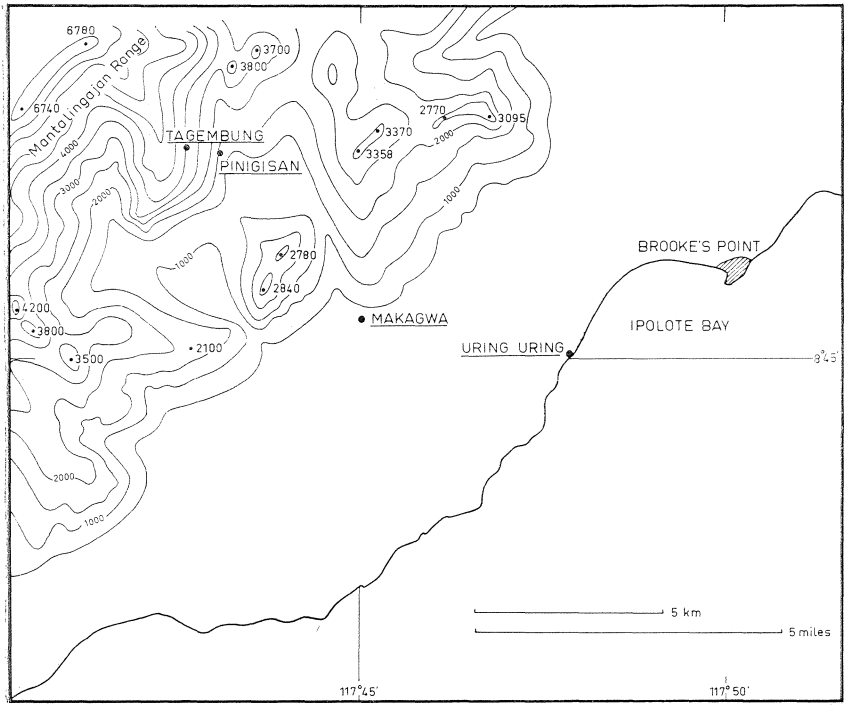

Fig. 8. Localities in the Brooke's Point Area, Palawan.

Malaise traps close to the beach, one in the open (Fig. 1), and one in a path cleared in secondary shrub. From 28 August to 29 September collecting took place with a single Malaise trap, in a native garden on bare ground. Robinson light trap operated close to the beach.

2. M a k a g w a. 22 Aug.

At the foothills of the Mantalingajan Range. Mixed vegetation. Insects mostly collected in open grassland (cogon-grass), or in and near a small river at the farm houses.

3. P i n i g i s a n. Approx. 600 m a.s.l. 31 Aug.—24 Sept.

Camp in a house on a small plateau about 100 m above the small village (barrio), which is surrounded by a small open area with mixed vegetation. Most insects collected at the plateau (Fig. 2) or in the undisturbed primary forest behind. The whole place was completely isolated from lowland biotopes by large areas of primary rain forest. Only persistent freshwater was a small spring with a shallow waterhole beneath, very slow current.

A Malaise trap placed about 20 meter inside the rain forest, another one in grassy vegetation about 10 meter outside the forest. Robinson trap operated in the open.

4. T a g e m b u n g. Approx. 1150 m a.s.l. 15—20 Sept.

Camp completely surrounded by large areas of low mountain rain forest, partly developed as mossy forest. No human population. No persistent water assemblages.

Malaise trap in dense forest; Robinson trap used in a small clearing.

B. URSULA ISLAND. 2 October.

A few insects were collected in this very small island, which was still covered with primary rain forest.

C. BALABAC.

1. D a l a w a n B a y (Indalawan). 4—13 Oct.

Camp situated just behind the north-eastern corner of the bay in a small area of newly cleared land with a few young coconut palms and some secondary growths (Fig. 4). At the coast small open mangrove areas; behind the camp undisturbed primary forest. A small stream near the camp.

Malaise traps operated on the open shore, in secondary shrub, and in margin of the forest (Fig. 3); Robinson trap used in the open just outside the forest.

2. B a l a b a c P e a k. 10 October.

Highest point of Balabac (1867 feet). Primary forest. The very top is free of trees.

D. TAWI TAWI. (Fig. 9).

1. T a r a w a k a n. 20 Oct.—17 Nov.

Housed in the Tarawakan Agricultural Highschool, a five year

old institution. Mixed vegetation, dominated by the fields of the highschool (Fig. 6) and the nearby primary forest, which was rather unspoiled. A few ditches spread over the area. A visit to the north coast of Tawi Tawi, 27 Oct.

A Malaise trap in open field with spread vegetation and felled trees, a second trap inside the forest, but in a rather open place.

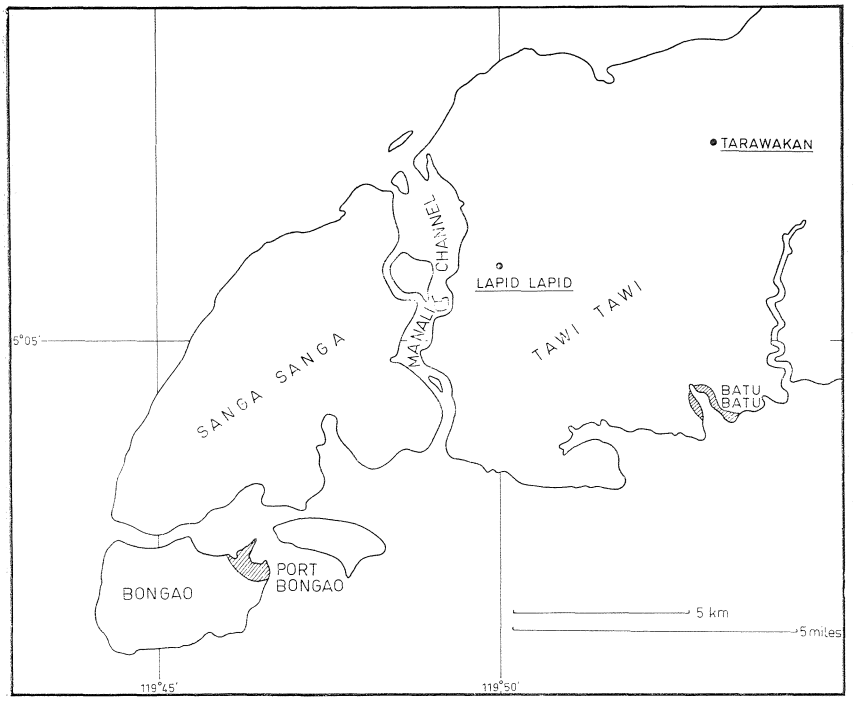

Fig. 9. Localities in Tawi Tawi.

2. L a p i d L a p i d. 19—23 Nov.

Housed in a newly established plantation. Newly cleared area of land ready for planting; rather sparse vegetation. Mangrove-like forest nearby, and east of the camp primary rain forest (only few insects from this biotope). Freshwater in the mangrove swamps and in a small pond near the camp.

Robinson trap used in the open with poor result. No Malaise traps operated.

3. Port Bongao (Bongao Island). A few insects were caught occasionally during the stay in Tawi Tawi.

E. MINDANAO.

1. Sapamoro, Curuan District, Zamboanga del Sur. 14—22 Dec.

Housed in a farm house located inland, south of the Vitali River. Large area cleared within the last few years, now covered by grassy vegetation and some secondary shrub mixed with poor remains of rain forest (Fig. 5). A small area of grassland was cultivated for keeping cows. A shallow ditch near the farm. Collecting took place also in a rather unspoiled primary forest north of the farm, at a small river. No traps used.

2. Latuan Cave. 21 December.

Situated a few kilometres southeast of Sapamoro. The cave is of considerable extension, located in a large hill. Not very deep. Large pedipalps, gryllids and spiders as well as smaller arthropods.

II. **The Bismarck Islands.** (Figs. 10—12).

A. NEW BRITAIN.

Rabaul Area:

1. Rabaul. Various dates from 11 Jan. to 25 July.

A few insects collected in the town or in cleared areas and secondary forest in the surroundings.

2. Bita Paka, SE of Kokopo. 10 July.

Cultivated areas and secondary shrub.

3. Credner Islands. 17 July.

Two small islands, the larger about 400 m long, 20 km ESE of Rabaul. Collecting in secondary shrub. A few larger trees present.

4. Tavurvur. 20 July.

Collecting near the rim of the volcano. Scattered bushes and tufts of grass.

Gazelle Peninsula:

1. Puktas. 6 May.

About 7.5 km SSW of Massava Bay. A few insects collected near small patch of primary forest at the village.

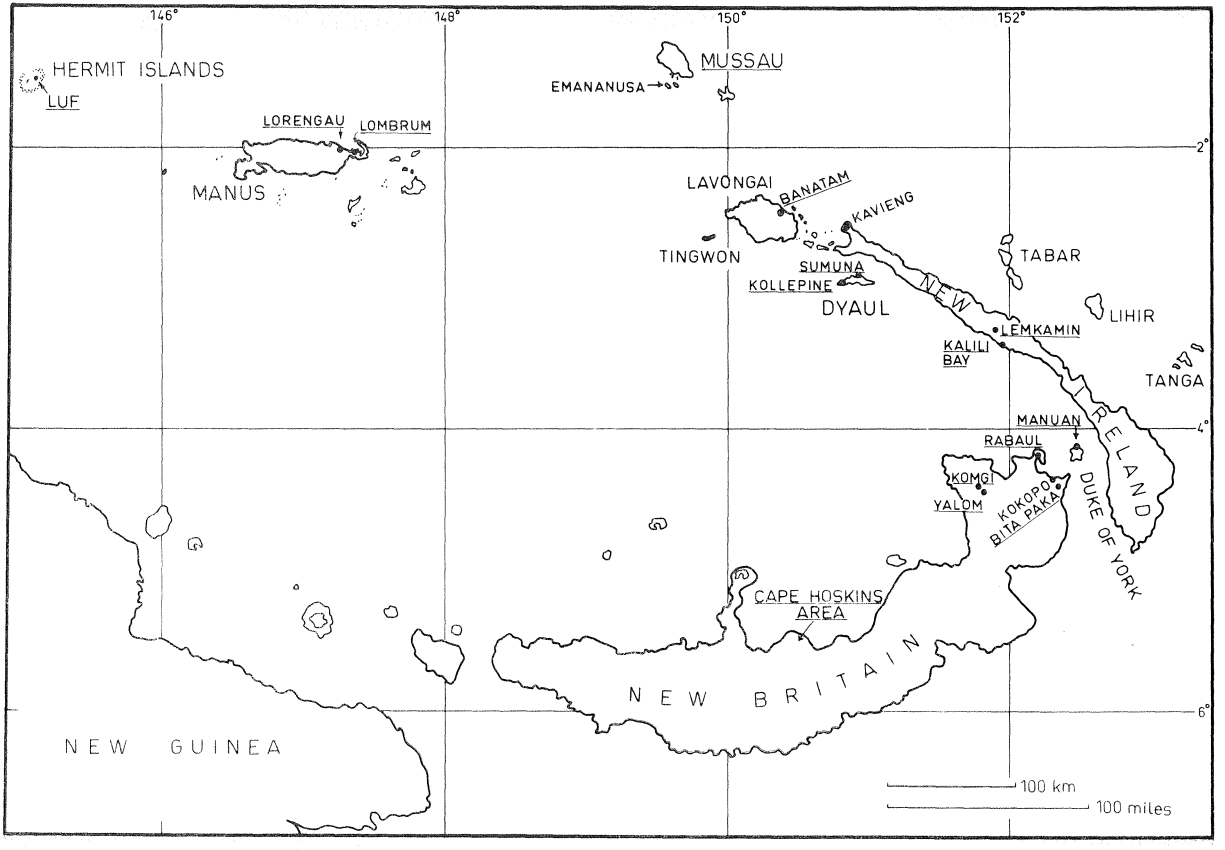

Fig. 10. The Bismarck Islands.

2. Y a l o m. 1000 m a.s.l. 8—25 May.

Village (about 450 inhabitants) located in a large valley which on the west and south side is limited by lime stone cliffs rising to an altitude of 200—250 m. Primary forest still present on the cliffs, otherwise mixed vegetation. Various small streams were investigated (Freshwater Sts. 13—24, see Wolff 1966). Berlese samples Nos. 41—50, mixed vegetation. Malaise trap operated at the the margin of a small patch of primary forest, just above a stream. Robinson trap used in the village.

3. K o m g i. 1000 m a.s.l. 14 May.

Collecting mainly in primary forest on a ridge and in a nearby small brook (Freshw. St. 19).

Cape Hoskins Area (Fig. 11):

1. B a n a u l i. 2 July.

Secondary growths and primary forest, only a few fields.

2. K w a l a k e s s i. 3 July.

Vegetation almost as at Banauli. Collecting in shrub in the neighbourhood of the sawmill. The nearby K a v u v u S t r e a m was investigated near the sea (St. 78) and 2 km from the sea (St. 79).

3. S o u t h o f H o s k i n s A e r o d r o m e. 6 July.

Coconut plantation (Freshw. St. 73).

4. V a l o k a. 4—13 July.

Rather small patches of primary forest, prolific secondary forest and cultivated areas. Freshwater in springs only, near the sea. Malaise trap operated in young secondary shrub. Robinson trap used at the Mission Station. Berlese samples Nos. 72—83 from primary forest.

At V o v o s s i 1 km W of Valoka, and P o r a - P o r a, 3 km W of Valoka, two brooks were examined (Freshw. Sts. 80 and 84).

5. V a i s i s i. 9 July.

Collecting in primary forest around the village, and in the Kavuvu Stream (Freshw. Sts. 81-83).

6. T h e r m a l A r e a, 8 km E of M t. B a n g o. 11 July.

Rather open primary forest.

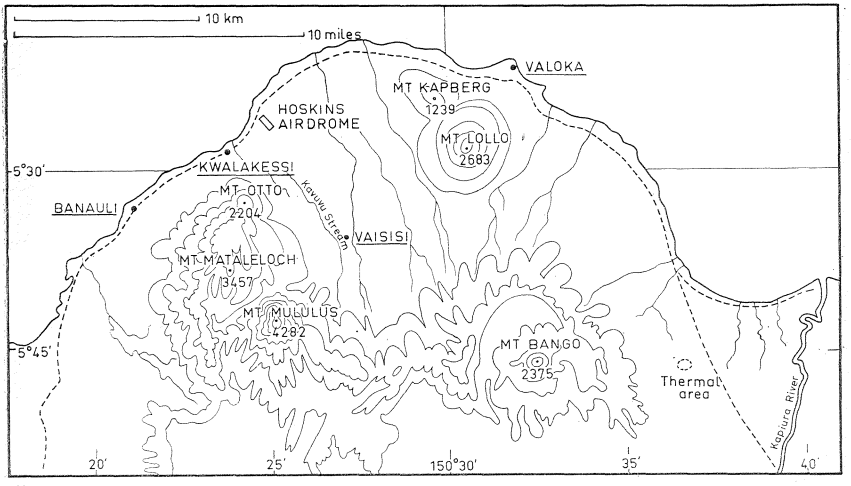

Fig. 11. Cape Hoskins Area, New Britain.

B. DUKE OF YORK.

M a n u a n. 18—21 July.

Village at the north coast. Mixed vegetation with small patches of primary forest. Berlese samples Nos. 84—94, secondary forest.

C. NEW IRELAND.

1. N a g o I s l a n d near Kavieng. 13 Jan.

Coconut plantation and shrub along the shore.

A few insects caught in the town of Kavieng at various dates from January to March.

2. D a n u, K a l i l i B a y. 3 April and 29 April—2 May.

Coconut plantations along the entire shore. Primary forest on abruptly rising hills behind. Many streams and brooks (Freshw. Sts. 2—12).

3. L e m k a m i n, Lelet Plateau. 900 m a.s.l. 5—23 April.

Village (about 100 inhabitants) situated on the plateau in a rather large, cleared area totally surrounded by forest. Berlese samples Nos. 29—32 from primary forest, 1200 m a.s.l., Nos. 33—40 from mixed vegetation. Malaise traps in various places. Robinson light trap operated in the village.

D. DYAUL.

1. S u m u n a. 1—13 March.

Village located close to Lamatau Harbour on the central part of the north coast. Mixed vegetation; also good primary forest, especially on the hill, Bendermann Berg (200 m a.s.l.) near Sumuna. Berlese samples Nos. 1, 3, 5—7 from primary forest, No. 2 from grassland, and No. 4 consisting of soil among coral blocks. Malaise traps operated in a coconut grove and in primary forest. Robinson trap in the village and onboard the ship. See also the notes (p. 288) concerning the fauna of Dyaul in relation to other islands in the Bismarck area.

2. K o l l e p i n e. 12 March.

At the western part of the north coast. Mixed vegetation. Berlese samples Nos. 8—10 from original forest.

E. LAVONGAI (New Hanover).

1. B a n a t a m. 16—26 March.

Behind the village situated at the coast, extensive gardens are found, surrounded by primary forest (Berlese samples Nos. 15—28). Some mangrove swamps present (Berlese samples Nos. 11—14). Malaise traps in the gardens and in the forest rand. Robinson trap in open area behind the village.

F. MUSSAU (St. Matthias Group). (Fig. 12).

1. T a l u m a l a u s. 17 Jan.—10 Feb.

Camp situated close to a small river, at the waterfall. Primary forest around the camp, and almost all collecting took place in this biotope. Both Malaise trap and Robinson trap operated, the latter close to the stream. Berlese samples a-c from primary forest.

2. B o l i u. 13—15 Feb. and 3—7 June.

Collecting in mixed vegetation around the Mission station and at neighbouring localities (Eabarae, Erigana) at the coast of Schadel Bay. Also visits to primary forest. Berlese samples Nos. 51—56 from mixed vegetation.

3. S c h a d e l B a y. 13—15 Feb. and 3 June.

Robinson trap operated onboard the ship at anchor off Boliu.

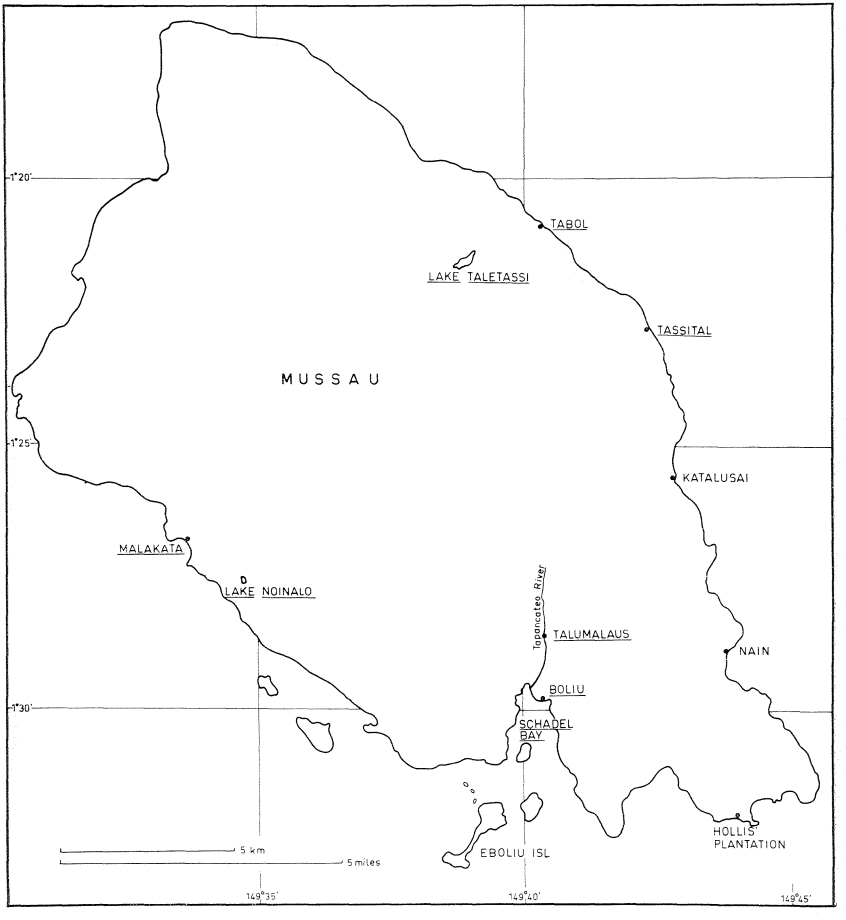

Fig. 12. Mussau Island.

4. Malakata. 15 Feb. and 9—12 June.

Mixed vegetation around the village situated at the coast. Berlese samples Nos. 57—61 from primary forest.

5. Lake Noinalo. 8—11 June.

Collecting in mangroves and primary forest around the lake. Freshw. Sts. 34—40. See Wolff (1966) for details.

6. Lake Taletassi. 4—7 June.

Freshwater investigations, see details in Wolff (l.c.), Sts. 28—33. Also collecting in primary forest near the lake and in an open area near camp (former lake bottom).

7. T a s s i t a l. 3 June.

A few insects collected in the village and secondary forest close to the sea.

8. T a b o l. 4 June.

Freshw. St. 27, a spring near the sea. Some collecting in a coconut grove at L i u r a k a, a village nearby.

9. E m a n a n u s a I s l a n d. 29 Jan.

About 12 km SW of Schadel Bay. Vegetation consisting of coconut palms, low shrub, and extensive mangroves.

G. MANUS (Admiralty Islands).

1. L o r e n g a u. 14—25 June.

Collecting took place near the town and at the camp situated about 4 km SW of the town, at Lorengau River near a waterfall. Mixed biotopes from open coastal plains to original forest at the camp. Lorengau River and the L i e i River, W of Lorengau, were examined together with small brooks and ponds (Freshw. Sts. 44—65). Berlese samples Nos. 62—71 from primary forest. Malaise traps operated in secondary forest at the camp.

2. L o m b r u m. 29 June.

Collecting in secondary forest around a dammed lake (Freshw. St. 69).

3. P a p i t a l a i L a g o o n (near Lombrum). 29 June.

Collecting in shrub near a small lake, located close to the sea (Freshw. St. 70).

H. LUF (Hermit Islands). 26—27 June.

This is the largest island in the atoll (5.7 km long, 1—2 km wide). Heights up to 250 m with remains of primary forest. Otherwise secondary shrub and coconut plantings.

III. **Solomon Islands.**

A. GUADALCANAL.

1. H o n i a r a. 25 July—4 Aug.

Collecting on grass-covered hills behind the town and in small valleys with remains of primary forest marked by drought (Ber-

lese samples Nos. 95—101). West of Honiara collecting in a luxuriant primary forest about 17 km from the town and about 10 km from the sea. Freshwater investigations in the B o n e g i Stream (Sts. 89—90) and in P o h a River 10—12 km from Honiara (Sts. 88, 91, 92).

B. RENNELL.

1. N i u p a n i. 17—31 Aug.
2. H u t u n a. 24 Aug.
3. T u h u g a g o (= Te-Uhungango). 2 Sept.
4. K a g a b a (= Kanggava). 2 Sept.

Details of the investigations in Rennell (centered around the lake Te-Nggano) are in preparation and planned to be published by Wolff in »The Natural History of Rennell Island« vol. 5 (Copenhagen).

Results.

After the return of "Noona Dan" to Copenhagen in December 1962 and the final preservation of collected material completed, counting (or probable estimates) show that about 138,000 land-arthropods were collected (Table 2). This is no doubt a low estimate and species found in very large numbers are not fully included (apart from Acari, and in part, Collembola). More than 125,000 of the specimens are insects.

The general collecting results were by no means as good as estimated beforehand. This is probably partly due to an over-estimation of the richness of tropical regions, but it is also explained by the fact that rather a large number of days were wasted in various ways. As several localities were visited it could not be avoided that a great deal of time was spent in sailing, packing and un-packing, talks with authorities etc. Thus, results can not be compared to those of an expedition remaining in one area the whole time. Several working days were also lost because of unforeseen situations; almost three weeks in the Philippines were wasted in this way. In fact, only 93 days were spent in serious collecting of insects during the total number of 135 days the expedition was in the Philippines. In the Bismarck-Solomon area about 165 days were good working days out of a total of 235 days in these waters.

Table 2.

The approximate composition of the collected material.

	The Philippines		The Bismarck and Solomon Islands	
Diplopoda		65		470
Chilopoda		15		100
Arachnida		1.466		9.459
Scorpiones	25		16	
Pseudoscorpiones	11		200	
Pedipalpi	20		8	
Opiliones	10		185	
Araneae	1.300		2.950	
Acari	100		6.100	
Insecta		61.188		65.430
Thysanura	20		2	
Diplura	1		40	
Protura	0		110	
Collembola	200		4.200	
Ephemeroptera	6		150	
Odonata	310		1.200	
Plecoptera	13		0	
Orthoptera	1.225		1.400	
Phasmida	25		100	
Dermaptera	60		250	
Embioptera	2		0	
Blattodea	310		260	
Mantodea	115		40	
Isoptera	100		800	
Zoraptera	0		1	
Psocoptera	150		170	
Mallophaga	10		300	
Siphunculata	0		100	
Homoptera	4.250		3.750	
Heteroptera	2.750		3.800	
Thysanoptera	45		45	
Neuroptera	70		110	
Lepidoptera	20.800		16.700	
Trichoptera	400		500	
Diptera, Nematocera	4.250		4.000	
Diptera, Brachycera and Cyclorrapha	8.150		13.000	
Siphonaptera	1		2	
Hymenoptera (excl. Formicidae)	7.200		3.800	
Hymenoptera, Formicidae	3.500		4.600	
Strepsiptera	25		0	
Coleoptera	7.200		6.600	
Total		62.734		75.459

It appears from Table 2 that almost all orders of insects were caught. Only Grylloblattodea and Mecoptera are absent, but they have never been found in these regions. Some orders, e.g., Embioptera and Zoraptera, which are poorly represented in collections, are likewise in the Noona Dan material represented by only a few specimens. These, nevertheless were caught on occasion. Strepsiptera were not collected in the Pacific area, although this group was not uncommon in the Philippines in light traps. Thysanura were collected in very low numbers in the Bismarck and Solomon Islands compared to the Philippines. On the other hand Araneae seem to have been less abundant in the latter area.

A comparison of the number of Diptera and Hymenoptera caught in the two areas shows that a much larger number of Diptera were caught in the Bismarck and Solomon Islands than in the Philippines, whereas the situation is reversed in the case of the Hymenoptera. This striking fact may be explained, in part, by the various interests of the collectors. The dipterologist, Mr. Lyneborg, collected in the Bismarck Islands, whereas the author, more interested in Hymenoptera, collected in the Philippines, but even so, this does not account for all the discrepancies, probably.

Other differences between the two areas are probably mainly explained by the methods used. Large numbers of small arthropods such as Collembola and Acari were caught by the Berlese funnel method, which was also responsible for almost all Pseudoscorpiones, Diplura and Protura, and the use of this method in the Bismarck-Solomon area explains the differences in these groups. The over-weight in freshwater groups and groups of arthropods living on the ground (probably also parasites on birds and bats), are also mainly explained by greater collecting activity of these animals in the Bismarck and Solomon Islands. However, the sampling of these kinds of arthropods is often rather time-consuming and other groups was therefore partly neglected. The result of this shift in collecting interest, strongly increased by lesser use of traps, was a small amount of captured specimens in some orders, e.g., Lepidoptera, compared to the results from the Philippines.

As mentioned in the introduction the first entomological results of the expedition are already published in the present journal (Spencer 1965; Browne 1966; Drake 1966; Petersen 1966) or elsewhere (Taylor 1965; Delfinado 1966; Sasakawa 1966). Several are

either in print or awaiting publication. At writing time 6,443 specimens are treated. The number of species recognized are 631, 428 species from the Philippines and 247 species from the Bismarck and Solomon Islands (some are common to both regions), and out of these no less than 120 species (19 per cent) are described as new to science. Moreover, a number of species are not named because of insufficient number of specimens. This means that the average number of specimens per species is about 10, and on average a new species is found after examination of nearly 55 specimens. These averages have been rather consistent from first results, but may of course be altered as more groups are included. If they hold good about 12,500 species of insects may be recognized in the Noona Dan collections, and out of these more than 2,250 new species.

So far only one new genus is erected on basis of the material examined, but it is known that other material under study contains comparatively more taxa above species level. As far as is known the most interesting insect caught is a specimen for which a new family in the Hymenoptera will probably have to be erected.

No attempt has yet been made to evaluate the zoogeographical significance of results so far at hand. Such an undertaking has very little meaning unless other sources are also taken into consideration. However, a large number of species are not only new to the fauna of individual islands, but also often to the two areas investigated, and some species are new to the zoogeographical region in question.

It is therefore obvious that the Noona Dan Expedition will contribute much that is new to the knowledge of the fauna of the Philippines and the Bismarck and Solomon Islands. Although the efforts of the expedition were small compared to other projects going on in almost the same areas, the results may prove to be relatively high. For example, areas in the centre of zoogeographical interest were visited, e.g., the border between the Malayan and the Philippine subregions and the outposts of the Papuan region, where also interesting problems concerning the composition and the evolution of the fauna of isolated islands could be studied.

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Summary.

A brief report of the Danish "Noona Dan" Expedition is presented, with special reference to entomology. It contains an annotated locality list, various maps etc. and short notes on equipment and methods, especially the use of traps, and the results are commented in general. The expedition went to the Philippines (Palawan, Balabac, Tawi Tawi, and Mindanao), the Bismarck Islands (New Britain, Duke of York, New Ireland, the very interesting Dyaul Island, Lavongai, and the more out-lying islands of Mussau, Manus, and Luf, Hermit Isls.), and to two places in the Solomon Islands (Guadalcanal and Rennell). Five entomologists participated at various times. About 138,000 land arthropods (more than 125,000 insects) were collected from the middle of August 1961 to September 1962. More than 6,000 specimens of various groups of insects are already studied. Results show, that the collection may contain on average one species for every 10 specimens collected, and one species new to science for every 55 specimens. Thus, almost one fifth of the species found are new species. A considerable number of species is new to the areas investigated and add much to the knowledge of their zoogeography.

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