Aethriamanta gracilis is new to the Philippines: 4 ♂, Sulu Archipelago, Tawi Tawi group, Tawi Tawi island, Tarawakan (alt. 100 m), 22/26-VI-1992, C.G. Treadaway & Th. Borromeo leg.

Agrionoptera bartola is a dubious species, described from a (single?) female. No designation of the holotype and no locality data were given!

The wide ranging Agrionoptera insignis has been divided into several subspecies, of which at least quatuornotata Brauer and similis Selys have been listed from the Philippines. The material available in coll. Müller from various islands looks quite uniform, but the infraspecific status is left open at the moment.

This Palawan taxon, mentioned already by RIS (1909, p. 99), was listed by LIEFTINCK (1974) as “Diplacina bolivari subsp.?” We have plenty of new material of both sexes. A thorough revision of the genus could clarify whether the Palawan taxon would deserve the status of a good species.

Lathrecista asiatica. We have not attempted to place the Philippine specimens into any of the many subspecies of this widespread species (cf. LIEFTINCK, 1974).


According to WATSON (1984), the Philippine populations conventionally considered as Orthetrum s. sabina apparently represent two distinct species: the true sabina and another species, conspecific or nearly related to O. serapia Watson, 1984. WATSON (1984) lists sabina from “Philippines” without further data, and the other taxon from “Luzon” and “Palawan”. Coll. Müller contains 341 Philippine “sabina” specimens from 26 islands. We have not attempted to analyze them in this respect, but list here all records as sabina.

Rhyothemis obsolescens is new to the Philippines: all material from Mindoro, Mindoro Oriental, Mt Halcon: 1 ♂, 1 ♀, Barrio Luyang (alt. 360-500 m), 14/17-VI-1991, R.A. Müller leg.; 1 ♂, Calopan, Nao-jan, Barrio Boliti (alt. ca 1500 m), VI-1991, N. Mohagan leg.; 2 ♂, 1 ♀, Budlungan, Bukayao River (alt. 700-1000 m), 20/31-V-1991; 1 ♂, Calapan (alt. 500 m), 5/15-VI-1992, N. Mohagan leg. As in case of R. triangularis this is a considerable extension of its known range.

Rhyothemis phyllis subphyllis. The subspecific status of the Palawan populations remains open (see LIEFTINCK, 1974). However, our specimens from Palawan and the Sulu Archipelago look quite similar to those from the Philippines proper.
Rhyothemis triangularis was reported as new to the Philippines by MÜLLER (1989) from Palawan. Later it was found to be more widespread in the archipelago. The dark area in the wings is considerable more extended than in continental Asian specimens. In the hind wings the dark area extends to the level of the nodus, in the fore wings it extends 1-2 cells proximal to the nodus, which is furnished with a dark spot in most specimens.

Tramea rosenbergi was reported as new to the Philippines by MÜLLER (1989) from Mindanao. Later it has been found at Nueva Vizcaya in Luzon and in western Samar.

Trithemis adelpha is a problematic taxon, the type locality of which is the Philippines. It has been considered conspecific with aurora. LIEFTINCK (1974) raised again the question whether “aurora will prove to be composed of two nearly related, yet distinct, taxa”. - In Cebu, M.H. collected aurora and adelpha simultaneously at the same site. Their co-occurrence is known also from other localities in Basilan, Panaon and Samar. Especially impressive is a long series of the larger adelpha males and females, collected together with aurora in Samar. Since no intermediate specimens of these “forms” appear in the large material of aurora/adelpha complex in coll. Müller (384 ♂, 115 ♀) and the differences are distinct in both sexes, we are tempted to believe that two really distinct species occur in the Philippines, often side by side. T. adelpha may have a smaller range in the archipelago. Since adelpha-like specimens have been reported also elsewhere, the variability of aurora throughout its wide distribution should be carefully studied.

NEEDHAM & GYGER (1937) listed a female specimen of Zygonyx ida Selys, 1869 from “Luzon” without any other collecting data. The identity of the specimen should be checked and further material should be found to confirm its occurrence in Luzon.

UNCONFIRMED OR INCORRECT RECORDS

The following species, reported from the Philippines, were not included in the above checklist:
- Pseudagrion crocops Selys, 1876. A specimen reported from the “Philippines” by de SELYS LONGCHAMPS (1882), without any other data (see MÜLLER, 1996).
- Pseudagrion decorum (Rambur, 1842). A ♀ specimen listed by de SELYS LONGCHAMPS (1891) from Luzon, certainly misidentified (see MÜLLER, 1996).
- Libellago l. lineata (Burmeister, 1839). For some reason this species was included in NEEDHAM & GYGER (1939), although furnished with comment “not yet reported from the Philippines”. TSUDA (1986, 1991) included the species in his Philippine list.
- Anax parthenope julius Brauer, 1865 was listed by de SELYS LONGCHAMPS (1891) from “Ilocin” (Luzon). Although NEEDHAM & GYGER (1937) referred to this record, LIEFTINCK et al. (1984) and TSUDA (1986, 1991) did not include the Philippines in the range of this species.
- Anax gibbosulus Rambur, 1842 was listed by NEEDHAM & GYGER (1937) from Luzon. Probably A. panybeus.
- Anax n. nigrofasciatus Oguma, 1915. Listed by TSUDA (1986, 1991) from the Philippines, but no
Synopsis of the Philippine Odonata

Macromia gerstaeckeri Kruger, 1899. Listed by NEEDHAM & GYGER (1937) on the basis of an inadequately labelled, incomplete specimen. Its occurrence in the Philippines is unlikely.

Idionyx yolanda Selys, 1871. Listed by LIEFTINCK (1939b) on the basis of a specimen from Basilan. M.H. has reidentified this specimen at RMNH as I. philippa.

GENERAL INFORMATION ON THE PHILIPPINES

The Philippines consist of 7107 islands, situated between the latitudes 5° and 21° N (from North to South ca 1900 km) and 117° and 121° E (from West to East ca 1100 km). The total land area is 299 404 km². Most of the islands are very small, merely rocks, and only a little more than 500 are larger than 1 km².

CLIMATE. – The Philippine climate is tropical. The weather pattern is rather complex and influenced by monsoons. The seasonality of the dry and wet season throughout the archipelago is presented in Figures 3-4. Typhoons, which are formed on the Pacific, occur over the northern parts of the archipelago usually from June to November, causing occasionally large devastation and making the travel difficult. Roads and bridges may be flooded away and remote areas or mountain sites may be blocked for weeks. Although some of the rarest dragonfly species might be found only during the wet season, the overall conditions for travelling and collecting can be too detrimental. In spite of own experience, it is difficult to state the best time for dragonfly collecting. May and June are quite good months to visit many islands. However, each season can be profitable, since different species occur in different periods. In order to study the phenology more precisely, the same site should be visited during different seasons.

DEFORESTATION. – Biologists involved in studies on the rich and geographically highly interesting Philippine fauna and flora, follow with increasing alarm the continuing and intensive destruction of the primary rain forest. It is an obvious danger that the whole archipelago will be cleared of most of its natural forest cover before a reasonable knowledge of its species diversity can be obtained. The original rain forests are destroyed in an increasing tempo. The second author’s two visits to Sibuyan Islands witnessed this alarming and rapid change. In 1986, the almost intact rain forest surrounded the Pawala River and continued almost to the mountains (Fig. 5), in 1987 it was largely destroyed (Fig. 6).

The destruction starts when the authorized forestry companies make roads to forest areas and cut down the commercially valuable trees. The roads enable settlers to arrive, who cut more trees for their houses, furnitures and other necessities. When the forest is depleted from the useful trees, it is burned down (“kaingin”). The burned areas remain suitable for cultivation only for a short time, since the thin humus layer wears out in a few years. The soil erodes or is covered by cogongras or secondary forest. This vegetation is useless for animals and plants, dependant on primary rain forests.

A considerable number of national parks, wildlife sanctuaries and other protected areas have been established in the Philippines. However, most of them are continuously encroached by the growing population and affected because of the inadequate law enforcement.

CHARACTERIZATION OF THE ISLANDS, WITH LISTS OF SPECIES

Luzon region

Main islands: Luzon, Catanduanes, Marinduque, Polillo, Burias, Babyan Islands, Batan Islands.

Dragonflies: 144 species.
Luzon, the largest of the Philippine islands, is characterized by a great variability of landscapes. In the North the Cagayan Valley separates the Central Kordillera, known for its famous rice terraces, from Sierra Madre mountains, which range from Escarpada Cape in the northeastern corner of the island to Laguna de Bay in the South. The wide plateaus of Cagayan Valley are extensively cultivated. A still larger plateau, extending from Laguna de Bay northwest to Lingayen Gulf on the west coast, is densely populated and divided by numerous roads. It separates the Central Cordillera in North and Sierra Madre in the East from the volcanic Zambales mountains in the West, which include the continuously active Mt Pinatubo (1754 m). The two plateaus were once covered by a dense lowland rain forest, of which practically nothing is left any more.

Southern Luzon is a mosaic of small lowland patches and separate volcanoes or volcano chains, of which Mt Mayon (2462 m) is at present very active. The others, like Mt Labo (1544 m) and Mt Isarog (1966 m) have been inactive for a long time and are partly still covered by the original dipterocarp forest.

The largest remaining rainforest areas in Luzon are in the Central Cordillera and Sierra Madre mountains. The highest peaks in Sierra Madre rise up to 1200-1905 m. They descend steeply towards the Pacific Ocean and safe harbours are few. Thus the eastern coast is very sparsely populated and difficult to enter. The peaks in Central Cordillera are higher, the highest of them Mt Pulog reaches 2934 m.

Luzon is the most frequently visited island of the Philippines. A large proportion of all Philippine dragonfly records in literature comes from Luzon. We are aware of dragonfly records from practically all provinces in Luzon, although the great majority of them come from the central provinces near Manila, particularly from Laguna province. At least 86 species have been found in Laguna province, most of them from Mt Maquiling and Los Baños, which is the type locality of many species described by Needham & Gyger. At least 46 species are known from Quezon province. Also over 40 species are known from "Manila"; most of those which are confined to clean streams have certainly disappeared by now. In general, the northern and southern provinces are rather poorly studied, e.g. we know only 15 spe-

Fig. 3. Precipitation and prevailing winds in January.

* Those species, which are not present in coll. Müller from the island in question are asterisked (*).
Species from Sorsogon, the southernmost province, and 14 species from Camarines Sur, the region of the interesting mountains: Mt Iriga and Mt Isarog.

Boettcher collected extensively in Luzon in 1914-1918. His material (849 specimens of 72 spp.) comes from a dozen provinces, from Sorsogon in the South to Ilocos Sur in the North.

Most of the roughly 3400 specimens in coll. Müller (representing 87 species) comes from the northcentral provinces Nueva Vizcaya and Nueva Ecija, where the second author has collected in June 1985 and June 1991. Especially A. Gorostiza has also contributed many specimens from there. We know a total of 46 and 25 species from these provinces. A fair amount of Müller’s specimens (35 spp.) come also from Quirino province in the central part of Sierra Madre, where C.G. Treadaway and Th. Borromeo visited in May 1990 and April 1991 and Celso M. Nazareno in August 1996. Smaller lots come from Mountain, Ifugao, Benguet, Aurora, Bulacan, Bataan, Cavite, Laguna, Rizal and Quezon provinces, from various collectors. From the deep South we have unfortunately so far no material.

**PLATYSTICTIDAE:** Drepanosticta annulata, D. halter-ata, D. philippa, D. trimaculata, Drepanosticta sp.n., Drepanosticta sp. n., *Drepanosticta* sp.n., Drepanosticta sp. n., Drepano-sticta sp. /spp. (?), Protosticta sp. n., Protosticta sp. n. –


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Fig. 4. Precipitation and prevailing winds in July.
LESTIDAE: *Lestes concinnus, L. praemorsus.
AMPHIPTERYGIDAE: *Devadatta sp.
CHLOROCYPHIDAE: Cyrano unicolor, Rhinocypha colorata, R. turconii.
EUPHAEIDAE: Euphaea refulgens, Heterophaea barbata.
CALOPTERYGIDAE: Neurobasis l. luzoniensis, Vestalis melanias.
CHLOROGOMPHIDAE: *Chlorogomphus splendidus.

CATHEDUANES ISLAND
1431 km², 18 species

This island is located W from Camarines Sur province in SW Luzon. It is separated from Luzon by 6.5 km wide and ca 80 m deep Maqueda channel. The island is hilly with many rivers and streams. The highest point is 898 m. A mountain chain stretches from N to S through the western part of the island. A smaller chain covers the eastern side of the island, which is almost yearly hit by typhoons.

In lowlands coco palms, abaca (Musa textilis) and rice are cultivated. Cogongrass covers the deforested hills and mountain slopes.

Already GONZALES (1983) reported that most of the forests were destroyed or badly damaged. According to Alex Buenafe, who visited the island in June 1996, a few forest patches still exist be-

Figs 5-7. Deforestation in the Philippines: (5) View from Camp “New St. Gallen” on the Pawala River (alt. 50-70 m), Sibuyan, July 1986. In the background Mt Guiting Guiting (2050 m). Dense forest still covers the mountain slopes, the habitat for some rare endemic species, like Risiocnemis kiautai. (Photo Roland A. Müller); (6) Camp “New St. Gallen” on the Pawala River in March 1987. Only 8 months earlier the site was covered with intact rainforest (cf. Fig. 5). (Photo Roland A. Müller); (7) Logged forest in the surroundings of Sibutu Hill in Sibutu Island (July 1990). The porous coral ground is clearly visible. After the trees have been cut, the thin humus layer is rapidly carried away by rainwater (Photo C.G. Treadaway).
tween Gigmoto and Viga. We do not know the present situation at Caramoran, Manamag and Virac, which GONZALES (1983) mentions in his report.

A. Buenafe's dragonfly collection, made in June 1996, contains ca 450 specimens of 18 species. The fauna shows resemblance to that of southern Luzon.


MARINDUQUE ISLAND
898 km², 27 species

There are no high mountains in this almost round island; the highest peak, Mt Malindig, in the South reaches 1157 m. The island is densely populated and the rain forests are almost destroyed, only a few patches are left.

No published dragonfly records are known to us. Our knowledge is based exclusively on the ca 400 specimens in coll. Müller, most of which have been collected in the southern part of the island by V. Francisco, in February 1993.


POLILLO ISLAND
605 km², 17 species

Polillo Islands are located eastwards from the Central Luzon. Polillo is the largest of the group. It is mostly flat with smooth slopes. The highest point is 345 m in the southern part of the island. According to secondhand information through some Philippine businessmen, the island is largely deforested and cultivated. A few small forest patches appear to be left on the higher slopes in the South. Much of our knowledge is based on the small collection (26 specimens), made by Boettcher in August 1915.


AESHNIDAE: *Anax guttatus*, *Gynacantha* sp. – LIBELLULIDAE: *Camacinia gigantea*, *Cratilla lineata assidua*, *Lathrecista asiatica*, *Orthetrum chrysis*, *Raphismia bispina*, *Rhodothemis rufa*, *Tetraphemis irregularis*. 
Mindoro region

Main islands: Mindoro and Lubang.

Dragoflies: 77 species.

MINDORO ISLAND
10 245 km², 77 species

Mindoro is a compact island just S of Luzon. The island is divided by a broad mountain range. The highest peak, the impressive Mt Halcon (2582 m), is situated 35 km SW from Calapan. Mt Baco (2363 m), in the central part of the island, belongs to Mt Iglit-Mt Baco Wildlife Reserve, which provides the only refuge for the Tamaraw (Bubalus mindorensis) against extinction.

In Mindoro extensive forests still cover the higher elevations. However, cultivation extends already over the foothills, and the future of the remaining forests looks grim. If the exploitation continues at the present rate, the remaining forest is to disappear within a few years.

Records in literature are rather scanty, some 15 species have been listed in various publications, most of them from Naujan. Boettcher collected in Calapan-San Teodore area in January 1916 and in Mangarin in November 1917, and gathered 83 specimens (21 spp.). Müller’s dragonfly material (ca 2000 specimens of 60 species) comes mainly from Mt Halcon, where the second author stayed in May 1991. Later A. Gorostiza, N. Mohagan, F. Venus and C.G. Treadaway have collected there at various times in 1991-1993. Mt Tarugin, W of Lake Naujan was visited by A. Gorostiza twice in 1990. Mindoro seems to be rich in libellulids. Rhythemis obsolescens has not yet been recorded from the other Philippine islands.


West Visayan region

Main islands: Panay, Negros, Cebu, Masbate, Tablas, Guimaras, Sibuyan, Siquijor, Ticao, Romblon.
Dragonflies: 67 species.

PANAY ISLAND
12 327 km², 34 species

A 140 km long and 35 km broad mountain chain extends through the whole western part of the island. The highest peak, Mt Madja-as (2117 m), is situated 12 km from Culasi near the W coast. The eastern part of the island is mostly lowland with gently sloping hills. The eastern parts are heavily overpopulated and all original forest have changed to culture steppe. Primary forest is restricted to the higher mountains, and only small remnants of the lowland forests are left. The highest peaks are covered with mossy forest.

Literature records from Panay are very scanty. Coll. Müller contains so far ca 450 specimens of 32 spp. from a dozen localities in Antique and Iloilo provinces (collected by Th. Borromeo in 1987, F. Mohagan in 1992-1993, Karel Cerny in 1991 and A. Buenafe in 1994-1996). Thus, the species list is still far from complete. Politically active rebels have their hide-outs in the mountain forests, which prevents all collecting activity in the most interesting areas. The Panay fauna appears similar to that of Negros. Neurobasis luzoniensis subpicta was also recorded here.


NEGROS ISLAND
9225 km², 40 species

Two high volcanos, Mt Canla-on (2465 m) in the N and Cuernos de Negros (1870 m) in the S give Negros a special charm. They are part of a rugged mountain chain, which extends through the whole island. The northwestern part of the island is a lowland region, which ascends smoothly towards the mountains. Ricefields characterize the lowlands and sugar-cane plantations the foothills. Tablas highlands at the altitude of 500-700 m in the SW is watered by numerous forested canyons. Original dipterocarp rain forest still covers the highest mountain slopes, changing to mossy forest in the highest peaks. In extreme deep and unpenetrable gorges the forest has remained intact also at low elevations.

Literature data on Negros dragonflies are scanty, only a few species have been listed before Müller's
material became available. It consists of some 2000 specimens, representing 37 species. Much of it comes from Mt Canla-on in the northern half of Negros, where A. Buenafe has been active since 1987. Other sites studied include Mt Talinis (C. Treadaway & Th. Borromeo, 1982 and 1985), Mt Bunga (A. Buenafe, 1990-1991) and Mt Mandalagan and Mt Balapag (F. Mohagan, 1992-1993). R. Müller visited some localities at Mt Silay in May 1996. From other regions the material is very scanty.


CEBU ISLAND
5088 km², 32 species

Cebu Island makes a hopeless impression to every naturalist. Almost bare and completely dried-up hills and rocks dominate the landscape. All slopes are covered with cogon grass. Stream-dwelling dragonflies are uncommon in Cebu, since the completely deforested river- and streambeds do not provide proper habitats. No original intact forests are left, but a few patches of dense secondary forest, like that at Camp Seven in Minglanilla area still harbour a few real “forest damselflies”, including an Amphicnemis species.

In the literature 21 species have been listed, many of them collected already by Semper. PLATEROS (1972) added several libellulids to the Cebu list. Our Cebu material includes ca 950 specimens (28 spp.), the bulk of them collected by W. Catal in 1988-1989. Also Th. Borromeo did some collecting, and both authors visited Cebu in May 1991.


MASBATE ISLAND
4047 km², 27 species

In Masbate, the lowland and hilly regions alternate, but there are no prominent mountains. Rain forests were reduced to a few km² on the highest hills. Cattle breeding (with herds as large as 4000 head) and rice cultivation provide the main means of livelihood.

There are no earlier dragonfly records known to us until Th. Borromeo collected nearly 250 specimens from northern and central parts of the island in 1987 and 1993.

**PROTONEURIDAE:** Prodasineura integra. –**COENAGRIONIDAE:** Agriocnemis femina, Amphi cnemis sp., Ischnura senegalensis, Pseudagrion pilidorsum, Teinobasis corolla, T. olivacea, T. samaritis. –**PLATYCNEMIDIDAE:** Risiocnemis rolandmuelleri. –**MEGAPODAGRIONIDAE:** Rhinagrion philippinum. –**CHLOROCYPHIDAE:** Rhinocypha colorata.

**CORDULIIDAE:** Heteronaias heterodoxa. –**LIBELLULIDAE:** Crocothemis servilia, Diplacina bolivari, D. braueri, Lathrecista asiatica, Neurothemis ramburii, N. terminata, Orthetrum chrysis, O. sabina, O. testaceum, Potamarcha congner, Raphismia bispina, Tetrathemis irregularis, Trithemis aurora, T. festiva, Zyxomma obtusum.

TABLAS ISLAND
686 km², 1 species

Practically all rain forest has already disappeared in Tablas, as also in Romblon. Thus, the view is almost desperate to a naturalist, especially during the dry season. Water in streams is brown. Stream banks lack low vegetation, the only green present are the coconut trees. The smallest streams have completely dried up.

No dragonfly records in literature. On his way home from Sibuyan in 1986 the second author collected one species near the airport.

**LIBELLULIDAE:** Pantala flavescens.

SIBUYAN ISLAND
449 km², 37 species

In Sibuyan untouched and wide rainforest still exists, also in lowland regions. Mountain slopes and gorges are usually steep and rough, especially on Mt Guiting Guiting (2057 m), the highest mountain in the island (Fig. 5). On the highest slopes of Mt Guiting Guiting the dipterocarp forest changed into lower mossy forest. From the coastal lowland regions and foothills the forest has already been cleared to cultivations. Zoologically and botanically the island is interesting due to remarkable endemics.

There are no earlier records known to us. The second author and his collaborators collected a total of ca 550 specimens, in areas around Mt Guiting Guiting in August 1986 and in April 1987, altogether during 6 weeks.

**PLATYSTICTIDAE:** Drepanosticta sp.n., Drepanosticta sp.n. –**COENAGRIONIDAE:** Agriocnemis femina, A. pygmaea, Amphi cnemis sp.n., Argiocnemis rubescens intermedia, Ischnura senegalensis, Pseudagrion pilidorsum, Teinobasis samaritis, Xiphagrion cyanomelas. –**PLATYCNEMIDIDAE:** Risiocnemis kiautai, R. roland-
muelleri, R. plebeja. — CHLOROCYPHIDAE: Rhinocypha colorata.

Siquijor Island
336 km², 19 species

Siquijor is located in the Bohol Sea, eastwards from the southern Negros. Mt Malabahoc (628 m) in the central part and Mt Cudtingan (466 m) in the northern part dominate the landscape. As all other small islands, Siquijor is largely cultivated and remnants of rain forest remain only in the highest and steepest slopes. During the rainy season, heavy downpours feed numerous small streams descending to the sea.


Ticao Island
334 km², 13 species

Ticao Islands belongs to Masbate province. It is located between Masbate and the southernmost tip of Luzon (Sorsogon province). The 43 km long and 15 km broad island is, in spite of poor transport conditions, largely cultivated. There are no high mountains, the highest peak (405 m) is in the NW and it still contains a few disturbed forest patches.

No records in the literature. A small collection (117 specimens) was made by Th. Borromeo in March 1993. It consists mainly of common species.

COENAGRIONIDAE: Agriocnemis femina, Ceriagrion lieftincki, Pseudagrion pilidorsum, Teinobasis corolla, T. olivacea, T. samaritis.
LIBELLULIDAE: Diplacodes trivialis, Neurothemis terminata, Orthetrum chrysis, O. sabina, O. testaceum, Pantala flavescens, Potamarcha congener.

Mindanao region/Eastern Visayan subregion

Main islands: Samar, Leyte, Bohol, Biliran, Panaon, Camotes Islands, Homonhon.
Dragonflies: 100 species.
The fate of the dipterocarp forest in Samar is similar as in Negros and Panay. Large areas have been deforested and changed to cultivated land or steppe. The hills are covered mostly by cogon grass, the virgin dipterocarp forest is restricted to the mountainous interior, which is rather difficult to enter. There are no high mountains in Samar, the highest peak Mt Capotoan in the northern part of the island reaches 846 m.

Literature contains only a few records from Samar; 12 species have been reported. Boettcher collected 78 specimens (19 spp.) in Catbalogan in April 1915. Müller's material (ca 650 specimens of 63 spp.) comes from a few localities. Most of the specimens were collected in Hinabangan, San Rafael (Th. Borromeo and C.G. Treadaway, 1992), at Oras and in eastern Samar (Th. Borromeo, 1992-1994) and at San Isidoro in western Samar (Th. Borromeo, 1994). Further studies on this interesting island are urgently needed.


**LEYTE ISLAND**

6268 km², 58 species

Leyte is separated from Samar only by a very narrow strait and these islands form a close biogeographical unit. A long mountain chain divides the island. The highest peak is Mt Cancayan (1350 m). In the S there is a separate smaller mountain chain with lower peaks between Maasin and Bontoc. At the higher elevations intact dipterocarp forest still prevails. In the central and northern parts of the island, there are some mountain lakes, with rich vegetation between 700-1000 m. The northwestern and northeastern parts of Leyte are lowlands with gently sloping hills. These areas are cultivated and all forests have disappeared.

Besides the 15 libellulid species listed without further data from Leyte (PLATEROS, 1972), only a
few records are available in the literature, most of them from Saint Bernard area in the southern Leyte. During his travels, Boettcher stopped twice in Leyte, but he collected only a few specimens.

Müller's material from Leyte consists of ca 850 specimens of 48 species. Most of the specimens come from Mt Balocaue in central Leyte, where Th. Borromeo has visited several times in 1986-1994. A smaller amount of specimens comes from Mt Hapag and Mt Saint Bernard (by A. Buenafe in 1989-1990) in the South.


**BOHOL ISLAND**

4117 km², 33 species

Bohol is largely deforested and cultivated. Large areas are covered by dry bushland or cogon grass. Some forest patches remain in the northeasterm part, but most of the original forests are restricted to the mountains in the southern part of the island.

Already Semper visited Bohol, and subsequently some species were listed in the early literature, *Rhinagrion philippinum* being described from there. Altogether 22 species has been listed in the literature. Boettcher stayed a few days in Garcia Hernandez in July 1916, but collected only 3 species.

Müller's small collection (ca 100 specimens of 17 species) comes mainly from the mountains surrounding Sierra Bullones (W. Catal, April 1989). A few specimens were collected in Jagna by Th. Borromeo in March 1988 and by A. Buenafe in Pilar in March 1994.

**PLATYSTICTIDAE:** Drepanosticta belyshevi, *Drepanosticta sp.n. - COENAGRIONIDAE:** Agriocnemis femina, Amphinemis sp., *Ceriagrion lieftincki, Teinobasis filamentum. - **PLATYCNEMIIDAE:** *Coeliccia dinoceras, Risiocnemis appendiculata. - MEGAPODAGRIONIDAE:** *Rhinagrion philippinum. - **CHLOROCYPHIDAE:** Rhinocypha colorata.

**AESHNIDAE:** Anax panybeus. - **CORDULIIDAE:** Heteronaias heterodoxa. - **LIBELLULIDAE:** *Brachydiplax chalybea, B. duivenbodei, Crocothemis servilia,

BILIRAN ISLAND
498 km², 24 species

Relatively steep extinct volcanoes characterize this island. Mt Sayoa (1266 m) is the highest mountain. Also in Biliran, cultivation climbs steadily higher up on the forested mountain slopes, but there are still some good dipterocarp forests left on steep slopes and gorges high in the mountains. Biliran is located N of Leyte and the two islands are separated only by a narrow strait. Consequently, their faunas are similar.

Boettcher collected 3 species in Biliran in October 1915. In October-November 1992 Th. Borromeo visited two sites on Mt Sayoa and collected ca 200 specimens of 23 species.


PANAON ISLAND
202 km², 38 species

Panaon is separated from southern Leyte only by the 400 m broad Panaon strait. A mountain chain extends from N to S, the highest peak being Mt Jinauanan (851 m). Many of the higher slopes and gorges are still covered with untouched dipterocarp forest. However, also here penetrate the settlers deeper and deeper to the mountain forests and exploit these.

Only two species from Panaon have so far been listed in the literature. Boettcher collected 15 specimens of 6 species in November-December 1915. Müller’s material from Panaon consists of over 650 specimens representing 38 species. Most of them were collected by W. Catal in August and October 1988 and some more by Th. Borromeo in October 1990 and February 1991. This material shows that the fauna closely resembles that of Leyte.


CORDULIIDAE: Heteronaias heterodoxa, Idionyx philippa. – LIBELLULIDAE: Cro-

HOMONHON ISLAND
104 km², 47 species

Gently sloping hills characterize this small island between Dinagat and the southernmost tip of Samar. It contains rich deposits of chrome, which will soon be exploited. The northernmost part of the island with the highest hill (Mt Pumungan, 341 m) is covered with secondary forests or bush, in 1988 only ca 2 hectares of good rainforest was left at Inapulangan.

In 1980s the largest area of original forest in the island was in the southeastern part around Magellanes Point. A few months before Roland Müller’s visit in May-June 1988, this forest was nearly completely burned down, only 2-3 km² remained untouched. At present also this last patch is disturbed (F. Lagramada in litt. 1993). The four-week collecting activity at Magellanes Point and in Bitaugan area in 1988 shows well how rich the dragonfly fauna in the tiny island was. Even three different Amphicnemis species were found. The island should be studied again after a few years to find out what has been lost together with the last forests.

No earlier records are available in literature. Müller’s material includes ca 1100 specimens.


Mindanao region/Mindanao subregion

Main islands: Mindanao, Basilan, Dinagat, Siargao and Bucas Grande, Camiguin, Sarangani Islands.

Dragonflies: 134 species.
Mindanao is the second largest island of the archipelago. Its area was once largely covered with rain forests. Volcanic mountains and marshland dominate now the landscape. Some of the higher mountains are still covered by extensive rain forests, especially at higher elevations. Mossy forests prevail above 1000 m.

Mt Apo volcano (2954 m) on the boundary of North Cotabato and Davao del Sur provinces is the highest mountain in the Philippines. Its slopes contain many steamy sulphur springs. Other high mountains include Mt Katanglad (2938 m) and Mt Kalatungan (2865 m) in Bukidnon province, Mt Ragang (2815 m) in North Cotabato province, Mt Mayo (2621 m) at Kampalili range in Davao province, Mt Malindang (2425 m) in Misamis Occidental province, Mt Matutum (2295 m) and Mt Busa (2083 m) in South Cotabato province and Mt Hilonghilong (2012 m) at Diuata Range in Agusan del Norte province.

There are two wide lowland regions in Mindanao. Agusan River valley separates the Diuata mountain range in the northeastern corner of the island from the extensive Bukidnon highlands in central Mindanao. The other lowland region, Cotabato Valley, is surrounded by Mt Ragang range in the North, Mt Apo and Mt Matutum ranges in the East and Mt Busa and Parker ranges in the South.

The future of the remaining forests looks as serious as in other islands. Lowlands and lower hills are largely cultivated and used for production of rice, banana and pineapple, or they are marshy. Lowland rain forests are reduced to very small patches here and there. Also forests in mountains have been reduced by logging and slash-and-burn cultivation by the settlers. Even the well known Mt Apo national park has not remained intact.

Most of the earlier literature records on Mindanao come from Zamboanga peninsula, Davao provinces and from Surigao area. Boettcher collected in Mindanao at three occasions in December 1914 - February 1915, in May-August 1915 and August-September 1916. Most of his 442 specimens (49 spp.) come from Surigao area, some also from Zamboanga, from Dansalan (in Lanao del Sur) and elsewhere, mainly in the coastal areas.

Müller's material from Mindanao consists of almost 7000 specimens, representing 104 species. A considerable part of it comes from Mt Busa mountain range. S from Koronadal in South Cotabato province, where the second author has collected in 1985 and 1986 and L. Vinciguerra in 1994. J. de los Reyes has also provided specimens from there now and then. During his 1985 and 1995 expeditions, the second author collected also at Mt Apo and plenty of further specimens have been provided from there by A. Buenafe in 1993-1995. Besides Mt Apo, many localities in Davao Oriental and Surigao del Sur provinces were studied during the 1995 and 1996 expeditions. From different mountains in Bukidnon province (Katanglad, Kalatungan, Imbayo Mts, etc.) comes a fine series collected by C.G. Treadaway in 1989, Th. Borromeo in 1989-1990, A. Buenafe in 1991 and 1995 and F. Mohagan in 1993. Other areas from where we have material include Mt Malindang in Misamis Occidental province (Th. Borromeo, 1987-1988), Kapatagan area in Lanao del Norte province (W. Catal, 1988) and Zamboanga del Norte province (W. Catalan, Th. Borromeo and C.G. Treadaway, 1987-1988).

At present records are available from all provinces except from Sultan Kudarat. The best known of these are South Cotabato (69 spp.), Surigao del Sur (59 spp.), Zamboanga del Sur (57 spp.), Bukidnon (56 spp.), Davao Oriental (53 spp.) and North Cotabato (45 spp.). From Mt Apo National Park (partly in North Cotabato, partly in Davao del Sur) we know at least 32 species.

Unfortunately, due to continuous political unrest, many faunistically interesting mountain areas (like Mt Ragang, Mt Hilonghilong, Mt Kampalili and some others) are too dangerous for collecting trips. Apparently many unknown species still exist on these mountains.

**PLATYSTICTIDAE:** *Drepanosticta aries, D. lestoides, D. lymetta, *D. megametta, *D. taurus, Drepanosticta sp., Drepanosticta sp.n., Drepanosticta sp.n.


BASILAN ISLAND
1280 km², 48 species

The lowlands of Basilan are nearly completely deforested and under cultivation. Mahogany and rubber plantations mixed with coconut groves and fruit orchards have spread over much of the island. There are small patches of young secondary forests, here and there. Swamp areas are uncommon, but the coastal areas are largely covered with dense mangrove forest.

In the mountains in the central part of the island, the original rain forest still exists in nearly inaccessible canyons and gorges. The highest peak (Basilan peak) reaches 1011 m. Plentiful rain feeds the numerous streams and brooks. Unfortunately, the politically unsettled conditions are preventing also
here the exploration of the faunistically most interesting mountain areas.

Literature contains a fair number of dragonfly records, the oldest of these by Semper. Also ASAHINA (1968) listed many species from this island. A total of 24 species have been listed in literature, including two taxa (*Devadatta podolestoides basilanensis* and *Rhinocypha dorsosanguinea*) originally described from Basilan. Boettcher visited the island in December 1914 and collected 125 specimens of 15 species, also *R. dorsosanguinea*.

Muller’s material includes nearly 300 specimens, representing 31 species collected by C.G. Treadaway and Th. Borromeo near Isabela and Lamitan in the northern part of Basilan, in June 1988, April 1991 and April 1993.

**PROTONEURIDAE:** *Prodasineura integra.* – **COENAGRIONIDAE:** *Agriocnemis femina,* *A. pygmaea,* *Argiocnemis rubescens intermedia,* Ceriagrion lieftincki, *Ischnura senegalensis,* *Pseudagrion pilidorsum,* Teinobasis filamentum, *T. recurva,* *T. samaritis.* – **PLATYCNEMIDIDAE:** Coelicia dinoceras, Risiocnemis fuligfrons. – **LESTIDAE:** *Lestes quercifolia.* – **AMPHIPTERYGIDAE:** *Devadatta podolestoides basilanensis.* – **CHLOROCYPHIDAE:** *Rhinocypha colorata,* *R. dorsosanguinea.* – **EUPHAEIDAE:** *Euphaea amphicyana,* *E. cora.* – **CALOPTERYGIDAE:** *Vestalis melanica.*


**DINAGAT ISLAND**

801 km², 62 species

Dinagat is situated northwards from the northeastern tip of Mindanao. The landscape is hilly in the S, and mountainous in the N. The highest peaks are Mt Redondo (929 m) and Mt Canbinlio (903 m). Large areas of the original dipterocarp forest have already been destroyed by burning or due to strip mining (surface quarrying) of chrome ore, but the steep mountains are still partly covered with dense forests. Mangrove forests cover large areas of the very sinuous coastline.

Our knowledge of the quite rich fauna is based largely on Muller’s collection. Only two *Risiocnemis* species had been listed in the earlier literature (NEEDHAM & GYGER, 1939). Boettcher visited the island briefly in December 1915, but collected only one specimen (*Amphicnemis cantuga*). Muller’s material contains ca 1200 specimens of 61 species. They were gathered by A. Buenafe from the northern mountains in May-June 1988, February 1989, April-May 1989, June-July 1989, September 1989 and March 1990. As far as we know, no collections have been made in southern Dinagat.

**PLATYSTICTIDAE:** Drepanosticta lestoides, *D. mylitta.* – **PROTONEURIDAE:** *Prodasineura integra.* – **COENAGRIONIDAE:** *Agriocnemis femina,* *Amphicnemis cantuga,* Amphicnemis sp., *Amphicnemis rubescens intermedia,* Ceriagrion lieftincki, *Ischnura senegalensis,* *Pseudagrion pilidorsum,* Teinobasis annamaiaje, Xiphiagrion cyanomelas. – **PLATYCYNEMIDIDAE:** Coelicia dinoceras, Risiocnemis

- LESTIDAE: Lestes praemorsus.
- AMPHIPTERYGIDAE: Devadatta podolestoides basilanensis.
- CHLOROCYPHIDAE: Cyrano angustior, Rhinocypha colorata, R. turconii.
- EUPHAEIDAE: Euphaea amphicyana.
- CALOPTERYGIDAE: Vestalis melanla.

GOMPHIDAE: Heliogomphus bakeri.
- AESHNIDAE: Gynacantha bayadera, Oligoaeschna sp.
- CHLOROGOMPHIDAE: Chlorogomphus sp.
- CORDULIIDAE: Hemicordulia mindana, Heteronaias heterodoxa, Idionyx philippa, Macromidia samal.


SIARGAO ISLAND
436 km², 10 species

It is situated SE from Dinagat. We have no specimens from there, but Boettcher collected 16 specimens of 10 species in September-November 1916.

- PLATYCENNIDIDAE: *Risiocnemis erythrura.
- LESTIDAE: *Lestes praemorsus.

CAMIGUIN ISLAND
238 km², 10 species

Mt Mambajao (1600 m) dominates this small volcanic island between Bohol and Mindanao. Aside of the few specimens of two common species collected by Boettcher in July 1916, no other data were available until A. Buenafe visited briefly Mt Hibokhibok and Mt Timbo-ong in May 1995, collecting 59 specimens of 9 species.

- PLATYSTICTIDAE: Drepanosticta sp.n.
- PROTONEURIDAE: Prodasineura integra.
- COENAGRIONIDAE: Pseudagrion pilidorsum.
- PLATYCENNIDIDAE: Risiocnemis appendiculata.
- CHLOROCYPHIDAE: Cyrano angustior, Rhinocypha turconii.
Palawan region

Main islands: Palawan, Busuanga, Culion, Dumaran, Cuyo Islands, Balabac.
Dragonflies: 92 species.

PALAWAN ISLAND
14 896 km², 78 species

Palawan, a 420 km long and only 45 km broad island, forms with the Balabac island group in the S and the Calamian group in the N "a bridge" between Borneo and Luzon. The mountain group, extending through the whole island is interrupted by narrow lowland straits at Baheli and at Quezon, conveniently dividing the island into a northern, a central and a southern part. The highest peaks are Mt Mantalingajan (2085 m) in the S, Victoria peak (1709 m) in the central part and Cleopatra Needle (1602 m) in the N.

Only 10-20 years ago Palawan was covered with fine and extensive rain forests. The present speed of logging and slash-and-burn farming severely endangers the future of the forests also here. The places which were covered by dense forests during a visit in 1985, were in 1991 already destroyed. Also a new road southwards from Quezon, towards the Mt Mantalingajan range, has already increased the number of settlers and hastened the destruction of the surrounding forests. It is to be expected that in 10-20 years a great majority of forests will have disappeared, if deforestation is allowed to proceed at the present pace.

Even so, at present extensive areas of the original dipterocarp cover still exist and provide shelter for a very interesting fauna and flora. As in other groups, species composition in dragonflies is an interesting mixture of Borneon / continental Asian origin, Philippine proper origin and endemic elements.

Literature contains records of 49 species, most of them listed by LIEFTINCK (1974). Boettcher collected in northern Palawan (Binaluan, Bacuit and Pancol) between November 1913 and January 1914, gathering at least 119 specimens of 18 species, including the holotypes of *Cyclophaea cyanifrons* and *Coeliccia boettcheri*. Our material includes ca 1900 specimens of 64 species. The second author collected in Port Barton area in North Palawan in May 1985 and our combined expedition in May-June 1991 covered localities in southern, central and northern parts of the island. Some specimens from central and northern Palawan were provided by C.G. Treadaway and Th. Borromeo in July 1988. A marvellous collection, gathered by Lorenzo Vinciguerra and his collaborators in Taytay and Saint Paul area in March 1992, increased considerably our knowledge of North Palawan dragonflies. Some endemic species, like *Cyclophaea cyanifrons* appear to be common and abundant.

**PLATYSTICTIDAE:** *Drepanosticta ceratophora, Drepanosticta* sp.n., *Drepanosticta* sp.n. - **PROTONEURIDAE:** *Prodasineura palawana, Prodasineura* sp.n. - **COENAGRIONIDAE:** *Agriocnemis femina, A. pygmaea, Argiocnemis rubescens intermedia, Archibasis viola, Ceriagrion lieftincki, Ischnura senegalensis, Pseudagrion pilidorsum, Stenagrion sp.n., Teinobasis olivacea, T. rubricauda, T. samaritis. - **PLATYCENMIDIDAE:** Asthenocnemis stephanodera, Asthenocnemis sp., Coeliccia boettcheri, *C. palawana, C. werneri, *Copera vittata palawana. - **CHLOROCYPHIDAE:** *Rhinocypha humeralis. - EUPHAEIDAE:** *Cyclophaea cyanifrons, Euphaea subcostalis. - CALOPTERYGIDAE:** *Neurobasis daviesi. - **GOMPHIDAE:** *Heliogomphus olivaceus, Ictinogomphus decoratus melaenops, Leptogomphus palawanus, Microgomphus chelifer* sp.n. - **AESHNIDAE:** *Gynacantha basiguttata, G. bayadera, G. dohrni, G. hyalina, G. subinterrupta, Heliaeschna*

BUSUANGA ISLAND
890 km², 28 species

Busuanga is the largest island of the Calamian Group located N from Palawan. Most of the forests, especially in the lowlands have been cut down to make way for cattle grazing. The island has some of the largest cattle farms in the Philippines. The lowland areas, consisting mostly of open grassland, cogon grass and bush are seasonally rather dry. Scattered patches of secondary forest exist and there are some small swampy areas, which dry up during the dry season. About half of the island consists of undulating gentle hills, some with young secondary forest, the others barren. The central and southern parts of the island seem to be more cultivated, with large grassland areas and scattered villages. Cashew nuts are a common crop in the western areas.

Only few records from Busuanga are available in the literature. Much of our knowledge is based on the ca 200 specimens (26 spp.) in coll. Müller. Most of these were collected by C.G. Treadaway and Th. Borromeo in August 1990 and May 1991. A small addition was made by Herbert Zettel in February 1996.

PLATYSTICTIDAE: Drepanosticta sp.n. – PROTONEURIDAE: Prodasineura palawana.


DUMARAN ISLAND
331 km², 19 species

The island is situated E of northern Palawan, separated by the only 2 km wide Dumaran Channel. The landscape of the island is flat, the highest point only 169 m. The coastland is covered by mangrove
and most of the interior by coconut palms. Here, too, most of the forest has been cut down. According to Alex Buenafe, who visited the island in December 1995, small patches still remain in the interior. He found also a small patch near Araceli, with small clean streams, from where he collected 19 spp. (140 specimens), two of them new to the Philippines.


**BALABAC ISLAND**

324 km², 15 species

The island is located between the southernmost tip of Palawan and Borneo. Our knowledge on the present situation of its nature is restricted to the unfortunate fact, that also here the rain forests are largely destroyed. It is very likely that also the remnants will disappear within the next few years. Since the fauna is very little known, many insect species may become extinct without having ever been discovered.

Our knowledge on the dragonfly fauna of Balabac is based on literature only. An expedition to the remaining forest areas should be urgently arranged, although the island is politically unsettled and dangerous to travel.


**CUYO ISLANDS**

52 km², 5 species

This group of small islands is located between Palawan and Panay. The main island, Cuyo, is densely populated and heavily cultivated. Mt Bonbon (259 m) is the highest point. Like most other hills in the island it is covered by cashew nut trees. Coconut palms prevail in the coastal areas. A small rest of the original forest still prevailed at Igaba, E from Little Baguio in December 1995, when Alex Buenafe visited the island. However, the forest patch was partly disturbed and is used as freshwater reserve. In the dry season, most of the streamlets were dry, and only a few dragonflies were seen.

A small collection of 12 specimens gathered by A. Buenafe in Cuyo, consists of 5 species.

PLATYCENEMIDAE: *Coeliccia boettcheri.* — LIBELLULIDAE: *Diplacodes trivialis, Neurothemis terminata, Orthetrum chrysis, O. sabina.*
ALBAGUIN ISLAND
3-4 km², 4 species

The small island is located in the bay near Port Barton, on the W coast of Palawan. Small patches of field characterize the island, which lack primary vegetation. On the coastline dominate coconut palms and mangrove trees. There is no permanent running water, in the rainy season small rillets and pools are formed. Correspondingly the species list is very short, apparently quite typical for a very small island in the Philippines. R. Müller collected 4 species during his visit in May 1985.

LIBELLULIDAE: Diplacodes trivialis, Neurothemis terminata, Orthetrum sabina, Trithemis aurora.

Sulu region

Main island groups: Jolo Group, Pangutaran Group, Tapul Group, Tawi Tawi Group, Sibutu Group.

Dragonflies: 55 species.

Jolo Group

JOLO ISLAND
893 km², 15 species

Jolo is the largest island in the Sulu Archipelago. Large coastland areas are bordered with mangrove, and hills and low mountains characterize the interior of this volcanic island. The highest peaks, Mt Tamutangas (812 m) and Mt Bahu (790 m), are still partly covered by a dense primary dipterocarp forest. Lowlands have been taken to cultivation or are covered by cogon grass. Rainfalls are heavy, but clean streams and brooks can be found only outside the Jolo City area. Unfortunately, the political situation continuously prevents the exploration of the mountain forests, which may still harbour the endemic Rhinocypha hageni, the only Jolo dragonfly mentioned in the literature. This species is not included in the small collection (88 specimens of 13 species) made in the surroundings of the capital Jolo by C.G. Treadaway and Th. Borromeo in June 1992. If still surviving, R. hageni may be confined to the streams in the virgin mountainous rainforests. J. Nyada collected a few Vestalis melania specimens in Jolo, in 1993.


LIBELLULIDAE: Diplacina braueri, Neurothemis ramburii, N. terminata, Orthetrum pruinosum clelia, O. sabina, O. testaceum, Pantala flavescens, Rhynothemis phyllis subphyllis, Tholymis tillarga.
Tapul Group

SIASI ISLAND
77 km², 2 species

Almost all forests in this island have been cut down, with the exception of a very small patch, covering the extreme summit of Bud Siasi Mountain (900 m). C.G. Treadaway and Th. Borromeo visited this forest in March 1991 and were surprised to note that this tiny woodland was almost empty of animal life, no mammals, birds, lizards or insects were encountered there. Only a few butterflies and dragonflies were seen just outside the forest, but none were flying inside. The rest of the island, apart from Siasi Town and numerous villages, is used for crop production or cattle raising or it is waste. Just outside Siasi Town, there are a few patches of young trees and bushes. The coastline is partly covered with dense mangrove. Water seems to be scarce all the year round and extremely scarce in the drier part of the year. Farmers have to go for long distances to collect as much water as possible. On Bud Siasi coconut milk is used as a replacement of water during the dry season, since otherwise all water should be carried up from the lowlands. Due to political unrest travelling to Siasi is rather dangerous.

COENAGRIONIDAE: Ceriagrion lieftincki. - LIBELLULIDAE: Zyxomma obtusum.

Tawi Tawi Group

TAWITAWI ISLAND
592 km², 44 species

There are still large continuous dipterocarp forests left in Tawi Tawi, although the clearing takes place also here. A new road is under construction, connecting Languyan in the N with Sanga Sanga Island in the S. The opening up of these, at present almost uninhabited, areas to traffic will speed up forest destruction. Due to the unsettled political situation, collecting trips to the remote mountain areas are dangerous at present. During a collecting trip by R. Müller and C.G. Treadaway, in June 1990, the surroundings of Languyan were still covered with dense forests. Also in the Tarawakan area, there still existed large primary forest in June 1992. Coll. Müller also includes specimens collected by Treadaway and Borromeo in February 1989 and March 1991. Available are ca 400 specimens, referable to 42 species. LIEFTINCK (1974) mentioned 15 species from the island.


bispina, Rhyothemis phyllis subphyllis, R. triangularis, Tetrathemis irregularis, Tramea transmarina euryale, Trithemis festiva, Urothemis signata bisignata, *Zyxomma petiolatum.

SANGA SANGA ISLAND
46 km², 31 species

Only narrow sea channels separate Sanga Sanga from Tawi Tawi and Bongao. It is a small, flat island, with low hills up to 70 m, originally covered with a dense dipterocarp forest. The coastline in the N and E is bordered by 1 km broad mangrove swamps. At present, the forest is almost gone, a small patch still exists at Boloboc only.


BONGAO ISLAND
ca 10 km², 26 species

The impressive element in Bongao is the 314 m high Bongao Peak. Aside of coconut palms and mangrove swamps, very little is left from the original vegetation. Trees of 5-10 m high and some bush still remain on a few steep slopes and in the valleys, where tiny streams and pools appear during the rainy season.


TUMINDANAO ISLAND
18 km², 1 species

Also this coral island is flat and rises only a few meters above the sea level. Mangrove covers most of the coastal areas. The thin humus layer above the coral ground has prevented the formation of rain forest. C.G. Treadaway and Th. Borromeo recorded a single species during their visit in November 1988.

LIBELLULIDAE: Rhyothemis phyllis subphyllis.

TANDUBAS ISLAND
ca 10 km², 3 species

Tandubas is a flat coral island, ca 12 km SE from the northernmost Tawi Tawi. Most of its surface is under coconut cultivation. The natural vegetation, which has apparently not been rich, is restricted to a few trees and bushes. The humus layer above the coral ground seems to have been very thin.


COENAGRIONIDAE: Teinobasis samaritis. — LIBELLULIDAE: Agrionoptera insignis, Brachydiplax chalybea.

SITANGKAI ISLAND
1-2 km², 2 species

This is a very small island, where land is in such demand that most people live in houses on stilts in the sea. Water is a scarce commodity during most of the year.

C.G. Treadaway and Th. Borromeo visited the island in November 1988 and collected 2 species.

LIBELLULIDAE: Neurothemis ramburii, Raphismia bispina.

Sibutu Group

SIBUTU ISLAND
101 km², 26 species

The Sibutu Group is situated nearest to Borneo. Sibutu, a flat island, was originally covered with dipterocarp forests. Large forest areas existed still in 1971 (DUPONT & RABOR, 1973). During a 3-week visit by R. Müller and C.G. Treadaway, in June 1990, there was only 1-2 km² rainforest left around Sibutu Hill (137 m), although the highest trees were already cut. In March 1993, C.G. Treadaway reported this, too, as having vanished. Anything like 90% of the land area is covered with coconut palms or dry bush. The porous coral ground absorbs quickly the surface water, therefore there are no streams. Without the protecting forest, the humus layer is carried away by heavy rains (Fig. 7).


AESHNIDAE: Anax guttatus, Gynacantha alcathe. — LIBELLULIDAE: Agrionoptera
insignis, Brachydiplax chalybea, Camacinia gigantea, Cratilla lineata assidua, Diplacodes trivialis, Lathrecista asiatica, Lyriothemis cleis, Neurothemis ramburii, N. terminata, Orthetrum pruinosaum clelia, O. sabina, O. testaceum, Pantala flavescens, Raphismia bispina, Rhodothemis rufa, Rhyothemis regia, Tramea transmarina euryale, Zyxomma obtusum.

GAGAYAN SULU ISLAND

? km², 3 species

In the literature, 3 species have been listed from this isolated island between Tawi Tawi and Palawan.


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REFERENCES

Synopsis of the Philippine Odonata


APPENDIX

ITINERARY OF ROLAND A. MÜLLER'S ZOOLOGICAL EXPEDITIONS TO THE PHILIPPINES

1985

March 30 - April 22 MINDANAO, South Cotabato prov.: Parker Mountains (Koronadal, Bulol, Barrio 8, Lake Sebu, Salacafe, Lake Maugham)

April 4 - May 5 MINDANAO, North Cotabato prov.: Mt Apo (Lake Agko, Marbel River, Lake Venado, Apo Peak Area

May 10 - 18 PALAWAN, Central Palawan: Puerto Princesa area; North Palawan: Port Barton area

June 2 - 9 LUZON, Nueva Vizcaya/Nueva Ecija prov.: Dalton Pass area

1986

July 12 - 16 MINDANAO, South Cotabato prov.: Barrio 8 area

July 19 - August 4 SIBUYAN (Romblon prov.): Magdiwan - Mt Guiting Guiting area
Synopsis of the Philippine Odonata 315

1987
March 18 - April 11 SIBUYAN (Romblon prov.): Magdiwang - Mt Guiting Guiting area
May 11 - June 1 HOMONHON (Eastern Samar prov.)
June 6 - 10 TAWI TAWI (Tawi Tawi prov.): Languyan area
June 5 and 11 BONGAO (Tawi Tawi prov.): Bongao Peak area
June 12 - July 2 SIBUTU (Tawi Tawi prov.): Sibutu Hill area
August 5 LUZON, Laguna prov.: Pagsanjan Falls

1988
May 13 - 18 MINDORO Island, Mindoro Oriental prov.: Mt Halcon area, 1
May 21 - 22 CEBU, Cebu Province: Minglanilla, Camp Seven area, 2
May 26 - June 1 PALAWAN, South Palawan: Quezon area, 3
May 28 - 30 PALAWAN, North Palawan: Port Barton, Matalangao, Olanguan areas, 1
June 1 PALAWAN, Central Palawan: Iwahig-Balsahan, 1
June 4 PALAWAN, Central Palawan: Narra, Esterella Falls, 1
June 4 - 5 PALAWAN, Central Palawan: Iwahig-Balsahan, 3
June 8 - 13 LUZON, Nueva Vizcaya/Nueva Ecija provinces: Dalton Pass area, 1

Note: Participants
1 Roland A. Müller
2 Roland A. Müller & M. Hämäläinen
3 M. Hämäläinen

1991
May 19 - 24 MINDANAO, Davao del Sur Province: Malagos
March 28 MINDANAO, North Cotabato prov.: Mt Apo (Lake Venado, Lake Agko)
March 29 - April 2 MINDANAO, Davao Oriental prov.: Baganga area
April 5 - 8 MINDANAO, Davao Oriental prov.: Cateel area
April 9 - 11 MINDANAO, Surigao del Sur prov.: Tandag, San Miguel, Carmen
April 12 - 25 MINDANAO, Surigao del Sur prov.: Carmen, Pakwan

1995
May 20 - 24 NEGROS, Negros Occidental prov.: Silay, Patag area, Mt Mandalagan
May 26 MINDANAO, Surigao del Sur prov.: Bislig, Tabon area
May 28 MINDANAO, Davao Oriental prov.: Boston, Caatijan area
May 29 - June 8 MINDANAO, Surigao del Sur prov.: Boston, Mt Agtuanganon
June 10 - 12 MINDANAO, Surigao del Sur prov.: Carmen, Pakwan
June 12 - 18 MINDANAO, Surigao del Sur prov.: Tago, Barangay, Meme River