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Observations on *Donacia (Cyphogaster) javana* WIEDEMAN, 1821 (Coleoptera Chrysomelidae Donaciinae) in the Malay Archipelago

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Summary

Some faunistical and biological observations were made in Singapore and the Philippines (Mindanao) (**Philippines fauna nov.**) on *Donacia (Cyphogaster) javana* WIEDEMAN, 1821 (Coleoptera Chrysomelidae Donaciinae). *Nymphaea pubescens* WILLDENOW (Nymphaeaceae) appears to be *Donacia javana*'s food plant.

Keywords : Chrysomelidae, Donaciinae, Faunistics, Singapore, Philippines, Mindanao, *Nymphaea*.

Résumé

Quelques observations faunistiques et biologiques ont été réalisées à Singapour et aux Philippines (Mindanao) (**Philippines fauna nov.**) sur *Donacia javana* WIEDEMAN, 1821 (Coleoptera Chrysomelidae Donaciinae). *Nymphaea pubescens* WILLDENOW (Nymphaeaceae) apparaît être la plante nourricière de *Donacia javana*.

Introduction

The subgenus *Cyphogaster* GOECKE, 1934, to which *D. javana* belongs, is easily identifiable from the two other subgenera *Donacia* FABRICIUS, 1775 and *Donaciomima* MEDVEDEV, 1973, composing the genus *Donacia* FABRICIUS, 1775, by the presence of a pair of median tubercles on the first ventrite of males (GOECKE, 1934 : 217). This subgenus, that mainly occurs in the Indo-malayan and Australian Regions, comprises presently seven species (ASKEVOLD, 1990 : 646; REID, 1993), and this number could be even fewer (see below).

In order to identify some aquatic leaf beetles collected by the author in Singapore and in the Philippines, different available diagnoses were gathered from GOECKE (1934 : 218; 1936 : 221-222), KIMOTO (1983 : 8) and KIMOTO & GRESSIT (1979 : 202). Two possible taxa eventually came out : *D. javana* or *D. lenzi* SCHÖNFELD, 1888, two species morphologically close to each other. I identified the specimens collected in Singapore as belonging to *D. javana*, but the specimens from the Philippines were identified as belonging to *D. lenzi*. However, having a doubt concerning the identification of the latter specimens, a couple from Mindanao (South Philippines) was submitted to my American colleague, specialist of Donaciinae, Dr. I. ASKEVOLD.

Based on a comparative study (including the endophallus) of the submitted Mindanao specimens with material from Java, Singapore, South India, Vietnam and Thailand, Dr. ASKEVOLD identified the Mindanao specimens as *D. javana*; adding (personal communication, 28/I/1992) that it is possible that *D. lenzi* is a synonym of *D. javana*; which could also, still according to ASKEVOLD (1990 : 646), be the case for *D. delesserti* GUÉRIN-MÉNÉVILLE, 1844. If these statements

are later confirmed, this would bring the number of taxa to only five species composing the subgenus *Cyphogaster*.

Observations

Observation in Singapore :

Donacia javana WIEDEMAN : Singapore, Botanic Gardens, 13.IV.1987, / *Nymphaea sp.* (leaves, upper face), 6 males - 5 females, P. LAYS.

Slides of the *Nymphaea sp.* were realised for specific identification; unfortunately when mailed to botanist Prof. J. LAMBINON (Liège), the material was lost. Three species of *Nymphaea* have been reported from Singapore (KENG, 1990 : 22) : *Nymphaea capensis* THUNB., *N. nouchali* BURM. F. and *N. pubescens* WILLD.

When one tries to catch it, this donaciine flies away quickly, even if the atmospheric conditions are not excellent (overcast sky, but without rain). Sometimes, the beetle runs and rushes under the leaves of its host-plant. The population of *D. javana* at the mentioned station is important and can cause serious damage to floating leaves of water lilies, giving them an aspect of lace.

One still does not know if *D. javana* was present prior to the modernization of Singapore, which has been built on a former marshy area. Nowadays, it seems quite certain that man, through artificial ponds, aquatic private gardens, reservoirs (Pandan, Payan, Tengeh, Selatar, Upper and Lower Pierce Reservoirs), etc., favorises, intentionally or not, the presence of water lilies which host *D. javana*.

As a matter of interest, the Post Office of Singapore has printed a stamp of 25 cents representing a drawing of *Donacia javana*.

Observations in the Philippines ***(First records)*** *:*

Donacia javana WIEDEMAN : Philippines, Mindanao, South Cotabato Province, Lake Sebu (6°13'N. - 124°42' E.), alt. 700 m., leaves of *Nymphaea pubescens* WILLD., P. LAYS : 14 males - 11 females, 9-10.VIII.1990 (1 male and 1 female of that serie are preserved in ASKEVOLD 's collection); 1 male, 28 .VIII.1990; 2 males - 1 female, (+ 1 specimen observed but not captured), 26.XI.1990 (1 PM); 2 males - 2 females, 1.II.1991 (12 AM); 3 males, (+ 5 specimens observed but not captured) 29.III.1994 (1.30 - 1.45 PM); 1 male, 16.VIII. 1994; 1 male, 26.XI.1994 (8 AM); 4 males - 10 females, 21.XII.1997 (11 - 12 AM, cloudy weather).

Philippines, Mindanao, South Cotabato Province, Polomolok, Purok Maguindanao (6°12'N- 125°04'E), alt. 270 m., 6 males - 3 females, 22.VIII.1990, leaves of *Nymphaea pubescens* WILLD., P. LAYS.

Donacia javana is here recorded for the first time from the Philippines.

Donacia javana is widely spread in the Indomalayan Region : Sri Lanka, India (Oriental part, Bengale, Assam), Burma, Thailand, Cambodia, Laos, Vietnam (Tonkin), Malaysia, Singapore, Sumatra, Java, Borneo, Sulawesi (GOECKE, 1934 : 224, 1960 : 4; KIMOTO, 1984 : 43-44; KIMOTO & GRESSIT, 1979 : 203).

As far as one can see, the species has never been reported from the Philippines. The single species recorded in this archipelago (from Luzon and some islands Southern Luzon) is *D. (Cyphogaster) lenzi* SCHÖNFELD, 1888; elsewhere, *D. lenzi* occurs in Korea, East China, Japan (Hokkaido, Honshu, Shikoku, Kyushu) and Taiwan (BOROWIEC, 1984 : 448; GOECKE, 1934 : 227, 1960 : 4; KIMOTO, 1983 : 9; KIMOTO, 1984 : 43-44) and has been observed on the following plants : *Brasenia schreberi*, *Nymphaea tetragona*, *Potamogeton sp.* (BOROWIEC, 1984 : 448).

However, in a key of the tribes, genera and subgenera of the Old World Donaciinae, ASKEVOLD (1990 : 653) gives the island of Mindanao (first mention of that island for the Donaciinae) as included in the area occupied by the subgenus *Cyphogaster*, however without giving the name of a species. Wishing more details regarding this original information, the latter author was contacted. ASKEVOLD (personal communications : 28/I/1992, 15/IV/1999) confirms that he has found 3 old specimens of *D. javana* from Mindanao (since ASKEVOLD has been forced to suspend his entomological activities, he can not provide further details about these specimens, for instance, what collection they were in or more specific locality details).

On 2 May 1990, I looked for donaciines in the prepared material held in the collections of the Entomological Section of the National Museum of Manila, but without success.

Since donaciines of Southeast Asia are poorly

represented in the collections and opportunities to observe them are rare, complementary information and comments follow here after.

Notes on Lake Sebu and Polomolok sites :

Lake Sebu (354 ha) (from a corruption of the native Tboli toponym *Sbù*) stands in the mountains that follow the general southeast-northwest axis of the Southern Cotabato coastline and named the Cotabato Cordillera, some of the area still being heavily forested. Up to 1945, only Tboli, horticulturist tribal people, were living around Lake Sebu and, while exploiting the lake's resources (fish, snails, shrimps) for their own consumption, their impact on the lake must have been minor. According to native informants, at that time more aquatic plants occurred along the lake shore and its water was inhabited by several large Vertebrates (e.g. : *Crocodylus sp.* and some other unidentified Mammals), all vanished since. In the 1950's, Visayan settlers came to Lake Sebu and started a duck raising industry (in order to supply local markets with their eggs, locally known as *balut*, a Philippine delicacy)- as a proof of the biological richness and the quality of the lake's water at that time, duck fed themselves with the large supply of the lake's snails- this business ended in the 1970's with the arrival of the aquaculture industry of *Tilapia nilotica* (Cichlidae), an activity that continues up to nowadays. These factors contributed to lesser floristic and faunistic diversity and affected the water quality (cultural eutrophication). Furthermore, logging activities and the introduction of ploughing technique altered the water of the lake, through erosion, removal of top soil and drying of some brooks that feed the lake. Since the 1970's the spectre of the building of a dam on Lake Sebu to produce hydroelectric power as well as to irrigate lands in the Allah Valley reappear from time to time (FRIESEN & STOLTZLUS, 1982). Corn fields, wet rice fields and second growth vegetation make up the main surroundings of the lake.

In spite of all these factors that contributed to affect more or less seriously the biodiversity of the lake and its water quality, it seems that human factors favoured the presence of *D. javana* in the area. Indeed, according to interviews with native Tboli and settlers, water lilies have been introduced here. An old Ilonggo settler, living along the lake, stated to us that it was him who, in 1971 and for ornemental purposes, brought back from Davao City three specimens of *Nymphaea pubescens*. Specimens of that water lily have been bequeathed to the Jardin Botanique National de Belgique (Meise) but have not yet been identified by a botanist; using several keys and data I have (BACKER & BAKHUIZEN VAN DEN BRINK, 1963 : 148-149; BENNET, 1987 : 62-63; BENTHAM & MUELLER, 1863 : 60-62; BEADLE, EVANS, CAROLIN, TINDALE, 1982 : 151-152; CONN, 1984 : 191-201, 1995 : 193-202; COOK, 1996 : 274-276; DASSANAYAKE, 1996 : 289-292; HUXLEY, GRIFFITHS & LEVY, 1992 : 338-341; KENG, 1990 : 22; KOCH, 1992 : 64-69; LI, 1976 : 542-545; MERRILL, 1912 : 201-202; RIDLEY, 1922 : 115-116; STANLEY & ROSS, 1983 : 179-180; VAN ROYEN, 1962;YANG & LU, 1996 : 610-614), the specimens of Lake Sebu and Polomolok seem to fit with the description given for *Nymphaea pubescens* WILLDENOW, 1797, a species widely spread in Southeast Asia and also all over the Phillipines.

In Lake Sebu, as in other parts of the Philippines (BROWN, 1951 : 529; QUISUMBING, 1978 : 289-290), native Tboli and settlers use the stems of water lilies as vegetables (after the removal of the epidermis, the stem is sliced and boiled [with vinegar, garlic and coco nut milk]). The leaves of this aquatic plant are also used as covers of baskets where newly collected *Tilapia* are gathered before their way to local markets; thus the leaves prevent the fish from jumping out of the baskets.

Nymphaea pubescens growths in the littoral zone of the lakes, where water depth does not exceed 1,5 meters. In Lake Sebu, the biggest station of water lilies stands in the Southern part of the lake, near the border and close to the place (not very far from the outlet) where the species is reported to have been planted for the first time, some thirty years ago; it occupies approximately a surface of between 0,5 and 1 hectare. At that place, which has been recently invaded by the fast growing *Eichhornia crassipes*, settlers started, in 1998, to build dykes in order to set up wet rice fields, encroaching then on the space occupied by water lilies. In different shallow places of the Southern and Western parts of Lake Sebu, other wet rice fields and fish ponds (between mud dykes for *Tilapia* fry) occur and it is more than probable that their buildings were made on places occupied by aquatic phytocoenosis. It is clear that the extension of such fields and fish

ponds in all the littoral zone could seriously affect *D. javana* populations here. Other smaller water lilies stations are scattered here and there on the lake's shores. Small stations of *Nymphaea pubescens* exist on the two other lakes of the area : Lake Lahit (24 ha) and Lake Sloton (75 ha), but no aquatic leaf beetle was observed during the few trips made, although it must also occur there.

Here are some other plants found in the waters of Lake Sebu (some still being under study by botanists) : *Nymphoides indica* (Menyanthaceae; " water snowflake " or " floating heart ", native Tboli name : *sawà*); *Eichhornia crassipes* (Pontederiaceae; " water hyacinth ", native Tboli name : *sawà bukay*; introduced for ornemental purposes); *Pistia stratiotes* (Araceae, " water lettuce ", native Tboli name : *kiyufu*); two Poaceae (?) (locally known, in Tboli, as *kenebeg bukay* and *kenebeg hulo*); one Cyperaceae (?) (Tboli : *blaas*); one Cyperaceae or Poaceae (Tboli : *hofo hnu*); four species of *Elodea* (?) and *Cabomba* (?) (Tboli : *lagut, lagut bonol, lagut hait, lagut tikung*).

The site in Polomok, surrounded by corn fields, consists of a small artificial pond (about 100 m², 30-40 cm deep), covered with about fifty leaves of *Nymphaea pubescens*, but no other macrophyta, and was formerly used for *Tilapia nilotica* breedings. In the 1950's, the Philippine Bureau of Fisheries launched a nationwide campaign for the adoption of backyard fishponds (for *Tilapia*); a campaign that has met with real success up to the present time. Such unexpected initiatives have certainly contributed to the maintenance or the extension of *D. javana* populations throughout the archipelago. The Philippines do not lack natural lakes and marshy areas (PRATT, 1911) that can hold donaciine populations. The island of Mindanao gets its name from substantives *danaw*, *lanaw*, meaning lake, thus Mindanao could mean " the (is)land of the lakes ", mainly reffering to Mindanao's biggest lake : Lake Lanao (the latter lake as well as Lake Buluan were selected for entomological prospections, but, owing to the risk of kidnapping, the trip was cancelled). The fact that *D. javana* was found in a station where *Nymphaea pubescens* was the sole aquatic macrophyte occurring reinforces the idea that it must be its food plant. As pointed out by REID (1993 : 104), it is correct that species of the subgenus *Cyphogaster* have been recorded on plants belonging to other families than the Nymphaeaceae, however, I guess, as ASKEVOLD (1990 : 617) does, that the latter botanical family forms their real food plants. This is supported by observations reported by REID (*loc. cit.* : 110) where larva of *D. (C.) australasiae* BLACKBURN, 1892, have been found attached to the roots of *Nymphaea* cf *violacea* and *N. gigantea*, in Australia. Only very careful field observations or, better, breeding could remove any doubt on that question.

All the specimens of *D. javana* were caught by hand. This beetle is particularly fast to react immediately to unfamiliar movements (and this under different weather conditions; they can fly immediately after the rain has stopped as well as at dawn). Frightened beetles fly quickly and land on an other leaf a few meters away; sometimes, the insect accidentally lands on water, on which it seems to bounce, but flies again immediately. The most effective way to capture this aquatic leaf beetle (by hand and when no net is available) is to move very slowly between the water lilies, and when a beetle is located, a hand must go slowly (including some stops) as close as possible, and then in a fast movement sink the leaf where the beetle rests (the hand covering the beetle). Either the beetle comes back up to the surface where it can be captured or (and usually) it clings to the leaf, which makes it easier to catch.

When *D. javana*, of which most specimens have an auburn color, rests on the young reddish-brown leaves of the water lilies*, there is a homochromy that could protect the beetle from potential predators; furthermore the beetle's brilliance makes it look like a drop of water (* sometimes written water-lily or waterlily).

Owing to their ability to react instantaneously to inhabitual movements and the fact that they fly very well, it has never been possible to observe *D. javana* eating *Nymphaea pubescens* ; nevertheless, it seems more than probable that this water lily species constitutes a real food plant for *D. javana*, on which the beetle can realize its complete life cycle. To support this view, one has to mention the following facts :

1- while Lake Sebu holds several other aquatic or semi-aquatic plants (see above), *D. javana* has been observed only on *Nymphaea pubescens*;

2- the station in Polomolok, where the donaciine

has been observed, was occupied only by *Nymphaea pubescens* and no other aquatic macrophyte.

3- in the ponds of the Botanic Gardens of Singapore, where a variety of aquatic plants are found (*Nelumbo nucifera*, etc.), *D. javana* was observed only on *Nymphaea sp.*

4- REID (1993 : 110) has also reported an observation of *D. javana*, in Java, on *Nymphaea*.

5- leaves' upper face of *Nymphaea pubescens* displays circular spots (⌀ : ± 5 mm) where upper epidermis is lacking; some of those leaves are so damaged that they die. I impute those spots to *Donacia javana*. Other organisms have been reported to damage *Nymphaea* leaves (HUXLEY, GRIFFITS & LEVY, 1992 : 339; SCHNEIDER & WILLIAMSON, 1993 : 486-493) : gram negative rod bacteria; *Cercospora*, *Ovularia* (Fungi), dark rotting patches on leaves; *Dichotomophthoropsis*, *Fusarium*, *Phytopthera*, *Phythium* and *Sclerotium* (Fungi); *Limnaea* (Gasteropoda); *Rhopalosiphum nymphaea* (Hemiptera), distorting foliage ; carterpillars of *Nymphula stagnata* and *Nymphula nympheata* (Lepidoptera), shred the leaves; larva of *Hydromyza sp.* (Diptera), mines the floating leaves; *Galerucella nymphaea* (Coleoptera). Indeed, aside from *Donacia javana*, the other visible organisms on *Nymphaea pubescens* leaves (upper surface), in Lake Sebu, were a species of a small unidentified fly (also found in the flowers of the same plant) and some dragonflies.

Several times attempts were made, in Lake Sebu, to discover larvae or pupae of *D. javana*. On 28 August 1990, six specimens of *Nymphaea pubescens* were uprooted and examined, without result (only a small empty cocoon, white, very thin and fragile, torn, of silk-like aspect, ± 10 mm long was found attached to the roots, but this can not be, for the moment, attributed to a donaciine since it totally differs from the usually hard and wax-like aspect of donaciines' pupa cocoons); on 26 November 1990, roots of one plant were checked, without result and on 21 December 1997, roots of three plants were checked, without result. The only pupae that were found attached to the roots, often in great number, during each prospection, were those of a small unidentified fly, whose imagos can be observed visiting *Nymphaea pubescens* flowers.

Discussion

As for any animal or plant found on islands, it is legitimate to wonder how, where from and when donaciines reached the Philippine Archipelago ? Owing to the paucity of the data (paleontological, biological, etc.) on *D. (Cyphogaster)* species, it is quite difficult to establish any firm statements regarding these questions; therefore, the following statements and reconstructions are only tentative.

With more than 7,000 islands and islets, Philippine geological history, while young geologically speaking, is particularly complex, difficult to understand and only parts of that history have been elucidated, so far (MÜLLER, VON DANIELS, CEPEK *et alii*, 1989; RANGIN, MÜLLER & PORTH, 1989) . A complex geological history that share also other parts of the Malay Archipelago (AUDLEY-CHARLES 1987 : 5-25; BUROLLET & SALLÉ, 1986; GOURONNEC, STEPHAN & BLANCHET, 1984; WHITMORE, 1987). Situated on the " fire belt ", the Philippines came into existence from tectonic movements, that seem to date back to Late Jurassic orogenesis and Cretaceous, mainly between the eastern margin of the Eurasian continent and the western edge of the Pacific Ocean basin. The general outlines of the islands have not always been what they are at present; for instance, Mindanao results from the " fusion " of several smaller islands. Land connections between the islands of this archipelago and neighbouring islands appeared and disappeared through time. Thus, during the Eocene or Oligocene, a land brigde connected Luzon to Taiwan (the latter being in contact with continental Asia), a contact that ended during the Late Miocene. During early Middle Miocene (13 m. y.) there was a probable land connection between Panay and Masbate, in Central Philippines; there is no doubt regarding the occurrence of land connections between Masbate, Panay and Negros during late Middle Miocene (11 m. y.), connections that broke during the Late Miocene (11-5.2 m. y.) (MÜLLER, JURGAN & PORTH, 1989). During the Pliocene, connections probably existed between Mindanao and Sulawesi, and, to the South, to the Greater Sunda islands. The Pleistocene saw numerous land contacts/ruptures of the islands inside and outside (MORLEY & FLENLEY, 1987 : 50-59) the Philippine Archipelago, following on both intense orogenetic activities as well as the rising and falling of sea level

during glaciations and interglacial phases. At that epoch, Luzon, Polillo, Marinduque and Burias formed one island; the same is true for Samar, Leyte, Bohol and Surigao; Negros, Panay, Masbate and Ticao; Mindoro, Palawan and Borneo (the latter in contact with continental Asia); Cebu remained isolated. Still during the Pleistocene, it seems that Mindanao (at least the Zamboanga Peninsula) was in contact, through the Sulu Archipelago islands, to Borneo (Sabah) during Early or Mid-Pleistocene, whereas its link with Sulawesi was interrupted prior to Quaternary (DICKERSON, 1928; LEWIS, 1997 : 591-604).

The archipelagic conditions that have always prevailed in that region favored isolation from Oriental and Australo-Papuan Regions, a factor that generated a high rate of species endemism.

Since WALLACE (1869), many authors have demonstrated the transitional aspects, biogeographically speaking, of the biota of that part of the world, situated at the junction of the Oriental and Australian Regions. Inside that zone, the term Wallacea was created to design an area where the mixed caracters of the Oriental and Australian fauna and flora are even more pronounced, and it includes the Philippines, Sulawesi, Sula Is. and the Lesser Sundas from Lombok to Timor, that is to say a zone between WALLACE's Line as modified by DICKERSON *et alii* and WEBER's Line (DICKERSON, 1928).

In Wallacea, two species of *D. (Cyphogaster)* occur : *D. javana* and *D. lenzi*. For *D. javana*, Wallacea forms the eastern limit of a species otherwise widely spread in tropical Asia (both insular and continental); whereas for *D. lenzi*, Wallacea is the southern limit of its area. In Southeast Asia, west of Wallacea, one finds, aside from *D. javana*, three other *D. (Cyphogaster)* species : *D. delesserti* GUÉRIN-MÉNÉVILLE, 1844, *D. provosti* FAIRMAIRE, 1885 and *D. transversicollis* FAIRMAIRE, 1887. East of Wallacea, only *D. (C.) australasiae* BLACKBURN, 1892 occurs (New Guinea, North Australia). It is patent that Wallacea, as far as donaciines are concern, constitutes the eastern limit of species widely spread in the Oriental Region, whereas east of Wallacea the territority of a species (*D. australasiae*) restricted to the Papua-Australian Region begins.

BOROWIEC (1984 : 470) states that the subgenus *D. (Cyphogaster)* " *first appeared in tropical south-easthern Asia, probably during great migrations to the south on the turn of the Pliocene and Pleistocene* ". It seems this subgenus must be much older. In 1956, HAUPT (1956 : 55, 56) described from Eocene deposits of Germany a donaciine he named *Hemidonacia insolita*. However, according to ASKEVOLD (1991 : 101), the latter species " *appears to agree most with the extant* D. (Cyphogaster) provosti "; thus, *D. (Cyphogaster)* get back to, at least, Eocene time. To support an older antiquity of *D. (Cyphogaster)*, there is an other argument that one can infer from zoogeographical data. *D. (C.) lenzi*, as already mentioned, occurs only in the north of the Philippines. If this species would have reached Luzon from a southern way (south of the Philippines and/or Greater Sunda islands), the donaciine should still exist in Southern Philippines or Indonesia, but this is not the case. The other remaining way is from the North, through Taiwan. One knows that a land bridge existed between Luzon and Taiwan during Eocene or Oligocene and that this contact ended during Late Miocene (DICKERSON, 1928). Thus, the occurrence of *D. lenzi* in Northern Philippines could attest of the existence of a former mid-Cenozoic land bridge that linked Taiwan and Luzon. Therefore one has also to conclude that *D. (Cyphogaster)* appeared prior to Plio-Pleistocene epoch as presumed by BOROWIEC.

As far as paleogeographic and geological data allow, the occurrence of *D. lenzi* in the Philippines, and consequently the existence of the subgenus *Cyphogaster*, dates back to at least Miocene time.

The South/North migrations (*D. javana*) or vice versa (*D. lenzi*) for the donaciines of the Philippines fit with a general trend underlined by DICKERSON (1928 : 302) who states : " *within Wallacea much of the migration has been in general north and south, rather than east and west* ".

Concerning *D. javana*, its absence in Mindanao was intriging since the species occurs in Borneo and Sulawesi. As mentioned above, Mindanao was in contact with at least Sulawesi during the Pliocene, and with Borneo during the Pleistocene; an intriging point now solved. Although not yet recorded there, *D. javana* must exist in Palawan (in contact with Borneo during Pleistocene) and Central Philippines.

These new observations confirm that *D. javana* is always locally found in great number and

that adults seem to occur all year round, facts also reported by GOECKE (1934 : 224). The data reported here allow us to classify *D. javana* amongst the ecological category of the periphytic primary phagotrophs (or macroconsumers), a category in which fall all the other members of the Donaciinae whose biology is known.

The observations reported here show, once again, how anthropic factors can affect the faunistic drift of the populations of Donaciinae species, in a negative or positive way. In a recent faunistic study conducted on the Donaciinae of Belgium (LAYS, 1997), we have demonstrated how human activities affected, negatively, aquatic leaf beetle populations of the 25 species recorded there. The obvious negative faunistic drift observed, since the 1950's, for the Donaciinae in Belgium comes from factors such : drying up of marshy areas; destruction of rivers' natural banks and the associated flora; pollution of lakes, ponds and rivers, etc., all those factors altered primarily the phytocoenosis associated with wet lands, then, secondarily, but crucially, affected the donaciines which can not survive without their aquatic or semi-aquatic food plants. As a consequence of these anthropic factors, 18 species are threatened with extinction and 4 species are considered as vanished in Belgium. Elsewhere, FURTH (1976, 1993) demonstrates how anthropic factors (drainage, DDT sprayings, cultural eutrophication, etc.) contributed to an almost certain extinction of *D. bicolor* and *D. marginata* in Israel. In Westfalia (Germany), KROKER (1985) imputes recent rarefaction of donaciines to anthropic factors.

As exemplified in the cases reported here and observed in Singapore and the Philippines, the impact of human activities on the donaciines, or more precisely, on their food plants, are not always negative. The creation of reservoirs, lakes, ponds for economic or other purposes, and subsequently the arrival, accidentally or not, of aquatic leaf beetles' food plants are anthropic factors that allow the maintain, or even the extension of donaciine populations.

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