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THE STATUS OF INSECT TAXONOMY IN THE PHILIPPINES[1]

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What is insect taxonomy or systematics? Simply expressed, it is the science that deals with the classification of insects. Some would split hairs to differentiate taxonomy and systematics. According to Simpson, taxonomy means the theoretical study of the bases, principles, procedures and rules of classification: whereas, systematics is the study of the kinds and diversity of organisms.

Modern taxonomic practice is concerned with populations, not individuals. In fact, taxonomy is a synthesis of many spheres of knowledge – morphology, physiology, genetics and ecology.

A taxonomist seeks to differentiate various organisms and to point out their outstanding characteristics. This is accomplished by making descriptions, keys, illustrations, etc. A taxonomist gives a name to each organism and publishes this in printed books or periodicals. Another activity of a taxonomist is to arrange the organisms to form a classification scheme. The desirable natural classification which is based on phylogenies is difficult to attain, so many workers resort to artificial classification which is based on one or a few characteristics.

Emphasizing the importance of taxonomy, Blackwelder (1962) says that "classification is not only a necessary preliminary for most other biological studies but is actually the source of many data in some other fields and the organizer of the data of others."

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The other question we now pose is — Where are we in the study of our insect fauna? At the outset I give a factual statement that insect taxonomy has not been a favorite subject of study by Filipinos. Filipinos have contributed very little in insect taxonomy, but despite this indifference, it is amazing to note that great advances in the taxonomy of certain groups have been achieved for us by foreign taxonomists.

Review of Major Insect Orders

Take the order ODONATA or the dragonflies and damselflies as the first example. The study of Philippine Odonata has been a monopoly of foreign specialists. In the latter half of the 19th century, Brauer who is a German and a French baron by the name of Edmond de Selys-Longchamps described many new species from the Philippines. Two American workers, Needham and Gyger, published a serialized monograph entitled *The Odonata of the Philippines* (Philippine Journal of Science 1937, 1938 & 1941). Much later between 1957 and 1961, a Dutch entomologist by the name of M. A. Lieftinck studied Indo-Australian Odonata including species he collected in the Philippines. Recently in 1969, S. Asahina from Japan published additional records and new species of Odonata from materials borrowed from our collections and those collected by Japanese visitors.

The ORTHOPTERA includes a large group of insects, such as the grasshoppers, katydids, crickets, walking sticks, mantids, etc. One of the earliest works, *Orthoptera nova ex Insulis Philippinis* was published in 1877 by Carl Stal, Swedish entomologist. A few years later in 1892, I. Bolivar wrote on the *Orthopteres des Iles Philippines.* Lawrence Bruner's *Preliminary Catalogue of the Orthopteroid Insects of the Philippines* was published in the Univ. of Nebraska Studies, vol. 15, 1916. J. A. G. and J. W. H. Rehn published in 1939 and 1941 in the Proc. Acad. Nat. Sci. Philadelphia the *Orthoptera of the Philippines.* Part I dealt with a group of walking sticks while Part II on short-horned locusts. Bey-Bienko published on the short- and long-horned locusts and the Blattoidea or roaches from Luzon (PJS 1935, 1941).

The ISOPTERA or termites, white ants or "anay" species of the Philippines have been likewise described by foreigners. Dr. Thomas E. Snyder compiled a catalog of the termites of the world in 1949 and published a bibliography of the termites the following year. Fifty-four local species have been conveniently listed by Snyder and Francia (PJS 1960) and identification keys to winged adults and soldiers were presented.

The HEMIPTERA or the true bugs are embodied in the notable work *Hemiptera Insularum Philippinarum* (1870) by Carl Stal who is considered by many as the father of modern hemipterology. E. Bergoth (1913 to 1925) supplemented Stal's work by doing *Studies in Philippine Heterop-*

tera, parts I & II (PJS 1918). Not much work on this group was done thereafter. Dr. Leopoldo Uichanco, who was very much interested in the Hemiptera, identified many of our local specimens but published only one on *Ectenus,* a high-altitude genus (PJS 1949). The lacebugs or tingids, a group of delicately-winged insects quite inconspicuous under the leaves of fruit trees and ornamentals, were catalogued in 1965 by Carl J. Drake and A. Ruhoff of the U.S. National Museum, Washington, D.C. The few known species from this country were included in this big volume (USNM Bull. 213).

Despite the minuteness of the members of the order HOMOPTERA many groups have been studied taxnomically because of their nuisance as agricultural pests. Most of the vectors (aphids, leafhoppers, whiteflies and psyllids) of plant diseases belong to this order. Other Homoptera are cicadas, treehoppers, mealybugs and scale insects.

The treehoppers or Membracidae were studied by Funkhouser (PJS 1915). Closely resembling the former are the Macherotidae which were reviewed in 1963 by a Chinese entomologist, Tsing-chao Maa (Pacific Ins. Monogr. 5). Gonzalo Merino published on the *Philippine Cicadellidae* (PJS 1937), later supplemented by studies of a few genera by Santiago Capco (PJS 1958, 1961). In 1967, the *Typhlocybine genera of the Oriental Region* by S. H. Mahmood from India was published in Pacific Insects Monogr. 12. The fulgorid hoppers described by C. F. Baker (1927), L. Melichar (1914), and F. Muir (1916-1925) and others who published in the Philippine Journal of Science are now incorporated in Zeno Metcalf's *General Catalogue of the Homoptera* (1937-1967). When Metcalf passed away in 1956, this comprehensive work was continued in a series of volumes by David Young, Jr. and assisted by Virginia Wade, the former assistant of Metcalf.

The soft-bodied plant lice or aphids was one of the favorite groups collected by Dr. Uichanco. Upon his retirement his aphid collections were indorsed to Venus Calilung who did a good paper on *A faunistic study of Philippine aphids* (Philipp. Agric. 1967).

Elizabeth Robinson published on the *Coccidae of the Philippine Islands* in 1917 (PJS, vol. 12) with a supplement the following year. In 1920, the famous American coccidologist, H. Morrison worked on *The nondiaspine Coccidae of the Philippine Islands* (PJS, vol. 12). *The Catalogue of the Armoured Scale Insects of the World* (1966) by N. S. Borchsenius in Moscow would certainly contain the known species from the Philippines.

The order NEUROPTERA includes a variety of nerve-winged insects like the antlions, lacewings, mantid-flies and spongilla flies. The taxonomic studies of Philippine neuropteroid insects were published by Nathan Banks (PJS 1916, 1937 and 1939).

The beetles or the order COLEOPTERA is the most numerous group of insects, constituting about 40% of all Insecta. Of the enormous number of beetles known from the Philippines, not a single species has been described by a Filipino. W. Schultze, the successor of Charles S. Banks (the first government entomologist of the Bureau of Government Laboratories, later the Bureau of Science), did monumental work in the study of Philippine beetles. He published *A Catalogue of Philippine Coleoptera* in 1915 (Bureau of Science Pub. 7, also in PJS 1916). Thereafter he published more on beetles during the period 1917 to 1934 when his *Thirteenth contribution to the Coleoptera fauna of the Philippines* was completed. Another outstanding work is his monograph of the Pachyrrhynchidae or the broad-nosed weevils. He also contributed an important chapter on *Insects of the Philippines* in Dickerson's (1928) *Distribution of Life in the Philippines.* This gave an estimate on the number of species known under each order up to 1928. Before specializing on the Coleoptera, Schultze published some taxonomic papers on Philippine Lepidoptera. Additional studies after Schultze's time are so enormous that it would require a big corps of beetle taxonomists to catalogue and update knowledge on Philippine Coleoptera.

Among our insects, the butterflies, moths and skippers or the LEPIDOPTERA are the best known. The most outstanding monographic works are four: (1) *Die Schmetterlinge der Philippineschen Inseln*: *Rhopalocera* (1886-1892); *Heterocera* (1896-1902) by Georg Semper, a German zoologist who worked on the collections of his brother Carl while the latter explored mountains in Luzon, Palawan, Bohol and Mindanao in the years 1850 to 1865. (2) *Lepidopteren der Insel Palawan* (1889) was published by Otto Staudinger, a German Lepidopterist who sent collectors to the Philippines. (3) *Macrolepidoptera of the World,* Vol. 9 (1927) published by A. Seitz, another German worker. At about this time Schultze noted 1,825 recorded species. (4) *Microlepidoptera of the Philippine Islands* published in 1967 as USNM Bull. 257 by A. Diakonoff, a Dutch entomologist in Leiden Museum. He updates our knowledge of this fauna by a total of 291 species, 146 of which were described as new. Diakonoff estimates that only 20% of the existing fauna was treated.

Feliciano Calora contributed in the study of the hairy-eyed noctuids (Philipp. Agric. 1966). Julian Jumalon of San Carlos University, Cebu City has the best collection of Philippine butterflies which includes specimens accumulated even before World War II. Prof. Jumalon is doing a study of the butterflies of Cebu.

The order DIPTERA, wherein the true flies, gnats, midges, and mosquitoes belong, has been studied by Filipinos as well as other nationalities. C. P. Alexander of Amherst, Massachussetts has practically monopolized the study of craneflies and his works are published in several

volumes of the PJS covering the periods 1913 to 1934. Little is known of our chironomid or "gamu-gamu" fauna except for Kieffer's work *Chironomides des Philippines et de Formose* (PJS 1921). The classification of the gall-forming gnats is extremely difficult. Uichanco did his master's thesis on *A biological and systematic study of Philippine plant galls* (PJS 1919), the majority of which are caused by gall midges.

The majority of Filipino taxonomists did work on flies and mosquitoes of medical importance. A bibliography of Diptera of medical importance in the Philippines is available in *The Syllabus and Laboratory Guide in Medical Entomology* (1969) by N. P. Salazar and B. D. Cabrera of the U.P. Institute of Hygiene, Manila. The important workers associated with the study of Philippine mosquitoes are: C. S. Banks, Francisco Baisas and associates, H. G. Dyar, K. L. Knight and W. B. Hull, P. F. Russell, J. A. Simmons *et al.* A. Stone and two associates at the Smithsonian Institution published in 1959 *A Synoptic Catalogue of the Mosquitoes of the World* (Thomas Say Found., vol. 6). In 1967, F. E. Baisas and F. H. Dowell prepared *Keys to the adult female and larval anopheline mosquitoes of the Philippines.* (Jour. Med. Ent., vol. 4). M. D. Delfinado, G. B. Viado and L. T. Coronel made a *Checklist of Philippine mosquitoes with a larval key to genera* (PJS 1962). In 1966, Delfinado revised *the culicine mosquitoes of the Philippines* (Mem. Amer. Ent. Soc. No. 7). She also worked on the genus *Culicoides* or the biting midges (1961) and *Simulium* or blackflies (1960).

The Philippine species of the genus *Musca* were studied by B. D. Cabrera and L. E. Rozeboom (PJS 1956). The robberflies of the Philippines are included in a monograph by F. M. Hull entitled *Robberflies of the World* published in 1962 (USNM Bull 224).

One of the earliest works on flies is Ostensacken's (1882) *Diptera from the Philippine Islands brought home by Dr. Carl Semper.* Members of the order were summarized by M. Bezzi in his *Studies in Philippine Diptera,* Parts I & II (PJS 1913, 1917) and additional work by him were published up to 1920. A catalogue of Philippine Diptera is under preparation by Dr. D. Elmo Hardy of the University of Hawaii and assisted by M. Delfinado. The project is being supported by the U.S. National Science Foundation.

Among the insect orders, the classification of the Philippine HYMENOPTERA at the moment, appears to be the best organized. This group of insects (the sawflies, bees, ants, parasitic wasps, etc.) has been the subject of my studies for the past 20 years, particularly the parasitic ones. In 1966, I published a *Catalogue of Philippine Hymenoptera (with a bibliography,* 1758-1963). This work includes a taxonomic arrangement of 2,137 hymenopterous species reported from the Philippines through 1963. All references to each species are enumerated and each reference is fully an-

notated to show its contents. Appended is a list of known hosts or prey, a bibliography, list of journal abbreviations, and an index to scientific names. Work on this catalogue was started in 1950 but the bulk of it was accomplished in 1956 to 1958 while I was at the U.S. National Museum on fellowships from the Philippine government and the Guggenheim Foundation. The types of Philippine species that were in Honolulu, Washington, Ann Arbor, Chicago, Harvard, New York and those in London, Oxford, Stockholm, Paris, Brussels, Zurich, Leiden, and Kyushu were examined.

The usefulness of the catalogue is enhanced by keys to the genera of parasitic families which I published in Pacific Insects in 1962 and 1964. What remains to be finished are the keys to the chalcid and proctotrupid genera of the parasitic groups and the genera of the aculeate wasps, ants and bees.

The majority of materials studied came from Baker's collections which, up to the present, have remained unsurpassed in number and quality. Uichanco mentioned in his resume of Philippine Entomology (1934) that "Although there have been scores of recent collectors, Charles Fuller Baker, who was professor of agronomy and subsequently Dean of the College of Agriculture from 1912 until his death in 1927, and his Cuban collector, Julian Valdez, whom he paid out of personal funds, did more than any other individual to augment our knowledge of Philippine insect fauna. With a total of 115 world authorities on various insect groups working on his material, whose reports were embodied in over 400 papers, the known number of insect species of the Philippines was increased to a hitherto unprecendented extent." Fortunately after Baker's death, his vast collection was transported and deposited in the U.S. National Museum, Washington, D.C.

Taxonomy and Zoogeography

The study of our zoogeography is well advanced with respect to other groups of animals like mammals, birds, land mollusks, fresh water fishes, amphibians and reptiles. The study of organisms in this country has led to the subdivisions of the Islands into several biologic provinces. Insect surveys and ecological studies of the butterflies, Microlepidoptera, the pachyrrhynchids or broad nosed beetles and some groups of Hymenoptera like the genera *Theronia* and *Xylocopa* have confirmed the distribution pattern of Philippine fauna into five major provinces which are listed by Diakonoff (1967) as follows: (1) Luzon and dependencies in the north; (2) a central area or the Visayan islands; (3) a southern region with Mindanao and Sulu Islands showing correlations with Celebes and Java; (4) Palawan and dependencies with pronounced Bornean features; and (5) Mindoro, more or less independent of the preceding.

The existence of members of the family Megalyridae (Hymenoptera) in the Philippines is a recent discovery. In 1961, I described a single specimen of a wasp I caught in Sierra Bullones, Bohol, as *Ettchellsia philippinensis*. This turned out to be the second species in *Ettchellsia* known only in Northern Borneo. Later in 1966, Borge Peterson of Copenhagen Zoological Museum in the Netherlands described *Megalyra tawiensis* from Tawi Tawi Island. The present record of *Megalyra* from the Philippines is of interest because the genus is mainly Australian in distribution and this is the first record of its occurrence in the Oriental Region.

The present report of *Xylocopa* (*Cyaneoderes*) *caerulea* (Fabricius) I caught in Palawan in 1963 is the first record of this species in this country. Its faunal range is reported to be Oriental, from India to Java. This carpenter bee is distinct in being the only species in the Philippines with bright blue hairs on the thorax of the female, the rest clothed with either black, yellow or rust-colored hairs on the thorax.

"Taxonomy in 1970"

In 1961, Paul Ehrlich made a prediction that there would be a greater difference between the taxonomy of 1958 and the taxonomy of 1970 than between the taxonomy of 1758 and that of 1958. He says, "In 1970 electronic data processing equipment will be the most important tool of the taxonomist. Techniques will have been devised which will permit, with the aid of this equipment, repeatable and relatively exact assaying of systematic relationships...Emphasis will have shifted away strongly from the naming of different kinds of the interactions among them...The taxonomic monographs will be less cumbersome as the lengthy synonymies, masses of unanalysed data, and list of type material become unacceptable for publication. Relationships will be presented in condensed form, either as a matrix of coefficients measuring similarity, or as a dendrogram expressing the structure of such a matrix. Raw data will be made available, on request, in a form suitable for computer handling...Large general collections will retain value as records of the diversity of life, but their value in scientific research, already much decreased, will become nil. The use of large numbers of characters will greatly diminish the usefulness of holotypes, and holotype material will no longer be designated." That in essence, is the so-called modern numerical taxonomy which would replace the conservative or conventional taxonomy. At that time Ehrlich anticipated that the traditional methods of taxonomy would have become outmoded in 1970. We are now in this age and we know that this has not happened yet.

On the other hand, Dr. Ashley B. Gurney of the U.S. Department of Agriculture quickly refuted Ehrlich's outlook by giving his own views

(1962), that "Electronic data-processing equipment certainly has a place in biometrical analysis, but by 1970 insect taxonomy will not have advanced sufficiently beyond the descriptive and revisionary stages to provide adequate raw data in more than selected cases...Machines cannot yet make decisions comparable to the judgment of the experienced systematist." Furthermore "the majority of insect groups are too poorly known to permit a radical departure from conventional methods."

Thus while the proponents of numerical taxonomy are slowly evolving methods and procedures to be used and since orthodox taxonomy should precede numerical taxonomy without knowing the species involved in the study and some of the characters for differentiation, I would suggest that we go ahead with the preparation of comprehensive monographs and catalogues that are utterly lacking in this country. When any group of organisms is sufficiently known, then a numerical study could be undertaken. I agree with Gurney when he says that "the space age for most systematists is still a long way ahead."

Problems of a Taxonomist

The problems of a taxonomist in the Philippines are many and varied. Some of the primary considerations are:

(1) Availability of job opportunities — Are there positions in the government or private agencies that would hire the services of a taxonomist? Would this job pay off to put body and soul together?

(2) Availability of library facilities — Are the libraries in the Philippines equipped with the necessary materials to meet the needs of a taxonomist? In the present state of our libraries, a taxonomist in this country is a frustrated individual.

(3) Availability of collections — Are there enough specimens in our museums for study and to serve as reference materials for routine identification of specimens? The present and usual trend is to send materials abroad for identification by specialists. For taxonomic studies Philippine materials are borrowed from abroad to supplement the little we have accumulated locally. If new collections will have to be obtained locally, this would mean a lot of field work and exposure to adverse elements like bad weather, snakes, leeches, biting and stinging insects, etc.

(4) Knowledge of languages — Because the majority of older literature on Philippine insects are in foreign languages — German, Latin, French, Italian, and Spanish, is one prepared with a reading knowledge, at least, to help get by? In the U.S. Department of Agriculture, Washington, D.C. linguists are hired to help researchers with the translation of foreign literature.

(5) Availability of funds — When one is ready to catalogue, or do a monograph or revisionary work, and more collections are needed and the examination of type materials in foreign countries would be imperative, could one afford the expense and trouble incurred in the attainment of the purpose?

(6) Availability of good optical equipment — Are there facilities available for the examination of minute specimens? Many insects are so minute that it would require a good microscope and accessories for examining them.

A negative answer to the above questions or the lack of the above incentives are *the* deterrents to the choice of taxonomy as a career in this country. Somehow, if these difficulties could be overcome by the present and future generations, we would expect a better knowledge of the extremely interesting insect fauna of the Philippines.