

## NOTES ON THE LEPIDOPTEROFAUNA OF MADAGASCAR

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The island of Madagascar is situated between  $12^{\circ}$  and  $25^{\circ}$  South latitude and separated from the East African coast by the Mozambique Channel: 3,000 meters deep, 390 kilometers wide at the minimum. The surface is 585,000 square kilometers (one kilometer equals nearly five-eighths of a mile).

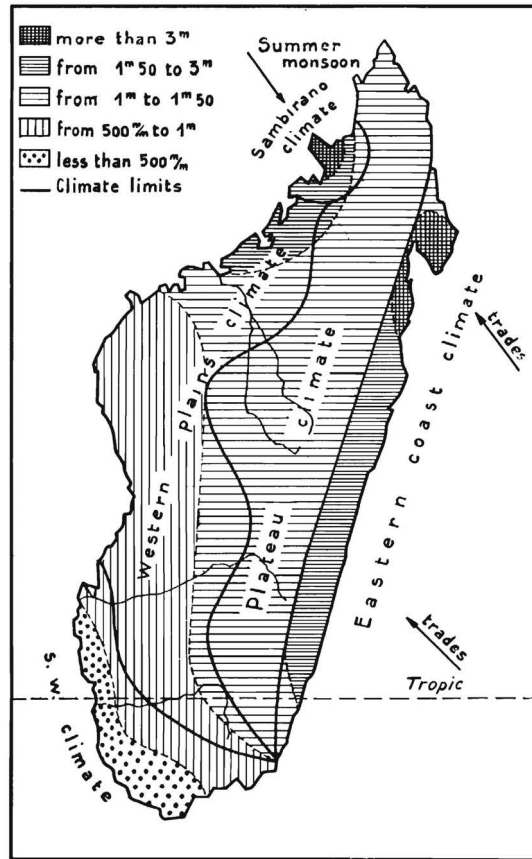


Fig. 1. Map of climates and rainfall on Madagascar.

Three-fourths of Madagascar is formed by a crystalline highland (gneiss and mica schists) surmounted by volcanic uplifts (Tsaratanana Mts., highest part of the island, alt. 2,884 m in the north; Ankaratra Mts., alt. 2,644 m in the center), while in the east and the west are plains having a very different aspect. The eastern plains, along the west of the Indian Ocean, are completely

alluvial; the western plains, of sedimentary origin, show the series of formations from the Trias, on the primary base, to the Tertiary and the Quaternary toward the Mozambique coast.

Because of the high altitude in the higher part of the island, the proximity to the Equator and, in the south, the presence of the Tropic of Capricorn, Madagascar has various different climates, determined in part by the system of the winds. Towards the Indian Ocean, the rivers are numerous and short with a torrential aspect, except in the coastal part. Towards the Mozambique Channel, the rivers are longer, often large, and less rapid.

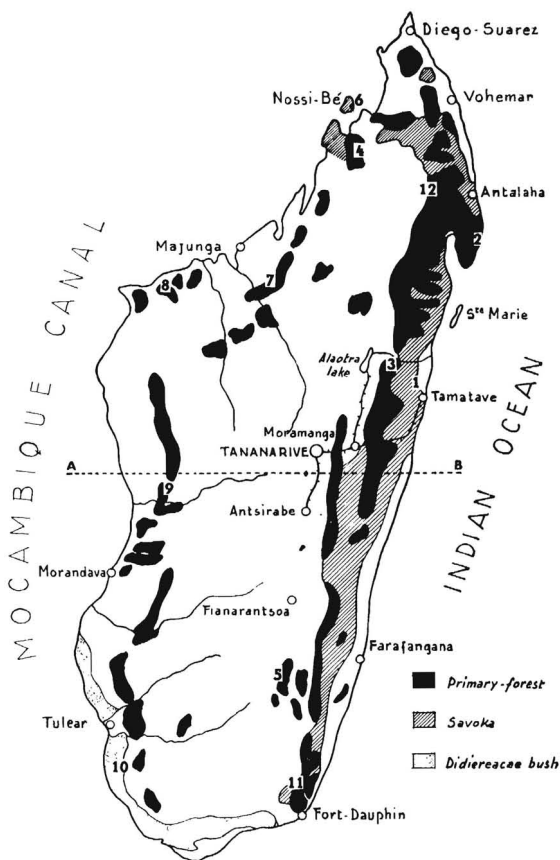


Fig. 2. Map of the distribution of forests on Madagascar. The "Savoka" is a secondary growth in the eastern zones. The numbers indicate the sites of the Integral Natural Reserves.

The vegetation of the island was exclusively a forest vegetation. From a very general point of view three plant formations are to be considered:

1.) The East and the Center formations are made by a rain forest, much more important than was indicated by RICHARDS (1952:12), show different aspects according to the altitude:

a) The eastern area is the only one to have a continuous forest zone, in some parts very narrow, on the slopes toward the wet trade winds. There are trees 10 to 20 m (30 to 65 feet) high with a very dense undershrub, of tree-ferns, *Pandanus*, orchids, and epiphytic plants. It rains all the year round, but the wettest season is during the summer: November to April.

b) The central area has now unfortunately only a few remnants of forests (the Eastern part of the Ankaratra Mts., Ambositra forest, etc.); there are generally denuded hills with reddish ravines in the laterite rocks; in the depressions or valleys are the rice plantations. The wet season is also during the summer, with fogs during the winter.

2.) The western formation is dry during a large part of the year with, in summer, a short but very rainy wet season. It shows some vestiges of forests with deciduous leaves, very different of the eastern and central forests.

3.) The subdesert far-Southern zone with the very strange bush of Euphorbiaceæ and Didiereaceæ, unique in the world.

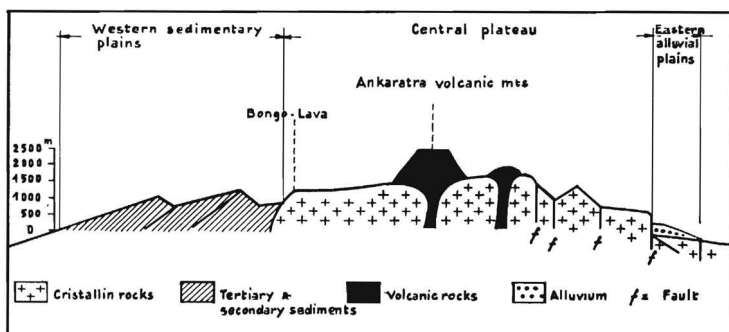


Fig. 3. Geological profile of Madagascar through the A-B line shown on figure 2.

Unfortunately these botanical formations were very much injured by the natives and their custom of burning the bush. Now only one-tenth of the general surface of the island has a primary vegetation, and the fauna is very restricted and local. For the protection of the remaining flora and fauna, France has made, since 1932, twelve Integral Natural Reserves in the different parts of the plant zones. The size of these different Reserves is very variable, 20 to 15,000 square kilometers, but it is strictly forbidden to enter such a Reserve (differing from a National Park), except with a special authorization for some scientific investigations. The flora and the fauna there are absolutely free.

About the Lepidoptera, the first general study was published by Dr. J. B. A. DECHAUFFOUR DE BOISDUVAL (1833). This study is generally known as a little book with the title *Faune entomologique de Madagascar, Bourbon et Maurice. Lépidoptères*. In fact, the original publication is in *Nouvelles*

*Annales du Museum* (Paris), 1833, vol. 2: pp. 149-270. The second general study is M. SAALMÜLLER'S: *Lepidopteren von Madagascar*, of which the first part was published in 1884 and the second, finished by L. VON HEYDEN, in 1891.

Between these two studies, of BOISDUVAL and SAALMÜLLER, a great number of original descriptions were published in different countries and periodicals, chiefly in France and England, and SAALMÜLLER, at the beginning of his book, had the merit to make a complete bibliography of the whole of the studies or papers published, up to his time, on the Madagascan Lepidoptera.

After SAALMÜLLER, the most important papers, with descriptions, were those of P. MABILLE (the original locality of these is generally unknown), CH. OBERTHÜR (from the collecting of MELOU, and PERROT brothers, and LAMBERTON), and G. KENRICK (from the material collected by F. B. PRATT). Between the two World Wars, the most important papers are those of L. B. PROUT (for the Geometridæ) and C. L. COLLENETTE (for the Lymantriidæ) from the material of the Tring Museum, collected and sold by MELOU and by N. and G. OLSOUFIEFF. Among the other collectors, it is important to cite the names of G. WATERLOT, A. SEYRIG, R. DECARY, and R. CATALA.

The classic views maintain generally that the fauna of Madagascar is very rich in Oriental affinities. After my first mission in Madagascar, during the austral summer 1951-1952, a small group of French specialists, in close relation with the "Institut de Recherches scientifiques de Madagascar," in Tananarive, was organized in the National Museum, Paris, to study with the collaboration of foreign specialists, if it is necessary, the Lepidopteroфаuna of the island. The results confirm entirely the more general views published by R. PAULIAN (1952) on the Madagascan insect fauna, and the classic older views must be completely modified or, at least, suffer some restrictions. If it is right that the endemic Lepidopteroфаuna is, with the still unlisted species, a rich fauna, it is no less true that this fauna is purely sylvan, limited now to the forest areas still existing. It is in these very restricted domains of the true native vegetation that the true Malgassican Lepidopteroфаuna must be studied.

As regards the number of individuals of any one species, it must be understood that this will depend upon the forest area. With the exception of the scrub on the burned areas, the rest of the forests are mostly on small patches in the bottom of valleys; the area is being reduced each year, and the fauna is disappearing there. These remnants of forest are very far from each other and effectively separated by regions devoid of animal life. Outside of the zones with a true Madagascan fauna, the zones cultivated by man have a great number of introduced species, as in the vicinity of Tananarive.

If, as I have said above, the species still to be listed are numerous, it is completely otherwise concerning the importance and the number of families. The richness in species of the catalogues of the fauna of Madagascar hides, in reality, the relative pooriness of the fauna. This fact, clearly true of the Lepidoptera, has been noted in other groups by J. MILLOT (1952) and R. PAULIAN (1952). Certain genera of Microlepidoptera, Geometridæ, Arctiidæ (Lithosiinæ), Lymantriidæ, and Satyridæ have reached an enormous development with a tremendous subdivision into endemic species and even sometimes of endemic

genera, with African affinities or unrecognizable because of profound modifications. On the other hand, other important families are very little represented; we can cite *Lycænidæ* with 42 species against more than 1,200 on the African continent and *Hesperiidæ* with 49 species against more than 450. It is also true for the *Notodontidæ*, *Saturniidæ*, *Pieridæ* (see, for this family, the excellent revision of the subfamily *Pierinæ* by G. BERNARDI, 1954). The *Pyalidæ*, that generally elsewhere form an important mass of the nocturnal Lepidoptero fauna, are only moderately abundant in Madagascar; the species are endemic, African, or scattered in every warm zone of the Old World. Many species injurious to crops belonging to this family are present in Madagascar. *Eupterotidæ* have just been discovered, with one species. *Metarbelidæ*, rather abundant on the Continent, are represented by only one genus and one species. *Hapialidæ* are unknown. Even if many species are still to be discovered and to be described in numerous families, the future discoveries, as compared with the importance of collecting during the past fifty years (R. Paulian, 1954), will not change the conclusions given here.

The origin of the Madagascar Lepidoptero fauna is African. Many common species, extensively scattered in every warm zone of the Old World, were described in 1833 from Madagascar and the Mascarene Islands by BOISDUVAL and then rediscovered in India some ten years after, when the African fauna was still almost unknown. This was one of original causes of the error, that made biogeographers consider the Madagascar Lepidoptero fauna an Indian fauna. If one refers to the numbers given below taken amongst the *Rhopalocera*, which are the best known, one will easily see that Madagascar has a fauna with an African origin. In the *Papilionidæ*, the endemics are all closely related to African groups; only one genus and one species, both endemics, have an indiscernable position. Among the 31 species of *Pieridæ*, a dozen endemics have Ethiopian affinities, the other species are all African, with the one exception of the imported genus *Catopsilia*, which has an Asiatic origin. Among the *Lycænidæ*, 24 endemic species are closely allied to the African species, several being even single strays; no genus is entirely Madagascan; 12 species are the same in Madagascar and in continental Africa; and 3 species have a vast geographical distribution in the Old World. In the *Nymphalidæ*, the genus *Precis* is exclusively Madagascan and Ethiopian. Among the *Hesperiidæ*, of 49 species, 31 are endemic and found in 8 endemic genera, with Ethiopian affinities, 18 species are also found in continental Africa. The majority of the *Sphingidæ* are African species or belong to African genera. The same is true for the *Geometridæ* where, because of the multitude of the species, there exist a certain number of endemic genera.

To end these few generalities, a little will be said about some spectacular species well known to lepidopterists.

*Chrysiridia madagascariensis* Less. (*Uraniidæ*) is a species of the eastern rain forest and flies during the day. This species emerges at the middle of the rainy season, and migrations to the central highlands sometimes occur. The foodplant of the larvæ is *Omphalea biglandulosa* Back — one of the *Euphor*

biaceæ found strictly in the forest. The species, except in migration, does not exist in the central highlands. R. CATALA, (1940) using variations of temperature, has obtained a great number of varieties, one specimen being almost entirely black.

*Argema mittrei* Guen. (Saturniidæ) is found in the eastern rain forest and some remnants of forests in the highlands (Ambositra, Isalo, etc.). It appears between September and April. The larvæ, polyphagous (R. Catala, 1937: 69), were found on one Mimoseæ, Myrtaceæ (*Eugenia*), and Cunoniaceæ (*Weinmannia*).

*Pharmacophagus antenor* Drury (Papilionidæ) is the largest of the diurnal Lepidoptera in Madagascar. It appears during almost the whole year in the western and southern areas. The larvæ feed on one Combretaceæ: *Quisqualis grandidieri* H. Baill.

The genus *Charaxes* (Nymphalidæ) presents beautiful species in the eastern rain forest.

Other species, less well-known and not very common in collections, are also interesting to signalize: *Hübneria dux* Saalm., a large Catocalinæ; *Epicausis smithi* Mab., with a long red anal tuft; the genus *Miniophylodes* (Noctuidæ); the genus *Isorropus*, with red and black species (Arctiidæ); and *Pemphigostola synemonistis* Strand, with an uncertain systematical position.

If it is a fact that the Lepidopterofauna of Madagascar has an African origin, how can it be explained? This comes within a more difficult and more general study, and it is necessary to use hypothetical reasoning. Moreover, the Lepidoptera are, from the point of view of biogeography, poor material. One of the last proposed hypotheses is that of Professor MILLOT (1952), who considers that Madagascar has been populated by natural islets that drifted from the main African rivers and landed along the island of Madagascar with their flora and fauna, the island acting as an empty place.

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