CHAPTER 4

The Invertebrates

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In the Animal Kingdom the invertebrates number more than a million species, divided into 116 orders and 47 classes, while the vertebrates are limited to a few tens of thousands of species, 45 orders, 8 classes. It is almost impossible to estimate the numbers for Madagascar. In spite of the enormous amount of scientific work already accomplished, the world of the invertebrates is still largely unstudied and undiscovered. The island holds, perhaps, more than 100,000 invertebrate species. In the butterflies alone, which number among the best-known Malagasy invertebrates, we have found well over 3000 species. It is obviously out of the question to discuss all the invertebrates here. We shall only point out a few which the traveller or naturalist might encounter in the course of his peregrinations about the island. We shall also leave aside Protozoa and marine forms, and choose our examples among the worms, gastropods, myriapods, crustaceans, arachnids and insects.

WORMS AND GASTROPODS

Among the astonishing species of the Malagasy fauna, we shall start with the huge flatworms (15 cm and more), coloured in brilliant contrasts of black and red, which wriggle across the soil of the Eastern rainforests.

Little forest leeches ("dinta") in Malagasy, live on the soil and leaves of these same forests. They make exploration unpleasant, particularly during rains. They are very thin and difficult to see, and can slide through cracks of shoes and clothing to fasten on one's skin and bloat with blood.

There are about 37 genera of Malagasy terrestrial molluscs, 7 of them endemic. Eleven are shared with India, 4 with both India and Africa, and only 6 with Africa alone. None have South American affinities. The commonest genus, *Tropidophora*, includes 85 of the island's approximately 300 species and extends to Europe and Arabia.

Terrestrial gastropods include large forms like *Ampelita*, once consumed in huge quantities by the Malagasy of Lake Alaotra. *Clavator* is a genus with numerous species which is also known as a fossil in Africa, and commonly used by geologists to date fossil layers. The large majority of the 300-odd species are endemic to the island. The regions richest in species are the calcareous regions of the north, west and south. Other species, mostly small and slug-like, haunt the eastern humid forests.

We should also point out that the giant snail, *Achatina* has been introduced from Africa by man. It is widespread in the east and the Sambirano where it attacks the fruit of cacao trees. It is brownish and conical, and may reach 5 – 6 cm shell length. People eat *Achatina* in Africa and the Pacific, but not in Madagascar.

SPIDERS AND SCORPIONS

Madagascar has about a dozen species of scorpions divided into 7 endemic genera. They have generally African affinities, but most Malagasy scorpions are small, not the enormous black species of Africa.

It remains true that they are disagreeable beasts with a painful or even dangerous sting. They live in both forest and savana. They are mainly nocturnal, with the unpleasant habit of taking refuge by day under any available cover, and are often found beneath the tent groundsheet when you strike camp. It is prudent to shake out your shoes in the morning before putting them on, particularly in the West and the southern bush where there are few hiding places.

More than 400 species of spiders, in 39 families, are known in Madagascar, though they are very incompletely studied as yet. We shall mention a few of the most obvious ones.

Nephila, and particularly the species *Nephila madagascariensis*, are large, long-legged spiders whose huge webs hang everywhere, even under the floor-timbers. Some time ago Reverend Father Camboue tried to start a silk industry using these spider webs, but the attempt failed. However, very beautiful traditional *lamba* were woven from spider silk for the Merina Kings in precolonial days.

The Gasteracanthea or crab spiders have about 20 Malagasy species in forests throughout the island. They are often brilliantly coloured, with abdomens ornamented with spines.

The Eusparassida are represented by a curious species, *Olios coenobita*, in the bush of the Mahafaly plateau. One is stupefied to discover certain thorn-bushes hung over with the whitened shells of little snails, dangling from threads as much as 80 cm above ground. The spiders have hoisted up empty shells by their silk, to form their own shelters. They manage to lift shells weighing 20 times their own weight!

The Arachaeidea are one of the oldest spider families of the world, originally described in many million years old Baltic amber. The genus *Archea* exists in Australia, South Africa, and Madagascar — a true Gondwanaland distribution. They are extremely small and difficult to see in the forest vegetation or the soil. They look like little monsters with outsized chelicerae and very long thin legs.

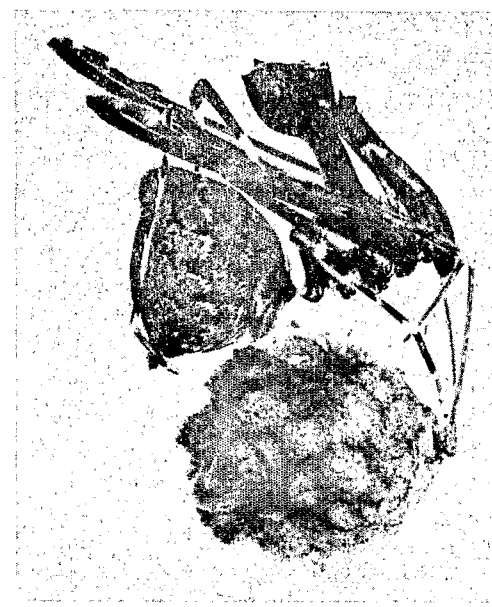

Fig. 4.1 *Archaea workmani* carrying her cocoon. This bizarre spider is only 3.5 mm long (Ph. Oberlé)

Among the sedentary spiders we should point out the aquatic species. Besides the freshwater *Argyronetes*, we know of two marine forms. They line the interior of little bell-shaped cavities with silk, either in the coral reefs or in clay nodules in the marine mud. They belong to two different species and genera: *Desis crosslandi*, (Baryche- lidae) and *Atrophonysia intertidalis*. Thanks to their "diving bells" which trap air through high tide, they can live at the low tide mark, where they make sorties in search of small invertebrate prey.

One venomous spider whose bite is actually dangerous is well known to Malagasy under the name "menavody" (*Latrodectus menavodi*). It is black, the size of a pea, with the end of the abdomen marked with one or more bright red spots. It hides in shadowy corners. The family is widespread: it's representatives in Europe and America are the "black widows".

Madagascar also has several small mygales, the tarantula group of spiders.

CRUSTACEANS

The truly terrestrial crustaceans of Madagascar are limited to isopods (wood-lice or sow-bugs). Crayfish live in the freshwaters, rather like those of Europe in appearance but in fact related to Australian and South American forms (Astacoides). There are also freshwater crabs (Potamonides) and shrimp. Some of the shrimp are small Atyidae and known as "patsa". They include a whole series of remarkable cave forms. Others are larger, like prawns, and much sought after by gourmets.

Among the oddities of the crustacean realm we might point out a curious little amphipod, *Austroniphargus bryophilus*. It is confined to the specialized ecological niche of the thin layers of water on the thick moss of natural basins in the granite rocks of a few mountaintops, in particular, the Andringitra massif. A related species has been recently found in the springs near Fort Dauphin.

MILLIPEDES AND CENTIPEDES

These have many Malagasy species. The Chilopodes, or centipedes have flattened bodies with a single pair of legs per segment, and move extremely rapidly. There are two large *Scolopendra* species, introduced by man and common throughout the tropics. They give a painful bite.

The Diplopodes, or millipedes have a rounded body, two pairs of legs per segment, and move more slowly. They are particularly frequent in the humid forests. *Sphaerotherium* are short and wide, brilliant green or matte brown. The Iules are thin and can grow to 15 cm long. They are black, though with red and orange variants. Millipedes are inoffensive vegetarians in spite of excreting a red liquid when disturbed. They roll up in a hard ball (*Sphaerotherium*) or a flat spiral disc (Iules) to protect themselves.

INSECTS

With the prodigious world of insects we enter an immense domain. In Madagascar their species number tens of thousands. We can only cite a few examples chosen among each of the Malagasy orders.

Although most Malagasy mammals and some of the birds belong to endemic families, it is not the same for insects. This ancient group has almost no endemic families. On the other hand there is a very high degree of endemism at the level of genus and species.

The insects of Madagascar are neither larger nor differently coloured from those of other lands, but the varied terrain, climate and vegetation have allowed the few forms which first occupied the island

to diversify almost infinitely. Madagascar has acted like a natural laboratory. The result of this isolated evolution is of the greatest interest to biologists, as well as for the ecologists who study natural equilibria. Perhaps no other region of the globe has shown such active speciation and adaptation to every habitat.

Let us correct, in passing, a common error. Entomology, the study of insects, is not just a theoretical occupation or a dreamer's distraction. Entomology results in highly concrete applications. It distinguishes useful from harmful insects, and provides means of combatting the latter. Some billions of billions of plant-eating insects live on the earth's surface, causing agriculture to lose the equivalent of the budget of a large nation every year. Without the long, patient research of entomologists, these depradations might be multiplied a hundredfold. We should also remember entomology's contribution to medicine, for instance by discovering the role of the Anopheles mosquito, and thus beginning to free mankind from the scourge of malaria.

From dragonflies to crickets

The Odonata or dragonflies and their two suborders, Anisoptera and Zygoptera, are represented in Madagascar by 10 families, 52 genera of which 13 are endemic, and 148 known species of which 101 are endemic. The largest species reach 13 to 14 cm wingspread,and are widely distributed in Africa and Madagascar (genus *Anax*). Many species of graceful damselflies gleam blue or red, along the forest streams.

The Dictyoptera include some 100 species of cockroaches of which 96 are endemic. There are about 60 mantids, some of them astonishing leaf mimics like the females of the genus *Brancksikia*.

Isoptera, or the termites, are represented by 17 genera and about 75 species, 71 of them endemic. We can divide them into three groups: termites which attack wooden buildings, termites attacking cultivated plants and live trees, and soil termites. Only the last group are particularly noticeable to travellers, particularly in the open savannahs of the west and south where their hills form small

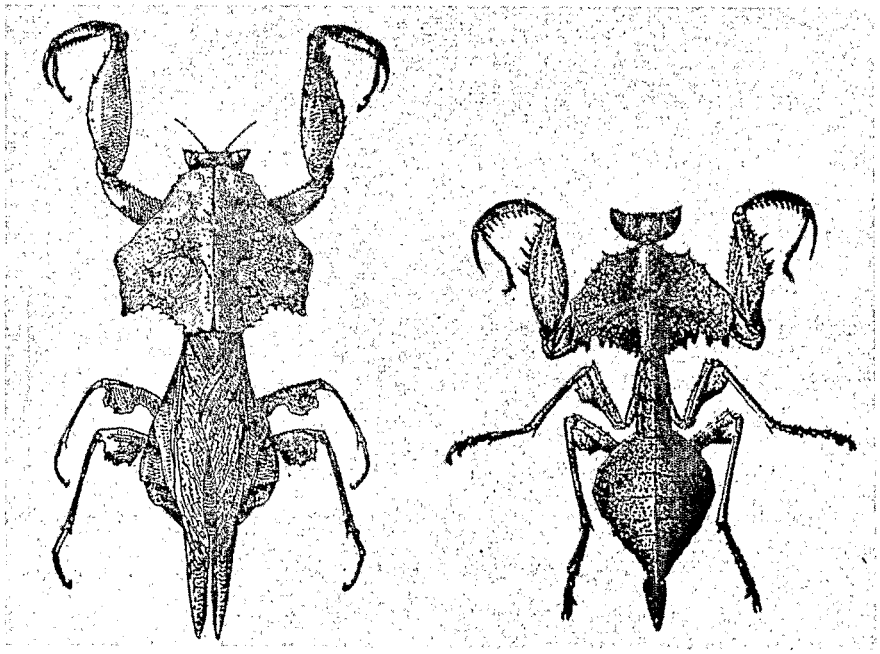

Fig. 4.2 *Brancksikia freyi*, female and larva. These mantids are leaf mimics (R. Paulian)

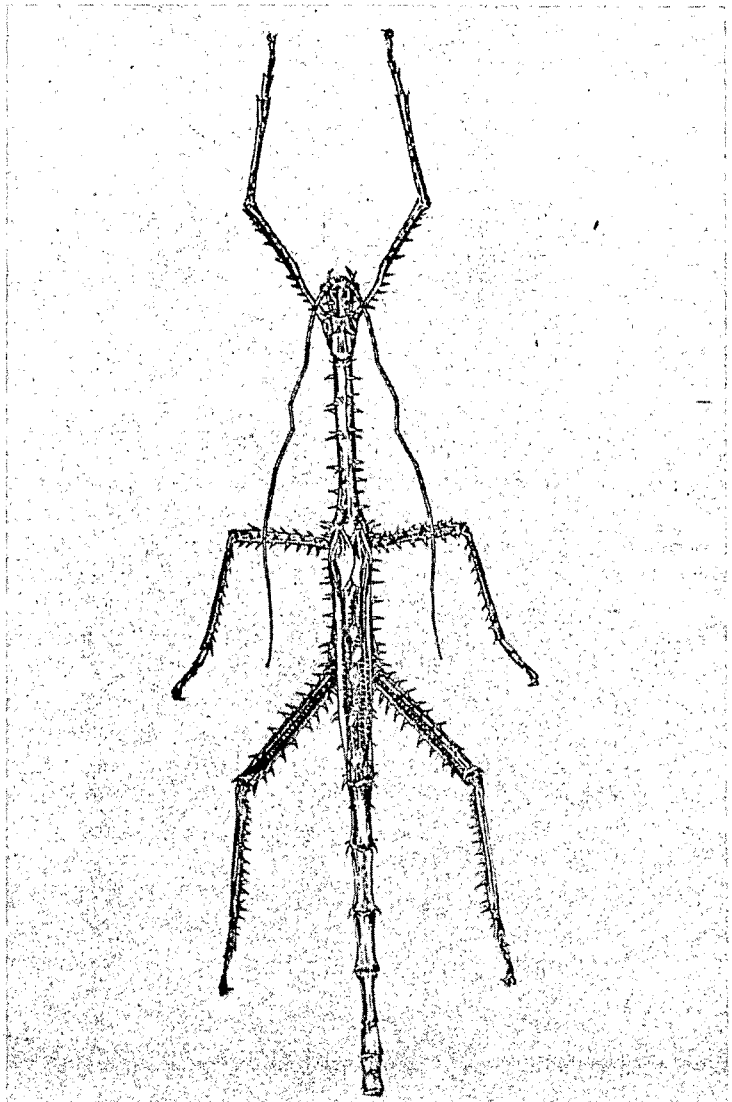

Fig. 4.3 *Achrioptera fallax* male, one of the eighty-odd Malagasy stick insects (R. Paulian)

characteristic cones. No Malagasy species build the monumental termite mounds several metres high which one sees in Africa.

The Cheleutopteas or phasmids have about 80 Malagasy species, all endemic. Some of the large phasmids of the genus *Achrioptera* mimic bunches of thorny twigs so cleverly that they are very difficult to see in spite of their bright colours. The largest females measure 25 cm long. Their short wings, which scarcely allow them to fly, are chiefly used in defence. The insect spreads them in ghostly, frightening fashion — but most of the time a frightened phasmid is immobile and escapes notice.

The Orthoptera, (grasshoppers, locusts, crickets) include a very large number of endemic species. The migratory locusts of the genera *Nomadis* and *Locusta*, under certain climatic conditions pullullate and become gregarious. They then move in immense flights of millions of individuals, descending to ravage

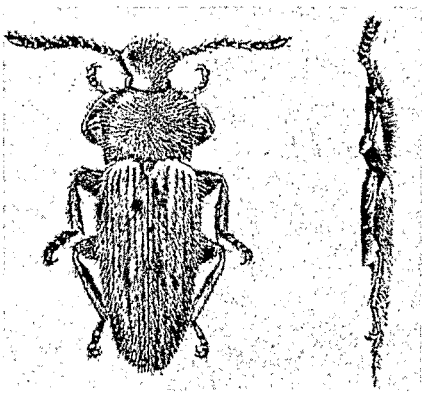

Fig. 4.4 *Tabula depressissima* dorsal and side views. This is an Elaterid beetle, flattened for living in the leaf axils of *Ravenala* the Travellers' Palm (R. Paulian)

the crops, and laying in particular spots. The eggs produce further armies of wingless nymphs which are as destructive as the adults. There was a time when these flights arising from the Southwest where the species reproduces, reached the High Plateau, and descended in clouds on the island's capital.

An anti-locust service was created, with a large centre at Betioky. Efficient controls have reduced the swarms, but the least relaxation of control could lead to renewed swarming. The rural people of the west and south do not disdain the nymphs as food, as well as some of the large crickets of the west which dig deep tunnels in the earth.

Two Acridian species of the genus *Phymateus*, "Valalan'alika", are remarkable for their garish colour: elytra steel blue with yellow checkerboard, and red wings, or else elytra brown to olive green and orange wings. The thorax bristles with rough tubercles.

Beetles

The Coleoptera are one of the best studied orders to date, with a large number of described species and genera. We shall only mention families with particularly remarkable species.

The Elateridae have large, beautiful species in the western dry forests and southern bush. They reach 45 mm long, with white or cream elytra decorated with black patterns.

The Buprestidae are one of the large Malagasy families of Coleoptera. More than 500 species are known, with practically 100% endemism, and the study of the small species of the forest canopy is far from complete. This swarming universe of insects includes many superb *Polybothris* species, metallic green or blue. We know of 160 species of Coccinellidae, a third of them endemic.

The Chrysomelidae number nearly 800 species, nearly all endemic. Many have handsome metallic colours. The most remarkable belong to the subfamily Sagrinae, with curiously swollen tibia on the hind legs.

The Anthribae have black species with white patterns. Their short rostrum gives them somewhat the appearance of weevils.

The Cerambicidae or long-horned beetles have 600 described species, nearly all endemic. The largest belong to the subfamily Prioninae and to the genus *Hoplideres*, where some females reach 85 mm in length, not counting the long antennae. These Prioninae are mono- chrome insects ranging from dark brown to light brown. They are nocturnal, and generally develop in dead wood.

The subfamily Lamiinae, though without such large species, has prettier ones. Some are diurnal, brightly coloured, with antennae which can be twice the length of the body. One of the commonest is *Stellognatha maculata*, whose black body has spots of pure white.

The Brenthidae are curious beetles with straight, elongate body, variable size and usually strong sexual dimorphism, the male often with neck and rostrum disproportionately elongated. Seventy-one species have been described, seventy of them endemic, divided into 39 genera of which 23 are endemic.

The Circulionidae or weevils have an enormous complex of families. Some 1300 species have already been described, only 3 or 4 non-endemic! Forms and sizes are extremely variable. Some mimic bark, moss or lichens. The strange group of the Attelabes roll up leaves into long cigars, to shelter an egg and the larva which emerges. Males often have head and thorax prodigiously elongated, which has earned one species the name "Giraffe". In the Tananarive region one species of this group attacks cultivated beans.

The Lucanidae are only represented by a few small species that are wholly endemic.

The Scarabeidae include a huge number of genera and species unique to Madagascar. Among the Scarabeinae (dung beetles) we might mention the remarkable group of forest-living *Eplissus* with their brilliant metallic colours, and the *Scarabaeus radama* and *Neonematicum sevoistra*, common in the southwest and the south, which you often meet on earthen paths rolling along their balls of dung destined to feed the larvae. The Melolonthinae or cockchafers again have many species and genera, of which the oddest are large pure white chafers. One of the most spectacular subfamilies is the Cetoniinae or flower beetles, with about 280 species divided into about 50 genera. The Malagasy flower beetles have many pretty species of various sizes, often with bright metallic colours. Among the loveliest are the lustrous and velvety *Euchroea*, like *E. coelestis* and *E. urania* whose larvae develop in *Pandanus* axils.

Among the Carabidae, carnivorous beetles, let us mention the Cicindeles, where the *Pogonostoma* species have South American affinities. They are arboreal with an elongate, cylindrical body, and steel blue or bronze-green colour. A large metallic blue Carabid, *Ctenostoma bastardi*, lives in the southwest. The Scaratini, redoubtable digging carnivores with large mandibles, are represented by about 60 species in 26 genera.

The order of Planipennidae includes, in the family Myrmeleonidae or ant-beetles, 17 described species. The Ascalaphidae have large forms in the west and south, including *Palpares voeltzkowi* with violet-black and white wings, and reddish-brown abdomen.

Butterflies and Moths

The Malagasy Lepidoptera, like the Coleoptera, are relatively well-known. Their often brilliant coloration and their great variety have attracted amateurs as well as professionals, so they have been studied in the field as well as the laboratory. The caterpillars of many species, though not the most spectacular ones, have become serious crop and storage pests.

On the High Plateau with its temperate climate you mainly find smallish, discretely coloured butterflies and moths. Leaving the capital, the amateur will find more beautiful species along forest roads in the Eastern escarpment, or on the beaches of damp sand by rivers and streams between Moramanga and Anosibe Anala, or around Prinet. But it is in the coastal regions that life explodes with exuberance, with magnificent large species in amazing colours.

Several Malagasy Lepidoptera have an international reputation, and are much sought by collectors. Some of these fortunately, are common like *Chrysiridia* (Urania) and certain *Papilio*. Others are rare or highly localized. Commercial collecting in habitats which are themselves threatened with destruction, may lead to extinction. This is true of the comet, *Argema mittrei*, and certain *Charaxes* and *Papilio*. Sale and exportation of these species should be controlled, and authorized only for specimens from

hatcheries under supervision.

Apropos of the sale of butterflies, we might point out that the glass cases sold by souvenir merchants in Tananarive often contain some species which are not Malagasy, but imported from Guyana or Brazil, such as the Morphos, huge butterflies with brilliant blue reflecting wings.

Some 64 families of Lepidoptera occur in Madagascar, with a whole range of shapes, colours and sizes from Microlepidoptera to Macrolepidoptera. It is impossible to sum up the number of genera and species: not only are the original descriptions scattered through many publications, but whenever a family is revised, new genera and species appear. Just for example, the Lymantriidae (ex Liparidae), revised in 1977, included before that date 24 genera and 182 known species. The 1977 revision added 28 new genera and 86 new species! Furthermore, at the moment only 13 of the 64 existing families have had a recent revision! Nonetheless, just to put forward a figure, we estimate more than 3000 species of Lepidoptera have been described, of which 97 – 98% are endemic.

It is strange that Madagascar has no species of Homoneura. These are primitive Lepidoptera, best known by the lovely species of the family Hepilidae or ghost-moths. In Africa and Australia, they reach a wingspan of over 20 cm, their brightly coloured wings spotted with pale mother-of-pearl.

Caterpillars of the family Psychidae live inside sheaths covered with silk or bristling with twigs. *Deborrea malagassa*, the "fangotabolo", is very common. On the High Plateaux it eats mimosas, and you often see the grey larval sheaths, as big as a hazelnut, hanging from the branches.

Among the Geometroidea there are beautiful species, particularly among the Uraniidae, a family that includes both delicate white forms and the well known, *Chrysiridia madagascariensis* or Urania moth. This gorgeous insect has a palette of iridescent greens and oranges on a background of velvet black. It migrates across the island in huge groups.

The superfamily of the Noctuoidia has many Malagasy representatives in its families the Noctuidae, Arctiidae and Amatidae.

In the Noctuidae there are large species in the subfamilies Ophiderinae and Catocalinae. In the latter the genera *Miniodes* and *Miniophyllodes* have forewings of yellow ochre and hindwings carmine. The genera *Cyligraramma* and *Erebus* are large nocturnal, slow flying, moths which take refuge in dark places by day and frequently enter habitations. Malagasy legends say these are "lolo-paty" come to visit the living. "Lolo" in Malagasy means both spirit and moth; "lolo-paty" can be translated "spirits of the dead".

The Catocalinae also has large, handsome species in the genus *Emmonodia*.

The family Agaristidae has 35 species and 11 genera in the Island. These pretty moths fly by day in the forests where it is difficult either to observe or capture them. The largest and handsomest are *Rothia*, a genus with 23 species. The forewings have red, white or blue spots on a velvet black background. The hindwings are variable, often with a wide black border.

The most amazing moth of this family is *Pemphigostola synemonistis*. The male has a hyaline stridulatory apparatus with narrow transversal ridges at the base of the leading edge of its fore-wings. It is the only Malagasy lepidopteran with a stridulatory organ, which is unusual for any insect of this order. The sexes are fairly dimorphic and the female lacks this organ, whose role and use are so far unknown.

The large, mainly nocturnal family Arctiidae has very small moths in the subfamilies Lithosiinae and Nolinae, and a few pretty, medium sized species among the Actiinae and Aganainae. Many of their caterpillars live among lichens and mosses.

The small family Amatidae has about 80 species in 16 genera, of which 15 are endemic. These are small moths, difficult to observe, brownish or black with white or yellow patterns. Only the genus *Euchromia*, also found in Africa and the Comoros, has two brighter species which reach 50 – 55 mm wingspan.

The superfamily Bombycoidea or silkmoths, has just one species of the family Eupterotidae and one

of Bombycidae. The best represented families of this group are the Attacidae or Saturnidae, and the Lasiocampidae.

Among the Attacidae, the best known is *Argema mittrei*, the comet moth, largest of the Malagasy Lepidoptera and one of the largest in the world. The male can exceed 20 cm length including tail. *Argema* is a clear yellow, with a few russet marks, distinguished by hindwings prolonged as two long "tails" which are especially long and narrow in the male. This nocturnal species is not rare, far from it. However it is sold commercially to such a degree that it could easily become rare. The Malagasy gatherers can easily recognize the 6 – 10 cm cocoon of white or pinkish silk, and gather hundreds to obtain fresh, intact adults at the moment of emergence. The caterpillars eat many sorts of plant and could easily be reared. It would be preferable to protect this species in the wild and have specialized hatcheries offering specimens for sale.

Still in the Attacidae, the genus *Tagoropsis* has fine large forms, in neutral yellow or brown colours.

The family Lasiocampidae in its two subfamilies contains almost a hundred Malagasy species in 27 genera. These nocturnal moths, coloured dull brown, reddish, or greyish, seem to have little attraction except for the specialist. However the Malagasy have been using *Brocera* silk for well over a century. They unrolled the cocoons to form a silk which was fairly coarse and raw but very solid. It was woven by the women, especially in the Betsileo country. This silk, in former times was exclusively made into "lambamena", the magnificent red and black dyed shrouds of the dead. Attempts to raise the caterpillars have been unsuccessful and cocoons were simply gathered from the wild for local craftsmen and women. With the introduction of the silkworm (true *Bombyx*) and the importation of silk thread, the use of *Brocera* cocoons has largely disappeared since they are somewhat prickly with hairs from the caterpillar. The Malagasy call *Brocera* caterpillars, cocoons and moths "Landy" or "Landibe".

The Sphingidae or sphinx moth family has about 60 Malagasy species in 24 genera. They are powerful fliers and there are several species of world-wide distribution, but there are also no less than 34 endemic species and 8 endemic subspecies. One of the most interesting Malagasy sphinx moths is *Xanthopan morgani praedicta*, the only species which fertilizes the comet orchid, *Angareceum sesquipedale* (see Chapter 2). It is one of the largest of the world's Sphingidae with a wingspan of 15 cm. Another sphingid, *Euchloron megaera lacorderei* is a handsome insect with bright green forewings and yellow hindwings speckled with black.

Among the diurnal butterflies, the Rhopalocera, we find most of the brightly coloured species.

The family Papilionidae is represented in Madagascar by only 13 species in 3 genera. *Graphium* has 3 endemic species of small wingspan. In *Papilio*, the swallowtails, the *P. demodocus* group has two endemic species: *P. grosemithi* and the rare *P. morondavana*. The *P. dardanus* group has one endemic subspecies, *P. dardanus meriones*. The *P. nireus* group has four endemics: *P. oribazus*, *P. epiphorbas*, *P. delandei* and *P. mangoura*. Finally the genus *Pharmacophagus* has one beautiful endemic species, *P. antenor*, which lives in the west and Southwest, a huge black butterfly with white markings and red lunules on the hindwings which are prolonged into the swallowtails.

The family Pieridae are butterflies with white wings marked in black or orange. They have eight genera and about 20 species. Only the genus *Milothrys* with large, rare species, contains pretty butterflies with orange wings 60 – 65 mm in wingspan.

The Danaidae have only two genera with one species each: *Danaida chryssipus* and *Amauris nossima*.

The Nymphalidae, with 18 genera and 45 species, include handsome butterflies much sought after by collectors. We may cite *Euxanthe madagascariensis*, seven species of *Charaxes* and four species of *Hypolimnas*, as well as the pretty little *Precis radama*, which is bright blue.

The Acraeidae, small butterflies (except the fine *Acraea hova*), have pretty forms with more or less translucent wings. They have 19 species in 2 genera.

Finally, the families Lycaenidae and Satyridae have many endemic species of small and medium sized butterflies, but monographs on these families have not yet been published.

From flies to water scorpions

The huge order Diptera, the flies, mosquitoes and so on, has more than 70 families present in Madagascar, with many genera and species, but it has not been the object of a summary publication. A few families are well studied such as the Blepharoceridae and the Pyrogotidae. One volume of the Faune de Madagascar deals with the Culicidae-Anophelinae mosquitoes.

Many of the flies are parasitic on man or animals. The Simuliidae have aquatic larvae, and a very disagreeable bite. These little flies the "mokafoy", pullullate in various regions. The Ceratopogonidae are tiny gnats which live by the edges of the sea and saline lakes. They are practically invisible but their bites are even more disagreeable than the Simulid's. The Anopheles are vectors of various diseases including malaria. Finally in the hot regions of the west and south several species of Tabanidae, or gadflies, also bite painfully.

Mammals and birds have Dipteran parasites, some of them wingless. Besides these bloodsucking Diptera, the Malagasy fauna has hundreds of other flies and gnats, including parasites of plants and of other insects.

With the Hymenoptera (wasps, bees, ants, etc.) we move to a large and economically important insect order. Many Hymenoptera play a primary role in maintaining biological equilibrium, as predators of other insects including the pest species of crops and forests. The abuse of chemical insecticides which destroy these Hymenoptera as well as the pests for which they are intended, can recoil on the user with even greater damage.

Although there are few studies in depth of the Malagasy Hymenoptera, we may estimate about 1700 known species, divided into 300 genera.

The Vespidae or wasps, the "fanemitra", with around 60 species, are all too easily found, particularly

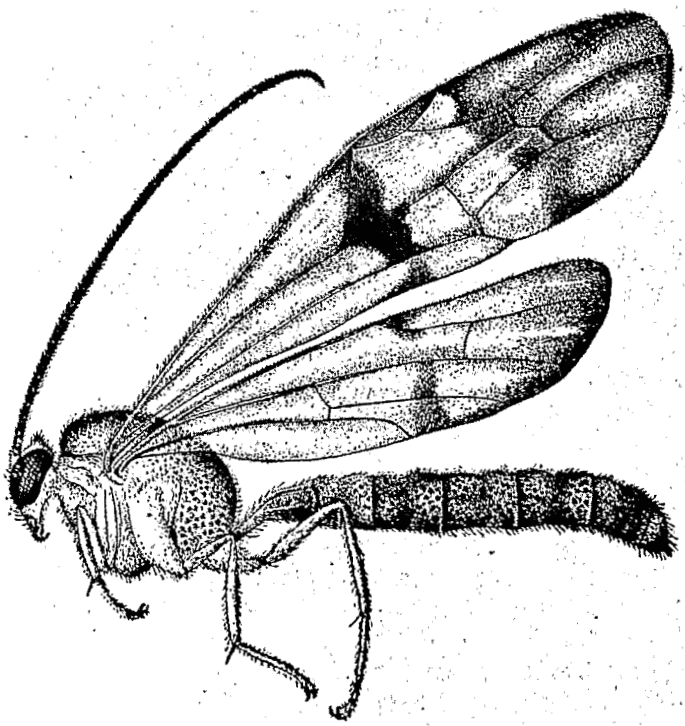

Fig. 4.5 *Hemipimpla pulchripennis*, an ichneumon which preys on Polistes wasps (R. Paulian)

in the dry western forests and bush. Their grey paper nests of open cells are hung from the vegetation at face or chest height, not very visible among the leaves. The inhabitants when disturbed become aggressive, and particularly the larger species have painful stings.

Malagasy bees give honey which is much appreciated, whether it comes from hives or honeycombs in the forest. Their Malagasy name, "renitantely", means "mother of honey".

The Formicidae or ants again have many species. On the forest trees you can see enormous balls more than half a meter in diameter which are the paper nests of tree-ants, genus *Crematogaster*. Covered galleries often connect these nests to the ground, running along the branches and down the trunk.

The Chrysidae are present, with 36 species that parasitize other insects, brilliantly coloured in metallic green. One can often see them flying round outside the woodwork of houses, looking for tunnels dug by the larvae of other insects, their prey.

The curious Mutilidae also have highly coloured forms. Their wingless females run on the ground; they are also parasites, particularly of caterpillars.

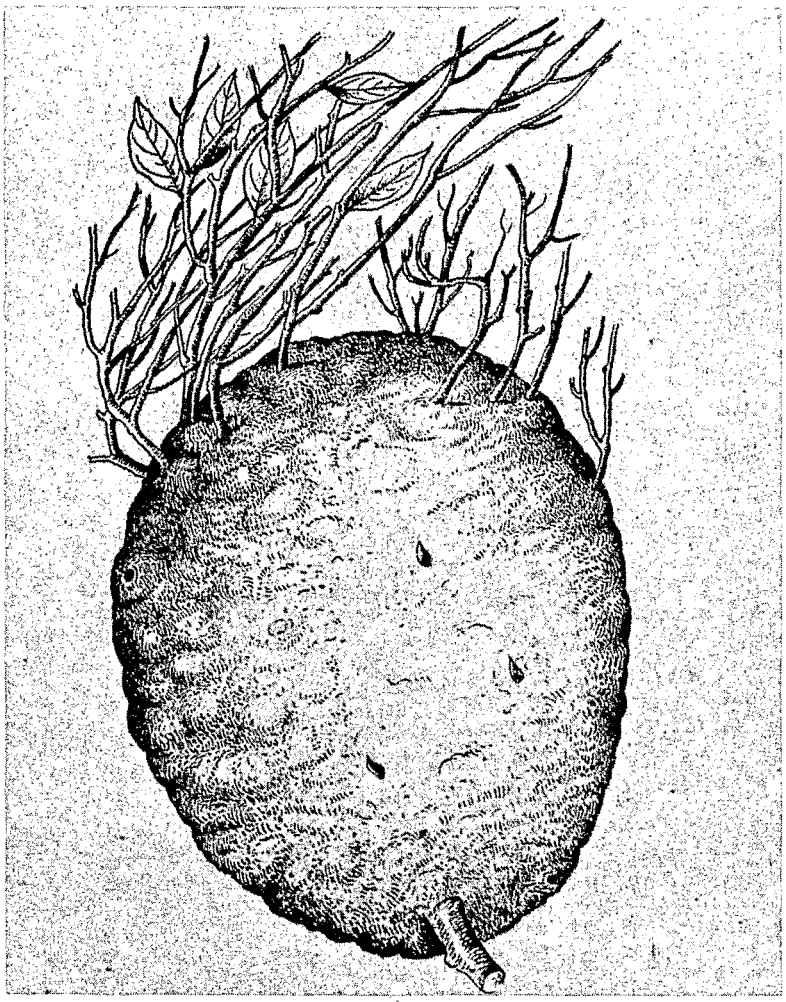

Fig. 4.6 The paper nest of arboreal *Camponotus* ants. These excrescences are common in both humid eastern and western deciduous forests (R. Paulian)

As a general rule the traveller should beware of all the Hymenoptera, and never catch them without precautions, for most inflict either bites or stings which are unpleasant or even dangerous.

The order Homoptera includes, among others, the Cicadidae or cicadas, the Yanidae or ciccadelles, the Fulgoridae, the Aphididae and the Coccidae or scale insects. Many families are still little studied, but an estimated 700 species are known.

About 30 cicada species in about 12 genera live in Madagascar. The large species of *Yanga* make the forests resound with their stridulation. *Yanga guttulata* may swarm, and its larvae become serious pests of sugarcane fields.

One common ciccadelle *Ptyelus goudoti*, dirty yellow coloured with black spots, attacks many legumes. In the parks and gardens of Tananarive, jacaranda trees frequently "rain" drops of foamy liquid as the larvae burrow into the host plant. This is a particularly common phenomenon in the jacarandas bordering Lake Anosy.

Among the Fulgoridae one common species, *Pyrops madagascariensis*, the "sakondro", is eaten by some groups of people. They pull off the rostrum, legs and wings, and serve the insects with rice either boiled or fried in oil. Many Fulgoridae and Flattidae (a related family with laterally flattened body, whitish or rose-red) live colonially as flower-mimics on trunks or branches. They secrete sugary manna, sap transformed as it passes through the intestine, which nourishes both ants and lemurs.

Among the scale-insects we must mention the "lokombitsika", a species of *Gascardia* which lives in fist-sized colonies, whitish, fixed onto branches. Each insect is enveloped in a thick layer of wax. These colonies attract ants, hence their name, "ant-wax".

The order of Heteroptera, the bedbugs etc., has many representatives. The families Nepidae, or water scorpions, and Belostomidae inhabit fresh water. The genus *Belostoma* includes a water bug which can reach 8 – 10 cm in length. These insects are attracted by lights in the evening, and often fall under streetlights or on house verandahs.

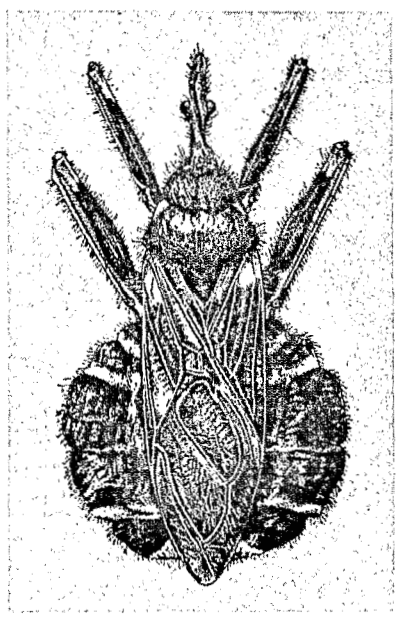

Fig. 4.7 *Pantoleistes grandis* (Reduvidae) (R. Paulian)

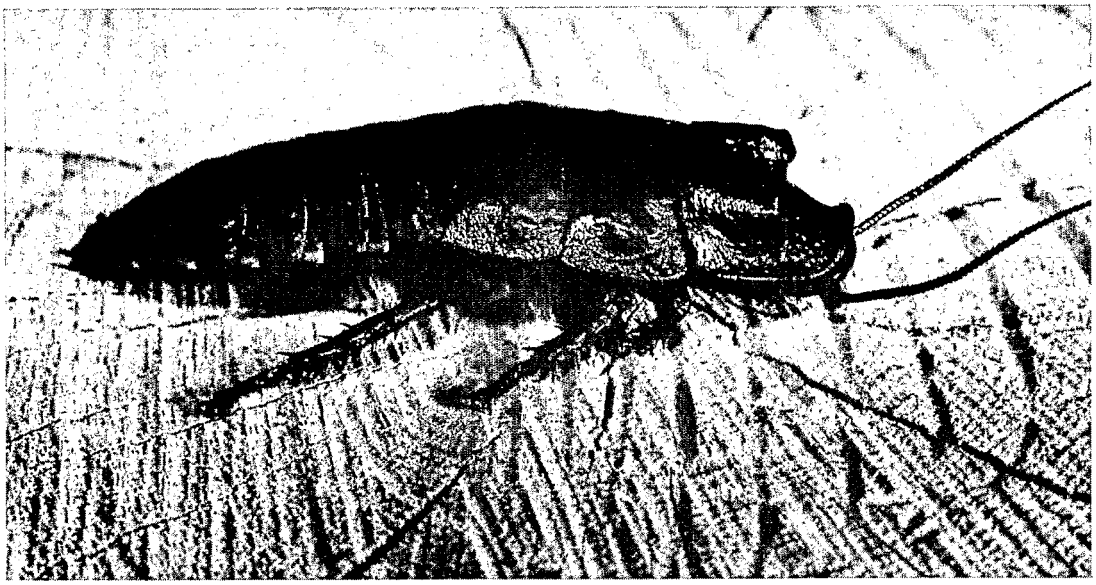

Fig. 4.8 *Gromphadorhina portentosa* a 60 gm cockroach which hisses in courtship or when alarmed (J. Fraser)

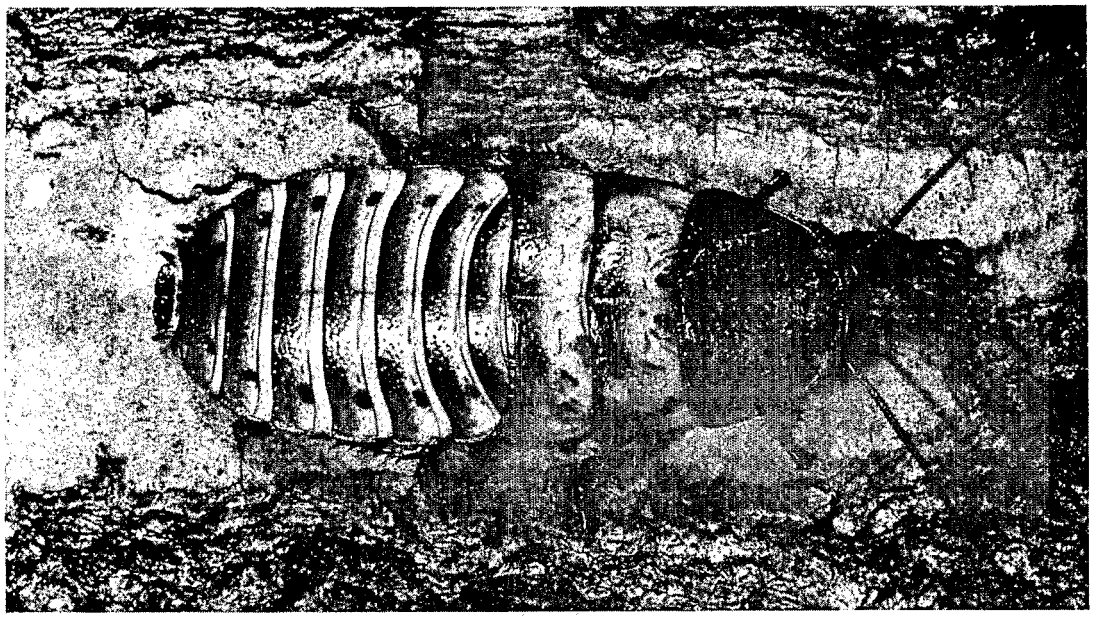

Fig. 4.9 *G. hopardi*. This cockroach also hisses when alarmed, but whistles in courtship (J. Fraser)

Among the Hemiptera only three families have yet been systematically revised, among about 15 families on the island. Some of these have many species, like the Coreidae and the Pentatomidae.

Many Hemiptera are serious crop parasites. Many are also attracted to lights, and the swarms of some Coreidae can be very disagreeable in the evening. One should be careful of the prettily coloured species of Reduviidae, which bite painfully. This family also contains remarkable species with thin elongate bodies and frail, outsized limbs, of which some live in caves.

Thus we finish our rapid survey of the world of malagasy invertebrates. It is a world with a prodigious number of species. These few pages can only show a pale reflection of its richness and endemism. However, it is a world under threat.

The invertebrates are fragile creatures, vulnerable to pesticides and insecticides, and to change in the natural environment with the degradation of forest cover.

Let us refrain from unthinkingly letting this fauna disappear. In spite of the small size of its individuals, it plays a primary role in the biological cycles of nature, and it offers an inexhaustible field for research.

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