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Drosophilidae of Seychelles: biogeography, ecology and conservation status

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† A large part of this work was done by the late Daniel Lachaise. The energy and knowledge of our former colleague and teacher has been a major driving force behind much of the research into Drosophilidae of islands of the western Indian Ocean and, indeed, the rest of Africa and to him we owe an enormous debt.

Introduction

A comprehensive collection of Drosophilidae (Diptera) was made 100 years ago during the Percy Sladen Trust Expedition to Seychelles. Recent collections made on the same islands provide a significant opportunity to study the way the composition of a fauna changes over a long period of time. Of particular interest is evidence of extinction and of invasion. Remote oceanic islands like the Seychelles Archipelago also provide evolutionary biologists the opportunity to study how speciation occurs when populations are physically isolated by great distances from a mainland and by short distances island to island. The evolution of species of Drosophilidae on the archipelagos of Hawaii, Tristan da Cunha, Marquesas, and Samoa, has, in each case and like Seychelles, resulted in high levels of endemicity and morphological diversity. But it is also true that on each archipelago native plant communities, upon which most insect communities depend, are succumbing to the dominance of invasive weeds and the impact of human activity. There is therefore much to be gained by carefully revising our knowledge of the taxonomy, the biogeography and insect-plant interaction so that conservation strategies are better informed.

In June 1908 the entomologist Hugh Scott went to Seychelles to join the Percy Sladen Trust Expedition in the final months of the second of the two voyages, he remained camping and collecting in the endemic mountain-forests of the larger islands until March 1909 after the expedition had ended (Thompson 1961). Scott collected on

Silhouette from August–November, on Mahé October–November, Praslin in November, Félicité in December, Mahé again in January and February and Anonyme in January. His specimens were eventually deposited in the Cambridge University Museum of Zoology and the British Museum of Natural History. Charles G. Lamb studied the material and documented its rich diversity; of the 25 drosophilid species collected by Scott, 20 were described as new. Lamb (1914) classified them into 13 groups that are now recognized as 12 genera (Lamb 1914).

Even as early as 1915 the importance of these discoveries of "unusual morphology" among species of *Drosophila* was linked to the study of genetics and the evolution of species. Cockerell (1915), in a review of Lamb's work, wondered "whether [the *Drosophila* species] do in fact differ in ways at all paralleled by Morgan's [*Drosophila*] mutants, or [are they] likely to have arisen in similar fashion. The important cytological paper by Metz, just published, represents one way of attacking this problem; the taxonomic results of Lamb, based on twenty species, afford us another" (Cockerell 1915).

Some 68 years later in 1977 Leonidas Tsacas and Jean David mounted a *Drosophila*-collecting expedition to the archipelago. They sampled from Mahé and Praslin and rediscovered most (22/25) of the species described earlier by Lamb. Additionally, they discovered an important species of the *D. ananassae* group, *Drosophila vallismaia* Tsacas, 1984. During the Oxford Seychelles Expedition a few years later in 1980, Nigel Varty and Susan North collected from Cousin and Praslin. Among their samples (in alcohol), Gerhard Bächli, recognized a new species of the *Drosophila melanogaster* subgroup which he subsequently described with Tsacas as *Drosophila sechellia* Tsacas & Bächli, 1981.

Taxonomically and genetically *Drosophila sechellia* is very close to *D. simulans* and *D. melanogaster.* While *simulans* and *melanogaster* have worldwide distributions, *sechellia* is restricted to Seychelles where it is intimately associated with toxic *Morinda* fruit. The implications of the discovery of *D. sechellia* are profound, not only for genetics, genomics and evolutionary biology in general, but also for affirming the conservation significance of the region (Lachaise *et al*. 1988, 2004). The importance of *Drosophila sechellia* cannot easily be exaggerated. In a recent major review of *Drosophila* genomics in *Nature* (Stark *et al*. 2007) *D. sechellia* is one of the key *Drosophila* species whose genome has been sequenced to completion.

Despite the rich diversity of species collected by Scott in 1908–1909 (Lamb 1914), by Tsacas and David in 1977 (Tsacas *et al*. 1981), and despite the addition of the high-profile species *Drosophila sechellia* and *D. vallismaia,* fieldwork targeting the Drosophilidae in Seychelles has, until the recent surveys, been limited. Specialist collecting effort during most of the last century was the summation of Scott's collecting on five islands over seven months and Tsacas and David's work on two islands for one month. Until the current Franco-Seychellois CNRS-ICS-NPTS field survey program (2003–2007) many islands had not been sampled for Drosophilidae. Incidental records (the bi-catch from other entomological work) and observations of that part of the fauna easily attracted to fruit offered some indication. Apart from the limited amount of collecting (not withstanding the recent surveys), there has also been a bias favouring

the inner granitic islands rather than the outer coralline islands. But in this respect the expectation of discovering a rich fauna of plant- or fruit-breeding drosophilid species was low. In commenting on the composition of the insect fauna of Aldabra, Cogan *et al.* (1971) wrote: "In any area close to the shore it was noted that the lesser fruit flies (Diptera-Drosophilidae) were actively displaced from the niche they commonly fill, i.e. fermenting fruit and vegetation, by small shore flies of the family Tethinidae. Rotting fruit in fly traps rarely produced drosophilids, but always very large numbers of four species of Tethinidae. It is obvious that the species of Tethinidae breeding in shore litter, rotting seaweeds, etc., are naturally attracted to fruity odours and the products of decomposition, and occur in such numbers that they are able to successfully compete with the fruit flies for the available food."

Justin Gerlach's (NPTS) Indian Ocean Biodiversity Assessment (2000–2005) marked the centenary of the Percy Sladen Trust Expedition to the Indian Ocean and presented an excellent opportunity to collaborate and maximise outcomes for biological science. A joint Franco-Seychellois team (CNRS-ICS-NPTS) carried out a field survey over several years from 2003–2007 with the objective to assess the current status of the biodiversity of the species of Drosophilidae in Seychelles.

The 41 species we have recorded has nearly doubled the previously known fauna. Some species remain undescribed, several are known only by unpublished notes or observations and in some cases specimens are unsuitable for description. The fauna is now classified into 12 described genera and one which is still incertae sedis in *Drosophila* (Cariou *et al*. 2008) A question we ask is: to what extent has the native drosophilid fauna been endangered by the spread and colonization of invasive species? The present work presents an account of the biogeography, ecology and conservation status of the Seychellois drosophilid fauna.

Materials and methods

The species that are common and abundant now but were absent or not collected 100 years ago (1908–1909) or 31 years ago (1977) are of particular interest. To have such comprehensive collecting records for Drosophilidae spanning such a large period of time is almost unique in the world. Over the last one hundred years contributions to knowledge of the drosophilid fauna has come from either faunistic surveys specificly targeting drosophilids or by way of other entomological survey work.

Origins

In discussing the biogeography of this fauna we use the terms endemic, introduced and invasive. We use *endemic* for species currently known only from islands of the Seychelles Archipelago and caution that the fauna of Madagascar is still poorly known. We use the term *introduced* for non-endemic species that have been reported from Seychelles but never in very large numbers (e.g., *Drosophila hydei, D. immigrans* and *Dettopsomyia formosa*). We use the term *invasive* to describe those non-endemic species which are present in huge numbers and at many localities, especially abundant in disturbed (non-native) habitats. The obvious examples of invasive species in the present surveys are *Drosophila malerkotliana* and *D. nasuta.* When scoring the

frequency of specimens of species in general collections one always needs to bear in mind that two important phenomena distort the outcome: on the one hand collectors are often targetting particular species collecting all of them (e.g. *D. sechellia*) and on the other hand collectors become reluctant to keep collecting super abundant species (e.g. *D. malerkotliana*) eventually collecting none of them. Our application of the three terms is therefore based on numbers of specimens collected *and* first-hand field experience.

Diversity

Twelve genera of Drosophilidae are represented in Seychelles (*Chymomyza, Dettopsomyia*, *Dichaetophora*, *Drosophila*, *Hirtodrosophila*, *Hypselothyrea*, *Leucophenga, Microdrosophila*, *Mycodrosophila*, *Scaptodrosophila, Scaptomyza* and *Zaprionus*) and 41 species (Table 1).

The composition of the drosophilid fauna of Seychelles is changing. In its present state the fauna includes eight subcosmopolitan species, seven in common with Africa and two in common with both the Afrotropical and Oriental regions. On the other hand, 17 species are probably endemic. The remaining species probably also exist in Madagascar, a country still poorly surveyed, or on the African continent (Carious *et al*. 2008). The increase in the number of species (24 in 1909 to 41 in 2007) is due mainly to more focused collecting over a wider range of habitats and islands, but is also due to the arrival of introduced or invasive species. Two species, very abundant in 1977, 2003 and at present, were probably not present in 1908, and were thus introduced between these two dates: *D. malerkotliana* and *Zaprionus tuberculatus*. The former is probably the most successful and vigorous colonizer of Afrotropical regions (see David & Tsacas 1981; Lachaise & Silvain 2004).

The high conservation value of the Vallée-de-Mai, Praslin

22 species of drosophilids were recorded in the Vallée-de-Mai (Praslin) during intensive surveys in 2003 (Table 2). This represents 54% of the total drosophilid fauna recorded from all of the islands of the archipelago. Moreover, 29% of these drosophilids are endemic to Seychelles. Two of them (*Drosophila vallismaia* and *Drosophila* sp. c) are known only from the Vallée-de-Mai. Four of the taxa collected at this important locality are probably new species overlooked in early fieldwork.

Ecological data obtained during the 2003 field studies in the Vallée-de-Mai has provided further evidence that preservation of the endemic plant community is key to the survival of a wide range of arthropods. The present drosophilid surveys have highlighted the importance of, among other plants, the endemic *Pandanus* palms. An important discovery made during these surveys is evidence that *Drosophila vallismaia* Vallée-de-Mai is intimately associated with the coco-de-mer palm *Lodoicea maldivica*. The fruitfly species was repeatedly found only on the coco-de-mer fruits and nowhere else. It was shown to breed in the dense, fibrous, and mildly flavoured husk of the nut. This coco-de-mer fruit husk is prone to alcoholic fermentation which makes the decaying plant tissue suitable as a resource for *Drosophila*. Yeasts that are host-specific on *Lodoicea* are probably also involved. It is extremely rare among drosophilids worldwide for a species to have such a small home range. This makes it particularly

Table 1. Drosophilidae of Seychelles

1a. granitic islands

Endemic	**Mahé**	**Cerf**	**Long**	**Anonyme**	**Silhouette**	**North**	**Praslin**	**Curieuse**	**Cousin**	**Cousine**	**Aride**	**La Digue**	**Cocos**	**Félicité**	**Frégate**
Leucophenga grossipalpis	•		•		•		•							•	
L. sericea	•				•		•								
Dichaetophora aberrans	•				•										
D. sechellia	•				•		•		•	•	•	•	•		•
D. vallismaia							•		•						
D. sp. c							•								
D. sp. d					•										
D. spinipes	•				•		•								
Hirtodrosophila sp. e	•				•		•								
Hypselothyrea notabilis	•			•			•				•				
M. nigrobrunnea	•						•								•
M. sp. f	•														
M. sp. g	•														
Scaoptodrosophila finitima	•	•			•										
S. jucunda	•				•		•								
S. sp. h							•								
S. sp. i	•				•		•								
S. sp. j					•										
Scaptomyza punctiscutata	•														
	14	1	1	1	11		12		2	1	2	1	1	1	2

Inidgenous	**Mahé**	**Cerf**	**Long**	**Anonyme**	**Silhouette**	**North**	**Praslin**	**Curieuse**	**Cousin**	**Cousine**	**Aride**	**La Digue**	**Cocos**	**Félicité**	**Frégate**
Dettopsomyia sp. b	•														
Mycodrosophila fracticosta	•				•		•		•		•	•			
M. nigerrima	•														
Scaptodrosophila caliginosa	•														•
S. lambi	•														
S. rufuloventer	•						•	•	•			•			
S. triangulifer	•				•				•						
	7				2		2	1	3		1	2			1

introduced	Mahé	Cerf	Long	Anonyme	Silhouette	North	Praslin	Curieuse	Cousin	Cousine	Aride	La Digue	Cocos	Félicité	Frégate
Chymomyza bicolor	•														
Dettopsomyia formosa	•			•	•				•		•				
D. immigrans	•					•						•			
Drosophila ananassae	•				•		•					•			
D. melanogaster	•				•						•				
D. simulans	•				•		•							•	
Microdrosophila pleurolineata	•				•	•	•								
Scaptodrosophila latifasciaeformis	•				•				•			•			
Zaprionus indianus	•				•							•			
Z. tuberculatus	•						•					•			
	10			1	7	2	4		2		2	5		1	

invasive	Mahé	Cerf	Long	Anonyme	Silhouette	North	Praslin	Curieuse	Cousin	Cousine	Aride	La Digue	Cocos	Félicité	Frégate
Dettopsomyia nasuta	•				•		•				•	•		•	
Drosophila malerkotliana	•				•		•	•	•			•	•		•
	2				2		2	1	1		1	2	1	1	1

1b Coral islands

Species		Denis	D'Arros	Aldabra
Leucophenga sp. a	endemic			•
Drosophila malerkotliana	invasive		•	
Drosophila sechellia	endemic	•		
Scaptodrosophila latifasciaeformis	introduced	•	•	
Zaprionus indianus	introduced		•	
		2	3	1

interesting for population genetic and evolutionary studies but its hostplant association makes it equally interesting as an ecological model with considerable potential. *Drosophila vallismaia* is a member of the *D. ananassae* species group (Lemeunier *et al.* 1997; Da Lage *et al.* 2007), a group of species most speciose in Australasia and the Oriental Regions and of increasing interest in genomic comparative studies. This species is certainly one of the priority species deserving consideration in conservation programs in Seychelles.

Table 2. The Drosophilidae of the Vallée-de-Mai, Praslin (the endemic status of *Mycodrosophila fracticosta* is uncertain: a similar species [perhaps conspecific] is known also from La Réunion).

Species known only from the Vallée-de-Mai
Drosophila vallismaia Tsacas, 1984
Drosophila (Drosophila) sp. c
Species endemic to Seychelles
Drosophila sechellia Tsacas & Bächli, 1981
Scaptodrosophila sp. i
Hirtodrosophila sp. e
Hypselothyrea notabilis (Lamb, 1914)
Leucophenga sericea (Lamb 1914)
Mycodrosophila fracticosta (Lamb, 1914)
Scaptomyza punctiscutata (Lamb, 1914)
Scaptodrosophila jucunda (Lamb, 1914)
Scaptodrosophila latifasciaeformis (dark brown scutellum)
Scaptodrosophila latifasciaeformis (faintly striped pleura)
Species widespread in the Afrotropical Region
Drosophila hirtipes Lamb, 1914
Scaptodrosophila caliginosa (Lamb, 1914)
Scaptodrosophila triangulifer (Lamb, 1914)
Invasive and introduced species
Drosophila malerkotliana Parshad & Paika, 1964
Drosophila nasuta Lamb, 1914
Scaptodrosophila latifasciaeformis (Duda, 1940)
Zaprionus indianus Gupta, 1970
Zaprionus tuberculatus Malloch, 1932
Drosophila ananassae Doleschall, 1858
Microdrosophila pleurolineata Wheeler & Takada, 1964

Other associations between endemic host-plants and endemic drosophilids have been discovered during work in the Vallée-de-Mai. For example, the association of the rare and endemic *Hypselothyrea notabilis* (a wasp-like fly) on the fruits of the endemic "lantannyen lat" (*Verschaffeltia splendida*). Evidence is inconclusive but does suggest a host plant association. Another important plant in the Vallée-de-Mai is one of the four endemic screwpines, the "vakwa prasol" (*Pandanus hornei*). Only on recently fallen syncarps does one find the rare *Scaptomyza punctiscutata*, another endemic drosophild with unusual morphology. It is also the resource upon which a new species, *Drosophila* sp. c has been found. Both *Verschaffeltia splendida* and *Pandanus hornei* fruits have yielded a number of specimens of *Microdrosophila pleurolineata*. We consider this species to be invasive. It was apparently absent 100 years ago and we have records of it from a wide range of habitats (e.g. Jardin Marron on Silhouette) including ones close to buildings and in gardens, for example, the Botanical Gardens at Mahé).

The Vallée-de-Mai also provides suitable refuge for the famous *Drosophila sechellia* due to the presence of a few *Morinda citrifolia* (Rubiaceae) near the waterfall. This important *Drosophila* is highly adapted to this plant species which status remains controversial, native or recently introduced (Lachaise & Silvain 2004). This paradox is a real puzzle of the Seychellois fauna.

During the 2003 survey we focused much attention on the endemic *Ficus*

species that occur in the Vallée-de-Mai. There are wide radiations of *Drosophila* (*fima* species group) and *Lissocephala* (*juncta* and *sanu* species groups) involving dozens of species on the African mainland, and in Madagascar and the Mascarene islands. We failed to find any species of these drosophilid genera in the Vallée-de-Mai. Despite the presence of *Ficus reflexa, F. rubra* and *F. bojeri* on Silhouette, Aride and Mahé nothing was found there either. In the Vallée-de-Mai a few syconia (figs) of the African native, *Ficus lutea,* were present but the feeding efficiency of frugivorous birds and bats appeared to have left nothing suitable for strictly fig-breeding insects.

A major ecological finding concerning the Vallée-de-Mai is the growing importance of invasive species which represent a real threat to this World Heritage Site. Among these species, *D. malerkotliana*, a member of the *ananassae* species group like *Drosophila vallismaia* is the main threat. Like *D. vallismaia*, *D. malerkotliana* is a member of the *ananassae* species subgroup within the *melanogaster* species group. But unlike *D. vallismaia* it is what could be called a lightning invader. It is predominant in all habitats in Seychelles and its population sizes are so considerable that it represents already at least 90% of all drosophilds in the inner Seychelles. The species was not recorded by Hugh Scott in 1908-1909 despite intensive collection (Lamb 1914) indicating that its spread is posterior to the 1908-9. Its extant populations are innumerable, counting billion of individuals. The spread of the species has therefore undoubtedly occurred within the last century. The impressive spread of *D. malerkotliana* is not restricted to Seychelles, the same rapid extension being presently observed throughout the African mainland and South America, but nowhere to the same extent than throughout inner Seychelles.

In evolutionary ecology it is often argued that 'a *Jack-of-all-trades is a master of none'*. This suggests that specialist species can generally coexist with generalists because they are more efficient than these latter in their own niche. However, *D. malerkotliana* is not such a generalist, it should rather be seen as a universal specialist. It can do whatever specialists do and can be more efficient than them even in their own niche. In the Vallée-de-Mai, *D. malerkotliana* takes advantage of the presence of *Artocarpus* (more especially the jackfruit tree *A. heterophyllus*) to enter the palm and vacoa forest and breed in any of the endemic host-plants which harbour sympatric endemic drosophilids. As the causal factor promoting the invasion of *D. malerkotliana* into the Vallée-de-mai is the presence of jackfruit, we strongly recommend that the threat be reduced by removing all *Artocarpus heterophyllus* from the Vallée-de-Mai.

Aride Island Nature Reserve

Only eight drosophilid species are known from Aride (Table 1). But Aride is an island of special interest for two reasons. Firstly, the population size of the two dominant species, *D. malerkotliana* and *D. nasuta* is unrivaled, reaching values much higher than elsewhere, even in mainland Africa. A single sample comprised between 50 and 100 thousand flies, in the proportion 75-80% *D. malerkotliana* to 20-25% *D. nasuta*. In this one sample (and others like it) there were more than two species present. The second major finding is that the endemic species *D. sechellia* could be extracted from these mass samples in quantities much larger than anywhere else: 1142 *D. sechellia*

individuals, by far the largest collection of *D. sechellia* ever made, was separated from the mass sample. It is worth noting that no more than 200 individual *sechellia* flies have ever been collected on Cousin island since the discovery of the species there in 1980. Clearly, the largest *D. sechellia* population is on Aride, followed by that of Denis island where *Morinda citrifolia* is abundant. Both islands supports very well established populations of *D. sechellia*, to what extent this reflects a recent phenomenon or is the result of a long term population dynamic, is open to speculation.

Aride differs from the other islands by the complete absence of representatives of the genus *Scaptodrosophila*. Many *Scaptodrosophila* species are associated with palms. In many parts of Africa a relationship exists between the diversity of *Scaptodrosophila* species and the diversity of endemic palm species. Unlike Mahé, Praslin and Silhouette, Aride island has probably never had endemic palms. In this way, information about the biogeography and ecology of drosophilids contributes to understanding the history of an island's flora. Another interesting observation is that the dominant *Scaptodrosophila* species differs from one island to another, the reason for this is unclear.

Silhouette island

The three closely related species *Drosophila melanogaster, D. simulans* and *D. sechellia* were all found on Silhouette in 2003 and 2007. *Drosophila melanogaster* is confined to La Passe and is most likely a recent introduction from Victoria harbour on Mahé where *D. melanogaster* was apparently confined until recently. *Drosophila melanogaster* is exceedingly rare in Seychelles. *D. simulans* was collected at all altitudes from sea level (La Passe), and c.50m in elevation (Anse Lascars) to nearly 400m below Gratte Fesse and Jardin Marron. *Drosophila sechellia* is reported for the first time from Silhouette at Anse Lascar, La Passe and near the church. Consistently with records from Cousin, Aride, Praslin, Frégate and Mahé, it is restricted to the fruits of *Morinda citrifolia*.

Discussion

Lamb's (1914) comprehensive documentation of the species of Seychelles one hundred years ago allows us to determine the extent to which the native drosophilid fauna is impacted by invasive species. It should be stressed, however, that we have found no evidence that any endemic drosophilid species has been driven to extinction since 1908. Indeed the number of species now known to occur in Seychelles (41, see Table 1) is much more than the 24 collected by Scott and described by Lamb. This is due partly to the arrival of invasive species but mostly to the discovery of rare or specialized species overlooked during earlier expeditions.

A major finding is the overwhelming dominance of the invasive species, *Drosophila malerkotliana* and *D. nasuta*. Together they represent some 90% of all drosophilid inividuals collected in the inner Seychelles, a situation that did not exist in 1908-1909. The former species represents 70–80% of the current multi-species community on any one of the granitic islands. This was not the situation in the early twentieth century. As a result of the pervasiveness of the two dominant *Drosophila* species,

the endemic fauna is considerably diluted on any particular fruit resource. On Aride, the endemic *D. sechellia* was 100 times less frequent than the invasive *D. malerkotliana* and only one specimen in one hundred thousand fruitflies was *Dettopsomyia formosa*. In 1908-9, the fauna was not so skewed. Note for instance that the now rare species *Leucophenga sericea* was then found throughout the damp endemic mountain-forests of Mahé (Lamb 1914: 328). Even if our sampling sites do not exactly match those reported by Lamb, it is likely that a change in the ratio of species abundance has resulted from a habitat change within the last hundred years.

Most of the land surface of the inner Seychelles is covered by introduced plants, notably the Prune-de-france *Chrysobalanus icaco* (Chrysobalanaceae), a tropical American bush introduced in the early twentieth century and that has now colonized the deforested slopes of Mahé, Praslin and Curieuse (Matyot 1998). Apart from cinnamon *Cinnnamomum verum*, other such widespread invasive plants include Moraceae (e.g. *Artocarpus heterophyllus* and *A. altilis*), Mimosaceae (e.g. *Albizzia lebbeck* and *Adenanthera pavonina*), Melastomataceae (e.g., *Clibidia hirta*), or Bignoniaceae (e.g. *Tabebuia pallida)*. These alien plants have provided a resource to which the invasive *Drosophila* species are well-adapted and the endemic or native species are maladapted. Concomittantly, the decrease of endemic trees like *Northea hornei* (Sapotaceae) has probably resulted in the contraction of the range of endemic *Drosophila*. It is, therefore, quite surprising that no drosophilid species has disappeared altogether since 1908. All species reported in 1914 have been rediscovered at least on one island, and new species have been discovered mostly during our 2003 field trips. It is worth stressing that most endemic drosophilid species that are recorded as new were discovered during our 2003 field work in remote patches of endemic palms and *Pandanus* spp., for example the Vallée-de-Mai and La Réserve on Praslin and Mahé respectively. The Vallée-de-Mai alone harbours 52% of the fauna of Drosophilidae of the inner Seychelles islands. It is most clear that these protected areas (gazetted or potential Nature Reserves) act as ultimate refuges for the endemic fauna of invertebrates. Outside these reserves invasive species dominate the altered or damaged environments. The "bigay" of mangos, guava and jackfruits are undesirable, whereas those of coco-de-mer, latanier palms and *Pandanus* are part of the biological legacy of Seychelles.

Two species of *Drosophila* have especially important scientific value - *Drosophila vallismaia* and *Drosophila sechellia*. Both were discovered and described in the 1980s. The reason for their "late appearance" in the history of the study of this fauna is their specialized ecological preference. Had Scott focused his sampling on *Morinda* or on coco-de-mer palm he most probably would have made the discoveries. A major finding of our 2003 survey was that *Drosophila vallismaia* is tightly restricted to the *Lodoicea maldivica* fruit husks, accounting for the confinement of this species to the Vallée-de-Mai (the species has not been found in the Fond Ferdinand *Loidicea maldivica* forest on Praslin, nor on a translocated coco-de-mer palm in the Jardin Marron on Silhouette). The *Lodoicea maldivica/Drosophila vallismaia* association exemplifies the endemic plant/endemic insect association.

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