The ecology and conservation of Silhouette island

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Key words: biodiversity, conservation, Seychelles

Abstract: The ecosystems of Silhouette island are described with summaries of the fauna and flora. These show that Silhouette is one of the most important biodiversity hotspots in the western Indian Ocean. It is exceptionally well preserved and data are presented on forest regeneration. The island is the subject of a conservation project by The Nature Protection Trust of Seychelles.

Introduction

In recent years the fauna and flora of Silhouette island, Seychelles have been reported on in numerous publications. Research into the status of its biota began with the explorations of Brauer in 1896 and the Percy Sladen Memorial Expeditions of 1905 and 1908-9. These were followed by a small number of brief surveys for specific groups such as the Lepidoptera collected by Legrand in 1956 and 1958-9. The recent upsurge in research on the island began with the Oxford University Silhouette Expedition in 1990 and has been followed by semi-annual research projects by The Nature Protection Trust of Seychelles, researchers working in conjunction with the NPTS and a small number of independent studies.

The state of knowledge of the island was discussed in 1992 in two papers summarising data on the flora and fauna of Silhouette (Gerlach 1993). In the 5 years after these publications there have been many new discoveries and developments in our scientific understanding of the island and its conservation status. The account below provides updated coverage of the island's ecosystems and conservation based on recent reports (mainly OUSE 1990 and NPTS 1996) and unpublished data. Full species lists for the island are given in the accompanying supplement, including authorities (which are not repeated here).

Summary of the physical aspects of the island

Silhouette is the third largest of the granitic islands at 1995ha. It is the second highest (740m) and this combination means that it supports almost all natural habitats found in the islands. Geologically it is somewhat distinct from the other granitic islands, with perhaps the exception of North island (Stephens 1996), being volcanic in origin with rocks dating back approximately 63 million years, some 90 million years younger than the other islands. The relatively young age of the island results in it retaining a more rugged topography than most other islands. This means that there are numerous steeply sloping valleys and boulder fields, characteristics that have been of major significance in the preservation of the island's biota.

Fig. 1. Composite aerial photograph of Silhouette island

At altitudes above 450m above sea level cloud cover is almost permanent, resulting in a high mean relative humidity (93% during July-Sept. 1990) and low temperatures (18-26°C). Despite the cloud cover and the high humidity high valleys such as the Anse Mondon valley are sheltered from direct rain by the adjacent peaks. No records of rainfall have been made but observations indicate that rain falling on Mt. Pot à Eau and Jardin Marron rarely affects adjacent valleys.

The substrate of most of the island is a shallow humus soil covering large granite boulders. Typically valley heads slope steeply and this steepness and the boulder substrate have prevented the development of significant layers of humus or soil. The areas of leaf litter that have accumulated in the valleys do cover some small pockets of soil with a pH of 6.0-6.5. This slight acidity is probably due to the high leaf litter content and the acidic processes of organic decomposition.

Marine life

No studies of the marine life of Silhouette have been carried out. There are 10km of fringing reef (including 5km of reef flat) and 7km of exposed rocky shore. Sea grass beds are restricted to patches on the reef flat.

Flora

Of the 195 angiosperm species recorded on Silhouette, 11% are probably introduced, 34% of the 174 native species are Seychelles endemics (2% endemic to Silhouette). As noted previously, Silhouette supports all the major habitat types in Seychelles with the exception of *Pisonia grandis* forest. The approximate areas covered by each habitat are shown in Table 1. The most important of these is the unique *Pisonia sechellarum* forest. This is a well defined area characterised by the dominance of *Pisonia sechellarum*. This tree is not found outside the forest which is defined as the area enclosed by a line uniting all the outlying *P. sechellarum* trees. In this area of 0.48ha 37% of the trees are *P. sechellarum*. Although this is only the second most abundant tree species in terms of the number of individuals its dominance is shown by its contribution to the canopy cover (see Table 2.).

Of the 59 plant species recorded in the *Pisonia* forest several are either restricted to the forest or have very limited distributions outside it. These include *Psychotria silhouettae* (only 5-6 plants in the Anse Mondon valley). *Pseuderanthemum tunicatum* and *Piper* sp. are more abundant but similarly restricted. *Acacia pennata* is also found near Gratte Fesse. *Achyrospermum sechellarum* and *Schefflera procumbens* were originally described from Mahé; both are now restricted to Silhouette (Anse Mondon valley, Mon Plaisir and Gratte Fesse and *Pisonia* forest, Morne Dauban, Mon Plaisir and Gratte Fesse respectively). There are no identifiable correlations between the abundance of any of the plant species, or between the plants and microhabitat factors within this area but the valley's sheltered microhabitat probably contributes to the site's remarkable flora.

Many of the plants share a high potential for asexual reproduction. *Pisonia sechellarum* trees reach a maximum height of 25m at which level they fall over as a

Table 1. Habitat areas on Silhouette

Habitat	Area (ha)	Habitat	Area (ha)
Littoral	4.0	Glacis	112.0
Open marsh	4.6	Mid-altitude forest	351.4
Mangroves	7.5	Palm rich forest	1087.5
Suburb	17.6	*Dicranopteris linearis* scrub	70.3
Casuarina habitat	1.5	*Clidemia hirta* scrub	2.3
Dry coastal forest	5.7	*Cyathea sechellarum* scurb	0.7
Mixed coastal forest	92.2	*Pisonia sechellarum* forest	0.5
Coffee plantation	8.4	Mist forest	215.3
Rubber plantation	7.4		

Table 2. Trees species in *Pisonia sechellarum* forest

Species	Composition		Species	Composition	
	trees	canopy		trees	canopy
Cinnamomum verum	42%	0	*Pandanus sechellarum*	2%	0
Pisonia sechellarum	37%	55%	*Northea hornei*	<1%	7%
Ficus bojeri	13%	9%	*Ficus lutea*	<1%	1%
Verschaffeltia splendida	2%	2%	*Paraserianthes falcataria*	<1%	0
Trema orientalis	2%	0	*Syzygium carophyllum*	<1%	0
Grisollea seychellarum	2%	0	open	-	26%

result of stresses upon the shallow roots and the soft wood. The fallen trunks continue to grow, developing new stems, a process that also occurs along exposed surface roots. This continuous cycle of growth and collapse followed by regrowth results in many apparently separate trees being found to be connected to a single main stem (at the most extreme one surface root supports 12 major trunks). This is a feature shared with the only other arborescent *Pisonia* found in Seychelles, *P. grandis*. *Hypoxidia rhizophylla, Achyrospermum sechellarum, Pseuderanthemum tunicatum, Psychotria silhouettae, Begonia sechellensis, B. ulmifolia, Procris insularis, Dracaena reflexa, Alophyllus pervillei, Pogostemon hyeanus, Clidemia hirta,* the strangling figs *Ficus bojeri* and *F. lutea* and the ferns *Bolbitis* sp. and *Asplenium* aff. *tenerum* grow by similar systems of nodal rooting and runners in addition to the creepers *Piper* sp., *Acacia pennata, Merremia peltata, Schefflera procumbens, Flagellaria indica, Tylophora coriacea* and *Adenia gummifera*. Stilt roots on *Pandanus sechellarum* and *Verschaffeltia splendida* may also be adapted to solving the problems caused by growth on steep rocky slopes. Of the higher plants in the forest 61% have some form of supporting growth described above.

With 550 trees over 1.5m tall per hectare there are an estimated 190 *Pisonia sechellarum* trees. Their density decreases towards the lower end of the forest where they are replaced by *Ficus bojeri*. *P. sechellarum* height also decreases from 22.7m to 13.1m. The reasons for these changes are not clear. Tree number is not correlated with the slope of the ground (Spearman's rank corrected for tied data: r=0.063 (all species), r=0.283 (*P. sechellarum*); P>0.2).

Important areas include the Morne Dauban moss forest, extensive glacis areas, lowland marshes and the lowland forest to the south of the island. This area has not been explored thoroughly and is the only significant area of primary lowland forest known to survive in Seychelles. It was maintained as a reserve in the early 1900s (Gardiner 1910). From the observations made to date no introduced trees have been planted deliberately and invasion appears to be very restricted. This is one of very few lowland sites in Seychelles where coconuts, *Cocos nucifera,* are restricted to their natural littoral fringe. A smaller area of similar forest is present at La Reserve/Grebeau. These areas are important for the presence of natural stands of rare species such as *Carissa edulis* and has been the source of much of the seed of *Mimusops seychellana* planted on Mahé and Praslin (H. Dauban *pers. comm.*).

An important habitat present on Silhouette is Coco-de-Mer (*Lodoicea maldivica*) forest. The 0.4ha forest at the source of the Grande Rivière at Jardin Marron contains 21 Coco-de-Mer planted in the 1940s. This is an un-natural habitat for Silhouette as this palm is naturally restricted to the Praslin group. However, it is of conservation value as the only wild reproducing population species outside of Praslin and Curieuse. In terms of flora and associated fauna it is not significantly different from natural palm forest and thus does not pose any conservation problems. Several female trees are fruiting and first nut fell in late 1996.

Silhouete is the only island to retain coastal marshes free from introduced species except for the fish *Oreochromis mossambicus* (tilapia). This was first introduced to Mahé (Baie Ternay) in the 1960s by Veevers Carter.

Fauna Silhouette supports an exceptionally diverse fauna due to the varied topography, wide habitat range and relatively intact flora. To date 1303 species have been recorded, of which approximately 1280 (98%) are native. Of these 907 (71%) are Seychelles endemics, 281 (31%) recorded only from Silhouette. The fauna is summarised in Table 3.

Table 3. Terrestrial animals recorded on Silhouette

Group		Species		% natives endemic to	
		Total	Native	Seychelles	Silhouette
Nemertea		1	1	0	0
Annelida	Hirudinea	2	2	100	100
	Oligochaeta	1	0?	0	0
Mollusca		37	34	70	21
Chelicerata	Schizomida	1	1	100	0
	Arachnida	80	80	75	23
	Opiliones	8	8	100	13
	Pseudoscorpiones	4	4	100	0
	Scorpiones	1	1	100	0
	Amblypygi	1	1	0	0
	Acari	13	13	92	69
Crustacea	Decapoda	10	10	0	0
	Isopoda	13	13	85	8
Myriapoda	Diplopoda	16	16	94	6
	Chilopoda	8	8	75	13
	Symphyla	1	1	?	?
Apterygota	Thysanura	6	6	100	0
	Collembola	6	6	100	0
Insecta	Odonata	11	11	45	18
	Orthoptera	32	32	81	16
	Dictyoptera	18	17	71	6
	Isoptera	2	2	100	50
	Dermaptera	12	9	44	22
	Hemiptera	122	122?	72	18
	Psocoptera	64	64?	97	9
	Thysanoptera	11	11	100	89
	Siphonaptera	1	0	0	0
	Neuroptera	3	3	0	0
	Lepidoptera	181	177	54	19
	Trichoptera	1	1	100	0
	Diptera	94	94?	68	61
	Hymenoptera	111	107	79	30
	Coleoptera	387	383	73	18
Chordata	Pisces	5	4	25	0
	Amphibia	12	12	92	0
	Reptilia	15	13	92	0
	Aves	16	14	43	0
	Mammalia	4	2	100	0

Most are small leaf-litter inhabiting invertebrates. The lowland species are predominantly pantropical or western Indian Ocean species whereas the high-altitude species are almost all Seychelles endemics, very often Silhouette endemics. These endemic taxa are isolated in the high valleys where leaf litter fauna is restricted to small pockets 1-15cm deep, which cover only 25% of the ground. This is the only site in Seychelles where fully detailed studies have been carried out and the recorded animal densities are shown in Table 4. Collembola are not listed as these have not been sampled. The data for mites are not accurate due to difficulties in field sampling. The only mites to be sampled reliably are the giant Holothyridae.

At present there is little reliable information on the distribution of the different animal species on Silhouette. Distribution records indicate that the greatest levels of diversity are found on Mont Dauban and at Mare aux Cochons. This may be due, in part, to collection work having concentrated on these areas. Detailed taxonomic work on the molluscs demonstrates that several species are restricted to very small areas of mist forest and that the climatic cline is a major factor in speciation (Gerlach 1995b) which may indicate that the high, wet centre of the island is the most diverse. The southern part is virtually unexplored; from the sea it appears to contain numerous isolated valleys and may include important centres of biodiversity. It is expected that the lowland forest 'reserve' on the south coast may be particularly interesting as it is one of the very few intact areas of natural lowland forest and the natural form of this habitat has never been studied in detail.

Of this diverse fauna the molluscs are the most thoroughly studied and it has been confirmed that Silhouette has the highest terrestrial mollusc diversity of any island in Seychelles and an exceptionally high level of endemism (19%). This is due to the presence of primary mist forest. Many of these endemic species have very restricted ranges, the most extreme case is that of *Gulella silhouettae* which is restricted to 0.7ha of mossy forest on Mt. Dauban (Verdcourt 1996). The exceptionally high proportion of carnivorous streptaxids in the fauna (see Table 3.) is notable, this is unusual in most faunas but is also found in the high-altitude areas on Mahé. This carnivorous fauna includes the only known representatives of nematode specialist feeders (Gerlach 1996) and radula-less carrion feeders (Gerlach & van Bruggen in prep.). Silhouette also probably supports the highest biomass of land snails in the world; data on the mass of living snails are lacking but individuals densities are exceptionally high and are dominated by the large acavid *Styldodonta unidentata*. The values of $1.11m^{-2}$ for this species is probably its natural level (lower figures from other islands being due to predation by rats, *Rattus* spp. and tenrecs, *Tenrec ecaudatus*) but may also be boosted by the abundance of food (especially jak fruit, *Artocarpus heterophyllus*).

Extensive studies have also been carried out on the arachnid fauna of which 80 spider species have been identified to date (44% of the approximate 180 Seychelles species). Endemism appears to be very high among the Silhouette spiders as 60 are endemic to Seychelles (of the others only 10 are pantropical and 10 African). Of Seychelles endemics 31 species belonging to widely distributed genera

Table 4. Invertebrate density in *Pisonia sechellarum* forest (data from OUSE 1990)

Taxon		Density (per m^2)			
		litter	ground area	on vegetation	Total
Nemertea		0.02	0.01	<0.01	0.01
Annelida	Hirudinea	0.15	0.04	0	0.04
Mollusca	Streptaxidae	1.07	0.26	0.01	0.27
	others	4.57	1.13	0.23	1.46
Arachnida	Araneae	1.30	0.34	0.53	0.87
	Opiliones	0.47	0.11	0.01	0.12
	Acari	33.70	8.32	0.03	8.35
Crustacea	Isopoda	6.12	1.51	0	1.51
Myriapoda	Diplopoda	5.36	1.38	0	1.38
	Chilopoda	1.25	0.31	0	0.31
Insecta	Coleoptera	37.17	9.18	-	-
	Formicidae	32.65	8.06	-	-
	other Hymenoptera	1.07	0.26	-	-
	Dermaptera	12.75	3.15	-	-
	Hemiptera	3.98	0.98	-	-
	Diptera	15.75	3.89	-	-
	Orthoptera	0.08	0.02	-	-
	Isoptera	0.07	0.02	-	-
	Lepidoptera	7.8	1.93	-	-
	Psocoptera	0.03	0.01	-	-
	Dictyoptera	0.02	<0.01	-	-
Total invertebrates		**165.38**	**40.83**	**-**	**-**

(3 of these appear to be restricted to Silhouette), 29 belong to endemic genera (13, or 16%, apparently Silhouette endemics). Other important arachnid populations include endemic holothyrid giant mites, opilionids and amblypygids (sight records include a large species which is probably the rare *Phrynichus scaber*).

The myriapod fauna is very significant in terms of diversity, the proportion of Seychelles endemics and its ecological role. The most obvious species is the Seychelles endemic giant millipede *Seychelleptus seychellarum*. This species occurs at a density of $0.11 m^{-2}$ and is probably the main detritivore, along with the snail *Stylodonta undientata*. The only other islands retaining large populations of this species are Fregate, Aride, Cousin and Cousine. Thus Silhouette is the only large island to retain the large detritivore communities that have been lost or reduced on islands such as Mahé, Praslin and La Digue (probably through predation, mainly by tenrecs, and habitat destruction). Other rare species persist in significant numbers, such as the pill-millipede *Cyliosomella furciparum*. A recent record is the distinctive white-headed millipede *Benoitiulus flavocollaris* which was found in Jardin Marron in 1996, previously the species was known only from the Le Niol area of Mahé. It is probably widespread at around 300-400m above sea-level, its recent discovery and the new range record are further evidence of the comparative lack of research into the fauna of the mid-altitude areas.

The taxonomy of most insect groups is in need of revision. Of the groups that are well known Silhouette supports significant populations of endemic Orthoptera. This includes several endemic species of cricket. The Phasmidae of

Silhouette are of exceptional importance as this is the only island to support all 6 Seychelles species, including one Silhouette endemic (the stick insect *Carausius scotti* which is associated with the birds nest fern *Asplenium nidus*).

The Silhouette amphibian and reptile faunas are of exceptional significance with most native species having been recorded. The unrecorded species are either specialists of sea-bird islands (*Mabuya wrightii*) or recently recognised species which have not been searched for to date (*Ailuronyx tachyscopaeus* and *A.* cf. *trachygaster*). The blind snake *Rhamphotyphlops braminus* is probably present in agricultural areas but has not been located. All the Seychelles amphibians are present although distribution records for the caecilians are very poor.

Historically large reptiles were abundant with crocodiles (*Crocodylus porosus*) and hawksbill turtles (*Eretmochelys imbricata*) being reported around the coast in 1771 (Gerlach 1995a). Both tortoises and terrapins were present although neither was identified to species. On biogeographical and evolutionary grounds it is probable that the early records of abundant giant tortoises refer to both species known to have occurred in the central granitic islands (*Dipsochelys hololissa* and *D. arnoldi*). It is also probable that two species of terrapin were present; *Pelusios castanoides* and *P. subniger*, the former may have been represented by the supposed endemic 'species' *P. seychellensis*. Both tortoises and terrapins were exterminated by hunting, the former having been recorded in 1771-1787 and the latter only in 1927 (Bour 1984).

Birds are represented by relatively few species, the majority are native and significant populations of Seychelles kestrel (*Falco araea*) and Seychelles blue pigeon (*Alectroenas pulcherrima*) are present. A notable breeding species is the white-tailed tropic bird (*Phaethon lepturus*) which nests in the high-altitude forests. As the breeding birds bring fish to their nests this species is a significant importer of nutrients into the Silhouette forest ecosystem and contributes to the high biomass and diversity of the detritivore community. The introduced species are largely restricted to lowland areas, although Indian mynahs (*Acridotheres tristis*) do venture to the high forest they are not resident there. The only introduced species to spend significant periods of time in the mid-high altitudes are the barn owls (*Tyto alba*). It is estimated that fewer than 12 pairs are present. Introduced house crows (*Corvus splendens*) were seen in 1979 (Greig-Smith 1979) but did not establish themselves on the island and now appear to be extinct in Seychelles. Lowland marshes are inhabited by moorhens (*Gallinula chloropus*) which are increasing in numbers. Two grey herons (*Ardea cinerea*) have been present since 1995, one of these was still immature in January 1997 and breeding has not occurred. Cattle egrets (*Bubuculus ibis*) occasionally visit the island but have never established themselves. Juvenile black-crowned night-herons (*Nycticorax nycticorax*) have also been recorded but at present the only breeding heron is the green-backed heron (*Butortoides striatus*) which is common around the coast. It is probable that several of the currently rare species occurred on Silhouette in the past. It is known that green parakeets (*Psittacula eupatria*) were present until the 1890s. These are now extinct although an unidentified parakeet (believed to be *P. krameri*) has been seen on Silhouette since 1995. If a population of a parakeet species were to become established this

could restore an important pollinator and seed dispersal agent. A species of *Zosterops* white-eye was reported to be present until the lowland forests were cleared in the 1920s (H. Dauban *pers. comm.*), white-eyes may have been heard in 1979 (P. Greig-Smith *pers. comm.*) although subsequent searches have failed to verify these records. It is highly probable that white-eyes were present. Anecdotal records have also been received concerning the presence of scops owls (*Otus insularis*). These have also not been verified. It is also believed probable that species such as the Seychelles black paradise flycatcher (*Terpsiphone corvina*), black parrot (*Coracopsis nigra*), Seychelles warbler (*Acrocephalus sechellensis*) and Seychelles magpie robin (*Copsychus seychellarum*) were present in the past. No ornithologist visited the island until 1866 (Newton 1867) and the first thorough ornithological investigation was made in 1979 (Greig Smith 1979).

Both native mammal species are present. The only known active roost for the sheath-tailed bat (*Coleura seychellensis*) is at La Passe. This has contained up to 25 bats (Matyot 1996). Others are probably present but only old abandoned roosts are known. Silhouette has a large population of fruit bats (*Pteropus sechellensis*) which are present throughout the island and are active at all times of day and night. This unusual behaviour pattern is also found on La Digue and is probably the consequence of the virtual absence of hunting on these islands. The presence of the bats in all habitats may contribute to the integrity of the island's forests with the bats fulfilling their natural fruit disperser role. On Mahé, in contrast othe bats feed almost exclusively in suburban areas, as a consequence large seeded trees such as *Northea hornei* are not dispersed and their age composition on Mahé is skewed towards old trees whilst Silhouette retains a more even spread with abundant seedlings.

CONSERVATION

Introduced plants

Silhouette has retained a more natural fauna and flora than any of the other large islands of the Seychelles group, due primarily to its steep, rocky slopes which have restricted agriculture and development. Tree plantations were established in lowland and mid-altitude areas between 1860-1950. These resulted in the replacement of some 110ha of natural forest with plantations of *Hevea brasiliensis, Coffea canephora, Tabebuia pallida* and *Cocos nucifera*. In addition cultivated trees have spread into the forests from agricultural areas. The most important of these are *Psidium cattleianum, Cinnamomum verum* and *Artocarpus heterophyllus*. Several other species have also been recorded in natural forest. Despite widespread invasion most of Silhouette's forest retain a high diversity of native plants and animals. With very limited disturbance and the survival of most native tree dispersal agents, indigenous species have been able to regenerate in abandoned plantations and invaded areas. Comparison of the diversity of dominant tree species in forest areas cleared at different times over the last 80 years demonstrates a healthy forest regeneration and a return towards semi-natural forests (Fig. 2.)

Above Grande Barbe forest regeneration is more restricted than on the eastern side of the island. This is largely a consequence of three major fires in this

area; in 1914, the late 1950s and 1966. These have damaged the seed-bank in this area and delayed regeneration. This is now occurring from seeds of the palms *Deckenia nobilis, Phoenicophorim borsigianum* and *Nephrosperma vanhouetteana* and the tree *Dillenia ferruginea,* with numerous shrubs of dry glacis and fire damaged habitats. A similar process of regeneration is apparent in areas dominated by the invasive shrub *Clidemia hirta* (Gerlach 1996). This species is spreading rapidly and has recently extended its range into the relatively dry south of the island during a period of increased rainfall. Natural forest regeneration in areas dominated by this species since the late 1990 demonstrate that invasion by this species is likely to be a temporary, although dramatic, phenomenon as long as the surrounding forests and seed-banks remain healthy.

Introduced mammals

Introduced mammals have included Javan rusa deer *Cervus timorensis* which were introduced in the 1800s. These died out or were hunted to extinction, their presence on Silhouette now only recorded by the horns mounted on the walls of the Grande Case at La Passe. Black rats (*Rattus rattus*) are present in all habitats. Trap data indicate that the population density is high (capture rate of 30 per 100 trap-nights, compared to 11.5-22 in data in Clout 1980) and significant ecological effects of the presence of this species would be expected. Dietary studies on Silhouette do not provide any evidence of such effects with the rats being almost entirely frugivorous, feeding on coastal *Terminalia cattapa* and *Clidemia hirta, Begonia sechellarum* and *Artocarpus heterophyllus* at high altitudes (Table 5.). The proportion of the latter species is under-estimated in faecal analysis due to its complete digestion. This is shown by examination of stomach contents, all stomachs examined contained pulp of this species in addition to seeds of *C. hirta* and *B. sechellarum* and ants

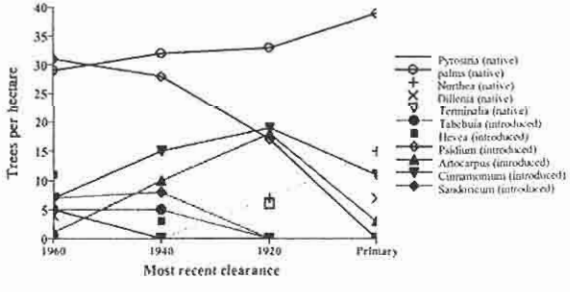

Fig. 2. Changes in forest composition following clearance. Trees over 2m high were counted in 1ha quadrats, only species making up >5% are shown.

Table 5. Analysis of rat faeces (8-9/96) - number of items (present in % of samples).

Altitude		10m	400m	550m
Number		20	25	50
Plant	Shoot	7 (35%)	-	-
	Fruit	18 (90%) *Terminaila*	-	-
	Seeds	5 (25%) *Terminaila*	5 (4%) *Begonia* 572 (100%) *Clidemia*	23 (4%) *Begonia* 342 (100%) *Clidemia*
Animal		1 (5%) snail (*Melanoides*)	-	-

(*Pheidole* sp.). There is no adverse effect of this frugivory on the native plant species as germination rates are not affected in *B. sechellarum*. The only animal remains recorded appear to have been accidentally ingested. No food caches were found on Silhouette although these are frequently encountered on other islands where they comprise seeds and snail shells. 85% of dead shells of *Stylodonta unidentata* found on Mahé are rat damaged whereas only two rat damaged shells have been found on Silhouette, both on the edge of settlement areas. Rat predated seedlings and growing shoots were not located on Silhouette despite the abundance of forest tree seedlings whereas recently dead seedlings are common on Mahé. These differences are probably due to the abundance of *A. heterophyllus* which provide year-round fruit with a high protein content, satisfying their breeding dietary requirements without the need for animal protein.

Cats (*Felis cattus*) are present on Silhouette. These have been observed in several localities and have been recorded hunting rats in the forests at night. They are only common around the settlement areas. There does not appears to be a feral cat population on Silhouette at present although the presence of domestic cats makes this highly probable in the future. The diet of the cats is almost entirely restricted to rats (93% of 30 scats examined from different sites) although some opportunistic consumption of invertebrates (grasshopper remains in 50% of scats) and carrion is apparent (juvenile fruit bat bones in 1 scat). Dogs (*Canis familiaris*) are also present but are fully domestic and rarely leave the settlements.

Development and conservation prospects

Development potential on the island is very limited. Development attempts have concentrated on the only practical areas; the coastal plateaux as these are the only areas of flat land. Limited fresh-water resources restrict the potential for agriculture or other developments in these areas. The only practical developments of any significant scale would be expansion of tourism. Given the restricted areas of suitable beaches and the difficulty of access only a limited expansion of the eco-tourism marked would be practical.

Conservation of the island has been entirely informal with the exception of the declaration of the Silhouette Marine National Park in 1987. Conservation measures and proposals have included the practice of considering the southern lowland forest as a reserve since the 1800s (Gardiner 1910) and the proposal for the protection of the mist forest, lowland forest and lowland glacis areas (Swabey 1970). Under the management of the Dauban family for 100 years from the middle of the last century, especially under Henri Dauban, management practices on the

island have included some degree of environmental sensitivity despite the expansion of the plantations. Under the more recent management by the Islands Development Company the forests have been treated as effective reserves with virtually no interventionist management. This has allowed the forests to remain largely intact and has contributed to the healthy regeneration that is apparent.

In 1994 The Nature Protection Trust of Seychelles was invited by the IDC to advise on forest conservation in order to ensure their preservation. The NPTS has prepared a managment plan to restore the island to as near a natural state as possible ('natural' being approaching the original state described in Gerlach 1995a). This will be implemented in conjunction with IDC. In 1997 the NPTS was able to establish a permanent presence on the island and is currently developing its information centre as a first step towards the establishment of a research station on the island. This initiative has received much interest and support form international organisations and international funding projects are being developed to ensure the preservation of one of the most important biodiversity hotspots in the western Indian Ocean.

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