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The distribution and population of the Seychelles (Bare-legged) Scops Owl *Otus insularis* on Mahé: consequences for conservation

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This study details the first baseline survey of the Critically Endangered Seychelles Scops Owl *Otus insularis*, currently only recorded from the 152-km^2 island of Mahé, the largest and highest island in the granitic Seychelles, western Indian Ocean. A survey was conducted in October 2000–March 2001 using playback of conspecific calls in random squares (500 m × 500 m) with midpoints being at least equal to 100 m asl. Playback was conducted in 159 of a possible 375 squares (42%). Territorial responses were detected in 60 of 159 (38%) squares, which represented an estimated 70 distinct territorial responses. Pairs responded in 51% and single birds responded in 49% of squares where a response was elicited. Scops Owls were more likely to be detected at higher altitudes, in mixed forest, and sympatrically with endemic frogs (*Tachycnemis seychellensis* and *Sooglossus* spp.). Two models were used to predict population: one based exclusively on altitude resulted in a population estimate of 134–159 territories (268–318 individuals) within a 34-km^2 range, whereas a second incorporating altitude and vegetation, which excluded unsuitable habitat, resulted in an estimate of 125–142 territories (250–284 individuals) in a 31-km^2 range. We discuss the implications of our findings to the Owl's conservation status and management.

The Seychelles Scops Owl *Otus insularis* (Tristram 1880) is currently known only from upland forests on the island of Mahé, the largest (152 km^2) and highest island (905 m) in the granitic Seychelles, western Indian Ocean (Figs 1 & 2). The species was thought to be extinct in the mid-twentieth century (e.g. Greenway 1958) prior to its rediscovery in 1960 (Loustau-Lalanne 1961). With a minimum population estimate of 80–90 pairs (Rocamora 1997, Watson 2000), it is currently classified as Critically Endangered on the basis of small population and restricted range (BirdLife International 2000). Current data indicate that it is predominantly found in the upland mist forests of central and north Mahé, within a supposed 21-km^2 (confirmed) to 39-km^2 (proposed) range (Rocamora 1997). However, the Owl's distribution and habitat requirements are still incompletely known.

In this paper we provide the first baseline distribution data derived from the playback of conspecific calls during a random point survey, identify factors that may explain the distribution, and produce a population estimate based on quantifiable Owl–habitat associations. In light of our findings we discuss the threatened status of the species and conservation priorities.

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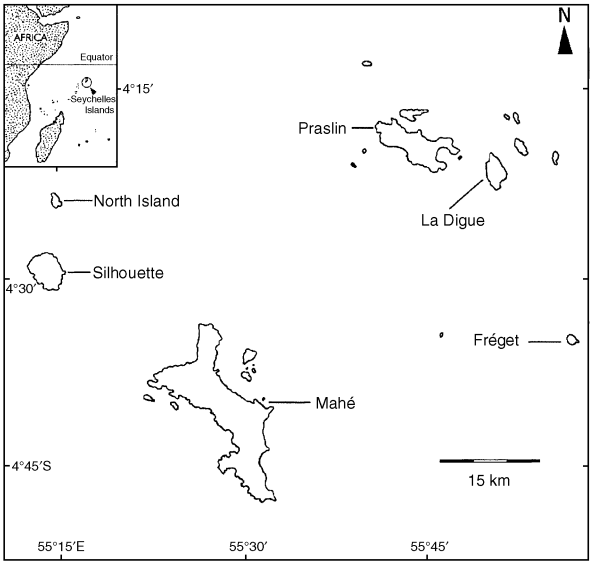

Figure 1. Location of inner Seychelles archipelago.

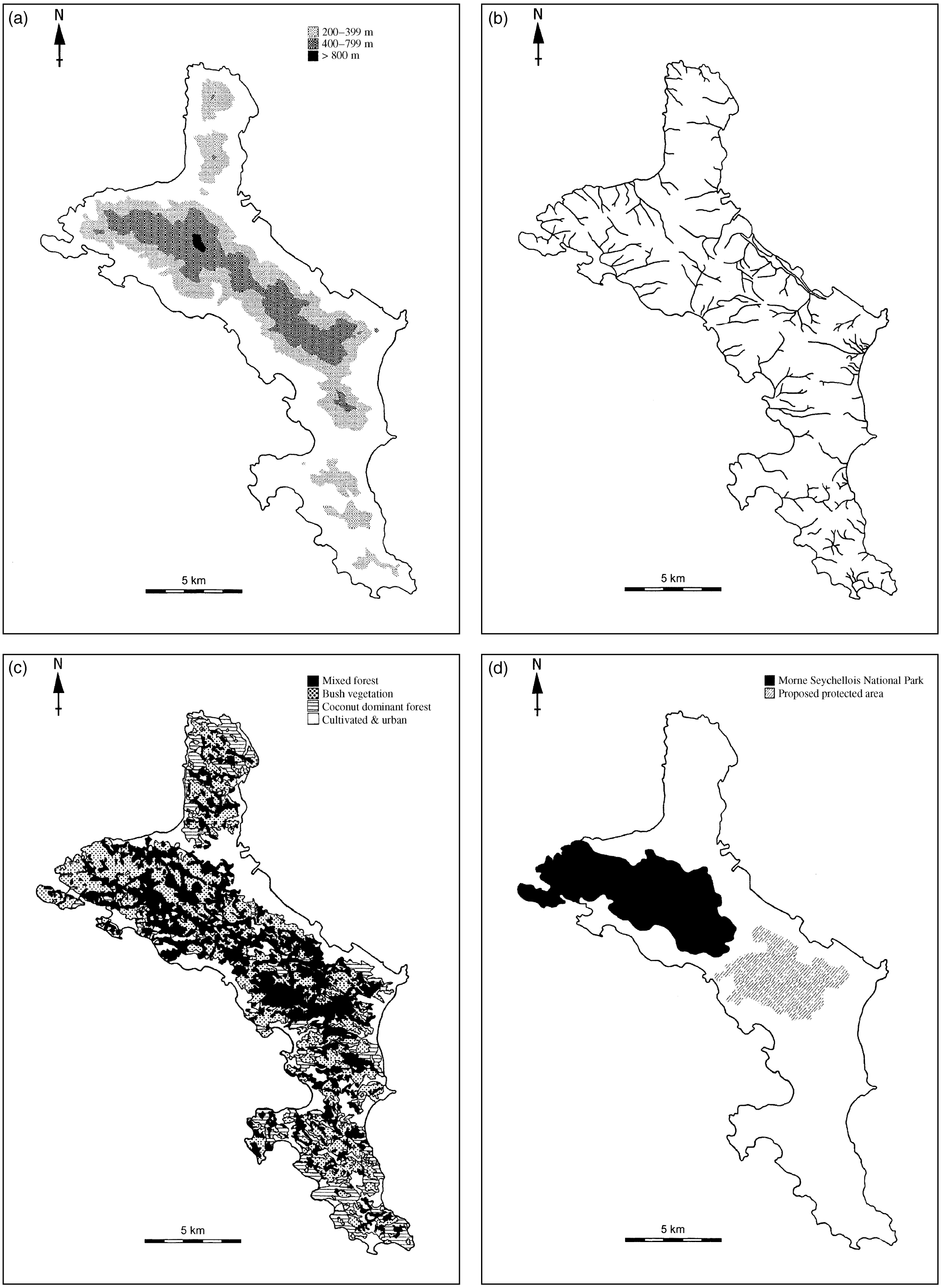

Figure 2. Map of Mahé showing: (a) altitude; (b) rivers; (c) distribution of vegetation; and (d) location of Morne Seychellois National Park and proposed second protected area.

METHODS

Study species

The Seychelles Scops Owl is a small brown owl *c.* 20 cm in length (Sinclair & Langrand 1998), which has small ear tufts, unfeathered tarsi and feet, and produces a characteristic, rhythmically repeated *waugh* territorial call (Tristram 1880; Watson 1980, 1999, Rocamora 1997). The use of conspecific call playback usually elicits a vocal response and approach to the source of playback (Watson 1980, 2000, Rocamora 1997).

Selection of random squares

The 1 : 10 000 Ordnance Survey (OS) maps of Mahé (Series Y851 D.O.S. 204, Edition 4-OSD 1988, maps 1–11) were divided into a 500-m × 500-m grid using the existing 1000-m × 1000-m grid. Each square containing land was sequentially numbered (west to east and north to south). There are no reliable recent records of the Seychelles Scops Owl below 100 m asl (Rocamora 1997), and random squares were only selected if the midpoint of the square was at least equal to 100 m. The midpoint coordinates of each selected square were calculated and subsequently located in the field during the day (±100 m) using compass bearings on distinctive landscape features and/or a GPS (315 Magellan). The map datum for the most recent OS maps of Mahé is South East Island; Clarke 1880 (modified) Ellipsoid. This was transformed to WGS84 using the following correction factors: d*X* – 42.9 m, d*Y* – 1785.5, d*Z* – 277.8, d*a* – 112.145; d*f* – 0.000054750714 (source UK Ordnance Survey pers. comm.).

Measuring characteristics of random squares

Habitat variables assessed on site

At the midpoint of each random square the following habitat characteristics were noted: (i) the five most numerous tree species visible from the midpoint, and whether these were native or introduced – this was expressed as the proportion of native tree species (i.e. number of native species/5); (ii) an index of the density of forest (estimated as the distance [m] of visibility looking north); and (iii) canopy height (estimated to the nearest metre). We also recorded the physical characteristics of each point: whether it was a valley, ridge or slope, and whether a boulder field was present or absent (a feature associated with Scops Owls in the literature, e.g. Collar & Stuart 1985). All measures of habitat characteristics on site were made by one observer (R.F.).

Habitat variables measured from map

We measured the following features of each selected square directly from the OS map: (i) altitude (m) at midpoint; (ii) length of river (m); (iii) maximum height difference (range, m); and (iv) mean number of 10-m contours per square, calculated as the mean number of contours intersecting the two diagonals of the square. The dominant vegetation type was assigned for each random square from a recent vegetation map of Mahé (GIS, Ministry of Environment [MoE] 2001). We grouped the vegetation into four categories based on the MoE's classification: (i) mixed forest comprising a mixture of native and introduced vegetation, and secondary forest derived from plantations; (ii) bush vegetation; (iii) Coconut *Cocos nucifera* dominated forest; and (iv) cultivated and/or urban areas.

Playback

The survey was conducted during October 2000–March 2001. Playback comprised 55 s of male call and 5 s of silence on a constant loop cassette to facilitate the detection of responses. Observers typically sat away (10–30 m) from the recorder so responses obtained during playback could also be detected (for more details see Currie *et al.* 2002 in press). Playback was conducted for 10 min north and then 10 min south at the midpoint of each square between 18:40 h and 23:00 h. The same stereo tape-player was used throughout the survey and its volume and tone were fixed, after first confirming that tape volume was sufficient to be heard by the human ear at least 200 m away during relatively calm conditions. The survey was not conducted in very windy and/or rainy conditions when audibility would have been affected. Current data indicate that Scops Owl territories are *c.* 300 m in radius (Currie *et al.* 2002 in press, see also Rocamora 1997, Watson 2000). To reduce the likelihood of counting the same individual twice, midpoints of neighbouring squares were positioned 500 m apart.

During playback we noted the following: (i) vocal response time in minutes; (ii) direction from which an Owl responded; (iii) the distance from the Owl to the tape-player (Owl–player distance) every minute for 5 min from the first response to playback; and

(iv) the number of birds that responded. Playback ceased in a given direction 5 min after a response was detected. If a bird was detected during the 10 min of playback facing north, playback was none the less conducted facing south, taking care to distinguish between individuals should a separate response be elicited.

Mean Owl–player distances were calculated from the five Owl–player distances following initial contact (see above). In squares in which multiple non-pair contacts were made, data on response time and Owl–player distances refer to the first responding Owl or pair. Data on response time and approach distance for a given direction were only recorded from the first bird or pair to respond; data from additional birds were discarded. Data on response time and distances are missing from one square.

Studies on genetically sexed colour-ringed birds have demonstrated that males respond more strongly to playback than females; males usually respond alone (Currie *et al.* 2002 in press). Therefore, where two individuals responded by duetting they were assumed to be a pair, whereas when multiple birds responded in a square, but did not display as a pair, i.e. duet, and could be separated on the basis of behaviour, inter-response distance and/or response direction, they were assigned to separate territories. The presence of an Owl had to be confirmed by two observers.

At each survey point, we noted the presence of possible prey species including frogs *Tachycnemis seychellensis* and *Sooglossus* spp., crickets (Orthoptera), and cicadas (Hemiptera: Cicadidae). Observers had familiarized themselves with the calls of these species by listening to recordings (Rocamora & Solé 1999) prior to the survey.

Playback was conducted in 159 of the 375 (42%) squares with midpoints greater than or equal to 100 m asl: 21 (13%) in October, 42 (26%) in November, 33 (21%) in December, 12 (8%) in January, 27 (17%) in February and 23 (15%) in March. The altitudinal distribution of 159 random squares was broadly representative of the total number of squares with midpoints greater than or equal to 100 m. There was no significant difference between the heights of squares sampled and heights of squares available (grouped at 100-m intervals); chi-squared tests, $\chi^2 = 4.82$, $df = 6$, $P = 0.57$ (combining data from the 700-m and 800-m altitude categories; three squares had a midpoint ≥ 800 m, none of which was surveyed).

We also opportunistically noted the presence/absence of Scops Owls in non-random squares assessed using the aforementioned playback methods. Site and map features of these squares were not recorded.

Analyses

Data were analysed using SPSS (Norusis 1992). Binary logistic regression was used to examine factors accounting for the presence/absence of Scops Owls. Two models (both F to enter $P < 0.05$, F to remove $P > 0.1$) were considered: one was based on habitat features of the square measured from the OS maps, and the other incorporated the same map features and those assessed on site. Coconut-dominant and agricultural/cultivated vegetation classes were merged in analyses incorporating vegetation type. Variables were only entered into the multivariate model if their univariate significance had a P value < 0.25 (Hosmer & Lemeshow 1989). Biologically meaningful first-order interactions were included in the original model. Non-significant factors and interactions were removed, the least significant first, until only significant factors and/or interactions remained. Additional statistical tests applied were two-tailed and corrected for ties when appropriate. Results are reported as mean ± standard errors (se).

RESULTS

Responses to playback

Vocal responses to playback were detected in 60 (38%) squares. These represented an estimated 73 distinct territorial responses. Given that three of the same territorial pairs/individuals appeared to respond in neighbouring squares, we estimate that 70 different territories were detected. Thirty-six (51%) of these responses were by pairs, the remainder by solitary individuals. Twelve squares were identified as containing more than one territory: 11 contained two territories and in one square three different pairs were detected simultaneously.

Mean response time was 3.7 (se = ±0.2) min and mean Owl–player distance was 47.1 (se = ±4.4) m. Individuals that took longer to respond typically remained further from the tape-player (Spearman rank correlation, $z = 2.13$, $n = 59$, $P < 0.05$).

Factors accounting for the presence of Owls

Altitude and vegetation type were the only two significant habitat variables explaining the presence

Table 1. Logistic regression examining correlating factors predicting presence of the Seychelles Scops Owl. Only significant factors are shown. Values for vegetation and endemic frogs (*Sooglossus* spp. and *Tachycnemis seychellensis* combined) show the percentage where either occurred in random squares where Owls were present ($n = 60$) or absent ($n = 99$).

Habitat feature	Owls present	Owls absent	Wald statistic	*df*	*P*	R^2
Map model						
Altitude (m; mean ± se)	404.5 ± 17.22	246.21 ± 10.72	32.92	1	0.0000	0.38
Vegetation (mixed forest; %)	66.7	37.4	10.26	2	0.0061	0.17
Map–site model						
Altitude (m; mean ± se)	404.5 ± 17.22	246.21 ± 10.72	16.23	1	0.0001	0.26
Endemic frogs (%)	96.6	44.3	11.67	1	0.0006	0.23
Vegetation (mixed forest; %)	66.7	37.4	6.55	2	0.0378	0.11

Table 2. Seychelles Scops Owl population estimate for Mahé based on altitude.

Altitude (m)	Total squares[a]	No. of squares sampled[b]	No. of squares (territories)[c]	Probability (*P*) of detecting Owls[d]	Predicted no. of squares (territories)[e]
100	126	41	4	0.09	12.3
200	92	43	10 (13)	0.23	21.4 (27.8)
300	62	34	14 (15)	0.41	25.5 (27.3)
400	49	22	16 (22)	0.73	35.6 (49)
500	30	14	11 (11)	0.79	23.5 (23.5)
600	11	4	4 (5)	1.0	11.0 (13.8)
700+	5	1	1	1.0	5.0
Total	375	159	60 (70)	–	**134.3 (158.7)**

[a]Number of squares in each height interval; [b]number of squares in which playback was conducted; [c]number of squares in which Owls were detected (data in parentheses indicate estimated number of territories); [d]probability (*P*) = number of squares in which Owls were detected/number of squares sampled; [e]predicted number of squares = total number of squares × *P*, predicted number of territories (in parentheses) = *P* × total number of squares × (number of territories/number of squares sampled).

of the Seychelles Scops Owls in both the map model and the map-site logistic regression analyses. Owls were detected more frequently at greater altitudes (no birds were detected in the survey below 150 m asl, and there was more than a 70% chance of detecting Scops Owls in squares above 400 m asl), and in mixed forest (65% of squares in which Owls were detected had mixed forest as dominant vegetation) (see Table 1). The presence of endemic frog species was also significant in explaining the presence of Scops Owls in the map-site model: 97% of squares with Scops Owls also had endemic frogs whereas only 44% of squares in which Scops Owls were not detected contained frogs; see Table 1. The presence of both genera of endemic frogs, when considered separately, also correlated significantly with the distribution of Owls (Logistic regression; *Tachycnemis seychellensis*, Wald statistic = 12.22, $df = 1$, $P < 0.001$; *Sooglossus* spp., Wald statistic = 4.51, $df = 1$, $P < 0.05$).

Population estimate and range

Population and range estimates were calculated from the map-based models. On the basis of altitude alone (at 100-m height intervals) we predicted that Owls would be detected in 134 squares (33.5 km^2) totalling 159 territories (1.19 territories per square; see Table 2). Using a more conservative and probably more accurate model, considering vegetation by altitude (at 100-m intervals), a similar estimate of 142 territories in 125 squares (31.3 km^2) was obtained (1.14 territories per square; see Table 3). A more conservative estimate was made for each model, assuming one territory per square to reduce the possibility of including subadults remaining on territory and the possibility of double-counting individuals whose territories overlapped more than one square. Conservative estimates were 125 territories (vegetation–altitude model) and 134 territories (altitude model).

Table 3. Seychelles Scops Owl population estimate for Mahé based on altitude and vegetation.

		Vegetation composition sampled (available)[b]			No. of squares (territories)[c]			Probability (*P*) of detecting Owls[d]			Predicted no. of squares (territories)[e]			Total squares (territories)[f]
Altitude	Total[a]	Bush	Mixed	Other	Bush	Mixed	Other	Bush	Mixed	Other	Bush	Mixed	Other	All habitats
100	126	18 (50)	10 (38)	13 (38)	2 (2)	2 (2)	0	0.11	0.20	0	5.6	7.6	0	13.2
200	92	15 (41)	25 (46)	3 (5)	1 (1)	8 (10)	1 (2)	0.06	0.32	0.33	2.7	14.7 (18.4)	1.7 (2.5)	19.1 (23.6)
300	62	12 (24)	19 (35)	3 (3)	3 (3)	11 (12)	0	0.25	0.58	0	6	20.2 (22.1)	0	26.2 (28.1)
400	49	5 (16)	16 (28)	1 (5)	2 (2)	13 (19)	1 (1)	0.40	0.81	1.0	6.4	22.8 (33.3)	5	29.2 (39.9)
500	30	9 (12)	5 (17)	0 (1)	7 (7)	4 (4)	0	0.77	0.80	–	9.3	13.6	–	22.9
600	11	2 (7)	1 (3)	1 (1)	2 (2)	1 (2)	1 (1)	1.0	1.0	1.0	7	3	1	11
700+	5	0 (2)	1 (3)	0 (0)	–	1 (1)	–	–	1.0	–	–	3	–	3
Total	375	159	66 (152)	72 (170)	21 (53)	17 (18)	40 (50)	3 (4)	–	–	37 (37)	82.9 (99)	7.3 (8.5)	**124.6 (141.7)**

[a]Number of squares in each height interval; [b]number of squares of each habitat sampled (total number available in parentheses calculated from MoE's vegetation map); [c]number of squares of each habitat type in which Owls were detected (data in parentheses indicate estimated number of territories); [d]probability (*P*) = number of squares Owls detected/number of squares sampled (for each habitat type); [e]totals number of squares × *P* (for each habitat type), predicted number of territories (in parentheses) = *P* × (number of territories/number of squares sampled) × number of available squares (for each habitat); [f]total number of predicted squares containing Owls for each height interval (number of predicted territories in parentheses). – no data.

Figure 3(a) shows the actual distribution of the Seychelles Scops Owl on Mahé detected during the survey. Figure 3(b) shows the distribution as predicted by altitude, and Fig. 3(c) shows the distribution predicted from vegetation–altitude (considering squares with at least 40% chance of detecting Owls, respectively). A combined (maximum) distribution considering all three distributions (Fig. 3a–c), but only using squares from Figure 3(b) and Figure 3(c) that were simultaneously predicted to contain Owls, gave an overall distribution of 137 squares (34.3 km^2), equivalent to 156–162 territories (137–162 territories assuming a minimum of one territory per square; see Fig. 3d). These were similar to the population and range predicted by the complete models (see Tables 2 & 3). This combined (maximum) distribution included 19 squares that contained Owls that were not predicted by either altitude or vegetation and altitude, whereas 15 squares were predicted to but did not contain Owls.

DISCUSSION

This paper presents the first complete baseline survey of the distribution of the Critically Endangered Seychelles Scops Owl on Mahé. Population estimates, derived from two models, were 134–159 territories (268–318 individuals) within a 34-km^2 range (altitude model) and 125–142 territories (250–284 individuals) in a 31-km^2 range (altitude–vegetation model). The estimate derived from the latter is probably more accurate because it excludes unsuitable habitat: Owls were never detected in exclusively unforested habitat. These novel and comprehensive data on range and distribution, and the revised population estimate based on quantifiable Owl–habitat associations, have important implications for both the Owl's conservation status and its future management.

Factors accounting for distribution: altitude, vegetation and endemic frogs

The study confirmed that the Seychelles Scops Owl is currently restricted to forest habitats at middle to high altitudes (mean detection altitude was 405 m). The distribution of the Owl coincided with the presence of mixed forest (comprising native and introduced tree species), normally characterized by high canopy and damp microclimate: typical of valleys and sheltered slopes. Although there was an increased likelihood of detecting Owls above 400 m, territories were occasionally detected at low altitudes (as low as 100 m) in the presence of suitable forest habitat.

On Mahé today, native vegetation is largely restricted to higher altitudes (Vesey-Fitzgerald 1940, Carlström 1996). The increased detection of Owls above 400 m could be explained by the species', preference for native and less-disturbed forest (see Tables 2 & 3). However, the present ranges of native-dominated forest and of the Scops Owl may both be

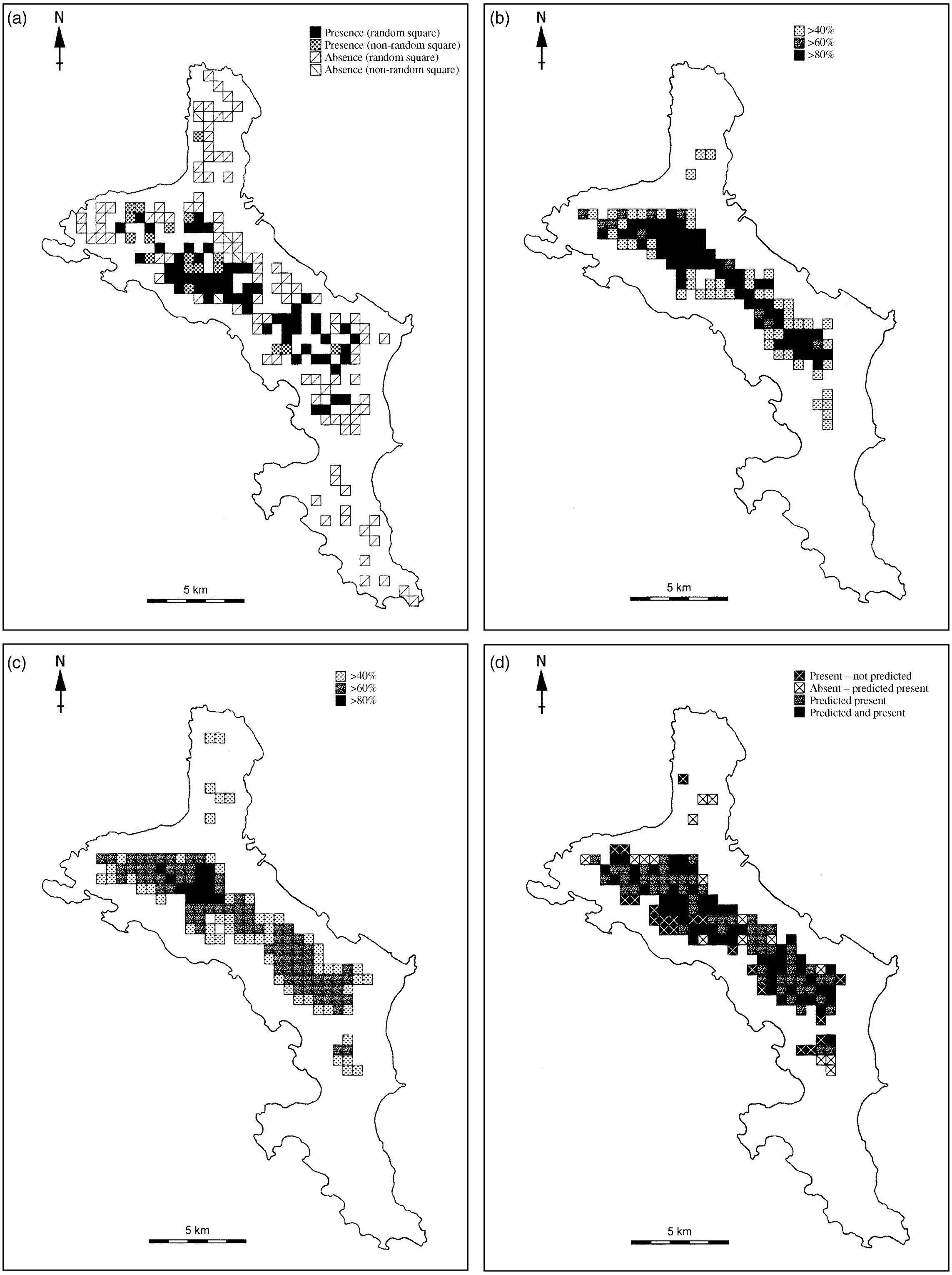

Figure 3. Distribution of the Seychelles Scops Owl on Mahé: (a) distribution detected during random point survey; (b) distribution predicted by height (calculated from Table 2); (c) distribution predicted by vegetation-height model (calculated from Table 3); and (d) maximum distribution from random point survey and squares predicted to contain Owls (>40%) using both the altitude and vegetation-altitude models.

related directly to reduced human activity at higher altitudes. The Owl is clearly able to utilize modified habitats, as its range is dominated by secondary forest, primarily Cinnamon *Cinnamomum verum* (first documented in the Seychelles in 1772; Friedmann 1994) and Albizia *Paraserianthes falcataria*, absent from plant species lists up to 1930 (Summerhayes 1931). Owls are also found in developed areas at high altitudes, for example in forest in the vicinity of urban and agricultural areas (tea plantations), and although there is a marked association between Owls and mixed forest, the importance of native and/or endemic flora in the Owl's requirements remains unclear.

The presence of endemic frogs provides a crude indicator of 'dampness'; *Tachycnemis* breed in water and *Sooglossus* spp., which have terrestrial larvae or carry the larvae on their backs, require very moist conditions to survive (Nussbaum 1984). Although there was a marked overlap in Owl and endemic frog distributions, it has not been demonstrated that frogs feature in the Owl's diet, which is dominated by invertebrates, primarily Orthoptera (Currie *et al.* 2003). The significant overlap in their respective distributions indicates that both have similar preference for damp conditions. Precipitation is generally greater at increased altitudes (Seychelles Meteorological Services unpubl. data; Walsh 1984), and forests are generally more humid than are other vegetation types (although this effect is less acute at increased altitude). The relationship between the Owl and generally damp mixed forest may be through increased prey availability in wet areas or associations with 'damp'-requiring invertebrate prey species. However, the Owl–frog association is not exclusive, for example *Tachycnemis* can be found at or near sea-level, whereas the Owl is not.

The documented association of the Owl with 'boulder fields' (e.g. Collar & Stuart 1985) is potentially misleading. Boulder fields are a common habitat feature in the montane landscape. They were recorded in 76% of random squares during the survey and were not significant in accounting for the presence of Owls. The association may have arisen as a result of individuals (males) roosting under overhanging tree roots in and around boulder fields, and may also have led to the supposition of subterranean nesting (Watson 2000).

Previous population estimates

Watson (2000) estimated that there were at least 80 pairs (based on an estimated maximum territory size of 57 ha), whereas Rocamora (1997), using the playback of conspecific calls at fixed points (*c.* 300 m apart) along seven transects, estimated that there were 90–180 territories. During the latter survey, if an Owl was detected in a 500×500-m square within the existing 1-km Ordnance Survey grid, then the Owl's presence was attributed to the 1-km square and resulted in a 'confirmed', but probably overestimated, distribution of 21 km^2 (Rocamora 1997).

Using playback and repeat observations of marked birds, we calculated previously that a conservative measure of Scops Owl territory size along transects was *c.* 12–16 ha (Currie *et al.* 2002). Population estimates and ranges calculated in the present study suggest that this was an under estimate and a territory size of *c.* 20–25 ha is probably more representative. Regardless of this, a minimum population estimate based on a territory size of 57 ha (Watson 2000) is conservative.

Until recently there was a lack of baseline data on factors affecting the Scops Owl's response to the playback of conspecific calls. In light of seasonal variations in the response of territorial individuals to the playback, the survey was conducted from October to March owing to the relatively high rate of detecting resident males: 87% on territories (Currie *et al.* 2002). We avoided conducting the survey in months that were consistently shown to have a low rate of detection: June–August (Currie *et al.* 2002). Previous survey work was conducted in some of these months (Rocamora 1997), and may have resulted in an underestimate of territory number (see Currie *et al.* 2002).

Survey methods

The detection of solitary Scops Owls through their response to playback is more common than the detection of pairs (Currie *et al.* 2002, see also Rocamora 1997). The playback methods used in this survey usually elicit a response from one bird, most often a male. This single bird response is typically indicative of a territory (Currie *et al.* 2002). In a few instances, mature fledglings, which are still on their natal territory, have been observed to respond to playback of an adult-like *waugh*, and may even duet with one of their parents (Currie 2002, Currie *et al.* 2002). Because mature fledglings can be detected throughout the surveying period of October–March (Currie 2002), we cannot rule out the possibility that some contacts were responses by such individuals. However, in 2 years of intensively monitoring 12 study pairs, using the same playback methods used in this survey, such instances were infrequent and similar occurrences during the survey were unlikely to have a significant effect on our population estimate.

Owing to the lack of baseline data on Scops Owl distribution, we set the minimum 100-m altitude selection criterion for non-random squares, as we have detected birds as low as 100 m asl. It has also been suggested that prior to deforestation, which occurred on Mahé at the end of the eighteenth and beginning of the nineteenth centuries, the Scops Owl may have originally occurred at much lower altitudes (Penny 1974). In fact, the 100-m selection criterion proved conservative, and no birds were detected below 150 m asl in any of the random squares.

Implications for conservation status and management

The Seychelles Scops Owl is currently listed as Critically Endangered (D1) on the basis of its small population and range (BirdLife International 2000). There are no data on population trends of the Owl: the first monitoring programme was set up in 1997 (Rocamora 1997). Data from this study show that the species could be down-listed to Endangered on the basis of population size, but until more information on population trends is available, this may be premature.

The stronghold of the Seychelles Scops Owl is documented as being within the 3045-ha Morne Seychellois National Park (MSNP; Rocamora 1997, Skerrett *et al.* 2001). In fact, only *c.* 55% of the Owl's maximum predicted range is within the park boundaries (see Figs 2d & 3d). The creation of a second protected area (*c.* 1000 ha) south of the MSNP is currently being planned (F. Dogley pers. comm.; see Fig. 2d). The gazetting of the proposed extension would protect approximately 80% of its range from development and habitat loss and represent a considerable improvement in the protection of the species.

Historically, the Seychelles Scops Owl was also recorded on Praslin and Félicité (Collar & Stuart 1985); however, there have been no reliable recent reports of the Owl on any of the granitic islands other than Mahé (Watson 2000, Hill 2002, Nature Seychelles unpubl. data). In light of this, the creation of additional populations has been proposed to increase its range (Watson 2000). Based on the quantifiable habitat associations from the Mahé population, the suitability of the second and third largest islands (Praslin, 37 km^2; Silhouette, 20 km^2) was assessed: smaller islands were not considered owing to insufficient high-altitude habitat. Although both islands would appear to contain some suitable habitat, they would only be able to support relatively small populations; on Praslin a maximum of ten (very dispersed) pairs and on Silhouette a maximum of *c.* 20 pairs (see Appendix 1). Translocation of individuals to Silhouette has previously been suggested (see Watson 2000) and, in light of these estimates, is the only realistic option for creating another population. It is also worth noting that Silhouette is described as having more endemic vegetation than Mahé (Friedmann 1994) and is also suspected of having a higher density of ground invertebrates owing to the absence of the introduced Tenrec *Tenrec ecaudatus* (J. Watson pers. comm.): the population estimate of 20 pairs, based on density of territories on Mahé, may be low. However, Silhouette has a suite of alien species that could have an impact on a small founder population of Scops Owls following translocation. The Scops Owl coexists with several introduced alien mammals including *Rattus rattus* and *Felis catus* on Mahé, and there is anecdotal evidence that rats may have a detrimental effect on breeding success, although as yet this impact remains unquantified (Currie 2002). Difficulties in monitoring adult survival and breeding success post release would result in problems establishing the success or failure of a translocation, identifying factors affecting success and hence identifying and implementing management actions (see Currie 2002). The potential impacts of Scops Owls on the existing fauna of Silhouette, although probably marginal, would also have to be considered. Given the potential risks, limited projected increase in population and constrained resources, translocation is not recommended as a priority action. However, translocation may be an important contingency measure (see below).

In light of the Owl's habitat requirements for large territories in upland forest, practical actions to improve its conservation status are limited. There are no realistic options for significantly increasing the Owl's range on Mahé and there are similar limitations in creating additional populations as there appears to be only one suitable island, Silhouette. The most practical conservation options for the Owl at this time are: (i) investigation of factors affecting habitat quality (and possibly breeding success); (ii) the continued and increased protection of suitable habitat, including the implementation of sympathetic land-use practices within its range on Mahé; (iii) the long-term systematic and comprehensive monitoring of the population; and (iv) the development of a realistic and effective contingency plan to be implemented should a catastrophic event occur on Mahé.

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Appendix 1. Predicted Seychelles Scops Owl population estimates for Silhouette and Praslin based on the Mahé models (see Tables 2 and 3).

		Vegetation type (squares)			Predicted no. of territories	
Altitude (m)	Squares	Bush	Other	Mixed forest	Altitude model	Altitude–vegetation model
(i) Silhouette						
100	19	5	7	7	1.71	1.95
200	15	4	1	10	3.45	3.77
300	10	1	1	8	4.1	4.89
400	8	2	2	4	5.8	6.04
500	3	1	0	2	2.37	2.39
600	3	2	0	1	3	3
Total	69	15	11	39	**20.43**	**22.04**
(ii) Praslin						
100	45	20	7	18	4	5.8
200	22	14	0	8	5.1	3.4
300	2	1	0	1	0.82	0.83
Total	69	35	7	27	**9.92**	**10.0**