

The Status and Conservation of Lanyu Scops Owl *Otus elegans botelensis*

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ABSTRACT

The Lanyu Scops Owl is endemic to Lanyu (Orchid Island), south-east of Taiwan. This one-year study investigates the species' current status, distribution on Orchid Island and habitat requirements, and identifies the natural and human pressures on this population. Methods used included a literature search, interviews with local people and field studies.

An estimated 150 to 230 owls still exist. Their prime habitat of mature forest with old trees has been greatly reduced, but the species does use some areas highly altered by man. Breeding success is probably severely limited by lack of suitable nest holes. Hunting pressure is high, given the small population and low productivity. Recommendations are made for the management of this species.

INTRODUCTION

The Lanyu Scops Owl was discovered in 1928 and classified as *Otus scops botelensis* (Hachisuka & Udagawa 1951). Marshall (1978), based on its vocalisation, reclassified it as a subspecies of *Otus elegans* found on three small islands: Lanyu (Orchid Island) near Taiwan and Ryukyu and Daito in Japan.

Lanyu is 45.7 km² in area.

The Lanyu Scops Owl was well established on Lanyu before 1931 (Kano 1931).

In 1969 it was still relatively common (S. R. Severinghaus pers. comm.). Marshall (1978) estimated that there were 10 males left in the central valley with an unknown number of females. Lin (1982) reported Lanyu Scops Owls in the forest, but did not give any population estimates. Since then there have been no field studies on this species. Thus the historical data point to a declining population, but prior to this study there was no information to indicate whether it was still a viable one.

The Lanyu Scops Owl has been listed as endangered in the Red Data Book (King 1981). Yet its natural history and habitat requirements are little known; nor have the other subspecies ever been studied. Thus, this study was undertaken to determine the current population and distribution of the Lanyu Scops Owl, to learn its habitat requirements, determine the cause of its endangerment and make preliminary recommendations for its management.

METHODS

I. Literature search and interviews:

All known popular and scientific writings about Lanyu were read to glean and compile as much information on the Lanyu Scops Owl as possible. Throughout this study, researchers interviewed the Yami and other long-term residents on the island about their knowledge of the owl and owl-capturing activities.

II. Field surveys:

1. Overall strategy: My assistants and I made many forays into the interior of the island by following mountain trails, valleys and streams, using the coastal highway around the island as a departure point each time. Survey sites were selected along these routes in order to ascertain the distribution of the owls and conduct vegetation sampling.
2. Survey by vocalisation: On field surveys at each of the selected sites, team members were positioned at at least two locations roughly 100m apart. Each team recorded the time, compass direction and variety of all owl vocalisations. Through triangulation, we were able to estimate the number of owls calling in the survey site during each survey period.

III. Capturing and banding:

Owls were captured in mist nets and banded with both an aluminium numbered band and a coloured plastic coil band for individual identification.

IV. Special area survey:

Areas where owls were common or regularly encountered were selected for habitat analysis. Vegetation sampling followed the point centre quarter method for trees (Smith 1966). In addition, the total number of trees and tree cavities, undergrowth density, diversity and percent cover, and herb cover within 5m radius of each sampling point were recorded.

For forested areas, sampling points were 50m apart along each transect, and the transect lines were 50m apart. Because the number of owls living around villages was limited and the habitat was varied, we did not do habitat analysis there through transect sampling. Instead, we sampled the areas around the three confirmed nests near villages to obtain a profile of the kind of disturbed habitat the owls would use. Taking each nest as the central point, four additional points were sampled 100m away from the nest in cardinal directions.

RESULTS AND DISCUSSION

1. Data base

During the study, field workers stayed on Lanyu 156 days. The results reported here were accumulated from 122 person-nights. More time was spent in the field during the breeding season (April to July) than during the rest of the year.

Survey routes covered most of the island (Fig. 1), but the coastal areas were surveyed more intensively. Four areas in the interior were not explored. Along the routes, we selected 71 survey sites but, because of weather and time limitations, were able to complete the work at only 50 of them (Fig. 2). The number of times each survey site was visited differed. Altogether the 50 sites were visited 195 times.

2. Capture and banding results

The field team captured owls in only 7 of the 25 locations where netting was attempted. In total 29 adults and 2 juveniles were banded, measured and released.

3. Distribution and habitat characteristics

Among the 50 sites surveyed, we heard owl calls at 40 of them (Fig. 3). Owls occurred widely from coastal areas of steep cliffs to the forests of the interior. They showed no apparent elevational

preferences and were found from sea level to near the highest peak (548m) on the island. Nor was their distribution or habitat related to distance from the ocean.

The habitat of Lanyu Scops Owls can be divided into two types: mature forest and disturbed areas around villages. The density of owls in forests was much higher (up to 20 birds per site) than that around villages, where there were only one or two pairs per site. Thus forests remain the most important habitat, while disturbed areas are marginal.

We sampled three sites with mature forest where owls were commonly seen, covering 5 ha in total. Altogether 14 species of trees were identified, among which *Pometisa pinnata*, *Artocarpus altilis* and *Laportea* sp. were the most important (Table 1). Trees of these species occurred in high numbers in large sizes and were widely distributed. The diameter of 53% of the trees here was over 30cm, the largest individual being a 206cm *Artocarpus altilis*. The mean distance between trees was 7.25 ± 6.71 m (n=96). The mean density of trees was 1.84/100 m². Undergrowth was moderately dense, composed mostly of shrubs with some *Alocasia macrorrhiza* and ferns. Some sites also had grasses, exposed rocky areas and bare soil. In the total area of 5 ha sampled, only 7 tree cavities could possibly have been used by owls.

Table 1. Vegetation analysis of mature forest tracts.

Tree species	Frequency	Relative density (%)	Relative dominance (%)	Mean basal area/tree (cm ²)	Frequency of occurrence (%)	Importance value
Fiji longan tree	31	32.29	44.79	3895.87	66.67	105.15
Breadfruit tree	20	20.83	37.29	5027.26	62.5	84.43
Wood nettle	15	15.63	12.49	2244.93	29.17	40.4
Casuarina	4	4.17	0.28	186.78	4.17	6.21
Betelnut	4	4.17	0.17	113.49	12.5	9.6
White-barked fig tree	2	2.08	0.52	706.86	4.17	4.36
Banana	2	2.08	0.18	247.5	4.17	4.02
Hontauyu copperleaf	1	1.04	0.07	176.71	4.17	2.87
Angular fruit fig	1	1.04	0.14	380.13	4.17	2.94
Coconut	1	1.04	0.18	490.87	4.17	2.98
Macaranga	1	1.04	0.07	176.71	4.17	2.87
Triplinnate eugenia	1	1.04	0.15	397.61	4.17	2.95
Mountain fig dapanan	1	1.04	0.15	415.48	4.17	2.95
Lanyu holly	1	1.04	0.32	855.30	4.17	3.12
Unidentified	11	11.46	3.22	788.41	25	25.2
Area sampled: 5 hectares			Mean distance between trees: 7.25 ± 6.71 m			
Total no of trees: 96			Mean density: 1.84 tree/100m ²			

Table 2. Vegetation analysis of areas around three nest trees.

Tree species	Frequency	Relative density (%)	Relative dominance (%)	Mean basal area/tree (cm ²)	Frequency of occurrence (%)	Importance value
Coconut	25	58.1	78.54	678.21	81.82	177.55
Casuarina	9	20.9	8.69	208.39	45.45	52.32
Betelnut	2	4.7	1.19	128.91	18.18	14.98
Pouteria	2	4.7	1.43	154.72	9.09	10.68
Leea	1	2.3	0.52	113.10	9.09	7.37
Blunt-leaved marking-nut	1	2.3	0.61	132.73	9.09	7.46
Formosan nato tree	1	2.3	0.82	176.71	9.09	7.67
Fiji longan tree	1	2.3	0.82	176.71	9.09	7.67
Breadfruit tree	1	2.3	7.37	1590.43	9.09	14.22

Total no of trees: 43

Mean density: 0.29 tree/100m²

Mean distance between trees: 18.57±22.24m

The owl habitat near villages had 9 species of trees. Coconut palm and casuarina were the most important (Table 2). Betelnut, *Artocarpus altilis*, and *Planchonella duclitan* were next in importance. The coconuts, casuarinas and betelnuts were most likely planted by aborigines in the last 30 years. There were very few large trees in this kind of habitat, the largest having a diameter of 45cm, whilst only 41.8% had a diameter over 30cm. The mean distance between trees was 18.57 ± 22.24m, the mean density being 0.29/100m². Undergrowth was not dense, composed mostly of shrubs and grasses, but slightly denser directly under the nest tree than elsewhere. Part of the ground area was covered with leaf litter and rocks, but there were also bare spots, roads, buildings and irrigation ditches within the sampled areas. Besides those already used as nests, no other cavities were found.

Based on field surveys, supplemented by aerial photography and topographical maps, only 18.33km² on Lanyu Island (or 40% of the land area) was found to be suitable Scops Owl habitat. Within this area only 5.1km² was mature forest. Suitability was defined as forest and wooded areas. Unsuitable areas include major villages, miscanthus grasslands, rangelands and pine plantations. Although more detailed study is necessary, Scops Owl habitat has undeniably decreased.

4. Breeding success

We located seven Lanyu Scops Owl nests, six in tree holes and one in the axil of a coconut frond. One was too high for us to examine but it fledged no young. Among the remaining six nests, four ended in failure: three were flooded during rainstorms, resulting in the drowning of the eggs, and the eggs of the fourth nest were probably preyed on by a rodent. Two of the six nests successfully hatched five young. Three of the chicks died within two days of hatching: one fell and hanged itself on a branch and two were injured and caught by children. Thus, seven nests fledged only two young.

5. Nest availability

Shortly after a nesting failure, owls tried to re-nest. In one case, a pair was seen to enter and explore four tree cavities 10 times in eight nights, copulating frequently (Table 3A). Three of the cavities were apparently unsuitable since they were not selected. The fourth and original nest cavity remained flooded for the 11 days the field team was there. This pair did not re-lay during this period.

Another pair was seen to copulate six times and explore three cavities repeatedly for two and a half months starting in early May. None of the cavities was used for nesting. This pair was still exploring at the end of July (Table 3B) and probably never nested during this season.

Table 3. Nest cavity searching behaviour of Lanyu Scops Owl.

A. Yehyiu area, 4 cavities visible.

3rd attempt: (1st nest destroyed 21 May. 2nd nest flooded by storm 4 June)

Date	No. of copulations	No. of cavity entries
7 June	-	1 (original nest)
9 June	2	1 (original nest)
10 June	-	2 (original nest)
		3 (other cavities)
13 June	1	-
14 June	1	-
15 June	3	2 (original nest)
		1 (other cavity)

B. Yunghsing area, 3 cavities visible.

pair H1005/H1018:

Date	No. of copulations	No. of cavity entries
7 May	1	-
8 May	1	-
14 June	2	1 (Fiji longan tree)
15 June	2	2 (same tree as 14/6)
		2 (on two other trees)
16 July	-	1 (same longan tree)

In one high density area, five pairs of owls explored eight cavities, but only one cavity was confirmed to contain a nest. Another cavity could have been used but was too high above ground to examine. The others were not used, and no other owl nests were found.

Two of the nest trees used collapsed towards the end of the breeding season. There were no other cavities known around the activity ranges of these two pairs.

It appears that Lanyu Scops Owls are severely nest-site-limited. Usable cavities are few in number and a major proportion of them is of poor quality, easily flooded during storms. The quality of the nest strongly influences breeding success.

6. Population size

Based on vocalisation analysis and capture results, there should be between 133 and 174 Lanyu Scops Owls in the 50 sites we surveyed (Fig. 3). According to aerial photos, large parts of the four areas not surveyed have been disturbed by man. The habitat here is thus marginal for owls at best, and the number living in these areas could not be large. I estimate the maximum population of Lanyu Scops Owls to be 150-230. Because it is an endemic subspecies, this figure represents the total number of these birds in the world.

7. Hunting pressure

Yami people, the aboriginals on Lanyu, had always lived in peace with Scops Owls, regarding them as bad omens, and had no tradition of hunting them. Chinese people reached Lanyu in the 18th century but whether they hunted these owls then is unknown. Between 1895 and 1945, during the period of Japanese occupation, the Japanese government designated Lanyu as a cultural reserve and strictly restricted access to scientists. The decline of the owl population after 1945 was assumed by Marshall to be due to habitat destruction (King 1981). Lanyu was not opened to outsiders until the late 1960s, since when many patches of mature forest were removed for development. Furthermore, outsiders had no traditional taboos that prevented them from capturing these owls. Thus the Lanyu Scops Owl has been under double stress.

According to interview results, people in 13 places on Lanyu caught 41 to 49 Scops Owls between the summer of 1985 and September 1986 (Table 4 and Fig. 4). This is about 20% of the existing population. Most of the owls were kept in captivity for a few days until they died, or were killed and eaten, or supposedly released.

Table 4. Number and fate of captured Lanyu Scops Owls

Date	No. of owls	Fate
June 85	1	Kept as pet a few days, then let go*
Aug 85	1	Kept as pet a few days, then let go*
Aug-Sept 85	2	Kept as pets, then died
Oct 85	2	Kept as pets, then died
Dec 85	3	Kept as pets, 1 died, 2 let go*
Jan 86	11 - 13	2-3 died in net, 8-9 eaten, 1 kept as pet, then died
Feb 86	2	1 killed by vehicle, 1 died in net
Feb-Mar 86	1	Died in net
Mar 86	10 - 12	1 died in net, 4-6 eaten, 5 kept as pets, 4 died, 1 let go*
Mar-July 86	6 - 10	Eaten
July 86	2	1 sold to a tourist, 1 wounded and brought to Taipei for care. Died on 12.11.86
Sept 86	1	Kept as pet, then died

Total: 41-49 owls caught, 1 killed by car

*Report that the bird was let go, but it most likely died in captivity.

If every owl in the estimated population were to breed, and if the breeding success of the seven nests we found was representative of the owl's productivity, the maximum recruitment last year would be 42-65 young, only just replacing the number of owls removed by people from the population that year. If natural mortality is taken into consideration, the population of Lanyu Scops Owls is bound to be decreasing. Given low productivity, the current hunting pressure surely contributes further to its decline.

Soldiers constitute the highest persecution pressure. They caught altogether 30-40 owls (65-95% of all those caught). The other 9 were caught by residents or construction workers temporarily on Lanyu.

Soldiers did not deliberately seek to catch owls. They were looking for amusement; so they netted all birds indiscriminately or shot them with sling shots. They set mist nets near their camps and checked them every several days. All live birds were removed and taken to their camps; all dead birds were discarded. These military camps had seven mist nets which they lent back and forth between units. Thus owls near all the military camps could be captured.

Based on several discussions, we feel the highest commanding officer stationed on Lanyu was not enthusiastic over co-operating with us without the encouragement of his superiors. It is thus crucial that co-operation be obtained at the highest level. The support of higher military command should be supplemented with an education programme on conservation, and a recreational programme to channel the time and energy of the soldiers to more constructive pastimes, such as bird-watching, participation in bird studies, or bird banding projects. Only then may the hunting pressure on Scops Owls be reduced.

CONCLUSIONS

Although the Lanyu Scops Owl is in no imminent danger of extinction, it is nonetheless highly vulnerable. Its prime habitat has become very limited in area, while its marginal habitat can only support a low population density and owls living in these areas are more easily and frequently caught.

Owls living in prime habitat have a complex social system, living in high densities without any individual or pair territories (Severinghaus, unpubl. data). Marginal habitat supports single pairs, which does not allow the development of the complex social system that could be important for the survival of the species. Thus it is paramount that prime mature forest be preserved for its future welfare.

MANAGEMENT RECOMMENDATIONS

Our understanding of the owls' biology is incomplete, so we are continuing this research to refine our management recommendations. In the meantime, the following suggestions have been made to the government agency in charge of wildlife:

1. Obtain the co-operation of the military on Lanyu to stop netting owls immediately and to assist in the enforcement of its protection.
2. Tighten the control on exporting endemic plants and animals from Lanyu, and prohibit the possession of mist nets without the permission of the central government agency in charge of wildlife.
3. Protect existing habitat, especially all remaining prime forest.
4. Carry out a careful, comprehensive, long-range plan for the development of Lanyu, and re-evaluate all development recommendations made by previous studies to avoid further irreversible damage to the island's ecology and native culture.
5. Designate the Lanyu Scops Owl as a National Treasure, so that it can be protected by the Cultural Resources Protection Law.
6. Establish a Lanyu Scops Owl reserve.
7. Launch a public education campaign.

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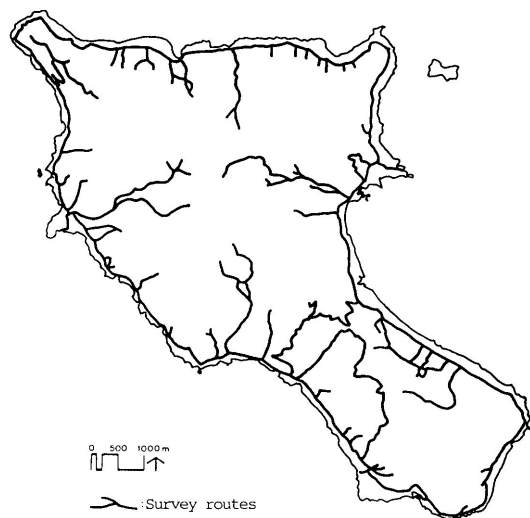


Figure 1. Survey route map for the study of Lanyu Scops Owl.

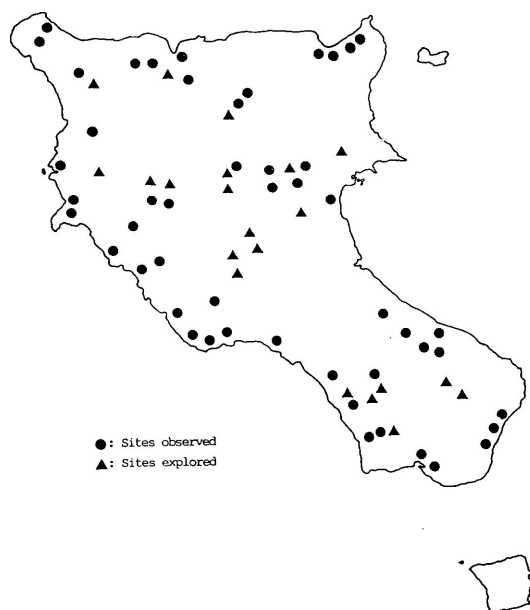


Figure 2. Distribution of observation sites established for study of Lanyu Scops Owl.

Estimated population size: 133-174.

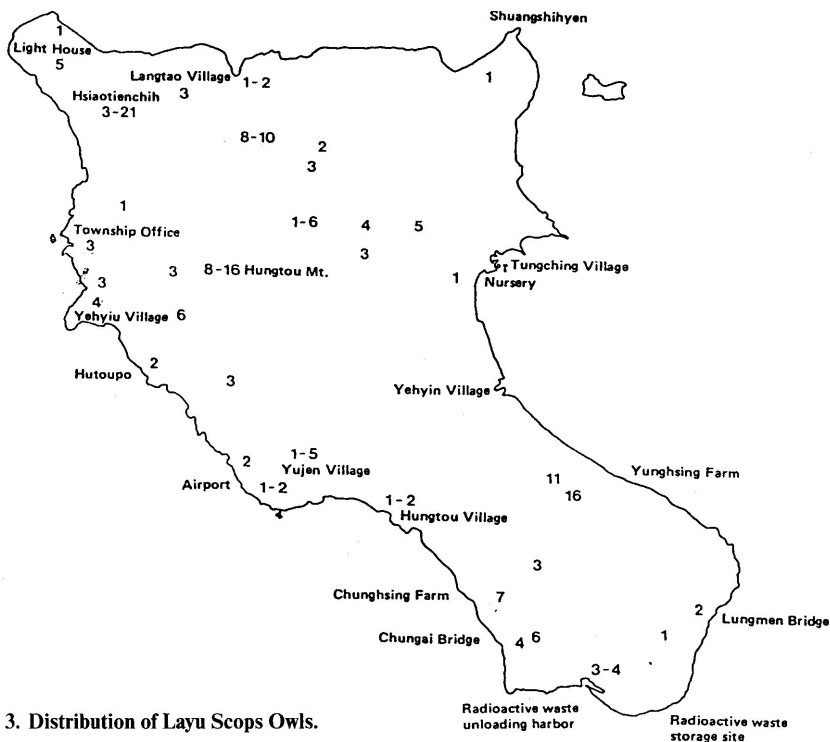


Figure 3. Distribution of Layu Scops Owls.

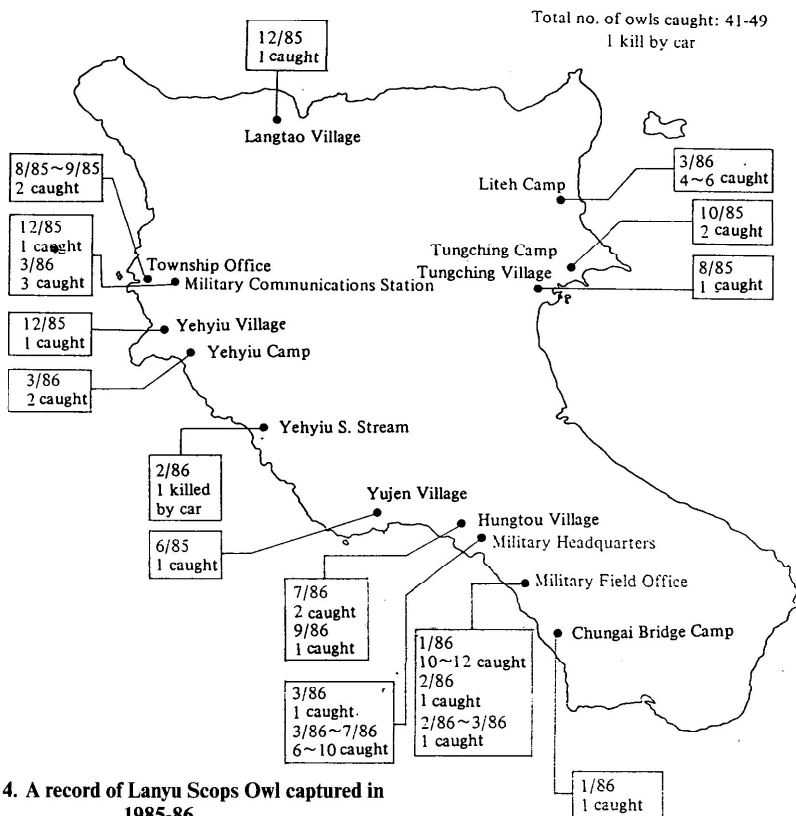


Figure 4. A record of Lanyu Scops Owl captured in 1985-86.

