

Sulawesi Primate Newsletter

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Sulawesi Primate Newsletter, page 11

Tarsiers and Agriculture: Thoughts on an Integrated Management Plan

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Biogeography and Ecology

Tarsius spectrum is one of Sulawesi's endemic mammals. In Northern Sulawesi, local people think that the tarsier is only common in Tangkoko Nature Reserve, Bitung. However, we found tarsiers almost everywhere we went in Sulawesi except in areas of dense human population and areas of intensive agriculture. Because of their nocturnal habits, they are difficult to see, and therefore, local people are often unaware that tarsiers live nearby.

Tarsiers are known by numerous common names in Sulawesi. In Manado and Bitung the tarsier is called *tangkasi*, while in the Minahasa language it is called *wesing*. The local people of Bolaang Mangondouw and Gorontalo call them *mimito*, while in Sangir they are called *sanggasi* or *higo*. The Tomini people call them *mimise sugasange* which means, "tarsier

which lives in a bunch of bamboo". In Bajau Sama, the language of the Bajau people who are sometimes known as Sea Gypsies, the tarsier is called *Podi*.

Tarsiers occur in a wide range of habitats in Sulawesi. We found tarsiers in the following habitat types: primary forest, secondary forest, bush and gallery forest along streams, mangrove, alang-alang grasslands, villages, and many types of cultivated areas. Tarsier sleeping sites vary by habitat type. In primary forest, tarsiers sleep in holes in large trees, especially strangler figs (Ficus sp.), or in vine tangles. In secondary forest, they often sleep in bamboo or in vine tangles. In gallery forest, they were observed to sleep in holes in trees, bamboo, and vine tangles. In mangrove tarsiers were observed to sleep under dry branches and dead leaves which had collected among the exposed roots of the mangrove. In alang-alang we believe that tarsiers were sleeping at the base of a clump of grass. In villages, tarsiers were seen to sleep in bamboo. In cultivated areas we found tarsiers to sleep in bamboo, vine tangles, sago palm (Metroxylon sagu), and salak trees (Salacca edulis).

The family group which sleeps together numbers from two to as many as eight individuals. One adult male with one adult female, with infant and/or sub adult offspring is a common arrangement, but more complex social groups are quite common. We observed groups with a single adult male and multiple adult females, groups with multiple adult males and multiple adult females, and rarely, we suspect groups with one adult female and

multiple adult males. There are some large groups which sleep together on some nights, but sleep separately on other nights. We have observed that in such groups, pairs of tarsiers will sometimes forage separately, even after having slept together. Our data suggest that the spectral tarsier mating system is somewhat ambiguous and does not fall into any of the categories which are often used for primates (e.g. noyau, monogamous, harem, multi-male/multi-female).

Conservation Threats to the Tarsier

From our observations, we assume that tarsiers were once distributed ubiquitously throughout Sulawesi. Therefore, places where we find them to be absent, we regard as local extinctions. Two habitat types routinely showed local extinction of tarsiers: areas of dense human population and areas of intensive agriculture. We wish to address the issue of local extinction in areas of intensive agriculture, because we find that tarsiers are not universally extinct in this habitat type. On the contrary, tarsiers sometimes exist in high population densities in these regions (e.g. Molibagu, North Sulawesi). We suspect that two factors are principally responsible for the local extinction of tarsiers in areas of intensive agriculture: use of agricultural poisons and the lack of suitable sleeping sites. These factors are compounded by a negative perceptions of tarsiers by farmers.

Agricultural poisons:

Our evidence for local extinction owing to agricultural poisons stems from observations at two sites. In the coconut plantations to the east of Malenge village (Malenge Island, Togian Islands, Central Sulawesi) herbicides and pesticides were used and signs were posted warning of the dangers to humans. Coconut trees to which poison had been applied were marked with conspicuous patches of red paint. No sign of tarsiers was found in this area. Beyond the area where the trees were marked with red paint, however, tarsiers were observed - first in low density, and further along, in higher density.

In the chocolate groves to the south of Marantale (Central Sulawesi) we were told that pesticides and herbicides had recently been applied. During our surveys, we found the recently emptied containers of these

poisons. All tarsiers at this site had sores on their hands and/or anogenital region. Body weight for tarsiers at this site was low compared to other sites. Tarsiers at other sites sometimes have sores on their anogenital region, and, rarely, we found sores on the hands of tarsiers. However, except at Marantale, never did we find an entire population to be afflicted with these sores. We suspect that there may be a link between the recent application of the poisons and the occurrence of the sores. It also seems self-evident that if the agricultural poisons being used are strong enough that humans need to take precautions, then tarsiers (which weigh only about 1/600th as much as a human) are probably at much greater risk.

Local Extinction Due to Lack of Sleeping Sites:

We consistently failed to find tarsiers in areas which had been cleared of all known sleeping sites, typically in areas of intensive coconut farming where shrubby undergrowth has been cleared along with all bamboo. One common agricultural pattern throughout the tropical Pacific is to mix coconut and chocolate cultivation. Tarsiers have been observed to forage in such habitat, even when no sleeping sites exist. But, when morning comes, the tarsiers are forced to wander back to where they came from (i.e. secondary forest, gallery forest, mangrove, etc.) to sleep. If the plantation is large enough, tarsiers will not penetrate the entire plantation during their nightly foraging, but concentrate on the periphery. We found no evidence of tarsiers actually sleeping in coconut or chocolate trees.

Negative Attitudes of Farmers:

Another of our findings was the unexpectedly severely negative attitude of many farmers toward the tarsier. Wherever we went, tarsiers were reported without doubt to eat the local crop - be it coconut, durian, chocolate, or whatever. Farmers were certain of this fact, and were not easily convinced that tarsiers eat no plant matter at all - only live caught animal prey. For example, with the permission of the garden owner, we trapped tarsiers in a mixed-tree garden which borders Lore Lindu National Park at Kamarora. We located a tarsier group sleeping in a salak bush, and

managed to trap several members of the group. During the course of trapping, we discussed the tarsier diet with the farmer, and assured him that tarsiers eat no fruit at all, that they eat lots of insects, and that therefore he might be pleased to have tarsiers in his garden. However, the next day we found that he had destroyed his own salak stand, presumably in an effort to rid his garden of tarsiers.

Integrating the Management of Tarsier Populations with Agriculture

We see no good reasons why tarsiers can not coexist with intensive agriculture on Sulawesi. Tarsiers do not eat any agricultural products at all, nor are they known to cause any damage to any agricultural crop. Second, tarsiers eat many agricultural pests. We have worked in areas where pesticides are used, and tarsiers do not exist; and we have worked in areas where no pesticides are used and tarsier densities are high. We did not make quantitative measurements of crop damage, but we noticed no greater crop damage in the areas in which pesticides were not used (but which had tarsiers), than in the areas where pesticides were used.

Further on this point, one of us (Y.M.) has heard that the Kerekelong Islands are infamous for their coconut blight. According to the stories, a large grasshopper eats all the leaves from the coconuts. Perhaps it is not coincidence that this is the only island group in the area which does not have tarsiers. More information is needed on the putative coconut blight which hits these islands. In addition, it was reported to Y.M. that the Sulawesi chocolate crop is occasionally subjected to sanctions by an international chocolate growers association because the use of agricultural poisons on Sulawesi exceeds the self-imposed limits of the organization. This matter also deserves further inquiry.

A Blueprint for Further Action

Our research turned up several interesting links between tarsier populations and intensive agriculture. Perhaps the most exciting of these is the possibility that tarsier populations could be managed in agricultural areas as a natural pesticide. To accomplish this, we would first need to demonstrate that crop damage from pests can be held to acceptable

levels by tarsiers. To do this, we would measure crop damage in areas which use agricultural poisons (e.g. Malenge Island), with crop damage in areas where poisons are not used, but where tarsiers exist in high density (e.g. Molibagu, North Sulawesi). Circumstantial evidence from our previous surveys makes us optimistic that results of such a study could well be favorable. If this is the case, we would then recommend an educational program for rural farmers. First, farmers must be convinced of the beneficial nature of tarsiers. Secondly, they should be informed about tarsier sleeping sites. Thus, when farmers clear their lands, they could leave suitable tarsier sleeping sites behind.

Habitat loss is affecting the survival of many of Sulawesi's endemic species. Fortunately, this process does not have to threaten the survival of the tarsier. Very rarely does a conservationist have the opportunity to mix species population management plan with something as practical as intensive agriculture. We are currently looking for sponsors to support the research we suggest in this paper.

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Authors' note : some of the information here was presented in an article titled "Save the Tarsier" in the newsletter *Tangkasi*. However, the article in this issue of the *Sulawesi Primate Newsletter* contains the proper multiple author listing, and more detailed information. Therefore, in citing our work, please refer to

Suroso Mukti Leksono, Yunus Masala, Myron Shekelle. (1997). Tarsiers and Agriculture: Thoughts on an Integrated Management Plan. *Sulawesi Primate Newsletter*, Vol IV, No. 2, pp. 9-11.

rather than the *Tangkasi* report.