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Arenga Fruit as a Food for Gibbons

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Palm fruits have featured as minor food sources in the diets of all the gibbon species whose feeding ecology has been studied: siamang or *Hylobates syndactylus* (Chivers 1974, Raemaekers 1979), white-handed gibbon or *H. lar* (Ellefson 1974, Raemaekers 1977), agile gibbon or *H. agilis* (Gittins 1979), and Kloss gibbon or *H. klossii* (Whitten 1980). Each of these studies has recorded rattan fruits as gibbon foods (*Calamus scipionum*, *C.* spp., and *Daemonorops* sp.) but the palm tree *Arenga* (Caryotoidae) has only been recorded as a food for agile gibbons (Gittins 1979) and Kloss gibbons (Whitten 1980 and Fig. 1).

Methods

Between February 1976 and May 1978 I studied Kloss gibbons in a 200 ha study area in central Siberut, the most northerly of the four Mentawai Islands off the coast of West Sumatra, Indonesia (Fig. 2). I habituated a family group (BG4) comprising a male, female, and their juvenile to my presence and was able to collect detailed feeding and ranging data. In the latter half of the study these were shot by a local hunter and another group (BG10) having the same composition moved into their vacated home range.

Results

On Siberut, *Arenga obtusifolia* is found in the dry lowland and lower slopes of the hill dipterocarp forest types (Whitten 1980) where it can occur at densities of 60 stems of 6 m trunk height and above per ¼ ha. It is absent from swamps and *Dipterocarpus*-dominated ridgetop forests, but was found in forest types that comprised 62% of the habituated group's home range of 31 ha.

The leaf rachis of *A. obtusifolia* is sufficiently stout for a 5 kg gibbon to walk upon and this was generally the mode of entry. Sitting on an old infructescence, ripe rose-red fruit were selected from a ripening infructescence. Gibbons were observed to feed in ten trees of this species representing 4% of the total known food sources.

Of the 61 fruit that were picked by the male of BG4 over four feeding visits, 54 were picked by hand, 52 of them being eaten and two rejected for some reason or simply dropped. Five were picked by mouth when both hands were required to keep a stable position.

Between 2.0 and 3.6 fruit were processed each minute during the feeding visit, each fruit requiring about six biting movements to remove the pericarp before the seed and thin pulp were accessible. Even ripe fruit were extremely tough and I found that considerable effort was necessary to open one using a sharp jungle knife. The male used his long lower canines to remove the pericarp in a similar fashion to that employed by captive gibbons to open walnuts (pers. obs.).

1. A Kloss gibbon feeds on fruit of *Arenga obtusifolia*.

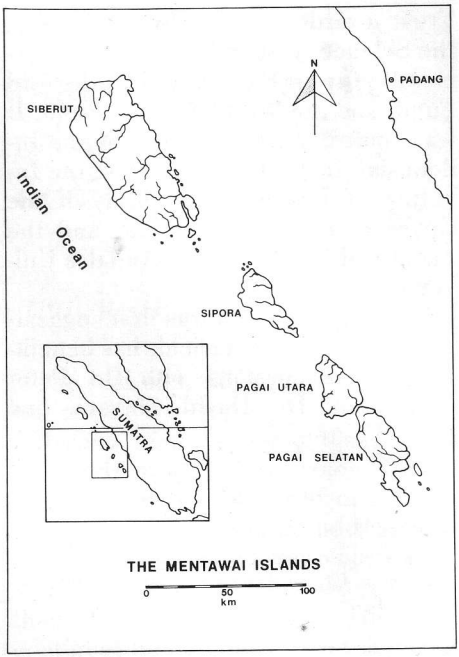
The most recorded feeding visits to a single *A. obtusifolia* tree was four with the first and last visits 112 days apart. As only 22 complete days of feeding records were achieved, these figures should be regarded as a minimum. Mature trees appeared to have infructescences of a wide range of ages (Fig. 1) and it is possible that some ripe fruit are available over a period of years.

Discussion

It is surprising that gibbons eat the fruit of *Arenga* because they contain oxalic acid (Burkill 1935). Furthermore Gimlette (1929 in Burkill 1935) records their use in Malaya as a poison to produce "dyspoena and restlessness from irritation of the mucous membranes and swelling of the mouth, fauces and parts which it touches."

Oxalic acid generally occurs in plants in the form of water-insoluble calcium oxalate (Palmer 1971), which exists as raphides or needle crystals. When eaten or touched these cause intense irritation. Oxalic acid can also occur in some fruit as water-soluble sodium oxalate, levels of which decrease on ripening as it is metabolized by oxidative decarboxylation (Wyman and Palmer 1964). If eaten, sodium oxalate preferentially absorbs calcium from the body forming insoluble, irritant calcium oxalate which affects the mouth, oesophagus and stomach. The decrease in body calcium levels may cause muscular spasms, renal failure, and death (Wade 1978).

Corner (in litt. 1979) reports that his tame pig-tailed macaque (*Macaca nemastrina*) ate the seemingly ripe fruit of a *Caryota* palm known also to contain oxalic acid (Burkill 1935). The monkey was unable to swallow and died after three weeks. Since no muscular spasms were observed it is likely



2. Map of the Mentawai Islands off the coast of Sumatra. Copyright A. J. Whitten.

that the active agent was the raphides of calcium oxalate.

Although the form of oxalic acid in the fruit of *A. obtusifolia* is not known, it seems likely that it is the metabolizable sodium oxalate and that careful selection of ripe fruits avoids the possibility of harmful affects. It is interesting that only the male of BG4, the female of BG10 and the female of the habituated agile gibbon group studied by Gittins (pers. comm.) have ever been observed to eat *A. obtusifolia*. Whether this indicates individual differences in tolerance, that other gibbons actively avoided the fruit because of some previous harmful experience, or some other explanation is unknown.

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