

SOME PRELIMINARY OBSERVATIONS OF VERVETS (*CERCOPITHECUS AETHIOPS*) FROM THE GREATHEEDS POND AREA ON ST. KITTS, W.I.

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Abstract: Preliminary observations of vervets at Greatheeds Pond on St. Kitts show at least two distinct groups using the northern and western sides of the pond for most feeding and other activity. The animals live in a mangrove forest surrounding the pond and enclosed by a dirt tract linking several areas of moderate to intense human activity. Although the level of human disturbance seems high, preliminary observations show that the animals use certain aspects of human intervention in the forest and surrounding areas to their advantage.

Résumé: Nos études préliminaire de *Cercopithecus aethiops* à Greatheeds Pond, St. Kitts, W.I. nous suggèrent qu'il y a au moins deux groupes distincts qui emploient les côtés du nord et ouest de l'étang pour la plupart de ses activités. Les animaux se logent dans un forêt de mangrove autour de l'étang et ceint par un sentier enchaînant plusieurs centres de l'activité humain. Malgré un niveau élevé de dérangement humain, nos études montrent que les animaux peuvent profiter de certains aspects de l'intervention humaine dans le forêt et environs.

Key Words: Vervets, Human, Disturbance, Feeding, Ranging.

Green monkeys (*Cercopithecus aethiops sabaesus*) are thought to have arrived on St. Christopher and several other Caribbean islands with the African slave trade in the 17th and 18th centuries. (See McGuire *et al.* 1974; Coppinger and Maguire, 1980; or Poirier, 1972 for details). An estimated 30,000 monkeys live on the island today (McGuire *et al.*, 1974; Coppinger and Maguire, 1980).

St. Kitts is a volcanic island in the Leeward Islands (Lesser Antilles) centered on 17° 15' N and 62° 40' W (Poirier, 1972) consisting of a main island and a long, narrow peninsula extending to the southeast. On the main island the volcanic slopes are heavily forested, and the forest extends down to the sea coast in ravines between cultivated fields.

The peninsula is sandy and the vegetation is dominated by bush and scrub with some xerophilic species. The main part of the peninsula is uninhabited by humans. (For a more complete discussion of the ecology of the island see McGuire *et al.*, 1974; Poirier, 1972).

We concentrated our survey on a less well-known group around Greatheeds Pond – the most northerly of a series of marshes on the (Atlantic) northeast coast is located about 5 km from the capitol city, Basseterre and about 1 km north of the village of Conaree (Figure 1). An access

road circles the pond and surrounding forest which covers approximately 12.5 hectares. Nearly all trees within the forest are mangrove. Along the periphery acacia (*Acacia farnesiana*) and clammy cherry (*Cordia obliqua*) are important as food resources. Across the access road both the sea grape (*Coccolobo uvifera*) and the sugar cane are used as food resources.

We chose Greatheeds Pond for study because monkeys are rarely hunted there and because the forest is at least 1 km from known human dwellings. There were two main objectives of this survey. First, we hoped to determine which parts of the forest were used by the monkeys and with what intensity. Second, we hoped to identify the monkey population using the forest; and determine its size and composition.

SUMMARY OF OBSERVATIONS

Most observations were made from a single emergent tree (about 10m) on the water's edge that allowed us a view of about two thirds of the pond and surrounding forest (Figure 2). Secondary observations were made from a series of blinds within the mangrove forest. Several searches of the entire forest were conducted with the help of student volunteers from the two primate research centres on the island.

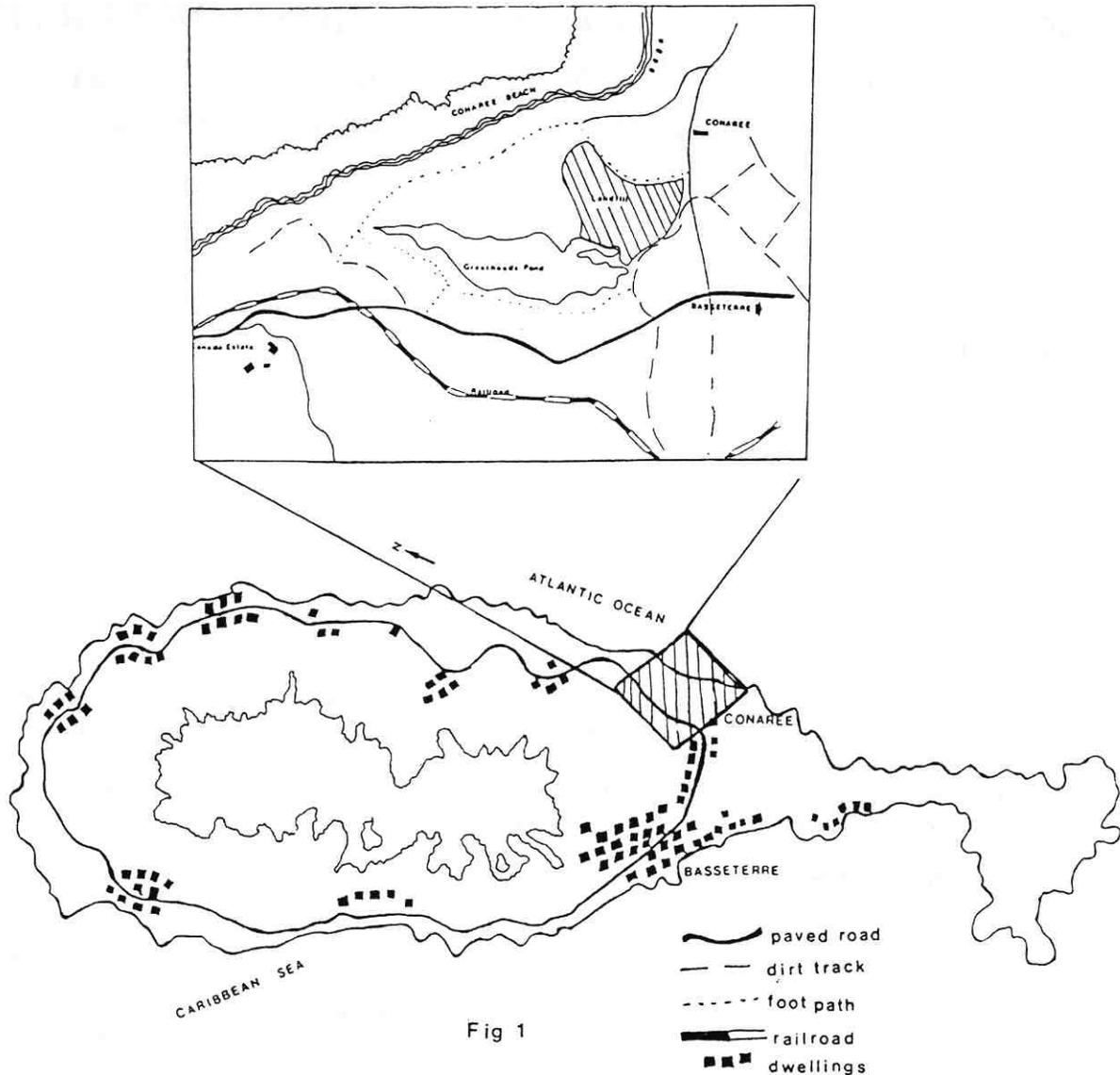


Fig 1

Fig. 1 Greatheeds Pond is located on the Atlantic side of St Kitts and is the northernmost of a series of shallow coastal ponds originating from the peninsular neck to the southeast. Details of the pond and vicinity are shown in the inset. The landfill to the southeast is a site of constant human activity. The railroad and cane fields are used seasonally by humans. The track around the pond is used daily, but predominantly in the morning and late afternoon.

Our observations on the pond site lasted from 23 June to 10 August, 1983, five or six days weekly. Direct observation of the animals' feeding area and travel routes was conducted from 0510 - 0830h and 1530 - 1845h daily. Searching various parts of the forest for traces of the animals was restricted to midday.

Monkeys became active in the predawn hours and moved into the feeding areas by 0600h and remained until 0800h. The animals generally returned to feed before 1600h. If undisturbed, they remained until 1800h. Nearly all of our contact and direct observation took place in the northwest corner of the forest (Figure 2), where the clammy cherry trees were most abundant, and there was easy access to sugar cane. We were able to observe monkeys feeding in the trees along the access road over a distance of about 100 to 150m.

The monkeys emerged from a low thicket on the northern end of the pond and crossed single-file over a series of fallen tree trunks before entering the feeding area (Figure 2). Just prior to crossing and after all the animals had entered, one individual sometimes would act as a sentry.

This crossing was the best time to observe the groups as they passed, but we later learned that an alternative route existed a little deeper in the forest (Figure 2) which was not visible from the observation post.

We made three types of sightings. Most frequently seen was a group of six monkeys. Despite the fact that the birth season was well under way, there were no infants in this group and no obviously pregnant females (although Fedigan [1982] reports that pregnancy may be hard to detect in vervets). We sexed the group by relative size and recorded its composition as one adult male, three proba-

TABLE 1
Approximate relative frequencies of sittings by area^a

		Northwest	Northern Border	Northeast	Southeast	Southwest
Direct Observation	(N)	56 ^b	12	2	0	3
	(%)	76.71	16.44	2.74	0	4.11
Traces	(N)	60	5	1	0	2
	(%)	88.24	7.35	1.47	0	2.94
Total	(N)	116	17	3	0	5
	(%)	82.27	12.06	2.13	0	3.54

^a The relative frequency of sittings in the five zones is computed as proportion of total sittings and by type. We included in the northwest zone sittings of animals moving into that zone along one of the travel routes from the rest or northern border zone. This might have distorted the relative frequencies or activity in each zone, but when compared to the proportion of indirect observations (traces) in the two zones, the difference is not significant ($p < .435$ for the northwest zone; $p < .41$ for the northern border zone.)

^b Includes observation of animals as they pass into this area from the northern border.

ble females and two juveniles.

Two adult males were consistently sighted alone or following at some distance behind the main group. These two males were observed several times at close range and identification of individuals was possible.

On two occasions we observed groups of 11 and 13 animals, respectively. It is likely that these other monkeys were not visible during most of the observations and that the actual group size is 12 or more.

FEEDING OBSERVATIONS

Most feeding occurred in a stand of clammy cherry trees along the access road on the northwest side of the pond (Figure 2 and Table 1). This road was well travelled, and the fruit trees are concentrated. Monkeys feeding in these trees fill their cheekpouches and then retreat to deeper parts of the forest to eat. We found a lot of pits, and pulp scattered on the ground and sticking to tree trunks up to 100m into the forest.

Animals used this same strategy when raiding the cane fields. They broke the stalk and then stripped out the pulp. Inside the forest dried stalks hang from the clammy cherry trees, and chewed pulp can be found on the forest floor.

We observed this activity daily except for a period of three weeks in July when no monkeys were seen in this area at all. There was also no indirect evidence of the monkeys during this time such as fresh feces, cane damage, or cane detritus in the trees. A careful search of the forest indicated that fruiting trees were not available elsewhere. This left us with two main questions. First, what other food resources may be available to these animals? Second, where are they located.

Several of the potential foods listed by McGuire *et al.* (1974) were abundant in the area. We saw many dis-

articulated crab shells. Large spiders, grasshoppers, and moths were abundant as well, and most trees showed new growth. Egg shells were found under trees in the main feeding area. The animals were not observed directly eating these foods, however, and most of the evidence for including them as dietary items comes from examining monkey feces.

All fecal samples recovered showed clammy cherry remains. Seeds are often found in the feces, but skins were always present. Some plant materials were identified, and some articles resembled insect hard parts. The frequency of the clammy cherry remains in the feces indicates that it is a favoured food. We looked for reasons why the animals might avoid this resource for such a long period of time, and considered that the pattern of the human disturbance of the forest may be an important factor.

The monkeys ranged throughout the forest. Table 1 shows the relative frequency of sightings in different parts of the forest. The fewest sightings were on the east side of the forest in the section near the landfill and in the southeastern section adjacent to it. In the northeastern section, there were two sightings. A local hunter also pointed out several traces of monkey hair on tree trunks there.

The northern border area appeared to contain the main resting and sleeping area. It was from here that the animals left to enter the feeding area and it was to this area that they returned after both morning and afternoon feeding. It was also the area where sentries were most often seen for up to two hours after the monkeys had entered it from other sectors.

In the northwestern sector we observed feeding in the trees and in the cane, travelling to and from the resting area, and some sentry behaviour. It was the only place where a whole group was observed feeding.

On three occasions several animals were observed feed-

ing on clammy cherry in the southwestern section. Dried fecal samples indicated that this part of the forest had been used before as well. How the monkeys travelled to this section was not clear, since there is a break in the forest cover both between the northwest and southwest and between the southwest and the southeast sectors.

HUMAN DISTURBANCE

Humans disturbed the forest in several ways. In the early morning and mid-late afternoon several groups of people would travel the road along the forest to the landfill. When they passed the feeding areas the monkeys would always flee into the forest. Morning and afternoon disturbances coinciding with the monkeys' feeding times also occurred as farmers came to tether or relocate their livestock grazing at the edges of the cane fields. These disturbances were temporary, and the monkeys often returned within an hour to the feeding site.

Humans accounted for the two persistent disturbances that we think may have been important determinants of forest utilisation. One local craftsman used the mangrove as a source for reeds for making baskets. On the occasions when he was there, he chose the relatively accessible western side of the forest, choosing and cutting materials over several days.

A second human lived on the forest's edge along the beach road to the north. He earned his livelihood from selling charcoal made from the trees in the forest, disturbing the forest in two ways. First, he cut down trees both to use as fuel and to clear trails into the forest. Later he would cover the logs with sand and burn them for several days to produce charcoal.

The charcoal maker and the basket weaver both began a round of activity in the same week – the first week that the monkeys disappeared (about 4 weeks after our observation began). It was a full week after the burning ended that the animals returned to the northwestern sector to feed, but the charcoal maker had a more lasting effect on the monkey group. The parts of the forest he cleared altered the routes available to them for travelling between sectors. Much of the northern border sector had been cleared so that there were narrow "highways" of vegetation over 10m high. The rest was under 3m.

It was along these highways that we made all the observations from blinds in the forest and most other sightings; and it was here that we found all our indirect evidence – fecal samples and dropped food – in the northern border area.

DISCUSSION

McGuire *et al.* (1974) describe the various types of human disturbances and their effects on the groups they were observing. Direct disturbance occurs when humans or their livestock come into contact with the monkeys, indirect disturbance occurs when activities outside of the areas used by monkeys affect the group.

Previous studies have reported that primate groups are sensitive to human activity in the forest, but they have

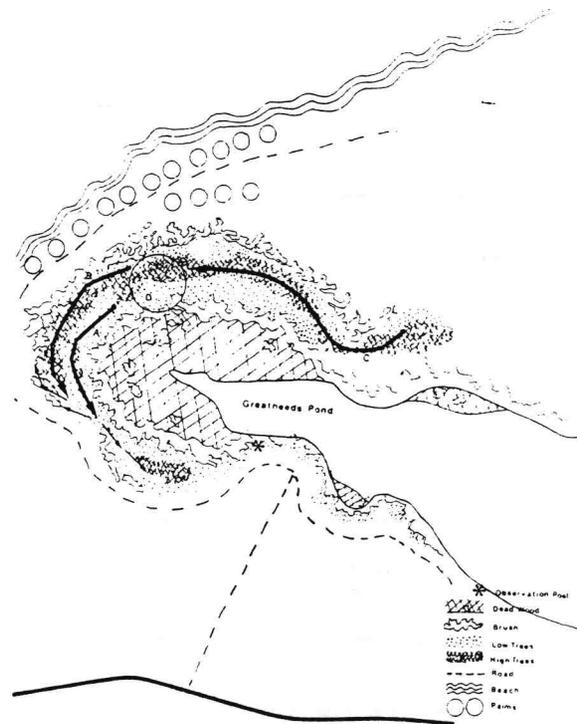


Fig. 2 The main contact area for this study was along the northern edge of the pond. From our observation post at the southern end of a cove, we could see the main travel routes used by vervets. A and B are the two routes usually taken to travel to the main feeding area in the northwest of the pond. Animals were observed directly using route A, while fecal and food remains identified route B. Route C was used by the satellite group on two occasions as they returned to the rest area (D). The animals usually traveled along the edge of tall trees to and from the rest area.

focused primarily on the effects of habitat destruction (Heltne *et al.*, 1970; Kano, 1982; Jones and Sabater Pi, 1971) or hunting of the primates by humans (Whitten and Whitten, 1982; Freese *et al.*, 1982; Jones and Sabater Pi, 1971). Our observations on Greatheeds Pond indicate that indirect effects of human activity patterns in the forest and surrounding fields may be more important.

The indirect effects of human disturbance are a new focus in primate ecology and conservation. Changes in forest utilisation due to human economic and subsistence activity are observed by Jones and Sabater Pi (1971) for lowland gorillas and common chimpanzees. Handler (personal communication) has reported similar changes in forest use patterns among pygmy chimpanzees in Zaire under pressure from logging industry. Human agricultural and forest management activity has been implicated also in altered patterns of habitat utilisation among pygmy marmosets (Soini, 1981), several species of New World monkeys in Venezuela (Rudran and Eisenberg, 1982), and vervets, Nilgiri langurs, and crab-eating macaques (Poirier, 1976).

Bishop *et al.* (1981) have proposed a four-point ordinal scale for estimating habitat disturbance. This scale measures four types of habitat disturbance. Disturbance to the habitat is a measure of direct human use of forest resources; disturbance to the animals measures the degree to which humans attempt actively to displace monkeys from these resources. The habituation scale records how accustomed the monkeys are to a human presence and the predation scale measures whether predators are naturally occurring prey species, domestic animals, or absent. A low score (1) indicates the least disturbance to the presumed "natural" habitat.

The Greatheeds Pond area is surrounded by land modified by human activity. Land on three sides of the pond is under continuous use for sugar cane cultivation and as a landfill. The northern border and northeast areas are used occasionally by humans, although at least one human makes his home in the northern border area. On the scale proposed by Bishop *et al.* (1981) the habitat disturbance is rated 2.5 (Table 2).

TABLE 2

Ordinal evaluation of human disturbances to monkey populations in the Greatheeds Pond area. Rankings follow Bishop *et al.* (1981). Details in text.

Disturbance to habitat	2.5
Disturbance to animals	2
Habituation to humans	1.5
Presence of predators	4
Total disturbance	10/16

Animals are rarely harrassed by humans, except when seen in the cane fields. This would rate 2 on the animal disturbance scale. The monkeys are totally unhabituated, fleeing whenever humans approach, but returning within a short time (1.5 on habituation scale). Finally, there is a complete absence of predators in the Greatheeds Pond area (4 on the predator scale).

As Bishop *et al.* (1981) suggest, this ordinal scale may be useful for comparing the relative disturbance in different areas, but one cannot interpret the scores as any sort of definitive description of habitat disturbance. This method is proposed as an interim approach to be supplemented with further research into the problem. According to the scale, the Greatheeds Pond area is significantly disturbed, despite the absence of direct human predation. There are both short-term effects due to the presence of humans and their livestock in the forest and long-term effects due to forest destruction and regeneration. We were unable to predict the location of the monkey groups on the basis of food resources alone. They change their utilisation patterns based on the effects of human disturbance in two ways.

First, they disappeared from the areas where favoured food resources were abundant. Second, the monkeys began travelling before sun-up to the feeding areas. Chapman (personal communication) has also found that the

vervets from the peninsula moved to and from sleeping sites under the cover of twilight whenever pressure from humans was felt.

In the future we hope to be able to carry out long-term studies at Greatheeds, on alterations in foraging behaviours and travel routes caused by various human activities and the rate of recovery from these disturbances.

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