**Mating by Nontroop Males among the Japanese Macaques of Yakushima Island**

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**Key Words**

Nontroop male
Mating strategy
Male influx
Mating seasonality
Dominance
Japanese macaque
Macaca fuscata yakui
Yakushima

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**Introduction**

The mating strategy of male cercopithecine monkeys has been described as a form of female defense polygyny [1]. Such characterizations of male mating strategy generally assume that males mate within a troop of which they are members. This assumption is important for many theories concerned with the role of dominance in mating or with the number of males living in a troop. For example, the resident male of a one-male troop is expected to maintain exclusive access to the females of a troop [1], while in multimale groups the subordinate males are expected to live in the group only if the dominant males cannot exclude them from mating [1,2]. However, many researchers have reported influxes of nontroop males during the mating season for Old World monkey species with both one-male and multimale group structures (Macaca fuscata [3], M. mulatta [4], Presbytis entellus [5], Cercopithecus mitis stuhlmanni [6], C. mitis albogularis [7], C. ascanius [8], Erythrocebus patas [9]). Many of these intruding males copulate successfully. These observations call into question current assumptions about the relationship between mating success and male troop membership.

Yamagiwa [3] has reported that nontroop males often succeeded in mating among the Japanese macaques (Macaca fuscata yakui) of Yakushima Island. This paper reports further research on mating by nontroop males in the Yakushima study site, showing that nontroop males accounted for a large proportion of the mating in this population.

**Field Site and Methods**

The study site is located on the northwestern coast of Yakushima Island within the Kirishima-Yaku National Park, Kagoshima Prefecture, Japan. The study troops live in continuous, largely undisturbed forest and are surrounded by many other troops. At the time this study began in 1984, three troops had been habit-

Mating by Nontroop Males

157
uated without provisioning [10]. One troop fissioned during the study. Yaku macaques live in multimale troops; the study troops included an average of 6.8 sexually mature male and 7.3 sexually mature female monkeys during the study period [11].

At this field site, the mating season is from late September to early January, with a peak in mating activity in October. The data consist of the number of completed mounting series, with ejaculation, observed in the 1984, 1985 and 1986 mating seasons. The data were collected by 6 observers and include matings noted during both focal animal follows and ad libitum observations.

Nontroop males were defined as those males first observed interacting with the monkeys of a study troop after the start of the mating season.

**Results**

Many nontroop males were observed interacting with the study troops during the mating season. Nontroop males included animals from outside the study area as well as members of one study troop that interacted with another study troop. Although a few nontroop males subsequently remained with the troop concerned, most left the troop by the end of the mating season. Counting the number of nontroop males was difficult because of the possibility of misidentification or double counts. The average number of nontroop males was 10.6 per troop per season according to a conservative estimate based on only well-identified males that were observed on at least 2 days.

Nontroop males accounted for 41% of all observed copulations (table 1), mostly in isolated consortships. Such consortships started with displays by a nontroop male near a troop. The male sometimes just sat quietly within sight of a troop or performed a tree-shaking display with loud barking. A female responded to these displays by leaving the troop and joining the nontroop male. Troop males, individually or cooperatively, sometimes chased the female or attempted to attack the visitor, but herding the females or driving away a visitor seemed to be difficult, and the troop males often failed to prevent mating by nontroop males.

**Discussion**

Mating by nontroop males has been reported in many early studies on Japanese macaques [12]. Even in the provisioned and relatively isolated Arashiyama troop, Wolfe [13] reported that 30% of the females traveled out of the troop to mate with nontroop males. Furthermore, mating by nontroop males has been reported for a wide range of Old World monkey species (cited above), including the case of a troop of blue monkeys (C. mitis) in which all of the mating was carried out by nontroop males and none by the resident male [5]. These data show that the pool of potential mating partners, even in a single mating season, is much larger than the membership of any one troop for both males and females [14].

The Japanese macaque and the species in the studies cited above have mating seasons, or at least a pronounced annual mating peak.

**Table 1.** Copulations by nontroop males

<table>
<thead>
<tr>
<th>Male types</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Troop Nontroop</td>
<td>266</td>
<td>59</td>
</tr>
<tr>
<td>Total</td>
<td>186</td>
<td>41</td>
</tr>
</tbody>
</table>
n = Number of completed mounting series with ejaculation.

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