Recently, many bird populations are declining due to changes in farming practices or abandonment of farmland across the world (Fujioka & Yoshida 2001; Wretenberg et al. 2006). In Japan, more than half of agricultural land is flooded fields for rice cultivation (MAFF 2010). Almost half the area of flooded paddy fields has been lost since 1967 (MAFF 2010), and the remaining flooded paddy fields have been changed drastically by modernization of farming practices including the use of cement in irrigation waterways. Traditional farmland called “Satoyama” is a mosaic landscape composed of paddy field, woodland, grassland, and streams. We studied the foraging behavior of five buzzard pairs in Satoyama of Tochigi Prefecture, central Japan, for two years. Seasonal changes in foraging sites and differences in the amount of prey captured at each foraging site were analyzed by Bayesian inference using a Markov Chain Monte Carlo (MCMC) algorithm. The main vegetation types which characterized the foraging areas of the buzzards varied over the course of the breeding season from paddy fields to levees and grass-arable fields, and eventually to wooded areas. Along with this shift, the main prey of the buzzards changed from frogs to insects. In paddy fields, frogs and small mammals were frequently captured. A variety of prey including frogs, small mammals, lizards, snakes, and insects were taken at levees and grass-arable fields. Insects and frogs were captured in woodland areas. Since the buzzards utilized almost all vegetation types found in Satoyama when foraging, spatial distribution of these foraging sites and the prey biomass therein need to be considered when planning the conservation of breeding habitat for this species.

**Key words** Foraging ecology, Grey-faced Buzzard, Raptor conservation, Satoyama

**Abstract** The Grey-faced Buzzard (*Butastur indicus*) is a migratory raptor breeding in Japan. It has a high breeding density in what is known as “Satoyama”, a traditional mosaic landscape of paddy fields, woodland, grassland, and streams. We studied the foraging behavior of five buzzard pairs in Satoyama of Tochigi Prefecture, central Japan, for two years. Seasonal changes in foraging sites and differences in the amount of prey captured at each foraging site were analyzed by Bayesian inference using a Markov Chain Monte Carlo (MCMC) algorithm. The main vegetation types which characterized the foraging areas of the buzzards varied over the course of the breeding season from paddy fields to levees and grass-arable fields, and eventually to wooded areas. Along with this shift, the main prey of the buzzards changed from frogs to insects. In paddy fields, frogs and small mammals were frequently captured. A variety of prey including frogs, small mammals, lizards, snakes, and insects were taken at levees and grass-arable fields. Insects and frogs were captured in woodland areas. Since the buzzards utilized almost all vegetation types found in Satoyama when foraging, spatial distribution of these foraging sites and the prey biomass therein need to be considered when planning the conservation of breeding habitat for this species.

**Keywords** Foraging ecology, Grey-faced Buzzard, Raptor conservation, Satoyama
Hirano 2001; Ueta et al. 2006a). As a result, the Grey-faced Buzzard is included on the Red List of threatened species, as vulnerable, by the Ministry of the Environment, Japan (MOE 2006).

Recent studies suggest that the buzzards prefer to breed in areas with paddy fields connected with woodland in Satoyama (Azuma et al. 1999; Momose et al. 2005). While paddy fields and woodland both offer foraging sites, woodland also provides nesting sites for the buzzards. Kojima (1999) showed that buzzard nests were frequently observed in coniferous trees in upland areas located near paddies and streams. Both paddy and woodland areas in Satoyama might be important as foraging sites for the buzzards in order to obtain enough prey resources for breeding (Azuma et al. 1998; Momose et al. 2005; Katoh et al. 2009).

Deterioration of the Satoyama habitat might be one of the reasons for the decline in the breeding density of Grey-faced Buzzards (Ueta et al. 2006a). Generally for breeding raptors, either foraging or nesting-sites can limit the population size supported in a particular area (Newton 1979). In Satoyama where both paddy and woodland are present, nesting sites are not limited; therefore, availability of suitable foraging sites might be the limiting factor for these buzzard populations (Ueta et al. 2006b).

Although the importance of Satoyama habitat is well recognized, little is known about the foraging ecology of the buzzards breeding there. Several studies suggested that there may be a temporal shift in prey capture sites from paddy areas to woodland areas (Azuma et al. 1998; Katoh et al. 2009). However, in previous studies, observations of prey attack and prey species identification were conducted using relatively few individuals or over only a short period during the breeding season (Azuma et al. 1998; Momose et al. 2005; Kadowaki et al. 2007). More systematic observations and statistical analyses are therefore necessary to derive more concrete conclusions. It is also important for the conservation of this species to elucidate environmental factors influencing the buzzards’ foraging activities.

The objectives of this study were to examine (1) whether the vegetation type at points where buzzards attacked prey changes over time, (2) whether the amount of prey differs between vegetation types at these attack points during the two breeding seasons. We analyzed the seasonal change in vegetation type at points where prey was attacked, as well as the difference in the number of captured prey items in different vegetation types by Bayesian inference using a Markov Chain Monte Carlo (MCMC) algorithm. In addition, we will report the perching sites that the buzzards used to search for prey, and comprehensively examine the foraging ecology of the buzzards with regard to perch type, vegetation type at attack points, and the types of prey captured.

**MATERIALS AND METHODS**

1) **Study area**

Field observations were conducted in the town of Ichikai (36°32′N,140°05′E), Tochigi prefecture, central Japan, a typical Satoyama with a high breeding density of Grey-faced Buzzards (Momose et al. 2005). In this area, the buzzards start breeding in April, soon after returning from their wintering areas. Egg incubation is from late April to May. Once the eggs are hatched, the buzzards feed nestlings from late May to June. Nestlings start to fledge around late June (Azuma et al. 1998; Sakai 2010), however, the adults continue feeding their fledglings for several weeks until July (Sakai 2010).

In the study area, paddy fields are located at the bottom of a valley. Secondary forest and planted conifers are present on the hilly side of the valley. Residential areas, upland fields, pear orchards and grassy areas are scattered between paddy and woodland. Paddy fields are mostly flooded from late April to August. Rice seedlings are transplanted in early May, and the plants are harvested around September. Each paddy field is surrounded by narrow levee (about 0.4–1.0 m in width). Grass on the levee is mowed several times in a year (Itoh & Katoh 2007). Narrow irrigation waterways (0.3–0.6 m in width) run alongside paddy fields. Secondary forest is composed of mostly deciduous broad-leaf trees dominated by Oak (*Quercus serrata*) and some coniferous trees such as Japanese Red Pine (*Pinus densiflora*). Coniferous planted woodland is mainly composed of Japanese Cedar (*Cryptomeria japonica*) and Hinoki Cypress (*Chamaeciparis obtusa*). In the study area, the territories of five breeding pairs were juxtaposed from south to north along Satoyama habitat, with long paddy fields and associated woodlands. We chose this site since it was easy to observe buzzard foraging over both paddy and woodland areas at this location.

2) **Field observations**

Foraging activities of the buzzards were observed from a car using a telescope and binoculars on sunny
Foraging ecology of Grey-faced buzzard

Table 1. Types of data collected for this study. Observation data were categorized before use in Bayesian modeling.

<table>
<thead>
<tr>
<th>Data type</th>
<th>Data recorded</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pair ID (Territory ID)</td>
<td>A, B, C, D, E</td>
</tr>
<tr>
<td>Perch type used to search for prey</td>
<td>“deciduous tree”, “utility pole”, “conifer tree”, “others”</td>
</tr>
<tr>
<td>Vegetation type at an attack point</td>
<td>“paddy field”, “levee”, “grass-arable field”, “woods area”, “other or unclear”</td>
</tr>
<tr>
<td>Prey type captured</td>
<td>“frog”, “small mammal”, “snake”, “lizard”, “insect”, “other or unclear”</td>
</tr>
<tr>
<td>Day</td>
<td>Number of days after April 1st</td>
</tr>
<tr>
<td>Year</td>
<td>2001, 2002</td>
</tr>
</tbody>
</table>

a “Grass-arable field” category include grass area and arable field, both of which are dry upland environments with vegetation. “Woods area” include woods, canopy, and the edge area.

and cloudy days during the daytime (0500–1900) during the breeding seasons (from April to July) in 2001 and 2002. The total observation time was 469 hours (116 days).

Each time the buzzards were observed to attempt an attack, we recorded the ID of the buzzard pair, perch type used to search for prey, vegetation type at the attack point, and the prey type captured (Table 1). For both years the date was recorded as the number of days after April 1st. Although it may be preferable to observe activities of individual birds rather than those of the pairs, it is sometimes difficult to distinguish individuals by observation, particularly if only the dorsal plumage is seen, or if they are observed from a distantly parked car. Thus the data was recorded for each pair as a unit. Differences in foraging behavior of different pairs may also reflect the landscape properties of their territory.

3) Statistical analysis

We constructed Bayesian models working with the Markov Chain Monte Carlo (MCMC) algorithm to analyze seasonal changes in vegetation type at attack points, and the types of preys captured by the buzzards for each habitat. Using a Bayesian model, we can flexibly include random effects such as variation among individuals and observation year. The MCMC also allows us to estimate multiple parameters simultaneously. Moreover, Bayesian models can explicitly deal with complicated ecological processes (Clark 2007). These features are quite useful and important in ecological studies, which have to consider several ecological processes as well as to deal with various confounding factors.

First, we examined whether the buzzards show seasonal changes in their foraging habitats. We assumed that the predicted proportion of the five vegetation types (paddy fields, levee, grass-arable field, woodland, and other or unclear) where prey were attacked followed the categorical distribution,

\[ p_h (i = 1, 2, \ldots, 5), \sum_{i=1}^{5} p_h = 1. \]

Each \( p_h \) was determined by the following statistical model,

\[
\begin{align*}
    p_h &= \frac{1}{1 - \exp(b_1 + b_2 \cdot x + r_p + r_y)} \\
    p_h &= \frac{1 - p_h}{1 - \exp(b_1 + b_2 \cdot x + r_p + r_y)} \\
    p_h &= \frac{1 - (p_h + p_h)}{1 - \exp(b_1 + b_2 \cdot x + r_p + r_y)} \\
    p_h &= \frac{1 - (p_h + p_h + p_h)}{1 - \exp(b_1 + b_2 \cdot x + r_p + r_y)} \\
    p_h &= 1 - (p_h + p_h + p_h + p_h),
\end{align*}
\]

where \( b_1 \) and \( b_2 \) are fixed parameters to be estimated, \( r_p \) and \( r_y \) are random effects representing variation among breeding pairs and years, and \( x \) was the number of days from April 1st, respectively.

The predicted proportion \( p_m \) of the six prey items (frog, small mammal, snake, lizard, insect, and other or unclear) were also assumed to follow the categorical distribution, and each \( p_m (i = 1, 2, \ldots, 6) \) was determined by the following statistical model,

\[
\begin{align*}
    p_m &= \frac{1}{1 - \exp(b_3 \cdot h + r_m)} \\
    p_m &= \frac{1 - p_m}{1 - \exp(b_3 \cdot h + r_m)} \\
    p_m &= \frac{1 - (p_m + p_m)}{1 - \exp(b_3 \cdot h + r_m)} \\
    p_m &= 1 - (p_m + p_m + p_m),
\end{align*}
\]
\begin{equation}
p_{m_i} = \frac{1 - (p_{m_1} + p_{m_2} + p_{m_3})}{1 - \exp(b_1 \cdot h + r_h)}
\end{equation}
\begin{equation}
p_{m_2} = \frac{1 - (p_{m_1} + p_{m_2} + p_{m_3} + p_{m_4})}{1 - \exp(b_2 \cdot h + r_h)}
\end{equation}
\begin{equation}
p_{m_3} = 1 - \left( p_{m_1} + p_{m_2} + p_{m_3} + p_{m_4} + p_{m_5} \right),
\end{equation}

where $b_1$ is a fixed parameter to be estimated, $h$ is the vegetation type at the attack point, and $r_h$ was a random effect for variation among breeding pairs in the vegetation type at the attack point $h$. We did not consider the effect of observation year in this model, because we found that the variation was extremely small and was negligible, when random effects were added to the model.

All parameters, including random effects, were estimated using the MCMC algorithm. We used a normal distribution $N(\mu = 0, \sigma = 10)$ as the nearly non-informative prior distribution for the fixed effects. The random effects were assumed to follow a normal distribution $N(0, 1/\tau)$, and $\tau$ was assumed to follow the prior Gamma distribution $G(0.1, 0.1)$. We fitted the models using 45,000 MCMC iterations with a 20,000-iteration burn-in. The 25,000 iterations used were thinned out by using only every fifth iteration to reduce autocorrelation between the adjacent samples. The median and 95% credible interval for each parameter was estimated from the posterior distribution. We determined iteration and burn-in lengths by checking the MCMC trajectory, and also verified that R-hat values ranged between 1.00 and 1.01, which indicated convergence (Gelman et al. 2004). We used three chains to confirm that estimated values were independent of initial parameters. All analyses were made using R 2.10.1 (R Development Core Team 2009) and WinBUGS 1.4.3 (Lunn et al. 2000).

From the estimated parameters above, seasonal shifts in the predicted probability were calculated for each of the vegetation types at the attack points over the course of the breeding season. Predicted probabilities of prey types captured within each vegetation type were also calculated by using estimated parameters.

4) The relationships between perch site, attack point, and prey

Foraging activity of the buzzards was analyzed by linking the perch type, the vegetation type at the attack point, and the type of prey captured (if any) for each mounted attack. The breeding seasons were divided into three parts based on the results of seasonal shift in attack points: early (0–35 days after April 1st), middle (36–75 days after April 1st), and late (76–120 days after April 1st) breeding seasons. The relationships between perch site, attack point, and prey were summed and visualized in a chart for each of the breeding seasons.

**RESULTS**

1) Foraging behavior of Grey-faced Buzzards
A total of 581 attacks and 157 prey capture events were recorded for the five buzzard pairs over the two years. The buzzards always attacked from perches. When the buzzards attacked in paddy fields, levees, and sometimes grass fields, they caught their prey on the ground using their talons. When they attacked in the canopy and sometimes in grass or arable fields, they usually flew over and grabbed their prey without landing.

2) Seasonal shifts in the vegetation types at attacked points
Seasonal shifts in attack probability for each of the vegetation types were clearly shown using the Bayesian models, which predicted the probability of attack within the vegetation types (Fig. 1). For example, paddy fields were most frequently used in April, and their use decreased thereafter. The use of levees

![Fig. 1](image-url)
Foraging ecology of Grey-faced buzzard

peaked around mid-May to June (40 to 60 days from April 1st), and grass-arable fields were mainly used in late June (around 80 days from April 1st). The use of woods increased drastically from late May (around 50 days from April 1st). Vegetation types in the category ‘other or unclear’ were minor throughout the breeding seasons.

3) Prey captured in each vegetation type

Parameters estimated by the Bayesian model also indicated that, within each vegetation type, some kinds of prey were more frequently captured than the others (Fig. 2). Except for prey which fell into the ‘unclear’ category, frogs were the most frequently captured prey in paddy fields, followed by mammal species (Fig. 2A). Levees and grass-arable fields had similar predicted probabilities of prey type captured. In both environments, frogs, insects, small mammals, lizards, and snakes were captured; however, the predicted probability of capture of frogs was higher in

![Fig. 2. Predicted probability of each prey type captured in A) paddy field, B) levee, C) grass-arable field, D) woodland, and E) other or unclear vegetations. The medians (open circles)±95% confidence intervals are shown.](image-url)
levees than in grass-arable fields while that of insects was higher in grass-arable fields than in levees. (Figs. 2B and 2C). In contrast to the other attack points, insects were the more frequently captured than frogs in woodland areas (Fig. 2D).

From the field observations, a variety of frogs such as Japanese Red Frog (*Rana japonica*), Tokyo Daruma Pond Frog (*Rana porosa porosa*), Japanese Tree Frog (*Hyla japonica*), and Schlegel’s Green Tree Frog (*Rhacophorus schlegelii*) were captured in paddy fields, levees, and grass-arable fields. In the woodland canopy, Japanese Tree Frog and Schlegel’s Green Tree Frog were captured.

Insects captured in levees and grass fields were Orthoptera, and insects captured in the canopy included Orthoptera and larvae of Coleoptera (e.g. *Antheraea yamamai*). Mammals captured in paddy, levee, grass-arable environments were generally mice and moles. Snakes captured were mostly Tiger Keelback (*Rhabdophis tigrinus*), and lizards captured were Japanese Grass Lizard (*Takydromus tachydromoides*) and Japanese Five-lined Skink (*Plestiodon japonicus*).

**4) The relationships between perch site, attack point, and prey**

Figure 3 shows the relationship between perch type, vegetation type at the attack point, and the prey captured. Breeding seasons were divided into three parts based on the results shown in Fig. 1, to clearly show the shift in the use of perch sites, attack points, and prey.

Utility poles and wires were the most frequently used perches during the entire study period. The buzzards mounted attacks in most of the vegetation types from utility poles and wires. Deciduous trees were used as perch sites for attacking in paddy fields and levees. Coniferous trees were used mainly when hunting in woodland. As the season progressed, the attack points shifted gradually from paddy fields to levees and grass-arable fields, and finally to woodland (Fig. 3). Along with this shift in attack points, the prey captured also changed from frogs to insects.

**DISCUSSION**

The present study clearly showed temporal shifts in vegetation types at prey attack points and in the types of prey captured by Grey-faced Buzzards. The buzzards used various environments in Satoyama for foraging. The attack points of the buzzards gradually shifted from paddy fields in the early season to grass-arable fields and levees in the middle season, and then to woodland in the late season. The captured prey also changed from insects in the early season to frogs in the middle season, and finally to insects in the late season.

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**Fig. 3.** The relationships between perch sites, attack points, and prey. The breeding seasons were divided into three parts: early (0–35 days after April 1st), middle (36–75 days after April 1st), and late (76–120 days after April 1st) breeding seasons. For each attack and attack trial, perch type used to search for prey, vegetation type at the attack point, and the captured prey type were observed and linked using lines. The thick solid lines, thin solid lines, and broken lines represent ten, two, and one observation(s), respectively.
shifted from paddy fields (flooded areas) to woodland (dry areas) over the course of the breeding season. Along with this change, prey type also shifted from frogs to insects.

Shifts in attack sites and prey types of the buzzards were previously pointed out by Azuma et al. (Azuma et al. 1998; Azuma 2003), who showed that the attack point of the buzzard changed from paddy area to woodland during the last half of the breeding season. Our study strongly supported their findings by statistically analyzing the observation data of the five buzzard pairs throughout their breeding seasons for two years. As we observed in this Satoyama habitat, a temporal shift in attack points was also reported in constructed wetland areas (Hirano et al. 2004). In addition, study of the stomach contents of the buzzards also suggested temporal shifts in the prey captured. A mole was observed in the stomach of the dead buzzards collected in April (Ishizawa & Chiba 1967), whereas insects and insect larva were found in the samples collected in June to September (Ishizawa & Chiba 1967; Hayashi et al. 1996). These results suggested that these temporal shifts in foraging site and prey were common in various habitats of this buzzard species.

Seasonal shifts in vegetation types used for prey attack and captured prey types might be attributed, in part, to the availability of prey. Prey availability for raptors that use perch hunting techniques is affected mainly by the availability of perching sites, and the biomass and visibility of prey (Bechard 1982; Widen 1994). Vegetation cover influences visibility of prey (Andersson et al. 2009), thereby strongly affecting foraging activity of the buzzards, especially when hunting ground-dwelling animals. Extensive vegetation cover impacts on the prey-detection rate of the buzzards. When the vegetation cover is low and prey biomass is large, there is a high level of prey availability.

Prey availability for the buzzards in Satoyama may vary both spatially and temporally. Since perch availability was roughly constant throughout the breeding seasons, the temporal change in prey availability was most likely influenced by seasonal changes in prey biomass and vegetation cover.

In the early breeding season, frog biomass is likely to be large in paddy fields, since frogs move to wet areas to lay their eggs (Hasegawa 1998). Paddy fields in early April are usually not flooded, and there is almost no vegetation cover after turning over the soil. After flooding and rice transplantation, vegetation cover in paddy fields increases. The water in fully flooded paddy fields might also disrupt the accessibility of prey for the buzzards. Some frogs (e.g. Tokyo Daruma Pond Frog and tree dwelling frogs) stay around paddy areas while and after laying their eggs (Hasegawa 1998); therefore, frog biomass in the paddy fields and leves might also be large in May. Leves and some of the grass-arable fields are mown several times by farmers, keeping vegetation cover at a relatively low height. In these areas, the buzzards should easily be able to find and access ground-dwelling species in the middle of the breeding season.

Late in the breeding season (June to July), the main habitats of some frogs shifts from paddy fields to the ground or leaves in grassland or woodland areas (Hasegawa 1998). Consequently, the biomass of frogs decreases around paddy fields. During the same period, biomass of insects, such as Orthoptera and larva of Coleoptera in grassland and woodland also increases (Fujioka & Lane 1997; Sakai unpublished data).

The buzzards most frequently used utility poles during the breeding season to search for prey. Prey visibility from the perching sites is important for the foraging predators (Andersson et al. 2009). In general, raptors using perches when searching for prey can attack further as they can see further from a higher perch (c.f. see Sonerud 1992). Utility poles and lines are abundant in the study area. Since utility poles are tall (about 8–13 m in height) and many of them are located between paddy fields and woodland areas, the buzzards can view prey in paddy, levee, grass areas, and woodland from top of the poles. In some environments, other perching sites are also utilized. Broad-leaf trees at woodland edge make suitable perching sites for attacking prey in paddy, levees, and grass-arable fields. Coniferous trees are taller than the surrounding deciduous trees and can be also used as the perching sites when hunting in the canopy of deciduous trees. In landscapes with a low density of utility poles, deciduous trees at woodland edge and the tops of coniferous trees may be frequently used by the buzzards.

Satoyama habitat can offer various foraging sites for the buzzards throughout their breeding season. This might be one reason for the high breeding density in Satoyama. For example, Azuma et al. (1999) and Matsuura et al. (2005) reported that the breeding density of Grey-faced Buzzards was high in Satoyama with narrow paddy fields and surrounded woodland. Momose et al. (2005) also showed that the breeding
density of the buzzards in and around Ichikai-town was positively correlated with the boundary length between paddies and woodland areas. A long boundary between paddy fields and woods indicates a complicated landscape composed of paddy fields and woodland (c.f. see Katoh et al. 2009). In such landscape, paddy and woodland are usually both present in a buzzard’s breeding territory. Levees and grassy areas are also abundant between paddy fields and woods in these landscapes.

Satoyama with paddy fields and woodland makes good foraging habitat for Grey-faced Buzzards for the following three reasons. Firstly, Satoyama with farm management which includes mowing provide a variety of foraging sites for the buzzards in their breeding territory. In such a landscape, the buzzards can capture their prey efficiently. Secondly, high prey biomass is supported by high environmental heterogeneity and connectivity between paddy and woodland in traditional Satoyama landscape. Frogs are important prey for the buzzards throughout their breeding season. The majority of frog species in Satoyama need both wetland (e.g. paddy) and upland (e.g. woodland) environments to complete their life cycles (Hasegawa 1995); therefore, it is necessary for both these environments to be present and in close proximity to maintain this frog biomass. Satoyama is also known to maintain a high diversity of insects (Kato 2001). Thirdly, a variety of perch sites are present in Satoyama so the buzzards are able to select different perch sites depending on their prey.

In order to conserve the foraging sites of Grey-faced Buzzards and to conserve the birds themselves, it is important to manage the temporal and spatial variability of the prey in Satoyama. Frogs were the most frequently captured prey throughout the breeding season, and insects were another important prey type in the later breeding season. Although small mammals and snakes were not as frequently captured as frogs and insects, their individual biomass is much larger than that of most frog and insect species, and these animals are also important prey for the buzzards. Since some of the prey items captured could not be identified in the present study, further studies are needed to elucidate the spatial and temporal distribution of prey biomass and how this biomass is maintained. In this study, many of the prey items captured by the buzzards could not be identified based on the field observation. Video recording at the buzzard nests and identification of the prey items carried by the buzzard pairs might overcome this problem.

In conclusion, the present study showed that various environments were used by the Grey-faced Buzzards to capture their prey in Satoyama. It is likely that the buzzards changed their foraging sites during their breeding season in response to changes in prey biomass. The results of this study are useful not only in understanding the foraging ecology of the buzzards, but also in suggesting a strategy that can be used to conserve their foraging habitats. Since the buzzards use various foraging sites within their territory, spatial distribution of these foraging habitats is important.

Further studies are needed to elucidate spatial and temporal distribution of prey biomass and how this biomass is maintained. In this study, many of the prey items captured by the buzzards could not be identified based on the field observation. Video recording at the buzzard nests and identification of the prey items carried by the buzzard pairs might overcome this problem.

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Foraging ecology of Grey-faced buzzard

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