

# The Behavioural Ecology of Blakiston's Fish Owl *Ketupa blakistoni* in Japan: Calling Behaviour

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## ABSTRACT

Blakiston's Fish Owl, once more widespread in Hokkaido, Japan, is now a rare resident, with a population of only 80-100 birds. It is threatened by disturbance to its riparian habitat and particularly by loss of large trees with cavities suitable for nesting in. Studies of the behaviour and ecology of this species are being conducted in Hokkaido to learn more about its life history. A brief description of its ecology and a detailed description of its vocalizations are given here. A wide range of hitherto undocumented calls have been recorded, the most interesting of these being calls used during courtship feeding and during mating. Calling behaviour is seasonally variable with a peak in activity just before and during the breeding season. Calling is curtailed by windy weather, but not affected by low temperatures or snow falls.

## INTRODUCTION

Blakiston's Fish Owl (*Ketupa blakistoni*) has a very restricted range in the Far East (see Fig. 1). It is known to occur only in China, in the extreme north-east (Heilungkian Province, as far west as the Great Kingan Mountains), in the Soviet Union, in the Soviet Far East, Sakhalin and the southern Kurile Islands, and in Japan only in Hokkaido (OSJ 1974; De Schauensee 1984; Flint *et al.* 1984). In the 1880s the species occurred widely in Hokkaido including the west (Hanawa 1981), but over the last 100 years its range has shrunk dramatically leaving the remnant population rare, endangered and very disjointly distributed (Brazil & Yamamoto this volume) (see Fig. 1). It is now the rarest of Japan's breeding owls. The subspecies occurring in Hokkaido, and also in the southern Kurile Islands and Sakhalin is *K. b. blakistoni*, while that on the continental mainland is *K. b. doerriesi* (OSJ 1974; Fujimaki 1974; Hanawa 1981).

*K. blakistoni* inhabit extensive mixed forests along rivers in inland Hokkaido, riparian forest alongside slow flowing rivers in the south-east, and steep-sided wooded valleys with fast flowing rivers to their mouths in the north-east. Distribution is limited by the availability of rivers with plentiful fish which remain at least partially ice-free throughout the winter (Brazil 1985) and on the availability of riparian forests with sufficient small mammals active during winter to sustain the owls while rivers are frozen. Their main prey is fish, such as trout, char and salmon, but in

spring they take frogs almost exclusively, and in winter they take birds and mammals up to the size of hares (Nagata 1972; Yamamoto 1981; Brazil & Yamamoto this volume). The typical hunting method employed by *K. blakistoni* is to



**Figure 1. Distribution of Blakiston's Fish Owl.** The distribution of this species is best known in Japan and least known in China. The range in China is largely hypothetical. Map based on Brazil & Yamamoto; De Schauensee (1984) and Flint *et al.* (1984).

stand in shallow water, on a log, or river bank, then jump feet first onto prey, although they will also fish, Osprey-like, by plunging into deep water on occasions, and take small mammals and birds in flight.

The current rarity of Blakiston's Fish Owl in Japan and perhaps also throughout its range in the USSR and China, is in part due to habitat loss, particularly of the large hollow trees necessary for nesting (Brazil 1983; Brazil & Yamamoto 1984). It is also threatened by the effects of toxic chemicals and by the attentions of over-enthusiastic photographers at the nest.

No more than 80-100 birds (only c20 breeding pairs) are estimated to survive in Japan (Brazil & Yamamoto this volume). Such rarity means that few observers are well acquainted with the species. In the interests of conserving the species and particularly the sub-species, *K. b. blakistoni* occurring in Japan, ecological and behavioural studies are being conducted in Hokkaido and an attempt is being made to provide nesting habitat in the form of nest boxes in known territories (Brazil & Yamamoto 1984; Brazil 1985). These studies, including those of an habituated pair in particular, have made it possible to make detailed notes on ecology, behaviour, and also on the vocalizations and other sounds produced by *K. blakistoni*, over several years.

In this species the pair bond is very strong; male and female stay in close proximity to each other day and night throughout the year. Pairing seems to be for life and adults which lose a mate remain in their territory alone, sometimes for many years. Males and females duet and although the duration of each phrase of the duet is very short it is repeated regularly, often for long periods. It may be heard throughout the night and in every month of the year and seems to function both to advertise territorial occupancy and, as in the Ural Owl (*Strix uralensis*) (Holmberg 1974), to maintain communication with the female, and to maintain the pair bond.

The voice of this species has been little studied and as recently as 1973 it was thought to be unknown (e.g. Weyden & Ginn, in Burton 1973). Even more recent literature sometimes fails to make note of the voice of this species; for example, although reference is made to calling being heard in Sakhalin by V.A. Nechaev, no calls are described (Fujimaki 1984), while Flint *et al.* (1984) give no calls at all for the species even though they include calls for other species of owls occurring in the Soviet Union. In Japan the voice is known however. The typical three note call has been reported in many variant forms by many observers (see below), although distinctly different calls are not mentioned and may be hitherto undescribed from Japan.

Details of calling behaviour in relation to the seasons and various weather factors are to be given in greater detail elsewhere (Yamamoto in prep); in this paper we will concentrate on describing the variety and context of the various calls and other sounds produced by *K. blakistoni*.

## STUDY AREA

*K. blakistoni* were studied in various districts of Hokkaido, the Shiretoko peninsula of the north-east, Daisetsu in the centre, the Hidaka mountains in the south, and the Lake Furen area, Nemuro district in the extreme south-east. An habituated pair was studied on a regular basis in south-east Hokkaido (the exact location is omitted for reasons of security). This territory included a stretch of a deep, slow-flowing river, partially tidal, which connects to a major sea lake. The river runs through a flat valley bottom with forested slopes rising steeply to the north. To the south the land rises more gently; it is at first marshy, with mostly alders and birches, then as the land becomes drier the forest becomes more varied. The forest in this general area is of mixed conifer (*Abies sachalinensis*), oak (*Quercus mongolicus*), alder (*Alnus japonica*) and birch (*Betula ermani*).

In winter the entire area is under snow cover, all standing water freezes over as do most rivers. Several large dead trees dot the riverside territory; these are used for perching in during calling and also during copulation. Daytime roosts are usually to the north of the river amongst conifers or denser stands of deciduous trees in steep-sided side valleys. The owls' strong attachment to the territory has made it possible to study their daily movements, and their acceptance of the observers has made it possible to observe male, female and juvenile at very close quarters.

## METHODS AND MATERIALS

Observations were made from 1983-1986 throughout Hokkaido, but particularly in the territory of an habituated pair in the south-east. Observations were made during daylight for feeding signs, or to find roosting birds, and from about one hour before dusk until the birds ceased calling. During observations all vocalizations were noted, details of the time of first calling, the length of calls (where possible) and the length of the interval between the calls were all recorded. Special note was made of unusual calls and their circumstances and other sounds heard associated with the owls. The interval between calls was measured in seconds with a stopwatch, while the length of calls was measured in tenths of seconds with a wrist watch chronometer. Tape recordings of various calls have been made for reference. Descriptions of calls have been made using the consonant/vowel combinations of Japanese, since the pronunciation of these is both fixed and particularly suited to transcribing natural sounds. For example "pa" would be pronounced as in pat, "pi" would be pronounced as in piece, "pu" as in put, "pe" as in pet and "po" in pot. All other syllables rhyme on the vowel, regardless of the preceding consonant. Where a letter is repeated in a call this indicates the relative length of the sound.

## RESULTS AND DISCUSSION

The sounds produced by *K. blakistoni* can be classified into three categories: A) Calling; B) Bill snapping; C) Flight.

### A. Calling

During calling the head is lowered and thrust forward, and the white throat bulges visibly in a pump-like manner immediately prior to giving voice. The male calls first giving typically a double note, a deep reverberating "buu-bu", the second note slightly lower than the first. This is quickly

followed by the female's single call, an even lower "buu". Calling is so synchronized as to suggest a single bird giving a three-note call. Since calling involves thrusting the head forwards, if the female has turned her head away, such as while looking for food, her response to the calling male may be delayed very slightly and preceded by a rapid head turn so that she can call while facing forwards. This duet is both lower and stronger than the call of the subspecies of the Ural Owl (*S. uralensis japonica*) which occurs in Hokkaido (OSJ 1975; Fujimaki & Hyakutake 1979) and which may sometimes be heard in the same habitat, and even within the territory of *K. blakistoni* (Brazil pers. obs.) Blakiston's Fish Owl is the largest and northernmost of the four members of the *Ketupa* genus. The other species have similar although unique calls. Young Malaysian Fish Owls (*K. ketupa*) give weak "pi-pi" or "ki-ki" calls whereas adults give a series of "bu bu bu..." notes repeated 7-10 times (Yamamoto pers. obs.) Burton (1973) however notes them as also giving a "to-wee-to-wee" call although Yamamoto, who kept birds from 1969-1973, did not hear this call. The Tawny Fish Owl (*K. flavipes*), like the Brown Fish Owl (*K. zeylonensis*) and *K. blakistoni* gives double calls described as "whoo-hoo" by Ali & Ripley (1969) and also heard given by captive birds (Yamamoto pers. obs.) *K. zeylonensis* calls at a similar interval to Blakiston's Fish Owl, c40-50s, however both male and female produce double calls and the male starts and finishes the duet which is composed of three parts, not two - "gou, gou, bo-bo, gou, gou". When aggressive they use a repetitive "ho-ho-ho" call and during courtship/display a "pishi" call (Yamamoto pers. obs.). Calls were described as a lugubrious "haou-haou-haou-ha" and a deep triple "hou-hou-hou" by Mikkola (1983), while Etchecopar & Hue (1970) describe it as also having a mewling call quite unlike an owl. Ali & Ripley (1969) described the calls of single *K. zeylonensis* as "boom-boom" or "boom-o-boom".

Of the four *Ketupa* owls the calls and calling behaviour of *K. zeylonensis* appear to be most similar to those of *K. blakistoni*; pairs of both species indulge in long bouts of duetting, sometimes for many minutes. These two species are also similar in their ecology, diet and hunting methods (see Pukinsky 1973), although they differ in the length of the body and the feathering of the tarsus.

In Hokkaido the first calls of the evening of *K. blakistoni* are to be heard at around dusk, just after the first member of the pair leaves the roost.

Occasionally first calls are given from the roost itself. The second bird then joins in the duet as the pair move through the territory to a suitable fishing location. Calling may continue for minutes or hours depending on the weather conditions and the season. During the breeding season from March to June calling activity increases, tending to start earlier, at or just before sunset, whereas after the breeding season they start calling after sunset. During the breeding season the interval between calls is also shorter, and during incubation the male calls 10-50m away from the nest and the female responds from inside. The pair always call to each other immediately after the male has delivered food to the incubating or brooding female. Presumably because the female was eating at such times, her responses were somewhat fewer in number.

Calls are greatly reduced during the winter from November to February, and on windy days, and increase again from March. Snow or low temperatures appear to have little or no effect on calling, whereas strong wind curtails it completely. Calling occurs only rarely during daytime, but slightly more often during the breeding season than at other times.

At all seasons, the majority of calls are given from dead or bare branches or the tops of conifers, at a height of between 20 and 50m. On rare occasions they call to each other from the ground, but only during hunting. Calls from high perches are presumed to act as declarations that the territory is occupied and are intended to be heard over long distances.

The male can be heard up to 1km away and the female up to 500m. Despite being larger than the Eagle Owl (*Bubo bubo*), the calls of *K. blakistoni* are not audible over such great distances -- up to 4km for that species (Glutz von Blotzheim 1980). This may be, in part, a result of their very different habitat. The white throat, which becomes so conspicuous while calling, is thought to visually reinforce the call and to replace it over distances greater than at which calls can still be heard.

The pair sit close together while calling, typically in the same tree and often on the same branch. Only rarely do they remain more than 50-100 m apart while calling. Single birds such as birds which have lost a mate, or younger unmated individuals occupying a territory, whether male or female, give the same double "buu-bu" call as a mated male.

First calls are usually given just before, or within the half hour after sunset, thus in winter (February) this is at between 16:45-18:15 and in summer (July) at between 19:45-20:15. Duets are very short, lasting less than one second, while the intervals between calls is on average more than 50 seconds long.



## Types of calls

Transliteration of calls is very difficult, and different observers record calls differently. The variation described so far in the literature appears to depend more on the ear of the observer and the way of describing the sound in written syllables, than on actual variation in the calls. It is in fact clear that in almost all cases observers are noting essentially the same, typical duetting calls.

These typical calls, which we describe as "buu-bu -- buu", have for example also been expressed as: "ho ho ho" (Kiyosu 1965; Udagawa, in Nagata 1980), "hou hou bou" (Nagata 1980), "houhou uouu" (Hirono 1977, in Kawabe 1980), "bobo bo" (Nagata *et al.* 1977, in Kawabe 1980), "bo-bo u" (Watanabe 1980), "boo boo, uoo" (WBSJ 1982), "wo wo wo" and "wo, bobo" (Kawabe 1980), "wo-wo-wo" (Takano 1982), "wo-wo-u" (Fujimaki & Hyakutake 1979), and even "un fu oon" (Sarashina & Sarashina 1977). Similarly the calls of single individuals, which we describe as "buu-bu", have otherwise been expressed as: "bo, bo" (Nagata 1972; Kawabe 1980), a series of double notes "bo-bo, bo-bo, bo-bo" (Kobayashi 1951), "bo bo", "wo wo" or "wo oo" (Kawabe 1980) and "o-o" (Takano 1977, in Kawabe 1980). Despite the apparent variety of these calls they do in fact only refer to the basic calls of a pair and of single individuals. Only Dement'ev & Gladkov (1966), describing the population in the Soviet Far East (*K. b. doerriesi*), note a completely different call, which they describe as a protracted and muffled "bauuu".

The second phrase of the male call and the female call may overlap. On occasions the female calls first and is followed by the male. Kawabe (1980) may have in fact been referring to this reversed call, when he described a duetting call as "wo, bobo". Such reversal occurs during a long series of calls. Usually the female calls after first hearing the voice of the male, but in a series of successive calls, the two individuals sometimes call on their own at even intervals.

Calling behaviour is clearly seasonal. As in *B. bubo* (Desfayes 1951) and *K. zeylonensis* (Mikkola 1983) vocal activity of *K. blakistoni* occurs throughout the year, but increases immediately prior to the breeding season, which commences in late February and early March, and especially in the weeks prior to egg-laying. Less typical and completely different calls, or typical calls in unusual contexts, may be heard during the breeding season, especially during courtship and copulation. Whereas smaller species have special calls given during sexual excitement or mating, for example the female Pygmy Owl (*Glaucidium passerinum*) twitters, the female Tengmalm's Owl (*Aegolius funereus*) chirks during copulation, the female Ural Owl utters a weak twittering, and the Tawny Owl (*Strix aluco*) gives an "ee-ee-ee" call to express sexual excitement and during copulation (Mikkola 1983), *K. blakistoni* uses a fairly typical "bu-bu" call. Sometimes the male alone, and sometimes both male and female call during copulation. At such times they give normal male and female calls. The female, however, has not been heard to call alone during copulation.

During the mating season the male was observed on many occasions to carry fish from the catching site to the female. On these occasions the female was heard to use a previously undescribed call, a thin, high-pitched squeaking, which was noted as "pss-pss-pss-pss" or "kwi-kwi-kwi-kwi" on different occasions. The call appeared very similar to the begging calls of young fish owls and was assumed to serve the same function. Under rather unusual circumstances a similar call has been heard from the male. On one such occasion the male had caught a fish, apparently with the intention of giving it to the female, but flew off along the river past the tree where she was perching, perhaps not having noticed that she had followed him to the fishing site. After nearly five minutes the male, still with the fish, returned to a nearby tree and continued to hold the fish for a further seven minutes. During this time he gave frequent high, thin whistling calls "sss-sss-sss-sss" somewhat similar to those described above for the female. It was assumed that he was attempting to attract the female to fly to him for the fish. The female made no move however and eventually the male ate the fish himself.

Unlike the typical low-pitched calls, which are very brief, these high-pitched calls of both male and female were repeated continuously for seconds at a time, but carry no more than a few tens of metres. Since male and female are often very close together the thin call may be used more often by the female when out of hearing of the observers.

During this study we have so far recognized several different and previously undescribed calls, which though uncommon occur regularly and are readily classified. In addition to the male's typical "buu-bu" call already described above, the male has been heard to give a triple call "buu-bu-buu" at the rate of once or twice a month. During courtship feeding and before copulation the male

sometimes uses a thin sibilant "pi-shi-shi", or "pi-hyu" call. A warning call, "kya-a", is used towards animal intruders in the territory, such as dogs.

In addition to the female's typical "bu" call, which completes the usual duet (described above), the female has been heard to give a double "bo-bo" call, but only when her distance from the male exceeded 300m. Sometimes the female's response during the duet also has a slight double quality to it - "bu-u". After courtship feeding a soft "pi-yu" call is sometimes used by the female, and before feeding the young the female has been heard to use a somewhat similar "pi-shi-shi" call. As in the male the warning call is "kya-a" and on one occasion, when crows (*Corvus macrorhynchos* and *C. corone*) were passing overhead to roost, the female gave a loud "kyarr, kyarr, kyarr" call somewhat similar to a juvenile's but louder (see below).

In addition to the above calls we have recorded several unusual calls during this study, the function of which is uncertain. These include: the male giving a single "buu", followed by the female "bu"; the male occasionally gave calls with rising rather than falling inflection such as "buu-bou", "bu-u", and "ouu". Occasionally the duets differed too. Intervals of up to 5 seconds have been recorded between male and female calls, with the female responding with a higher or lower pitched "bo" on different occasions. A softer call than the typical duet was also heard "gwo-gwo", followed by the female's lower "gwo".

Successful breeding is now rare in Hokkaido thus there are a few opportunities to observe young birds. However, in 1985 one of two chicks which hatched in the study area survived and the young bird was followed until it disappeared from the territory in April 1986, and in 1987 two chicks hatched and survived. The typical call of this young bird which did not differ from that of other young *K. blakistoni* (Yamamoto pers. obs.) from about 10 days after hatching (in May), is a long, fairly loud, sibilant call "pshheu-pshheu", other calls are a) "pss-pss-pss-ps", b) "pi-shu", c) "pi-pyu" or d) "kwi-kwi-kwi-kwi", which can be heard over 300-400m on windless nights. These calls became louder and stronger as the young birds grew. Given while still in the nest, and for some months after leaving the nest, they appear to be begging calls. A further call has been noted, a loud "kiya kiya", but it is very rare and its function is unclear. Young birds also call in flight, when they give laughing "ka-ka-ka-ka", "kaow-kaow-kaow-kaow" or "kya-a-u kya-a-u" calls. All of these 'immature' calls may be heard until at least the April after hatching.

The time at which the young first give adult type calls is not yet known.

## B. Bill Snapping

A loud clicking noise produced by snapping the upper and lower mandibles together is used by both male and female to deter intruders such as mink, red fox and man (when close to the nest). Bunn (1974) has suggested that the bill snap of Barn Owl (*Tyto alba*) may actually be a tongue click, since the bill closes too gently to produce such a sound, which he considered is more likely to be made with tongue and pharynx. Our observations of *K. blakistoni* however, suggest that this sound is produced by rapidly snapping the mandible open and closed. Although it is a larger bird, the snap is not as loud in this species as in the smaller, sympatric Ural Owl. During bill snapping the wings are held half opened and the head is held low and forward, pointing at the intruder.

## C. Flight

Calling in flight is very rare in *K. blakistoni*, as it is apparently in other species of owls, although flight calls have been described for Long-eared (*Asio otus*) and Eagle Owls (Blondel & Baden 1976; Mikkola 1983). During the present study of *K. blakistoni* calls in flight were heard no more than once or twice a year. On these occasions it was a result of the female moving closer to the male during a long series of duet calls. On occasions when the male continued to call even though the female had already taken flight, she replied while flying. Juveniles also call in flight as described above.

It has been suggested that selective pressure for silent flight is not so great in fish owls as in other species of owls because their prey occupy a different sound medium, and Mikkola (1983) considers that *K. zeylonensis*, at least, lacks silent flight. In fact the typical hunting method employed by *K. blakistoni*, described above, would indicate that silent flight is not of great necessity. However in winter most bodies of water within its current range freeze. As a result during winter it hunts small mammals and birds which presumably necessitates reasonably silent flight, and thus the same selection pressure for silent flight is operating as in other owl species, if only seasonally. Our observations indicate in fact that the wing beats of *K. blakistoni* are rarely audible to the

human ear even when within just a few metres of birds in flight. When lifting off laden with fish, when taking off from the ground, or moving from a low branch to a higher one their extremely broad wings do produce a distinctly audible, throbbing, although soft, "basa-basa-basa", but this invariably happens after a hunt or when they are not hunting and the sound can have no influence on their prey (Brazil 1985). Occasionally the sound is loud and audible up to 10m away, and sometimes the wind-rush during fast gliding is also audible. At all other times they appear silent.

The use of calls during courtship feeding, during mating, high-pitched calls and other variants on the typical calls such as occasional reversal, the female calling before the male, the male giving single notes or rising notes, differences between the calls of adults and juveniles, all indicate that the variety of vocalizations of this species is much greater than has been previously described. We have been able to study these calls only by being within very close range of individual owls since some of the calls do not carry very far. The calls of *K. blakistoni* are most similar to *K. zeylonensis*, but differ mainly in the number of phrases given as part of the duet.

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