# THE BEHAVIOUR OF BITTERNS AND THEIR USE OF HABITAT

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## ABSTRACT

Australasian Bitterns *(Botaurus stellaris poiciloptilus)* were studied in the Whangamarino wetlands in the autumn and winter of 1986. A seasonal difference in the time of feeding was noted, as well as a local movement to feeding grounds. A decrease in the number of birds seen in the study area in winter seemed to be related to the duck hunting season and high water levels. A mixture of water purslane and willow weed on a wet substrate was the preferred habitat. "Surveillance posture" seems a better description of the traditional "freeze" behaviour. The birds gave this response even when there was no apparent danger.

## INTRODUCTION

The Whangamarino wetlands, in the lower Waikato Basin, have been described as the second-largest (7100 ha) swamp and bog complex remaining in the North Island, supporting the largest bittern population known in New Zealand (Ogle & Cheyne 1981). Ogle & Cheyne suggested that these wetlands may be an important breeding ground for bitterns in the Waikato region and perhaps beyond. They reported an average density of bitterns of one per 49 ha, with the highest density over a 100 ha sample being one per 8.3 ha. Studies of *Botaurus stellaris stellaris* in Europe have reported densities from one per 2 ha to one per 50 ha (Cramp & Simmons 1977).

In the Whangamarino wetlands, Ogle & Cheyne (1981) saw 55% of the birds in mineralised swamps. These swamps contained willows (*Salix* spp.), bamboo sedges *(Eleocharis sphacelata* or *Baumea articulata)*, cutty crass (*Carex* spp.), water purslane *(Ludwigia palustris)* and willow weeds (*Polygonum* spp.). The other 45% of the bitterns were distributed throughout acid bog, semimineralised swamp and miscellaneous sites. Ogle & Cheyne also suggested that the dispersal of bitterns during the summer could be due to a decrease in surface water.

My aim in this study was to examine and describe the behaviour of bitterns and their habitat use in the Kopuku Arm of the Whangamarino wetlands.

## METHODS

I made 90 hours of observations from the permanent hide from April to August 1986. After an initial three days of observation, I made fortnightly half-day (6 hour) observations, alternating dawn to midday and midday to dusk. A total of 97 sightings of bitterns were made in the Whangamarino wetlands, 59 by Wildlife Service staff and 38 by me. I made my observations from a hide on the southwestern margin of the Kopuku Arm, and a total of six Wildlife Service Officers and contract researchers provided data from sightings made during their routine work in the general Whangamarino

wetland area. We all recorded the observations on prepared standard data sheets. I used a stopwatch to time behaviour and tried, unsuccessfully, to distinguish individual birds from photographs.

On 2 July I took five sweep-net samples around the edges of the main waterways of the Kopuku Arm to find potential prey of bitterns. One regurgitation sample was collected by a contract researcher when a bittern was accidentally disturbed. By calculating the viewing range from the hide I could estimate bittern densities.

Wildlife Service staff recorded their observations on cards, using the following behaviour descriptions:

Feeding – any behaviour associated with feeding.
Walking – wading in water or walking across vegetation.
Comfort behaviour – self-maintenance behaviour e.g. preening, wing flapping or roosting.
Flying – a bird flying overhead, but not flushed into flight.
Alarm flying – a bird flushed into flight.

## RESULTS

Observations made in this study allowed me to expand the standard descriptions of bittern behaviour.

**Feeding behaviour:** I watched individual birds feeding in autumn for an average of 30 minutes (range 7-60 min) and in winter for an average of 23 minutes (range 3-63 min). All these birds fed on or near edges of ponds or waterways.

Figure 1 represents bittern feeding behaviour. In maximum concentration, a bird held its neck and back parallel to the substrate. It would then sway its head from side to side, creating S-waves down its neck, or keep absolutely still for up to 10 minutes. A lunge sometimes followed. To lunge, the bird pivoted its body (with neck and back straight) on its legs, sometimes completely submerging its head. It shook and bit the larger food, raising its head skyward to swallow the food.

Drinking sometimes followed swallowing. After taking food, the bird sometimes walked rapidly to another feeding site. At times, birds fed with their legs fully under water.

**Surveillance:** The bill was held erect with neck fully stretched. This lasted from a few seconds to 10 minutes. In this posture the plumage of the bird takes on a reed-like appearance. Typically the bird would rapidly scan the area and if it saw a threat, would lower itself slowly into the vegetation by retracting its head and crouching down. Surveillance postures were seen in all forms of the birds' terrestrial behaviour.

**Walking:** A bird would raise each foot high and then slowly lower it, with its head either retracted close to the body or extended.

**Preening:** In preening (seen seven times), birds appeared to use the uropygial gland at the base of the tail, repeatedly spreading the secretion through the plumage, particularly on the front of the throat and breast.

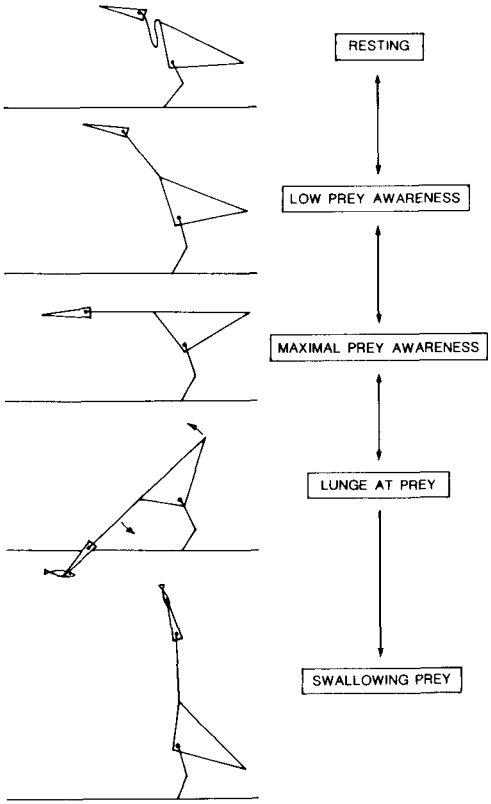


FIGURE 1 — Feeding behaviour of the Bittern

**General:** As I saw only solitary birds, I saw no interactive behaviour. I could not recognise individual birds, although some differences in plumage were noted. Figure 2 charts the number of birds I saw in each observation period. I found no birds in the last three observation periods (13 and 27 July and 8 August). Estimated densities of bitterns were calculated to range from 2/ha to 30/ha.

In autumn (1 March to 30 April) I saw birds feeding throughout the day. In winter (1 June to 31 August), most feeding was from early morning to mid or late afternoon, with a peak around midday. Observations by Wildlife Service staff showed similar trends. Differences were found between autumn and winter also for walking, which presumably is associated with feeding. Bitterns walked 10 to 500 metres during any observation period.

The regurgitation sample, collected from Kopuku Arm, consisted of five eels up to 200 mm long, two nursery web spiders *(Dolomedes minor)* and a common black field cricket *(Teleogryllus commodus)*. Birds were seen

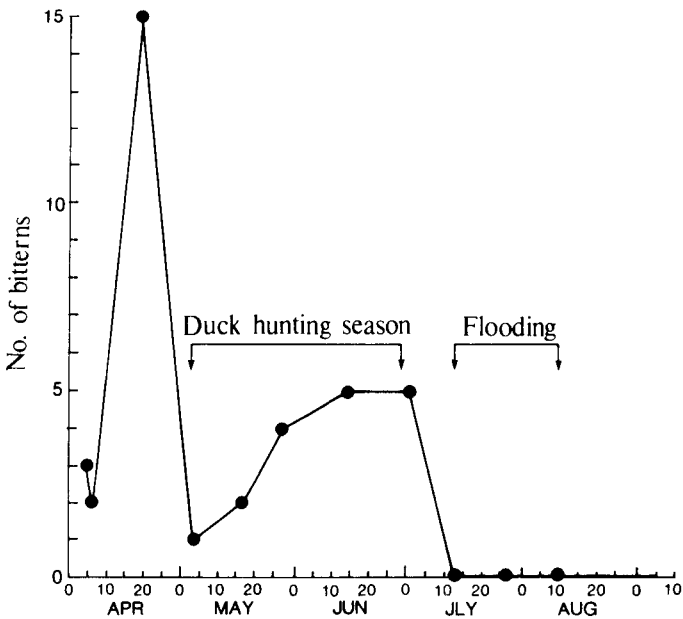


FIGURE 2 — Numbers of bittern seen per observation period in 1986 from the permanent hide, Kopuku Arm, Whangamarino Swamp

to feed on eels (the largest 50 cm long) on four occasions. Of the range of animals taken in the sweep-net samples on 2 July, only dragonfly larvae (Order Odonata) and mosquito fish *(Gambusia affinis)* were of suitable size to be bittern food. Mosquito fish were abundant in the samples taken. I did not do terrestrial sampling.

Comfort behaviour (e.g. preening) was observed in early morning and late afternoon in autum, but not in winter. In autumn, birds seem to fly before and after feeding. Only twice were flying birds seen in winter. It was noted that the direction of the flight was to and from the southwest (a similar direction as the Kopuku Arm waterway runs). The birds seen flying by the Wildlife Service staff (n = 8) were flying south or west from Kopuku Arm.

Of the Wildlife Service staff sightings, 97% (n = 57) were in the northeastern part of the Whangamarino wetlands, over 76% (n = 45) from the Kopuku Arm. Wildlife staff saw fewer birds walking and less comfort behaviour than I did from the hide (Table 1), but they saw more alarm flying (n = 24) than I did (n = 5). Of the five times I saw from the hide a bird flying in alarm, only once had it been disturbed by me.

From the habitat descriptions summarised in Table 2, all but two birds were in an area of mixed water purslane *(Ludwigia)* and willow weed *(Polygonum)* on a wet substrate.

TABLE 1 — Summary of bittern sightings, April-August 1986, in Whangamarino Swamp

| | | BEHAVIOUR OF BITTERNS | | | | |
|---|---|---|---|---|---|---|
| | | Walking | Feeding | Comfort Behaviour | Flying | Alarm Flying |
| TOTAL NUMBER OF BITTERN SIGHTINGS | Permanent Hide | 19 | 15 | 9 | 14 | 5 |
| | Wildlife Staff | 8 | 16 | 3 | 8 | 24 |

TABLE 2 — Bittern habitat use, April-August 1986, in Whangamarino Swamp

| | | | | BITTERN HABITAT FEATURES | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Dominant Plant Species | | | | | | Substrate Dampness | |
| | | Behaviour | n | Ludwigia | Polygonum | Ludwigia & Polygonum | Juncus | Cyperaceae | Other | Wet | Dry |
| Observers | Permanent Hide | Feeding | 16 | 0 | 0 | 14 | 1 | 0 | 1 | 16 | 0 |
| | | Walking | 8 | 1 | 0 | 7 | 0 | 0 | 0 | 8 | 0 |
| | | Comfort behaviour | 3 | 0 | 0 | 3 | 0 | 0 | 0 | 3 | 0 |
| | Wildlife Staff | Feeding | 15 | 0 | 0 | 15 | 0 | 0 | 0 | 15 | 0 |
| | | Walking | 19 | 0 | 0 | 19 | 0 | 0 | 0 | 19 | 0 |
| | | Comfort behaviour | 11 | 0 | 0 | 11 | 0 | 0 | 0 | 11 | 0 |

## DISCUSSION

**Feeding:** The small amount of time (less than 1 hour) bitterns spent feeding in autumn and winter and the long distances walked (up to 500 metres) suggest that the bitterns concentrated on finding larger food items. The presence of larger food items in the one regurgitated sample supports this suggestion. I was unable to verify Soper's (1984) view that bitterns feed at night.

Quiet stalking was the main method of feeding. Birds could spend up to 10 minutes motionless, presumably using their well-known ability to swivel their eyes to look below the bill while the head is held horizontal (Figure 1).

All birds fed at the edges of ponds and waterways, which confirms the expected preference for aquatic food. Most of the animals regurgitated were aquatic, and birds were seen capturing eels. The regurgitated material was covered in mucus. The animals in it showed signs of digestion, but some were damaged (e.g. lost limbs), probably by the bittern's capture methods. Crop contents, which the birds seem to regurgitate when disturbed during or straight after feeding (also observed by Ogle & Cheyne 1981), may provide a useful method of assessing bittern diet.

Sweep-net samples showed an abundance of mosquito fish and dragonfly larvae, both likely foods. However, sweep-net samples may not have truly

represented the potential prey animals present. More sampling (including terrestrial sampling) is needed throughout the year in places where bitterns have been feeding. The observed difference in peak feeding activity between seasons may have been associated with seasonal changes in the abundance of fish and insects.

**Surveillance posture:** This is, I believe, a suitable term to describe the well-known "freeze" behaviour of bitterns. The traditional interpretation makes it seem to be an involuntary action of the bird in the presence of danger. In my experience, however, it is primarily an awareness behaviour by which the bird investigates its surroundings, whether or not there is danger. When deep in vegetation a bittern, by raising its head, gets a clearer view of its surroundings. In this surveillance posture, the bird's plumage takes on a reed-like appearance, thus camouflaging the bird.

**Local movements:** The density of birds in the Kopuku Arm (30/ha) was higher than the range observed by Ogle & Cheyne (1981). In autumn birds were seen flying before and after feeding. This behaviour along with the bird densities suggested to me a local movement to and from the feeding grounds of the Kopuku Arm. The idea that birds fly into good feeding places is in contrast with the view of Williams (1985) that bitterns live in established feeding territories and rarely fly. My observations, however, were not made in spring and summer, when the birds are more likely to be resident and territorial.

As individual identification was difficult, I may have counted some birds twice. Although this would have made me overestimate the density of bitterns, the overestimate is unlikely to be significant because on 20 April, when I recorded the highest density, I saw three bird simultaneously, and later a further six flew into the area.

The decrease in the number of birds observed in winter (Figure 2) suggests that the Kopuku Arm was a less important feeding ground in winter. Note, however, that the duck hunting season (3 May to 29 June) may also have reduced the numbers seen in late autumn and early winter. Ogle & Cheyne (1981) suggested that drying out of the wetlands in summer forces the birds to move elsewhere. Deepening water in winter may change the birds' habits also because they prefer shallow standing water that does not fluctuate much. In any future study of bitterns movements, colour banding and radio telemetry would be useful.

**Habitat:** The bitterns seemed to prefer a mixture of water purslane and willow weed on a wet substrate. Ogle & Cheyne (1981) also found this. This habitat was still preferred in winter, even though the water purslane and willow weed had died down. Sedges (*Baumea* spp.) and rushes (*Juncus* spp.) are an alternative source of cover at this time.

Concern over the decrease in wetlands and a corresponding decrease in bittern numbers has been repeatedly expressed (Falla 1975, Moon 1979, Ogle & Cheyne 1981, Williams 1985). Accurate population estimates are difficult. Unless suitable habitat is preserved for this species, the numbers will continue to decrease to dangerously low levels, as has occurred with bitterns in Britain (Whitlock 1981, Moore 1980).

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# SHORT NOTES

## Morepork hunting House Sparrows

At dusk on 12/11/61 I watched a Morepork *(Ninox novaeseelandiae)* as it made a straight silent glide from the top of a tall deodar in my Remuera garden. Its objective across the road was a couple of large Italian cypresses where many House Sparrows both nested and roosted. The owl first alighted on the leader of one of the cypresses. Then it fluttered around the dense foliage like a moth round a lamp or a Barn Owl *(Tyto alba)* winnowing the ivy on an old building. A squeak was heard and one sparrow was seen fleeing.

The Morepork found a gap in the foliage, thrust in its head and shoulders and, after withdrawing, paused briefly before resuming its evening hunt. I could not be sure that the raid on the cypress had been successful.

When a pair of suburban Moreporks raised young in a specially designed and sited nesting box at King's College, Otahuhu, in 1960 (*Notornis* 9: 133-134), House Sparrows were a significant item in the owlets' diet, especially after they had become feathered.

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