CALLS OF THE WHITE-RUMPED SWIFTLET

By M. K. TARBURTON

Following the discovery that some swiftlets can echolocate in complete darkness (Medway 1959, Novick 1959), the species that can were separated from the genus *Collocalia* into the larger genus *Aerodramus* (Medway & Pye 1977). The White-rumped Swiftlet (*A. spodiopygius)* was placed in this genus because Pecotich (1974) had recorded that *A. s. terraereginae* in coastal Queensland and *A. s. chillagoensis* at Chillagoe (inland Queensland) produced the echolocatory *click* call. Subsequently this call and two other calls used at Chillagoe were described (Roberts *et al.* 1976).

This paper records four new calls for the species. Three of these are from *A. s assimilis* in Fiji and one from *chillagoensis*. It is confirmed that two of the previously described calls from *chillagoensis* are given by *assimilis*.

METHODS

During 4 days of continuous watching of chicks to study their feeding rates and during 10 hours of watching adult feeding behaviour, I wrote down phonetic versions of swiftlet calls in Fiji. In addition, I made two 1 hour visits to tape-record calls, which I later described in writing. Narrow band sonagrams of these recordings were made with a digital Sona-graph 7800 (Kay Elemetrics Corp.). Dry Cave (in which the tape recordings were made) and Waterfall Cave are at Nasinu 9 Mile, 14 km north of Suva. Ono Cave is in the Wainibuka Valley, 64 km north-west of Suva and Waiyala Cave is in the Sigatoka Valley, 40 km north of Sigatoka.

Observations on swiftlets at Chillagoe (Queensland, Australia) were made for 4 months during the 1985/86 and 1986/87 breeding seasons.

RESULTS

Echolocatory click call

The usual call of the White-rumped Swiftlet is a distinctive *click*. This call is given frequently in the twilight zone of caves used for roosting and breeding. It is used continuously for echonavigation by birds flying in total darkness. Birds clinging to the wall or being handled seldom gave it; and even when they did, they flapped their wings, as Harrisson (1966) found in the Mossy-nest Swiftlet (*A. vanikorensis*). The sonogram of the *click* call (Fig. 1) is characterised by a sharp wave front and rapid decay. Most energy is concentrated at 4-5 kHz, although the call ranges from 1 kHz to 8 kHz. On one sonagram, a harmonic was visible at 14-15 kHz.

The repetition rate of this call varied. On sonagrams of two birds, the time from the start of one *click* to the start of the next varied between

0.09 s and 0.173 s. Calls from live birds and recorded calls gave a mean rate of 4.0/s ± 0.23 ($\bar{x}$ ± SE, n = 22, range 1.4-5.9).

Birds flying swiftly along the narrow passage of Dry Cave, Nasinu, or those just frightened from their roost, appeared to call at a faster rate than those making repeated short flights from the wall in an effort to locate their nest. In Dry Cave individuals differed (by ear) in the pitch of their calls.

In the larger caves, such as Ono, Waiyala, and Waterfall Caves,the cacophony just after sunset of many hundreds of flying birds giving the *click* call was so great that I wondered how the call could have an echolocatory use. However, even when several thousand roosting birds were put to flight, the birds managed to move through the cave, though movement was slower.

The *click* call of a fledgling on its first flight is higher in pitch and noticeably quieter than that of the adult. However, this "thinner" call is enough to prevent juveniles from colliding with the cave wall, and the calls of adult birds help guide the juveniles towards the entrance instead of into other sections of the cave.

The chirrup call

To the ear this adult call was more highly pitched that the *click* call. The sonagram (Fig. 1) shows that the reason is not that the frequencies are higher than those of the *click* call, but that the higher frequencies within the same range are more sustained.

The most common form of the call is *chirrup, chirrup.* I have also heard *giddy up, giddy up* and *gar-p.* The call is used much less than the *click* call, mostly when a bird arrives at the nest. The bird already at the nest utters it to the new arrival as if in challenge or threat and yet as a means of identifying itself. If the incoming bird settles quietly, that is the end of the interaction. If the incoming bird replies, the result is a sharp vocal exchange or squabble, best described as a screech (shown on the right-hand side of the sonagram), which sometimes leads to a brief fight and the new arrival flying away. Such behaviour indicates that the arriving bird is probably not the mate of the brooding bird. The greeting call and threat display in the Common Swift (*Apus apus*) are similarly described (Lack 1956) as a high-pitched scream. Its function is not echolocation.

I heard the *chirrup* call used away from the cave only once when one bird joined another in its 25 m diameter feeding circuit. It is uttered by birds wheeling around above the entrance to a cave and usually whenever two birds are chasing each other.

At Chillagoe the call I heard given in such aerial pursuits is a long *tweet-tweet-tweet-tweet-tweet-tweet, peer-peer-tweet* or *tweer-tweer* that sounds like the scream that the Fijian *chirrup* call sometimes ends with.

The shree-ee call

At Chillagoe I heard a new call given only once. It was more shrill than any other call and was given when a flock had been dispersed from above a cave entrance by a Brown Goshawk (*Accipiter fasciatus*). Some minutes later the flock reassembled above the goshawk, occasionally giving this high-pitched *shree-ee* call, which had the indications of an alarm call. I do not have a recording of this call.

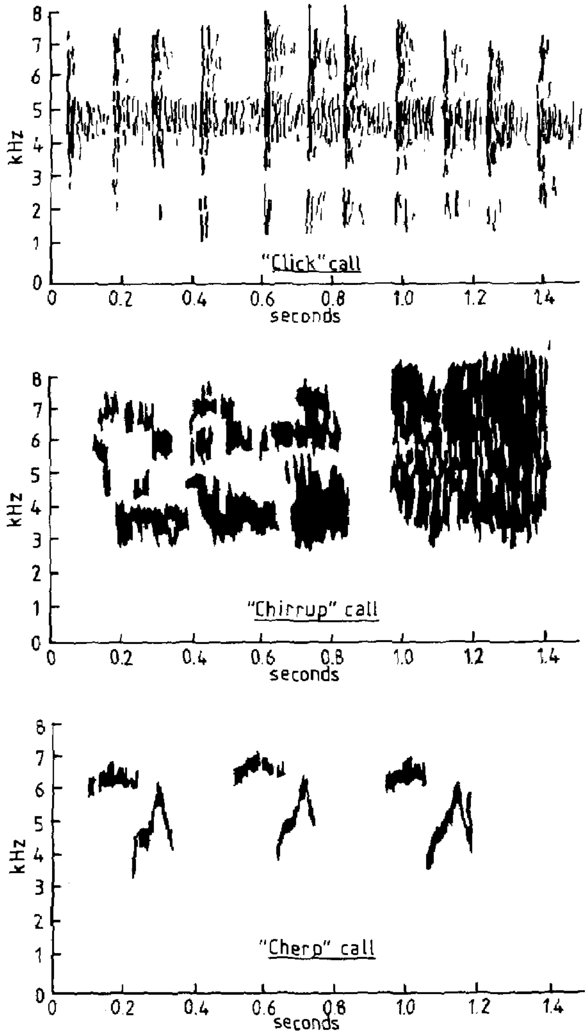

FIGURE 1 — Sonagrams of adult calls
The distinct broad bands of the *click* call are made less clear only by the echoes of the high energy signal at 4-5 kHz.
The portion of the *chirrup* call between 1.0 and 1.4s is the *simultaneous calling of two birds apparently as a threat call.*
The *cherp* call displays more refined melodic notes than the other calls.

The cherp call

This is the least common of the three adult calls given in Fiji. I have heard it only in the total darkness of a cave and then only rarely. It was given by roosting or recently landed birds. The call was a mellow yet fast *cherp, cherp, cherp*, much softer than the *chirrup* call.

The chick's begging call

This call usually starts as a plaintive whisper that develops into a demanding *cheep* and then a loud raspy call. As chicks aged, each stage of this call became louder and harsher. Sometimes the call started suddenly, close to the chick's full volume.

Begging, which accompanies this call, was often triggered by nearby chicks begging, an adult landing nearby, or an echolocating bird passing close by.

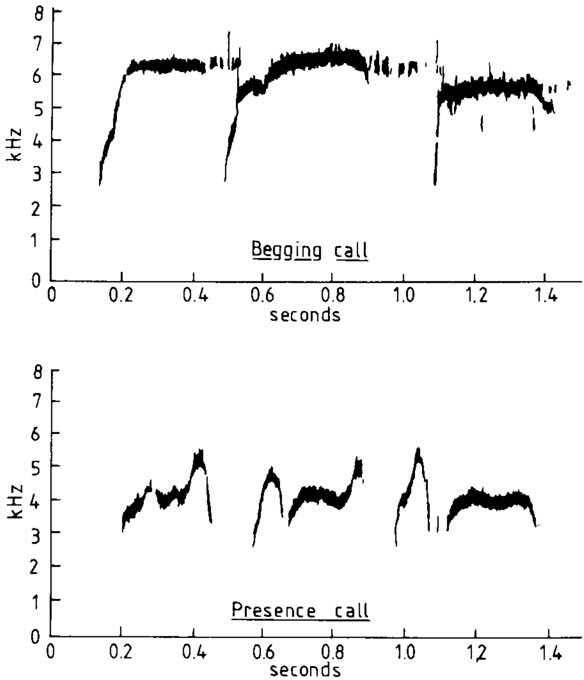

FIGURE 2— Sonagrams of chick calls
The begging call is more highly pitched and less melodic than the presence call.

The chick's presence call

This call is a single soft *cheep, chip* or *peep* that I noticed sometimes when the cave was quiet. What function it has, I do not know. The pattern on the sonagram shows its similarity to the *cherp* call of adults, and so it may be a subsong for that call.

DISCUSSION

Echolocatory click call

The echolocatory *click* call, called the *rattle call* by Medway (1959, 1962a,b, 1966, 1967) and Medway & Wells (1969), has been proposed as the basis for separating swiftlets with the call into the genus *Aerodramus* Oberholser (Medway & Pye 1977).

With these calls, White-rumped Swiftlets are able to detect rods down to 6.3 mm diameter (Griffin & Thompson 1982) but between 10 mm and 20 mm by Smyth & Roberts (1983). These authors agree that the *click call* is not sensitive enough to be used for nocturnal feeding because most swiftlet prey is too small to be detected with the low frequency of this call. The advantage of low-frequency calls is that they do not attenuate as quickly as high-frequency calls (Pye 1983). These findings do not mean that swiftlets cannot feed at all at night. The Indian Edible-nest Swiftlet *Aerodramus unicolor* (Kershaw *in* Ali & Ripley 1970) and the White-rumped Swiftlet (Tarburton 1987) have been observed feeding around lights at night. The Alpine Swift *Apus melba* (Freeman 1981) and the Chimney Swift *Chaetura pelagica* (Cottam 1932) also feed around lights at night, indicating that echolocation is not essential for night feeding. However, both authors indicated that the swifts were migrating, not nesting, when observed feeding nocturnally.

Being able to echolocate in the dark, White-rumped Swiftlets not only can nest in relatively safe sites but also can feed in rich feeding areas far from their nests during dawn and dusk, the times when aerial insects are the most abundant (Medway 1967, Hespenheide 1975, Tarburton 1986). While the latter function has been doubted (Fenton 1975) I have observed White-rumped Swiftlets feeding actively until last light 20 km from their roosting caves in Fiji. I have also recorded birds coming into Fijian caves as late as 2230 hours. That most of the birds had left the caves by 0430 hours that morning means that their echolocating ability allows them to make the most of the tropical day. Common Swifts cannot reach their nests or chicks if they arrive at the nest site a few minutes after dark (Lack 1956). Being able to echolocate, the White-rumped Swiftlets do not have this problem.

The echolocatory call is sometimes given by adults feeding in bright light and so may have another function as well as navigation. I have not heard lone feeding birds use it, but I have heard it soon after one feeding bird started to chase another. The call may therefore have a communication function. Even I could detect differences between the calls of birds in the quietness of Dry Cave, and so identification of individuals may be one function. Mercer (1966), Watling (1982) and Clunie (1984) apparently confused the chirrup call with the click call in describing a high-pitched twittering commonly used for echolocation in caves.

The *click* call is a double click similar to that of *A.s. terraereginae* in coastal Queensland (Roberts *et al.* 1976, Smyth & Roberts 1983). It has a pulse at each end of the *click* and so it sounds *cli-ik*, but the click is so fast that the two pulses are barely perceptible. The syringeal procedure for making this double click has been determined (Suthers & Hector 1982). In effect, the birds transform a longer squeak-like vocalisation into two brief clicks by momentarily closing the syrinx in the centre of the call. The call is not a clicking of the mandibles. Suthers & Hector suggested that, by generating these brief clicks, the swiftlets increase the bandwidth of their sonal signal. This bandwidth, having abrupt rise-decay times, should improve the birds' determination of target distance, which is based on measuring the pulse-echo interval.

Swiftlets using paired clicks, 20 ms or so apart, not only have better information on target distance but also have better knowledge of target velocity because, when the clicks are reflected, both the pitch and the time interval between the clicks are changed by the doppler shift (Pye 1983). This should enable the birds to avoid other birds or bats that might be flying in the same air space.

As a result of this call, the swiftlets of Fiji and Chillagoe have protected most of their nests and roost sites from predators by placing them in areas of total darkness.

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SHORT NOTES

A Study of Cattle Egret Numbers in the Horowhenua

Before our study began in 1983, Cattle Egrets (*Bubulcus ibis*) had visited the Horowhenua district only in very small numbers. E.B. Jones (1964) recorded the first birds – five in 1964 on fields at the southern end of Lake Horowhenua, a lake of about 400 ha lying immediately west of Levin. The fields at the southern end have remained the egrets' favourite site ever since. After 1964, E.B. Jones (1972, 1973, 1974, 1976) recorded one in 1966, up to five in 1973, and one in 1976. For the years leading up to 1980, Heather (1982) summarised records of 2-5 birds. An unexpected 12 birds on 1 December 1980 were presumably on passage and did not stay. Only a couple of birds visited our area in 1981 and 1982 (Powlesland 1982, Heather 1983).

Here we record our observations of Cattle Egrets at Lake Horowhenua from June 1983 to early 1987. Figure 1 shows the monthly maximum counts from at least weekly (and often daily) visits (over 200 in all) to the places regularly frequented by Cattle Egrets in late autumn, winter and spring, and less frequent visits in the summer and early autumn, when the egrets were generally absent. The trends shown support the trends shown nationally over these years.

On 11 June 1983, a flock of ten Cattle Egrets was seen flying over Arawhata Road at the southern end of Lake Horowhenua. These birds settled in trees on the eastern side of the road. By 16 June, this group had increased to 12, and they were feeding among dairy cows. We were able to approach within 50 m of them in a car (compared with 100 m on foot) and watch them taking flies off stems of grass and pulling worms out of the ground. By September some of the birds were showing colour and by 12 November seven were in full breeding plumage. On 17 November, only five birds remained, and by 22 November all had gone, presumably for Australia.

On 27 April 1984, four Cattle Egrets had arrived back in the Arawhata Road area. By 10 May there were 10 birds; 12 days later there were 42. On 19 June 64 were present, including a colour-dyed bird that had earlier been found exhausted at Te Horo, 10 km south of Lake Horowhenua. This bird had been banded as a chick at Lawrence, New South Wales, Australia, on