

The places where cassowaries spend the night are fairly easy to find. They leave a slight depression where the sternum rested and often the impressions of the tarsi are apparent. Usually two or more droppings are present where the bird defecated during the night. The birds rarely return to the same place to sleep. However, on Mt. Missim I did find one spot where apparently a bird (or birds) slept repeatedly.

Also, on Mt. Missim a place was found where apparently cassowaries dust-bathed. A 1.4 m high excavation in dry soil in the underside of an overhanging bank was found by K. Kristensen who once flushed a cassowary from this "cave".

In mid-October at Haia, villagers showed me chicks, roughly one month old, which they had caught. This would suggest the eggs hatched sometime in September.

As the largest native terrestrial vertebrates in PNG cassowaries are heavily hunted for their meat in many regions. Additionally, the feathers and bones of these birds serve a number of utilitarian and decorative functions for many people in PNG. Among some tribes, the cassowary is a valued item in trade or for conferring prestige upon its owner.

Conservation

Beside the dietary and cultural importance of cassowaries, these birds also serve a vital role in PNG's forest ecosystems. Many of the seeds which cassowaries disperse are too large for most other frugivores to move. Preliminary data indicate that seeds that are not dispersed have a very low chance of surviving and in the prolonged absence of cassowaries some species may become extinct.

It is not clear just how vulnerable these birds are to hunters and loss of habitat. We need to learn more of their biology before we can determine how seriously they are threatened. Without information on cassowary biology it will be impossible to formulate viable plans for their conservation.

I plan to collect a great deal more data on behaviour and movements in the future through the use of radio-telemetry. However, it would be extremely useful to learn of any observations members of the PNG Bird Society have of these birds. When do you see chicks or find nests? When do you hear them calling? etc. If anyone has observations I would like to learn of them. I can receive mail at P.O. Box 1261, Goroka, Eastern Highlands Province, PNG, during 1989 - 1992.

Pratt, T.K. 1983. Diet of the Dwarf Cassowary, *Casuarius bennetti picticollis* at Wau, Papua New Guinea. *Emu* 82: 283-285.

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SOFT SONG VOCAL MIMICRY IN THE BROWN ORIOLE *ORIOLUS SZALAYI* OF NEW GUINEA

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Summary

Ten instances are cited of soft song mimicry by the Brown Oriole *Oriolus szalayi* observed within an 8 km radius of Popondetta, Oro Province, PNG. Because of the nature of this mimicry a new term - soft song mimicry (SSM) - is suggested to describe it. Brown Oriole SSM consists of low, scratchy warbles and harsh notes interspersed with identifiable mimicry of several lowland bird species; it is usually followed without pause by a normal, full-volume Brown Oriole advertising song. Whether both sexes perform SSM is not known. All the recorded instances occurred in impoverished environments and some in the presence of the avian models or other loud, penetrating songsters.

It is suggested that the SSM/normal volume advertising song units are an attempt at song diversification, to deter inter- and intra-specific competitors and to maximise the Brown Oriole's fitness in impoverished environments.

Distribution

The Brown Oriole is found in the Western Papuan Islands and all New Guinea lowlands, from sea-level up to 1400 m (Beehler *et al.* 1986). However, congeneric oriole species forming a superspecies with *O. szalayi* are found through the Moluccan Islands, Tenimbar, Wetar, Timor, the Lesser Sundas, New Guinea and Australia.

Unusually for an oriole, though in common with some other Australasian oriole species, *O. szalayi* is rather drably coloured; adults being basically brown with a streaked underside and a dark red bill.

Description of SSM

The vocal mimicry of the Brown Oriole as reported here takes the form of scratchy warbles and harsh notes among which may be heard mimicry of the calls of Red-checked Parrot *Geoffroyus geoffroyi*, Spangled Drongo *Dicrurus hottentotus*, Singing Starling *Aplonis cantaroides* and Raggiana Bird of Paradise *Paradisaea raggiana*, also once, incongruously but quite definitely, the song notes of the Northern Fantail *Rhipidura rufiventris*. Particularly in comparison with normal-volume song of the Brown Oriole, these mimicked calls are all given at low absolute volume, but nevertheless they can be heard quite clearly at a distance of c. 80m. This low-volume mimicry is usually followed without pause by a loud, normal-volume, rollicking

advertising song. When followed by such a song (70% of observations) without exception it is the same song which is given. The reason why 30% of examples of low-volume mimicry are not followed by normal-volume advertising song is not known.

Sexes of the Brown Oriole are alike and it is not clear whether both employ low volume vocal mimicry, although on each of two occasions when two Brown Orioles were visible only one bird was performing mimicry.

In referring to secondary song, Van Tyne & Berger (1976) define whisper song as "the quiet inward rendering of the primary song with or without slight variation or additions and with an auditory limit of no more than about twenty yards.". They further define subsong as "the very quiet inward rendering of song which is intrinsically different from the primary song.". Brown Oriole low-volume vocal mimicry does not totally fit either of these definitions. The Brown Oriole mimicry described here, whilst quiet, was clearly audible at 80m and I could not distinguish any Brown Oriole primary song in the low-volume mimicry.

As these low-volume vocalisations were loud in comparison with accepted definitions of normal subsong and whisper song, apparently contained no primary song, and were usually immediately followed by loud, normal-volume advertising song it seems preferable to describe them differently: I propose the term "soft song mimicry" (SSM).

Observations

I first observed SSM by the Brown Oriole on 23 October 1983. All observations were made at three separate localities: i) in Popondetta town; ii) in an area of secondary forest, bushland and gardens, *etc.*, c. 3 km northwest of Popondetta; iii) in the Girua/Haijo logging area c. 8 km due east of Popondetta, in a patch consisting of selectively logged forest, tracks, an unsealed road, food gardens and secondary bush.

Popondetta lies within the tropical coastal New Guinea lowlands at 84 m. It is c. 19 km from the coast and lies on a plain consisting of a mosaic of forest, secondary growth, coarse grassland and cultivation, dissected by a river system dominated by the radial pattern imposed by the slopes of the quiescent Mount Lamington volcano. The forest is advanced secondary and seral forest of various stages and types. Much of the area has been radically altered by human activity *viz.*, plantation, agricultural blocks, logging, urbanisation, *etc.* Development of large-scale cocoa planting in the sixties and of a vast oil palm scheme covering some 10000 hectares in the seventies and eighties (Clapp 1979, 1981) has irreversibly changed large areas.

Despite an average annual rainfall of some 2405 mm (McAlpine 1973) plants in the Popondetta area often undergo some moderate moisture stress, particularly during the drier months.

Table 1. Soft Song Mimicry observed in the Popondetta area 1983/84

Date	1983				1984					
	23/10	18/12	26/12	31/12	01/01	15/01	17/01	19/01	30/06	08/07
Time	about 1600	0710	0650	0850	0710	0800- 0830	1610- 1630	1300	1115	1415
Site	G	P	P	P	P	N	P	P	P	G
SSM with normal song	*	*		*	*	*	*		*	
SSM without normal song			*				*	*		*
Model Present	SS	NO	NO	NO	NO	SD	NO	NO	NO	NO
Other Catalyst present	NO	SD	SD	NO	GST	RB	NO	NO	NO	NO
Species Mimicked										
<i>G.geoffroyi</i>					?			*	*	
<i>R.rufiventris</i>						*				
<i>A.cantoroides</i>	*									
<i>D.hottentotus</i>						*				
<i>P.raggiana</i>		*	*		?					
No of Orioles Present	1	1-2	2	1	1	1	1	1	1	1?

G = Girua/Haijo; P = Popondetta; N = 3 km north of Popondetta

SS = Singing Starling; SD = Spangled Drongo; GST = Grey Shrike Thrush; RB = Raggiana Bird of Paradise.

The full list of observations is summarised in Table 1, but as SSM by the Brown Oriole has not been previously reported in the literature it is worthwhile detailing some of the more interesting examples.

18 December 1983: At 07:10 in Popondetta, in a tall *Casuarina equisetifolia*, I saw a single Brown Oriole. Six or 7 m away in the same tree were four Spangled Drongos *Dicrurus hottentotus*. The oriole was uttering unusual noises in a low tone, but these

were clearly audible from c. 70 or 80 m. There were some harsh, unidentifiable sounds, but also several clear imitations of Raggiana Bird of Paradise *Paradisaea raggiana*. From this SSM the Brown Oriole proceeded immediately into a normal-volume Brown Oriole advertising call. This occurred several times and after several minutes a second Brown Oriole flew to a perch near the Spangled Drongos and then flew off again, whereupon the SSM ceased. Whilst present the drongos were calling, interspersing their calls between the Brown Oriole mimicry and song.

26 December 1983: At 06:50 in Popondetta I saw one Brown Oriole (A) in a casuarina and another (B) in the same tree 3 or 4 m distant and higher. A single Spangled Drongo was also in the tree, higher than oriole A and 3 or 4 m distant. Initially oriole A sang normally, then it went into a rasping, high-pitched, soft song, on this occasion not followed by a normal Brown Oriole advertising song (indeed, oriole A did not sing normally for some 10 minutes). None of the soft song could be clearly identified as mimicry except some clearer calls at the end which were mimicry of *P. raggiana*. The soft songs were much quieter than normal Brown Oriole song. The length of the soft song bouts varying between 5 and 15 seconds. Occasionally the Spangled Drongo called, as did oriole B (with a normal Brown Oriole song). Eventually the drongo flew off, but oriole A continued with SSM. Then oriole B departed and shortly afterwards oriole A gave one drawn-out normal Brown Oriole call (not the rollicking advertising song and not at the end of an SSM bout) and then flew off. The SSM was clearly audible from 40 to 50 m distance.

1 January 1984: At 07:10 in Popondetta a Brown Oriole was in a casuarina tree. It was uttering SSM which apparently started when several Grey Shrike-Thrushes *Colluricincla harmonica* came to the casuarina. The SSM consisted of jumbles of harsher notes ending in some clearer notes that could have been mimicry of *P. raggiana* or Red-cheeked Parrot *Geoffroyus geoffroyi*, these being followed immediately by a normal-volume advertising song.

15 January 1984: Between 08:00 and 08:30, 3 km NW of Popondetta, in a large spreading tree, a Brown Oriole uttered SSM and obviously mimicked a Spangled Drongo with the latter's harsh and varied calls. Sometimes the oriole ended the SSM by immediately giving a loud normal advertising song, but sometimes the mimicry ended without this. The SSM was always much quieter than the normal song. In the immediate vicinity, indeed at times in the same tree, both *D. hottentotus* and *P. raggiana* were present. At one stage the Brown Oriole was giving SSM in bursts while at least one Spangled Drongo was simultaneously calling at intervals - possibly an example of interspecific countersong through mimicry.

30 June 1984: A single Brown Oriole was seen and heard giving SSM at 11:15. The SSM appeared to be distinctly louder than on other occasions - yet still well below the volume of normal Brown Oriole song. The only calls recognisable in the SSM were

those of the Red-cheeked Parrot.

Discussion

These are the first recorded instances of vocal mimicry by the Brown Oriole outside of its relationship with the Helmeted Friarbird *Philemon buceroides* (Peckover & Filewood 1976; Diamond 1982; Clapp 1982a, 1986) although the Brown Oriole does apparently practice SSM in the Port Moresby area (B.W. Finch, pers. comm.).

The closely related Olive-backed Oriole *Oriolus sagittatus* of Australia and southern New Guinea, has a subsong which includes mimicry interspersed with scratchy warbles (Pizzey & Doyle 1980). Several members of the Oriolidae are listed by Baylis (1982) as performing interspecific vocal imitation (mimicry). Peckover & Filewood (1976), in discussing the interspecific visual mimicry of *P. buceroides* by *O. szalayi*, say: "this mimicry extends to the calls, for both species have many vocalisations in common." I consider that too sweeping a statement but agree that some apparent vocal mimicry of *P. buceroides* by *O. szalayi* does occur.

Brown Oriole SSM does not conform to the normally accepted description of mimicry in subsong (Van Tyne & Berger 1976) and has the unusual feature of being completely unitary with normal full-volume advertising song in 70% of my observations. On balance, the occurrence of Brown Oriole SSM and the presence either of a model species or of one with a loud song, seems connected. The presence of another Brown Oriole also seems to be a stimulus for SSM.

All 10 observed instances of Brown Oriole SSM occurred in secondary, suburban or severely disturbed habitats and this may be significant.

The Brown Oriole is cryptically coloured - basically brown, with grey, black and white and much streaking. In the field the overall impression is that of a brown bird. Despite its normally loud song and calls it can be difficult to locate in the thick, sun-dappled, tropical forest canopy. Those calls mimicked by the Brown Oriole in SSM are, when uttered by the models, loud, far-carrying or otherwise conspicuous calls, except for that of *Rhipidura rufiventris*. In this way Brown Oriole SSM apparently conforms with a great deal of mimicry in true subsong (Baylis 1982).

The alternation of SSM and warbles with full-volume Brown Oriole advertising song may be "information coding" as discussed by Baylis (1982).

The primary message in the mimicry may be to let competitors (both inter- and intra-specific) know that the mimicking individual is present. The normal full-volume Brown Oriole song following the SSM would serve to inform the models and other

orioles that the mimic is really a Brown Oriole and thus reduce aggression. Only the loud, rollicking advertising song is used in a unitary fashion to end SSM, and this suggests that the SSM has an advertising role.

There does appear to be some interaction with the models. On several occasions the models were present during SSM and on others, birds were present which were mimicked by the Brown Oriole at other times. Sometimes the Spangled Drongo called at the same time as the Brown Oriole was performing SSM of its calls. However I saw no overt aggression at all between mimics and models or other species.

I never observed SSM during feeding. Nor was SSM encountered during more than 42 hours observation of breeding orioles (Clapp 1982a, 1986). It is interesting to note that Brown Orioles would never encounter Raggiana Birds of Paradise in Popondetta, and Spangled Drogos only very irregularly, although both of these species are present in the forest just a few kilometres away. The inclusion of the calls of these birds in the mimicry repertoires of Brown Orioles in Popondetta suggests that orioles I observed, and which have also bred in town spend a good deal of their time in adjacent forest and secondary habitats possibly feeding on fruit, little of which would be available in the town.

I believe that the SSM I observed was not due to chance resemblances to vocalisations of the supposed models. In particular the number of instances of SSM of the Red-cheeked Parrot would preclude chance. It is also apparent that Brown Oriole SSM is not a developmental stage in song learning. No Brown Oriole primary song was discernible in the SSM and the Brown Oriole advertising song was used competently and loudly by the mimic in every instance except one, when it was absent altogether.

There appears to be more than one receiver class i.e. other Brown Orioles constitute one receiver class and the various interspecific models constitute another. This possibly reflects the same message being given to two different classes of competitors in two different ways, interspecific communications through SSM and intraspecific communication through the normal advertising song which follows.

Despite residence in PNG from 1970 to 1984, I never noticed Brown Oriole SSM before 1983. All my observations of SSM took place in impoverished environments, where it may be vital for male Brown Orioles to maximise their hold over territory and hence over females, food and nesting sites (Clapp 1982b), all three of which are liable to be in short supply in relatively poor environments. Possibly the SSM/normal advertising song unit is an attempt to protect resources in an impoverished environment. Neither insects nor fruit are so plentiful in depauperate environments such as towns and this particularly applies to fruit of the sort eaten by Brown Orioles. This may be a dynamic situation reflecting the increasing degradation of the environment in the

vicinity of Popondetta and, in the Oro Province at least, SSM may indeed not have occurred much before then.

Brown Orioles tend to perch in one place for lengthy periods and to sing the same songs repeatedly at frequent intervals for long periods (pers. obs.; Peckover & Filewood 1976). Conceivably other Brown Orioles and other species may become habituated to the oriole's monotonous singing and thus tend to ignore its message. Cryptic in colouration, Brown Orioles tend to be "invisible" or low profile in their environment for much of the time. It might well be advantageous to a Brown Oriole to be able to diversify its song to make it more conspicuous to certain competitors or potential mates.

I therefore conclude tentatively the Brown Oriole SSM/full volume advertising song unit is a means of song diversification in order to maximise oriole fitness in impoverished environments.

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