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FORKTAIL

urnal of the Oriental Bird Club No. 1

The Oriental Bird Club has been established for ornithologists throughout the world, both amateur and professional, who share a common interest in the region's birds and wish to assist in their conservation.

The Club aims to:

- Encourage an interest in the birds of the Oriental Region and their conservation
- Liaise with, and promote the work of, existing regional societies
- Collate and publish material on Oriental birds

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Cover photograph: captive male Gurney's Pitta *Pitta gurneyi*, Bangkok, 1985, by P. D. Round.

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The scope of *Forktail*

Forktail is intended to be an annual journal. However, the Oriental Bird Club's first subscription year was 1985, so this issue is for those who joined then rather than in 1986. Apologies for absence are therefore in order, but, as members will appreciate, some critical obstacles stand in the path of producing a journal the year a society starts up. Agreement must be reached on the type of journal to be issued; an accumulation of subscriptions is needed to pay for it; an accumulation of texts is needed to fill it; the procedures for editorial management must be established; and a printer has to be found. With all these now achieved, there are good grounds for hoping that *Forktail* 2 can appear before the end of 1986, and so discharge the club's immediate obligations to its membership. Thereafter it is proposed that *Forktail* should appear each June or July, with a deadline on submissions of the previous 1 March.

The object of the Oriental Bird Club is 'to promote an interest in Oriental birds and their conservation for the benefit of the public', and to this end the Club undertakes, among other things, to 'collate and make available for public use material on Oriental birds and publish a journal by the name of *The Forktail*'. Clearly this constitutional formulation allows the widest range of subjects for both the Club and *Forktail* to address, with only the provision of a concern for conservation serving as some indication of a priority to observe. I certainly regard it as essential that *Forktail* should be a medium for as broad a spectrum of interests as possible, and not develop into a 'specialist' journal that specialists in other fields can afford to ignore. It should not become (or be thought to have become) a field identification journal, a distributional journal, a taxonomic journal, an academic journal, an 'expatriate' journal, or whatever: it must be all of these things, and more. The contents of the first few issues are intended to manifest this commitment to the diversity of ornithological interests and activities in the Oriental region; and to counteract the biases that result through chance from the routine submission of material, it has been editorial policy to solicit contributions that will improve the journal's overall representativeness. It is to be hoped that, in the course of the next few years, *Forktail*'s reputation will be sufficiently confirmed for the practice of active solicitation of text to become almost redundant.

There are, however, certain factors that constrain the subject-matter of the journal. The first, as noted, is the constitutional commitment to the promotion of interest in the conservation of Oriental birds (something which I both personally and professionally welcome). This does not make *Forktail* a conservation journal, but it means that a proportion of papers will always have some clear bearing on conservation issues. There is good sense here: the less bird conservation there is in the Orient, the fewer birds there will ultimately be for the public to enjoy and study.

The second constraint is the will of the membership, difficult though this may be to gauge (Annual General Meetings are the obvious forum). It is clearly of practical value that the journal should take some account of the feelings and opinions of those who finance it, however the constitutional requirements may be construed. A set of

highly specialized papers from a wide variety of disciplines would scarcely be in the spirit of the Club's aims and ambitions. It is clear that the main thrust in the Club's formation came from an increasing body of active amateur birdwatchers with a deep interest in pursuing their hobby in Asia. This journal exists because of them: it must, to some extent, repay them with material that reflects their activities. At any rate, papers with a very obvious minority interest, and without obvious broader implications for ornithology, are unlikely to be acceptable to *Forktail*, even if technically eligible.

The third constraint on material concerns documentation that might more appropriately be published elsewhere. Ever since the first moves towards forming the Oriental Bird Club, those involved in it have repeatedly stressed their desire to co-operate and not compete with other ornithological and general natural history societies. A vacant niche existed which the Club has occupied, but it was a generalist's niche, and generalists always partially intrude across a range of more specialist niches. Authors of papers naturally have the right to choose the journal they wish to publish in, and it seems possible that *Forktail* will attract some material away from pre-existing national and local journals. However, it is Club policy not to publish first records of bird species in a country without seeking the permission of the relevant national society, and to urge submission of such records to national journals when it is known (as in the case of the *Journal of the Bombay Natural History Society* for India and *Kukila* for Indonesia) that they are in principle committed to publishing them. In certain other circumstances, where it is felt appropriate, prospective authors in *Forktail* may be advised to offer first refusal of their papers elsewhere, such advice being part of the less specific Club policy to work as much as possible in ways that complement and support the activities of national and local societies.

Certain authors understandably prefer to seek publication in 'refereed' journals. In the debate over whether *Forktail* should be such a journal, the view prevailed that, since the referee system evolved to help assess papers treating subjects outside the sphere of an editor's competence, and since the preponderance of submissions to *Forktail* was expected to concern non-specialist (or at least non-statistical) material, an Editorial Committee to review all submissions was preferable, with referees to be used only where expert guidance was required. *Forktail* is thus not a fully refereed journal, but the knowledge and scrupulousness of my colleagues on the present committee make it the equivalent of one, and I should regret it if papers were offered elsewhere because our formal standards are judged to be insufficient.

To the members of the Editorial Committee – P. M. Cocker, R. F. Grimmett, T. P. Inskipp, R. P. Martins, N. J. Redman – I offer my best thanks for their dedicated assistance, and I thank too, the two referees consulted in this issue – D. R. Wells and E. O. Willis – for their prompt and willing labour. I must also acknowledge here the early role of T. M. Reed, whom I succeeded as editor in December 1985. Even the authors deserve a vote of gratitude, for their willingness to support an unknown venture, and for their patience while the venture moved slowly from concept to fulfilment. I should record my appreciation of the Royal Society for the Protection of Birds, whose postal address the Club uses, and of the International Council for Bird Preservation and its director, Ch. Imboden, for the

free use of the many office facilities in the course of my (I should stress spare-time) editorial work for *Forktail*. For her tolerance of my use of that 'spare time' I must pay tribute to my wife, Alison. Finally, I thank P. Creed of Pisces Publications for his expert and patient guidance in bringing the journal out.

1 August 1986 N. J. Collar

FORKTAIL 1 (1986): 7–13

Supplementary notes on some birds of Lore Lindu Reserve, Central Sulawesi

ARNOUD B. VAN DEN BERG and CECILIA A. W. BOSMAN

From a sound-recording expedition to Lore Lindu Reserve, Central Sulawesi, Indonesia, in July-August 1984, notes are provided on the occurrence, altitudinal distribution, nesting season and/or vocalisations of 34 bird species where data are at variance with or additional to previous work. Two species, *Falco peregrinus* and *F. severus*, were new to the area. The occurrence of *Serinus estherae* on Mt. Rorekatimbu was confirmed, and its plumage found to differ from other populations. *Hieraaetus kienerii, Eurostopodus macrotis, Picoides temminckii, Ficedula westermanni, Eumyias panayensis* and *Myzomela sanguinolenta* were more widespread in altitudinal range, or more obviously abundant, than previously reported. Descriptions of vocalisations are given for 19 species. Nesting season data are given for nine species.

In July and August 1984, in Central Sulawesi (formerly Celebes), Indonesia, at Lore Lindu Reserve and its environs (c. 1°15′–1°30′S 119°50′–120°20′E), south-east of the provincial capital Palu, we made sound-recordings of 97 bird species for the collection of the Library of Natural Sounds (LNS), Laboratory of Ornithology, Cornell University, Ithaca, New York, USA. This paper presents a selection of our ornithological notes on occurrence, altitudinal distribution, nesting season and vocal behaviour, and is intended as a supplement to Watling (1983), to which one should refer for more information on the Lore Lindu Reserve and its avifauna, and which is followed in taxonomy, nomenclature, and delineation and classification (with capital first letters) of vegetation zones.

The notes are from the following localities (see Figure): *lower Palu river valley* (=LP), 0–200 m, secondary vegetation and agricultural fields at Palu and Lowland Rain Forest at Saluki (200 m); *upper Palu river valley* (=UP), 300–1,000 m, Lowland Rain Forest at Sidaonta along metalled road up from Saluwa (300 m) and along c. 4 km of footpath up to Lake Lindu; *Lake Lindu* (=LL), 960–1,000 m, secondary vegetation bordering rainforest at Tomado and Anca, along the shore of the 3,000 ha lake (see also Klapste 1982b); *lower Sopu river valley* (=LS), 650–850 m, Lowland Rain Forest and secondary vegetation at agricultural land, along c. 19 km of road and footpaths at confluence of Gumbasa river near Pertigaan Lindu, at Kamarora and at Tongoa (respectively km post 50, 57 and 62); *upper Sopu river valley* (=US), 850–1,800 m, Upper Lowland Rain Forest to Montane Rain Forest, along c. 18 km of the road to Napu, mostly at Dongi-dongi logging camp (km post 75, 990 m) and at pass south of Mt. Rorekatimbu (km post 89, 1,800 m); *Mt. Rorekatimbu* (=MR), 1,800–2,610 m, Upper Montane Rain and Moss Forest, along c. 9 km path to Anaso logging camp.

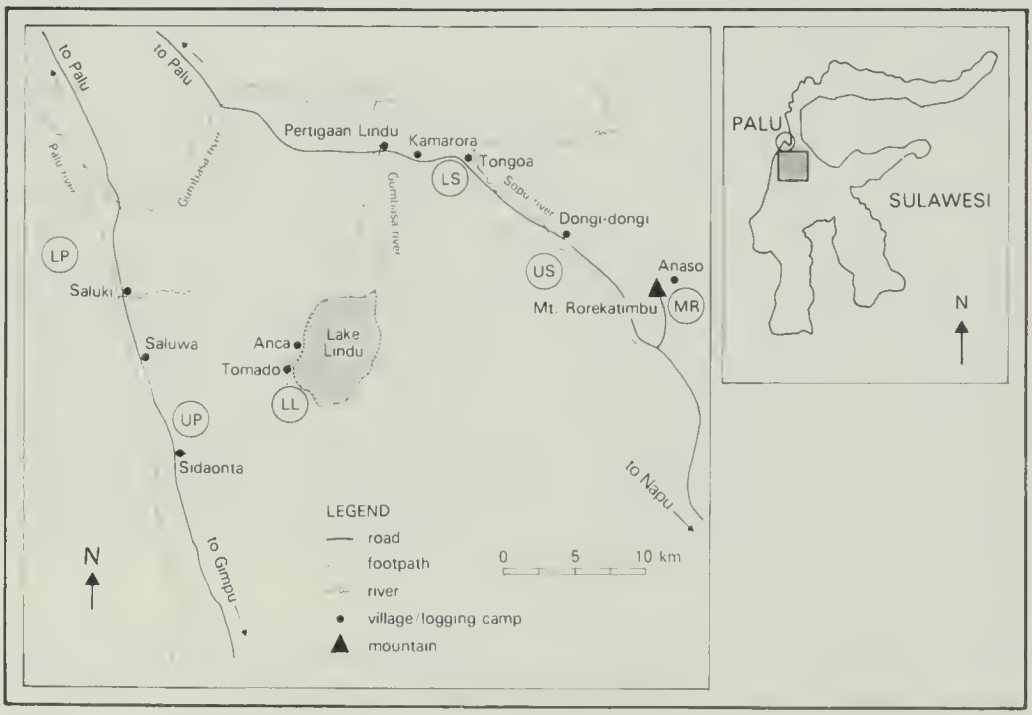
JERDON'S BAZA *Aviceda jerdoni* On 1 August, a few kilometres beyond Tongoa, and on 5 and 27 August, near Saluwa, pairs were seen in and above roadside forest.

In flight, probably both birds were calling, one at a higher pitch than the other, every 2 s a downward 'peeew' of 0.5 s duration. A recording presumably of this species was made at the first location (LNS 32933). This raptor was not noted by Watling (1983) but was mentioned for the area by Riley (1924).

SULAWESI HAWK-EAGLE *Spizaetus lanceolatus* This hawk-eagle was seen or heard on many days especially in Sopu river valley where it was even perching on buildings at the forest edge. The most commonly heard call was a continuous series of four to ten 0.5 s 'kluuu' notes, each note slightly lower in pitch, and each successive series on a slightly higher scale than the previous one. There was a 0.5 s pause between each series, preceded by a higher, rather more disyllabic starting note with a distinct upward inflection (LNS 32747, 32751). A slightly different call was also recorded: a fast series of c. 45 'kee' notes delivered over 9 s, only slightly varying in pitch and each note of 0.2 s duration, usually uttered when the bird was circling several kilometres up in the sky (LNS 32764). The song of perched birds consisted of series of 55 'kee' calls in 10 s up to 77 'kee' calls in 12 s with an upward inflection after one-third, and a downward deflection after two-thirds of each series (LNS 32900, 33008). On 28 July, at upper Sopu river valley, one such bird was observed while singing from a horizontal branch in the canopy of a tree above the river (LNS 32900). It called with bill wide open, and during the pauses between each series of calls it preened its feathers.

BLACK KITE *Milvus migrans* While Watling noted this species as common for Lake Lindu, we, surprisingly, did not find any kite other than the common Brahminy Kite *Haliastur indus*, in August.

Figure. Lore Lindu Reserve and its environs,Central Sulawesi, Indonesia, showing locations mentioned in the text.



BRAHMINY KITE *Haliastur indus* This kite showed a large altitudinal range, being present even at 2,400 m circling over Moss Forest near the top of Mt. Rorekatimbu.

LESSER FISH-EAGLE *Ichthyophaga humilis* On 8–11 August, at Lake Lindu, mostly at dawn and dusk, but also in late morning between 10h00 and 12h00, the song was heard and sound-recorded (LNS 32953, 32958, 32968, 32971). Three birds in immature plumage were seen daily at the lake. On 21 and 22 August, the song was also heard at Kamarora and Pertigaan Lindu on agricultural land near small rivers (LNS 33020). The song was a loud and far-carrying sequence of seven to 11 disyllabic 'kahAW' calls delivered over 6 to 10 s respectively, abruptly shortening at the end.

SPOT-TAILED GOSHAWK *Accipiter trinotatus* Sound-recorded on 16 August at Pertigaan Lindu, and on 28 August at Sidaonta (LNS 33013, 33089; identified by F. Rozendaal). It uttered five rhythmic 'ke' notes in nearly 2 s, each successive note slightly lower in pitch than the preceding, and the last notes more slowly delivered. This vocalisation was also described by Heinrich (Stresemann 1940). When calling the bird kept moving through the lower canopy never repeating it twice from the same spot.

RUFOUS-BELLIED EAGLE *Hieraaetus kienerii* While Watling had only four sightings, all below 1,000 m, we found this species to be much commoner, and also at higher altitudes. On 20 August, two birds in display, one (still) in white immature plumage, were observed at 2,400 m on Mt. Rorekatimbu, producing a rising song of five or more syllables.

PEREGRINE FALCON *Falco peregrinus* On 22 August, at Kamarora, a small and dark Peregrine of the subspecies *F. p. ernesti* was seen in a 20 m high tree-top at the forest edge, feeding on a bird. This species had not previously been recorded from Lore Lindu (see Watling 1981).

ORIENTAL HOBBY *Falco severus* In the second half of July, three birds were present at Dongi-dongi. When perched in the highest tree-tops or chasing each other over the forest, these falcons were quite vocal, especially in the morning and evening, giving long series of high, slightly variably pitched, penetrating 'kleee' calls (five per second) (LNS 32771, 32790, 32803, 32810). These calls were also described by Coomans de Ruiter (1947). This species had not previously been recorded from Lore Lindu (see Watling 1981).

MALEO *Macrocephalon maleo* During July and August, birds were absent from the known nesting sites on volcanic thermal soil in Lowland Rain Forest at Kamarora and Saluki. Villagers said that eggs were laid from October onwards, indicating seasonal breeding.

GREEN IMPERIAL PIGEON *Ducula aenea* Apart from the frequently repeated, characteristic, rolling 'birrup', certain other vocalisations were recorded, such as a plain shortish 'hoo' and more disyllabic variable cooings, e.g. 'koo koooo' (inflected downward at the end) and a questioning 'woohoo woo' (with upward inflection in the first syllable) (LNS 32999, 33011, 33012, 33014, 33016, 33050, 33053).

YELLOW-AND-GREEN LORIKEET *Trichoglossus flavoviridis* On 25 July, at 2,400 m in Moss Forest above Anaso, a nesting hole high in a dead tree was found occupied by two birds. This species was very common in Sopu river valley where large noisy flocks were seen moving fast through and foraging in tall flowering *Euphorbia* trees (LNS 32792).

SULAWESI HAWK-CUCKOO *Cuculus crassirostris* On 16 August, at Pertigaan Lindu, and on 22 August, at Kamarora, before or just after dawn, sounds of this species were recorded in secondary growth at the forest edge bordering agricultural fields. Birds were not seen, but the recordings agree with descriptions by Heinrich (Stresemann 1940). At the first locality, at 05h50, the song consisted of three cooing notes with a hardly audible fourth 'kO kO ku (ku)', lasting in total 1 s. The first two notes were rather similar, the third was softer and four semitones lower in pitch, and the fourth even softer and shorter (LNS 33010). At the second location, at 04h15 (before daylight) and 05h50, two different calls, probably of this species, were a two-note cooing, repeated every 8 s, the second note four semi-tones lower in pitch than the first, and a three-note cooing with each following note two semitones lower in pitch (LNS 33043, 33048).

SPECKLED BOOBOOK *Ninox punctulata* On the evening of 19 August, sound-recordings of this endemic owl were made in broken forest at c. 2,000 m along the road to Anaso. Its song consisted of 15 'toy' sounds on a rising scale accelerating slightly towards a kind of climax, after which a lower pitched 'toy' was given, lasting in total 5 s, often immediately followed by one or more repetitions of the five to seven climax 'toy' sounds. After play-back, a rather rhythmic four-note call was given: three 'toy' sounds on a rising scale followed by a high, piercing and vibrating 'seeeet'. This call was usually repeated every 1.2 s (LNS 33022). Descriptions of this species's vocalisations can also be found in Coomans de Ruiter (1950).

GREAT EARED NIGHTJAR *Eurostopodus macrotis* On 30 July, just after dawn, at 1,750 m in the upper Sopu river valley, this large nightjar were seen flying over the forest. Watling mentioned 1,100 m as maximum elevation for this species.

SULAWESI KINGFISHER *Ceyx fallax* On 29 August, on the banks of the Saluki river near the Maleo nesting ground, a pair of this species showed alarm behaviour, suggesting the presence of a nesting site. The call was typical for the genus, a thin 'seeee' repeated every 3 to 5 s (LNS 33100).

GREEN WOOD-KINGFISHER *Halcyon (Actenoides) monachus* On 29 August, at Saluki, long mournful calls of this species, repeated about every 6 s, were recorded at 05h30 (dawn) (identified by F. Rozendaal). The 'huuuuwEEEEu' call, also given after play-back, was of 2 s duration, starting with a slowly rising 1.5 s 'huuuu', immediately followed, with a catch in the voice, by a mournful, higher pitched 'wEEEEu' (0.5 s), and ending with a shortish subdued lower note (LNS 33099). The bird was present in forest near a palm grove bordering the Saluki river.

SACRED KINGFISHER *Halcyon sancta* On 19 July, one individual of this southern migrant was present in the centre of Palu. This species was not seen by Watling, although previously recorded from the Palu valley (Escott and Holmes 1980).

BLUE-TAILED BEE-EATER *Merops philippinus* On 9 and 10 August, at Anca, a family of two adults and a juvenile bird were seen on a bamboo in an open field, possibly indicating a breeding period in June-July (LNS 32950, 32952, 32963).

PURPLE-BEARDED BEE-EATER *Meropogon forsteni* On six occasions, above Sidaonta, in the lower and upper Sopu river valleys and above Anaso (at 2,300 m), pairs of this species were observed in the mid-height of forest near earth banks of excavated hill-side forest-trails or in steep ravines near roads (e.g. at km post 72 before Dongi-dongi). On 27 July and 20 August, at Anaso, sound-recordings were made of the species's queer, frequently given call (one per 2 s), a peculiarly loud, penetrating and high-pitched 'wheep' (LNS 32878, 32880, 33025). When calling, the birds sat inconspicuously on horizontal branches while constantly wagging the tail slowly up and down. Regularly, large insects were caught in short flights, and beaten to death on a thick branch before being swallowed. On 11 August, above Sidaonta, a nesting hole was apparently being excavated in a bank at a height of 1 m just beside the footpath to Lake Lindu. For more information on this species, see Klapste (1982a).

PURPLE-WINGED ROLLER *Coracias temminckii* Seen at somewhat higher elevations than by Watling, e.g. above Dongi-dongi at 1,000 m (LNS 32809).

SULAWESI WOODPECKER *Picoides temminckii* Watling regarded this species as relatively uncommon and observed it only above 900 m. However, after becoming familiar with its call, we found it a common tree-top species at all elevations down to 300 m near Saluwa. Its call was a sharp trill lasting 1 s, slightly inflected downward halfway, given at long irregular intervals (LNS 32858, 33065). A description of this sound was also given by Coomans de Ruiter and Maurenbrecher (1948) who observed this species at sea-level in southern Sulawesi.

GREY WAGTAIL *Motacilla cinerea* On 21 August, in upper Sopu river valley, one individual was seen and sound-recorded (LNS 33035). This date is three to four weeks earlier than the first arrival date given by Watling for this northern migrant.

PYGMY CUCKOO-SHRIKE *Coracina abbotti* This species appeared to be rather common on Mt. Rorekatimbu. It was quite vocal and generally seen in groups of about five birds (*contra* Watling). The calls were thin, piercing, high-pitched and pure-toned (LNS 32821, 32883). The song, recorded from a solitary bird, started with two hardly audible notes followed by a faster four-note warble lasting 1 s, of similar thin and piercing quality as the calls, though a little lower pitched (LNS 32889). Sharp, high 'tseet' flight-calls were also noted.

MOUNTAIN TAILORBIRD *Orthotomus cuculatus* On 30 July, in upper Sopu river valley, two adults of this species were feeding two juveniles (LNS 32906).

LITTLE PIED FLYCATCHER *Ficedula westermanni* Owing to its characteristic song, this species was noted as common between 1,300 and 2,400 m elevation, most often in the canopy (*contra* Watling). On 25 July, two adults with two apparently recently fledged juveniles were seen in the understorey of Moss Forest (LNS 32820). On 20 August, a male calling in alarm with food in its beak was observed near the top of Mt. Rorekatimbu above Anaso. The commonest song was a 'tee-

dEE–turr-dUrr' lasting 1 s with a typical hesitant pause between the two disyllables (LNS 32800, 32893, 33040). Also a more complicated song lasting 2 s was recorded, in which similar 'tee-dEE' notes were followed by a warble of six to eight notes (LNS 32907). On play-back, the latter song provoked a much stronger approach reaction than the former.

BLUE-FRONTED FLYCATCHER *Cyornis hoevelli* The fine song of this Upper Montane and Moss Forest species was of 4–5 s duration, given from the lower storeys of forest and mainly heard in the morning and evening twilight. It started with a soft, short note followed by a rich and loud thrush-like sequence of c. 20 notes, closely matched in pitch (LNS 32822, 32824, 32879, 32887, 33032). On 28 July, on Mt. Rorekatimbu, a bird was seen in juvenile plumage, with black fringes to the body feathers giving it a scalloped appearance.

ISLAND FLYCATCHER *Eumyias panayensis* In forest and at forest edge above 1,000 m, this species appeared to be very common (*contra* Watling). It was seen in both lower storey and canopy, and was often present in mixed-species bird-flocks. The song, a clear rather monotonous warble lasting c. 5 s, consisted of a fast series of c. 20 notes, of a more liquid quality towards the end, reminiscent of Black-fronted White-eye *Zosterops atrifrons* (LNS 32782, 32797, 32913).

CITRINE FLYCATCHER *Culicicapa helianthea* The song of this species was always a combination of four or five loud, clear notes at different pitch, given in a variable order, lasting 1–1.5 s (LNS 32788, 32802, 32807, 32825, 32835). On 21 July, at Dongi-dongi, two adults were feeding two juveniles.

STREAK-HEADED WHITE-EYE *Lophozosterops squamiceps* Apparently partly frugivorous, as several birds on Mt. Rorekatimbu were seen eating berries.

SCARLET MYZOMELA *Myzomela sanguinolenta* A common and vocal species between 1,000 and 2,400 m, seen daily on Mt. Rorekatimbu in secondary growth and canopy. Among a variety of calls were: a loud and clear 'peeeew' repeated every 2 or 2.5 s, given while moving through the canopy (LNS 32847, 33024, 33036); a sharp disyllabic call 'treeu trEE', higher pitched in the second syllable, given every 10 s while perched in a tree-top (LNS 33031); a fast and liquid trisyllabic 'tuwEEdu' call lasting 0.5 s repeated every 2 or 3 s while foraging in *Loranthus* (LNS 32896); and a fast, shortish, thin and high-pitched warble delivered while perched on the bare branch of a tree-top (LNS 32895).

STREAKED HONEYEATER *Myza sarasinorum* This common montane species had a wide variety of calls, such as long series of short, sharp 'kep' notes, much resembling nervous scoldings of squirrels though less penetrating, endlessly repeated two (LNS 32828) to four times per second (LNS 32849, 32861, 32884, 33029); also a combination of three to five wheezy high-pitched notes in less than a second, usually given at long, irregular intervals by birds foraging in *Loranthus* (LNS 32847, 32881).

INDONESIAN SERIN *Serinus estherae* On 26 July, 16h00, at 2,400 m on Mt. Rorekatimbu, 'chip' contact-calls of two birds foraging in small tree-tops were sound-recorded (LNS 32848). Until recently, this species was only known from

highlands in Java and Sumatra (Indonesia) and Mindanao (Philippines). In August 1980, it was discovered on Mt. Rantekombola, south-western Sulawesi, in open habitat above 2,000 m (Schuchmann and Wolters 1982). In Central Sulawesi, Watling observed this species in Upper Montane Rain Forest at Rano Rano, Lore Lindu, in March 1981. As early as April 1979, he had a probable sighting on Mt. Rorekatimbu. Unfortunately, he did not give any details of plumage. Our birds, however, were distinctly different from those described by Schuchmann and Wolters, showing orange-red forehead and orange-red rump and uppertail-coverts, instead of yellow.

SULAWESI MYNA *Basilornis celebensis* On a few occasions, solitary immature birds were found associating with large flocks of Flame-browed Myna *Enodes erythrophris* feeding on berries in tree-tops (LNS 32912).

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New information on the 'Brown-streaked' Flycatcher *Muscicapa latirostris williamsoni*

D. R. WELLS, P. D. ROUND and J. SCHARRINGA

Breeding of the Asian Brown Flycatcher *Muscicapa latirostris williamsoni* is recorded from peninsular Thailand, confounding speculation that this race was a migrant from north of its known range. However, the breeders observed may not represent a migratory population. The species appears to prefer evergreen conditions, but part of each breeding territory of *williamsoni* was in open habitat, birds commonly feeding at the forest/clearing interface (where two nests were found). Breeding appeared over by July, clutch-size not larger than two, and multi-broodedness to occur. Juveniles resemble those of other flycatchers; adults in new and old plumages are strikingly different.

An inclusive interpretation of the taxonomic limits of the Asian Brown Flycatcher *Muscicapa latirostris* allows the suggestion that its widespread but rather uniform Palearctic migrant population emerged late in the history of a species that may formerly have been mainly Oriental in distribution (Wells 1982). Pockets of breeders have long been known in the uplands of India (Ali and Ripley 1972), and sparse records between southern China and Indonesia of birds of more varied morphology indicate the existence of a perhaps more ancient, South-East Asian breeding range. We speculate that this may still be widely populated and one of us (D.R.W.) has for some time been assembling the evidence. Recent discoveries include distinctive, additional populations in north-west Thailand and Sabah, with evidence of breeding from both areas (Wells 1982, Wells and Francis 1984).

This paper fills out another piece of the map but there are still large areas of the region that, on present understanding, could hold breeding Asian Brown Flycatchers where none has yet been found. Their inconspicuousness and the hitherto inadequate knowledge of their preferred habitats may well be factors in this lack of records and we draw attention in particular to the possible presence of further indigenous populations on the Greater and nearer Lesser Sunda islands. These lie within or marginal to the known winter range of migrants; thus, short of actual breeding records, it will be necessary to establish presence outside the migration season (late July to the end of April) and if possible to collect mensural data. Fairly certainly, the blunt-winged island forms discussed by Wells (1982) are sedentary or make only short seasonal movements – *M. l. randi*, known only in the Philippines, has been taken among other migrants on Luzon (Wells 1977). Continental South-East Asian birds with a wing-tip morphology much as in Palearctic breeders, on the other hand, may be considerable intratropical migrants.

These include, in particular, the 'Brown-streaked' Flycatcher *Muscicapa latirostris williamsoni*, a form described by Deignan (1957) as a separate species but since linked with other continental subspecies of *latirostris* via plumage intergrades (Wells 1977, 1982). Apparently pure *williamsoni* have now been identified from about

latitude 17°20′N in Burma to below the equator, on Siberut island, west of Sumatra (NUSZRC) (see Figure). Deignan implied, without discussion, that *williamsoni* was sedentary but, among a greater number of records gathered since, Wells (1977) noted that all those of northern winter date were from south of latitude 10°N. The rest fell within an eight-week portion of the general autumn passage period, indicative of migration – a conclusion bolstered in peninsular Malaysia by regular seasonal appearances and the actual interception of birds moving at night. This prompted Wells to speculate that *williamsoni* might in reality come from breeding grounds north of its recorded range, and to dismiss isolated instances of post-juvenile moult at Kyeikpadein, Pegu, Burma on 30 July (BMNH) and adult primary and tail moult at Khao Phanom Bencha, Krabi province, Thailand on 3 August (ANSP) as unusual postponements of events normally completed before migration.

Field findings in peninsular Thailand during 12–18 June 1984 (P.D.R. and J.S.) and 26–30 June 1985 (P.D.R. and D.R.W.), reported here, show both considerations to have been premature. The mystery of where *williamsoni* breeds is now at least partly solved by discovery of a minimum nine territories, with proof of nesting in five, at three sites, namely 10°43′N 99°00′E in Tha Sae district, Chumphon province; within 5 km radius of the headquarters of Khao Sok National Park (8°55′N 98°33′E), Surat Thani province; and within 1 km of the headquarters

Figure. Breeding and other locality records of the 'Brown-streaked' Flycatcher *Muscicapa l. williamsoni.*

of the Khao Chong nature centre (7°33'N 99°47'E), north end of Khao Banthad wildlife sanctuary, Trang province. Breeding may, therefore, be presumed to span a minimum ten degrees of latitude of the range as currently mapped. In effect, equivalent semi-evergreen rainforest biotope extends a further one degree south of Khao Chong, over the Malaysian border into Perlis state (*cf.* Collar *et al.*, *Forktail*, this issue), and may be found to be occupied to its terminus.

Status

In 1985, migrant *williamsoni* arrived on schedule in the Kuala Lumpur area of peninsular Malaysia from 24 July. They are of unknown origin, and our findings of 1984–1985 shed no definite light on the latitude at which local breeders cease to be migratory. Hints that those located were south of this limit included repeated impressions of a longer tail than in proven migrants, which could have been due to proportionate shortness of the wing-tip folded against it. No birds were handled but the Krabi specimen mentioned above (ANSP 127964, from a locality midway between Khao Sok and Khao Chong) supplied one additional morphological clue. R. Meyer de Schauensee (*in litt.* to D.R.W., 1976) found its outer (tenth) primary to project 11.5 mm beyond the longest primary covert, which is over three times the value for migratory *williamsoni* and actually a little in excess of any broad-winged island form measured. Such a shape would be expected in a resident, but since this particular specimen was moulting and also badly worn we have no information on the rest of the wing-tip (*cf.* Wells 1977).

Preferred habitat

All the territories found were at low elevation, not above the base of slopes; indeed, apart from passage birds attracted to floodlights on the Malayan mountains, there is only one definite upland record of *williamsoni*. This is of an adult (ANSP 130379) from 1,000 m altitude on Khao Luang, Prachuap Khiri Khan province, at 11°39'N in the Thailand–Burma divide. It is dated 10 August, which is well within the known migration season, and has a typical migrant wing-shape. By contrast, northern Thai and Viet Nam subspecies (e.g., *siamensis*) have not been found in the lowlands. This difference may be determined by an apparent species preference for evergreen to semi-evergreen conditions, at least within the tropics. Such conditions are available down to sea level over relevant latitudes adjacent to the Bay of Bengal but not below 800–1,000 m in areas that experience a longer and more severe dry season.

At least a part of each breeding territory was in open habitat managed by man, either 'parkland' with a ground layer of short herbs or bare soil (much as noted for wintering birds in peninsular Malaysia) or recently fired slash-and-burn farm clearings with most of the soil bare, apart from fallen logs. Clearings reinvaded by appreciable secondary cover were not used, including one at Khao Sok in 1985 that had been occupied when clear in 1984. A freshly burned farm clearing with fallen wood near Sandakan, Sabah, is, incidentally, the site of collection of the only known parent and dependent fledglings of the Borneo subspecies *M. l. umbrosa* (C. M. Francis, postscript to Wells and Francis 1984). These sites were in all cases

surrounded by secondary forest including, at Khao Sok, much bamboo, and it may be guessed that prior to deforestation *williamsoni* would have sought out fresh wind-throw gaps.

Foraging behaviour

Where no trees had been left standing in isolation, the interface between forest and clearing provided most of the perches from which feeding sallies were launched. On many occasions, adults with dependent young, and older fledglings themselves, were also noted using low, charred stumps and fallen wood often fully exposed on open ground. More unexpected behaviour in all parents feeding young was the regular taking of food items from the ground itself. One bird, watched as it tended a brood of nestlings at Khao Chong on 16 June 1984, flew down into short grass seven times in 43 minutes, during which it visited the nest 12 times. Ground foraging was not seen in independent birds, nor has it ever been recorded in wintering individuals in peninsular Malaysia. The latter not infrequently snatch from surfaces, but strictly only from those that are arboreal, such as bark (Wells 1977, Ramachandran 1982).

Fully exposed clearings may not be used for the whole day. In one at Khao Sok, watched under bright, windy conditions on 29 June 1985, an adult and two fledglings fed in the open only before 08h30 and after 15h45. At 08h30 they were seen to enter adjacent bamboo jungle and are presumed to have sheltered there through the hottest part of the day.

Breeding, brood-size and broodedness

Failure to find nests or any fledglings with less than full-grown wings or tail suggests that by the end of June 1985 the breeding season was over, i.e. at least one month before the expected peak of the south-west monsoon wet weather in August–September.

Mossy, open-cup nests found on 12 and 16 June at Khao Sok and Khao Chong respectively were both in forest-edge trees, on the tops of horizontal boughs 15–18 m above ground. Asian Brown Flycatchers in India select similar sites (Ali and Ripley 1972). Both nests were being visited frequently but neither could be reached to examine contents, though two gapes were seen above the rim of the second. The number of fledglings of equivalent age consorting as evident siblings was two in two cases although in two other instances only a single young was seen. It is unlikely, therefore, that *M. l. williamsoni* has a clutch larger than c/2, which is below that reported in India but the modal value among insectivorous passerines of the Malay Peninsula (Medway and Wells 1976).

In both years, indications of multi-broodedness were observed, with overlap in the raising of consecutive broods to independence. Thus, in the first slash-and-burn clearing at Khao Sok on 12 June 1984 two fully speckled fledglings accompanied a third apparently older bird in post-juvenile moult, with a nest that evidently contained chicks nearby. While it is possible that two or more territories overlapped here, no more than two adults were ever present and were seen briefly to visit the nest together. At least the younger fledglings were also being fed and the inference is

that two, and possibly three, broods were being raised in overlapping succession by a single pair. It was not established if the feeding of the broods was partitioned between mates but no other group of fledglings in either year was seen to be tended by more than a single adult. One adult at Khao Sok in 1985 associated with one fully speckled fledgling and a second in mid post-juvenile moult, though it fed only the younger of these.

Plumage, wear and basic moult

The full juvenile plumage was noted as white below with narrow but sharp blackish-brown streaking on the breast; dark brown above including wings and tail (rump and uppertail-coverts slightly rufescent), with all of the upper contour plumage boldly spotted buff-white; the greater coverts and tail tipped, and tertials edged, rufous-buff. In the field, juveniles may not, therefore, be easy to separate from those of other flycatcher species.

Our early misgivings about specific identification arising from unexpected foraging behaviour were redoubled by the appearance of the unmoulted adults. By mid-June, fading or abrasion had in all cases reduced typical ventral streaking to a soft mottling, and eliminated all, or virtually all, trace of an eye-ring and wing-patterning, and all rufescent coloration except on the tail, leaving the birds dull, plain grey-brown above and whitish below. The adult feeding nestlings at Khao Chong on 16 June may have commenced basic moult as it had a brownish wash on the sides of the breast and rufous tips to the greater coverts (*cf.* the description of fresh adult plumage in Wells 1977).

By late June 1985 at Khao Sok, moult had proceeded further. At least one lone adult was in full, fresh, basic plumage, permitting an almost feather-by-feather confirmation of the *williamsoni* identification. Its lower mandible was distinctly more orange-yellow than in unmoulted birds implying, but not necessarily proving, that this feature, too, may vary seasonally. This bird gave high-pitched subsong from a restricted area of clearing edge not far from a 1984 breeding site, but date is the only indication that it may have nested locally itself. Of other adults still tending young in that week, one was completely unmoulted, hence strikingly different-looking, and the other had just begun moult, with a recognizable chocolate-brown wash on the sides of the breast. One of two fledglings associating with it was sufficiently far into post-juvenile moult to be identified beyond reasonable doubt as *williamsoni* and thus to reaffirm the connection between the two plumages.

A contrast as striking as this between the new and old plumages of the adults of *williamsoni* had not been expected from experience of Palearctic subspecies on passage through the tropics in spring and autumn. Depigmentation may be extreme in *williamsoni*, but further post-breeding (wet season) collecting is needed to provide the necessary basis for comparison, since no other South-East Asian population is yet known in its freshly moulted plumage. For this reason, also, further subspecific allocations, at least in the continental tropics, should be made with caution. In the meantime, field observers in the region are urged to be watchful.

BMNH, NUSZRC and ANSP are, respectively, the British Museum (Natural History), the

National University of Singapore Zoological Reference Collection and the Academy of Natural Sciences, Philadelphia, from all of which specimens have at one time or another been borrowed. We thank Mr Phanat Rattanarathorn and Mr Prasert Khunnarong, superintendents of Khao Sok and Khao Chong respectively, for their assistance and hospitality. D.R.W. and P.D.R. also wish to acknowledge Peter Alexander-Marrack who has allowed them to use joint field observations made in 1985.

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Crab-plovers *Dromas ardeola* in the Gulf of Kutch

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An anomalous wader, the Crab-plover *Dromas ardeola* of the north-eastern Indian Ocean, was studied in and near the Gulf of Kutch Marine National Park in February and March 1984. Some 2,300 birds were counted throughout 40% of available intertidal flats, so the total population of the area may be 5,000 or more. Roosts were traditional, cohesive and tidally related. When feeding (which may also occur at night), adults spaced out evenly along the shoreline; most immatures foraged close to (some soliciting food from) adults. Two foraging techniques were: motionless waiting, then dash or walk and stab (commoner, for larger crabs); slow pause-peck-pause for smaller prey. Intra- and interspecific kleptoparasitism occurs. Handling of prey varied with size; immatures took smaller items and handled them longer. The breeding grounds of the Gulf of Kutch population are not known to be local.

Crab-plovers *Dromas ardeola* are extremely unusual waders. They have customarily been placed in a family of their own, Dromadidae, and were considered to be closely related to the stone-curlews Burhinidae (Jehl 1968), but DNA studies place them as a subfamily Dromadinae of the pratincoles and coursers Glareolidae, this in turn being placed in the superfamily Laroidea (i.e. closer to the gulls and terns than to true plovers) within the Charadriiformes (Sibley and Ahlquist 1985). Their breeding habits are unique within the Charadriiformes: they nest colonially in burrows in sandbanks and the females produce a clutch of only one egg; the young are precocial, but unable to walk at first and remain in the burrow, relying on the adults for food; they continue to be fed by the parents after they leave the nest and apparently remain dependent for a considerable period – indeed young have been seen to solicit food from adults on passage and in winter quarters, although begging becomes indiscriminate and juveniles may even beg from each other (Cramp and Simmons 1983).

Crab-plovers are confined to tropical coastlines and their range extends eastwards from the Red Sea and the west coast and islands of Africa, through the Arabian Gulf and the Indian Ocean, as far as the east coast of India and the Andaman Islands (Ali and Ripley 1969, Cramp and Simmons 1983, Urban *et al.* 1986). They have been recorded as winter visitors to Pakistan and the west coast of India (Ali and Ripley 1969) and, prior to this study, the Gulf of Kutch was reported to support a small but significant winter population (S. Chavan pers. comm.). It remains unknown whether the birds breed in the Gulf of Kutch. The nearest breeding records are from southern Iran and Oman, and possibly also Sri Lanka (Ali and Ripley 1969, Phillips 1978, Cramp and Simmons 1983).

The Gulf of Kutch Marine National Park provides the specialist habitats they need to obtain their diet of crustaceans and other marine invertebrates, i.e. shallow lagoons or tidal zones exposing mudflats and coral reefs (Archer and Godman 1937). Their behaviour in the winter quarters is gregarious with a crepuscular though tidal-based activity pattern (see Cramp and Simmons 1983).

The 1984 Oxford University Expedition to the Gulf of Kutch had an ideal opportunity to make a population estimate for the species in the Marine National Park and to make some additional observations on the wintering biology of this unusual and little studied bird.

METHODS

Counts and observations of Crab-plover populations were made during the course of a five-day boat cruise along the south coast of the Gulf of Kutch (27 February – 3 March) and over a period of six days spent on Pirotan Island (20 – 25 February). Incidental observations were made while travelling along the southern coast of the Gulf of Kutch between 7 February and 10 March 1984. Observations of numbers and behaviour were made at all stages of the tidal cycle, using binoculars and telescope.

Low-tide observations were made on the reef flats of several coral islands, namely Bhaidar, Mathechusna and Pirotan Islands and also at Bhaina Bet and the mudflats at Salaya Point and Rozi Bunder. High-tide roosts were located and counted on Bhaidar and Pirotan Islands, Goos Reef, Gandhnakadoi Reef and on the mudflats beyond the reclamation dam to the north of Jodiya (for all localities, see Figure).

RESULTS

Population and distribution

Maximum counts from the high-tide roosts are listed in the Table. Bhaidar Island held the largest roosting population and a maximum of 1,200 birds were counted at the roost at the northern end of the island. This island is surrounded by a relatively large area of reef flat, and at low tide only a narrow channel separates it from the Chusna Islands. We were unable to locate a roost on the Chusna Islands, although the surrounding reef flats were used for feeding at low tide. The main part of the Bhaidar population was seen feeding within 1,000 m of the high-tide roost. On Pirotan, the roost of up to 470 birds was on the western side of the island. The exposed northern side did not support many feeding birds, but 200 were seen feeding on the muddier and more sheltered south-western side.

Table. Maximum counts of Crab-plovers at high-tide roosts

Date	Location	Maximum count
17.02.84	Jodiya Dam	230
24.02.84	Pirotan Island	470
27.02.84	Goos Reef	260
27.02.84	Gandhnakadoi Reef	200
01.03.84	Bhaidar Island	1,200
Total		2,360

Immatures were easily recognised by their smaller size and browner coloration. The immature plumage is retained for up to two years, so accurate assessment of age was not possible. Immatures were present in all roosting flocks and on the feeding grounds. At Pirotan, it was possible to get close enough to make a count of the proportion of immatures in the flock. Out of a roost of 470 birds, 80 were immatures. Thus the immatures represented approximately 17% of the flock.

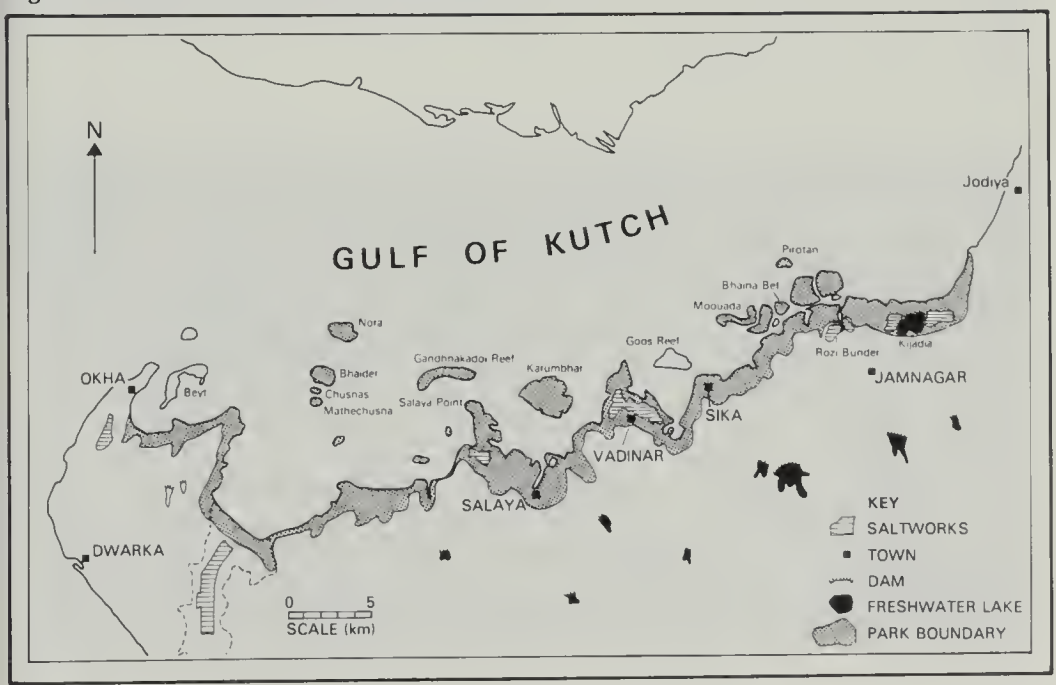
It is not known whether the wintering population of Crab-plovers is sedentary, but it appears from the limited evidence (see Foraging dispersion below) that the numbers of Crab-plovers on the exposed reef flats at low tide and then at high-tide roosts relate to the size of the available feeding area. A total of 2,300 birds were counted in the areas surveyed, which represents 40% of the available intertidal flats along the 160 km length of the south coast of the Gulf of Kutch. So a conservative population estimate would be about 5,000 birds.

Diurnal rhythm

Activity was linked to the tidal cycle. At high tide, the birds gathered to roost on high ground. They could be found roosting an hour or two either side of high tide. Other waders started to feed as soon as the tide began to ebb, but Crab-plovers always remained on their roost for up to two hours before moving off to the water's edge to feed.

During our stay on Pirotan, high tide coincided with dawn and dusk and the roost was easily visible. In the mornings, the flock dispersed during the ebb tide to feeding grounds that could not be seen from the island. On the night of 24

Figure. The Gulf of Kutch Marine National Park



February, adults and immatures were heard on the shoreline of the northern part of the island at about 22h40. The rotating beam of the lighthouse revealed that they were feeding.

Roosting

At Bhaidar and Pirotan Islands, the birds were always seen at the same roosts. They gathered well before high tide and, once settled, the single-species flock was tight and cohesive and over 70% of the flock would appear to sleep, while the rest would be preening or moving out of the way of the rising tide (see Plate). The immatures tended to be noisy and there would always be a few individuals trying to solicit food by standing in front of an adult with head lowered, calling continuously with a twittering sound and pecking at the beak of the adult. It was difficult to tell whether the birds were begging from a parent or from any adult nearby. Only one adult was seen to regurgitate food in response to such solicitation.

Foraging dispersion

Adult Crab-plovers would space out evenly along the shore. As the tide receded, the distance between the feeding birds increased. Distances between the birds were not quantified, but the impression was that at low tide birds would be spaced up to 50 m apart, a dispersion substantially greater than hitherto reported (Cramp and Simmons 1983, Urban *et al.* 1986). Feeding took place mainly at the edge of the water and along the tidal channels, particularly on the outer section of the reef flat where live corals were exposed. A few birds would feed further inshore on the reef flats where the corals are covered with sand.

Most immatures would forage in close attendance with a single adult. This may well have been one of the parents, but we did not see any birds foraging in family

Plate. Crab-plovers by Tom Owen Edmunds

groups of three. Some immature birds would run close behind a feeding adult, soliciting whenever food was located. Most immatures would obtain their own food, but they still remained in contact with an adult, although they might stray up to 50 m away at times. We did not observe any immature birds foraging entirely alone.

Foraging techniques

Two kinds of direct foraging techniques were observed. The commoner involved standing motionless, waiting for the prey, then taking 8–20 steps and standing still again for up to 70 s. When prey was detected, the bird would dash forward and stab at the victim, or move forward more slowly and probe with an open bill. This method yielded a prey item every 1–5 minutes and was used for hunting larger prey, usually crabs. In the less usual technique, when feeding on small items, the birds would pause briefly (1–10 s), then move forward 2–4 steps and either peck or pause again. This method usually gave rise to 3–4 pecks per minute. The prey items involved were too small for the observer to see how many of the pecks were successful.

Immatures tended to hunt by the second method, but if they found a large crab, they would stand still and call until the accompanying adult arrived. Thus it would appear that, despite the assertion that immatures in winter beg wholly indiscriminately (Cramp and Simmons 1983), a bond can persist between immature birds and at least one parent and that many of the immatures were feeding in co-operation with a parent.

Birds holding a large prey item were subjected to kleptoparasitism from neighbouring birds of their own species and fighting would then commonly develop. On one occasion, a bird with a large crab was followed by two Ruddy Turnstones *Arenaria interpres*. They appeared to be scavenging for any dropped pieces, rather than actually trying to appropriate the prey. Brown-headed Gulls *Larus brunnicephalus* and a second, unidentified *Larus* species were seen chasing Crab-plovers with prey.

Handling prey

Small items, including small crabs, were consumed whole. Large crabs took more handling, but were eventually swallowed whole, as long as the crab was small enough to be aligned in the beak. Very large crabs with pincers as long as the beak had to be prepared before they could be consumed.

Birds were not always successful in tackling large crabs. The crab would assume a defensive stance, with pincers spread, showing the brightly coloured body. The bird would circle the crab, stabbing at the pincers, but would eventually give up and move off.

Smaller crabs were picked up by one pincer and shaken, then dropped upside down and stabbed. The bird would then carry the prey off to dry ground. If other birds were attracted to the catch, it would be forced to fly a considerable distance to an isolated spot.

Once on dry ground, the process continued, and the crab was eventually swallowed, usually within 30 s. If the crab was too big for this, the limbs would be

eaten first, pincers before legs. To do this, the bird would hold one limb in its beak and shake its head until the crab fell to the ground, then swallow the limb left in the beak and rapidly grab the next one. The carapace was opened by wedging the bill inside the front of the shell, then shaking the head and beating the shell on the ground. The whole process took about three minutes.

Whether foraging independently or with an adult, immatures tended to catch smaller prey than adults and took longer to handle a prey item. Accompanied immatures tended to spend time begging from the adult and would often run up to beg when the adult was dealing with a prey item. On one occasion when an adult and an immature bird were foraging in close association the adult kept the immature away, with raised rump feathers, until it had consumed all the limbs of a large crab. It then moved off and left the young bird to deal with the carapace. The immature bird spent five minutes trying to open the carapace, which was eventually stolen by a nearby adult.

DISCUSSION

The population estimate of 5,000 birds in the south of the Gulf of Kutch is probably a conservative one. It would be relatively easy to perform a complete census, making use of the fact that flocks use the same high-tide roosts over several days and possibly over longer periods.

Since Crab-plovers can only rear a maximum of one young per pair, a count of 17% birds less than two years old would suggest that breeding had been relatively successful. Bearing in mind the fact that very few of the immatures appeared to be foraging entirely independently it might perhaps be inferred that most of them were in their first year.

It was suggested to us by local ornithologists that breeding may occur within the Gulf of Kutch. The sand dunes on Bhaidar might be suitable for the construction of nest burrows. Further research and questioning of local people might well reveal more information, for despite its remoteness, the area is well visited by fishermen. It would also be worth investigating the north side of the Gulf.

The specialised feeding techniques of Crab-plovers restrict their feeding activities to the period of low water. With such a limited time available for feeding, it would seem likely that they need to hunt at every low tide. When one tide falls at night, they probably feed in darkness and indeed our observations confirmed that this does at least sometimes happen. It is possible, however, that the lighthouse on Pirotan Island could have influenced the night-time behaviour of the birds, as they were hunting close to the lighthouse in an area which they had never been seen to use during the day. (Night hunting presumably requires good eyesight and hearing; the large eyes of the Crab-plover suggest that it can utilise low levels of light.)

It was clear from our observations that Crab-plovers roost in the close vicinity of their feeding grounds. However, some form of artificial marking would be necessary to discover the movements between feeding and roosting grounds and the amount of exchange between islands. The monospecific high-tide roosts provide an ideal

opportunity for large-scale netting, for example with cannon-nets. Considering that the birds spend so much of their time roosting, the presence of suitable roosting sites is an important ecological requirement for the species.

Studies in Aldabra showed that birds fed in flocks of 7–50 (mean 22), with each bird 3 m distant from the next one without provoking aggression (Cramp and Simmons 1983). Our observations in the Gulf of Kutch revealed a very different pattern with birds much more spread out yet with fights a common occurrence. It was not clear whether the low-tide feeding distribution of Crab-plovers reflected the distribution of the prey, or if the birds spaced themselves out in an attempt to avoid interference from neighbours.

The prolonged association between immature birds and adults is of considerable interest. The immatures obviously take some time to become skilled at feeding themselves and continue to rely on at least one parent to help with the catching and preparation of larger food items. It is very difficult to interpret the bond between an immature bird and its parents, but from our observations, it appeared that a young bird would associate with one adult, rather than feeding in a family party. The matter was further confused by the impossibility of discriminating between first and second year birds in the field.

Some important questions must be asked in relation to the conservation of Crab-plovers in the Gulf of Kutch. How much of the intertidal area is suitable for feeding? How many undisturbed roosting sites are available? How does the deposition of sediment in the Gulf affect their feeding grounds? Is there a danger that their feeding habitat could be destroyed by an oil spill from the international oil terminal at Vadinar? Are Crab-plovers a useful indicator of the equilibrium of the coral ecosystem of the Gulf?

The significance of the Gulf of Kutch as a habitat for these rare and highly sophisticated birds has been recognised by the management of the Marine National Park, and it has been proposed that they should be the emblem of the Park. It is important that further studies should be carried out to try to understand the ecology of the Crab-plover, and the Marine National Park has the facilities for this.

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The past and future of Gurney's Pitta *Pitta gurneyi*

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Gurney's Pitta *Pitta gurneyi*, whose plumages are described here with particular reference to the little-known juveniles and to those of Banded Pitta *P. guajana*, is known only from southernmost Burma (last record 1914) and from peninsular Thailand between 11°50'N and 7°30'N (last record – prior to 1986 – 1952). The species was considered relatively common at least until around 1920, but in the past 50 years has been seen in the wild only twice, although a few captive specimens have been known since the 1960s, the last such dying in 1985 (a sonagram of the one type of call produced by this individual is provided). The species appears to breed from late May through to November. Records suggest that it disappears from southern Burma in response to the monsoon rains (July to September), and so may not breed there. Its distribution in the peninsula coincides with the distribution there of its (almost sole) habitat, semi-evergreen rainforest, and only the most northerly records (possibly both migrants) and those from the mountain Khao Phanom Bencha in 1936 could refer to different (drier) habitats, these being the only cases where the species has been recorded away from lowland. Competition with Banded Pitta at most sites may have confined Gurney's to lowland forest, its disappearance (and possible extinction) being directly attributable to the almost entire deforestation of lowland peninsular Thailand. Khao Phanom Bencha and a few other sites are identified as conceivably still holding the species.

Gurney's (or the Black-breasted) Pitta *Pitta gurneyi* is endemic to the forests of peninsular (i.e. southernmost) Burma and Thailand, from south of 12°N to around 7°N. It is not known to extend into Malaysia, but this is just possible (see Natural constraints). Such a restricted range is unusual in a (non-montane) species in mainland South-East Asia, a fact remarked upon by Chasen (1939:203) and Wells (in Medway and Wells 1976:2). It is evidently this very limited distribution, combined with a lack of records in recent decades, that led to the species being considered by King (1978–1979) as threatened (IUCN status category 'Indeterminate'), although there is no mention of it in Jintanugool *et al.* (1985) or Blower (1985a). As King's treatment of the bird is somewhat cursory, a complete review of our knowledge of it seems appropriate; and indeed, the provision of every available detail relevant to the species's conservation is now essential in the face of evidence that, if it survives at all, it stands at the very edge of extinction.

In the following account, unless otherwise clearly stated, all coordinates and modern place-name spellings are derived from *The Times atlas of the world* (1980) or Office of Geography (1966a,b), the latter taking precedence over the former where discrepancies over coordinates occur. AMNH stands for American Museum of Natural History, ANSP for the Academy of Natural Sciences, Philadelphia, BMNH for British Museum (Natural History), BNHS for Bombay Natural History Society, CUMZB for Chulalongkorn University Museum of Zoology, Bangkok, IUCN for International Union for Conservation of Nature and Natural Resources, MAPS for Migratory Animal Pathological Survey, MCML for Merseyside County Museums, Liverpool, MNHN for Muséum National d'Histoire Naturelle, Paris, NRM for Naturhistoriska Riksmuseet, Stockholm, NUSZRC for National University of

Singapore Zoological Reference Collections, RMNH for Rijksmuseum van Natuurlijke Historie, Leiden, ROM for Royal Ontario Museum, Toronto, RTSD for Royal Thai Survey Department, SMF for Natur-Museum Senckenberg, Frankfurt, TISTR for Thailand Institute of Scientific and Technological Research, UMMZ for University of Michigan Museum of Zoology, UMZC for University Museum of Zoology, Cambridge (U.K.), USNM for National Museum of Natural History, Washington, ZMK for Zoological Museum, Copenhagen.

DESCRIPTION

The male Gurney's Pitta is unmistakable, having an intense iridescent blue hindcrown and nape, contrasting with a black forecrown, lores, sides of head and ear-coverts (see cover photograph). The head pattern contrasts sharply with a whitish throat and a bright yellow band across the upper breast extending onto the sides of the neck. The lower breast, belly and vent are black, with the feathers of the breast glossy, but those of the belly and vent matt. The flanks are yellow with short, bold, black bars. The upperwing coverts, tertials, mantle and rump are all rufescent brown; the primaries and secondaries are darker blackish-brown. The uppertail-coverts and tail are turquoise-blue.

The female is relatively subdued in coloration, having the entire crown and nape a rich ochre. The lores, sides of head and ear-coverts are black while the underparts are narrowly barred black on dull white, although this white is suffused with yellow across the breast. The upperparts and tail are as in the male.

Knowledge of plumages of juveniles is poor, owing to a paucity of skins: there are two males (Gyldenstolpe 1916, Meyer de Schauensee 1946) and two females (Meyer de Schauensee 1946 and in CUMZB). Of these, only the last is undescribed. From the descriptions of this (below) and the others, it would seem that there are no discernible differences between males and females. The Gyldenstolpe male appears to have been in post-juvenile moult, since it shows some black and yellow on the undersides; Meyer de Schauensee's (younger) male shows no such feathering.

In the CUMZB specimen, collected by C. J. Aagaard (see Distribution in Thailand), the upperparts, wings and tail are coloured as in the adult, save that there may be buffy tips to feathers of the coverts and tertials. The feathers of the crown are blackish-brown, with buffy shaft streaks, and there is also a long, buffy supercilium, the individual feathers of which are narrowly edged and tipped blackish, giving a scaly appearance. The lores, sides of head and ear-coverts are blackish-brown; the throat is buffy white, with some brown scaling. There is a dark brown, horseshoe-shaped patch across the upper breast which extends onto the sides of the lower breast. This is finely streaked with rufescent buff. The flanks and sides of belly are whitish, boldly barred blackish, while the centre of the lower breast and belly are buffy and are finely barred dark brown. The legs appear to be dull fleshy, while the bill is black.

The adults are impossible to confuse with any other pitta occurring in the region, given a good view. Both sexes of the Banded Pitta possess a broad white stripe which shows on the folded wing and which is formed by the broad white tips to the

median coverts and inner greater coverts. The female Banded Pitta (of the races that occur in the peninsular region) differs additionally from female Gurney's in having flame-orange sides to the hindcrown and nape, and a broad, buffy supercilium.

Adults of both sexes and juveniles of Banded Pitta differ from Gurney's Pitta in the following respects. (1) The tail and uppertail-coverts of Banded Pitta are a rich azure-blue (as compared with paler, turquoise-blue in Gurney's Pitta). (2) While both Gurney's and Banded Pittas possess white bases to the outermost five or six primaries, this band of white is approximately one centimetre wide in Gurney's and roughly half that width in the Banded Pitta. The assertion by King *et al.* (1975) that Gurney's Pitta has no white in the wing is technically incorrect, but is probably appropriate for the purposes of field identification, since the white bases to the primaries are so slight that they would probably be invisible even when the bird was seen in flight from above. (3) Banded Pittas have broad white edges to the outer webs of secondaries 5, 4 and 3, which are lacking in Gurney's Pitta, so that even if juvenile Banded Pittas lack the white coverts that form the white stripe on the folded wing (one specimen in BMNH appears to, others do not) they should still be easily separable from juvenile Gurney's.

DISTRIBUTION IN BURMA

Gurney's Pitta was first discovered in Burma in 1875 (Hume 1875:296). Locality records for the country are, apparently, derived from two collectors (W. Davison, Hume's collector, and W. L. Abbott for USNM) in three years (1875, 1877 and 1904) at six localities, all in southern parts of the most southerly division of Burma, Tenasserim. Davison, the collector of the type material, seems to have obtained by far the highest number of specimens (38 in BMNH alone) and certainly learnt more about it in the wild than anyone: without his remarkable record (in Hume and Davison 1878:244-245) we would know virtually nothing of the species. In his account he lists the localities at which he found the bird as Laynah, Malewoon and Bankasoon; Palaw-ton-ton is also noted without comment as a locality. As the glossary in Hume and Davison (1878:522-524) makes clear, 'Laynah' is modern-day Lenya (11°28′N 99°00′E), while 'Malewoon' is Maliwun (10°14′N 98°37′E) and 'Bankasoon' Bankachon (10°09′N 98°36′E). Palaw-ton-ton was, according to the glossary, 'a Malay village on the coast about 30 miles [50 km] north of Victoria Point', but the village in question (Kampong Pulo Tonton) is actually on an island (Pulo Tonton) c. 8 km north-west of Victoria Point, at 10°01′N 98°31′E (and is so mapped, e.g., on Army Map Service 1966).

Abbott obtained only two specimens, at Sungei Balik on 26 February and Telok Besar on 1 March (Riley 1938:261, also B. W. Miller pers. comm. 1986). 'Sungei Balik' is evidently Sungei Baleihgyi (10°29′N 98°32′E), while 'Telok Besar', untraceable as such, could perhaps be Talobusa (10°23′N 98°33′E); in any case it is evident from the dates that 'Telok Besar' is close to Sungei Baleihgyi, as Riley (1938:15) indicates that Abbott was collecting at the latter on 25–26 February and the former from 27 February to 6 March 1904.

Oates (1883: 419) mentions that his collectors also obtained specimens at

Maliwun, but this was evidently in deliberate duplication of Davison's work. One of these specimens is in AMNH, another in RMNH; the whereabouts of any others is unknown to us. The specimen in BNHS listed without date from Bankachon (Abdulali 1975:480) was collected by G. C. Shortridge in January 1914 (S. Unnithan *in litt.* 1985), again presumably in duplication of Davison.

DISTRIBUTION IN THAILAND

The earliest record – apparently made in either 1875 or 1877 – of Gurney's Pitta in Thailand was by Davison at 'Kenong, within the estuary of the Pakchan, but on the Siamese or southern side' (Hume and Davison 1878:244), i.e. just across the river (and border) from Bankachon. However, no locality bearing this name can be traced; the only settlement on the south side of the Pakchan estuary whose name has any resemblance is Ranong (9°58'N 98°35'E), which used commonly to be spelt 'Renong' (see, e.g., the map accompanying Robinson and Kloss 1921), so it seems that 'Kenong' was the result of a typographer's misreading of a manuscript R as K.

This record was quickly followed by Hume's (1879:156) announcement, without comment, that the species had been found on 'Tonka', i.e. Phuket Island (Ko Phuket) off the west coast of peninsular Thailand. This evidently refers to a male bird in BMNH from 'Tapraw' (untraced), taken on 11 April 1879 by J. Darling (one of Hume's collectors: see Robinson 1927: xxxiii), since a specimen of a male listed as from 'Tapraw, Island of Tonkah' is mentioned by Sclater (1888:449), although the issue is confused by this being attributed to Davison and ascribed to the type material.

There is a skin of an adult female Gurney's Pitta in MNHN, received in 1893 but otherwise undated; it was collected by G. M. Bel at or in 'Siam Prov. Banataphan' (C. Voisin *in litt.* 1985). This would appear most likely to have come from Ban Saphan district in Prachuap Khiri Khan province, at 11°13'N 99°31'E (read from RTSD 1973).

All the remaining records from Thailand stem from the twentieth century in the years 1909–1919, 1929, 1936, 1952 and 1986. E. C. Dickinson (*in litt.* 1985) has pointed out that early collectors in the northern peninsula were chiefly dependent on the railway system for their transport and that railway station villages were commonly used as bases for collecting forays. This fact is certainly borne out by Gurney's Pitta records and indeed helps confirm the identity of some sites.

Robinson and Kloss (1911:49) found the species in 'several localities' in Trang province. They do not specify these sites, but there are skins in BMNH, AMNH, NRM, NUSZRC and UMZC dating from 1909–1910 and stemming from Trang which are evidently theirs and whose labels bear more precise site data: 'Chong', 4, 5 (two specimens) and 12 December 1909, 'Lam-ra', 6, 8, 11, 18, 19, 20, 21 and 31 January and 24 February 1910, 'Ko-Khau', 13, 19 and 21 January 1910, and 'Krongmon', 16 February 1910. All these localities are mentioned (with these spellings) several times throughout Robinson and Kloss (1910, 1911), but only one of them, Chong, is traceable with immediate certainty. As Robinson and Kloss (1910:669-670) make clear, Chong is Khao Kachong, whose coordinates as read

from Army Map Service (1965) are 7°31′N 99°48′E, this being Khao Chong in or near the Nature Centre at the northern end of the Khao Banthad Wildlife Sanctuary (described, e.g., by Lekagul *et al.* 1985:36). The altitude at which one of the Chong specimens was taken on 5 December is noted on the label as 250 ft (75 m).

The other sites were evidently not visited by Robinson and Kloss personally, as they say (1910:670-671) that 'after our departure from Chong our collectors visited several localities in the N. E. portion of the State [Trang] towards Lakon [i.e. Nakhon Si Thammarat], but for various reasons were unable to ascend any of the hills'. There is a Ban (=village) Lamphu La, whose old name was Ban Lam Ra, at 7°41′N 99°34′E, this being only 10 km north of Trang town. E. C. Dickinson (*in litt.* 1985), who maintains a Thai locality card index bequeathed him by H. G. Deignan, confirms the position and identity of this locality, which he also has as 'Lam Phura' and 'Sathani [station] Lam Phila'. 'Ko-Khau' (untraceable as such or as, e.g., Kho Khao) must have been very close; Robinson and Kloss (1911:15) describe it as 'at some considerable distance inland'. Dickinson suggests that 'Ko-Khau' is a typographer's misreading of 'Ko-Khan' (it appears indeed as the latter on specimen labels) and that this is therefore (Ban) Khok Khan, or now (Ban) Khuan Khan, at 7°34′N 99°38′E. 'Krongmon' (specimen in AMNH, where the label reads 'Krongmun') seems unlikely to have been far distant either. It does not feature in any gazetteer, but there is a Khlong Muan railway station at 7°53′N 99°38′E, which is only another 10 km or so to the north of Ban Lamphu La (Dickinson's index agrees with this identification and position). 'Krongmon' is also important for providing a record of the highly threatened Giant Ibis *Thaumatibis (Pseudibis) gigantea* (Robinson and Kloss 1911:17).

Robinson (1915:97) found Gurney's Pitta 'in the neighbourhood of Ban Kok Klap' (in former Bandon – now Surat Thani – province), where he collected during the week 29 June to 6 July 1913. He describes this locality as four miles (c. 7 km) west of the main Bangkok–Singapore railway, and on the banks of the river Lampun (Khlong Lamphun). By relating this information to several maps it is possible to determine the coordinates of the site as 8°53′N 99°17′E. During this collecting trip he also visited the mountain c. 25 km to the east of Ban Kok Klap, named 'Kao Nawng' (Khao Nong), where he failed to find the species (reporting it as 'not extending far up the slopes, as it was not met with at either of our camps').

Gyldenstolpe (1916:85) collected an immature male Gurney's Pitta on 8 December 1914 inland of Koh Lak (now renamed – or replaced by – Prachuap Khiri Khan, as noted by Deignan 1963:99). This is the most northerly record for the species. The locality is given as 'Koh Lak Paa' ('paa' merely signifies 'forest'), the encounter being made 'during one of my excursions among the mountain chain separating Tenasserim and Siam'. It is clear from Gyldenstolpe's (1916:10) account of his itinerary that he was in the low dividing range several (perhaps up to 20) kilometres to the north of the mountain Khao Luang, and the approximate coordinates for the record may therefore be read from the latitude of Prachuap Khiri Khan just before it intersects the Burmese border, hence 11°50′N 99°40′E. The statement in King (1978–1979) that this record was from Koh Lak itself, 'an island on the west [*sic*] coast of the Isthmus of Kra in Thailand', is obviously erroneous.

In October 1915 a nest (the first and until 1986 only to be recorded) was found at

'Klong Wang Hip, Tung Song' (Herbert 1924:298). Tung Song (Thung Song) is a town in Nakhon Si Thammarat (the record is thus generalised in Medway and Wells 1976:255); Klong Wang Hip ('Klong Wahip' on BMNH specimen labels) is described by Herbert in Baker (1919a:178-180) as a stream at the foot of the hills about eight miles (13 km) north-east of Thung Song. He also mentions the mountain Khao Wang Hip and implies it was very close to the stream in question; the coordinates for the mountain read from Army Map Service (1965) are 8°19′N 99°42′E. E. C. Dickinson's card index places Klong Wang Hip at 8°10′N 99°40′E. One small anomaly in this record is Herbert's statement that 'the female was shot by my Dyak collector as it flew from the nest . . . on the 9th October' when the skin of this bird in BMNH is dated 1 October. A male from the same locality – presumably the mate (these are the only two specimens from this site) – is dated 9 October. Perhaps therefore it was the male that was shot as it flew from the nest, the search for the latter having intensifed after dissection of the female had showed it to contain a shelled egg ready for laying.

In January 1916 the same collector (C. Chunggat for E. G. Herbert, on BMNH labels) obtained (at least) six further specimens of Gurney's Pitta: on 5th, at 'Maprit', he took four, three males and a female; on 17th and 20th, at 'Klong Bang Lai', he took a female and a male respectively (Baker 1919b:417-418; specimens all in BMNH). Herbert again provided details of these two localities in Baker (1919a:178-180), Maprit being 'a station on the southern railway, west of Patiyu' and Klong Bang Lai 'a camp on the banks of a stream of that name, about 10 miles [17 km] north-west of Maprit and close to the hills'. The two sites are marked on the map that accompanies Robinson and Kloss (1921) and on the map in Robinson (1927: xii). Royal Survey Department (1930) marks Maprit as 'Ma Prid station', from which the coordinates are 10°55′N 99°20′E: this puts it a little to the north-east of its position on the map in Robinson and Kloss (1921) and it is also thus north, and not west, of Pathiu (this error is because Pathiu was misplaced on many nineteenth century maps north-east of its true position). Through this link it becomes possible to identify 'Maprit' with what Office of Geography (1966b) calls Sathani Map Ammarit, at 10°52′N 99°21′E (its coordinates for Pathiu being 10°42′N 99°19′E). E. C. Dickinson's card index places Klong Bang Lai at 10°45′N 99°10′E, and indicates that this is the same as Ban Salui (also marked on Royal Survey Department 1930).

There is a skin of a male Gurney's Pitta in ZMK, collected by R. Havmøller on 23 May 1916 at 'Hannaat, Bandon, Siam' (S. Brogger-Jensen *in litt.* 1985). Hannaat cannot be traced with certainty. There is, however, a Ban Han Not at 8°55′N 99°10′E, in the lowlands of the Tapli valley, Surat Thani province, due west of Robinson's Ban Kok Klap.

On 12 December 1917 Robinson and Kloss (1919:103) obtained a male at Klong Tung Sai (Klongtun Sai on BMNH label) on Junk Seylon (=Phuket Island). The coordinates (read from RTSD 1973) are 8°02′N 98°23′E (the locality is thus marked in Robinson and Kloss 1919:89).

In March 1919 Robinson and Kloss (1924:222) found the species at 'Tasan' (Thasan), in Chumphon ('Chumporn', 'Chumpawn' on BMNH labels) province. Ban Tha San is at 10°29′N 98°55′E, mapped as (e.g.) Ban Htasan at precisely these

coordinates on the junction of the river 'Khlaung Htaung Kha' and another unnamed stream in Bagge (1897). Robinson and Kloss (1921:10-11) describe Thasan as 'pleasantly situated among low hills covered with evergreen forest at the confluence of two clear-water streams' and mark it on the map that accompanies their paper; Robinson (1927: xii) also maps it. Seven birds (four males, three females) were collected there in the eight days 15–22 March; three of these (one male, two females) are in BMNH, the other four being in NUSZRC.

On 25 July 1929, C. J. Aagaard collected a specimen of a juvenile female Gurney's Pitta at or in 'Bandon', i.e. in Surat Thani province. The specimen, erroneously labelled '*Eucichla cyajane irena*' (meaning Banded Pitta *Pitta guajana*) is now deposited in CUMZB. The precise collecting locality is not clear. Bandon is the former name both for the city and for the province of Surat Thani, the former being at 9°08'N 99°19'E, the latter stretching along the whole lowland area bordering Bandon Bay (Robinson 1915; see map in Robinson and Kloss 1921).

In August 1936 collectors for Meyer de Schauensee (1946) found the species on the mountain Khao Bhanam (Phanom) Bencha (1,360 m), at 8°17'N 98°56'E, north of the town of Krabi. Four birds (two females, an immature female and a male nestling) were reported collected in the three weeks 5–27 August, at 600–1,060 m, but the nestling (in USNM) is in fact dated 19 September (B. W. Miller *in litt.* 1986).

On 24 December 1952, H. G. Deignan collected an adult female Gurney's Pitta at Ban Khlua Klang, Prachuap Khiri Khan province; the gonads were not enlarged (specimen in USNM: B. W. Miller *in litt.* 1986). While this site is not marked on any modern map, Deignan (*in litt.* 1956 to R. E. Elbel) stated that 'Ban Khlua Klang is a very new settlement currently being carved out of the forest for the cultivation of castor beans; it is in tambon Huai Yang, and in amphoe Prachuap Khiri Khan'. This enables the site to be placed with confidence in the present-day Huai Yang sub-district, in the plains or foothills to the east of the mountain Khao Luang, at around 11°38'N 99°36'E (as also given in E. C. Dickinson's card index).

From 1952 to 1986, no ornithologist reported encountering Gurney's Pitta in the wild, despite considerable fieldwork within its known range, and the few records were all of birds in trade (see below). However, in June 1986 P.D.R. and U. Treesucon found a pair with a nest (which failed) at an unprotected site in the Khlong Thom district of Krabi province. This rediscovery of the species took place long after the text of this paper was complete (and only a few days before it went to press); all further details plus a general prognosis will be found in Round and Treesucon (*Forktail* 2, in press).

NUMBERS

Within its rather restricted area of distribution, Gurney's Pitta has been judged to be relatively numerous. This at least was the finding of Robinson and Kloss, who reported it 'the commonest of the genus [*Eucichla*, of which however they recorded only one other species (Banded Pitta) while obtaining four of *Pitta*] in Trang', where they 'secured over thirty specimens from several localities' (Robinson and

Kloss 1911:49), and found it 'very common indeed' around Ban Kok Klap (where, in contrast to the situation in Trang, the Banded Pitta was 'even commoner') (Robinson 1915-97) and 'equally common' at Thasan (Robinson and Kloss 1924:222); however, on Phuket Island they considered it 'apparently not nearly so common . . . as on the mainland of Trang' (Robinson and Kloss 1919:103).

These findings evidently led subsequent reviewers of the species to describe it as occurring 'rather commonly' (Riley 1938:261), being 'apparently fairly plentiful' (Gibson-Hill 1949:256), and 'fairly common locally' (Glenister 1951:246 and subsequent reprints down to 1983). Chasen (1939:203) made the mistake of returning the species to *Pitta* whilst citing without proviso the remark above about it being the commonest of the genus at Trang, so that he exaggerated its abundance there. On the other hand, in southernmost Burma, to which Davison considered the species probably a non-breeding migrant, he was at pains to stress that it was 'by no means a common bird' and that 'it was only by persistently hunting them, and never missing an opportunity of securing a bird where possible, that I and my people succeeded in getting the number we did' (Hume and Davison 1878:244). (With regard to these comments it is worth noting that four of the six Burmese localities for Gurney's Pitta have produced only a single specimen each.)

What is curious about Robinson and Kloss's findings is that other workers have failed to find it in Trang: Riley (1938:13) reports that Abbott was at Chong for a month from around 19 January to 21 February 1897, and was in Trang generally from February 1896 to April 1897 and again from December 1898 to early March 1899, obtaining over 1,300 specimens of birds, yet not one *Pitta gurneyi*; and Meyer de Schauensee's (1946) collectors worked at Chong in October 1936, with similar negative results. E. C. Dickinson (*in litt.* 1985) comments that such anomalies may be attributable to the hunting methods of the native collectors involved, those using snares probably being much more successful than those depending on firearms.

In recent years the species has been judged uncommon (Lekagul and Cronin 1974:143), and this is presumably a source for the unattributed statement in King (1978–1979), repeated by Bain and Humphrey (1982:330), that it 'is now scarce over much of its range in Thailand'. This assertion may well be true, but it gives a false impression of being derived from positive contact with the bird in the field. In fact, such information as exists on the modern status of the species emanates solely from observations of specimens in trade. At the Bangkok Sunday Market from November 1966 to December 1968 there were only six Gurney's as against 37 Banded Pittas (also listed as 'uncommon' by Lekagul and Cronin 1974:142) among a total of 214 pittas offered for sale (McClure and Chaiyaphun 1971:68).

One of these birds was purchased by B. Lekagul in September 1968 and its skin is now in his private collection (there is also a market-purchased female in TISTR, with no data). The skin of a female in UMMZ is derived from a captive bird received in the flesh in September 1972 (B.W. Miller *in litt.* 1986), and might evidently have been one of the birds reported by McClure and Chaiyaphun (1971). At least one pair of *gurneyi* was in captivity in Britain up to around 1975, when the male escaped (Vince 1980:105), this stock perhaps also deriving from birds on sale in 1966–1968 (C. Vince *in litt.* 1985 has no clear record of the origin or number of these birds, 'but from memory I would say I had an adult male and probably three

immatures, one of which I always considered a female'). However, during casual observations at the Sunday Market from 1978 to the present, there was only one further undoubted record of a Gurney's Pitta, a male bird which was kept alive in an aviary until 2 June 1985; reports of at least three further individuals were received during this period, whereas in contrast the number of Banded Pittas entering the (now illegal) trade in Bangkok has remained constant, at roughly 20 individuals per year (P. na Patalung verbally 1985).

BIOLOGY

Our knowledge of the biology of the species is slight and easily summarised. It is strictly confined to evergreen forests, never venturing into the open or into gardens: favoured localities are narrow, densely wooded but undergrowth-free valleys lying between hills (Hume and Davison 1878:244). The Koh Lak (Prachuap Khiri Khan) specimen was flushed in 'a very dense and almost impenetrable piece of jungle' (Gyldenstolpe 1916:85). Birds keep to the ground (they have a habit of jerking up their tails and slightly drooping their wings as they hop along) and feed on snails, worms, slugs and insects; they are shy and retiring, rarely flying when disturbed but hopping rapidly away at the slightest indication of danger to the cover of an obstacle or some tangled vegetation where they remain hidden until the trouble has passed (Hume and Davison 1878). Usually birds are found singly, 'occasionally a couple together' (Hume and Davison 1878). The one nest found held a clutch of four eggs but the female contained a shelled egg (Herbert 1924), so the full clutch may be as much as five (Chasen 1939). Herbert reported that this nest 'was made of dry bamboo-leaves, domed, with an entrance on one side, and placed on the ground at the foot of a bamboo-clump' (Baker 1934:259; also 1926:458).

Davison apparently discerned three calls from the species: one ('its ordinary note') distinctly pitta-like yet 'notably' different; a 'peculiar note – a sort of kir-r-r' when suddenly alarmed; and – heard on one occasion only – a 'peculiar short double note', given with a flapping of wings and jerking of tail by a male perched high in a tree (Hume and Davison 1878). During the morning and evening birds call (presumably giving the first of the calls above) 'and may then be heard answering one another in all directions' (Hume and Davison 1878).

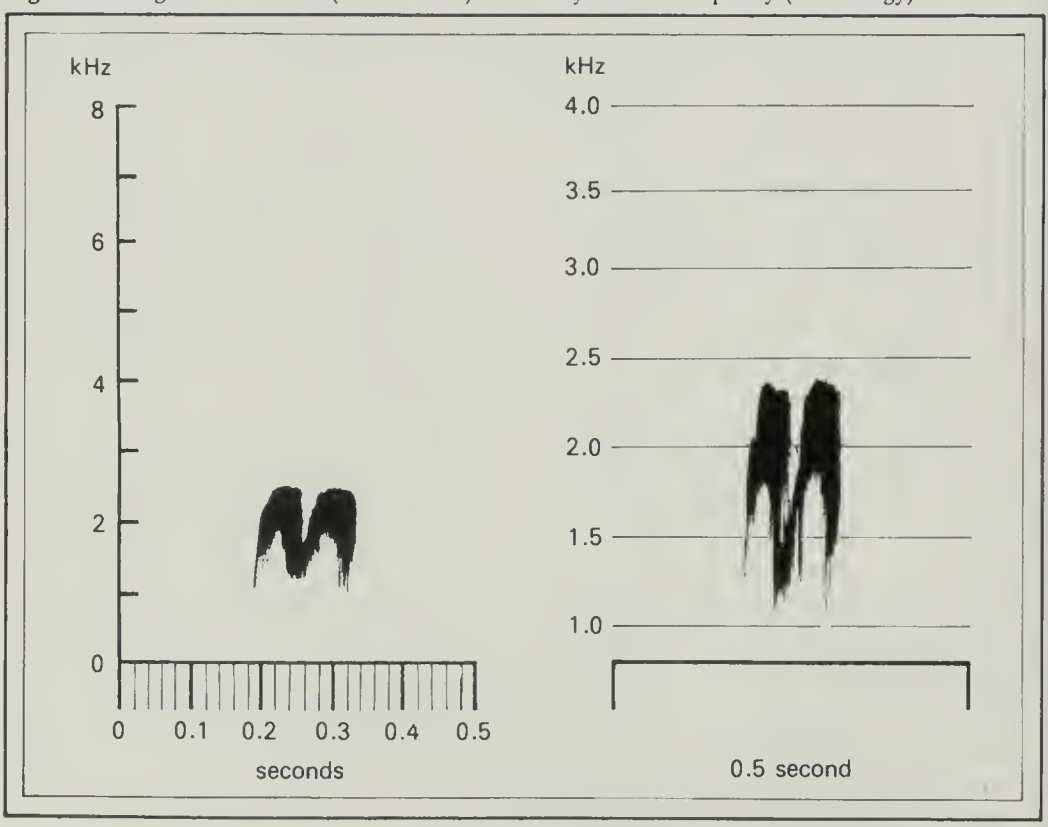
The 'kir-r-r' note may be similar to the well known 'brief but strident, whirr' of Banded Pitta (Medway and Wells 1976:255), which also appears sometimes to be given in the context of alarm. The captive male *gurneyi* in Bangkok, tape-recorded by P.D.R. on 31 May 1985 (less than two days before it died), was heard to give a mellow but explosive 'taroop' at frequent intervals; both syllables were very short with the first stressed (the tape recording of the call sounded to J. Hall-Craggs and N.J.C. like a very rapid but rather mellow whistled 'lilip', both syllables equally stressed). This may be the 'peculiar short double note' mentioned by Davison, but it was only given when the bird was standing on the ground. The head and neck were first stretched upwards, then suddenly bobbed downwards as the sound was uttered. According to P. na Patalung, the bird's owner, no other call was uttered by the bird in over six years of captivity, calling was restricted to a six-week period

during May and June each year (mostly taking place in the early morning and evening), and the bird was not with certainty heard to call from a perch (although it usually roosted in the low trees and shrubs with which the aviary was provided).

Sonagrams of this call, prepared by J. Hall-Craggs, are given in Figure 1. Making allowances for the amount of reflection on the recording, she comments (*in litt.* 1985) that this is 'a distinctly disyllabic sound of brief duration, 0.12 to 0.125 s, each syllable c. 0.06 s, the two connected at the lower frequencies (just >1.0 to 1.5 kHz) but increasingly divided up to c. 0.02 s at the highest frequency, c. 2.4 kHz. In view of the very short time interval between the syllables, the separation is surprisingly clear and easy to hear. The call begins and ends abruptly, giving a slight consonantal sound, but has an overall tonal quality of rather mellow, hollow timbre. It is likely that this sound is locatable and used to maintain contact or to gain attention'. Thirty calls were recorded consecutively over a period of three minutes forty-two seconds, thus an average of one call every 7.4 s, although some calls were only 2–3 s apart.

Davison reported that 'specimens dissected in April, May and June showed no signs of breeding'. This finding is fairly consistent with the few records of breeding that we have, although of course Davison's birds were all from Tenasserim, where somewhat different conditions apply (see Natural constraints) and where breeding was never recorded. Breeding records comprise the Aagaard juvenile from 25 July, the nestling collected in September, when an immature bird was also obtained

Figure 1. Sonagrams of the call (two versions) of Gurney's Pitta in captivity (see Biology).



(Meyer de Schauensee 1946), and the nest found in early October (Herbert 1924); the bird taken by Gyldenstolpe (1916) in December was also immature. The induction to be made is that breeding might commence in late May or early June and continue into November. It seems clear therefore that, like other pittas so far studied in Thailand (Robinson 1915, Herbert 1924, Round and Treesucon 1983), *gurneyi* is primarily a wet season breeder.

Davison speculated that the Burmese birds went to breed 'probably to Siam or into the higher portions of the hills dividing Siam from Tenasserim' and on the face of it Gyldenstolpe's specimen seems a good testimony to the latter proposition. It is noteworthy that the immature and nestling in August/September were from a mountain locality – not, incidentally, 'at least 2000 ft' as reported in Medway and Wells (1976:255), but as noted above (at least, according to Meyer de Schauensee's collectors) between 2,000 and 3,500 ft – and indeed the locality of the October nest appears, on the evidence presented above, to have been in the vicinity of a mountain and therefore quite possibly in hilly country. The testimony of Robinson (1915), that birds in July were common in lowlands but absent from an adjacent mountain, takes no account of the fact that his first hill camp was at 360 m, and that no collecting appears to have been conducted *en route* upwards. It is much to be regretted that Robinson and Kloss never investigated (or at least never published) the gonadal condition of the many birds they collected.

MOVEMENTS

The problem of the species's (former) numerical status is compounded by the problem of its movements. Davison's experience in southern Tenasserim was that a few birds began to appear around 10 February but that the species remained scarce until mid-April, becoming more numerous until the end of May, and then largely disappearing with the onset of the regular monsoon, though with some birds staying on into July (Hume and Davison 1878:244). Robinson and Kloss (1924:222-223) were respectful of this view, but could not confirm it, reporting that they had always found it equally common, in Trang (in the south of its range) in December and January, near Chumphon (north-centre) in March, and in Surat Thani (centre) in June and July. Chasen (1939:204) took these findings as providing 'no evidence to show that the bird is migratory in Peninsular Siam'; Gibson-Hill (1949:256) rephrased this as 'the evidence would suggest that in the peninsula it is sedentary', and Bain and Humphrey (1982:330) in turn declared that 'the Thai population is believed to be sedentary'. The point about Robinson and Kloss's evidence is, however, that it neither confirms nor negates Davison's judgement; and the point about Davison's judgement is that it was based on more fieldwork in Tenasserim and greater knowledge of the species than anyone else has ever achieved.

Davison's skins in BMNH and AMNH – plus two in SMF (D. S. Peters *in litt.* 1985), one in MCML (Fisher 1980:282), one in ROM (N.J.C.), one dated by month of three in MNHN (C. Voisin *in litt.* 1985) and one in RMNH (F. G. Rozendaal *in litt.* 1986) – appear to confirm the pattern he suggests. In 1875 he obtained three birds in February, six in March, three in April and one in May (one of those in April

was from Palaw-ton-ton, the one in May from Lenya: the latter indicates that he was not in southernmost Burma in that month). In 1877 he obtained five in April, 19 in May and five in June. Taken together this yields three in February, six in March, eight in April, 20 in May, and five in June. It turns out, however, that two of his BMNH specimens were taken in December 1875, while the AMNH specimen collected by Oates in 'South Tenasserim' is dated 23 January 1877 (as indicated by Baker 1926:458) and the BNHS specimen is also from January (see above). So proven records for Burma extend from December through to June, with July also claimed. In Thailand the records listed above cover January and February (Trang), March (Chumphon), April (Phuket), May and July (Surat Thani), August and September (Krabi), October (Nakhon Si Thammarat) and December (Prachuap Khiri Khan, Phuket, Trang), i.e. no records apparently exist for June prior to 1986 or November.

If the picture appears confused, this need not be blamed wholly on paucity of data. It seems very likely that the species's seasonal responses may be complex and dependent on several factors; such migrations as occur may, for example, be age-related or confined to populations in only part of the whole range. From the point of view of conservation, however, some understanding of the species's displacements, seasonal or otherwise, is obviously essential it if is to be afforded adequate protection throughout its annual (and life) cycle.

NATURAL CONSTRAINTS

The factors naturally restricting the species's range to what it is (or was) appear to be related to climate, vegetation and, in part, competition, although how is by no means clear. Drawing on Smitinand *et al.* (1967), Wells (in Medway and Wells 1976:2-3) notes and maps two important ecological boundaries across the isthmus of the Malayan peninsula, the first being the northern limit of 'rainforest' at about 10°40'N (on the Thai side of the Tenasserim chain), beyond which it is replaced by 'dry evergreen forest', the second being the transition from 'Thai–Burmese' to 'Malaysian' floristic formations, this occurring as a north-north-east divide roughly between 6° and 7°N (and thus just including the northernmost part of Perlis state in Malaysia). Whitmore (1984:201-203) proposes slightly different boundaries and vegetation categories, the Kra Isthmus being characterised as holding 'semi-evergreen rain forest' changing north of around 12°30'N (i.e. just north of Prachuap Khiri Khan) to 'moist deciduous forest', while in the south he re-draws the ecotone line (between semi-evergreen and evergreen rainforest) east-north-east through Perlis and Pattani (see Figure 3). Wells's comment is that 'Gurney's Pitta, the one species confined between the two zones of differentiation, may have evolved in this small area; alternatively its former range may have been reduced by extinction'. Either way, the conclusion must be that the region under review has features which enable (or would enable, man permitting) the bird to survive there.

RTSD (1972) charts the distribution of tropical monsoon climate as occurring throughout peninsular Thailand from just north of 12°N south to the Malaysian border, with the exception of the eastern half of the region from around 8°N, this

being classified as 'tropical rainforest climate'. This conforms well with Whitmore's ecological boundary to the north (and gives a slightly better accommodation than Wells's to the Prachuap Khiri Khan record at around 11°50'N), and similarly, to the south, what Wells and Whitmore treat in terms of floristic composition can also be seen as a real climatic boundary (although the lines are not exactly coincidental, the features are obviously correlated). It is also worth noting that the 80% humidity contour almost exactly embraces the Pitta's range, running across the isthmus just south of Prachuap Khiri Khan and just south of Trang (RTSD 1972).

Records of Gurney's Pitta are thus all from semi-evergreen rainforest, with the possible exceptions of Prachuap Khiri Khan, which is at the boundary with moist deciduous (dry evergreen) forest, Khao Phanom Bencha, which has some 'hill evergreen forest' (Round in press), and of Thung Song, which may be or may have been in or on the edge of the evergreen rainforest area. Certainly it is striking that, of 65 specimens of bird (inexplicably, Gurney's Pitta is not counted among them) listed from Ban Khlua Klang (Prachuap Khiri Khan) in H. G. Deignan's papers (which are now in the possession of E. C. Dickinson), there are no exclusively Sundaic lowland forest species: most are common birds of open country or deciduous forest, indicating that the area supported a continental Indochinese fauna. The Gurney's Pitta at that and the other Prachuap site may thus have been migrant individuals in atypical habitat, *en route* to or from the moister forests to the west in Burma, or at least having dispersed from breeding areas to the south.

The climatic difference between semi-evergreen and evergreen rainforest, as indicated by RTSD (1972), which plots the rainfall patterns at Ranong, Surat Thani, Phuket and Songkhla, is that the former not merely experiences a 'dry' season, but also endures periods of much greater wetness: the area of such forest thus coincides with the distribution of 'tropical monsoon climate' within peninsular Thailand. Ranong receives under 100 mm per month, December–March, but 200–600 mm per month, April–June, and over 800 mm per month, July–September. Further south, at Phuket, the dry season is similar but otherwise rainfall is fairly regularly distributed at c. 250–350 mm per month. At Surat Thani the pattern is broadly similar, though with lower rainfall and December still 'wet'. Down at Songkhla, however, in the 'tropical rain forest climate', the rainfall is fairly constant from February to September at approximately 100 mm per month, rising to 300, 550, 450 and 175 mm for the months from October to January (so overall much drier). It is possible, therefore, that Gurney's Pitta is adapted to a seasonal environment and requires high levels of rainfall in which to breed, but that the phenomenally high rainfall at Ranong and just across the border in southern Burma forces it elsewhere for the duration of the monsoon. (Davison reported parallel fluctuations in the populations of many southern Tenasserim birds.)

There may be some quite specific adaptation in the ecology of the species which is responsible for its restriction of range. Such a feature could only be identified from a close study of the bird in the wild. Meanwhile, the other major consideration concerns competition from other species of pitta. Throughout the Sunda subregion sympatric species of pitta tend to show segregation on size, habitat or altitude. The Blue Pitta *Pitta cyanea* and Garnet Pitta *P. granatina* have distributions that border the northern and southern frontiers respectively of Gurney's Pitta (Lekagul and

Cronin 1974, King *et al.* 1975). Although there is a vocal record of *cyanea* from Surat Thani province, Thailand (P.D.R. and D.R.W.), and a sight record of *granatina* from Trang (Holmes 1973:51), *cyanea* is larger and *granatina* smaller than *gurneyi*, and neither should compete with it. Moreover, both the similar-sized Blue-winged Pitta *P. moluccensis* and the smaller Hooded Pitta *P. sordida*, though partly sympatric with *gurneyi* in the breeding season, are largely segregated on habitat, preferring forest-edge, secondary growth and bamboo (Round in press).

The closest potential competitor would be the Banded Pitta *P. guajana*, which is almost identical to *gurneyi* in size and which also inhabits forest interior. The relationship of *guajana* and *gurneyi* is unusual, however, in that both have been found together at many sites: in Trang (Robinson and Kloss 1911), Surat Thani (Robinson 1915), Chumphon (Robinson and Kloss 1921) and on Khao Phanom Bencha (Meyer de Schauensee 1946). Although Robinson's (1915) findings imply that both Banded and Gurney's Pittas were abundant in the lowlands, they show that *gurneyi* was absent at around 360 m on a nearby mountain, where *guajana* was common up to at least 600 m. Robinson and Kloss (1911:49) described *guajana* in Trang as 'exceedingly common wherever met with, but very local' and (1924:223) wrote of its distribution in peninsular Thailand as 'most strictly associated with limestone hills such as are found throughout the Malay Peninsula on both sides of the main range . . . The association is correlated with the presence of certain species of shells on the limestone, which constitute the principal article of food of these birds'. Most subsequent workers have thought this claim mistaken, however, since the species appears to be equally common in lowland forests which are remote from limestone outcrops. Chasen (1939:202) stressed that the species was 'a bird of the low-country forests' but that 'it avoids the swamps'.

The possibility exists, therefore, that while *gurneyi* and *guajana* can both occupy lowland forest, with some degree of segregation or dominance based on subtle variations in forest-floor conditions, reduced resources commonly lead to *gurneyi* being excluded from the hill slopes by *guajana*. In some cases even the lowland–foothill ecotone may be unsuitable for *gurneyi*: in recent searches by P.D.R. of valley-bottom forests among the foothills of the peninsular mountain spine (at Khlong Nakha Wildlife Sanctuary in Ranong province and at Khao Chong in Trang, 50–100 m, as well as in an isolated patch of c. 20 km^2 of logged forest in the level lowlands near the town of Krabi), only *guajana* could be found.

In a few sites, however, *gurneyi* might be able to survive on higher ground (although whether it could do so in the absence of adjoining lowland forest must remain open to doubt: see Habitat destruction); on Khao Phanom Bencha, for example, the resource base must have been (and may still be) sufficiently wide to allow it to co-exist with *guajana*, but the destruction of all adjacent lowland forest may have caused *gurneyi* problems at this site. The other area of high ground from which *gurneyi* has been recorded is the hill region of Prachuap Khiri Khan. Since the most northerly records of Banded Pitta are from Thasan, Chumphon province (Robinson and Kloss 1921:223), and it is so far unknown from Tenasserim, it seems likely that *gurneyi* is less altitudinally restricted wherever *guajana* is absent. The narrow strip of forest remaining on the submontane slopes of the Thai–Burmese border in southern Prachuap province may yet prove crucial for *gurneyi*.

The Table provides measurements of *gurneyi*, *guajana*, *cyanea* and *granatina*. Curiously, while body size varies between species, bill and tarsus lengths barely do. Feeding ecology may not, therefore, be the principal isolating mechanism. However, differences in the weight of *gurneyi* and *guajana* conceivably indicate differing preferences for forest substrates.

HABITAT DESTRUCTION

The sense that some disaster must have befallen Gurney's Pitta is very strong when one considers that as many as 62 skins, none more recent than 1919, lie in BMNH drawers, and yet that the species has only twice been found by ornithologists in the

Table. The comparative morphology of four species of pitta from the Malay peninsula. Measurements are in millimetres; those of *P. guajana irena* and *P. granatina* are from live specimens netted at Pasoh, Negeri Sembilan, Malaysia (2°59'N 102°18'E); all others are from specimens in the flesh (i.e. before preparation as museum skins). Maximum and minimum lengths are italicized.

Pitta gurneyi males

	Wing	*Tarsus*	*Gape*	*Wt(g)*
NUSZRC				
	106	40	*29.5*	–
	107	40	28	–
	104	39	28	–
	103	*41*	–	–
	102	*38*	–	–
	–	39	–	–
BMNH				
	(76)	38	*27*	71
	103	41	28	79
	102	41	28	79
	107	–	–	86
	107	41	29	57
	102	38	29	–
$\bar{x}$	104.3	39.6	28.3	74.4

Pitta gurneyi females

NUSZRC				
	104	*35*	–	–
	107	*41*	–	–
BMNH				
	105	38	28	86
	103	–	28	–
	105	41	*29*	79
	102	*36*	*25*	–
	102	40	29	–
$\bar{x}$	104.0	38.5	27.8	82.5

Pitta guajana irena males

	95	41	*26*	86.6
	98	*39*	29	–
	104	45	*31*	84.3
	101	*46*	29	75.5
	105	46	30	86.6
	104	41	27.5	88.6
	105	43	31	89.9
$\bar{x}$	101.7	43.0	29.1	85.3

Pitta guajana irena females

	Wing	*Tarsus*	*Gape*	*Wt(g)*
	98	*40*	29	90.7
	94.5	42	29	76.5
	99	42	29	85.9
	100	44	*31*	92.7
	99	43	*27*	83.5
	101	42	29	78.9
	101	43	28	83.7
	98	42	28	81.4
	101	40	28	80.8
	104	*45*	30	96.9
	99.5	44	30	74.0
	101	43	29	77.1
$\bar{x}$	99.7	42.5	28.9	83.5

Pitta guajana ripleyi (NUSZRC)

male	102	40	–	–
female	98	40	–	–

Pitta cyanea cyanea males

	119	*46*	32	113
	117	46	32	106
	119	46	*31*	–
	114	44	32	120
	117	–	*33*	113
	117	*41*	–	106
	121	43	32	113
	114	46	33	106
	112	–	*28*	111
$\bar{x}$	116.7	44.6	31.6	111.0

Pitta cyanea cyanea females

	117	*46*	30.5	120
	–	43	30.5	–
	112	43	30.5	113
	120	44	33	–
	117	*41*	30.5	113
	109	41	*28*	113
	109	43	30.5	120
	117	44	30.5	99
	114	46	*35*	–
	114	46	30.5	99
$\bar{x}$	114.3	43.7	31.0	111.0

Pitta granatina both sexes

	Wing	*Tarsus*	*Gape*	*Wt(g)*
	90	42	28	60.2
	89	42	28	60.7
	89	40	28	54.2
	88	–	*27*	52.0
	94	42	*29*	61.2
	89	42	29	59.0
	90	–	27	60.6
	89	42	28	63.8
	90	*39*	27	62.8
	87	44	28	59.9
	87	44	28	53.7
	85	44	28	57.6
	90	*45*	29	57.6
	89	40	29	64.0
	93	45	29	62.6
	89.5	45	(32)?	55.9
	91	42	29	52.7
	90	42	28	61.3
$\bar{x}$	89.4	42.5	28.2	58.9

wild in the past half-century. This seeming disappearance cannot simply be attributed to a lack of fieldwork within its range. Although no systematic ornithological surveys appear to have been conducted in southernmost Burma since Abbott's visit just after the turn of the century (the duration and intensity of Shortridge's work in 1914 are not known; the species is no more than listed by Salter 1983:7), no fewer than 22 terrestrial forest localities in the semi-evergreen rainforest zone of peninsular Thailand were visited in the years from 1962 to 1985 by ringing or collecting teams of MAPS (King 1966, McClure and Leelavit 1972) and TISTR (J. Nabhitabhata verbally 1985) or by independent birdwatchers and researchers who reported their findings to the Association for the Conservation of Wildlife. In spite of this, not one specimen or even sighting of Gurney's Pitta resulted, although five of the sites visited (Ranong, Khao Wang Hip, Klong Tung Sai, Khao Phanom Bencha and Khao Chong) were close to or coincided with former *gurneyi* localities (see Figure 2).

Such recent fieldwork has, however, taken place against a scenario of large-scale forest destruction, by both officially approved logging and illegal encroachment,

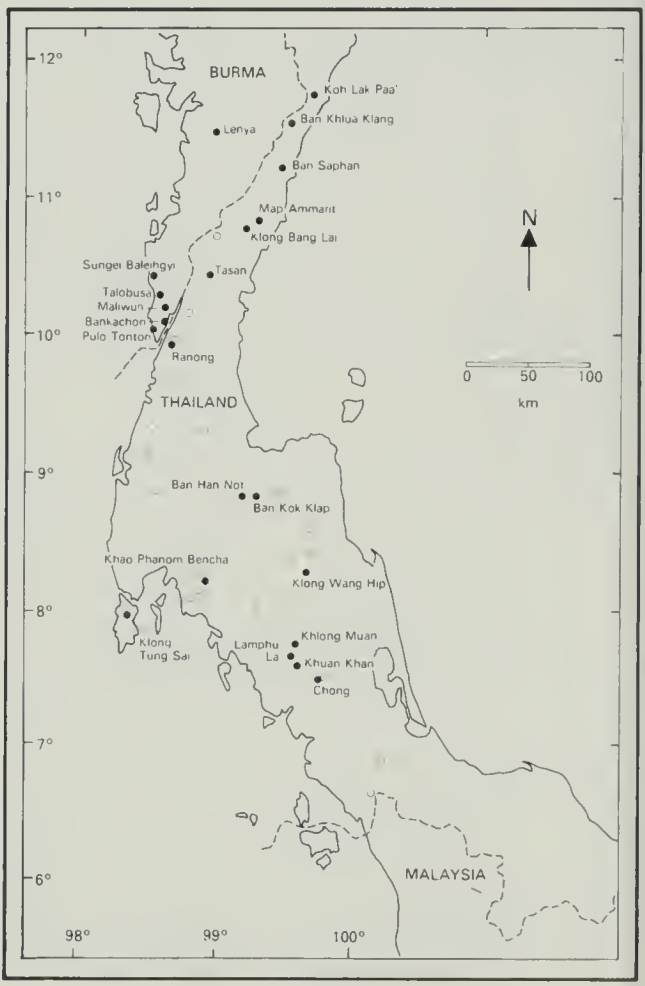


Figure 2. Records (and their absence) of Gurney's Pitta. Black circles and respective names represent sites for the species mentioned in the text. Open circles represent sites where fieldwork was conducted, 1962–1985: all such sites were forested at the time of visit, but none resulted in a record of Gurney's Pitta.

within the range of Gurney's Pitta. According to unpublished data in the Royal Thai Forest Department, the cover of terrestrial forest in peninsular Thailand had been reduced to 14,301 km^2, or approximately 20% of the land area of the region, by the end of 1982 (Round in press). Although this still comprises some extensive blocks, of which the largest, shared between the provinces of Ranong, Surat Thani and Phang-na (including some selectively logged areas), was measured at 4,426 km^2 (Round in press), all such areas coincide almost exactly with the uplands of the peninsular mountain spine (Figure 3). The forests of the level lowlands have almost entirely disappeared and have been replaced by croplands, fruit orchards, rubber and oil-palm plantations. The major expansion of Thailand's protected area network did not take place until the late 1970s and, as a result, the opportunity to include extensive forested lowlands never arose. Most of such areas had already been destroyed.

There are currently five national parks and five wildlife sanctuaries in peninsular Thailand (excluding coastal sites and offshore islands) but, although their combined area exceeds 5,000 km^2, it is doubtful whether any of them encompasses individual

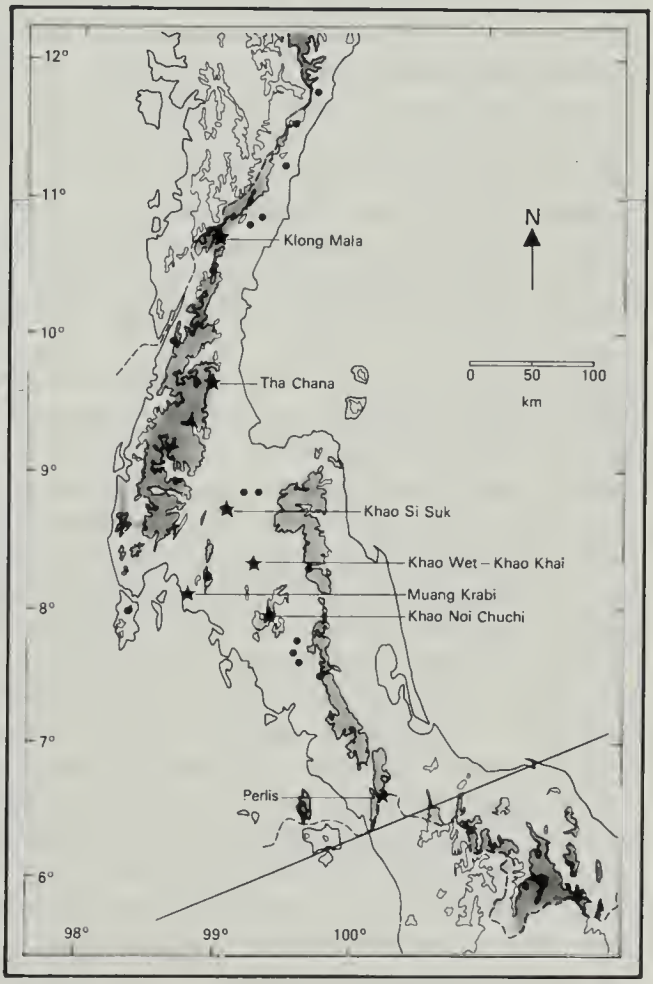


Figure 3. The distribution of remaining forest cover in peninsular Thailand in relation to elevation (note: forest cover in Burma is omitted from this map). The contour line is placed at 200 m above mean sea level. The shaded area represents remaining forest (source: Royal Thai Forest Department 1983). Black circles indicate sites for Gurney's Pitta, as in Figure 2. The stars indicate sites referred to in the text which may still support lowland forest. The bold diagonal line marks the suggested boundary between semi-evergreen 'Thai type' rainforest and evergreen 'Malayan type' rainforest (after Whitmore 1984).

patches of level lowland forest greater than 5 km^2 (Round in press). Even where lowland areas have been included within protected areas, most have suffered subsequent encroachment by 'slash-and-burn' farmers and, in the worst affected areas, cultivation has ascended the hill slopes above 200 m.

The Thailand distribution of Gurney's Pitta mapped by Bain and Humphrey (1982:332) is puzzling in its lack of relation to proven records until one realises that all they have done is delineate remaining forest patches within the species's known latitudinal extremes (compare the map of deforested areas in Bain and Humphrey 1982:10; see Figure 3). If one considers the 16 precise localities where Gurney's Pitta was (or is assumed to have been) collected in Thailand (treating both sites in Phuket, one of which is untraced, as a single locality, and discounting Aagaard's 'Bandon') and compares them with the map of forest cover (Figure 3), it is evident that at least seven (Klong Bang Lai, Maprit, Ban Kok Klap, Hannaat, Krongmon, 'Ko-Khau' and Lam-ra) are in parts of the level lowlands which are now remote from remaining forest. At a further eight sites, (three in Prachuap, plus Thasan, Ranong, Klong Wang Hip, Phuket and Chong), although the lowlands are deforested, nearby hills still support forest above the 100 or 200 m contour and at one of these, Chong, there is still c. 2 km^2 of valley bottom forest remaining. The one other site, Khao Phanom Bencha, is the only undoubted locality where Gurney's Pitta was found on the steep, submontane slopes. Not only is the mountain still almost entirely forested, but by good fortune it was established as a national park in 1982.

Wells (1985) has identified over 30 species of bird which are lowland specialists in peninsular Malaysia and Thailand. These are species which either do not cross the hill-foot boundary or populations of which are thought to be unable to survive on hill slopes without adjoining level forest. Most such species (e.g. Red-crowned Barbet *Megalaima rafflesii* and Sooty-capped Babbler *Malacopteron affine*) are now extremely scarce in Thailand as a direct result of lowland deforestation, and speculation that Gurney's Pitta may also have fallen victim to this process led P.D.R. and his colleagues to search for remaining level lowland forests within its former range during 1984–1985.

In the course of the fieldwork the area identified as being most likely to support an intact lowland forest bird community was along the Klong Mala and its tributaries in Tha Sae district, Chumphon province (approximately 10°43'N 99°00'E). This area, an estimated 910 km^2 of forest, encompassed as much as 150 km^2 of level lowlands between 100 and 200 m elevation (Round in press), and lies roughly between the former *gurneyi* localities of Maprit and Thasan. A reconnaissance during 21–25 September 1984 by P.D.R., K. Komolphalin and U. Treesucon confirmed the continued presence of many lowland forest birds now scarce or absent elsewhere. Even then, however, there were many clearings created by newly arrived settlers. During 11–20 June 1985, P.D.R. and U.T. returned, equipped with a newly acquired tape-recording of the call of Gurney's Pitta (see Biology), only to discover that in the dry season since the last visit hundreds of landless settlers had moved into the area, cut and burnt almost all the standing lowland forest, and established cucumber fields in its place. No patches of trees larger than a few hectares remained and, although the survey concentrated on the Klong Lahia, near

the eastern boundary of the area, the settlers reported that the lowlands elsewhere along the Klong Mala river system had already also been cleared. Even though the area is shortly to be declared a wildlife sanctuary, it is unlikely that there will be any forest remaining other than on the hill slopes by the time this happens (for other details and comment, see Round and Treesucon 1986).

Recently it has become clear that deforestation is not much less a problem in the lowlands of southern Tenasserim: there, where Burma's 'most highly developed moist evergreen forest and associated fauna' are found, the stands are 'under increasing pressure from local people (resin tapping, mangrove charcoal, timber exploitation) and the highly organised Thai timber thieves' (Blower 1985b:85).

PROGNOSIS

During 1982–1985, at least one captive male Gurney's Pitta lived in a private aviary in Bangkok and, since this bird was bought from a trader no earlier than 1978, this provided concrete evidence of the species's survival in the wild until at least that time. In addition, there were reports of three further individuals held captive in Thailand in the early 1980s, at least one, concerning a female held in 1982, being considered genuine (P. na Patalung verbally 1985). Prior to 1986, the records of birds in captivity in the previous two decades were the only evidence that the species survived, albeit in very small numbers and perhaps only in one or two localities. However, if we are to refer to the 'disappearance' of Gurney's Pitta, it is as well to reflect how records of it have been patchily distributed over time ever since its discovery: 1875–1879 by Davison, Oates and Darling; 1904 by Abbott; 1909–1919 by Robinson, Kloss, Shortridge, Herbert and Havmøller; 1929 by Aagaard; 1936 by Meyer de Schauensee; 1952 by Deignan; and 1986 by Round and Treesucon.

It should also be noted that even though biologists from MAPS and TISTR visited such a large number of peninsular forest localities, relatively few pittas of any species (and no more than ten Banded Pittas) were ringed or collected (King 1966, McClure and Leelavit 1972, J. Nabhitabhata verbally 1985). This is undoubtedly a reflection of the difficulty both in seeing pittas, which can be highly secretive, and of catching them in mist-nets. Rather more Banded Pitta sightings, for example, have been made by birdwatchers searching specifically for this family of birds from 1979 onwards. However, since the call of Gurney's Pitta had not been tape-recorded and was not known with certainty until 1985, the species could easily have been overlooked. Pittas are most often seen when the observer is able to move swiftly and silently along a well-marked forest trail; slow stalking is much less successful and enables the birds to disappear quietly before they are seen. Most parks and sanctuaries in peninsular Thailand are not yet provided with good trail networks; moreover, the steep, rugged mountainous terrain combined with the threat of encountering armed insurgents has discouraged exploration of the remoter areas.

Although most former *gurneyi* localities were evidently in the lowlands, this might simply reflect their relative accessibility, since most were close to the few major settlements and railway lines which existed around the turn of the century. There is

also the evidence of Meyer de Schauensee's records that, at least on occasion, the species could be found at considerable elevation and, indeed, much of what is known about the habitat requirements of Gurney's Pitta is pure conjecture. Nevertheless, the destruction of the Klong Mala forests in 1984–1985 was a serious blow to hopes of rediscovering the species, only partially compensated for by the events of June 1986.

There is thus still an urgent need to mount a comprehensive search for Gurney's Pitta, and this might also be used to identify those areas in peninsular Thailand which continue to support the richest lowland forest bird communities. Such survey work could also yield further detailed information concerning the impact of the 'diversity attenuation phenomenon' (Wells 1985:216) on the lowland bird community in Thailand. Such a search should first concentrate on those former *gurneyi* localities where forest still remains on the submontane slopes: the hills west of Prachuap; Thasan (Chumphon province); the headwaters of the Klong Lamphun (Surat Thani province); Khao Wang Hip (Nakhon Si Thammarat province); Khao Phanom Bencha (Krabi province); the headwaters of the Klong Tung Sai (Phuket Island); and Khao Chong (Trang province). Of these, the Prachuap hills and Khao Phanom Bencha appear to provide the best hope.

Particular attention should also be given to those areas which may still support some level lowland forest. In addition to the Klong Mala area, mentioned under Habitat destruction, the Tha Chana district of Surat Thani province (approximately 9°34′N 98°57′E) on the gently sloping, eastern flank of the peninsular mountain spine is identified in Round (in press) as possibly still supporting 116 km^2 of forest below 100 m.

Areas of 20–50 km^2 of forest, mostly centred on or around lower hills which are remote from the main mountain massifs, may still exist at four further sites (coordinates read from RTSD 1973): Khao Si Suk, Phanom district, Surat Thani province (8°42′N 98°55′E); Khao Wet–Khao Khai, Phrasaeng district, Surat Thani province (8°23′N 99°11′E); Muang district, Krabi Province (8°11′N 98°49′E); and Khao Noi Chuchi, Thung Song district, Nakhon Si Thammarat province (7°54′N 99°18′E) (Figure 3). However, all of these areas are certain to be much disturbed.

With regard to the possible occurrence of Gurney's Pitta in Perlis state, Malaysia, despite the opinion that it 'almost certainly' does not or did not live there (Robinson and Kloss 1924:223), potential habitat was extensive until five years ago but now only two separated fragments, both logged, remain. One is a 100–200 ha valley bottom in the Bukit Bintang Forest Reserve (total area 2,638 ha) and the other a maximum 1,000 ha of lowlands within the Mata Air Forest Reserve. The latter totals 4,884 ha but its lowland remnant is in two parts, separated by a forested hill ridge. One of these parts is threatened by a new town, the other by plantation agriculture. Both forest reserves are on the north-west side of Perlis, up against the line of limestone hills that forms the Thailand frontier. Mata Air is contiguous with Thaleban National Park in Thailand, and World Wildlife Fund Malaysia has urged the fusion of the two into an international conservation area. Plans are in hand to search these two areas in 1986. Meanwhile, of course, approaches need also to be made to the Burmese authorities in order to determine the feasibility of survey work

in south Tenasserim.

Gurney's Pitta is, as Hume (1875) called it, a 'really lovely species'. The search to discover a viable population, the survey to plot its distribution accurately, the work to determine its year-round and life-cycle needs, and the effort to get it adequately conserved, must involve major initiatives. The future of one of the finest and most distinctive birds in South-East Asia is the prize.

Museum specimens: an inventory and appeal

Museum specimens have played an important part in the preparation of this paper, and it is our wish to trace every one in the hope that some new information may come to light. To date we can account for 103: AMNH has seven, ANSP four, BMNH 62, BNHS one, CUMZB one, MNHN four, NRM three, NUSZRC eight, RMNH two, ROM one, SMF two, TISTR one, UMMZ one, UMZC one, USNM three, ZMK one, and B. Lekagul's private collection one. We would greatly appreciate being sent details of any other specimens.

J. Hall-Craggs selflessly devoted a day and a half of her valuable time making 21 sonagrams in search of the most appropriate illustration for reproduction here. E. C. Dickinson provided confirmation of the identity of many Thai localities, copied us the letter from Deignan to Elbel, and commented helpfully on the typescript. B. W. Miller, having already checked all pitta specimens in the U.S.A., provided a complete print-out of his data on Gurney's, answered several major queries with alacrity, and drew our attention to the undocumented record dating from 1952. We thank them heartily for their very generous assistance. We are also most grateful to the staff of the Sub-department of Ornithology, BMNH, for access to the collections in their care, to M. LeCroy (AMNH), S. Unnithau (BNHS), C. Voisin (MNHN), C. Edelstam (NRM), F. G. Rozendaal (RMNH), D. S. Peters (SMF) and S. Brogger-Jensen (ZMK) for the provision of data from labels on specimens in their respective museums, to T. Wongratana for permission to examine the bird collection in CUMZB, to the staff of the Forest Mapping and Remote Sensing Subdivision of the Royal Forest Department, Bangkok, for permission to examine maps of forest cover, and to the staff of the Map Room, University Library, Cambridge, for their patience in providing many of the maps consulted in this study. We are also grateful to J. Nabhitabhata for information on localities visited by field teams from TISTR, to R. E. Elbel for help with Deignan's collecting localities, and to P. na Patalung for information on Gurney's Pitta in trade and for permission to tape-record and photograph the individual in his care. T. P. Inskipp kindly drew our attention to Vince (1980). Members of staff at the ICBP International Secretariat kindly read and commented on this paper in draft. J. F. Bellamy and R. Pfaff very ably prepared much of the typescript. N.J.C.'s part in this paper is a contribution from the ICBP/IUCN Red Data Book programme.

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Some important birds and forests in Nepal

C. INSKIPP and T. P. INSKIPP

A table is provided of 122 bird species with restricted breeding distributions and for which Nepal may hold significant populations. Habitat threats and population changes are detailed for 33 species for which Nepal may be especially important. Threats to some upland forests which are particularly species-rich are described. The vital importance of forests to Nepal's avifauna is emphasised.

Nepal is a small country, only about 800 km long and covering roughly the same land area as Greece. About 830 bird species – including 609 which breed or probably breed – have been recorded there, almost a tenth of the total known worldwide.

The exceptional diversity of Nepal's avifauna can partly be attributed to the wide ranges of altitude, climate and vegetation in the country. There are dramatic changes in topography within short distances, Nepal having a unique altitudinal range from the lowlands at 75 m above sea level to the summit of Sagarmatha (Mount Everest) at 8,848 m only 145 km away. There are tropical lowland forests with rainfall up to 4,000 mm per year, mixed temperate broad-leaved and coniferous forests higher up, almost treeless steppe vegetation in the rainshadow of the Himalayas where rainfall is less than 500 mm per year, and alpine flora in the high altitude zone. The other major factor contributing to Nepal's species richness is its position of overlap between the Palearctic realm to the north and the Oriental realm to the south, encompassing ranges of species which originate in both realms.

Nepal is land-locked and largely situated in the Himalayan range and associated foothills, with only a narrow lowland strip in the south and a small high plateau area in the north-west immediately north of the range. It lies in the centre of the Himalayas and can be conveniently divided at the Kali Gandaki valley into a wetter eastern section and a drier western section (Figure 1). Approximately 584 bird species have been found in the west, and 774 species in the east, with 545 species common to both sections. Although the west is comparatively less studied at present, it is nevertheless poorer in species than the east (Inskipp and Inskipp 1985).

There are 122 bird species whose breeding distribution is restricted to an area encompassing the Himalayas, north-east India, northern South-East Asia and south-west China (Figure 2) and for which Nepal may hold significant populations (these are listed in the Appendix). The boundaries of this area are to some extent arbitrary but do coincide roughly with the mountain ranges contiguous with the Himalayas and their neighbouring lowlands. In the following discussion, every mention of status in Nepal refers to Inskipp and Inskipp (1985) and every mention of status in the Indian subcontinent refers to Ali and Ripley (1984).

Two species, Imperial Heron *Ardea imperialis* and Green Cochoa *Cochoa viridis*, are restricted to the area defined above but have not been recorded in Nepal since last century and are therefore omitted. Nepal is probably important for other more

widely distributed species which are rare wherever they occur, e.g. the Dark-sided Thrush *Zoothera marginata*, which occurs south-east to south Viet Nam. There are other species whose breeding is unknown, so their true status is difficult to determine. The White-vented Needletail *Hirundapus cochinchinensis* is present during its presumed breeding season in south-central Nepal, Meghalaya, south-east Thailand, Kampuchea, southern Laos, south-east Viet Nam, Hainan and Taiwan: its disjunct Nepalese population was described as a separate subspecies *rupchandi* (Biswas 1951) but the variation shown by Indonesian wintering birds suggests that the species may be monotypic (Mees 1973). Some species are endemic to the Indian subcontinent but occur fairly widely in lowland areas, thus reducing the likelihood that Nepal is important for them. The White-rumped Needletail *Zoonavena sylvatica*, for instance, is 'patchy and local, though quite abundant in certain localities' in the Indian peninsula; it has been found in a number of localities in Nepal in recent years. Species in these categories fall outside the scope of this review.

Nearly all the significant species are passerines (106 species, 86.9%), with babblers Timaliidae (32 species, 26.2%), thrushes Turdidae (20 species, 16.4%) and warblers Sylviidae (12 species, 9.8%) the best represented families. Of the non-passerines the Galliformes (6 species, 4.9%) and woodpeckers and allies (5 species, 4.1%) are dominant in the list.

The species may be divided into three groups: (1) 24 entirely confined to the Himalayas, or extending marginally into the hills of Afghanistan in the west (one species just reaches the USSR, where it is rare), into neighbouring Xizang Zizhiqu (Tibet) to the north, or, in the case of two species, also into the hills of north-eastern India; (2) 88 with distributions as above but extending either south-east in the uplands through northern Burma to, in the case of some species, northern Viet Nam, or north-east further into China (four species have disjunct populations in Taiwan and one other has a tiny isolated pocket in south-east China); (3) ten that occur in lowland areas adjacent to the hills referred to in the first two groups.

Most of the species breed in forest habitats (74, 61%), 20 (16%) in forest and scrub, 15 in scrub, five in grassland, three in bamboo, two in forest and bamboo, two in rocky habitats and one in rock and grassland habitats. Many of them are threatened in Nepal by forest damage or destruction. The areas which have suffered the most lie between 1,000 and 2,000 m in the central and eastern parts of the country. Much of west Nepal and other areas above 2,745 m are currently much less affected.

Nepal may be especially important for the 33 species described below. They either have particularly restricted ranges within the general area considered or have been described as uncommon or rare in the Indian subcontinent. Possible habitat threats and any known population changes are detailed for each species; however, there is little information available for many of them. The great majority of species (28) occur in the uplands and only five in the lowlands and foothills. There are 18 forest species and another four of forest and scrub (see Appendix). Nine inhabit dense forests with thick undergrowth: Wood Snipe *Gallinago nemoricola*, Purple Cochoa *Cochoa purpurea*, Long-billed Thrush *Zoothera monticola*, Rufous-throated Wren-Babbler *Spelaeornis caudatus*, Black-headed Shrike-Babbler *Pteruthius rufiventer*,

Golden-breasted Fulvetta *Alcippe chrysotis*, Hoary-throated Barwing *Actinodura nipalensis*, Fire-tailed Myzornis *Myzornis pyrrhoura* and Gould's Shortwing *Brachypteryx stellata*. Of these the first six also require damp conditions.

SPECIES RESTRICTED TO THE HIMALAYAS

The Cheer Pheasant *Catreus wallichi* has been listed as 'Endangered' in the Red Data Book (King 1978–1979). Its status in Nepal is uncertain but populations there are likely to be significant. Elsewhere in its range, which once extended west to Hazara in Pakistan, there have been local extinctions, mainly due to persecution (King 1978–1979). However, as the species is extremely shy and secretive it is easily overlooked and may be more frequent than assumed. The birds are usually only evident in the early morning when they are heard calling briefly and sporadically. At present there are still large areas of forest within its Nepalese range, which lies in the west between 1,800 and 3,050 m. Small-scale felling does not affect the Cheer Pheasant as it is a bird of scrub and stunted trees or secondary growth; clear-felling would, however, eliminate the species and may already have affected it in some areas (Lelliott 1981).

The Wood Snipe is a montane species inhabiting swampy areas among thick vegetation in woods. Last century it was apparently more frequent in Nepal, being described as not uncommon in the Kathmandu valley (Hodgson 1831), but it has not been reported there since about 1948 (Ripley 1950).

The Rufous-breasted Bush-Robin *Tarsiger hyperythrus* is a rather enigmatic bird. There had only been four Nepalese records up to 1978 but since then, for reasons unknown, it has apparently increased and spread to west-central areas. The only breeding records for the species come from Nepal since 1979, but the nest and eggs are still undescribed.

The Pied Thrush *Zoothera wardii* can withstand some tree-felling as it occurs in well-wooded ravines and small patches of forest in open country. However, it is likely to have been affected by some habitat loss as its summer altitudinal range, between 1,500 and 2,400 m, mainly lies within the most severely deforested areas of Nepal.

In contrast, the breeding habitat of the Smoky Warbler *Phylloscopus fuligiventer* is not threatened as it summers between 3,900 and 5,000 m in rocky alpine pastures and low scrub. The total range of this species is, however, very small: from central Nepal east to Bhutan and south-east Xizang Zizhiqu.

The apparently local Spiny Babbler *Turdoides nipalensis* has the distinction of being the only bird species endemic to Nepal. It is probably under-recorded, however, because of its skulking nature, and may well occur over the western border in India. It is one of the few species which has probably benefited from deforestation as it inhabits secondary growth, being commonest in the thickest scrub which mainly grows well away from cultivation (Proud 1959).

Although described as common, the Hoary-throated Barwing seems worthy of mention because of its very limited range, which extends from west Nepal (82°E) to Bhutan (92°E) and in Pome district, south-east Xizang Zizhiqu (Meyer de

Schauensee 1984). It frequents forests of oak or of mixed oak, conifer and rhododendron, and like the other eight species found in forests with thick undergrowth it is presumably affected adversely by loss of or damage to the understorey. Degradation of forests has taken place in many parts of Nepal, owing to local people collecting foliage for their animals or allowing their stock to graze under the trees.

The Rufous-throated Wren-Babbler occurs in dense forests from east Nepal (88°E), where it is limited to the upper Mai valley, to western Arunachal Pradesh (92°30'E). Along with the other five species of damp forests it is probably affected by the selective removal of trees and other vegetation, which has resulted in forests gradually drying out. Its breeding habits are unknown.

The White-throated Tit *Aegithalos niveogularis* occurs from the Kagan valley (74°E) east to central Nepal (85°E). The overlap in range with the Black-browed Tit *A. iouschistos* (Inskipp and Inskipp 1985), although sympatric breeding has not been proved, tends to support treatment of the two forms as separate species (Ali and Ripley 1984) not one, as in Vaurie (1959).

MORE WIDESPREAD UPLAND SPECIES

The distribution of the little-known Orange-rumped Honeyguide *Indicator xanthonotus* is linked to nests of wild bees as one of its main food items is beeswax. The males are largely sedentary, polygynous, and defend a territory around a particular nest against other individuals of the species (Cronin and Sherman 1976). The bird may be overlooked as it is drab and unobtrusive.

Three representatives of the thrush family could be suffering from deforestation. The very local Gould's Shortwing summers in dense undergrowth at about 3,500 m, the only breeding record being from the upper Arun valley in Nepal (Cronin 1979). The Purple Cochoa breeds in dense humid evergreen forests at about 2,150 m, a habitat much reduced now in Nepal. The only recent records are from the Mai valley in the far east. The Long-billed Thrush frequents damp dense forests from 2,285 to 3,850 m in summer.

Although the Chestnut-crowned Bush-Warbler *Cettia major* is described as scarce in both Nepal and the rest of the subcontinent, it could easily be under-recorded because of its secretive behaviour. As it summers at forest edges over 3,550 m it is probably not threatened by habitat loss within its breeding range.

There are three species of parrotbill in this group: Great *Conostoma aemodium*, Fulvous *Paradoxornis fulvifrons* and Brown *P. unicolor*. The scarcity of all three can probably be attributed to the disappearance of their favoured bamboo habitat. Bamboo is extensively cut as it is a useful material for building, making baskets and various other purposes.

Two babblers, the Golden-breasted Fulvetta and Black-headed Shrike-Babbler, are likely also to have suffered from loss of their preferred forest habitat, the former frequenting ringal bamboo and other thick undergrowth and the latter occurring in dense, damp, mossy forests. The Nepalese distribution of the Golden-breasted Fulvetta is limited to the southern slopes of Annapurna and the upper Mai valley.

The Fire-tailed Myzornis, Rusty-flanked Treecreeper *Certhia nipalensis* and Yellow-bellied Flowerpecker *Dicaeum melanoxanthum* all occur at fairly high altitudes which must be affected to some degree by the deterioration of forests. The Myzornis, a vivid green and red bird of uncertain affinities that is partly dependent on nectar, summers locally in mossy forests of juniper or rhododendron and bamboo thickets between 2,135 and 3,950 m. The Treecreeper inhabits oak and mixed forests between 2,550 and 3,660 m and the Flowerpecker, whose behaviour, calls and seasonal movements are poorly known, is found locally in tall trees in open forest between 2,400 and 3,000 m.

Although the Crimson Rosefinch *Carpodacus rubescens* has not been recorded in Nepal since 1949, it could be overlooked and its presence there could be significant, as it has a very restricted range. The Vinaceous Rosefinch *C. vinaceus* is interesting as it has an unusual and disjunct distribution. It occurs in Taiwan, where it is common (Severinghaus and Blackshaw 1976), in a limited area in southern China (Meyer de Schauensee 1984) and locally in Burma (Smythies 1953), but has only been recorded once in the Himalayas outside Nepal. It was first noted in Nepal in 1952 and has been seen there more frequently in recent years. The reason for this increase in sightings is unknown, but is unlikely to be merely better observer coverage, as the areas where the species has been seen have been frequently visited since about 1950. The Spot-winged Rosefinch *C. rhodopeplus* is probably more frequent and widespread in Nepal than elsewhere in its range. Its habitat is probably still intact as it occurs in scrub near the tree-line, as does the Crimson-browed Finch *Pinicola subhimachala*. The latter is partial to juniper and occurs locally from central Nepal east to Arunachal Pradesh, in Xizang Zizhiqu and north to Sichuan.

Finally the Scarlet Finch *Haematospiza sipahi* and Spot-winged Grosbeak *Mycerobas melanozanthos* may suffer to some degree from deforestation as they occur in forests over 2,400 m. They are locally distributed in Nepal, the former in conifers and the latter in mixed coniferous and broad-leaved forests.

With the exceptions of the Purple Cochoa and the Long-billed Thrush breeding of all the species mentioned in this group is little or poorly known.

LOWLAND SPECIES

The Bengal Florican *Houbaropsis bengalensis* is the rarest and most threatened of all bustard species (Inskipp and Collar 1984). It has a limited and disjunct distribution and if it survives at all outside northern India and Nepal it can only be in tiny numbers. The spread of agriculture into its grassland habitat has reduced its Nepalese population almost entirely to protected areas. Even there it is threatened by the deterioration of the grasslands through an increase of coarse grasses and the colonization of saplings (Inskipp and Inskipp 1983).

Another species suffering from agricultural encroachment is the Swamp Francolin *Francolinus gularis*, which frequents tall grasses, swamps and other wet areas. Apart from a record of a single bird in the Kosi marshes, the only recent records are from the Royal Sukla Phanta Wildlife Reserve.

The Pale-footed Bush-Warbler *Cettia pallidipes* and Grey-crowned Prinia *Prinia*

cinereocapilla both have fairly limited distributions and have probably suffered from habitat loss. Both are fairly common in the Royal Chitwan National Park, which holds abundant scrub and thick undergrowth, but only a few reports exist from elsewhere in Nepal where conditions are generally much less favourable. However, the former is probably under-recorded as it is shy and skulking.

The Spot-winged Starling *Saroglossa spiloptera* is known with certainty only from Kangra (76°E) to east Sikkim (89°E), but may also breed somewhat further east. It has an unusual east-west post-breeding migration along the base of the Himalayas.

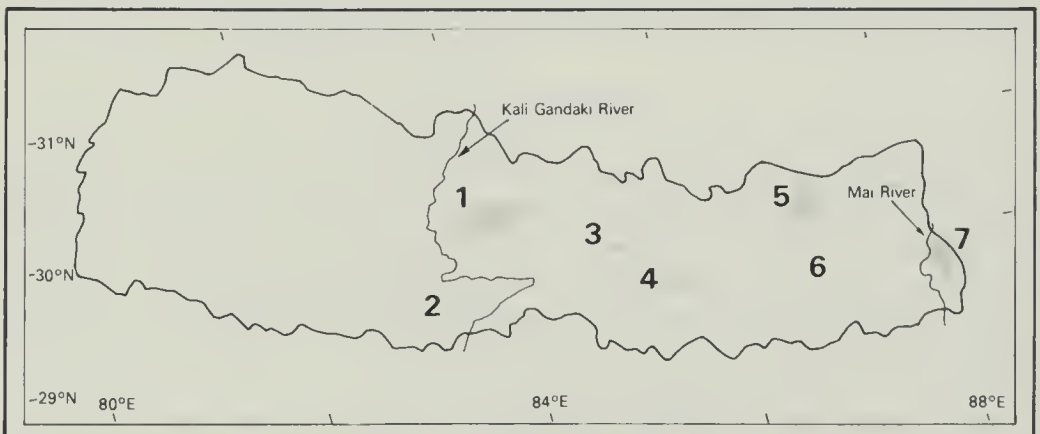
SOME IMPORTANT FORESTS

Some upland forests which are particularly species-rich and therefore of national importance can be identified. These areas have exceptionally high rainfall as a result of local topographical features. The following have been studied ornithologically: the Mai valley; the southern slopes of Annapurna, including the Modi Khola valley, Pipar and Ghorepani; the south-east corner of the Kathmandu valley, especially Phulchowki; and the upper Arun valley. Bioclimate and annual rainfall maps indicate other little-known areas with similar rainfall which may also be of importance if topographical features are favourable (Figure 1).

None of these species-rich forests is protected as a national park or wildlife reserve, although there are proposals for an Annapurna Conservation Area (Sherpa *et al.* 1985) and a wildlife reserve at Pipar (Forster and Lelliott 1982).

Seventeen of the 33 bird species for which Nepal may hold significant breeding populations are recorded from these forests (14 from the upper Mai valley, 13 south of Annapurna and 12 from the upper Arun). Three of these, the Purple Cochoa, Rufous-throated Wren-Babbler and Golden-breasted Fulvetta, only occur in these

Figure 1. Some important forests in Nepal.



1. Southern slopes of Annapurna
2. Tansen area
3. South-east corner of Kathmandu Valley
4. Bagmati Valley
5. Upper Arun Valley
6. Lower Arun Valley
7. Mai Valley

forests within their Nepalese ranges. The latter could therefore be of international importance to the future of these species.

The best known forest, on the northern slopes of Phulchowki (1,525–2,760 m) is famous for its varied fauna and flora. A total of 219 bird species have been recorded there and 165 of these breed or probably breed. As many as 79% of the total are forest-dependent. This area is the most severely threatened of all the species-rich forests mentioned here. Its importance and plight have been well described by Martens (1982). Local wood-cutting parties daily remove large quantities of firewood either for their own use or for sale in Kathmandu. Large amounts of foliage are also collected for animal fodder. In 1982 the track which runs to the summit was surfaced. As a result vehicles can now easily be used to remove timber and the upper slopes are being increasingly threatened. Since about 1975 the lower slopes have been extensively quarried for stone and only bare rock remains over large sections. Many workers' homes have been erected below the quarry on land which was forest only a few years ago.

If Phulchowki's forests are to survive, the quarry must be closed and protection of the forest enforced. Visits to the mountain could become a tourist attraction and bring an additional income to the people of Godaveri, a village at the base of the mountain. This could provide an incentive to the villagers not to cut down the forest; alternative sources of fuel and animal fodder would then be necessary.

A list of 190 bird species has been recorded at Pipar (N. Picozzi *in litt.* to M. Green), most of which are listed by Forster and Lelliott (1982). A species list is not available, however, for the Modi Khola valley nor for the whole species-rich forest area south of Annapurna. Good habitat still remains but the cutting of trees to supply tourist trekkers with fuel is causing concern in the Modi Khola valley, near Ghorepani and along the Ghandrung ridge. The number of trekkers in the proposed Annapurna Conservation Area has markedly increased in the last eight years. The use of kerosene by trekkers as an alternative to wood has been recommended (Sherpa *et al.* 1985). There is little or no tourist activity at Pipar but adjacent to settlements and summer pastures the forest floor is intensively grazed and timber is collected. The harvesting of bamboo, which grows abundantly in the area, may now be exceeding regeneration (Forster and Lelliott 1982).

Present threats in the upper Mai and upper Arun valleys are less well documented. A total of 222 bird species so far reported in the upper Mai valley (1,990–3,050 m) is similar to that found on Phulchowki, and a similar percentage (77%) is forest-dependent. In 1981 local people appeared to be detrimentally affecting the forests by removing wood and foliage and allowing their stock to graze the understorey (pers. obs.). In about 1974 the forests of the upper Arun valley were little affected by human interference; the most damaging impact came from shepherds who used the forests for grazing sheep *en route* to and from the alpine pastures (Cronin 1979). Good forests still remained in 1981 (Krabbe 1981). About 200 bird species have been recorded there (Inskipp and Inskipp 1985). A more exact figure cannot be given as an unknown number of these species were found outside the forests.

By 1980 less than a third of Nepal was still forested. Wood provides 87% of the nation's energy requirements, and as the population is increasing rapidly so are the

pressures on remaining forests in both protected and unprotected areas (Anon. 1983).

More work is urgently needed in the species-rich forests described above and in other forests which are likely to be of similar importance.There are undoubtedly other species-rich forests which need to be identified, especially in the lowlands. Present threats must be determined and the extent of their effects assessed. Up-to-date lists of bird species need to be compiled within each species-rich forest. The conservation status of all species for which Nepal may be important needs to be determined. All species which appear to be at risk must be identified.

About 65% of all Nepal's breeding birds (Inskipp and Inskipp 1985) and 79% of those for which the country may hold significant breeding populations utilise forests. Therefore to ensure the future of the Nepalese avifauna, including those species for which the country may be important, conservation of the country's forests is vital. Nepal now has a National Conservation Strategy for the rational use of resources, aiming to strike a balance between the needs of the growing population and those of nature conservation (Anon. 1983).

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Figure 2. The distribution of birds under review (represented by shading).

APPENDIX
122 BIRD SPECIES FOR WHICH NEPAL MAY HOLD SIGNIFICANT POPULATIONS.

Status

+	Occurs as a breeding bird but abundance unknown	U	Uncommon
C	Common	S	Scarce
FC	Fairly common	R	Rare
LC	Locally common	VR	Very Rare
LFC	Locally fairly common	Ex	Extinct
O	Occasional	+?	Probably breeds
		?	Possibly breeds

Habitat

F	Forest
S	Scrub
B	Bamboo
G	Grassland
R	Rocks
*	Lowland species

References

Nepal = Inskipp and Inskipp (1985). Western Himalayas (east to Kumaon) = Ali and Ripley (1984). Eastern Himalayas (Sikkim to Arunachal Pradesh) = Ludlow and Kinnear (1937), Ali and Ripley (1984). North-eastern India (Assam, Meghalaya, Manipur, Nagaland, Mizoram, Tripura) = Hume (1888), Ali and Ripley (1984). Bangladesh = Khan (1982), Ali and Ripley (1984). Northern Burma = Smythies (1953). Northern Thailand = Lekagul and Cronin (1974), Round (in press). Northern Laos = King *et al.* (1975). Northern Viet Nam = King *et al.* (1975). Xizang Zizhiqu = Ludlow (1944, 1951), Zheng (1976), Li *et al.* (1978), Zheng *et al.* (1980). Southern China (Yunnan, Sichuan, north to eastern Qinghai and southern Neimenggu, east to Hunan) = Zheng (1976), Peng *et al.* (1979). Taiwan = Severinghaus and Blackshaw (1976).

		Nepal	W. Himalayas	E. Himalayas	N.E. India	Bangladesh	N. Burma	N. Thailand	N. Laos	N. Viet Nam	Xizang Zizhiqu	S. China	Taiwan	Habitat
Snow Partridge	*Lerwa lerwa*	FC	+	C							+	+		R
Swamp Francolin	*Francolinus gularis*	S		+	+	R								G*
Blood Pheasant	*Ithaginis cruentus*	LFC		LC			C				+	+		F
Satyr Tragopan	*Tragopan satyra*	U	+	+							+			F
Himalayan Monal	*Lophophorus impejanus*	C	+	C			?				+			S
Cheer Pheasant	*Catreus wallichi*	+	+											S
Bengal Florican	*Houbaropsis bengalensis*	S	+	+	+	Ex?								G*
Wood Snipe	*Gallinago nemoricola*	S	+	+	?						+	?		F
Speckled Wood-Pigeon	*Columba hodgsonii*	O	+	FC	+		+				FC	+		F
Ashy Wood-Pigeon	*Columba pulchricollis*	O		+	+		R	R			+	+	+	F
Slaty-headed Parakeet	*Psittacula himalayana*	FC	C	+										F
Orange-rumped Honeyguide	*Indicator xanthonotus*	S	VR	VR	+		VR							F
Brown-fronted Woodpecker	*Picoides auriceps*	FC	LC											F
Himalayan Woodpecker	*Picoides himalayensis*	FC	+											F
Darjeeling Woodpecker	*Picoides darjellensis*	FC		C	+		LC			+	FC	+		F
Crimson-breasted Woodpecker	*Picoides cathpharius*	O		S	+		C	R	+	+	+	+		F
Blue-naped Pitta	*Pitta nipalensis*	S		+	+	R	+		+	+		+		F
Nepal House-Martin	*Delichon nipalensis*	FC	+	LC	+	R	+			+	+	?		R
Striated Bulbul	*Pycnonotus striatus*	O		+	LC		LC	U	+	+		+		F
Rufous-breasted Accentor	*Prunella strophiata*	FC	C	C							C	+		F/S
Robin Accentor	*Prunella rubeculoides*	FC	C	C							C	+		S
Gould's Shortwing	*Brachypteryx stellata*	S	+	S			?			+	C	+		F/S
Indian Blue Robin	*Erithacus brunneus*	FC	C	S	+		+				+	+		F/S
Golden Bush-Robin	*Tarsiger chrysaeus*	FC	U	FC	+		+			?	FC	+		F/S
White-browed Bush-Robin	*Tarsiger indicus*	O	+	LC	+		?			?	LC	+	FC	F
Rufous-breasted Bush-Robin	*Tarsiger hyperythrus*	O		S							+	+		F
Blue-fronted Redstart	*Phoenicurus frontalis*	C	C	C			+				FC	+		S
White-throated Redstart	*Phoenicurus schisticeps*	O		LC							C	+		S
White-bellied Redstart	*Hodgsonius phoenicuroides*	O	LC	LC			R	?	+	+	C	+		S
Grandala	*Grandala coelicolor*	LC	LC	LC							LC	+		R/G
Purple Cochoa	*Cochoa purpurea*	S	+	R	+		R	R		+		+		F
White-tailed Stonechat	*Saxicola leucura*	LFC	+	+	LC	+	LC							G*
Blue-capped Rockthrush	*Monticola cinclorhyncha*	O	FC	C	+									F/S
Pied Thrush	*Zoothera wardii*	U	U		+									F
Plain-backed Thrush	*Zoothera mollissima*	FC	S	C	+						+	+		F
Long-tailed Thrush	*Zoothera dixoni*	O	+	FC	+					?	+	+		F
Long-billed Thrush	*Zoothera monticola*	O	S	S	+	?	U			+				F
Tickell's Thrush	*Turdus unicolor*	O	C	?										F
White-collared Blackbird	*Turdus albocinctus*	FC	C	C	+		+?				C	+		F
Grey-winged Blackbird	*Turdus boulboul*	C	C	C	+				+	+		+		F

		Nepal	W. Himalayas	E. Himalayas	N.E. India	Bangladesh	N. Burma	N. Thailand	N. Laos	N. Viet Nam	Xizang Zizhiqu	S. China	Taiwan	Habitat
Black-backed Forktail	*Enicurus immaculatus*	O	+	+	C	U	+	U						F*
Chestnut-headed Tesia	*Tesia costaneocoronota*	FC	+	FC	+	+	C	R		+	C	+		F
Pale-footed Bush-Warbler	*Cettia pallidipes*	FC	LC	LC	+		+	R				?		F*
Chestnut-crowned Bush-Warbler	*Cettia major*	S	+	U	+			?			+	+		S
Aberrant Bush-Warbler	*Cettia flavolivacea*	C	+	LC	+		+	?	+	+	+	+		S
Grey-sided Bush-Warbler	*Cettia brunnifrons*	C	C	C			R				C	+		F/S
Grey-crowned Prinia	*Prinia cinereocapilla*	FC	+	FC	+									F/S*
Black-faced Warbler	*Abroscopus schisticeps*	FC	+	LC	+		R			+	+	+		F
Grey-hooded Warbler	*Seicercus xanthoschistos*	C	LC	C	C		+				+			F
Grey-cheeked Warbler	*Seicercus poliogenys*	S		S	C	+	+		+	+		+		F
Large-billed Leaf-Warbler	*Phylloscopus magnirostris*	O	U	FC			+				C	+		F
Buff-barred Warbler	*Phylloscopus pulcher*	C	C	C	+		+		+	+	C	+		F
Smoky Warbler	*Phylloscopus fuligiventer*	U		LC							+			S
Rufous-bellied Niltava	*Niltava sundara*	C	FC	C	+		C				FC	+		F/S
Rufous-tailed Flycatcher	*Muscicopa ruficauda*	U	C											F
Sapphire Flycatcher	*Ficedula sapphira*	S		FC	+		?		+?		+	+		F
Ultramarine Flycatcher	*Ficedula superciliaris*	C	C	U	LC		?				+	+		F
Slaty-backed Flycatcher	*Ficedula hodgsonii*	S		LC	+		+				+	+		F
Yellow-bellied Fantail	*Rhipidura hypoxantha*	C	C	C	+	R	LC	R	+	+	C	+		F
Slender-billed Scimitar-Babbler	*Xiphirhynchus superciliaris*	S		LC	+	R	S?			+		+		F/B
Scaly-breasted Wren-Babbler	*Pnoepyga albiventer*	FC	+	C	S		U			+	C	+		F
Rufous-throated Wren-Babbler	*Spelaeornis coudatus*	U		S										F
Black-chinned Babbler	*Stachyris pyrrhops*	FC	C											F/S
Great Parrotbill	*Conostoma aemodium*	U		U			+				+	+		B
Brown Parrotbill	*Paradoxornis unicolor*	U		U			+				+	+		B
Fulvous Parrotbill	*Paradoxornis fulvifrons*	U		U			+				+	+		B
Spiny Babbler	*Turdoides nipalensis*	O												S
Slender-billed Babbler	*Turdoides longirostris*	LFC		LC	LC	+	FC							G*
White-throated Laughingthrush	*Garrulax albogularis*	C	C	C	+					+	LC	+	C	F/S
Striated Laughingthrush	*Garrulax striatus*	LC	+	LC	+		FC				C	+		F
Variegated Laughingthrush	*Garrulax variegatus*	C/S	C									?		F/S
Rufous-chinned Laughingthrush	*Garrulax rufogularis*	O	U	LC	+	+	+			+			+	F
Spotted Laughingthrush	*Garrulax ocellatus*	LFC	+	FC			LC				+	+		F/S
Grey-sided Laughingthrush	*Garrulax caerulatus*	O		+	+		FC				U	+		F
Rufous-necked Laughingthrush	*Garrulax ruficollis*	LFC		FC	LC	R	C				+	+		F*
Blue-winged Laughingthrush	*Garrulax squamatus*	S		U	FC		S			+		+		F
Scaly Laughingthrush	*Garrulax subunicolor*	LFC		LC			FC			+	+	+		F/S
Black-faced Laughingthrush	*Garrulax affinis*	C		C			LC			+	C	+		F/S
Fire-tailed Myzornis	*Myzornis pyrrhoura*	O		+			R				LC	+		F/S
Black-headed Shrike-Babbler	*Pteruthius rufiventer*	S		U	+		FC			+		+		F
Green Shrike-Babbler	*Pteruthius xanthochloris*	O	U	LC	+		R				C	+		F
Rusty-fronted Barwing	*Actinodura egertoni*	S		C	+		C				+	+		F
Hoary-throated Barwing	*Actinodura nipalensis*	FC		C							+			F
Red-tailed Minla	*Minla ignotincta*	C		C	LC	+	+			+	C	+		F
Golden-breasted Fulvetta	*Alcippe chrysotis*	S		S	S		FC			+		+		F/B
White-browed Fulvetta	*Alcippe vinipectus*	C	LC	C	+		+			+	+	+		S
Nepal Fulvetta	*Alcippe nipalensis*	C		C	C	U	C				+			F
Rufous Sibia	*Heterophasia capistrata*	C	+	C							+			F
Whiskered Yuhina	*Yuhina flavicollis*	C	LC	C	LC	+	C	R	+	+	C	+		F
Stripe-throated Yuhina	*Yuhina gularis*	C	U	C	+		+		+	+	C	+		F
Rufous-vented Yuhina	*Yuhina occipitalis*	C		C			FC				C	+		F
Black-browed Tit	*Aegithalos iouschistos*	O		LC			FC				C	+		F
White-throated Tit	*Aegithalos niveogularis*	O	U											F/S
Grey-crested Tit	*Parus dichrous*	FC	U	FC			+				U	+		F
Rufous-vented Tit	*Parus rubidiventris*	C	+	C	+		+				C	+		F/S
Spot-winged Tit	*Parus melanolophus*	C	C											F
White-cheeked Nuthatch	*Sitta leucopsis*	+	FC	?							R	+		F
White-tailed Nuthatch	*Sitta himalayensis*	C	+	C	+		FC		+	+	+	+		F
Kashmir Nuthatch	*Sitta coshmirensis*	FC	C											F
Rusty-flanked Treecreeper	*Certhia nipalensis*	FC		U	?		FC				+			F
Fire-capped Tit	*Cephalopyrus flammiceps*	S	LC	R?				?	?		+	+		F
Fire-tailed Sunbird	*Aethopyga ignicauda*	FC	+	C	LC	+	C				+	+		F
Yellow-bellied Flowerpecker	*Dicaeum melanoxanthum*	+	+	S	+		+	R?		?		+		F
Grey-backed Shrike	*Lanius tephronotus*	FC	+	C							C	+		S
Black-headed Jay	*Garrulus lanceolatus*	O	+											F
Gold-billed Magpie	*Urocissa flavirostris*	C	FC	+		R	FC			+	+	+		F
Spot-winged Starling	*Saroglossa spiloptera*	O	+	+?										F*
Black-breasted Weaver	*Ploceus benghalensis*	LFC	+	+	+	U						?		G*
Crimson Rosefinch	*Carpodacus rubescens*	S		S							C	+		F
Dark-breasted Rosefinch	*Carpodacus nipalensis*	FC	U	FC			?			?	C	+		F/S

		Nepal	W. Himalayas	E. Himalayas	N.E. India	Bangladesh	N. Burma	N. Thailand	N. Laos	N. Viet Nam	Xizang Zizhiqu	S. China	Taiwan	Habitat
Pink-browed Rosefinch	*Carpodacus rhodochrous*	FC	U/C	+							+			F
Vinaceous Rosefinch	*Carpodacus vinaceus*	S	?				?				+	+	C	F
Dark-rumped Rosefinch	*Carpodacus edwardsii*	S		U							C	+		F/S
Spot-winged Rosefinch	*Carpodacus rhodopeplus*	FC	S	?			+					+		S
White-browed Rosefinch	*Carpodacus thura*	FC	C	C							C	+		S
Streaked Rosefinch	*Carpodacus rubicilloides*	+	FC	+							C	+		S
Crimson-browed Finch	*Pinicola subhimachala*	U		U	?		?				+	+		F/S
Scarlet Finch	*Haematospiza sipahi*	U	+	U	+		?	R	+	+		+		F
Gold-naped Finch	*Pyrrhoplectes epauletta*	O	+	FC			?				FC	+		F
Red-headed Bullfinch	*Pyrrhula erythrocephala*	FC	FC	FC							+			F
Collared Grosbeak	*Mycerobas affinis*	FC	LC	LC			?				FC	+		F
Spot-winged Grosbeak	*Mycerobas melanozanthos*	S?	U	U	+		?	S	?		+	+		F

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Effects of selective logging on the ecological organization of a peninsular Malaysian rainforest avifauna

ANDREW D. JOHNS

Selective timber logging affects the avifauna in a variety of ways. There is a significant overall decrease in species richness. Families such as Alcedinidae, Trogonidae, Timaliidae, Muscicapidae and Dicaeidae were much reduced, both in species richness and overall abundance. Many species of the Pycnonotidae, and migrant insectivores such as *Hirundo rustica* and *Merops viridis* were observed far more frequently in logged (i.e. selectively logged) forest.

Species that possess a highly specialized diet or foraging behaviour, those exploiting resources that are evenly dispersed and predictable, and those that are physiologically intolerant of microclimatic changes were most often absent from logged forest. Terrestrial and sallying insectivores appear particularly susceptible. These birds tend to be replaced by more robust species, often those able to feed opportunistically on a variety of foods. The presence of some colonizing birds is highly ephemeral, but long-term changes in patterns of species abundance are to be expected in logged forest consistent with long-term changes in habitat parameters.

INTRODUCTION

Tropical rainforests support a high species richness among bird communities. This is partly due to historical factors (Pearson 1982) and partly due to environmental and habitat conditions promoting sympatry through specialization (Karr 1976); other factors may be involved.

Mean abundance per species may be very low in tropical compared to temperate forests (Karr 1971). Species may be rare for a number of reasons, usually because their food resources are rare or because their optimal living space along microclimatic gradients or within the habitat structure is small. Species which exist at very low densities are likely to be susceptible to any form of disturbance that alters features of their environment (Willis 1974, 1979): it is clear that species-rich rainforest communities are less constant (*sensu* Putman and Wratten 1984) in the face of environmental change than are simpler communities (e.g. Michael and Thornburgh 1971, Webb *et al.* 1977). Depending on the form of the disturbance, however, common species can be as seriously affected as rare ones. Abundance alone is not a reliable predictor of susceptibility to disturbance (Karr 1982a,b).

This paper examines the response of a species-rich avifauna to selective timber logging, a prevailing form of habitat disturbance in tropical rainforest. Logging operations in peninsular Malaysia rarely cut more than 5% of total stems for their timber, but incidental damage is considerable; destruction of less than 40% of the stand is unusual. The remnant is often left to regenerate, either naturally or with certain management procedures designed to promote the re-establishment of commercially important trees (see UNESCO 1978). The level of damage is sufficient to cause considerable change in patterns of resource abundance,

microhabitat diversity, predator/prey relationships and other controlling factors. The differing responses of species may be used as a basis to examine broad ecological attributes which permit or prohibit survival following habitat disturbance.

STUDY AREA

Data were collected in tropical dipterocarp forest (for a description of this vegetation type, see Whitmore 1984) in the Sungai Tekam Forestry Concession, Pahang, West Malaysia (4°10'N 102°40'E). This area is part of a large block of, until recently, entirely undisturbed primary rainforest. Observations were made in one compartment (C13C) before, during and after selective logging, and in 1–2 year-old (C5A), 3–4 year-old (C1A) and 5–6 year-old logged forests (C2). The period of study was from April 1979 until June 1981.

Study sites (Figure 1) ranged from around 80 m (C2) to 400 m above sea level (C5A), were of undulating to steep terrain and of a uniform vegetation type. None of the higher areas possessed the stands of the common dipterocarp *Shorea curtisii*, which does not occur below the hill-foot boundary and could have been a cause of variation between sites. The different altitudes of the study sites may be a cause of some variation (Wells 1985), but it will later be shown that this is a minor influence.

Site C13C remained adjacent to primary forest throughout the study; the older logged forests were progressively further from primary forest (see Figure 1). Birds would be expected to move freely between primary and logged forest in contiguous areas, unless constrained in some way, but (because of isolation) not between primary and older logged forests, at least on a regular basis.

Observations at C13C showed that 3.3% of trees were cut for their timber, but a

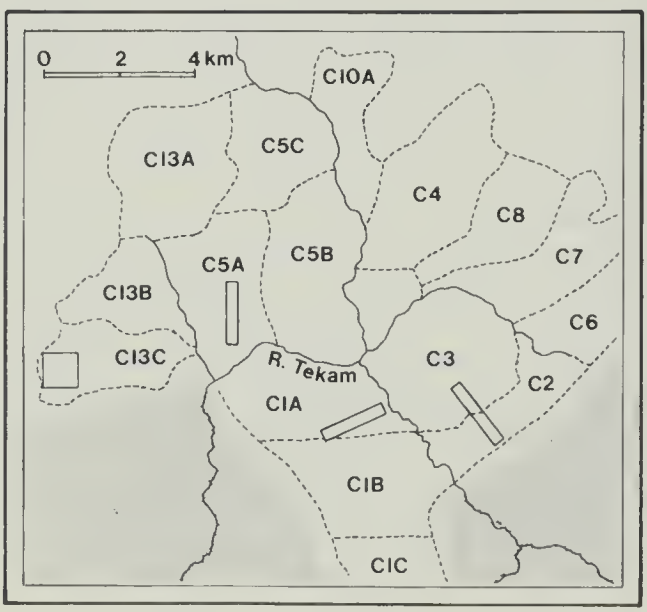

Figure 1. Location of study areas in the Sungai Tekam Forestry Concession. Shaded areas are clear-felled forest, now under plantation crops. All remaining areas are forested. Compartments logged at the time of the study are numbered. Boxed areas represent the study sites.

total of 51% was destroyed during the operation to fell and remove them. The high level of indiscriminate damage counteracts preferences shown by loggers for large specimens of selected tree taxa: the loss of most taxa and all size classes of tree is proportional to their abundance. Selective logging is not selective at all.

In addition to the loss of food resources, there are considerable changes in forest microclimate. Loss of a high proportion of canopy cover causes increased temperature, increased insolation, and decreased humidity in the understorey. Wind damage through dessication and treefalls is also increased.

Extraction levels, and subsequent damage levels, were uniform between all sites studied. Environmental effects of the selective logging operation at Sungai Tekam have been discussed in detail elsewhere (Johns 1983).

METHODS

Data were collected in the form of spot observations; notes were made on first observing an individual bird and not subsequently. In most cases, however, individual birds did not remain visible for more than a few seconds. The majority of species were seen only rarely and many exhibited cryptic behaviour, which probably gives rise to under-representation in the population sample. Many species associated in mixed-species flocks, and in these there would be a bias towards recording the most conspicuous flock members. Cryptic species may, in some cases, be more effectively sampled by mist-netting programmes, but this is only really feasible in the understorey of rainforest and introduces a new set of biases (e.g. Lovejoy 1974). The importance of differential detectability is reduced since analyses compare relative abundances of the same sets of species between habitats.

Results presented for C13C were collected for five months (February to June 1980) prior to logging and six months (January to June 1981) after its completion (data collected during the six-month logging period are not here considered). Birds were observed by walking at random along a 100×100 m trail grid cut through an area of approximately 1 km^2. Observation times varied, but were generally between 06h00 and 18h00, and 19h30 and 22h00 daily. Between two and three weeks were spent at the study site each calendar month.

Results from C5A, C1A and C2 were collected by walking along three 3 km trails. Only the first kilometre was walked during the night. The entire length of the trail was covered at least once per day. Observation times were as at the main study site. Between 12 and 16 full days were spent at each site, but no more than six in any 30-day period.

The local abundance of some bird species may be a reaction to seasonal fluctuations of food abundance (e.g. Leighton 1982), thus comparative analyses are between matched monthly samples, unless indicated otherwise.

Before the onset of data collection, nine months were spent learning to recognize individual species. Not all vocalizations were reliably distinguished and all such data are dropped from the analyses. The use of these data would, in any case, overestimate the abundance of very vocal species such as hornbills Bucerotidae and barbets Capitonidae.

RESULTS

Species richness

Owing to the preponderance of rarity (i.e. of species living at very low densities), it may take a considerable time to record the full avifauna of an area of rainforest. In fact, owing to the dynamic nature of such an avifauna, it may be impossible to do so. Species accumulation curves (Figure 2) do not reach asymptotes. The differences in curve shape between primary and recently logged forests at C13C on the one hand, and the older logged forests on the other, indicate a greater abundance of birds in the latter. More species are recorded per day because more birds are recorded per day; the actual number of common species (i.e. those making up >1% of records) is in fact similar between sites (27 and 26 at C13C before and after logging, and a mean of 25.7 for the three older logged forests: see Appendix). The initial similarity of curves at C13C before and after logging indicates that results may not be significantly biased by differences in habitat-influenced observational ability (i.e. that the greater abundance of birds in the older logged forest is real).

Logged forests appear to support a lesser species richness than primary forest, however. Many species vacate the area as soon as logging begins and subsequently avoid it (pers. obs.). Others may be present in much reduced numbers and remain undetected. Significantly fewer species were observed per month following logging at C13C (Mann-Whitney U test: $U=1$, $n_1=n_2=4$, $p<0.05$). Species abundance curves indicate that logged forests accumulate species fairly quickly following an initial period of destabilization and loss of many species, but they do not necessarily regain species typical of primary rainforest (see Appendix).

The use of diversity indices to examine these data is inadvisable. Examining the whole avifauna by a single index ignores the fact that different subsets react to environmental disturbance in different ways (see Karr and Roth 1971).

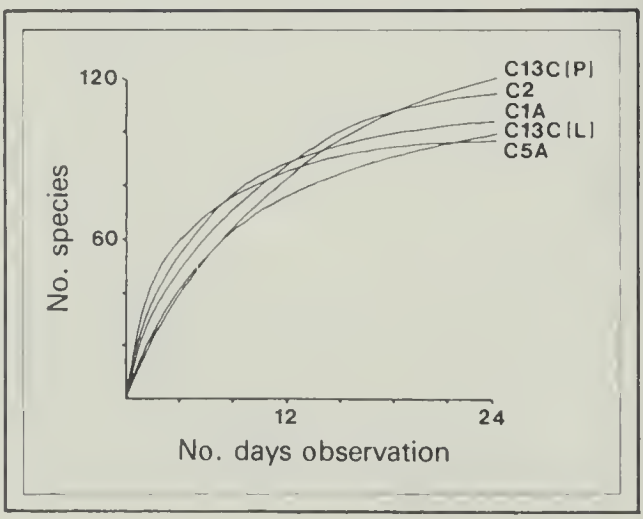

Figure 2. Cumulative number of bird species in primary and selectively logged forests. Results from C13C are separated into those made before logging (P) and those made directly after logging (L).

Species composition

Degradation of forest habitat is certain to cause alterations in the composition of the avifauna. Such alterations may be temporary if the gene pool remains accessible and the forest is allowed to regenerate, or permanent if the logged area is isolated. Logging may be followed by the loss of some species, but will also be followed by the appearance of previously unrecorded species from secondary or edge habitat, many of which follow logging roads into forested areas (see Appendix).

The assemblages may first be examined in terms of sets of species (i.e. feeding guilds: Table 1). The number of species is a feature of sample size.

The primary forest avifauna is dissimilar to those of the older logged areas, but they are remarkably similar amongst themselves (Table 2). It should be noted that

Table 1. Comparison of feeding guild membership within primary and logged forest species assemblages. Feeding guild definitions follow those of Karr (1980), with the addition of the following: faunivore/frugivores (hornbills, which incorporate significant quantities of reptiles, etc., as well as fruit), sallying insectivores (birds that sally forth from a perch to capture flying insects) and sweeping insectivores (birds that fly swiftly in straight lines in open areas, normally above the canopy).

		Number of species		
Trophic group	Feeding guild	Unlogged (C13C)	Recent logged (C13C)	Old logged (C5A, C1A and C2)
Frugivores	Terrestrial	1	2	1
	Arboreal	16	10	9
Faunivore/frugivores	Arboreal	6	5	7
Insectivore/frugivores	Terrestrial	5	1	2
	Arboreal	28	23	30
Insectivore/nectarivores	Arboreal	10	8	9
Insectivores	Terrestrial	16	6	4
	Bark-gleaners	11	7	11
	Foliage-gleaners	55	40	41
	Salliers	20	17	9
	Sweepers	9	7	7
Carnivores	Raptors	15	9	11
	Piscivores	1	0	1
Number of species observed		193	135	142

Table 2. Pairwise comparison of the distribution of species between feeding guilds in different forests surveyed. Results are for chi-squared tests (the following groups are combined in the analyses: both frugivore guilds, both insectivore/frugivore guilds, raptors and piscivores). No areas are significantly different at the level $p<0.05$. Similarity is indicated: * = $p>0.95$, ** = $p>0.99$. It should be noted that effects of differential altitude of the study area appears inconsequential.

	C13C (primary)	C13C (logged)	C5A	C1A	C2
C13C (primary)	–				
C13C (logged)	3.03*	–			
C5A	11.58	7.62	–		
C1A	9.77	3.25*	1.99**	–	
C2	11.98	5.25	4.41	1.03**	–

the avifauna of C13C after logging was still in a state of change. This is also demonstrated by the shape of the species accumulation curve, which falls midway between that of undisturbed forest and that of the older logged forests (Figure 2). In effect, it was still losing species of primary forest but had not yet gained the edge species that were present in older logged areas. It should also be noted, however, that the areas with similar avifaunas were usually located close to each other.

The point should be emphasized that overall similarity of organization masks many changes of species composition, particularly between primary and older logged areas. If a correcting factor is applied to take into account the difference in time spent in unlogged and the old logged forests, i.e.:

$$d = \frac{n}{\left(\frac{t_1}{t_2}\right)}$$

where n = number of observations of species in unlogged forest,
t_1 = number of days observation in unlogged forest,
t_2 = number of days observation in the three old logged forests combined.

If species with a value of $d < 1.0$ are discounted, 22 species in total were judged to avoid logged forests (Table 3). On the other hand, 20 species were observed only in older logged forests or along logging roads.

Table 3. Intolerant and colonizing bird species at Sungai Tekam. Intolerant species are defined as those that occurred at C13C but not in older logged forests, taking the correction factor into account. Colonizing species are those occurring only at C5A, C1A and/or C2, and those associated with open logging roads (marked with an asterisk). Feeding guild codes are explained in the Appendix.

Intolerant species	Feeding guild	Colonizing species	Feeding guild
Otus rufescens	R	*Spizaetus cirrhatus*	R
Hirundapus giganteus	SwI	*Falco* sp.	R
H. cochinchinensis	SwI	*Clamator coromandus*	AIF
Harpactes kasumba	FGI	*Phodilus badius*	R
Ceyx erithacus	TI	*Caprimulgus indicus**	SwI
Lacedo pulchella	TI	*C. macrurus**	SwI
Halcyon concreta	TI	*Anthracoceros malayanus*	FF
Buceros bicornis	FF	*Muelleripicus pulverulentus*	BGI
Sasia abnormis	BGI	*Dryocopus javensis*	BGI
Hemipus hirundinaceus	SaI	*Cymbirhynchus macrorhynchos*	FGI
Pericrocotus cinnamomeus	FGI	*Pycnonotus goiavier**	AIF
Malacopteron affine	FGI	*Hypsipetes charlottae*	AIF
Stachyris poliocephala	FGI	*Corvus enca*	FGI
S. leucotis	FGI	*Copsychus saularis**	FGI
Macronous ptilosus	FGI	*Prinia rufescens**	FGI
Copsychus pyrropyga	FGI	*Orthotomus ruficeps**	FGI
Enicurus leschenaulti	TI	*Motacilla cinerea**	TI
Ficedula mugimaki	SaI	*Lanius cristatus**	FGI
Culicapa ceylonensis	SaI	*Zosterops everetti*	AIF
Rhipidura perlata	SaI	*Lonchura leucogastra*	AF
Prionochilus percussus	AF		
Dicaeum concolor	AF		

In general terms, there would appear to be less species of certain groups of insectivores in logged forests, notably terrestrial, foliage-gleaning and sallying species. Terrestrial species were uncommonly observed, but the lack of observations of almost all such species in old logged forests suggests they were avoiding such areas. A number of foliage-gleaners (e.g. babblers of genus *Stachyris*) and flycatchers (e.g. Mugimaki Flycatcher *Ficedula mugimaki* and Spotted Fantail *Rhipidura perlata*) were observed commonly in primary but never in logged forest. They may have been replaced to some extent by colonizing insectivore/frugivores (e.g. Yellow-vented Bulbuls *Pycnonotus goiavier* and Everett's White-eyes *Zosterops everetti*), but these species are present in large numbers only in very recently logged forest. There is some change in the species of frugivore present, although absolute numbers of frugivorous species are similar between study sites. For example, flowerpeckers Dicaeidae, which specialize on mistletoe (Loranthaceae) berries, are entirely absent from older logged forests.

Individual species abundances

Pairwise comparisons of the distribution of individuals between feeding guilds in all combinations of the different forest types give no conclusive results. Using chi-squared tests, all sites are significantly different from all others ($p<0.001$ in every case) regardless of proximity or altitude. This is probably a reflection upon vagaries of small sample sizes: the older logged forests would have been expected to be more similar to each other than to primary forest.

The response of particular species (see Appendix) may in some cases be attributed to particular effects of logging. For example, logging causes blockage and eutrophication of forest streams, and this adversely effects piscivorous kingfishers Alcedinidae and stream-feeding passerines, such as White-crowned Forktails *Enicurus leschenaulti*. Concentration of logging activity on ridgetops destroys a high proportion of traditional dancing-grounds of Great Argus Pheasants *Argusianus argus*, which are preferentially established in such areas (G. W. H. Davison verbally); their reproductive success, although not their immediate population density, is likely to be affected as a result.

Logging causes contrasting shifts in the abundance of certain species groups (Figure 3), which often reflects the dominance or demise of particular species. Babblers Timaliidae of such genera as *Malacopteron* and *Stachyris* were observed commonly in primary forest but far less so following logging. Comparing observations before and after logging at C13C, a significant drop in numbers was evident (Mann-Whitney U test: $U=0$, $n_1=n_2=4$, $p<0.05$). There was also a significant drop in the numbers of understorey flycatchers Muscicapidae in logged forests (comparing primary forest at C13C with the three logged forest sites: $U=0$, $n_1=4$, $n_2=3$, $p<0.05$). By contrast, significantly higher numbers of bulbuls Pycnonotidae were recorded (comparing primary with older logged forest sites: $U=0$, $n_1=4$, $n_2=3$, $p<0.05$). This was largely due to the appearance in the sample of large numbers of the colonizing Cream-vented and Yellow-vented Bulbuls *Pycnonotus simplex* and *P. goiavier*. The opening-up of the canopy by logging allowed invasion of lower levels by large numbers of sweeping insectivores, notably

by migrant Barn Swallows *Hirundo rustica*. Migrant Blue-throated Bee-eaters *Merops viridis* were also commonly observed in the lower levels of logged forest.

It should be noted that although species are here classified into discrete feeding guilds, some may alter foraging strategies in response to changes in the resource profile. For example, bark gleaners such as Crimson-winged and Banded Woodpeckers *Picus puniceus* and *P. miniaceus* switch to foliage-gleaning when faced with a shortage of bark insects. In view of the predominance of specialized feeders in rainforest, however, major changes in food chosen or feeding behaviour are unlikely to be widespread.

DISCUSSION

Rarity

There is no pattern in the abundance of species in the sample at C13C before logging in relation to their abundance in logged forests. Many species rarely observed in primary forest were equally infrequent in logged areas while others were encountered regularly (e.g. Crested Jay *Platylophus galericulatus*). Some species that were observed frequently in primary forest survive well in logged forest (e.g. Bushy-crested Hornbill *Anorrhinus galeritus*) whereas others do not (e.g. Spotted Fantail *Rhipidura perlata*).

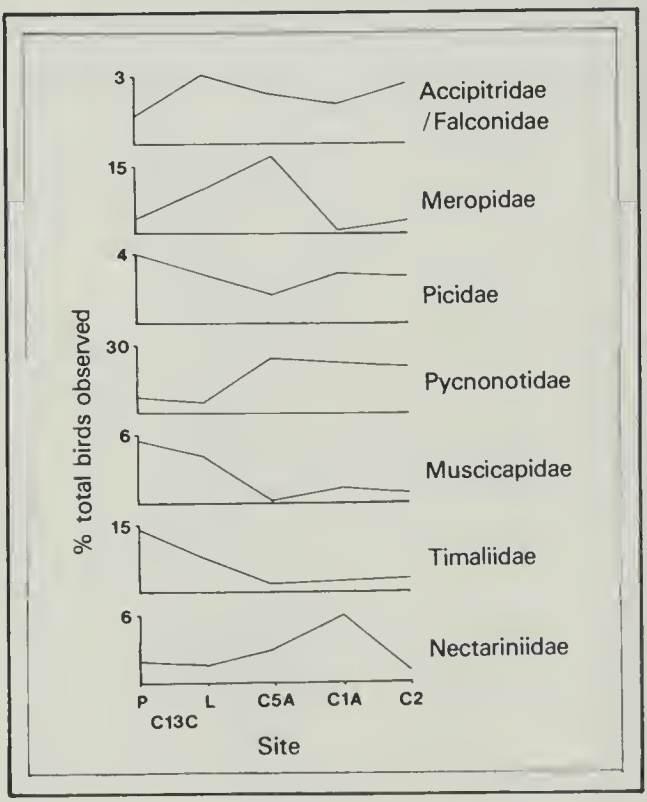

Figure 3. Changes in the relative abundance of selected families of birds in primary and logged forests. Results from C13C are separated into those made before logging (P) and those made directly after logging (L).

Furthermore, there is no pattern in the survival of sets of species of different body weight: some large-bodied species survive successfully (e.g. hornbills Bucerotidae) whereas others do not (e.g. partridges Phasianidae). Responses are more likely to be due to changes in habitat parameters than due to body weight *per se*, although it should be noted that large-bodied species are often more specialized feeders (*cf.* Cope's Law: Ricklefs 1979).

No direct conclusions can be drawn concerning patterns of rarity since samples are limited and serendipity would be a major influence. Seasonal or periodic fluctuations cannot be taken into account, and it is clear that there are high proportions of itinerants among many bird populations, some species (e.g. green pigeons *Treron* and some hornbills *Rhyticeros*) being entirely nomadic (Leighton 1982, Wells 1985). It is necessary to examine features of the environment that are likely to affect patterns of bird distribution.

Food resources

Frugivorous birds may be divided into two main groups: those that feed primarily on small fruits (e.g. bulbuls Pycnonotidae) and those that feed primarily on large fruits (e.g. hornbills Bucerotidae). Both types of fruit are distributed patchily in dipterocarp forest, largely because very few of the tree species produce fruit that is edible to birds (McClure 1966, Fogden 1972).

Small fruits are characteristically produced by small and early-maturing trees, which are often commoner in early successional patches or in riparian habitat, and thus show a highly clumped distribution (Fogden 1972). Large bird-edible fruit are usually produced by rare and widely dispersed canopy trees, and are exploited by large-bodied species capable of travelling long distances and which frequently form cohesive flocking units (e.g. green pigeons *Treron* and Mountain Imperial Pigeon *Ducula badia*).

Specialization towards exploiting a resource that is both patchily distributed and erratic in its seasonality is, to a certain extent, preadaptive to survival in conditions of habitat disturbance. In logged forest, dispersion of large fruit sources will become increasingly irregular, but those species which are physiologically and anatomically adapted for extensive ranging are likely to persist. Less wide-ranging species which feed on sugar-rich fruits are often able to exploit colonizing trees and shrubs (Fogden 1972) and may be less vulnerable than those species which specialize on large fruits produced by trees which are eliminated by logging; for example, disproportionate loss of strangling fig trees *Ficus* subgenus *Urostigma* may adversely affect large hornbills (Leighton and Leighton 1983).

Among the most susceptible frugivores may be small species which feed on lipid-rich fruit (e.g. Green Broadbill *Calyptomena viridis*). Lipid-rich fruit are not often borne by colonizing trees. Flowerpeckers Dicaeidae would appear to be severely restricted in logged forest for similar reasons: in this case, a reliance on a single group of plants (Loranthaceae) which are parasites of canopy trees.

Insectivore/nectarivores, which feed in association with flowers to a major extent, share many behavioural traits with frugivores. Although not well adapted for flying long distances, the species in question typically show considerable local population

shifts, even in primary forests, consistent with the spatial and temporal patterning of food resources. This feature would enable species to exploit patchy food resources in logged forest, and most appear to persist at Sungai Tekam. The more open habitat in recently logged forest contains higher densities of many flowering plants visited by sunbirds of the genera *Anthreptes* and *Hypogramma*, and supports the thick, tangled pioneer community of bananas Musaceae and gingers Zingiberaceae that is occupied by many spiderhunters *Arachnothera*.

Foliage insects are a largely predictable resource in primary forest, but become less so following logging. The overall abundance of insects is less in logged forest, and periods when they are a scarce resource are longer (Wong 1982). Such periods of low abundance of foliage insects are marked by shifts in the feeding habits of some species; bulbuls Pycnonotidae and malkohas *Phaenicophaeus* add fruit or increase the proportion of fruit in their diet. Species which are obligate insectivores will not remain in habitat where shortages of insect prey occur. For example, a severe reduction in the numbers of large foliage insects favoured by trogons *Harpactes* may account for the low numbers of these birds in logged forests.

Babblers Timaliidae are extremely abundant in primary forest and may make up a major portion of the biomass (Wong 1985). They are mostly gleaning insectivores and may find less food in regenerating vegetation. Certain understorey flycatchers, in such genera as *Muscicapa* and *Philentoma*, were also observed far less frequently in logged forests. This is not likely to be correlated with food abundance since the numbers of some flying insects (notably mosquitos Culicidae) increases considerably. There are, however, two ways in which the insects may be less accessible to flycatchers in logged forests. First, sallying species might be limited in their feeding by an absence of suitable perches in the vicinity of food resources, for example, along logging roads and in cleared areas where the insects congregate to breed in water-filled ruts. Second, in such open areas, flying insects become increasingly exploited by sweeping insectivores such as swifts Apodidae and Barn Swallows *Hirundo rustica*, which are restricted to foraging above the canopy in primary forest. These birds, and especially migrant Blue-throated Bee-eaters *Merops viridis*, occupy foraging volume normally used by understorey flycatchers.

Their position at the top of the food chain might be expected to render carnivores susceptible to disturbances affecting the food web, but most appear to exploit a variety of prey species opportunistically and are able to move over very large areas. Many species take advantage of the fact that prey have to cross open areas more frequently in logged forest and are thus more easily seen and captured. Patrolling or scanning of roadways was observed in many species, such as Collared Scops Owls *Otus bakkamoena*, which catch beetles, and hawk eagles *Spizaetus* and Crested Serpent Eagles *Spilornis cheela*, which catch mostly reptiles.

Microhabitat gradients

Karr and Freemark (1983) suggest that selection of optimal microhabitats is a primary determinant of activity, particularly among understorey species. Optimal microhabitats will be selected on the basis of foraging volume (habitat structure) and conditions of temperature and humidity. The activity of many small birds is limited

by temperature fluctuations; some are known never to cross sunlit patches (Bell 1982). Microclimatic changes associated with logging probably limit populations of understorey groups such as babblers Timaliidae more than do alterations of food supply. Babblers are known to become heat-stressed very easily outside of their preferred environment (M. Wong verbally). Species which normally follow the outer surface ('skin') of the forest searching for food (e.g. drongos *Dicrurus*, malkohas *Phaenicophaeus*, leafbirds *Chloropsis*) do not show such physiological limitations and are more likely to respond to features of resource abundance than to microclimatic gradients. As the canopy is broken up by logging, these species will also occupy foraging volume normally exploited by (but now rendered unsuitable for) understorey species.

Logging acts directly to eliminate or reduce certain parts of the microhabitat mosaic. The bark of some forest trees is scorched by sunlight, which also kills the covering of mosses and epiphytes. This change causes a reduction in the numbers of some bark-gleaning insectivores and those that probe among moss and epiphytes for their food. Drying and hardening of the soil severely reduces the availability of soil arthropods and has a marked effect upon litter-gleaning birds: this group may be the most vulnerable to elimination by logging. Terrestrial babblers (e.g. Black-capped Babbler *Pellorneum capistratum*, Large Wren-Babbler *Napothera macrodactyla*, and *Trichastoma* species) were rarely observed in logged forest at Sungai Tekam, and no species of pitta Pittidae was encountered (these birds are normally easily detected because of their characteristic calls).

Nest sites

Loss of suitable nest sites is another factor that may restrict the populations of certain birds in logged forest (e.g. cavity nesters: McClure 1968). Reproductive success of birds has been reported to be depressed even in forest logged 25 years previously (Wong 1985), although it is not clear whether a lack of nest sites or other factors give rise to this difference. No data are provided by this study (see Johns 1985).

Cautionary note

Many large-bodied forest birds travel over large distances and may range between logged and primary forests at Sungai Tekam, although in the case of areas C1A and C2 this would require travelling at least 6 km. Their exploitation of logged forest indicates that it is not wholly unsuitable habitat, but they may not be able to persist solely within it. Most small-bodied itinerant birds would not range so far on less than a seasonal basis, however. Differences in species composition between sites may to some extent be due to the limited observation time, the patchy distribution of birds, the serendipity of encounters, and slight differences caused by altitude, but a consideration of microhabitat parameters suggests that avoidance of logged forest by some species is likely.

The persistence of a large number of bird species in logged areas some distance from primary forest might be taken to indicate resilience to disturbance. It should be borne in mind, however, that following logging the land was left to regenerate

naturally, apart from some replanting in heavily damaged areas: there was no further disturbance. This is atypical of many regions, where logged forests are invaded by hunters and agriculturalists (Johns 1985).

Furthermore, the study considers only short-term results. It would be expected that the most critical period of resident birds is immediately following logging; it is at this time that the species assemblage shows characteristics of instability (notably a predominance of generalist species: see Pimm and Lawton 1978). Itinerant birds may not be stressed at this time, however, because of the proximity of primary forest. While many species persist in the primary/logged forest mosaic at Sungai Tekam, it has yet to be proven that forest avifaunas can be maintained in discrete areas that are completely logged (i.e. selectively logged throughout).

As logging continues at Sungai Tekam, primary forest will become increasingly remote from the older regenerating forests and their use by nomadic and perhaps by itinerant birds may thus fall off over time (unless they regenerate quickly to a stage whereby they can support these birds). In time, primary forest may remain only on steeper land. Many species' distributions are limited by slope (i.e. the hill-foot boundary: Wells 1985) and the source of colonists may thus be curtailed (unless older logged forests support the susceptible species by this time). It is hoped that longer-term observations at Sungai Tekam will provide answers to some of these outstanding questions.

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APPENDIX

BIRD SPECIES RECORDED IN PRIMARY AND SELECTIVELY LOGGED FORESTS AT SUNGAI TEKAM.

Migrant species are marked (Mig); montane species, probably accidental at Sungai Tekam, are marked (Mont).

Feeding guild data are from D. R. Wells (*in litt.*) and my own personal observations. Feeding guild codes are as follows: TF, terrestrial frugivore; AF, arboreal frugivore; FF, arboreal faunivore/frugivore; TIF, terrestrial insectivore/frugivore; AIF, arboreal insectivore/frugivore; IN, insectivore/nectarivore; TI, terrestrial insectivore; BGI, bark-gleaning insectivore; FGI, foliage-gleaning insectivore; SaI, sallying insectivore; SwI, sweeping insectivore; R, raptor; P, piscivore.

Observations made at C13C are divided into those made in primary forest (P) and those made directly after logging (L). Species abundances are noted as follows: −, not observed; x, <0.5% of sample; xx, between 0.5 and 1.0% of the sample; xxx, >1.0% of the sample; p, present (these species were not included in the population sample since they are above-canopy feeders and would thus be underestimated in primary forest where the canopy is closed). Species which follow logging roads, and may thus occur along open roads even within otherwise primary forest, are marked with an asterisk (*).

Nomenclature follows Wells (1985), with minor additions.

Family and species	Feeding guild	C13C (P)	C13C (L)	C5A	C1A	C2
ACCIPITRIDAE						
Anneda jerdoni (Mig)	R	−	x	−	−	−
Pernis ptilorhyncus (Mig)	R	x	−	−	−	−
Accipiter trivirgatus	R	x	xx	x	−	x
A. gularis (Mig)	R	x	−	−	−	−
Butastur indicus (Mig)	R	x	x	−	−	−
Spizaetus cirrhatus	R	−	−	x	−	−
S. nanus	R	x	−	x	−	−
S. alboniger	R	x	x	−	x	x
Hieraaetus kienerii	R	x	xx	x	−	−
Ictinaetus malayensis (Mont)	R	x	−	−	−	−
Spilornis cheela	R	x	xx	xx	xx	xxx
FALCONIDAE						
*Microhierax fringillarius**	R	x	x	xx	x	xxx
Falco sp.	R	−	−	x	−	−
PHASIANIDAE						
Rhizothera longirostris	TIF	x	−	−	−	−
Arborophila charltonii	TIF	x	−	−	−	−
Rollulus rouloul	TIF	x	−	−	−	−
Polyplectron malacense	TIF	x	−	−	−	x
Argusianus argus	TIF	xx	xx	xx	xxx	xxx
COLUMBIDAE						
Treron curvirostra	AF	xxx	xxx	−	−	x
T. olax	AF	x	−	−	−	−
T. vernans	AF	x	x	−	xx	xxx
Ptilinopus jambu	AF	x	−	−	−	−
Ducula badia	AF	x	xxx	xxx	xxx	xxx
*Streptopelia chinensis**	TF	−	x	−	−	−
Chalcophaps indica	TF	x	x	−	xxx	x
PSITTACIDAE						
Psittacula longicauda	AF	−	x	−	−	−
Psittinus cyanurus	AF	xx	xxx	xxx	xxx	xxx
Loriculus galgulus	AF	xxx	x	xx	xx	xxx
CUCULIDAE						
Clamator coromandus (Mig)	AIF	−	x	−	−	−
Cuculus vagans	FGI	x	−	−	−	−
C. micropterus	FGI	x	xx	−	−	xxx
Cacomantis sonneratii	FGI	x	x	x	−	−
C. variolosus	FGI	x	−	x	−	x
Chrysococcyx xanthorhynchus	FGI	x	−	−	−	−
Surniculus lugubris	FGI	x	x	−	−	−
Phaenicophaeus diardi	FGI	x	x	x	−	x
P. sumatranus	AIF	x	−	xx	x	x
P. chlorophaeus	AIF	xx	xx	x	x	xx
P. javanicus	AIF	xx	xxx	xx	x	x
P. curvirostris	AIF	x	xx	x	xxx	xx
Centropus rectunguis	TI	x	x	x	−	−
TYTONIDAE						
Phodilus badius	R	−	−	−	x	x
STRIGIDAE						
Otus rufescens	R	x	−	−	−	−
O. bakkamoena	R	x	xx	x	xx	x
Ketupa ketupu	R	x	−	−	−	xx
Glaucidium brodiei (Mont)	R	x	x	−	−	−
Ninox scutulata	R	x	−	−	−	−
CAPRIMULGIDAE						
Eurostopodus temminckii	SwI	xx	xx	x	x	xxx
Caprimulgus indicus (Mig)*	SwI	−	−	−	−	x
*C. macrurus**	SwI	x	−	x	−	−
APODIDAE						
Callocalia sp.	SwI	p	p	p	p	−
Hirundapus giganteus	SwI	p	p	−	−	−
H. cochinchinensis	SwI	p	p	−	−	−
Raphidura leucopygialis	SwI	p	p	p	p	p
HEMIPROCNIDAE						
Hemiprocne longipennis	SwI	x	xxx	xxx	xxx	xx
H. comata	SwI	x	x	xxx	xx	xxx
TROGONIDAE						
Harpactes kasumba	FGI	xx	x	−	−	−
H. diardii	FGI	x	x	−	x	−
H. orrhophaeus	FGI	x	−	−	−	−
H. duvaucelii	FGI	x	x	−	xx	x
H. oreskios	FGI	x	−	−	−	−
ALCEDINIDAE						
Alcedo euryzona	P	x	−	−	x	−
Ceyx erithacus	TI	x	x	−	−	−
Halcyon concreta	TI	x	−	−	−	−
Lacedo pulchella	TI	x	x	−	−	−
MEROPIDAE						
Merops leschenaulti (Mig)	SaI	x	−	−	−	−
M. viridis (Mig)	SaI	xxx	xxx	xxx	x	xxx
Nyctyornis amictus	SaI	x	x	−	x	x
CORACIIDAE						
Eurystomus orientalis	SaI	−	x	x	−	xx
BUCEROTIDAE						
Berenicornis comatus	FF	x	−	−	−	x
Anorrhinus galeritus	FF	xxx	xxx	xxx	xxx	xxx
Rhyticeros corrugatus	FF	−	x	−	−	xxx
R. undulatus	FF	xxx	xxx	xx	xx	xx
Anthracoceros malayanus	FF	−	−	−	xx	xxx
Buceros rhinoceros	FF	xxx	xxx	xx	xxx	xx
B. bicornis	FF	xxx	−	−	−	−
Rhinoplax vigil	FF	xxx	xxx	xx	xxx	xx
CAPITONIDAE						
Megalaima chrysopogon	AIF	xx	xx	xx	x	x
M. rafflesii	AIF	x	−	−	−	−
M. mystacophanos	AIF	x	xxx	x	xxx	xxx
M. henricii	AIF	xx	xxx	−	xxx	xx
M. australis	AIF	xx	xxx	−	xx	−
Calorhamphus fuliginosus	AIF	xxx	xxx	xxx	x	−
PICIDAE						
Sasia abnormis	BGI	x	−	−	−	−

Family and species	Feeding guild	C13C (P)	C13C (L)	C5A	C1A	C2
Celeus brachyurus	BGI	x	–	–	–	–
Picus puniceus	BGI	xxx	xx	xx	x	x
P. mentalis	BGI	x	x	–	x	–
P. miniaceus	BGI	x	x	–	xx	x
Dinopium rafflesii	BGI	x	–	x	–	–
Meglyptes tukki	BGI	x	x	–	xx	–
Muelleripicus pulverulentus	BGI	–	–	xx	–	x
Dryocopus javensis	BGI	–	–	–	–	xxx
Picoides canicapillus	BGI	x	–	x	–	–
Hemicircus concretus	FGI	xx	xx	x	xx	xx
Blythipicus rubiginosus	BGI	xx	x	x	x	x
Reinwardtipicus validus	BGI	x	x	x	–	–
EURYLAIMIDAE						
Corydon sumatranus	FGI	–	x	x	–	x
Cymbirhynchus macrorhynchos	FGI	–	–	–	–	x
Eurylaimus javanicus	FGI	x	–	–	–	–
E. ochromalus	FGI	x	xx	xx	x	–
Calyptomena viridis	AF	xx	x	–	–	–
PITTIDAE						
Pitta granatina	TI	x	–	–	–	–
HIRUNDINIDAE						
Hirundo rustica (Mig)	SwI	p	p	p	–	p
CAMPEPHAGIDAE						
Hemipus picatus	SaI	x	x	–	–	–
H. hirundinaceus	SaI	xx	x	–	–	–
Tephrodornis virgatus	FGI	xxx	xx	x	–	
Coracina fimbriata	AIF	x	–	x	–	–
Pericrocotus divaricatus (Mig)	FGI	x	–	x	–	xxx
P. cinnamomeus	FGI	xx	–	–	–	–
P. flammeus	FGI	xxx	xxx	xx	x	xxx
AEGITHINIDAE						
Aegithina viridissima	FGI	x	x	x	xxx	x
A. lafresnayei	FGI	x	x	–	–	–
Chloropsis cyanopogon	AIF	x	x	xxx	x	x
C. sonnerati	AIF	xx	xx	xxx	–	–
C. cochinchinensis	AIF	xx	xxx	xx	xxx	xxx
Irena puella	AF	xxx	xxx	xxx	xxx	x
PYCNONOTIDAE						
Pycnonotus melanaleucos	AIF	x	–	x	–	–
P. atriceps	AIF	x	–	xxx	–	–
P. squamatus	AIF	x	x	xxx	–	–
P. cyaniventris	AIF	x	x	xx	x	x
P. eutilotus	AIF	x	–	x	–	xx
*P. goiavier**	AIF	–	x	xxx	–	–
P. simplex	AIF	xx	xx	xxx	xxx	xxx
P. brunneus	AIF	xx	xxx	xxx	xxx	xxx
P. erythrophthalmas	AIF	x	x	–	xxx	xx
Criniger finschii	AIF	x	–	xx	–	x
C. ochraceus	AIF	xxx	x	x	–	–
C. bres	AIF	xx	x	xx	x	xx
C. phaeocephalus	AIF	xx	x	–	xx	–
Hypsipetes criniger	AIF	xxx	x	x	xxx	xx
H. charlottae	AIF	–	–	x	–	–
H. malaccensis	AIF	xxx	xx	xx	xxx	–
DICRURIDAF						
Dicrurus annectans (Mig)	FGI	x	–	–	–	–
D. aeneus	FGI	xx	xx	x	xxx	xxx
D. paradiseus	FGI	xxx	xxx	xx	xxx	xx
ORIOLIDAF						
Oriolus xanthonotus	FGI	xx	x	x	xx	–
CORVIDAF						
Platylophus galericulatus	FGI	x	xx	–	xx	xxx
Platysmurus leucopterus	FGI	x	–	–	–	xx
Corvus enca	FGI	–	x	xxx	xx	x
PARIDAF						
Melanochlora sultanea	FGI	x	x	xx	–	x
SITTIDAF						
Sitta frontalis	BGI	xx	x	x	–	–
TIMALIIDAE						
Pellorneum capistratum	TI	x	–	–	–	–
Trichastoma malaccense	TI	xx	x	–	x	–
T. bicolor	FGI	xx	–	–	–	x
T. sepiarium	TI	x	–	–	–	–
Malacopteron magnirostre	FGI	xxx	xx	x	xx	x
M. affine	FGI	xx	x	–	–	–
M. cinereum	FGI	xxx	xx	x	xx	x
M. magnum	FGI	xxx	xxx	–	xxx	x
Pomatorhinus montanus	FGI	xx	x	–	x	–
Kenopia striata	FGI	xx	–	–	x	–
Napothera macrodactyla	TI	x	–	–	–	–
Stachyris pallocephala	FGI	x	x	–	–	–
S. leucotis	FGI	x	–	–	–	–
S. nigricollis	FGI	xx	–	–	xxx	–
S. maculata	FGI	xx	–	–	x	–
S. erythroptera	FGI	xxx	xx	x	xxx	xx
Macronous gularis	FGI	xx	xxx	x	xxx	xxx
M. ptilosus	FGI	x	–	–	–	–
Alcippe brunneicauda	FGI	x	xxx	x	xxx	–
Yuhina zantholeuca	FGI	xxx	xx	x	xx	–
TURDIDAF						
Erithacus cyane (Mig)	TI	x	–	–	–	–
*Copsychus saularis**	FGI	xx	xx	xxx	xxx	xx
C. malabaricus	FGI	xxx	xxx	x	xxx	x
C. pyrropyga	FGI	x	x	–	–	–
Enicurus ruficapillus	TI	x	x	x	xxx	x
E. leschenaulti	TI	xx	–	–	–	–
Turdus obscurus (Mig)	TI	x	–	–	–	–
Zoothera citrina	TI	x	–	–	–	–
SYLVIIDAE						
Gerygone sulphurea	FGI	x	–	–	–	–
Phylloscopus inornatus (Mig)	FGI	x	–	–	–	–
P. borealis (Mig)	FGI	x	–	x	–	–
P. coronotus (Mig)	FGI	xxx	xxx	x	–	–
Abroscopus superciliaris	FGI	–	x	–	–	–
Orthotomus sericeus	FGI	xx	x	x	x	–
O. atrogularis	FGI	xxx	xx	xx	xxx	xxx
O. ruficeps	FGI	–	x	–	–	–
*Prinia rufescens**	FGI	–	x	–	–	–
MUSCICAPIDAE						
Rhinomyias umbratilis	SaI	x	x	–	–	–
Muscicapa sibirica (Mig)	SaI	x	–	–	–	–
M. latirostris	SaI	xx	xxx	x	–	x
M. williamsoni (Mig)	SaI	x	–	–	–	–
M. ferruginea (Mig)	SaI	–	x	–	–	–
Eumyias thalassina	SaI	x	x	–	–	–
Ficedula mugimaki (Mig)	SaI	x	x	–	–	–
F. solitaris (Mont)	SaI	–	x	–	–	–
F. dumetoria	SaI	x	–	–	–	–
Cyanoptila cyanomelana (Mig)	SaI	x	–	–	–	–
Cyornis unicolor	SaI	x	–	–	–	–
Culicicapa ceylonensis	SaI	xx	x	–	–	–
Rhipidura perlata	SaI	xxx	xx	–	–	–
Hypothymis azurea	SaI	xxx	x	–	x	x
Philentoma velatum	SaI	x	x	x	x	–
P. pyrhopterum	SaI	xx	x	x	x	–
Terpsiphone paradisi	SaI	xx	–	–	xx	xx
MOTACILLIDAF						
*Motacilla cinerea**	TI	x	x	xx	–	x
Dendronanthus indicus	TI	x	–	–	–	–
LANIIDAF						
Lanius cristatus (Mig)	FGI	–	–	x	–	–
L. tigrinus (Mig)*	FGI	x	x	x	–	x
STURNIDAE						
*Aplonis panayensis**	AF	x	–	–	–	–
Gracula religiosa	AF	x	xxx	xxx	xxx	xxx
NECTARINIIDAE						
Anthreptes simplex	IN	xx	x	x	xx	–
A. rhodolaema	IN	x	–	–	–	–
A. singalensis	IN	xx	x	x	–	x
Hypogramma hypogrammicum	IN	xx	x	–	x	–
*Aethopyga siparaja**	IN	x	–	–	–	–
A. mystacalis	IN	x	–	–	x	–
Arachnathera longirostra	IN	x	xx	xx	xxx	–
A. crassirostris	IN	–	x	xx	–	x
A. robusta	IN	x	x	x	–	x
A. chrysogenys	IN	x	x	x	–	–
A. affinis	IN	x	x	x	x	–
DICAEIDAF						
Prionochilus thoracicus	AF	x	–	–	–	–
P. maculatus	AF	x	–	–	–	–
P. percussus	AF	x	x	–	–	–
Dicaeum trigonostigma	AF	x	–	–	–	–
D. concolor	AF	x	–	–	–	–
ZOSTEROPIDAF						
Zosterops everetti	AIF	–	–	xxx	–	–
ESTRILDIDAE						
Lonchura leucogastra	AF	–	–	x	–	–
Total number of species observed		193	135	103	87	89
Total number of individuals		1,804	1,723	1,010	552	701

A re-assessment of the affinities of some small Oriental babblers Timaliidae

COLIN J. O. HARRISON

For some time I have been studying the babblers Timaliidae (or Timaliinae). They are generally rather sedentary birds that have diversified to produce a number of disparate forms, and this was reflected in their earlier classification which contained an unusually large number of genera with only one or two species (Sharpe 1883, Baker 1922). To some extent this situation still applies but in recent decades monotypic genera have been taxonomically unfashionable and there has been a tendency to lump them into larger groupings (Ali and Ripley 1971 – 1972). At times this appears to have been done by linking those nearest each other in published lists of the species.

I find myself in disagreement with some of these larger groupings and in addition a study of museum skins shows that some species should be re-assigned to more appropriate genera. While ultimately I hope to discuss these views in more detail elsewhere (Harrison in press, and in prep.), their summary here may stimulate fieldwork to confirm or refute them.

In order to define the various genera I have found it necessary to pay particular attention to aspects such as bill-structure, tail shape and the general pattern of plumage, but not necessarily the finer details of pattern or colour. It is possible that those who are fortunate enough to watch the living birds in the wild might be able to consider these ideas of relationship more critically or gain some further clues to affinities. They will not, of course, be in a position to review the scattered specimens from different parts of the ranges of widespread species which can justify conclusions that may not be obvious if only a single specimen is seen. However, because so many of these species are furtive by nature, the general behaviour of most babblers as living birds is very poorly known, and further study is needed. Even the appearance of young birds has not yet been recorded for some species. Admittedly young babblers tend to resemble the adults, but there may be differences in the plumage markings and in colour of iris and bill, and these usually more generalised characters may at times provide clues to possible origin and affinity.

WHITE-BELLIED BABBLER Currently known as the White-bellied Yuhina *Yuhina zantholeuca*, this occurs from the Himalayas to Sumatra and Borneo (Deignan 1964). Unlike yuhinas it is uniform olive-green or yellowish-green on the upperparts and head, and greyish-white on the underparts. The crown feathers are moderately elongated but not so markedly as in typical yuhinas. The key feature is the bill. This is stout (dorsoventrally deep) at the base and tapers evenly on both mandibles to a sharp tip. It differs distinctly from those of *Yuhina* species but matches those of the small babblers of the genus *Stachyris*. The other features of

structure and plumage pattern and colour would not be out of place in the latter genus, and I propose to transfer this babbler to it as the White-bellied Babbler *Stachyris zantholeuca*.

CHESTNUT-EARED BABBLER This species usually appears under the name of White-browed Yuhina or Striated Yuhina *Yuhina castaniceps*, and was earlier called the Chestnut-headed Staphida or Chestnut-headed Staphidia, the latter being a misspelling. In the past it has been lumped as constituting five species, now lumped as subspecies, in the genus *Staphida*, with a range from Bengal to Borneo (Deignan 1964). It lacks a distinct crest, and has a small blunt-tipped bill more like those of some fulvettas *Alcippe*. The tail is distinctly rounded with most of its feathers having bold white tips. It does not show any obvious affinities with the yuhinas; nor, for that matter, does it appear to fit satisfactorily into another existing genus, and I propose to return it to its monotypic genus. Plumage pattern and colour vary considerably between the various subspecies, and since the chestnut ear-coverts are one of the few consistent features I suggest that these would provide a more suitable name – the Chestnut-eared Babbler *Staphida castaniceps*.

CHESTNUT-BACKED MINLA This species is generally known as the Chestnut-backed Sibia (Rufous-backed Sibia in King *et al.* 1975) *Heterophasia annectans*, and occurs from the Himalayas to northern Thailand and Viet Nam (Deignan 1964). It does not resemble the other sibia species, which are reasonably consistent in their plumage patterns and generally slender build. Although larger, the Chestnut-backed Sibia resembles the Red-tailed Minla *Minla ignotincta* in bill-shape, general proportions and various aspects of plumage pattern. It appears to belong to this genus and I propose to re-assign it as the Chestnut-backed Minla *M. annectans*.

BLUE-WINGED SIVA This species occurs from the Himalayas to Malaya and Viet Nam (Deignan 1964). Formerly placed in the now unused genus *Siva*, it has in recent times been assigned to the genus *Minla* and the English name changed accordingly. If one discounts the extensive blue of the plumage as a purely specific character, it is closest in general appearance, and in aspects of head pattern and tail-feather shape, to the two species in the genus *Leiothrix* – the Pekin Robin or Red-billed Leiothrix *L. lutea*, and the Silver-eared Mesia *L. argentauris*. It differs from the minlas in almost all details. Its most appropriate place would appear to be either in the genus *Leiothrix* as *L. cyanouroptera*, or possibly retained in the monotypic genus *Siva*.

In listing these proposals I would add a comment based on my personal view that an English name should be no longer than is necessary to identify a species. The scientific name is the one that defines the taxonomic relationships. Since both the names Siva and Minla now apply to single species only, it would be reasonable to discard the adjectival appendages 'blue-winged' and 'silver-eared' and refer to these birds by the shorter name which adequately identifies them. Such rationalisation of names would be appropriate for a number of species not discussed here. Since I do not believe that the English name should be of the same hierarchical type as the

scientific one I do not see a problem in later taxonomic changes. I would prefer to see a series of short varied vernacular names as exemplified by the English names of European ducks and finches.

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Nepal House Martin *Delichon nipalensis* new to Thailand

ALAN TYE and HILARY TYE

The observations described below were made at Phu Kradeung National Park in Loei Province, northern Thailand. The main topographical feature of the park is a 60 km^2 plateau rising from the surrounding lowlands at c. 300 m to a maximum of 1,360 m. Much of the perimeter of the gently undulating plateau is made up of a series of sandstone cliffs, which fall vertically c. 10–50 m to meet the steep slopes which in turn form the lower part of the plateau's sides.

On 30 November 1984, we watched a large mixed flock of hirundines and swifts at one of the cliffs, Pa Makduk, feeding over and out from the cliff edge. Brown Needletails *Hirundapus giganteus*, White-rumped Swifts *Apus pacificus* and Barn Swallows *Hirundo rustica* all fed singly or in small groups above the grassland and open pine woodland of the plateau itself and occasionally joined or flew through the main flock: hence the numbers of these species in the main flock were variable. The main flock fed primarily above the broadleaved forest on the slopes of the plateau's sides, just out from the cliff, and comprised about 40 Dusky Crag Martins *Hirundo concolor*, 50–60 Red-rumped Swallows *H. daurica* and 30 small house martins *Delichon* sp. Our field description of the house martins was as follows: 'Small

martin. Black throat, undertail-coverts and tail; black/blue upperside; underside white, not dusky; white rump fairly narrow; tail more or less square; looks "neater" than European House Martin *Delichon urbica;* noticeably smaller than Dusky Crag Martin.' We watched these birds for over 30 minutes, while they flew in front of us, above and below our own elevation, often passing within 20 m.

The above description seems diagnostic of Nepal House Martin *Delichon nipalensis*, which has not been previously recorded from Thailand (P. D. Round *in litt.*). In particular, the combination of square tail with black throat and undertail-coverts eliminates the other *Delichon* species. Our description fits well with that in Ali and Ripley (1972) except that we did not see the 'broken white collar on hind-neck'. This is shown in Ali (1977) as a very fine broken line, and examination of museum specimens suggests that it would be visible in the field in less than 10% of individuals (less than three birds in our flock).

The avifauna of Phu Kradeung has been poorly studied to date (P. D. Round *in litt.*). The Nepal House Martin may occur there regularly but has perhaps been overlooked hitherto. Although not recorded before in Thailand, it is known from northern Burma and northern Viet Nam (Ali and Ripley 1972). In Burma it breeds in the Arakan range in the west (subspecies *nipalensis*) and occurs in the north-east (subspecies *cuttingi*) where its status is uncertain (Smythies 1953) and from where it may extend into Yunnan (Meyer de Schauensee 1984). It is recorded as resident in Viet Nam, in north-west Tonkin (King *et al.* 1975), although the subspecies there has not been determined (Vaurie 1959). We were not able to determine the subspecies of the Thai birds.

The records from north-east Burma, Yunnan, north-west Tonkin, and our record from north-central Thailand, all fall along the margins of the Yunnan range of mountains, which reach their southernmost extent in Burma, Thailand, Laos and Viet Nam. Possibly, the race *cuttingi* breeds widely within these mountains, moving to lower altitudes and latitudes in winter. Along the margins of the Himalayas, the Nepal House Martin's altitudinal breeding range is 2,000–4,000 m, descending to c. 350 m in winter (Ali and Ripley 1972). We saw it, in winter but further south, at c. 1,300 m.

The species is highly gregarious and subject to sporadic winter movements (Ali and Ripley 1972), suggesting that it might well be expected to occur in the ornithologically little-known areas of northern Thailand, east Burma (Shan States) and Laos. The status of the Nepal House Martin in Thailand remains uncertain: our record was from the non-breeding season. The large flock seen, rather than one or two birds, suggests it is not a vagrant but may be (at least) an irregular or regular winter visitor. If it is a migrant, it presumably comes from further north in Laos, Burma or Yunnan, whereas the known populations to date seem to undertake only short-distance, altitudinal migrations (Ali and Ripley 1972). Hence, either the birds we saw come from a migratory population or, possibly, they breed locally in northern Thailand. Suitable breeding habitat is present at Phu Kradeung and other mountainous areas in north-west Thailand, where rock overhangs occur on vertical cliff faces (its preferred nest site: Ali and Ripley 1972), some at over 2,000 m.

We thank P. D. Round for helpful discussion and T. P. Inskipp for commenting on the manuscript.

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Does the Pied Harrier *Circus melanoleucos* breed in the Philippines?

EDWARD C. DICKINSON

On 5 July 1975 I saw a pair of Pied Harriers *Circus melanoleucos* in the rolling cogon grasslands (*Imperata* sp.) east of Laguna de Bay along the road from Tanay, Rizal, to Siniloan, Laguna Province, Luzon. The male was in full adult plumage and the two birds executed an apparent aerial food-pass, though no actual prey exchange could be confirmed. After the birds separated neither landed within view. All my other records of this species from the Philippines are from October to February inclusive.

Parkes (1973) considered an August record of Lint and Stott (1948) to be unusually early, citing Brown and Amadon (1968). The timetable of migration given by the latter authors agreed with that of Smythies (1953) for Burma and with my own experience in Thailand, but adequate data on the seasonal occurrence of the species in the Philippines has not been published.

The species has nested in Burma – in April/May in a grassy plain south of Myitkyina – and may do so regularly in small numbers (Smythies 1953). Brown and Amadon (1968) underlined that breeding in Burma, in the south of its range, is six to eight weeks earlier than in the north. Hence one might expect records in the Philippines as late as May to be northern migrants, and for these to have returned by August would indeed be unusually early.

M. LeCroy (*in litt.*) has revealed the existence of a skin from Mindoro collected on 30 July 1963, and additional evidence of 'oversummering' is to be found in the manuscript notes of E. A. Mearns held by the United States National Museum (USNM). Much of his information was gathered in Mindanao and he found *C. melanoleucos* there in every month except July and December. Many of his records were from 'the broad sweep of cogonal country extending from the Serenaya Marsh

to the upper Libungan River east of Cotabato' and the Lake Lanao basin, and here in 1904 there were 'many' on 12 and 13 March, the species was 'noted' from 3 to 10 April and 'some were seen' on 28 and 29 May. His notes also say: 'At Tagulaya, on the west shore of the Gulf of Davao, June 14, 1904, I noted "The black and gray harrier is here in abundance upon the cogonals; but I saw none to-day" '. This implies sightings within the preceding few days since a chronological review of his collecting places him in that area only after 11 or 12 June. He also recorded the species from the 'base of Mt. Mayon, Tobaco side, Albay Province, Luzon' on 4 and 5 June 1907.

In summary there seems to be good evidence of occurrence throughout the year (although no doubt northern migrants augment the population in winter) and in habitat entirely suitable for breeding. The apparent food-pass described above is suggestive, but obviously formal evidence of breeding has yet to be found.

Dr. George Watson (USNM) was good enough to provide copies of Mearns's notes and Mary LeCroy details of the July specimen in the American Museum of Natural History.

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FORKTAIL

urnal of the Oriental Bird Club No. 2

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Cover: Swallow with features of a White-eyed River-Martin (see Dickinson, within). Photo: Didi Brandt.

FORKTAIL

Number 2, December 1986

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Production of this second issue of *Forktail* has proceeded as rapidly as possible in order to bring it to 1986 Oriental Bird Club members before the year is out. Regrettably the pressure of time means that the circulation of texts amongst the Editorial Committee has been incomplete. The editor always takes final responsibility, but should there be any complaint over this issue the Editorial Committee can in no way be held to account. On the other hand, I have to thank R. F. Grimmett and T. P. Inskipp who, through their proximity at work, have kindly reviewed most of the papers in this issue at short notice and high speed. Tim Inskipp's help has been of particular importance: the combination of his voluminous knowledge and meticulous attention to detail has been vital to the entire editorial process. I must also thank T. H. Johnson and T. M. Reed for acting as referees of certain contributions, and P. Creed and D. Steel of Pisces Publications for their painstaking commitment to *Forktail* over the past six months.

It will be observed that the paper on Philippine conservation priorities is not strictly ornithological. However, birds form a component of the analysis, and the interest and value of this analysis appear very obvious; early publication such as *Forktail* could provide was therefore considered entirely justified. We expect to continue to carry a proportion of such important, more general papers. In this particular case, the Oriental Bird Club was requested by the authors to waive copyright, so that the paper can be reproduced in journals in the Philippines without delay. We have willingly complied, but hope that those who subsequently publish it will at least be ready to indicate that it first appeared in *Forktail*.

Finally as we go to press, two of ornithology's most distinguished leaders, Salim Ali and Zheng Zuoxin, prepare to turn 90 and 80 respectively. The Oriental Bird Club most respectfully salutes them.

22 October 1986 N. J. C.

FORKTAIL 2 (1986): 3–20

On the bird migration at Beidaihe, Hebei province, China, during spring 1985

MARTIN D. WILLIAMS, DAVID N. BAKEWELL, GEOFFREY J. CAREY and STEPHEN J. HOLLOWAY

We wish to dedicate this paper to the memory of the late Axel Hemmingsen.

A survey of the bird migration at Beidaihe, Hebei province, China, was conducted during spring 1985. Changes in habitats since 1945, when bird migration was last studied at the town, are briefly described. Short-term effects of weather on migration are noted. Records which may be considered to be of interest are summarised, or given in full, for 18 species. These include totals of 244 Red-crowned Cranes *Grus japonensis*, 309 Hooded Cranes *G. monacha*, 652 Siberian Cranes *G. leucogeranus* and 132 Great Bustards *Otis tarda* and two sightings of a swift which may be of a species new to science.

A Danish scientist, Axel Hemmingsen, studied birds at Beidaihe from 1942 to 1945. The two papers which are based on his studies (Hemmingsen 1951, Hemmingsen and Guildal 1968) present a wealth of information on the birds in the area. The first of these (Hemmingsen 1951) is of a general nature and discusses topics such as the habitats at Beidaihe, the effects of weather on bird migration and factors affecting the timing of the migrations of birds. The second paper (Hemmingsen and Guildal 1968) gives accounts of the occurrence of each of the species which Hemmingsen recorded in Hebei province, particularly at Beidaihe. There are also notes on the identification of many of the species he recorded. Together, the two papers form a superb reference work which is, perhaps, yet to receive the attention it deserves.

In spring 1985 the eight-member Cambridge Ornithological Expedition to China 1985 surveyed bird migration at Beidaihe from 15 March to 1 June. The survey was primarily intended to produce data which could be of value in present and future assessments of population changes.

This paper is, in large part, an attempt to update the material in the papers by Hemmingsen and by Hemmingsen and Guildal, so repetition of their information has largely been avoided. A full account of the expedition is now available (Williams 1986).

In this paper, the Chinese names for localities at Beidaihe are, as in the papers by Hemmingsen (1951) and Hemmingsen and Guildal (1968), in the form given by the Wade-Giles system for romanisation of Chinese characters. Beidaihe, however, is the form of the town name given by the recently introduced pinyin system (it was written Peitaiho by Hemmingsen).

BEIDAIHE AS A LOCALITY FOR A MIGRATION SURVEY

Beidaihe (strictly Beidaihe Haibin – North Dai River Beach) is a seaside

resort, lying approximately 280 km to the east of Beijing (Peking). The town is on the northern part of a plain which occupies much of Hebei province. Approximately 15 km inland of Beidaihe is the south-eastern extent of a mountain range, the southern flank of which extends westwards for over 300 km. The eastern flank of the range runs roughly parallel to the coast and bounds a northward extension of the plain (see Figure 1); the resultant coastal strip runs approximately north-east–south-west and acts as a 'funnel' for many of the birds whose migration routes are believed to cross in the area (Tugarinov 1931, Zheng 1976). This, together with the wide variety of habitats in the environs of the town, makes Beidaihe an excellent place for studying migration. (Additionally, the small hills at Beidaihe contrast with the flat land around, and especially to the south of, the town and probably act as good landmarks for migrating birds.)

Previous studies – by La Touche (1920, 1921) at nearby Qinhuangdao from 1910 to 1917 and by Axel Hemmingsen (Hemmingsen 1951, Hemmingsen and Guildal 1968) at Beidaihe from 1942 to 1945 – together with occasional observations by Wilder and Hubbard between 1894 and 1940 (Wilder 1924, 1940, Wilder and Hubbard 1924) have yielded a considerable amount of information on bird migration in the area and have shown that certain rare species (notably the Oriental White Stork *Ciconia (ciconia) boyciana* and the

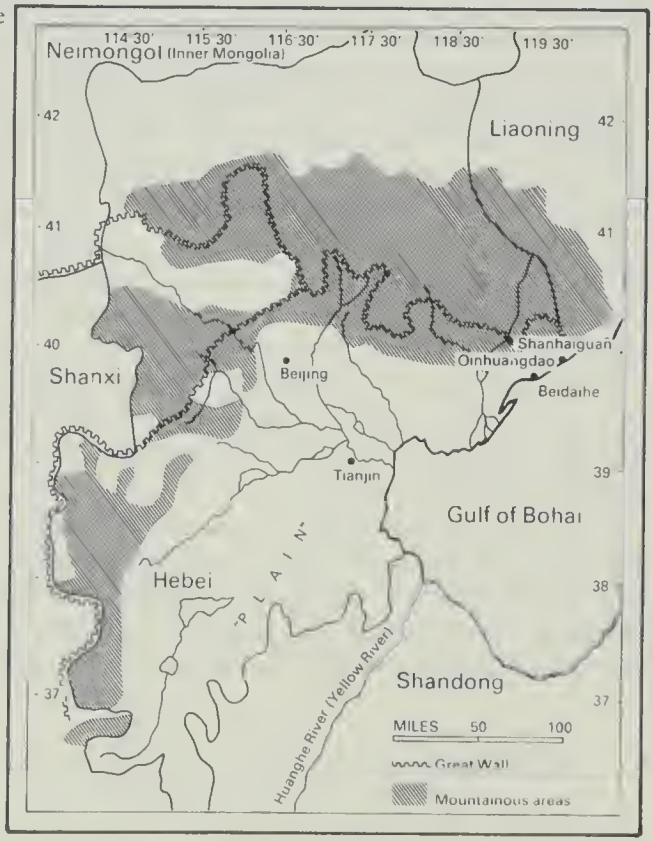


Figure 1. Map of Hebei Province (after Wilder and Hubbard 1924).

Siberian Crane *Grus leucogeranus*) passed through in large numbers. More recent visits – by A. Galsworthy (*in litt.*), W. W. Thomas (*in litt.*) and J. Boswall (1983) – between 1976 and 1983 indicated that development had not drastically affected the habitats and good numbers of migrants were still to be found. It appears that there has been little work on bird migration in China since Hemmingsen's study, Chinese ornithologists having, until recently, tended to study landbirds at their breeding and wintering grounds; some attention is now being paid to migration studies (Wei-shu Hsu verbally, Chang Fuyuen verbally, Zhang *et. al.* 1985, Mao 1985). Hence, prior to spring 1985, Hemmingsen's study provided the most recent information on the numbers of those species (other than raptors: Zhang *et. al.* 1985) which pass through the area.

HABITATS AND LOCALITIES: DIFFERENCES SINCE HEMMINGSEN

The considerable expansion of Beidaihe since the time of Hemmingsen seemed to have had little detrimental impact on the range and types of habitats available. However, the Heng-Ho mudflats (the 'Sandflats' of Hemmingsen, described by him as the area 'par exellence' for waders) held disappointingly few birds – perhaps because the damming of the Heng-Ho had reduced the supply of nutrients and the area was more prone to disturbance than before; and the 'Grassy Sands' of Hemmingsen (formerly used as a resting area by birds such as storks, cranes and Great Bustards *Otis tarda*) had been planted with trees. Moreover, development was continuing apace (for example, an area of open fields in mid-March had become a small housing estate by the end of May) and may well lead to the damage or destruction of certain areas; the Tai-Ho (Daihe) estuary, Tai-Ho pool and Yang-Ho estuary appeared to be particularly at risk.

A reservoir, which we named the Heng-Ho reservoir, had been created since Hemmingsen's study. This is a narrow reservoir (c. 1 km long) formed by the damming of the Heng-Ho just upstream of the mudflats. During late May good numbers of herons, crakes, and *Acrocephalus* and *Locustella* warblers occurred in the dense vegetation on the margins of the reservoir and in adjacent, disused paddyfields.

The following three localities were rarely, or never, visited by Hemmingsen.

The Tai-Ho estuary attracted waders such as Whimbrels *Numenius phaeopus*, Rufous-necked Stints *Calidris ruficollis* and Terek Sandpipers *Xenus cinereus*, usually in lower numbers than occurred at the larger and less disturbed Yang-Ho estuary.

The Tai-Ho pool was partially tidal, and connected to the Tai-Ho by a narrow channel. Considering its size (< 70 m across at its widest point), this was an excellent area for waders, including several, largely freshwater species

such as Wood Sandpipers *Tringa glareola*, Marsh Sandpipers *T. stagnatilis*, Black-winged Stilts *Himantopus himantopus* and Long-toed Stints *Calidris subminuta*.

The Yang-Ho estuary lay approximately 4km to the south-west of Beidaihe and attracted the largest numbers of waders (e.g. up to 78 Grey Plovers *Pluvialis squatarola*, 54 Eastern Curlews *Numenius madagascariensis* and 154 Whimbrels).

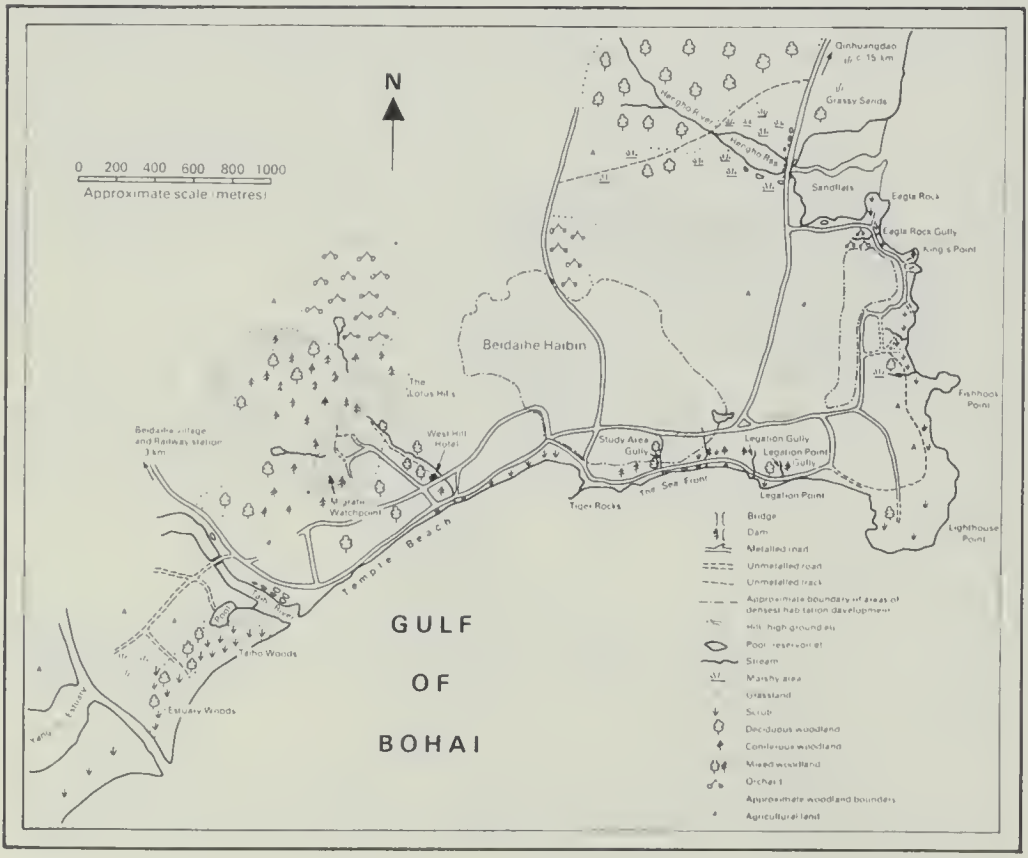
The Lotus Hills, which are at the western edge of Beidaihe, were found to be an excellent vantage point for recording diurnal migration (it appears that Hemmingsen made only a few casual observations of passing migrants from this locality, despite his notes on grounded migrants there).

The positions of the main localities at which we recorded migrants are indicated in Figure 2.

METHODS

Observation (using binoculars and telescopes) provided the means of data

Figure 2. Sketch map of the area surveyed by the Cambridge Ornithological Expedition to China 1985 (after Hemmingsen 1951).



collection. The most useful sources of information on the identification of the species recorded were Sonobe (1982) and Meyer de Schauensee (1984) (we did not have Etchécopar and Hüe 1978–1983). The survey techniques may be broadly categorised into those used to record passing (i.e. overflying) migrants and those used to record migrants present (i.e. grounded) in the area.

Methods used to record passing migrants

The great majority of passing migrants noted during the survey were recorded during periods of prolonged observation from suitable vantage points. The main migration watchpoint was the top of one of the Lotus Hills: a total of 453 hours (not man-hours) observation was made from this locality. Observers counting waders at the Yang-Ho estuary frequently noted passing birds such as raptors and waders: comparison of flock sizes and times of passage of species seen from more than one locality allowed the discrimination of individuals which had been recorded from two or more places and hence prevented erroneously high counts being entered in the daily log.

Initially, counts from the Lotus Hills were made daily (weather permitting) and, at minimum, covered the periods from 08h00 to 15h30 (the majority of the cranes passed at around 12h00–15h00). From mid-April these counts were found to produce little information considered pertinent to population dynamics and the duration of the minimum daily coverage was accordingly shortened, observations typically beginning by 07h00 and, if few birds were noted, ending by 14h00, until the daily observations were curtailed on 20 May. The majority of the birds were located by scanning the horizon with binoculars, attention concentrating on the region south-west of Beidaihe since this proved to be the most productive sector for initial detection of passing birds.

Temple Beach was the main locality from which offshore movements were recorded.

Methods used to record migrants present in the area

Daily counts of migrants present at areas representing the various habitats in and around Beidaihe were made. Particular attention was paid to recording waders at the Yang-Ho estuary and the Tai-Ho pool, since the resultant data would be of value to Interwader (a project concerned with the migrations and wintering areas of waders in South-East Asia).

Variation in the degree of daily coverage

At least three factors influenced the degree of daily coverage.

Number of observers. Four observers were present from 15 March to 8 April. Five to seven observers were present from 9 April to 23 May. There were four observers on 24 and 25 May and three observers from 26 May to 1 June.

Discovery of 'new' areas. Initial recording areas were largely selected on the basis of information given in Hemmingsen (1951). As the survey progressed we discovered several localities which attracted good numbers of migrants – most notably Tai-Ho Pool and the Yang-Ho estuary. These were included among the recording areas. Hence, even disregarding changes in the number of observers, the coverage of the area tended to improve as the survey progressed.

Variation in weather and numbers of birds grounded or passing. The weather was rather rarely solely responsible for affecting the degree of coverage of the area: counts from the Lotus Hills were sometimes precluded or curtailed by fog, rain or excessively strong winds, and similar weather reduced or prevented observations of grounded birds. The extent and nature of coverage was also influenced by the numbers of birds grounded or passing: on days when visible migration was very evident we concentrated on counting birds from observation points such as the Lotus Hills watchpoint; similarly on days when there were influxes of migrants we concentrated on counting birds at the various recording areas.

Time-independent factors affecting comparability of results between studies

At least four factors, excluding changes in habitats and numbers of birds occurring, led to the expedition's results differing from those of Hemmingsen.

Number of observers. Hemmingsen worked mainly alone (he notes a few records by other observers).

Optical equipment. Hemmingsen first used 'not too good field glasses'. From June 1943 he used his 18× and 8× binoculars. Each expedition member had binoculars and a telescope.

Watchpoint used for, and degree of concentration on, passing bird counts. Hemmingsen made most of his observations in the eastern part of Beidaihe: we found that many of the birds following the coastal plain northwards passed to the west of the town, and hence relatively few would have been readily visible from eastern Beidaihe. He appears to have relied heavily on hearing calls in order to detect passing birds such as geese and cranes (though to minimise the numbers missed he paid his servant or his servant's children for each flock which they pointed out) and to have made only rather casual observations of passing (overflying) migrants from early April onwards. Hence, even during periods in which Hemmingsen made a special effort to record passing migrants, it is extremely likely that the proportion of the passing birds he recorded will have been significantly lower than the proportion recorded by the expedition.

Localities visited. Hemmingsen made most of his observations in the eastern part of Beidaihe (particularly at Lighthouse Point, Eagle Rock and the Sand Flats). He mentions visits to other localities such as the Lotus Hills but makes no reference to birds in the Tai-Ho/Yang-Ho area. The greater range of habitats covered during the survey led to several species which

Hemmingsen rarely or never recorded in spring being recorded in some numbers: examples are Goldcrests *Regulus regulus*, Eurasian Siskins *Carduelis spinus* and Chestnut Buntings *Emberiza rutila* (mainly noted in the West Hill/Lotus Hills area) and Long-toed Stints, Marsh Sandpipers and Wood Sandpipers (most were recorded at Tai-Ho Pool).

RESULTS

A total of 284 species was recorded. The results suggest that the abundances and passage periods of most birds have altered little since Hemmingsen's time (certain of the species for which population changes are indicated are given below).

The timing of migration

We arrived at Beidaihe on 15 March, by which date the sea-ice had largely melted (ice was strewn along the tideline and over the mudflats). Winter visitors such as Siberian Accentors *Prunella montanella* and Rustic Buntings *Emberiza rustica* were departing (other winter visitors recorded by Hemmingsen, such as Pine Buntings *E. leucocephalos* and Lapland Buntings (Lapland Longspurs) *Calcarius lapponicus*, had presumably already gone), the migrations of Bean Geese *Anser fabalis* and Daurian Jackdaws *Corvus dauuricus* were well underway and the passage periods of Hoopoes *Upupa epops*, Daurian Redstarts *Phoenicurus auroreus* and Yellow-throated Buntings *Emberiza elegans* were beginning. During the period to 3 April, 2,607 Bean Geese and over 7,000 cranes of four species passed north, Common Goldeneye *Bucephala clangula* numbers peaked and declined, the first rush of dabbling ducks on 23 March closely followed the opening of ice-bound areas (thus according with Hemmingsen's observations), and there was a general increase in the numbers of species recorded each day as birds such as Grey Herons *Ardea cinerea*, Black Kites *Milvus migrans*, Kentish Plovers *Charadrius alexandrinus*, White Wagtails *Motacilla alba*, Orange-flanked Bush-Robins *Erithacus (Tarsiger) cyanurus* and Lemon-rumped (Pallas's Leaf) Warblers *Phylloscopus proregulus* appeared. Flocks of Bohemian Waxwings *Bombycilla garrulus* and Pallas's Reed Buntings *Emberiza pallasi* lingered throughout much of April and, in the second week of the month, there was the first wave of grounded migrants. The tide became higher than in mid-March – presumably because of the retreat of the continental anticyclone which lies over northern China in winter – and the resultant deposition of silt at the Tai-Ho pool, in particular, led to there being rich feeding areas for the waders which began to arrive in numbers from the middle of April.

The overall migration peaked around the middle of April/early May, when Pied Harriers *Circus melanoleucos*, Little Curlews *Numenius minutus*, Oriental Pratincoles *Glareola maldivarum*, Olive Tree (Olive-backed) Pipits *Anthus*

hodgsoni, Stonechats *Saxicola torquata*, Inornate (Yellow-browed) Warblers *Phylloscopus inornatus* and Little Buntings *Emberiza pusilla* were among the common migrants. By mid-May, the numbers of migrating birds had declined, though the numbers of some birds – notably Curlew Sandpipers *Calidris ferruginea*, Brown Shrikes *Lanius cristatus*, Siberian Blue Robins *Erithacus cyane*, Asian Brown Flycatchers *Muscicapa latirostris*, Chestnut-flanked White-eyes *Zosterops erythropleura* and Chestnut Buntings – were at, or approaching, their peaks. Schrenck's Bitterns *Ixobrychus eurhythmus*, Baillon's Crakes *Porzana pusilla*, Pallas's Warblers *Locustella certhiola* and Thick-billed Warblers *Phragmaticola (Acrocephalus) aedon* were among the freshwater marsh species which passed in the latter half of May – their late migrations presumably timed to coincide with the fresh growth of emergent vegetation.

Very little passage was evident at the end of May, when the most notable observation was of two Streaked Reed-Warblers *Acrocephalus sorgophilus* at the reservoir on 31 May (the species is known to breed in only one or two provinces in China: Meyer de Schauensee 1984).

The routes used by migrants observed passing Beidaihe

The majority of the passing cormorants, herons, storks, geese, raptors, cranes, Great Bustards, waders, swifts and hirundines were observed to follow the coastal plain northwards. These birds appeared to show little preference for the exact routes followed within the 'corridor' bounded by the coastline and mountain flanks – hence many birds (> 70%) passed to the west of the Lotus Hills and relatively few overflew the town.

On several occasions crane flocks were observed passing at distances which precluded any plumage features being discerned, even with good visibility and the use of telescopes (the flocks were probably over 6 km from the Lotus Hills).

Birds were also observed to arrive from the sea and either head inland (a re-orientation towards the north was sometimes evident) or make landfall. Such arrivals/passages usually coincided with weather conditions which hindered migration (e.g. strong winds, drizzle and rain) and presumably involved birds which had been heading north over the Bay of Bohai before encountering adverse weather. Passerines predominated among the birds seen to arrive in this manner; there were also small numbers of herons, raptors (many raptors pass over the Bay of Bohai in autumn: Zhang *et. al.* 1985), owls and hirundines.

Offshore movements, involving ducks and, on one occasion, waders passing east along the south coast of Beidaihe, were sometimes recorded. These movements were associated with inclement weather (low cloud and mist) and may have involved birds which were following the coast in order to avoid becoming disoriented.

Figure 3 indicates the routes which migrants passing Beidaihe were observed to use.

Correlations between weather and migration

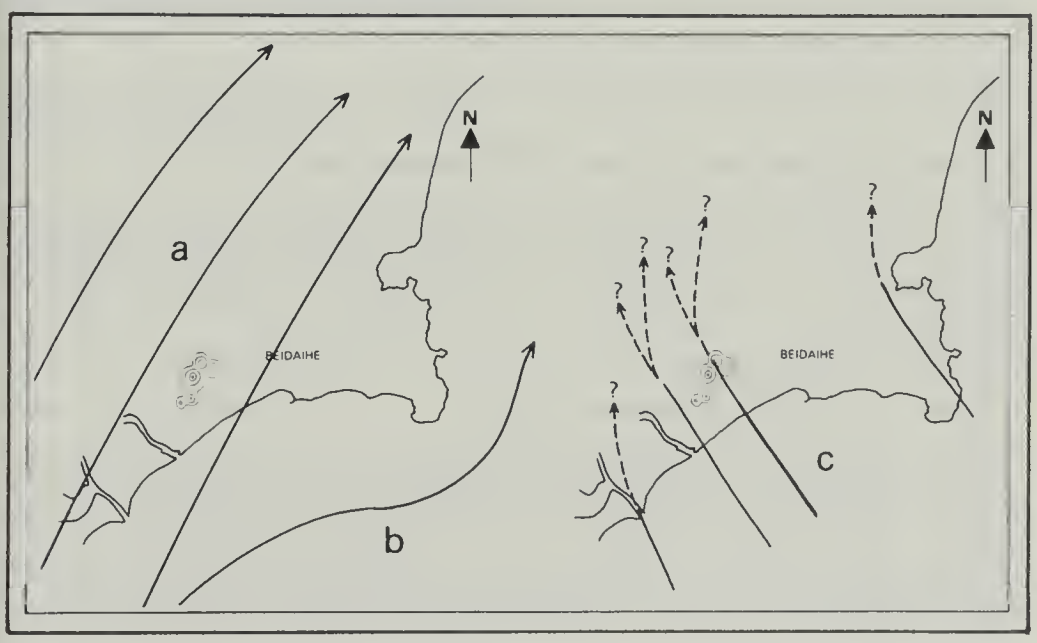
A strong correlation between the weather and the number of passing cranes is apparent in the data, large numbers of these birds being associated with the pressure starting to decrease as high pressure systems moved away to the east of Beidaihe (this correlation is also evident in Hemmingsen's data: Hemmingsen 1951). The weather-dependence of the numbers of passing geese seems to be similar (only one wave of goose migration was recorded – this coincided with large movements of cranes – Hemmingsen noted a similar association). For movements of other migrants, a combination of factors seems to have been involved (including rain and, probably, the weather elsewhere), though they are again associated with decreasing pressure. The results are thus in broad agreement with studies of the short-term effects of weather on spring bird migration on the east coast of the U.S.A. (Nisbet and Drury 1968) and on the coast of Jiangsu Province (Mao 1985).

We found, as had Hemmingsen (1951), that influxes (as opposed to movements) of migrants were associated with low pressure. This accords with the finding that spring bird migration on the east coast of the U.S.A. is inhibited when the pressure is low (Nisbet and Drury 1968).

Species of interest

Our records of the following species may be considered to be particularly

Figure 3. The routes used by migrants observed passing Beidaihe: (a) followed by the majority of the cormorants, herons, storks, geese, raptors, cranes, Great Bustards, waders, swifts and hirundines; (b) followed by ducks and waders which passed offshore; (c) followed by migrants (predominantly passerines) which arrived from over the sea (observations suggested that these birds tended to orient towards, and pass over or near, the Lotus Hills).



noteworthy. Summaries of the spring records of La Touche and Hemmingsen, augmented where appropriate by records of other observers and by autumn records of La Touche and Hemmingsen, are given for those species which have previously been recorded in the Beidaihe/Qinhuangdao district.

Abbreviations used are as follows: H – Hemmingsen and Guidal (1968); LT – La Touche (1920, 1921); WH – Wilder and Hubbard (1924); Wa – Wilder (1924); Wb – Wilder (1940).

ORIENTAL WHITE STORK *Ciconia (ciconia) boyciana* LT – no spring records. Wb – a flock of 50 flew north on 18 March 1940 and was followed by a single bird four days later. H – only two spring records (six on 6 March 1940 and nine on 12 March 1943) in marked contrast to the large flocks noted in autumn (Hemmingsen recorded over 1,000 birds in three of the four autumns which he spent at Beidaihe: Hemmingsen 1951). The species has suffered a severe decline in recent years (Archibald and Luthin 1985) and is listed as Endangered in the ICBP/IUCN Red Data Book (King 1978–1979).

A total of 12 flew north, the records being as follows: four on 18 March, four on 28 March, one on 29 March, two on 16 April and a late individual on 17 May.

Evidently a scarce spring migrant at Beidaihe, with passage predominantly occurring from early March to the end of the month.

BAIKAL TEAL *Anas formosa* LT – extremely abundant on passage. WH – erratic spring migrant in Hebei. Wb – large flocks 16 – 25 March 1940. H – dense flocks (once probably 1,000 – 2,000) spring 1944; otherwise one in May 1945 and no records 1943.

Despite the erratic nature of the species's occurrence in spring, it seems surprising that the intensive coverage at Beidaihe during spring 1985 produced only one record (five on 20 March).

STELLER'S EIDER *Polysticta stelleri* A male flew north on 16 April. This may be only the second record for China, the species having previously occurred in Heilongjiang (Meyer de Schauensee 1984).

EIDER *Somateria* Four females on 5 April were either Common Eiders *S. mollissima* or King Eiders *S. spectabilis*. Neither species is listed by Meyer de Schauensee (1984); both winter on the Kamchatka Peninsula (Cramp and Simmons 1977).

MANDARIN DUCK *Aix galericulata* LT – one record. H – 24 birds recorded in spring. We recommend this as a candidate species for the third edition of the ICBP/IUCN Red Data Book.

Approximately 22 – 23 Mandarin Ducks were recorded from 9 April to 3 May. Fourteen flew north on 9 April (a large passage of ducks and waders occurred on this date); otherwise birds were noted at small pools or the reservoir, with records as follows: a pair on 10 April, a male on 18 and 19 April, a female on 22 April, probably remaining until 3 May, and two pairs

on 28 April.

WHITE-TAILED EAGLE *Haliaeetus albicilla* LT – common spring and autumn migrant at Qinhuangdao. H – no spring records. Listed as Vulnerable in the ICBP/IUCN Red Data Book (King 1978 – 1979).

The only record, despite the relatively intensive coverage, was an immature which flew north on 31 March.

MOUNTAIN HAWK-EAGLE *Spizaetus nipalensis* LT and H – no records. Those breeding in Heilongjiang and, presumably, adjacent U.S.S.R. winter in Taiwan (Meyer de Schauensee 1984).

A total of 85 was recorded from 27 April to 25 May. All birds passed north. It is surprising that the species has not previously been recorded in the Beidaihe/Qinhuangdao district.

COMMON CRANE *Grus grus* LT – 'immense flocks pass over during March and early in April'. H – main passage in March; spring totals of 1,028 (1943), 426 (1944) and 2,796 (1945).

A total of 4,409 passed north from 15 March to 7 May. The majority (4,321) passed from 21 March to 5 April, with the highest day total being 1,424 on 31 March (see below under 'Cranes').

RED-CROWNED CRANE *Grus japonensis* H – noted from 12 – 25 March, with a total of 90 (additionally, 125 probable Red-crowned Cranes seen by another observer) recorded in three springs (at the time, Hemmingsen's Beidaihe records constituted the only field observations for north China). Listed as Vulnerable in the ICBP/IUCN Red Data Book (King 1978 – 1979).

A total of 244 – almost half of those known to winter in China (G. W. Archibald *in litt.*) – was recorded flying north from 15 – 31 March. The highest day total was 128 on 21 March; 50 on 22nd and 21 on 23 March were other notable day totals. Since the species is an early migrant (13 were recorded on our first day at Beidaihe) it is possible that some passed prior to our arrival at Beidaihe.

HOODED CRANE *Grus monacha* WH – three cranes with white necks on 21 April 1923 seem likely to have been this species. H – 10, plus 50 – 100 probable, in 1943 were the only spring records. Listed as Vulnerable in the ICBP/IUCN Red Data Book (King 1978 – 1979).

This is the latest of the migrant cranes, with 309 birds recorded from 25 March to 20 April (representing a majority of the known Chinese wintering population: G. W. Archibald *in litt.*). Two hundred and fifty-seven flew north on 2 April.

SIBERIAN CRANE *Grus leucogeranus* LT – great numbers March, April. WH – large flocks of from 50 to 300 were flying north-east on 6 April 1916. Despite later doubt (Wilder 1924) these were surely Siberian Cranes (Wilder described them as 'great white birds with black tipped wings and necks straight out in the characteristic crane fashion . . . too high in the haze for certain identification'. The description does not fit the Red-crowned Crane,

which has mainly white wings, and it seems very unlikely that Wilder would have mistaken flocks of storks, which do not fly in V-formation or soar in a coordinated manner, for flocks of cranes). H – possible on 17 March 1943, none spring 1944 and 628 – 728 spring 1945. Listed as Endangered in the ICBP/IUCN Red Data Book (King 1978 – 1979).

Between 20 March and 1 April, 652 birds – approximately 44% of the known Chinese wintering population (Archibald 1985) – flew north, with all except 12 passing from 20 – 26 March.

The records of La Touche, Wilder and Hemmingsen suggest that the species declined from 1917 to 1942. A further, less marked decline is suggested by the total we recorded (as indicated above, we believe that the proportion of passing birds recorded during the 1985 study exceeded the proportion which was recorded by Hemmingsen).

The inferred decline over the course of this century accords with the change in known status and distribution of wintering birds in China – from common in the lower valley of the Chang Jiang (Yangtze Kiang) River (Styan 1891) to 1,482 birds (in winter 1984 – 1985: Archibald 1985) restricted to Lake Poyang, Jiangxi province.

CRANES *Grus* Approximately 1,785 unidentified cranes were recorded from 22 March to 2 April; two late birds passed north on 20 April. It is probable that the overwhelming majority of these birds were Common Cranes (which, in addition to being the most abundant of the cranes, appears featureless at a distance). Hence the total number of Common Cranes observed passing north probably exceeded 6,000.

GREAT BUSTARD *Otis tarda* LT – passes from early March to the beginning of May. H – largest flying flock of 60 birds; a flock of 210 was present on 12 April 1944.

A total of 132 flew north from 17 March to 23 April; the largest flying flock numbered 15 birds. There were two slight peaks of passage around the beginning and middle of April. This strongly suggests a sharp decline in the species since the time of Hemmingsen (who did not give spring or autumn passage totals).

ASIAN DOWITCHER *Limnodromus semipalmatus* LT and H – no records. WH – one 30 July 1923; they cite seven specimens taken at Tientsin (c.200km south of Beidaihe) end of April – May. Listed as Rare in the ICBP/IUCN Red Data Book (King 1978 – 1979).

We had only three records of this species: two at the Yang-Ho estuary on 18 April and a single flew north on 28 April.

EASTERN CURLEW *Numenius madagascariensis* LT – passes 12 April to 3 May. WH – recorded 11 April 1916 and 21 April 1923. H – no spring records but as common as the Eurasian Curlew *N. arquata* in autumn.

Recorded from 26 March to 16 May, with a total of 661 bird-days (compared to 280 bird-days for the Eurasian Curlew). Most birds occurred at the Yang-Ho estuary, with numbers reaching a peak of 54 on 19 April and

declining gradually thereafter.

Given that the world population of the species is estimated to be c.12,000 (Parish 1985), and that the estuaries at Beidaihe are too small to hold major concentrations of waders, it appears that a good proportion of the world population migrates through the Beidaihe area.

SAUNDERS'S GULL *Larus saundersi* LT, WH and H – no records. A little known species (the breeding grounds have yet to be discovered) which favours estuarine areas in winter when it is regularly recorded from Hong Kong and Japan (B. F. King *in litt.* to J. Boswall); there are a few recent records from the coast of China (Melville 1984).

A total of 23 bird-days was logged from 2 April to 22 May, with records as follows: 2 April – two (one adult summer, one 1st winter); 16 and 17 April – two (both 1st winter); 18 April – seven (two adult, three 2nd summer and two 1st winter); 19 April – one (1st winter); 20 April – one (1st summer); 21 April – three (two adult winter and one 1st summer); 22 April – one (1st summer); 27 April – one (1st winter); 1 May – one (1st summer); 7 May – one (1st summer) and 22 May – one (1st summer).

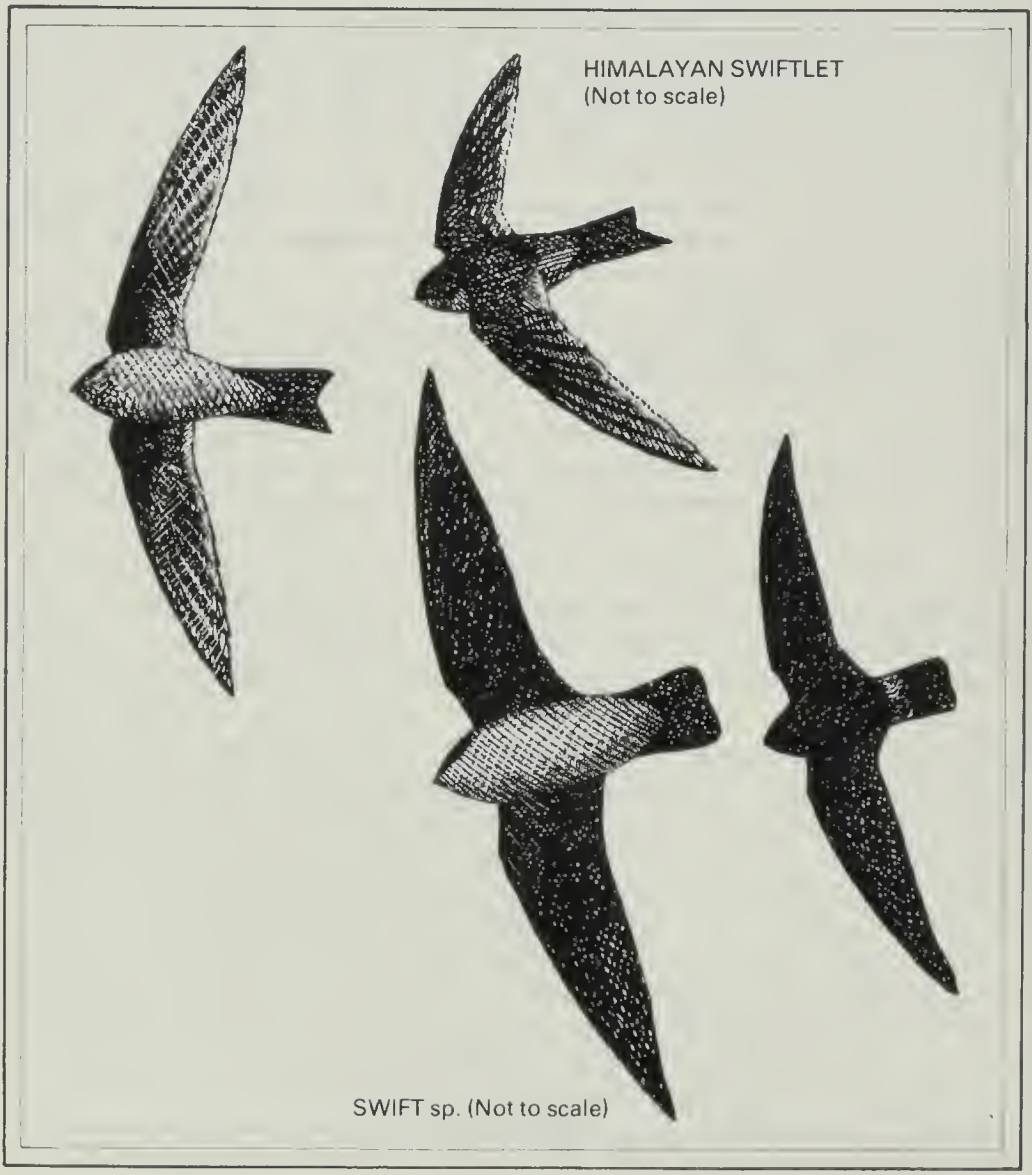
A maximum of 19 and a minimum of 10 birds seem to have been involved; the actual figure was probably 14 or 15. The main passage occurred during the period 16 – 22 April.

SWIFT Apodidae On 26 April, after a day of above average migration, a swift showing characteristics associated with the genus *Collocalia* was watched by D.N.B., G.J.C. and M.D.W. over c.17h00 – 17h30. It approached the Lotus Hills watchpoint from the south and fed over the north-facing slope before moving off northwards with numerous hirundines, Common Swifts *Apus apus* and Pacific Swifts *A. pacificus*. This, or a second bird, was seen on 29 April, again flying north, by G.J.C.

The following description was compiled from field notes taken on 26th. Size slightly larger than House Martin *Delichon urbica* or similar to Chimney Swift *Chaetura pelagica*. Body: upperparts dark brown, except for pale brown squarish rump patch; prominent dark-capped appearance; underbody pale brown, throat possibly palest. Flight weak and fast-flapping, rather reminiscent of Chimney Swift, but perhaps not as flickery and bat-like. Wings short, broad-based and triangular but not quite as short and rounded as Chimney Swift; held almost at rightangles to body and when gliding appeared to be pressed slightly forward; uniform in colour – looked dark brown above and below, contrasting with pale brown underbody. Tail short and almost square, but at times appeared to have a slight notch.

This description agrees to some extent with the descriptions of Himalayan Swiftlet *Collocalia brevirostris*, Black-nest Swiftlet *C. maxima* and Edible-nest Swiftlet *C. fuciphaga* (King *et. al.* 1975). However, many Himalayan Swiftlets were watched by D.N.B., G.J.C. and M.D.W. over 7 – 9 June at the summit of Emei Shan, in central Sichuan province (the birds were identified on range – the Himalayan Swiftlet is the only *Collocalia* to have occurred on Emei Shan: Meyer de Schauensee 1984). The species showed

similarities to the bird(s) seen at Beidaihe (hereafter referred to as 'Beidaihe Swift'), but clearly differed from it on several counts (see below and Figure). Size larger than Beidaihe Swift – though without a size comparison it is difficult to say to what extent. Upperparts smoky grey with paler rump and a less dark-capped appearance than Beidaihe Swift. Underbody pale grey-brown, some birds having pale throats, others darker – the latter characteristic leading to a less contrasing head pattern; underbody contrasted less with underside of wings than did the underbody of Beidaihe Swift. Flight less flickery, more like Common Swift. Wings slightly 'spade-ended', i.e. trailing edge of primaries slightly convex but overall longer and narrower than Beidaihe Swift; not uniform in colour – underwing-coverts clearly



darker than remiges, while on upperside a pale trailing edge to the secondaries and, on over 70% of birds, pale edges to some inner primaries. Tail longer than that of Beidaihe Swift and the fork a noticeable feature at all times.

We have not seen Black-nest or Edible-nest Swiftlets. They are, apparently, very difficult to distinguish in the field from Himalayan Swiftlet (King *et. al.* 1975). Of the two species, only the Black-nest Swiftlet has been recorded in China (breeding in south-eastern Xizang at the Bhutan border – over 2,500km from Beidaihe: Meyer de Schauensee 1984); the nearest to Beidaihe that the Edible-nest Swiftlet occurs is northern Viet Nam and the Philippines (King *et. al.* 1975). Neither of these species is known to be a long distance migrant. Hence, we do not believe that the bird (or birds – the records may well involve two individuals) seen at Beidaihe was a Himalayan Swiftlet and it is perhaps unlikely that it was a Black-nest or Edible-nest Swiftlet. It must, therefore, be possible that it (or they) belonged to a previously undescribed species.

PECHORA PIPIT *Anthus gustavi* LT – passes in May. H – no records.

Two on 10 May and a single on 11 May were the only definite passage individuals. Six at disused paddyfields by the reservoir on 20 May were probably the first sighting of up to four pairs which, from 29 May to 1 June (our last day at Beidaihe), were holding territories (birds were observed in song-flight and, on one occasion, a bird flew around an observer, calling anxiously, when intrusion into a territory occurred). The nearest known breeding grounds would seem to be well to the north of Beidaihe, at Lake Khanka, south-eastern U.S.S.R. (J. Boswall verbally).

PENDULINE TIT *Remiz pendulinus* LT – passes in spring, but not common. H – three spring records (26 April, 6 and 10 May).

With just over 1,000 bird-days recorded from 28 April to 28 May, the numbers were substantially higher than might have been expected from the records of previous observers (Hemmingsen's records, together with his analysis of the literature, suggest that the species was rather uncommon in Hebei). This may indicate that the range expansion currently being undertaken by western populations (Anon. 1982, 1983, 1984) is also taking place in the east. The main passage was over 6–11 May, with 274 birds being recorded on the 8th and 276 on the 9th.

BRAMBLING *Fringilla montifringilla* We found, as had previous observers, that the species was a common to abundant migrant; however a flock of c.33,700 in fields by the Tai-Ho on 4 April was exceptional.

CONCLUDING REMARKS

We believe that bird migration has been studied more in the Beidaihe/ Qinhuangdao district than in any other area in China. For many species, the

data yielded by the studies of La Touche and, particularly, of Hemmingsen are among the most accurate information available on their previous abundance in China. Hence there exists an excellent, and probably unparalleled, opportunity for further studies of bird migration in the area to be carried out and enable population changes over the course of the last 60 years to be inferred.

The results of the survey in spring 1985 are of some value in such inferences of population changes. Given that, since Hemmingsen's study, China has suffered widespread environmental damage (Vermeer 1984) and there was a campaign to eradicate the Eurasian Tree Sparrow *Passer montanus* in China, which led to many passerines being killed (Boswall in prep. and *Forktail*, this issue), it is heartening that our results generally indicated that the populations of most of the species recorded seem to have changed little (Williams 1986). Those species for which the difference in abundance noted by Hemmingsen and by the expedition appear to reflect a change in population are noted above under 'Species of interest'.

Ideally, however, the migration studies will cover several years, since year-to-year fluctuations in numbers which are due to factors such as variations in the weather, rather than to population changes, may then be assessed. It is likely that counts of passing birds will prove to be of most value to population studies. Counts of this nature can provide useful information on the populations of large diurnal migrants which regularly overfly a recording area in relatively high numbers, since they are usually scattered over breeding and wintering areas. The Bean Goose, the four species of crane recorded during the survey and the Great Bustard are examples of such migrants which pass Beidaihe in spring.

The studies should also help elucidate the effects of weather on migration. Hemmingsen believed Beidaihe to be a particularly good locality for such work, as successive air masses pass eastwards over the area at fairly regular intervals and lead to the weather exhibiting a periodic nature. The waves of migration which occur at Beidaihe (particularly the waves of cranes and geese) show strong correlations with the nature and movements of these air masses.

Additionally, the town has the potential to become a centre for promoting birds and bird conservation since it is a popular resort within easy reach of Beijing and many birds may be seen during spring and autumn.

A follow-up study will take place during autumn 1986. This will again concentrate on recording diurnal migration. The British and Chinese ornithologists who will co-operate in the venture will assess the possibilities for establishing Beidaihe as a centre for the study of bird migration and for the promotion of conservation.

Axel Hemmingsen's excellent work on the birds at Beidaihe formed the basis for the expedition. Without this, together with advice and encouragement from Roger Balsom, Operations Manager of SCT-China, and Jeffery Boswall, the expedition would not have

taken place. We also wish to thank Dr Joseph Needham, and Dr Christopher Perrins and Dr Derek Ratcliffe, who acted as Patron, and Scientific Advisers, respectively. The encouragement of Dr George Archibald was timely, and boosted a somewhat battered morale.

Ron Appleby, Roger Beecroft, Simon Stirrup and Andrew Webb joined the survey for short periods. Their visits to Beidaihe, which lasted between three and four weeks, added substantially to the coverage of the area (timed as they were to the peak of overall migration).

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The avifauna of the Suru River Valley, Ladakh

P. R. HOLMES

This paper presents a compilation of all bird records from the Suru Valley, Ladakh. The list of 128 species is likely to be extended by further work. The avifauna is found to be generally similar to that of the Upper Indus Valley around Tikse, approximately 100–140 km to the east, which has been intensively studied in recent years. Possible migration routes of some species, in particular Inornate (Yellow-browed) Warbler *Phylloscopus inornatus*, are discussed.

During the second half of the last century and the first part of this century, a great deal of interest was expressed in the ornithology of Ladakh, in the north-western Himalayas (Figure 1). This was largely because Ladakh was

Figure 1. Sketch map of Ladakh showing the main rivers and mountain ranges. The stippled area is the dominant mountain range, the Karakoram.

the first part of the Tibetan Plateau to be opened to outsiders. Several bird collecting expeditions were mounted. Most interest centred on the Indus Valley, but a few parties also explored side valleys, including the Suru Valley (Table 1). Several of the other Ladakh expeditions passed through Kargil in the Suru Valley on the way to Leh on the Indus (Table 2). The list in Table 2

Table 1. Expeditions that have visited the Suru Valley

F. Stoliczka	1868	Summer? – Kargil to Panikhar?	von Pelzeln (1868) Stoliczka (1868)
F. Ludlow	1919	April – Kargil July – Wakka Nullah to Rangdum Gompa	Ludlow (1920)
B. B. Osmaston	1925	July – Sanku to Zuildo	Osmaston (1926)
B. B. Osmaston and H. Whistler	1928	June – Kargil 26 June to 16 July – Rangdum to Kargil	Osmaston (1930)
W. Koelz	1931 1933	September – Rangdum July – Rangdum to Kargil	Koelz (1939)
Southampton University	1977	July – Kargil to Zuildo	Williams and Delaney (1980)
P. R. Holmes	1978	End August to early September – Rangdum and below Kun	Holmes (1978)
Southampton University	1980	July to early August – Kargil to Rangdum area	Delaney *et al.* (1982)
R. P. Martins and	1982	July – Kargil, Sanku and Rangdum area	Unpublished
C. R. Robson Oxford University	1983	August and September – Kargil to Rangdum	Holmes *et al.* (1983)
P. M. Cocker	1984	end August to early September – Kargil and Zuildo	Unpublished

Table 2. Expeditions that have passed through Kargil or Kargil to the Wakka Nullah only.

G. Henderson (First Yarkand Mission) – end June/early July 1870 (Henderson and Hume 1873)
J. Biddulph and F. Stoliczka (Second Yarkand Mission) – end August/early September 1873 (Sharpe 1891)
W. L. Abbott – June 1893 (only?) (Richmond 1896)
C. H. Crump (collector for A. E. Ward)* – May, June and September 1906 (only?) (Ward 1908)
M. L. Wathen – July 1922 (Wathen 1923)
B. B. Osmaston – May 1923 (Osmaston 1925)
R. Meinertzhagen and V. S. LaPersonne – April 1925 (Meinertzhagen 1927)
J. A. Sillem – May 1929 (Sillem 1931)

*Crump's itinerary is unclear. He may also have passed through Kargil and the Suru Valley in previous years for the compilation in Ward (1906 – 1907), as may Ward himself.

is probably not complete. The two earliest works quoted (Henderson and Hume 1873, Sharpe 1891) have not been examined; records of surviving specimens will be in Vaurie (1972). Vaurie also lists specimens from unpublished work, some of which (e.g. explorations by F. Ludlow) is likely to have involved the Suru Valley.

The reports of these expeditions generally dealt with birds collected rather than field observations. Vaurie (1972) describes in detail the ornithological exploration of Ladakh and lists all records of birds collected that are now in museum collections. However in many cases the specimens associated with published records have been lost. Vaurie also includes some otherwise unpublished records.

After the explorations of W. Koelz in the early 1930s interest in the region waned, and no ornithologists published records for the Suru Valley until the late 1970s when, after the opening of the road along the valley, several British university expeditions went there (Table 1). The expeditions from Oxford University were the first to adopt a widespread use of mist-nets in the Suru Valley.

The Suru Valley is interesting for two main reasons; it has until recently been little explored ornithologically, and its north–south orientation might be expected to concentrate trans-Himalayan migrants.

This compilation of the birds of the Suru Valley has been prepared for several reasons. It examines the numbers of trans-Himalayan migrants observed in the Suru Valley. It is also intended as an aid to visiting ornithologists; the opening of the road has already resulted in a large influx of tourists in the summer months, which is likely to increase in the coming years, so the area is now accessible to ornithologists. Finally it is intended as a record of the avifauna before human pressure increases. A comparison is made with the avifauna of the Tikse area in the nearby Indus Valley, which has been intensively studied in recent years (Williams and Delaney 1985, 1986).

STUDY AREA

A map of the Suru River Valley is given in Figure 2. Detailed maps of the area are difficult to obtain, although the area is covered by the U. S. Aerial Survey (series U502, sheet NI 43–7, edition 2–AMS). The Suru River is formed from the confluence of several streams in the Rangdum plain (c.34°03′N 76°22′W) at 4,000m. It flows west for about 40km, and then turns sharply north for about 70km before joining the Dras River north of Kargil (c.34°36′N 76°07′E) at 2,600m. The valley floor may be roughly divided into four ecological areas (Williams and Delaney 1979). From Kargil to Parkachik the valley is mostly utilised for agriculture. Between Parkachik and Gulma Tongas the valley sides are much steeper, with the only vegetation being occasional patches of willow scrub growing out of the scree.

From Gulma Tongas to Zuildo the valley opens out into a wide, marshy area, which as one moves towards Rangdum and the source of the Suru, gives way to a flat, stony desert. On both sides the valley is bordered by high peaks, the highest being the Nun-Kun massif near Parkachik (7,135 m).

A major problem with compiling records for the Suru Valley is the frequent alteration of the names of settlements, in part due to variation in the romanisation of names. An example is present-day Parkachik, which was called Parkachen by Koelz (1939) and on the aerial survey map is split (perhaps correctly) into two villages called Parkaryan and Parkutse. The village of Panikhar, visited by most ornithologists, has its place taken on the map by a village called Suru, whereas the village known to ornithologists as Suru (or Namsuru) is recorded as Nanshor. Vaurie (1972) incorrectly makes Karpokhar (near Sanku) the same as Panikhar. Smaller villages are not necessarily permanent, and some (e.g. Gulma Tongas) have been abandoned. The names used on Figure 2 are not guaranteed as correct.

Most sites visited have been the major settlements – Kargil, Sanku, Panikhar, Parkachik, Zuildo, etc. One site, studied by Holmes (1978) and Holmes *et al.* (1983) was not in an inhabited area and is just referred to as 'below Kun' (see Figure 2). Many records for the eastern end of the valley (Zuildo, Rangdum, Tazi Tonazas) have just been recorded as 'Rangdum';

Figure 2. The Suru River Valley. Heights of the main study sites are given in metres.

thus for some of the older records 'Rangdum' is best interpreted as the Rangdum area.

SYSTEMATIC LIST

The systematic list follows the order of species in Vaurie (1965) for easy comparison with Vaurie (1972). For each species, records are given starting from Kargil and moving upstream towards Rangdum. Where a species has been recorded by several observers in both the 1920s/1930s and recently, the sources and years are omitted. Vaurie (1972) does not give the year for any records.

The records presented here are for the main Suru Valley, with one or two records of species recorded a short way up side valleys. Species recorded along tributaries well away from the main valley are excluded, for example records of Western Crowned Warbler *Phylloscopus occipitalis* (Ludlow 1920) and Red-rumped Swallow *Hirundo daurica* (Williams and Delaney 1979) along the Wakka Nullah.

The following status codes are used: B = Breeding confirmed, PB = Probably breeding, M = Migrant, PM = Probable migrant, WV = Winter visitor, V = Presumed vagrant, ? = Status uncertain. For many species listed as PB breeding has probably been recorded, but this has not been published.

BAR-HEADED GOOSE *Anser indicus* (?) Parties of eight and ten recorded by Osmaston (1930) from the Zuildo area in late June/early July 1928. These were possibly from the nearby breeding lakes in Rupshu.

RUDDY SHELDUCK *Tadorna ferruginea* (PB) Records from the Rangdum area of single adults on 14 and 20 July 1977, a juvenile from 28 July to 4 August 1980 (Williams and Delaney 1979, Delaney *et al.* 1982) and one on 14–15 July 1982 (R. P. Martins and C. R. Robson *in litt.* 1986). The Suru Valley around Zuildo would appear to be suitable breeding habitat for this species.

COMMON TEAL *Anas crecca* (M) Singles recorded from Sanku on 31 August and 1 September 1983 (Holmes *et al.* 1983).

NORTHERN PINTAIL *Anas acuta* (M) A flock of eight observed in the Rangdum area between 27 June and 3 July 1928 (Osmaston 1930) and a flock of five seen on 12 September 1931 (Koelz 1939).

GARGANEY *Anas querquedula* (M) Two sightings at Sanku on 2 September 1983 (Holmes *et al.* 1983), three sightings each of two individuals in July 1980 at Rangdum (Delaney *et al.* 1982) and a single at Zuildo on 31 August 1984 (P. M. Cocker *in litt.* 1986).

NORTHERN SHOVELER *Anas clypeata* (M) Three birds recorded at Sanku on 2–3 September 1983 (Holmes *et al.* 1983).

COMMON MERGANSER (GOOSANDER) *Mergus merganser* (PB) Recorded in the Rangdum area by most visitors in June/July. According to Ali and Ripley (1983) no nests have been found in Indian limits, but downy young have been seen on Ladakh lakes in June.

BLACK KITE *Milvus migrans* (?) Three singles observed at Kargil and Baru in August 1980 (Delaney *et al.* 1982), and two seen at Kargil on 27 August 1984 (P. M. Cocker *in litt.* 1986). In 1983 one recorded at Minji on 30 August and two at Sanku on 2–3 September (Holmes *et al.* 1983). One was seen over Rangdum Gompa on 17 July 1977 (Williams and Delaney 1979) and another was at Zuildo on 31 August 1984 (P. M. Cocker *in litt.* 1986).

NORTHERN GOSHAWK *Accipiter gentilis* (?) One at Zuildo on 13 July 1982 (R. P. Martins and C. R. Robson *in litt.* 1986).

EURASIAN SPARROWHAWK *Accipiter nisus* (?) A female was recorded north-west of Kargil on 9 July 1980 (Delaney *et al.* 1982), one was seen between Kargil and Baru on 14 October 1977 (Williams and Delaney 1979) and a female was present at Minji over 22–24 August 1983 (Holmes *et al.* 1983).

BOOTED EAGLE *Hieraaetus pennatus* (PM) Recorded at Sanku on 25 August (three) and 8 September 1983 (Holmes *et al.* 1983).

GOLDEN EAGLE *Aquila chrysaetos* (PB) Two immatures were seen over Panikhar on 16–17 July 1980 (Delaney *et al.* 1982). Several records of one or two birds from the Rangdum area in August 1980, July 1982 and August/September 1984 (Delaney *et al.* 1982, R. P. Martins, C. R. Robson and P. M. Cocker *in litt.* 1986). There are also several records from side valleys.

LAMMERGEIER *Gypaetus barbatus* (PB) From the north–south section of the valley there are two records from Kargil on 7 and 11 July 1980, with two birds on the latter date (Delaney *et al.* 1982), and a record from near Sanku on 9 July 1928 (Osmaston 1930). There are several records in July and August from Panikhar to Rangdum.

HIMALAYAN GRIFFON *Gyps himalayensis* (PB) Several sightings (maximum five individuals) from Kargil in July 1980 (Delaney *et al.* 1982), and four seen there on 11 July 1982 (R. P. Martins and C. R. Robson *in litt.* 1986). There are several records (up to four individuals) from Panikhar, Parkachik and the Rangdum area in July/early August 1977 and 1980 (Williams and Delaney 1979, Delaney *et al.* 1982).

MARSH HARRIER *Circus aeruginosus* (M) Three records of possibly the same individual at Sanku on 28 August and 8 and 9 September 1983 (Holmes *et al.* 1983). Two present at Zuildo between 31 August and 2 September 1984 (P. M. Cocker *in litt.* 1986).

SAKER FALCON *Falco cherrug* (?) One recorded at Panikhar on 11 July 1977 (Williams and Delaney 1979).

PEREGRINE FALCON *Falco peregrinus* (?) An immature was seen east of Parkachik on 12 July 1982 (R. P. Martins and C. R. Robson *in litt.* 1986). Two records in 1980, from Zuildo on 1 August and Tazi Tozanas on 5 August (Delaney *et al.* 1982).

NORTHERN HOBBY *Falco subbuteo* (B) Regular sightings between July and September from Kargil to Panikhar, with nesting recorded at Kargil and Sanku. One recorded in the Rangdum area on 14 July 1982 (R. P. Martins and C. R. Robson *in litt.* 1986).

EURASIAN KESTREL *Falco tinnunculus* (B) Apparently common between Kargil and Parkachik and in the Rangdum area. Records from July–September.

HIMALAYAN SNOWCOCK *Tetraogallus himalayensis* (B) Recorded from Kargil to the Rangdum area. Frequents mountainsides above the valley floor (at least in summer/autumn).

CHUKAR *Alectoris chukar* (B) Recorded at several sites from Kargil to Zuildo. Most records are from around cultivation. Delaney *et al.* (1982) discuss the current status of this species in the Suru Valley and suggest it may have declined recently.

COMMON QUAIL *Coturnix coturnix* (?) Heard in crops at Minji on 12 July 1928 (Osmaston 1930) and Panikhar on 17–18 July 1980 (Delaney *et al.* 1982). Perhaps in good years this species reaches the Suru Valley to breed.

[RAIN QUAIL *Coturnix coromandelica* (?) Osmaston (1925) reported hearing several calling in crops near Sanku on 6 August 1923, although Vaurie considered the record doubtful. Perhaps Osmaston recorded *C. coturnix* as *C. coromandelica* by mistake.]

PHEASANT-TAILED JACANA *Hydrophasianus chirurgus* (V) One recorded near Panikhar on 14 July 1980 (Delaney *et al.* 1982) was presumably a straggler from the Vale of Kashmir.

MONGOLIAN (LESSER SAND) PLOVER *Charadrius mongolus* (B) An immature was seen at Kargil on 27 August 1984 (P. M. Cocker *in litt.* 1986). Several pairs breed in the Rangdum area.

LITTLE STINT *Calidris minuta* (M) One was collected at Rangdum on 11 September 1931 by Koelz (1939).

TEMMINCK'S STINT *Calidris temminckii* (M) Eight recorded at Panikhar on 27 July 1980 (Delaney *et al.* 1982). Several in the Rangdum area from July–September, with a maximum of 20+ recorded on 30 July 1980 by Delaney *et al.* (1982).

CURLEW SANDPIPER *Calidris ferruginea* (M) One recorded east of Rangdum on 29 July 1980 (Delaney *et al.* 1982).

RUFF *Philomachus pugnax* (M) A flock of 33 seen east of Zuildo on 18 July

1977 (Williams and Delaney 1979), and a pair recorded at Rangdum on 30 July 1980 (Delaney *et al.* 1982).

COMMON REDSHANK *Tringa totanus* (B) Breeds in the Rangdum area. Birds recorded there in August and September (Koelz 1939, P. M. Cocker *in litt.* 1986) may be passage birds.

COMMON GREENSHANK *Tringa nebularia* (M) Records of singles from Sanku on 3–4 September 1983 (Holmes *et al.* 1983), Panikhar on 14 July 1980 (Delaney *et al.* 1982) and the Rangdum area from July and September (Williams and Delaney 1979, R. P. Martins, C. R. Robson and P. M. Cocker *in litt.* 1986).

GREEN SANDPIPER *Tringa ochropus* (M) Up to three seen on several dates between Kargil and Panikhar in July/August 1977 and 1980 (Williams and Delaney 1979, Delaney *et al.* 1982). Many records of small numbers (maximum three) from the Rangdum area between July and September.

WOOD SANDPIPER *Tringa glareola* (M) Two singles recorded from Sanku on 3 and 5 September 1983 (Holmes *et al.* 1983). One collected from near Parkachik in July 1933 (Koelz 1939). Found to be the commonest wader in the Rangdum area by Williams and Delaney (1979) and Delaney *et al.* (1982), with a maximum of 40+ on 30 July 1980. There are further records in the Rangdum area of two on 14 July 1982 (R. P. Martins and C. R. Robson *in litt.* 1986) and singles on 31 August and 1 September 1984 (P. M. Cocker *in litt.* 1986).

COMMON SANDPIPER *Actitis hypoleucos* (PB) Recorded from Sanku (Williams and Delaney 1979, Holmes *et al.* 1983), Panikhar and Rangdum (Delaney *et al.* 1982) from July–September. All sightings are of one or two birds.

COMMON CURLEW *Numenius arquata* (M) One at Kargil on 27 August 1984 (P. M. Cocker *in litt.* 1986).

SOLITARY SNIPE *Gallinago solitaria* (?) One at Zuildo on 31 August 1984 (P. M. Cocker *in litt.* 1986). This species may breed in Ladakh (Ali and Ripley 1983).

BLACK-WINGED STILT *Himantopus himantopus* (PM) Two birds recorded from Rangdum on 3–6 August 1980 (Delaney *et al.* 1982).

IBISBILL *Ibidorhyncha struthersii* (B) Several records between Kargil and Parkachik. Osmaston (1926) recorded breeding near Sanku on 10 July 1925.

GREAT BLACK-HEADED GULL *Larus ichthyaetus* (?) An adult was seen at Rangdum on 30 July 1980 (Delaney *et al.* 1982). Ludlow (1950) says this species probably breeds on Tibetan lakes.

COMMON TERN *Sterna hirundo* (B) Recorded all along the valley over July–September. Osmaston (1926) recorded breeding near Sanku in 1925; surprisingly this is the only breeding record for the valley.

ARCTIC TERN *Sterna paradisaea* (V) A male was collected at Zuildo on 2 July 1928 (Whistler 1936). This is the only record for the Indian subcontinent. It is not noted by Vaurie (1972), presumably an accidental omission.

SNOW PIGEON *Columba leuconota* (B) Recorded from the whole length of the valley over July–September.

ROCK PIGEON *Columba livia* (PB) Recorded from Kargil to Panikhar over July–September. Koelz (1939) described it as 'common in Purig'.

HILL PIGEON *Columba rupestris* (PB) Common throughout the Suru Valley (Delaney *et al.* 1982), with records over July–September. All three *Columba* species will feed in fields around settlements.

COLLARED DOVE *Streptopelia decaocto* (?) One recorded in the Baru plantation on 6 July 1980 by Delaney *et al.* (1982).

ORIENTAL TURTLE DOVE *Streptopelia orientalis* (PB) Fairly common around cultivation between Kargil and Panikhar over July–September.

COMMON CUCKOO *Cuculus canorus* (B) In July–September found quite commonly from Kargil to Panikhar (Williams and Delaney 1979, Holmes *et al.* 1983). Osmaston (1926) found nestlings between Parkachik and Gulma Tongas on 18 July 1925, and heard adults calling at Zuildo between 27 June and 3 July 1928 (Osmaston 1930).

LITTLE OWL *Athene noctua* (PB) Collected by Osmaston (1930) near Panikhar on 7 July 1928, where it was also heard on 25 July 1980 (Delaney *et al.* 1982). Vaurie (1972) has a record from Parkachik on 6 July which is probably Osmaston's specimen. A possible family party recorded at Zuildo on 20 July 1977 (Williams and Delaney 1979) and a single seen in the same site on 31 July 1980 (Delaney *et al.* 1982).

EURASIAN NIGHTJAR *Caprimulgus europaeus* (?) One was trapped in the scrub below Kun on 12 September 1983 (Holmes *et al.* 1983). This bird was probably a migrant, but the range of the species in Kashmir is little known and the Suru Valley may well be suitable breeding habitat.

COMMON SWIFT *Apus apus* (PB) Large flocks recorded between Kargil and Panikhar between July and early September (Williams and Delaney 1979, Delaney *et al.* 1982, Holmes *et al.* 1983). Koelz (1939) records it as common, especially in the lower valley.

ALPINE SWIFT *Apus melba* (?) One seen at Sanku on 3 September 1983 (Holmes *et al.* 1983).

EUROPEAN ROLLER *Coracias garrulus* (?) Singles recorded from Sanku on 8 July 1977 (Williams and Delaney 1979) and 26 August 1983 (Holmes *et al.* 1983). Koelz (1939) found one dead near Rangdum on 11 September 1931.

COMMON KINGFISHER *Alcedo atthis* (?) One recorded at Panikhar on 19 July 1980 (Delaney *et al.* 1982). Four further records in the Upper Indus Valley in 1980 and 1982 (Delaney *et al.* 1982, Southampton University Ladakh Expedition, winter 1981/1982, provisional report) suggest there is no reason to exclude the possibility of this species breeding in Ladakh.

HOOPOE *Upupa epops* (B) Common around villages between Kargil and Parkachik. Single birds recorded east of Parkachik as far as the Rangdum plain (Delaney *et al.* 1982, Holmes *et al.* 1983). Records over July–September.

EURASIAN WRYNECK *Jynx torquilla* (PB) Several records in plantations between Kargil and Panikhar from July and September.

SCALY-BELLIED GREEN WOODPECKER *Picus squamatus* (PB) Three records from Kargil on 27 July 1977 (Williams and Delaney 1979) and 8 and 9 July 1980 (Delaney *et al.* 1982). The 1977 bird was probably a juvenile.

NORTHERN CRAG MARTIN *Hirundo rupestris* (B) Fairly common around cliffs all along the valley.

BARN SWALLOW *Hirundo rustica* (?) Single records in 1980 from Panikhar on 14 July and Zuildo on 2 August (Delaney *et al.* 1982). Ali and Ripley (1983) suggest this species might breed in Ladakh.

HOUSE MARTIN *Delichon urbica* (B) Records are ascribed to this species rather than Asian House Martin *D. dasypus* since Vaurie (1972) gives the range of the latter as south-east Tibet eastwards. Recorded from Panikhar (Williams and Delaney 1979, Delaney *et al.* 1982), Kochak (Williams and Delaney 1979), below Kun (Holmes *et al.* 1983) and Zuildo (Delaney *et al.* 1982). Koelz (1939) recorded the species as common from Kargiak (Zanskar?) to Kargil. In the Suru Valley this species is often and perhaps usually found in company with *Hirundo rupestris*.

SHORT-TOED LARK *Calandrella cinerea* (?) The only definite record is of at least three in the Rangdum area on 13–14 July 1982 (R. P. Martins and C. R. Robson *in litt.* 1986).

HUME'S SHORT-TOED LARK *Calendrella acutirostris* (B) Apart from the above, all definite records of *Calandrella* larks (including all specimens listed in Vaurie 1972) are this species rather than *C. cinerea*. Recorded in small numbers between May and July from the length of the valley. Frequents dry, open areas on the valley floor, so is most numerous between Parkachik and Rangdum.

HORNED LARK *Eremophila alpestris* (B) Recorded on scree slopes near Kargil (Williams and Delaney 1979) and Panikhar (Vaurie 1972, Williams and Delaney 1979). Abundant around Rangdum, and west to Tangola (Koelz 1939).

ORIENTAL SKYLARK *Alauda gulgula* (B) Common throughout the Suru

Valley in fields and grassland areas.

BROWN TREE PIPIT *Anthus trivialis* (?) Recorded from Kargil on 27 August 1984 (P. M. Cocker *in litt.* 1986), Sanku on 7 September (two) and 9 September 1983 (Holmes *et al.* 1983), near Zuildo on 19 July 1977 (Williams and Delaney 1979) and Rangdum on 27 June (Vaurie 1972). Ali and Ripley (1983) say that Meinertzhagen (1927) suggests this species (subspecies *A. t. hartingtoni*) might breed in Ladakh, but this is not the impression gained from the original paper.

ROSY PIPIT *Anthus roseatus* (PB) Two adults in heavy moult trapped in the scrub below Kun on 26 August 1983 (Holmes *et al.* 1983), with one retrapped on 2 September. Several records from grass and marshy areas in the Rangdum area in July/August.

FOREST WAGTAIL *Dendronanthus indicus* (?) A single record from 'Suru Valley in August' (Stoliczka 1868, quoted by Vaurie 1972 and Ali and Ripley 1983) is thought unlikely by Vaurie (1972). However other stragglers have been recorded in Simla and Kutch (Ali and Ripley 1983).

YELLOW WAGTAIL *Motacilla flava* (M) Koelz (1939) collected a single *M. f. beema* at Rangdum on 12 September 1931. Ward (1906–1907) says this subspecies breeds in Ladakh.

YELLOW-HOODED (CITRINE) WAGTAIL *Motacilla citreola* (B) Common all along the valley over July–September, breeding along field edges and in scrub patches.

GREY WAGTAIL *Motacilla cinerea* (PB) Recorded in April and July/August from Kargil to Panikhar. One recorded at Zuildo on 1 August 1980 (Delaney *et al.* 1982).

WHITE (PIED) WAGTAIL *Motacilla alba* (B) Common all along the valley over July–September. The dominant Ladakh subspecies is *M. a. alboides*, but *M. a. personata* may also breed sporadically (Ali and Ripley 1983). This species is more a bird of stony river banks than *M. citreola*.

GREY-BACKED SHRIKE *Lanius tephronotus* (?) Vaurie (1972) lists a record for this species at Sanku on 10 July. Biswas (1950) gives the range of *L. tephronotus* as including Kargil and the Suru Valley and lists specimens from Kargil and Sanku, the latter probably the same one as Vaurie's.

LONG-TAILED SHRIKE *Lanius schach* (PB) Recorded at Kargil (Osmaston 1925, Delaney *et al.* 1982, P. M. Cocker *in litt.* 1986), Minji (Holmes *et al.* 1983) and Sanku (Williams and Delaney 1979, Holmes *et al.* 1983). A shrike (either *L. schach* or *L. tephronotus*) was seen between Sanku and Kargil on 16 July 1982 (R. P. Martins and C. R. Robson *in litt.* 1986). Records are from July to September. Both *tephronotus* and *schach* were found together at Padum in Zanskar in 1983 (Holmes *et al.* 1983) and it may be that the species co-exist along the Suru Valley. However since all recent records

are for *schach*, an alternative possibility is that *schach* is displacing *tephronotus*.

GOLDEN ORIOLE *Oriolus oriolus* (PB) Common at Kargil. Koelz (1939) recorded one at Guntung on 27 July 1933, Holmes *et al.* (1983) recorded several at Minji and Sanku in August 1983 and Williams and Delaney (1979) saw one at Kochak in July 1977. All records are from plantations.

ROSY STARLING *Sturnus roseus* (M) Three records of juveniles at Sanku on 25 August (two) and 31 August 1983 (Holmes *et al.* 1983), and an adult recorded on 18 July 1980 at Panikhar (Delaney *et al.* 1982). Between four and six immatures present at Zuildo from 31 August to 1 September 1984 (P. M. Cocker *in litt.* 1986).

BLACK-BILLED MAGPIE *Pica pica* (B) Common around villages between Kargil and Parkachik, with records from May to September.

RED-BILLED CHOUGH *Pyrrhocorax pyrrhocorax* (PB) Common all along the valley. Many observers suggest that this species has a greater tendency to feed at the valley bottom than *P. graculus*.

YELLOW-BILLED (ALPINE) CHOUGH *Pyrrhocorax graculus* (PB) Common all along the valley.

COMMON JACKDAW *Corvus monedula* (?) A small flock was recorded at Kargil in early May 1923 by Osmaston (1925).

LARGE-BILLED CROW *Corvus macrorhynchus* (B) Nests recorded at Kargil on 18 April 1919 (Ludlow 1920) and early May 1923 (Osmaston 1925) with other records at Kargil on 1 June (Vaurie 1972) and in July (Wathen 1924, Delaney *et al.* 1982). Two seen at Sanku on 23 August 1983 (Holmes *et al.* 1983). Unidentified crows seen at Kargil, Sanku and Panikhar (Williams and Delaney 1979, Delaney *et al.* 1982) were probably this species. Williams and Delaney (1979) recorded 300+ crows over Kargil on 14 October 1977.

CARRION CROW *Corvus corone* (?) Meinertzhagen (1927) recorded two at Kargil in April 1925. Recorded as common at Kargil in early June and Sanku on 9 July 1928 (Osmaston 1930). Koelz (1939) recorded the species from Tsaliko (c.10km south of Minji?) to Kargil in July 1933. There are also records from Kargil on 20 April and 28 July (Vaurie 1972), the former possibly Meinertzhagen's record and the latter possibly taken by Koelz. Some sight records, particularly those of Osmaston, may refer to *C. macrorhynchus*.

COMMON RAVEN *Corvus corax* (B) Recorded at Kargil (Williams and Delaney 1979, Delaney *et al.* 1982), Tangola and Parkachik (Koelz 1939) and Rangdum.

WHITE-THROATED DIPPER *Cinclus cinclus* (?) The only record from the Suru Valley proper is of one on a small stream at Zuildo on 1 August 1980 (Delaney *et al.* 1982), but there are several records from tributaries of the

Suru. Ali and Ripley (1983) say this species prefers smaller streams to *C. pallasii*, so it would not be expected on the main Suru River.

BROWN DIPPER *Cinclus pallasii* (B) Recorded from Kargil in April, July, September and October, with further July records from Trazpone, Sanku and Panikhar (Williams and Delaney 1979, Delaney *et al.* 1982).

NORTHERN WREN *Troglodytes troglodytes* (B) One heard near Kargil on 11 July 1980 (Delaney *et al.* 1982), one recorded below Kun on 15 September 1983 (Holmes *et al.* 1983) and an adult feeding young at Zuildo on 6 August 1980 (Delaney *et al.* 1982) are the only records, all from rocky areas away from habitation.

ROBIN ACCENTOR *Prunella rubeculoides* (B) Recorded as common in the Rangdum area by all visitors between July and September. Osmaston (1930) includes this species in a list of birds nesting at Suru Bridge (=Panikhar) on 6–8 July 1928, and Vaurie (1972) lists a record for this site (presumably Osmaston's) for 7 July. I find this record doubtful since it is below the altitude range and in the wrong habitat: the species is found in wet and swampy areas, usually between 3,600 and 5,300m (Ali and Ripley 1983). The record may refer to *P. strophiata*.

RUFOUS-BREASTED ACCENTOR *Prunella strophiata* (B) Recorded from the scrub below Kun in August/September 1983, where fairly common (Holmes *et al.* 1983). Ludlow (1920) refers to a nest taken 'near Suru' on 6 July 1919; from Ludlow's itinerary this was between Parkachik and Gulma Tongas, and so may be 'below Kun'.

BROWN ACCENTOR *Prunella fulvescens* (?) Two birds seen between Parkachik and Gulma Tongas on 26 July 1980 (Delaney *et al.* 1982).

BLACK-THROATED ACCENTOR *Prunella atrogularis* (M/WV) At least one was in the Baru plantation on 14 October 1977 (Williams and Delaney 1979).

LONG-BILLED BUSH WARBLER *Bradypterus major* (B) Recorded as common between Kargil and Parkachik in July 1925 and 1928 by Osmaston (1926, 1930). Koelz (1939) found several in crops at Guntung on 27 July 1933. The only recent record was of two at Sanku on 24 July 1977 (Williams and Delaney 1979); none was recorded in 1980 by Delaney *et al.* (1982) or in 1983 by Holmes *et al.* (1983). Williams and Delaney (1979) suggest that the decline of this species has been caused by the destruction of scrub and rank grass. A detailed survey is required of the current status of this local species in the Suru Valley.

BLYTH'S REED WARBLER *Acrocephalus dumetorum* (M) Singles recorded from Sanku on 9 September 1983 (Holmes *et al.* 1983), below Kun on 31 August 1978 (Holmes 1978) and 12 September 1983 (Holmes *et al.* 1983), and Rangdum on 29 August 1978 (Holmes 1978). All records are of birds trapped in scrub patches. A single *Acrocephalus* warbler (probably either

dumetorum or Paddyfield Warbler *A. agricola*) was seen at Kargil on 27 August 1984 (P. M. Cocker *in litt.* 1986).

BARRED WARBLER *Sylvia nisoria* (M) A juvenile was trapped in the scrub below Kun on 2 September 1983 (Holmes *et al.* 1983). This is only the fifth record for India, but is the fourth for Ladakh, and the third there within three years. This species may be a regular migrant through Ladakh.

[COMMON WHITETHROAT *Sylvia communis* (?) Williams and Delaney (1979) noted four singing birds possibly of this species at Kargil on 7 July 1977. One individual was obtained in Ladakh on 1 June 1925 by Meinertzhagen (1927).]

(HUME'S) LESSER WHITETHROAT *Sylvia curruca* (B) *S. c. althaea* has been recorded as common in scrub areas between Kargil and Panikhar from June to September. Osmaston (1926) found a nest between Parkachik and Gulma Tongas on 18 July 1925. The species was noticeably absent in the scrub below Kun in 1983 (Holmes *et al.* 1983).

EURASIAN CHIFFCHAFF *Phylloscopus collybita* (M) One trapped at Minji on 30 August 1983 (Holmes *et al.* 1983).

MOUNTAIN CHIFFCHAFF *Phylloscopus sindianus* (B) Common in plantations and tall and low scrub throughout the valley from April to October, even at Rangdum (Williams and Delaney 1979, Delaney *et al.* 1982). Newly fledged juveniles were caught below Kun on 2 and 3 September 1983 (Holmes *et al.* 1983). 'Hundreds' of presumed migrants were in the plantation between Kargil and Baru on 14 October 1977 (Williams and Delaney 1979). Vaurie (1972) refers records of this species to *P. collybita tristis*.

PLAIN LEAF WARBLER *Phylloscopus neglectus* (B) Ward (1908) records that his collector C. H. Crump collected a pair plus their eggs at Kargil on 28 May 1906, and again on 22 June. These records are not in Vaurie (1972), and there is the possibility of confusion with *P. sindianus*. However *neglectus* has been recorded elsewhere in Ladakh (Vaurie 1972, Williams and Delaney 1979).

TICKELL'S LEAF-WARBLER *Phylloscopus affinis* (B) Records from Minji on 16 August (two) and 22 August 1983 (Holmes *et al.* 1983). Recorded from between Panikhar and Parkachik on 8 July (Vaurie 1972), below Kun in August/September 1978 and 1983 (Holmes 1978; Holmes *et al.* 1983) and in the Rangdum area in July. All records are from scrub patches.

SULPHUR-BELLIED WARBLER *Phylloscopus griseolus* (B) Occurs widely throughout the valley, with records from June to September. The species breeds on rocky or stony hillsides or on scree slopes (Ali and Ripley 1983). Six were trapped in the scrub below Kun on 12–13 September 1983 (Holmes *et al.* 1983). These were probably altitude migrants.

INORNATE (YELLOW-BROWED) WARBLER *Phylloscopus inornatus* (M) Found in late August/September at Kargil in 1984 (P. M. Cocker *in litt.* 1986), Minji, Sanku and Panikhar in 1983 (Holmes *et al.* 1983) and below Kun in 1979 and 1983 (Holmes 1978, Holmes *et al.* 1983). By the second week of September 1983 it was very common and increasing at Panikhar and below Kun; several individuals were in the later stages of moult (last primaries and secondaries almost fully grown, waxy sheaths present). Ali and Ripley (1983) describe *P. inornatus* as breeding in coniferous or birch forest; Ladakh is east and north of the known breeding areas in Indian limits, so these birds may be migrants from for example the Tien Shan mountains north of the Takla Makan desert in the Chinese province of Sinkiang (see discussion).

LARGE-BILLED LEAF-WARBLER *Phylloscopus magnirostris* (?) and GREENISH WARBLER *P. trochiloides* (B) Williamson (1976) suggests a few distinguishing characters for these two species but in the hand they may be practically indistinguishable, although *magnirostris* tends to be slightly larger. Records in August/September 1983 by Holmes *et al.* (1983) of one from Minji, two from Sanku, and several from Panikhar and below Kun were provisionally recorded as *magnirostris*. The range of wing-lengths recorded for the adults among these suggests at least some *magnirostris*. There are no records for either species in the Suru Valley in Vaurie (1972). One female with a brood-patch trapped below Kun on 26 August and 3 and 12 September 1983 had been ringed as a juvenile in the same site on 30 August 1978 (Holmes *et al.* 1983). An adult male definitely *magnirostris* was caught at Panikhar on 30 August 1983 (Holmes *et al.* 1983). Singles definitely *trochiloides* were caught at Sanku on 29 August and at Panikhar on 11 September 1983 (Holmes *et al.* 1983). Delaney *et al.* (1982) report 2–3 pairs of *trochiloides* breeding at Panikhar in July 1980, with other July records of birds seen and heard (the call is distinctive) between Panikhar and Rangdum.

GOLDCREST *Regulus regulus* (?) Meinertzhagen (1927) collected three males from a small party at Kargil on 20 April 1925. A record from Kargil on 30 April (Vaurie 1972) may refer to the same birds. Meinertzhagen referred his specimens to *R. r. tristis*; since this race breeds in Turkestan (Ali and Ripley 1983) this would make them passage birds.

WHITE-BROWED (STOLICZKA'S) TIT-WARBLER *Leptopoecile sophiae* (?) A pair seen on 14 October 1977 between Kargil and Baru by Williams and Delaney (1979). Ali and Ripley (1983) say this species breeds in Ladakh between 3,000 and 3,900m.

STONECHAT (COLLARED BUSH CHAT) *Saxicola torquata* (PB) Eight birds seen at Baru on 6 July 1980 (Delaney *et al.* 1982), and one there on 18 August 1983 (Holmes *et al.* 1983). Pairs were recorded at Sanku in July 1977 (Williams and Delaney 1979) and September 1983 (Holmes *et al.* 1983), and one was recorded at Zuildo on 31 August and 1 September 1984 (P. M. Cocker *in litt.* 1986).

PIED WHEATEAR *Oenanthe pleschanka* (B) Several records from Kargil and Baru over June–August. Juvenile wheatears probably this species were trapped at Minji on 19 August and 4 September 1983 (Holmes *et al.* 1983). A family party was seen at Sanku in July 1977 (Williams and Delaney 1979). Records are from around cultivated areas.

VARIABLE WHEATEAR *Oenanthe picata* (B) Recorded at Kargil on 16 July (Vaurie 1972). Three birds, including a female feeding a juvenile, were on a scree slope above Kargil on 7 July 1977 (Williams and Delaney 1979).

DESERT WHEATEAR *Oenanthe deserti* (B) Recorded east of Kargil on 7 June (Vaurie 1972). An adult female and juvenile recorded in a boulder-strewn area outside Panikhar on 31 August 1983 (Holmes *et al.* 1983). Koelz (1939) described the species as generally distributed west to Parkachik as a breeding bird.

BLUE ROCK THRUSH *Monticola solitarius* (B) Apparently relatively common in boulder-strewn areas and on scree slopes all along the valley.

BLACK REDSTART *Phoenicurus ochruros* (B) Very common at all sites along the valley. Found in the complete range of habitats, from plantations and scrub to cultivated fields and wild rocky areas.

GÜLDENSTÄDT'S REDSTART *Phoenicurus erythrogaster* (?) Recorded at Kargil on 20 April 1925 by Meinertzhagen (1927). Williams and Delaney (1979) refer to this species as present in the Baru plantation on 14 October 1977 in their description of the ornithological fieldwork, although they omit it from their systematic list. The species probably breeds in the hills above the Suru, and would be expected to frequent the valley bottom in winter, as in the Indus Valley (Williams and Delaney 1979, Delaney *et al.* 1982).

RIVER CHAT *Chaimarrornis leucocephalus* (B) Recorded in April and July–September from Kargil to below Kun.

WHITE-TAILED RUBYTHROAT *Erithacus* (*Luscinia*) *pectoralis* (B) Koelz (1939) recorded this species as common in July 1933 between the Pensi-La and Rangdum. Osmaston (1926) found a nest between Parkachik and Gulma Tongas on 18 July 1925, and found the species to be fairly common around Zuildo between 27 June and 3 July 1928 (Osmaston 1930). The only recent records are a juvenile trapped below Kun on 29 August 1978 (Holmes 1978) and one male from near Panikhar over 21–24 July 1980 (Delaney *et al.* 1982). Williams and Delaney (1979) discuss the apparent reduction in numbers of this species, and suggest this is due to a reduction in scrub habitat. This may be especially true in the Rangdum area, where scrub is cut for fuel for the tourist tea stalls.

BLUETHROAT *Erithacus* (*Luscinia*) *svecica* (B) Very common in the north–south section of the valley between April and September, especially at Sanku (Holmes *et al.* 1983). Not recorded above Panikhar by Williams and Delaney (1979) or Delaney *et al.* (1982), but Holmes *et al.* (1983) found them

to be common below Kun in August/September 1983. One was trapped at Rangdum on 29 August 1978 (Holmes 1978), and singles were recorded there on 31 August and 1 September 1984 (P. M. Cocker *in litt.* 1986). Williams and Delaney (1979) suggest that this species has declined like *E. pectoralis*. The more recent survey of Holmes *et al.* (1983) found Bluethroats to be very common but these may have been migrants rather than locally breeding birds.

BLACK-THROATED THRUSH *Turdus ruficollis atrogularis* (M/WV) Observed 'between Dras and Kargil' in April 1925 by Meinertzhagen (1927) and a total of 12 recorded on 14 October 1977 from plantations at Kargil and Baru (Williams and Delaney 1979).

BLUE WHISTLING THRUSH *Myophonus caeruleus* (PB) Recorded from Kargil to Parkachik, mostly along side streams. Records over July–September.

LITTLE FORKTAIL *Enicurus scouleri* (?) A pair were recorded in a gorge above Sanku on 23 July 1977 (Williams and Delaney 1979). This is the only record for Ladakh.

GREAT TIT *Parus major* (PB) Fairly common at Kargil and Minji. Recorded less commonly as far as Panikhar (Williams and Delaney 1979, Delaney *et al.* 1982, Holmes *et al.* 1983). All records are from willow or poplar plantations.

WALLCREEPER *Tichodroma muraria* (PB) Singles recorded at Kargil on 11 July 1980 (Delaney *et al.* 1982) and Minji on 25 August 1983 (Holmes *et al.* 1983). Several records between Parkachik and Rangdum in July/early August (Williams and Delaney 1979, Delaney *et al.* 1982).

FIRE-CAPPED TIT *Cephalopyrus flammiceps* (B) Two recorded on 31 July 1977 at Kargil (Williams and Delaney 1979). Recorded at Sanku on several dates in late August/early September 1983, with an adult feeding a juvenile on 31 August (Holmes *et al.* 1983). Several records from below Kun in late August/early September 1983 with at least four on 26 August (Holmes *et al.* 1983). All these records are from scrub patches. Koelz (1939) saw a flock east of Rangdum in September 1931.

HOUSE SPARROW *Passer domesticus* (B) Fairly common around all human habitation, more abundant between Kargil and Panikhar than around Rangdum.

BLACKISH-WINGED (ADAMS'S) SNOWFINCH *Montifringilla adamsi* (B) Flocks up to 40 recorded on rough grazing and boulder-strewn slopes in the Rangdum area in July/August (Williams and Delaney 1979, Delaney *et al.* 1982, R. P. Martins and C. R. Robson *in litt.* 1986).

RED-FRONTED SERIN *Serinus pusillus* (B) Found quite commonly in small flocks in cultivated areas and scrub patches along the whole length of the valley.

EURASIAN GOLDFINCH *Carduelis carduelis* (B) Found fairly commonly in scrub patches and cultivated areas between Kargil and Panikhar and in the scrub below Kun.

TWITE *Acanthis flavirostris* (PB) Records in the Rangdum area of three to five on 13–14 July 1982 (R. P. Martins and C. R. Robson *in litt.* 1986) and up to seven from 31 August to 1 September 1984 (P. M. Cocker *in litt.* 1986).

PLAIN MOUNTAIN FINCH *Leucosticte nemoricola* (PB) Common all along the valley, generally in areas away from cultivation. Particularly numerous in the Rangdum area where some were even found in Zuildo village (Williams and Delaney 1979, Delaney *et al.* 1982).

BLACK-HEADED (BRANDT'S) MOUNTAIN FINCH *Leucosticte brandti* (PB) Recorded in small groups on grassy areas and stony slopes from Panikhar to Rangdum, often in association with *L. nemoricola* and *Montifringilla adamsi*.

COMMON ROSEFINCH *Carpodacus erythrinus* (B) Abundant in cultivated areas and scrub patches at most sites. Fewer at Rangdum, where they are found on boulder-strewn slopes and in dwarf scrub (Delaney *et al.* 1982).

GREAT ROSEFINCH *Carpodacus rubicilla* (?) A pair recorded on 27 June 1928 near Rangdum by Osmaston (1930) and up to seven in the Rangdum area on 13–14 July 1982 (R. P. Martins and C. R. Robson *in litt.* 1986).

RED-BREASTED ROSEFINCH *Carpodacus puniceus* (PB) Records from the Rangdum area in July and August (Osmaston 1926, Koelz 1939, Delaney *et al.* 1982).

ROCK BUNTING *Emberiza cia* (B) Common on rocky slopes all along the valley, often entering scrub areas e.g. below Kun (Holmes *et al.* 1983).

DISCUSSION

If further intensive studies of the avifauna of the Suru Valley were carried out in late autumn, winter and spring, as at Tikse in the Upper Indus Valley (Delaney and Williams 1985, 1986), the species list would undoubtedly be greatly extended from the 128 definitely recorded so far. The breeding species along the Suru and Upper Indus Valleys are very similar. There is evidence that the common wintering species from the Indus Valley also occur in the Suru Valley: Güldenstädt's Redstart, Brown Accentor, Black-throated Thrush and Stoliczka's Tit-warbler have all been observed, and only Eastern Great Rosefinch *Carpodacus rubicilloides* has yet to be recorded from the Suru Valley.

The number of migrant species so far recorded in the Suru Valley is considerably less than in the Upper Indus Valley (Williams and Delaney 1979, Delaney *et al.* 1982, Southampton University Ladakh Expedition,

winter 1981/1982, provisional report). This is probably due to the smaller amount of study in the Suru Valley, particularly in the use of mist-nets. However, there are differences in the numbers of some migrant species recorded in the two valleys. For example Inornate (Yellow-browed) Warblers were first recorded in the Suru Valley in 1978 when 11 were trapped below Kun in late August/early September (Holmes 1978). In 1983 this species was very common in early–mid-September both at Panikhar and below Kun, and numbers were perhaps increasing at other sites during the same period (102 trapped in total: Holmes *et al.* 1983). However in the Indus Valley this species was not recorded until 1981, when only seven were trapped (Southampton University Ladakh Expedition, winter 1981/1982, provisional report).

The large difference in numbers may be explained by a migration route that takes Inornate Warblers through the Suru Valley but not the Upper Indus Valley. The Muztagh Pass, which is at a point where the main mass of the Karakoram Range is almost divided in two, is directly north of the Suru Valley (Figure 1), whereas Tikse is south of the eastern end of the main mass of the Karakoram Range. It may be that Inornate Warblers from the Tien Shan and other mountain ranges to the north move along the mountains and river valleys on the western edge of the Takla Makan desert. Following such a route, many would arrive at the Muztagh Pass and could move through; very few would be likely to go right round to the eastern end of the Karakoram. Having passed through the Muztagh, they could continue south-east along the Indus Valley to its junction with the Dras/Suru Valley. Following the Suru Valley they would be forced east by the Great Himalaya Range and Nun-Kun and would move either out into Zanskar over the Pensi-La – Inornate Warblers were found in Zanskar in autumn by Koelz (1939) and Holmes *et al.* (1983) – or via a pass over the Great Himalaya into Punjab.

There is evidence of a difference between the Suru and Upper Indus Valleys in some other species, although since these have Ladakh breeding populations it is not easy to distinguish migrants from local birds. One example concerns Common Rosefinch. The three Southampton University expeditions, operating almost daily at Tikse from mid-August to mid-October (all winter in 1981/1982), trapped 183, 164 and 212 Common Rosefinches in 1977, 1980 and 1981 respectively, with birds caught into October in all three years. Williams and Delaney (1979) say that there is no evidence of passage birds in the 1977 total. In the Suru Valley in 1983, the trapping totals for Common Rosefinches at the three main study sites between mid-August and early to mid-September were Minji 140 (14 days trapping), Sanku 139 (18 days) and below Kun 217 (13 days). On several days there appeared to be arrivals of groups of birds, many of which were carrying substantial levels of subcutaneous fat, which suggests that they were migrants (Holmes *et al.* 1983).

Some of the other passerine species trapped at Tikse, for example Eurasian Chiffchaff and Blyth's Reed Warbler, as well as the rarer passerine migrants recorded, may follow some other route to reach Tikse. These may come over

the top of the Karakoram, but it is perhaps more likely that they come round the eastern end.

There is much scope for further study of the birds of the Suru Valley. The winter avifauna needs to be studied to see if it is similar to that recorded at Tikse. Suitable sites for such long-term studies would be the Baru plantation and the large areas of scrub around Sanku. The Muztagh Pass could also be studied to examine its role as a migration route.

The members of the 1983 Oxford University expedition all contributed to this study: Adam Gretton, Ben Hatchwell, Hilary Holmes, Mark Hunter, Adrian Parr and Ian Sleigh. Mark Cocker, Rod Martins and Craig Robson very kindly provided their unpublished records. I would also like to thank Charlie Williams and Simon Delaney from the Southampton University expeditions for their help. Rings for use by the Oxford University expeditions were provided by the Bombay Natural History Society.

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Notes on the current status of ornithology in the People's Republic of China

JEFFERY BOSWALL

This paper is respectfully dedicated to Professor Cheng Tso Hsin (= Zheng Zuoxin) on the occasion of his 80th birthday, 18 November 1986.

As with science generally, ornithology was 'held up' for the ten years of the so-called Cultural Revolution 1966–1976, but during the past decade it has re-emerged and is now developing rapidly. Some indication is given of the scope of ornithology in China today, including its recent history, ornithological society, vehicles of publication, and the role of non-Chinese ornithologists in China.

RECENT HISTORY

The following notes expand and update earlier ones on the recent state of ornithology in China (Grimm 1979, Cheng 1979a,b).

Before the Communist Party came to power in China in 1949, many scientists were trained in the West and maintained their contacts in that direction. For example, Cheng Tso Hsin (now known as Zheng Zuoxin), the doyen of Chinese ornithology, received from the University of Michigan, Ann Arbor, an M.A. in 1928 and Sc.D. in 1930. He was a visiting professor to the United States, 1945–1946, spending his time with bird collections in Washington and New York.

After 1949, Chinese science looked more to the U.S.S.R. and many Chinese scientists were trained there during the early 1950s. Zheng twice visited the Soviet Union during this time, for three months on each occasion, to work on Chinese birds in Soviet skin collections, particularly in Leningrad. With strained Sino-Soviet relations developing in 1956, Russian aid to China was withdrawn in 1960, and Chinese science entered a period of isolation. During this time the political climate favoured economic ornithology and for example Zheng worked on the Oriental Pratincole *Glareola maldivarum* as a predator on locusts Acrididae (Cheng 1955). 'Sparrows' (which effectively meant any passerine birds), along with rats, bugs and flies, were declared pests and in 1958 a 'three-day war' was declared on the birds. The campaign was witnessed by Han Suyin (1959). Reputedly 800,000 birds were destroyed by hysterical crowds in three days in March. The destruction, it was claimed, was followed by plagues of insects, and the campaign was later officially admitted to have been a mistake (A. Galsworthy *in litt.*). To a series of books on China's 'economic fauna', Zheng contributed at this time a large volume on birds (Cheng 1963) working as editor and major contributor. The work was considered sufficiently important by the

Americans for it to be translated into English (Cheng 1964).

Mao Zedong's (= Mao Tse-tung's) Cultural Revolution (1966–1976) had a strongly anti-intellectual bias. It was a serious setback for science, the worst phase being 1966–1968. Many academics and other scientists were set to menial work, imprisoned and even tortured (Needham 1978). Many also died. Zheng was fortunate enough to be able to remain at the Institute of Zoology. There he worked on, amongst other things, the revision (up to 1973) of his two-volume checklist which first appeared in 1955–1958; this was published in 1976, and is still (1986) in print. It was soon translated into English at the Smithsonian Institution, Washington, but is not officially published. During the revolutionary decade, 1966–1976, however, he published only 15 books, papers and articles (0.7 per year), compared with 202 during the previous eleven years, 1955–1965 (18.4 per year) and at least 114 during the ten subsequent years, 1977–1986 (11.4 per year) (Cheng 1982 and *in litt.*).

At the time of Chairman Mao's death in September 1976, ten years' virtual stagnation of Chinese science had led to there being substantial gaps between its development in China and the West. In 1978 a very senior Chinese officer in the science field, Fang Yi, expressed the view that China was lagging 15 to 20 years behind the rest of the world in many branches of science and technology, even more in others (Needham 1978).

Since 1976, Chinese science had been allowed to develop more freely and there has been an intensifying desire among Chinese academics to re-establish old contacts overseas and to make new ones. For example, Zheng's institute sent Lu Taichun to work for one year (till July 1981) at the Sub-department of Ornithology of the British Museum (Natural History) at Tring. Since 1976 Zheng himself has visited Japan (twice), the United States (twice), Australia, Britain and France. In 1981 Zheng's American university honoured him with a regents' citation. In May 1984 he visited the Mai Po Marshes Reserve in Hong Kong. In 1986 he published a global list of bird names in Chinese (Zheng 1986).

In June 1986, I found him in Beijing correcting the proofs of a further update of his distributional list, and he expressed the hope that the book may appear before his 80th birthday on 18 November 1986. The work is in English and is entitled *A synopsis of the birds of China*, and will comprise 1,224 pages. It includes 20 species new to China, making the new total 1,186 species. The author's name is printed in the old romanisation: Cheng Tso Hsin. A further bird volume, on the babblers Timaliinae, in the *Vertebrata Series* of *Fauna Sinica*, has been completed by Zheng and is also awaiting publication. It is expected in 1987.

Some other Chinese ornithologists, since 1976, have also travelled abroad. A scientist from the Kunming Zoological Institute in Yunnan province, Zheng Baolai (Polly Cheng), spent twelve months during 1982–1983 at the Smithsonian Tropical Research Institute in Panama studying birds with Martin Moynihan and Neal G. Smith. She later moved on to the Division of Birds at the National Museum of Natural History in Washington D.C. to

work on a proposed Chinese-language field guide to the birds of China. Hsu Weishu of the Beijing Natural History Museum has visited Australia and other countries. Although a number of Chinese were registered to attend the 18th International Ornithological Congress in Moscow in 1982, none came. Five, however, were at the Ottawa IOC four years later (when Hsu Weishu was elected a member of the IOC Permanent Executive Committee), and in the same year the Chinese made four contributions to the Third International Symposium on Pheasants in Asia, Chiang Mai, Thailand (see Ridley 1986). Most professional ornithologists in China are found either in universities or in appropriate national or provincial academies of science. For an account of bird conservation in China see Boswall (in press, a) and of man–bird relations see Boswall (in press, b).

SOCIETY

In 1980, an Ornithological Society of China was established. The secretary-general is Tan Yaokuang and the address: Institute of Zoology, Academica Sinica, 7 Zhongguancun Lu, Haitien, Beijing (Peking). Up to at least 1985 it was not open to foreigners. In January 1985 there were 342 Chinese members. They pay no subscriptions. Most members are in Beijing, Shanghai, Guangzhou (Canton), Chengdu, Harbin and Kunming. Some are academics; many are teachers. Zhang Zhi-yen of Lanzhou, Gansu province, is one of the very few amateur ornithologists in China. He has studied, for example, the roosting behaviour in winter of Black-necked Cranes *Grus nigricollis* in Guizhou province. The society publishes a newsletter, *Zhongguo niaolei xuehui tongxun* (Newsletter of the Ornithological Society of China); the first issue appeared in April 1981. The editor-in-chief and vice secretary-general of the society is Hsu Weishu, Peking Natural History Museum, 126 Tien Chiao Street, Beijing.

The inaugural meeting and first symposium of the O.S.C. was held at Dalian in Liaoling province in 1980. The second symposium was at Xi-an in Shanxi province in 1982, and the third at Yancheng in Jiangsu province, 20–25 November 1985. At this meeting Zheng Zuoxin was elevated to president emeritus and Qian Yanwen was elected as the new president; 113 persons attended. Of the 133 papers submitted, eleven were read at plenary meetings and the remainder at meetings of one of three groups: the ecology group, the fauna group and the experimental biology group. At the ecology group meetings progress was reported on studies of rare and endangered birds such as Cabot's Tragopan *Tragopan caboti*, Chinese Monal *Lophophorus lhuysii*, Blood Pheasant *Ithaginis cruentus*, Silver Pheasant *Lophura nycthemera*, and Brown Eared Pheasant *Crossoptilon mantchuricum*. Progress with the domestication and training of the Azure-winged Magpie *Cyanopica cyana* and (it appears) the Great Spotted Woodpecker *Picoides major* as predators on injurious insects was also reported. To the fauna group were presented studies of cranes Gruidae mainly in north-east China, and

avifaunal surveys of Tongbo Mountain in Henan province, Tianmu Mountain in Zhejian province and Yuntai Mountain in Jiangsu province, among others. Papers read to the third group included those on avian chromosomes, the structure of the egg shells of three species of crane as revealed by the scanning electron microscope, the bioenergetics of birds and the diets of artificially raised nestling birds, e.g. of Black Stork *Ciconia nigra* and Black-headed Ibis *Threskiornis melanocephalus* (Wang Qishan *in litt.*).

RECENT BOOKS

There should eventually be 14 volumes on birds within the *Vertebrata Series* of *Fauna Sinica* (Wong 1982). Volume 4 (Cheng *et al.* 1978) dealt with the Galliformes; volume 2 (*sic*) (Cheng *et al.* 1979) with the Anseriformes; volume 13 (Li *et al.* 1982) with the Paridae and six other passerine families and volume 8 (Zheng 1986) with the Eurylaimidae and five other passerine families. Intending purchasers can try Guoji Shudian, China Publications Centre, P. O. Box 399, Beijing, People's Republic of China; or alternatively Guanghua Bookshop Ltd., 9 Newport Place, London WC 2. A work on the birds of Xizang (Tibet) summarising the results of fifteen expeditions to that region made since 1959 appeared in 1983 (Zheng *et al.* 1983). Other recent faunistic works include *Birds of the Chanbaishan Mountains* (Fu *et al.* 1984), *The avifauna of Changbai Mountain* (*sic*) Zhao *et al.* 1985) and *Sichuan fauna economica, volume 3* (birds) edited by Li (1985).

An outline history of Chinese ornithology from the earliest times to the 1960s appeared in 1980 by Meyer de Schauensee (1980) and his comprehensive guide to the birds of China was published in 1984 (Meyer de Schauensee 1984). The second of the two volumes of *Oiseaux de Chine, de Mongolie et de Corée* by R. D. Etchécopar and F. Hüe appeared in 1983. For notes on Zheng Zuoxin's forthcoming books, see under 'Recent history' above.

PERIODICALS

To date there is no journal devoted entirely to ornithology but papers on birds appear in a number of national journals, prominent among them being *Acta Zoologica Sinica*, *Acta Zootaxonomica Sinica*, *Acta Ecologica Sinica*, *Zoological Research*, *Chinese Journal of Zoology*, *Chinese Wildlife* and *Sichuan Journal of Zoology* (Tan 1985a; see Table 1). Meyer de Schauensee (1984:523) mentions that bird papers are published in *Acta Geographica Sinica*. The occasional *Memoirs of the Beijing Natural History Museum* are worth noting; see for example Xu and Purchase (1983). In English there are *China Reconstructs* and *China Pictorial*; both are very wide-ranging but regularly carry bird and other natural history stories of significance. Iain C. Orr (1980)

has compiled an immensely useful bibliography of nature reserves and biology in China culled from a wide range of natural history journals in Chinese and popular articles in English-language Chinese government publications.

Tan (1985a) surveyed 190 published papers and two books on ornithology which had appeared in China during 1983–1984 and 75 unpublished papers on ornithology which were presented to the Eleventh Conference of the Zoological Society of China in April 1984 (see Table 2). Just over one-third of the 267 texts (265 papers and two books) are concerned with ecology. Of these, the majority deal with reproduction, feeding and behaviour of individual species. Only five concern population ecology, one of these being

Table 1. Numbers of ornithological papers in seven important Chinese scientific journals in 1983 and 1984 (after Tan 1985a).

	1983	*1984*	*Total*	*%*
Acta Zoologica Sinica	3	2	5	2.6
Acta Zootaxonomica Sinica	3	1	4	2.1
Acta Ecologica Sinica	9	1	10	5.3
Zoological Research	8	8	16	8.4
Chinese Journal of Zoology	24	19	43	22.6
Chinese Wildlife	46	52	98	51.6
Sichuan Journal of Zoology	5	9	14	7.4
Totals	98	92	190	100.0

Table 2. The subjects covered by papers and books on ornithology which were published, or presented to a conference in China, during 1983 – 1984 (from Tan 1985a).

Subject	*Number of papers/books*	*%*
Local avifaunas	38	14.2
Taxonomy	7	2.6
Distribution	11	4.1
Migration	3	1.1
New records for China or provinces	10	3.7
New subspecies	1	0.4
Palaeontology	1	0.4
Detailed study of individual bird	1	0.4
Ecology of species	105	39.2
Nests and eggs	4	1.5
Population size/census	2	0.8
Physiology	5	1.9
Experimental laboratory research	4	1.5
Anatomy/structure	1	0.4
Tissue	2	0.8
Diseases (of *Gallus gallus*)	2	0.8
Biological control	9	3.4
Protection	17	6.4
Domestic birds	18	6.6
Method of specimen preparation	2	0.8
Birds in ancient texts	2	0.8
Lecture course for study groups	7	2.6
Book reviews	3	1.1
Organisation news	10	3.7
Unspecified	2	0.8
	267	100.0

on the population dynamics of the Brown Eared Pheasant, which is treated in the ICBP/IUCN Red Data Book (King 1978–1979). Seventy-two species are covered by the papers on ecology. Thirty-six papers and the two books present the results of avifaunal studies. The books are based on large-scale investigations in Xizang (Tibet) (Zheng *et al.* 1983) and on Hainan Island (Gao 1984). Tan (1985a) notes that both received special commendations and that the former, in particular, is an excellent reference book.

The seven papers on taxonomy include a recent systematic review of Chinese parrotbills *Paradoxornis* (Cheng 1984), which suggests a new taxonomic system for the genus and describes a new subspecies of Black-breasted Parrotbill *P. flavirostris gongshanensis*. By 1983, the Institute of Zoology in Beijing housed over 68,000 skins, many collected since 1949 and representing about 80% of the Chinese species.

Only three of the 265 texts are concerned with migration, one of these dealing with the Black-naped Oriole *Oriolus chinensis*. Since 1984, migration has received increasing attention. Zhang *et al.* (1985) studied autumn raptor migration near Tangshan, Hebei province. Scientists from the East China Normal University made a radar and field observation study of migration at Haizhou Bay, Jiangsu province (Mao 1985).

Tan (1985b) lists 98 species as endemic to China but an analysis by Geoffrey Carey (*in litt.*) shows that at least 27 of these breed in one or more countries neighbouring China.

BIRD RINGING

The advent of bird ringing in China, in 1983, will no doubt lead to the publication of further papers on migration. By the end of 1984, 3,084 birds of 53 species had been ringed (Anon. 1984). The two species best represented on the list are the Bar-headed Goose *Anser indicus* and the Great Black-headed Gull *Larus ichthyaetus*. By the end of 1985, over 12,000 birds of 161 species has been ringed (Anon. undated). Under the guidance of Chang Fuyuen and Yang Rouli, the directors of the National Bird Banding Centre, ringing had started up at 50 different localities by the spring of 1985 (Chang Fuyuen pers. comm. to M. D. Williams). The Centre's address is: c/o Forestry Academy of Science, Beijing. In additon, Qin Jian-hua directs a National Bird Banding Office, c/o Ministry of Forestry, Beijing.

WORK BY NON-CHINESE ORNITHOLOGISTS

Teams from the International Crane Foundation and Earthwatch have operated with Chinese ornithologists in surveys of birds, particularly cranes, at the Zhalong (Heilongjiang province), Lake Poyang (Jiangsu province) and Yen Cheng (Jiangxi province) nature reserves. The Wild Bird Society of

Japan has been very active in seeking co-operation with Chinese ornithologists, and has for example hosted them in Japan and provided manpower support for the efforts to save the White Crested Ibis *Nipponia nippon*.

The 1985 spring migration at Beidaihe, Hebei province, was surveyed by a team of British ornithologists (Williams *et al.*, *Forktail*, this issue; Williams 1986); a follow-up survey was undertaken in autumn 1986. W. G. Harvey visited Karamay, Xinjiang, in June 1985 (Harvey 1985a,b). C. R. Robson (*Forktail*, this issue) and D. S. Farrow travelled in Xizang province in spring 1986.

Elsewhere (Boswall 1985) I have suggested that more bird-watching may actually be done in the U.S.S.R. by the members of specialist ornithological holiday tours than by the negligible number of Soviet birders. The same could easily prove to be true of China. For example, those on the birding trip led by Ben King to Sichuan in May–June 1984 saw sights 'not shared by any living ornithologist' (King 1984a), such as the full and extraordinary display of a wild Temminck's Tragopan *Tragopan temminckii*. It is very much to be hoped that the selected observations made on such tours will be published, following the example of King (1984b). Specialist bird-watching holidays to China were pioneered by Cecil Klein of the British company Study China Travel. Following a reconnaissance in 1981 by David McDonald, James Hancock and Christopher Perrins, the very first such trip was led by Christopher Perrins to north-east China in 1982. I followed him there in 1983 (Boswall 1983). By 1984, two more British companies (Birdquest and Ornitholidays) and two American ones (World Nature Tours and Kingbird Tours) were offering bird tours to China. In my opinion the scientific importance of these tours is underestimated by certain leaders, participants and others.

World Wildlife Fund Hong Kong has organised a number of visits to Chinese reserves, e.g. to Poyang and to forest areas in Guangdong and Fujian (David S. Melville *in litt.*).

CONCLUSION

Ornithology in China would seem to be undergoing a transition. Work which laid the foundations for modern ornithology in the West, such as the collection of specimens, is still being carried out, whilst techniques such as bird ringing and the use of radar to study migration are being introduced. Given the continuation of China's political open-door policy and the readiness of the country's ornithologists to exchange views and work with their counterparts overseas, it seems likely that any gaps between the development of ornithology in China and in the West will soon be substantially reduced.

Thanks are due to William W. Thomas for arranging for Zhang Junfan to translate Tan

(1985a) and a published biography of Zheng Zuoxin. Gratitude is due also to Linda Birch, Minna Daum, Anthony Galsworthy, David S. Melville, Iain Orr, Marion Parsons, Tan Yaokuang, Wang Qishan, Martin Williams, Michael G. Wilson, Zheng Guangmei, Zheng Zuoxin and Xu Weishu for help in various ways.

POSTSCRIPT

After this paper was in proof, translations were received of Zheng (1981) and Liu (1984). Both papers are relevant and important, and it is hoped to cover them in a supplementary article in a future *Forktail*.

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The rediscovery of Gurney's Pitta *Pitta gurneyi*

PHILIP D. ROUND and UTHAI TREESUCON

By following up information about birds in trade, a four-year search to trace Gurney's Pitta *Pitta gurneyi* culminated in June 1986 with the discovery of a nesting pair in a 1.6 km^2 forest fragment in southern Thailand. The nest was 94 cm up in the main fork of a palm, only 50 m from a logging road in one of the lowest-lying parts of the area. The clutch of three hatched and both adults fed the young, the male more often than the female, and both more often in the afternoon; earthworms were the most frequent food. A 'skyeew' was given in alarm and as contact. The nest was empty on 2 July, the young having probably been predated or taken for trade (but possibly having fledged). Bird-trappers maintained that the species still occurs in secondary growth and even old plantations, but searches in such habitat and at other localities were unsuccessful, although the birds are evidently unobtrusive at this season. Protection of the site of discovery is urgently needed, as are further searches for and studies of the species.

Gurney's Pitta *Pitta gurneyi* is endemic to the semi-evergreen rainforest zone of peninsular Thailand, where it breeds, and extreme south Tenasserim in Burma, where it may only be a non-breeding, dry season migrant. Past records, together with such facts as were known concerning its biology, are summarised in Collar *et al.* (1986). Until 1986, apart from occasional live birds and specimens in trade, the species had not been recorded since 1952; it was surmised that this lack of recent records could be accounted for by the near total destruction of its lowland forest habitat and that the species might be nearing extinction.

This paper reports the discovery of a nesting pair of Gurney's Pittas in June 1986 and makes recommendations for the species's conservation. In order to avoid drawing undue attention to the site, and thus possibly further jeopardising the birds' precarious prospects for survival, the exact location of the find is not revealed.

BACKGROUND

In early May 1986, N. J. Collar alerted one of us, P.D.R., to a report he had received from B. W. Miller in the United States that two Gurney's Pittas had been seen in the secret backroom of an unidentified Bangkok animal dealer. Since trade in all species of pitta, together with most other native wild birds, is illegal in Thailand, dealers are understandably reticent about parting with information and, of the three major animal trading companies in Bangkok contacted by P.D.R., only one admitted to familiarity with Gurney's Pitta. The managing director maintained that his company still received five or six Gurney's Pittas per year and, speaking further with an unidentified contact over the telephone, claimed that as many as 50 birds per year were still

entering the trade.

Other contacts in Bangkok identified a small town in southern Thailand as a major entrepôt for locally caught wildlife. P.D.R. visited the largest of the three illicit dealers resident there in order to make enquiries concerning the source of Gurney's Pittas said to be entering trade. The dealer confirmed that he received 'small numbers' of Gurney's Pitta; and while he did not know the precise origins of the birds he sold, he promised to ask the village subdealer who usually brought him birds. The site subsequently mentioned proved to be one which had already been identified by Round (in press) as probably still supporting lowland forest. The subdealer himself was unable to give exact details concerning the whereabouts of the birds but, although he referred to the site by the name of a mountain, he was nevertheless able to confirm that Gurney's Pittas originated from lowland forest (*paa tam*). He was unwilling to take outside observers in to meet his local contacts, claiming that the area was not safe.

THE SEARCH

On 10 June, we decided to approach the general area mentioned by the subdealer via a different route. A village headman was contacted and he was able to confirm that the district, which had previously been a stronghold of insurgents, was now secure. Some of the villagers contacted were apparently able to recognise Gurney's Pitta when shown a photograph of a captive male, although it was evident that others were confusing the species with the much commoner Blue-winged Pitta *P. moluccensis* or with Banded Pitta *P. guajana*. The consensus seemed to be, nevertheless, that Gurney's Pitta was still present.

On 11 June, the authors accompanied by two villagers as guides, hiked into a 1.6 km^2 plot of lowland forest at 80–100 m elevation. This was still connected to forest on the hill slopes rising to approximately 650 m elevation. All remaining lowlands were intensively cultivated, fields of hill rice and tapioca alternating with rubber plantations and with small patches of secondary scrub jungle and selectively logged forest. Camp was established at two sites in the forest, separated by about 1 km, during 11–14 June at 100 m elevation and during 14–17 June at 80–90 m elevation.

While those parts of the forest nearest the foothills appeared to be little disturbed, the lower-lying parts of the area supported few trees taller than 15–20 m, among which only one species, *Dipterocarpus* sp., predominated. This indicated that the forest had formerly been logged over, probably within the previous twenty years. There was much bamboo *Dendrocalamus* sp. while palms (chiefly *Licuala peltata* Roxb. with some *L. spinosa* Wurmb. and *Salacca rumphii* Wall.) predominated in the understorey (Plate 1). The lowest-lying parts of the area were swampy.

The entire area was subject to a high level of human use and was criss-crossed with a network of trails ramifying among the dipterocarp trees,

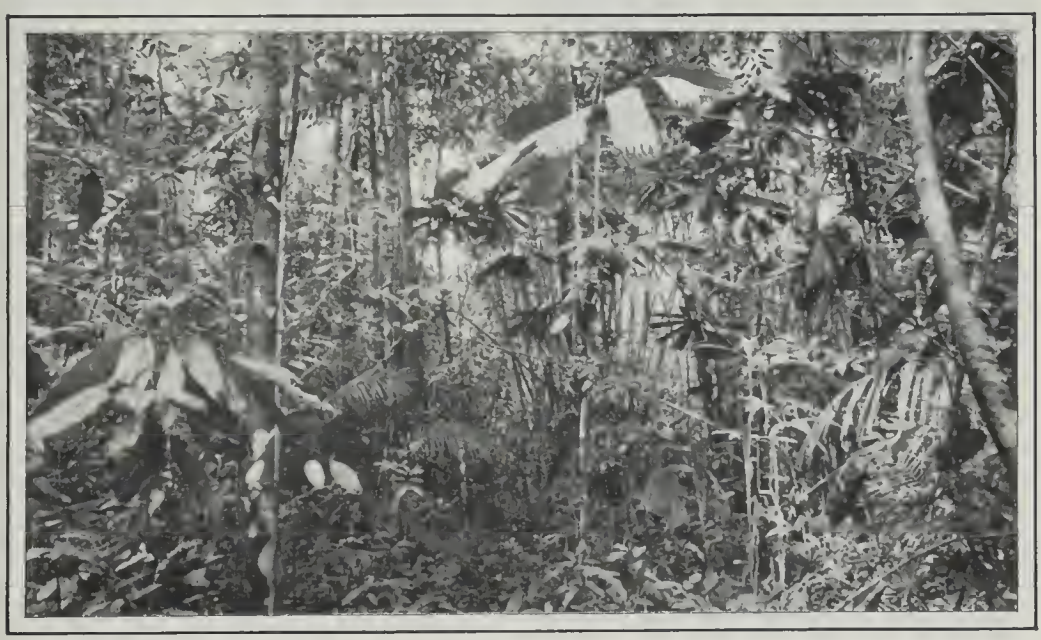
which were being tapped for resin. Gunshots were heard daily while bird-trappers, chiefly those seeking White-rumped Shamas *Copsychus malabaricus*, were occasionally encountered.

Although most larger birds, such as pheasants Phasianidae and some hornbills Bucerotidae had been hunted out, the area still supported a great diversity of forest birds. These included many of the extreme lowland specialists listed in Wells (1985), such as Red-crowned Barbet *Megalaima rafflesii*, Large Wren-Babbler *Napothera macrodactyla*, together with many other species which are scarce or absent from existing nature reserves in Thailand.

Soon after first light each day, we set out independently to search for birds, with most effort being concentrated within a 0.5km radius of the camp. Searches usually continued until dusk. All bird species seen or heard were recorded and particular attention was paid to listening for pitta-like calls (usually short, monosyllabic or disyllabic, fluty or whirring notes). We were already familiar with the calls of eight of the 12 species of pitta thought to occur in Thailand (Lekagul and Cronin 1974; and also with the 'lilip' ('tarup') call of the captive male Gurney's Pitta tape-recorded by P.D.R. (Collar *et al.* 1986). We both carried this call on tape and played it at frequent intervals in an attempt to generate a response. Any unfamiliar bird calls were either taped and played back or otherwise followed up.

On occasion, one of us was accompanied by the elder of our two guides, who claimed to have seen Gurney's Pitta and to be able to recognise it by call. However, both Gurney's and Banded Pittas are known in southern Thailand by the same name (*nok ten*) and it appeared that our guide was confusing the

Plate 1. Forest in vicinity of Gurney's Pitta nest, 29 June 1986. Note the preponderance of bamboos (*Dendrocalamus* sp.) and palms *Licuala peltata*. (U. Treesucon)



two as he constantly drew our attention to the distinctive 'kirrr' alarm calls of Banded Pittas. (Under forest conditions, when no more than fleeting views are usually obtained, it is probably difficult to distinguish between these two species on the ground without the aid of binoculars.)

After the first three days, we had encountered small numbers of both Hooded Pitta *P. sordida* and Banded Pitta without getting any indication that Gurney's might be present. On 14 June we decided to move our camp at midday to the second, slightly lower site, even though we had been warned by our guides beforehand that this area was more disturbed, with rather fewer forest birds, owing in part to its proximity to a logging road.

In the late afternoon, following a brief but heavy rain shower, we had gone out to examine the forest edge along the logging road. P.D.R. returned to the forest interior first and at 17h40 was rounding a bend in the trail less than 100m from the forest edge when a male Gurney's Pitta flew up off the ground, about 10 m ahead on the trail. The bird was easily recognised by its plump shape and uniformly brown back and wings which contrasted with the blue crown and tail. No further sightings were obtained in the next five minutes, although a single yelping 'skyeew' note was heard, similar to the contact or alarm call given by both Hooded and Blue-winged Pittas, but differing in its distinctly wavering, tremulous quality. When the prepared playback tape with the 'lilip' call was used, after only three notes a sudden movement on the trail revealed the presence of a male Gurney's Pitta. The bird was at first breast on, but it turned and bounded off up the trail, stopping at intervals to forage briefly. The bird allowed itself to be followed for about 30m before it moved off into the dense ground vegetation at the side of the trail.

After a further 20 minutes, U.T. joined P.D.R. and the prepared tape was played briefly. There was no immediate response, but after we had waited approximately five minutes, first one and then a second bird started calling with 'skyeew' notes, which were taped. Without any need for further playbacks, the male bird then emerged once again onto the path, granting further views before moving off in the same direction as previously. There was no positive indication as to the sex of the second bird, which was assumed to be the female of the pair.

The site was revisited early on the morning of 15 June, but an hour's wait produced no further sightings. P.D.R. moved to search for further birds closer to the foothills where a guide had reported past sightings of Gurney's Pitta, while U.T. remained in the vicinity. At 08h20 U.T. obtained a response to the taped playback of the calls heard on the previous day and was moving towards the source when, brushing against some vegetation, he flushed an unidentified pitta off its nest in spiny understorey vegetation. The nest contained three eggs. U.T. took up a concealed vantage point about 20m away and was able to watch a male Gurney's Pitta return to the nest and commence brooding some 30 minutes later. The male remained on the nest throughout the day.

At 16h44, the brooding male called from the nest, giving one sequence of

four 'lilip' calls followed by two more sequences of two such calls each. The male flew off the nest at 17h05 and U.T. left some minutes later. The male was subsequently encountered by P.D.R. on the same length of trail where it had been seen the previous day.

THE NEST

The nest was a flattened dome, 18cm deep with an external horizontal diameter of 19cm and an internal diameter of 16cm. The side entrance was approximately 14cm wide by 11cm high. It was constructed of bamboo leaves and the leaves of unidentified broadleaved plants. The floor was a shallow cup, lined with fine black rootlets. The nest was situated 94cm off the ground in the base of spiny *Salacca rumphii* palm, at the point where the fronds diverged (Plate 2). The nest tree was situated at the side of a shallow gully.

Such a nest, situated in a low tree, resembles the nest of Banded Pitta (Robinson 1915; pers. obs.) and conflicts with E.G. Herbert's statement, reported in Baker (1934), that his one nest of Gurney's Pitta was placed on the ground. However, this may be open to some slight doubt since Herbert never saw the nest *in situ* but received it from his collector. Moreover, his

Plate 2. The nest tree, *Salacca rumphii*. Note nest a little right of centre. Fan-shaped leaves are those of *Licuala peltata*. 28 June 1986. (U. Treesucon)

earlier account (Herbert 1924) does not mention the situation of the nest, remarking only that it was 'similar to the one in my collection', meaning the nest of a Blue Pitta *P. cyanea* which itself was said to have been taken on the ground, at the foot of a bamboo clump. Interestingly, however, the only nests of Blue Pitta we have seen have been placed on epiphytic ferns in low trees rather than on the ground (Round and Treesucon 1983), so perhaps there is considerable variation in nest site among pairs of the same species.

The nest was situated only about 50 m from a logging road, which skirted the southern fringe of the forest block, in one of the lowest-lying parts of the area, close to 80 m elevation. Most other areas at similar elevation were thought to be unsuitable for pittas as they were dominated by a swamp forest formation, with up to 5 cm of standing water in parts and with a deep tangle of tree roots and litter which might impede foraging for a ground bird. The area in which the Gurney's Pitta territory was situated was on moist, light, sandy soil. Bamboo leaves predominated in the litter.

BEHAVIOUR AT THE NEST

It was possible to approach and to watch the nest while concealed in foliage, without disturbing the birds. Observations were made subsequently at intervals on 16 and 17 June. The heads of two tiny young were first seen at midday on 17 June and were presumed to have hatched sometime between the nights of 15–16 and 16–17 June. From the afternoon of 24 June, when a blind was set up near the nest, the birds were watched almost continuously throughout the daylight hours until the morning of 29 June when, having been joined by F. R. Lambert, we had arranged to depart in order to search additional areas for Gurney's Pitta territories. When the site was revisited on the morning of 2 July neither young nor adults could be found although the nest structure was intact. The young would have been 13–14 days old when last seen on 29 June, at which time their feathers were only just beginning to emerge from pin. It was assumed at the time that either the nest had been predated, most likely by a snake, or the young had been stolen by a villager in order to be sold. However, unexpectedly early fledging appears to be a frequent phenomenon among tropical forest birds and may be an adaptation to avoid the high levels of nest predation to which tropical forest birds are supposedly prone. It is therefore conceivable that, following up to three further days of extremely rapid development, the birds might have left the nest of their own accord. While the fledging period appears not to be recorded for any species of pitta, the collection of Dr Boonsong Lekagul, Bangkok, contains three skins of juvenile Blue-winged Pittas which, though apparently fledged, are only about two-thirds the overall head- and body-length of an adult, suggesting that young pittas might leave the nest while still only part grown.

The female brooded the eggs and the eggs or young overnight on the nights of 15–16 and 16–17 June respectively. On the morning of 16 June,

the male visited the nest seven times during 06h50 to 09h30 and was thought to be feeding the brooding female, as distinct feeding actions were seen on at least two occasions, while in a third instance the male inserted his head into the nest entrance. The female left the nest on the male's seventh visit, at 09h31; the male commenced brooding and was still on the nest when we departed at 10h23. When the nest was revisited at 16h50, the male had already left and was seen moving across the forest floor in the vicinity while the female was brooding.

On 17 June, the nest was watched, 07h15–11h40, and again, 13h13–14h05. On this occasion, the female left the nest at the male's first observed visit with food at 08h18. It was not determined, however, whether the male fed the female or (as now seems more likely) the young, as the latter were not discovered until 11h30 when the male stood up to shift position on the nest. When the nest was revisited at 13h13, the female was already brooding the young and the male came in with food on five occasions in the next 52 minutes of observation. From 24 June (8–9 days old) onwards, the young were not brooded overnight or at any time during the day.

A total of 355 visits by the adults to the nest were recorded from 08h40 on 25 June until 08h05 on 29 June. On only four occasions did the male, and on one occasion the female, visit the nest apparently without bringing food for the young. The male contributed 290 visits, compared with the female's 65 (Figure; see also Plates 3 and 4). Almost half of the female's visits were recorded on the last near-complete day of observations (33 visits on 28 June), and with hindsight it seems that this may have been because she was slow in becoming habituated to the presence of the blind. She gave no overt signs of alarm other than during a 30-minute period immediately after the blind was first entered on the morning of 25 June, when a series of 'skyeew' calls was heard. Although no alarm calls were given subsequently, she was noticeably

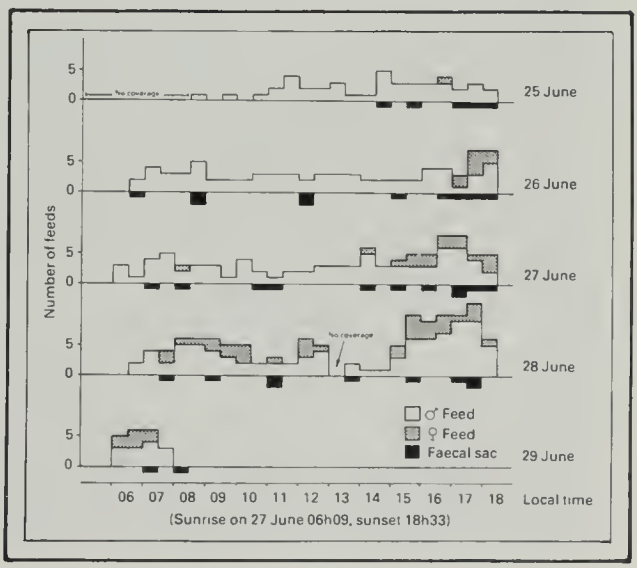


Figure. Frequency of feeding visits to young in nest.

more hesitant in delivering food to the nest than was the male, usually looking around for a few seconds immediately after alighting and before feeding the young. In contrast, the male showed not the slightest agitation, feeding the young immediately on alighting at the nest entrance and sometimes even foraging within 2 m of the occupied blind.

The earliest recorded nest visit was at 06h18 on 27 June, only nine minutes after sunrise, while the latest occurred at 18h28 on 26 June, four minutes before sunset. The female made the last visits of the day on both 27 and 28 June, and these took place at 18h25 and 18h20 respectively. The female consistently increased her feeding visits in the late afternoon and the frequency of feeds made by the male also increased during this time (Figure). The shortest interval between two consecutive feeds by the same parent (the male) was less than one minute and the longest 52 minutes, but most took place at intervals of 5–15 minutes. Even though there was intermittent, sometimes heavy, rain throughout the four days of observation, this did not appear to impede foraging and the adults continued to bring food to the nest throughout.

The only time when both parents were seen together on the nest was when the eggs or young were still being brooded, and on one other occasion when the male was still attempting to feed the young with a large (3–4 cm long) leatherjacket-like insect grub which they were unable to swallow, when the female also appeared with a beakful of earthworms.

Eleven faecal sacs were extruded by the young during the full day's observations on 27 June and at least nine and ten on 26 and 28 June respectively. These were usually extruded after the male had probed into the nest cavity with the bill, though on occasions the young extruded them onto

Plate 3. ♂ *Pitta gurneyi* at nest, immediately after feeding young, 28 June 1986. (U. Treesucon)

the nest rim without prior external stimulus. Both sexes were seen to carry off faecal sacs. On two occasions when a faecal sac broke open, the male was seen to eat part of the contents.

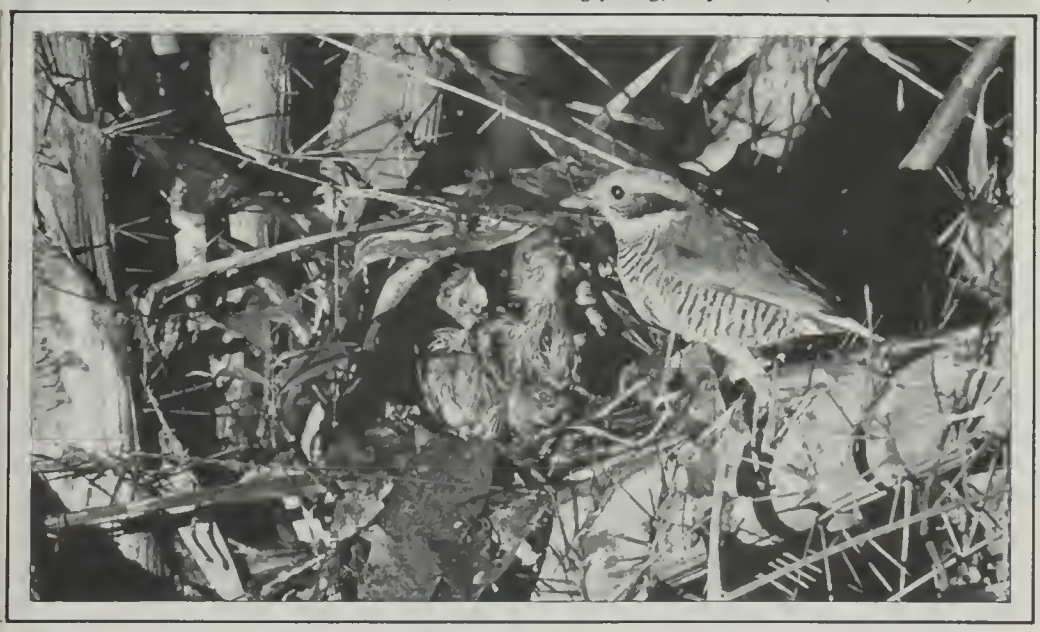
Earthworms were the most frequently observed prey item brought to the young and accounted for 46 of 63 observed feeds (Table). However, this may in part be due to the ease with which they could be seen, since they usually drooped from the bill. On only a small percentage of the male's feeding visits was it actually possible to detect food in the bill, since the blind occluded views of the birds' approach to the nest. In addition, the male flew up to the nest entrance from a point almost directly below and in front, feeding the young with its back turned to the observer. We both had the impression that the male was actually bringing in a higher proportion of small food items than could be determined with certainty. Because the female usually alighted to the side of the nest entrance and hesitated before feeding the young, the prey items which she brought were more often identified.

The birds were occasionally seen foraging, when they usually tossed the leaf litter aside with sideways flicks of the bill, sometimes giving short probes

Table. Food items brought to the nest, 17 June and 25–29 June 1986.

	No. of feeds observed	Annelid worms	large winged insect	large insect grub	large grub or slug	small insect grub	small, unident-ified
male	35	24	1	2		2	6
female	28	22	1	2	1	1	1

Plate 4. ♀ *Pitta gurneyi* at nest, immediately after feeding young, 28 June 1986. (U. Treesucon)



into the loose topsoil. Both adults were frequently observed with mud adhering to their bills.

After the birds had vanished from the nest, we attempted to search for possible pitta prey items, by searching beneath the leaf litter in those areas where the birds had been seen foraging. However, after approximately five minutes of searching, we had collected only one earthworm, a large spider, a millipede and two small cockroaches. Small cockroaches were very numerous in the leaf litter.

VOCALISATIONS

The 'skyeew' note described above was the most frequently heard call and this presumably corresponds with the 'peculiar kir-r-r' of Hume and Davison (1878). However, while their description serves to convey the impression of the slight tremolo, it incorrectly suggests similarity to the entirely distinct 'kirrr' ('whirr' in Medway and Wells 1976) of a Banded Pitta. In fact, the call is much more likely to be confused with the contact or alarm calls of Hooded and Blue-winged Pittas, as already mentioned. Both sexes gave this call: in alarm, such as in response to the presence of an observer; in response to taped playbacks of both this and the 'lilip' calls, and apparently also as a contact call. However, the overall rate of calling was very low: in 39 hours of observations at the nest during 26–29 June, only nine sequences of calls (eight sequences of 1–3 notes; one of six notes) were heard. Of these, three were given at dawn and two at dusk: two more, in the early afternoon, may have been given in response to distant 'skyew' calls from a Hooded Pitta.

The 'lilip' call was only heard on the one occasion already mentioned above when the male delivered it before leaving the nest and eggs unattended. This suggests that this note too may have a contact function, possibly serving to alert or attract the female.

No primary song was heard with certainty, although on 14 June, P.D.R. heard a sequence of mellow 'prew' notes spaced at roughly one second intervals, which had a somewhat pitta-like quality, coming from the area where, within seconds, the male was first flushed from the trail.

SEARCHES ELSEWHERE

During 29 June to 1 July, together with F. R. Lambert, we visited an adjacent area, on the opposite side of the same mountain range, where villagers were said to be actively engaged in trapping pittas (chiefly Banded Pittas) for illicit trade. The two most experienced trappers were extremely helpful and acted as our guides. They showed us how, by imitating the explosive 'kirrr' note of the Banded Pitta, they could entice the birds to respond, and they apparently use this method to lure them into mist-nets.

Both trappers were familiar with Gurney's Pitta and claimed that usually about two birds per month were trapped from around the area of their district. They reported that this species was much scarcer than Banded Pitta and, in addition, more difficult to catch because they were unable to imitate its call. When played our tape of Gurney's Pitta, they immediately recognised the 'skyeew' note as belonging to this species, but were unfamiliar with the 'lilip' call. Moreover, although their usual trapping areas comprised approximately 5 km^2 of level lowland forest, at approximately 150m elevation, they maintained that they had never encountered Gurney's Pitta there but usually found it, together with the Giant Pitta *P. caerulea* and the much commoner Blue-winged and Hooded Pittas, in patches of secondary scrub jungle, even including old, overgrown rubber plantations, closer to their houses. Such areas were only slightly lower in elevation than the remaining forest, at around 110m.

Although we spent two days searching, in both forest and in secondary growth and cultivation, no Gurney's Pittas were located. The trappers maintained that the birds were most easily detectable from November to January (i.e. outside the breeding season), when they were more inclined to call. They nevertheless maintained that the species was present all year, although they did not appear to be familiar with the nest.

A small area of forest and secondary growth at less than 50m elevation at Ban Nai Chong, some 20km north of the town of Krabi, was also searched, during 10–16 July, by R. Filby and S. Dalziel. Although a number of Banded Pittas were encountered, no Gurney's were found even though the prepared playback tape was used extensively. The apparent absence of Gurney's Pitta here is difficult to account for because the habitat appears very similar to that at the site of the recent discovery. However, the area differs in that it lacks any permanent watercourses and, in addition, has been isolated from the remaining forests of the submontane slopes.

DETECTABILITY AND NUMBERS

Although all or most pittas are shy and secretive, it appears that Gurney's may be especially difficult to locate, at least when nesting, because it calls so infrequently. During the period 11–25 June, while we were still actively searching for additional pitta territories, we estimated that there were about 10 Banded Pitta territories in and around the 1.6 km^2 forest block which held the Gurney's Pitta territory. This was based chiefly on birds heard, as there was a high incidence of calling and, on occasions, Banded Pittas even responded to playbacks of the taped 'skyeew' note of Gurney's Pitta. Nothing was known concerning the breeding status of the particular individuals concerned, but assuming that Banded Pitta breeds at the same time of year as does Gurney's (see Chasen 1939) our findings suggest that it may be more vocal than Gurney's Pitta at a comparable stage in the breeding cycle. This might, however, be a function of the differing population levels

in the two species. If there was only one pair of Gurney's in the forest block, as seemed to be the case, the birds might be less inclined to call than would Banded, since pairs of the latter might continually be encountering their neighbours.

STATUS UPDATE

The discovery of a single nesting pair of Gurney's Pittas in June 1986 appears to confirm the supposition, made in Collar *et al.* (1986), that the species is restricted to the extreme lowlands. The only positively claimed upland records, from Khao Phanom Bencha (Meyer de Schauensee 1946), must be open to doubt. While it is possible that, due to the species's former abundance in the once extensive forests of the lowlands, some individuals were able to disperse up the submontane slopes, it seems far more likely that a simple recording error may have led to specimens being attributed to the wrong altitudinal station.

There is virtually no forest below 100m within the boundary of any protected area in peninsular Thailand. Furthermore, it is now doubtful whether even as much as 20km^2 of extreme lowland forest in total remains throughout the entire Thai range of Gurney's Pitta as the speed of forest clearance has accelerated even further in the past two or three years, owing to the adoption of coffee as a cash crop.

The only ray of hope is that Gurney's Pitta may be able to survive in secondary forest and scrub jungle. Certainly the location of the 1986 nest, though situated in an ornithologically species-rich forest, was in a relatively disturbed part, with few large trees and a preponderance of bamboo. There are also the (probably reliable) reports of bird-trappers at one locality that they regularly find small numbers of Gurney's in patches of secondary growth, even including old, overgrown rubber plantations. At present, however, nothing can be inferred concerning the breeding status of these individuals since the trappers appeared never to have seen a Gurney's Pitta nest. Many tropical forest birds are relatively long-lived and it is possible that the trappers are merely encountering displaced birds that are moving around, searching unsuccessfully for suitable breeding habitat. In addition, it is doubtful whether Gurney's Pitta could ever utilise those secondary habitats that are remote from remaining forest. Indeed, such patches of lowland secondary growth themselves are undoubtedly at risk due to the continuing intensification of agriculture on already deforested areas.

RECOMMENDATIONS

If Gurney's Pitta is to be saved, the immediate establishment of a protected area around the site of the 1986 find will be necessary, and recommendations

for this have already been submitted to the Thai government by ICBP and IUCN. Such a reserve should aim to protect the largest possible area of lowland forest, selectively logged forest and secondary growth, as well as all contiguous areas of forest on hill slopes. If possible, agriculture should be discontinued (or at least not intensified) around the immediate margins of the site, so that the areas occupied by secondary forest may actually increase. Similar recommendations, involving the maintenance of intact forest blocks, with corridors radiating from them and linking surrounding secondary growth and plantations, have already been suggested for the conservation of forest birds in the Neotropics (Evans 1986). If such measures were applied around the site of the Gurney's Pitta find, many other lowland forest birds might also benefit.

There is also an urgent need for detailed research around the site of the find, in order to determine the numbers, ecology and breeding status of any such Gurney's Pittas as remain. Areas of secondary growth and scrub in the lowlands outside the margins of existing parks and sanctuaries should also be searched for Gurney's Pitta and other key lowland bird species, with a view to extending the boundaries of such sites.

These measures need to be implemented with the greatest urgency as, with the passage of each dry season (January to April), there is a successive reduction in the amount of forest remaining as farmers open up new areas for cultivation. With so little Gurney's Pitta habitat remaining, just one further dry season may be sufficient to ensure the species's destruction.

Many people directly assisted us in our long search. We thank the superintendents of those national parks and wildlife sanctuaries in peninsular Thailand where, during the past four years, we have searched fruitlessly for Gurney's Pitta. Mr. Pisit na Patalung gave us the names of some key contacts among the illicit animal traders; we must thank the traders themselves for (wittingly or unwittingly) aiding our search. We are grateful to the villagers, village headmen and the sub-district head around the site of the eventual find for their hospitality, forbearance and assistance. The bird-trappers, known as Lung Beung and Lung Chawp, proved to be good friends and field companions. Wherever else we may differ, they share with us a common interest in pittas and, like us, are concerned to see bird habitats protected. Many people have enthusiastically encouraged us in our search, especially Dr. N. J. Collar and Dr. D. R. Wells.

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Recent observations of birds in Xizang and Qinghai provinces, China

C. R. ROBSON

Between 3 March 1986 and 19 April 1986 216 species of birds were recorded from 23 localities in Xizang and Qinghai provinces, China; 7–11 species were new for Xizang, three for Qinghai, and 17–20 for 'South-east Tibet'. Notable species seen include Black-necked Crane *Grus nigricollis*, Kozlov's Babax *Babax koslowi* and Kozlov's Bunting *Emberiza koslowi*.

Vaurie (1972) treated Tibet (Qinghai–Xizang Plateau) as a geographical region rather than a country with political boundaries, splitting it up into three plateau regions – Northern, Outer and South-eastern (cited as South-east Tibet in this paper) – according to vegetation, topography and climate, etc. Chinese scientists recognise different divisions for the region (Zhang 1978) and these together with Vaurie's can be found on Figure 2. Unfortunately the names of the Chinese divisions could not be translated and I have used those of Vaurie for convenience.

The history of ornithology in South-east Tibet is rather brief, and the region's avifauna is still poorly known. In southern South-east Tibet the most important work was done by F. Ludlow and Major G. Sherriff during their collecting expeditions of 1936, 1938 and 1946–1947. Previously only very small collections had been made by F. M. Bailey in 1911 and again accompanied by Captain Morshead, in 1913. G. Bonvalot and Prince H. d'Orléans were the first to make collections in northern South-east Tibet, in 1890, followed by P. K. Kozlov in 1900–1901 and the Brooke Dolan Expedition of 1934–1935, with E. Schäfer. There was also a small collection made by Captain Bower and Dr Thorold in 1891–1892. In recent times collecting has been carried out in South-east Tibet by Chinese ornithologists, and reported on by Cai Qikai *et al.* (1977), Li Dehao *et al.* (1978), Li Dehao and Wang Zuxiang (1979), Jiang Zhihua *et al.* (1979), Zheng Zuoxin *et al.* (1980) and Zheng Zuoxin (1983). Some of the birds they collected were outside Vaurie's (1972) division for the South-eastern Plateau Region, but all were within present-day Chinese limits, and Xizang province. In this paper I include the whole of this part of Xizang up to the border, and call it South-east Tibet, rather than the South-eastern Plateau.

North-eastern Tibet has been much more widely explored, and is probably the best known part of Tibet (Qinghai–Xizang Plateau). A great number of expeditions have criss-crossed the area, starting with the great Russian expeditions of the 1870s, led by N. M. Przhevalsky, V. I. Roborovsky and, later, P. K. Kozlov, who completed his last explorations there in 1907–1909, and ending with the work done by F. R. Wulsin, J. F. Rock and W. Beick between 1922 and 1930, and by Sien Yaohua and his co-workers in 1959–1962.

During March and April 1986 D. S. Farrow and I spent seven weeks travelling from Lhasa to Qinghai Hu (Koko Nor) via Pome District, Qamdo and Yushu in South-east Tibet. During the course of our trip we observed over 200 species of birds, among which were 7–11 new species for Xizang province, three new for Qinghai province and 17–20 new for South-east Tibet (South-eastern Plateau region as described by Vaurie 1972). In addition we made a number of observations representing minor range extensions, or providing recent information on little-known or threatened species. During the second half of March, we observed a small migration of raptors through southern South-east Tibet. The largest single movement occurred at Güncang on 13 March. On that day cloud cover dropped to c.3,200m in the late morning and then lifted again to c.4,800m in the early afternoon. After the cloud lifted raptors began passing through between c.3,600 and 4,200m.

We arrived in Lhasa by aeroplane from Chengdu, Sichuan, on 3 March 1986. After a few days birdwatching in the Lhasa area we travelled east by truck, along the Lhasa–Chengdu road to Güncang in westernmost South-east Tibet, where we spent the next six days, 10–16 March, exploring various habitats up to 4,300m. We were surprised by the extensive pine and mixed coniferous forest with prickly oak and rhododendron remaining in this area, and decided to move on east to Pome District (30°15′N 95°00′E), where we expected to lose altitude and perhaps find some evergreen forest.

We travelled by truck again, arriving at Tangmai, Pome District, on 20 March, after spending a day at Dongjug. Between Dongjug and Tangmai we dropped down in altitude and evergreen elements became increasingly dominant. At Tangmai itself, we found ourselves surrounded by pristine evergreen forest (see Plates 1–2). It rained heavily at Tangmai, and on 24 March we moved, again by truck, south-east along the Po Tsangpo river to Bomi. We left the evergreen forest behind, some 20km after Tangmai, as we regained altitude. We found extensive forest once more at Bomi, and spent two days, 25–26 March, exploring an area across the river to the south. On 27 March we continued south-east to Rawu, then north via Baxoi and Bamda to Qamdo on the upper Mekong, arriving on 31 March. On the way to Qamdo we passed through high and often rugged terrain, including the breathtaking gorges of the Salween and Mekong. The general terrain remained rather rugged, but more open around Qamdo, with some patches of forest on a north-facing aspect. We found a good area of forest about 7km north of Qamdo, on the east side of the Mekong, and spent two days, 1–2 April, looking for birds there.

In Qamdo we decided to try and head north for Yushu along a road which was marked on our maps. We took a lift in a truck from Qamdo to Sagoo, some 65km to the north-west along a major tributary of the Mekong. There was no transport north of Sagoo, and the road itself, very obvious on our maps, disappeared. We walked on to Hsün-ta and then Gamda, through a well-wooded area, on 4–5 April. From Gamda we had a very long day's walk over high country to Goinxab. The next two days were spent walking on

through open steppe country to Ka-ma and eventually Nangqên on the Mekong again, arriving there on 8 April. We picked up the road again at Nangqên and travelled by truck via Doramarkog to Yushu. Yushu (just inside the northern border of South-east Tibet) was very disappointing, the surrounding hills bare and overgrazed. We travelled by bus for the two-day 800km journey to Xining over the high, windswept Qinghai Plateau, on 12–13 April. From Xining we took a bus west to Qinghai Hu, and spent our last few days in Tibet proper on the Bird Island peninsula at the western end of the lake, 15–19 April. All these localities are mapped in Figures 1 and 2.

RECORDS OF PARTICULAR INTEREST

GREAT CORMORANT *Phalacrocorax carbo* Maximum of five at Tangmai from 21–23 March, one between Tangmai and Bomi on 24 March, two at Rawu on 28 March and two at Nangqên on 8 April. Although previously recorded from the Northern and Outer Plateau regions (Vaurie 1972), these appear to be the first records for South-east Tibet.

COMMON SHELDUCK *Tadorna tadorna* A pair on the Mekong, about 30km south of Qamdo, on 31 March. Although previously recorded from the Northern and Outer Plateau regions (Vaurie 1972), this appears to be the

Plate 1. Evergreen forest along the Yigrong Chu near Tangmai, habitat for Bay Woodpecker and Black-eared Shrike-Babbler (C. R. Robson)

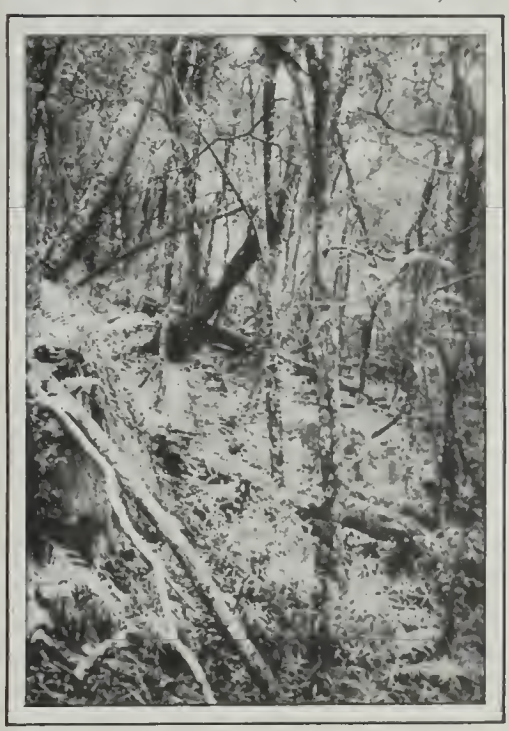
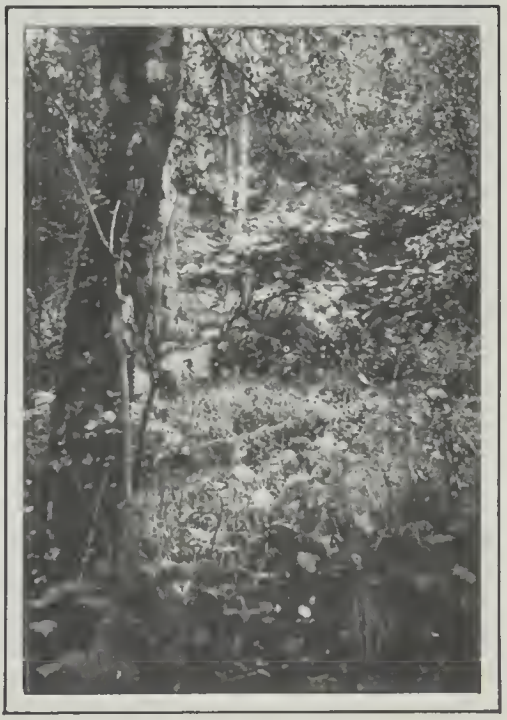


Plate 2. Undergrowth in evergreen forest c. 7km south-west of Tangmai, habitat for Yellow-throated Fulvetta and Grey-cheeked Warbler (C. R. Robson)



first record for South-east Tibet.

EURASIAN WIGEON *Anas penelope* A flock of ten at Tangmai on 22 March, one at Rawu on 28 March, and one a few kilometres north-east of Hsün-ta on 5 April. Zheng (1976) maps this species right across South-east Tibet as a winter visitor, without specific location, and Meyer de Schauensee (1984) mentions it as a winter visitor to the region, but no definite records for the region, prior to ours, have been traced. It has previously been recorded from the Northern and Outer Plateau regions (Vaurie 1972).

GADWALL *Anas strepera* At least five, about 7km south-west of Tangmai, on 20 March, another two at Tangmai on 21 March, and two or three at Rawu on 28 March. Zheng (1976) maps this species right across South-east Tibet as a winter visitor, without specific location, but no definite records, prior to ours, have been traced. It has previously been recorded from the Northern and Outer Plateau regions (Vaurie 1972).

SPOT-BILLED DUCK *Anas poecilorhyncha* One at Güncang on 13 and 15 March, and about eight at Rawu on 28 March. The sighting at Rawu appears to represent an extension eastwards of its known range in South-east Tibet. Zheng (1976) maps it for South-east Tibet, south of the Tsangpo valley, as a winter visitor, without specific location, but only one previous record for the region has been traced: one or two flocks seen on the Tsangpo at Dzeng, near Tsela Dzong (29°25′N 94°22′E) in March 1947 (Ludlow 1951). It has previously been recorded from the Outer Plateau region (Vaurie 1972).

NORTHERN SHOVELER *Anas clypeata* One at Güncang on 15 March. This appears to be only the second record for South-east Tibet, and an extension westwards of its known range in the region. Zheng (1976) maps it as a winter visitor to South-east Tibet, south of the Tsangpo valley, without specific location, but only one previous record for the region has been traced: two specimens taken at Bomi (Zheng 1983). It has previously been recorded from the Northern and Outer Plateau regions (Vaurie 1972).

SMEW *Mergus albellus* At least 25, in a large mixed flock of ducks, at the western end of Qinghai Hu, on 16 April. This may be the first record for Qinghai Hu, and the Northern Plateau region. Zheng (1976) maps it to the north of the upper Hwang Ho area as a winter visitor, without specific location, and Sien *et al.* (1964) give a record from Xining by E. Stresemann and W. Meise, 1937–1938. It has also been recorded from Dobo (36°41′N 101°30′E), north-east Qinghai province, in the Outer Plateau region (Vaurie 1972).

BLACK KITE *Milvus migrans* At least 145 moving east at Güncang on 13 March, followed by six east on 15 March and 18 east on 16 March. A rather disorientated flock of 40 at Nyingchi on 17 March, some eventually going east. Another disorientated flock of 32 over Dongjug on 19 March. A flock of 17 moving north or north-east over Tangmai, on 21 March, followed by seven going in the same direction on 23 March. At least 40 birds, which had

roosted in the fields at Bomi on 24–25 March, had all left by the evening of the 25th, presumably in an easterly or south-easterly direction.

WHITE-TAILED EAGLE *Haliaeetus albicilla* At least three (one adult and two immatures) c. 8km west of Lhasa on 4 March, and single adult and immature birds at Güncang, on 11 and 12 March respectively, both moving in an easterly direction. These appear to be the first records for Xizang province and South-east Tibet. It has previously been recorded from north-east Qinghai province in the Northern and Outer Plateau regions (Sien *et al.* 1964, Vaurie 1972).

HIMALAYAN GRIFFON VULTURE *Gyps himalayensis* Several seen at the following localities: Güncang, 10–16 March; Rawu, 28 March; between Baxoi and Bamda, 30 March; between Bamda and Qamdo, 31 March; c.7km north of Qamdo, 2 April; between Qamdo and Sagoo, 3 April; between Sagoo and Hsün-ta, 4 April; between Hsün-ta and Gamda, 5 April; between Gamda and Goinxab, 6 April; between Goinxab and Nangqên, 7–8 April; between Nangqên and Doramarkog, 9 April; between Doramarkog and Yushu, 10 April; and at Yushu, 11 April. Surprisingly, these appear to be the first records for South-east Tibet. It has previously been recorded from the Northern and Outer Plateau regions (Vaurie 1972).

CINEREOUS VULTURE *Aegypius monachus* Two birds c. 8km west of Lhasa on 4 March, and another just north of Lhasa on 5 March. These may be the first records for Xizang province, and the Outer Plateau region. Zheng (1983) lists it for southern and western Xizang, but appears to give no specific localities. It has been recorded from the Northern Plateau region and South-east Tibet, as far south as Tongchi Gompa (33°25′N 97°03′E) in south-east Qinghai province (Vaurie 1972).

NORTHERN HARRIER *Circus cyaneus* One moving east at Güncang on 12 March, followed by another two on 13 March, three at Tangmai on 22 March, one at Sumzom on 27 March, one c. 7km north of Qamdo on 1 April, one between Qamdo and Sagoo on 3 April, and one between Gamda and Goinxab on 6 April. Zheng (1976) maps it across southern South-east Tibet as a winter visitor, without specific location, and Meyer de Schauensee (1984) also mentions it as a winter visitor to the region, but no definite records for the region, prior to ours, have been traced. It has previously been recorded from the Northern and Outer Plateau regions (Vaurie 1972).

MARSH HARRIER *Circus aeruginosus* One between Yushu and Madoi, at c.4,085m, on 12 April. This may be only the second record for Qinghai province. It has previously been recorded from the Zaidam (April, August) and northern Chang Tang (September) in the Northern Plateau region, and southern Xizang in the Outer Plateau region (Vaurie 1972).

NORTHERN GOSHAWK *Accipiter gentilis* One moving east at Güncang on 13 March.

NORTHERN SPARROWHAWK *Accipiter nisus* Two moving east at Güncang on 13 March.

COMMON BUZZARD *Buteo buteo* Single birds at Güncang on 11 and 13 March, the latter moving in an easterly direction. It appears that this species has previously only been recorded from the northern part of South-east Tibet. It has also been recorded from eastern Qinghai province, in the Outer Plateau region (Vaurie 1972).

STEPPE EAGLE *Aquila rapax nipalensis* At least 25 in the Lhasa area on 4–5 March, at least 46 moving east at Güncang on 13 March, followed by singles on 15 and 16 March, and two birds moving in a north or north-easterly direction at Dongjug on 19 March. These may be the first records for Xizang province. Zheng (1983) lists it for western Xizang, but appears to give no specific localities. It has been recorded from north-east Qinghai province, in the Outer Plateau region, and northern South-east Tibet, as far south as Ge Chu (32°08′N 96°48′E) in south-east Qinghai (Vaurie 1972).

GOLDEN EAGLE *Aquila chrysaetos* One between Ganden and Güncang on 9 March, at least six at Güncang, 10–16 March, one at Tangmai on 22 March, and two more on 23 March, one or two at Bomi on 25 March, two or three at Rawu on 28 March, three or four c. 7km north of Qamdo on 1–2 April, two or three between Qamdo and Sagoo on 3 April, and several, including a pair displaying, between Sagoo and Hsün-ta on 4 April. Surprisingly, there only appears to be one previous record for Xizang province, from Nom Chu (32°02′N 98°13′E) (Vaurie 1972). Zheng (1983) lists it for southern Xizang, but appears to give no specific localities. It has been recorded from north and north-east Qinghai province, in the Northern and Outer Plateau regions (Vaurie 1972).

SAKER FALCON *Falco cherrug* Two pairs, believed to be breeding, in hills at the western end of Qinghai Hu on 18 April. One bird was observed for over 20 minutes, sitting very tight on a nest, and presumably incubating, with its mate keeping watch nearby. Another pair were seen chasing one another, possibly as part of some sort of display, in the vicinity of another nest.

COMMON COOT *Fulica atra* One, a few kilometres north-west of Qamdo, on 3 April. This appears to be the first record for South-east Tibet. Zheng (1976) maps it across South-east Tibet as a winter visitor, without specific location, but no definite records for the region, prior to ours, have been traced. It has been recorded from the Northern and Outer Plateau regions (Vaurie 1972).

COMMON CRANE *Grus grus* A single bird came down very low under heavy cloud before heading off north, at Tangmai, on 21 March. The following day, at the same locality, a flock of 16 cranes, probably this species, went through in the same direction. This appears to be the first record for Xizang province and South-east Tibet. Zheng (1983) lists it for eastern

Xizang, but appears to give no specific localities. It has been recorded from the Northern Plateau region (Vaurie 1972).

BLACK-NECKED CRANE *Grus nigricollis* Two or three groups, totalling at least 57 birds, c.8km west of Lhasa, on 4 March, another two flocks of c.41 and c.15, between Lhasa and Ganden (three hours by bus east of Lhasa), on 8 March, and a flock of 23+ to the east of Ganden, on 9 March. This species was listed by Vaurie (1972) as one of the six endemic Tibetan birds (but see, e.g. Clements and Bradbear, *Forktail*, this issue).

NORTHERN LAPWING *Vanellus vanellus* One at Rawu on 28 March, and another a few kilometres north-west of Qamdo on 3 April. These may be the first documented records for South-east Tibet. Zheng (1976) maps it across southern South-east Tibet as a winter visitor, without specific location, and Ludlow (1951) says it passes through South-east Tibet during spring and autumn migration, but gives no details. No other records for the region have been traced. It has been recorded from the Northern and Outer Plateau regions (Vaurie 1972).

EURASIAN WOODCOCK *Scolopax rusticola* One at Güncang on 14 March. This appears to be only the fifth record for Xizang province. From South-east Tibet there were two previous records quoted by Vaurie (1972), and another by Li *et al.* (1978), and from Lhasa, in the Outer Plateau region, a single bird (Ludlow 1950).

GREAT BLACK-HEADED GULL *Larus ichthyaetus* One on the Mekong at Nangqên on 8 April, a second winter bird. This appears to be the first definite record for South-east Tibet. It has been observed to the north-east of Yushu, in south-east Qinghai province, according to Meyer de Schauensee (1984), but no details are given. It has been recorded from the Northern and Outer Plateau regions (Vaurie 1972).

COMMON BLACK-HEADED GULL *Larus ridibundus* One adult at the western end of Qinghai Hu on 16 April. This may be the first record for the area. Vaurie (1972) lists it as a migrant for the Northern Plateau region, but gives no details other than a record from the Zaidam on 5 March by P. K. Kozlov.

MEW GULL *Larus canus* Two birds, a first winter and a second winter, at the western end of Qinghai Hu on 16 April. These appear to be the first records for Qinghai province and the Northern Plateau region. The nearest previous records are from Sichuan and Shaanxi provinces (Zheng 1976).

HERRING GULL *Larus argentatus* One second winter or second summer bird, at the western end of Qinghai Hu, on 17 April. I could not determine the subspecies of this bird, but it most resembled *L. a. heuglini* or *L. a. barabensis*. The former is sometimes considered conspecific with Lesser Black-Backed Gull *L. fuscus*, and is said to hybridise with *L. a. vegae* in northern central Siberia, producing a hybrid population which has been named *L. f. taimyrensis* (Cramp and Simmons 1983). This appears to be the

first record for Qinghai province and the Northern Plateau region, the nearest previous record being in Kansu province (Zheng 1976).

PALLAS'S SANDGROUSE *Syrrhaptes paradoxus* At least 20–30 birds on the Bird Island peninsula, at the western end of Qinghai Hu, on 17 April. Several birds were seen at the same locality in 1984 (M. A. S. Beaman verbally). These appear to be the first records for the Qinghai Hu region. It was recorded previously in the Northern Plateau region from the Zaidam (Vaurie 1972), and mapped to the north-east of Qinghai Hu, probably in Kansu province, by Zheng (1976).

HIMALAYAN SWIFTLET *Collocalia brevirostris* A flock of at least 50, c.7km south-west of Tangmai, on 23 March, and another flock of at least 40 a few kilometres south-east of Tangmai, along the Po Tsangpo, on 24 March. There only appear to have been two previous records for Xizang province. Zheng (1976) has mapped it in southern Xizang, in the Outer Plateau region (c.28°50′N 91°00′E), and Meyer de Schauensee (1984), presumably based on Zheng (1976), says it occurs in south Tibet (Xizang). The other record is of four birds collected in April, May and August to the south of the 'Big Bend' in the Tsangpo (29°50′N 95°05′E), South-east Tibet, reported on by Zheng (1983).

GREAT BARBET *Megalaima virens* Several birds calling daily in the Tangmai area, 20–23 March, with a maximum of five on 22 March. These appear to be the first records for south-east Tibet, and the second for Xizang province, the only previous record there being of four birds collected in May 1974 in the Outer Plateau region, near the border with central Nepal (Cai *et al.* 1977).

BAY WOODPECKER *Blythipicus pyrrhotis* One or two heard calling from evergreen forest c. 7km south-west of Tangmai on 20 March, and one seen in evergreen forest a little way along the Yigrong Chu, near Tangmai, on 22 March. These appear to be the first records for Xizang province and South-east Tibet. It is already known to occur across the border in Arunachal Pradesh, India (Ali 1977).

BARN SWALLOW *Hirundo rustica* At least four or five between Qamdo and Sagoo on 3 April. This appears to be only the third record for South-east Tibet and the fifth for Xizang province. One of the previous records for South-east Tibet was from a locality close to ours (Zheng 1983).

NEPAL HOUSE MARTIN *Delichon nipalensis* At least 500 between Dongjug and Tangmai on 20 March. This appears to be the first record for South-east Tibet and only the second for Xizang province. The only previous record was of seven birds collected in southern Xizang, in the Outer Plateau region, just north of the border with central Nepal, in June 1976 (Zheng 1980).

WATER PIPIT *Anthus spinoletta* One at Nyingchi on 17 March, and another possible heard at Rawu on 28 March. The bird at Nyingchi was probably of

the race *A. s. blakistoni*, which is less heavily streaked on the underparts in winter plumage than *A. s. japonicus*. This appears to be the first record for Xizang province and South-east Tibet. It has previously been recorded from the Northern and Outer Plateau regions, as far south as Yushu in south-east Qinghai province, northern South-east Tibet (Vaurie 1972).

BROWN DIPPER *Cinclus pallasii* One, a few kilometres west of Dongjug, on 18 March, five or six at Dongjug on 19 March, at least two, up to a few kilometres east of Dongjug, on 20 March, and one at Tangmai on 22 March. There only appears to be one previous record for South-east Tibet, from Buho in the northern part of the region (Vaurie 1972). The species has also been recorded from southern Xizang, in the Outer Plateau region (Vaurie 1972, Zheng 1983), and the Xining area, north-east Qinghai province, also in the Outer Plateau region (Sien *et al.* 1964).

BLACK REDSTART *Phoenicurus ochruros* Two males at Rawu on 28 March. It appears that previously this species had only been recorded from the northern part of South-east Tibet. It has been recorded widely in the Northern and Outer Plateau regions (Vaurie 1972).

PLUMBEOUS REDSTART *Rhyacornis fuliginosus* One male on the Salween between Baxoi and Bamda on 30 March. This record appears to be to the north-east of those previously listed for South-east Tibet (Ludlow 1951, Vaurie 1972, Zheng 1983). It has also been recorded from southern Xizang, in the Outer Plateau region (Vaurie 1972, Zheng 1983).

DESERT WHEATEAR *Oenanthe deserti* One male, c. 8km west of Lhasa, on 4 March. This appears to be the earliest record for Xizang and Qinghai provinces. According to Vaurie (1972:158) the earliest record is 2 April, but he also mentions a record from the upper Hwang Ho in March (1972:282).

BLUE ROCK THRUSH *Monticola solitarius* One male above the Dreypung Monastery, near Lhasa, on 7 March. This appears to be the first record for the Lhasa area. The nearest previous record was from Kharta Shika (28°05′N 87°19′E), over 500km to the south-west (Vaurie 1972). It has also been recorded in southern Xizang, near the border with central Nepal, and western Xizang, in the Outer Plateau region (Zheng 1983).

NAUMANN'S THRUSH *Turdus naumanni* One, of the nominate race, at Güncang, on 12 March, with Red-throated Thrushes *T. ruficollis*. This appears to be the first record for Xizang province. It has previously been recorded from the Zaidam (10 October) and Dobo (36°41′N 101°30′E, 27 October), Qinghai province, in the Northern and Outer Plateau regions respectively (Vaurie 1972). There are also two records from the Qinghai–Kansu border east of Xining (Sien *et al.* 1964).

RED-THROATED THRUSH *Turdus ruficollis* Two at Rawu on 28 March, one or two between Bamda and Qamdo on 31 March, one c. 7km north of Qamdo on 2 April, three between Gamda and Goinxab on 6 April, and one between Nangqên and Doramarkog on 9 April. It appears that all previous

records from South-east Tibet were from the western part of the region. It has also been recorded from the Northern and Outer Plateau regions (Vaurie 1972).

GREY-CHEEKED WARBLER *Seicercus poliogenys* Four or five, including one singing, in undergrowth in evergreen forest, c. 7km south-west of Tangmai, on 23 March. This appears to be the first record for Xizang province and South-east Tibet. It is known to occur across the border in Arunachal Pradesh, India (Ali 1977).

CHESTNUT-CROWNED WARBLER *Seicercus castaniceps* Two or three, a little way along the Yigrong Chu, near Tangmai, on 22 March, two or three c. 7km south-west of Tangmai on 23 March, and one a few kilometres south-east of Tangmai, along the Po Tsangpo, on 24 March. Not listed for Tibet by Vaurie (1972), but mapped by Zheng (1976) in southernmost South-east Tibet and mentioned by Meyer de Schauensee (1984). The locality given by Zheng is outside the Chinese international border according to the *Times atlas of the world*. This species was reported from two localities in South-east Tibet by Li *et al.* (1978).

BLACK-FACED WARBLER *Abroscopus schisticeps* One between Dongjug and Tangmai on 20 March, common in flocks along the Yigrong Chu near Tangmai, and up to c. 7km south-west of Tangmai, on 21–23 March. Previously only recorded in South-east Tibet from one locality, in the same area as ours (Ludlow 1951). It has recently been recorded in southern Xizang, in the Outer Plateau region (Zheng 1983).

KOZLOV'S BABAX *Babax koslowi* At least five at Sagoo on 4 April, four at Hsün-ta on 5 April, and one in a narrow gorge east of the Mekong, near Nangqên, on 9 April. These appear to be the first sightings of *B. k. koslowi* for about 70 years. The southern race, *B. k. yuguensis*, has been recorded recently from three localities in South-east Tibet (Li *et al.* 1978, Li and Wang 1979, Zheng 1983). This species is listed by Vaurie (1972) as one of the six endemic Tibetan birds.

STRIATED LAUGHINGTHRUSH *Garrulax striatus* Two, in evergreen forest c. 7km south-west of Tangmai, on 23 March. There only appear to be records from two other localities in South-east Tibet. It was recorded from a locality near ours (Ludlow 1951), and one to the south of ours, along the Tsangpo (Zheng 1983). It has also recently been recorded from southern Xizang, in the Outer Plateau region (Zheng 1983).

BLACK-EARED SHRIKE-BABBLER *Pteruthius melanotis* One male in a mixed-species flock, in evergreen forest a little way along the Yigrong Chu, near Tangmai, on 22 March, and another two males in a mixed-species flock, in evergreen forest c. 7km south-west of Tangmai, on 23 March. These appear to be the first records for Xizang province and South-east Tibet. The species is known to occur across the border in Arunachal Pradesh, India (Ali 1977).

YELLOW-THROATED FULVETTA *Alcippe cinerea* Two flocks, of five and ten respectively, in undergrowth in evergreen forest c. 7 km south-west of Tangmai, on 23 March. This appears to be only the second record of this little known babbler for Xizang province and South-east Tibet. It was previously recorded from Trulung (30°03′N 95°03′E) in January 1947 (Ludlow 1951).

BLACK-THROATED TIT *Aegithalos concinnus* Common along the Yigrong Chu near Tangmai, up to c. 7 km south-west of Tangmai, and a little way south-east of Tangmai, along the Po Tsangpo, over 21–23 March. This appears to be only the second known locality for this species in south-east Tibet. It was previously recorded in flocks in winter at a locality near ours (Ludlow 1951). Recently it has also been recorded from southern Xizang, in the Outer Plateau region (Zheng 1983).

WILLOW TIT *Parus montanus* One at Rawu on 28–29 March. It appears that previously this species has only been recorded from the northern part of South-east Tibet. It has been recorded widely from east and north-east Qinghai province, in the Outer Plateau region (Vaurie 1972).

BROWN-THROATED TREECREEPER *Certhia discolor* Several seen daily in the Tangmai area, 21–23 March. This appears to be the first record for South-east Tibet and only the second for Xizang province. The only other record is of a bird collected on 11 June 1977 in southern Xizang, in the Outer Plateau region, near the border with Sikkim and Bhutan (Li *et al.* 1979).

CHINESE GREY SHRIKE *Lanius sphenocercus* One, twice seen patrolling the edge of alpine meadows at c. 4,100 m above Güncang, on 11 and 16 March. This may be the first record for Xizang province. Zheng (1983) lists it for eastern Xizang, but appears to give no specific localities. It has been recorded from north-east, east and south-east Qinghai province as far south as Dzogchen Gompa (32°07′N 98°54′E), in northern South-east Tibet (Vaurie 1972).

YELLOW-BILLED CHOUGH *Pyrrhocorax graculus* At least six at Rawu on 28–29 March. It appears that this species has previously only been recorded as far east as Pome District (30°15′N 95°00′E) in South-east Tibet. It has also been recorded from southern and western Xizang (Zheng 1983) and north-east Qinghai province (Vaurie 1972), in the Outer Plateau region.

DAURIAN JACKDAW *Corvus dauuricus* An apparent breeding colony of c.20 birds at Bomi on 25–26 March. This appears to represent a range extension north-west along the Po Tsangpo in South-east Tibet. It has been recorded from north-east and eastern South-east Tibet, and north-east and eastern Qinghai province, in the Outer Plateau region (Vaurie 1972).

COMMON STARLING *Sturnus vulgaris* A flock of six at Nangqên, on 8 April. This appears to be the first record for South-east Tibet. It has been recorded from the Northern and Outer Plateau regions (Vaurie 1972, Zheng 1983).

RUFOUS-NECKED SNOWFINCH *Montifringilla ruficollis* Abundant on high, open plateau north of Bamda on 31 March. This appears to be an extension southwards of its known range in South-east Tibet, into the central part of the region. It has also been recorded from the Northern and Outer Plateau regions (Vaurie 1972).

WHITE-RUMPED SNOWFINCH *Montifringilla taczanowskii* Common in high, open plateau country (above 4,100 m) north of Bamda on 31 March. This appears to confirm an extension south and westward of its known range in South-east Tibet, into the central part of the region. Apart from a recent record from Markam (29°80′N 98°50′E) to the south-east of our locality (Zheng 1983), all previous records have been to the north of ours (Vaurie 1972). Many of the birds we saw were paired and displaying in the vicinity of pika *Ochotona* burrows. The species is listed by Vaurie (1972) as one of the six endemic Tibetan birds. It has also been recorded from the Northern and Outer Plateau regions (Vaurie 1972).

LAPLAND LONGSPUR *Calcarius lapponicus* One seen and heard on the Bird Island peninsula, at the western end of Qinghai Hu, on 17 April. This appears to be the first record for Qinghai province, and the Northern Plateau region. It has been recorded by W. Beick in western Kansu province (c. 37°35′N 102°20′E) in April (Vaurie 1972, Zheng 1976).

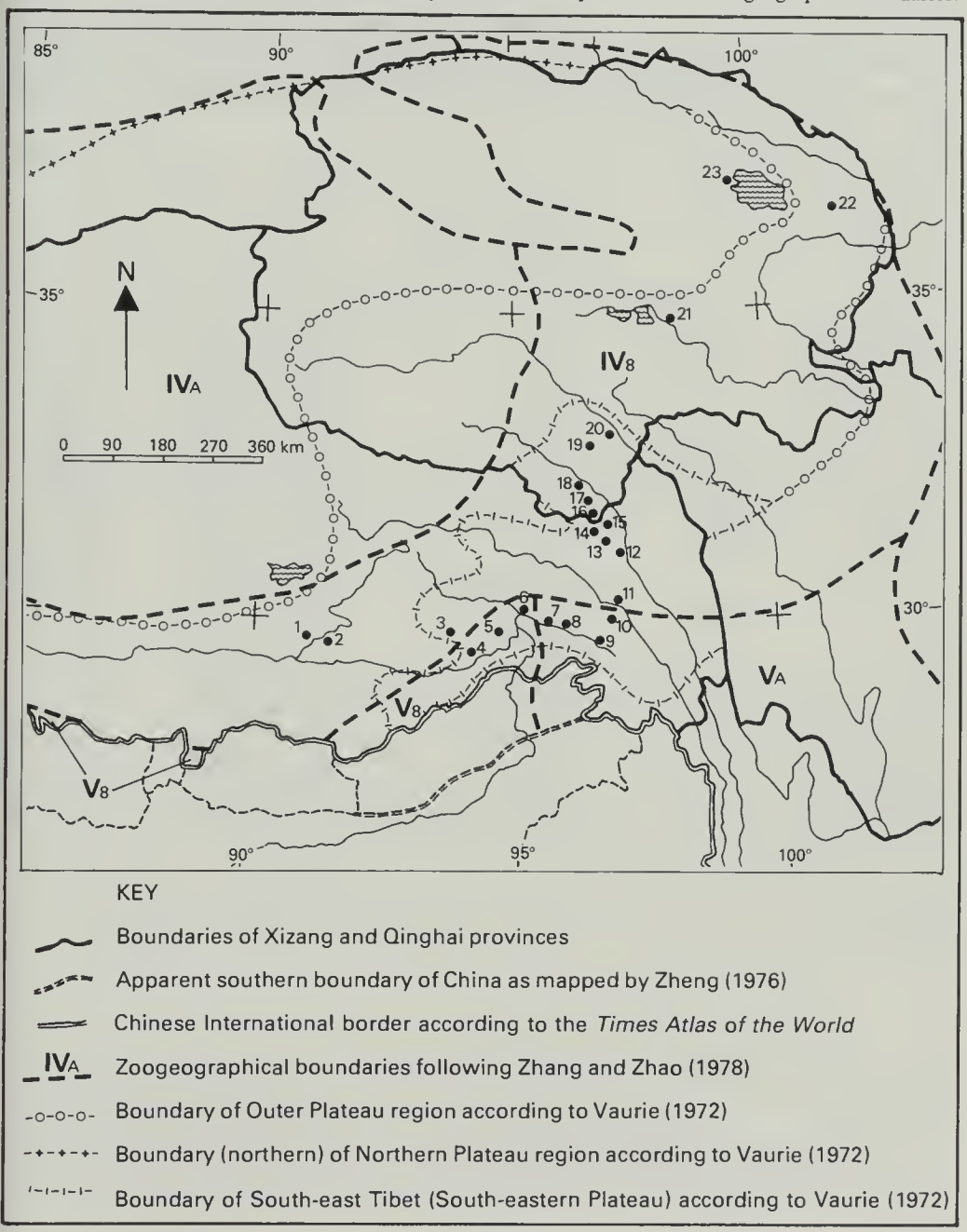
KOZLOV'S BUNTING *Emberiza koslowi* A flock of 12 (11 males and one female) on the edge of a pass, at c. 4,050m, just before (east of) Goinxab, on 6 April. The flock was very confiding as it fed on open ground on a bank above the path. Nearby there were steep grassy ridges with scattered junipers and bushes, which presumably would be suitable breeding habitat for this bird. This rare and little known species was apparently last recorded in April

Figure 1. Provinces, rivers and lakes of western China.

and May 1935 (Schäfer 1938, Schäfer and Meyer de Schauensee 1939), and prior to that only by P. K. Kozlov in August and September 1900 and January 1901. It is listed by Vaurie (1972) as one of the six endemic Tibetan birds.

LITTLE BUNTING *Emberiza pusilla* At least ten at Tangmai on 21–23 March, a total of at least 30 up to c. 10 km south-east of Tangmai along the

Figure 2. Our itinerary in Western China, with various political and zoogeographic boundaries.



Po Tsangpo on 24 March, two at Bomi on 25 March, and two at Rawu on 28 March. These appear to be the first records for Xizang province and South-east Tibet. It is known to occur across the border in Arunachal Pradesh, India (Ali 1977).

LOCALITIES VISITED

Listed below are 23 localities corresponding to the numbers on Figure 2. Coordinates for localities 1–18 were taken from an American Operational Navigation Chart (DMAAC 1984), and coordinates for localities 19–23 from the new Bartholomew map (Bartholomew 1985).

a. Name on the Bartholomew map.	b. Name on DMAAC (1984).	c. English pronunciation if apparently different from a.		
1: Lhasa	La-sa	La-sa	29°39′N 91°07′E	
2: Ganden			29°40′N 91°28′E	
3: Güncang	Keng-chang		29°48′N 94°10′E	3,170 m
4: Nyingchi	Lin-chih	Nin-chi	29°33′N 94°32′E	
5: Dongjug		Dongju	29°58′N 94°48′E	3,650 m
6: Tangmai		Tungmi	30°06′N 95°07′E	2,130 m
7: Bomi	Po-mi	Po-mi	29°52′N 95°46′E	2,775 m
8: Sumzom	Sung-tsung	Sung Dung	29°45′N 96°07′E	3,200 m
9: Rawu	Jan-wu		29°29′N 96°48′E	3,840 m
10: Baxoi	Pa-hsui	Pa-ma	30°03′N 96°53′E	3,320 m
11: Bamda	Pang-t'a		30°15′N 97°16′E	4,055 m
12: Qamdo	Ch'ang-tu	Chamdo	31°09′N 97°10′E	3,260 m
13:		Sagoo (Sagoom)	31°25′N 96°52′E	3,350 m
14:	Hsün-ta	Samka	31°34′N 96°44′E	3,445 m
15:		Gamda	31°34′N 96°45′E	3,870 m
16: Goinxab	Kung-ya-ssu	Pidza	31°56′N 91°36′E	3,930 m
17:		Ka-ma	32°05′N 96°31′E	3,625 m
18: Nangqên	Nang-ch'ien	Nangchee	32°12′N 96°29′E	3,625 m
19: Doramarkog		Doramarko	32°55′N 96°36′E	4,025 m
20: Yushu			33°00′N 97°00′E	3,565 m
21: Madoi		Mado	35°00′N 98°10′E	4,115 m
22: Xining		Shi-ning	36°38′N 101°40′E	
23: Qinghai Hu		Chinghai Hu	37°00′N 99°45′E	c. 3,140 m

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APPENDIX
ALL OTHER BIRD RECORDS FROM XIZANG AND QINGHAI PROVINCES

The list below provides all our bird records from Xizang and Qinghai other than those given in the main text. The numbers after each species relate to the localities where they were recorded (see Figure 2). For the English and scientific names I have adopted those put forward by King *et al.* (1975) and by B. F. King in an unpublished list of Chinese birds, with a few exceptions (for which 'King' names follow in brackets). The systematic order follows Voous (1977).

Great Crested Grebe *Podiceps cristatus* 23.
Whooper Swan *Cygnus cygnus* 23.
Bar-headed Goose *Anser indicus* 1, 1–2, 9, 20–21, 23
Ruddy Shelduck *Tadorna ferruginea* 1, 1–2, 5–6, 6, 9, 9–10, 12, 12–13, 15–16, 17–18, 18–19, 19–20, 20–21, 23.
Common Teal *Anas crecca* 1, 2, 9, 12–13, 23.
Mallard *Anas platyrhynchos* 1, 1–2, 3, 5–6, 9, 9–10, 19–20, 23.
Common Pintail *Anas acuta* 6, 9, 9–10, 23.
Red-crested Pochard *Netta rufina* 1, 23.
Common Pochard *Aythya ferina* 23.
Tufted Duck *Aythya fuligula* 22, 23.
Common Goldeneye *Bucephala clangula* 23.
Goosander *Mergus merganser* 1, 1–2, 6, 6–7, 17–18, 18–19, 20–21, 23.
Black Kite *Milvus migrans* 1, 2, 3, 6, 7, 9, 10–11, 11–12, 12, 12–13, 13–14, 16–17, 17–18, 18–19, 19–20, 21–22, 23.
Lammergeier *Gypaetus barbatus* 1, 2, 2–3, 3, 6, 7, 9, 10–11, 11–12, 12, 12–13, 13–14, 14–15, 16–17, 17–18, 18–19, 19–20, 20.
Northern Goshawk *Accipiter gentilis* 3, 6, 6–7, 14–15.
Northern Sparrowhawk *Accipiter nisus* 1, 2, 3, 5–6, 6–7, 7–8, 12, 15–16, 16–17, 17–18
Upland Buzzard *Buteo hemilasius* 1, 11–12, 14–15, 19–20, 20–21, 21–22, 23.
Common Kestrel *Falco tinnunculus* 1, 2–3, 3, 10–11, 12, 15–16, 16–17, 17–18, 20–21.
Saker Falcon *Falco cherrug* 1, 2, 15–16, 16–17, 19–20, 20–21, 23.
Szechenyi's Monal Partridge (Buff-throated Partridge) *Tetraophasis szechenyii* 3, 9, 12, 14–15.
Tibetan Snowcock *Tetraogallus tibetanus* 16–17.
Tibetan Partridge *Perdix hodgsoniae* 2, 2–3, 12, 13–14, 16–17, 18–19.
Common Hill Partridge *Arborophila torqueola* 5–6, 6.
Blood Pheasant *Ithaginis cruentus* 5, 7, 12, 14–15.
White Eared Pheasant *Crossoptilon crossoptilon* 3 (*harmani*), 12, 14–15, 15, 16–17.
Common Coot *Fulica atra* 23.
Ibisbill *Ibidorhyncha struthersii* 5–6, 7, 14–15, 18–19, 20–21.
Little Ringed Plover *Charadrius dubius* 23.
Kentish Plover *Charadrius alexandrinus* 23.
Northern Lapwing *Vanellus vanellus* 1, 23.
Black-tailed Godwit *Limosa limosa* 23.
Common Greenshank *Tringa nebularia* 1

Common Sandpiper *Actitis hypoleucos* 7.
Great Black-headed Gull *Larus ichthyaetus* 1, 1–2, 20–21, 23.
Brown-headed Gull *Larus brunnicephalus* 9, 12, 19–20, 20–21, 23.
Hill Pigeon *Columba rupestris* 1, 2, 10–11, 12–13, 13–14, 14–15, 15–16, 16–17, 18–19, 21–22, 23.
Snow Pigeon *Columba leuconota* 3, 5, 12, 12–13.
Oriental Turtle Dove *Streptopelia orientalis* 12, 12–13, 13–14, 14–15.
Derby's Parakeet (Derbian Parakeet) *Psittacula derbiana* 3, 5, 5–6, 6, 7, 7–8.
Little Owl *Athene noctua* 20–21, 23.
Tawny Owl *Strix aluco* 6, 15.
Hoopoe *Upupa epops* 1, 3, 4, 9, 12, 15–16, 16–17, 18–19, 20, 20–21.
Grey-headed Woodpecker *Picus canus* 3, 5, 14–15.
Black Woodpecker *Dryocopus martius* 7, 13–14, 14–15.
Darjeeling Woodpecker *Picoides darjellensis* 6.
Crimson-breasted Woodpecker *Picoides cathpharius* 6.
Three-toed Woodpecker *Picoides tridactylus* 7, 14–15.
Long-billed Calandra Lark (Tibetan Lark) *Melanocorypha maxima* 19–20, 20–21, 21–22, 23.
Mongolian Lark *Melanocorypha mongolica* 21–22, 23.
Greater Short-toed Lark *Calandrella cinerea* 15–16, 16–17, 17–18, 18–19, 19–20, 21–22, 23.
Oriental Skylark *Alauda gulgula* 1, 3, 4, 7, 7–8, 12–13, 13–14, 14–15, 15–16, 16–17, 18–19, 19–20, 20, 20–21, 21–22, 23.
Horned Lark *Eremophila alpestris* 1, 9, 9–10, 11–12, 15–16, 16–17, 17–18, 18–19, 19–20, 20–21, 21–22, 23.
Northern Crag Martin *Hirundo rupestris* 1, 10–11, 11–12, 12, 12–13, 13–14, 16–17, 17–18, 18–19, 23.
Olive-backed Pipit (Olive Tree Pipit) *Anthus hodgsoni* 6, 6–7, 7.
Yellow-hooded Wagtail *Motacilla citreola* 18.
White Wagtail *Motacilla alba* 1, 3, 4, 5, 5–6, 6, 7, 7–8, 9, 10–11, 11–12, 12, 12–13, 13–14, 14–15, 15–16, 16–17, 17–18, 18–19, 19–20, 21–22, 23.
Long-tailed Minivet *Pericrocotus ethologus* 6.
White-breasted Dipper (White-throated Dipper) *Cinclus cinclus* 2–3, 3, 5, 5–6, 9, 13–14, 14–15, 16–17, 18–19, 19–20.
Northern Wren *Troglodytes troglodytes* 1, 2, 3, 5, 6, 7, 13–14, 14–15, 18–19.
Maroon-backed Accentor *Prunella immaculata* 6.
Rufous-breasted Accentor *Prunella strophiata* 3, 5, 5–6, 6, 6–7, 7, 7–8, 8, 12, 13–14, 14–15.
Brown Accentor *Prunella fulvescens* 1, 2, 2–3, 3, 4, 7, 9, 10–11, 12, 12–13, 13–14, 14–15, 15–16, 23.
Robin Accentor *Prunella rubeculoides* 1, 2, 3, 9, 12, 13–14, 14–15, 15–16, 16–17, 18–19, 20–21, 21–22, 23.
Alpine Accentor *Prunella collaris* 1, 3, 5, 6
Orange-flanked Bush-Robin *Tarsiger cyanurus* 6, 7.
Black Redstart *Phoenicurus ochruros* 12–13, 13–14, 14–15, 15–16, 16–17, 17–18, 18–19, 19–20, 20–21, 21–22, 23.
Hodgson's Redstart *Phoenicurus hodgsoni* 3, 6, 6–7, 7–8, 10–11, 12, 12–13, 13–14, 14–15, 15–16, 16–17, 18–19.
Blue-fronted Redstart *Phoenicurus frontalis* 5–6, 6, 6–7, 7, 7–8, 9, 12, 13–14, 14–15, 15–16, 18–19.
White-throated Redstart *Phoenicurus schisticeps* 2, 3, 5, 6–7, 7, 7–8, 9, 12, 13–14, 14–15, 15–16, 18–19.
Daurian Redstart *Phoenicurus auroreus* 6.
Guldenstadt's Redstart *Phoenicurus erythrogaster* 1, 2, 3, 4, 20–21, 21–22.
Plumbeous Redstart *Rhyacornis fuliginosus* 5–6, 6.
Isabelline Wheatear *Oenanthe isabellina* 21–22, 23.
River Chat *Chaimarrornis leucocephalus* 5, 5–6, 6, 13–14.
Chestnut-bellied Rock Thrush *Monticola rufiventris* 6.
Blue Whistling Thrush *Myophonus caeruleus* 5–6, 6.
Plain-backed Thrush *Zoothera mollissima* 3, 6.
White-collared Blackbird *Turdus albocinctus* 6, 6–7, 7.
Common Blackbird *Turdus merula* 2, 3.
Kessler's Thrush (White-backed Thrush) *Turdus kessleri* 14–15, 15–16, 16–17.
Red-throated Thrush *Turdus ruficollis* 1, 2, 3, 6, 6–7, 7.
Chestnut-headed Tesia *Tesia castaneocoronata* 6.
Brownish-flanked Bush Warbler *Cettia fortipes* 5–6, 6.
Ashy-throated Warbler *Phylloscopus maculipennis* 6, 6–7.
Goldcrest *Regulus regulus* 3, 5, 5–6, 6, 7, 7–8, 12, 13–14, 14–15, 22.
White-browed Tit Warbler *Leptopoecile sophiae* 1, 2, 3, 9, 12, 23.
Crested Tit Warbler *Leptopoecile elegans* 3, 12.
Yellow-bellied Fantail *Rhipidura hypoxantha* 5–6, 6, 6–7, 7.
Spot-breasted Scimitar-Babbler *Pomatorhinus erythrocnemis* 12, 12–13.
Streak-breasted Scimitar-Babbler *Pomatorhinus ruficollis* 6, 6–7, 7.
Scaly-breasted Wren-Babbler *Pnoepyga albiventer* 6, 6–7.
Rufous-capped Babbler *Stachyris ruficeps* 5–6, 6.
Giant Babax *Babax waddelli* 3.
Giant Laughingthrush *Garrulax maximus* 3, 4, 7, 7–8, 8, 8–9, 11–12, 12, 13–14, 14–15.
Elliot's Laughingthrush *Garrulax elliotti* 11–12, 12, 12–13, 13–14, 14–15, 16–17, 18–19.
Henri's Laughingthrush (Brown-cheeked Laughingthrush) *Garrulax henrici* 2, 3, 4, 5, 5–6, 6, 6–7, 7, 7–8, 8–9, 9.
Black-faced Laughingthrush *Garrulax affinis* 3, 5, 5–6, 6, 6–7, 7–8.
Chestnut-crowned Laughingthrush *Garrulax erythrocephalus* 6, 6–7.
Red-billed Leiothrix *Leiothrix lutea* 6.
Green Shrike-Babbler *Pteruthius xanthochlorus* 5, 5–6, 6, 6–7, 7.
Streak-throated Barwing *Actinodura waldeni* 6.
Chestnut-tailed Minla *Minla strigula* 5–6, 6, 6–7.
Red-tailed Minla *Minla ignotincta* 5–6, 6, 6–7.
Rufous-winged Fulvetta *Alcippe castaneceps* 5–6, 6, 6–7.
Chinese Fulvetta *Alcippe striaticollis* 3, 7, 12.
Streak-throated Fulvetta *Alcippe cinereiceps* 5, 5–6, 6.
Beautiful Sibia *Heterophasia pulchella* 6.
Stripe-throated Yuhina *Yuhina gularis* 6.
Whiskered Yuhina *Yuhina flavicollis* 6, 6–7.
Black-browed Tit *Aegithalos iouschistos* 3, 5, 5–6, 6, 7, 7–8.
Yellow-browed Tit *Sylviparus modestus* 5–6, 6.
White-browed Tit *Parus superciliosus* 15–16, 23.
Grey-crested Tit *Parus dichrous* 3, 5, 7, 13–14
Rufous-vented Tit *Parus rubidiventris* 3, 5–6, 6, 7, 7–8, 13–14, 14–15.
Coal Tit *Parus ater* 3, 5, 5–6, 7, 7–8.
Great Tit *Parus major* 1, 2, 3, 6–7, 7, 7–8, 12, 12–13, 13–14, 14–15.
Green-backed Tit *Parus monticolus* 5, 5–6, 6, 6–7, 7.
Chestnut-vented Nuthatch *Sitta nagaensis* 3, 5, 5–6, 6, 6–7, 7–8.
Wallcreeper *Tichodroma muraria* 1, 7–8, 10–11, 12, 16–17, 18–19.
Rusty-flanked Treecreeper *Certhia nipalensis* 6, 6–7.
Common Treecreeper *Certhia familiaris* 3, 7, 12, 13–14
Fire-breasted Flowerpecker (Buff-bellied Flowerpecker) *Dicaeum ignipectus* 6, 6–7.
Chinese Grey Shrike *Lanius sphenocercus* 16–17.
Eurasian Jay *Garrulus glandarius* 3, 6.
Gold-billed Magpie *Urocissa flavirostris* 6.
Black-billed Magpie *Pica pica* 1, 2–3, 8, 9, 10–11, 11–12, 12, 12–13, 13–14, 14–15, 15–16, 16–17, 17–18, 18–19, 21–22, 22.
Tibetan Ground Jay *Pseudopodoces humilis* 1, 2, 11–12, 15–16, 16–17, 17–18, 18–19, 20–21, 21–22, 23.
Eurasian Nutcracker *Nucifraga caryocatactes* 6, 7.
Red-billed Chough *Pyrrhocorax pyrrhocorax* 2–3, 3, 4, 6, 7, 7–8, 9, 10–11, 11–12, 12, 12–13, 13–14, 14–15, 15–16, 16–17, 17–18, 18–19, 20–21, 21–22, 23.
Daurian Jackdaw *Corvus dauuricus* 2, 9, 10–11, 11–12, 12, 12–13, 13–14, 14–15, 15–16, 16–17, 17–18, 18–19, 19–20, 21–22.
Large-billed Crow *Corvus macrorhynchos* 2–3, 3, 5–6, 6, 6–7, 7, 7–8, 9, 10–11, 11–12, 12, 12–13, 13–14, 14–15, 16–17, 18–19.
Common Raven *Corvus corax* 1, 6, 9, 11–12, 12, 13–14, 17–18, 18–19, 19–20, 20–21, 21–22.
Eurasian Tree Sparrow *Passer montanus* 9, 10–11, 11–12, 12, 12–13, 13–14, 14–15, 15–16, 16–17, 17–18, 18–19, 19–20, 20, 20–21, 21–22, 23.
Streaked Rock Sparrow *Petronia petronia* 16–17, 17–18, 21–22, 23.
Plain-backed Snowfinch *Montifringilla blanfordi* 23.
Rufous-necked Snowfinch *Montifringilla ruficollis* 2, 19–20, 20–21, 21–22, 23.
David's Snowfinch (Small Snowfinch) *Montifringilla davidiana* 23.
White-rumped Snowfinch *Montifringilla taczanowskii* 20–21, 23.
Adams's Snowfinch (Blackish-winged Snowfinch) *Montifringilla adamsi* 1, 2, 16–17, 19–20, 20–21, 21–22, 23.
Black-headed Greenfinch *Carduelis ambigua* 3, 4, 6, 6–7, 7.
Twite *Carduelis flavirostris* 1, 2, 7, 9, 11–12, 12–13, 15–16, 17–18, 18–19, 19–20, 20, 23.
Common Crossbill (Red Crossbill) *Loxia curvirostra* 12, 13–14, 14–15.
Plain Mountain Finch *Leucosticte nemoricola* 3, 4, 9, 12, 12–13, 13–14, 14–15, 15–16, 16–17, 17–18.
Brandt's Mountain Finch *Leucosticte brandti* 15–16, 23.
Beautiful Rosefinch *Carpodacus pulcherrimus* 1, 1–2, 2–3, 3, 4, 7, 9, 10–11, 11–12, 12, 12–13, 13–14, 14–15, 15–16, 16–17, 18–19.
Dark-rumped Rosefinch *Carpodacus edwardsii* 5–6, 6.
Three-banded Rosefinch *Carpodacus trifasciatus* 3, 6, 12, 13–14, 14–15.
White-browed Rosefinch *Carpodacus thura* 3, 7, 7–8, 9, 12, 13–14, 14–15.
Streaked Rosefinch *Carpodacus rubicilloides* 1, 2, 7–8, 9, 10–11, 12, 13–14.
Great Rosefinch *Carpodacus rubicilla* 1.
Gold-naped Finch *Pyrrhoplectes epauletta* 6.
Pink-tailed Rosefinch *Urocynchramus pylzowi* 23.
Grey-headed Bullfinch *Pyrrhula erythaca* 3, 6, 6–7.
Collared Grosbeak *Mycerobas affinis* 6.
White-winged Grosbeak *Mycerobas carnipes* 2, 3, 5, 7–8, 9, 12, 13–14.
Rock Bunting *Emberiza cia* 1, 2, 2–3, 3, 4, 5, 5–6, 6–7, 7, 7–8, 9, 10–11, 11–12, 12, 12–13, 13–14, 14–15, 16–17, 17–18, 18–19, 21–22.

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Conservation priorities in the Philippine Archipelago

PAUL HAUGE, JOHN TERBORGH, BLAIR WINTER and JOHN PARKINSON

To determine how conservation planning should most efficiently proceed so as to protect all the Philippine Archipelago's terrestrial vertebrate species, we took the island having the largest total number of species (Mindanao), identified the island containing the greatest number of species not found on Mindanao, and repeated this procedure until an asymptote began to be approached. The most critical islands from the point of view of conservation thus prove to be Mindanao, Luzon, and Palawan. Together they contain 86% of all Philippine terrestrial vertebrate species.

Single-island endemics (Philippine species that occur on only one island) constitute an important part (176 species, or 28%) of the terrestrial vertebrate fauna. Mindanao, Luzon and Palawan are again the key islands, containing 72% of all single-island endemics. The creation and management of parks and reserves on these three islands should therefore have the highest priority in the overall conservation plan for the Philippines. Smaller islands, however, also merit attention since they hold significant numbers of endemic species, these being especially vulnerable to extinction. The trends in both total species numbers and in numbers of single-island endemics are strongly convergent in the four classes of vertebrates, suggesting that a conservation plan optimal for, say, mammals, would also be optimal or nearly so for other taxa.

The Philippine Archipelago consists of a vast array of more than 7,000 islands lying between 5 and 20°N and between 117 and 127°E in the western Pacific Ocean. The biota of these islands is exceptionally rich and includes large numbers of species that occur nowhere else in the world. Within the archipelago the biogeographic situation is exceedingly complex. Species richness may vary greatly from one island to the next, and many islands possess unique endemics. Furthermore, there are marked gradients in species composition along the chain resulting from the fact that the archipelago has been colonized by species invading from the south and south-east through Mindanao, from the south-west through Palawan, and from the north through Luzon (Inger 1954), although the Luzon (from Taiwan) and Palawan routes have been rejected for certain taxa (Heaney 1986). The picture has been made still more complex by the occurrence of numerous small-scale radiations within the archipelago itself. Superimposed on these patterns are the effects of a Pleistocene history of repeated land-bridge connections between many of the islands, and possibly between the Philippines and the emergent Sunda Shelf.

All these layers of complexity have produced intricate patterns of distribution. While these very intricacies have provided a major source of fascination for biogeographers (Taylor 1922, Dickerson 1928, Inger 1954, Leviton 1959, Diamond and Gilpin 1983, Heaney 1986), they are bound to confound any studied attempt to formulate an overall conservation plan for

the Philippines. In the absence of a thorough biogeographic analysis, it would be difficult to answer such questions as: Which islands contain the greatest concentrations of species? Which islands are richest in endemic forms? Are the patterns for different taxonomic groups (e.g. birds, mammals, reptiles, etc.) similar or dissimilar? How many parks, and on which islands, would be required to protect, say, 90% of the fauna? The difficulty in answering these questions stems from the fact that the available information is often scattered through a miscellany of guidebooks, expedition reports, and taxonomic treatises. But to ignore these questions in planning for the future management and expansion of the Philippines' reserves would certainly lead to mistakes, mistakes that it might not be possible to rectify later because time is quickly running out.

The urgency of the need for vigorous conservation work in the Philippines is made plainly evident by recent statistics on the rate and extent of deforestation. The Philippines rank high among tropical countries in both rate of deforestation and extent of area deforested. The percentage of the nation's land area covered by forests and woodland plummeted between the mid-1960s and the early 1980s from 57% to 41%. By the first half of the 1980s, the rate of deforestation had 'slowed' to an average of 91,000 ha per year (World Resources Institute/International Institute for Environment and Development 1986), due perhaps in part to the nation's economic problems at that period. However, rapid deforestation, compounded by continuing economic development and a population that is expected to jump by some 37% by the year 2000 (World Resources Institute/International Institute for Environment and Development 1986), clearly poses a serious threat of extinction to a major portion of the rich and unique Philippine fauna and flora.

Still, the existing framework of government parks and conservation programmes makes us confident that the information presented here can and will be used to avoid costly errors in conservation planning and to ensure the full protection of the precious biological heritage of the Philippines. Accomplishing that task requires that priorities be clearly specified to assure the greatest possible benefit from each unit of land brought under protection.

METHODS

From available literature we attempted to extract species lists of mammals, birds, reptiles and amphibians for each of the 30 or so major islands. While in theory this may seem simple and straightforward, in practice we met with many frustrations, such as ranges given as 'throughout the archipelago', when other evidence suggested the contrary, and the incompleteness of the faunal surveys of many of the islands. Poorly understood distributions and systematics necessitated the complete exclusion of bats, although bats face the same extinction pressures as other taxa. (L. Heaney reports to us the possible extinction of one bat species, *Dobsonia chapmani*, and the

endangered status of two others, *Acerodon lucifer* and *Nyctimene rabori*, among the 72 species of Chiroptera recorded in the Philippines: clearly, much more work on Philippine bats is needed, especially in light of their economic value in pollination, seed dispersal, and insect control.) Some of the sources included evaluations of how carefully each island had been explored and collected in, but more often this critical information was left up to the reader's imagination. Many of the islands have not been covered adequately by zoologists. This proved to be the greatest difficulty we encountered. We were also required to do a certain amount of detective work to ascertain the synonymies in a kaleidoscopic nomenclature. In the end we were obliged to concentrate our attention on the six best studied islands, and to lump everything else under the heading of 'other islands'.

We examined the data in two ways. First, we looked at the overall pattern of faunal richness simply as the total number of species recorded for each island. To identify conservation priorities in an objective fashion, we asked the question: How should conservation planning proceed in order to protect all of the archipelago's terrestrial vertebrate species, and do so as efficiently (in terms of land area) as possible? We answered this question by starting with the island having the largest total number of species, and then asking which island contains the greatest number of species not found on the first, repeating this procedure until an asymptote began to be approached. Second, we asked more specifically about endemic species whose distributions within the archipelago are confined to single islands, and repeated the procedure described above. Single-island endemics are of critical importance because of their uniqueness and because their continued existence within the Philippines will require very specific action.

The data came from a mix of expedition reports, field guides, and taxonomic monographs. We endeavoured to be as up-to-date as possible by contacting specialists in several groups and enlisting their help, but the fact remains that the biogeography of Philippine vertebrates is far less completely known than one would wish. The results are not a perfect reflection of reality: they are a summary of what has been learned to date about the fauna of an unusually complex and numerous set of islands.

RESULTS

All terrestrial vertebrates

Looking at the fauna as a whole, it is apparent that the second largest island, Mindanao, holds the greatest number of species in all but one of the groups of vertebrates considered (Table 1). Luzon, the largest island, has almost as many species, including a sizeable proportion (33%) that do not occur on Mindanao. Although fifth in size, Palawan comes next in our ranking because of its highly distinctive fauna, nearly half of which is made up of species which do not occur on either Mindanao or Luzon.

From the point of view of conservation, it is obvious that these three islands are the most important. Not only do they hold the vast majority of the total number of terrestrial vertebrate species, but they hold most that occur nowhere else in the archipelago, as discussed below. Together, Mindanao, Luzon and Palawan harbour 86% of all terrestrial vertebrates recorded for the archipelago. Values for individual groups range from 77% for mammals to 92% for birds. These results emphasize the vital importance of the larger islands as species banks. The smaller islands in general contain reduced and repetitive subsets of the faunas of the nearest large islands, a finding that has been noted for other archipelagos as well (Diamond and Marshall 1977, Terborgh *et al.* 1978, Patterson and Atmar 1986).

Single-island endemics

We come now to the problem of single-island endemics, species that occur (or are known to occur) only in the Philippines, and on only one island within the archipelago (Table 2). Taken together, these single-island endemics are an important element of the Philippine fauna, contributing 176 species, or 28% of the total (excluding bats) of 625 terrestrial vertebrate species. Developing a conservation plan for these species should have the highest priority, but doing so is an especially difficult task because of the distinct and

Table 1. Species numbers for indigenous mammals, birds, reptiles and amphibians on selected Philippine islands.

1. Total number of indigenous species on the island.
2. Additional species not found on any island to the left.
3. Total number of 'other' islands was 16 for mammals, approximately 24 for birds, 24 for snakes, 49 for skinks, 59 for gekkonid lizards, and 22 for amphibians. The Sulu Archipelago was counted as one island (the listing 'Sulu Archipelago' appears in many distributional records). Only the six listed islands were considered for 'other lizards'.
4. This is a conservative estimate. L. Heaney (pers. comm.) estimates that there may be as many as 93 indigenous non-volant mammal species in the Philippines.
5. Mammals exclusive of bats (from Heaney 1986).
6. Resident land birds, from Delacour and Mayr (1946), Amadon and duPont (1970), duPont (1971, 1976), Parkes (1971, 1973), Rabor (1977), Erickson and Heideman (1983).
7. From Savage (1950), Leviton (1952, 1957, 1959), Brown and Alcala (1970), Rabor *et al.* (1970).
8. From Brown and Alcala (1970, 1978, 1980).
9. From Brown and Alcala (1970), Rabor *et al.* (1970).
10. From Rabor (1952), Inger (1954), Leviton (1955), Alcala (1957, 1958), Brown and Alcala (1967, 1970, 1974), Rabor *et al.* (1970).
11. NA = data not available.

	Mindanao		Luzon		Palawan		Negros		Mindoro		Bohol		Others[3]		TOTAL
	T[1]	A[2]	T	A	T	A	T	A	T	A	T	A	T	A	
Mammals[5]	25	–	28	21	23	19	8	2	14	6	9	0	40	11	84[4]
Birds[6]	197	–	195	39	122	43	143	6	127	5	117	0	230	12	302
Snakes[7]	36	–	31	15	26	15	23	5	13	1	14	0	44	6	78
Skinks and gekkonid lizards[8]	41	–	29	17	13	10	20	7	13	0	18	0	53	10	85
Other lizards[9]	12	–	5	1	3	0	5	0	6	2	6	1	NA[11]	NA	16
Amphibians[10]	32	–	17	7	19	10	12	1	9	1	18	2	41	7	60
TOTAL	343	–	305	100	206	97	211	21	182	15	182	3	408	46	625

exacting spatial requirements of each one of them. Fortunately, the key islands remain the same: Mindanao, Luzon and Palawan. These collectively contain 72% of the single-island endemics. Conversely, however, 28% of the single-island endemics occur on islands besides these three, including large proportions of the single-island endemic lizards (29%), snakes (32%), mammals (33%) and amphibians (47%). Discordant trends exist in some taxa. Mindoro, for example, has nine endemic birds and mammals but only three such reptiles, while Negros has just four endemic birds and mammals but seven such reptiles. The 'other' islands (islands besides the six principal islands studied here) collectively contain 14% of the single-island endemics, including an especially large proportion (37%) of the single-island endemic amphibians. Thus these 'other' islands should not be neglected.

DISCUSSION

The priorities we have developed here are based on the simple optimality criterion of protecting the largest number of species, particularly endemic species, per unit of land set aside. Fortunately, the task was facilitated by the fact that the four major classes of terrestrial vertebrates – mammals, birds, reptiles, and amphibians – show highly concordant patterns of distribution. Thus, in specifying priorities, we were spared the unhappy job of making value judgements, such as whether a bird is intrinsically more worthy of protection than a rat or a snake. Another fortunate coincidence is that endemics are concentrated on the most species-rich islands, making it possible to preserve both quantity and quality on the same islands. The high degree of concurrence among taxa in the distributional patterns we have examined not only makes it easy to specify such priorities as to which islands need protection, but it provides a basis for confidence that the distributions

Table 2. Numbers of single-island endemic species[1] on selected Philippine islands.

1. Species that occur only in the Philippines, and on only one island within the archipelago.
2. Total number of single-island endemics in that taxonomic category.
3. Percentage of all single-island endemics in that taxonomic category.
4. See Table 1, note 3.
5. All references as in Table 1.
6. NA = data not available.

	Mindanao		Luzon		Palawan		Negros		Mindoro		Bohol		Others[4]		TOTAL
	T[2]	%[3]	T	%	T	%	T	%	T	%	T	%	T	%	
Mammals[5]	9	21	18	42	3	7	1	2	6	14	0	0	6	14	43
Birds	14	29	14	29	12	25	3	6	3	6	0	0	2	4	48
Snakes	8	29	6	21	5	18	5	18	1	4	0	0	3	11	28
Skinks and gekkonid lizards	8	24	9	27	8	24	2	6	0	0	0	0	6	18	33
Other lizards	2	40	0	0	0	0	0	0	2	40	1	20	NA[6]	NA	5
Amphibians	4	21	3	16	3	16	0	0	1	5	1	5	7	37	19
TOTAL	45	26	50	28	31	18	11	6	13	7	2	1	24	14	176

of other taxa, i.e. plants and invertebrates, are fundamentally similar. Indeed, the 'critical faunas analysis' of Collins and Morris (1985) for swallowtail butterflies showed Palawan (32 species), Mindanao (28 species) and Luzon (26 species) again to be the most important Philippine islands, embracing between them all 49 Philippine species of swallowtails. Their work followed that of Ackery and Vane-Wright (1984), who coined the term 'critical faunas analysis' and applied the concept to milkweed butterflies on a global scale, finding, *inter alia*, that Luzon, Negros, and Mindanao are among the most important locations for a hypothetical worldwide conservation effort for that group of butterflies. The work presented here is quite similar to critical faunas analysis, which both Ackery and Vane-Wright (1984) and Collins and Morris (1985) applied to worldwide species distributions and used to make recommendations for action on a global scale.

The pronounced concentration of the fauna on Mindanao, Luzon and Palawan means that preserves on these islands can be highly efficient in protecting large numbers of species simultaneously. Preserves on other islands, though less efficient that these three islands at protecting species, are still essential if all species are to be protected. Special attention should be given to the needs of endemic species that occur only on the smaller islands. They are highly vulnerable to extinction, since smaller islands are likely to contain only one or a few populations of a given species and are more susceptible to complete deforestation. Well-targeted efforts on certain small islands could yield disproportionate conservation results. However, it should be remembered that while endemic species on a given island may often be generally sympatric, and therefore protectable in a single park (e.g. on Mindoro, or Negros, or Bohol), this will not always be the case. For instance, new species finds on the poorly known south-eastern peninsula of Luzon indicate that many species may occur only on that part of the island, thus suggesting a high level of allopatric endemism within the island (Heaney 1986).

With no first-hand knowledge of either the geography or the fauna of the Philippines, we have not ventured to go further than to suggest the islands on which preserves could have the greatest benefit. The best choice of sites on these islands would depend on many factors: the state of the habitat, human population densities, local variation in species diversity, the spatial requirements of endemics, etc. Many of the islands contain complex environmental gradients, climates that range from seasonally dry to permanently wet, and montane as well as lowland vegetation types. The mountains of Luzon, for example, harbour a rich assemblage of endemic rodents, while the montane avifauna of Mindanao is especially well differentiated. Reptiles are most abundant in the lowlands. Special considerations such as these would have to be taken into account in detailed planning (Brown and Alcala 1964).

It would also help to know which species are able to live in second growth and other common types of human-created habitat, but this sort of information is not included in handbooks or taxonomic monographs. The

chances are good that more than half of the species pool can make use of disturbed environments (*cf.* Terborgh and Weske 1969). This being so, biological reserves could be designed expressly to benefit the minority of species that absolutely require unaltered natural conditions.

The final question we wish to consider is that of the size of existing and future reserves. How large should they be, or perhaps more appropriately, how big is big enough? There has been a good deal of controversy in the literature over this issue – for a juxtaposition of contrasting viewpoints, see Simberloff and Abele (1975) and the ensuing rejoinders: Diamond (1976), Terborgh (1976), Whitcomb *et al.* (1976), Simberloff and Abele (1976). It is unfortunate in our opinion that the debate has centred on the largely bogus question of whether several small patches of habitat may contain more species than a single large patch of equal aggregate area. Obviously, the answer depends on how the various patches are situated with respect to the variety of available habitat types. Far more importantly, parks should include genetically viable populations of the particular species one is trying to protect. To make the point with an absurd example, it may be possible to protect a square kilometre of forest that contains the nest of a given bird species, but that is irrelevant if five years later the birds are no longer present. The object is to preserve species and whole ecosystems over the long run, not just to include one or more individuals of as many species as possible at the outset. There can be no doubt that large areas are more effective over the long run.

Nevertheless, the question of how large is large enough is still a valid and necessary one to ask. The answer has to be tailored to the particular objectives at hand. It might be possible to assure the continued existence of an amphibian, for example, by protecting a few springs or preserving the vegetative cover along a watercourse. At the other extreme, making sure that the Philippine Eagle *Pithecophaga jefferyi* is still with us 100 years from now is perhaps the most challenging conservation objective in the Philippines. If enough habitat can be protected in Mindanao and Luzon to perpetuate the eagle populations of these two islands, it seems probable that a majority of all Philippine vertebrates will be secure along with them.

What must be kept in mind is that the spatial requirements of species differ enormously. If we begin with the big and spectacular and give them the highest priority, then many lesser creatures of little popular appeal can ride their coattails to perpetuity. The ones that are left out can then perhaps be afforded special attention on a smaller scale. We cannot realistically expect that any conservation plan will be accepted that optimizes purely biological criteria. But what we should realize is that the political concerns based on the popular appeal of certain impressive, adorable, or 'charismatic' creatures can potentially by channelled into very constructive action.

We wish to thank Walter C. Brown, John E. DuPont and Robert F. Inger for their help in discovering the literature on Philippine vertebrates, and Lawrence R. Heaney, Paul D. Heideman, and Robert S. Kennedy for reviewing the manuscript and providing critical

advice. It should be recorded that this paper was originally prepared four years ago under a different authorial sequence, and has been thus cited, e.g. by Lewis (1986); this revision represents a refinement but not a reworking of the earlier text. The Oriental Bird Club waives copyright of this paper but petitions journals that reproduce it to indicate *Forktail* as its first publisher.

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Notes on Nordmann's Greenshank *Tringa guttifer* in Thailand

ROB G. BIJLSMA and FRANK E. DE RODER

Nordmann's or Spotted Greenshank *Tringa guttifer* is a notoriously elusive bird which is inadequately known both on its breeding grounds (Velizhanin and Yalchontov 1976, Nechaev 1982) and in its winter quarters (Lekagul *et al.* 1985). It is listed in the ICBP Red Data Book (King 1981).

During a stay of nearly two months in Thailand (November and December 1984), we identified five Nordmann's Greenshanks, one bird near Samut Sakhon (13°31'N 100°20'E) and four birds at Ko Li Bong (Ko Libong) (7°16'N 99°20'E). The largest concentration so far recorded for Thailand is eleven at Ko Li Bong in December 1985 (Parish 1986).

Identification

The most striking difference from Greenshanks *Tringa nebularia*, which were always present in places where we observed Nordmann's Greenshanks, was the chunkier outline of the latter, presumably caused by the combination of the distinctly shorter legs, slightly smaller size, slightly shorter neck and stouter bill. Although the upperparts are said to be paler in winter than in Greenshanks (King *et al.* 1975), one bird actually had darker, brownish upperparts and another had a coloration which was similar to that of a Greenshank. These birds might have been juveniles (Hayman *et al.* 1986). The barring of the tail-feathers is supposed to be paler than in Greenshanks; in three of the four birds at Ko Li Bong the barring was unexpectedly paler and hardly discernible, especially in flight. The webbing between all three front toes could be seen under good light conditions up to a distance of c.45 m (using a 20× telescope).

Nordmann's Greenshanks were less vocal than Greenshanks. The most commonly heard call was a short 'kuk', resembling the sound made by a Bar-tailed Godwit *Limosa lapponica*. Another sound was a long-drawn, unmelodious call 'chrieeuw', not unlike the panic call of a Greenshank but very different from the latter's normal call; it is presumably identical to the 'keyew' mentioned in King *et al.* (1981).

Foraging behaviour

The feeding behaviour of two individuals was observed on 4 and 5 December near the village of Ban Pa Tu Pute at Ko Li Bong, using a Bushnell 20–45×60 telescope. A long pier permitted an excellent view over the surrounding mudflats and the nearby roost. Bird A was feeding on sandy mudflats with some exposed volcanic rocks; 10–15% of the mudflats were covered with a thin layer of water and the activity of crabs was at a peak. Bird

B frequented sandy mudflats where water covered 70% of the area and the incoming tide forced crabs to recede into their holes.

Our Nordmann's Greenshanks were active, solitary feeders which located their prey whilst running and walking in irregular patterns across the mudflats. Occasional disputes with Greenshanks may have been indicative of the existence of feeding territories. Fifty percent of the feeding movements consisted of pecks; jabs (in which half the bill is inserted into the mud) were made less often, whereas probes (in which the bill is fully inserted) occurred occasionally (Table 1). Although jabs and probes are indicative of tactile feeding, Nordmann's Greenshanks were seen to use these movements only after having spotted the prey visually. This always involved crabs, which tried to escape down their burrows in the mud, but which were secured by the birds thrusting their bills into the holes.

The number of successful feeding movements per minute did not vary much between the two birds (Table 2). However, we had the impression that bird B walked more rapidly than bird A and made more attempts to catch prey in order to achieve the same absolute success per minute. Undoubtedly, the hectic activities of bird B were caused by the fact that the availability of crabs had seriously decreased because of the incoming tide.

Eleven times the prey was identified, always crabs with carapace lengths between 0.5 and 6 cm. The length of the carapace was estimated on the basis of the length of the bill, being 48–58 mm (Hayman *et al.* 1986). In two cases the crab was discarded immediately after catching; both crabs had carapace lengths equalling bill length. The remaining crabs were handled according to their size. Small crabs were simply adjusted in the bill and swallowed whole. Larger crabs were vigorously shaken until the legs came off. In one instance, the legs were swallowed separately. Mean handling time was 11.9 + 6.1 s (n = 9, variation = 4–25 s).

Table 1. Feeding movements of two Nordmann's Greenshanks at Ko Li Bong, 4 December 1984.

	peck	jab	probe	total
Bird A	28	30	6	64
Bird B	137	94	36	267
Total	165	124	42	331

Table 2. Foraging characteristics of two Nordmann's Greenshanks at Ko Li Bong, 4 December 1984.

	Bird A	Bird B
Steps per minute		88.0 ± 42.0
Pecks per minute	8.0 ± 5.3	14.1 ± 5.4
Steps per peck		6.8 ± 3.2
Successes per minute	2.1 ± 1.2	2.4 ± 1.5
Steps per success		43.6
Success percentage	30.9 ± 13.7	18.0 ± 8.8
Minutes of observation	8	19

Discussion

The similarity in stance and feeding behaviour of Terek Sandpipers *Xenus cinereus* and Nordmann's Greenshanks (Hayman *et al.* 1986) is indeed striking. Both species have relatively short legs and mainly prey on crabs. This type of food obliges both species to make fast runs in order to catch the crab before it disappears into its burrow. However, the feeding movements of Nordmann's Greenshanks are not nearly so fast as those of Terek Sandpipers, which must be the fastest mudflat-runner around.

Of the five Nordmann's Greenshanks observed in Thailand during November and December 1984, four were recorded on coastal mudflats and one in a saltpan. Coastal mudflats are mentioned by King *et al.* (1975) as the habitat in winter quarters, but it seems that it might also be worthwhile looking for Nordmann's Greenshanks in saltpans and fish- and shrimp-ponds.

The foraging behaviour of Nordmann's Greenshanks, as observed at Ko Li Bong, did not differ greatly from that of the Greenshanks we have observed. However, fishing was not recorded. This hunting technique is common practice among Greenshanks. At Samut Sakhon Greenshanks were hunting for fish and mudskippers along the edge of saltpans, sometimes swimming or wading through belly-deep water. The Nordmann's Greenshank observed here was not feeding when detected but there can be no doubt that this species takes fishes when the circumstances are favourable, as in the breeding area (Nechaev 1982). Given its webbed feet, it might even swim more than Greenshanks.

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Does the White-eyed River-Martin *Pseudochelidon sirintarae* breed in China?

EDWARD C. DICKINSON

Although it is almost twenty years since the discovery and description of the White-eyed River-Martin *Pseudochelidon sirintarae* (Thonglongya 1968), there has been no success in improving our knowledge of the species. All records have been from Bung Boraphet, a reservoir and marsh in central Thailand; after the initial nine specimens were collected, a further individual was taken in November 1968 (Thonglongya 1969), two birds were 'found' in 1972 (King 1978–1979), six adults were seen in February 1977 (King and Kanwanich 1978), and four immatures were seen in January 1980 (Sophasan and Dobias 1984). All records have been from November to February, the winter period.

Speculation about the species's breeding distribution has been limited. Thonglongya (1969) searched for it without success along three large rivers north of Bung Boraphet in May and June 1969. However, King and Kanwanich (1978) noted that if it nests in river sand flats in Thailand it must do so in March and April, as the monsoon rains from May onwards would render water levels too high. They also commented that the bird may nest 'somewhere in China'.

North of the 'golden triangle' opium-growing area (where Thailand, Laos and Burma meet) lie the closely parallel valleys of the Salween, Mekong and Chang Jiang. This area of south-western China is certainly a possible summer home for the White-eyed River-Martin, but the Chinese ornithological literature does not record it, although explorations there have not been very thorough.

In May 1972 the Sun Fung Art House, a Hong Kong sales outlet of some Beijing studios, had in its stock a set of four scroll paintings of which one (see front cover) bore a superficial resemblance to the River-Martin. A closer look revealed both similarities (the head and bill shape, the white eye, the coloration, and the existence of elongated tail feathers) and differences (the bill was red not yellow, the white rump was absent, and the elongated tail feathers were the outer not the central ones).

The methodology of illustration in Chinese paintings is to pass on styles and subjects. Allowing for artistic licence either over time or simply over the distance between some remote Chinese area and Beijing, and as the species is unknown to China's ornithologists, any original drawing is most likely to have been made in the field. With no inspection of a museum skin possible, it seems seriously likely that the River-Martin has been found and sketched, at some time, in China.

The handbooks on which Chinese painters draw for their subjects are full of Barn Swallows *Hirundo rustica*, and the bird in this illustration is too deliberately different to be intended as a Barn Swallow. The objection that the picture might be based on the illustration (by Dr. Boonsong Lekagul) that accompanied the original description can be discounted because (a) the description had very limited circulation, (b) the proprietor of the Sun Fung Art House felt that the picture had been painted no later than 1970, (c) the bird depicted is simply too unlike Dr. Boonsong's illustration.

The plate shows the Chinese inscription that accompanied the picture, with the artist's signature beneath it. If a student of such paintings could assist in tracking down the artist and the date of the picture, we might possibly get a clue as to where to look in China for the nesting grounds of the White-eyed River-Martin. Until then it seems destined to remain one of the most elusive species in the world.

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Plate. Incription and artist's signature on painting of a possible White-eyed River-Martin.
Photo: Didi Brandt.

The threatened White-winged Wood Duck *Cairina scutulata* in Bangladesh

MOHAMMAD ALI REZA KHAN

Of some 30 species of resident and migratory ducks and geese in Bangladesh, the White-winged Wood Duck *Cairina scutulata*, locally called *bhadi hansh* or *shetapakkha balaka*, is possibly the most endangered (Khan 1981, 1982, 1983; also King 1978–1979). Reports of the species are few. Mitra (1957), based on his forestry operations of the 1940s and 1950s, and Rashid (1967) reported it to be present in the Chittagong revenue division. Ali and Ripley (1983) cited H. G. Alexander as having seen two parties of 30 ducks in the open Padma river in 1948; however, neither my own fieldwork from 1969 nor that of others, including century-old District Gazetteer reports, suggest that this duck ever occurred outside the evergreen and semi-evergreen forests of the Chittagong revenue division of eastern Bangladesh, and there exists no forest belt within a distance of 100 km all along the course of the Padma river (see Figure).

In the 1970s and 1980s all records of the White-winged Wood Duck in

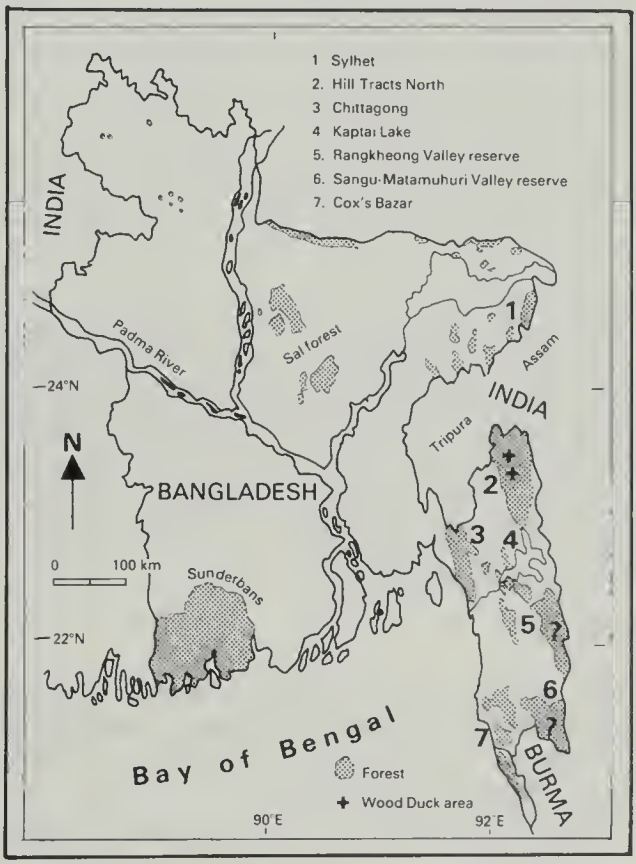

Figure. Bangladesh showing White-winged Wood Duck habitat.

Bangladesh have referred to a small population in and around the Pablakhali Wildlife Sanctuary in the Hill Tracts North Forest Division. This sanctuary, usually stated to be 440 km^2 in extent, lies entirely within the Kassalong Valley Reserve, itself holding some 1,700 km^2 of forest and situated at approximately 23°10′N 92°05′E. The species was first investigated there by Husain (1975, 1977). I paid over a dozen visits to the forested areas of Chittagong revenue division (which includes Sylhet, Chittagong, Hill Tracts North and South, Jhoom Control and Cox's Bazar Forest Divisions) between 1978 and 1984, but never found the species in any other forest. I first visited the sanctuary in early 1978. This was followed by three successive field trips there up to 1981, before the entire Hill Tracts District was made a prohibited zone for members of the public because of 'political unrest'. As far as I know no-one has yet returned to the sanctuary since that time for purposes of scientific study.

From the present-day occurrence of the Wood Duck in the Hill Tracts North forests it may be conjectured that the species once existed in similar forests throughout the Chittagong revenue division, and indeed there are two isolated forest belts in the Greater Hill Tracts District where it may yet be found. These are the Rangkheong Reserve Forest, covering 760 km^2 at around 22°10′N 92°20′E, and the Sangu-Matamuhuri Valley Reserve Forest, covering 740 km^2 at around 21°20′N 92°20′E. The destruction of forest, due to human settlement and forestry operations, is apparently less in these two areas than in other areas of Greater Hill Tracts. Moreover, these two forests are rather inaccessible by road and waterways. These reserves have not been surveyed ornithologically excepting one short collecting trip in 1965, restricted to a small strip around Ruma Bazar in the Rangkheong Reserve Forest, when the Wood Duck was not encountered (Husain 1968).

The White-winged Wood Duck usually occurs in pairs or small family parties, and Husain and Haque (1982) considered that about 20 pairs were present over an area of about 240 km^2 in and around the Pablakhali Sanctuary. This should not be taken to mean that one pair occupied every 12 km^2, as in reality these pairs live in four or five isolated pockets within the area, and several pairs may live permanently within a small area of 5–10 km^2. At least two pairs lived close to the Pablakhali resthouse at Amtali and I encountered them on all my visits. However, forest villagers and local tribesmen considered that, while the species was not an uncommon bird in the Pabalkhali area about two decades ago, its population had certainly declined in recent years.

Habitat

Most of the reserved forests of Chittagong revenue division have been categorised as tropical evergreen, semi-evergreen and deciduous in type (Champion and Seth 1968). All forests here have three distinct strata with an additional undergrowth.

The moist deciduous upper stratum, reaching 30–50 m, does not form a closed canopy. The tallest trees are civit *Swintonia floribunda*, chundul

Tetrameles nudiflora, uriam *Mangifera longipes*, chapalish *Artocarpus chaplasha*, barta or lakooch *A. lakoocha*, garjan *Dipterocarpus* spp., surujbed or toon *Toona ciliata*, buddha narikel *Pterygota alata* and shimul *Bombax ceiba*. The second stratum forms a closed canopy at 20–30 m and consists of high evergreens, including jam *Syzygium* spp., batna *Quercus* spp., telshur *Hopea odorata*, pitraj *Aphanamixis polystachya*, and nageshwar *Mesua ferrea*. The third stratum reaches 7–15 m and comprises the saplings of the upper two strata intermixed with, e.g., *Vitex glabrata*, *Saraca indica*, *Mallotus philippensis*, *Macranga* sp., *Castanopsis indica*, *Garcinia* spp. and *Elaeocarpus* spp. In the undergrowth bamboo, cane or palm may occur in pure stands or mixed in with ferns, ground orchids, vines and lianas.

There is no forest patch utilised by the Wood Duck in the Pablakhali Sanctuary which may be termed virgin or untouched by forestry operations and human activities. The forest has been worked on a selective and/or clear-felling basis, or at least bamboo has been removed.

Probable causes of decline

The most obvious cause of decline of the White-winged Wood Duck in the Hill Tracts District seems to be the systematic clear-felling of primary forest of all categories and its replacement with commercially viable timber species (teak, rubber, dipterocarps and *Syzygium*) under the existing forestry practice in Bangladesh (Anon. 1981). Moreover, selective logging of old softwood trees like civit, uriam, chapalish and lakooch for making tea-chests, plywood, packing-boxes, match-boxes and match-sticks may be responsible for destroying the Wood Duck's nesting trees. Around 1961–1962 the deforestation of the region was compounded by the implementation of the Kaptai hydroelectric project, which inundated about 906 km^2 of the Kassalong Valley Reserve including a major portion of the Pablakhali Sanctuary.

Although the creation of the impoundments has provided new breeding and wintering grounds for migratory birds of prey, waterfowl and waders as well as resident ducks, rails and herons, as emphasised by Husain (1985), I have never seen Wood Duck venturing into the clear-water, fast-flowing or deeper portions of the Kaptai Lake. Rather it prefers small pools, puddles and ox-bow lakes spread all over the Kassalong forest. Neither Husain (1975, 1977, 1985) nor myself has any report on definite status of the Wood Duck in the Hill Tracts prior to the creation of Kaptai Lake, and it therefore seems hard to justify the claim (reported by Karpowicz 1985) that the population of Wood Duck has risen since the completion of the Kaptai hydroelectric project.

Another factor that has directly affected the ducks is the hunting of adults and capture of young by local people. Even in the early 1980s senior forest and other officials used to shoot Wood Duck in the Pablakhali Sanctuary. At least up to 1981 the locals went hunting the ducklings with their dogs. At the approach of danger, the mother deserts the ducklings; the dogs sniff them out and the locals collect and rear them for some time before eating or selling

them. This practice may still be continuing.

A further problem is the use by locals and settlers in the Hill Tracts of nylon gill-nets for fishing. These are roughly a metre in height and 10–15 m in length, and are stretched with poles under the surface of a small lake or pool. The adult ducks swimming under water occasionally get entangled, and are either eaten directly or sent to market.

In the mid-1980s the government started leasing out the forest lands, of both Pablakhali Sanctuary and neighbouring areas, to the plains-dwellers for settlement there at the rate of 2.5 ha per family. By now (1986) an estimated 10,000 families have been settled in the Greater Hill Tracts District. This has posed a serious threat to the survival of the Wood Duck and other wildlife of Pablakhali and its neighbourhood, because the settlers are clearing the forest land given to them, encroaching on the reserved forest, fishing the lakes and pools, and disturbing the habitat and activity patterns of the Wood Duck. This detrimental trend of human settlement must be stopped not only to save the Wood Duck but also for the greater benefits of the forest and other wildlife. Instead of settling the plains-dwellers as a counter-measure to tribal insurgency, the government should solve the latter problem politically.

Conclusion

As nothing is known about the status of the species since 1981, an immediate survey in the Pablakhali Wildlife Sanctuary and its environs is needed to determine whether any population still survives there. If the result is positive, steps must be taken to save it. All remaining isolated softwood trees should be saved from selective logging, to ensure nesting sites. Use of gill-nets in the sanctuary and other areas holding Wood Duck should be banned. All forestry operations in the Pablakhali Sanctuary, for that matter in all other sanctuaries, should be stopped and human settlement discouraged. A small scientific unit might be established at Amtali within the Pablakhali Sanctuary for continuous monitoring of the Wood Duck situation in the area.

I am grateful to Prof. Kazi Zaker Husain and Md Nazrul Haque, Department of Zoology, Dhaka University, and to Mr. A. K. Fazlul Haque, D. F. O., Hill Tracts North Division, for their kind help and co-operation.

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Black-tailed Crake *Porzana bicolor*: a new species for Thailand

J. SÉRIOT, O. PINEAU, R. DE SCHATZEN and Ph. J. DUBOIS

Late in the afternoon of 25 January 1985, in the Doi Inthanon National Park, Thailand (18°34′N 98°51′E), 1,300m above sea level, two of us (O.P. and J.S.) and C. Howlett observed a crake which they identified as a Black-tailed Crake *Porzana bicolor*. The next day the bird was seen by R.S. and Ph. J.D.

It was feeding on a marshy field, staying close to a bushy area along a stream. It was scared by every movement in the surroundings and often disappeared under the bushes. This habit was also noted by Delacour and Jabouille (1931). The size of the bird was roughly that of a Pintail Snipe *Gallinago stenura*, with which it was seen. The wings and back were reddish-brown, uppertail-coverts blackish, tail black. The throat was whitish, but the rest of the head, neck, flanks and belly were dark ash-gray, darker on breast, vent blackish, undertail-coverts black. The bill was yellowish-green with a red spot (only visible at close range) at the base. The legs were red (not reddish-brown); eyes red.

Notified by us, Ph. Goffart and D. Lafontaine saw the Black-tailed Crake on 29 January 1985. P. D. Round and B. F. King saw it on 31 January and heard three further birds calling (of which one was seen) at an additional site, less than 1km distant. It seems possible that the species nests here (P. D.

Round *in litt.*).

Published information on the Black-tailed Crake is sparse, and the species appears to have been reported very little in the past fifty years; this is evidently due in some degree to the inaccessibility (on political grounds) of certain parts of its range, but also possibly to confusion with the Brown Crake *Amaurornis akool*.

There are a few specimens from unspecified localities in Nepal, some others possibly being from an adjacent site in northern India (Inskipp and Inskipp 1985). Baker (1929) recorded the species from Sikkim, where it nests 'between 4,000 and 6,000 feet' (1,200 and 1,800 m). He also described it as common in the North Cachar Hills, Khasi Hills, 'Assam' (now in Meghalaya), 'a dozen birds breeding in a small patch about 100 yards long by 600 wide' at one unspecified locality. Baker (1935) added that the species never nested below 3,000 feet (900 m) except in the Lakhimpur district.

In Burma, Smythies (1953) reported that 'a nest was taken by Osmaston near Mogaung on the 18 July' and 'Harington records that Tancock obtained a nest with 6 eggs at Sinlum Kaba on the 9 May'. The species is known throughout the higher hills of the country from the Chin Hills in the west (where one observer found it common) to Karenni in the east (one specimen obtained at Nattaung), and it is described as not uncommon in the Shan states (Smythies 1953).

In China, the Black-tailed Crake is recorded from south-east Sichuan east to Wa Shan and south to the Likiang Mountains in north Yunnan (Meyer de Schauensee 1984). In Viet Nam, Delacour and Jabouille (1931) considered it scarce, two birds having been collected in the High Tonkin; they also record it from Cha Pa, central Annam. In Laos, David-Beaulieu (1941) noted it in the marshes of Xieng Khouang and Nong Het. Delacour and Jabouille (1931) mention it as occurring in Siam but it is not listed for Thailand by Deignan (1963), Lekagul and Cronin (1974) or King *et al.* (1975). Our observations thus seem to be the first for Thailand.

The Black-tailed Crake is typical of mountain areas, seldom seen below 1,000 m; Baker (1929) found it near 'small streams, especially those which had plenty of cover on one side and open grassland on the opposite one', and we found it in such habitat in Doi Inthanon. Delacour and Jabouille (1931) also noted that it frequents open meadows mainly in the mornings and evenings. Baker (1935) gives its breeding season as apparently from mid-May to the end of August; the behaviour of the Thai birds suggests that breeding might occur at Doi Inthanon, perhaps earlier than Baker's dates.

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Status of wintering Black-necked Cranes *Grus nigricollis* in Bhutan

F. A. CLEMENTS and N. J. BRADBEAR

The Black-necked Crane *Grus nigricollis* has been described as the least known of all crane species (Walkinshaw 1973, King 1978–1979, Archibald and Oesting 1981, Johnsgard 1983) with incomplete knowledge available on its status and distribution. During the last ten years researchers have shown increasing interest in the species and the habitats it occupies for breeding and wintering.

The Black-necked Crane is a central Asian species, with a breeding range now known to include Ladakh and areas of southern China bordering the Tsangpo river (Xizang province), and in Sichuan and Qinghai provinces (Johnsgard 1983). Meyer de Schauensee (1984) also reports it breeding from north-west Kansu southwards, but his source for this is unknown. It is probable that there are unknown breeding areas in the central plateau of Xizang (Tibet) (Walkinshaw 1973). The main wintering areas used by this species are reported to include parts of south-central Xizang, south-west Sichuan and Yunnan provinces in China and the northern Viet Nam lowlands, while a few birds have been reported in Bhutan, Arunachal Pradesh in north-east India, and in the Kamon range in northern Burma (Archibald and Oesting 1981, Khacher 1981a,b, Archibald 1983).

Recently, teams of Indian researchers under the auspices of the World Wildlife Fund have been studying Black-necked Cranes at the Indian breeding grounds in Ladakh (Gole 1981a, Hussain 1985), and more casually where the species winters in Bhutan. Wintering cranes have been known

from Bhutan for some years and two recent reports from the WWF project have suggested that 70 birds may be present (Gole 1981b,c).

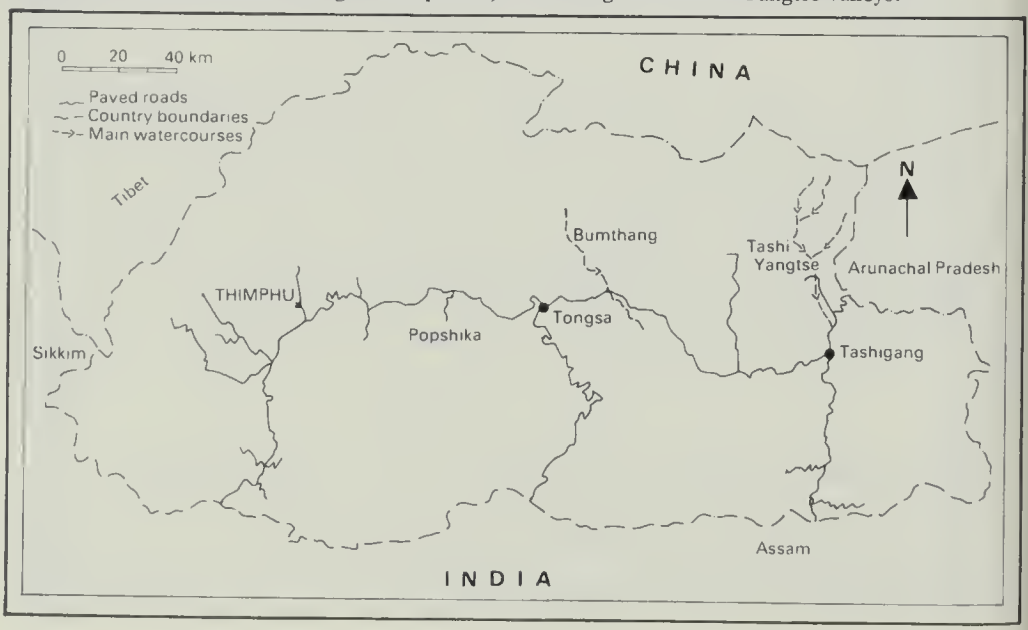
In March 1986, at the invitation of the Royal Government of Bhutan, we had the opportunity to visit the country. In addition to the official purpose of our visit, we were able to make observations in known Black-necked Crane wintering areas, and to discuss with local ornithologists the wintering status of this species in Bhutan.

Bhutan is a small, sparsely populated, east Himalayan kingdom situated in the north-east of the Indian subcontinent and bordered to the north by the great Himalayan range and Xizang (Tibet). Of the 1.2 million population 90% are dependent on subsistence agriculture, and 60% of the land is still covered by primary forest.

Black-necked Crane wintering grounds in Bhutan are high-altitude, large U-shaped valleys with wide valley bottoms consisting of undrained mires and small-field agricultural land. Wintering cranes have been reported from three areas in Bhutan: Popshika, Bumthang, and Tashi Yangtse (Gole 1981b, Khacher 1981a). Working from west to east, the Popshika and Bumthang valleys are situated in central Bhutan at altitudes between 3,000 and 3,400 m. Tashi Yangtse is in the extreme east of Bhutan and is lower, at approximately 2,400 m (Figure).

The Popshika valley lies to the south of the main lateral road to Tongsa, approximately half a day's drive east of the capital, Thimphu. The valley is completely surrounded by forested mountain slopes and access is via a narrow pass at 3,700 m. In the centre of the valley is a small hill on which is situated the seasonally occupied village and monastery known as Gangte Gompa. Agricultural field systems are situated around the village and along

Figure. Map of Bhutan, showing the Popshika, Bumthang and Tashi Yangtse valleys.



the valley sides on the lower slopes. The whole extent of the valley floor is one vast mire. Cranes were present in this valley despite the rather late date of our visit (12 March). In total, 77 birds were seen in three main flocks scattered across the valley floor. We were present in the afternoon during which time most birds were resting and feeding, the latter taking place in fields as well as on marshy ground. Some flight and restless activities were observed, presumably prior to departure for the breeding grounds. Approximately 20% of birds present were juvenile.

The Bumthang valley, equivalent in extent to Popshika but more populous and agriculturally developed, is situated two hours drive east from Tongsa; the journey involves crossing the Yotong-La pass at approximately 4,000 m. A Swiss development programme has been present in the area for many years. We did not visit land at the head of the valley, but in 24 hours we only encountered two Black-necked Cranes feeding on a small area of dry, rough grassland adjacent to the main village. As mentioned by Gole (1981b), the favoured marsh in the centre of the valley has been drained and improved for agriculture, causing cranes wintering here to be widely dispersed.

We were unable to visit the extreme east of Bhutan and the valley of Tashi Yangtse. The road east of Tongsa to Tashigang is not surfaced and is often impassable.

From our own observations and from communication with ornithologists and local people, it would appear that many more birds are wintering in Bhutan than was previously thought. Other foreign researchers who had visited the Popshika valley have reported the presence of only a few birds (Gole 1981b). We had been informed that up to 140 Black-necked Cranes had been wintering here, and our encounter with 77 individuals in March when some birds would already have left for the breeding grounds confirmed this verbal information. The Popshika valley is therefore a most important wintering ground, comparable with the Sea of Grass in western Guizhou province, China (Archibald 1983).

Despite our encounter with only two individuals in the Bumthang valley, we were informed that upwards of 40 birds still use the valley during winter. Owing to some agricultural improvement and disturbance they are apparently more widely scattered, and are found towards the head of the valley.

It is unfortunate that we were unable to visit Tashi Yangtse because it is likely that this valley harbours the largest numbers of Black-necked Cranes in the whole of Bhutan. We were told of the discovery there of more than 300 individuals, present during winter 1984/1985 and 1985/1986; our information came from two separate sources, both of whom had seen the birds.

It therefore seems possible that 500–600 Black-necked Cranes are present in Bhutan in most winters. With so little information available on Black-necked Crane in general, and in particular on its winter status in Bhutan, it is vital that while verbal reports are treated warily, their potential importance is realised. We believe that estimates of numbers are likely to be correct for the following reasons. At least one government official in Bhutan

is committed to Black-necked Crane conservation and has been studying these birds in Bhutan and China for some time. The information given to us by him for the Popshika valley is likely to be correct judging from numbers we encountered after migration north had started. The Tashi Yangtse valley has been mentioned only briefly in previous literature (Khacher 1981a,b) and to our knowledge has not yet been visited by foreign ornithologists. The size and isolation of this valley suggest that it could indeed support considerable numbers of cranes. One must be wary of the possibility of duplication in numbers between valleys, and of confusion with other crane species, although the latter is most unlikely.

Our tentative conclusions on the numbers of birds wintering in Bhutan should not be taken as evidence that the population of this least known of cranes is safe. Wintering areas outside China have suffered markedly over the last 30 years. Bombing during the Viet Nam war reduced the habitat available and directly disturbed birds, some of which have now returned (Archibald and Oesting 1981). The wintering flock in the Apa Tani valley, Arunachal Pradesh, India, is no longer present as a result of the shooting of birds and direct disturbance by local people (Khacher 1981b). In Bhutan, too, there is evidence that wetland habitat is being lost, as in the Bumthang valley, so it is fortunate that birds here are wintering in more than one area. The continued presence of necessary marshland habitat in high-altitude, isolated valleys depends upon the denial of agricultural improvement to poor, rural communities.

The Royal Government of Bhutan is committed to gradual development with a strong conservation strategy, and is unwilling to allow large numbers of foreigners into the country. It is hoped that information made available in this article will indicate the need for close co-operation with the Royal Government of Bhutan so that conservationists can work together to safeguard the sites used by Black-necked Cranes in winter.

We wish to thank officials of the Royal Government of Bhutan, and the Ministry of Agriculture and Forestry, who provided us with much useful help and information. We also wish to thank N. J. Collar and other staff of ICBP who made information available to us.

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Submissions should be in duplicate, typewritten on one side of the paper only, and double-spaced. The approximate position of figures and tables should be indicated in the margin. Papers should be concise and factual, take full account of previous relevant literature but avoid repetition of established information as much as possible; opinions expressed should be based on adequate evidence. Titles of papers must be accurate and concise, and (for the benefit of abstraction services) include any relevant scientific (taxonomic) name.

Whenever possible, authors should consult an issue of *Forktail* for style and layout. Spelling follows *The shorter Oxford English dictionary*, except that external features of birds are spelt and hyphenated in accordance with the entry under 'Topography' in *A dictionary of birds* (1985). Spelling of place-names accords (unless another source is specified) with the most recent edition (currently seventh, 1985) of *The Times atlas of the world*; we use 'South-East Asia' and 'Viet Nam'. Localities with well-known other spellings or older names should have these placed in parentheses after their first mention. For localities too small to be in the *Times atlas* a source of the spelling adopted should preferably be indicated and the precise geographical coordinates provided (these should be double-checked where possible). It is appreciated that authors will not always have access to the above sources; in such cases the editor will seek to introduce conformity.

English and scientific names of birds should preferably follow those provided by King *et al.* in a *A field guide to the birds of South-East Asia* (e.g. Black-winged Cuckoo-shrike, White-browed Bush-Robin). Birds not mentioned there should be named in accordance with a recent standard work, e.g. White and Bruce's *The birds of Wallacea*. On first mention of a bird both English and scientific name should be given, thereafter only one, preferably the English. Scientific trinomials need be used only if subspecific nomenclature is relevant to the topic under discussion. These recommendations also apply for any other animal or plant species mentioned.

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publishers will re-draw figures and typeset lettering. Good photographs are also considered. Captions for figures and photographs should be typed on a separate sheet.

Authors of papers are encouraged to offer their work to one or more ornithologist or biologist for critical assessment prior to submission to *Forktail*. Such help as is received should naturally be mentioned in an acknowledgement section before the full references are presented.

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Cover photograph: Storm's Stork *Ciconia stormi* at the nest (possibly the first ever discovered), Chiew Larn Reservoir, peninsular Thailand, 24 October 1986 (see Nakhasathien, within). Photo: Seub Nakhasathien.

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This issue of *Forktail* was planned to be out in July, and I apologise for its delayed appearance. I hope at least that its distribution does not fall foul of the Christmas postal overload and that members (at least in Europe) find it welcome holiday reading. Notwithstanding, it is still my intention to publish future issues in the (Palearctic) summer months.

P. M. Cocker resigned from the Editorial Committee in mid-year and was replaced by S. Harrap. To both of them and to the rest of the committee I again express my thanks for their capable and lively support, and again I thank D. R. Wells and R. S. Kennedy for serving as referees.

19 October 1987 N.J.C.

ADDITIONS AND CORRECTIONS
to previous issues

Forktail 1

To the list of Founder Members on page 2 should be added the name G. ALLPORT.

Forktail 2

Throughout Holmes, *Birds of Suru Valley, Ladakh*, for Delaney read Delany.

On page 80 (Robson, *Birds in western China*), the coordinates for locality 15 (Gamda) should read 31°43′N 96°45′E, and those for locality 16 (Pidza) 31°56′N 96°36′E.

FORKTAIL 3 (1987): 3–16

The Amami Woodcock *Scolopax mira*: its identity and identification

MARK A. BRAZIL and HIROSHI IKENAGA

The Amami Woodcock *Scolopax mira* is a good species, resident on at least four islands in the Nansei Shoto (Japan): Amami-oshima, Tokunoshima, Okinawa and Tokashiki-jima. It is generally less rufous and more olivaceous than Eurasian Woodcock *S. rusticola*, with longer legs, a more gently sloping forehead and flatter crown. The first (supraocular) crown bar is narrower in *mira*, and its two facial bars are parallel, not convergent as in *rusticola*. The folded wing of *mira* lacks a bold pattern and its tail lacks a dark band and paler tip. No aerial display is recorded in *mira*, whose flushing behaviour is generally unlike *rusticola*'s. Habitat protection and hunting prohibition are needed to secure *mira*'s future.

The Amami Woodcock is a little-known bird, long considered endemic to the single island of Amami-oshima, in the Nansei Shoto group of islands, Japan. It was first described as a race of the Eurasian Woodcock *Scolopax rusticola mira* by Hartert (1916), although he admitted that, on the basis of only the type specimen (an adult male taken on Amami-oshima on 10 December 1904 by one of Alan Owston's collectors), he would have described it as a distinct species. He was, however, swayed in his opinion by the appearance of a young bird (the specimen of which we are unable to trace) which closely resembled *S. rusticola* in coloration. His caution was initially followed (e.g. Kuroda 1918, OSJ 1942, Kiyosu 1965), but more recently some authors have considered this bird to be a full species (Kobayashi 1979, WBSJ 1982, Cramp and Simmons 1983), although their judgement has been based on limited evidence (such as tarsus length and egg size) or even on erroneous information, as in Cramp and Simmons (1983) where the decision stemmed from a belief that both *rusticola* and *mira* breed in the northern 'Ryukyu Islands'. Vaurie (1965) alone seemed completely convinced of the separation of the two, and he regarded *mira* as 'too sharply differentiated to be conspecific' with *rusticola*. Short (1972) regarded *mira* as questionably distinct at species level from *rusticola* however, and Prater *et al.* (1977) reasonably, in the absence of up-to-date and adequate information from the field, but in contradiction to Vaurie (1965), maintained the original view that the Amami Woodcock was merely a subspecies of the Eurasian Woodcock.

Until recently it was thought that the Amami Woodcock was extremely difficult to identify in the field because of its close similarity to the Eurasian Woodcock (Takano 1980, WBSJ 1982, Hayman *et al.* 1986). Lengthy observation of both forms in the field, as well as an examination of skins and of photographs of birds from the Japanese main islands and the Nansei Shoto, have led us to the firm conclusion the two are specifically distinct, and that confusion over the identification of *S. rusticola* and *S. mira* need not exist. In this paper we review the available literature concerning *S. mira* and present details from our own observations and others showing that various

characteristics not only facilitate the separation of *S. mira* from *S. rusticola* in the field, but provide strong evidence for their separation as species.

DISTRIBUTION

The Eurasian Woodcock is monotypic with almost no variation throughout its large range, which includes various regions and islands (on some of which, such as the Azores, it is sedentary) that are more isolated from the major part of the species's range than the Nansei Shoto are from mainland Japan (Vaurie 1965). It breeds in temperate northern Japan (commonly on Hokkaido, and uncommonly in northern and central Honshu) and migrates through southern Japan including the subtropical Nansei Shoto with some wintering there, from September to April/May (Vaurie 1965, Short 1972, OSJ 1974, WBSJ 1982). (Nansei Shoto, literally south-west islands [see Figure 1], refers to all those Japanese islands stretching in an arc between Kyushu and Taiwan, and therefore including the Ryukyu Islands which stretch from Okinawa south-westwards; in the past "Ryukyu" has been used somewhat incorrectly to include islands north of Okinawa.) It seems highly unlikely that this wide-ranging species should include a resident island race as its only distinct subspecies. Except for one record of supposed breeding of Eurasian Woodcock on Amami, which in fact may well have been Amami Woodcock (see Hachisuka 1952), the nearest regular breeding grounds are c. 1,000 km north of the Amami Woodcock's range. The Eurasian Woodcock has also been recorded once in summer on Yakushima, an island just south of Kyushu (Ogawa 1905). This island, with a mountain peak higher than any in Kyushu, has vegetation more akin to that in the mountains of central Honshu, and if the Eurasian Woodcock were to breed anywhere in the Nansei Shoto this would be the most likely habitat for it.

Other island endemic woodcock species exist in the Oriental region, and the zoogeographical evidence from the Nansei Shoto indicates that conditions there have been ideal for the evolution of endemic species. Several endemic birds have clear or arguable specific status: the Okinawa Rail *Rallus okinawae*, Pryer's Woodpecker *Sapheopipo noguchii*, Ryukyu Minivet *Pericrocotus tegimae*, Ryukyu Robin *Erithacus komadori*, Lidth's Jay *Garrulus lidthi*, the recently reclassified Amami Thrush *Zoothera amami* (Ishihara 1986), and the extinct Ryukyu Woodpigeon *Columba jouyi* and Miyako Kingfisher *Halcyon miyakoensis*. The island chain also harbours several endemic mammals, reptiles, amphibians and numerous other taxa (Brazil 1985a). The existence of an endemic woodcock species on these islands is therefore highly plausible, given that the birds in question are sedentary, morphologically and (contrary to common belief) visibly distinct, and that migratory Eurasian Woodcock pass through the islands without apparently remaining and mixing. Short (1972) considered that *mira* was definitely related to *rusticola* and not to other species of the genus *Scolopax* and is

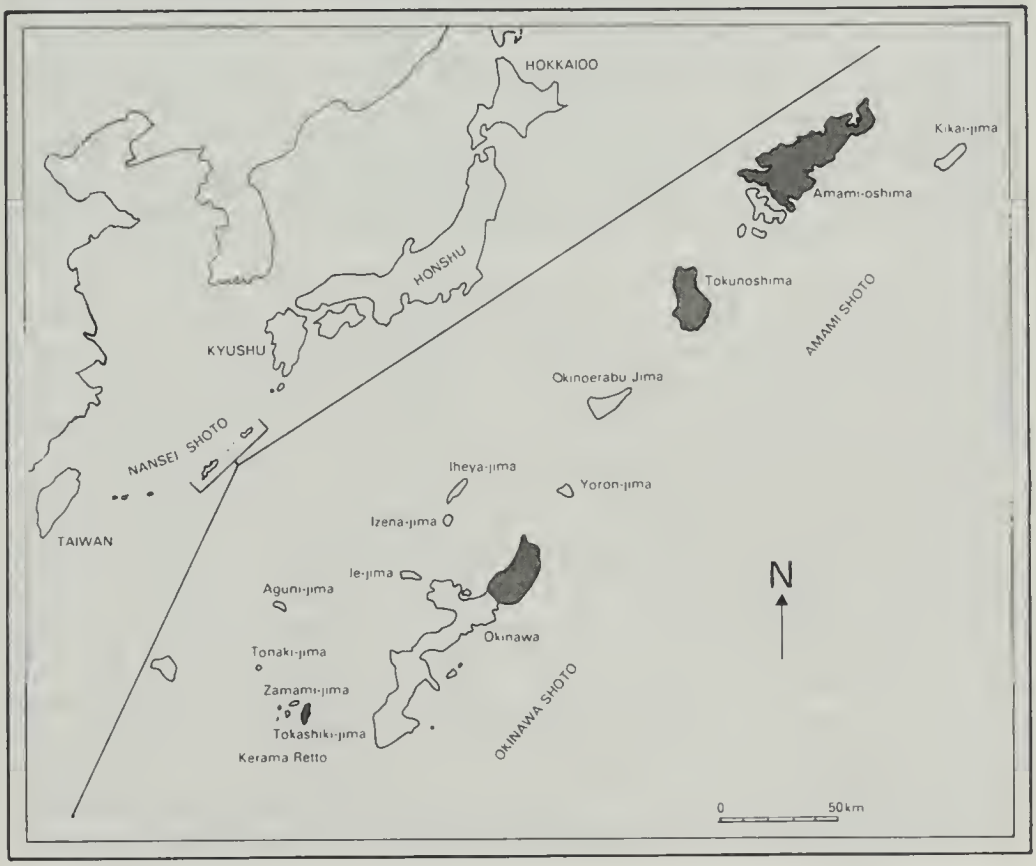
therefore of Palearctic origin.

Until very recently *S. mira* was believed to be a single island endemic occurring only on Amami-oshima, a large (709km^2) forested island lying midway between Kyushu and Okinawa (see Figure 1) (OSJ 1974, WBSJ 1982). Kuroda and Hachisuka (in Hachisuka 1952) suspected that it occurred also on Tokunoshima, the next major island south of Amami, and its breeding there has now been confirmed (WBSJ 1978).

On 1 August 1980, during an attempt to catch an unknown species of rail rumoured to exist on Okinawa – this was the as yet undescribed Okinawa Rail (Yamashina and Mano 1981) – an adult Amami Woodcock in active post-breeding moult was caught (K. Ozaki *in litt.*, Yoshii 1985). This record from the northern part of Okinawa, known as Yambaru, was further south again of its known range, and brought the status of the bird into question. Was *S. mira*, like *rusticola*, migratory, moving further south in autumn? (The Ryukyu Robin is now known to migrate within the island chain.) If not, was the Amami Woodcock caught on Okinawa a very unusual stray, or the representative of a previously unsuspected resident population?

As the capacity to identify Amami Woodcock has developed amongst the

Figure 1. The distribution of the Amami Woodcock in Japan.



few resident birdwatchers in the Nansei Shoto, its presence on Amami at all seasons has been confirmed, and more records and photographs of *mira* from Okinawa have come to light. In September 1985 *mira* was also found to occur on Tokashiki-jima in the Kerama Retto, a small group of islands off south-western Okinawa, where the species was photographed by Kenji Takehara; it is presumably resident there. Thus the species is currently known from four islands in the Nansei Shoto (Brazil 1985a, 1986; see Figure 1). It remains to be seen whether it also occurs on islands further south such as Miyako, Ishigaki or Iriomote. The last is particularly well forested and seemingly the most suitable of the southern islands for this bird, except perhaps for the presence there of a nocturnal predator, the threatened endemic Iriomote Cat *Prionailurus iriomotensis*.

DESCRIPTION AND MEASUREMENTS

Hartert (1916, 1917), in his original description of *mira*, noted that it differed from *rusticola* in its 'darker, less rufous, more olivaceous upperside, darker under wing-coverts, less rufescent underside, and larger dimensions, especially a stronger and wider bill. All portions of the upper surface, except the black patches, are more olivaceous and darker . . .' In a later account (Hartert 1922) he noted that the wing was blunter, the wing-tip shorter, and the tarsus and toes longer in *mira* than in *rusticola* and that the black spots of the upperparts were more elongated. Vaurie (1965), no doubt following Hartert (1916, 1917, 1922), noted the very much rounder wing of *mira* when compared with *rusticola*, and also noted a tarsus both longer and thicker, with bigger toes, and a bill which is longer, broader, more flattened and less ridged than in *rusticola*. Takano (1980) also described *mira* as being generally olive-brown, as did WBSJ (1982). However Prater *et al.* (1977) called it 'much redder than most *S. rusticola*, with no grey' and Cramp and Simmons (1983), following Vaurie (1965) closely, differentiated it from the Eurasian Woodcock as follows: 'upperparts more strongly tinged red with larger black spots; tarsus longer and thicker; toes thicker, wing much rounder with longer primary 11; bill longer, broader, more flattened and less ridged.'

The contradiction here over the basic colour comparison is best put down to some degree of variation in the extent of rufous in the plumage of *mira*, combined with western authors being limited to examination of only a very small number of *mira* skins. M.A.B. visited the British Museum of Natural History, Tring, in 1987, when only one specimen was located. The specimen (an adult female, no. 2–225–11 from Alan Owston's collection dated 15 November 1904) is in most respects typical of other specimens of *mira* examined in Japan, except that it is rather more rufous. It is however less grey than specimens of *rusticola* and its overall appearance is generally dark as noted by Hartert (1916, 1917). It may well be that recent descriptions in the west are all based on this specimen, hence the assumption that *mira* is

more rufous than *rusticola*. It was regrettably not possible to refer to the type-specimen, the series of *mira* mentioned by Hartert (1922), or the juvenile that led him to judge it a race not a species, since these were all sold along with the bulk of the Rothschild Collection. The type, an adult male collected on 10 December 1904 and once at the Tring Museum (Hartert 1927), is now in the American Museum of Natural History (OSJ 1942, Greenway 1978), presumably along with the rest of the series.

A comparison of the plumage characteristics of the two species based on a combination of our own field observations, examination of specimens of *S. mira* in Japan and in Britain, of illustrations appearing in the Japan Bird Club (1983) and Kuroda (1984), and of many photographs taken by Kenji Takehara and Mamoru Tsuneda, lead us to conclude that, as Hartert (1916, 1917, 1922), and past Japanese authors have noted, *mira* is on the whole less rufous and more olivaceous in general coloration than *rusticola*.

Hayman *et al.* (1986) noted that the uppertail-coverts of the Amami Woodcock are paler sandy rufous, contrasting more with the back and tail, and that the silvery spots underneath the tail tip are smaller, duller, greyer and less sharply defined than in Eurasian. More readily observed however is that the tail of *rusticola* generally shows a black subterminal band as a result of the uppertail-coverts not fully covering the basically black, grey-tipped tail feathers. In *mira* the tail feathers are dark brown, not black, and are vermiculated with paler brown at the edges and anterior to the grey tips, thus there is no black band. Hayman *et al.* (1986) also noted that the middle secondaries are finely marbled with rufous-brown and whitish-buff, as well as being notched along the feather edges, but that at least some individuals are paler than Eurasian Woodcock with rather uniform sandy or buffish wing coverts. The bill of *mira* is dull horn-brown, the iris dark brown, the legs dull brown, perhaps tinged greyish or dull yellowish, longer than in Eurasian (Hayman *et al.* 1986).

Kiyosu (1965) noted that *rusticola* eggs are the smaller of the two species (Table 3), rounder, buff-brown with spots distributed more at the top, the bottom paler, while *mira* eggs are longer and more oval, the base colour is a pale pinkish-brown and the spots, while concentrated at the top, are also widely scattered at the bottom. Vaurie (1965) referred to eggs of *mira* as being unmistakeably different from those of *rusticola*, being darker, larger, and much more spotted on a more reddish ground, and except for considering them darker his description is in agreement with that of Kiyosu (1965). Kiyosu (1965) described the chicks of *mira* as being redder than the adults and more like *S. rusticola*; his description may however have been based on Hartert's young bird. We have been unable to trace the original specimen, nor have any other specimens of young birds come to light. To our knowledge there is none in Japanese collections.

Separation of *mira* from *rusticola* specimens has in the past depended greatly on the major difference in tarsus length. As so few measurements of *mira* are available we include here all those known to us (Tables 1 and 2), even though the method of taking these measurements was not mentioned in

Table 1. Published measurements (in mm) of *Scolopax mira* and *S. rusticola*.

a) *mira*	Hartert (1916)	Kiyosu (1965)	Kobayashi (1979)	Hayman *et al.* (1986)
Bill	75–83	75–83	77–82	75–83
Wing	200–215	189–215	190–207	198–215
Tail	—	68.5–82	75–78	67–70
Tarsus	47–49	44–49	42–43	44–49
Middle toe and claw	48–50	46–50	—	—
Primary order	2,3,4,5	—	—	—
Total length	—	—	—	340–360
n	unknown	unknown	unknown	unknown

b) *rusticola*	Kiyosu (1965)	Kobayashi (1979)	Cramp and Simmons (1983)
Bill	68–83	67–80	58–92
Wing	180–219	191–208	182–218
Tail	75–94	71–82	66–98
Tarsus	33.4–40	34–38	33.4–40
Middle toe and claw	—	—	36.2–43.3
Primary order	2,3,4,5	—	2,3,4,5
Weight (g)	199–445	—	131–420
Total length	—	—	330–350
n	unknown	unknown	1,524 (adults and juveniles combined)

Table 2. Measurements (in mm) of *Scolopax mira* specimens in the Yamashina Institute for Ornithology measured by K. Ozaki.

Rec/Ring no. (Japan)	080–05671	85–267	85–160
Date obtained	Aug 1980	June 1984	July 1985
Island	Okinawa	Amami	Amami
Sex	unknown	male	female
Age	adult	adult	adult
Wing span	—	635	680
Total length	—	330	380
Wing length (natural)	195	202	186
(max)	210	213	212
Tail length	75.5	70	71
Tarsus	47.7	48.7	49.9
Middle toe and claw	—	51.6	55.3
Hind toe and claw	—	14.5	15.2
Bill tip to gape	—	—	76
Bill tip to nostril	64.5	66.1	67
Nostril length	—	—	6
Culmen	80.9	82.1	83.5
Bill tip to rear of skull	—	121	123.8
Bill depth at base	—	—	15.9
Bill tip to overhang	—	—	4
Weight (g)	365	220	390
Ovarium			6.5 × 13.5 (ova all less than 0.5)

Table 3. Measurements of *S. mira* and *S. rusticola* eggs from Japan.

	mira		*rusticola*
	Hachisuka (1952)	Kiyosu (1965)	Kiyosu (1965)
Length (mm)	48.2–50.2	47–51.5	40.3–46.8
Width (mm)	36.5–37.8	35–39	31.8–36.8
Clutch	2–4	3–4	—
Weight (g)	—	—	Mean 21.99
n	Not given	Not given	Not given

the relevant publications. Measurements of *rusticola* are given for comparison. Kiyosu (1965), Kobayashi (1979) and Hayman *et al.* (1986) unfortunately only provide ranges for unspecified numbers of specimens, while WBSJ (1982) only gives total lengths of 36cm for *mira* and 34cm for *rusticola*. Whether any of these measurements refer to the same specimens is not known. Prater *et al.* (1977) only give two tarsus measurements of 44 and 45 mm and make the general comment that 'the wing and bill lengths are in *S. rusticola* range, but (the) tarsus is much longer and thicker'.

While the measurements in Tables 1 and 2 support Prater *et al.* (1977) in showing the tarsus of *mira* to be longer than that of *rusticola*, this difference might only amount to 2mm in some instances, although it does appear that on the whole *mira* does have a noticeably longer tarsus. Hartert (1916, 1917) noted that the wings of *mira* are 'much shorter, the distance from the outer secondaries to the end of the primaries being at least 1–2cm less' than in *S. rusticola*, and similar points were made by Kiyosu (1965) who described the primaries as being more rounded, and closer in length to the secondaries (15 mm difference) than in *S. rusticola* (25 mm difference). Hayman *et al.* (1986) observed that *mira* has much broader wings and a shorter tail than the Eurasian Woodcock, though in fact tail measurements for *mira* fall well within the range of *rusticola*. There seems to be no evidence in support of Cramp and Simmons's (1983) statement that *mira*'s bill is longer than *rusticola*'s, nor are data available to support their statement that *mira* has thicker toes, although the indication from Tables 1 and 2 is that the middle toe is longer in *mira* by at least 2.7 mm.

There is clearly quite a large degree of structural overlap between the two species, with only tarsus and middle toe measurements and overall wing shape clearly separating them. While these points might be observed in the field, identification based on them alone, under field conditions, is not likely to be possible.

FIELD CHARACTERS

Until five years ago, field identification of the Amami Woodcock was considered extremely difficult (Takano 1980, WBSJ 1982). Characters for separating the two species easily in the field were not known, making certain identification for the visiting ornithologist fraught with doubts. Japanese birdwatchers, eager to see the bird, visited Amami between May and August and relied primarily on the fact that only Amami Woodcock bred there: thus any woodcock seen there in summer had to be *mira* (e.g. Takano 1981). The species was, on the whole, considered to be unidentifiable in winter.

We observed Amami Woodcock at night along forest roads in northern Okinawa, from September 1984 to June 1987, and along a forest road in central Amami, an area known as Kinsaku-baru, in July 1985 and June 1987. Birds were all seen after sunset on or near unpaved roads. They were easily

dazzled with a hand-held search-beam and remained in view for several seconds to several minutes, and allowed close views down to 0.5m. From these observations and from other sources – including examination of skins – we have determined that, given reasonable views, and with care, it is possible to separate them by: (1) the depth of the base of the bill; (2) the angle of the forehead; (3) the shape of the head; (4) the face pattern; (5) the crown pattern; (6) the wing pattern; and (7) voice.

Since it is anticipated that typical views of *S. mira* will be brief, or at least made using weak light, here we concentrate on the main field characteristics separating *mira* from *rusticola*, beginning with the more general characters which should be visible under these conditions, and proceeding to the finer details. In view of the contradictions in plumage descriptions noted above we suggest that much greater attention is paid to the physical characteristics of the birds and to their patterning than to their coloration.

Overall appearance

S. mira generally appears long-legged as a result of the tarsi being up to 1cm longer than in *rusticola*. Once dazzled it tends to crouch slightly, when its long legs, hunched neck, head and bill shape combine to give it a distinctive outline similar to that of the (smaller) Painted Snipe *Rostratula bengalensis*. Although some *mira* may be slightly larger than *rusticola*, with broader wings and a shorter tail, these features are not consistent (at least based on the measurements currently available), nor are they obvious in the field. The overall colour pattern of *mira* is more uniform, darker olive-brown, and less rufous-brown than *rusticola*, with far fewer contrasting blocks of darker and greyer coloration on the wings and mantle.

Head and bill shape

Shimura (1984) and Sonobe and Taniguchi (1985) refer to the position of the eye as an important field character, but in our opinion this is not immediately obvious in the field. The two species have differently shaped heads, and eye position is in relation to the overall head shape: thus although *mira* has a lower eye than *rusticola*, it is its head shape which stands out as conspicuously different (see Figure 2).

Whereas *rusticola* has a steeply rising forehead and a high-peaked crown, *mira* has a gently sloping forehead forming a shallower angle with the bill (visible at some angles even in flight – D. McWhirter *in litt.*), and a flatter crown (incorrectly illustrated in WBSJ 1982, but described in Brazil 1985b and Hayman *et al.* 1986). The bill of *mira* is deeper at the base and droops more at the tip than that of *rusticola*. Although Hayman *et al.* (1986) describe the bill of *mira* as being tipped darker, in fact it lacks the very prominent dark tip of *rusticola*.

Head pattern

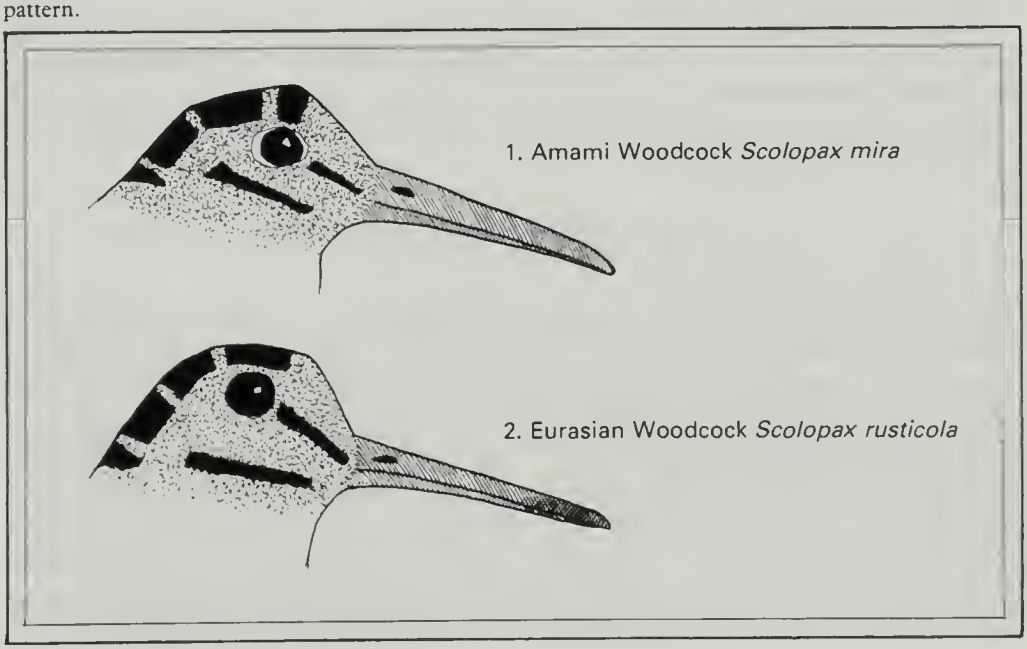
Kobayashi (1979) has suggested that the two species can be separated by the

different coloration of the forehead (brown in *mira* and ashy in *rusticola*); but while this is of value when comparing skins directly, it is in fact virtually impossible to observe in the field. However, as Sonobe and Taniguchi (1985) have indicated, the pattern on the crown immediately above the eyes merits scrutiny. In *rusticola* both the first and the second dark crown bars are equally broad, while in *mira* the first is noticeably narrower than the second. While we agree with Sonobe and Taniguchi (1985) that this character is diagnostic (it is clear on skins and on a certain proportion of photographs), it is not often visible in the field: at some angles the crown bars are not clear and, especially if the bird's plumage is damp, after pushing through wet vegetation for example, their width is difficult to judge. Facial characteristics, on the other hand, are much easier to observe, and are more striking.

Both species have a pale face with two dark bars, one across the lores from the mid-line of the bill to the eye, and one from just below the bill across the cheeks. Since the crown and eye are higher, and the forehead more steeply rising, in *rusticola*, the angle between these two bars is noticeable (see Figure 2). In *mira* the crown and eye are lower, the forehead less steep, and thus these two bars are almost parallel. These facial bars are almost always easily seen, even at angles when the crown pattern is invisible, and are thus a much more useful guide in the field. Moreover, from a comparison of photographs the pale area between the eye and the lower bar is larger in *rusticola*.

Both observations and photographs (see for example Kuroda 1984) show that most *mira* have a bare pink patch around the eye (Brazil 1985b, Hayman *et al.* 1986), which is larger behind the eye than in front, and this can be one

Figure 2. Illustrations of Amami and Eurasian Woodcocks showing head shape, eye position and facial pattern.



of the first things noticed; however, not all birds show it. The significance of this is not yet known, although it is possible that it is an age or sexual character. The same character has also been described from the Obi Woodcock *S. rochussenii*, but not from any other species of woodcock (Hayman *et al.* 1986).

Feather patterning

Head shape and bill depth can be seen even in silhouette, and in reasonable light conditions the facial or even the crown markings are distinctive. Any two of these characters should confirm the identification of *mira*. There are also, however, differences in the specific details of the pattern on the feathers visible on the folded wing. In the unlikely eventuality that the bird is seen on the ground, but with its head obscured, then the pattern on the folded wing should be closely scrutinised. The greater coverts and tertials of *rusticola* carry large ovals of dark brown separated by narrow regions of pale cinnamon-brown, giving a distinctly patterned appearance. Those of *mira* lack this bold pattern; they are instead almost uniformly dark olive-brown with small pale cinnamon-brown triangles visible along the leading edge of the feathers. The primaries of *rusticola* show a similar pattern to those of *mira*, but the cinnamon triangles are much broader-based and longer in the former. This difference alone makes it possible to identify photographs of birds (see for example Kuroda 1984, Okinawa Yacho Kenkyukai 1986) and, while we have not relied on it exclusively in the field, it is a useful extra character. The upper tail of *rusticola* shows a conspicuous dark band and paler tip, whereas in *mira* the dark band is missing. The under-tail of *mira* has smaller, duller and less sharply defined silvery spots at the tip than in *rusticola* (Hayman *et al.* 1986).

The bulk of measurements available for *rusticola* are from western sources such as those included in Cramp and Simmons (1983). Future studies of the morphological differences between these two species would be facilitated by a greater series of measurements of both *rusticola* and *mira* from Japan.

HABITAT, BEHAVIOUR AND VOICE

The Amami Woodcock is a reasonably common resident of subtropical evergreen broadleaf hill forests, with cycads. In Japan the Eurasian Woodcock breeds in temperate, deciduous, broadleaf forests with deep leaf-litter where the dominant ground-cover of dwarf bamboo is not particularly dense, and winters in subtropical, evergreen, broadleaf forests in Kyushu and the Nansei Shoto, and elsewhere to the south of Japan; in Okinawa it also occurs in the 'lowlands' in suburban areas with grass, amongst sugarcane and in copses. The islands of the Nansei Shoto are mountainous, their forested flanks cut with steep-sided valleys and streams. The Amami Woodcock is a bird of the forest floor, preferring damp and shady areas. It is

seldom seen except when it ventures out onto forestry tracks at night. There it probes in the soft earth and short vegetation along the road edges or in the mud of the roadside banks. In winter it is also said to occur among sugarcane fields (WBSJ 1982), but it should be noted that reference to it there pre-dates knowledge of certain field characters for its separation from *rusticola*.

The behaviour of the Eurasian Woodcock is well known and has been reviewed in great detail in Cramp and Simmons (1983); from the little that is known of the Amami Woodcock, there are two obvious points of differentiation from the continental form, namely display and voice. *S. rusticola* is well known for its conspicuous crepuscular aerial display, or roding flights, over forests and forest clearings. Aerial display flights are also noted for the Dusky *S. saturata* and American Woodcock *S. minor*, but not for the Celebes *S. celebensis* or Obi Woodcocks (Hayman *et al.* 1986), although this may be because the last two species are very poorly known.

We have observed *S. rusticola* in Japan most frequently during its roding display flights above the forest canopy, but despite being in the species's forests at the right times of day and year we have never observed, nor found any reference to, any display flights by *S. mira*. Eurasian Woodcocks wintering on, or passing through, Amami-oshima have been reported as giving typical displays and calls there in March and April (K. Kobayashi in Hachisuka 1952). Displays of *mira* observed on Amami-oshima by M. Tsuneda (verbally 1985), a resident birdwatcher on the island, were all quite different from those of *rusticola*; all took place during February and March, on the ground. During these displays between single males and single females the males' wings were held loosely hanging, quivering at their sides, while the head was bobbed gently. The females stood watching nearby and were then mounted. All that is known of the breeding biology of *S. mira* is that it nests on the ground, and lays 2–4 eggs between mid-March and early May (Hachisuka 1952, Kiyosu 1965).

Our observations of Eurasian Woodcocks in Japan suggest that when flushed they usually fly off silently, often directly but sometimes zig-zagging between trees, and drop again after some distance. Amami Woodcocks on the other hand are as likely to run for cover as to fly when disturbed, sometimes call when flushed, and if flushed tend either to drop again very quickly after flying only a short distance or to fly up steeply and land on the branches of trees or amongst vegetation on near-vertical sections of banking. This behaviour may be an adaptation for escaping from ground predators such as snakes, of which there are many within its range.

Since the identification of Amami Woodcock on Okinawa it has been noticed that while some woodcocks remain where first seen or just fly short distances, others flush immediately and fly right off. The popular but unsubstantiated opinion is that the former are Amami Woodcock (those that sit tight are almost invariably Amami), and the latter Eurasian Woodcock.

The Eurasian Woodcock's distinctive call given during roding flight can be transcribed in various ways but basically consists of a soft grunting

followed by a sibilant note, 'ung-ung a-ung, twissick', or even 'chikit chikit boo boo' (WBSJ 1982). No comparable calls have been heard from Amami Woodcocks, which have only been heard to vocalize when flushed, or during displays on the ground. On taking flight they occasionally give a snipe-like 'jeh' or 'jee', while during courtship displays they have been heard to give strong 'gu' calls and softer 'ku' calls (M. Tsuneda verbally 1985), and during distraction displays a continuous shrill 'reep-reep-reep' (Hayman *et al.* 1986).

A NOTE ON CONSERVATION

S. rusticola is generally classified as a game bird in Japan and may be shot (see Environment Agency 1977). Through its treatment as a subspecies of *rusticola*, *mira* comes under the same classification, although on Amami-oshima *rusticola* is given special protection by the Kagoshima Prefectural Government in order to protect *mira*. No special protection is afforded *rusticola* in other islands, such as Tokunoshima or Okinawa, where it remains a game bird, and thus *mira* is not protected there. While four other extant endemic bird species of the region (the Okinawa Rail, Pryer's Woodpecker, Lidth's Jay and Ryukyu Robin) have all been designated as Natural Monuments and therefore cannot be hunted or trapped, *S. mira* has not yet been formally protected in this way. By chance some may occur within the small 'wildlife protection area' for Pryer's Woodpecker on Mt. Yonaha, Okinawa, and birds certainly exist in the extensive northern (U.S. Marine Corps) training area, Okinawa. Since the latter is a restricted area these birds are, to all intents and purposes, protected from hunting, although not necessarily from disturbance of their habitat – a new landing pad for vertical take-off and landing jets, for example, is currently under construction in the area. Deforestation in other parts of Yambaru is now a critical issue (Brazil 1985a). On Amami-oshima, the Kinsaku-baru forest, one of the most important areas within the bird's range on the island, is not protected at all; the importance of this forest and others like it on Okinawa cannot be underestimated.

Given its status as a full species and one which is endemic to the Nansei Shoto, the Amami Woodcock should be made a Natural Monument at the first possible opportunity, in order to prevent hunting (Brazil 1985a). Investigations should be made to estimate its current range and population size, which at the moment is unknown. Observations suggest that it is reasonably common on Amami-oshima and Tokunoshima, while on Okinawa it seems to be uncommon, and in fact it is possibly being hunted there.

We would like to thank Kenji Takehara for his photographic record of the Amami Woodcock on the Tokashiki Islands, and Shinichi Hanawa of the Wild Bird Society of Japan, Kiyoaki Ozaki of the Yamashina Institute for Ornithology, and Douglas McWhirter for carefully reading and commenting on the manuscript. M.A.B. would like to thank Yoshitaka Takatsuki for his help and hospitality on Amami-oshima and especially Mamoru

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Habitat preferences of the Hook-billed Bulbul *Setornis criniger* and the White-throated Babbler *Malacopteron albogulare* in Borneo

FREDERICK H. SHELDON

The Hook-billed Bulbul *Setornis criniger* and White-throated Babbler *Malacopteron albogulare*, two forest birds of Borneo, Sumatra, and (in the case of *M. albogulare*) peninsular Malaysia, are of patchy distribution and apparent rarity. However, accumulated evidence from fieldwork by the author and from the literature, museum skins, and unpublished records of other workers suggests that, in Borneo at least, both species prefer peatswamp forest, with *M. albogulare* also occupying floristically similar and often adjacent heath or other poor-soil forests. Speculation is made regarding the preference of these species for peatswamp forest in peninsular Malaysia and Sumatra, although *M. albogulare* is known from "typical" lowland forest in the former. The conservation of these species in Sabah (and probably most of Borneo) will depend on protection of the limited areas of peatswamp.

In discussions of tropical bird distributions, it is common for researchers to classify habitats using broad criteria. Thus, we speak of birds that live, for example, in lowland, upland, montane, savanna, mangrove, secondary, and primary forests. Each of these major forest categories, however, comprises a mixture of discrete habitats. These are usually defined approximately by their major component plant species, and their characteristics are strongly influenced by such factors as geological history, soil type, drainage, adjacent habitats, and human disturbance. Ornithologists, birdwatchers, and conservationists need to recognize the small differences among habitats, because fine details of forest structure and composition will often influence bird distribution and relative abundance.

Two examples of birds which are usually said to live in 'lowland' forests, but which probably occur mainly in forests defined by specific soils and flora, are the Hook-billed Bulbul *Setornis criniger* and the White-throated Babbler *Malacopteron albogulare*. Little is known about these birds, and less has been written, largely because of the specificity and patchiness of their distributions.

BACKGROUND

While participating in two surveys of the birds of Sabah, East Malaysia – one in 1976–1977 (Yale University) and one in 1981–1983 (Western Foundation of Vertebrate Zoology [WFVZ]) – I became interested in *Setornis* and *M. albogulare*. Even though I spent many months netting and observing

birds in the forests of Sabah, I encountered these species only a few times. Further, I knew from publications and personal contacts that others who studied the birds of Sabah had recorded these species rarely. When the birds were located, and good field data were available, these species were almost always associated with forests growing on poor-quality soils (e.g. Wells 1976, Smythies 1981, Davies and Payne 1982).

To learn more about the Bornean distribution of these species, I examined specimens in the British Museum of Natural History, Philadelphia Academy of Natural Sciences, Sabah Museum, Sarawak Museum, Peabody Museum (Yale University), and University of Singapore Museum (Raffles Museum collection), and I collected data by correspondence from the American Museum of Natural History, Amsterdam Zoological Museum, Bogor Museum, Leiden Museum of Natural History, Museum of Comparative Zoology (Harvard University), and U. S. National Museum of Natural History.

Setornis criniger Lesson 1839

The Hook-billed Bulbul, also called the Long-billed or Van Bemmelen's Bulbul, occurs in Borneo, Bangka Island, and Sumatra (e.g. Chasen 1935, Smythies 1981). It was collected in eastern Sumatra in the early 1900s by W. L. Abbott, whose specimens are in the U. S. National Museum (Rand and Deignan 1960). The Sumatran sites are: the Siak River (10 December 1906), Kateman River (three specimens, September 1903), and Rupat Strait (27 February 1906). On Bangka it was collected at Klabat Bay. These are the only citings of van Marle and Voous (in press), who have made a thorough search for Sumatran records.

The Bornean records of *Setornis* are summarized in Table 1. The most informative are those of Wells *et al.* (1975), Wells (1976), Wells *et al.* (1978), and the WFVZ, and derive from two localities, Mt. Mulu National Park, Sarawak, and Merintaman-Menggalong Forest Reserve, near Sipitang, south-western Sabah. In both locations, *Setornis* occurred only in peatswamp forest. The birds of Mulu were found in the *Shorea albida* facies of the *kerangas*-peatswamp forest, where peat overlays sand.

In Sabah, this species was observed by D. M. Batchelor in the early 1960s (Smythies 1981, D. M. Batchelor *in litt.*), who encountered it in the Klias-Lumbidan region of the south-western coast. He described it as a rather active bird in the trees but not particularly vocal. It utters a harsh 'currrk', more guttural and hard than the call of the Yellow-vented Bulbul *Pycnonotus goiavier*. The white spots at the tip of the tail are conspicuous in flight, but otherwise this species could easily be passed over for one of the commoner bulbuls. Batchelor reports that one individual even entered his bungalow in search of spiders and their prey. The WFVZ survey saw an 'extremely noisy' flock of three birds fly out of the peatswamp forest at Menggalong, over a road, and into some roadside bushes. The white tail spots were particularly visible. Three birds were later netted together at ca. 1m in the peatswamp forest.

Malacopteron albogulare (Blyth) 1844

The White-throated Babbler, also called the Grey-breasted Babbler, has been found on the Malay Peninsula, Borneo, Sumatra, and the Batu Island of Pini (Chasen 1935, Delacour 1947, Voous 1950, King *et al.* 1975, Smythies 1981). Voous (1950) summarized its plumage characteristics,

Table 1. Record localities of *Setornis criniger* in Borneo.

Locality	Notes
Kuching, Sarawak	35 specimens[1,2,7,8]; 1891–1956; including specimens collected at mile 4 Stapok Rd., mile 3 Astana Rd., Kampang Sourbaya, and mile 10 Matang Rd; food: berries, small beetles, dragonflies, fly nymphs, insects, ants, and fruits.
Simanggang, Sarawak	2 specimens[1,7]; virgin forest, in low trees; 5 July 1952, 12 Sept. 1952.
Lawas River, Sarawak	1 specimen[11].
Sungei Engkalat, Igan, Sarawak	1 specimen[1]; 27 Oct. 1950.
Similajau, Sarawak	1 specimen[1]; old jungle; 23 Jan. 1953.
Sadong, Sarawak	2 specimens[1]; old forest; 10 Aug. 1957.
Baram Dist., Sarawak	3 specimens[1,4,9]; 1891, Dec. 1898.
Mt. Kalulong, Sarawak	1 specimen[3]; Feb. 1893.
Sibu, Sarawak	3 specimens[4]; 23 July 1874, 21 Nov. 1874, 1880s.
Bintulu, Sarawak	2 specimens[4,11]; no date.
Mt. Dulit, Sarawak	1 specimen[4]; 1880s.
Mt. Mulu, Sarawak	Net records[15,17,18]; 27 Apr.–1 May 1978; found only in the *Shorea albida* facies of the Peatswamp-*kerangas* forest; its hoarse call showed it to be fairly common.
Tutong River, Brunei	3 specimens[9]; Oct.–Dec. 1897.
Sempang, W. Borneo	3 specimens[5,9]; 1900s.
Landak River, W. Borneo	1 specimen[5]; 1900s.
Mt. Kenepai, W. Borneo	1 specimen[10]; southern foot of the mountain, 11 Jan. 1894.
Kendawangan River, S. W. Borneo	1 specimen[5]; 1900s.
Kapuas River, W. Borneo	5 specimens[5,10,11]; 3 in 1845 and 2 in 1900s.
Pontianak, W. Borneo	2 specimens[10]; 1826–1827.
Jpo. Opeloe Segedong, Pontianak, W. Borneo	1 specimen[6]; 7 Apr. 1931.
Bandjermasin, S. Borneo	1 specimen[10]; 1836.
Upper Mahakam, E. Borneo	1 specimen[10]; May 1900.
Merintaman-Menggalong Forest Reserve, Sipatang, Sabah	Net records[13,14]; 17–23 Mar. 1975; peatswamp forest. 4 specimens[19]; 15–16 July 1983; peatswamp forest; gonads minute.
Klias-Lumbidan Dist., Sabah	1 specimen[11], no data. Sight records[15,16], in abandoned rubber and thin forest; seen eating spiders, spider prey, berries, and small fruits; c. 1960.
Quoin and Kalabakan, Sabah	Sight record[12]; in pristine and recently cut primary forest; early 1960s.

Note: Many localities recorded prior to the 1970s are likely to be concocted, the labels having been written, for example, after local hunters brought birds to camp. Thus, most listings above are useful only in providing a general idea of collecting area. Specimens with vague localities, e.g. those saying simply 'Borneo' or 'Sarawak', have not been listed.

1 = Sarawak Museum; 2 = University of Singapore Museum; 3 = Sabah Museum; 4 = British Museum; 5 = U. S. National Museum; 6 = Bogor Museum; 7 = Peabody Museum; 8 = Museum of Comparative Zoology; 9 = American Museum; 10 = Leiden Museum; 11 = Everett (1889); 12 = Norman (1964); 13 = Wells *et al.* (1975); 14 = Wells (1976); 15 = Smythies (1981); 16 = D. M. Batchelor (*in litt.*); 17 = Wells *et al.* (1978); 18 = Anderson *et al.* (1982); 19 = WFVZ.

measurements and biogeography in a discussion of the evolution of the six species of *Malacopteron*. He came to the conclusion that *M. albogulare* is the most aberrant of the genus. Its plumage is the most distinct and, in terms of specimen numbers and collecting localities, it appeared to Voous to be rarer and to have a more disjunct distribution than its congeners.

Now that more is known about this species, Voous's (1950) conclusions can be amended to some extent. Two factors seem to have played a role in distorting our understanding of the abundance and distribution of *M. albogulare*. First, as will be discussed below, the apparent preference of this species for peatswamp forests, which are unpleasant places to work because of wetness and insect life, acted to reduce the number of specimens. (This source of bias applies to *Setornis* as well.) Second, *M. albogulare* is unaccountably difficult to find by observation. Hence, early collectors who depended on shooting would have obtained relatively few specimens. With the advent of mist-netting, the number of records has increased dramatically, and at least in peninsular Malaysia this species is now known to be commoner, for example, than the Sooty-capped Babbler *M. affine* (D. R. Wells, verbally).

In peninsular Malaysia, confirmed records exist from northern Trengganu to southern Johor (Voous 1950, Wells 1982). The type-specimen is purported to be from Singapore, but there is some doubt about this (e.g. Gibson-Hill 1949, Voous 1950), and the birds are certainly not there now. From Sumatra there are few records. The only specimens with locality data are from the Tasik River, Langkat (1919–1920); Pini Island (1896); and the Lingga Archipelago (Voous 1950, van Marle and Voous in press). Field observations have been made by F. G. Rozendaal at Panti, Barat (1980), and by D. A. Holmes at Bajubang, Jambi (1975) (van Marle and Voous in press).

The Bornean site records I have assembled are summarized in Table 2. Most of these records derive from specimen labels, the data of which are often old and inaccurate. Consequently, I have weighed the more recent, documented (by specimen or capture) records more heavily in attempting to assess the habitat preference of *M. albogulare*. Wells *et al.* (1978) found these birds to be common in the peatswamp and *kerangas* forest of Mulu Park, and not to occur at all in other habitats. The WFVZ survey observed *M. albogulare* and netted four individuals in coastal-Ramin swamp-forest (a kind of peatswamp forest) in the Merintaman-Menggalong Forest Reserve, Sabah (16 July 1985). The WFVZ also netted a single bird in a seven-year-old *Albizia falcataria* plot in the Sabah Softwoods's tree plantation north-west of Tawau, south-eastern Sabah (July 1982). The soil type at Sabah Softwoods was unknown to us, but appeared in retrospect to be the lateritic variety common to most of the Bornean lowland forest. The Softwoods's plantation was once dipterocarp forest contiguous with the Kalabakan forest where Norman (1964) reported having seen *M. albogulare*. However, months of extensive birding, netting, and collecting in the Quoin, Kalabakan, and contiguous lowland dipterocarp forest (now almost entirely logged) have never yielded a confirmed record of this species, other than that in the

Albizia (Thompson 1966, Yale University, WFVZ).

R. Sims and E. Banks collected a single specimen for the British Museum in 1956 at Gunong Ensuan, east-central Sabah. This region of Sabah consists of a mosiac of forest types, including forests growing on ultrabasic-alluvial outwash from the Tawai Massif and forests growing on podsols (*kerangas*). Davies and Payne (1982) observed *M. albogulare* in the same region as Sims and Banks, and because they were particularly interested in the effects of

Table 2. Record localities of *Malacopteron albogulare* in Borneo.

Locality	Notes
Kuching, Sarawak	35 specimens[1,2,5,7]; 1892–1954; including specimens labelled as collected at miles 4–5 on Stapok Rd. and mile 10 on Matang Rd.
Similajau, Sarawak	2 specimens[1]; 24 Jan. 1953; old jungle, a pair on a treetop; food: ants.
Kalingkang, Sarawak	1 specimen[1]; 26 Oct. 1959; virgin forest on hill; food: hoppers and ants.
Matalun, Sarawak	1 specimen[1]; 10 Nov. 1955.
Long Akah, Sarawak	1 specimen[1]; 10 Feb. 1955; alt. 500 feet; food: insects.
Betong, Seribas, Sarawak	1 specimen[2,7]; 8 Aug. 1916.
Belingian, Sarawak	5 specimens[2,7]; 1902, 1903, and 1917.
Samarahan River, Sarawak	5 specimens[2,3,7]; 13–23 Nov. 1919.
Mt. Dulit, Sarawak	2 specimens[3]; Oct. 1898, 3000 feet; 17 Nov. 1932, in the 'moss forest'.
Lawas River, Sarawak	1 specimen[3].
Bintulu, Sarawak	2 specimens[3].
Niah, Sarawak	Net records[8].
Semengoh Forest Res., Sarawak	Sight (?) record[9].
Mt. Mulu, Sarawak	2 specimens[7]; Oct. 1893, 1000 and 3000 feet. Net records[10,11,13]; found only in the peatswamp-*kerangas* net sites.
Muara Tewe, S. Borneo	1 specimen[6].
Kendawangan River, S. W. Borneo	3 specimens[4,7].
Pontaniak, W. Borneo	2 specimens[7]; 1826–1827.
Kapuas River, W. Borneo	1 specimen[7].
Lumbidan, Sabah	1 specimen[6].
Morutai Besar, Sabah	1 specimen[7]; Harvard Univ. expedition 1937.
Gunong Ensuan, Sabah	1 specimen[3]; 3 May 1956; 5°51′N 117°8′30″E; alt. 1000 feet.
Kuala Kunkun, Sabah	2 sight records[12]; 5 May 1980; seen independently by two individuals in two different habitats: forest on ultrabasic-alluvium soil and forest on podsols.
Sabah Softwoods, Sabah	1 specimen[14]; 4°33′N 117°40′E ; 28 June 1982; in the 7-year-old *Albizia falcataria* groves; testes 7 × 3 mm.
Merintaman-Menggalong Forest Reserve, Sipitang, Sabah	4 specimens[14]; 16 July 1983; found in the mid-storey of the peatswamp forest; gonads minute.

Note: Many localities recorded prior to the 1970s are likely to be concocted, the labels having been written, for example, after local hunters brought birds to camp. Thus, most listings above are useful only in providing a general idea of collecting area. Specimens with vague localities, e.g. those saying simply 'Borneo' or 'Sarawak', have not been listed.

1 = Sarawak Museum; 2 = University of Singapore Museum; 3 = British Museum; 4 = U. S. National Museum; 5 = Peabody Museum; 6 = Everett (1889); 7 = Voous (1950), including specimen records from the American Museum, Museum of Comparative Zoology, Philadelphia Academy, Amsterdam Museum, Leiden Museum, and Brussels Museum of Natural History; 8 = Harrisson (1967); 9 = Fogden (1976); 10 = Smythies (1981); 11 = Wells *et al.* (1978); 12 = Davies and Payne (1982, verbally); 13 = Anderson *et al.* (1982); 14 = WFVZ.

different forest types on the distribution of fauna, they took care to note that the bird occurs both in *kerangas* and in forests lying on ultrabasic soils. Interestingly, this was the only locality, out of 35 survey sites, where Davies and Payne recorded *M. albogulare*. The WFVZ survey failed to find this species in a *kerangas* forest they surveyed at Sungei Labau, north-east of Sook (5°16′N 116°31′E), despite extensive netting.

In Brunei, C. F. Mann (*in litt.* 1987 to N. J. Collar) reports *M. albogulare* 'common in rain forest not far from Bandar Seri Begawan'. This population may also be associated with adjacent coastal swamp forest, however, and further data on the status of the species in the region will be most interesting.

In the field, *M. albogulare* has a bright white superciliary line and yellow lores that render its facial appearance reminiscent of some of the fantails *Rhipidura*. In birdskins, this eyeline is faded and unremarkable. The bird also has a notable grey hood, and its grey breast-band is vivid. Once found, the species is easy to identify.

DISCUSSION

Some general patterns of *Setornis* and *M. albogulare* distribution are indicated by the localities listed in Tables 1 and 2. Only Mt. Kalulong, Long Akah, and Sabah Softwoods (Kalabakan) are not located in, or adjacent to, obvious regions of extensive peatswamp and/or heath forest. Further, there are more than 10 localities where both species have been collected or reliably recorded, often by the same person at the same time. (These coincidental localities notably do not include Mt. Kalulong, Long Akah, and Kalabakan.) Taken as a whole, the records imply that, in Borneo, *Setornis* and *M. albogulare* prefer peatswamp forests to the commoner lateritic-soil, mixed-dipterocarp forests, and that at least *M. albogulare* also inhabits heath and contiguous forests growing on ultrabasic soils. Negative evidence of the habitat preference of these birds derives from the fact that, despite extensive netting and observation, neither has ever been recorded in Sabah's 'typical' mixed-dipterocarp forests. However, this is not to say that they do not occur in such forests in other parts of Borneo.

The characteristics of the various types of Sundaland forests are explained clearly and thoroughly by Whitmore (1984a). Peatswamp grows on acidic peat soils, usually over marine deposits, and comprises a catena of forest types, which lie in concentric formation and vary in physiognomy and flora. Heath forests are of two varieties, *kerangas* and *kerapah*: *kerangas* describes forests growing on podsols, *kerapah* forests where peat has accumulated on top of the podsols. The acidity of peatswamp and heath soils, the variety of peatswamp forest types, and the occurrence of peat in heath formations result in floral similarities between peatswamp and heath forests. In Borneo, for example, *Shorea albida* is often the dominant tree species in sections of both kinds of forest. Commonly, heath and peatswamp forests lie adjacent to

one another (Brunig 1974, Anderson *et al.* 1982, Whitmore 1984a).

The most extensive areas of peatswamp forest are in Borneo (c. 7.8×10^6 ha), north-eastern Sumatra (c. 9.7×10^6 ha), and coastal peninsular Malaysia (c. 0.5×10^6 ha), and they have not developed to a significant degree elsewhere in Western Malesia (Whitmore 1984a). Bornean peatswamp occurs mainly in the coastal lowlands of Sarawak and the western and southern coastal lowlands of Kalimantan (Whitmore 1984b). In Sabah, peatswamp is developed to a significant degree only in Merintaman-Menggalong Forest Reserve. There is a possibility that small formations occur elsewhere in the state, but data on habitat distribution are difficult to obtain (Whitmore 1984b).

Most Far Eastern heath forest occurs in Borneo, with lesser amounts on the east coast of peninsular Malaysia, east-coast Sumatra, and the islands of Bangka, Karimatas, Anambas, and Natunas (Brunig 1974, Whitmore 1984a,b).

The fact that the distribution of peatswamp and heath forests in Borneo coincides well with the distribution of *Setornis* and *M. albogulare* invites the speculation that these two birds species are likely to occur primarily in the peatswamp and related heath forests of Sumatra and (for *albogulare*) peninsular Malaysia. Indeed, in peninsular Malaysia, D. R. Wells (verbally) has found *albogulare* to be the dominant *Malacopteron* of peatswamp, but it is not at all restricted to such forest; it is found regularly by mist-netting in mixed-dipterocarp forest. The important criterion affecting its distribution appears to be that the forest be level and lowland. In Sumatra, van Marle and Voous (in press) suggest that *Setornis* and *M. albogulare* be sought in peatswamp and/or swamp forest. All of the Sumatran records of *Setornis* are from lowland, swamp-dominated areas. Some of the specimens of Sumatran *M. albogulare* clearly were collected in swampy regions, but others, e.g. those from Pini and the Lingga Archipelago, may or may not have come from swamp or heath.

The small difference in habitat preference between the Bornean and peninsular Malaysian (and Sumatran?) populations of *M. albogulare* is possibly the result of a difference between total avifaunas in those two places. Variation in numbers and types of species would affect the ecological parameters (e.g. niche dimensions) dictating habitat requirements. For example, a reduction in the extent of competitive interactions between *M. albogulare* and its congeners or ecological equivalents in peninsular Malaysia could have resulted in more relaxed habitat requirements for mainland populations, thus allowing them freer use of mixed-dipterocarp forest.

The Bornean, Sumatran and (for *albogulare*) peninsular Malaysian representatives of *Setornis* and *M. albogulare* are similar in morphology as well as in habitat preference. *Setornis* is not divided into subspecies, and the two subspecies of *M. albogulare* (*albogulare* and *moultoni*) are virtually indistinguishable (Voous 1950). These similarities are likely to be the result of recent population vicariance caused by rising sea-level. Peatswamp formation is believed to require special conditions of nutrient-poor alluvium

overlying salt and sulphide-rich clays (as occur on the inland side of seaward-advancing mangroves). Such conditions were likely to have been in place in Borneo, Sumatra, and peninsular Malaysia only since the Pleistocene, when sea-level changes were relatively common and alluvium was derived from sediment-based (as opposed to volcanic) highlands (Whitmore 1984a).

CONSERVATION

The poor quality of the soil in peatswamp and heath decreases the development potential of these kinds of forests (e.g. for agriculture). Nevertheless, the trees comprising peatswamp and heath formations are valuable, the land is often near the coast and easily accessible, and the unique features of these formations are not usually appreciated. The forests are, therefore, subject to logging, and this threatens bird species that are primarily dependent upon them. *Setornis* and *M. albogulare* inhabiting the Merintaman-Menggalong Forest Reserve of Sabah, for example, are in immediate danger. This reserve – which has the only good examples of coastal-Ramin swamp-forest in Sabah and the last stands of the Borneo camphor *Dryobalanops aromatica* (W. Meijer *in litt.*) – was once part of the Klias National Park. It has since been de-gazetted and is now part of a wood-products concession and is expected to be cleared and replaced with a mill and tree plantation. Such development would probably result in the extirpation of the local populations of *Setornis* and *M. albogulare* and the extinction of the former in Sabah.

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The winter birds of Ladakh

D. P. MALLON

This paper reports on the birds seen in the central part of the Transhimalayan district of Ladakh, north-west India, during four consecutive winters, 1980–1984, and includes additional records from the literature. Fieldwork was based in the Indus and Zanskar valleys and their tributaries, and four areas were visited each winter in order to obtain some evenness in coverage. All species recorded during the months of December, January and February are included in the winter list; 84, representing approximately 30% of the total number of species recorded for Ladakh, are listed and discussed. Of these, 50 are considered to have regular winter status, and the remainder are irregular winter species, occasional stragglers from migrant populations or vagrants. There are few reports on the winter avifauna of the Tibetan region as a whole, and considerable scope exists for further research.

The Transhimalayan district of Ladakh, north-west India, has close ecological affinities with the Tibetan region and it was included in the Outer Plateau zone of Tibet by Vaurie (1972). Its avifauna has been relatively well studied, though most reports to date deal with the summer months and migration periods and the only winter information was provided for 1981–1982 by the University of Southampton expedition (Williams and Delany 1985, 1986).

Ladakh has an arid, high-altitude environment and the area as a whole is extremely rugged and mountainous. Settlements are concentrated along the main river valleys (Nubra-Shyok, Indus, Suru, Zanskar), each of which contains small areas of low-lying, open, level ground. The eastern part of Ladakh contains several lakes and forms the western extremity of the Chang Thang, the northern plateau of Tibet.

METHODS AND STUDY AREA

As part of a general ecological survey of Ladakh (Mallon 1983, 1984, in press, Osborne *et al.* 1983, Mallon and Nurbu in press), I collected records of birds on six visits to the district between 1980 and 1986. This report is based on data obtained during the winters 1980–1981, 1981–1982, 1982–1983 and 1983–1984. I define 'winter' as the months of December, January and February.

The areas covered during the winter lay in central Ladakh between the Indus valley and the northern side of the main Himalayan range. No winter visits were made to the Suru valley, or to the eastern plateau and Nubra-Shyok valleys, both these latter being closed to visitors. It was impossible to revisit the whole of the area each year and the coverage was inevitably subject to some bias. Leh, the base for each expedition, was well covered, while the Zanskar plain (between the villages of Padum, Sani and Karsha) was visited only once. To ensure some even coverage, the following areas were

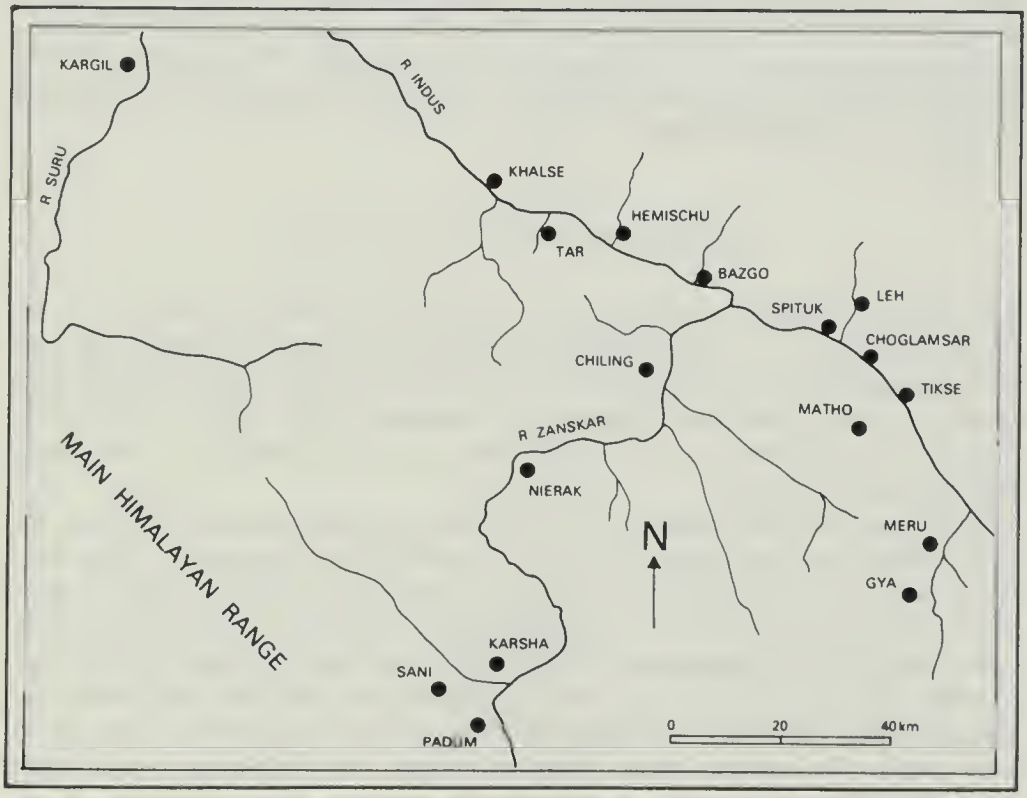
investigated each year: Leh and its environs; the floor of the Indus valley from Tikse to Spituk; the villages and side-valleys of the lower Indus between Bazgo and Khalse. The Zanskar river gorge from the Indus confluence to Nierak was followed in three winters (once continuing to Padum), and in one winter to a point several kilometres beyond the Markha valley. Sites are mapped in the Figure.

The lowest point in the study area was the floor of the Indus valley at an altitude of 3,000 m. Most records were obtained between 3,000 and 3,600 m and only a few over 4,000 m. Several days in 1981–1982 were spent with the University of Southampton party, one of whom, Simon Delany, also undertook the journey to Padum with me that winter. A few visits were made with Chering Nurbu, the Leh Forest Ranger; otherwise field visits were made by myself alone or with local porters.

CLIMATE

According to figures given by Kachroo *et al.* (1977) based on records over 1941–1960, mean temperatures in Leh are: December, maximum 1.6°C, minimum −11.1°C; January, maximum −2.8°C, minimum −14°C;

Figure. Ladakh, showing the study area.



February, maximum 0.8°C, minimum −11.8°C. Zanskar proper has a harsher climate, though there are no records: temperatures down to −27°C were recorded there in 1981–1982 and −32°C in the Zanskar gorge in 1982–1983.

Snow cover is heaviest in Zanskar, lying on the northern side of the main Himalayan range, and decreases north-eastwards. The Zanskar plain around Padum at an altitude of 3,600m is covered throughout the winter with snow, while in Leh, 3,550m, snow rarely lasts for more than a few days at a time. The eastern plateau area, seen from the air, shows wide tracts of snow-free country. Naturally, variations occur from year to year. The winter of 1982–1983 was much colder than usual, and temperatures of −20°C and below were recorded several times in Leh, while snow cover was more extensive and longer-lasting than usual.

HABITATS

A small amount of open water occurs in winter, in the form of unfrozen stretches along the Indus and Zanskar rivers and most mountain streams. The pool at the village of Sani in Zanskar is fed by warm springs and never freezes. On the hill slopes strong solar radiation results in clear patches appearing soon after snowfall and these are exploited by bird species favouring open ground. Trees and bushes occur naturally in most valleys of Ladakh, but have long been cut out in most places for fuel and timber and now survive only where remote from human habitation. However, trees and bushes are cultivated at all villages, forming dense stands in some places (especially the Markha valley), and there are extensive Forest Department plantations. The main tree species found are willow *Salix*, poplar *Populus* and *Myricaria*, apricot *Prunus armeniaca* and other fruit trees. A few stands of Black Juniper *Juniperus indica* and even fewer of Himalayan Birch *Betula utilis* occur in mountain areas. Of great importance is the presence of large quantities of the bush *Hippophae rhamnoides*, both wild and cultivated, which provides food and shelter for many species.

All birds remaining in winter are forced by severe conditions to make some movements to lower elevations. A few hardy species remain as high in the mountains as conditions permit, while others concentrate in valley bottoms and around villages. The richest variety of winter habitats occurs along the floor of the Indus valley between Tikse and Spituk, with its combination of village fields, open ground, extensive plantations and open water, as well as Shey marsh.

SYSTEMATIC LIST

Eighty-four species are treated below. Any definition of a winter species is bound to be arbitrary, so for the sake of completeness all species recorded

during the months of December, January and February are listed, even though some of them are almost certainly late autumn or early spring passage migrants. Also included are three Tibetan species which, although not seen in the three winter months, are not known to migrate outside the region and are presumed to occur in winter.

The systematic list follows Holmes (1986) in using the order of species in Vaurie (1972), the most useful reference work. A code following the scientific name gives the species's status in Ladakh. Some of these are provisional and may be refined on further study; they should be regarded as a general guide rather than a definitive statement. The number following the status code refers to the number of winters during this study that the species was recorded. The codes used are: R = Resident; PR = Presumed Resident; W = Winter visitor; w = winter straggler from summer or migrant populations; S = Summer visitor; M = Migrant; V = Vagrant; ? = status uncertain. Many species are given two or three codes, e.g. (RW) shows a resident species with additional winter birds arriving from outside.

GREAT CORMORANT *Phalacrocorax carbo* (Mw) (1) A single bird seen at Tikse on 2 December 1981 by the Southampton University party must have been a late passage migrant.

GREAT BITTERN *Botaurus stellaris* (V) (1) One was seen at Tikse on 14 November 1981 and one, probably the same bird, at Shey on 31 December 1981 and 8 January 1982. This bird spent the winter there (Williams and Delany 1985). This is the only record for Ladakh.

RUDDY SHELDUCK *Tadorna ferruginea* (Sw) (2) Two were seen on the pool at Sani, Zanskar, 4–7 February 1982, and two at Choglamsar on 4 February 1981. According to local people, some duck had been present on Sani pool all winter.

MALLARD *Anas platyrhynchos* (MW) (4) Some remain each winter. Recorded along the Indus, the lower Zanskar and on Sani pool. Usually in parties of 1–3 birds, but a flock of 14 was seen on the Indus three times in 1980–1981.

COMMON TEAL *Anas crecca* (Mw) (1) Five were seen on the lower Zanskar river on 24 February 1981 and three there on 27 February 1981. The dates would indicate that they were early spring migrants.

EURASIAN WIGEON *Anas penelope* (Mw) (1) One was seen on the Indus at Spituk on 19 February 1981.

NORTHERN PINTAIL *Anas acuta* (Mw) (2) Three were seen at Choglamsar on 19 February 1981, one on the lower Zanskar on 24 February 1981 and two on the Indus near Khalse on 24 February 1983.

COMMON POCHARD *Aythya ferina* (Mw) (1) A single bird was present on Sani pool, 4–7 February 1982.

COMMON MERGANSER *Mergus merganser* (R) (1) Some of the breeding population winter. Seen in small parties (1–4) along the Indus and Zanskar rivers and on Sani pool. Also recorded from localities in Tibet in December and January (Vaurie 1972).

NORTHERN GOSHAWK *Accipiter gentilis* (W/?) (3) Regular in winter in small numbers. Seen in the Indus valley plantations, around villages and occasionally in mountain valleys.

NORTHERN SPARROWHAWK *Accipiter nisus* (W/?) (3) There were three winter sightings, in January 1982, February 1983 and January 1984, at villages in the Indus valley. Williams and Delany (1986) say the species wintered in small numbers, 1981–1982.

LONG-LEGGED BUZZARD *Buteo rufinus* (MW) (3) Winters in very small numbers. One or two birds were present in the Indus valley between Tikse and Spituk in each of three winters.

GOLDEN EAGLE *Aquila chrysaetos* (R) (4) Widespread throughout the area. Recorded in winter from many localities in the mountains, but not seen along the floor of the Indus valley and unusual close to houses. One was seen attempting unsuccessfully to catch members of a flock of finches in flight.

LAMMERGEIER *Gypaetus barbatus* (R) (4) Widespread. Recorded throughout the study area, from the environs of villages to remote mountain valleys. Usually below 4,500m at this season, but occasionally soaring higher.

HIMALAYAN GRIFFON *Gyps himalayensis* (R) (4) Widespread. Winter distribution as for the Lammergeier, though not seen together except at carcases. Usually seen in pairs.

SAKER FALCON *Falco cherrug* (MW) (3) Passage migrant and winter visitor in very small numbers. Recorded around plantations and at villages along the Indus valley.

PEREGRINE FALCON *Falco peregrinus* (V) (1) A single bird was observed on a rocky ridge at 3,800m near Tharu in the Indus valley on 5 January 1984.

MERLIN *Falco columbarius* (MW) (3) Migrant and winter visitor in very small numbers. Recorded in the Indus valley between Tikse and Spituk.

HIMALAYAN SNOWCOCK *Tetraogallus himalayensis* (R) (4) Found widely over most of Ladakh, though not common. Some movement to lower altitudes is apparent in winter, but the species does not descend to the open floors of the main valleys, and was not seen to approach fields or settlements.

TIBETAN SNOWCOCK *Tetraogallus tibetanus* (PR) Recorded only from eastern Ladakh. No long-range migration by this species has been noted, so it is presumed to be resident there. A party of 20 was seen in Phoyul valley, near Meru, in November 1981, feeding along the valley bed at 3,800m and

approximately 500m away from a party of *T. himalayensis*.

CHUKAR *Alectoris chukar* (R) (4) Common and widespread. In winter frequents stony hillsides and valleys, descending regularly in parties of up to 20 to feed in village fields. Occasionally seen feeding on berries in *Hippophae* bushes.

TIBETAN PARTRIDGE *Perdix hodgsoniae* (R) Not seen. Recorded only in the eastern plateau area of Ladakh. Ali and Ripley (1968–1974) say it is resident there.

WATER RAIL *Rallus aquaticus* (V) (1) A single bird was observed on 8 February 1984 at Shey marsh.

COMMON COOT *Fulica atra* (Mw) (1) A single bird was observed on 8 January 1982 at Shey marsh. This species is a regular passage migrant.

NORTHERN LAPWING *Vanellus vanellus* (Mw) (1) A single bird was seen on 18 December 1981 at Shey marsh. It may have been a straggler from the autumn passage: 40 were observed at this locality on 21 November 1981, 13 on 27 November and eight on 28 November.

COMMON GREENSHANK *Tringa nebularia* (Mw) (1) A single bird was seen on 4 February 1981 at Shey marsh.

GREEN SANDPIPER *Tringa ochropus* (MW) (4) Winters in small numbers. Frequents open-water margins in the Indus valley. Also recorded in north-east Tibet in January (Vaurie 1972).

COMMON SANDPIPER *Actitis hypoleucos* (Mw) (1) A single bird was seen at Shey marsh on 3 December 1981. It was not seen there on subsequent visits and was probably a late passage bird.

SOLITARY SNIPE *Gallinago solitaria* (R) (4) Winters in small numbers. Usually found along open stretches of hill streams, 3,400–3,700m. Occasionally also on the floor of the Indus valley around Shey marsh.

IBISBILL *Ibidorhyncha struthersii* (R) (4) Winters in small numbers. Frequents shingle banks along the Indus, and one bird was observed at Sani pool on 5 February 1982. Some of the summer population may move to lower altitudes in winter.

TIBETAN SANDGROUSE *Syrrhaptes tibetanus* (R) Recorded at Leh in December (Vaurie 1972) and a party was seen near Tikse in January 1982 by C. Denby (University of Southampton Ornithological Project 1981–2, Preliminary Report). This species normally occurs only in eastern Ladakh and these records may represent local movements during severe weather. Outside winter, a party of 11 was seen at Gya on 17 and 18 November 1981 feeding in village fields (see Plate).

SNOW PIGEON *Columba leuconota* (R) (3) Winters in very small numbers. Records from three winters of one or two birds feeding in fields with flocks of

other *Columba* spp. The Snow Pigeon is generally scarce in the Indus valley and mountains of central Ladakh throughout the year. It appears to be commoner in the Suru valley (Holmes 1986).

ROCK PIGEON *Columba livia* (R) (4) Common around villages, where large feeding flocks gather. It was not seen in Zanskar in winter and is unusual in the mountains. Often in mixed flocks with the next species.

HILL PIGEON *Columba rupestris* (R) (4) Common resident. In winter seen in small parties and large flocks around settlements, often feeding in fields. Also seen in mountain valleys away from habitation and recorded in Zanskar in winter.

LAUGHING DOVE *Streptopelia senegalensis* (W) (3) Winter records were of two birds seen in Leh seven times between 2 December 1981 and 10 January 1982, two at Bazgo on 23 February 1983, and one in a plantation at Shey on 3 January 1984.

TIBETAN (LONG-BILLED) LARK *Melanocorypha maxima* (PR) Not seen. Recorded in Ladakh only in the eastern plateau area (Ali and Ripley 1968–1974). There are no reports of long-distance migration and it is presumably resident there.

HORNED LARK *Eremophila alpestris* (R) (4) Winters in large numbers. Found on open ground in valley bottoms, on hill slopes and fields. Avoids

Plate. Tibetan Sandgrouse *Syrrhaptes tibetanus* at Gya, Ladakh. (Photo: D. P. Mallon)

precipitous, rocky areas and was not recorded in Zanskar, possibly because of the heavy snow cover. Occurs in both small parties and large flocks. One flock of over 300 birds was seen near Tikse on 3 December 1981. It is possible that the winter population contains some birds from nearby parts of the Tibetan plateau.

ROSY PIPIT *Anthus roseatus* (Sw) (1) Apparently a winter straggler. Four were seen at Shey marsh on 3 December 1981 and six at the same locality on 8 January 1982.

GREY WAGTAIL *Motacilla cinerea* (Sw) (4) A few birds stay on for the winter. Seen along streams at 3,500–3,600m along the Indus valley. Recorded each year in Leh.

WHITE WAGTAIL *Motacilla alba* (SMw) (3) A common summer visitor and passage migrant. In winter it was seen four times between Shey and Spituk and twice in Leh.

COMMON STARLING *Sturnus vulgaris* (Mw) (2) Two were seen at Choglamsar on 2 December 1981 and one at Choglamsar on 15 January 1983. It is regular on passage.

BLACK-BILLED MAGPIE *Pica pica* (R) (4) A common resident in all villages along the Indus valley and its tributaries east to Meru and Gya, also in the Markha valley, Chiling and the area south-west of Khalse. Not yet recorded from Zanskar, but two were observed in Nierak, halfway up the Zanskar gorge on 31 January 1984, and not far from the northernmost villages of Zanskar, so it could spread there soon.

RED-BILLED CHOUGH *Pyrrhocorax pyrrhocorax* (R) (4) Common resident. In winter it frequents settlements, valley bottoms and the lower hills up to 3,750m. Often feeds in fields and gardens and seen daily in Leh. Rarely seen in remote mountain areas at this season. Seen in pairs and flocks up to a maximum of 300.

YELLOW-BILLED CHOUGH *Pyrrhocorax graculus* (R) (4) Common resident. Recorded in winter over the whole area in a variety of habitats: cliffs and gorges, mountain valleys, fields and settlements. It is not common along the Indus valley plantations and does not often feed around houses, though a flock of up to 100 was regularly seen around an Indian Army transit camp at Phyang, south-west of Leh. In Zanskar it is more often associated with villages. Overall, twice as many *P. graculus* as *P. pyrrhocorax* were seen. The two species were not observed in mixed flocks.

COMMON JACKDAW *Corvus monedula* (V) (1) A single bird was seen at 3,600m at a village in the Hemischu valley on 2–3 January 1982. Vaurie (1972) gave three records for Ladakh, in spring and summer, and Osmaston (1925) observed a flock at Kargil in May.

CARRION CROW *Corvus corone* (R) (4) Common resident in the villages of

the Indus valley, but less widespread than the Black-billed Magpie. Seen feeding in pairs and small parties in fields. A winter roost in Leh regularly contained up to 250 birds.

COMMON RAVEN *Corvus corax* (R) (4) Widespread resident. Found in winter singly or in pairs throughout the area, in the mountains, remote valleys and around villages. Seen on most days in Leh.

WHITE-THROATED DIPPER *Cinclus cinclus* (R) (4) Winters in small numbers. Mostly found by hill streams at 3,500–3,700m, but also on occasion by the Indus and Zanskar rivers.

BROWN DIPPER *Cinclus pallasii* (R) (4) Regular in winter and commoner than the last species (seen in the ratio 3:1). Recorded equally along hill streams and the major rivers. Seen in the Indus valley area, all along the Zanskar gorge and in Zanskar.

NORTHERN WREN *Troglodytes troglodytes* (R) (4) Small numbers were seen each winter around villages (scrub, terrace walls) in the Indus valley.

ALPINE ACCENTOR *Prunella collaris* (W) (2) One was observed in the Matho valley (3,850m) on 9 January 1982, two in the lower Zanskar valley on 13 February 1982 and one at Tikse on 20 February 1983. The first three birds were in rocky habitats and the last was feeding on the monastery roof with three other *Prunella* spp. Williams and Delany (1986) reported this species at Tikse in mid-winter 1981–1982.

ROBIN ACCENTOR *Prunella rubeculoides* (RW) (4) Very common in winter, recorded throughout Ladakh and Zanskar. Moves down in autumn from its breeding areas to villages and scrub patches in the valleys. Frequently seen feeding in gardens and in Zanskar closely associated with houses. Unusual in the mountains at this time. There appears to be an influx of winter birds from outside Ladakh.

BROWN ACCENTOR *Prunella fulvescens* (R) (4) An altitudinal migrant, with additional birds from outside Ladakh. Very common in winter throughout the Indus valley and central mountain areas, but was not seen in the Zanskar plain. Affects trees and bushes in remote mountain areas, villages and valley bottoms. Much less often seen around houses than the Robin Accentor. Very common in the Indus valley plantations (Williams and Delany 1986). In total, approximately equal numbers of Brown and Robin Accentors were seen over the four winters.

BLACK-THROATED ACCENTOR *Prunella atrogularis* (MW) (2) A single winter bird was seen at Tikse on 20 February 1983. Several were ringed there on autumn passage in 1977, 1980, 1981 and during winter 1981–1982 (Delany *et al.* 1982, University of Southampton Ornithological Project 1981–2, Preliminary Report).

STOLICZKA'S (WHITE-BROWED) TIT-WARBLER *Leptopoecile sophiae*

(R) (4) Regular in winter in small numbers. Recorded at many localities in valley-bottom scrub, especially in dense stands of *Hippophae rhamnoides*.

RED-THROATED FLYCATCHER *Ficedula parva* (Mw) (1) A single bird was observed in a Leh garden on seven days between 8 and 19 December 1981. Vaurie (1972) says the species is reported as breeding in Ladakh, as does Ripley (1982), but the locality he quotes, at 1,800 m, is clearly not in Ladakh. Ali and Ripley (1968–1974) say that it has been recorded in Ladakh only as a passage migrant, which is most likely to be its status: there is very little insect life in Ladakh in winter and little chance of survival for potential wintering birds.

EVERSMANN'S REDSTART *Phoenicurus erythronotus* (V) (1) Two males were observed at 3,400 m in the Hemischu valley on 6 February 1981 and one in the same locality five days later, the first records for Ladakh. It has been recorded in Baltistan, to the north-west (Vaurie 1972).

GÜLDENSTÄDT'S REDSTART *Phoenicurus erythrogaster* (RW) (4) Abundant in winter, the small summer population swollen by winter visitors. An altitudinal migrant, seen in the valley bottoms from late September on. It is invariably associated with bushes of *Hippophae rhamnoides* and can be found wherever the latter grows, in and around villages and in valley bottoms. The greatest concentrations occur along the floor of the Indus valley between Tikse and Spituk where dense stands of this bush are found. Daily counts in the area regularly exceeded 100, and 170 birds were counted one afternoon at Choglamsar; 3,489 were ringed or marked at Tikse in 1981–1982 (University of Southampton Ornithological Project 1981–2, Preliminary Report). Birds were also seen in remote mountain valleys where *Hippophae* grew, and in small numbers in Zanskar. Some remain at low altitudes until the end of April. Ludlow (1950) said that in winter the species 'swarms' in the parks and *Hippophae* thickets of Lhasa, Tibet.

RIVER CHAT *Thamnolaea leucocephala* (Sw) (1) A single bird was observed by a stream at a village in the Hemischu valley on 7 February 1981, the only winter record. It is a summer visitor in small numbers, recorded widely throughout the area.

DARK-THROATED THRUSH *Turdus ruficollis* (W) (4) The black-throated form is regular and not uncommon in winter in the plantations and scrub of the Indus valley, especially areas with *Hippophae*. Daily totals of 6–15 were seen. A single winter red-throated bird was seen at Shey on 2 December 1981.

DUSKY THRUSH *Turdus naumanni* (V) (1) Seen at Tikse in 1981–1982 (Williams and Delany 1986).

SONG THRUSH *Turdus philomelos* (V) (1) A single bird was present at Tikse from mid-November on, and was ringed later in the winter (Williams and Delany 1986).

BLUE WHISTLING THRUSH *Myophonus caeruleus* (Sw) (2) One was seen at Chiling on 28 February 1981 and one in Leh on 1 January and 13 February 1984. It occurs in summer in small numbers throughout the area.

LITTLE FORKTAIL *Enicurus scouleri* (V) (1) A single bird was observed by myself and Chering Nurbu by a stream at 3,400 m in the Indus valley near Khalse on 14 January 1984. The only other record for Ladakh is of a pair in the Suru valley on 23 July 1977 (Williams and Delany 1979).

RUFOUS-NAPED TIT *Parus rufonuchalis* (?) (1) Status uncertain. Two were seen and photographed on 28 January 1984 and one seen on 30 January 1984, in remote side-valleys along the Zanskar gorge. Both were at about 3,800 m in patches of trees (one in juniper, the other in mixed willow and birch). It has not been recorded previously in Ladakh. Given that it does not normally undertake long-distance migrations, it may well be resident in these areas, perhaps a relict population from a time when Ladakh had more tree cover. According to Vaurie (1972) it is known in Baltistan and western Tibet, and Whistler (1925) said it was common in the juniper woods of Lahul, to the south-east of Ladakh.

GREAT TIT *Parus major* (R) (4) Regular in winter in villages and plantations along the Indus valley, but not seen in the villages of Zanskar.

WALLCREEPER *Tichodroma muraria* (R) (4) Seen in small numbers in Leh, villages and rocky valleys (up to 4,000 m in January).

BAR-TAILED TREECREEPER *Certhia himalayana* (V) (1) A single bird was seen in Leh by Chering Nurbu on 10 February 1981 and by me on 13 February. There are two previous records for Ladakh, in April and November (Vaurie 1972).

HOUSE SPARROW *Passer domesticus* (R) (4) Regular in winter but apparently in smaller numbers than during the summer. Found in villages and plantations in small groups and large flocks. In Zanskar, only one bird was seen, the summer population having apparently moved to lower elevations.

SPANISH SPARROW *Passer hispaniolensis* (V) (1) A few recorded at Tikse in late winter 1981–1982 (Williams and Delany 1986) are the only records for Ladakh.

ADAMS'S (BLACKISH-WINGED) SNOWFINCH *Montifringilla adamsi* (R) (4) A common altitudinal migrant, regularly seen in winter. Seen on snow-free ground on hill slopes, in valley bottoms, in open parts of the Indus valley and around villages. In Zanskar it is common around houses. Several flocks containing over 100 birds were observed.

BLANFORD'S (PLAIN-BACKED) SNOWFINCH *Montifringilla blanfordi* (?) Not seen in winter. Three birds were seen and photographed at Gya on 18 November 1981 around village fields, and Vaurie (1972) gives four records

from eastern Ladakh, in summer and autumn. No long-range migration has been noted, and this species probably also winters in eastern Ladakh.

RED-FRONTED SERIN *Serinus pusillus* (R) (4) Quite common in winter. Small parties were recorded widely around villages, on open ground and in mountain valleys.

EURASIAN GOLDFINCH *Carduelis carduelis* (Sw) (1) Two were seen in Leh on 10 January 1983 and one there on 14 January. These seem to be the only records for the Indus valley area at any time of year. It is fairly common in summer in the Suru valley and in Zanskar, but none was seen in the latter area in winter.

TWITE *Acanthis flavirostris* (R) (4) A few flocks, the largest containing 85 birds, were seen each winter at Leh, Shey and other villages.

PLAIN MOUNTAIN FINCH *Leucosticte nemoricola* (?) (1) Common in summer throughout the area, but only recorded during one winter, 1983–1984, when flocks of 60 and 100 birds were seen in fields in the lower Indus valley, and a flock of 30 at Nierak. It is unclear whether the species was overlooked in other winters or normally leaves the area.

BRANDT'S MOUNTAIN FINCH *Leucosticte brandti* (R) (4) Seen in small numbers in mountain valleys, on open stony ground and along field margins, but more often found away from villages than most other passerine species. Occasionally descends to the Indus valley floor in severe weather.

MONGOLIAN FINCH *Bucanetes mongolicus* (W) (3) Seen on stony ground, in rocky valleys and, rarely, at village margins, and observed at various points in the Indus valley, Markha valley and Zanskar gorge. Seen in pairs and large flocks: over 150 were observed feeding on a bare slope at the summit of a pass (4,200 m) on 16 January 1984. Said to be quite common at Tikse in early summer (Williams and Delany 1986).

COMMON ROSEFINCH *Carpodacus erythrinus* (Sw) (1) A winter straggler. Four seen at Sabu near Leh on 29 January 1981, and two at Tikse on 20 February 1981. It is an abundant summer visitor to the whole of Zanskar and Ladakh.

STREAKED ROSEFINCH *Carpodacus rubicilloides* (RW) (4) An altitudinal migrant, common in winter around villages and in plantations and thickets in river valleys. Numerous between Tikse and Spituk, but not seen at this season in mountain valleys or in Zanskar. Williams and Delany (1986) say that some of the wintering birds come from the Tibetan plateau, which is highly likely in view of the small summer population in the study area.

GREAT ROSEFINCH *Carpodacus rubicilla* (RW) (4) An altitudinal migrant, more widespread but fewer in number than *C. rubicilloides*. Recorded at many localities in the Indus valley, Zanskar gorge and villages of the Zanskar plain. Much more a mountain bird than the last species,

occurring in rocky valleys, remote mountain areas and on bare stony slopes, as well as at village margins and in trees and scrub in valley bottoms. It is a rather uncommon and local breeding bird and the winter population appears to be increased by birds from outside Ladakh.

PINE BUNTING *Emberiza leucocephala* (W) (3) Between one and five birds were recorded in each of three winters at four villages in the Indus valley and at Chiling. One bird was feeding in a garden, the others were in *Hippophae* bushes. Williams and Delany (1986) said that small numbers roosted in the Tikse plantation from November on.

YELLOWHAMMER *Emberiza citrinella* (V) (1) A single bird was seen at Tikse in December 1981 (Williams and Delany 1986).

REED BUNTING *Emberiza schoeniclus* (V) (1) Occurred very occasionally at Tikse in 1981–1982 (Williams and Delany 1986).

DISCUSSION

Around 275 bird species have been recorded in Ladakh to date, and the 84 listed here represent 30.5% of that total. Of these 84, 46 were seen in three or four winters and, plus four presumed residents (Tibetan Snowcock, Tibetan Partridge, Tibetan Sandgrouse, Tibetan Lark), are regarded as regular in winter, making a total of 50 regular winter species. Seventeen species were represented by a single bird seen over four winters: eight of these are vagrants, eight are regular passage migrants, and one is a summer visitor. The remaining 17 species were recorded in one or two winters and more than one individual was seen. Some of these are also likely to be vagrants (e.g. Eversmann's Redstart), some are irregular winter visitors and stragglers, and several may turn out to be regular winterers (e.g. Alpine Accentor, Black-throated Accentor, Rufous-naped Tit, Blanford's Snowfinch).

Detailed analysis of the winter avifauna is complicated by lack of accurate census data on individual species and the difficulty in separating summer, winter and migrant populations. However, the 50 regular wintering species may be further broken down as follows. Nine species are migrants and winter visitors (Mallard, Long-legged Buzzard, Saker Falcon, Merlin, Green Sandpiper, Laughing Dove, Dark-throated Thrush, Mongolian Finch, Pine Bunting). Two species are migrants and summer visitors to the study area, of which a few birds overwinter (Grey Wagtail, White Wagtail). Three species (Common Merganser, Solitary Snipe, Stoliczka's Tit-Warbler) are reported as breeding or probably breeding in Ladakh by Ali and Ripley (1968–1974). They were not observed in the study area during the summer, and winter individuals are probably altitudinal migrants from nearby parts of the Tibetan plateau, but some may originate from non-local sources. Five species are summer breeders augmented by large numbers of winter visitors (Robin Accentor, Brown Accentor, Güldenstädt's Redstart, Streaked

Rosefinch, Great Rosefinch). Twenty-five are resident species with no apparent changes in population from summer to winter, and the four presumed residents are assumed to have stable winter populations. The precise status of two species (Northern Goshawk, Northern Sparrowhawk) is unclear: both are commoner in winter, but records from the summer months suggest that one or both may breed in Ladakh.

Most wintering species arrive by late September–early October, and some are present until the end of April–beginning of May, with considerable overlap in each case with summer visitors. However, spring migration begins by the end of February and is well under way during March, and many winter birds begin to leave at this time.

The majority of wintering birds are concentrated in a narrow altitudinal band in the main river valleys and around villages where fields and trees provide food and shelter. In remote mountain areas the only species seen regularly and widely in winter are Golden Eagle, Lammergeier, Himalayan Griffon, Himalayan Snowcock, Yellow-billed Chough, Brandt's Mountain Finch, Mongolian Finch and Great Rosefinch, with Brown Accentor, Güldenstädt's Redstart and Stoliczka's Tit-Warbler in scrub patches and the two dipper species on open streams. Hill Pigeon, Horned Lark, Adams's Snowfinch and Red-fronted Serin are occasionally seen in such areas.

Few comparisons with other areas can readily be made. Ludlow (1950) reported on a three-year stay in Lhasa and included comments on several species that wintered there. Lhasa, like Ladakh, lies in the Outer Plateau zone, but evidently has a milder climate.

There is plenty of scope for further work in Ladakh: a single observer may well have overlooked some species in such a large area, and other vagrants and winter stragglers will no doubt turn up, while more research could clarify the status of some species recorded so far. An obvious line of enquiry would be a survey of the winter avifauna of the Suru valley in western Ladakh, which would usefully complement the report by Holmes (1986), and ornithological investigations of the eastern plateau and Nubra-Shyok valleys would be of great interest, if these areas were ever opened to visitors.

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The discovery of Storm's Stork *Ciconia stormi* in Thailand

SEUB NAKHASATHIEN

A nesting pair of Storm's Storks *Ciconia stormi* was found in lowland rainforest at Khlong Mon, a tributary of the Khlong Phra Saeng, Khlong Saeng Wildlife Sanctuary, Surat Thani province. The nest and young are described. The entire lowland area, the last extensive piece of lowland rainforest in Thailand, has since been inundated by the Chiew Larn Reservoir and it is feared that the species, newly discovered for Thailand, could become extinct there. Recommendations for the conservation of the species are made.

Storm's Stork *Ciconia stormi* is known from Borneo (Smythies 1981), Sumatra (White 1974) and peninsular Malaysia, for which Medway and Wells (1976) listed only five records. Since that time, however, probably owing to increased coverage and improved knowledge of the identification features of the species, one or two birds have been recorded in most years from peninsular Malaysia (Wells 1982 and *in litt.*). However, the breeding record from peninsular Thailand described below represents a northward extension of the known breeding range by over 500 km.

Although Chasen (1935) had previously treated *C. stormi* as a distinct species, Kahl (1972) retained it as a subspecies of the Woolly-necked Stork *C. episcopus*. Holmes (1977), however, provided positive evidence for the sympatry of both Storm's and Woolly-necked Storks in Sumatra, indicating that the two forms are distinct species which are ecologically segregated. He found *C. stormi* in dense forests while *C. episcopus* occurred in open swamp, rice paddy, grassland and dry cultivated areas. There are also records of *C. episcopus* for peninsular Thailand: from Phuket (Müller 1882); from Surat Thani province and the island of Ko Samui (Robinson 1915a,b); from Trang, where Riley (1938) lists five specimens, and from Krabi and Yala (Medway and Wells 1976). Both *C. stormi* and *C. episcopus* may, therefore, have co-existed in peninsular Thailand too, though *C. episcopus* appears to have been lost. The report of a colony of *C. episcopus* in Songkhla province (Medway and Wells 1976) is unsubstantiated; certainly the species is not listed for this region by TISTR (1981). Robinson (1915a) indicated that *C. episcopus* frequented rice fields in Bandon (now Surat Thani) province, and this suggests that both *stormi* and *episcopus* were segregated by habitat in peninsular Thailand, as in Sumatra. Moreover, the distinctive plumage and bare part colours of the Storm's Storks observed in Thailand reaffirm its status as a full species.

THE FIND

Since 3 April 1986, I have been engaged on a programme of the Wildlife

Conservation Division, Royal Forest Department, to capture and translocate wildlife trapped by the rising waters of the newly constructed Chiew Larn Reservoir in Surat Thani province, southern Thailand. This reservoir, when full, will flood 165 km^2 of land below 95 m a.s.l. along the Khlong Phrasaeng and its tributaries, within the contiguous Khlong Saeng Wildlife Sanctuary (1,236 km^2) and Khao Sok National Park (645.5 km^2). Dam construction was approved in February 1982 following an environmental impact assessment (Anon. 1980). In the four years before inundation of the area commenced in April 1986, forest areas below 100 m elevation were logged. This process is still continuing.

In the course of capturing and relocating mammals, birds and reptiles trapped on the 241 islands created by the rising floodwaters, my team and I travelled by motor boat around most of the reservoir basin. On 27 September 1986, I saw a bird which I first thought was a hornbill landing in a tall dipterocarp tree protruding from the floodwaters. After checking the bird with binoculars, I realised that it was a stork with a bright orange bill. The bird jumped along the branch to a major fork and sat down on a large, bulky nest. A second bird, after circling, glided down to another, similarly flooded dipterocarp tree 70 m from the first. After consulting King *et al.* (1975), I identified the bird as *Ciconia (episcopus) stormi* on the basis of its bright orange-fleshy bill and black sides to the neck.

I visited the site again the following day when I found a second, old, unoccupied nest on another dipterocarp, 200 m from the first. Thereafter, I visited the site on 15, 17 and 21 October, each time for less than 15 minutes, in order to avoid causing disturbance. On every occasion, one member of the pair was incubating. Even though the floodwaters were steadily rising, the leaves of the tree remained green and shaded the nest. When I revisited the nest on 24 October (i.e. 27 days after the nest was first located) two small chicks could be seen. These were presumed to have hatched sometime during 21–24 October. I set up a blind on my boat, and moored under the shade of a tree about 100 m from the stork nest. The nest was no more than 15 m above the water surface and, by using a 1200 mm telephoto lens, I was able to take a number of photographs of the chicks and an adult in attendance (see Cover).

I visited the site again on 13 November but was unable to return until 22 November, when I observed that the nest had been destroyed; no storks were to be seen in the vicinity. While I considered that the young might have been eaten by a predator, I thought it more likely that they had been stolen by villagers. Although I had been careful not to draw attention to the nest, many villagers travel around the reservoir by boat and could have seen the nest by chance. Early in the morning of 23 November, a man came to tell me about a Tapir *Tapirus indicus* and a Gaur *Bos gaurus* which had become trapped on islands. I told him about the disappearance of the stork chicks and he promised to make enquiries of the villagers at the Chiew Larn Resettlement Village, near the dam site. He returned that evening, having located the birds. He took us to the house of the deputy village headman who

said he could return the chicks, but requested us not to penalise the man who had taken them. The chicks had been released on a small stream behind a house and, since it was dark, we had to search the dense streamside vegetation for almost one hour with flashlights before we could locate them. One of the birds had evidently sustained a broken mandible during capture from the nest, as the villager had used a 12m long bamboo pole to dislodge both nest and birds from the tree. Although both birds could walk, using their spread wings to aid balance, they were still very young and we considered that their chances of survival would be poor if we released them back into the forest. That same evening we took the birds to the Nature and Wildlife Educational Center at Khao Tha Phet, Surat Thani. They were placed in a $6m^2$ aviary and supplied with a flat bamboo basket, lined with sawdust. The birds remained in the basket, standing up and calling when anyone approached the aviary. Both birds could walk in order to take freshwater fish, which had been cut into small pieces, from their keeper. Subsequently they were moved to a larger aviary.

THE NEST

The nest was situated 19m up in a major fork of the eastern branches of a 27m tall *Dipterocarpus baudii* Korth., on the bank of the Khlong Mon, a tributary of the Khlong Phra Saeng, at 69m a.s.l. (9°05'N 98°30'E). When first discovered, the nest was only 15m above the surface of the water. It consisted of a flat platform, 15cm deep, with an external horizontal diameter of 50cm. It was constructed mainly of dry sticks 15–60cm in length, some of which were recognised as coming from trees of the families Loranthaceae, Dipterocarpaceae and Rubiaceae. The floor of the nest was lined with dry leaves and some down.

The second, unoccupied, nest was similar but situated in the topmost branches of a 30m tall dipterocarp. These appear to be the first descriptions of the nest of Storm's Stork.

DESCRIPTION OF THE ADULTS

The identification features of Storm's Stork are not well known and in the past ignorance has led to its confusion with the Woolly-necked Stork. Both species show a black body and wings, contrasting with a white belly and undertail-coverts. Storm's Stork differs, however, in having black sides to the neck and foreneck. The only white on the head and neck is restricted to the cheeks and nape and to a very narrow wedge extending down the midline of the foreneck for the upper third of its length. The tail pattern differs in that the outer pairs of tail feathers are black, but this feature is difficult to see except in flight. However, the most distinctive features of the birds I saw

were the bright orange-flesh bill and bright yellow orbital skin. The legs were pale orange and the facial skin dull orange. The sexes are similar.

DEVELOPMENT OF THE YOUNG

The chicks were first seen on 24 October, when believed to be 1–3 days old. Both were covered in white down, but showed a black bill and naked black crown. During 20 minutes' observation, when attended by a single parent, they moved around frequently, but crouched down and remained motionless on the floor of the nest when the loud calls of a Crested Serpent-Eagle *Spilornis cheela* could be heard.

By 13 November, the chicks had roughly doubled in size and black feathers could be seen emerging through the white down on their throats, wings and bodies. A yellow tip to the bill could be seen together with pale yellow facial skin and bright yellow gular skin. Sometimes the birds stood erect and spread their wings. Although unattended by the parents during the period of observation, they still lay flat and motionless on the nest floor in response to unfamiliar sounds. There was a noticeable size difference between the two chicks. By roughly 30 days after hatching the areas of black feathering had greatly increased and both chest and wing coverts were glossed with bronze-red and green. After 45 days, the birds resembled the adults, although they were still very much smaller with shorter bills, some small patches of down were still present, the facial skin was paler yellow and the bill was dull orange-flesh with the distal third being dusky. The birds differed additionally from the adult in that the black feathering on the head extended below the eye to the base of the bill. The legs were dark greyish-flesh initially, but the lower tarsus became dull reddish-orange after about three weeks. When 90 days old, the captive chicks were able to fly for a short distance and the individual which had sustained the damaged bill was able to feed normally. Throughout the period of study, the chicks called with loud, harsh *krack*, *krack*, *krack* notes.

ECOLOGY

Prior to the construction of the Chiew Larn Dam, no more than 21 km^2 of the basin, most of which lay within 100 m of the banks of the main rivers, had previously been cleared and settled by 283 households, and most of the lowland area was still covered by what Whitmore (1975) termed semi-evergreen rainforest. The forest comprised three strata, with many huge trees. These included *Hopea ferrea*, *Cynometra bijuga*, *Dipterocarpus* spp., *Mesua ferrea* and *Ficus* spp. The density of trees having a diameter exceeding 10 cm at breast height was roughly 500–800 trees per hectare and the canopy cover was 80–90% of the total area. The undergrowth consisted

predominantly of rattans and other palms, bamboos, shrubs and climbers (Anon. 1980). The soils were chiefly fertile alluvium. The valley floor was only 13.5 m above sea level in its lowest parts, varying from roughly 5 km in width to less than 100 m on the upper reaches of some tributaries.

The number of Storm's Storks in the area, even before the construction of the dam, must have been very small, with the population having perhaps been slowly reduced by hunting over a period of decades. The deputy village headman, who formerly lived near the nest site, reported that he had once seen four Storm's Storks feeding along a tributary of the Khlong Mon, before he moved out of the area in 1985. The local name, 'nok kra su-um', refers to the birds' way of fishing, by quiet stalking, along the bank of a stream in dense forest. He also mentioned that the species was difficult to shoot because it was extremely shy.

CONSERVATION ASPECTS

After dam construction was approved, there was a great increase in human activity in the area. The villagers were evacuated and resettled outside the area of impoundment; roughly half of the area (72 km^2) was clear-cut, of which 40 km^2 were burnt. Despite this, the remaining areas of selectively logged lowland forest, below 100 m but above the zone of inundation, still supported a great many forest birds during 1986 and 1987. Besides Storm's Stork, many other lowland specialists listed by Wells (1985 and *in litt.*) were recorded, including Crested Fireback *Lophura ignita*, Malaysian Peacock-Pheasant *Polyplectron malacense*, White-fronted Scops Owl *Otus sagittatus*, Black Hornbill *Anthracoceros malayanus* and Ferruginous Babbler *Trichastoma bicolor*, all of which are considered to be threatened in Thailand (Round in press).

The impact of the Chiew Larn Dam upon the lowland bird community was never assessed. It was stated (Anon. 1980) that 'in regards to birds . . . including crested fireback pheasant, the adverse effects of the impoundment are likely to be minor, because most birds are mobile and able to flee away in the event of flooding'. The study identified those common and ecologically tolerant species such as Chinese Pond-Heron *Ardeola bacchus* and Black-capped Kingfisher *Halcyon pileata*, which might arguably benefit from the creation of the reservoir, but never mentioned that many resident, lowland forest species might be expected to perish. Even though the reservoir, when full, will flood only a small proportion of the surrounding forest area, estimated by Round (in press) as covering over 4,000 km^2 in 1984, most of this area is steeply mountainous, rising to 1,395 m, with large areas of sheer limestone crags, and is clearly unsuitable for Storm's Stork and other lowland bird species. The impact assessment made no mention of the fact that the dam would inundate the only extensive tract of lowland, valley-bottom rainforest within any protected area in southern Thailand.

Since the beginning of inundation, in April 1986, ease of access by boat into previously remote areas has greatly increased, and many rural people from Surat Thani and neighbouring provinces have entered the reservoir in order to fish and to cut timber and rattans. Of 298 villagers around the reservoir in February 1987 who were interviewed by my team, half had moved to the area from other provinces since inundation. Permits to cut rattans in the reservoir basin have since been granted to 200 more people. In theory, such villagers are only permitted to cut in the concession areas, up to the 100 m contour, but in practice, because of the reservoir's long perimeter, this regulation is difficult to enforce and much illegal hunting and collection of forest products are taking place in both Khao Sok National Park and Khlong Saeng Wildlife Sanctuary. Thus, even if Storm's Stork and other vulnerable lowland forest birds are able to utilise the reservoir margins, they face a grave risk from hunters.

Storm's Stork is thought to be at risk throughout its range due to lowland forest destruction (King 1978–1979). The following measures should be urgently implemented in the hope that those parts of the Khlong Saeng Basin outside the inundation zone, and perhaps elsewhere, may continue to support Storm's Stork and other lowland rainforest birds.

1. Access to the site by villagers should be strictly limited and all activities, other than fishing, should be banned. Each fisherman, together with his place of residence, should be recorded.
2. The quality and regularity of surveillance by Forest Department officials should be increased.
3. Storm's Stork should be added to the list of protected wild animals under the Wild Animals Reservation and Protection Act, B.E. 2503.
4. Searches for Storm's Stork and other lowland rainforest birds should be conducted elsewhere in southern Thailand, with a view to extending the boundaries of existing parks and sanctuaries to include additional lowland forest regions, wherever feasible.
5. Measures for the rehabilitation of the two captive Storm's Storks should be considered, although it may not be feasible to reintroduce these birds, which have become very tame, into the wild.

Many people assisted me in making the discovery and in recovering and caring for the stolen chicks. I would like to thank my colleagues in the Wildlife Conservation Division: Ms Sumaree Chiputpanich, Mrs Tuangrat Pothieng, Mr Tunya Jundart, Mr Vatee Virakigosol, Mr Sawai Wanghongsa, and all of my assistants. I also thank Mr Pirom, the villager who discovered the whereabouts of the stolen chicks, and Mr Liend, the deputy village headman who returned them. Mr Kitti Bunyarak and others cared for the chicks at the Khao Tha Phet Nature and Wildlife Educational Center in Surat Thani. Mr Punya Chaiyakuum made a fibre gape for the chick with the broken mandible. I also thank Dr D. R. Wells for his comments and for his assistance in locating references and Philip Round for helping me draft the manuscript and for correcting my English.

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Notable bird observations from Brunei, Borneo

CLIVE F. MANN

Some of the more interesting distributional records of birds for Brunei in the last few years are provided, including the first record for Borneo of the Great Bittern *Botaurus stellaris* and of the Brown-chested Flycatcher *Rhinomyias brunneata*. A record of breeding by the Oriental Pratincole *Glareola maldivarum* on Borneo is also included.

This paper records some of the more interesting new distributional records, and one breeding record, for Brunei, Borneo, in the past few years. In the last decade or so there have been a number of persons interested in birds, spending periods of varying length in the country, and in some cases publishing their observations. However, much of Brunei is still unexplored, or underexplored, ornithologically. In an attempt to collate all available knowledge on bird distribution in the country, I recently wrote an annotated checklist of the birds of Brunei (Mann in press), with the cut-off date July 1986. Some observations in this paper also appear there in less detail.

It will be noted that the Wasan Rice Scheme features prominently in this paper. With much of Brunei being covered by one form of forest or another in the past, open country species are comparatively few. However, swamps, lakes and paddyfields are important for birds associated with water, both migrant and sedentary. With increasing affluence, there has been a tendency to abandon rice growing, and the fields rapidly revert to grassland and scrub, which is not attractive to a great variety of species. However, government rice-growing schemes have been developed, of which Wasan (4°45′N, 114°50′E), situated approximately 17 km south-west of Bandar Seri Begawan, is the most important ornithologically, being of sufficient size and diversity of habitat to attract a variety of migrant herons, waders, rallids (e.g. Baillon's Crake *Porzana pusilla*, Watercock *Gallicrex cinerea* and Common Moorhen *Gallinula chloropus*) and warblers, and a few ducks and raptors (e.g. Marsh Harrier *Circus aeruginosus*, Peregrine Falcon *Falco peregrinus* and Eurasian Kestrel *F. tinnunculus*).

The total area of the scheme is approximately 400 ha, and development began in the late 1970s. There is a large central reservoir, formed by a dam across a stream, which has typical swamp vegetation. The rest of the area consists of rice at various stages of development, bare mud awaiting planting, ploughed land, and areas left fallow which have reverted to grassland and scrub. In early 1987 a number of fields were planted with melons. The proportions of the different habitats vary through the year, and from one year to another. Numerous irrigation ditches form a grid across the whole area.

In this paper, observers referred to by their initials are: Patricia Cox (PC), Simon Cox (SC), J. Elkin (JE), D. Harvey (DH), M. Harvey (MH), John

McKean (JM), Clive F. Mann (CFM), A. Conrad Ozog (ACO) and Kathleen Shurcliffe (KS).

SYSTEMATIC LIST

GREAT BITTERN *Botaurus stellaris* Wasan Rice Scheme: one on 17 January 1987 (ACO, JM and KS). It was seen again on about 2 March 1987 (P. Waggitt). There is one record for Singapore, autumn 1908, and one for Malacca, West Malaysia, 3 March 1909 (Medway and Wells 1976), i.e. in a single winter; one for Luzon (Philippines) on 12 March 1905 and one of five birds on Palawan (Philippines) on 14 February 1979 (Kennedy *et al.* 1986). This species normally winters south to Viet Nam, Cambodia and Hong Kong (King *et al.* 1975). The bird seen was clearly not an American Bittern *B. lentiginosus* because it lacked black primaries, and it was considered not to be the Australasian Bittern *B. poiciloptilus* by JM who knows this latter species well. Characters noted included the distribution of black on the head, and the ochraceous area on the wing.

LESSER TREEDUCK *Dendrocygna javanica* Kilanas (4°45'N 114°51'E): one found in a moribund condition at the Government Rice Scheme on 22 November 1986 is now in the collection of the Brunei Museum. In Borneo this species was hitherto only known from Bandjarmasin ('very common'), Bangkau Lake (flock of several hundred) and off Bako National Park (90–100, 20 July 1958) (Smythies 1981). The first two localities are in Kalimantan, and the last in Sarawak.

NORTHERN SHOVELER *Anas clypeata* Wasan Rice Scheme: an eclipse male on 17 January 1987 (JM, ACO and KS). The previous Borneo records are from Sarawak, i.e. Kuching on 24 December 1894, two at Trusan on 25 November 1902, Sundar on 26 November 1935, Sibu undated (Smythies 1957); and Sabah, i.e. seven at Tampassak Plains on 8 March 1982 (F. H. Sheldon pers. comm.) and one from Padas Damit on 8 December 1984 (Parish and Wells 1984).

TUFTED DUCK *Aythya fuligula* Wasan Rice Scheme: two females on 7 December 1986 (JE, DH, MH, CFM and ACO). The previous records for Borneo are from Sabah and Sarawak: Labuan in October (?1890) (Smythies 1957), Kota Belud on 2 January 1968 (Smythies 1981), Sandakan, one for about three weeks in November 1982 (F. H. Sheldon pers. comm.), Kuching in December 1899, and Sibu in 1939 (Smythies 1981).

COMMON COOT *Fulica atra* Wasan Rice Scheme: an immature on 7 December 1986 (JE, DH, MH, CFM and ACO). The only previous records for Borneo are both from Sabah: eight at Kota Belud in January 1959 (Smythies 1981) and a specimen in the Sabah Museum collected on 5 February 1968 on the Kampang River, Penampang (F. H. Sheldon pers. comm.).

ORIENTAL PRATINCOLE *Glareola maldivarum* Wasan Rice Scheme: probably four pairs attempted to breed on the naked baked earth that resulted from ploughing during a prolonged drought in early 1987. Territorial behaviour was noted in March, and on 25 and 29 May one juvenile was seen with eight adults (CFM). I have recently been informed (D. Parish *in litt.* 1987) that this species breeds regularly at Kota Belud, Sabah. Other than this, however, the nearest confirmed breeding site is in Perlis, with possible breeding in Kedah, Kelantan and northern Tregganu, all in peninsular Malaysia (Medway and Wells 1976).

LONG-BILLED PLOVER *Charadius placidus* Muara Spit (5°02′N 115°07′E): adult with Malaysian Plover *C. peronii* on 14 January 1983 (CFM). There are two previous Bornean records, both from Brunei, in January and December 1982 (Vowles and Vowles 1985).

[RINGED PLOVER/SEMI-PALMATED PLOVER *Charadrius hiaticula/ semi-palmatus* Wasan Rice Scheme: one seen on four dates between 6 November 1986 and 29 January 1987, but views were insufficient to distinguish the species, although the former is more likely (CFM, JM, ACO and KS). There are two previous records of Ringed Plover from Brunei, undated 1971–1972 and September 1980 (Vowles and Vowles 1985), but there is no mention that the Semi-palmated Plover was eliminated when establishing the identity of the birds. There is a more recent record of *C. hiaticula* from Miri, Sarawak (Ollington in prep.)]

NORTHERN LAPWING *Vanellus vanellus* Sungai Bera, near Seria (4°38′N 114°21′E): one on 6 December 1986. Good views were obtained, and a field description submitted showing important features (José Diederix). There is one previous record from Borneo, also in Brunei (Smith 1976).

HORSFIELD'S BRONZE CUCKOO *Chrysococcyx basalis* Jerudong (4°56′N 114°50′E): present from 1 June to 19 July 1985. Initially three, rising to at least five, all immatures, stayed in an area of low scrub, occasionally feeding on the ground. The birds were identified by the following features: whitish supercilium, with dark ear-coverts; dark brown upperparts (crown concolorous), with variable but initially small amounts of bronze-green, becoming more obvious later; greyish-white underparts with some dark freckling on throat and breast, and a very small amount of dark barring (becoming more obvious later) on the flanks. The only records accepted by Smythies (1957) were of a specimen from southern Borneo (in the Leiden Museum) and one from North Natuna Islands (in the Raffles – now National – Museum, Singapore). He rejected other records because of nomenclatural confusion. More recently there is a sight record of one at Seria, Brunei, in August 1981 (Cameron 1983). This species breeds in Australia and visits South-East Asia, rarely as far as the Malay Peninsula, in the austral winter.

HOOPOE *Upupa epops* Near Panaga, Seria (4°36′N 114°17′E): one on 7

September 1986. Photographs were submitted which, with a field description, were adequate to identify the species (Mr and Mrs N. Song). Pantai Mentiri Golf Course, near Muara (4°58′N 115°01′E): one on 24 March 1987 (J. Woods, who knows this species well from Africa). There are three previous records for Borneo: Labuan in the 1870s, Kuching in January–February 1964, and Lumut (Brunei) in September 1977 (Smythies 1981).

[BLACK-NAPED ORIOLE *Oriolus chinensis* Jerudong: one, seen briefly, but believed to be this species, 18 December 1983 (CFM, PC and SC). Known previously in Borneo only from southern Kalimantan and south-west Sarawak (Smythies 1981). It is advisable to treat this record as unconfirmed at the moment.]

STONECHAT *Saxicola torquata* Berakas, near Bandar Seri Begawan (4°59′N 114°57′E): one on 10 December 1983 (PC, SC and CFM). Previous Bornean records are: Sarawak: Kuching on 31 January 1898 (Smythies 1957) and 24 March 1963 (Smythies 1981), Satang Island on 2 December 1955 and Kuala Niah on 23 February 1958 (Smythies 1957); Sabah: Kampung Nukohan, Kuala Penyu, on 26 March 1975 (Wells 1976); Brunei: Muara on 27 December 1966 (Harrisson 1967). This species is a resident or migrant to much of mainland South-East Asia.

[CLAMOROUS REED WARBLER *Acrocephalus stentoreus* Jerudong: one or more seen and heard between 24 June and 5 July 1984. The identity could not be confirmed by catching the birds. Attempts at netting the following January yielded only Oriental Reed Warbler *A. (arundinaceus) orientalis* (CFM). The dates of the Jerudong birds would appear to be much too late for wintering *A. orientalis*. Two specimens of *stentoreus* were taken at Rantau, Kalimantan, in 1916 (Mees 1971). More recently it has been recorded from Polder Alabio and Muara Kaman, Kalimantan (Holmes and Burton 1987), the birds apparently being identified by song in November at the first locality, and in April at the second.]

[ASIAN BROWN FLYCATCHER *Muscicapa latirostris* Lamunin Forest (4°41′N 114°45′E): individuals seen in forest clearings at two localities, about 8km apart, in May 1987, may have been *M. l. umbrosa*, recently described by Wells (1982) from Tawau, Sabah. Other specimens have recently been taken on the Bole River west of Lahad Datu, and Sepilok forest reserve (Wells and Francis 1984). These localities are also in Sabah. Firm identification must await capture of the bird.]

BROWN-CHESTED FLYCATCHER *Rhinomyias brunneata* Bandar Seri Begawan: immature trapped on 23 and 24 October 1982. Numerous photographs were taken, but the film was destroyed in processing. Skins were later examined in the British Museum (Natural History) to confirm the identification (CFM). Among the features noted on this bird were the pale lower mandible, darkening distally, and the dark edges to the throat feathers giving a scaling effect. This is a migrant from eastern China, and is

widespread in West Malaysia during the northern winter, possibly reaching Sumatra (Medway and Wells 1976). There is one record from Thailand (Nabhitabhata and Nadee 1985). The Brunei bird had a wing-length of 91 mm. This could indicate a previously unknown population since hundreds of handlings in peninsular Malaysia have never yielded a wing-length greater than 86 mm (D. R. Wells pers. comm.). This is the first occurrence on Borneo.

CRESTED MYNA *Acridotheres cristatellus* Bandar Seri Begawan: two or three present from January 1983 to February 1986 (CFM). The only other record in Borneo is of a party living in Kota Kinabalu, Sabah, from 1978 to 1979 (Smythies 1981). Darus and Stuebbing (1986) record that these birds are still present.

YELLOW-BREASTED BUNTING *Emberiza aureola* Wasan: A male coming into breeding plumage on 27 March 1987 (CFM and ACO). The only previous Bornean record is of one at Kuching on 18 November 1964 (Smythies 1981). This species winters south to peninsular Malaysia and Singapore.

[BLACK-HEADED BUNTING *Emberiza melanocephala* Bandar Seri Begawan: what was believed to be an immature of this species was seen on 30 November 1985 (CFM and R. F. Ollington). However, the view was fairly brief, and it is preferable to treat it as unconfirmed. This species is a winter visitor to India, with one record of a vagrant in peninsular Thailand (King *et al.* 1975) and three records from Japan, two from Hachijo Island (in the Izus), November 1928 and November 1930 (OSJ 1974), and one from Okinawa, autumn 1985 (Okinawa Yacho Kenkyukai 1986).]

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Records of Javan Pond-Heron *Ardeola speciosa* and Dusky Warbler *Phylloscopus fuscatus* in peninsular Malaysia in March 1986

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During a four-month stay in peninsular Malaysia from December 1985 to March 1986 I recorded two species of bird whose occurrence in the country was previously uncertain – Javan Pond-Heron *Ardeola speciosa* – or poorly documented – Dusky Warbler *Phylloscopus fuscatus*. It therefore seemed worthwhile to report these observations in some detail.

Javan Pond-Heron

On 21 March 1986 I was observing kingfisher foraging behaviour during low tide at a lagoon within mangroves, about 2–3 km west-north-west of Kuala Gula, Perak, peninsular Malaysia. Around 09h00 I noticed two small, short-legged herons, obviously of the genus *Ardeola*, on the mud about 10–20 m from the edge of the mangroves. I observed them in full sunlight with a 30 × telescope. Both were in full breeding plumage and I immediately identified them as Javan Pond-Herons *A. speciosa*, a species I was familiar with from Thailand and whose identification in Malaysia was previously unconfirmed. Several Chinese Pond-Herons *A. bacchus*, two of them also in breeding plumage, were present nearby and provided convenient comparison.

I made the following description. Unstreaked pale beige head and neck blending into a deep rusty breast, which in turn was sharply delimited against a white belly and undertail-coverts. Back dark slaty grey, almost black, with long plumes extending over folded wings and tail. In flight, when the white wings and tail were visible, the birds gave a striking four-coloured impression. Bill light grey basally, pale yellow in the middle and with a black tip. Legs yellow.

Four days later, on 25 March 1986, two or possibly three Javan Pond-Herons were observed and photographed at the same place by Richard Lansdown and Andrew Hawkins, who confirmed the identification.

Pond-herons identified as *A. bacchus* regularly winter south to Singapore, but are common only in the northern peninsular Malaysian states from October to April (Medway and Wells 1976), when they are generally in basic plumage. According to present knowledge *bacchus* and *speciosa* cannot safely be separated in the field in this plumage (Hancock and Kushlan 1984). Usually they acquire breeding plumage after or shortly before leaving Malaysia, although in central Thailand I observed some individuals of *speciosa* in full breeding plumage as early as mid-February. Owing to this

problem *speciosa* has probably been overlooked among *bacchus* in peninsular Malaysia, although it has been suspected to occur (Wells 1984) and may even winter regularly in small numbers given the relative proximity of its Thai and Javan breeding grounds. Careful field observations in late March and April, when pond-herons moult into nuptial plumage, should clarify the true status of this species in peninsular Malaysia.

Dusky Warbler

On 18 March 1986 around 18h00 I observed a brownish *Phylloscopus* in degraded mangroves about 2–3km west-north-west of Kuala Gula, Perak, peninsular Malaysia (only some 200m from where I was subsequently to see the Javan Pond-Herons). Its habit of hopping on or very near the ground and its call, a hard 'chak', immediately suggested *P. fuscatus*, a species I had observed on many occasions only a few weeks before in Thailand. I viewed the bird for several minutes with 10×50 binoculars down to a distance of 8m. Plumage characteristics and bill structure confirmed the initial identification.

The next day I caught a Dusky Warbler, possibly the same individual, in a mist-net about 100m from the first place of observation and also within degraded mangrove. Several colour photographs (see Plate) and the following description were taken. Typical *Phylloscopus*, the size of a Chiffchaff *P. collybita*, with uniform olive-brown upperparts and tail and with a rusty tinge on the rump and uppertail-coverts. No wing-bars; remiges

Plate. *Phylloscopus fuscatus* caught at Kuala Gula, Perak, on 19 March 1986. (Photo: A. J. Helbig)

and wing coverts brown with olive-brown edges. Underparts whitish with a brownish tinge, especially on the breast, and lightest on the lower belly. Buff undertail-coverts. Supercilium uniform brownish-white, bordered below by a blackish eye-line. Bill thin and pointed, lower mandible completely yellow, upper mandible dark horn with thin yellow cutting edges. Feet dark brownish-flesh, soles yellow. Moult: sixth secondary growing (30% of final length); two outermost pairs of rectrices growing (90%), next two pairs towards centre of tail freshly grown with bases still in sheaths; uppertail-coverts moulting.

The Dusky Warbler normally winters south to the northern parts of the Malay Peninsula (Lekagul and Cronin 1974) and was not dealt with by Medway and Wells (1976). Up to 1984 there were only three reports of this species in peninsular Malaysia, all from mangroves of the Selangor coast: two mist-netted and photographed (but photographs not definitive – D. R. Wells pers. comm.) near Kuala Selangor on 2 April 1977, one observed near Klang, 20 February 1979 (Wells 1986), and two seen at Kuala Selangor on 27 November 1984 (*Bull. Oriental Bird Club* 1: 27). Thus the observations described above establish the fourth record of *Phylloscopus fuscatus* in Malaysia and apparently the first to be well documented photographically. The fact that they all occurred in mangroves seems to indicate a distinct preference for this habitat at the southern extremity of the species's winter range. Further north, it frequents a wide variety of wooded habitats (but including mangroves).

I thank Dr D. R. Wells for comments on an earlier draft of this note.

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Feeding methods and other notes on the Spoon-billed Sandpiper *Eurynorhynchus pygmaeus* in Okinawa

DOUGLAS W. McWHIRTER

Two recent comprehensive books about shorebirds indicate at least two feeding methods for the Spoon-billed Sandpiper *Eurynorhynchus pygmaeus*. One is a side-to-side motion of the bill with the head held down as the bird moves forward (Hayman *et al.* 1986). The second is similar except the head is up and the bill nearly perpendicular to the substrate (Johnsgard 1981). A third mode, simple jabbing into the substrate with the head and bill held perpendicular, is hinted at in the source material used in Johnsgard.

On 2 October 1985 at Itoman, Okinawa, Nansei Shoto, Japan, I was able to observe a juvenile Spoon-billed Sandpiper for 30 minutes before heavy rain set in. Although I was not able to view the bird subsequently, two friends, Masahiko Kaneshiro and Masakuni Yamashiro, watched what was almost certainly the same bird for over an hour on 6 October 1985. Our combined notes on foraging by the bird reveal three distinct methods.

The commonest by far was a jabbing motion into the substrate with the head held low and forward while the bird moved about. It is possible that the bird 'strained' material through its bill tip in a duck-like fashion, but we do not believe so. Other local birdwatchers reported seeing the same kind of feeding behaviour. Nearby Rufous-necked Stints *Calidris ruficollis* and a sandpiper tentatively identified as Western *C. mauri*, which seemed to accompany the Spoon-billed, also foraged in this manner. The second type of foraging noted was like the second method mentioned above. Kaneshiro and Yamashiro noticed about five minutes of this and likened it to the 'scything' sometimes performed by Common Greenshank *Tringa nebularia*.

A third method was unique in my experience. On two occasions when I was watching the bird it clearly shuffled its feet about, trampling noticeably up and down as it did so. It then took a quick step or two back and jabbed its bill several times into the riled area. The bill was held roughly perpendicular to the water surface. The action was similar to but not the same as the 'puddling' of wet mud I have observed in Little Ringed Plover *Charadrius dubius* and Common Black-headed Gull *Larus ridibundus*.

The above observations suggest that Spoon-billed Sandpipers are at least as versatile in their feeding behaviour as similar-sized stints *Calidris*, and that the relative scarcity of the species is not due to specialized energy acquisition or dependence on a unique prey. In fact, the enlarged bill tip may be a greater aid to taking prey than a 'regular' billtip (see Johnsgard 1981). Those concerned with conserving the species may want to focus their attention on other aspects of the bird's niche.

On Okinawa, the species has been a very rare migrant. Up to four are seen annually, mostly in October. A few have been seen in other autumn months and also in April. They rarely stay more than a few days. The birds, most often singles, sometimes pairs, usually occur with Rufous-necked Stints. The foraging area at Itoman was a large cement-lined ditch about 800 m long and 10–15 m across. The bird consistently fed where the water was slightly flowing, about 1–1.5 cm deep, with a shallow mud bottom and a dense, unappealing flocculate suspended in the water. Other Spoon-billed Sandpipers have been seen feeding on tidal mudflats and tidal sandflats interspersed with patches of mud and rock.

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Recent extensions in breeding range of the Yellow Bittern *Ixobrychus sinensis*

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The Yellow Bittern *Ixobrychus sinensis* is found from the Indian subcontinent, far eastern USSR, Japan and China, discontinuously to Papua New Guinea and Micronesia (Hancock and Kushlan 1984). Hitherto the breeding distribution was known to extend throughout most of the South-East Asian region, but not extending into southern peninsular Malaysia (Medway and Wells 1976), north-east or east Burma or south-west Thailand (King *et al.* 1975), Borneo or Wallacea (White and Bruce 1986). The incidence of vagrancy is high (two definite records from Australia) and colonisation has occurred of islands such as the Seychelles, this showing the ability of the species to adapt (Hancock and Kushlan 1984).

Until Cairns (1954) published his finding of a colony on Penang Island, off the north-west coast of the peninsula, the Yellow Bittern had been considered a winter visitor and passage migrant to peninsular Malaysia. However, since the early 1980s, birds have been seen more frequently during the (northern) summer months (D. R. Wells verbally 1987). In July 1986, during work on the breeding cycle of the Cinnamon Bittern *I. cinnamomeus* in ricefields in the Sekinchan area of Selangor State, West Malaysia, I located

a second breeding area for the peninsula, containing up to 100 pairs. Of 42 nests actually checked, three were in rice and the remainder in scrub and reeds lining ditches and bunds (raised banks) between fields (nests in rice were located by walking through the crops flushing sitting adults).

The first nests were found in late April, and contained eggs and small chicks. A visit to the area in June produced four new colonies within a half-mile radius of the first, with between them more than 10 breeding pairs (colonies were regarded as distinct when a distance of over 200 m lay between the nearest nests of respective groupings). In early July an isolated colony of twelve nests was found in a previously unstudied area of the same ricefield system. One nest held an incomplete clutch, one held a complete clutch and five held unfledged young at different stages of development; the remaining five were not approached too closely, owing to the risk of disturbance causing desertion.

In late June 1986, as a result of an increase in the number of records of summering Yellow Bitterns in Singapore, I paid a visit to a potential breeding site there, the Kranji Reservoir, where I saw more than 20 birds, many of which were immatures, and found a nest of the species.

For many years in Borneo there have been suggestions that a breeding population of Yellow Bitterns exists (Smythies 1981); for Sabah such speculation was founded on a sighting of an immature bird near Kota Kinabalu and two records of adults at Kota Belud in July (Smythies 1981). Holmes and Burton (1987) suggest the presence of a resident population in Kalimantan, although there has as yet been no proof of breeding. In September 1986, during fieldwork in the Kota Belud Bird Sanctuary, Sabah, I observed a flightless juvenile Yellow Bittern begging from an adult. The juvenile was subsequently caught and examined, and had not yet grown fully formed flight feathers.

Given this proof of breeding in Borneo, where long suspected, the suggestion by Uttley (1987) that a resident population exists in Sulawesi may yet prove to be correct. However, it remains debatable whether the new records presented here indicate a range expansion by the Yellow Bittern itself or merely confirmation of its long-term presence as a breeding bird in the areas covered.

During the fieldwork relevant to this paper, the author was working for Interwader, which I would like to thank for its support.

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Notes on the feeding behaviour of the Milky Stork *Mycteria cinerea*

C. SWENNEN and E. C. L. MARTEIJN

As part of the Interwader East Asia/Pacific Shorebird Study Programme in 1984, we studied the foraging behaviour and prey selection of birds living on intertidal flats around the Malay Peninsula. The opportunity arose to observe a Milky Stork *Mycteria cinerea* for one hour at close range with the help of a 40 × 60 telescope from a hide. Little has been published on the behaviour of this large bird, which at present is scarce and may be in danger of extinction in Malaysia, and indeed is currently regarded as globally threatened (King 1978–1979). The following observations may, therefore, be of interest.

Our bird was discovered on an intertidal mudflat near Sungai Burung, Perak State, peninsular Malaysia, about one hour after low tide on 9 October 1984. According to local fishermen, Milky Storks were regularly to be seen foraging on the flats in that area, which is only 20km north of the Pulau Kelumpang Forest Reserve, the main roost site for Milky Storks where we had counted 101 birds a few days earlier (see Plate 1; also Plate 2). The white head feathers, yellow-orange bill and pink legs indicated that our bird was an adult. It was foraging at a distance of about 25–100m in front of the mangrove. It avoided coming nearer to the vegetation and spent its time walking through the large pools on the flat or visiting the water's edge.

The flat consisted of very soft mud and was impassable for man (one sank in waist-deep). When walking, the very long tarsi of the stork only sank in about 6cm (a quarter of their length), but when standing still to probe or preen, the tarsi sank in about 15–20cm (about three-quarters of the length of the tarsus). Probably the thick, long toes of the species reduce pressure by increasing the surface area of the feet and hence help it cope with soft substrates.

Detailed observations on the foraging behaviour could only be made for 39 minutes. For the remaining 21 minutes the bird rested, preened or was alert because of people within sight. While feeding, the bird walked or waded through the mud with great deliberation, making 6 to 60 steps per minute (mean of 22.5 ± 16.3 steps per minute). This number appeared to be strongly negatively correlated with the number and duration of probes.

Three feeding methods were observed in this individual, two of them tactile (probing in mud, groping in shallow water), the third being direct visual searching. On the mudflat the stork searched for large, water-filled holes in the mud. It probed in and around these holes with the mandibles open about 6 cm wide at the tip. The slightly curved mandibles were inserted and partly withdrawn a number of times over 5 to 32 seconds (mean 16.5 ± 8.7 seconds) per hole. Most probings were to a depth of 15 to 18 cm (three-quarters the bill length), but occasionally went up to the full length of the bill (about 23 cm) and even up to the eyes. Before a prey was captured, the bill was always inserted to its full length. Occasionally, starting from a hole, the bill was inserted from half to three-quarters of its length and ploughed through the mud in a straight line for about one metre ahead creating a runnel in the soft mud.

Only one fish was clearly located by sight, as after a short rest the bird suddenly flew about 5 m, alighted, and immediately caught a fish without probing deeply. All other fish were caught by probing in and around deep

Plate 1. A group of Milky Storks *Mycteria cinerea* flying to rest in the Pulau Kelumpang Forest Reserve, October 1984. (Photo: C. Swennen and E. C. L. Marteijn)

holes in the mud. The bird probed in 2.3 ± 0.7 different spots per minute and on average caught one prey every four minutes. The prey was pulled out of the mud and swallowed with a few catch-and-throw movements. All prey were rather large mudskippers Gobiidae. The length of the fish could be estimated in relation to the length of the bill (± 23cm): $2 \times 10-14$cm, $3 \times 14-18$cm, $2 \times 18-22$cm, 1×23cm. After catching a fish, greyish mud usually stuck to the whole bill, which was then cleaned by moving up and down in a water-filled hole, while rapidly opening and closing the mandibles. After a few seconds the bill came out bright orange-yellow again. When a large fish was swallowed, the bird rested for 20 to 58 seconds before starting to forage again.

At a great distance we saw other Milky Storks feeding on a mudflat whilst standing and slowly walking up to their belly in the extremely turbid rising water. The birds were holding their bills in front of their bodies in the water for long periods. The distance was too great to study their behaviour and its success in any detail. This behaviour was similar to the 'groping' feeding of storks described by Kahl (1964) as the main feeding strategy for the closely related Wood Stork *Mycteria americana*. Kahl does not record the latter species as probing in sediments.

The only other ciconiiform birds seen feeding in the area were Little Heron *Butorides striatus* and Little Egret *Egretta garzetta*. Both species were feeding by standing motionless and waiting until a fish was seen nearby,

Plate 2. Adult Milky Stork soaring over Kuala Gula, October 1984. (Photo: C. Swennen and E. C. L. Marteijn)

contrasting with the tactile feeding of 'our' slowly-walking Milky Stork.

Discussion

For the Milky Stork observed, foraging on an exposed flat, the estimated wet weight of the fish eaten in 39 minutes was 225 g (estimated by comparison with weights of fishes of similar length). In the Wood Stork, Kahl (1964) found the daily intake of fish for birds in captivity was up to 16% of the body weight, and estimated the intake of wild Wood Storks at 21% of their body weight. As the estimated weight of a Milky Stork is about 3 kg, one may expect a daily intake of 630 g of fish. This means that a Milky Stork may be able to capture its daily ration in only about two hours of intensive feeding. Feeding on exposed flats depends on the tides, but on most days ebb tide is low enough to be used by the birds in this way.

Vast mudflats teeming with mudskippers occur along the west coast of the Malay Peninsula. Therefore it seems that the decline of the breeding population of the Milky Stork in Malaysia, of which only 115 individuals are left (Parish 1984), cannot be caused by lack of food or of potential feeding grounds.

Thanks are due to the Director General and Staff of the Malaysian National Parks and Wildlife Department for providing logistical support and advice during our stay at the Kuala Gula Ranger Post of the Matang Forest Reserve in Perak.

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Collapse of a nest tree used by Finch-billed Mynas *Scissirostrum dubium* in North Sulawesi

GARY J. WILES and YUNUS MASALA

Finch-billed Mynas *Scissirostrum dubium* are endemic to Sulawesi (formerly known as Celebes) and several smaller neighbouring islands in Indonesia (White and Bruce 1986). The species is highly gregarious, and during a visit to Tangkoko-Batuangus Nature Reserve (1°32′N 125°13′E), North Sulawesi, we commonly observed it foraging in the canopy of lowland forest in noisy flocks of up to 50 or more birds. These mynas nest colonially in the trunks of dead trees (Stresemann 1940, Watling 1983, White and Bruce 1986) and colonies may contain hundreds of pairs of birds (Stresemann 1940). It is believed that the heavy, pointed bill of this species is an adaptation for excavating nest holes (White and Bruce 1986).

On 13 May 1987, while walking through the reserve in lowland forest approximately 1 km from the sea coast, we discovered a large, recently fallen tree used by a colony of Finch-billed Mynas for nesting. The carcasses of 15 to 20 nestlings were visible on the ground next to the tree and additional searching revealed more young buried beneath broken wood debris or inside partially intact nest cavities. A total of 82 nestlings and one adult were eventually collected but more birds were undoubtedly present. No eggs were found. All but two of the birds were dead, with both of the surviving young still chirping weakly. Nearly all of the nestlings were similar in size and extent of feather development. Most were 8–10 cm long with pinfeathers present on the wings, tail and head. These birds were estimated to be about seven days old. Reddish rump feathers, which are a characteristic of subadult and adult plumages, were beginning to show on some of the birds. Two smaller young were also found, these being about 5 cm long and naked and estimated to be less than three days of age.

The nest tree was approximately 36 m tall with its top having previously broken off. It possessed large buttresses that were about 5 m tall and had a straight trunk with a diameter of 1 m at the tops of the buttresses. Several hundred nest cavities occurred in the upper 14 m of the snag, with the lowest cavity being approximately 22 m above the ground. Bole diameter in this section of the tree was about 0.6 m. Nest cavities were densely concentrated on all sides of the trunk. The entrance holes of most cavities were approximately 40 mm in diameter and cavity depths varied through 25–30 cm. Cavities were teardrop-shaped and angled downward at 30–60°.

Because two of the young mynas were found alive, it seems likely that the nest tree had fallen sometime during the previous 24 hours. No strong winds were noted on the previous day and the tree had probably toppled under its

own weight. The tree was badly rotted as indicated by the way the upper half of the trunk had broken apart on hitting the ground. No limbs or bark remained on the tree, further indicating that the tree had reached an advanced state of decay before falling.

From these brief observations, we conclude that colonies of Finch-billed Mynas are occasionally susceptible to catastrophic events such as the loss of occupied nest trees. Breeding appears to be highly synchronized and, within this colony, most hatching occurred in early May. Although the clutch-size of Finch-billed Mynas has not been previously reported, the scattered nature of the dead nestlings found at our site may indicate that only one young is produced per clutch. If this is indeed true, then this colony probably contained more than one hundred breeding pairs of mynas.

G.J.W. thanks Tulende Wodi and the other staff at Tangkoko-Batuangus Nature Reserve for their hospitality during his visit. Their familiarity with the reserve's birds and knowledge of scientific bird names were invaluable. We kindly thank D. Scott Klotzbach, Derek Holmes, Craig Robson, Paul J. Conry, Frank Rozendaal and Peter Holmes for information and advice.

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Letter: Was the 'Chinese' White-eyed River-Martin an Oriental Pratincole?

I have read with much interest E. C. Dickinson's tentative identification of the birds in the Chinese painting reproduced as the cover of *Forktail* 2 as White-eyed River-Martins *Pseudochelidon sirintarae*.

I would like to offer an alternative identification, one that is less speculative from the zoogeographic viewpoint. I believe that this painting portrays a species well known in China, the Oriental Pratincole *Glareola maldivarum*. The character that first caught my eye was the buffy throat set off by a thin dark necklace. Other arguments in favour of the identification as *Glareola* rather than *Pseudochelidon* include the broad somewhat hooked red bill, the brown rather than black dorsal colour, the pale underparts (rather than black all over as in the River-Martin), and the forked tail, with elongation of the outer rectrices (with some white in the longest) rather than the filament-like central rectrices protruding from a 'normal'-shaped tail of *Pseudochelidon*. Arguments against the identification as pratincoles would include the lack of a pale rump (which, as Dickinson pointed out, is also an argument against the river-martin identification), the absence of chestnut wing linings (which at least one field guide says are hard to see), the greatly exaggerated fork of the tail (relatively short and shallowly formed in *G. maldivarum*, rather than elongated and deeply forked as portrayed in the King-Woodcock-Dickinson field guide) and the bill painted as wholly red rather than red merely at the base (the last two characters courtesy of Tim Inskipp, who knows the Oriental Pratincole in life, as I do not). The apparent white eye is, I think, a 'red herring.' I have seen many Chinese paintings that have this 'bug-eyed' look even for birds known to have dark irides, and the pratincole does have at least a narrow white eye-ring.

Although ornithological subjects in Chinese paintings are often rendered quite realistically, in many instances artistic licence has prevailed to the extent that the pictured birds utterly defy identification. The painting on the cover of *Forktail* 2 is not an accurate rendition of *any* known species, but I believe that the weight of the argument is on the side of *Glareola* over *Pseudochelidon*.

I am pleased to say that I have corresponded with Mr. Dickinson about this point, and that he now agrees that my identification is the more probable.

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20 October 1987

Editor's Note: The identification of the cover illustration as Oriental Pratincole was made independently by C. D. R. Heard in a letter to J. T. R. Sharrock and passed direct to E. C. Dickinson, who has urged publication of this judgement.

Obituary: Sálim Ali, 1896 – 1987

Dr. Sálim Ali was born in Bombay in 1896 and died in that same city in the third week of June 1987 at the age of 90. In the introduction to the ten volume 'Indian Handbook', he described Alexander Hume as 'the father of Indian ornithology'; if that is so then Sálim Ali himself can truly be described as the 'builder of Indian ornithology', who through his numerous books largely created the present body of our knowledge about the subcontinent's avifauna and, as the 'Great Instructor', made millions of people in that most populous country aware of and interested in birds. If anyone doubts this, they should witness the number of small regional nature clubs and wildlife societies now existing in India and, sadly, not paralleled by a similar proliferation in neighbouring countries of the region.

In his autobiography (*The fall of a sparrow*, 1985), he describes how, as a boy of about 12 years of age, he shot a Chestnut-shouldered Rock Sparrow *Petronia xanthocollis* and, realising that this was something different from his usual House Sparrow *Passer domesticus* targets, was persuaded by an uncle who was a member to take it to the Bombay Natural History Society. There the Honorary Secretary took both time and trouble to foster the young boy's interest in further study of birds and natural history.

Though possessing no university degree and originally starting out in the sphere of commerce, in a family mining and timber business enterprise in Burma, he left this at the age of 27 during the depression to take up a course in ornithology at St. Xavier's College in Bombay. As a result of this and his proven aptitude, he obtained a post as Assistant Curator at the Prince of Wales Museum. Later he studied under Professor Erwin Stresemann at the Berlin Museum, and on returning to India became involved in detailed studies of the breeding behaviour of the Baya Weaver *Ploceus philippinus* as well as many regional ornithological surveys under the patronage (vital in those years of economic hardship between the two world wars) of various princely states. The Hyderabad State, Nilgiri Hills, Travancore and Cochin, Kutch and Bahawalpur ornithological surveys ensued, during which he built up his extensive first-hand field knowledge of many regions. His first major publication was *The birds of Kutch* (1945), followed by *Indian hill birds* (1949), *The birds of Travancore and Cochin* (1953) and *The birds of Sikkim* (1962). Besides revising and enlarging these earlier works in recent years, he published his findings on the behaviour of the Baya Weaver (*J. Bombay Nat. Hist. Soc.* 53, 54).

In 1944 he met Sidney Dillon Ripley, then serving in Sri Lanka with the U. S. Army, and from that chance encounter there developed a most fruitful partnership involving several joint ornithological expeditions to the little-known north-eastern Himalayan regions (the Mishmi Hills and the Naga Hills). Ripley collaborated with Sálim Ali in the compilation of the ten

volume *Handbook of the birds of India and Pakistan*. Sálim Ali started writing this in 1964 and the last volume was published in 1974 on his 78th birthday.

Over this period his natural gift for informative writing, often combined with evocative and amusing descriptive phrases, attracted the attention of persons living all over India as well as in Europe and the USSR (to single out two regions that recognised his contributions with honours). He was awarded the prestigious Padma Vibhushan by Indira Gandhi in 1976 and received honorary doctorates of science from several Indian universities, starting with Aligarh Muslim University in 1958. In 1967 he was awarded the British Ornithologists' Union Medal (the first non-Briton to receive this), and in 1976, from World Wildlife Fund International, the Paul Getty Wildlife Conservation Prize, worth $50,000. Typically, having sought funds all his life to support various field expeditions, he gave all this prize money to his beloved Bombay Natural History Society, with which he was closely associated for over 50 years. In the 1920s he became Honorary Secretary of that Society and later President, and it was largely through his leadership that the Society carried out many valuable research projects including bird migration studies, the ecology of endangered bird species, and successful campaigns to save vital ecological regions, especially the preservation of the now famous sanctuary of Bharatpur and the last remnants of evergreen rainforest in the Nilgiri Hills.

Though I had corresponded with Sálim Ali from 1964, when I sent him a calendar I had painted of hill birds, I did not meet him until the IUCN Delhi conference in 1969. At that time, a mere 73 years of age, he was still an extremely wiry and active person, who charged around Delhi driving his own Land-rover and leading early morning birdwatching trips before we settled down to the morning's conference agenda. It has been my privilege to receive much help and encouragement (as a neophyte ornithologist) from him over the years, and as recently as May of this year he wrote me a most helpful letter from his hospital bed discussing material I had written for a book on the birds of Pakistan.

Besides his writing skills and encyclopedic knowledge of the sub-continent's birds, Sálim Ali was an excellent field man, accustomed to the discomforts and rough conditions associated with studies in remote areas, and he was rigorous in his discipline of making everyone benefit from early morning starts. Whilst I was working in the Bombay Natural History Society's Museum in 1980, Sálim Ali (only 84 years old!) attended the Society's offices almost daily, and on one occasion my wife spotted him preceding her up the broad flight of stone steps to his first floor office, not wearily dragging his feet, but running up two steps at a time! I would hasten to add that despite increasing deafness, he was a sociable person and enjoyed talking to people, and during that 1980 sojourn in Bombay he often stopped to chat to my wife and was unfailingly courteous to her.

He could, however, be quite peppery in dealing with incompetence or what he considered to be uncivil behaviour, and I also recall the celerity with which he successfully dispersed an accumulating crowd of local urchins

when he was trying to show a small newly created bird sanctuary on one of Bombay's creeks to some visiting Dutch ornithologists.

He was not only, in his own words, a lover of birds, who actively enjoyed the thrill of birdwatching, but he was a dedicated conservationist and his contribution to saving India's wildlife heritage will endure for many generations after his passing. The further researches of some half-dozen of his young protégés, who started their careers with the Bombay Natural History Society, will also continue his lifetime work of adding to our knowledge of Indian ornithology.

T. J. Roberts

Guidelines for contributors

Forktail publishes original papers in the English language (also, in certain cases, English translations of papers in Oriental languages) treating any aspect of the ornithology (e.g. distribution, biology, conservation, identification) of the Oriental region, i.e. the region bounded by the Indus River to the west, Lydekker's Line to the east (i.e. the eastern boundary of Wallacea), the Chang Jiang (Yangtze Kiang) basin to the north and the Lesser Sundas, Christmas Island and Cocos (Keeling) Islands to the south; the Japanese Nansei Shoto (islands south-west of Kyushu) are included, and indeed material concerning any part of China or Pakistan may be published. Submissions are considered on the understanding that they are being offered solely for publication by the Oriental Bird Club, which will retain copyright. Referees are used where appropriate; all submissions are reviewed by the *Forktail* Editorial Committee, and those accepted are normally published in order of receipt. (Some further indication of the type of material appropriate for the journal is provided in the inaugural editorial, 'The scope of *Forktail*', *Forktail* 1: 3–5.)

Submissions should be in duplicate, typewritten on one side of the paper only, and double-spaced. The approximate position of figures and tables should be indicated in the margin. Papers should be concise and factual, take full account of previous relevant literature but avoid repetition of established information as much as possible; opinions expressed should be based on adequate evidence. Titles of papers must be accurate and concise, and (for the benefit of abstraction services) include any relevant scientific (taxonomic) name. To facilitate revision, the use of a word processor is strongly advised.

Whenever possible, authors should consult an issue of *Forktail* for style and layout. Spelling follows *The shorter Oxford English dictionary*, except that external features of birds are spelt and hyphenated in accordance with the entry under 'Topography' in *A dictionary of birds* (1985). Spelling of place-names accords (unless another source is specified) with the most recent edition (currently seventh, 1985) of *The Times atlas of the world*; we use 'South-East Asia' and 'Viet Nam'. Localities with well-known other spellings or older names should have these placed in parentheses after their first mention. For localities too small to be in the *Times atlas* a source of the spelling adopted should preferably be indicated and the precise geographical coordinates provided (these should be double-checked where possible). It is appreciated that authors will not always have access to the above sources; in such cases the editor will seek to introduce conformity.

English and scientific names of birds should preferably follow those provided by King *et al.* in *A field guide to the birds of South-East Asia* (e.g. Black-winged Cuckoo-shrike, White-browed Bush-Robin). Birds not mentioned there should be named in accordance with a recent standard work, e.g. White and Bruce's *The birds of Wallacea*. On first mention of a bird both English and scientific name should be given, thereafter only one, preferably the English. Scientific trinomials need be used only if subspecific nomenclature is relevant to the topic under discussion. These recommendations also apply for any other animal or plant species mentioned.

Underlining (= *italics*) is used for all words of foreign languages, including generic and specific scientific names. Metric units and their international symbols should be used; if it is necessary to cite other systems of measurement, these can be added in parentheses. Temperatures should be given in the Centigrade (Celsius) scale. Numbers one to ten are written in full except when linked with a measurement abbreviation or higher number, thus 'five birds' but '5 km' and '5–12 birds'; numerals are used for all numbers above ten, four-figure numbers and above using the comma thus: '1,234', '12,345'. Details of experimental technique, extensive tabulations of results, etc., are best presented as appendices. Authors of papers containing statistical analysis should observe the provisions of the relevant section of 'Notice to contributors' in a recent *Ibis*. Dates should be written 1 January 1985, times of day as 08h30, 17h55 (24-hour clock;), etc. When citing a conversation ('verbally') or letter ('*in litt.*'), the contact's name and initials should be included, preferably with the year of communication. A full-length paper must include a summary not exceeding 5% of the total length.

Any figure, diagram, line-drawing or map should preferably be in black ink on strong white or translucent paper; it should be called a Figure, numbered appropriately, and fully captioned.

Maps must be marked with a scale and north arrow. Lettering on figures should be very neat, although the publishers will re-draw figures and typeset lettering. Good photographs are also considered. Captions for figures and photographs should be typed on a separate sheet.

Authors of papers are encouraged to offer their work to one or more ornithologist or biologist for critical assessment prior to submission to *Forktail*. Such help as is received should naturally be mentioned in an acknowledgement section before the full references are presented.

References in the text should follow the form '(Campbell and Lack 1985)' and 'King *et al.* (1975) suggest . . .'. More than one within the same parentheses should be chronologically listed, alphabetically if of the same year. Publications by the same authors in the same year may be distinguished by 'a', 'b', etc., after the date. Full references must be listed alphabetically at the end in the form:

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