Ornithological Notes from the Raffles Museum. Nos. 15–22

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No. 15, Notes on the Avifauna of Great Redang Island (Trengganu)

The Trengganu Archipelago is situated off the northern end of the Trengganu coast. It extends for about thirty miles in a broken chain of islands, islets and rocky outcrops, lying roughly parallel with the shore and some 7–12 miles distant from it. It divides naturally into four major sections. Starting from the south these are,

(*a*) **Pulau Bidong Laut** (Little Redang)[1] and its attendant islets,

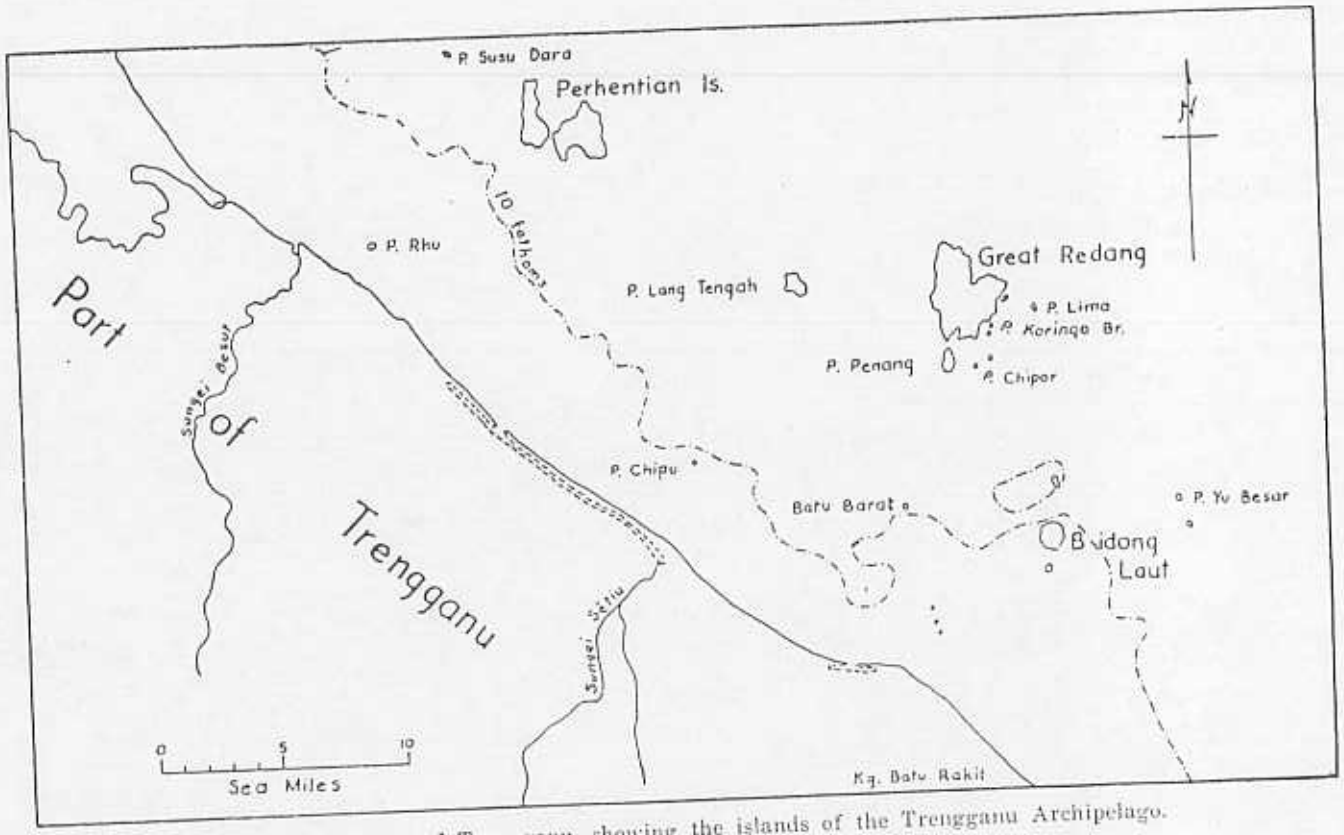
(*b*) **Great Redang,** and its attendant islets,

(*c*) **Pulau Lang Tengah** (= P. Lantinga of early authors), and

(*d*) the two **Perhentian Islands,** and their attendant islets, of which the Perhentians (approx. Lat. 5° 54′ N., Long. 102° 44′ E.) and the Great Redang group (approx. Lat. 5° 47′ N., Long. 103° 01′ E.) are the most important. These notes deal primarily with the avifauna of the latter, as at present recorded: the information available about the other groups is summarised in an appendix, and appears in tabular form on pp. 238–9, *infra*.

Great Redang has a maximum length of about four miles and a breadth of three miles. It is the largest island in the archipelago, with a surface area nearly twice that of its nearest rival, the two Perhentians. The north-east and south-west sides are embayed, and between the bays, joining their heads, is a flat valley, about half a mile wide and two miles long, which divides the higher portion of the island into two halves. From a distance it has the appearance of being two islands, of which the north-western, rising to an altitude of about 1,240 feet, is the higher. The north-eastern bay is topped by a broad, sandy beach bordered by low cliffs. The southern bay is partly filled by a mangrove forest, with a small river running through it. Beyond the head of the stream the land rises slightly and is taken up with coconut,

1. As far as possible the spellings used in this paper follow The China Sea Pilot, Vol. 1, first ed. (1938) amended 1946.



Part of the coast of Trengganu, showing the islands of the Trengganu Archipelago.

banana and tapioca plantations. Behind the plantations is a marshy area, with a few abandoned rice-fields, and then, near the middle portion of the valley, another area of plantations, with a score or so of houses.

The China Sea Pilot describes the island as thickly wooded, but this is not strictly correct. The lower and more sheltered slopes, especially on the western sides, are wooded. Elsewhere, on the rocky and more exposed slopes, particularly towards the north end and round the north-eastern bay, the vegetation is low and stunted. Only parts of it, round the valley and along the south-east side, provide full cover for a true woodland fauna. The other areas must be very inhospitable when the north-east monsoon breaks. The migrant birds, if they come here, should be found in concentration pocketted in the valley and round the southern bay: it would make a good ringing station, if one were ever to be established on the east coast of the peninsula.

On its south-east and south-west sides Great Redang is flanked by a number of small, wooded islets and barren rocky outcrops. The most important of the islets is Pulau Penang (height 450 feet), which lies across the entrance to the southern bay, and converts it into a reasonably safe anchorage. Pulau Penang is rocky to seaward, with a sandy beach along the northern part of the side facing Great Redang, much of which is taken up by a moderate-sized kampong. Behind it the Malays have cleared the greater part of the original vegetation of the islet, and replaced it with thickly grown orchards of bananas and coconuts. The next largest islet, Pulau Lima (height 250 feet), lies on the east side of the island, unprotected from the monsoon, and it is much more sparsely covered. Pulau Koringo (height 50 feet), on the south-west side, is well-wooded but small. Near it, close to the entrance to the anchorage, is Pulau Chipor, an almost bare outcrop (35 feet high) of granite boulders, the kind of small islet much favoured by *Sterna sumatrana* and *Demigretta sacra*.

Great Redang is about twelve miles from the mainland, and separated from it by depths of 13–14 fathoms. It is interesting ornithologically in that it is an isolated unit of land, with a fair range of habitats. It also seems reasonable to suppose that if there is a migratory stream down the east side of Malaya it passes near the island. Accordingly, this attempt has been made to determine, as far as the existing data permit, which birds appear to be frequenting it, and how the avifauna compares with those of the neighbouring groups.

The list presented here has been prepared from information from three sources,

(*a*) Specimens and data collected by C. Boden Kloss during a visit, lasting in all for eighteen days, to Pulau Bidong Laut, Great Redang, Pulau Lang Tengah and the Perhentians, made in the first part of September, 1910 (Reported, *Journ. F.M.S. Mus.*, 4, (3 and 4), 1911, pp. 175–212).[2]

(*b*) Specimens and data collected by the present writer during a tour of the east coast of Malaya and its off-lying islands, including Bidong Laut and Great Redang, from June to August, 1948.

(*c*) Specimens collected by R. K. S. Charles, Raffles Museum collector, on Great Redang and the adjacent islets, 5–15 September, 1950. No full report has previously been prepared on (*b*) and (*c*), but use has been made of the data relating to the sea birds (*Sterna* spp.) and the edible-nest swiftlets (*Collocalia* spp.), (Gibson-Hill, 1950 and 1948).

Kloss's list of 1911 gives sixteen birds collected on Great Redang, and a further two species observed only. Some of the specimens which he took are now in the Raffles Museum collection, and they have been re-examined in preparing this paper. The present list brings the total number of species apparently occurring on or near the island up to thirty-six, but even so it is probably far from complete. Nevertheless it sheds further light, largely confirmatory, on the species partial to off-lying islands, and on those conspicuously absent from such places. It also adds a little to our knowledge of the use of the east coast of Malaya as a migration route, though in this respect the material brought back by Mr. Charles in September 1950 is disappointing. In order to fit in with other collecting, and the movements of launches, he visited Redang during the first half of the month, probably some four to six weeks before the peak of the migratory wave—if it occurs down this coast. The ideal time for a visit would probably be the last two weeks in October. Unfortunately this is a period of bad weather on this coast, the beginning of the *Musim tutup kuala* (the season that closes the river entrances), and a time when it is very difficult for boats to get in

2. Kloss was accompanied by four collectors, in addition to personal servants, but his main interest (following Abbott) was in the mammals, and in birds he tended to confine himself to those species likely to produce new forms. In the eighteen days the party collected 400 specimens, 305 mammals and 95 birds. Between one-quarter and one-third of the bird skins are still in the R.M. collection. An analysis of the mammal fauna of these islands will be given in *Bull. Raff. Mus.* 25.

and out of the estuaries on the mainland. Nevertheless, I still feel that zealous collecting on Great Redang itself at this period would show the presence of an interesting number of immigrant species. It is to be hoped that it may be possible to add them at a future date as addenda to the present list, which probably covers all, or all but one or two, of the resident birds.

On the evidence at present available it seems likely that twenty different species are breeding on Great Redang or the adjacent islets, of which five are sea or shore birds, and fifteen land birds. Members of a further three or four species, here classed as "strays," may also be nesting there. It is clear that the lists for the other groups in the archipelago (*see* Appendix *A*) are even less complete, but even when allowance is made for possible deficiencies in collecting they still fall short of the Great Redang total: on the existing lists it seems that two sea or shore birds and four, probably five, land birds are breeding on Pulau Bidong Laut, at the most one shore and two land birds on Pulau Lang Tĕngah, and two shore and eleven land birds on the Pĕrhentians and their islets (*see* Appendix *B*). The sea or shore birds known to be nesting on Great Redang or its off-lying rocks are,

12. *Ardea s. sumatrana* Raffles
15a. *Butorides striatus javanicus* (Horsf.)
22. *Demigretta sacra* (Gmel.)
153. *Sterna s. sumatrana* Raffles
154. *Sterna a. anæthetus* Scop.

Neither *Sterna dougallii* or *S. albifrons chinensis* has yet been reported from the area, though the former is known to nest in small numbers on a stack off Pulau Tĕnggol, seventy miles away, and the latter on nearby parts of the mainland. The fifteen land birds probably resident and nesting on the island are,

48. *Haliastur indus intermedius* Gurney
100a. *Amaurornis phœnicurus chinensis* (Bodd.)
169. *Ducula aenea polia* (Oberh.)
170. *Ducula bicolor* (Scop.)
177. *Chalcophaps i. indica* (Linn.)
178. *Calœnas n. nicobarica* (Linn.)
231. *Collocalia lowi robinsoni* Stres.
261. *Halcyon chloris humii* Sharpe
451. *Copsychus malabaricus mallopercnus* (Oberh.)

481a. *Orthotomus s. atrogularis* Temm.

517. *Pachycephala cinerea butaloides* Stres.

526. *Aplonis panayensis strigatus* (Horsf.)

535. *Anthreptes m. malaccensis* (Scop.)

541b. *Leptocoma jugularis flammaxillaris* (Blyth)

569. *Munia striata subsquamicollis* (Baker)

The list above is very typical of the better-favoured Malayan coastal islands, both in the kinds of birds present and in the notable absentees. Obviously the groups of the larger land birds are not likely to be represented: it is interesting to note further that so far as the evidence goes the Capitonidæ, Picidæ, Timaliidæ, Eurylaimidæ, Pycnonotidæ, Muscicapidæ and Dicæidæ are all unrepresented, in spite of the relative abundance of some of their members on the mainland. It is again typical that the Turdidæ are represented only by *Copsychus malabaricus*, the Alcedinidæ by *Halcyon chloris* (as a breeding species), and that the only resident warbler is *Orthotomus atrogularis*. Further, *Aplonis panayensis*, *Leptocoma jugularis*, *Ducula bicolor*, *Chalcophaps indica* and, where it is sufficiently isolated, *Calœnas nicobarica*, are forms that always turn up on these islands. With them, where the areas of grass and open scrub are sufficient, one usually finds, as first representatives of their families, *Amaurornis phœnicurus*, *Centropus sinensis* and *Munia striata*. Taken together they must be regarded as the members of their groups best able to maintain themselves in small populations in areas of limited extent. A point which is very far from clear is why *Pycnonotus goiavier* is never found with them, and why *Rhipidura javanica*, *Copsychus musicus*, *Ægithina tiphia* and *Halcyon smyrnensis* are only found occasionally.

Twelve of the birds on the present Great Redang list are clearly passage migrants and winter visitors from outside our area, namely,

114. *Charadrius mongolus atrifrons* Wagl.

117. *Numenius phaeopus variegatus* (Scop.)

128. *Actitis hypoleucos* (Linn.)

156. *Thalasseus bergii cristatus* (Steph.)

185b. *Cuculus f. fugax* (Horsf.)

197. *Eudynamys scolopacea* (Linn.), subsp.

239. *Apus pacificus* (Lath.), subsp.

250. *Alcedo atthis bengalensis* Gmel.
332. *Hirundo rustica gutteralis* Scop.
520. *Dendronanthus indicus* (Gmel.)
524. *Lanius cristatus* Linn., subspp.
527. *Sturnus sturninus* (Pall.)

of which two, *Lanius cristatus superciliosus* Lath. and *Sturnus sturninus,* and possibly a race of a third, *Apus pacificus,* appear to be birds that normally travel down the east side of the peninsula in greater numbers than they do down the west side. The migrant section of the list is obviously by no means complete, though we are still far from sure how many additional names we ought to expect to find on it on an island like Great Redang. The constitution of the Malacca Strait migratory stream is fairly well established, but we still have much to learn about the species moving along the western border of the South China Sea. It may be that few do so. The months of greatest movement are cut into by the changes of the monsoon, which on the east coast of Malaya are a serious matter. On the other hand, if all migrating birds really followed the line least beset by storms, routes off western Europe would be very different.

The Birds known from the Great Redang Group[3]

(Great Redang, Pulau Penang and adjacent islets and rock outcrops)

12. **Ardea sumatrana sumatrana** Raffles. Dusky-Grey Heron.

A nest, containing two part-fledged chicks, was found in a tree on the edge of the mangrove patch on Great Redang, 9 August, 1948. The nest was about twenty feet from the ground, beginning 2–3 feet from the main trunk of the tree and supported between two almost horizontal branches. It was a large, untidy construction of dead sticks, about 30 inches across, with a very shallow depression. Unfortunately it was not possible to get within about thirty feet of it, and it had to be viewed from a nearby tree. One adult was on or very close to the nest when it was first seen: it rose early and did not return while we were in the vicinity. A second (or the same) adult was seen later in the afternoon, towards nightfall, on Pulau Chipor, a low-lying stack near the entrance to the anchorage.

3. Trinomials are used in all the lists in this paper where local specimens have been examined, or where only the one race, as given in the Malayan checklist (1949) is likely to occur in the area. The checklist number is printed before the name in these lists for convenience of cross-reference to other recent papers from the Raffles Museum.

15a. **Butorides striatus javanicus** (Horsf.). Little Green Heron.

Seen twice on the shore of Great Redang, near the mangrove area, on 9 August, 1948. An adult female was taken on the same island by Charles on 15 September, 1950. Probably resident.

22. **Demigretta sacra** (Gmel.). Reef Heron.

Seen on several occasions on the off-lying rocks, and once on the sandy beach near the north-east corner of the island, on 9–10 August, 1948. A nest containing three eggs, 40 × 34, 41 × 32·5, 40·5 × 33 mm. ovoid, pale bluish-green in colour, was found in a rock cleft under an overhanging boulder on Pulau Chipor, and two abandoned nest sites in similar situations on Pulau Paku Kechil, an islet off the east side of the island. Six out of eight birds noted were of the dark grey form. A grey-form adult (♂) in fresh plumage was taken by Charles on one of the islets on 5 September, 1950, and a number of others seen.

48. **Haliastur indus intermedius** Gurney. Brahminy Kite.

Seen on several occasions in August 1948 and September 1950, always in flight near or above the anchorage. Probably resident.

61. **Icthyophaga ichthyætus ichthyætus** (Horsf.). Greyheaded Fishing-Eagle.

Recorded by Kloss for September 1910 (Kloss, 1911: 178); this specimen is not now in the R. M. collection. There is no other record for the islands. Status uncertain: this may have been a stray from the Sĕtiu River area on the mainland.

66. **Haliæetus leucogaster** (Gmel.). Whitebellied Sea-Eagle.

Solitary adults were seen in flight near Pulau Ekor Tibu, north of the entrance to the anchorage, and again off the south-east corner of the island, on 9 August, 1948. This species was also encountered, again a solitary adult, off Pulau Chipu, near the Sĕtiu coast, on the run back to the mainland. Also reported by Charles, September 1950. Status uncertain: these birds range more widely away from their breeding sites than the Brahminy Kites, and the adults seen may have been strays from the mainland.

100a. **Amaurornis phœnicurus chinensis** (Bodd.). Whitebreasted Water-Hen.

An adult male was taken in the scrub land towards the head of the southern valley on Great Redang on 9 August, 1948. It

seems likely that this species is resident on the island: the date is early for a migrant, and the terrain seemed eminently suitable for it. Parts of this area should also suit *Centropus sinensis* which is known from several smaller islands, but no sign was seen of it, nor did the local Malays appear to know anything of its occurrence there.

114. **Charadrius mongolus atrifrons** Wagl. Lesser Sand-Plover.

Two adults (♂ 1, ♀ 1) were taken by Kloss on 3 September, 1910. A doubtful visual record, 10 August, 1948. A sand-plover was seen in small parties by Charles, September 1950, but no specimens secured. In general in Malaya this third is common on mudflats and muddy shores all round the coast of the mainland, and on suitable off-lying islands, from the middle of August to April or May. It arrives with or shortly after *Actitis hypoleucos*, and seemingly leaves a week or two later.

117. **Numenius phaeopus variegatus** (Scop.). Eastern Whimbrel.

A single formal record, Kloss, September 1910. Not seen August 1948, and not reported September 1950.

128. **Actitis hypoleucos** (Linn.). Common Sandpiper.

Seemingly a fairly common winter visitor or passage migrant here, as elsewhere on the Malayan coast. Three solitary individuals were seen on 9 August 1948; specimens taken by Kloss, September 1910, and Charles, September 5–15 1950 (♂ 3, ♀ 2). Young (1941: 153) gives 4–18 August for the first birds seen in Kelantan. The earliest example encountered on the east coast in 1948 was a solitary bird seen near Marang, south of Kuala Trengganu, on 27 July.

153. **Sterna sumatrana sumatrana Raffles.** Blacknaped Tern.

Encountered on or near the majority of the rocky outcrops off Great Redang, with evidence of breeding on three of the islets, on 9 August, 1948. lc/2 addled eggs (37 × 28, 38·5 × 28·5 mm.) found on Pulau Paku Kechil, off the east side of Great Redang, and 3c/2 on Pulau Chipor (40 × 27, 39·5 × 28·5 mm.). (36·5 × 27, 39·5 × 28·5 mm.) and (40 × 29, 37·5 × 29 mm.). A total of fifteen chicks recorded, all found singly, the largest ranging up to 140 mm. in length. A long series of adults (♂ 3, ♀ 9) taken 5–15 September, 1950, together with three young birds (♂ 1, ♀ 2). The latter comprise a male in full first winter plumage, a fully grown juvenile (♀) and a smaller juvenile female (exp. cul. 23 mm., wing 157 mm., tail 65 mm., and tarsus

19·5 mm.). Berwick (this journal, *antea*) reports eggs found on Pulau Tengku Burong and Pulau Serenggeh, in the Perhentian group, on 31 May, 1951, and says that the fishermen from Pasir Hantu, on Perhentian Kechil, told him that they had already raided the colonies once. This suggests laying in this area over the period from about the third week in May to the third week of July, a rather wider interval than was previously suspected, but the ease with which these "stacks" can be robbed may be partly responsible.

154. **Sterna anæthetus anæthetus** Scop. Bridled Tern.

A small colony of these birds was found on a stack-like islet known as Batu Barat, lying to the south of the Great Redang group proper, towards P. Bidong Laut, on 10 August, 1948. A heavy sea and a strong swell made landing impossible, but according to the local boatmen only chicks, and no fresh eggs, would have been present on the stack by that date. From the number of adults seen in the vicinity it would seem that there were, very approximately, 60 pairs of *anæthetus* and 20 pairs of *sumatrana* breeding there. An immature female from this colony was obtained in September 1950 (exp. cul. 36 mm., wing 222 mm., tail damaged, tarsus 21 mm).

156. **Thalasseus bergii cristatus** (Steph.). Large Crested Tern.

A group of about 200 birds, including a small number of juveniles, was found on a low, rounded rocky spur on the south end of P. Chipor. I was assurred that the birds were not known to nest anywhere in the area; the Malay name was given as *Paka*. An adult female was taken off P. Chipor, 10 September, 1950.

166. **Treron vernans griseicapilla** Schleg. Pinknecked Green Pigeon.

An adult male was taken by Charles, 9 September, 1950. There are no other records for these islands, and this bird may have been a stray from the mainland.

169. **Ducula aenea polia** (Oberh.). Green Imperial Pigeon.

Said to be present on Great Redang in small numbers, August 1948 and September 1950. Two adults (♂ 1, ♀ 1) were taken by one of the fishermen, 9 August, 1948, but I did not see the part of the island from which they came.

170. **Ducula bicolor** (Scop.). Pied Imperial Pigeon.

Fairly plentiful on Great Redang, August 1948. Taken by Kloss, September 1910, and Charles, September 1950 (♂ 2).

Probably resident. Common in the Perhentians, where, from data in Berwick (this journal, *antea*) it appears that eggs are laid in April and May (P. Perhentian Besar and P. Serenggeh): five eggs measured by Berwick average 44·1 × 31·4 mm.

177. **Chalcophaps indica indica** (Linn.). Emerald Dove.

Kloss (1911: 178) gives a visual record for this bird, Great Redang, September 1910. It has been taken on East Perhentian Island. Probably resident.

178. **Calœnas nicobarica nicobarica** (Linn.). Nicobar Pigeon.

Taken by Kloss, September 1910, on Great Redang: reported, but not secured, September 1950. I was told that it was resident in the wooded part of the island and on the islet known as Pulau Koringo Besar, but now very scarce and hard to find. Members of the Skeat Expedition spent about a week on P. Bidong Laut; Great Redang may have been the source of the example of *nicobarica* wrongly localised in their collection as from Kota Bharu (Kelantan).

185b. **Cuculus fugax fugax** (Horsf.). Malayan Hawk-Cuckoo.

An adult female was taken by Kloss on Great Redang, 2 September, 1910 (R. M. coll.): listed by Kloss (1911: 178) as the immigrant race, *C. f. nisicolor* Blyth (not Hodgs.).

197. **Eudynamys scolopacea** (Linn.). subsp. Koel.

An example was taken by Kloss on Great Redang, September 1910. He lists it as "*Eudynamis honorata* (Linn.)", and it is not clear whether it was of the immigrant or resident race: neither this specimen or the bird from P. Bidong Laut can now be located in the R. M. collection.

231. **Collocalia lowi robinsoni** Stres. Robinson's Swiftlet.

This bird is said to nest in two caves on the east side of Great Redang, and in a small cave on one of the off-lying rocky islets (Pulau Lima). One of the island caves was examined, a small fault-cave (fissure) approached from the sea. A few birds were seen, and about a score of nests noted high on the wall. Unless the cave had been cleared after the finish of the season, the colony must be a very small one. I was told that a black-nest swiftlet also breeds on P. Bidong Laut. Berwick (this journal, *antea*) reports both this species and *C. francica* (Gmel.) nesting in a cave on P. Serenggeh, a stack between West Perhentian and P. Susu Dara, and it is likely that the latter also occurs on Great Redang.

239. **Apus pacificus** (Lath.) subsp. Immigrant Swift.

A small party was seen over the cleared area on Great Redang on 9 August, and another over the village on Pulau Penang on 10 August, 1948. An adult was taken by Charles on 10 September, 1950 (ex. sex, skin badly damaged). According to Young (1941: 155) "Autumn arrivals (in Kelantan) appear about mid-July and then in increasing numbers throughout August"; no more are seen after about the third week in October, until the northward movement in the spring. No data are available for Trengganu.

250. **Alcedo atthis bengalensis** Gmel. Indian Common Kingfisher.

Taken by Kloss, September 1910; seen once in the mangrove area on Great Redang, 9 August, 1948. Charles found it common on Great Redang in September 1950, and took three immature birds (♂ 1, ♀ 2), 7–15 September. Probably a migrant.

254. **Ceyx rufidorsum rufidorsum** Strickl. Redbacked Kingfisher.

Seen by Kloss on Great Redang and again in the Perhentians, September 1910: no other records for the islands.

261. **Halcyon chloris humii** Sharpe. Whitecollard Kingfisher.

This species is apparently much addicted to small islands, and has been recorded from a number of them in our area. Kloss took an example on Great Redang, September 1910; several birds were seen, 9–10 August, 1948; Charles took two birds (ad. ♂, im. ♀), 6–8 September, 1950. Probably resident.

332. **Hirundo rustica gutteralis** Scop. Eastern Swallow.

This bird is not recorded by Kloss, nor was it seen in August 1948, but Charles took an adult male, 10 September, 1950, and reports that it was not uncommon during his stay on the island. Young (1941:9) says that over a period of seven years the first arrivals in Kelantan, with one exception, were noted between 5 and 23 August, and that the birds are most numerous there from October to January: probably 9–10 August was too early for them.

451. **Copsychus malabaricus malloperenus** (Oberh.).
Common Shama.

An adult female was taken on Redang by Kloss, on 4 September 1910; Charles collected two examples, ad. ♂ 6

September, and juv. ♂, not fully grown (exp. cul. 19 mm., wing 188 mm., tail 101 mm., tarsus 23 mm.), 10 September. Presumably the Shama, another bird fond of small islands, is resident on Great Redang.

481a. **Orthotomus atrogularis atrogularis** Temm.
Blacknecked Tailor-Bird.

An example of this bird was taken by Kloss on Great Redang in September 1910. A blacknecked Tailor-bird was both seen and heard there on 9–10 August 1948. Presumably resident.

517. **Pachycephala cinerea butaloides Stres.**
Mangrove Flycatcher-Shrike.

Apparently quite common in the mangrove area on Great Redang, in August 1948. Kloss took a specimen there in September 1910. Presumably resident.

520. **Dendronanthus indicus** (Gmel.). Forest Wagtail.

A passage migrant and winter visitor, recorded formally by Kloss, September 1910. Young (1941: 10) says that according to his notes this bird usually reaches Malaya at the beginning of September: earliest date 18 August, latest 20 September.

524a. **Lanius cristatus cristatus** Linn.
524c. **Lanius cristatus superciliosus** Lath. Brown Shrike.

Three immature examples of the Brown Shrike were taken on Great Redang in 1950: *cristatus*, ex. sex, 7 September; *superciliosus*, ♂ ♂, 7 and 10 September. In some respects the last two skins are the most interesting material in the 1950 collection. There are a number of visual records for *Lanius cristatus* for the eastern states, but few formal ones and we are very short of reliable information on the relative numbers, and the local range, of the four races coming to Malaya.

The typical race, which breeds in eastern Siberia, is fairly common as a winter visitor in Malaya, and probably makes up the bulk of the population on the west side of the peninsula. *L. superciliosus* is much rarer, in collections at least: the R. M. coll. contains only five examples, Pulau Langkawi (23 April), ?Malacca (? date), and three from Singapore Island (26 September to 7 November). There appear to be no records for this

form for Siam proper, and few for Peninsular Siam, but Dr. Abbott took four specimens on the Trengganu coast between 22 September and 1 October (Tg. Dungun, Paka, Tg. Labohan and Kemamum River). Young (1941: 10) suggests that this is probably the commonest form of *L. cristatus* in Kelantan. Now we have a further two examples from the east coast area. Earlier (1949: 228) I have suggested that this bird was probably reaching Malaya by way of the west coast of Borneo or the Anamba Islands. Riley (1938: 480) gives the winter range as southern China, Indo-China, the Malay Peninsula, Java and the Sunda Islands as far (east) as Sumba: possibly it is coming across to Malaya from the southern spur of Cochin-China.

The three specimens from Great Redang are earlier than any dates for autumn birds in the Raffles Museum collection, and a little earlier than the arrival dates which Young suggests for Kelantan. According to Berwick (this journal, *antea*), however, in 1950 the Brown Shrike was first seen in Kota Bharu on 24 August. It seems likely that these birds reach Kelantan, and subsequently Trengganu, a little before those coming down the west side of the peninsula appear in Perak, not rather later as Young suggests.

526. **Aplonis panayensis strigatus** (Horsf.).
Glossy Tree-Starling.

Common round the settlement on Pulau Penang, and also present on Great Redang. Recorded September 1910 and August 1948: the 1950 collection contains four examples (ad. ♂ 3, juv. ♀ 1), 9–14 September. Resident.

527. **Sturnus sturninus** (Pall.). Daurian Starling.

One record, an immature female shot from a small flock on Great Redang, 14 September, 1950. This bird winters as far west as Burma, but it seems likely that in part at least it favours the east coast route down the peninsula. Abbott took a female at Paka, on the Trengganu coast, on 25 September, 1900, and Kloss's party an example on the Nerus River on 29 September, 1910. Edgar (*in litt.*) reports a small flock seen at Sĕmut Api (Pantai Chinta Bĕrahi), on the Kelantan coast, on 21 September. This bird reaches Singapore as early as the middle of September, sometimes in considerable numbers, but there are not many comparable records for the west side of the peninsula.

535. **Anthreptes malacensis malacensis** (Scop.).
Brownthroated Sunbird.

This bird is present in small numbers on Great Redang, where it was encountered several times on 9–10 August, 1948: formal record, Kloss 5 September, 1910 (ad. ♀). Presumably resident on the islands.

541b. **Leptocoma jugularis flammaxillaris** (Blyth).
Yellowbreasted Sunbird.

Common on Pulau Penang, and also seen on Great Redang (August, 1948). Formal records. Kloss 2 September 1910 (ad. ♀): Charles 13 September, 1950 (ad. ♂, in fresh plumage). Presumably resident. Birds from Redang are ascribable to the northern race, *L. j. flammaxillaris*, here near the southern limit of its area.

569. **Munia striata subsquamicollis** (Baker)
Sharptailed Munia.

The 1950 collection includes two adults of this species (♂ 1, ♀ 1), taken 9–10 September. Not previously recorded from the islands (though I watched and enquired for a Munia), but presumably resident there.

Appendix A

Pulau Bidong Laut (Little Redang)

P. Bidong Laut lies about eight miles south by east of Great Redang, and some five miles nearer to the Trengganu coast. It is a little over a mile long and just under a mile wide, with its highest point 1,055 feet above sea level. There is a small islet about a mile away to the south of it, another some two miles away to the north and a pair of islets, P. Yu Bĕsar and P. Yu Kĕchil, five miles to seaward. The east side of Bidong Laut is edged with low cliffs, while on the west, facing the mainland, there are two sandy beaches separated by a rocky spur. The beaches are backed by a fringe of coconut palms, which shelter the few houses of a small village, and behind them are part-abandoned plantations of tapioca and bananas, and several areas of lallang grass. The remainder of the island is covered with a sparse stunted forest, broken by patches of scrub and secondary growth near the settlement over areas where formerly hill padi was grown.

Kloss collected for two days on Bidong Laut, 30 & 31 August, 1910. Previously members of the Skeat Expedition had spent about a week there, with remarkably little to show for their labours (c. 6–14 December, 1899): the birds taken, six specimens representing five species, are recorded by Bonhote (1901: 57–81, *passim*). Kloss took examples of five species, only one of which was represented in the Skeat Expedition's collection. The full list of the birds known from the island, including those seen on my visit on 9 August, 1948, is as follows.

22. *Demigretta sacra* (Gmel.)	..	Kloss, 1910.	G.–H., 1948.
112. *Charadrius a. alexandrinus* Linn.	.. ..	Skeat, 1899.	
128. *Actitis hypoleucos* (Linn.)	..	Skeat, 1899.	Kloss, 1910.

153.	*Sterna s. sumatrana* Raffles ..	G.–H., 1948.	
170.	*Ducula bicolor* (Scop.) ..	Kloss, 1910.	G.–H., 1948.
197.	*Eudynamys scolopacea* (Linn.) subsp.	Kloss, 1910.	
346.	*Dicrurus a. annectens* (Hodgs.)	Skeat, 1899.	
360.	*Corvus enca compilator* Richm.[4]	Skeat, 1899.	
526.	*Aplonis panayensis strigatus* (Horsf.)	Kloss, 1910.	G.–H., 1948.
535.	*Anthreptes m. malacensis* (Scop.)	Skeat, 1899.	
541.	*Leptocoma jugularis* (Linn.) subsp.	G.–H., 1948.	

Pulau Lang Tĕngah

Pulau Lang Tĕngah (Pulau Lantinga, *fide* Kloss) lies about five miles west of Great Redang. It is roughly a mile and a half long and half a mile wide, with its highest point, to the tops of the trees, 520 feet above sea level. The north-east (seaward) side is rocky: on the landward side there are two sandy beaches divided by a rocky headland. Behind the beaches is a fringe of coconut palms: the remainder of the island is wooded. There were no inhabitants at the time of Kloss's visit, "but two or three ruined houses and sheds stood amongst the palms." There is no history of subsequent permanent occupation, though fishermen from Great Redang sometimes spend a night there.

Kloss collected mammals for a few hours on Pulau Lang Tĕngah in 1910. No landing was made in 1948, and his notes provide the only data available on the avifauna. He records seeing,

12. *Ardea s. sumatrana* Raffles.

128. *Actitis hypoleucos* (Linn.).

481. *Orthotomus a. atrogularis* Temm.

541. *Leptocoma jugularis* (Linn). subsp.

Perhentian Islands

The two Perhentian Islands (East Perhentian or Pulau Pĕrhentian Bĕsar, and West Perhentian or P. Pĕrhentian Kĕchil) lie close together about eight and a half miles north-westward of Pulau Lang Tĕngah and roughly nine miles from the nearest point on the Trengganu coast. The anchorage between the two islands is just over eleven miles from the estuary of the Bĕsut River (Kuala Bĕsut), and twelve miles from the present outlet of the Sĕtiu River. Both islands are about two and a half miles long; the eastern, rather irregular in shape, rising to a height of 1,134 feet, is two miles across at the widest point, and the western, rising to 1,125 feet, just over one mile. The channel between them is only two cables wide at its narrowest point, and still further reduced by a ridge of rocks which runs westward from East Perhentian and cuts nearly half way across it. South of this neck is a sheltered bay, formed by the two islands, with several sandy beaches round it. On the west side of the bay, at the south-east point of West Perhentian, is a moderate-sized village.

4. Possibly this should be *Corvus macrorhyncha*, of which the R.M. coll. contains a specimen from the Perhentians. Kloss (1911) omits *C. alexandrinus* (Bonhote 1901: 79) when listing the Skeat Expedition's birds. The total is five, as shown here.

There are a few houses on East Perhentian, but the island is not inhabited permanently. The north-eastern aspects of the islands are rockier, with steep slopes and a thick covering of stunted vegetation. The southern and western portions of East Perhentian are densely wooded, with some good trees near the southern bay. The grater part of West Perhentian has been cleared of its original vegetation and is covered with a dense plantation of coconut palms (on the flat land near the sea) and bananas (on the slopes). Three and a half miles north-westward of West Perhentian is the small island of Pulau Susu Dara, densely wooded, steep-to and reaching a height of about 735 feet. A mile south of P. Susu Dara is a smaller but rather similar islet, P. Sĕrĕnggeh, which rises to a height of 195 feet, and eastward of P. Susu Dara a cluster of islets of which the largest, P. Rawa, rises to a height of 180 feet.

Kloss spent seven days on the Perhentians in 1910, collecting mostly on East Perhentian and concentrating on the mammals: he records six birds from the group (five collected, one, *Ceyx r. rufidorsum*, seen), but he does not appear to have visited P. Susu Darat and its adjacent islets. The present writer spĕnt a day in the group in June, 1947, mostly on West Perhentian. Subsequently on 30–31 May, 1951, it was visited by Berwick, who paid special attention to the hitherto unexplored northern islets (Berwick, this journal, *antea*). The birds at present known from the islands are as follows,

22. **Demigretta sacra** (Gmel.) ..	Kloss, 1910.	G.–H., 1947.
48. **Haliastur indus intermedius** Gurney	G.–H., 1947.	
153. **Sterna s. sumatrana** Raffles ..	G.–H., 1947.	Berwick, 1951.
170. **Ducula bicolor** (Scop.) ..	G.–H., 1947.	Berwick, 1951.
177. **Chalcophaps i. indica** (Linn.)	Kloss, 1910.	
178. **Caloenas n. nicobarica** (Linn.)	Berwick, 1951.	
231. **Collocalia lowi robinsoni** Stres.	Berwick, 1951.	
233. **Collocalia francica** (Gmel.) subsp.	Berwick, 1951.	
254. **Ceyx r. rufidorsum** Strickl.	Kloss, 1910.	
261. **Halcyon chloris humii** Sharpe	G.–H., 1947.	
359. **Corvus m. macrorhynchos** Wagl.	Kloss, 1910.	
451. **Copsychus malabaricus malloperenus** (Oberh.) ..	G.–H., 1947.	
474. **Phylloscopus b. borealis** (Blas.)	Kloss, 1910.	
481. **Orthotomus a. atrogularis** Temm.	G.–H., 1947.	
526. **Aplonis panayensis strigatus** (Horsf.)	Kloss, 1910.	G.–H., 1947.
541. **Leptocoma jugularis** (Linn.) subsp.	G.–H., 1947.	

Berwick also records *Pycnonotus zeylanicus* (Gmel.), "heard singing in Pulau Perhentian Kechil." It will be noted that only one undoubted migrant has been recorded so far from the Perhentians, *Phylloscopus borealis* (formal record, Kloss), but no doubt those reported from Great Redang and P. Bidong Laut also occur here. Kloss's obsession with mammals was

considerable, and no one else has been to the Perhentians at a suitable time of year, while all the visits to Great Redang have been made at the beginning of the migrant season. Unfortunately it is not easy to reach these islands during the period of the north-east monsoon, which makes egress from the kualas of the Sĕtiu and Rĕsut Rivers uncertain, and return a most chancy business. Even in September Kloss was running something of a risk if his boat (a 44-foot Trengganu lug-rigged ketch, the *Trengganu Pĕrahu Pinas*) was as unseaworthy as he suggests, "The prau was not a good sea-boat, her anchor and cable were untrustworthy and her sails so rotten that on a stormy night towards the end of the cruise they were practically blown away" (Kloss, 1911: 175).

Appendix B

Table of the Birds recorded from the Trengganu Archipelago

The following table is minimal, and shows only formal records and visual records of reasonable authenticity. I am of the opinion that I saw two different *Charadrius* spp. on Great Redang on 9 August, 1948, but only *mongolus atrifrons*, of which Kloss took two specimens on the island, has been entered here. Similarly no note is made of *Ketupa ketupa* which I was told occurs on Redang, together with a small owl "that makes a noise a little like a dog", or of the *Burong But-But* (*Centropus* spp.), which my guides failed to locate for me. I have also omitted *Streptopelia chinensis* for Great Redang, though it might just possibly be there: there were several caged birds in the kampong on Pulau Penang, some of which the owners assurred me had been taken on the main island, but they said the same of a caged bulbul, *Pycnonotus jocosus*, which they must certainly have bought in the market in Kota Bharu. On consideration I have ignored my own record of *Pycnonotus goiavier* from the Perhentians, as I think the individual seen may have had a similar origin (though probably brought up from Kuala Trengganu). *Collocalia lowi* is shown only for Great Redang and the Perhentians and *C. francica* for the latter, as actually recorded, but there can be little doubt that *francica* is also on Redang or one of its islets, and *lowi*, or both, probably on P. Bidong Laut.

Genuine migrants again are shown only where they have been reported or taken, though there can be little doubt that any migrant now known from the group will turn up sooner or later from Great Redang and probably from the Perhentians: certainly *Dicrurus annectans* and *Phylloscopus borealis*. Finally it is difficult to determine the status of *Ichthyophaga ichthyaetus*, *Haliaetus leucogaster*, *Treron vernans*, *Ceyx rufidorsum*, and the *Corvus* spp. reported from these islands, and they have accordingly been put down provisionally as "Strays", with, it is to be hoped, no reflection on their standing in the avian world. For brevity passage migrants and possible winter visitors are all described as "Migrants": we have in any case nothing to show whether or not any of them remain on the islands until their return flight, though some, *Charadrius mongolus*, *Actitis hypoleucos*, *Thalasseus bergii*, *Eudynamys scolopacea*, *Alcedo atthis*, *Hirundo rustica* and *Dendronanthus indica* at least, may well do so.

Breeding has been actually recorded only in the case of *Ardea sumatrana* (Redang), *Demigretta sacra* (Redang), *Sterna sumatrana* (Redang & Perhentians), *Sterna anæthetus* (Pulau Barat, Redang group), *Ducula bicolor* (Perhentians), *Caloenas nicobarica* (Perhentians), *Collocalia lowi* (Redang & Perhentians) and *Collocalia francica* (Perhentians). Great Redang records are in this paper, *antea*; records for the Perhentians in Berwick, 1952 (this Journal, antea).

Name and Number, as on the Malayan Checklist (1949)	Recorded from				Probable Status
	P. Bidong Laut	Great Redang	P. Lang Tengah	Perhentian Islands	
12. *Ardea s. sumatrana* Raffles ..	..	+	+	..	Resident
15a. *Butorides striatus javanicus* (Horsf.)	..	+	..	..	Resident
22. *Demigretta sacra* (Gmel.) ..	+	+	..	+	Resident
48. *Haliastur indus intermedius* Gurney	..	+	..	+	Resident
61. *Icthyophaga i. ichthyaetus* (Horsf.)	..	+	..	..	Stray
66. *Haliaetus leucogaster* (Gmel.)	..	+	..	..	Stray
100a. *Amaurornis phoenicurus chinensis* (Bodd.)	..	+	..	..	Resident
112. *Charadrius a. alexandrinus* Linn.	+	..	..	..	Migrant
114. *Charadrius mongolus atrifrons* Wagl.	..	+	..	..	Migrant
117. *Numenius phaeopus variegatus* (Scop.)	..	+	..	..	Migrant
128. *Actitis hypoleucos* (Linn.) ..	+	+	+	..	Migrant
153. *Sterna. s. sumatrana* Raffles	+	+	..	..	Resident
154. *Sterna a. anaethetus* Scop. ..	..	+	..	..	Breeding
156. *Thalasseus bergii cristatus* (Steph.)	..	+	..	..	Migrant
166. *Treron vernans griseicapilla* Schleg.	..	+	..	..	Stray
169. *Ducula aenea polia* (Oberh.)	..	+	..	..	Resident
170. *Ducula bicolor* (Scop.) ..	..	+	..	+	Resident
177. *Chalcophaps i. indica* (Linn.)	+	+	..	+	Resident
178. *Caloenas n. nicobarica* (Linn.)	..	+	..	+	Resident
185b. *Cuculus f. fugax* (Horsf.) ..	..	+	..	..	Migrant
197. *Eudynamys scolopacea* (Linn.), subsp.	+	+	..	+	Migrant
231. *Collocalia lowi robinsoni* Sres.	..	+	..	..	Resident
233. *Collocalia francica* (Gmel.), subsp.	..	..	..	+	Resident
239. *Apus pacificus* (Lath.), subsp.	..	+	..	..	Migrant
250. *Alcedo atthis bengalensis* Gmel.	..	+	..	..	Migrant
254. *Ceyx r. rufidorsum* Strickl. ..	..	+	..	+	Stray
261. *Halcyon chloris humii* Sharpe	..	+	..	+	Resident
332. *Hirundo rustica gutteralis* Scop.	..	+	..	..	Migrant
346. *Dicrurus a. annectans* (Hodgs.)	+	..	..	..	Migrant
?359. *Corvus* sp., ?*macrorhynchos* Wagl.[5]	+	..	..	+	Stray
451. *Copsychus malabaricus malloperenus* (Oberh.) ..	..	+	..	+	Resident
474. *Phylloscopus b. borealis* (Blas.)	..	..	..	+	Migrant

5. See footnote 4, *antea*. Bonhote records *Corvus enca* from P. Bidong Laut, and Kloss *Corvus macrorhyncha* from the Perhentians.

Name and Number, as on the Malayan Checklist (1949)	Recorded from				Probable Status
	P. Bidong Laut	Great Redang	P. Lang Tengah	Perhentian Islands	
481a. *Orthotomus a. atrogularis* Temm.	..	+	+	+	Resident
517. *Pachycephala cinerea batuloides* Stres.	..	+	..	..	Resident
520. *Dendronanthus indicus* (Gmel.)	..	+	..	..	Migrant
524. *Lanius cristatus* Linn., subspp.	..	+	..	..	Migrant
526. *Aplonis panayensis strigatus* (Horsf.)	+	+	..	+	Resident
527. *Sturnus sturninus* (Pall.) ..	..	+	..	..	Migrant
535. *Anthreptes m. malacensis* (Scop.)	+	+	..	..	Resident
541. *Leptocoma jugularis* (Linn), subsp.[6]	+	+	+	+	Resident
568. *Munia striata subsquamicollis* (Baker)	..	+	..	..	Resident
Totals: Resident Species.					
Sea and Shore Birds	2	5	1	2	
Land Birds ..	4	15	2	11	
Strays	1	4	..	2	
Passage Migrants ..	4	12	1	1	
Total Number of Species Recorded Here	11	36	4	16	

6. Presumably these are all the northern race, *L. j. flammaxillaris* (Blyth), but I have only examined material from Redang.

Summary

This paper provides an annotated list of the birds known from the island of Great Redang (about Lat. 5° 47′ N., Long. 103° 01′ E.), off the northern end of the coast of Trengganu. Data have been obtained from the report published by Kloss on his collecting on the island in September 1910 (*Journ. F.M.S. Mus.*, 4, 1911: 178), from specimens and information collected by the present writer on the island on 9–10 August, 1948, and specimens taken by the Raffles Museum collector, 5–15 September, 1950. On the information at present available it seems probable that five sea or shore birds and fifteen land birds are breeding on Great Redang or its adjacent islets; twelve passage migrants and a further four species here classified as strays are also recorded from the island. Appendices give the birds known from the other sections of the Trengganu Archipelago, and compare the species recorded from them with the avifauna of Great Redang as listed here.

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No. 16, Notes on the Alien Birds recorded from Singapore Island

A summary of the information available on the alien birds known from Singapore Island in 1924 was published by the late F. N. Chasen as No. 5 in the old series of Records of the Raffles Museum (*Journ. Malayan Br. Roy. Asiat. Soc.*, 2, (1), pp. 68–70). Since that time a number of additional birds, some of which are still with us, have been seen or taken on the island. To keep our knowledge up to date the existing records are noted, and in parts analysed, below. For convenience this is done under two headings, (*a*) isolated occurrences, including birds which may have bred here for a time but have failed to establish themselves permanently, a category which includes representatives of about six species, and (*b*) birds which, so far as we know, are at present breeding on the island under feral conditions, a total of seven species. The latter are now accepted elements in the local avifauna, and some are included in the 1949 Checklist of the Birds of Singapore Island (*Bull. Raff. Mus.*, 21, pp. 132–183). Taken together these two groups cover about thirteen species, all of which are known, or can reasonably be inferred, to have arrived here with human assistance. For completeness, brief references are also included below (in section (*b*)) to two birds which have appeared on the island during the last fifty years, and are now firmly established, but which have probably come unaided.

A rapid inspection of these notes will show that few of the records go back beyond the early 1920's, and that a surprising number of birds appear to have been liberated here recently. There is, actually, no doubt that at least two of the processes discussed below have been in operation for a long time, and that a large number of alien birds must have gained their freedom on the island in the last century. The absence of records is due to the prevailing lack of local interest in ornithology, rather than to any shortage of subject matter. Dealers made their profits in trade skins—sometimes bringing them from as far afield as the Moluccas and New Guinea, or worse, Borneo and Sumatra, to confound later workers—but apart from two short periods no one was interested in recording the birds alive on the island itself with any precision. The brief intervals of light were 1877–1880, when Lt. Kelham was stationed at Tanglin Barracks and Hume was having localised skins collected and sent to him,[1] and the few years round 1890 when Davison, Hume's former collector, was Curator of the Raffles Museum and Library. Davison, never strong, died in Singapore in January 1893, and from then until 1921, when the late F. N. Chasen joined the staff as taxidermist, there was no one at the Museum officially and especially interested in birds. If there had been we might well have appreciably earlier records of some of the flush of birds which appear to have arrived suddenly in the years 1922–25.

Introduced birds can reach our area in at least three ways. Individuals may be brought here and liberated with the deliberate intention of establishing the species, if it can come to terms with its new environment; cage birds may escape, or be set free because their owners are weary of them; finally birds are at times liberated by the devout at the annual festival to lighten their souls of the burden of their minor offences. This last custom is dying out, but it was formerly not uncommon among the Chinese. The animals most often chosen are tortoises and turtles, but in default, or as additional material, birds are used, preferably the little Munias and the Java Rice-bird, *Padda oryzivora*. Whether or not the animals are in a fit state to live when liberated is no concern of the people participating in the ceremony. No doubt many die after a few days, but it is almost certain that the Javanese race of *Munia leucogaster* became established on the island in this way. It is extremely likely that the various colonies of *Padda oryzivora* in Malaya had a similar

1. Kelham, *ibis*, 1880–82; reprinted *Journ. Straits Br. Roy. Asiat. Soc.*, 1882–83. Hume, *Stray Feathers*, 1879–80.

origin, and even if they did not, the feral stocks must undoubtedly have been augmented from this source from time to time. Finally it is very probable that the Javanese Amandavats, *Amandava amandava* subspp., reported at intervals have been heavy with a rich man's peccadillos, in spite of their light and cheerful air. Until very recently it was frequently easier, and cheaper, for the Singapore livestock dealers to obtain birds brought in from Java and Sumatra on the small trading vessels, than it was for them to get them from the mainland of Malaya. This period has probably passed, but the proportion of Indonesian-taken birds in the dealers' hands is still fairly high.

Some of the alien birds now breeding in Singapore may have been established here deliberately, but there is no certain evidence of this origin for any of them. The most likely candidate, surprisingly enough, is the Ceylon House Crow, *Corvus splendens protegatus* Madar., from southern India. It was certainly taken to the Klang district of Selangor, about fifty-five years ago, as part of an early but unsuccessful experiment in biological control of an insect pest. Subsequently one or more attempts are said to have been made to introduce it into Singapore Island, for sentimental reasons, by workers from India, but the real origin of the present small colony is uncertain. According to Ridley (1906: 170) *Padda oryzivora* was another unsuccessful experiment. He says that the birds were set free in the hope that they would reduce the number of insects in the Botanic Gardens, and then disappointingly they confined their attention to fallen grain, but it is doubtful if anyone in this part of the world could have been so naive as to believe that *Padda oryzivora* was an insect-feeder.[2] And, as we have said, this is certainly one of the birds liberated by the penitent Chinese. It is possible that some of the introduced birds were brought here to enliven the landscape—as Hugh (afterwards Sir Hugh) Low is said to have established *Streptopelia chinensis* from Malaya on Labuan Island while stationed there—but we have no evidence on this count, beyond the reported attempts of the Southern Indians to bring *Corvus splendens* down from Klang.

There is no doubt that the majority of the introduced species reported from the island have had their origin in escaped or liberated cage-birds. On the whole this is not surprising. Caged birds are kept widely by the Malays and Indonesians, and escapes are by no means infrequent. In three years my driver's

2. Anyway the records of its presence here antedate the establishment of the Botanic Gardens in Tanglin. Oxley (1849) refers to feral Java Sparrows, and writes as if they were present when he first came here.

wife has had at least eight such birds, always for only a few weeks or at the most a month or two; about half of them have escaped; the remainder have died or been given away. We should certainly have more records from this source if it were not for the fact that several of the birds to which the Malays are most partial are indigenous, with no racial distinction between birds from Java and Malaya. The birds most commonly kept, in rough order of preference, are doves, especially *Streptopelia chinensis* and *Geopelia striata*,[3] though no doubt the two *Streptopelia tranquebarica* came this way: then bulbuls, with particular preference for *Pycnonotus jocosus*, though *P. goiavier*, and in Java *P. cafer*, are also kept: next come the Malay Loriquet, *Loriculus galgulus*, an indigenous bird, and several mynahs, especially the Tiong, *Gracula religiosa*,[4] but also *Aplonis panayensis*, and in Java, *Acridotheres fuscus javanicus* and *Gracupica melanoptera:* finally, munias and in Java *Padda oryzivora*. It will be noted that in the above list, excluding the munias and Padda, we have three birds already very common on the island, three more that are native and would not be noticed here, and five of the aliens under discussion.

The Malays are not over partial to keeping parrots, except for the popular little Malay Loriquet. Nevertheless there is no doubt that examples are, or were, brought here in some numbers by the Bugis sailors on the trading boats coming from further east. Ridley (1906: 171–172) comments on,

Pseudeos fuscata (Blyth) subspp. (New Guinea area).
Trichoglossus haematod (Linn.) subspp. (Buru & Ceram to New Guinea).
Domicella domicella (Linn.) (Ceram & Amboina).
Domicella g. garrula (Linn.) (Halmahera & Weda Is.).
Domicella garrula flavopalliata (Salvad.) (Morotai, Raou, Batjan & Obi).
Lorius roratus pectoralis (P. L. S. Müll.) (New Guinea, etc.).
Kakatoe galerita (Lath.) subspp. (New Guinea, North & East Australia).
Kakatoe sulphurea (Gmel.) subspp. (Celebes, Buton, Lesser Sunda Is.).
Kakatoe moluccensis (Gmel.) (Southern Moluccas, Ceram, Sapurua & Haruku).

3. *Geopelia s. striata* (Linn.) is probably the most popular of the cage birds. It has a value apart from its song. According to the Malays it prevents fire occurring in a house and wards off evil spirits when hung near the doorway. When selecting one for use for these purposes special attention must be paid to the note of its "coo" and the number of scales on its toes.

4. *Gracula r. religiosa* Linn. Javanese birds are said to have a wider range of sounds at their control, and to be better mimics, though both are members of the typical race. Clearly the characteristic has no taxonomic associations.

reaching Singapore in this way, of which only one, *Domicella garrula flavopalliata* (Salvad.) from parts of the Moluccas, has been recorded in a feral state, and then only solitary individuals. The parroquet now nesting here, temporarily at least, has clearly come from southern India; it is probable that the other parroquet recorded has a similar origin. From their location on the island it seems probable that both of these birds have been brought over by members of the Army, or its followers.

(*a*) Isolated Occurrences

Streptopelia tranquebarica humilis (Temm.)

Two adult males of this bird, found together, were taken on Singapore Island in December 1940, and the skins sent to the Raffles Museum by the late Cosmo Clunies-Ross. One had just completed a major moult, and the other was finishing one: the birds showed no indication of recent captivity. There are no other records for this species for southern Malaya, Singapore Island or the territories to the south. Robinson & Kloss (1921: 35) give Pakchan as the southern limit of its range, and Chasen omits it from his handlist of Malaysian birds. It is, however, known to have bred in the Dindings, on the Perak coast, in 1933, and wandering flocks have been reported from that region on several occasions. The situation was reviewed by Edgar in 1947 (*Malayan Nat. Journ.*, 2, (2), p. 2), and on the evidence that he brought forward it was included in the Malayan Checklist of 1949 (*Bull. Raff. Mus.*, 20, pp. 85–86) as occurring naturally in parts of Perak. There seems, however, no reason to doubt that its single appearance on Singapore Island, 300 miles further south, was due to the escape of caged birds.

Domicella garrula flavopalliata (Salvad)

An adult female of this species was taken by Prof. G. R. Ransome in the grounds of the Singapore General Hospital in November 1951. The bird, which had been seen in the neighbourhood at intervals during the previous week or ten days, was in good condition and had apparently been at large for some time. The skin was kindly identified for us by J. D. MacDonald of the British Museum (N. H.). Two races of this bird are recognised, the typical race occurring on Halmahera and the Weda Islands, and *D. g. flavopalliata*, found on four of the larger islands in the Moluccas. Solitary short-tailed parrots, largely red in colour, have been reported at fairly wide intervals, mostly from the Kallang and Katong districts of Singapore, and during the last

few months of the year. It seems likely that the records refer to this form, and that the birds are brought here by the crews of the Makassar (Bugis) schooners from southern Celebes, which in good seasons trade east to Aru and the Moluccas and then west to the Java ports and Singapore: timing, place and contacts all fit neatly.

Psittacula alexandri (Linn.), subsp. incert.

Spittle (MS notes) records a solitary male of this species seen on the Changi Promontory on 7 August, 1943, and a party of three males seen in the same locality on 8, 10 and 13 of the same month. The birds were also seen independently by A. E. Allin and a Major J. Hughes, I.A., who was familiar with the species in India. There are no formal records of *P. alexandri* from the southern portion of the Malay Peninsula, and it seems most unlikely that any birds would reach Singapore Island naturally. A northern race, *P. a. fasciata* (P. L. S. Müller) is resident in Tenasserim and Siam proper, but the only record for the Malay Peninsula is an immature bird taken at Koh Pra Tung, Takuapah Inlet, on the west coast of Peninsular Siam, lat. about 9° north (Robinson & Kloss, 1923: 116), and the statement by Robinson (1907, p. 72; and 1910, p. 8) that W. R. Davison saw it at Kuala Trengganu but failed to secure a specimen. If the Changi birds had been liberated by local people they are most likely to have been *P. a. alexandri* (Linn.), which is resident and widespread in Java, and also occurs in southern Borneo. On the other hand they may have been survivors from birds kept at the military camp at Changi before the capitulation in February 1942; in this case they were probably the northern *P. a. fasciata*.

The Changi birds were not seen after August 1943, and there is no indication that breeding occurred, or even that there were any females of the species feral in the area. A reference by F. G. H. Allen (*Malayan Nat. Journ.*, 5, (4), p. 205) to a bird seen in company with a small flock of *P. krameri* (see below) in the neighbourhood of Buona Vista Road in January 1951 must almost certainly indicate a subsequent liberation. Again the specimen was not secured, but it is interesting to note that this is in the new military area, and close to the quarters of the Ceylon Pioneer Corps, which suggests a further contact with India. A number of subsequent visits were made by Allen and others, principally to watch *P. krameri*, but the Redbreasted Paroquet was not noted again.

Pycnonotus sinensis formosae Hart.

Two birds, believed to be examples of this form, were seen together on open, scrubby ground near Kallang airport by F. G. H. Allen and others at intervals during April 1949. There occurrence on the island is reported in fuller detail by Allen (1949: 93–94). There has been no further indication of their presence here.

Turdus naumanni Temm.

Turdus ruficollis Pall

These two birds are put together, though they have long stood as separate records, because on full investigation it seems likely that we are actually dealing with only one specimen. *Turdus naumanni* is recorded by Hume (1879: 156), who reports an example taken on Singapore Island in 1878–9 by W. R. Davison who was then collecting in western Malaya for him. Kelham (1881: 510; reprinted 1883: 9), who was stationed in Singapore from about September 1877 to the latter part of 1880, says that Davison showed him a specimen of *T. ruficollis* "which had been shot at Singapore." He adds that he himself did not meet with the species in Malaya. Hume makes no reference to such a skin, and *T. ruficollis* does not occur anywhere on his list of the avifauna of the western half of the Malay Peninsula, on which he and Davison were then working. Nor, it may be added, does he refer to this record in any of the three subsequent volumes of *Stray Feathers*.

There is no doubt that examples of either *Turdus naumanni* or *T. ruficollis* taken on Singapore Island must have been escaped or liberated cage birds. As we have said, on the whole it seems likely that there was only one such specimen. If this is not so, we have the peculiar situation that in the course of a relatively short stay in Singapore Davison (much of whose time in Malaya was spent on the mainland) obtained examples of *two* northern thrushes not otherwise recorded from south-east Asia, even as escaped birds. Further the two species are closely allied, and on several occasions *naumanni* has been listed as *ruficollis*. It seems probable that Kelham made this same mistake, particularly as the reference works at his disposal were mostly books devoted to Indian ornithology (which contain no account of *naumanni*, as it has never been taken in the Indian region). Finally Kelham's identifications are not always entirely trustworthy: he made a very bad mistake in listing examples of *Thalasseus bengalensis*

(Less.) from Malacca and Singapore as *Sterna seena* Sykes (= *S. aurantia* Gray), by which misdemeanour he has lead a number of authorities into error.[5]

Gracupica melanoptera (Daud.) subsp.

Two races of this species are found in Java, the typical form, *G. m. melanoptera*, in the west and *G. m. tricolor* (Horsf.) in the east, and a third, *G. m. tertia* Hart., in Bali. It does not occur in Sumatra or Borneo. Birds brought to Malaya are most likely to be from Java, but they might be either of the two forms found on that island.

G. melanoptera is quite a popular cage bird in its own country, and there are several scattered visual records of escaped birds seen in Singapore. The most recent are a bird reported from the Kallang area early in 1950, and another which frequented a garden in Ridley Park for some six weeks at the end of 1950, in company with three examples of the Javanese race of *Acridotheres fuscus* (a bird which is now breeding here freely in a feral condition: see below). Chasen, writing in 1935, says that examples of the typical race from western Java had previously been introduced to Singapore, but they had failed to maintain themselves (Chasen, 1935: 295). In his later work (Birds of the Malay Peninsula, 4, 1939: 365) he records *G. melanoptera* (subspecies not defined) as having been taken in Singapore "from time to time", and adds that "one specimen in the Raffles Museum was killed from a flock of similar birds". The specimen to which he refers is still extant in the Museum collection. It is an immature female of the typical race, said to have been shot at Katong on 20 July, 1920 by the Museum taxidermist, P. de Fontaine. This fits in with an earlier account given by Chasen (1924: 169), but it is the only formal record for

[5] *Sterna seena*, Malacca and Singapore, *fide* Kelham (*Ibis*, 1882, p. 201), got into the British Museum Catalogue of Birds, Vol. 25 (Saunders, 1896, p. 37), and has been accepted uncritically by a number of subsequent writers, in spite of the fact that the description accompanying his note shows clearly that he was dealing with a slender-billed species and certainly not with *S. aurantia*. Robinson & Kloss (*Journ. Nat. Hist. Soc. Siam*, 5, (1), p. 49) printed a flat denial of the record as long ago as 1921, pointing out that the most southerly limit of the occurrence of *aurantia* in south-east Asia is the solitary male taken by Count Gyldenstolpe at Koh Lak (Prachuab Kirikhan) on the west side of the Gulf of Siam, at approximately 11° 48′ N. lat. Nevertheless Alexander (Birds of the Ocean, 1928, pp. 173–174), Stewart Baker (Fauna of British India, Birds, 6, 1929, p. 126) and Peters (Checklist of Birds of the World, 2, 1934, p. 332) all include the Malay Peninsula in the range of *aurantia*. Baker goes so far as to give its distribution as "On all large rivers throughout India and Burma and throughout the Malay States to Singapore."

this species that I can find for our area. Certainly we have nothing to show that *G. melanoptera* has ever succeeded in breeding here, and there is probably only one record of a bird actually being taken on the island.

Amandava amandava (Linn.) subsp.

According to Hume (1880: 118) Davison obtained specimens of "*Estrelda amandava*, Linn." and "*Estrelda flavidiventris*, Wall." in a "thoroughly wild state on Singapore Island". He adds that as in the case of *Padda o. oryzivora* (see below) "they appear to occur nowhere else in the Peninsula, and plentiful as they may now be, in a wild state, on that Island, we believe that all three species have been introduced there". Strangely enough Kelham, who devotes a third of a page to the Java Sparrow, makes no mention of the *Amandava* spp. They do not appear to have succeeded in maintaining themselves for long, and there have never been any locally taken specimens in the Singapore or F.M.S. Museums' collections. Nevertheless escapes of such birds have certainly occurred, and continue to do so at intervals. Probably they are mostly examples of the Javanese race *Amandava amandava punicea* (Horsf.), which is imported in some numbers as a caged bird. F. G. H. Allen and Bromley both give post-war visual records of a pair (♂ ♀) of Scarlet Amandavats from the neighbourhood of the Kallang airport, but there is no indication that the birds are breeding there.

(*b*) Birds which, so far as we know, are at present breeding here under feral conditions

Psittacula krameri manillensis (Bech.)

Checklist No. 179 *bis*.

A small colony of these parroquets, recorded by F. G. H. Allen (1951: 205), was found in the area of Buona Vista Road, on the south side of Singapore Island, at the beginning of January 1951. About ten birds were present in the immediate neighbourhood, and these were watched carefully through the month. On 7 January one was seen to approach a dead Durian Tree and make for a small hole in the trunk about 35 feet from the ground. On subsequent visits a bird was seen enlarging the hole, which by 12 January was big enough for it to enter and sit inside. On 23 January another bird was noticed making a second hole on the opposite side of the trunk, at about the same level. The following day Allen sent a Malay up the tree, and he reported two eggs in the first nest. The birds were not further

disturbed by close examination. One pair apparently failed in their efforts, but at least one clutch was raised successfully in the area. This is the only record of the occurrence of *P. krameri* in the Malaysian subregion.

In February the Museum collector was sent to obtain a specimen to confirm the identity of the subspecies. The birds are *P. krameri manillensis* which occurs in Ceylon and Peninsular India: northwards it intergrades into *P. k. borealis* (Neum.) which is found in central and northern India, eastward to Burma and the Shan States, in Indo-China (?), Macao and Hongkong: it has not been recorded in Siam, and no specimens are known from Indo-China. The Singapore birds must have been introduced from Ceylon or southern India—the possible source of the *P. alexandri* subsp. recorded above.

According to Whistler (1944: 220) *manillensis* breeds in Ceylon from December to April: further north the season is rather later and in Burma the northern race, *P. k. borealis*, breeds from February to May, with the majority of the eggs laid in march (Smythies, 1940: 277). The Singapore birds are seemingly nesting at much the same time that they would have done in Ceylon or southern India. Further it appears that in Ceylon at least the great majority begin (and in many cases complete) their nesting during the wetter part of the year. Seasons are less marked in Singapore, but here again the birds are apparently starting to lay towards the end of the period of heaviest rainfall.[6] In both Ceylon and Burma *P. krameri* is a dry-zone parroquet, which does not bode too well for its survival in southern Malaya.

Oriolus chinensis maculatus Vieill. Checklist No. 351b.

This bird, which is indigenous to Java, Sumatra and Borneo, and probably Banka, Billiton and Singkep, but has not been recorded from the Rhio Islands, is undoubtedly a newcomer to Malaya. It was first noticed in Singapore in the nineteen-twenties, when it became apparent that a few birds were resident on the outskirts of the town. It is likely that it had been established here in a small way for some time before its presence was first reported. A northern race of the same species, *O. c. diffusus* Sharpe, is a common winter visitor in open wooded districts and

6. Rainfall in Singapore varies to some extent from year to year, but on the average of a long series no month drops below 6″ or reaches 12″. The wettest months are usually November and December—with the heaviest rains beginning in October and dropping away in January or early February but in some years the rain is late and January the wettest month.

breeding in a tree in the dock area at Tanjong Pagar. The crows are said to have been noticed there since 1948 at least, which suggests strongly that they were liberated during the B.M.A. period or the Japanese occupation. *C. protegatus* is sometimes kept as a pet by the southern Indians who provide much of the labour force in the docks. Birds may have been set free during the war because their owners had difficulty in feeding them or they may have escaped when the area was bombed in 1944–45.

Pycnonotus jocosus pattani Deignan. Checklist No. 427.

This bird was apparently introduced to Singapore Island about twenty-five to thirty years ago, when a few examples were first noted in gardens in the Tanglin area of the town. It seems probable, though not certain, that it is maintaining itself by breeding in this neighbourhood, but the possibility that the stock is being kept up by continued escapes cannot be completely ruled out. It is a popular cage bird with the Malays, and it occurs naturally in the north of the peninsula south to Kedah and Kelantan. It is also found in Java and Sumatra, but five of the six skins which I have examined of birds taken under feral conditions in Singapore are indistinguishable from a series of *P. j. pattani* from the northern part of the peninsula and Siam proper (*Bull. Raff. Mus.*, 23, 1950, pp. 123–124). There is no record of nesting in Singapore, nor does the small, scattered community appear to increase appreciably in numbers, except in so far as it has seemingly recovered from a post-war drop when none were reported for about two years.

Pycnonotus cafer aurigaster (Vieill.). Checklist No. 428.

P. cafer aurigaster was first noted here in November 1923, when a party of about six birds was seen in the grounds of Government House: one was shot and sent to the Raffles Museum for identification (Chasen, 1924: 86–87). Subsequently this species was discovered in the Sepoy Lines area, and several years later in Tanglin. A small but definite population is still present in the residential areas on the north side of the town. No nests have been found, but there can be little doubt that the bird is breeding here. Searight (*in litt.*) reported three fully fledged young seen together near Kay Siang Road on 7 July, 1949. Two adults were seen there again on 12 January, 1950, and three fully fledged young on 19 April. The closely allied *P. goiavier personatus* (Hume) normally lays two eggs to a clutch in the southern part of the peninsula, and I have only one record of a clutch of three. On the other hand *aurigaster* is said to lay 2–3 eggs to a clutch in Java.

Acridotheres fuscus javanicus Cab. Checklist No. 530b.

The presence of this bird on Singapore Island was first reported in 1925 (*Singapore Naturalist*, 1, (5), p. 73). By the middle nineteen-thirties it was well established in a few localities on the edge of the town, but still by no means numerous. Since then it has multiplied considerably, and it is now plentiful over a fairly wide area, and penetrating to the furthest parts of the island. It keeps more to residential areas and the vicinity of orchards than the Malayan race, *A fuscus torquatus* Davison, normally does, but where the two come in conflict the Javanese bird appears to be replacing the local one. In spite of its success on Singapore Island there are still no records of a spread to the mainland, nor has *javanicus* yet been reported from any of the off-lying islands.

Acridotheres tristis tristis (Linn.). Checklist No. 532.

The presence of this bird on Singapore Island in a feral condition was first reported in the middle nineteen-thirties when Chasen noted that there were "a few pairs" here.[7] In the course of the next five years it became firmly established in parts of the residential area on the outskirts of the town, and spread to Changi at the east end of the island. Subsequent, in the period 1940–50, there was a very considerable increase in its numbers and it is now plentiful in all suitable localities. It has become one of the commonest and most conspicuous garden birds in the Tanglin district and neighbouring areas. There are a number of records of breeding, including those published by Spittle (1949: 197) who reports eggs laid over the period February to July, with birds seen carrying nesting material at different times from 15 January to 1 September: he suggests certainly two, and sometimes three, broods in a year.

7. I cannot agree with Chasen's note (1935: 295), "Introduced birds are established in several places in the Malay States, notably in Perak and Province Wellesley". The evidence for a southward spread down the peninsula is too striking. In addition, birds introduced here from the Indian region would almost certainly come from Ceylon or southern peninsular India. The Ceylon race of *A. tristis*, *melanosternus* Legge, is said to be much darker than the typical form, with the black head not sharply defined from the dark vinous-brown back, the under-parts overlaid with an ashy black wash, and the white wing spot smaller and less conspicuous. Birds from the southern part of peninsular India are said to be intermediate, and much darker than those from northern India. The Malayan stock is undoubtedly typical *tristis*, with the head conspicuously darker than the body, the belly very pale, and the white wing-spot large and prominent.

This bird is certainly an interloper and a recent, though now firmly established, addition to the island's avifauna, but it would appear to have reached our area naturally. The evidence available (summarised in Gibson-Hill, 1950: 72) shows a steady spread southwards from Burma. In the eighteen-seventies Davison found it common throughout the cultivated and inhabited plains of Tenasserim north of Mergui, but he did not encounter it further south. The first record of its occurrence in the peninsula was in 1919, when Robinson and Kloss collected three specimens at Nam Chut, at the head of the Pakchan Estuary. Ten years later Dr. Hugh Smith found it at Patalung, approximately 210 miles further south, and some 60 miles north of Perlis. It was first noticed nesting in Province Wellesley in 1931. In 1932 it was plentiful at Taiping, in northern Perak, and had just begun to attract attention at Kuala Lumpur: three years later the first few pairs were noted on Singapore Island.

Padda oryzivora oryzivora (Linn.). Checklist No. 565.

This is a common and popular cage bird which has been carried, and become established, so widely through the Malaysian subregion that its original range is problematical: probably it was at one time restricted to Java and Bali. In Malaya it is known to occur, or have occurred, on the outskirts of Alor Star, Georgetown (Penang), Ipoh, Kuala Lumpur, Seremban and Malacca. It is quite possibly present, in small numbers, at several other points, but except in north Kedah, where it has moved away from the town and established itself in and on the edge of the mangrove belt on the coast, its position in this country is by no means secure. No doubt in the past the local populations were augmented regularly by the liberation of fresh birds, but this custom is dying out and those who still practice it now find it considerably easier and cheaper to make use of indigenous munias.

It is not clear how long *P. oryzivora* has been on Singapore Island, but it is not unlikely that it has been here since the early days of the settlement. It was certainly present by the late eighteen-forties (Oxley, 1849: 595). Some thirty-four years later Kelham (1883: 22) notes it as common, particularly in the neighbourhood of the Botanic Gardens at Tanglin, but it was probably not really wide-spread even in his day. Ridley (1898: 86) describes it as "abundant in the (Botanic) gardens, where it nests, and in other places near the town, but it is never to be

seen any distance from this part of Singapore."[8] Chasen (1924: 69), more exuberantly, calls it one of the commonest birds in Singapore, and found in most parts of the island. Robinson (1927: 288), writing about three years later is rather more cautious again, noting it as "now thoroughly established in several localities in Singapore, where it is often seen in flocks of considerable size." "Several localities" expresses the situation immediately before the war fairly adequately, though I never saw a flock of more than about twenty individuals, nor did I encounter it away from the vicinity of the town and the army quarters at Changi. Such a limited range and population is a poor achievement at least ninety years after it was first liberated on the island. There is no doubt that it has bred here in a feral condition during that period—Kelham, Ridley and Bucknill (in Bucknill & Chasen, 1927: 208) all mention nesting—but there does not seem to have been any great excess of population. The numbers decreased considerably during the recent war, and it is now absent from several of its former haunts, nor does it seem to be making good the lost ground. If anything it is less numerous now (1951) than it was in 1948.

P. oryzivora is a fairly prolific breeder, and its nests are no more accessible to its enemies than those of the other local munias. It seems likely that it has failed to find a natural supply of food in Malaya, except possibly in the mangrove belt in northern Kedah. Kelham describes it as "frequenting the roads and feeding in company with the Common Sparrows (*Passer montanus*)", and its partiality for the neighbourhood of the Botanic Gardens (where there was a small zoological collection from about 1870–1903) and Tanglin Barracks is significant. Robinson says that it was at one time not uncommon in the goods yard of the Kuala Lumpur railway station, but that in later years it failed to maintain itself there. There can be no doubt that in this country it formerly fed largely on fallen grain, and that in the time when horses were in common use it could

8. A later note by Ridley (1906: 170) suggests that all the small colonies in the Malay States were due to a deliberate attempt to establish this bird in the country. *Padda oryzivora* "was introduced to the (Botanic) gardens many years ago under the impression that it was insectivorous and established itself there. This graminivorous bird was distributed to various parts of the peninsula where it has settled down but never goes far from where it was first turned out." Events may have taken place as he says, but there have undoubtedly also been a number of ritual liberations over the area. The reluctance of small communities to extend their boundaries is most noticeable in this species; see also the note on the Christmas Island colony (*Bull. Raff. Mus.*, 18, 1947, pp. 157–159). The Ceylon House Crow, *Corvus splendens*, seems to be equally unenterprising.

manage successfully enough in their vicinity. Subsequently it probably subsisted largely on the dried rice put down for chickens, but the war and the rice shortage following it have reduced this to a minimum. It seems not unlikely that under present conditions *oryzivora* will ultimately disappear from the island.

Munia leucogastra leucogastroides Horsf. & Moore.
Checklist No. 570b.

This is the Javanese race of a species indigenous in the Malay Peninsula. The local bird, *M. l. leucogastra* (Blyth) occurs mostly in the fringes of scrub and secondary jungle bordering open country: it is widely but locally distributed on the west side of the mainland from Negri Sembilan northwards, and is also known from western Pahang and Kelantan. The Javanese bird, *leucogastroides*, is, or at least was formerly, imported into Singapore in some numbers as a cage bird, and not infrequently liberated here. For the most part the survivors apparently take up residence in areas of scrub or broken grassland near to human habitations. A number of small colonies are known, scattered over the greater part of the island. The presence of this *leucogastroides* was first noted in 1922, but it is not a form likely to attract much attention, and it may have been here for some time. Specimens now in the Raffles Museum collection were obtained in the Botanic Gardens in March 1923, and the following year Chasen (1924: 69) recorded it from Fort Canning, the Cathedral grounds and several places in the Tanglin district, and doubtfully from Bukit Timah. More recently breeding has been reported from rural and semi-rural areas, including Sime Road, Loyang and the Changi Promontory. On the other hand it seems to have disappeared from the centre of the town, though it is still present in the Botanic Gardens. On the whole it appears to have established itself successfully, and though the total population is not large it seems likely that it has become a permanent, self-perpetuating element in the local avifauna.

Summary

Summaries are given of the information available on the local occurrence of thirteen birds of which feral or seemingly feral individuals have been recorded from Singapore Island which clearly owed their presence here to the introduction of caged birds. Six of these species are known only from one or more isolated records. One, an *Amandava amandava* subsp., apparently established a colony on the island in the latter part of the last century, but subsequently failed to maintain itself. So far as is known examples of the remaining seven forms are still breeding on the island at the present time. Two of these, *Psittacula krameri manillensis* (Bech.) and

Corvus enca compilator Richm., are only recent arrivals: three others, though clearly nesting here do not appear to be firmly established: the remaining two, *Acridotheres fuscus javanicus* Cab. and *Munia leucogaster leucogastroides* Horsf. & Moore, seem now to be maintaining populations of reasonable size, and to have become permanent elements in the local avifauna. Brief notes are given on a further two alien species which have become established on the island in the last fifty years but which have probably (*Oriolus chinensis maculatus* Vieill.), or certainly (*Acridotheres t. tristis* (Linn.)), made their own way here.

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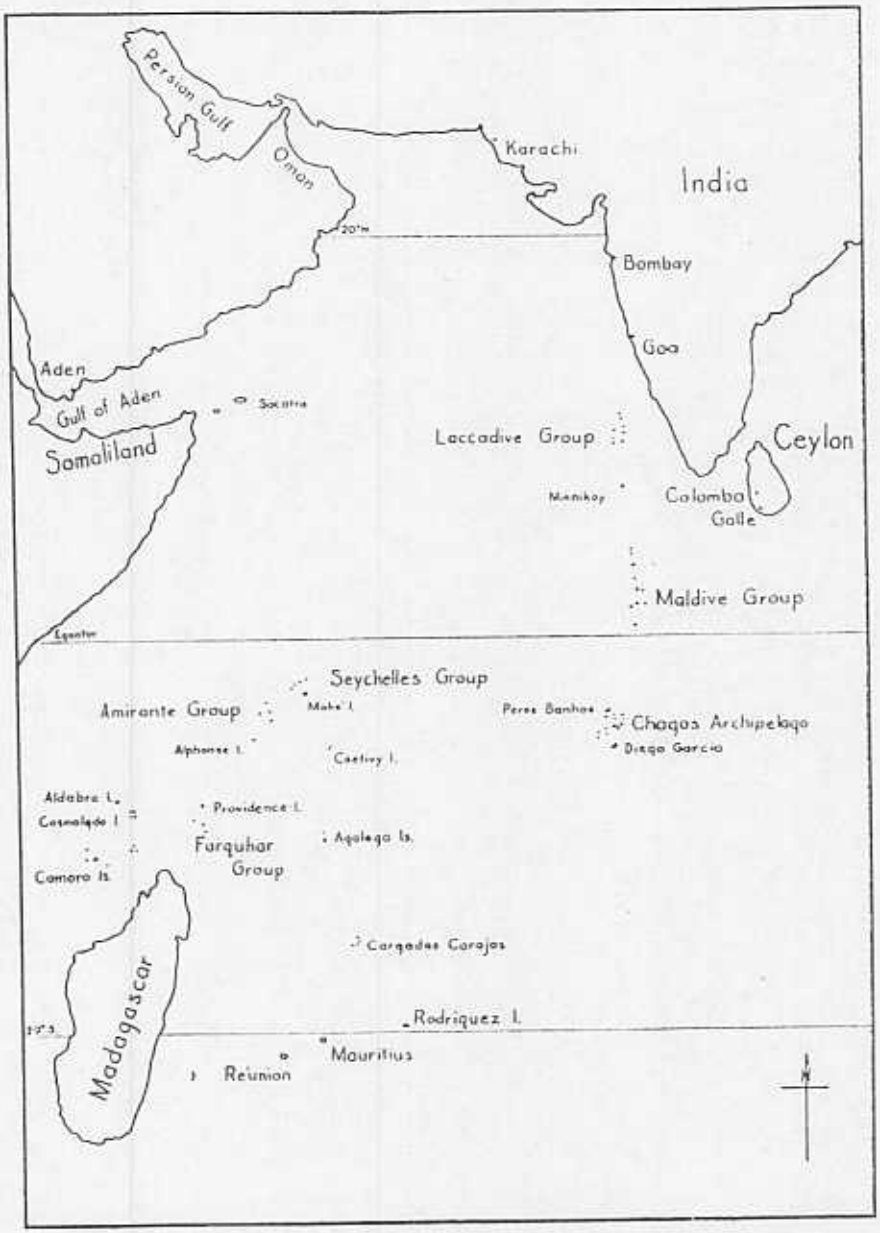

Sketch map of the Western Indian Ocean, showing the position of the Agalega Group and other islands to which reference is made in this note.

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No. 17, Notes on the Birds reported from the Agalega Islands, western Indian Ocean

The Agalega Islands (approx. Lat. 10° 20′ S., Long. 56° 40′ E.) lie in the western part of the Indian Ocean, about 330 miles south of Port Victoria (Mahé) in the Seychelles, and 570 miles north of Port Louis, Mauritius. The group consists of two low-lying islands joined by a submerged ridge of sand about a mile long, drying at low water. Together they extend for twelve miles in a line south-east to north-west, the direction of the prevailing trade wind. North Island, rising to about 25 feet, is thickly covered with coconut palms at its northern end: the remaining vegetation consists of scrub, with some grassy areas and patches of stunted trees, including *Tournefortia* and the Mapou, *Pisonia calpidia*. The South Island, only 15 feet high, is largely covered with coconut palms and casuarina trees. The islands are surrounded by a coral reef which is steep-to. There is a small settlement, Port Sainte James, with an adjacent anchorage on the north-western side of North Island (in the lee of the group), and another, Port Sainte Rita, on the north-eastern side of South Island.[1]

The Agalega Islands were not visited by any of the nineteenth century exploring expeditions, or by the Percy Sladen Trust Expedition to the Indian Ocean in 1905 (Gardiner, 1907: 135). They got a place on Gardiner's original itinerary; but subsequently his route had to be curtailed, owing to delays caused by heavy weather in the earlier part of the voyage, and he

1. Data mostly from the South Indian Ocean Pilot, Sixth ed., 1946: 100–102. The islands are a dependancy of Mauritius, and are visited periodically by a vessel from Port Louis.

passed straight from the Saya de Malha Bank to Coetivy in the Seychelles. The islands are east of the course followed by Lord Crawford in the *Valhalla* (Nicoll, 1909: xxiv). Again they were omitted by Vesey-Fitzgerald (1941: 519) during his survey of the bird colonies in the Indian Ocean between latitudes 03° S. and 10° S., and longitudes 47° E. and 60° E., this time, apparently, because they are not administratively part of the colony of Seychelles. The result is that there is still no reference to the avifauna available in any English work or journal, and they are the only group in this area so served.

In the latter part of 1951 Professor C. Northcote Parkinson, of the University of Malaya, showed me a translation from a MS diary written by a French sailor, Charles Duclos-legris, who had served in the Indian Ocean in 1803–06. The MS includes a short note on the islands which his vessel seems to have passed or visited in June 1805. Duclos-legris describes the presence on Agalega of tropic-birds (*Paille-en-queue*), frigate-birds (*Frégate*) and at least one booby (*Fou*), identifiable as *Sula sula rubripes*. In response to an enquiry for further information the Curator of the Mauritius Institute has kindly sent a copy of an annotated list of the birds of the islands taken from a booklet published in Paris by a Capitaine J. George Lionnet (1924: 80–81). The list is said to be the work of W. Bojer (1797–1856), a naturalist who spent many years in Mauritius (J. Vinson, *in litt.*, 1 March, 1952), but it seems likely that while the identifications are Bojer's the notes are by Lionnet, and I have attributed them accordingly.

Bojer's names follow Lesson's *Traité d'Ornithologie*, 1831, and using the short notes appended to them, with some reference to Duclos-legris, one can arrive at the identity of the great majority of the birds in terms of present nomenclature with reasonable certainty. The resulting list, with further annotations, is printed below. The subspecific designations, where given, are of course conjectural, but in most cases they can be accepted with reasonable assurance. The continued presence of these birds at Agalega is perhaps less certain. The South Indian Ocean Pilot (1946: 100) says "The chief exports are copra, other coconut products, and guano." The words have an ominous ring. In several cases in the Seychelles (Vesey-Fitzgerald, 1941: *passim*) and elsewhere in the Indian Ocean "interference" by guano workers or nut collectors has driven the birds from their nesting grounds.

A Provisional List of the Birds reported from the Agalega Islands

(based on identifications attributed to W. Bojer, 1797–1856)

1. **Phaëthon rubricauda rubricauda** Bodd.

Redtailed Tropic-bird.

This bird is shown as "Phaeton phoenicurus", with the comment, "2 plumes rouges trés longues dans la queue; pond en août et septembre sur le sable, dans les broussailles au bord de la mer." This is clearly *P. rubricauda*, which alone has red on the elongated centre tail feathers, and almost certainly the typical race, *Phaëthon r. rubricauda*, which is known to nest on Round Island near Mauritius (the type locality), Assumption Island, the Cosmoledo atoll and the southern island of the Aldabra group (data summarised in Gibson-Hill, 1950*b*: 76). The only other form of *rubricauda* reported from the Indian Ocean is *westralis* Mathews, which occurs only on the eastern side, breeding on the Cocos-Keeling Islands, Christmas Island, Houtman's Abrolhos (the type locality) off the west coast of Australia, and Gunong Api in the Banda Sea (*loc. cit.*: 77). The nest site described is the common one in this species.

2. **Sula sula rubripes** Gould. Redfooted Booby.

Lionnet gives this bird as "Soula crythorincha" or Fou; the former must be a faulty transcription of Lesson's *Sula erythrorhincha*, a synonym of *Sula sula*. The birds are described as laying a single egg once a year in a clumsily built nest placed in the Mapous (= *Pisonia calpidia*). This could only apply to *Sula sula* or *Sula abbotti*, and Duclos-legris shows that the former at least was certainly on the islands. According to his note "the boobies are of different colours, but the commonest are grey, with red claws ...."; these are clearly adults of *Sula sula* breeding in the grey-phase, or, if his description covers reddish pink feet, immature birds.

Only one race of *Sula sula*, *Sula sula rubripes* Gould (type locality Raine Island, northern Queensland, *fide* Mathews), is known to occur in the Indian Ocean and adjacent seas. It is reported as breeding in considerable numbers at suitable points in the Chagos, Farquhar, Aldabra and Amirante groups of islands, and (? formerly) on Bird Island in the Seychelles.

3. **Fregata** sp. Frigate-bird.

Lionnet lists this bird as "Tachypetes aquila, Frégate", and ascribes to it habits similar to those of the last species. The

identification poses the old problem again and in the absence of specimens it seems unwise to attempt a further diagnosis at the present stage.

Both *Fregata minor* and *F. ariel* are reported as breeding on the atolls of Aldabra and Cosmoledo, 550 miles west of the Agalega Islands, and as ranging north-east to the Amirante group and the Seychelles (Vesey-Fitzgerald, 1941: 530–31). Both groups are nearer to the present island than they are to the Aldabras. Frigate-birds are also known to nest in the Cargados Carajos group, and on Nelson Island in the Chagos Archipelago. The latter birds are given as *Fregata ariel* by Gadow & Gardiner (1907: 110), but Gardiner did not bring any specimens back with him, and the photograph of a bird flying over Cargados Carajos looks as if it might almost be an adult female of *F. minor*.[2] Good series of well localised specimens of *Fregata* are much needed from all the central groups, Agalega, Cargados Carajos and Chagos. Further east races of *F. minor* and *F. ariel* occur together on North Keeling, in the Cocos-Keeling group, and breed in two large mixed colonies (Gibson-Hill, 1948: 84–87; and 1949*a*: 228 & 235). Both or either species may equally well be represented by the indeterminate *Fregata* sp. of the mid-ocean islands.

4. **Butorides striatus** (Linn.) subsp. Little Green Heron.

This is given on the original list as "Ardea species" or "Garce", with the note, "Un oeuf dans un nid dans les broussailles; mange les souris, les petits oiseaux et pêche au bord de la mer." Vinson (*in litt.*) transcribes the name as *Butorides striatus* (subsp. ?), which is presumably correct, though three is the normal size of a full clutch in this species, or, according to Osmaston, two in the Andaman Islands (in Baker, 1929: 359). However, the only other possible member of the Ciconiiformes recorded by Gardiner is *Ardea cinerea* (*firasa* Hartert), which he found breeding on the southern islands of Providence Reef, in the Farquhar group. Peters (1931: 99) gives its range as Aldabra, Madagascar and probably the Comoro Islands, but again the Grey Herons usually lay three or four to five eggs to a complete clutch. Of *Butorides striatus* Gardiner says (in Gadow & Gardiner, 1907: 109), "This heron was seen in every group of islands which we visited. It feeds along the shore, darting off

2. Plate 16, lower, in Gardiner & Cooper (1907). The picture is of a Wideawake Fair on Cargados Carajos.

into the densest bush when disturbed. It is particularly common on the islands where terns breed, feeding on their eggs. Young birds were seen in June on Petite Coquillage, Peros Banhos."

Peters (tom. cit.: 105) recognises four different races of *B. striatus* from the island groups surrounding the Agalegas,

B. s. rutenbergi (Hartlaub): Comoro Is., Madagascar, Rodriguez & Réunion,

B. s. degens Hartert: the Seychelles,

B. s. crawfordi Nicoll: Assumption and Aldabra Islands,

B. s. albolimbatus Reichenow: Diego Garcia Island (Chagos Archipelago).

Apart from the impossibility of determining which one of the four is the most likely to be on the Agalega Islands, there is the consideration that, being as isolated as any, the islands may well have a race peculiar to them.

5. **Plegadis falcinellus** (Linn.) subsp. Glossy Ibis.

This bird is said to be resident on the islands, laying two eggs in a nest built on the scrub bushes in September or October. The Glossy Ibis occurs on Madagascar, and again in Java and Borneo, but this is the only record of it on one of the smaller islands across the Indian Ocean. The Agalega birds probably belong to the western race, typical *P. f. falcinellus* (type locality Austria, Italy), not to the smaller eastern race, *P. f. peregrinus* (Bp.), type locality Java.

6. **Numida meleagris** (Linn.), ?**mitrata** Pallas.
Tufted Guinea-fowl.

Given as "Numidia (sic.) mitrata" or "Pintade", and said to lay 30–40 eggs in the grassy areas in the months December to February. According to Peters (1934: 135) the range of *mitrata* Pallas includes Madagascar, Comoro Island and Rodriguez. Rand (1936: 371) reports finding downy young in Madagascar on 31 January, 12 February and 25 February, the last being one-third grown; this suggests laying there in November and December, at least, dates which fit well with those recorded here.

7. **Numenius** sp. "Curlew".

Lionnet lists "Numenius madagascariensis" or "Corbigeau" as a non-breeding visitor to the islands: "Je n'ai pu savoir où ils pondent; je ne pense que ce soit à Agaléga." The first name given cannot be correct, and the vernacular one may refer to either the

Curlew, *N. arquata* (Linn.), or the Whimbrel, *N. phaeopus* (Linn.), both of which must certainly be reaching the islands. Linnaeus named the large eastern curlew *Madagascariensis* in error for Makassar, in Celebes, believing that his specimen had come from the former place instead of the latter. There is actually no authentic record of its occurrence on the western side of the Indian Ocean, but this point was not appreciated in Bojer's day. Races of both *arquata* and *phaeopus* are found widely as winter visitors on the African coast and the islands eastward, and a few individuals are present all through the year, presumably juveniles spending their first summer in winter quarters. There is no evidence of their breeding in this region, but it would be a reasonable error for Bojer, aware of the existance of a so-called Madagascar Curlew, to assume that the birds on the Agalega Islands were examples of it.

Vinson (*in litt.*) interprets "Corbigeau" dubiously as *Numenius arquata;* but *N. phaeopus* is actually the commoner bird on Madagascar (*fide* Rand, 1936: 348) and the mid-ocean islands, and Bourne (in Saunders, 1886: 336) gives "Corbijeu" as the word used for *N. phaeopus* on Diego Garcia, in the Chagos group. Only one form of the latter, the typical race from Europe and western Siberia, reaches the western part of the Indian Ocean. Two races of *N. arquata* are known there, in Madagascar, and eastern Africa, the typical race and *N. a. orientalis* C. L. Brehm: examples of both no doubt reach the Agalega Islands, together with *N. p. phaeopus*.

8. **Arenaria interpres interpres** (Linn.). Turnstone.

This is another winter visitor. According to Gardiner (in Gadow & Gardiner, 1907: 107) flocks of six or eight birds were common on the shores of all the islands visited by the Percy Sladen Trust Expedition. Bourne reports it again from Diego Garcia, and Rand (1936: 351) says it is fairly common on the coasts of Madagascar. The Turnstone is also known to winter in small numbers on the Cocos-Keeling Islands, in much the same latitude as the Agalega group.

9. **Sterna anæthetus antarctica** Less. Bridled Tern.

This bird is said to breed on the Agalega Islands, in May and June, laying a single egg in a nest among the bushes (Lionnet). According to Vesey-Fitzgerald (1941: 526) it nests on all suitable small islands and islets through the Seychelles, but "there is no well-marked breeding season, and a few eggs may be found during most months of the year'". It also occurs on Mauritius.

but does not appear to be known from Cargados Carajos or the Chagos Archipelago. Baker (1929: 143) says that it "probably breeds both on the Maldives and Laccadives", but there is no certain evidence that it does so in the former group. It is only a winter visitor to Ceylon, recorded mostly in October and November, but it is said to nest in large numbers on the Vingorla Rocks (about 16° N. Lat.) off the west coast of India "during the rains, probably June and July" (Baker, *loc. cit.*, data from Hume, 1876: *passim*). According to Archer & Godman (1937: 541—43) the Red Sea race of this species assembles "in hundreds of thousands to breed on the islands off Zeyla in the month of July": the authors give egg dates ranging from early in July to the second week in August. Further east, the typical race again has a fairly marked, though slightly earlier, breeding season, with egg dates June and July in Malaya, May and June in the Inner Gulf of Siam, June to August in Mid-Java and February and March in East Java (data summarised in Gibson-Hill, 1950*c*: 13). It seems likely that there is a definite breeding season, or at least a peak period, in the Seychelles, but it may vary in different parts of the group which is, in fact, an extensive one of political convenience rather than a distinct faunal area.

Gardiner (in Gadow & Gardiner, 1907: 108) says that *S. anæthetus*, "so far as our observations go, never occurs on the same islands as *S. fuliginosa* (= *S. fusca*, below), and indeed rather shuns the locality of its "Fairs"." The determining factor is almost certainly their different nest site requirements rather than a species aversion, but it would be interesting to know if on Agalega, with eleven miles of island at their disposal, the two birds are breeding relatively close together or well apart. A difference in their choice of nest sites has already been noted; the present species is said to place its nest "dans les broussailles", and *S. fuscata* to lay its eggs on the sand, but the two could still be close to each other. *Sterna anæthetus* almost invariably chooses a sheltered breeding place; the only definite statement to the contrary of which I am aware is Hoogerwerf's record of *S. a. anæthetus*, the typical race, breeding on an exposed coral reef near Bawean Island in the Java Sea, but I am by no means sure that he has not confused *anæthetus* and *fuscata*. On the Malayan islands, in the Inner Gulf of Siam and on Gunong Api in the Banda Sea, *anæthetus* nearly always seeks some form of cover, while according to Archer & Godman (*loc. cit.*) the birds on the islands off Zeyla nest under a low-growing scrub of *harun* bush, which may be so thick that "on the approach of danger, the

Terns sitting on eggs deposited on the sand beneath its shelter are sometimes unable to extricate themselves in time and may be taken in the hand."

The Agalega Islands birds can be safely assigned to the race *antarctica* Lesson (type locality Mauritius and Calcutta) which, as noted above, is the form breeding in the area from Mauritius north through the Seychelles to Vingorla Rocks, off the west coast of India, north of Goa. *S. a. fuligula* Licht. of the Red Sea, Persian Gulf and Mekran coast area seems scarcely separable on the few birds that I have seen, but *antarctica* has priority and the point need not concern us here.

10. **Sterna fuscata nubilosa** Sparr. Wideawake Tern.

Lionnet describes this species as a bird of passage (*Oiseau de passage*), and notes that it comes to lay its egg on the sand in July and August, and departs again in February. He makes no such point about the previous species, which, one is left to suppose, is present on the islands all through the year. This may well be so. Vesey-Fitzgerald (*loc. cit.*), writing of the Seychelles, says that *Sterna anæthetus* is a "common resident species, which comes to roost by night in trees on most of the coral islands", while earlier he describes *Sterna fuscata* as a "migratory species visiting the islands in large numbers to breed." In Malaya the colonies of *anæthetus* break up outside the breeding season, and the birds scatter southwards, but many of them do not go further than the quieter waters at the ends of the Singapore Strait. The birds nesting on the Zeyla islands, on the other hand, apparently disappear completely, moving, according to Archer, down the African coast to the neighbourhood of Witu and the Lamu Archipelago. It seems likely that *Sterna anæthetus* is sedentary in areas where there is no very great seasonal change in the conditions round it; where there is much change it moves away. In Malaya it leaves the east coast islands to escape from the full force of the north-east monsoon; on the Somali coast it migrates to avoid winter in the Gulf of Aden. The present bird, on the other hand, appears to be truly pelagic, like *Anoüs stolidus*, and to have no use for the land outside the breeding season.

Sterna fuscata is known to breed in considerable numbers at several points in three of the mid-ocean island groups east and north of the Agalega Islands, in all cases with laying at approximately the same time of the year. Gardiner (in Gadow

& Gardiner, 1907: 108) describes it as nesting abundantly on the islands of Cargados Carajos, with eggs very plentiful in August. Bourne (in Saunders, 1886: 337) reports laying on Diego Garcia, in the Chagos Archipelago, in September. In the Seychelles the Wideawakes apparently breed earlier, to coincide with the run of the south-west monsoon, but the difference is not great. The birds come in from the sea in May, lay in June and if undisturbed normally have the young away from the breeding grounds by the early part of September, when the monsoon begins to break (Betts, 1940: 523–25). On islands where the first layings are taken, the cycle is delayed and the birds may not be back at sea by the end of the monsoon: according to both Betts and Vesey-Fitzgerald the increasing heat causes a heavy mortality among those still left on the land. Here there is clearly a marked survival value in a rigid adherence to the nesting programme.

There remains a fifth recorded breeding area in the western Indian Ocean, a colony on the Laccadive Islands, but here the picture is most confused. We have, apparently, three reports of nesting, each putting laying by a large community of birds (not a few individuals such as might easily be out of step) at markedly different times in the year. Hume (1876: 477–8) describes breeding on the Cherbaniani Reef in 1875 with an abundance of young chicks, all at such a stage that the great majority of the eggs must clearly have been laid in the previous December. By 1890 the birds had deserted this reef and moved to Pitti, where in 1891 Alcock (1902: 181) found breeding at a date that puts the egg-laying period back to late August and early September. Finally, in 1939 Betts (1939*a*: 383) was told that the birds were nesting on Pitti in May (not September or December), and in that month he received four eggs from the atoll which were examined by Stuart Baker, who identified them as undoubtedly belonging to *S. fuscata* (Betts, 1939*b*: 764).

Peters (1934: 339) ascribes birds from all the colonies in the western and northern parts of the Indian Ocean known to him, in addition to those in the China and Sulu Sea areas and on the Riu Kiu Islands, to *S. f. nubilosa* (replacing the *infuscata* Lichtenstein of some earlier writers). *Passim* he includes the Maldives in the range of this bird: Gardiner took an immature bird on Minikoi Atoll, (midway between the Laccadives and Maldives), in July or August 1899, but I know of no authentic record of breeding in the Maldives.

11. **Anoüs stolidus pileatus** (Scopoli). Common Noddy.

This species is given as "Sterna species" or "Maka" in the published list, but Vinson (*in litt.*) interprets it as *Anoüs stolidus*. The race *pileatus*, type locality the Philippines (*ex* Sonnerat), covers the whole of the Indian Ocean, except for the Red Sea and Gulf of Aden (= *A. s. plumbeigularis* Sharpe), and waters eastward to the Central Pacific.

In the brief note given with the name, the Maka is said to lay one egg in a nest built in the scrub bushes in May or June. The Noddy is an extremely versatile nester, making use of the ground, rocky ledges, low bushes or the crowns of pandanus or coconut palms, according to the circumstances in which it finds itself. In the Cocos-Keeling Islands the main colony was on North Keeling, and here the birds were building on the ground; but a small sub-colony, established at the south end of the main atoll, was breeding high up in the coconut palms.

According to Vesey-Fitzgerald (1941: 527–28), *Anoüs stolidus* is found widely throughout the area of the colony of Seychelles: specifically he cites breeding from islands in the Seychelles, Amirante and Cosmoledo groups. Gardiner (in Gadow & Gardiner, 1907: 109) says that it was present on all the islands visited by the Percy Sladen Trust Expedition in 1905, including Cargados Carajos and the Chagos Archipelago. Hume (*loc. cit. supra*) found evidence of its breeding on the Cherbaniani Reef in the Laccadives. It does not, however, appear to have been reported from the Maldives, and Gardiner (*loc. cit.*) says expressly that he did not encounter it in the group in 1899–1900. Further east it breeds in some numbers on the Cocos-Keeling Islands and Christmas Island, but it is not known to nest in the Bay of Bengal. An analysis of the breeding seasons, as so far recorded over this area, is given by the present writer in an earlier paper (1950*a*: 222–224): on Christmas Island the majority of the birds lay in May, with the eggs hatching in June (Gibson-Hill, 1947: 104–108).

12. **Gygis alba monte** Mathews. White Tern.

This bird is listed as "Sterna alba" or "Goélette blanche". The note makes identification certain: it reads "Elles pondent en mai et juin; pas de nid; posent leur oeuf sur une branche", a form of nesting peculiar in the Indian Ocean to *Gygis alba*. Only one race is recognised in this area.

Gygis alba is more sedentary than the other terns reported from the Agalega Islands, and even when fishing it does not normally travel more than 15–20 miles from its nesting grounds.

It is not known to breed in the Maldives or Laccadives, in the Bay of Bengal or on Christmas Island, but it occurs widely among the small islands in the remainder of the tropical belt. It nests on the Cocos-Keeling Islands, and several islands in the Chagos Archipelago and the Cargados Carajos group; according to Vesey-Fitzgerald (1941: 530) it breeds on all the islands and islets of the Seychelles Archipelago, on three of the islands in the Amirante group, on Providence Island, Alphonse Island and Coetivy. It is not known from Comoro, Glorioso or the Aldabra group.

In the Seychelles this bird apparently lays at all times of the year, as the typical race does in the Atlantic. On the Cocos-Keeling Islands the greater part of the laying appears to be concentrated in two periods, May to July, and September to November, but breeding may occur at other times. It would seem that the period May and June given for Agalega is too short.

Notes

The following points would seem to merit especial attention if it were possible for a limited spell of collecting to be done on the islands at some future date.

(a) The identity of the *Fregata* sp. It is possible, as has been pointed out above, that forms of both *Fregata minor* and *F. ariel* occur on the Agalega Islands. Further even when we know which species are there, the question of the subspecies remains undetermined. It might be assumed that the birds would be *F. minor aldabrensis* Mathews and *F. ariel iredalei* Mathews (type localities, Aldabra Island; definitions *Austral. Av. Rec.*, 2, 1914: 199 and 121), but this may not be so. Both races are weak. It is very desirable that good representative series should be collected of the adults of any frigate-birds on the islands. Juvenile and immature birds are of relatively little value except, if fully feathered, for their measurements. A full examination of long series of birds from more easily accessible colonies shows that there is too much variation with age, and individually, in the plumage of the immature *Fregata* for it to have any taxonomic significance. Finally it may be pointed out that these remarks apply equally to the frigate-birds occuring in the Cargados Carajos group and the Chagos Archipelago, both of which require elucidation.

(b) The identity of the bird given in the list as *Butorides striatus* subsp. This is the only heron at present recorded from the islands. One skin should be sufficient to confirm the specific identification, but again, if the bird is *striatus*, the nature of the subspecies remains a point of some interest, and if possible an adequate series should be procured.

(c) Confirmation should be sought that the bird known as "Maka" is in fact *Anoüs stolidus*, as accepted here. If it is not it is almost certainly *Anoüs tenuirostris* (Temm.), (= the *A. leucocapillus* of some earlier accounts). In either case one good skin should be sufficient to confirm the diagnosis—unless both birds are present.

(d) Any eggs or data on breeding would be valuable. It is quite possible that the breeding seasons are wider than the notes published by Lionnet suggest.

(e) Should *Sula sula rubripes* be nesting at the time of the visit it would be of interest to know if in fact adults are breeding there is a grey or part-brown phase; in any colouring that is other than the full white plumage with blackish-brown primaries, secondaries and greater wing-coverts. If they should be doing so an attempt should be made to ascertain the proportion of dark and white birds among those actually engaged in incubating, sitting with young chicks or feeding young birds.

(f) Waders are not likely to be of much importance, unless any should be found nesting on the islands. The Crab-Plover, *Dromas ardeola* Paykull, is said to breed in the Chagos Archipelago, the Comoro group and on Aldabra, and it might possibly be doing so here. The elucidation of the curlew-like bird is not of much significance as it is reasonably certain that in actual fact both *N. arquata* and *N. phaeopus* reach the islands in small numbers.

Acknowledgment

I am much indebted to Mr. J. Vinson, M.B.O.U., Curator of the Mauritius Institute, for providing me with a copy of the annotated list of Agalega birds published by Capitaine J. G. Lionnet, and for his comments on it.

Summary

Notes are given on the birds recorded from the Agalega Islands in a list published by Capitaine J. G. Lionnet in his booklet "L'Ile D'Agalega", Paris, 1924. The group, which consists of two islands extending over a length of about twelve miles, is situated in the western Indian Ocean, centre approx. Lat. 10° 20′ S., Long. 56° 40′ E. It is roughly 570 miles north of Port Louis, Mauritius, and 330 miles south of Mahe, in the Seychelles. It is the only isolated island group in this region whose avifauna had not previously been recorded in an accessible form. The breeding sea birds would appear to include *Phaëthon r. rubricauda* Bodd., one or more *Fregata* sp., *Sula sula rubripes* Gould, *Sterna anæthetus antarctica* Less., *Sterna fuscata nubilosa* Sparr., *Anoüs stolidus pileatus* (Scop.) and *Gygis alba monte* Math.; and the breeding shore and land birds, *Butorides striatus* (Linn.) subsp. *Plegadis falcinellus* (Linn.) subsp., and *Numida meleagris*, ?*mitrata* Pallas.

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VINSON, J., *in litt.*

No. 18. The Apparent Breeding Seasons of Land Birds in North Borneo and Malaya

The pages that follow in no way constitute even an introduction to this subject, which must inevitably wait for a later date for full treatment. They consist largely of brief notes and critical comments inspired by recent papers by Banks (1950: 642) and Voous (1950: 279–87), both of whom suggest a direct relationship between the termination of the major rainy season in an area and the beginning of the peak period of reproductive activity, the one in considering data for Sarawak and North Borneo and the other for Indonesia. Banks's note, as is shown below, is based in part on the information derived from Mr. V. W. Ryves's collection of eggs made in North Borneo in 1938–39 (this journal, 1949: 106–115). The present notes provide a fuller analysis of the material available from the latter source, and from this point go on to question the significance of rainfall in relation to the breeding seasons of land birds in the light of information derived from Malaya. The Appendix belongs to the first section of the paper: it has been prepared to record, for future reference, data more extensive than is required in the immediate argument. It is placed at the end of the paper, instead of after the first part, as there is some continuity of argument between the two sections.

The notes given here in the second section are of necessity incomplete. More information is essential before anyone can attempt a constructive survey of the breeding seasons in Malaya. Apart from the lack of an adequate volume of local records, we are still without even one reported instance of the nesting of a regretably large number of local birds. Approximately 420 species are listed as resident or breeding in this country, and in over 170 cases, roughly forty per cent of the total, we have no account of nesting in our area. Their classification as "Resident" in the checklists remains a question of probability.

An Analysis of the Data available for North Borneo

An earlier note in the present series (No. 5, in *Bull. Raff. Mus., 21*) gives descriptions and measurements of a series of birds' eggs collected in North Borneo by Mr. V. W. Ryves between 27 March and 24 August, 1938, and 17 January and 7 April, 1939. The paper covers a total of 273 eggs, from 127 different

clutches, and laid by 44 different species (Passerines 31, Non-Passerines 13).[1] The object of the paper was to record the dimensions and appearance of the eggs, and, where light was thrown on it, the clutch size. There was no intention at that time of using the data from the collection to assess the dating of a possible breeding season among the North Borneo land birds.

Recently Banks (1950: 642) has analysed this note to obtain a monthly distribution of ninety nests for comparison with data from the Sarawak Museum collection and rainfall records for North Borneo and Sarawak. His published figures are as follows,

Month	J.	F.	M.	A.	M.	J.	J.	A.	S.	O.	N.	D.
Sarawak (Sarawak Museum Coll., 58 records)												
Number of nests	5	7	13	10	3	6	2	2	2	4	2	2
Rainfall (in inches)	20	20	16	10	9	7	7	8	10	11	16	17
North Borneo (Ryves coll., 30 records)												
Number of nests	8	24	44	5	3	3	2	1	(No collecting)			
Rainfall (in inches)	17	11	11	7	7	8	7	8	(?No rainfall?)			

To which he adds, "The foregoing data suggest that the main nesting seasons in Sarawak and North Borneo occur at the end of the months of heaviest rainfall, in March and April in Sarawak and a little earlier, February and March, in the western parts of North Borneo." This statement calls for some comment here, at least in so far as it is in part based on Ryves's North Borneo collections.

[1] To this summary of material collected must be added 66 eggs of *Collocalia esculenta cyanoptila* Oberh., surviving from 40 c/2 (not 33 c/2 complete as Banks assumes), taken at Kabayan Cave on 5 February, 1939. It is necessary that we ignore these eggs in the discussion that follows as they represent a very different quality of record. They were all taken from a well-known farmed cave on a pre-arranged visit, and could have been obtained in the same way, with equal ease, on any day over a wide period of time. There are also a further 19 clutches, introducing three new species, to be added to the total, as explained below in the text. This gives a total of 47 different species (Passerines 34), with 146 clutches eligible for consideration.

In the first place more than ninety records are available from North Borneo. Even omitting the 66 eggs surviving from 40 c/2 of *Collocalia esculenta*, as one clearly must, the original note from here summarised 127 different nests, not 90. In some cases it is not stated clearly in the note in which of two months the clutches had been taken, but it is obvious from the text that such information exists. In addition to these records there are a further nineteen, based on unpublished manuscript notes by Ryves. These cover sets of eggs which were given away (at least 8) or broken accidently before the collection reached the Raffles Museum. As these eggs were not available for examination in 1948, and Ryves had not recorded their size or colour in any detail, no reference was made to them in the earlier paper.

Using all the nests from the Ryves collection, including those in the MS notes but excluding the *Collocalia* eggs, we have a total of 146 breeding records, covering 47 species (Passerines 34, Non-Passerines 13). In addition Ryves's field notes give the approximate state of incubation of the eggs when he took them. Using this information it is possible to calculate roughly the date on which the clutch probably was, or would have been, completed. These 146 records are now shown here in Appendix *A*, arranged by species and in half-monthly periods, in terms of the latter dates. Thus rather fuller information is now available for anyone wishing to use it. Consideration must still, however, be given to certain points. These arise from the important fact, noted in the opening paragraphs of this and the previous note, that Ryves made his collection at two different periods in two different years, and in two different localities.

In 1938 he was living on Sandakan Estate, 11½ miles from the town of Sandakan. His collecting was done on, and in the vicinity of, the estate from 27 March to 24 August. In this period he obtained 34 dated records, of which seven are clutches that must have been laid in March. The following year he was active in and around Kiau, alt. 3,000 feet, in the Kota Belud District of the West Coast Residency, from 17 January to 7 April, obtaining 112 dated records. The majority of these came from the village of Kiau, which is about 25 miles inland, on the south-western slope of Mount Kinabalu. The other localities from this period, each of which produced only a few clutches, are Kuala Abai, which is on the coast about 4 miles south-west of the mouth of the Tempasuk River, Kota Belud, which is about 6 miles inland on high ground on the south bank of the river, and Koung.

alt. 1,300 ft., which is on the north bank and about 5 miles west of Kiau.[2]

These two working periods are summarised separately in the table on page 274, with the figures now shown by monthly instead of half-monthly totals as rainfall figures are only available for the former. The table also gives a combined total, in which the records of the two years are added together. In preparing this two nests found before 1 April in 1938, and two found after 30 March in 1939, have been omitted to eliminate the week over which Ryves collected twice in the two years. It is, however, more than doubtful if we can justly join the two sets of figures together in this way, and use them, in combination, to cover North Borneo, as Banks has tried to do. In the first place Ryves was working in very different localities in the two years, and clearly the Kiau collecting area must be much better than his Sandakan one. The steep fall in the laying figures between the last fortnight in March and the first half of April cannot be wholely natural with records drawn from a number of species. No information is available on the condition of the Sandakan Estate, but it can certainly be taken as a general rule (of which we have ample evidence here in Malaya) that a well-kept rubber estate is a poor locality for birds, and if it is large, the planter does not often get away from it. The jungle edge, scrub, *bĕlukar*, abandoned orchards and waste land, if one can move through them, or over them, are all much better than the neat, barren lines of *Hevea* which cover the greater part of a prosperous estate. The Kiau area, on the other hand, sounds promising: Chasen & Pendlebury, see footnote below, describe it as a good collecting ground, words that could never be used of a rubber estate.

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2. Koung and Kiau are described by Pendlebury & Chasen (*Journ. F.M.S. Mus*, 17, (1), 1932: 7) as follows,

Koung. 1,300 feet. (The lowland zone).

A very pleasantly situated Dusun village with a halting-bungalow on the bridle-path leading to the mountain (Kinabalu).

The surrounding country is largely cultivated but there are small areas of old jungle on the neighbouring hill-tops and in the deep gullies. Koung was used purely as a halting place but it yielded a few specimens.

Kiau. 3,000 feet. (The lower mountain zone).

A Dusun village at the foot of the mountain. Although there is no old forest near the village, Kiau is a good collecting ground and the prevailing secondary growth and thin lines of primary forest wisely left by the Dusuns on the ridges and steep slopes produce both mountain and lowland forms.

Distribution of Nesting Records, North Borneo and Sarawak, by Months

	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	
Sandakan (N.B.): 1938(1)													
Number of nests	No collection		(7)	7	5	7	5	3		(No collecting)			North Borneo
Rainfall (1938)													
Sandakan	22.07	24.02	9.24	9.26	9.46	11.05	10.63	5.73	17.71	11.41	22.78	19.96	
Labuan	?	?	?	11.14	15.69	5.40	10.27	23.11	13.99	10.43	15.19	16.35	
Kiau area (N.B.): 1939(2)													
Number of nests	10	42	59	1			(No collecting)						
Rainfall (1939)													
Sandakan	23.35	25.53	13.21	6.43	3.65	5.32	10.84	1.51	10.20	9.86	9.37	?	
Labuan	8.26	2.84	3.00	12.64	11.22	13.88	10.43	11.74	23.54	18.62	14.70	20.72	
North Borneo (Combined)(3)													
Number of nests	10	42	64	7	5	7	5	3		(No collecting)			
Sarawak(4)													Sarawak
Number of nests	3	7	13	10	3	6	2	3	5	4	5	11	
Rainfall (?Av.)	20	20	16	10	9	7	?	8	10	11	10	17	

(*Nesting data for North Borneo corrected to probable date of completion of clutch: Rainfall shown in inches*).

1. Nests taken by V. W. Ryves in and near Sandakan Estate, 11½ miles from Sandakan. Total number of records, 34. Meteorological data: Sandakan from P.M.O., Sandakan Hospital, via *Smithson. Misc. Coll., 105*, 1947: 254. Labuan, Malayan Meteorological Service. Summary of Observations 1938 (pub. 1939): 79.
2. Nests taken by V. W. Ryves in Kota Belud area, mostly at or round Riau. Total number of records, 112. Meteorological data: Sandakan, as above: Labuan, Malayan Meteorological Service, Summary of Observations 1939 (pub. 1948): 83.
3. Combined nest totals of (1) and (2): 142 records; see text p. 273.
4. All data from Banks (*Ibis*, 87,(4), 1950), see text, p. 271.

In addition to differences of form and altitude, Sandakan and Kiau are over a hundred miles apart, with one on a coast that looks north-east, and the other near a coast facing north-west. Banks does not give the exact localities or source of his rainfall figures. This is unfortunate as the precipitation is by no means uniform all round the coast. Rutter (1922: 10) sums up the rainfall in North Borneo as follows,

> "……Even (the period) of the north-east monsoon, however, cannot definitely be called the rainy season, though most of the year's rain falls between November and February; March, April and May are usually dry; then follows what might be called an intermediate wet season during June and July, counterbalanced by a dry spell until October. But beyond saying that December and January are the wettest months (61 inches fell in Sandakan during January 1918, a record for the State) and August the driest, it is impossible to lay down any general rules as to rainfall in North Borneo, since the amount varies greatly in different parts of the country, and even in localities only a few miles apart……"

The variation in total rainfall is illustrated by the summaries for the period 1923–32 published in the last edition of the State Handbook (1934: 135),

	Rainfall	
	Inches	Days
Sandakan	139·97	151
Jesselton	108·25	161
Beaufort	155·57	210
Kudat	87·78	155
Tenom	69·79	170
Tambunan	74·00	180
Tawau	78·44	135

There is also a regional difference in the dates of the period of heaviest rainfall. Rutter's account gives a good general picture. The rhythm that he outlines, it may be noted, is not very different from that occurring in northern Trengganu (Malaya), at about the same latitude. In the Sandakan area the period of heavy rain normally continues at least as late as the end of February, with April to July moderately dry. On the other hand on the island of Labuan, on the west coast, the dry weather covers the period January to March, with the heaviest rainfall from August or September to December. This is not unlike the arrangement in the Malacca district on the west side of Malaya, except that there the heavy rain runs from June or July to November, instead of August to September, and the dry spell is December to February.

These variations are important if we are to accept an association between the end of the rainiest period and the beginning of the breeding season. Unfortunately no precipitation figures appear to be available for the Kiau or Kota Belud districts. It is probable that the latter has its heaviest rain from October to January, with the lighter rains from March to May (though I found July wet enough). The table here gives rainfall figures for Sandakan (figures from the district hospital, on the outskirts of the town), and for variety, Labuan. Strictly if rainfall figures are to be of any value they must be of the area in which the collecting has been done. If the nesting season of the birds is influenced directly, or indirectly, to any important extent by the rain, it can only be by the precipitation in the area where the birds are residing, not by an average of the different figures for the country as a whole, those for the capital town, or the spot where the most accurate recorders are working. From this it follows that nesting records from different places cannot be lumped together unless the rainfall rhythms are similar.

In actual fact I do not think that we are justified in combining Ryves's two sets of figures, and then claiming that they show peak breeding limited to February and March "at the end of the months of heaviest rainfall." On the other hand his figures for 1938, though distressingly low, are not without value on their own. They show nests found with clutches completed roughly as follows,

Clutches completed ..	March	April	May	June	July	August	
No. of nests found ..	7	7	5	7	5	3	nests

and interestingly enough the eight records for July and August are made up of four Megapode nests, one *Centropus*, one *Amaurornis phœnicurus*, and two *Rhipidura javanica*. The first three birds may not be following the general breeding rhythm of the main mass of the population. Apart from two clutches of *Amaurornis* (one each in May and June) the nests which Ryves took during his first three months in North Borneo are all of birds which keep fairly well in season in Malaya. On the other hand in the peninsula some at least of the Rallidæ lay over a very wide period, if not at any time in the year. Madoc (1947: 11) gives February to June, possibly July, as the laying months for *Amaurornis*, but I have seen a clutch taken in Perak in late August, and Ryves took two sets of eggs in Negri Sembilan in October—and two at Kota Belud, in North Borneo, in January. I have no precise dates for *Centropus sinensis* for Malaya, but

the allied *C. bengalensis*, another lalang-nesting bird, certainly has a wide breeding season. Madoc (*tom. cit.*: 54) puts the period at March to May: Edgar (1933: 136) records only three clutches, and these must have been laid in late December (one) and January (two): Spittle (1949: 187) found post-nest juveniles on Singapore Island in February, June and October: I have a record of a September nest with fresh eggs. White head (1893: 246) writing of *megapodius cumingii* in the southernmost Philippines, says "Whilst in Palawan I had a good opportunity of watching these birds, for they were very plentiful, June to August being their nesting months", It would not be surprising to find them laying late, as temperature should seemingly be important in their case; Ryves says his eggs were taken from large mounds of friable sand which the birds had built up in the jungle edge abutting the sea shore.[3] It is not clear whether or not they also make use of rotting vegetation in Borneo, but they are presumably at least partly dependant on sun heating for incubating. Unfortunately Ryves also took eggs on the Mantanani Islands, in the bay off Kuala Abai, on 25 and 26 January, 1939, so the megapodes are not laying only at the warmest time of the year. Nevertheless, late breeding of this species remains reasonably certain: presumably it also lays over a wide period.

Briefly, Ryves's 1938 figures seem to me to show that the main laying season in the Sandakan area may easily be running on until June at least, and that it starts in March or earlier. This is very suggestive of the apparent rhythm of the northern Malay States. Again I would put the Kota Belud set as part of a sequence roughly similar, possibly beginning a little earlier (as we do not know when the main season starts in the Sandakan area), but certainly not stopping sharply at the end of March.

3. Ryves found two mounds on 1 August, 1938, on the mainland, at Tanjong Telok, about 18 miles north-west of Sandakan. One contained one fresh egg, and the other two. These I have counted as two clutches laid in July. Subsequently, on 5 August, a Suluk brought him four eggs (two part incubated and two fresh laid) from mounds at Si-birle or Sa-bine, a place apparently near to Tanjong Telok. These I have attributed to July and August respectively. The mounds are described by Ryves as 3–3½ feet high at the centre and 40–60 feet in circumference at the base (= c. 12–19 feet across at the base). Whitehead (*loc. cit.*) says the largest nest he saw was 5½ feet high and 34 paces round (= c. ? 25–30 feet across), "and must have contained many cartloads of earth, sticks, and stones.....no doubt the gradual work of many birds for several years; for the birds, if not molested, use the same heap many seasons." He also adds that "A good many green leaves are plucked and placed in the hole, and amongst these the egg is laid."

There can be little doubt that there is a limited breeding season in North Borneo, and that its peak occurs in the first six months of the year. At the same time it seems to me that Banks is incorrect in cutting its peak down precipitately at the end of March, and in tying its run too precisely to the end of the local rainy season. Neither points can really be taken as legitimate conclusions from the data made available to us by Ryves's collection of eggs; and Banks gives no indication that he has access to any other source of information. Whitehead does, of course, give us some records, but too frequently they are insufficiently precise, and his time in the Kinabalu area overlaps that of Ryves. For interest and convenience I have summarised Whitehead's dated notes in Appendix *C*. below. I do not think, however, that they take us much further than my general statement above. There can be no doubt that at least the majority of the birds have peak or restricted breeding periods, and that in at least the majority again these occur sufficiently synchronously to give us a breeding peak, a general breeding season for the area; but before we can attribute the control of the birds' activities to changes in rainfall we must have a sufficient number of egg dates, and a precise record of the weather in the localities from which they were obtained.

The Breeding Season in Malaya

Local variations in rainfall are again important in any consideration of the possible factors determining the breedings seasons in Malaya. There is no doubt that in Singapore the majority of the commoner birds at least apparently begin laying between the end of December and the end of January; thence in a number of species, breeding continues until the drier spell in August or September, but activity is reduced from July onwards, and is less marked in late April and May, during the middle of the period. Even in so small an area as Singapore Island there is a minor difference in rainfall from point to point, but we can with reasonable accuracy accept a single set of figures to cover the 225 square miles. The official recording station at Kalang Airport gives the following average monthly precipitation over the years 1930–1938,

	J.	*F.*	*M.*	*A.*	*M.*	*J.*	*J.*	*A.*	*S.*	*O.*	*N.*	*D.*
Rainfall (in inches)	7.6	4.7	7.6	7.5	9.9	6.1	5.4	6.3	5.7	7.2	10.0	8.9
Number of wet days	12	9	11	13	15	11	10	14	10	14	18	16

Unfortunately the apparent correlation between rainfall and laying that we find in Singapore becomes much less clear when we move up country. The rainfall of Malaya is summarised in the introduction to the annual official Summaries of Meteorological Observations (1938: 9, ¶ 6) in the following terms,

> The seasonal variation of rainfall in Malaya is of three types. Along the East Coast, and for a few miles inland, the maximum rainfall occurs with the North-East Monsoon, the remainder of the year being comparatively dry. There is a steady increase of rainfall month by month from June or July to December, followed by a steady decrease on to the middle of the year. Over the inland districts and along the greater part of the West Coast the maximum rainfall usually occurs in October and November. A second rainy season, though not so pronounced, occurs in March and April, the middle periods of the monsoons being comparatively dry. Along a limited length of coast in the region of Malacca, the wettest portion of the year is at the height of the South-West Monsoon, the lowest rainfall occurring in December and January. The change from minimum to maximum is fairly regular, as is also reverse.

or taking it in figures, from the tables published in the Malacca Strait Pilot (1946: 36–40), with the addition of Kuala Trengganu and Bangkok from the South China Sea Pilot (1937: 624–5), we get the following sequence, running from south to north.

	J.	F.	M.	A.	M.	J.	J.	A.	S.	O.	N.	D.
Singapore	7.6	4.7	7.6	7.5	8.9	6.1	5.4	6.3	5.7	7.2	10.0	8.9
Malacca	4.1	2.7	5.0	6.5	7.5	8.2	9.6	7.9	9.6	11.3	8.7	6.7
Jeram (Selangor) ..	8.0	2.8	6.5	6.9	7.1	3.8	2.6	5.4	4.5	7.9	9.6	8.6
Kuala Trengganu ..	9.3	2.7	2.8	2.7	1.7	3.2	3.6	4.9	1.8	15.8	10.6	6.9
Penang	4.6	2.4	5.7	11.2	11.5	6.9	6.8	12.8	15.8	18.4	10.2	3.9
Alor Star (Kelah) ..	1.7	1.2	5.3	10.5	8.6	7.5	6.6	10.6	10.2	13.7	8.3	6.2
Bangkok (Siam) ..	0.3	0.8	1.4	2.3	7.8	6.3	6.3	6.9	12.0	8.1	2.6	0.2

The characteristic annual rhythm in Malaya is a period of heaviest rainfall and a period of slightly less heavy rainfall, the major and minor rainy seasons, separated by two spells of rather drier weather. If we analyse the figures given above on roughly these lines we get the following approximate distribution for the periods of heavier rain,

	Major Rains	Minor Rains
Singapore	October to January	March to early June
Malacca	June to November	March to early May
Jeram (Selangor) ..	October to January	March to May
Kuala Trengganu ..	October to January	June to August
Bayan Lepas (Penang) ..	August to November	April to June
Alor Star (Kedah) ..	August to November	April to June
Bangkok (Siam) ..	May to October	No season

The two most important points about the distribution of rainfall shown by this analysis are (1) the peculiar behaviour of the weather round Malacca, and (2) as one passes north up the peninsula, apart from the Malacca district, there is a recession of the rainy seasons, so that the major rains which in the south start in October move back to August in Kedah and finally to May in the Bangkok district of Siam. Now if there is a direct relation between reproduction and the rainy season, as Banks and Dr. Voous suggest, and laying begins at the end of the heavy rains, and in relation to that event, the start of the breeding season should show the same changes in time as the weather in (1) and (2). We have absolutely no evidence at the moment to suggest that (1), the weather in the Malacca district, has any major effect on the breeding season of at least the majority of the birds in that area. Secondly, as one moves north up the peninsula the start of the breeding season does not recede. Such evidence as we have all points to its beginning rather later as one moves north, not earlier, until in the Bangkok district of Siam some of the birds at least begin to breed with the start of the heavy rains.[4] I am not yet sure how universally true this is, but it certainly applies to a number of the commoner species, and in particular to three small passerines on which we have a reasonable amount of information, *Orthotomus atrogularis*, *Cisticola juncidis* and *Munia punctulata*. In the south of the peninsula these birds begin breeding early, the first pairs laying a little after the start of the new year (and by a coincidence roughly at the close of the rains), and the nesting season is long and diffuse. As one passes north laying normally starts later, until beyond the end of the peninsula, in Thailand proper, it begins in May in the Bangkok district, along with the rains. The end of the season, on the other hand, seemingly remains at roughly the same point, so one has in effect a cutting down of the length by delaying the start.

If one views the situation from the standpoint of the southern end of the peninsula, as I did while collecting data in internment, or from the area a little further south, inevitably one's immediate reaction is to assume too close an association between the end of the rains and the beginning of the breeding peak. This point applies to Sarawak, at roughly the latitude of the area

4. See table on p. 279. Data for breeding in Bangkok in Herbert (1923–24, *passim*) and Madoc (1950, *passim*).

Egg-dates for Selected Areas in the Southern Portion of the Malay Peninsula

Locality	*Jan.*	*Feb.*	*Mar.*	*Apr.*	*May*	*June*	*July*	*Aug.*	*Sept.*	*Oct.*	*Nov.*	*Dec.*	*Total*
Negri Sembilan (2°30′ — 3° N. Lat.)	10	22	28	**37**	22	29	10	4	..	2	1	2	157
Selangor (2°45′ — 3°35′ N. Lat.)	17	22	**26**	**27**	20	10	5	2	3	2	1	10	143
Pahang (3°10′ — 4° N. Lat.)	1	6	**8**	**8**	5	2	1	2	..	..	..	1	34
Perak 4°10′ — 5° N. Lat).	..	1	6	**13**	**14**	10	9	1	..	..	2	..	54
Rangsarn (Thailand) (about 6°20′ N. Lat.)	..	1	7	17	23	**34**	31	13	1	..	..	1	129

The figures given above are derived only from dated and localised clutches in the Raffles Museum collection, and from records in V. W. Ryves's field book. No use has been made of a small number of scattered clutches from parts of Malaya outside the areas defined, or of published sources; the latter are in nearly all cases phrased too vaguely to permit a fair rendering in the form employed above. Eggs of all species are included except sea birds, herons, egrets etc., and waders. 9 of the 10 December records for Selangor are large hawks which normally begin nesting early in Malaya.

All the records shown are from lowland localities; no attempt has been made to include data from the hill stations. The boundaries of latitude shown in the margin cover only the portions of the states from which records have been utilised.

The principal sources of the collection are as follows.
Negri Sembilan—V. W. Ryves.
Selangor—V. W. Ryves and G. C. Madoc.
Pahang—G. C. Madoc.
Perak—A. E. Coope and a few eggs from A. T. Edgar; Coope's eggs were mostly taken in the neighbourhood of Kuala Kangsar, towards the northern border of the area as defined in the margin; Edgar (1933: 121—162) gives rather earlier dates for the Sitiawan district of Perak, at Lat. 4° 10′ — 4°15′ N.
Rangsarn, Peninsular Thailand—C. J. Aagaard's collector.

from Singapore north to the Bernam River in Malaya (the boundary between Selangor and Perak), and to much of Indonesia. In a most interesting paper on breeding seasons in the latter area, Voous (1950: 279–87) reaches the conclusion that,

> "3. The breeding season generally starts at the close of the rainy season and reaches its peak before the driest month. The peak months vary in different areas, as follows: N. E. Sumatra, April-June; W. Borneo, Jan.-March; W. Java, March-June; Mid Java, March-July; E. Java, March-June.
>
> 4. In the regions discussed, which lie close to the equator, both temperature and day lengths are remarkably constant throughout the year. It is quite improbable that the very slight monthly differences in temperature and day-length have a direct influence upon the breeding periodicity of birds.
>
> 5. It seems most probable that the peak of the breeding season of most of the birds is adjusted to take advantage of optimum conditions at the end of the rainy season, though it is not clear how far this could apply to the evergreen habitats."

The statement is not made dogmatically, but it seems fairly clear that Voous considers the closing of the major rains to be the determining factor in dating the beginning of the breeding peak. Much simplified his data can be expressed roughly as follows,

Area	Breeding Peak	Heaviest Rains	Driest Period
N.E. Sumatra ..	April-June	Sept.-December	February
W. Borneo ..	Jan.-April	Sept.-Feb. (+?Feb.-June)	June-August
W. Java ..	March-June	Sept.-June	June-August
Mid Java ..	March-July	November-April	July-Sept.
E. Java ..	March-June	November-April	July-Sept.

With the data in this form it is possible to argue two ways. Clearly the peak breeding period does bear a relation to the months of heaviest rain, in that it follows them, except in N. E. Sumatra, where it apparently follows the driest period and precedes the season of greatest rainfall, as it must in effect be doing in the southern part of peninsular Thailand.[5] But in West Borneo and West Java breeding starts well before the real end of the wetter weather. Only in Mid and East Java does it start as the rains begin to die down. On the other hand, if as in (*a*) below we take the middle of March as our axis, and as in (*b*)

[5] cf. Records for Central Perak, Lat. 4° 10′–5° N., and Bangnara, Pattani, Lat. 6° 20′ N., in table on p. 281.

the last month of heavier rain, calculating from the middle of each month, we get the following tables,

Area	(a) Heavier Rain Ends	(a) Breeding Peak Begins	(b) Breeding Peak Begins
N.E. Sumatra ..	3 Ms earlier	1 M. later	4 Ms later
W. Borneo ..	1 M. earlier (or 3 Ms later)	2 Ms earlier (2 Ms earlier)	1 M. earlier (or 5 Ms earlier
W. Java ..	3 Ms later	March	3 Ms earlier
Mid Java ..	1 M. later	March	1 M. earlier
E. Java ..	1 M. later	March	1 M. earlier

This is, of course, only approximate, but it shows what would, in fact, appear to be an important point, namely that on the data available, the time when breeding seemingly gets under way bears a more consistant relation to a fixed point on the calendar than it does to the termination of the major rains in that area.

One notices this again in considering individual cases. The figures with which we have been dealing, though specific to particular areas, are generalities in time, they are averages over a number of years. In Malaya at least, the weather varies within limits from year to year, as well as from place to place. Here in Singapore the end of the Christmas rains appears in practice to range from the beginning of January to the end of February, and it has been even later. The end, when it comes, may be clear-cut or gradual. It is not infrequently preceded by abortive, irregularly spaced spells of drier weather. Yet over the last four years the cock tailor-birds in and near to my garden have become noticeably vociferous without fail some time in the last ten days of December. On the one hand they start calling before the end of the rains are apparent, as such, and on the other their actions have proved far more regular, in relation to the printed calendar, than the weather has.

This matter of annual variations in the time when the rainy season proper begins cannot be wholely unimportant if the latter is the factor initiating breeding directly, or indirectly. These irregularities can be considerable, as is shown by the analyses of the weather conditions on Christmas and the Cocos-Keeling Islands, published in earlier numbers of the *Bull. Raff. Mus.*, 18 (1947: 18–21) and 22 (1950: 24–26). Both these places have

fairly well determined wet and dry seasons, and their establishment and condition undoubtedly have a very considerable effect on the flora and the insect fauna. Averages of precipitation readings over a long period place the beginning and end of the rainy periods with admirable concision. Unfortunately the weather appears to be unaware of the schedule to which it ought to be working. On a detailed examination of the Christmas Island rainfall from 1900–1939 we find that April, which has the wettest mean reading of the year and comes at the height of the rains, varied from a fall of 1.45 inches in 1925 to 40.5 inches in 1935. Over the same period, nine of the twelve months feature at least once as the wettest month of the year, yet the rainy season as such only lasts about six months.

The Cocos-Keeling Islands again have a regular alternation of wet and dry seasons, but in the readings for the period 1902–1941 every month appears at least once as the wettest month in a particular year, and all except February and June as the driest. Nevertheless on both islands one finds that the numbers and kinds of the commoner and more noticeable insects are effected profoundly by the rainfall. On Christmas Island January 1940 was wet, as it should be, but February turned out to be unexpectedly dry. It was, in fact, so dry that the insect population came to resemble that of November. Then in March the rainy season re-asserted itself, and the fauna swung back to the normal for the time of the year.

These two island groups present us with extreme instances of variability, but minor irregularities are by no means uncommon in Malaya. In Singapore a year that followed the mean of the rainfall readings for the last fifty years closely would not be a normal year: like the average man it would be unusual to the point of being freakish. If the inception of the breeding season in the local birds was closely tied to the rainfall they should in at least the majority of cases anticipate these variations by corresponding variations in the time at which they begin nesting. The little evidence that I have available suggests that this is not so. The year 1940 on Christmas Island was peculiar in several respects. In the fall conditions built up for the usual beginning of the November preliminary rains, the *apertifs*, and then nothing happened—no meal, no real rain came until after the end of the year. The local swiftlets, *Collocalia esculenta natalis* Lister, which had begun building in September, in anticipation of damper weather, also hung fire. The colony which I had under observation was still apparently without eggs when

I left the island in the middle of December, though in 1938 and 1939 laying had begun in October. It seems, from the records that I have seen, that the birds in the Fraser's Hill area (on the Selangor-Pahang boundary, central Malaya) normally start building in February, as the heavy rains end, and have the drier weather in which to incubate. If the rains end late there are numerous abandoned nests, or deserted, incomplete clutches. In both these cases where a season, one dry and the other wet, occasionally runs abnormally late the birds appear to begin breeding (in ignorance rather than defiance of the irregularity), at about their normal time on the solar calendar, and only subsequently are they forced to stop their seasonal activities because of adverse conditions.

On the present evidence it looks as if the breeding seasons in Malaya (and for that matter other Malaysian and related areas) are controlled by more than one factor, a primary factor or initiating stimulus and (usually) one or more conditioning or secondary factors. The former appears to have a solar quality about it, in that it has a regular annual rhythm, common to a wide area. Certainly it is not the local rainfall, or anything directly dependant on it. This "solar" factor determines the natural time of inception of the breeding season. What happens then depends on the strength and nature of the external factors working on it. The rainfall comes in this category and figures prominently there, by direct or indirect action. If the climatic conditions are temporarily adverse for nesting either in themselves or in the material that they make available, the birds proceed to the point at which they can go on further, and are then forced to abandon the nest or clutch. If the delay is not too long they succeed with the second attempt, though with less certainty, as they have already suffered one loss that season. On the other hand if the adverse factors are only of very minor importance the birds may continue with their nesting in spite of them. There must be a threshold, differently placed individually, racially and specifically. Up to a point the adverse conditions produce no reaction: beyond it the interference, by itself or in association with other stimuli, carries the day and there is a modification or cessation of breeding activity.

The stimulus to start breeding must come equally and to all members of a sedentary population at the same time: the early breeders, therefore, are those which react more quickly than the remainder, and the tendency to do so a characteristic genetically controlled. If adverse conditions delay the start of successful

breeding by a short period over a number of years, presumably the early breeders are ultimately eliminated from the stock. They stand a very good chance of losing their first nest or clutch, each year, and having done so have less in reserve against possible loss after conditions have improved. In this period they are at a disadvantage. While birds prompted at the same time by the same stimulus but reacting more slowly are better able to cope with later disasters, until in the end, by selection, we are left with a late breeding population. Thus the rainfall can give us populations with later breeding seasons in some areas than others, or by pressure at the other end of the reproductive season, earlier nesting populations, without itself being the primary factor that controls the year's reproductive cycle in the birds.

If there is no dry season in the area, or if continued rain does not seriously effect the success of breeding, the basic rhythm, or something approximating to it, is maintained. In this way we can account for similar breeding seasons in East and West Java, in spite of a difference of three months in the dates of the end of the heavier rains. If the latter were effecting breeding directly, the two seasons should show a more constant relationship. Presumably in this case the adverse effect of the weather is not sufficiently strong to modify the natural breeding rhythm, which remains fairly constant through the whole length of Java. On the other hand, as we move north from Java, the date of the beginning of the breeding season does alter, in many cases, but certainly the change cannot be influenced by the end of the rainy season, from which it becomes dissociated.

These remarks are, of course, made in general terms, and apply only to those species (apparently the main bulk, nevertheless) which seemingly breed at set times of the year, and whose periods of reproductive active are sufficiently synchronous to constitute a breeding season and breeding peak for the local avifauna as a whole. There are probably a few species which follow no fixed seasons, and have individuals breeding at all times of the year, but in some at least of the birds possibly in this group, such as *Pycnonotus goiavier*, there is definitely a marked peak period which corresponds to the general breeding season. *Aplonis panayensis* and *Passer montanus*, two other birds apparently laying at all times of the year, again have definite peak periods. A few groups of birds probably have their peak periods at times different from those of the majority. The terns certainly lay from May to July (see this journal, 23, 1950: 1–43), and it is possible that the larger Ardeidae nest only over the

same period. The larger hawks apparently lay before the main bulk of the birds, that is from November to January or February; this, it may be added, cannot be entirely associated with a need for a good supply of the helpless newly fledged chicks of the passerines as a source of food for their own young, as several of the birds in question are fish-eaters or scavengers. The Rallidae are a little puzzling: we have relatively few records, and of those that we have there are nearly as many for the last four months of the year as there are for the first four. Some other lalang-nesting birds also show wide or late breeding seasons, again judging only by the few records available to us. It may transpire that these out of season records are abnormal for the species. Certainly the great majority of the Malayan birds do nest during the same months and over the period defined earlier in these notes, and it is to them that the general remarks above apply.

Appendix A

Details of Nesting Records, North Borneo (Ryves coll.)

As already noted, the table which follows on pages 291–292 shows all the clutches (146) which Mr. V. W. Ryves collected, grouped according to the approximate dates on which laying was or would have been completed, except for the 40 c/2 of swiftlet eggs from Kabayan Cave.

Appendix B

Size of clutches in which Incubation had begun (Ryves coll. North Borneo)

Much of the Malayan data on egg-laying gives no indication of whether or not the "clutch" recorded was complete. The following figures have therefore been taken from Ryves's North Borneo field notes giving the size of clutches in which incubation had started.

Megapodius freycinet cumingii Dill. 1 c/2.
Ducula aenea polius Oberh. 1 c/1.
Ducula b. badia (Raffl.) 1 c/1.
Macropygia ruficeps nana Stres. 4 c/1.
Amaurornis phoenicurus javanica (Horsf.) 2 c/4. 1 c/5.
Otus bakkamoena lempiji (Horsf.) 2 c/2.
Halcyon chloris cyanescens (Oberh.) 1 c/3.
Halcyon concreta borneana Chas. & Kloss 1 c/2.
Anthracoceros malayanus (Raffl.) 1 c/3.
Collocalia esculenta cyanoptila Oberh. 40 c/2.
Harpactes oreskios uniformis Rob. 1 c/1.
Centropus sinensis eurycercus Blyth 1 c/2.
Pitta granatina ussheri Sharpe 1 c/2.
Rhinomyias o. olivacea (Hume) 1 c/3.
Criniger ochraceus ruficrissum Sharpe 1 c/2.
Garrulax mitratus treacheri (Sharpe) 2 c/2.

Malacocincla pyrrhogenys canicapilla (Sharpe) 2 c/2.
Stachyris nigriceps borneensis Sharpe 3 c/3.
Macronus gularis montana (Sharpe) 5 c/2. 1 c/3.
Siva castaniceps everetti (Sharpe) 2 c/3.
Turdus javanicus seebohmi (Sharpe) 1 c/1.
Prinia flaviventris superciliaris Salvad. 1 c/3.
Seicerus superciliaris schwaneri (Blyth) 1 c/3.
Artamus l. leucorhynchus (Linn.) 2 c/3.
Dicaeum concolor borneanum Lönn. 1 c/2.
Leptocoma jugularis microleuca (Oberh.) 1 c/3.
Dicrurus leucophaeus stigmatops (Sharpe) 2 c/2.

Appendix C

Data from Whitehead's Exploration of Mt. Kinabalu

The following egg dates for the Kinabalu area have been extracted from Whitehead's "The Exploration of Mount Kinabalu, North Borneo" (London, 1893). The figures given refer to the number of species, not to individual nests. As in the case of the data from the Ryves collection, the records are listed under the month in which the clutches were, or would appear to have been, completed. Records which obviously refer to Labuan, Lawas or Palawan have been omitted, and of course it has not been possible to make use of several undated references to nests and eggs.

Whitehead was in this area three times, attempting to arrange an expedition to the upper levels of Mount Kinabalu. In February and March 1886 he spent about a month at Kuala Abai and at a point a little way inland on the edge of the Tempasuk Plain (?Kota Belud), but he was unable to proceed further owing to disturbances in the interior. The following year, on his second attempt, he left Labuan on 25 January, and returned there unsuccessful on 16 April, having spent the greater part of his time at Melangkap (alt. about 1,300 feet), on the east side of the plain, and collecting on the adjacent western ridges of Kinabalu to altitudes of about 4,800 feet. On his third and final attempt in 1888 he reached Kuala Abai on 16 December, and arrived back there en route for Labuan on 25 May, having reached the summit area of Kinabalu and spent the whole of February camping on the mountain at altitudes above 7,000 feet, and the greater part of March up to 9 April, at 3,000–3,600 feet near Kiau and Koung. He was unwell for the remainder of his stay in the area, which was spent mostly in the neighbourhood of Melangkap and Kapar. Both Whitehead's major journeys cover the months during which Ryves was at and in the vicinity of Koung and Kiau; and during April and May 1888 Whitehead, who had left England in October 1884, without benefit of modern medicines, was patently unfit. Nevertheless he shows more egg dates for April than he does for February. March is clearly the peak month in both workers' records, but Whitehead had only one full April in the area, and it looks very much as if he would have obtained as many records for that month as for March if he had stayed on at or near Melangkap in 1887, or possibly even if he had been fitter and more settled in 1888. It must be realised also that he was not primarily interested in nests and eggs, and by April 1888 the main object of his journey—collecting on the upper levels of Kinabalu—had been completed, and he was concerned principally with obtaining further specimens of species poorly represented in his collections from the lower levels, before returning to the coast for the last time. Clearly March is a month of considerable breeding activity among the birds in this area, and probably it is the peak period, but there is nothing in Whitehead's notes to indicate a sudden end to laying at the beginning of April.

The monthly distribution of Whitehead's records of species found breeding, is as follows,

Month	*Jan.*	*Feb.*	*March*	*April*	*May*
Number of Species ..	5	6	11	7	3

In the majority of cases Whitehead had only one or two records of nests, and only two species occur twice in this table. Clearly he imagined the laying periods to be much shorter than they really are. A list of the species arranged, as in the table, under the month in which the clutches recorded were (probably) completed, is given below. The annotations consist of summaries of Whitehead's notes relating to the dating of the records, with the reference to the relevant page in his book, followed by a note on the clutches, if any, taken by Ryves in 1939.

January

Pomatorhinus montanus bornensis Cab.

Lays two eggs about the middle January (p. 225). Ryves took eggs in February (4 clutches) and March (3 clutches).

Macronus ptilosus reclusus Hart.

A nest, c/3, taken on 17 January (p. 224).

Macronus gularis montana (Sharpe)

The eggs may be found from the middle of January to March (p. 229). Ryves took eggs in February (3 clutches) and March (4 clutches).

Turdus javanicus seebohmi (Sharpe)

A full-fledged nestling taken on 18 February (p. 217). Whitehead says that he never saw this species below 8,000 feet.

Chlorocharis e. emiliae Sharpe

A young bird, which had not long left the nest, taken on 12 February (p. 224). Encountered at altitudes of 6,000–12,000 feet.

February

Excalfactoria chinensis lineata (Scop.)

A nest (with eggs) found in the middle of February, and in other months (p. 246).

Spizaëtus cirrhatus limnæetus Horsf.

A nest with egs found (?) near Kota Belud (p. 201). No precise dating given: this is attributed here to February 1886 by inference.

Macronus gularis montana (Sharpe)

See above: Whitehead, p. 229.

Oriolus cruentus vulneratus Sharpe

The nesting season is apparently in February: females shot during the month had well-developed eggs in the ovaries, and a full-grown fledgling was procured early in March (p. 206).

Kitta chinensis minor (Cab.)

Nestlings encountered in March (p. 205). Ryves took single clutches in February and March.

Kitta chinensis jefferyi (Sharpe)

In April the old birds had their families with them, consisting of two young ones (p. 206). Not encountered below 8,000 feet.

March

Accipiter v. virgatus (Temm.)

Two eggs taken by a native collector on 30 March, "evidently of this Hawk, which had been seen by me about the locality where the nest was found" (p. 201).

Otus bakkamoena lempiji (Horsf.)
An egg taken on 20 March (p. 204). Ryves took six clutches, 2 c/2 and 4 c/4 in February (1 clutch) and March (5 clutches).

Calyptomena whiteheadi Sharpe
A nest with two eggs and one with two newly hatched chicks found on 17 March (p. 182). Ryves took a nest containing one fresh egg on 23 March.

Muscicapa melanoleuca westermanni (Sharpe)
A nest with one egg, 25 March (p. 211).

Muscicapa hyperythra malayana (O-Grant)
A nest with two hard-set eggs found on 22 March (p. 211).

Rhinomyias gularis Sharpe
A nest and two eggs taken on 11 March (p. 214).

Garrulax mitratus treacheri (Sharpe)
A nest with one egg taken on 17 March (p. 226). Ryves took seven nests, all c/2, in February (3) and March (4).

Alcippe castaneiceps everetti (Sharpe)
A nest with three eggs found about 13 March (p. 223).

Arachnothera affinis everetti (Sharpe)
Several nests (with eggs) taken about the middle of March (p. 233). Ryves took one nest, c/2 fresh, on 28 February.

Dicrurus hottentottus borneensis (Sharpe)
One nest taken on 20 March, and one on 20 May (p. 207). Ryves took 1 c/2, fresh, on 12 February.

Dendrocitta occipitalis cinerascens Sharpe
A nest with two eggs found on 13 March (p. 205).

April

Caprimulgus m. macrurus Horsf.
The eggs are two in number, laid in April (p. 244).

Hierococcyx f. fugax (Horsf.)
Found laying in a nest of *Culicicapa ceylonensis* on 29 April (p. 242).

Culicicapa ceylonensis calochrysea Oberh.
See above (p. 214).

Myophonus borneensis Slater
A nest, possibly with young, found on 23 April (p. 218). Ryves found a nest, c/2 fresh, on 15 February.

Aethopyga s. siparaja (Raffl.)
A nest with c/2 found at the end of April (p. 232).

Dicrurus leucophaeus stigmatops Sharpe
A nest with two eggs found on 4 April (p. 207). Ryves had three nests, c/2, two fresh, one fully incubated, 27–29 March.

May

Copsychus saularis niger Wardl. Rams.
Eggs found at the beginning of May (p. 218). Ryves had one nest, c/3, fresh, on 3 March.

Prinia flaviventris superciliaris Salvad.
Eggs laid about the middle of May (p. 222). Ryves took two clutches, Sungei Batang, Sandakan, North Borneo, 23 May (c/3) and 15 June (incomplete).

Dicrurus hottentotus borneensis (Sharpe).
One clutch taken 20 May: see under March (p. 207).

Egg-laying Dates, North Borneo, shown by Half-monthly Periods

Compiled from data collected by V. W. Ryves, 27 March to 24 August, 1938 and 17 January to April, 1939

Name of Bird	*Number of clutches completed shown by half-months, January—August*															
	January		*February*		*March*		*April*		*May*		*June*		*July*		*August*	
Megapodius freycinet cumingii Dill	1	2	..	..	..	..	..	..	..	..	..	..	..	3	1	..
Ducula aenea polius Oberh.	1	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Ducula bia badia Raffles)	..	..	1	1	1	1	..	..	..	..	..	..	..	..	..	..
Macropygia ruficeps nana Stress.	..	..	3	5	2	1	..	..	..	1	1	..	1	..	..	..
Amaurornis phoenicurus javanica (Horsf.)	..	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Otus bakkamoena lempiji (Horsf.)	..	..	..	1	3	2	..	..	..	..	..	..	..	..	..	..
Ninox scutulata borenecensis (Bp.)	..	..	1	..	..	..	..	..	..	1	1	..	..	..	..	..
Halcyon chloris cyanescens (Oberh.)	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Halcyon concreta borneana Chas. and Kloss	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..
Anthracoceros malayanus (Raffles)	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Harpactes oreskios uniformis Rob.	..	..	..	1	..	..	..	..	..	..	..	..	..	..	1	..
Centropus sinensis eurycercus Blyth	..	..	..	..	..	1	..	..	..	..	..	1	..	..	..	..
Chrysocolaptes validus xanthopygius Finsch	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..
Calyptomena whiteheadi Sharpe	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..
Pitta granatina usheri Sharpe	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..
Hirundo tahitica abbotti	..	..	..	..	1	1	..	..	1	..	..	..	1	..	1	..
Misocapa banyumas montana Rob. and Kinn.	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..
Hypothimis azurea prophata Oberh.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Rhipidura javanica longicauda Wall.	..	..	..	..	..	..	..	..	..	1	..	1	..	..	..	..
Terpsiphone paradisi borneensis (Hart.)	..	..	..	..	1	3	..	..	..	..	..	..	..	..	..	..
Rhinomyias o. olivacea (Hume)	..	..	..	..	..	1	..	..	..	..	1	..	..	..	..	..
Rhinomyias u. umbratilis (Strick).	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..
Lalage nigra schisticeps Neum.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Criniger ochraceus ruficrissus Sharpe	..	..	1	..	1	1	1	1	..	..	..	..	..	..	..	..
Pycnonotus zeylanicus (Gmel.)	..	..	..	1	..	1	..	..	..	..	..	..	..	..	..	..
Pycnonotus goiavier goiavier (Jac. and Puch.)	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Pycnonotus simplex perplexus Chas. & Kloss	..	..	..	1	1	1	..	..	..	..	..	..	..	..	..	..
Garrulax mitratus treacheri (Sharpe)	..	..	..	3	2	2	..	..	..	..	..	..	..	..	..	..
Pomatorhinus montanus borneensis Cab.	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..
Malacocincla pyrrhogenys canicapilla (Sharpe)	..	..	..	2	2	2	..	..	..	..	..	..	..	..	..	..
Stachyris nigriceps borneensis Sharpe	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Carried forward ..	2	6	8	17	20	21	2	2	1	3	3	2	2	3	3	..

Egg-laying Dates, North Borneo, shown by Half-monthly Periods

Compiled from data collected by V. W. Ryves, 27 March to 24 August, 1938 and 17 January to April, 1939

Name of Bird	*Number of clutches completed shown by half-months, January—August*															
	January		*February*		*March*		*April*		*May*		*June*		*July*		*August*	
Brought forward ..	2	6	8	17	20	21	2	2	1	3	3	2	2	3	3	..
Macronus ptilosus montana (Sharpe) ..	..	..	2	1	1	3	..	..	..	..	1	..	..	..	..	..
Sica cantatrix everetti (Sharpe) ..	..	..	1	6	1	4	..	..	..	..	..	..	..	..	..	..
Cupsychus saularis niger Ward. Ram. ..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..
Myophonus borneensis Slater ..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..
Turdus Javanicus seebohmi (Sharpe) ..	..	..	..	1	1	..	..	..	..	..	..	..	..	..	..	..
Seicercus superciliaris schwaneri (Blyth) ..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..
Prinia flaviventris superciliaris Salvad. ..	..	..	..	..	..	1	1	1	..	1	..	1	..	..	..	..
Artamus l. leucorhynchus (Linn.) ..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..
Dicaeum concolor borneanum Lonn. ..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..
Leptocoma jugularis microlaema (Oberh.) ..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..
Arachnothera affinis everetti (Sharpe) ..	..	2	..	..	..	1	2	..	..	..	..	..	..	..	..	..
Munia atricapilla minuta (Mey.) ..	..	..	..	..	..	2	..	..	..	..	..	..	..	..	..	..
Munia fuscans (Cass.) ..	..	..	..	..	1	2	..	..	..	..	..	..	..	..	..	..
Dicrurus leucophaeus stigmatops (Sharpe) ..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..
Dicrurus hottentottus borneensis (Sharpe) ..	..	..	1	..	1	..	..	..	..	..	..	..	..	..	..	..
Kitta chinensis minor (Cab.)	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Totals (1938–1939) ..	2	8	13	28	33	33	5	3	1	4	4	3	2	3	3	..

The table above shows the number of clutches apparently completed in each half month over the period from January to the middle of August: no data are available for the months September to December inclusive. The figure for the first half of January is certainly relatively too low, as Ryves did not begin collecting until about 15th January (1939): the two clutches shown are incubated clutches found in the second half of the month. Nests found before 1st April in 1938 (*L. j. microlaema* (Oberh.), 27th March, and *M. fuscans* (Cass.), 28th March), or after 31st March in 1939 *H. t. abbotti* (Oberh.), 4th April, and *A. l. leucorhynchus*) (Linn.) 7th April) are shown here and in the separate entries on p. 274, but not in the combined totals to avoid reduplication of figures over the period 27th March to 7th April. All entries are shwon under the half month in which the clutch presumably was, or would have been, completed.

Summary

The present paper is devoted to notes on two recent papers by Banks (1950: 642) and Voous (1950: 279–87) on the breeding seasons of birds in different parts of the Malaysian sub-region. Bank's note is based on a descriptive account of a collection of eggs made by V. W. Ryves in North Borneo in 1938–39, which appeared in an earlier number of this journal (1949: 106–15). The original material is subjected to a fuller analysis than was possible for Banks, and the greater part of it placed on record. The extended analysis shows that little evidence can be obtained from the collection on the dates of the possible breeding season in North Borneo, as the collecting was done at different times, in places 100 miles apart and in two different years, and neither series of records is sufficient on its own. Voous's paper suggests a relation between the termination of the period of heavy rains and the beginning of the peak breeding period in this area. His data is examined, together with material from the Malay Peninsula, and it is suggested in the present note that the initiating factor is something less variable locally and from year to year than the end of the rains, and that it is in fact associated with the rhythm of the solar year, rather than the pluvial one. One of the points brought forward is that while the end of the rains recedes as one passes north up the Malay Peninsula, starting in about January in the extreme south, and finishing at about September-October in the Bangkok area of Thailand proper, the beginning of the breeding season in a number of birds advances as one moves north, until it reaches May or June, and thus coincides with the beginning of the heavy rains, not their end.

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No. 19. Notes on the Avifauna of Pulau Senang, Pulau Pawai and Pulau Sudong, on the north side of the Singapore Strait

The three small islands and their adjacent islets which form the subject of the present paper lie between six and seven miles from the western entrance to Keppel Harbour in a south-westerly direction, and immediately to the north of the main channel of the Singapore Strait. They are grouped roughly along a line running from about Lat. 1° 12½′ N., Long. 103° 43½′ E., to Raffles Light (approx. Lat. 1° 9½′ N., Long. 103° 44½′ E.).[1] They are partly rocky, and partly of coral and mangrove formation. Pulau Pawai, the highest rises to about 145 feet above sea level, or 175 feet measured to the tops of the trees: Pulau Sudong, barely 20 feet above a normal high tide, is marked on the charts as 55 feet to the tops of the trees, in this case coconut palms: the islet of Pulau Berkas, east of Pawai, is still lower.

All the islands are surrounded by a fringe of coral reef, partly drying at low water. It is mostly from fifty to two hundred yards wide, but in some places it stretches out much further. In the case of Pulau Sudong the area of partially exposed reef is nearly nine times the area of the island. Much of the coral is dead, and very little of it is in a healthy condition. The vegetation varies considerably: Pulau Senang possesses a wide range of trees and plants, while Sudong has little beyond mangrove trees, coconut palms and *Terminalia catappa*. The largest of the three major islands has an area of about 225 acres at high tide, and the smallest, Sudong again, an extent of less than 60 acres. Pulau Satumu, the smallest unit in the group, has an area of just over an acre, and breeding populations of three birds.

6. The principal account of the birds of the Kinabalu and other areas visited by Whitehead, in the appendix to this book, consists of reprints, with slight alterations, of papers published in the *Ibis* by Bowdler Sharpe, 1887–1890, but use has also been made here of notes in the general text to the book.

1. Admiralty Chart No. 3837 refers. See also Malacca Strait Pilot, 3rd edn., 1946: 183–186.

A number of other islands, similar to one or other within the range of the present group, are scattered in the area south of Singapore, and again north of the Rhio Archipelago. So far as is known the resident birds are all common species. Their interest lies in the question of which species attempt and are able to maintain themselves on such small units of land, and how they compare with those doing so on the islands off other parts of the Malayan coast. The survey on which this paper is based was carried out on a number of visits by the present writer to these and other islands over the period 1948 to 1951. Collecting was undertaken by the Raffles Museum collector on Pulau Sudong and Pulau Pawai in September 1949, and on Pulau Senang and Pulau Pawai from 20 May to 10 June, 1951. The notes published here are arranged in three sections, (1) brief descriptions of the islands, (2) an analysis of the indigenous birds reported from them, and (3) comments on the data recorded.

1, Notes on the Islands in the Group

Pulau Satumu

Pulau Satumu, or Coney Island,[2] has an area of only about an acre at high tide. Much of its surface is taken up with the lighthouse and adjacent buildings (plate 1, lower picture). The vegetation, such as there is, consists almost entirely of cropped grass and coconut palms. Two large mangrove trees, *Bruguiera* sp., survive: there are also a few introduced lime trees and papayas, and bushes of the red hibiscus. The island supports small breeding colonies of three birds,

Apus affinis subfurcatus (Blyth)
Leptocoma jugularis microleuca (Oberh.)
Passer montanus malaccensis Dub.

first reported about twenty years ago (Anon, 1923: 25) and confirmed in 1951. At high water there is practically no shore, yet at low tide the exposed parts of the reef are normally frequented by one or two examples of *Actitis hypoleucos*, all through the year. The birds fly to the neighbouring islet of Pulau Biola, or on to Senang, during high water, and return as the tide drops.

2. The English names used for these islands are inherited from the old charts. Their significance is often obscure, and they bear no relation to the current Malay names. Neither rabbit nor hyrax occurs in Malaya; nor are there any animals likely to be on these islands that could be mistaken for them. Satumu is from the Malay *tumu*, the large mangrove tree *Bruguiera conjugata* Merr., and a fair translation of it would be One-Tree Island. The building of a lighthouse on the islet was first mooted in 1838, but the foundation stone was not laid until 1854, during the governorship of Col. W. J. Butterworth, C.B.

During the periods of migration a much larger number of waders appears on the reef, of which the commonest is probably the eastern whimbrel, *Numenius phaeopus variegatus* (Scop.)

Pulau Biola

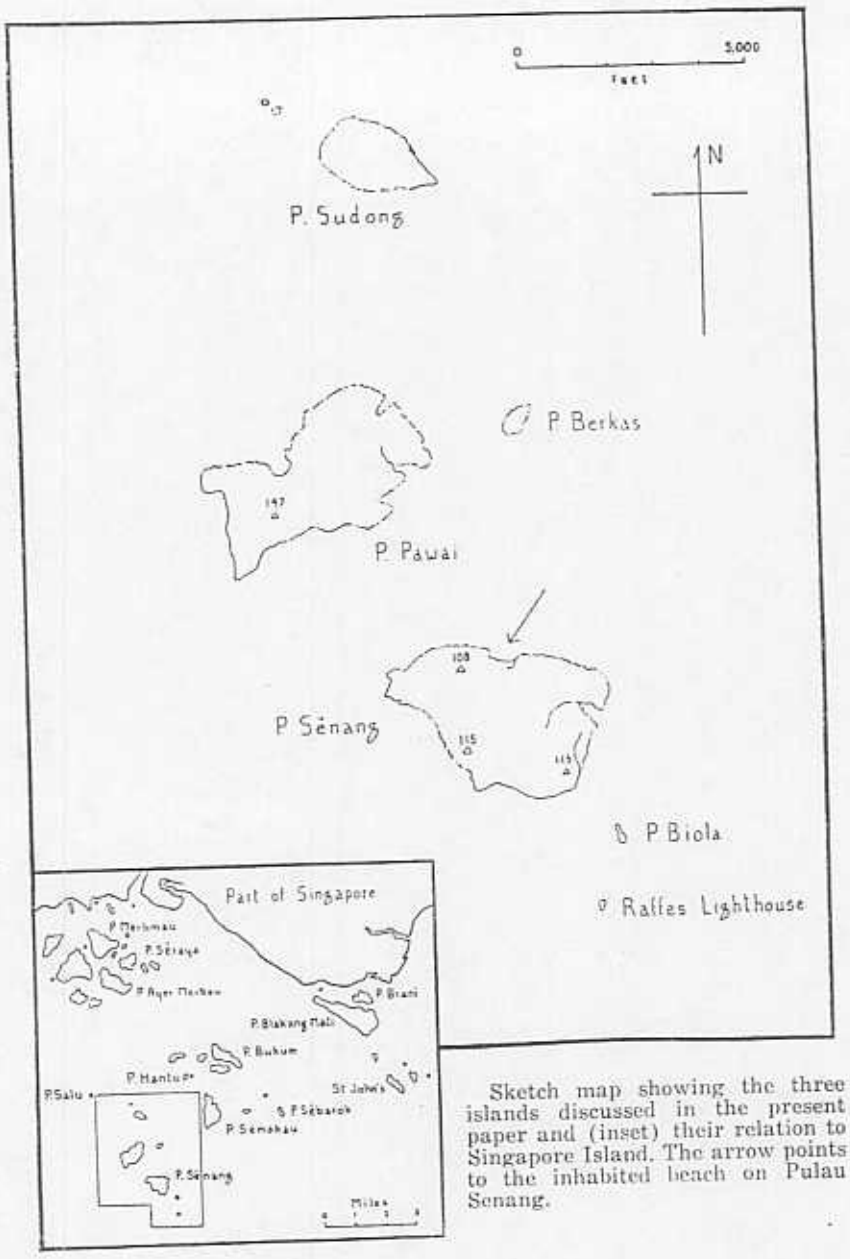
Pulau Biola, or Rabbit Island,[3] a humped island, elongated at the northern end, lies in the middle of the strait between Pulau Satumu and Senang. It is roughly 500 feet long, with an area of about two acres. The island is rocky, with a low cliff surmounted by bushes and stunted trees. Pulau Biola lies at the south angle of a submerged reef, and landing is difficult except at the south end of the island. Only one resident bird has been recorded, *Butorides striatus javanicus* (Horsf.), of which a nest containing two young almost ready to fly was found in May 1951. No other indigenous birds were seen, but no way was discovered of getting to the upper part of the main hump.

Pulau Senang

Pulau Senang, or Barn Island,[4] is a low-lying, undulating island, rising to seven humps of which the two largest are only 115 feet high, or, as the Sailing Directions graciously concede, 154 feet to the tops of the trees. It has a maximum length of about 1,600 yards and a width of about 1,000: its area, at high tide, is about 225 acres. A stream runs to the sea on the east side, and a smaller one on the north: both are surrounded by limited patches of nipah palm where they cross the shore (plate 2, upper picture). The southern curve of the coast, facing towards Pulau Satumu (see plate 1, upper picture) and the point

3. A rock outcrop is a suitable home for the Cony (*Hyrax* sp., not the rabbit, as it is usually translated in English), but the early navigators are not likely to have had that much subtelty, or knowledge of the habits of the Hyrax. Pulau Biola, the Malay name, is from *biola*, now used for a violin or fiddle, but originally applied to the Portuguese viola, from which it is derived. The resemblance in shape to a viola is fairly good. The Sĕlat (Strait) Biola is strictly the channel between this islet and Pulau Senang, but it is frequently used for the whole width between Satumu and Senang. The Sĕlat Biola proper is narrow, but it has a depth of 9–10 fathoms.

4. Barn Island was probably descriptive, and is certainly the most excusable of the English names used in this immediate area. It is not unlikely that the island was occasionally used for watering ships (the alternative would probably have been Pulau Aur, a well-known watering point): if this were so, a hut or barn may well have been built on the island at some point. The Malay, Pulau Senang is from the Javanese *sĕndang* a freshwater spring, not from *sĕnang*, ease or restfulness. The island has two springs, and is the only one in the immediate vicinity with potable surface water. Pulau Pawai has well-water. So now does Pulau Sudong, but until recently the available wells on Sudong were brackish and the inhabitants had to obtain their water from here or Pulau Sĕmaku.



Sketch map showing the three islands discussed in the present paper and (inset) their relation to Singapore Island. The arrow points to the inhabited beach on Pulau Senang.

at the west end (Tg. Batu Balok), are rocky, with a skirting of rock pools or narrow strips of white sand. There are also three other well-defined sandy beaches, at which landings can be made in good weather. The remainder of the coast is fringed with a narrow belt of mangrove.

Much of the interior of the island is now covered with low scrub and *bĕlukar*,[5] with occasional clumps of larger trees. There are also several acres of coarse grass (plate 2, lower picture). Coconut palms have been planted along the beach on the north side, and there is a random growth of palms behind the other beaches. Formerly a broad area stretching into the centre of the island from the north beach was worked as a fruit farm, with trees including durians, rambutans and mangosteens. These were destroyed during the Occupation by our ill-mannered guests, and the majority cut down for firewood. In their place an attempt was made to grow tapioca, but the experiment was not a success.

The island is now occupied by a retired keeper from Raffles Light, who lives with his family in two plank and atap houses on the crest of the northern beach. His family maintains a small area of cultivation, including vegetables, bananas and papayas. In addition, in spite of the destruction of the former orchard, there are still a small number of fruiting trees growing in a wild state in parts of the island. Senang thus possesses a fairly wide range of habitats within a small compass. There are areas of mangrove in all stages, scrub and grassland, *bĕlukar*, light woods and fruit trees. As a result the bird population is singularly rich in apparently resident species, and the list longer than those for any other island in this neighbourhood. It seems likely that the following land birds are breeding on the island,

Streptopelia chinensis tigrina (Temm.)
Centropus sinensis eurycercus Blyth
Caprimulgus macrurus bimaculatus Peale
Apus affinis subfurcatus (Blyth)
Halcyon smyrnensis fusca (Bodd.)
Halcyon chloris humii Sharpe
Dendrocopos canicapillus auritus (Eyton)
Hirundo tahitica abbotti (Oberh.)
Pycnonotus goiavier personatus (Hume)
Pycnonotus p. plumosus Blyth
Copsychus saularis musicus (Raffl.)

5. *Bĕlukar* (Malay) = secondary jungle, or scrub with trees and bushes up to 20–30 feet in height.

Orthotomus sepium ruficeps (Less.)
Rhipidura javanica longicauda Wall.
Pachycephala cinerea butaloides Stres.
Acridotheres t. tristis (Linn.)
Anthreptes m. malacensis (Scop.)
Leptocoma jugularis microleuca (Oberh.)
Aethopyga s. siparaja (Raffl.)
Passer montanus malaccensis Dub.

about which further details are given in a later section of this paper.

Pulau Pawai

Pulau Pawai, or Alligator Island,[6] lies about half a mile north-west of Pulau Senang. Pawai is much the same size as Senang, with a length of about 1,650 yards and an area of about 210 acres. The eastern half of the island is low-lying and swampy, with a considerable area of mangrove, from which rises a low hillock, Bukit Lang Kuku, with a height of about 50 feet. East of this, across a narrow strait, is a mangrove islet, Pulau Berkas, 300 yards by 150, with little solid ground to it and a likely breeding place of *Ardea s. sumatrana* Raffles, if it is in fact nesting in this area.

The western half of Pulau Pawai is firmer ground, rising to two humps 95 and 147 feet high. The west side of the island, and the point at the south-west corner (Tg. Bĕrhala Kuda) have rocky or sandy shores, but in parts the mangrove belt has established itself in front of them. There is another small sandy beach on the north side of the island, flanked by mangrove, but giving easy access to the interior of the island. Here there is a small collection of huts occupied by Chinese, and an area of cultivation, including fruit trees, running towards the foot of the larger hillock. The remainder of the more solid ground is covered with scrub and *bĕlukar*, which thins towards the summit of the hillock. The latter in turn is crowned by a conspicuous clump of trees, in which the Brahminy Kite is said to nest.

Fewer visiting birds are known from this island, though no doubt numbers of waders occupy the broader creeks in the mangrove during the migratory periods. An immature female of the eastern sparrow-hawk, *A. virgatus gularis* (Temm. & Schleg.)

6. The meaning of Pawai is obscure. Alligator Island may be as wild a naming as the several Albatross Islands in Tropical Archipelagoes, or it may be a minor error for Crocodile Island. But one would certainly never have looked there for crocodiles. *Kuku Lang* (hawk's claw) is a wild gambier, so named from the shape of its tendrils.

was taken on the island late in September 1949. The following land birds are apparently nesting there,

Treron vernans griseicapilla Schleg.
Streptopelia chinensis tigrina (Temm.)
Apus affinis subfurcatus (Blyth)
Halcyon chloris humii Sharpe
Hirundo tahitica abbotti (Oberh.)
Oriolus chinensis maculatus Vieill.
Pycnonotus goiavier personatus (Hume)
Pycnonotus p. plumosus Blyth
Copsychus saularis musicus (Raffl.)
Orthotomus sepium ruficeps (Less.)
Anthreptes m. malacensis (Scop.)
Leptocoma jugularis microleuca (Oberh.)
Aethopyga s. siparaja (Raffl.)
Pachycephala cinerea butaloides Stres.

a total of fourteen species, five less than the number recorded for Pulau Senang, but including two species, *Treron vernans* and *Oriolus chinensis*, not yet recorded from the latter island. Pawai is rather richer in fruiting trees, including examples of a jambu, *?Eugenia* sp., and one or more *Ficus*-like trees, but it lacks the lighter, open scrub-land found in parts of Pulau Senang. Nevertheless it is likely that one or two of the birds known from the latter island are on Pawai—or will soon establish themselves there—*Halcyon smyrnensis*, *Acridotheres tristis* and *Passer montanus* should all be able to do as well there as on Senang.

Pulau Sudong

Pulau Sudong,[7] the poorest of the three islands in resident birds, lies about three-quarters of a mile north of the east end of Pulau Pawai. It is droplet- shaped, roughly 900 yards long and 300 wide, with an area of about 60 acres. It is a low, flat island, nowhere rising more than 20 feet above high tide level. The eastern, pointed end is a sandy spit covered with coconut palms and an occasional *Terminalia catappa*. The centre of the island contains a small area of open scrub, with round it, at the western end, a broad belt of mangrove which is slowly extending out over the fringing reef (see plate 4, lower and upper pictures).

7. Pulau Sudong has no English name. *Sudong* in Malay means a watchman's hut, but it is more likely that the word was originally *sondong* = a plough net used for shrimps, whose shape mirrors the combined form of island and reef fairly efficiently.

Sudong lies near the eastern point of a large area of coral reef, a mile and a half long and nearly three-quarters of a mile broad, much of which dries at low water. The greater part of the coral has been killed by silt, and it is very difficult to find healthy portions of the reef. The shallow pools nevertheless produce numbers of molluscs, especially *Rangak*, *Lambis lambis* (Linn.), and the small clam, *Tridacna squamosa* (Lam.), and banks of the Indian Carrageen, *Eucheuma spinosum* J. Ag., known to the Malays as *Agar-Agar*.[8] It is this which is largely responsible for the fairly extensive fishing village, which occupies the greater part of the eastern end of the island. Both molluscs and *agar-agar* are gathered largely by the women of the village, and they must of necessity live near their work. Otherwise the position of the village seems ill-advised. There is no surface water on the island, and until recently all the wells sunk proved brackish. In addition the material of it, largely sand, is not a good growing medium and little can be cultivated but tasteless papayas and the coconut palm.

Few land birds appear to be resident on the island: the only likely species that have been recorded are,

Apus affinis subfurcatus (Blyth)
Halcyon chloris humii Sharpe
Hirundo tahitica abbotti (Oberh.)
Orthotomus sepium ruficeps (Less)
Pachycephala cinerea butaloides Stres.
Anthreptes m. malaccensis (Scop.)
Leptocoma jugularis microleuca (Oberh.)
Passer montanus malaccensis Dub.

which is probably a fair number, considering the poverty of the island and the masses of wholely undisciplined children in the village. Old nests have been found apparently belonging to the first two and last two species. The exposed reef and west end of the island are much frequented at low water by waders during the migratory periods, and to a lesser extent all through the northern winter. All but two or three of the rarer migrants recorded from Singapore have been seen there.

[8] See Burkill *et al.*, 1935, Dictionary of the Economic Products of the Malay Peninsula. 2 vols. *Eucheuma* sp. occurs in 1: 954–55. *Gelidium* sp., an allied red seaweed also used as a source of agar-agar, *tom. cit.*: 1063–64. *Lambis lambis* occurs in 2: 1301, where Burkill, quoting Deraniyagala, says its flesh is mildly narcotic and somewhat unwholesome, but it is eaten widely on the islands.

2, The Indigenous Species recorded from the Group

The following birds indigenous in southern Malaya have been recorded from the three islands, Pulau Senang, Pawai and Sudong and the adjacent islets. The first three columns show the islands on which they are known to occur, the last four their occurrence, so far as it has been reported, on Pulau Pisang, the Ayer Merbau group, Ubin and the Johore-Pahang Archipelago.

Checklist Number and Name	Probable Status in the Group	Known from			Also known from			
		P. Senang	P. Pawai	P. Sudong	P. Pisang	Ayer Merbau Group	P. Ubin	Pahang—Johore Is.
12 *Ardea s. sumatrana* Raffles	Visitor	+	-	-	-	+	+	+
15A *Butorides striatus javanicus* (Horsf.) ..	Resident	+	+	+	+	-	-	+
22 *Demigretta sacra* (Gmel.)	Visitor	+	-	+	+	-	-	+
43 *Machaerhamphus a. alcinus* Wester ..	Visitor	+	.	.	-	+	-	+
48 *Haliastur indus intermedius* Gurney ..	Visitor	+	+	+	-	+	-	+
60 *Haliaetus leucogaster* (Gmel.)	Resident	+	+	-	+	+	-	+
166 *Treron vernans griseicapilla* Schleg. ..	Visitor	?	+	-	-	+	-	+
170 *Ducula bicolor* (Scop.)	Resident	+	+	-	-	+	-	-
175 *Streptopelia chinensis tigrina* (Temm.) ..	Resident	+	?	-	-	+	+	-
205B *Centropus sinensis eurycercus* Blyth ..	Resident	+	-	-	-	+	+	-
229 *Caprimulgus macrurus bimaculatus* Peale ..	Resident	+	+	-	-	-	+	-
240 *Apus affinis subfurcatus* (Blyth) ..	Resident	+	-	-	-	-	+	-
256 *Halcyon smyrnensis fusca* (Bodd.) ..	Resident	+	+	+	-	+	+	-
261 *Halcyon chloris humii* Sharpe	Resident	+	-	-	-	+	+	-
312 *Dendrocopos canicapilla auritus* (Eyton) ..	Resident	+	?	-	-	+	+	-
333 *Hirundo tahitica abbotti* (Oberh.) ..	Resident	-	+	-	-	-	+	-
351B *Oriolus chinensis maculatus* Vieill. ..	Resident	+	+	-	-	+	+	-
431 *Pycnonotus goiavier personatus* (Hume) ..	Resident	+	+	-	-	+	+	-
433A *Pycnonotus p. plumosus* Blyth ..	Resident	+	+	-	-	+	+	-
450 *Copsychus saularis musicus* (Raffl.) ..	Resident	+	+	-	-	+	+	-
484 *Orthotomus sepium ruficeps* (Less.) ..	Resident	+	-	-	-	+	+	-
487 *Rhipidura javanica longicauda* Wall. ..	Resident	+	+	+	+	+	+	-
517 *Parkycephala cinerea butaloides* Stres. ..	Resident	-	-	-	-	-	+	-
532 *Acridotheres t. tristis* (Linn.)	Resident	+	+	+	+	+	+	+
535 *Anthreptes m. malacensis* (Scop.) ..	Resident	+	+	+	+	+	+	+
541A *Leptocoma jugularis microleuca* (Oberh.) ..	Resident	+	+	-	+	+	+	+
543 *Aethopyga s. siparaja* (Raffl.)	Resident	+	-	+	-	+	+	-
563 *Passer montanus malaccensis*	Resident							
Total (Max. 28 species) ..		25	18	11	15	29	21	12
Resident Species only 9 ..		20	15	9				
Visitors ..		5	3	2				

12. Ardea s. sumatrana Raffles. Dusky-Grey Heron.

Visual records probably refering to this bird are received at intervals from the islands south of Singapore, and it seems likely that individuals occasionally wander round the area, visiting suitable parts of different islands for a time and then moving on. The only formal record is an immature male which was sent

9. Totals include the Little Green Heron, *Butorides striatus*.

up alive from Pulau Senang in February 1950, and which is now in the Raffles Museum collection. It is just possible that *sumatrana* nests in our area, but on the whole it is unlikely that it does so. As far as the information at present available goes it prefers to breed in mangrove areas, in a solitary state and with some isolation. The only two Malayan nests so far recorded were both found under these conditions: on an islet in the Sri Buat group, off Mersing (Madoc, 1936: 127), and in a mangrove swamp on Great Redang (this journal, *antea:* 127). In both cases the large, untidy nest, situated some 15–20 feet up in a mangrove tree, was most conspicuous. The little islet of Pulau Bërtias is the most likely point for breeding in our area.

15a. **Butorides striatus javanicus** (Horsf.).
Little Green Heron.

This is another visitor, but much commoner. It has been reported on a number of occasions from all three islands: formal records exist for Pulau Senang (ad. ♂, 10:6:51. ad. ♀, 25:5:51. imm. ♂, wf 140 mm., 31:5:51. imm. ♀, wf 169 mm., 31:5:51) and Pulau Sudong (September 1949). This bird might be nesting on any of the islands in the group, in the mangrove sections, though it must count itself very lucky if it manages to escape the small boys on Pulau Sudong: nesting is known from the little islet of Pulau Biola (Rabbit Island) in the strait between Satumu and Senang, and from Pulau Berkas.

22. **Demigretta sacra** (Gmel.). Reef Heron.

This is a fairly regular visitor to the stretch of exposed reef on Pulau Sudong round low tide, and it has been seen on the beach of Pulau Biola, but it is not otherwise known from the group. Formal record, Pulau Sudong, ad. ♂, white phase, September 1949.

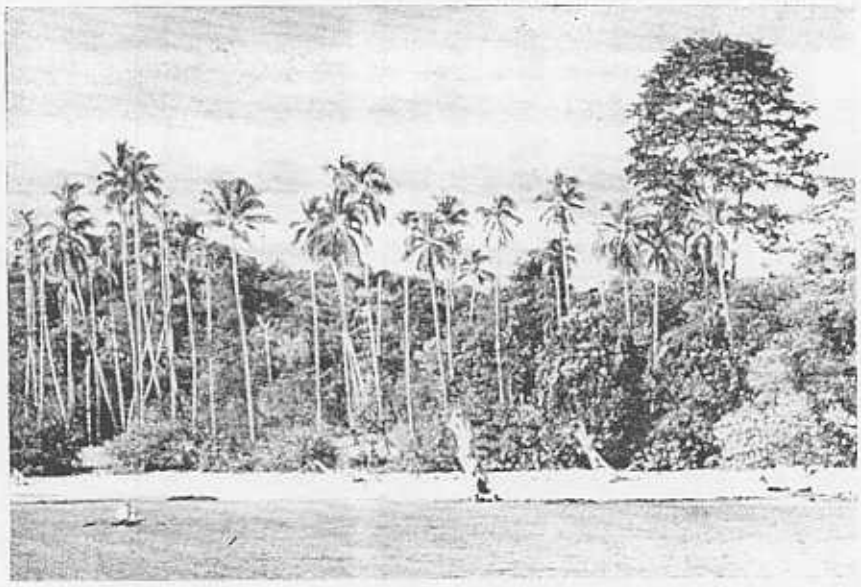
43. **Machaerhamphus a. alcinus** Wester. Bat Hawk.

An adult female was taken on Pulau Senang on 20 June, 1951: the stomach contained the remains of four bats, *Rhinolophus* sp. This bird is a widely but sparsely distributed resident on the mainland of the peninsula: we have a dubious visual record of Robinson's for Singapore, but it has not been reported with certainty from the island or its vicinity. Recently we have had a formal record from Singkep, and it is therefore possible that it is breeding on the Rhio Islands. In Borneo it is known as far south as the Baram district of Sarawak (Moulton, 1914:

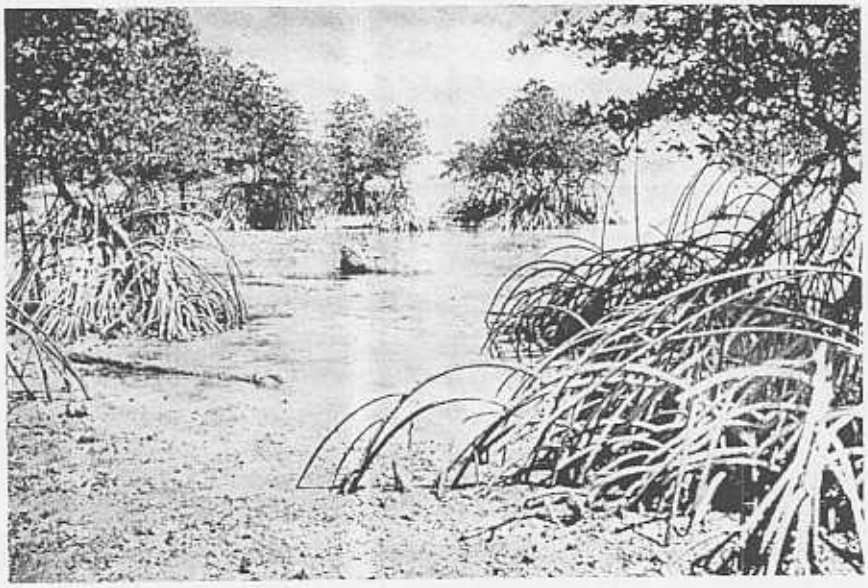
Nipah and Coconut Palms, Pulau Senang.

Vegetation behind the settlement on Pulau Senang: an open grassy space fringed on the seaward side by a belt of coconut palms.

Pulau Senang (Barn Island)



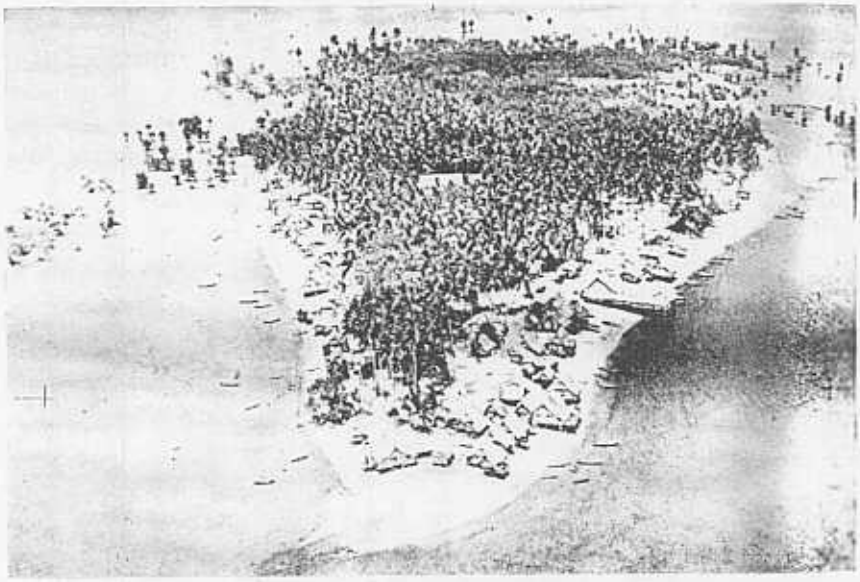
The sandy beach at the south-west corner of Pulau Senang, from the sea.



Mangrove at the west end of Pulau Senang.

Pulau Senang (Barn Island)

The west end of Pulau Sudong from the air, showing the mangrove fringed shore.



The east end of Pulau Sudong from the air, showing the small fishing village and the great preponderance of coconut palms at this end of the island.

Pulau Sudong (Photographs by P. D. R. Williams-Hunt).

66), and in Sumatra it has been taken in the Padang Highlands, alt. 500 metres (Kloss, 1931: 312). Pagden had a pair under observation in the Kuala Lumpur Botanic Gardens for a long period in 1948, but the only certain local record of breeding is an inaccessible nest found at Batu Caves, near Kuala Lumpur, about forty years ago (Chasen, 1939: 45).

58. **Haliastur indus intermedius** Gurney. Brahminy Kite.

This bird has been reported on several occasions over the sea near all three islands, and scavenging from the beach on Pulau Sudong. According to the Chinese on Pulau Pawai it has occasionally nested in the clump of trees crowning the hillock, but this has not been confirmed. The Brahminy Kite is common and widespread all round the south coast of Singapore Island: breeding on the island itself (Singapore) and the adjacent mainland has been reported on several occasions.

60. **Haliæetus leucogaster** (Gmel.). Whitebellied Sea-Eagle.

Visual records of birds in flight close to the shore exist for all three islands. They are almost certainly strays from Singapore or the neighbouring mainland: breeding known from both areas.

166. **Treron vernans griseicapilla** Schleg.
Pinknecked Green Pigeon.

Occurs on Pulau Pawai in small numbers. It is said to breed on this island and on the neighbouring Pulau Sĕmakau, but strangely enough it has not been recorded from Pulau Senang. This is a common bird in coastal districts and on sheltered islands, especially as a feeding wanderer, outside the breeding season. The only formal record for Pawai is a skin taken at the end of September 1949, and we still, therefore, require certain evidence that it is nesting there.

This species occurs on all the larger islands in the Johore-Pahang Archipelago (on Tioman it is represented by the race *T. v. adina* (Oberh.), from the Anambas and Natuna Islands); on such islands as Pisang, Tekong, Ubin and the Ayer Merbau group; among the Langkawi Islands; widely through the Rhio Archipelago; and on Great Redang (Trengganu). On the other hand it has not been reported from any of the isolated islands in the Malacca Strait or from other localities in the Trengganu Archipelago. It thus apparently frequents only the more sheltered islands, typically those with small patches of open woodland and a good belt of mangrove.

170. **Ducula bicolor** (Scop.). Pied Imperial Pigeon.

This bird occurs as an occasional visitor on Pawai (and rather more often on Pulau Sēmakau) in the period September to January or February. It is said also to reach Senang occasionally. There is nothing to suggest that it nests anywhere in our area, and it is probable that the birds are coming from the Merbau group, Pulau Pisang or the Rhio Islands, or even further afield. During this period it also turns up in the mangrove zone at the west end of Singapore Island, but there again it is definitely a feeding visitor. Its typical home is the rather more isolated islands: in Malaya it is known from Pulau Jarak, the Sembilans and Pulau Pisang in the Malacca Strait region; and on the east side from Pulau Tenggol, the Trengganu Archipelago and Pulau Kapas, as well as the greater part of the Johore-Pahang Archipelago.

175. **Streptopelia chinensis tigrina** (Temm.). Spotted Dove.

This attractive dove is resident in small numbers on both Pulau Senang and Pawai, but it does not occur feral on Sudong (formal records; Senang, ad. ♀ ♀, 20 & 31:5:51, imm. ♂, 31:5:51: Pawai, ad. ♀, 20:5:51). The Spotted Dove is not normally an island bird, and though known from the Langkawi group, Penang, Singapore, Pulau Ubin and Pulau Tekong, it does not occur on Pulau Pisang or in the Johore-Pahang Archipelago. On the mainland it is common in open, wooded country and orchard areas throughout the lowlands of the peninsula: it has also penetrated to similar habitats at Cameron's Highlands (alt. 5,000 feet).

205b. **Centropus sinensis eurycercus** Blyth. Crow-Pheasant.

The larger crow-pheasant is present in small numbers on Pulau Senang: it is also said to occur on Pulau Pawai but I have no formal or personal visual records from that island. Its natural habitat in Malaya appears to be open country with a vegetation consisting predominantly of lalang and *melastoma:* in such areas it is common throughout the mainland, and it occurs again on Langkawi, Penang and Singapore. There is a doubtful record for Great Redang, but otherwise it is not apparently known from any of the islands off the east coast of Malaya, though some of them contain limited areas of seemingly suitable open country —certainly of an extent greater than that found on Pulau Senang or Pawai. Pulau Jemor, in the Aroas (Malacca Strait),

again has what would seem to be a suitable habitat for it, but it is not known from this group or any of the other isolated islands in that area. Coming south again, we find it on Pulau Ubin, in the Ayer Merbau group and on Tekong Besar. It is also present in parts of the Rhio-Lingga Archipelago. On our present knowledge it seems that this is a species that can exist in fairly small pockets of suitable terrain, but that they must be reasonably sheltered. It can thus tolerate the limitation of extent of habitat area that one finds on small islands, but not the exposure to bad weather such as accompanies it in the Malacca Straits and off the east coast of Malaya.

229. **Caprimulgus macrurus bimaculatus** Peale.
Longtailed Nightjar.

There is only one record of this bird from the present area, a nest found on Pulau Senang on 14 May, 1922, during an excursion of the old Singapore Natural History Society (Anon, 1923: 25). It seems likely that *macrurus* is rather similar to the preceding species in its reactions to islands. We have much the same distribution for it, except that there is not even an unconfirmed visual report from the Trengganu Archipelago. Chasen (1924: 29) describes it as very numerous on the Singapore Islands, "especially in the fall of the year," but it is not clear what he means to imply. The Longtailed Nightjar is certainly present on all the pseudo-islands—Ubin, Tekong, the Ayer Merbau group and possibly Blakang Mati, on the majority of which it breeds vociferously, as it does on Singapore itself. But there is no indication that it is markedly mobile, and it has not been reported from any of the Malacca Strait islands, which the migrants and autumn wanderers pass over or frequent. Possibly there has been confusion on visual records between the resident *C. macrurus* and the immigrant *C. indicus jotaka*. The latter certainly occurs on many of the islands in this area, and on all those in the Malacca Strait region (Gibson-Hill, 1950: 294), as a passage migrant and winter visitor: *C. indicus* is even one of the few birds sent up to us from Raffles Light.

240. **Apus affinis subfurcatus** (Blyth). House-Swift.

The House-Swift is known from all three islands, Senang, Pawai and Sudong, and even from Raffles Light (Pulau Satumu), in every case as a resident species: the absence of a record from the Ayer Merbau group is almost certainly an omission in reporting. This is clearly a bird that extends its range with man, like

Passer montanus, and with him will establish itself on small islands, if they are sufficiently sheltered. It also reaches them occasionally without his association in July 1948 I found a small colony breeding in a cave on the uninhabited islet of Pulau Batu Gajah, off Mersing,—but in general *affinis* is fairly clearly sedentary, or very largely so, and it seemingly does not like exposure. It is not known from any of the isolated islands in the Malacca Strait, though it occurs on Pulau Pisang, where it nests in parts of the lighthouse quarters. Its distribution on the east coast of Malaya is limited: it has not been reported from the Trengganu Archipelago or, naturally, Pulau Tenggol: but it is present on the landward side of Pulau Kapas, where the village is situated (though again it nests here in a cave or caves), and in parts of the Johore-Pahang Archipelago.

256. **Pelargopsis capensis malaccensis** Sharpe.

Storkbilled Kingfisher.

The Storkbilled Kingfisher is probably no more than a visitor to our area. It has been reported from Pulau Pawai, and we have a formal record for Pulau Senang (ad. ♂, 9 June, 1951). It is common as a winter visitor on Pulau Ubin and Tekong, and occurs, though in relatively smaller numbers, on Singapore Island. Strangely enough we have no records of breeding in southern Malaya, though it is undoubtedly a resident species in the Rhio-Lingga area further south. It is not a true immigrant, like *Halcyon pileata*, which is very plentiful in the autumn months on the Malacca Strait islands; or to a lesser extent *Alcedo atthis bengalensis*, which has been recorded during the migratory period from these islands and from Great Redang, and again is much more plentiful on Singapore Island in the winter months. *P. capensis* has not, in fact, been reported from any of these localities, and is not even known from Pulau Pisang. Probably it is resident in small numbers in southern Malaya, and when not breeding drifts to open coastal localities, with no definable migratory movement, and no particular affection for islands as such. It seems to seek cover more determinedly than the kingfishers of the genus *Halcyon*, and apart from sections of north-western Malaya where it is a fairly prominent ricefield bird, it is, over its range as a whole, typically a haunter of the edges of water or clear areas in wooded country. It fishes, with abandon in the manner of *Alcedo atthis*, but in Malaya I think

it mostly takes small lizards, snakes, young birds and large insects, much as *Halcyon smyrnensis* does. But clearly it lacks the latter's passion for publicity in all its actions.

259. **Halcyon smyrnensis fusca** (Bodd.).

Whitebreasted Kingfisher.

Known only from Pulau Senang in our immediate area (formal record, ad. ♀, 10 June, 1951).

This is one of the most deliberately conspicuous birds that I have ever met. It invariably selects an isolated branch, stump or post on which to perch, and never occupies it without advertising its arrival, and later its departure, in most raucous tones. Its wholehearted zest commands one's respect, but it is a noisy neighbour, and no one in full possession of their senses is likely to encourage its presence. On the other hand it is a bird which cannot be overlooked.

In Malaya *H. smyrnensis* is essentially a land feeder, taking mostly large insects (grasshoppers, other orthoptera and carpenter bees), centipedes, scorpions, lizards and young birds; it will also make up with such smaller insects as bees, ants and crickets. It is not known from any of the isolated islands in the Malacca Strait, nor from Pulau Pisang: it has not been reported from any of the east coast islands, though it might possibly occur in parts of the Johore-Pahang Archipelago. The present record is the only one from among the islands immediately south of Singapore, and until recently it was not known in the Malaysian sub-region away from the mainland of the Malay Peninsula, and the islands of Langkawi, Penang, Singapore, Ubin and Tekong, all in their way direct continuations of the mainland, and on all of which it is common. Recently, as noted elsewhere in this journal (p. 366), it has been discovered in the Deli district of Sumatra, and on Pulau Blakang Padang off the north side of Batam and on Singkep, both in the Rhio-Lingga group. It seems, in fact, to be in the process of extending its range at the present time, and it is likely that its occurrence on Pulau Senang is not so much an indication of island haunting as of an outward pressure from the Johore, Singapore, Tekong front. It is probable that it also now frequents Blakang Mati and the Ayer Merbau group. Here, as on Pulau Senang, the possibility of its presence is an indication of the extent to which these areas are in reality merely extensions of the coastal zone of the mainland of the peninsula.

261. **Halcyon chloris humii** Sharpe. Whitecollared Kingfisher.

In many respects this bird is a complete contrast to the preceding species. It is a coastal form with a marked affection for small islands: it is even among the few resident birds recorded from Pulau Jarak and the Sembilan Islands. Here it is known from all the islands in our present area, Sudong, Pawai and Senang, and is almost certainly breeding on all three of them. Formal records; Pulau Senang, 3 ♂♂, 27 and 30 May, 9 June, 1951: Pulau Pawai, ♀ September 1949, ♂ 7 June, 1951: Sudong, 2 ♀♀, September 1949.

311. **Dendrocopos canicapillus auritus** (Eyton). Pygmy Woodpecker.

This is the only woodpecker reported from the islands. It is an inhabitant of secondary jungle or open wooded areas, with a marked preference for coastal districts. It is present in small numbers on Singapore Island, Pulau Ubin, Tekong and the Ayer Merbau group. In our area it occurs only on Pulau Senang, from which it is known by three records, two visual and one formal (Chasen, 1924: 30).

333. **Hirundo tahitica abbotti** (Oberh.). Resident Swallow.

This bird is widely distributed as a resident species throughout the lowlands of Malaya. Probably as a result of the opening up of the country, and the establishment of clear settled areas inland, it has also spread into the submontane regions and reached at least the three major hill stations (alt. 4,000 to 5,000 feet). It is common on Langkawi, Penang, Singapore, Ubin and Tekong, and it occurs in parts of the Johore-Pahang Archipelago. It is also known from Pulau Pisang, the Ayer Merbau group, and the three islets in our immediate area, Sudong, Pawai and Senang (formal records; Pawai, ♂♀, 20 May, 1951: Senang, 2 ♀♀, 25 May, 1951). On the other hand it does not appear to have been reported from any of the smaller islands in the Malacca Strait, or from any of the completedly wooded or more exposed islands off the east coast of Malaya. Clearly it requires areas that are partly cleared, and with a source of mud for nest-building. Given these conditions, on the mainland or on an island, it will occur and become at least fairly plentiful. Provided it is not exposed to prolonged periods of bad weather, the extent of the area in which it can thrive can be small.

351b. **Oriolus chinensis maculatus** Vieill. Blacknaped Oriole.

This bird is apparently resident on Pulau Pawai in small numbers (formal record, imm. ♂, not quite fully fledged, 24 May, 1951). It is said also to be present on Pulau Sëmakau, but this has not been confirmed. Apart from these records it has not been reported from any other small island off the Malayan coast. It is, however, relatively a newcomer to the Malay Peninsula and judging by the present case it may ultimately establish itself on the islands more immediately adjacent to Singapore, the Ayer Merbau group, Pulau Ubin and Tekong Besar. But unless it goes much further afield than this it cannot be regarded as an island-frequenting bird. Certainly for the present it must be regarded as one of the species treating the Sudong-Pawai-Senang group as an extension of the mainland.

431. **Pycnonotus goiavier personatus** (Hume). Yellowvented Bulbul.

This bird is present on Pulau Pawai and Pulau Senang, from both of which we have formal records of immature birds (Pawai, ♂, 18 September, 1949: Senang, ♂, 24 May, 1951). In both cases it is conspicuous, and seemingly fairly common, in open areas. It is also known from Pulau Ubin, Pulau Telong and the Ayer Merbau group, and naturally from Penang and Singapore, where it is very common in gardens, orchards and open wooded country. It has not, on the other hand, been reported from any of the other islands. Clearly it is not an island form, and its presence here is another indication of the mainland character of the group.

433a. **Pycnonotus p. plumosus** Blyth. Large Olive Bulbul.

The Large Olive Bulbul occurs on both Pawai and Senang (formal records; Pawai, ♀, 22 May, 1951: Senang, 2 ♀♀, 21 and 22 May, 1951). So far as there can be said to be island bulbuls they are certainly this species and the nearly allied *P. simplex* Less. On the mainland both frequent wooded areas in the lowlands, *simplex* with a preference towards primary forest and thicker woodland, *plumosus* with a preference towards *bĕlukar* and more thinly covered areas.

These biases determine their distribution in the island world. Of the two, *plumosus* is certainly the more common on Singapore Island. Both are known from Pulau Pisang, Pulau Ubin and Tekong Besar, with *simplex* common on Pisang, and

plumosus more numerous on the other two islands. *Plumosus* alone occurs in the Ayer Merbau group and here: so far *simplex* is the only one recorded from the Johore-Pahang Archipelago. Neither occur on Pulau Jarak, the Sembilan Islands, Pulau Tenggol or the Trengganu Archipelago, all areas lacking the grace of a bulbul's presence. Both species again are obviously facultative island dwellers, following areas of their natural habitat on to sheltered islands, but with no zest for insular life as such.

450. **Copsychus saularis musicus** (Raffles). Magpie Robin.

The Magpie Robin occurs on both Pawai and Senang (formal records; Pawai, ad. ♂, 21 September, 1949, imm. ♀, 24 May, 1951: Senang, ad. ♂, 30 May, ad. ♀, 26 May, 1951). It is also known from Pulau Ubin, Tekong Besar and the Ayer Merbau group, but it has not been reported from Pulau Pisang, or any of the other off-lying islands except for Tioman, Langkawi, Penang and Singapore. On the mainland it is a bird of open wooded areas, including orchards and gardens: it is normally restricted to the lowlands, or submontane localities, but Berwick (1947: 39) reports it as common all over Cameron's Highlands at altitudes to 5,000 feet. It is widespread in the Rhio Archipelago, but clearly it again is not a true island bird. In Malaya the normal resident representative of its group in these areas is undoubtedly the Shama, *C. malabaricus malloperenus* (Oberh.), which is known from Pulau Pisang, several of the islands in the Johore-Pahang Archipelago, including Pulau Tinggi, Aur, Pemanggil and Tioman, and from Great Redang and the Perhentians in the Trengganu Archipelago; in addition, of course, to Tekong Besar, Ubin, Singapore, Penang and Langkawi.

484. **Orthotomus sepium ruficeps** (Less.). Ashy Tailor-Bird.

On the mainland this bird occurs mostly in scrub, secondary jungle and the coastal mangrove belt: it is fairly plentiful in southern Malaya, and less common in the northern states. Among the islands its position is very similar to that of *G. saularis musicus*, except that it is known from Pisang and all the islands in the present group (formal records; Pawai, ♂, 21 May, 1951: Senang, ♂, 26 May, 1951). Again it does not occur on any of the east coast islands, where its place is taken by the Blacknecked Tailor-Bird, *Orthotomus atrogularis*, which is found on all the

larger islands in the Johore-Pahang Archipelago, and three of the major units, Great Redang, Bidong Laut and the Perhentians, in the Trengganu Archipelago. The presence of *Orthotomus sepium ruficeps* in our immediate area is yet another case of the extension southwards of a representative of the mainland coastal avifauna.

487. **Rhipidura javanica longicauda** Wall.
Pied Fantail-Flycatcher.

Here we get a slight variation, in that there is apparently no resident member of this family on the east coast islands. The present species, also, is less widespread among the Singapore islands, being known only from Pulau Senang (formal records, ♂ 7 May, ♀ 9 June, 1951), Pulau Pisang, Tekong Besar and Ubin. For the rest, as might be expected, it occurs on Singapore, Penang and Langkawi. It is a bird of open wooded country, spreading out to gardens and orchards on the one hand, and, in parts, the mangrove zone on the other: it might well be a genuine frequenter of small islands, but obviously from its recorded distribution it is not. So far as there is an island-seeking flycatcher it is almost certainly *Hypothymis azurea*.

517. **Pachycephala cinerea butaloides** Stres. Flycatcher-Shrike.

On the mainland this bird is largely confined to the mangrove and casuarina zones, and their immediate neighbourhood. In such localities it is common along the whole length of the mainland coast, and on the larger islands of Langkawi, Penang and Singapore. It is also by no means uncommon among the smaller coastal islands, wherever there is an area of suitable habitat and reasonable shelter for it. It is known from all three of the islands in our present area (formal records; Pawai, ex sex, September 1949; Senang, ♂, 24 May, 1951). It has also been reported from the Sembilan Islands and Pulau Pisang in the Malacca Strait, from the Ayer Merbau group, Ubin and Tekong Besar near Singapore, from Pulau Babi, Pulau Tinggi and Sri Buat in the Johore-Pahang Archipelago, and from Great Redang in the Trengganu group. Its status among the outer islands of the Pahang-Johore series, Pulau Aur, Pemanggil and Tioman, is uncertain: possibly it is confined to the inner chain of islands. Clearly we are not dealing with an ardent nesophile, but it is probably not unfair to consider it as a case of minor addiction.

532. **Acridotheres t. tristis** (Linn.). Common Myna.

An immature female of this bird was taken on Pulau Senang, under feral conditions, on 10 June, 1951. This is the only indication of its presence on the island, and the only record for the species from any of the off-lying islands, other, that is, than Penang and Singapore. It is possible that it is descended from introduced stock. The owner of the island assures me that this is not so, but he presumably cannot speak with authority for the period of the Occupation. If it has arrived naturally, we shall presumably next hear of its from the northern islands of the Rhio group. An account of its spread down the peninsula appears in the *Malayan Nature Journal*, 5, (2), 1950: 58–75.

535. **Anthreptes m. malacensis** (Scop.).
Brownthroated Sunbird.

This is a coastal species largely, but by no means completely, confined to the vicinity of coconut palms. It is very plentiful near these palms, and in parts among the mangrove zone and round the *Hibiscus tiliaceus*, on all the three islands under discussion here (formal records; Pulau Pawai, ad. ♂ 22 May, ♀ 25 May: Pulau Senang, ad. ♂ ♂, 19 and 31 May, ♀ ♀, 19, 20 and 21 May, all 1951). This is a common species on small islands wherever a suitable area exists for it: it is known from Pulau Pisang, the Ayer Merbau group, Ubin and Tekong; from Tinggi, Babi, Aur, Pemanggil and Tioman at least in the Pahang-Johore group; and from Bidong Laut, Great Redang (and Pinang) and the Perhentians in the Trengganu Archipelago. The only series from which it has not been reported are the small islands of the Malacca Strait itself.

541a. **Leptocoma jugularis microleuca** (Oberh.).
Yellowbreasted Sunbird.

This bird, and the northern race, *M. j. flammaxillaris* (Blyth), which replaces it in the neighbourhood of Penang on the west side of the peninsula, and north of Kuala Trengganu on the east side, ranks with the kingfisher *Halcyon chloris humii* as one of the two mainland birds occurring most widely on the smaller off-lying islands. In our immediate area it is common on all three islands (formal records, Pulau Pawai, ad. ♂ & ♀, 22 May, 1951; Senang, ad. ♂, imm. ♂, 19 May, 1951) and on Pulau Satumu (Raffles Light). In the Malacca Strait area it is present on Pulau Jarak, the Sembilan Islands and Pulau Pisang; in the

Singapore area, in the Ayer Merbau group, and on Ubin and Tekong Besar, and no doubt it occurs also on the majority of the other off-lying islands. On the east side of Malaya it occurs widely in the Pahang-Johore Archipelago, is common on the west side of Pulau Kapas, and present again on each of the four major units (Bidong Laut, Great Redang, Lang Tengah and the Perhentians) in the Trengganu Archipelago.

543. **Æthopyga s. siparaja** (Raffl.). Crimson Sunbird.

On the mainland this species occurs mostly in the mangrove zone, in coastal coconut plantations and scrub, and in the neighbourhood of dry, open beaches. It is a likely bird for the smaller islands, but does not seem to have any marked predilection for them. In our immediate area it is known from Pulau Pawai and Senang (formal records, ad. ♂ ♂, 22 & 20 May, 1951), on neither of which is it particularly common. In addition it has been reported from the Langkawi group, Penang, Singapore, Pulau Ubin, Tekong Besar and the Ayer Merbau group: it also occurs fairly widely in the Rhio Archipelago, but it scarcely seems to be truly addicted to island life. It has not, it will be noted, been reported from any of the small islands in the Malacca Strait, or from any of the groups off the east coast of Malaya.

563. **Passer montanus malaccensis** Dub. Tree-Sparrow.

The Tree-Sparrow has established itself on Pulau Sudong, Senang and Satumu. It does not appear to be on Pawai yet, though it is said to be present on the neighbouring island of Sĕmakau, and is, no doubt, on Bukum, Brani and Blakang Mati. This is another instance of a bird treating these islands as an extension of the mainland. Like several of the preceding species doing so, it is a lowland bird which has recently been reported breeding widely over all open areas at Cameron's Highlands. So far as islands are concerned it is known from Langkawi, Penang, Singapore, Ubin, Tekong Besar and the Ayer Merbau group. It would not be surprising to find it on at least one inhabited point in the Pahang-Johore Archipelago, but at present it has not been reported from any of the east coast islands, or from any of the smaller islands in the Malacca Strait.

3, Comment

The survey recorded here was undertaken as part of an investigation into the birds occurring on the smaller islands off the Malayan coast. Three other preliminary notes have been

completed, recording some of the data obtained previously. These are an annotated list of the birds known from the smaller islands in the middle section of the Malacca Strait (*Bull. Raff. Mus.*, 23, 1950: 289–298), a survey of the avifauna of the Trengganu Archipelago (this journal, *supra:* —) and a list of the birds known from Pulau Pisang (this journal, *infra:* —). Material of some comparative significance also appears in a revised list of the birds recorded from the Rhio-Lingga Archipelago (this journal, *infra:* —). In addition an attempt is being made to list the avifauna of all or part of the Pahang-Johore Archipelago, over which a preliminary running survey was made in June 1948.

In most cases complete lists are being prepared of the birds known from particular areas, with the object of recording the information obtained for future reference. The enquiry itself, however, is concerned only with the land bird populations of the medium-sized and small islands, and to a lesser extent with the non-resident land birds reaching them. The larger islands of Langkawi, Penang, Singapore and Tioman lie outside the scope of the present investigation.[10] Similarly no special attention is at present being paid to the birds on the smaller islands of the Langkawi group, on Pulau Pangkor, on the Ayer Merbau group, Pulau Brani and Pulau Blakang Mati, and on Pulau Ubin, Pulau Tekong Besar and Tekong Kechil, because of their proximity to land masses, either in the form of the larger islands or the mainland of the peninsula itself.

Further information may inevitably modify our views on some points, especially on the status of particular species. Nevertheless the general lines of grouping already determined will

10. The principal published sources for the avifauna of these areas are,

Langkawi. Kloss, C. B., & Robinson, H. C., "On birds from the northern portion of the Malay Peninsula, including the islands of Langkawi and Terutau, etc.", *Ibis*, 1910, pp. 659–675, and 1911, pp. 10–80.

Robinson, H. C. "On a collection of birds from Pulau Langkawi and other islands on the north-west coast of the Malay Peninsula." *Journ. F.M.S. Mus.*, 7, (3), 1917, pp. 129–191.

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Singapore. Gibson-Hill, C. A. "A checklist of the birds of Singapore Island", *Bull. Raff. Mus.*, 21, 1950, pp. 132–183. "Notes and Addenda", *op. cit.*, 23, 1950, pp. 115–126.

Tioman. Kloss, C. B. "Some birds of Tiuman (sic) Island", *Journ. Straits Br. Roy. Asiat. Soc.*, 45, 1905, pp. 280–281. Chasen, F. N., & Kloss, C. B. "Birds from .... Tioman and Aor", *Journ. Malay. Br. Roy. Asiat. Soc.*, 6, (3), 1928, pp. 74–75.

probably survive unchanged. It seems likely that we can recognise four categories of resident land birds among the species occurring on the smaller islands, namely,

(*a*) Birds which do not normally occur as breeding species on the mainland; *Ducula bicolor* (Scop.) and *Calocnas n. nicobarica* (Linn.).[11]

(*b*) Birds which normally occur on the mainland, but seemingly establish themselves readily and prosper on suitable small islands. This category clearly grades into the next, and relegations or promotions are probable. On present knowledge the group appears to include,[11]

Haliaetus leucogaster (Gmel.)
Halcyon chloris humii Sharpe
Leptocoma jugularis (Linn.) subspp.
Aplonis panayensis strigatus (Horsf.)
Chalcophaps i. indica (Linn.)
Anthreptes m. malaccensis (Scop.)
Copsychus malabaricus malloperenus (Oberh.)
Orthotomus atrogularis Temm., subspp.
Gracula r. religiosa Linn.
Hypothymis azurea praphata Oberh. and two or more *Collocalia* spp.

(*c*) Mainland birds likely to establish themselves on isolated islands, but with no considerable natural tendency to do so. On present knowledge the group appears to include,[11]

Pachycephala cinerea butaloides Stres.
Pycnonotus plumosus Blyth, subspp.
Pycnonotus s. simplex Less.
Leptocoma c. calcostetha (Jard.)
Treron vernans griseicapilla Schleg.
Leptocoma b. brasiliana (Gmel.)

(*d*) For the rest there follow those birds able to live in suitable habitats on sheltered islands, though not typically island-inhabiting species.

The group of islands at present under discussion was selected as representative of a number of similar units in the area

11. It is not considered that at this stage any of these three lists are necessarily complete.

south of Singapore, though richer than most in the range of habitats provided. In all cases their relative proximity to each other, and to the mainland (as represented in the island of Singapore), affords them considerable protection from adverse weather, and in effect makes them extensions of the latter's coastal zone. Without pursuing the generalities initiated in the previous paragraph any further, it is possible to appreciate this point merely by analysing the resident birds listed in the present paper. With over twenty species to consider, we are clearly dealing with a habitable area. On the other hand, neither of the birds in group (*a*) above nest here, and only three of the examples in group (*b*). Further, two, possibly three of the other species in group (*b*), namely *O. atrogularis*, *C. malabaricus* and possibly *A. panayensis*, are replaced in their families by allied species not usually found on small islands. Group (*c*) again only contributes three species, leaving us with fifteen birds, nearly three-quarters of the total, which are not apparently markedly addicted to island life. An analysis of these fifteen birds reveals an interesting point. Inevitably they are all primarily lowland species, but six of them, namely

Streptopelia chinensis tigrina (Temm.)
Apus affinis subfurcatus (Blyth)
Hirundo tahitica abbotti (Oberh.)
Pycnonotus goiavier personatus (Hume)
Copsychus saularis musicus (Raffl.)
Passer montanus malaccensis Dub.

are included in the small group of birds which are known to have moved up to higher altitudes since the hill-stations were established, particularly to Cameron's Highlands, at altitudes of 4,700 to 5,200 feet, where they now occupy a cleared area of less than twenty years' standing.[12] In addition another three species are birds which are apparently increasing their range in the lowlands at the present time, namely

Halcyon smyrnensis fusca (Bodd.)
Oriolus chinensis maculatus Vieill.
Acridotheres t. tristis (Linn.)

12. Fraser's Hill, alt. about 3,800–4,000 feet, was opened up in the middle nineteen-twenties. Cameron's Highlands, with 6 square miles at alt. 4,700–5,200 feet, and a further 12 square miles slightly lower, was established about ten years.

All nine species must be classed as aggressive birds with expanding populations and a tendency to move into the areas cleared or partly cleared by man, and to take up residence in the untidy areas of *bĕlukar*, rotting orchards and displaced vegetation with which he inevitably surrounds himself in this country. The remaining species, like a number of the preceding ones, are all birds that are common or fairly common in the coastal zone on Singapore Island.

Assuming these islands to be representative of their fellows we can say that the resident land birds in this area differ markedly from those found on the medium-sized and small islands off the more exposed parts of the Malayan coast. Few of the species typical of the latter occur here, and in their place we are dealing with an avifauna consisting largely of the species found commonly in the coastal zone on Singapore Island, and including a high proportion, nearly fifty per cent, of species with a known tendency to follow man into the semi-cleared areas which he produces. The avifauna is in fact an impoverished extension of that of parts of Singapore Island, and if the bird populations of the more densely wooded and more exposed islands off the east and west coasts be taken as typical, by no means a normal one.

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A Note on the Plates

Plate 2. Pulau Senang and Pulau Satumu.

Upper picture. The south-eastern corner of Pulau Senang (Barn Island), with the waters of the Sĕlat Biola in the foreground: a view taken from the upper gallery of Raffles Light at low tide. Tanjong Bĕrhala Kuda, at the south end of Pulau Pawai, is just visible on the left of the picture, running out behind the end of Senang. The portion of Senang nearest the camera has a rocky coast, fringed with a sandy beach: to the right is the mangrove belt at the north-east corner of the island.

Lower picture. Raffles Light (Pulau Satumu or Coney Islet) from the sea, at low tide. In spite of its small size and limited free area the islet supports small colonies of *Apus affinis*, *Leptocoma jugularis* and *Passer montanus*.

Plate 3. The vegetation on Pulau Senang.

Upper picture. Coconut and nipah palms, with part of one of the open, grass-covered areas in the distance.

Lower picture. The grass-covered open space behind the beach on the north coast, with, in the distance, the coconut palms fringing the shore and, on the left, part of the *bĕlukar* covered slope leading to the centre of the island.

Plate 4. The vegetation on Pulau Senang.

Upper picture. The beach near the south-western corner of the island from the sea, showing, behind it, the mixed vegetation covering the interior of the island. The trees along the edge of the beach include *Terminalia catappa*, *Hibiscus tiliaceus* and *Barringtonia* sp., interspersed with clumps of pandanus.

Lower picture. A section of the mangrove zone at the western end of the island: low tide.

Plate 5. Pulau Sudong from the air, about two hours from high tide.

Upper picture. The north-west end of the island, with Pulau Sĕmaku in the distance. At this end of Sudong the mangrove belt is spreading out over the reef, and the island is extending slowly seaward.

Lower picture. The east end of Pulau Sudong, showing the sandy beaches and the fishing village situated among coconut palms. The vegetation of the island consists almost entirely of two elements—coconut palms at the east end, and a secondary scrub, *bĕlukar*, surrounded by a belt of mangrove at the western end. The total area at high tide is about 60 acres. Until recently the islanders had no good source of fresh water on Sudong, and drinking water had to be fetched by boat from Pulau Sĕmaku. The attraction of the island is the large expanse of reef, amounting to over 500 acres, stretching westward which dries one to two feet at low water. The reef pools and neighbouring shallows contain several edible molluscs, and extensive growths of *Agar-agar*, mostly or entirely Carrageen, *Eucheuma spinosum* J. Ag., both of which are dried and exported to the mainland.

Summary

The present collection of notes gives short descriptions of three small islands, Pulau Senang, Pulau Pawai and Pulau Sudong, lying some six miles from Singapore Island, and taken as representative of a number of similar islands in the surrounding area. Short descriptions are given of the three islands, and the resident land birds and strays from the surrounding areas are summarised. Finally on analysis it is shown that the avifauna differs from that typical of the more exposed islands off the east and west coasts of Malaya, and is in fact an extension of that of the coastal zone of Singapore Island, with a high proportion (amounting to nearly fifty per cent of the apparently resident birds) of species which are known at the present time to have expanding populations and a marked tendency to follow man into the areas that he has cleared, or partly cleared, on the mainland.

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No. 20. New Records for Singapore Island

The following four species should now be admitted to the Singapore Checklist (*Bull. Raff. Mus.*, 21, 1950: 132–183) on the strength of specimens taken on the island, or in its immediate neighbourhood. Notice is also included of the first formal record of a fifth species, *Sterna a. anæthetus* Scop.

43. Machaerhamphus alcinus alcinus Westerman. Bat Hawk.

According to Chasen Robinson was of the opinion that he had seen this bird one evening in flight over the Botanic Gardens at Tanglin. At the time that the checklist was compiled the nearest formal record was an adult male taken by one of the Raffles Museum collectors over the Muar River, in north-western Johore, in December 1892, reported at some length, but with no details of value, by Kelsall (*Journ. Straits Br. Roy. Asiat. Soc.*, 25, 1894: 171–2). On 20 June, 1951, an adult female was taken on Pulau Senang, a small island between six and seven miles south-west of the western entrance to Keppel Harbour and less than half a mile from Raffles Light (Pulau Satumu). The stomach contained the remains of four bats, *Rhinolophus* sp. The islands form part of the colony of Singapore, and though we still have no formal record for the island itself, it seems that this species might now be admitted to the Singapore Checklist as a visual record.

Machaerhamphus alcinus is a relatively rare bird, and the records quoted above are the only reports of its occurrence in the

Malay Peninsula south of the vicinity of Kuala Lumpur. There is an old record of a pair breeding at an inaccessible site at Batu Caves about 1910; and Pagden had two birds under observation in the Kuala Lumpur Botanic Gardens for a long period in 1948, but he failed to find a nest. So far as is known central Selangor represents the southern limit of its breeding range in Malaya. In Borneo it has been taken as far south as the Baram district of Sarawak, and in Sumatra the Padang Highlands, alt. 500 metres, but there is no evidence of its breeding in either locality. There is also a recent record for Singkep Island (this journal, *postea:* 356), at the southern end of the Rhio-Lingga Archipelago.

154. **Sterna anæthetus anæthetus** Scop. Bridled Tern.

Formal record: an adult bird, ex sex, found dead on the beach a mile west of Telok Paku, at the east end of Singapore Island, by Lim Chye Ann, on 29 April, 1951. The specimen was easily recognisable, but not in a fit state for presentation.

These terns winter in fair numbers scattered over the open water at the eastern entrance to the Singapore Strait, and again at the southern entrance to the Malacca Strait. They do not normally approach near to the land, except in late April and early May when they move north to return to their breedings grounds. At this period occasional individuals, presumably strays, have been reported close to Singapore Island. Previous records include several birds seen off Changi Point and in the channel between the island and the Pulau Ayer Merbau group; there is also an old formal record of two adults taken off the Sultan Shoal Reef (♂ ♀, 3 May, 1923). A summary of the breeding colonies established in Malayan waters appears in an earlier issue of the present journal (*Bull. Raff. Mus.*, 23, 1950: 30–38).

179*bis*. **Psittacula krameri manillensis** (Bechst.).
Roseringed Paroquet.

Formal record: an adult male taken in the Buona Vista area, Singapore Island, on 9 February, 1951 (L. K. A. Charles).

A small colony of these paroquets has apparently become established, from introduced stock, in the Buona Vista area of Singapore. In May 1952 there were at least 20–24 birds there. Their presence was first reported early in 1951, when successful breeding was noted, but as seven or eight individuals were recorded in a single flock it seems likely that they have been feral

there for several years. The birds belong to the race found in southern India and Ceylon, and the original examples were presumably brought in from that region. They are occurring close to the area where the Ceylon Pioneer Corps was formerly quartered. See Allen (*Malayan Nat. Journ.*, 5, (4), 1951: 205), and for formal identification, including recognition of the subspecific status, this journal, *antea:* 248–49.

429. **Pycnonotus zeylanicus** (Gmel.). Yellowcrowned Bulbul.

We now have several visual records of the occurrence of this bird in open jungle and gardens on Singapore Island in the Bukit Timah and Tanglin areas. One, possibly two, birds were resident in the One-Tree Hill neighbourhood during April and May 1951, and subsequently solitary examples were reported from the Forest Reserve at Bukit Timah, and the Botanic Gardens. *Pycnonotus zeylanicus* is known formally from Pulau Ubin, in the strait between Singapore and the mainland, and it is probably resident on Singapore Island in small numbers. It is widely distributed in open wooded and scrub country, particularly in the neighbourhood of the larger rivers above tidal water, throughout the mainland of Malaya, except on the west side south of Malacca.

446. **Luscinia cyane** (Pallas). Siberian Blue Robin.

Formal record: a male in full breeding plumage taken on Bukit Timah by F. G. H. Allen, on 25 May, 1952. According to the collector it was in company with two females of the same species.

The previous most southerly record for Malaya was an example taken on Gunong Pulai, in south Johore, by C. Boden Kloss (Robinson, 1928: 220). It has not been reported from Pulau Pisang, but is well represented in autumn collections from the other islands in the Malacca Strait (Langkawi, Pulau Paya, Pulau Jarak, Pulau Lalang, One Fathom Bank and the Aroas). In all cases except one (an adult male taken on Jarak 3 May, 1932) the skins are dated October to December. It is seemingly common among the islands, and on the Malayan coast north of Tanjong Tuan, during these months. About the turn of the year it moves inland, to altitudes of from 2,500 to 4,000 feet along the main mountain range, where it remains, in the northern Malay States at least, until the end of April.

Luscinia cyane is one of a small group of birds which apparently follow this routine, appearing first on the Malacca Strait

Islands south to the Aroas, and then moving inland to hill country for the remainder of their stay here. Other examples include,

Turdus o. obscurus Gmelin
Gockichla sibirica (Pallas) subspp.
Muscicapa cyanomelana cumatilis (Thayer & Bangs)
Muscicapa s. sibirica Gmelin
Muscicapa ferruginea (Hodgson)
Muscicapa mugimaki Temminck

Several of these other birds, like *Luscinia cyane*, have not been reported from Pulau Pisang. Only two of them, *Turdus obscurus* and *Muscicapa mugimaki*, are at present known from Singapore Island, the former by two old formal records and the latter by a visual record of a bird seen in a garden on the outskirts of the town on 9 April, 1950. In the case of the other species a number of the birds make their way west from the Malacca Strait Islands, reaching high ground in western Sumatra, and in some instances moving on south to the mountains of western Java, before returning north in April. It seems likely that some examples of *cyane* follow this programme, but the proportion doing so must be much smaller than in the case of the other species. This bird is not known from Java, and I can trace only one record for Sumatra, a skin taken by Kloss in the Korinchi Valley, alt. 3,000 feet on 16 March, 1914. Chasen (*Bull. Raff. Mus.*, **11**, 1935: 232) includes Borneo in the wintering range of *Luscinia*, but these must be birds coming down through the Philippines. It has been reported from only the northern part of the island: the only published record known to me is an adult male taken by Whitehead on the lower slopes of Kinabalu, alt. about 1,000 feet, on 20 March, 1887 (Sharpe, *Ibis*, 1889: 286).

25 May is a very late date for a bird breeding in northern Asia to be so far south, but this appears to be one of a small number of Siberian forms which arrive fairly early in the autumn and leave late in the spring. Count Gyldenstolpe took examples among the Khun Tan Hills, 35 miles north-east of Chiang Mai in northern Thailand, on 22 September and 6 May (*Kungl. Sv. Vet. Akad. Hand.*, 56, (2), 1916: 49), and Robinson a nearly adult male in dense jungle on the hills of Koh Samui (Lat. 9° 22–34′ N.) off the east coast of the Peninsula on 16 May (*Journ. F.M.S. Mus.*, 4, 1915: 149). Both Robinson and Count Gyldenstolpe express the opinion that this species might be breeding in or near their collecting areas, in view of the

lateness of its presence there; but these are isolated records and there is still no indication of its doing so anywhere in South-east Asia.

Breeding Records

Data collected by F. G. H. Allen adds three more to the species resident in Singapore for whom breeding has been recorded locally.

350a. **Dicrurus paradiseus platurus** Vieill. Large Raquet-Tailed Drongo.

A pair of these birds was found nesting in the forest reserve on Bukit Timah on 7 February, 1951. One of the birds was sitting on 25 February, eighteen days later. Subsequently a second nest was discovered, containing two young chicks.

530b. **Acridotheres fuscus javanicus** Cab. Javanese Myna.

Introduced: see this journal, p. *antea*.

On 19 May, 1952 a nest containing two fresh eggs was found in a hole in a dead tree, about 30 feet from the ground, in the Reformatory Road area. The eggs are the usual uniform bluish glaucous colour, and measure 28·5 × 20·5 and 27·5 × 21 mm.

545. **Arachnothera l. longirostra** (Lath.). Little Spider-hunter.

An empty nest was found early in May 1952, at Mandai. There was a bird scolding in the vicinity, and the nest was freshly built. On 17 May it contained a single cold egg: there were no signs of the presence of an adult, and it appeared that the birds had deserted. Two is the normal clutch size for the spider-hunters in Malaya, though some species at least not infrequently lay only one egg. It seems also that members of this genus are unduly suspicious, and more liable to desert than at least the commoner sunbirds.

Revised Totals

The number of birds accepted as occurring on Singapore Island at the present time, or known to have occurred here as casual visitors or strays during the present century, is now 290. 156 of these, including 7 introduced birds, are almost certainly resident on the island, while a further five are probably resident here. Breeding (on Singapore Island) has now been reported in the case of 67 birds, of which five are introduced forms. A

note on the latter (including those which have apparently been liberated but failed to establish themselves here) appears in an earlier part of the present journal (pp. 240–57, *antea*).

The Singapore totals now read,

Birds known to occur, or have occurred, naturally ..	283	
Birds introduced and apparently established ..	7	
Total ..	—	290
made up of,		
Birds known to be breeding, or have bred, here ..	67	
Birds almost certainly resident on the island ..	89	
Birds probably resident	5	
Total (presumed or known residents) ..	—	161
Birds known to be regular winter visitors, or passage migrants, in reasonable numbers	47	
Birds known as scarce, but probably regular, visitors ..	29	
Occasional visitors and strays	53	
Total (apparently non-resident birds) ..	—	129
		290

Additions to the Singapore list since June 1949 bring the total number of species known from Malaya as a whole to 577 species. The two additions are,

179*bis*. **Psittacula krameri manillensis** (Bechst.).

Introduced: breeding in the Buona Vista area, Singapore Island reported by F. G. H. Allen (*Malayan Nat. Journ.*, 5, (4), 1951: 205); see also this journal, pp. 248–9, *antea*.

472*bis*. **Acrocephalus bistrigiceps** Swinhoe.

Occasional visitor, reported from Singapore Island and north-western Kelantan: formal record, Nee Soon catchment area, Singapore Island, 4 December, 1949 (see *Bull. Raff. Mus.*, 23, 1950: 119); visual records for Kelantan, C. G. Young (*Malayan Nat. Journ.*, 2, (1), 1941: 10), and E. J. H. Berwick (this journal, *antea*).

No. 21. The Birds known from Pulau Pisang, Malacca Strait

Pulau Pisang (Lat. 1° 28′ N., Long. 103° 15′ E.) lies off the Johore coast, in the southern part of the Malacca Strait, about seven miles south of the mouth of the Sungei Benut, and just under eight miles west by south from the fishing villages of Pontian Besar and Pontian Kechil. The island is rocky and steep-sided, in contrast to the adjacent coast of the mainland which is

low-lying and muddy, with a broad belt of mangrove. The position of Pulau Pisang and its relation to the islands adjacent to Singapore is shown in the map on p. 295, *antea*. Scrivenor (1916: 31–34) gives a note on the geology of the island: the only paper dealing directly with its avifauna is a note by Chasen (1932: 3–7) reporting on some of the material collected by de Fontaine, 4–18 December, 1930.

Pisang is a slightly irregular, humpbacked island, about 2,000 yards long and 1,100 yards across at the widest point, with an area of 275–300 acres. The summit, 440 feet high, is crowned with a sixty-foot lighthouse. There is a small clearing round the buildings, with a coconut and banana plantation on one of the slopes below them. The remainder of the island is densely wooded. The shore-line is formed of low cliffs, crowned with trees, alternating with boulder-fringed slopes where the vegetation comes almost down to the water's edge. There are no real beaches, and the island has nothing to attract waders or sea birds. Its general appearance is reminiscent of Pulau Jarak, but the vegetation is much richer in species. The trees include the Durian, Jackfruit, Mango and several forms of *Ficus*, which between them attract or support large numbers of *Pteropus vampyrus* and *Cynopterus brachyurus*. The Durians have a better fate than the majority of the fruits, and are harvested and sold at Pontian.

There are three smaller but very similar islands in the immediate vicinity of Pulau Pisang.[1] Close eastward is Pulau Sauh, 236 feet, and about half a mile westward the islets of Pulau Kĕmudi, 330 feet, and then Pulau Tunda, 239 feet. These have never been investigated closely, but from the sea they do not appear to possess any important natural features not found on Pisang itself.

Several collections have been made on Pulau Pisang in the last fifty years, and 67 forms, covering 65 species, are now known from the island. It seems likely that Pisang was visited in the early years of the present century, when Robinson was examining all possible places in search of new mammals, but no records are known from this period. Kloss made a small exploration of the island in the latter part of 1915, and it was

1. The word "Pisang" in Malay means a banana, and was probably given to the island as roughly descriptive of its shape. The off-lying islets appear to have been named on the analogy of the island as a junk, riding at anchor with her bow towards the land: *sauh* means an anchor, *kĕmudi* a rudder, and *tunda* (= towed) is probably abbreviated from *sampan tunda*, the dinghy drawn behind a larger vessel.

then that he obtained the rock samples which were sent to Scrivenor (*q.v.*). Skins brought back from this visit led Chasen to send de Fontaine there in December 1930 (Chasen, 1932: 3–7). His collections added several unrecorded species, and brought the total number of birds known from the island up to 41. With this encouragement Chasen sent a collector to Pisang again in 1934, working from 1–15 January. This added a further seven species, including *Pitta sordida cucullata* (♂ 1, ♀ 1), *Ixobrychus sinensis* (♂ ♂ 2) and *Dupetor flavicollis* (♂ ♂ 2, ad. ♀ ♀ 3, imm. ♀ 1), the last two of which appear to have been passing in some numbers, but have never been taken on the island on any other occasion. The island was subsequently visited by F. G. H. Allen and the present writer in October 1947, by the latter again in December the same year, and by F. G. H. Allen on two occasions in 1948–49. Finally the Raffles Museum collector was working the island from 9 December, 1947 to 5 January, 1948. The birds obtained on these latter visits include *Chalcites xanthorhynchus* (Allen, October 1947), *Accipiter soloensis*, *Caprimulgus indicus jotaka*, *Pericrocotus roseus divaricus*, *Locustella certhiola* and *Aethopyga siparaja*.

In all cases except for the easily recognisable *Demigretta sacra*, *Haliastur indus* and *Haliaetus leucogaster* the records are based on skins now in the Raffles Museum collections, or birds handled by the present writer. Details of their occurrence in other parts of the Malacca Strait (the Sĕmbilan Islands, Pulau Jarak, the Aroas, and the One Fathom Bank Light), the Ayer Mĕrbau group, Pulau Ubin and the Pulau Sĕnang group, are given in the table on pages 330–332 below. Members of 24 of the 65 species are probably resident, or at least breeding, on the island. The remaining birds comprise one certain stray, *Sula leucogaster*, one species, *Haliastur indus*, which is probably a visitor from the adjacent parts of the mainland, and about 42 passage migrants or winter visitors. The latter are of particular interest, in view of the island's position in the Malacca Strait—any migratory stream travelling south or north over the inshore waters of the west coast of Malaya at this latitude must inevitably pass close to Pisang, which is a very suitable resting place for almost all birds except the Ardeiformes and Charadriiformes. For the present, the migrants known from the island are merely being recorded here. A summary of the information available on the movements of the passage migrants occurring in Malaya as a whole will be given in a later paper.

The records from the Malacca Strait Islands are discussed in more detail in an earlier paper by the present writer (this journal, 23, 1950: 263–299, *passim*). A total of 86 species are known from this area, of which 42 have not yet been taken on Pulau Pisang. These 42 birds comprise 15 sea and shore birds for which Pulau Pisang, like Jarak, is clearly physically unsuitable, and 27 migrants which presumably do not normally reach the southern end of the Malacca Strait. The intensity of collecting in the five areas has been in the receding order, Pulau Pisang, Pulau Jarak, the One Fathom Bank Lighthouse, the Sĕmbilan Islands and the Aroas: so far as we know the last group has only been visited twice (Robinson, August and November 1906).

Records from the Pulau Sĕnang group are discussed in an earlier paper in the present series (this journal, *antea:* 294–321). Records from Pulau Ubin and the Ayer Mĕrbau group are based on skins in the Raffles Museum collection or handled by the present writer, data in a paper by Chasen (1924: 22–36) and notes from visits to Pulau Ubin and Tĕkong Bĕsar by F. G. H. Allen, Mrs. W. S. C. Leech and the present writer. A total of 54 different birds (including passage migrants and winter visitors) has been reported from the Pulau Sĕnang group, 41 from the Ayer Mĕrbau group and 107 from Pulau Ubin. All but 7 of the birds known from Pulau Sĕnang and the Ayer Mĕrbau groups have also been reported from Ubin. Only 35 of this total of 114 birds are at present known from Pulau Pisang, while 32 birds from that island are not known from the Singapore groups. These latter are mostly migrants, but they also include three species which are almost certainly resident on Pisang—*Calocnas nicobarica*, *Platysmurus leucopterus* and *Dicaeum concolor:* these will be discussed later. A large proportion of the birds recorded from Pulau Ubin but not from the other islands are, of course, species resident in open or fairly open country in the lowlands of Johore, as opposed to inhabitants of thickly wooded areas.

The table below gives a list of the 67 birds known from Pulau Pisang. The status shown in the second column is their probable status on the island, not in Malaya as a whole. The term winter visitor is used for all non-breeding visitors occurring regularly except for *Haliastur indus*, which may be drifting over for a day or two at any season; it is possible that *Haliaetus leucogaster* is also in this category, but for the present it is shown as "?Resident", and counted under that head in the totals, on the strength of the assurrance of one of the light-keepers that at least one pair nests annually on Pulau Kĕmudi.

Checklist number and name	Probable status on Pulau Pisang	Also known from						
		Sembilan Is.	P. Jarak	Aroa Is.	One Fathom Bank	P. Ubin	P. Ayer Merbau	P. Senang Is.
7 *Sula leucogaster plotus* (Forster)	Stray	.	+	+	+	.	.	.
15A *Butorides striatus javanicus* (Horsf.)	Resident	+	+	+	+	.	.	.
22 *Demigretta sacra* (Gmelin)	Resident	+	+	+	+	+	+	+
25 *Ixobrychus s. sinensis* (Gmelin)	Passage Migrant	.	.	.	+	.	+	+
28 *Dupetor f. flavicollis* (Latham)	Passage Migrant	+	+	+	+	.	.	.
48 *Haliastur indus intermedius* Gurney	Visitor	.	.	.	.	+	+	+
50 *Accipiter soloensis* (Horsf.)	Passage Migrant & Winter Visitor	+	+	.	.	.	.	.
52 *Accipiter virgatus gularis* (Temm. & Schleg.)	Passage Migrant & Winter Visitor	+	+	+	+	+	+	+
60 *Haliæetus leucogaster* (Gmelin)	? Resident	+	+	+	.	.	+	+
94 *Rallina fasciata* Raffles	Passage Migrant	.	.	.	+	.	.	.
101 *Gallicrex cinerea* (Gmelin)	Passage Migrant	+	.	.	+	.	.	.
128 *Actitis hypoleucos* (Linn.)	Passage Migrant & Winter Visitor	+	+	+	.	+	+	+
163 *Treron c. curvirostra* (Gmelin)	Winter Visitor	+	.	.	+	+	.	.
166 *Treron vernans griseicapilla* Schleg.	Resident	.	.	.	.	.	.	.
168 *Ptilinopus jambu* (Gmelin)	Winter Visitor	+	.	+	+	+	+	+
170 *Ducula bicolor* (Scop.)	Resident	+	+	.	.	.	+	+
177 *Chalcophaps i. indica* (Linn.)	Resident	+	+	.	.	.	.	.
178 *Caloenas n. nicobarica* (Linn.)	Resident	+	+	.	.	.	+	+
182 *Clamator coromandus* (Linn.)	Passage Migrant & Winter Visitor	+	.	+	+	.	.	.
186 *Cuculus m. micropterus* Gould	Passage Migrant & Winter Visitor	+	+	+	+	.	.	.
193 *Chalcites x. xanthorhynchus* (Horsf.)	Winter Visitor	.	.	.	.	+	.	.
196A *Surniculus lugubris dicruroides* (Hodge.)	Passage Migrant & Winter Visitor	+	+	+	+	+	.	.
197 *Eudynamys s. scolopacea* (Linn.)	Passage Migrant & Winter Visitor	+	+	+	.	.	.	.
197B *Eudynamys scolopacea malayana* Cab. & Heine	Passage Migrant & Winter Visitor	+	+	+	.	.	.	.
228 *Caprimulgus indicus jotaka* Temm. & Schleg.	Passage Migrant	+	+	+	+	.	.	.
237B *Hirundo-apus gigantea indicus* (Hume)	Passage Migrant	.	.	.	.	.	.	.
240 *Apus affinis subfurcatus* (Blyth)	Resident	.	.	.	.	+	+	+
250 *Alcedo atthis bengalensis* Gmelin	Winter Visitor	+	+	.	.	+	+	.
253 *Ceyx e. erithacus* (Linn.)	Passage Migrant & Winter Visitor	+	+	+	+	.	.	.

Checklist number and name	Probable status on Pulau Pisang	Also known from						
		Sembilan Is.	P. Jarak	Aroa Is.	One Fathom Bank	P. Ubin	P. Ayer Merbau	P. Senang Is.
260 *Halcyon pileata* (Bodd.)	Passage Migrant & Winter Visitor	+	+	+	+	+	+	-
261 *Halcyon chloris humii* Sharpe	Resident	+	+	.	.	+	+	+
264 *Merops superciliosus philippinus* Linn. ..	Passage Migrant	.	.	.	.	+	.	.
268A *Eurystomus o. orientalis* (Linn.) ..	Passage Migrant & Winter Visitor	+	+	+	?	.	.	.
268B *Eurystomus orientalis abundus* Ripley ..	Passage Migrant & Winter Visitor	+	+	+	?	.	.	.
328 *Pitta brachyura cyanoptera* Temm. ..	Passage Migrant & Winter Visitor	+	+	+	+	.	.	.
330 *Pitta sordida oscillata* Hartl.	Passage Migrant & Winter Visitor	+	+	+	+	.	.	.
332 *Hirundo rustica gutturalis* Scop. ..	Passage Migrant & Winter Visitor	-	-	.	.	+	+	.
333 *Hirundo tahitica nitidi* (Oberh.) ..	Resident	.	.	.	.	+	+	+
342 *Pericrocotus roseus divaricatus* (Raff.) ..	Passage Migrant & Winter Visitor	+	.	.	+	.	.	.
346 *Dicrurus a. annectans* (Hodgs.) ..	Passage Migrant & Winter Visitor	.	+	+	.	+	.	.
350A *Dicrurus paradiseus platurus* Vieill. ..	Resident	.	.	.	.	+	.	.
358 *Platysmurus l. leucopterus* (Temm.) ..	? Resident	.	.	.	.	.	.	.
433A *Pycnonotus p. plumosus* Blyth ..	Resident	.	.	.	.	+	+	+
451 *Copsychus malabaricus melloperensis* (Oberh.)	Resident	.	.	.	.	+	+	-
458 *Turdus o. obscurus* Gmelin	Passage Migrant & Winter Visitor	+	+	+	+	.	.	.
470 *Locustella certhiola* (Pall.) subspp. ..	Scarce Passage Migrant	.	.	.	+	.	.	.
471 *Locustella lanceolata* (Temm.) ..	Passage Migrant	+	+	+	+	.	.	.
472 *Acrocephalus arundinaceus orientalis* (Temm. & Schleg.)	Passage Migrant	.	+	+	.	.	.	.
474 *Phylloscopus borealis* (Blas.) subsp. ..	Passage Migrant & Winter Visitor	+	+	.	+	+	.	.
484 *Orthotomus sepium ruficeps* (Less.) ..	Resident	.	.	.	.	+	+	+
487 *Rhipidura javanica longicauda* Wall. ..	Resident	.	.	.	.	+	.	+
492 *Muscicapa s. sibirica* Gmelin	Passage Migrant & Winter Visitor	+	+	.	+	.	.	.
493 *Muscicapa ferruginea* (Hodgs.) ..	Passage Migrant & Winter Visitor	+	+	+	+	.	.	.

Checklist number and name	Probable status on Pulau Pisang	Also known from						
		Sembilan Is.	P. Jarak	Aroa Is.	One Fathom Bank	P. Ubin	P. Ayer Merbau	P. Sesang Is.
505 *Muscicapa westermanni* Temm. ..	Passage Migrant & Winter Visitor	+	+	.	+	.	.	.
515c *Terpsiphone paradisi incei* (Gould) ..	Passage Migrant & Winter Visitor	+	+	+	+	.	.	.
517 *Pachycephala cinerea batulaides* Stres.	Resident	+	.	.	.	+	+	+
520 *Dendronanthus indicus* (Gmelin) ..	Passage Migrant & Winter Visitor	.	.	.	.	+	.	.
524A *Lanius c. cristatus* Linn.	Passage Migrant & Winter Visitor	+	.	.	+	.	.	.
525 *Lanius tigrinus* Drap.	Passage Migrant & Winter Visitor	.	+	.	+	+	+	.
526 *Aplonis panayensis strigatus* (Horsf.)	Resident	+	.	.	.	+	+	+
527 *Sturnus sturninus* (Pall.)	Passage Migrant & Winter Visitor	.	.	.	.	.	.	.
535 *Anthreptes m. malaccensis* (Scop.)	Resident	.	.	.	.	+	+	+
541A *Leptocoma jugularis microleuca* (Oberth.)	Resident	+	+	.	.	+	+	+
543 *Arthopyga s. siparaja* (Raffl.) ..	Resident	.	.	.	.	+	+	+
552 *Dicaeum cruentatum ignitum* (Bechs.)	Resident	.	.	.	.	.	+	.
556 *Dicaeum concolor borneanum* Lonn.	Resident	.	.	.	.	.	+	.
562A *Zosterops palpebrosa williamsoni* Rob. & Kloss	Resident	.	.	.	.	+	+	.
Number of Birds listed here, Resident, ...		24	10	7	4	..	..	.. 13
Regular Visitors, ...		39	39	34	26	30	..	.. 5
Occasional Visitors and Strays, ..		4	..	..	..	..	..	.. ..
Total Number of Births listed here, ..		**67**	**39**	**34**	**26**	**30**	**32**	**25** **18**
Total Number known from the island(s), ..			56	49	41	52	(107)2	(41)2 54
Number probably Resident on the island(s), ..			13	7	8	..	(69)2	(20)2 22

2. Ayer Mĕrbau group and Pulau Ubin: provisional totals only are given as the preliminary surveys on the islands have not yet been completed.

The Species breeding on Pulau Pisang

Representatives of twenty-four species are probably breeding on Pulau Pisang, as we noted in the earlier part of this paper. These include the two land birds not known to nest on the mainland, namely, *Ducula bicolor* (Scop.) and *Caloenas n. nicobarica* (Linn.), together with seven of the birds listed in the paper on the avifauna of the Pulau Sĕnang group as much addicted to islands (category (*b*) on p. 317, *antea*), and two widespread shore birds, namely,

Butorides striatus javanicus (Horsf.)
Demigretta sacra (Gmelin)
Haliæetus leucogaster (Gmelin)
Chalcophaps i. indica (Linn.)
Halcyon chloris humii Sharpe
Copsychus malabaricus malloperenus (Oberh.)
Aplonis panayensis strigatus (Horsf.)
Anthreptes m. malaccensis (Scop.)
Leptocoma jugularis microleuca (Oberh.)

In addition the nesting birds include three of the six species given in category (*c*) in the earlier paper, mainland birds likely to establish themselves on isolated islands, though with no considerable natural tendency to do so: the three birds are,

Pycnonotus p. plumosus Blyth
Pachycephala cinerea butaloides Stres.
Treron vernans griseicapilla Schleg.

To these can be added seven other species reported from several sheltered islands, though probably occurring in such places less frequently than the species listed above. These, some at least of which almost merit a place in category (*c*) of the earlier paper, are as follows,

Apus affinis subfurcatus (Blyth)
Hirundo tahitica abbotti (Oberh.)
Orthotomus sepium ruficeps (Less.)
Rhipidura javanica longicauda Wall.
Aethopyga s. siparaja (Raffl.)
Dicæum cruentatum ignitum (Begb.)
Zosterops palpebrosa williamsoni Rob. & Kloss

Briefly it can be said that up to this point the birds listed are all, to varying degrees, typical of the resident avifauna of the smaller wooded islands found off the Malayan coast. Further the first eleven birds given in these lists include all the species known or believed to be breeding on Pulau Jarak, and, if *Ardea sumatrana* were added, the four shore and land birds from the

Aroas, and all the eleven shore and land birds believed to be nesting in the Sembilan group except for *Pachycephala cinerea* (given in group (*b*) above) and an unidentified *Collocalia* sp. It will also be found that the species on the Pulau Pisang list up to this point cover a large proportion of the resident forms recorded from the smaller islands off the east coast of Malaya. Yet only twelve of these birds are included in the 22 species believed to be breeding in the Pulau Sĕnang group, north of the Singapore Strait.

The remaining three species probably resident on Pulau Pisang include two birds known from wooded country in the adjacent parts of the mainland. They are,

Dicrurus paradiseus platurus Vieill.
Platysmurus l. leucopterus (Temm.)

and a third species, *Dicaeum concolor borneanum* Lonn., about which little information is available, except that it is a fairly scarce bird in Malaya, and that it apparently favours wooded country in the lowlands or submontane region. Clearly these three birds, and to a lesser extent some of those in the last list on the preceding page, represent a mainland element in the resident avifauna, though the balance remains strongly in favour of the island-frequenting forms.

The strait between Pulau Pisang and the mainland is less than seven miles wide, and apart from a narrow channel close to the island with depths of 6–8 fathoms, the depth is only 3–4 fathoms or less. A drop of 20–25 feet in the level of the water in the Malacca Strait would leave the bank on which Pulau Pisang stands separated from the mainland by a shallow creek less than 500 yards wide at high water. On the other hand an increase in the depth of the Strait by 200–250 feet would still allow us an island of over 150 acres. The resident avifauna, as its constitution suggests, is almost certainly a residual one, surviving from a period when the island was relatively much closer, if not actually joined, to the mainland. Clearly it contains some at least of the species able to maintain themselves in a small area of coastal woodland, in addition to those natural to a fairly thickly wooded island. Nevertheless about two-thirds of the birds are those which from previous experience we could expect to find on a tree-covered island of moderate size, and nearly half of them, 10–11 species, those which should be present on a more isolated island, if it were sufficiently wooded. As might be expected from its position, Pisang can be said to have an island avifauna, with a small mainland element in it.

In effect a comparison has already been made between the avifauna of this island and that of Pulau Jarak. The latter, with an area of 70–75 acres, is only about one quarter the size of Pisang. It is poorer in fruiting trees, and lacks the bananas and other plants of the cleared patch on the slope below the lighthouse. Apart from this, Jarak is very similar to Pisang, and like the latter island it even includes a small number of coconut palms. Nevertheless, as we have noted in the account of the birds of Jarak, it has only five species which might possibly be resident, and these are all birds with well-known colonising propensities. Tweedie's suggestion that the fauna and flora of Pulau Jarak was probably destroyed by ash blown over during the cataclysmic eruption which formed the Toba Meer crater in Sumatra (this journal, 23, 1950: 262) has already been considered and accepted. Some allowance must be made for the differences in the vegetation of the two islands, in size, and in the distance from the mainland, but even allowing for these, the avifauna of Jarak remains extremely limited and specialised in comparison with that of Pisang, and there can be little doubt that the main difference between the two is that between a residual avifauna and one built up by colonisation over a relatively short period. The differences between the two populations are of further interest when we come to consider the avifauna of Pulau Bĕrhala, an isolated, wooded island with an area of about 90 acres, situated just over 25 miles from the coast of Sumatra, on the west side of the Strait (see pages 336–343, *infra*).

Summary

A short review is given of the birds known from Pulau Pisang, a small, densely wooded island, with an area of 275–300 acres, situated, together with three adjacent islets, 7–8 miles from the Johore coast, near the southern end of the Malacca Strait (approx. Lat. 1° 28′ N., Long. 103° 15′ E.). 67 different birds, representing 65 species, are known from the island. Four of these are probably strays or casual visitors, 39 regular visitors and 24 residents. Full discussion of the regular visitors is delayed until a later paper, but it is interesting to note that a number of passage migrants which are apparently plentiful, in season, on the other islands on the east side or in the middle of the Malacca Strait, are not known from Pulau Pisang, or seemingly relatively uncommon there. The 24 residents include a large proportion of the typical island forms, together with a few species not usually found away from the mainland. It seems clear that Pulau Pisang has an island avifauna, and that it is residual in origin, and not the result of colonisation. In this it is in sharp contrast to Pulau Jarak (and the Sembilan Islands) which in actual fact have longer lists of recorded passage migrants, but much fewer resident forms.

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No. 22. The Birds recorded from Pulau Bĕrhala, Malacca Strait, by J. C. van der Meer Mohr

The Pulau Bĕrhala group (approx. Lat. 3° 46′ N., Long. 99° 30′ E.) consists of a small island with two attendant islets. It lies on the west side of the Malacca Strait, about 25 miles from the nearest point on the coast of Sumatra, and 50 miles due east of Bĕlawan, the port for Medan. Measuring from the Malayan side of the Strait it is about 85 miles west of the mouth of the Bernam River, or 40 miles west-south-west of Pulau Jarak. The largest island, which is more or less pentagonal in shape, rises to a height of 581 feet, and has an area of about 90 acres. There is a sandy beach on the south side, divided into two sections by a rocky spit and protected by a broad coral reef. Opposite the south-east corner is a small, wooded, rocky islet, rising to a height of about 60 feet, and joined to the main island by a spit of sand which dries at low water. The beach is backed by a belt of coconut palms interspersed with the usual seashore trees; behind it are a few small, partly cultivated patches which have been cleared by fishermen visiting the island to rest and collect turtle eggs. The remainder of the island is densely wooded but with little undergrowth, as on Pisang and Jarak, with the east, west and north sides steep-to and fringed with granite boulders. About half a mile north-westward of the main island is a steep-sided rocky islet, crowned with vegetation, and rising to a height of about 140 feet. The channel between the group and the Sumatran coast has a minimum depth of 16–17 fathoms.

Several collections were made on the main island and its attached islet 25–35 years ago. The first recorded visit was that of E. Mjöberg, F. C. van Heurn and J. B. Corporaal, in November 1919: they reported an unidentified Pitta, and took an

example of *Ninox scutulata*. The following year collectors from the F.M.S. Museums landed on Bērhala, but nothing is known of the specimens which they took there. In November 1925 J. C. van der Meer Mohr and Dr. L. Fulmer paid a short visit to the island, in the course of which they saw a solitary example of *Halcyon coromandus* and collected specimens of four other birds. Van der Meer Mohr subsequently returned there for a week (21–28) at the end of August 1926, ten days (7–17) in August 1927 and a few days at Christmas the same year. A summary of the collections made on the islands, compiled by van der Meer Mohr, appears in *Treubia*, 12, (3–4), 1930: 277–298.

From all these visits 24 species of birds are now known from the islands, of which 10 are probably resident there; seven of the records are visual and the remainder formal. A list of the birds is given in the accompanying table, together with an assessment of their probable status on the island and a summary of the records of their occurrence on the other islands in the Malacca Strait. Four mammals were also found on Pulau Bērhala: these were identified by Chasen & Kloss (1928:1–2) as,

Rattus rattus neglectus (Jent.) = *R. r. diardii* (Jent.)
Pteropus hypomelanus ?fretensis Kloss
Suncus m. murinus (Linn.)
Tragulus javanicus ?kanchil Raffl.

of which the last two were almost certainly introduced, the mouse-deer intentionally, some fifty years ago, and the shrew inadvertently. The indigenous mammals are, therefore, very similar to those recorded from Pulau Paya, the Sembilans, Pulau Jarak and Pulau Jemor (in the Aroas), except that in the other islands the *Rattus rattus* are believed to constitute four races, one peculiar to each island, and *Pteropus hypomelanus* three races. Chasen & Kloss (1928: 1) dismiss the Bērhala *rattus* as "Apparently indistinguishable from the common field rat of Sumatra and the Malay Peninsula. All with white underparts and thereby different from *R. r. jarak* from Pulau Jarak. Very numerous on the island." The lack of differentiation suggests repeated immigration from the Sumatran mainland, or, which is much more likely, that the population is much younger than on the other islands and that the *Rattus rattus* has been introduced relatively recently, possibly by the same agency as the house-shrew. The terrestrial mammals are, in fact, limited to three kinds, all of which are probably recent arrivals. It is for this latter point that the subject has been introduced here.

The last visit paid to the island (December 1927) was made principally to collect passage migrants, but it was unsuccessful, and the list of recorded birds contains an unduly high proportion of resident forms. The few migrants recorded are all species common in the coastal regions bordering the Straits from October to March or longer; and except for *Dendronanthus indicus* and *Motacilla cinerea*, birds which probably winter in small numbers on the islands along the east side, in addition to occurring plentifully during the migratory periods. Only *Eudynamys scolopacea* seems to be really common on Bĕrhala; and this bird, *Hirundo gutteralis*, *Actitis hypoleucos*, *Motacilla cinerea* and *Muscicapa latirostris* are the the only ones recorded on more than one occasion. It seems very probable that the main migratory movement travels down the east side of the Strait and thus misses Pulau Bĕrhala.

Birds listed from Pulau Bĕrhala by J. C. van der Meer Mohr

List from *Treubia*, 12, (3–4), 1930: 292–3. Details of distribution at other points in the Malacca Strait from this journal, 23, 1950: 289–98.

Checklist Name and Number	Probable Status on Pulau Berhala	P. Jerak	Sembilan Island	One Fathom Bank	Aroa Island	P. Pisang
711* *Fregata* sp., *ariel* (G. R. Gray)[1]	Visitor					
12* *Ardea s. sumatrana* Raffl.	?Resident	·	·	·	+	·
22* *Demigretta sacra* (Gmel.)	Resident	·	+	·	+	·
60 *Haliaetus leucogaster* (Gmel.)[2]	Resident	+	+	·	+	·
128* *Actitis hypoleucos* (Linn.)	Winter Visitor	+	+	·	+	+
168 *Ptilinopus jambu* (Gmel.)	Passage Migrant & Winter Visitor	+	+	·	+	+
170 *Ducula bicolor* (Scop.)	Resident	·	+	+	+	·
178 *Caloenas n. nicobarica* (Linn.)	Resident	+	+	·	·	*
185A *Cuculus fugax nisicolor* (Blyth)	Passage Migrant & Winter Visitor	+	+	·	·	+
196A *Surniculus lugubris ?dicruroides* (Hodgs.)	Passage Migrant & Winter Visitor	·	+	+	+	·
		+	+	+	+	·

* Visual records only: no specimens taken.

1. Mohr (1930: 286) says that "According to the Malay fishermen the frigate birds (probably *F. ariel*) roost on the small islet north of the main island." There is, however, no suggestion of nesting in this note. The birds must almost certainly be *ariel*, of which I have seen a number of specimens from different parts of the Malacca Strait. There is no reliable record of any other species from this area, the Rhio Archipelago or the Bay of Bengal, and we now know that the birds frequenting the Aroas, the most likely nesting site, are *F. ariel*.

2. Mohr found a nest of this species in the bare top of a tall tree on Bĕrhala.

Checklist Name and Number	Probable Status on Pulau Berhala	P. Jarak	Sembilan Island	One Fathom Bank	Area Island	P. Pisang
197 *Eudynamys scolopacea* (Linn.) subsp.3 ..	Passage Migrant & Winter Visitor	+	+	.	+	+
219A *Ninox s. scutulata* (Raffl.)	Passage Migrant & Winter Visitor	+	.	+	+	.
232* *Collocalia* sp.. ? *innominata* Hume4 ..	Resident	.	+	.	.	.
250 *Alcedo atthis bengalensis* Gmel. ..	Passage Migrant & Winter Visitor	+	+	.	.	+
256A* *Halcyon c. coromanda* (Lath.) ..	Passage Migrant & Winter Visitor	+	.	+	+	.
261 *Halcyon chloris humii* Sharpe ..	Resident	+	+	.	.	+
? *Pitta* sp.	Passage Migrant & Winter Visitor	+	+	+	+	+
132 *Hirundo rustica gutteralis* Scop. ..	Passage Migrant & Winter Visitor	.	.	.	.	+
404 *Muscicapa l. latirostris* Raffl. ..	Passage Migrant & Winter Visitor	+	.	+	+	.
518 *Motacilla cinerea melanope* Pall. ..	Passage Migrant & Winter Visitor	.	+	.	.	.
529 *Dendronanthus indicus* (Gmel.)5 ..	Passage Migrant & Winter Visitor	.	.	.	.	+
526* *Aplonis panayensis strigatus* (Horsf.) ..	Resident	.	+	.	.	+
535 *Anthreptes m. malaccensis* (Scop.) ..	Resident	+	.	.	.	+
541A *Leptocoma jugularis microlaema* (Oberh.) ..	Resident	+	+	.	.	+
Number of Species known from the Island(s),						
as Probable Residents, ...	10	7	13	..	8	24
as Regular Visitors, ...	14	40	40	50	33	39
as Strays or Casual Visitors, ...	2	2	3	2	..	4
Totals ..	**24**	**49**	**56**	**52**	**41**	**65**
Number of Species listed here,						
as Probable Residents, ...		6	9	..	4	8
as Probably Regular Visitors, ...		8	8	7	9	8
Totals ..		**14**	**17**	**7**	**13**	**16**

* Visual records only: no specimens taken.

3. Very common as a winter visitor to all these islands, but not, it will be noted, recorded from the lighthouse on the One Fathom Bank. After his visit in August 1926 Mohr (1927: 2) seemed to think that these birds might be resident on Pulau Bērhala, but this cannot be so. The Koel lays parasitically, preferably in the nest of a *Corvus* sp.: in China it parasitises *Urocissa* sp. and *Graculipica*, but even if it accepted *Aplonis* the starlings are clearly not plentiful enough on any of these islands to support the number of koels that one encounters.

4. Nests, without eggs, of a *Collocalia* sp. were found in caves on the main island and on the attached islet, in ?August (Mohr, 1930: 281 & 285). No adults were collected. Mohr suggests that the birds are *innominata* Hume, which is possible. It breeds in large numbers in caves on Pulau Bēlitang, between Langkawi and Tĕrutau (*fide* Robinson, 1927: 128), but no nesting sites have been found in Malaya. Breeding of a small colony of swiftlets has been reported from an islet in the Sembilan group, but unfortunately no examples were collected, not even a nest, which might have told us something: *lowi*, *francica* and *innominata* are all possible names.

5. Peculiarly distributed, as a migrant and winter visitor, in the region of the Malacca Strait. It is common in coastal districts on the east side at least. It has been reported from the barren Pulau Perak (9 April, 1949), and from Pulau Pisang, but not from any of the other isolated islands, as the table shows. F. G. H. Allen took a bird on a ship in the central portion of the Strait, 75–100 miles south-west of Pulau Jarak, early in October.

The Birds probably breeding on Pulau Bĕrhala

Ten species are probably breeding on Pulau Bĕrhala, as we have noted in the table above. They are all characteristic island-frequenting birds. The total consists of two shore birds, the herons,

Ardea s. sumatrana Raffl.
Demigretta sacra (Gmel.)

and eight land birds,

Haliætus leucogaster (Gmel.)
Ducula bicolor (Scop.)
Caloenas n. nicobarica (Linn.)
Collocalia sp.
Halcyon chloris humii Sharpe
Aplonis panayensis strigatus (Horsf.)
Anthreptes m. malaccensis (Scop.)
Leptocoma jugularis microleuca (Oberh.)

all of which have a marked affection for small or medium-sized wooded islands. They are also all birds capable of colonising such places if suitable conditions for residence exist there. At the same time at least one species which one would expect to find under such conditions, *Chalcophaps indica*, is absent.

It is of some interest to compare the resident birds of Pulau Bĕrhala with those known from Pulau Jarak, Pisang and other islands. The description of Bĕrhala given above is based on the accounts and photographs published by van der Meer Mohr (1928 & 1930), and the note in the Malacca Strait Pilot. Excellent descriptions of Pulau Jarak are given by Audy (1950) and Audy, Harrison and Wyatt-Smith (1950). There is no good published account of Pulau Pisang, but I have paid two visits to the island. It is also of interest to make some reference here to the birds reported from Pulau Rumbia, in the Sĕmbilan Group, and Pulau Paya, off the the mouth of the Sungei Kĕdah, though collecting has probably not been complete on the former, and only a few birds have been taken on the latter. In general all five islands are roughly similar, medium-sized, rocky, rising steeply from the water, and still very largely or completely wooded. Physical details are summarised in the accompanying table. Pulau Bĕrhala, Paya and Rumbia have two or more sandy

beaches, for the rest the shore lines all drop steeply to the water. Rumbia is surrounded by a small group of similar but smaller islands: Jarak is completely isolated: the other three have two or three adjacent islets. There are small settlements on Rumbia (a fishing village) and Pisang (the lighthouse quarters): Bĕrhala and Paya have occasional inhabitants when visiting fishermen stay for a short time, mostly in the turtle-laying season. Pisang and Paya have the richest and fullest range of vegetation, Rumbia and Bĕrhala less so; that on Jarak is definitely restricted and limited in range, with some of the trees present showing indication of relatively recent colonisation of the island (see Wyatt-Smith, in Audy *et al.*, 1950: 235–38).

No complete collection has ever been made of the avifauna of Pulau Paya, and we know only of the occurrence of a few

	P. Berhala	P. Jarak	P. Rumbia[6]	P. Paya[7]	P. Pisang
Area (in acres)	90	75	c. 240	c. 140	275–300
Highest Point (feet)	581	508	567	290	441
Distance from Land (miles) ..	25	40	11	15	7
Depth of Channel (fathoms) ..	16–17	35–40	15–20	10–12	6–8
Number of Islets	2	0	group	2	3
Number of Settlers	occ.	0	20–30	occ.	10–15
Nesting spp.					
Shore Birds	2	2	2	2	2
Land Birds	8	5	8+	10+	22

Data for Pulau Rumbia (Rēmbia) and Pulau Paya are only approximate. Altitudes of the highest points are taken from the Malacca Strait Pilot (1946). The distance from the nearest land and the depths of water between the islands and the mainland are from the relevant Admiralty Charts. The area of Jarak is from Harrison (in Audy *et. al.*, 1950) and of Bĕrhala from Mohr (1930).

6. Pulau Rumbia, the largest of the islands in the Sembilan group, off the coast of Perak between Pangkor and the mouth of the Perak River. Rumbia (Malay) = the Sago Palm, *Metroxylon* spp., given as *Rēmbia* in Penang Malay, but never "Rumpia", as transcribed by Robinson.

7. Pulau Paya, following the Malacca Strait Pilot, but the name should be *Payar*, guarding the waterways, not *Paya*, a marsh.

birds from specimens taken by Robinson on two casual visits. Nevertheless it seems highly likely that it is similar in form and scope, though not necessarily in complete detail, to that on Pulau Pisang. The limited number of species recorded include *Irena puella* and *Dicrurus paradiseus*, both of which must be resident there, and whose presence suggests strongly another residual fauna with traces of mainland elements in it: (for an account of Pulau Pisang, see pages 326–336, *antea*). No trace of such an element is found in the recorded bird population of Pulau Rumbia, or any other island in the Sembilan group, which show only colonising forms. This point applies also to Pulau Bĕrhala, and even more so to Pulau Jarak, as we have already noted.

An examination of the chart shows that both Bĕrhala and the Sĕmbilan group lie close to the line across from Toba Meer in Sumatra to northern Perak (Kuala Plus and Kota Tampan), where the deposits of wind-borne pumice have been found. If, as seems so extremely likely, the passage of the volcanic ash at the time of the eruption denuded Pulau Jarak of its flora and fauna (see Tweedie, 1950: 262) it should have had a roughly similar effect on Pulau Bĕrhala and, though possibly less severe, on the Sĕmbilan Islands. The impoverished nature of the avifauna of these islands, with the emphasis on colonising species, suggests strongly that this did in fact occur. Pulau Bĕrhala, it may be pointed out, also has a mammal fauna apparently so recent in arrival that the very plastic *Rattus rattus* has not had time to segregate characteristics establishing a diagnosable endemic race (cf. Chasen & Kloss, 1928:2).

Summary

A brief analysis is given of the birds reported by J. C. van der Meer Mohr from Pulau Bĕrhala. Bĕrhala (Lat. 3° 46′ N., Long. 99° 30′ E.) is a small, wooded island, with two adjacent islets, situated on the west side of the Malacca Strait, about 25 miles from the nearest point on the Sumatran coast and 50 miles due east of Bĕlawan, the port for Medan. Only twenty-four species are at present known from the island, of which ten are probably resident there. The number of migratory species is low, and it seems probable that the great majority of these birds pass down the east side of the Strait, not the west. The species presumed to be breeding on the island comprise two shore herons and eight land birds, all of which are widely known from small and medium-sized islands in the Malayan area, and apparently have marked colonising propensities. The avifauna is, in fact, clearly oceanic rather than residual. A consideration of the bird population in relation to those of other roughly similar islands in the Malacca Strait suggests that Pulau Bĕrhala, like Pulau Jarak and the Sĕmbilan group, was probably denuded at the time of the Toba Meer eruption, and that the present avifaunn is a recent colonisation.

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