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POST-JUVENILE DISPERSAL OF NIGHT HERONS IN MALAYA

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The Black-crowned Night Heron *Nycticorax nycticorax* is nearly cosmopolitan in range, breeding in North and South America, Africa, Madagascar and Eurasia from continental Europe to the Pacific coast and south-east to Celebes (Vaurie, 1965). In Malaya (West Malaysia) the only known breeding colony is situated on the west coast, in the outer fringe of the mangrove on extensive mudflats near the small port of Kuala Gula, Perak, at 4° 52' N, 100° 32' E. Local tradition, and the name of the area (Bagan Sungei Burong = Bird River Flats), suggest that the colony has existed for a considerable time; published records date from 1946 (Gibson-Hill, 1949). In successive years, active nests have been found from July 9 (eggs only: Medway and Wells, 1970) through all months to mid-December (eggs and young: Medway and Nisbet, 1965). On May 10, however, a visitor found roosting birds but no nests (Allen, 1948). It appears that breeding at this colony is seasonally restricted to the latter half of the year.

The night herons nest gregariously in *Avicennia* saplings with up to three nests in each tree. In November 1964 the average density was estimated as 8 nests to 100 sq. yds, with a total of 1,500-2,000 nests in the area surveyed, most containing 1-3 young (Medway and Nisbet, 1965). From the nest colony during the breeding season, up to 3,000 adults on an evening can be counted flying inland at dusk, in loose skeins heading in a generally north-east to easterly direction (Medway and Nisbet, 1968). The fish regurgitated by nestlings during handling were recognized by our field assistants as fresh-water species (e.g. *Trichogaster* sp.) characteristic of ditches, drains and flooded paddies. In combination, these observations indicate that although nesting in mangrove the night herons disperse each evening to feed in wet situations inland.

At this colony during 1964-68, 7,450 nestlings were banded by associates and cooperators of the University of Malaya Bird Ringing Project. Up to January 1970, a total of 55 distant recoveries (0.74 percent) have been reported (Appendix A). In the following pages we outline the pattern of post-juvenile dispersal and subsequent movements illustrated by these recoveries.

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RESULTS

(1) *Method of recovery*

All recoveries were reported by small farmers, hunters or other rural people; none by ornithologists or experienced banders. Reports indicated that most of the birds were shot or trapped in paddy fields or swampy country (Table 1). Some of the correspondence made it clear that the writer felt that the bird, being banded, belonged to someone; several letters included apologies for catching or killing it. We suspect that more birds than admitted were in fact killed (and eaten), including probably a proportion of those said to have been found dead, those purportedly kept alive or released after capture, and those for which details were not supplied. Certainly there is no local aversion to hunting or eating night herons. Indeed, although nominally a protected species breeding in a gazetted sanctuary, the nestlings at Bagan Sungei Burong are regularly raided and slaughtered for food.

(2) *Distance and direction of dispersal*

The greatest distance between the nesting site and the place of recovery was 262 miles (422 Km). Half the recoveries reported, however, were less than 40 miles (64 Km) from the nesting site, and 75 percent were less than 50 miles (80 Km) distant (Table 2). All recoveries, except one from Penang Island, were from the mainland of the Malay Peninsula. In 7 instances (13 percent) the indicated direction of movement was southward; in the remaining 48 instances the points of recovery were at higher latitudes than the nesting site. The majority of these northerly recoveries fell in the densely populated rice-growing areas of the coastal plain of northern Perak, Province Wellesley and Kedah (cf. Ooi, 1963).

The 6 most distant recoveries show no consistent direction of dispersal: four were at higher latitudes, two at lower latitudes. Four of the six were from the west coast plain of the Malayan states. Two of the birds, however, had crossed to the east coast, a journey which must have involved flight over the forested mountains of the Main Range of Malaya or its northward extension in southern Thailand (Figure 1).

TABLE 1. METHOD OF RECOVERY AS INDICATED BY REPORT

Method	Shot	Trapped and killed	Found dead	Captured and released	Captured and kept	Broken wing	Broken leg & died	Caught and eaten	Not stated
No. of recoveries	17	3	7	4	5	1	1	2	15

TABLE 2. DISTANCES OF RECOVERIES FROM BANDING SITE

Distances in miles	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100	100-110	110-130	130-140	140-150	150-260	260-270
No. of recoveries	4	7	4	12	13	5	2	2	2	2	1	1	1	1	1	1

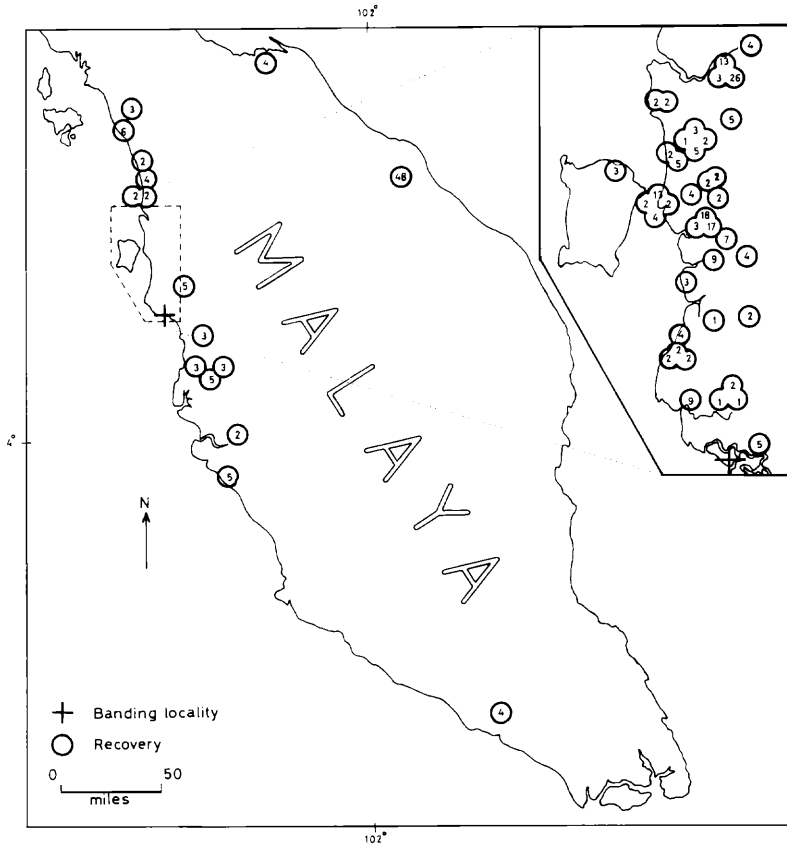
TABLE 3. INTERVAL BETWEEN BANDING AND RECOVERIES

Elapsed time (months)	1	2	3	4	5	6	7	8	9	13	17	18	26	48
No. of recoveries	3	17	9	8	8	1	1	0	2	2	1	1	1	1

TABLE 4. DATES OF BANDING AND RECOVERY, INDICATED BY CALENDAR MONTHS

Month	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
No. banded	0	0	0	0	0	0	0	0	858	2422	3279	891
No. of recoveries	13	13	5	4	3	0	1	0	0	1	4	11

Figure 1. Banding and recovery locations, showing elapsed time in months between banding and recovery.

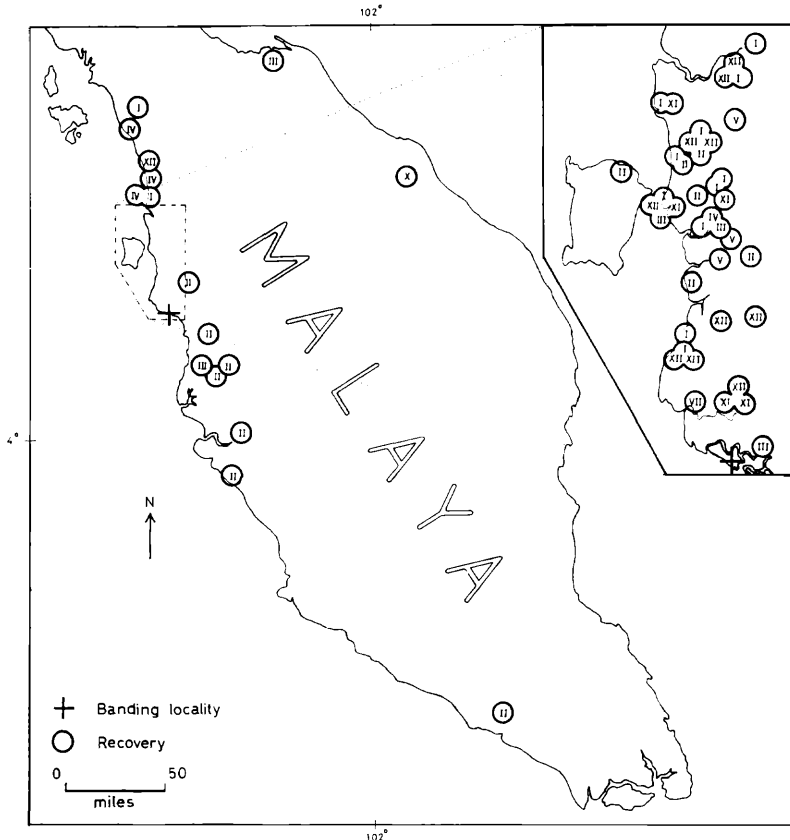


(3) *Elapsed time*

The longest interval between banding and recovery was 48 months. Few birds were recovered during the first month after banding. This delay can be attributed to the interval between banding and fledging. Immediately after fledging, however, the young birds were apparently naive and unduly susceptible to shooting or capture. 20 recoveries occurred within the first two months after banding, over half within three months and 84 per cent within six months (Table 3).

Only six birds were recovered more than one year after banding. Of these, four were taken from the lowlands of Province Wellesley at 31-42 miles from the nesting colony. The recovery at 26 months was in Kedah at a distance of 50 miles, and the recovery at 48 months was in Kelantan, across the peninsula on the east coast,

Figure 2. Banding and recovery locations, showing calendar month of recovery (I = January, XII = December, etc.).



138 miles from the nesting colony (Figure 1). On the other hand, the two most distant recoveries at 142 and 262 miles were made within 4 months after banding. Overall there is no correlation between distance and the time interval between banding and recovery.

(4) Date of recovery

All banding was carried out in the months of September-December. Recoveries, mostly of young birds (above), showed a corresponding peak in December through February (Table 4). The location of recoveries during and after the observed breeding season provides no evidence of migration or seasonal dispersion from the breeding site and subsequent return. Two birds were recovered at ages exceeding 24 months, presumably as sexually mature adults.

One of these, aged at least 26 months, was taken in January, *i.e.* at the end of the observed breeding season, only 50 miles from Bagan Sungei Burong; the other, 48 months after banding, was shot in Kelantan, 138 miles from the colony in October, the middle of the breeding season (Figure 2).

DISCUSSION

N. nycticorax is apparently a natural reservoir of the virus of Japanese B encephalitis in other countries (McClure, 1962). The disease is not prevalent in Malaya but, should it become so, knowledge of the dispersal movements of Black-crowned Night Herons would be valuable in charting likely areas of infection and in planning appropriate control measures.

Although the two birds recovered on the east coast must have crossed forested hills, the species has not been recorded in forest in Malaya. All recoveries of banded birds were reported from the lowlands, where in most cases rice-fields or swamp were specified by the finder.

The preponderance of young birds may be attributed to their naivety and consequent enhanced vulnerability to hunting or trapping by man in this habitat. It is noteworthy, however, that recoveries of banded nestlings of this species in both Japan and Taiwan show similarly high proportions of birds under six months old (respectively 81 percent and 83 percent; McClure, 1969). The effectiveness of man and man-made traps as compared with animal predators and natural hazards may not be greatly distorting. If this is so, these figures can be accepted as a relatively unbiased indication of natural age-specific mortality among night herons.

Most recoveries in Malaya occurred at distances that could be travelled by night herons in a few hours of flying, and are likely to be within the normal feeding range of birds roosting at Bagan Sungei Burong. The observations of Allen (1948) show that adults are present outside the breeding season. Many juveniles raised there probably continue to use the site as a daytime roost after fledging.

On the other hand, the few distant recoveries indicate that some juveniles disperse far from the breeding site within a short time of fledging. The range covered includes most suitable habitat in Malaya, and most localities from which the species has been recorded, except Singapore where it is a rare vagrant (Gibson-Hill, 1950). It is conceivable that other breeding colonies may yet be discovered in Malaya, but it is equally possible that the heronry at Bagan Sungei Burong is the only breeding site in the country.

Black-crowned Night Herons of the northern Palearctic are migratory (Vaurie, 1965). Among the Japanese population, from nestlings banded at a breeding colony at Shinhama (35° 40' N), overseas migrants have been recovered in Taiwan and the Philippines (McClure, 1969). Within Japan, recoveries indicated widespread local dispersal, with 53 percent of recovered young being taken to the north-east of the breeding site; those taken to the

south and south-west were at a greater distance, and presumed to have been on migration (McClure, 1969). The population in Taiwan (mean latitude of banding sites 25° N) has also been shown to be partially migratory. Of six recoveries, five were scattered over the island and one taken on Mindanao, Philippine Islands (McClure, 1969).

There is no evidence that migrants reach Malaya. In four years of netting night-flying migrants at Fraser's Hill radio tower in central Malaya, five species of small ardeids have been taken but no *Nycticorax* (Nisbet, 1968; Medway and Nisbet, 1968; Medway, Nisbet and Wells, 1968; Medway and Wells, 1970). Neither the direction of dispersal from Bagan Sungei Burong, nor the dates of recoveries, show evidence of migration or incipient migration within the equatorial region.

It is not known whether the birds reaching as far south as Johore or north to Patani would subsequently return to breed at their birth-place. The single recovery from Pulau Chondong, Kelantan, was killed during the breeding season (Appendix A). At an age of 4 years it is unlikely still to have been immature. Since breeding at Bagan Sungei Burong is evidently protracted, this bird might yet have nested earlier or (had it lived) later in the season. On the other hand, it may possibly have founded or joined a satellite colony on the east coast.

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APPENDIX A

RECOVERY DATA OF NIGHT HERONS BANDED IN WEST MALAYSIA. ALL BIRDS
BANDED AS NESTLINGS AT BAGAN SUNGAI BURONG, KUALA GULA
(4°52'N, 100°35'E)

Band No.	Banded (date)	Recovery Details		
		Date	Locality	Coordinates
110.00235	8 Oct 64	13 Nov 64	Butterworth, P.W.	5°25'N, 100°25'E
110.00236	8 Oct 64	early Jul 65	K. Kurau, Pk.	5°N, 100°28'E
110.00477	9 Oct 64	10 Feb 65	Parit, Pk.	4°30'N, 101°E
110.05123	17 Dec 64	14 Apr 65	Sg. Limau, Yen, Kd.	5°55'N, 100°20'E
110.05159	18 Dec 64	3 Mar 65	Bruas, Pk.	4°30'N, 100°50'E
110.05187	18 Dec 64	8 Jan 66	Seberang Prai, P.W.	5°23'N, 100°25'E
110.05299	29 Sep 66	11 Jan 67	Bedang, Kd.	5°43'N, 100°31'E
110.05390	8 Dec 64	7 Feb 65	Telok Anson, Pk.	4°0'N, 101°05'E
110.05409	18 Dec 64	4 May 65	Kg. Pinang Tunggal, Sg. Patani, Kd.	5°32'N, 100°30'E
110.05413	18 Dec 64	25 Feb 65	Jarak Atas, P.W.	5°15'N, 100°25'E
110.05427	18 Dec 64	28 Feb 65	20 mi. from Parit, Pk.	About 4°30'N, 101°E
110.05455	18 Dec 64	24 Feb 65	Padang Manora, Pg.	5°30'N, 100°20'E
110.05528	30 Sep 66	21 Nov 66	Sg. Mas, Kota Kuala Muda, Kd.	4°52'N, 100°23'E
110.05542	30 Sep 66	Feb 67	Sg. Besar, Sel.	3°40'N, 100°55'E
110.05752	26 Sep 65	3 Feb 66	Bumbong Lima, P.W.	5°34'N, 100°24'E
110.0577?	29 Sep 66	21 Jan 67	Sg. Acheh, Nibong Tebal, P.W.	5°10'N, 100°25'E
110.05795	29 Sep 66	31 May 67	Simpang Ampat, P.W.	5°15'N, 100°25'E
110.06571	1 Oct 66	6 Nov 66	Prai, P.W.	5°23'N, 100°23'E
110.06627	24 Nov 66	20 Feb 67	Padang Rangas, Pk.	4°46'N, 100°51'E
110.06844	30 Sep 66	7 Dec 66	Sg. Patani, Kd.	5°38'N, 100°30'E
110.07191	14 Oct. 66	6 Feb 67	Junjong, Kd.	5°18'N, 100°32'E
110.07210	17 Oct 66	11 Dec 66	Prai, P.W.	5°24'N, 100°25'E
110.07259	28 Oct 66	4 Dec 66	Titi Serong, Parit Buntar, Pk.	5°06'N, 100°27'E
110.07471	30 Nov 66	4 Jan 67	Kula Muda, Kd.	5°35'N, 100°22'E
110.07479	30 Nov 66	6 Jan 67	Parit Buntar, Pk.	5°13'N, 100°35'E
110.10119	2 Dec 66	22 Dec 69	Sg. Patani, Kd.	5°40'N, 100°25'E
110.11224	3 Oct 67	19 Feb 68	Kepala Batas, P.W.	5°10'N, 100°30'E

APPENDIX A — Continued

Band No.	Banded (date)	Recovery details		
		Date	Locality	coordinates
110.11717	4 Oct 67	27 Feb 68	Bandar Bharu, Kd.	5°10'N, 100°40'E
110.12433	31 Oct 67	15 Feb 68	Batu Pahat, Joh.	1°50'N, 102°55'E
110.12481	30 Oct 67	5 Feb 68	Prai, P.W.	5°25'N, 100°25'E
110.12918	1 Nov 67	1 Dec 67	Kepala Batas, P.W.	5°25'N, 100°25'E
110.12964	1 Nov 67	16 Dec 67	Parit Buntar, Pk.	5°07'N, 100°25'E
110.12979	16 Nov 67	27 Apr 69	Bt. Mertajam, P.W.	5°20'N, 100°25'E
120.00031	4 Nov 64	Jan 65	Yen Besar, Kd.	5°48'N, 100°25'E
120.00048	4 Nov 64	Dec 65	Nibong Tebal, P.W.	5°10'N, 100°25'E
120.00140	4 Nov 64	31 Mar 65	Selinsing, Pk.	4°50'N, 100°25'E
120.00157	4 Nov 64	22 Apr 65	Kg. Sanglang, Kd.	6°15'N, 100°12'E
120.00161	4 Nov 64	Oct 68	Pulai Chondong, Kel.	5°56'N, 102°14'E
X.000178	1 Nov 67	12 Jan 68	Kaugar, Ps.	6°26'N, 100°17'E
X.000247	2 Nov 67	8 May 68	Bt. Mertajam, P.W.	5°20'N, 100°29'E
X.000259	2 Nov 67	10 Jan 68	Sg. Dua, P.W.	5°31'N, 100°26'E
X.000302	2 Nov 67	13 Nov 67	Masjid Tinggi, Pk.	5°0'N, 100°30'E
X.000524	15 Nov 67	3 Jan 70	Sg. Patani, Kd.	5°40'N, 100°25'E
X.000554	15 Nov 67	3 Mar 68	Pujud, Patani, Thai- land	6°45'N, 101°15'E
X.000640	16 Nov 67	24 Mar 69	Bt. Mertajam, P.W.	5°20'N, 100°25'E
X.000851	16 Nov 67	6 Jan 68	Seberang Prai, P.W.	5°29'N, 100°23'E
X.000853	16 Nov 67	8 Jan 68	Sg. Dua, P.W.	5°27'N, 100°26'E
X.000858	16 Nov 67	5 Jan 68	Sg. Dua, P.W.	5°27'N, 100°26'E
X.000859	16 Nov 67	25 Dec 67	Ulu Bandar, Kd.	5°10'N, 100°33'E
X.000946	17 Nov 67	24 Jan 68	Bt. Mertajam, P.W.	5°23'N, 100°27'E
X.00094?	17 Nov 67	14 Mar 68	Masjid Timah, Prai, P.W.	5°23'N, 100°25'E
X.000986	17 Nov 67	4 Apr 68	Yen, Kd.	5°43'N, 100°23'E
X.001057	17 Nov 67	19 Dec 67	Bagan Serai, Pk.	5°01'N, 100°32'E
X.003029	6 Nov 68	19 Dec 68	Seberang Prai, P.W.	5°32'N, 100°27'E
X.003764	8 Nov 68	23 Dec 68	Kuala Sg. Semut, Kd.	5°58'N, 100°21'E

Abbreviations: } Joh. = Johore; Kd. = Kedah; Kel. = Kelantan;
of States } Pk. = Perak; Pg. = Penang; Ps. = Perlis; P.W. = Province
} Wellesley; Sel. = Selangor.

Other abbreviations: Bt. = Bukit; K. = Kuala; Kg. = Kampong
Sg. = Sungei.

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SEX AND AGE CRITERIA IN THE SLATE-COLORED JUNCO

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INTRODUCTION

The Slate-colored Junco (*Junco hyemalis*) has always been a difficult species for bird banders to sex and age (Blake, 1962, 1964, 1967; Wood, 1969). The characters most used to sex and age the Slate-colored Junco are: (1) the color of the iris, (2) the length of the wing chord, (3) ossification of the skull, and (4) the degree of brownness (or lack of brownness) in the plumage. These characters vary from specimen to specimen, both between and within sexes and ages, and no dependable methods for sexing and ageing all live Slate-colored Juncos have yet been devised.

The objective of the present study was to examine the sex and age characteristics of the Slate-colored Junco in late Fall and Winter in a southern part of its wintering range—at Raleigh, North Carolina.

METHODS AND MATERIALS

Seventy-one specimens were collected on the Dorothea Dix farms near Raleigh, North Carolina, between late November 1968 and late February 1969. These specimens were all prepared as study skins, but the skulls were removed and kept separate (Grant, 1971). All measurements of the length of the chord of the folded wing were in millimeters. The plumage colors were objectively judged as: no brown, trace of brown, slight brown, somewhat brown, rather brown, quite brown, and very brown, and are those used by Blake (1964).

The iris of immature birds is gray usually until the October after hatching and is the most reliable age criterion, according to Blake (1962). Few Slate-colored Juncos arrive in North Carolina before November; therefore, iris color as the method of ageing is of no value in the southern portion of its wintering range.

The amount of white in the outer rectrices was not measured in