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HEMATOZOA FROM MONTANE FOREST BIRDS IN PAPUA NEW GUINEA

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ABSTRACT: Blood smears were examined from 141 montane forest birds of 45 species in southeastern Papua New Guinea. *Haemoproteus* spp. occurred in 46 (32.6%), *Leucocytozoon fringillinarum* Woodcock, 1910 in five, *Trypanosoma* sp. in one and *Haemogregarina* sp. in one. Intensity of infection by *Haemoproteus* was highest in those avian species and families with the highest prevalence; increasing altitude had no demonstrable effect on the prevalence of *Haemoproteus* spp.

INTRODUCTION

A considerable amount has been learned in recent years concerning the prevalence of hematozoa in birds in Southeast Asia (McClure et al., 1978). There is, however, only one report on the blood parasites of birds in Papua New Guinea (Ewers, 1967), and only one report from the neighboring Solomon Islands (Laird and Laird, 1959). This paper presents the results of a study of prevalence and intensity of blood parasites in a population of montane forest birds in Morobe Province, southeastern Papua New Guinea.

MATERIALS AND METHODS

The study was conducted on Mt. Kaindi (2,362 m) and Mt. Missim (2,839 m) south and northeast of Wau (7°22'S, 146°40'E). These two mountains are separated by the valley of the Bulolo River, approximately 1,000 m. Birds were caught in mist-nets set up at four sites on Mt. Kaindi: 1) cultivated ground and coffee plantation at 1,350 m, 2) mid-montane forest dominated by *Castanopsis* spp. and *Elaeocarpus* spp. at Kunai Creek, 1,450 m, 3) similar vegetation at 1,850 m, 4) upper montane forest dominated by *Nothofagus* spp. on Mt. Kaindi south summit, 2,360 m (Gressitt and Nadkarni, 1978). In addition, birds were caught at approximately 2,050 m on Mt. Missim. Nets were set from dawn for a period of about 5 hr between 27 December 1981 and 27 January 1982. One or more thin blood smears were made from a toe clipping; the slides were air-dried and fixed in 100% ethanol within 6 hr and were stored at low humidity until being stained with Giemsa 2–5 wk after collection. Slides were examined using an Olympus BA 211 microscope for 15 min with the 40× objective and for a minimum of 15 min under oil immersion. Avian nomenclature follows that of Rand and Gilliard (1967).

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RESULTS

Blood smears were collected from 141 birds of 45 species, from 15 families. All were in the Order Passeriformes with the exception of three columbiform species and one cuckoo. Forty-six birds (32.6%) of 17 species harbored mature gametocytes of *Haemoproteus* spp., and one species (*Heteromyias albospecularis* Salvadori) contained immature gametocytes (Table 1). *Haemoproteus zosteropis* (Chavrarty and Kar, 1945) Bennett and Peirce, 1981 was identified from *Zosterops novaeguineae* Salvadori, *Haemoproteus columbae* Kruse, 1890 from *Macropygia nigrirostris* Salvadori and *Haemoproteus passeris* Kruse, 1890 from *Erythrura papuana* Hartert and *E. trichroa* (Kittlitz). Immature forms that could not be distinguished from *Plasmodium* spp. occurred in two of the three muscicapid infections (*Rhipidura rufiventris* (Vieillot) and *Tregellasia leucops* (Salvadori)) and in the single pachycephalid infection, *Pitohui dichrous* (Bonaparte).

All birds in four of the five species of Dicaeidae were infected with *Haemoproteus* spp. ($n = 18$), and so were all *Amblyornis macgregoriae* De Vis ($n = 5$) and

TABLE 1. Prevalence and intensity of infection of birds in Papua New Guinea with *Haemoproteus* and *Leucocytozoon* spp.

Host species	No. examined	No. infected	Intensity[a]
Columbidae			
Macropygia nigrirostris Salvadori	1	1	31
Muscicapidae			
Heteromyias albospecularis Salvadori	1	1 (1)[b]	6 (4)
Paradisaeidae			
Diphyllodes magnificus (Pennant)	2	1 (1)	2 (1)
Ptilorhynchidae			
Amblyornis macgregoriae De Vis	5	5	1; 3; 6; 10; 41
Meliphagidae			
Melilestes megarhynchus (Gray)	2	1	1
Oedistoma iliolophum (Salvadori)	1	1 (1)	4 (1)
Myzomela rosenbergii Schlegel	1	1	12
Meliphaga analoga group (Reichenbach)	8	1	1
Melipotes fumigatus Meyer	3	3	6; 23; 58
Ptiloprora guisei (De Vis)	3	1	12
Melidectes torquatus Sclater	1	1 (1)	1 (1)
Dicaeidae			
Melanocharis longicauda Salvadori	1	1	102
M. versteri (Finsch)	7	7	4; 7; 8; 22; 35; 98; 280
M. striativentris Salvadori	7	7	8; 8; 10; 30; 74; 80; 82
Rhamphocharis crassirostris Salvadori	3	3	16; 18; 350
Zosteropidae			
Z. novaeguineae Salvadori	7	7	1; 1; 2; 3; 9; 43; 136
Estrildidae			
Erythrura trichroa (Kittlitz)	3	1 (1)	7 (ca. 500)
E. papuana Hartert	3	3	1; 1; 24

[a] Number of infected cells per 10^4 erythrocytes.

[b] Figures in parentheses indicate values for *Leucocytozoon*.

No *Haemoproteus* infections were recorded in the following birds: Columbidae: *Ptilinopus rivoli* (Prévost) (1), *Gallicolumba beccarii* (Salvadori) (1); Cuculidae: *Chrysococcyx meyerii* Salvadori (1); Turdidae: *Amalocichla incerta* (Salvadori) (1); Orthonychidae: *Eupetes leucostictus* Sclater (2); Maluridae: *Clytomyias insignis* Sharpe (1); Acanthizidae: *Sericornis perspicillatus* Salvadori (2), *S. papuensis* (De Vis) (1), *S. nouhuysi* Van Oort (5); Sylviidae: *Phylloscopus trivirgatus* (Strickland) (4); Muscicapidae: *Rhipidura brachyrhyncha* Schlegel (1), *R. rufiventris* (Vieillot) (1), *Eugerygone rubra* (Sharpe) (2), *Microeca papuana* Meyer (4), *Tregellasia leucops* (Salvadori) (4), *Peneothello cyanus* (Salvadori) (4); Pachycephalidae: *Pachycephala leucostigma* Salvadori (3), *P. soror* Sclater (3), *P. schlegelii* Schlegel (5), *Colluricincla megarhyncha* (Quoy and Gaimard) (7), *Pitohui dichrous* (Bonaparte) (2), *P. nigrescens* (Schlegel) (1); Ptilorhynchidae: *Ailuroedus melanotis* (Paykull) (1); Neosittidae: *Climacteris placens* Sclater (1); Meliphagidae: *Toxorhamphus poliopterus* (Sharpe) (16); Dicaeidae: *Oreocharis arfaki* (Meyer) (4); Zosteropidae: *Zosterops atrifrons* (Meyer) (4).

all *Zosterops novaeguineae* ($n = 7$). On the other hand no infections were recorded in the Acanthizidae ($n = 8$), and no mature infections in Pachycephalidae ($n = 21$). Most infections were of low intensity; 52% of infected birds contained less than 10 infected cells per 10^4 erythrocytes. All infections with more than 40 parasites per 10^4 erythrocytes occurred in those species with high prevalences of infection (*A.*

macgregoriae, *Melipotes fumigatus* Meyer, *Melanocharis versteri* (Finsch), *M. striativentris* Salvadori, *Rhamphocharis crassirostris* Salvadori and *Z. novaeguineae*), most noticeably in Dicaeidae.

There was no demonstrable difference in prevalence of *Haemoproteus* spp. infection between the sites in *Elaeocarpus* and *Castanopsis* forests at 1,450 m and 1,850 m and in *Nothofagus*-dominated forest at 2,360 m.

Leucocytozoon parasites were seen in the blood smears from five birds (Table 1). All were rounded forms and conformed to the description of *L. fringillinarum* Woodcock, 1910. The heavily infected *E. trichroa* was caught on the edge of a coffee plantation and a cultivated garden at 1,350 m; the other four were in undisturbed forest up to 1,850 m. All infections of *Leucocytozoon* occurred concurrently with *Haemoproteus* spp. infections.

A single large trypanosome, referrable morphologically to the *Trypanosoma avium* complex (Danilewsky, 1885) Laveran, 1903 was found in the blood of one specimen of *H. albospecularis*, collected at 2,050 m on Mt. Missim. This infection occurred concurrently with *Haemoproteus* sp. and with *L. fringillinarum*.

Haemogregarina sp. occurred in one smear from *Sericornis perspicillatus* Salvadori, collected at 2,360 m. The infection consisted of a single group of eight extracellular radiating spindle-shaped merozoites, approximately 8 μm in length and 1 μm wide with deeply-staining nuclear material occupying the central third of each organism. Parasites were not detected in two other smears made from the same bird.

Accessions: Identified specimens have been deposited at the International Reference Centre for Avian Haematozoa, Memorial University of Newfoundland, St. Johns: *Haemoproteus zosteropis* from *Zosterops novaeguineae*—94987, *Haemoproteus columbae* from *Macropygia nigrirostris*—94988, *Haemoproteus passeris* and *Leucocytozoon fringillinarum* from *Erythrura trichroa*—94989.

DISCUSSION

The overall prevalence of *Haemoproteus* spp. (32.6%) was similar to that of 31.3% for *Haemoproteus/Plasmodium* from the Sepik valley (Ewers, 1967). The high species diversity and the problems of mist-netting in tropical rain forests precluded the collection of large samples of any one species, and it is difficult to make valid comparisons on host-susceptibility to *Haemoproteus* spp. Nonetheless, in the best represented families, the high prevalence and intensity in Dicaeidae (18/22 infected) contrasted with the prevalence in Pachycephalidae (no mature gametocytes in 21 hosts), Muscicapidae (one with mature gametocytes in 24 hosts) and Meliphagidae (9/35 infected); the prevalence in the latter family is similar to that recorded from the Sepik Valley (10/38) by Ewers (1967). Larger samples are needed before conclusions can be drawn regarding host susceptibility at a generic or species level.

The absence of any demonstrable altitudinal effect on *Haemoproteus* prevalence between 1,450 m and 2,360 m was probably due to the altitudinal range of the host species collected. Of the 10 species infected with *Haemoproteus* which were collected above 2,000 m, five occurred at altitudes below 1,450 m and only two (*H. albospecularis* and *Ptiloprora guisei* (De Vis)) were confined to altitudes above 1,900 m (Beehler, 1978).

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BOOK REVIEW . . .

Pathobiology of Marine Mammal Diseases (2 vol.), Edwin B. Howard, ed. CRC Press, 2000 Corporate Boulevard, N.W., Boca Raton, Florida 33431, USA. 1983. Vol. 1—238 pp.; Vol. 2—233 pp. Each volume priced at $68.00 (US) in USA, $78.00 (US) outside USA.

The announcement that a book was being prepared on the diseases of marine mammals was welcomed by many working in this area. There was a need; and unfortunately there still is a need, as the present effort does not fill the void.

The publication consists of two volumes, hardbound and printed on good quality paper. There are nine contributors. Volume 1 contains five chapters, the first chapter is an introduction and probably is supposed to take the place of a preface. The first volume contains 238 pages of which 172 are photographs. Volume 2 contains six chapters, 233 pages, of which 148 pages are photographs. Together, pages of photographs make up to 68% of the volumes.

If a photograph is worth a thousand words, one would expect to find a wealth of information because of them. Not so. The many photographs are mostly of poor quality, some unnecessary, and some irrelevant. There is complete disregard for the economy of space as a large number of the pages are half-blank. Some photomicrographs have magnifications, most do not. The poor reproduction of some of them is probably the result of black-and-white reproductions from colored transparencies.

There are many typographical errors, misspelled names of authors and animals, use of non-words ("irregardless"), a tendency towards pomposity—e.g., "that some atavistic impulse triggered by a gallimaufry of possible etiologies." The text is poorly referenced and in some instances there seems to have been very little attempt to review pertinent literature. The editing is poor.

The cost of the volumes is prohibitive. Even though there are some good sections, these volumes cannot be recommended.

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