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First Report of *Haemoproteus* sp. in Hill Mynah Blood in Thailand

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Abstract: Avian haemosporidian, *Haemoproteus* sp., which was a common avian blood parasite, was examined in 30 Hill Mynahs *Gracula religiosa intermedia*. Asexual reproduction found in avian host consisted of schizogony in the tissues and gametocytes which were the only stage found in the red blood cells of birds. The mature gametocyte encircled the erythrocyte nucleus to form a halter-shaped appearance. Results showed that there were only three infected birds. Both macrogametocytes and microgametocytes were recognized. However, further studies on taxonomy of both parasite and vector, together with the relationships among host, vector and parasite are necessary. The finding from this study is hoped to urge a serious investigation of haemosporidian parasites in tropical birds.

Key words: *Haemoproteus* sp., macrogametocytes, microgametocytes

Introduction

In surveying the parasitological literature, it is found that every species of bird studied was a host or was infected with at least one, and often several species of parasites (Janovy, 1997). Haemosporidian parasites are common blood parasites of reptiles, birds, and mammals with some stages of development in both the tissues and the circulating blood cells of infected hosts (Garnham, 1966). Avian haemosporidian, *Haemoproteus* sp. which is the most common genus encountered has been reported in about 67% of infected bird species (Bennett *et al*., 1982). *Haemoproteus* that occurs in birds, is usually found in the peripheral blood of hosts as asexual development. The intermediate hosts or vectors are bloodsucking insects such as the hippoboscid or louse fly in which the sexual development of the parasite occurs. *Haemoproteus* can possibly occur in samples of avian blood from anywhere in the world (Atkinson and van Riper III, 1991; Burry-Caines and Bennett, 1992). They had been found and reported in many avian species (Bennett *et al*., 1994) but not in Hill Mynahs. Evidentially, this paper is the first time ever of reporting *Haemoproteus* sp. in Hill Mynah blood in Thailand.

Materials and Methods

Blood was drawn from wing veins of 30 Hill Mynahs, the northern race, *Gracula religiosa intermedia* (Archawaranon, 2002a). These birds were kept in five outdoor aviaries, 4 x 5 x 3 m^3 in dimension, six birds per aviary, provided with food, water, small houses and perches, at the Zoological Research Station, Ramkhamhaeng University, Bangna Campus, Bangkok, Thailand (Archawaranon, 2002b). A drop of blood was smeared on slide, air-dried and fixed in absolute methanol. The blood smear was stained with Wright's stain. Asexual reproduction which occurs in avian hosts exhibited schizogony in the tissues and gametocytes in the red blood cells of birds. *Haemoproteus* was diagnosed by the presence of pigmented intraerythrocytic gametocytes. Then, the gametocytes were checked under the light microscope and photographed. The mature gametocyte encircled the erythrocyte nucleus to form a halter-shaped look and occupied over a half of the erythrocyte cytoplasm. Macrogametocytes (female) had pigment granules dispersed throughout the cytoplasm while microgametocytes (male) had them clustered into a mass.

Results

Only three out of 30 Hill Mynahs (10%) were infected. The gametocytes were sharply defined in the cytoplasm of erythrocytes but not numerous. A macrogametocyte (Fig. 1) had pigment granules more dispersed throughout the cytoplasm. A microgametocyte (Fig. 2) stained pale blue and had pigment granules gathered into a mass. The significant appearance of gametocyte was the encirclement of gametocyte around the nucleus of the erythrocyte to form a halter-shaped configuration. However, the result of this study showed that there was less than 1% of erythrocytes which had gametocytes in the cytoplasm in an infected bird.

Discussion

There were a number of reports on *Haemoproteus* in many other avian species including pigeons and doves (Ahmed and Mohammed, 1977), rallids (Bennett, 1980), ducks and geese (Williams and Bennett, 1980), red-winged blackbird (Hood and Welch, 1980), barbets (Bennett and Nandi, 1981), South-east Asian parakeets (Miltgen *et al*., 1981), domestic turkeys (Atkinson *et al*., 1986), bulbuls (Rahal *et al*., 1987), tufted titmouse, white-breasted nuthatch (Bennett, 1989), Indian birds (Bennett, 1990), wild turkeys (Fedynich and Rhodes,

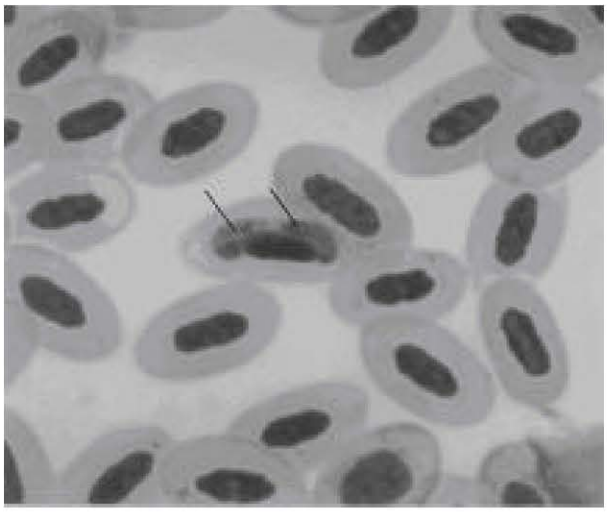

Fig. 1: *Haemoproteus* sp. macrogametocyte from a Hill Mynah

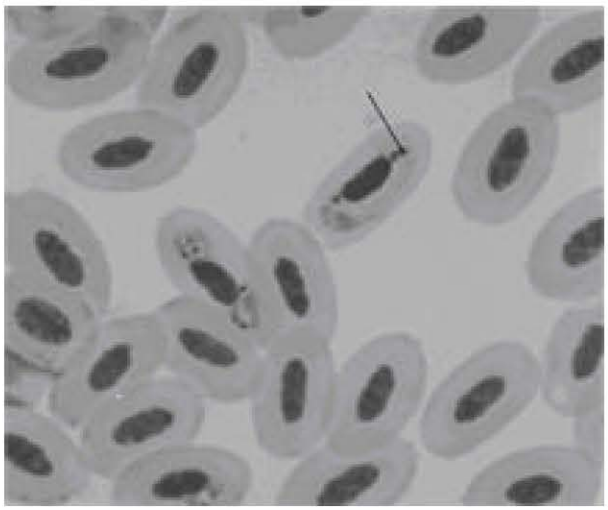

Fig. 2: *Haemoproteus* sp. microgametocyte from a Hill Mynah.

1995), wild doves (Adriano and Cordeiro, 2001) and birds of prey and owls (Krone *et al.*, 2001) but none on Hill Mynahs. However, this was the first time of finding *Haemoproteus* in Hill Mynahs blood in Thailand.

Previous studies revealed that bloodsucking vectors transmitted the worm-like infective stage, the sporozoite, into the avian hosts by salivary gland secretion. After entering the bloodstream, sporozoites invaded the tissues and developed asexual reproduction (schizogony) to form numerous merozoites. Merozoites then intruded upon circulating blood cells, developed (gametogony) into male (micro-) or female (macro-) gametocytes that were infective to other bloodsucking arthropods. Microgametocytes produced threadlike, flagellated microgametes which fertilized larger spherical macrogametes in the midgut of the insects. This process of sexual reproduction produced a fertile zygote which quickly differentiated into ookinetes and developed into oocytes. Oocytes underwent asexual reproduction (sporogony) to produce a lot of elongate sporozoites and were ready to enter a new avian host. Therefore, it was the only stage of developing gametocytes found in the avian circulating blood cells. *Haemoproteus* was diagnosed by the presence of pigmented intraerythrocytic gametocytes and the absence of schizonts in the peripheral blood (Campbell, 1988).

Various species of *Haemoproteus* are the most common haemosporidians encountered in wild birds and have been believed for a long time to be the least pathogenic. Although it was generally agreed that anemia, anorexia and depression were a serious consequence of *Haemoproteus* infection such as in pigeons and quails (Campbell, 1988), there was no evidence of anemia in domestic turkeys with experimented infections of *H. meleagridis* (Atkinson *et al.*, 1988). From my study, birds did not show any symptom of illness. Research on the pathogenicity and epizootiology of *Haemoproteus* indicated that it had a considerable impact on non-immune, juvenile birds especially during abnormal environmental conditions such as high rainfall and a large number of vector population. Besides, *Haemoproteus* might persist for years (Atkinson and van Riper III, 1991) and perhaps for the life time of infected birds (Ahmed and Mohammed, 1978).

Taxonomic confusion still surrounds the haemoproteids of avian species. The haemoproteids of many bird species, therefore, require a re-description or review (Bennett *et al.*, 1994). Most species of *Haemoproteus* are relatively host-specific and restricted to closely related host family (Atkinson, 1986). The pre-erythrocytic development of *Haemoproteus* sp. is still poorly understood. Few suitable or effective experimental models are available. These parasites are also difficult to transmit experimentally because few vectors are known and it is rarely successful in passaging by blood and tissue inoculation (Atkinson and van Riper III, 1991). Most work has been based on histological examination of tissue from naturally infected birds (Mohammed, 1965; Miltgen *et al.*, 1981). The haemoproteid from Hill Mynahs in my study should be further described. Moreover, it is necessary to reveal host-vector-parasite relationships. A long term study within the bird population is essential in order to disclose seasonal variation in parasite prevalence, vector density and age of infection such as in the nesting area. Hopefully, the finding from this study will be attended by a serious investigation of haemosporidian parasites in tropical birds.

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