Blood parasites in diurnal raptors: morphology, ultrastructure and molecular characterizations

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During January 2012 to December 2017, there were 194 diurnal raptors (22 species) submitted to the Kasetsart University Raptor Rehabilitation Unit (KURRU). Blood samples were collected from jugular vein, using EDTA tubes, and were prepared for parasite morphological, ultrastructural and molecular studies for the bird's health care. Cytochrome *b* (cyt*b*) of mitochondrial DNA of the avian malaria (Cosgrove, et al. 2006) and 18S rRNA gene of trypanosome (Sehgal et al. 2001) were amplified by nested PCR using specific primers designed in a previous report in all blood samples. Four species of blood parasites (BP) were detected. *Plasmodium* were detected in 2 Shikras, 1 crested goshawk under light microscope but the polymerase chain reaction (PCR) showed more 4 positive sequences including 1 Brahminy kite (BK), 1 Himalayan griffon vulture (HGV), 1 honey buzzard (HB) and 1 Cinereous vulture (CV). Microscopic examination revealed *Haemoproteus* gametocytes in 5 birds including 1 black - shouldered kite (BSK), 3 Blyth's hawk-eagles (BHE), and a Shikra. PCR could detect *Haemoproteus* in a Grey-faced buzzard (GFB), and a changeable hawk-eagle (CHE). Leucocytozoids were detected in only 2 crested goshawks (CG, 1.0%). *Trypanosome*s were detected in plasma of only 5 birds (2.6%). Co-infection with *Plasmodium* and trypanosome was recorded in one Shikra.

Overall prevalence of BP in diurnal raptors (20/194, 10.3%) was much less than those found in nocturnal raptors (60/163, 36.8%). Morphology and ultrastructure of all blood parasites were summarized and compared to those found in nocturnal raptors of the KURRU. Phylogenetic tree of cyt*b* analysis showed *Plasmodium* in 2 Shikras and a BK were *P. circumflexum* and that from a CV was similar to *P. ashfordi*. *Plasmodium* isolates from a HGV and a HB were 97.5% similarity to *P. circumflexum* from a Shikra*. Haemoproteus* in one BHE was 100% identical to sequences from BSK, CHE and GFB. The cyt*b* gene sequences of 7 *Haemoproteus* were grouped in the same evolution group and similar to those of owls in Asia and Europe. Based on microscopy, *Leucocytozoon* in 2 CGs were identified as *L. toddi.* But molecular study revealed that they were more closely related to unknown species in diurnal raptors: a common buzzard and *L. californicus*. This evidence suggested that the species might be a new species of leucocytozoids or may be subspecies of *L. californicus*. Morphology and 18S rRNA gene analysis revealed that all 5 trypanosome sequences were *T. corvi*. These results of BP may be useful for clinical evaluations of diurnal raptors for conservation.

References

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