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Brief report

Absence of haematozoa in passerines from a Norwegian archipelago

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In 1982, Hamilton and Zuk proposed a novel theory of sexual selection, based on female choice for male secondary sexual characters which reveal the health or infection status of their bearer. Their hypothesis was supported by an interspecifc positive correlation between plumage brightness and haematozoan prevalence, but has since been criticised as relying upon a desultory haematozoan sampling regime with respect to host sample sizes and locations (reviewed in Møller 1990).

We attempted to test the Hamilton and Zuk hypothesis intraspecifically during an investigation into the breeding ecology and differential reproductive success of the House Sparrow (*Passer domesticus*). The study was undertaken during the spring and summer of 1994 on a coastal archipelago ('Helgeland') in northern Norway (66.3°N, 5.4°E).

Blood smears were taken from adult and juvenile House Sparrows caught in mist nets, and from nestlings known from our nest visitation schedule to be around 10 days of age. Blood was obtained following brachial venipuncture, smeared, and air dried in the field.

All House Sparrows were marked with an individual combination of a single coded metal ring (issued by the Norwegian Museum of Natural History, Stavanger) and two or three plastic colour rings. During the study, blood smears were also taken from any non-target species of bird accidentally caught while mist netting. To prevent pseudo-replication, a small square was drawn upon the rear of both tarsi of these birds using a permanent marker pen (effective for the duration of the field season, *pers. obs.*). All birds smeared were sexed and aged wherever possible (Svensson 1984).

The blood smears were fixed in 100% ethanol for two minutes, and thoroughly air dried. Smears were stained (after completion of the fieldwork) in Giemsa's solution for 30 minutes (strength 1: 10; pH 7.2). The long delay (up to three months) between fixation and staining did not appear to affect either the morphology of the blood cells or the penetration of the stain.

Smears were screened microscopically (by IRKS) using a × 40 objective lens for leucocytozoids and haemoproteids, and a × 100 lens under oil immersion for plasmodiids (Weatherhead & Bennett 1991). Nestling smears were scanned for one minute using × 40 power and then examined for an arbitrary period of five minutes using × 100 power (modified from van Riper et al. 1986). Smears from adults were examined for five min-

utes under each magnification. The number of fields examined during five-minute periods averaged 30 using × 40 power, and 80 using × 100 power. Davidar and Morton (1976) considered these levels to be sufficient to classify smears as negative.

At least one blood smear was examined from each of the following birds: 452 House Sparrows (of which 294 were nestlings), eight Starlings (*Sturnus vulgaris*), three Fieldfares (*Turdus pilaris*), two Redwings (*Turdus iliacus*), 12 Redpolls (*Acanthis flammea*), seven Pied Wagtails (*Motacilla alba yarelli*), five Willow Warblers (*Phylloscopus trochilus*), five Wheatears (*Oenanthe oenanthe*), two Red Crossbills (*Loxia curvirostra*), five Meadow Pipits (*Anthus pratensis*), two Rock Pipits (*Anthus spinoletta*), 39 Bramblings (*Fringilla montifringilla*) and one Blackcap (*Sylvia atricapilla*).

No haematozoa could be detected.

As the study was carried out during the host's breeding season, blood parasite levels, for several reasons, should theoretically have been maximal. Adults may suffer a relapse of chronic infections due to the energetic costs of reproduction (Atkinson & van Riper 1991) and/or the immunosuppressive effects of sexual hormones (Folstad & Karter 1992). Vector populations and thus host exposure also increase during the summer (Møller 1994). Hence, the inability to detect haematozoa in breeding birds suggests that Helgeland birds are genuinely uninfected by these parasites.

Published studies reporting an absence of haematozoa are relatively rare (e.g. Figuerola et al. 1996, Rytkönen et al. 1996, Gonzalez-Solis & Abella 1997), although this almost certainly underestimates the number of studies which produced negative results. Three possible scenarios have been proposed to explain negative records.

Earlé and Underhill (1993) attributed the absence of blood parasites in waders (Charadriiformes) breeding on the Arctic tundra to insufficient evolutionary time for the host–vector–parasite cycle to become established.

This would not explain the absence of haematozoa in Helgeland. It may be significant that the House Sparrow has followed an unnatural process of colonisation, spreading northwards into this region during the 19th century following several mid-European introductions (Summers-Smith 1988). However, the other passerine species sampled here are not recent additions to the local avifauna, and there is no reason to presume only a brief evolutionary association with this habitat. Furthermore, Eide et al. (1969) recorded considerable prevalences of haematozoa from several of these bird species on mainland Norway.

A subsequent failure to detect haematozoa in the Kentish Plover *Charadrius alexandrius* in southern Europe, led Figuerola et al. (1995) to suggest waders in general may possess an inherently high resistance to haematozoa, irrespective of breeding latitude.

With the exception of the Starling, however, haematozoa have been recorded from each of the species sampled here (Peirce 1981), including the House Sparrow, which would imply that none possess any particular species-specific freedom from blood parasitism.

Bennett et al. (1995) examined the haematozoan communities of three populations of a single host species, the pied flycatcher. Parasite arrays varied considerably between populations, with a notable absence of *Leucocytozoon* and *Trypanosoma* at one site. This was attributed to a lack of local breeding sites for the appropriate vector.

A deficiency of vectors is unlikely to account for the absence reported here. Regarding House Sparrows on Helgeland specifically, haematophagous mites (Acari: Acarina), fleas (Insecta: Siphonaptera) and flat-flies (Diptera: Hippoboscidae) were regularly found both on the birds and in their nests. Strong evidence (from other host species) indicts both fleas (Allander & Bennett 1994) and hippoboscids (Baker 1975) as vectors of avian haematozoa, and mites could equally plausibly act in such a capacity (Greiner et al. 1975).

Furthermore, despite the northern latitude, the archipelago is reasonably lush in vegetation, with diverse habitats such as clear running streams, wooded marshes and grassland ponds. These would be ideal development sites for the larvae of blackflies (Diptera: Simuliidae), mosquitoes (Diptera: Culicidae) and midges (Diptera: Ceratopogonidae) (Greiner et al. 1975). The summer climate is mild, and the abundance of human-biting midges suggests environmental variables *per se* do not preclude the presence of volant insect vectors.

Therefore, none of the three main hypotheses seems to explain the apparent freedom from

haematozoa reported in Helgeland passerines. This report adds to the burgeoning literature on avian haematozoa, and emphasizes the warning of Bennett et al.(1995) that haematozoan infections are not a property of the species alone.

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Selostus: **Veriloisien esiintyminen Norjan saariston varpuslinnuilla**

Kirjoittajat tutkivat veriloisten esiintymistä varpuslinnuilla pesimäaikaan pohjoisnorjalaisessa saaristossa. Verinäyte otettiin yhteensä 452 varpuselta, joista 294 oli pesäpoikasta, ja 89 muulta linnulta 12 lajista. Yhtään veriloista ei tässä tutkimuksessa löydetty. Kirjoittajat käyvät läpi mahdolliset syyt loisien puuttumiseen, ja toteavat, ettei yksikään aikaisemmin kirjallisuudessa esitetty hypoteesi päde tähän tutkimukseen. Veriloisia on löydetty lähes kaikilta tässä tutkimuksessa mukana olleiden lajien muista populaatioista. Tämä sulkee pois sen mahdollisuuden, ettei näille lajeille olisi jostain syystä kehittynyt veriloisia ja että kyseiset lajit olisivat vastustuskykyisiä veriloisille. Saarilla esiintyy todistettavasti loisten kantajia, punkkeja, kirppuja, lintukärpäsiä sekä muita verta imeviä kaksisiipisiä. Tutkimuksen tulos tukee käsitystä, että veriloisten infektiot eivät ole lajikohtaisia ominaisuuksia vaan populaatioiden välillä voi olla suuriakin eroja loisten esiintymisessä.

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