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SHORT NOTE

Comparing anting hypothesis predictions to observations of behaviour in a North Island robin (*Petroica australis longipes*)

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Anting is a specialised behaviour in birds, and is generally divided into two categories: passive and active. Passive anting occurs when a bird permits ants to invade its plumage e.g., by lying down on an ant-hill. Active anting is usually described as a bird picking up an invertebrate and rubbing it through its plumage (Simmons 1985). Mostly, various species of ants have been described, but caterpillars and millipedes have also been noted (Clunie 1976; Wenny 1998), as have other non-animal objects like mothballs (Clark *et al*. 1990) and fruit (Clayton & Vernon 1993).

Anting has been reported in approximately 200-250 bird species around the world, but any adaptive explanation for the behaviour is unclear in most cases (Simmons 1985). This is mainly due to a low number of observations of the behaviour for most species; with the behaviour often only seen once (e.g., Chambers & Chambers 1981; Osborn 1998; Wenny 1998). To my knowledge, anting has only been reported once in New Zealand: in 1956, a male North Island robin (*Petroica australis longipes*) was observed using ants to rub its wing feathers in the characteristic way of active anting (Kinsky 1957).

Hypotheses proposed to explain anting are numerous (Table 1), but in most studies it has not been possible to assess which of these hypotheses is correct because of incomplete observations and a lack of data of important variables. During a comprehensive study of North Island robins on Tiritiri Matangi Island (36° 36'S, 174° 53'E), anting was observed on two occasions. Because information on bird identity, moulting and the occurrence of ectoparasitic mites was known, the common hypotheses of anting behaviour could be compared to observations (Table 1). Also, because the observation effort for the study years was known, the frequency of anting could be calculated.

The observations in this study were collected during three breeding seasons between September 2000 and June 2003. On average 92 robins were present on the island for each of the three years of study. All territories on the island were visited on average every fourth day during the breeding season (September – March), and on two other occasions (May and July) outside of this time. Anting was observed on two occasions, and by the same individual, a female robin born in September 2000. The observations were made with the observer sitting between 3 - 5 m away from the bird and the behavioural sequence lasted 2 - 4 mins. The anting took place in March and June, after the female had gone though the post-breeding moult. The female picked up from the ground, what appeared to be a 5-10 mm long invertebrate with dark brown to black exoskeleton, then rubbed it vigorously through its plumage. All feathered areas that the bird could reach (back, wings and breast) were rubbed; an extensive rubbing rarely seen in earlier studies (but see Clunie 1976). On both occasions the invertebrate was dropped after rubbing, which is highly unusual as robins will either eat or cache invertebrates gathered while foraging. Unfortunately, on neither occasion was the invertebrate recovered.

While anting behaviour was rarely observed during this study, the wealth of data for this population made it possible to compare observations with anting hypothesis predictions. Because the anting bird was not moulting, irritation from moulting feathers could not explain the behaviours seen. Also, the food preparation hypothesis is not supported as, both times, the bird dropped the invertebrate after anting and did not ingest it. Fungal and bacterial infections were never observed on the bodies of birds handled during the study years (Berggren unpubl. data), and a topical application of an anti-bacterial / anti-fungal substance to the feathers or skin would have little impact on a skin infection (Scott *et al*. 2000).

The North Island robin is host to several biting ectoparasites. The blood-sucking mite, *Ornithonyssus bursa*, has been found to retard chick growth and reduce fledging age in robins (Berggren in press). In other species, *O. bursa* has been found to affect fitness of individuals (Weddle 2000; Tscharntke *et al*. 2002). Additionally, the native blood-sucking louse fly *Ornithoica* sp. parasitizes both juvenile and adult North Island robins (Berggren 2005). Louse flies are common in many other bird species, spending most

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Table 1 Hypotheses explaining the behaviour of anting in birds and a comparison of prediction to observation in the North Island robin (*Petroica australis longipes)* on Tiritiri Matangi Island during 2000 - 2003.

Hypothesis	Prediction	Observation	Did observation fit prediction?
Anting is a form of food preparation (Judson & Bennett 1992)	The robin would eat the insect after handling	After anting, the robin discarded the invertebrate	No
Anting is a self-treatment for fungal or bacterial skin infections (Ehrlich *et al*. 1986; Clark *et al*. 1990)	Fungal and/or bacterial growth on birds occur and should be a cost for the individual	No fungal or bacterial infections were ever found on the body of robins	No
Anting is a self-treatment against ectoparasites (Clark *et al*. 1990; Clayton & Vernon 1993)	Ectoparasites occur and should be a cost for the individual	At least two species of ectoparasites occur on robins, one of which retards body growth	Yes
Anting reduces skin-irritation during moulting (Lunt *et al*. 2004)	The individual should be moulting during the behaviour	The individual was not moulting when the behaviour was seen	No

of their life in the plumage (Lee & Clayton 1995). This parasite is another potential negative addition to the parasite load of the robin, as each is of substantial size (approx. 6 mm long), and an individual robin may host many of these ectoparasites (Berggren 2005).

The likely identity of the invertebrates used for anting by the robin is a native millipede or beetle. Several of these invertebrates are known to excrete defensive secretions when attacked (Meads 1990; Grant 1999). The smell from millipedes used in anting has been described as acrid, similar to the smell from other invertebrates and objects used (Clunie 1976). Also, birds are observed roughly handling these invertebrates, and thus increasing the levels of toxic excretions (Clunie 1974). Secretions from millipedes have been found to be highly toxic to other invertebrates that come in contact with the liquid or fumes (Hopkin & Read 1992). These toxins are especially toxic to Arachnida (spiders and mites), which become sedated when in contact with secretions (Hopkin & Read 1992). If similar substances are produced by the invertebrates used by anting North Island robins, this could act to reduce the ectoparasite load, and thus would be an adaptive behaviour.

Taking into account observation effort (338 field days) during the three years of study, there was a 0.6 % likelihood that anting would be encountered on any given day. This low frequency makes it difficult to gather information on this behaviour with a purely observational approach. A better understanding on the mechanisms and effects of anting in the North Island robin will require an experimental approach.

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