Ectoparasites from the Balearic Shearwater *Puffinus yelkouan mauretanicus*

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INTRODUCTION

The Balearic Shearwater, *Puffinus yelkouan mauretanicus* Lowe, 1921, breeds only on islands of the western Mediterranean Sea, mainly in the Balearic archipelago. It migrates through the Strait of Gibraltar up the west coast of Europe, reaching as far as Norway (Jouanin & Mougin 1979). Ectoparasitic insects of the Balearic Shearwater are poorly known. Edwards (1961) recorded one species of feather louse, *Halipeurus diversus* (Kellogg, 1896), based on four females taken from skins preserved in museum collections. Beaucournu and Alcover (1993) commented that the flea, *Xenopsylla gratiosa* Jordan and Rothschild, 1923, had been found on *P. y. mauretanicus* from Mallorca, without giving further details. We report recent collections made by J.S.A. from birds caught alive in breeding colonies on the Balearic Islands, which confirm the two insects mentioned above as regular ectoparasites of that petrel. Voucher specimens have been deposited in the collection of the Museum of New Zealand, Wellington, New Zealand.

The Balearic Shearwater was originally regarded as a race of the Manx Shearwater, *Puffinus puffinus* (see Jouanin & Mougin 1979), but its phylogenetic relationships and consequent taxonomic position have been a matter of debate over the last two decades (Bourne *et al.* 1988, Walker *et al.* 1990). We use the combination *Puffinus yelkouan mauretanicus* in this paper, following the nomenclatorial arrangement given by Bourne *et al.* (1988). Further research on the ectoparasites of the Balearic Shearwater and of the Levantine Shearwater, *Puffinus yelkouan yelkouan* (Acerbi, 1827), may help to elucidate their true relationships.

RESULTS

During May - June 1995, 19 individual birds (18 chicks and one adult) from four breeding localities were searched for ectoparasites, using a method comparable to that followed by Fowler and Shaw (1990). One chick yielded no lice or fleas. A total of 314 lice of the species *Halipeurus diversus* (Phthiraptera: Philopteridae) were found on 17 hosts (16 chicks and one adult), and 180 specimens of the flea *Xenopsylla gratiosa* (Siphonaptera: Pulicidae) were collected from 10 chicks (Table I). Both species were taken from nine chicks.

DISCUSSION

The louse *Halipeurus diversus* is widespread on a number of *Puffinus* species inhabiting the Atlantic and the Pacific Oceans (see Edwards 1961). In the Mediterranean Sea, *H. diversus* has been found on the Levantine Shearwater as well as on the Balearic Shearwater.

In their study of the louse fauna from 230 live Manx Shearwaters, *Puffinus puffinus puffinus* (Brünnich, 1764) in Wales, Fowler and Shaw (1990) recorded eight louse species. Among them, *H. diversus* and *Trabeculus aviator* (Evans, 1912) were found on 99.5% of the birds examined, while *Austromenopon paululum* (Kellogg and Chapman, 1899) was present on 13.5%. The remaining five species showed an extremely low infestation rate. Considering that the collecting method applied by J.S.A. for the present study is comparable to that used by Fowler and Shaw and that *Trabeculus* lice have been recorded from most *Puffinus* species, the absence of any *Trabeculus* specimen from our samples may be significant. Further collecting from the Balearic Shearwater is needed to validate that absence, as well as to ascertain the status of *Austromenopon*

TABLE I. ECTOPARASITES COLLECTED FROM BALEARIC SHEARWATERS IN FOUR BREEDING LOCALITIES (M: males; F: females; N: nymphs; w.o.: weeks old)

Locality	*Number of birds*	H. diversus *(No. of hosts)*	X. gratiosa *(No. of hosts)*
Cueva de Sa Cella (Mallorca Island)	1 adult	4 M, 7 F, 4 N (1)	0
	11 chicks (*ca* 4 w.o.)	10 M, 13 F (9)	12 M, 65 F (8)
Cova dels Porxos Cap de Berberia (Formentera Island)	2 chicks (*ca* 8 w.o.)	8 M, 10 F (2)	3 M, 100 F (2)
Tagomago Islet (off Ibiza Island)	2 chicks (*ca* 7 w.o.)	46 M, 64 F, 3 N (2)	0
Cueva La Llumeta Conills Islet (off Cabrera Island)	3 chicks (*ca* 9 w.o.)	79 M, 66 F (3)	0
TOTALS	19	147 M, 160 F, 7 N (17)	15 M, 165 F (10)

and any other lice which might possibly parasitise it. In particular, finding the louse *Saemundssonia kosswigi* Timmermann, 1962 (currently known only from the Levantine Shearwater) would be significant evidence towards confirming the apparent close relationship of the two Mediterranean *Puffinus* populations.

The flea *Xenopsylla gratiosa* has been recorded from the breeding grounds of several petrel species on many islands of the Mediterranean Sea and the north Atlantic Ocean, including Cory's Shearwater, *Calonectris diomedea* (Scopoli, 1769), on the Balearic Islands (Beaucournu & Alcover 1993).

In their study of the ectoparasites of Cory's Shearwaters, Wink *et al.* (1979) found three species of lice (predominantly *Halipeurus abnormis* (Piaget, 1885)) on adult birds as well as on 6-8 weeks-old chicks. Lice were markedly less common on the chicks. However, chicks were also parasitised by an average of 40 or more fleas, *X. gratiosa*. Fleas were absent from the adult birds.

In our study (Table I) the chicks from Tagomago and Conills Islets yielded no fleas but many more lice per bird than did the adult and the chicks from Mallorca and Formentera Islands; many fleas were obtained from these last two collections, all of them on chicks.

Our results are not dissimilar from those of Wink *et al.* (1979), and the inverse ratios of lice:flea loads may be significant. However it must be borne in mind that, while lice and (adult) fleas are both obligate parasites, lice are permanently resident on the host whereas (bird) fleas tend to frequent the nest itself, temporarily infesting the bird mainly for feeding. Examination of the bird itself may not reveal the true flea infestation of adult birds; young birds confined in nests, on the other hand, more frequently harbour fleas as well as, occasionally, even flea larvae (R.L.C.P. unpublished).

The only adult bird searched for ectoparasites in the present study yielded 11 adults and four nymphs of *H. diversus*, but only one of the 16 chicks parasitised by *H. diversus* had nymphs (3).

This very low proportion of immature *Halipeurus* lice on Balearic Shearwater chicks is also consistent with the findings of Wink *et al.* (1979) for the species *H. abnormis* on young Cory's Shearwaters.

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SUMMARY

Two species of insect ectoparasites were found on 18 Balearic Shearwaters (*Puffinus yelkouan mauretanicus* Lowe, 1921) from breeding localities in the Balearic Islands, during May and June 1995. The louse *Halipeurus diversus* (Phthiraptera: Philopteridae) was collected from 17 birds and the flea *Xenopsylla gratiosa* (Siphonaptera: Pulicidae) from 10 birds. Both species were taken from nine birds.

REFERENCES

BEAUCOURNU, J.C. and ALCOVER, J.A. 1993. Els sifonàpters. *In* ALCOVER, J.A.; BALLESTEROS, E. and FORNÓS, J.J. (*eds*) *Història Natural de l'Arxipèlag de Cabrera*. Consell Superior d'Investigacions Cientifiques, Mallorca. Editorial Moll, Monografies de la Societat d'Història Natural de les Balears 2: 377-382.

BOURNE, W.R.P., MACKRILL, E.J., PATERSON, A.M. and YÉSOU, P. 1988. The Yelkouan Shearwater *Puffinus* (*puffinus?*) *yelkouan*. *British Birds* 81: 306-319.

EDWARDS, R.L. 1961. Studies of the Philopteridae (Mallophaga) from the birds of the order Procellariformes [sic]. 1. The genus *Halipeurus*. *Journal of Parasitology* 47(1): 125-157.

FOWLER, J.A. and SHAW, G.J. 1990. The Mallophaga of Manx Shearwaters *Puffinus p. puffinus* from Ynys Enlli, Wales. *Seabird* 12: 14-19.

JOUANIN, C. and MOUGIN, J.L. 1979. Order Procellariiformes. *In* Mayr, E. and Cottrell, G.W. (*eds*) *Check-list of Birds of the World*, vol. I, 2nd edition of Peters, 1931 Check-list. Cambridge (Massachusetts), Museum of Comparative Zoology. Pp 48-121.

WALKER, C.A., WRAGG, G.M. and HARRISON, C.J.O. 1990. A new shearwater from the pleistocene of the Canary Islands and its bearing on the evolution of certain *Puffinus* shearwaters. *Historical Biology* 3: 203-224.

WINK, M., WINK, C. and RISTOW, D. 1979. Parasitenbefall juveniler und adulter Gelbschnabelsturmtaucher (*Calonectris diomedea*). *Bonner zoologische Beiträge* 30(1-2): 217-219.

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