A COMPARISON OF TWO METHODS FOR COLLECTING FEATHER LICE FROM DEAD BIRDS

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Jensen J-K. & Olsen B. 2003. A comparison of two methods for collecting feather lice from dead birds. Atlantic Seabirds 5(3): 119-126. *Two procedures for the collection of feather lice from birds are described – a 'dry' method and a 'wet' method. The dry method consists of placing the bird in a plastic bag with chloroform for 30 minutes after which the plumage is brushed and all dislodged lice collected. The wet method consists of thoroughly washing the dead bird in soapy water and straining the water to collect the lice. Eleven Little Auk* Alle alle *corpses were deloused using both methods. Three species of feather louse were recorded using both methods but the wet method consistently resulted in the recording of more lice than the dry method alone. The wet method is especially suitable for collecting lice from dead birds but is impractical for use on live birds.*

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INTRODUCTION

Feather lice can provide valuable information about their bird hosts. A classic example is the work of Hopkins (1942) where he indicated a close relationship between the flamingos (Phoenicopteriformes) and the geese (Anseriformes) in spite of the fact that flamingos superficially more resemble storks than herons (Ciconiiformes). Zonfrillo and Palma (2000) referred to feather lice from the Levantine Shearwater *Puffinus yelkouan* in their discussion of the taxonomic status of shearwaters, and Jensen *et al.* (1999) deduced from the feather lice found on Sooty Shearwaters collected around the Faroe Islands that these birds came from Tristan da Cunha. Several Iceland Gulls *Larus glaucoides* collected in the Faroe Islands were infested with feather lice from Little Auks *Alle alle*, probably as a result of predation by the gulls on the auks in Greenland colonies (Palma & Jensen in prep.). Paterson *et al*. (2000) address the issue of co-evolution of seabirds and feather lice.

Small live birds are usually deloused by suspending them by their head in a glass container filled with chloroform vapours (Williamson 1954; Ontario Bird Banding Association, 1960). Fowler and Cohen (1983) improved this method and considered the statistical validity of the method for a range of host species. Their results suggest that as many as 88% of the lice present on a bird (excluding the head) may be extracted by this method, and that the collected

samples appear to be reasonably representative of the species and age classes of the feather lice present. However, they stated that the only method by which the absolute number of ectoparasites present on a bird may be determined is by careful feather-by-feather examination of its plucked plumage.

Clayton & Walther (1997) published a thorough account on the collection of arthropod parasites from both live and dead birds, but most authors do not give details on how they deloused the birds (e.g. Jensen *et al*. 1999; Pilgrim & Palma 1982), so it is difficult to compare results. Systematically delousing a dead bird feather-by-feather is very time consuming, therefore it is feasible only when the sample comprises few birds. A more or less systematic inspection of the feathers to establish presence or absence of feather lice, however, is often the rule. Foster *et al*. (1996) washed birds in soapy water and strained off the lice from the water. They found this method to be very effective and stated that the higher abundance of lice they found on Great Shearwater *Puffinus gravis* compared with a study by Bourgeois & Threlfall (1979) was probably due to different collecting techniques. On birds found dead, the feathers are often wet and dirty but the lice cling to the feathers even after death. Therefore, washing the birds and straining off the lice from the water as carried out by Foster *et al.* (1996) appears to be a good method.

The aim of this study was to compare the efficiency of two sampling methods for collecting feather lice from dead birds. In the first method, we used chloroform to extract the lice, should any have remained alive, and brushed them onto a sheet of white paper. In the second method, the same birds were washed thoroughly in soapy water and the lice strained off in a special strainer following Foster *et al.* (1996).

METHODS

We examined 11 Little Auks found dead on the beach in Nólsoy, Faroe Islands, in December and January 1996-1998. The corpses were stored separately in plastic bags before examination in order to avoid transfer of lice between them. A few of them were stored in a freezer. Prior to delousing, all the birds were air-dried by hanging them indoors for 1 or 2 days until they were completely dry.

Method 1: the 'Dry' Method To delouse the corpses using method 1, each bird was placed in a plastic bag with a cotton wad saturated with concentrated chloroform for 30 mins to ensure that all lice were dead. Each corpse was then held over white paper and the feathers brushed with the fingers and manipulated for a couple of minutes until no more debris or lice fell onto the paper. All dislodged material such as sand, beach debris, feathers, etc. was systematically

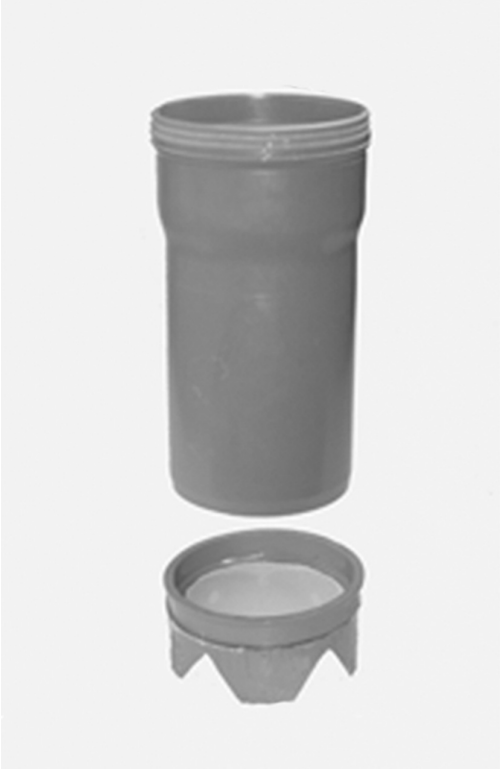

Figure. 1. The feather lice strainer is made of a 20 cm PVC waste pipe and a 6 cm high socket made from a pipe coupling, and equipped with a 400 micron plankton net. The internal diameterof the pipe is 10 cm. The pipe coupling has been cut so the wider part is 2 cm high, sawn through below and glued together with the plankton net in between. As the water must flow easily from the strainer the socket has been sawn so that it stands on four legs.
Figuur 1. De veerluisfilter is gemaakt van 20 cm PVC-pijp en een 6 cm hoge pijphouder voorzien van een planktonnet van 400 micron. De interne diameter van de pijp is 10 cm. Het bovenstuk van de pijphouder is 2 cm hoog, van onder doorgezaagd en vastgelijmd met het plankton-net ertussen.Om het water ongestoord te laten vloeien is de standaard uitgezaagd zodat het op vier poten staat.

searched for lice under a dissecting microscope. Lice were collected with a wet needle and immersed in 70% alcohol.

Method 2: the 'Wet' Method In method 2, the same birds that had been deloused using method 1 were washed in order to find more lice. Each corpse was thoroughly washed twice in a plastic bucket with lukewarm water and liquid soap. After each wash, the water was poured through a strainer (Fig. 1). Finally, each corpse was thoroughly rinsed in the bucket with a pressurized water spray and the water again strained off. The lower part of the lice-strainer, which holds the mesh net, was then placed under the dissecting microscope and any additional lice collected were again stored in 70% alcohol. The bucket and the lice strainer were cleaned very thoroughly after processing each bird.

Table 1. The number of feather lice collected from 11 Little Auks using chloroform (method 1 – the Dry Method) and washing the same birds (method 2 – the Wet Method). Values indicated for method 2 include those for method 1.

Tabel 1. Het aantal veerluizen dat verzameld werd van elf dode Kleine Alken met behulp van choloroform ('droge' methode 1) en door dezelfde vogels te wassen ('natte' methode 2). Waarden voor methode 2 zijn inclusief die voor methode 1.

Species	Method	Males	Females	Nymphs
Austromenopon merguli (T.)	1. Dry	39	37	88
	2. Wet	84	99	110
	% increase wet over dry	115	168	25
Quadraceps klatti (T.)	1. Dry	142	173	357
	2. Wet	164	209	382
	% increase wet over dry	15	21	7
Saemundssonia merguli (D.)	1. Dry	17	27	38
	2. Wet	32	48	60
	% increase wet over dry	88	78	58

All lice were identified by comparing them with specimens previously determined by R.L. Palma and slide-mounted following the technique in Palma (1978). A representative part of this insect material is deposited in the Natural History Museum, Tórshavn, Faroe Islands.

In presenting the results for method 2 the lice collected using method 1 were added to those collected using method 2, as we would expect that all lice found with method 1 would also have been found by merely washing the birds after the lice were dead. Freezing the birds before delousing might well have the same effect as the treatment with chloroform, and therefore the treatment of the frozen birds with chloroform could have been omitted.

RESULTS

Three species of feather lice were collected from the 11 Little Auks (Table 1), and all species were found during the first treatment (method 1 – the Dry Method). Washing the birds (method 2 – the Wet Method) did not reveal any new species, although the total number of lice discovered increased by 29% on

Table 2. Feather lice infestation of 11 Little Auks indicated by using chloroform (method 1 – the Dry Method) and by washing the same birds (method 2 – the Wet Method). Values represent numbers of birds, and those indicated for method 2 include those from method 1.

Tabel 2. Aantal met veerluizen besmette Kleine Alken volgens de droge methode 1 en de natte methode 2. De waarden voor methode 2 zijn inclusief die voor methode 1.

Species	Method	Males	Females	Nymphs
Austromenopon merguli (T.)	1. Dry	5	6	7
	2. Wet	7	8	7
	% increase wet over dry	40	33	0
Quadraceps klatti (T.)	1. Dry	11	10	9
	2. Wet	11	10	10
	% increase wet over dry	0	0	11
Saemundssonia merguli (D.)	1. Dry	7	9	10
	2. Wet	9	11	10
	% increase wet over dry	29	22	0

average (Table 1). The wet method was especially effective in collecting adults of *Austromenopon merguli* (a 141% increase) and *Saemundssonia merguli* (an 82% increase), while the number of adult *Quadraceps klatti* increased by only 18%. The increase in number of nymphs was lower - 25%, 58% and 7% respectively.

The observed infestation rate (i.e number of birds hosting the various species and ages of lice) also increased when the birds were washed (Table 2). *Quadraceps klatti* occurred on all the birds with either method, while the infestation rate for adult *Austromenopon merguli* and *Saemundssonia merguli* increased 36% and 25% respectively when the birds were washed. Infestation with nymphs increased by 11 % for *Quadraceps klatti* but no increase in the number of nymphs was found for the other two species.

DISCUSSION

Skinned birds in collections that have been washed with soapy water have few if any feather lice, demonstrating the efficiency of washing away lice with soapy

water. Delousing birds using the wet method probably extracts almost all the lice, so in this discussion the cumulative number of lice extracted with methods 1 and 2 are treated as the total number present on the bird. Searching the same birds after delousing failed to reveal any further lice.

The dry method probably dislodges only those lice that are unattached to the feathers and leaves the remainder. *Quadraceps klatti*, the most numerous louse we found on the Little Auks, is most easily extracted both as adult and nymph, as respectively 85% and 93% were extracted using the dry method. For *Saemundsonia merguli*, 55% of the adults and 63% of the nymphs were extracted with the dry method, while for *Austromenopon merguli* the respective proportions were 42% and 80%. As the nymphs were extracted more easily than the adults for all three species, the dry and wet methods also indicate different age distribution of the lice. The infestation rate was also higher after applying the wet method, although, for birds heavily infested there was no difference.

These findings suggest that it is impossible to extract a representative sample of louse species and age classes using a method that fails to extract all lice. This is especially the case with live birds, but on dead birds rough methods can be used and washing the birds as described above (the wet method) after the lice have been killed or are dead, seems to be a reliable method. It is relatively easy, quick and effective, and if the corpses are not required, can be done in the field. However, some lice live within the quills of feathers and will probably be unaffected by either dry or wet methods of collecting. These lice will require special examination by opening feather quills of dead or moulted birds.

The use of chloroform in our dry method might not have had the same effect as in the study of Fowler & Cohen (1983), where the lice on the live birds might have actively left the feathers as they were affected by the chloroform vapour. After the treatment with chloroform, we therefore brushed the birds towards the head against the feathers until apparently all the loose lice were found. The brushing of the feathers in the dry method is unlikely to increase the likelihood of collecting lice subsequently using the wet method. Therefore, we assume that the same total number of lice would have been discovered using the wet method alone, provided that the lice were dead before washing.

Before washing dead birds for delousing, we recommend that the lice are killed by either freezing the birds or by placing them in a plastic bag with chloroform vapour for 30 minutes. We do not know whether lice that die from freezing or from chloroform vapour attach more tightly to the feathers. In any case, birds found dead are often frozen before delousing, so freezing the birds apparently is a good standard method to kill lice on dead birds.

Delousing live birds must be carried out as careful as possible, so washing the birds is excluded. The period should also be as short as is necessary

to extract a representative sample of the louse species and age classes (Fowler & Cohen 1983). According to Fowler & Cohen (1983), as many as 88% of the lice present on a Blackbird *Turdus merula* (excluding the head) may be extracted in 30 minutes from the live bird using their method, but there may be large differences between louse species collected. They also state that any method based upon the examination of feathers *in situ* is likely to be strongly biased against the recording of mobile species and the smaller nymphal instars.

Before examination, it is very important that the corpses are stored separately so that transfer of lice between them does not take place. The lice-strainer must also be cleaned and examined very carefully after each session.

In this study we have compared delousing methods for feather lice, but washing the birds in soapy water and straining off the water is also an effective way of extracting feather mites from dead birds, but in this case the net in the strainer has to be 100 micron mesh (Foster et al. 1996) rather than the 400 micron net used here for lice.

Comparing collections of feather lice compiled using different methods may give inaccurate results as the efficiency of extracting the lice depends on the species and their age. Washing a dead bird thoroughly in soapy water as in the wet method extracts almost all the lice from the plumage and so is an effective tool for studying the louse fauna of dead birds. It is an especially suitable method for use on dirty and wet specimens found on the seashore and elsewere.

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EEN VERGELIJKING VAN TWEE METHODEN OM VEERLUIZEN VAN DODE VOGELS TE VERZAMELEN

In dit artikel worden twee methoden voor het verzamelen van veerluizen beschreven: een ‘droge’ methode en een ‘natte’ methode. De droge methode houdt in dat een dode vogel 30 minuten in een plastic zak met chloroform wordt gehouden, waarna het verenkleed wordt gekamd en alle luizen die hebben losgelaten, worden verzameld. De natte methode bestaat uit het grondig wassen van een dode vogel met water met zeep, waarna het water wordt gefilterd om de luizen te verzamelen. Elf dode Kleine Alken *Alle alle* werden met beide methoden van luizen ontdaan. Met beide methoden werden drie soorten luizen vastgesteld, maar de ‘natte’ methode resulteerde steevast in hogere aantallen luizen dan de ‘droge’ methode. De ‘natte’ methode is zeer geschikt om luizen van dode vogels te verzamelen, maar is niet praktisch bij levende vogels.

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