# AGEING MANX SHEARWATERS *PUFFINUS PUFFINUS*

K. LEONARD[1] & N.D. MCKEE[2]

Leonard, K. & McKee, N.D. 2005. Ageing Manx Shearwaters *Puffinus puffinus*. Atlantic Seabirds 7(1): 31-38. *There is little published information on ageing criteria for juvenile Manx Shearwaters Puffinus puffinus. We detail ageing criteria that have been used at Copeland Bird Observatory, Co. Down, for approximately 30 years. It involves using basic moult techniques and differences in feather colour, shape and pattern to distinguish fully moulted juvenile birds from adults. Juvenile birds have black feathers, a distinctive pointed and hooked primary shape, and pale edgings to their mantle feathers. Adults have brown feathers with rounded, worn primaries and mantle feathers. The shape and colour of the axilliaries have been reported as an ageing criterion and these were found to be useful features. Using these techniques, it is possible to confidently age fully grown down-less Manx Shearwaters caught in the autumn. These characters may also be of use in identifying first year birds found away from the colony in the year after fledging.*

[1] 16 Birch Park, Bangor, Co. Down, BT19 1RZ, Northern Ireland, U.K; [2] 67 Temple Rise, Templepatrick, Co. Antrim, BT39 0AG, Northern Ireland, U.K. E-mail: kerrysleonard@hotmail.com

## INTRODUCTION

The Manx Shearwater *Puffinus puffinus* is a common breeding seabird around the British Isles. Researchers have long studied the species as it is easy to catch, tolerant of disturbance and shows a high degree of philopatry. This enables detailed studies of marked birds to be undertaken. Great Britain and Ireland hold approximately 332,000 Apparently Occupied Sites, about 90% of the world total (Mitchell *et al.* 2004). In Northern Ireland, there are three colonies, one at Rathlin Island, Co. Antrim, and two on the Copeland Islands, Co.Down, that lie at the mouth of Belfast Lough. One of these two colonies is on Old Lighthouse Island and this is where Copeland Bird Observatory is located. Manx Shearwaters have been trapped and ringed by members of Copeland Bird Observatory since 1952. The colony has increased steadily over this time from an estimated 250 pairs in the early 1950s, to 2867 Apparently Occupied Sites in 2000 (Stewart 2000; Mitchell *et al.* 2004). This represents approximately 8% of the Irish population. There has been a steady increase in the number of chicks being ringed annually, with a peak of 911 pulli caught in 2002 (Leonard 2002). Manx Shearwater pulli are relatively easy to catch as they fledge from their burrows in late August and September. Young birds spend time on the surface

practising wing-flapping and exploring the area around their burrow. Most young are docile and can be quickly ringed and released at the point of capture.

Most young birds (EURING age code 1) are easily identified by having varying amounts of soft, grey down covering their body. Fledgling birds are left with small areas of down on the nape and vent and this is typical of most procellariids (Warham 1990). However, many juvenile birds can be caught that have lost all this down, having completely acquired their first-year plumage. Other criteria are needed to age these fully grown birds (EURING age code 2) and any characters used must be useful under night-time handling conditions. There is little published information on ageing these birds; the available criteria are summarised by Baker (1993), who highlights feather colour and axilliary shape and pattern as the main characters to use. Here we describe the ageing criteria used on Copeland Bird Observatory and summarise our findings on the usefulness of published criteria.

## METHODS

All birds examined were trapped by members of Copeland Bird Observatory on Old Lighthouse, Co. Down, Northern Ireland. Manx Shearwaters have been ringed on Copeland since 1952. Since the early 1970s the techniques developed here have been used to age Manx Shearwaters during the time of chick emergence in early September. Since 1970 approximately 13,000 Manx Shearwater pulli have been ringed and any birds without down are aged using a combination of the features discussed in this paper.

In 2004, we also examined the axilliary pattern of Manx Shearwaters to determine this character's usefulness as an ageing criterion. The axilliary patterns of captured birds were compared with the patterns illustrated on page 55 of Baker (1993), reproduced in Figure 4. Juvenile axilliaries are described as pointed in shape with a thick black band across the tip of the feather. Adult axilliaries are rounded with either no or small amounts of black at the tip of the feather. The axilliary shape and pattern was scored as juvenile-type or adult-type. Twenty-five adult birds were trapped between 13 and 17 July 2004 and the axilliary pattern scored. Twenty-five juveniles (pulli with some down) were similarly examined in early September 2004.

**Ageing Criteria** The main ageing criteria are summarised in Table 1.

**Primary Shape** The shape of the primaries of juvenile birds differs dramatically from that of adults. In juveniles, the outer two or three primaries are very pointed (Figures 1 and 3a). Primaries 4 to 8 are blunt-ended, the end of the feathers appearing to have been cut off across the shaft. On the inner edge

*Table 1. Summary of main ageing characters of juvenile and adult Manx Shearwaters.*
*Tabel 1. Samenvatting van de belangrijkste kenmerken om de leeftijd van Noordse Pijlstormvogels te bepalen.*

| | Juvenile | Adult |
|---|---|---|
| Outer primary shape | Pointed and fresh | Rounded and worn |
| Inner primary shape | Blunt-ended with hooked inner edge; fresh | Rounded and worn |
| Mantle feathers | Black with pale grey edges | Uniform brown and worn |
| Feather colour | Sooty black | Brown |
| Axilliaries | Pointed, much black on feather | Rounded, no or small amounts of black |

of these primaries there is a distinctive hooked point at 90° to the shaft (Figure 1). All these feathers are sooty black in colour. The edges of the feathers are fresh and unworn; the shafts of the feathers are black. The inner edges of the fresh unused primaries are often 'crumpled' giving them a waved, undulating appearance (Figure 1). In adults, all the old un-moulted primaries are rounded in shape (Figures 1 and 3b). The outer few feathers can be pointed to some degree, but rarely. However, the edges of all the feathers are worn and frayed, often with nicks on the edge. The feather shafts are brown.

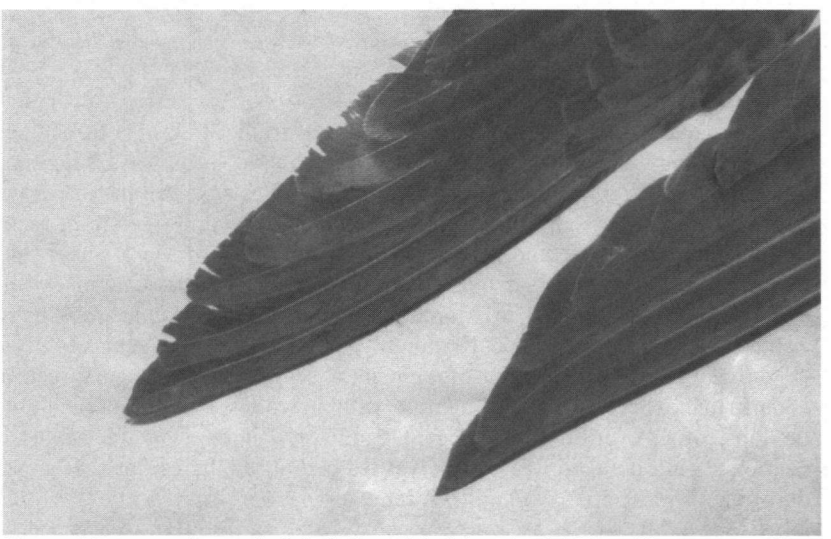

*Figure 1.Primary shape of adult (left) and fledgling (right) Manx Shearwaters. (Steve Stansfield)*
*Figuur 1. Vorm van handpen van een adulte (links) en een juveniele (rechts) Noordse Pijlstormvogel.(Steve Stansfield)*

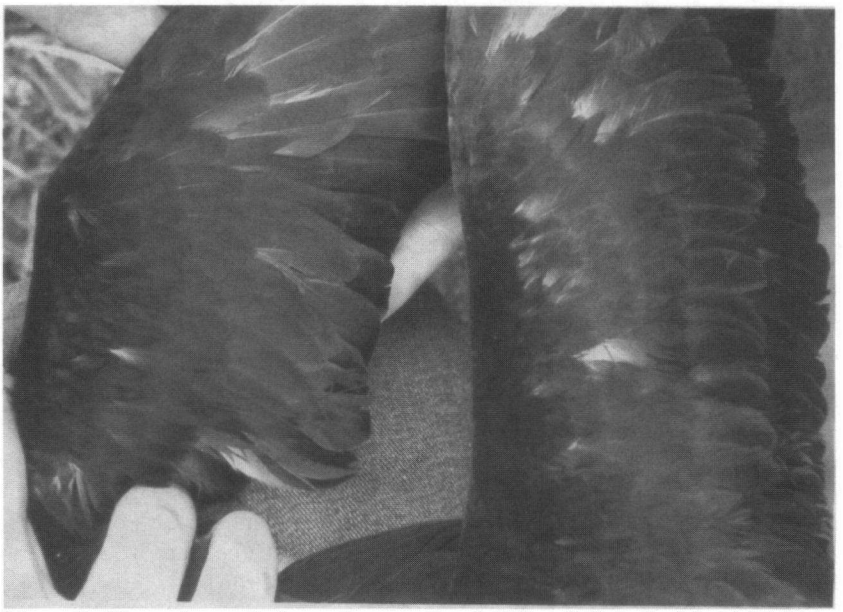

*Figure 2 .Wear of secondaries and coverts on fledgling (left) and adult (right) Manx Shearwaters. (Steve Stansfield)*

*Figuur 2. Slijtage van armpennen en vleugeldekveren van een juveniele (links) en een adulte (rechts) Noordse Pijlstormvogel. (Steve Stansfield)*

**Feather colour** The ground colour of the main feather tracts is one of the main differentiating features between adults and juvenile birds. As suggested by Baker (1993), the ground colour of juvenile birds is black. All the major feather tracts are the same sooty black colour, fresh and unworn – remiges, rectrices, scapulars, mantle, nape and head. The moult schedule of Manx Shearwaters is not definitely known but it must occur during the winter (Cramp & Simons 1977). Adults returning in March have fresh black feathers but by early September their feathers are 6-10 months old and are consequently heavily worn (Figure 2). The ground colour of the mantle, scapulars, remiges and rectrices is a dark muddy brown. This contrast with juveniles is usually clear-cut and obvious, often even at a distance in good torch light. On wet nights some caution should be exercised as the wet feathers of adults can at first appear as dark as juveniles and may require closer examination.

**Mantle feathers** Juvenile mantle and scapular feathers are fresh and sooty black. On closer inspection the mantle feathers typically have a pale grey edge,

which produces a scaly effect. This is due to a change in the texture of the feather over about 1.5mm of the margin, rather than a coloured margin. Adult mantle feathers have no pale edge, are rounded and worn, often with nicks at the shaft.

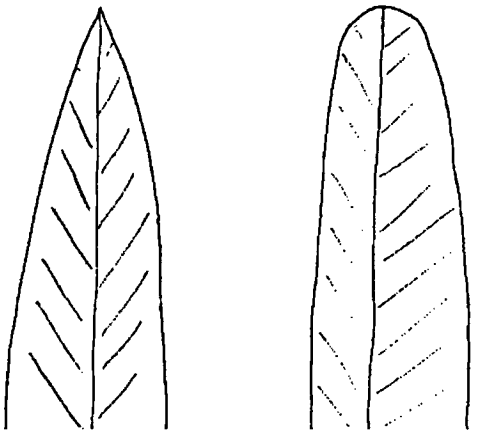

*Figure 3.Outer primary shape of juvenile (left) and adult (right) Manx Shearwaters.*
*Figuur 3. Vorm van buitenste handpen van juveniele (links) en adulte (rechts) Noordse Pijlstormvogels.*

**Axillaries** All 25 adults and juveniles examined had axillaries that fell within the normal range as specified in Baker (1993; Figure 4). Juvenile axilliaries were found to be pointed in shape with large amounts of black across the tip of the feather. Adult axilliaries were rounded with the great majority of birds having white feathers with no black markings. From our small samples it would appear that axilliary pattern is a good indicator of shearwater age.

**Plumage texture** The fresh plumage of juveniles feels soft to the touch compared with that of adults. On dry nights experienced shearwater ringers can often identify juvenile birds without recourse to other plumage features.

**Other features** There are some other minor features that can be useful in distinguishing between adults and juveniles. Juvenile birds have fleshy pink legs, whereas the legs of adults are colder and greyer. B. Zonfrillo *(pers comm.)* has accurately pointed out that juvenile birds have a different smell to that of adults. The odour of juveniles is musty, powdery and not unpleasant. This is probably caused by the powdery 'dandruff' from the newly moulted feather sheaths. In contrast to juveniles, adults have no particular smell other than that of an ocean-going seabird. This is a somewhat strange but very useful criterion.

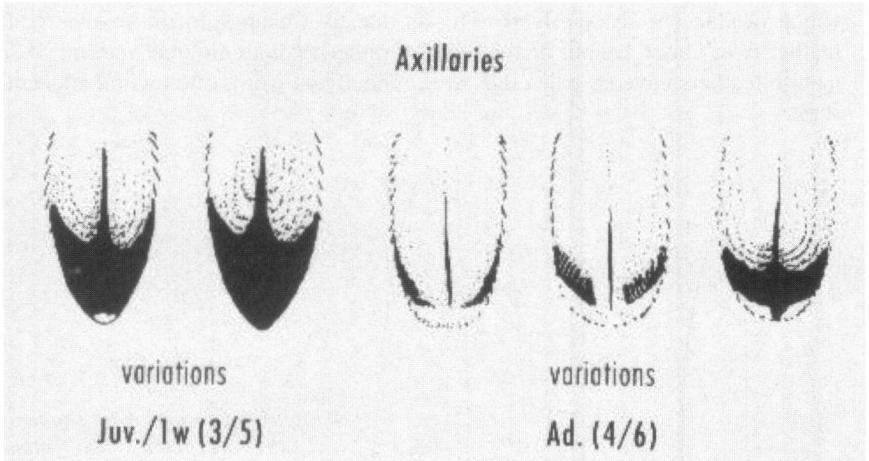


*Figure 4. Axilliary patterns of Manx Shearwaters (reproduced with permission from Baker 1993).*

*Figuur 4.Patroon van de okselveren van Noordse Pijlstormvogels (met toestemming overgenomen uit Baker 1993).*

## DISCUSSION

The ageing criteria listed herein have been used to age juvenile Manx Shearwaters on Copeland Bird Observatory for nearly 35 years, and with practice it is quite straightforward to age accurately all full-grown birds trapped in the autumn. The main features that are used are feather colour, primary shape and wear, and mantle feather shape and wear. Individuals with sooty black plumage, pointed and hooked primaries and pale-edged mantle feathers are fully moulted pulli (EURING age code 1). Birds with muddy brown feathers, rounded and worn primaries and mantle feathers are adults (EURING age code 4). The ability to accurately age all birds caught at a colony during the fledging period is extremely important and this has greatly enhanced the quality of data gathered on shearwaters at Copeland. Without the use of these criteria many autumn birds would be recorded as of unknown age (EURING age code 2). These specific juvenile ageing characters of Manx Shearwaters fall within the general summary of Warham (1990), juvenile petrels being described as having fresh unabraded plumage, dark feathering and pale edges to the wing coverts, mantle and scapulars.

Primary shape is an important character for ageing shearwaters. The shape of the outer primary feathers has also been recorded as an ageing character in several other petrel species, for example Northern Fulmar *Fulmarus glacialis*, Cory's Shearwater *Calonectris diomedea* and Leach's Storm-petrel

*Oceanodroma leucorhoa* (Baker 1993). Juvenile birds have pointed outer primaries. Bolton and Thomas (2001) included primary shape and wear to help age European Storm-petrels *Hydrobates pelagicus* in their first year (age code 5); all birds with a pointed tip to the outermost primary were first year birds, whereas most older birds (age code 6) had a relatively blunt outer primary. Primary shape is therefore a common ageing character across several petrel species. The use of primary shape could potentially be combined with moult and wear in other feather groups to age juveniles of other shearwater species.

The degree of ossification of the skull of juvenile birds can be used to distinguish them from adults (Svensson 1992). As far as we are aware, there are no published studies applying this technique to Manx Shearwaters but Sugimori *et al.* (1985) used skull ossification to identify juvenile Short-tailed Shearwaters *Puffinus tenuirostris*. Checking for skull ossification is an intrusive technique and of limited practical use in a shearwater colony at night.

We found axilliary pattern as reported by Baker (1993) to be a useful characteristic with all juvenile and adult birds having feather patterns that fell within the expected range. However, in order to view the axilliaries it is necessary to turn the bird upside-down and fully extend the wing. In our opinion, this increases the likelihood of injury to both ringer and bird, and we accord the technique only secondary importance.

Although the features outlined here have been developed for use in the colony in the autumn they may have wider applications. Little is currently known about the moult of first year Manx Shearwaters. Lee (1995) identified five birds off North Carolina and Georgia as first-year birds. One bird in its first winter and two in the following spring showed only varying degrees of body moult. One bird examined the following August had still not started moult. By mid-December of its first full year another bird had moulted primaries 1-8 (numbered ascendingly). From these birds, the tentative conclusion may be drawn that juvenile shearwaters moult no primaries until at least the following summer, and probably the autumn. Baker (1993) suggested that the axilliary pattern could also be used to age first year birds (Euring age code 5). It is feasible, therefore, that the ageing characters detailed here could be used to identify first-year Manx Shearwaters caught in the northern hemisphere during the northern summer, either at colonies or when tape-lured at coastal headlands. Very few Manx Shearwaters return to their colonies in the first year and there seem to be no published records of this (Brooke 1990), so there would be appear to be little opportunity to test this. However, a few first year Manx Shearwaters have returned to the Copeland colony (Leonard *et al.* in prep.) so the ability to accurately identify first-year birds using plumage characters could help add to our knowledge of the species' post-fledging and pre-breeding movements.

## ACKNOWLEDGEMENTS

We acknowledge the many volunteer members from Copeland Bird Observatory who have helped with the trapping of Manx Shearwaters at the observatory over the last 50 years. We thank Jeff Baker for giving us permission to include Figure 4 in this manuscript. Steve Stansfield kindly provided the photographs for Figures 1 and 2. George Henderson, Steve Stansfield and one anonymous referee provided useful comments on earlier drafts of this manuscript. The Environment and Heritage Service Northern Ireland provided funding that helped with the production of this manuscript.

## LEEFTIJDSBEPALING VAN NOORDSE PIJLSTORMVOGEL

Er is weinig informatie gepubliceerd op over leeftijdskenmerken van juveniele Noordse Pijlstormvogel *Puffinus puffinus*. Wij gaan dieper in op de leeftijdskenmerken die al ongeveer dertig jaar worden gebruikt op Copeland Bird Observatory, Co. Down. Er wordt gebruik gemaakt van standaard ruikenmerken en verschillen in kleur, vorm en patroon van de veren om volledig geruide juvenielen te onderscheiden van adulte vogels (fig 1 t/m 3). Juveniele vogels hebben zwarte veren, kenmerkend gepunte en hoekige handpennen en lichte randen op de mantelveren. Adulte vogels hebben bruine veren met afgeronde, gesleten handpennen en mantelveren. Vorm en kleur van de okselveren worden in de literatuur genoemd als leeftijdskenmerk (fig 4), hetgeen bevestigd kon worden. Door gebruik te maken van de gepresenteerde kenmerken (tabel 1) is het mogelijk om volgroeide, donsloze Noordse Pijlstormvogels die in het najaar zjn gevangen, op leeftijd te brengen. Deze kenmerken kunnen ook nuttig zijn bij herkennen van eerstejaars vogels die het jaar na uitvliegen buiten de kolonie worden gevonden.

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