The Australian
BIRD BANDER

Rapid Band Wear on Australian Ravens

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The author describes an unusual type of band wear encountered in a study of the Australian Raven (*Corvus coronoides*) and discusses the mechanism of its causation. This is a subject of importance to all banders interested in the banding of the larger and long-lived species of birds.

In 1961, a programme of research on the interaction between ravens and lambing flocks was started by the CSIRO Division of Wildlife Research. Banding and the subsequent study of movements was an important part of the programme.

Prior to the study more than a thousand ravens had been banded, mainly by one enthusiast. Several ravens had been seen to peck at their bands soon after release and some, loosened in this way, fell off. For this reason we tried to devise a stronger type of band, before embarking on large-scale banding.

Clip-bands, such as are used for pelicans in Europe, appeared to be easy to make and to fasten firmly. Since trials with captive ravens showed that pecking scored soft aluminium bands, it was decided to make these clip-bands from monel metal to the same specification as that used for banding *Puffinus spp.* under the Australian Bird-banding Scheme (Serventy, 1957). Suitable strips, longer than those described by Serventy (54 x 11 mm) were already available for use on *Phalacrocorax spp.* These were formed into clip-bands, by hand, on a metal jig and shaped on a former-rod to the correct diameter (11 mm), see Figure 1 (a); their mean weight was 2.34 gm (± .10 gm).

These bands were first used in 1962 and since then more than 5,000 ravens have been banded with them. This total included a number of territorial pairs from an intensive study area; when these were retrapped a year later signs of band-wear were found. We attributed these defects to our early troubles in band-shaping and possibly to a faulty batch of metal strips, but since we had overcome our manufacturing troubles and had recently started on a fresh batch of metal stripping we were optimistic. A year later it became evident that neither our shaping technique nor the quality of the metal was the cause—the new bands were wearing just as quickly. Some bands are nearly illegible after less than three years' wear (see Figure 1 (b)).

Specimen bands were forwarded to the Physical Metallurgy Section of CSIRO and were examined by Dr. M. E. Hargreaves, who reported that the wear was largely due to abrasion, probably by dust, and had taken place almost entirely between the band and the bird's leg, i.e. on the inner surface. No evidence of corrosion was found.

Figure 2 shows the weights of 149 clip-bands recovered after 100 to 1200 days' use. The rate of band-wear may be expressed in the equation $y = 2.3396 - .00046\,x$, where y = the weight of the band and x = the number of days the band was in position on the bird's leg.

Three aspects of this band failure seem important:

(1) As shown by expert examination the abrasive agent appears to be dust. Ravens seldom

A B C

Figure 1

• (*a*) *Unused monel-metal clip-band for* Corvus coronoides. (*b*) *Band after 3 years' wear, showing deep notching directly opposite to the clip. Bands were placed on the bird's leg with numerals uppermost—hence "upside-down" effect.* (*c*) *Close-up of a monel-metal clip-band showing perforation of the metal following abrasion of the inner surface. Perforation occurs where the metal is thinner, behind the numeral stamped on the band; in extreme cases whole segments may fall out.*

wade for either food or drinking and so, except for heavy rainfall, there is no chance of dust being cleansed from the band, other than by rubbing against the leg.

Ravens forage largely by walking: sometimes they hop with both legs off the ground together and at others they may pounce on prey, such as lizards or small birds, seizing them in their claws. As with most *Corvidae,* food is frequently held in the feet, while being shredded for eating. In other words, although the raven is a capable flier, most of the daylight hours are spent on the ground searching for food, and during most of this time the band would be in motion up and down the bird's leg.

(2) The characteristic notching (see Figure 1 (b)), which takes place diametrically opposite to the clip and on the upper edge of the band, appears to be the result of frequent impact at the same locus as the band travels up and down the leg (see Figure 3). Such an action concentrates the wear and results in local accelerated damage.

It is possible that the amount of freedom between the band and the leg is critical in determining the localisation of impact. For ravens it was necessary for the bands to have plenty of play since individuals varied widely in size (450-750 gm live weight), but no significant difference in wear was found in bands on large and small birds. There was no difference in rate of wear from birds in alpine as compared to arid habitats.

(3) Since the process of stamping information on bands leaves only a thin skin of metal behind the numerals and figures, relatively little abrasion from the inside rubs through this layer (see Figure 1 (c)). In anticipation of the wear being greatest at the bottom edge of the band in contact with the foot, as is usual with standard bands, the clip-bands were always placed "upside-down" so that the numerals would be farthest from the foot. Contrary to what was expected, the greatest wear was on the upper edge. This wear, in conjunction with the localised notching described above, may cause whole segments of the legend to part from the band, as happened with the two extreme cases of wear in Figure 2.

In bird-banding throughout the world relatively little analysis of band wear has been made and this has been largely confined to sea birds (Coulson and White, 1955, 1959; Harris, 1964), where damage is caused by both abrasion and corrosion. Table 1 compares the data in these papers with that for the Australian raven.

On the basis of so few studies it is impossible to be sure that band wear is directly proportional to band weight—it may well be that surface area is significant in cases of corrosion—however, the weight loss per year expressed as a percentage of initial band weight provides the fairest comparison. From these three analyses, each with a different type of band and a different species, it is clear that a loss in the vicinity of 10% per annum can be expected with aluminium bands on sea birds and that monel-metal clip-bands on ravens fare little better. Harris (*loc. cit.*) rates 4 years as the useful life of double-ended aluminium bands on shearwaters; Coulson and White (1959) found that nearly half of their kittiwake bands were illegible after three years' wear. Although, to date, no raven band has defied deciphering (after a maximum of three years' wear), two cases showed entire numerals missing and it is anticipated that fewer than 50% of recoveries will be legible after four years' wear.

The evidence above shows that effective (i.e. legible) band-life may be surprisingly short. In the case of sea birds this has been recognised for many years and once recognised allowance can be made when estimating longevity, mortality,

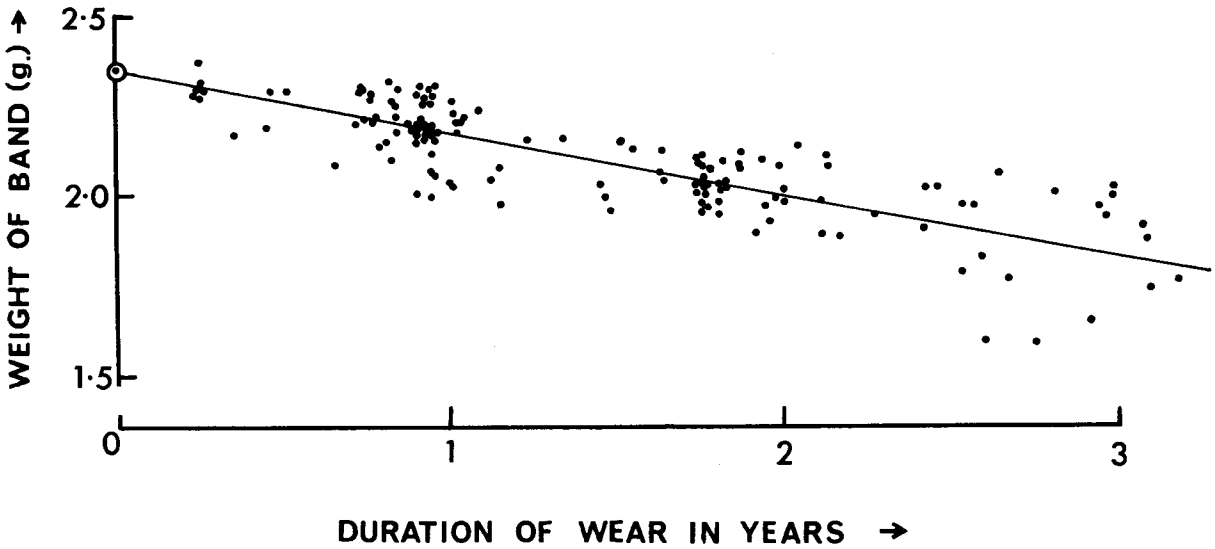

Figure 2.

• *Weights of 149 clip-bands recovered after 100-1200 days use.*

and other population parameters. It is possible that deterioration similar to that reported for *Corvus coronoides* may occur in other species, especially where unbalanced (i.e. clip) bands are used and the factors causing internal localised abrasion are present.

With resident species of birds, the waste of time and effort involved in retrapping and rebanding, the possibility of encountering trap-shyness, and above all the chance that band-failure may pass unrecognised, are very real dangers when the species has a long lifespan. With migratory and nomadic species the position is even worse, since the chances of retrapping for the purpose of rebanding are remote.

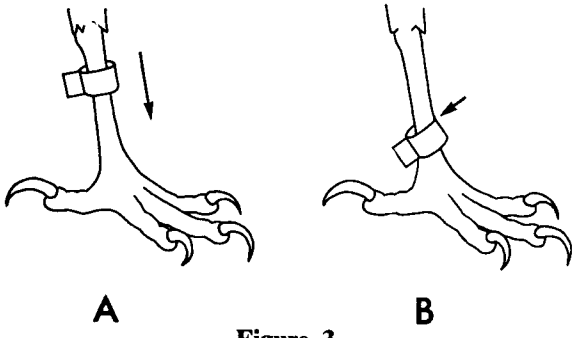

Figure 3.

• *As the band falls freely down the leg the heavier "clip" section falls faster. Contact with the leg is persistently at the same locus, i.e., on the upper side, diametrically opposite to the clip.*

The experience reported in this paper suggests that a close watch needs to be kept on the condition of bands during long-term studies. It is hoped that it may also prompt band manufacturers to experiment with more durable metals (e.g. stainless steel) and resistant plastic coatings in an attempt to meet the need for a legible band enduring for ten years or more.

TABLE 1

Comparative data on band wear from three species of birds.

Species	Average Initial Weight (g)	Number in Sample	Weighted Regression Coefficient (g/year)	% Loss per Year
Corvus coronoides[1]	2.34	149	− 0.169 (± 0.0112)	7.2
Puffinus puffinus[2]	1.40	431	− 0.147 (± 0.0051)	10.5
Rissa tridactyla[3]	0.71	66	− 0.065 (± 0.0023)	9.3

1. Data from present study—monel metal clip-bands.
2. Harris (1964) Table 1.—"double-ended" aluminium bands.
3. Coulson and White (1959) Table 1 and Figure 1. No. 3 B.T.O. rings.

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