Research

EDITORIAL

Effects of attaching telemetry equipment to free-living birds

Andrew Dixon

TECHNOLOGICAL developments in telemetry techniques have meant that a wide range of tracking tools are now available for biologists to study the movements and demographics of free-living birds, while miniaturisation has significantly increased the number of species that can be tracked remotely. Furthermore, improvement in battery technology, especially combined with the ability to recharge them via solar panels, has meant that telemetry tags can now remain functional for several years. For long-lived avian species, such as birds of prey, it is often necessary for researchers to collect data over long periods of time in order to better understand the factors influencing their behaviour and survival during their lifetime. The method used to attach telemetry tags to birds is often dictated by the size of the tag and its functional longevity. Generally speaking, short-life transmitters can be fixed directly to the plumage of a bird and are subsequently shed when the feathers are moulted, whereas long-life transmitters need a more permanent method of attachment such as a harness, neck collar or internal implant.

Andrew Dixon, BSc, PhD,
International Wildlife Consultants, PO Box 19,
Carmarthen SA33 5YL, UK
e-mail: falco@falcons.co.uk

Studies that rely on tagging individuals to obtain data on movements and survival need to take into account any potential adverse effect of the tagging method. It is probably true to say that deleterious effects of tagging can never be completely avoided (Kenward 2001), thus it is incumbent on researchers to ensure that such effects have minimal influence on the outcome of their studies and on the welfare of the animals. Tagging an animal can potentially affect every major life-history trait (eg, Saraux and others 2011) and attaching telemetry devices may result in combinations of immediate, delayed, short-term, long-term, direct and indirect effects on the animals under study (Withey and others 2001). Despite the widespread use of tracking devices such as radio transmitters, satellite transmitters and GPS data loggers, relatively few studies have been undertaken to assess the impact of attaching these devices to wild birds (an exception being Murray and Fuller 2000). This is somewhat surprising, given

the high-profile of many bird tracking projects and the depth of public feeling in relation to animal welfare.

In a paper summarised in this issue of *Veterinary Record*, Peniche and others (2011) report on the presence of pathological lesions that were associated with harness-mounted radio transmitters attached to red kites (*Milvus milvus*), which were found either dead or dying in England. The severity of these lesions indicated that the presence of the harness-mounted transmitter was detrimental to the survival of these birds and was probably the cause or a significant contributory factor in their deaths. Analysis of 18 dead red kites that were recovered with harness-mounted transmitters indicated that the presence of lesions was significantly associated with the length of time that the birds had been carrying their telemetry tags; these birds had been fitted with harness-mounted transmitters for periods ranging from one month to seven years. The main body of this paper illustrates how harness mounted transmitters can impact on survival, but it also refers to other potential sublethal effects such as failure to breed, which was noted in two of the three cases studied.

Harness-mounted satellite transmitters with solar-powered rechargeable batteries have the potential to track long-lived species, like this saker falcon (*Falco cherrug*), throughout their lifetime, but this involves a trade off between the conservation benefit and animal welfare

In comparison to the large number of studies that use harness-mounted telemetry equipment on birds of prey, only a few have reported deleterious effects, for example, on spotted owls (*Strix occidentalis*) (Paton and others 1991) and prairie falcons (*Falco mexicanus*) (Steenhof and others 2006). This absence of evidence should not be interpreted as an absence of effect, as many of the telemetry studies conducted on birds of prey have no way of comparing a control group or the birds were not followed long enough to observe possible effects.

In the case of red kites, many individuals monitored in the UK reintroduction projects are also marked using patagial tags (flexible, visual markers stapled to the wing), potentially providing a control group against which the survival and reproductive rates of radio-tagged birds can be compared. There is a trade-off between the research and/or conservation benefits of long-term deployment of telemetry tags with animal welfare, and guidelines have been established in recognition of this ethical dilemma. For example, the recommended weights of transmitters in relation to bodyweight of birds vary from 2 to 3 per cent (Fuller and others 2005) to 5 per cent (Cochran 1980) of bodyweight. However, these are arbitrary values and there is a need to develop guidelines based on empirical evidence from telemetry studies. In their study, Peniche and others (2011) noted that the weight of the telemetry equipment in all of the birds that exhibited pathological lesions exceeded 2 per cent of bodyweight, although all were within the 5 per cent recommendation.

The study by Peniche and others (2011) highlights the need to carefully consider the impacts of tagging methods in research studies and will hopefully serve as an impetus to closely examine the range of potential effects, both short- and long-term, of harness-mounted transmitters on birds of prey.

References

COCHRAN, W. W. (1980) Wildlife telemetry. In Wildlife Management Techniques Manual. Ed. S. D. Schemnitz. The Wildlife Society. pp 507-520

FULLER, M. R., MILLLSPAUGH, J. J., CHURCH, K. E. & KENWARD, R. E. (2005) Wildlife radio telemetry. In Techniques for Wildlife Investigations and Management. Ed. C. E. Braun. The Wildlife Society. pp 377-417

KENWARD, R. E. (2001) A Manual for Wildlife Radio Tagging. Academic Press.

MURRAY, D. L. & FULLER, M. R. (2000) Effects of marking on the life history patterns of vertebrates. In Research Techniques in Ethology and Animal Ecology. Eds L. Boitani, T. Fuller. Columbia University. pp 15-64

PATON, P., ZABEL, C., NEAL, D., STEGER, G., TILGHAM, N. & NOON, B. (1991) Effects of radio tags on spotted owls. *Journal of Wildlife Management* **55,** 617-622

PENICHE, G., VAUGHAN-HIGGINS, R., CARTER, I., POCKNELL, A., SIMPSON, D. & SAINSBURY, A. (2011) Long-term health effects of harness-mounted radio transmitters in red kites (*Milvus milvus*) in England. *Veterinary Record* doi:10.1136/vr.d4600

SARAUX, C., LE BOHEC, C., DURANT, J. M., VIBLANC, V. A., GAUTHIER-CLERC, M., BEAUNE, D., PARK, Y-H., YOCCOZ, N. G., STENSETH, N. C. & LE MAHO, Y. (2011) Reliability of flipper-banded penguins as indicators of climate change. *Nature* **469,** 203-206

STEENHOF, K., BATES, K. K., FULLER, M. R., KOCHERT, M. N., MCKINLEY, J. O. & LUKACS, P. M. (2006) Effects of radio marking on prairie falcons: attachment failures provide insights about survival. *Wildlife Society Bulletin* **34,** 116-126

WITHEY, J. C., BLOXTON, T. & MARZLUFF, J. M. (2001) Effects of tagging and location error in wildlife radiotelemetry studies. In Radio Tracking and Animal Populations. Eds J. J. Millspaugh, J. M. Marzluff. Academic Press. pp 43-75

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