THE FUTURE FOR FLIPPER BANDING AFRICAN PENGUINS: DISCUSSION, RECOMMENDATIONS AND GUIDELINES

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INTRODUCTION

Flipper banding has enhanced our understanding of penguin biology and aided management decisions since the 1950s (Williams 1995). More recently, however, a body of evidence has emerged to suggest that this marking technique may no longer be the method of choice in all circumstances, because concerns have been raised about the potential adverse effects of flipper bands (Ainley *et al*. 1983, Culik *et al*. 1993, Trivelpiece & Trivelpiece 1994, Hindell *et al*. 1996, Clarke & Kerry *et al*. 1998, Froget *et al*. 1998, Dann *et al*. 2000, Ainley 2002, Jackson & Wilson 2002, Gauthier-clerc *et al*. 2001, 2004). In the more specific context of the African Penguin *Spheniscus demersus* the use of flipper bands has been invaluable in obtaining information about the population dynamics and conservation status of the species (Hockey *et al*. 1995). In particular, it would have been impossible to analyse the success or otherwise of rehabilitation efforts following the oiling of penguins but for the data derived from flipper-banded individuals (Nel & Whittington 2003). It has been estimated that the African Penguin population is 19% larger than it would have been without these rehabilitation efforts (Nel *et al*. 2003). There is thus clear recognition of the role of flipper banding to measure the success of rehabilitation efforts. Set against this is the potential adverse effect of bands on penguins. Adding to this concern is the fact that the African Penguin is now classed as Vulnerable because their numbers have declined from over 1.45-million at the beginning of the last century to 179 000 adult birds (Nel *et al*. 2003). Approximately 22 000 African Penguins have been flipper-banded since 2000 (including 19 000 during the Treasure Oil Spill), raising questions about the need for and desirability of banding additional individuals.

The combination of these factors has prompted penguin biologists, managers and conservationists to re-address the desirability of continued flipper banding of this species. Against this backdrop, WWF-South Africa funded a workshop held in Cape Town, South Africa in January 2004, co-hosted by BirdLife South Africa and the Marine and Coastal Management Branch of the Department of Environmental Affairs and Tourism, to address the issue of banding African Penguins and to compile a set of recommendations and guidelines to facilitate decision-making with regards to flipper banding this species.

WORKSHOP DISCUSSION

There was recognition that there is good evidence that flipper banding has detrimental effects on a variety of penguin species, including reduced survivorship, retarded return to colonies, longer foraging trips, reduced breeding success, increased swimming costs, greater heat loss and physical damage to flippers (reviewed by Petersen *et al* submitted ms). In commentary at the workshop, doubts were expressed about the validity of some of these studies, particularly of their statistical analyses. Nevertheless, with eight out of nine studies detecting adverse effects, the bulk of peer-reviewed evidence is that metal flipper bands can be detrimental to a range of species.

Most evidence of adverse effects of bands has been derived from sub-Antarctic and Antarctic species, although the temperate-water Little Penguin *Eudyptula minor* (Dann *et al*. 2000) has also been demonstrated to be adversely affected by flipper banding. Evidence of such effects is currently lacking for *Spheniscus* species. This should not be taken to mean there are no adverse effects, because the lack of evidence may simply reflect insufficient research. No large-scale effects of flipper bands have however been reported by field workers in southern Africa, despite intensive banding. There are however, no published data supporting this conclusion, nor have there been any experimental tests with appropriate controls. *Spheniscus* species occur in relatively warm waters which conceivably reduces their susceptibility to the effects of flipper banding (Barham 2004). However, they predominantly feed on fish- rather than crustaceans, and foraging for fish requires bursts of speed that may intensify any adverse hydrodynamic drag of flipper bands. A wide range of views was expressed at the workshop about the desirability of continuing flipper banding on African Penguins. One of the key arguments favouring continuation was the need to identify birds that have been oiled and rehabilitated from those that are not. This is because there is evidence that a proportion of oiled and rehabilitated birds do not breed again (Wolfaardt & Nel 2003) and further research is required to understand why this occurs. Unless all oiled and rehabilitated birds are marked in some way, the assumption that an unmarked bird has never been rehabilitated and thus is a "control" bird cannot be made. Whether this necessitates flipper banding is debatable. For some purposes it may be adequate that birds are distinguishable as a cohort, but for others (e.g. investigation of the impact of different levels of oiling on reproduction) it will be necessary to distinguish individual birds. An alternative to flipper banding all rehabilitated birds is that a sufficient number of control (un-oiled) birds could be flipper banded at the time of the oiling incident to allow comparison with the performance of (banded) oiled birds. This would obviate the need to mark all birds treated for oiling, and would have the additional advantage that oiled banded birds could be compared with un-oiled banded birds, thus isolating the effects of oiling from those of banding. This suggestion needs to be carefully thought through to ensure that (a) the procedure will allow sufficient numbers of oiled and control birds to be distinguished; (b) the total number of birds banded will not then exceed the number that would have been banded if all the oiled birds had been banded; and (c) there is sufficient capacity to accomplish this without jeopardizing the rehabilitation process.

There were divergent opinions at the workshop about the seriousness of flipper banding effects. One view was that threats such as competition with seals (du Toit 2001) and commercial pelagic fisheries (Frost *et al*. 1976, Crawford *et al*. 1990, du Toit *et al*. 2002) constitute a more

important threat and that flipper banding is likely to have comparatively small or no effects. This perspective was distilled in the view that flipper banding should be innocent until proven guilty. A more prevailing view was that current information does not allow an informed judgment of the effect of flipper banding, but that it would be prudent and sensible to curtail and control flipper banding by an agreed-upon protocol as a precautionary measure. It was in this vein that the following recommendations were developed (Petersen & Branch 2004).

RECOMMENDATIONS

The precautionary principle should be invoked to limit flipper banding. Flipper banding of African Penguins should only take place under permit granted by the relevant authority, which must specify the maximum number of birds and the circumstances under which they may be banded.

- Any marking of penguins should be based on the method that minimizes the impact on the individual birds, colonies and overall population while being capable of resolving the problem or testing the hypothesis.
- The number of penguins to be marked should be minimized. Birds should not be marked if the sample size is too small for meaningful analysis. No further flipper banding should take place once sufficient birds have been banded to supply adequate data, or if there are already sufficient banded birds in the population. Deciding what constitutes 'sufficient numbers' will require proactive objective-setting and statistical analyses to determine the necessary numbers of birds that should be banded, particularly in the case of mass rehabilitation following an oil spill.
- The Southern African Foundation for the Conservation of Coastal Birds (SANCCOB) and any other authorised rehabilitation centre should (without further permission) be allowed to use hospital identification tags or equivalent temporary markers to identify penguins, but these must be removed before the birds are released.
- If permission is to be granted for birds to be permanently flipper banded, follow-up programmes to collect data must be in place. Because SANCCOB and other rehabilitation centres have limited resources, this may require collaboration among institutes to ensure adequate follow-up.
- In the event of a mass oiling of penguins, a sufficient number of birds should be banded to follow the subsequent fate of the oiled and rehabilitated birds. This will require that SANCCOB keeps sufficient bands in stock for this purpose. (SANCCOB has committed itself to keeping 2000-3000 bands in stock.)
- For mass events (e.g. oil spills), alternatives that are less intrusive than banding need to be developed and considered to mark entire cohorts. Once developed, these techniques could also be useful as interim marking measures for sub-adults because of their presumed greater vulnerability to flipper banding (Froget *et al*. 1998, Gauthier-clerc 2004).
- Flipper banding should be confined to penguin populations that a) are most appropriate for the topics being addressed, b) will not become threatened as a result, and c) for which follow-up and resighting effort will be sufficient for successful analysis.
- Subject to the availability of funding and personnel to maintain a database, front-view digital photographs should be routinely taken of all birds in adult plumage released after rehabilitation, to build up a database in the event that photographic recognition becomes a viable option (Burghardt *et al*. 2004)

PROPOSED FORUM

There was unanimous support for the idea of an Advisory Forum, to which proposals for the marking of penguins should be passed. The Forum would advise on the suitability of proposed marking methods and whether the number of birds being marked is appropriate. It would be advisory in capacity and would not supersede the authority of relevant conservation bodies, which would still retain the power to grant or deny research permits and to stipulate the conditions of those permits. The Forum should provide a means of ensuring consistency and transparency. It would also ensure consultation among conservation agencies, research groups and rehabilitation centres on research projects involving marking of penguins. A draft application form indicates the type of information needed to evaluate applications requesting permission to mark African Penguins (Appendix 1).

GUIDELINES

1. No marking of African Penguins should be allowed without evaluation by the Forum and approval of the relevant management authorities, based on a motivation and justification, which should include:
   - Identification of the research question or problem,
   - Specification of the marking technique and its appropriateness for the question being investigated and the research site involved,
   - Motivation of why individual marking is necessary,
   - Justification of the number of birds that needs to be marked,
   - Specification of and commitment to follow-up procedures, and
   - Approval by ethics committees, if so required.
2. Management authorities will retain power of approval and control over issuing permits for exercises involving marking.
3. It is recognised that marking of penguins is often required for conservation purposes.
4. Efficient, electronic data management should be in place to ensure accessibility of information and safe storage.
5. Until flipper banding can be proven to have no detrimental effects, it should only be permitted for activities that have clear conservation or management applications.
6. Experimental design must be based on rigorous controls and adequate replication. The number of birds to be marked must be kept to a minimum. Sample sizes should be established by appropriate statistical analyses that take into account available data and data variability. If the sample size of available birds is too small adequately to address the question being posed, marking should not take place. Conversely, no birds should be marked in excess of the number required for valid analysis.
7. In the event of an oil spill, once analyses have determined the number of birds that need to be individually marked,

the remaining rehabilitated birds may be marked with a less intrusive method (if available), to distinguish the oiled cohort from control birds. (Alternatively, careful thought could be given to marking a sufficient number of un-oiled control birds, as discussed above.)

8. Authorised rehabilitation centres should be permitted to use temporary tags to identify individual birds while they are at a rehabilitation centre, but these tags must be removed prior to release of the birds.
9. Any marking device attached to a penguin must be of the best design possible.
10. Persons applying markers must be properly trained and be approved by the institute responsible for the study. Untrained personnel shall not be permitted to undertake banding.
11. If birds are encountered that have been injured by a flipper band or have an open or ill-fitting band, the band should be:
    - Removed if the bird has an open wound, and
    - If there is no external wound, the band should either be replaced with a better type of band, or re-closed if this is not an option, or removed.

    Any such action should be reported to the South African Bird Ringing Unit (SAFRING) and only carried out by a trained and authorised person.

POST WORKSHOP

An outcome of the workshop was the general agreement that a research project to evaluate the effect of flipper banding on African Penguins was required. This project is underway at Robben Island where flipper-banded and transpondered penguins are being compared with transponder only penguins.

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APPENDIX 1

DRAFT APPLICATION FORM FOR PERMIT TO MARK AFRICAN PENGUINS

Name: Affiliation: Date:

1. Research question or problem being addressed:
2. Purpose of marking:
3. Method of marking:
4. If individual identification of marking is planned, why is it necessary?
5. How many birds will be marked?
6. What statistical justification is there for marking this number of birds?
7. From which colony or colonies will the birds come?
8. What follow-up procedures are planned and who will be responsible?
9. What data will be gathered?
10. How and where will data be stored?
11. Has any similar study already been done and, if so, what justifies repetition?
12. Does your institute require ethics committee approval? If yes, please attach approval.

Support of Forum……
Approval by Authority ……
Explanations for decisions ……