Journal for Nature Conservation 12 (2004) 25–39

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Journal for
Nature Conservation

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The "capacity to reason" in conservation biology and policy: the southern elephant seal branding controversy

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Received 2 April 2003; accepted 26 August 2003

KEYWORDS
Southern elephant seals;
Mirounga leonina;
Consilience;
Ethics;
Controversy;
Research;
Conservation value

Summary

Modern environmental research is typically governed by a number of protocols designed to embrace the epistemological and ethical values of society. These protocols evolve in response to changing values, and few disciplines in environmental science have received as much attention as biological conservation. This paper describes the events leading to a controversy regarding a particular research technique used to investigate the cause of a long-term population decline of southern elephant seals (*Mirounga leonina*) at Macquarie Island, south of Australia – hot-iron branding of individuals. We discuss procedures and protocols that were in place at the time the controversy erupted, the subsequent reflection of the researchers and authorities involved, and the steps taken to avoid future occurrences. Our treatment of the issue is framed within a discussion of modern ethical philosophy, and our aim is to identify the true source of the controversy. We offer several suggestions as to how such events can be avoided in the future, and provide a model framework for incorporating changing ethical values into important biological conservation objectives.

Introduction

Modern environmental research, incorporating both theoretical and applied aims, is typically governed by a number of protocols designed to embrace, among other things, the epistemological and ethical values of society. These protocols evolve in response to changing values, and few disciplines

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doi:10.1016/j.jnc.2004.04.001

in environmental science have received as much attention as biological conservation (e.g., Farnsworth & Rosovsky, 1993; Elliot, 1995; Trompf, 1997; Brown, 1999; Ehrlich, 2002). In the past, biological research was often immune to the scrutiny of non-scientists because, presumably, the availability of information to the public was limited or non-existent. However, the contemporary research environment requires researchers to seek the bulk of their funding from sources within the public sector, a situation that requires both greater accountability and greater responsibility for the incorporation of public values when designing, implementing and communicating research. To facilitate this accountability and responsibility, organisations governing and implementing conservation research aim to ensure that only the most justified research proposals are sanctioned.

As this paper will illustrate, despite the complexity of verification procedures, when research involves charismatic and iconic fauna or "natural wonders" (e.g., marine mammals, pandas, the Great Barrier Reef, old-growth forests), polemic attitudes can develop that are grounded more in emotive than empirical arguments (Bekoff, 2002). The social foundations of such arguments are said to be ill-understood, ambivalent and with multiple characteristics; therefore, demystifying them is not a simple task (Macnaghten & Urry, 1998). The main aim of this paper is to illustrate how a media-driven campaign can influence policy decisions by capitalising on inherent weaknesses within the policy process and the science communication interface. We attempt to understand this dilemma by presenting an example of how a well-established (though not flawless) review process failed to avoid controversy over an Antarctic conservation research project based in Australia. The project, which had been running for 9 years without incident by following established protocols, involved examining the causes and processes influencing the population decline of southern elephant seals (*Mirounga leonina*) on Macquarie Island. We describe in broad terms the genesis of the controversy (it is not possible to provide full details for legal reasons) and its consequences on all of the key stakeholders (the researchers, their managers, and on the conservation project itself), with the aim of showing how managers might use this information to avoid or to be better prepared for future occurrences of this kind.

Public reaction to the procedure of hot-iron branding as a method of permanently marking individual seal pups was particularly unfavourable. Although the practice of branding seals in Australia was stopped in 1999, the repercussions of this controversy are ongoing 5 years later. We do not attempt to evaluate the branding technique or alternatives in depth in this paper, although there is work in progress on this issue. What we aim to do, rather, is to emphasise the following points:

- if branding compromised the health or survival of the species, it would be counter-productive to the scientific aims of the project;
- if branding was done incorrectly or inexpertly, resulting in unreadable brands, it would be useless to the project (re-sighting is a principal component of the project); and
- if branding caused inordinate pain and suffering to the individuals, then the unfavourable public response would be justified.

To this end we describe the biological and historical background of southern elephant seal research on Macquarie Island and provide a brief chronology of events that resulted in the controversy. We also outline the internal and external procedures in place at the time the controversy erupted. We illustrate how the repercussions of the debate influenced subsequent and on-going conservation research projects, the research permitting processes, ethics committee scrutiny and environmental impact assessments. In so doing, we outline and re-iterate some recommendations for better communication among stakeholders that may be of use to broad-scale conservation projects involving high-profile species.

Macquarie Island and southern elephant seals

Macquarie Island

Macquarie Island (MI) is a 34 km long island (12,785 ha total) in the Southern Ocean approximately 1500 km south-east of Tasmania, Australia (54°30′ S, 158°57′E; Fig. 1). MI is part of the State of Tasmania and is designated as a World Heritage Area, primarily because of its unique geological features (UNESCO, 1997). The Tasmanian state government's Department of Primary Industries, Water and Environment (DPIWE) has statutory authority over MI. MI is also a Tasmanian State Reserve under the protection of a division of DPIWE – the Tasmanian Parks and Wildlife Service (TPWS). TPWS are responsible for the issuing of permits for scientific research on MI, which has "restricted area" status. MI has no permanent residents; however, there is an Australian National Antarctic Research Expeditions (ANARE) station staffed

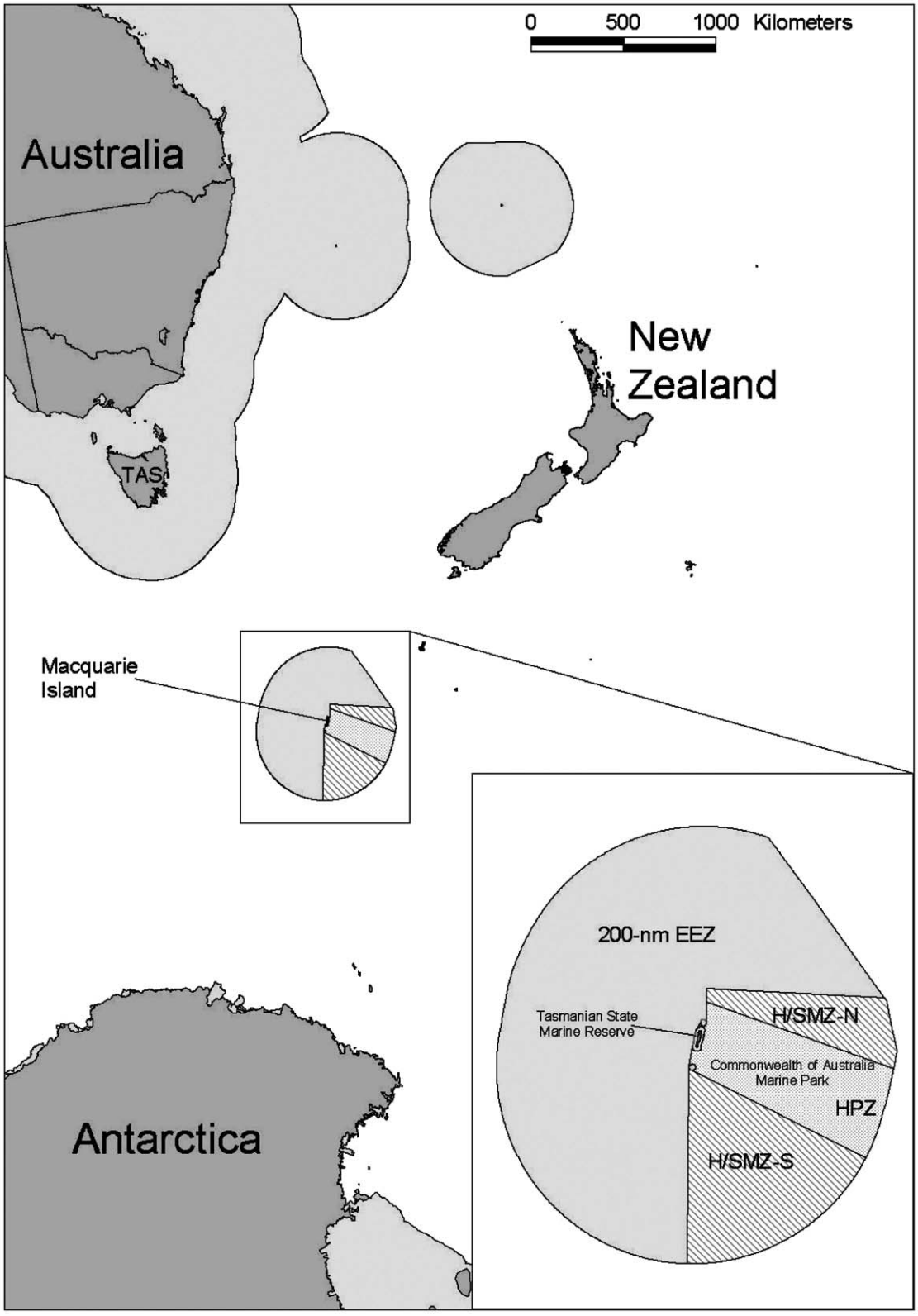

Figure 1. Macquarie Island and the limits of the 200-nm Australian Economic Exclusive Zone (EEZ), the Marine Park (Commonwealth waters) showing the Habitat/Species Management Zones for the northern and southern regions of the Park (H/SMZ-N and H/SMZ-S, respectively) and the Highly Protected Zone (HPZ), and the Marine Reserve (Tasmanian waters) around the island.

year-round by transient scientists. Part of the waters surrounding MI are a Marine Park proclaimed in 1999 under the Commonwealth *Government Environment Protection and Biodiversity Conservation Act* (Macquarie Island Marine Park Management Plan, 2001, Fig. 1).

Southern elephant seals

History of the Macquarie Island population

The population of southern elephant seals (*Mirounga leonina*) on MI was over-exploited during the early 1800s for the production of blubber oil (Hindell & Burton, 1987). When sealing lapsed in the early 1900s the population began to recover (Carrick, Csordas, Ingham, & Keith, 1962). In the 1950s and 1960s, ANARE organised a major research programme to investigate important aspects of the basic biology of the species (Carrick & Ingham, 1960; Bryden, 1968). Not until the mid-1980s was research interest renewed on MI, mainly due to reports of a significant decline in the population (Hindell, Slip, & Burton, 1994b) for reasons not related to commercial exploitation or human activities (Burton & van den Hoff, 2002; Hindell, Bradshaw, Sumner, Michael, & Burton, 2003). Hindell and Burton (1987) reported a mean rate of decrease from 1950 to 1985 of 2.1% per annum, and since the 1980s the rate of decline has been around 1% per annum. The net reduction of the MI population of southern elephant seals was estimated between 45% and 55% during that period (1985 estimate = 86,500 individuals; Hindell & Burton, 1987). After consideration of the possible causes for a decline in seal numbers, reduced food availability (not associated with human activity) was hypothesised to be a major contributing factor (Hindell et al., 1994b, 2003).

In 2000 after the branding controversy had subsided, and following the suspension of the AAD conservation research programme, the MI southern elephant seal population was classified as an "endangered" species under the Tasmanian *Threatened Species Protection Act 1995* because of the continuing population decline (Bryant & Jackson, 1999). The Commonwealth of Australia classifies the population as "vulnerable" (Shaughnessy, 1999). The MI population of southern elephant seals was not, however, listed on the IUCN Red List of endangered species (IUCN, 2000). Independent of the branding issue, these new classifications dictated that the management authorities responsible for MI create a specific management plan for southern elephant seals. All newly proposed research had to conform therefore to the main aim of understanding the mechanics of the decline, and propose means to reduce further decline.

Life cycle of the Macquarie Island population

The annual life cycle of southern elephant seals at MI varies between the sexes and among age classes (Hindell & Burton, 1988b; Hindell, 2002). Adult females come ashore in late September/October to give birth and suckle a single pup (Hindell & Burton, 1988b). Lactation lasts for an average of 24 days, after which time the females mate and then return to sea to feed (Hindell, 2002). Adult females spend an average of 75 days at sea before returning to the island for a 4-week moult (Hindell & Burton, 1988b; Slip, Hindell, & Burton, 1994). After moulting the seals return to sea for approximately 7.5 months before returning to breed (Hindell & Burton, 1988b). Pups spend 4–6 weeks fasting on the island after weaning (Arnbom, Fedak, Boyd, & McConnell, 1993; Hindell, 2002). On average, southern elephant seals spend more than 80% of their annual cycle at sea (Hindell, 2002).

Research programmes on southern elephant seals at Macquarie Island

ANARE first used hot-iron branding on elephant seals at Heard and Macquarie Islands in the 1950s and 1960s to measure demographic parameters of these populations (Chittleborough & Ealey, 1951; Carrick & Ingham, 1960; Ingham, 1967). Only once before had southern elephant seals been branded – at South Georgia in the 1920s (Matthews, 1929). Apart from some sporadic investigations in the 1960s, it was not until 1984 that the AAD renewed its interest in the MI population. The 1984 visit was to investigate whether the population was declining, as had been demonstrated for most other southern elephant seal populations in the Southern Ocean (Laws, 1984). In the latter half of the 1980s and since, research programmes supported by ANARE investigated aspects of at-sea behaviour, body energetics, veterinary studies on anaesthetic techniques, and human disturbance (Woods, Hindell, & Slip, 1989; Hindell, 1991; Hindell, Burton, & Slip, 1991; Slip, Burton, & Gales, 1992a; Slip, Gales, & Burton, 1992b; Hindell, Bryden, & Burton, 1994a; Slip et al., 1994; Slip & Woods, 1996; Engelhard et al., 2001; Engelhard, Brasseur, Hall, Burton, & Reijnders, 2002a). Early results indicated that female foraging success was linked to pup survival (McMahon, Burton, & Bester, 2000) and that the population was still in slow decline (approximately 2.1% per year – Hindell & Burton, 1987). Clearly, further investigation was necessary

to establish, for instance, if a commercial fishery might affect the population balance (DeMaster, Fowler, Perry, & Richlen, 2001). Southern elephant seals from MI travel thousands of kilometres during their annual foraging trips (i.e., well beyond the limits of the established Marine Protected Areas and the Australian Exclusive Economic Zones – Bradshaw, Hindell, Michael, & Sumner, 2002; van den Hoff, Burton, Hindell, Sumner, & McMahon, 2002, Fig. 1). Therefore, long-term changes in food availability within their foraging regions may be driving the decline.

In an attempt to quantify the structure of the population to understand the continuing decline, the AAD began a study using hot-iron branding to mark permanently approximately 2000 recently weaned elephant seal pups per year from 1993 until the planned end of the project in 2002. The research team calculated that 2000 animals per year were the minimum required for there to be a statistically significant number of adults surviving to maximum lifespan (approximately 15 years for males and up to 23 years for females). The programme aimed to use permanently identified seals to estimate long-term growth rates, survival and dispersal.

The University of Tasmania (UTAS) began research in 1994 investigating the swimming and foraging energetics of adult female elephant seals to contribute to the understanding of this population and its response to the changing ocean environment (Hindell & Slip, 1997; Hindell & Lea, 1998; Hindell et al., 1999; Hindell, Lea, Morrice, & MacMahon, 2000). A 5-year programme was planned in an attempt to monitor foraging success across an entire cycle of the Antarctic Circumpolar Wave (ACW). The ACW is a climatic (pressure) anomaly that travels around the Southern Ocean with a periodicity of approximately 4–5 years (White & Peterson, 1996). Therefore, a 5-year research programme could expect to observe a relative high and low in food availability that would be measurable by the behaviour and fat accumulation of individual elephant seals over that period. This programme began in the 1999 breeding season.

The conventional approach in ecology to test a food-shortage hypothesis is to manipulate the food supply, most usually through food supplementation experiments (e.g., Predavec, 2000). This approach was not possible for southern elephant seals due to absence of mothers from the island prior to the breeding season (Hindell & Burton, 1988a). The only approach available was to use a "natural experiment" (*sensu* Diamond, 1983) – to use naturally occurring variation in food supply to test the hypothesis. The ACW and El Niño-Southern Oscillation (ENSO – Tershy, Breese, & Alvarez-Borrego, 1991) events in the Southern Ocean have been linked to changes the reproductive performance of several species of marine predator (Guinet, Jouventin, & Georges, 1994; Tynan, 1998; Bradshaw, Davis, Lalas, & Harcourt, 2000). Thus, research projects needed to run for sufficient time to contrast relatively low-resource years with high-resource years, thereby teasing out the influence of a reduction in food availability on maternal foraging success.

Brief chronology of events

The controversy began in early 2000 when local Tasmanian media reported that the programme of hot-iron branding of southern elephant seals on Macquarie Island was causing physical harm to individual animals. Television and newspapers showed images of unhealed brands on some recently weaned elephant seal pups. These images and commentary precipitated intense public debate about the branding procedure. Almost immediately, the Australian Antarctic Division (AAD) withdrew its applications to the Tasmanian Government for permits to conduct further research. All authorities involved reviewed their individual protocols and processes. Meanwhile, the research programme was suspended, which caused considerable angst among all concerned because the debate was public and vitriolic.

Following the airing of the video footage, TPWS interviewed the person responsible for releasing it (an employee of the TPWS at the time) because such an action was contrary to TPWS policy on personal behaviour. As a consequence of the media coverage and questions raised by TPWS, the AAD immediately suspended its research programme of continued branding.

The AAD had planned three more seasons of research in the breeding months September – November. Branding was discontinued permanently; however, AAD researchers were permitted by TPWS to continue marking pups with plastic rear-flipper tags (Wilkinson & Bester, 1997). The UTAS programme that had begun in late 1999 was at the time unaffected by the media-generated controversy, mainly because it did not use the branding technique itself to study animals at sea. Instead, the UTAS researchers examined individual females that had been branded in 1993 so that any effects of differences in age on the foraging behaviour of the seals within the sample could be avoided.

Early in 2001, accusations of animal maltreatment directed at the AAD and UTAS researchers involved in the previous seasons were sent to the media, re-igniting the controversy. However, no evidence of maltreatment was ever presented. Concurrently, AAD and UTAS over-wintering researchers were preparing to leave for MI. Reactions to the media publicity resulted in the suspension of permits by TPWS and the cancellation of the winter programme by AAD (but involving UTAS researchers also). TPWS decided that an internal review of research practices was required, and no further research would be permitted until that time, including research conducted by their own scientists. This meant that AAD, UTAS and TPWS research scientists sat idle while the data collected by many data-loggers on the seals would be lost.

In mid-2001, the investigators for the UTAS programme presented information to TPWS in an attempt to review informally the procedures and re-instate the research project for the following breeding season. After consultation with UTAS researchers, TPWS agreed to permit a limited version of previous research protocols with restrictions on access and sample sizes. Permits were then signed and held by the Director of TPWS in September 2001. At that time, a conservation Non-Government Organisation (NGO) requested and received copies of all permits for vertebrate research on MI. This information was taken to the press by the NGO because it was claimed that no review had been undertaken. The NGO requested that the State Minister responsible suspend all permits until a formal review had been undertaken. The Minister agreed and TPWS announced a review of all vertebrate research in all nature reserves (including projects done by their own researchers). UTAS researchers were, however, permitted to retrieve data-loggers from any seals returning to MI but not to re-deploy them. All other biological programmes planned for that season were approved without modification.

A formal review organised by TPWS was held in December 2001 to examine the guidelines for issuing permits to research projects, with the participation of UTAS and the NGO. The outcome of this review was that all research applications were to be treated as new and they could be lodged after a 2-week, internet-based public comment period had elapsed. The Minister and the TPWS re-approved UTAS's limited permit. In the time elapsed since this permit was re-approved, and despite the cancellation of all branding, there have been several instances of continued media exposure generated by NGO and public protests claiming that the limited amount of research itself is causing the decline in numbers. However, a series of papers examining the impact of research procedures on female elephant seals and their pups found no significant impact of research practices on the animals (Engelhard et al., 2001, 2002a; Engelhard, Hall, Brasseur, & Reijnders, 2002b).

The latest issue to arise concerning elephant seal research on Macquarie Island was the intervention by the Premier of the State of Tasmania, who was also acting State Minister for the Environment, in early October 2002. The newly adopted research application and permitting protocols (see below) had all been followed, and all approval had been met to continue the long-term UTAS research programme. The approved permit was then sent to the Premier for final certification. Despite approval from two separate animal ethics committees (see below) and all associated permitting institutions, the Premier, with support from a local NGO, vetoed the permit, claiming the research was still too invasive. After an 18 month delay, nearly 8 months of negotiations with different stakeholders and the permits and ethics committees, the University of Tasmania elephant seal research programme has been re-instated.

Seal research permit protocols

Prior to the controversy there were protocols in place for managing research into the enigmatic, continuing seal population decline. Following the controversy and subsequent reviews, a new, more complex model for research approval was developed. These processes are represented in a schematic flow chart (Fig. 2). Each level of the flowchart represents a separate authority in the path to research approval and implementation. Currently, if any of the existing authorities do not sanction the research, the proposal is either rejected outright, or requires modification and re-submission to the permitting authorities responsible. It is of some concern therefore that a breach of public confidence in the scientific community took the responsible authorities completely by surprise.

The protocols vary according to the rules established by the researcher's employer. In this instance, the employers were the Commonwealth Government of Australia (AAD), the Government of Tasmania (DPIWE) and the University of Tasmania (UTAS). However, analogous models and procedures exist in many other countries. Here, we discuss these protocols and the interactions among them.

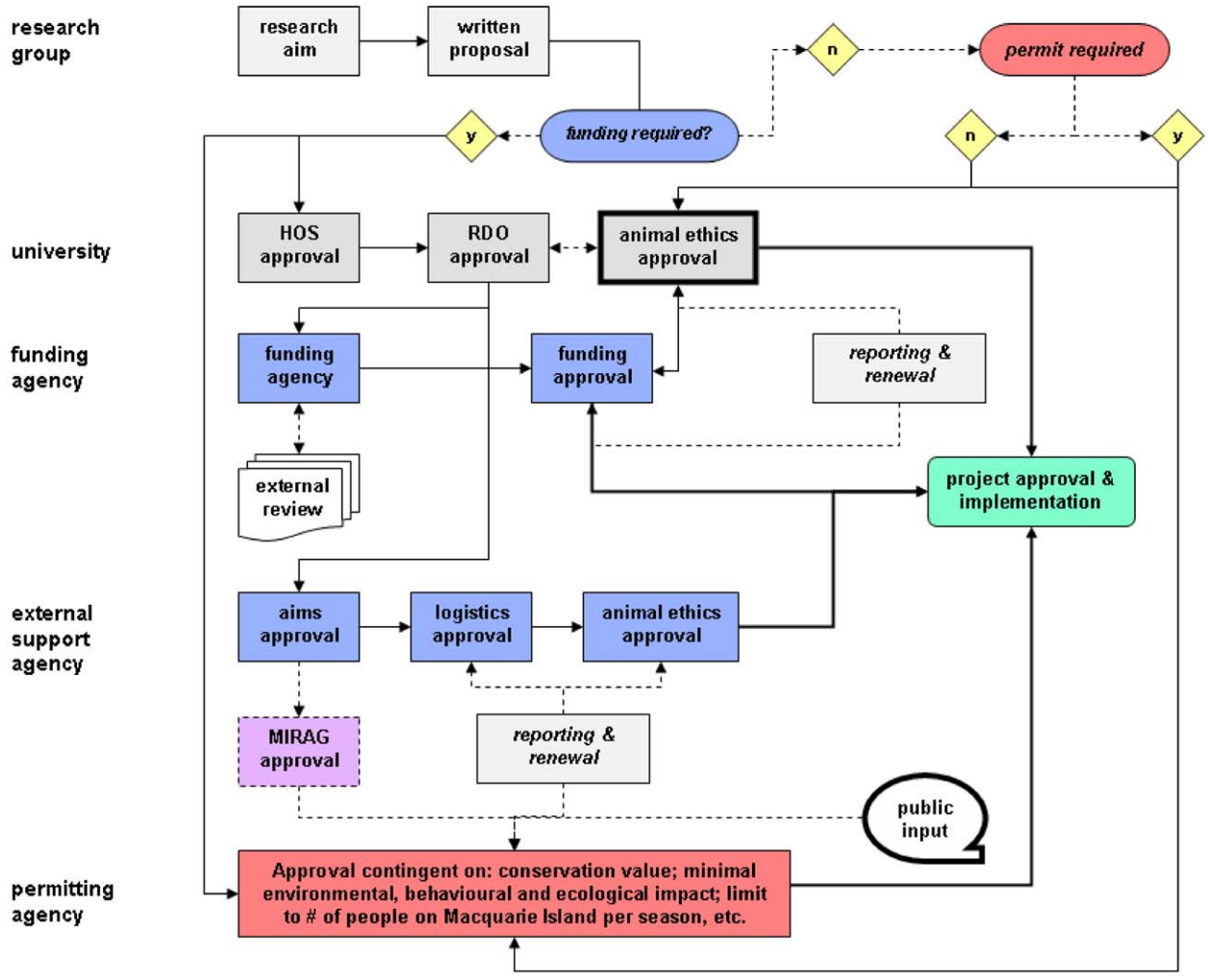

Figure 2. Schematic flowchart describing the research approval process for biological research done within Australia, with particular emphasis on Antarctic and subantarctic research prior to and following the controversy. Prior to the controversy, animal ethics approval was not required by the University of Tasmania (box in boldface), nor was public input required during permit application (box in boldface). Dashed lines indicate where some form of external decision is made regarding the 'validity' of the research proposal. Researchers (groups) design and write proposals with clearly identified aims and outcomes. Proposals are sent to the Head of School (HOS) within the university, and concomitantly to the permitting agency. When funding is required, HOS and Research and Development Office (RDO) approval is required before the proposal is sent to external funding agencies. Most funding agencies (e.g., Australian Research Council) send research submissions to several external scientific and lay referees for appraisal. In the case of research proposed for Antarctic and subantarctic regions, external support agencies (e.g., Australian Antarctic Division) are required to review, permit and in some cases, help to fund, the research. Animal ethics approval must be obtained both at the university (prior to the controversy) and external support agency levels, and in most cases funding cannot be approved without their sanction. Research intended for Macquarie Island must also satisfy the members of the Macquarie Island Research Advisory Group (MIRAG—known previously as 'MIRAC') before it can be forwarded to the Tasmanian Parks and Wildlife Service (TPWS) for further approval. Subsequent to the elephant seal controversy, a two-week, internet-based public comment forum is now a necessary process in the permitting of all TPWS research permit applications. Upon approval and implementation of research projects, research groups must provide reports at least annually to the ethics, funding and permitting agencies for continued approval.

Commonwealth government

Macquarie Island and its marine environment have an unusual combination of state and federal jurisdiction. While it is a State Nature Reserve (within 3 nm of the coast), it is also a Commonwealth Marine Park (Fig. 1). Permits are required by the Government of Tasmania for terrestrial

research and a permit issued under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is required for research and most other activities done in the Marine Park. It is intended that the management of the Commonwealth-declared Marine Park complement the management of the State-declared Nature Reserve (see URL: http://www.ea.gov.au/coasts/mpa/macquarie/index.html).

Only limited scientific research activity is permitted in the Marine Park's Highly Protected Zone (HPZ – Fig. 1). Certain activities are prohibited altogether within the HPZ's 5.8 million ha, including fishing and mineral and petroleum exploration. The other zones require and receive slightly less-stringent control. In the 10.4 million ha Habitat/Species Management Zones (Northern and Southern – Fig. 1), limited scientific research and environmental monitoring, along with limited conditional commercial fishing, may be permitted. Mineral and petroleum exploration, however, are prohibited. Government of Tasmania jurisdiction prevails over research on MI in all respects other than issues pertaining to the Commonwealth Marine Park and the *EPBC Act*.

The characteristics of the southern elephant seal population at Macquarie Island are described in "The Action Plan for Australian Seals" produced by Environment Australia (Shaughnessy, 1999). In the section (12) describing conservation actions already initiated, "a demographic study based on branding several cohorts of weaned pups to provide time-series data" is noted. Significantly, no controversy over branding was anticipated at the time this action plan was written because in the section (13) dealing with conservation actions required, it was envisaged the above study, based on mark-recapture, would continue.

All ANARE scientific programmes involving animals must have approval from the Antarctic Animal Ethics Committee (AAEC – see URL: http://www.aad.gov.au/science/ResearchResources/ASAC/red/red_toc.asp). This independent Committee has developed guidelines to complement the Australian Code of Practice for the Care and Use of Animals for Scientific Purposes (ACPCUASP; see URL: http://www.health.gov.au/nhmrc/research/awc/code.htm). It is noteworthy that AAD researchers were asked to present methodological options for their study to the AAEC at the beginning of the research. The options discussed included marking animals with paint, bleach, tags or brands or the implant of an electronic chip. The option preferred by the AAEC at the time was hot-iron branding (H. Burton, AAD, pers. comm.). This decision was apparently made on the basis that branding was the least intrusive of the techniques, had an acceptably low failure rate, required only a single application (to either side of the animal) and the brand remained for life. Australian researchers have been using the hot-iron branding technique since 1948 and a considerable amount of information and expertise was available (H. Burton, AAD, pers. comm.). Furthermore, the AAEC monitored the activities of researchers in the field through a proxy. In the case of Macquarie Island, the Station Leader – who is an ANARE employee but also an officer authorised by the Director of TPWS to implement certain duties – had this responsibility. The Station Leader's annual report to the AAEC included an assessment of the status of the brands according to select criteria. All reports received prior to the controversy were considered to be positive (H. Burton, AAD, pers. comm.).

The government of Tasmania

Scientific research done on MI is subject to regulations flowing from the *National Parks and Wildlife Act 1970* (Tasmania) and the *Threatened Species Protection Act 1995* (Tasmania) because of MI's status as a National Park and a World Heritage Area. The Tasmanian *Animal Welfare Act 1993* stipulates that all research be done by a licensed institution in accordance with the ACPCUASP via the approval of a properly constituted Animal Ethics Committee (Government of Tasmania, 2001). The AAD holds the license on behalf of ANARE to do animal research at MI in accordance with this Act.

As illustrated in the chronology of the events, biologists are required to obtain permission from TPWS to do biological research of any kind on MI. TPWS had been responsible for issuing permits to the seal researchers (AAD and UTAS) previously and then, following the allegations of animal maltreatment, withdrew them in response to adverse publicity. Following the permitting review in late 2001, the Nature Conservation Branch of DPIWE now has carriage of permits and invites the community to view and comment on all new research proposals. Specifically, the public is invited to scrutinise proposed research through the summaries provided online until a specified closing date (see URL: http://www.dpiwe.tas.gov.au/inter.nsf/WebPages/SJON-55E3 × 3?open). More recently, a new management plan is now being prepared and one of its main recommendations is that all conservation biological research done on Macquarie Island must be compatible with the conservation strategy (Frost, 2003).

The University of Tasmania

As of 2002, any University person intending to do research involving animals must submit an application for approval through the UTAS Animal Ethics Committee (AEC). The AEC is licensed by DPIWE until 31 March 2005, subject to certain conditions. One requirement is that DPIWE's Inspector for Animal Research be an *ex-officio* committee member with the right to inspect research facilities. Another is that the AEC produce an annual report summarising numbers of animals, the purpose for which they were used and the end point of research for every animal used in University research. The AEC annual report is tabled in the Tasmanian Parliament and becomes a matter of public record.

The AEC is comprised of a clinical veterinarian; four individuals with research experience in farm animals, aquaculture, laboratory animals and wildlife research; two representatives from an animal welfare organisation; an independent lay person; the Curator of the Central Animal House; a chair, a secretary and the *ex-officio* Inspector for Animal Research (as per the AEC's licence conditions). The AEC reviews and approves applications for permits to conduct animal research. No public consultation occurs.

A review of both the Human and Animal Ethics Committees following the seal-branding controversy recommended major institutional and strategic changes. The review, finalised in February 2002, made recommendations regarding the prerequisites for the chair of the committee. Another recommendation was that UTAS should examine all joint research activities with other institutions and that each should grant ethics approval separately. This approach (>1 independent animal ethics committees) is not common elsewhere. It was made clear, moreover, that approval by another institution's animal ethics committee would not automatically imply approval by the UTAS AEC.

Finally, and perhaps most significantly, it was recommended that UTAS develop a public information and education strategy to disseminate the details of all research involving animals. Concern was expressed by both UTAS researchers and the AEC members that the rights of both the researchers and the members should be protected in this process. The terms of reference for the review were broad and embraced, *inter alia*, the status of the AEC, its membership, its framework of processes, and its procedures for monitoring research protocols, for handling complaints and responding to publicity on sensitive issues. A regular review mechanism was also considered essential to keep the AEC apprised of changing legal and political circumstances.

Procedural difficulties

In the above sections, we have outlined the new procedures in place to regulate university-based animal research on Macquarie Island; however, prior to the controversy there were difficulties in the interactions between these procedures that exacerbated the issue. Firstly, prior to 2002 and the controversy, the UTAS AEC had agreed to devolve all animal ethics approval to the Antarctic AEC. Here it was assumed that approval given to UTAS personnel involved in Antarctic research would be evaluated by the Antarctic AEC in a manner similar to, and likely to be approved by, the UTAS AEC. Although UTAS personnel were not involved with the AAD seal branding programme, there was no reporting mechanism in place where *post hoc* assessments of any research practices in Antarctica were submitted to the UTAS AEC by the Antarctic AEC. This was, perhaps, understandable considering that UTAS did not have a logistical mechanism of its own to evaluate research procedures occurring in these remote regions. However, since the controversy a complex reporting procedure now exists for both AECs. It should also be noted that since 1997, the UTAS AEC had rejected the use of hot-iron branding proposed for other species of seal studied by UTAS-based personnel within regions of mainland Australia.

In addition to the difficulties inherent in the existence of two, separate AEC to evaluate animal research, there was a potential conflict of interest in the jurisdiction of MI because there were both state (Tasmania) and federal (Commonwealth of Australia) interests at play. Final authority for different procedures may have been at times unclear between the two management bodies; however, a more complex procedure now exists that marries the two government agencies. We hypothesise that many of the recent amendments resulted from the adverse public reaction to the branding controversy and its repercussions. This begs the question: were the laws, regulations and processes outdated in terms of contemporary community ethics?

Modern ethical philosophy

> Ethics, in the empiricist view, is conduct favoured consistently enough throughout a society to be expressed as a code of principles (Wilson, 1998).

In the aftermath of the controversy, implications for the maintenance of effective science and policy

intercourse became apparent. In other contexts, authors have raised the prospect that "the demoralisation of the scientific community… threatens the healthy, fact-based development of environmental policy and resource management" (Johnston and VanderZwaag, 2000). Similarly, the question has been asked: "How far dare we go before the science is too compromised to be recognisable or to provide any real good, before we have become part of the problem?" (Meffe, 1999). Others have considered that extensive cross-disciplinary work was required to realise the goals of conservation biology, and they warned that "failure to do so will render conservation biology intellectually and functionally sterile" (Barry & Oelschlaeger, 1996). Prior to the branding controversy, all existing protocols had been followed, thus it is vital to examine the concerns expressed by these authors, among others, about the ethics, integrity and values of conservation biology, and more particularly, its perceived advocacy role in the policy process.

The role of the authorities described above in assessing the validity and pertinence of research applications cannot be separated from the ethical code of principles they are established to represent. Humans have a moral obligation to develop well-reasoned, defensible ethical principles in relation to practices in conservation biology if the difference between humans and animals is as simple as our "capacity to reason". This concept is disputed by Singer (1998), who noted that not all humans display this capacity; therefore, how are these principles designed, by whom and using what framework? Are there enough points of convergence among the disparate members of society to make sense of ethics and conservation biology?

Ethical decision-making is a vital skill for cultural and professional survival (Oz, 1994; Kallman & Grillo, 1996; Akindemowa, 1999; Bekoff, 2002). Ethical professional behaviour, therefore, should cultivate rights and duties, both legal and moral. Where the rules (protocols and laws) are unable to provide definitive answers, or at least some consistent measure of certainty, a profession is urged to self-regulate (see Farnsworth & Rosovsky, 1993). Professionals need to make good decisions most of the time, and good decision-making is premised on having the "right attitude" towards the profession and its objectives. Knowing instinctively how to behave, making the right choices and understanding rights and duties are matters of unique personal interpretation. When faced with an ethical dilemma and the need to make a decision, however, an individual cannot afford to base action purely on intuition or personal preference. To solve problems it is necessary to acknowledge and incorporate appropriate ethical principles that would be acceptable to the wider community. While this, too, is problematic, groups such as animal ethics committees, statutory permit authorities, funding bodies and employers provide many of the guidelines necessary to help contextualise the subjective from the essentially objective sciences.

Therefore, ethics, while usually comprising self-applied constraints, also rely on the reinforcement by society through sometimes competing forces. Laws (which can be historically grounded in ethical principles commonly accepted in society) provide an unavoidable obligation to conform. Professional codes of practice and conduct exist and indeed, "it is healthy for a discipline to reflect upon its own assumptions [about ethics] and to acknowledge relevant ethical problems where they arise" (Farnsworth & Rosovsky, 1993). In addition, religious doctrines and those unspoken and unwritten principles of so-called "civilised" behaviour inform ethics in a less tangible way. In general terms, it seems that the key to effective translation of ethical principles into accepted practices is through communication. For example, Maguire (1996) points out that:

> Changing public values in favour of preservation of biological diversity is a task full of perils, but people sometimes do change what they value when they learn more about biological diversity, about the connection between biological diversity and other values they already care about, and about how their actions may affect biological diversity.

Ethical decision-making is inherent in conservation biology. Both involve value judgements based on an individual's values, the values of others, adequate examination of the facts, consideration of all perspectives, the consequences of alternative actions, and what is most beneficial. In the case of a perceived ethical dilemma, it may simply involve choosing right from wrong, given adequate and appropriate information and skills. However, when a dilemma involves choosing a perceived right from a differently perceived right, clearly this is much more problematic because there may be competing interests, with each "right" having some merit. For example, most conservation biologists develop an intimate understanding and respect for the species they study (Soulé, 1991), with a concurrent personal desire to improve the situation in which the species of interest is found. This desire is coupled with the skills of designing experiments to answer specific conservation questions. But, when these techniques require an element of invasiveness, there is a danger

that they may engender a controversy between value systems (conservationist v. non-interventionist/preservationist).

Some commentators suggest, therefore, that conservation biologists need to develop a stronger advocacy role by taking public responsibility as both citizens and scientists for their actions. "The term conservation biology implies that we have an ethical obligation to provide decision makers with explanatory knowledge and prescriptive recommendations" (Barry & Oelschlaeger, 1996). Advocacy is, however, a role for which they are not necessarily suited or trained, prompting Song and M'Gonigle (2001) to warn: "for biologists to enter the policy realm, a thorough understanding of the dynamics of contemporary economic and political institutions and their relationship to conservation is essential". Wilson's pathway to consilience (Wilson, 1998) describes a circular, logical direction for all stakeholders (biologists, policy-makers, responsible authorities and the public) to take; once the connections are made (consilience), each gains a greater knowledge and appreciation of the positions of others. However, it is doubtful whether, in the case of this controversy, consilience was ever going to be possible because of the evocative power of the video images displayed in the public media.

Discussion

The efficacy of hot-iron branding in biological and agricultural research has been investigated extensively, with most studies concluding that the technique does not appear to compromise long-term health, survival probability or behaviour (Mills, Wolfe, Le Riche, & Meyer, 1978; Aurioles-Gamboa & Sinsel, 1988; Schwartzkopfgenswein, Stookey, Janzen, & McKinnon, 1997; Troy, Middleton, & Phelan, 1997; Pomeroy, Fedak, Rothery, & Anderson, 1999; Castley, Knight, Mills, & Thouless, 2002). It was not the intention of this paper to judge the efficacy of the hot-iron branding practice as a research technique, *per se*. It is noteworthy though that the practice of hot-iron branding of seal species is still used in other countries as a tool in ecological and conservation research (e.g., Carlini, Marquez, Daneri, & Poljak, 1999; Raum-Suryan, Pitcher, Calkins, Sease, & Loughlin, 2002). Regardless, the net negative result of the seal branding controversy in Australia was that the pup-branding programme, the cornerstone of the conservation study that was to provide essential information for the management of southern elephant seals, was suspended indefinitely.

Yet, there were some positive aspects to the controversy. What has been accomplished in the long term is the exposure of conservation biology as having both values and an advocacy role to play in public policy. It has signalled to scientists and their responsible authorities the need to be better, proactive communicators about their values, motivations and intentions when such activities are likely to be contentious and poorly understood by sections of the community, which is largely underprioritised in modern science (Cribb & Hartomo, 2002). This is not a new or original concept; our conclusions simply re-inforce this idea within the context of a recent conservation science project. However, as mentioned earlier, it is debatable whether in this instance pre-emptive communication by the scientists themselves to the public would have moderated the adverse publicity.

The Government of Tasmania now assigns a public consultation period before research permit applications are assessed. Any unfavourable public reaction is likely to ring alarm bells. However, caution must be exercised in the interpretation of public consultation forums. It is often observed that vocal minority groups with particular political and ethical agendas can inundate a forum with largely negative comments, while proponents often refrain from comment. Governing authorities responsible for gauging the conservation, biological, ethical and political outcomes of conservation research proposals must balance these ideas to promote the ultimate goals of conservation—the preservation of biodiversity through the acquisition of information.

Regardless, the most recent intervention by the State Minister to suspend the ongoing research despite the public consultation period and the newly devised permitting and animal ethics assessments is cause for concern for all conservation biologists. Even though the procedural, ethical and scientific values had been ratified and approved, political agendas ultimately took priority over the conservation goals of the proposed research. Our recommendation in this case is that conservation biologists should embrace a philosophy of informing and continually educating the public and their elected representatives of the importance of conservation science. It may then be more likely that political agendas and conservation ideals promoted by conservation biology will reach points of congruence.

Although this was a specific case, it has implications that resonate generally throughout most political, scientific and academic communities. Scientists and responsible authorities need to be aware that the general community (as taxpayers

funding scientific research, if for no other reason) does take an interest and does have rights to be informed about biological research. It is known, for instance, that ecological field experimentation may at times be intrusive (Farnsworth & Rosovsky, 1993; Bekoff, 2002); that it is often difficult to collect meaningful data with strictly observational techniques or in the laboratory alone; that sufficient replication (i.e., sampling effort) is required to answer complex questions due to highly variable ecosystems (Dutilleul, 1993; Osenberg, Schmitt, Holbrook, Abu-Saba, & Flegal, 1994); and that trade-offs may be an unfortunate, but unavoidable, cost of achieving the greater good. This case study illustrates that scientists and administrators must also become better social observers and communicators (Cribb & Hartomo, 2002).

We have identified that although complex and thorough procedures existed to pre-empt controversies like the one described in this paper, political agendas presented through the public media can circumvent the legitimate process to approve conservation research. Once emotive statements and images become public, personal opinions may be interpreted as fact and repeated out of context. Here, a potential dogma can arise that further fuels debate and perpetuates misinformation, thus continuing to impede the legitimate process. To circumvent, or at least to attenuate, this occurrence, research and management institutions must be prepared to promote research pro-actively. The more educated people are about scientific research and its methods and motivations, the less likely they will be to challenge scientific procedures based largely on emotion.

We recommend that although public input is welcomed, research institutions and their governing authorities can promote their research through better communication *within* institutions (e.g., universities), that is, between research groups and their institution's public relations officers. Because scientists do not necessarily possess the skills or knowledge required to promote their work successfully in the public sector, they need to interact more effectively with those who do. Popularisation of scientific results in lay magazines, newspaper articles and television documentaries are high-impact, positive vehicles for this type of communication (Cribb & Hartomo, 2002). In the case of potentially controversial research, these vehicles can be used frequently so that the important issues remain foremost in the public mind (Bekoff, 2002; Fleishman, 2002).

Finally, it is worth noting that despite the vitriolic accusations made against biologists in this particular instance, these people represent a crucial component of conservation objectives. Biologists are typically the individuals responsible for alerting the general public to the plight of threatened species, and can provide realistic approaches and information essential to manage biodiversity problems. Biologists have a fundamental role in conservation, and as a consequence of their acute understanding and awareness of the pertinent issues (Soulé, 1991), are the most appropriate individuals to do so. This intimate knowledge therefore engenders a social responsibility to identify conservation problems, to educate policy makers and the public, and to collect important scientific information upon which effective policy is founded. It is understandable that researchers may be reticent to divulge the details of their proposed or ongoing work (Fleishman, 2002) given previous instances of contentious debate, the prospect of litigation, and the possibility of strict regulation or even sabotage (Farnsworth & Rosovsky, 1993). Even though researchers appear to be the targets of more and more violent attacks by extreme animal rights groups (Kaiser, 1999; Teitelbaum, 2002), these aspects are outweighed by the potentially incapacitating and counterproductive repercussions of stifled or poor communication (Bekoff, 2002) as was the case for the elephant seal branding controversy discussed. Therefore, we are obliged to urge biologists to be active participants in all levels (scientific, political and ethical) of the conservation of biodiversity.

Acknowledgements

We thank M. Haward (IASOS, University of Tasmania), R. Swain (School of Zoology, University of Tasmania), K. Cussen (Environmental Ethics, Macquarie University) and R. Harcourt (Macquarie University) for helpful comments on earlier versions of this manuscript.

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