Penguins crowded out?

SIR — In your review of scientific research in Antarctica you report Wayne Trivelpiece as saying (*Nature* **350,** 294; 1991) that he observed a 10–20 per cent decline in Adélie and chinstrap penguin populations near the Polish research base Arctowski in Admiralty Bay, King George Island, South Shetlands, over the past three years. He speculated that this was due to overfishing of krill in that area. He suggested that penguins be used as a monitor for krill, and that by counting penguins the krill population would be assessed. We would like to suggest that Antarctic penguins are also sensitive indicators of human interference, and that the decline in the penguin populations at Admiralty Bay may be attributed to this fact alone.

Although seemingly unconcerned, Adélie penguins react strongly to human interference during the breeding season. Heart rate is a good indicator of stress, and we found heart rates to increase by almost 50 per cent when breeding Adélie penguins were approached by a human and to increase by 270 per cent when the birds were caught and weighed in a bag[1,2]. Adélie penguins brooding large chicks fled only when approached closer than 6 metres, but a solitary human at a distance of 20 metres from commuting penguins on a well-used walkway caused the birds to deviate by 70 metres (ref. 2). Contrary to the view expressed in *Nature* (**350,** 291; 1991), we believe that tourism does adversely affect breeding penguins, almost irrespective of how "well-behaved" the tourists are.

Scientists studying penguins may also have a negative impact on the birds. Daily visits to a colony, including adult and egg measurement, reduce breeding success of the study birds when compared to non-visited colonies nearby[3], and flipper bands, widely used by Trivelpiece and his co-workers, are also liable to affect birds. Kinkel[4] reported that the use of wing tags in gulls reduced the number of birds returning to the colony, retarded the return of the others, weakened the pair bond and reduced reproductive performance. Penguins are nearly perfectly streamlined[5] and attachment of foreign bodies including flipper bands is certain to have a negative influence on their energetics and behaviour at sea[6,7].

In addition, we found that aircraft operating near a base caused birds to panic at distances greater than 1,000 metres and that three days of continuous helicopter operation caused 8 per cent of the nests to be abandoned[2]. Finally, surface-active agents such as oil, faeces and detergents originating from ships and bases destroy the waterproofing quality of the feathers and cause loss of buoyancy and insulation. Most oiled penguins die in the water, unnoticed by scientists ashore[8].

It is therefore not surprising that penguin populations are reported to be detrimentally affected by the presence of humans. At the joint US–NZ base at Cape Hallett, Antarctica, Adélie penguins declined from 62,900 pairs in 1959 to 37,000 pairs in 1968[9]. The station was abandoned in 1973, and by 1981 the number of breeding pairs had increased to 66,000[9]. The sharp decline in penguin numbers at Cape Royds between 1955 and 1963 has been attributed[10] to interference by visitors on foot and to helicopters flying over the colony. Since the restriction of human activity in that area, the population has recovered. Recently, Woehler *et al.*[11] found that at Shirley Island, near Australia's Casey station, the Adélie penguin population had increased by 209 per cent everywhere but in the vicinity of the base, where numbers were stagnating.

Scientists in our department have spent several field seasons in Admiralty Bay, and report that the area is increasingly affected by tourism. Tourists and personnel often approach and enter colonies within the 'sites of special scientific interest'. And the operation of scientific vessels and supply ships, often with helicopters, further increases disturbance throughout the breeding season. King George Island is the most densely populated area in Antarctica, with eight stations being operated year round and a large number of summer camps, with all the associated problems of disturbance, sewage and pollution.

If penguin numbers are to be used to monitor the krill population, the study site as well as the methods employed by the scientists in the field need to be very carefully selected. Neither is the case in the studies conducted on King George Island.

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2. Wilson, R. P. *et al. Polar Biol.* (in the press).
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Honest blunders

SIR — These days, we hear a lot about fraud and deceit in science. What we collect, however, is the honest blunder. When Einstein was studying to be admitted to the Zurich technical university, he was doing rather badly: he scored mainly 1s (on a scale from 1 to 6). But in the second half of the year things suddenly went better, and Einstein's marks went up to 6. According to a report of a Canadian historian[1], this was obviously due to the fact that the school opened a brand-new physics laboratory, in which Einstein could do his own experiments.

Only after he had published this hypothesis was the historian told[2] that, in the same year, the school had reversed its scale, so that it now ran from 6 to 1.

That is the kind of blunder we like.

We would appreciate hearing about (preferably your own) most embarrassing moments in science. We want to expand our collection and, with your help, perhaps blunder into publishing a book on the subject.

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1. Pyenson, L.: *The young Einstein.* p.12. (Hilger, Bristol, 1985).
2. Stachel, J. J. (ed.): *The collected papers of Albert Einstein I.* p. 14, note 3. (Princeton University Press, 1987).

Secret Service

SIR — As the Office of Scientific Integrity (OSI) draft report of the investigation of the Weaver *et al.* 1986 *Cell* paper remains confidential, I will not discuss details of its contents. But I should like to correct two significant errors in your article "Secret Service as ultimate referee" (*Nature* **350,** 553; 1991).

(1) The Secret Service possesses extraordinary expertise in many areas, notably in forensic work, and they contributed very significantly to the OSI investigation, but they were not involved in the statistical analyses to which you refer, neither is it anywhere represented that this is the case. You apparently have received incorrect information or made an unwarranted inference.

(2) Contrary to your assertions, the date of creation of the subcloning data is not known with certainty, and is not stated in the draft investigative report. To be consistent and in sequence with related experiments, the subcloning data would have had to be created around June 1985.

The substantive issues you raise about the statistical analyses are important, and we look forward to further discussion of these matters at the appropriate time.

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■ See opposite page.

Letters submitted for Correspondence should be typed, double-spaced, on one side of the paper only.