



Better times for southern fur seals

In the 'good old days' when Chernobyl was just another little village near Kiev, sloths in the Amazon jungle hadn't seen the hair or hide of beef cattle, and no grounded supertankers spewed oil onto sea otters in Prince William Sound, the world's wildlife breathed more easily — or did they?

The romantic three-masted schooners of the 1800s, sailing before the trade winds to bring home spices and fine china, often carried other cargoes: leopard-skins and ivory from Africa, furs from North America, and whale oil from the southern oceans. With no Greenpeace ships harassing hunters, no international commissions setting limits for sustainable harvesting, and no vocal public voicing concern, exploiting wild animals without a thought for their possible extinction was par for the merchant course.

In our own backyard, traders saw Australia's two sub-Antarctic islands, Macquarie and Heard, and their populations of elephant and fur seals as a rich source of income waiting to be tapped. And exploited they were, in a few short, and no doubt bloody, years. In 1811 — the year following the discovery of Macquarie Island — sealing vessels from Sydney procured bet-

ween 60 000 and 100 000 fur-seal skins. Records show that they took another 50–80 000 from the island in the next year, and 2–3000 in the year after. Then fur-sealing was virtually over. By 1815 the *Sydney Gazette* reported that it was no

longer profitable. And when the Russian explorer, Bellingshausen, visited the island in 1820 he stated that fur seals had been exterminated.

Heard Island has a similar history. In 1856 — less than 3 years after Captain J.J. Heard sighted the island to which he gave his name — ships' manifests show that sealers secured a cargo of 500 fur-seal skins and 3000 barrels of elephant-seal oil. Elephant-sealing continued for another 25 years but, during that period, few additional fur-seal skins appear to have been traded. Given the high value of the furs, it's reasonable to assume that no seals were present. It seems that the first harvest of 500 fur seals represented the entire Heard Island population at that time.

Original species

Since the opportunistic days of early sealing, what has happened to the southern fur-seal populations of these islands? The answer's good news; the islands are again resplendent with these beguiling animals. But whether the populations are recovering from remnants of the original or are immigrants from other breeding areas is unknown. Dr Peter Shaughnessy, of CSIRO's Division of Wildlife and Ecology — part of a team that has been monitoring the fur-seal populations — thinks that we'll probably never be able to conclusively solve the mystery. For unfortunately,



After being weighed and measured, a pup gets a reassuring hug from Dr Gwen Shaughnessy.

despite the large numbers of seals killed, no species was ever identified.

However, Peter Shaughnessy and others who have worked with him gathering data on the seal populations — his wife Dr Gwen Shaughnessy (also a biologist) and Dr Lloyd Fletcher from the Antarctic Division — are prepared to make a few guesses about the original inhabitants. Whatever the case in the past, three southern fur-seal species are found on or near the islands now: the sub-Antarctic fur seal (*Arctocephalus tropicalis*), the Antarctic (*A. gazella*), and the New Zealand fur seal (*A. forsteri*).

They are fairly confident that the New Zealand fur seal wasn't the original species on either island. It breeds in New Zealand, on her sub-Antarctic islands, and on islands off the coast of South Australia and Western Australia. Although it has been observed visiting Macquarie since 1948, the fact that it hasn't been able to breed there suggests that it probably never did.

Of the two remaining fur seals, both now breed in small numbers on Macquarie. However, field observations indicate that the Antarctic seal tends to spend most of the winter at sea — unlike the sub-Antarctic seal, which spends a lot of time ashore throughout the year. This is an important clue to the puzzle because several thousand fur-seal skins were taken from Macquarie Island during winter, suggesting that the sub-Antarctic species was the original inhabitant.

But there is another possibility. The rapid extermination of fur seals on Macquarie could have eliminated a species unique to the island. The current competition between the two species breeding there now gives some weight to this idea: they are both attempting to colonise an island that is a long way from the sites where the bulk of their populations breed (see the box on page 7). By contrast, on Heard Island, the Antarctic fur seal has dominated the breeding since observations began — in the latest count, of the 249 pups born, only one was not an Antarctic fur seal — strengthening its claim to being the original one.

Populations are building up

Although up until 1919 gangs of men periodically inhabited Macquarie collecting oil from elephant seals and penguins, few fur seals were sighted between 1820 and the arrival of an Australian National Antarctic Research Expedition (ANARE) in 1948 and the establishment of a permanent station. Since 1950, an annual census — part of a long-term project aimed



An Antarctic fur seal displays her new tag.

at documenting the population growth of fur seals — has recorded a gradual increase (see the chart on page 7).

Without the ANARE station, information about the seal populations would be sparse. Much of it has been gathered by keen amateur seal-watchers. For example, Lloyd Fletcher — the station's resident medical officer for several years — monitored seal numbers and behaviour during his stay. And although Peter Shaughnessy was stationed there in 1966 and 1968 and has returned on several ANARE visits since, he has gathered much of his seal data from logbooks kept by other Expedition staff. The fact that different observers have made the counts means they may not be entirely reliable, but there is no doubt that fur-seal numbers have increased since the early fifties.

The scientists have found that counting the pups is the best way to determine the size of the population. Depending on whether the population is increasing, stationary, or decreasing, the number of pups represents a different proportion of the

The Antarctic pup's grizzled coat (pup on the left) helps researchers to distinguish it from its sub-Antarctic cousin.



Fish and seals

Circus seals balancing balls on their noses and being rewarded with a tasty fishy morsel serve to remind us that seals are clever performers that like fish. Fish-farmers in southern Tasmania are being reminded all the time. Along with the growth of this new industry — in the last 5 years the number of Tasmanian fish farms has grown to about 20 — has come an escalation in the number of seal attacks. The culprits are not the southern seals mentioned in the main article but a close cousin, the Australian fur seal (*Arctocephalus pusillus doriferus*).

Concerned about the predation, the Tasmanian Department of Lands, Parks and Wildlife, and most of the companies involved in sea-farming in Tasmania, have recently funded Mr David Pemberton, a zoologist with the Department, to investigate the extent and severity of the seal attacks on fish pens and to recommend future seal-management strategies. Peter Shaughnessy assisted David Pemberton with the work.

After studying seal attacks for nearly a year, they found that the main offenders are large animals that raid the pens at night — much like the wily fox and the chicken coop. Individuals appear to learn quickly where to find the pens full of succulent salmon and trout and, until killed or discouraged, keep returning to dine. Apart from fish being eaten, the seal attack leaves holes in the nets, allowing other fish to escape. The cost to farmers has varied between the loss of nearly half the fish in a pen to only a few fish killed or injured. Certainly, the problem is costly enough to need attention.

In collaboration with the fish-farmers, David Pemberton tried various deterrents — some more successful than others.

He was hopeful that an acoustic warning device, tuned to a frequency in the seals' hearing range, would scare them away. Unfortunately it didn't. Seal bombs that explode underwater and scare the seal with a shock wave look promising, but may damage the fish if detonated too close to a

pen. Bright lights scare the seals, while being chased by boats or having shots fired near them also discourages them, but they quickly learn to avoid or ignore these deterrents. Using the emetic lithium chloride placed within dead fish suspended close to the fish pens also met with only limited success. The intention was to make the seal feel ill after taking the doctored bait and to associate the nausea with eating the farm's salmon or trout.

Of course, the obvious solution is to fence the seals out with strong predator nets placed around the fish pens. Provided these can resist fouling it is probably the best — albeit the most expensive — remedy. Stainless-steel fencing seems promising, but its cost is prohibitive.

David Pemberton suggests that another option would be to capitalise on the fact that solitary animals attack the pens. As circus experience has shown, seals are easily trained and he thinks that perhaps they can be 'conditioned' not to attack the fish. His idea is to set-off an acoustic warning note when the seal approaches; then a series of aversion tactics would be employed involving, for example, seal bombs, bright lights, and chasing in boats. The idea is that the seal would learn to associate the sound with the harassment.

After a seal had been conditioned in this way, it would not be necessary to continually harass the animal. Only occasional aversive stimulus — as behavioural scientists would say — would be needed to reinforce the conditioned response. This concept could only be applied to farms that have one or two individuals attacking them.

Resolving conflicts between people and wildlife is never easy, particularly when the latter threaten the income of the former. But we've certainly come a long way since the days when we thought that only dead fur seals had any value.

The interaction between seals and fish farms in Tasmania. D. Pemberton. *Report of the Department of Lands, Parks and Wildlife Tasmania, June 1989.*

total. If the population is increasing scientists can estimate the total by multiplying pup numbers by between 3.5 and 4.5. On this basis, last year's population of breeding fur seals on Macquarie Island was about 200, still a very long way short of pre-sealing numbers.

In addition to collating population data, Lloyd Fletcher and Peter and Gwen

Shaughnessy have undertaken several field trips to study the behaviour and breeding patterns of the animals. For example, at various times during 1986/87, with the financial support of the Antarctic Science Advisory Committee, they studied a colony of sub-Antarctic and Antarctic fur seals on the northern peninsula of Macquarie Island. By tagging and marking some of the

seals with yacht enamel, they kept track of movements and, in particular, the territorial behaviour of the adult males.

Identifying the species needs experience. Although the bulls are easily distinguished by the colour of their fur — sub-Antarctic males have a creamy-coloured chest and face, while Antarctic males are uniformly grey to dark brown — the cows look very similar. The scientists separate the females by the shorter, broader nose of the sub-Antarctic fur seal (reminiscent of a Pekinese dog) and the fact that they make distinctive sounds — a feature first noticed by Gwen Shaughnessy. With practice the pups can be identified by their fur: Antarctic pups have a whitish muzzle and grizzled coat.

Male fur seals are strongly territorial and typically herd small groups of females and young. The researchers noticed that these groups had a sub-Antarctic bull, but most cows were Antarctic. Peter Shaughnessy and his colleagues suspect that the seals may be hybridising, as some of the pups appeared to have characteristics of both species.

Indeed, if hybridisation is not happening, then it is not clear where the Antarctic cows in these small groups are mating, for the larger sub-Antarctic bulls here prevent the Antarctic males from plighting their troth in the territories. In fact the only copulation observed by the scientists was between a sub-Antarctic bull and an Antarctic cow. Peter Shaughnessy thinks that perhaps the Antarctic males and females mate on the way to and from the water.

One implication is that the recruitment of Antarctic seals will be slow until some Antarctic bulls grow big enough to win and hold territories from their sub-Antarctic rivals. (This will quite likely happen in the next few years, as Antarctic bulls are usually slightly larger.) Recruitment will also be slowed because the progeny of the mixed marriages are likely to be infertile. When scientists visit the island this summer, they hope to be able to answer the question about hybridisation following an electrophoretic examination of proteins and enzymes in blood samples taken from the pups.

No hybridisation appears to occur on Heard Island, in contrast to Macquarie. Several ANARE participants have visited and surveyed the fur-seal population there since the early sixties. The latest count puts the breeding population of Antarctic fur seals at between 800 and 1000. Interestingly, this is 3–500 more than the total numbers of skins said to have been taken in 1855. But Peter and Gwen Shaughnessy

Sorting out seals

You may be surprised to hear that there are two distinct groups of seals. True seals (the family Phocidae) lack external ears and have hindflippers that they can't move forward to help them move about on land. Out of water they resort to wriggling or pulling themselves along with their foreflippers to make any headway. On the other hand, fur seals belong to the family Otariidae and, as the name suggests, possess external ears. And members of this family (including those circus performers the sea lions) can rotate their hindflippers forward, which lets them use all four limbs to move about on land.

Most of the 18 species of true seal live in the Northern Hemisphere, whereas most of the nine species of fur seal and five of sea lion live in the south. The Antarctic Convergence — where sea temperature changes 2–4°C in a space of about 50 nautical miles — is an important feature of the high biological productivity of southern fur seal country. Near the Convergence, with its associated upwelling of cold, nutrient-rich water, massive krill populations support our planet's largest mammals and, through a simple food chain, other species such as penguins and fur seals.

Antarctic and sub-Antarctic fur seals get their name from the location of the islands



Antarctic fur seals breed on islands south of or close to the Antarctic Convergence. Sub-Antarctic fur seals breed on islands north of it.

where most are found during the breeding season. Antarctic fur seals — now back up to a population of about 1 500 000 — breed on islands south of, or close to, the Convergence, particularly on South Georgia, as well as Kerguelen and Heard. Sub-Antarctic fur seals, on the other hand, breed on islands north of it, particularly Gough, as well as Marion, Amsterdam, and islands of the Crozet Archipelago.

Their total population is thought to be about 250 000.

As the map shows, Macquarie Island (apart from being on the other side of Antarctica in relation to most of the other islands) is just north of the Convergence — perhaps a bit further north than Antarctic fur seals are used to, but maybe a little further south than favoured by their sub-Antarctic cousins.

and a colleague from the University of Tasmania, Mr Peter Keage, think that it's unlikely that the island has more seals present now than when it was officially discovered.

Using some more sleuth-like deduction, they suggest that the chances of the numerous whaling and sealing vessels that

were operating in the region during the early 1800s missing the island would have been slim, particularly as its summit is 2745 m above sea level and visible for more than 50 nautical miles. And astute traders would have been encouraged by the sightings of penguins and fur seals that were reported in the published journals of one

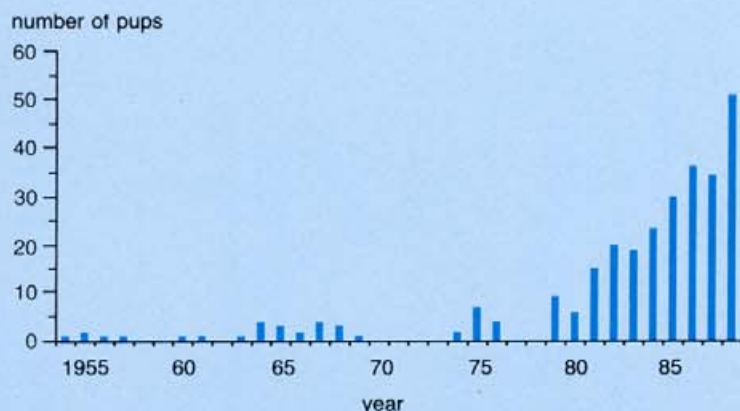
Captain James Cook, who sailed close to the island in 1777.

Our sleuths guess that fur-sealers landed earlier than official records indicate. So, despite three decades of population growth, fur seals on Heard Island — like those on Macquarie — have a while to go yet before they reach their former number.

David Brett

Pup numbers, counted at the end of calendar years, as most pups are born in December, give a good indication of the population of breeding fur seals. Antarctic and sub-Antarctic pup numbers are shown here together. No counts were made in some years.

Pup numbers on Macquarie Island



More on the topic

Recovery of the fur seal population at Macquarie Island. P.D. Shaughnessy, G.L. Shaughnessy, and L. Fletcher. *Papers and Proceedings of the Royal Society of Tasmania*, 1988, **122**, 177–87.

Fur seals at Heard Island: recovery from past exploitation? P.D. Shaughnessy, G.L. Shaughnessy, and P.L. Keage. In 'Marine Animals of Australasia — Field Biology and Captive Management.' (Royal Zoological Society of New South Wales: Sydney 1988.)

Fur seals, *Arctocephalus* spp., at Macquarie Island. P.D. Shaughnessy and L. Fletcher. *Proceedings of an International Symposium and Workshop, Cambridge, England, 23–7 April 1984*, 177–88.