
Daniel Blumstein

Vigilance in quokkas may be largely unrelated to predation.

Cats with bells on

DOMESTIC cats are superb hunters and cat owners often attempt to curb their pet's hunting activities by either fitting a bell to their collar, to warn prey of the cat's approach, or by keeping them indoors. There seems little doubt that keeping puss confined will reduce predation, but the efficacy of cat bells has been contentious.

Two Australian studies concluded that cat bells had no effect on predation rate, and suggested that cats might cleverly learn to overcome the handicap of wearing a bell.

Dr Graeme Ruxton, with students Sarah Thomas and Jessica Wright, of the University of Glasgow, conducted an eight-week study in which cats wore bells for only half the time: in four-week blocks, or in alternate weeks.

'We found that equipping cats with bells reduced prey delivery rates by about 50%,' Ruxton says. 'On average, each cat delivered 5.5 prey animals in the four weeks with the bell off and 2.9 items in those with the bell on. Of the 21 owners, 18 recorded fewer prey items in the weeks with the bells on.'

During bell-wearing periods, the cats took home a total of 82 mammals, 26 birds and 10 amphibians. For periods without bells the totals were 167 mammals, 48 birds and 11 amphibians. Bell wearing, then, significantly reduced predation on birds and mammals.

The predation success of the cats did not change during the course of the experiment. A longer study is being undertaken in the UK by the Royal Society for the Protection of Birds.

Ruxton GD Thomas S and Wright JW (2002) Bells reduce predation of wildlife by domestic cats (*Felis catus*). *Journal of Zoology* (London), 256:81-83.

Steve Davidson

Quokka defence

MANY animals form groups and, like humans, their behaviour tends to change as group size increases. Typically, individuals in a group of animals forage more and become less vigilant as group size increases. This is usually attributed to a reduction in the *per capita* risk of predation in larger groups. But what happens when a population becomes isolated from predators? Does their inherited behaviour in relation to group size change?

Dr Daniel Blumstein of the University of California Los Angeles and the Marsupial CRC, Sydney, and his colleagues, have been studying the evolution of group-size effects in macropodids (kangaroos, wallabies and rat kangaroos). They were interested in the quokkas of Rottnest Island, off Western Australia, because these small, wallaby-like marsupials have been virtually free of predation for about 7000 years. Mainland quokkas also occur, but are endangered.

The researchers were keen to find out how the loss of predators has influenced the benefit to individuals of forming groups.

They found that, despite long isolation from predators and therefore relaxed natural selection, quokkas showed typical group-size effects. They foraged more and looked around less as group size increased. The scientists think that the observed group-size effects must, at least partly, result from factors other than anti-predator benefits.

The quokkas did retain some anti-predator behaviour in that they remained sensitive to the distance from cover and to the time of day when foraging. However, given virtually no predation risk on the island, competition for food or other resources may also influence time allocation in the quokkas. Scramble competition, which causes animals to forage more and show less vigilance as group size increases, could also be partly responsible for the observed behaviour pattern in Rottnest quokkas.

In a similar study of western grey kangaroos (quokka cousins), an insular population living with limited risk of predation did not exhibit the typical group-size effects observed in a mainland population subject to predation. Perhaps, in quokkas, the difference is that removal of the threat of predation releases competition between individuals that may be suppressed when predators are around. They can afford to drop their guard. Vigilance in quokkas may be largely unrelated to predation.

Quokkas seem to be peculiar among kangaroos and wallabies in that individuals in groups of about 10 or more allocated virtually all their time to foraging and none to vigilance, as measured over five minute periods. This unusual threshold effect probably is due to the negligible predation on Rottnest Island, where careless non-vigilant quokkas, experience rates of predation no greater than vigilant ones.

Blumstein DT Daniel JC and McLean IG (2001) Group-size effects in quokkas. *Australian Journal of Zoology*, 49:641-649.

Steve Davidson

Moss mystery solved

FOR 25 years, the identity of a tiny moss sample harvested near the summit of the Mount Erebus volcano in Antarctica, has eluded scientists.

As a 'protonema' – the juvenile form of moss – the sample could not be identified by physical or reproductive traits, and all attempts to encourage it to mature in the laboratory failed.

The application of modern genetic technology, however, has enabled ANU geneticist Dr Mary Skotnicki, Macquarie University botanist Patricia Selkirk and their colleagues from New Zealand to finally identify the moss as *Campylopus pyriformis*.

The discovery came after the team compared DNA sequences and other genetic information from the protonema, with samples of *C. pyriformis* from a second Antarctic volcano, Mount Melbourne, and from two volcanic areas in the North Island of New Zealand. Other moss species from elsewhere in Antarctica were also compared.

The Mt Erebus protonema was found to share a significant proportion of its genetic material with the three *C. pyriformis* specimens and very little, or none, of its genetic material, with other species.

'The next question to consider is does the Mount Erebus moss remain in the juvenile stage because conditions are too harsh

for further development, or does it contain mutations that keep it that way,' Selkirk says.

'The persistence of the protonemal stage in culture conditions suitable for differentiation suggests mutation is a distinct possibility.'

Skotnicki ML Selkirk PM Broady P *et al* (2001) Dispersal of the moss *Campylopus pyriformis* on geothermal ground near the summits of Mount Erubus and Mount Melbourne, Victoria Land, Antarctica. *Antarctic Science*, 13(3):280–285.

Wendy Pyper

Lobster lines

CARIBBEAN spiny lobsters, like many other spiny lobster species, are gregarious for most of their long lives and have some interesting, even odd, habits. During mass migrations across the ocean floor, the lobsters form single-file queues that reorganise into tightly packed, outward-facing rosettes when it's time to rest or when confronted by predators. They also show co-denning (sharing of a safe retreat) and cooperative defence.

Many explanations have been offered for the evolution of these behaviours, particularly co-denning and queuing, but these educated guesses have rarely been tested.

Florida State University's Professor Bill Herrnkind and his colleagues have analysed seven years of field data and conducted experiments in large sea-water enclosures to assess the benefits of these lobster activities. Their research was motivated by the annual value of the global lobster catch (some US$2.7 billion), and the importance of the ubiquitous lobster to marine ecosystems.

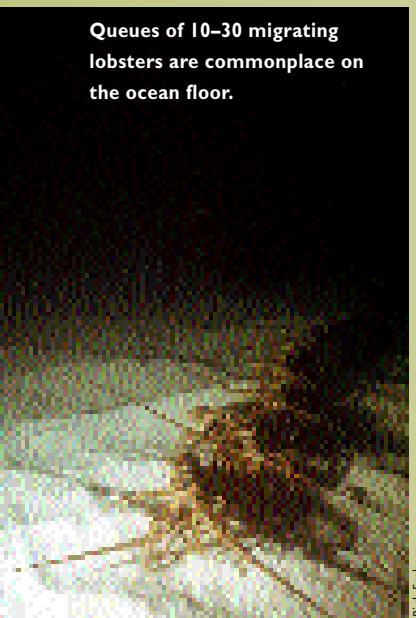
The scientists' earlier work had shown that for mass migrating lobsters, queuing reduces fluid drag on following lobsters in the line by about one-half, a significant boost to efficiency of movement. Because the leader experiences maximum drag, taking turns over time is advantageous, but the drag reduction does not become optimal until the group has at least five members. Queues of 10–30 migrating lobsters are commonplace on the ocean floor.

Could there be other benefits from queuing, such as greater vigilance against enemies? An analysis of group size indicated that, during movement in the open, queuing would contribute to a cooperative defence, vigilance against enemies and a dilution effect (reduced probability of predation due to numbers).

The scientists concluded that the observed groupings were not due to chance. The results will provide a focus for future modelling and experimentation on the advantages lobsters gain from forming groups.

Herrnkind WF Childress MJ and Lavalli KL (2001) Cooperative defence and other benefits among exposed spiny lobsters: inferences from group size and behaviour. *Marine and Freshwater Research*, 52:1113-24

Steve Davidson



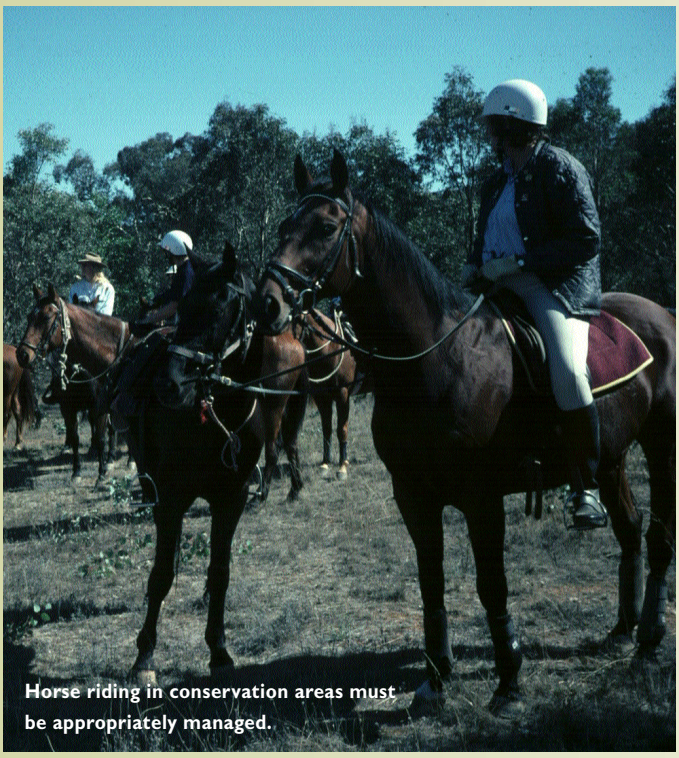
Queues of 10–30 migrating lobsters are commonplace on the ocean floor.

Rick Frehsee

Stepping lightly

THE issue of horse riding in conservation areas tends to generate heated debate. Advocates of horse riding are likely to feel aggrieved if their preferred recreational pursuit is restricted while non-equestrians often disapprove of horse riding anywhere in nature parks. What is the objective scientific evidence for and against?

When the question of horse riding in Canberra Nature Park, a large, fragmented, semi-natural park in and around the national capital, arose, the ACT government engaged Dr Jill Landsberg, then of CSIRO Wildlife and Ecology, to prepare a guiding report. Working closely with Bill Logan and Dr David Shorthouse, both with Environment ACT, she examined the published evidence on the impacts of horse riding in conservation areas comparable to the Canberra Nature Park.



Environment ACT

Horse riding in conservation areas must be appropriately managed.

The scientists' review established that, because of their large weight and small hoof area, horses have a relatively high potential for damaging the environment. A man wearing boots applies a stationary pressure of 206 grams per square centimetre to the ground, whereas a shod horse and rider applies a crushing 4380 grams per cm^2. This is more than 2.5 times the pressure exerted by a four-wheel drive vehicle including four people and gear.

One study showed that horse traffic caused more damage on established trails than motorcycles, bicycles or hikers. Environmental impacts tend to be highest in previously untracked areas and lowest on constructed and well maintained trails.

Horses can also spread weeds because seeds of many weed plants in pastures and dried stock feeds retain their viability in horse manure. Riding off-track, especially in disturbed, damp areas, raises the risk of weed establishment in reserves.

'Horse riding is certainly popular but it is a relatively expensive activity to provide for and it can reduce opportunities for lower-impact recreational use of parks,' Landsberg says. 'Considering all the evidence, we believe it is socially equitable to provide for recreational horse riding in urban nature parks even though conservation is the paramount objective. But it seems sensible to allow fewer horse riders than other park users engaging in lower impact, more passive recreational pursuits like walking.'

Landsberg has some sympathy for horse riders. She says they may not be good for parks, but nor are they as bad as sometimes painted. The key is to have an appropriate plan of management. The authors have published principles to guide the management of horse riding in urban nature parks and for assessing risk at individual sites.

Landsberg J Logan B and Shorthouse D (2001) Horse riding in urban conservation areas: reviewing scientific evidence to guide management. *Ecological Management and Restoration*, 2:36-46.

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