The great barred frog.

The great frog survey

ONE OF the largest frog surveys undertaken in Australia has provided scientists with an insight into the ecology of a common, but poorly understood ground-dwelling frog. Dr Kirsten Parris, an ecologist at the Australian National University, traversed 124 survey sites in 21 State Forests and nine National Parks, encompassing a study area of 125 000 km^2, in an effort to understand the distribution and habitat requirements of the great barred frog (*Mixophyes fasciolatus*).

Parris's study area extended from the Clarke Range in mid-east Queensland to the southern highlands of New South Wales. The 124 survey sites – at selected streams, dams and lagoons – were surveyed for frogs over four breeding seasons between 1995 and 1999. The surveys were done at night, by walking around a water body spotlighting for frogs and counting and recording frog calls, or with automatic tape recorders that recorded frog calls intermittently from 6 pm to midnight. Vegetation and habitat information was also recorded at each site.

Parris found 43 frog species during the survey, while the great barred frog was observed 140 times across 55 sites.

'The species was most common in the forests of south-east Queensland, close to the centre of its range,' Parris says.

'It inhabited all five broad forest types identified in the survey, but was more likely to be found in the wetter forest types – wet sclerophyll and rainforest. These forests tend to support relatively dense 'mesic' vegetation in their understorey and mid-storey, such as palms, ferns, shrubs and climbers. This is associated with a moist microclimate, which may be important for ground-dwelling amphibians.'

Statistical analysis showed that in forests within its climatic range, the frog was most likely to occur in wetter forests in areas with lower rainfall and intermediate temperatures in the warmest quarter of the year.

The great barred frog was also found across a large range of stream sizes as well as at 'lentic' water bodies such as dams. This 'flexible' habitat use may explain its continued abundance, in the face of serious population declines suffered by three of its relatives; the stuttering frog, *M. balbus,* Fleay's barred frog, *M. fleayi,* and the giant barred frog, *M. iteratus.*

The results of the study provide a benchmark against which any future changes in the distribution and abundance of the great barred frog can be assessed. The frog may also be used as a model for research into processes threatening stream-breeding frogs in general, and into conservation options for its endangered relatives.

Dr Parris is now based at the Australian Research Centre for Urban Ecology in Melbourne.

Parris KM (2002) The distribution and habitat requirements of the great barred frog *(Mixophyes fasciolatus). Wildlife Research,* 29:469-474.

Wendy Pyper

Butting whales

IN THE 19th century, enraged sperm whales sometimes turned on the whalers that pursued them and sunk their ships, inspiring the fictional tale of Moby Dick. Now scientists may have worked out how these whales managed to destroy well-constructed ships that were many times their own size.

It could all be in the size and design of the whale's melon, the bulbous forehead of toothed whales. In the sperm whale the forehead is massive, more than a third of its body length.

Evolutionary biologist at the University of Utah, David Carrier, and his colleagues, were particularly intrigued by two well-documented cases of early whaling ships being rammed and sunk by ornery whales. The first of these was the *Essex,* weighing 238 tons and made of stout white-oak ribs, each 30 cm square, and oak planks, 10 cm thick, covered by pine planks.

One of two harpooned sperm whales had already smashed the whalers' rowing boat when another awesome 26-metre animal headed straight for the *Essex,* striking her on the port side so that the ship shook 'as if she had struck a rock.' Several minutes later the whale charged the ship again and stove in her bows. Within 10 minutes the ship capsized. Similarly, in 1851, a large harpooned sperm whale being pursued by the *Ann Alexander* suddenly reversed direction, twice charged at the ship, and on the second attempt sank her.

Sperm whales possess two huge oil-filled sacs within their head, known as the spermaceti sac and the junk. Various biologists have argued that the spermaceti is used in whale sonar, buoyancy control, acoustic stunning of prey or vocal communication and acoustic sexual selection, that is, for impressing female whales. Whalers though have long believed that the exaggerated melon of sperm whales and some of their relatives is also a weapon used as a battering ram in male-to-male head-butting sessions and, occasionally, for exacting revenge on whalers.

The Utah scientists investigated this possibility firstly by analysing the correlation between the relative size of whale melons and the degree of difference in body size between males and females in a number of whale, dolphin and porpoise species. In many animal species that have competitive males that endeavour to mate with several females, the males are larger than females. What's more, the size of male weapons, such as antlers in deer, tends to increase with the degree of male-female difference in body size. Carrier and his colleagues also used a two-dimensional physical model to simulate the impact between two 39-tonne sperm whales.

'We found that relative melon size increases as sexual difference in body size increases, suggesting that some bull whales can use their melons as weapons in contests for access to females,' says Carrier. 'Our modelling also indicates that the momentum of the spermaceti organ of a large mobile sperm whale could seriously injure a stationary opponent of similar size, despite the necessity for damping to protect the attacking whale.'

Carrier DR Deban SM and Otterstrom J (2002) The face that sank the *Essex*: potential function of the spermaceti organ in aggression. *The Journal of Experimental Biology,* 205:1755–1763.

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