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Gene sleuths get behind the whale

Spending time at the business end of a blue whale is not always an endearing experience. But for Australian Antarctic Division research scientists Dr Nick Gales and Dr Simon Jarman, the 'noxious brown stain' discharged by the whale after eating contains a glut of information about the animal's diet.

The trick lies in accessing this information, which is vital to the sustainable harvesting of living resources in the Southern Ocean.

'We can only establish ecologically sustainable limits to the commercial fisheries of krill, squid and fish with some understanding of dynamic food chains,' Gales says

'This means learning more than just who eats who, but also how much of a commercial species a predator might eat, and where, when and how it hunts for prey.

Using DNA technology and some clever experimental design, Jarman, Gales and their team believe they can probe the secrets of whale and other marine predator poo, to answer the questions of 'who' and 'how much'.

The team is initially concentrating on blue whales and their favoured diet of krill, as they have access to samples of blue whale faeces, and DNA sequence information for several krill species.

'Blue whales are widely distributed and we want to look at their diet across geographic regions,' Gales says. 'So we've put together sampling kits – a poo-scooper and sampling jars – for collaborators in Victoria, Western Australia, Mexico, California and Newfoundland.' The material will then be examined for krill DNA.

'I have DNA sequence information for all the krill species likely to be the major component of the whales' diets,' Jarman says. 'Using this sequence information, I've developed a method that allows us to identify which krill species are present in a sample. We're developing similar methods that will allow us to identify any species: krill, squid, fish, or any other animal.'

The methodology will later be applied to the diets of other whales, including humpback, fin, sperm, bryde's and minke whales, while other team members will consider the composition of penguin, dolphin, sea lion and seal scats. In a series of feeding trials, the DNA in scats from animals fed on single and multiple-species diets will be examined.

To answer the questions of where marine predators are feeding, and when and how they feed, the team will employ satellite tracking equipment, time-depth recorders and digital cameras. A tiny magnet that attaches to the target animal's jaw and records eating activity is also being developed.

'Advances in miniaturised electronics are making it possible to design and build a new generation of instruments,' Gales says. 'This should enable us to photograph a predator's prey from a small camera on the animal's head; track and record the diving behaviour of whales over great distances; and record when an animal is feeding during a dive.'

These technologies are being developed in trials on captive animals, or those close to Australia, but eventually will be deployed in Antarctica and the Southern Ocean.

Information obtained from the project, which will run for the next five years, will feed into food web models that will calculate how much krill or other commercial species can be taken from the Southern Ocean without affecting predator populations. Much of the data will also be used to inform Australia's commitment to the Convention on the Conservation of Antarctic Marine Living Resources.

Part of this project is being assisted by CSIRO Marine Research. Contact: Nick Gales (03) 6232 3437 nick.gales@aad.gov.au.

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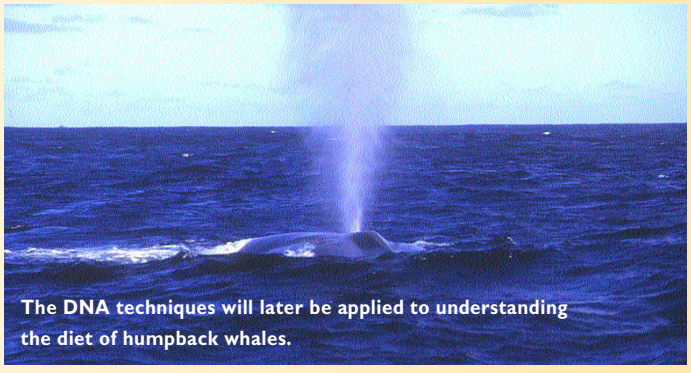

The DNA techniques will later be applied to understanding the diet of humpback whales.

The diet of the blue whale will be studied across various geographic regions.

the mesopause region, increases the likelihood of cloud formation,' Burns says.

Burns notes that any advantage in looking for climate change in the mesopause is still a matter of scientific debate. Further study in the region, however, will help scientists better understand atmospheric processes. Already, questions have arisen over the pace of cooling in the mesopause. Russian scientists report cooling way in excess of predictions, at a rate of 7°C per decade. This is 10 times greater than expected!

'If the Russian reports are accurate, it could mean we are missing a significant process in the upper atmosphere associated with climate change,' Burns says.

'Our group, and others, are trying to confirm or disprove the Russian results. With accurate measurements and a better understanding of mesopause processes, hopefully we can match experimental measurements with theory. Then we'll be more confident of future temperature predict\ions.'

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