

Where to for Whales?

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Bryde's whales are found year-round in the Hauraki Gulf. They are a non-migratory baleen whale, around 13 m in length and are found in temperate to tropical waters. In New Zealand they are mostly sighted in northern waters, but most frequently in the Hauraki Gulf. There is variation in the residency times and population structure with some animals seen only once whereas others have been seen multiple times over several years. The most vulnerable animals are those that are frequently sighted in the Gulf, and estimate of around 46 (CV = 0.08) whales (Wiseman 2008). Bryde's whales are listed as a Nationally Critical species due to their low population size but are secure offshore with an estimated 10,000 individuals (Baker et al. 2010).

From 1989-2010 there have been 46 whales found dead in the Gulf; 85% (n = 39) were Bryde's whales. Of those, there are only 16 where we can assign a probable cause of mortality, 81% (n = 13) most likely died from vessel strike injuries and the other 19% (n = 3) died from gear entanglement – 2 from entanglement in mussel spat lines (Behrens 2009). This entanglement risk should definitely be considered with the planned development of the aquaculture industry.

We know that whales are concentrated in the 'inner' gulf, bordered by the Coromandel Peninsula, the mainland and Great and Little Barrier Islands. With 17 aerial surveys, flying a total of 2,300 nm, conducted between Cape Rodney and Bream Head, only five whales were sighted (average = 0.02 whales). In contrast boat-based data, primarily from Whale & Dolphin Safaris, found an average of 1.8 whales per survey (Behrens 2009). These whales were typically alone which makes them vulnerable to strike as larger aggregations are easier to see. Unfortunately their preferred habitat overlaps entirely with the major shipping routes into, and out of, the Port of Auckland. The possibility of shifting the shipping lanes is unlikely but we will undertake an analysis of whale aggregations and the AIS tracks from ship movements to determine whether there are any points where the two do not overlap. The most likely solution is for ships to slow down once entering the Gulf region and we continue to work on this solution as there is considerable support from industry who are used to similar measures being taken in other waters, e.g., off the northeastern seaboard of the USA.

So why are Bryde's whales vulnerable to vessel strike? We don't know but we suspect their dietary preferences for mid-water schooling fishes and krill mean they are using shallow waters which put them in the way of the considerable draft of large ships; up to 12.5 m. They also may not be localising the source of ship sounds as they approach and thereby not taking avoidance action. So to answer these questions we are using the University of Auckland research vessel *RV Hawere* to search for whales and then to deploy a d-tag (Johnson & Tyack 2003) to 'see' their underwater world. The d-tag has a velocimeter, 3-D motion sensors, a time-depth recorder and in-built hydrophones, all recording continuously. The tag has four suction-cup feet and is attached to the whale from the end of an 8 m carbon fibre pole from the front of a small boat. This will allow us to understand the whales' depth, speed and behaviour below the surface and record sounds made by the whale as well as received noise. The tag should stay attached for up to 19 hours and we retrieve the tag once it detaches from the whale; it has a small VHF antenna that sends out a signal and that allows us to locate the tag on the surface of the water.

We are interested in many aspects of the whales' behaviour in the Gulf and hope to study the sound of prey with and without birds, then record anthropogenic noise, mostly from vessel traffic and determine whether there is possibility of masking whale communication and possible prey localisation. We are also using new genetic techniques to determine whale prey and to test water samples throughout the Gulf for seasonal and/or temporal changes in zooplankton. This might be an indicator of why the Bryde's change their prey choices throughout the year from krill to schooling fishes. Understanding possible ecosystem drivers behind the year-round occurrence of whales is extremely important to ensure their continued presence in the Hauraki Gulf.

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