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BRYDE'S WHALE (*Balaenoptera edeni*): Eastern Tropical Pacific Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

The International Whaling Commission (IWC) recognizes 3 stocks of Bryde's whales in the North Pacific (eastern, western, and East China Sea), 3 stocks in the South Pacific (eastern, western and Solomon Islands), and one cross-equatorial stock (Peruvian) (Donovan 1991). Bryde's whales are distributed widely across the tropical and warm-temperate Pacific (Leatherwood et al. 1982), and there is no justification for splitting stocks between the northern and southern hemispheres (Donovan 1991). Past surveys have shown them to be common and distributed throughout the eastern tropical Pacific with a concentration around the equator east of 110ºW (corresponding approximately to the IWC's "Peruvian stock") and a lower densities west of 140ºW (Lee 1993; Wade and Gerrodette 1993). They are also the most common baleen whale in the central Gulf of California (Tershy et al. 1990). Sightings and acoustic recordings of Bryde's whales in southern California waters have increased in the past decade (Kerosky *et al*. 2012, Smultea *et al*. 2012), possibly signaling a northward range expansion (Kerosky *et al*. 2012). Acoustic recordings indicate Bryde's whales are present in southern California waters from summer through early winter (Kerosky *et al*. 2012). At least seven sightings have been documented in southern / central California waters between 1991 and 2014 (Barlow and Forney 2007, Smultea *et al*. 2012, Barlow 2016). Bryde's whales in California waters likely belong to a larger population inhabiting at least the eastern part of the tropical Pacific. Acoustic call types of Bryde's whales in southern California waters match a type found along the west coast of Baja California (Kerosky *et al*. 2012). For the Marine Mammal Protection Act (MMPA) stock assessment reports, Bryde's whales within the Pacific U.S. Exclusive Economic Zone are divided into two areas: 1) the eastern tropical Pacific (east of 150ºW and including the Gulf of California and waters off California; this report), and 2) Hawaiian waters.

POPULATION SIZE

In the western North Pacific, Bryde's whale abundance in the early 1980s was estimated independently by tag mark-recapture and ship survey methods to be 22,000 to 24,000 (Tillman and Mizroch 1982; Miyashita 1986). Bryde's whale abundance has never been estimated for the entire eastern Pacific; however, a portion of that stock in the eastern tropical Pacific was estimated as 13,000 (CV=0.20; 95% CI = 8,900-19,900) (Wade and Gerrodette 1993), and the minimum number in the Gulf of California was estimated at 160 based on individually-identified whales (Tershy et al. 1990). The most recent verified sighting in California waters occurred in 2014 during a systematic line-transect survey designed to estimate cetacean abundance (Barlow 2016). That sighting did not occur during standard search effort and thus, no estimate of abundance is available from the 2014 survey.

Minimum Population Estimate

The only minimum estimate of Bryde's whale abundance for the eastern tropical Pacific (11,163; Wade and Gerrodette 1993) is over 8 years old and thus, no current estimate of minimum abundance is available.

Current Population Trend

There are no data on trends in Bryde's whale abundance in the eastern tropical Pacific.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

There are no estimates of the growth rate of Bryde's whale populations in the Pacific (Best 1993).

POTENTIAL BIOLOGICAL REMOVAL

The potential biological removal (PBR) level for this stock cannot be calculated because a current abundance estimate is unavailable.

HUMAN CAUSED MORTALITY

Historic Whaling

The reported take of North Pacific Bryde's whales by commercial whalers totaled 15,076 in the western Pacific from 1946-1983 (Holt 1986) and 2,873 in the eastern Pacific from 1973-81 (Cooke 1983). In addition, 2,304 sei-or-Bryde's whales were taken in the eastern Pacific from 1968-72 (Cooke 1983) (based on subsequent catches, most of these were probably Bryde's whales). None were reported taken by shore-based whaling stations in central or northern California between 1919 and 1926 (Clapham et al. 1997) or 1958 and 1965 (Rice 1974). There has been a prohibition on taking Bryde's whales since 1988.

Table 1. Summary of available information on the incidental mortality and injury of Bryde's whales (eastern tropical Pacific stock) for commercial fisheries that might take this species (Carretta *et al*. 2014a, 2012a, 2012b, Carretta and Enriquez 2009, 2010; Carretta *et al*. 2004). n/a indicates that data are not available. Mean annual takes are based on 2001-2013 data unless noted otherwise.

Fishery Name	Year(s)	Data Type	Percent Observer Coverage	Observed mortality (and injury in parentheses)	Estimated mortality (CV in parentheses)	Mean annual takes (CV in parentheses)
CA/OR thresher shark/swordfish drift gillnet fishery	2001-2013	observer	19%	0	0	0
Total annual takes						0

Fishery Information

The California swordfish drift gillnet fishery is the only fishery that is likely to take Bryde's whales from this stock, but no entanglements have been observed (Table 1). Detailed information on this fishery is provided in Appendix 1. Mean annual takes for this fishery are zero (Table 1) and are based on 2001-2013 data, the period during which a season/area closure has limited most fishing to southern California waters. Although Bryde's whales have not been observed entangled in California gillnets, some gillnet mortality of large whales may go unobserved because whales swim away with a portion of the net.

Ship Strikes

One Bryde's whale was documented to have been killed by a ship strike in 2010 (Carretta et al. 2014b, Carretta et al. 2015). The whale was initially sighted alive in Washington state waters with propeller marks and stranded dead about a week later. The mean annual serious injury and mortality rate of Bryde's whales over the most recent 5-year period (2009-2013) is 0.2 whales annually.

STATUS OF STOCK

Commercial whaling of Bryde's whales was largely limited to the western Pacific. Bryde's whales are not listed as "threatened" or "endangered" under the Endangered Species Act (ESA). Bryde's whales in the eastern tropical Pacific would not be considered a strategic stock under the MMPA. The total human-caused mortality rate is 0.2 whales annually. Current abundance of this stock is unknown and therefore PBR cannot be calculated for this stock. Likewise, human-caused mortality cannot be evaluated in the context of PBR. Increasing levels of anthropogenic sound in the world's oceans has been suggested to be a habitat concern for whales, particularly for baleen whales that may communicate using low-frequency sound.

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