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Author(s): Jared R Towers, Mark Malleson, Christie J McMillan, Jane Cogan, Susan Berta, and Caitlin Birdsall

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## OCCURRENCE OF FIN WHALES (*BALAENOPTERA PHYSALUS*) BETWEEN VANCOUVER ISLAND AND CONTINENTAL NORTH AMERICA

JARED R TOWERS, MARK MALLESON, CHRISTIE J MCMILLAN, JANE COGAN, SUSAN BERTA,  
AND CAITLIN BIRDSALL

**ABSTRACT**—Historically, Fin Whales (*Balaenoptera physalus*) were relatively common off the west coast of North America but very few records of their occurrence in waters between Vancouver Island and continental North America exist. To confirm their presence in these waters we collected photographs documenting at least 13 unique individuals during 43 encounters from 1999 to 2017. These records are the first of live Fin Whales in Queen Charlotte, Johnstone, Georgia and Juan De Fuca Straits and are also the only confirmed sightings between Vancouver Island and continental North America since 1930. Additionally, 12 dead Fin Whales all with evidence of ship strikes are reported in these waters between 1986 and 2017. Most (88%) sightings of live Fin Whales occurred between July and October and no individuals were documented dead or alive between January and April. We suggest that Fin Whales in coastal waterways may be at greater risk to ship strikes and predation by mammal-eating Killer Whales (*Orcinus orca*) than in less confined waters further offshore.

**Key words:** *Balaenoptera physalus*, Fin Whales, movements, North America, photo-identification, population recovery, predation, prey, ship strike, Vancouver Island

Fin Whales (*Balaenoptera physalus*) have a wide distribution in the North Pacific Ocean from the Chukchi Sea to the Tropic of Cancer (Mizroch and others 2009; Edwards and others 2015). Due to extensive hunting in the eastern North Pacific during the 20th century they are currently considered threatened off the west coast of Canada and endangered off the continental United States (Gegr and others 2006; National Marine Fisheries Service 2010). Whaling companies operating from April to October out of ports along the west coast of Vancouver Island and Washington State and on the northern and southern ends of Haida Gwaii took over 7000 Fin Whales before industry activities ceased in 1972 (Mizroch and others 1984; Gegr and others 2000; Nichol and others 2002). Although the locations of kills were often recorded as approx-

imate or not provided at all, they include deep waters around Haida Gwaii, adjacent islands, and west of Vancouver Island and the continental US (see maps in Gegr and Trites 2001 and Mizroch and others 2009). Fin Whales have been documented during recent cetacean surveys in these same areas (Williams and Thomas 2007; Ford and others 2010; Carretta and others 2015a; Nichol and others 2017, in press) and there is some evidence that this species is increasing in abundance in the eastern North Pacific (Moore and Barlow 2011; Nadeem and others 2016).

In the relatively protected waters between Vancouver Island, other inshore islands, and the mainland coastline, Fin Whales are rare (Washington Department of Fish and Wildlife 2012). However, numerous other marine species regularly occupy these waters, and the region experiences a high volume of commercial vessel traffic servicing both industrial and metropolitan ports. A sizable whale-watch industry focused on Killer Whales (*Orcinus orca*) operates off both the northeastern and southern ends of the island. Humpback (*Megaptera novaeangliae*) and Minke (*Balaenoptera acutorostrata*) Whales also aggregate seasonally in these areas to consume euphausiids and Pacific Herring (*Clupea pallasii*), known prey of Fin Whales (Clapham and others 1997; Flinn and others 2002; Mizroch and others 2009). Although Pacific Herring and euphausiids occur in these waters at densities deemed sufficient to support commercial harvests (Levy and others 1996), cetacean surveys (Everitt and others 1979; Calambokidis and Baird 1994; Kelp 2002; Williams and Thomas 2007) and whaling operations (Merillees 1985) conducted in this region have detected no live Fin Whales. However, dead Fin Whales have been observed on at least 12 occasions in waters inside of Vancouver Island since 1986 (Jensen and Silber 2003; Douglas and others 2008; Sherlock and Wood 2009; Williams and O'Hara 2009; Bains 2015; Carretta and others 2015b; Cascadia Research

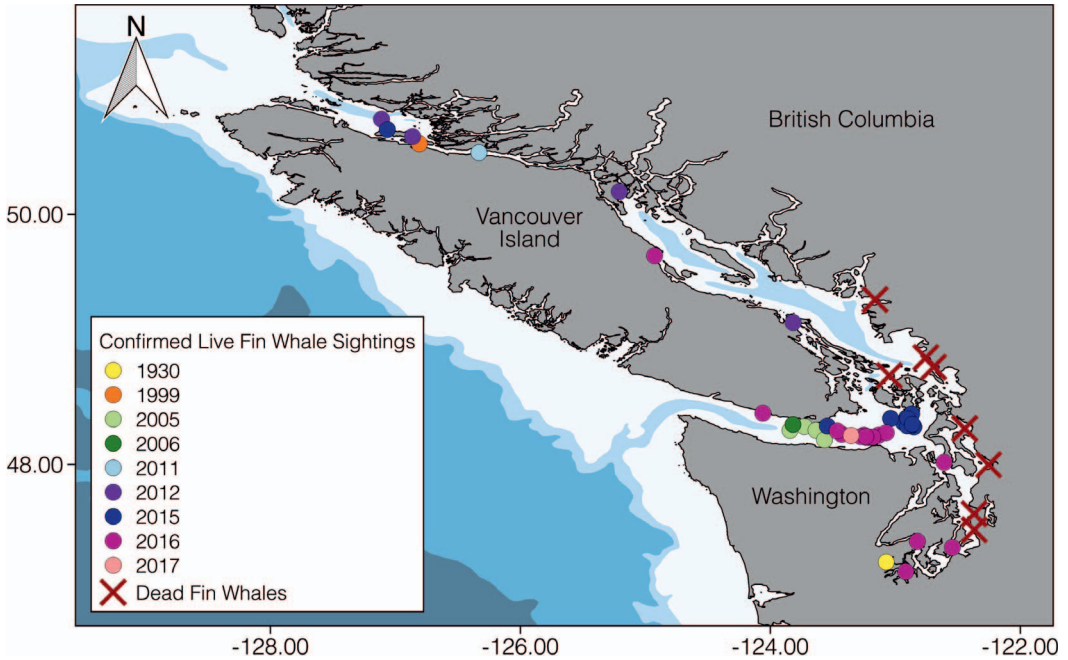


FIGURE 1. Locations of all confirmed sightings of Fin Whales between Vancouver Island and continental North America by year and locations where carcasses of dead Fin Whales struck by ships were documented.

2017) (Fig. 1, Fig. 2, Table 1). Precise locations of these mortality events could not always be determined (Douglas and others 2008), with several incidents limited to reports of whales draped over the bulbous bow of a ship that had just returned to port from more open waters.

There is only 1 historical record of a live Fin Whale in the waters between Vancouver Island and continental North America. It was shot in Shelton, Washington in 1930, and although initially identified as a Humpback Whale was later confirmed with photographs to be a Fin Whale (Scheffer and Slipp 1948) (Fig. 1, Table 1). Additional reports of live Fin Whales in 1864 (Scammon 1874), 1915 (Scheffer and Slipp 1948), 1972 (Osborne and others 1988), and on occasion since 1999 (BC Cetacean Sightings Network data 2016), are unconfirmed with photographs. While it is likely that at least some of these records are accurate, their validity remains uncertain. Historically, accurate identification of whales to species was not typically prioritized and distinguishing features were not routinely discerned or described (Andrews, 1916; Pike and MacAskie 1969). The issue of misidentification persists today because the differences in appearance

between whales within the genus *Balaenoptera* can be subtle depending on individual variation, behavior, weather, and a number of other factors (Jefferson and others 2015). For example, photographic evidence has confirmed species identity as different from initial visual observations for several recent reports of balaenopterid whales in British Columbia and Washington (Marine Education and Research Society [MERS], unpubl. data).

Due to the dearth of confirmed records of live Fin Whales between Vancouver Island and continental North America in published literature, we collected photographs of this species in this region to verify identity and examine trends in their occurrence. Photographs from encounters with live Fin Whales were obtained from our own research and whale-watching vessels or were submitted to our sightings networks by colleagues and members of the public. Species identity was confirmed by body size, shape, and pigment (Jefferson and others 2015), and the identities of individual Fin Whales were visually differentiated by inspecting dorsal fin shapes and the size and placement of body scars apparent in photographs.

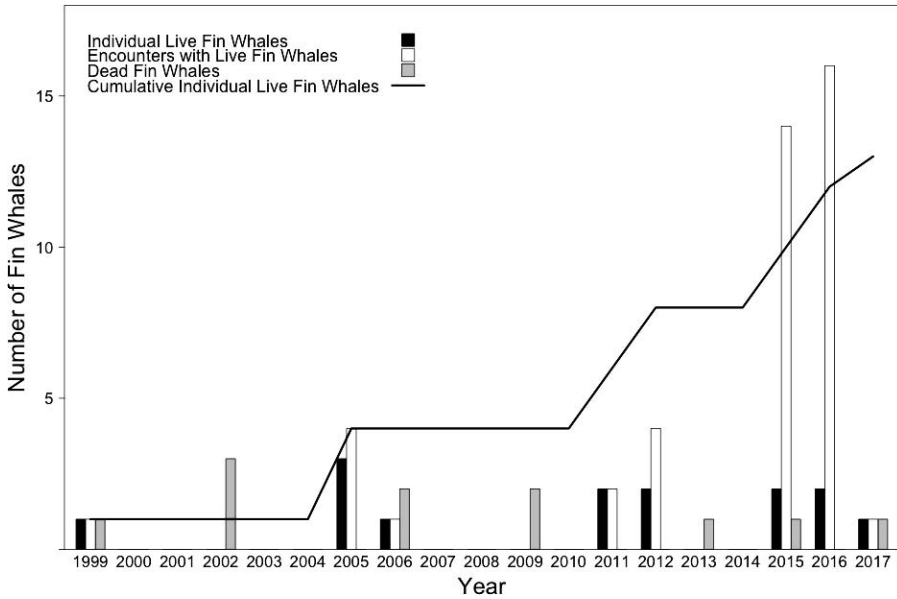


FIGURE 2. The total number of dead and live Fin Whales and the total number of encounters with live Fin Whales between Vancouver Island and continental North America each year since 1999 (1 other dead Fin Whale was documented in 1986).

Our records indicate that at least 13 unique individual Fin Whales have been photographed alive in waters between Vancouver Island and continental North America on a total of 43 occasions since 1930 (Fig. 2, Table 1). The 1st confirmed sighting occurred off northeastern Vancouver Island in upper Johnstone Strait on 7 May 1999 (Fig. 1, Table 1). The next confirmed sightings occurred in Juan De Fuca Strait in 2005 with photographs of single individuals in the eastern portion of the strait from 20 August, 22 September, 2 October, and 8 December (Fig. 1, Table 1). We identified a Fin Whale photographed in these waters on 31 August 2006 (Fig. 1, Table 1) as the same individual observed the previous year in October and despite poor photo quality, likely the same individual photographed in September. We concluded that the other 2 encounters were of unique individuals. The next Fin Whales confirmed in these inside waters occurred in Johnstone Strait where an adult and juvenile were photo-identified traveling together on 19 September 2011 (Fig. 1, Table 1). Coincidentally, another Fin Whale was photo-identified in Johnstone Strait on this same date the following year (Fig. 1, Table 1). This animal

had been photo-identified 5 d earlier on 14 September, 138 km to the south in Hoskyns Passage, and in Dodd Narrows on 11 September, 157 km south of Hoskyns Passage (Fig. 1, Table 1). Photographs also document the presence of unique individuals off northeastern Vancouver Island in Broughton Strait on 5 August 2012 and in Queen Charlotte Strait on 17 October 2015 (Fig. 1, Table 1). Only 2 Fin Whales were observed feeding and frequenting areas with high prey abundance. The first of these individuals was photographed on 13 unique dates between 2 September and 27 December 2015 (Fig. 1, Fig. 2, Fig. 3, Table 1). It occurred in the vicinity of Minke Whales and schools of Pacific Herring in eastern Juan De Fuca Strait on several days, and photographs confirmed lunge feeding behavior on at least 1 d (Fig. 4). The 2nd individual was photographed in eastern Juan De Fuca Strait and in Puget Sound on 15 unique dates between 9 July and 7 August 2016 (Fig. 1, Fig. 2, Table 1). It was documented near foraging Humpback Whales in Juan De Fuca Strait on several occasions and observed lunge feeding on euphausiids alongside them on at least one of these dates. Finally, an individual with a scar

TABLE 1. Details of the history of confirmed sightings of dead and live Fin Whales in waters between Vancouver Island and continental North America.

Encounters	Dates	Status	Locations	Source
1	8/22/1930	Alive	Shelton	Scheffer and Slipp 1948
1	4/6/1986	Dead	Tacoma	Douglas and others 2008
1	5/7/1999	Alive	Johnstone Strait	This study
1	6/6/1999	Dead	Vancouver	Sherlock and Wood 2009
1	8/11/2002	Dead	Seattle	Jensen and Silber 2003
1	10/2/2002	Dead	Cherry Point	Jensen and Silber 2003
1	11/6/2002	Dead	Waldron Island	Jensen and Silber 2003
1	8/20/2005	Alive	Juan De Fuca Strait	This study
2-3	9/22/2005 - 8/31/2006	Alive	Juan De Fuca Strait	This study
1	8/Dec/05	Alive	Juan De Fuca Strait	This study
1	5/16/2006	Dead	Lummi Bay	Douglas and others 2008
1	11/9/2006	Dead	Everett	Douglas and others 2008
1	7/25/2009	Dead	Vancouver	Sherlock and Wood 2009
1	8/7/2009	Dead	Tacoma	Carretta and others 2015b
1 (2 whales)	9/19/2011	Alive	Johnstone Strait	This study
1	8/5/2012	Alive	Broughton Strait	This study
3	9/11/2012 - 9/19/2012	Alive	Dodd Narrows, Hoskyns Pass, Johnstone Strait	This study
1	4/13/2013	Dead	Seahurst Park	Carretta and others 2015b
1	5/11/2015	Dead	Vancouver	Bains 2015
13	9/2/2015 - 12/27/2015	Alive	Juan De Fuca Strait	This study
1	10/17/2015	Alive	Queen Charlotte Strait	This study
15	7/9/2016 - 8/7/2016	Alive	Juan De Fuca Strait, Admiralty Inlet, Puget Sound	This study
1	7/26/2016	Alive	Comox	This study
1	5/12/2017	Dead	Tacoma	Cascadia Research 2017
1	10/12/2017	Alive	Juan De Fuca Strait	This study

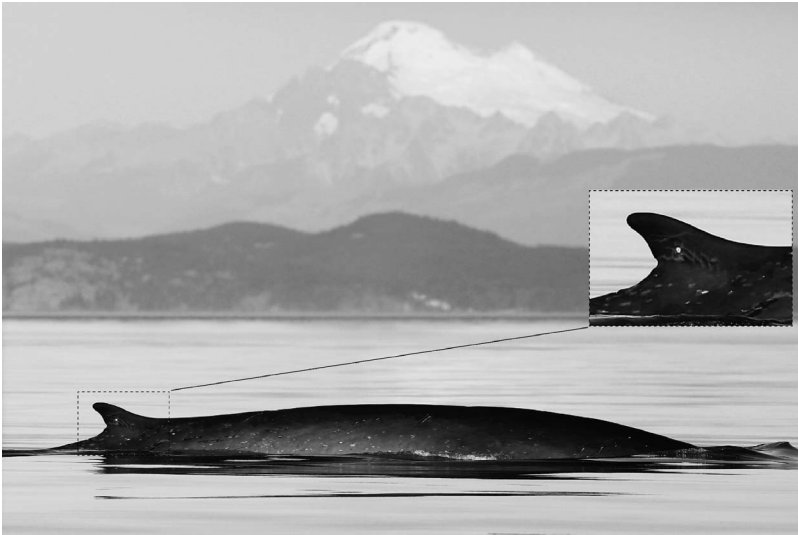


FIGURE 3. Fin Whale photographed west of San Juan Island with Mt. Baker visible in the background. Small white and grey round and ovoid scars visible on the right flank and dorsal fin are Cookiecutter Shark scars at different stages of healing. The inset shows well-healed parallel scars on the dorsal fin. The sizes of spacing between these scars indicate they were caused by Killer Whale teeth (see Mehta 2004). Photo: Mark Malleon.



FIGURE 4. Fin Whale lunge feeding on Pacific Herring with a Minke Whale surfacing in the background near Smith Island on 07 September 2015. Inset shows the fish from the same school on a subsequent lunge. Photos: Ivan Reiff.

along the left peduncle and missing most its left fluke blade, injuries indicative of a ship strike or entanglement in fishing gear, was photographed inside the Comox Marina on 26 July 2016 (Fig. 5, Table 1), and another Fin Whale was photographed in eastern Juan De Fuca Strait on 12 October 2017.

Although the patterns of distribution of North Pacific Fin Whales are poorly understood (Mizroch and others 2009; Edwards and others 2015),



FIGURE 5. Fin Whale inside the Comox Marina. The white scar on the left side of the caudal peduncle aligned with the missing portion of the left fluke blade is indicative of an interaction with a vessel or fishing gear. Photo: Shannon Middleton.

our results reveal a seasonal pattern of occurrence in and adjacent to waters between Vancouver Island and the mainland. A total of 88% of all encounters, including documentation of 10 of the 13 individuals, occurred between the months of July and October, and no Fin Whales were documented dead or alive between January and April (Fig. 6, Table 1). Interestingly, an analysis of whaling records in British Columbia found that Fin Whales shifted their activity within closer proximity to the shore as the whaling season progressed with a minimum mean distance to land in September. As the animals moved closer to the coast each month to feed, their abundance in British Columbia peaked in August, and then started to decline in September as pregnant females neared term and began to move south (Gregar and others 2000). More recent detections of Fin Whales off the coasts of Washington and Oregon also suggest they occur in greatest abundances during September (Douglas and others 2008), in further support of the seasonal trend reported by Gregor and others (2000). As both Queen Charlotte Strait off northern Vancouver Island and Juan De Fuca strait off southern Vancouver Island lie in a southeasterly direction from the open ocean (Fig. 1), these bodies of water may

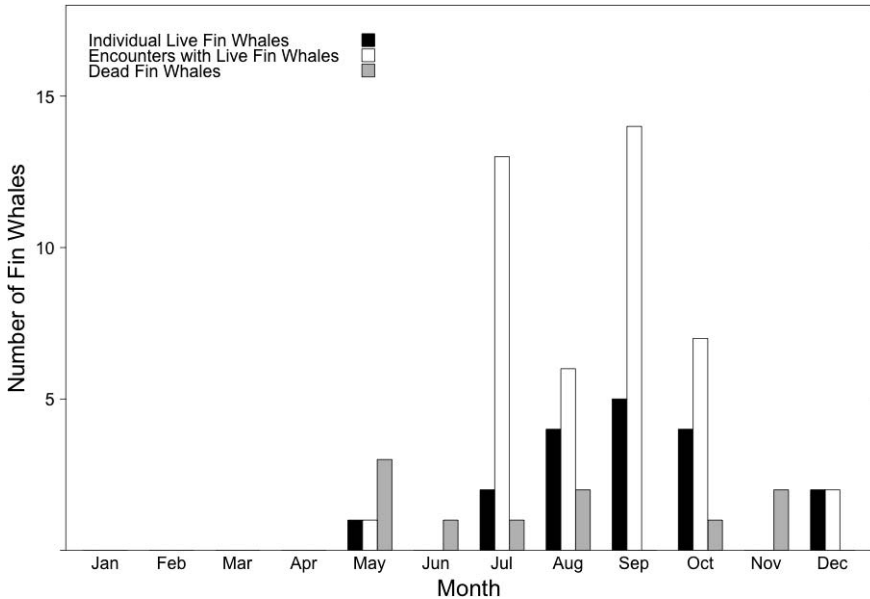


FIGURE 6. The number of unique individual Fin Whales both dead and alive and the number of encounters with live Fin Whales between Vancouver Island and continental North America by month.

act as bottlenecks to movement for some individual Fin Whales traveling south. It is therefore no surprise that Fin Whale encounters in the inside waters increase during the late summer and early fall (Fig. 6). It is not known where Fin Whales from this population can be expected to occur during winter or spring, but the presence of healed Cookiecutter Shark (*Isistius brasiliensis*) scars on animals photographed in this study (see Fig. 3) indicate that these individuals spent time in warm pelagic waters at lower latitudes (Towers and others 2013).

There may be several reasons that Fin Whales do not occur in waters inside of Vancouver Island more often. Fin Whales are known prey of Killer Whales (Ford and Reeves 2008) who, evidence indicates, help shape the behavior of their prey (Jefferson and others 1991; Corkeron and Connor 1999; Reeves and others 2006; Ford and Reeves 2008). Some Fin Whales photographed in the eastern North Pacific show scars indicative of Killer Whale attacks (for an example see scars on the dorsal fin of the individual in Fig. 3), while others, such as 1 individual reported by Douglas and others (2008), appear to fall prey to these predators. Killer Whale density is relatively high in coastal

waters off the west coast of North America (Forney and Wade 2006; Ford and others 2010) and mammal-eating Bigg's Killer Whales frequently travel and hunt in these areas (Ford and Ellis 1999; Towers and others 2012; Ford and others 2013). Several species of balaenopterid will live-strand in an attempt to avoid falling prey to Killer Whales (Lowry and others 1987; Ford and others 2005; Goodall and others 2007), and this may explain the death of 3 Fin Whales found stranded together 150 km north of Vancouver Island in November 2015 (Lindsay 2015). It seems reasonable to assume that because Fin Whales require vast stretches of open water to escape these predators (Ford and Reeves 2008) that their preference for more oceanic waters (Jefferson and others 2015) may be in part to decrease predation risk. On the other hand, oceanic waters propagate low frequency sounds (such as Fin Whale calls) more effectively than confined coastal waterways (Bass and Clark 2003). As Fin Whales tend to often travel with conspecifics (Jefferson and others 2015), this species may prefer oceanic habitat for social reasons. In the eastern North Pacific, Fin Whales are usually found in groups (Leatherwood and others 1988), and this likely functions to reduce an individual's odds falling

prey to predators (Acevedo-Gutierrez 2002). However, it may also be attributed to the species' ability to communicate over long distances (Payne and Webb 1971) enabling congregation in areas of high productivity in an otherwise vast ocean containing widely distributed prey. While the productive waters inside of Vancouver Island may contain sufficient biomass of euphausiids and Pacific Herring during certain times of year to support a number of Fin Whales, these narrow waterways pose a potential problem for safe navigation if chased by predatory Killer Whales (Ford and Reeves 2008), and may not provide an optimal acoustic environment for locating conspecifics.

The rare but increasing number of confirmed occurrences of Fin Whales in coastal waters between Vancouver Island and continental North America (Fig. 2) may reflect recovery of local populations in the North Pacific. If the population remains stable or continues to grow, it is reasonably safe to assume that Fin Whales will continue to make occasional forays into busy inland waterways where risks of fatal ship strikes and predation events by Killer Whales may exceed those in less confined waters further offshore. However, it remains uncertain whether Fin Whales will attain greater abundances in the eastern North Pacific and in the waters inside Vancouver Island. We recommend care when discerning Fin Whales from other rorquals in these waters, and that mariners exercise caution when transiting these waters given the documented presence of Fin Whales in the region.

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- MERS Marine Education and Research Society, Box 554, Alert Bay, BC V0N 1A0 Canada; Fisheries and Oceans Canada, Pacific Biological Station, 3190 Hammond Bay Road, Nanaimo, BC V9T 6N7 Canada (JRT and CJM), jrtowers@gmail.com; Center for Whale Research, 355 Smugglers Cove Rd, Friday Harbor, WA 98250 USA (MM and JC); Orca Network, Whale Sighting Network, 485 Labella Vista Way, Freeland, WA 98249 USA (SB); BC Cetacean Sightings Network, Coastal Ocean Research Institute, Box 3232, Vancouver, BC V6B 3X8 Canada (CB). Submitted 04 July 2017, accepted 22 November 2017. Corresponding Editor: Denim Jochimsen.*