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**Mid-1800s whaling records appear to document the presence and migratory movements of pygmy blue whales (Balaenoptera musculus brevicauda) between Australia and Indonesia**

**Chatwin, D. And Branch, T. A.**

# Mid-1800s whaling records appear to document the presence and migratory movements of pygmy blue whales (*Balaenoptera musculus brevicauda*) between Australia and Indonesia

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## Abstract

As a by-product of the search for sperm whales (*Physeter macrocephalus*) in Indonesian waters during the era of Open Boat Whaling, British and American whalers occasionally recorded sightings of other types of large whales. These included 'humpers' [humpbacks; *Megaptera novaeangliae*] and what the whalers called 'finbacks'. While 'finbacks' could have been Bryde's or Omura's whales in these waters, we suggest that most of these 'finbacks' were pygmy blue whales (*Balaenoptera musculus brevicauda*), including 98 sightings by British whalers, and 25 sightings by American whalers. A great majority of these sightings align with modern data indicating a south-west to north-east migratory corridor for pygmy blue whales between Australia and Indonesia passing to the west of the island of Timor through the Timor and Wetar Straits. The schedule and location of these historical sightings also hint that historically migration north (at least) commenced earlier and that pygmy blue whale distribution range was broader than modern day evidence indicates, encompassing waters across the southern end of the southern islands of Indonesia, and into the Banda and Molucca Sea. We consider additional sightings of 'finbacks' east of Halmahera and Morotai islands more likely to be other balaenopterid species since they are mostly nearshore and outside of known pygmy blue whale ranges.

## Introduction

For more than 30 years the lead author has been documenting British sperm whaling in Indonesian waters, and this has resulted in an interesting side project, finding probable historical sightings of pygmy blue whales (*Balaenoptera musculus brevicauda)*, recorded as 'finbacks'. These data may never have even surfaced except for the recent publication of a series of papers documenting migratory activity (using satellite tracking), of pygmy blue whales up the west coast of Australia and into Indonesian waters (Double et al. 2014, Möller et al. 2020, Thums et al. 2022, Burton et al. 2023), that mirror patterns of sightings, strandings, and catches in the 20th century (Branch et al. 2007). Here we show that this migratory pattern is also clearly visible in sightings recorded in the logs of open boat 19th century whalers seeking sperm whales (*Physeter macrocephalus*) from north-western Australia through to the interior waters of Indonesia.

The key period of interest in this region is the 1830s to 1870s when voyage logbooks and tracks are available. As a by-product of their search for sperm whales in Indonesian waters, British and American whalemen occasionally recorded in their logs or journals sightings of other types of large whales. These included 'humpers' (humpbacks; *Megaptera novaeangliae*), 'killers' (killer whales; *Orcinus orca*), 'grampus' (Risso's dolphin; *Grampus griseus*), 'blackfish' (various species of large delphinids) and 'finbacks'. These 'finbacks' were not specifically fin whales (*Balaenoptera physalus*) but could instead be any type of large rorqual with a dorsal fin, apart from humpback whales. During this time period, both common names and scientific names were confused even among the most prominent cetacean scientists of the age, and 'finbacks' could have referred to species we now know as blue, fin, sei, Bryde's (*B. brydei*), Omura's (*B. omurai*), and even possibly minke whales (*B. acutorostrata*). The key focus of whalers in this region was almost exclusively on hunting sperm whales, but the whalers used colouring, features, and size to differentiate between the other species, except for the various species of blackfish and the species comprising the 'finbacks' group.

The British sought sperm whales in Indonesian waters from 1803 until the 1850s (Chatwin 2022). During that time British whaleships made over 300 voyages into or through Indonesian waters. Nearly all these voyages approached Indonesia from the Indian Ocean and to the south of Java, Sumba [Sandalwood Island] and Timor. Although over 300 voyages are documented via 'speakings' and 'reports' to *Lloyds List* and in newspapers (see British Southern Whale Fishery Voyage dataset), because there was no requirement to retain actual voyage documents like logs and journals, we have records for only 14 voyages in total and only six of these record the presence of 'finbacks'.

The situation is not much better for the American whalers with logbook data from 91 voyages as indexed in the American Offshore Whaling Logbook (AOWL) dataset (Smith et al. 2012). From these 91 only five document 'finback' sightings including one which records sighting and capture of a 'sulphur bottom', the name that some American whalers used for blue whales as far back as the early 1800s (Sonnini 1804, p. 200).

The AOWL dataset also records 98 sightings of 'whales' in the target area by an additional 15 American whaling vessels. To rule out the possibility that these 'whales' might have been 'finbacks' or 'blue whales' the original logs were examined. All sightings could be re-assigned as sperm or humpback whale sightings based on a knowledgeable reading of the original source, log, or journal, with further checks of the landed cargo where necessary.

In this paper, we examined the British and American data for the years in the region of interest (north-western Australia through to Indonesian waters), extracting mentions of 'finbacks' or 'sulphur bottoms'. We plot the locations of these mentions and present an argument for why we believe that most of these 'finback' sightings were pygmy blue whales.

## METHODS

### Voyages examined

We focused our study on the area encompassing Australia, Timor, and Indonesia between 20°S and 5°N and 110–135°W. We compiled records listed as 'finbacks' from 11 voyages (six voyages by five British vessels; five voyages by five American vessels) for sightings made in the years 1832–36, 1838–40, 1844–46, 1857, and 1871–73 (Table 1).

The sightings were extracted from the vessel logs, and coordinates and other details recorded (Appendix 1) and the locations plotted on monthly maps using QGIS v3.34, distinguishing between the sightings from British and American vessels (Figure 1a–l).

The British sightings ($n$ = 98) are primarily sightings of more than one whale and date between 1832 and 1840. During this short period of nine years, on average 30 British whaling ships were operating annually in Indonesian waters (Chatwin 1987).

The American sightings ($n$ = 25) are between 1840 and 1873 with the majority of the sightings at either end of the period (Appendix 1). Unfortunately, the number of whales for each sighting is not recorded in the American data, only the presence of a 'finback', and we have as yet been unable to review the original records. One voyage, that of the *Rodman*, records the capture of a 'sulphur bottom' on 11 August 1857 using a bomb lance to the south-east of the island of Sumba].

The British data were collected by the main author from logbooks and journals. The American data are from the American Offshore Whaling Logbook (AOWL) dataset online at Whaling History (Smith et al. 2012). Voyage tracks for each of these vessels is included in Appendix 2, Figures S1 and S2.

Table 1. List of voyages sighting 'finbacks', all of which were primarily targeting sperm whales.

| Nationality | Vessel | Years | Comments |
|---|---|---|---|
| British | *Vigilant* | 1832 | Cruised to the south and west of Timor encountering many 'finbacks' with further encounters in the north whilst proceeding to New Guinea |
| British | *Argus* | 1832-1835 | Two voyages and four seasons on the whaling grounds into the Indonesian Archipelago with most 'finback' sightings in the Molucca and Halmahera Seas |
| British | *Japan* | 1835-1836 | Cruised to the south-west and west of Timor encountering 'finbacks' there, also cruised in the Molucca Sea |
| British | *Eclipse* | 1838-1839 | All over the Indonesian Archipelago sighting 'finbacks' mostly around and to the south-west of Timor |
| British | *Gipsy* | 1840 | Cruised to the south and all over the Indonesian Archipelago and to the north of New Guinea sighting 'finbacks' in the Timor Strait |
| American | *Emerald* | 1840 | Only two 'finback' sightings to the east of Sumba |
| American | *Harbinger* | 1844 | One 'finback' sighting well to the south-south-west of Sumba |
| American | *Draco* | 1845-1846 | Two cruises north each winter from the Coast of New Holland [Australia] sperm whaling grounds towards the Savu Sea then anticlockwise to the west under Sumba and Sumbawa and back to the Coast of New Holland |
| American | *Rodman* | 1857 | In winter 1857 sailed north-east from the Coast of New Holland sperm whaling grounds towards Sumba then anticlockwise to the west under Sumba and then back again |
| American | *Vigilant* | 1871-1873 | Same deployment practice as *Draco* and *Rodman* for three seasons in a row. In early winter sailed north-east from the Coast of New Holland sperm whaling grounds towards Sumba then anticlockwise to the west under Sumba and then back to the Coast of New Holland Ground |

**Deployment strategies and the sighting and recording of 'finbacks' in Australian and Indonesian waters**

An explanation for why so few American vessels recorded 'finbacks' or noted the presence of other types of large rorquals (apart from humpbacks) is explained in some depth in Chatwin (2022). Essentially, the British sought sperm whales both outside of, and inside Indonesian waters (*i.e.* within the archipelago). The Americans though, at least until the mid-1840s, only sought sperm whales in the waters to the south of Indonesia. When they did start moving into the Indonesian Archipelago in the 1840s it was primarily to transit south to north to the Western Pacific Right Whale Grounds in the Sea of Japan. Sperm whaling undertaken by the American Fleet during these transits were speculative and not targeted.

One other point of difference in the deployment practice of the two fleets is that neither the British or Americans looked for whales in the Timor Sea or inside the Banda Sea. Today, both areas are identified as pygmy blue whale habitat (Möller et al. 2020, Thums et al. 2022, Burton et al. 2023) but research undertaken by the main author has not found a single transit in the surviving records of either fleet (over 100 voyages) to the east of Timor (*i.e.* through the Timor Sea), or across the Banda Sea, west to east, or east to west. The most likely reason is that British and American whalers knew sperm whales were not to be found in the Banda or Timor Seas.

**Taxonomic review**

During this period there was confusion about species names not only among the British and American whalers, but also among scientists. Large whale specimens were rarely encountered by land-based scientists, and usually only after stranding; and strandings of blue whales were rare in UK and US waters. At this time in the UK, species of large rorquals with prominent dorsal fins were all considered 'finner' whales (e.g. Gray 1847), even those that were recognizably blue whales (e.g. Turner 1870), and were distinguished from right (*Eubalaena* sp.), bowhead (*Balaena mysticetus*), and sperm whales (which all lack dorsal fins), and humpback whales (which have clearly recognizable hump-like dorsal fins). During this period of confusion, almost every new stranding of a blue whale was promptly given a new scientific name (e.g. *Balaenoptera gigas*, *B. carolinae*, *B. sibbaldii*, *B. sulfurea*, *Sibbaldius latirostris*), and only later was it realized that many of the strandings represented the same species, called blåhval by the pioneering Norwegian whaler Svend Foyn (the origin of the English name "blue whale"), tunnolik by the Greenlanders, sulphur bottom by the American whalers (after the yellowish diatoms growing on the underside) and steypireyðr (a combination of the terms 'launch forward' + 'red-blooded animal') by Icelanders (Reinhardt 1868).

To add to this confusion in the 1800s, what we now recognize as fin whales were at that time usually given the scientific name of *Balaenoptera musculus*. Only through the careful detective work of True (1898) did it become apparent that the Linnaean *Balaena musculus* (Linnaeus 1758) was copied from sources that originated in Sibbald (1692), and the famous Sibbald's whale was a blue whale in every respect (except a curiously tall dorsal fin). Thus from the time of True (1898), blue whales have been named *Balaenoptera musculus* and fin whales *Balaenoptera physalus* in most scientific writing.

If the scientists could not make up their minds about which common name or scientific name to call blue whales at that period, certainly the whalers could not either. The fast-swimming rorquals were of little interest to the open-boat whalers and with very few exceptions, the whalers did not attempt to harpoon them. In the unlikely event they did manage to kill one, the whale promptly sank and was usually lost (e.g., Scammon 1874). Only in the 1860s were blue whales deliberately targeted by the American adventurer and inventor Thomas Roys (Schmitt et al. 1980), and then much more successfully (and famously) by the Norwegian Svend Foyn from Finnmark in northern Norway, marking the transition to the start of modern whaling.

**Are these 'finbacks' pygmy blue whales?**

In Smith et al. (2012) the following passage is noted: "Non-target whale species were often recorded, including 'finbacks' (probably most often fin whales, *Balaenoptera physalus*, but also presumably sei and Bryde's whales, *B. borealis* and *B. edeni/brydei*, respectively)". It is likely that Smith et al. expected all blue whale sightings to be specifically listed as 'sulphur bottom' as they occasionally were by American whalers. However, it is clear from reading British scientific literature that 'sulphur bottom' was a specifically American name for blue whales, while the British described all such rorquals using some variant of 'finbacks'. For example, the British scientist Gray entitled his 1847 paper on the rorquals "On the finner whales", while Turner (1870) named a blue whale stranding a "Great Finner Whale". Echoes of this naming reverberated to the 20$^{th}$ century with blue whale strandings reported off India as being 'Great Indian Fin Whales' (Prater 1915, McCann 1934, Chari 1951).

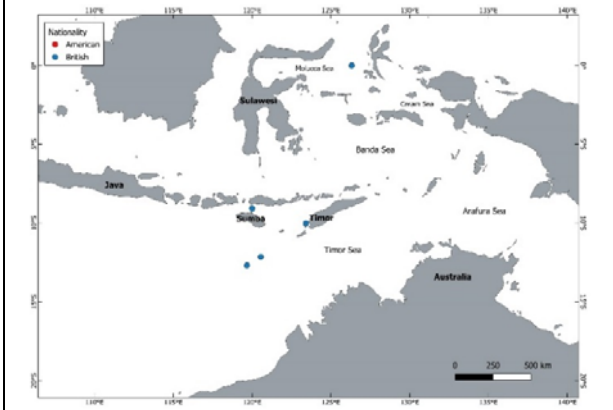
In the waters of our study the following species could have been listed as 'finbacks': blue, fin, sei, Bryde's, Omura's, and minke whales. Modern-day surveys and sightings in the area suggest that fin, sei, and minke whales are extremely rare or absent from the region and can be discounted, while pygmy blue whales are commonly observed (Rudolph et al. 1997). There is one record of a stranded Bryde's whale (Mustika 2009), and one record of a sei whale in the Indonesian Archipelago (Rudolph et al. 1997). However, Omura's whales are present throughout (Cerchio et al. 2019). There are currently two villages in Indonesia, Lamalera and Lamakera, just above the island of Sumba, where hunting for whales, dolphins, sharks, and rays occurs (e.g.

Mustika 2006). In Lamalera the villagers target only sperm whales. In Lamakera, baleen whales (referred to as *keraru*) were hunted until the 1990s. The exact species identity is unknown, although reports include one minke whale (Barnes 1996), Omura's whales (Cerchio et al. 2019), and Bryde's whales (Rudolph et al. 1997). The size of whales caught at Lamakera was generally small (7–11 m) but occasionally larger (Barnes 1996). Given these sizes, the shallow nearby waters, and the recent naming of small-form Bryde's whales as Omura's whales (Wada et al. 2002), most of the catches were probably Omura's whales. Kahn (2005) considers it most likely that these catches were Omura's whales given fishermen interviews but reported that during four years of surveys in this region, only pygmy blue whales were sighted. Elsewhere in Indonesia, sightings of Omura's whales have been reported from nearshore waters and shallow bays of Komodo National Park (Kahn 2001). Since Omura's whales generally have a nearshore, coastal distribution, unlike the deeper waters favoured by blue whales (and even deeper waters in which sperm whales are typically found), we consider it less likely that 19th century 'finback' sightings by whalers were Omura's or Bryde's whales, although we cannot rule this possibility out.

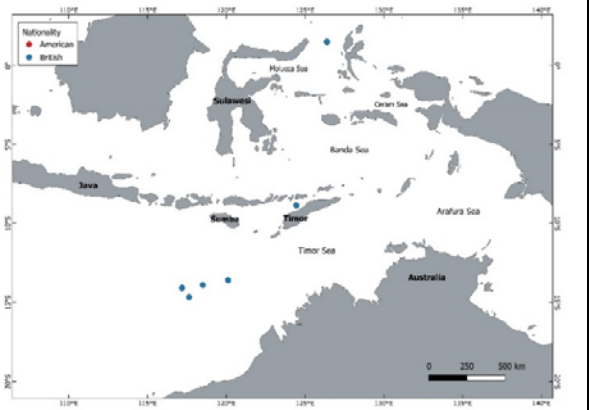
**RESULTS**

Sightings of 'finbacks' plotted by month (Figure 1) show considerable geographic variation. Inside the Indonesian Archipelago, i.e. north of Timor, relative few sightings are reported in March–May, but in June–August a cluster of sightings is reported in the Molucca Sea and even some in the Halmahera Sea in August. In September–February there are again almost no sightings north of Timor except for a cluster of inshore sightings in the shallow waters between Halamahera and Morotai islands in December, and just east of Morotai Island in January. Only one sighting was recorded in the Banda Sea, but whaling vessels did not travel through this region as sperm whales are absent. South of the Indonesian Archipelago in the seas ranging from Java to Timor to north-western Australia, there are 'finback' sightings in every month except January, and in February there are only a pair of sightings close to Java. The spread in this region differs from month to month.

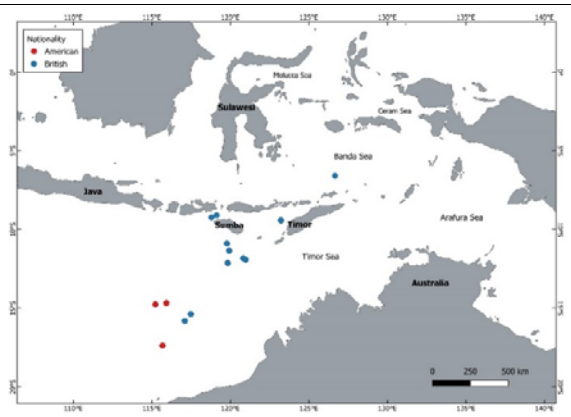
Figures 1a-l - British (Blue) and American (Red) 'finback' sightings by month – commencing with March



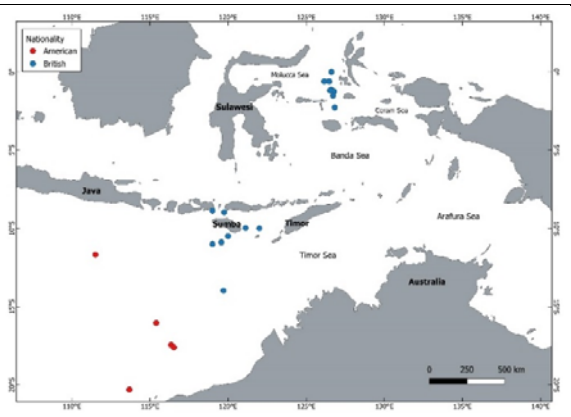

March



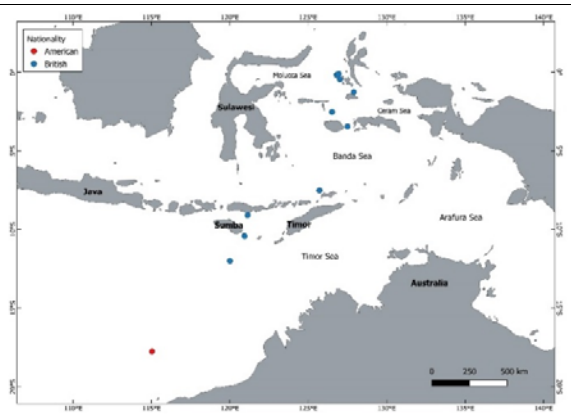

April



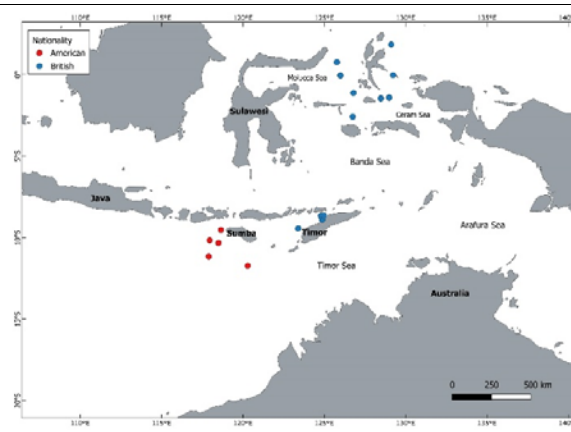

May



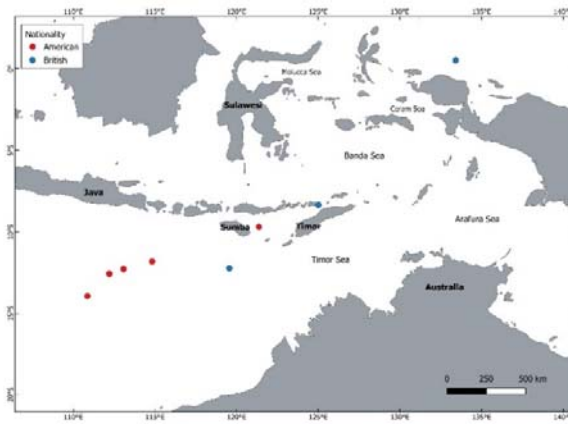

June



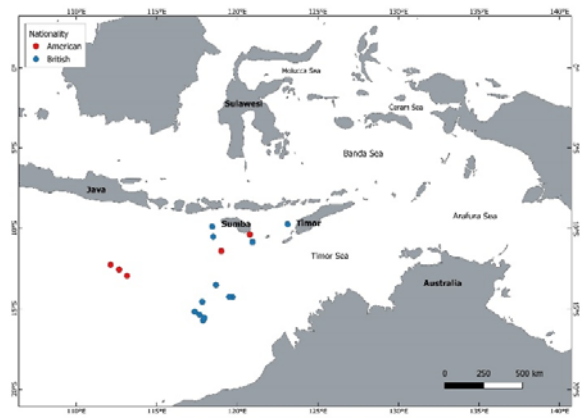

July



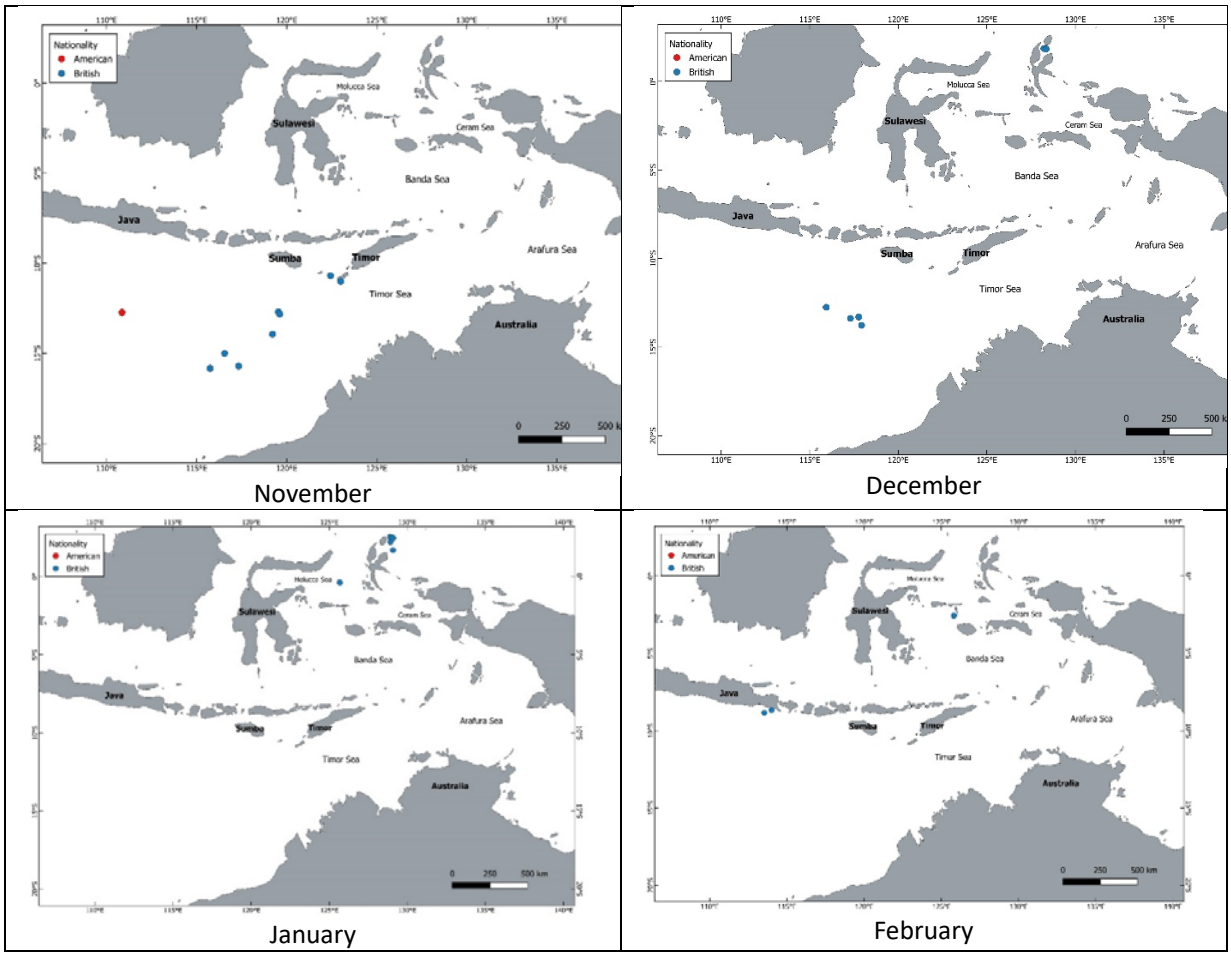

August




September




October




**Comments on migratory pathway of 'finbacks'**

The maps are arranged from March to February to reflect the first indication of a migration northwards by 'finbacks'. The whales are described as migrating along a corridor SW to NE from off the NW coast of Australia through the Savu Sea, Timor and Wetar Straits and into the Banda Sea and beyond. The choice of March as the commencing month also reflects an almost complete absence of 'finback' sightings below the equator in the months of January and February.

March

Of the three sightings in the corridor only one is of multiple whales perhaps reflecting a proclivity for early migrations to commence with singles. A sighting of a single finback above Sumba is likely linked to a slightly earlier sighting by the same vessel in February of the same year below Java and may not be a pygmy blue whale; there is a documented migration path of other types of rorquals (Bryde's whales in particular) west to east along the lesser Sunda Islands [Mustika 2006]. North of the equator there is a presence for a fourth month in a row [December through March] of 'finbacks' in the Molucca Sea. There is no obvious linking of these whales to the south.

April

Only one of the five sightings in the migratory corridor is of a single whale reflecting probably an increase in the migrating numbers. North of the equator for a fifth month in a row [December through April] the presence of 'finbacks' is recorded also with no obvious linkage to the south.

May
No sightings in April above Sumba but two within four days above Sumba in mid-May. As indicated in March there is a known transit / migration path for other types of rorquals west to east along the lesser Sunda Islands and it is noted that these may not be pygmy blue whales. [Mustika 2006]. To the south most early sightings in the corridor in May are single whales but by late May multiple whales are migrating across the SW to NE migratory corridor. A single Banda Sea sighting in early May is of multiple finbacks in the company of killers and grampus. The vessel making the sighting was transiting the western Banda Sea south to north to undertake whaling north of the equator.

June
To the south of the equator we find 'finbacks' all along the SW to NE migratory corridor with several 'late-comers' [perhaps] and whales to the south and north of Sumba. There is a single sighting of a finback in mid-June to the west below Java. This sighting is late in the era [1871] with the only other sightings in that area between September and October. This vessel though represents an atypical deployment. June also finds finbacks in the Molucca Sea after a sighting absence of two months with the vessel's Master remarking that finbacks were present 'in abundance'.

July
A few sightings of multiple whales in the SW to NE corridor to the west and south of Timor Island. Two important sightings either side of the Western Banda Sea likely confirm a migration corridor across the western end of the Banda Sea. Finbacks are still concentrating in the Molucca Sea.

August
Sightings in the Timor Strait where the British Fleet would routinely be re-provisioning each August at Kupang. In August 1857 an American vessel struck and killed a Sulphur Bottom to the south of Sumba. American vessels have commenced their usual anti-clockwise deployment below and to the west of Sumba. North of the equator sightings in the Molucca and Halmahera Seas are combinations of single and multiple finbacks.

September
American vessels have almost completed their anti-clockwise deployment south of Indonesia well to the west of Sumba. British sightings in the migratory corridor at the top of the Timor Strait and south of Sumba. North of the equator a sighting to the north of New Guinea but the whales present in the Moluccas in August are no longer present.

October
The British have re-engaged and are sighting whales all along the NE to SW migratory corridor and around Sumba. American vessels are completing their anti-clockwise deployment well to the south of Java. There are no sightings above the equator despite vessels from the British Fleet being present.

November
Very similar to October with fewer sightings. Again, a clear NE to SW migratory corridor is shown. No finback sightings in the Molucca Sea despite the British Fleet being present seeking sperm whales.

December
Sightings well to the south in the NE to SW corridor. North of the equator sightings of finbacks between the islands of Halmahera and Morotai.

January
No sightings of finbacks below the equator. To the north of the equator finbacks to the east of Morotai (all multiples) but there is no obvious path by which they travelled there. A single finback sighted in the Molucca Sea.

February
Minimal sightings of finbacks even though the British Fleet is operating both north and south of the equator. It is likely that the sightings off the SE of Java are the same pod (two consecutive days). A single 'finback' in the Molucca Passage accompanied by grampus.

**Seasonal patterns (March–August and September–February)**

Sixty per cent of finback sightings (*n* = 74) occur during March–August (Figure 2), and forty percent during September to February (Figure 3). Most of these sightings are along an identified known migratory corridor (see Figure 4) based on satellite tracked pygmy blue whales from a series of studies (Double et al. 2014, Möller et al. 2020, Thums et al. 2022, Burton et al. 2023a). Most historical sightings are of multiple whales and not single whales perhaps indicating that population numbers were once much larger. The data also confirm a pathway via the Banda Sea through to the Molucca Sea as indicated by modern satellite tracks (Figure 4). While satellite tracking data indicate that May is when pygmy blue whales should start to be seen in our study region, historical sightings data clearly indicate 'finbacks' inside the 'migratory corridor' in March, and continued presence south of Timor in most months of the year.

Sightings (*n* = 49) in September–February (Figure 3) consist mostly of more than one whale rather than single whales. Our conclusion is that the data further confirm the migratory corridor for pygmy blue whales from south-west to north-east below Timor, but we can draw no conclusion as to whether it is a southward migration as indicated by modern satellite track data, since our data points are stationary and do not include which way the whales were heading. Additional insights during these months include a much further west extension of sightings to at least below Java and a considerable distance south. Modern data hints at this but does not indicate a similar range during these months (Möller et al. 2020).

During December–April there is also a grouping of finback sightings to the east of Halmahera and Morotai Islands in the Halmahera Sea (Figure 3). Given there are no connecting sightings data to the southern or western 'finback' locations, or to satellite tracking data, we believe these 'finback' sightings could be another species of rorqual, or perhaps even a different population of blue whales (although we regard this as unlikely) approaching this area from the north.

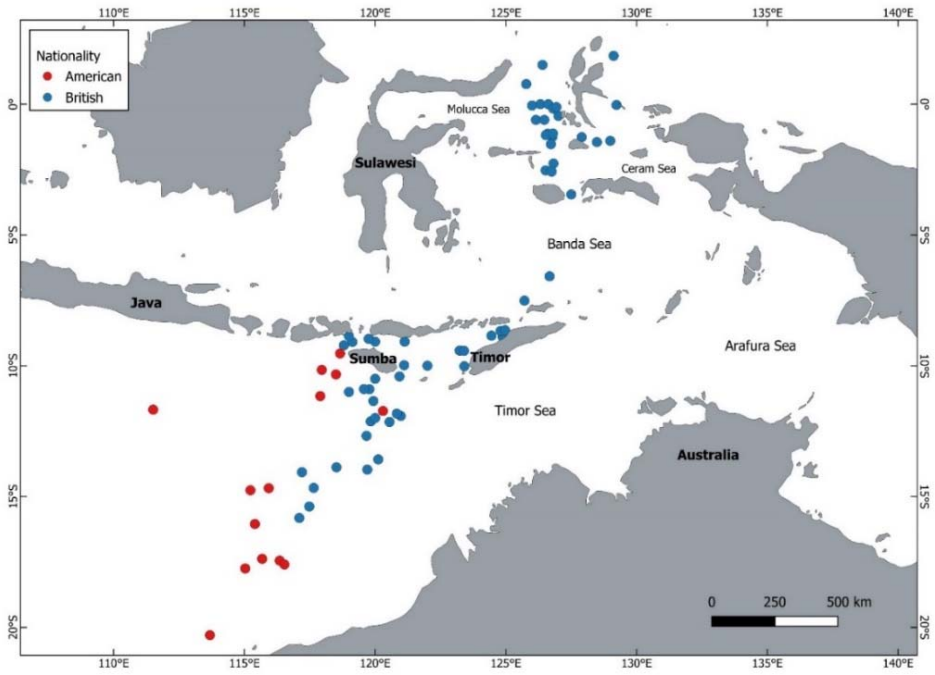



Figure 2. Sightings of 'finbacks' from **March to August** by British (blue) and American (red) vessels.

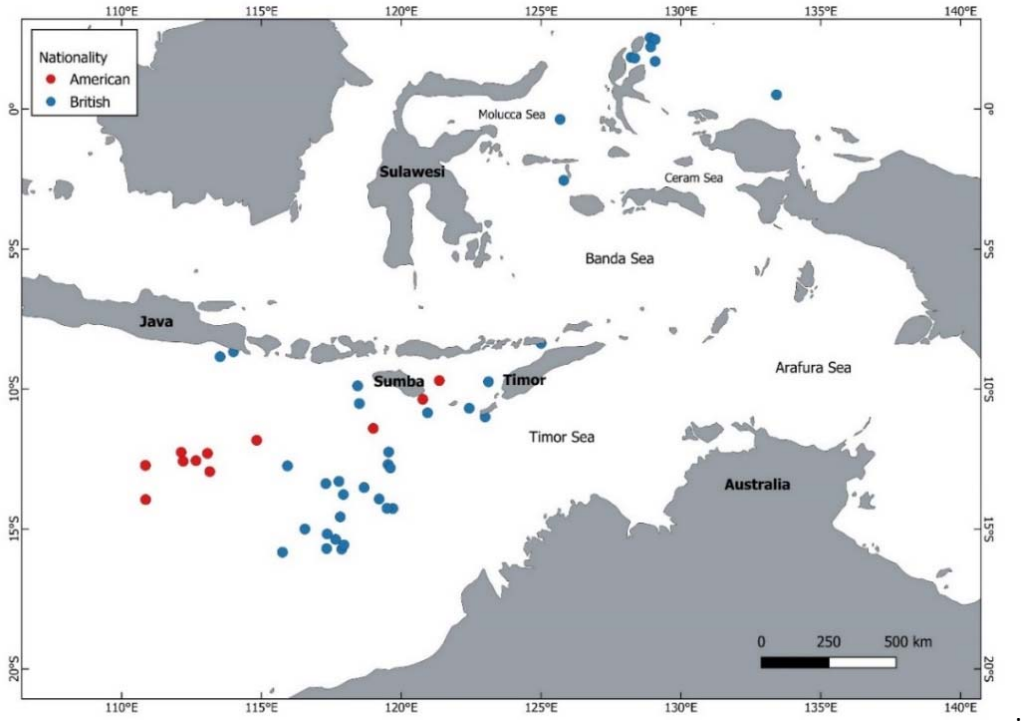



Figure 3 Sightings of 'finbacks' from **September to February** by British (blue) and American (red) vessels.

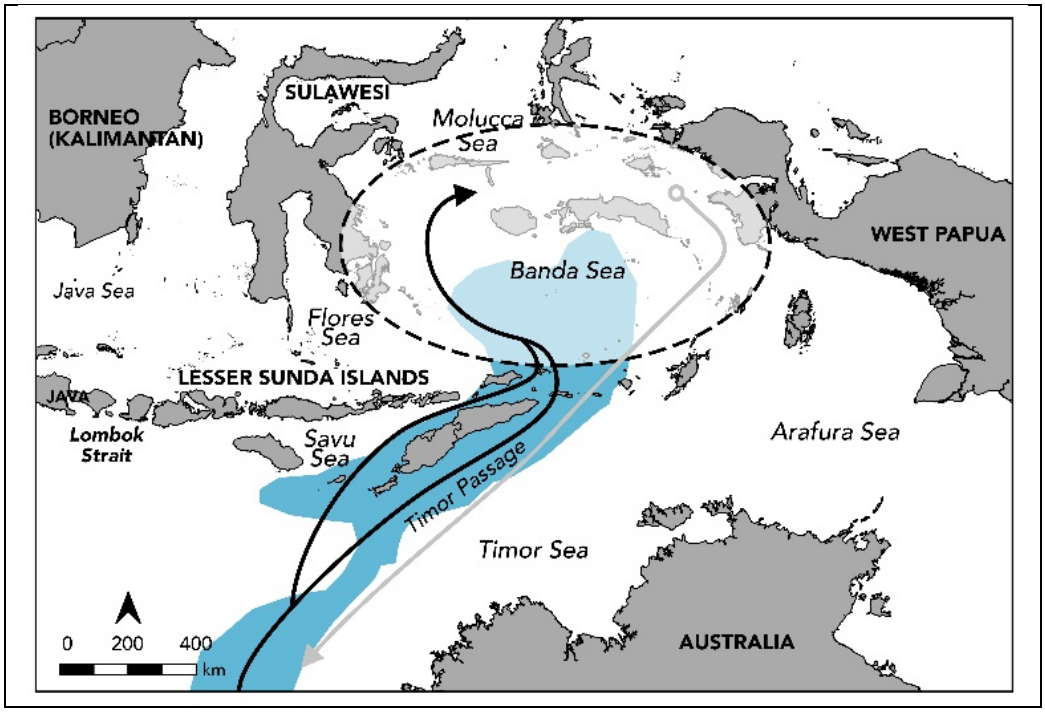



Figure 4. Known migratory corridor and possible breeding and feeding areas determined by satellite tracking of pygmy blue whales. Subset of map in Burton et al. (2023) included here with permission. Map prepared by Phil Bouchet on behalf of Sarah Marley. Underlying data published in Double et al. (2014), Möller et al. (2020), and Thums et al. (2022).

## DISCUSSION

Given the close correspondence between 19th century 'finback' sightings and modern satellite tag data, we conclude that the majority of our historical finback sightings are pygmy blue whales and that these whales were present and ranged more widely and over a longer duration that indicated by modern satellite tracking data. These whales were certainly not sperm whales or humpback whales since the logs separately reported sightings of those species. Furthermore, modern sightings data record almost no fin, sei, or minke whales in and around the Indonesian archipelago. While some of these sightings may be Omura's or Bryde's whales, these species are expected to have a largely coastal, shallow-water presence whereas blue whales prefer deeper waters. Since sperm whaling effort was heavily concentrated in deep waters, it is most likely that the associated 'finback' sightings were pygmy blue whales.

However, we are less certain about which species to assign to the 'finback' sightings made during December–April east of Halmahera and Morotai Islands in the Halmahera Sea. Given the lack of connection to other 'finback' sightings, the distance from satellite tracking data, and the oceanographic characteristics of this region, we believe these 'finback' sightings could be another species of rorqual, or perhaps even a different population of blue whales (although we regard this as unlikely) approaching this area from the north.

### The lack of connecting 'finback' sightings in the Banda and Timor Seas

To open boat whalers the centre of the Banda Sea and the waters to the east of Timor Island were dead water in terms of sperm whales. Consequently, passages between the Wetar Strait and Buru / Ambon and vice versa were accomplished as quickly as possible, usually within just a few days. In contrast the eastern side of the Banda Sea (around the Kai Islands) was a regularly visited British Sperm Whale Ground in the 1830s, as evidenced by the *Eclipse* voyage track (Appendix 2). Typical voyage tracks to this Kai Islands whaling ground however did not involve a direct transit across the Banda Sea west to east but instead a transit north across the western Banda Sea, through the Manipa Strait following the Banda Arc across the north of Ceram,

and then south through the Gorong Archipelago. This track avoids areas of blue whale concentrations in the Banda Sea as indicated in satellite tracks and was followed because sperm whales could be encountered all along the voyage track. Similarly, in the Timor Sea, to the east of the island of Timor there were no sightings of sperm or 'finback' whales since the traditional fleets did not sail or spend time in these areas of water where sperm whales were not to be found.

**'Finbacks' to the west and southwest of Sumba**

The 'finbacks' sighted in the waters to the south of Java (10–15°S, 110–115°E) repeat satellite tracked pygmy blue whales in August–October south and south-west of Java and Bali (Möller et al. 2020), but the sightings from the traditional whalers occurred in February, or are considerably south of these satellite tracks in September to December. These sightings reflect search effort undertaken by the American Whaling Fleet when sailing north-east from the Coast of New Holland Ground off the middle of Western Australian towards the Savu Sea seeking sperm whales. Following this, as shown in our log tracks, the great majority of American vessels turned west seeking sperm whales south of Java before returning south to the Coast of New Holland Ground.

## CONCLUSION

Much of our historical sighting data is in accord with modern migratory knowledge of pygmy blue whales between Australia and Indonesia. Our data confirm the existence of a south-west to north-east corridor from below Timor Island, and a concentration of whales to the side of the corridor around Sumba and probably much further west. It also indicates that historically migration may have commenced earlier—in mid-March rather than May. The eventual end point of at least some pygmy blue whales in the Molucca Sea also appears confirmed, but not the dates and pattern of the southern return journey.

A wealth of information exists in historical whaling records, which can complement and expand modern data from satellite tracking by greatly increasing the total search effort area, and the months that are examined, to fill in gaps in estimated range and whale migratory routes.

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Appendix 1. Locations of 'Finback' sightings by nationality, vessel, and date

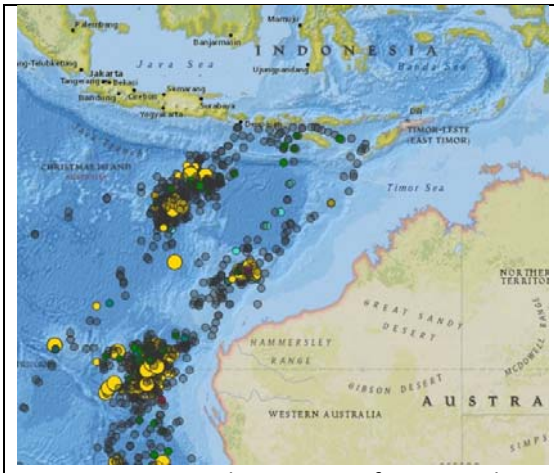
| Source | Nationality | Vessel | Latitude | Longitude | Date | Comments |
|---|---|---|---|---|---|---|
| Log | British | Argus | -8.90 | 124.88 | 7 Aug 1832 | Near Batogada |
| Log | British | Argus | -2.58 | 126.75 | 14 Aug 1832 | In Pitt's Passage |
| Log | British | Argus | -1.12 | 126.80 | 15 Aug 1832 | Great number of finbacks |
| Log | British | Argus | -0.05 | 126.00 | 28 Aug 1832 | |
| Log | British | Argus | 2.55 | 128.90 | 5 Jan 1833 | East of Morty |
| Log | British | Argus | 1.70 | 129.08 | 10 Jan 1833 | Point Sallaway west |
| Log | British | Argus | 2.48 | 129.08 | 20 Jan 1833 | Near Morty |
| Log | British | Argus | 0.00 | 126.32 | 11 Mar 1833 | |
| Log | British | Argus | 0.00 | 126.62 | 18 Jun 1833 | Molucca Passage |
| Log | British | Argus | -0.60 | 126.15 | 19 Jun 1833 | Plenty finbacks |
| Log | British | Argus | -0.60 | 126.47 | 24 Jun 1833 | |
| Log | British | Argus | -1.13 | 126.60 | 25 Jun 1833 | Finbacks in abundance |
| Log | British | Argus | -1.25 | 126.78 | 26 Jun 1833 | Plenty finbacks |
| Log | British | Argus | -1.18 | 126.53 | 27 Jun 1833 | Finbacks plenty |
| Log | British | Argus | -1.53 | 126.72 | 28 Jun 1833 | Finbacks plenty |
| Log | British | Argus | -2.27 | 126.82 | 30 Jun 1833 | Saw finbacks |
| Log | British | Argus | -2.53 | 126.52 | 1 Jul 1833 | Plenty finbacks |
| Log | British | Argus | 0.77 | 125.78 | 7 Aug 1833 | Saw finbacks |
| Log | British | Argus | 1.85 | 128.22 | 1 Dec 1833 | Saw finbacks off Morty [Morotai] |
| Log | British | Argus | 1.82 | 128.35 | 2 Dec 1833 | Saw finbacks |
| Log | British | Argus | 2.22 | 128.92 | 1 Jan 1834 | Saw finbacks |
| Log | British | Argus | -10.41 | 120.93 | 12 Jul 1835 | Near Sandlewood [Sumba] Island |
| Log | British | Eclipse | -10.52 | 118.50 | 17 Oct 1838 | |
| Log | British | Eclipse | -9.89 | 118.44 | 28 Oct 1838 | A quantity of finbacks |
| Log | British | Eclipse | -9.42 | 123.23 | 23 May 1839 | Off Timor |
| Log | British | Eclipse | -10.00 | 122.00 | 1 Jun1839 | SW of Timor |
| Log | British | Eclipse | -10.50 | 120.00 | 13 Jun 1839 | SW of Sumba |
| Log | British | Eclipse | -11.00 | 119.00 | 15 Jun 1839 | SW of Sumba |
| Log | British | Eclipse | -12.00 | 120.00 | 11 Jul 1839 | SW of Sumba |
| Log | British | Eclipse | -10.85 | 120.94 | 27 Oct 1839 | |
| Log | British | Eclipse | -10.69 | 122.43 | 4 Nov 1839 | |
| Log | British | Eclipse | -11.00 | 123.00 | 6 Nov 1839 | |
| Log | British | Eclipse | 3.27 | 127.95 | 26 Dec 1839 | |
| Log | British | Gipsy | -8.85 | 124.45 | 27 Apr 1840 | Grampuses Blackfish etc |
| Log | British | Gipsy | -6.58 | 126.67 | 7 May 1840 | Blackfish killers grampuses porpoises |
| Log | British | Japan | -11.35 | 119.93 | 2 May 1835 | |
| Log | British | Japan | -10.90 | 119.78 | 3 May 1835 | |
| Log | British | Japan | -12.13 | 119.83 | 5 May 1835 | |
| Log | British | Japan | -3.45 | 127.50 | 4 July 1835 | Off Manipa [Banda Sea] |
| Log | British | Japan | 0.51 | 133.42 | 2 Sep 1835 | |
| Log | British | Japan | -8.37 | 125.00 | 17 Sep 1835 | Off Point Maubara [Timor Starit] |
| Log | British | Japan | -9.74 | 123.12 | 5 Oct 1835 | Off Coupang [Kupang] |

| | | | | | | |
|---|---|---|---|---|---|---|
| LOG | British | Japan | -13.52 | 118.67 | 13 Oct 1835 | |
| Log | British | Japan | -14.57 | 117.82 | 14 Oct 1835 | |
| Log | British | Japan | -15.72 | 117.87 | 24 Oct 1835 | |
| Log | British | Japan | -15.57 | 117.95 | 26 Oct 1835 | |
| Log | British | Japan | -15.37 | 117.65 | 29 Oct 1835 | |
| Log | British | Japan | -15.18 | 117.35 | 31 Oct 1835 | |
| Log | British | Japan | -15.70 | 117.33 | 4 Nov 1835 | |
| Log | British | Japan | -15.83 | 115.75 | 22 Nov 1835 | |
| Log | British | Japan | -15.00 | 116.55 | 23 Nov 1835 | |
| Log | British | Japan | -13.30 | 117.77 | 1 Dec 1833 | |
| Log | British | Japan | -13.38 | 117.30 | 3 Dec 1835 | |
| Log | British | Japan | -13.77 | 117.93 | 6 Dec 1835 | |
| Log | British | Japan | -0.37 | 125.68 | 25 Jan 1836 | Molucca Strait |
| Log | British | Japan | -2.55 | 125.81 | 18 Feb 1836 | |
| Log | British | Japan | -10.02 | 123.41 | 12 Mar 1836 | Off Coupang Harbour |
| Log | British | Japan | -12.15 | 120.55 | 24 Mar 1836 | |
| Log | British | Japan | -12.68 | 119.67 | 26 Mar 1836 | |
| Log | British | Japan | -13.58 | 120.12 | 1 Apr 1836 | |
| Log | British | Japan | -13.88 | 118.52 | 13 Apr 1836 | |
| Log | British | Japan | -14.67 | 117.65 | 15 Apr 1836 | |
| Log | British | Japan | -14.07 | 117.20 | 26 Apr 1836 | |
| Log | British | Japan | -15.82 | 117.10 | 4 May 1836 | |
| Log | British | Japan | -15.38 | 117.48 | 5 May 1836 | |
| Log | British | Japan | -11.92 | 120.98 | 23 May 1836 | |
| Log | British | Japan | -11.83 | 120.83 | 26 May 1836 | |
| Log | British | Japan | -8.97 | 119.75 | 1 Jun 1836 | |
| Log | British | Japan | -8.87 | 119.00 | 2 Jun 1836 | |
| Log | British | Japan | -9.43 | 123.40 | 4 Aug 1836 | |
| Log | British | Japan | -8.67 | 124.80 | 9 Aug 1836 | Off Dili |
| Log | British | Japan | -8.64 | 124.97 | 14 Aug 1836 | Off Copang [Kupang] |
| Log | British | Japan | -12.25 | 119.55 | 15 Sep 1836 | |
| Log | British | Japan | -14.27 | 119.70 | 16 Oct 1836 | |
| Log | British | Japan | -14.26 | 119.49 | 29 Oct 1836 | |
| Log | British | Japan | -13.93 | 119.21 | 1 Nov 1836 | |
| Log | British | Japan | -12.70 | 119.53 | 14 Nov 1836 | |
| Log | British | Japan | -12.82 | 119.61 | 15 Nov 1836 | |
| Log | British | Japan | -12.75 | 115.93 | 3 Dec 1836 | |
| Journal | British | Vigilant | -8.85 | 113.52 | 21 Feb 1832 | Grampusses, Blackfish and porpoises |
| Journal | British | Vigilant | -8.67 | 114.00 | 22 Feb 1832 | Java shore 3 to 4 leagues |
| Journal | British | Vigilant | -9.08 | 120.00 | 17 Mar 1832 | In Flores Strait. Killers & porpoises |
| Journal | British | Vigilant | -9.09 | 119.13 | 14 May 1832 | |
| Journal | British | Vigilant | -9.22 | 118.80 | 17 May 1832 | |
| Journal | British | Vigilant | -13.97 | 119.70 | 3 Jun 1832 | |
| Journal | British | Vigilant | -10.89 | 119.57 | 7 Jun 1832 | |
| Journal | British | Vigilant | -9.98 | 121.11 | 14 Jun 1832 | Porpoises |
| Journal | British | Vigilant | -7.51 | 125.71 | 3 Jul 1832 | N of Wetar Strait. Blackfish and porpoises |

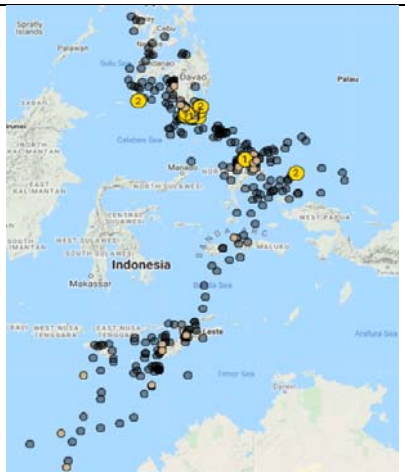
| | | | | | | |
|---|---|---|---|---|---|---|
| Journal | British | Vigilant | -1.26 | 127.90 | 9 Jul 1832 | Finbacks turning flukes like sperm whales |
| Journal | British | Vigilant | -0.45 | 127.01 | 11 Jul 1832 | Blackfish and Porpoises |
| Journal | British | Vigilant | -0.17 | 126.81 | 13 Jul 1832 | |
| Journal | British | Vigilant | -0.11 | 126.93 | 14 Jul 1832 | Blackfish and Porpoises |
| Journal | British | Vigilant | -9.08 | 121.13 | 30 Jul 1832 | Near Flores |
| Journal | British | Vigilant | -1.45 | 128.48 | 18 Aug 1832 | |
| Journal | British | Vigilant | -1.40 | 128.99 | 19 Aug 1832 | |
| Journal | British | Vigilant | -0.03 | 129.23 | 20 Aug 1832 | Blackfish and Porpoises |
| Journal | British | Vigilant | 1.85 | 129.12 | 21 Aug 1832 | |
| Journal | British | Vigilant | 1.50 | 126.40 | 22 Apr 1833 | Moluccas |
| CoML | American | Draco | -11.16 | 117.90 | 10 Aug 1845 | |
| CoML | American | Draco | -10.33 | 118.50 | 11 Aug 1845 | |
| CoML | American | Draco | -9.53 | 118.66 | 12 Aug 1845 | |
| CoML | American | Draco | -10.16 | 117.96 | 15 Aug 1845 | |
| CoML | American | Draco | -13.95 | 110.86 | 30 Sep 1845 | |
| CoML | American | Draco | -12.95 | 113.15 | 14 Oct 1845 | |
| CoML | American | Draco | -17.75 | 115.03 | 31 Jul 1846 | |
| CoML | American | Draco | -9.70 | 121.36 | 4 Sep 1846 | |
| CoML | American | Draco | -11.83 | 114.83 | 20 Sep 1846 | |
| CoML | American | Draco | -12.30 | 113.07 | 22 Sep 1846 | |
| CoML | American | Draco | -12.58 | 112.20 | 25 Sep 1846 | |
| CoML | American | Draco | -12.26 | 112.13 | 7 Oct 1846 | |
| CoML | American | Draco | -12.56 | 112.66 | 9 Oct 1846 | |
| CoML | American | Draco | -12.73 | 110.85 | 10 Nov 1846 | |
| Maury | American | Emerald | -11.41 | 119.00 | 18 Oct 1840 | |
| Maury | American | Emerald | -10.37 | 120.77 | 25 Oct 1840 | |
| CoML | American | Harbinger | -17.38 | 115.68 | 6 May 1844 | |
| CoML | American | Rodman | -11.73 | 120.30 | 11 Aug 1857 | Strike and capture of sulphur bottom |
| CoML | American | Vigilant | -14.68 | 115.93 | 8 May 1871 | |
| CoML | American | Vigilant | -14.76 | 115.23 | 9 May 1871 | |
| CoML | American | Vigilant | -20.30 | 113.68 | 10 Jun 1871 | |
| CoML | American | Vigilant | -16.05 | 115.40 | 10 Jun 1872 | |
| CoML | American | Vigilant | -11.68 | 111.51 | 13 Jun 1872 | |
| CoML | American | Vigilant | -17.45 | 116.35 | 23 Jun 1873 | |
| CoML | American | Vigilant | -17.60 | 116.53 | 25 Jun 1873 | |

**Appendix 2. Voyage tracks for five American and five British whaleships.**

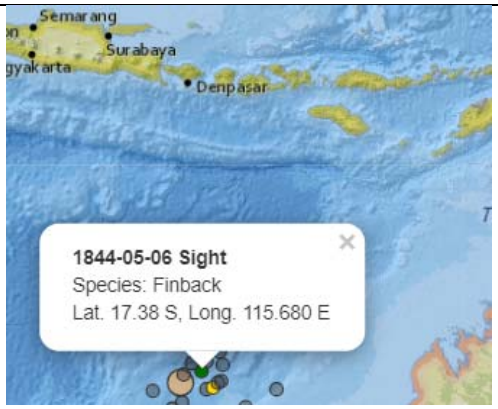
Fig. S1 a-e Voyage tracks of American whaleships which sighted finbacks/s. Four voyages illustrating typical deployment practice to the south and west of Indonesia. The other, by *Emerald* demonstrating an atypical deployment involving a transit south to north and then north to south through Indonesian waters. Colored circles represent different species (yellow for sperm whales, green for 'finbacks') or no encounter (grey). From Whaling History Voyage Maps, https://whalinghistory.org/?s=AT&t=T



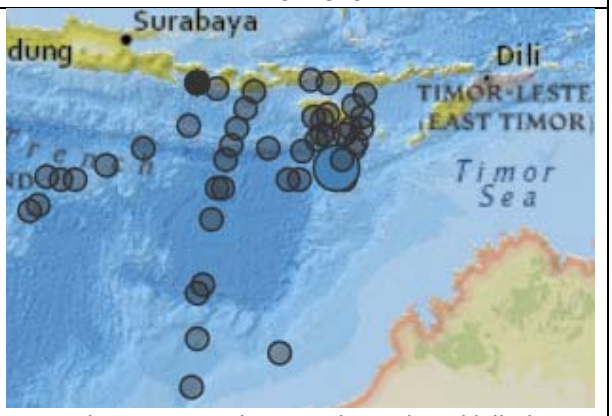

*Draco* 1845 and 1846 – two forays north



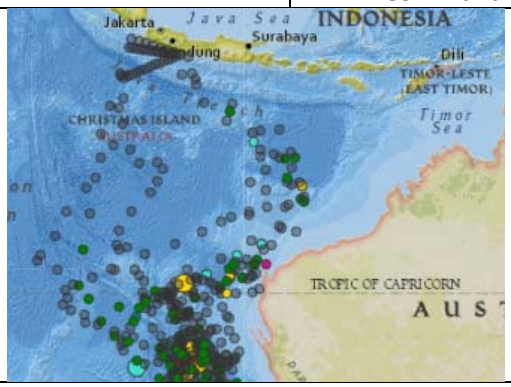

*Emerald* – sighted 'finbacks' south of Sumba and Timor 1840




*Harbinger* 1844 - single sighting in early May 1844 well to the SSW of Sumba

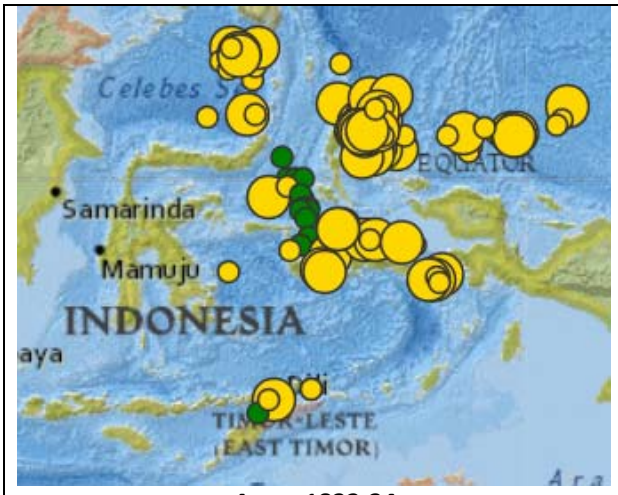



*Rodman* 1857 – this vessel struck and killed a Sulphur Bottom [Pygmy Blue Whale?] 11 August 1857 with a bomb lance south of Sumba

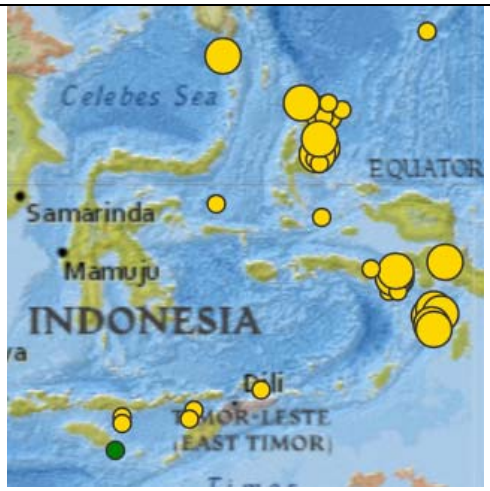



*Vigilant* – late era voyage but still typical deployment below Indonesia - sighting 'finbacks' in months of May and June in 1871, 1872 and 1873.

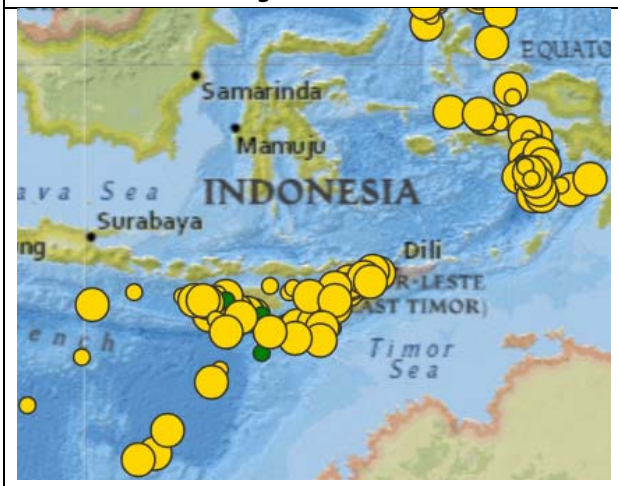
Fig. S2 a-f. Voyage tracks of British whaleships which sighted 'finbacks', demonstrating their typical deployment practice. Each color represents a species: sperm whales (yellow) and 'finbacks' (green). [there is no color for "no sighting" so I assume the yellow circles are sperm whales]



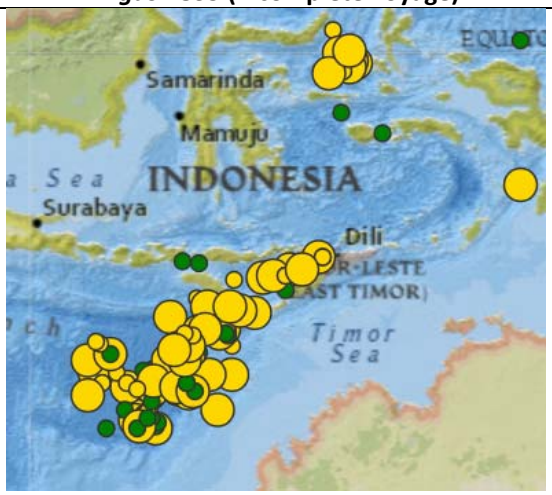

***Argus* 1832-34**




***Argus* 1835 (incomplete voyage)**

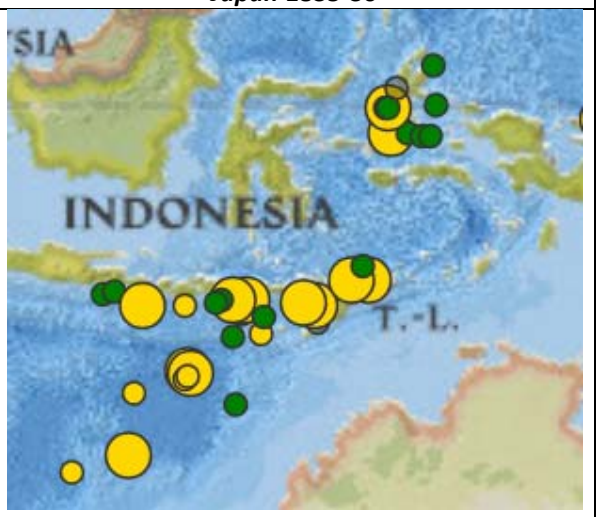



***Eclipse* 1838-39**




***Japan* 1835-36**


***Gipsy* 1840**




***Vigilant* 1832**