

# An Update of the CETA project: cetacean observation program in East Antarctica 2010-2014

CLAIRE GARRIGUE<sup>1</sup>, HELENE PELTIER<sup>2</sup>, MAGALY CHAMBELLANT<sup>1</sup>, REMI DODEMONT<sup>1</sup>,  
VERONIQUE PERARD<sup>1</sup>, VINCENT RIDOUX<sup>2</sup>, JEAN BENOIT CHARRASSIN<sup>3</sup>

<sup>1</sup>Opération Cétacés, BP 12827, 98802 Nouméa, New Caledonia

<sup>2</sup>Observatoire Pelagis, UMS3462, CNRS/Université de La Rochelle, Avenue Michel Crépeau F-17042, 17000 La Rochelle

<sup>3</sup>LOCEAN UMR 7159, Muséum National d'Histoire Naturelle, Université Pierre et Marie Curie, Tour 45-55, 4 place Jussieu, BP100, 75252 Paris Cedex 05, France

Contact author: [op.cetaces@lagoon.nc](mailto:op.cetaces@lagoon.nc)

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## ABSTRACT

The CETA program (Distribution des Cétacés en Terre Adélie) was launched with support of the French Polar Institute (IPEV) in 2009 to carry out a study on cetacean distribution off Adélie Land (IWC Area V). This work is a part of the Southern Ocean Research Partnerships (SORP) on non-lethal whale research and one of the only French research initiatives on cetaceans in the Antarctic region. Opportunistic surveys conducted in January 2010, 2011 and 2014 allowed the collection of 144 sightings on the continental shelf off the Adélie Land. Antarctic blue whales (*Balaenoptera musculus*) and humpback whales (*Megaptera novaeangliae*) were identified and sightings of Antarctic minke whale (*Balaenoptera bonaerensis*) and killer whale (*Orcinus orca*) type A and C confirmed the presence of both species in this area. Photo-identifications (Photo-ID) were realised on blue whales (3), humpback whales (9), Antarctic minke whales (17) and killer whales (35). One humpback whale observed on the east coast of Australia was resighted on the continental shelf of Adélie Land highlighting the connection between these two areas. No new match was found when we compared a set of 1,300 photo-ID originated from the adjacent feeding or breeding grounds as well as migratory corridors. Three humpback whales were genetically compared with the genotyped whales from Oceania and northbound and southbound migration (N=2,353) but no match was found. One blue whales photo-identified in 2010 was resighted in the Ross Sea area during the Antarctic Blue Whale Expedition in 2013.

## INTRODUCTION

Little information is available on the distribution of cetaceans on the continental shelf off Adélie Land, East Antarctica (IWC Area V, 65-66°S and 140-145°E). Apart from the SOWER cruises, no dedicated program has been conducted on cetaceans in this area. Only 24 observations were opportunistically made from the supply vessel l'Astrolabe between 1997 and 2008 and identified principally killer whales (*Orcinus orca*) but also Antarctic minke (*Balaenoptera bonaerensis*) and fin (*Balaenoptera physalus*) whales and a pod of humpback whales (*Megaptera novaeangliae*). The CETA project (French Polar Institute, IPEV1014) was launched in January 2010 starting by a two-year pilot study to assess distribution patterns and relative abundance of cetaceans off Adélie Land with four main targeted species: blue (*Balaenoptera musculus*), humpback, right (*Eubalaena australis*) and killer whales. Photo-identification (Photo-ID) and biopsy sampling on these later ones were also part of the project. Unfortunately, due to adverse ice conditions during the 2012 and 2013 austral summer seasons; IPEV scientific programs on board R/V l'Astrolabe were cancelled. The CETA project resumed part of its fieldwork in January 2014.

## MATERIALS AND METHODS

### Field work

Data were collected during the transits between Hobart, Tasmania and Antarctica and during the oceanographic surveys from 2009 December 31 to 2010 January 29, 2010 December 29 to 2011 January 31 and during the logistic process from 2014 January 6 to 31.

The R/V l'Astrolabe was used as a platform of opportunity in 2010 and 2011 since the CETA project was conducted during an oceanographic survey that included other IPEV research programs (ALBION: Adélie Land Bottom Water Formation and Ice Ocean Interaction; and ICOTA: Coastal Ichthyology in Adélie Land). The sampling design was therefore neither regular nor random; it was dictated by the stations sampled during ALBION and ICOTA research programs and by weather conditions (Figure 1). In 2014, the CETA project was conducted from the R/V l'Astrolabe anchored in a large polynya 40km from the research station of Dumont

D'Urville (DDU). In line transect mode, two dedicated trained observers (CG, HP, MC, VP, RD) searched for cetacean at 180° in front of the ship. Observation was carried out during 24 hours a day weather permitting. Data collection was mainly conducted from the bridge (height: 11.70 m). Linear transects were conducted whenever possible, i.e. when the boat was cruising at 10 to 12 knots between the oceanographic sampling stations or during transits from Australia to Antarctica and back. Observations were also collected during plankton sampling when the ship speed was only 2 to 5 knots (Line transect <6 knots) and at fixed stations during hydrographic instrumentation deployment from the crow nest (height: 17.9 m). When target species were encountered, attempts were made to approach for focal follow in order to collect photo-IDs and biopsy samples following standard IDCR/SOWER methods. Photo-IDs performed using digital SLR CANON 40D and 50D with 100-200 x 1.4 and 400mm lenses. Biopsy samples were collected using a veterinarian riffle Paxarms with small darts (Krützen et al., 2002). In 2014, data were collected from the R/V L' Astrolabe anchored on the pack ice (fixed station) but also from a 7 m semi-inflatable boat "Remora" provided by the Australian Antarctic Division (AAD).

### Data availability and analysis

Photo-ID of humpback whales were compared with different catalogues including the catalogue from the breeding ground of New Caledonia, South Pacific, some catalogues from the migratory corridors of Australia and New Zealand and some catalogues from feeding grounds (Table 3). Photo-IDs of blue whales were forwarded to Dr Paula Olson. They were matched to the photo-IDs collected during the IDCR/SOWER surveys organised by the International Whaling Commission (IWC, 1993-2009), to opportunistic photos from collegial scientists (2009, 2010, and 2012) and to the recent Southern Ocean Research Partnership's Antarctic Blue Whale Voyage (2013). Photo-IDs of killer whales were sent to Dr Robert Pitman for matching.

Skin samples were analysed by the AAD and the results were sent to the Oregon State University for matching with the catalogue of genotypes from Oceania (N=1,188), and from the northbound and southbound migration routes (N=1,165) (Constantine et al., 2014).

## RESULTS

Sampling effort amounted to 304h42 on the continental shelf off Adélie land area (Figure 1, Table 1) of which 207h48 were conducted in line transects, 77h30 during fixed stations and 19h24 from the Remora.

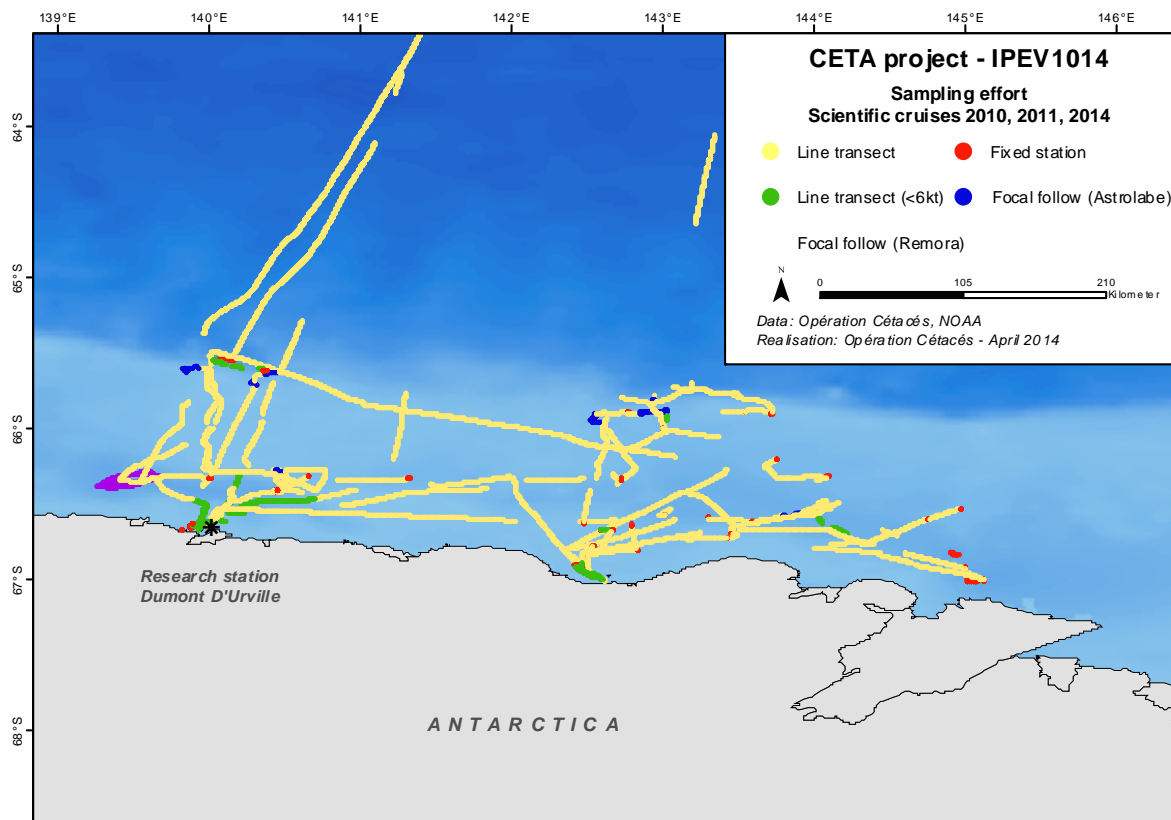


Figure 1. Sampling effort during the CETA project (2010, 2011, and 2014).

Five mysticetes species have been identified off Adélie Land, all from the Balaenopteridae family: blue, minke, sei (*Balaenoptera borealis*) and fin whales as well as humpback whales. Some unidentified Balaenopteridae were also encountered. Two odontocetes species have been identified: the sperm whale (*Physeter macrocephalus*) and the killer whale.

A total of 144 sightings of cetaceans have been collected on the continental shelf of Adélie Land during the CETA project (Figure 2, Table 2). Most of the animals sighted were identified to the species (114/144, 79%), 64 % (N=92) with certainty and 15 % (N=22) were “likely” species considered. Animals in 14 sightings were only identified to genus, all *Balaenoptera* spp.. Sixteen sightings were of unidentified cetaceans.

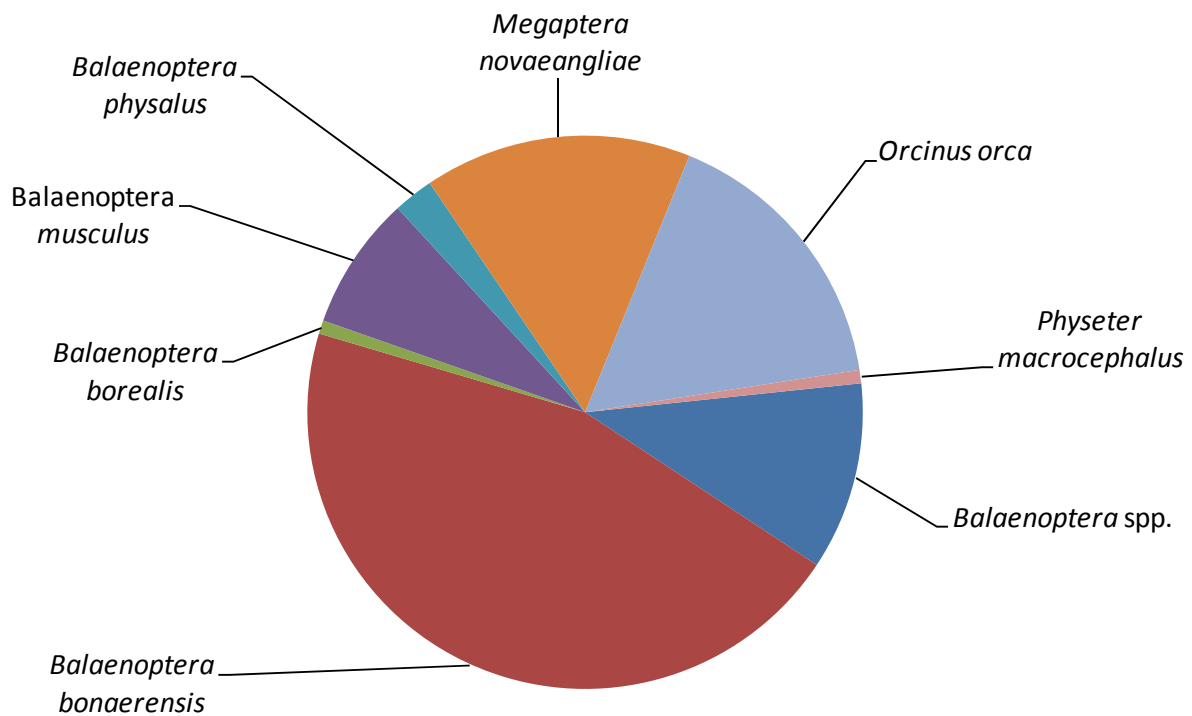


Figure 2. Sightings occurrence for the species of cetaceans identified with certainty and as “likely” on the continental shelf of Adélie Land (2010, 2011 and 2014).

Most of the sightings were of Antarctic minke whales (40%, N=58) which were encountered in the inner part of the continental shelf and mainly in the western part of the study area (Figure 3). In January 2014, observations conducted from a polynya located 40km WNW of the DDU research station allowed to identify 32 individual Antarctic minke whales and six of them were resighted within the 12 days. Seventeen Antarctic minke whales were photo-identified, and five of them were biopsied (Garrigue et al., 2014).

Three of the four target species of this project were observed: the blue, humpback and killer whales. The killer whale was the second most frequent species encountered, representing 15% of the sightings with 21 observations distributed over the entire study area from the edge of the continental shelf to the coastal area (Figure 3). The first photo-ID catalogue of killer whales from Adélie Land was developed. It includes a minimum of 35 photo-identified whales (Chambellant et al., 2012). It was sent to Dr B. Pitman for expertise who confirmed that killer whale ecotypes type A and C were present Adélie Land waters (B. Pittman pers.com.).

Humpback whales contributed for 14% of the sightings, most of them over the slope of the continental shelf (Figure 3). Nine individuals were photo-identified and three biopsy samples were collected. The nine humpback whales photo-identified during the CETA project were matched to 1,300 individual whales photo-identified in adjacent feeding, breeding grounds and migratory corridors (Table 3). No humpback whale was resighted in any of the regions. The genotypes of three humpback whales biopsied during the CETA project, were matched to 2353 genotype samples and no match was found (see Constantine et al., 2014).

Blue whales were sighted at the edge of the continental slope and in the Adélie depression. Three blue whales were photo-identified. One blue whale identified during the CETA project and observed on the 14<sup>th</sup> of January 2010 was matched to a blue whale photographed the 25<sup>th</sup> of February 2013 during the SORP/ABWV in the Ross sea region (Olson et al., 2013).

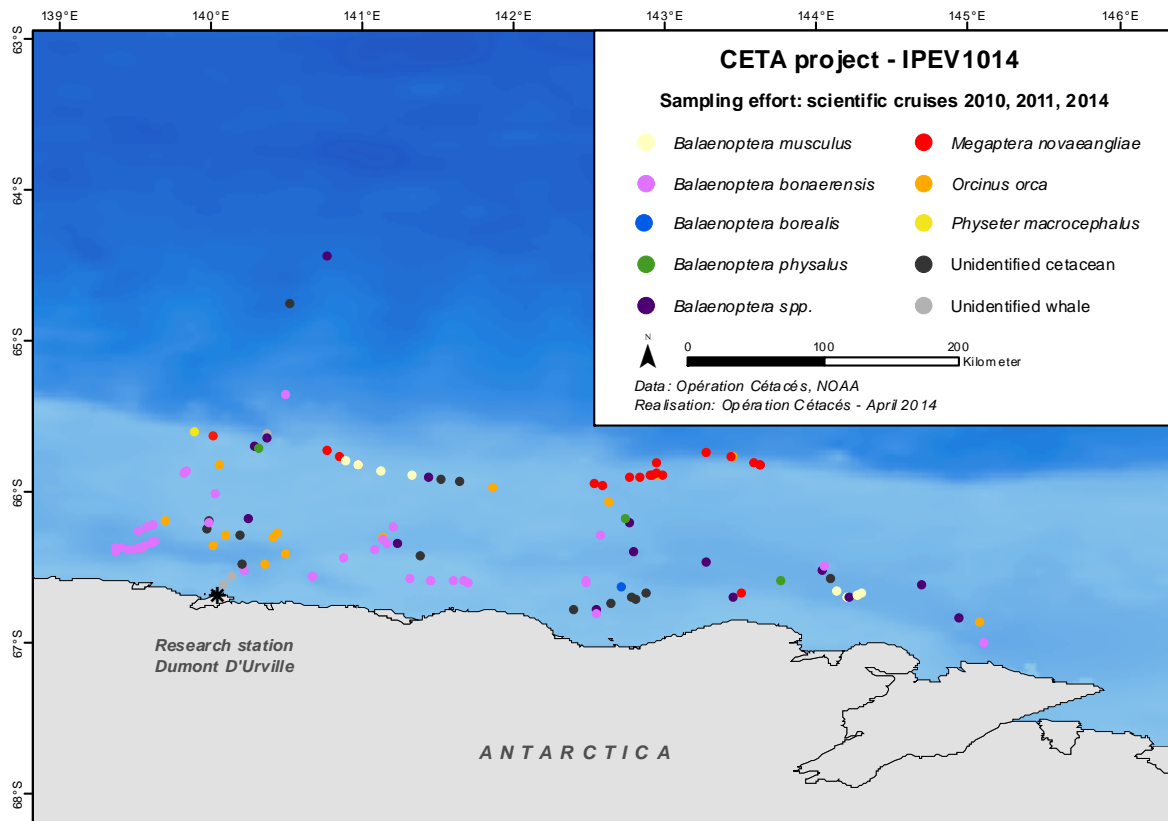


Figure 3. Sighting locations for different species of cetaceans identified with certainty and as “likely” on the continental shelf of Adélie Land during the CETA project (2010, 2011 and 2014).

## DISCUSSION

The sampling effort conducted in an area located between 150°E and 140°E by the CETA research program as part of the Southern Ocean Research Partnership (SORP) represents one of the few French initiatives for cetacean research in Antarctica (Garrigue et al., 2010, Chambellant et al., 2012). It contributes to the knowledge of cetaceans using non-lethal research techniques and extends the data available in the region.

The presence of species that have previously been reported off Adélie Land were confirmed and other species of conservation interest were reported for the first time. Our results suggest that Adélie Land constitutes a summer habitat for cetacean species that might be of potential importance.

Apart from the match previously reported between Adélie Land and the Australian east coast (Garrigue et al., 2010; Constantine et al., 2014), no new match was found between the nine humpback whales photo-identified during the CETA project and humpback whales identified in the breeding grounds of New Caledonia, the adjacent feeding grounds, or migratory corridors.

The recapture of one true blue whale a few years apart in the Ross Sea area contributes to increase the knowledge on movements of this poor known species and confirms the interest of all scientific programs on large whales in Antarctic waters. Our sightings will be combined with environmental data to identify biological and physical ocean features that favour the presence of whales in this region. Development of future research projects will depend on the results.

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inflatable boat for the 2014 survey. We thank Dr Paula Olsen for matching blue whales and Dr Bob Pitman for his help with killer whale ecotypes determination. We thanks RosemaryGales, Kylie Owen, Olive Andrews and Nadine Botts who nicely provided their photos of humpback whales from the migratory corridors and feeding grounds for comparison. Photos from Eden were collected by K. Owen during the SURFAH project (Surface and Underwater Research on Feeding in Australian Humpback whales). Photos from New Zealand were collected by N. Botts during the Cook Strait Whale project.

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Table 1. Details of sampling effort during the CETA project (2010, 2011 and 2014).

| <b>Date</b>       | <b>Line transect<br/>(10-12 kts)</b> | <b>Line transect<br/>(2-5 kts)</b> | <b>Fixed station</b> | <b>Focal Follow</b> |
|-------------------|--------------------------------------|------------------------------------|----------------------|---------------------|
| 10/01/2010        |                                      |                                    | 01:05:00             |                     |
| 11/01/2010        | 02:24:00                             | 01:04:00                           | 00:32:00             |                     |
| 12/01/2010        | 02:16:00                             | 03:02:00                           | 02:17:00             |                     |
| 13/01/2010        | 04:14:00                             |                                    | 02:18:00             |                     |
| 14/01/2010        | 03:10:00                             | 01:51:00                           | 01:34:00             | 00:10:00            |
| 15/01/2010        | 07:49:00                             |                                    | 03:24:00             |                     |
| 16/01/2010        | 04:38:00                             |                                    | 01:20:00             | 01:00:00            |
| 17/01/2010        | 00:54:00                             | 00:30:00                           |                      |                     |
| 18/01/2010        | 00:16:00                             |                                    | 00:32:00             |                     |
| 19/01/2010        | 01:41:00                             | 00:30:00                           | 01:29:00             |                     |
| 20/01/2010        | 00:58:00                             |                                    | 01:02:00             |                     |
| 21/01/2010        | 01:50:00                             | 03:45:00                           | 01:43:00             |                     |
| 22/01/2010        | 01:14:00                             |                                    |                      |                     |
| 05/01/2010        | 02:55:00                             | 06:05:00                           |                      |                     |
| 23/01/2010        | 04:15:00                             |                                    |                      |                     |
| 24/01/2010        | 07:23:00                             |                                    |                      |                     |
| <b>Total 2010</b> | <b>45:57:00</b>                      | <b>16:47:00</b>                    | <b>16:11:00</b>      | <b>1:10:00</b>      |
| 03/01/2011        | 05:08:00                             | 02:49:00                           |                      |                     |
| 10/01/2011        |                                      | 4:45:00                            | 3:50:00              |                     |
| 11/01/2011        | 1:56:00                              |                                    | 2:15:00              |                     |
| 12/01/2011        | 9:27:00                              |                                    | 1:30:00              | 0:22:00             |
| 13/01/2011        | 6:13:00                              |                                    | 1:15:00              | 0:30:00             |
| 14/01/2011        | 13:24:00                             |                                    |                      |                     |
| 15/01/2011        | 4:03:00                              |                                    | 2:51:00              | 0:27:00             |
| 16/01/2011        | 5:54:00                              |                                    | 2:41:00              | 2:50:00             |
| 17/01/2011        | 6:19:00                              |                                    | 2:19:00              | 0:20:00             |
| 18/01/2011        | 2:59:00                              |                                    | 0:36:00              |                     |
| 19/01/2011        | 7:55:00                              |                                    | 0:35:00              |                     |
| 26/01/2011        | 06:03:00                             |                                    |                      | 00:28:00            |
| <b>Total 2011</b> | <b>19:18:00</b>                      | <b>00:21:00</b>                    | <b>10:03:00</b>      | <b>06:07:00</b>     |
| 13/01/2014        |                                      |                                    | 00:46:00             |                     |
| 14/01/2014        | 02:40:00                             |                                    |                      |                     |
| 15/01/2014        |                                      |                                    | 05:00:00             |                     |
| 16/01/2014        |                                      |                                    | 02:30:00             |                     |
| 17/01/2014        |                                      |                                    |                      | 04:00:00            |
| 18/01/2014        |                                      |                                    |                      |                     |
| 19/01/2014        |                                      |                                    | 01:00:00             | 02:23:00            |
| 20/01/2014        |                                      |                                    | 05:30:00             |                     |
| 21/01/2014        |                                      |                                    |                      | 05:44:00            |
| 22/01/2014        |                                      |                                    |                      |                     |
| 23/01/2014        |                                      |                                    |                      |                     |
| 24/01/2014        |                                      |                                    | 06:30:00             |                     |
| 25/01/2014        | 02:45:00                             |                                    | 06:00:00             |                     |

|                   |                  |                 |                 |                 |
|-------------------|------------------|-----------------|-----------------|-----------------|
| <b>Total 2014</b> | <b>5:25:00</b>   | <b>0:00:00</b>  | <b>27:16:00</b> | <b>12:07:00</b> |
| <b>TOTAL</b>      | <b>166:40:00</b> | <b>41:08:00</b> | <b>77:30:00</b> | <b>19:24:00</b> |

Table 2. Number of sightings by species collected during the CETA project (2010, 2011, and 2014).

|                                      | <b>Number of sightings</b> | <b>%</b> |
|--------------------------------------|----------------------------|----------|
| <i>Balaenoptera bonaerensis</i>      | 44                         | 30       |
| Like <i>Balaenoptera bonaerensis</i> | 14                         | 10       |
| <i>Balaenoptera borealis</i>         | 1                          | 1        |
| <i>Balaenoptera musculus</i>         | 6                          | 4        |
| Like <i>Balaenoptera musculus</i>    | 4                          | 3        |
| <i>Balaenoptera physalus</i>         | 1                          | 1        |
| Like <i>Balaenoptera physalus</i>    | 2                          | 1        |
| <i>Megaptera novaeangliae</i>        | 18                         | 12       |
| Like <i>Megaptera novaeangliae</i>   | 2                          | 1        |
| <i>Balaenoptera</i> spp.             | 11                         | 8        |
| Like <i>Balaenoptera</i> spp.        | 3                          | 2        |
| <i>Orcinus orca</i>                  | 21                         | 15       |
| <i>Physeter macrocephalus</i>        | 1                          | 1        |
| Unidentified whale                   | 3                          | 2        |
| Unidentified cetaceans               | 13                         | 9        |
| <b>Total</b>                         | <b>144</b>                 |          |

Table 3. List of the different humpback whale photo-ID catalogues used for matching purposes with individuals photo-identified in Adélie Land during the CETA project (2010, 2011, and 2014).

| <b>Regions</b>                 | <b>Owners/<br/>references</b>           | <b>Period</b>  | <b>Number of<br/>photo-ID<br/>matched</b> | <b>Number of<br/>matches with<br/>Adélie Land</b> |
|--------------------------------|---|----------------|---|---|
| New Caledonia                  | Opération cétacés                       | 1995-2013      | 1048                                      | 0   |
| <b>Breeding grounds</b>        |   |                | <b>1048</b>                               | <b>0</b>  |
| Eden                           | K. Owen                                 | 2011-2012      | 76  | 0   |
| Tasmania                       | R. Gales                                | 2007           | 40  | 0   |
| New Zealand                    | N. Botts                                | 2011-2012-2013 | 59  | 0   |
| <b>Migratory<br/>corridors</b> |   |                | <b>175</b>                                | <b>0</b>  |
| Balleny Islands                | New Zealand<br>Ministry of<br>Fisheries | 2006           | 10  | 0   |
| Opportunistic<br>sightings     | O. Andrews                              | 2011 & 2013    | 8   | 0   |
| Antarctic Whale<br>Expedition  | The Australian<br>Antarctic Division    | 2010           | 59  | 0   |
| <b>Feeding grounds</b>         |   |                | <b>77</b>                                 | <b>0</b>  |