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INTRODUCTION

The killer whale (*Orcinus orca*) is the largest member of the family Delphinidae and is easily recognized due to its large size and a distinctive black and white color pattern. The killer whale is known for its sexual dimorphism, well-developed social organization, and role as a top predator in marine ecosystems. Killer whales have been studied extensively in coastal areas of the northeastern Pacific Ocean; however, populations in tropical pelagic regions have been little studied. Knowledge of their ecology, population structure, and other characteristics is limited.

Killer whales are found in all the world's oceans, from tropical to polar waters and coastal to offshore environments. While they are widely distributed, killer whales are more common in higher latitudes and coastal waters (Heyning and Dahlheim 1988; Forney and Wade 2006) where previous studies have yielded a great deal of information on aspects of life history, population structure, and ecology (for review see Baird 2002; Ford 2002). Three ecotypes of killer whales have been identified in the northeastern Pacific differentiated by their external morphology, behavior, and feeding ecology: 'resident' (prey on fish), 'transient' (prey on marine mammals), and 'offshore' (prey on fish) (Baird and Stacey 1988; Ford et al. 1998; Baird 2000; Dahlheim *et al.* 2008). Genetic and acoustic attributes also define the ecotypes (Barrett-Lennard *et al.* 1996; Hoelzel *et al.* 1998). Multiple populations of these ecotypes are known to exist along the west coast of North America, southeastern Alaska, the Gulf of Alaska, and the Aleutian Islands.

The eastern tropical Pacific (ETP) region, as defined for this catalog, extends southwest from San Diego, California to Hawaii and south to Peru. Killer whales are found year-round in the ETP (Dahlheim *et al.* 1982). The photographic catalogs of Black *et al.* (1997) and Guerrero-Ruiz *et al.* (1998) show movement by several whales in and out of the Gulf of California and around the Baja California Peninsula, Mexico. The waters surrounding Baja are highly productive and contain large populations of known prey species for killer whales including fish, sharks, and marine mammals. Killer whales in the Gulf of California have been documented feeding on a variety of prey, including marine mammals (Guerrero-Ruiz *et al.* 1998) and predation on a blue whale was observed further south in the ETP (Pitman *et al.* 2007). But to date, defined ecotypes in the ETP have not been recognized. The Southwest Fisheries Science Center (SWFSC) catalog was established to add to the understanding of the movement, external morphology, and ecology of killer whales inhabiting the ETP. It is the first catalog of tropical pelagic killer whales.

METHODS

Photographs of killer whales were collected primarily from research cruises conducted in the ETP by SWFSC, but also from naturalists working in waters adjacent to Baja California. The SWFSC has been conducting extensive shipboard line-transect surveys for the abundance of cetaceans in the eastern tropical Pacific since 1986 (see Kinzey *et al.* 2000 and Jackson *et al.* 2004). Research effort is presented in Fig. 1. During the surveys, date, time, location, group size, and behavioral observations were recorded for all cetacean sightings, including killer whales. Photographs of killer whales were obtained

opportunistically during 10 of the surveys, but with a more directed effort beginning with the survey in 1998. Thirty-five mm SLR film cameras using both black and white and color slide film were used through 2003; during the 2003 and 2006 surveys digital SLR cameras were used almost exclusively. Black and white negative and color slide films were scanned into digital format for analysis. The naturalists working in the Baja California region were guiding tourist trips or conducting other research and collected killer whale photographs ancillary to those activities. They recorded date, location, and behavioral observations during their encounters of killer whales. Their contributed photographs were also in film and digital formats and the films were digitized. Over 4,000 photographs were examined for inclusion in this catalog.

Photographic quality varied widely. To be included in the catalog, photographs had to have at least two unique features on each whale readily visible. Features used to identify individual whales included nicks in the dorsal fin, marks in the saddle patch, scars on the dorsum, and shape of the eye patch. Exceptions to these criteria were allowed for whales that were part of a larger group and the whale could be identified as different from the other group members and also for marginal photos of one side of a whale for which the photo of the other side met the criteria. Photographs of individual whales were compared within and between years.

Organization of the Catalog

The catalog is arranged by geographic area – Coastal North, North, Coastal South, South, and West – similar to the survey strata used for the SWFSC surveys (Fig. 2). The Coastal strata are delineated by the 1000m contour line near the coasts of North and South America.

Each group of killer whales sighted during SWFSC surveys and by Baja naturalists was given a group identifier. The group identifier consists of a two-digit sequential number followed by a two-digit number for the year the group was sighted (e.g. 01.86, 02.86, 03.90 etc.). Individual killer whales were given a unique identifier beginning with E, for ETP, followed by a number (e.g. E157). Photographs of each whale are labeled with the whale's E number on the lower left corner and the group(s) in which the whale was seen on the lower right. Group numbers are chronological within a geographic area, but whale identification numbers are not consistently sequential.

RESULTS AND DISCUSSION

The catalog contains 195 individual killer whales from 52 groups documented in the ETP. The date, location, and identification numbers of individual whales for each group are given in Table 1; the date, location, and group numbers for each whale are given in Table 2.

A total of 179 groups of killer whales were sighted during SWFSC cruises from1986-2006 (Fig. 2). Of the 179 groups, 70 groups/240 individual whales were photographed. Of these, 47 groups yielded photographs of 187 individually identifiable whales that met the criteria for catalog inclusion. Photographs of an additional 8 whales from 5 groups sighted by naturalists in the Baja area of Mexico also met the criteria and were thus included.

Re-sights and Movement

Thirteen whales from five groups were re-sighted (Table 3). During SWFSC surveys, whales E130 and E131 were re-sighted within two weeks in September 1993. They moved 227 km closer inshore from a location west of the Baja Peninsula. Three whales, E106, E138, and E141, were seen together 10 years apart along the Pacific coast of Baja. They were photographed in October 1993 and August 2003. E106 was also photographed in March 1993 near Magdalena Bay, southwestern Baja. Whales E256 and E259 were sighted in the Gulf of California near Loreto in March 2004 and March 2006.

Five whales in group 22.99, seen in October 1999, were re-sighted as part of group 51.06 in October 2006. Both sightings occurred well offshore, 800km south of Acapulco, Mexico; the two sightings were separated by 275 km. This is the first re-sighting of a pelagic, tropical group of killer whales.

Photographs of three whales from this catalog match to published photographs of whales from Mexico ('ME' whales) in the catalog of Killer Whales of California and Western Mexico (Black *et al*. 1997) (Table 4). The three matches were found from a cursory comparison of photos with the Mexico portion of the Black *et al*. catalog (no comparisons were made to the California portion). More matches are likely when a thorough comparison of Mexican whales is completed in the near future. Whale E062, photographed in 2000 at Cabo Corrientes, Mexico matches to whale ME72, seen in the Gulf of California in 1993 and 1995. In 1993, E111 was photographed on the west coast of southern Baja. It matches to ME37 that was seen in the Gulf of California in 1986, 1991, 1993, and 1994. Whale E154 was photographed near the Islas Tres Marias, Mexico in 2003 and matches to ME16, photographed at Isla Socorro in 1989 and 1997. The 14-year interval is the longest time span of a re-sighted whale in this catalog.

The locations of all the re-sighted whales are shown in Fig. 3; they illustrate movement by whales in and out of the Gulf of California, around the Baja Peninsula, to Isla Socorro, and to Cabo Corrientes. The longest point-to-point distance traveled by one of these whales is 700 km. The re-sights of whales in the Baja area over such distances and long periods of time (2 to 14 years) add to the body of evidence that these waters support a population of killer whales that range widely throughout the area. Whales re-sighted together over time spans of 2 weeks to 10 years suggest some stability in group structure as found in other areas of the Pacific.

Saddle Patch Pigmentation

Immediately noticeable in photographs of killer whales from the ETP is that many whales have faint to almost non-existent saddle patches. This is unusual relative to most other known populations of killer whales. In general, saddle patches in the ETP are narrower and fainter than what is observed on killer whales in temperate waters of the northeastern Pacific. Killer whales photographed near Hawaii also exhibit faint saddle patches (Baird *et al.* 2006), and there is anecdotal evidence that killer whales from other tropical regions have faint saddle patches as well. Whether this morphological feature can be related to population structure is not yet determined.

The size, shape, and intensity of pigment of the saddle patch vary widely among individual killer whales in the ETP. The varying intensity of the saddle patches makes photo-identification of these whales tricky since the perceived intensity of the saddle patch can change with the lighting conditions in a photo. All of the whales' saddle patches were closed (no black intruding into the saddle patch), except for whale E064, photographed near Cabo Corrientes. The six associates photographed with E064 had closed saddle patches.

Whale Barnacles

Another distinctive feature of killer whales in the ETP is the prevalence of the specialized cetacean barnacle, *Xenobalanus* sp., attached to the dorsal fin. Over 30% of the killer whale groups photographed in the ETP carried these barnacles, primarily in oceanographic areas of increased primary productivity, namely around Baja California, the Costa Rica Dome, waters extending along the 10°N Thermocline Ridge, and waters off Peru and the Galapagos Archipelago (Kane *et al.* 2008). Currently not enough is known about the life history of the barnacle for its use as a biological tag in determining movement of killer whales in the ETP.

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Table 1. ETP killer whale groups, with whale identification numbers, date, location, catalog area, and source of photographs (either photographer name or SWFSC) for each group. Group numbers are chronological. Whale numbers were assigned as photos entered the catalog; there are gaps in the whale numbering due to the elimination of duplicates and photos of poor quality. CN=coastal north, CS=coastal south, N=north, S=south, W=west.

Group No.	Whale No.	Date	Location	Catalog Area	Photo Source
01.86	E154	08/02/1986	W of Baja	N	SWFSC
02.86	E155	08/08/1986	SE of Revillagigedos Is.	N	SWFSC
03.90	E245	11/18/1990	Equatorial	S	SWFSC
04.93	E106, E110, E111	03/1993	Pacific coast Baja	CN	Folkens
05.93	E130, E131, E134-E136	09/09/1993	W of Baja	N	SWFSC
06.93	E127-E131	09/23/1993	Pacific coast Baja	CN	SWFSC
07.93	E106, E137-E141	10/27/1993	Pacific coast Baja	CN	SWFSC
08.95	E264-E266, E268, E269	10/17/1995	Gulf of CA	CN	SWFSC
09.95	E271-E274	10/21/1995	Gulf of CA	CN	SWFSC
10.97	E123, E124	08/27/1997	Gulf of CA	CN	SWFSC
11.98	E020	09/17/1998	Guatemala basin	N	SWFSC
12.98	E022	10/05/1998	S of Acapulco, MX	N	SWFSC
13.98	E023	10/22/1998	Equatorial	W	SWFSC
14.98	E027-E029, E031-E033, E104	11/03/1998	NW of Revillagigedos Is.	N	SWFSC
15.98	E024-E026	11/08/1998	S of Cabo Corrientes, MX	N	SWFSC
16.98	E001, E002	11/13/1998	W of Peru	S	SWFSC
17.98	E013-E017, E019	11/16/1998	Mathematicians Seamounts	N	SWFSC
18.98	E003-E005, E007, E009-E012	11/23/1998	W of Peru	S	SWFSC

Table 1 (continued). Killer whale groups.

Group No.	Whale No.	Date	Location	Catalog Area	Photo Source
19.99	E049-E051	08/01/1999	Pacific coast Baja	CN	SWFSC
20.99	E053, E054	08/07/1999	NE of Revillagigedos Is.	CN	SWFSC
21.99	E039, E041-E043, E045	10/21/1999	S of Mexico	N	SWFSC
22.99	E047, E048	11/10/1999	Mathematicians Seamounts	N	SWFSC
23.00	E074, E075	08/03/2000	W of Revillagigedos Is.	W	SWFSC
24.00	E065-E068	08/08/2000	S of Baja tip	CN	SWFSC
25.00	E058-E064	08/15/2000	Cabo Corrientes, MX	CN	SWFSC
26.00	E076-E079	09/09/2000	Equatorial	W	SWFSC
27.00	E080, E081	10/07/2000	coastal Panama	CN	SWFSC
28.00	E082-E085	10/20/2000	coastal S Mexico	CN	SWFSC
29.00	E071, E072	11/09/2000	coastal Ecuador	CS	SWFSC
30.00	E086-E091	11/12/2000	Mathematicians Seamounts	N	SWFSC
31.00	E073	11/13/2000	Gulf of Panama	CN	SWFSC
32.00	E092-E095	11/23/2000	Mathematicians Seamounts	N	SWFSC
33.00	E096-E100, E103	12/04/2000	NW of Revillagigedos Is.	N	SWFSC
34.03	E106, E138, E141, E161-E166, E168-E171	08/07/2003	Pacific coast Baja	CN	SWFSC
35.03	E175-E181	08/09/2003	S of Baja	N	SWFSC
36.03	E157, E158	08/14/2003	Tres Marias Is., MX	CN	SWFSC
37.03	E182-E190, E192-E197	09/26/2003	W of Costa Rica	N	SWFSC
38.03	E200	10/11/2003	Guatemala Basin	N	SWFSC

Table 1 (continued). Killer whale groups.

Group No.	Whale No.	Date	Location	Catalog Area	Photo Source
40.04	E256-E259	03/19/2004	Gulf of CA	CN	Greenfelder, Johnston, Pederson
41.05	E260	03/31/2005	Gulf of CA	CN	Greenfelder, Pederson
42.06	E261	03/03/2006	Gulf of CA	CN	Greenfelder
43.06	E256, E259	03/05/2006	Gulf of CA	CN	Greenfelder
44.06	E226, E228-E231	08/08/2006	W of Clipperton I.	W	SWFSC
45.06	E244	09/08/2006	coastal Costa Rica	CN	SWFSC
46.06	E201-E203	09/25/2006	W of Costa Rica	N	SWFSC
47.06	E232-E237	10/09/2006	W of Peru	S	SWFSC
48.06	E039, E041-E043, E045, E240-E243	10/11/2006	Guatemala Basin	N	SWFSC
49.06	E204, E206-E208	11/05/2006	coastal S Mexico	CN	SWFSC
50.06	E209-E215, E217, E218	11/06/2006	S of Mexico	N	SWFSC
51.06	E219-E223	11/14/2006	E of Mathematicians Seamounts	N	SWFSC
52.06	E224, E225	12/06/2006	Pacific coast Baja	CN	SWFSC

Table 2. Individual ETP killer whales, with the number(s) of the group(s) in which the whale was sighted, date, location and catalog area. Whale numbers were assigned as photos entered the catalog; there are gaps in the whale numbering due to the elimination of duplicates and photos of poor quality. Group numbers are chronological (see Table 1). CN=coastal north, CS=coastal south, N=north, S=south, W=west.

Whale No.	Group No.	Date	Location	Catalog Area
E001	16.98	11/13/1998	W of Peru	S
E002	16.98	11/13/1998	W of Peru	S
E003	18.98	11/23/1998	W of Peru	S
E004	18.98	11/23/1998	W of Peru	S
E005	18.98	11/23/1998	W of Peru	S
E007	18.98	11/23/1998	W of Peru	S
E009	18.98	11/23/1998	W of Peru	S
E010	18.98	11/23/1998	W of Peru	S
E011	18.98	11/23/1998	W of Peru	S
E012	18.98	11/23/1998	W of Peru	S
E013	17.98	11/16/1998	Mathematicians Seamounts	N
E014	17.98	11/16/1998	Mathematicians Seamounts	N
E015	17.98	11/16/1998	Mathematicians Seamounts	N
E016	17.98	11/16/1998	Mathematicians Seamounts	N
E017	17.98	11/16/1998	Mathematicians Seamounts	N
E019	17.98	11/16/1998	Mathematicians Seamounts	N
E020	11.98	09/17/1998	Guatemala Basin	N
E022	12.98	10/05/1998	S of Acapulco, MX	N
E023	13.98	10/22/1998	Equatorial	W
E024	15.98	11/08/1998	S of Cabo Corrientes, MX	N
E025	15.98	11/08/1998	S of Cabo Corrientes, MX	N
E026	15.98	11/08/1998	S of Cabo Corrientes, MX	N
E027	14.98	11/03/1998	NW of Revillagigedos Is.	N
E028	14.98	11/03/1998	NW of Revillagigedos Is.	N

Table 2 (continued). Individual ETP killer whales.

Whale No.	Group No.	Date	Location	Catalog Area
E029	14.98	11/03/1998	NW of Revillagigedos Is.	N
E031	14.98	11/03/1998	NW of Revillagigedos Is.	N
E032	14.98	11/03/1998	NW of Revillagigedos Is.	N
E033	14.98	11/03/1998	NW of Revillagigedos Is.	N
E039	21.99	10/21/1999	S of Mexico	N
	48.06	10/11/2006	Guatemala Basin	N
E041	21.99	10/21/1999	S of Mexico	N
	48.06	10/11/2006	Guatemala Basin	N
E042	21.99	10/21/1999	S of Mexico	N
	48.06	10/11/2006	Guatemala Basin	N
E043	21.99	10/21/1999	S of Mexico	N
	48.06	10/11/2006	Guatemala Basin	N
E045	21.99	10/21/1999	S of Mexico	N
	48.06	10/11/2006	Guatemala Basin	N
E046	21.99	10/21/1999	S of Mexico	N
E047	22.99	11/10/1999	Mathematicians Seamounts	N
E048	22.99	11/10/1999	Mathematicians Seamounts	N
E049	19.99	08/01/1999	Pacific coast Baja	CN
E050	19.99	08/01/1999	Pacific coast Baja	CN
E051	19.99	08/01/1999	Pacific coast Baja	CN
E053	20.99	08/07/1999	NE of Revillagigedos Is.	CN
E054	20.99	08/07/1999	NE of Revillagigedos Is.	CN
E058	25.00	08/15/2000	Cabo Corrientes, MX	CN
E059	25.00	08/15/2000	Cabo Corrientes, MX	CN
E060	25.00	08/15/2000	Cabo Corrientes, MX	CN
E061	25.00	08/15/2000	Cabo Corrientes, MX	CN
E062	25.00	08/15/2000	Cabo Corrientes, MX	CN
E063	25.00	08/15/2000	Cabo Corrientes, MX	CN
E064	25.00	08/15/2000	Cabo Corrientes, MX	CN

Table 2 (continued). Individual ETP killer whales.

Whale No.	Group No.	Date	Location	Catalog Area
E065	24.00	08/08/2000	S of Baja tip	CN
E066	24.00	08/08/2000	S of Baja tip	CN
E067	24.00	08/08/2000	S of Baja tip	CN
E068	24.00	08/08/2000	S of Baja tip	CN
E071	29.00	11/09/2000	coastal Ecuador	CS
E072	29.00	11/09/2000	coastal Ecuador	CS
E073	31.00	11/13/2000	Gulf of Panama	CN
E074	23.00	08/03/2000	W of Revillagigedos Is.	W
E075	23.00	08/03/2000	W of Revillagigedos Is.	W
E076	26.00	09/09/2000	Equatorial	W
E077	26.00	09/09/2000	Equatorial	W
E078	26.00	09/09/2000	Equatorial	W
E079	26.00	09/09/2000	Equatorial	W
E080	27.00	10/07/2000	coastal Panama	CN
E081	27.00	10/07/2000	coastal Panama	CN
E082	28.00	10/20/2000	coastal S Mexico	CN
E083	28.00	10/20/2000	coastal S Mexico	CN
E084	28.00	10/20/2000	coastal S Mexico	CN
E085	28.00	10/20/2000	coastal S Mexico	CN
E086	30.00	11/12/2000	Mathematicians Seamounts	N
E087	30.00	11/12/2000	Mathematicians Seamounts	N
E088	30.00	11/12/2000	Mathematicians Seamounts	N
E089	30.00	11/12/2000	Mathematicians Seamounts	N
E090	30.00	11/12/2000	Mathematicians Seamounts	N
E091	30.00	11/12/2000	Mathematicians Seamounts	N
E092	32.00	11/23/2000	Mathematicians Seamounts	N
E093	32.00	11/23/2000	Mathematicians Seamounts	N
E094	32.00	11/23/2000	Mathematicians Seamounts	N
E095	32.00	11/23/2000	Mathematicians Seamounts	N

Table 2 (continued). Individual ETP killer whales.

Whale No.	Group No.	Date	Location	Catalog Area
E096	33.00	12/04/2000	NW of Revillagigedos Is.	N
E097	33.00	12/04/2000	NW of Revillagigedos Is.	N
E098	33.00	12/04/2000	NW of Revillagigedos Is.	N
E099	33.00	12/04/2000	NW of Revillagigedos Is.	N
E100	33.00	12/04/2000	NW of Revillagigedos Is.	N
E103	33.00	12/04/2000	NW of Revillagigedos Is.	N
E104	14.98	11/03/1998	NW of Revillagigedos Is.	N
E106	04.93	03/1993	Pacific coast Baja	CN
	07.93	10/27/1993	Pacific coast Baja	CN
	34.03	08/07/2003	Pacific coast Baja	CN
E110	04.93	03/1993	Pacific coast Baja	CN
E111	04.93	03/1993	Pacific coast Baja	CN
E123	10.97	08/27/1997	Gulf of CA	CN
E124	10.97	08/27/1997	Gulf of CA	CN
E127	06.93	09/23/1993	Pacific coast Baja	CN
E128	06.93	09/23/1993	Pacific coast Baja	CN
E129	06.93	09/23/1993	Pacific coast Baja	CN
E130	05.93	09/09/1993	W of Baja	N
	06.93	09/23/1993	Pacific coast Baja	CN
E131	05.93	09/09/1993	W of Baja	N
	06.93	09/23/1993	Pacific coast Baja	CN
E134	05.93	09/09/1993	W of Baja	N
E135	05.93	09/09/1993	W of Baja	N
E136	05.93	09/09/1993	W of Baja	N
E137	07.93	10/27/1993	Pacific coast Baja	CN
E138	07.93	10/27/1993	Pacific coast Baja	CN
	34.03	08/07/2003	Pacific coast Baja	CN
E139	07.93	10/27/1993	Pacific coast Baja	CN
E140	07.93	10/27/1993	Pacific coast Baja	CN

Table 2 (continued). Individual ETP killer whales.

Whale No.	Group No.	Date	Location	Catalog Area
E141	07.93	10/27/1993	Pacific coast Baja	CN
	34.03	08/07/2003	Pacific coast Baja	CN
E154	01.86	08/02/1986	W of Baja	N
E155	02.86	08/08/1986	SE of Revillagigedos Is.	N
E157	36.03	08/14/2003	Tres Marias Is., MX	CN
E158	36.03	08/14/2003	Tres Marias Is., MX	CN
E161	34.03	08/07/2003	Pacific coast Baja	CN
E162	34.03	08/07/2003	Pacific coast Baja	CN
E163	34.03	08/07/2003	Pacific coast Baja	CN
E164	34.03	08/07/2003	Pacific coast Baja	CN
E165	34.03	08/07/2003	Pacific coast Baja	CN
E166	34.03	08/07/2003	Pacific coast Baja	CN
E168	34.03	08/07/2003	Pacific coast Baja	CN
E169	34.03	08/07/2003	Pacific coast Baja	CN
E170	34.03	08/07/2003	Pacific coast Baja	CN
E171	34.03	08/07/2003	Pacific coast Baja	CN
E175	35.03	08/09/2003	S of Baja	N
E176	35.03	08/09/2003	S of Baja	N
E177	35.03	08/09/2003	S of Baja	N
E178	35.03	08/09/2003	S of Baja	N
E179	35.03	08/09/2003	S of Baja	N
E180	35.03	08/09/2003	S of Baja	N
E181	35.03	08/09/2003	S of Baja	N
E182	37.03	09/26/2003	W of Costa Rica	N
E183	37.03	09/26/2003	W of Costa Rica	N
E184	37.03	09/26/2003	W of Costa Rica	N
E185	37.03	09/26/2003	W of Costa Rica	N
E186	37.03	09/26/2003	W of Costa Rica	N
E187	37.03	09/26/2003	W of Costa Rica	N

Table 2 (continued). Individual ETP killer whales.

Whale No.	Group No.	Date	Location	Catalog Area
E188	37.03	09/26/2003	W of Costa Rica	N
E189	37.03	09/26/2003	W of Costa Rica	N
E190	37.03	09/26/2003	W of Costa Rica	N
E192	37.03	09/26/2003	W of Costa Rica	N
E193	37.03	09/26/2003	W of Costa Rica	N
E194	37.03	09/26/2003	W of Costa Rica	N
E195	37.03	09/26/2003	W of Costa Rica	N
E196	37.03	09/26/2003	W of Costa Rica	N
E197	37.03	09/26/2003	W of Costa Rica	N
E199	39.03	11/12/2003	NW of Clipperton I.	N
E200	38.03	10/11/2003	Guatemala Basin	N
E201	46.06	09/25/2006	W of Costa Rica	N
E202	46.06	09/25/2006	W of Costa Rica	N
E203	46.06	09/25/2006	W of Costa Rica	N
E204	49.06	11/05/2006	coastal S Mexico	CN
E206	49.06	11/05/2006	coastal S Mexico	CN
E207	49.06	11/05/2006	coastal S Mexico	CN
E208	49.06	11/05/2006	coastal S Mexico	CN
E209	50.06	11/06/2006	S of Mexico	N
E210	50.06	11/06/2006	S of Mexico	N
E211	50.06	11/06/2006	S of Mexico	N
E212	50.06	11/06/2006	S of Mexico	N
E213	50.06	11/06/2006	S of Mexico	N
E214	50.06	11/06/2006	S of Mexico	N
E215	50.06	11/06/2006	S of Mexico	N
E217	50.06	11/06/2006	S of Mexico	N
E218	50.06	11/06/2006	S of Mexico	N
E219	51.06	11/14/2006	E of Math. Seamounts	N
E220	51.06	11/14/2006	E of Math. Seamounts	N

Table 2 (continued). Individual ETP killer whales.

Whale No.	Group No.	Date	Location	Catalog Area
E221	51.06	11/14/2006	E of Math. Seamounts	N
E222	51.06	11/14/2006	E of Math. Seamounts	N
E223	51.06	11/14/2006	E of Math. Seamounts	N
E224	52.06	12/06/2006	Pacific coast Baja	CN
E225	52.06	12/06/2006	Pacific coast Baja	CN
E226	44.06	08/08/2006	W of Clipperton I.	W
E228	44.06	08/08/2006	W of Clipperton I.	W
E229	44.06	08/08/2006	W of Clipperton I.	W
E230	44.06	08/08/2006	W of Clipperton I.	W
E231	44.06	08/08/2006	W of Clipperton I.	W
E232	47.06	10/09/2006	W of Peru	S
E233	47.06	10/09/2006	W of Peru	S
E234	47.06	10/09/2006	W of Peru	S
E235	47.06	10/09/2006	W of Peru	S
E236	47.06	10/09/2006	W of Peru	S
E237	47.06	10/09/2006	W of Peru	S
E240	48.06	10/11/2006	Guatemala Basin	N
E241	48.06	10/11/2006	Guatemala Basin	N
E242	48.06	10/11/2006	Guatemala Basin	N
E243	48.06	10/11/2006	Guatemala Basin	N
E244	45.06	09/08/2006	coastal Costa Rica	CN
E245	03.90	11/18/1990	Equatorial	S
E256	40.04	03/19/2004	Gulf of CA	CN
	43.06	03/05/2006	Gulf of CA	CN
E257	40.04	03/19/2004	Gulf of CA	CN
E258	40.04	03/19/2004	Gulf of CA	CN
E259	40.04	03/19/2004	Gulf of CA	CN
	43.06	03/05/2006	Gulf of CA	CN
E260	41.05	03/31/2005	Gulf of CA	CN

Table 2 (continued). Individual ETP killer whales.

Whale No.	Group No.	Date	Location	Catalog Area
E261	42.06	03/03/2006	Gulf of CA	CN
E264	08.95	10/17/1995	Gulf of CA	CN
E265	08.95	10/17/1995	Gulf of CA	CN
E266	08.95	10/17/1995	Gulf of CA	CN
E268	08.95	10/17/1995	Gulf of CA	CN
E269	08.95	10/17/1995	Gulf of CA	CN
E271	09.95	10/21/1995	Gulf of CA	CN
E272	09.95	10/21/1995	Gulf of CA	CN
E273	09.95	10/21/1995	Gulf of CA	CN
E274	09.95	10/21/1995	Gulf of CA	CN

Table 3. Re-sighted groups of killer whales during SWFSC surveys in the ETP and naturalist trips in the Gulf of California.

Group No.	Date	Estimated group size	No. of whales photo-identified	No. of whales re-sighted	Time/Distance between sightings
04.93	03/1993	undetermined	3		
07.93	10/27/1993	8	6	1	7 months/391 km
05.93	09/09/1993	8	5		
06.93	09/23/1993	6	5	2	14 days/227 km
07.93	10/27/1993	8	6		
34.03	08/07/2003	13	9	3	10 years/456 km
21.99	10/21/1999	6	6		
48.06	10/11/2006	8	9	5	7 years/275 km
40.04	03/19/2004	10-14	4		
43.06	03/05/2006	9-11	2	2	2 years/50 km

Table 4. Photographic matches between ETP killer whales and photographs of killer whales from Mexico published in Killer Whales of California and Western Mexico (Black *et al.* 1997). (No comparisons were made to the California portion of the Black *et al.* catalog.)

Whale No.	Years	Location
E62	2000	Cabo Corrientes
ME72	1993, 1995	La Paz Bay, Gulf of CA
E111	1993	Pacific coast Baja
ME37	1986, 1991, 1993, 1994	Gulf of California
E157	2003	Islas Tres Marias
ME16	1989, 1997	Isla Socorro

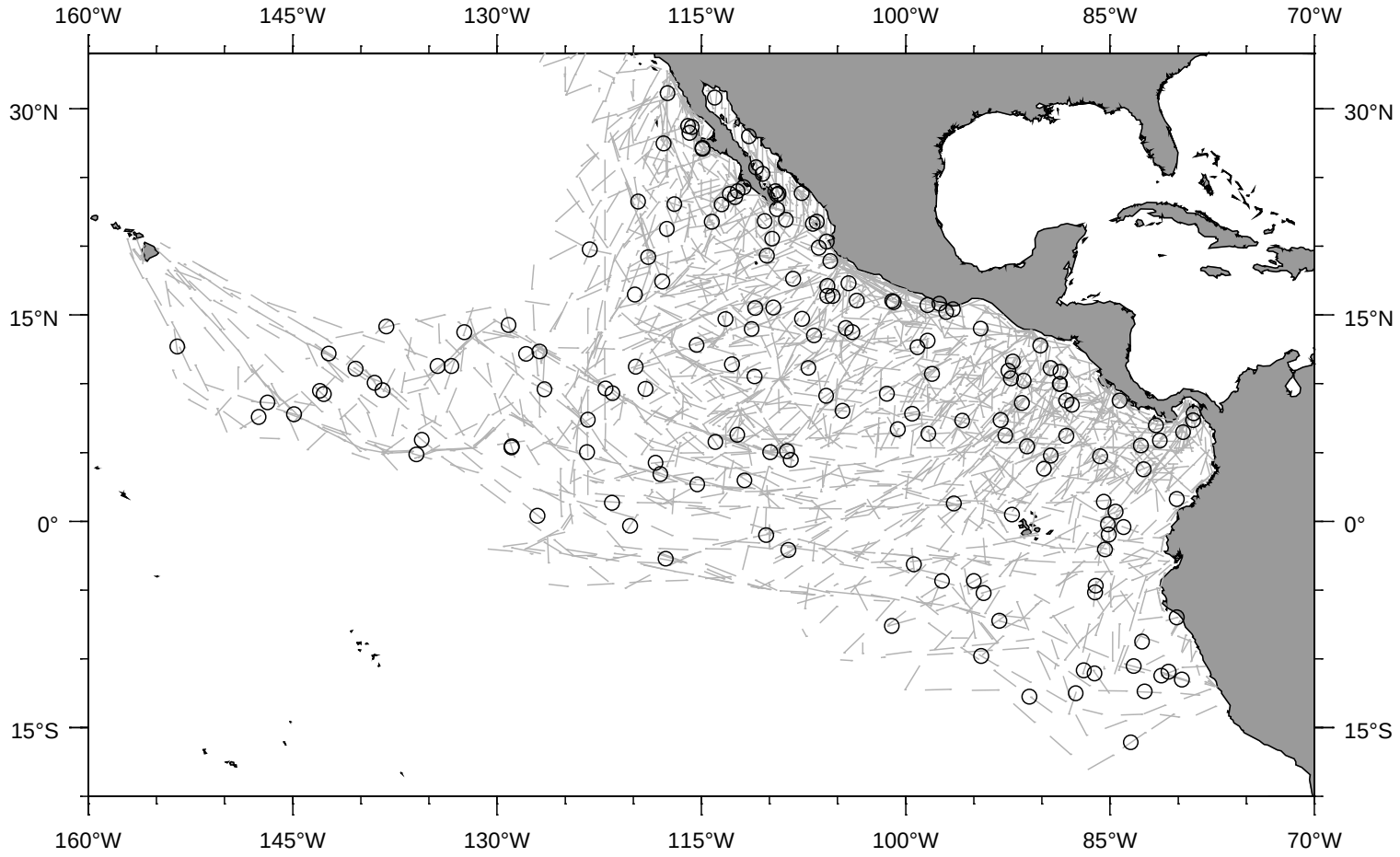

Figure 1. Effort (dashed lines) and killer whale sightings (open circles) during SWFSC research cruises 1986-2006.

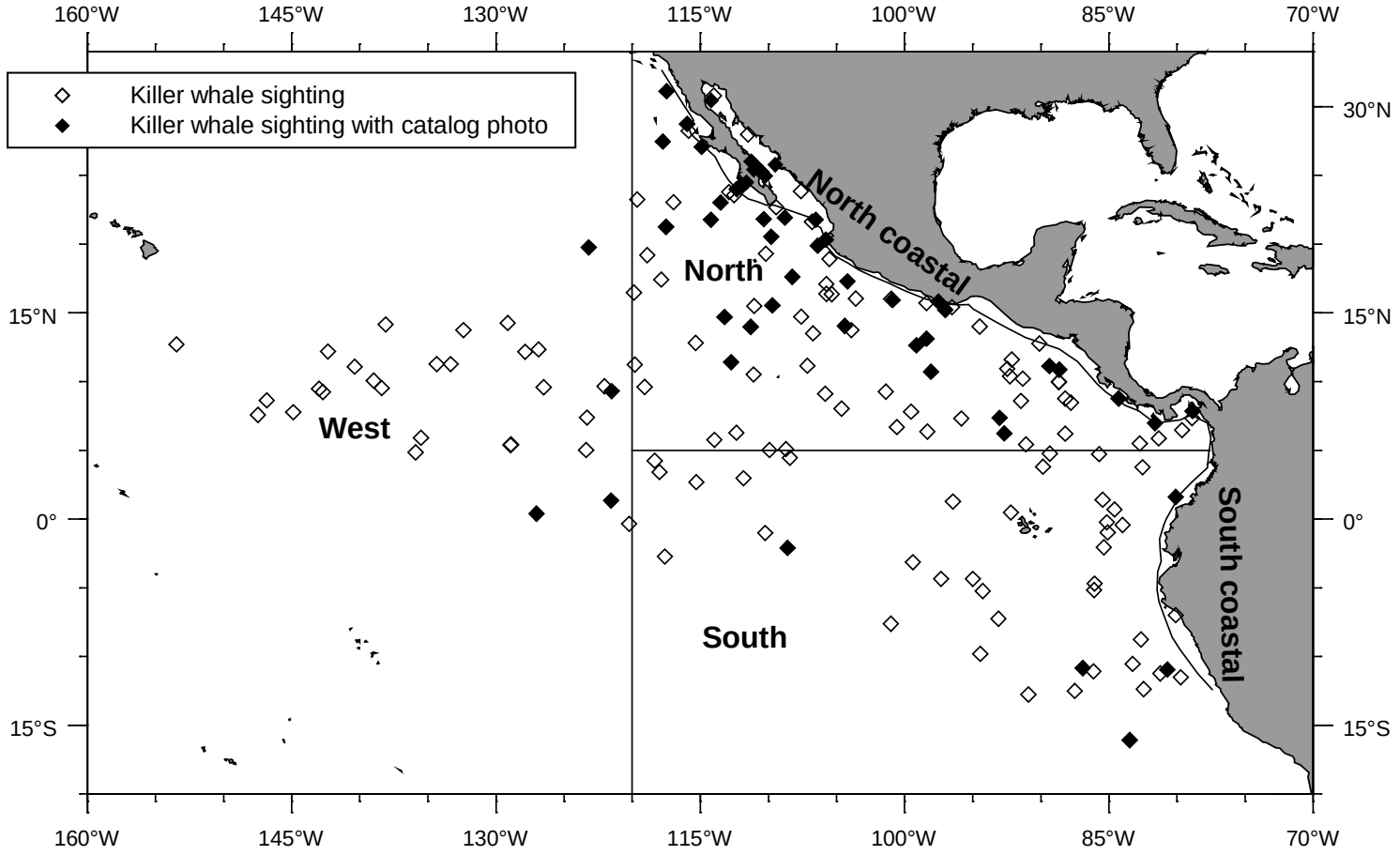

Figure 2. Distribution of killer whale sightings (open diamonds) and sightings with photo-identified whales (solid diamonds) from SWFSC cruises (1986-2006) and trips by naturalists. The five geographic catalog areas are labeled.

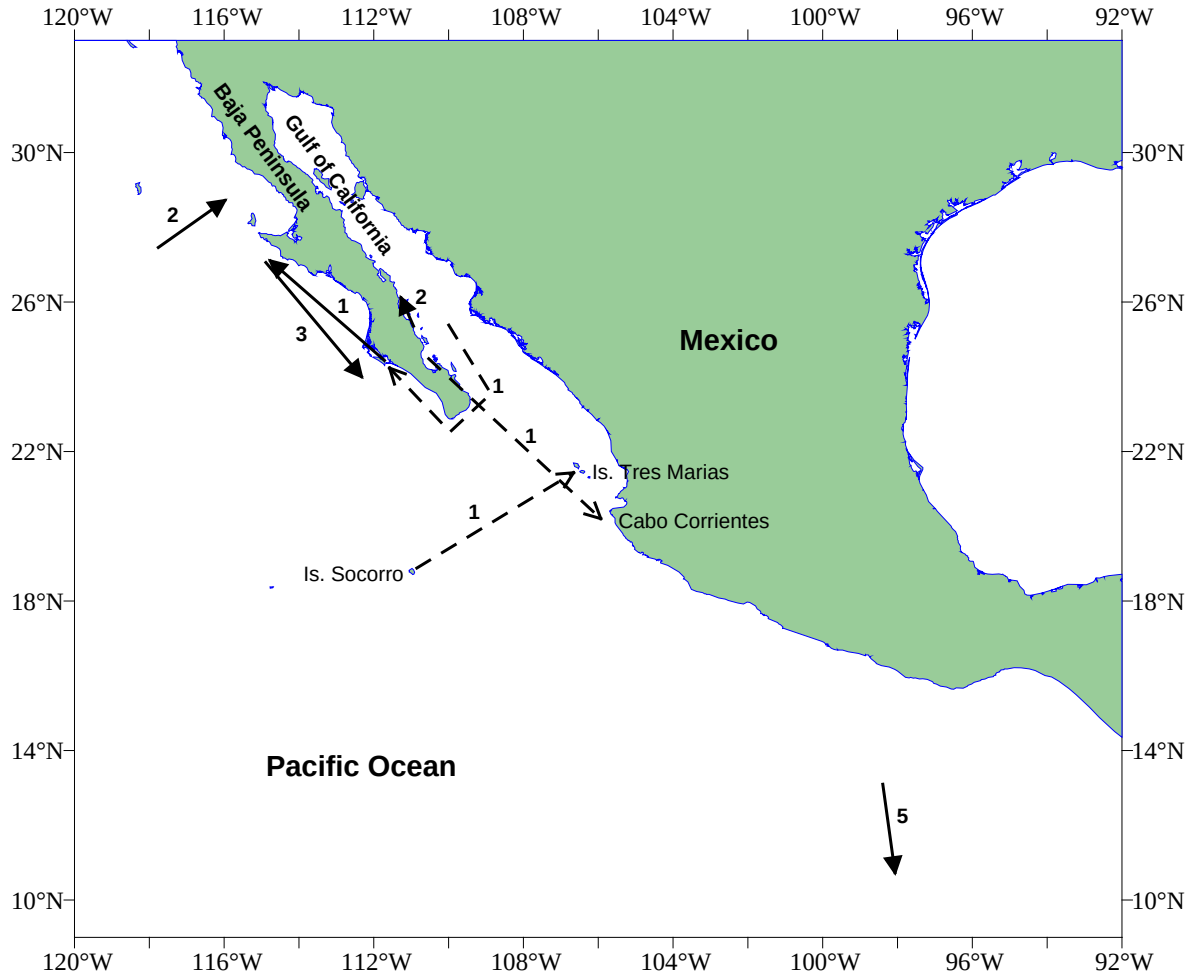

Figure 3. Movements of re-sighted whales. Lines with arrows represent the shortest distance between re-sightings, not actual whale movements. Solid lines represent the movements of whales re-sighted during SWFSC cruises and naturalist trips. Dashed lines represent the movements of three whales in this catalog that match to Mexican whales in Killer whales of California and western Mexico (Black *et al.* 1997). The number of whales re-sighted is indicated next to each line.

LEFT SIDE

RIGHT SIDE

Whale Number

Group Number(s)

FORMAT FOR IDENTIFICATION PHOTOGRAPHS

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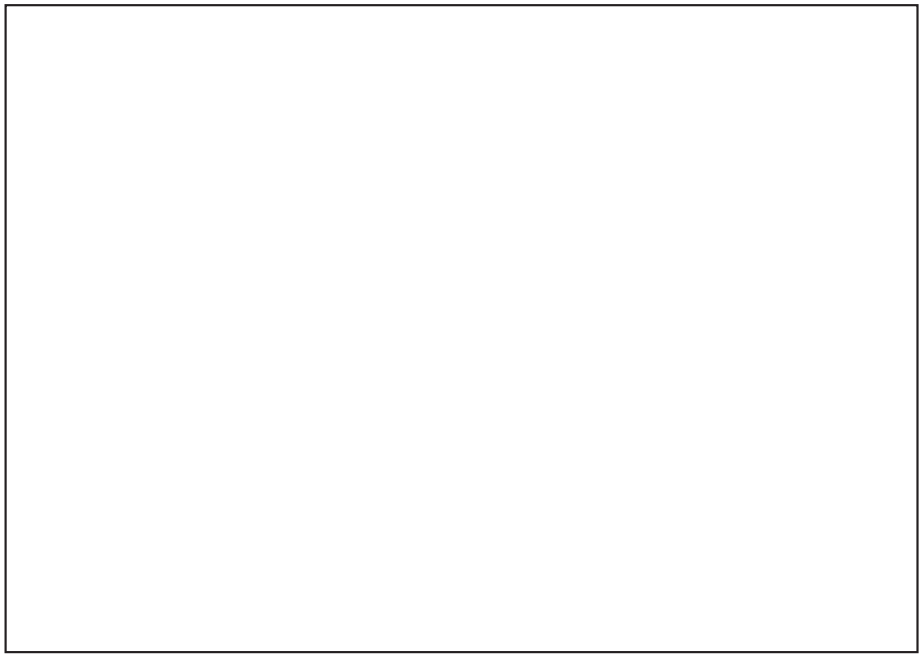
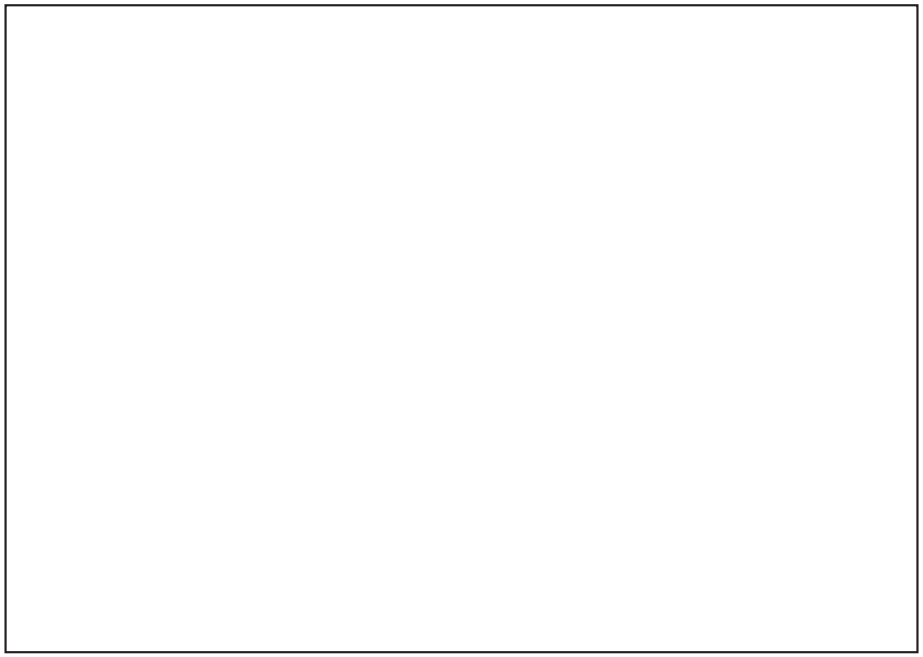
E110 04.93

E106 04.93, 07.93, 34.03

E111 04.93





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E139 07.93

E140 07.93

E141 07.93, 34.03

E264 08.95

E141 07.93, 34.03

E264 08.95

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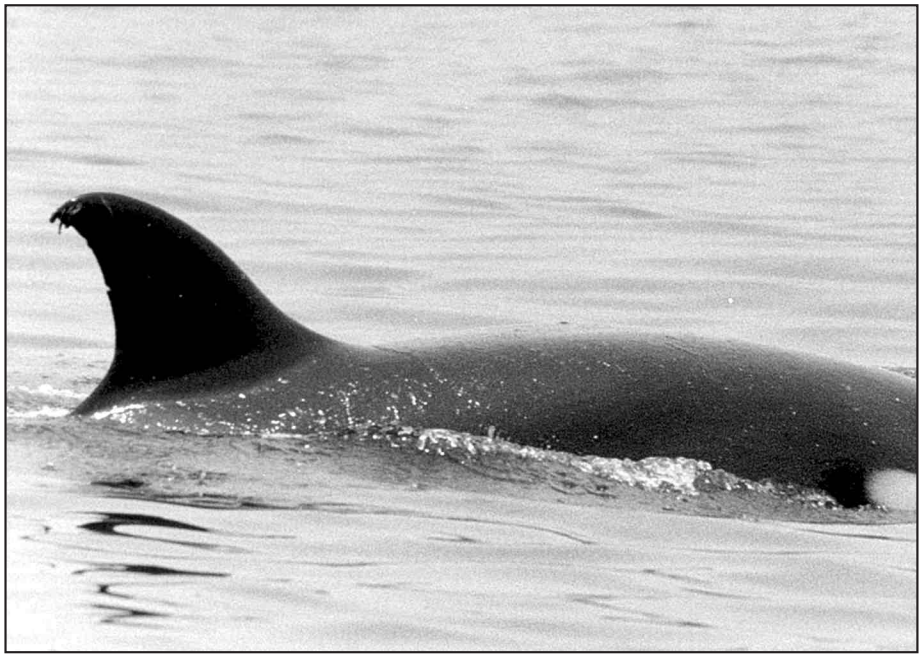
E067 24.00



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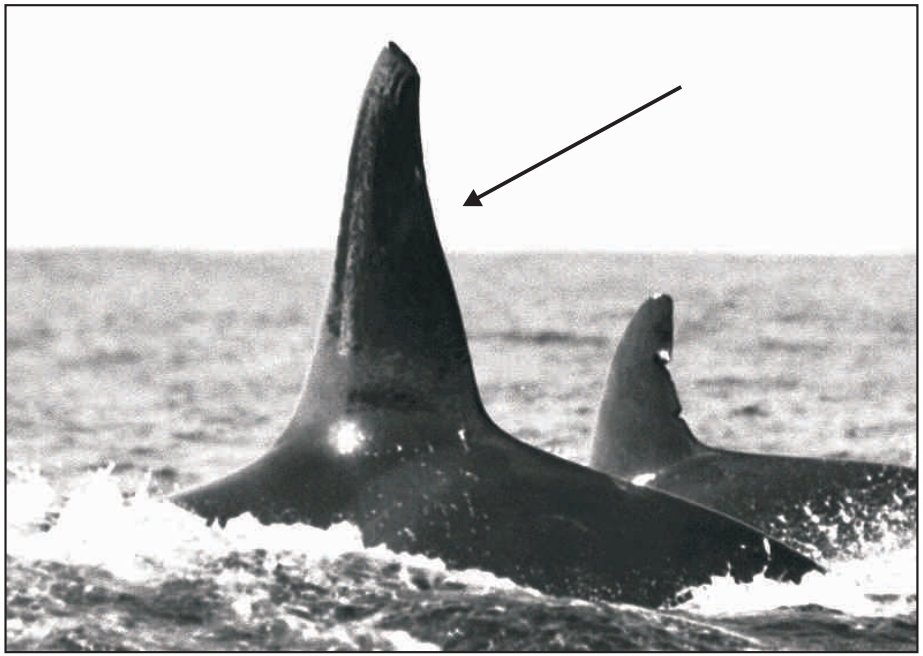

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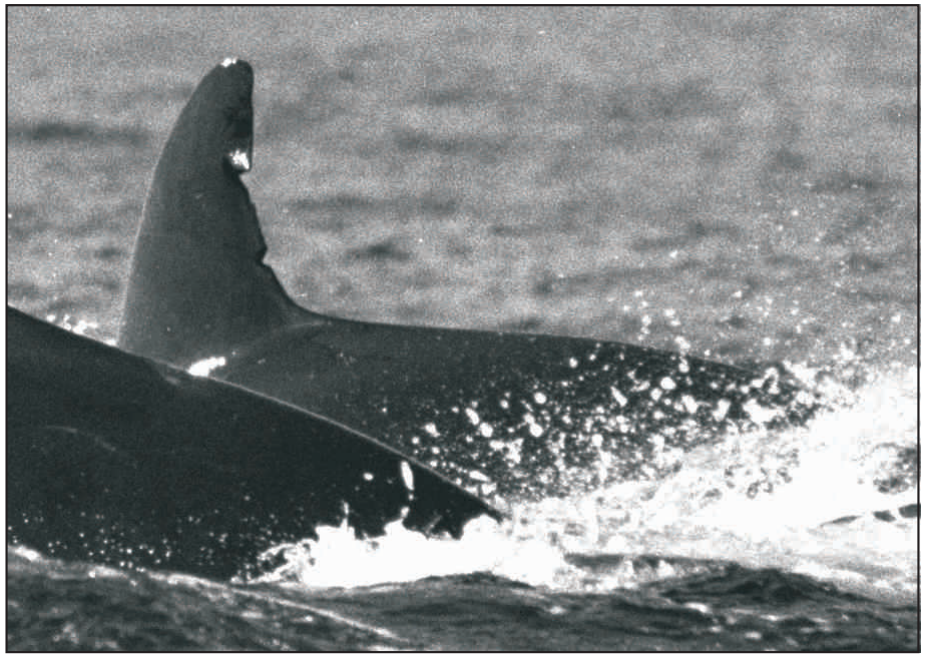

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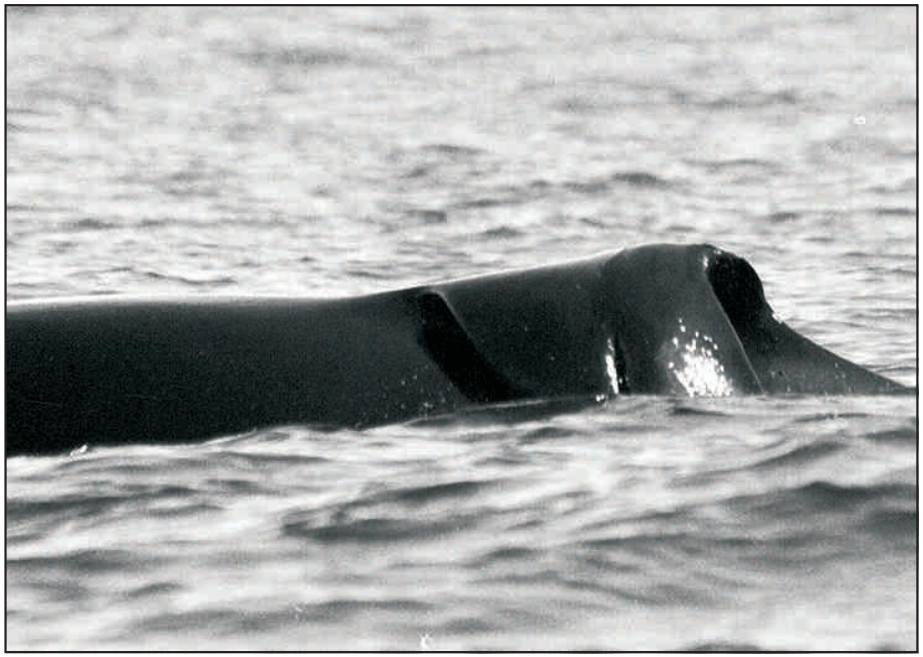
E081 27.00



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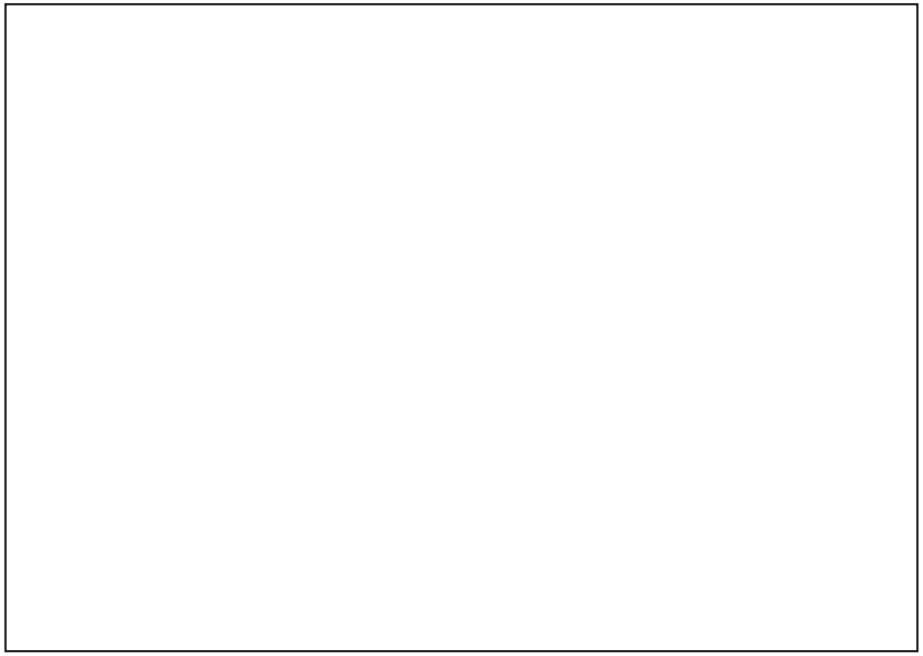

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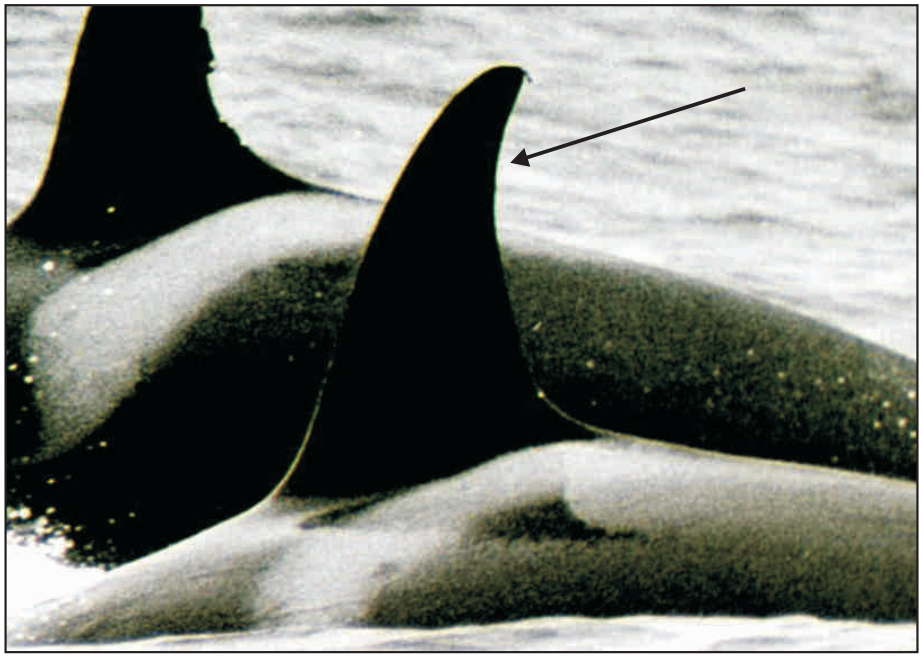

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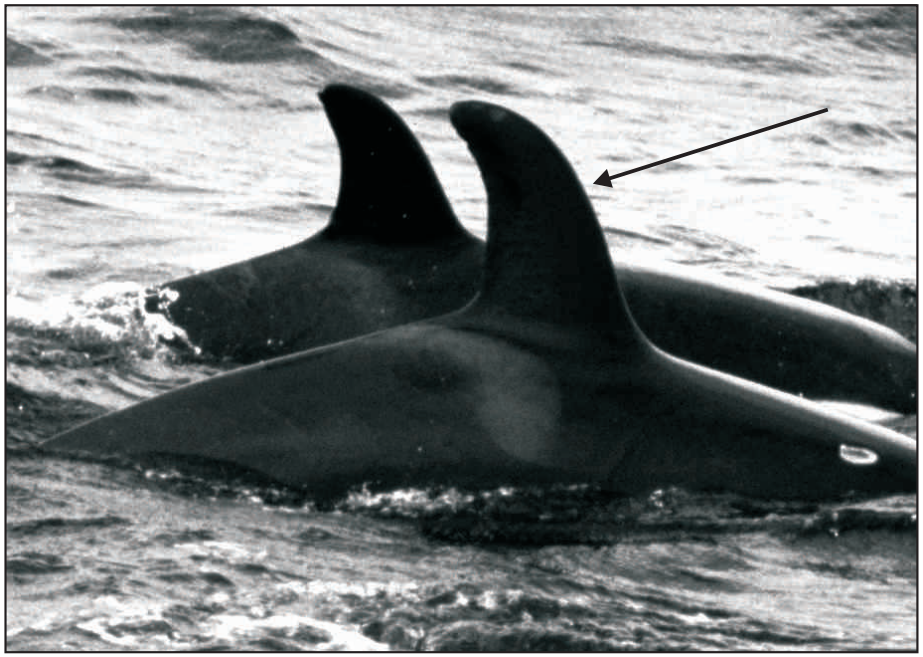
E155 02.86



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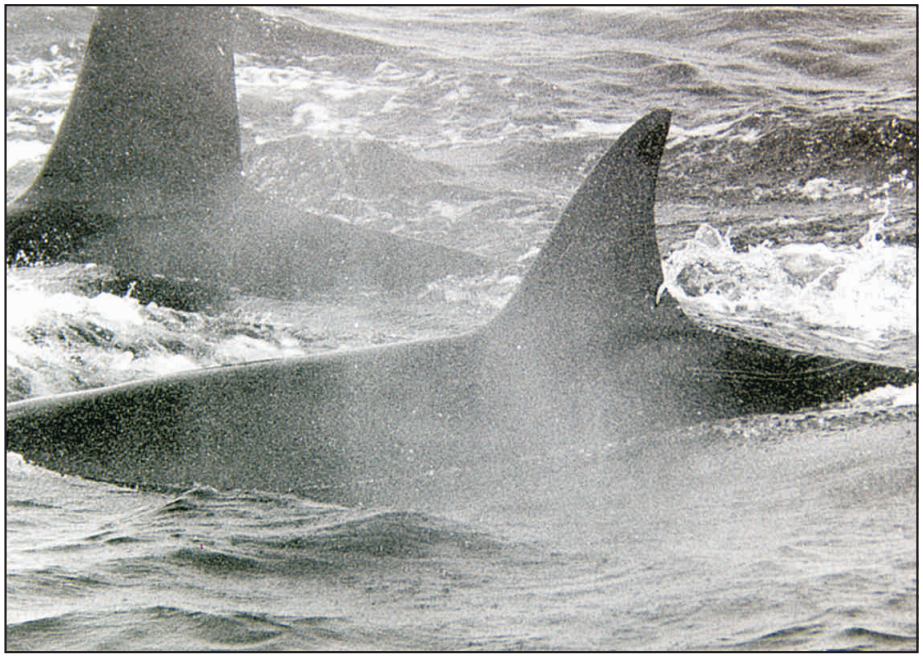

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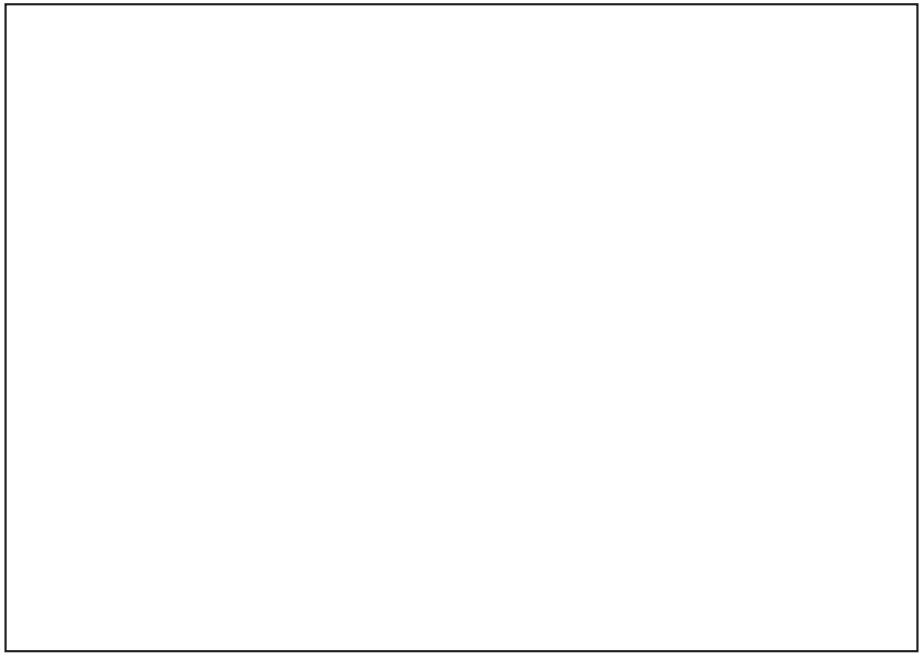

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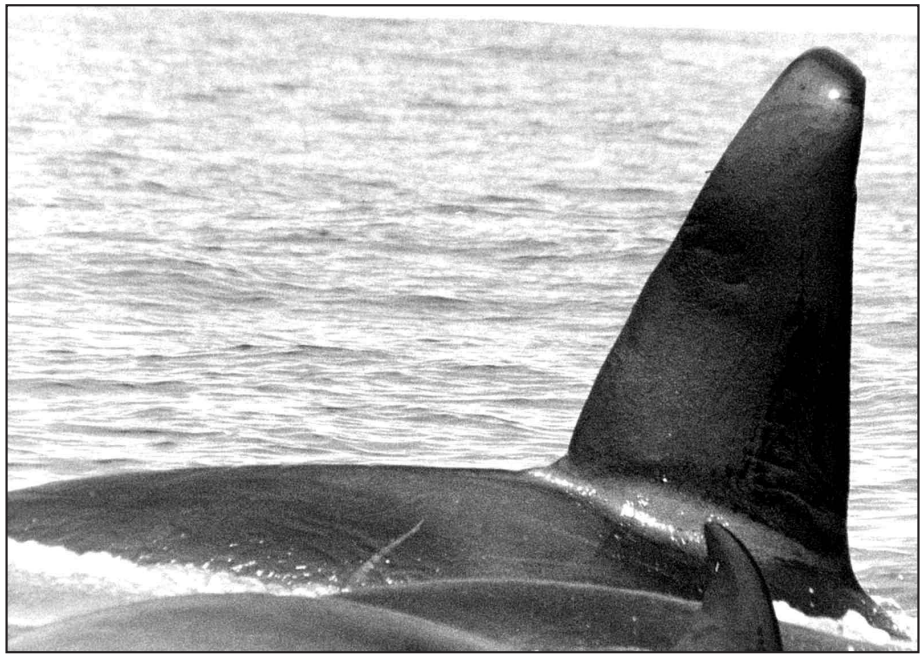

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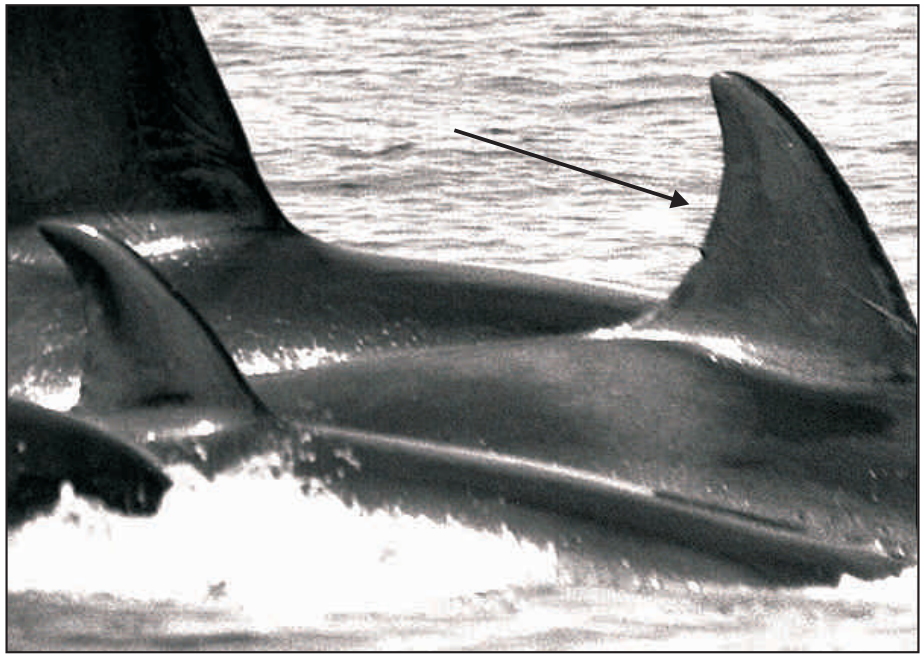

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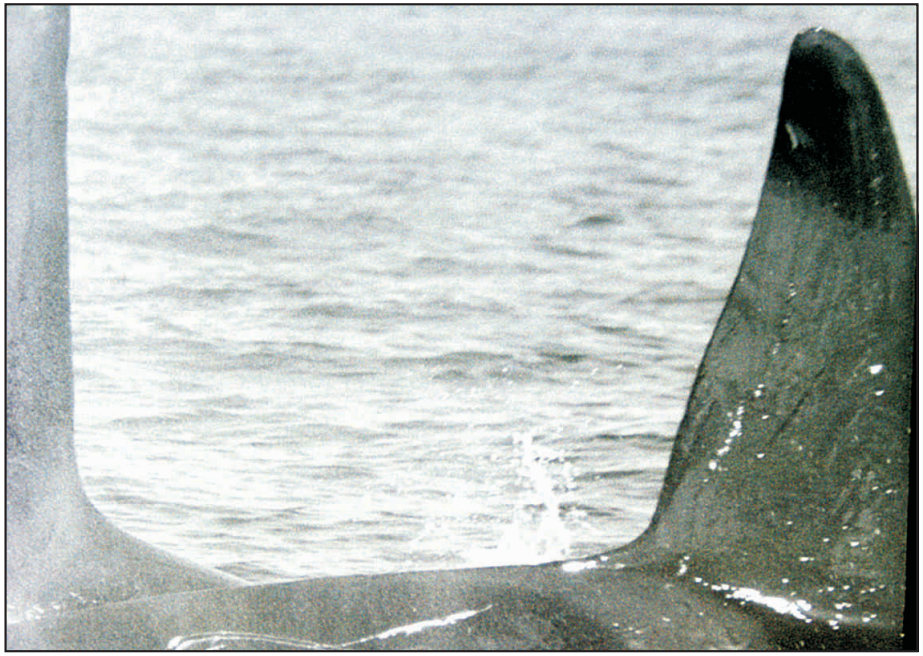

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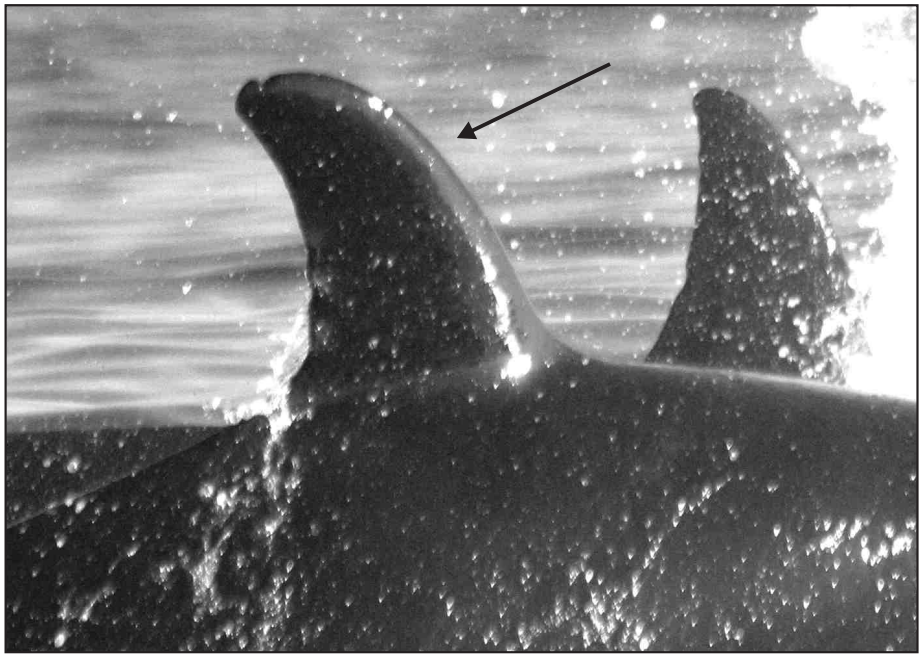

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North

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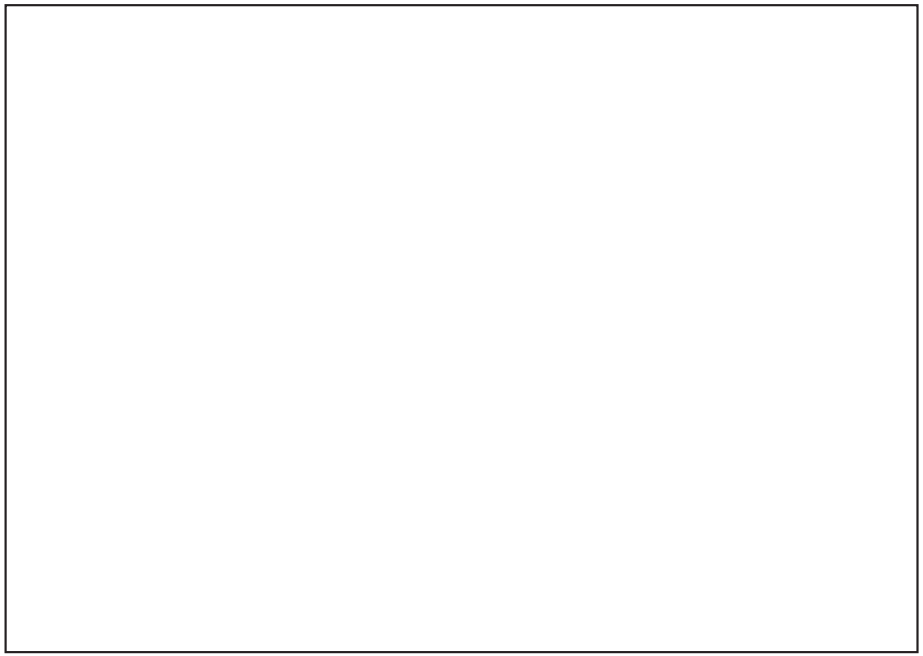

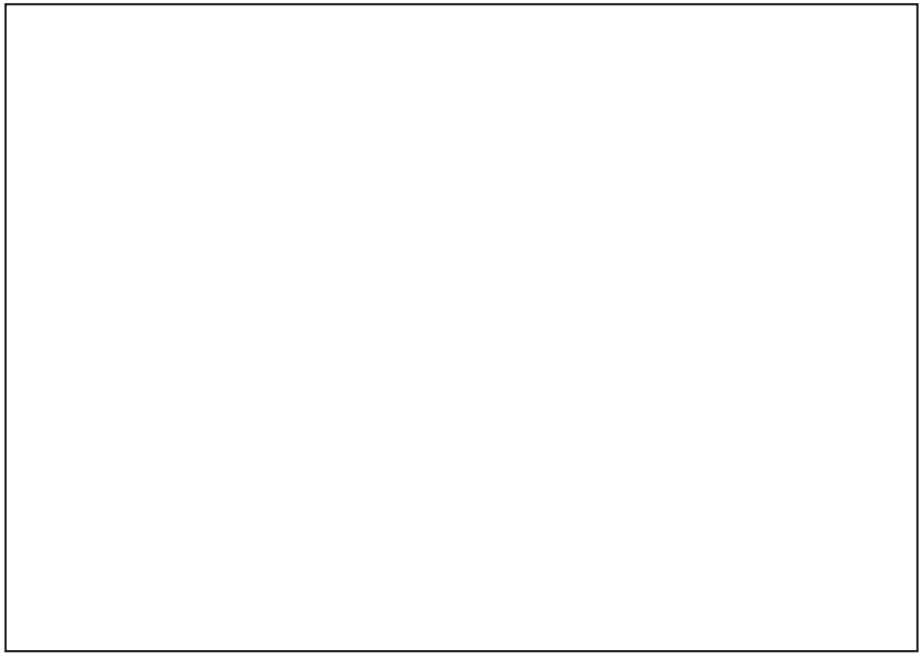

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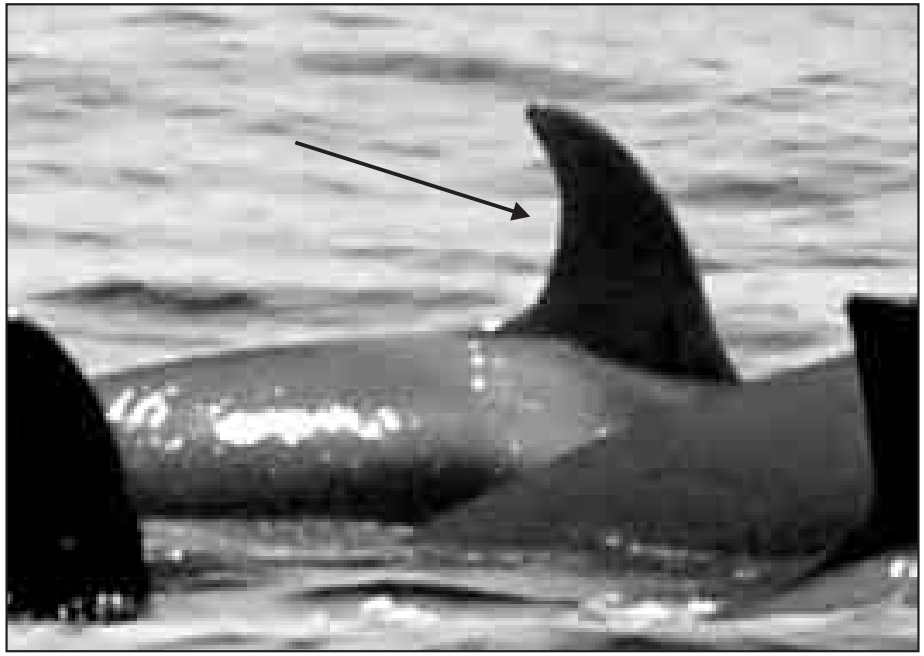

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North

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E221 51.06

North

E223 51.06

E222 51.06

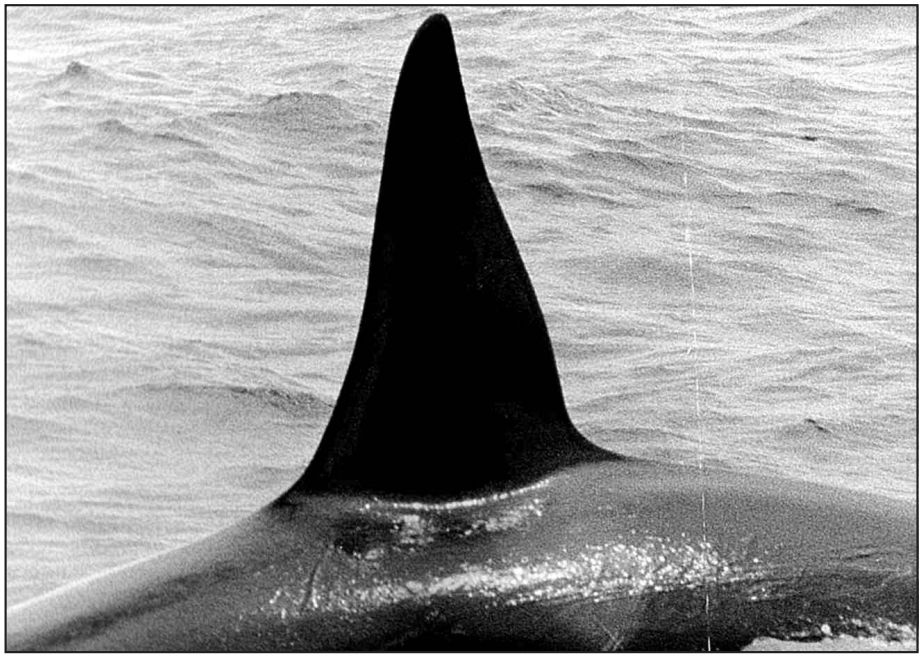
E223 51.06

E071 29.00

E071 29.00

E072 29.00

E245 03.90

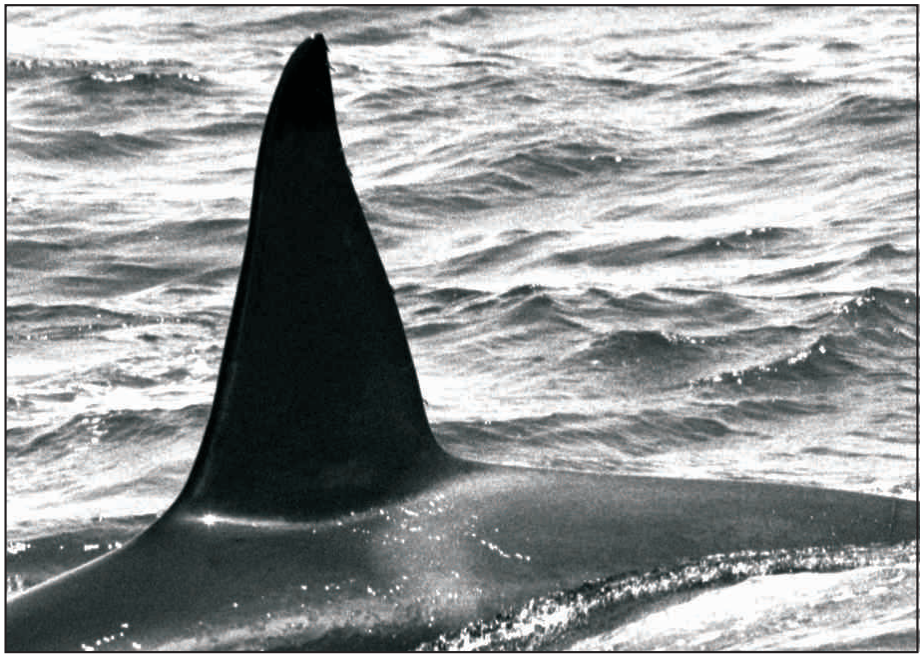


E001 16.98

South

E002 16.98

E003 18.98



E004 18.98

E005 18.98

E004 18.98

South

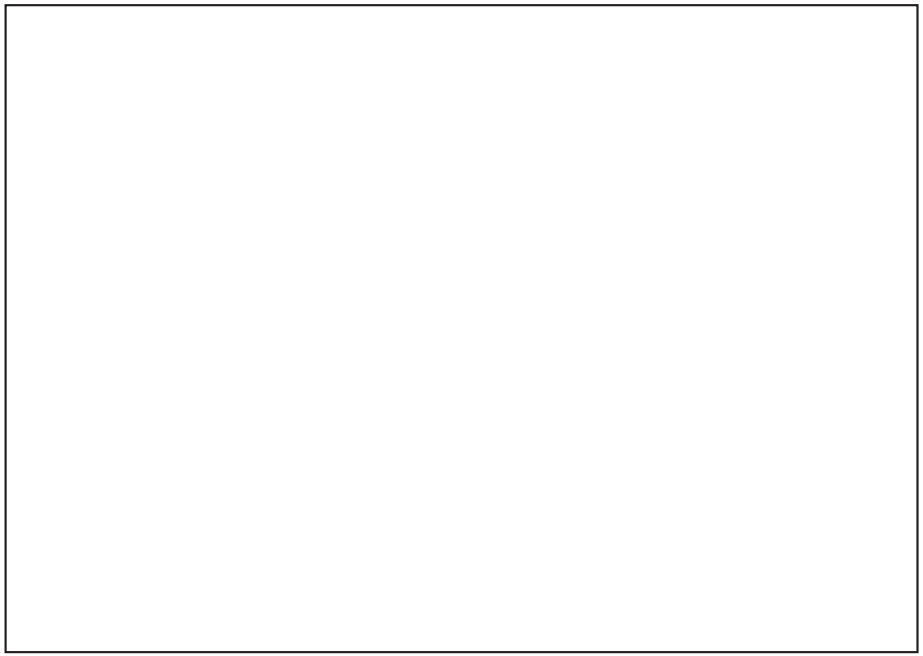
E007 18.98

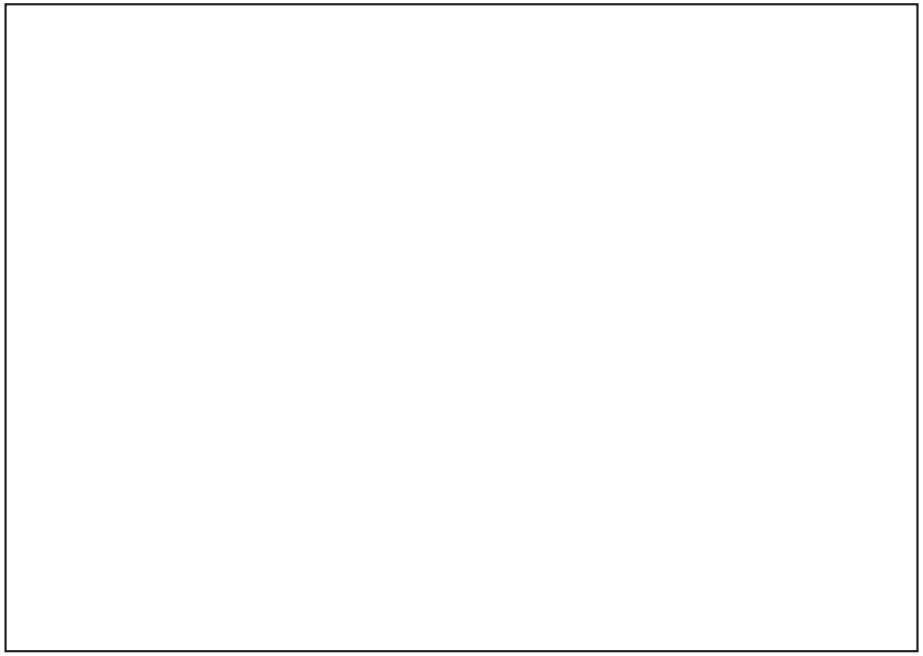
E009 18.98

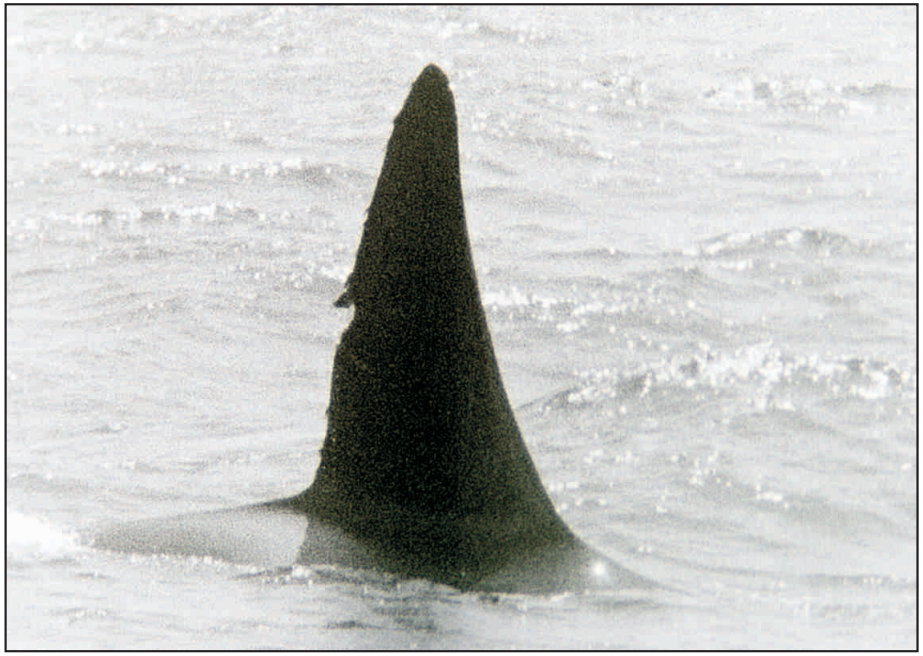
E009 18.98

South

E010 18.98







E011 18.98

E012 18.98

E232 47.06

South

E233 47.06

E234 47.06

South

E235 47.06

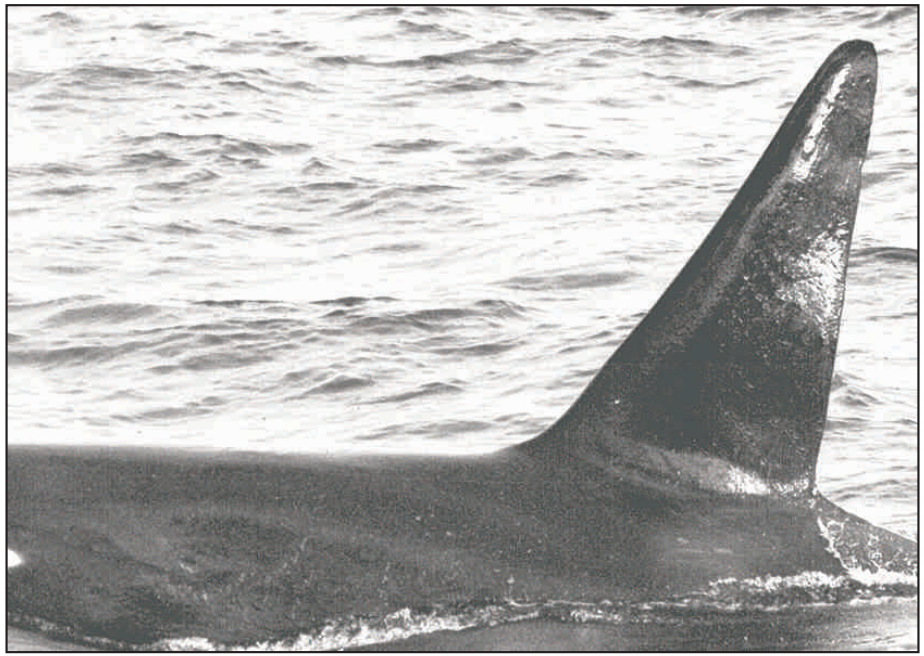
E236 47.06

South

E237 47.06

South

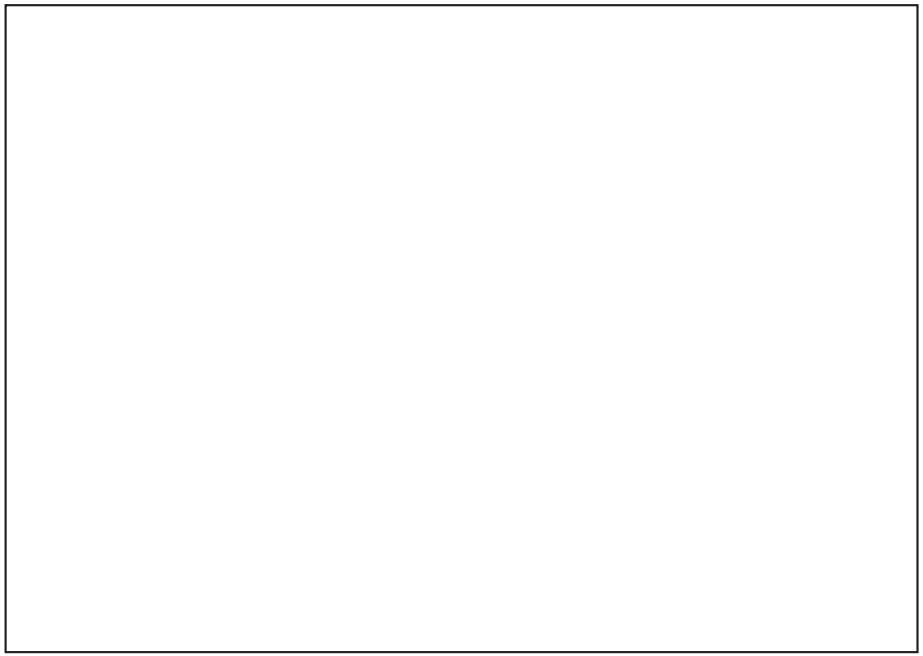
E023 13.98

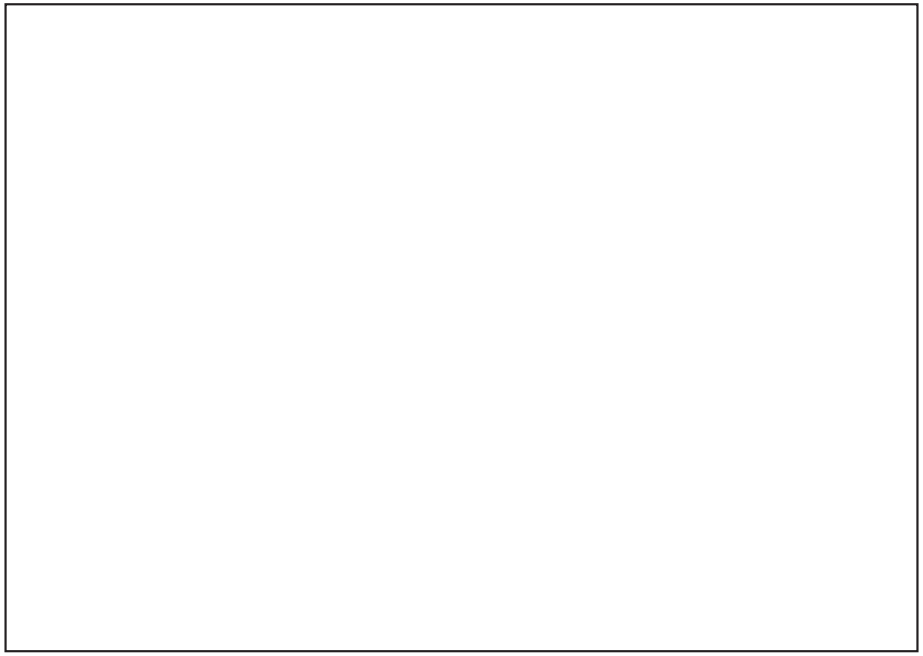


E074 23.00

West

E075 23.00





E076 26.00

West

E077 26.00

E078 26.00

E079 26.00

E226 44.06

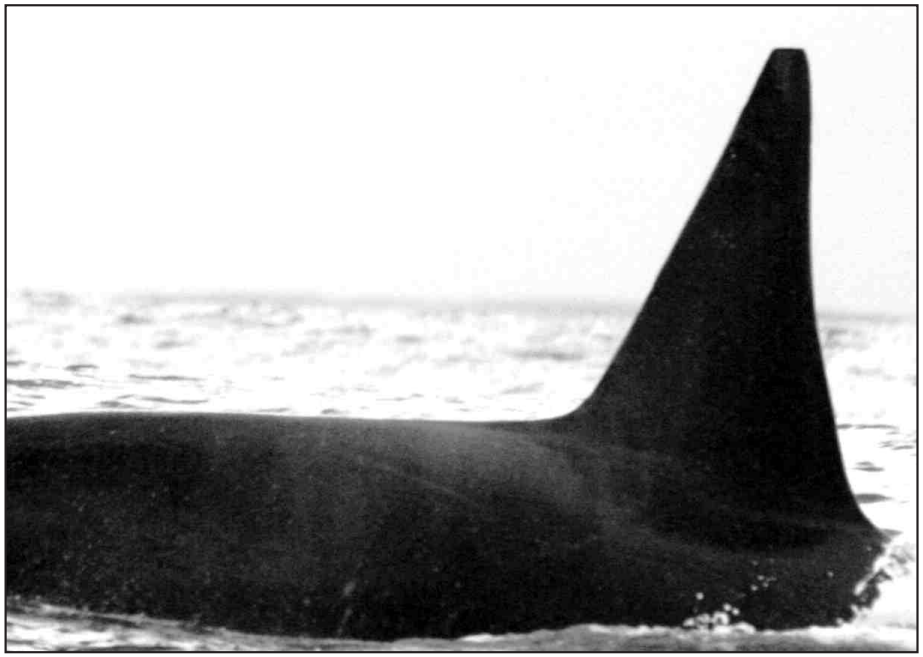
E228 44.06

E228 44.06

E229 44.06

West

E230 44.06



E231 44.06

West

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