FILE COPY #2

LA JOLLA N.M.F.S. SOUTHWEST FISHERIES SCIENCE CENTER
APR 14 1999
LIBRARY

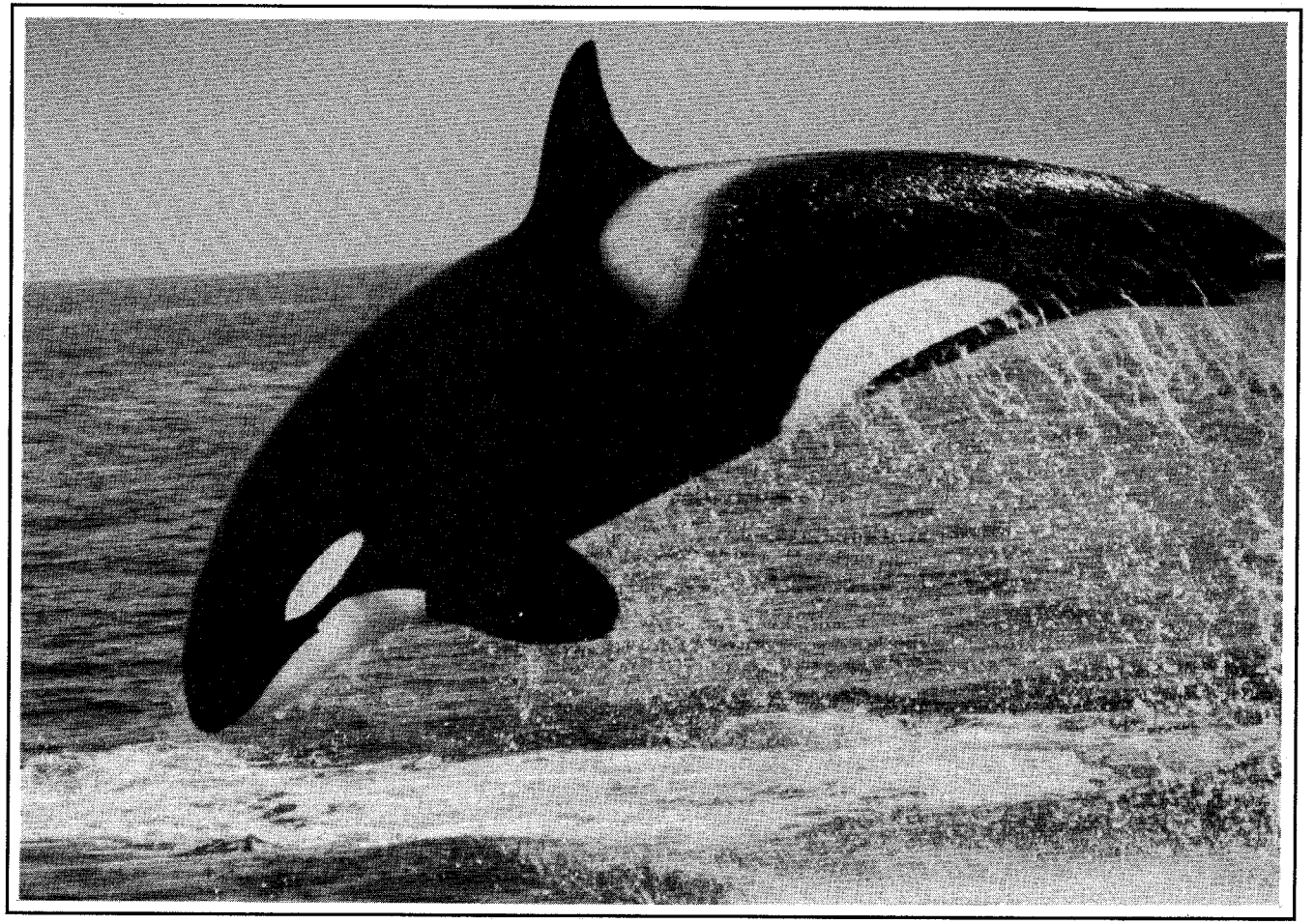
Killer Whales of California and Western Mexico: A Catalog of Photo-Identified Individuals

Nancy A. Black

Alisa Schulman-Janiger

Richard L. Ternullo

Mercedes Guerrero-Ruiz



U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Southwest Fisheries Science Center

NOAA-TM-NMFS-SWFSC-247

SEPTEMBER 1997

The National Oceanic and Atmospheric Administration (NOAA), organized in 1970, has evolved into an agency which establishes national policies and manages and conserves our oceanic, coastal, and atmospheric resources. An organizational element within NOAA, the Office of Fisheries is responsible for fisheries policy and the direction of the National Marine Fisheries Service (NMFS).

In addition to its formal publications, the NMFS uses the NOAA Technical Memorandum series to issue informal scientific and technical publications when complete formal review and editorial processing are not appropriate or feasible. Documents within this series, however, reflect sound professional work and may be referenced in the formal scientific and technical literature.

Jay Barlow of the Southwest Fisheries Science Center
(P.O. Box 271, La Jolla, CA 92038) served as the
Contract Office's Technical Representative for this contract

Request for Additional Killer Whale Photographs

We attempted to contact many people for this catalog, however, we know we did not reach or did not know about persons who may have taken additional killer whale photos from California and Mexico. As this killer whale identification project is ongoing, we would appreciate any photographic contributions, including photos taken prior to and during 1997 as well as future photos. Clear photographs taken perpendicular to the animal's dorsal fin with both the dorsal fin and saddle patch in view are best for our purposes. Photos of the animal's left side are preferred, but right side images are also of value. The ideal film to use is black and white, ASA 1000 or higher, shot at a speed of 1000 or higher. It is also important to photograph all whales in the group, not just the adult males. We realize most photographs taken of killer whales are opportunistic and are not taken under ideal conditions. We appreciate all contributions and will look at varying quality and format for photos, including slides, prints, and negatives.

Please send photos to: Nancy Black - central and northern California, Oregon, Mexico (Mexican photos will be sorted and usable ones forwarded to Jorge Urban, UABCS); and Alisa Schulman-Janiger - southern California, Mexico.

NOAA Technical Memorandum NMFS

This TM series is used for documentation and timely communication of preliminary results, interim reports, or special purpose information. The TM's have not received complete formal review, editorial control, or detailed editing.

SEPTEMBER 1997

Killer Whales of California and Western Mexico: A Catalog of Photo-Identified Individuals

Nancy A. Black[1]
Alisa Schulman-Janiger[2]
Richard L. Ternullo[3]
Mercedes Guerrero-Ruiz[4]

[1]P.O. Box 52001
Pacific Grove, California 93950
Oceanic Society

[2]2716 S. Denison Avenue
San Pedro, California 90731
San Pedro High School Marine Science Magnet,
American Cetacean Society (Los Angeles Chapter)

[3]1013 Hillside Avenue
Pacific Grove, California 93950
Oceanic Society, Pacific Cetacean Group,
American Cetacean Society (Monterey Bay Chapter)

[4]Ap. Post 19-B
Baja California Sur, 23081, Mexico
Universidad Autonoma de Baja California Sur

NOAA-TM-NMFS-SWFSC-247

U.S. DEPARTMENT OF COMMERCE
William M. Daley, Secretary
National Oceanic and Atmospheric Administration
D. James Baker, Under Secretary for Oceans and Atmosphere
National Marine Fisheries Service
Rolland A. Schmitten, Assistant Administrator for Fisheries

ACKNOWLEDGMENTS

We thank the many people who contributed photographs to this catalog. Each contribution represented a step to help generate the first eastern North Pacific catalog of killer whales outside the Pacific Northwest and Alaska. Because long stretches of exposed coastline and uncertain weather combine to make dedicated surveys difficult, the contributions from many people who encountered killer whales opportunistically were essential in compiling this catalog. Our list of acknowledgments is long, but appropriate, considering the scope of this project. Our apologies to anyone inadvertently omitted. The acknowledgments also include a brief history of how this catalog was developed.

We especially thank Marilyn Dahlheim of the National Marine Mammal Laboratory (NOAA), who along with Dave Ellifrit (Center for Whale Research) sorted and identified our early collection of killer whale photographs from California. This work formed the basis of our catalog and greatly facilitated its completion. She gave us many rolls of Fuji Neopan film and provided one of us with experience photographing killer whales in Alaska, both of which improved our ability to photograph whales for this catalog. Marilyn also offered tremendous encouragement, motivation and advice throughout this effort. She assisted us in matching whales between California, Mexico and Alaska and improved our drafts with her edits. We value her friendship and are grateful for all her efforts to ensure the completion of this catalog.

We thank Alan Baldridge, who in 1967 began compiling historical killer whale sightings from Monterey Bay and later collected some identification photos taken off California. His enthusiasm and strong interest in killer whales increased people's awareness and understanding of killer whales off central California and inspired us to pursue more killer whale research in the area. We thank Dennis Kelly who began collecting killer whale sightings in southern California in 1979 and by 1984 had accumulated forty-five sightings and nearly two hundred photographs. He discovered that several whales were readily identifiable and repeatedly photographed. In 1985, he donated his collection to Alisa Schulman-Janiger, who had begun collecting killer whale sightings the previous year. By 1990 she had identified nearly fifty different individuals. By this time Nancy Black was photographing killer whales in Monterey Bay and, together with Richard Ternullo, was detailing each sighting. There are now more than six hundred sightings recorded for the Monterey Bay area. We met at conferences and discovered that several whales matched between our study areas. Some of this work was conducted under an NMFS photo-identification permit.

We are grateful to Michael Bigg and Stephen Leatherwood, who provided guidance and inspiration, and encouraged us to combine our efforts. We are saddened that they are not with us today to share in the completion of this project. We also thank Charles Woodhouse of the Santa Barbara Museum of Natural History, who shared his extensive collection of killer whale sightings.

We thank Jay Barlow of the Southwest Fisheries Science Center (SWFSC)/NOAA for providing the needed funding under contract #40JGNF500356 through the Pacific Cetacean Group to produce this catalog. Jay also provided SWFSC identification photos from NMFS cruises in California and Mexico. We are very grateful to Karin Forney (SWFSC) for her edits of the text and tables and for the many hours she spent formatting and printing them for the final version. Karin also provided us with additional NMFS photographs on short notice. We appreciate all her efforts and assistance with this catalog. We thank Roy Allen (SWFSC) for his work on the layout and Maryann Rodriguez (SWFSC) for her editorial comments on the final version of our text. Jorge Urban of the Universidad Autonoma de Baja California Sur in La Paz collected many photos from Mexico and assisted in identifying and compiling these photos for the catalog.

Graeme Ellis of the Pacific Biological Station in Nanaimo, British Columbia, and John Ford of the Vancouver Public Aquarium provided advice and encouragement as well as assistance in matching whales between California, Mexico and the Pacific Northwest. Graeme also provided excellent identification photos of some offshore whales for the catalog. John Calambokidis of Cascadia Research Collective provided and printed many high-quality photos of killer whales taken off California. He also provided photos taken by his staff aboard National Marine Fisheries Service (SWFSC) cruises from California, Oregon, and Washington. Bernardo Alps contributed many of his photographs and spent countless hours scanning and printing some catalog photos by computer. Dawn Breese contributed many killer whale photos from the Sea of Cortez that she had previously sorted and identified

from photos taken by herself, Bernie Tershy, Craig Strong, and Don Croll. Photos provided by Danielle Waples and Dan Costa were obtained while conducting behavioral observations of marine mammals as part of the Acoustic Thermometry of Ocean Climate (ATOC) project.

We thank Debra Shearwater, founder of Shearwater Journeys, who has been collecting killer whale images since 1978. In 1984, she encouraged charter boat skippers from Monterey to form a network and begin a systematic compilation of marine mammal sightings, including killer whales. By 1986, she had identified repeat visits by several individual killer whales. She donated hundreds of boat trips that provided a platform of opportunity for graduate students to obtain marine mammal sightings and photograph killer whales. Through her efforts, we were able to obtain images from more than forty people, spanning 19 years, to be considered for this catalog.

Oceanic Society Expeditions organized many week-long research trips in Monterey Bay over the last six years. These trips allowed us to spend significant time with killer whales in the Bay. We thank all the volunteers that participated in this program. The Elderhostel Program provided a significant number of volunteers to this project. We thank Birgit Winning and Mary Jane Schramm for organizing the trips and providing logistical support. Sam's Fishing Fleet (Fred Mountford) of Monterey donated use of a 55' charter vessel on many occasions. The Defense Language Institute's (U.S. Army) Outdoor Recreation Equipment Center gave us special permission to rent, on short notice, a 19' Boston Whaler. We thank Terry Siegrist and Brian Ward for their efforts and support. Other crucial contacts included the dedicated volunteers from the Gray Whale Census Project (American Cetacean Society/Los Angeles) who notified us when killer whales were spotted from their shore-based station on the Palos Verdes Peninsula. Eric Martin contributed his photos from many dedicated efforts to photograph killer whales off Los Angeles and was often willing to spend extra time and effort identifying all the whales in a sighting. Sean Van Sommeran of the Pelagic Shark Research Group also reported killer whale sightings to us and contributed photos and videos of killer whales.

Other organizations and individuals who contributed boat time and provided us with opportunities to photograph killer whales in Monterey Bay were Moss Landing Marine Laboratories (Tracy Thomas, Mike Prince), Earthwatch Program 1987 (Randy Wells), Monterey Bay National Marine Sanctuary, United States Coast Guard Station Monterey (Commander Lee), Monterey Bay Whale Watch, Michael DeGruy, Randy's Fishing Trips, Chris' Fishing Trips, Monterey Sport Fishing, and Santa Cruz Sportfishing.

Additional people and organizations who contributed photographs or sightings include: Carmenita Alba, Alejandro Acevedo, Carlos Alvarez, American Cetacean Society-Orange County Chapter and Monterey Bay Chapter, Jack Ames (California Department of Fish and Game), N.L. Anaya, Scot Anderson, Shane Anderson, Wes Armstrong, Leonard Aube, Fran Austin, Toni Bacon, Stephen F. Bailey, A. Balbinder, Kenneth Balcomb and Diane Claridge (Center for Whale Research), Frank Balthis, Damien Baraty, Jay Barlow, John Baroni, Chris and Sally Bartell, Benton Basham, K. Bates, Cheryl Bauldini, Mike Baxter, Bob Beebe, Dave Beeninga, Fred Benko (M/V Condor), Scott Benson, Prentice Bloedel, James Borrowman, Nancy Brannigan, Ron Branson, Sheila Brown, P. Bryant, R. Burke, Cabrillo Marine Aquarium and docents, Ixta Calixto, Tom Campbell, Jim Carretta, Andy Carter, M. Caywood, Sal Cerchio, Todd Chandler, Robert Charter, Samuel Chavez, Doug Cheeseman, Frank Cipriano, Denny Clark, Herb Clarke, Kevin Cody, Carrie Cole, Mauricio Cortes, James Cotton, Mike Danzenbaker, Jim Darling, Charles Davis, Donna Davis, Sheila Dean, A. Delgado-Estrella, Charlie Denny, Mary Donovan, Pat Dunlap, James Elams, Dave Ellifrit, Bruce Elliott, Luis Enriquez, C. Esquivel, Holly Etheridge, Carl Etow, Kip Evans, Connie Ewald, P. Feinblatt, Mark Fenner, Dagmar Fertl, Lulu Flores, Pieter Folkens, Karin Forney, M. Fowler, M. Frahen, Nels Fredrickson, I. Fuentes, M.C. Garcia, Misty Gay, Diane Gendron, Henry Genthe, Don Giles, Jud Goodspeed, Monte Graham, Dave Graybost, J. Mel Godfrey, Dawn Goley, Brad Goodhart, Ed Greaves, John Hall, R. Hallowell, R. Hams, Janet Hardin, Judy Harold, Roger Harris, Ron Hart, Glenna Hartmann, James Harvey, Mark Haywood, Mitch Heindel, Kathy Heise, J. Henderson, J. Herald, John Heyning, Kevin Hicks, Gary Hoffman, Marge Hohly, D. Honkola, Hopkins Marine Station, Alan Hopkins, Peter Howorth, Hubbs/Sea World Research Institute, Molly Hurst, Island Packers, Jeff Jacobsen, G. James, David Janiger, Oscar Janiger, Armando Jaramillo, Ken and Mary Jasper, R. Jeffers, Tom Jefferson, Tom Johnson, Scott Kathy, Carol Keiper, Larry Kepko, Sue and Mike Kersey, J. Ketchum, Tom Kieckhefer, Greg Kruse, Susan Kruse, Marta La Fata, Greg Lasley, Dave Lemon, Nick Lemon, Ron LeValley, John Lewis, Mike Lippsmeyer, Brian Lucas, Tammy Ljungblad, Bill MacDonald, J. Mariani, T.

Marinan, Eric Martin, Dena Matkin, Elenore McMahon, E. McCoy, Diana McIntyre, Greg Meyer, Scott Millichap, R. Moncada, Monterey Bay Aquarium Research Institute and R/V Pt. Lobos, Mike Moran, Alan Morgan, Alexandra Morton, F. Murphy, Natural History Museum of Los Angeles County, Sylvia and Paul Neal, Harry Neece, Greg and Nancy Nelson, Melanie Nelson, Michael Newcomer, Rod Norden, Tom Norris, C. Navarro, E. Ochoa, B. Odell, Leon Oliver, Raul Ortiz, Elizabeth Osnes-Erie, Rod Palm, C. and J. Paturzo, P. and G. Pedersen, Katy Penland, Angel Perdomo, Hector Perez-Cortez, Doug Perrine, Emo Pierracci, Bob Pitman, T. Pfifter, D. Pohlson, Point Vicente Interpretive Center and docents, Rick Porter, Valerie Powers, Jennifer Quan, David Ratcliff, Kim Raum-Suryan, Mark Rauzon, Jay Reifel, David Riens, Derek Rindle, Susan Ritman, J. Rivers, Don Roberson, Dave Roberts, Jerry Roberts, C. Robertson, Christina Roetzel, Galen Rowell, J. Russo, F. Salazar, Ron Saldino, Juan Carlos Salinas, D. Salyer, William Samaras, Jose Sanchez, L. Sartf, Jim Scarff, School for Field Studies, Brad Schram, Mary Jane Schramm, Richard Sears (Mingan Island Cetacean Study), B. Sexton, Doug Shaw, Jennie Sheldon, Greg Silber, Arnold Small, Brian Smith, Holly Snyder, Marty Snyderman, G. Sosa, B. Southern, B. Spellman, Kenny Stagnaro, Richard Stallcup, Jon Stern, T. Steurer, A. Stevens, William Stephens, Paul Strassman, Craig Strong, John Suchil, Margaret Swann, Jack Swenson, Bob Talbot, Barbara Taylor, Monte Taylor, N. Tooly, J. Trochet, University of California Santa Cruz, T. Vadon, R. Valles, Astrid van Ginneken, E. Vazquez, Nancy Venette, Paul Wade, Marc Webber, Brian Weed, B. Weiss, Randy Wells, Tom Walmsley, D. Whitehurst, Silvan Wick, Bill Williamson, Brent Williamson, Bruce Wright, Sue Yee, Ben Zamora, and Tim Zoliniack.

SUMMARY

This catalog includes 268 photographs of killer whales from California and western Mexico depicting the best available perpendicular view of the dorsal fin and saddle patch. Photographs of both left and right sides of each whale are included when possible. The compilation of this killer whale catalog is based on more than 15 years worth of photographs taken opportunistically off California and Mexico. There was some dedicated effort to identify whales in Monterey Bay over the last six years. Of the 268 identified killer whales, 211 whales were identified off California (whale numbers begin with "CA") and 71 off Mexico (whale numbers begin with "ME"). Fourteen whales were photographed in both California and Mexico, and are included in the California numbers.

In the eastern North Pacific, there are at least three recognizable types of killer whales ("residents," "transients," "offshores") that do not associate with members of the other groups. Each type exhibits different home ranges, vocalizations, dietary preferences, foraging patterns, morphological features, and genotypes. This catalog also includes a group termed "LA Pod," as they have been most frequently sighted off Los Angeles and do not intermix with the other types.

Killer whales were assigned to either the transient or offshore type or the LA Pod when possible. For this catalog, 105 whales were part of the transient population and 56 were of the offshore type. Killer whales were assigned a type based on direct matches or linked associations to other known transient and offshore type whales previously identified from other regions. There were no links or matches to the North Pacific resident type. Not all whales (37) from California and no whales from Mexico could be assigned a type.

Of the 105 transient type killer whales included in the catalog, 10 whales were matched with transients in other catalogs and the remainder was linked to this type via associations. Transient whales are generally unpredictable in their movements, spend less time in one area, prey on marine mammals, travel in groups of 10 or less, and have fairly pointed dorsal fins with "closed" saddle patches. Matches from whales photographed in California were made to regions both within the state and outside the state, including Oregon, Washington, British Columbia, and Southeast Alaska. No transient type whales were linked or matched to any whales identified south of Santa Barbara and the northern Channel Islands.

Of the 56 offshore types, 20 whales were matched with offshores in other catalogs and the remainder was linked by association. Offshore whales are a little-known form differentiated from the other two types during the 1980's. These whales were first identified off western Vancouver Island, and were termed "offshore" on the assumption they normally lived in the outer waters of the west coast. They were not known to inhabit the extensively surveyed inland waters of Washington, British Columbia, or Alaska. Offshore

whales generally travel in large groups of 25-75 but have occurred in groups less than 10. Offshore whales have not been observed preying on marine mammals, are quite vocal, and generally have a more rounded dorsal fin than transients, some with "open" saddles.

Thirteen whales identified in California, with six of those also identified in Mexico, are dubbed the LA Pod and are an unusual group that does not yet fit in with known types. Their well-marked, rounded tip fins and tight associations are different from transients and they have not been linked to the offshore group. This group was regularly sighted off Los Angeles from 1982 to 1991; after a four-year gap, sightings resumed in 1995.

Of the 71 Mexican whales, five whales matched to individuals sighted off San Diego and Orange County, six off Los Angeles (LA Pod), and two off Monterey (LA Pod). There were 14 matches between western Baja California and California, several of which included the LA Pod. Except the LA Pod, no whales from Mexico have been seen further north than Orange County.

The majority of whales were identified in Monterey Bay (137). Some of these whales were also photographed near Cordell Banks (west of Bodega Bay), Farallon Islands (west of San Francisco), Port San Luis, Santa Barbara, Los Angeles, Orange County, and San Diego. Many individuals have been repeatedly sighted in Monterey Bay since 1978.

The photographs compiled for this catalog were compared to similar catalogs from other regions of the Pacific, including Washington State, British Columbia, Queen Charlotte Islands, Southeast Alaska, Prince William Sound, and the central Gulf of Alaska to the southeastern Bering Sea.

INTRODUCTION

Although killer whales (*Orcinus orca*) inhabit all oceans (Heyning and Dahlheim 1988), they are generally associated with polar ice or the inland waters surrounded by forest-covered mountains of the Pacific Northwest. It is in these temperate and polar regions that killer whales appear most commonly and have been extensively studied (Ford et al. 1994, Dahlheim et al. 1997). Killer whales inhabiting the inland waters and fjords off Norway and Iceland have been photo-identified and studied in recent years (Lyrholm 1988, Sigurjonsson et al. 1988). In contrast to the protected inland passages of the North Atlantic, Pacific Northwest, and Alaska, killer whales living in the open waters of California and Mexico are less concentrated and less predictable in their movements. In fact, few people even realize killer whales occur in California and Mexican waters (Dahlheim et al. 1982).

Killer whales are the largest members of the dolphin family (Delphinidae), with a wide prominent dorsal fin, black body, a white patch above and behind each eye, a large white ventral patch that comes up on the flanks, and a light gray or white saddle behind the dorsal fin. Males grow to about 9.5 m, and have dorsal fins up to 1.8 m high. Females grow to 7 m, and have more falcate dorsal fins that do not exceed 1.4 m in height.

Killer whales living off California, Baja California, and in the Sea of Cortez inhabit one of the most highly productive ecosystems in the world. Areas of upwelling, driven by wind and global motion, along the west coast of North America and in the Sea of Cortez bring colder, nutrient-rich water to the surface. This, in turn, creates regions suitable to support a high diversity of marine organisms. More than 20 species of marine mammals, including baleen and toothed whales, pinnipeds, and sea otters, more than 90 species of seabirds, and a large variety of fishes and cephalopods inhabit these waters. With such an abundant and diverse prey base, it is not surprising that one of the most formidable marine predators, the killer whale, takes advantage of these food resources.

Killer whales are adept at locating, pursuing, killing, and consuming a wide range of prey items (Jefferson et al. 1991) even other kinds of whales much larger than themselves. Certain types of killer whales appear to specialize in preying on mammals and others on fishes and cephalopods, possibly with some overlap. Usually, a group effort is required to successfully feed on a large prey item, such as a blue whale. Killer whales in Norway, for example, are known to form coordinated groups to herd and consume schooling fish such as herring. Some groups of killer whales in the Pacific Northwest feed on seasonally abundant salmon. Because killer whale groups inhabiting both overlapping and diverse regions have become genetically and behaviorally distinct, prey preference may be one way to identify different types of whales. As we discover more about the distribution, behavior, and ecology of killer

whales in California and Mexico, we are slowly gaining information on prey preferences among individuals and their association patterns and movements. This information will help us to distinguish population types or stocks of killer whales in the Pacific.

Much of what we know about killer whales comes from pioneering research by Michael Bigg, who began studies in the 1970's in response to the capturing of killer whales for exhibit. Little was known about the life history of killer whales, and serious questions regarding the increased rate of whale removal needed to be addressed. He and his colleagues took many photographs and closely examined killer whales of the Pacific Northwest. By 1973 he concluded that every killer whale has natural markings, such as nicks, scratches, and scars, which could be used to repeatedly identify individuals. It was found that killer whales could often be individually distinguished by taking a clear, perpendicular photograph of the dorsal fin and saddle patch. By photographing whales over many years, many aspects of their movements, population size, reproductive rate, life span, and social structure could be deduced. The photo-identification techniques that were used then are still applied to all killer whale studies.

The killer whales living south of Puget Sound, Washington have never been intensively studied, given the unpredictable distribution of the whales and the difficulties of conducting research in unprotected waters. Although killer whales are regularly observed, their status has been largely unknown. Based on line transect surveys conducted off California, the population of killer whales was estimated to be 747 (C.V. 0.71) with a range of 213 to 2,615; however, this estimate was based on few sightings (Barlow and Gerrodette 1996). A more precise way to estimate their population may be through more extensive photo-identification of individual whales by applying mark-recapture techniques.

In the eastern North Pacific, there are at least three recognizable types of killer whales ("residents," "transients," "offshores") that have not been observed to associate with members of the other groups (Ford et al. 1994). Each type exhibits different home ranges, vocalizations, dietary preferences, foraging patterns, morphological features, and genotypes. Although residents and transients in the Pacific Northwest and Alaska have overlapping ranges, with fine-scale differences in core occurrence areas, they are genetically distinct populations with differences comparable to killer whales living in separate regions of the world. The ecology of the offshore type of killer whale is least known, but recent results suggest some of these individuals are genetically similar to the southern residents from Washington State and southern Vancouver Island (Hoelzel et al. 1997). Unless one has an extensive knowledge of killer whales, it is not possible to conclude which group an individual belongs to without clear photographs and knowledge of their past associations. However, there are certain characteristics that may be used to distinguish among types.

The resident type of killer whale that inhabits Pacific Northwest and Alaskan waters has been extensively studied for more than 25 years, and probably more is known about these whales than any other cetacean population in the world. They are termed "resident" because of their relatively predictable and seasonal occurrence within core areas. Their distribution appears tightly coupled to the salmon that return to natal rivers to spawn during summer and fall. Residents generally travel in large groups of up to 50 individuals, although group size may be as small as six. These whales are very vocal and exhibit a close matrilineal-based social structure; adult males appear to remain with their mothers for life. Resident type whales have been identified and categorized into several pods: (1) Washington State and southern Vancouver Island (Strait of Juan de Fuca), where the three pods of the southern resident form occur; (2) northern Vancouver Island (Johnstone Strait), where several pods of northern residents occur (Ford et al. 1994); (3) Southeast Alaska, where two primary pods are frequently seen (Dahlheim et al. 1997); (4) Prince William Sound with a variety of resident pods (Heise et al. 1991); and (5) the central Gulf of Alaska to the southeastern Bering Sea (Dahlheim 1997), where pods fitting the resident type have been recently photographed and cataloged. Pods of whales are generally distinct for each area, with some mixing among pods and regions. Their dorsal fins tend to have rounded tips and few trailing notches, and their saddle patches may be "closed" and uniformly gray or "open" with varying amounts of black intrusions (Baird and Stacey 1988).

Transient type whales appear to prey primarily on marine mammals, cover a more extensive range, and are less seasonally predictable than the residents. They are often vocally silent as they travel along coastlines, frequenting sea lion and seal rookeries and whale migration paths. Transients generally travel in small groups of 10 or less, although they may often join to

form larger groups of up to 25 while pursuing and attacking large whales. A few individual transients are known to have occurred in both central California and Southeast Alaska, a distance of 2,600 km (Goley and Straley 1994). Group composition is more variable among transients, although associations of some individuals appear stable. It is possible to assign an individual to the transient population by considering a transient whale to be any individual whose recorded vocalizations include call types unique to transient whales (J. Ford, pers. comm.), or an individual that has associated with a known transient at some time (G. Ellis, pers. comm.). Transient type whales have been well studied in the Pacific Northwest and Alaska; this method of designation continues to hold true, as transients have never been documented to travel with the other types of killer whales.

Transient whales tend to be most vocal during and after a mammal kill and while engaged in social activities. The few recorded vocalizations of killer whales off California reveal call types shared with whales from the Pacific Northwest to as far north as Southeast Alaska, but also include some call types unique to California whales (J. Ford, pers. comm.). The fact that many call types are shared between whales separated by great distances is one indication that there is a continuously linked population of transient killer whales in these regions. Linked associations of individuals are another way of detecting a continuous population. Recent genetic data also indicate such a population (Hoelzel et al. 1997). Off central California, transients are the most frequently sighted type. They prey on a variety of marine mammals and even birds, but have been most commonly observed attacking and feeding on gray whales, Dall's porpoise, and California sea lions. Transients have dorsal fins with pointed tips and more trailing notches than do residents, and larger saddle patches that are never "open."

The offshore whales are a little-known form differentiated from the other two forms during the 1980's, and subsequently found to have been first photographed in 1979 (Ford et al. 1992). Killer whales that have never been photographed and identified before first appeared off western Vancouver Island. Since these whales had not previously been detected in these well-explored waters and no one knew their origin, they were termed "offshores," as it was assumed they must have come from offshore areas. In the late 1980's and early 1990's, more "offshore" type whales were sighted and photographed around the Queen Charlotte Islands (Ford et al. 1992) and in Southeast Alaska (Dahlheim et al. 1997). About 75 of these whales that had never been identified before swam into the Straits of Juan de Fuca (Washington) in 1992, a region with more than 20 years of intensive killer whale studies (Walters et al. 1992). In California, they have been sighted within 10 miles of shore off Monterey and Los Angeles. However, they have been identified in offshore waters twice, 200 and 300 miles off Oregon.

Offshore type whales often travel in large groups of 25 to 75 (possibly up to 100) individuals, and are frequently quite vocal. They have never been observed preying on mammals, and may feed on fishes or cephalopods. These whales are well-marked, averaging even more notches and nicks on the trailing edges of their dorsal fins than transients. They have rounded fin tips that resemble residents but the fin shape is generally less falcate. The saddle patches resemble those of the residents in size; they are nearly all closed, like the transients, although "open" saddles are occasionally observed (G. Ellis, pers. comm.).

As with the transients, offshore type whales are linked through associations with known offshore whales. In California, the first known photographs of the offshore type were taken in February 1993, 42 miles off Pt. Conception, but reports of large groups of killer whales (60+) off central California suggest they may have occurred here in the mid-1980's. Over the past few years, the offshore type has been documented in large numbers off Los Angeles and Monterey Bay, primarily during the winter.

The production of this catalog was based on more than 15 years worth of photographs collected opportunistically of killer whales off California and Mexico and the results of dedicated effort to identify whales in Monterey Bay over the past few years. It is hoped that, with long-term studies based on this first effort to produce a catalog, we may greatly increase our understanding of killer whales in this region and how they compare to, and fit in with, other known killer whales in the North Pacific. We now know that some killer whales travel long distances, thereby affecting management decisions and conservation efforts in various states and countries.

METHODS

Killer whale photographs were collected from a variety of sources and varied widely in quality. They usually were taken during marine mammal observation cruises, such as aboard research vessels and whale watch boats. Since 1991, there was some dedicated effort to photo-identify killer whales in Monterey Bay, including 15 to 40 days per year on Oceanic Society Expeditions marine mammal research trips. Reports were received of all cetaceans, including killer whales, from many vessels in the Bay (charter, commercial, whale watch, and research vessels). When killer whales were encountered, an attempt was made to photo-identify the group, to observe and record behaviors, and to collect vocalizations. Color slides were used for photo-identification during the first few years. Beginning in 1993, the use of Fuji 1600 Neopan black and white film (shot at 1/2000 sec) greatly increased the quality of the photographs needed to identify whales. In addition, vessels working in the Bay called in sightings on days we were not at sea, and when possible we headed to the sighting immediately. Given the proximity of the Monterey Submarine Canyon to shore, and the frequent occurrence of killer whales along the canyon edge, we often relocated the whales.

Killer whale photographs obtained off Los Angeles were also collected from a variety of whale watch vessels and the Sea Education Afloat (SEA) program, many carrying trained volunteers associated with the Cabrillo Whalewatch Program. Some photographs were submitted by professional photographers. The trained census volunteers who identify, count, and record behaviors of gray whales and other marine mammals daily from December to May each year from a shore-based cliffside post at Point Vicente (sponsored by the Los Angeles Chapter of the American Cetacean Society) often reported nearshore killer whale sightings. If possible a dedicated effort was made to locate and photograph individual killer whales.

Besides the dedicated effort to identify killer whales in Monterey Bay and Los Angeles, we received photographs from the National Marine Fisheries Service (Southwest Fisheries Science Center) taken on their marine mammal research cruises in California, Oregon, and Mexico. Some dedicated effort was spent on these cruises to photograph killer whales. Besides NMFS personnel aboard these cruises, some trips included researchers from Cascadia Research Collective who also spent dedicated time photographing killer whales. Cascadia Research also made an effort to photo-identify killer whales during their surveys for large whales off California. Other photographs were submitted to us from a variety of sources, including photographs taken opportunistically during research cruises, whale and bird watching trips, fishing trips, and private boat trips.

Sighting data and photographs from killer whales in Mexico were taken by the Marine Mammal Project at the Universidad Autonoma de Baja California Sur (UABCS) with some taken incidentally to other projects by students of UABCS and by researchers from other Mexican national institutions such as el Centro Interdisciplinario de Ciencias Marinas del Instituto Politecnico Nacional (CICIMAR-IPN), and el Centro Regional de Investigacion Pesquera (CRIP or the Fisheries Department). In addition, other photographs were obtained from U.S. marine mammal researchers working in Mexico, including photographs from Mingan Island Cetacean Study, a collection of killer whale photographs from Canal de Ballenas (Dawn Breese, Bernie Tershy, Craig Strong), and from people working on natural history cruises.

In 1992, an initial collection of killer whale photographs from Monterey Bay was sorted through by Marilyn Dahlheim (National Marine Mammal Laboratory/NOAA) and Dave Ellifrit (Center for Whale Research), resulting in the identification and numbering of about 60 individually distinct whales. This data was added to a collection of identified killer whales from southern California to form the basis of this catalog. Additional photographs of killer whales from California and Mexico were compared to these whales and either matched to numbered whales or added as new individuals. All whales identified in California were given CA numbers and whales identified only in Mexico were given ME numbers. Whales that were sighted in both California and Mexico were given CA numbers.

To obtain the best photographs of the left and right sides of each whale, all photographs from each sighting were examined and sorted by fin shape, fin nicks, saddle shapes and markings for both left and right images. Photographs of each numbered whale were placed together, resulting in many photos of various sides and angles of each whale. The best photographs from this compilation were chosen for the catalog. As better photographs were obtained for left and right sides they replaced earlier photographs. In some

cases, the best images of the left and right sides of each whale were included from different sighting dates, often several years apart. Therefore, it is possible that new nicks and scratches were found on whales over the years, and if there was no better image of either side, some left or right sides of older images lacking the new marks were included. In attempting to identify killer whales, the angle of the photograph is also a factor; whales may appear different from each side, especially if they have bent fins. The azimuth and height angle of some photos may cause small nicks or saddle features to disappear, or fins to apparently change shape. This is especially true for young males whose fins are still growing and are vertically unstable, causing their fin shape to vary depending on photo angle. Sun glare is another factor that can appear to make left and right sides differ and fins may appear to have nicks that are non-existent (G. Ellis, pers. comm).

The date, location, and photographer were recorded for each identified whale and for resightings of identified individuals. All whales identified during a particular encounter were recorded as associates and used to link whales to a type. The numbered whales are not all consecutive, as some whales were eliminated due to duplication and poor photograph quality. In some cases we included only one photograph of either the left or right side because only one usable image was available. Therefore, it is possible that there are a few duplicate whales in the catalog due to this problem. This should be resolved as we continue to photograph whales and collect images from others in this on-going project.

The photographs compiled for this catalog were compared to killer whale catalogs for other regions of the Pacific, including Washington State, Vancouver Island (B.C.), Queen Charlotte Islands (B.C.), Southeast Alaska, Prince William Sound, and the central Gulf of Alaska to the southeastern Bering Sea. We received assistance in comparing these catalogs from Marilyn Dahlheim (National Marine Mammal Laboratory/NOAA), Graeme Ellis (Pacific Biological Station, Department of Fisheries and Oceans, B.C.), John Ford (Vancouver Public Aquarium), and Dave Ellifrit (Center for Whale Research). This catalog differs from those of the Pacific Northwest and Alaska in that many of its photographs were taken opportunistically; therefore, the photographic quality of images is variable. Thousands of pictures were sorted through, and only photographs of whales that had unique features were used for the catalog.

RESULTS AND DISCUSSION

Two hundred and sixty-eight (268) killer whales were identified from California and western Mexico. For each numbered whale, the animal's sex, date and location of the sighting, and photographer are given in Table 1. Two hundred and eleven whales were identified off California, and 71 whales off Mexico. Some whales were photographed in both California and Mexico. Thirty-seven whales from California could not be assigned a type because they have not been linked by association to other known transients or offshores. There were no links to the resident whales. The unassigned whales may eventually be linked by future photographs of these individuals and their associates, or they may belong to other currently unknown types (Hoelzel et al. 1997).

Killer whales were consistently photo-identified from 1985 to 1997, with a few earlier sighting dates included. Most whales were identified off central California (primarily Monterey Bay), followed by the Los Angeles area (Table 2). Within California, whales identified in Monterey Bay were also photographed at Cordell Banks, Farallon Islands, Port San Luis, Santa Barbara and the northern Channel Islands, Orange County, and San Diego. Whales identified in California were also sighted off Mexico, Oregon, Washington, British Columbia, and Southeast Alaska (Table 3). Catalogs from other regions were compared to photographs in this catalog (Table 4). Locations where whales were identified and the number of matches between locations are given in Figure 1.

One hundred forty-six whales were sighted multiple times. CA1 has been photographed on at least 29 days over nine years, CA3 on at least 24 days over 14 years, and CA29 on at least 23 days over 19 years. Although associations shifted, many whales were closely affiliated, CA2 (female) was photographed with CA1 (male) on 16 of her 18 sightings, CA4 (f) was photographed with CA1 on 15 of her 17 sightings, and CA26 (f) was photographed with CA29 (m) on 10 of her 11 sightings. One important factor to consider is that not all whales present during the encounters were identifiable or photographed. Also, because of the opportunistic nature of many of our sightings, often several years elapsed between resightings of individuals, making it especially difficult to track and document the new scarring and/or extensive fin shape changes that occur in maturing male killer whales during

their teenage years. In addition, opportunistic photographers often bias efforts toward capturing the more noticeable large-finned males or well-marked animals. One adult male (CA43) was photographed several times in central California between 1992 and 1994. In March 1996, he showed up in Monterey Bay with his fin completely flopped over to the left side. It was easily found that he was CA43 due to his distinct saddle patch markings.

California Whales

Transient Whales

Of the 211 whales identified off California, 105 are known transient types: 10 of these match with transients in other catalogs, while 95 others are linked to them via associations. Seventy-five whales have been sighted more than once. The resighting rate among males is higher, as these whales are generally more distinct and easily identifiable; whereas close pictures of female types are often needed to identify whales by saddle only, as their fins may not be well marked.

Fourteen transient whales represent long-range matches from California to Oregon, Washington, British Columbia, and Alaska. These include whale numbers: CA18, 20, 27, 28, 38, 52, 54, 59, 73, 79, 122, 169, 170, and 172. CA18, 20, 27, and 54 were sighted in Glacier Bay, Alaska in 1989, and CA20 and 27 were identified off the west coast of Washington in 1995, but this group has been more frequently sighted off central California since 1987 than other regions. CA28 and 38 have also been sighted many times off central California since 1988, and were identified off Tofino, British Columbia in 1995. CA52 and 59 are two males that were photographed off Santa Barbara, Monterey Bay, Oregon, and Tofino, B.C.

CA73 is a male photographed a few times off central California with other known transient whales and was also identified off British Columbia with known transients that occur in Southeast Alaska. This key whale links most transients of Southeast Alaska to the 105 transients in this catalog. This is evidence for a continuous transient population from Southeast Alaska to Santa Barbara and the Channel Islands. Genetic data also support this conclusion (Hoelzel et al. 1997).

CA122 is a female type photographed off Santa Barbara and off northern Vancouver Island where she was involved in an attack on a mother/calf pair of gray whales. This whale has associated with other known transients involved in attacks on gray whales in Monterey Bay and in the Santa Barbara Channel.

A preliminary conclusion based on comparisons with the other killer whale catalogs suggests that although the transients are linked from Southeast Alaska to California via associations, the transients that inhabit the inland waters of Alaska, British Columbia, and Washington do not directly match those of California. However, the transient whales identified in the open ocean off the west coast of British Columbia and Washington matched with some California whales. There is less effort in the outer waters off the west coast of these northern areas compared to heavier effort in the inland waters. This may suggest there are some range differences between the transients, i.e., those inhabiting protected inland waters vs. those frequenting the open waters. The four whales that matched to Glacier Bay, Alaska, from central California were only seen once in the inland waters of Southeast Alaska, despite extensive effort (M. Dahlheim, pers. comm.), whereas they are more frequently sighted off California. This suggests that the presence of those whales in inland Alaska was unusual and this area may not be part of their regular range.

Offshore Whales

Fifty-six whales in this catalog are offshore type killer whales; 20 matched with images of offshore types in other catalogs, and 38 are linked by association. Offshore type whales were first photo-identified off Pt. Conception, California, in 1993 as matching to this known type. However, large groups of whales had been previously reported off central California in the 1980's, but few photographs were available. During 1995 and 1996, groups of 40-100 whales were occasionally sighted off Los Angeles, Orange County, and Monterey Bay, primarily during the winter, from late December to late March. During these sightings, the whales were in subgroups that were dispersed over several miles. Certain individuals were more frequently photographed and seemed to approach boats more often, while others were elusive and remained at a distance. It has not yet been possible to adequately photograph all animals in these large groups. The offshore types have also been sighted during September and October in central California in small groups of

less than 10, some of which were part of the larger winter groups. Twenty of these whales identified off California matched to whales sighted off the Queen Charlotte Islands, Vancouver Island, and Washington during summer months; three from Monterey Bay matched to Southeast Alaska. Several photographs of these offshore whales are not of the best quality; better photographs and more time spent matching with the offshore catalog compiled for British Columbia and Alaska may produce additional matches.

Offshore whales ranged as far as some of the transients. The longest range matches were from Monterey Bay to Southeast Alaska, and Los Angeles to northern Queen Charlotte Islands. It is unclear if these whales have recently begun to frequent our coast from unknown areas, or whether the more extensive network of people contributing whale photographs and an increased effort to photo-identify them has caused the apparent increase in their frequency of occurrence. Similarly, to the north, most sightings of the offshore type whales have occurred around the Queen Charlotte Islands, with more effort concentrated there just within the last five years. However, with the extensive effort to identify whales in inland waters over 20 years, it is interesting that these new whales have been photographed only just recently. It is possible that the occurrence of these whales in nearshore waters may be due to changing ocean conditions.

LA Pod

One unusual group of killer whales known as the LA Pod, as they are often seen off Los Angeles and Orange County, has never been linked to a specific type. They have only been seen with members of their own pod although each member has not been present for every sighting. Whales within this group have never been observed to kill a mammal, many are well marked, often with extensive nicks and tears in their fins, and their fin shape does not appear transient-like. Saddle types of these whales more closely resemble the offshore type of killer whale; however, they have not been linked with any known offshore whales. This group is composed of at least 13 whales, including three adult males, and was sighted about 30 times between 1982 and 1991, primarily off Los Angeles. However, we have no photographs of the whales between 9/91 and 9/95, although several have been photographed since then. Members of this group have been documented from the Sea of Cortez to Monterey, California. This is the only group of whales identified off the Palos Verdes Peninsula before 1995.

Mexico Whales

No whales identified in Mexico could be linked to any population type. In some photographs, the whales' dorsal fin, saddle patch shape, and gray shade intensity appear different from known transient types. However, some whales in the Sea of Cortez and western Baja California have been observed to attack marine mammals. Most of the photographs included in the catalog from Mexico were taken in the Sea of Cortez. Where there was more effort to identify whales in regions such as Canal de Ballenas and La Paz Bay, certain individuals were repeatedly sighted over several years.

Group sizes from this region generally range from one to 30 animals and whales are sighted year-round; some individuals travel with particular associates. The longest time span for an identified animal resighted in the Sea of Cortez was 12 years. An interesting feature of many of these Mexican whales is that they often have barnacles, probably *Xenobalanus*, attached to their dorsal fins. This provides a greater photo-identification challenge, as good photographs are needed to detect if fin marks are barnacles or true nicks. A few whales in the LA Pod have carried these barnacles when sighted off Los Angeles. Other than this pod, which is known to have traveled to Mexico, no other identified California whales have ever been seen with such barnacles.

Of the 71 whales identified in Mexico, five whales matched to individuals sighted off San Diego, six off Los Angeles (LA Pod), and two off Monterey Bay (LA Pod) which represented the furthest northern match. There were 14 matches between western Baja and California, several of which include the LA Pod. Except for the LA Pod, no whales from Mexico have been seen further north than Orange County.

REFERENCES

Baird, R.W. and P.J. Stacey. 1988. Variation in saddle patch pigmentation in populations of killer whales *(Orcinus orca)* from British Columbia, Alaska, and Washington State. Can. J. Zool. 66:2582-2585.

Barlow, J. and T. Gerrodette. 1996. Abundance of cetaceans in California waters based on 1991 and 1993 ship surveys. U.S. Dep. Commer., NOAA Tech. Memo., NOAA-NMFS-SWFSC-233.

Dahlheim, M.E. 1997. A photographic catalog of killer whales *(Orcinus orca)* from the central Gulf of Alaska to the southeastern Bering Sea. In press.

Dahlheim, M.E., D.K. Ellifrit, and J.D. Swenson. 1997. Killer whales of southeast Alaska: A catalogue of photo-identified individuals. Day Moon Press, Seattle, WA. 72 pages plus Appendix.

Dahlheim, M.E., S. Leatherwood, and W.F. Perrin. 1982. Distribution of killer whales in the warm temperate and tropical eastern Pacific. Rep. Int. Whaling Comm. 32:647-653.

Ford, J.K.B., G.M. Ellis, and L.M. Nichol. 1992. Killer whales of the Queen Charlotte Islands. A preliminary study of the abundance, distribution, and population identity of *Orcinus orca* in the waters of Haida Gwaii. An unpublished report.

Ford, J.K.B., G.M. Ellis, K.C. Balcomb. 1994. Killer whales: The natural history and genealogy of *Orcinus orca* in British Columbia and Washington State. UBC Press, Vancouver, Univ. of Washington Press, Seattle.

Goley, P.D. and J.M. Straley. 1994. Attack on gray whales in Monterey Bay, California, by killer whales previously identified in Glacier Bay, Alaska. Can. J. Zool. 72:1528-1530.

Heise, K., G. Ellis, and C. Matkin. 1991. A catalogue of Prince William Sound killer whales. Published by North Gulf Oceanic Society, Homer, AK for the National Marine Mammal Laboratory, Seattle, WA.

Heyning, J.E. and M.E. Dahlheim. 1988. *Orcinus orca.* Mammalian Species 304:1-9.

Hoelzel, A.R., M.E. Dahlheim, and S.J. Stern. 1997. Genetic variation among killer whales *(Orcinus orca)* in the eastern North Pacific, and genetic differentiation between foraging specialists. Journal of Heredity. In press.

Jefferson, T.A., P.J. Stacey, and R.W. Baird. 1991. A review of killer whale interactions with other marine mammals: Predation to co-existence. Mammal Review 21:151-180.

Lyrholm, T. 1988. Photo-identification of individual killer whales *(Orcinus orca)* off the coast of Norway, 1983-1986. In: North Atlantic Killer Whales. Eds. J. Sigurjónsson and S. Leatherwood. Rit Fiskideildar (Journal of the Marine Institute Reykjavik) Vol. XI:89-94.

Sigurjónsson, J., T. Lyrholm, S. Leatherwood, E. Jónsson, and G. Vikingsson. 1988. Photo-identification of killer whales *(Orcinus orca)* off Iceland, 1981-1986. In: North Atlantic Killer Whales. Eds. J. Sigurjónsson and S. Leatherwood. Rit Fiskideildar (Journal of the Marine Institute Reykjavik) Vol. XI:99-114.

Walters, E.L., R.W. Baird, and T.J. Guenther. 1992. New killer whale "pod" discovered near Victoria. The Victoria Naturalist 49:7-8.

Table 1. Identified Killer Whales: Whale Number, Sex, Date, Location, Photographer.

All whales identified in California are given a CA designation. Any whale matched with another catalog has all known alternate whale numbers listed under the CA number. Alternate whale numbers beginning with two letters (i.e. AO) represent whales included in Dahlheim et al. 1997 (Killer Whales of Southeast Alaska). Alternate whale numbers beginning with a "T" or "O" represent "transient" and "offshore" type killer whales from the Pacific Northwest identified by G. Ellis (catalog in prep). This table is divided into five sections and corresponds to the order of the catalog photos: transient type whales, LA Pod, unknown type whales, offshore type whales (CA500 numbers), and whales identified only in Mexico (ME designation). CA and ME whale numbers are not consecutive as some numbers were eliminated due to duplicates or poor photo quality. * indicates a female with a closely associated calf. (SWFSC=Southwest Fisheries Science Center, NMML=National Marine Mammal Lab)

ID#	SEX	DATE	LOCATION	PHOTOGRAPHER
Transient Type Whales				
CA9	M	5/18/80	Santa Barbara	P. Howorth
		3/81	Santa Barbara	P. Howorth
		9/13/81	Monterey Bay	J. Scarff
		10/8/87	Monterey Bay	N. Black
		5/5/92	Monterey Bay	N. Black
				S. Cerchio
CA10	M	10/7/84	Monterey Bay	H. Clarke
		9/27/86	Monterey Bay	J. Stern
		10/23/86	Monterey Bay	S. Kruse
		10/8/87	Monterey Bay	N. Black
		4/18/88	Farallon Is.	C. Ewald
		8/23/95	Monterey Bay	N. Black
		11/3/96	Monterey Bay	N. Black
CA11	M	9/30/84	Monterey Bay	J. Swenson
				B. Goodhart
		9/27/86	Monterey Bay	J. Stern
		10/23/86	Monterey Bay	S. Kruse
		10/8/87	Monterey Bay	N. Black
		4/18/88	Farallon Is.	C. Ewald
		7/17/94	Cordell Banks	R. Stallcup
		8/23/95	Monterey Bay	N. Black
		11/3/96	Monterey Bay	N. Black
CA12	M	10/11/87	Monterey Bay	N. Black
		4/18/88	Farallon Is.	C. Ewald
		10/23/88	Farallon Is.	N. Brannigan
				M. Moran
		12/12/89	Monterey Bay	N. Black
		4/8/92	Monterey Bay	M. Graham
		10/17/92	Farallon Is.	R. Harris
		2/25/94	Monterey Bay	J. Elams
		5/10/94	Monterey Bay	N. Black
		9/9/94	Monterey Bay	N. Black
		9/12/94	Half Moon Bay	Cascadia
				J. Calambokidis
		9/13/94	Monterey Bay	N. Black
		2/19/95	Monterey Bay	N. Black
CA13	F?	10/11/87	Monterey Bay	N. Black
		12/12/89	Monterey Bay	N. Black
		9/9/94	Monterey Bay	E. Martin
CA14	M	10/11/87	Monterey Bay	N. Black
		4/18/88	Farallon Is.	C. Ewald
CA15	F?	10/26/87	Monterey Bay	N. Black
CA16	M	6/76	Anacapa Is.	S. Anderson
		9/13/81	Monterey Bay	J. Scarff
		10/26/87	Monterey Bay	N. Black
		11/15/87	Monterey Bay	N. Black

Table 1. (continued)

ID#	SEX	DATE	LOCATION	PHOTOGRAPHER
CA16 (cont)				R. Norden
				R. Hallowell
		10/20/89	North Channel Is.	P. Howorth
				L. Kepko
		4/27/90	Santa Barbara	M. Caywood
		9/15/90	Monterey Bay	M. Danzenbaker
		10/7/90	Monterey Bay	N. Black
				R. Branson
		11/12/90	Monterey Bay	N. Black
CA17	F	10/26/87	Monterey Bay	N. Black
		10/20/89	North Channel Is.	P. Howorth
				L. Kepko
		11/12/90	Monterey Bay	N. Black
		5/15/93	Monterey Bay	N. Black
				E. McMahan
		8/31/94*	Monterey Bay	N. Black
				T. Walmsley
		9/13/94*	Monterey Bay	N. Black
		2/3/95*	Monterey Bay	N. Black
				B. Elliott
		2/4/95*	Monterey Bay	D. Waples
CA18 AO11 T133	F?	10/26/87	Monterey Bay	N. Black
		10/23/88	Farallon Is.	N. Brannigan
				M. Moran
		8/6/89	Glacier Bay, AK	J. Straley
				NMML
		5/2/92	Monterey Bay	N. Black
CA20 AO10 T132	M	10/26/87	Monterey Bay	N. Black
		10/23/88	Farallon Is.	N. Brannigan
				M. Moran
		8/6/89	Glacier Bay, AK	J. Straley
				NMML
CA20 (cont)		5/2/92	Monterey Bay	N. Black
				D. Goley
		10/17/92	Farallon Is.	R. Harris
		5/15/93	Monterey Bay	N. Black
		5/10/94	Monterey Bay	N. Black
		9/9/94	Monterey Bay	N. Black
				E. Martin
		9/18/94	Monterey Bay	S. Yee
		7/26/95	20mi. W Olympic Pen., WA	Cascadia
				D. Ellifrit
CA21	F	10/8/87*	Monterey Bay	R. Branson
		10/26/87*	Monterey Bay	N. Black
		10/20/89*	North Channel Is.	P. Howorth
				L. Kepko
		1/26/97	Monterey Bay	R. Ternullo
		2/8/97	Monterey Bay	N. Black
		4/21/97	Monterey Bay	N. Black
CA22	M	11/2/86	Cordell Banks	R. Stallcup
		8/87	Santa Barbara	M/V Condor
		3/19/89	Monterey Bay	N. Black
				T. Jefferson
		11/12/90	Monterey Bay	N. Black
		10/9/92	Monterey Bay	J. Hardin
		10/10/95	Monterey Bay	N. Black
CA23	F	11/2/86	Cordell Banks	R. Stallcup
		10/26/87	Monterey Bay	N. Black
		1/89	Monterey Bay	D. Cheeseman
		3/19/89	Monterey Bay	N. Black
		5/2/92	Monterey Bay	N. Black
		5/5/92	Monterey Bay	N. Black
				S. Cerchio
		5/15/93	Monterey Bay	N. Black
		8/20/93	Monterey Bay	N. Black

Table 1. (continued)

ID#	SEX	DATE	LOCATION	PHOTOGRAPHER
CA23 (cont)		9/12/94	Half Moon Bay	Cascadia J. Calambokidis
		3/6/96	Monterey Bay	N. Black
CA24	M	11/12/90	Monterey Bay	N. Black
		4/27/92	Monterey Bay	S. Van Sommeran
		9/29/93	Monterey Bay	N. Black
		4/27/94	Santa Barbara	M/V Condor F. Benko
		5/28/94	Santa Barbara	M/V Condor R. Hart
		8/21/94	Santa Barbara	M/V Condor R. Hart
		9/4/94	Santa Barbara	M/V Condor R. Hart
		4/24/95	Monterey Bay	R. Ternullo
		9/2/96	Santa Barbara	M/V Condor R. Hart J. Sheldon
		9/17/96	Santa Barbara	M/V Condor R. Hart
		5/21/97	Monterey Bay	N. Black
CA25	M	1/28/85	Santa Barbara	M/V Condor F. Benko
		11/12/90	Monterey Bay	N. Black
		4/27/92	Monterey Bay	S. Van Sommeran
		9/29/93	Monterey Bay	N. Black
		4/27/94	Santa Barbara	M/V Condor F. Benko
		5/28/94	Santa Barbara	M/V Condor R. Hart
		9/2/96	Santa Barbara	M/V Condor R. Hart J. Sheldon
		9/17/96	Santa Barbara	M/V Condor
CA25 (cont)		5/21/97	Monterey Bay	R. Hart N. Black
		7/13/97	Port San Luis	Cascadia T. Chandler
CA26	F	10/2/82	Monterey Bay	S. Bailey
		9/8/91	Monterey Bay	S. Dean
		9/28/91	Monterey Bay	N. Black
		5/2/92	Monterey Bay	N. Black
		9/16/92	Farallon Is.	Cascadia J. Calambokidis
		5/28/94	Santa Barbara	M/V Condor R. Hart
		3/13/96	Monterey Bay	N. Black
		8/26/96	Monterey Bay	N. Black
		9/5/96	Monterey Bay	R. Ternullo
		12/1/96	Monterey Bay	R. Ternullo
		4/11/97	Monterey Bay	N. Black
CA27 AO13 T135	F	10/23/88	Farallon Is.	N. Brannigan M. Moran
		8/6/89	Glacier Bay, AK	J. Straley NMML
		5/2/92	Monterey Bay	N. Black D. Goley
		5/15/93	Monterey Bay	N. Black
		5/10/94*	Monterey Bay	N. Black
		9/9/94*	Monterey Bay	N. Black E. Martin
		9/18/94	Monterey Bay	S. Yee
		7/26/95	20mi. W. OlympicPen.,WA	Cascadia D. Ellifrit
CA28 T160	F?	5/2/92	Monterey Bay	N. Black D. Goley
		5/5/92	Monterey Bay	N. Black

Table 1. (continued)

ID#	SEX	DATE	LOCATION	PHOTOGRAPHER
CA28				S. Cerchio
(cont)		5/15/93	Monterey Bay	N. Black
		5/10/94	Monterey Bay	N. Black
		9/12/94	Half Moon Bay	Cascadia
				J. Calambokidis
		8/11/95	Tofino, B.C.	R. Palm
CA29	M	9/30/78	Monterey Bay	M. Webber
		10/2/82	Monterey Bay	S. Bailey
				J. Trochet
		9/5/83	Monterey Bay	F. Cipriano
		10/15/83	Monterey Bay	S. Bailey
		10/16/83	Monterey Bay	H. Clarke
				A. Small
		9/84	Monterey Bay	R. Jeffers
		10/12/85	Monterey Bay	J. Mariani
		1/18/91	Monterey Bay	via D. Shearwater
		9/1/91	Monterey Bay	M. Danzenbaker
				H. Clarke
		9/8/91	Monterey Bay	S. Dean
		9/28/91	Monterey Bay	N. Black
		5/2/92	Monterey Bay	N. Black
		9/11/92	Monterey Bay	T. Steurer
		9/16/92	Farallon Is.	Cascadia
				J. Calambokidis
		9/18/92	Monterey Bay	M. Fenner
		4/28/93	Monterey Bay	M. Graham
		3/13/96	Monterey Bay	N. Black
		3/30/96	Santa Barbara	H. Snyder
				M. Gay
		4/6/96	Monterey Bay	R. Ternullo
		8/26/96	Monterey Bay	N. Black
		9/5/96	Monterey Bay	R. Ternullo
		12/1/96	Monterey Bay	R. Ternullo
				J. Henderson
		4/11/97	Monterey Bay	N. Black
CA30	M	5/5/92	Monterey Bay	N. Black
				S. Cerchio
		1/13/94	Monterey Bay	D. Ratcliff
		1/26/94	Monterey Bay	B. Sexton
				D. Ratcliff
		8/17/94	Monterey Bay	N. Black
				G. Rowell
		10/10/95	Monterey Bay	N. Black
CA31	F?	11/2/86	Cordell Banks	R. Stallcup
CA32	F?	5/2/92	Monterey Bay	N. Black
		5/5/92	Monterey Bay	N. Black
				S. Cerchio
		10/23/92	Monterey Bay	N. Black
		8/20/93	Monterey Bay	N. Black
		9/9/94	Monterey Bay	E. Martin
CA33	F	9/6/82	Monterey Bay	S. Bailey
		5/5/92	Monterey Bay	N. Black
				S. Cerchio
		5/15/93	Monterey Bay	N. Black
		5/10/94	Monterey Bay	N. Black
		8/17/94	Monterey Bay	N. Black
				G. Rowell
		9/12/94	Half Moon Bay	Cascadia
				J. Calambokidis
CA34	M	1/20/89	Santa Cruz Is.	P. Feinblatt
		5/5/92	Monterey Bay	N. Black
				S. Cerchio
CA35	F?	5/2/92	Monterey Bay	N. Black
		5/5/92	Monterey Bay	N. Black
				S. Cerchio
		5/15/93	Monterey Bay	N. Black

Table 1. (continued)

ID#	SEX	DATE	LOCATION	PHOTOGRAPHER
CA35		5/10/94	Monterey Bay	N. Black
(cont)		9/12/94	Half Moon Bay	Cascadia
				J. Calambokidis
CA36	F?	5/5/92	Monterey Bay	N. Black
				S. Cerchio
		5/15/93	Monterey Bay	N. Black
		5/10/94	Monterey Bay	N. Black
		9/12/94	Half Moon Bay	Cascadia
				J. Calambokidis
CA37	M	8/12/91	Fort Bragg	NMFS(SWFSC)
				B. Taylor
				J. Barlow
CA38	F	9/6/82	Monterey Bay	S. Bailey
T161		10/23/88	Farallon Is.	N. Brannigan
				M. Moran
		5/2/92	Monterey Bay	N. Black
		5/5/92	Monterey Bay	N. Black
				S. Cerchio
		5/15/93	Monterey Bay	N. Black
		5/10/94	Monterey Bay	N. Black
		9/12/94	Half Moon Bay	Cascadia
				J. Calambokidis
		8/11/95	Tofino, B.C.	R. Palm
CA39	F	9/28/91	Monterey Bay	N. Black
		5/2/92	Monterey Bay	N. Black
		4/27/94	Santa Barbara	M/VCondor
				F. Benko
		10/10/95*	Monterey Bay	N. Black
		3/13/96*	Monterey Bay	N. Black
		4/11/97	Monterey Bay	N. Black
CA40	F	9/28/91*	Monterey Bay	N. Black
CA40		5/2/92*	Monterey Bay	N. Black
(cont)		10/10/95	Monterey Bay	N. Black
		4/11/97	Monterey Bay	N. Black
CA41	M	11/12/90	Monterey Bay	N. Black
		10/16/92	Monterey Bay	N. Black
		10/23/92	Monterey Bay	N. Black
		3/11/93	Monterey Bay	N. Black
		8/16/94	Monterey Bay	N. Black
		8/17/94	Monterey Bay	N. Black
				G. Rowell
		8/31/94	Monterey Bay	N. Black
				T. Walmsley
		10/10/95	Monterey Bay	N. Black
		3/6/96	Monterey Bay	N. Black
		4/11/97	Monterey Bay	N. Black
		5/31/97	Monterey Bay	N. Black
CA42	F?	11/12/90	Monterey Bay	N. Black
		10/16/92	Monterey Bay	N. Black
		10/23/92	Monterey Bay	N. Black
		3/11/93	Monterey Bay	N. Black
		8/20/93	Monterey Bay	N. Black
CA43	M	11/12/90	Monterey Bay	N. Black
		10/16/92	Monterey Bay	N. Black
		8/20/93	Monterey Bay	N. Black
		1/26/94	Monterey Bay	N. Black
		5/10/94	Monterey Bay	N. Black
		8/31/94	Monterey Bay	N. Black
				D. Clark
		9/4/94	Santa Barbara	N. Black
		3/13/96	Monterey Bay	M/V Condor
		8/27/96	Santa Barbara	F. Benko
				M/V Condor
		8/28/96	Santa Barbara	R. Hart

Table 1. (continued)

ID#	SEX	DATE	LOCATION	PHOTOGRAPHER
CA43		2/8/97	Monterey Bay	N. Black
(cont)		5/31/97	Monterey Bay	N. Black
CA44	F	10/23/92	Monterey Bay	N. Black
		3/11/93	Monterey Bay	N. Black
		8/16/94	Monterey Bay	N. Black
		8/17/94	Monterey Bay	N. Black
		8/31/94	Monterey Bay	N. Black
		8/26/96	Monterey Bay	N. Black
		4/11/97	Monterey Bay	N. Black
		5/31/97	Monterey Bay	N. Black
CA45	F?	10/23/92	Monterey Bay	N. Black
		3/11/93	Monterey Bay	N. Black
		8/16/94	Monterey Bay	N. Black
		8/17/94	Monterey Bay	N. Black
				G. Rowell
		3/16/96	Monterey Bay	N. Black
		8/26/96	Monterey Bay	N. Black
		4/11/97	Monterey Bay	N. Black
		5/31/97	Monterey Bay	N. Black
CA46	F?	10/23/92	Monterey Bay	N. Black
		3/11/93	Monterey Bay	N. Black
		8/16/94	Monterey Bay	N. Black
		8/17/94	Monterey Bay	N. Black
		8/26/96	Monterey Bay	N. Black
		4/11/97	Monterey Bay	N. Black
		5/31/97	Monterey Bay	N. Black
CA49	F	5/2/92	Monterey Bay	N. Black
		5/5/92	Monterey Bay	N. Black
				S. Cerchio
		5/15/93	Monterey Bay	N. Black
		5/10/94	Monterey Bay	N. Black
		9/9/94*	Monterey Bay	N. Black
CA49				E. Martin
(cont)		9/18/94*	Monterey Bay	S. Yee
		2/19/95	Monterey Bay	N. Black
		4/6/96	Monterey Bay	R. Ternullo
CA50	F	9/1/91	Monterey Bay	N. Black
		5/2/92	Monterey Bay	N. Black
		9/16/92	Farallon Is.	Cascadia
				J. Calambokidis
		9/3/93	Monterey Bay	E. Greaves
				M. Rauzon
		9/6/93	Monterey Bay	N. Black
		8/17/94	Monterey Bay	N. Black
				G. Rowell
		8/31/94	Monterey Bay	N. Black
				T. Walmsley
		2/3/95	Monterey Bay	N. Black
		8/27/95*	Monterey Bay	N. Black
		12/1/96	Monterey Bay	R. Ternullo
		4/11/97	Monterey Bay	N. Black
CA51	F	9/1/91	Monterey Bay	M. Danzenbaker
		9/8/91	Monterey Bay	S. Dean
		5/2/92	Monterey Bay	N. Black
		9/16/92	Farallon Is.	Cascadia
				J. Calambokidis
		10/23/92	Monterey Bay	N. Black
		9/3/93	Monterey Bay	E. Greaves
		9/6/93*	Monterey Bay	N. Black
		9/29/93	Monterey Bay	N. Black
		8/17/94	Monterey Bay	N. Black
		8/31/94	Monterey Bay	N. Black
				T. Walmsley
		2/3/95	Monterey Bay	N. Black
		8/27/95	Monterey Bay	N. Black
		12/1/96	Monterey Bay	R. Ternullo

Table 1. (continued)

ID#	SEX	DATE	LOCATION	PHOTOGRAPHER
CA52	M	4/26/92	Santa Barbara	T. Campbell
T129		7/11/92	Tofino, B.C.	R. Palm
		9/12/96	10mi. W Coos	NMFS(SWFSC)
			Bay, OR	K. Forney
				B. Smith
				Cascadia
				C. Alvarez
		2/8/97	Monterey Bay	N. Black
		4/21/97	Monterey Bay	N. Black
CA53	F?	5/2/92	Monterey Bay	N. Black
		9/16/92	Farallon Is.	Cascadia
				J. Calambokidis
		9/3/93	Monterey Bay	M. Rauzon
		9/6/93	Monterey Bay	N. Black
		9/29/93	Monterey Bay	N. Black
		8/17/94	Monterey Bay	N. Black
				G. Rowell
		8/31/94	Monterey Bay	N. Black
				T. Walmsley
		9/18/94	Monterey Bay	S. Yee
CA54	F?	10/26/87	Monterey Bay	N. Black
AO12		10/23/88	Farallon Is.	N. Brannigan
T134				M. Moran
		8/6/89	Glacier Bay, AK	J. Straley
				NMML
		5/2/92	Monterey Bay	N. Black
				D. Goley
		10/16/92	Monterey Bay	N. Black
		5/15/93	Monterey Bay	N. Black
		5/10/94	Monterey Bay	N. Black
CA55	M	9/30/79	Monterey Bay	via D. Shearwater
		9/22/82	Monterey Bay	via D. Shearwater
				D. Roberson
				S. Bailey
CA55		9/30/84	Monterey Bay	B. Goodhart
(cont)		10/7/84	Monterey Bay	H. Clarke
		10/29/84	Monterey Bay	A. Small
		10/4/85	Monterey Bay	A. Hopkins
		10/20/85	Monterey Bay	J. Mariani
		12/7/86	Monterey Bay	R. Wells
		11/15/87	Monterey Bay	N. Black
				R. Hallowell
		1/6/88	Monterey Bay	N. Black
		9/3/88	Monterey Bay	G. Lasley
		9/25/88	Monterey Bay	N. Black
		10/23/88	Farallon Is.	N. Brannigan
				M. Moran
		12/12/89	Monterey Bay	N. Black
		9/15/90	Monterey Bay	M. Danzenbaker
		4/20/91	Monterey Bay	N. Black
		5/4/91	Santa Barbara	M/V Condor
				F. Benko
CA56	F?	3/11/93	Monterey Bay	N. Black
		8/26/96	Monterey Bay	N. Black
CA57	F?	3/11/92	Monterey Bay	N. Black
		5/15/93	Monterey Bay	N. Black
		8/16/94	Monterey Bay	N. Black
		8/17/94	Monterey Bay	N. Black
		8/26/96	Monterey Bay	N. Black
CA58	F?	5/15/93	Monterey Bay	N. Black
CA59	M	4/26/92	Santa Barbara	T. Campbell
T130		7/11/92	Tofino, B.C.	R. Palm
		9/12/96	10mi. W Coos	NMFS(SWFSC)
			Bay, OR	K. Forney
				B. Smith

Table 1. (continued)

ID#	SEX	DATE	LOCATION	PHOTOGRAPHER
CA59 (cont)				Cascadia
				C. Alvarez
		2/8/97	Monterey Bay	N. Black
		4/21/97	Monterey Bay	N. Black
CA63	M	9/13/81	Monterey Bay	J. Scarff
		10/15/83	Monterey Bay	S. Bailey
CA68	M	4/18/88	Farallon Is.	C. Ewald
		8/5/91	Monterey Bay	NMFS(SWFSC)
				B. Taylor
		1/21/96	Monterey Bay	N. Black
		7/29/96	Farallon Is.	H. Genthe
		8/26/96	Monterey Bay	N. Black
		9/5/96	Monterey Bay	R. Ternullo
		4/11/97	Monterey Bay	N. Black
CA73 T159	M	1/16/83	Monterey Bay	B. Weed
		10/10/83	Monterey Bay	B. Basham
		9/12/94	Half Moon Bay	Cascadia
				J. Calambokidis
		2/12/95	Monterey Bay	N. Black
		2/13/95	Monterey Bay	N. Black
		8/25/95	Hippa Is. (Queen Charlotte Is.)	D. Rindle
CA79	M	1/28/89	Point Reyes	M.J. Schramm
		12/20/93	Monterey Bay	N. Black
		7/22/94	42mi. W Cape Flattery	NMFS(SWFSC)
				J. Cotton
		1/28/95	Monterey Bay	N. Black
				B. Elliott
				L. Osnes-Erie
		2/3/95	Monterey Bay	N. Black
CA80	M	1/16/82	Half Moon Bay	T. Johnson
		1/89	Monterey Bay	D. Cheeseman
CA80 (cont)		1/9/92	Monterey Bay	D. Graybost
		3/29/93	Monterey Bay	B. Southern
		3/6/97	Monterey Bay	N. Black
				R. Ternullo
		5/3/97	Monterey Bay	N. Black
CA93	M	9/30/84	Monterey Bay	J. Swenson
CA96	F?	5/18/80	Santa Barbara	P. Howorth
CA111	F?	11/12/90	Monterey Bay	N. Black
		5/10/94	Monterey Bay	N. Black
		3/13/96	Monterey Bay	N. Black
		2/8/97	Monterey Bay	N. Black
CA113	F?	5/10/94	Monterey Bay	N. Black
		1/21/96	Monterey Bay	N. Black
		3/13/96	Monterey Bay	N. Black
		2/8/97	Monterey Bay	N. Black
CA115	F?	1/28/95	Monterey Bay	N. Black
				B. Elliott
				L. Osnes-Erie
		2/3/95	Monterey Bay	N. Black
CA116	F?	2/3/95	Monterey Bay	N. Black
		8/27/95	Monterey Bay	N. Black
CA117	juv	2/3/95	Monterey Bay	N. Black
CA118	F?	2/3/95	Monterey Bay	N. Black
CA119	juv	2/3/95	Monterey Bay	N. Black
CA120	F?	12/20/93	Monterey Bay	N. Black
		2/3/95	Monterey Bay	N. Black

Table 1. (continued)

ID#	SEX	DATE	LOCATION	PHOTOGRAPHER
CA122 T164	F?	6/95	N Vancouver Is., B.C.	via G. Ellis
		9/13/96	Santa Barbara	M/V Condor R. Hart
CA125	F?	10/10/95	Monterey Bay	N. Black
		3/13/96	Monterey Bay	N. Black
CA126	F?	9/12/94	Cordell Banks	Cascadia J. Calambokidis
CA131	F?	8/26/96	Monterey Bay	N. Black
		4/11/97	Monterey Bay	N. Black
CA132	F?	8/26/96	Monterey Bay	N. Black
		4/11/97	Monterey Bay	N. Black
CA133	F?	8/26/96	Monterey Bay	N. Black
		4/11/97	Monterey Bay	N. Black
CA134	F?	8/26/96	Monterey Bay	N. Black
		4/11/97	Monterey Bay	N. Black
CA135	F?	8/26/96	Monterey Bay	N. Black
		9/5/96	Monterey Bay	R. Ternullo
CA136	F?	1/21/96	Monterey Bay	N. Black
		8/26/96	Monterey Bay	N. Black
		9/5/96	Monterey Bay	R. Ternullo
CA137	M	10/10/95	Monterey Bay	N. Black
		3/13/96	Monterey Bay	N. Black
		4/11/97	Monterey Bay	N. Black
CA138	F?	10/10/95	Monterey Bay	N. Black
		3/13/96	Monterey Bay	N. Black
CA140	F	10/10/95*	Monterey Bay	N. Black
		3/13/96	Monterey Bay	N. Black
		4/11/97	Monterey Bay	N. Black
CA142	F?	1/21/96	Monterey Bay	N. Black
		9/5/96	Monterey Bay	R. Ternullo
CA146	F?	9/5/96	Monterey Bay	R. Ternullo
CA147	F?	12/20/93	Monterey Bay	N. Black
CA148	M	8/26/96	Monterey Bay	N. Black
		4/11/97	Monterey Bay	N. Black
CA153	F?	4/27/94	Santa Barbara	M/V Condor F. Benko
		10/10/95	Monterey Bay	N. Black
		5/31/97	Monterey Bay	N. Black
CA154	F?	12/20/93	Monterey Bay	N. Black
CA155	F	10/10/83	Monterey Bay	B. Basham
		9/12/94	Farallon Is.	Cascadia J. Calambokidis
CA160	F?	12/1/96	Monterey Bay	R. Ternullo
		4/11/97	Monterey Bay	N. Black
CA163	F?	4/11/97	Monterey Bay	N. Black
CA165	M	4/21/97	Monterey Bay	N. Black
CA166	M	4/21/97	Monterey Bay	N. Black
CA167	juv	4/21/97	Monterey Bay	N. Black
CA169	F?	9/12/96	10mi. W Coos Bay, OR	NMFS(SWFSC) K. Forney Cascadia

Table 1. (continued)

ID#	SEX	DATE	LOCATION	PHOTOGRAPHER
CA169				C. Alvarez
(cont)		2/8/97	Monterey Bay	N. Black
		4/21/97	Monterey Bay	N. Black
CA170	F?	9/12/96	10mi. W Coos Bay, OR	NMFS(SWFSC) K. Forney Cascadia C. Alvarez
		2/8/97	Monterey Bay	N. Black
		4/21/97	Monterey Bay	N. Black
CA171	F?	2/8/97	Monterey Bay	N. Black
		4/21/97	Monterey Bay	N. Black
CA172	F?	9/12/96	10mi. W Coos Bay, OR	NMFS(SWFSC) K. Forney Cascadia C. Alvarez
		4/21/97	Monterey Bay	N. Black
CA173	F?	4/21/97	Monterey Bay	N. Black
CA174	F?	4/21/97	Monterey Bay	N. Black
CA175	F?	3/6/97	Monterey Bay	N. Black
CA176	F?	3/6/97	Monterey Bay	N. Black
CA177	F?	3/6/97	Monterey Bay	N. Black
CA178	juv	3/6/97	Monterey Bay	N. Black
CA179	M	5/21/97	Monterey Bay	N. Black
		7/13/97	Port San Luis	Cascadia T. Chandler
CA180	F?	5/21/97	Monterey Bay	N. Black
CA182	F?	5/31/97	Monterey Bay	N. Black
CA188	M	9/12/96	10mi. W Coos Bay, OR	NMFS(SWFSC) K. Forney Cascadia C. Alvarez
CA189	F?	9/12/96	10mi. W Coos Bay, OR	NMFS(SWFSC) K. Forney Cascadia C. Alvarez
CA193	M	9/12/96	10mi. W Coos Bay, OR	NMFS(SWFSC) K. Forney Cascadia C. Alvarez
CA194	F?	9/12/96	10mi. W Coos Bay, OR	NMFS(SWFSC) K. Forney Cascadia C. Alvarez
CA195	M	7/94	Olympic Pen., WA	Cascadia J. Calambokidis
		7/25/95	Olympic Pen., WA	Cascadia D. Ellifrit
		9/12/96	10mi. W Coos Bay, OR	Cascadia C. Alvarez
			LA Pod	
CA1	M	1/5/82	Los Angeles	B. Beebe
		1/12/83	Santa Barbara	S. Leatherwood S. Anderson
		1/29/84	Los Angeles	A. Schulman

Table 1. (continued)

ID#	SEX	DATE	LOCATION	PHOTOGRAPHER
CA1 (cont)		2/17/84	Los Angeles	T. Bacon
		12/14/84	Los Angeles	E. Martin
		3/23/85	Los Angeles	E. Martin
		4/10/85	San Diego	J. Roberts
		4/15/85	Los Angeles	A. Schulman
				E. Martin
		4/20/85	Los Angeles	C&J Paturzo
				J. Russo
		4/22/85	Los Angeles	B. Talbot
		10/28/85	Los Angeles	E. Martin
		2/5/86	Orange Co.	D. Beeninga
		3/28/86	Los Angeles	E. Martin
		11/20/86	San Diego	J. Hall
		3/17/87	Los Angeles	M. Swann
		9/2/87	Monterey Bay	N. Black
				R. Wells
		9/19/87	Monterey Bay	N. Black
		9/20/87	Monterey Bay	N. Black
		9/21/87	Monterey Bay	N. Black
		10/1/87	Monterey Bay	N. Black
		2/12/88	Orange Co.	D. Beeninga
		2/13/88	Los Angeles	A. Schulman
				E. Martin
				L. Aube
		3/16/88	Los Angeles	A. Balbinder
		3/26/88	San Benitos Is. MX	M. Webber
		9/24/88	Monterey Bay	N. Black
		3/24/89	Los Angeles	K. Bates
		3/8/90	Los Angeles	B. Weiss
		3/25/90	Los Angeles	D. Pohlson
				D. Whitehurst
		9/7/91	Santa Barbara	P. Howorth
CA2	F	1/5/82	Los Angeles	B. Beebe
		1/12/83	Santa Barbara	S. Leatherwood
				S. Anderson
		1/29/84	Los Angeles	A. Schulman
		4/10/85	San Diego	J. Roberts
		4/15/85	Los Angeles	A. Schulman
		10/28/85	Los Angeles	A. Schulman
		3/28/86	Los Angeles	E. Martin
		11/20/86	San Diego	J. Hall
		3/17/87	Los Angeles	M. Swann
		9/20/87	Monterey Bay	N. Black
		9/21/87	Monterey Bay	N. Black
		2/12/88	Orange Co.	D. Beeninga
		2/13/88	Los Angeles	A. Schulman
				E. Martin
				L. Aube
		3/16/88	Los Angeles	A. Balbinder
		3/26/88	San Benitos Is., MX	M. Webber
		9/24/88	Monterey Bay	N. Black
		3/25/90	Los Angeles	D. Whitehurst
		12/4/95	Santa Barbara	N. Fredrickson
CA3	M	1/5/82	Los Angeles	B. Beebe
		1/12/83	Santa Barbara	S. Leatherwood
				S. Anderson
		11/24/83	Orange Co.	P. Bryant
		1/29/84	Los Angeles	A. Schulman
		1/85	Canal de Ballenas, MX	A. Morgan
		3/16/85	Monterey Bay	R. Wells
		3/23/85	Los Angeles	V. Venette
		4/20/85	Los Angeles	J. Russo
		3/17/87	Los Angeles	M. Swann

Table 1. (continued)

ID#	SEX	DATE	LOCATION	PHOTOGRAPHER
CA169 (cont)		2/8/97 4/21/97	Monterey Bay Monterey Bay	C. Alvarez N. Black N. Black
CA170	F?	9/12/96	10mi. W Coos Bay, OR	NMFS(SWFSC) K. Forney Cascadia C. Alvarez
		2/8/97 4/21/97	Monterey Bay Monterey Bay	N. Black N. Black
CA171	F?	2/8/97 4/21/97	Monterey Bay Monterey Bay	N. Black N. Black
CA172	F?	9/12/96	10mi. W Coos Bay, OR	NMFS(SWFSC) K. Forney Cascadia C. Alvarez
		4/21/97	Monterey Bay	N. Black
CA173	F?	4/21/97	Monterey Bay	N. Black
CA174	F?	4/21/97	Monterey Bay	N. Black
CA175	F?	3/6/97	Monterey Bay	N. Black
CA176	F?	3/6/97	Monterey Bay	N. Black
CA177	F?	3/6/97	Monterey Bay	N. Black
CA178	juv	3/6/97	Monterey Bay	N. Black
CA179	M	5/21/97 7/13/97	Monterey Bay Port San Luis	N. Black Cascadia T. Chandler
CA180	F?	5/21/97	Monterey Bay	N. Black
CA182	F?	5/31/97	Monterey Bay	N. Black
CA188	M	9/12/96	10mi. W Coos Bay, OR	NMFS(SWFSC) K. Forney Cascadia C. Alvarez
CA189	F?	9/12/96	10mi. W Coos Bay, OR	NMFS(SWFSC) K. Forney Cascadia C. Alvarez
CA193	M	9/12/96	10mi. W Coos Bay, OR	NMFS(SWFSC) K. Forney Cascadia C. Alvarez
CA194	F?	9/12/96	10mi. W Coos Bay, OR	NMFS(SWFSC) K. Forney Cascadia C. Alvarez
CA195	M	7/94 7/25/95 9/12/96	Olympic Pen., WA Olympic Pen., WA 10mi. W Coos Bay, OR	Cascadia J. Calambokidis Cascadia D. Ellifrit Cascadia C. Alvarez
			LA Pod	
CA1	M	1/5/82 1/12/83 1/29/84	Los Angeles Santa Barbara Los Angeles	B. Beebe S. Leatherwood S. Anderson A. Schulman

Table 1. (continued)

ID#	SEX	DATE	LOCATION	PHOTOGRAPHER
CA1		2/17/84	Los Angeles	T. Bacon
(cont)		12/14/84	Los Angeles	E. Martin
		3/23/85	Los Angeles	E. Martin
		4/10/85	San Diego	J. Roberts
		4/15/85	Los Angeles	A. Schulman
				E. Martin
		4/20/85	Los Angeles	C&J Paturzo
				J. Russo
		4/22/85	Los Angeles	B. Talbot
		10/28/85	Los Angeles	E. Martin
		2/5/86	Orange Co.	D. Beeninga
		3/28/86	Los Angeles	E. Martin
		11/20/86	San Diego	J. Hall
		3/17/87	Los Angeles	M. Swann
		9/2/87	Monterey Bay	N. Black
				R. Wells
		9/19/87	Monterey Bay	N. Black
		9/20/87	Monterey Bay	N. Black
		9/21/87	Monterey Bay	N. Black
		10/1/87	Monterey Bay	N. Black
		2/12/88	Orange Co.	D. Beeninga
		2/13/88	Los Angeles	A. Schulman
				E. Martin
				L. Aube
		3/16/88	Los Angeles	A. Balbinder
		3/26/88	San Benitos Is. MX	M. Webber
		9/24/88	Monterey Bay	N. Black
		3/24/89	Los Angeles	K. Bates
		3/8/90	Los Angeles	B. Weiss
		3/25/90	Los Angeles	D. Pohlson
				D. Whitehurst
		9/7/91	Santa Barbara	P. Howorth

ID#	SEX	DATE	LOCATION	PHOTOGRAPHER
CA2	F	1/5/82	Los Angeles	B. Beebe
		1/12/83	Santa Barbara	S. Leatherwood
				S. Anderson
		1/29/84	Los Angeles	A. Schulman
		4/10/85	San Diego	J. Roberts
		4/15/85	Los Angeles	A. Schulman
		10/28/85	Los Angeles	A. Schulman
		3/28/86	Los Angeles	E. Martin
		11/20/86	San Diego	J. Hall
		3/17/87	Los Angeles	M. Swann
		9/20/87	Monterey Bay	N. Black
		9/21/87	Monterey Bay	N. Black
		2/12/88	Orange Co.	D. Beeninga
		2/13/88	Los Angeles	A. Schulman
				E. Martin
				L. Aube
		3/16/88	Los Angeles	A. Balbinder
		3/26/88	San Benitos Is., MX	M. Webber
		9/24/88	Monterey Bay	N. Black
		3/25/90	Los Angeles	D. Whitehurst
		12/4/95	Santa Barbara	N. Fredrickson
CA3	M	1/5/82	Los Angeles	B. Beebe
		1/12/83	Santa Barbara	S. Leatherwood
				S. Anderson
		11/24/83	Orange Co.	P. Bryant
		1/29/84	Los Angeles	A. Schulman
		1/85	Canal de Ballenas, MX	A. Morgan
		3/16/85	Monterey Bay	R. Wells
		3/23/85	Los Angeles	V. Venette
		4/20/85	Los Angeles	J. Russo
		3/17/87	Los Angeles	M. Swann

Table 1. (continued)

ID#	SEX	DATE	LOCATION	PHOTOGRAPHER
CA3		6/10/87	Cedros Is., MX	T. Johnson
(cont)		9/20/87	Monterey Bay	M. Danzenbaker
		9/21/87	Monterey Bay	N. Black
		2/13/88	Los Angeles	A. Schulman
				E. Martin
				L. Aube
		2/19/88	Orange Co.	G. Hoffman
		3/16/88	Los Angeles	D. Salyer
		3/26/88	San Benitos Is., MX	M. Webber
		9/24/88	Monterey Bay	N. Black
		10/2/88	San Miguel Is. (Channel Is.)	P. Howorth
		3/24/89	Los Angeles	K. Bates
		3/8/90	Los Angeles	B. Weiss
		3/15/90	San Martin Is., MX	J. Roberts
		9/7/91	Santa Barbara	P. Howorth
		12/4/95	Santa Barbara	N. Fredrickson
		1/20/96	Orange Co.	D. Beeninga
CA4	F	1/5/82	Los Angeles	D. Beebe
		1/12/83	Santa Barbara	S. Leatherwood
				S. Anderson
		1/29/84	Los Angeles	A. Schulman
		2/17/84	Los Angeles	T. Bacon
		12/14/84	Los Angeles	E. Martin
		3/23/85	Los Angeles	A. Schulman
				E. Martin
		4/10/85	San Diego	J. Roberts
		4/15/85	Los Angeles	A. Schulman
				E. Martin
		10/28/85	Los Angeles	A. Schulman
				E. Martin
		3/28/86	Los Angeles	E. Martin
CA4		11/20/86	San Diego	J. Hall
(cont)		9/20/87	Monterey Bay	N. Black
		2/13/88	Los Angeles	A. Schulman
				E. Martin
		9/24/88	Monterey Bay	N. Black
		10/2/88	San Miguel Is. (Channel Is.)	P. Howorth
		3/8/90	Los Angeles	B. Weiss
		4/27/94	Santa Barbara	M/V Condor
				F. Benko
CA5	F?	1/12/83	Santa Barbara	S. Leatherwood
		1/29/84	Los Angeles	A. Schulman
		3/23/85	Los Angeles	P. Miller
		4/15/85	Los Angeles	A. Schulman
				E. Martin
		11/20/86	San Diego	J. Hall
		9/20/87	Monterey Bay	N. Black
		9/21/87	Monterey Bay	N. Black
		2/13/88	Los Angeles	A. Schulman
				E. Martin
				L. Aube
CA6	F	1/29/84	Los Angeles	A. Schulman
				B. Spellman
		3/23/85	Los Angeles	V. Venette
		4/10/85	San Diego	J. Roberts
		4/15/85	Los Angeles	A. Schulman
				E. Martin
		10/28/85	Los Angeles	E. Martin
		3/28/86	Los Angeles	E. Martin
		11/20/86	San Diego	J. Hall
		3/17/87	Los Angeles	M. Swann
		9/20/87	Monterey Bay	N. Black
		9/21/87	Monterey Bay	S. Bailey
		2/13/88	Los Angeles	A. Schulman

Table 1. (continued)

ID#	SEX	DATE	LOCATION	PHOTOGRAPHER
CA6				E. Martin
(cont)		9/24/88	Monterey Bay	N. Black
		12/4/95	Santa Barbara	N. Fredrickson
CA7	F?	1/85	Canal de Ballenas, MX	A. Morgan
		9/21/87	Monterey Bay	S. Bailey N. Black
		2/13/88	Los Angeles	A. Schulman E. Martin L. Aube
		3/26/88	San Benitos Is., MX	M. Webber
CA8	M	1/29/84	Los Angeles	A. Schulman
		4/20/85	Los Angeles	J. Russo C&J Paturzo
		3/28/86	Los Angeles	E. Martin
		9/20/87	Monterey Bay	N. Black
		10/1/87	Monterey Bay	N. Black
		2/12/88	Orange Co.	M. Godfrey
		2/13/88	Los Angeles	A. Schulman E. Martin L. Aube
		2/19/88	Orange Co.	G. Hoffman
		3/26/88	San Benitos Is., MX	M. Webber
		9/24/88	Monterey Bay	N. Black
CA65	F?	1/29/84	Los Angeles	A. Schulman
		1/85	Canal de Ballenas, MX	A. Morgan
		3/23/85	Los Angeles	E. Martin
		4/15/85	Los Angeles	A. Schulman
		3/28/86	Los Angeles	E. Martin
CA65		11/20/86	San Diego	J. Hall
(cont)		2/13/88	Los Angeles	A. Schulman E. Martin L. Aube
		3/26/88	San Benitos Is., MX	M. Webber
		3/15/90	San Martin Is., MX	J. Roberts
CA66	F?	1/29/84	Los Angeles	A. Schulman
		1/85	Canal de Ballenas, MX	A. Morgan
		4/15/85	Los Angeles	A. Schulman E. Martin
		3/28/86	Los Angeles	E. Martin
		2/13/88	Los Angeles	A. Schulman E. Martin L. Aube
		2/19/88	Orange Co.	G. Hoffman
		3/26/88	San Benitos Is., MX	M. Webber
CA67	F?	4/15/85	Los Angeles	A. Schulman E. Martin
		2/13/88	Los Angeles	A. Schulman
CA69	F?	1/12/83	Santa Barbara	S. Leatherwood S. Anderson
		2/13/88	Los Angeles	A. Schulman
CA90	F?	1/12/83	Santa Barbara	S. Leatherwood S. Anderson
		1/85	Canal de Ballenas, MX	A. Morgan
		3/26/88	San Benitos Is., MX	M. Webber

Table 1. (continued)

ID#	SEX	DATE	LOCATION	PHOTOGRAPHER
			Unknown Type Whales	
CA60	M	9/20/80	Humbolt Co.	E. McCoy
		10/6/85	Monterey Bay	E. Greaves
				D. Shaw
				R. Stallcup
		9/88	Monterey Bay	via D. Shearwater
		6/18/92	Monterey Bay	T. Vadon
		10/18/92	Humbolt Co.	M. Fowler
CA61	F?	7/2/79	San Diego	A. Baldridge
CA64	M	2/18/78	Orange Co.	D. Roberts
		10/78	Islas de Los Coronados, MX	M. Snyderman
		2/13/79	Orange Co.	R. Charter
		4/25/80	Orange Co.	M. LaFata
CA70	M	3/8/82	Orange Co.	D. Beeninga
		6/10/82	Orange Co.	S/P Neal
		7/11/82	San Diego	T. Ljungblad
		8/21/85	Canal de Ballenas, MX	Tershy/Strong
		8/29/85	Canal de Ballenas, MX	Tershy/Strong
		9/26/85	Canal de Ballenas, MX	Tershy/Strong
		3/18/86	Loreto, MX	MICS/R. Sears
		3/17/87	Loreto, MX	MICS/R. Sears
		3/28/88	Canal de Ballenas, MX	D. Croll
		3/5/92	Loreto, MX	MICS/R. Sears
		6/28/93	La Paz Bay, MX	L. Enriquez
		4/95	La Paz Bay, MX	D. Croll
CA70 (cont)		12/6/96	Isla San Jose, MX	P/G Pedersen
CA71	M	2/14/82	Islas de Los Coronados, MX	W. Stephen
		3/8/82	Orange Co.	D. Beeninga
		7/11/82	San Diego	T. Ljungblad
		10/17/95	Loreto, MX	NMFS(SWFSC)
CA72	M	9/15/86	Farallon Is.	Cascadia
				J. Calambokidis
CA74	F?	9/15/86	Farallon Is.	Cascadia
				J. Calambokidis
CA76	M	10/11/88	Cape Mendocino	K. Balcomb
				D. Claridge
CA77	F?	10/11/88	Cape Mendocino	K. Balcomb
				D. Claridge
CA87	M	2/14/82	Islas de Los Coronados, MX	T. Ljungblad
				W. Stephen
		3/8/82	Orange Co.	D. Beeninga
		6/10/82	Orange Co.	S/P Neal
		7/11/82	San Diego	T. Ljungblad
CA88	F?	2/14/82	Islas de Los Coronados, MX	T. Ljungblad
				W. Stephen
		3/8/82	Orange Co.	D. Beeninga
		7/11/82	San Diego	T. Ljungblad
		8/21/85	Canal de Ballenas, MX	Tershy/Strong
		8/29/85	Canal de Ballenas, MX	Tershy/Strong
		3/18/86	Loreto, MX	MICS/R. Sears
		3/5/92	Loreto, MX	MICS/R. Sears

Table 1. (continued)

ID#	SEX	DATE	LOCATION	PHOTOGRAPHER
CA89	F?	7/11/82	San Diego	T. Ljungblad
		3/21/85	Loreto, MX	MICS/R. Sears
		8/21/85	Canal de Ballenas, MX	Tershy/Strong
		8/29/85	Canal de Ballenas, MX	Tershy/Strong
		3/28/88	Canal de Ballenas, MX	D. Croll
CA94	M	4/23/90	Catalina Is.	M. Caywood
CA95	F	4/23/90*	Catalina Is.	M. Caywood
CA105	M	9/88	Monterey Bay	R. Branson
CA106	F?	9/88	Monterey Bay	R. Branson
CA107	M	7/31/94	Monterey Bay	N. Black
CA108	F?	7/31/94	Monterey Bay	N. Black
CA110	F?	10/31/93	Monterey Bay	N. Black
CA127	F?	11/4/91	200mi. W San Francisco	NMFS(SWFSC) P. Wade S. Benson
CA128	F?	11/4/91	200mi. W San Francisco	NMFS(SWFSC) P. Wade
		11/25/95	Pt. Conception	B. Alps
CA129	F?	11/4/91	200mi. W San Francisco	NMFS(SWFSC) S. Benson
CA130	M	8/12/91	104mi. W Fort Bragg	NMFS(SWFSC) J. Cotton
CA149	M	9/27/94	Monterey Bay	J. Harvey T. Norris K. Raum-Suryan
CA150	F?	9/27/94	Monterey Bay	J. Harvey T. Norris K. Raum-Suryan
CA151	F?	11/25/95	Pt. Conception	B. Alps K. Penland
CA152	F?	10/20/89	Santa Barbara	P. Howorth
CA156	M	11/25/95	Pt. Conception	B. Alps K. Penland
CA157	F?	11/25/95	Pt. Conception	B. Alps K. Penland
CA158	F?	4/23/90	Catalina Is.	M. Caywood
CA159	M	5/15/94	Ft. Bragg	R. LeValley
CA184	M?	4/12/97	1550mi. W CA	NMFS(SWFSC) J. Cotton
CA185	M	10/12/96	Monterey Bay	R. Saldino
CA186	F?	10/9/96	Pt. Conception	NMFS(SWFSC) B. Smith Cascadia C. Alvarez
CA187	F?	8/26/96	180mi. NW Eureka	NMFS(SWFSC) B. Smith
CA190	M	10/9/96	Pt. Conception	Cascadia D. Ellifrit

Table 1. (continued)

ID#	SEX	DATE	LOCATION	PHOTOGRAPHER
CA191	F?	10/9/96	Pt. Conception	Cascadia D. Ellifrit

Offshore Type Whales

ID#	SEX	DATE	LOCATION	PHOTOGRAPHER
CA500 O153	M	4/16/94	Johnstone Strait (Vancouver Is., B.C.)	J. Borrowman
		2/11/95	Los Angeles	B. Alps T. Marinan A. Schulman
		7/17/95	Langara Is. (Queen Charlotte Is., B.C.)	G. Ellis
		3/15/96	Monterey Bay	N. Black
		3/29/96	Los Angeles	C. Roetzel
CA501	M	2/11/95	Los Angeles	K. Hicks C. Roetzel
CA502 O150	F?	9/8/89	Vancouver Is., B.C.	J. Darling
		2/11/95	Los Angeles	B. Alps A. Schulman
		7/17/95	Langara Is. (Queen Charlotte Is., B.C.)	G. Ellis
CA503	F?	2/11/95	Los Angeles	B. Alps A. Schulman
		3/15/96	Monterey Bay	N. Black
CA504	F?	2/11/95	Los Angeles	B. Alps A. Schulman
CA505	F?	2/11/95	Los Angeles	B. Alps A. Schulman
		3/29/96	Los Angeles	C. Roetzel
CA506	F?	2/11/95	Los Angeles	B. Alps A. Schulman
CA507	F?	2/11/95	Los Angeles	B. Alps A. Schulman
		3/15/96	Monterey Bay	N. Black
CA508 O128	F?	2/11/95	Los Angeles	B. Alps
		7/17/95	Langara Is. (Queen Charlotte Is., B.C.)	G. Ellis
		8/25/95	Port Hardy, B.C. (Vancouver Is.)	G. Ellis
CA509	F?	2/11/95	Los Angeles	B. Alps K. Hicks A. Schulman
CA510 O127	F?	2/11/95	Los Angeles	B. Alps A. Schulman
		7/17/95	Langara Is. (Queen Charlotte Is., B.C.)	G. Ellis
		8/25/95	Port Hardy, B.C. (Vancouver Is.)	G. Ellis
CA511	F?	2/11/95	Los Angeles	B. Alps A. Schulman
CA512	F?	2/11/95	Los Angeles	B. Alps A. Schulman
CA513	F?	2/11/95	Los Angeles	K. Hicks

Table 1. (continued)

ID#	SEX	DATE	LOCATION	PHOTOGRAPHER
CA514 O119	F?	8/1/93	Queen Charlotte Strait (Queen Charlotte Is, B.C.)	A. Morton
		2/10/95	Los Angeles	R. Porter
		2/11/95	Los Angeles	K. Hicks
CA515	F?	2/10/95	Los Angeles	Dunlap/Johnson
CA516 O143	F?	2/11/95	Los Angeles	E. Martin
		8/25/95	Port Hardy, B.C. (Vancouver Is.)	K. Heise G. Ellis
		3/15/96	Monterey Bay	N. Black
CA517	M	2/10/95	Los Angeles	R. Porter
		2/11/95	Los Angeles	E. Martin
		3/15/96	Monterey Bay	N. Black
CA518 (44L)	F	9/6/92	Victoria, B.C.	A. van Ginneken
		2/10/95*	Los Angeles	Dunlap/Johnson
		2/11/95*	Los Angeles	P. Strassman
CA519	M	2/11/95	Los Angeles	E. Martin
CA520	F?	2/11/95	Los Angeles	E. Martin
CA521	F?	2/10/95	Los Angeles	Dunlap/Johnson
		2/11/95	Los Angeles	E. Martin
CA522	F?	2/10/95	Los Angeles	Dunlap/Johnson R. Porter
		3/29/96	Los Angeles	C. Roetzel
CA523	M	2/6/93	Pt. Conception	M. Taylor
CA524	M	2/6/93	Pt. Conception	M. Taylor
CA525 O123	M?	2/6/93	Pt. Conception	M. Taylor
		8/1/93	Queen Charlotte Strait, (Queen Charlotte Is, B.C.)	A. Morton
		2/10/95	Los Angeles	Dunlap/Johnson R. Porter
		2/11/95	Los Angeles	E. Martin
CA526	M?	2/6/93	Pt. Conception	M. Taylor
		2/11/95	Los Angeles	E. Martin
CA527	F?	2/6/93	Pt. Conception	M. Taylor
CA528	F?	2/6/93	Pt. Conception	M. Taylor
CA529 O3	F	7/17/91	Langara Is. (Queen Charlotte Is., B.C.)	J. Ford
		9/7/94*	Farallon Is.	Cascadia J. Calambokidis
		1/18/95*	Monterey Bay	N. Black
		2/11/95*	Los Angeles	M. Jasper E. Martin A. Schulman
		2/20/95	Monterey Bay	D. Waples
		1/29/96*	Los Angeles	E. Martin
CA530	juv	9/7/94	Farallon Is.	Cascadia J. Calambokidis
		1/18/95	Monterey Bay	N. Black
		1/29/96	Los Angeles	E. Martin
		2/11/95	Los Angeles	M. Jasper E. Martin A. Schulman

Table 1. (continued)

ID#	SEX	DATE	LOCATION	PHOTOGRAPHER
CA531 O4	M	7/17/91	Langara Is. (Queen Charlotte Is., B.C.)	J. Ford
		8/10/92	La Perouse Bank (Queen Charlotte Is., B.C.)	P. Bloedel
		9/7/94	Farallon Is.	Cascadia J. Calambokidis
		1/18/95	Monterey Bay	N. Black
		2/11/95	Los Angeles	K. Cody E. Martin A. Schulman
		1/29/96	Los Angeles	E. Martin
		9/10/96	210mi. W Coos Bay, OR	NMFS(SWFSC) B. Smith Cascadia C. Alvarez
CA532 O5	F?	7/17/91	Langara Is. (Queen Charlotte Is., B.C.)	J. Ford
		9/7/94	Farallon Is.	Cascadia J. Calambokidis
		1/29/96	Los Angeles	E. Martin
CA533 O7	M	7/17/91	Langara Is. (Queen Charlotte Is., B.C.)	J. Ford
		9/7/94	Farallon Is.	Cascadia J. Calambokidis
		1/13/96	Los Angeles	S. Ritman
CA534	F?	1/18/95	Monterey Bay	N. Black
		1/13/96	Los Angeles	S. Ritman
CA535 O8	M	7/17/91	Langara Is. (Queen Charlotte Is., B.C.)	J. Ford
		2/11/95	Los Angeles	M. Jasper A. Schulman E. Martin
		1/29/96	Los Angeles	E. Martin
CA536 AP27 O101	M	9/6/92	Victoria, B.C.	D. Claridge
		6/13/93	Clarence Strait, AK	NMML J. Swenson
		8/9/93	Port Hardy, B.C. (Vancouver Is.)	G. Ellis
		2/20/95	Monterey Bay	D. Waples
CA537 AP7 O152	F?	9/8/89	Icy Strait, AK	D. Matkin NMML
		7/17/91	Langara Is. (Queen Charlotte Is., B.C.)	G. Ellis
		2/20/95	Monterey Bay	D. Waples
CA538	F?	9/7/94	Farallon Is.	Cascadia J. Calambokidis
CA539	M	1/28/95	Santa Barbara Is.	E. Martin
		10/19/95	Monterey Bay	N. Black
		9/10/96	210mi. W Coos Bay, OR	NMFS(SWFSC) K. Forney
CA540	M	1/28/95	Santa Barbara Is.	E. Martin
CA541	F?	1/28/95	Santa Barbara Is.	E. Martin
CA542	F?	1/28/95	Santa Barbara Is.	E. Martin
		3/29/96	Los Angeles	C. Roetzel
CA543	F?	1/28/95	Santa Barbara Is.	E. Martin

Table 1. (continued)

ID#	SEX	DATE	LOCATION	PHOTOGRAPHER
CA544	F?	1/28/95	Santa Barbara Is.	E. Martin
CA545	M	9/2/94	Monterey Bay	A. Schulman N. Black
CA546 O144	M	9/2/94	Monterey Bay	A. Schulman N. Black
		8/25/95	Port Hardy, B.C. (Vancouver Is.)	G. Ellis
CA547	F?	9/2/94	Monterey Bay	A. Schulman N. Black
CA548	F?	9/2/94	Monterey Bay	A. Schulman N. Black
CA549 O135	F?	9/2/94	Monterey Bay	A. Schulman N. Black
		8/25/95	Port Hardy, B.C. (Vancouver Is.)	G. Ellis
CA550 O96	F?	9/6/92	Victoria, B.C.	A. van Ginneken
		7/29/93	Langara Is. (Queen Charlotte Is., B.C.)	G. Ellis
		9/16/93	Queen Charlotte Is.,B.C.	via G. Ellis
		2/20/95	Monterey Bay	D. Waples
		1/29/96	Los Angeles	E. Martin
CA551 O145	F?	9/2/94	Monterey Bay	A. Schulman N. Black
		8/25/95	Port Hardy, B.C. (Vancouver Is.)	G. Ellis
CA552	F?	10/19/95	Monterey Bay	N. Black
CA553 AP26 O100	F?	5/25/90	Queen Charlotte Is., B.C.	R. Burke
		9/6/92	Victoria, B.C.	D. Ellifrit
		6/13/93	Clarence Strait, AK	NMML J. Swenson
		8/1/93	Queen Charlotte Strait, B.C.	G. Ellis
		2/20/95	Monterey Bay	D. Waples
CA554	M	2/19/95	Monterey Bay	J. Ames
CA555	F?	3/15/96	Monterey Bay	N. Black

Mexican Whales

ME9	F?	1/85	Canal de Ballenas	A. Morgan
ME11	F?	5/26/87	La Paz Bay	A. Acevedo
ME12	F?	4/7/84	Canal de Ballenas	Tershy/Strong
		5/4/84	Canal de Ballenas	Tershy/Strong
		6/20/84	Canal de Ballenas	Tershy/Strong
		9/26/85	Canal de Ballenas	Tershy/Strong
		10/17/85	Loreto	NMFS(SWFSC)
		3/2/86	Canal de Ballenas	Tershy/Strong
		5/26/87	La Paz Bay	A. Acevedo
		3/89	Isla Espiritu Santo	S. Wick
		10/17/89	Loreto	NMFS(SWFSC)
		3/17/95	Aqua Verde, Isla San Jose	P. Folkens
ME13	F?	5/26/87	La Paz Bay	A. Acevedo
ME16	M	2/23/89	Isla Socorro	J. Jacobsen
		3/25/97	Isla Socorro	J. Jacobsen

Table 1. (continued)

ID#	SEX	DATE	LOCATION	PHOTOGRAPHER
ME17	F?	2/23/89	Isla Socorro	J. Jacobsen
		3/25/97	Isla Socorro	J. Jacobsen
ME18	M	3/25/97	Isla Socorro	J. Jacobsen
ME19	F?	3/25/97	Isla Socorro	J. Jacobsen
ME20	M	2/19/90	Isla Isabel	C. Alvarez N.L. Anaya I. Calixto
ME21	M	2/19/90	Isla Isabel	C. Alvarez N.L. Anaya I. Calixto
ME29	F?	4/6/89	Loreto	S. Chavez
ME31	F?	4/6/89	Loreto	T. Norris S. Chavez
ME33	M	2/25/92	La Paz Bay	J. Sanchez S. Chavez
ME36	M	12/82	Canal de Ballenas	D. Honkola
		1/19/86	Canal de Ballenas	Tershy/Strong
		8/86	Canal de Ballenas	G. Meyer
		9/90	Canal de Ballenas	G. Meyer
		5/24/91	La Paz Bay	J. Sanchez
		3/5/92	Loreto	MICS/R. Sears
		6/22/92	Canal de Ballenas	O. Janiger
		10/92	Canal de Ballenas	G. Meyer
		9/23/94	La Paz Bay	J.C. Salinas
		3/17/95	Aqua Verde, Isla San Jose	P. Folkens
		9/13/95	La Paz Bay	NMFS(SWFSC) S. Chavez
ME37	F?	1/19/86	Canal de Ballenas	Tershy/Strong
		5/24/91	La Paz Bay	J. Sanchez
		10/91	Canal de Ballenas	G. Meyer
		8/13/93	La Paz Bay	R. Valles J. Sanchez
		9/23/94	La Paz Bay	J.C. Salinas
ME38	F?	9/20/85	Canal de Ballenas	Tershy/Strong
		3/17/95	Aqua Verde, Isla San Jose	P. Folkens
		9/13/95	La Paz Bay	NMFS(SWFSC) S. Chavez
ME39	F?	9/13/95	La Paz Bay	NMFS(SWFSC) S. Chavez
ME40	M	3/17/87	Loreto	MICS/R. Sears
		10/91	La Paz Bay	S. Sanchez
		2/93	Magdalena Bay	P. Folkens
		8/13/93	La Paz Bay	R. Valles J. Sanchez
ME41	M	7/9/85	Canal de Ballenas	Tershy/Strong
		1/26/88	Canal de Ballenas	D. Breese
		5/88	Isla San Pedro	S. Wick
		7/19/88	Canal de Ballenas	M.C. Garcia
		10/22/92	La Paz Bay	A. Jaramillo
		8/13/93	La Paz Bay	R. Valles J. Sanchez
ME42	F?	5/91	La Paz Bay	SFS/J. Urban
		2/25/92	La Paz Bay	J. Sanchez S. Chavez
		Sum 93	La Paz Bay	J.C. Salinas
ME45	M	10/22/92	La Paz Bay	A. Jaramillo

Table 1. (continued)

ID#	SEX	DATE	LOCATION	PHOTOGRAPHER
ME47	M	6/10/83	Canal de Ballenas	Tershy/Strong
		3/13/84	Loreto	G. James
		5/4/84	Canal de Ballenas	Tershy/Strong
		6/20/84	Canal de Ballenas	Tershy/Strong
		1/85	Canal de Ballenas	F. Murphy
		9/26/85	Canal de Ballenas	Tershy/Strong
		3/2/86	Canal de Ballenas	Tershy/Strong
		1/26/88	Canal de Ballenas	D. Breese
		3/91	Loreto	MICS/R. Sears
		6/28/93	La Paz Bay	L. Enriquez
		9/23/93	Isla Cedros	NMFS(SWFSC) J. Quan
ME48	F?	6/28/93	La Paz Bay	L. Enriquez
		9/23/93	Isla Cedros	NMFS(SWFSC) J. Quan
ME49	M	10/27/93	Punta Eugenia	NMFS(SWFSC) W. Armstrong
		3/94	La Paz Bay	J. Ketchum
		4/7/94	Loreto	D. Gendron
ME51	F?	4/7/94	Loreto	D. Gendron
ME52	M	2/25/95	Loreto	D. Gendron R. Valles
		7/4/96	Canal de Ballenas	D. Croll
ME53	F	1/30/86	Canal de Ballenas	D. Croll
		3/2/86	Canal de Ballenas	Tershy/Strong
		4/6/89	Loreto	T. Norris
		3/91*	Loreto	MICS/R. Sears
		2/25/95	Loreto	D. Gendron R. Valles
ME54	F?	1/30/86	Canal de Ballenas	D. Croll D. Gendron
ME54 (cont)		3/27/97	San Jose Channel	R. Valles S. Anderson
ME56	F?	1/30/86	Canal de Ballenas	D. Croll
		2/25/95	Loreto	D. Gendron R. Valles
		3/27/97	San Jose Channel	S. Anderson
ME57	F?	5/20/95	La Paz Bay	L. Enriquez E. Vazquez
ME61	M?	10/21/95	Loreto	NMFS(SWFSC)
ME62	F?	10/21/95	Loreto	NMFS(SWFSC)
ME63	M	10/21/95	Loreto	NMFS(SWFSC)
ME65	F?	10/17/95	Loreto	NMFS(SWFSC)
ME66	F?	10/17/95	Loreto	NMFS(SWFSC)
ME67	F?	10/17/95	Loreto	NMFS(SWFSC)
ME72	M	6/28/93	La Paz Bay	L. Enriquez J. Sanchez
		8/13/93	La Paz Bay	J. Sanchez
		9/13/95	La Paz Bay	S. Chavez
ME73	M	4/30/96	Cabo Corrientes	R. Moncada
ME74	M	4/30/96	Cabo Corrientes	R. Moncada
ME75	F?	4/8/87	N Sea of Cortez	G. Silber
		4/30/96	Cabo Corrientes	R. Moncada
ME76	M	10/17/90	Mexiquillo, Michoacan	D. Perrine

Table 1. (continued)

ID#	SEX	DATE	LOCATION	PHOTOGRAPHER
ME77	M	4/4/88 7/5/94	Magdalena Bay La Paz Bay	MICS/R. Sears J.C. Salinas J. Sanchez
ME78	F?	7/5/94	La Paz Bay	J.C. Salinas J. Sanchez
ME81	F?	1/30/86	Canal de Ballenas	D. Croll
ME82	F?	6/20/84	Canal de Ballenas	Tershy/Strong
ME83	F?	3/28/88	Canal de Ballenas	D. Croll
ME84	F?	3/2/86	Canal de Ballenas	Tershy/Strong
ME85	F?	3/2/86	Canal de Ballenas	Tershy/Strong
ME86	M	9/23/93	Isla Cedros	NMFS(SWFSC) J. Quan
ME87	M	5/4/84 6/20/84	Canal de Ballenas Canal de Ballenas	Tershy/Strong Tershy/Strong
ME88	M	1/29/73 Spring 77	San Benitos Is. San Benitos Is.	S. Leatherwood S. Leatherwood
ME89	M	1/29/73	San Benitos Is.	S. Leatherwood
ME90	F?	10/27/93	Punta Eugenia	NMFS(SWFSC) J. Rivers
ME91	F?	10/27/93	Punta Eugenia	NMFS(SWFSC) W. Armstrong
ME92	M	2/26/97	La Paz Bay	S. Anderson
ME93	F?	2/26/97	La Paz Bay	S. Anderson
ME94	F?	2/26/97	La Paz Bay	S. Anderson

Table 2. Number of Whales Identified By Year and Location

Location \ Year	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97
Sea of Cortez				1	1	4	13	12	6	5	4	3	6	6	9	6	18	5	5
Baja, Pacific				3					1	9	2	2			7				4
San Diego	1			5			4	5			1		3						
Los Angeles/ Orange Co.	1	1		8	1	9	11	7	4	12	2	7					30	13	
Santa Barbara/ Channel Is.		2	1		7		1		1	2	5	1	3	2	6	7	14	5	
Monterey Bay	1		3	5	5	5	4	3	23	11	6	10	8	35	34	36	34	42	46
Gulf of the Farallones/ Cordell Banks				1				5		11	1			7		17		1	
Cape Mendocino		1								2				1		1			

Table 3. Number of Whales Identified by Location and Between Locations

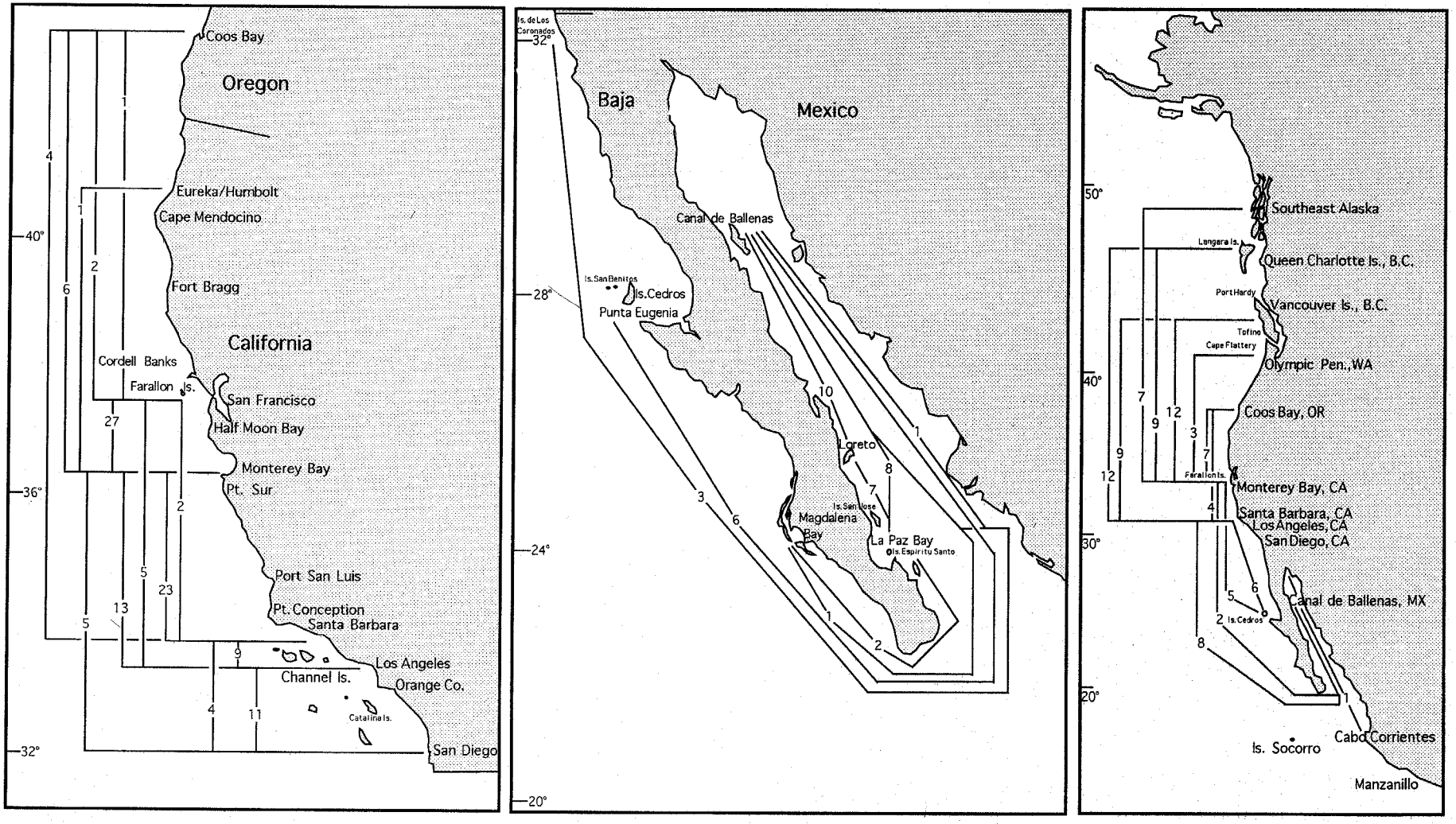
Location		1	2	3	4	5	6	7	8	9	10	11	12
# of Whales Identified		56	25	12	53	42	137	35	4	-	-	-	-
Sea of Cortez	1												
Baja, Pacific	2	11											
San Diego	3	4	6										
Los Angeles/ Orange County	4	6	11	11									
Santa Barbara/ Channel Islands	5	2	4	4	9								
Monterey Bay	6	2	5	5	13	23							
Gulf of the Farallones/ Cordell Banks	7	0	0	0	5	2	27						
Cape Mendocino	8	0	0	0	0	0	0	0					
Western WA and OR	9	0	0	0	1	3	9	4	0				
Vancouver Is.	10	0	0	0	7	2	12	2	0				
Queen Charlotte Is.	11	0	0	0	12	0	9	5	0				
Southeast Alaska	12	0	0	0	0	0	7	4	0				

Table 4. Killer Whale Catalogs and Number of Identified Whales in Each Area.
Numbers represent the total number of whales seen per area and have not been adjusted for matches between areas.

Location/Catalog	Number of Whales
California/Mexico	105 transients 56 offshores 37 undetermined type (CA) 57 Mexico (only) 13 LA Pod
Vancouver Island, B.C. and Washington State[1]	200 transients 296 residents 205 offshores
Southeast Alaska[2]	95 transients 145 residents 25 offshores
Prince William Sound[3]	55 transients 205 residents
Gulf of Alaska to southeastern Bering Sea[4]	289 combined residents and transients

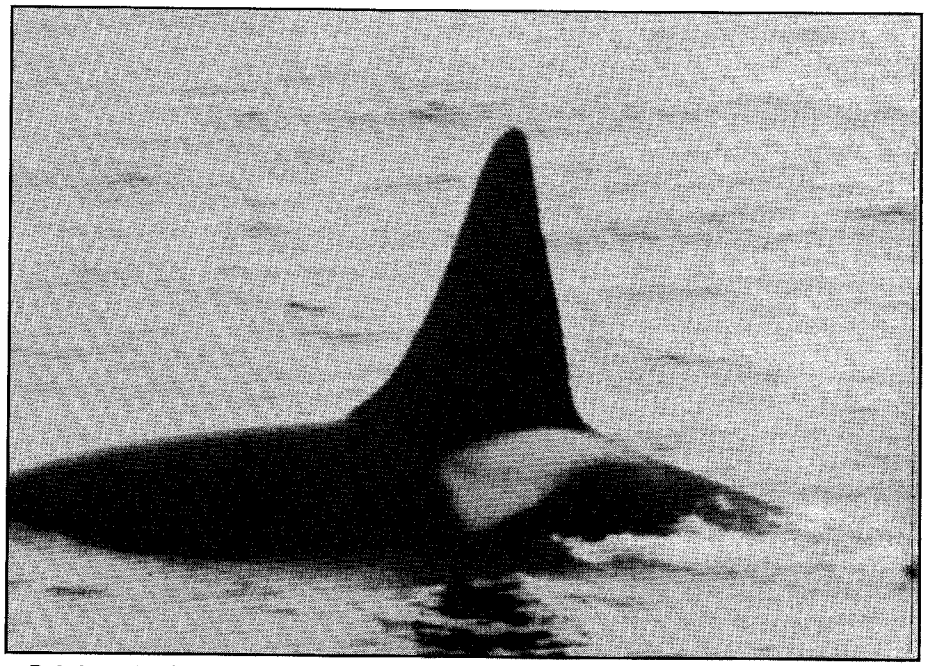
Sources:
1. Ford et al. 1994
2. Dahlheim et al. 1997
3. Heise et al. 1991
4. Dahlheim 1997, in press

Figure 1. Locations where killer whales were photographed and number of matches between locations.

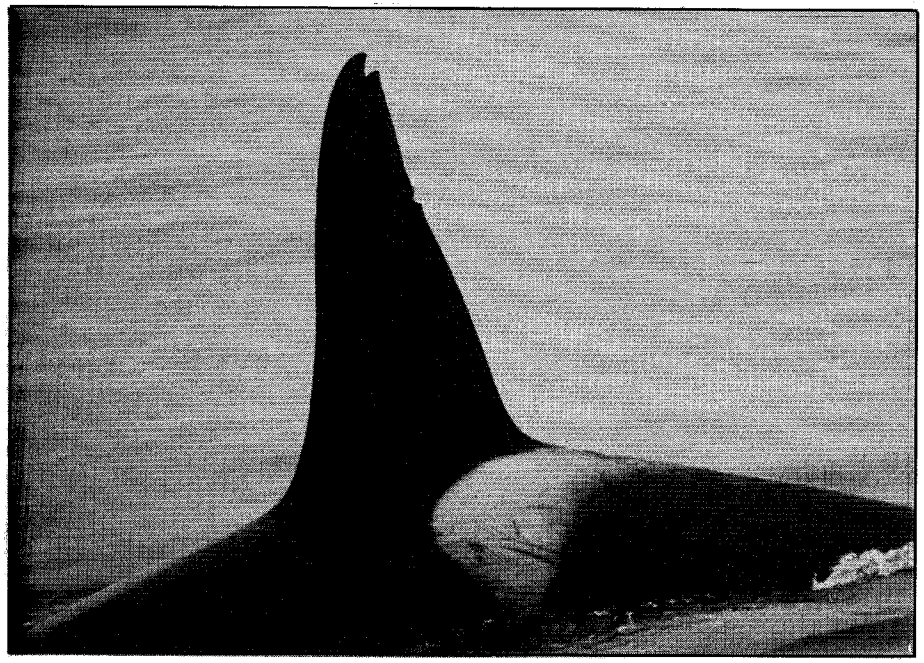


Attack by transient killer whales on a Dall's porpoise off Coos Bay, Oregon, September 12, 1996.

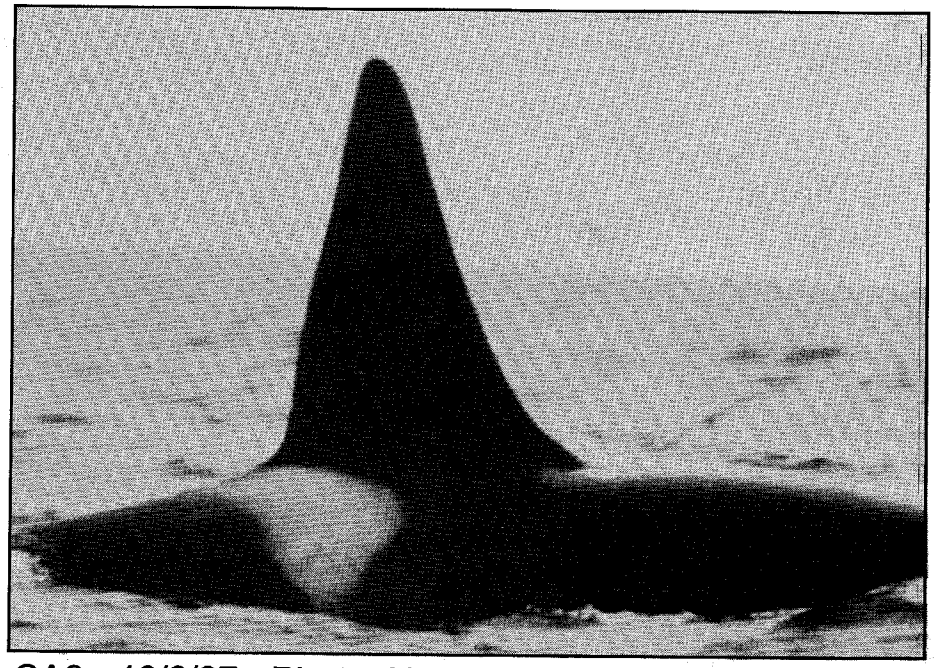
Photos: Karin Forney, NMFS/SWFSC



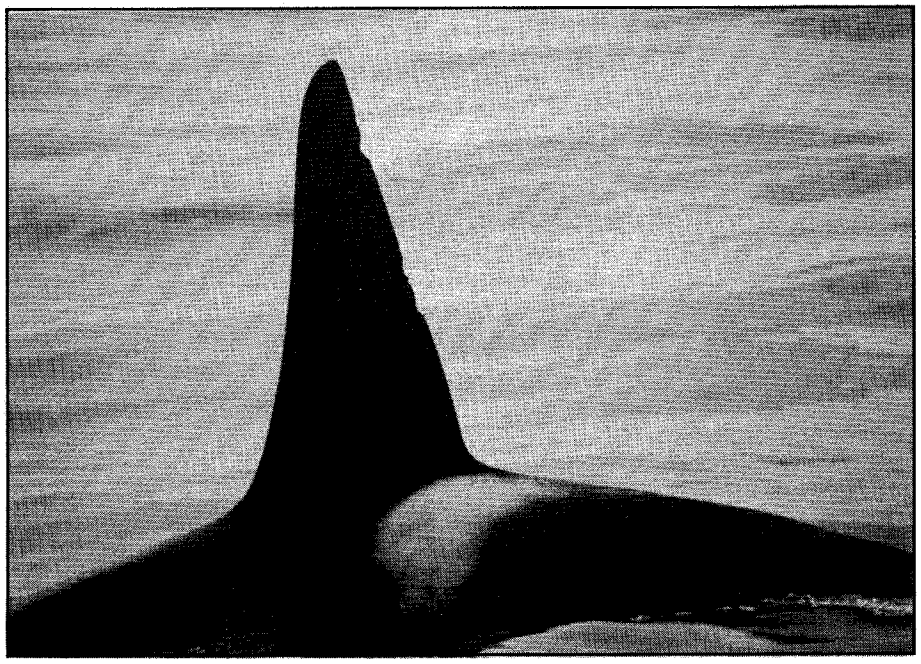
CA9 - 10/8/87 - Photo: N. Black



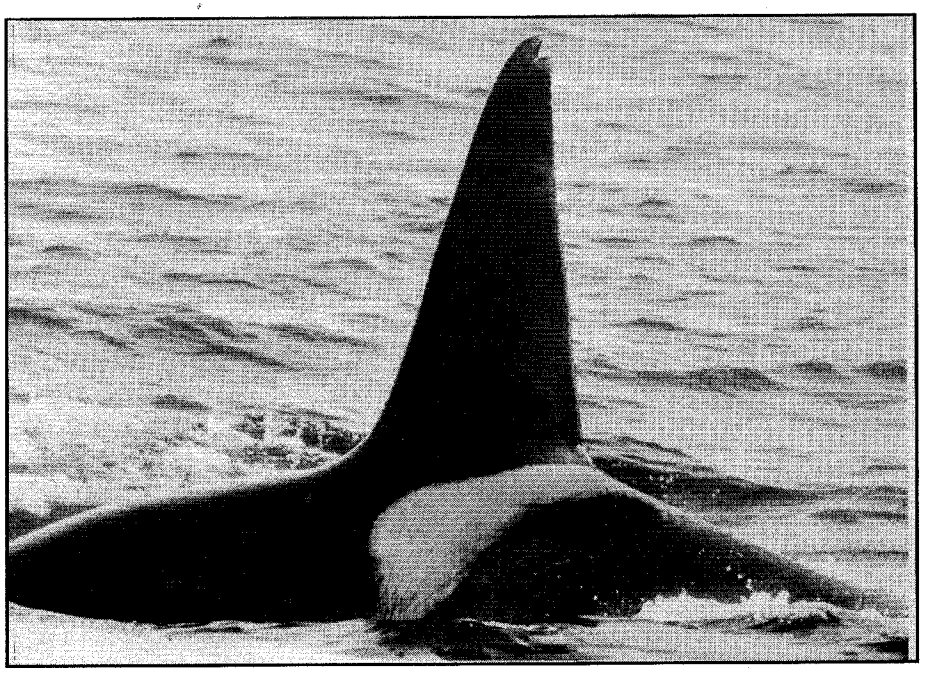
CA10 - 11/3/96 - Photo: N. Black



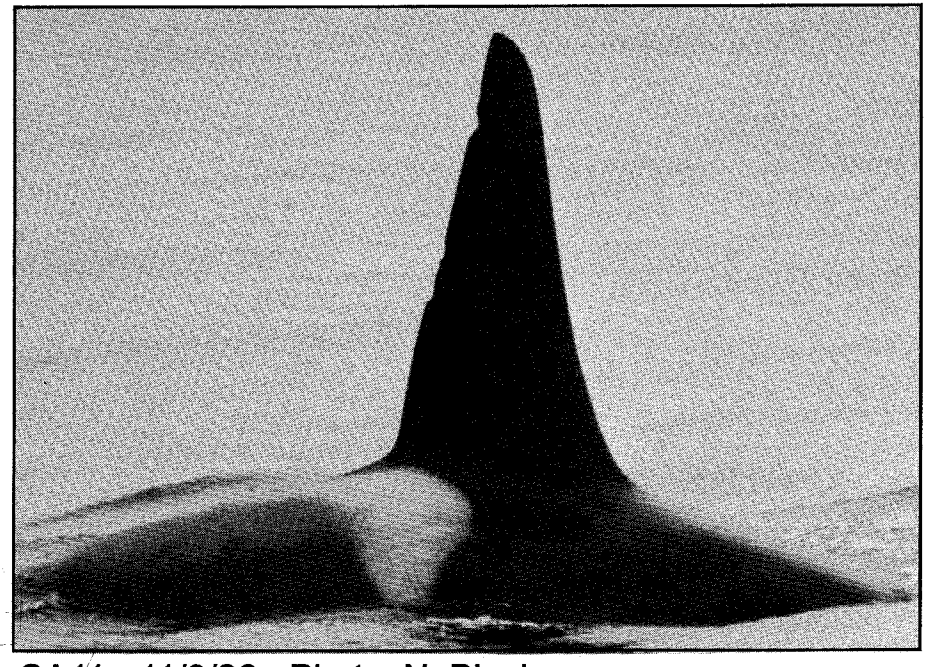
CA9 - 10/8/87 - Photo: N. Black



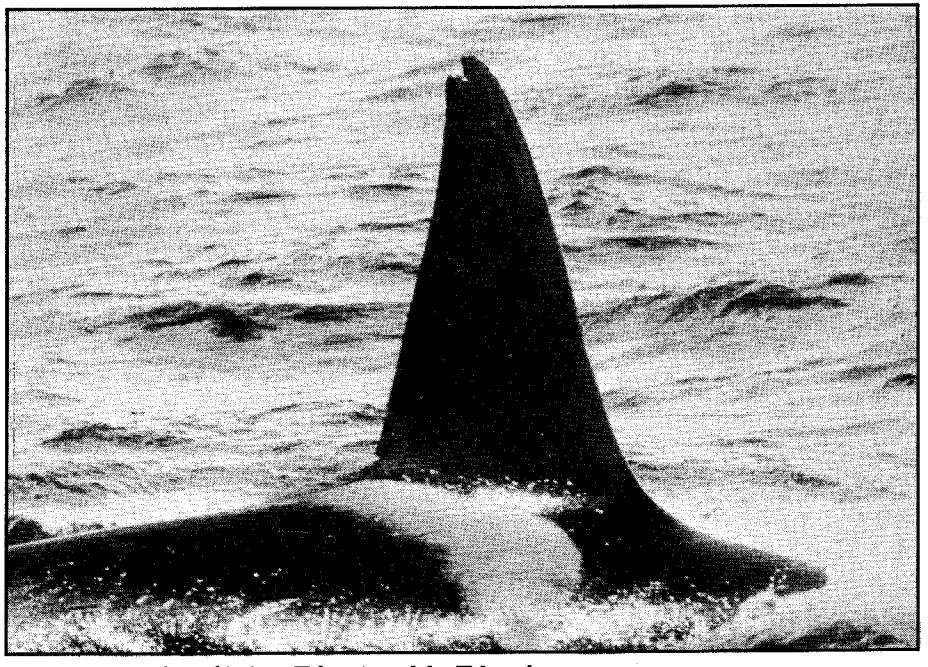
CA11 - 11/3/96 - Photo: N. Black



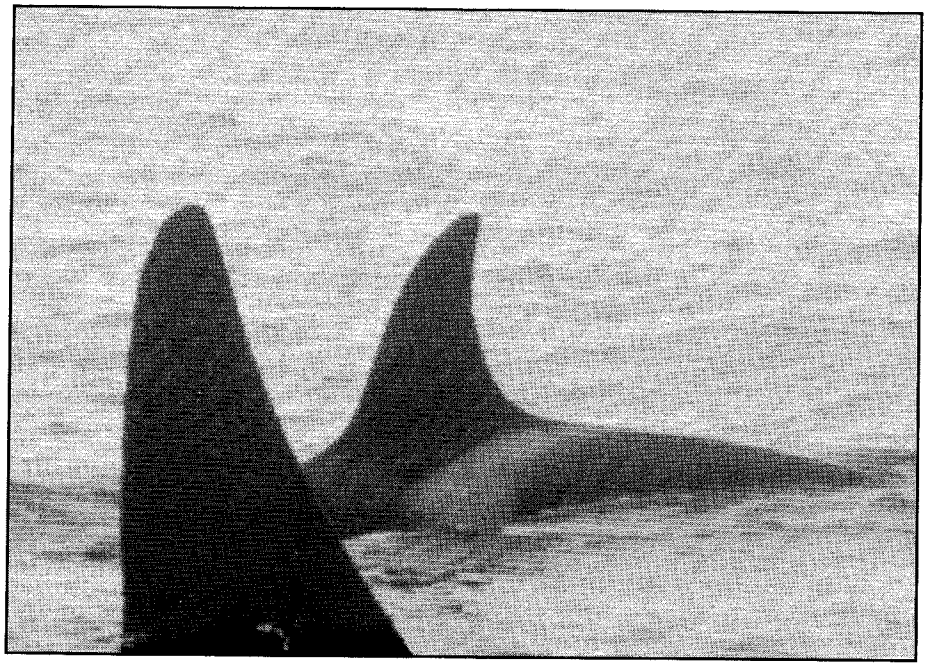
CA12 - 9/9/94 - Photo: N. Black



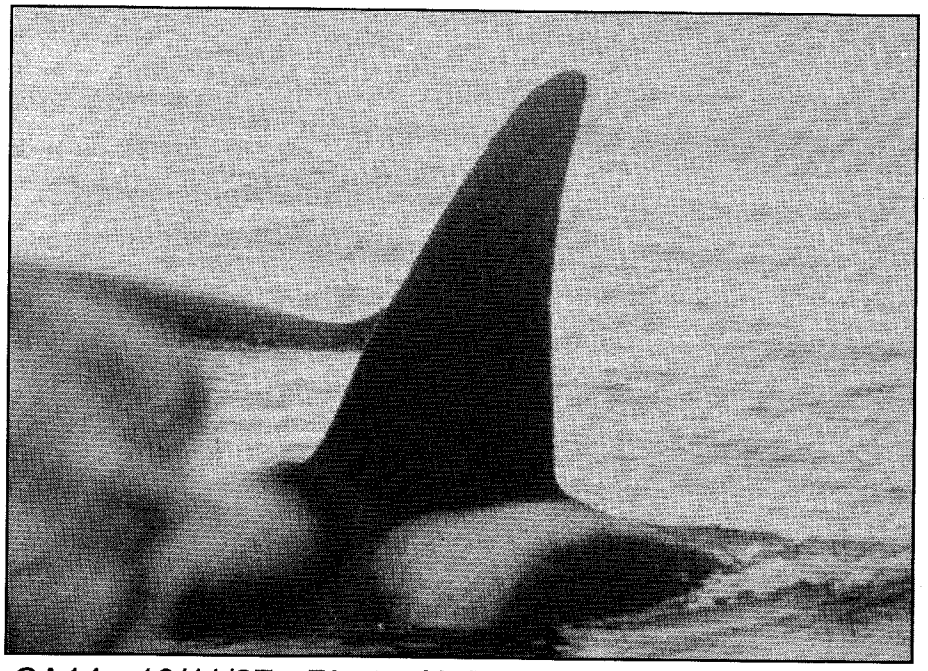
CA11 - 11/3/96 - Photo: N. Black



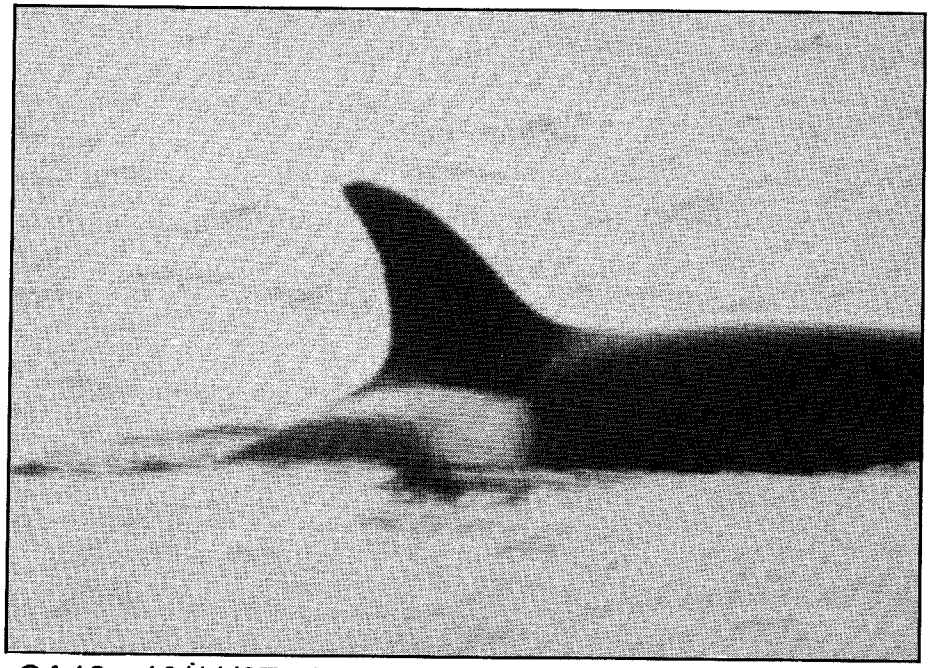
CA12 - 9/12/94 - Photo: N. Black



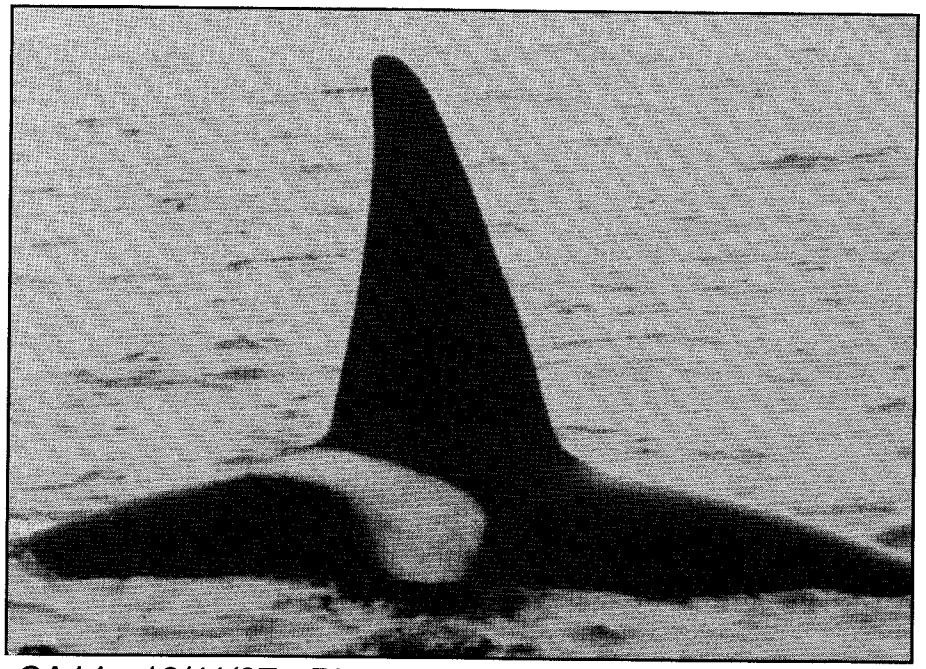
CA13 - 10/11/87 - Photo: N. Black



CA14 - 10/11/87 - Photo: N. Black

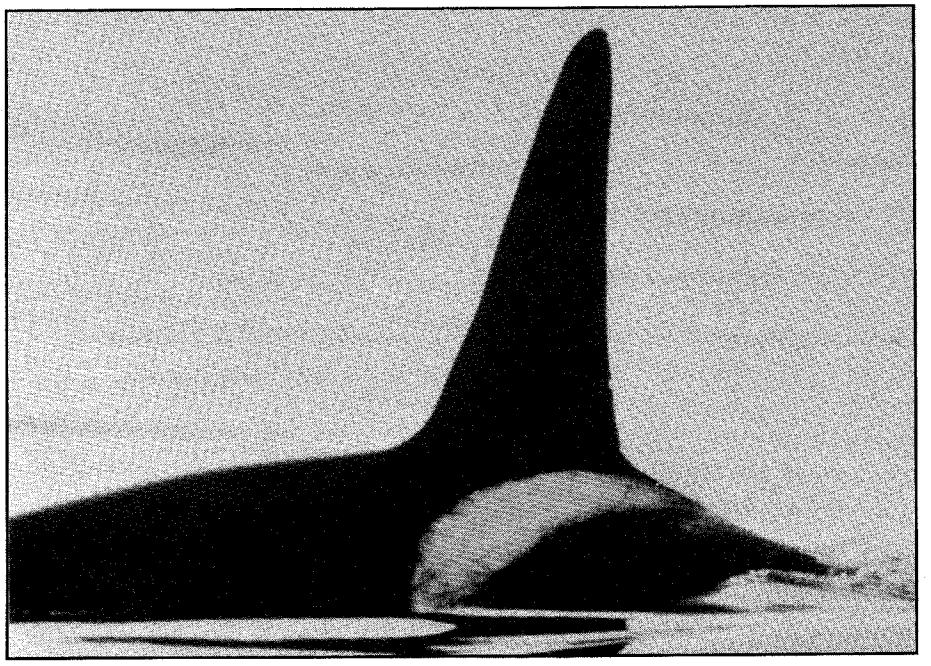


CA13 - 10/11/87 - Photo: N. Black

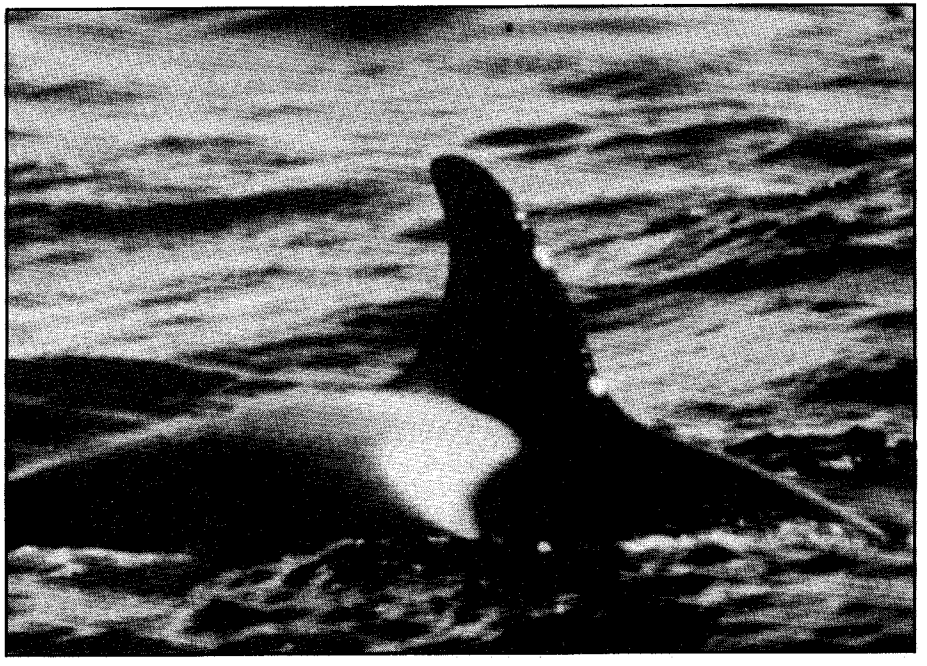


CA14 - 10/11/87 - Photo: N. Black

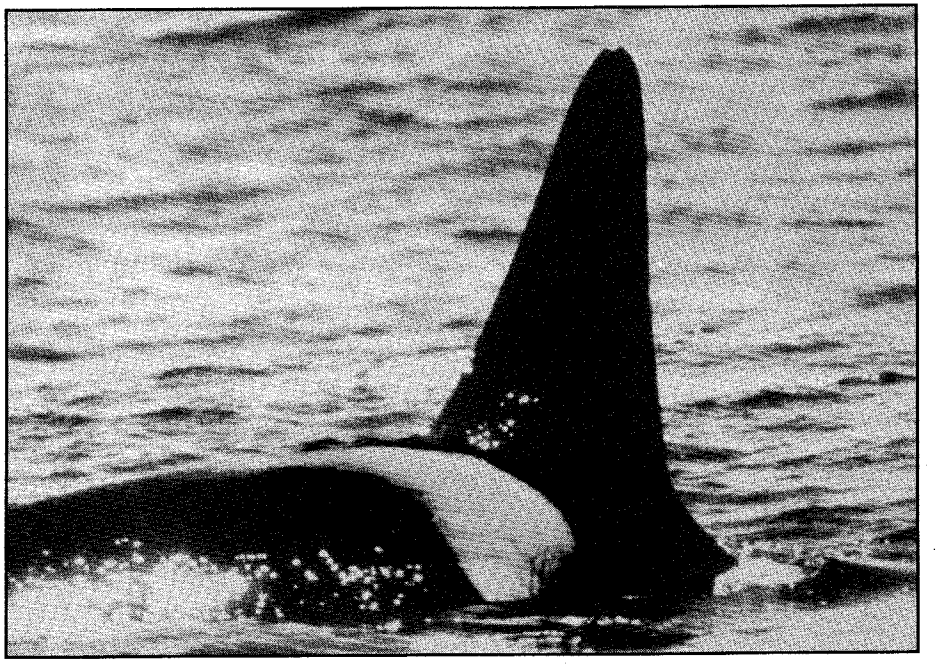
CA15 - 10/26/87 - Photo: N. Black



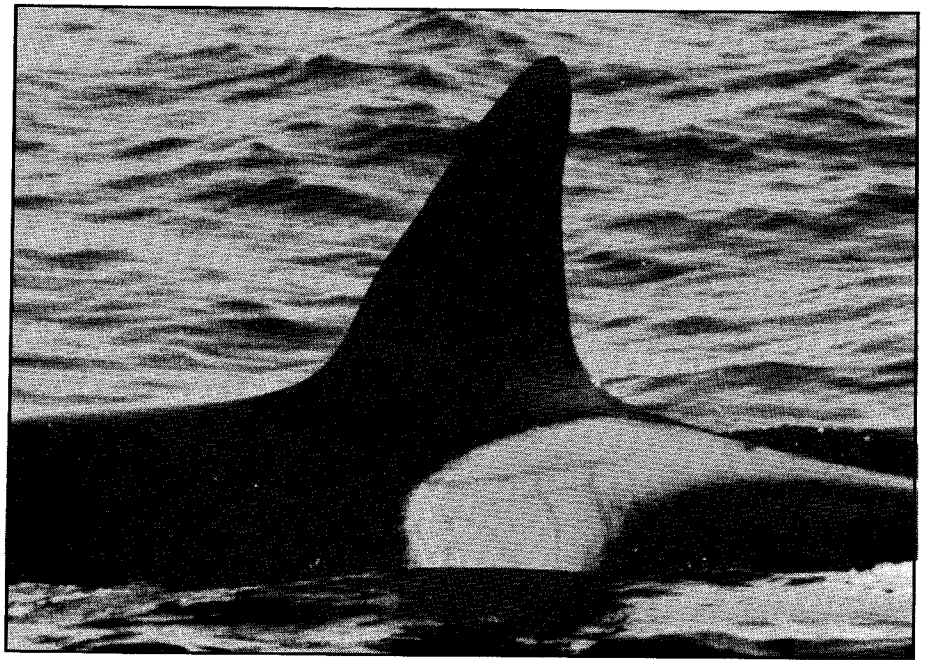
CA16 - 9/15/90 - Photo: M. Danzenbaker



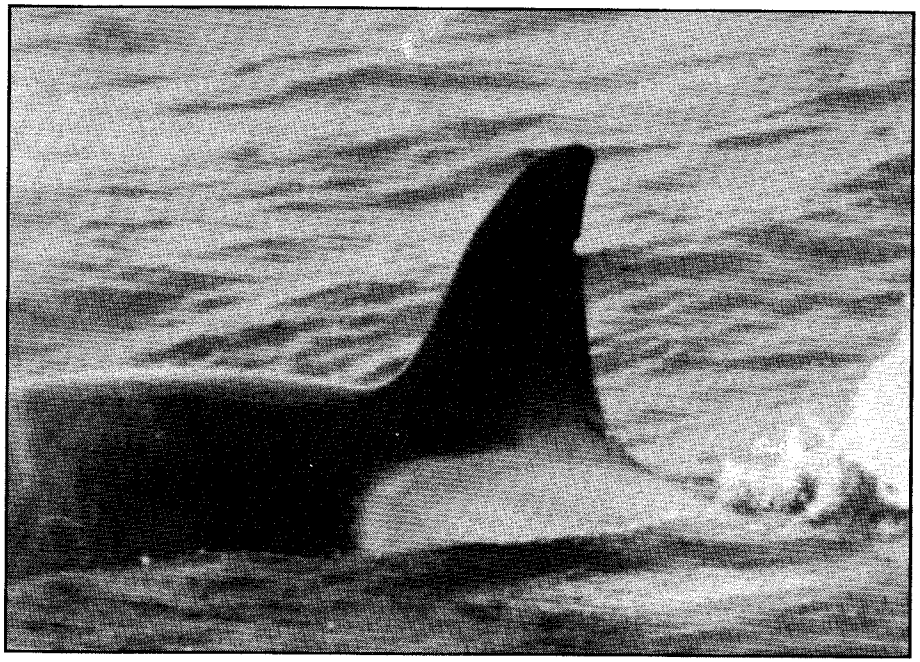
CA15 - 10/26/87 - Photo: N. Black



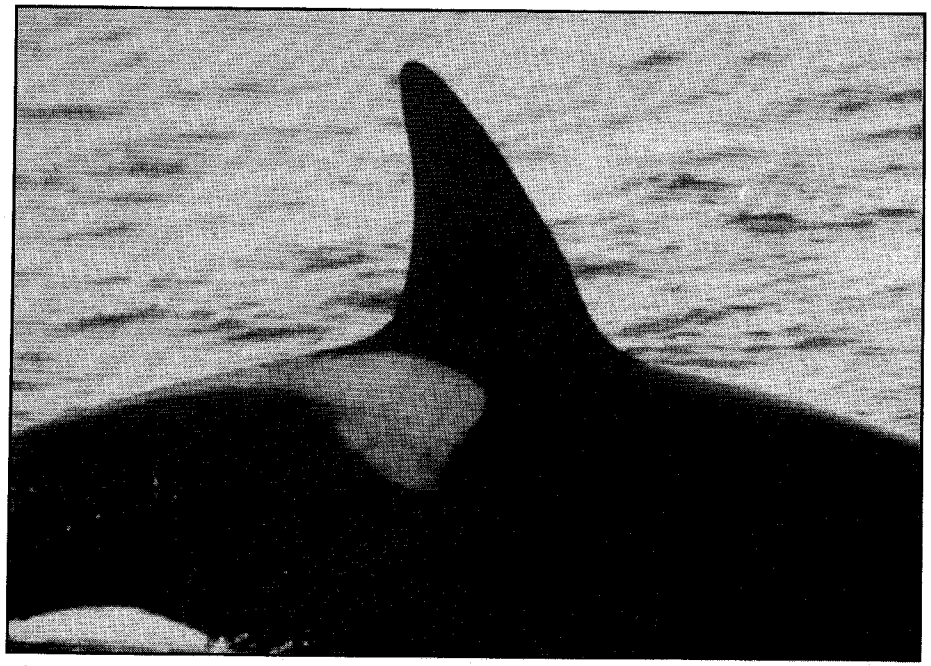
CA16 - 10/7/90 - Photo: R. Branson



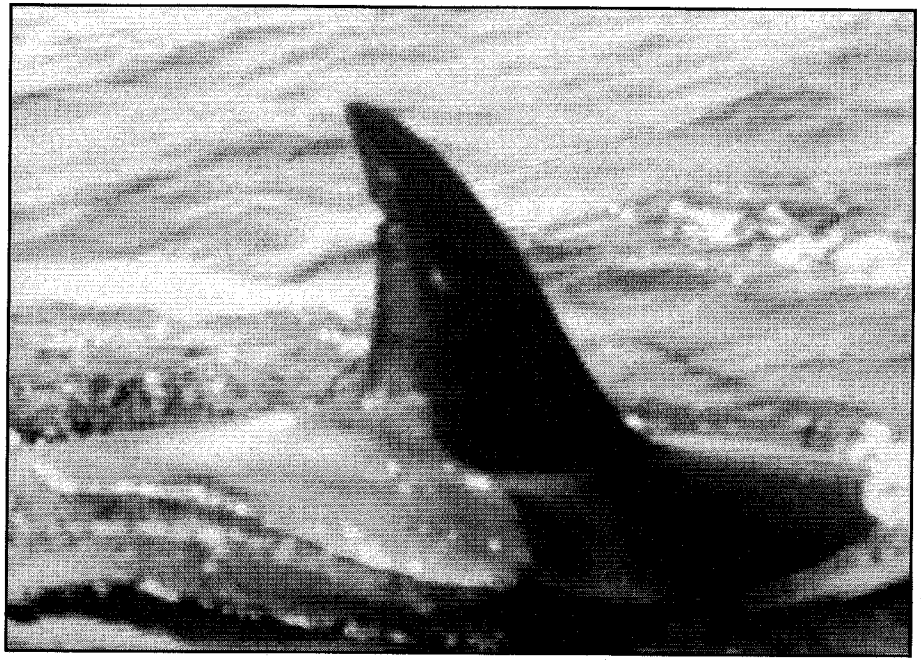
CA17 - 9/13/94 - Photo: N. Black



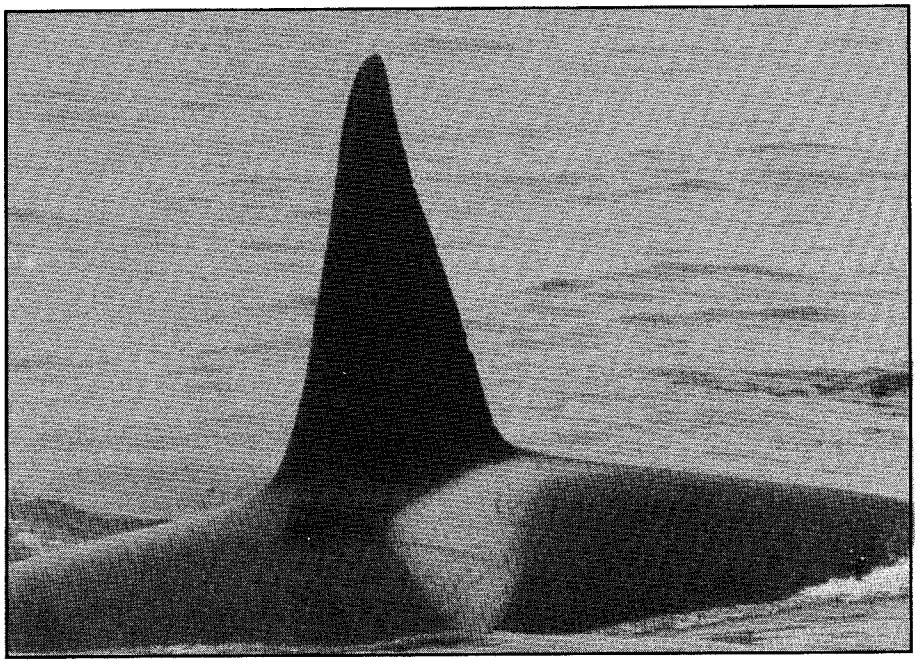
CA18 - 10/26/87 - Photo: N. Black



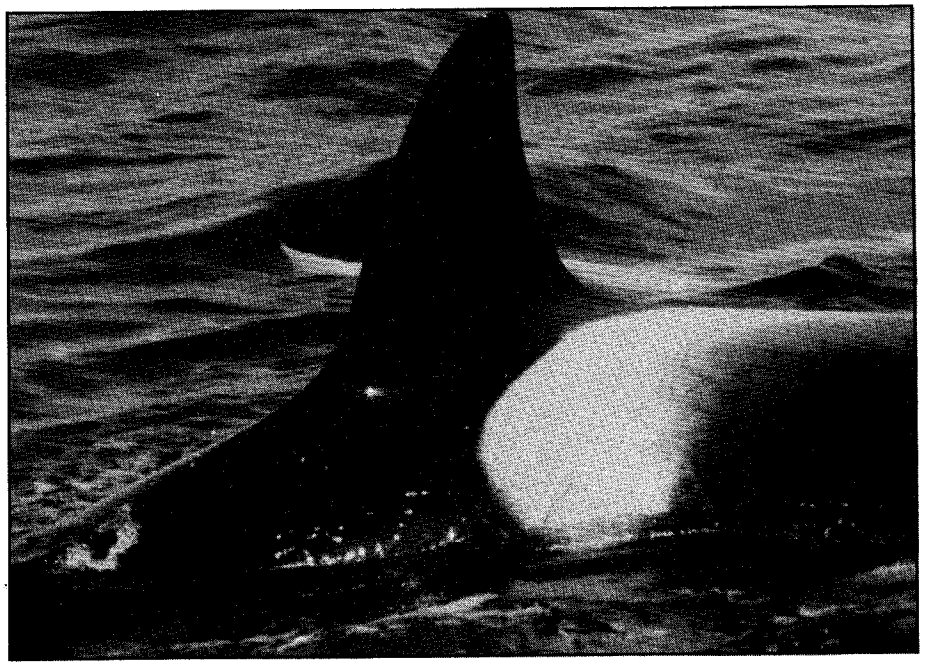
CA17 - 10/26/87 - Photo: N. Black



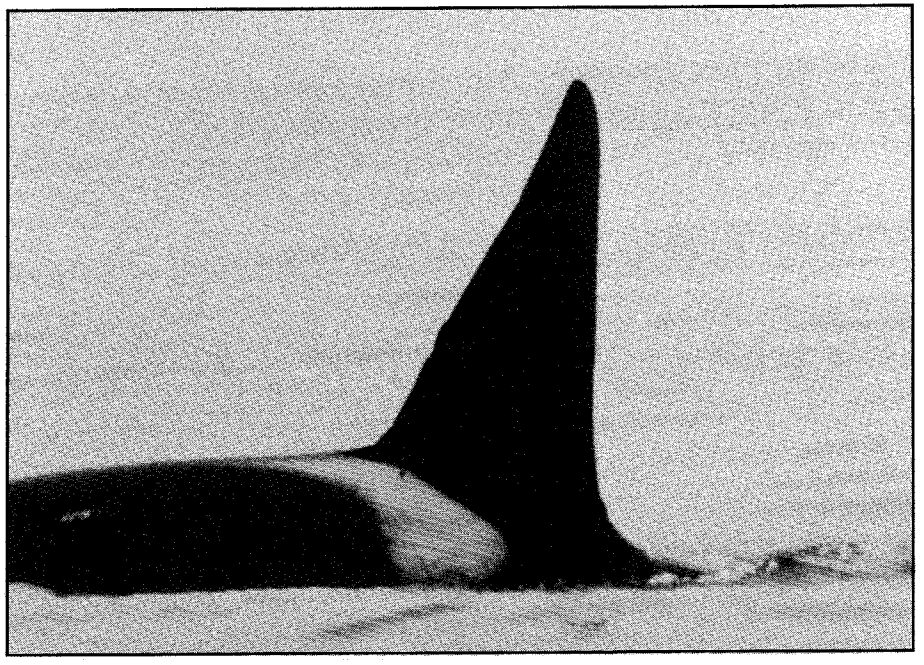
CA18 - 10/26/87 - Photo: N. Black



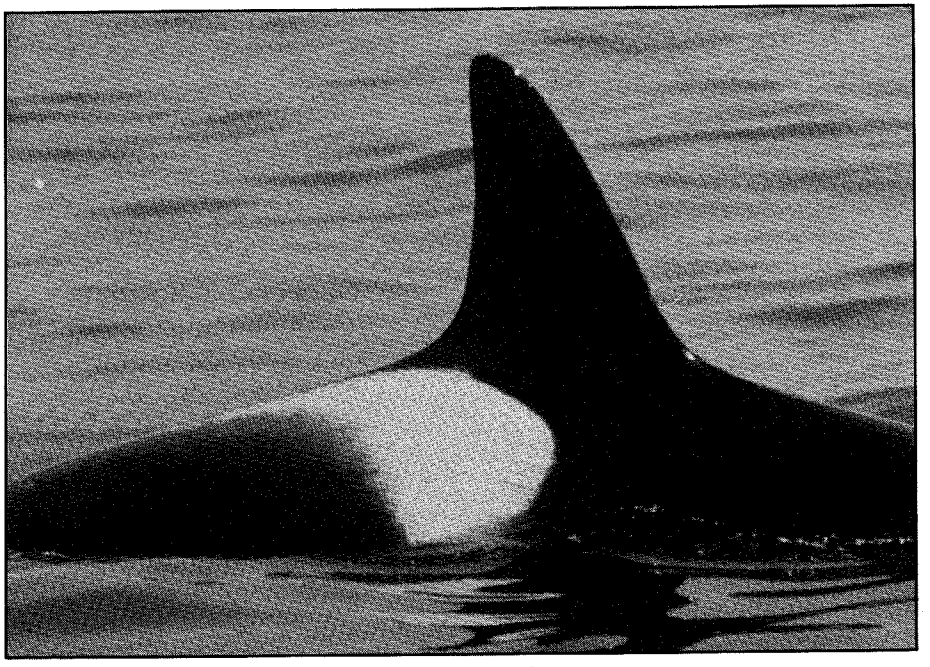
CA20 - 5/10/94 - Photo: N. Black



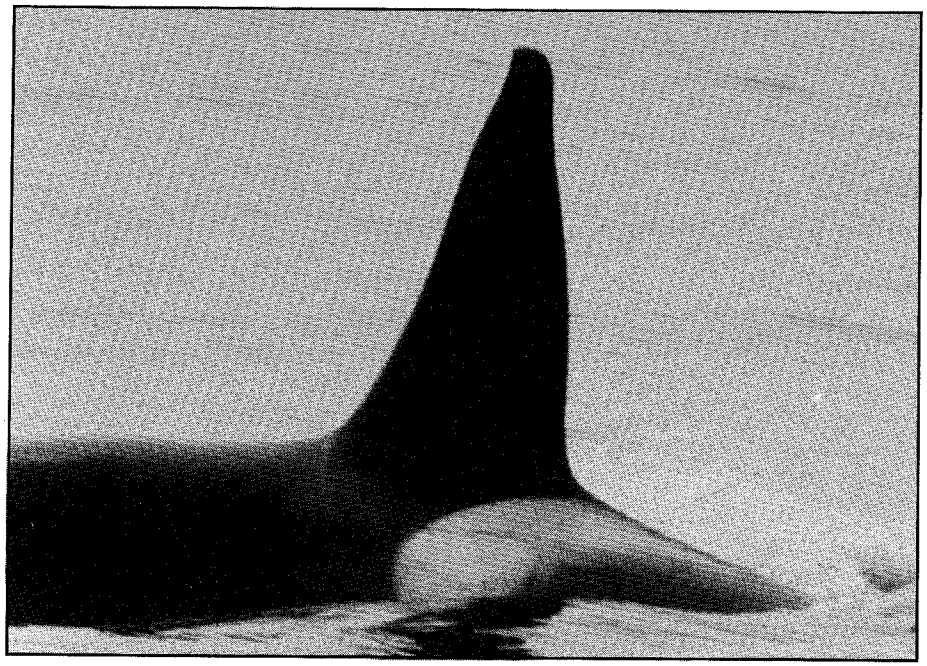
CA21 - 4/21/97 - Photo: N. Black



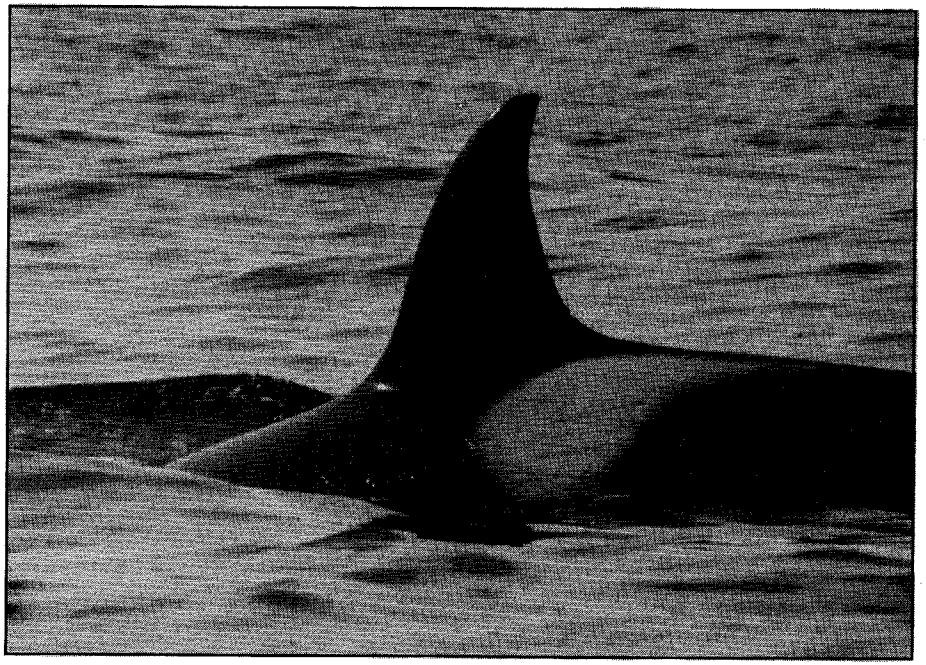
CA20 - 5/15/93 - Photo: N. Black



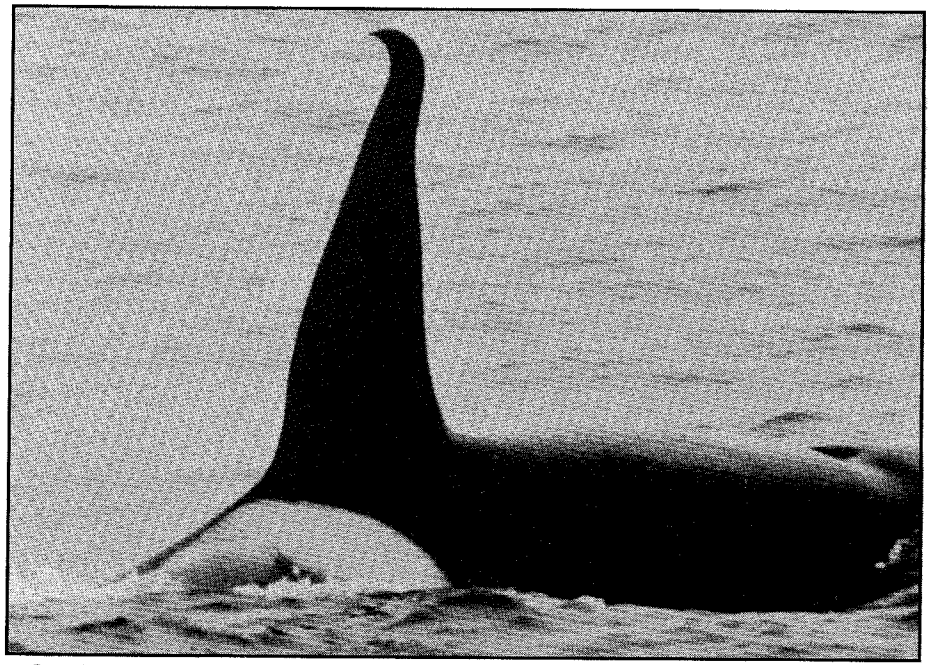
CA21 - 4/21/97 - Photo: N. Black



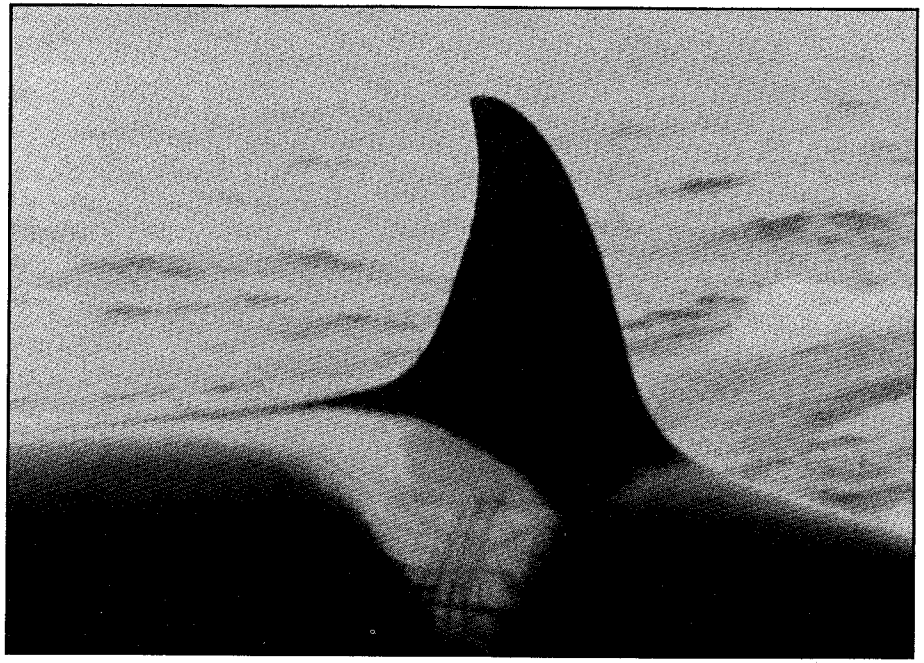
CA22 - 3/19/89 - Photo: T. Jefferson



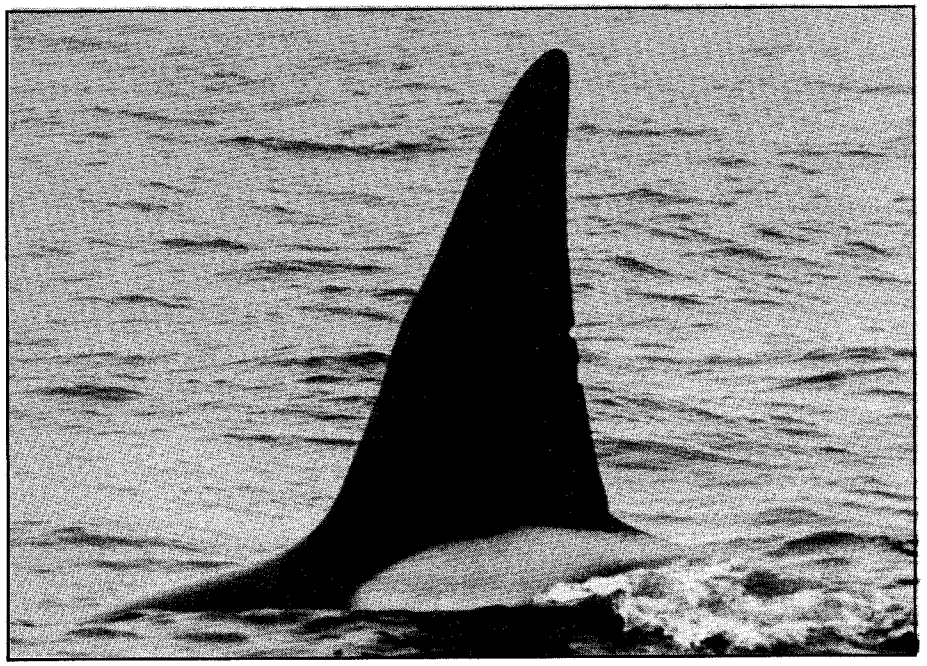
CA23 - 9/12/94 - Photo: J. Calambokidis/Cascadia



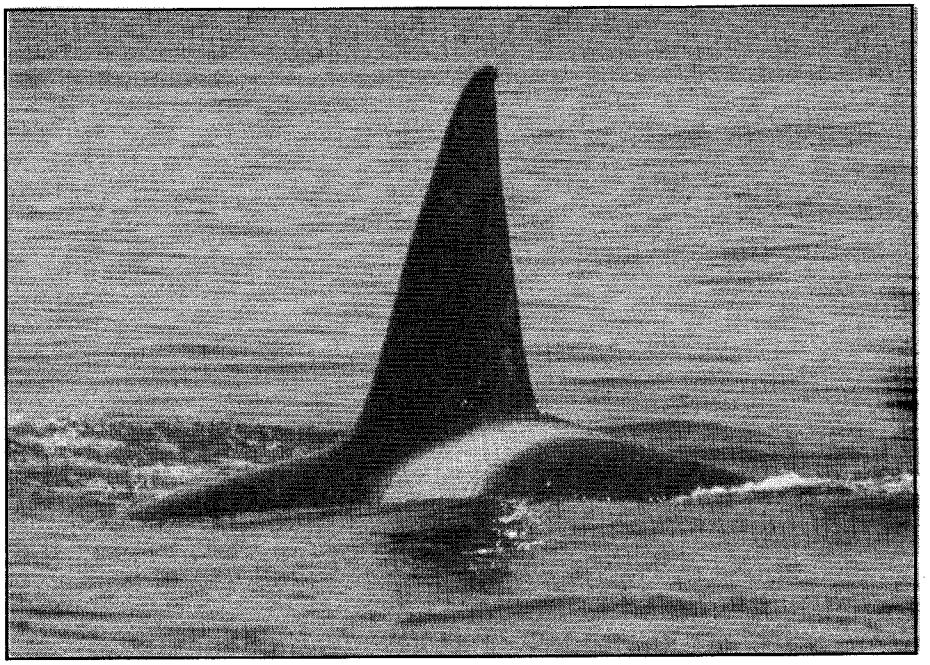
CA22 - 3/19/89 - Photo: T. Jefferson



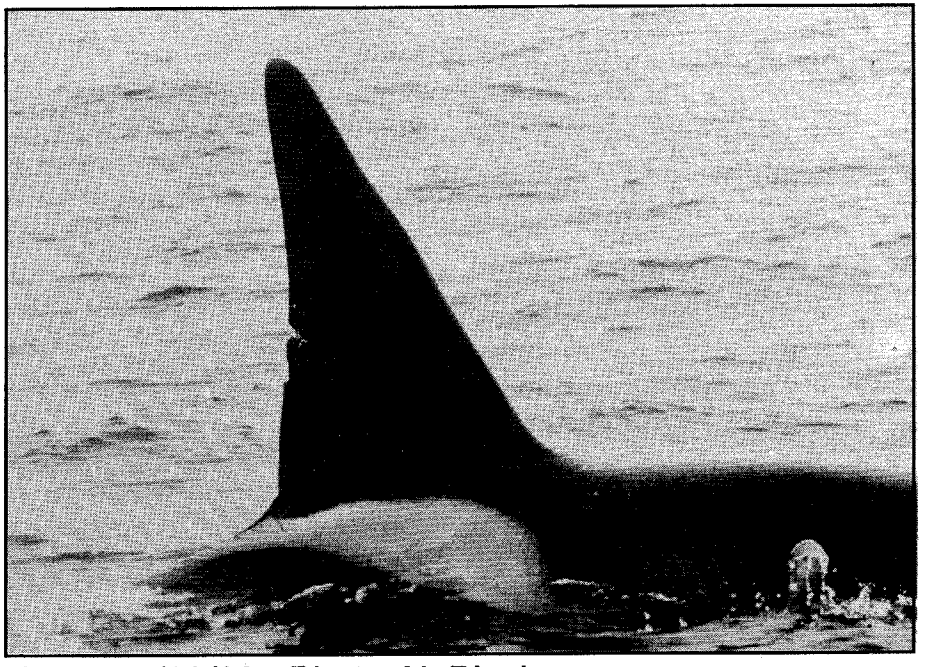
CA23 - 5/5/92 - Photo: N. Black



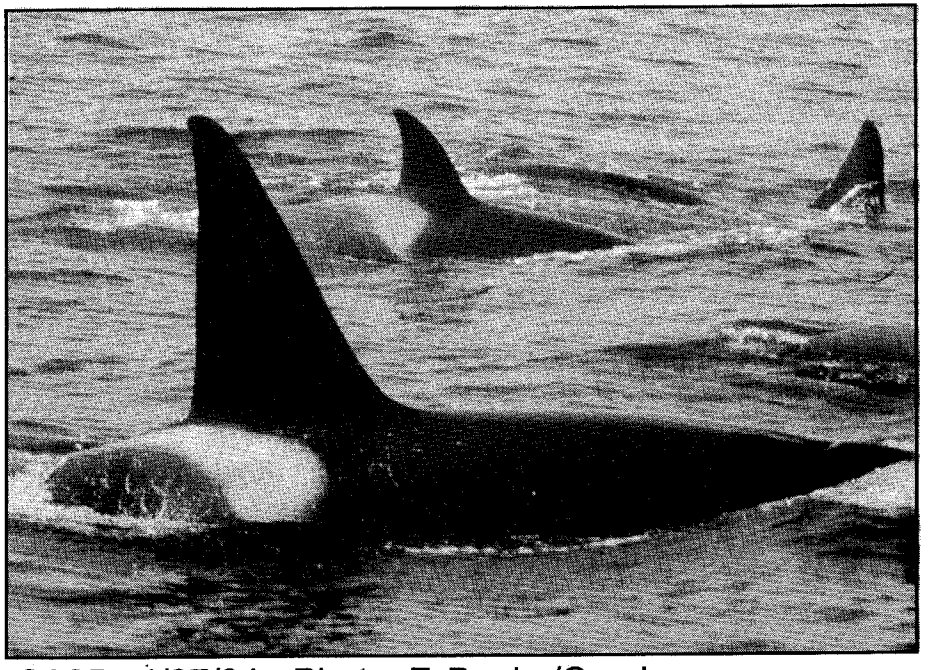
CA24 - 9/29/93 - Photo: N. Black



CA25 - 7/13/97 - Photo: T. Chandler/Cascadia

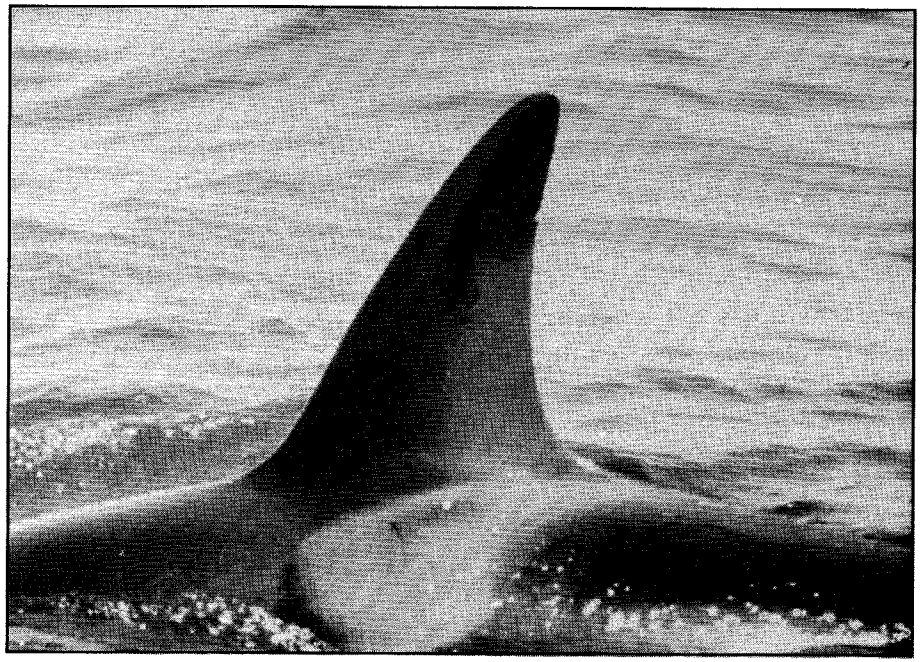


CA24 - 9/29/93 - Photo: N. Black

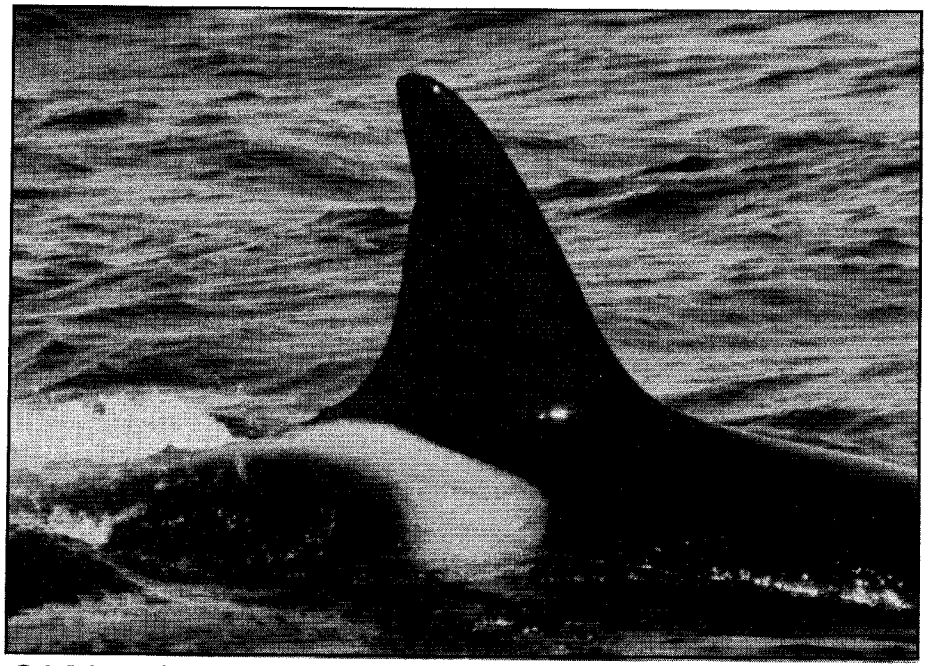


CA25 - 4/27/94 - Photo: F. Benko/Condor

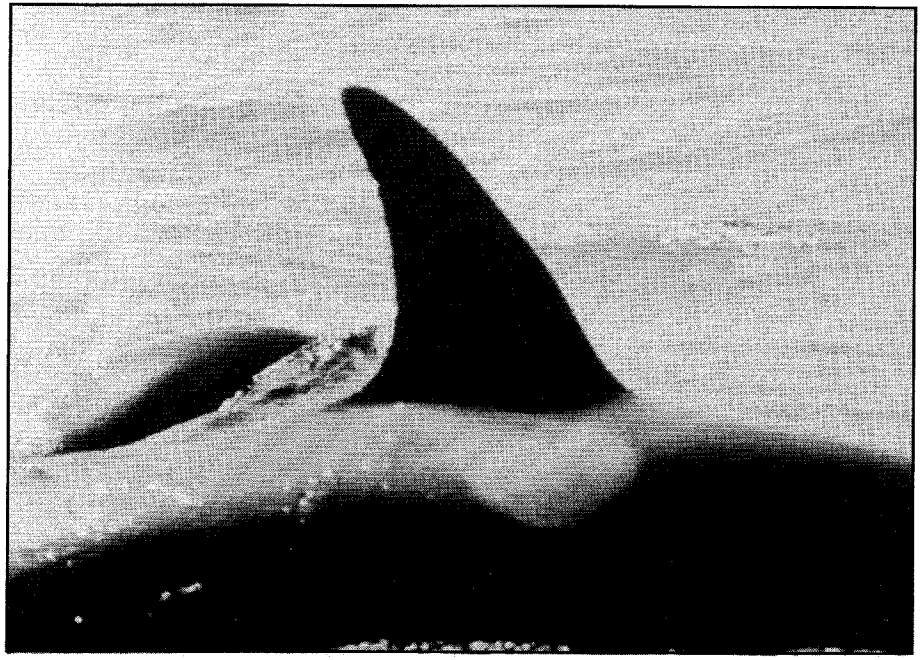
CA26 - 3/13/96 - Photo: N. Black



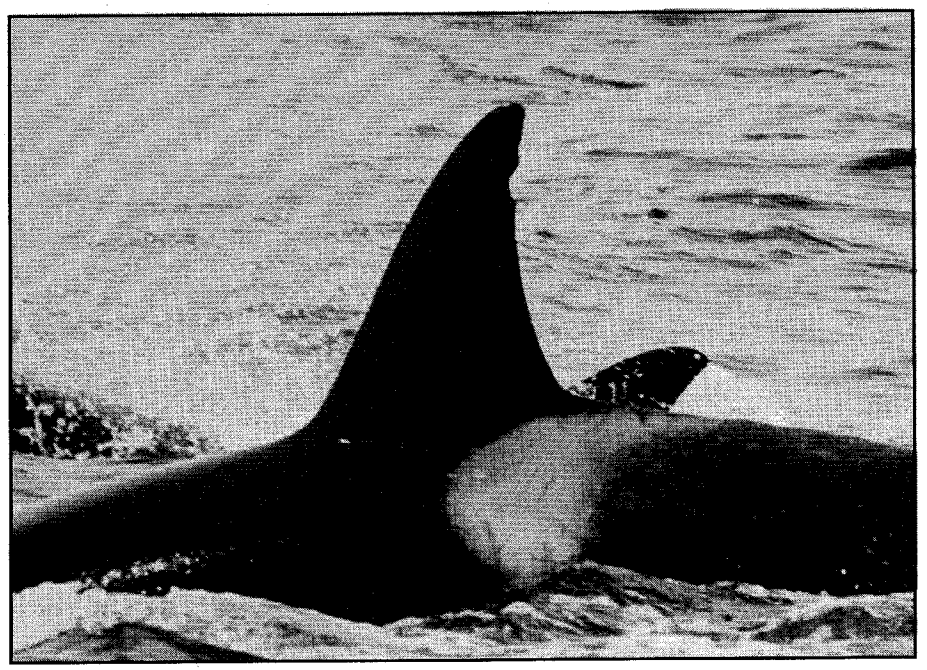
CA27 - 5/2/92 - Photo: N. Black



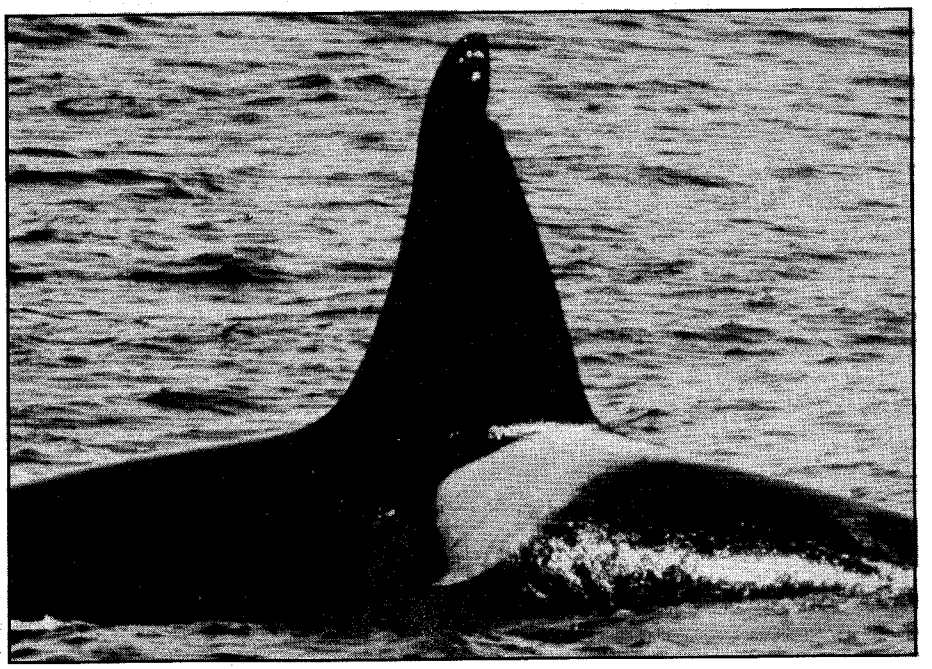
CA26 - 3/13/96 - Photo: N. Black



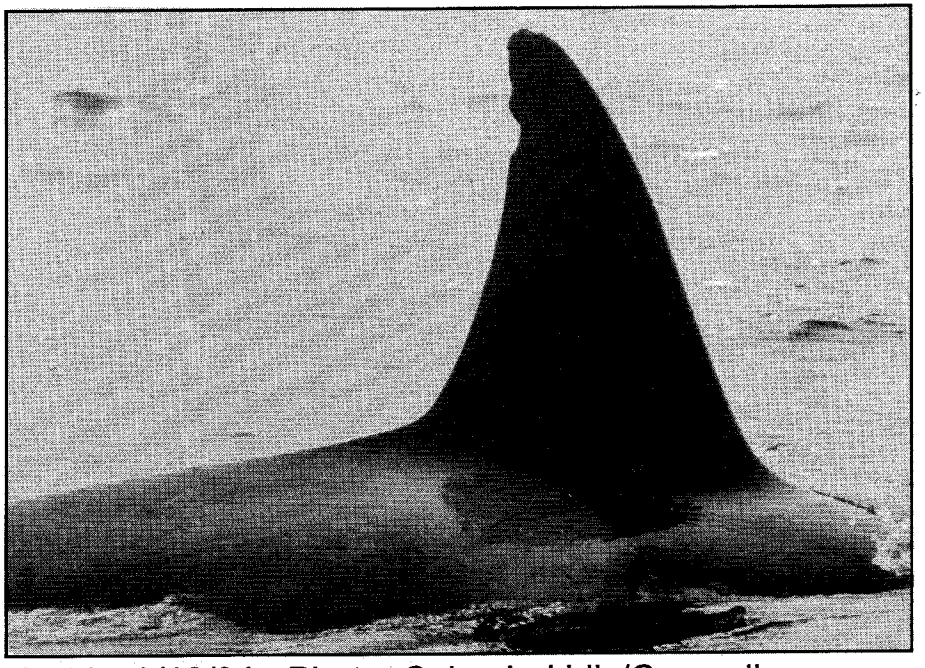
CA27 - 5/2/92 - Photo: N. Black



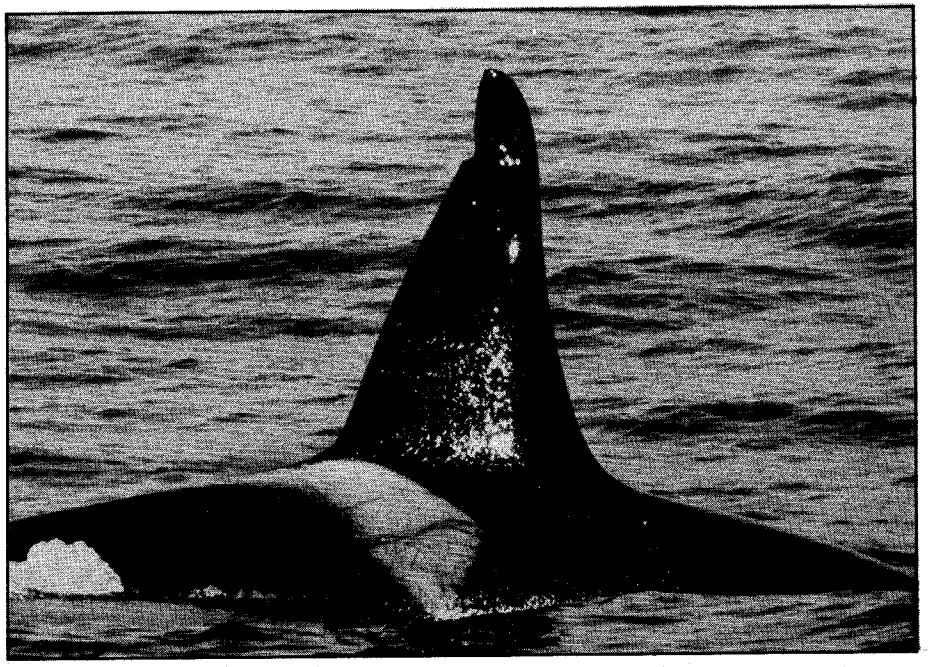
CA28 - 5/10/94 - Photo: N. Black



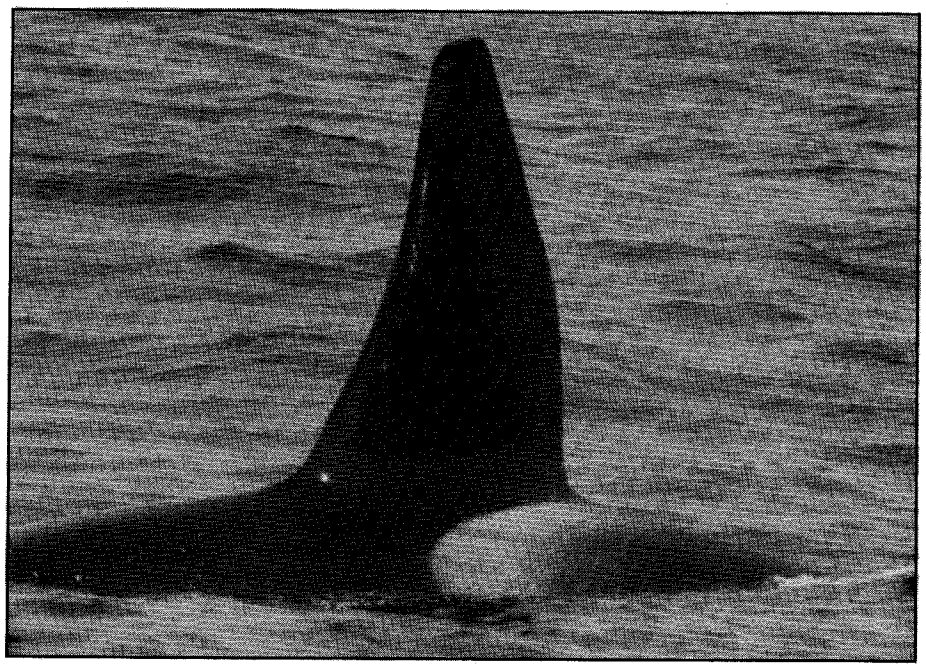
CA29 - 9/5/96 - Photo: R. Ternullo



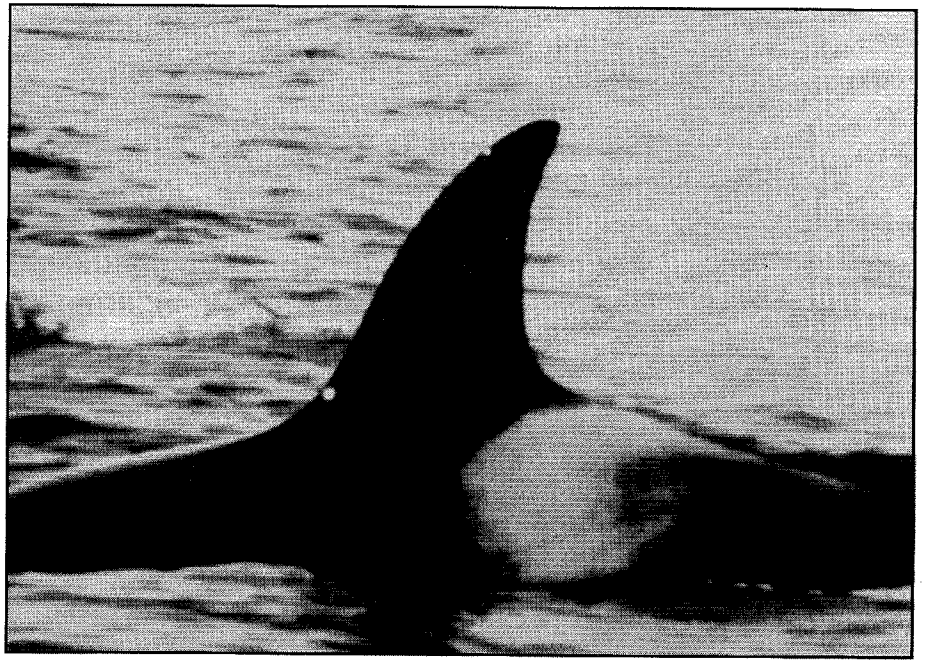
CA28 - 9/12/94 - Photo: Calambokidis/Cascadia



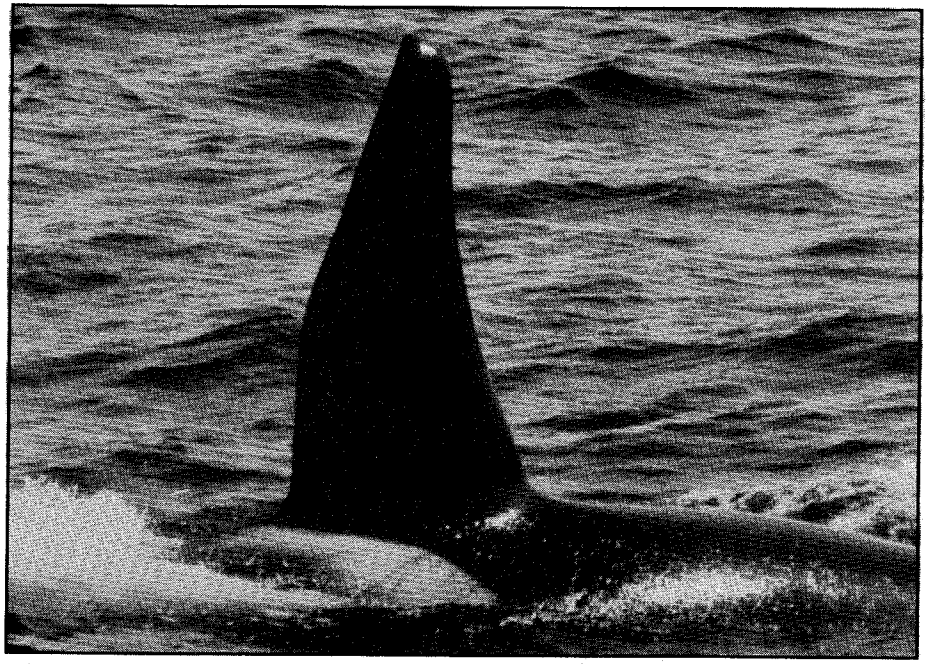
CA29 - 8/26/96 - Photo: N. Black



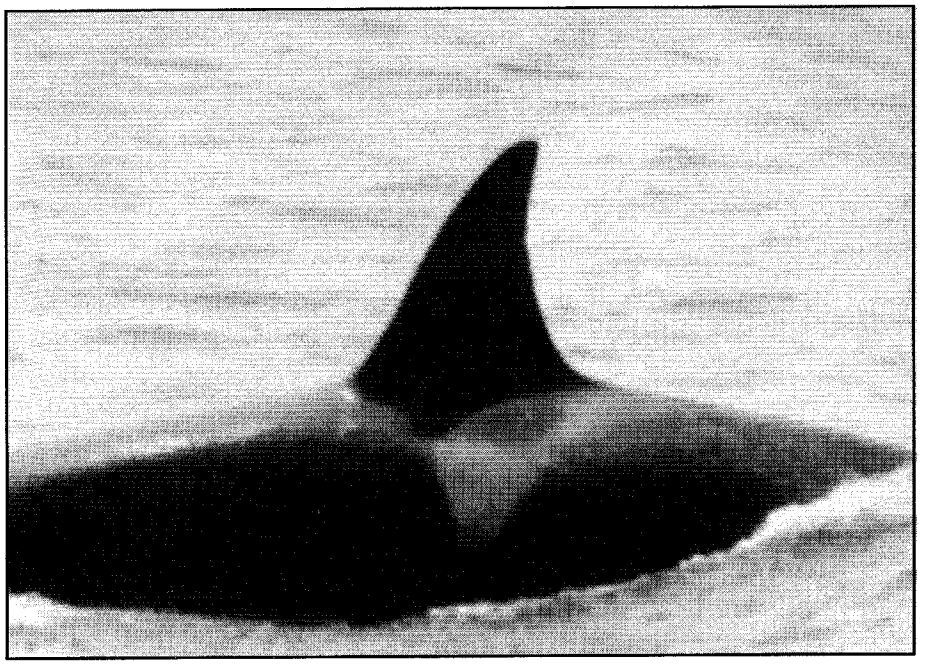
CA30 - 10/10/95 - Photo: N. Black



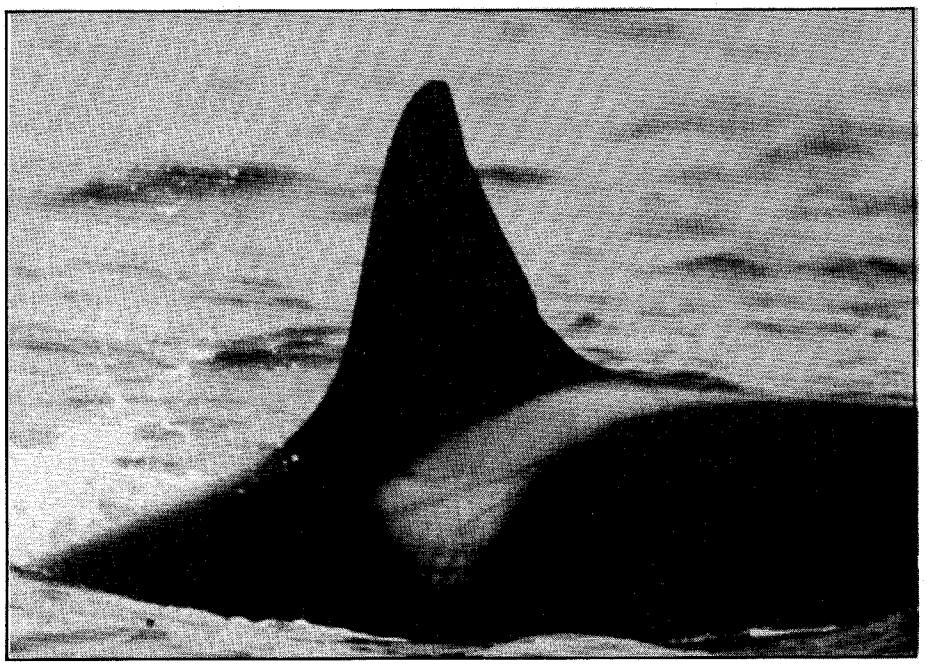
CA31 - 11/2/86 - Photo: R. Stallcup



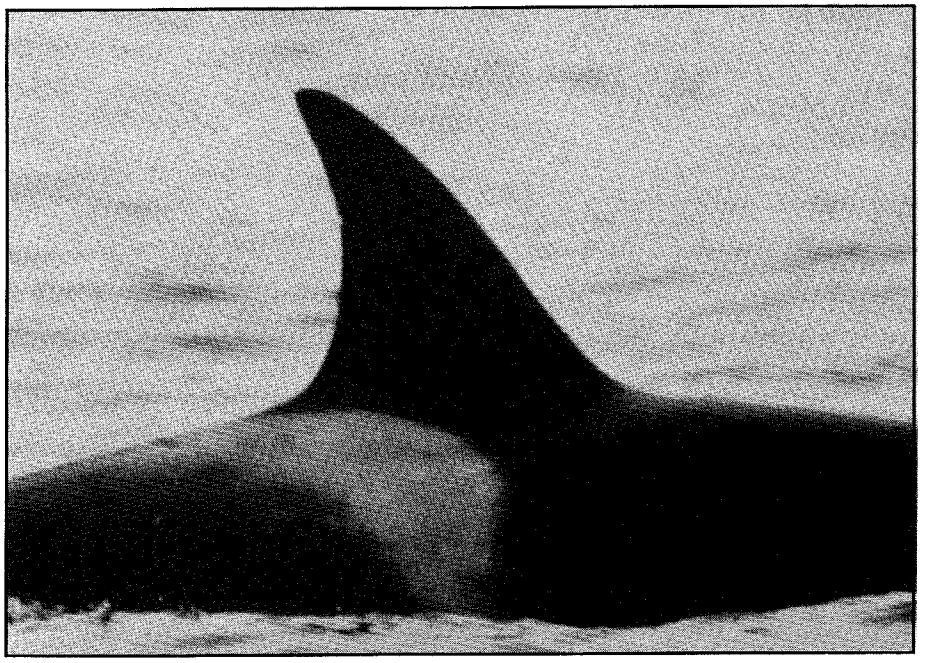
CA30 - 10/10/95 - Photo: N. Black



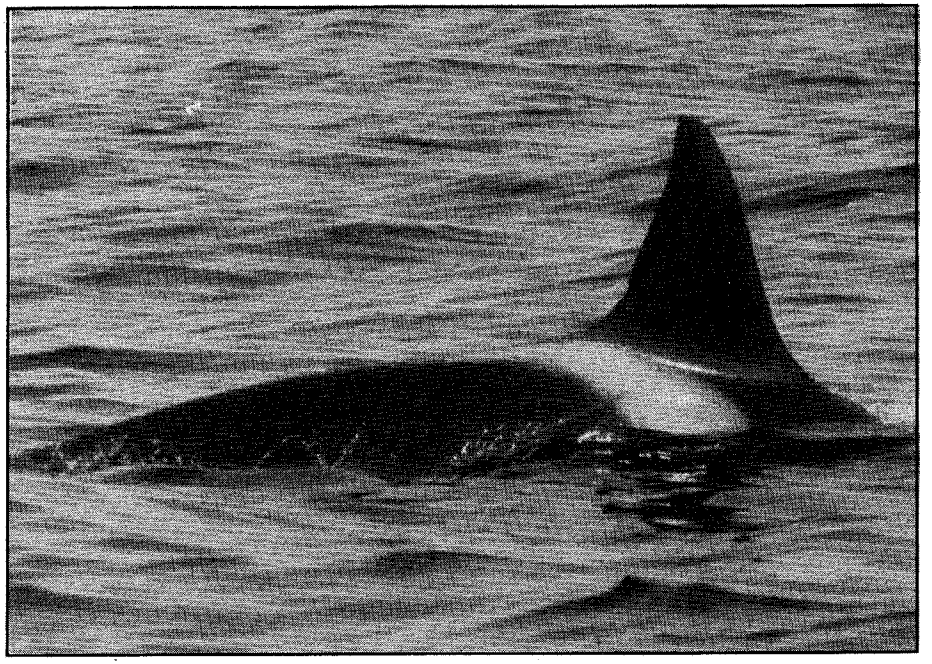
CA32 - 8/20/93 - Photo: N. Black



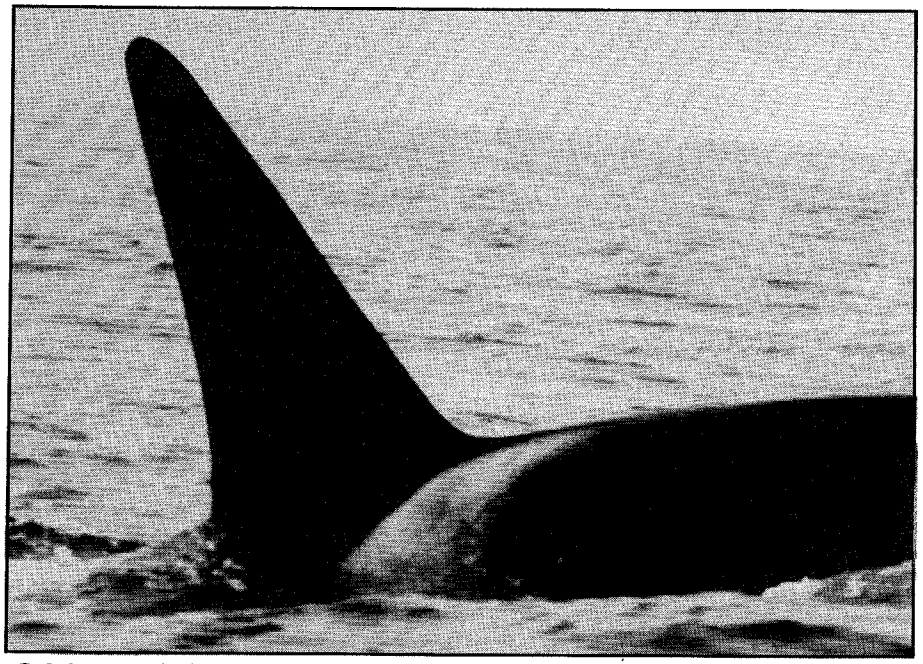
CA33 - 5/5/92 - Photo: N. Black



CA32 - 5/5/92 - Photo: N. Black

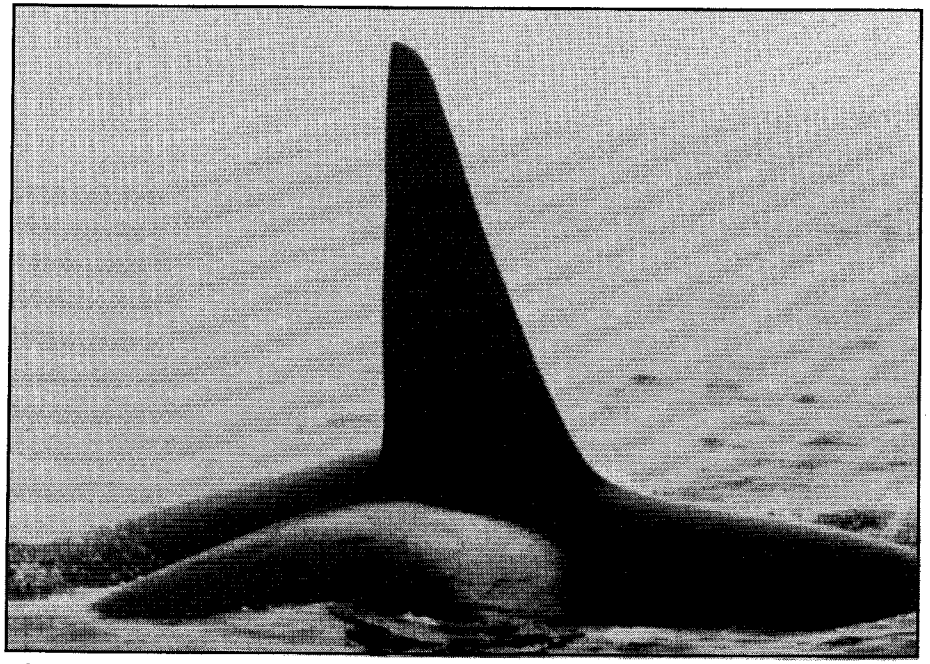


CA33 - 9/12/94 - Photo: J. Calambokidis/Cascadia

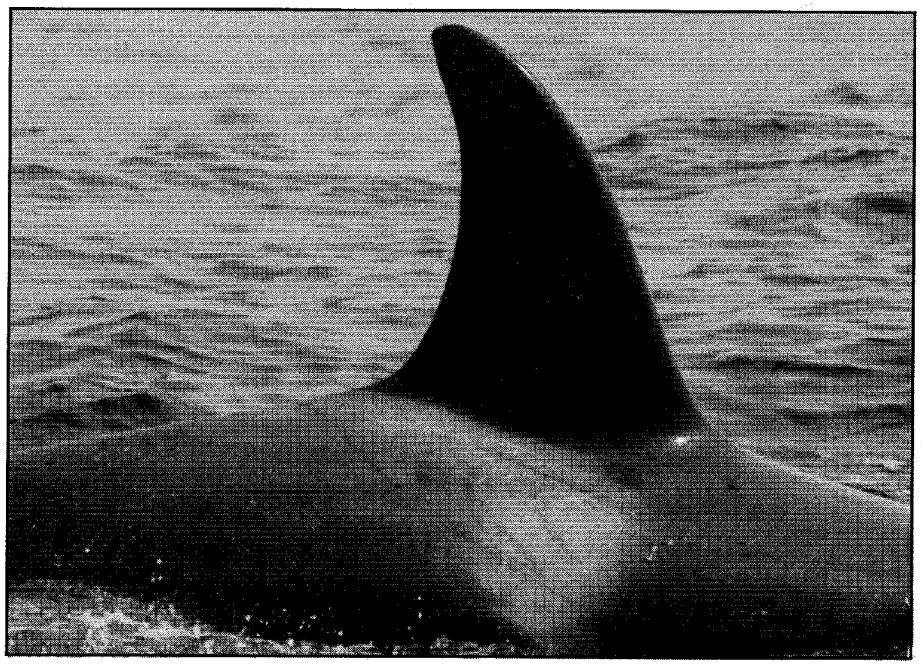


CA34 - 5/5/92 - Photo: S. Cerchio

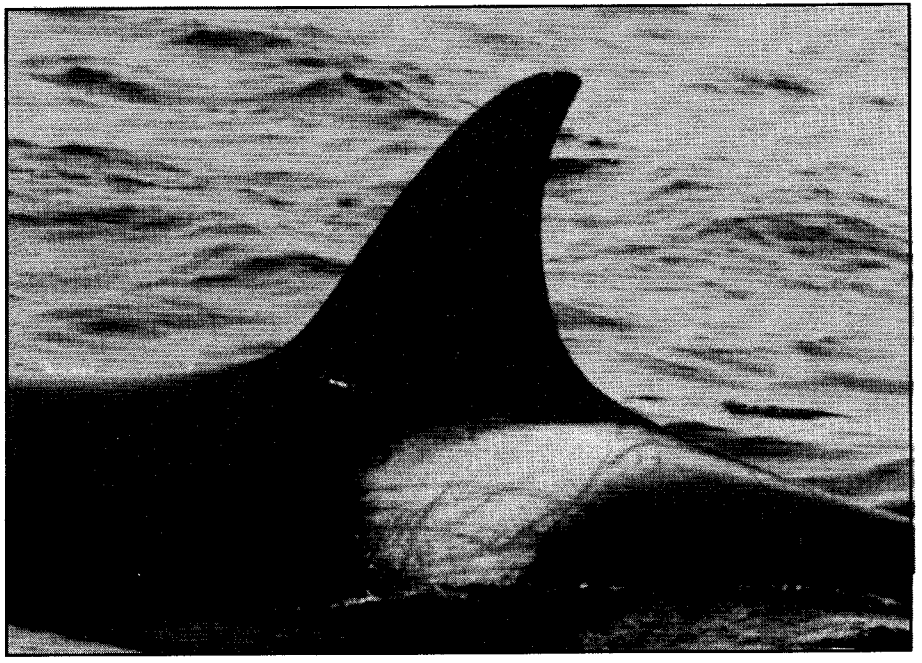
CA35 - 5/10/94 - Photo: N. Black



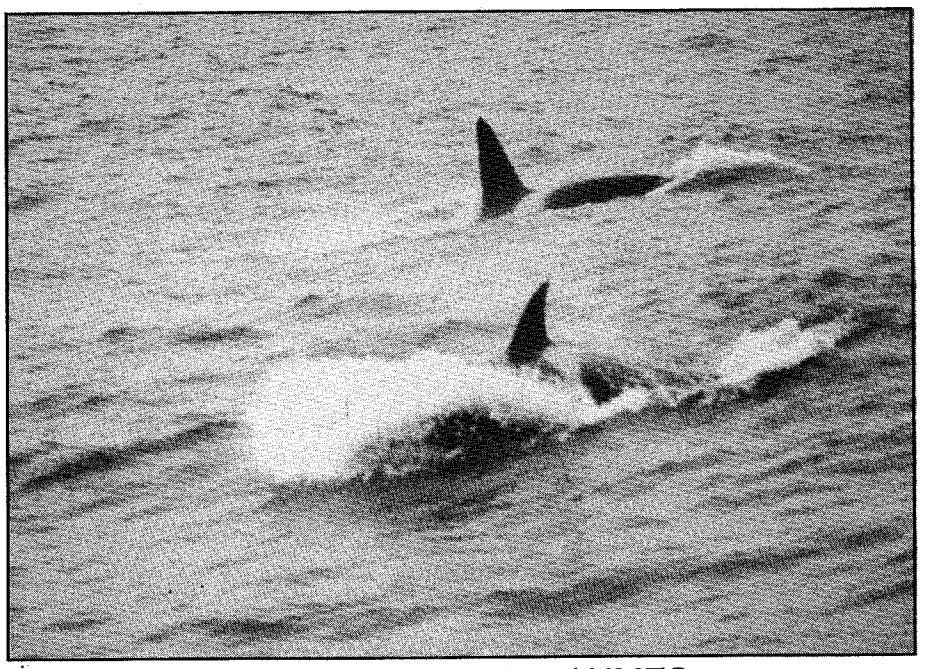
CA34 - 5/5/92 - Photo: N. Black



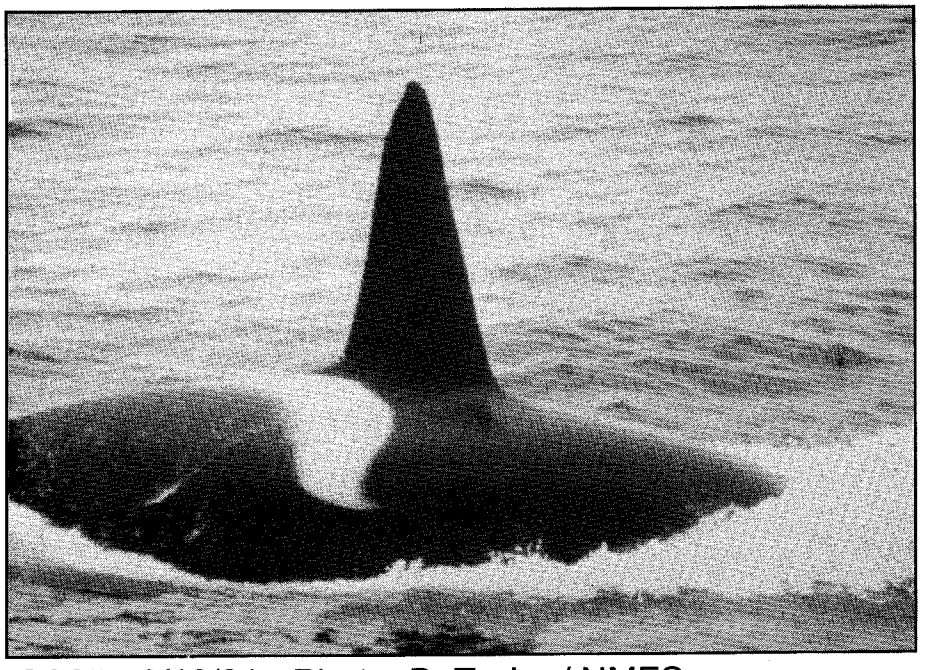
CA35 - 9/12/94 - Photo: J. Calambokidis/Cascadia



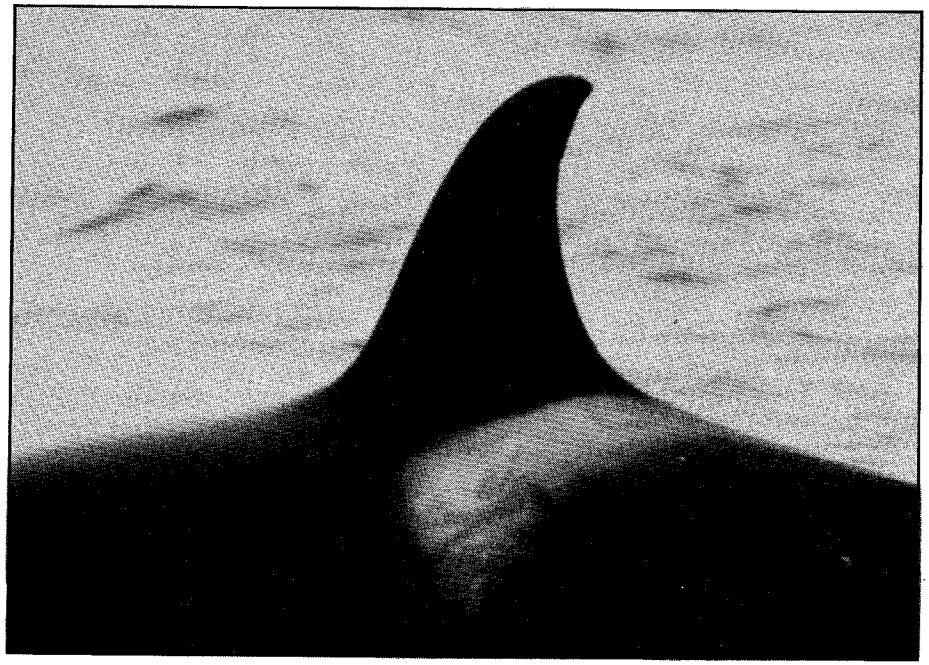
CA36 - 5/10/94 - Photo: N. Black



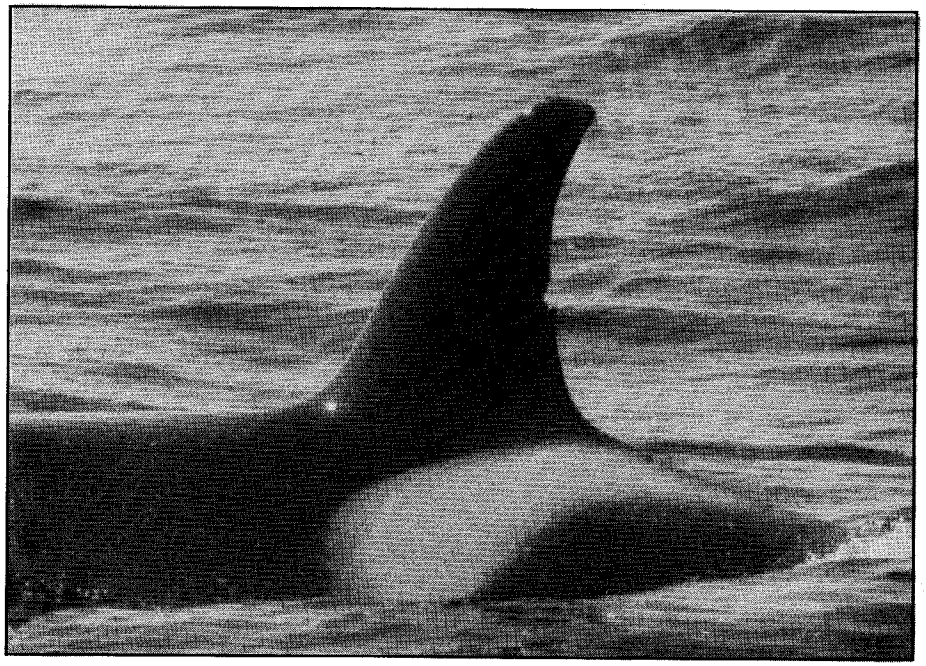
CA37 - 8/12/91 - Photo: J. Barlow / NMFS



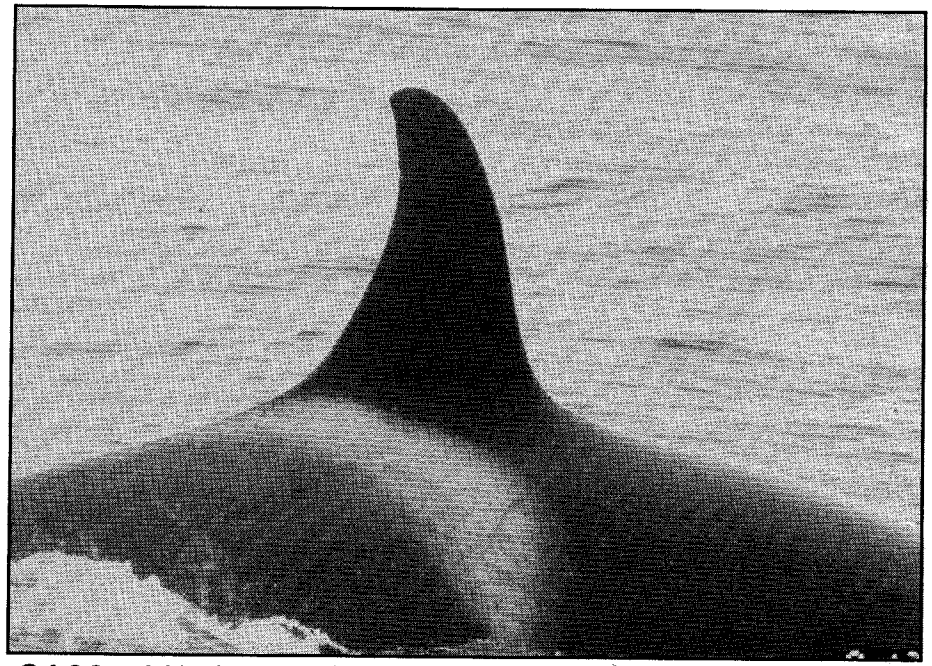
CA37 - 8/12/91 - Photo: B. Taylor / NMFS



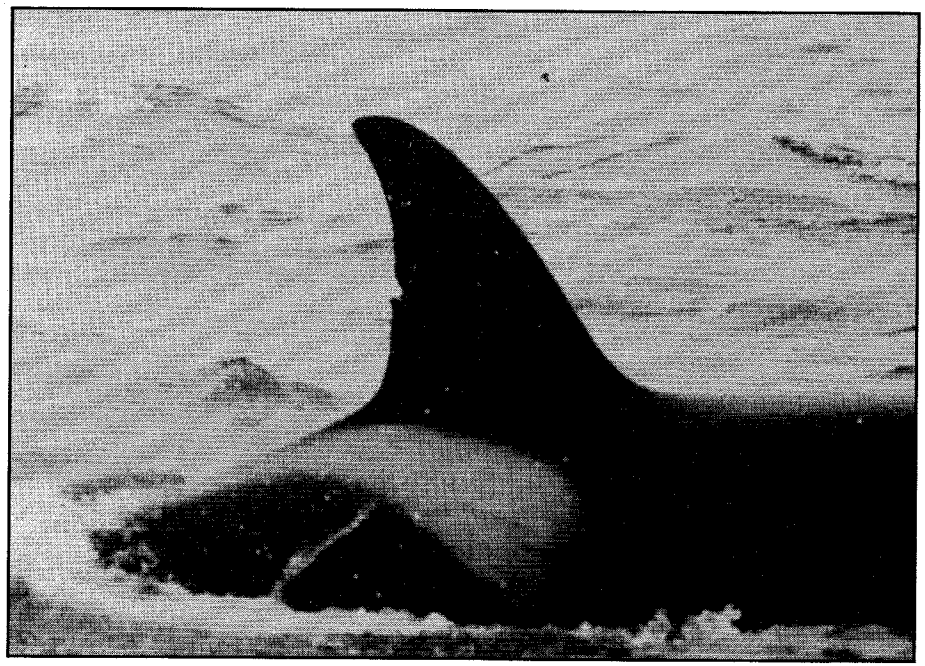
CA38 - 5/5/92 - Photo: N. Black



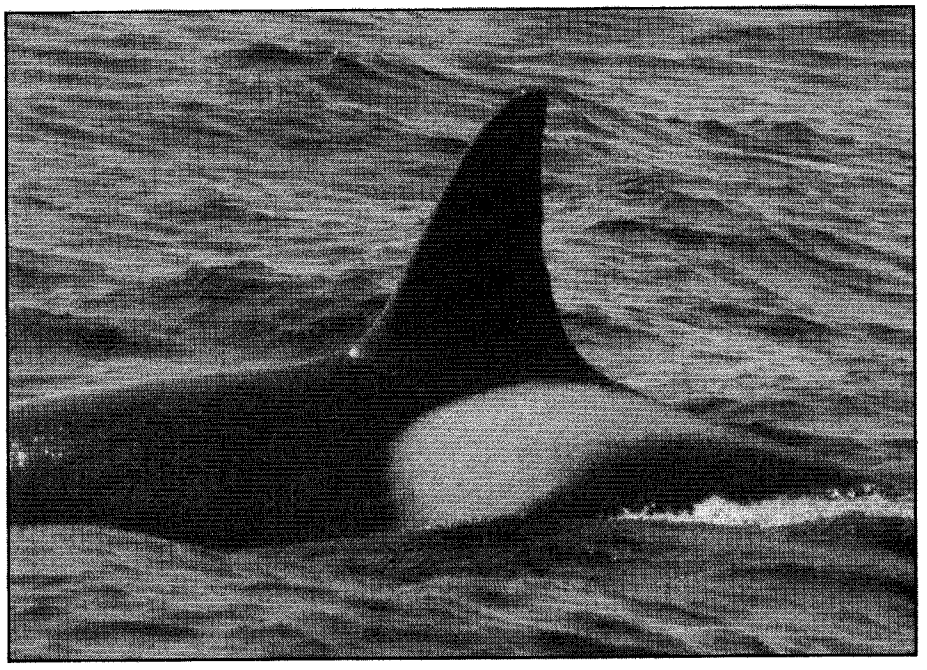
CA39 - 3/13/96 - Photo: N. Black



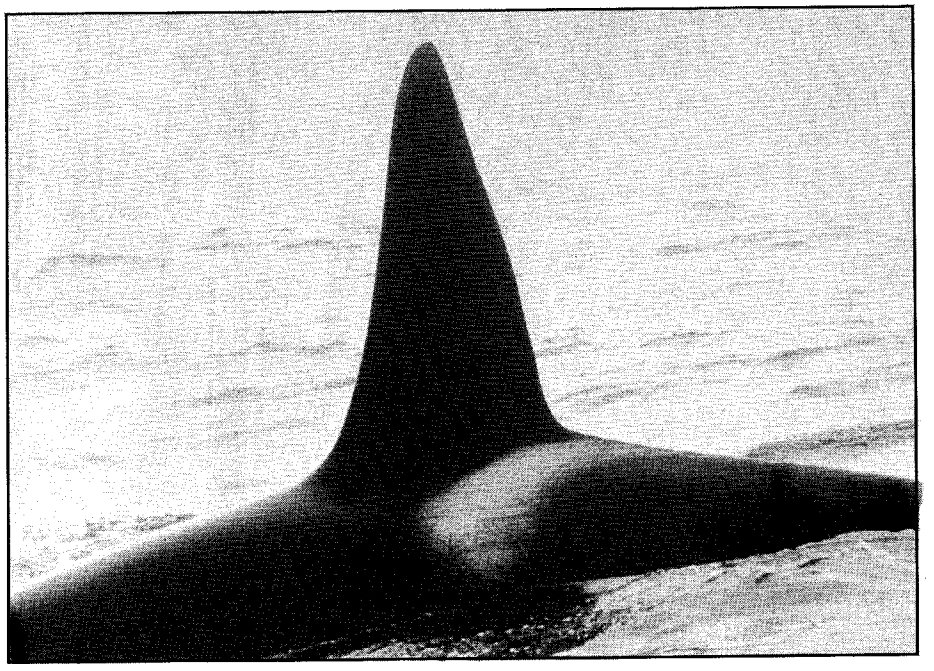
CA38 - 9/12/94 - Photo: J. Calambokidis/Cascadia



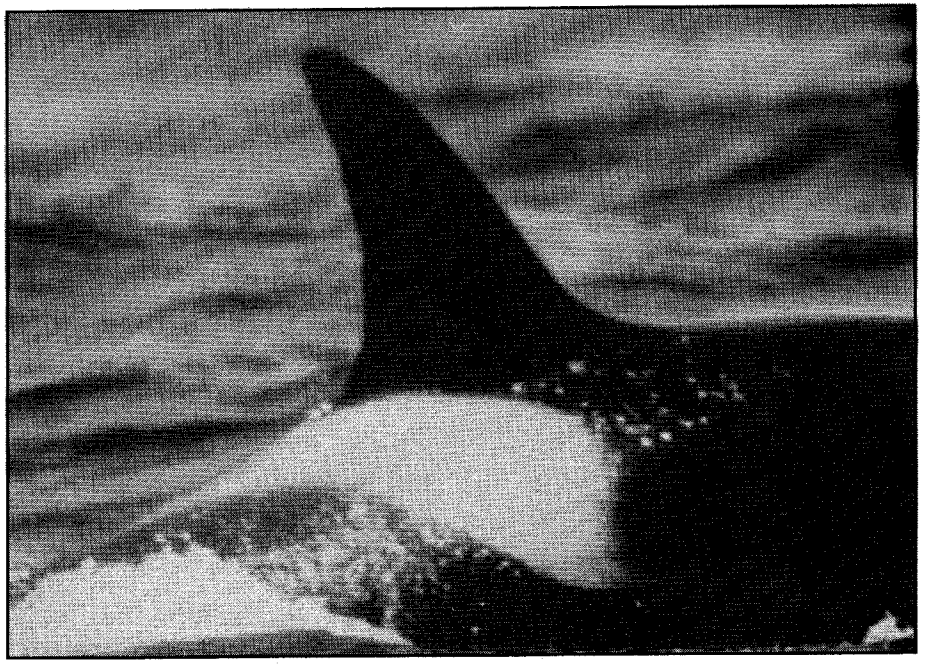
CA39 - 9/28/91 - Photo: N. Black



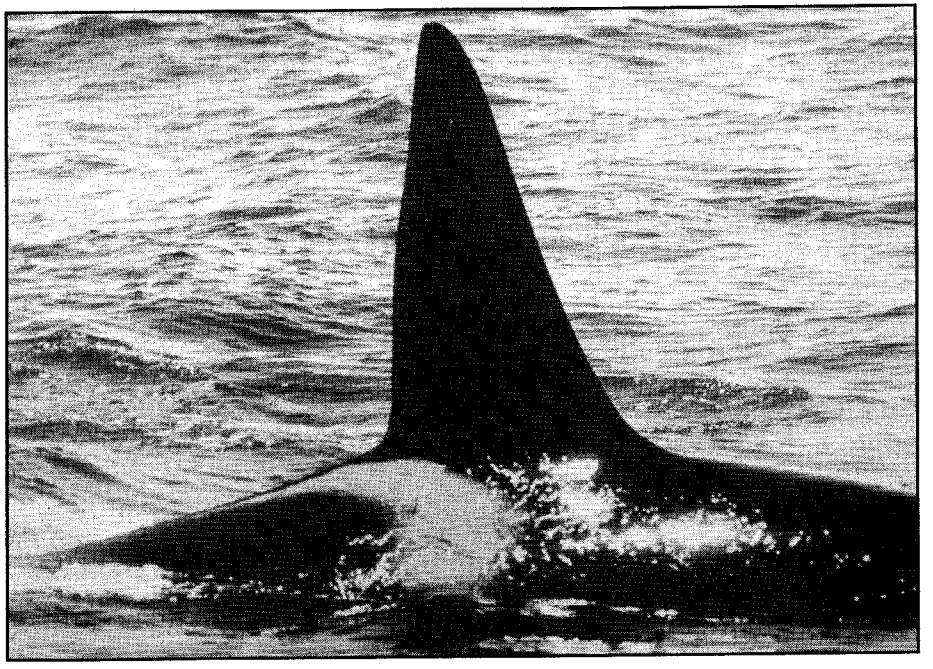
CA40 - 10/10/95 - Photo: N. Black



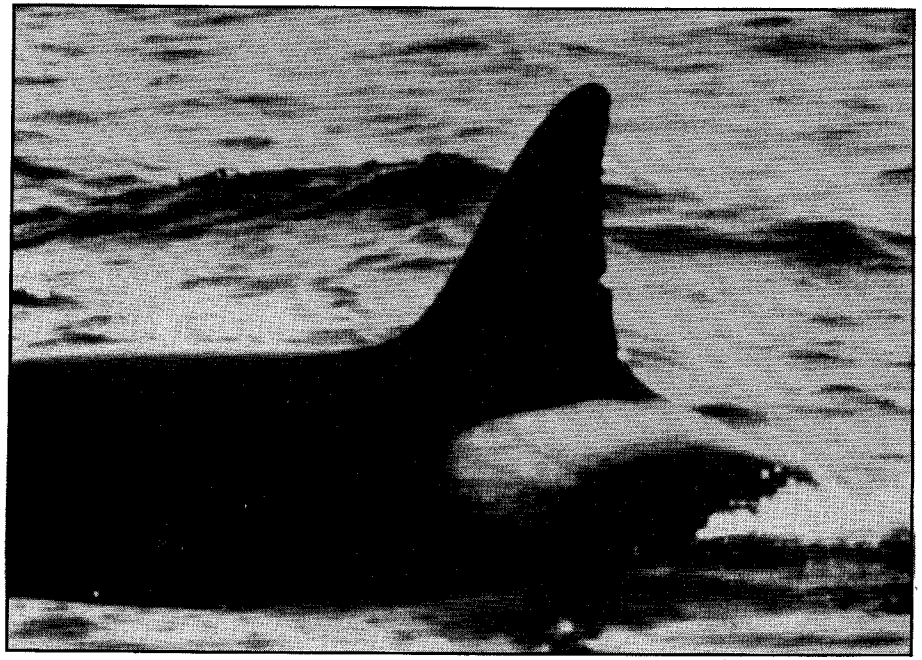
CA41 - 8/17/94 - Photo: N. Black



CA40 - 5/2/92 - Photo: N. Black

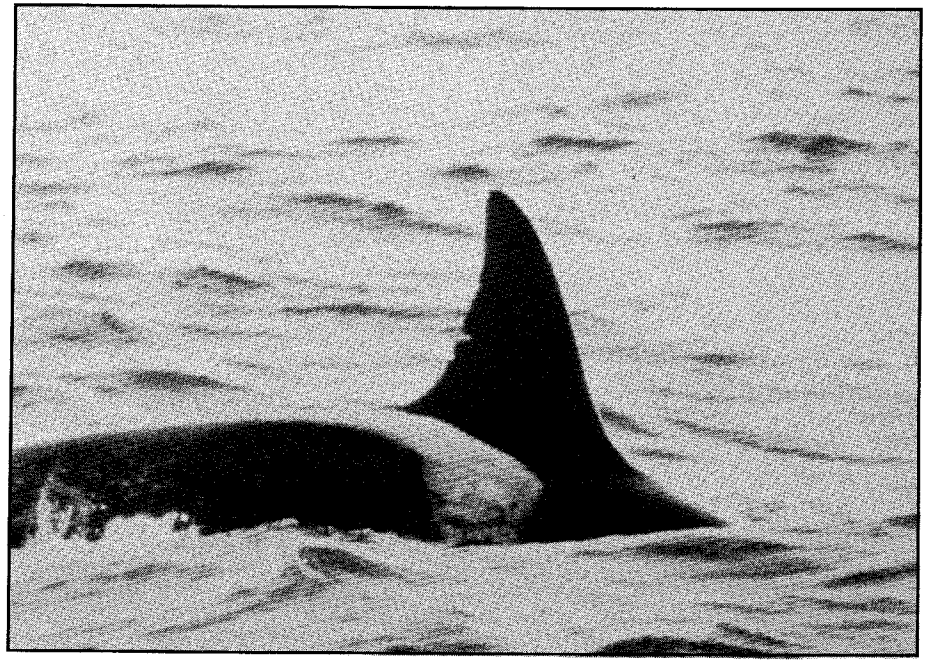


CA41 - 10/10/95 - Photo: N. Black

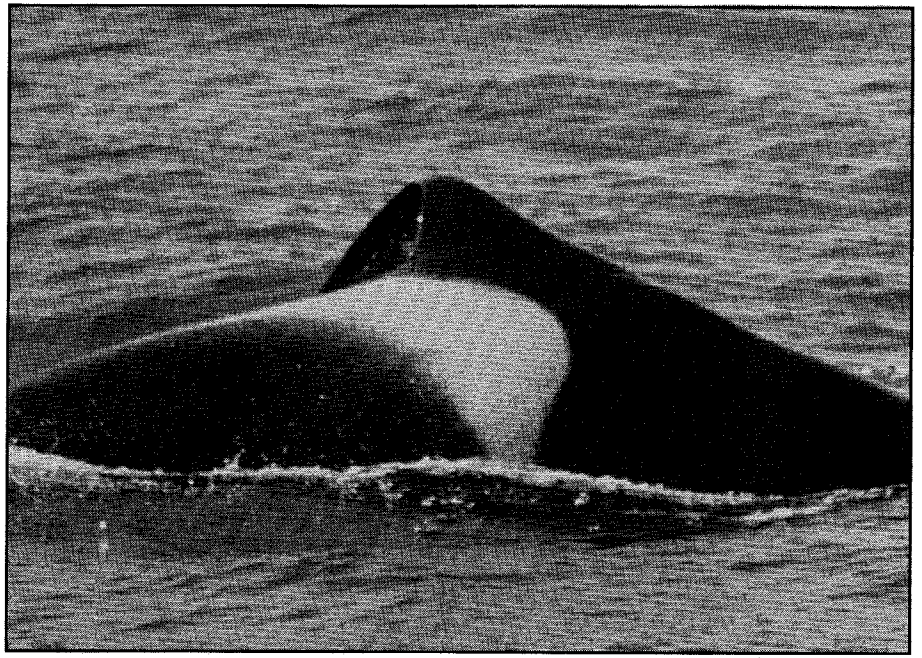


CA42 - 10/23/92 - Photo: N. Black

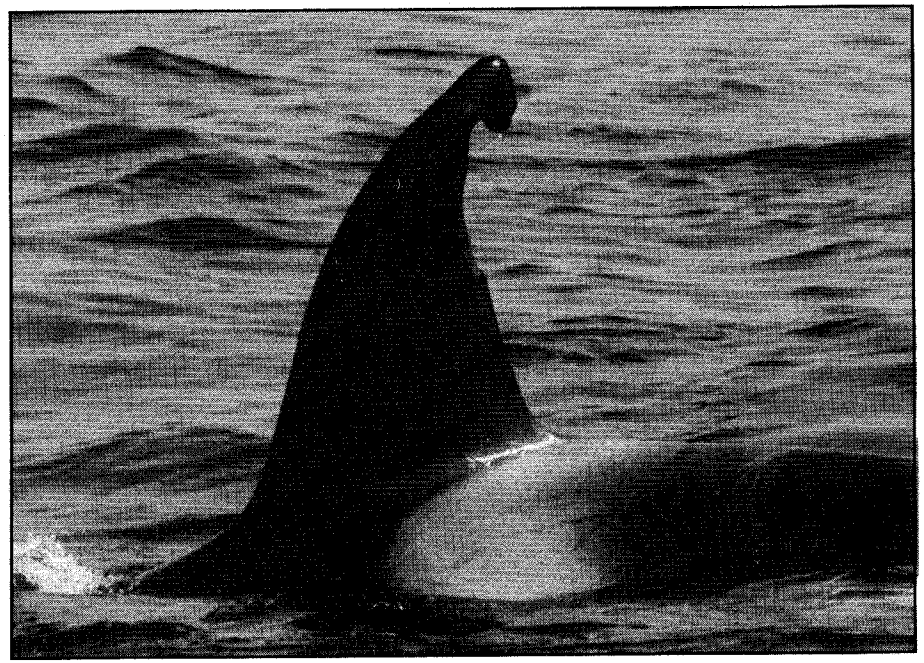
CA43 - 3/13/96 - Photo: N. Black



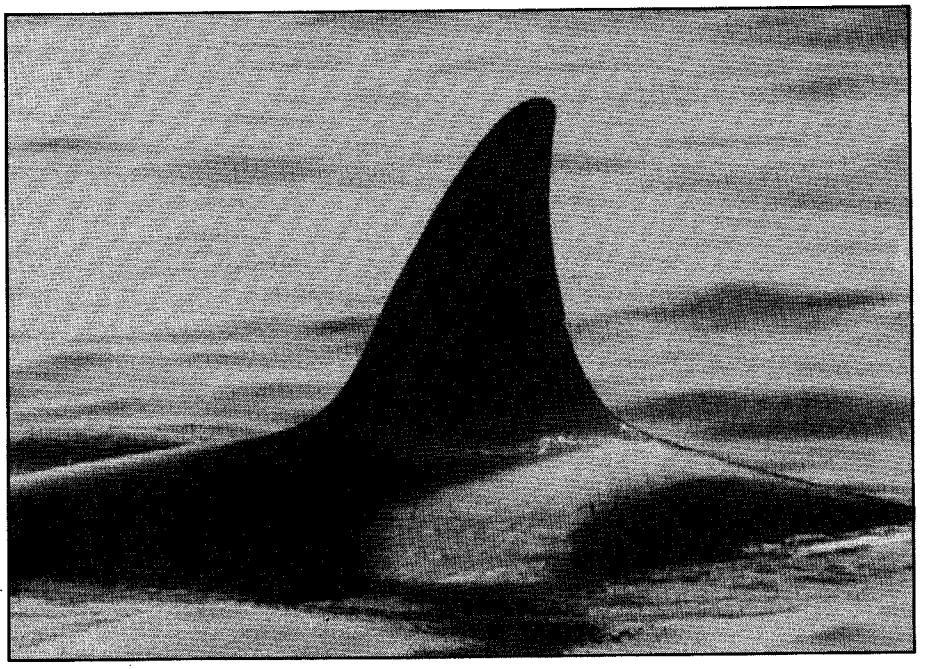
CA42 - 10/16/92 - Photo: N. Black



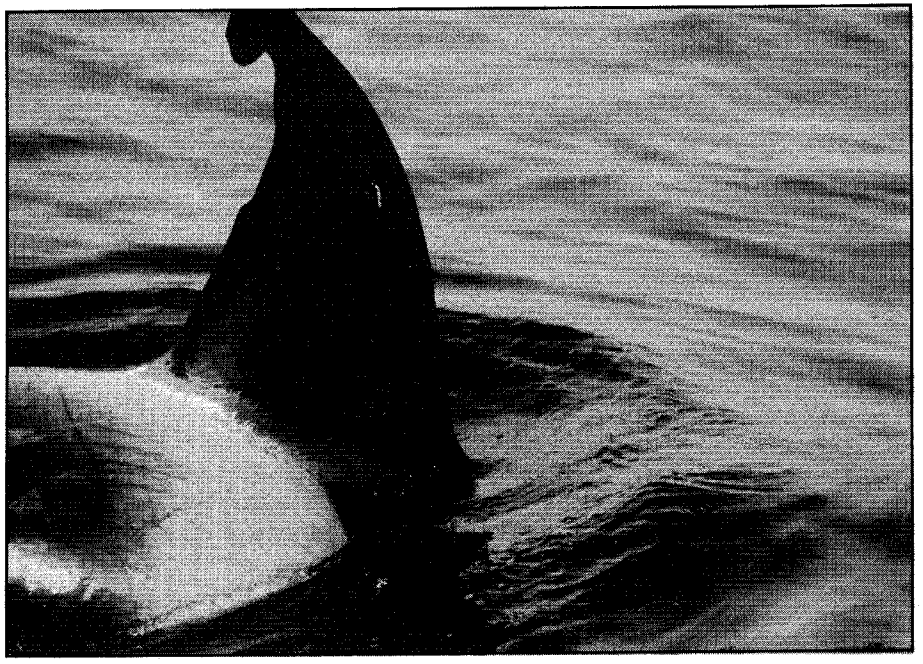
CA43 - 2/8/97 - Photo: N. Black



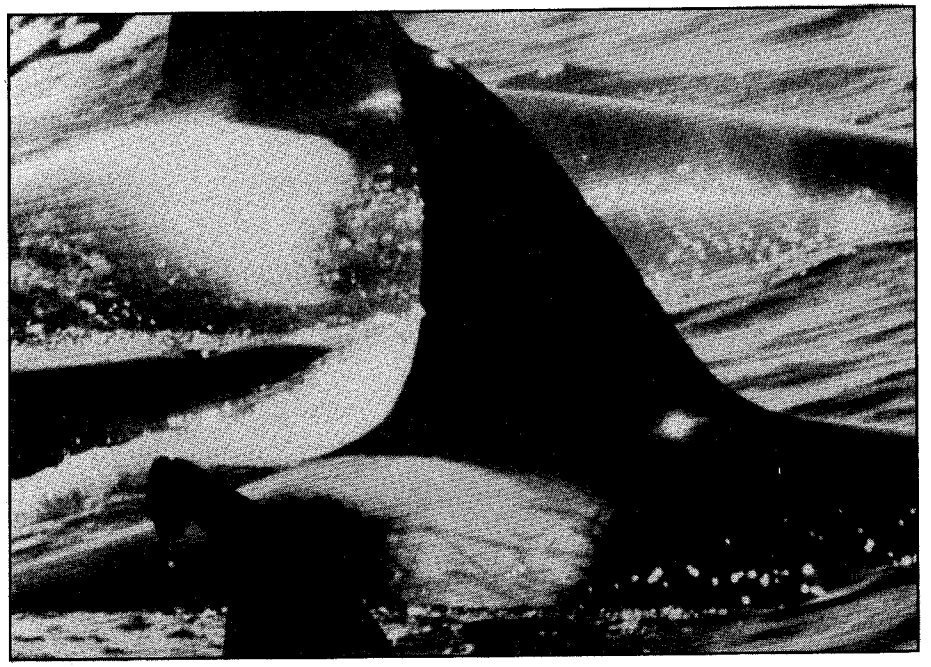
CA44 - 8/26/96 - Photo: N. Black



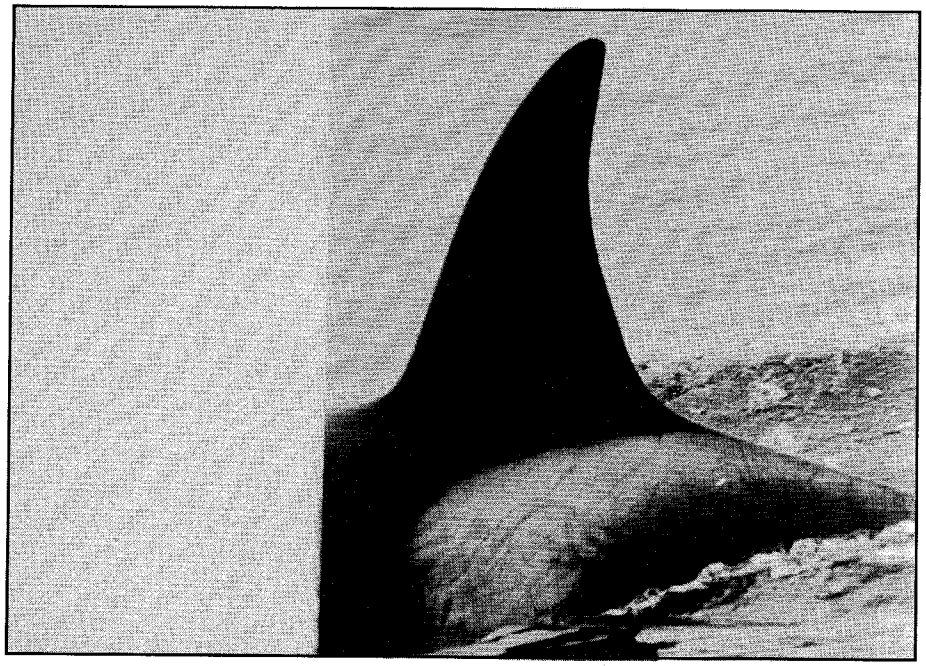
CA45 - 8/26/96 - Photo: N. Black



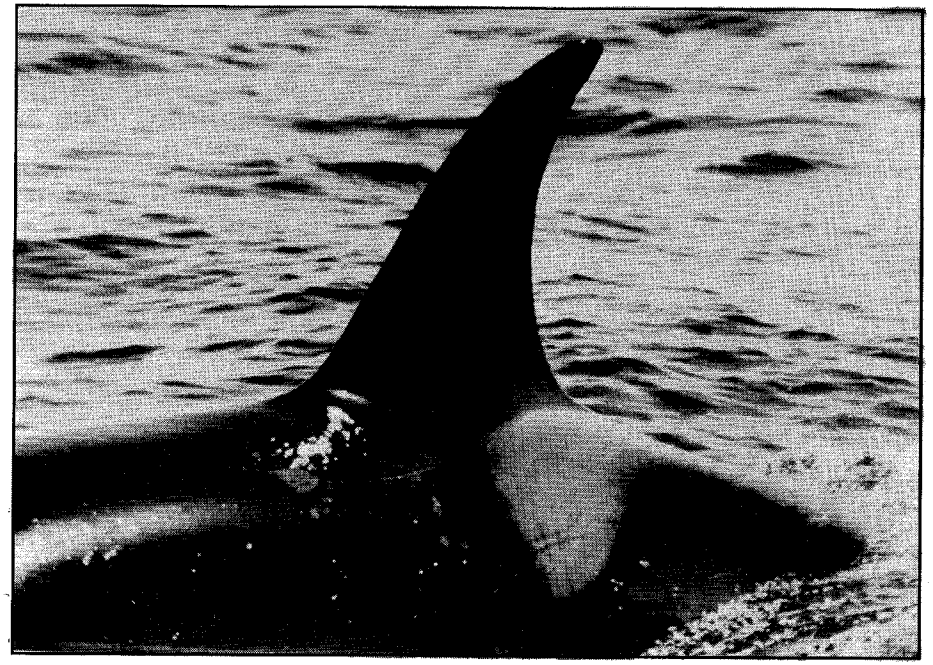
CA44 - 8/26/96 - Photo: N. Black



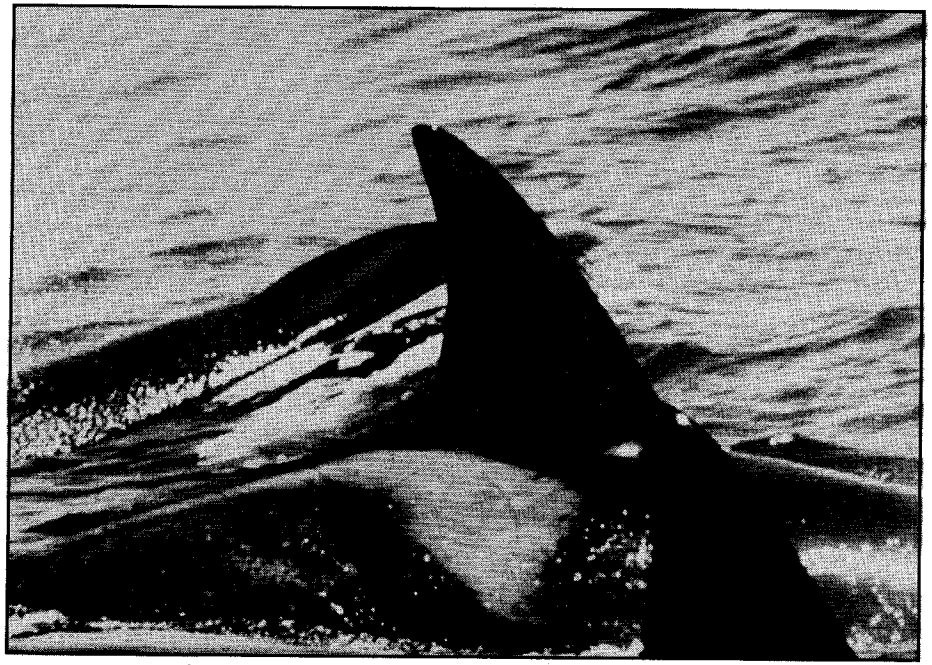
CA45 - 8/16/94 - Photo: N. Black



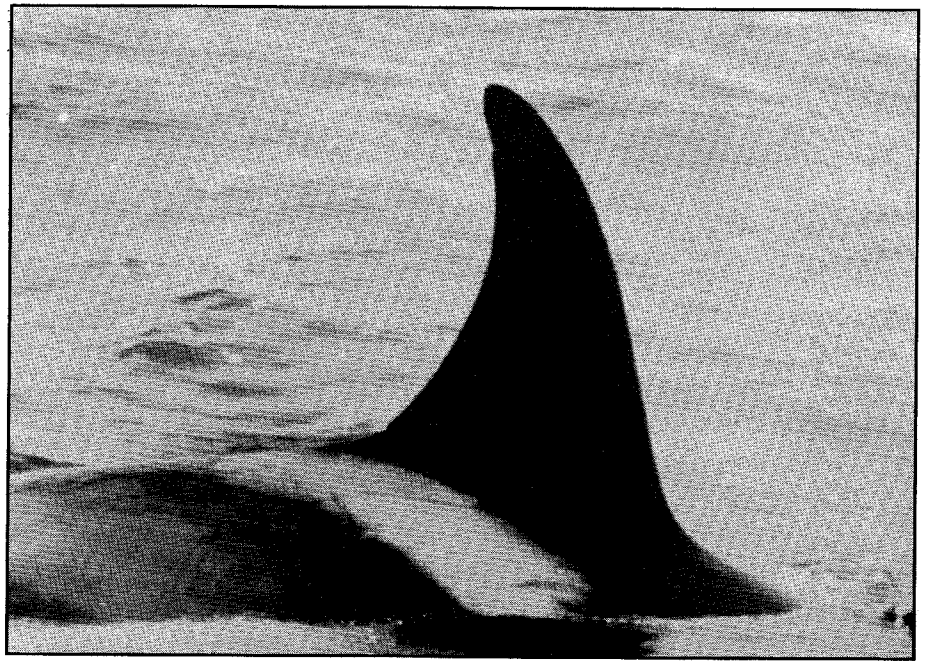
CA46 - 8/17/94 - Photo: N. Black



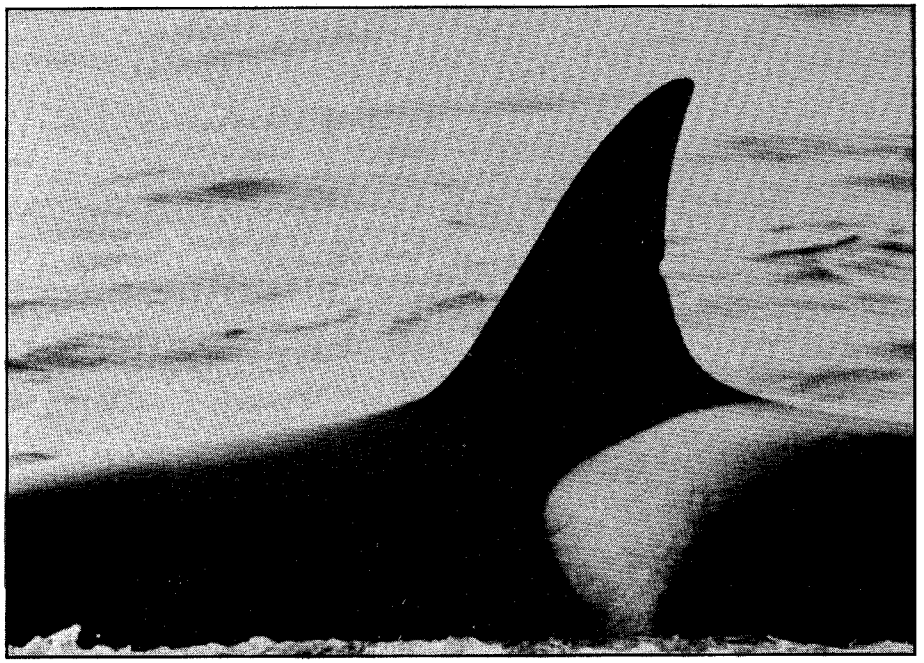
CA49 - 4/6/96 - Photo: R. Ternullo



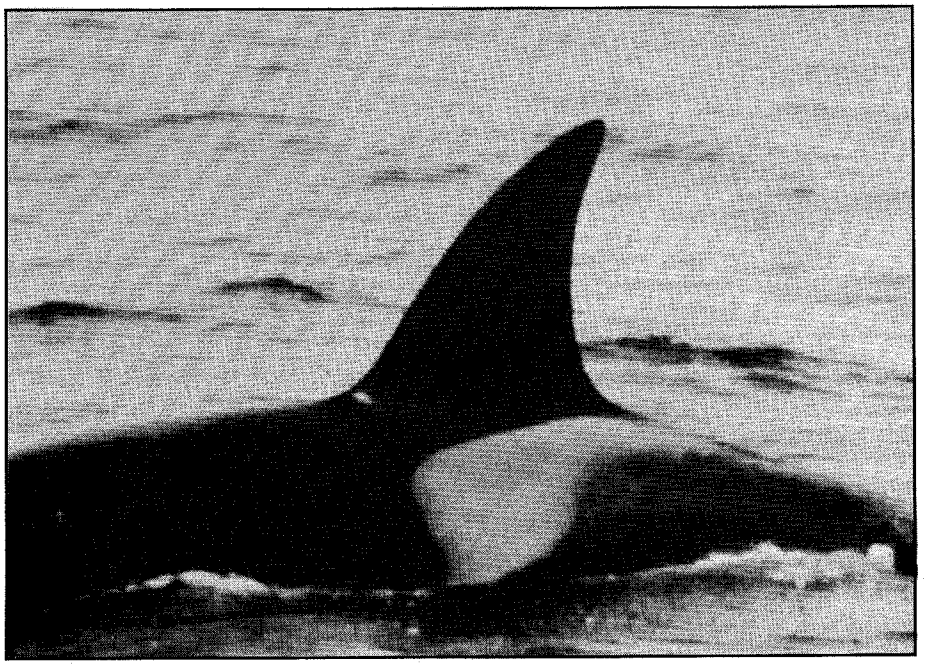
CA46 - 8/16/94 - Photo: N. Black



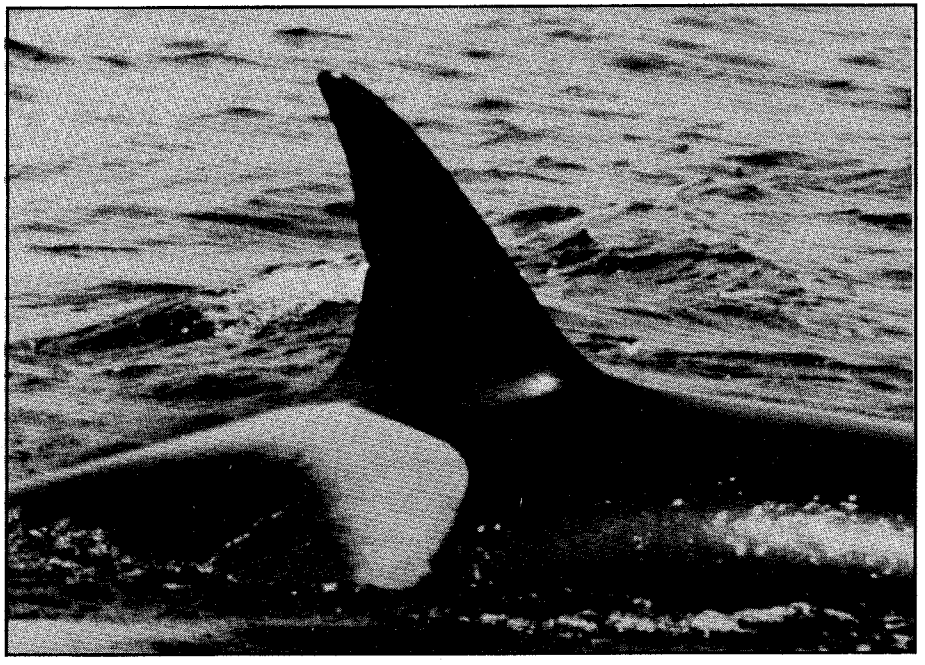
CA49 - 5/2/92 - Photo: N. Black



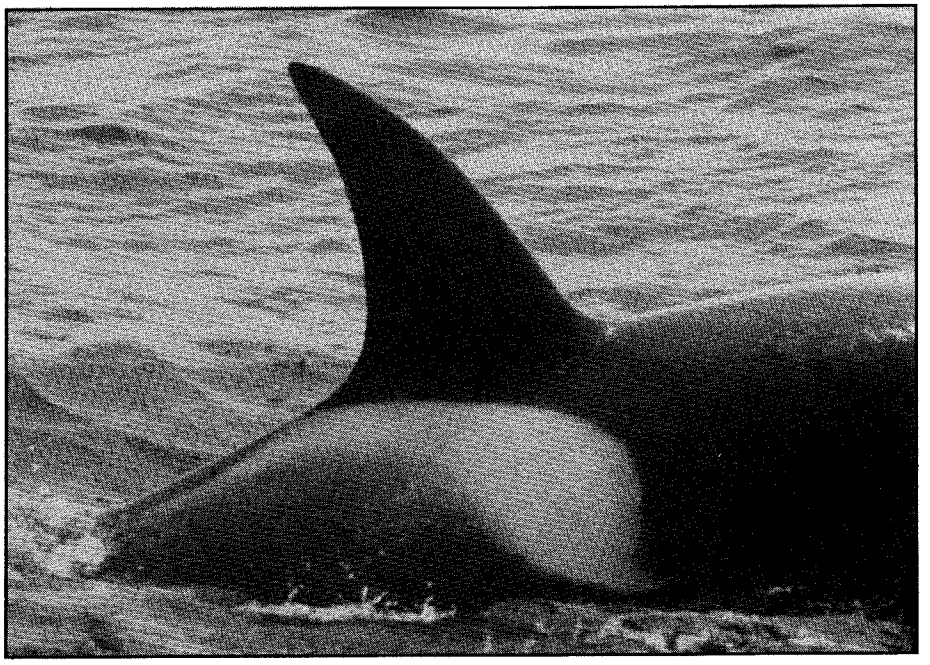
CA50 - 8/17/94 - Photo: G. Rowell



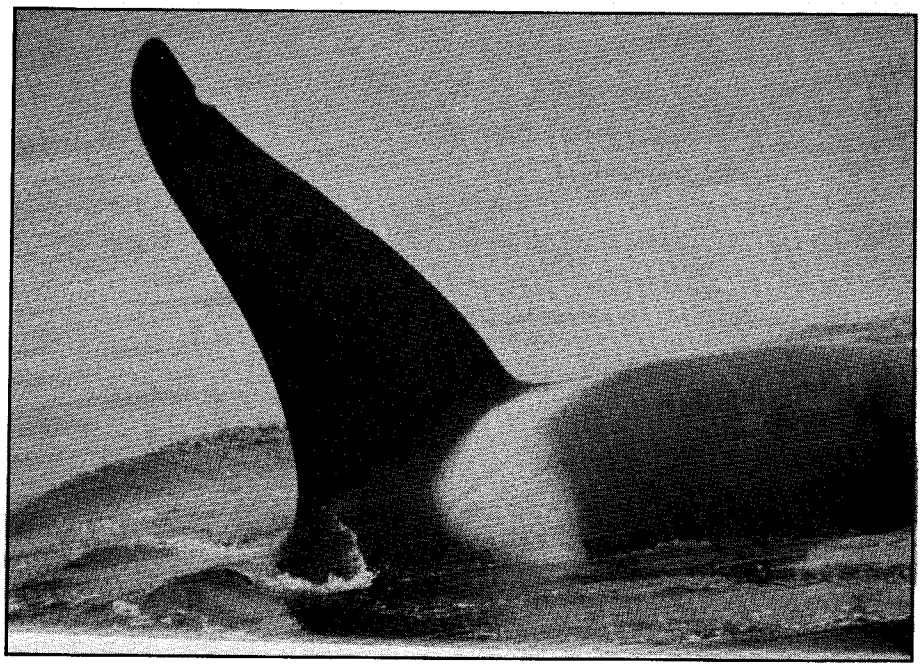
CA51 - 9/6/93 - Photo: N. Black



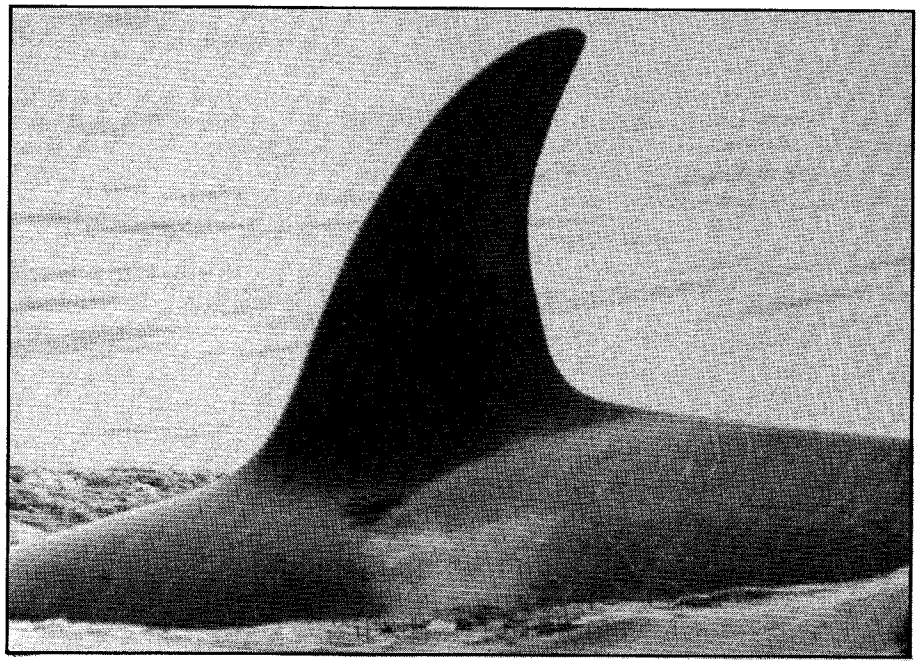
CA50 - 9/6/93 - Photo: N. Black



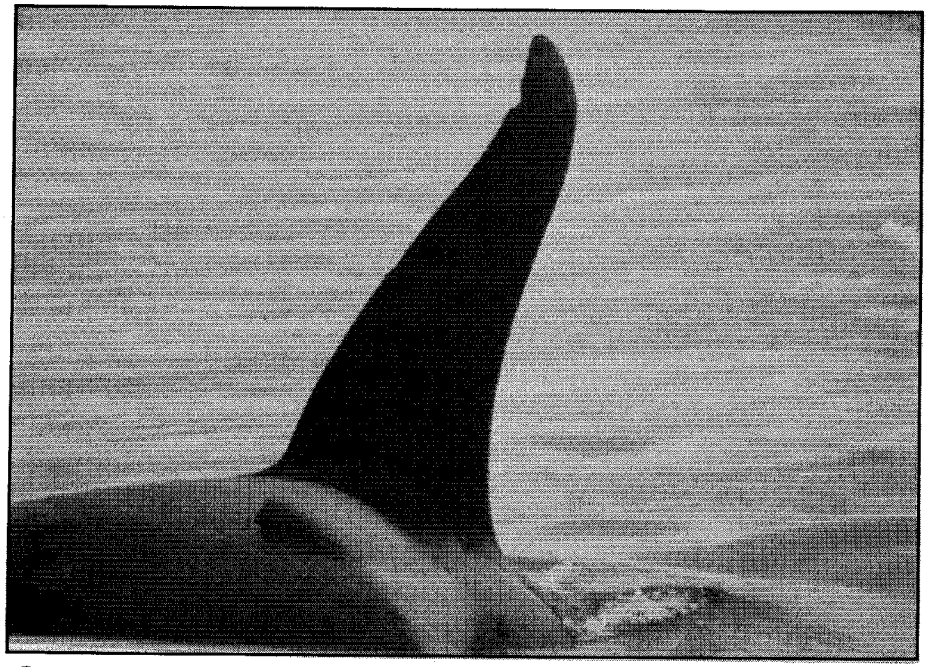
CA51 - 9/6/93 - Photo: N. Black



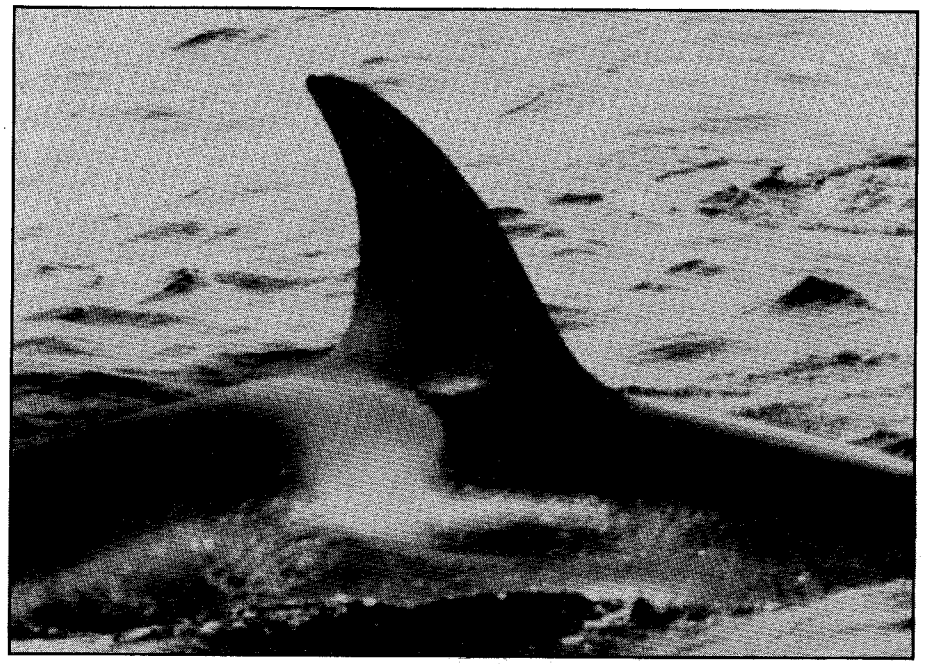
CA52 - 4/21/97 - Photo: N. Black



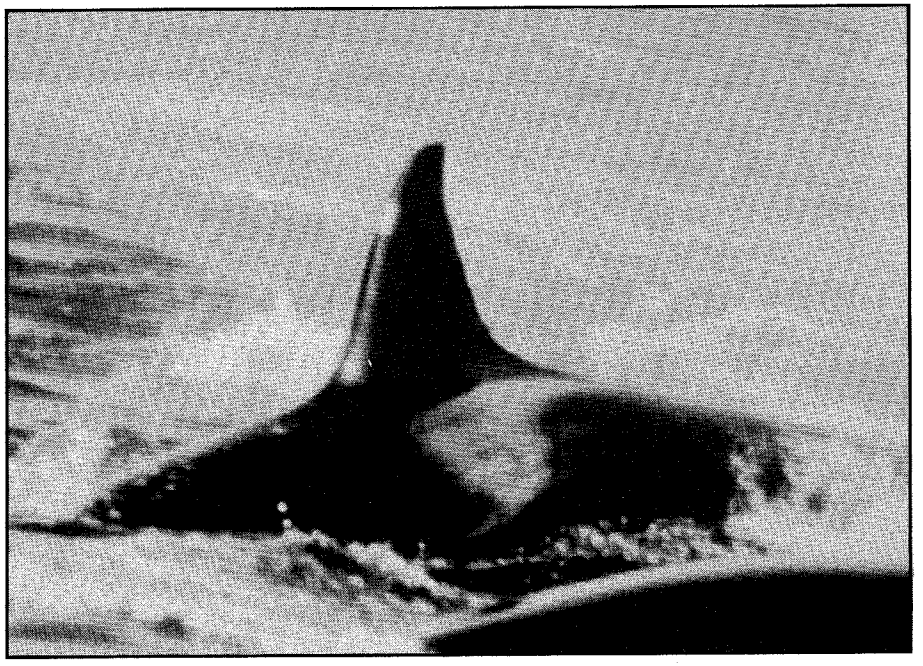
CA53 - 9/16/92 - Photo: J. Calambokidis/Cascadia



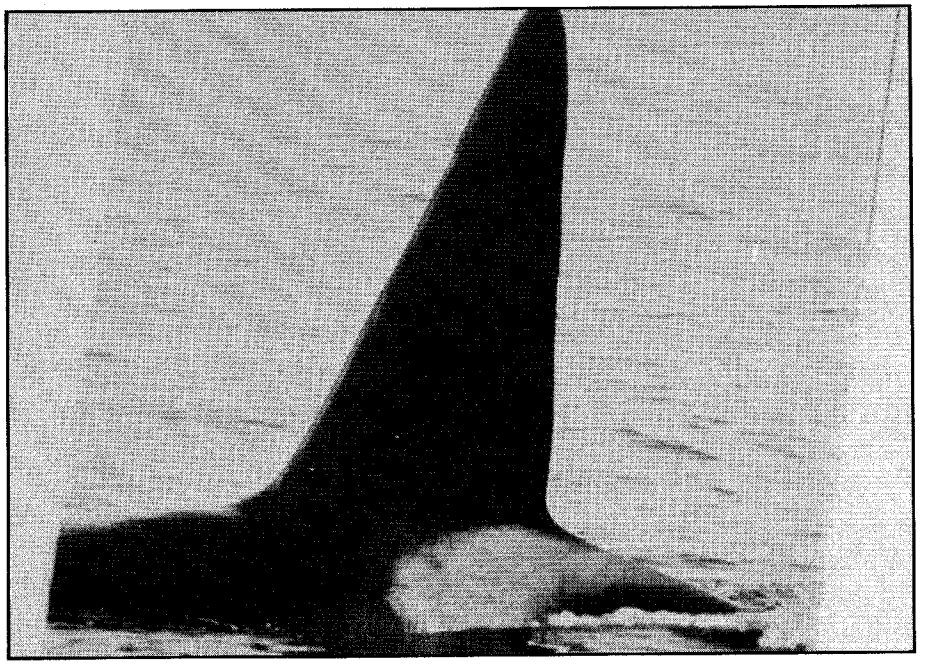
CA52 - 4/21/97 - Photo: N. Black



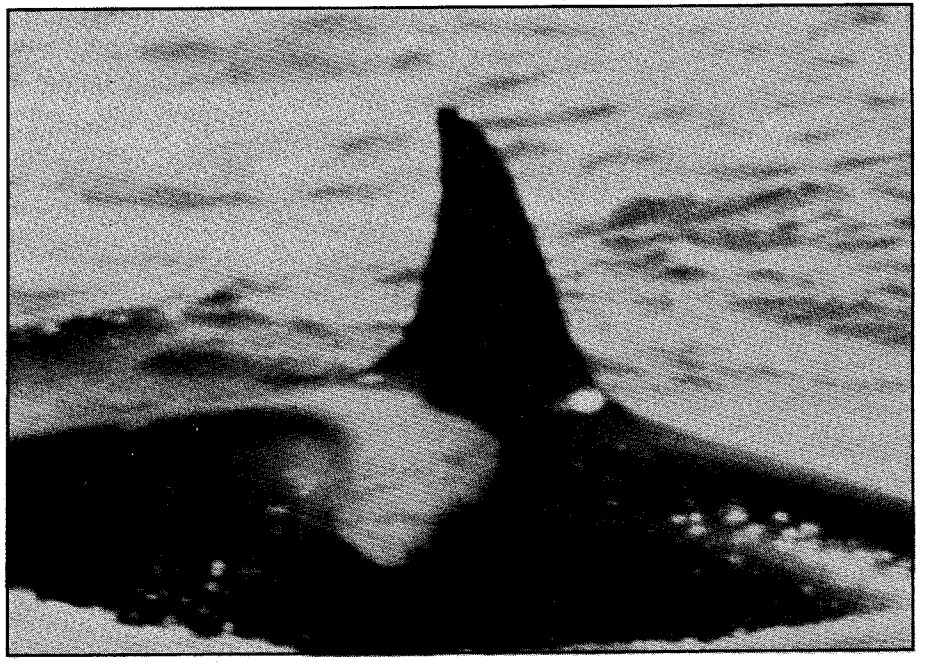
CA53 - 9/6/93 - Photo: N. Black



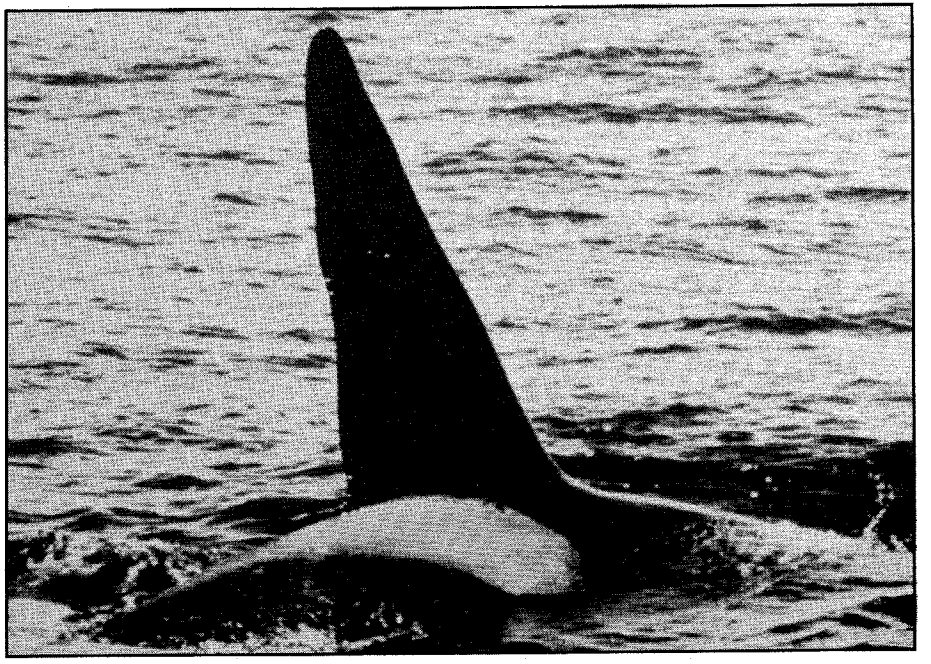
CA54 - 5/2/92 - Photo: N. Black



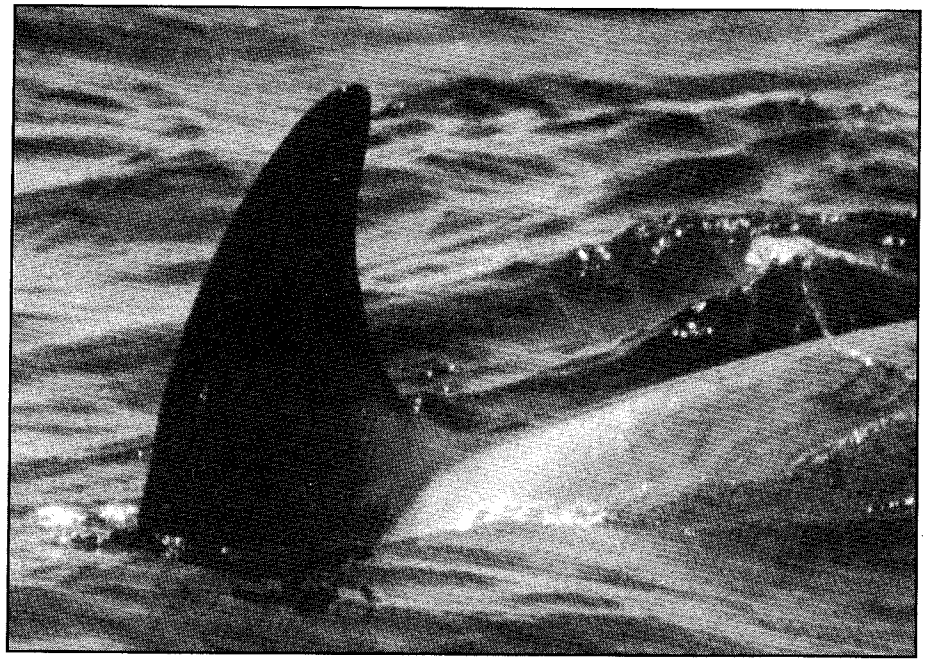
CA55 - 4/20/91 - Photo: N. Black



CA54 - 5/2/92 - Photo: N. Black

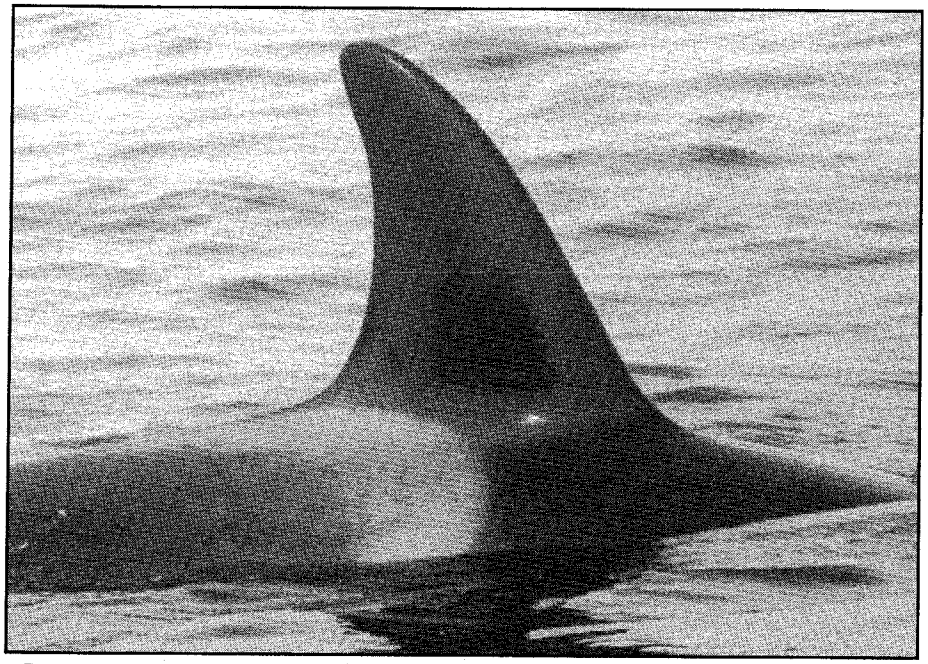


CA55 - 4/20/91 - Photo: N. Black

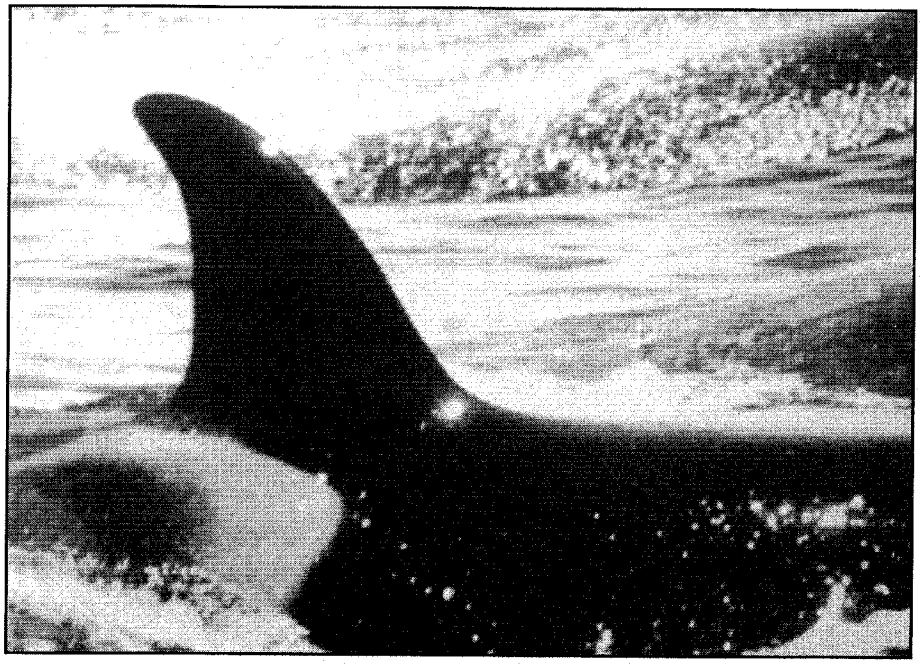


CA56 - 8/26/96 - Photo: N. Black

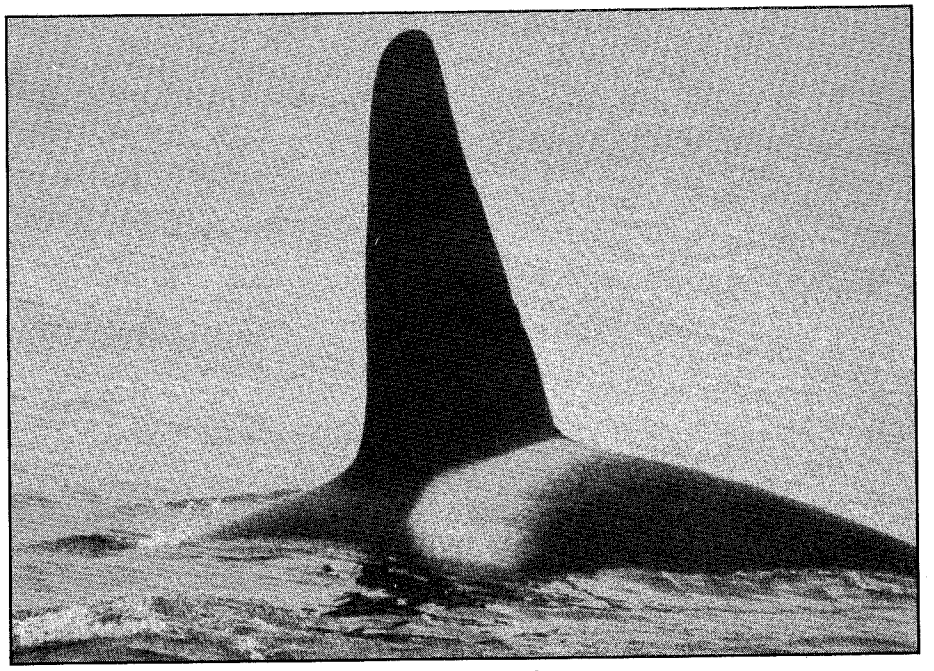
CA57 - 8/26/96 - Photo: N. Black



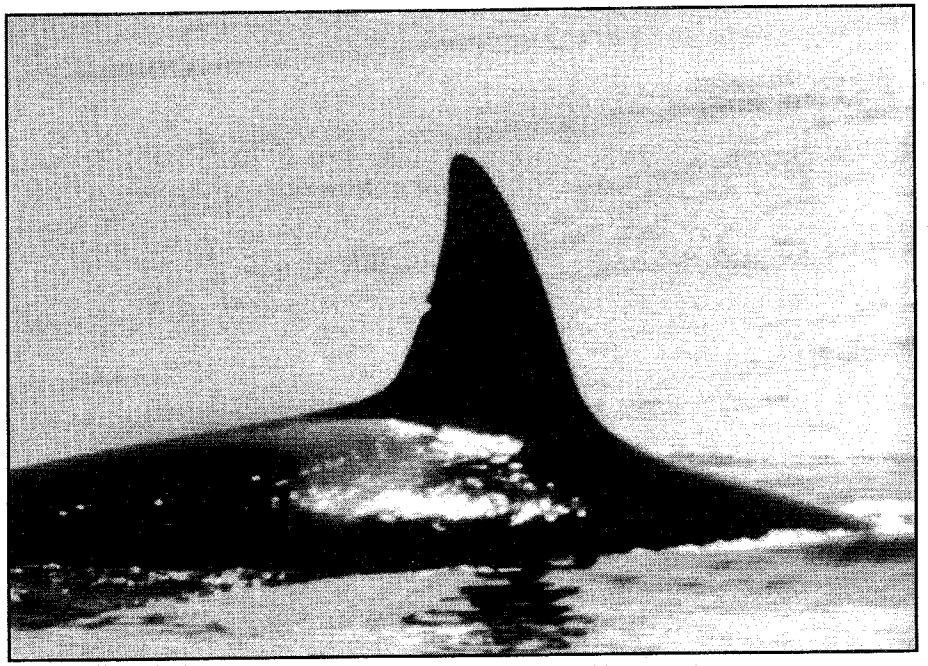
CA56 - 9/26/96 - Photo: N. Black



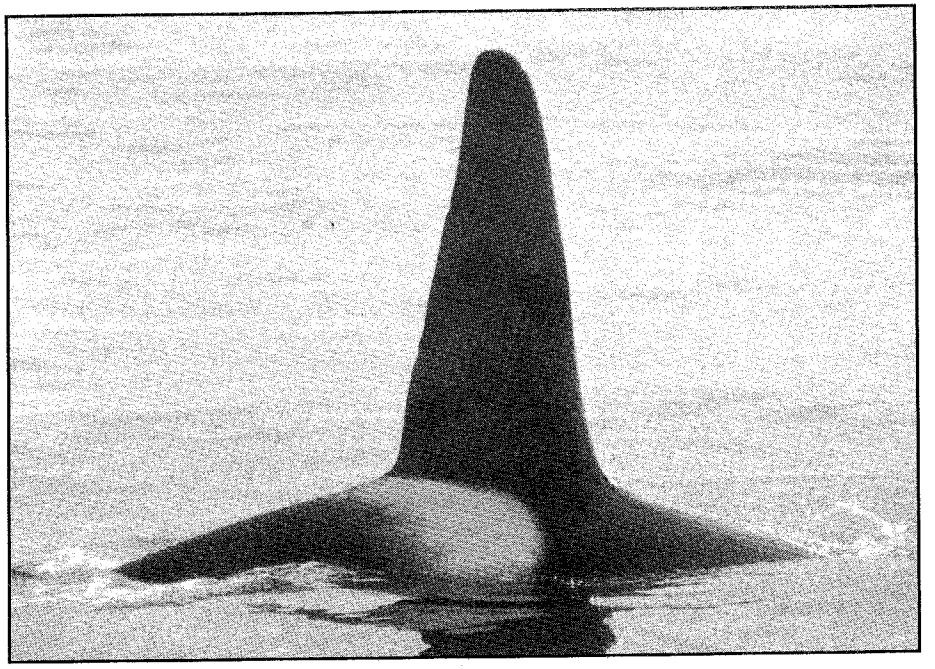
CA57 - 8/16/94 - Photo: N. Black



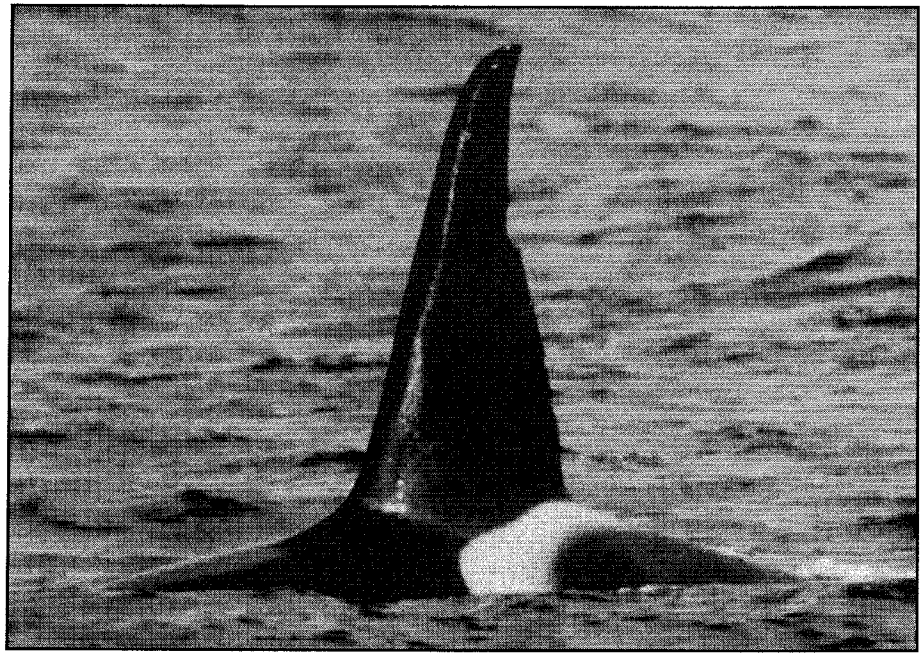
CA59 - 4/21/97 - Photo: N. Black



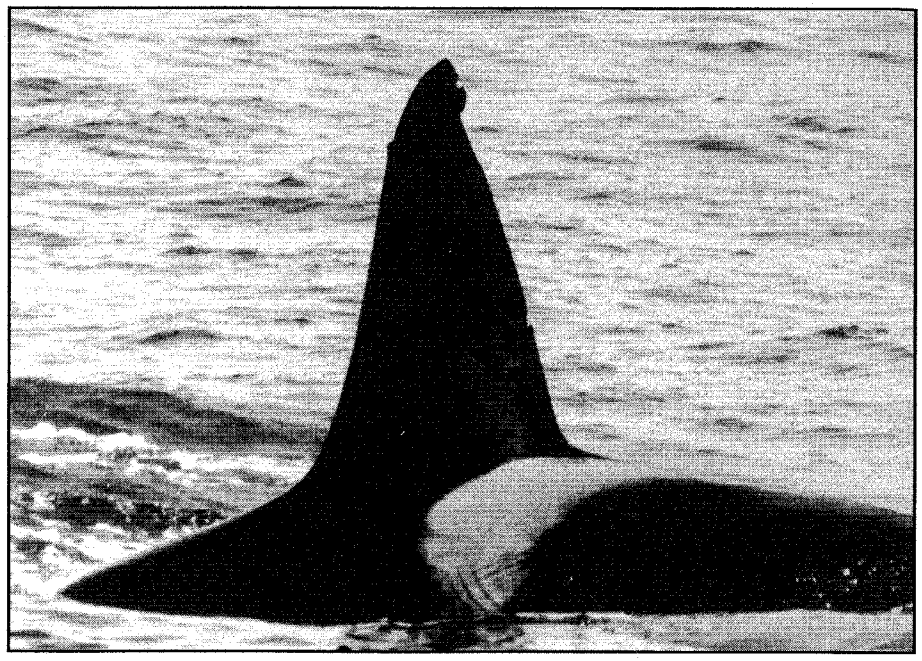
CA58 - 5/15/93 - Photo: N. Black



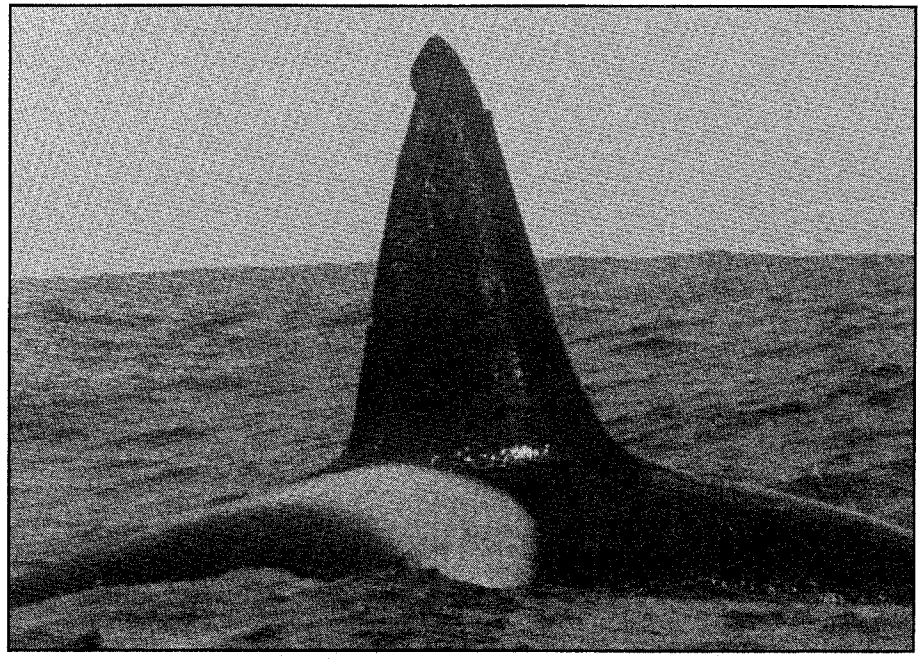
CA59 - 4/21/97 - Photo: N. Black



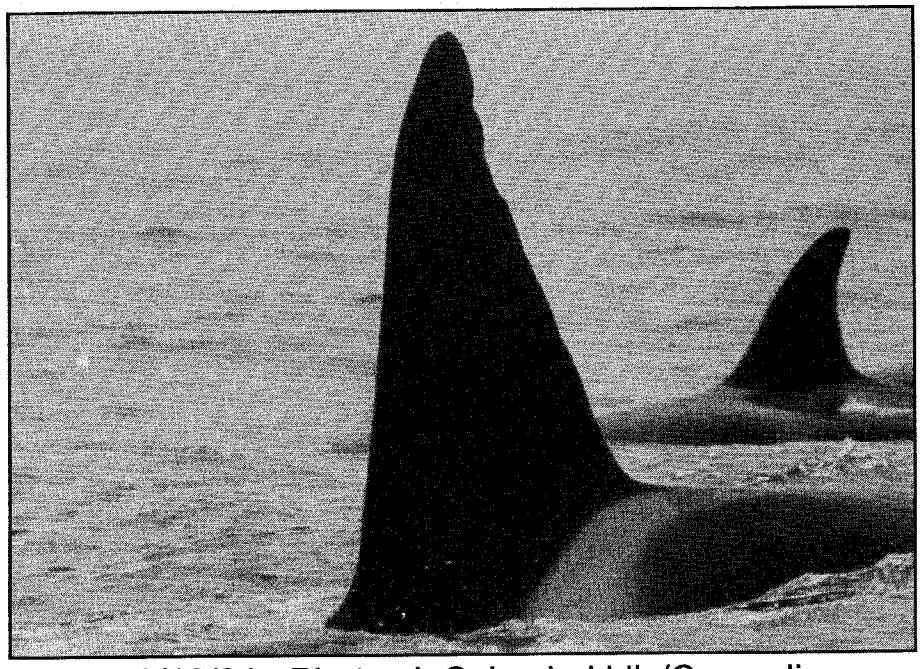
CA63 - 10/15/83 - Photo: S. Bailey



CA68 - 9/5/96 - Photo: R. Ternullo

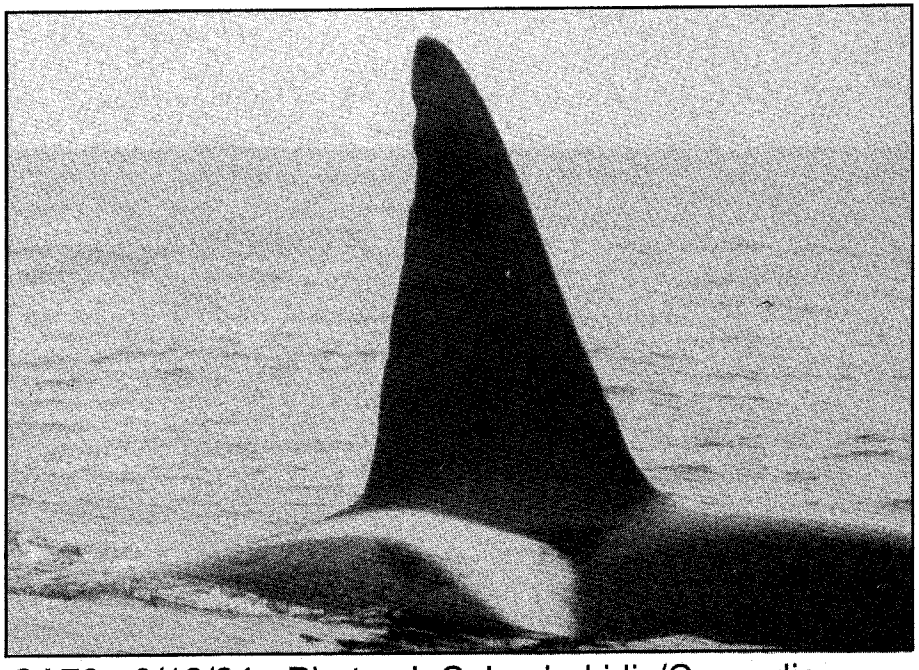


CA68 - 1/21/96 - Photo: N. Black

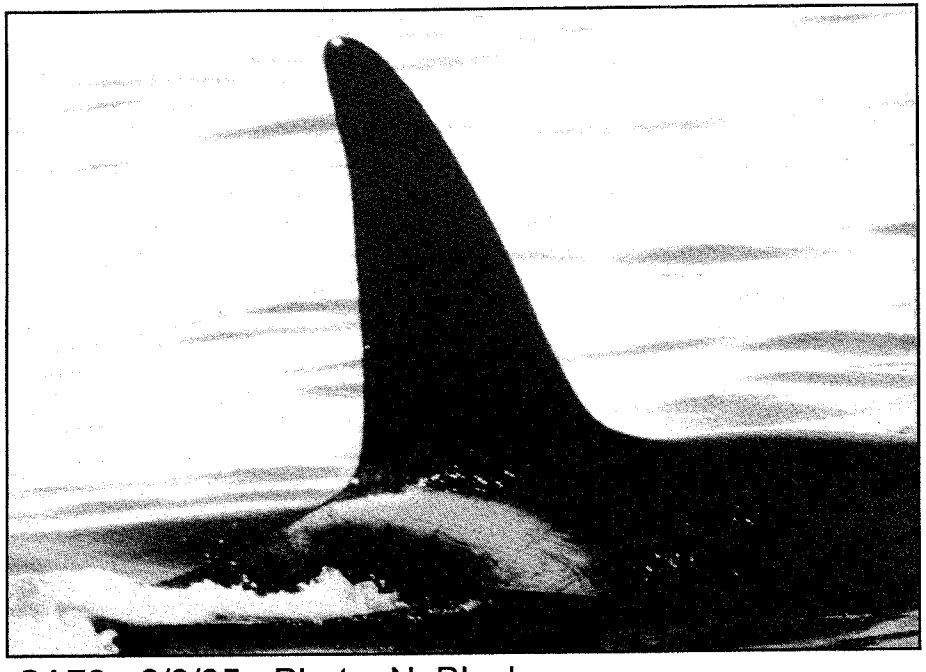


CA73 - 9/12/94 - Photo: J. Calambokidis/Cascadia

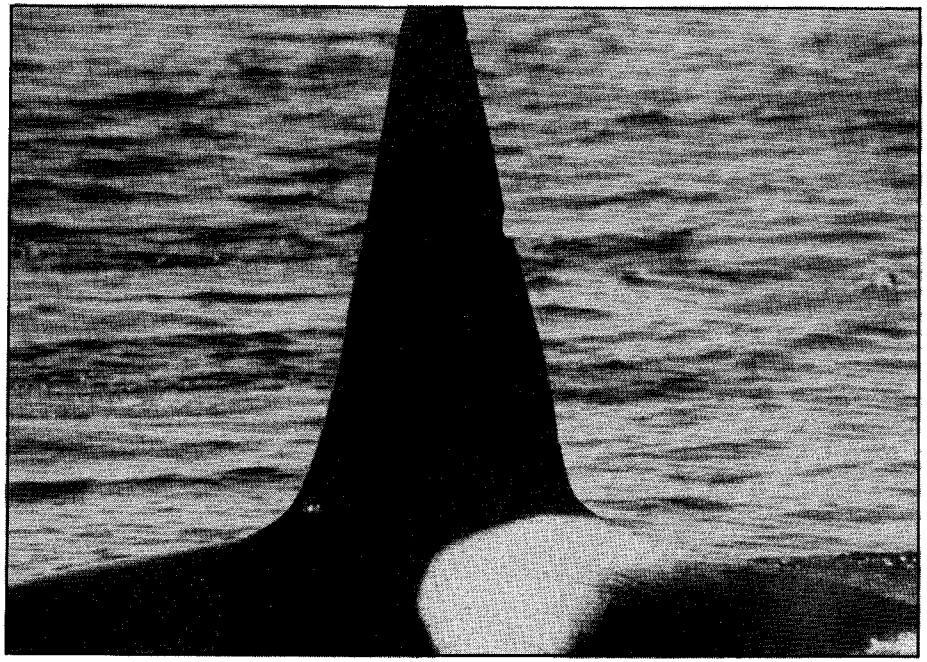
CA79 - 12/20/93 - Photo: N. Black



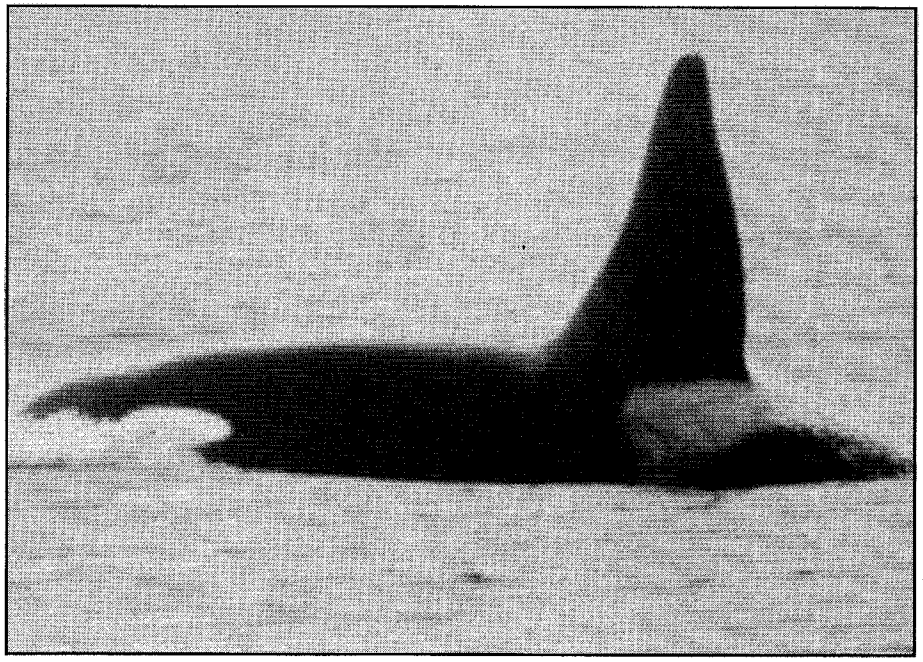
CA73 - 9/12/94 - Photo: J. Calambokidis/Cascadia



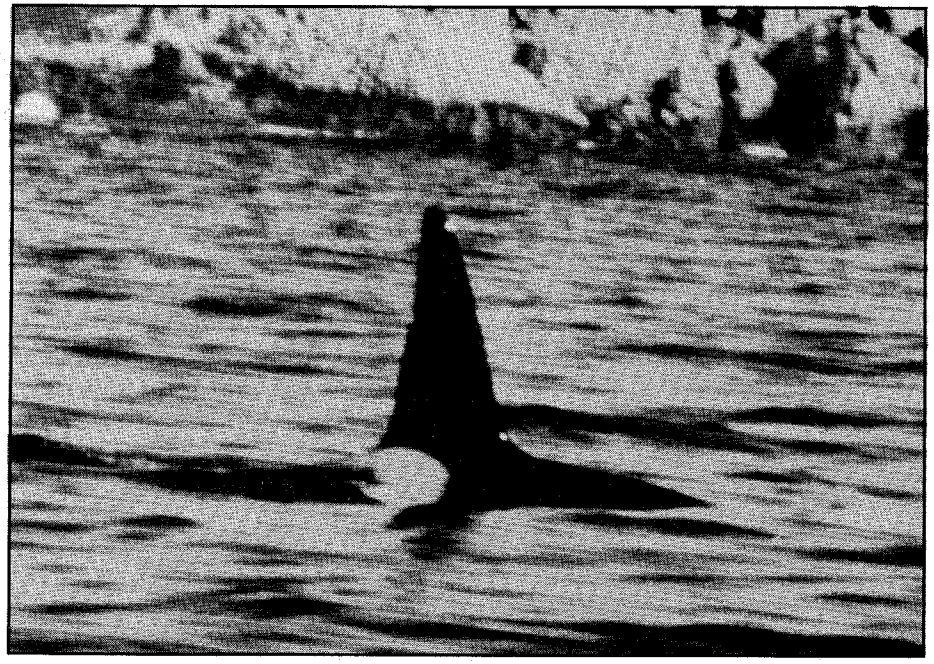
CA79 - 2/3/95 - Photo: N. Black



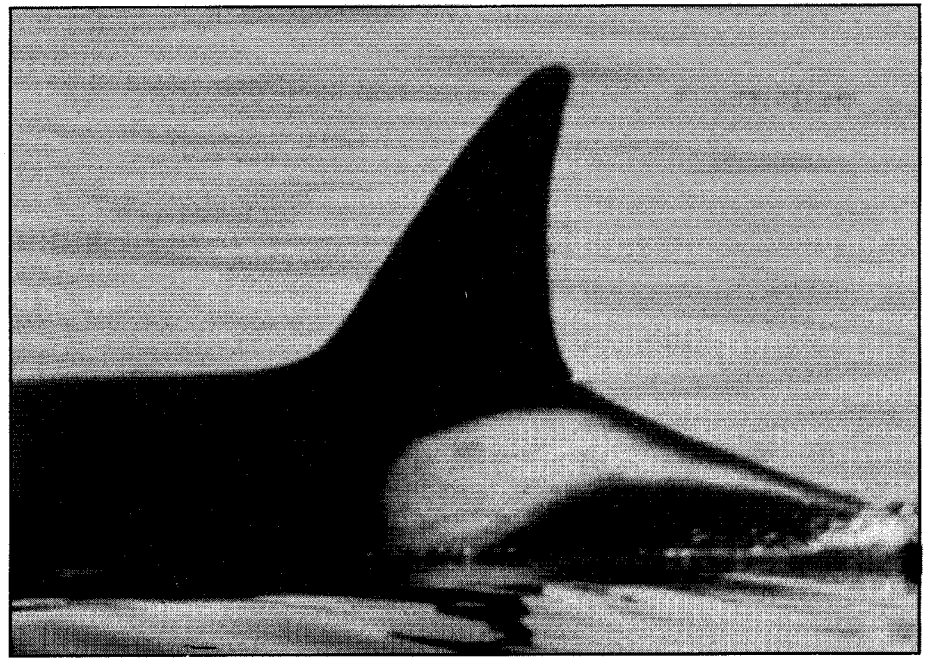
CA80 - 3/6/97 - Photo: N. Black



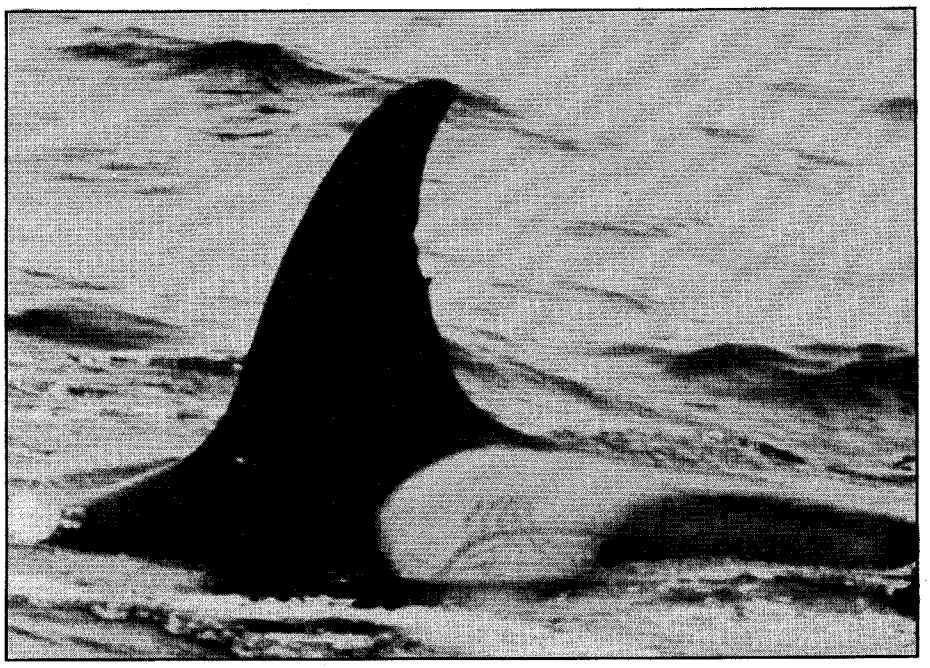
CA93 - 9/30/84 - Photo: J. Swenson



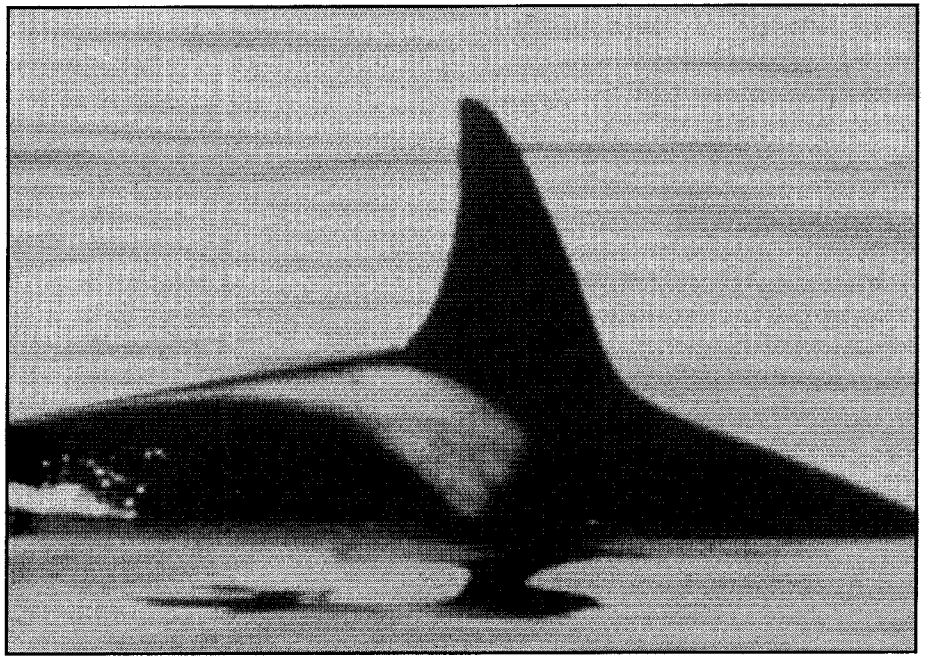
CA80 - 1/9/92 - Photo: D. Graybost



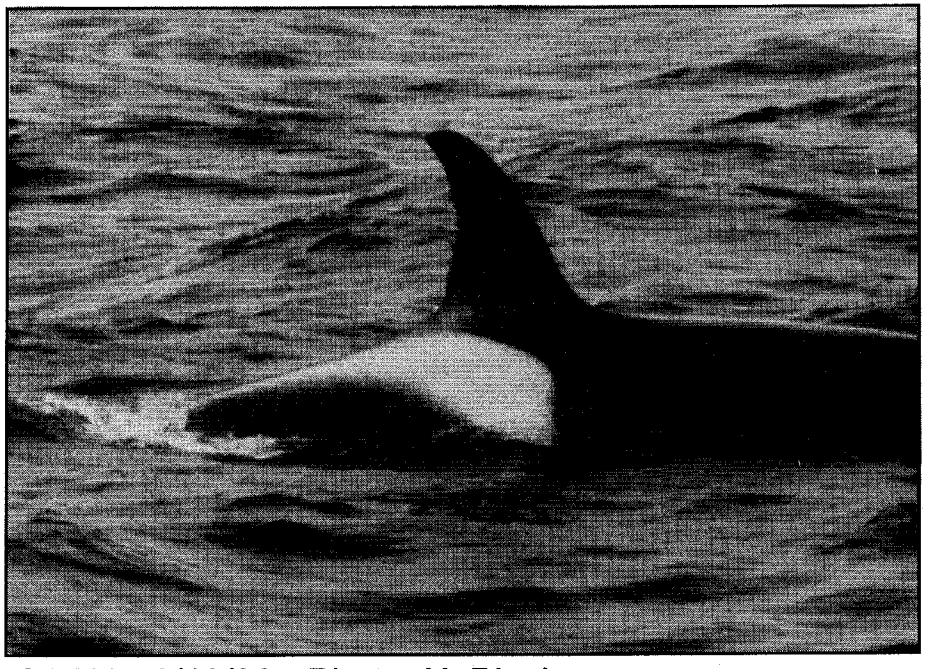
CA96 - 5/18/80 - Photo: P. Howorth



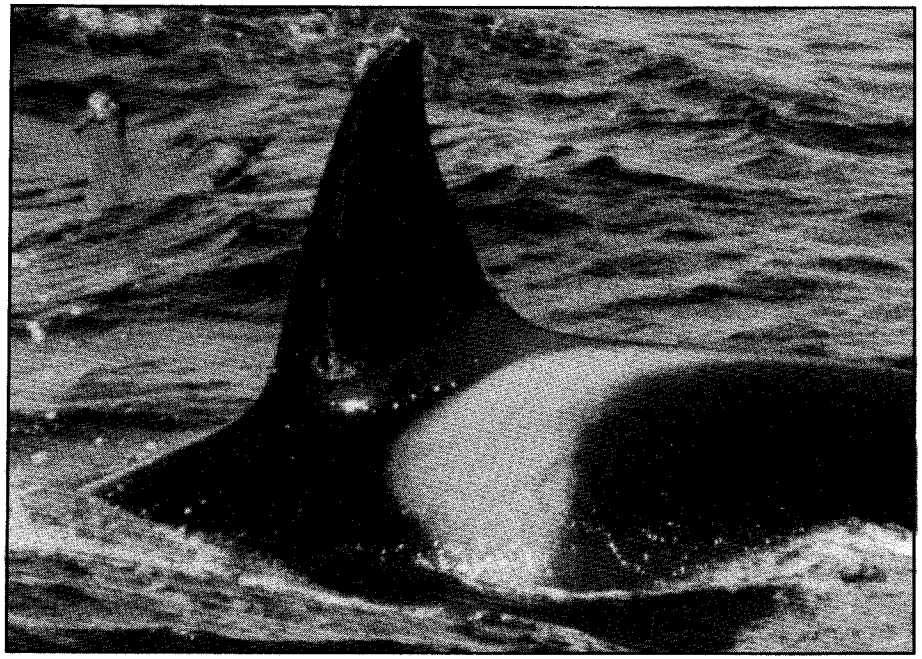
CA111 - 5/10/94 - Photo: N. Black



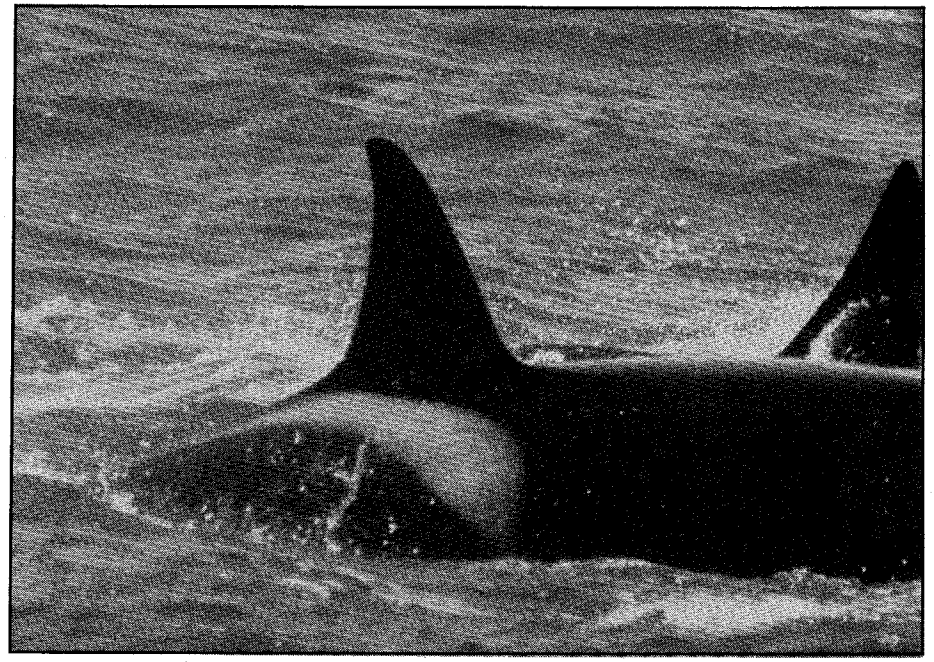
CA96 - 5/18/80 - Photo: P. Howorth



CA111 - 3/13/96 - Photo: N. Black



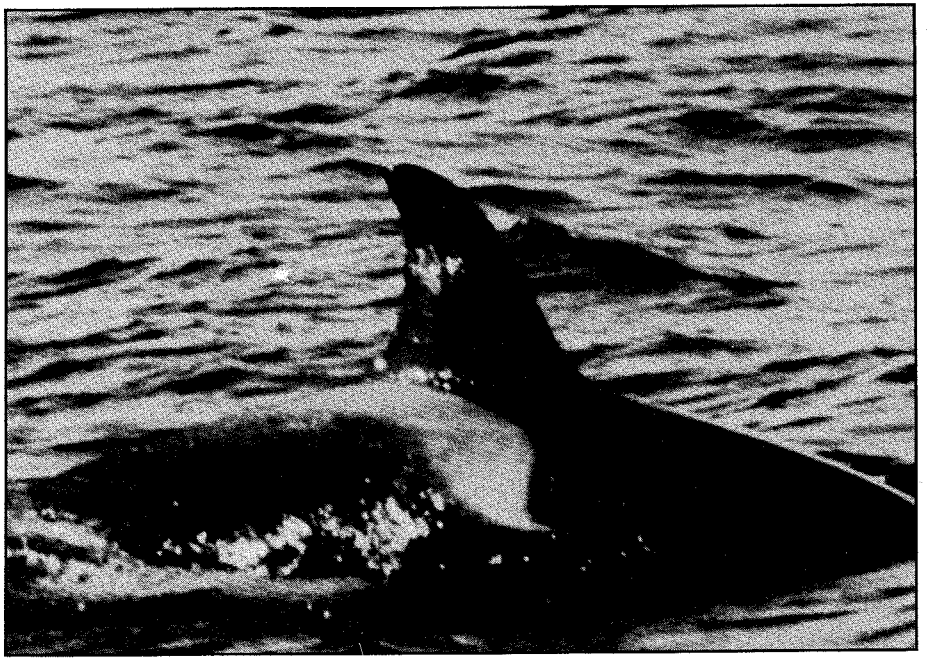
CA113 - 3/13/96 - Photo: N. Black



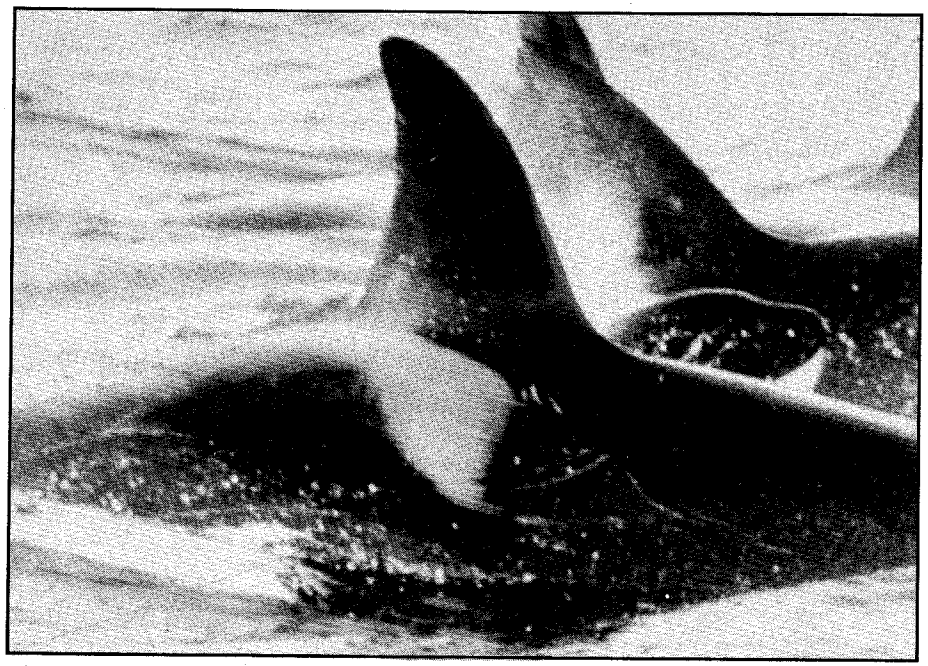
CA113 - 2/8/97 - Photo: N. Black

CA115 - 2/3/95 - Photo: N. Black

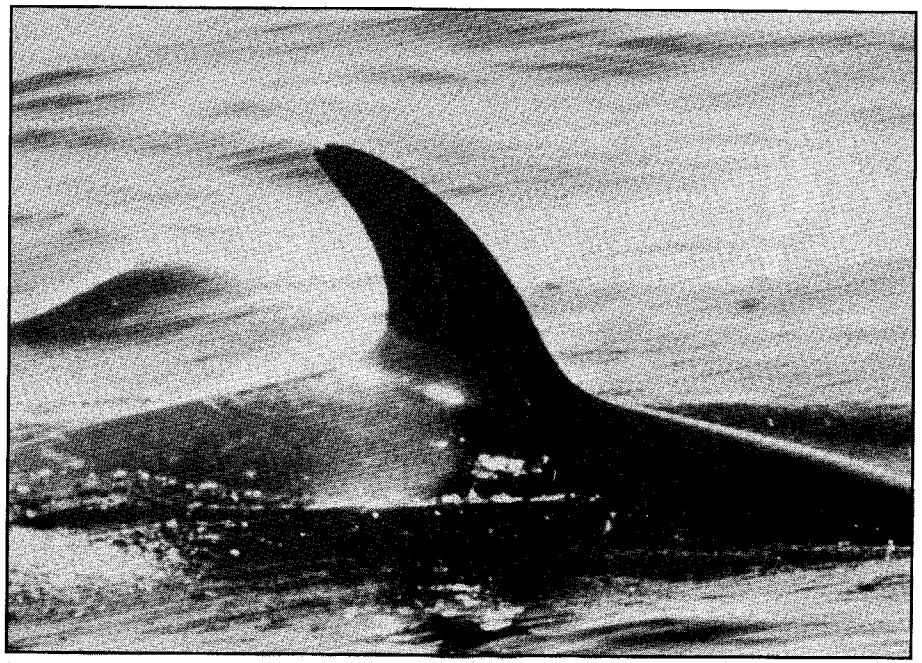
CA116 - 2/3/95 - Photo: N. Black



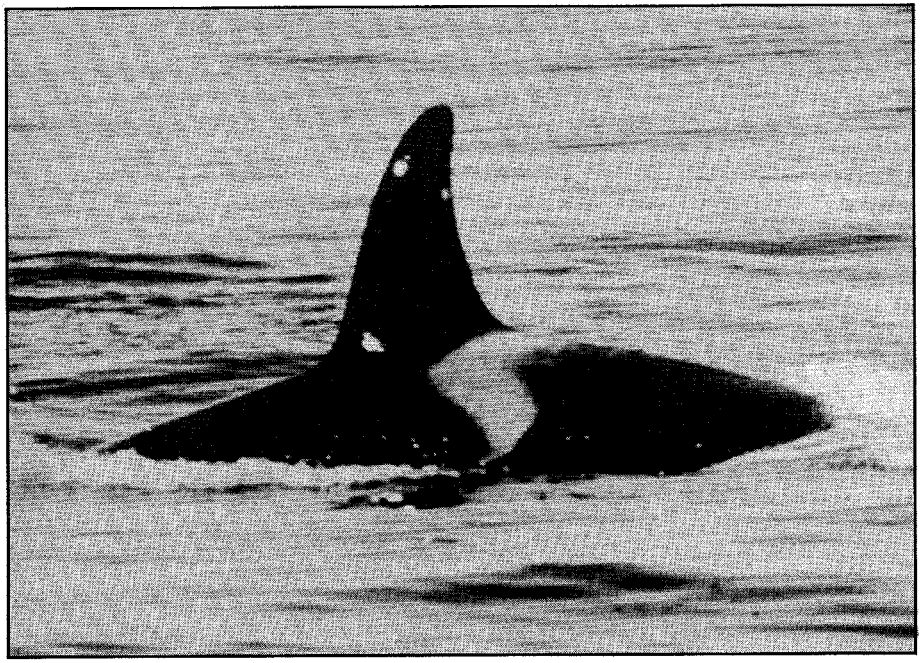
CA117 - 2/3/95 - Photo: N. Black



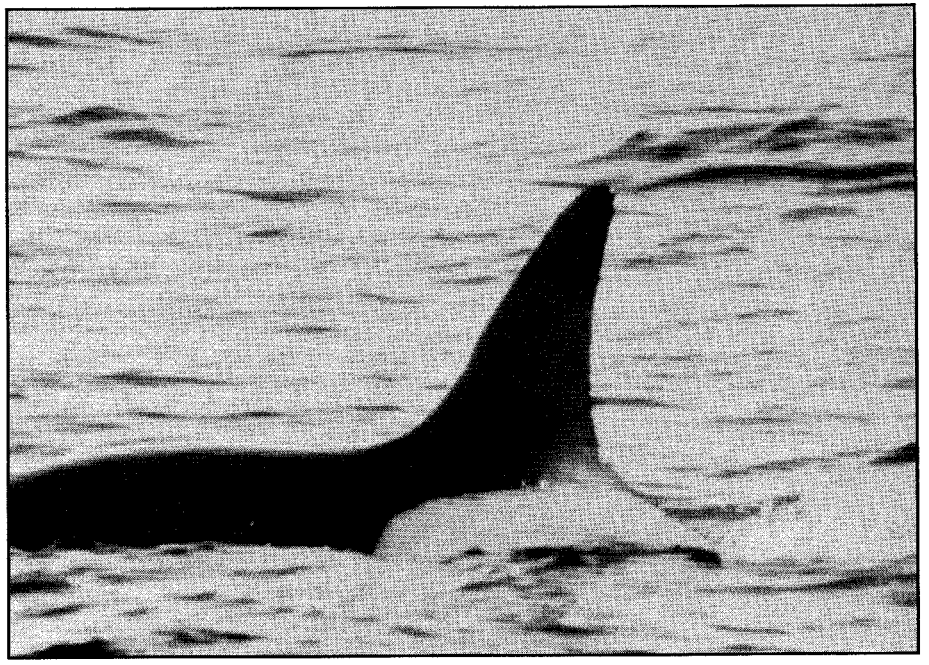
CA118 - 2/3/95 - Photo: N. Black



CA119 - 2/3/95 - Photo: N. Black

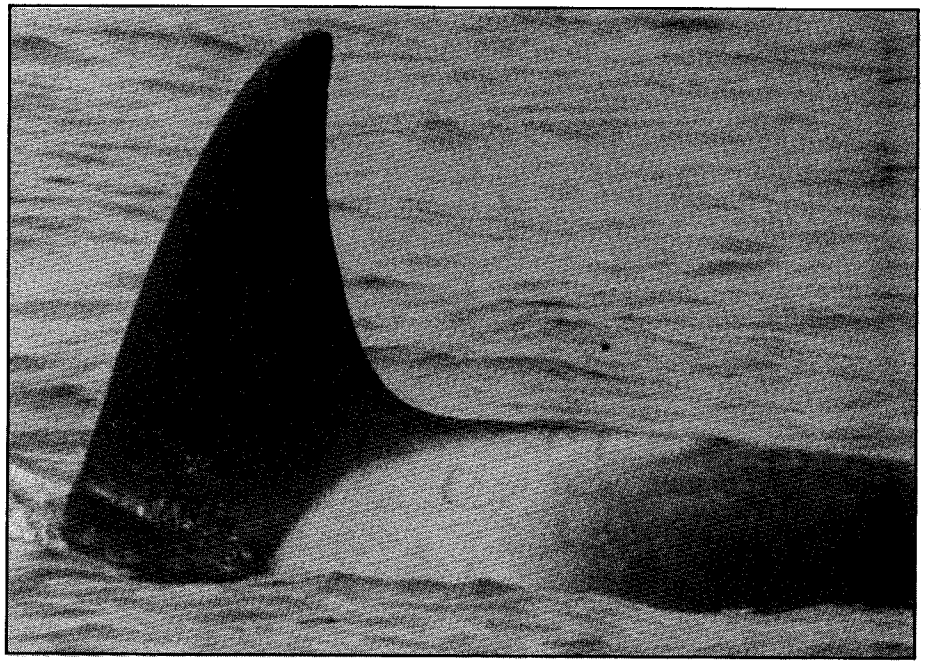


CA120 - 2/3/95 - Photo: N. Black

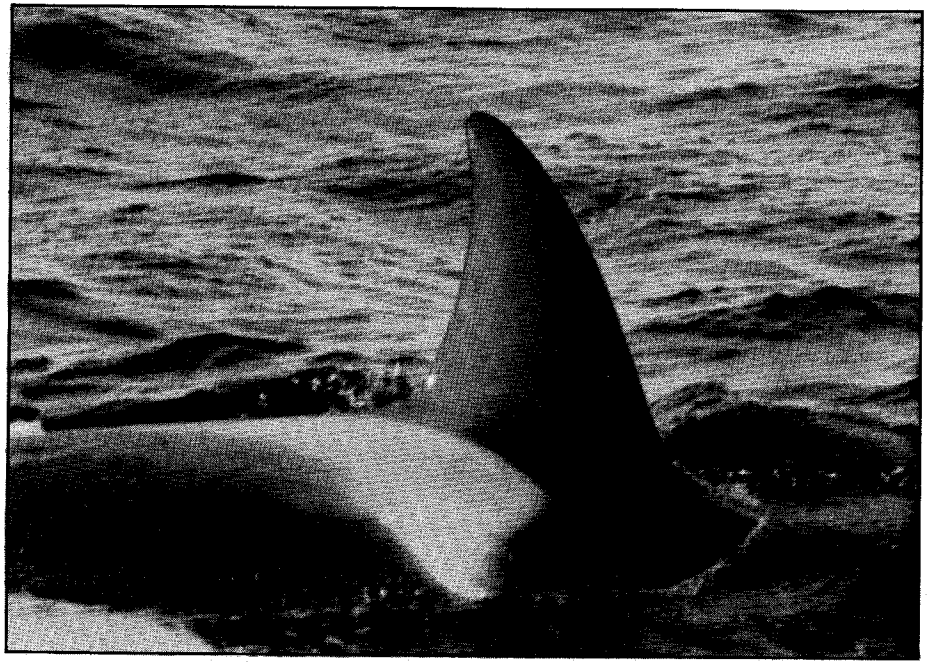


CA122 - 9/13/96 - Photo: R. Hart/Condor

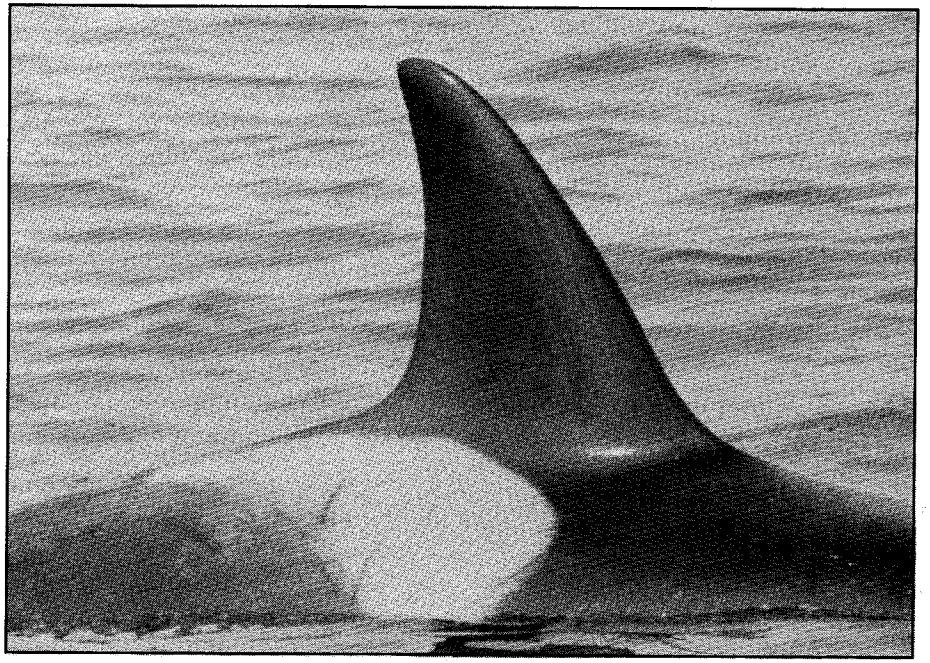
CA125 - 10/10/95 - Photo: N. Black



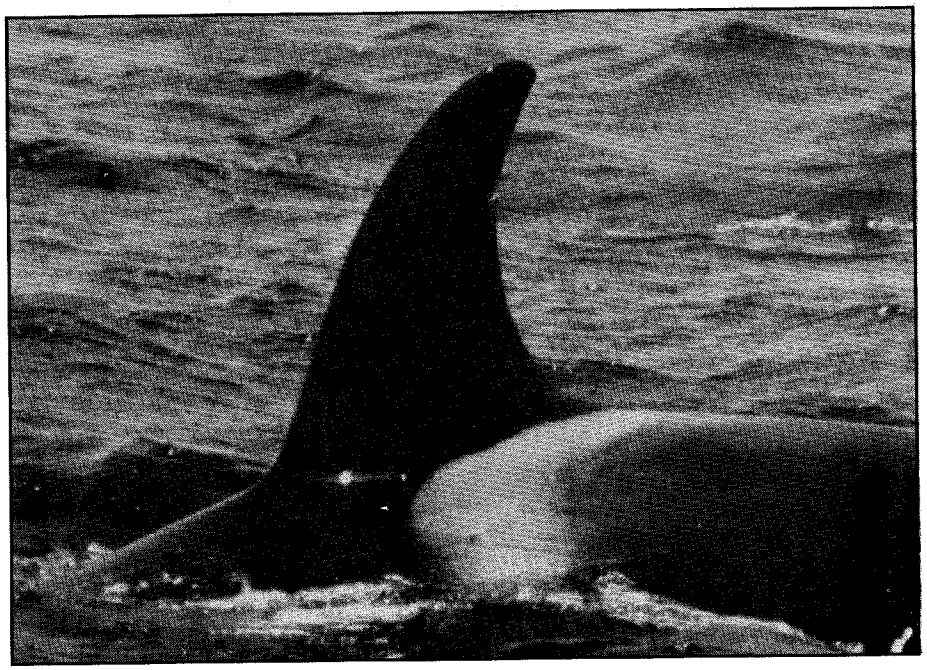
CA126 - 9/12/94 - Photo: J. Calambokidis/Cascadia



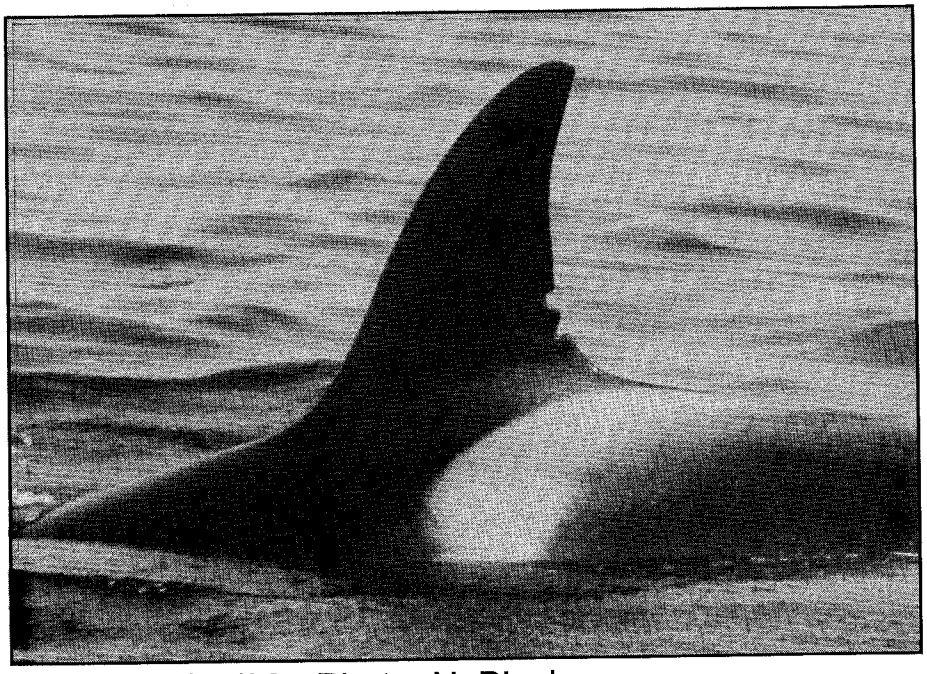
CA125 - 3/13/96 - Photo: N. Black



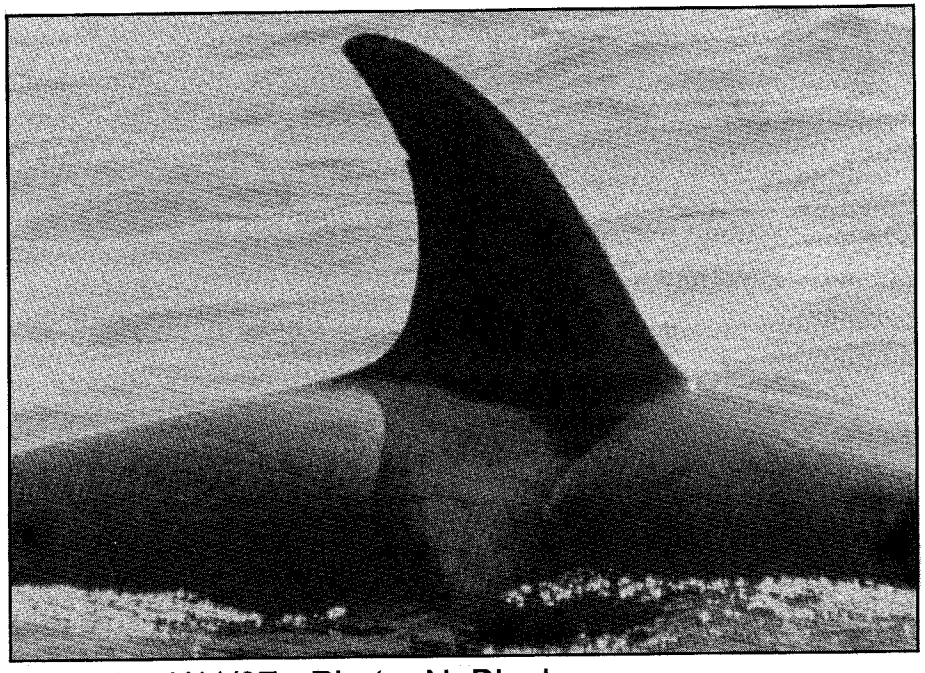
CA126 - 9/12/94 - Photo: J. Calambokidis/Cascadia



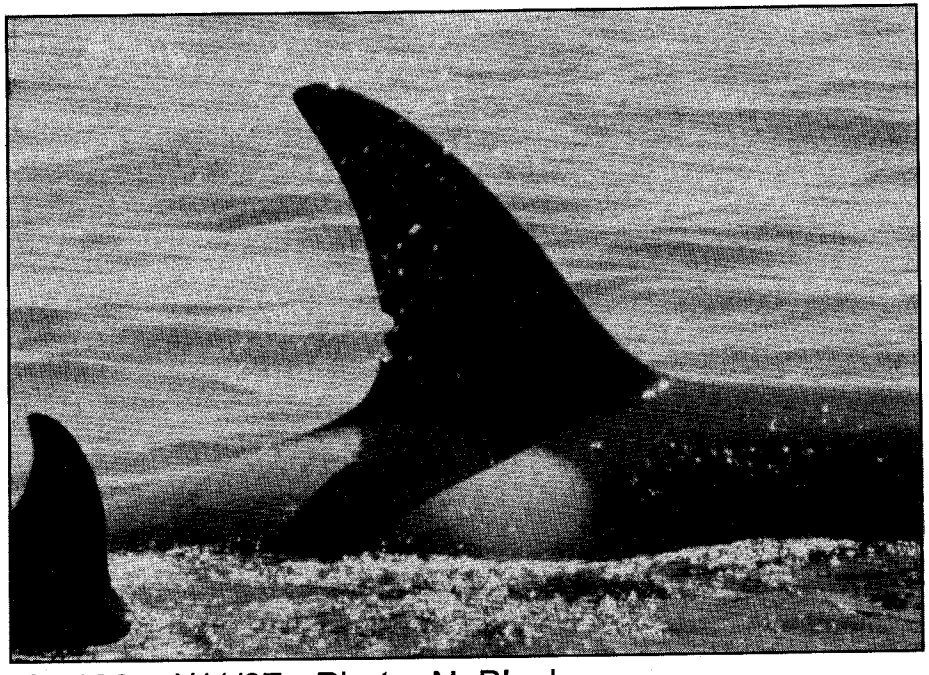
CA131 - 8/26/96 - Photo: N. Black



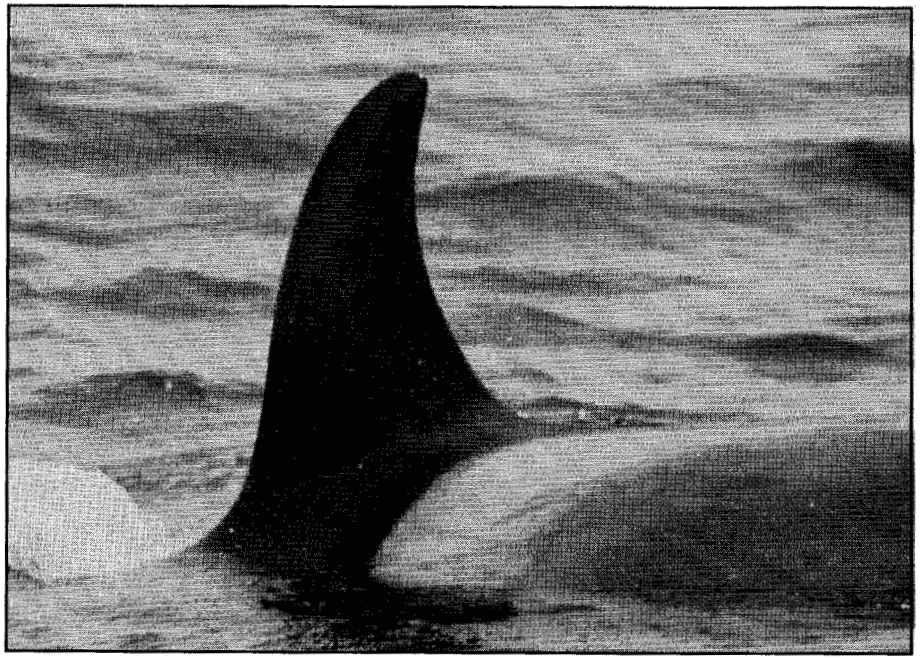
CA132 - 8/26/96 - Photo: N. Black



CA131 - 4/11/97 - Photo: N. Black

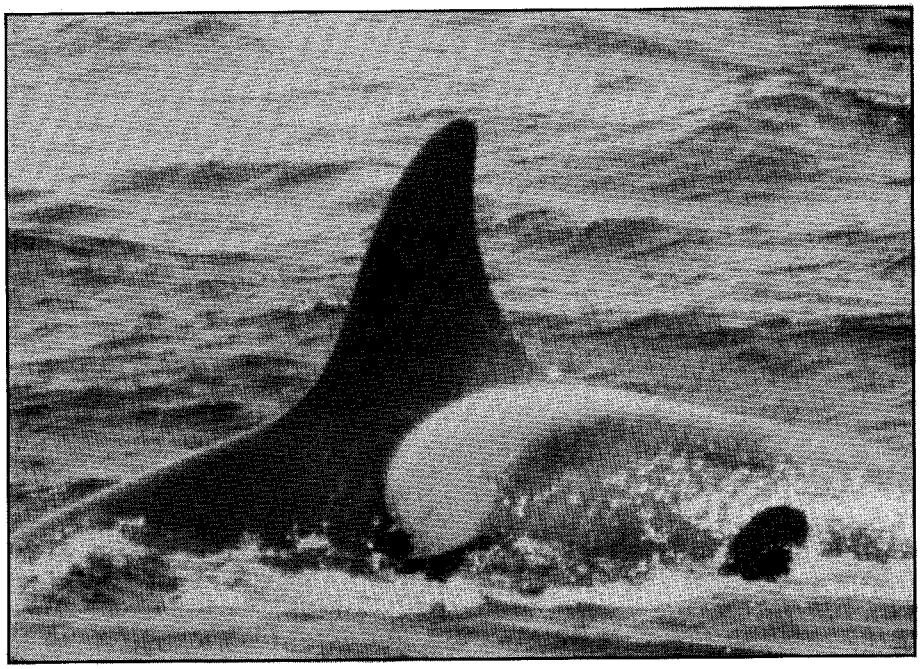


CA132 - 4/11/97 - Photo: N. Black

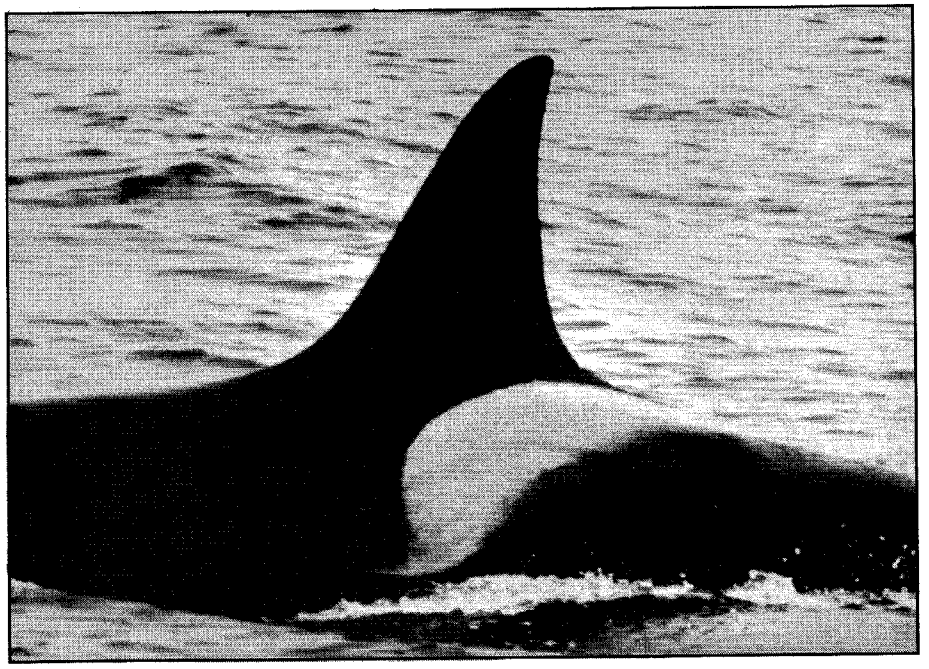


CA133 - 8/26/96 - Photo: N. Black

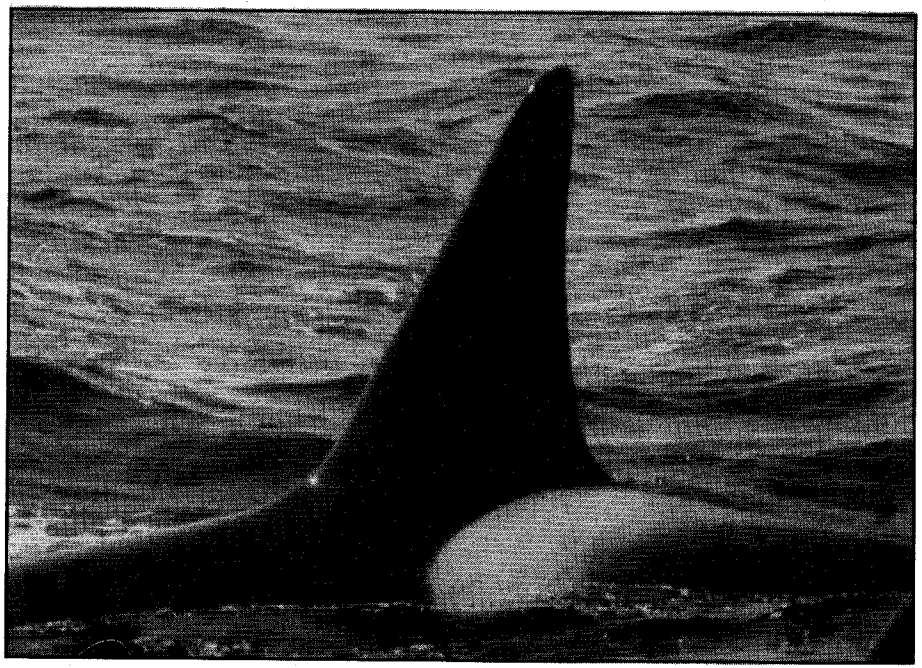
CA134 - 8/26/96 - Photo: N. Black



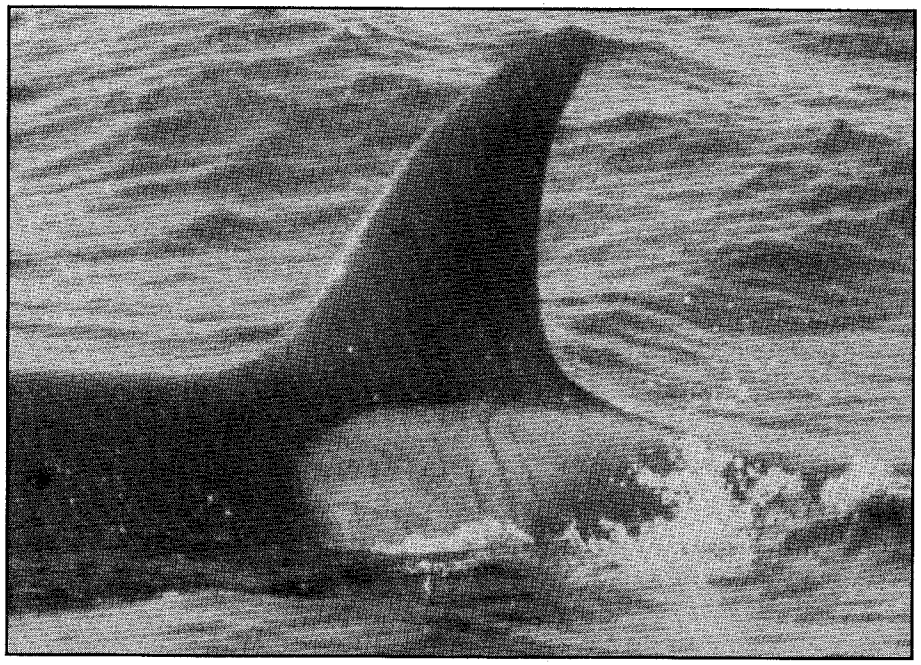
CA135 - 8/26/96 - Photo: N. Black



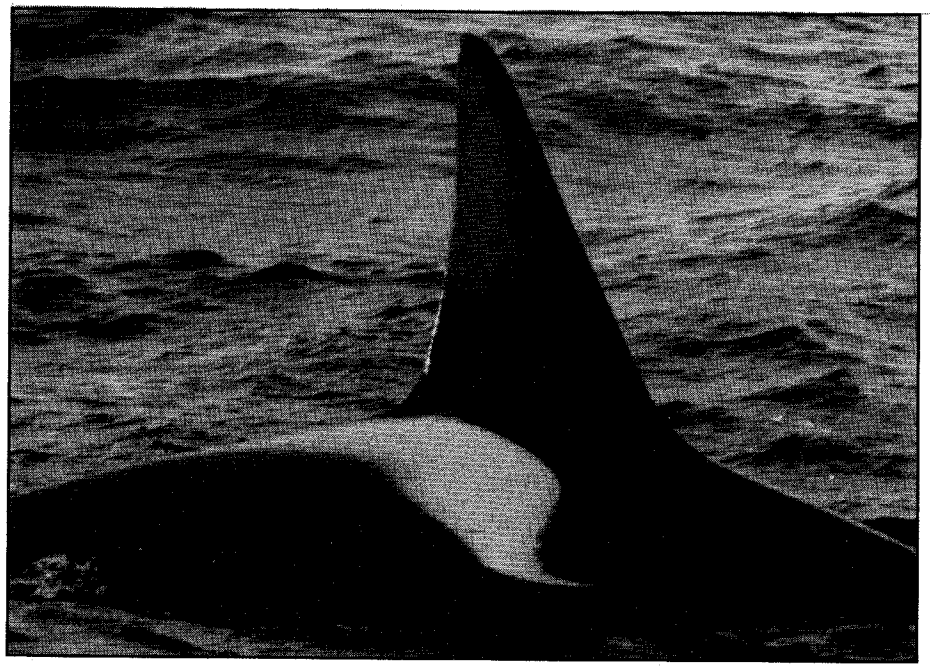
CA136 - 9/5/96 - Photo: R. Ternullo



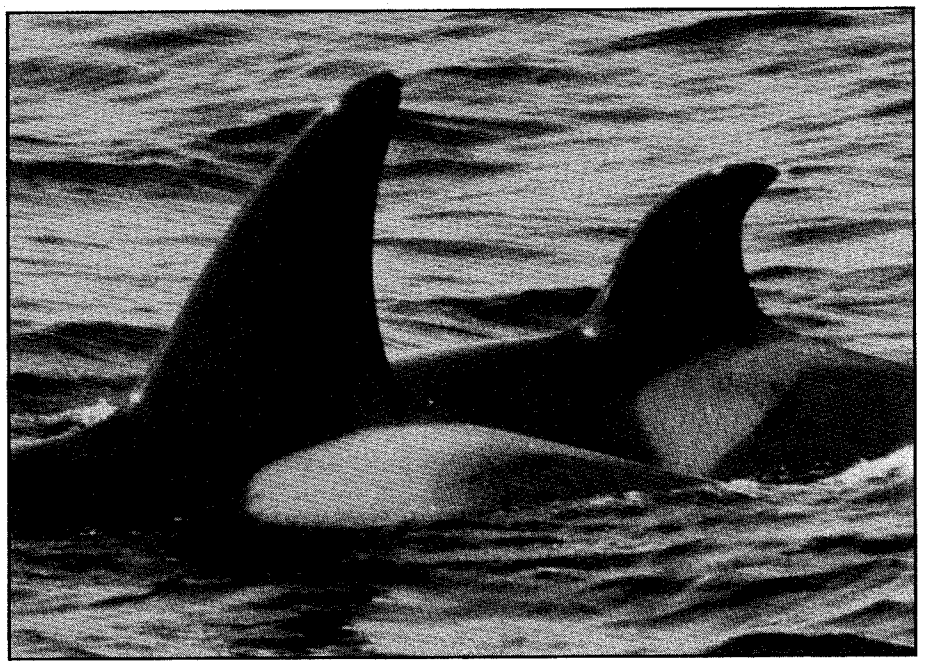
CA137 - 10/10/95 - Photo: N. Black



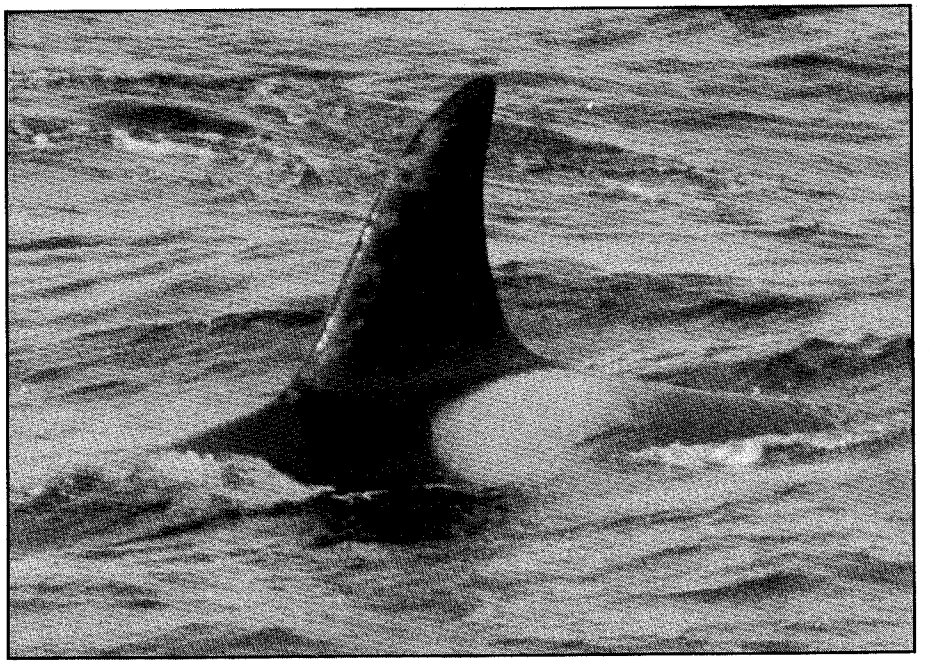
CA138 - 3/13/96 - Photo: N. Black



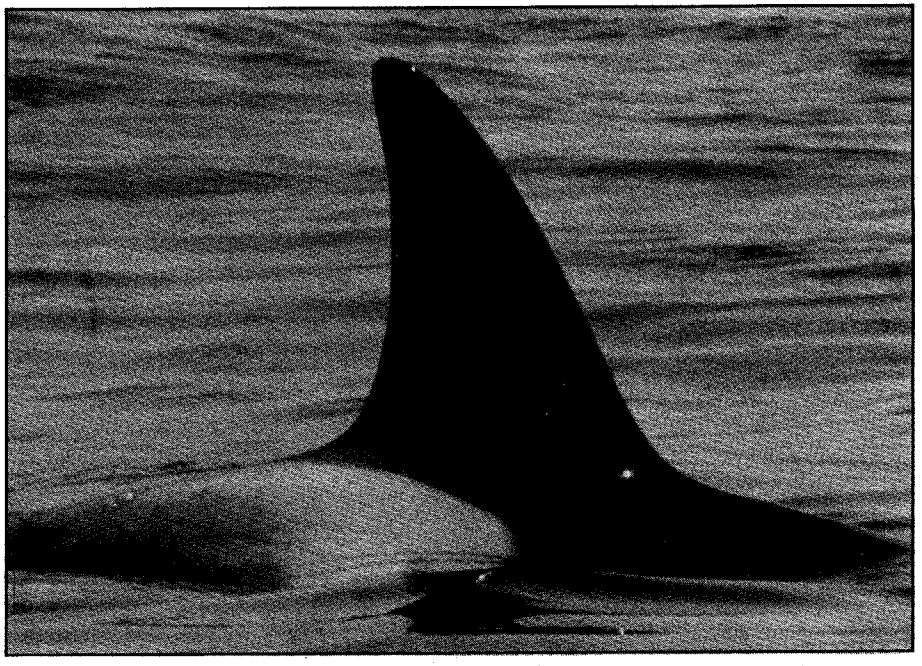
CA137 - 3/13/96 - Photo: N. Black



CA140 - 10/10/95 - Photo: N. Black

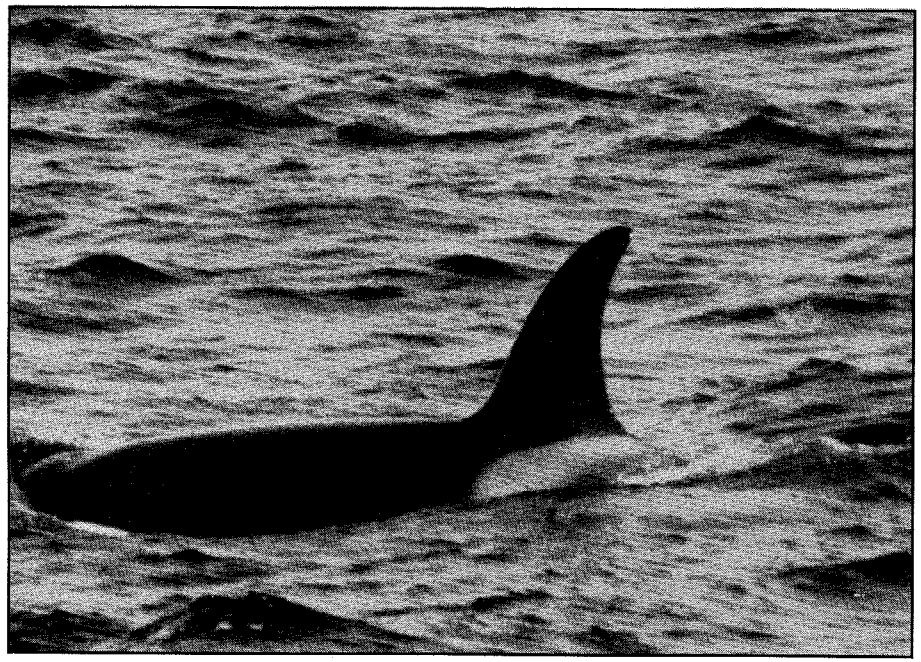


CA142 - 1/21/96 - Photo: N. Black

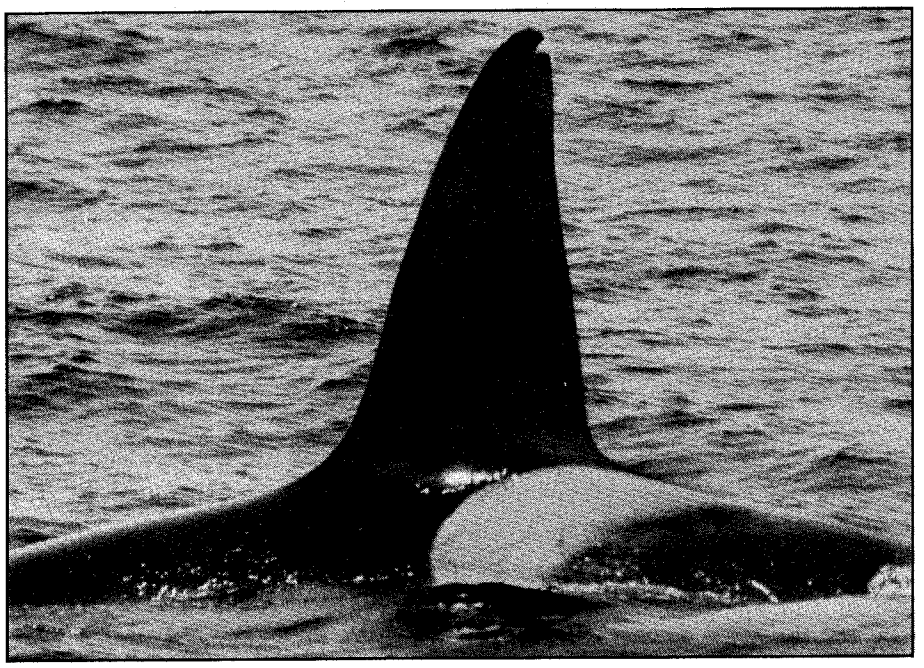


CA140 - 4/11/97 - Photo: N. Black

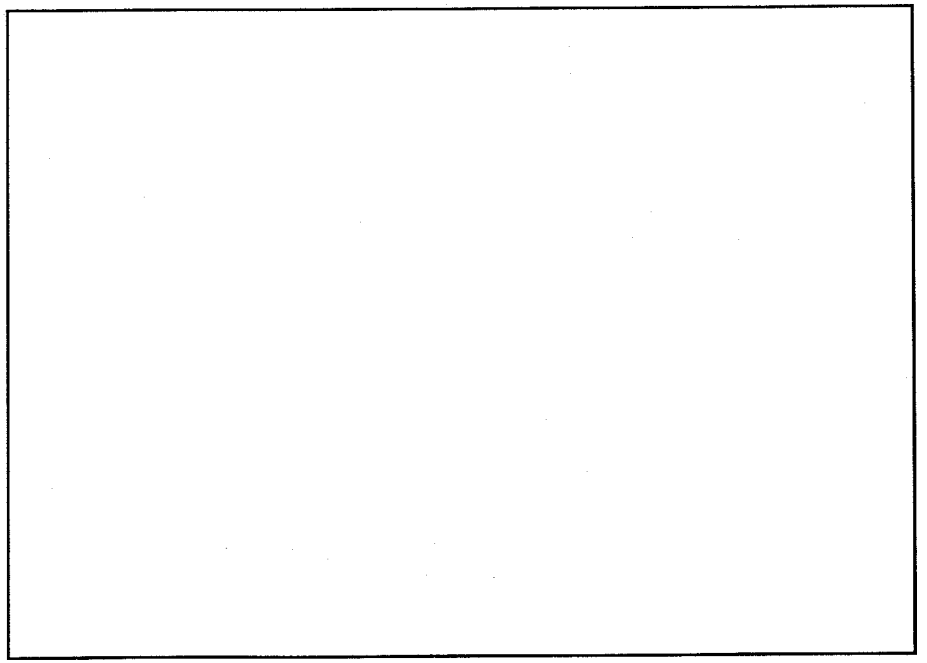
CA146 - 9/5/96 - Photo: R. Ternullo

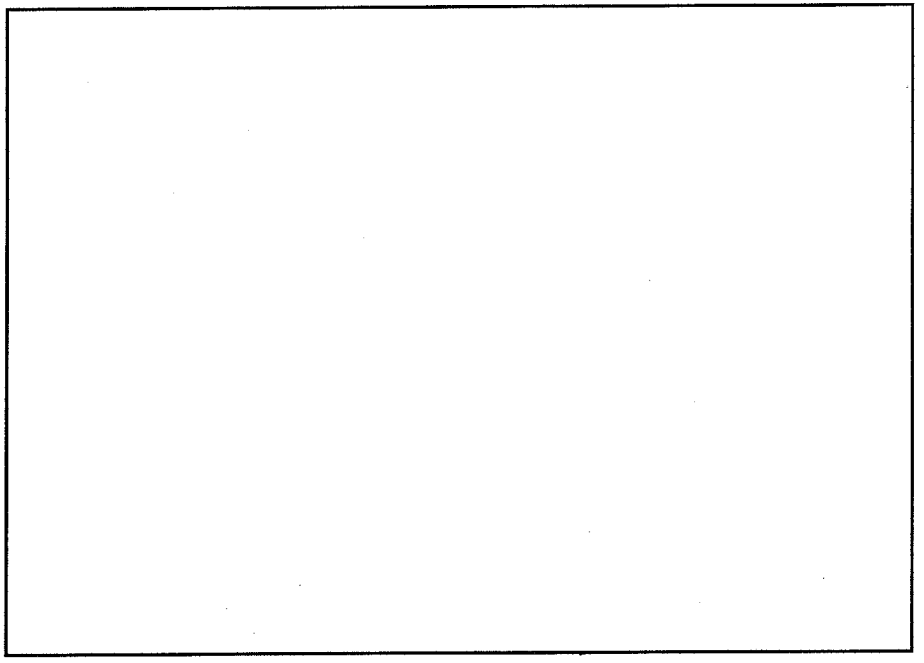


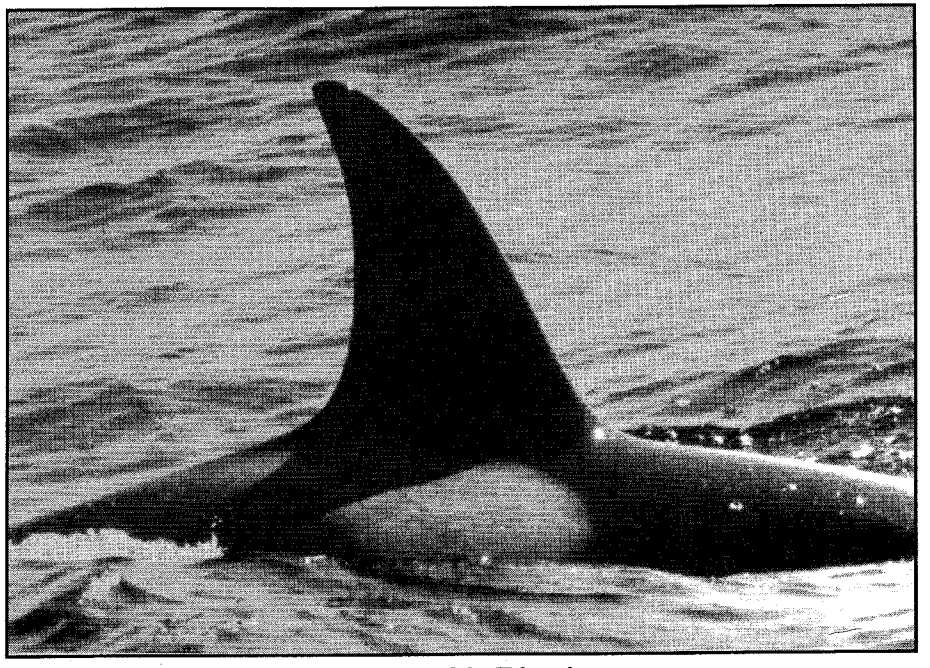
CA147 - 12/20/93 - Photo: N. Black



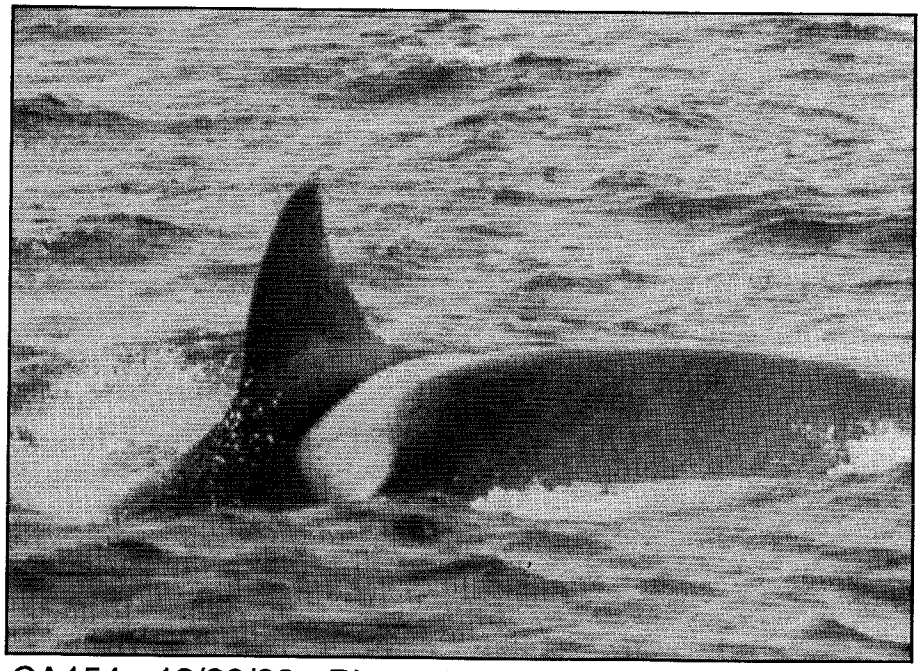
CA148 - 8/26/96 - Photo: N. Black



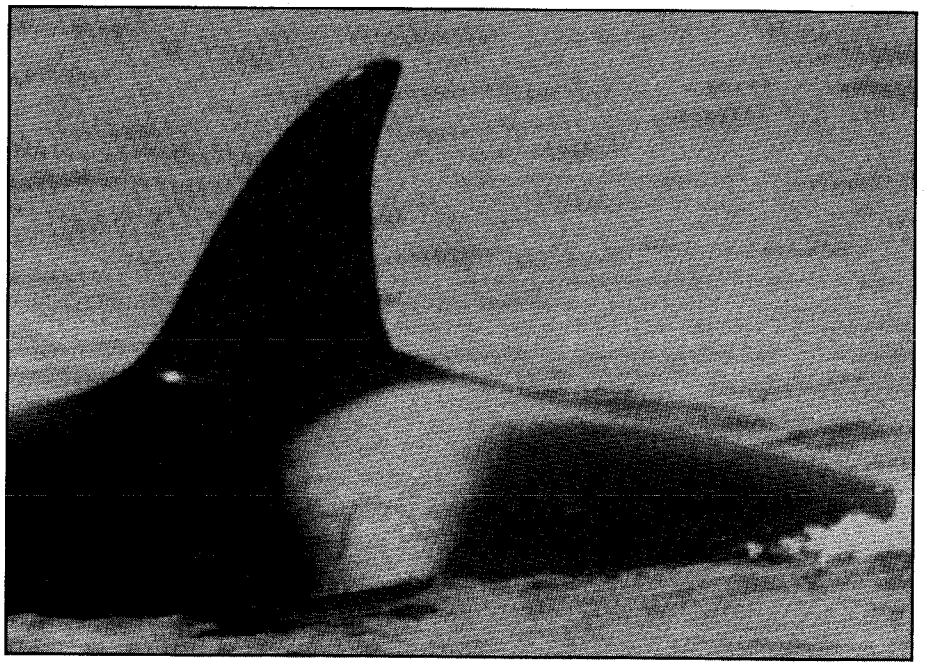




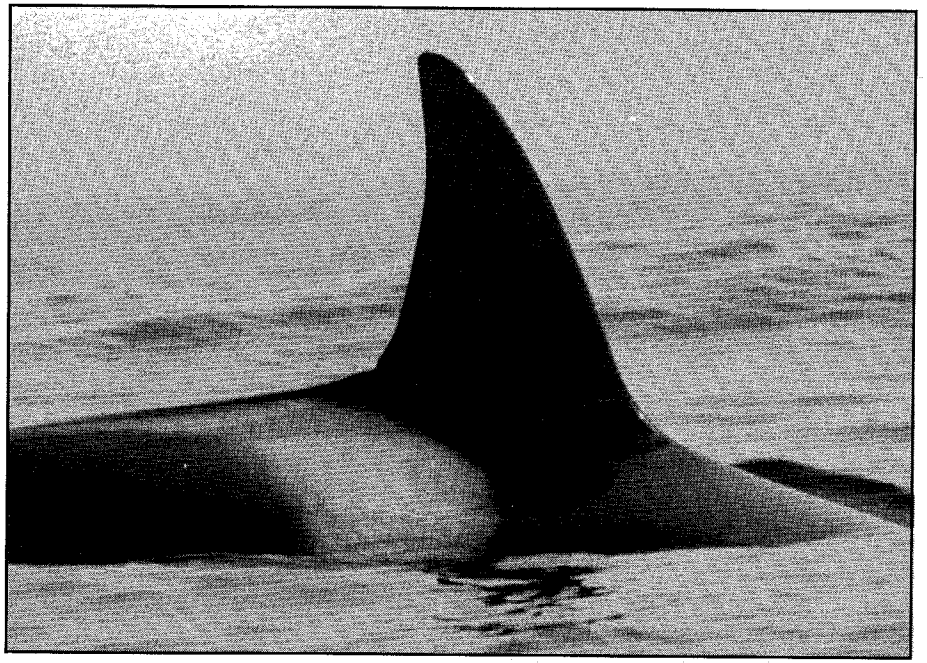
CA153 - 10/10/95 - Photo: N. Black



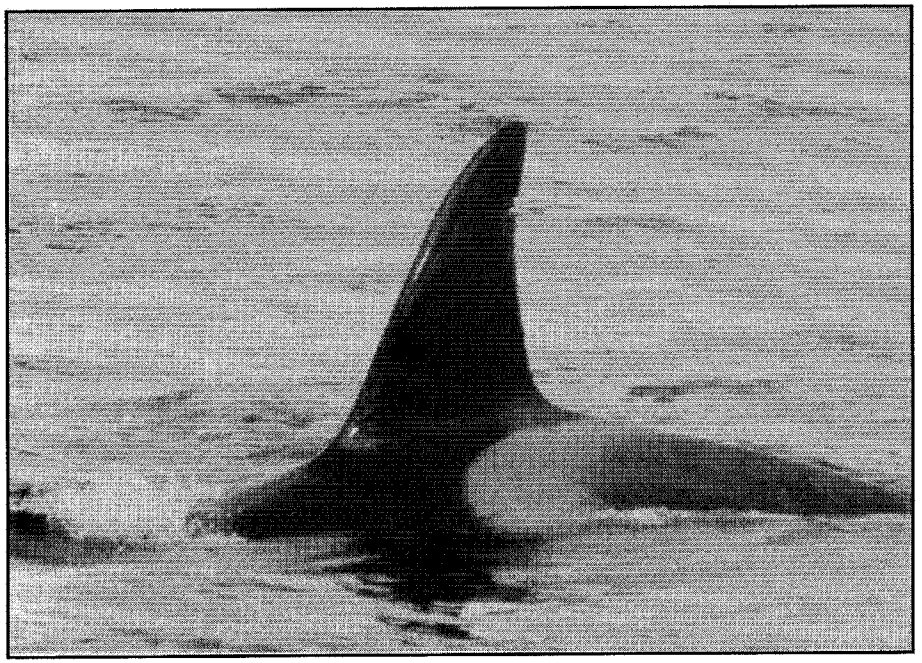
CA154 - 12/20/93 - Photo: N. Black



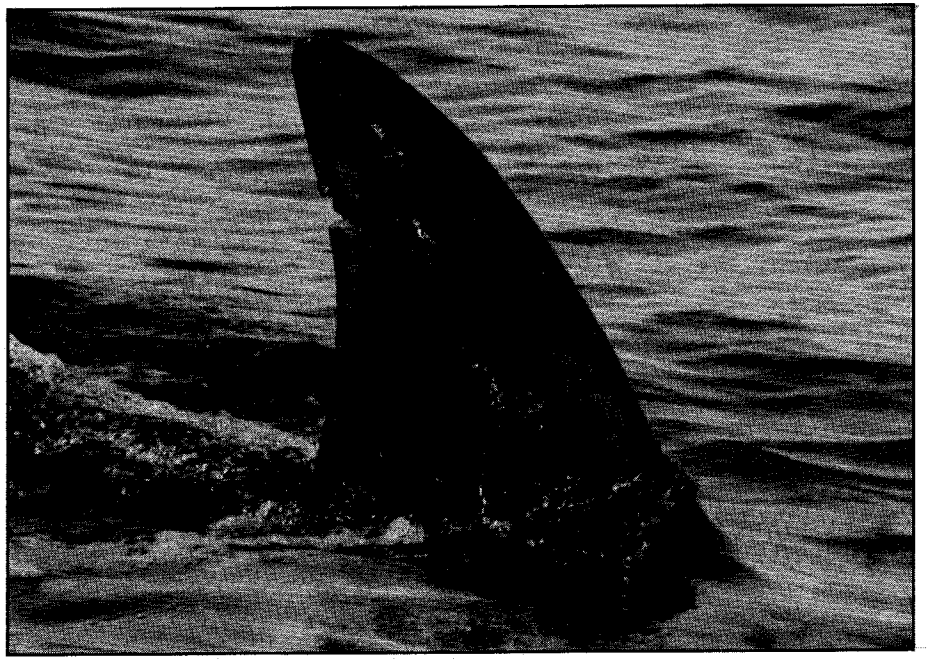
CA155 - 10/10/83 - Photo: B. Basham



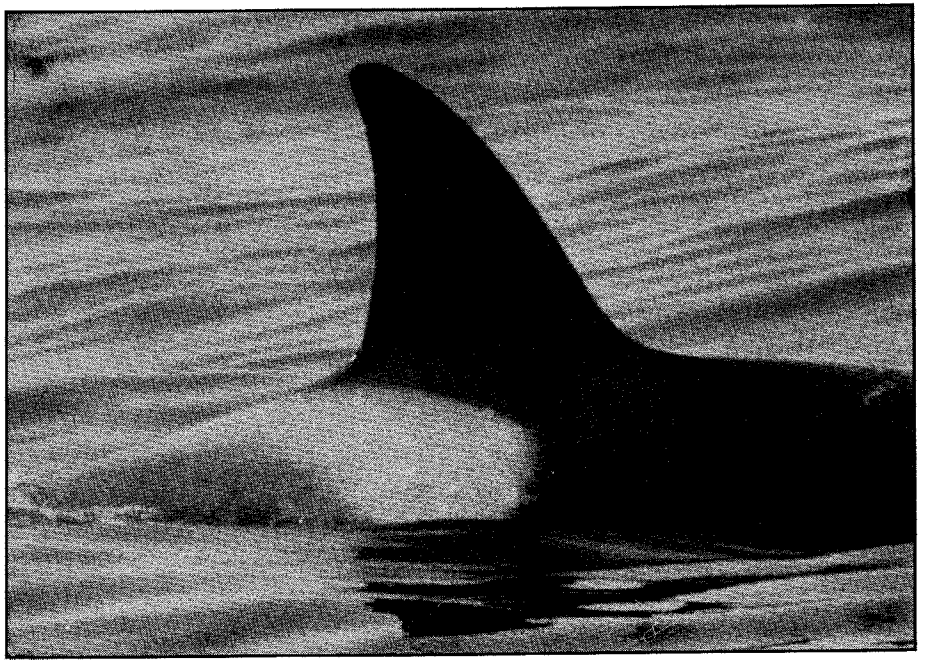
CA155 - 9/12/94 - Photo: J. Calambokidis/Cascadia



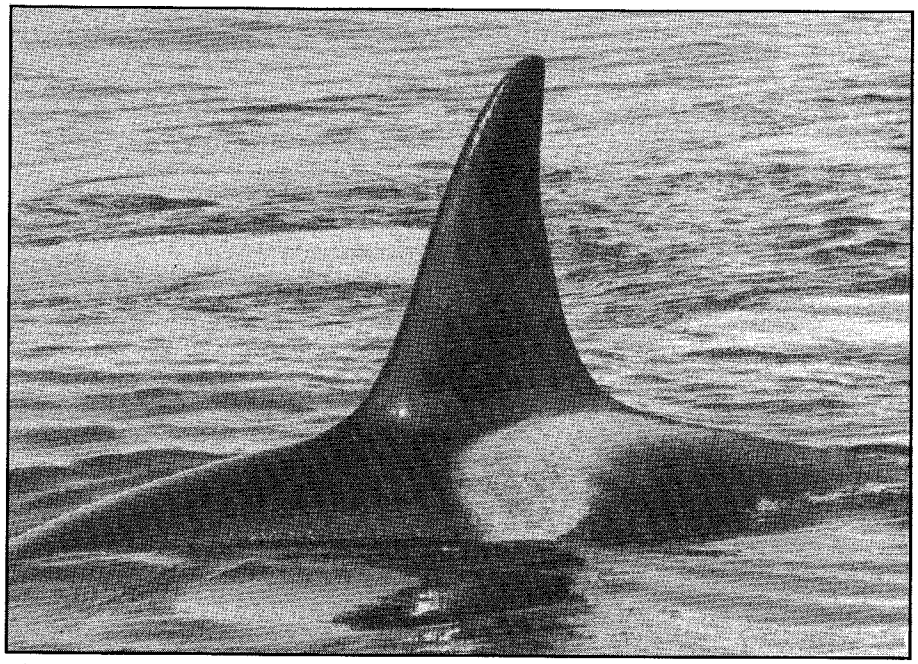
CA160 - 12/1/96 - Photo: R. Ternullo



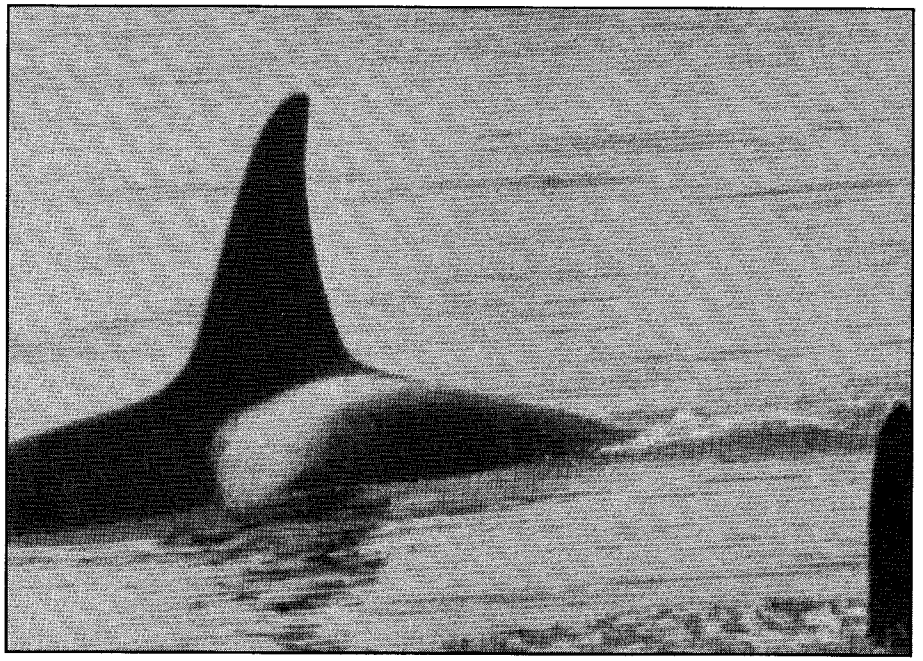
CA160 - 12/1/96 - Photo: R. Ternullo



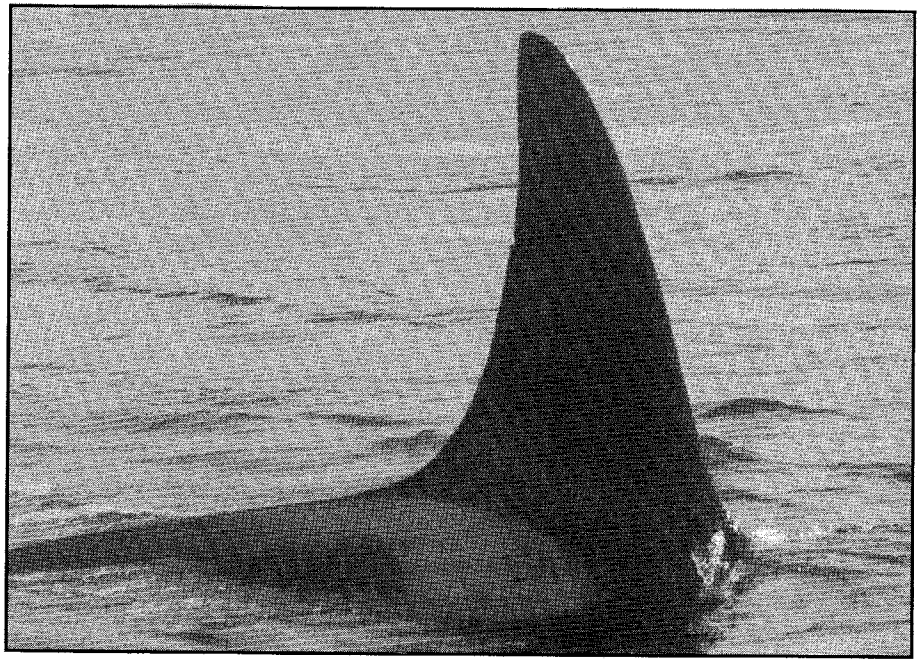
CA163 - 4/11/97 - Photo: N. Black



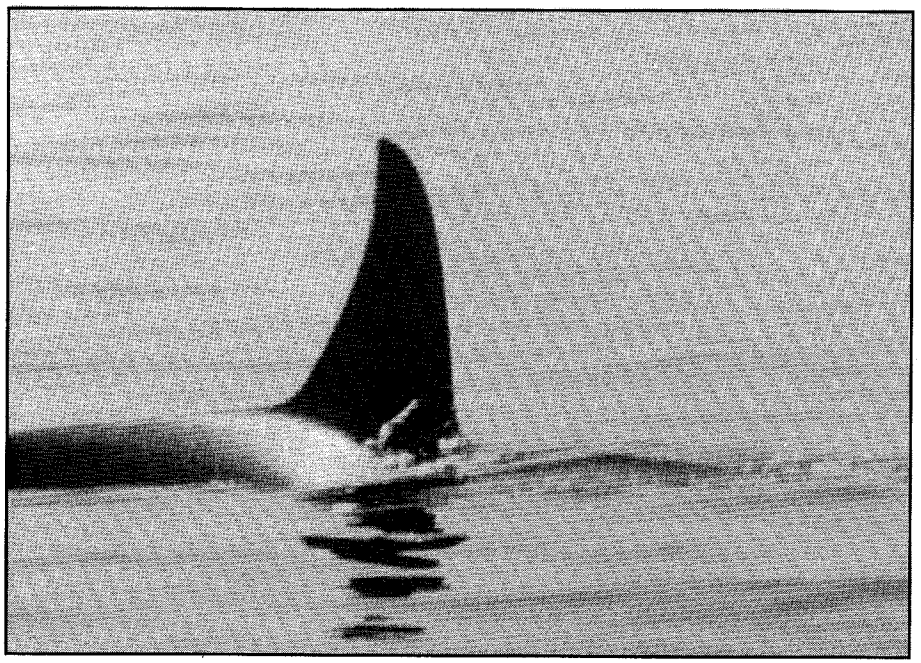
CA165 - 4/21/97 - Photo: N. Black



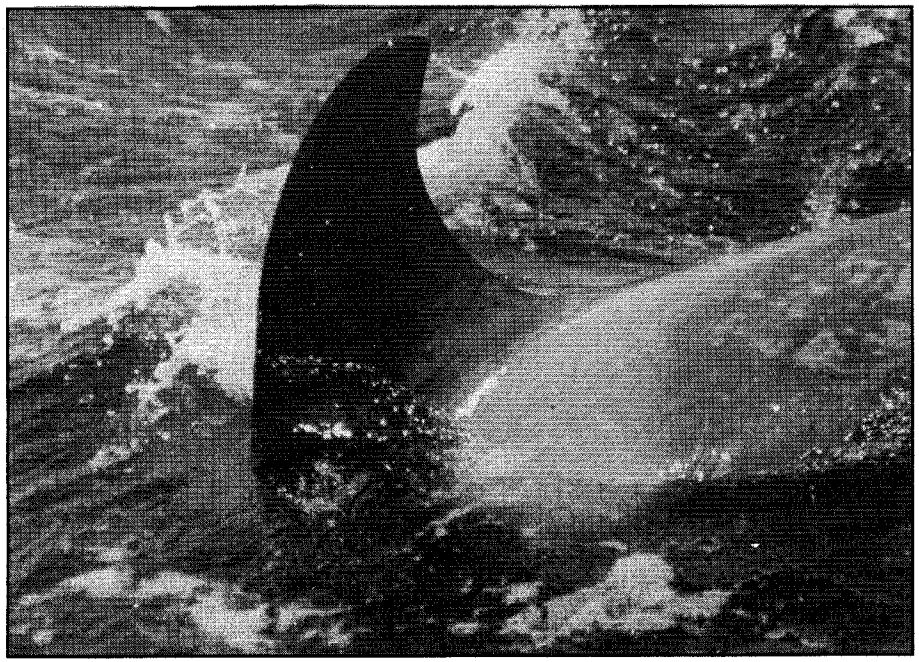
CA166 - 4/21/97 - Photo: N. Black



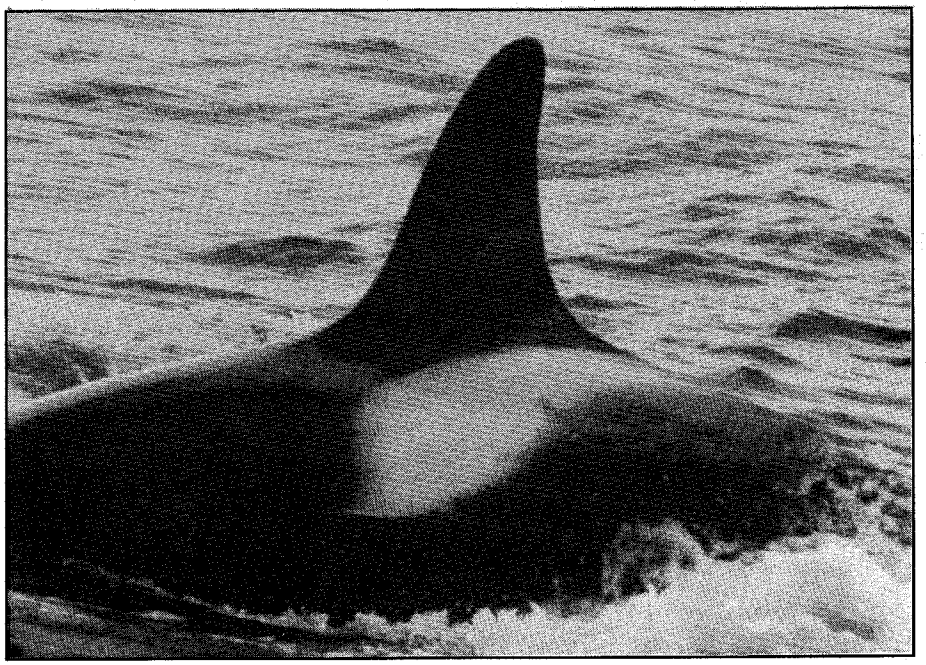
CA165 - 4/21/97 - Photo: N. Black



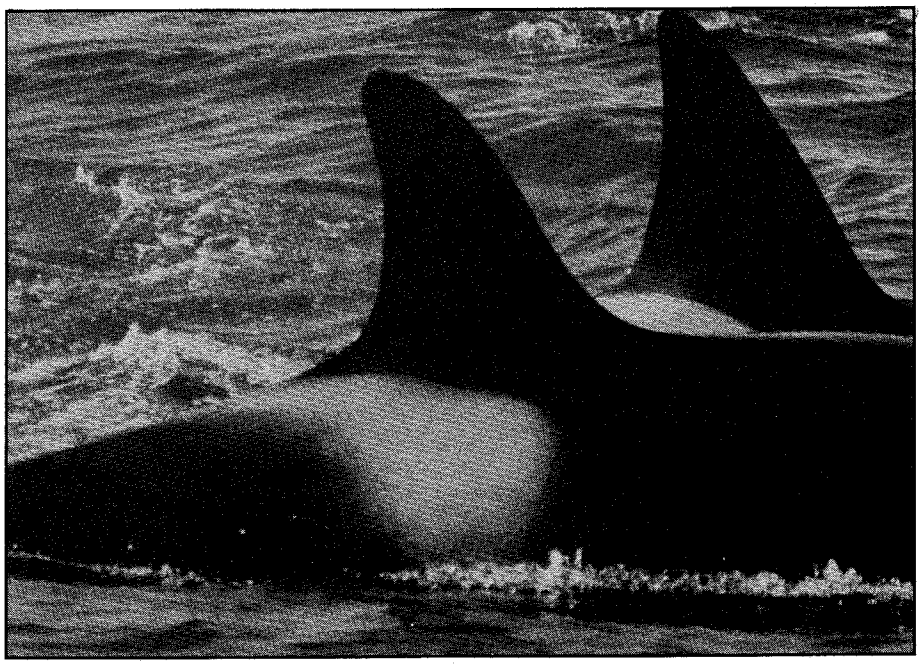
CA166 - 4/21/97 - Photo: N. Black



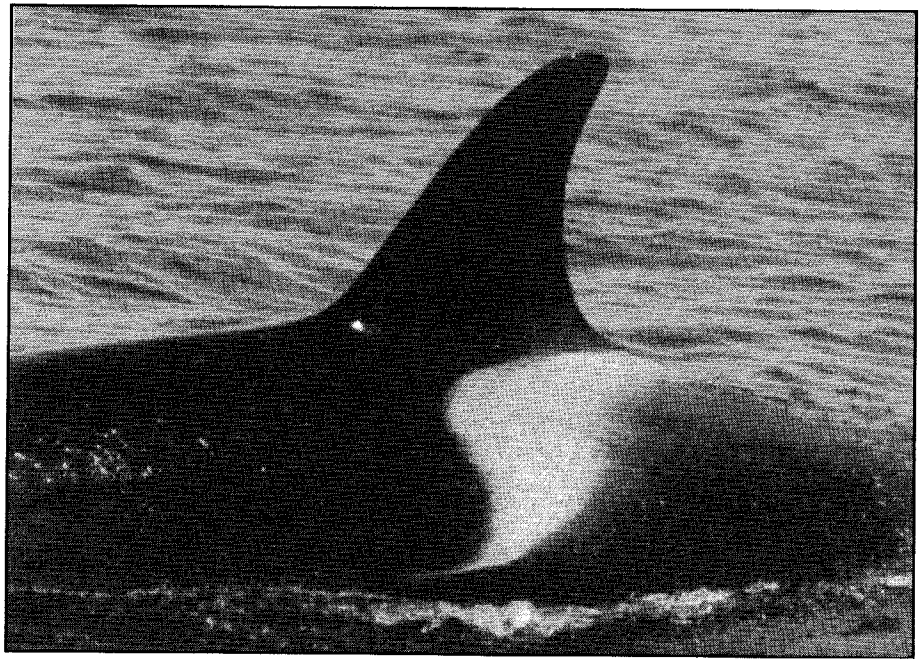
CA167 - 4/21/97 - Photo: N. Black



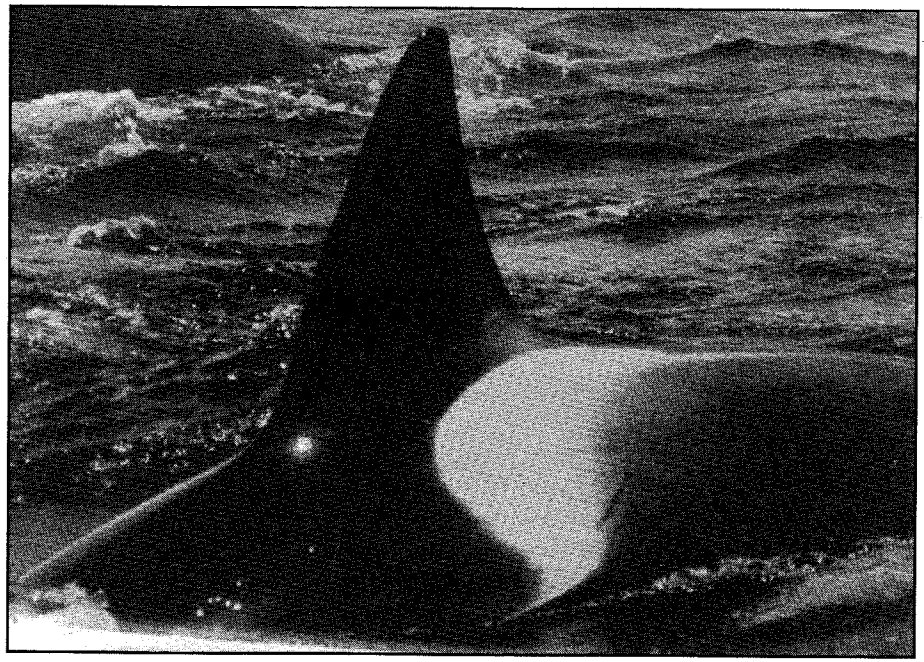
CA169 - 9/12/96 - Photo: K. Forney/NMFS



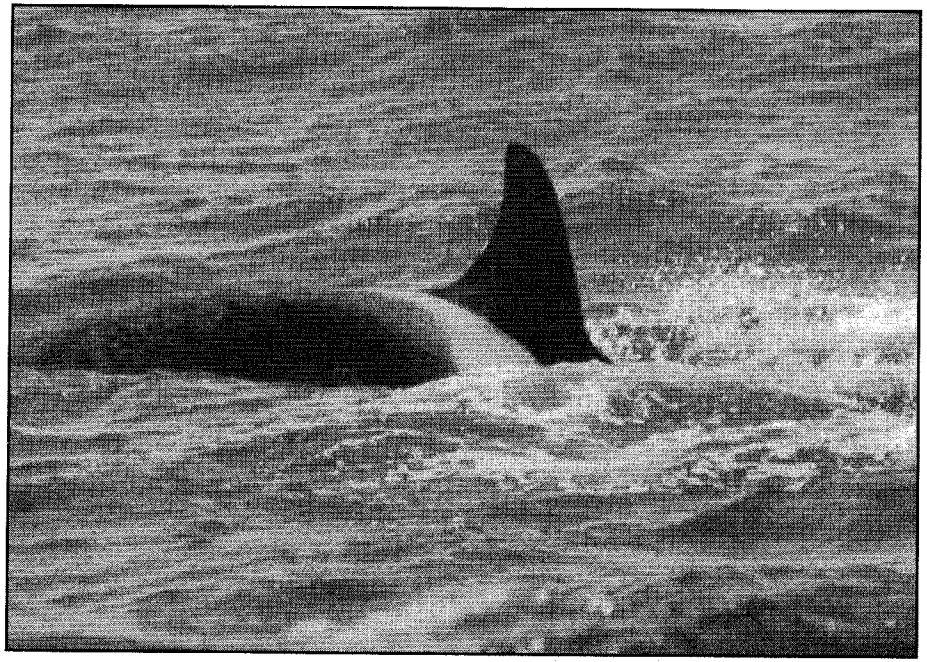
CA169 - 2/8/97 - Photo: N. Black



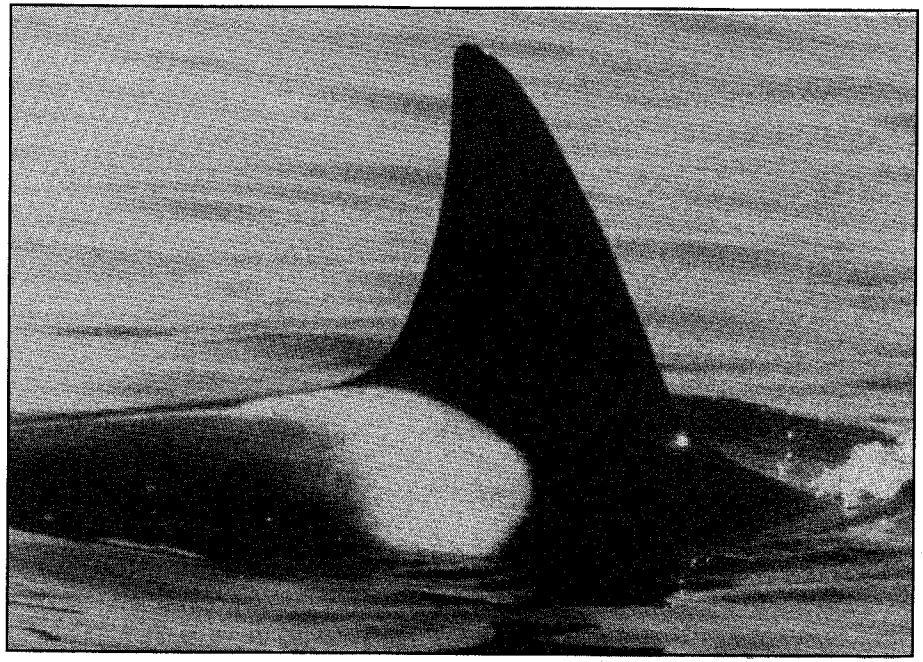
CA170 - 4/21/97 - Photo: N. Black



CA171 - 4/21/97 - Photo: N. Black

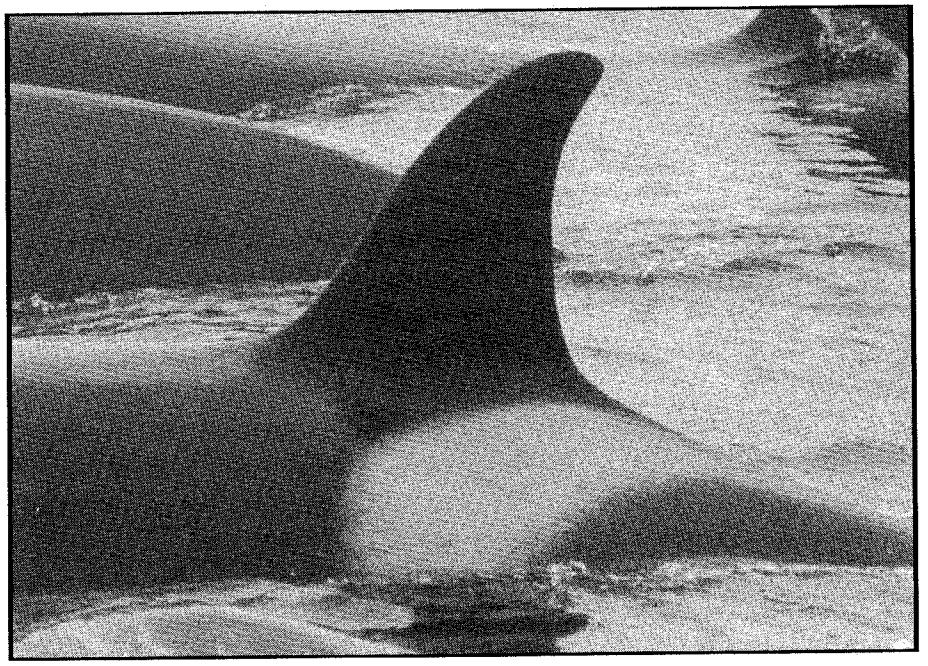


CA170 - 2/8/97 - Photo: N. Black

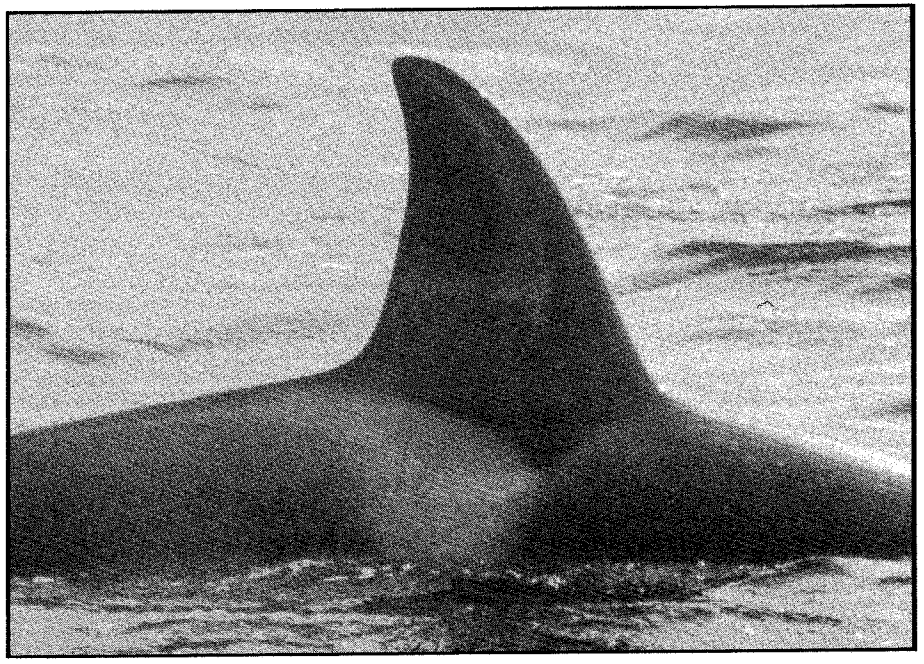


CA171 - 4/21/97 - Photo: N. Black

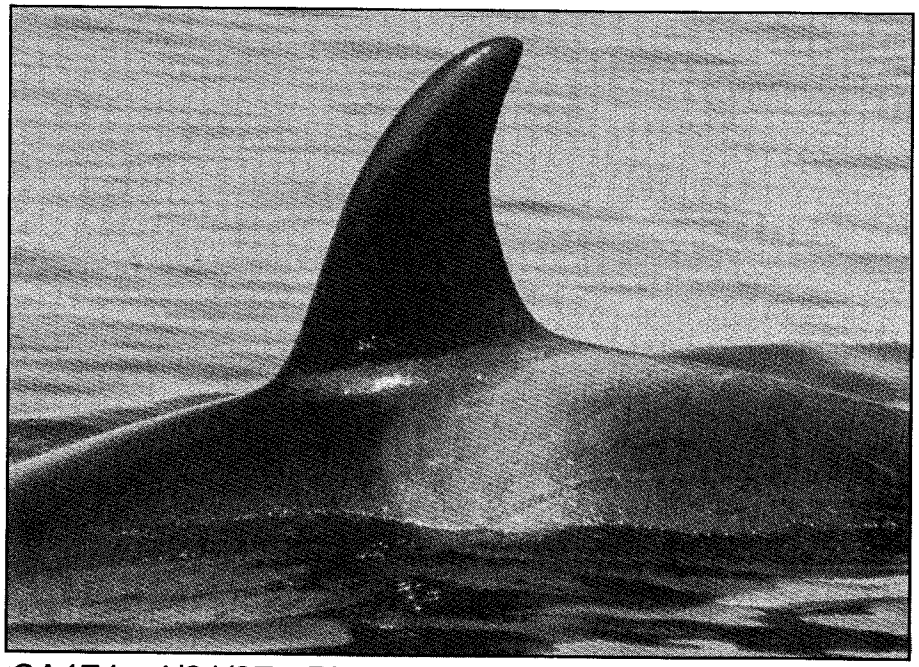
CA172 - 4/21/97 - Photo: N. Black



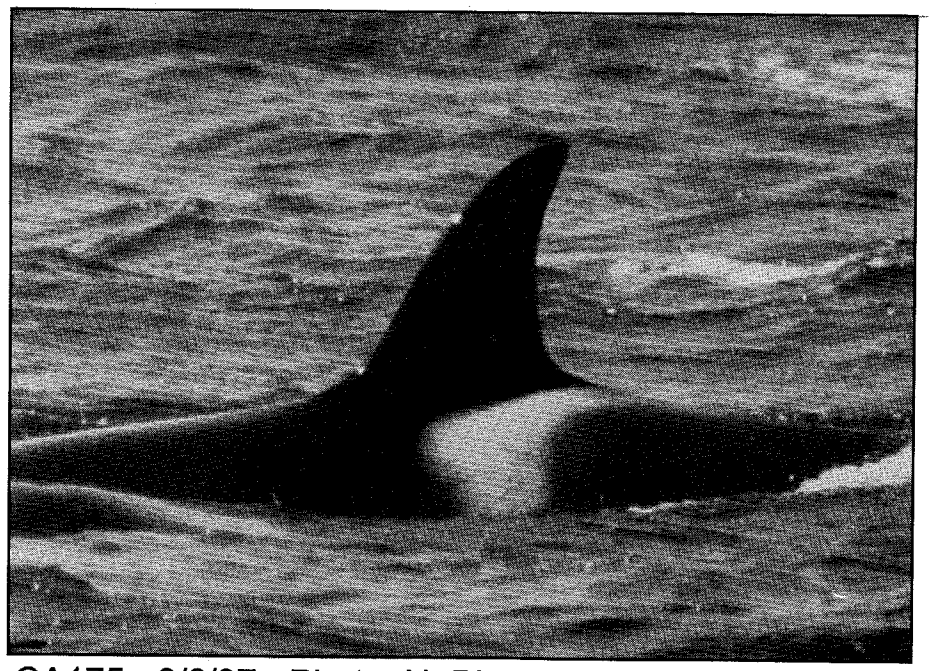
CA173 - 4/21/97 - Photo: N. Black



CA172 - 4/21/97 - Photo: N. Black

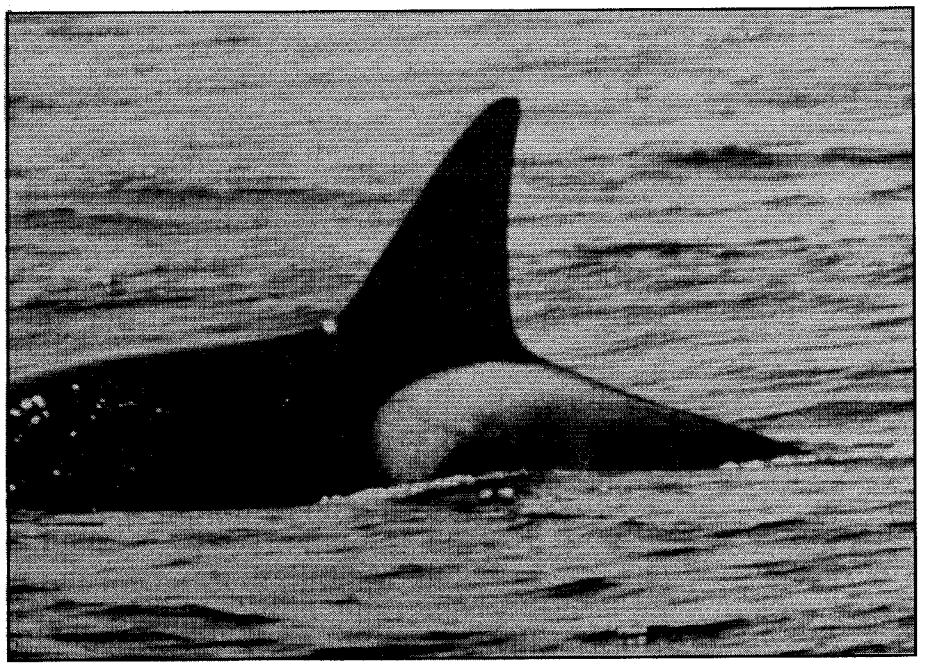


CA174 - 4/21/97 - Photo: N. Black

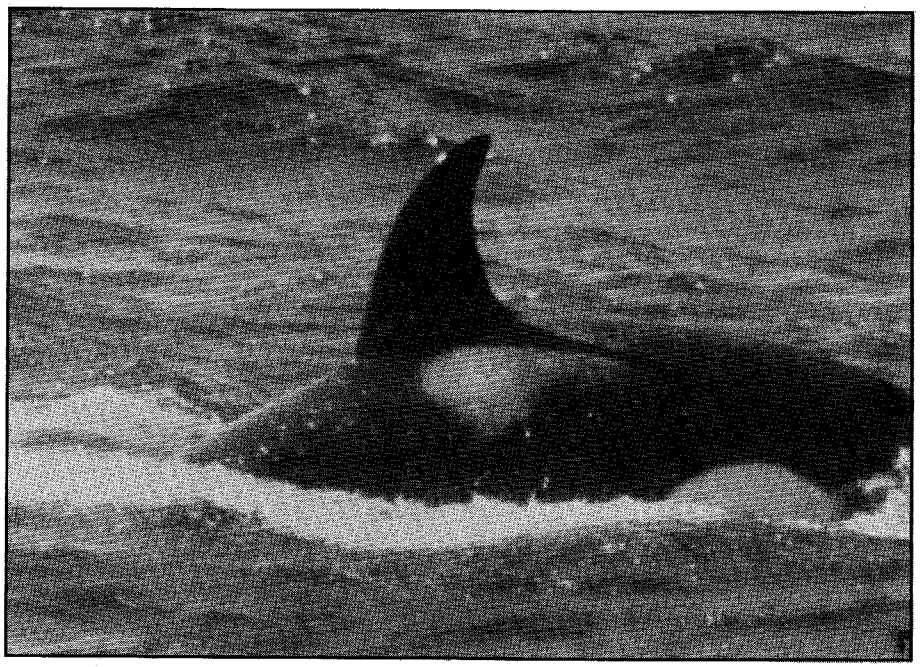


CA175 - 3/6/97 - Photo: N. Black

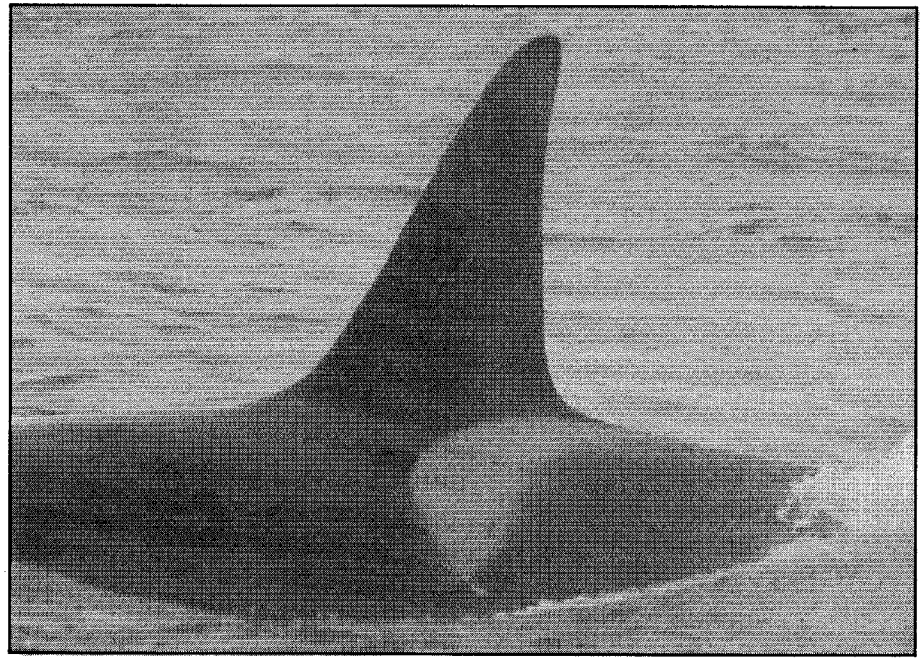
CA176 - 3/6/97 - Photo: N. Black



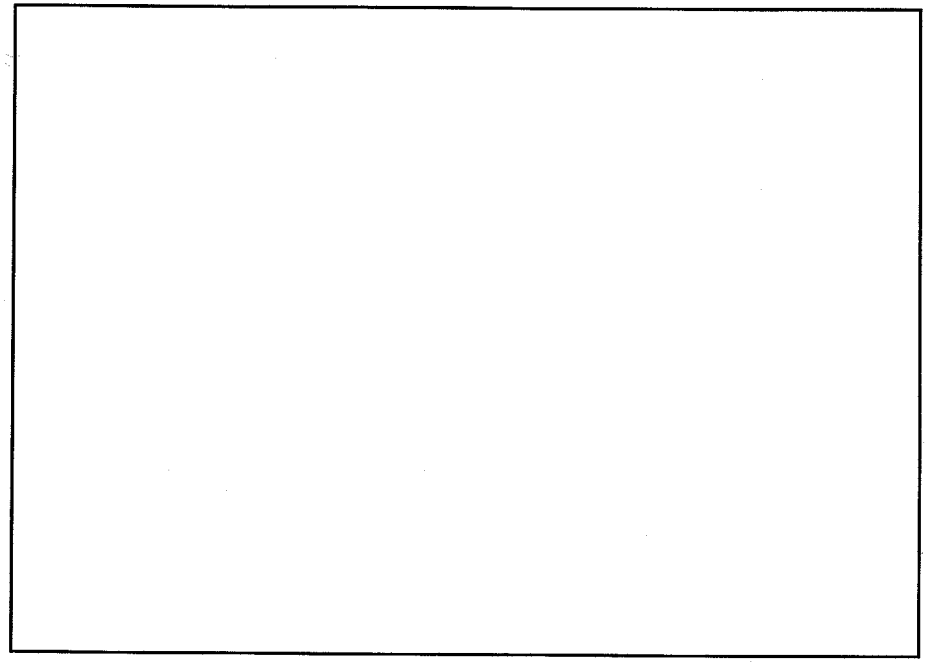
CA177 - 3/6/97 - Photo: N. Black

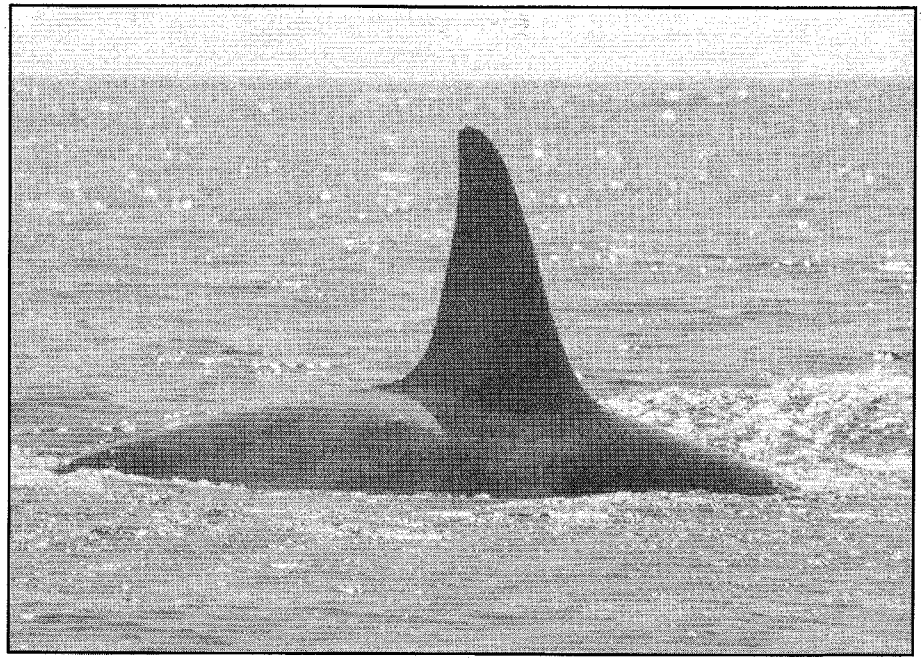


CA178 - 3/6/97 - Photo: N. Black

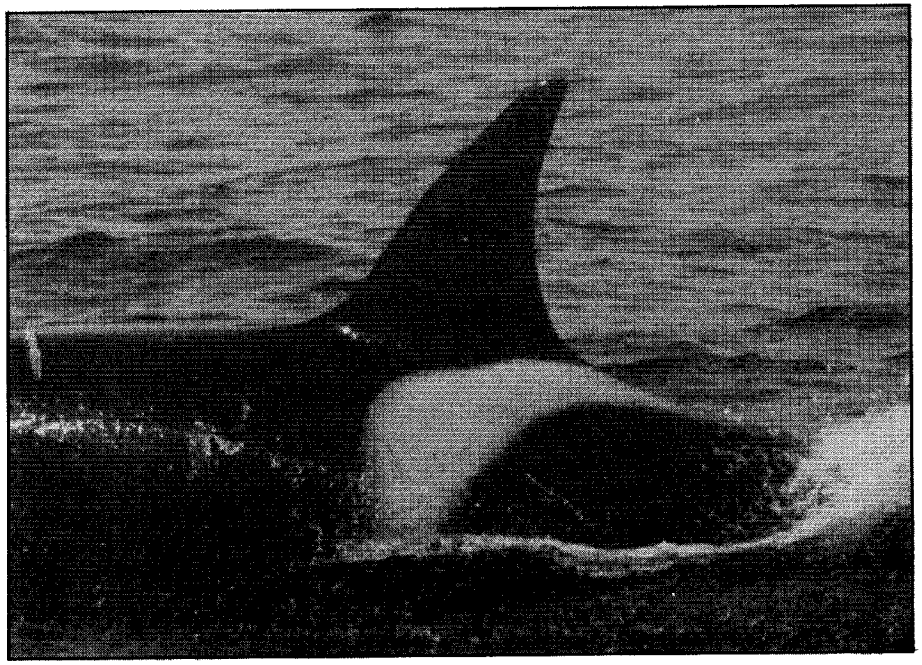


CA179 - 5/21/97 - Photo: N. Black

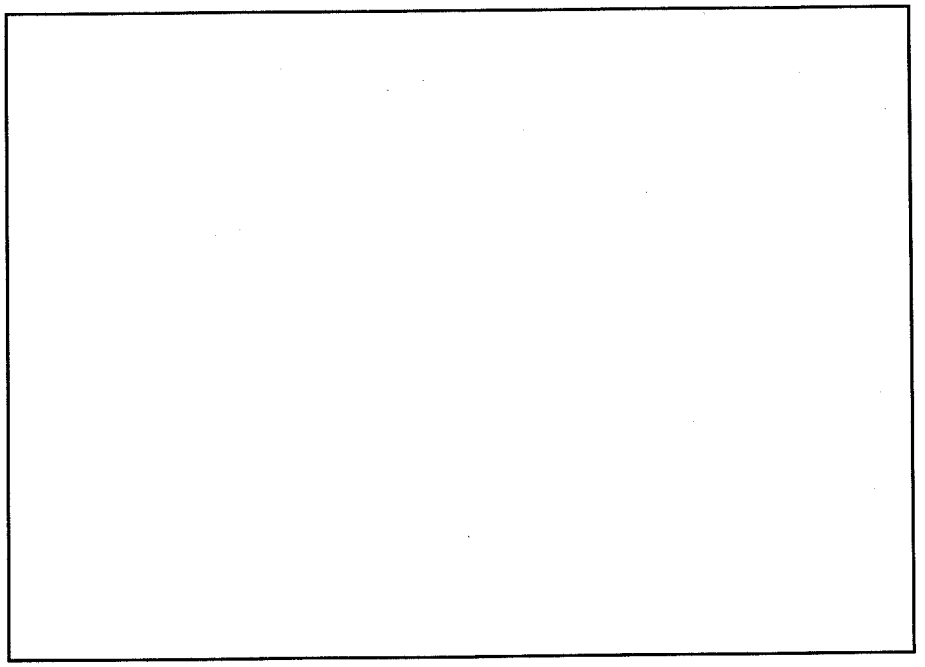


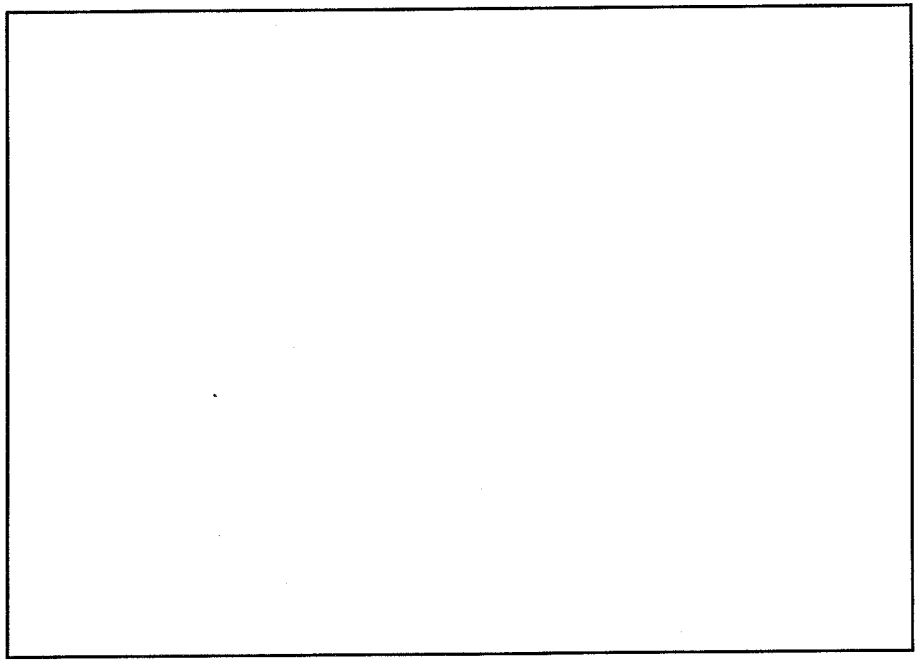


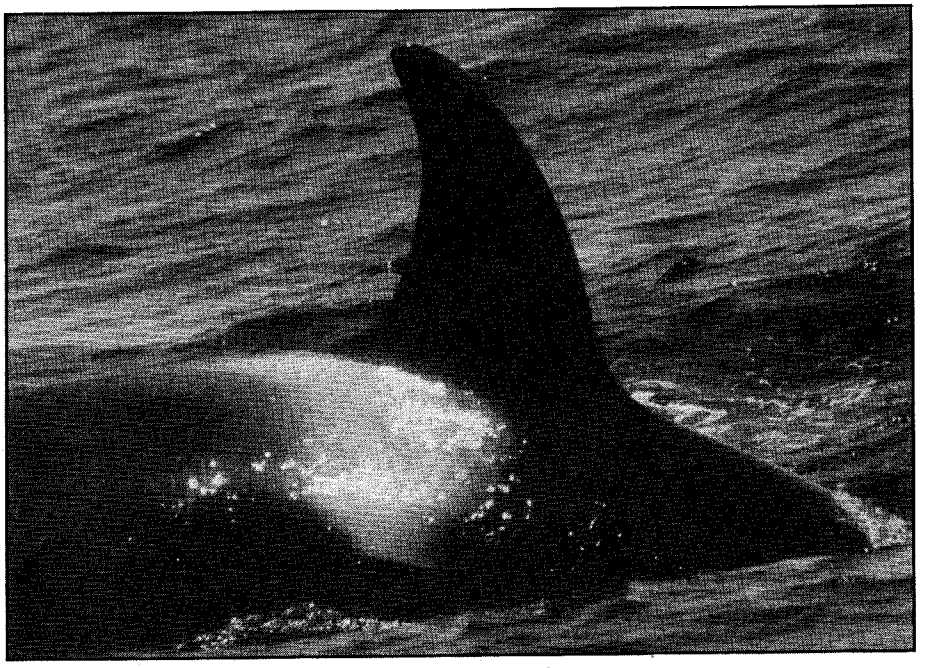
CA179 - 7/13/97 - Photo: T. Chandler/Cascadia



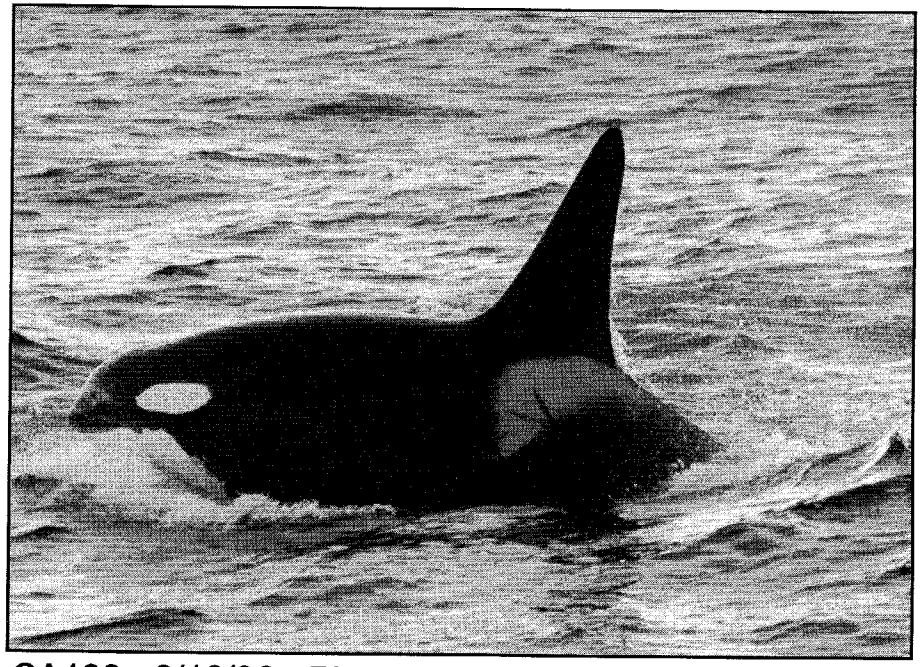
CA180 - 5/21/97 - Photo: N Black



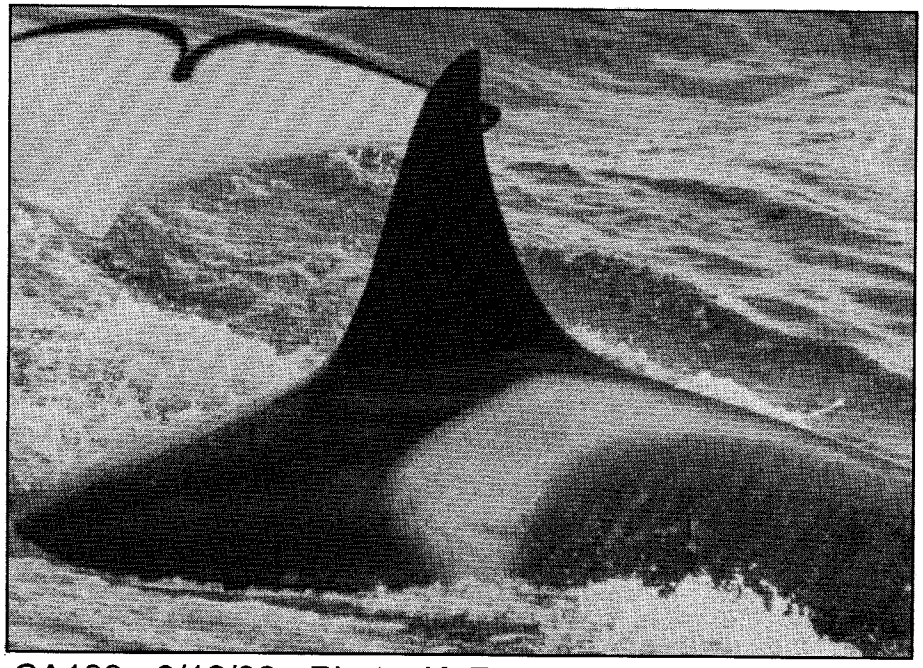




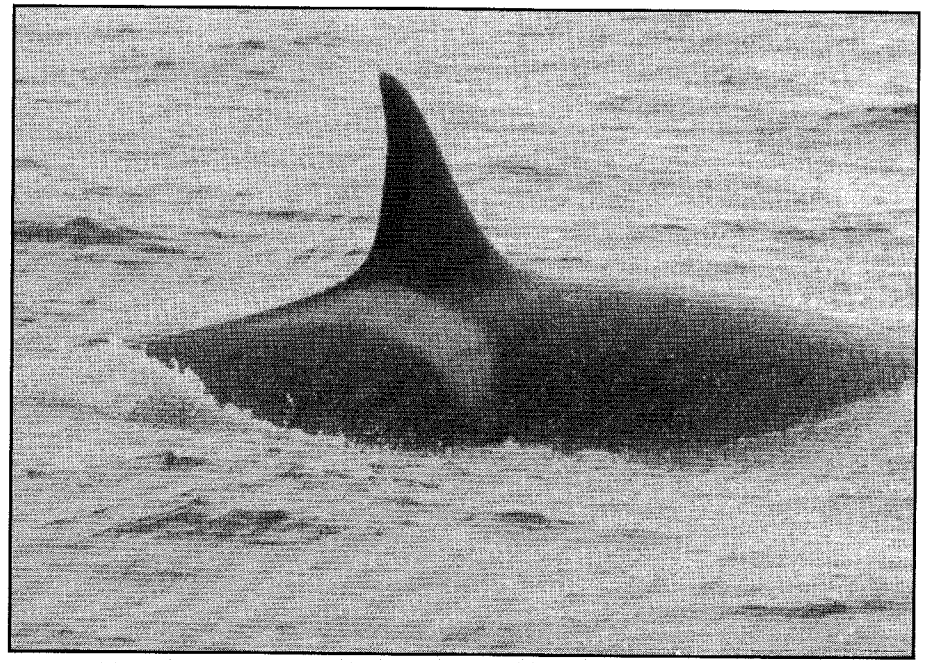
CA182 - 5/31/97 - Photo: N. Black



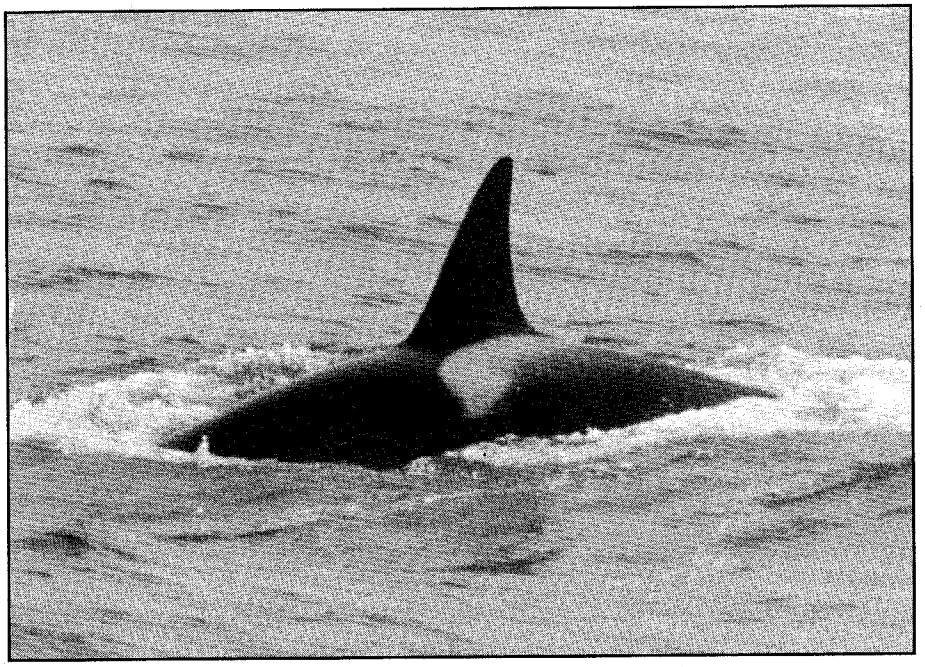
CA188 - 9/12/96 - Photo: K. Forney/NMFS



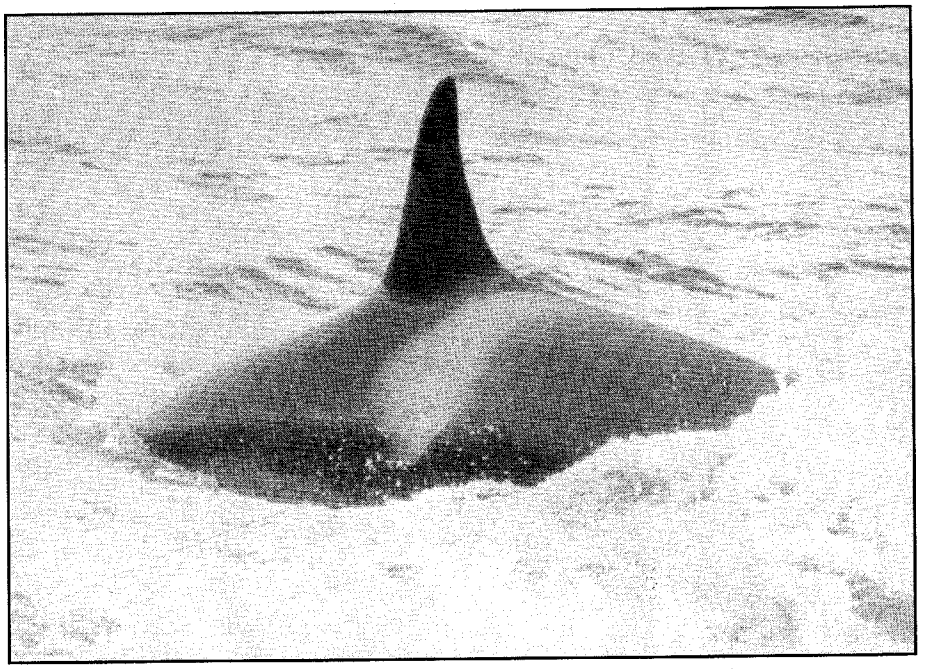
CA189 - 9/12/96 - Photo: K. Forney/NMFS



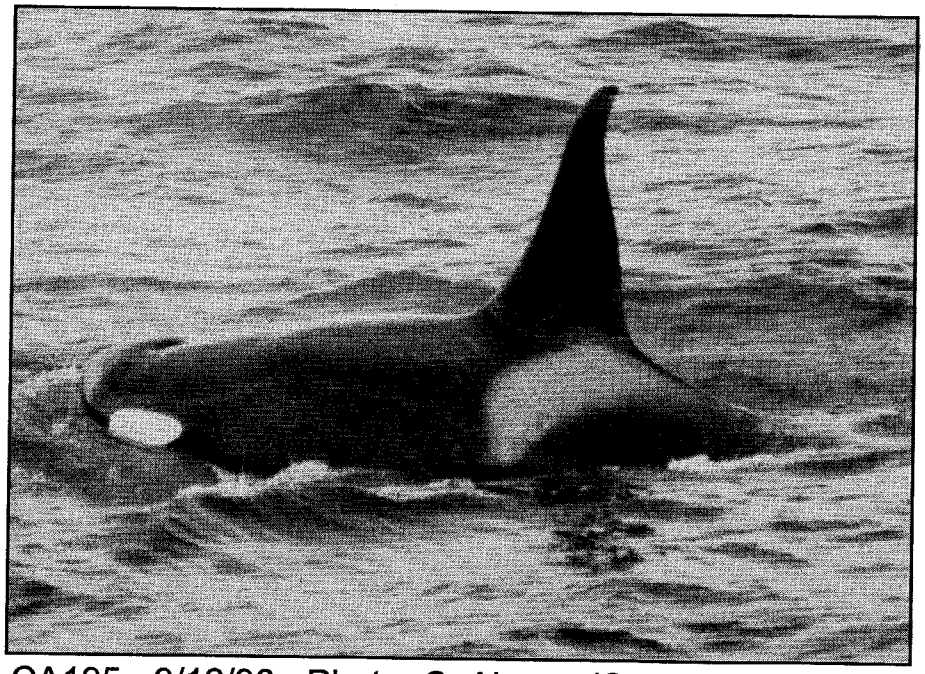
CA189 - 9/12/96 - Photo: K. Forney/NMFS



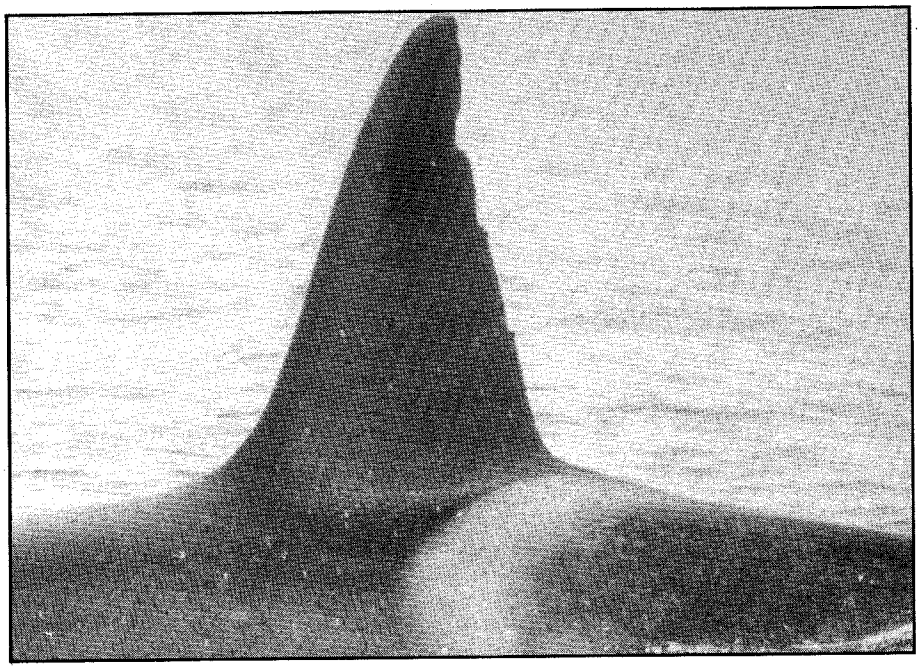
CA193 - 9/12/96 - Photo: K. Forney/NMFS



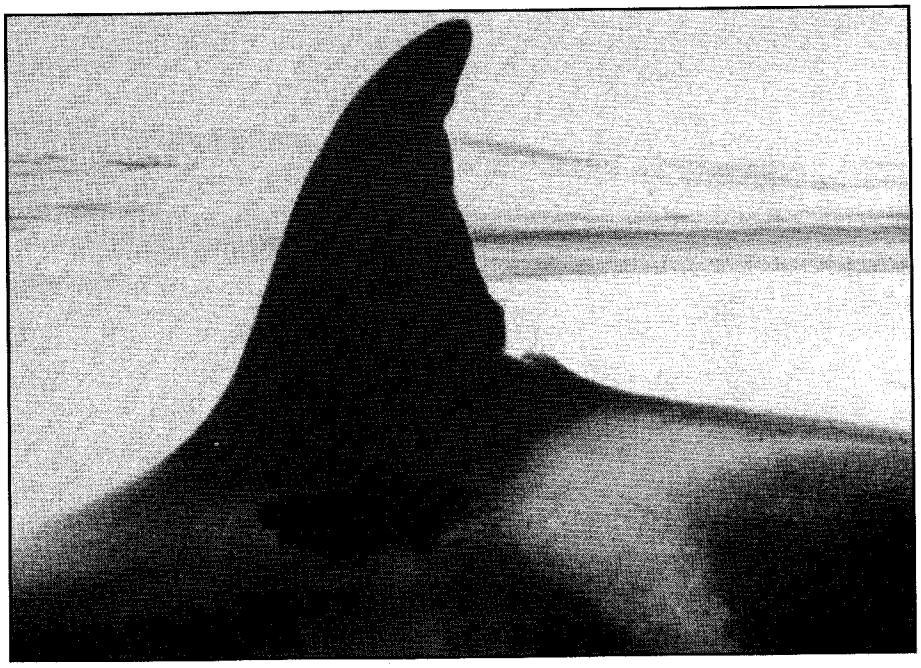
CA194 - 9/12/96 - Photo: C. Alvarez/Cascadia



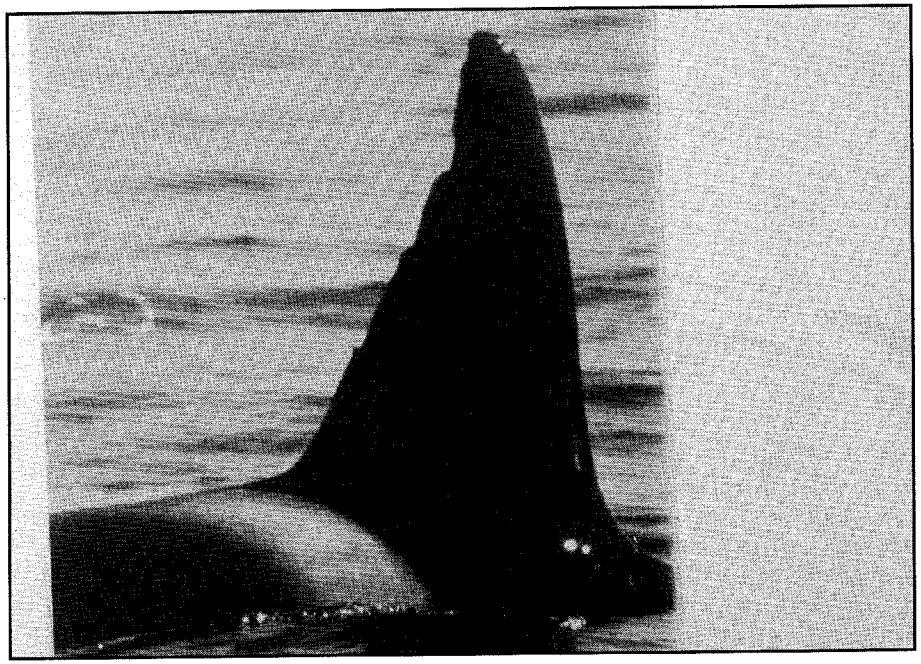
CA195 - 9/12/96 - Photo: C. Alvarez/Cascadia



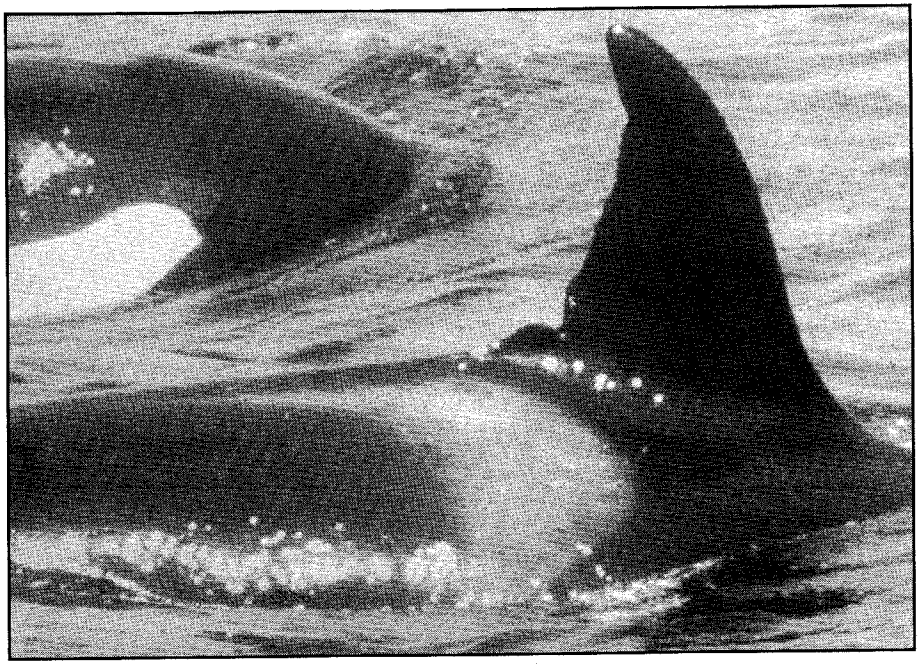
CA1 - 10/28/85 - Photo: E. Martin



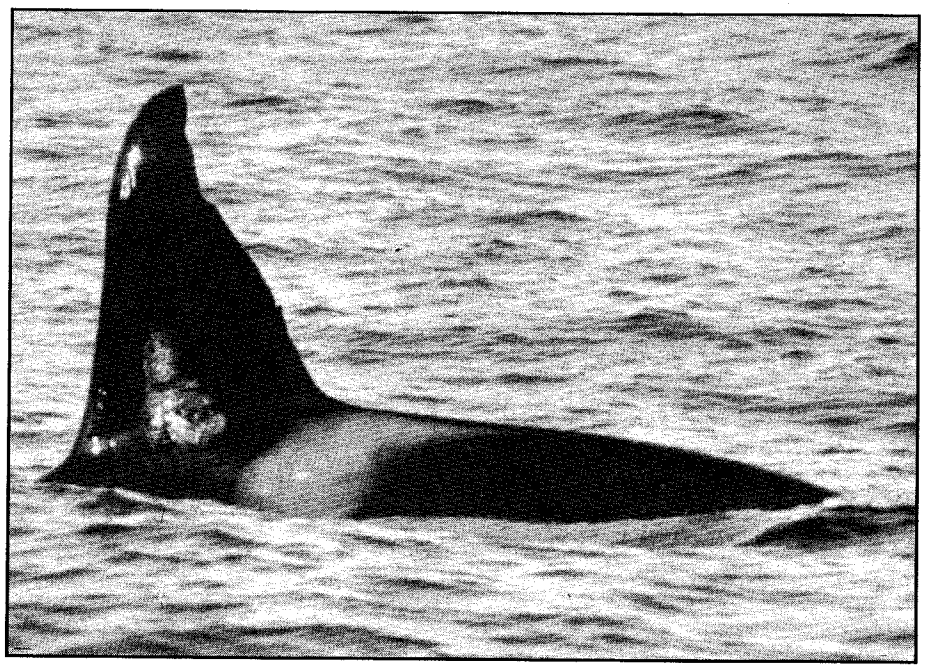
CA2 - 11/20/86 - Photo: J. Hall



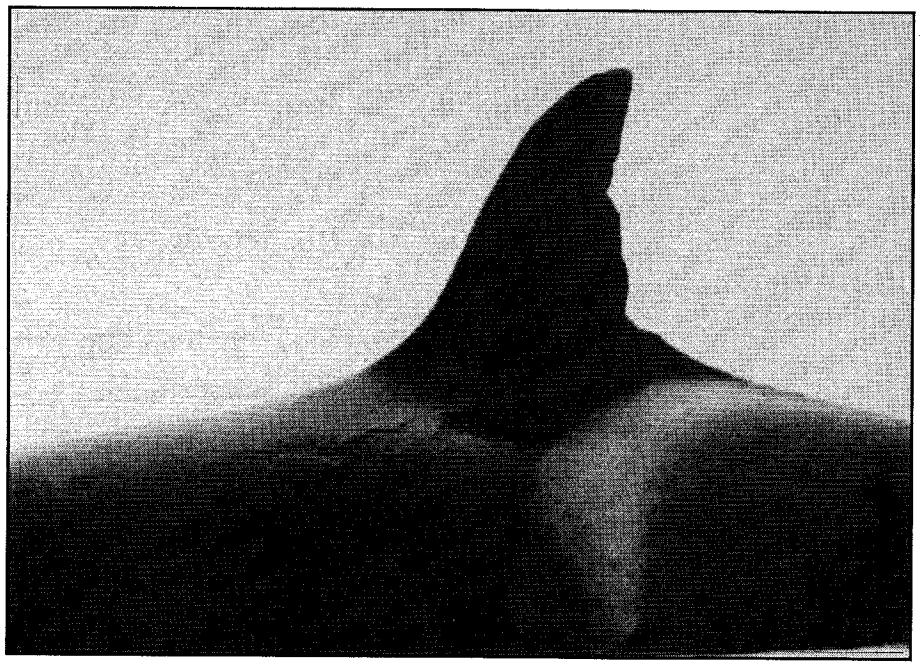
CA1 - 1/29/84 - Photo: A. Schulman



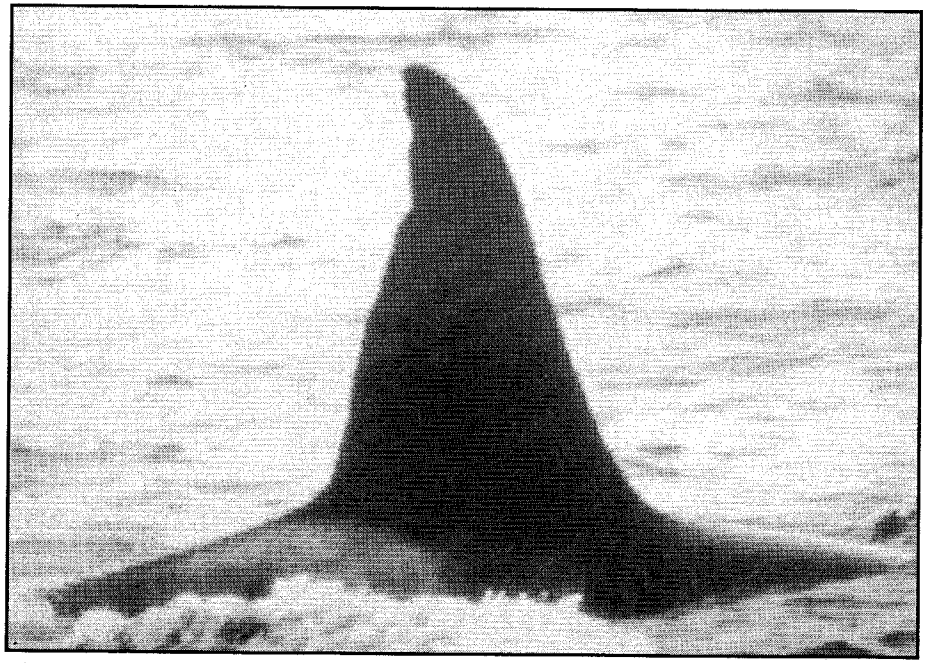
CA2 - 4/15/85 - Photo: A. Schulman



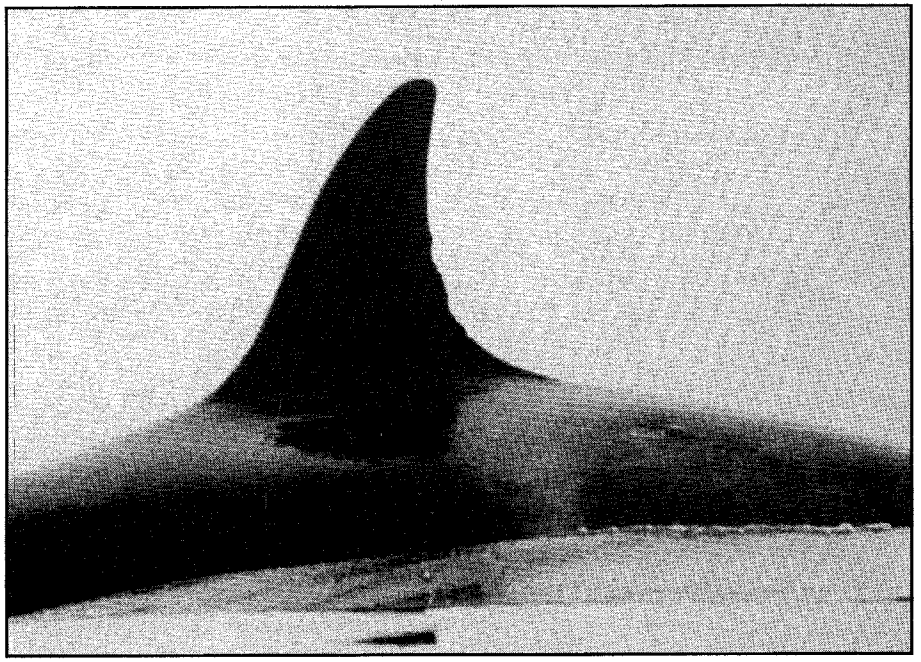
CA3 - 3/15/90 - Photo: J. Roberts



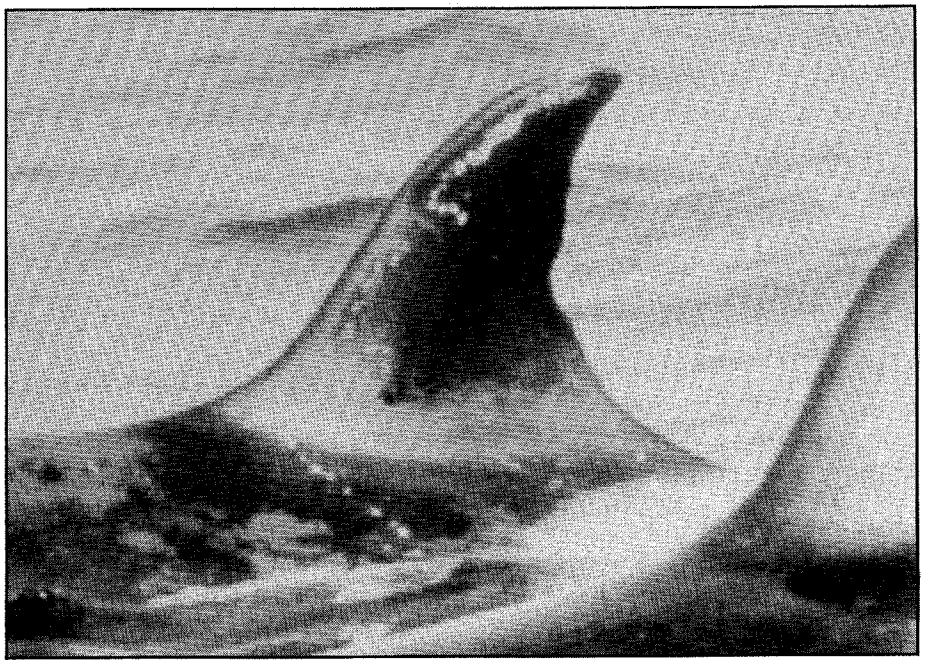
CA4 - 11/20/86 - Photo: J. Hall



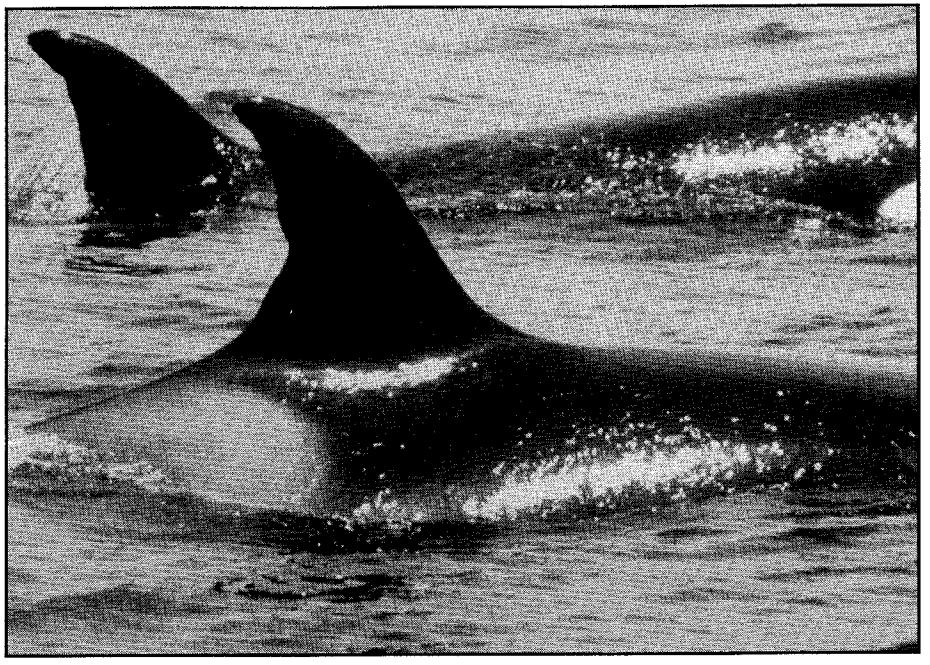
CA3 - 3/16/85 - Photo: R. Wells



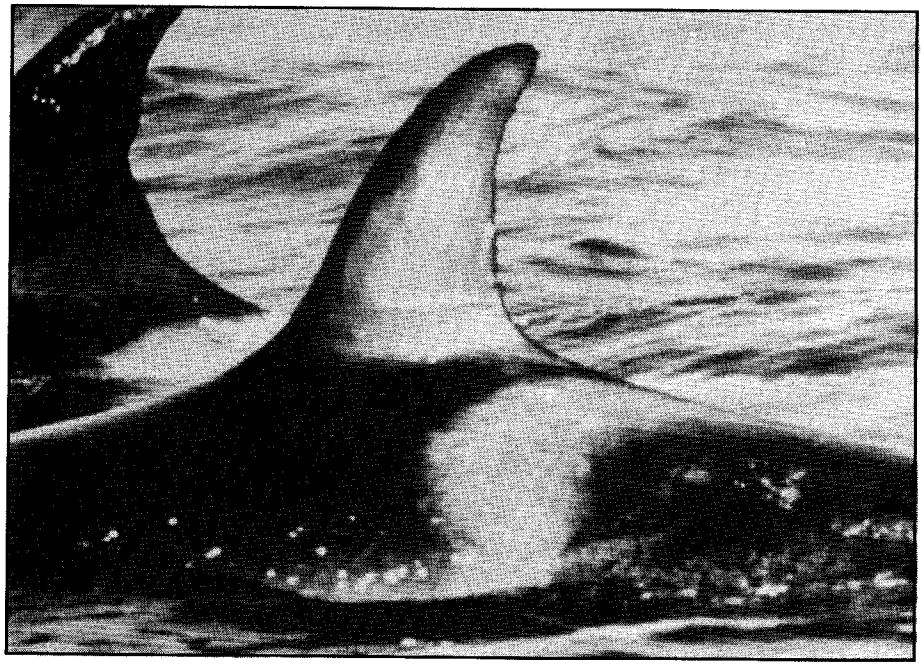
CA5 - 11/20/86 - Photo: J. Hall



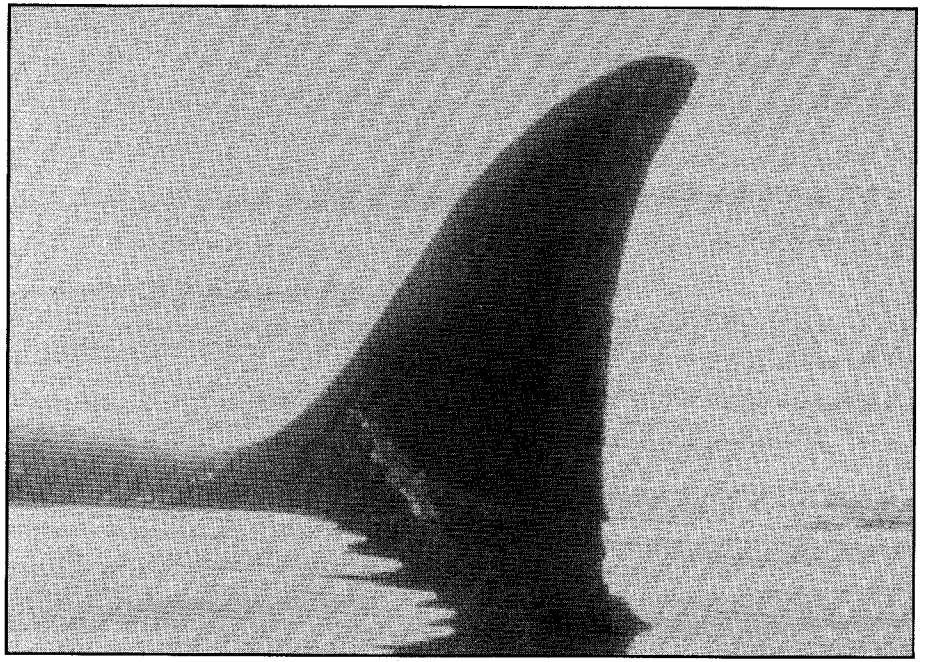
CA6 - 9/21/87 - Photo: S. Bailey



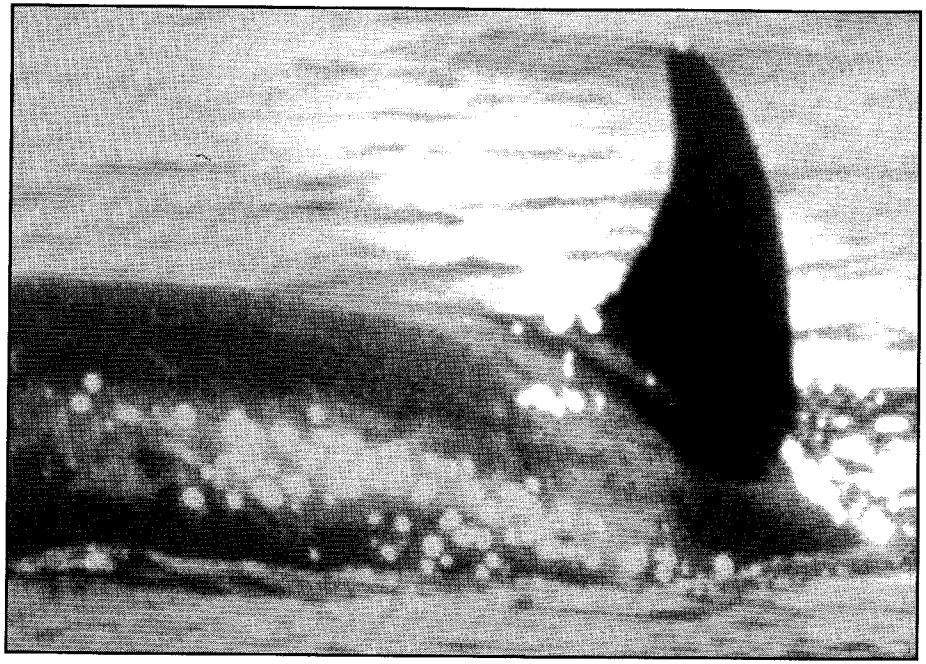
CA6 - 4/15/85 - Photo: A. Schulman



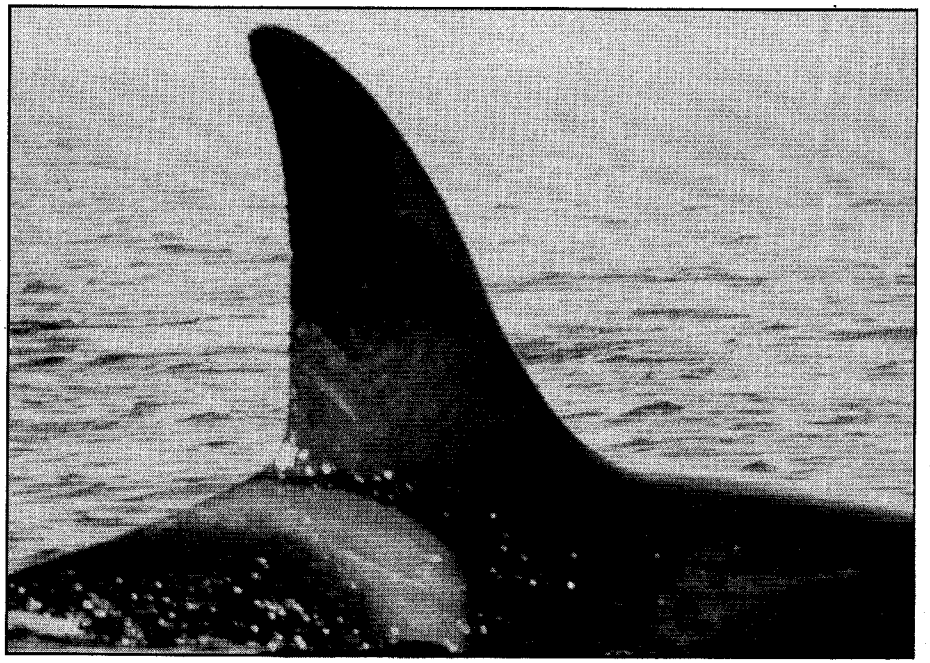
CA7 - 9/21/87 - Photo: S. Bailey



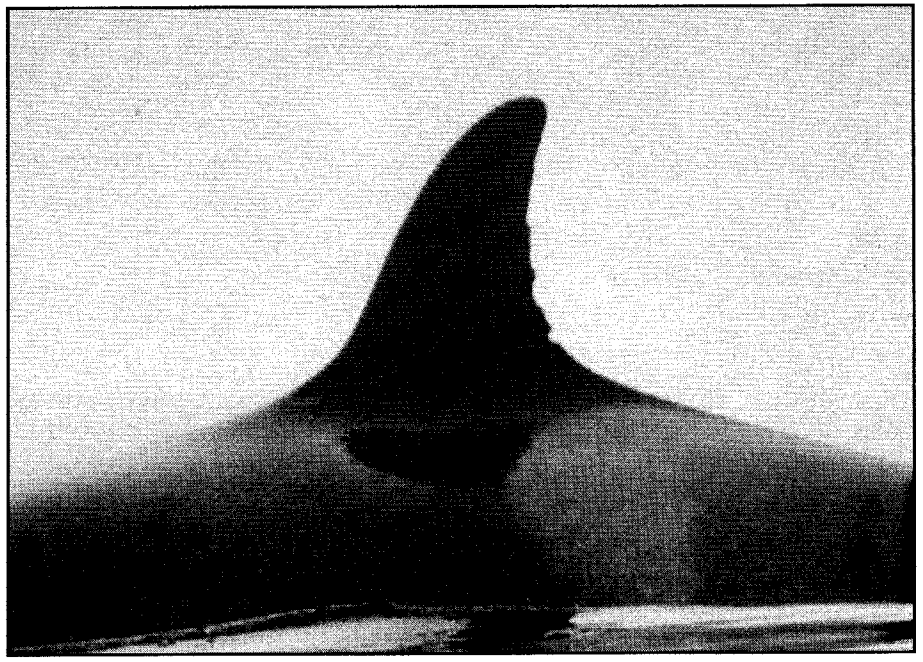
CA8 - 1/29/84 - Photo: A. Schulman



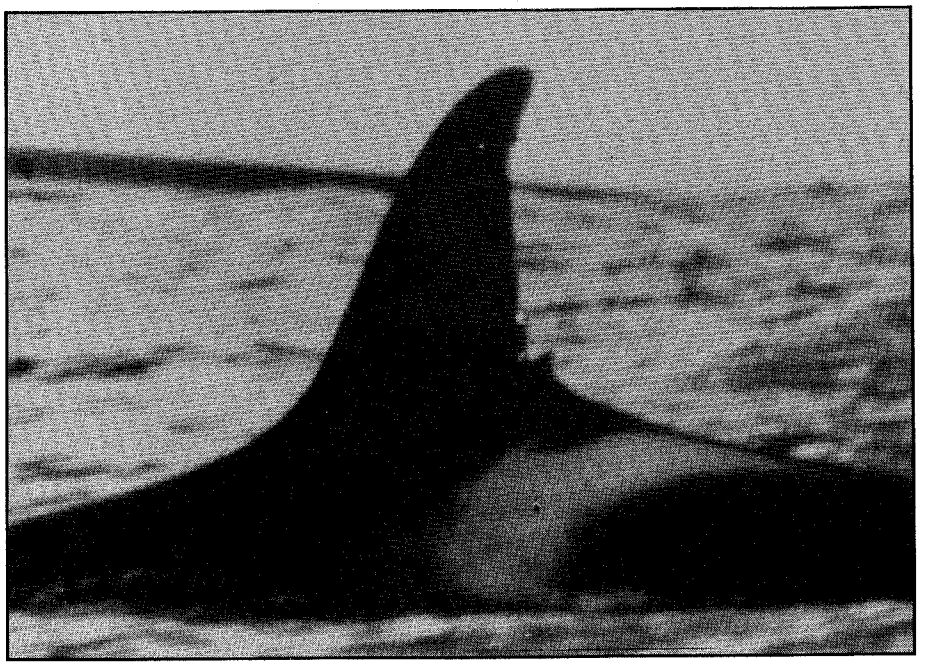
CA7 - 3/26/88 - Photo: M. Webber



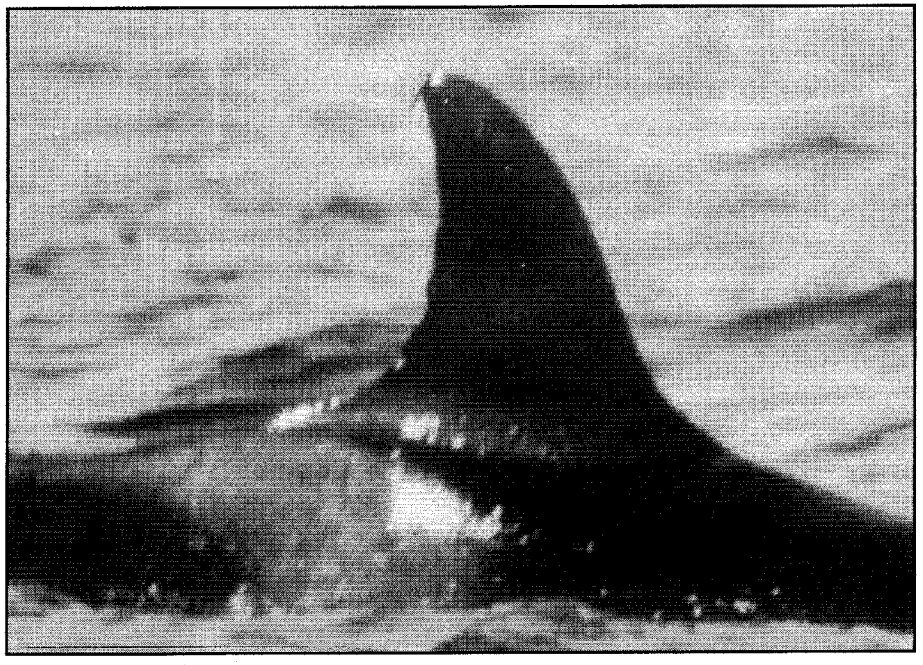
CA8 - 1/29/84 - Photo: A. Schulman



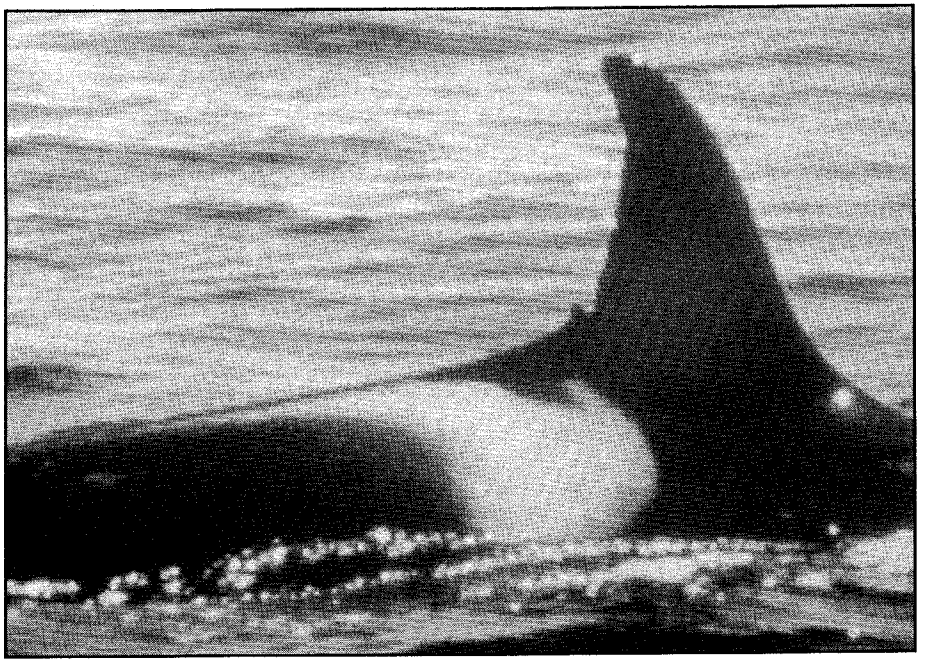
CA65 - 11/20/86 - Photo: J. Hall



CA66 - 2/13/88 - Photo: E. Martin



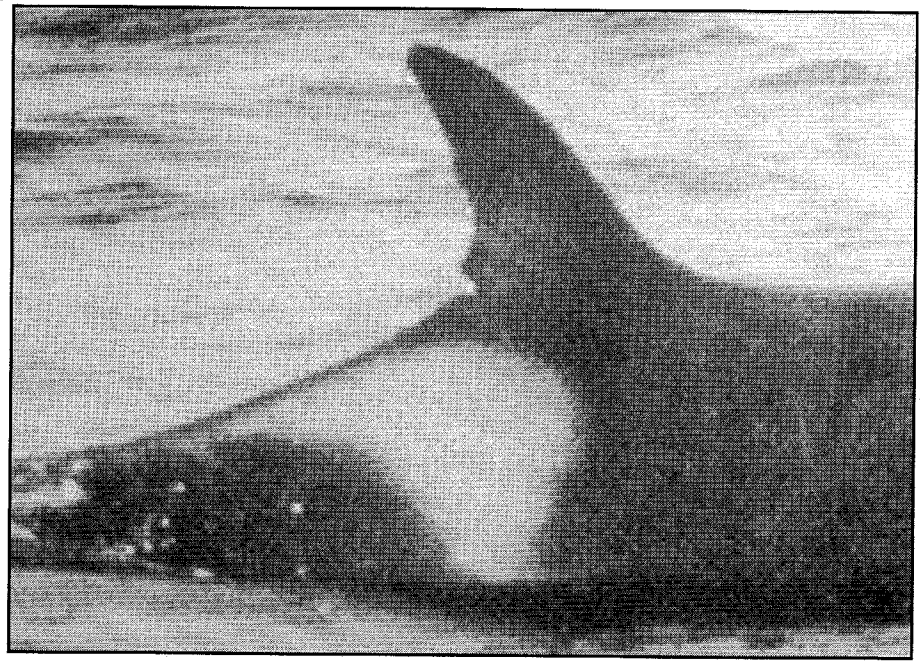
CA65 - 3/23/85 - Photo: E. Martin



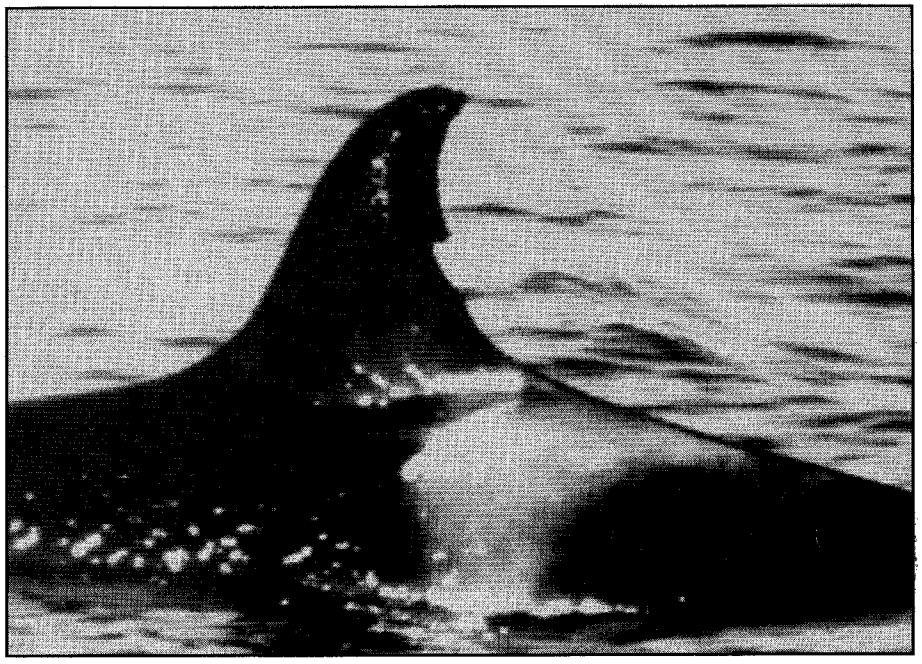
CA66 - 3/26/88 - Photo: M. Webber

CA69 - 1/12/83 - Photo: S. Anderson

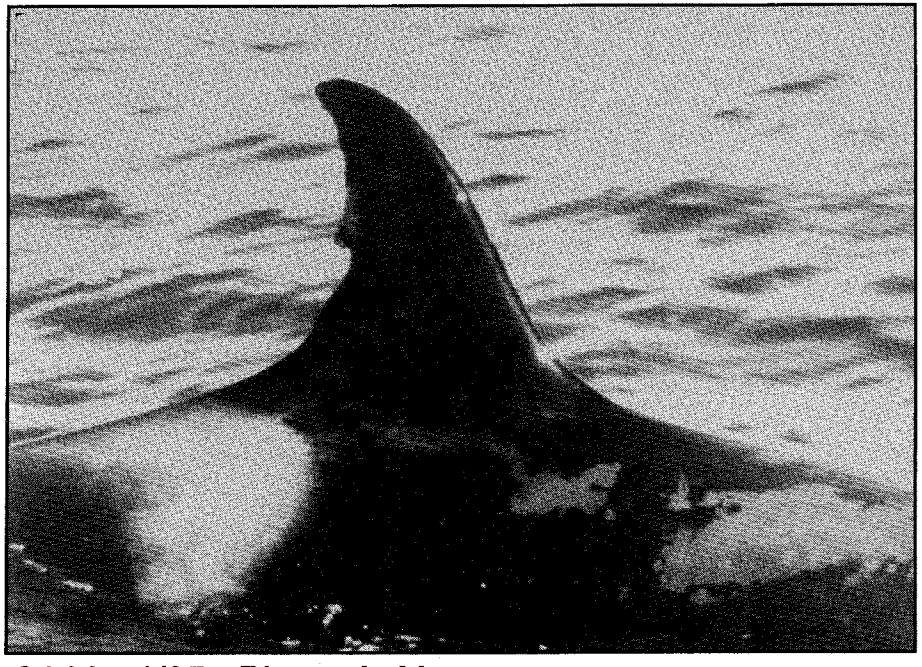
CA67 - 4/15/85 - Photo: A. Schulman



CA69 - 1/12/83 - Photo: S. Leatherwood

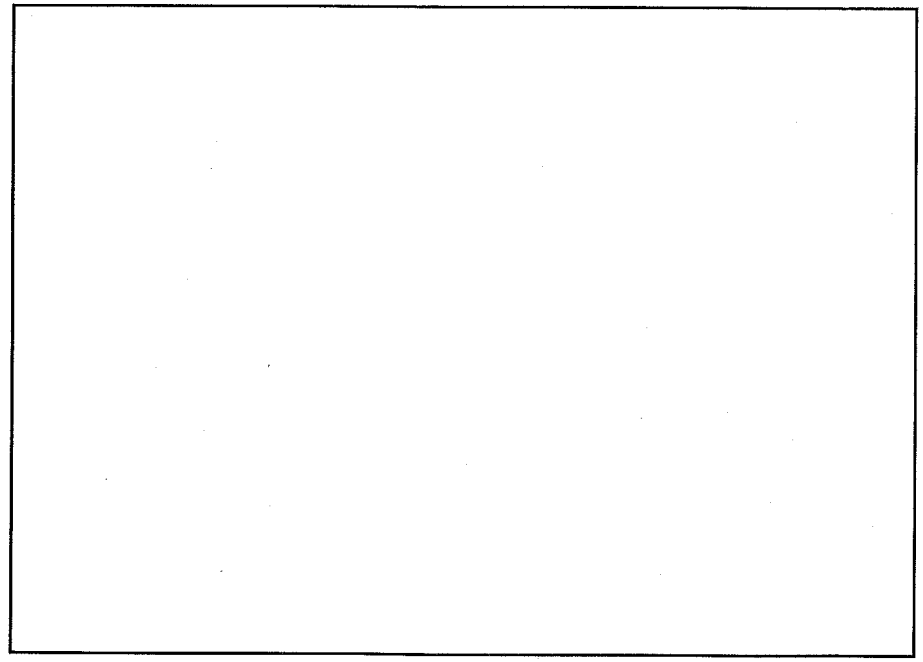


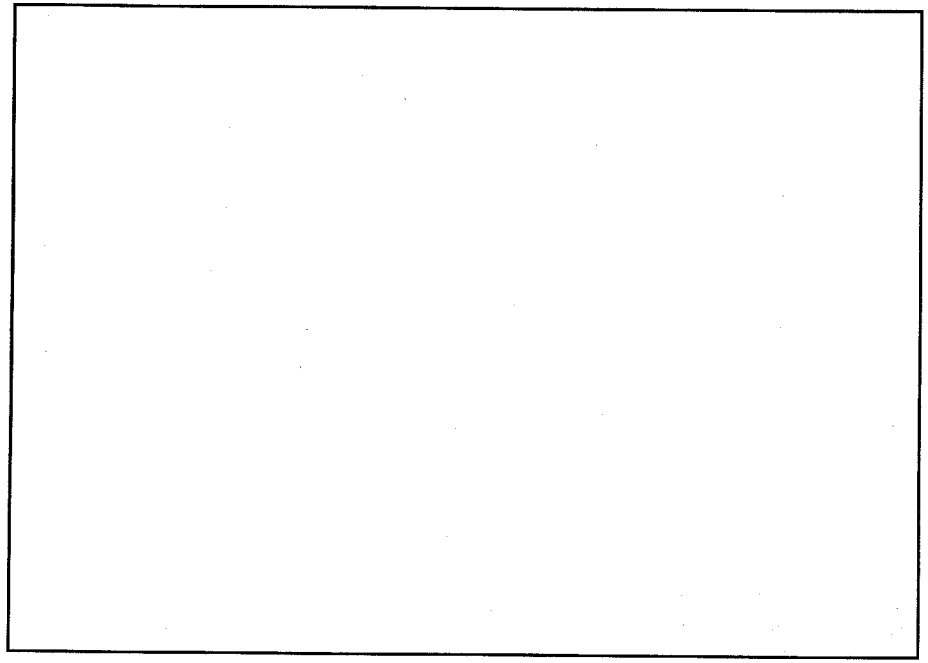
CA90 - 1/85 - Photo: A. Morgan

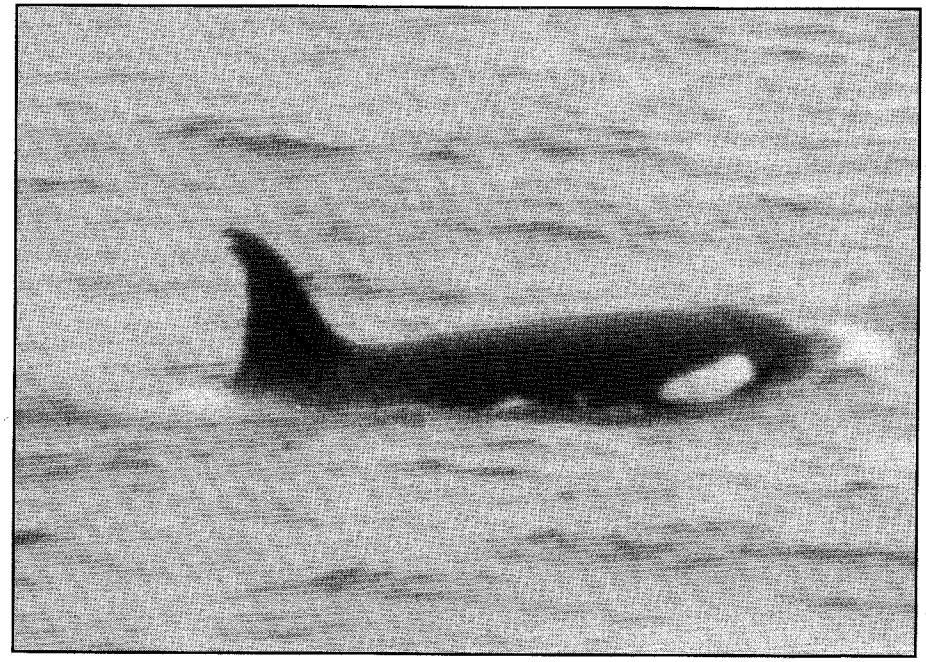


CA90 - 1/85 - Photo: A. Morgan

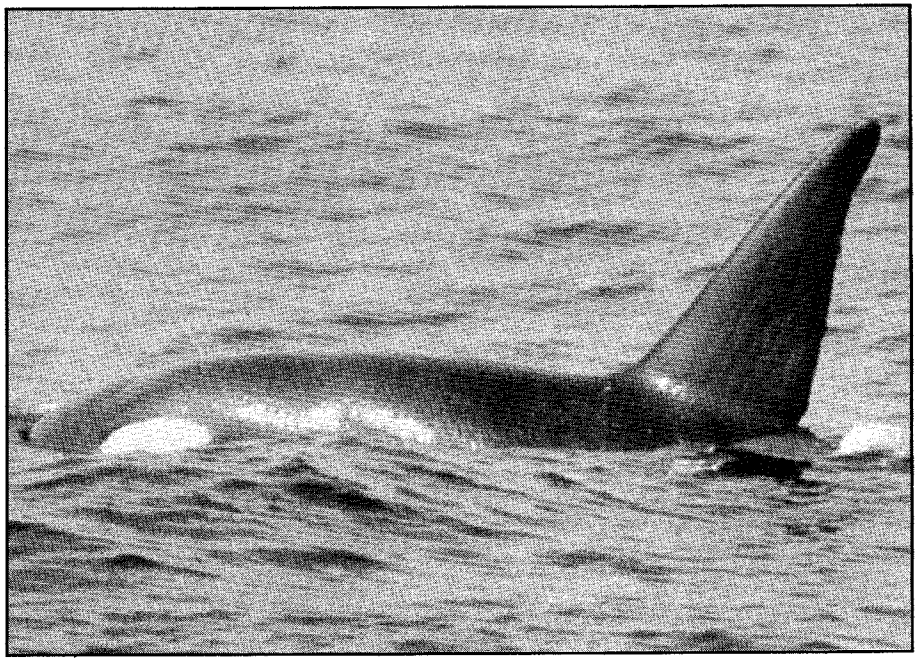
CA60 (right animal) - 10/6/85 - Photo: R. Stallcup



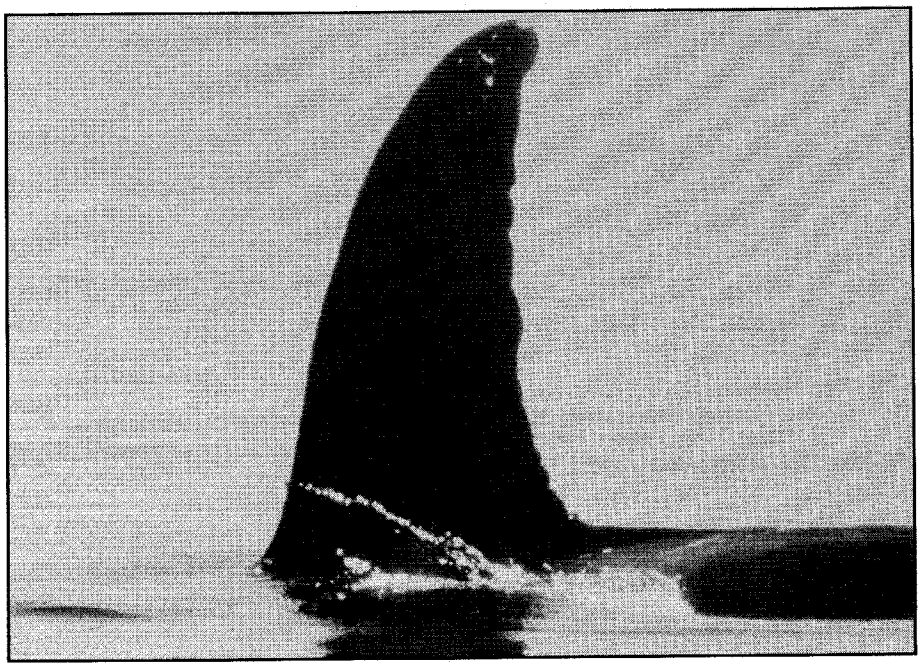




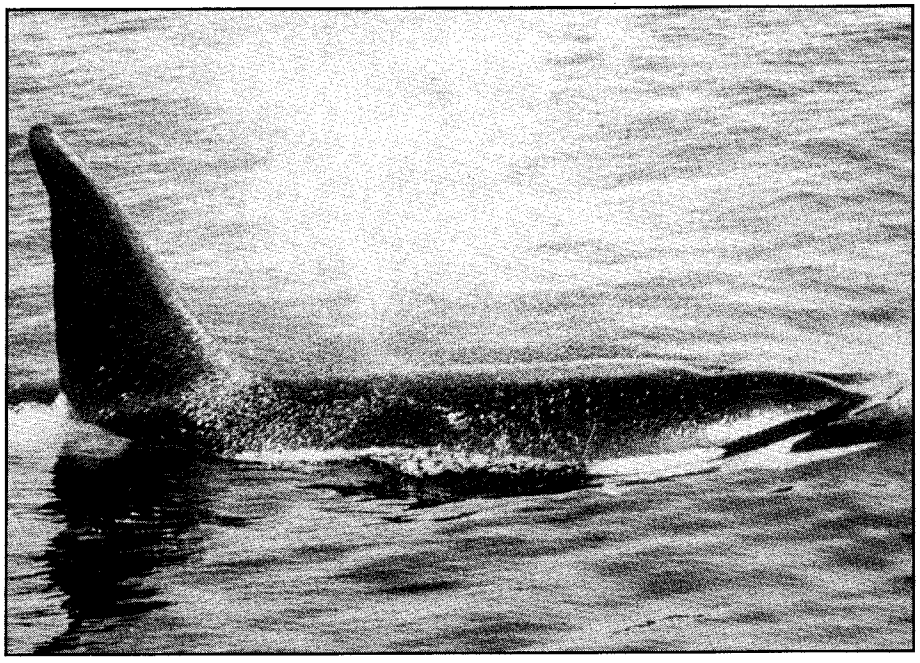
CA61 - 7/2/79 - Photo: A. Baldridge



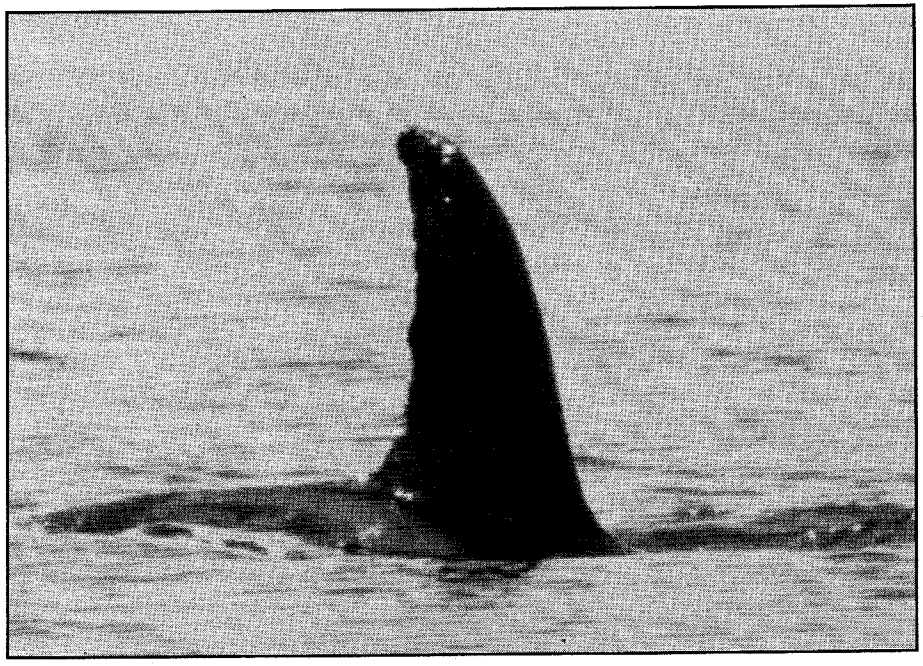
CA64 - 10/78 - Photo: M. Snyderman



CA70 - 8/21/85 - Photo: Tershy/Strong

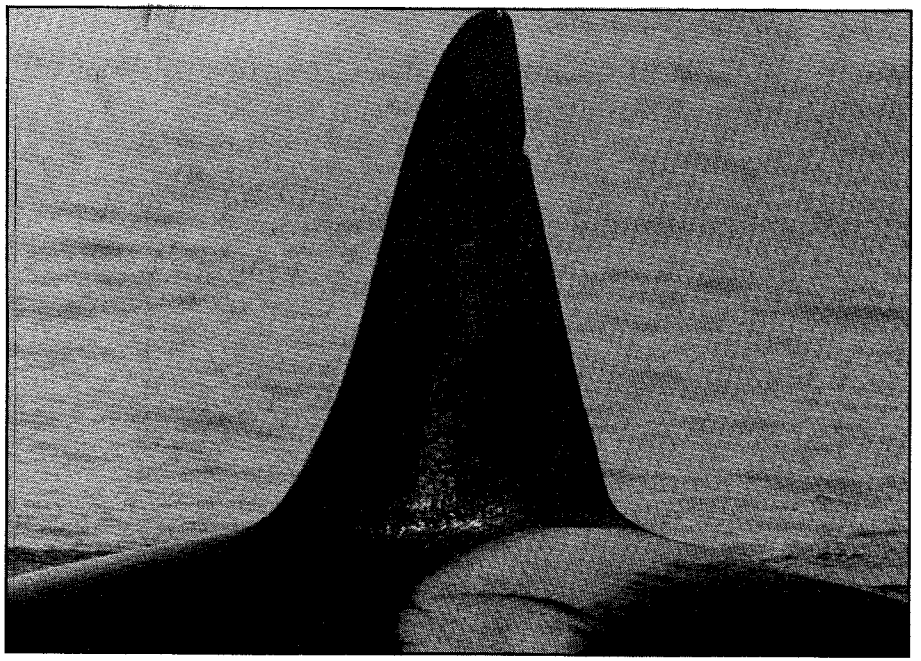


CA64 - 2/13/79 - Photo: R. Charter

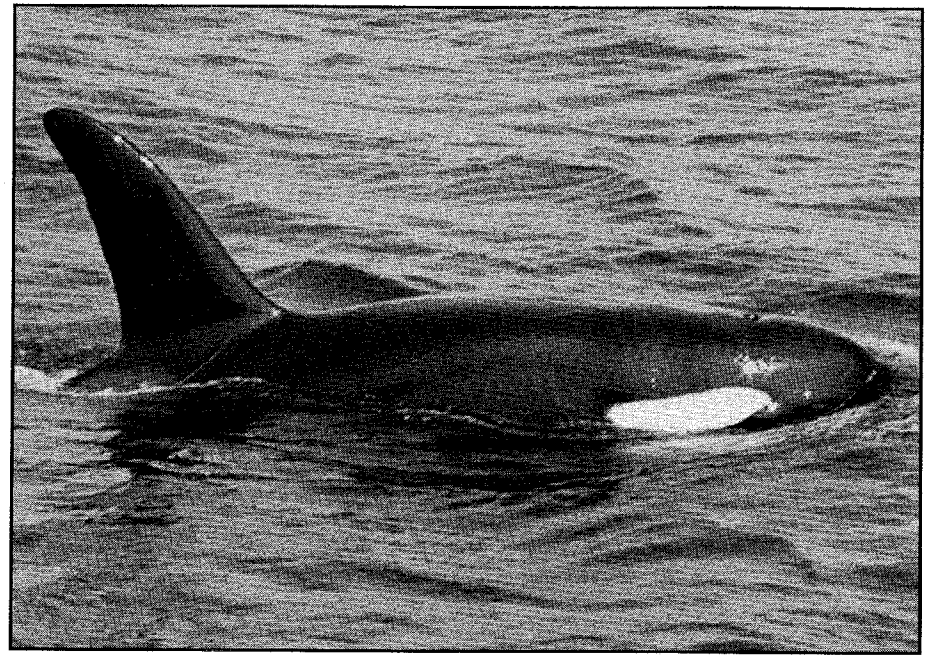


CA70 - 9/26/85 - Photo: Tershy/Strong

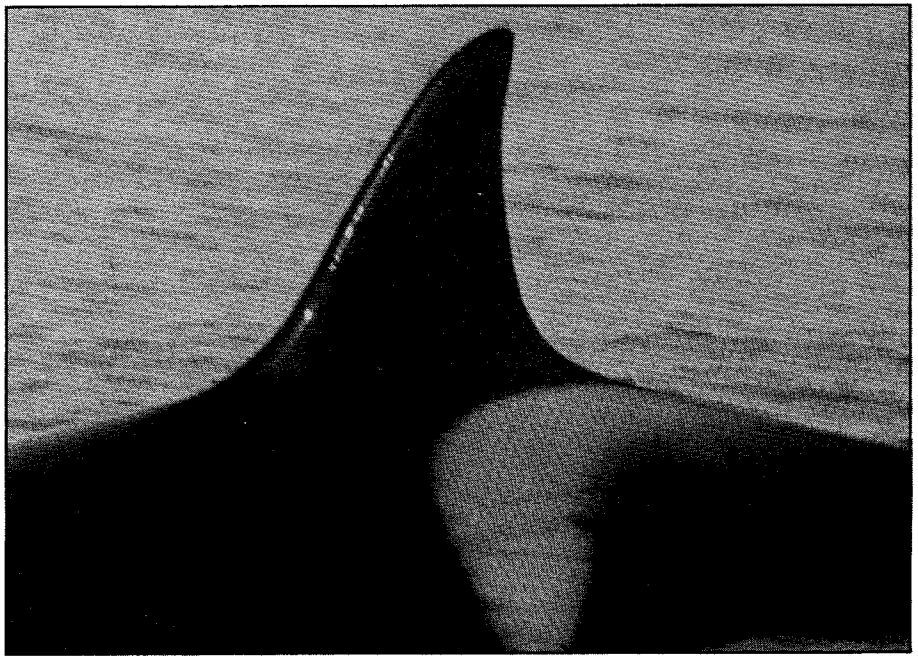
CA71 - 2/14/82 - Photo: W. Stephen



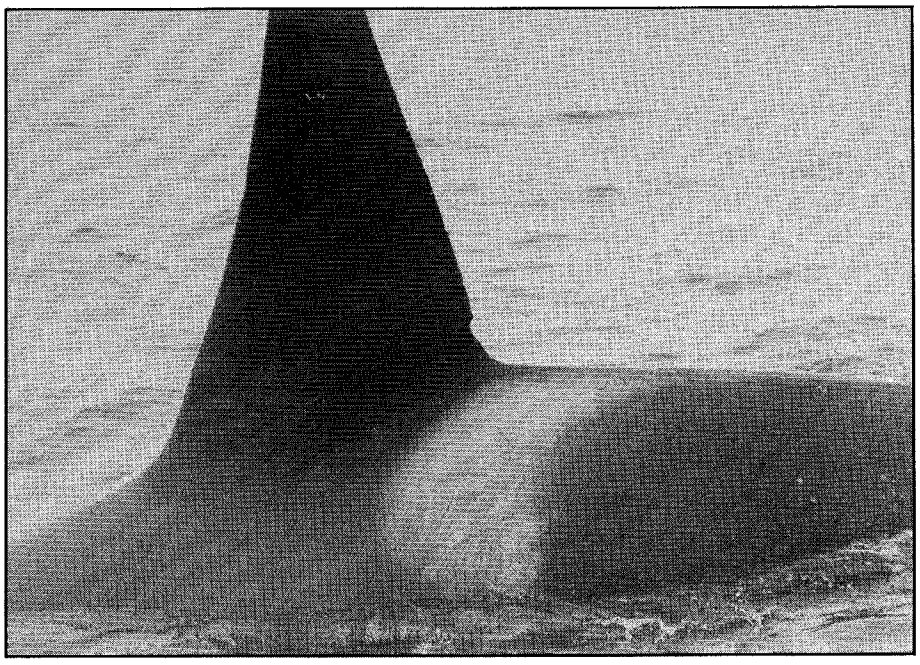
CA72 - 9/15/86 - Photo: J. Calambokidis/Cascadia



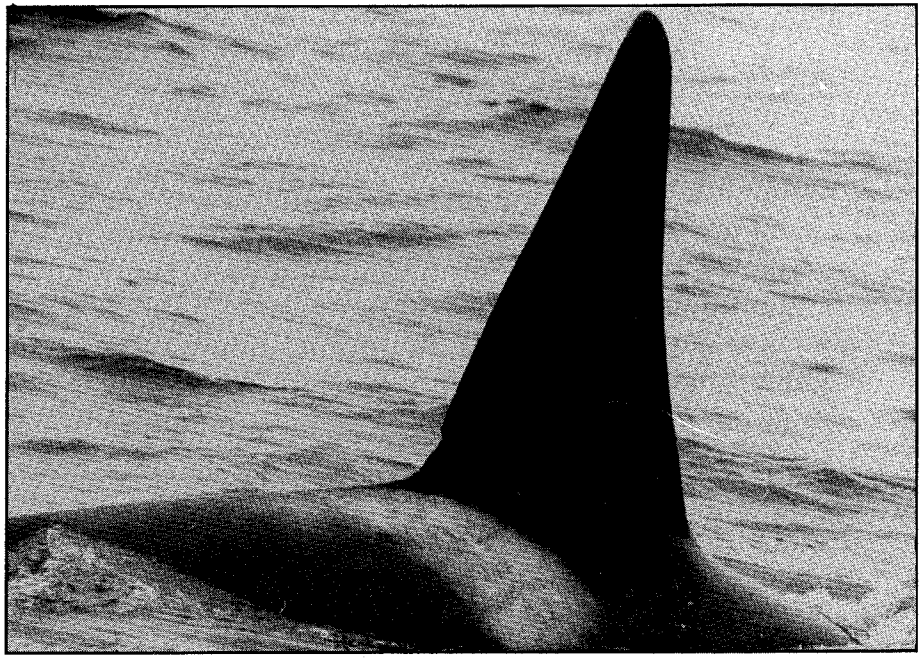
CA71 - 3/8/82 - Photo: D. Beeninga



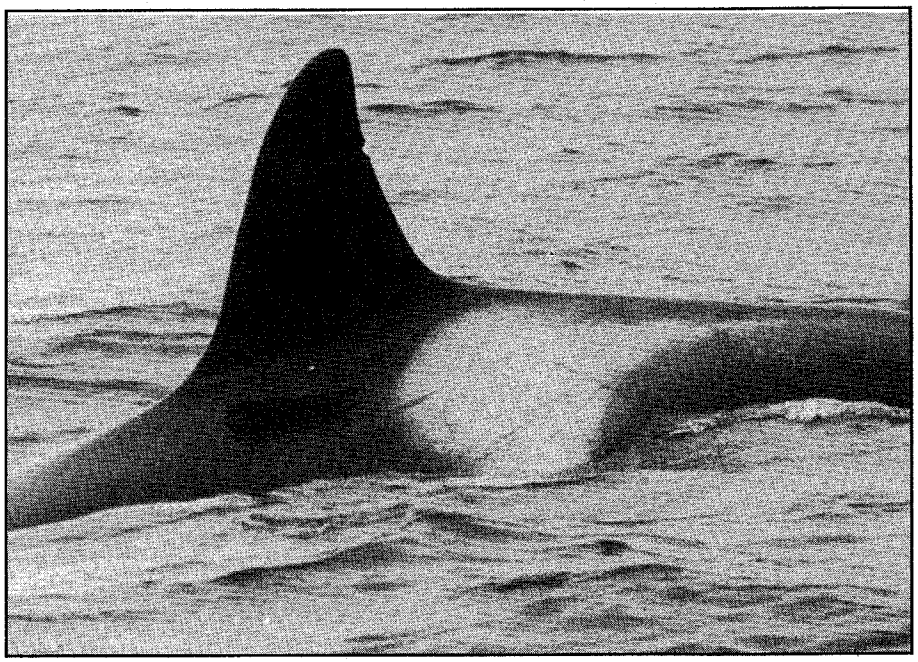
CA74 - 9/15/86 - Photo: J. Calambokidis/Cascadia



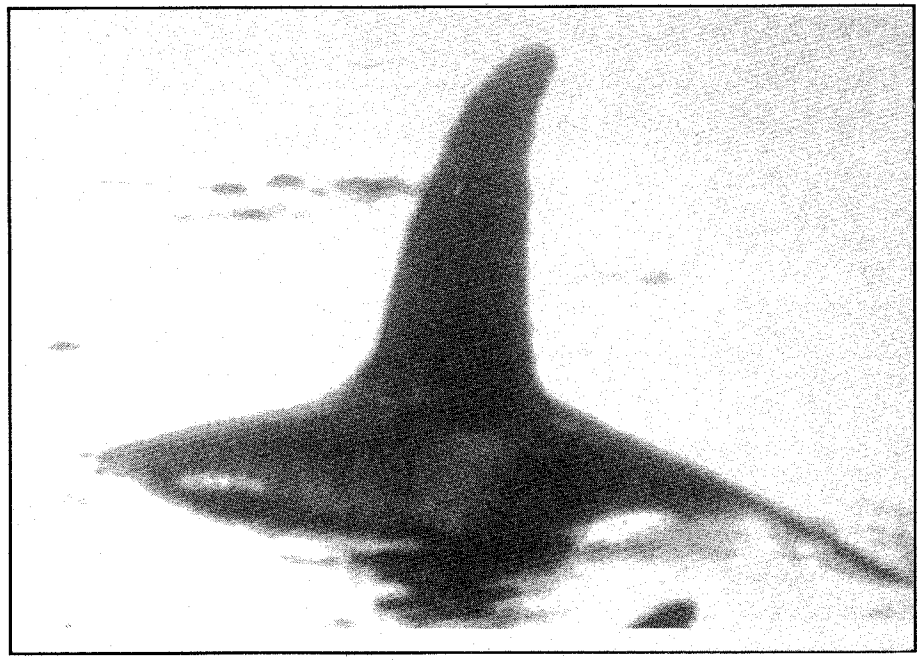
CA76 - 10/11/88 - Photo: D. Claridge



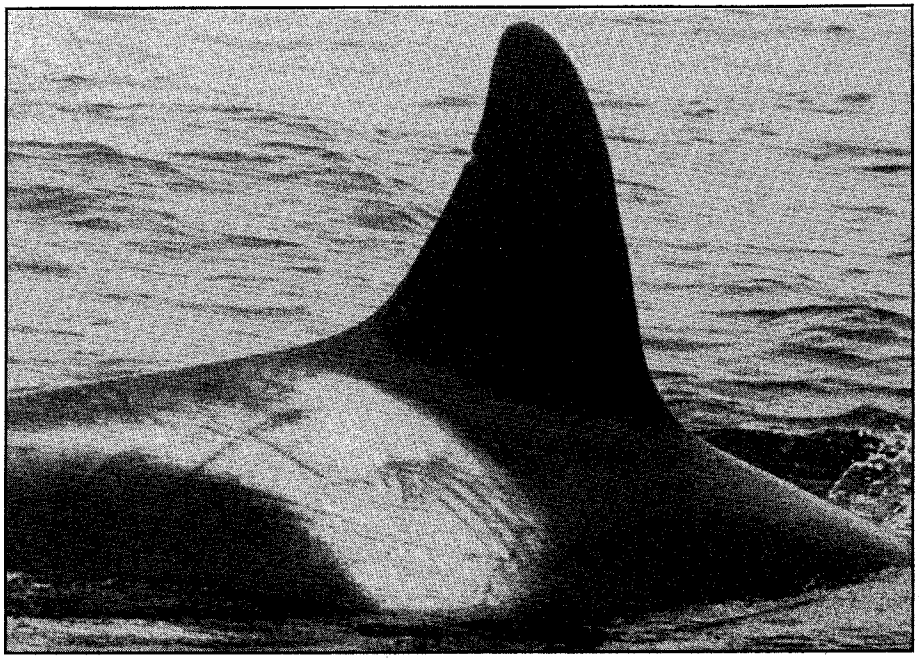
CA76 - 10/11/88 - Photo: K. Balcomb



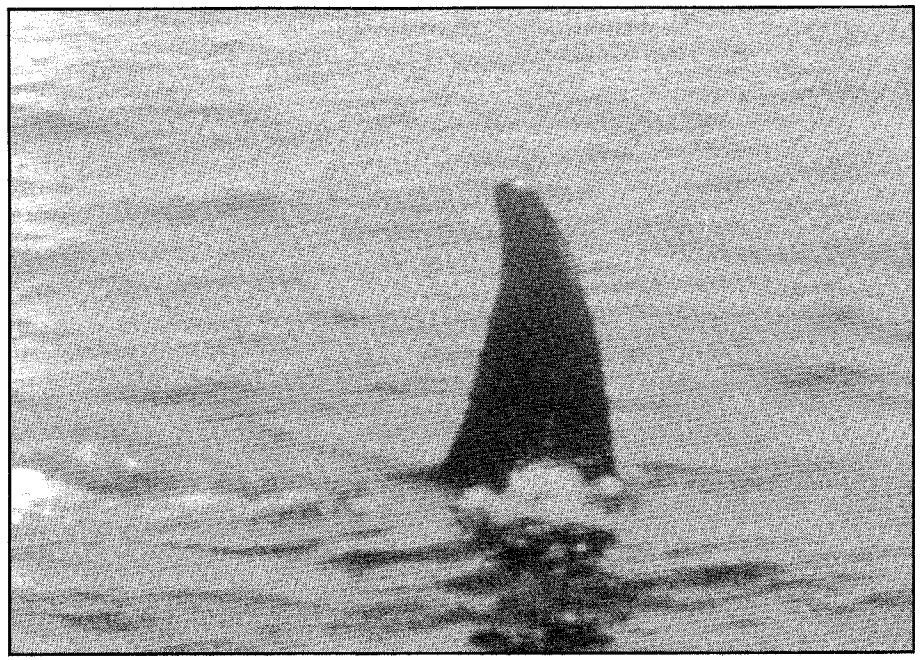
CA77 - 10/11/88 - Photo: D. Claridge



CA87 - 2/14/82 - Photo: W. Stephen

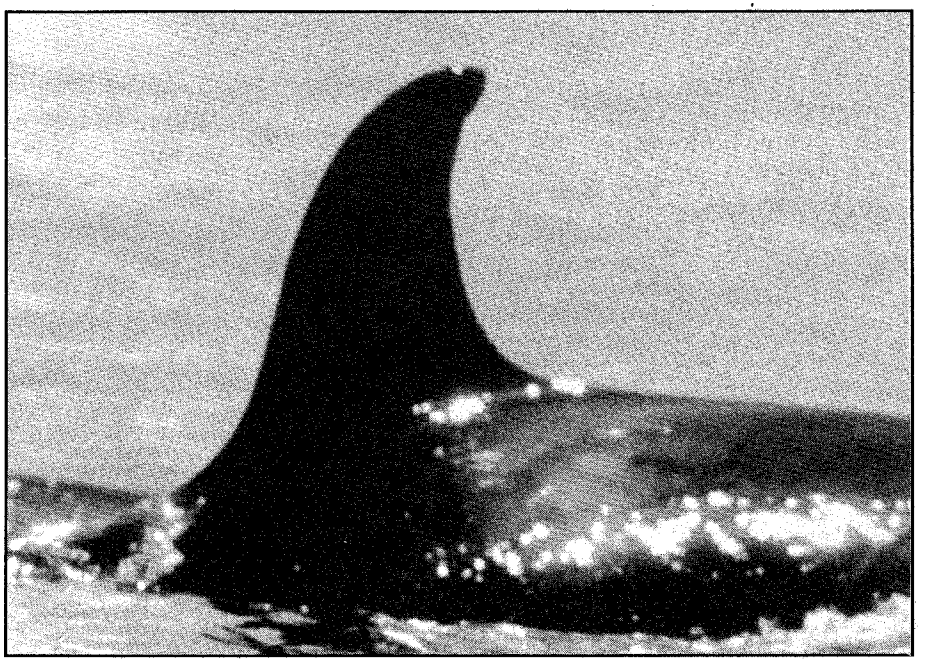


CA77 - 10/11/88 - Photo: D. Claridge



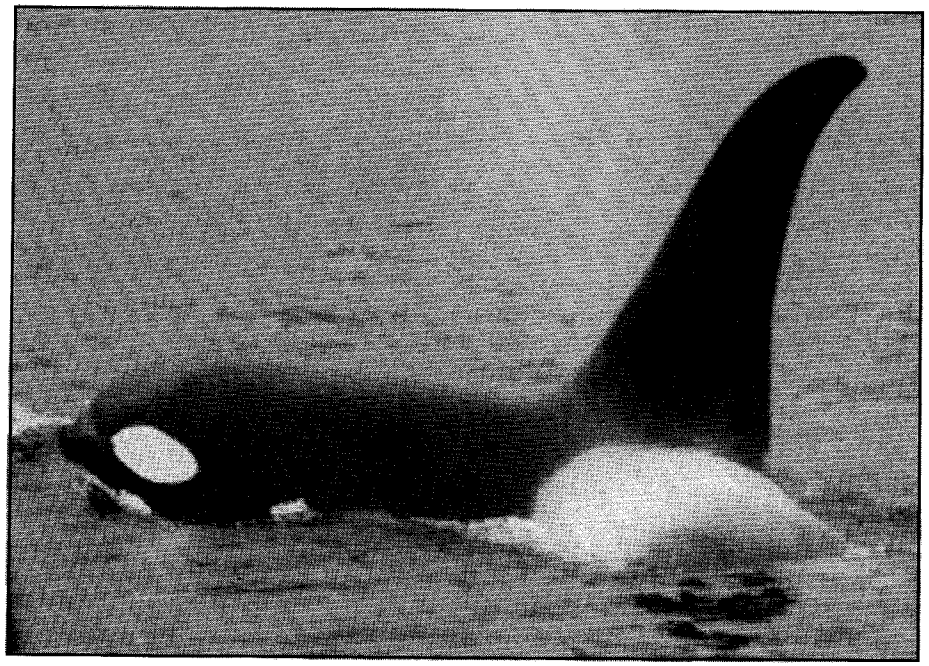
CA87 - 6/10/82 - Photo: Neal

CA88 - 3/18/86 - Photo: R. Sears/MICS

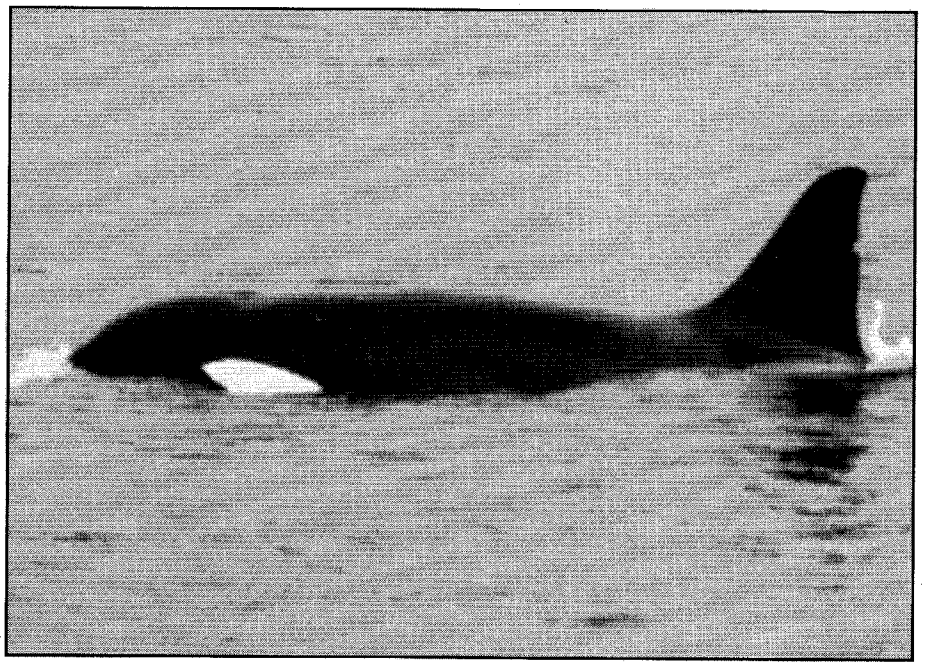


CA89 - 3/21/85 - Photo: R. Sears/MICS

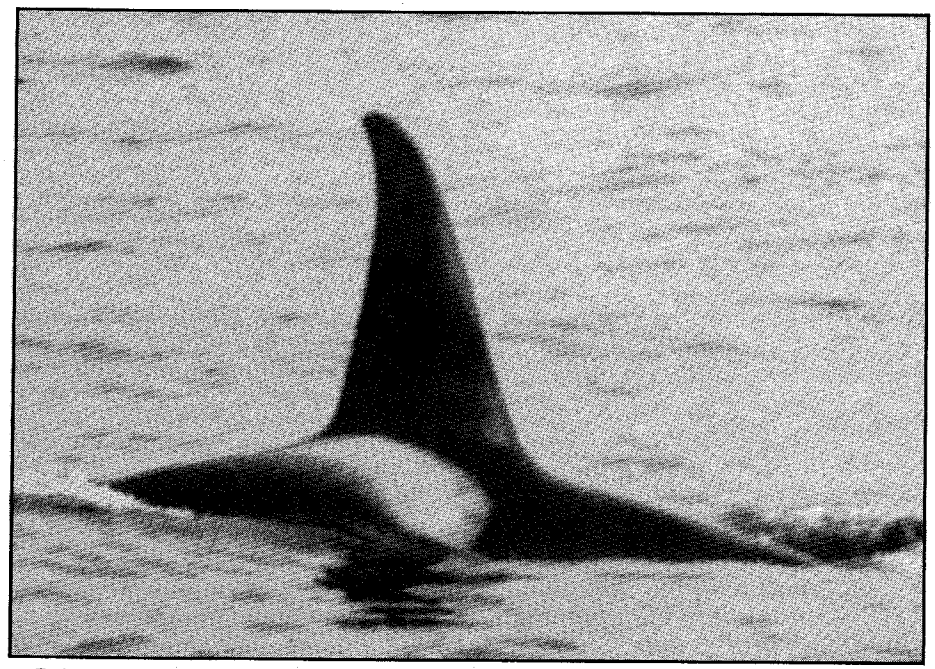
CA89 - 8/21/85 - Photo: Tershy/Strong



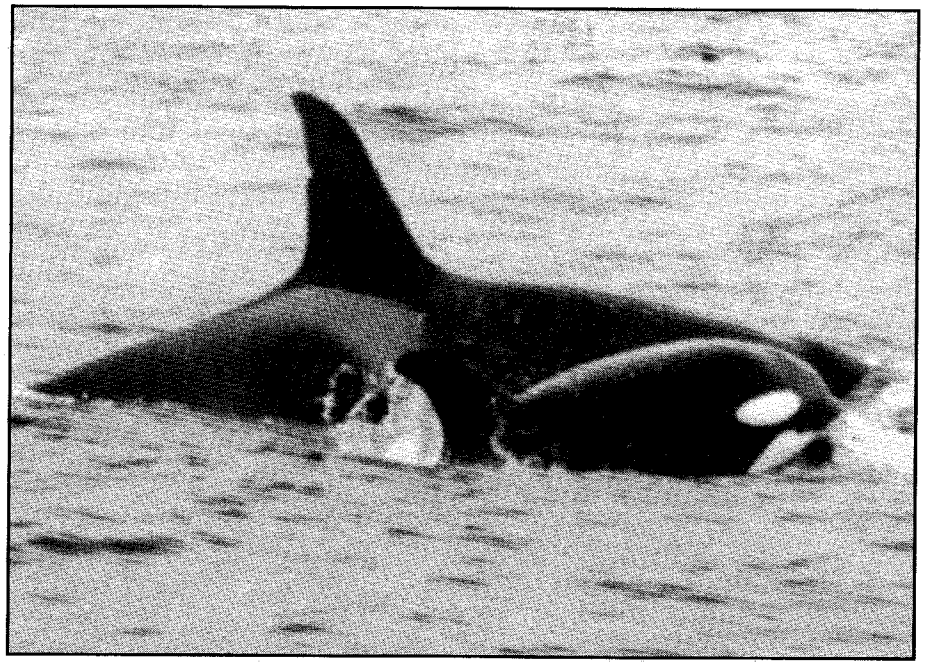
CA94 - 4/23/90 - Photo: M. Caywood



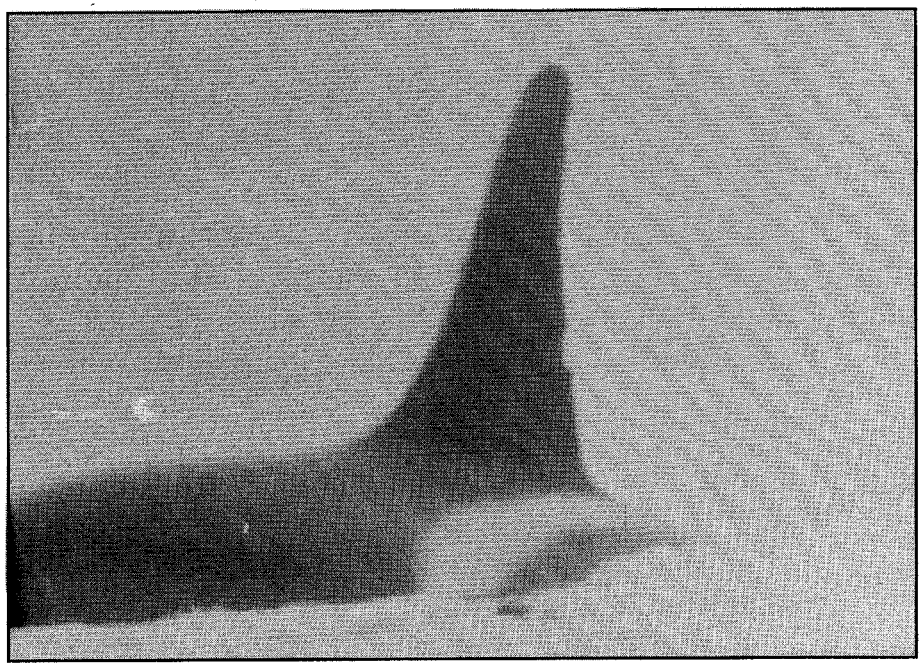
CA95 - 4/23/90 - Photo: M. Caywood



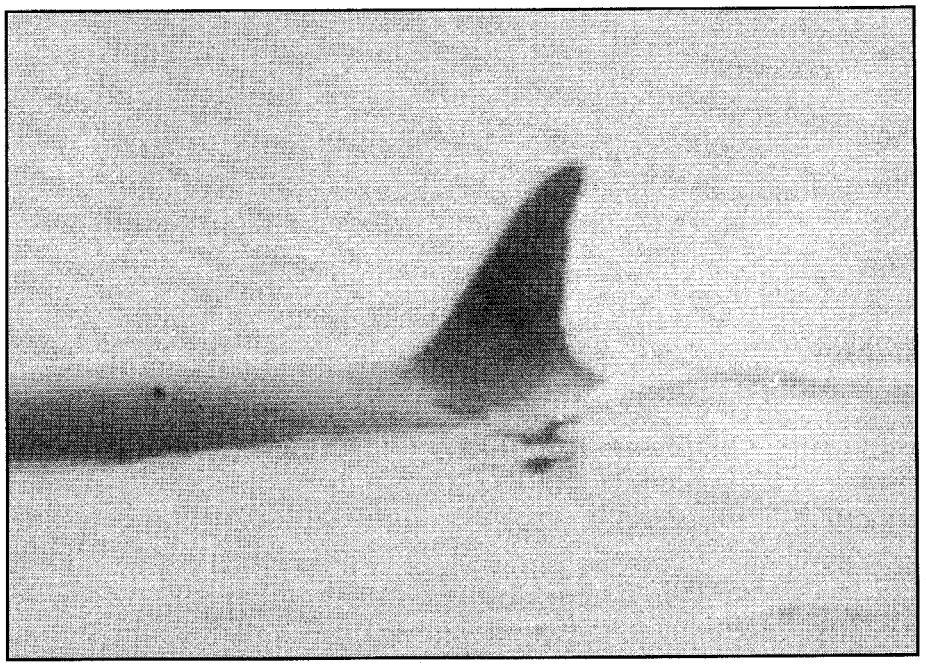
CA94 - 4/23/90 - Photo: M. Caywood



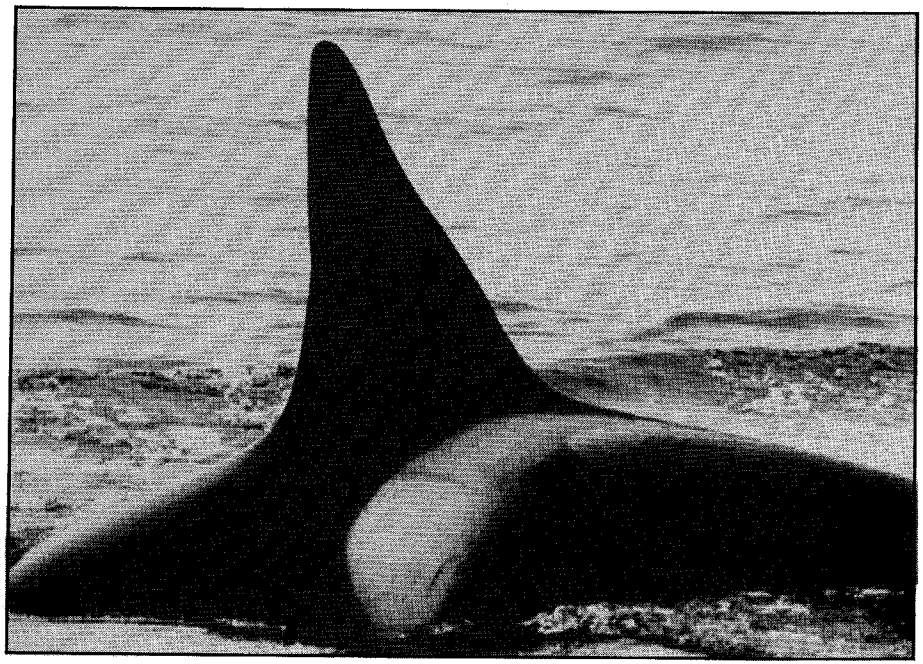
CA95 - 4/23/90 - Photo: M. Caywood



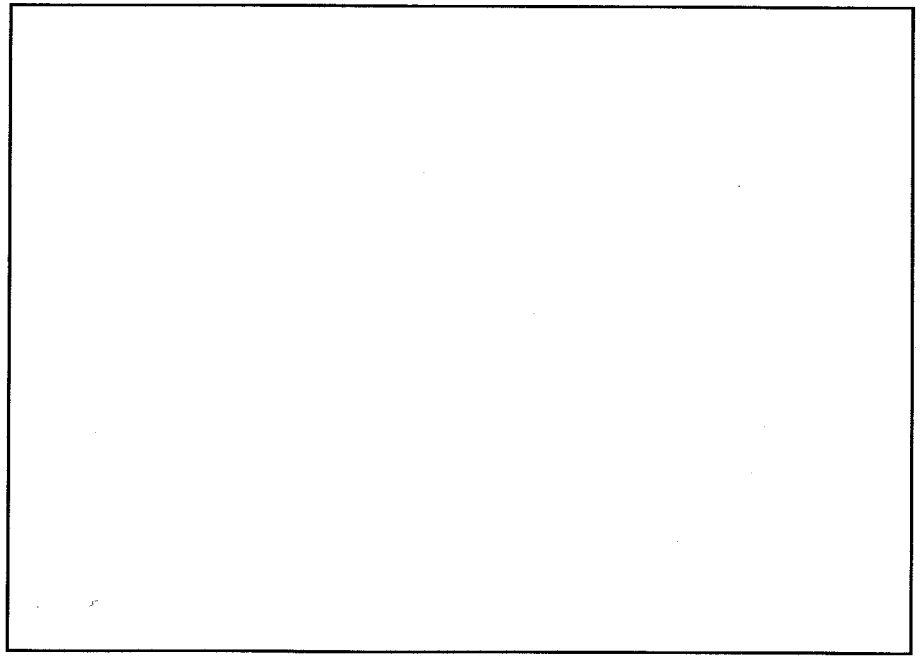
CA105 - 9/88 - Photo: R. Branson

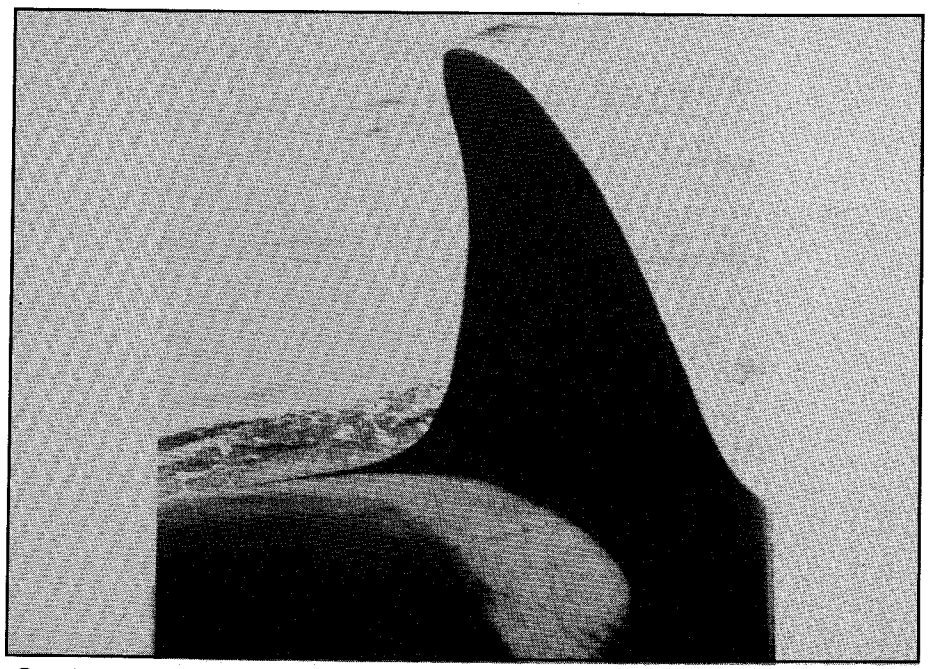


CA106 - 9/88 - Photo: R. Branson

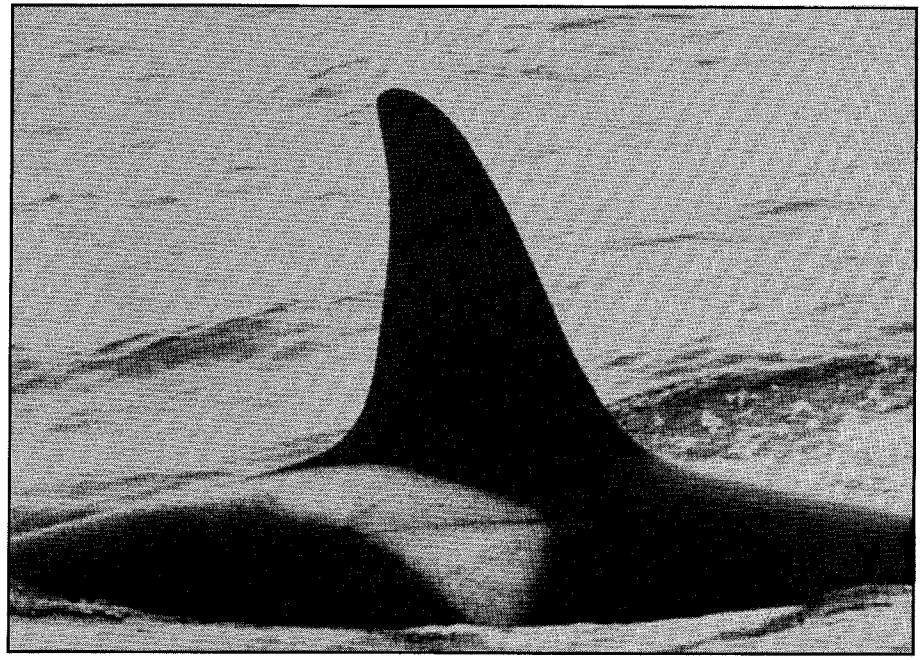


CA107 - 7/31/94 - Photo: N. Black

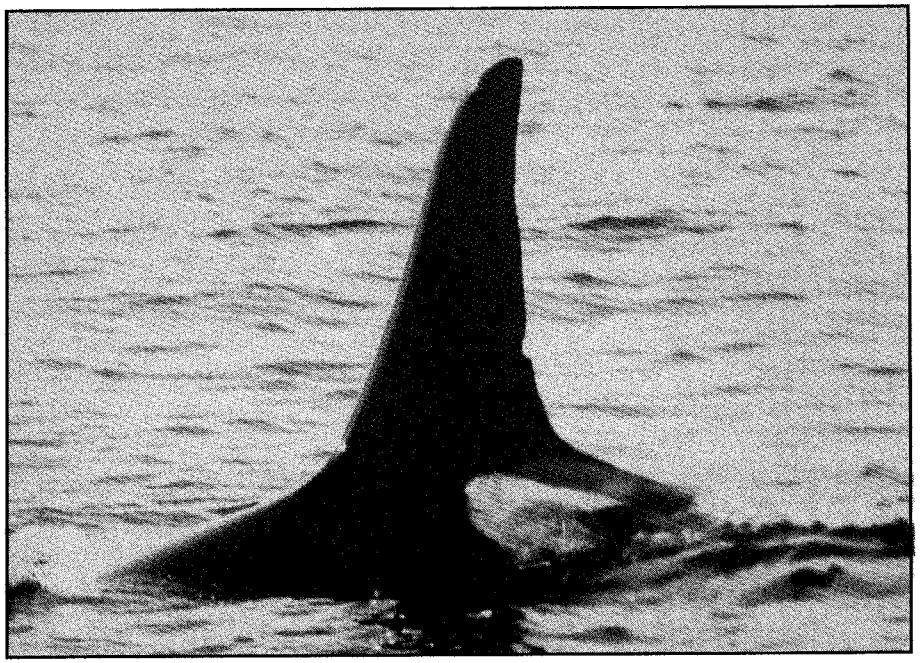




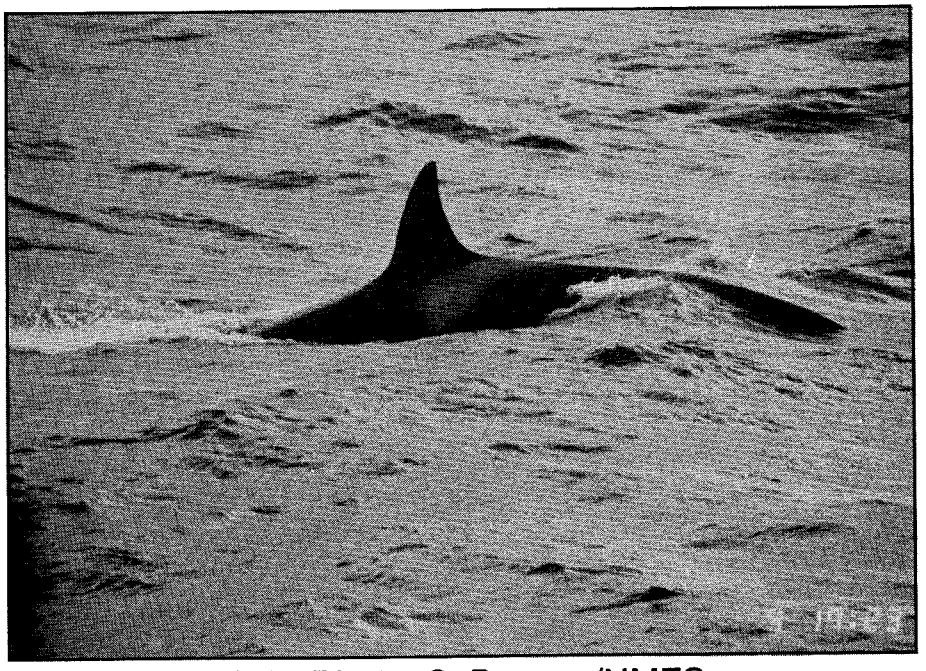
CA107 - 7/31/94 - Photo: N. Black



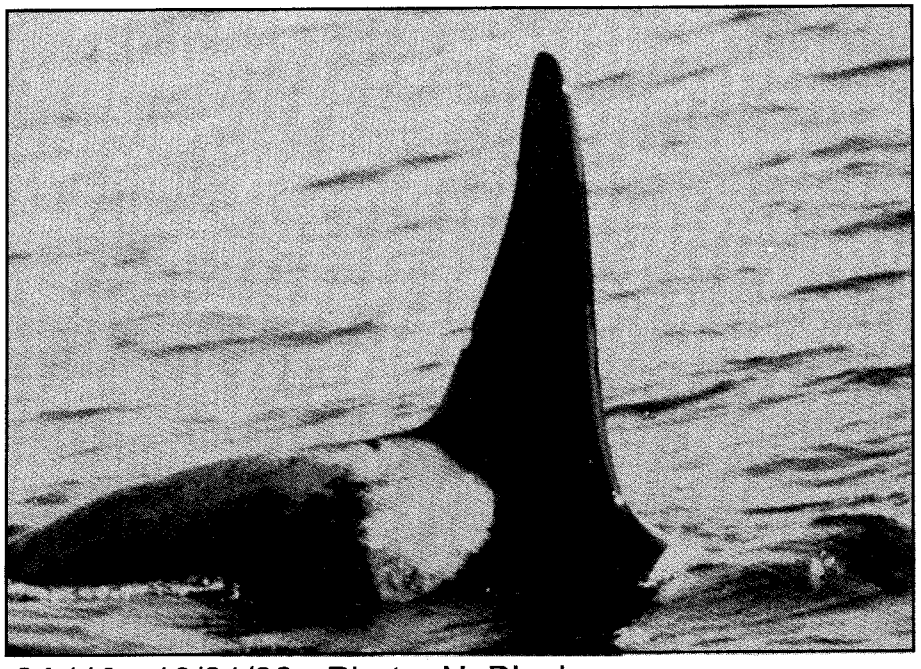
CA108 - 7/31/94 - Photo: N. Black



CA110 - 10/31/93 - Photo: N. Black



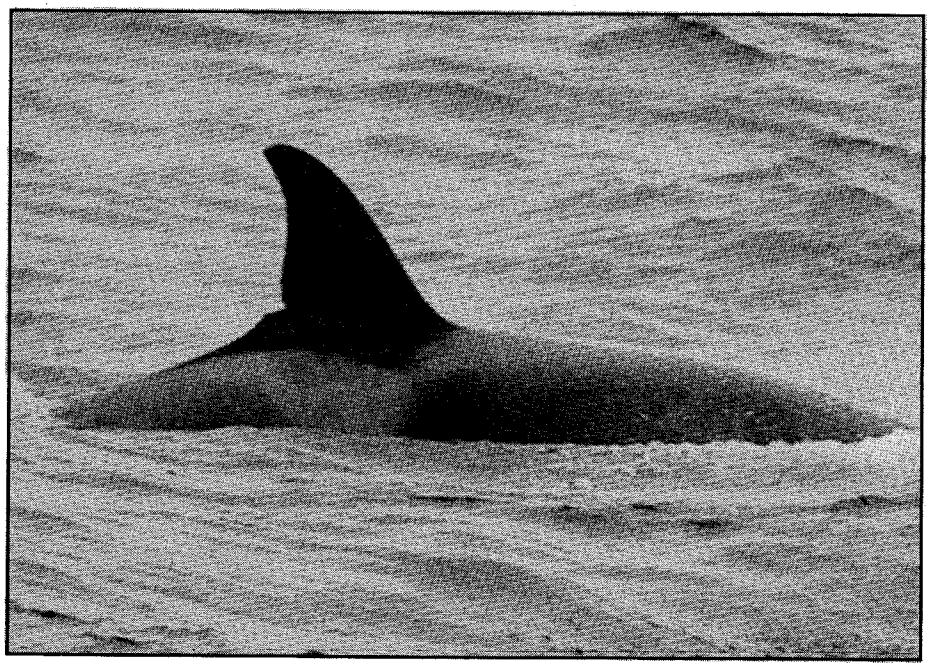
CA127 - 11/4/91 - Photo: S. Benson/NMFS



CA110 - 10/31/93 - Photo: N. Black

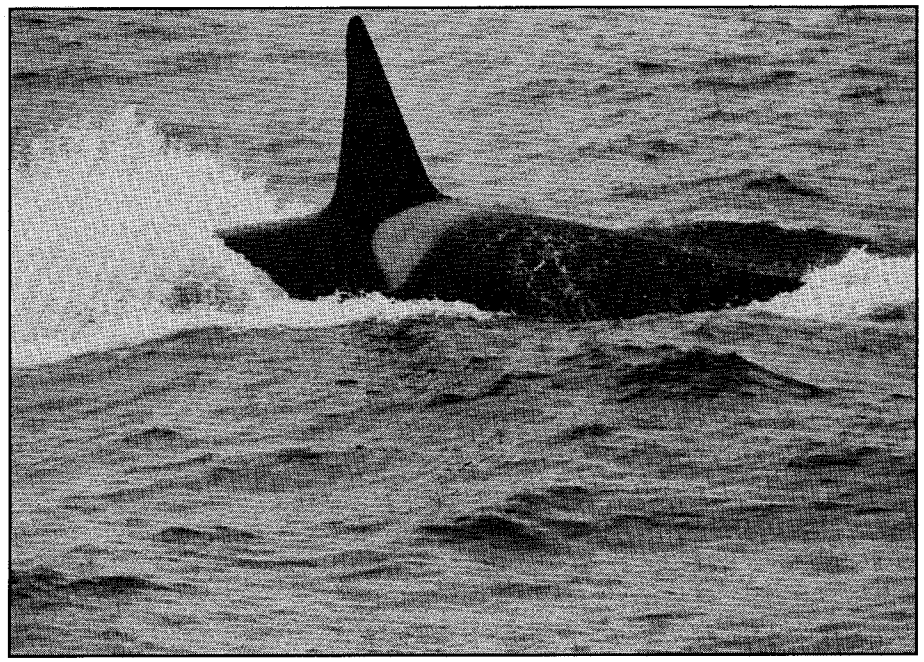
CA128 - 11/4/91 - Photo: P. Wade/NMFS

CA129 (left animal) - 11/4/91 - Photo: S. Benson/NMFS

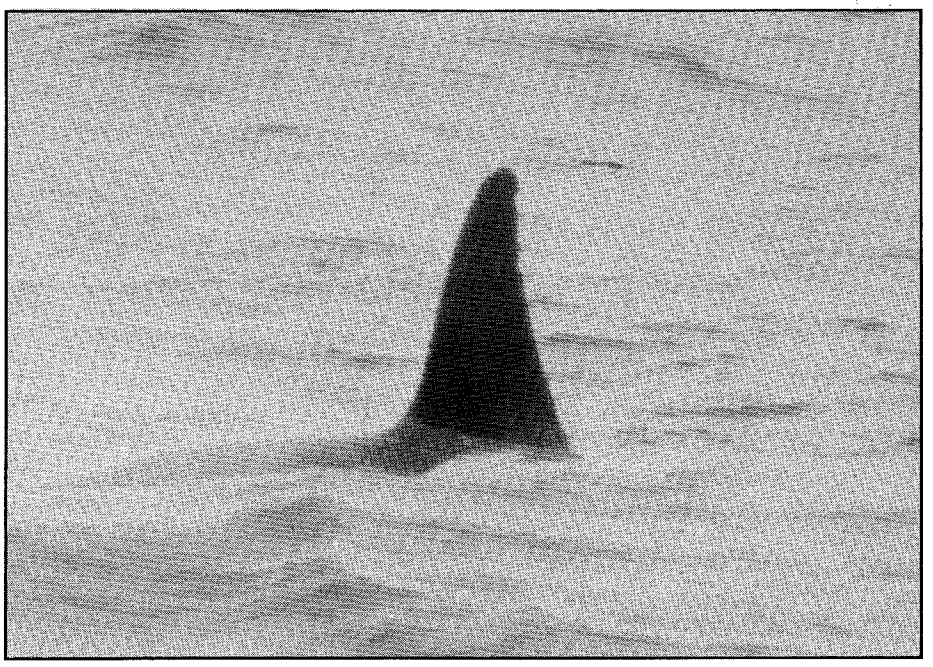


CA128 - 11/25/95 - Photo: B. Alps

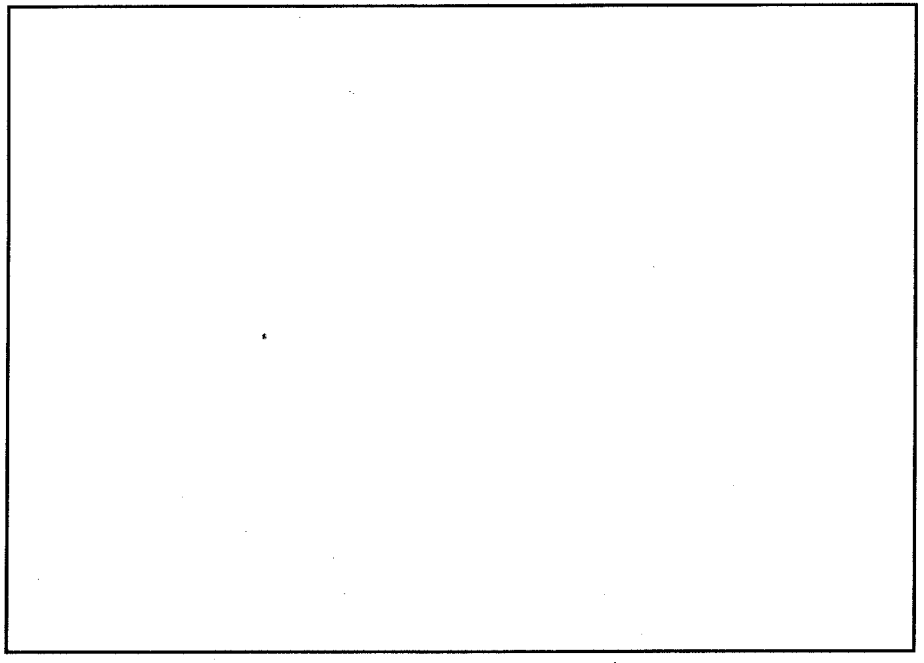
Unknown



CA130 - 8/12/91 - Photo: J. Cotton/NMFS

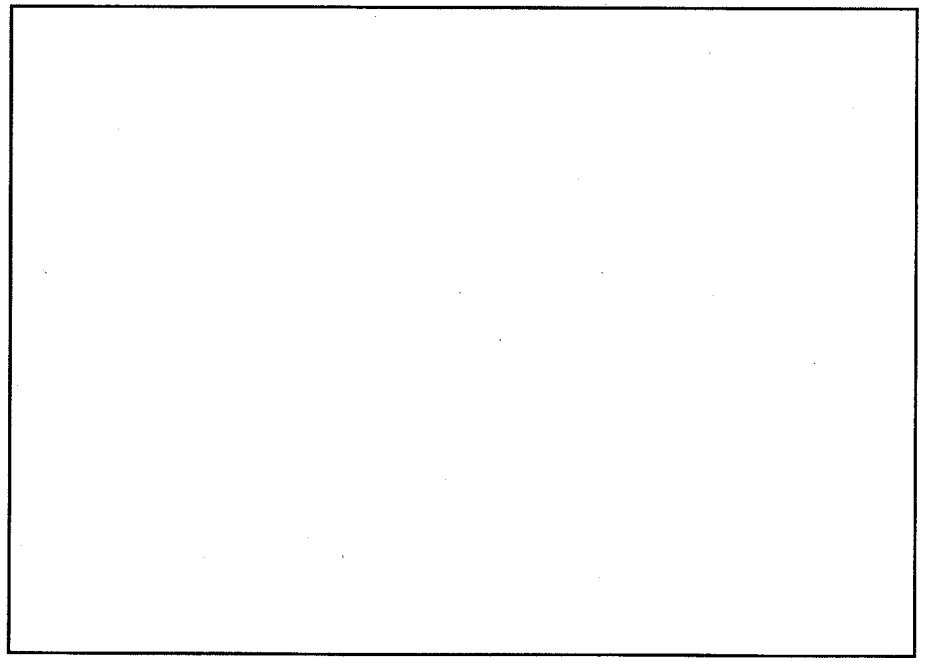


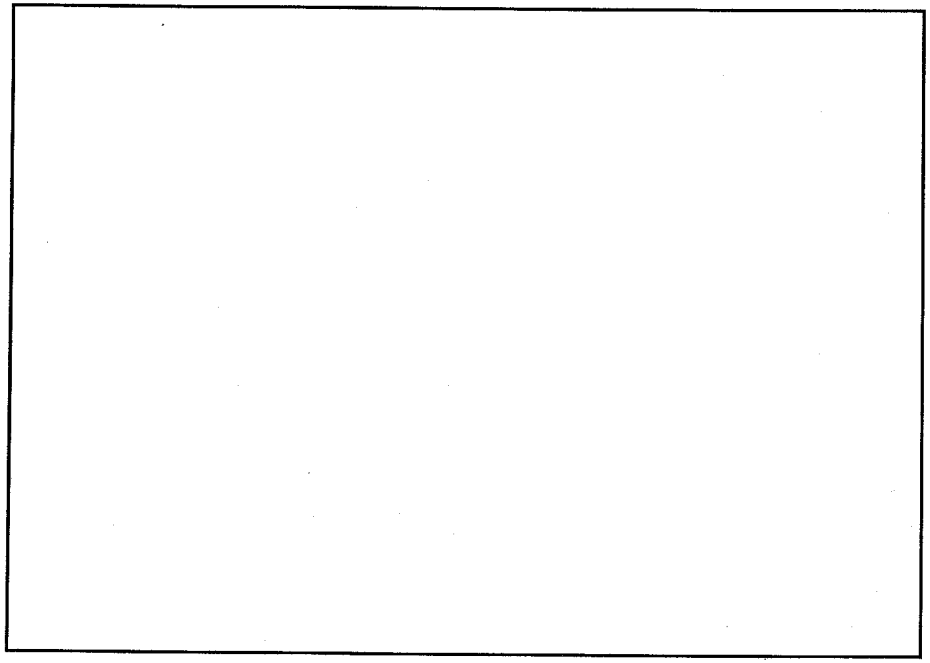
CA149 - 9/27/94 - Photo: J. Harvey

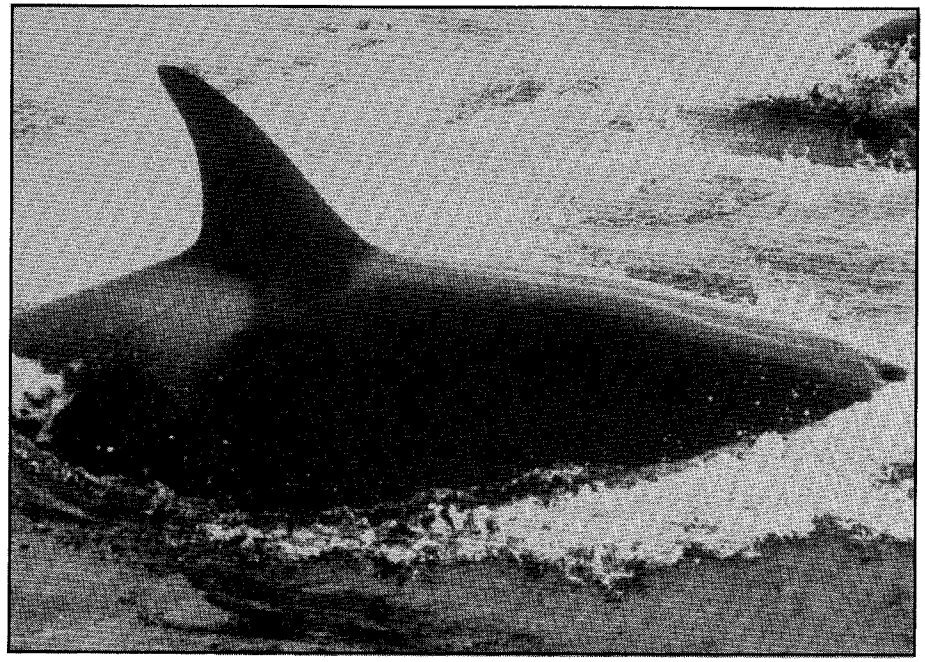


CA149 - 9/27/94 - Photo: T. Norris

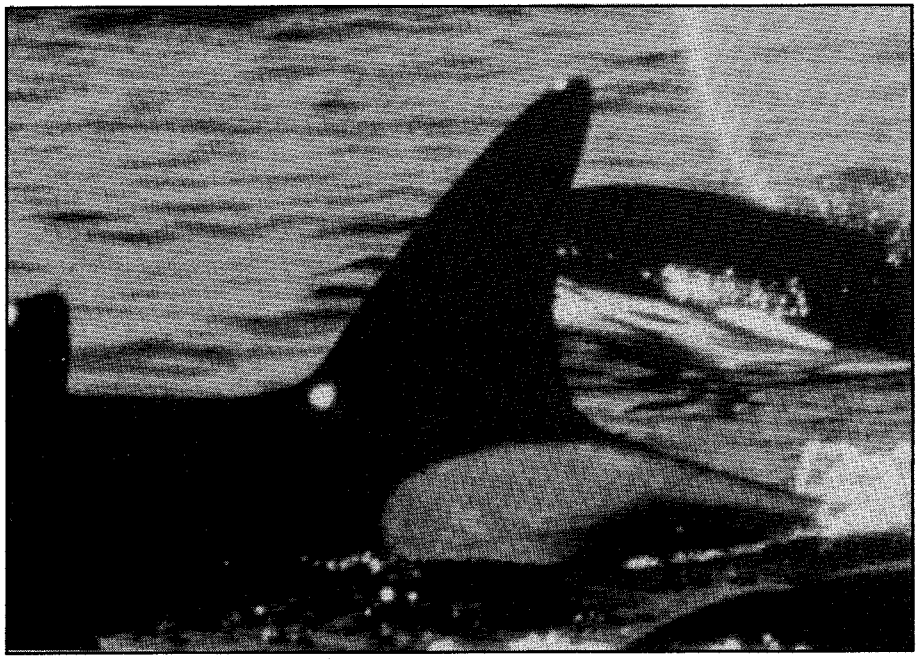
CA150 - 9/27/94 - Photo: J. Harvey



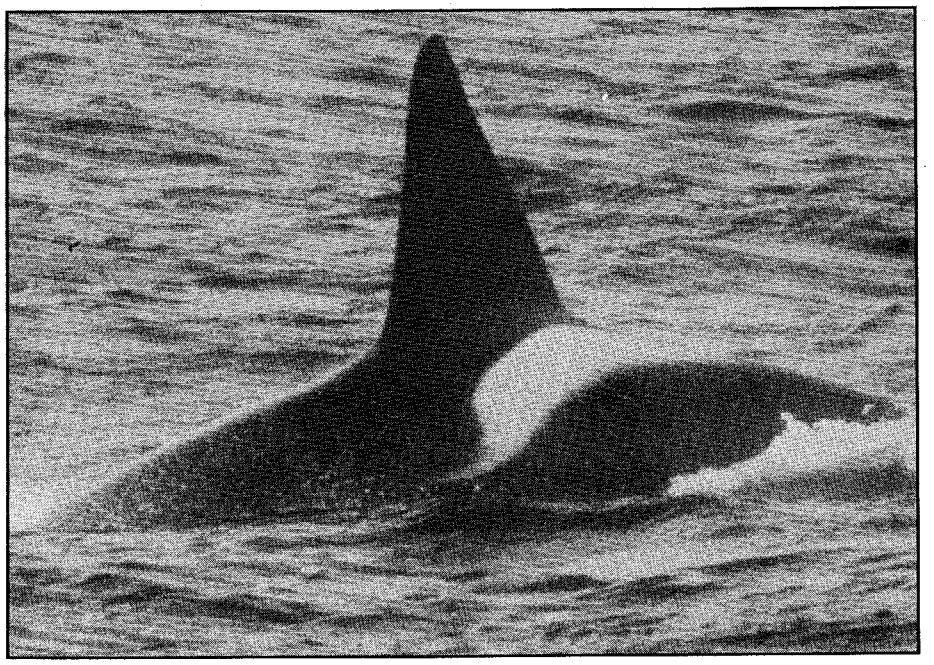




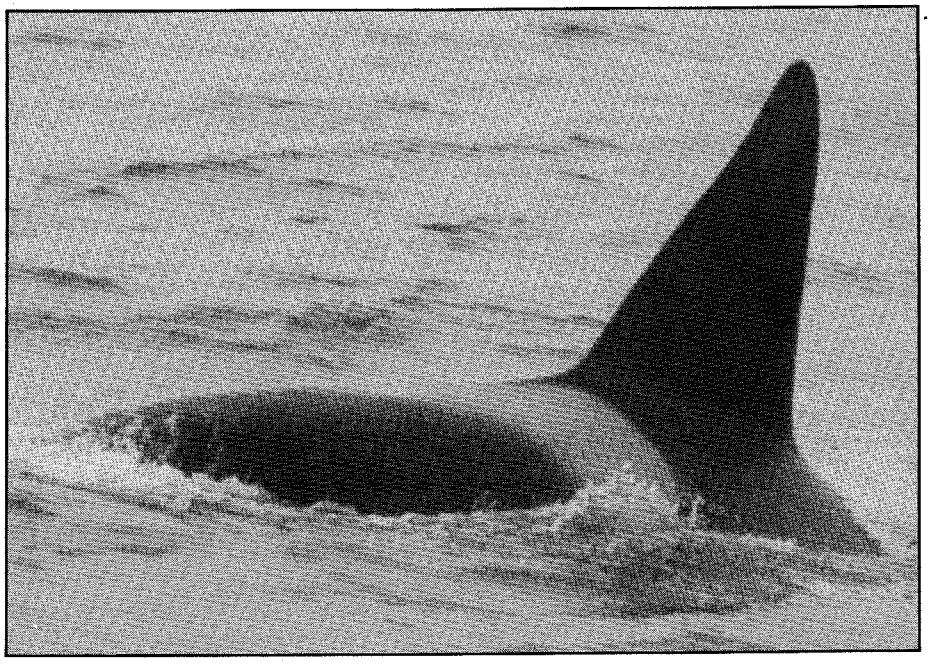
CA151 - 11/25/95 - Photo: K. Penland



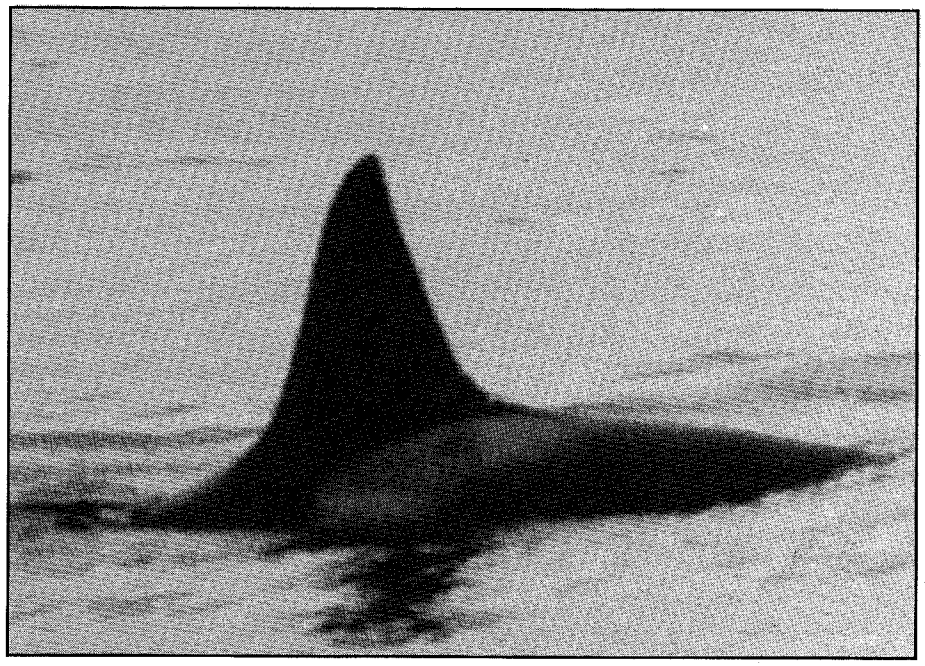
CA152 - 10/20/89 - Photo: P. Howorth



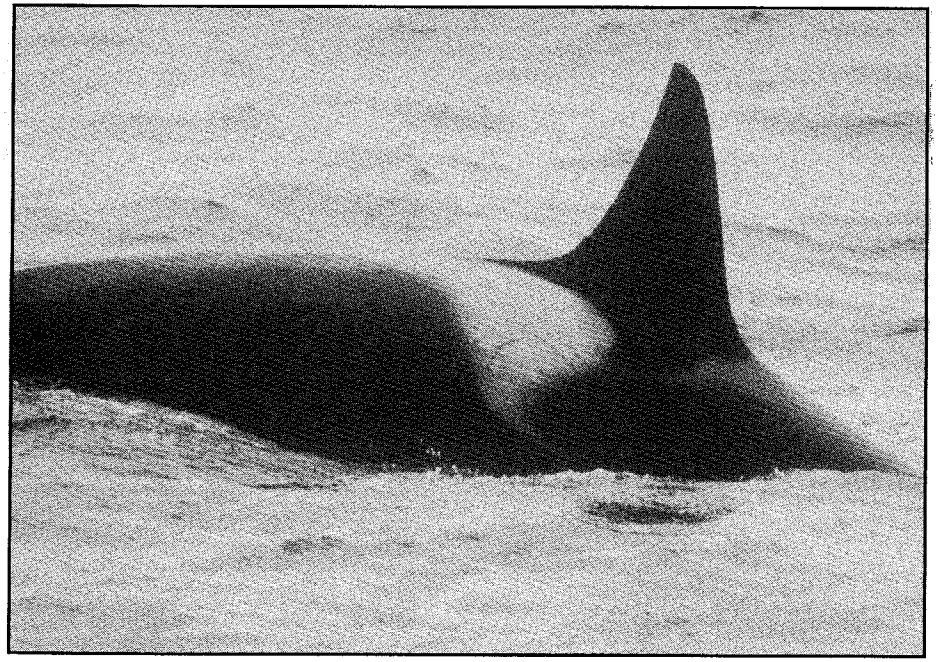
CA156 - 11/25/95 - Photo: K. Penland



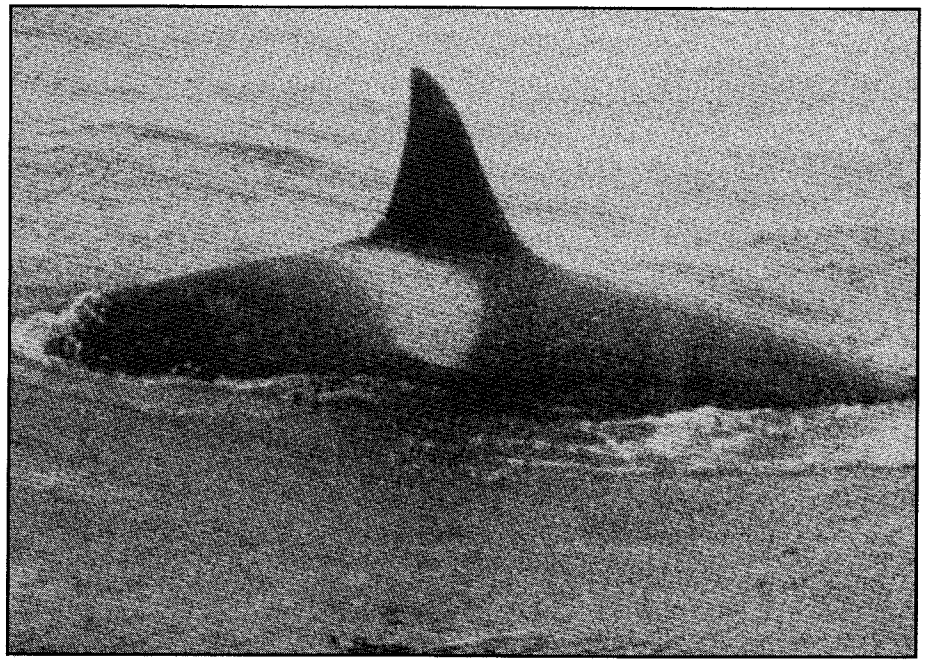
CA156 - 11/25/95 - Photo: B. Alps



CA158 - 4/23/90 - Photo: M. Caywood



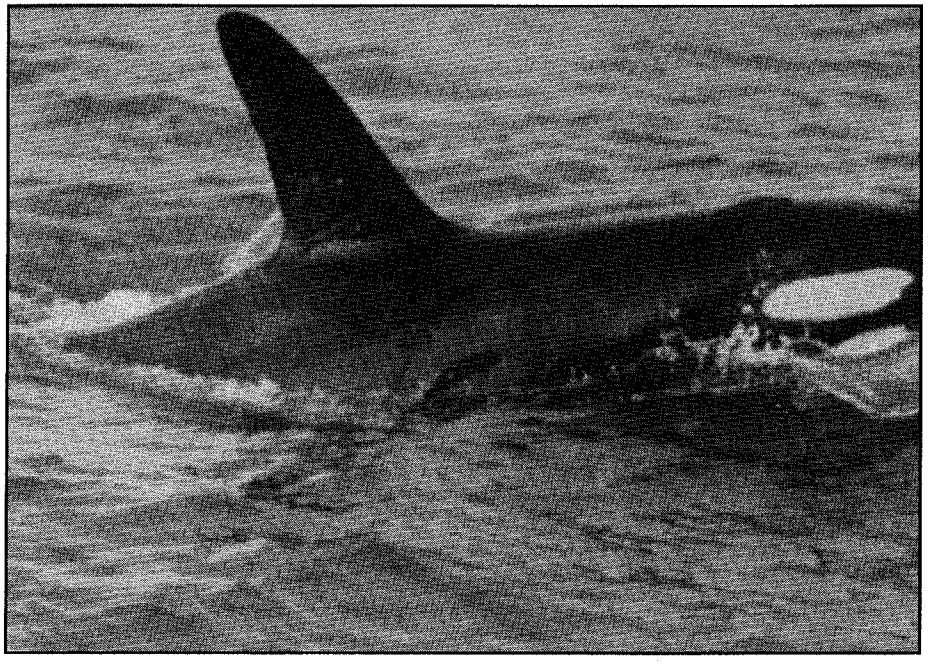
CA157 - 11/25/95 - Photo: K. Penland



CA158 - 4/23/90 - Photo: M. Caywood

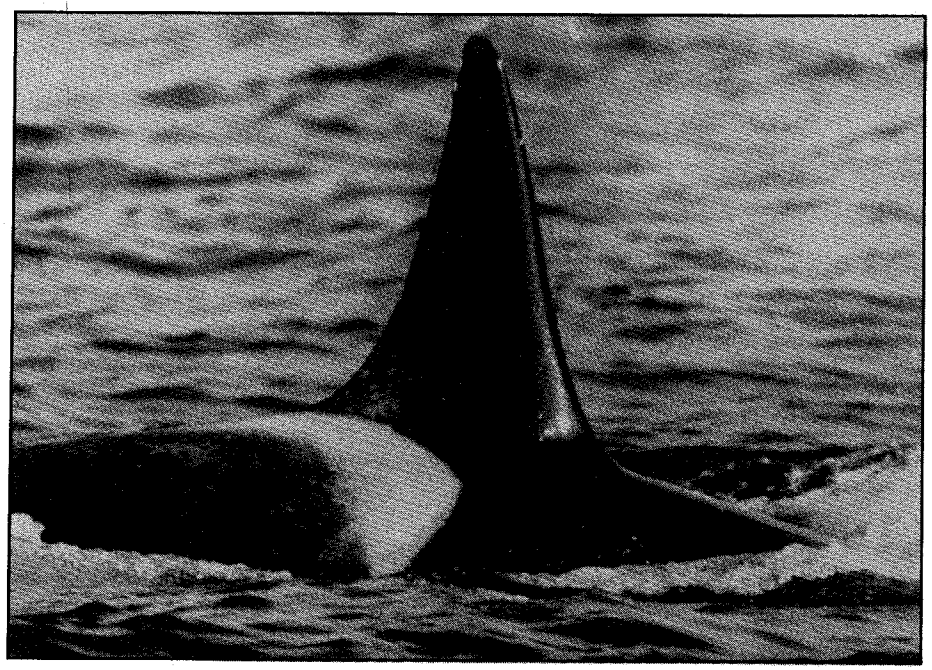
CA159 - 5/15/94 - Photo: R. LeValley

CA159 - 5/15/94 - Photo: R. LeValley

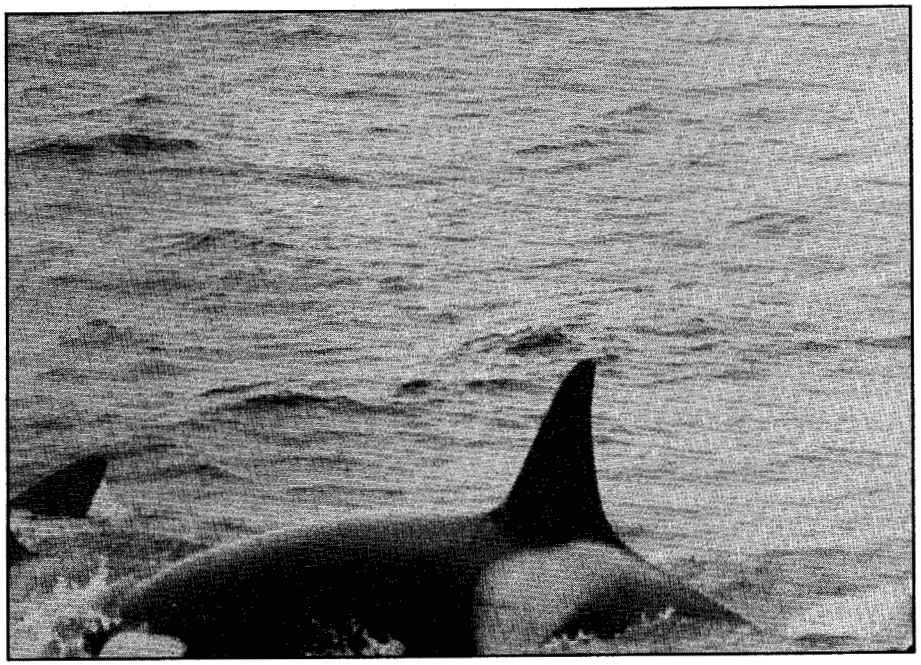


CA184 - 4/12/97 - Photo: J. Cotton/NMFS

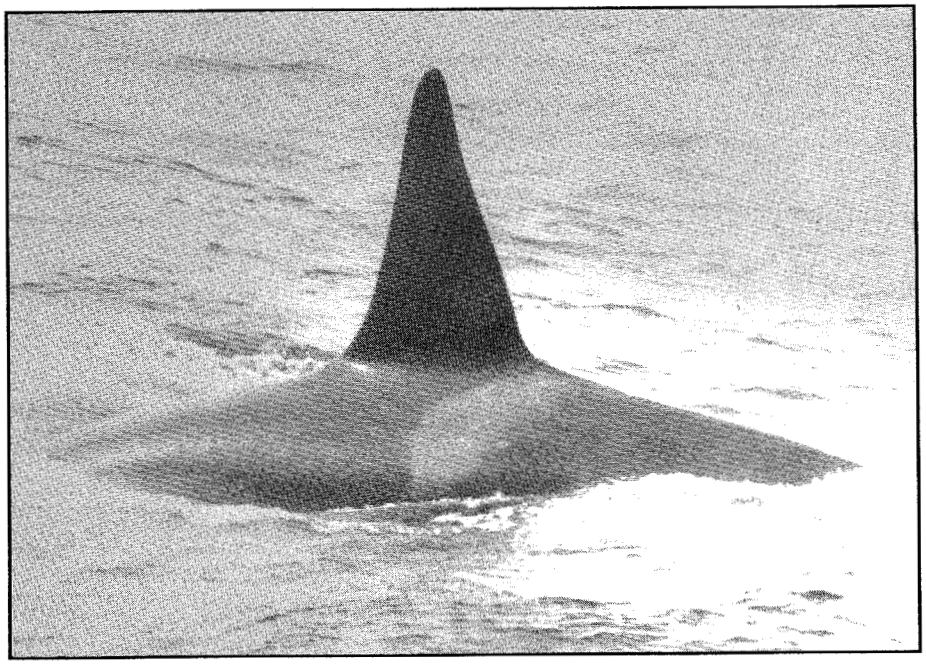
CA186 - 10/9/96 - Photo: B. Smith/NMFS



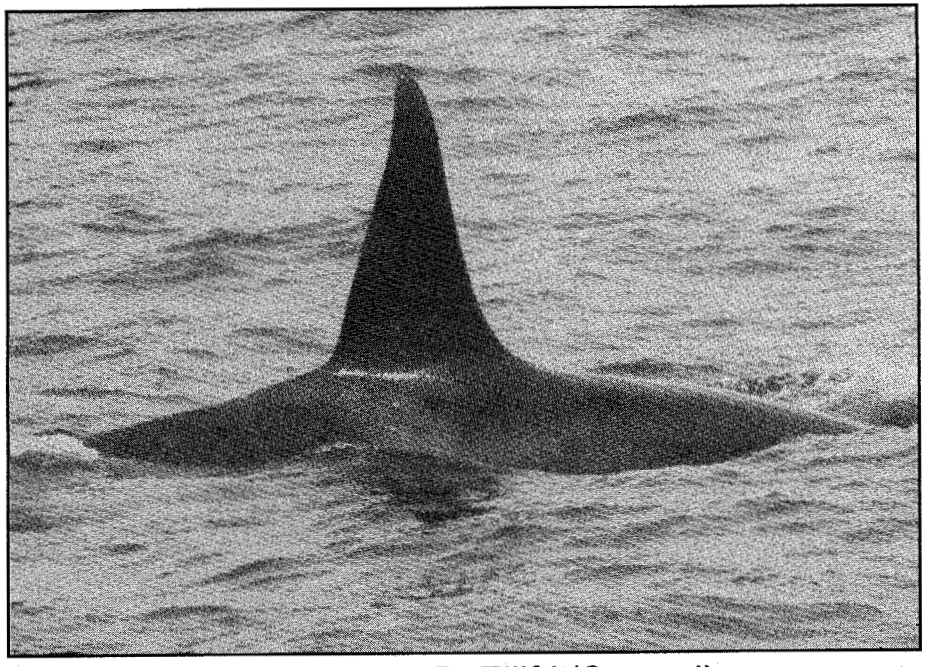
CA185 - 10/12/96 - Photo: R. Saldino



CA187 - 8/26/96 - Photo: B. Smith/NMFS



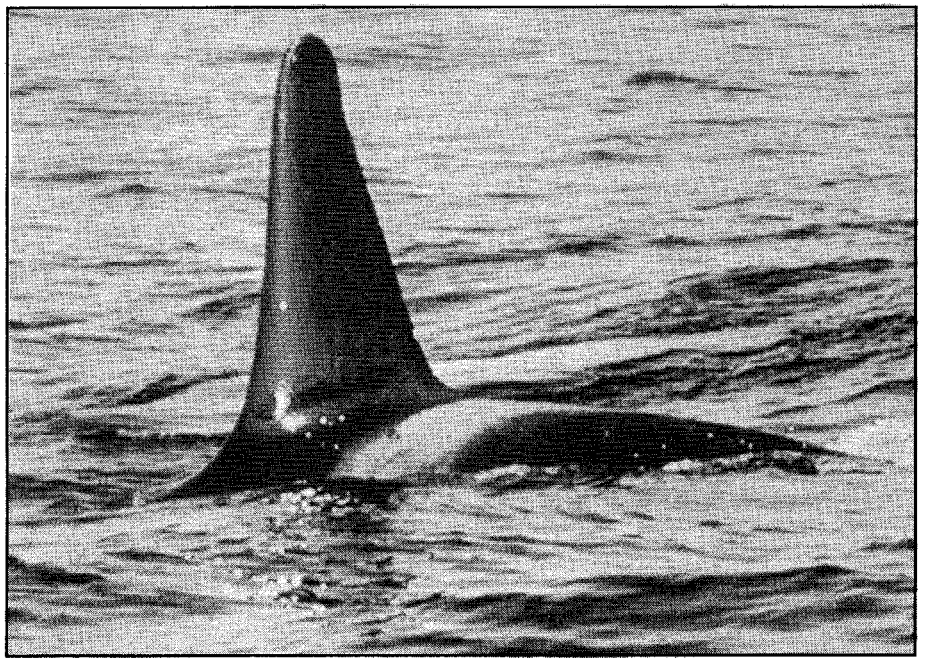
CA190 - 10/9/96 - Photo: D. Ellifrit/Cascadia



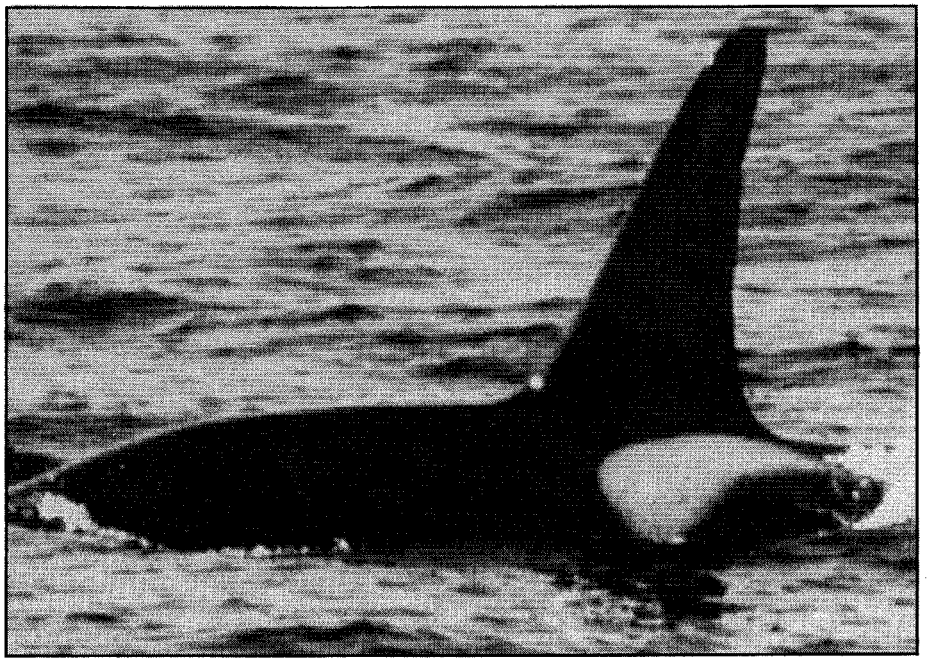
CA190 - 10/9/96 - Photo: D. Ellifrit/Cascadia

CA191 - 10/9/96 - Photo: D. Ellifrit/Cascadia

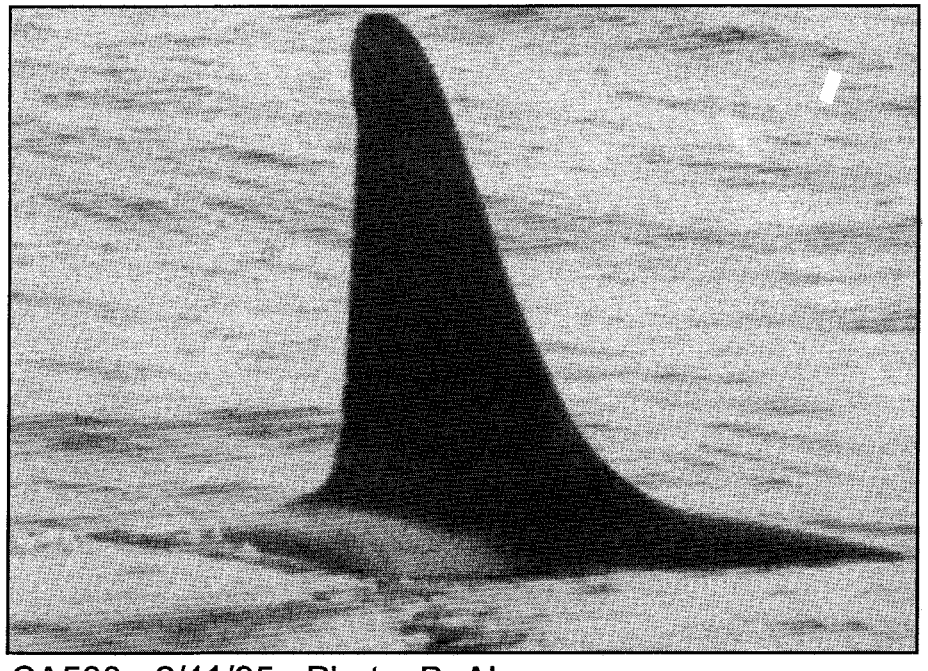
Unknown



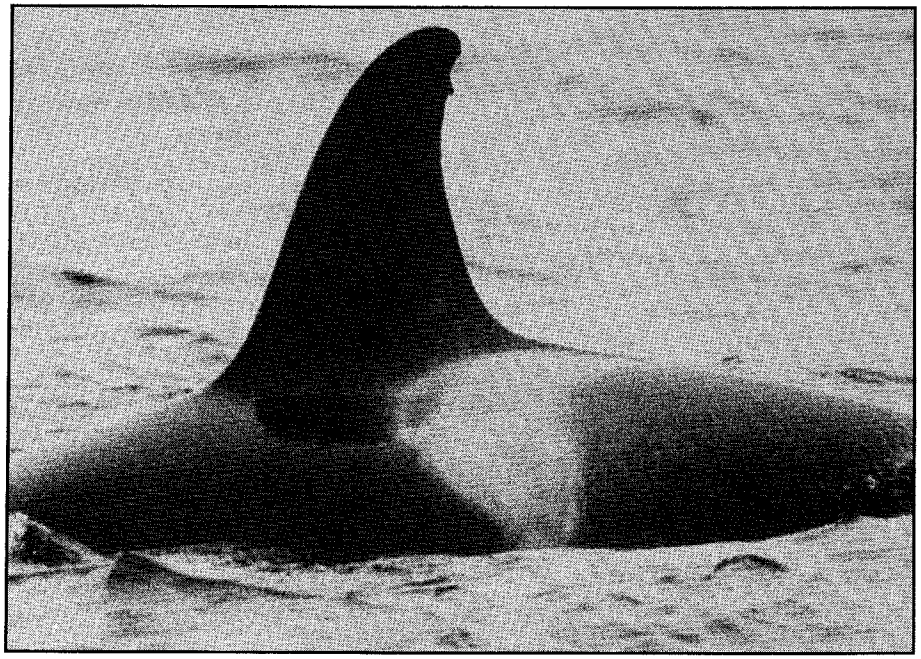
CA500 - 2/11/95 - Photo: A Schulman



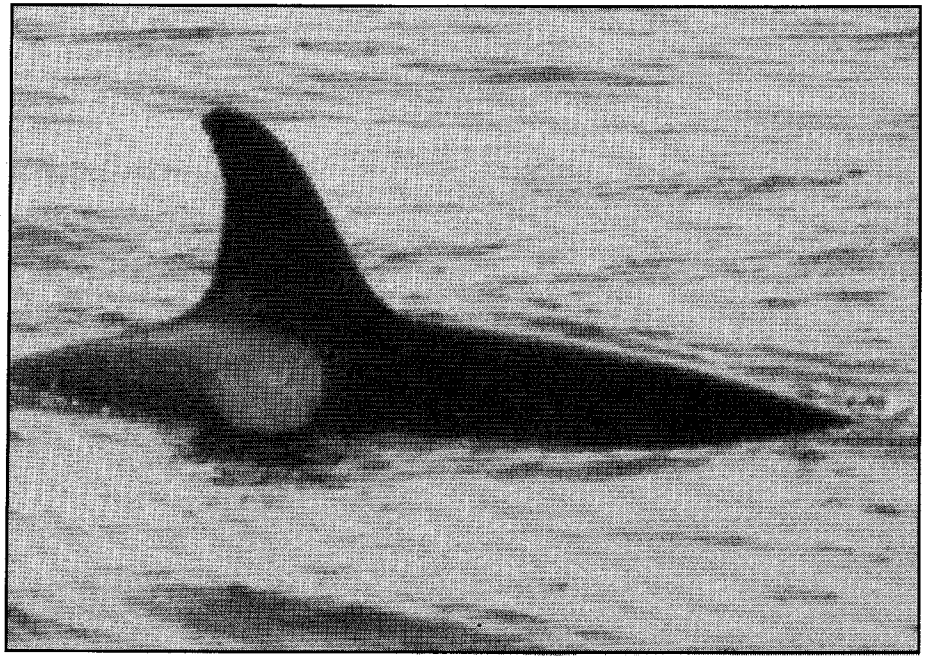
CA501 - 2/11/95 - Photo: K. Hicks



CA500 - 2/11/95 - Photo: B. Alps



CA502 - 7/17/95 - Photo: G. Ellis



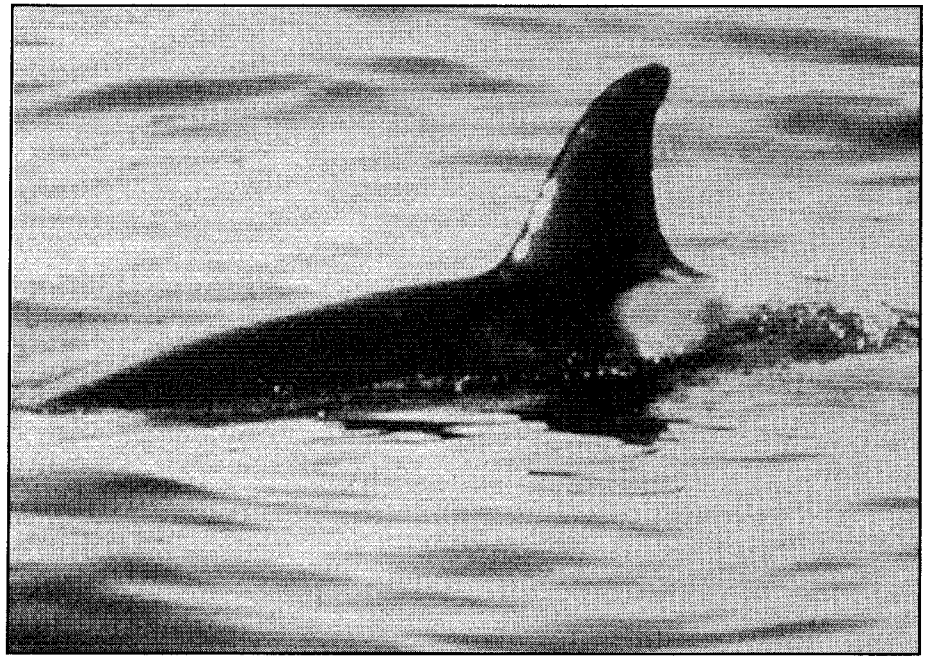
CA502 - 2/11/95 - Photo: B. Alps

CA503 - 3/15/96 - Photo: N. Black

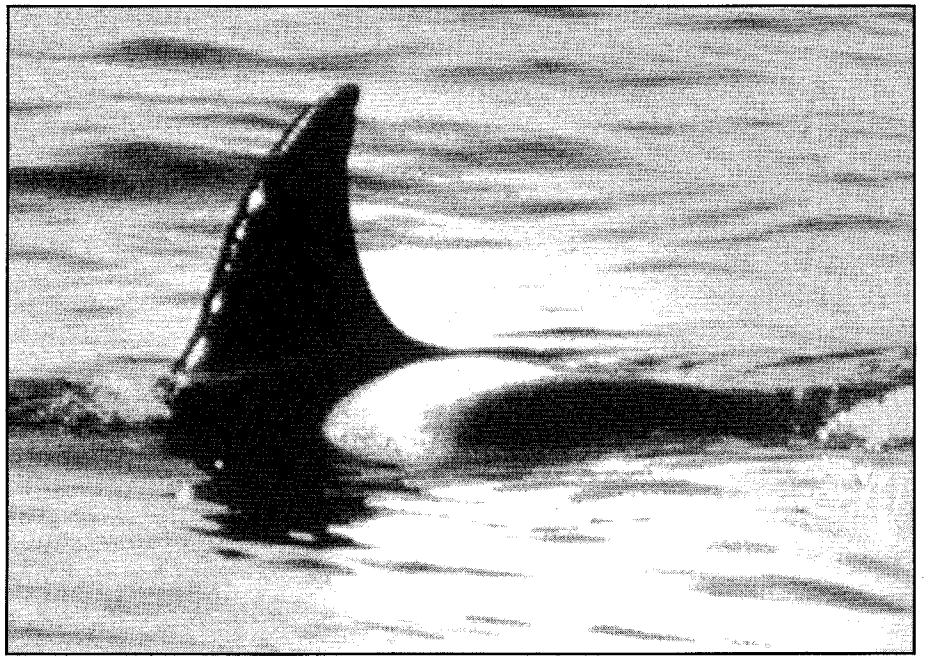
CA504 (rear animal) - 2/11/95 - Photo: B. Alps

CA505 - 2/11/95 - Photo: A. Schulman

Offshore

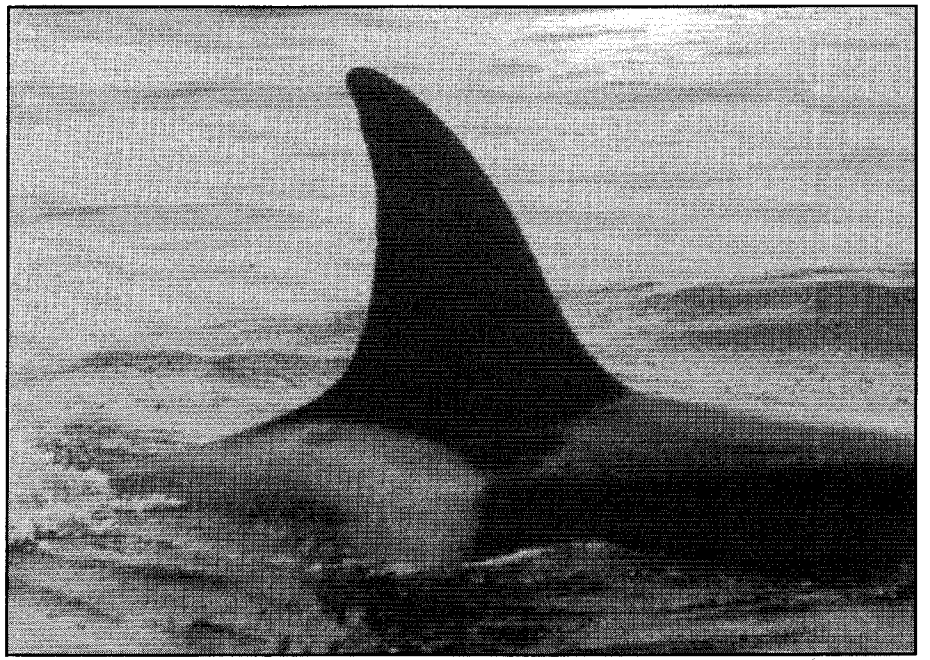


CA506 - 2/11/95 - Photo: A. Schulman

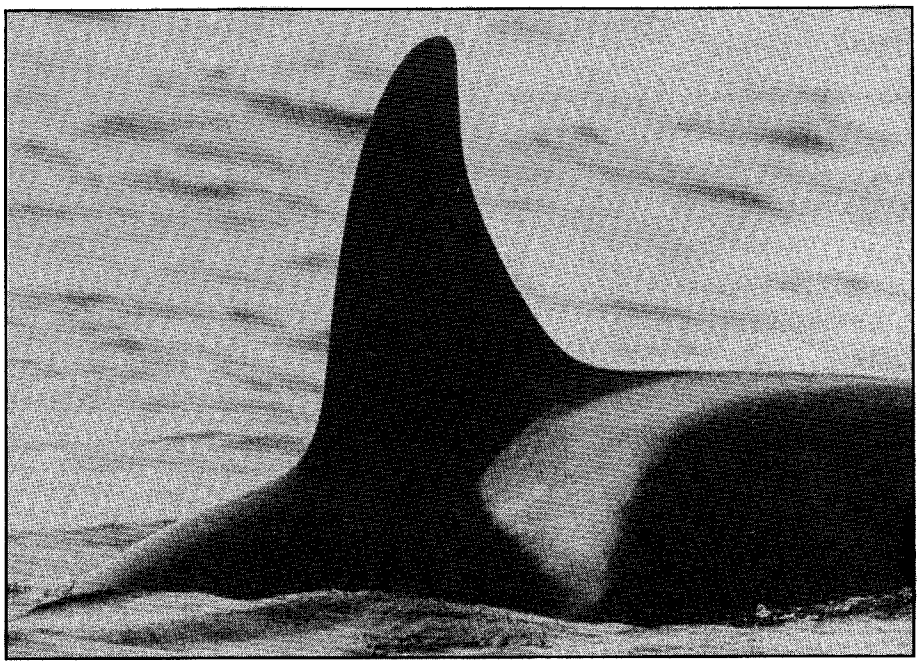


CA507 - 2/11/95 - Photo: A. Schulman

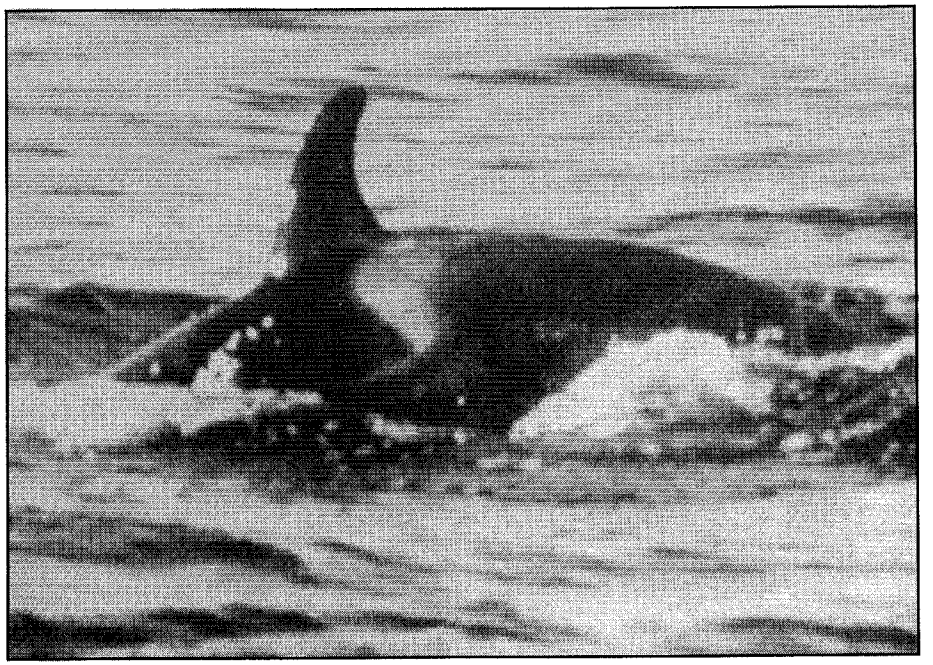
CA506 - 2/11/95 - Photo: B. Alps



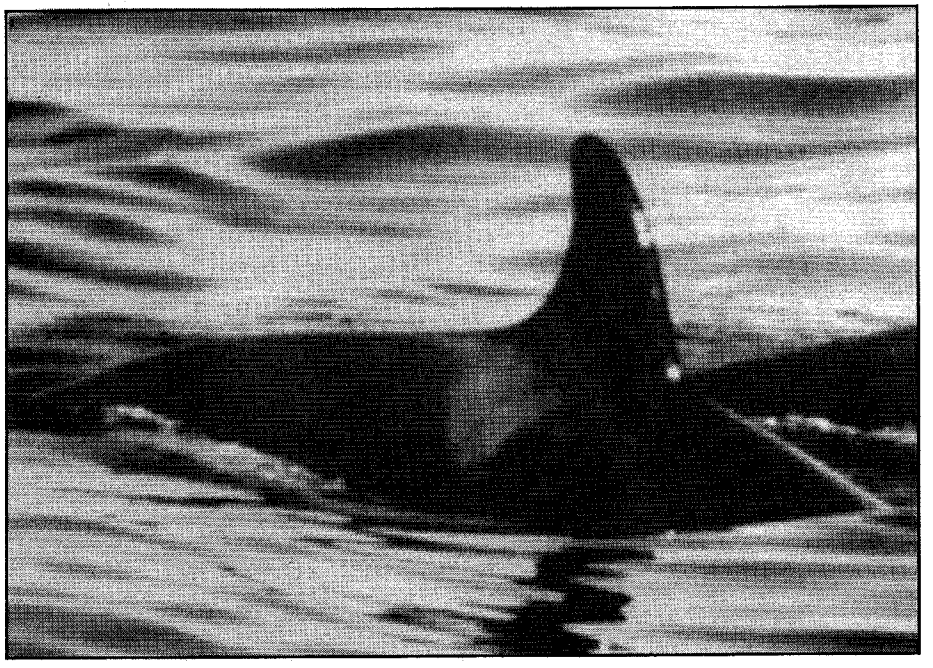
CA507 - 3/15/96 - Photo: N. Black



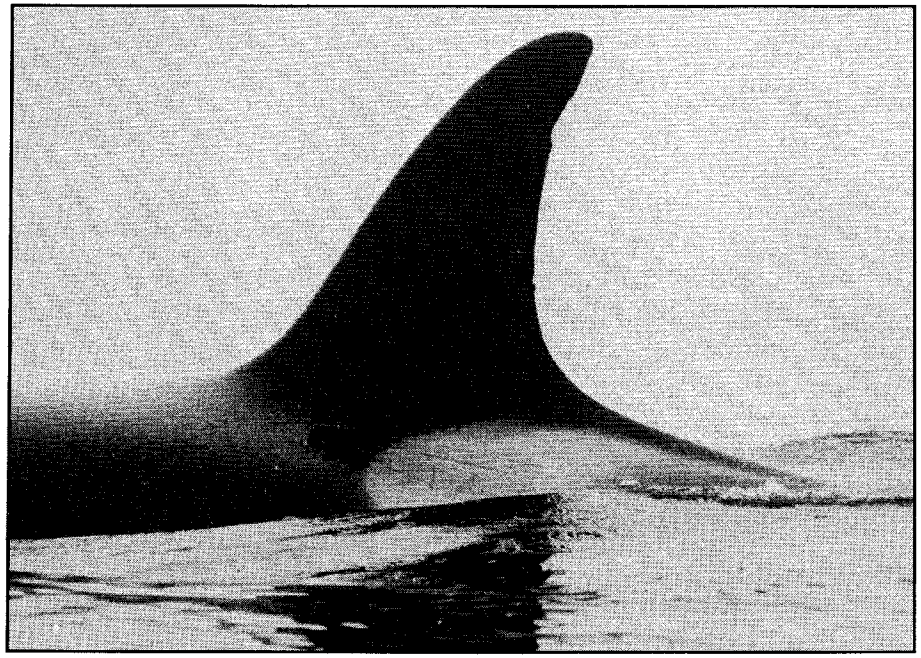
CA508 - 7/17/95 - Photo: G. Ellis



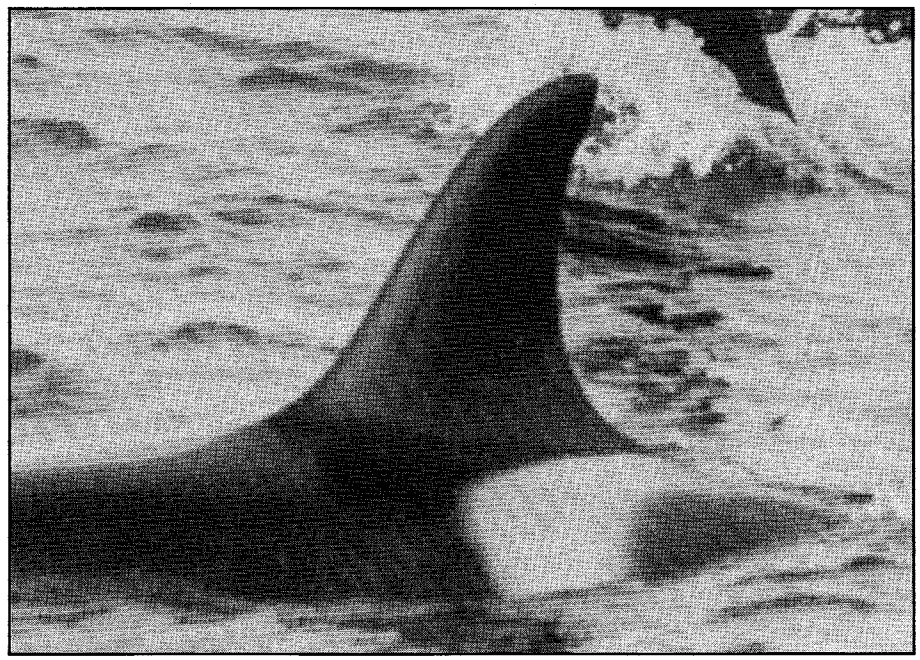
CA509 - 2/11/95 - Photo: A. Schulman



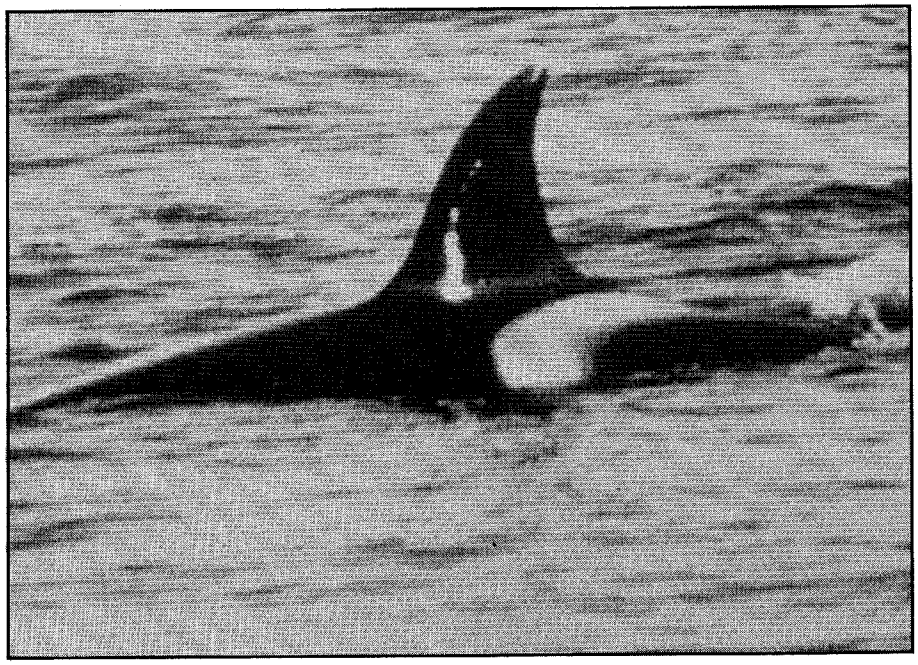
CA509 - 2/11/95 - Photo: K. Hicks



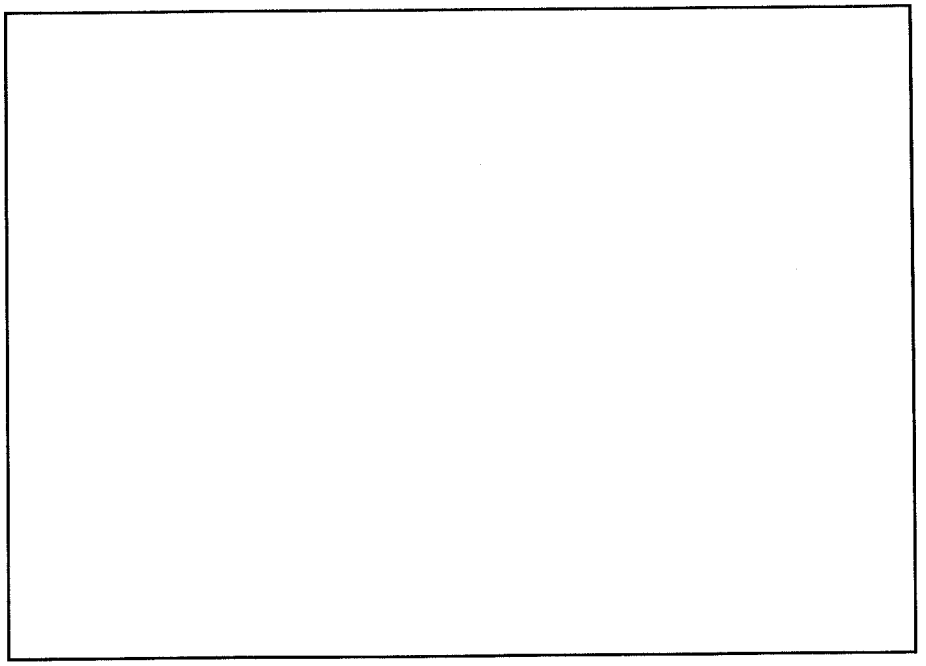
CA510 - 8/25/95 - Photo: G. Ellis

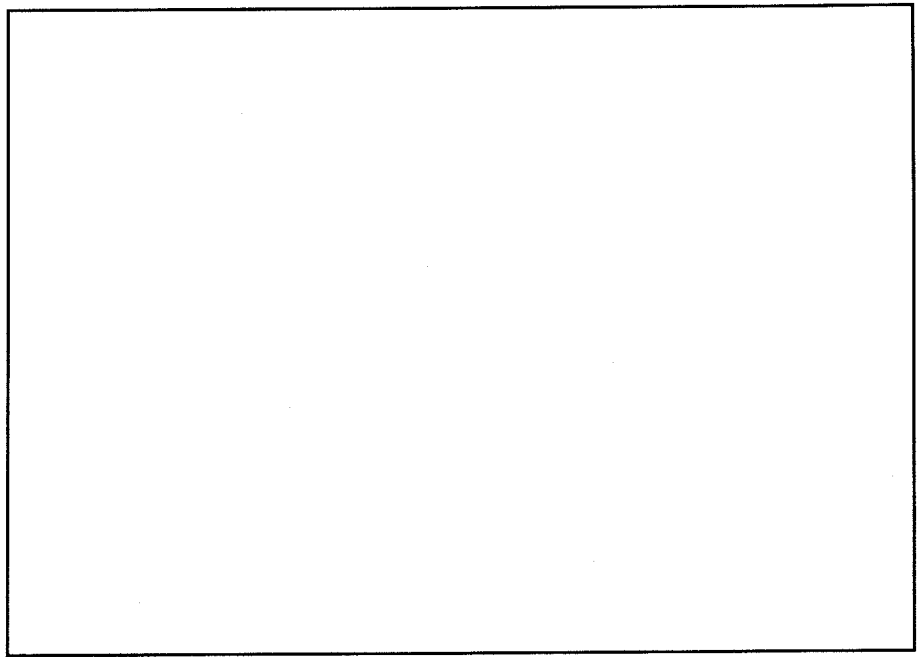


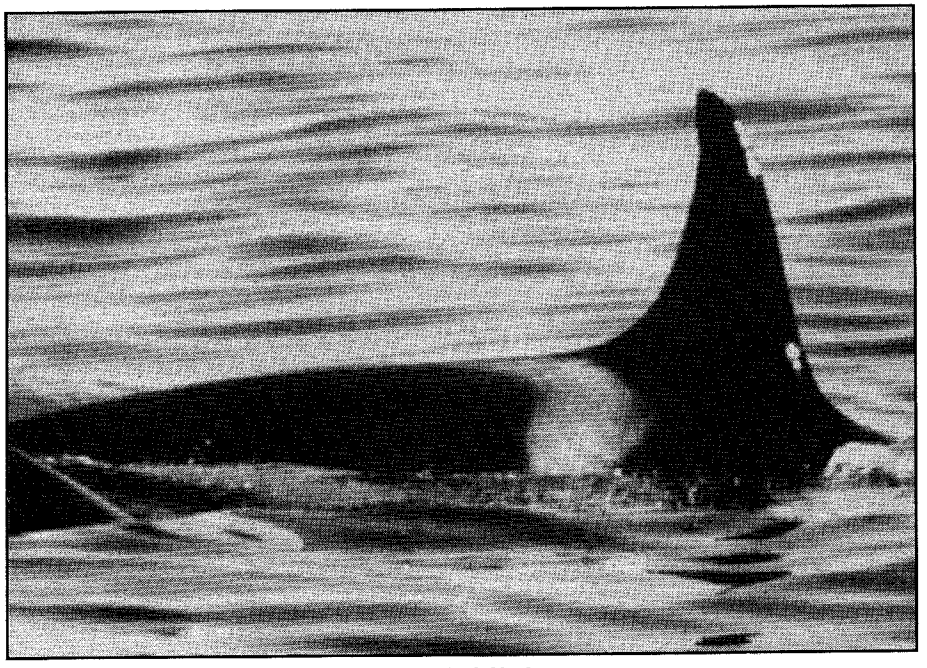
CA511 - 2/11/95 - Photo: B. Alps



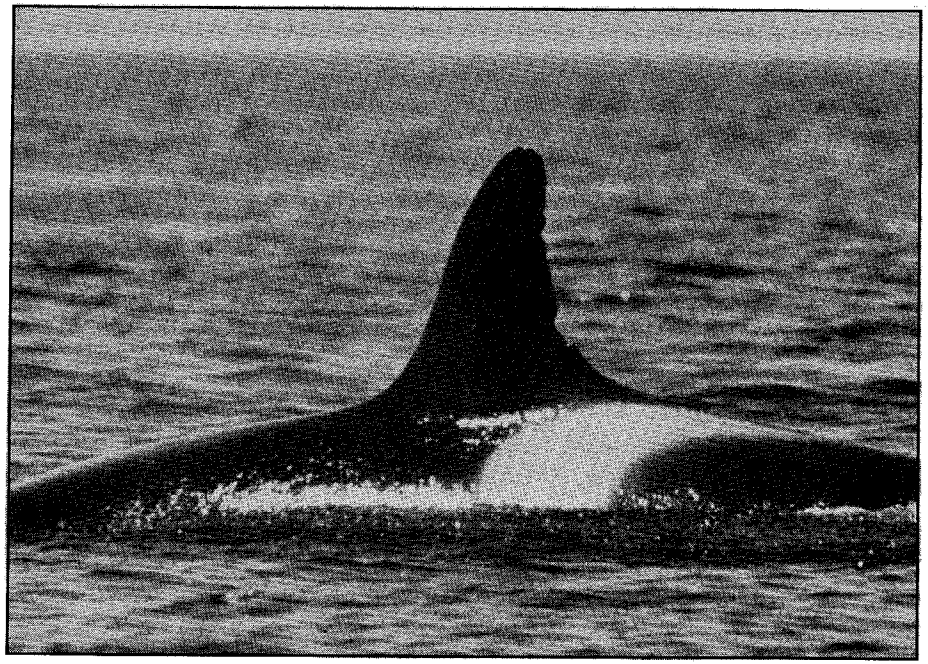
CA512 - 2/11/95 - Photo: A. Schulman



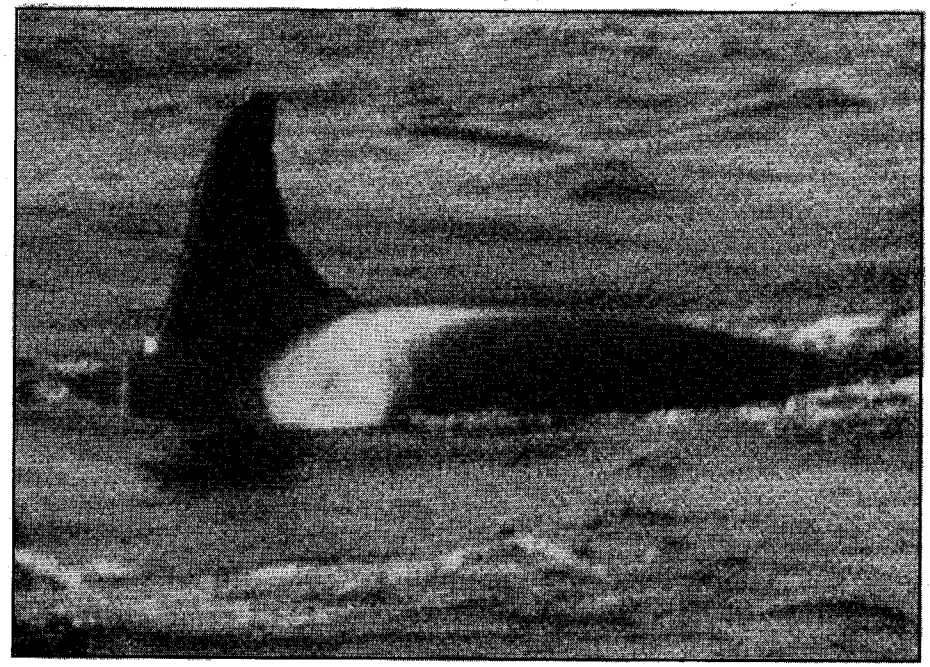




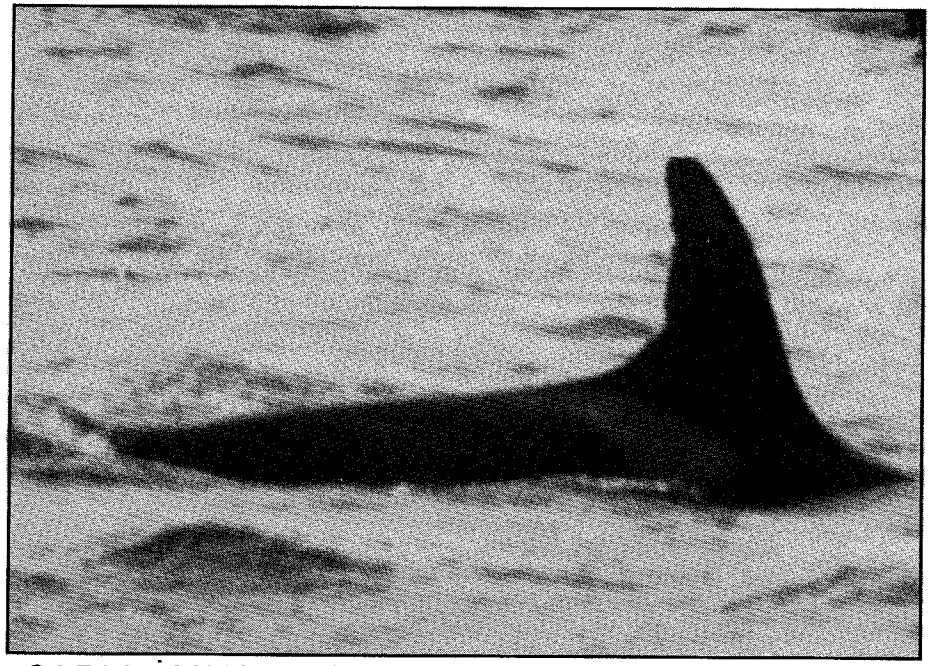
CA513 - 2/11/95 - Photo: K. Hicks



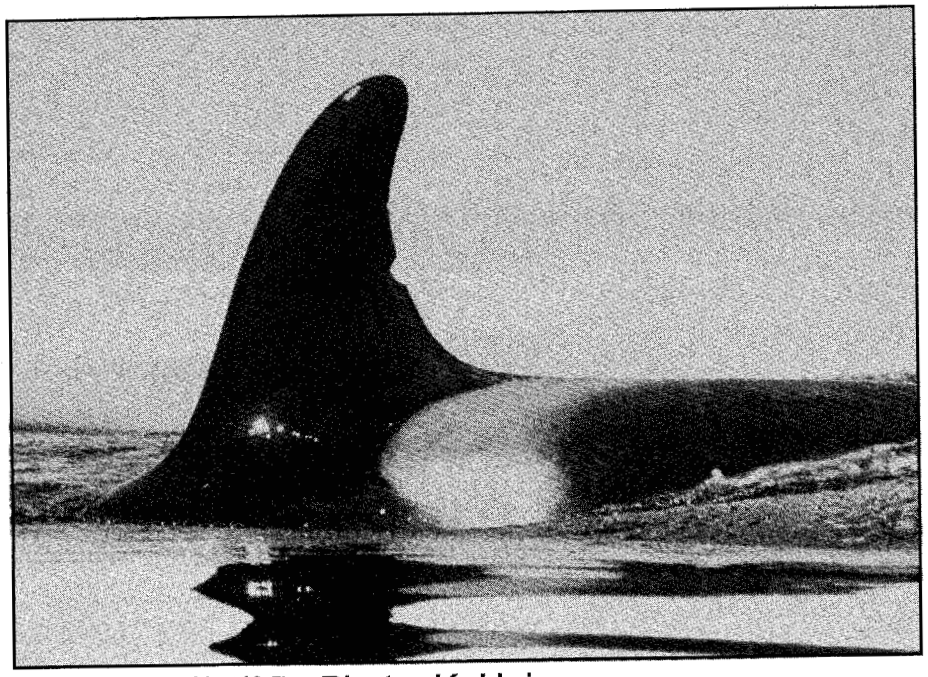
CA514 - 8/1/93 - Photo: A. Morton



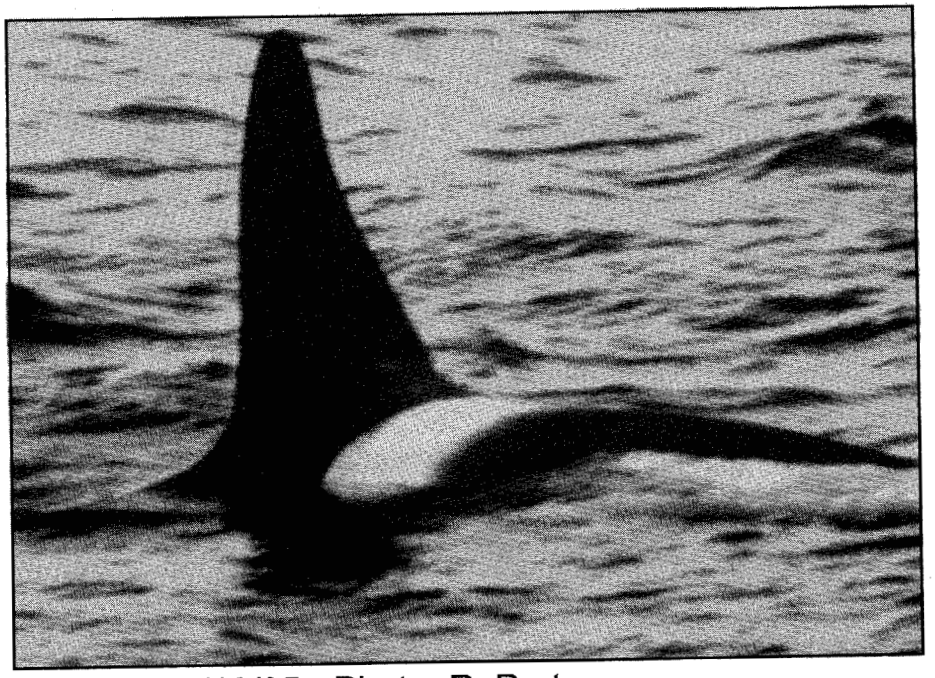
CA515 - 2/10/95 - Photo: Dunlap/Johnson



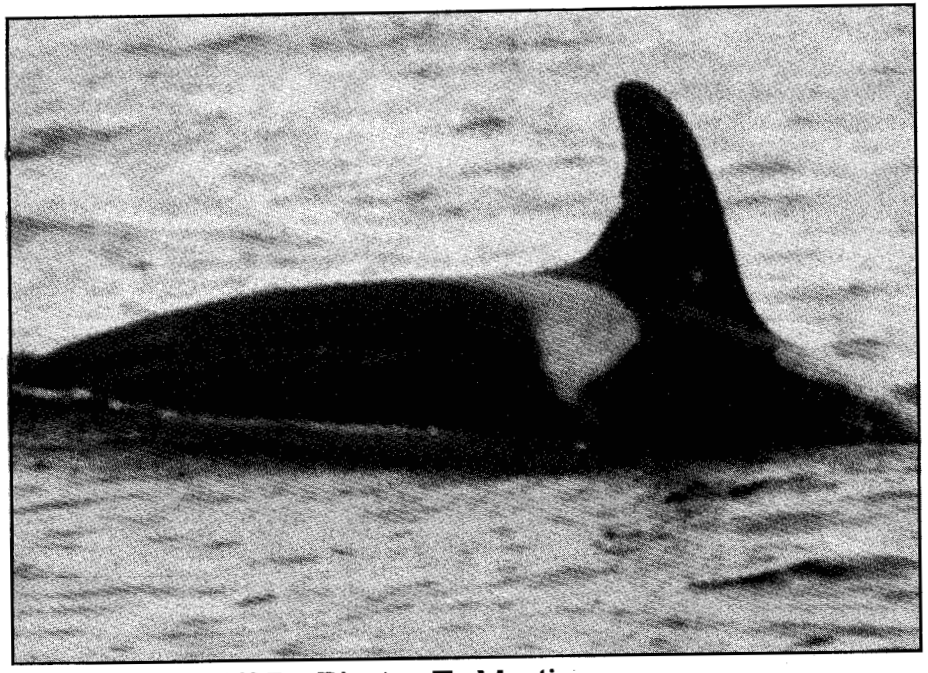
CA514 - 2/11/95 - Photo: R. Porter



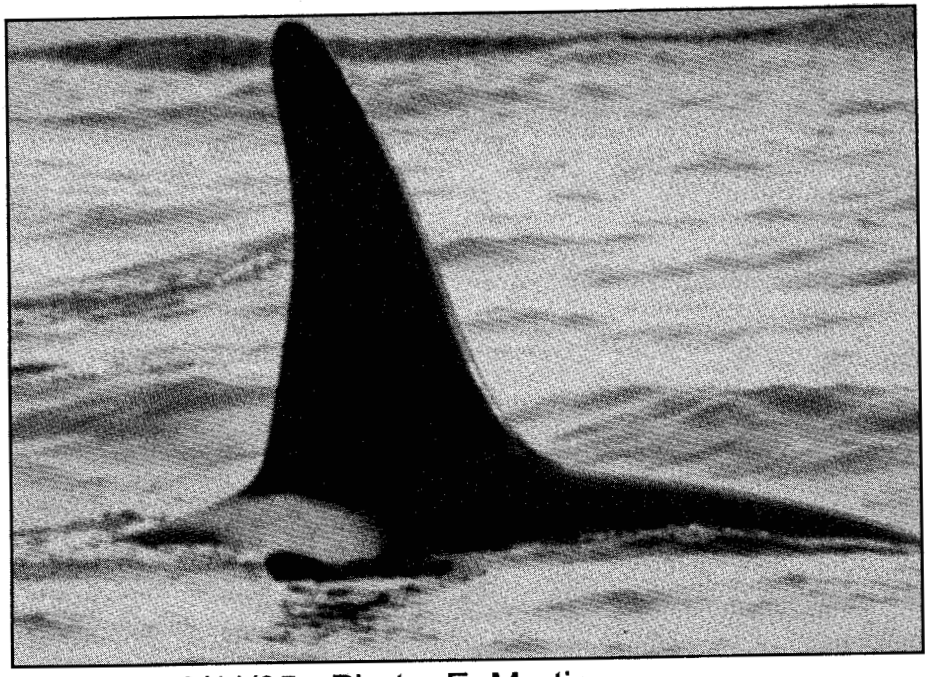
CA516 - 8/25/95 - Photo: K. Heise



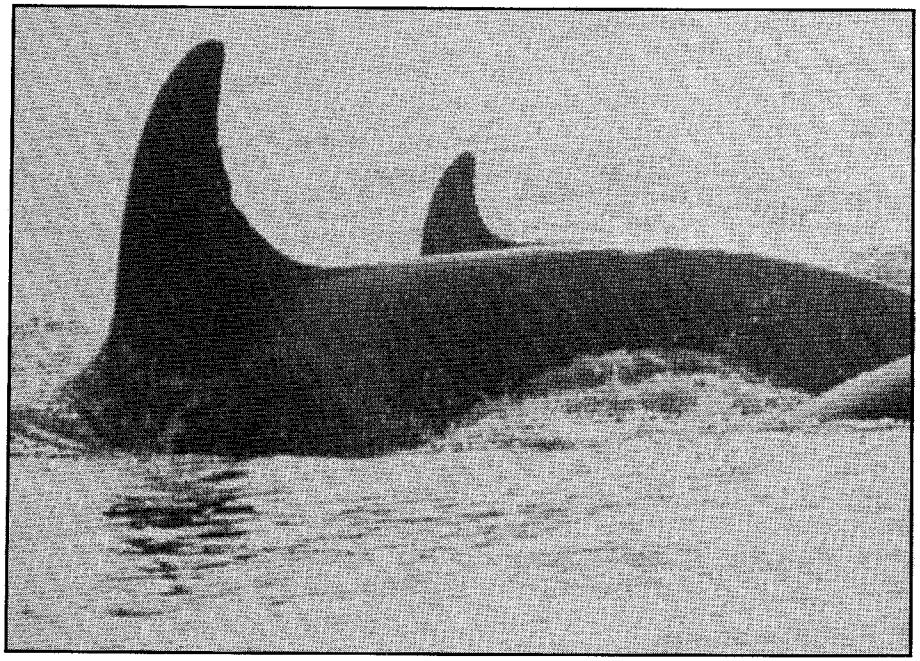
CA517 - 2/10/95 - Photo: R. Porter



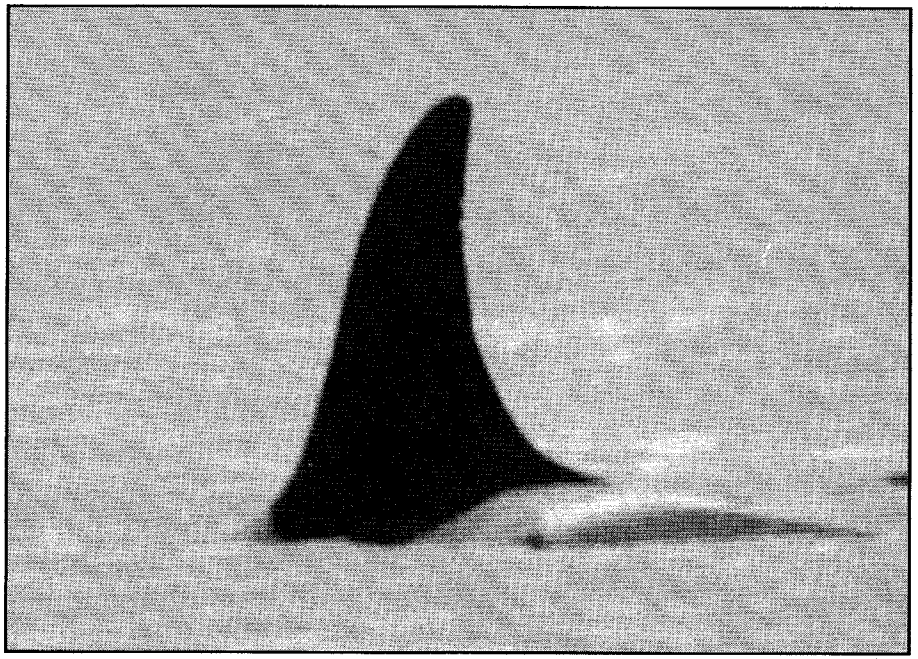
CA516 - 2/11/95 - Photo: E. Martin



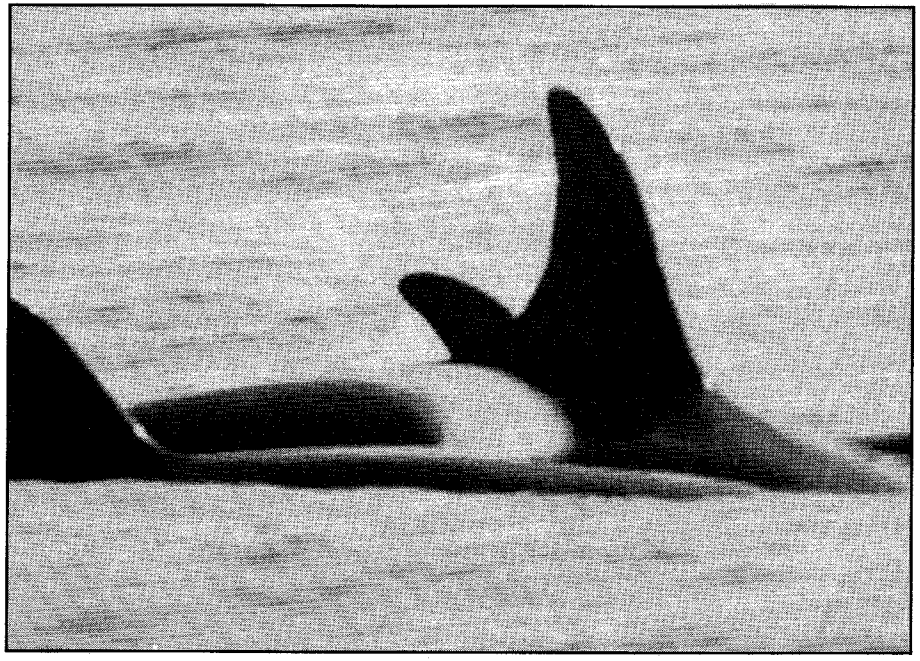
CA517 - 2/11/95 - Photo: E. Martin



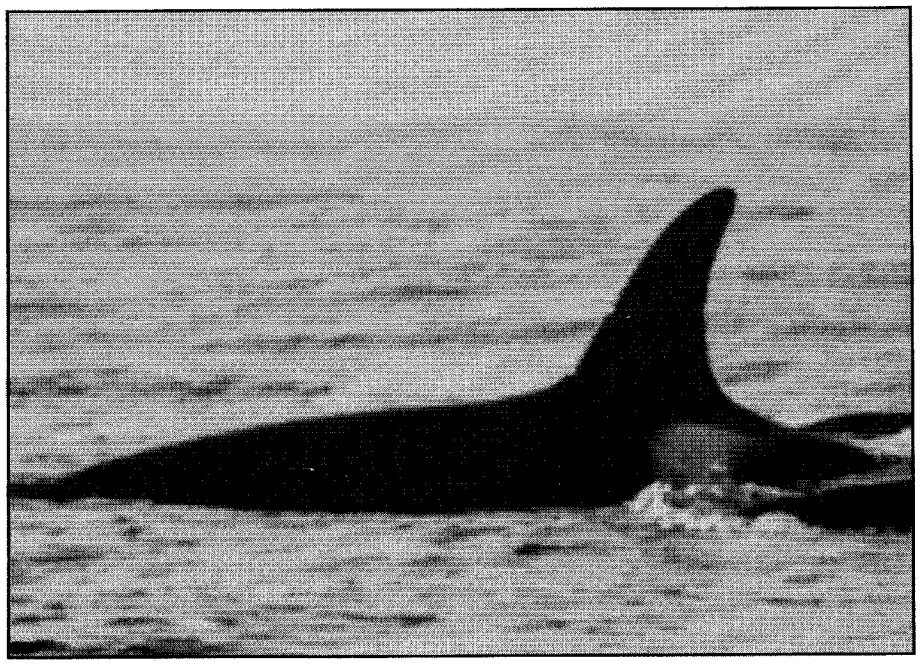
CA518 - 2/11/95 - Photo: P. Strassman



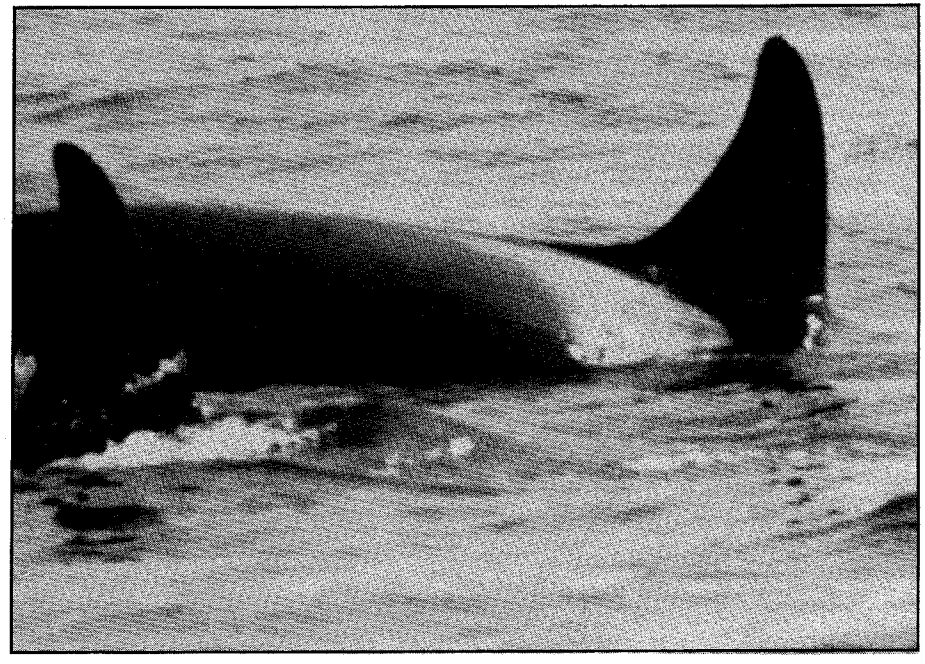
CA519 - 2/11/95 - Photo: E. Martin



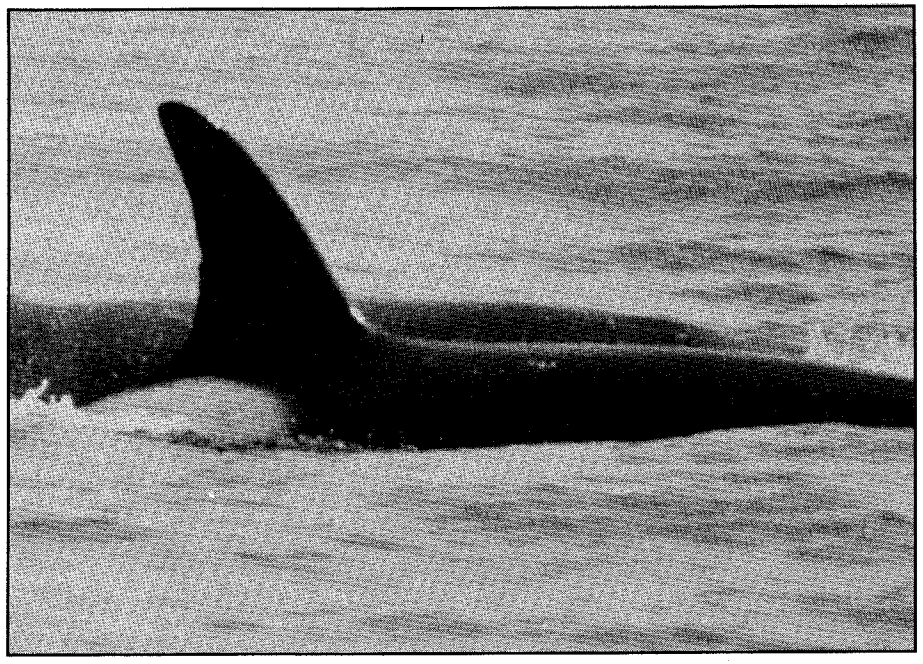
CA519 - 2/11/95 - Photo: E. Martin



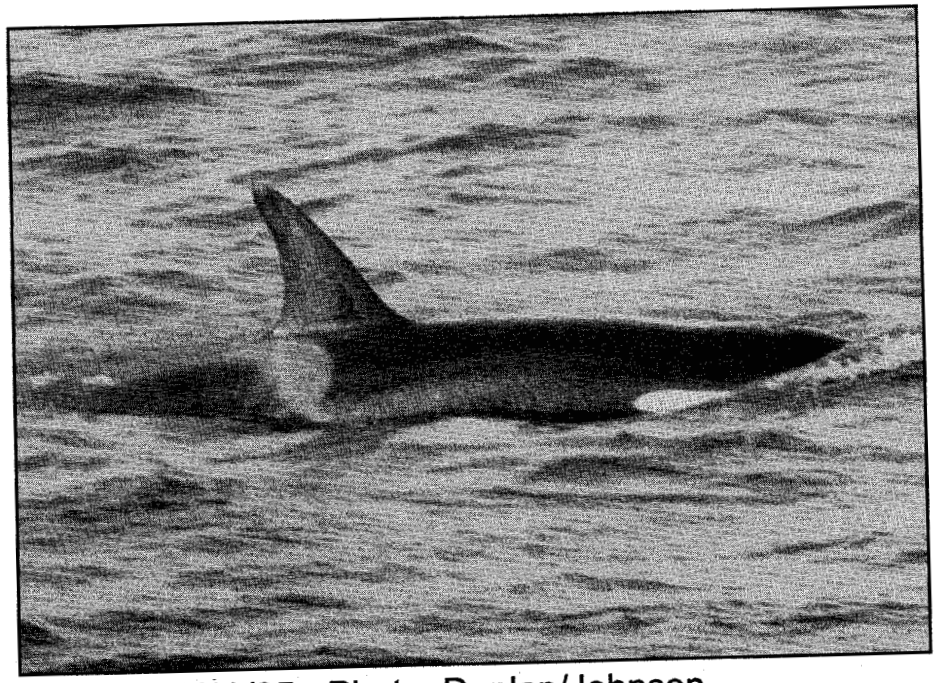
CA521 - 2/11/95 - Photo: E. Martin



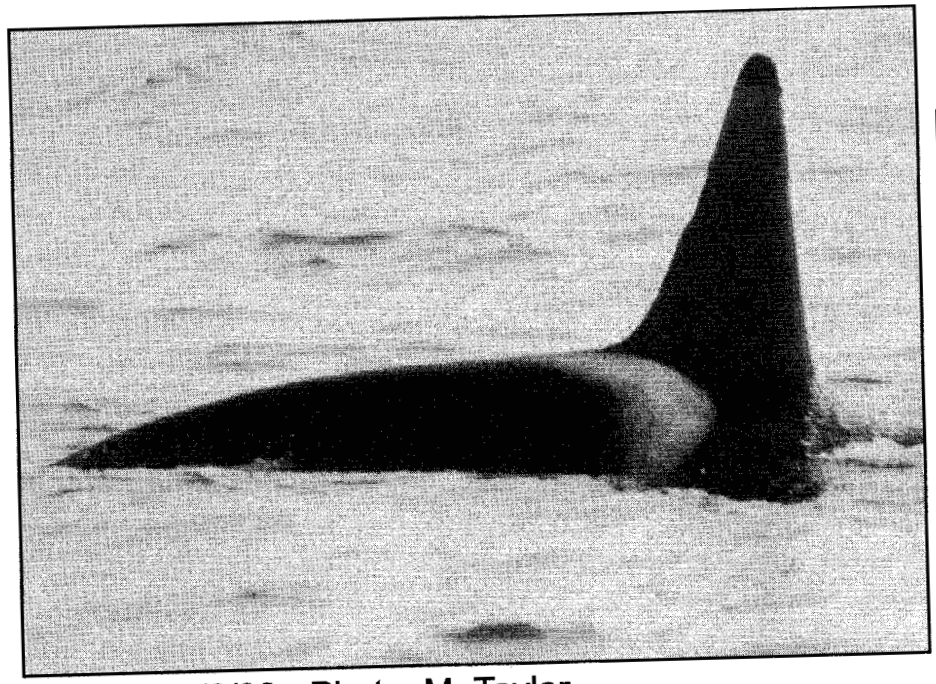
CA520 (front animal) - 2/11/95 - Photo: E. Martin



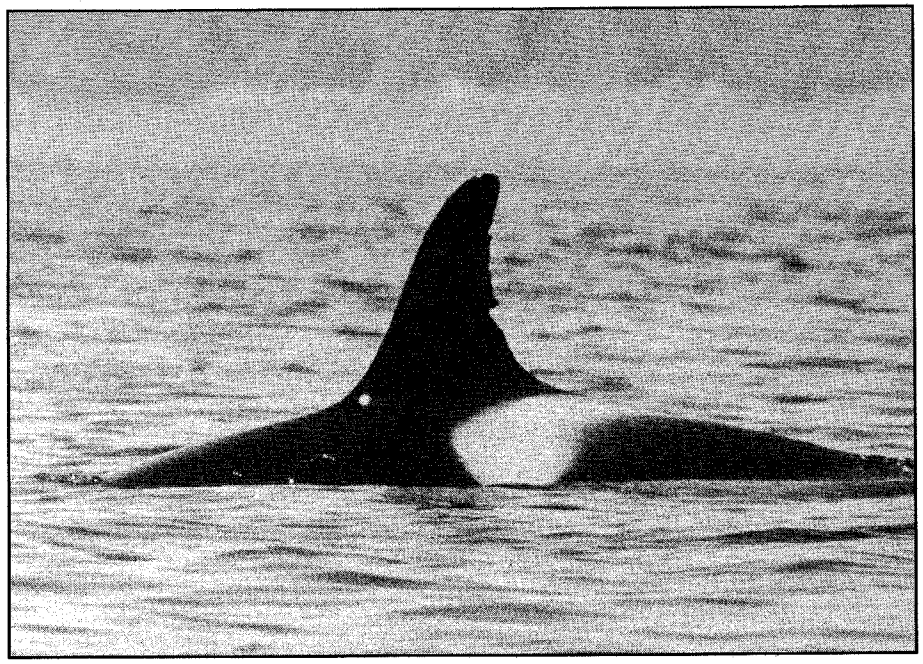
CA521 - 2/11/95 - Photo: E. Martin



CA522 - 2/10/95 - Photo: Dunlap/Johnson

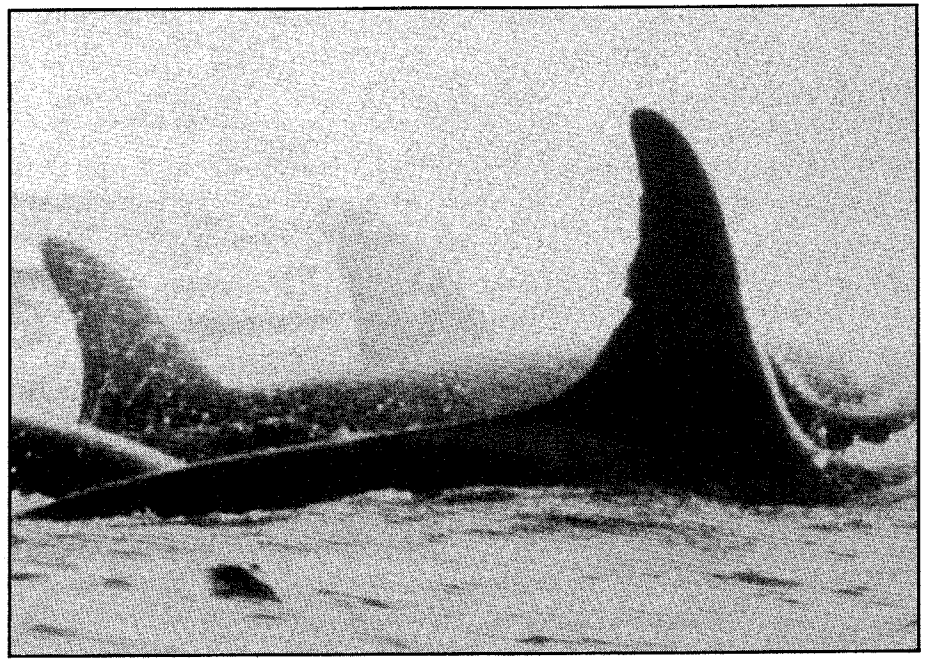


CA523 - 2/6/93 - Photo: M. Taylor

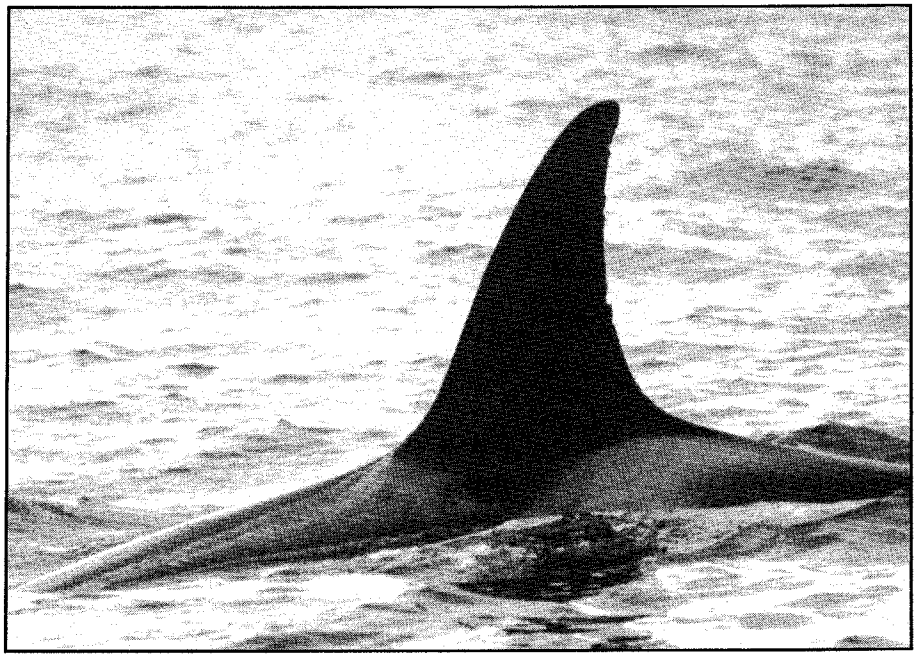


CA525 - 8/1/93 - Photo: A. Morton

CA524 - 2/6/93 - Photo: M. Taylor

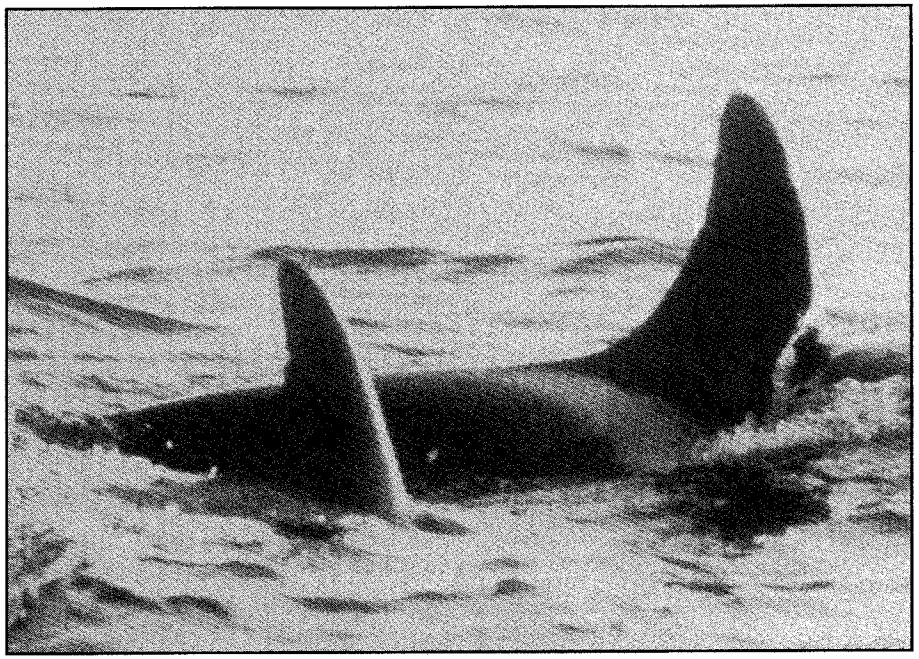


CA525 - 2/6/93 - Photo: M. Taylor

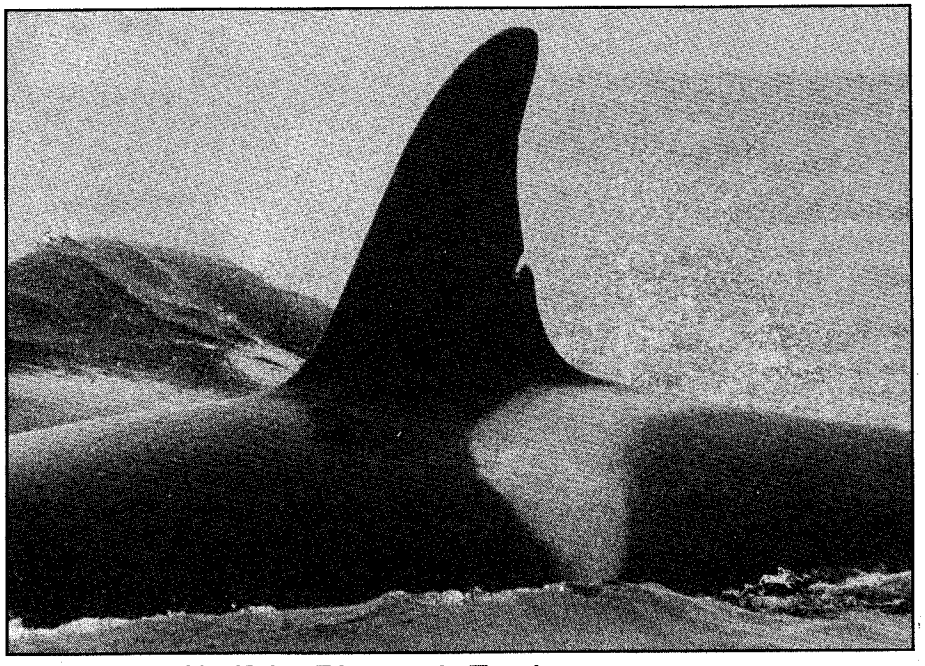


CA526 - 2/11/95 - Photo: E. Martin

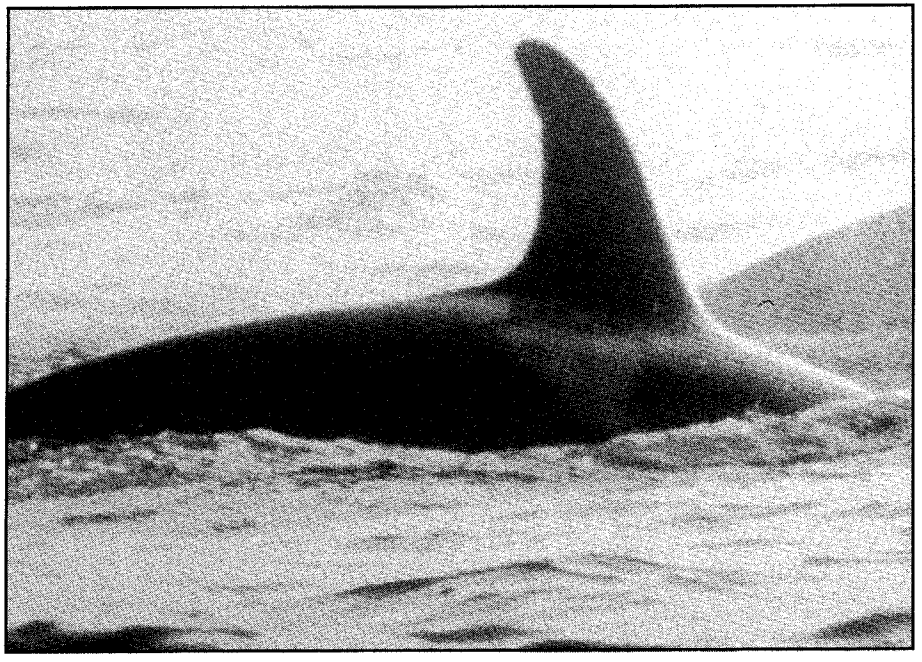
CA526 - 2/11/95 - Photo: E. Martin



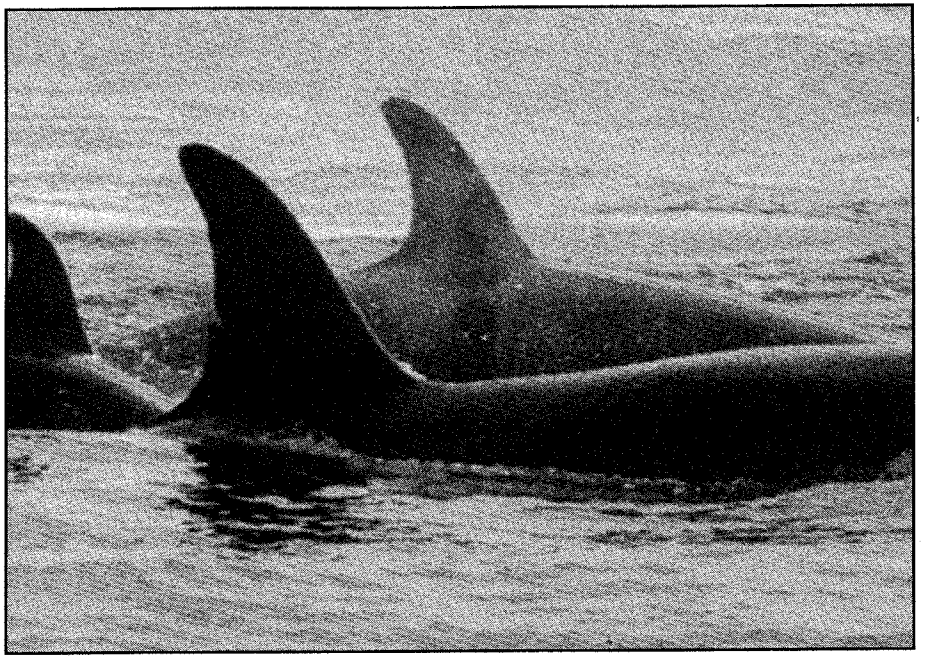
CA527 (front animal) - 2/6/93 - Photo: M. Taylor



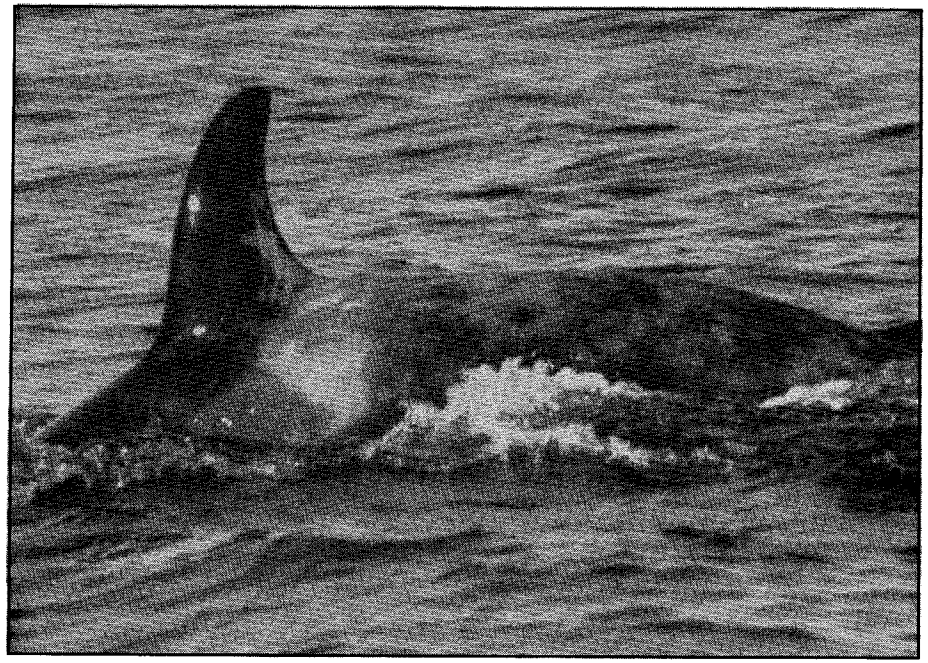
CA529 - 7/17/91 - Photo: J. Ford



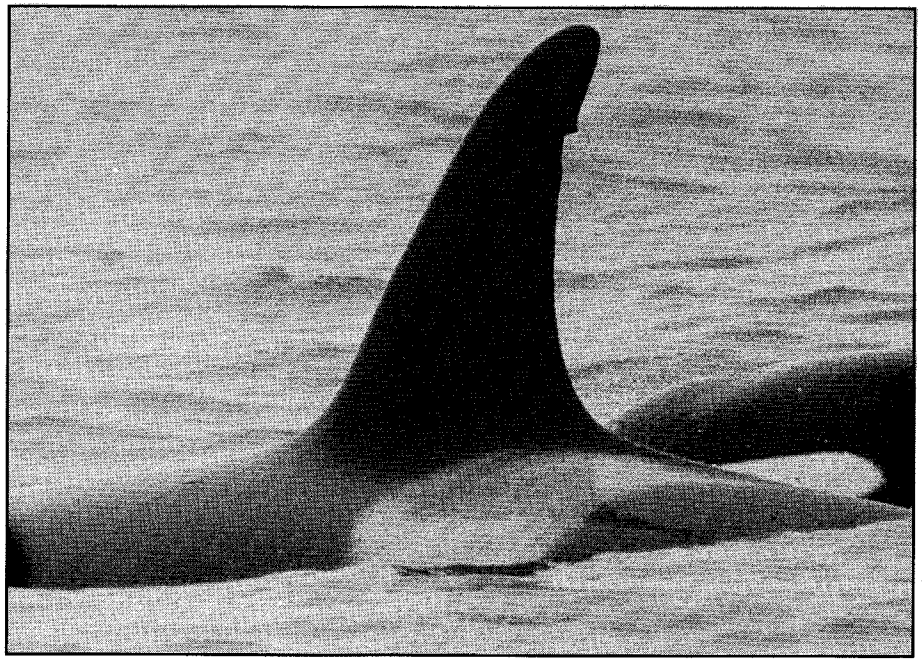
CA528 - 2/6/93 - Photo: M. Taylor



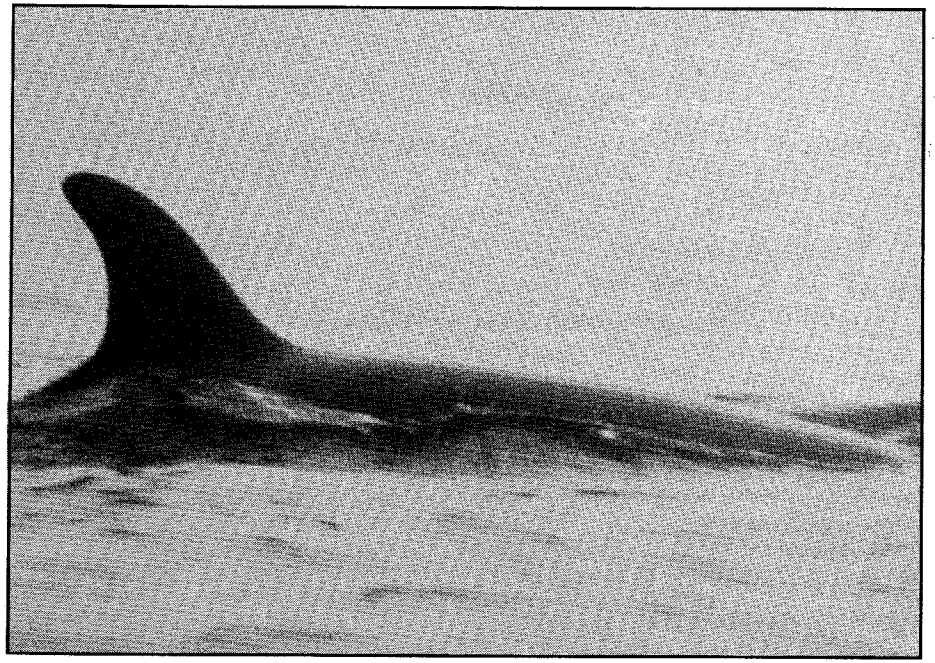
CA529 - 2/11/95 - Photo: M. Jasper



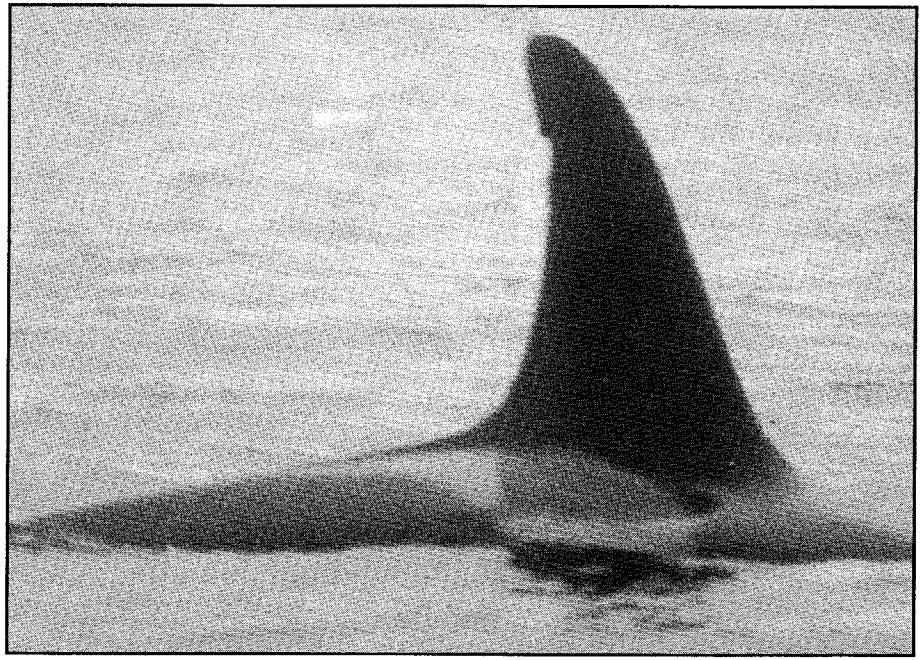
CA530 - 9/7/94 - Photo: J. Calambokidis/Cascadia



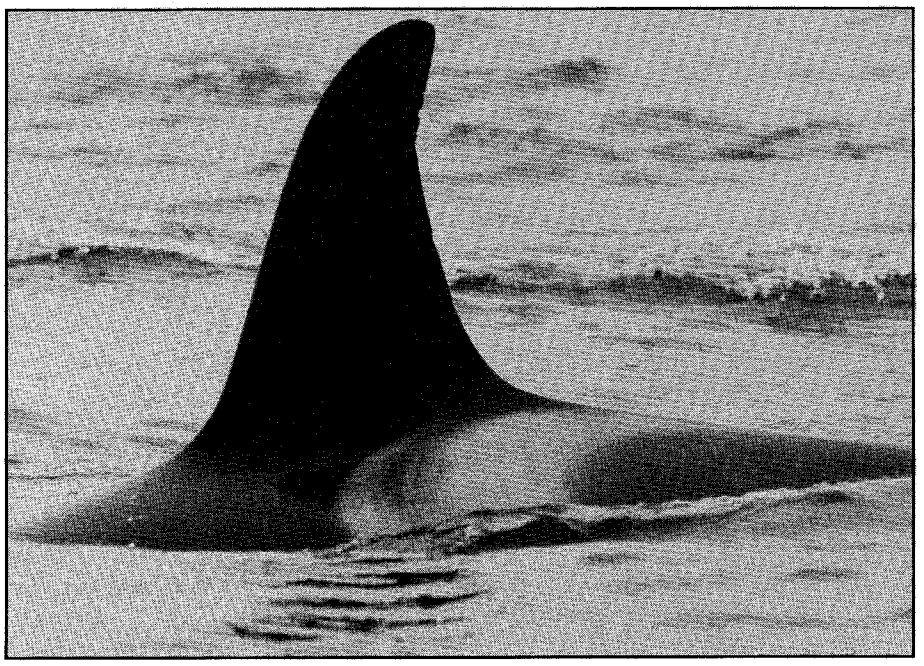
CA531 - 7/17/91 - Photo: J. Ford



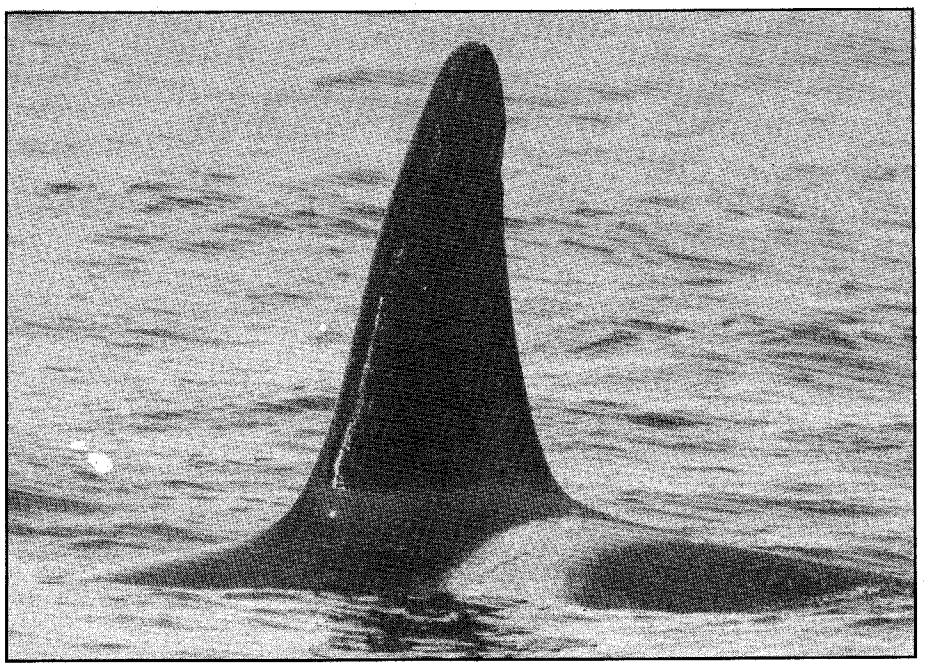
CA530 - 1/29/96 - Photo: E. Martin



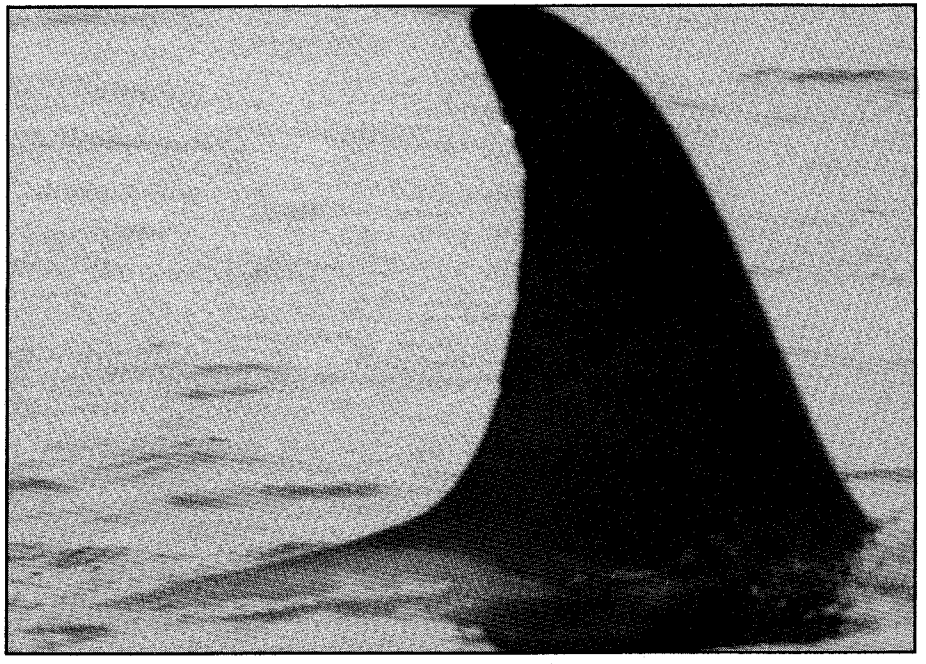
CA531 - 2/11/95 - Photo: E. Martin



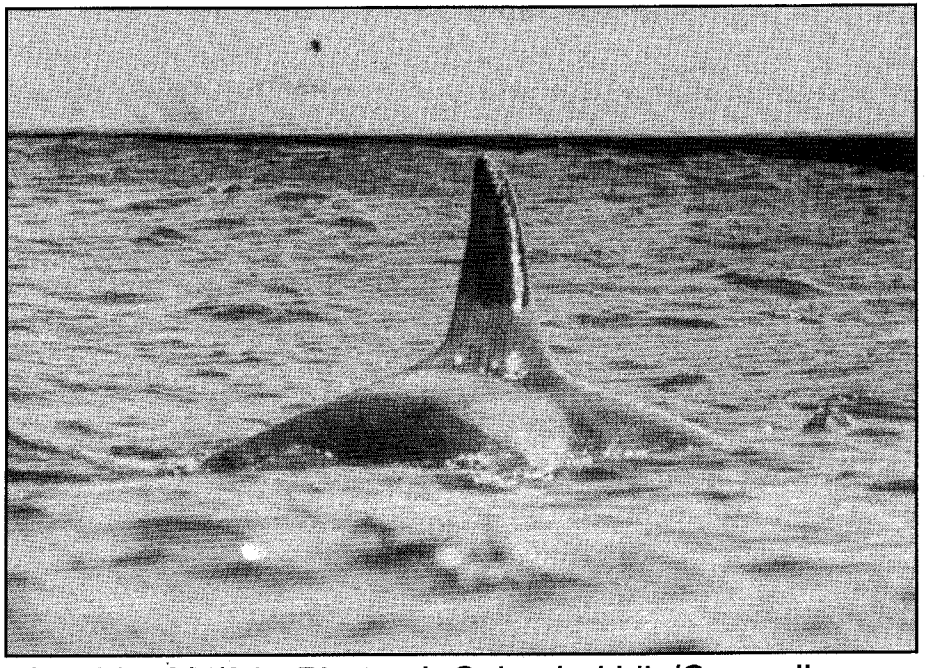
CA532 - 7/17/91 - Photo: J. Ford



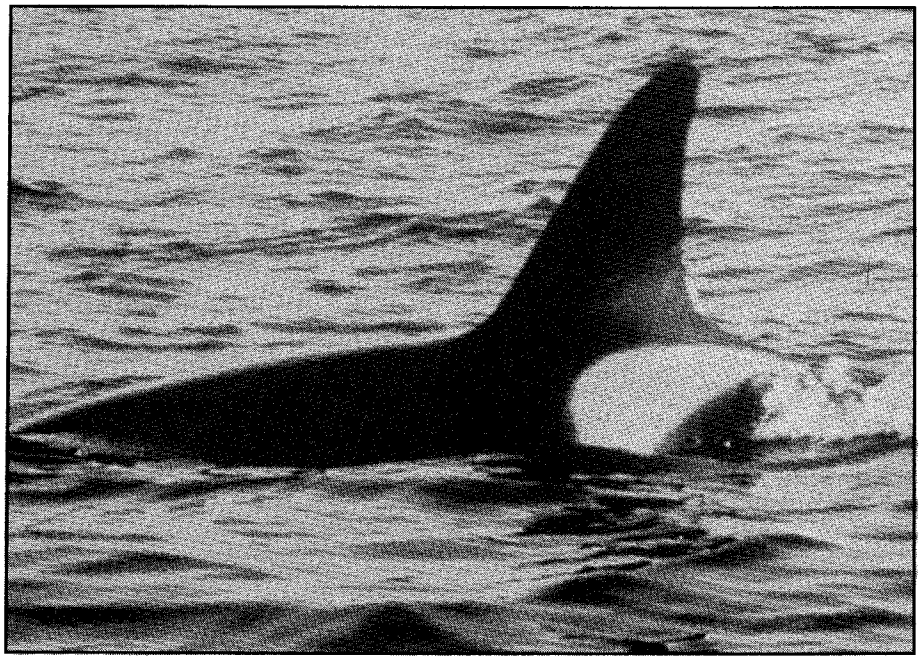
CA533 - 9/7/94 - Photo: J. Calambokidis/Cascadia



CA532 - 1/29/96 - Photo: E. Martin

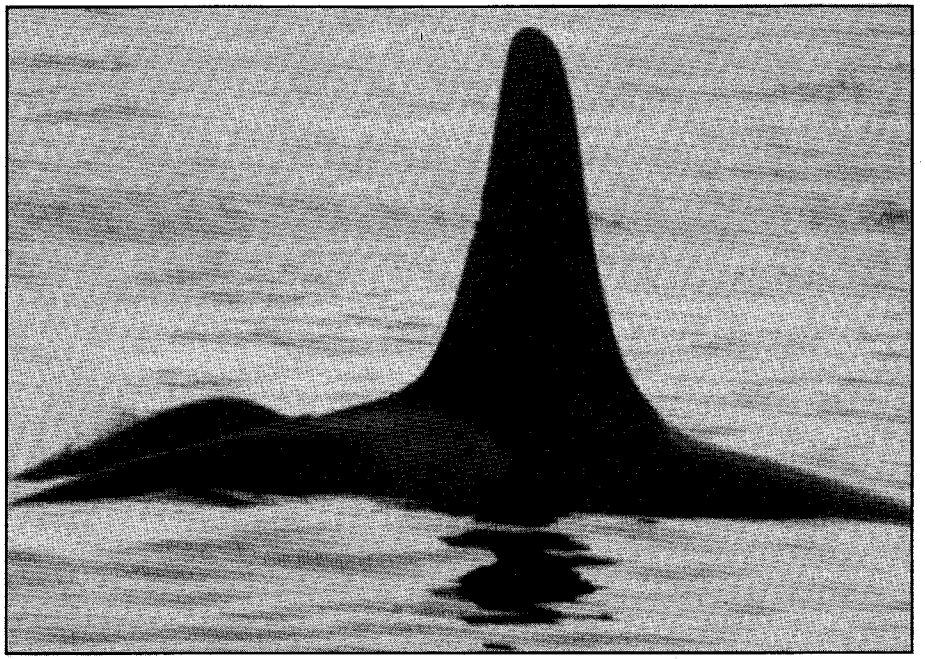


CA533 - 9/7/94 - Photo: J. Calambokidis/Cascadia

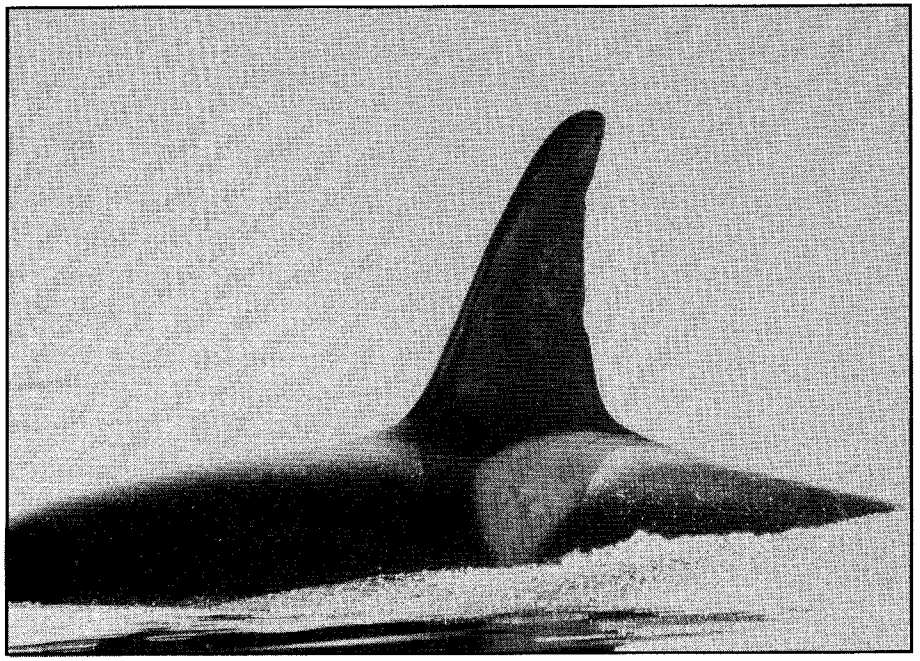


CA534 - 1/13/96 - Photo: S. Ritman

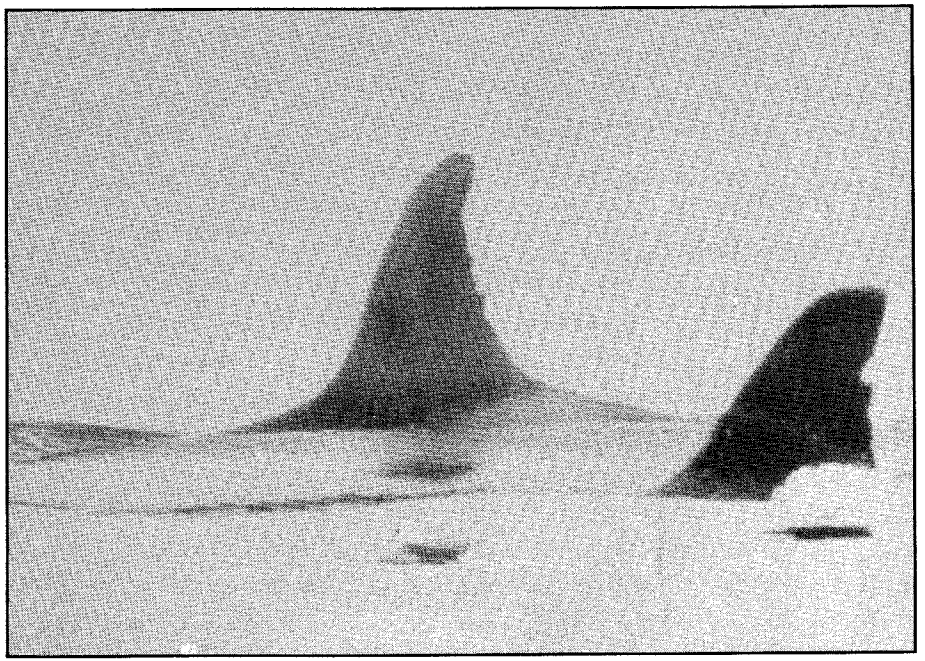
CA535 - 2/11/95 - Photo: M. Jasper



CA535 - 2/11/95 - Photo: E. Martin

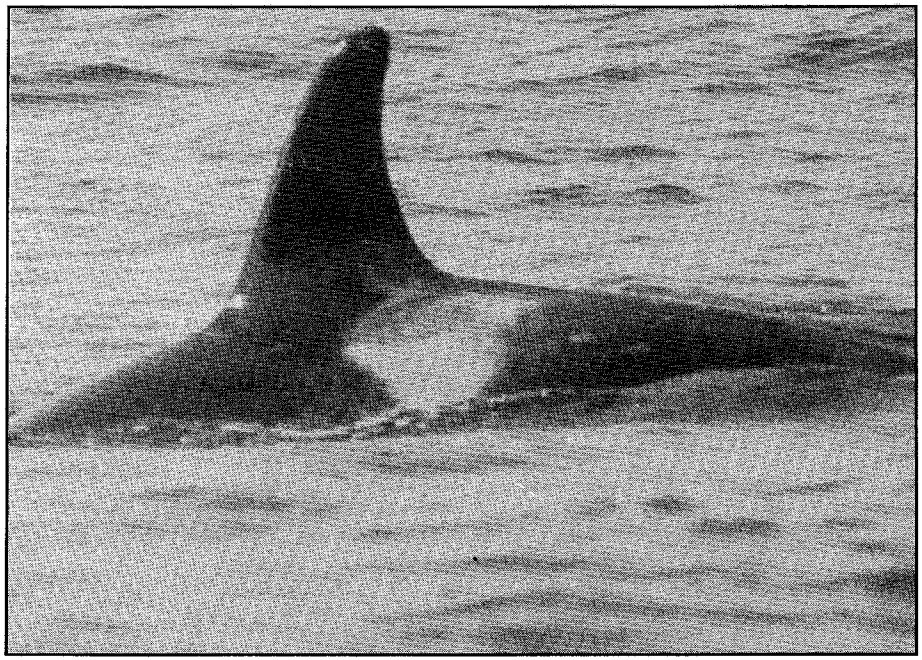


CA536 - 6/13/93 - Photo: J. Swenson/NMML

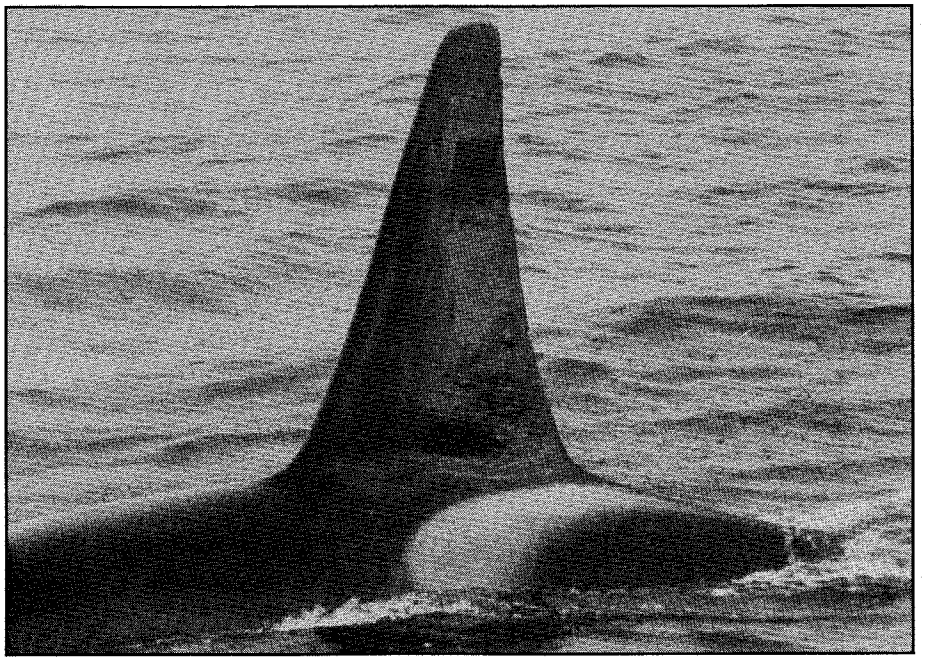


CA537 (left animal) - 9/8/89 - Photo: D. Matkin/NMML

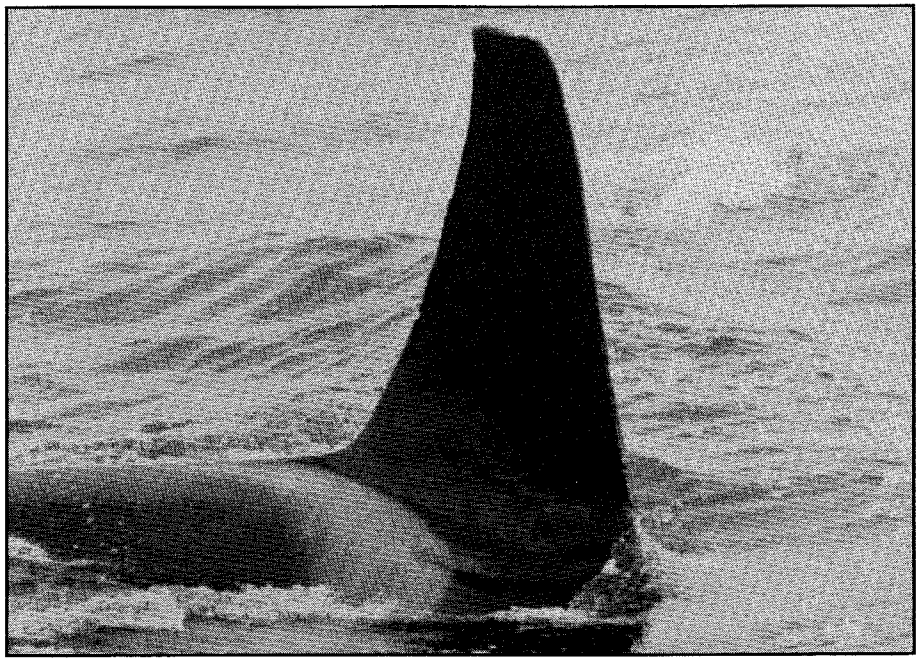
Offshore



CA538 - 9/7/94 - Photo: J. Calambokidis/Cascadia

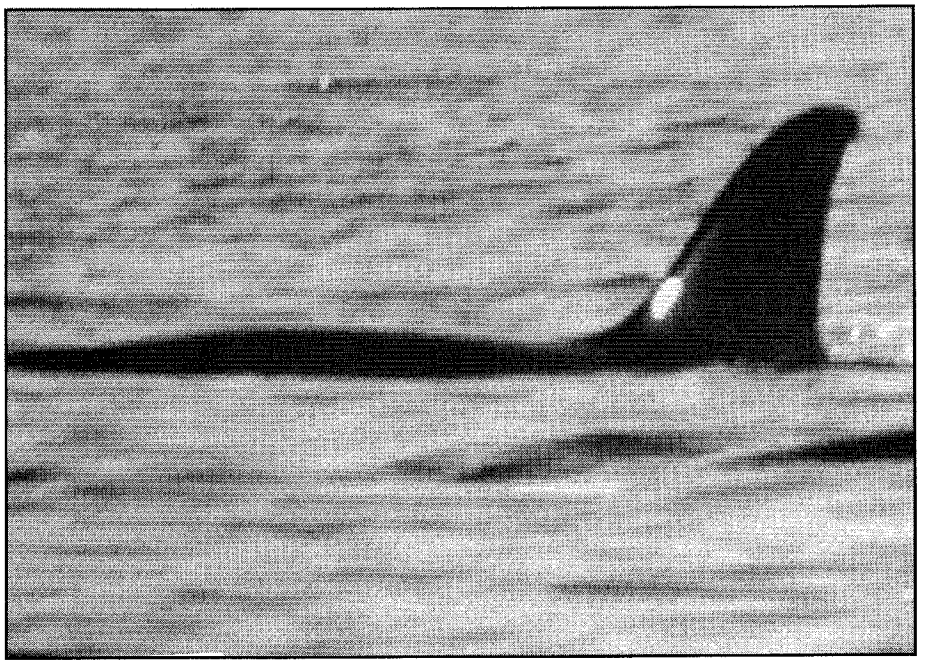


CA539 - 10/19/95 - Photo: N. Black

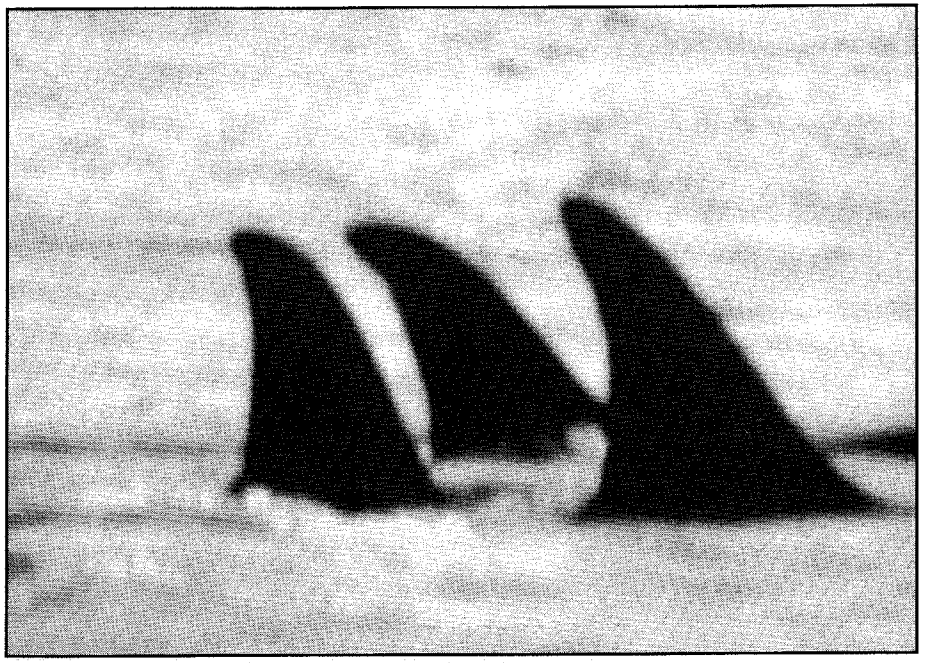


CA539 - 9/10/96 - Photo: K. Forney/NMFS

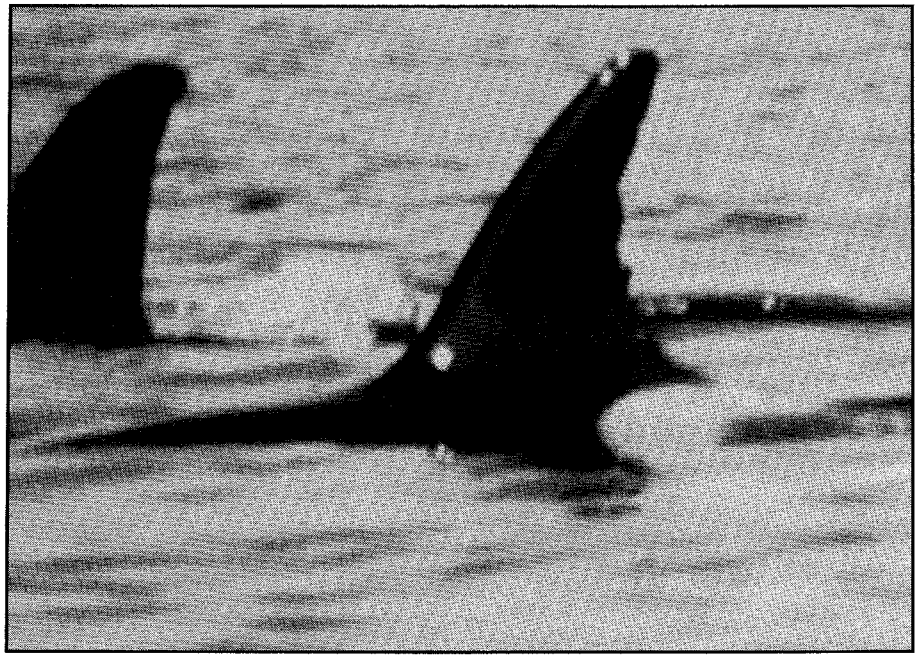
CA540 - 1/28/95 - Photo: E. Martin



CA541 - 1/28/95 - Photo: E. Martin

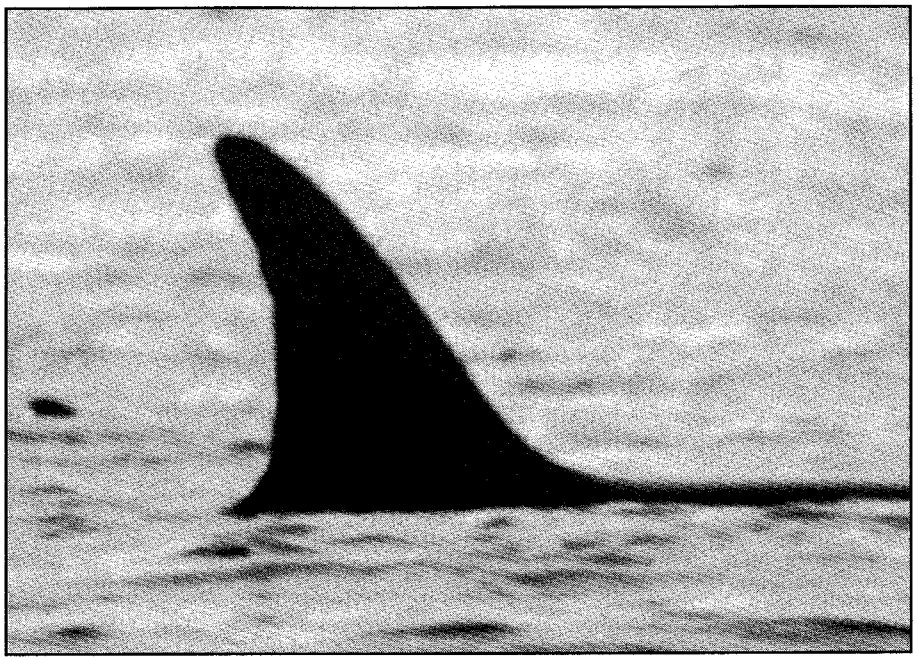


CA541 - 1/28/95 - Photo: E. Martin



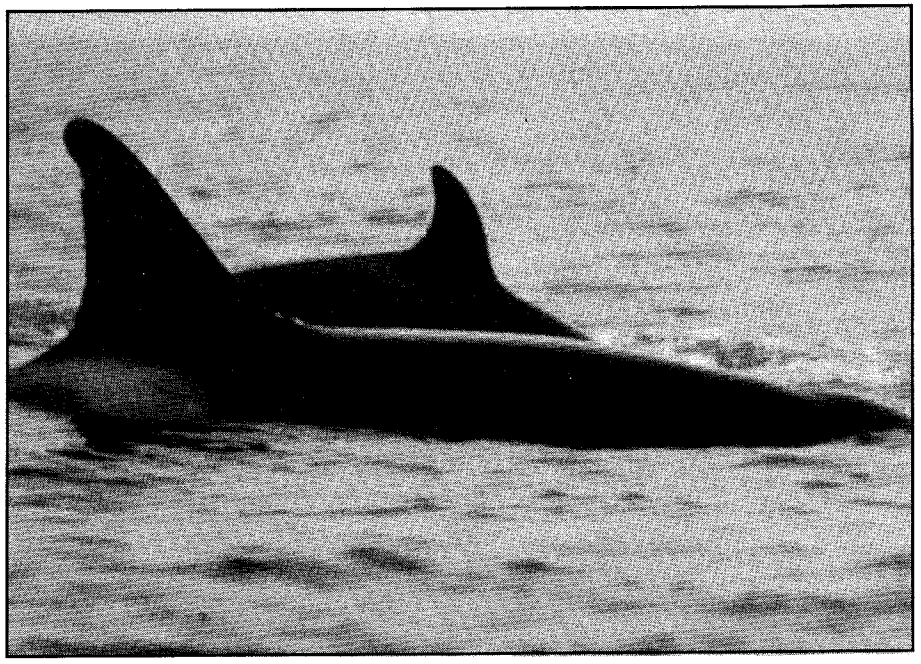
CA542 - 1/28/95 - Photo: E. Martin

CA543 - 1/28/95 - Photo: E. Martin

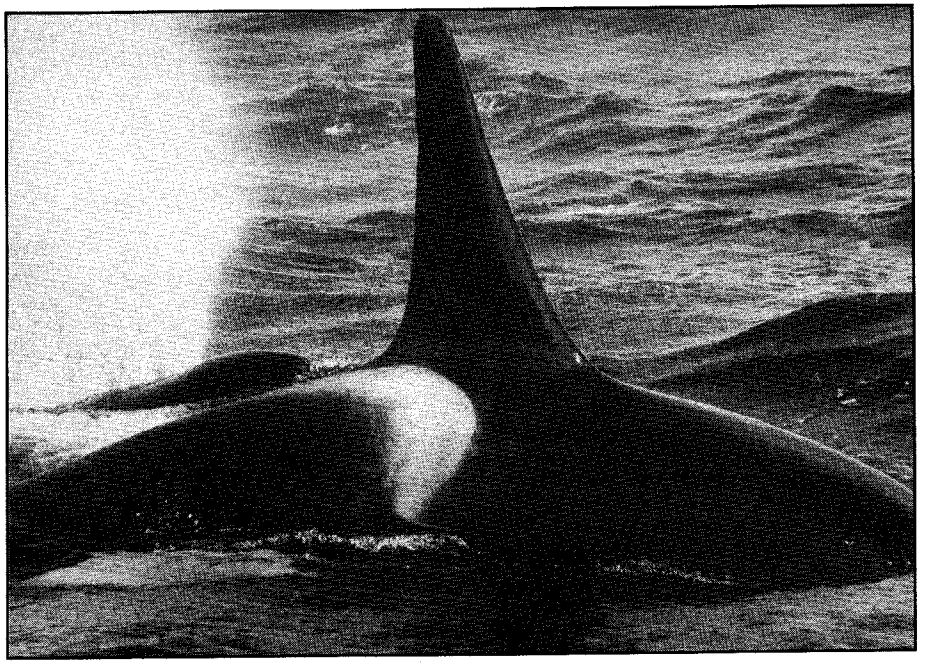


CA543 - 1/28/95 - Photo: E. Martin

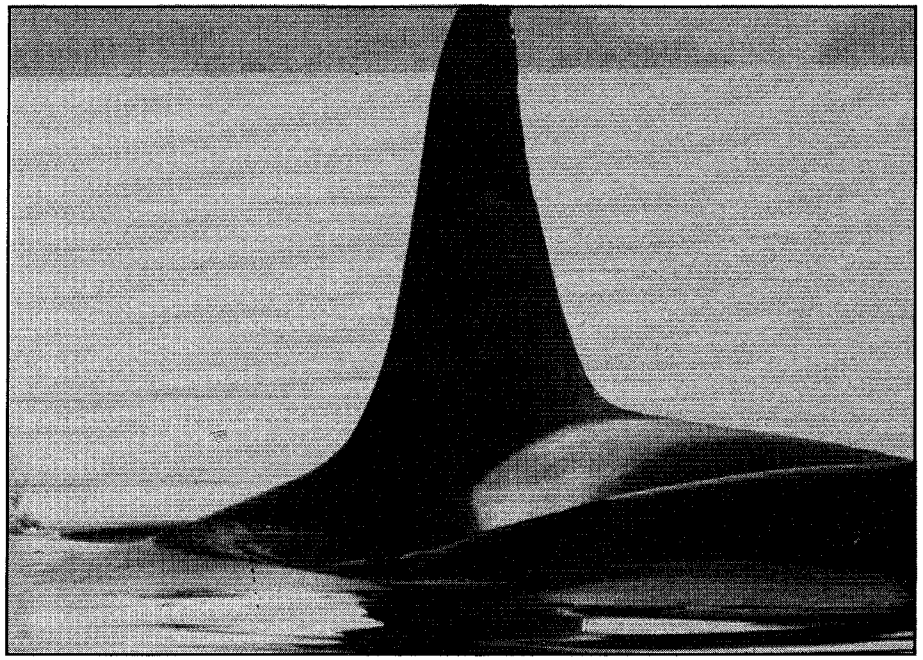
CA545 - 9/2/94 - Photo: A. Schulman



CA544 (front animal) - 1/28/95 - Photo: E. Martin



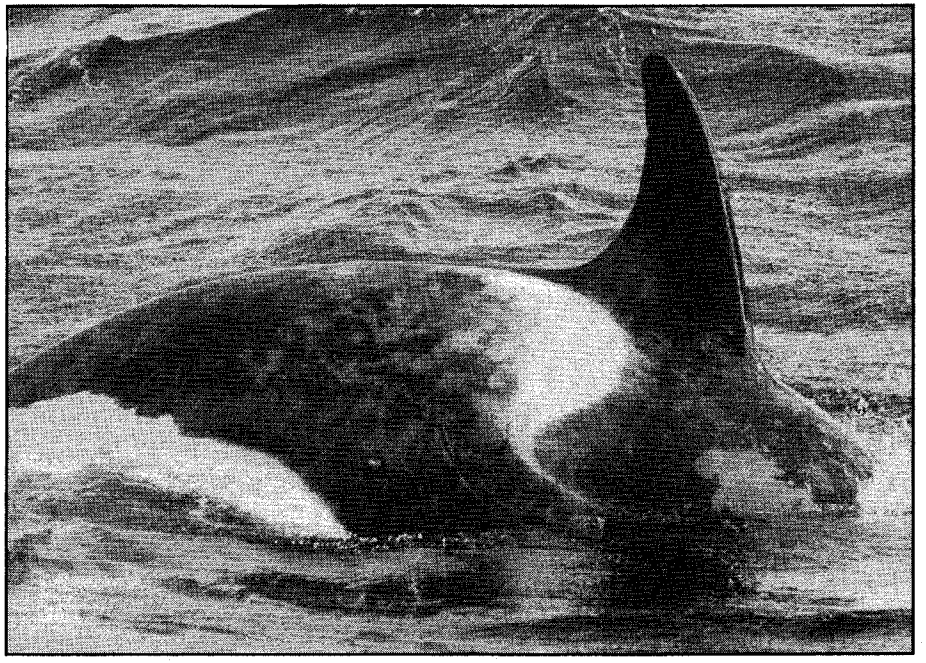
CA545 - 9/2/94 - Photo: A. Schulman



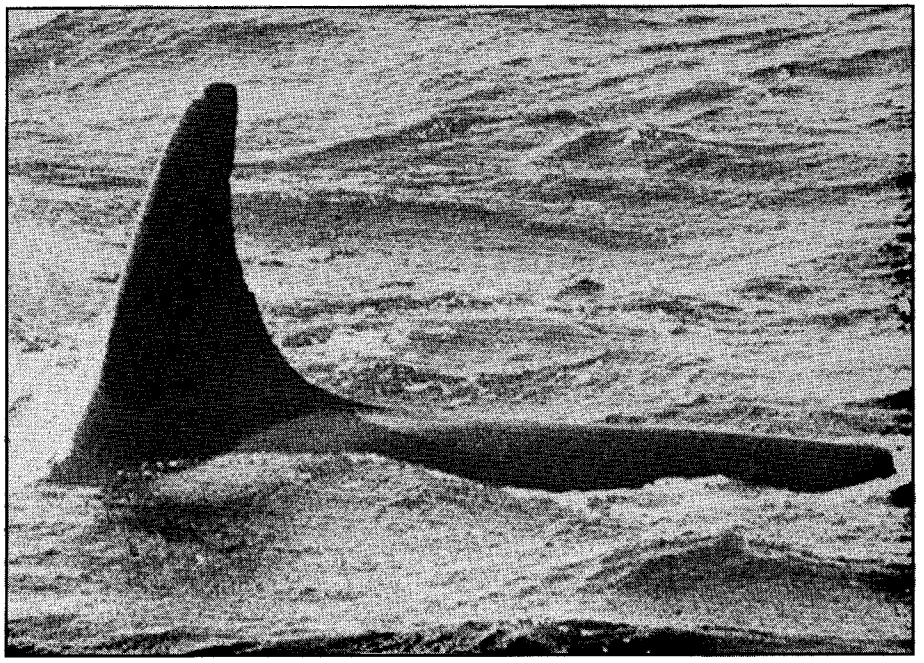
CA546 - 8/25/95 - Photo: G. Ellis

CA547 - 9/2/94 - Photo: A. Schulman

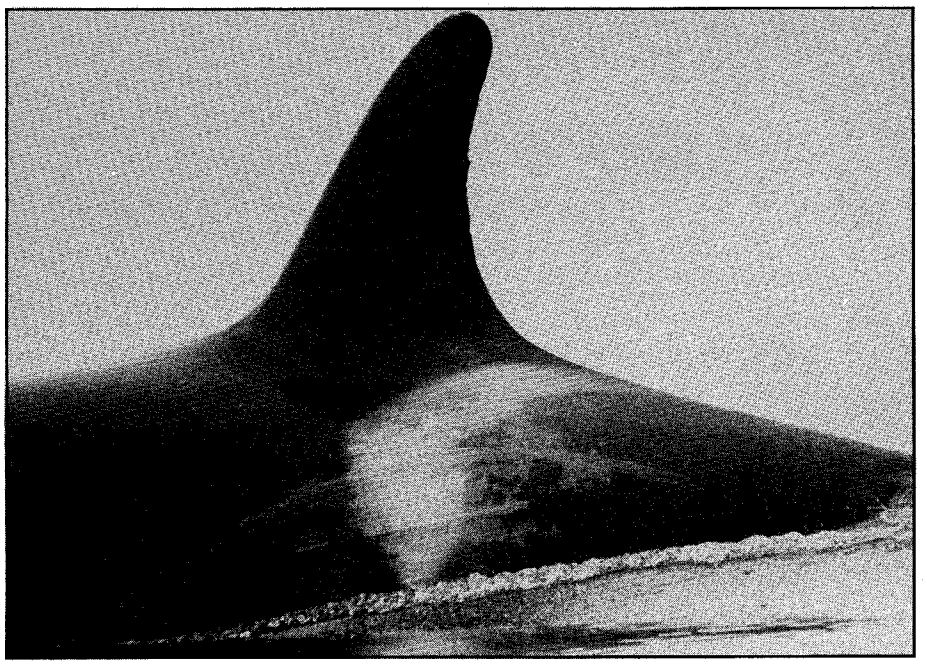
CA546 - 9/2/94 - Photo: A. Schulman



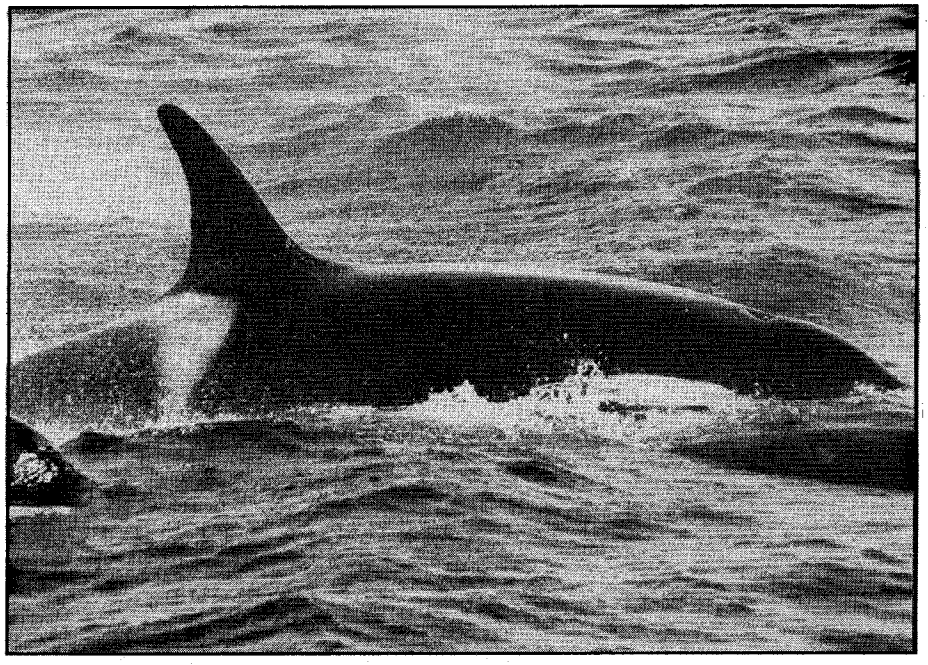
CA547 - 9/2/94 - Photo: A. Schulman



CA548 - 9/2/94 - Photo: A. Schulman

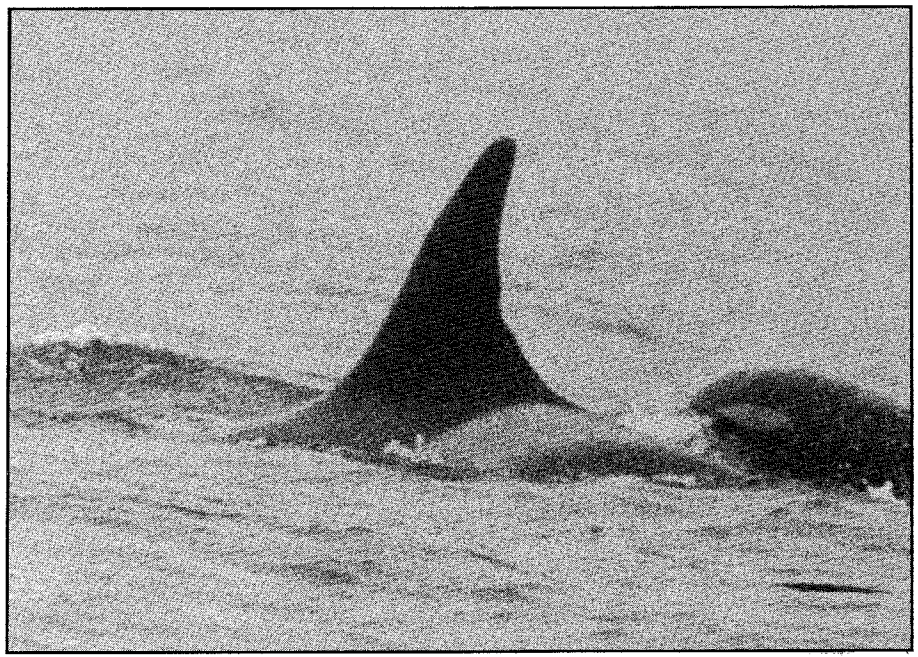


CA549 - 8/25/95 - Photo: G. Ellis

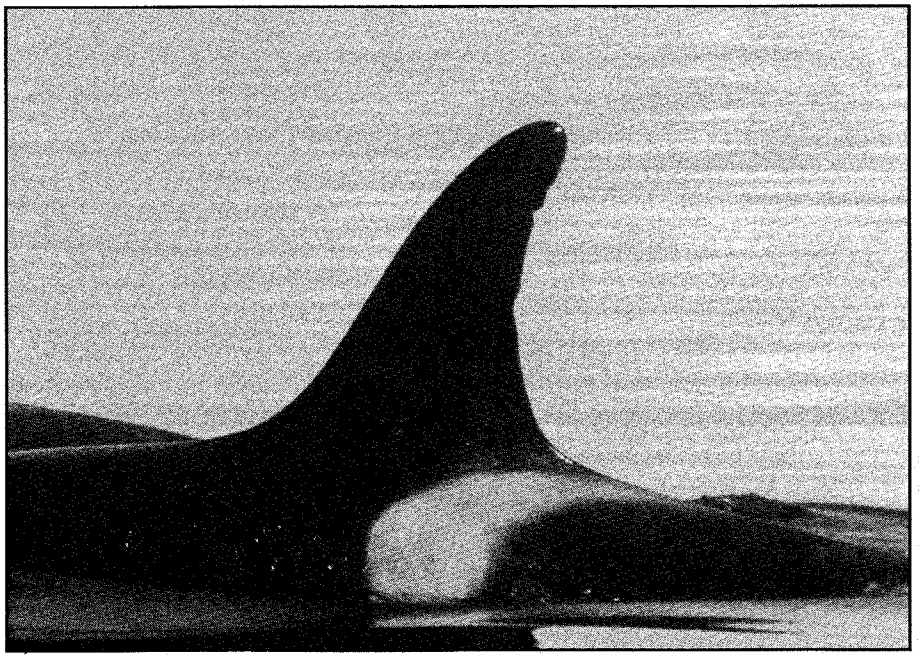


CA548 - 9/2/94 - Photo: A. Schulman

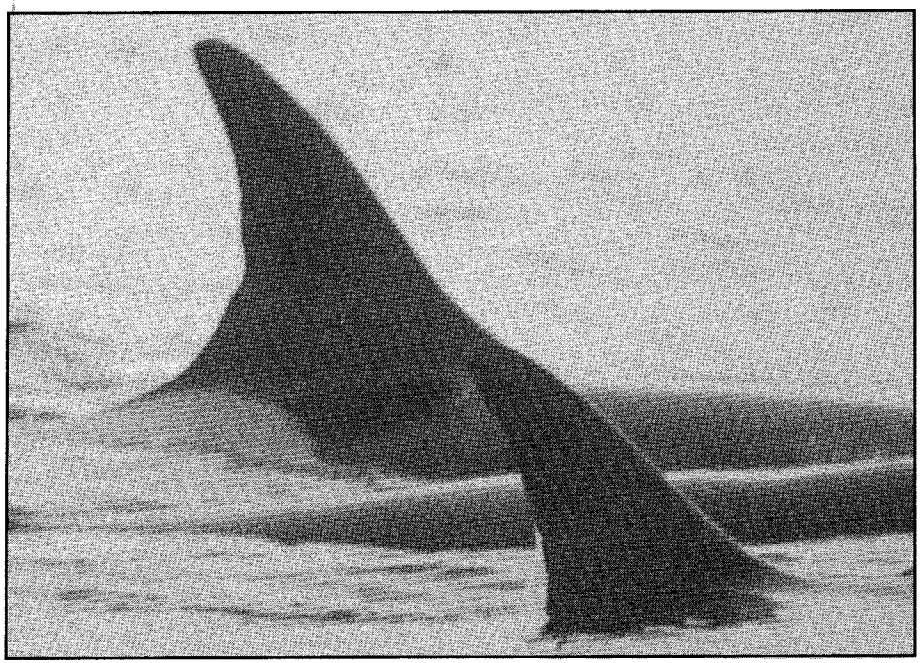
CA549 - 9/2/94 - Photo: A. Schulman



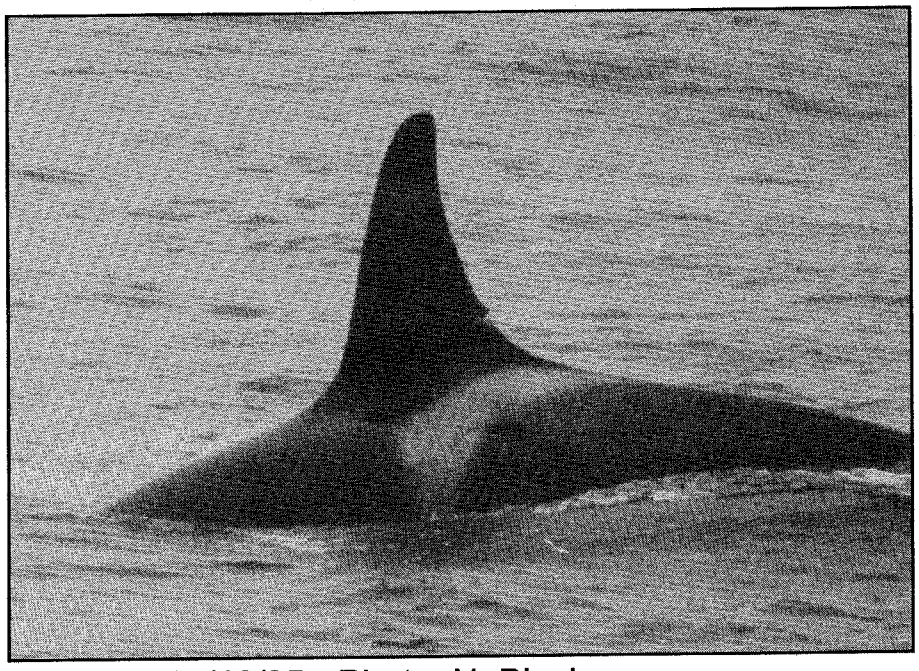
CA550 - 7/29/93 - Photo: J. Ford



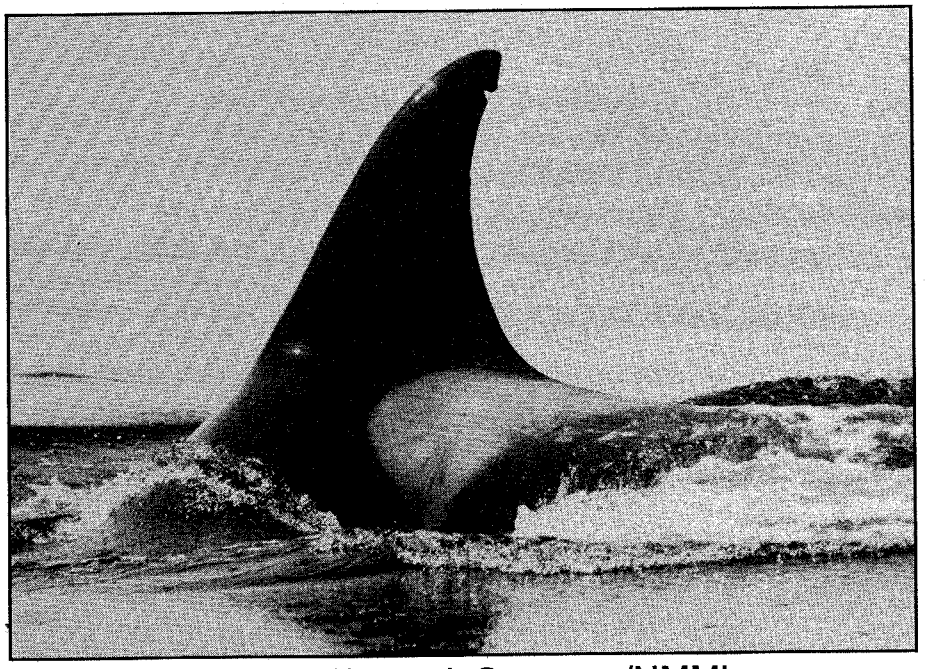
CA551 - 8/25/95 - Photo: G. Ellis



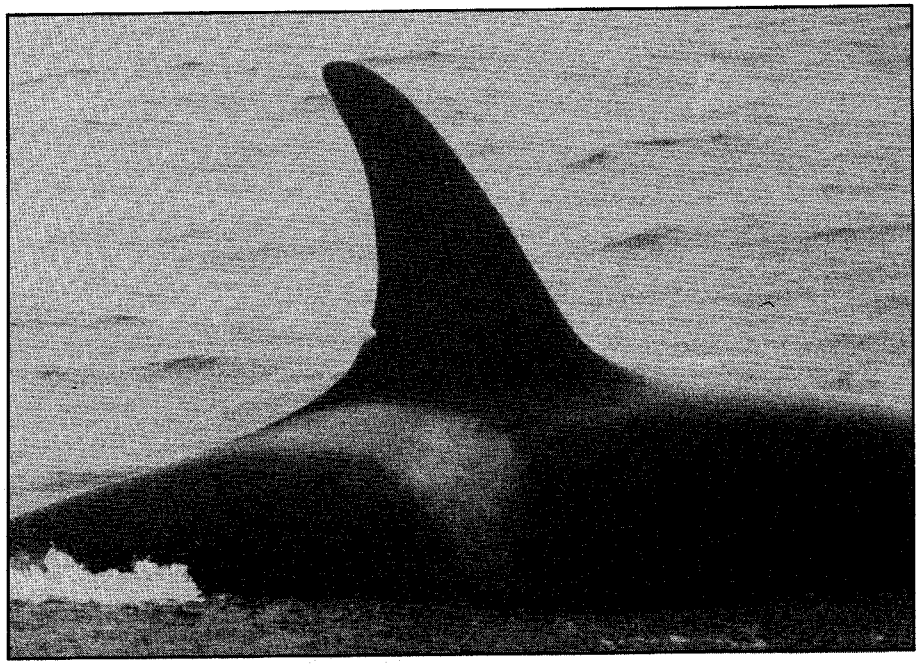
CA550 - 1/29/96 - Photo: E. Martin



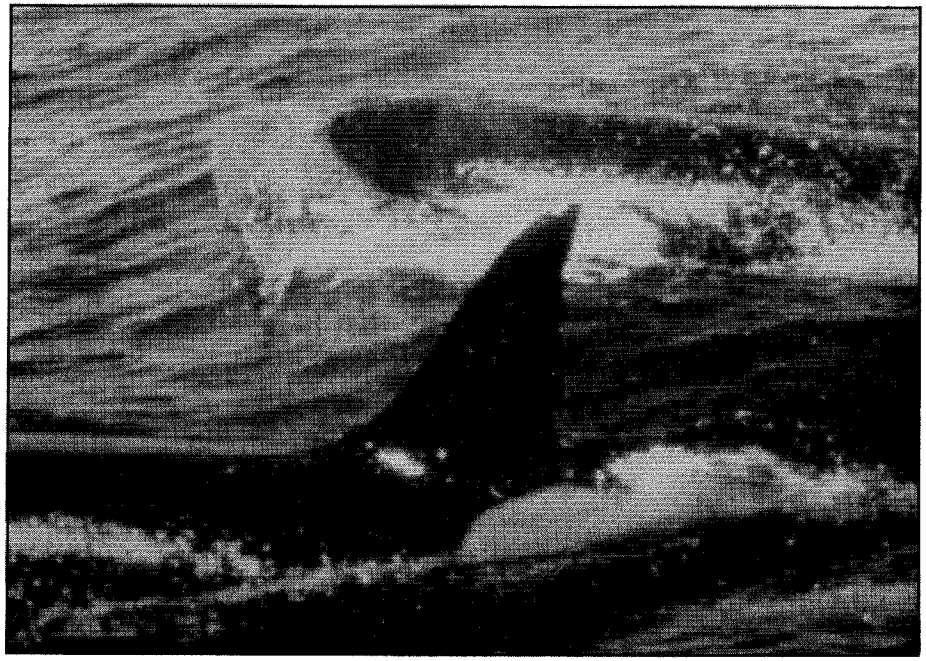
CA552 - 10/19/95 - Photo: N. Black



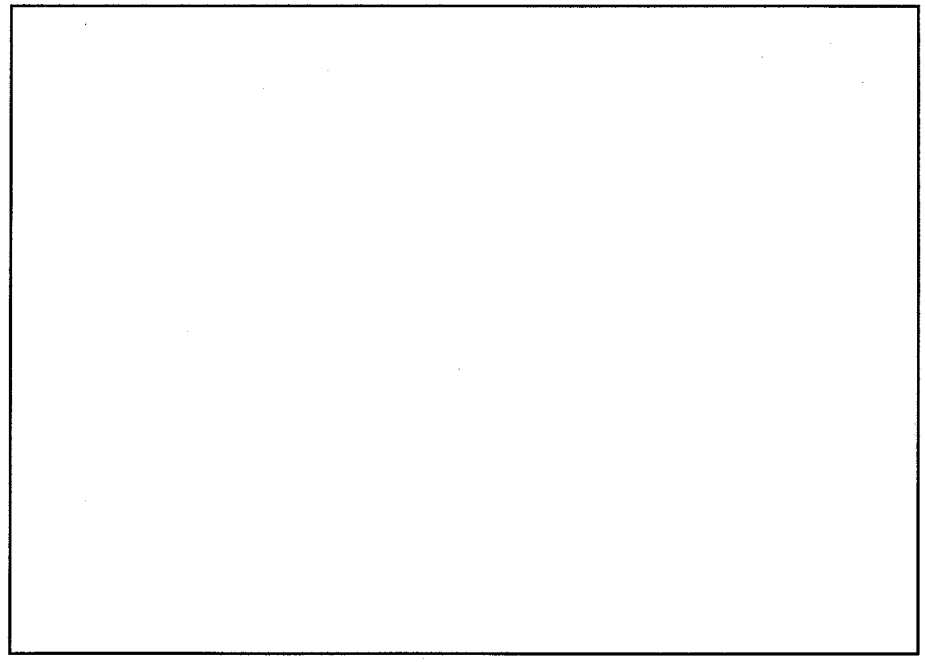
CA553 - 6/13/93 - Photo: J. Swenson/NMML

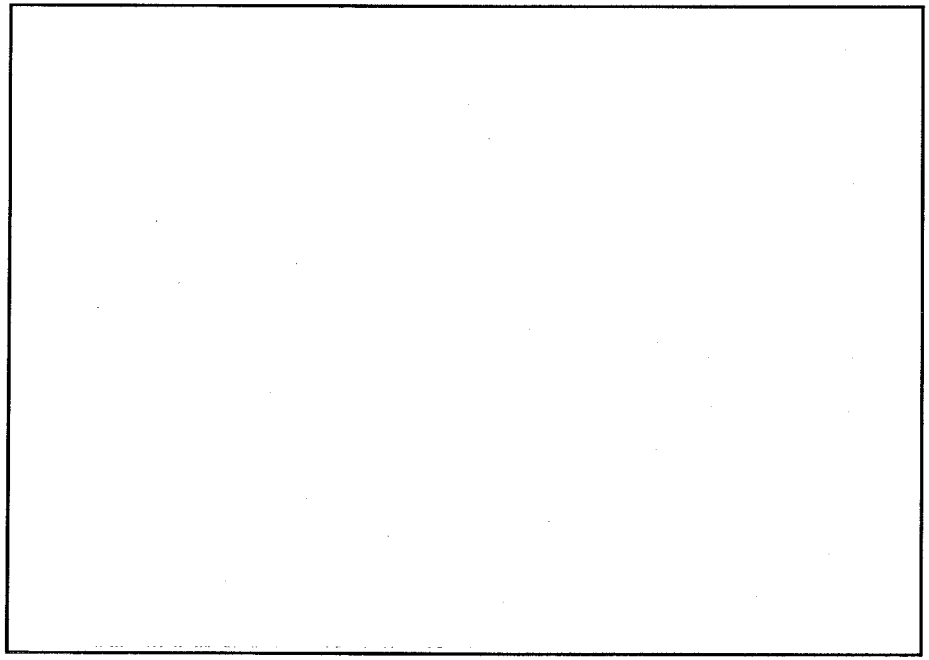


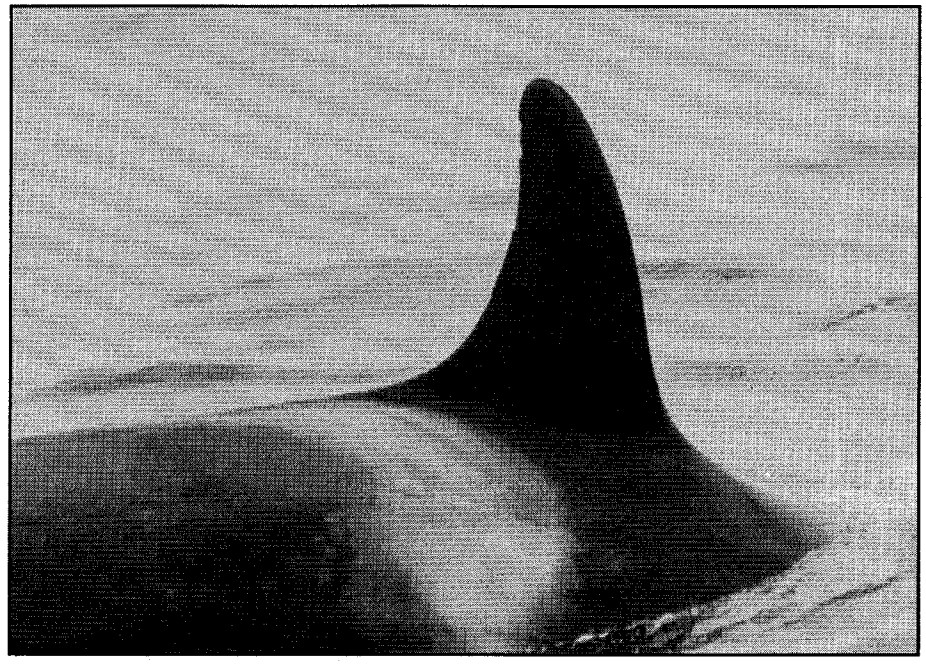
CA552 - 10/19/95 - Photo: N. Black



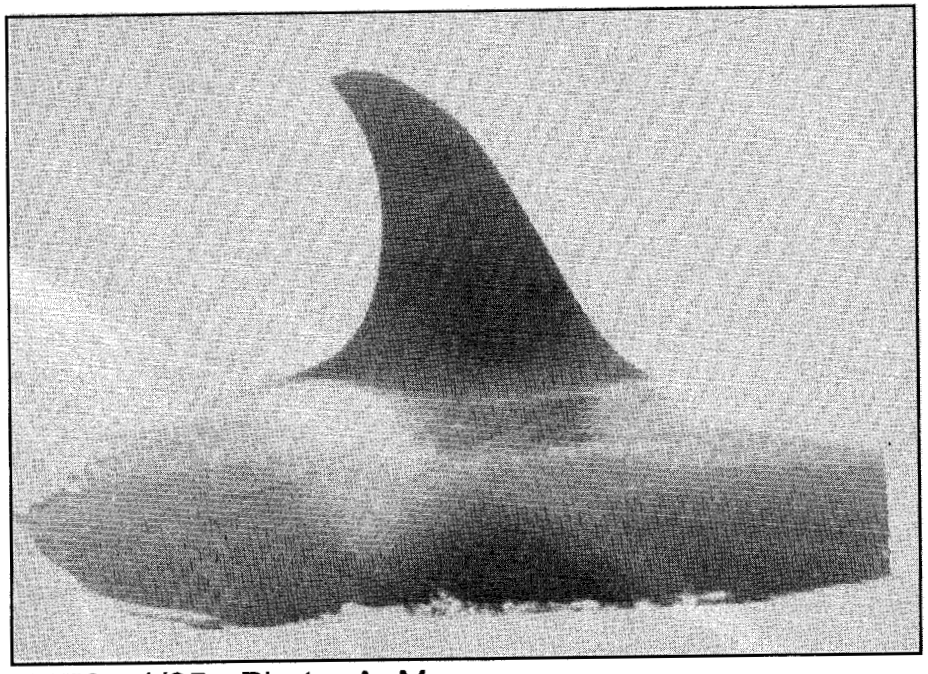
CA554 - 2/19/95 - Photo: J. Ames



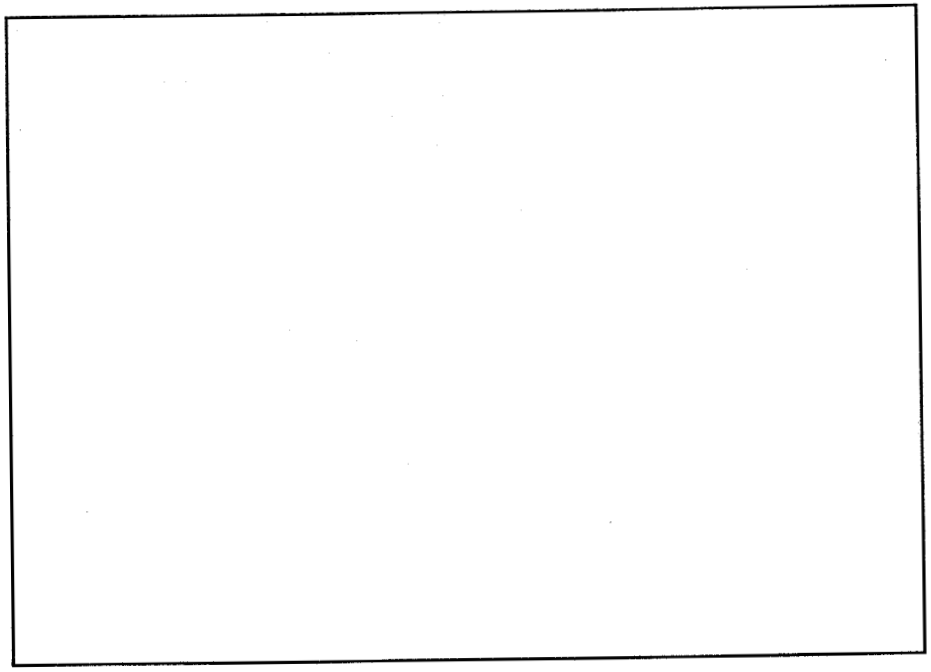


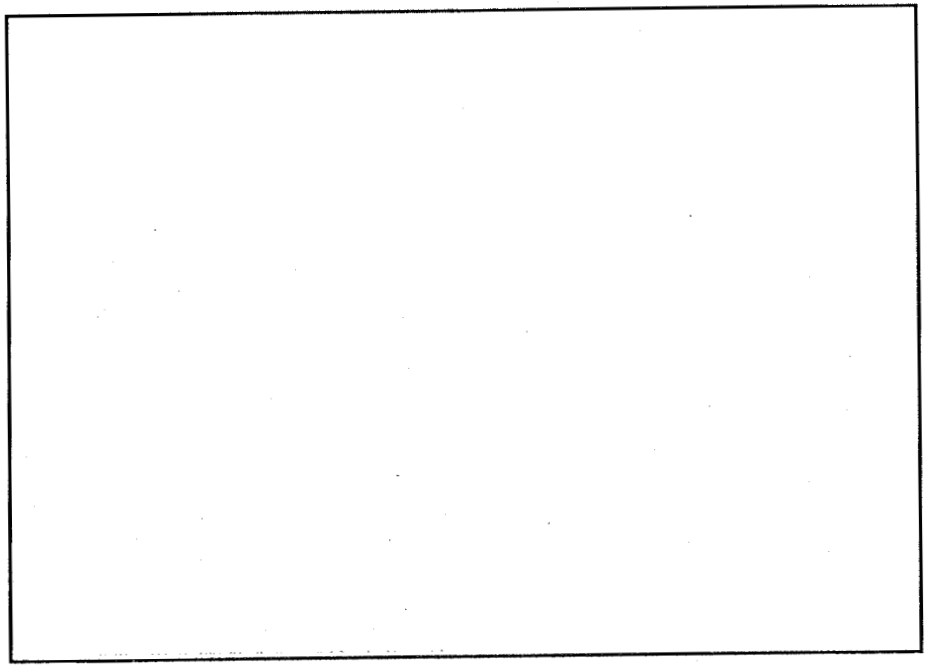


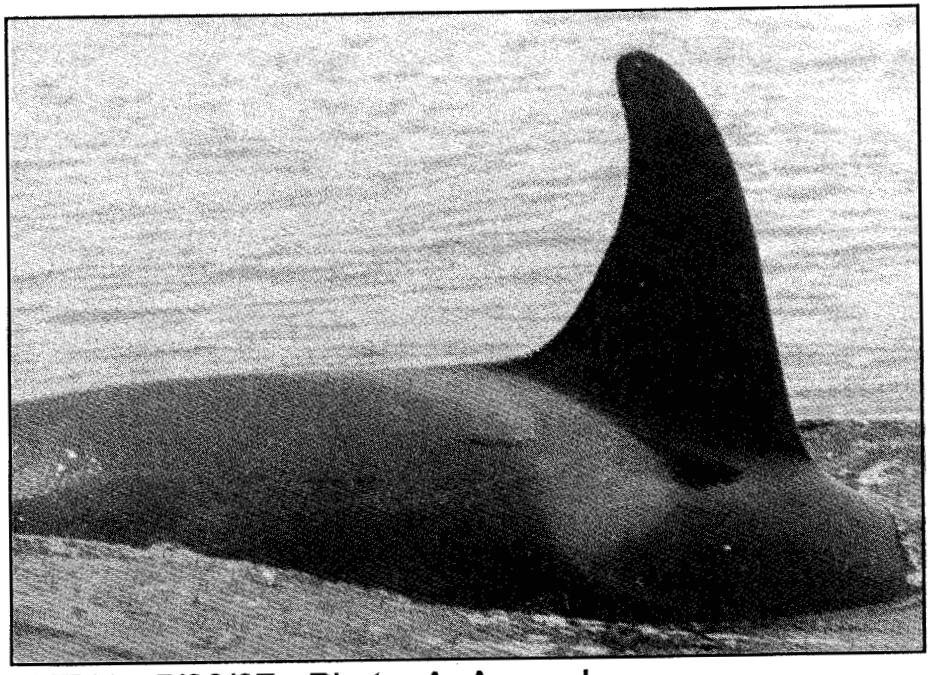
CA555 - 3/15/96 - Photo: N. Black



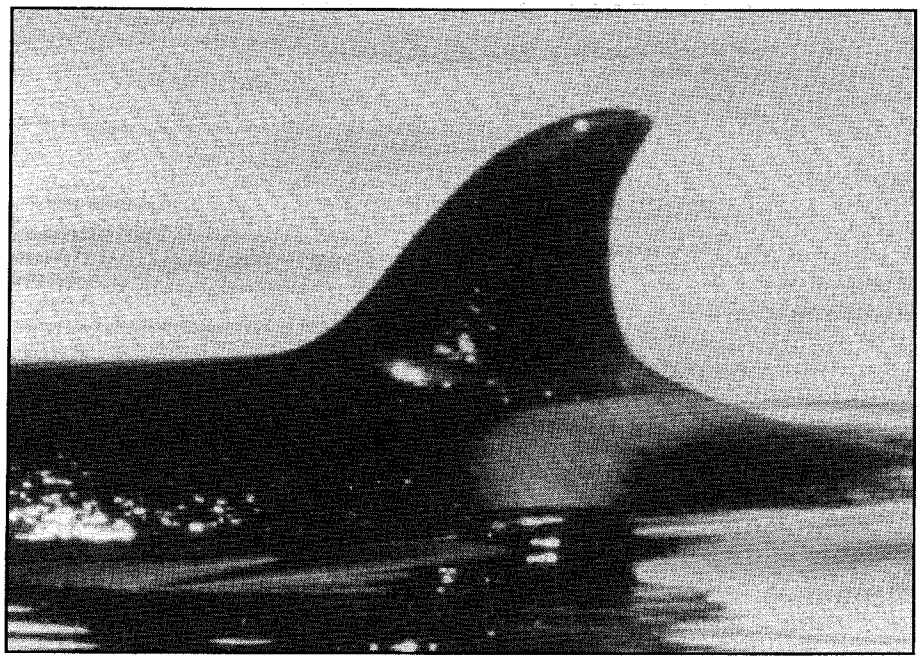
ME9 - 1/85 - Photo: A. Morgan



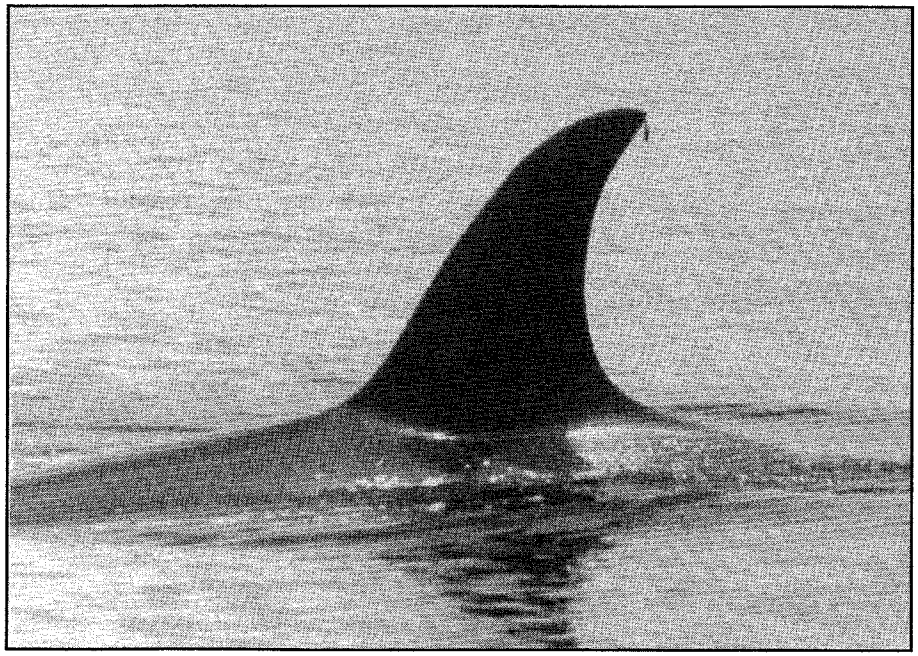




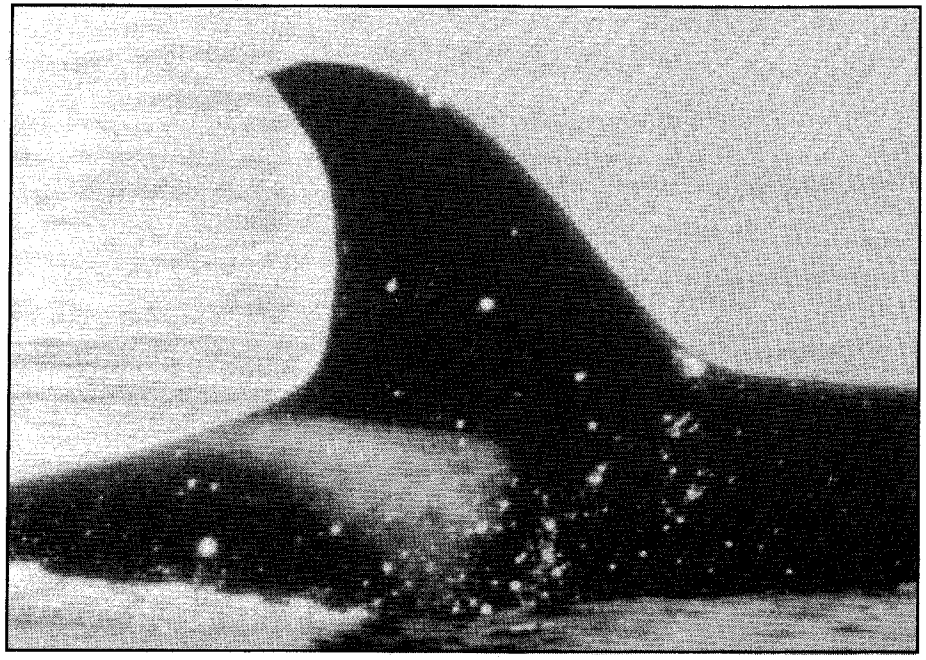
ME11 - 5/26/87 - Photo: A. Acevedo



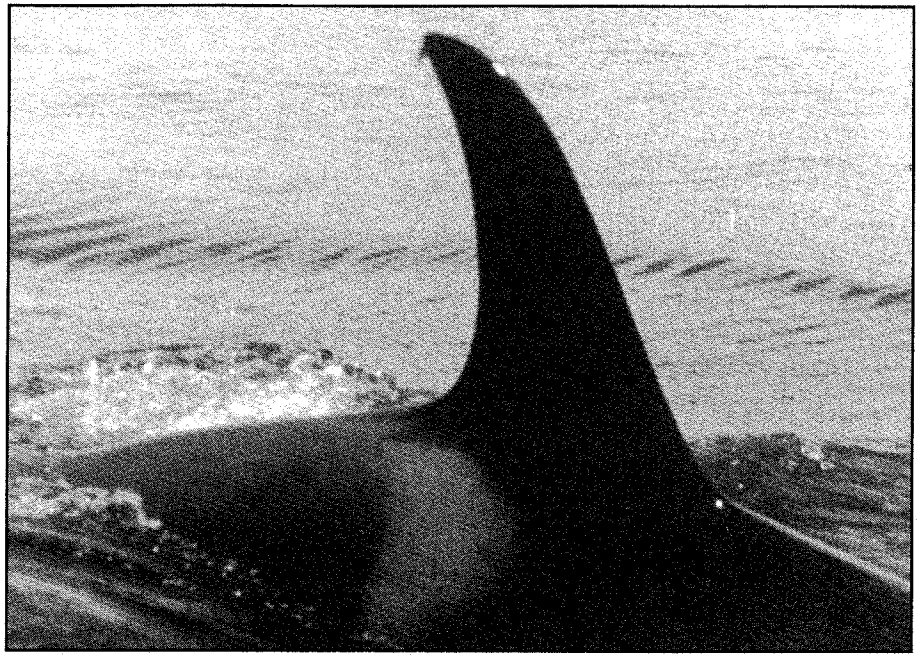
ME12 - 3/89 - Photo: S. Wick



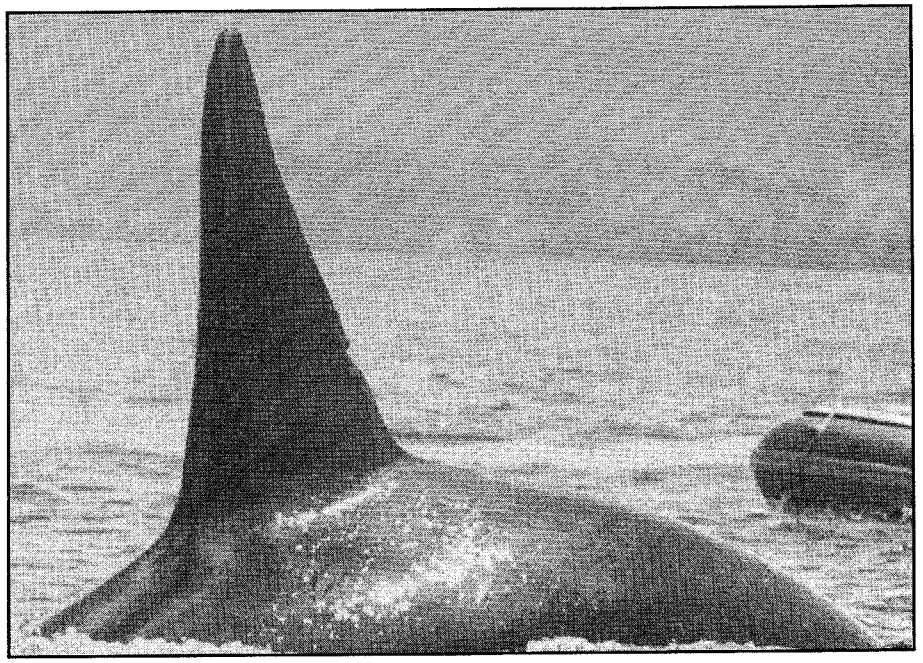
ME13 - 5/26/87 - Photo: A. Acevedo



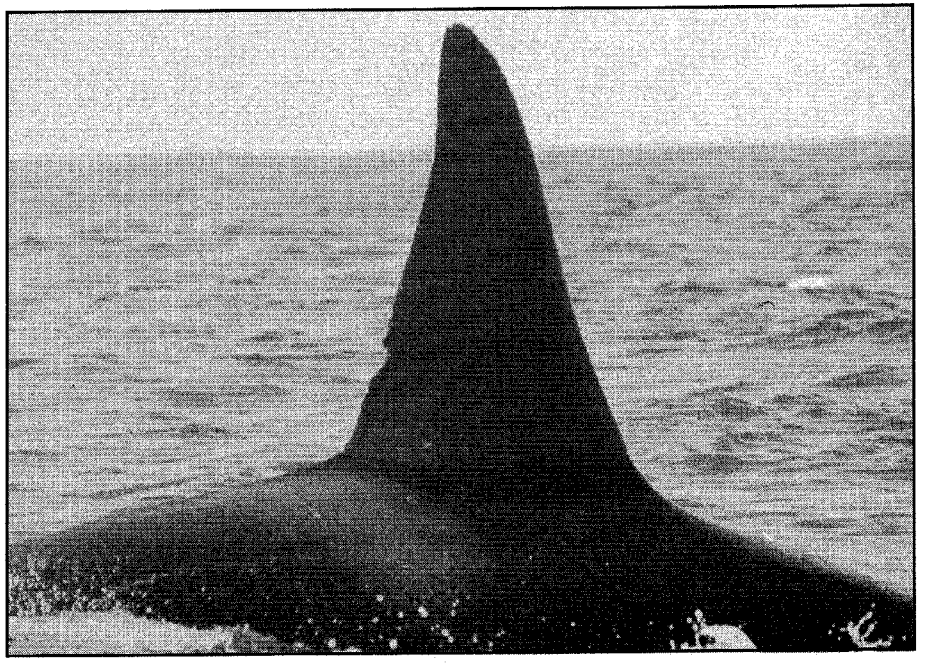
ME12 - 9/26/85 - Photo: Tershy/Strong



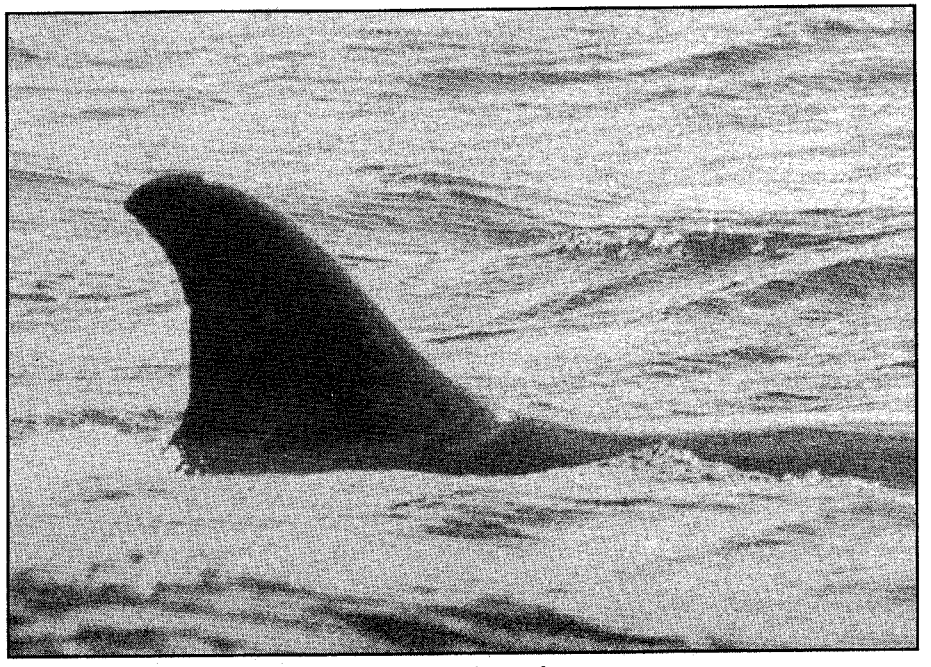
ME13 - 5/26/87 - Photo: A. Acevedo



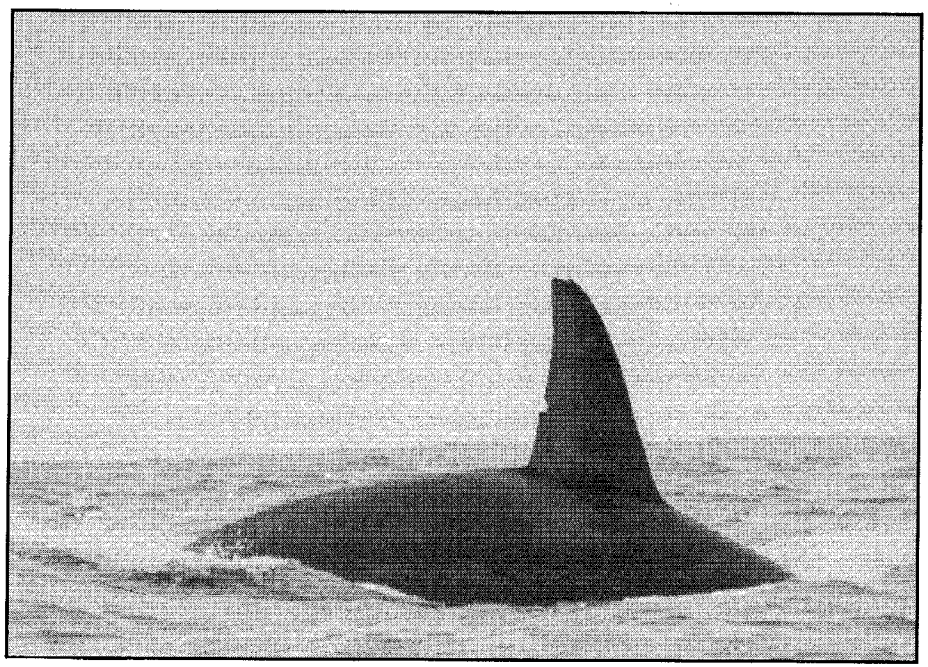
ME16 - 3/25/97 - Photo: J. Jacobsen



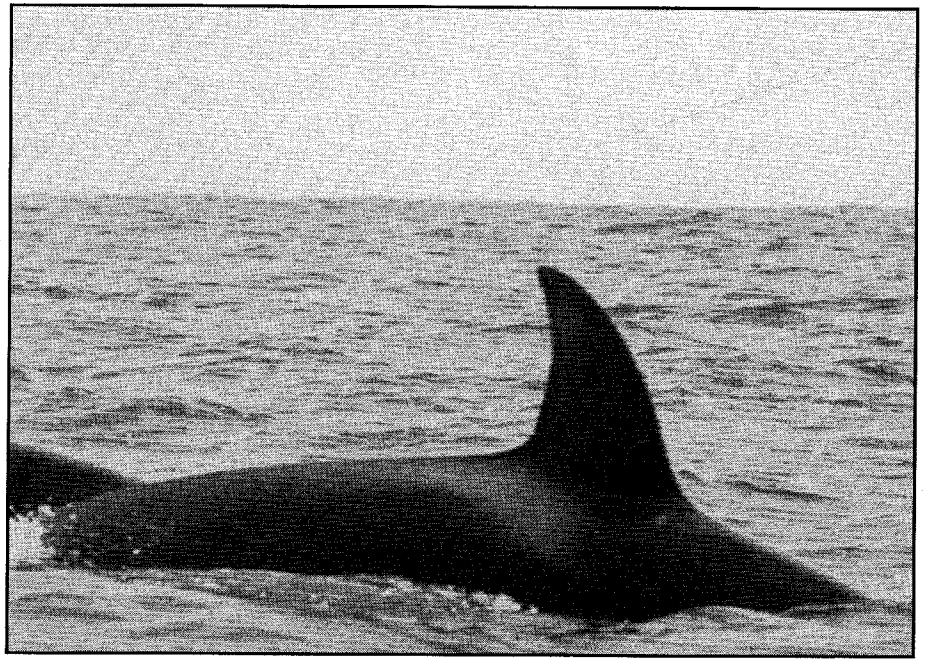
ME16 - 3/25/97 - Photo: J. Jacobsen



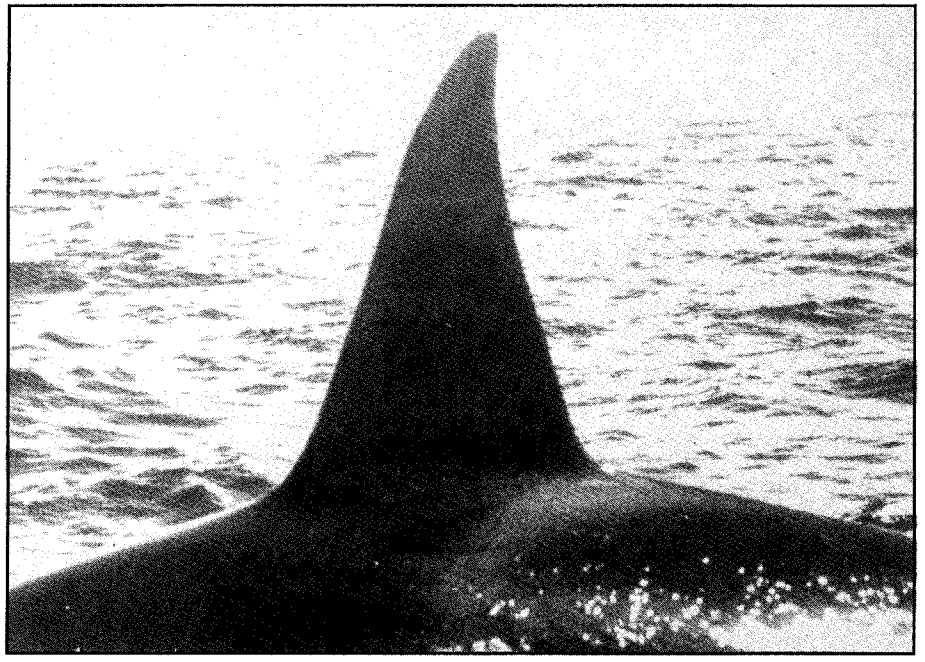
ME17 - 2/23/89 - Photo: J. Jacobsen



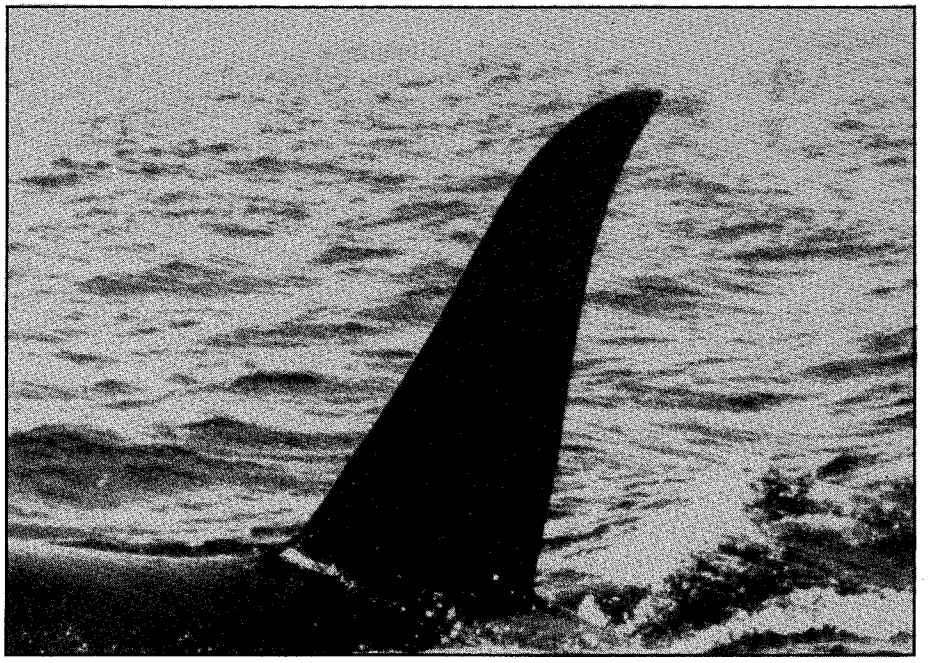
ME18 - 3/25/97 - Photo: J. Jacobsen



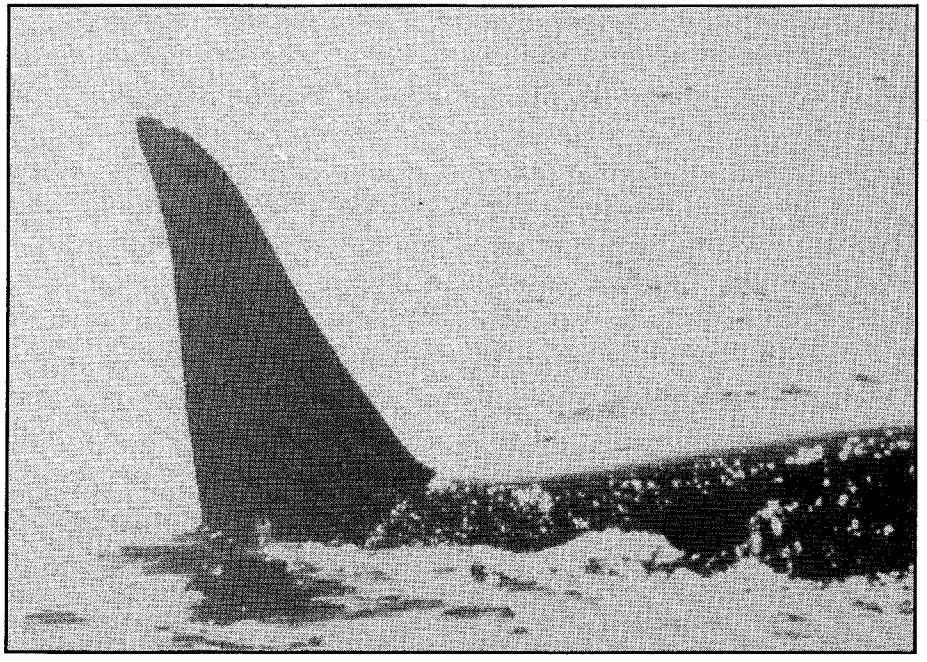
ME19 - 3/25/97 - Photo: J. Jacobsen



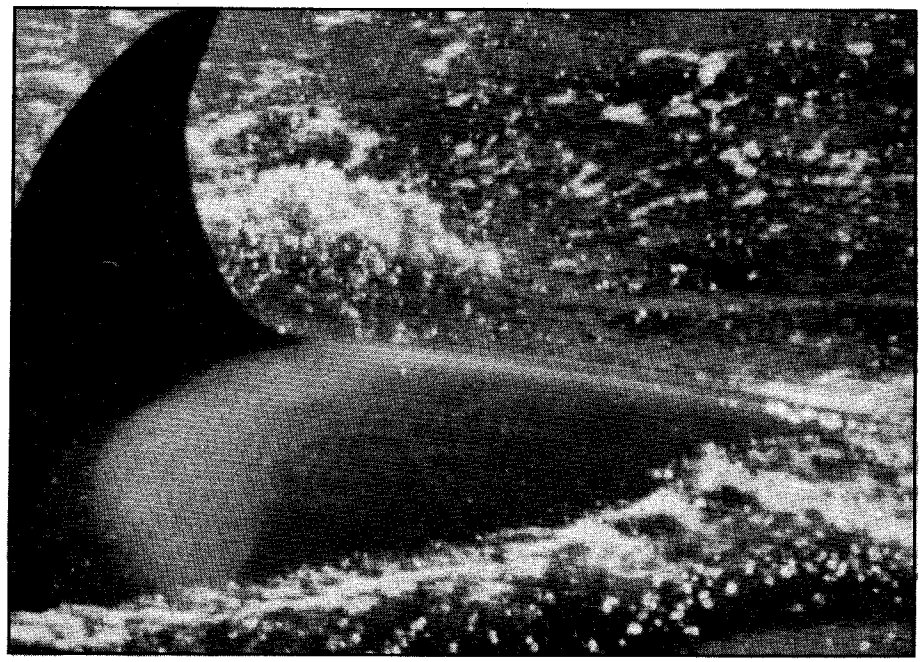
ME20 - 2/19/90 - Photo: C. Alvarez



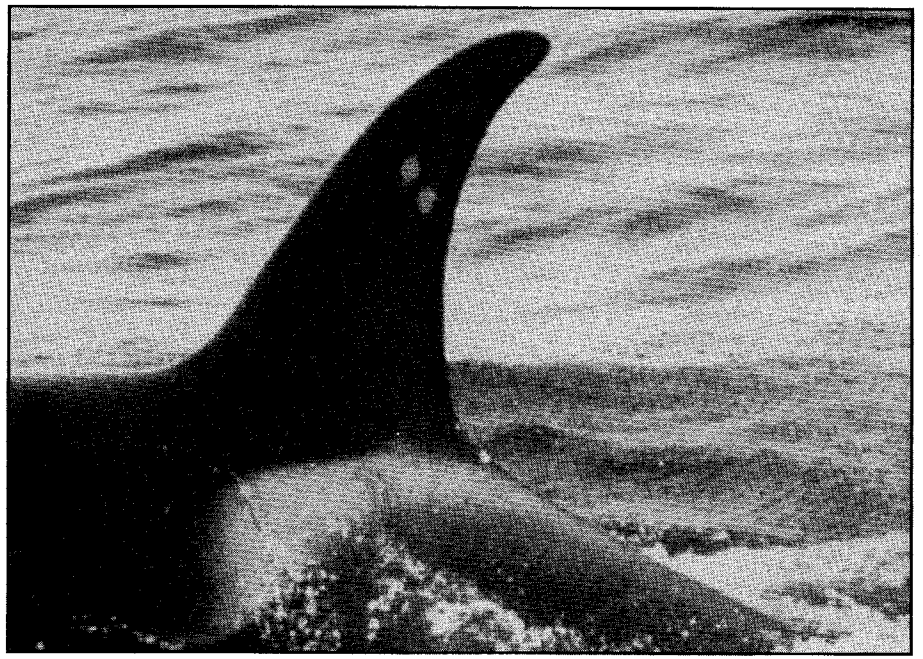
ME21 - 2/19/90 - Photo: C. Alvarez



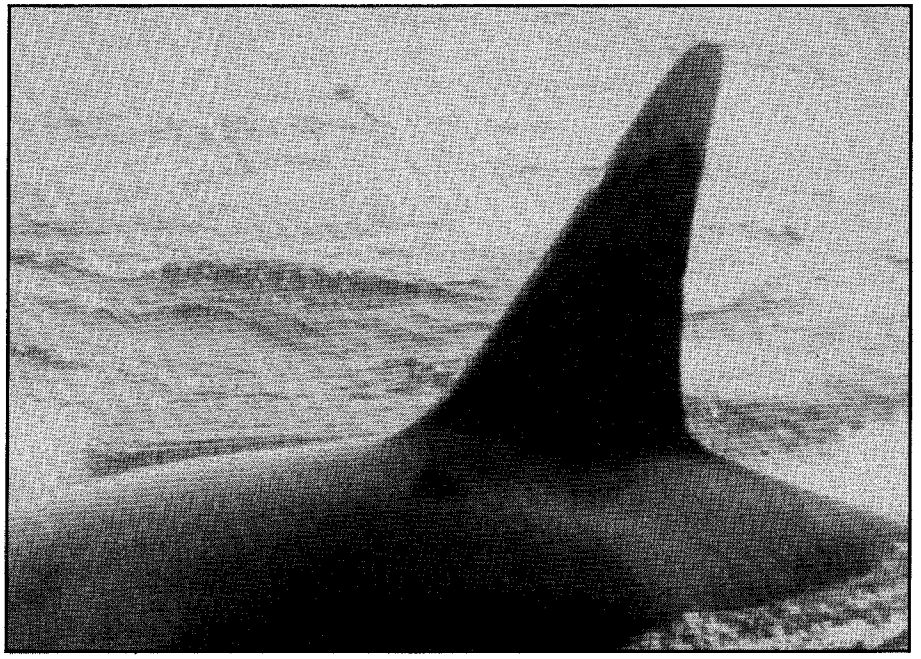
ME21 - 2/19/90 - Photo: C. Alvarez



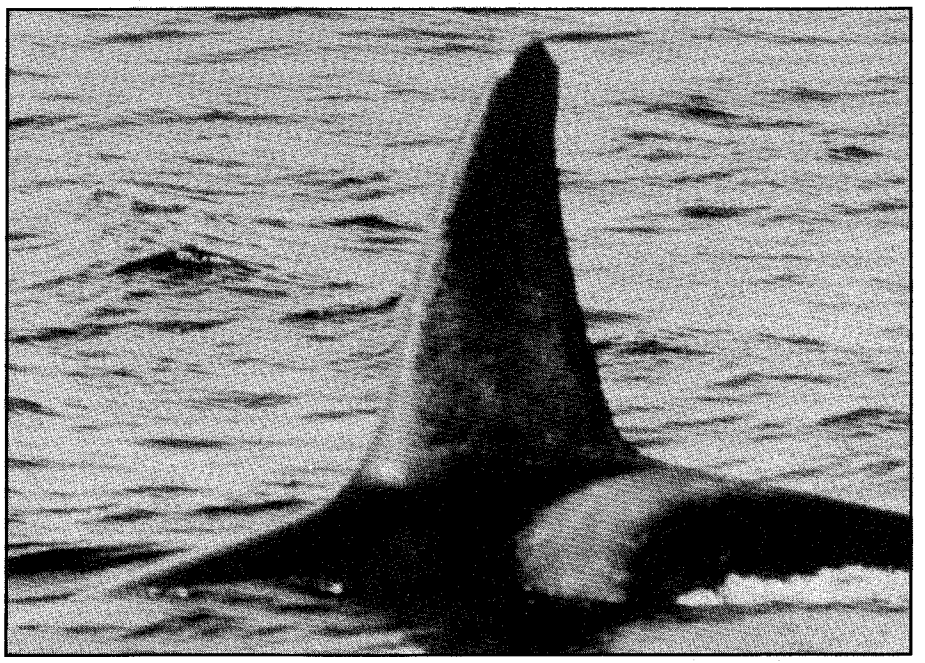
ME29 - 4/6/89 - Photo: S. Chavez



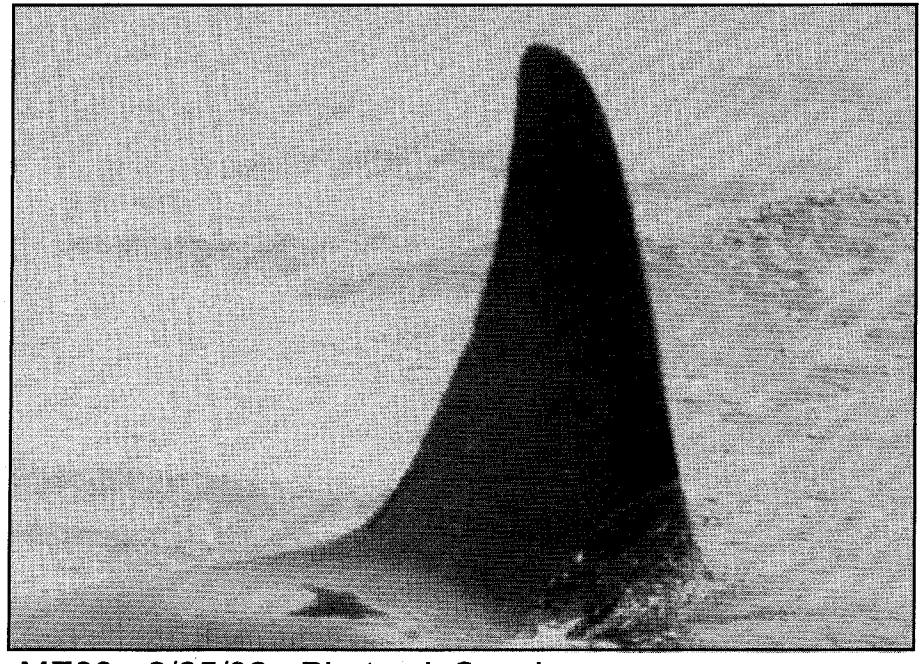
ME31 - 4/6/89 - Photo: T. Norris



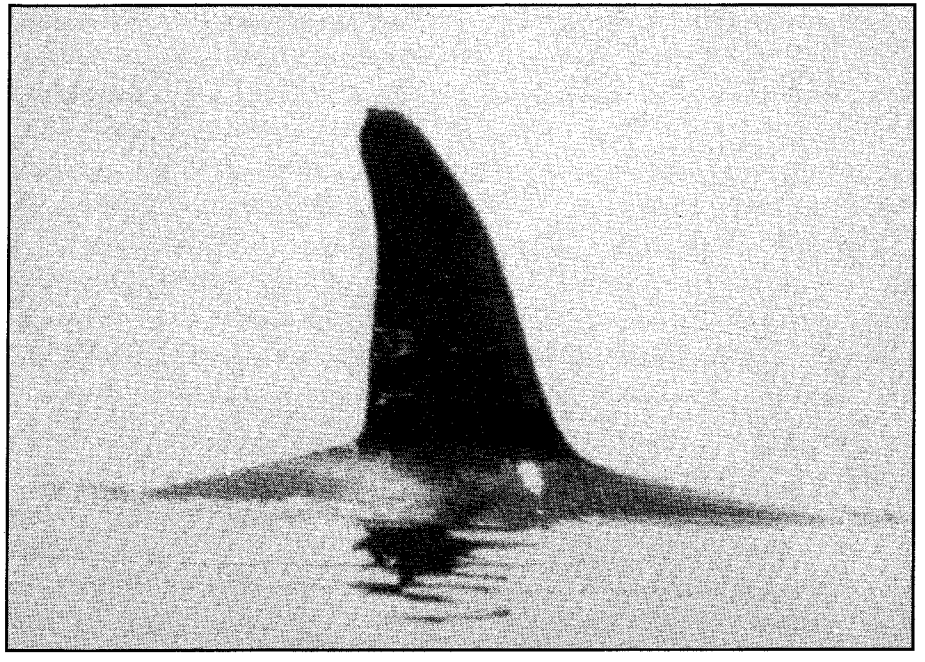
ME33 - 2/25/92 - Photo: J. Sanchez



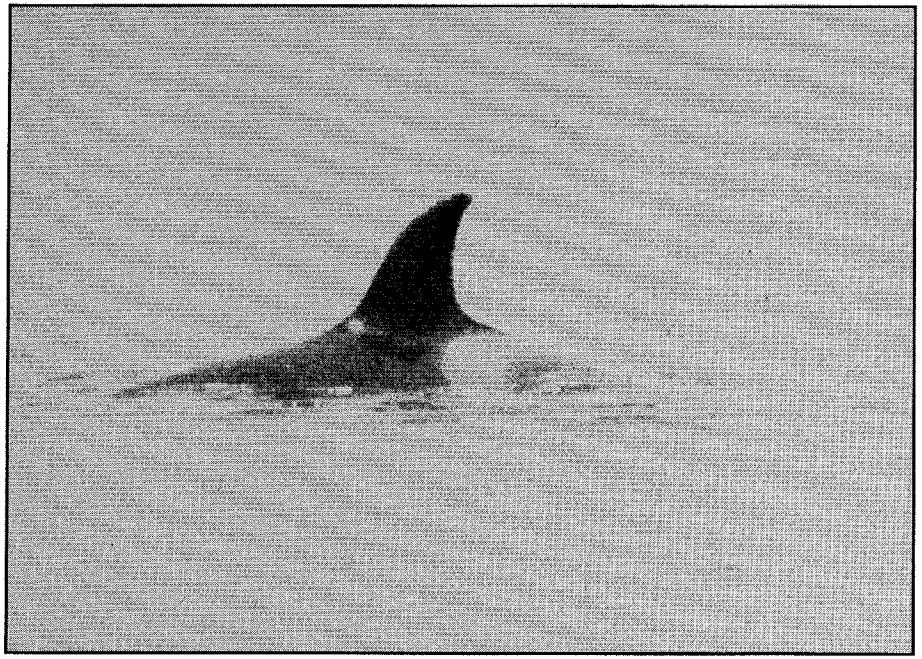
ME36 - 3/17/95 - Photo: P. Folkens



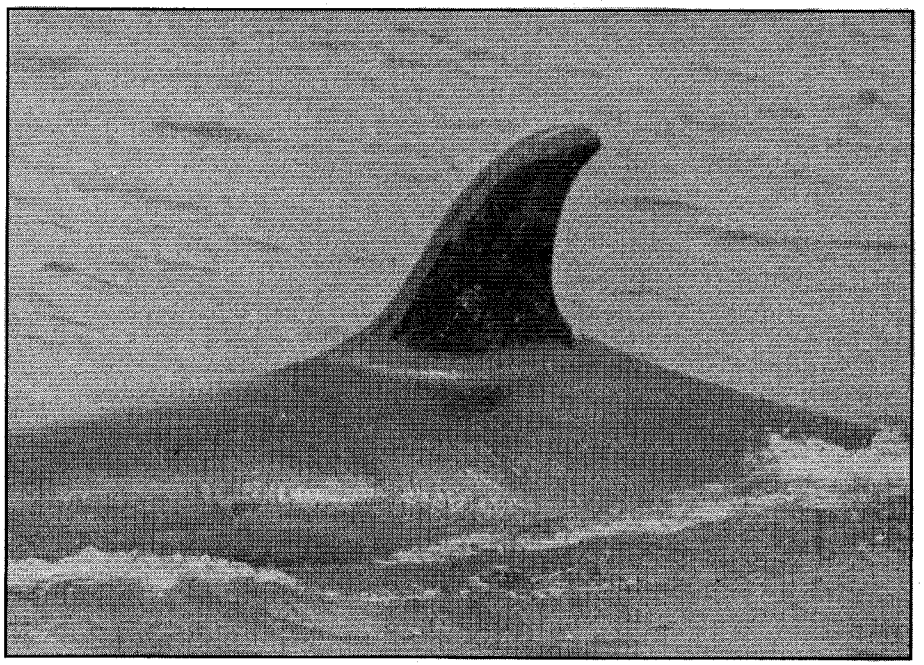
ME33 - 2/25/92 - Photo: J. Sanchez



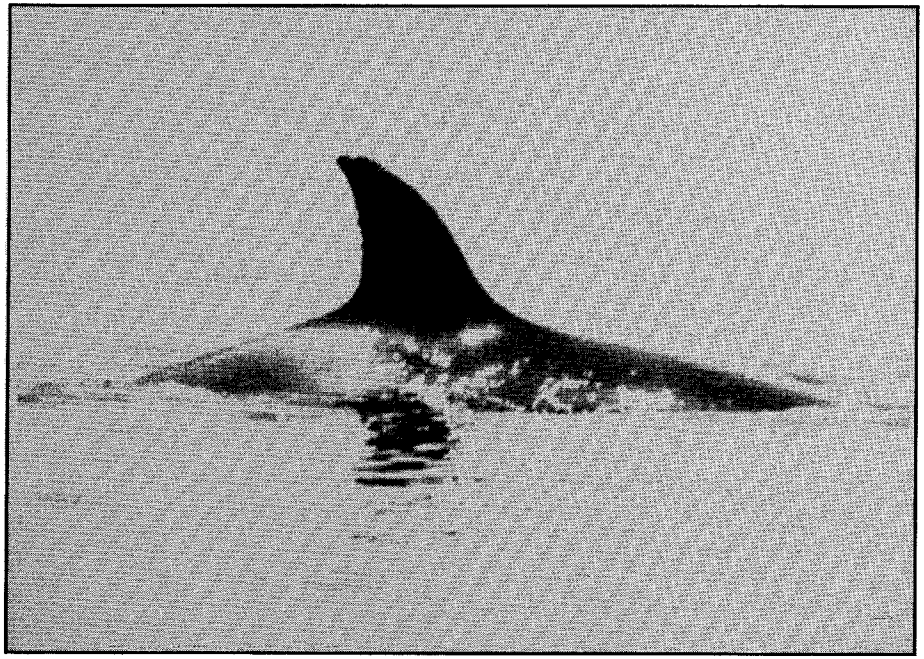
ME36 - 5/24/91 - Photo: J. Sanchez



ME37 - 5/24/91 - Photo: J. Sanchez

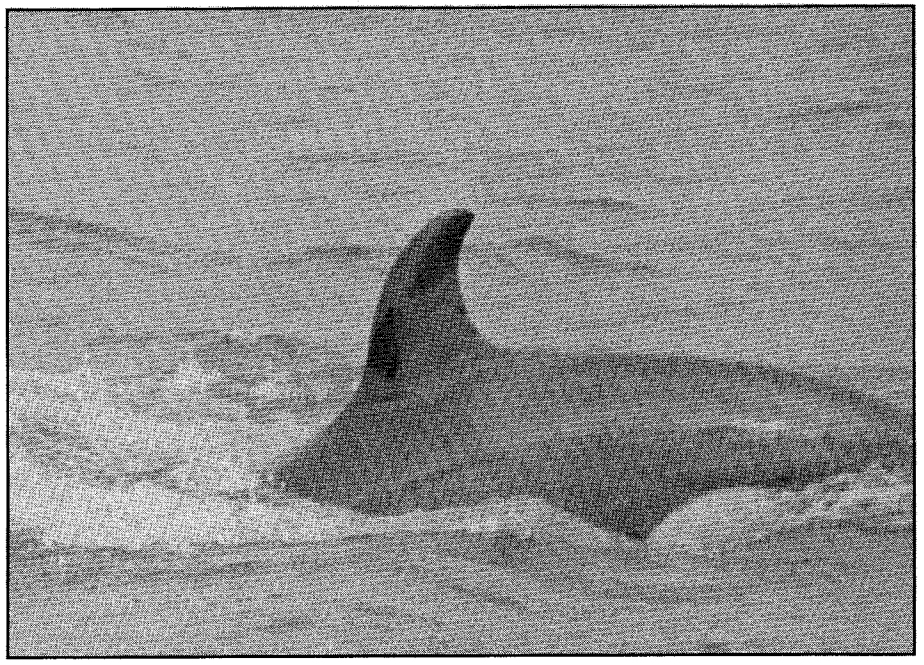


ME38 - 9/13/95 - Photo: S. Chavez

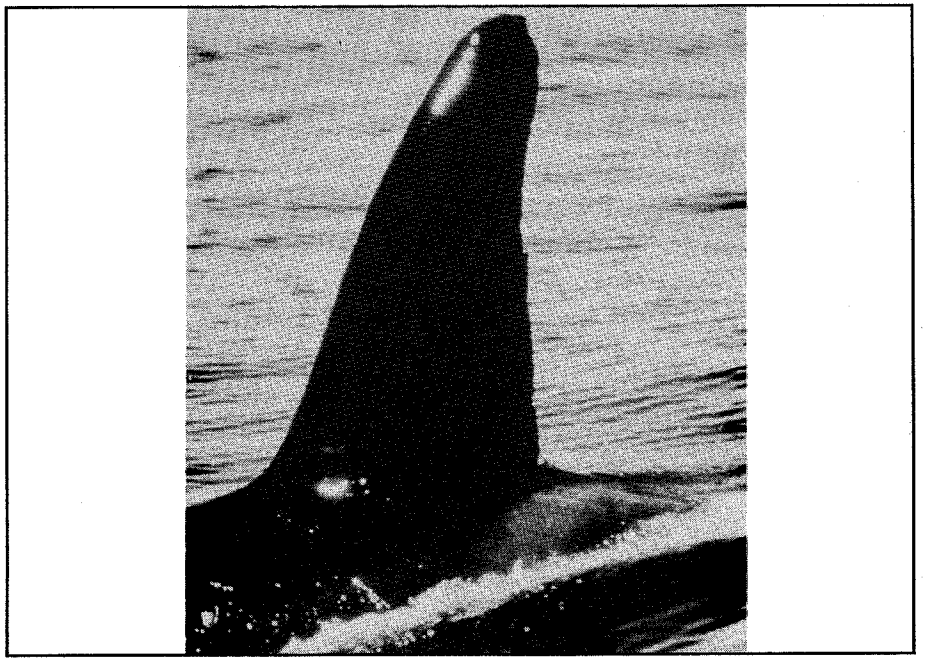


ME37 - 5/24/91 - Photo: J. Sanchez

ME38 - 9/13/95 - Photo: S. Chavez

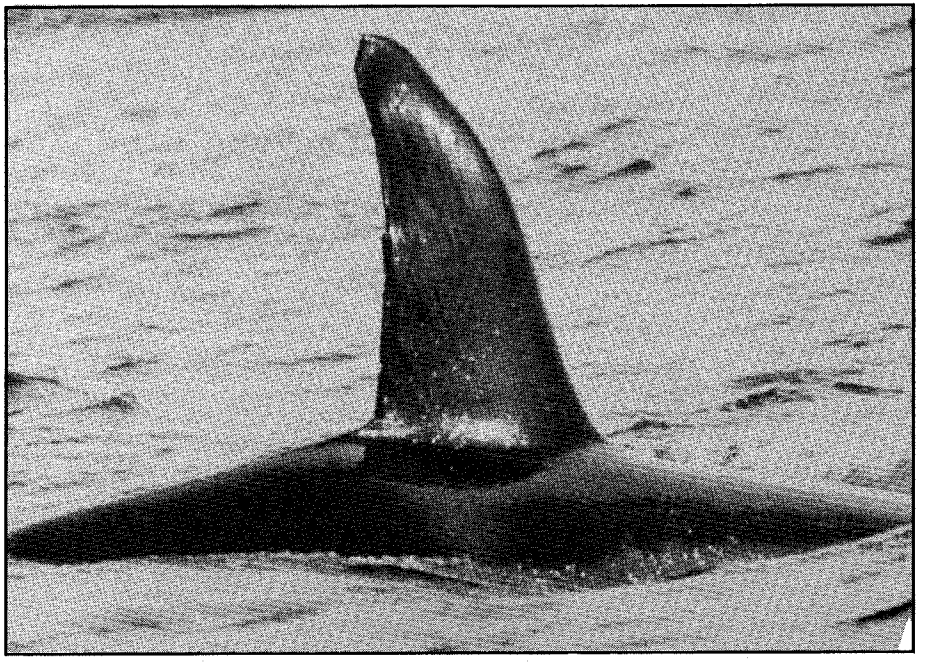


ME39 - 9/13/95 - Photo: S. Chavez

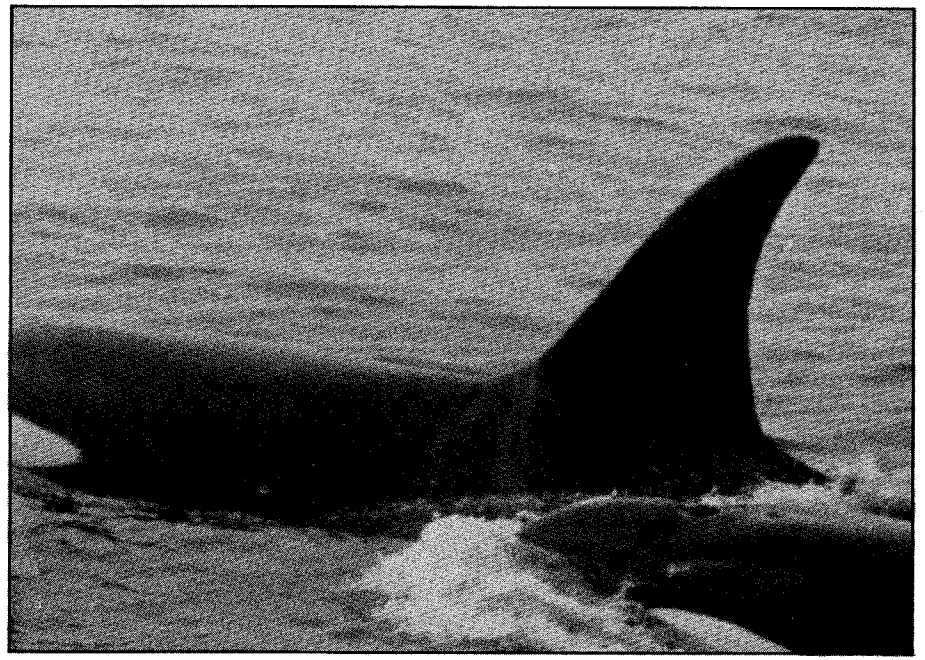


ME40 - 2/93 - Photo: P. Folkens

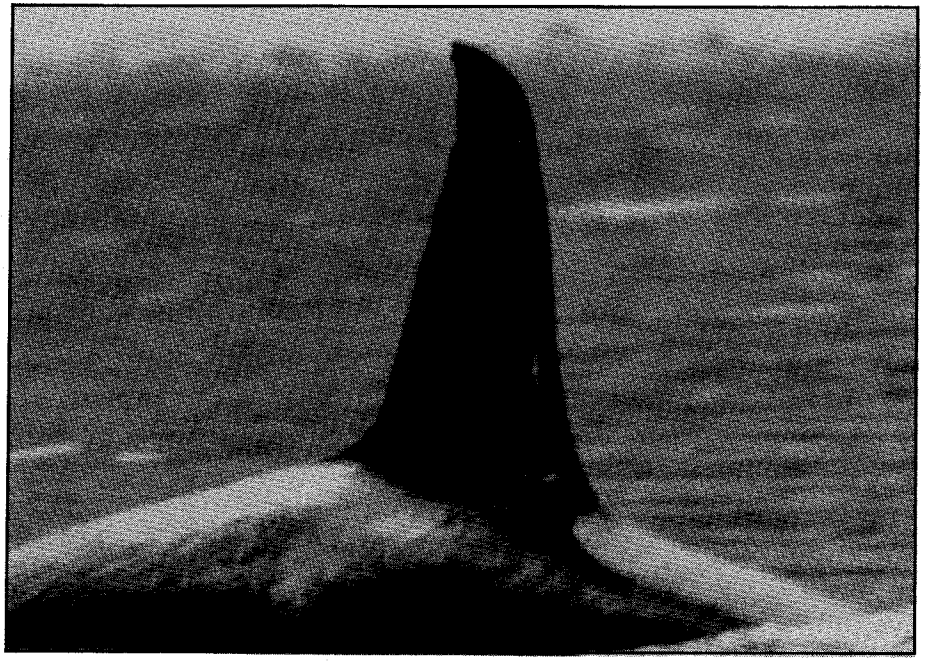
ME39 - 9/13/95 - Photo: S. Chavez



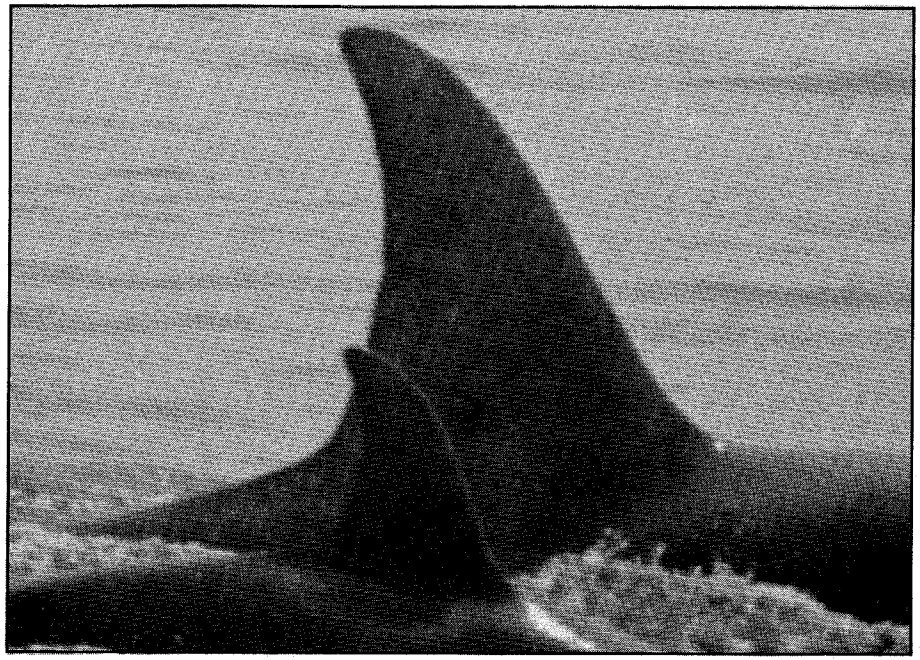
ME40 - 3/17/87 - Photo: R. Sears/MICS



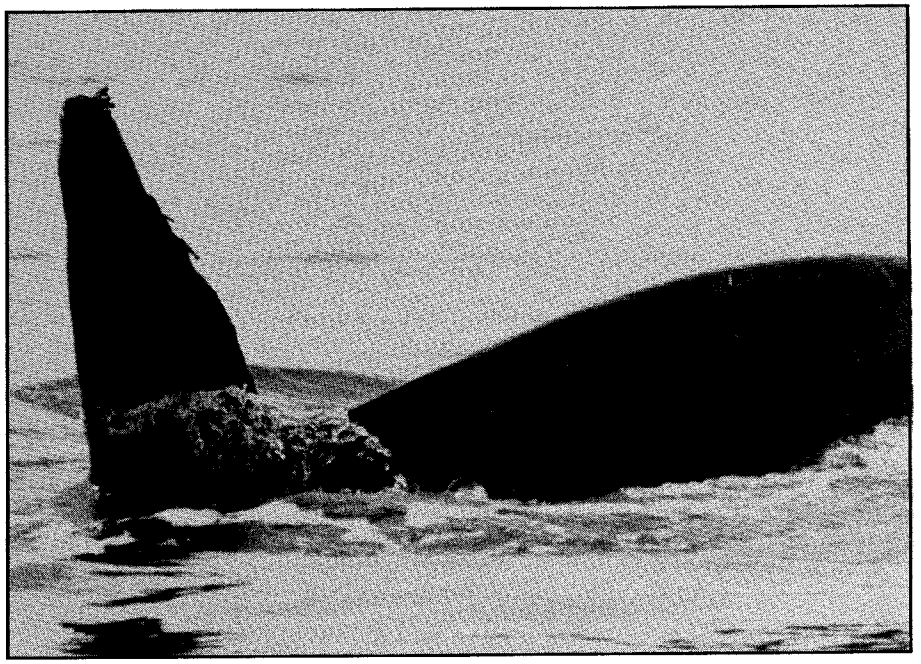
ME42 - 2/25/92 - Photo: J. Sanchez



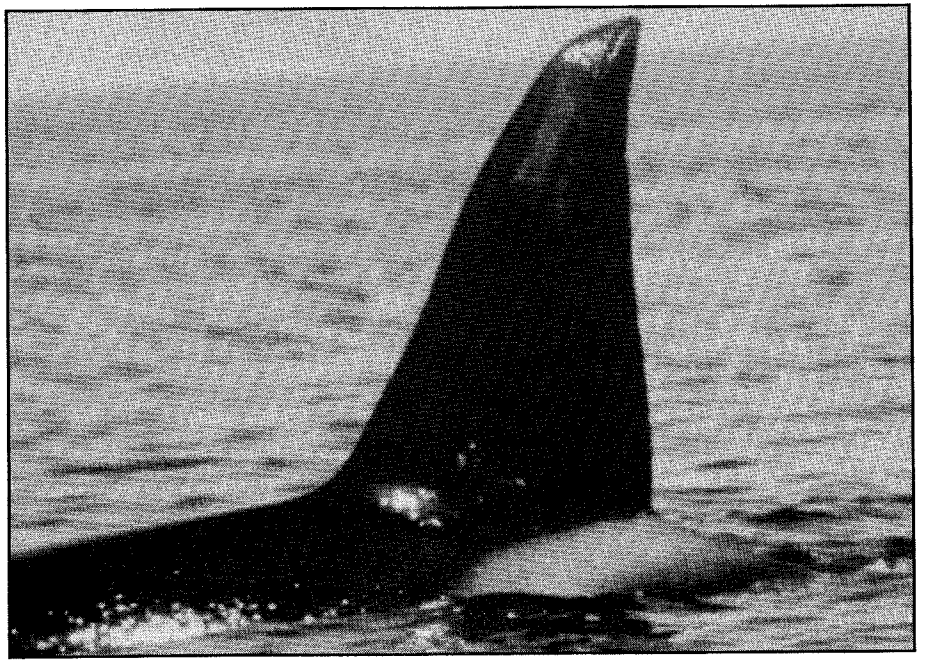
ME41 - 7/9/85 - Photo: Tershy/Strong



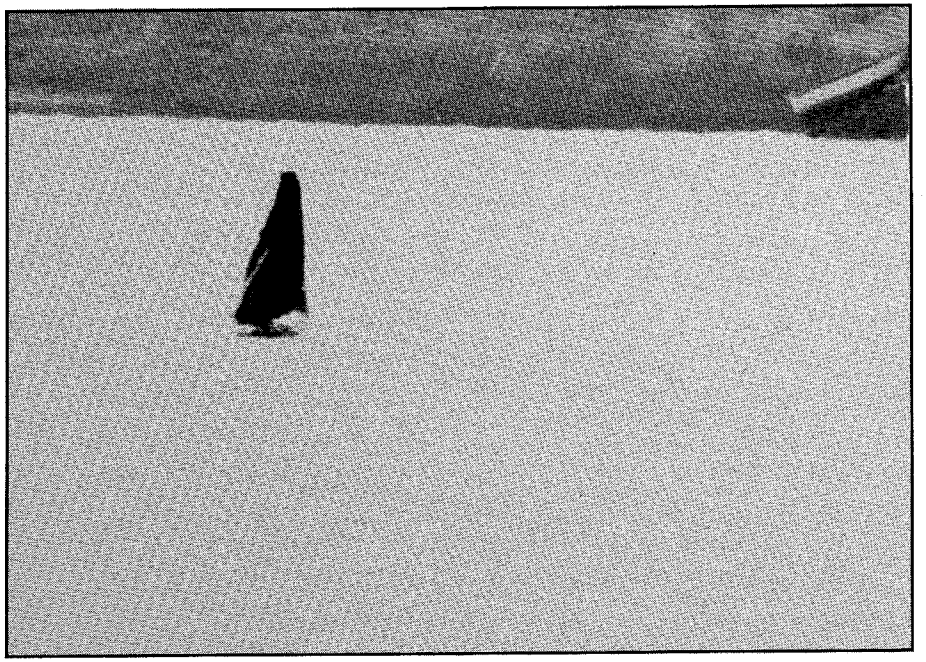
ME42 - Summer 93 - Photo: J. Salinas



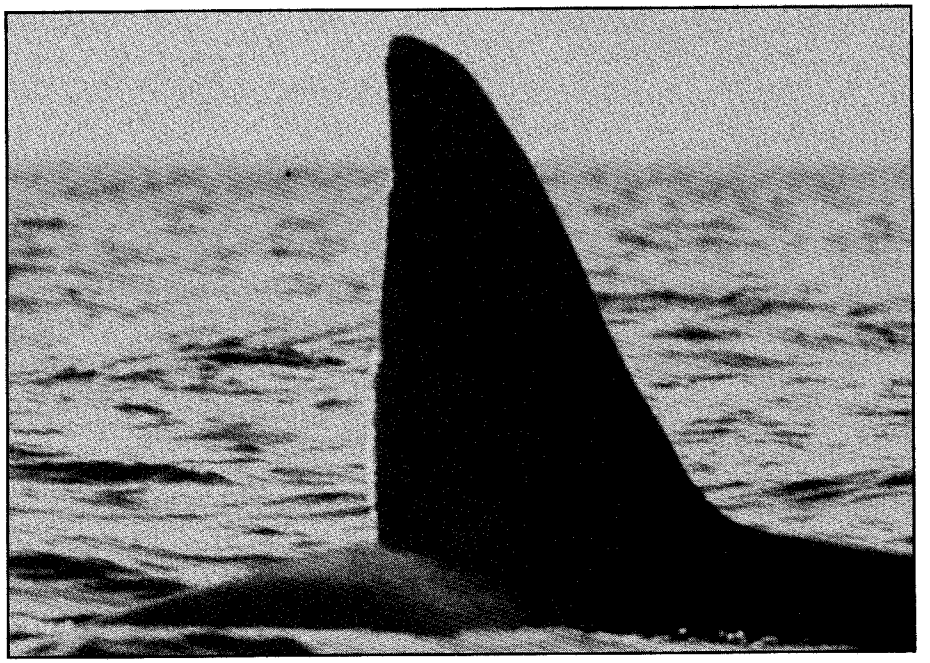
ME45 - 10/22/92 - Photo: A. Jaramillo



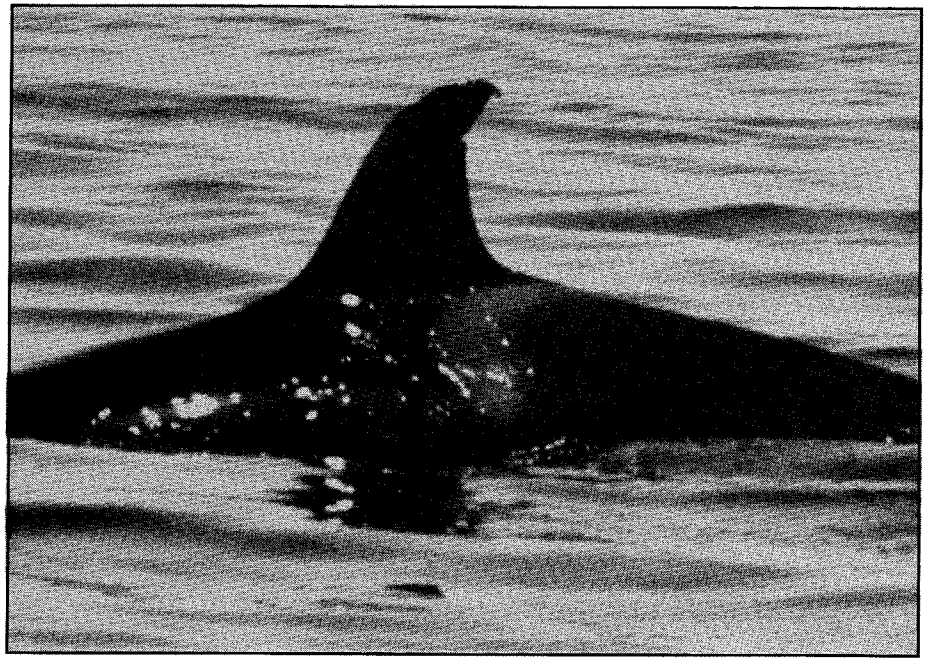
ME47 - 6/20/84 - Photo: Tershy/Strong



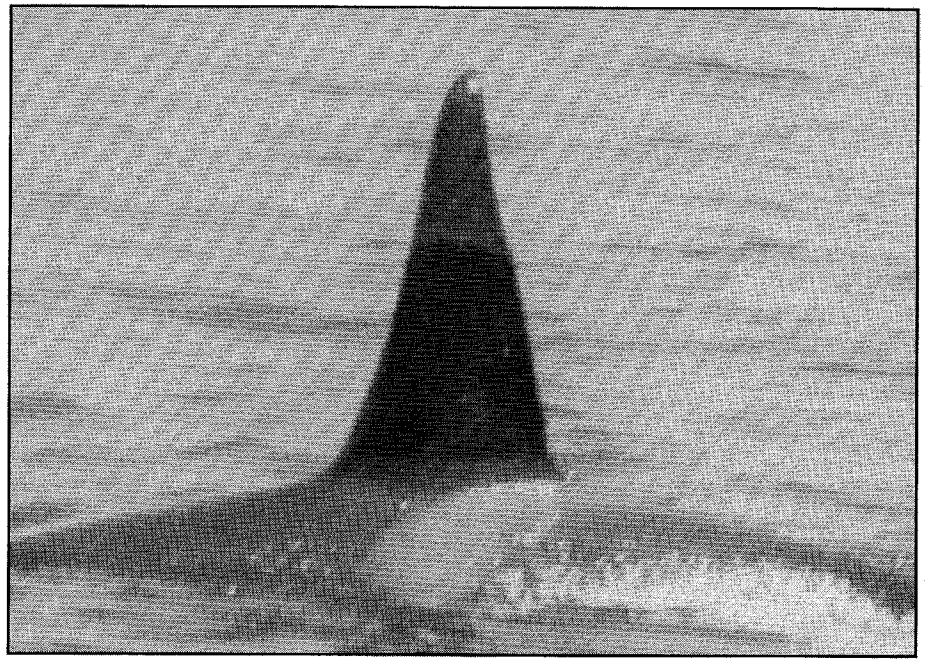
ME45 - 10/22/92 - Photo: A. Jaramillo



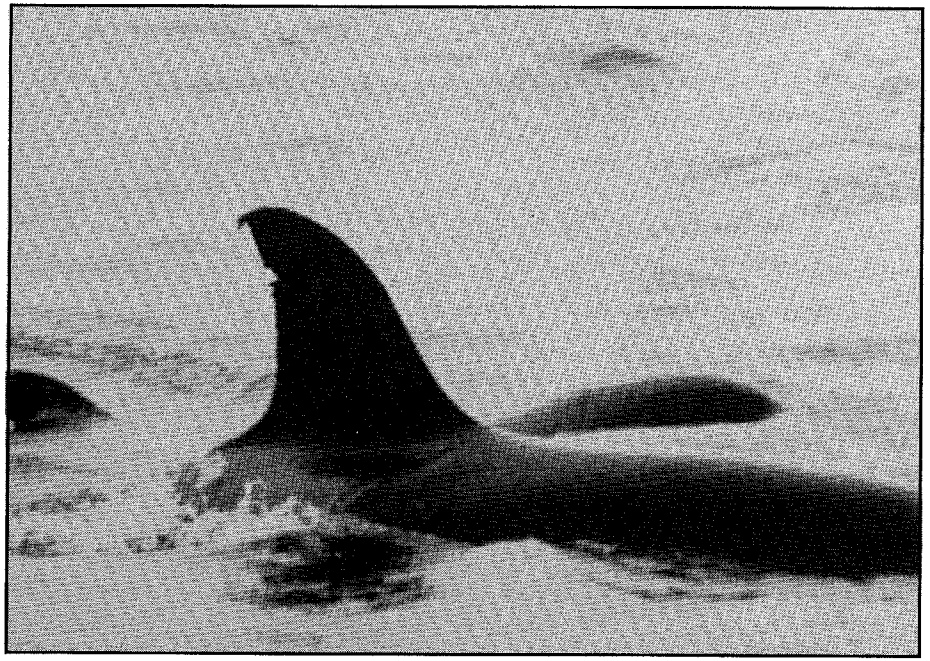
ME47 - 3/2/86 - Photo: Tershy/Strong



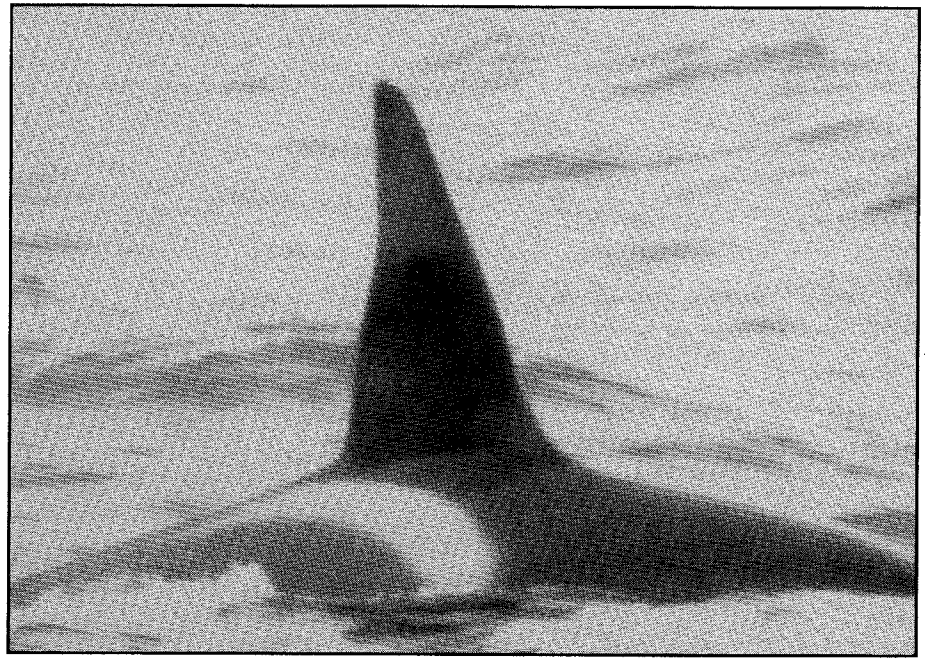
ME48 - 6/28/93 - Photo: L. Enriquez



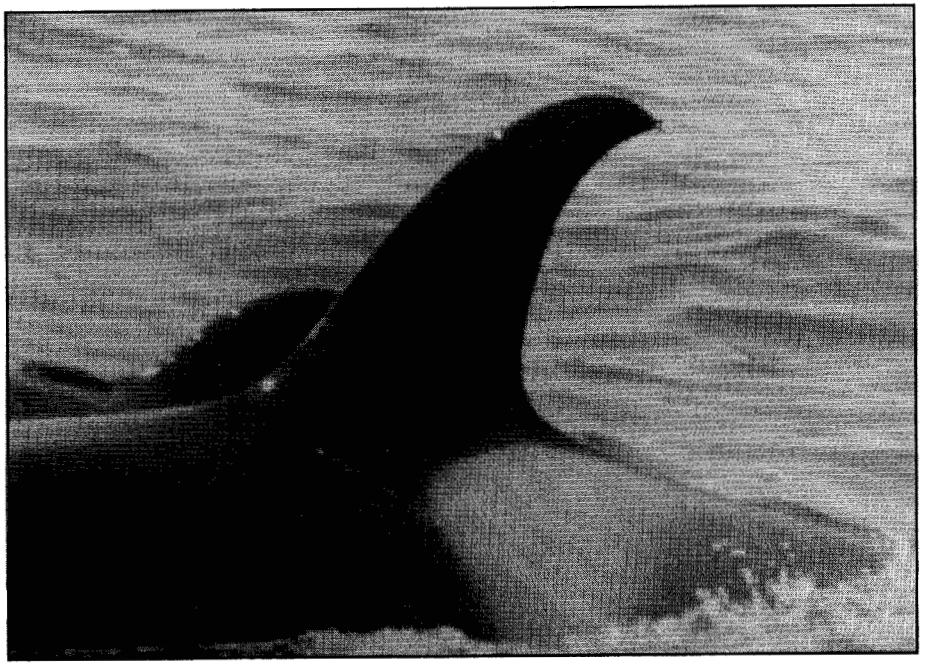
ME49 - 4/7/94 - Photo: D. Gendron



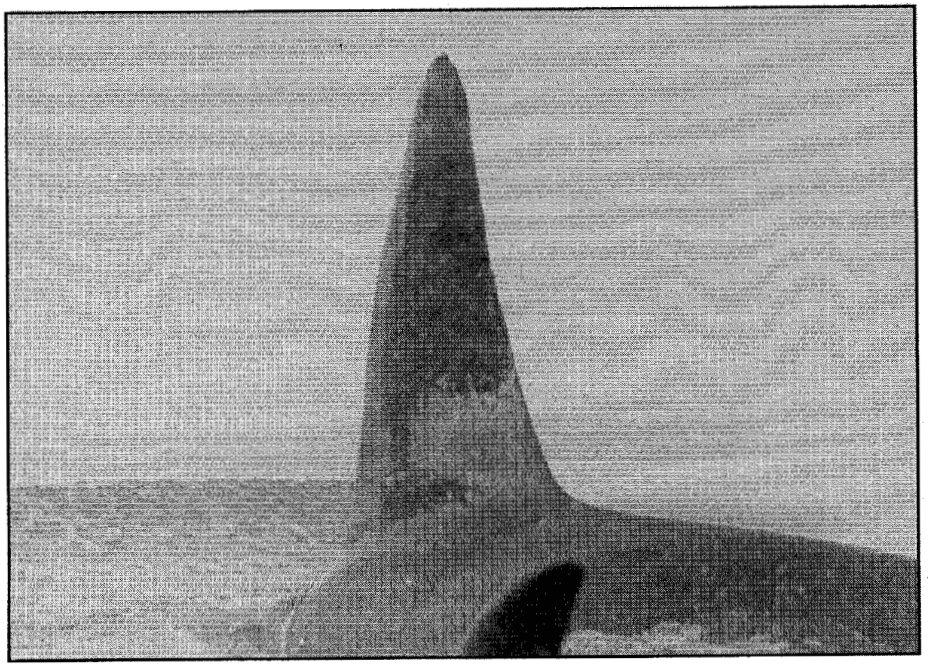
ME48 - 9/23/93 - Photo: J. Quan/NMFS



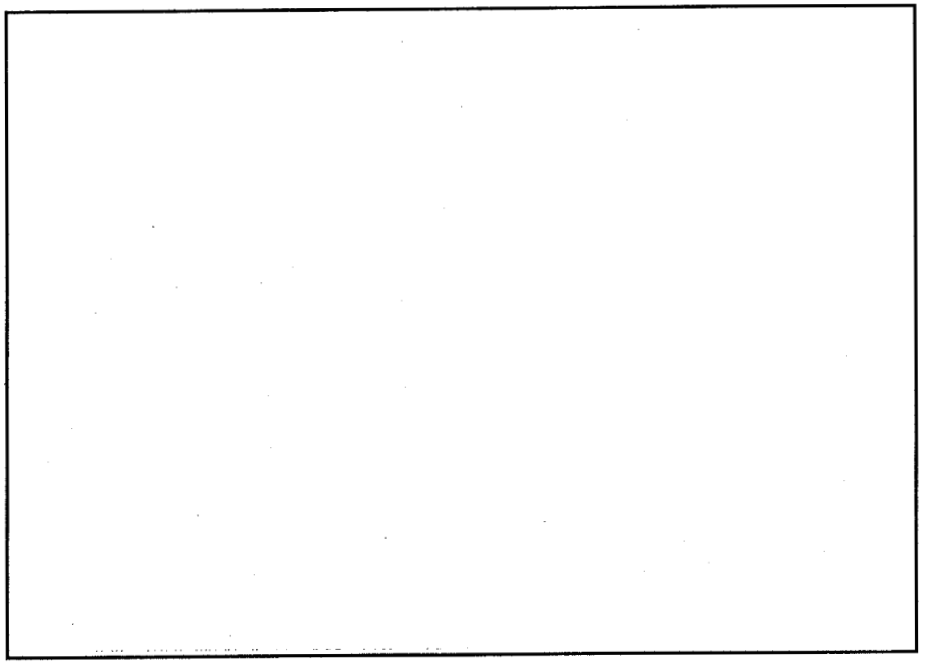
ME49 - 10/27/93 - Photo: W. Armstrong/NMFS

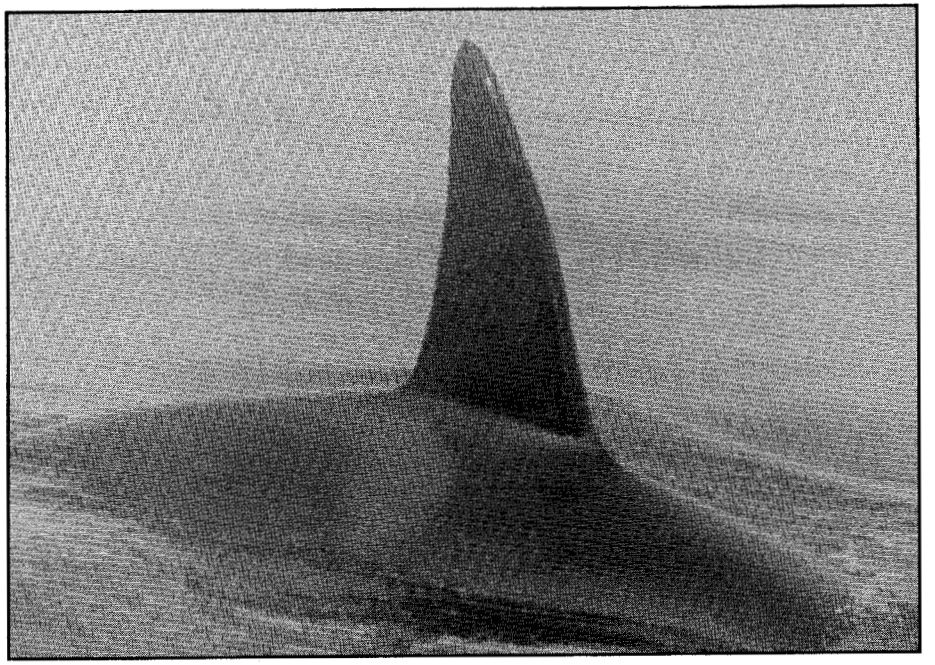


ME51 - 4/7/94 - Photo: D. Gendron

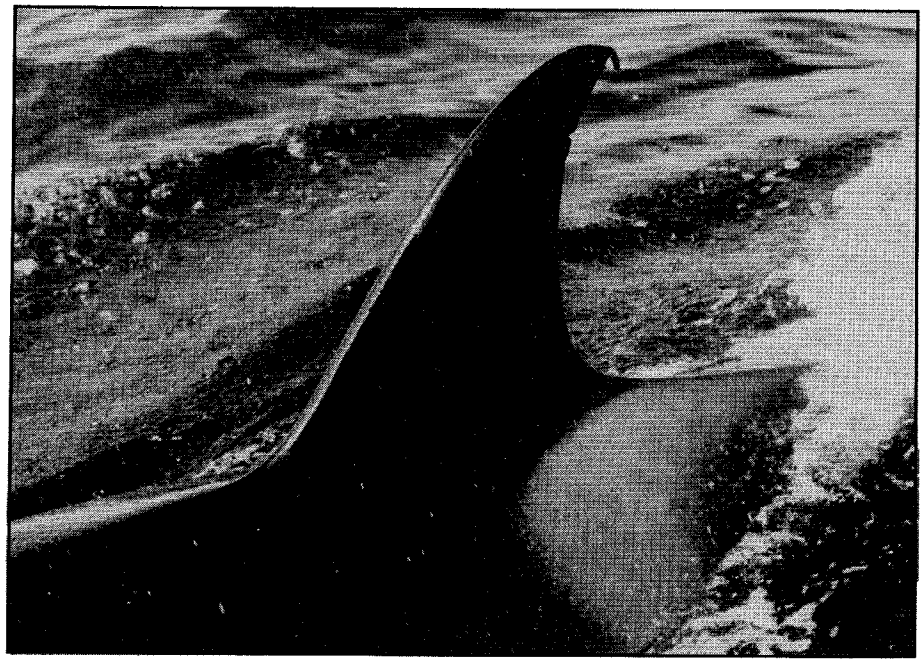


ME52 - 2/25/95 - Photo: D. Gendron

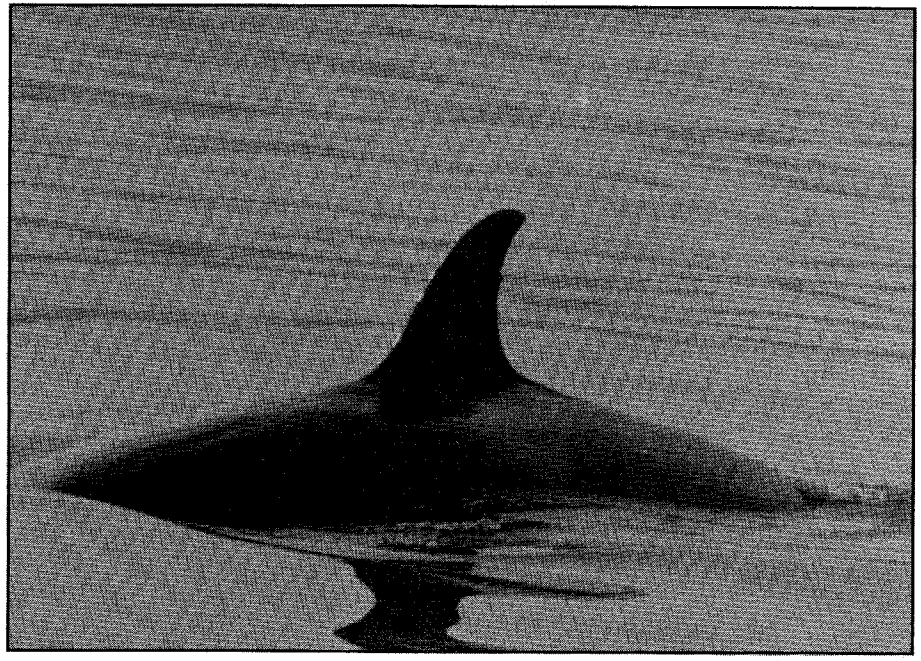




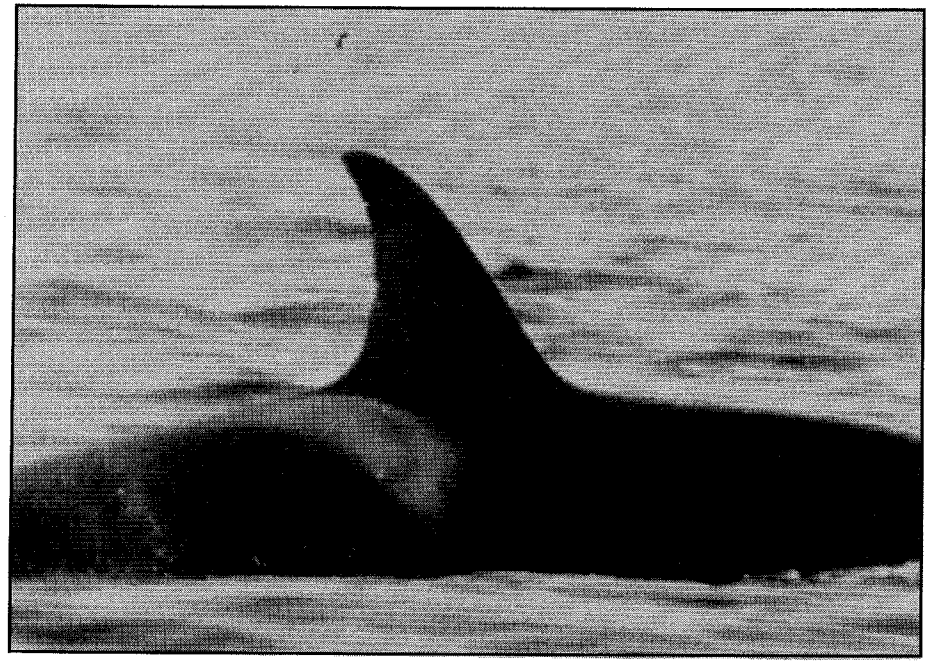
ME52 - 2/25/95 - Photo: D. Gendron



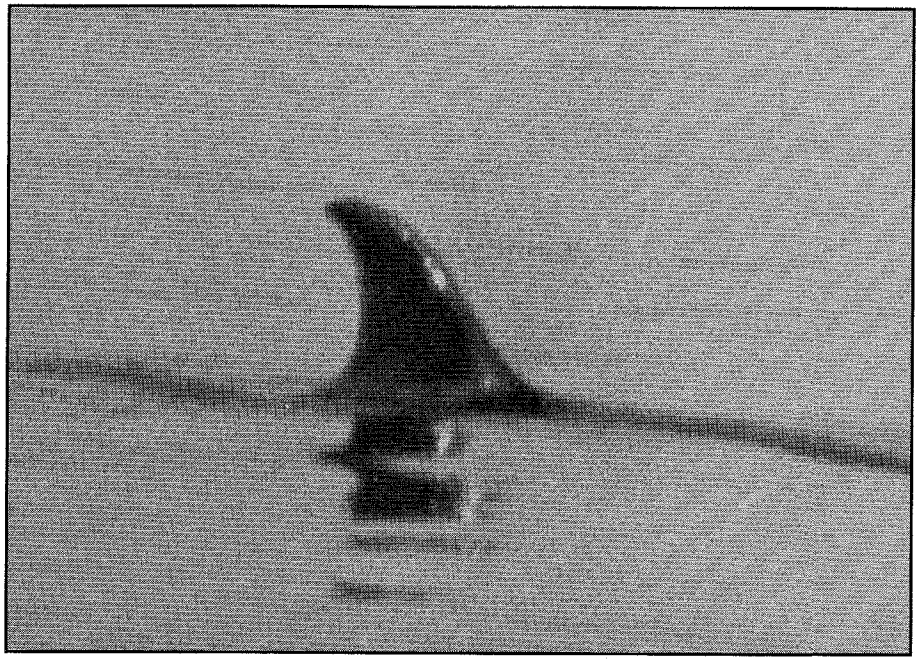
ME53 - 1/30/86 - Photo: D. Croll



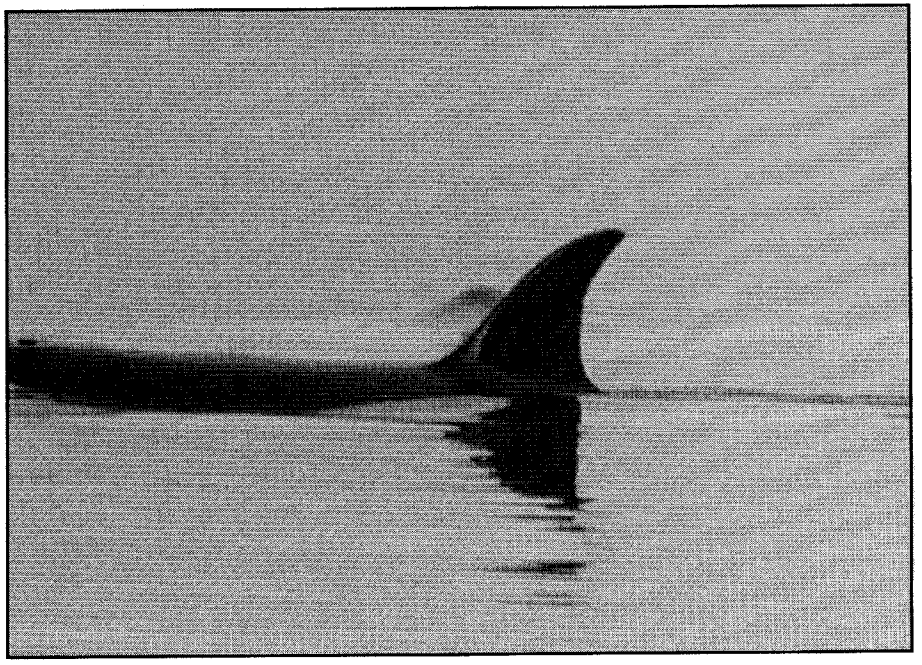
ME54 - 2/25/95 - Photo: D. Gendron



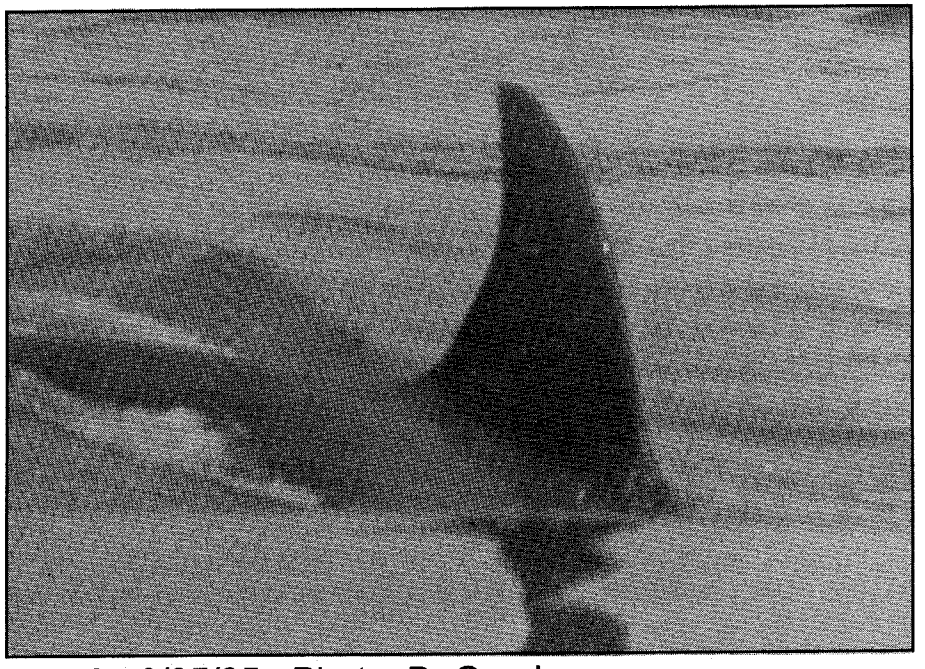
ME53 - 3/2/86 - Photo: Tershy/Strong



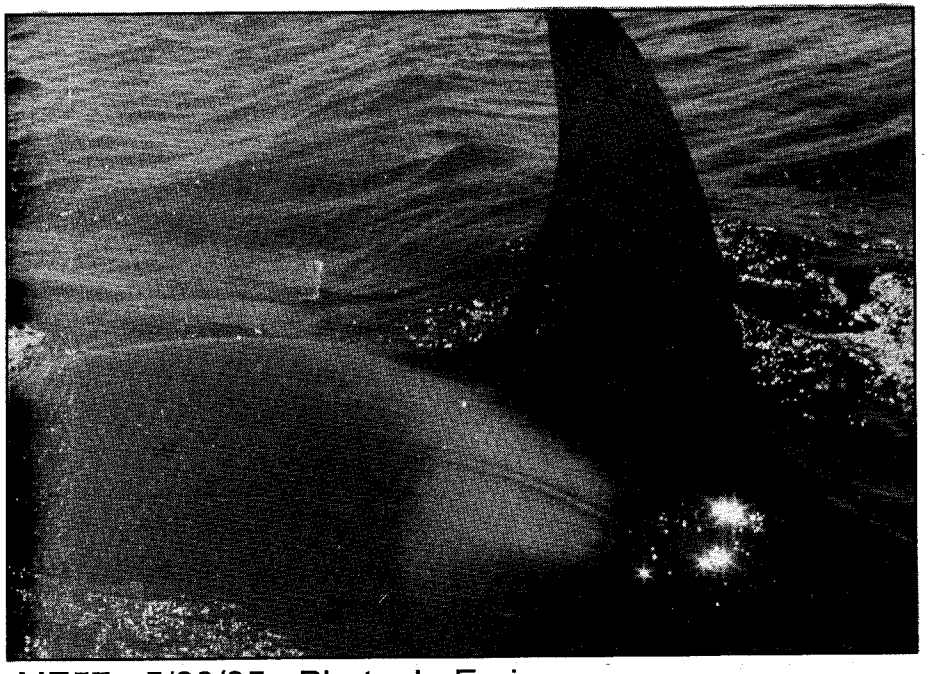
ME54 - 2/25/95 - Photo: D. Gendron



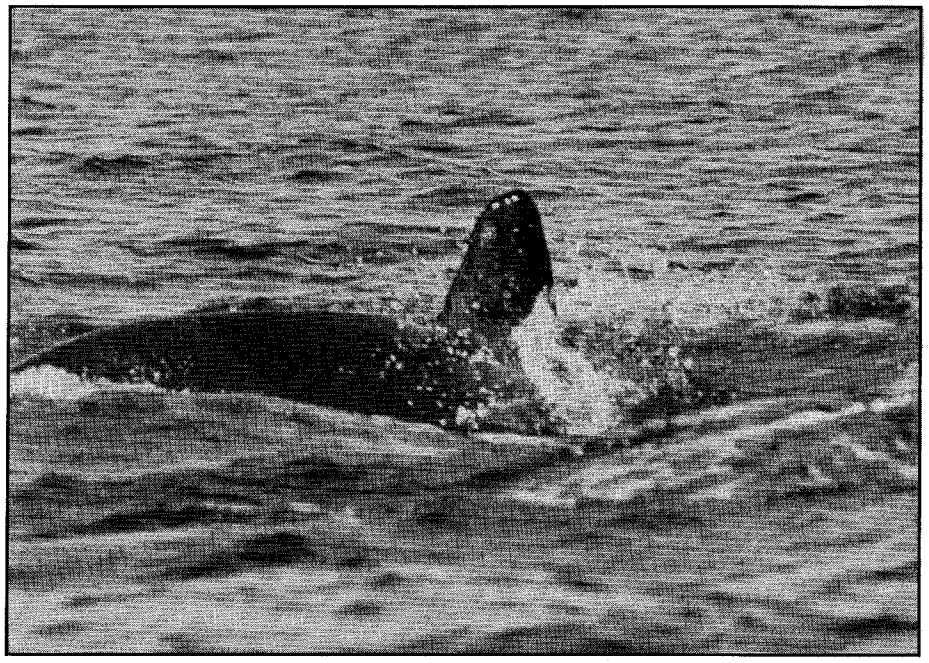
ME56 - 2/25/95 - Photo: D. Gendron



ME56 - 2/25/95 - Photo: D. Gendron



ME57 - 5/20/95 - Photo: L. Enriquez



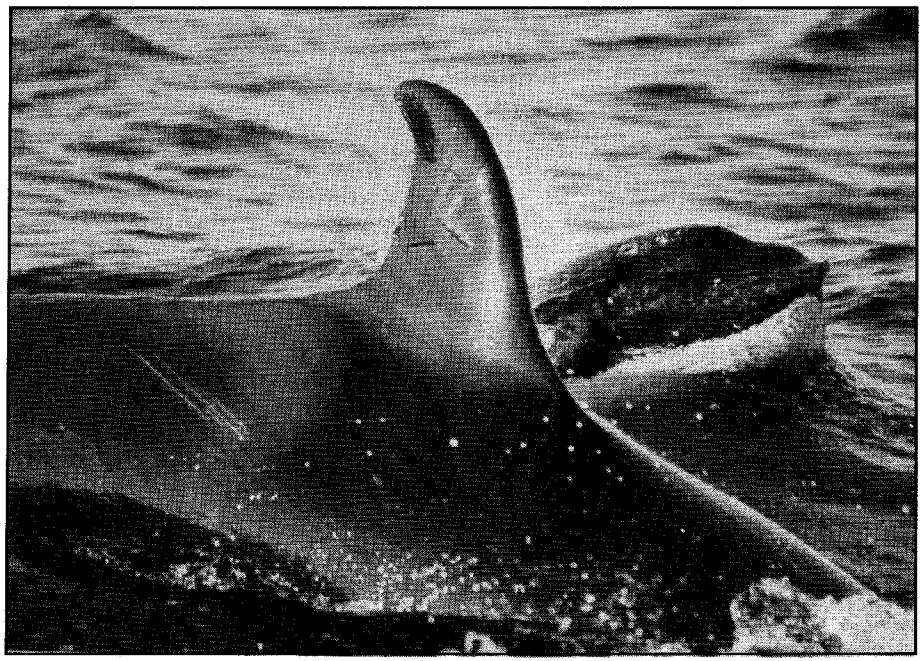
ME61 - 10/21/95 - Photo: NMFS/SWFSC

ME62 (right animal) - 10/21/95 - Photo: NMFS/SWFSC

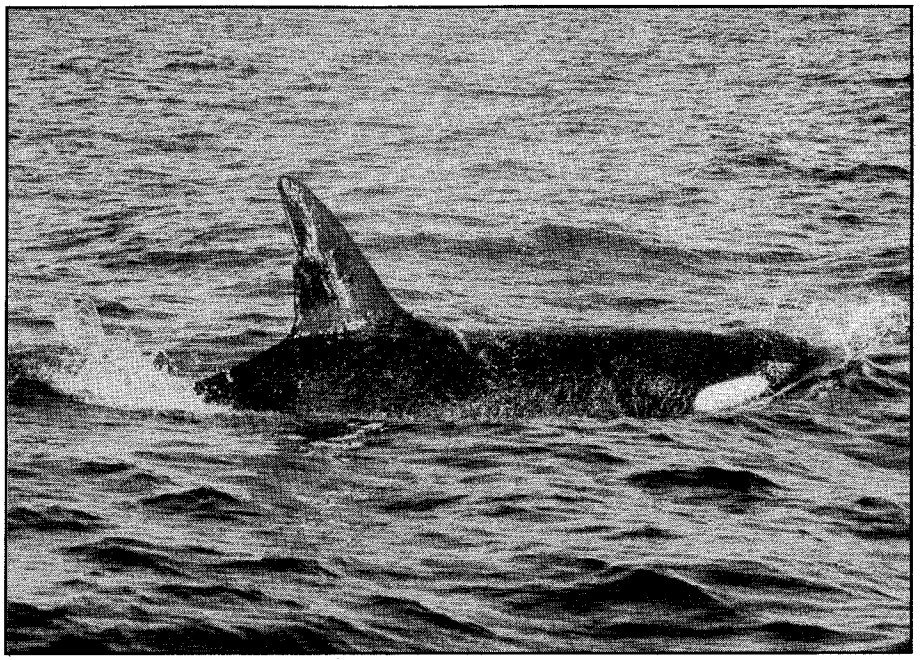
ME65 - 10/17/95 - Photo: NMFS/SWFSC

ME63 - 10/21/95 - Photo: NMFS/SWFSC

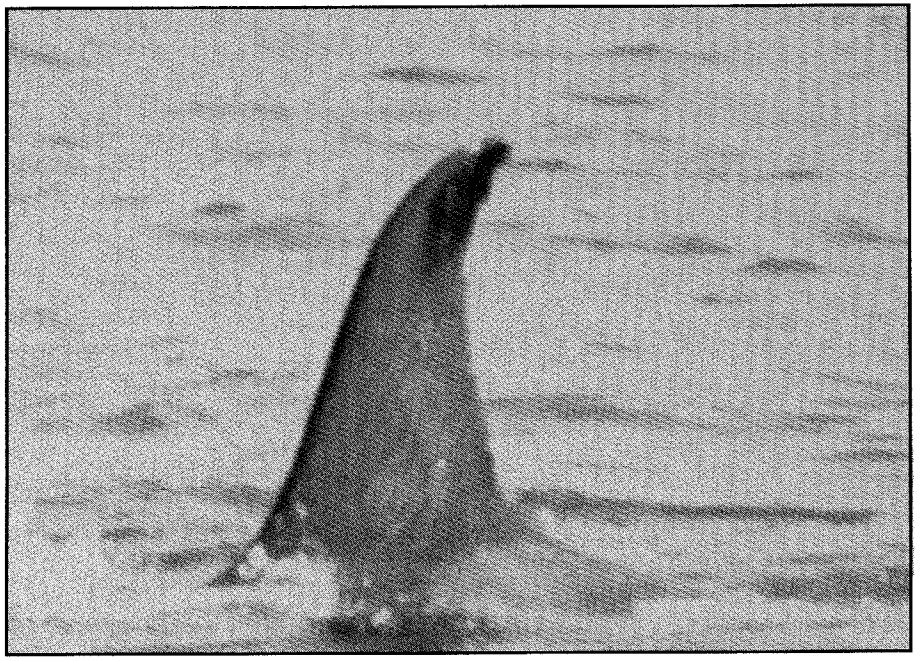
ME65 - 10/17/95 - Photo: NMFS/SWFSC



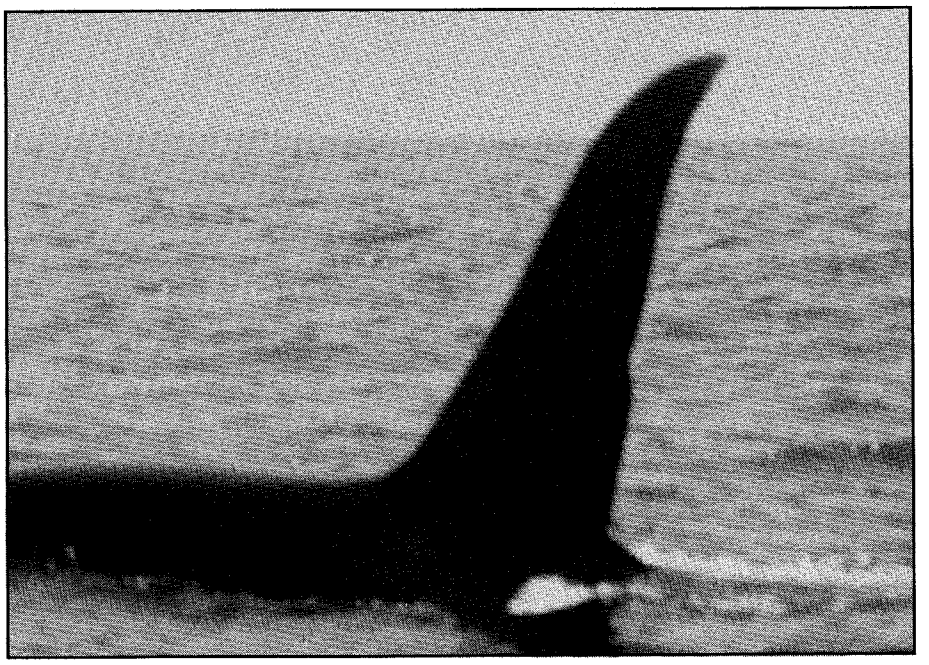
ME66 - 10/17/95 - Photo: NMFS/SWFSC



ME67 - 10/17/95 - Photo: NMFS/SWFSC

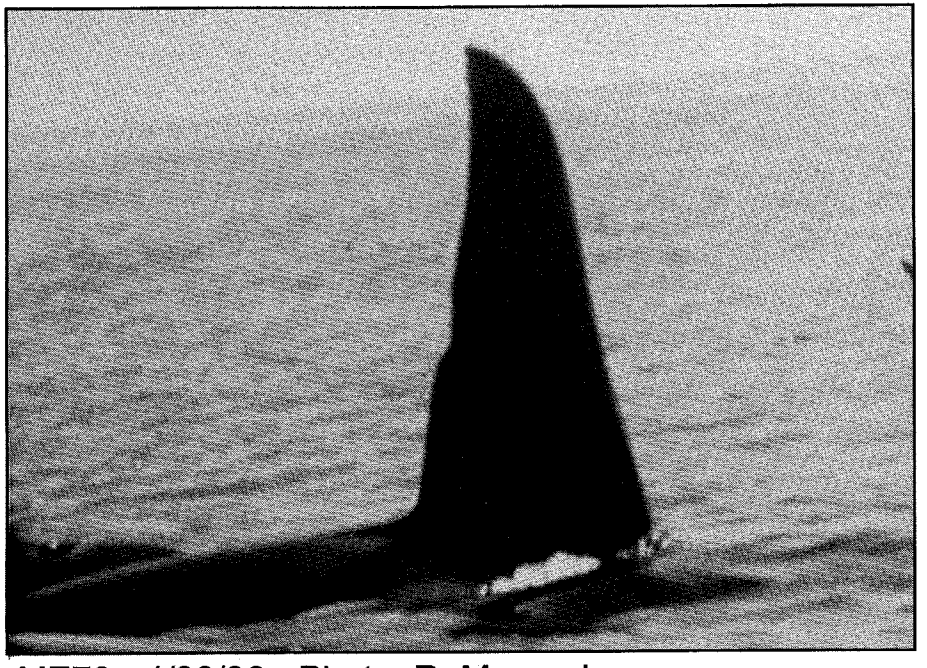


ME72 - 6/28/93 - Photo: L. Enriquez

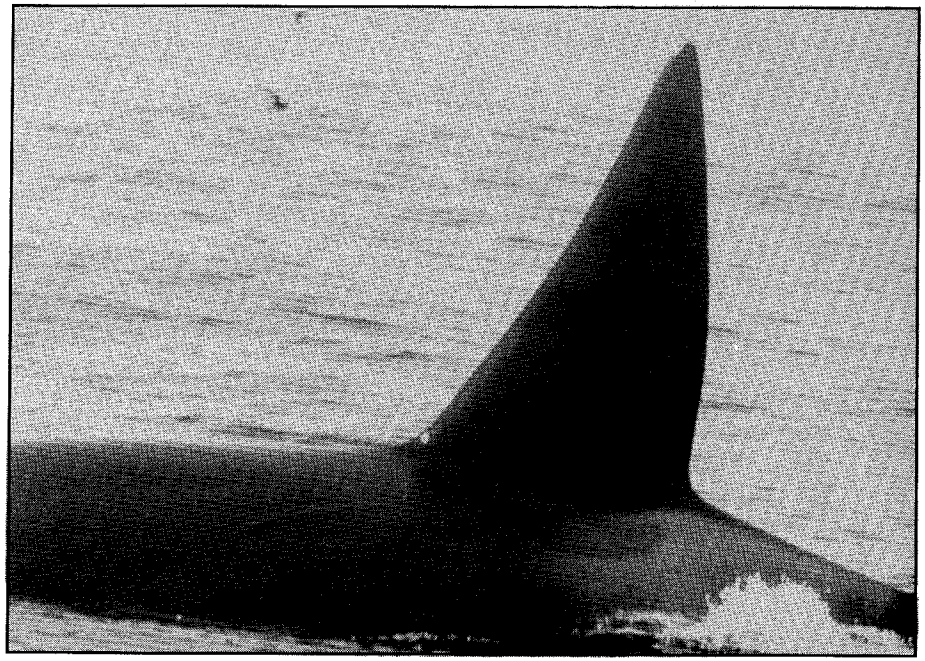


ME73 - 4/30/96 - Photo: R. Moncada

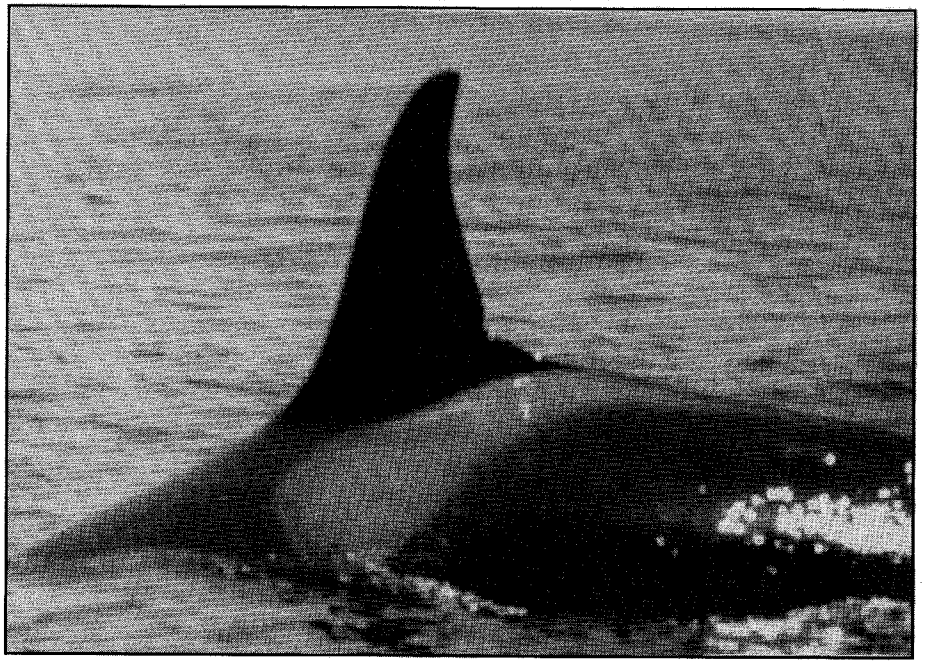
ME72 - 6/28/93 - Photo: L. Enriquez



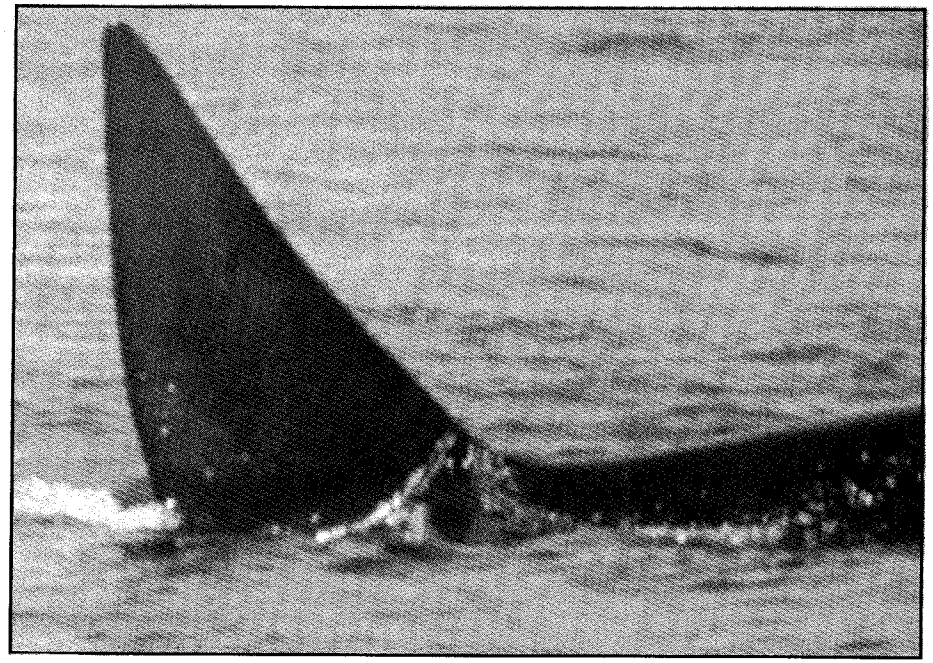
ME73 - 4/30/96 - Photo: R. Moncada



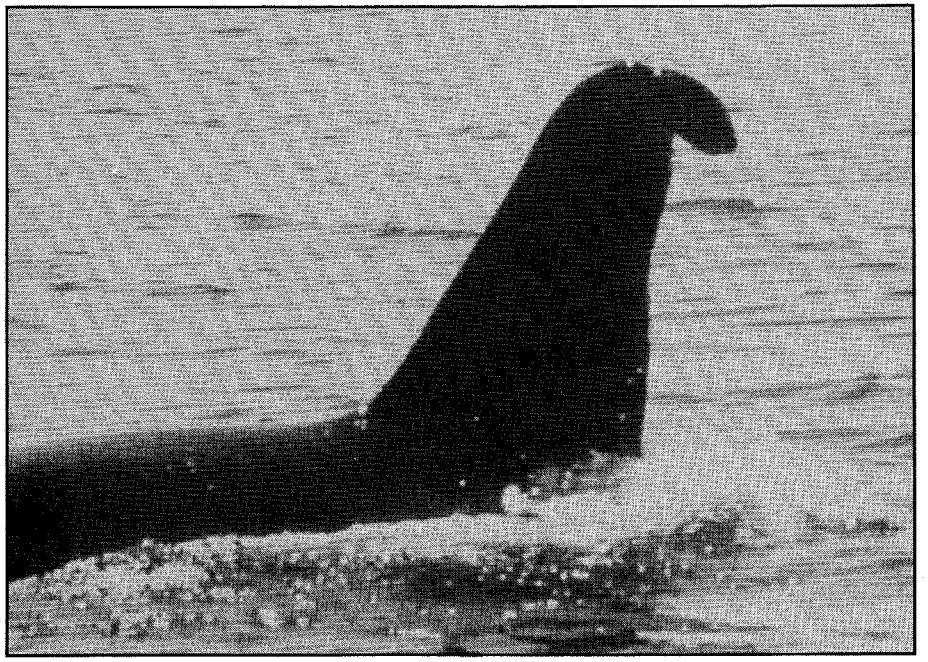
ME74 - 4/30/96 - Photo: R. Moncada



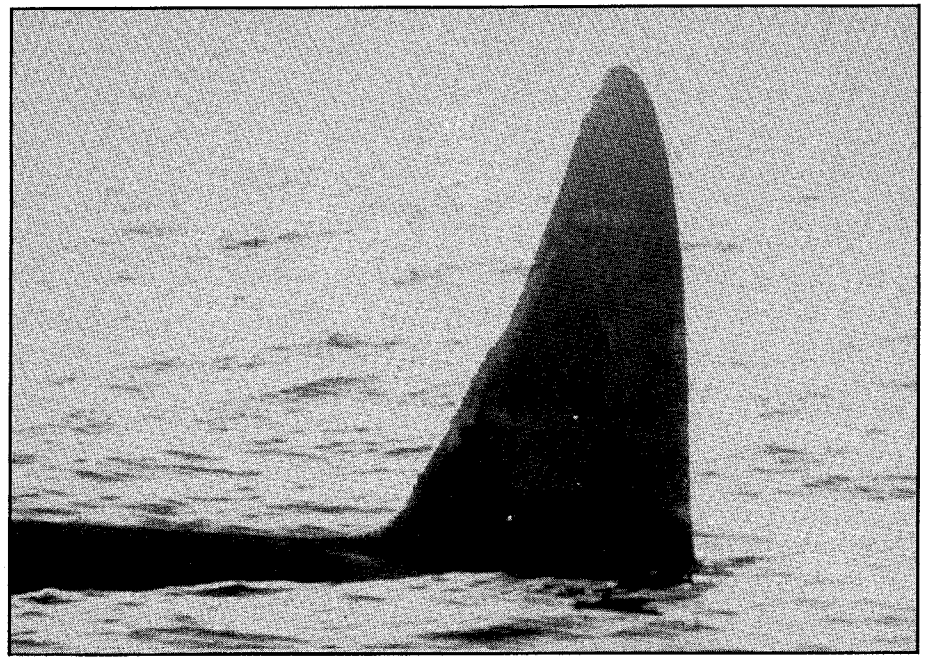
ME75 - 4/30/96 - Photo: R. Moncada



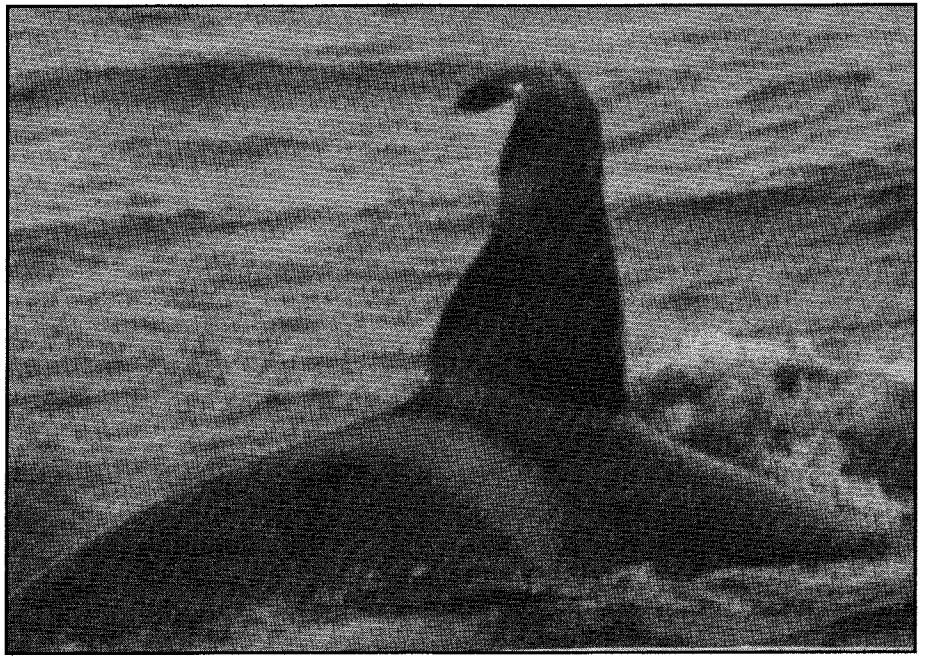
ME74 - 4/30/96 - Photo: R. Moncada



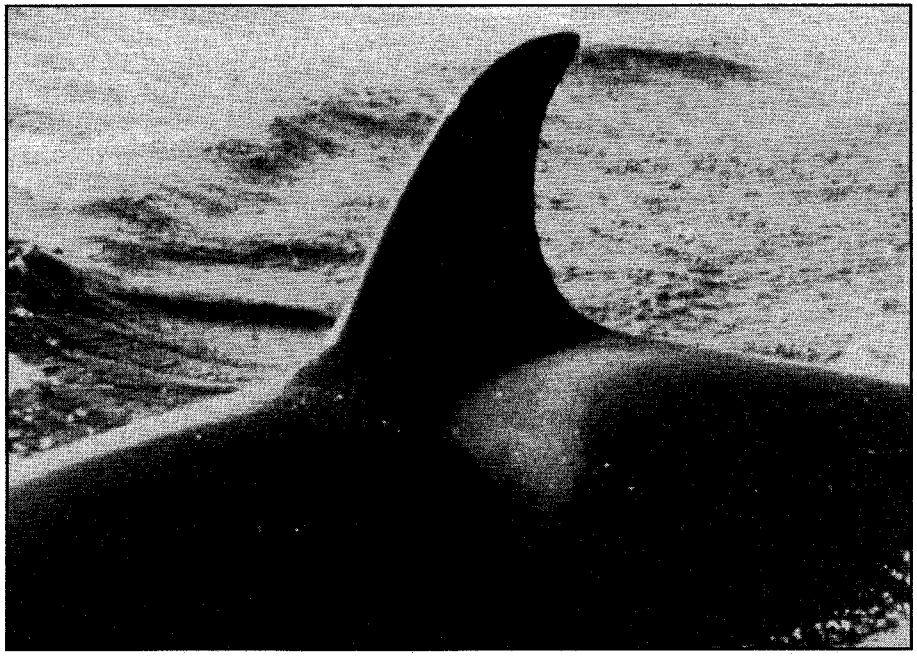
ME77 - 4/4/88 - Photo: R. Sears/MICS



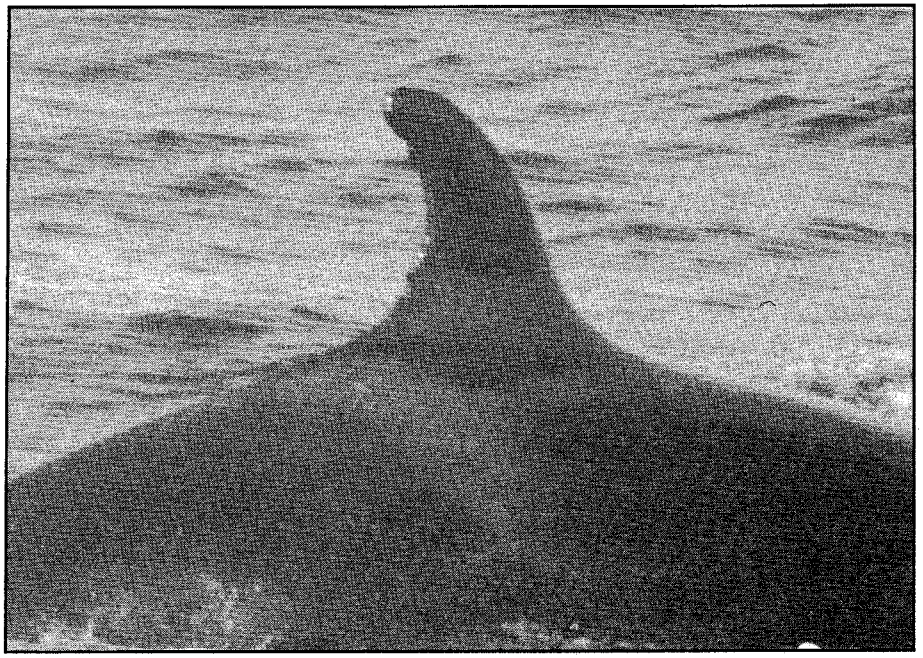
ME76 - 10/17/90 - Photo: D. Perrine



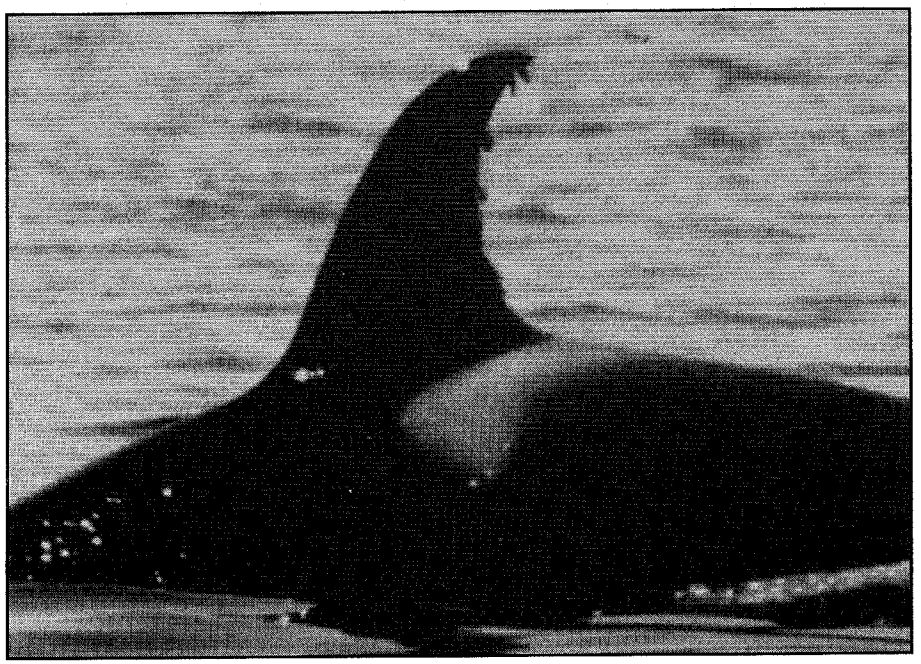
ME77 - 7/5/94 - Photo: J. Salinas



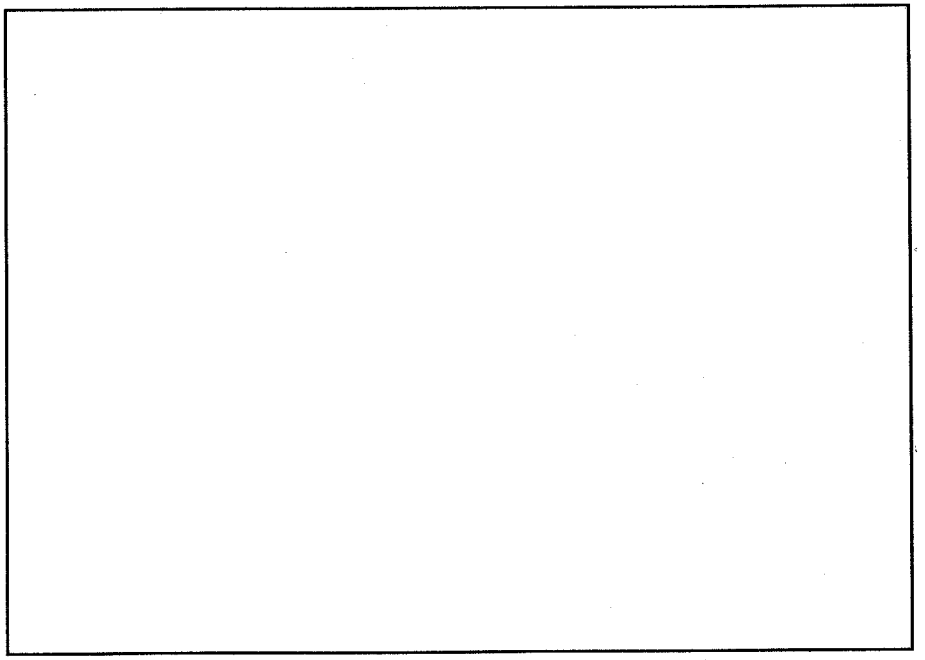
ME81 - 1/30/86 - Photo: D. Croll

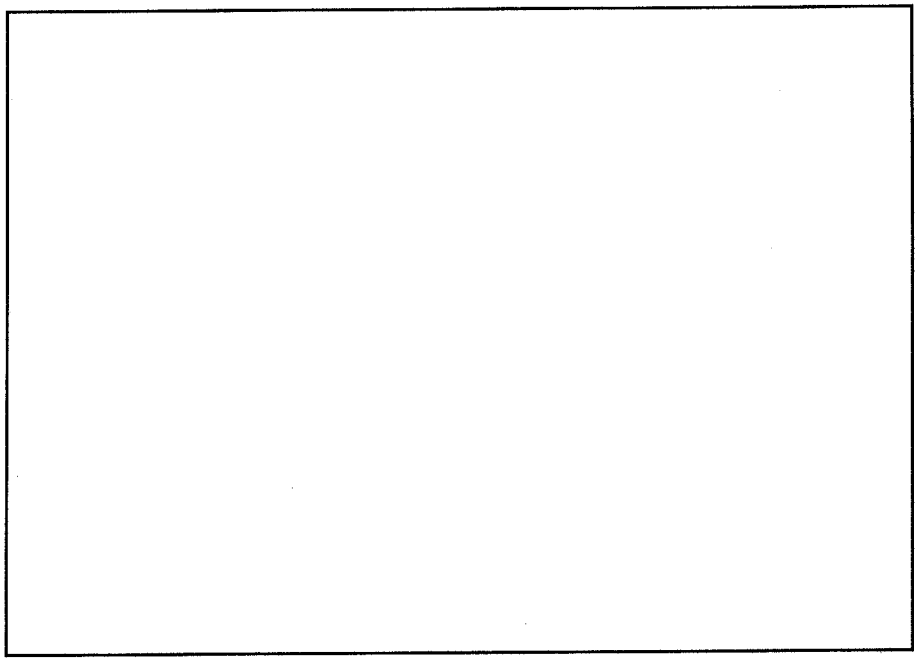


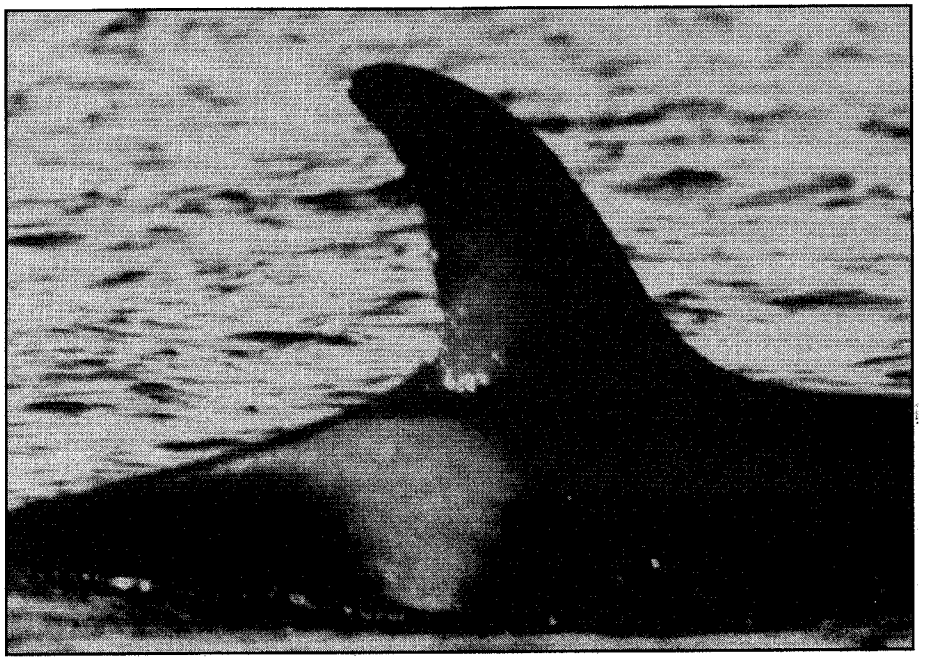
ME78 - 7/5/94 - Photo: J. Salinas



ME82 - 6/20/84 - Photo: Tershy/Strong

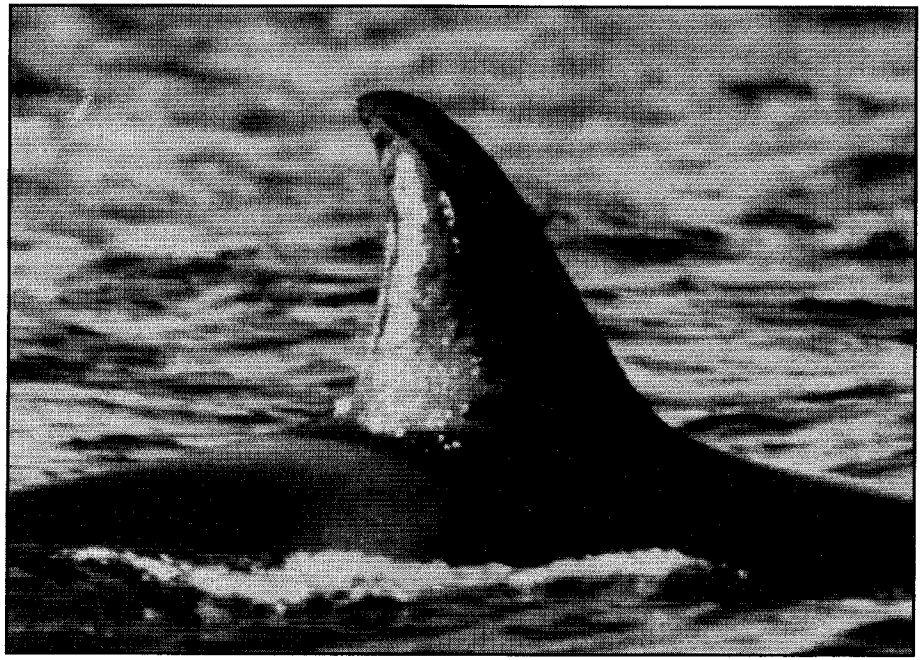




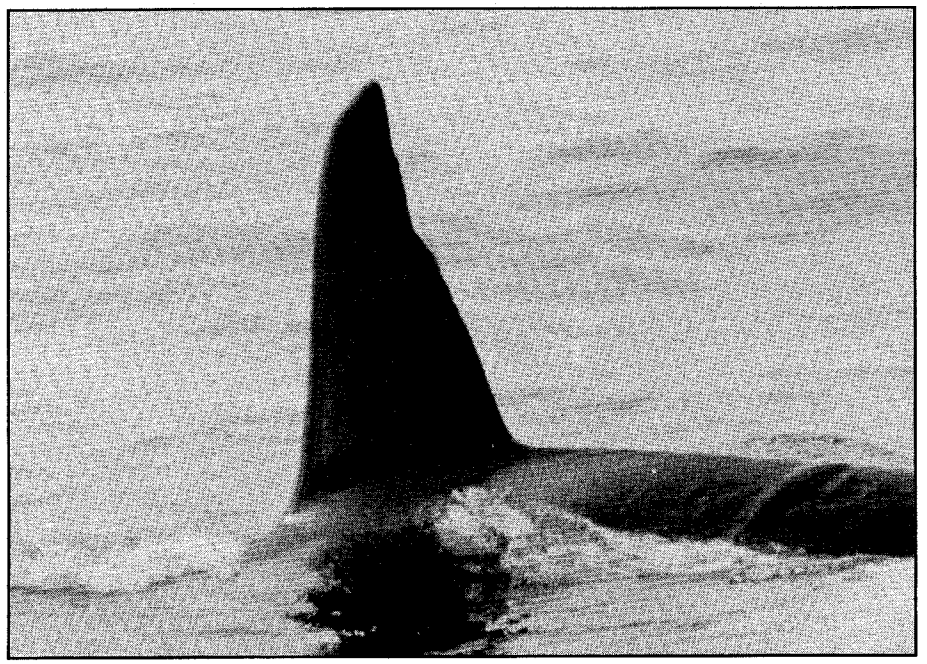


ME83 - 3/28/88 - Photo: D. Croll

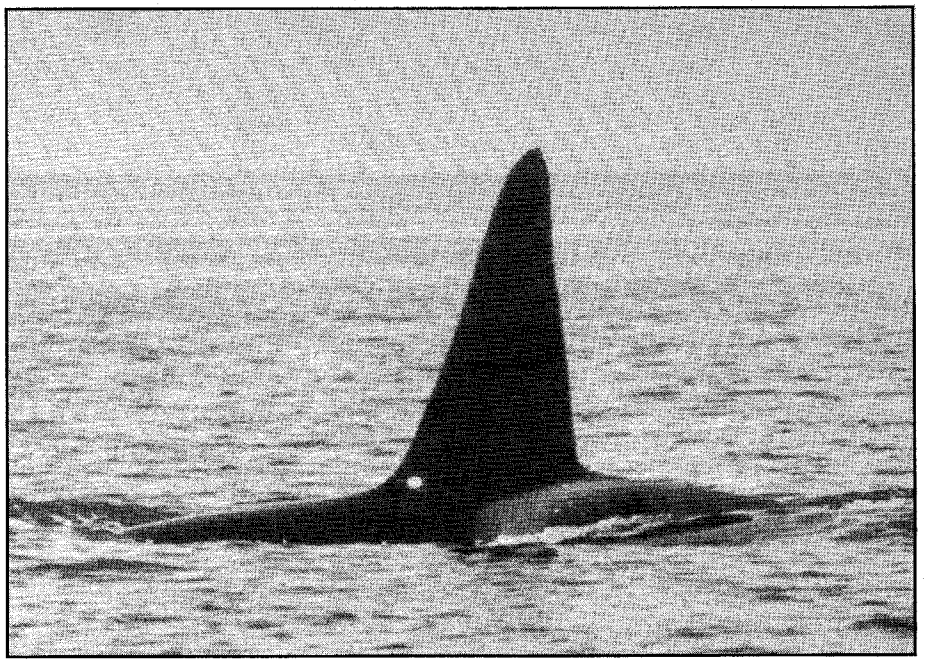
ME84 - 3/2/86 - Photo: Tershy/Strong



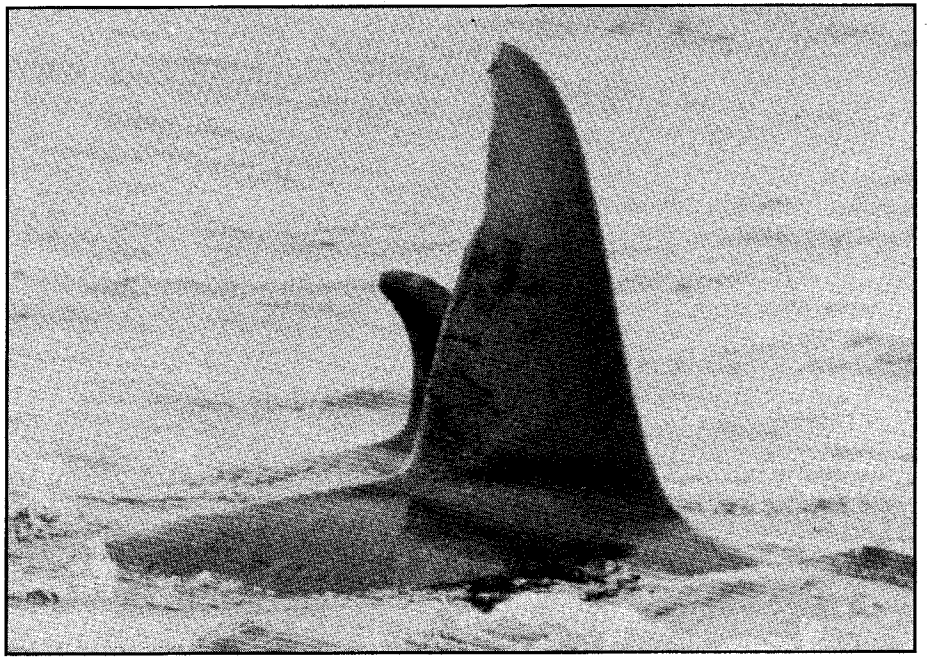
ME85 - 3/2/86 - Photo: Tershy/Strong



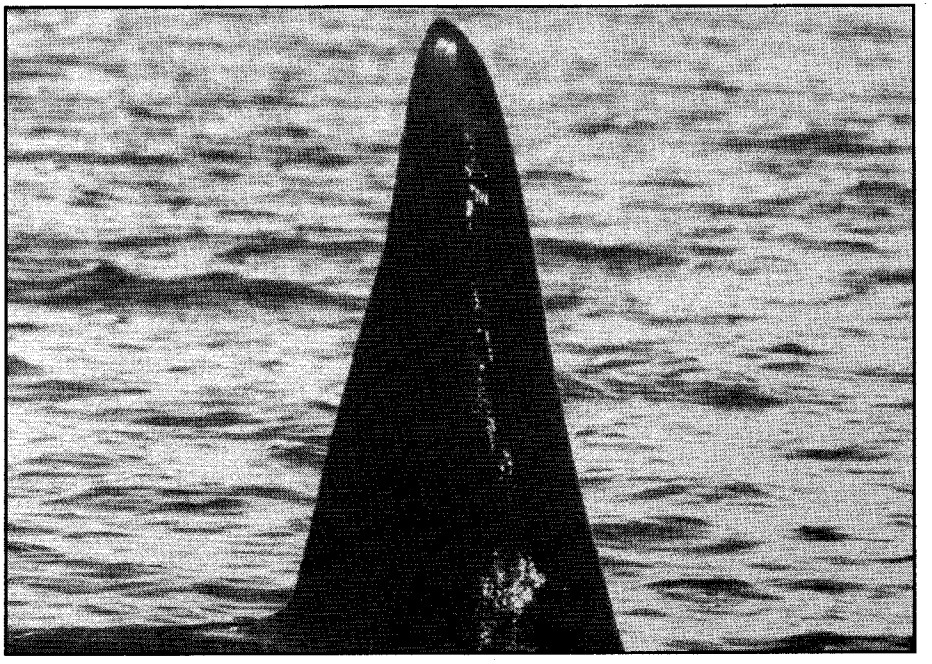
ME86 - 9/23/93 - Photo: J. Quan/NMFS



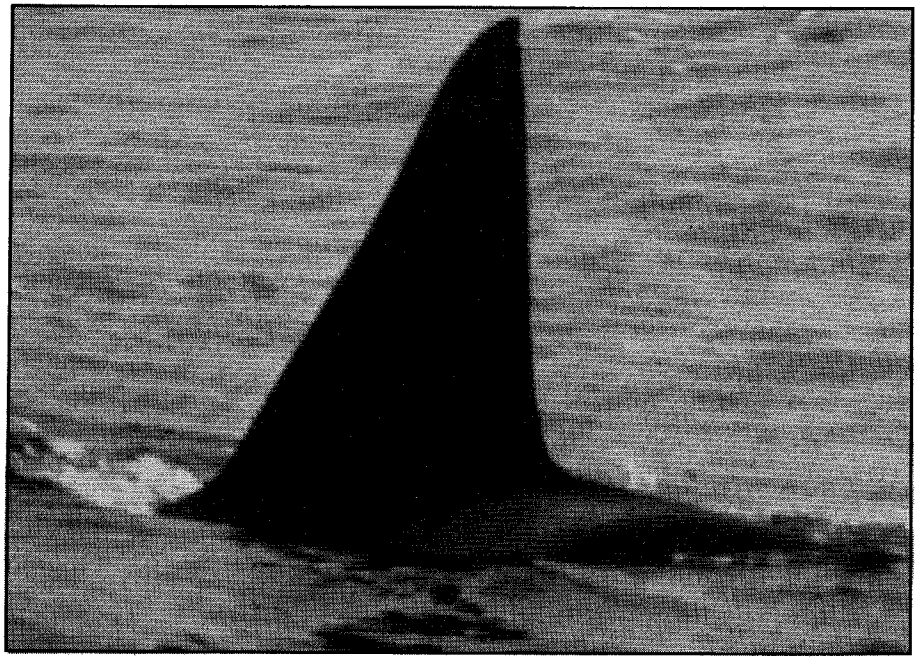
ME87 - 6/20/84 - Photo: Tershy/Strong



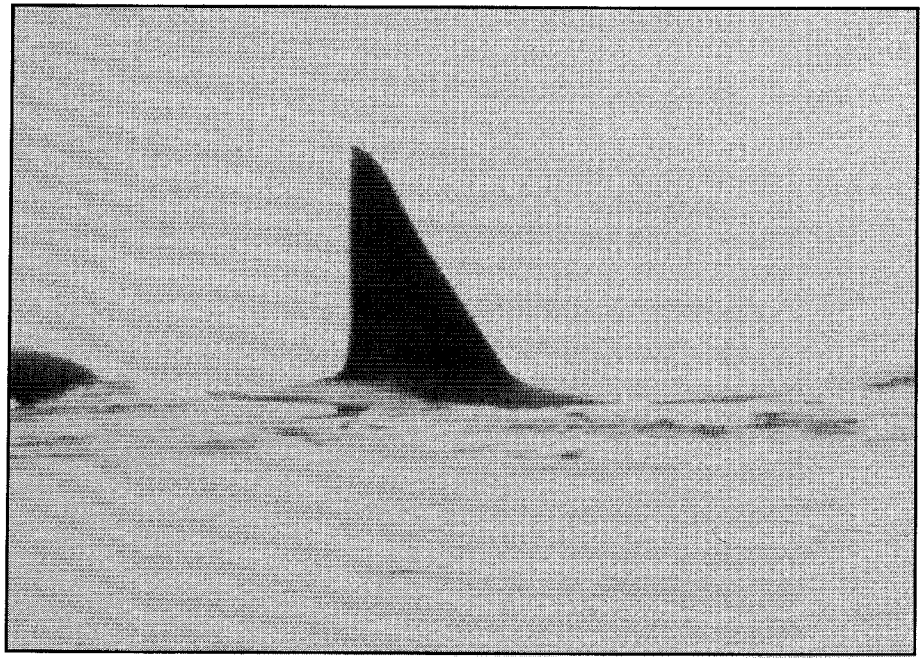
ME86 - 9/23/93 - Photo: J. Quan/NMFS



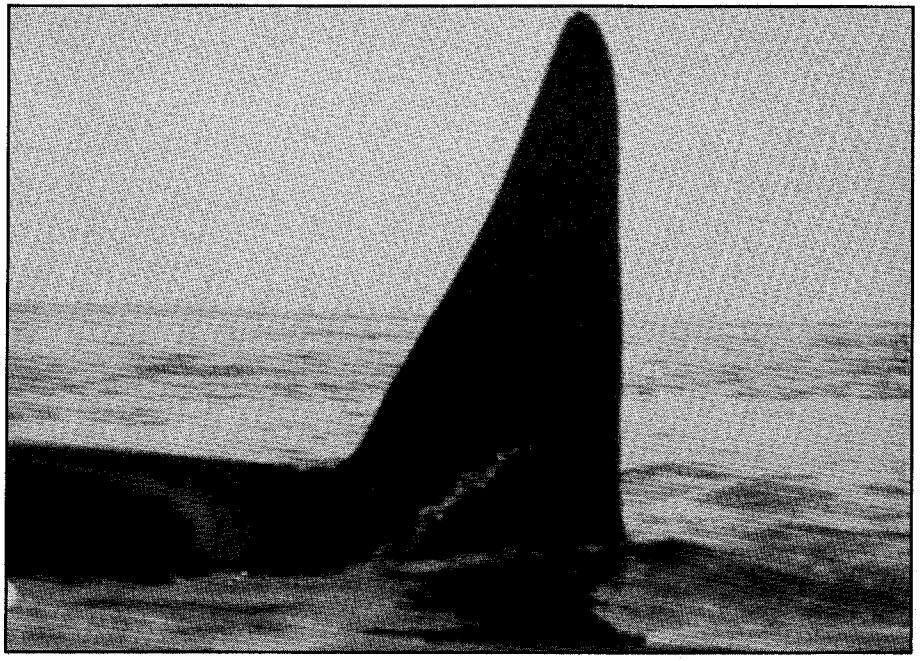
ME87 - 6/20/84 - Photo: Tershy/Strong



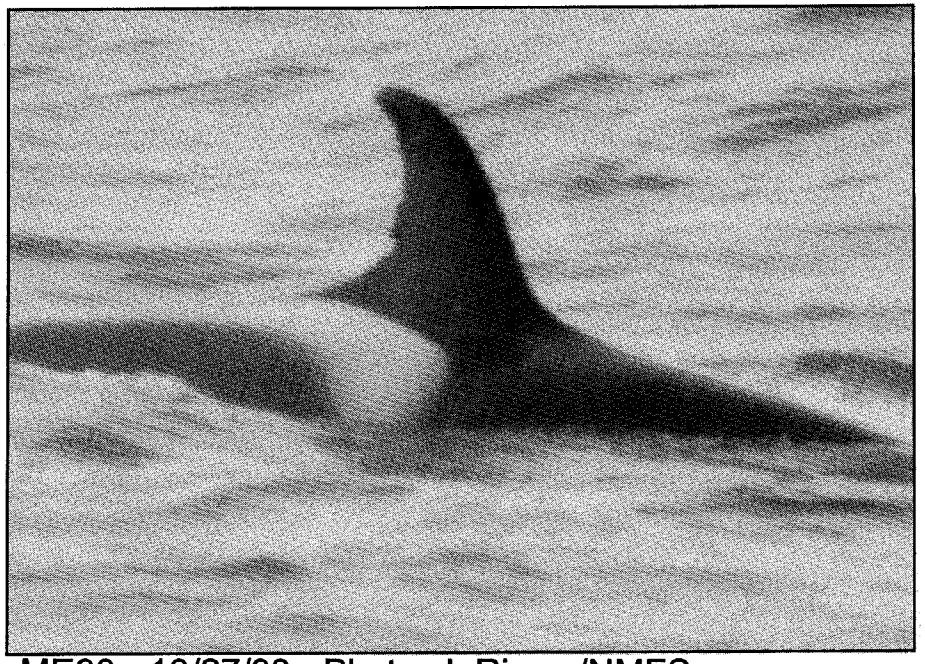
ME88 - Spring 77 - Photo: S. Leatherwood



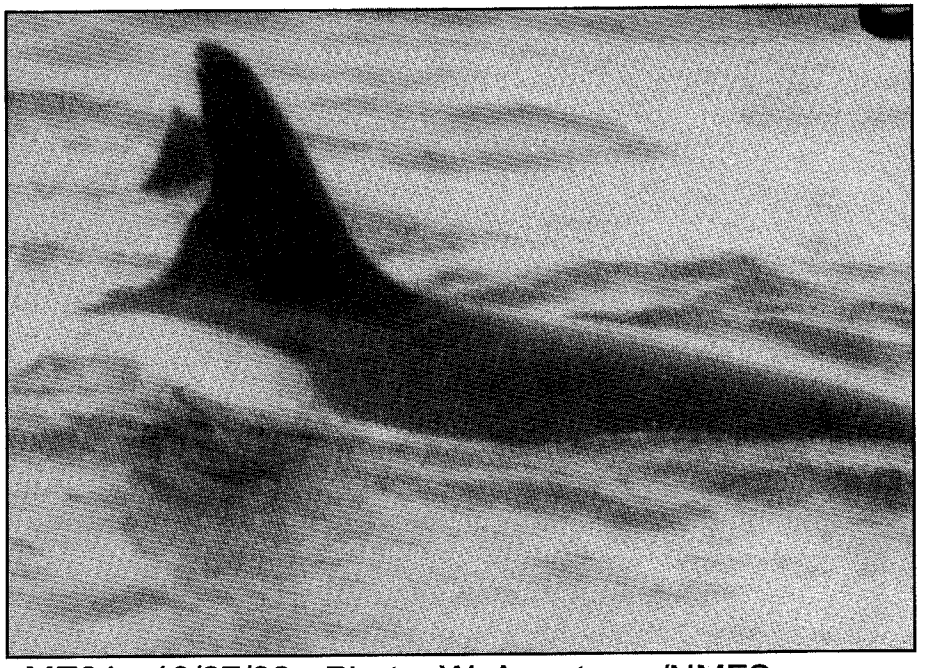
ME88 - 1/29/73 - Photo: S. Leatherwood



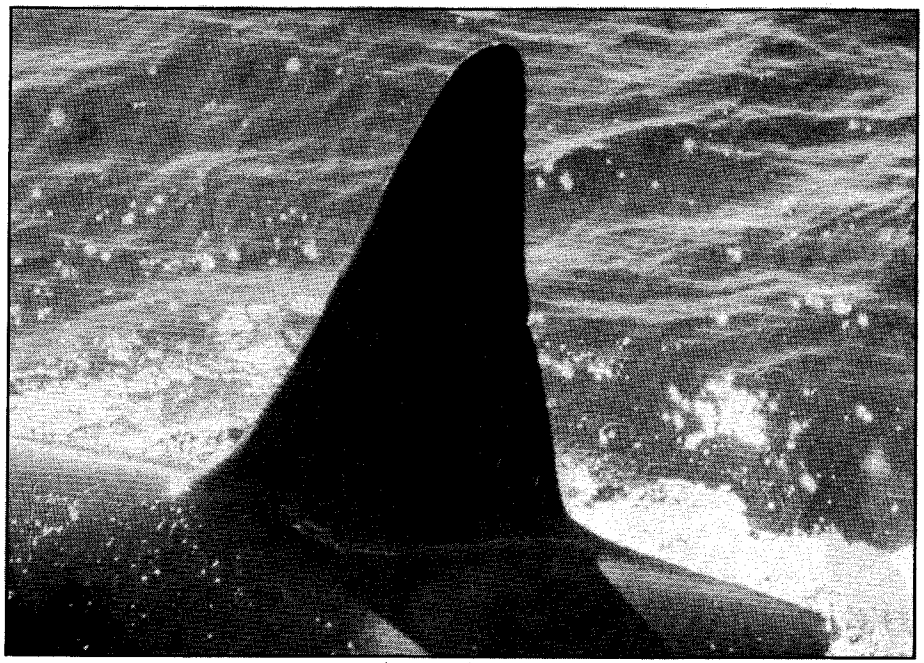
ME89 - 1/29/73 - Photo: S. Leatherwood



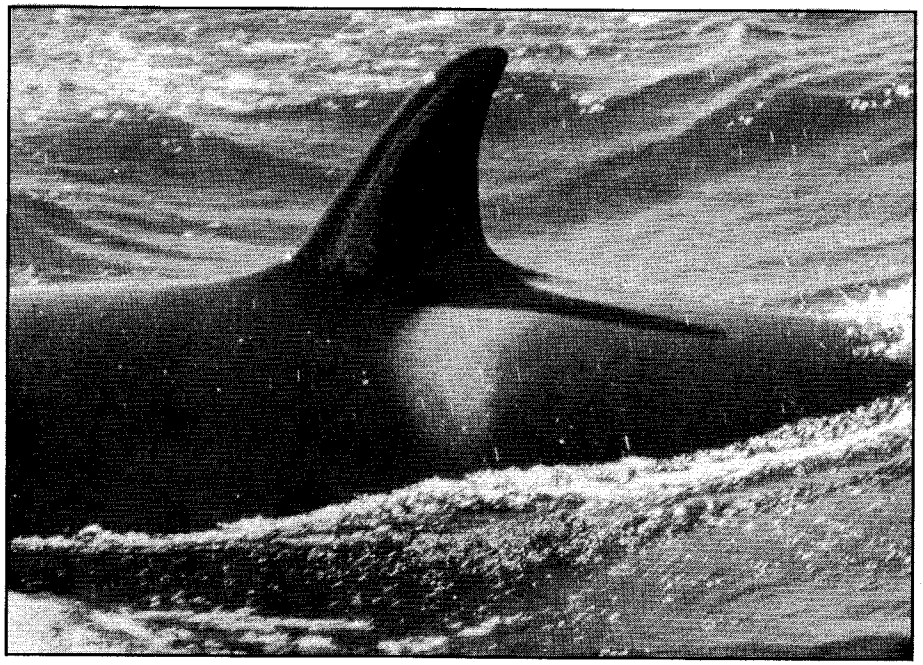
ME90 - 10/27/93 - Photo: J. Rivers/NMFS



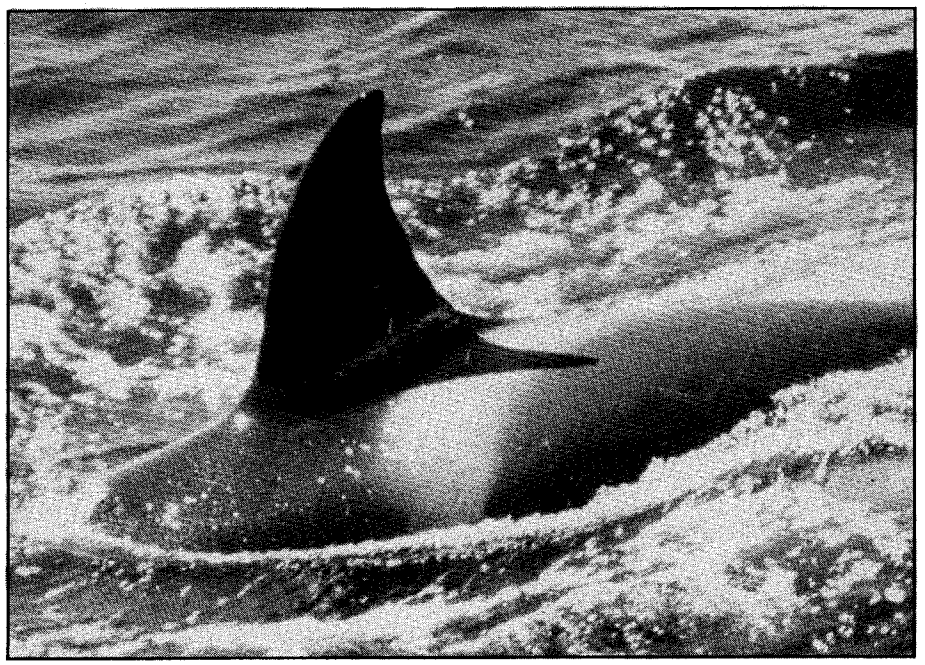
ME91 - 10/27/93 - Photo: W. Armstrong/NMFS



ME92 - 2/26/97 - Photo: S. Anderson



ME93 - 2/26/97 - Photo: S. Anderson



ME94 - 2/26/97 - Photo: S. Anderson

RECENT TECHNICAL MEMORANDUMS

Copies of this and other NOAA Technical Memorandums are available from the National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22167. Paper copies vary in price. Microfiche copies cost $9.00. Recent issues of NOAA Technical Memorandums from the NMFS Southwest Fisheries Science Center are listed below:

NOAA-TM-NMFS-SWFSC-

237 Status of the pacific sardine *(Sardinops sagax)* resource in 1996.
J.T. BARNES, M. YAREMKO, L. JACOBSON, N.C.H. LO, and J. STEHLY
(April 1997)

238 Manual for OTO 3.0 and OPS programs for reading daily increments.
J. BUTLER and E. MOKSNESS
(April 1997)

239 Changing oceans and changing fisheries: Environmental data for fisheries research and management. A workshop.
G. BOEHLERT and J.D. SCHUMACHER, (Editors)
(April 1997)

240 Documentation of California's commercial market sampling data entry and expansion programs.
D.E. PEARSON and B. ERWIN
(April 1997)

241 The Hawaiian monk seal in the Northwestern Hawaiian Islands, 1995.
T.C. JOHANOS and T.J. RAGEN
(June 1997)

242 Plankton sampling during the whale habitat and prey study 10 July-4 August 1996.
W.A. ARMSTRONG and S.E. SMITH
(July 1997)

243 Benthic Invertebrates of four Southern California marine habitats prior to onset of ocean warming in 1976, with lists of fish predators.
J.R. CHESS and E.S. HOBSON
(August 1997)

244 Fishes collected by midwater trawls during two cruises of the *David Starr Jordan* in the Northeastern Pacific Ocean, April-June and September-October, 1972
J.L. BUTLER, H.G. MOSER, W. WATSON, D.A. AMBROSE, S.R. CHARTER, and E.M. SANDKNOP
(September 1997)

245 Mapping benthic habitats and ocean currents in the vicinity of Central California's Big Creek Ecological Reserve
M. YOKLAVICH, R. STARR, J. STEGER, H.G. GREENE, F. SCHWING, and C. MALZONE
(September 1997)

246 The physical oceanography off the Central California coast during May-June, 1996: A summary of CTD data from pelagic juvenile rockfish surveys.
K.M. SAKUMA, F.B. SCHWING, K. BALTZ, D. ROBERTS, and S. RALSTON
(September 1997)