Commercial Collection of Pinnipeds in the California Channel Islands, 1877-1981

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Abstract – From at least 1877 to 1981, Santa Barbara, California was the center for collecting pinnipeds for zoos, circuses, oceanaria and research institutions worldwide. Three primary collectors, with numerous assistants, dominated this trade for a century. Their methods and equipment were trade secrets handed down from each collector to his successor. This paper reviews the commercial collection of pinnipeds at the northern Channel Islands both for historical interest and for researchers interested in various collection techniques.

Introduction

Santa Barbara, California was the center for the commercial collection of pinnipeds for zoos, circuses, oceanaria and research institutions from at least 1877 to 1981 (*Santa Barbara News-Press* 1969). California sea lions (*Zalophus californianus*), often simply referred to as "seals" in various accounts (which will be discussed in detail later), were the most sought-after and by far the most numerous species caught, although harbor seals (*Phoca vitulena*) also were collected on occasion (R. Headley, pers. comm.). Mention of commercial collection methods in technical papers is sparse (Cornell 1987; Herder 1983), and even popular accounts of commercial collection activities at the northern Channel Islands are scarce (*Santa Barbara News-Press*, July 1877; Holder 1910; Ashkenazy 1980; Howorth 1974, 1988). One article on collecting California sea lions at the Coronados Islands off Baja California, Mexico was published in the *Los Angeles Times* (Dunn 1931). Although specific contemporary methods and equipment were discussed by Cornell (1978) and Herder (1983), neither discussed historic methods and equipment, nor did they discuss contemporary commercial practices of Santa Barbara collectors in particular. I described historical and contemporary methods used by commercial collectors at Santa Cruz Island in an unpublished report prepared for The Nature Conservancy (Howorth 1985).

Up until passage of the Marine Mammal Protection Act in 1972, commercial collections were carried out under the authority of special permits issued by the California Department of Fish and Game. Government observers were not required to monitor such collections. Reports were filed by collectors with the California Department of Fish and Game only in the two decades preceding the Marine Mammal Protection Act. Thus, catch statistics, including species, numbers, sex, size, age and area of collection, virtually went unmonitored for decades. Aside from occasional reports in the *Santa Barbara News-Press* (see below) and brief sketches in regional history texts (Gidney *et al.* 1917; Phillips 1927), virtually nothing seems to have been published on the activities of the early collectors.

Following passage of the Marine Mammal Protection Act in 1972, commercial collections were carried out under the authority of permits issued by the National Marine Fisheries Service, under the Department of Commerce. These permits were issued to the facility where each animal would ultimately be kept rather than to the collectors themselves. Collectors were authorized by the National Marine Fisheries Service on the basis of their expertise. Only collectors of record were allowed to capture pinnipeds along the west coast..

National Marine Fisheries Service observers were sent on nearly all collection trips after 1972. Their main purpose was to make certain that the animals were collected and held in a humane manner and were caught only in areas approved for collection activities. The collections were carried out in accordance with the provisions of the Marine Mammal Protection Act and with prevailing National Marine Fisheries Service policies. Catch statistics were only of secondary interest to National Marine Fisheries Service observers at the time (D. Beach, pers. comm.).

Methods

A literature survey was conducted to gather data on commercial pinniped collections. Unpublished literature was examined, including internal reports made by National Marine Fisheries Service observers following collection activities. I examined material in the archives of the Ventura County Historical Society Museum, the Santa Barbara Historical Society and the Channel Islands Archives of the Santa Barbara Museum of Natural History. Accounts on the subject were checked in the *Santa Barbara News-Press* and other newspapers. In all cases, I surveyed the literature on: 1) collection activities; 2) collectors; 3) the Channel Islands in general; 4) the species of pinniped and 5) the boats used in collection activities.

In 1969 I began working with Richard Headley, last of the three primary collectors, who owned a company called Sea Lions International. During the next eight years I learned a great deal about the methods and equipment used to capture pinnipeds commercially through first-hand accounts from Headley and his assistant, Louis Nelson. Headley was able to provide considerable historical background on the commercial collection of pinnipeds. In 1974, I began collecting for Lawrence Bond, one of Headley's former assistants who in 1968 formed his own company, called Global Sea Lions. I continued to work for Headley at the same time.

In 1976, I established the Marine Mammal Center, both to temporarily house captured animals and to serve as a nonprofit clinic for distressed pinnipeds which were to be rehabilitated and returned to the wilds. During the same period I began collecting for International Animal Exchange, Inc. (Ferndale, MI) which acted as a jobber for commercially collected specimens. I continued to collect pinnipeds until March 1981, when I made the last commercial capture of pinnipeds at the northern Channel Islands. During the period from 1974 through 1981, I kept detailed records of each collection activity.

History and Techniques

In 1846, Capt. E.A. Eastman, a veteran of the Mexican War, crossed the Santa Ynez Mountains with Fremont. Sometime afterward, he claimed to be the first person "who captured a sea lion alive" (*Santa Barbara News-Press*, 16 March 1969). Eastman continued to collect sea lions until at least 1889, when a newspaper account mentioned that Eastman had constructed a 1,000 gallon water tank on a boxcar for shipping sea lions to the east coast (*Santa Barbara Weekly Herald* 1889). The sloop *Challenge* had been sent out to capture 10 sea lions for Eastman as he made his preparations.

Meanwhile, in 1875, Capt. James P. Mullett (sometimes listed as James R. Mullett) arrived in Santa Barbara, to stay for four years (*Santa Barbara Daily News* 1891). By July of 1877, Mullett had captured several sea lions at the Channel Islands from the schooner *Reliance*. He delivered some of the animals to New York, then sailed with the others to Europe to set up a market there. Once Mullett established the business, he worked as a jobber out of Philadelphia and London, returning to Santa Barbara periodically for more animals which were shipped overland to New York. Reportedly, in each shipment, nearly half died before reaching the east coast (*Santa Barbara Daily News* 1891).

In 1879, the Rogers brothers, local entrepreneurs, purchased the schooner *N.B.* and dispatched it to the northern Channel Islands to hunt for sea lions. By June of the same year, such forays were common enough for the newspaper to remark that "another lot of sea lions" had arrived for shipment to the eastern states (*Santa Barbara News-Press*, 30 June 1879). At least one specimen came from Anacapa Island, according to the account. In September, the Rogers brothers again sent *N.B.* to the northern Channel Islands, this time to fill an order for 37 animals (*Santa Barbara News-Press*, 25 September 1879). On 23 December 1879, however, the schooner *N.B.* was driven ashore at San Miguel Island and completely destroyed (Howorth 1985, 1993; S. Haller, pers. comm.)

The undaunted Rogers brothers purchased another sealing schooner, the *Surprise*, in 1880. One account mentions that the *Surprise* was prowling around the northern Channel Islands looking for "hair" seals (*Santa Barbara News-Press*, 11 February 1880). The article stated "The animals are rather scarce at this time of year, and a large capture is not expected." On 13 March 1881, the *Surprise* was swept ashore at San Miguel Island and wrecked (Howorth 1985, Howorth & Hudson 1993; Haller, pers. comm.).

The Rogers brothers were not engaged solely in the live capture of pinnipeds. They also sold seal oil and "trimmings," such as dried genitals of male sea lions, which were used in Asia as aphrodisiacs. Several other schooners wrecked on the northern Channel Islands also were listed as sealers, and could have been engaged in live capture activities as well. These ships include: 1) the *Leader*, wrecked on San Miguel Island on 7 June 1876; 2) the *Kate and Ann*, also wrecked at San Miguel Island on 9 April 1902 and 3) the *Ella G.*, wrecked on Santa Rosa Island on 2 February 1908 (D. Morris, pers. comm.; Howorth 1985, 1993). The *Kate and Ann* had a notorious reputation for smuggling opium and Chinese immigrants into America (S. Haller, pers. comm.). Reportedly the Rogers brothers continued in the seal trade into at least the 1890s, assisted by a man referred to in newspaper accounts as Fred Forbush. About 1911, a "Mr. Rogers" asked Ira Eaton to fill an order for sea lions for him (Eaton 1980). This person could have been one of the Rogers brothers. A Herbert Rogers was in the sea lion trade as late as 1914 (*Santa Barbara News-Press*, 16 March 1969).

Whether Mullett was involved with the Rogers brothers remains unknown. However, one account mentions that a schooner, chartered by Mullett, caught 32 seals at Anacapa Island only days after the Rogers brothers' schooner *Surprise* was wrecked at San Miguel Island. Moreover, Eaton (1980) mentions that Ira Eaton caught sea lions for George McGuire, Mullett's successor, as well as for "Mr. Rogers," as late as 1911. Mullett and the Rogers brothers were likely business rivals. Mullett, however, was the first "big dealer" in sea lions, at least according to newspaper accounts (*Santa Barbara News-Press*, 16 March 1969). From the period 1877-1905, Mullett reportedly had captured at least 600 sea lions (*Santa Barbara News-Press*, 15 May 1905). In 1905, J.E. Slinkey joined Mullett in his endeavors.

Not much is known about the techniques used by these collectors. However, one newspaper account is revealing—"Three vaqueros will approach a seal lying on the rookery; one of them throws his reata over the seal's flippers, which give him [the seal] his motive power, and the other two vaqueros at the same time—one on each side of the seal—fling lassos over the neck and fin [presumably the fore flipper]" (*Santa Barbara News-Press*, July 1877). The captive then was placed in a box and the lid "nailed down." Holder (1910:255-256) described this technique in a more colorful manner - "The moment the reata falls and the game is caught, the men dash for the rocks, where they can take a turn with their ropes....After a long struggle the sea lions are mastered; the ugliest are gagged, bound, thrown over, and towed to the boxes, into which they are placed."

The newspapers also described catching seals in the "big cavern at the islands," quite possibly Painted Cave at Santa Cruz Island. "A seal net was spread at the entrance to the cave and then

the hunters shot off a gun, scaring the seals so that they made for the net, where four large bulls were caught. These were lassoed and secured in cages let down into the water and thus brought into captivity" (*Santa Barbara News-Press*, July 1877). Interestingly, this account precisely describes methods used by collectors more than a century later in the same place, except that whistles, horns or sticks rapped against the gunwales of a skiff, instead of firearms, were used to spook the animals into the water (R. Headley, pers. comm.).

In 1904, Capt. George McGuire purchased Mullett's operation. Mullett worked with McGuire at least into the following year because a newspaper account mentions Mullett and Slinkey catching a number of sea lions at the northern Channel Islands. One of McGuire's first moves was to eliminate the use of "corral cages" because he felt they were cruel (*Santa Barbara News-Press*, 14 March 1955). What corral cages were is unknown, but one account (*Santa Barbara News-Press*, 4 December 1955) implies that they were actually used to catch animals. Headley (pers. comm.) feels the corral cages might instead have been floating receivers (pens) moored in island coves for holding animals prior to shipping them to Santa Barbara.

McGuire did switch to a "three-mesh net" designed for catching sea lions. This very likely was a trammel net, consisting of three panels, with larger mesh on the outside panels. Such nets are still used by commercial gill net fishermen today (M. Vojkovich, pers. comm.).

Quite a number of Santa Barbara fishermen worked for McGuire over the years, including Capt. Colis Vasquez, Capt. Ira Eaton, "Dutch" Fredericks and J.E. Slinkey, mentioned earlier. Vasquez worked off the schooner *Peerless* until 1907, when McGuire purchased the *Gussie M.*, a steam schooner, for his use (*Santa Barbara News-Press*, 15 May 1907). Ira Eaton worked off his *Irene* from 1905-1913, at which time he purchased the *Gussie M.* from McGuire (Eaton 1980). The following year, Eaton purchased the *Sea Wolf*, which finally was lost in a southeaster off Santa Barbara in 1928 (Eaton 1980). Eaton named his boat after Jack London's fictional sealing schooner in his memorable novel, *The Sea Wolf*. After Eaton's *Sea Wolf* foundered, Eaton leased the schooner *Santa Cruz* from the owners of Santa Cruz Island. In 1933, Eaton purchased the *Pelican*, which he owned until his death in 1938 (Eaton 1980). Sometime during this period or possibly later, a vessel called the *Husky* was used for collecting sea lions (Fig. 1).

Eaton collected numerous sea lions for McGuire along the north shore of Santa Cruz Island. He worked on occasion at "Black Point," west of Potato Harbor, where he "had caught many seal[s] there to fill orders for Captain McGuire" (Eaton 1980). He also worked at Painted Cave and in the cove immediately to the west. A net was stretched across the entrance of the cave to trap sea lions (Eaton 1980). This method was used as late as 1937 by "Dutch" Fredericks, one of Eaton's assistants. The *Santa Barbara News-Press*, 29 November (1937) succinctly described Fredericks' technique: "His method is to fire shots to scare the seals out of the caves into nets." Fortunately, Eaton (1980) provided a good description of the net. It was 38 m long, 15 m deep, with 100 cork floats and 100 5 cm-long lead weights. It weighed about 91 kg.

During this same period, Capt. Pietro Margolis collected sea lions at the Coronados Islands, off Baja California, Mexico, from his 15m fishing vessel *Ventura*. The operation was described by Dunn (1931). At "Lesser Coronado," four men would drop a net into the water from rocky ledges above either side of a water-filled crevice. A fifth man would walk up to the cave at the mouth of the crevice and beat the water with a long bamboo pole to frighten sea lions hiding in the cave out into the net. Sometimes a pistol was used instead to scare the animals. The rectangular net was manipulated with hand lines secured to each corner. Two men were stationed on each side of the crevice, one holding a line secured to the top of the net,

Figure 1. Unidentified workers from the *Husky* pulling a subadult California sea lion into a floating cage. Photograph courtesy of the Santa Barbara Historical Society.

the other man holding a line leading to the bottom of the net. When an animal struck the net, the men would quickly form the net into a bag by bringing all four corners together with the hand lines. The animal was then hauled onto the ledge and placed in a cage. Some 200-300 animals reportedly were caught by Margolis, although how long he collected in the area is unknown.

Margolis' net was about 9 m long by 2.5 m deep, woven of 12 mm tarred line with a 15 cm mesh. The ends of the hand lines were wrapped to form a better grip. The bottom line, or lead line, was weighted with 30 cm lengths of 25 mm diameter lead pipe to make it sink rapidly.

McGuire retired from active pinniped collecting work in 1940, serving instead as a jobber of sea lions. He continued to market sea lions until his death at the age of 102 (*Santa Barbara News-Press*, 4 December 1955). According to a newspaper account, McGuire sold "more than 2,500 seals" from the time he started in the business in 1904 (*Santa Barbara News-Press*, 14 March 1955). Phillips (1927) mentions that McGuire sold seals to 3,005 different markets worldwide, so the first figure may be conservative. McGuire, with over half a century of experience in the trade, certainly earned his nickname of "Seal King."

Walter Miller purchased the collecting part of the business from McGuire in 1940 (R. Headley, pers. comm.). Miller collected sea lions near Potato Harbor (probably the same "Black Point" mentioned by Eaton) at Painted Cave and at

Gull Island, all off Santa Cruz Island, and from a cave west of Frenchy's Cove, on the north shore of west Anacapa Island (R. Headley, pers. comm.). Miller reportedly collected a few Steller sea lions (*Eumetopias jubatus*) on two occasions at Año Nuevo Island, in Santa Cruz County, California (R. Headley, pers. comm.).

Headley (pers. comm.) said that Miller used cotton trammel nets to collect sea lions. The outer panels were of 60 cm mesh (stretched knot-to-knot), while the inner panel was 25 cm mesh. Cork floats were used along the top of the net, while lead weights were used along the bottom. The nets were set with anchors or tied to the rocky cliffs when convenient.

Miller sold his sea lions through Louis Goebel, of Jungleland (Thousand Oaks, CA); Art McBride, of Pacific Ocean Park (Santa Monica, CA); and probably through McGuire, who continued to market sea lions from his home in Santa Barbara at the time. According to Headley (pers. comm.), Miller generally sold between 75-100 sea lions per year.

In 1958, Richard Headley purchased the business from Miller. Headley also acquired the 11.5m fishing vessel *Seal* (Fig. 2), built by Larson in San Pedro in 1916. Headley worked Miller's collecting sites at Santa Cruz Island, and Miller's spot near Frenchy's Cove, west Anacapa Island. Headley did not visit Año Nuevo Island, however. Headley did work Santa Barbara and San Nicolas Islands on a few occasions, along with the south side of Anacapa Island (R. Headley, pers. comm.). Headley also began collecting extensively on San Miguel Island, at Tyler Bight and Adam's Cove.

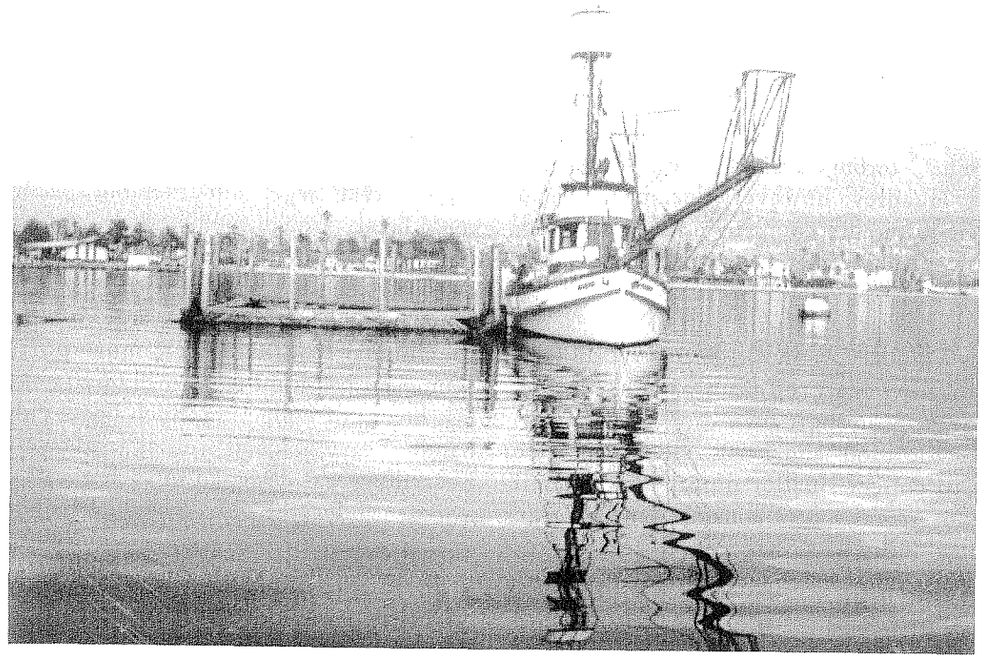
Headley was an innovator, quick to try new areas and methods. Headley switched to single-panel nylon nets, with foam floats instead of corks. The mesh size was about 25 cm, knot-to-knot. Each net was about 75 m long and 15 m deep, although "suspenders" placed every 2 m or so cut the depth of the nets to about 7.5 m. This put huge bulges in the net, increasing its catching qualities according to Headley (pers. comm.). The nets were anchored in place with 20 kg old-fashioned anchors, marked for retrieval with a buoy on their crowns. One anchor was set at each end of the net, although sometimes two nets were tied together to form one long net. Occasionally the nets were set in an L- or V-shape using a third anchor. The nets were tied to rocks or cliffs when convenient rather than anchored.

When a sea lion blundered into the net, Headley and his assistant would tie up to the cork line in a skiff, seize the animal by its hind flippers, then place a lasso around its flippers. The lasso was drawn through the back of a slatted wooden cage floating in the water. The animal then could be pulled by the lasso attached to its hind flippers into the cage as the net was removed from the animal with blunt-tipped, stainless steel hooks on the ends of stout wooden poles. Blunt-tipped net knives, also on the end of poles, sometimes were used to safely cut net away from an ensnared animal. A plywood guillotine door was slid into place once the animal was freed of the net and drawn all the way into the cage. [Headley donated an 8mm film of one of his collections to the Channel Islands Archives at the Santa Barbara Museum of Natural History.]

On rare occasions, harbor seals were caught in the nets although they were set specifically to catch sea lions (R. Headley, pers. comm.). At San Miguel Island, northern elephant seals (*Mirounga angustirostris*) and northern fur seals (*Callorhinus ursinus*), occasionally were caught in the nets, but these were immediately released.

On the beaches Headley collected pinnipeds using 1 m diameter hoop nets. Headley found that small sea lions could be captured by seizing their hind flippers by hand, although this was risky. Headley also used hoop nets to collect harbor seals on beaches, but he found them difficult to collect in numbers, so he never developed a large market for them (R. Headley, pers. comm.).

Headley collected some 200-300 sea lions per year until the passage of the Marine Mammal Protection Act in 1972 (R. Headley, pers. comm.). At this time, the demand dropped dramatically because of stiffer



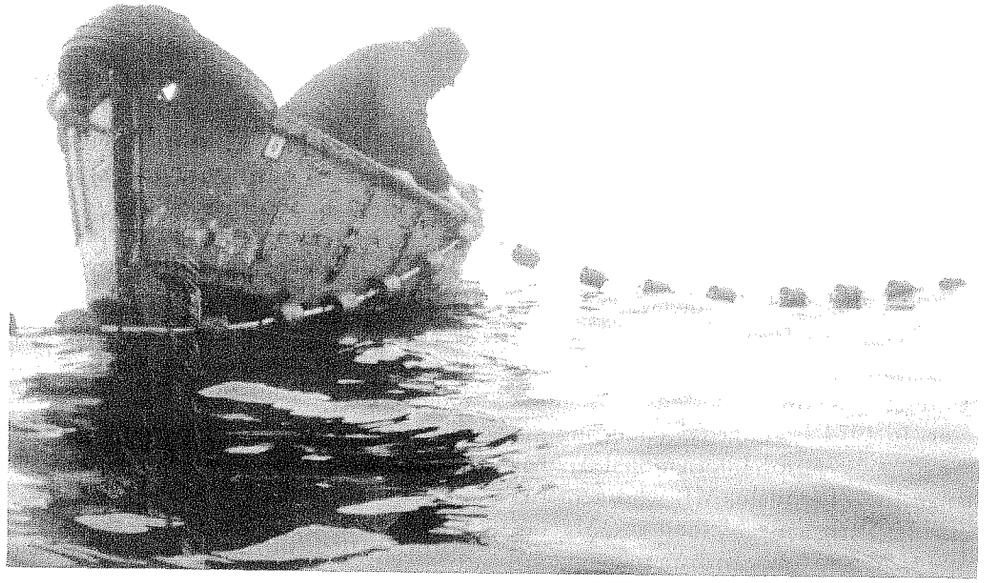


Figure 2. *Upper:* The fishing vessel *Seal* tied up beside floating sea lion holding pens in Santa Barbara Harbor. *Lower:* Louis Nelson, chief collector for Richard Headley, tending a water net off San Miguel Island. Photographs by Peter C. Howorth.

government regulations on permanent holding and exportation of marine mammals.

When Headley first entered the business, Joseph Gorgita, a fisherman from Port Hueneme, CA, also was capturing sea lions off the northern and southern Channel Islands (R. Headley, pers. comm.). Gorgita reportedly sold his animals through jobbers, just as Miller had done. Headley, however, became his own jobber, forming a company called Sea Lions International. Headley expanded the worldwide market developed by his predecessors.

Personnel from Marineland of the Pacific (Palos Verdes, CA) and from Sea World (San Diego, CA) captured pinnipeds as well as cetaceans, for their own display purposes during the 1960s and 1970s. Hoop nets were used to collect smaller pinnipeds (Cornell 1978; B. Andrews, pers. comm.). At Sea World, "Wally" nets were used to collect larger pinnipeds. The Wally nets were large, circular throw nets with a noose around their perimeter (Cornell 1978). Both types of nets were used on beaches rather than in the water.

Lawrence Bond, one of Headley's assistants, started his own Santa Barbara-based company in 1968 called Global Sea Lions. Bond used much the same methods as Headley, although he favored capturing animals on beaches with hoop nets rather than collecting them in the water (L. Nelson, pers. comm.). Bond worked mainly at San Miguel Island, although he did make at least one land-based collection at San Nicolas Island.

In 1969 I started working for Headley. First as an assistant to Headley and his chief collector, Louis Nelson (Fig. 2), later as an assistant to Nelson, and finally as chief collector. In 1974 I also began collecting for Bond, and in 1976, for International Animal Exchange Inc. (Ferndale, MI) who acted as jobbers. In 1976 I established the Marine Mammal Center of Santa Barbara to temporarily house animals collected for commercial purposes. That same year I organized the marine mammal rehabilitation program, a nonprofit operation devoted to rehabilitating pinnipeds and returning them to the wilds.

As chief collector for Headley, I gradually initiated a few changes in collecting methods and equipment over the years. For the collecting net, I reduced the number of lead weights so captured animals more easily could reach the surface to breathe. Lighter twine was used so that large, unmarketable specimens could break through the net safely, and escape without leaving any part of the net stretched over their neck. I eliminated the use of stout wooden cudgels use to stun large, belligerent specimens. I built lighter, more portable equipment because I used small (8-10 m long), fast boats for collecting. Such boats did not handle heavy loads as well as larger vessels. Everything was designed in such a way as to avoid snagging the nets, including building a skiff and floating cage with smooth sides. For hoop nets, I made rings and handles of 3 cm, schedule 80, plastic pipe so animals would not damage their teeth if they bit the hoop during their struggles. As a result of these measures, mortality was reduced to one animal, out of 220 caught during the period 1974-1981.

I developed a new approach to capture during this period. With several assistants, I would swim to animals dozing on rocks or on beaches. By staying in the water until the last moment, it was possible to approach animals quite closely. This method proved very effective for capturing California sea lions as well as harbor seals. Also, many areas that would not have allowed setting the water net because of physical obstructions were opened up to us. Then, too, areas in which only a few animals were hauled out became feasible for collecting efforts because each attempt could be made in minutes, whereas setting the water net would have taken up to an hour.

At Painted Cave, Santa Cruz Island, we collected sea lions by having one person shine a powerful, narrow-beamed light on sea lions hauled out on a narrow ledge in the inner chamber of the cavern. We would swim over to the animals in darkness, to either side of the beam of light, and catch them in the hoop nets. (A reliable light was a necessity.) For specific collecting sites, I made special nets shaped to prevent escape, then stretched them across the mouths of certain coves and caves. In some areas, these nets were set before I attempted a beach capture, thus bolstering our chances of a good catch.

I collected animals at all of the sites Headley had shown me. In addition, I made a land-based collection at San Nicolas Island, and at Gull Island and West Point off Santa Cruz Island.

Discussion

Historical interest aside, the methods developed by commercial collectors can be applied quite successfully to research efforts. In 1981, Daniel Miller of the California Department of Fish and Game (Monterey), consulted with me concerning the proposed capture of harbor seals at the mouth of Klamath River. The animals were to be captured, tagged and released as part of a National Marine Fisheries Service study on the effects of harbor seals on the local salmon fishery. Miller and I went over capture strategies and I loaned the department my largest collection net. The department's efforts were quite successful (D. Miller pers. comm.; Herder 1983). In 1982, I consulted with Douglas DeMasters of the National Marine Fisheries Service (La Jolla, CA). DeMasters was coordinating the radiotagging of harbor seals at San Miguel Island with Brent Stewart of what was then the Hubbs-Sea World Research Institute (San Diego, CA). We collected and radiotagged several harbor seals using the swimming approach with wetsuits (B. Stewart, pers. comm.). This method was also used by Brent Stewart and Pamela Yochem in later studies. In 1983, I brought my collection skiff, water nets, hoop nets, cages and other gear to Monterey, California, where the National Marine Fisheries Service was conducting a mark/recapture, food habits, and feeding cycle duration study on California sea lions (K. Nicholson, pers. comm.). During this project, we employed several strategies, including use of the water net, the skiff as a rapid landing craft for collectors with hoop nets, and the swimming approach. This, too, was quite successful. During the course of this project, we were able to capture a young male California sea lion that had a severe wound around its neck inflicted by a commercial fisherman's gill net. The net was removed and the animal recovered, according to the Society for the Prevention of Cruelty to Animals (Monterey, CA).

The multifaceted approach to capture proved very useful in the Monterey project, particularly since the collecting efforts took place over several days. Collectors repeatedly using a single technique and one type of gear, especially in the same area, have invariably met with progressively less success (R. Headley, L. Nelson, R. DeLong, G. Antonelis, D. DeMasters, K. Nicholson, pers. comms.). In 1986, variations of one approach were used in the Seattle, Washington area in an attempt to remove a few California sea lion bulls preying upon a steelhead (*Salmo gairdnerii*) run (R. DeLong, pers. comm.). The animals became progressively more wary and were not caught (G. Antonelis, pers. comm.).

From the standpoint of efficiency, the greater the variety of methods, equipment and collecting sites, the better the chances of success. Having enough equipment and personnel to adapt to local conditions, including the size and configuration of the collecting site, its accessibility, the number and species of animals present, and the weather and sea conditions, is essential to consistent success, especially when one area is repeatedly worked over a period of time. Pinnipeds definitely become wary of repeated collection attempts using only one method. In fact, pinnipeds may become so disturbed by repeated human presence that they temporarily or permamently abandon haul out areas (Peterson & Bartholomew 1967; R. DeLong, pers. comm.). This is all the more reason why every attempt should be made to capture animals in the swiftest, most efficient manner.

Nets set in the water are extremely efficient when not used in the same area over a period of a few days. At San Miguel Island, it was not unusual to catch more than 100 sea lions in a day's set. Captured animals were culled to meet each client's requirements as to size, age and sex, so the majority often were released unharmed. On one particularly productive day, however, nearly 300 sea lions were caught but only 78 were kept.

Water nets (Fig. 3) are discriminatory only if deployed when one species of pinniped is present. Nets set in the presence of several species are not discriminatory. Hoop nets (Fig. 3), on the other hand, can be used to select for species, size, approximate age and even sex in the case of mature specimens. When handled carefully, hoop nets pose virtually no threat to the well-being of the animal being captured. For several reasons, specimens can easily be drowned with waternets. If the net is not watched diligently and ensnared animals removed promptly, they may become exhausted and drown, especially if a heavy lead line is used. The lead line should be only heavy enough to sink the bottom of the net. Large specimens caught in a net often drown smaller animals by placing so much tension on the net that the smaller ones cannot reach the surface. If a net becomes fouled on rocks, an animal trapped toward the bottom of the net may nor be able to reach the surface to breathe. For this reason, collecting sites should be surveyed carefully for underwater obstructions before the net is deployed.

Another danger that arises through the use of water nets is that animals may break loose with part of the net stretched tightly around their necks. This happens frequently when pinnipeds are incidently caught in commercial monofilament gill nets used by the fishing industry (Ford, Andrews, Barrett, pers. comms.). Over time, the net chafes its way through the tissues, creating a large open wound which may become infected. In young animals the tightly stretched net acts like a garrote, slicing its way through tissue as the animal grows. Surgical removal of the net, followed by lengthy convalescence, often saves such animals, providing infections are not too severe.

Persons engaged in the collection of pinnipeds should use nets made of twine rather than monofilament. Twine does not seem to stretch as much and is comparatively larger in diameter for a given strength. Twine made of natural fibers is biodegradable and will break down over time, whereas nylon twine lasts much longer. Mesh size should be selected according to the species sought. By using twine with a small mesh size, even subadult animals will not be able to get the net around their necks (Fig. 3).

Commercial collection methods and equipment have been employed in capturing distressed pinnipeds on mainland beaches. The animals usually are captured with hoop nets or by hand, although the swimming approach and water nets have been used when more conventional methods failed. During the period 1976 through 1987, hundreds of distressed pinnipeds have been captured, rehabilitated and released. The experience gained during the years of commercial collection activities have proved very useful for this nonprofit endeavor.

Acknowledgments

My sincerest thanks go to Richard Headley, who introduced me to the commercial collection of marine mammals and provided considerable historical insight into the subject, and to Louis Nelson, whose enthusiasm and warm regard for his captives led me toward a deeper involvement with marine mammals. Special thanks go to National Marine Fisheries Service biologists Robert DeLong, George Antonelis and Douglas DeMasters and observers Doug Beach, Gene Nitta, and Dana Seagars. The Nature Conservancy funded an initial study of the subject at

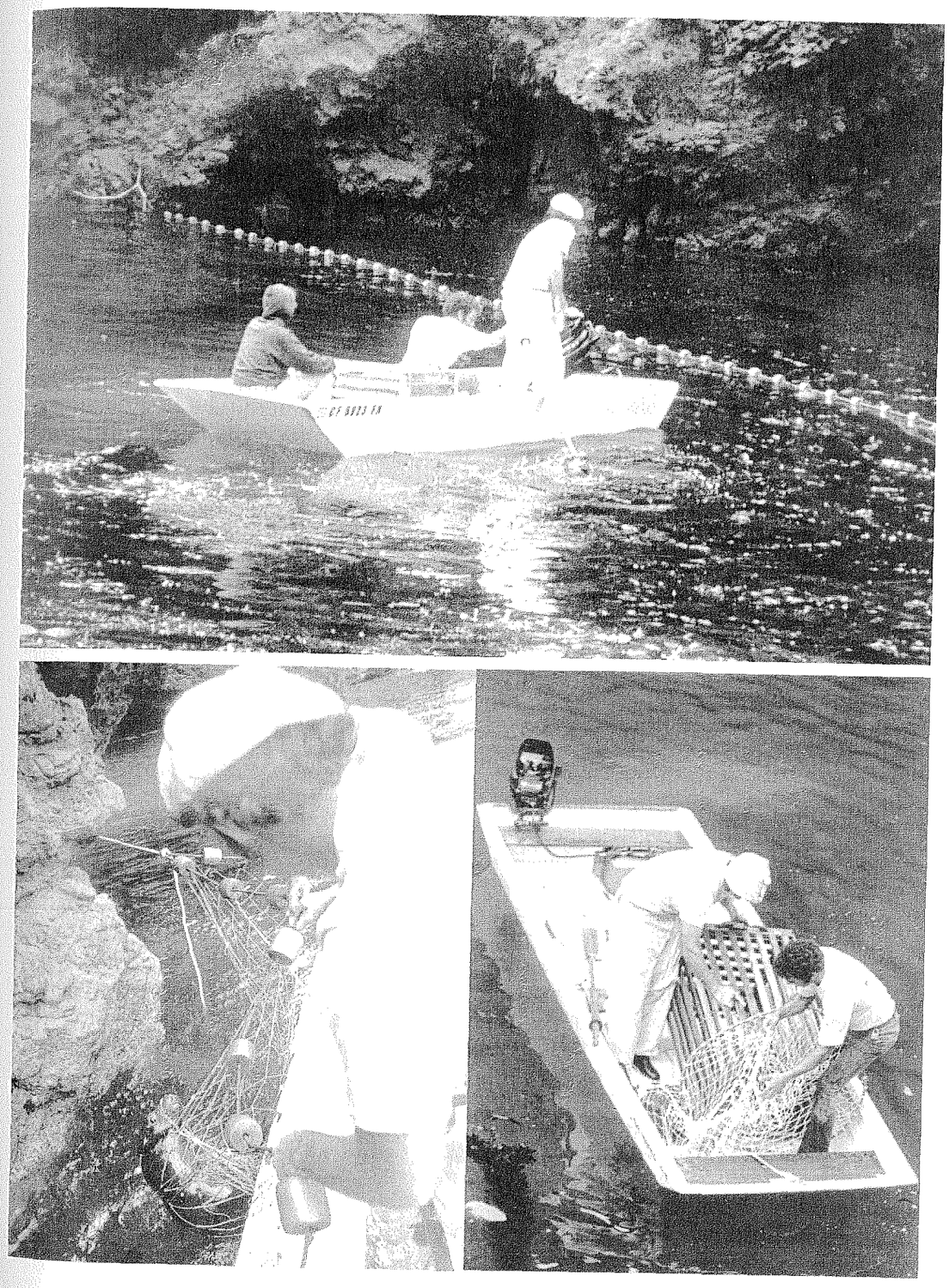


Figure 3 (facing page). *Upper:* A water net deployed by tying to rocks at the entrance of a sea cave off Santa Cruz Island. A California sea lion is caught in the net just behind the outboard motor. *Lower Left:* Author Peter Howorth retrieving a subadult sea lion from the water net. *Lower Right:* A subadult sea lion being transferred from a hoop net to a wooden cage by author and assistant Jon Holcomb (on right). All photographs by Dick Smith.

Santa Cruz Island, and the National Park Service, Channel Islands National park, has provided continued support. Staff at the Ventura and Santa Barbara County Historical Societies, as well as, Susan Dixon, librarian at the Santa Barbara Museum of Natural History's Channel Islands Archives were very helpful in tracking down historical information. Brent Stewart (Hubbs Research Institute) and Charles Woodhouse (Santa Barbara Museum of Natural History) provided encouragement and support through numerous projects involving pinnnipeds. Finally, I thank fellow participants of the Marine Mammal Stranding Network, whose efforts have immeasurably deepened our understanding and awareness of pinnipeds.

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Submerged Archaeological and Historical Sites in the Channel Islands National Park and Channel Islands National Marine Sanctuary

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Abstract – The waters of the Channel Islands National Park and Channel Islands National Marine Sanctuary contain numerous submerged archaeological and historical sites. Stone artifacts discovered in 18 submerged archaeological sites span the period from some 9,000 years ago to recent history. The remains of shipwrecks cover the period from possibly as early as Cabrillo's voyage (1542-1543) to the present and includes 105 wreck sites.

Introduction

Submerged archaeological material dating from as much as 9,000 years ago to recent history exists in the Southern California Bight (Hudson 1976). In addition to Indian artifacts, the submerged material includes ships, from perhaps as early as Cabrillo's voyage in 1542-1543 to the present, as well as 20th century aircraft (L. Pierson, pers. comm.; Howorth 1984a; Hudson & Howorth 1985). Such materials constitute an important part of the nation's cultural, archaeological and historical resources.

Submerged prehistoric cultural resources have been reported from numerous sites along the mainland coast of the Southern California Bight, particularly in San Diego County (Carter 1953; Marshall & Moriarty 1964; Masters 1983, 1985; Moriarty 1961, 1964, 1969; Tuthill & Allanson 1954). In the northern part of the bight fewer such resources have been documented (Harrington 1928; Holt 1937; Howorth 1974, 1975, 1976b, 1983a; Hudson 1976, 1979, 1980; Muche 1978; Orr 1968; Phelps & Muche 1977; Pierson & Stickel 1978; Wallace & Kritzman 1956). Most of the material from the northern part of the bight came from the mainland coast (Hudson 1976), however, a recent study found 17 submerged prehistoric localities at Channel Islands National Park and National Marine Sanctuary (Hudson & Howorth 1985). Another prehistoric locality has been discovered since that study.

Submerged historical sites within the boundaries of the Channel Islands National Park and Channel Islands National Marine Sanctuary consist of shipwrecks, parts of shipwrecks, artifacts lost or jettisoned from ships and aircraft wrecks. To date only one historic wreck, the paddlewheeler *Winfield Scott*, has been documented in detail by a professional maritime historian (Delgado 1983). Several other shipwrecks are now the subjects of ongoing investigations by trained diver/archaeologists and by nautical historian Stephen Haller (National Park Service). Forty-eight submerged historic sites within the Channel Islands National Park and National Marine Sanctuary were included in an archaeological literature survey and sensitivity zone map compiled for the Bureau of Land Management (Pierson 1980; Pierson & Stickey 1978). In 1987, Pierson & co-authors prepared another shipwreck report for the Minerals Management Service (MMS), covering the area from Morro Bay to the Mexican border and including the California Islands. In this study, Pierson added six shipwrecks to Channel Islands National Park and National Marine

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