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A PROFILE OF THE MONTEREY SQUID FLEET IN 1992

by

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ABSTRACT

There were approximately 20 vessels active in the 1992 Monterey Bay squid fishery. The size of the fleet has not changed since the early 1970's when 15 to 20 vessels participated in the fishery.

Since 1977, eleven steel hulled vessels have been added to the fleet, replacing smaller wooden hulled vessels that were in use during the 1960's. The hold capacity of the new fleet remains about 800 tons, because the new larger vessels replaced small vessels that used lighters (20 - 25 ton capacity non-motorized barges).

Purse seines were legalized in 1989 and have replaced lamparas which were in use during the 1960's and 1970's. Seines used in the squid fishery are small and shallow, ranging from 120 to 200 fm in length with most less than 25 fm deep.

Crew size has been reduced nearly 50% by the addition of net reels, power blocks, submersible fish pumps, and vacuum pumps used for unloading at dockside.

In the 1970's flasher type fathometers were used by the fleet and few vessels had navigational aids. Today most of the fleet have sonar, radar, and loran C. Three vessels carry global positioning systems.

In 1988 squid attracting lights were legalized and the entire fleet used lights during the 1992 season.

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INTRODUCTION

A prerequisite for fishery management is a knowledge of vessels, gear, and fishing methods currently used by the fishing fleet.

From 1970 to 1975 the Monterey squid fleet numbered 15 to 20 active vessels, except for 1972 when 33 vessels participated in the fishery (Kato and Hardwick, 1975). Since 1975, the number of vessels in the Monterey fleet has not changed significantly, but many of the older wooden vessels have been replaced by larger steel-hulled vessels with greater horsepower and state of the art electronics. In addition, purse seines banned in 1953 and squid attracting lights banned in 1959 are once again the gear of choice by the fleet.

This report describes many changes in vessels and fishing gear that have increased the efficiency of the Monterey Bay squid fleet since 1975.

METHODS

Monterey squid vessel captains were interviewed between July and September 1992. Information was provided voluntarily in response to questions asked in these subject areas: 1) Vessel characteristics, 2) Nets, 3) Hydraulics and power equipment, 4) Electronics, and 5) Light systems. In most cases, captains relied on memory to describe their vessels, nets, and gear. Some answers could not be verified by the interviewer, but all information is considered accurate to the best of the captains'

knowledge.

All data obtained are considered confidential with regard to specific vessels, and all vessels were assigned an anonymous identification number for the purpose of presenting and comparing the data. Vessel identification numbers were kept constant throughout the analysis. For example, vessel number 5 is the same vessel in all tables.

RESULTS AND DISCUSSION

Eighteen vessel captains or crew members were interviewed. There were also 4 other vessels that fished briefly during the season, but their captains were not interviewed before they left the area.

Vessel Characteristics

The 1992 Monterey squid fleet was composed of vessels that averaged 52 ft in length with 300+ horsepower engines and hold capacities of 40 tons. This is a marked increase over the early 1970's when the typical Monterey squid vessel averaged only 37 ft in length, 124 horsepower, and only 12 tons in hold capacity (Kato and Hardwick, 1975). However, lighters (a non-motorized barge) capable of carrying 25 tons of squid were commonly used by small squid vessels during the 1970's. Lighters increased the hold capacity of these vessels to an amount comparable to the average hold capacity of the 1992 fleet.

Wood-hulled Vessels

The oldest and one of the larger vessels active in 1992 was

built in 1941 (Table 1). This vessel is a remnant of the sardine fishery, which flourished in California until the early 1950's.

There were five other wooden vessels, all built before 1959 and similar to, but slightly larger than, vessels that were active in the squid fishery in the early 1970's. These vessels averaged 44 ft in length, 183 horsepower, and about 20 tons in hold capacity (Table 1).

Steel-hulled Vessels

None of the vessels that were active in the 1992 season were built during the 1960's. The ten vessels built from 1971 to 1985 were of steel construction and larger than older vessels. These vessels averaged 52 ft in length, 320 horsepower, and nearly 40 tons in hold capacity (Table 1).

The two newest vessels in the fleet were built in 1989 and continued the trend toward larger more powerful vessels. These vessels averaged 68 ft in length, 500+ horsepower, and 75 tons in hold capacity (Table 1).

Fiberglass-hulled Vessels

The first fiberglass vessel to fish squid at Monterey was built in 1988. Although of modern construction and design, its length (45 ft) is typical of earlier squid vessels (Table 1). This vessel fished briefly and the captain was not included in interviews.

Power Equipment

Power equipment used by squid vessels of the early 1970's bears little resemblance to that used by the present day fleet.

Power Skiffs

In the 1970's, lampara nets (Scofield 1951) were used by the squid fleet and sets were made without the aid of a power skiff. Some vessels used only a lighted buoy tied to a tow line on one end of the net, rather than a skiff (Kato and Hardwick, 1975).

By 1980, the fleet had converted to wooden skiffs powered by outboard engines. In 1992, outboard powered wooden skiffs were still in use, but most of the newer vessels had upgraded to aluminum skiffs with inboard engines.

Power skiffs allow the net to be towed from both ends during a set, reducing the time needed to encircle a school of fish. The skiff is also used to tow the main vessel away from the net during brailing, allowing the captain more freedom in determining how to make the set. Without a power skiff, the main vessel had to be down wind of the net during hauling and brailing.

Power Blocks and Net Drums

In the 1970's, lamparas used by the fleet were hauled with hydraulically or mechanically powered gurdies made from automobile differentials, but the net was stacked by hand (Kato and Hardwick 1975).

By 1992, the entire fleet had converted to either hydraulic power blocks and/or net drums (reels) to haul the net during a set (Table 2). Without a drum the net is hauled by the power block and then stacked by the crew on the stern of the vessel. With a drum, the net may be hauled by either the power block or the drum, and is wound directly onto the drum. The net is stored

on the drum between sets and deployed directly from the drum during the next set. Although lamparas nets are currently not used for squid at Monterey, they are adaptable to net drums.

Net drums or reels have been installed on 11 of 18 vessels described in this report. This modification does not affect the way the net fishes, but allows for a more efficient operation. The net drum was a tremendous labor saving device that reduced the crew size on squid vessels from an average of ten to five crewmen.

Submersible Fish Pumps

Sock brails are still in use by most of the fleet to transfer squid from the net into the vessel's hold. However, by 1992 submersible fish pumps had been installed on five vessels (Table 2). Both methods are capable of transferring 40 to 45 tons of squid per hour, but brailing is more labor intensive.

By the early 1980's, squid buyers at Monterey had converted to vacuum pumps to unload vessels at dockside. This method is much faster and less labor intensive than brailing. The second smaller sock brail carried by vessels in the 1970's for unloading the catch is no longer used.

Nets

In 1953, purse seines were banned from use on the squid fishing grounds in Fish and Game District 16, which lies south of a line drawn 100 degrees magnetic from Point Pinos easterly to the mainland shore (Figure 1). Purse seines used in this shallow part of Monterey Bay were suspected to cause damage to squid egg

cases that are attached to the bay floor. Lamparas were used exclusively to take squid in District 16, until 1987, when the Department allowed the limited experimental use of purse seines. Results from the experiment indicated that purse seine nets were no more damaging to squid eggs than lamparas (Paul Wild, CDFG, pers. comm.). The ban on purse seines was lifted in 1989, and they have since been the net of choice by the Monterey squid fleet.

Net Dimensions

Purse seines used by the 1992 Monterey squid fleet were small in comparison to those used in other purse seine fisheries, and ranged in length from 120 to 200 fm (Table 3). Seines were also of shallow construction, with most nets less than 25 fm deep; nine vessels had nets 20 fm or less deep. These relatively shallow nets were designed for fishing near shore over squid spawning grounds. Their shallow construction, which limits the amount of contact with the bottom of the bay, reduces the amount of damage to squid egg cases which are attached to the substrate.

Mesh Size

The most common mesh size used for squid was 1.25 inches, but many vessels have more than one net with mesh sizes ranging from 0.5 to 1.75 inches (Table 3). Different mesh-size nets are used early or late in the season depending on the size of squid present at the time. The small and large mesh nets are also used as anchovy and mackerel nets, respectively.

Foot Rope

Chain and wire cable that are commonly used as foot ropes on purse seines have nearly been eliminated in the Monterey Bay squid fishery. These are also believed to increase the damage to squid egg cases. In 1992, only one vessel used a wire cable foot rope; all other vessels have switched to a lead-core rope as foot rope.

Purse Lines

Rope purse lines are used by most of the vessels, in place of wire cable (Table 3). Rope purse lines are also believed to cause less damage to squid egg cases than wire cable.

Electronics

There have been tremendous advances in marine electronics since the early 1970's, when most Monterey squid vessels had no navigational aids such as radar or loran. Fish finders were flasher type fathometers, and only one vessel had sonar (Kato and Hardwick 1975).

Both navigational and fish finding capabilities of the fleet have improved dramatically over the 1970's era. Any comparison of the fishing power or catch per unit of effort of the 1992 fleet with earlier fleets should reflect these changes.

Navigational Aids

In 1992, 15 of 18 vessels had both loran C and radar. All vessels had at least one navigational aid (Table 4). Three vessels carried satellite Global Positioning Systems (GPS), although they were not used extensively in the squid fishery.

Fathometers

All vessels had fish finders which also serve as fathometers. Popular brands include Raytheon, Furuno and Si-Tex with ranges up to 3200 ft (Table 4) and operating frequencies from 28 to 200 KHz.

Sonar

Sonar was used by 12 of 18 vessels (Table 4). The most popular brand used by the fleet was Wesmar, with ranges up to 3200 ft. The primary difference between sonar and fathometers is that the sonar transducer is mounted away from the hull where it can be rotated 360° and directed from vertical to horizontal. Fathometers have fixed vertical beams. Sonar allows a greater area to be searched during scouting and increases the probability of locating squid.

Light Systems

Squid attracting lights were banned from the Monterey squid fishery by legislation in 1959 because processors felt that squid caught with the aid of attracting lights were of poorer quality and smaller in size than those caught without lights. Also, some fishermen felt that lights disrupted spawning, although this was never substantiated. In addition, fishermen were upset that processors could attract squid directly under their piers and dip net them without using vessels. The Department has maintained a neutral position regarding the use of attracting lights.

In 1977 and 1978, the Fish and Game Commission issued two experimental gear permits to use attracting lights for squid in

Monterey Bay. This decision was controversial, and the permits were discontinued based on many of the same reasons as in 1959 when attracting lights were originally banned.

In 1987, after a 28 year prohibition, the squid fishing industry agreed (although not unanimously) to allow fishing with squid attracting lights in Monterey Bay. The industry introduced legislation that allowed lights only in Fish and Game District 17. This encompasses all of Monterey Bay except District 16, which includes most of the traditional squid fishing grounds (Figure 1).

In 1988, further legislation lifted the remaining ban on attracting lights in District 16. The entire squid fleet used attracting lights in the 1992 season. Vessel no. 5 (Table 5) does not have a generator and only has one light, but the captain claimed that he was using attracting lights.

All but one vessel carried an auxiliary generator, and outputs ranged from 4.5 kw to 75 kw. Vessels had up to 24 lights of varying wattage and type (incandescent, quartz halogen, and mercury vapor), although 10 vessels carried six or less lights (Table 5). In some cases, the combined wattage of all the lights approached or exceeded the capacity of the generators output; however, all lights are not used at the same time.

On a typical trip, vessels leave port at about midnight and scout until squid are located; they then anchor and turn on the attracting lights. When squid have formed a dense school under the vessel the lights are turned off and the net is set. Lights

are turned back on during pursing and brailing; this presumably reduces the amount of squid that escape the net and begins to attract more squid for the next set.

The use of attracting lights since 1989 has increased the fleet's ability to catch squid. Lights are beneficial when squid are scattered or less abundant because the available squid concentrate under the lights. This practice may maintain higher catch rates than could be achieved without lights, and may also give a false impression of squid abundance.

Catch and Processing Capacity

Daily Hold Capacity

There have been many gear changes by the Monterey squid fleet since the early 1970's that have reduced the crew size and increased the efficiency of the fleet. However, the daily hold capacity of the fleet, based on 20 vessels, has not changed appreciably over the years, and remains about 750 to 800 tons per day.

Daily Fleet Fishing Capacity

Due to the increased efficiency of the fleet, the actual daily fishing capacity is greater than the fleet's total hold capacity. Now squid are located more quickly with sonar and attracting lights, and gear innovations (drums, submersible fish pumps) have reduced the time it takes to complete a set. In addition, unloading at dockside is now faster with vacuum pumps, allowing vessels to return to the fishing grounds sooner. These changes allow some vessels to make two trips per day, increasing

the daily fishing capacity to about 1,000 tons.

Processing Capacity

Regardless of improvements and increased efficiency of the squid fleet, the industry's capacity to process only 500 to 600 tons of squid per day remains less than the daily catch potential of the fleet. As long as this situation prevails, the squid catch at Monterey will be ultimately limited by the processors capacity. The imposition of daily landing limits by processors on squid vessels during times of peak squid catches is still necessary, a feature reminiscent of the 1970's fishery.

REFERENCES

Kato, S. and J. Hardwick 1975. The California squid fishery. In Contributed papers submitted to the expert consultation on fishing for squid and other cephalopods. Tokyo and Hakodate (Japan) 9-13 September 1975. FAO Fish. Rep.,(170) Suppl. 1: 150p.

Scofield, W. L. 1959. Purse seines and other roundhaul nets in California. Calif. Dept. Fish and Game, Fish Bull.,81:83p.

TABLE 1. Characteristics of vessels active in the 1992 Monterey squid fishery.

Vessel	Year built	Length (feet)	Hull type	Horse power	Hold capacity (tons)
1	1941	72	Wood	360	70
2	1944	48	Wood	165	25
3	1947	40	Wood	160	13
4	1948	52	Wood	160	30
5	1952	38	Wood	165	16
6	1958	40	wood	265	13
7	1971	56	Steel	335	41
8	1977	50	Steel	320	40
9	1977	46	Steel	225	18
10	1978	52	Steel	350	33
11	1978	50	Steel	240	40
12	1978	54	Steel	390	45
13	1979	53	Steel	240	40
14	1980	50	Steel	235	30
15	1985	54	Steel	350	40
16	1985	56	Steel	500	65
17	1989	58	Steel	500	65
18	1989	78	Steel	540	85

TABLE 2. Power equipment used by 1992 Monterey squid vessels.

Vessel	Skiff type	Skiff length (feet)	Fish pump	Power block	Net drum
1	1	20	Yes	Yes	No
2	2	18	No	No	Yes
3	2	18	No	Yes	No
4	1	16	No	Yes	Yes
5	1	18	No	No	Yes
6	2	15	No	No	Yes
7	1	19	No	No	Yes
8	2	19	No	Yes	No
9	2	17	No	Yes	No
10	1	18	No	Yes	Yes
11	2	17	No	Yes	No
12	2	19	Yes	Yes	Yes
13	2	18	No	Yes	Yes
14	2	21	No	Yes	No
15	1	19	No	Yes	Yes
16	1	20	Yes	Yes	Yes
17	1	18	Yes	Yes	Yes
18	1	25	Yes	Yes	No

Note. Skiff type: 1=Inboard and 2=Outboard

TABLE 3. Description of purse seines used by the 1992 Monterey squid fleet.

Vessel	Net length (fm)	Net depth (fm)	Purse line type	Foot rope type	Mesh size (inches)	Net drum
1	160	21	Cable	LCR	1.5	No
2	160	25	Rope	LCR	0.5	Yes
2	175	25	Rope	LCR	1.5	Yes
2	200	20	Rope	LCR	1.5	Yes
3	120	22	Rope	LCR	0.687	No
3	130	21	Rope	LCR	1.25	No
4	180	22	Rope	LW	1.25	Yes
5	150	20	Rope	LCR	1.25	Yes
6	120	16	Rope	LCR	0.75	Yes
7	200	20	Rope	LCR	1.25	Yes
8	190	20	Rope	LCR	1.25	No
9	125	20	Rope	LCR	1.25	No
9	125	22	Rope	LCR	1.25	No
10	140	24	Rope	LCR	0.687	Yes
11	145	14	Rope	LCR	1.25	No
11	200	26	Rope	LCR	1.25	No
12	175	26	Rope	LCR	1.25	Yes
13	165	25	Rope	LCR	1.375	Yes
14	150	16	Rope	LCR	1.25	No
15	160	22	Rope	LCR	1.25	Yes
16	140	20	Rope	LCR	1.25	Yes
16	200	26	Rope	LCR	1.25	Yes
17	150	20	Rope	LCR	1.25	Yes
18	200	34	Cable	LCR	1.75	No

Note. Type foot rope: LCR = lead core rope, LW = lead wire

TABLE 4. Electronic equipment used by the 1992 Monterey squid fleet.

Vessel	Loran	GPS	Sonar	Range (feet)	Fath-ometer	Radar	Range (miles)
1	Yes	No	Yes	2400	Yes	Yes	24
2	Yes	No	No	--	Yes	Yes	24
3	Yes	No	Yes	800	Yes	Yes	24
4	Yes	No	No	--	Yes	Yes	16
5	No	No	No	--	Yes	Yes	16
6	Yes	No	No	--	Yes	No	--
7	Yes	No	Yes	1000	Yes	Yes	24
8	Yes	Yes	Yes	800	Yes	Yes	32
9	No	No	No	--	Yes	Yes	24
10	Yes	No	Yes	1400	Yes	Yes	40
11	Yes	No	Yes	1400	Yes	Yes	24
12	Yes	No	Yes	1600	Yes	Yes	26
13	Yes	No	Yes	3200	Yes	Yes	32
14	Yes	No	Yes	2400	Yes	Yes	36
15	Yes	No	No	--	Yes	Yes	24
16	Yes	No	Yes	2400	Yes	Yes	36
17	Yes	Yes	Yes	2400	Yes	Yes	24
18	Yes	Yes	Yes	2400	Yes	Yes	40

TABLE 5. Description of light systems used by the 1992 Monterey squid fleet.

Vessel	Auxiliary generator	Output (KW)	No. of lights	KW all lights
1	Yes	30	4	8
2	Yes	6	5	5.5
3	Yes	4.5	2	2
4	Yes	6.5	4	4
5	No	--	1	<1
6	Yes	10	2	8
7	Yes	20	12	20
8	Yes	30	17	25
9	Yes	5	6	5
10	Yes	30	6	6
11	Yes	5.5	3	4
12	Yes	21	18	24
13	Yes	33	6	15
14	Yes	40	22	30
15	Yes	25	10	16
16	Yes	75	24	38
17	Yes	50	14	30
18	Yes	40	10	20

Note. The total kw of all lights on a given vessel is, in most cases, the captain's best estimate.

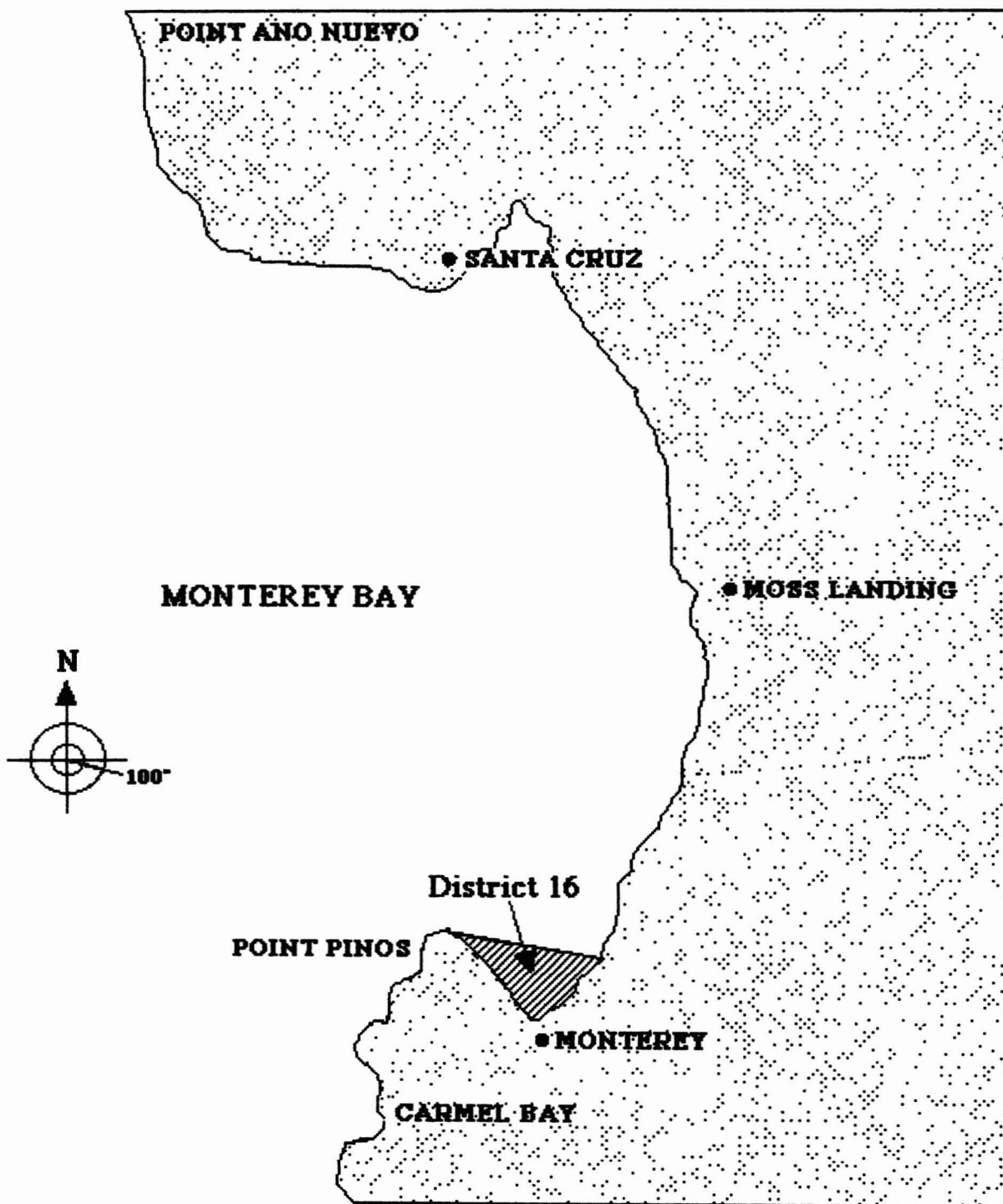


Figure 1: Monterey Bay with Fish and Game District 16 delineated by a line drawn 100° magnetic from Point Pinos to the eastern shore.