

The Traditional Central California Setnet Fishery

EDWARD UEBER

Introduction

Setnets, curtainlike fishing gear designed to entangle fish or catch them by the gills, have been under study in recent years. In 1984, the California Department of Fish and Game (CDFG) began a study of the central California setnet fishery to determine its scope and the incidence and magnitude of captured birds and mammals. Concurrent with this study was a continuing project conducted by the national Sea Grant Program and the National Marine Fisheries Service to develop methods less controversial than setnet fishing and, where possible, to introduce new gear which would capture the desired fish but not birds and mammals.

Another reason for the study was a desire by industry and the CDFG for an economic assessment of the fishery. The California legislature wanted to learn the number of active setnet fishermen and

the importance of setnet revenues to fishermen's total income. Two other areas of legislative interest were fuel consumption and safety conditions aboard setnet vessels.

The foremost objective of this study was to determine the number of active setnet fishermen and to provide an economic and descriptive profile of the setnet fishery. Secondary objectives were to assess the costs of setnet fishing and the ex-vessel revenues attributable to it, and to gather information about vessel fuel use.

The setnet fleet was known to consist of Vietnamese and non-Vietnamese (traditional) fishermen. Due to language difficulties, the author was unable to obtain information from Vietnamese fishermen. This report, therefore, represents only the traditional sector of the central California setnet industry.

Background

In California, setnets include gill nets and trammel nets. Trammel nets include the traditional three-wall trammel nets ("trammel" nets) and suspender gill nets ("suspender nets"). A gill net is a single-walled net which is hung taut (without slack) (Fig. 1A). Fish are generally caught in such nets by having their gill covers hooked on the netting; this is called gilling.

Trammel nets (Fig. 1B) are three-walled nets with a slack inner wall of small mesh and two outer walls of taut large mesh, one wall on each side of the inner wall. Fish swim through the larger outer mesh, strike the small inner mesh, and push the small mesh through the

other outer wall. This loop of small mesh forms a pocket and the fish are trapped (Clark, 1931).

Suspender nets are legally designated as trammel nets in CFG Code 8700 and are identical to gill nets except that lines (suspenders) are attached between float-rope and footrope (Fig. 1C). The suspenders cause the single-wall net to bag or become slack. Suspender nets both gill and entangle fish. Fishermen who use suspender nets claim that they are easier to empty, less expensive, and catch a wider range of species. Trammel net users say that the three-wall net is better for catching Pacific halibut, *Hippoglossus stenolepis*, and that sharks and other fishes do not fall out of the net as easily as from suspender or gill nets.

In 1982, the Pacific Coast Groundfish Plan, developed by the Pacific Fishery Management Council (PFMC) and approved by the Secretary of Commerce as prescribed in the Magnuson Fisheries Conservation and Management Act of 1977, became law. This plan prohibits fishing for groundfish with set trammel or gill nets north of lat. 38½°N (Point Reyes) in the U.S. fishery conservation zone (FCZ). In areas south of lat. 38½°N, Article 5 of the CFG Code, Section 8680 through 8693, is the governing regulation in California ocean waters and the FCZ (PFMC, 1982).

In 1983, 1984, and 1985, Article 5 was changed, and in 1986 new CFG permit regulations were instituted. The new Article 5 does not apply to setnetters fishing in the FCZ¹. The 1986 permits are nontransferable and obtainable by qualified fishermen only. The new regulations limit the number of permits to 135

ABSTRACT—In 1984, the central California traditional (non-Vietnamese) setnet fishery was calculated to consist of 266 fishermen fishing from 133 different vessels. These men fished with set gill, trammel, and suspender nets predominantly for Pacific halibut, *Hippoglossus stenolepis*; rockfish, *Sebastes* spp.; white croaker, *Gempsonus lineatus*; shark (*Squaliformes*); lingcod, *Ophiodon elongatus*; and sablefish, *Anoplopoma fimbria*. The estimated capital value of the traditional setnet vessels and the setnet gear in 1984 was \$11,000,000. Fixed and variable costs (excluding crew wages) were estimated at around \$3,500,000, and ex-vessel revenues were about \$4,000,000. Results in this report pertain only to the traditional setnet fishery and should not be extrapolated to include either the Vietnamese fishermen or the fishery in which Vietnamese setnetters fish.

Edward Ueber is with the Tiburon Laboratory, Southwest Fisheries Center, National Marine Fisheries Service, NOAA, 3150 Paradise Drive, Tiburon, CA 94920.

¹Carper, H. A. 1986. Letter to Joseph C. Greenley, 6 March 1986, Sacramento, Calif.

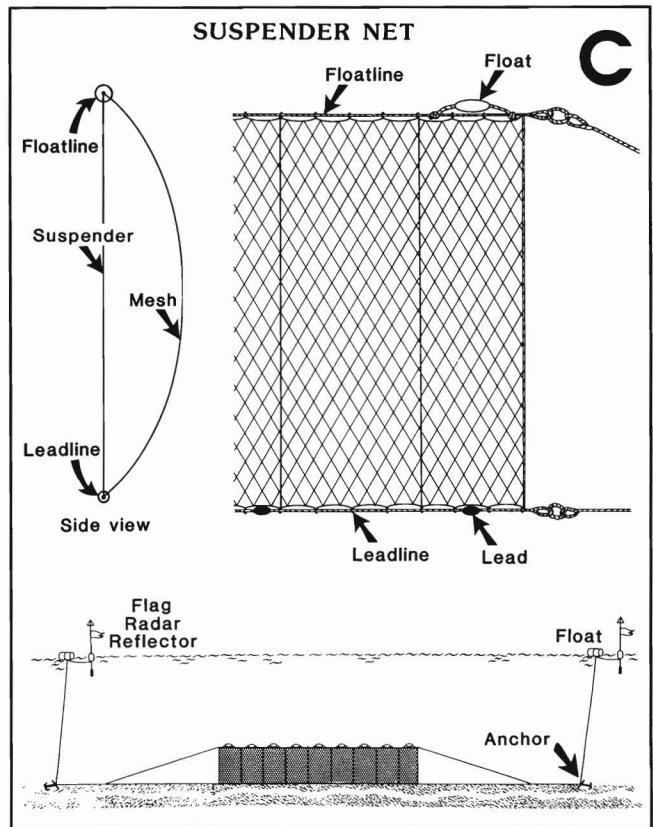
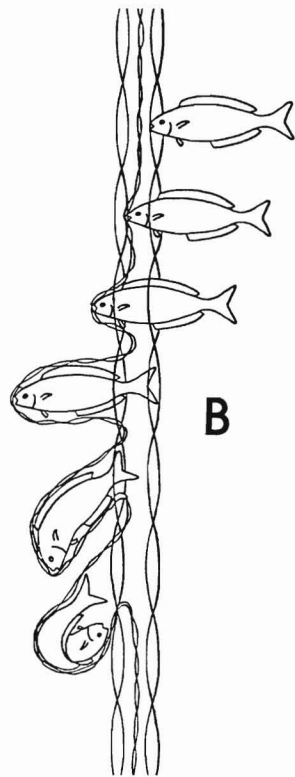
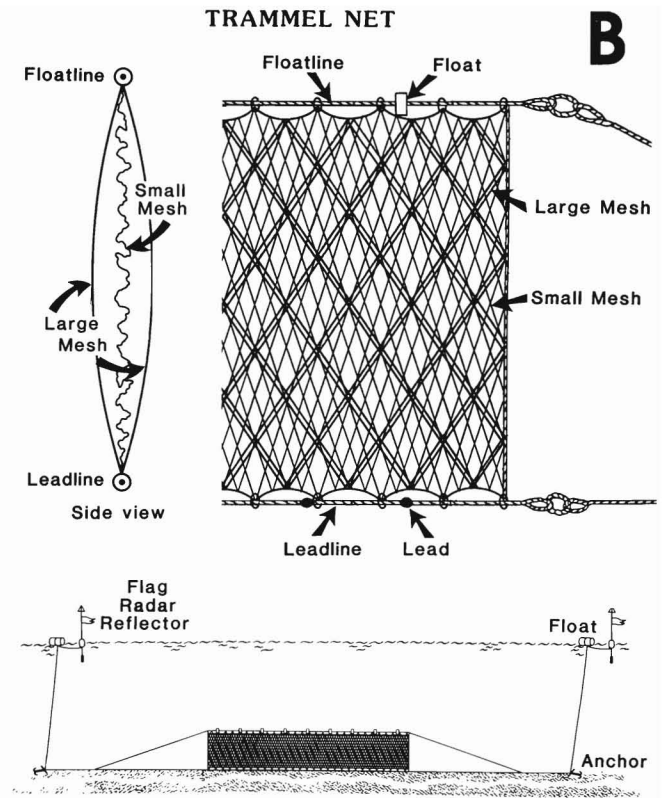
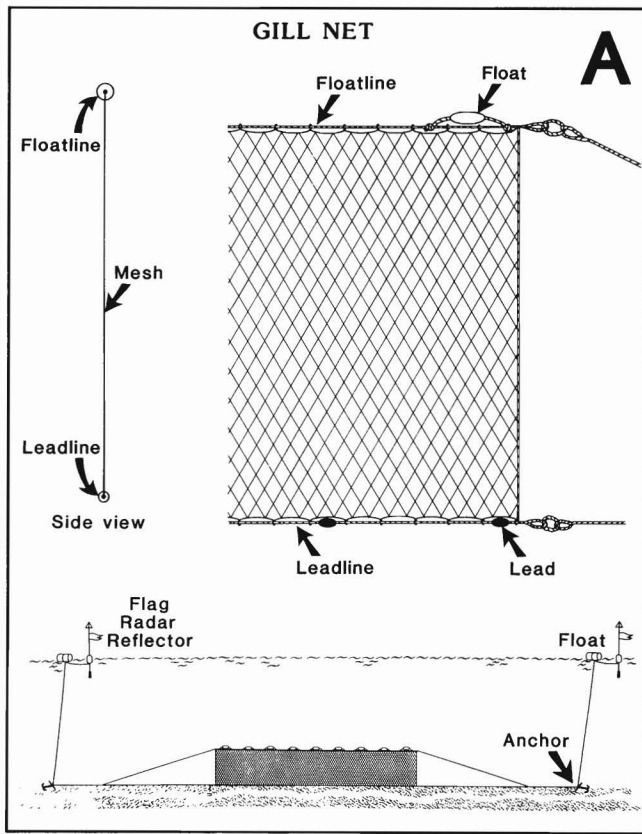


Figure 1.—Three methods of setnetting in central California in 1984: A = gill net, B = trammel net, and C = suspender net.



Retrieving a gillnet in the angel shark fishery. Photo courtesy of Constance Ryan.

in the nearshore trammel-net and suspender net fishery for Pacific halibut, *Hippoglossus stenolepis*, and the gillnet fishery for white croaker, *Genyonemus lineatus*, and nearshore rockfish, *Sebastes* spp. It is hoped that these regulations will diminish setnet interaction with other fishermen, birds, and mammals.

History

Setnets which gill or entangle fish have been used in the Americas for over 7,800 years. Archaeologists believe that the Chinchorro society, one of the oldest in the Americas, depended on setnet fishing for its supply of protein (Allison, 1985). Records of setnet fishing

also exist from west coast North American native societies. Native Americans of Washington, Oregon, and Canada constructed setnets from line made of stinging nettle. The use of nettle to make line for fishing nets was also known in early Europe. "In fact the word 'net' is derived from 'nettle'" (Stewart, 1977).

In 1878, Spencer F. Baird, introduced setnets from Europe to Cape Ann, Mass., fishermen (Collins, 1882). These nets proved very effective and their use spread quickly. By 1888, gill and trammel setnets were being used in California and accounted for 76 percent of the value of all fishing apparatus in California excluding the value of the vessels (Collins, 1892).

By 1915, only trammel and gill nets were allowed south of Carmel Point, Calif., as trawl and paranzella nets were banned (Scofield, 1915). Set trammel and gill nets and drift gill nets were used in southern California to catch white seabass, *Atractoscion nobilis*; flatfishes, Pleuronectiformes; rockfishes, *Sebastes* spp.; Pacific barracuda, *Sphyræna argentea*; and crabs. White seabass was the most important species taken by setnets before 1930 (Whitehead, 1930), but Pacific halibut and rockfishes were also targeted.

The striking feature of all the set and drift nets used through the centuries by disparate peoples is their similarity. Setnets employed by native fishermen in 6000 B.C. were designed and fished exactly as the nets used today in central California. The only difference is the material used in net construction. Lines are no longer made of crushed nettle fiber, but synthetic nylon fiber. Floats of wood, reed, cork, or glass have been replaced by plastic. Anchors of stone have become the exception to the more common steel anchors, and footropes are weighted with lead, not rocks, waterlogged sticks, or ceramic clay.

Although materials have changed, setnets remain devices which gill (gill nets) or entangle fish (trammel nets). Set gill nets used in California in 1888 had from 2- to 8-inch mesh; the set gill nets in 1986 had from 2 $\frac{1}{8}$ -to 9-inch mesh. Trammel nets in 1888 generally had an inner wall of 8-inch mesh; today 8-inch mesh is still the most frequently used.

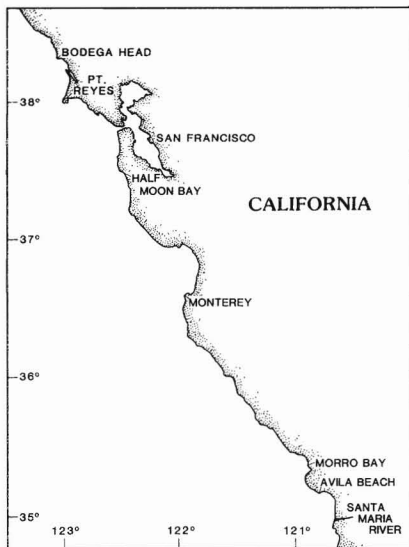
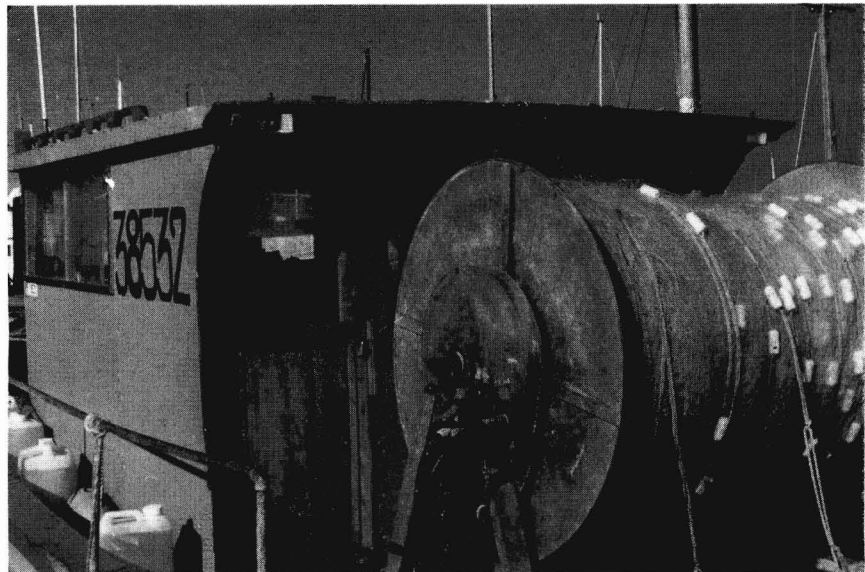


Figure 2.—The study area.

There has been a change in California in the public's perception of the deployment, quantity, location, and species which are exploited with set gill and trammel nets. Although fishermen have been using trammel nets to catch halibut and sharks continually since the 1880's, gillnetting of white croaker, rockfishes, and lingcod, *Ophiodon elongatus*, has mostly occurred since 1980. Much of this increase has been by ex-salmon trollers using trammel nets (Anonymous, 1986) and Vietnamese fishermen using gill nets. This expansion has caused public concern because of the incidental catches of marine birds and mammals reported in the media.

Methods

A list of all set gillnet permits was obtained from CDFG offices in Monterey and Menlo Park. These two offices issued over 95 percent of the permits to fishermen who fished from Point Sal (10 miles west of Santa Maria) to Point Reyes (30 miles west-northwest of San Francisco) (Fig. 2). In 1984, 586 setnet permits for fishermen were issued from Monterey and Menlo Park. From these, 120 permits were randomly selected and classified by surname as belonging to either the Vietnamese (40 permits) or traditional (80 permits) component of



Gillnet on reel, Berkeley, Calif., 1984. Photograph by the author.

the fishery. Attempts to interview Vietnamese fishermen were unsuccessful because of language difficulties; therefore, survey results pertain only to the traditional component of the fishery and should not be used to generalize for the entire fishery.

Phone numbers, addresses, and other information, such as vessel locations or fishing companies, were gathered for traditional fishermen from the CDFG, processors, harbor masters, and fishermen's associations. Attempts were made to contact fishermen by phone or in person at their home port or buyer.

Vessel values were obtained from the vessel captains. Some captains felt their current wooden vessels could be replaced more cheaply with new steel vessels. When a captain stated the above, the lesser cost of a steel vessel was used to represent replacement value. The sample was expanded by the formula: Total number of permits (586) times the percentage of traditional fishermen in the sample (80/120) times the percentage of active traditional fishermen (27/80) in the sample [(586) (0.67) (0.34) = 132.51 ~ 133] equals the number of active traditional permittees in the study. The vessel price actually paid was adjusted by the Consumer Price Index to represent the value of the 133-vessel

fleet in 1984.

To determine the annual mortgage cost associated with this fleet required three steps. The first and second steps determined the sampled fleet's value and expanded this figure to the entire fleet. The third step required assigning one mortgage rate to the entire fleet value. This assumed that this value would prevail for all vessels, and that all vessels would have a 10-year mortgage. After discussion with persons familiar with marine vessel mortgages and lending institution mortgage rates in central California, a rate of 12 percent² was felt to be a usable estimate.

Results

Who Was Contacted

As mentioned, attempts were made to contact only the traditional, non-Vietnamese fishermen. Of these 80, 16 permittees (20 percent) could not be located; 64 (80 percent) were contacted. Thirty-seven fishermen (46 percent) were not fishing setnets in the ocean between Point Sal and Point Reyes in

²Personal communication with George Grundig, George M. Grundig and Assoc., 61 Moraga Way, 5, Orinda, CA 94563; and Michael Penzer, Bank of America, Box 37000, San Francisco, CA 94137.

1984. Twenty-seven fishermen (34 percent) were active in that area; however, only 23 (85 percent) of the 27 active fishermen were interviewed. One fisherman declined to be interviewed, and three were unavailable due to location or health. The following results and comments are based on the products of these 23 interviews and may not be representative of the entire traditional fleet nor are they in any way an indication of the magnitude of the Vietnamese setnet fishery in proportion, size or value.

Demographics of Fishermen

All except one of those interviewed were vessel captains. Three-fourths of them (17) were sole owners of their vessels, 8 percent (2) partly owned their vessels, and 17 percent (4) were non-owners. Crew size (including captain) averaged two people per vessel (range one to five). Vessels without crews (captain only) represented 30 percent of the fleet, 48 percent had two people, 18 percent had three, and 4 percent of the vessels had five people (Fig. 3).

Captains and crews of the vessels exhibited differences in age, education, and fishing experience. Captains averaged 45 years of age, with 14 years of education and 20 years of fishing experience. Crewmen averaged 31 years of age (Fig. 4), with 12 years each of education (Fig. 5) and fishing experience (Fig. 6). Over 80 percent of captains and crews were high school graduates. Forty-four percent of the captains had a post-high school education and 18 percent had a postgraduate education. Thirteen percent of the crewmen had post-high school education and none had postgraduate education.

One of the interesting aspects of the setnet fishery is the relationship between crew and captain. Most crewmen obtained the majority of their fishing experience with their current captain and averaged 7 years with this captain. Time spent with current skipper ranged from 1 to 26 years (Fig. 7), with 65 percent having had between 1 and 6 years with the current captain. The remaining 35 percent had been with the captain over 10 years. Sons of captains represented 13 percent of the total crewmen, and

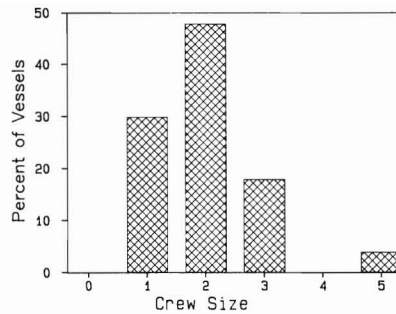


Figure 3.—Crew size (includes captain) of traditional central California setnet vessels in 1984.

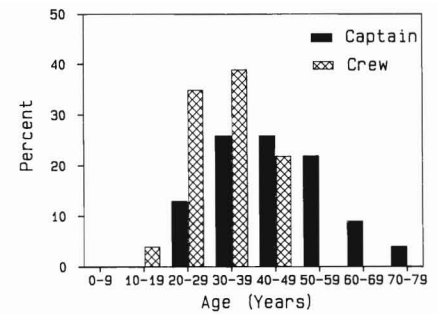


Figure 4.—Ages of captains and crew members on traditional central California setnet vessels in 1984.

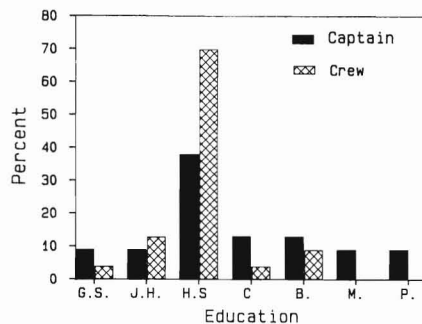


Figure 5.—Education of captains and crew members on traditional central California setnet vessels in 1984. G.S. = 3rd-8th grade; J.H. = 9th-11th grade; H.S. = high school; C. = some college; B. = bachelor's degree; M. = master's degree; P. = doctorate.

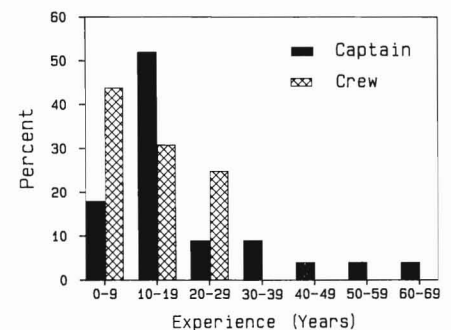


Figure 6.—Experience of captains and crew members on traditional central California setnet vessels in 1984.

cousins 9 percent. All related crew members' fishing experience was gained with their relative and this experience averaged 10 years. The 78 percent of the crewmen not related to the captain averaged 6 years experience. Unrelated crew members who had fished with only one captain (17 percent of the total) averaged 2 years fishing experience. The unrelated crew members who had fished with more than one captain (61 percent of the total) averaged 8 years fishing with their current captain.

Gear Characteristics

Fishermen often fish with different nets during a given year. Neither the type of nets used nor the combination of nets appears to be related to fisher-

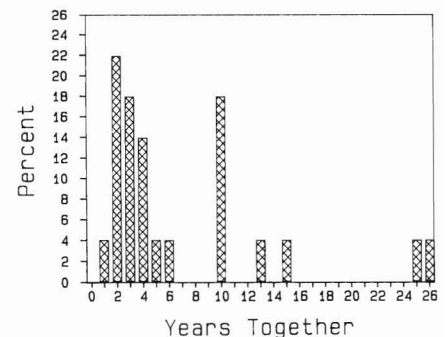


Figure 7.—Years captains and crew members on traditional central California setnet vessels have fished together through 1984.

men's experience. Less than 10 percent of the fishermen stated that they fish with different types of nets during one trip. Seventy percent of the fishermen fish gill nets, 35 percent with trammel

nets, and 43 percent with suspender nets. The total percentage exceeded 100 because some used more than one gear. Sixty-one percent used one gear only: Gill (35 percent), trammel (13 percent), and suspender (13 percent). Dual gear use was: Gill and trammel, 9 percent; gill and suspender, 17 percent; trammel and suspender, 4 percent; and all three net types, 9 percent.

Gill nets were grouped into three mesh-size categories: Small, 2 $\frac{1}{8}$ -3 inches; medium, 4 $\frac{1}{4}$ -4 $\frac{5}{8}$ inches; and large, 6-9 inches. The small-mesh nets are used to fish white croaker. The average effective fishing height of these nets (distance from floatrope [corkline] to footrope [leadline] when set) is 12 feet. The medium-mesh nets have an effective fishing height of between 12 and 18 feet and are used to fish rockfish, lingcod, and sablefish. Gillnets with the largest mesh have an effective fishing height of 16-22 $\frac{1}{2}$ feet, and are used to catch rockfish, lingcod, starry flounder, *Platichthys stellatus*; and other flatfishes. These nets also can catch halibut and sharks, but are not considered optimal for these species.

Trammel nets have 8- to 10-inch mesh in the inner walls (81 percent were 8-inch) and 14- to 36-inch outer wall mesh (27 percent were 24-inch and 27 percent were 32-inch). The effective fishing height of these nets range from 6 to 18 feet (45 percent fished 18 feet). These nets are used to catch halibut, soupfin shark, *Galeorhinus zyopterus*, and other sharks, but rockfish, lingcod, and crabs are also caught.

Suspender nets have mesh sizes ranging from 7 $\frac{1}{2}$ to 9 $\frac{1}{2}$ inches, with 63 percent either 8 or 8 $\frac{1}{2}$ inches. Effective fishing height ranges from 6 to 16 feet (30 percent fished 10 feet and 20 percent fished 15 feet). These nets are used to catch halibut, sharks, and rockfish, but other large fish are also caught.

Setnet netting is monofilament nylon and three-strand twisted nylon. Braided nylon was not being used, nor was multifilament nylon, although some fishermen indicated that they were going to build some multifilament nets, because of reports of less loss of captured fish.

All trammel nets were constructed of twisted three-strand nylon ranging in

size from size 8 (0.038-inch diameter, 75-pound test) to size 16 (0.056-inch diameter, 135-pound test). Ninety percent of all suspender-net mesh was constructed of monofilament line from size 69 (19-pound test) to size 139 (28-pound test). Roughly half of the gill-net mesh was monofilament and the other half twisted three-strand nylon. Monofilament size was from 19-pound to 60-pound test line, while three-strand was between 50-pound and 170-pound test.

Anchors varied in type and weight among and between net types. The fishermen reported choice of type and weight to be a function of depth of water, length of net, time of year, and area of fishing.

Gill nets had the largest variety of anchor types (seven) and the largest weight range (24-90 pounds). The seven anchor types were Danforth³ (35 percent), stock (23 percent), Northrop (12 percent), rocks (12 percent), cement blocks (6 percent), window heights (6 percent), and kedge (6 percent). Anchors used by trammel-net fishermen were the most homogenous: Danforth (80 percent), Northrop (10 percent), and kedge (10 percent).

Weight of trammel-net anchors ranged from 40 to 55 pounds (chain included). The average anchor weighed 51 pounds and 60 percent of the anchors weighed 55 pounds.

Suspender-net fishermen used Danforth or Northrop anchors 87 percent of the time and stock anchors the rest of the time. Anchors averaged 44 pounds and weights ranged from 30 to 80 pounds.

It appears that trammel-net fishermen have developed a coastwide consensus on the type and range of weights most suited for that gear. Suspender-net fishermen have the second smallest variance in anchors and appear to be adopting two types of anchors which weight about 40-45 pounds. Gill-net anchors, on the other hand, show no trend in type or weight. Fishing experience of the captain appeared to have little to do with either the anchor type or weight.

³Mention of trade names or commercial firms does not imply endorsement by the National Marine Fisheries Service, NOAA.

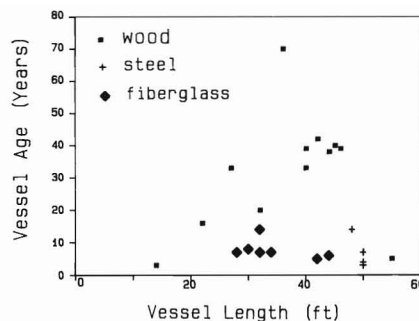


Figure 8.—Age of vessels vs. length relationship in the traditional central California setnet fishery in 1984.

All fishermen assembled their own nets. This generally requires the fishermen to attach premade netting or web to the footrope and floatrope and to attach bridles to the net for anchor, buoy, and flag. The fishermen's average annual assembly time for gill nets was 150 hours and for suspender and trammel nets 185 hours each. The gill net takes less time because only one item is attached to both foot- and floatropes.

Although obvious correlations were not found between types of setnet gear and fishermen's experience, age, or education, the gear used and the construction material of the vessel appeared to be correlated. Vessels were constructed of three materials: Wood (52 percent), fiberglass (30 percent), and steel (18 percent). Three-fourths of the wooden vessels were equipped with trammel and suspender nets and 58 percent with gill nets. Fiberglass and steel vessels were equipped with gill nets 82 percent of the time and trammel and suspender nets 55 percent. Vessel construction material was also correlated to vessel age. Wooden vessel ages ranged from 3 to 70 years, with an average of 31 years and a mode of 35. Fiberglass vessel age ranged from 5 to 14 years, with an average of 8 years and a mode of 7 years. Steel vessel ages ranged from 3 to 14 years with an average of 7 years and a mode of 6 years (Fig. 8). No significant correlation ($r = 0.36$; $P = 0.08$; $n = 23$) was found between vessel age and horsepower, but roughly three-fourths of the wooden and fiberglass vessels had diesel engines; the remainder were gasoline. All the steel vessels had diesel engines.

the data available.

Vessels' fixed costs were obtained by asking captains how much they actually paid for their vessels, how much they would sell their current vessel for, how much they would pay for a similar vessel, and how much it would cost to replace their vessel with a similar new one. The actual price and the willing-to-pay and willing-to-sell prices were all estimated to be near \$10,000,000. This price is used as the surrogate for the total value of the 133 vessels in the calculated traditional fleet. The replacement price for the same vessels was estimated to be \$15,000,000.

Fifty-seven percent of the surveyed vessels are mortgaged. Mortgages are held by private institutions (17 percent of all vessels), backed by government-guaranteed loans with private institutions (13 percent), or entail personal loans from relatives (17 percent) (no response 10 percent). Interest rates ranged from 8 to 13.2 percent, but 26 percent of all loans had no interest charge. These zero-interest loans required repayment in 2-4 years on a pre-determined payment system. As previously noted, the traditional setnet fleet is valued at \$10,000,000. If the entire fleet were mortgaged at 12 percent with a 10-year loan, the vessel owners would have an annual fixed cost of \$1,750,000.

Although the total amount of the crews' remuneration could not be evaluated, the method was determined. Remuneration of setnet fishermen was generally on a lay (share) basis, which varied by vessel, area, ownership, fishery, and value of landing. Sixty percent of the fishermen were paid on a share of gross revenues, 36 percent on a share of net revenues, and 4 percent were salaried. Crewmen receiving a share of the gross revenue averaged 25 percent of the gross (range from 12 to 40 percent). Those receiving a share of the net revenue averaged 24 percent (range from 7.5 to 40 percent). Net revenue was determined by subtracting fuel and food from gross revenue. One vessel divided the food costs among owner and crew. Some crewmen received a higher percentage of the agreed-upon gross or net share when the revenues for the trip were low.

Table 1.—Minimum fixed and variable costs¹ attributed to setnetting in California, 1984.

Item	Costs
Fixed cost of vessel: 10-year mortgage at 12 percent	\$1,750,000
Variable cost of fishing	
Moorage	\$ 67,000
Insurance	264,000
Repair and other Improvements	158,000
Fuel	355,000
	\$959,000
Net material 1984	550,000
Labor: 31,000 hr @ \$8.07/hours	250,000
Minimum variable cost	1,759,000
Minimum 1984 setnet fishing costs	\$3,509,000

¹Variable costs not included are crew remuneration and miscellaneous costs.

Seventy-eight percent of the captains made their entire income from fishing. The remaining captains earned between 40 and 80 percent of their income from fishing. Setnetting earnings comprised from 2 to 100 percent of captains' earnings, with 30 percent earning between 2 and 19 percent, 26 percent between 20 and 39 percent, 13 percent between 40 and 59 percent, 13 percent between 60 and 79 percent, and 18 percent between 80 and 100 percent.

The 1984 variable costs to the setnet fleet which I could attribute to moorage, insurance, repair, improvements, and fuel was nearly \$1 million dollars (Table 1). Nets owned by the fleet were valued at \$850,000. The cost of materials used to build or repair these nets in 1984 was \$550,000. Building and repairing the setnets owned by the fleet took an estimated 31,000 hours of labor. This work is estimated to be worth \$250,000 (\$8.07/hour).⁵ Other variable costs, such as ice, food, crew remunerations, bookkeeping, and miscellaneous services, could not be estimated from available data and, therefore, the variable

⁵Blend of four 1984 hourly rate values. Hourly rate for a moderately-skilled government worker: GS-6 (\$7.45), GS-7 (8.28). Weekly Federal Employers News Digest, Vol. 33, No. 36, 16 April 1984, Washington, D.C. Hourly rate for manufacturing total all categories: Humboldt County (\$7.62), and San Francisco County (\$11.38). 1985 County Business Patterns, U.S. Bureau of the Census, Wash., D.C.

cost should be considered a minimum. Minimum variable costs for 1984 would be about \$1.8 million and total costs, variable plus fixed, would be about \$3.5 million.

Ex-vessel Revenue

Three problems exist due to the incompatibility of the data base used to determine ex-vessel revenue and the area and scope of the study. One problem was caused because the ex-vessel values in PacFIN⁶ for 1984 were not accurately differentiated by gear. Only 19 percent of the fish from the study area in the "net" and "other gear" categories were attributed to the "net" category. In 1985, 59 percent of the fish in these two categories were net-caught. Therefore, the species breakdown from the 1985 report rather than 1984 was used to determine catch by species.

Ex-vessel value estimates from 1984 data were not considered reliable because the "other gear" category accounted for over 90 percent of the landings in the Monterey area. How much of this could have been landed by setnets is not known. However, the total ex-vessel values of the "other gear" and "net" categories for 1984 and 1985 were only 8 percent apart and I believe that the 1985 ex-vessel value breakdown is similar to the 1984 value.

Another problem existed because the study site area was different from the PacFIN data. PacFIN uses the Pacific Marine Fishery Commission areas designated Conception and Monterey. This covers the area from the Mexican/California border north to lat. 40½°30' N (roughly Cape Mendocino, Calif.). This northern boundary of the Monterey area is 150 n.mi. north of the study area, and the southern border of the Conception area is 260 n.mi. southeast of the study area.

A third problem was that only the traditional fishermen were sampled and PacFIN data covers both traditional and Vietnamese fishermen. The final problem entailed combining price and quantity information for the "other gear"

⁶PacFIN is the Pacific Fishery Information Network data report published by the Pacific Marine Fishery Commission, Portland, Oreg.

Table 2.—California landings of “net” and “other gear” for the Pacific Marine Fishery Commission Monterey and Conception areas, 1984 (PacFIN⁶ Report #009 and 054, 14 February 1985).

Species	Other gear			Net			Combined total	
	Qty. (mt)	Price (\$/kg)	Value (\$K) ¹	Qty. (mt)	Price (\$/kg)	Value (\$K)	Qty. (mt)	Value (\$K)
Flatfish	60	\$.93	\$56	52	\$1.00	\$52	112	\$108
Rockfish	1,804	.91	1,632	2,893	.84	2,425	4,697	4,057
Lingcod	171	.73	124	99	.69	68	270	192
Sablefish	307	.68	210	33	.46	15	340	225
Other	1	.71	1	1	.63	1	2	2
Misc. groundfish	37	1.76	65	128	1.55	198	165	263
California halibut	73	4.11	300	421	4.04	1,700	494	2,000
Total			\$2,388			\$4,459		\$6,847

¹K = 1,000.

Table 3.—Estimated¹ ex-vessel revenue attributed to traditional setnet fishermen in central California, 1985.

Species	Landings by other gear		Landing values			Value of traditional setnet fishery	
	Value ² (\$K)	Setnet (%)	Gear (\$K)	Other net (\$K)	Total setnet (\$K)	% Total ⁴	
Calif. halibut	\$300	100	\$300	\$1,700	\$2,000	100	\$2,000
Flatfish	56	80	45	52	97	90	87
Rockfish	1,632	50	816	2,425	3,241	50	1,621
Lingcod	124	50	62	68	130	50	65
Sablefish	210	50	105	15	120	35	42
Other	1	50			1	100	1
Misc. groundfish	65	50	32	198	230	70	161
Total							\$3,977

¹Author's estimate; see text for other estimates.

²K = 1,000.

³Percentage of PacFIN report estimated to be made by setnets in study area from the “other gear” category.

⁴Percentage of adjusted landings attributed to traditional setnet fishermen.

category. Precision is lacking because only some of the fish in the “other gear” category were believed to be net-caught, and a price differential may have existed among gears within the “other gear” category.

The incompatible PacFIN and study data were adjusted after discussions with groundfish biologists⁷ and industry people familiar with the breakdown of landings. The largest adjustments were to the rockfish in the PacFIN “other gear” category north of Bodega Bay and the sablefish and rockfish caught south of Santa Maria. Total value for these areas before adjustments was \$6,847,000 (Table 2). Final estimates which have been adjusted for area, other gear landings, and Vietnamese landings resulted in an ex-vessel value for the traditional setnet fishermen of central California of \$3,977,000 (Table 3). Due to the many adjustments, this figure was rounded to \$4,000,000. Other scientists and fishermen were also contacted and their suggested adjustments resulted in total

⁷F. Henry, personal communications, California Department of Fish and Game, Menlo Park, Calif. K. Worcester and J. Richards, Sea Grant Advisors, Port San Luis, Calif.

ex-vessel revenues of \$4,309,000, \$4,274,000, \$4,070,000, and \$3,776,000.

Conclusion

The traditional sector of the central California setnet fishery was calculated to support a highly educated and experienced group of 266 fishermen, fishing from 133 vessels for many different kinds of fish. The estimated cost, excluding crew remuneration and miscellaneous costs of the setnetting, is in excess of \$3.5 million and the fishery produces an ex-vessel revenue of around \$4 million. Setnet revenues represented an estimated 41 percent of the captain's total earnings from fishing in 1984. The value of vessels and setnet gear was about \$11 million.

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