



The Fish, the People, and the Tradeoffs: Social-Ecological Coupling in the Wetfish Fishery of Monterey Bay, California

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CASE STUDY INTRODUCTION

A loud noise boomed from the pier, and Danny looked up from his steamy bowl of clam chowder. The foghorn's rumble rippled through the shallow clouds, warning the slowly incoming fishing boats of the rugged California coast which would be all too willing to pierce their hulls and claim the vessels for herself. Rounds upon rounds of wrapped lines filled the back of the boats as seagulls and cormorants hovered above, hoping to snag a special treat.

Danny walked to the end of the pier, planning to watch the fishermen unload their catch and see what luck they had today. But the boats never came. They took a left and parked beside a smaller pier just down the shoreline from "Fisherman's Wharf".

He ran past the shops with sweaters and postcards, past the whale watching companies and the calamari stand, and made his way to the other pier. He sat on the ledge and watched as a giant tube sucked up the tiny fish, pumping them into a small building on the pier.

"Watcha got there?" He called to the man in the foul weather gear.

"Last catch of the year of squid!" He responded with a smile.

"Last catch? But it's not yet the end of the year? How can it be the last catch?"

"Fish season is it's whole other thing, son. In fact, there's a whole world here that most people here don't even know about. Everybody is so disconnected these days to where their food comes from. They think that the fish they order at that fancy restaurant on the wharf comes from here? Ha! It was caught in another ocean, shipped to another continent to be packaged, frozen on a boat in the high seas, and then ends up all pretty on their plate. Folks these days, don't have any real idea what they are eating and where it's from."

CASE STUDY BACKGROUND

For the next few class periods, we will be diving deep into a case study of the Monterey Bay wetfish fisheries. Read the following documents to prepare for the first class period. **Come to the next class with 6 discussion questions about the reading:** 3 focused on the historical perspective readings and 3 focused on the SES theory readings.

Historical perspective readings (required)

- Schmalz, David. 2014. "The modest little fish - and Monterey icon - contains grad teachings on how to manage fish populations." Monterey County Weekly. Link: http://www.montereycountyweekly.com/archives/2014/0102/the-modest-little-fish-and-monterey-icon-contains-grand-teachings/article_d68733a2-727e-11e3-95cc-0019bb30f31a.html
- U.S. West coast sardine season halted to stave off overfishing. 2015. The Wall Street Journal. Link: <http://www.wsj.com/articles/u-s-west-coast-sardine-season-halted-to-stave-off-overfishing-1429149949>
- Cesare, Chris. 2014. Sardine ban looms as fishermen weigh disaster funds. Santa Cruz Sentinel. Link: <http://www.santacruzsentinel.com/environment-and-nature/20150309/sardine-ban-looms-as-fishermen-weigh-disaster-funds>
- Ueber, Edward and MacCall, Alec. The rise and fall of the California sardine empire. Link: <https://swfsc.noaa.gov/publications/CR/1992/92104.PDF>

Social-ecological theory readings (required)

- Gordon, Scott H. 1954. The economic theory of a common-property resource: the fishery. The Journal of Political Economy 62 (2): 124-142. Link: <http://www.econ.ucsb.edu/~tedb/Courses/Ec100C/Readings/ScottGordonFisheries.pdf>
- Ostrom, Elinor. 2009. A general framework for analyzing sustainability of social-ecological systems. Science 325 (419). Link: <http://vw.slis.indiana.edu/talks-fall09/Lin.pdf>
- Binder, C.R., Hinkel, J., Bots, P.W.G., Paul-Wostl, C. 2013. Comparison of frameworks for analyzing social-ecological systems. Ecology and Society 18 (4): 26. Link: <http://www.ecologyandsociety.org/vol18/iss4/art26/>

Supplementary Reading (optional)

- Aguilera, S.E. 2015. Managing small-scale commercial fisheries for adaptive capacity: insights from dynamics social-ecological drivers of change in Monterey Bay. PloS ONE. 10(3): e0118992. DOI: 10.1371/journal.pone.0118992
Link: <http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0118992>

- Coastal Pelagic Species Fishery Management Plan. September 2011. Pacific Fishery Management Council. Link: http://www.pcouncil.org/wp-content/uploads/CPS_FMP_as_Amended_thru_A13_current.pdf
- Radovich, John. 1982. The collapse of the California sardine fishery: What have we learned? CalCOFI Report, Vol. 23.
Link: http://www.calcofi.org/publications/calcofireports/v23/Vol_23_Radovich.pdf
- Kittinger, J.N. et al. 2013. Emerging frontiers in social-ecological systems research for sustainability of small-scale fisheries. Current Opinion in Environmental Sustainability 5: 352-357.
Link:
http://www.centerforoceansolutions.org/sites/default/files/Kittinger_etal_2013_Cosust.pdf
- Hinkel, J., Cox, M.E., Schluter, M., Binder, C.R., Falk, T. 2015. A diagnostic procedure for applying the social-ecological systems framework in diverse cases. Ecology and Society 20 (1): 32.
Link: <http://www.ecologyandsociety.org/vol20/iss1/art32/>
- Palumbi, Stephen and Sotka, Carolyn. The Death and Life of Monterey Bay: A Story of Revival. 2010. Island Press.
No available link, this is a book which is recommended if the library has it.
Amazon link: <http://www.amazon.com/The-Death-Life-Monterey-Bay/dp/1610911903>

Module 1

This module includes a class discussion, lecture on social-ecological theory, and a concept map activity. Below, this table provides some information about the fisheries pertaining to this case study.

	Monterey Bay Fishery		
	Market Squid	Northern Anchovy	Pacific Sardine
Primary management authority	State	Federal	Federal
FMP implementation	2005	1978	2000
Limited entry implementation	1998	2000	2000
Limited entry permit type	Squid	CPS Finfish	CPS Finfish
Number of permits, 2013*	76	61	61
Number of resident vessels	~10	~10	~10
Number of resident seafood buyers in area	4	4	4
Primary gear	Round haul net	Round haul net	Round haul net
Peak season	Spring/Summer	Fall	Fall
Preferred oceanographic regime	Cooler	Cooler	Warmer
Spawning habitat	Nearshore	Nearshore	Offshore
Primary market destination	China	Domestic US	Japan/Australia
Average ex-vessel price, 1974-2012 (\$/lb)	0.245	0.062	0.148

Table 1. Key features of the commercial fisheries that comprise the interconnected Monterey Bay wetfish fisheries system (directly from Aguilera *et al* 2015). *Available permits does not indicate the number of vessels with landings as some permitted vessels may not participate in a given year. The number of market squid permits applies only to round haul (seine) vessels; light boat and brail vessel permits are issued separately.

Module 2

In this module, you will be handed a handout at the beginning of each step. Below are the instructions and materials for Step 1. For this step and each one after, the resources are available to you but are not mandatory. You may also conduct your own research to find answers to the questions which you will present to the class.

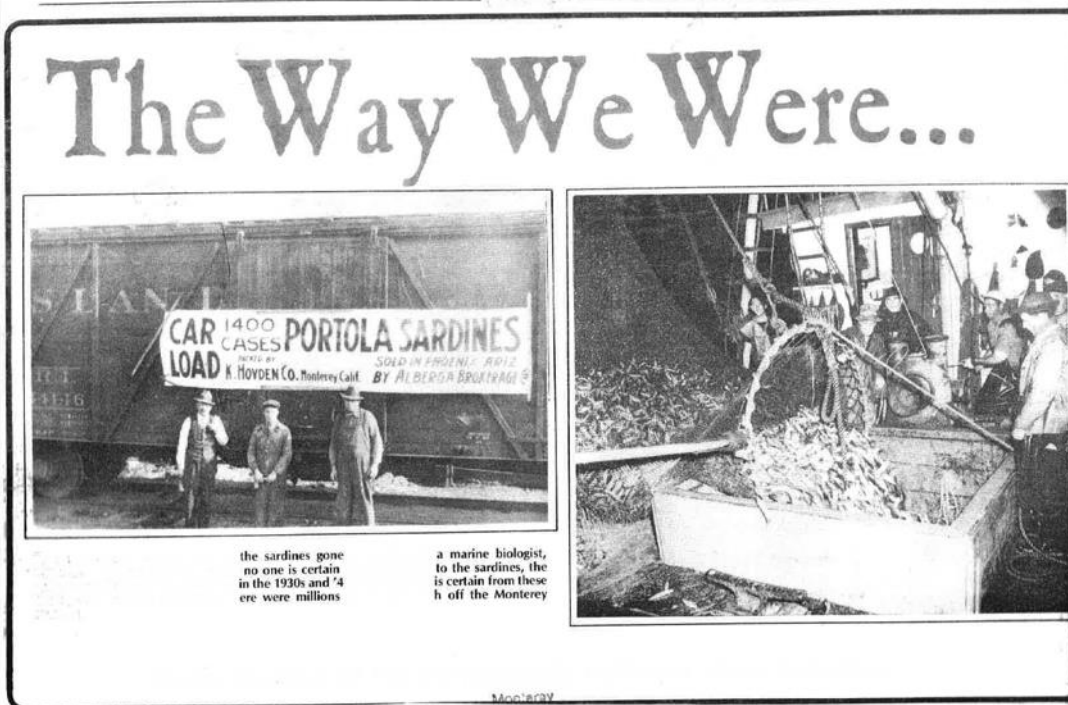
Module 2: Step 1

Using the previous module materials and the resources below to thoroughly answer the question:

What happened in this case? What is the problem?

Resources:

- Ueber, E., MacCall, A. The rise and fall of the California sardine empire. Ch. 3. 31-48.
Link: <https://swfsc.noaa.gov/publications/CR/1992/92104.PDF>
- Historical Archives (below) All documents were photocopied from the Monterey Bay public library. They are included in no particular order below.



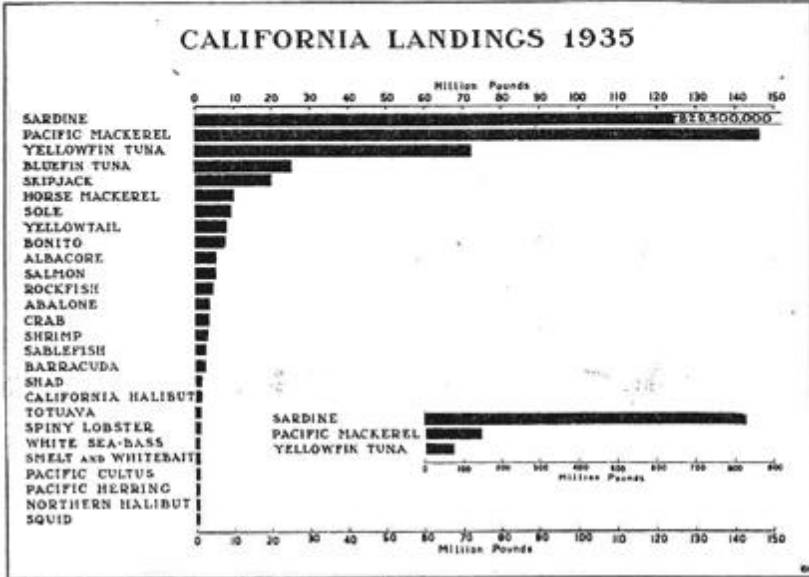
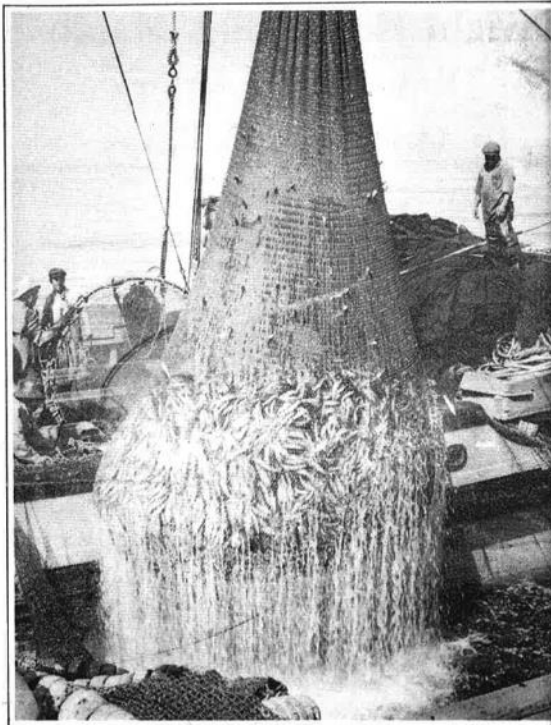
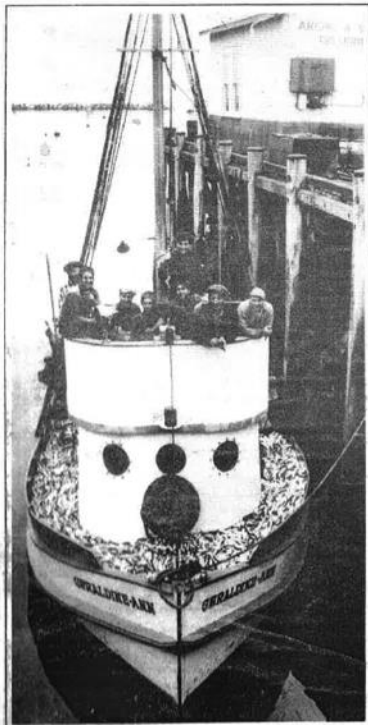


FIG. 1.

Crabbing



Crabbing
Monterey
and Monterey Peninsula

MAY 16, 1984

Clipping...

39

'Where Did the Sardines Go?' Someone Asked. 'In the Cans,' Ed Ricketts Replied

The ghosts are there. They are in the decaying canneries, burned out warehouses and empty lots. They are heard rustling in the overgrown weeds along the Southern Pacific railroad tracks.

They are the ghosts of cannery workers, bums and prostitutes who once inhabited a stretch of road that has become known as Steinbeck's Cannery Row.

By JOANNI FRODGEN

It is early morning on the 4,725-foot long street that was the center of the Monterey fishing industry. The warehouses and

canneries that once churned out hundreds of millions of pounds of canned sardines have been given a facelift and converted into shops and restaurants catering to the memories of John Steinbeck's beloved characters: "Doc," "Flora," and "Mac and the Boys."

The stench of processed sardines that inspired the slogan, "Carmel by the Sea; Pacific Grove by God and Monterey by the Smell," has been replaced by fresh sea breezes and ocean brine. Whistles that once called cannery workers to the factories are silent.

The sardines have disappeared but the memories have not. The ghosts are there and they tell a story.

In 1902, the year John Steinbeck was born, Frank E. Booth opened a sardine processing plant. Ironically, the plant that was the inspiration for the industry was built at the west end of

Alvarado Street in downtown Monterey. Like most new enterprises, the processing plant did not meet overnight success.

However, three years later, a Norwegian, Knut Hovden, became Booth's plant manager. The collaboration was a success. Fishing nets were re-designed and production techniques revamped. By 1916, Hovden had opened his own cannery at the south end of Ocean View Boulevard (Cannery Row's original name). As much as 250 tons of sardines a night were processed at the canneries, carried along conveyors through boiling water before being packed and sealed.

Five more canneries opened during World War I as the demand for inexpensive and high protein food increased. By 1939, Monterey had become known as the "Sardine Capital of the World."

More than 420 million pounds of sardines were packed in the 30 plants by then operating. That did not include 70 factories operating reduction facilities independently or with canneries turning the waste into feed for livestock as well as ingredients for cooking oil, soap, explosives and paint.

The supply of fish was endless. World War II came and the canneries continued to pack sardines. Money was made and there seemed to be no end in sight. A few men warned the packers and fishermen they would destroy nature's delicate balance. Size limits on sardines were extended from a minimum of seven inches to nine.

In 1945, the Sardine industry hit its peak. In 1948, the total number of sardines caught during a six-month fishing season equalled that of one week's catch in 1939.

They had disappeared. Some blamed the fishermen while

Continued on next page

FISHERIES - SARDINES

Monterey
Public Library
California Room

5th Great Cannery Row Reunion Dec 14, 1987 p.5 Herald.

Worker Recalls Heyday of Sardine Industry

After nearly 40 years of being employed in the fish canneries of Monterey's Cannery Row and Moss Landing, 73-year-old Dorothy Wheeler of Pacific Grove said she's ready to go back to work today if offered the chance.

Even though there's little chance of restarting the canneries that closed with the decline of Monterey Bay's sardine fishery, if a job were offered, "I'd say, 'Yeah, I'll be right there,'" Mrs. Wheeler said Sunday as she was honored as Ladies Cannery Worker of the Year during the fifth annual Great Cannery Row Reunion.

The lone remaining local cannery, located at Moss Landing, receives about 70 tons of squid or mackerel a day, said Michael Hemp, executive director of the Cannery Row Foundation, which sponsors the annual reunion.

That amounts to only half the load that a single boat would bring in during Cannery Row's heyday when a fleet of between 80 to 100 boats out of Monterey fished for sardines every night during a six-month season, bringing in about one billion fish, Hemp said. Two-thirds of the catch never saw a can. It was ground into fertilizer or fishmeal, he

added.

"We fattened cattle and raised all kinds of agricultural crops with most of Monterey's sardines," Hemp said.

It was as a young mother with three small children, ages one through four years, that Mrs. Wheeler left her first husband in 1936 and started a new life.

She got a job with the Hovden Cannery, which has since been converted into the Monterey Bay Aquarium, earning 33½ cents an hour canning sardines. Out of that wage she had to budget \$10 a month

for rent and \$1.50 a day for baby-sitting.

"Then I knew I could swing it on my own," she said, even though working in the canneries meant that "I'd have to pick the children up at midnight (from the babysitter) and drag them up the hill" to home.

She quickly persuaded a supervisor to promote her to a daytime job in the warehouse, wrapping and sometimes labeling cans of sardines.

"I think my boss felt a little sorry because of the hard luck story I gave," she recalled with a chuckle. As the sardines gave out and

there was less work in the canneries, Mrs. Wheeler, who remarried in 1945, found a job moonlighting as a bartender at a beer and wine bar in New Monterey. She enjoyed the work so much she stayed on through three bar owners and 22 years.

When the Hovden cannery closed, Mrs. Wheeler went to work in Moss Landing for the Santa Cruz Canning Co., until that plant, too, shut its doors a little more than 10 years ago.

But she hasn't slowed down in retirement. She walks three miles or more a day and is a volunteer worker for Meals on Wheels. She also has amassed a sizable collection of ladyhead planters as a hobby.

Mrs. Wheeler was one of several former Cannery Row figures who were honored by the Cannery Row Foundation during Sunday's reunion.

Jake Stock, a popular Peninsula musician since the late 1930s and occasional cannery worker, was awarded the foundation's Maury S. Cooper Spirit of the Row award, the organization's highest annual recognition for service to Cannery Row.

The Men's Cannery Worker of the Year award went to Harvey Waugh, one of Cannery Row's most notable boilermakers. Skipper Sal Colletto, who was 13 when he began going to sea and only 17 when he was running his family's fishing boat, was named Fisherman of the Year. The two men were unable to attend the reunion because of illness, Hemp said.

Old Fishermen Get Together With Kids To Talk Sardines

Monterey Public Library California Room

By Calvia Demmon
Special Staff Writer

Thirteen children met four retired fishermen Tuesday at the New Monterey Neighborhood Center and got a nostalgic lesson in the lost arts of the sardine industry.

The children came from CHEER for Kids, a child-care center sponsored by Community Hospital of the Monterey Peninsula. The fishermen came from the Old Timers Club, downstairs in the neighborhood center, where a couple dozen of them meet every day to play pinocle and reminisce.

Mary Lee Duval, a teacher at the child-care center, had arranged the meeting after reading about the Old Timers Club in a Herald story.

As the children pulled their circle of chairs close, Sergio Conte opened the discussion with a brief summary of his work in "the business we had 40 years ago in Monterey."

Conte said he was a retired fisherman and a retired painter, and had made his living with the "sardines and with the paint brush."

Salvatore Enea stood up next, telling the children that he went into commercial fishing after he graduated from Monterey Grammar School in 1917.

"I fished until we lost it in 1953," Enea said.

Though the industry was through by that year, the decline started earlier, Enea said. "In 1946 the sardines started to disappear, and the smaller

sardines came in. . . At night, when the lights came on, all you could see in the nets was silver — every little niche had a little sardine in it. You talk about a job, shaking them off the nets.

"What did the sardines smell like?" a girl asked.

"They don't smell too bad when they're fresh, but when they get a couple days old they smell bad," Enea said.

"What was the biggest thing you ever caught in your net?" a child asked.

"One night we caught seven basking sharks," Enea said. "They have a greasy film. Once it touches the net, it rots the whole net."

"Did you catch any starfish?" another child asked.

"We used to catch them and sell them when we were little kids, for a nickel apiece," he said. "I don't know what they did with them."

Sardine Memorabilia

Danny Campo had brought along his collection of photographs, pieces of net, rope, various types of cork and other floaters, and samples of hooks and net needles.

He talked as he displayed the items, many of them — such as cork floats and pieces of thick cotton rope — decades old and no longer used or sold.

"I started with one little cannery right next to the wharf," he said. "Then there were so many fish we had to start building canneries — 26 of them."



OMAR MUNIRA WAS ENGROSSSED BY PHOTOS . . . Danny Campo showed the kids pictures of the old days

(Special Photo by Robert Pahl)

California History Pm Monterey Public Library

MONTEREY PENINSULA HERALD

MONTEREY PENINSULA HERALD, MONTEREY, CALIFORNIA, FRIDAY, FEBRUARY 26, 1937.

Union Now In Industry

Seine Established

UNION OFFICIAL



Old Problem Of Odor Now Solved, Hope

Definite progress was made during the past season toward elimination of reduction plant odors, a source of contention between the sardine industry and the community at large for the past several years.

Due largely to the persistent and painstaking efforts of Major W. H. Landers, employed by the City of Monterey as canneries inspector, but paid by the canners through a fund subscribed for that purpose, more effective methods of dealing with the odor problem were devised, and a systematic inspection assured faithful maintenance of apparatus in all plants.

PERFECT COOPERATION
Major Landers has repeatedly

Italian Fishermen Pioneers of Monterey's Sardine Industry

Italian fishermen, most of whom learned their trade on the Mediterranean and were veterans of the Alaska and Sacramento river salmon fisheries when they came to Monterey, are the pioneers of the Pacific coast sardine industry.

Peter Ferranti, now president of the San Carlos Canning company, was the first of the Italian fisher-

men to come to Monterey and his contribution to the upbuilding of an industry which produces millions of dollars worth of products each year and now extends from British Columbia to Southern California was a most important one.

LAMPARA ADAPTED
For Ferranti it was who adapted the lampara net of his native Sicily to the fishing problems of F. K. Booth, pioneer California sardine canner.

When Ferranti came on the local fishing scene more than 30 years ago, sardines were taken at Monterey by use of small gill nets and the daily catch was a few tons, at the best.

With introduction of the lampara net, however, sardine catch figures boomed and the sardine industry began its steady growth.

Ferranti brought friends and relatives, all Italian fishermen, to Monterey to work for the Booth company and soon a comparatively large fleet of sail boats were profitably working lampara nets in pursuit of fish for canning.

When gasoline power boats took the place of the sailing craft the Italian fishermen changed to the new type of craft and when the larger purse seine boats proved their worth in the industry—Italian fishermen once more progressed with changing times.

Fishermen of Italian descent "made" the Monterey sardine fishery—and they are still the dominant factor in catching and delivering sardines in the "sardine capital of the world."

In other ports, notably San Pedro, Slavonian fishermen and men of other races have become dominant in sardine and other fishing, but not so at Monterey.

The step upward from \$15,000 lampara fishing craft to \$40,000 purse seine outfits was a difficult one for many pioneer Monterey fishermen because the costly change-over became necessary during the depression years. But many of them have "made the grade" and during the 1936-37 season fully 35 locally owned and locally manned purse seine boats

worked out of Monterey. This was more than half of the purse seine fleet—and the number of Monterey seiners grows each year.

HIGH BOATS
In addition to boats owned here many additional seiners were worked, under charter, by Monterey fishermen.

Any anyone who doesn't think Italian fishermen are good fishermen should "look at the record" which shows that the three high boats for 1936-37 were ALL owned and operated by crews of Monterey Italian fishermen.

But the Monterey sardine fleet is far from a "closed corporation" for men of Italian descent. Men of all nationalities man the boats. There were Slavonian crews, Japanese crews and crews of mixed nationalities working here during the season just closed. And most of them good fishermen, too.

It is a significant and encouraging fact that the sons of pioneer sardine fishermen are now running fishing craft out of Monterey.

fishermen to come here with Pete Ferranti. During the present season several of his sons were in the crew of "The Eneas," his fine purse seiner.

Bruce Ferranti, nephew of Pete, is an official of the boat owners' organization and has been a fish captain for years.

And there are many others, too numerous to be mentioned, who learned the business of catching fish under their pioneer fathers' and uncles' and who today rank among the most skillful and successful fishermen of Monterey.

INSEPARABLE IN LIFE AND DEATH

CLEVELAND, (UP)—Mr. and Mrs. Eberhardt Wirth were inseparable, even in death. Only a few hours after her husband had died of pneumonia at City Hospital Mrs. Wirth, unaware of his death, died at the family home, of diabetes. Wirth was 82; his wife, 86. A double funeral was held.

New Cannery Shows Faith In Industry

Pledge to Erect Modern, Attractive Plant Fulfilled by Del Mar Co.

By EDWARD DAVID

President, Del Mar Canning Co.

It is with great pleasure that I am able to announce in behalf of the Del Mar Canning Co., completion of our new cannery and reduction plant in Monterey.

This modern structure has been erected in its entirety since last November when the original Del Mar plant was completely destroyed by fire. It represents an investment of approximately \$325,000 and indicates our company's faith in the future of Monterey and of the sardine industry here.

The Del Mar Canning Co., has fulfilled in this new cannery all of the promises made in regard to the quality and design of the equipment and building. All obnoxious odors are positively eliminated.

THANKS COMMUNITY

Another feature of this up-to-date plant and one of which we are particularly proud, is an efficient system of settling tanks through which pass waters used in the many operations of the plant. The fish oil is run through a battery of late design centrifugal oil separators. Through use of these separators and the settling tanks, all possibility of polluting the waters of the bay has been eliminated.

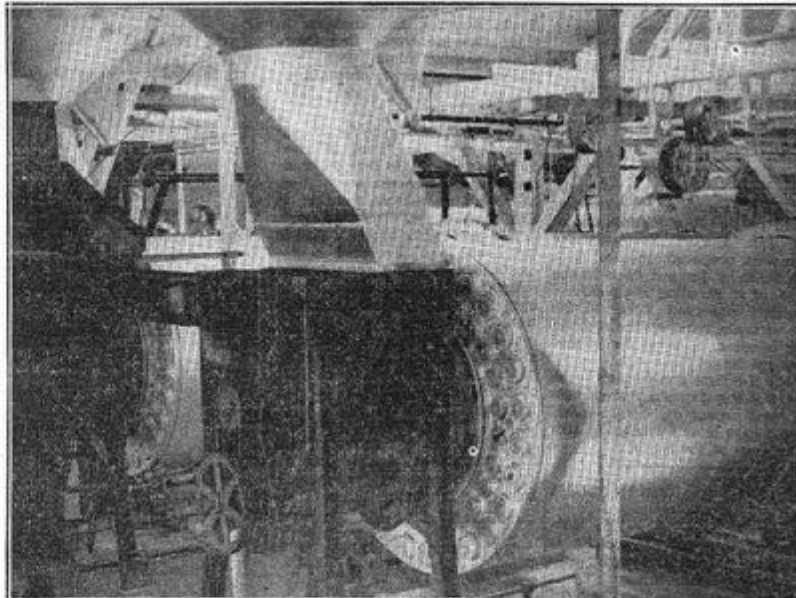
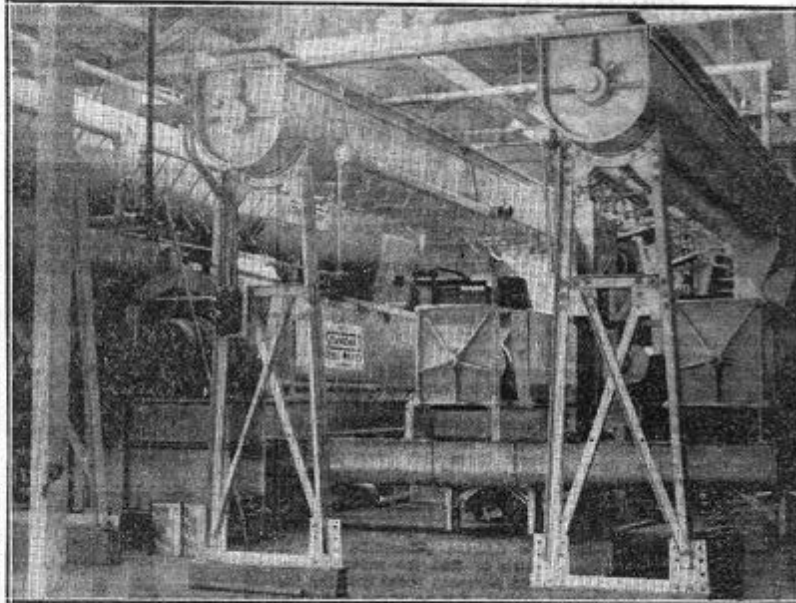
Sardines will be canned in the most sanitary manner possible through use of the latest type and most efficient machinery and equipment available. Several new type pocks have been added to the Del Mar line.

The entire plant, both canning and reduction, is housed in a spacious modern building of pleasing design with a Monterey type white stucco front.

The 400 or more employees of the Del Mar Co., will work under sanitary conditions in the well ventilated plant. Extra large rest rooms with all conveniences have been provided for their comfort.

In closing I wish to take this opportunity to extend thanks to the people of Monterey Peninsula for splendid cooperation with our company.

Sardine Meal Machinery



New machines for the reduction of sardines into meal are seen above in the Del Mar cannery plant in New Monterey. While the greater part of the sardine catches will be canned, the sardine meal production of the plant will be an important asset to the region's commerce.

Monterey
Public Library
California Room

Fisherman's Life is Gamble; With the Odds Against Him

BY TED DUREIN

Monterey sardine fishermen gamble against the elements, against the vagaries of nature, against the weakest link in a chain, or web, or strand in a heaving, straining line. They are never sure of their daily bread until the catch, boom in the sea, is delivered safe to the cannery hoppers. This is their life. They can only hope by consummate skill and exhausting labor to shorten the odds in their favor. They never get an extra break.

These fishermen live in a cruel world of the night. Much of the time it is the pitch blackness of the night in which they hunt that elusive phosphorescent glow upon the surface of the sea which means a school of fish.

Then just as suddenly—the ship bows in, the nets overhead, the net made around the fish, the purse drawn beneath fattened thrashing beneath silver harvest—these fishermen are exasperated.

to develop when regional engineers submit their recommendations to officials at Washington. And, of course, there will then be the matter of obtaining appropriations for actual work.

The need is very real, however, and those in close touch with the project feel that the money will be forthcoming at the proper time. Monterey's fishing fleet, of international importance as a producer of high protein food products, can readily justify its claim to federal protection from the storms which each year bring losses of hundreds of thousands of dollars to individual boat owners.

outlined against the night, creased with deep shadow, working deftly and nimbly as a trained surgeon, under the gauzy glow of operating lights. Sweating in the cold night.

They come into harbor with the breaking dawn to tie up lines and spend at the cannery hoppers, there to head away the inert, unobscure cargo from the hold.

The crew on into the harbor to their moorings. The fishermen slip away to their homes on the hill, there to sleep away the daylight until it is night, and fishing time again.

WE WENT FISHING

This January we invited our services aboard Skipper Sal Colletto's "Liberator" to watch the fishermen at work.

It was about five o'clock of a chilly winter evening that we left our moorings and put out to the fishing grounds. We stayed up on the bridge, with Captain Sal, watching him search the sea and air for signs of fish.

By daylight, fish can be detected by curious patterns left by their motion in the water, and sometimes by birds hovering over their hiding place in the sea.

At night it is usually by the phosphorescence on the water.

But by day or night, it is usually that curious sixth sense developed by long association with nature that makes a good skipper. "Go there," he directs the helmsman. "Or there," he waves with his hand. Sometimes after the sinner has settled over a school of fish, he cannot tell you how he knew they were there.

We found no fish by daylight this January day, so we have to

sear the entrance to the Bay and also direct, prepared and served by Dominic Costanza, the cook. There was chicken, and artichokes, and salad, and French bread and all manner of good things.

After dinner darkness began to set in and we headed south past Carmel Bay. Some sensors had stopped and several had made nets. Captain Sal scouted around, and finally decided there were no fish there. He was right. The school that put over their nets got nothing. We found this out by listening in on the inter ship, and ship to shore radio.

We headed north this time, and an hour or so later, off Santa Cruz on the other side of the Bay, things began to get hot. The fishometer which indicates depth of the open bottom, but also will indicate a school of fish directly under the ship, began to act up. A NET IS MADE

The first time Captain Sal was suspicious, and said he thought it was only snappers. So we scouted a little farther, and suddenly he decided this was it.

The big skiff was shoved overboard, and began drawing the net off the stern of the seiner, over the big roller. They drew the net, with the top held on the surface with corks, and the bottom held down with leads, in a big circle around the fish and came back to the seiner again.

Then the boom, tied up alongside the mast of the seiner, was let down and made fast to the skiff, now out on the outside of the circle of net opposite the seiner. Gradually the net is drawn smaller around the top and the leads hauled aboard from below until the fish are all cramped up as tight as possible.

Captain Sal estimated we had 700 tons of sardines in the purse. Everybody was jubilant. Then

there was a loud shout. "They're taking the line down. They're taking the line down."

The "they" were the sardines. And the "line" was the top of the net. The heavy mass of fish had suddenly surged to one side and pulled the net down, corks and all, and about 50 tons of fish got away before they got things under control. That's part of the gamble.

Sal explained that some fish are "heavy" and some are "light" and strangely enough this has nothing whatever to do with weight. It means the way they act, either pulling down on the net, or not. Fish during January had been generally "light," so Sal was not prepared for these "heavy" fish which surprised him and pulled down the line.

"We should have split the net," said Sal, which means that they should have pulled up a special draw string which would have separated the catch into two batches of sardines, of about 100 tons each. They would have then operated on each batch separately.

But it was too late for that now. Then the work began of braiding in the fish. Gradually, as the fish were braided up out of the sea and dumped into the hold of the ship the net was pulled tighter and piled up on the stern of the ship.

Everybody works, and works hard, including Dominic, the cook, and Treble Balesteri and Dick De Polo out in the skiff, and Vincent Colletto, Bart Rappoli, Nick Giacalone, Frank Pappalardo, Caesar Colletto, Vincent Crivello, Joe Turasso and Jack Aiello.

Finally, Captain Sal estimated that there was about 75 tons left in the net. It turned out to be only about half that much, and sure Sal doesn't often misjudge these things, the crew made investigation. They found that a sea lion

had torn a huge hole in the net and let out the fish.

"These are the things that make fishing such a gamble," Sal said. "When we had those 200 tons of fish in the net at first, that didn't mean a thing. You can't count a single fish until they are delivered at the cannery."

A GAMBLE

He might have added that most of the boats that went out that night didn't catch a thing. That's another hazard. No fish. But even when there are fish, your chances of getting them into port are precarious.

Finally the last fish was headed into the hold, the net stowed aboard, the hatch bolted down, and we headed for the cannery.

The dawn was breaking when we tied up there. And by the red rosy glow of the morning we were reared ashore and became a newspaper man once more. And the crew of the Liberator totaled up their earnings at \$2 dollars per ton for 140 tons. Not bad for one night. But there weren't many nights like that this season.

And besides, you should see these fishermen sweat out there in the chilly night under the lights.

LOOF GIVES CLUE

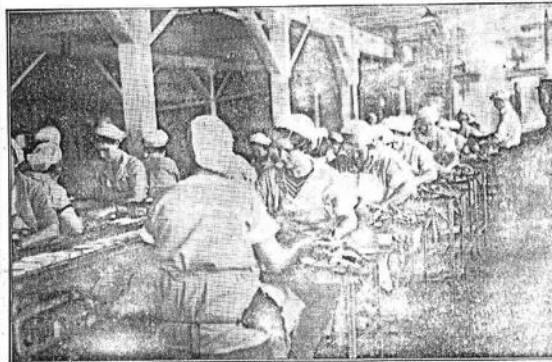
NASHVILLE, Tenn., (AP) — City police recently were on the lookout for what they thought must be a "fendly man." B. H. Kemp Northville reported the following morning from his parked car: one necktie, two pairs of boys' overalls and a dozen slippers.

INDIANAPOLIS, Ind.—According to an ad in an Indianapolis newspaper, one householder has acted as his own OPA and set a price ceiling on his house. The ad reads: "Priced for quick sale, \$14.75. Please do not inspect unless you expect to make lower counter offer."

FISHERIES - SARDINES

2274

They Love to Hear the Whistles Blow

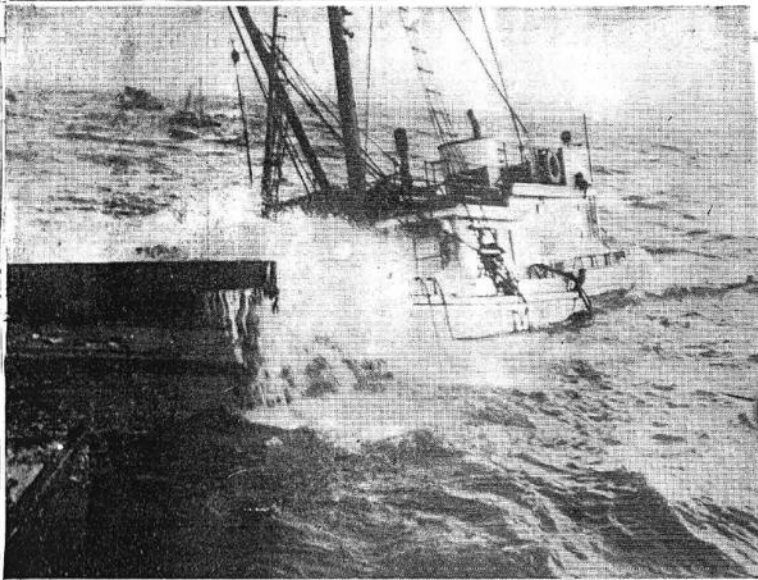


Monterey's sardine industry makes seasonal employment for approximately 3,000 persons each year. Some of the neatly uniformed girl packers are shown here busy at their tables tucking away the fish which will eventually make their way in cans to all parts of the globe and throughout the United States. These workers are called to work when fish are delivered to the canneries from the incoming purse seine fleet by means of cannery whistles which are a familiar and welcome sound for most peninsula residents. (Herald Photo)

30 C Oakland Tribune, Friday, Dec. 10, 1943

Monterey Public Library California Room

COAST SCIENTISTS PUZZLED BY SARDINES' DISAPPEARANCE



A purse seiner wallows in Monterey Bay after the two-day gale. This boat is part of the Monterey sardine fleet, which suffered an estimated million dollar loss as a result of the storm. Note the wrecked shipping.—A.P. Wirephoto.

PALO ALTO, March 7.—(AP)—Poison gas, earthquakes and other things which may have changed the nature of northern California's off-shore waters are among the factors being considered by scientists seeking to learn why the sardine has virtually disappeared from the Monterey and San Francisco fishing areas.

The poison gas hypothesis is only one of many speculations of uncertain origin. It holds that the sardines disappeared after poison gas ammunition was dumped into the ocean by the Army.

The United States made known during World War II that it had huge supplies of poison gas ready for retaliatory use in case the Axis powers resorted to that method of warfare. But where it was kept and how it was disposed of, if at all, is top secret.

Ocean bottom earthquakes also figure prominently in the speculation about the fate of the sardine. This idea envisions ocean floor changes which alter currents in some way detrimental to sardine life.

All this is guesswork, says Oscar

E. Sette, of the Stanford University station of the U.S. Fish and Wild Life Service, whose staff now is trying to uncover the facts.

Sette believes that the solution of the mystery lies within the ocean itself. He and his staff are designing special equipment and recruiting scientific manpower to investigate. This, he adds, will take some time.

'Where Are they? Sardines?' State Fishermen Ask

California's fishermen are wondering where the sardines went this year.

The Fish and Wild Life Service in Washington, D. C., announced yesterday that only 31,610 tons have been landed in Monterey, San Pedro and San Francisco, compared with 192,969 tons by the same time last year.

The service estimated that California fishermen have lost \$5,000,000 in expected tonnage of sardines which did not show up. Canneries have only packed one-seventh of last year's total.

the schools nor reach them with their nets. Again the prevalence

grounds.

Scientist Predicts Eclipse of Sardine

State Fisheries Chief Says Fish Will Disappear in South as Well; May Never Return to This Region

SAN FRANCISCO, Nov. 26 (AP)—Southern California sardine fishermen were warned today that the sardine catch will fall off in a year or two.

The warning came from Richard Croker, chief of the State Bureau of Marine Fisheries, who said that the San Pedro fishing fleet will see its multi-million dollar catch decline in the same manner as San Francisco's.

Fishermen Meet To Discuss "Strike" Strategy

SAN PEDRO, Cal., Nov. 26 (U.P.)—Sardine fishing boat owners and crews met jointly today to discuss strike strategy in getting cannery owners to pay an extra \$10 a ton for their catches.

They insisted through their AFL and CIO fishermen's unions that technically they were not on strike, but merely were not fishing. Their demand is \$50 instead of \$40 a ton.

About 375 boats, among them many from Monterey, San Francisco, Oakland and Seattle, bobbed idly at wharves in the Los Angeles fish harbor.

Involved in the work stoppage are some 65 Monterey boats manned by approximately 700 local fishermen.

Combined, those figures add up to a total loss to the community of \$5,000,000 so far this season.

Estimated losses to canners were impossible to obtain at this time. Monterey now has a total of 28 processing plants with a potential payroll of 4,000 employees, according to AFL Fish Cannery Workers Union representatives while at the start of the season the local fishing fleet numbered 72 boats, manned by close to 1,000 men.

Union officials estimated today that but 600 people, including those working on a small squid pack, now are employed on Cannery Row, while but three purse seiners remained in the bay today.

Croker said that California sardines probably never will return to the San Francisco shoreline in any quantity. The sardines practically disappeared in this area last December and have not been found in large numbers outside of San Pedro.

PLANTS CLOSED

More than 14,000 tons were taken into San Francisco Bay in 1945. Only 503 tons have been taken this year. Thirty-seven reduction plants employing 2,000 persons were forced to close.

Croker said he believed that after this year's catch, the San Pedro take will fall rapidly.

Informed here of Croker's statement regarding San Francisco fishing, Monterey waterfront observers, while holding the view that the local disappearance of fish is temporary, pointed out that conditions here approximate those in the north.

BIG LOSSES SUFFERED

Fishermen here with landings this season far behind last year already have suffered a dollar loss of \$1,200,000.

Losses to cannery workers are more difficult to determine, but waterfront observers estimate they have suffered a decrease of at least \$3,000,000 in their earnings, based on last year's payroll plus a wage increase of 25 per cent they received this season.

And last year, which branched

very workers, was not a good year.

Where once more than 50 big purse seiners tugged at anchor during daylight hours, now only two or three are spotted inside the breakerwater. These may be gone tomorrow.

The normal cannery payroll is down about a third.

The fishing industry of Monterey, in other words, is struggling to keep alive, a struggle which may be abandoned for the season next month.

The season doesn't close officially until Jan. 15, however.

This prediction may be changed, of course, if the sardines return to Monterey Bay. Only the small boat fleet is here to look for them, however, and few local observers expect the fish this late in the season.

BOATS GO SOUTH

At least 40 of Monterey's purse seiners are fishing for San Pedro canners; 15 more are fishing out of Port Huemane, with the fish caught being shipped into Monterey by truck.

Hernaez Mercario, manager of the Monterey Purse Seine Association this week estimated the October payroll for Monterey boats at about \$500,000, most of it coming from San Pedro canners.

Most of this money is spent in Monterey. The boats fishing in southern waters spend money in Southern California for groceries, fuel, and other operational expenses, but send most of the sardine home.

In this respect the boatowners are luckier than the canners. They can move their investment to the source of the raw material and get many years and then returned to get some return.

If the local boats had not gone to San Pedro, Mercario said, the payroll would have been "but a fraction" of \$600,000.

MACKEREL IMPORTANT

A heavy ton of mackerel during September and the early part

Monterey Becomes Almost a Ghost Port Without Sardines

By DICK RYAN

Monterey, once the greatest sardine port in the world, today is virtually a ghost port in the fishing industry.

Where once more than 50 big purse seiners tugged at anchor during daylight hours, now only two or three are spotted inside the breakerwater. These may be gone tomorrow.

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MACKEREL IMPORTANT

A heavy ton of mackerel during September and the early part

of October, together with small catches of squid and local salmon, kept local canneries in operation.

Two have shut down as yet. A third may have taken at least some loads of trucked-in sardines.

Trucked-in fish from Port Huemane is more expensive than locally caught fish. Local observers place an estimate of \$17 a ton on the cost of trucking sardines to Monterey. Part of this cost is born by the fisherman, the balance by the canners.

It must be utilized to the fullest in canning, not reduction, in order for the canners to realize their costs. One cannery said this week that he doubted if any cannery in Monterey was making a profit on trucked fish.

One plant has enjoyed a fairly heavy pack of anchovies. Some others have packed albacore in fairly heavy quantities, but expect to finish the run within the next few weeks.

In a normal season, or even in a season such as last year when the sardine run was heavy early, canneries would have employed close to 3,000 persons a day.

During October the average was closer to 2,500 most of these on a part-time basis only. The crew is fairly high because operators must can a high percentage of trucked fish to break even.

Much of what pack there was in Monterey was made up of substitute for chum salmon, has not moved rapidly.

As one cannery said this week, no one can tell where the sardine has gone this year. The history of migrating fish is similar in all parts of the world.

MARKET POOR

Packhouses sardines disappeared for many years and then returned in greater numbers than before.

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A heavy ton of mackerel during September and the early part

Monterey Peninsula Herald Thursday November 2, 1956, 27

Norwegian bringings, also members of the sardine family, are in short supply this year.

Canneries are faced with a market for canned goods, oil and meat which is in the doldrums. The price of oil is up to nearly twice what it was this time last year.

Southern canners are flooding the market with an immense pack. The local canners, faced with more expensive trucked-in fish, are in a difficult position.

The unsold pack is secured by loans from banks, in many cases, of from 50 to 60 per cent of its value. The balance of the funds must come from the cannery's cash reserve, or current operating expenses must be put over.

When the Korean war began, there was a rush to buy food-stuffs of all kinds. Local canners were not able to cash in on the demand at that time and now the demand is gone.

It looks like a bleak winter for Monterey's biggest single industry year.

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Fisheries SARDINES #16

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Expert Writes On Problem Of Small Sardines

"Christmas Trees" May Be Avoidable Through Use of Different Mesh

Sardine "Christmas Trees" was a number one source of expense and trouble to Monterey fishermen during the season of 1937-38. The "Christmas Tree," which has become a standard term in fishing vocabulary and refers to hauls of small, shimmering fish which become gilled by the purse seines and ring nets, is a beautiful sight—but not to the fishermen who must remove the fish from the webbing.

These gilled sardines are of no value, being too small to can and having a low oil content. When a purse seine is filled with a school of the silvery "ornaments," it simply means the task of shaking the fish out at great delay and considerable expense.

NOT FISHERMEN'S FAULT
In an article in "California Fish and Game," on the problem of "Christmas Trees in the California Sardine Fishery," John F. Janssen, Jr., of the California State Fisheries Laboratory, Division of Fish and Game, presents the difficulties of avoiding netfish of gilled fish, and then suggests several methods which might solve the problem.

He points out that fishermen can not be blamed for the "Christmas Tree" hauls, since it is virtually impossible to tell whether a haul will contain large or small fish.

The fishermen certainly lose by dragging the gilled sardines. Often their nets, valued at from \$3,000 to \$5,000, are periled by the weight of the tiny fish, especially if a strong wind makes it necessary to cut away pieces of the webbing to save the net.

Besides the task of hauling in the net, the gilled fish must be

removed within a few hours to avoid rotting of the net. After the fishermen shake out most of the fish, the remaining sardines must be pulled out by hand or boiled away in a tanning vat.

The latter method is expensive and takes from eight to twelve hours, however, and is harmful to the net if done too often. Then a "blind haul" must be taken, to wash out all slime and residue from the net.

"Christmas Trees" are caught from San Francisco south to San Pedro, but they occur most frequently in the Monterey area.

SOLUTION DIFFICULT
In his article, Janssen shows the difficulties of enlarging or reducing the mesh size of purse seines to avoid gilling the small sardines. Increasing the mesh size would gill larger fish with added danger to the net, while decreasing the size would add to the original expense of the net and would increase its drag through water.

As a possible solution, Janssen suggests making the top strip of the net smaller mesh, leaving the lower webbing the present size, about 1 1/4 to 1 1/2 inches, when struck.

If the top strip of mesh were not over one inch in size, the gilling of small fish would be greatly reduced. Smaller fish might be caught in the reduced mesh, but the very small sardines are rarely found abundantly on the deep water where purse seines operate.

Accompanying the article by Janssen are several photographs taken in Monterey of "Christmas Tree" hauls by J. B. Phillips.

Scientists Visit Monterey On Sardine Investigation

By ALBERT CAMPBELL.

Do sardines spawn north of Point Conception? That question has been a much debated one during all the study that has been made of the fish that means everything to Monterey—except its history and romance. It has been fairly well established by researches of the California fish and game scientists that the principal spawning area is in southern California waters.

But the thought persists that maybe the warm waters of the California current, also called sometimes the Japanese current, which runs from fifty to a hundred miles offshore, may be a spawning area. There has been a belief among fishermen, too, that during seasons of scarcely alongshore when the delirious cry of "depletion" begins to be raised that there are plenty of schools of sardines a couple of hundred miles out to sea.

SCIENTISTS IN PORT
To answer, if possible, questions of this kind the United States Bureau of Fisheries, headed on this coast by O. E. Sette, has chartered the schooner E. W. Scripps, property of the Scripps Institution of Oceanography, and is conducting a survey of the Pacific coast from Cascade Head in northern Oregon to Lower California and 300 miles to sea. The vessel is now at anchor in Monterey harbor.

Included in the party of scientists are Lionel Walford, Ralph Silliman, Robert Luckhart, all of the U. S. Bureau of Fisheries, and Vernon Brock, research man of the Oregon fish commission. Two oceanographers of the Scripps Institution are with the party—Richard Tibby and Charles Davis.

MODUS OPERANDI
Method of study is to run "station lines" in a southwest course 300 miles to sea from eight points

about 150 miles apart along the coast. Thus a strip of ocean 300 miles wide and extending from northern Oregon to Lower California is covered.

Three nets designed to catch sardine spawn are dragged at varying depths. A new feature of these particular nets is the "open and close" mouth. They do not open till they arrive at their working depth. They close again when being brought up. Thus any samples taken are from a specified known depth. Purpose of this method of study, which is new, is to gain knowledge of the "vertical distribution" of spawn. Aside from the work on the sardine spawn subject there is observation of ocean temperatures, salinity of water, presence of feed, and other subjects of interest to oceanographers as well as ichthyologists.

NO CONCLUSIONS, YET
The expedition started May 10 and will finish about the middle of July. The scientists are not ready to publish any "official conclusions" but state that they have "to date" found no sardine spawn north of Point Conception. They have seen no schools of sardines far out at sea and that may be even more to the point, they have found no feed in the water out there of the type sardines are known to live on.

The trip has been rough as to weather but the only unfortunate incidents were unavoidable cases of sickness. O. E. Sette, leader of the expedition, had to leave at Eureka to have an appendicitis operation. One reason for the call at Monterey was to set Captain Earl Hammond ashore so he could go by train to San Diego because of the serious illness of his wife. The party will remain here till tomorrow afternoon at least, then proceed with its work.

Sardine Payroll \$40,000

Wave of Prosperity Hits Peninsula as Industry Gets Going

With today's catch estimated at close to 2,000 tons, sardine industry fishermen and cannery workers tonight will have earned between \$40,000 and \$45,000 for the first two days' operations of the new season which opened yesterday.

At a price of \$11 per ton, the two days' catch, totaling about 3,000 tons, is worth in round figures \$33,000 to the fishermen, while cannery workers are estimated to have earned \$10,000, or an aggregate of well over \$40,000.

CATCH INCREASES
Many boats were still out today from the second night of fishing but those returning reported better conditions than those found yesterday.

A check of plants at noon today revealed that 1,400 tons of sardines had been landed at that time, with many boats yet to unload.

Additional loads of sardines are expected at almost every plant along the row and approximately 1,600 people were employed in the canneries today, an increase of 700 over yesterday.

The catch today was reported by most operators to be superior in quality to the fish delivered for the first day. However, one plant owner refused to accept two loads of fish today as unfit for canning. At the same time, another large plant began packing operations today after having had to send all of the first day's catch to the reduction plant.

Another Cannery Closes

A third cannery in Monterey will be liquidated this week, in the fourth disastrous year of a sardine shortage.

The \$400,000 Custom House Packing Co. cannery is being dismantled, all equipment is to be sold, and the company liquidated.

The Aeneas Cannery was sold on the auction block for \$100,000 March 20 to the Reconstruction Finance Corporation, which held the full mortgage on the machinery and equipment and had a joint interest in the building.

The California Frozen Fish Co. cannery was due to go on the auction block Oct. 20, but the procedure was "postponed by a technicality," a spokesman said.

NOT BROKE
The Custom House cannery, however, "is not broke, but can no longer face overhead costs with no raw material to bring in returns," according to George Leutsinger, manager. The cannery has been closed for some time.

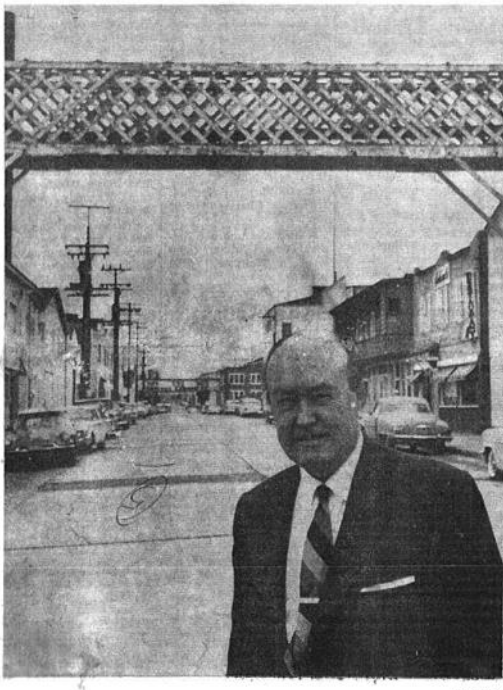
(Nine of the 16 canneries in Cannery Row have been operating this season, all of them on anchovies, mackerel and tuna. Two small shipments of sardines have been made by truck from southern ports.)

Leutsinger said, "We can see nothing that might change the situation, and we do not feel that the present anchovy catches will make a lot of difference."

FOUNDED IN 1916
Custom House was founded in the early 1920's.

Early in the history of the cannery, it was bought out and is still owned by Bragdon Wilbur and Thomas Frank of San Francisco.

The machinery will be sold for use in Africa, where a large sardine enterprise is growing along a 100-mile stretch of coast, in Peru where the fish cannery industry is advancing in some fields, and to local firms who may wish to buy machinery.



The 'Row's' Last Holdout

W. O. Luande, president of K. Hovden Co., today was the sole survivor of the fish lunge which has slowly killed Monterey's once-great sardine cannery industry. His background is Cannery Row and some of the empty canneries which have been closed.

'Fish Capital Of World' Down To Its Last Cannery

PH 7-13-62

And then there was one. Operations at the Carmel Cannery Co. plant on Cannery Row have straggled to a halt and closing of the sardine cannery firm was announced formally today.

This leaves William O. Luande, president, and Robert Wood, vice president and secretary, of K. Hovden Food Products the only cannery operating in the port which once was called "The Fish Capital of the World."

Hovden, one of the largest plants on the Row, has held on with a variety of packs, some squid was the most recent, and now is hopeful of some activity in the Philippine market.

Only three months ago California Packing Corp. closed its big Cannery Row plant and now is in the final stages of moving its equipment to Puerto Rico.

Carmel stopped canning in December, according to Herman Kramer, acting superintendent of the plant. "Since then it's been a matter of how long we could last without the sardines," he said.

"If only we could have called anchovies sardines, we could have made it. They are just the same, except people won't buy anchovies. You can't can what you can't sell," Kramer said.

Carmel Canning has managed to hang on by selling a few cases of fish in South America and a few in the lo-

ber pack, which provided steady employment for some 100 persons, the last 35 cases packed in the plant were sold to Montemar market in New Monterey.

Only two full-time men remain at the plant—Walter and Frank Avila, the warehouse foreman. Both men have worked on Cannery Row more than 30 years.

"We're oiling, greasing and painting all the machinery. There is a slight possibility the cannery in a year be leased or sold," Avila said. But he was doubtful the cannery would be coming back to life.

"The fish are gone now and so are the canneries. There's nothing left here for us. All I know is the canning business, and this is the end," Avila said.

Kramer agreed. "I came here in 1929, canning has been my life. Now I'll have to move. This is a hard thing for us," he said.

The Future
What are the future plans for the cannery? Kramer said the owner, Harry Irving of San Francisco, would probably prepare to lease the operation or sell it outright. "Mr. Irving said he was not going to sell the company by piecemeal. He's very much interested in seeing the industry come back, but it's a losing proposition to continue to wait," Kramer said.

The Monterey sardine cannery industry, which now has dwindled to one plant, once supported 18 bustling

workers. But the annual catch, which brought 243,613 tons to Monterey and Moss Landing in 1945, now is down to 3,000 to 4,000 tons. Now there are only about a dozen purse seiners based at Monterey, employing about 75 fishermen, where 15 years ago there were 925 fishermen on 78 boats.

79

California History Km Monterey Public Library



San Francisco Bulletin Oct. 17, 1959

Culture Replaces Sardines



By WES WILLOUGHBY

MONTEREY, Oct. 17.—Take it from the leathery-faced fishermen, the gusty pascanos in these historic streets, the discouraged cannerymen themselves: Cannery Row has just about had it. Not the storied, narrow, twisting street, not the celebrated novel by John Steinbeck.

But the canneries themselves.

In five years—or sooner—there may be none left.

The reasons are all tied to a tiny aromatic fish once dubbed "silver from the sea."

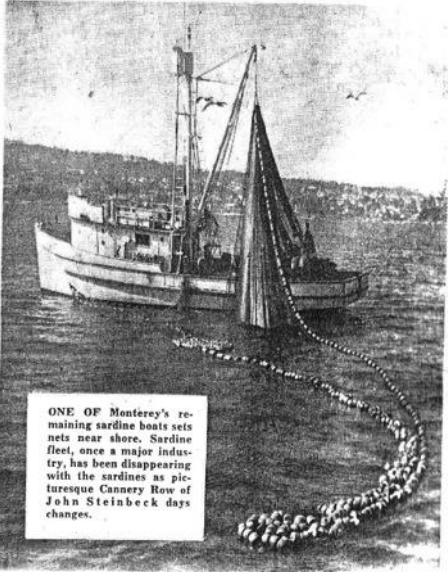
The fish is the sardine, and, in 1946, Monterey was the sardine capital of the world.

At that time, more than 80 big fishing boats and 1200 fishermen were casting their nets for sardine in the choppy waters of Monterey Bay.

Some 31 canneries and "reduction plants" (which turned the silvery fish into meal for cattle and oil for paint) were operating full speed 13 years ago.

AND MOST of the season's 234,613-ton haul was put into tins for the worldwide market.

Today—as yesterday and ever since the start of the current season in August—



ONE OF Monterey's remaining sardine boats sets nets near shore. Sardine fleet, once a major industry, has been disappearing with the sardines as picturesque Cannery Row of John Steinbeck days changes.



OTHER CANNERY (foreground) falls to the background is one of only five of the original 31

Economics Held Responsible For Poor Season

Mercurio Speaks for Boat Owners

By RITCH LOVEJOY
The reason why Monterey had a poor fishing season was purely an economic one, says Horace Mercurio, acting manager for the Monterey Purse Seine Association, the local boat owners cooperative. Mercurio acted as spokesman in the absence of President Frank Cardinale, who was working in the interests of boat owners at Port Huemene at the time of the interview.

"It's the old question of supply and demand," Mercurio said. "This year, we had the supply, but not the demand. It was quite the opposite last year."
MORE FISH
Mercurio illustrated his theory by pointing out that there were three times as many fish caught this year in Monterey in a shorter season.

"The boats started out August 1st on strict limits," he said, "but the fish in the raw were so expensive that cannerymen could not put them into reduction plants for oil and meal."
"With the quality of fish here, limits had to be small in order to pack what was brought in. (Fish mixed in size take more work to pack.)"
"On October 6th, the fleet stopped operating due to the fact that San Pedro operators wanted to pay less than the \$67.50 prevailing price per ton."
PRICE REDUCED
"The fleet, boat owners and cannerymen had negotiated a \$60 per ton price which brought fishing for three days. During this time only four canneries took fish."
"Then on November 22nd, the fishing fleet resumed operations again at \$50 per ton. All the fleet went out, but on small limits of 25 and 30 tons, set by the association."
"Still, with this broken season, the catch was 29,500 tons compared to last year's 12,764 tons. The industry knows that instead of all this talk about fish depletion, that the fish were diverted to other parts of the ocean."
"Mainly, Mercurio says, sardine schools were seen day in and day out in Mexican waters as far south as Tres Marias Islands, where the tuna fleet worked. The fish were large and small, and the same quality as those caught along the coast of California, Oregon and Washington."

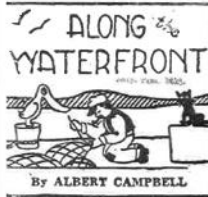
"We believe that in the coming year fish will be plentiful, because it seems that they are returning to former feeding grounds," Mercurio went on.
"This season we had more sardines in Monterey Bay, between Monterey and Santa Cruz, than in any good year. And if fish had been in demand, as it was last season, the tonnage would have been at least four times the amount caught then."
"Although the fish has come back, we of the Industry of Monterey and elsewhere in California, believe in conserving the species."
"We have presented a proposed bill to the legislature in Sacramento to cut down one more month of fishing, during the spawning time."
"Formerly, the fleet opened season on the pilchard from August 1st to February 15th. The recent voluntary conservation plan cut the season to August 1st to January 15th, with a five-day fishing week and five-day light of the moon layoff."
"The proposed legislation will include another cut of season, shortening it to August 1st to December 15th, also with the five-day week and light periods."
"In San Pedro, the season would start October 1st and lasts until February 1st."
"This year, San Pedro has had

the same story to tell," Mercurio said. "They started October 1st, and had five fishing days. They laid off until November 27th, when the \$50 price agreement was reached, but resumed fishing on limits ranging from 25 to 50 tons, set by the cannerymen."
"For the same economic reasons seiners were held up. Cannerymen could not move the goods. Yet, San Pedro, although the Monterey fleet stayed here this year, caught 103,700 tons of sardines. Last year, with all the Pacific Coast fleet in their grounds, they only caught 79,822 tons."
FISH GIVEN AWAY
"If they had gone out on no limit as in previous years, Mercurio

reiterated, they too would have made four times the total catch.
"It is known," he said, "that fishermen in those grounds were getting so many sardines in their nets that they had to give them away to neighboring boats. Fish there were not only thick and plentiful but of very fine quality ranging from nine to 11 inches in length."
"If the demand for the canned product had warranted it, cannerymen had the opportunity to have all the fish they wanted. San Pedro, incidentally, is also on a conservation program."
Formerly Monterey Sardine Industries, Inc., the Monterey Purse Seine Association started

in 1923. By May 1947 it was working on a cooperative basis, but dissolved and started out on a trade association basis, adapting the new name. It ceased to operate on October 1948, and re-formed again by November, to go back under the cooperative setup but retain the new name.
The cooperative takes orders from the cannerymen, and then allocates to the boats, and assigns them to deliver to certain packers. The trade association plan called for individual contracts with cannerymen, and thus some boats were left out during small orders.
Present officers are: President Frank Cardinale, Vice-president Sal Colletto, Secretary Horace Balbo, Treasurer John C. Spadaro, Directors are Pete Majorano, John Russo, John Mineo, Sam Lonerio, and Joseph A. Ferrante. Grace E. Bevan has been bookkeeper for the boat owner's group since 1934.

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WAY AHEAD

Well, you may have gleaned all his from the (other) news columns of the Herald but we had fun this morning discussing sardine figures with the scorekeepers at the fish and game office.

Most interesting to us was the disclosure that this sardine season is 13,569 tons ahead of the preceding season, to date. The month of November 1938 was way ahead of November 1937—48,628 tons against 31,754 tons. Season totals to end of November show 1938 with 113,299 tons and 1937 with 126,569 tons.

Season total for 1938-39 was a little better than 180,000 tons. It is a safe bet that this season will go to 200,000 by the middle of February.

A factor which may influence the situation is that December is the last month of reduction permits. All fish taken after December 31 must be for packing, and only offal may go for reduction.

Oh, yes, the score yesterday was 3545 tons.

BOY: PAGE MR. DIES

Did you know they were campaigning for a government dredging project over at Moss Landing and Elkhorn to make a harbor that's okay. No one cares any more than they cared a few years back when Coos Bay made great threats of running away with Mon-

terey's sardine business.

And no one should object if we get a laugh out of what we read in the Watsonville Register-Patriot on the subject. Under "Harbor Hearing Highlights" we read several quotations. One is: "Al Meyer, Monterey shark reduction plant operator: 'Canneries won't stay in Monterey much longer. I understand certain interests have offered the city \$300,000 to clean the canneries out and make the place a beauty spot.'"

And we might add some "Highlights of the hearing of 'Harbor Hearing Highlights.'" Ferinstanz:—M. T. Londahl, prominent Monterey newspaper man: "Well, it's news to me but we already have all the serious news we need on the Moss Landing subject—you might find room for this in your column."

Al Campbell, dilettante waterfront observer: "Al Meyer is a nice chap but he lacks imagination. Wonder what gave him the idea the city would sell out a \$7,000,000 industry for a lousy half-million."

Joe Palooka, well-known sports figure: "Teh! Teh!"

WATCH THAT BILGE, BOYS

It may be "just a gesture" but it is a good one. The boat owners' union has posted a notice to the effect that the organization will cooperate with the fish and game and coast guard authorities in enforcing the law about bilge water. That law, as the reader doubtless understands by now, requires seiners to pump the bilge into special pipes on the hoppers to be conveyed ashore.

The union's notice advises that members convicted by fish and game or coast guard authorities will also find themselves being fined by the union.

The other evening, we understand, A. N. Lucido, one of the

Sardine and Plant Payrolls \$800,000

Production of Canned Goods, Oil And Meal Estimated to Be Worth At Least Another \$1,000,000

October operations of Monterey's sardine industry, now drawing to a close because the full moon makes fishing impractical, had a dollar value of approximately \$1,800,000 a Herald survey revealed today.

This valuation, which makes the month one of the biggest in history of the industry here, was arrived at by adding plant labor payrolls, payments for sardine catches and estimated value of canned goods, oil and meal produced by plants here.

During the month:

1. The 11 canning plants and one reduction plant paid out close to \$222,923 in wages to the 2,500 people employed on cannery jobs.

2. Some 52,498 tons of fish (worth \$11 a ton) were delivered and the 700 men who man the purse seine fleet got \$577,473 for them.

3. Production of canned fish, sardine oil and fish meal was estimated to be worth at least \$1,000,000—although an exact valuation was impossible because market prices and production totals were not available.

Although start of the present canning season was delayed a month by labor strife, total catch for this year is less than 6,000 tons behind the catch at the end of October last year.

A total of 75,910 tons of sardines have been landed this season while last year's catch at the same time was only 81,549 tons. October, 1938, catch was only 29,095 tons, a little better than half the take for the same month this year.

According to canners, the fish have been fair sized thus far and are fairly firm. Most of the catch has been packed because of the favorable "war" market which has kept the price of canned fish in the neighborhood of \$3.30 per case.

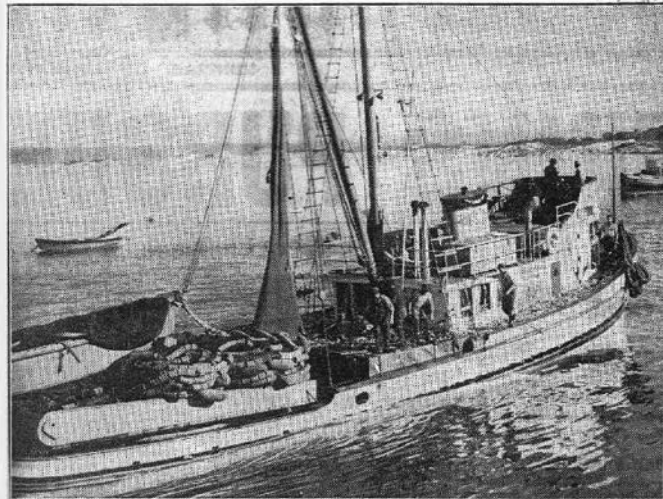
Cannery workers also report a good meal and oil market. During October fishing an all time record was made for a one day's catch when on Monday, the 9th, 6,102 tons of fish were landed along the row. This topped by 1,268 tons the previous record set exactly two years before on October 9, 1937.

For the mathematically minded, the sardine population off this section of the California coast was reduced by 314,988,001 citizens because of the October catch. That is; averaging sardines at three to the pound and using a sharp pencil.

Plant payrolls have been running higher than last year because a higher percentage of the catch is being canned and because cannery workers won minimum wage increase of 2½ cents an hour for this season.

10/7-6/39

Sardines Fill Decks of Lucky Seiner



When the purse seiner Santa Rita returned home to Monterey with 164 tons of sardines December 18, the load was so great that the boat was deep in the water "and couldn't carry one more fish" according to its crew. The boat is 83 feet long and has a beam of 21 feet, with a normal cargo capacity of about 140 tons. The huge catch was made off Santa Cruz, with Captain Pete Bellecci in command. (Herald photo)

Module 2: Step 2

Now that we know there is a problem in this fishery, how do we fix it? Be as detailed as possible in your response and explain why you decided how to fix the system.

How should we manage the sardine fishery?

The resources for this section include:

- a) MSY, Maximum Sustainable Yield. Pew. April 2012. 4pp.
Link: http://www.pewtrusts.org/~media/assets/2015/03/turning_the_tide_msy_explained.pdf
- b) Newell, R., Sanchirico, J., and Kerr, S. Fishing Quota Markets. 53 pp.
Link: <http://www.rff.org/files/sharepoint/WorkImages/Download/RFF-Event-fishing-quota.pdf>
- c) A fishery manager's guidebook. Management measures and their application. FAO. Fisheries Technical Paper 424.
Link: <http://www.fao.org/docrep/015/i0053e/i0053e.pdf>
- d) Coastal Pelagic Species Operational Definitions of Terms (Pages 10-12)
Link: http://www.westcoast.fisheries.noaa.gov/publications/fishery_management/cps_program/cps_fmp_as_amended_thru_a13_current.pdf
- e) Magnuson Stevens Act
Link: http://www.nmfs.noaa.gov/msa2005/docs/MSA_amended_msa_20070112_FINAL.pdf
- f) Gutierrez, N.L., Hilborn, R., and Defeo, O. (2011) Leadership, social capital and incentives promote successful fisheries. Nature 470: 386–389.
Link: <http://www.monitoringmatters.org/articles/Gutierrez.pdf>
- g) World Ocean View, Chapter 6, Exploiting a living resource: Fisheries. 2010.
Link: http://worldoceanreview.com/wp-content/downloads/wor1/WOR1_english.pdf

Module 2: Step 3

During this step, you are tasked with answering the question:

What should the sardine quota be? How should managers determine what the quota is? What factors are important in determining a quota?"

The resources folder for this section will include:

- a) Sardine, anchovy, and squid landings and ex vessel revenue

Found at:

<https://www.wildlife.ca.gov/Fishing/Commercial/Landings#26004335-2000>

Hint: Look at Table 18 PUB for the Monterey Area

Other source: http://pacfin.psmfc.org/pacfin_pub/all_species_pub/woc_r308.php

- b) Caddy, J.F., Mahon, R. 1995. Reference points for fisheries management. FAO Fisheries Technical Paper 347.

- c) Link: <http://www.fao.org/docrep/003/v8400e/v8400e00.HTM> Review of some California Fisheries for 1983. CalCOFI Reports Vol. 25, 1984.

Link: http://www.calcofi.org/publications/calcofireports/v25/Vol_25_Fisheries_Review.pdf

Module 2: Step 4

Congratulations on getting to Step 4! Your next questions are:

What variables or factors should go into a harvest guideline? What variables or factors should go into a cutoff? How should managers decide what these numbers should be?

If you have time, what do you think the numbers should be?

The resources for this section include:

- Historical quota allocations (provided below)
- Historical values of sardine stock and recruitment (provided below)
- “Fishery Managers Scale Back Sardine Harvest” by Terry Dillman, Dec 1 2013 in *Fishermen’s News* Link: <http://www.fishermensnews.com/story/2013/12/01/features/fishery-managers-scale-back-sardine-harvest/225.html>
- Dowling, NA et al. (2015) Guidelines for developing formal harvest strategies for data-poor species and fisheries. *Fisheries Research* 171: 130-140.
Link: https://www.researchgate.net/publication/282936482_Guidelines_for_developing_formal_harvest_strategies_for_data-poor_species_and_fisheries

Year	sardine_directed_mt_quota	Year	sardine_directed_mt_quota	Year	sardine_directed_mt_quota
1975	0	1988	1000	2001	134737
1976	0	1989	1000	2002	118,442
1977	0	1990	1000	2003	110,908
1978	0	1991	10,584	2004	122,747
1979	0	1992	20415	2005	136179
1980	0	1993	25160	2006	118,937
1981	0	1994	11,837	2007	152,564
1982	0	1995	48,215	2008	89,093
1983	0	1996	34,864	2009	66,932
1984	0	1997	48,988	2010	67,039
1985	0	1998	43,545	2011	50,526
1986	1000	1999	120,474	2012	109,409
1987	1000	2000	186791		

Source: CalCOFI reports

Table App.C1. Historical values of sardine stock and recruitment.

Year	Biomass	Age 0	Year	Biomass	Age 0
	2+, 10³tons	10⁶ fish		2+, 10³tons	10⁶ fish
1930	3377	8860	1956	108	3530
1931	3804	19318	1957	90	2014
1932	3524	31607	1958	177	641
1933	3415	9120	1959	122	247
1934	3625	6278	1960	88	165
1935	2845	11980	1961	54	125
1936	1688	15445	1962	27	24
1937	1207	15051	1963	21	114
1938	1201	26279	1964	11	60
1939	1608	32141	1965	10	54
1940	1760	13692	1966	10	54
1941	2458	7273	1967	10	54
1942	2065	8279	1968	10	54
1943	1677	5308	1969	10	54
1944	1260	3617	1970	10	54
1945	720	3710	1971	10	54
1946	566	8624	1972	10	54
1947	405	9483	1973	10	54
1948	740	8212	1974	10	54
1949	793	645	1975	10	54
1950	780	884	1976	10	54
1951	277	2163	1977	10	54
1952	136	2664	1978	10	54
1953	202	850	1979	10	54
1954	239	588	1980	10	54
1955	170	1309			

Source: Draft Report of the Pacific Sardine Harvest Parameters Workshop, Pacific Fishery Management Council and the Southwest Fisheries Science Center of the National Oceanic and Atmospheric Administration, 2013, Scripps Institution of Oceanography

Link: http://www.pcouncil.org/wp-content/uploads/I1b_ATT1_SARDINE_WKSHP_RPT_APR2013BB.pdf

Module 2: Step 5

The last of the steps! You've made it! Now...

Knowing the history of this fishery and management decisions, would you change anything? Would you remove or add any variables? Change any structural aspect of the management plan? If so, what would you change, why, and what would the new management look like? If not, why are you satisfied with the current management system?

The resources for this section include:

- a. Assessment of the Pacific Sardine Resource in 2015 for USA Management in 2015-16
Link: http://www.pcouncil.org/wp-content/uploads/2015/03/G1a_ExecSumSardine_Assessment_Print_APR2015BB.pdf
- b. Draft Report of the Pacific Sardine Harvest Parameters Workshop
Link: http://www.pcouncil.org/wp-content/uploads/I1b_ATT1_SARDINE_WKSHP_RPT_APR2013BB.pdf
- c. Oceana's "The Modern Day Pacific Sardine Collapse: How to Stop Overfishing and Prevent a Future Crisis" April 8 2015
Link: <http://usa.oceana.org/predators-prey/modern-day-pacific-sardine-collapse-how-stop-overfishing-and-prevent-future-crisis>
- d. Sardine population growing significantly. Monterey Herald. Diane Pleschner-Steele, 2012
Link: <http://www.montereyherald.com/general-news/20120610/diane-pleschner-steele-sardine-population-growing-significantly>
- e. Abraham, K. 2015 Feds vote to close sardine fishery ASAP. Monterey County Weekly. Link: http://www.montereycountyweekly.com/blogs/news_blog/feds-vote-to-close-sardine-fishery-asap/article_e4fcf67e-e460-11e4-8842-af67d385fc88.html
Coastal Pelagic Species Fishery Management Plan and Amendments
Link: <http://www.pcouncil.org/coastal-pelagic-species/fishery-management-plan-and-amendments/>
- f. Sardine Public Comment
 - i. http://www.pcouncil.org/wp-content/uploads/2015/03/B1b_OpenPubComment3_OceanaSardine_APR2015BB.pdf
 - ii. Pages 25-32 found at: ftp://ftp.pcouncil.org/pub/Briefing_Books/ADVANCE_BB_BY_SECTION/September_2014/C_Coastal_Pelagic_Species_Management_Sept2014.pdf
- g. Council Votes to Close 2015-2016 Pacific Sardine Fishery. PFMC.
Link: <http://www.pcouncil.org/2015/04/36387/council-votes-to-close-2015-2016-pacific-sardine-fishery/>
- h. Fimrite, P. 2015. Sardine population collapses, prompting ban on commercial fishing. SF Gate. Link: <http://www.sfgate.com/bayarea/article/Sardine-population-collapses-prompts-ban-on-6197380.php>

Module 2: Assignment

In 10 minutes, address each of the following questions and elaborate on your ideas. There is no right or wrong answer, but be thorough in your reasoning. You will be graded on your level of thought and detail.

1. What surprised you in this activity?
2. What did not surprise you?
3. What did you learn?
4. What did you find confusing?
5. What do you still have questions about?

Module 3

The instructor will assign you to one of the 7 options below. After reading your option, answer the 7 questions provided the next page. Write your answers in large print on the paper/board provided to you. You are welcome to use any or all of the resources below, or find information on your own to answer each question.

While the Market Squid Fishery Management Plan was being created, there was a public comment period, and these 7 options were all proposed. Only one of them was actually implemented, but they were all seriously considered. At the end of the class period, you will have an opportunity to defend your option to the class. Then, the class will be voting on which option they would implement if they were a fishery manager. NOTE: Only consider data through 2005 (since the decision was made in that year). At the end of the class period, the option chosen by the managers will be revealed.

Options for Establishing a Seasonal Catch Limitation

Each option was proposed by one or more stakeholders during the 2005 Market Squid Fishery Management Plan draft period.

- A.1 Statewide seasonal catch limit of 80,000 tons
 - Option A.1: Establish a statewide seasonal catch limitation of 80,000 tons. This seasonal catch limitation is based on the seasonal catch limitation using the 3-year recent average catch from the 1999-2000 to 2001-2002 seasons with the assumption that the stock is below B_{MSY} (average spawning biomass) and above MSST (minimum stock size threshold). This approach uses a multiplier of 0.67. Under this option, a maximum statewide seasonal catch limitation of 80,000 tons would be implemented.
- A.2 Statewide seasonal catch of 118,000 tons
 - Option A.2 (proposed action): Establish a statewide seasonal catch limitation of 118,000 tons. This seasonal catch limitation is based on the recent average catch and the assumption that the stock is above the B_{MSY} . This approach uses a multiplier of 1.0. Under Option A.2, a maximum seasonal catch limitation of 118,000 would be implemented.
- A.3 Regional seasonal catch limit based on multi-year averages
 - Option A.3: Establish regional seasonal catch limitations based on either a multi-year recent average catch for each region with the assumption that the stock is above B_{MSY} . The regions would be north and south of Point Conception.
- A.4 Statewide seasonal catch limit based on environmental conditions
 - Option A.4: Establish a statewide seasonal catch limitation based on environmental conditions as recommended by the SRSC: a seasonal harvest of 115,000 tons in a non-El Niño period and a landings cap of 11,000 tons during an El Niño period.
- A.5 Statewide seasonal catch of 125,000 tons (status quo)
 - Option A.5 (status quo): Establish a statewide seasonal catch limitation of 125,000 tons, a value in close proximity to the highest catch on record.
- A.6 No seasonal catch limitation
 - Option A.6: Do not set a seasonal catch limitation. The SFAC did not support any landings limit. Most fishers and processors opposed the landings limit. There was speculation that the likelihood of repeating a

catch of 125,000 tons in a season is unlikely given the implementation of weekend closures. Landings for the 2001-2002 season were 123,411, which was 98.7 percent of the limit.

- A.7 Establish a seasonal catch limitation of between 24,000 -125,000 tons
 - Option A.7: Establish a seasonal catch limitation of between 24,000 to 125,000 tons (as directed by the Commission, 1 August 2003). The maximum value (125,000 tons) represents the current interim regulation, while the minimum value represents a 6 year average of seasonal landings from the 1997-1998 to 2002-2003 seasons and the assumption that the stock is below the MSST. The primary purpose of this option is to give the Commission greater flexibility in determining a seasonal catch limitation with a level of protection they are comfortable with.

Based on the management option you were assigned and any available resources, answer the following 7 questions. Remember is that this decision was made in 2005, so all information provided is prior to that year.

- 1) Who are the 'winners' of this option?
- 2) Who are the 'losers' of this option?
- 3) What are other indirect benefits of this option?
- 4) What are other associated opportunity costs?
- 5) What are the limitations and assumptions of this option?
- 6) What data exists that can help inform why this option should be voted for?
- 7) What data would be helpful to inform about this option, but does not exist?

Resources (available for your use, but not mandatory):

- PDO Index, source: JISAO, University of Washington
Link: <http://research.jisao.washington.edu/pdo/PDO.latest>
- Pacific Decadal Oscillation Explanation, source: JISAO, University of Washington
Link: <http://research.jisao.washington.edu/pdo/>
- MEI (ENSO) Index, source: ESRL, NOAA
Link: <http://www.esrl.noaa.gov/psd/enso/mei/table.html>
- Earth System Research Laboratory MEI Explanation
Link: <http://www.esrl.noaa.gov/psd/enso/mei/>
- Pomeroy, C., M. Hunter, and M. Los Huertos. (2002) Socio-Economic Profile of the California Wetfish Industry. In California's "Wetfish" Industry: Its Importance Past, Present and Future, D.B. Pleschner, ed. Santa Barbara, CA: California Seafood Council. 46 pp.
Link: https://caseagrants.ucsd.edu/sites/default/files/67570_0.pdf
- Rogers-Bennett, L (2003) Environmental Variability and its impact on invertebrate fisheries. CalCOFI Report Vol. 45, 63-64.
Link: http://calcofi.org/publications/calcofireports/v45/Vol_45_Symposium.pdf
- Sweetnam, D (ed.) (2005) Review of Some California Fisheries for 2004: Coastal Pelagic Finfish, Market Squid, Sea urchin, lobster, spot and ridgeback prawn, groundfish, highly migratory species, ocean salmon, nearshore live-fish, pacific herring, and recreational. CalCOFI Report Vol. 46, 10-31.
Link: http://www.calcofi.org/publications/calcofireports/v46/Vol_46_Fisheries_Review.pdf

- Pomeroy, C., and M. Fitz Simmons. (2001) Socio-Economic Organization of the California Market Squid Fishery: Assessment for Optimal Resource Management. California Sea Grant Project R/MA-39. 10 pp.
Link: http://www.psmfc.org/efin/docs/otherpublications/Pomeroy_&_FitzSimmons_2001.pdf
- Vojkovich, M. (1998). The California Fishery for Market Squid (*Loligo opalescens*). CalCOFI Report Vol 39, 55-60.
Link: http://www.calcofi.org/publications/calcofireports/v39/Vol_39_Vojkovich.pdf
- Sullivan, W. (1988) New Theory on El Nino's Origin. The New York Times.
Link: <http://www.nytimes.com/1988/11/29/science/theory-ties-earthquakes-in-pacific-to-el-nino.html>

Landings of Squid in the Monterey, Santa Cruz, and Moss Landing Ports 1975-2005

Source: CDFW Table18PUB Poundage and Value of Monterey Bay Area Commercial Fishing Data

year	lwt-lbs	year	lwt-lbs	year	lwt-lbs
1974	14495217	1985	8402386	1996	10299872
1975	4994167	1986	12027122	1997	18260453
1976	5021817	1987	12369609	1998	0
1977	4468975	1988	10795340	1999	664099
1978	20255327	1989	15741568	2000	15708698
1979	28346052	1990	17455007	2001	17078248
1980	15712600	1991	14770145	2002	55263371
1981	28268997	1992	13472990	2003	30690273
1982	23357491	1993	13314438	2004	12219049
1983	1097928	1994	29944112	2005	4224691
1984	861720	1995	3841346		

CPUE (Landings/Number of Vessel Trips) Squid Fishery in Monterey and Santa Cruz Counties 1981-2005

Source: PacFIN, sourced from CDFW

year	CPUE (lbs/trips)	year	CPUE (lbs/trips)	year	CPUE (lbs/trips)
1976		1986	11115.72861	1996	23355.71882
1977		1987	15638.03034	1997	27542.16139
1978		1988	13564.98736	1998	
1979		1989	18232.66782	1999	22899.41379
1980		1990		2000	29144.15213
1981	12596.70811	1991	22848.66949	2001	38292.03587
1982	12418.51992	1992	18084.55168	2002	52730.125
1983	5428.70936	1993	18596.1257	2003	32374.02532
1984	5862.040816	1994	23765.03405	2004	25181.15226
1985	8762.350365	1995	20973.4786	2005	18368.22174

Number of Processors in Squid Fishery in Monterey and Santa Cruz Counties 1981-2005

Source: PacFIN, sourced from CDFW

year	# of processors	year	# of processors	year	# of processors
1976		1986	20	1996	8
1977		1987	16	1997	6
1978		1988	16	1998	
1979		1989	16	1999	9
1980		1990		2000	8
1981	20	1991	12	2001	7
1982	23	1992	15	2002	10
1983	12	1993	8	2003	13
1984	14	1994	11	2004	11
1985	22	1995	6	2005	5

Number of Vessels in Squid Fishery in Monterey and Santa Cruz Counties 1981-2005

Source: PacFIN, sourced from CDFW

year	# of vessel identifiers	year	# of vessel identifiers	year	# of vessel identifiers
1976		1986	40	1996	28
1977		1987	33	1997	28
1978		1988	30	1998	
1979		1989	32	1999	12
1980		1990		2000	23
1981	53	1991	29	2001	18
1982	52	1992	37	2002	33
1983	32	1993	33	2003	35
1984	31	1994	32	2004	23
1985	59	1995	28	2005	12

Inflation adjusted market price for Squid Fishery (1974-2005)

Source: CDFW Table18PUB Poundage and Value of Monterey Bay Area Commercial Fishing Data

Year	Inflation adjusted market price	Year	Inflation adjusted market price	Year	Inflation Adjusted market price
1974	0.71	1985	0.59	1996	0.07
1975	1	1986	0.23	1997	0.17
1976	0.53	1987	0.37	1998	
1977	0.39	1988	0.2	1999	0.18
1978	0.82	1989	0.15	2000	0.16
1979	0.58	1990	0.14	2001	0.13
1980	0.71	1991	0.15	2002	0.16
1981	0.41	1992	0.12	2003	0.3
1982	0.51	1993	0.37	2004	0.3
1983	0.56	1994	0.16	2005	0.27
1984	0.36	1995	0.63		

Squid Exported From the State of California 1975-2005

Source: NOAA NMFS, Trade by Specific U.S. Customs District, Trade Type: Exports

<http://www.st.nmfs.noaa.gov/commercial-fisheries/foreign-trade/raw-data/imports-exports-annual>

year	kilos	year	kilos	year	kilos
1975	2938699	1986	5150069	1997	59589845
1976	2814134	1987	5416738	1998	2530080
1977	2038001	1988	9778686	1999	40461880
1978	2545968	1989	14229863	2000	84097797
1979	2098673	1990	11161582	2001	98393470
1980	901784	1991	11869522	2002	65074821
1981	7420685	1992	12743267	2003	19739888
1982	8680066	1993	8755007	2004	28195016
1983	111198	1994	23682017	2005	41718284
1984	122606	1995	37803900		
1985	1843103	1996	50480428		

Inflation adjusted value of California exports for Squid Fishery (1975-2005)

Source: NOAA NMFS, Trade by Specific U.S. Customs District, Trade Type: Exports

<http://www.st.nmfs.noaa.gov/commercial-fisheries/foreign-trade/raw-data/imports-exports-annual>

year	Inflation adjusted squid exports	year	Inflation adjusted squid exports	year	Inflation adjusted squid exports
1975	7793547.56	1986	13172173.69	1997	89606093.59
1976	6642499.37	1987	13228466.14	1998	5373414.1
1977	4806830.11	1988	22539173.94	1999	61470986.2
1978	5669230.01	1989	34989314.61	2000	97140952.31
1979	4737950.54	1990	20998766.39	2001	94900962.16
1980	1822025.48	1991	21095274.26	2002	67264561.45
1981	20492239.11	1992	24869545.73	2003	32500549.93
1982	24780901.16	1993	19174344.98	2004	42990755.19
1983	480748.63	1994	42268249.66	2005	62958466.38
1984	600098.54	1995	58821978.85		
1985	5454399.54	1996	76533454.09		

'Where Did They Go?'

Monterey Bay's Empty Squid Nets

By Tom Weber
and Peter Duorkin
Chronicle Correspondents

Monterey

Just as the once-scorned squid has become a fashionable food, the squiggly creature is in critically short supply.

The shortage threatens the way of life of the older men who sustain one of Monterey Bay's last fishing industries.

Starting in March, the 300 fishermen and mates who live off the squid that were once as thick as the bay's early morning fog will begin putting down their fencible nylon nets for the season, which runs into November.


The owners of the 30 squid boats are crossing their fingers that consecutive years of horrible harvests are past. But no one knows for sure if the squid's near-disappearance in the last two seasons is a temporary casualty of El Niño or a permanent legacy of overfishing.

Like so many things of the sea,

Monterey
Public Library
California Room

SQUID CATCH

MONTEREY BAY



1981	14,000 tons
1982	11,000 tons
1983	10,500 tons
1984	200 tons

the matter is something of a mystery to scientists and fishermen alike.

"Why aren't they spawning, where the hell did they go?" asked John Crivello, a business agent for the Fisherman's Union of America, which represents the hearty men who haul up the funny-looking

cephalopod.

"Three or four years ago squid was available in abundance and there was good money to be made," said the union representative. "The last two years were the worst we've ever had in the history of Monterey Bay."

The second-biggest recorded catch of Monterey Bay squid was landed in 1981 — 14,000 tons. Since then, the annual haul has dropped to 11,600 tons in 1982, 10,500 tons in 1983 and less than 200 tons last year, according to estimates by James Hardwick, a marine biologist with the California Department of Fish and Game.

Hardwick, who is in charge of the department's Monterey and Santa Cruz offices, said there had been earlier cycles of bad catches, and each time the squid came back. Yet the last two years were far worse than ever before.

The boat owners who fish for squid are mainly middle-aged to older Italians. The crew members are often young Vietnamese.

The fishermen cling to the hope that the warming current of El Niño has temporarily driven away the plankton on which squid feed. "If the water gets colder, the squid will come back and spawn," said Crivello.

In fact, said Hardwick, since last summer the water has cooled off and recently the sea level is down to normal, suggesting that the damaging warming trend may be over.

Hardwick also blames the vanishing squid on the currents and poor nutrients in the water. "One good spawning year and we'll have lots of squid," he said optimistically.

But some fishermen believe the squid's spawning grounds right off Cannery Row have been fished out — just as the sardines were decades ago. The nets they use to capture the squid are like giant earthmoving shovels which, they say, often destroy the pods in which the animals lay their eggs.

"It was catch, catch, catch," said Pierre Mercurio, 62, who has been harvesting squid here since 1948.

Richard Parrish, Monterey-based fisheries biologist for the federal National Maritime Fisheries, said this theory could prove correct. "If the squid is like the salmon," he said, "and always comes 'home' to spawn, then the fishery we had



JOHN FAVALORO HAS 'IMPORT SPECIALS' AT LIBERTY FISH CO. "Once we got so much Monterey squid we dumped the heads"

Squid: it's time we took this mollusc 'seriously'

By ANNE PAPINEAU

CALAMARI ARE for eating. Squidding means "goin' fishin'" for those 10-armed cephalopods.

And *Loligo opalescens* (the local squid variety) — well, they may unlock the secret of universal communication.

Small wonder then that the Great Monterey Festival will return to the Monterey Fairgrounds in an expanded format Saturday and Sunday, May 25-26.

A nobler mollusc there never was, and certainly an apt subject for a festival. More apt, perhaps, than the garlic cloves and artichoke hearts feted annually just north of here.

There is more to the squid story than dusting them in onion ring batter and chasing them with a light beer. To know squid only as those often rubbery, pale little meat rings is to do oneself an injustice. Indeed, when we blanket the deceased mollusc in tomato sauce, bread crumbs or cheese, we blind ourselves to its qualities of true greatness, according to connoisseurs.

Asked to rate the intelligence of squid in relation to human beings and dolphins, William Gilly, assistant professor of biology at Hopkins Marine Station in Pacific Grove, said: "I would think they're above either."

The focus of Gilly's research at Hopkins, a facility operated by Stanford University, is the nerve cells of squid: how single nerve cells function, how they transmit and process information.

"I think they communicate with each other more quickly by changing color than we do by talking," Gilly observed. "If we could capture their color-changing mechanism and incorporate it into our skin, if we could find the genes that control that mechanism and incorporate them through genetic engineering techniques."

If, indeed, these possibilities boggle the imagination. Here we have a species that recognizes skin color not as an excuse for exclusion or surface value judgments but as a communication medium.

May 23, 1985 The Carmel Pine Cone / CV Outlook 25



Loligo Opalescens, the local squid variety, garners high intelligence ratings from biologists like William Gilly of Hopkins Marine Station. They're not intelligent enough, however, to escape fishermen's nets,

The marine biologist, who said he has "looked at 10,000 squid informally over the last five years," added:

"Since light travels faster than sound, there is unlimited possibility for communication with other people and over long distances, too. We could probably eliminate the long distance telephone."

TAKING HIS cue from *Loligo*

or even the divers who gathered these squid for display at the Monterey Bay Aquarium on Cannery Row. (Photograph courtesy the Monterey Bay Aquarium.)

opalescens, Gilly declined to interpret the precise messages conveyed by squid coloration. His field is neuro-physiology, not semantics. What the assistant professor will do is describe squid communication as it occurs in the field, so to speak.

"When the squids mate, they wrestle around a lot," Gilly noted. "During this period of wrestling, the male is basically trying to wrestle the female to subdue her and have a successful mating. He has to hold her tentacles and transfer little packets of sperm.

"A lot of other males keep trying to wrestle the female away, so only the biggest male is able to undertake this rapturous union."

"Once the male does get the female oriented in this stereotyped sexual position for the mating and manage to survive the onslaught of all these other frustrated males who don't have a female."

"Once he gets her in exactly the right position, he turns his tentacles a beautiful bright red, crimson. Once he does that, the other males don't try to attack them and break up their little thing. Biologically this is a signal. 'I'm strong enough to have this successful mating. You'll only be disturbing the climax of our efforts here.' What the emotion is I would have to leave to the reader."

Gilly added that the union of squid "is not a five minute affair. They mate in this position for maybe an hour while the female starts laying eggs."

Fortunately for us, it would appear that *Loligo opalescens* has no designs on world domination. With its superior communication methods, the squid population could probably crush the entire cruise ship industry inside of a week.

Clever and communicative as squid are, Gilly pointed out there is one way in which the tentacled creatures are "especially dumb."

While the nets used by local fishermen contain mesh that is, for the most part, "quite enormous in relation to squid size," the molluscs allow themselves to remain trapped within it. They collectively flee to the center of the nets, to be hauled to the tables of Fisherman's Wharf restaurants or Squid Festival food booths.

"The squids' cleverness at escaping things does them in, because they flee the net and cluster in the middle of it," Gilly noted.

So not to worry. For one more Squid Festival, we rule them. Squid are our snacks, our side dishes, our prey. But just imagine, if squid held grudges, we'd probably be fishing for another festival theme right now.

Monterey Bay Facing Squid Shortage

MPH 9/5/73

Now it's a squid shortage. The little 10-armed creatures form the cuttlebone of Monterey's present fishing industry and they apparently have taken a long vacation from the bay.

Jerry Spratt, marine biologist with the state Department of Fish and Game in Monterey, said squid landings by fishermen have been in a decline for the last five months, and John D. Favaloro of Abalonetti's Restaurant on Fishermen's Wharf, which specializes in serving calamari dishes, said he is down to his last thousand pounds.

Favaloro said he obtained his last catch of squid a month ago. Since then, he said, there has been nothing.

"We're known as squid specialists," he said. "Now I can't supply my customers. The few squid I have I want to keep for Abalonetti's."

He said the restaurant, which is operated in conjunction with the Liberty Fish Market, usually had a large, dependable supply of squid, up to 100 tons a day landed by fishermen for freezing at the Monterey Fish Co.

Spratt said his department feels the squid shortage may be due to the Davidson current, which brings warm water from the south to Monterey Bay, and which has been flowing exceptionally strong this year.

Samplings in the bay indi-

cate the squid have spawned during the year, he said, but in small numbers.

"The warm water is the only explanation that sticks its head up right now," he commented, adding that the exceptionally wet winter last year, with its increase in fresh water runoff, may have driven the squid to other areas.

Spratt noted that squid have been reported in larger than normal numbers off Eureka, brought up mixed with other catches of fish, and that fishing off Southern California has been excellent, though the southern fishing usually takes place during winter and spring.

He added that his department receives complaints and queries from fishermen "all the time, every day. They all ask, 'where are the squid?'"

Spratt said that the scarcity is due "to environmental conditions this year — it is definitely not overfishing."

Favaloro said, however, that the Monterey Fish Co. has been attempting to buy squid from Southern California for freezing and has been unable to obtain any.

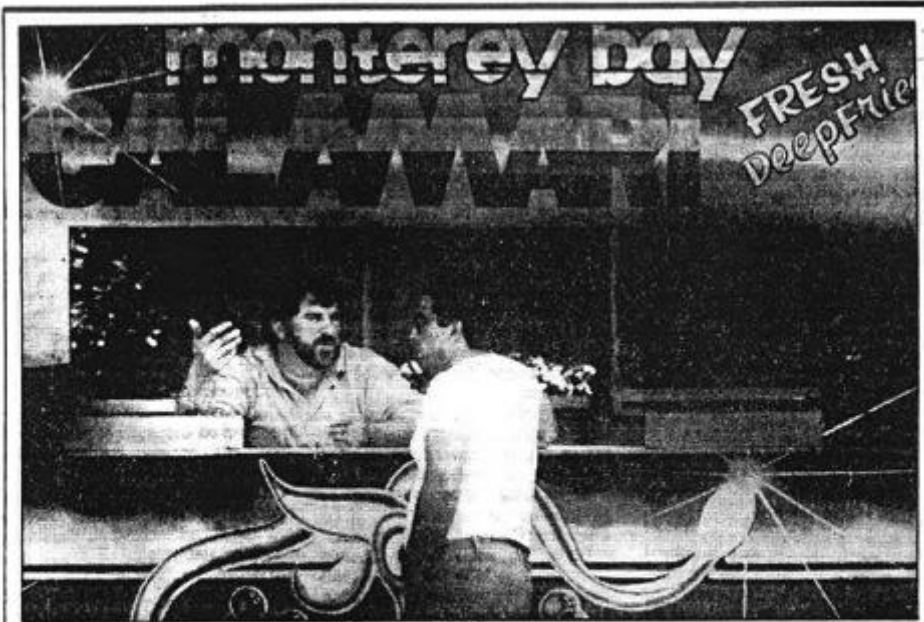
He said two squid boats were working the south coast about 10 days ago with little or no success and that southern fishermen are having difficulty keeping up with the demand.

Stop The Stench !!

Persons wanting odors from reduction plants in New Monterey and Monterey permanently stopped, but who do not wish to harm the fishing and canning industry may join the Monterey Peninsula Health and Welfare League as associate members without dues by signing membership blank in Pacific Grove at Rodgers and Dyke's Pharmacy, and in Monterey at The Hotel San Carlos.

P12

This was the advertisement placed in newspapers in the area by the Monterey Peninsula Health & Welfare League in 1935 soliciting new members.



(Bernard Photo)

Talking Squid

May 22, 1988 p. 5

The Great Monterey Squid Festival — an annual culinary, musical and social event — will be celebrated today and Sunday from 10 a.m. to 7 p.m. at the Monterey Fairgrounds. Among those who will be offering the sea mollusk and other foods are Jerry

Noto and Vince Liguori, pictured here setting up festival booths. Entertainment includes rock bands, jazz ensembles, folk dancers and country groups. Squid will be offered fried, broiled, chowdered, marinated, sauteed, raw, peppered and barbecued.



HARD AT WORK — Crewmen of the fishing boat Sea King of Monterey guide huge net aboard as early morning fog hides the horizon. The 45-foot boat is owned by Santo and John Scardina. It was a sardine boat once, but has been converted to other uses since the sardines left the Monterey area.

BIG LOAD whine as fish ly haul net King. Last bit

The Catch Has Changed —Fishermen Still Fish

By **MAC BOWE**
Mercury Staff Writer

MONTEREY — The sardines that made Monterey a famous fishing port are gone, but fishermen still ease their boats to sea through the pre-dawn fog.

Only occasionally do they come up with a few survivors of the millions of sardines that once caulked Monterey Bay and the sea outside.

Now they search for mackerel or salmon or squid.

Such men are Santo and John Scardina, owners of the 45-foot Sea King. Their boat was built for sardine fishing, but was converted when the sardines mysteriously disappeared from the area in the late 1940s.

One morning this week they went out for squid. They found them, too. Seven tons worth.

And one lone sardine.

"Let 'im live," shouted the crew when the sardine was spotted. "Throw 'im back!"

Santo Scardina gently tossed it back into the sea. Just then a big, winch-operated brail (dip net) dug into the pocket of the Sea

King's net and thousands of squirting squid were hauled aboard.

The catch was the second effort of the Sea King's crew that morning. Seven other squid boats were settling down to regular "sets." Fishermen call each placement of their huge nets a "set."

Earlier the boats had milled around any boat making a "set" like children crowding around a playground fight.

As the Sea King prepared to set its net again, the boat swung past the Tira, just hauling aboard a net occupied only by a few jelly fish.

"Washed his net," said John Scardina, the Sea King's captain.

Santo stared at the fathometer, trying to read it for signs of squid.

"He must have read a scratch on the meter," he said.

Then the captain shouted an order in Sicilian and the crew cast loose the skiff trailing behind the Sea King.

The net, or lampara, rustled over the stern of the fishing boat, following a line tied to the skiff.

The Sea King swung in a 1,200-foot circle and met the skiff again. Santo picked up the lead line and passed it back to a gurdy or rubber lined winch on the stern of the boat.

The winches groaned and the crew started to haul in the net, drawing the circle tight until a n y t h i n g within it was trapped in a pocket.



SNACK — Nino Sacchi takes a bite of squid during a break in the fishing. Squid can be fried or boiled. Fishermen consider it a delicacy.

UNLOAD in a day unload. B dina gu squid fre King to v Squid fis a ton plants ar ners, acc Crewmen shares, d proceeds 3 1/2 shai ceeds ge and net fuel.

Squid Reeled In

State proposes calamari fishery management.

By Andrew Scutro

First squid went from being lowly baitfish to a fancy date dish. The delicacy—long loved locally—is now savored from Seattle to Shanghai to Salerno. Worth \$18 million to fishermen and \$70 million to processors in 2002, it's become the state's most valuable fishery.

Now the once wide-open California squid fishery—a staple of the dwindling Monterey commercial fishing fleet—is about to impose strict rules on itself.

Under a plan introduced to the California Fish & Game Commission at a meeting in Long Beach on Aug. 1, squid fishing will come under state management. But unlike the prospect of most government regulation—which makes fishermen bristle and buck—the proposed squid rules are seen as needed.

If adopted as expected in December, the Market Squid Fishery Management Plan could set an annual catch limit at 118,000 tons or lower. The number represents a three-year average of annual catches dating back to 1999.

California squid fishing was unrestricted until 1997, when a moratorium limited the number of squid permits to 184. Under the current proposal, the number would be pared down to 52.

For Dave Crabbe, a Monterey squid fisherman who favors restricted access and took the cause to the state legislature, whittling the fleet down will protect the viability of the fishery as well as the fishermen.

"There's definitely a historical group of fishermen who would prefer 52 boats," he says.

Crabbe has been a squid fisherman for 20 years and serves as an unofficial spokesman for the local fleet. Usually there are about 15 squid boats working out of Monterey, but with fisheries elsewhere in decline, the Monterey Bay has become more crowded. In recent years, hopeful fishermen arriving from elsewhere meant 40 boats might be chasing squid. That creates bad tension on the water—especially when high demand is pushing the price up to \$500 a ton.

Besides creating cramped conditions, Crabbe says, it forces fishermen to go after measly, possibly immature catches they might otherwise ignore.

Before 2002, Monterey averaged an annual haul of 10,000 tons. But more numerous boats led to a record haul last year of 27,000 tons.

Under the proposed rules, "historic" and permitted fishermen, or those who have been able to prove a certain number of hauls over the years, will be allowed to continue fishing. Those who

can't prove they make a living fishing squid will be culled.

It might get ugly.

"There's a lot of people who are going to be very upset if they get squeezed out," says Kathy Fosmark, co-chair of the Alliance of Communities for Sustainable Fisheries, and owner of a local 56-foot boat equipped for albacore, salmon and swordfish; she has a squid permit but doesn't use it.

Chamois Andersen of the Department of Fish & Game says the new arrangement is fair.

Compounding the anxiety for the fleet is the potential for no-harvest zones or marine-protected areas that might be created under federal rule changes in the Monterey Bay National Marine Sanctuary management plan. Under the state plan, no squid spots in the Monterey Bay would be closed, but some productive areas have been put under increased protection in the Channel Islands off Santa Barbara.

Crabbe, like many commercial fishermen, is worried.

"We're squeezing the number of boats into smaller and smaller fishing areas," he says. "That future from a fisherman's standpoint is nerve-racking." Out of the 15 boats in the Monterey fleet, he says, at least five would sell if they could find buyers.

Although the fishing life may be imperiled, market squid are not considered an endangered resource. They live less than a year and are usually harvested at six months, after they've spawned. When they spawn they lay 3,000 eggs.

Coinciding with the proposed rule implementation is an effort to learn more about squid populations, funded in part by a possible increase in permit fees from \$4,000 a year to \$5,000.

Diane Pleschner, who represents the California Wetfish Producers Association, says the exact status of the squid population is unclear. Both the state and the industry would like to know those numbers.

"Our goal will be to determine a true maximum sustainable yield for squid," Pleschner says.

Unlike fish with longer life spans and better-documented habits, squid remain a dynamic and cyclical resource, Pleschner says.

"Mother Nature pretty much determines what squid do," Pleschner says. "The industry is being pro-active about setting a balance between preserving the resource and sustaining the fishery."

The plan is under public review prior to planned adoption before 2004. The Fish & Game Commission says it will get a hearing in Monterey in the fall. ✦

Area Fishermen File for Relief After El Nino Empties Pockets

MPH Nov. 19, 1984 p. 11

By Ken Schultz
Herald Staff Writer

Just ask Joe Allotti, 37, former owner of a Monterey wharf fish processing firm, what happened when the warm ocean current known as El Nino chased salmon and squid far from Monterey Bay in search of cooler waters.

"We were going good for a few years and El Nino wiped everything out. I went down with the boats," the bearded Allotti said matter-of-factly Sunday at the Moss Landing Harbor District office, where he had gone seeking a low-interest federal disaster loan.

Allotti said his fish company, which employed nine women to clean squid for 10 hours a day when the catch was plentiful, lost \$30,000 in the past two years.

"I'm looking for help, just like anybody else," Allotti said.

So on Sunday he showed up at the harbor office and joined a list of about 230 Central Coast commercial fishermen and others in related businesses who have applied since Thursday for Small Business Administration disaster relief loans because of financial losses attributed to El Nino.

Even so, "There are a lot of people hurting worse than I am," said Allotti, who has resumed fish-

ing with his father, a Monterey commercial fisherman who owns his own boat.

Two SBA officials temporarily set up shop in North County for four days ending Sunday to accept applications after the federal agency last Tuesday declared El Nino a disaster, much like a hurricane or earthquake. The action enables fishermen and others in the fishing industry to receive subsidized federal loans.

Under the disaster relief program, the SBA is offering loans up to \$500,000 at 4 percent interest.

"It's not your normal disaster," said Alice Moeller, a 29-year-old loan officer with the SBA's disaster office in Sacramento.

"It's not like an earthquake that hits and you know it's over."

"Fish Weren't There"

She told of interviews in which fishermen reported catches off 50 percent and more during El Nino.

"The fish just weren't there," she said.

Although some fishermen noticed a dramatic decline in salmon catches beginning in 1978, Miss Moeller said the federal disaster relief extends back only as far as December 1982. Loan applications will be accepted until July 22, 1985.

Assistant Moss Landing Harbor

Master Don Green, 48, said the local salmon fishery has yet to recover from the effects of a severe two-year drought that ended in 1978.

Rivers ran low and "There was no salmon spawned during the drought," Green said.

"No Salmon Again This Year"

"It's never been the same, not in this area," Green said of the commercial salmon fishery.

"There was no salmon again this year," the harbor official said, "but the guys got lucky on albacore tuna. Tuna's where the money's at."

But commercial fishermen from harbors in Moss Landing, Monterey and Santa Cruz have had to venture further out at sea in pursuit of their catch.

"They drive themselves," Green said. "They've made money" this year after a period of financial hardship, "but they've pushed the boat to go places they shouldn't have," he added.

"You have to admire them," senior SBA loan officer Warren Kight-



LOAN OFFICER WARREN KIGHTLINGER EXPLAINS DISASTER AID PROGRAM TO FISHERMAN ... SBA offers economic assistance to victims of El Nino's warm current

linger said of the fishermen he met during the four days away from his Fresno office to interview prospective loan clients. "They're real dedicated."

Search for Lost Boat Continues

WANCHESSE, N.C. (AP) — Seven airplanes flew over 21,000 square miles of sea off the New Jersey and Delaware coasts Sunday, the fifth day of the search for an 86-foot

"The weather today is ideal for searching," Fullerton said, with winds at 15 miles per hour and seas at four to seven feet. The Amazing Grace left Hampton



Module 3: Assignment

In a few pages, answer the following questions regarding the squid quota options activity.

- a. What are your outside-class assumptions and experiences which influenced how you thought about the various options?
- b. What data and information was helpful in making you decide on an option?
- c. Which values did you compare and contrast and did you rank any values higher than others? If so, what was your reasoning?
- d. From this activity, what can you say are some of the largest challenges a fishery manager faces?
- e. Which of Ostrom's variables play a role in this decision? Pick at least 5 variables, describe what they are, and describe what they look like in this system and/or the role they play.
See Ostrom, Elinor. 2009. A general framework for analyzing sustainability of social-ecological systems. Science 325 (419).

Module 3: Post-activity Handout

Responses from the Department of Fish and Wildlife with reasons why Option A.2 was selected from the 6 Market Squid quota options.

- The Commission adopted a seasonal catch limit of 118,000 short tons (Option A.2) but directed the Department to re-evaluate the catch limit in two years because of concerns for the lack of knowledge regarding squid stock abundance. Although there is little information to indicate whether the fishery is or is not sustainable at the higher catch levels experienced since the mid-1990's, as a precautionary measure, it is prudent not to allow landings to expand beyond present levels without better methods to assess the status of the resource. Regional catch limits were not adopted by the Commission for two reasons. First the smaller fishery in the northern region is not preempted by the catch in the southern region so continuing with a statewide limit does not create a "race for fish". The northern fishery typically harvests squid from April through September while the southern fishery does not begin catching squid until October. Second, from a biological perspective, squid harvested in the northern and southern fisheries are identical. No scientific information to date suggests that squid from southern and northern fisheries are from genetically distinct stocks. Their lengths, weights, and sex ratios are similar between regions. Although spawning peaks are at different times of the year for these regions, the temperature and depth of egg deposition is comparable between regions.
- Based on the best scientific information, Option A.2 takes into account the level of fishing effort and ecological factors, including, but not limited to, the species' role in the marine ecosystem and oceanic conditions. (FGC §§7050(b)(5), 7072(b), 8425(a).) The Department supports a harvest policy which assumes that the stock is above BMSY because available data indicate that squid continue to serve as a primary source of forage even at times when the fishery is also utilizing the resource. For example, because squid continue to comprise a substantial portion of the diet of California sea lions during times that the fishery is landing high volumes of squid, there is no evidence to indicate that the squid resource is limited and not fulfilling its role as a forage item even during the heaviest times of fishery utilization. Therefore, it does not appear that any adjustment to the allowable catch level is needed to quantitatively reserve some amount of the resource for use as forage until there is a viable estimate of the squid population size and a viable estimate of the total amount of squid consumed by predators.
- The Department acknowledges that squid are data-poor; however, the stock appears robust enough to withstand high levels of landings because the market squid fishery can support landings of greater than 100,000 tons in multiple seasons (1999-2002). This is likely due to specific reproductive characteristics of squid, for which there is scientific information. The short lifespan of market squid coupled with the existence of multiple cohorts within a year suggests that the spawning biomass undergoes continuous recruitment. Therefore, a default control rule of 1.0, which assumes that the stock is above the average spawning biomass (BMSY), rather than the lower value of 0.67 (Option A.1), which assumes that the stock is above the minimum stock size threshold (MSST) but below BMSY, is most likely

appropriate for this species. However, to give forewarning of any over-harvest, Option A.2 will also be applied in conjunction with monitoring the fishery through the egg escapement method. In addition, the combination of MPAs, weekend closures, and a restricted access program will minimize resource impacts by reducing fishing effort on specific spawning aggregations and in other sensitive locations.

- The Department agrees that it would be ideal to base the catch limit on environmental conditions (i.e., El Niño) to prevent overfishing. However, environmental conditions are near impossible to predict as well as their effects on living marine populations. El Niño Southern Oscillations (ENSO) events are a highly variable phenomenon, lasting from 12-18 months, and the time between events ranges from two to seven years. In addition, the strength of the warming events varies greatly from event to event. Limiting the fishery based on an unpredictable phenomenon would likely have no impact on the resource because the low availability of squid significantly reduces fishing effort.
- Based on the best scientific information or other relevant information that can be obtained without substantially delaying the FMP, the preferred Option A.2 takes into account the level of fishing effort and ecological factors, including, but not limited to, the species' role in the marine ecosystem and oceanic conditions. (FGC §§7050(b)(5), 7072(b), 8425(a).) The Department supports a harvest policy which assumes that the stock is above BMSY because available data indicate that squid continue to serve as a primary source of forage even at times when the fishery is also utilizing the resource. For example, because squid continue to comprise a substantial portion of the diet of California sea lions during times that the fishery is landing high volumes of squid, there is no evidence to indicate that the squid resource is limited and not fulfilling its role as a forage item even during the heaviest times of fishery utilization. Therefore, it does not appear that any adjustment to the allowable catch level is needed to quantitatively reserve some amount of the resource for use as forage until there is a viable estimate of the squid population size and a viable estimate of the total amount of squid consumed by predators. Additionally, regulatory options are available to the Commission for their consideration that would prevent fishing activity in some places where squid are suspected to serve an important forage role.

Module 4

Review the Public Comment to the Market Squid FMP prior to class. Select 3 comments that you find particularly interesting. For example, you might look for seemingly valid or outrageous comments, two comments that seem contradictory, comments that do or do not fit their preconceived notions about the stakeholder that submitted the comment, or comments that otherwise might spark discussion or be important to consider during a decision-making process.

Public Comment Link: <https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=33599&inline=true>

Full Fishery Management Plan Link:

<https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=33570&inline=true>

Consider the following questions to further prepare for the class discussion:

1. Do any of the stakeholders seem more credible than others? Why? Think critically about how your personal background and experiences might influence this opinion.
2. Do you empathize with a group of stakeholders more than the others? Why do you think this is?
3. Do you feel that public comment is an effective way to communicate with policy makers?
4. Does this new form of information (public comments) change your opinion of the wetfish fishery management issue in any way? Why or why not?
5. Can you find common ground among stakeholders? Do you think is a starting point for compromise in a decision-making process?

Module 5

For the next week of class, we will be engaging in a Pacific Fishery Marine Council meeting. You will be assigned one stakeholder, which you will research extensively and later defend at the meeting. Your goal is to convince the Council to vote for your position. Use data, facts, and a professional attitude. The resources provided for you are not mandatory, but may help you as you develop your positions. Feel free to research beyond these resources and to use resources from previous modules to provide the most thorough and supported position possible.

The Council will be voting on several sensitive subjects at the end of the meeting, including:

Item 1

The sardine fishery should be permanently closed within state waters

VOTE Options:

- YES, the sardine fishery should be permanently closed within state waters
- NO, the sardine fishery should not be permanently closed within state waters

Item 2

The sardine fishery should be closed whenever NOAA officially declares an El Nino event, to ensure enough forage fish are available to marine mammals. The sardine fishery shall remain closed until NOAA declares the El Nino event is over.

VOTE Options:

- YES, the sardine fishery will be closed during when NOAA officially declares it has begun to when it officially declares it is over
- NO, the sardine fishery will not be closed according to an El Nino event
- MODIFICATION, proposed modification to the stipulation above, introduced by a stakeholder during the Council meeting

Item 3

The overfished sardine population is one with a 1+ stock biomass on July 1 of 50,000 mt or less, should be changed to somewhere between 500,250 mt and 1,125,000 mt.

VOTE Options:

- YES, overfishing limit should be changed
- NO, overfishing limit should not be changed
- If YES, Council will determine what the new threshold will be

Item 4

The West Coast sardine fishery quota should be divided by regions instead of seasonally allocated. $\frac{1}{2}$ of the quota should be allocated south of Point Conception until the Mexico border, $\frac{1}{4}$ of the quota should be allocated between Point Conception and the Oregon-California border, and $\frac{1}{4}$ should be allocated north of the Oregon-California border until the Canada border.

VOTE Options:

- YES, the sardine fishery reallocated geographically. $\frac{1}{2}$ of the quota should be allocated south of Point Conception until the Mexico border, $\frac{1}{4}$ of the quota should be allocated

between Point Conception and the Oregon-California border, and $\frac{1}{4}$ should be allocated north of the Oregon-California border until the Canada border.

- NO, the sardine fishery quota will not be reallocated geographically, and the seasonal allocation stands
- MODIFICATION, proposed modification to the stipulation above, introduced by a stakeholder during the Council meeting

Item 5 (*if Module 4 was completed*)

The squid fishery is a limited access fishery, thus it is up to the fishery managers to decide who gets to fish when (limited entry). While the original Market Squid Federal Management Plan devised a system of permits, limiting it to 77 was an inappropriate number and does not reflect the true fishery. There should be 300 catcher vessel permits and 50 light boat permits for the Market Squid fishery.

VOTE Options:

- YES, the number of Market Squid catcher vessel permits will be increased to 300, and the number of light boat permits will be increased to 50
- NO, the number of permits will remain at 77
- MODIFICATION, proposed modification to the stipulation above, introduced by a stakeholder during the Council meeting

You will be given 10 minutes to present your information and make a case for why the Council should vote a certain way, or make a certain decision. Once each stakeholder has presenting their case to the Council, you will have 5 minutes to prepare a response (max 5 minutes long) to the first round of presentations. After the first set of rebuttals, you will have another 5 minutes to prepare a concluding response and in 5 minutes maximum, try to convince the Council to vote in your favor. The last set of responses is optional, if your stakeholder group decides to engage or not. Citing legitimate resources will add credibility to your argument and is recommended. Physical products are unnecessary. Be sure to keep your presentations to The Council under the allotted time, for you will be cut off if you exceed the limit. Presentations should be delivered in a professional and succinct manner.

Module 5: Stakeholder Instructions

- A. Commercial Fisherman: Congratulations! You are a commercial fisherman. Your family has been fishing in Monterey for the last 4 generations, and before that, who knows how long they were fishing in Sicily! You normally catch sardine, anchovy, and squid, and you love what you do.
- B. Wetfish Producers Association: Congratulations! You are the president of the Wetfish Producers Association. You are hired by the fishery producers and your job is to represent the buyers and producers in any fishery related matters. You have hired a lawyer, scientist, and media relations personnel to help you in your efforts. You spend a lot of time lobbying on behalf of the producers at the local, state, and federal levels.

- C. NMFS stock assessment scientist: Congratulations! You are a lead investigator for NOAA's National Marine Fisheries Service. As a federal employee, you have a responsibility to this nation, its resources, and its people. Your job is to conduct sardine and anchovy stock assessments. You are on a budget, and your numbers are a critical element to the harvest guidelines.
- D. Oceana: Congratulations! You are a scientist at Oceana. After completing a Bachelors in Marine Biology, you decided the best way to save the ocean is through activism in an NGO. Recently, you noticed stranded birds and sea lions on the beaches. Your boss says it's because the sardine harvest guideline doesn't set enough aside for natural predators. Your job is to be the voice of those who do not have one.
- E. Pew: Congratulations! You are a Senior Associate at The Pew Charitable Trusts. Your job is to protect the environment and the people that use it. You rely on the latest science to develop innovative solutions to today's resource management issues. You are interested in long term benefits of policies, both for the environment and for coastal communities. Your primary job, however, is to create fast tangible results for the Board of Trustees.
- F. University Ecologist: Congratulations! As a PhD in Fisheries Ecology, you are an expert in the Biology and Ecology of fish! You publish about 50 scientific peer review journal articles a year, and conduct both field and laboratory experiments. Your job is to stay bias, be guided by the data, and to communicate your results.
- G. Sea Grant social scientist: Congratulations! You have a PhD in Environmental Anthropology and have spent your life dedicated to understanding the human dimensions of fisheries.
- H. Monterey Bay City Council: Congratulations! You are an employee of the City of Monterey. Your job is to support the community, ensure the local economy stays strong, and that the city retains its culture and identity. You are on a tight budget and you represent a wide variety of citizens.
- I. Monterey Bay National Marine Sanctuaries Office: Congratulations! You are a federal employee working for the NOAA National Marine Sanctuaries. While you do not have any authority over fishery management, you are well connected in the community and can create proposals or suggestions for the Council to take into consideration. Your primary interests are education and outreach, resource protection, and research.
- J. Cannery Row Wharf Restaurant Owner: Congratulations! You are the proud owner of a restaurant on Cannery Row. Thousands of tourists walk by your restaurant every year, and many are looking for local seafood. While many of the fisheries don't produce local seafood, your goal is to keep the fishing industry image part of Monterey, so that tourists continuing expecting local fish!

Module 5: Resources

These are not mandatory reading, but may be helpful for preparing your presentations.

- Pleschner, DB (2015) Another View: Sardine population isn't crashing. The Sacramento Bee
- Link: <http://www.sacbee.com/opinion/op-ed/soapbox/article19165350.html> Abraham, K. (2013) Oceana Takes Small Win, Bigger Loss in Forage Fish Lawsuit. Monterey County Now. Link: http://www.montereycountyweekly.com/blogs/animal_blog/oceana-takes-small-win-bigger-loss-in-forage-fish-lawsuit/article_737dda56-ade6-54ee-b457-4536a44a6933.html
- Court Rules in Favor of Fishing Families and Local Seafood Processors Throughout California (2013) TPG Online Daily
Link: <http://www.tpgonlinedaily.com/court-rules-in-favor-of-fishing-families-and-local-seafood-processors-throughout-california/>
- Pew (2013) The state of the science: Forage fish in the California current. Scientific Report. 20 pp. Link: http://www.pewtrusts.org/~media/legacy/uploadedfiles/peg/publications/other_resource/the20state20of20the20science2020forage20fish20in20the20california20currentpdf.pdf
- City of Monterey Fishing Community Sustainability Plan (2013) Lisa Wise Consulting, INC. 85 pp.
Link: http://www.smharbor.com/harbordistrict/packets/03182015_8a1.pdf

Inflation adjusted market price for Sardine Fishery (1980-2012)

Source: CDFW Table18PUB Poundage and Value of Monterey Bay Area Commercial Fishing Data

Year	Inflation adjusted market price	Year	Inflation adjusted market price	Year	Inflation adjusted market price
1980	0.85	1991	0.07	2002	0.16
1981		1992	0.1	2003	0.11
1982	1.21	1993	0.1	2004	0.11
1983	0.87	1994	0.11	2005	0.14
1984	0.85	1995	0.05	2006	0.15
1985	0.24	1996	0.12	2007	0.06
1986	0.79	1997	0.07	2008	0.13
1987	0.31	1998	0.03	2009	0.08
1988	0.57	1999	0.11	2010	0.22
1989	0.23	2000	0.12	2011	0.26
1990	0.11	2001	0.18	2012	0.1

Amount of Sardine Exported From the State of California 1975-2012

Source: NOAA NMFS, Foreign Trade, Trade Type: Exports

<http://www.st.nmfs.noaa.gov/commercial-fisheries/foreign-trade/raw-data/imports-exports-annual>

Year	Kilos	Year	Kilos	Year	Kilos
1975	33869	1988	237262	2001	36400505
1976	19006	1989	418220	2002	33660854
1977	18448	1990	787235	2003	26905606
1978	10892	1991	1614329	2004	27838174
1979	32101	1992	1180605	2005	31800508
1980	37025	1993	1641024	2006	38543496
1981	23987	1994	1457684	2007	66895868
1982	30834	1995	12534653	2008	51844271
1983	26717	1996	12319097	2009	33909479
1984	7290	1997	10976789	2010	21931746
1985	33478	1998	22396553	2011	19604858
1986	10240	1999	36088862	2012	19510748
1987	14675	2000	42270104		

Value of Sardine Exported From the State of California 1975-2012

Source: NOAA NMFS, Foreign Trade, Trade Type: Exports

<http://www.st.nmfs.noaa.gov/commercial-fisheries/foreign-trade/raw-data/imports-exports-annual>

Year	Inflation adjusted CA exports	Year	Inflation adjusted CA exports	Year	Inflation adjusted CA exports
1975	191486.3	1988	434927.35	2001	23565835.8
1976	122702.45	1989	1063433.71	2002	26609717.36
1977	142391.2	1990	982099.6	2003	18011041.7
1978	165619.52	1991	1603680.44	2004	18044956.73
1979	265962.99	1992	1401020.67	2005	18956646.22
1980	259294.29	1993	2133111.56	2006	25067875.2
1981	135928.1	1994	1892239.53	2007	45487838.72
1982	190894.96	1995	10188758.58	2008	40147558.71
1983	165776.12	1996	9147159.79	2009	27240690.47
1984	53402.52	1997	7825647.24	2010	14611899.78
1985	175618.45	1998	17129687.27	2011	16693814.35
1986	41223.26	1999	24010106.26	2012	15931614.21
1987	52739.84	2000	32231461.58		

Inflation adjusted ex-vessel value for Sardine Fishery (1980-2012)

Source: CDFW Table18PUB Poundage and Value of Monterey Bay Area Commercial Fishing Data

Year	Inflation adjusted ex-vessel value	Year	Inflation adjusted ex-vessel value	Year	Inflation adjusted ex-vessel value
1980	127.52	1991	116290.82	2002	1673444.9
1981		1992	261158.33	2003	846578.9
1982	104.05	1993	14601.68	2004	1475397.93
1983	30.48	1994	172928.46	2005	679571.96
1984	595.56	1995	329171.69	2006	1902759.93
1985	1165.35	1996	150973.95	2007	3593046.15
1986	37015.5	1997	1007166.04	2008	4361356.87
1987	10655.68	1998	514903.54	2009	3804765.46
1988	1509.98	1999	1372899.8	2010	613104.34
1989	70906.13	2000	1314032.23	2011	2070784.01
1990	21512.02	2001	1890873.46	2012	959432.6

Module 5: Assignment (Day 1)

Complete a short written response addressing the following questions:

- a) What data sources, information, and tools do you want/need prior to the hearing?
- b) What do we know about the dynamics of the wetfish fishery S-E System?
- c) What are the knowledge gaps?
- d) What are the factors to consider when reviewing data, sources, and preparing your argument?

Module 5: Student Evaluation Forms

Please fill one of these out per group member. Do not fill one out for yourself.

Your Stakeholder Group: _____

Please rate 1-5 how each member of your stakeholder group contributed to the mock Council meeting preparation and presentation. You may rate each student the same (not a ranking). Your responses are confidential and your group members will not see how you rated them.

1 = Student did not contribute at any level to the group

3 = Student participated somewhat but left a majority of the work to others

5 = Student contributed to the group's work

Group Member Name: _____ Points: _____

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Group Member Name: _____ Points: _____

Module 5: Assignment (Day 2)

Congratulations on defending your position to the Pacific Fisheries Management Council. While the Council may or may not have voted in your favor, your participation in a public hearing plays an important role in how we manage our natural resources.

In a few pages, please respond to each of the following questions:

1. What was your stakeholder, what were their primary interests, what were their positions on the issues being voted upon, and why did they hold this position?
2. Pick one other stakeholder that was present during the Council meeting, and discuss the same points (what were their primary interests, what were their positions on the issues being voted upon, and why did they hold this position?).
3. What are the various scales of this system?
4. How might components of the S-E system interact differently in the future? In a different region? Under a different management system?
5. From your reading and research, is the goal of this management aligned with the value systems of any or all stakeholders that participated? Was this a component of the meeting discussion? If so, how? If not, why do you think that is? Properly cite your sources.
6. Do you think a different decision would have been reached if any of the stakeholders (representing components of the S-E System) were not present?