

**A HISTORY OF THE CALIFORNIA
LIVE-BAIT FISHING INDUSTRY**



by

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**MARINE RESOURCES
TECHNICAL REPORT NO. 27**

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ABSTRACT

Fishing for live bait was originally introduced in 1910 by Japanese albacore fishermen employing "blanket" nets. The northern anchovy has always been the mainstay of the fishery providing 98 to 99% of the catch since 1957. Prior to that the Pacific sardine contributed 15 to 20% of the catch. In past years, when fishermen had difficulty locating fish, Los Angeles - Long Beach Harbor provided as much as 80% of the entire live-bait catch. A live-bait sampling program was initiated in 1955 by the Department of Fish and Game to maintain a closer check on the relative health of the anchovy resource. This sampling program provides the first visible indication of the yearly spawning success of northern anchovies and Pacific sardines. A brief summary of the fishing conditions from 1957 - 1973 are presented.

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ACKNOWLEDGMENTS

The live-bait monitoring program has been a function of the Department of Fish and Game for over 30 years. During this span many Departmental biologists have been responsible for maintaining the essential records and data which the author has used to prepare this manuscript. The meticulous field notes kept by many have been invaluable. To all of these fine biologists, too numerous to name here, the author is gratefully indebted.

INTRODUCTION

The unique California live-bait fishery developed to provide the rapidly expanding sport fishing industry with live fish for use as bait or chum. Fishing for live bait was originally introduced in 1910 by Japanese albacore fishermen employing "blanket" nets. The lampara net, introduced into the fishery in 1912, is presently in use by all live-bait fishermen although several own and have the capability of using a purse seine. Originally, sport boats carried their own nets to capture bait. However, as demand increased, boats necessarily became specialized with their only function being to furnish live bait for the growing number of sport boats and anglers.

THE FISHERY

The live-bait industry is located principally in southern California, but also supports smaller fisheries in Morro Bay and San Francisco. The rapid expansion of bait hauling as a supporting industry to ocean sport fishing caused the California Department of Fish and Game (then Division of Fish and Game, Bureau of Marine Fisheries) in 1938 to institute a system for determining the amount of live bait taken. This information was obtained by personal interviews about every 2 weeks with the captains of the bait boats (Aplin, 1942). This method of gathering data proved to be inaccurate and in the following year log books were issued with daily forms which were to be completed and returned to the Department voluntarily each month. All catches were reported as number of scoops taken, and converted to pounds by a constant factor determined by sampling the weights of scoops periodically. This conversion factor has been 12.5 lbs. per scoop since 1959.

From a prewar annual average of 1,700 tons the live bait landings reached a high of 7,324 tons in 1968 and has averaged 5,660 tons a year since 1950 (Table 1). No figures are available from 1943-45 since wartime security regulations eliminated bait hauling for all practical purposes.

The mainstay of the live-bait fishery has always been anchovies, but prior to the virtual disappearance of the sardine, as much as 15 to 20% of the bait catch consisted of sardines. Since 1957, when the last large influx of young sardines was observed, anchovies have comprised approximately 98% to 99% of the live bait catch. The remainder of the catch is comprised of white croaker, *Genyonemus lineatus*, queenfish, *Seriphus politus*, Pacific sardine, *Sardinops sagax caeruleus*, jack mackerel, *Trachurus symmetricus*, Pacific mackerel, *Scomber japonicus*, Pacific herring, *Clupea pallasii*, squid, *Loligo opalescens*, and Pacific butterfish, *Peprilus simillimus*.

The ever increasing demand for live bait has been met with greater efficiency and replacement of older fishing craft. Sonars, fathometers, and mechanical net pullers are but a few of many innovations introduced into the fishery which have increased efficiency. The small independent bait operator has become nearly extinct as the number of boats reporting their catch to the Department of Fish and Game has gone from a high of 30 boats in 1940 and 1953 to a low of 10 boats in 1969. During the past 5 years the number of boats supplying bait to the partyboat fleet has decreased to an average of 12.

In 1953 when commercial landings of anchovies rose to 42,918 tons, serious concern was expressed by bait operators and sportfishing interests.

TABLE 1. Commercial Landings and Live Bait Catch of Anchovies
in Tons in California 1939-1973

(Live Bait Catch 1943-45 Not Recorded)

Year	Commercial landings	Live Bait	Total	Percent live bait	Number of boats reporting
1939	1,074	1,503	2,577	58.8	
1940	3,159	2,006	5,165	35.8	30
1941	2,052	1,582	3,634	43.5	
1942	847	258	1,105	23.3	9
1943	785	-	-	-	-
1944	1,946	-	-	-	-
1945	808	-	-	-	-
1946	961	2,748	3,709	74.1	-
1947	9,470	2,854	12,324	23.2	-
1948	5,418	3,725	9,143	40.7	25
1949	1,661	2,802	4,463	62.8	23
1950	2,430	3,824	6,263	61.1	25
1951	3,477	5,142	8,619	59.7	22
1952	27,892	6,810	34,702	19.6	24
1953	42,918	6,391	49,300	13.0	30
1954	21,205	6,686	27,891	24.0	23
1955	22,346	6,125	28,471	21.5	22
1956	28,460	6,332	34,792	18.2	18
1957	20,274	4,110	24,384	16.9	17
1958	6,801	4,236	10,037	42.2	24
1959	3,587	4,737	8,324	56.9	16
1960	2,529	4,657	7,186	64.8	13
1961	3,856	5,913	9,769	60.5	16
1962	1,382	6,167	7,549	81.7	22
1963	2,285	4,442	6,727	66.0	23
1964	2,488	5,191	7,679	67.5	22
1965	2,867	6,223	9,090	68.5	24
1966	31,140	6,772	37,912	17.8	18
1967	34,805	5,399	40,204	13.4	16
1968	15,538	7,324	22,862	32.0	19
1969	67,639	5,391	73,030	7.4	10
1970	96,242	6,110	102,352	5.9	11
1971	44,853	6,387	51,240	12.5	11
1972	69,100	5,850	74,950	7.8	12
1973	131,766	5,944	137,710	4.3	12

Their concern centered both on the lack of restrictive measures toward commercial fishing of anchovies and that unlimited demand would cause the anchovy to go the way of the sardine. Commercial landings dipped the following 2 years to 21,205 and 22,346 tons respectively. This decline was due primarily to a lessening market demand created by world-wide competition, and a slight increase in the availability of sardines.

In 1955 the Department of Fish and Game instituted a live-bait sampling program in order to maintain a closer check on the relative health of the anchovy population. Weekly samples were collected from the major sportfishing landings and checked for length, weight, and age. This information has been valuable in determining the relative strength of incoming year classes. In addition to anchovies, a record of the occurrence of young sardines or "firecrackers" is recorded. This is the first visible indication of spawning success of sardines in local waters.

Under continuing pressure from the sportfishing industry and conservation groups for restrictive measures concerning the commercial take of anchovies, the Legislature, in 1955, enacted the following: "During the period from September 1, 1955, to March 31, 1956, the total amount which may be taken or received for canning, including canned pet food, shall not be more than 21,000 tons. During the period from April 1, 1956, to March 31, 1957, the total amount of anchovies which may be taken or received for canning, including canned pet food shall not be more than 35,000 tons."

Legislation also was enacted to protect the young anchovy. The law declares: "No anchovies less than 5 inches in length measured from tip of snout to tip of tail may be purchased for any purpose except for use as bait; provided that the allowable percentage of undersized anchovies which may be contained in any load or lot purchased shall be not more than 25% by weight of all anchovies in said load or lot."

This marked the first time that total annual bag limits had been placed on any marine fish caught commercially in California.

This was just the beginning of a series of conflicts which developed between commercial fishing interests and the California sportfishing industry over the use of anchovies. The bitterness which developed between these factions resulted in a major confrontation in 1967 during anchovy reduction hearings before the California Fish and Game Commission concerning a third reduction fishing season. With the advent on an anchovy reduction fishery, resentment has grown and little can be done to allay fears of overfishing whenever live bait becomes scarce.

The seasonal distribution and behavior of the northern anchovy has a major influence on the live-bait industry. Historically, live-bait dealers have difficulty during June, July, and August in meeting their commitments. California Cooperative Oceanic Fisheries Investigations (CalCOFI) surveys have shown that during these months anchovies appear in large schools during daylight hours at depths of 360 to 600 feet. At night, the schools rise to the surface and disperse to feed; towards daylight they again form into large schools and return to deeper water (Frey 1971). This behavioral pattern, rather than any lack of fish, is often the reason bait haulers find it difficult to obtain enough bait during the summer months.

The behavior pattern of anchovies may be influenced in localized areas or the entire southern California coast by numerous environmental factors including water temperature, food, and light. In past years, when bait shortages occurred during summer months, Los Angeles-Long Beach Harbor usually proved an exception and many live bait fishermen along the coast depended on this traditional fishing area for their bait. In some years the harbor provided as much as 80% of all live bait caught and was the mainstay of the live bait fishery in southern California.

The live-bait fishery, from 1946 until the late 1950's, experienced few problems other than occasional short periods when fishing was difficult in localized areas. These generally arose during the summer months as previously mentioned and were an annual occurrence.

During this era the sportfishing industry and the number of partyboats expanded rapidly (Table 2). Along with the expanding number of partyboats at least 10 new bait boats were launched between 1952 and 1954 to replace older craft.

This growing industry exerted even greater pressure on the live-bait fishermen to meet its ever expanding needs for bait. A brief summary of the fishing conditions for the years 1957 to 1973 will illustrate the success and problems which have faced the live-bait fishermen in meeting these needs.

SUMMARY OF THE LIVE-BAIT SEASONS 1957-1973

1957

In 1957, the live-bait season started in the early part of April. The availability of anchovies was only fair during 1957 and some boats found it very difficult to meet their commitments. During this season, the temperature of ocean waters along the California coast rose and became even higher in 1958 and 1959. With these warmer waters came bonito, barracuda, and yellowtail in numbers never before observed. Demand for bait became high and availability low, which led to increased effort on the part of bait haulers. During this period Los Angeles-Long Beach Harbor was the area of heaviest bait production and fishing effort. Boats from Santa Monica, Newport, San Clemente, and Oceanside also fished in Los Angeles Harbor because they could not locate bait within their own areas. This situation prevailed through July and August and in some cases

TABLE 2. Number of Angler Days, Anglers, and Number of Mobile Boats Reporting.

California Partyboat Fleet 1947-1973

Year	Number angler days	Number anglers	Number boats statewide
1947	359,436	*	343
1948	407,757	*	430
1949	469,915	*	464
1950	544,264	*	596
1951	556,949	*	562
1952	588,087	*	593
1953	502,146	*	599
1954	532,190	*	612
1955	496,286	*	556
1956	523,063	*	515
1957	536,175	*	454
1958	515,152	*	382
1959	557,154	*	396
1960	516,255	637,498	402
1961	495,805	593,916	384
1962	#	595,866	358
1963	#	643,155	377
1964	#	695,373	373
1965	#	688,103	363
1966	#	857,000	407
1967	#	780,102	397
1968	#	849,654	412
1969	#	802,811	406
1970	#	873,327	387
1971	#	728,126	466
1972	#	792,618	387
1973	#	873,428	388

This statistic discontinued in 1962.

* Not available until 1960.

was never really relieved. Some areas used small Pacific mackerel as bait.

Anchovies from the 1955 and 1956 year classes predominated with older fish occurring only in small quantities. "Pinhead" anchovies became very abundant during July and remained until the end of the year.

1958

In 1958 the bait season started as early as March in some areas. This season, with its warm water and continued abundance of game fish, again exerted heavy pressure on live-bait haulers to produce large quantities of bait. Anchovies remained small in size all year, but were available for the most part in sufficient quantities. San Diego, Oceanside, and San Clemente boats had few problems obtaining bait until late March. Los Angeles-Long Beach boats were forced to travel to Newport Beach for their bait during much of May, June, and September. Bait did not appear in Santa Monica Bay until the first part of June when some small anchovies appeared. Very few fish sampled in 1958 were over 2 years old, and "pinhead" fish again appeared in tremendous quantities. Some of the old time bait haulers from Los Angeles remarked they had never seen such a heavy concentration of young fish in any previous year.

During this same period large and plentiful anchovies could be found between Port Hueneme and Morro Bay. Morro Bay had the largest and most abundant anchovy population of any port sampled.

1959

An exceptional season occurred in 1959, Boats experienced difficulty in obtaining bait of good quality with small anchovies dominating the catches. San Clemente and Oceanside boats expended many extra hours of effort in order to fulfill relatively small commitments. San Diego reported an adequate supply of small anchovies and adult sardines, which

were the preferred bait for yellowtail fishing.

The large influx of small fish-of-the-year into the southern California bait-fishery was evidenced by the fish sampled at San Pedro. Of all fish sampled, 86.7% were of age group 0 (Wood and Strachan, 1970). This strong 1959 year class provided a large proportion of the catch in subsequent years. In 1964-65, when these fish were 5 years old, they were still appearing in catches sampled at a majority of ports (Wood and Strachan, 1970).

Morro Bay fishermen reported sufficient quantities of anchovies during the season but these too were relatively small.

The anchovies taken in California by bait haulers from late 1957 through 1959 were small. Water temperatures undoubtedly had a significant influence on the large influx of small anchovies into local waters. Fishermen's observations, stomach analysis of offshore fish, and sample data from Wood and Strachan (1970) indicate that larger anchovies prefer colder waters, and the younger, smaller fish prefer the warmer inshore waters. Stomachs of tuna caught offshore in deep waters during 1959 were found to contain large anchovies (Radovich, 1961). Numerous samples of large anchovies were also collected offshore by the Department of Fish and Game's Sea Survey cruises. Anchovy samples collected from the live-bait fishery both during these years as well as today indicate that fish caught north of Santa Monica Bay, where the waters are cooler, are consistently larger than those caught to the south.

1960

During the 1960 season fishing improved somewhat overall but small fish were still prevalent. In January, sardines were still available in San Diego but anchovies remained scarce as they had been since the

middle of the previous summer. Los Angeles Harbor reported small anchovies and firecracker sardines very abundant for several months. From February through April Santa Monica and Santa Barbara reported good catches with 6 to 8 inch fish appearing in the bay during March. San Diego bait haulers continued fishing off Newport Beach for their anchovies while Los Angeles Harbor bait was averaging 3.6 to 4.6 inches in length. In April fishing became spotty in Santa Monica Bay while larger fish showed in Los Angeles Harbor for the first time. Fishing improved in San Diego during May and the availability of anchovies improved both in Santa Monica Bay and Los Angeles Harbor although the fish were rather small. During the summer fishing was generally good and only for a few short periods did fishermen have difficulties in meeting commitments. Bait fishing remained good for the rest of the season and even through December.

1961

Bait fishing during the 1961 season was very good for the most part in all areas for the entire year. Santa Monica Bay and Los Angeles Harbor experienced some problems with pinheads during the summer months. In addition, Los Angeles-Long Beach bait haulers were forced to fish outside the harbor for a short period during the month of September.

1962

In April, when sportfishing activity increased, bait fishermen had difficulty locating bait in some areas. Los Angeles-Long Beach fishermen were forced to fish 6 to 8 miles outside the breakwater for their bait. Anchovies were also in short supply at Newport and Oceanside. Boats from these areas fished in San Diego Bay where anchovies were both abundant and large. In May, fish moved back into Los Angeles Harbor and remained throughout the summer although "pinheads" plagued the fishermen from early

July through September. In San Diego, for the first time in 4 or 5 years, anchovies remained in the area for the entire summer making bait easily obtainable. Newport Beach and Oceanside, unable to catch bait near their home ports, were forced to fish in San Diego for much of the summer. In the opinion of one veteran skipper from Newport Beach, this was their most difficult season in terms of meeting their commitments within his memory.

1963

During March fishing for live bait was difficult in most areas and fishermen expended considerable time and effort in locating fish. From April through September Los Angeles-Long Beach Harbors had abundant anchovies and provided the largest portion of the live-bait catch. Boats from Newport, San Diego, and Oceanside often were found in Los Angeles Harbor during this period since fish remained scattered in most areas to the south. Los Angeles Harbor accounted for 80% of all live bait taken in July, in southern California. Bait appeared plentiful from Santa Monica Bay to Morro Bay for most of the summer but became somewhat scarce in October. "Pinheads" appeared in Los Angeles Harbor during October and remained through December but since demand for bait was low no major problems were encountered.

1964

Fishing for live bait during the early months of 1964 was much improved over the previous 2 seasons and many bait haulers were able to meet their commitments with few problems.

Anchovies 6 inches and longer in total length were reported off Newport Beach and Los Angeles in January and February. During this same period San Diego and Morro Bay fish were averaging 3.2 and 3.6 inches in length respectively. Small fish of this size may occur frequently

in live-bait catches from San Diego but their occurrence in Morro Bay was unusual.

During the following 2 months anchovies from 4 to 6 inches in total length were reported plentiful in all areas from San Diego to Port Hueneme and fishermen experienced no difficulties in meeting demands.

In the peak summer months of July and August, when demand for live bait is greatest, Oceanside and Newport encountered periods when fish availability was low in their areas. Additional expenditure of effort by fishermen was necessary to meet commitments in Oceanside during July and in Newport during part of August. During the same period bait haulers from Newport were forced to travel to Los Angeles Harbor for a short time in order to fill their needs.

Sportfishing activity dropped off sharply after Labor Day and with it demand for live bait. San Diego remained the only active port during September and bait fishing was poor. In the early part of September they purchased bait from Los Angeles bait haulers and toward months end they were getting bait 12 to 24 miles off San Diego. The remainder of the year saw little activity and no reported difficulties from any of the live-bait haulers.

1965

No major problems occurred during the early months of 1965. Demand was typically low for this time of the year and bait haulers were able to meet the demands of the sportfishing fleet. However, in July when the availability of anchovies decreased, live-bait fishermen from Santa Barbara, Newport Beach, and Oceanside all experienced difficulties in locating bait near their home ports. Live-bait fishing was reported good in San Diego but heavy red tides in Santa Monica, Redondo Beach, and Playa del Rey killed all the live bait being held in receivers. In August

fishing remained poor in Newport and Oceanside and fell off in San Diego where fishing had been good previously. During this period bait haulers from these areas spent numerous days in Los Angeles Harbor in order to meet commitments. As in past years September brought low demand and no significant problems occurred the rest of the year.

An event did occur in November of this year which was to have a significant effect on the lives of all live bait fishermen in particular and all ocean sportfishing interests in general. This was the adoption of regulations governing an experimental anchovy reduction fishery passed by the California Fish and Game Commission at its November 12 meeting.

1966

The live-bait fishery reported 6,740 tons were caught during the year with over 95% being taken in southern California. This was an increase of 600 tons over 1965 and reflected the gradual increase in the use of live bait in California during the previous 5 years.

Analysis of catch and sampling data for the last 10 years compared with the data from 1966 showed no significant changes which could be attributed to the commercial reduction fishery.

During the summer San Diego reported bait was too small at times and made from one to two trips a week to Los Angeles during June and July in order to meet their commitments. Occasionally, some deep water fishing well off shore was also required. Live-bait haulers from San Diego have traveled to Los Angeles Harbor on numerous occasions for bait during the summer months at least 5 out of the last 10 years. In addition to San Diego, bait haulers from Oceanside and Santa Monica fished in Los Angeles during a good part of June and July. In the fall and winter anchovies were reported to be abundant in all areas.

Data from 1957 through 1966 indicate wide variations in size and abundance of anchovies available to live-bait fishermen. Reports of shortages have been made in all months of the year, but are most prevalent during the summer and to a lesser extent, the spring.

1967

The year 1967 was exceptionally good for live-bait fishermen. Anchovies were both large and abundant throughout most of the year in all areas. During March, April, and May fish 6 to 8 inches in total length were abundant between San Diego and Los Angeles. In June 5 to 6 inch fish were still abundant in these areas and fishermen had no problems in meeting their demands.

By mid-July San Diego boats began making several trips to San Pedro Bay for their bait. During the month of August most live-bait fishermen north of San Pedro were interviewed. They stated that the live-bait fishery was in the best condition of the past 15 years and anchovies were very abundant. Bait remained abundant and available for the remainder of the season.

1968

After an exceptionally good season in 1967, the following season of 1968 was to be one of the poorest seasons for the live-bait industry in recent years. The 1967-68 season was equally as poor for the anchovy reduction fishery and Department of Fish and Game survey cruises found fewer anchovy schools in the nearshore waters of southern California than in previous years (Hardwick 1969). In February and March anchovies were unavailable south of Los Angeles and all live-bait haulers could be found fishing in Los Angeles Harbor. Fish were abundant in the Oxnard-Hueneme area and bait haulers there had few problems.

The center of bait fishing remained in Los Angeles Harbor until late in July when bait became difficult to find everywhere except at Port Hueneme. At the time fishermen blamed high water temperatures in excess

of 70° F for the bait shortage within the harbor. During the peak month of August a large influx of "pinheads" moved inside of Los Angeles Harbor and remained until the end of September forcing fishermen to fish outside for their bait. Nevertheless, good fishing returned during this period off La Jolla and Newport Beach, alleviating the pressure of Los Angeles to supply the major portion of the live-bait catch. October saw large fish move in all along the coast and 4 to 6 inch fish were reported in Los Angeles Harbor for the first time since late July. Anchovies remained abundant in most areas until the end of the year.

In order to meet the increasing demand for live bait in times of difficult fishing, bait haulers in San Diego and Newport Beach purchased sonar equipment and installed it on their boats.

1969

Live-bait fishing continued to follow the same general pattern as the previous season. Fishing was sporadic during January and February with the best catches being made 6 to 8 miles off the coast between Newport Beach and La Jolla. Los Angeles bait haulers were fishing off Newport in these early months since anchovies were unavailable in the harbor. Fishing continued to improve steadily and in March Los Angeles based fishermen were obtaining good results fishing off Pt. Fermin. Fishing north of Los Angeles was poor except for Santa Monica Bay and most fishermen were focusing their efforts in the bay where anchovies were abundant.

A unique problem for bait fishermen occurred in April when large schools of anchovies moved inshore off Newport Beach and inside Los Angeles Harbor. Bait haulers reported schools were too large and they were having difficulties locating schools small enough to handle with

their nets.

Los Angeles Harbor, as in many previous seasons, was the area of greatest bait activity during the peak months of June, July, and August. Bait haulers from San Diego, Newport Beach, and Oceanside depended heavily on this area for a substantial amount of their bait. Santa Monica Bay experienced difficulties in July and fishermen from this area could also be found in Los Angeles Harbor meeting their bait demands.

Toward the end of August, fishing improved along the coast, particularly in San Diego, and remained good for the rest of the year. At the same time pinheads appeared inside Los Angeles Harbor and bait haulers from San Pedro were forced to fish outside the breakwater for the remainder of the season.

1970-1972

The following three seasons, from 1970 through 1972, were very similar in their patterns of abundance and availability of anchovies to the live-bait fishery. Live bait was generally abundant at the beginning of the year but became increasingly difficult to locate from March through May. Improvement was reported in June and excellent fishing continued throughout the entire summer and early fall months in almost all areas.

It's noteworthy that during this span San Diego-Oceanside bait haulers were able to meet commitments from local waters and did not have to depend on fish from Los Angeles-Long Beach Harbor as they had in previous years.

This appeared to be the most successful period of good fishing for live bait during the past 15 years.

1973

The 1973 season, from January through September, was difficult for many bait haulers and in many respects was similar to the unique conditions which existed during the poor bait seasons of 1958-59, namely: (1) an exceptional

year class of anchovies which have been evident in all bait catches during the past 4 months, (2) the appearance in tremendous numbers of the pelagic red crab, *Pleuroncodes planipes*, off southern California, (3) the collapse of the annual albacore fishery off southern California as the fish approached the coast farther north than usual and did not come within range of the southern California fleet, (4) the appearance of record numbers of yellowtail resulting in the highest number caught by sportfishermen since 1959-60, (5) the occurrence in southern California waters of some species taken north of their usual range, and (6) the intrusion of warm waters along the southern California coast as water temperatures recorded at Scripps Institution of Oceanography's pier were above normal from May of 1972 until mid-March of 1973.

Although many events closely paralleled those in 1959-60, they occurred on a much smaller scale in 1973. Following the influx of warm water which occurred in the winter months, the southern California coast has had colder than average waters during the summer months.

Bait fishermen began having problems when, from December 1972 until May 1973, anchovies were extremely scarce in the Oxnard-Ventura area. Fishermen stated that this was the longest period of time in their experience that bait was unavailable. However, spawning squid appeared in good numbers and bait haulers used them to alleviate some of the pressures brought about by the lack of anchovies. South of Santa Monica Bay fishermen encountered the customary shortages which occur during winter and early spring. Anchovies were available for the most part between Los Angeles and San Diego but often the fish were wild and difficult to catch. In Los Angeles Harbor, anchovies did not consistently school-up under the light skiffs and bait fishermen were forced to fish outside and as far as

Newport Beach on many occasions. Fishing improved somewhat in May but on many nights, a great deal of running time and effort were required by the bait haulers in order to meet their commitments.

Beginning in June and continuing up to the present time a large influx of "pinhead" anchovies moved both inside Los Angeles Harbor and inshore along most the southern California coast. These presented a major problem to sportfishermen because they are not satisfactory as hook bait and can only be used for chumming. Santa Monica Bay was an exception for most of the summer with larger fish making up a major portion of their catches. San Diego fishermen did not make any trips to San Pedro during the summer but spent many nights 10 to 15 miles offshore in order to obtain bait. However, bait haulers from Newport Beach did fish in Los Angeles on many occasions and as far south as Oceanside during the latter part of the summer.

Late in September, large schools of anchovies again moved inshore along the entire coast with the exception of Los Angeles-Long Beach Harbor. The abundance of quality bait coupled with the traditional decrease in demand by the sportfishing industry following Labor Day, relieved much of the pressure on the bait haulers and enabled them to meet their commitments with little difficulty. The availability of anchovies remained good in all areas for the rest of the year which was in sharp contrast to the difficult winter months of the previous season.

Los Angeles Harbor continued to be plagued by small fish and occasional shortages of bait which forced the fishermen, for the most part, to fish outside the harbor in order to obtain sufficient quantities of anchovies to meet their needs.

The major problem for all live-bait haulers during the early part of 1973 and through the summer was not the unavailability of anchovies but their size and erratic behavior. As in the past, the area north of Los Angeles has again produced consistently larger fish than the area to the south.

In the opinion of most bait haulers this season has produced more pinheads and for a longer period of time than any other season in memory.

The anchovy fishery, from all existing biological data, appears to be in a very healthy condition. Anchovy surveys from 1972 and 1973 by the California Department of Fish and Game indicate a substantially larger population than at any time since the inception of acoustic surveys in 1966. This has been substantiated by reports from commercial fishermen that, at the present time, large quantities of anchovies are available offshore and around the channel islands. This has been born out by the successful landings of anchovies for reduction since the fishery reopened in southern California on September 15th.

The lack of quality bait for sportfishing which occurred the past season can be attributed to the lack of larger anchovies in the traditional bait fishing areas and the large influx of fish-of-the-year which moved inshore along the entire southern California coast. Reasons for the behavior of the anchovies this past season is a matter of supposition at this time, however, it seems reasonable to assume that the warmer waters which occurred during the winter months, followed by a heavy successful spring spawning, had a significant influence on the live-bait fishery.

REFERENCES

- Alpin, J. Alfred. 1942. Bait records. *In* The commercial fish catch of California for the year 1940. Calif. Dep. Fish and Game, Fish Bull. 58:20-23.
- Frey, Herbert W. (Ed.) 1971. California's Living Marine Resources and Their Utilization. State of Calif., Resources Agency, Dep. Fish and Game. 148 p.
- Hardwick, James E. 1969. The 1967-68 anchovy reduction fishery. *In* The northern anchovy (*Engraulis mordax*) and its fishery 1965-1968. Calif. Dep. Fish and Game, Fish Bull. 147:1-102.
- Radovich, John. 1961. Relationships of some marine organisms of the northeast Pacific to water temperature particularly during 1957 through 1959. Calif. Dep. Fish and Game, Fish Bull. 112:1-62.
- Wood, Richard, and Alec R. Strachan. 1970. A description of the northern anchovy live-bait fishery, and the age and length composition of the catch during the seasons 1957-58 through 1964-65. Calif. Fish Game 56(1):49-59.
- Young, Parke H. 1949. Live bait fishery, p. 183-189. *In* The commercial fish catch of California for the year 1947 with a historical review 1916-1947. Calif. Div. Fish and Game, Fish Bull. 74:1-267.