

STATUS OF THE SPINY LOBSTER

by

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HISTORY OF THE FISHERY

Commercial

The records of legal landing of spiny lobster, *Panulirus interruptus* have been maintained by the Department from 1916 to the present (Table 1). Briefly, the annual catches between 1918 and 1943 averaged around 300,000 lbs, with a high of 508,000 lbs in 1927 and a low of 169,000 in 1942. From 1943 to 1950 there was a dramatic increase in landing, peaking at 933,000 lbs in 1950. The average yearly landing during this period was about 610,000 lbs.

From 1951 to 1971 the landings have been steadily decreasing, dropping from a high of 901,000 lbs in 1954 to a low of 224,000 in 1971. The 21 year average is 545,000 lbs while the yearly average for the past 10 years is about 404,000 lbs. It is important to note that all the above figures, while called annual or annual average catches actually represent only 6 months fishing in any one year (Jan.-Mar. and Oct.-Dec.).

Wilson (1949) commented that it was doubtful if the State was getting complete records of the catch over 20 years ago, and so it is today with an unknown but probably sizeable number of lobsters being landed illegally.

The Department lacks good information on the effort expended in the commercial fishery for spiny lobster. It can be generally assumed that there has been an overall increase in effort. The number of permits issued rose from 345 in 1965-66 to 614 in 1968-69, then dropped

to 553 in 1969-70. In 1970-71 a \$100 permit fee was required for the first time, and the number of permits dropped to 185. It has since increased again and 256 have been issued so far in 1972-73.

Spiny lobsters are fished throughout their range in California. The major portion of the population is from Point Conception southward along the coast and at all offshore islands and Cortes Bank. Commercial effort is probably greatest at the offshore islands, although 24% of the 1971 landings were reported from the mainland between Pt. Loma and La Jolla. Nowhere in its southern California range is the spiny lobster completely protected from man's predation. Commercial fishing is prohibited in Santa Monica Bay, on the mainland side of Santa Catalina Island and in Los Angeles and San Diego Harbors. Trapping is generally prohibited within 750 ft of any breakwater. There is also a National Park Service closure to commercial lobster fishing within certain limits of Anacapa and Santa Barbara Islands. However, all these areas are open to sport fishermen. Most small boat harbors in southern California prohibit sport diving within the harbor confines but hoop net fishing is not prohibited.

The major reported catch areas vary from year to year in both commercial and sport landings. In 1960-62 about equal numbers were taken by divers from Catalina and Santa Cruz Islands but in 1963-64 about three times as many were taken at Santa Cruz as at Catalina.

Recreational

Spiny lobsters have long been the object of an important sport fishery, particularly by skin divers. Wilson (1948) states, "Not many lobsters are taken in traps by sport fishermen. The lobster season is open only during the cooler winter months, which somewhat restricts the activities of skin divers, but among those who are active, the spiny lobster is in greatest demand. No record is available of the

amount taken by skin divers, but assuredly the figure is not significant. One observer estimates that 200 skin divers may be seen on a warm Sunday afternoon during the winter months, from Point Conception southward."

The Department has records of only a limited portion of the recreation catch of spiny lobsters. Since 1958 we have records of the reported catches of partyboat divers. These range from a low of 150 (1960) to a high of 6051 (1969) (Table 2).

We have no data whatsoever on the take by divers operating from private boats at any of the southern California islands or the mainland, or by divers operating from the shoreline. We know, however, that they do take lobsters and our wardens frequently cite violators of the laws regarding spiny lobsters. The most frequent violation is for possession of shorts rather than for an overlimit.

Sportfishermen may not now use traps to take spiny lobster but can use a hoop net. A hoop net sportfishery exists in San Diego Bay, an area closed to both commercial trapping and sport diving operations. Similar fisheries could be occurring elsewhere that we are unaware of in southern California.

The Department's data on diving effort comes from the charter boat logs required by law. They list the numbers of divers who participate in these trips. There has been a steady increase from 1958 (the first year records were kept) to the present. In 1960, 1,239 divers used charter boat facilities and by 1970 this number had grown to 23,656. This, however, represents all charter boat diving effort and not for lobster only. As with the recreational catch we have no information on the effort expended by sports divers operating from the shoreline or private boats.

Some indication of the increasing amount of pressure being put on all of southern California marine resources is available in the numbers of divers annually certified by the Los Angeles County Department of Parks and Recreation. In 1960 they trained approximately 5,000 divers. This number had grown to about 8,000 per year by 1965 and 10,000 by 1970. Additional divers are trained by NAUI, PADI, NADS, and various colleges and universities in all southern California coastal counties.

BIOLOGICAL KNOWLEDGE

Range

California spiny lobsters have been recorded from Monterey Bay, California, to Magdalena Bay, Baja California, and in a relatively restricted area at the northern end of the Gulf of California. Point Conception is considered the northern limit of the major portion of the population and only one occurrence has been reported from Monterey Bay. Harvested from Point Conception south into Baja California, lobsters have been recorded from the intertidal zone to depths in excess of 240 ft.

Life History

Migrations--Past studies have shown only haphazard local movements of tagged adult lobsters. However, Department divers in 1965-66 observed a seasonal onshore-offshore movement of adults at San Clemente Island. During the winter months, both male and female lobsters were found offshore in 50 to 100 ft depths (the depth limit of the study) at San Clemente Island. During late March and early April, females began to move into water less than 30 ft deep and by the end of April berried females and juvenile males formed most of the shallow water population. A general inshore movement of adult males began in May. Both male and female lobsters were found offshore again in October.

Verbal, but undocumented, reports from commercial fishermen indicate a similar pattern of movement throughout the California fishing grounds.

Subpopulations

None of the work done on California spiny lobsters indicates the presence of subpopulations. However, tagging studies indicate there may be distinct adult populations at offshore islands. All population mixing appears to occur in the larval stages.

Reproduction

California spiny lobsters generally mate between January and April. The female carries a sperm packet from the time of mating until the eggs are extruded and fertilized, generally in May and June. Eggs take an estimated 10 weeks to hatch, and when the young are released they begin the 12 molts of the phyllosoma larvae which ultimately result in the puerulus stage (the first that truly resembles the adult). The spawning range has not been documented, but is believed to include all areas occupied by the major portion of the population.

Berried females, those with eggs, are generally found in warm, inshore waters less than 30 ft deep. Fifty percent of the females with a carapace (body shell) length of ^{66 mm} 2.6 inches and 90% of those with a carapace length of ^{68.5 mm} 2.7 inches are sexually mature. The smallest berried female of which we have a record had a carapace length of 2.5 inches and was 6 years old.

Females collected at San Clemente Island carried between 120,000 (2.6 inches carapace length) and 680,000 (3.6 inches carapace length) eggs. A female with a carapace length of 6.2 inches has been reported to carry up to 800,000 eggs.

Food Habits

Adult spiny lobsters have a variety of food organisms in their diet which includes snails, sea urchins, sponges, hydroids, rock scallops, coralline algae, annelids, mussels, crabs, barnacles, and fish. Little is known concerning larvae or post larvae food habits.

Size, Age and Growth

Growth--Spiny lobsters grow by shedding their entire exo-skeleton and undergoing a brief period of rapid growth. The actual shedding is preceded by formation of a new, soft, calcium deficient shell underneath the old shell; an uptake of water expands the new shell before it hardens. Subsequent feeding replaces the water with solid tissue.

An annual growth rate of 0.15 inch carapace length has been reported for male spiny lobsters in the range of 2.01 to 3.46 inches carapace length. For females the annual increase was 0.19 inches carapace length, in the range of 2.20 to 3.58 inches carapace length. Both males and females in this size range molt once a year, immediately after completing the reproductive cycle.

No information is available on natural molting or growth rates for California spiny lobsters smaller than 2.01 inches carapace length; however, it may be assumed to be similar to that recorded for the Japanese spiny lobster, *Panulirus japonicus*. With this species it appears that 20 molts bring a specimen with carapace 0.24 inch long to a stage with a carapace 1.18 inches length. The latter is considered 1 year old. Four molts occur the second year and the animal has a carapace length of almost 2 inches, and during the third year the lobster molts three times.

Animals larger than 3.46 inches in carapace length are presumed to molt no less often than annually. The encrusting growth on their

shells imply a longer period probably exists between molts.

Data collected at San Clemente Island in 1965-66 indicate the time required for a California spiny lobster to reach the legal size of 3.25 inches carapace length is approximately 10 years for females and 11 for males.

Natural Mortality--No data are available on natural mortality. There is no direct means of age determination for spiny lobsters but the latest figures in the literature indicate that males grow at a rate of 3.7 mm carapace length per year and females at the faster rate of 4.4 mm carapace length per year (Mitchell et al, 1969).

DISCUSSION

The Department's current concern with the spiny lobster stems primarily from the steadily decreasing commercial landings over the last 20 years, as well as reports by sport divers of decreased abundance. Concurrent with the decreased reported landings, there has been an increased market and sport demand for lobsters resulting in a sizeable, but unquantifiable, illicit fishery for undersized lobsters and lobsters out of season. It has been estimated by some that the unreported annual take (both legal and illegal) may well equal or exceed the reported take.

It is evident that the most pressing initial need is for reliable catch and effort data by area for both the commercial and sport fishery.

The sport take and effort from party boats is reported through a log book system but we have no data on catch and effort from private boats and from the shore. This must be determined for an accurate assessment of the total fishery.

Much is known of the basic biology of lobster, but population dynamics data is lacking, especially as they apply to the existence of

separate insular adult subpopulations. We must first determine whether or not separate adult populations occur, then ascertain what differences exist, if any, in growth rates, sexual maturity, fecundity and sex ratios. These differences directly effect the design of a proposed management scheme.

Lobster studies should also examine the adequacy of present gear regulations, particularly relating to trap mesh size to provide adequate escapement of sub-legal lobsters.

A research program is needed that will; 1) accurately assess the total magnitude of the fishery; 2) identify population units and the dynamics of each; and 3) investigate the adequacy of existing gear regulations.

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TABLE 1. Yearly California landings of spiny lobsters 1916-1971

Year	Spiny lobster
1916	250,632
1917	355,259
1918	195,750
1919	256,894
1920	247,156
1921	334,271
1922	376,310
1923	384,381
1924	294,356
1925	432,059
1926	442,198
1927	508,123
1928	355,800
1929	396,764
1930	374,450
1931	383,697
1932	319,307
1933	380,014
1934	366,651
1935	371,661
1936	414,183
1937	393,242
1938	308,378
1939	376,928
1940	281,102
1941	357,334
1942	168,641
1943	298,377
1944	512,490
1945	478,619
1946	690,272
1947	593,401
1948	563,520
1949	834,658
1950	933,449
1951	824,611
1952	807,070
1953	749,245
1954	901,293
1955	855,416
1956	735,869
1957	647,281
1958	632,618
1959	503,947
1960	351,032
1961	412,453
1962	515,816
1963	584,192
1964	446,655
1965	480,325
1966	489,088
1967	449,874
1968	312,483
1969	309,472
1970	225,399
1971	224,486

TABLE 2. Numbers of charter boat divers and lobsters taken in southern California waters 1958-1970.

Year	Number of divers	Number of spiny lobsters
1958 & 59	1,725	512
1960	1,239	150
1961	2,604	628
1962	5,050	1,446
1963	5,063	998
1964	5,537	2,115
1965	7,478	4,092
1966	9,362	3,548
1967	10,571	4,393
1968	14,934	4,671
1969	17,836	6,051
1970	23,656	5,933