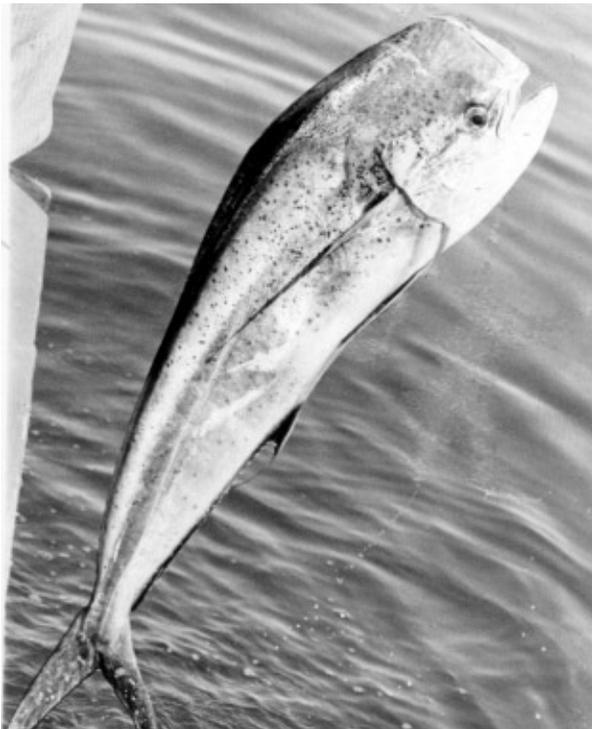


Dolphin

History of the Fishery

The dolphin (*Coryphaena hippurus*), also known as mahi mahi, or more commonly in California, as dorado, occurs in the California recreational catch primarily during warm water years. Most catches occur in the Southern California Bight, especially south of Los Angeles. Before 1972, the annual California commercial passenger fishing vessel (CPFV) catches during the July through October fishing season seldom exceeded a few hundred fish. Thereafter over 1,000 were taken in 23 of the next 25 seasons. A major shift occurred in 1990 when the catch exceeded 31,000 fish, and averaged 15,602 fish per year between 1990 and 1997 (range: 1,000 to 31,548).

In commercial fisheries, an estimated average of 1,084 dolphin have been landed and 324 released per year by the high seas longline fishery landing in California during the period August 1, 1995, through December 31, 1999. It is occasionally taken by albacore bait and troll boats and tuna purse seine vessels. It is rare in the drift gillnet catch, possibly because its surface-swimming habits take it above the reach of the top of these nets. Judging from the length of net extenders deployed, observed sets have averaged about 35 feet below the surface over the past decade. During the summer of 1996, when over 21,000 dorado were taken by the CPFV fleet, the $>68^{\circ}$ F layer was observed to be less than 33 feet deep, indicating a very shallow suitable habitat zone for dolphin. This



Dolphin, *Coryphaena hippurus*
Credit: NMFS

is also a species that commonly associates with surface floating objects, and thus may have evolved avoidance capabilities that prevent it from becoming entangled in drifting materials.

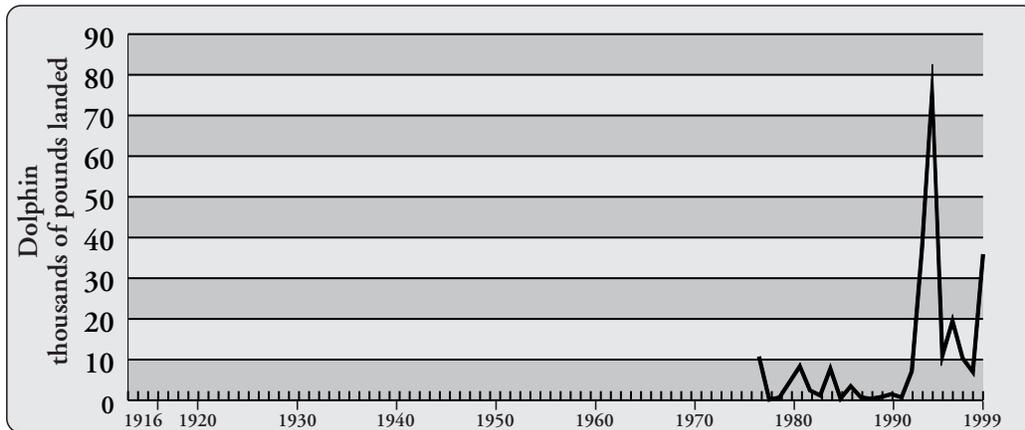
Status of Biological Knowledge

Growth in dolphin is extremely rapid. Fish reach maturity in less than a year (at about 14 inches or seven months old) and only rarely live beyond three to four years. Actual growth rates vary among regions and are sensitive to prevailing water temperatures. In captivity, dolphin grow about 0.05 inches per day at 64° F, 0.13 inches per day at 77° F, and 0.23 inches per day at 84° F. Length/age data from fish taken in the wild show dolphin have an average growth of about a 0.09 inches per day. In the western Pacific, dolphin reach a length of 15 inches the first year, 27 inches the second year, 35 inches the third year, and 43 inches the fourth year.

Larval dolphin feed mainly on crustaceans, particularly pontellid copepods, with fish larvae appearing in the diet of young juveniles greater than eight inches. Adult dolphin are mainly piscivorous, with flying fish being the most important in volume and occurrence. Jacks, mackerels, rabbitfishes, squids and portunid crabs are also taken in various parts of their range. Adults can swim faster than 33 feet per second, and can feed at low light levels. All life stages of dolphin serve as prey for other oceanic fishes, particularly marlin, epipelagic sharks, swordfish, sailfish, and other dolphin.

There is little information about Pacific Ocean migrations, but dolphin are thought to migrate relatively long distances in the western Atlantic and Mediterranean. In the eastern Pacific, temperature seems to be an important factor in defining the range and possibly the movements of this species, the northern barrier being the California Current, and in the south, the Peru Current. Various authors report seasonal patterns in catches, possibly relating to spawning migrations or seasonal intrusion of preferred warm water temperatures. Norton noted the dramatic increase in recreational catches of dolphin off southern California and northern Mexico over the past 30 years (especially during the last decade). He suggested that the habitat of dolphin has been expanding northward in response to an oceanic and atmospheric regime shift that has brought periods of warmer water and enhanced northward current flow to California. It has also brought less cold water upwelling off northern Mexico, which had formerly inhibited northward dispersal.

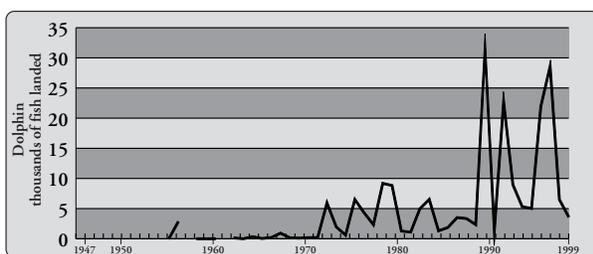
Dolphin are oviparous with pelagic eggs and larvae; fertilization is external. Spawning is thought to occur year round in waters above 75° F, although there may be



Commercial Landings 1916-1999, Dolphin
 Data Source: DFG Catch Bulletins and commercial landing receipts. No commercial landings are reported for dolphin prior to 1977.

reproductive peaks with eggs released in batches within a given reproductive pulse. Fecundity increases sharply with size, and assuming three spawns a year, estimated total egg production varies from about 240,000 to almost 3 million eggs per year for fish. Certain times of the year may be more conducive to larval survival, e.g., in Hawaii the strongest cohorts are spawned in July. Spawning of the California-Mexico dolphin population evidently takes place in waters south of the U.S. West Coast EEZ. In CalCOFI larval fish surveys, larvae have been collected off central and southern Baja California, Mexico, and only occasionally in warm water years, off southern California, with peak abundance in August and September. Age at female maturity is 0.6 years with maximum reproductive age at four.

Little is known of stock structure in the Pacific. Because of the dolphin's brief life-cycle and seasonal catch patterns, it seems unlikely that the U.S.-Mexico stock is shared with Hawaii or fishing nations in the central and western Pacific, however, stock mixing cannot be ruled out. The relationship of the Mexico stock to stocks occurring further south along the Pacific coast of Central and South American is not known. Because seasonal migrations in the North Pacific show a reverse tendency to that in the Southern Hemisphere, there may be at least two stocks in the Pacific Ocean separated by the equator.



Recreational Catch 1947-1999, Dolphin
 Data Source: DFG, commercial passenger fishing vessel logbooks.

Status of the Population

The status of the population is unknown. Since California is on the northern range of dolphin, our fisheries may be subject to a great deal of variation due to changes in oceanographic patterns and even moderate variations in stock size.

Management Considerations

See the Management Considerations Appendix A for further information.

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