

Coastal Pelagic Species: Overview

Coastal pelagic resources are small to medium sized, schooling species, that migrate in coastal waters often near the ocean surface. California's major coastal pelagic species include Pacific sardine (*Sardinops sagax*), Pacific mackerel (*Scomber japonicus*), jack mackerel (*Trachurus symmetricus*), northern anchovy (*Engraulis mordax*), and market squid (*Loligo opalescens*). Coastal pelagic species (CPS) collectively comprise one of the largest marine fisheries in California with respect to biomass, landed volume, and revenue. Historically, commercial utilization of each species in this group has, for varying periods of time, been primarily canning for human consumption. Much of the CPS catch is now frozen for bait or export, but some is still canned for human consumption.

One characteristic common to coastal pelagic species is the highly dynamic nature of their populations with respect to movement, biomass, and availability to the fishery. "Boom or bust" population cycles of coastal pelagic stocks have been attributed to a number of key factors, including relatively short life-cycles, variable recruitment, and annual and longer-cycle variation in optimal habitats for spawning, larval survival, recruitment, and feeding. Large natural fluctuations in coastal pelagic species abundance have been accentuated in the past by human influence, as exemplified by the Pacific sardine during the 1940s and 1950s. Although there are many similarities in the life histories of these fish species, there also are differences. They are all open-ocean, relatively near-shore, schooling fish for most of their life-cycles, but jack mackerel occur as far as 600 miles offshore, and sardine spawn as far as 300 miles offshore. Each fish species matures at a relatively young age of one to three years; and while jack mackerel live to be 35 years old, relatively few individuals of the other species attain half this age. Market squid live up to only 10 months and are an average of only six months old when captured during spawning activities. The eggs and larvae of all the species are common in coastal areas, but beyond 200 miles offshore only jack mackerel eggs and larvae are commonly encountered in scientific collections. Anchovy, Pacific mackerel, and sardine are known to migrate seasonally along the coast. Jack mackerel migrate away from nearshore banks and islands at a relatively young age (four to six years) and, while they range from at least off Baja California, Mexico to the Gulf of Alaska, little is known about their migratory habits as older adults. Estimates of biomass date back to the 1930s for sardines and Pacific mackerel, and to the late-1940s for anchovy. While there are no time series estimates of jack mackerel biomass, age and length composition data are available since the

late 1940s. Biomass estimates for market squid are difficult, if not impossible, to obtain using normal assessment methods, and future management of the squid resource will likely depend upon real-time estimates of spawning escapement.

CPS management has varied widely and prior to the 1970s, management was minimal. When sardine and Pacific mackerel biomasses were declining (in the mid-1960s), the commercial fishing industry proposed an anchovy reduction fishery. By the late 1960s, this reduction fishery was authorized by the California Fish and Game Commission, complete with quota, season, area, and size restrictions. Legislation followed in the early 1970s that established moratoria on the commercial take of Pacific mackerel and sardines. The resurgence of Pacific mackerel, and the transition to federal management (Pacific Fishery Management Council) for anchovy in 1978, were accompanied by strict management regimes that included requirements for annual quotas and assessments of anchovy biomass.

Pacific sardine showed early signs of an abundance resurgence in the early 1980s, and by the mid-1980s the State of California managed this species as required by Fish and Game Code with biomass assessments and annual quotas. In 1998, the sardine population was declared fully recovered, with fish once again extending from British Columbia to the Gulf of California, Mexico. With the coast-wide sardine expansion, the State of California recognized that it no longer had sufficient resources to effectively manage the sardine resource alone and petitioned the Pacific Fishery Management Council to consider federal management of CPS. In 1998, the Council approved Amendment 8 to the Northern Anchovy Fishery Management Plan, to place Pacific sardine, Pacific mackerel, jack mackerel, and market squid in the management unit with northern anchovy. Amendment 8 was approved by the Secretary of Commerce and modified the anchovy plan to conform to the recently revised Magnuson-Stevens Fishery Conservation and Management Act and changed the name to the Coastal Pelagic Species Fishery Management Plan. Implemented in January 2000, Amendment 8 requires a limited entry permit to commercially harvest coastal pelagic finfish species south of Point Arena, California, with open fishing access north of this latitude. Species managed under authority of the plan are divided into two categories, actively managed (initially Pacific sardine and Pacific mackerel) and monitored (initially northern anchovy, jack mackerel, and squid). Actively managed species require annual determination of harvest limits based on current biomass estimates. Harvest strategies for actively managed species account for all west-coast CPS catches including Mexico, natural variability in the stocks, and the importance of CPS as forage for other fish, marine mammals, and birds. Monitored species are

not subject to mandated harvest limits based on current biomass estimates, although other management measures such as area closures may be employed. The State of California is developing its own management plan for market squid, and has already implemented interim measures which prohibit fishing on weekends, restrict the design and intensity of lights used as attracting devices, and place a three-year moratorium on new vessels entering the fishery.

The outlook for CPS and their fisheries will depend upon the forces of nature, economics, and the combined wisdom of resource users and managers. Environmental factors have inherent cycles that can affect each resource in short and long time scales. Fishery scientists are just beginning to understand the mechanisms that determine success or failure of coastal pelagic populations. Hopefully, resource managers will continue to use the growing knowledge base of how these species respond to the environment, implementing harvest policies accounting for this uncertainty. Future utilization of the west coast CPS will depend not only on resource health and availability, but also upon basic economics and events in world export markets. The anchovy fishery's largest historical commercial utilizations were the reduction fisheries in California and Baja California. These fisheries have ceased to exist, primarily for economic reasons, and yet anchovy abundance remains high enough to allow continued use as live bait for the recreational fishing industry and as a fresh-frozen product for human consumption. Pacific mackerel catches sustained the southern California purse seine fleet throughout the 1980s, with record average landings; however, recent biomass assessments indicate that the large population increase documented in the late 1970s has not been followed by further highly successful recruitment pulses. The decline in availability to the fishery of Pacific and jack mackerel through the 1980s lead to rapid expansion of the market squid and sardine fisheries in southern California during the 1990s. Fish processors freeze significant portions of the squid and sardine catch for export to Europe, Asia, and Australia where it is utilized for human consumption, bait, or aquaculture feed.

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