

9. GOPHER ROCKFISH



Gopher rockfish, *Sebastes carnatus*. Photo credit: Todd Phillips

Review of the Fishery

The gopher rockfish is an important species in the nearshore rockfish group. However, it has been a minor component of the commercial and recreational rockfish fishery since at least the late 1960s. Gopher rockfish make up about 50 percent of the estimated take of the shallow nearshore rockfishes and 6 percent of all nearshore rockfish species combined.

Recreationally, gopher rockfish have not been considered a primary target of anglers, due to their small size. Nevertheless, they comprise a fair percentage of the recreational catch in California and have been landed in the following fishing modes: private/rental boats, commercial passenger fishing vessels (CPFVs), and shore-based (man-made structures, and beaches/banks). Based on all *Sebastes* species from 2004-2006, gopher rockfish comprise 9.3 percent of private/rental boat catch, 8.7 percent man-made catch, 4.7 percent CPFV catch, and 0.9 percent beach/bank catch (CRFS data, 2004-2006). Beaches and banks tend to be too shallow for gopher rockfish, thereby minimizing catch for this mode. Gophers comprise a very small percentage of recreational take by divers due to their small size and relatively cryptic nature. In 2001, according to CPFV logbook data, catches of gopher rockfish were 35,400 fish (Figure 9.1); prior to 2001, gopher rockfish were not reported separately in CPFV logbooks. From 2001-2006, CPFV logbook data show that landings of gopher rockfish ranged between 28,400 and 40,400 fish (Figure 9.1).

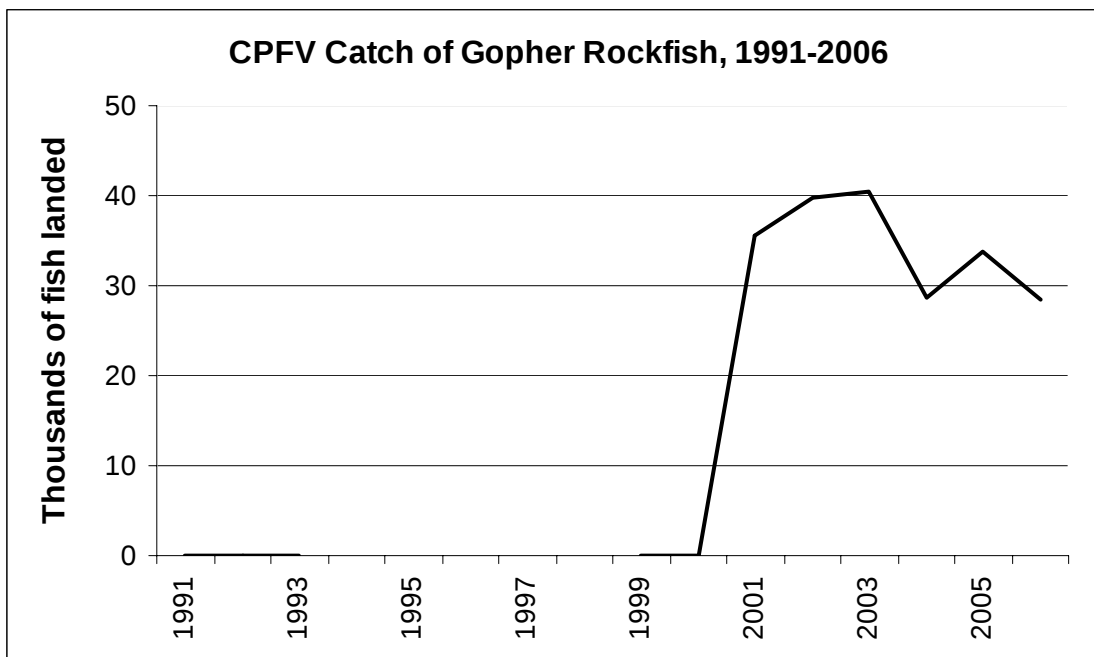


Figure 9.1. Commercial Passenger Fishing Vessel (CPFV) logbook catch of gopher rockfish from 1991 through 2006. Data Source: CDFG commercial landing receipts and CPFV logbook data. Data not available for 1994 through 1998.

A review of the Marine Recreational Fishery Statistical Survey (MRFSS) and the California Recreational Fisheries Survey (CRFS) data show landings of gopher rockfish peaked in 1986 with nearly 500,000 fish landed. Because of deliberate management action, the recreational harvest limit for gopher rockfish was reduced by 50 percent in 2000, and this is evident in the data (see Management Considerations, below). Gopher rockfish landings have declined by 35 percent since 1989 (Figures 9.2 and 9.3).

Historically, commercial landings of gophers have been recorded specifically as “gopher rockfish” and non-specifically as “gopher group”, where the group market category contains multiple species. The latter category was introduced in the early 1980s. Prior to this time, gopher rockfish landings were minimal because of difficulty with monitoring the catch of all market categories, and improper monitoring specifically for gopher rockfish. The “gopher group” market category is mainly composed of gopher and black-and-yellow rockfishes, *Sebastes chrysomelas*, since distinguishing between these two species can be problematic. Presently, catch is required to be sorted to species, so use of the “gopher group” market category has been very limited since 2002.

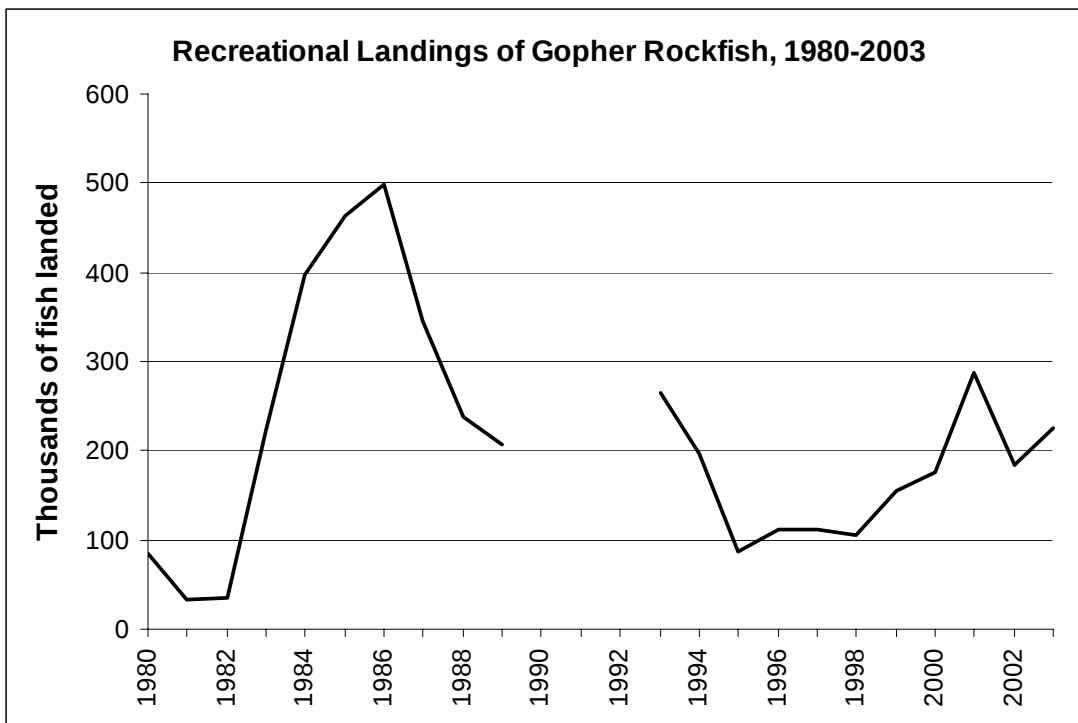


Figure 9.2. Recreational catch (in numbers of fish) of gopher rockfish from 1980 through 2003. Data Source: MRFSS data for all fishing modes and gear types; 1993 through 1995 data does not include CPFV mode. Data not available for 1990 through 1992.

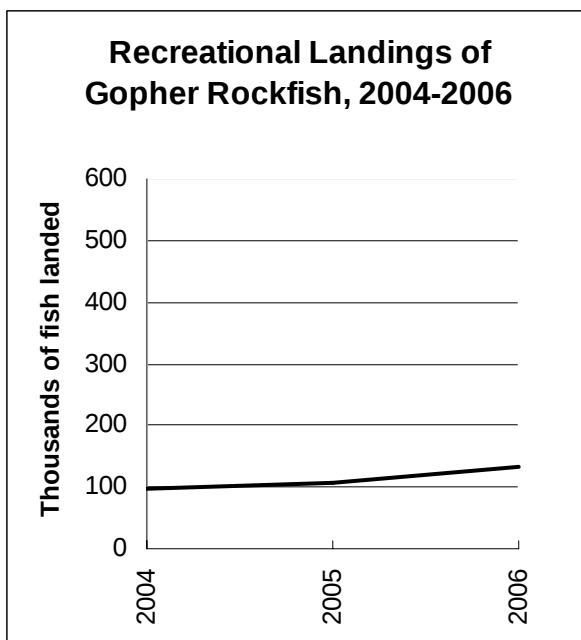


Figure 9.3. Recreational catch (in numbers of fish) of gopher rockfish. Data Source: CRFS data for all fishing modes and gear types.

According to Department of Fish and Game's commercial landing receipt database, combined commercial landings of "gopher" and "gopher group" market categories exceeded 150,000 pounds (68 metric tons) in most years between 1988 and 1998, and peaked at 233,400 pounds (106 metric tons) in 1996, remaining high for the following two years. More recently, landings declined considerably to 37,800 pounds (17 metric tons) in 2004, 43,400 pounds (20 metric tons) in 2005, and 38,600 pounds (17 metric tons) in 2006. Low commercial landings in 2003-2006 are due in part to more restrictive management actions taken to keep catches under lower harvest targets (Figure 9.4; see Management Considerations)

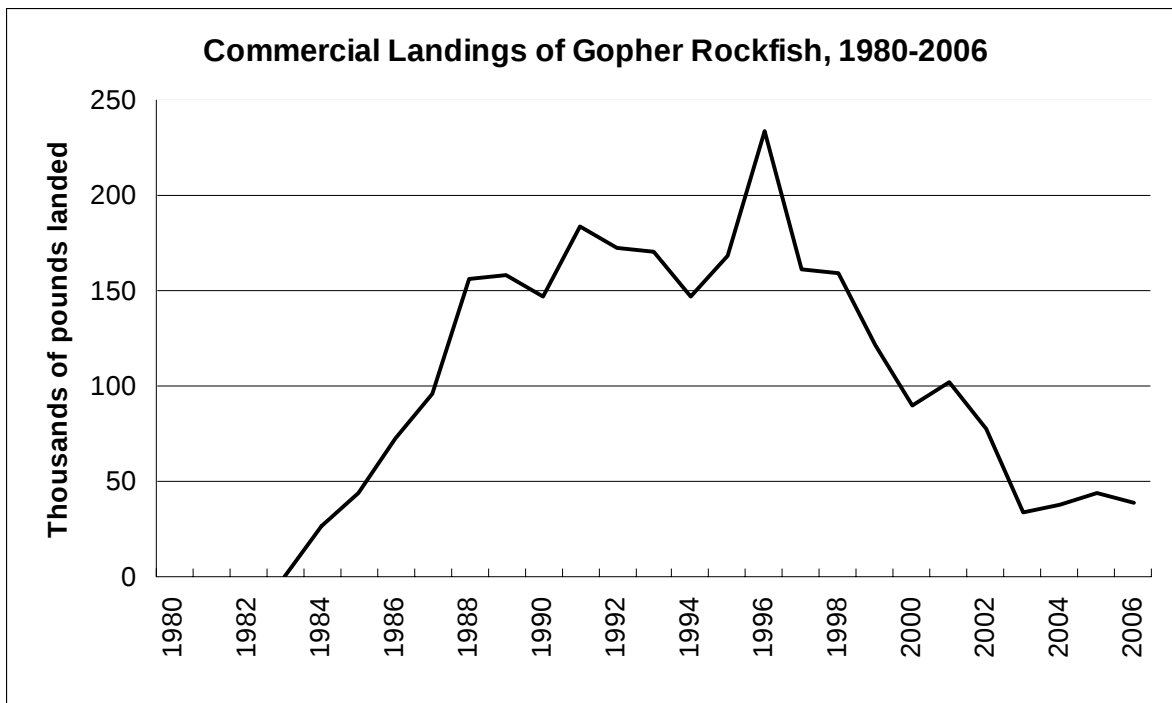


Figure 9.4. Commercial catch in pounds of combined gopher rockfish and gopher group market categories from 1980 through 2006. Data Source: CDFG commercial landing receipts for all gear types. Data not available prior to 1983.

Gopher rockfish are commonly targeted commercially with hook-and-line and trap gear, although they can be incidentally taken by trawl and gillnet. Development of the live/premium fishery in the late 1980s resulted in an increase in commercial landings of gopher rockfish. Live gopher rockfish are primarily caught by hook-and-line and are more valuable compared to dead fish. The average price per pound of live gopher rockfish in 1996 was \$2.70/pound compared to \$0.90/pound for dead fish. The demand for live fish has increased and currently the majority of gopher rockfish are landed in live condition. In 2005, 94 percent of gopher rockfish were landed live; this number dropped slightly to 77 percent in 2006 when the price reached an all-time high of \$7.22/pound. The optimum size for live gopher rockfish

is between one and two pounds because the market prefers attractive, plate-sized fish. Since this size is close to the size at maturity, there is a concern by managers to ensure gopher rockfish are allowed to reach spawning age before they are harvested in the live-fish fishery (see Management Considerations, below).

Fishing revenue from the 2006 commercial harvest of gopher rockfish was about \$270,000 (ex-vessel 2006 dollars). The contribution to total business output, for the State, from this 2006 commercial harvest is estimated to be \$521,000. Likewise, total employment and wages from gopher rockfish is estimated to be the equivalent of 9 jobs and \$240,000, respectively.

Commercial landings of gopher rockfish have changed regionally. Historically, the majority of catch has been landed in central California; however, the proportion of gopher rockfish landings by area has changed over time. Although landings in central California have decreased, landings north of Bodega Bay have remained constant with approximately 26 percent of all gopher rockfish landed in 2006. Landings have drastically decreased south of Point Conception over the last ten years, from 31,000 pounds (14 metric tons) in 1996 to 400 pounds (0.2 metric tons) in 2006. The decrease in gopher rockfish landings south of Point Conception is likely due to more restrictive management measures like lower commercial allocations and trip limits (see Management Considerations, below).

From 2004 to 2006, the number of total pounds landed by both recreational and commercial sectors fluctuated between 111,727 and 140,050 pounds annually. Currently, a majority of the total gopher rockfish landings is landed by the recreational sector. In 2004, a total of 121,577 pounds were landed by both sectors, with the recreational sector accounting for 69 percent. A similar trend was observed for 2005 and 2006; the recreational sector made up 61 percent and 72 percent of the total landings, respectively.

Status of Biological Knowledge

Life history characteristics, behavior, and morphology are strikingly similar between gopher and black-and-yellow rockfishes. The geographical range of gopher rockfish is similar to, but extends further south than black-and-yellow rockfish. The range is reported from Eureka (California) to Punta San Roque (southern Baja California), although they are rare north of Sonoma County (California) and south of Santa Monica Bay (California). Recent literature suggests their range extends further north to Cape Blanco (southern Oregon). Gopher rockfish have been observed from the intertidal to depths of 264 feet (81 meters), but adults are usually found at depths between 40 and 120 feet (12 and 37 meters), deeper than their black-and-yellow congeners. Black-and-yellow rockfish are more aggressive, and occupy the food-rich shallow zones, whereas gopher rockfish take competitive refuge in deeper zones.

Gopher rockfish prefer to occupy rocky habitats of nearshore kelp forests. They are found on the same reefs as kelp, *Sebastes atrovirens*; blue, *Sebastes*

mystinus; and olive rockfishes, *Sebastes serranoides*. During high swell conditions, individuals take shelter in crevices associated with high relief areas. One study of a Baja Californian tide pool noted that 94 percent of all gophers surveyed were juveniles, suggesting that rocky intertidal habitats might be nursery areas for these subtidal species.

Gopher rockfish are a relatively small species of rockfish, reaching a maximum recorded length of 17-inches (43-centimeters). It is rare to observe gopher rockfish larger than 15-inches (38-centimeters) in central California; and 8-inches (20-centimeters) in southern California. Males grow at a slightly faster rate and reach maximum size at a younger age than females. Maximum age of gopher rockfish is 35 years, but few fish have been estimated older than 20 years. Estimates of size at maturity vary based on geographic range, with individuals maturing at a smaller size in southern California. Off central California, a few female gopher rockfish were mature at 8.3-inches (21-centimeters), while the largest immature female was 12.2- inches (31-centimeters) long. Males were estimated to mature at a smaller size than females.

Reproduction in the gopher rockfish is relatively well known. Like other *Sebastes*, gophers have internal fertilization that takes place after a series of courtship rituals. Females ranging between 176- and 307-grams (6.2- and 10.8-ounces) carry approximately 249 eggs per gram of body weight. Females release 0.2-inch (5-millimeter) larvae from January through May, peaking in March. After 30-90 days, larvae settle out of the plankton into kelp canopies. The settled larvae are large, about 1-inch (2.5-centimeters) in length, and remain close to the kelp fronds. Survival and subsequent recruitment of gophers are highly variable from year to year. The portion of the stock north of Point Conception showed evidence of weak recruitment in the 1970s, with peaks in the mid-1980s and mid-1990s, which suggests that recruitment has been somewhat enhanced during the shift to warmer ocean conditions.

Movement of adult gopher rockfish is limited. Their home range is usually rather small, especially if it includes high-quality, high-relief habitat. In southern California, home ranges increased with fish size and water depth, and were shown to be between 15 and 45 square feet (1.4 and 4.2 square meters). Gophers are also territorial. A study in southern California described three types of movement behavior in gophers: home-bodies, commuters, and floaters. The home-body types patrol and defend an area of the reef and occupy a shelter within it. The commuters are more transient, moving between shelter holes and feeding sites, but also displaying some territorial behavior. The floaters are non-territorial, inhabiting portions of other fish territories, and avoiding assault from dominant fish.

Gopher rockfish primarily feed at night on benthic crustaceans such as shrimp and small crabs, smaller fishes (juvenile rockfishes, sculpins, surfperch, and kelpfishes), gastropods and cephalopods. The adult diet is more varied, as juveniles prey mostly on zooplanktors such as cyprids (barnacles).

Status of the Population

In May 2005, the first gopher rockfish stock assessment was completed along the California coast from Point Conception to the Oregon border. That portion of the stock was estimated to be healthy according to the management criteria set forth by the state. Both commercial and recreational regulations are in place to keep the fishery sustainable. The management outcomes based on the 2005 stock assessment are discussed in the next section.

Management Considerations

The gopher rockfish became a federally designated groundfish in 1982 when the Pacific Fisheries Management Council (PFMC) adopted the Pacific Coast Groundfish Fishery Management Plan. Since then it has been managed under the joint jurisdiction of the state and the federal government. Prior to 1982, this species was regulated by CDFG in conjunction with the state legislature and the California Fish and Game Commission (FGC).

Since the late 1990s, considerable federal pressure developed to rebuild “overfished”¹ species and subsequent management actions designed to avoid these species shifted fishing effort into nearshore areas putting additional pressure on shallow species such as gopher rockfish. At the same time, state and federal management took a more precautionary approach for unassessed, “data poor” species by lowering harvest limits. In addition, the popularity of the commercial live-fish fishery increased dramatically in the 1990s resulting in even greater pressure on nearshore stocks.

California’s Marine Life Management Act (MLMA) of 1998 was adopted in response to the need to take a more precautionary approach to management that prioritized resource sustainability, and to address the rapid development of the live fish fishery. This important piece of legislation made the possession of a commercial nearshore permit mandatory and delegated finfish management authority to the FGC. Minimum commercial size limits for nearshore species including gopher rockfish were enacted. The MLMA also required that the FGC adopt a Fisheries Management Plan (NFMP) for nearshore finfish.

In 2000, under these new guidelines, the FGC adopted a precautionary approach for nearshore stocks including gopher rockfish. In the absence of a gopher rockfish assessment, harvest limits were set at 50 percent of historic landings.

Nineteen nearshore species including the gopher rockfish are managed under provisions outlined in the NFMP, which was adopted by the FGC in 2002.

¹ “Overfished” is a formal federal or state designation used when the status of an assessed stock is determined to be at a critically low level; several important California groundfish species share this designation including bocaccio, canary, cowcod, widow and yelloweye rockfishes and previously, lingcod.

The NFMP also mandated a precautionary management approach for stocks without quantifiable assessments so harvest limits continued to be set at 50 percent of historic landings until better information was available. In conjunction with the NFMP adoption, the FGC adopted a restricted access program which reduced the number of nearshore permittees regionally, limited approved gears to trap and hook-and-line, and provided for minimal bycatch in other fisheries.

Harvest limits are set according to the outcomes of stock assessments whenever possible. The most recent assessment was completed for the gopher rockfish in 2005. Since the gopher rockfish cannot be managed separately from other nearshore rockfish species without significantly increasing bycatch, gopher rockfish was not removed from the nearshore rockfish group to be managed under a separate harvest limit. Instead, a point-of-concern was set at a level determined appropriate for the higher harvest limit that was adopted, based on the assessment and the contribution of gopher rockfish to the nearshore rockfish group. This allowed increased fishing opportunities in 2006 for anglers targeting shallow nearshore rockfish in waters off central California, effectively a harvest limit increase of over 50 percent from the status quo.

The PFMC and the State of California continue to work in a coordinated effort to develop and adopt various management specifications to keep harvests within targets. Specific regulatory measures for the commercial fishery have been used to manage rockfishes, including cumulative trip limits and season closures. Other regulatory actions include gear and depth restrictions and license and permit regulations such as finfish trap permits, nearshore fishery permits (2001), and restricted access permits (2003). For the sport fishery, season closures are used and maximum fishing depth was restricted starting in 2001. Daily bag limits for the rockfish, cabezon, *Scorpaenichthys marmoratus*; and lingcod, *Ophiodon elongates*, complex were decreased in 2000 to 10 fish with a two fish sub-limit for shallow nearshore species. The sub-limit was eliminated in 2004, mainly to protect gopher rockfish from increased discard mortality. More recent regulatory actions include the adoption of marine protected areas (MPAs) for the Channel Islands, and a network of MPAs along the central coast from Point Conception to San Mateo County, which will protect some portion of the stock.

Although the assessment indicated a healthy stock, there were some uncertainties in the data. For example, there was uncertainty in the measurement of relative abundance and in the value of natural mortality. Future gopher rockfish stock assessments would benefit from having additional length and age composition data collected throughout California and discard information from the commercial fishery.

Jayna A. Schaaf-Da Silva

Marine Biologist, Monterey, (Jdasilva@dfg.ca.gov)

Further Reading

- Allen, L., D.J. Pondella, and M.H. Horn. 2006. The Ecology of Marine Fishes. University of California Press, Berkeley, 660 pp.
- Berkeley, S., M. Hixon, R. Larson, and M.S. Love. 2004. Fisheries sustainability via protection of age structure and spatial distribution of fish populations, *Fisheries* 29:23-32.
- Eschmeyer, W.N., O.W. Herald, and H. Hammann. 1983. A Field Guide to Pacific Coast Fishes, North America. Houghton Mifflin, New York, 336 pp.
- Key, M., A.D. MacCall, T. Bishop, and R. Leos. 2005. Stock assessment of the gopher rockfish (*Sebastes carnatus*). Status of the Pacific Coast Groundfish Fishery through 2005, Stock Assessment and Fishery Evaluation: Stock Assessments and Rebuilding Analyses. Pacific Fishery Management Council, Portland, Oregon. Vol. 5, 59 pp.
- Larson, R.J. 1980. Territorial behavior of black-and-yellow rockfish and gopher rockfish (*Scorpaenidae*, *Sebastes*). *Marine Biology* 58:111-122.
- Love, M.S., M. Yoklavich, and L. Thorsteinson. 2002. The Rockfishes of the Northeast Pacific. University of California Press, Berkeley. 406 pp.
- Miller, D.J. and R. Lea. 1972. Guide to the Coastal Marine Fishes of California. Department of Fish and Game, Fish Bulletin 157, Sacramento, 249 pp.

Table 9.1. Gopher rockfish and gopher group commercial landings, 1916-2006

Year	Pounds	Year	Pounds	Year	Pounds
1916-1982	<i>no data</i>	1990	147,435	1998	158,674
1983	53	1991	183,231	1999	121,919
1984	26,103	1992	172,256	2000	89,949
1985	43,811	1993	170,079	2001	101,601
1986	72,714	1994	147,069	2002	77,280
1987	95,702	1995	167,911	2003	33,178
1988	156,017	1996	233,415	2004	37,803
1989	158,110	1997	161,204	2005	43,385
				2006	38,638

Data Source: CDFG commercial landing receipts for all commercial gear types; data not available for 1916-1982.