Kelp Bass, *Paralabrax clathratus*
Enhanced Status Report

Kelp Bass, *Paralabrax clathratus*. (Photo Credit: Miranda Haggerty, CDFW).

California Department of Fish and Wildlife
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Enhanced Status Reports

The Marine Life Management Act (MLMA) is California's primary fisheries law. It requires the California Department of Fish and Wildlife (Department) to regularly report to the California Fish and Game Commission (Commission) on the status of fisheries managed by the state. The 2018 Master Plan for Fisheries expanded on this general requirement by providing an outline for Enhanced Status Reports (ESRs) that is based on the MLMA's required contents for Fishery Management Plans (FMPs). The goal of ESRs is to provide an overview of the species, fishery, current management and monitoring efforts, and future management needs, and provide transparency around data and information that is unavailable or unknown. ESRs can help to guide Department efforts and focus future partnerships and research efforts to address information gaps and needs to more directly inform management. It is also anticipated that some ESRs will be foundations for future FMPs by providing background information and focusing analyses and stakeholder discussions on the most relevant issues.

Note that in order to describe management measures in clear terms, ESRs contain summaries of regulatory and statutory language. To ensure full compliance with all applicable laws and regulations, please refer directly to the relevant sections of the Fish and Game Code and/or Title 14 of the California Code of Regulations.

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List of Acronyms

CalCOFI	California Cooperative Oceanic Fisheries Investigations
CDFW	California Department of Fish and Wildlife
CDFG	California Department of Fish and Game
CPFV	Commercial Passenger Fishing Vessel
CPUE	Catch Per Unit Effort
CRFS	California Recreational Fisheries Survey
ENSO	El Niño Southern Oscillation
EFI	Essential Fishery Information
FGC	Fish and Game Code
FMP	Fishery Management Plan
MLS	Marine Logs System
MPA	Marine Protected Area
MRFSS	Marine Recreational Fisheries Statistics Survey
MSE	Management Strategy Evaluation
NGO	Non-Government Organization
NPGO	North Pacific Gyre Oscillation
PDO	Pacific Decadal Oscillation
PISCO	Partnership for Interdisciplinary Studies of Coastal Oceans
RecFIN	Recreational Fisheries Information Network
SST	Sea Surface Temperature
TL	Total Length

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Fishery-at-a-Glance: Kelp Bass

Scientific Name: *Paralabrax clathratus*

Range: Kelp Bass range from the Columbia River in Washington south to southern Baja California, Mexico, but are rare north of Point Conception in California.

Habitat: Kelp Bass primarily reside in nearshore habitats, including kelp forests, bays, and estuaries.

Size (length and weight): Kelp Bass can grow up to 72.1 centimeters (28.0 inches) in total length and 6.6 kilograms (14.5 pounds).

Life span: The oldest recorded Kelp Bass was 34 years old.

Reproduction: Kelp Bass release their eggs into the water column where fertilization takes place. They are group spawners, forming aggregations in kelp beds, over rocky reefs and in open water. Females can spawn multiple times within a season, which occurs from April through November, peaking in the summer months.

Prey: Adult Kelp Bass primarily feed upon fishes, including anchovies, Topsmelt, Señorita, and perches, as well as other pelagic and benthic prey when available. Juveniles primarily eat kelp-associated invertebrates and kelp.

Predators: The main predator of adult Kelp Bass is Giant Sea Bass.

Fishery: There is only a recreational fishery for Kelp Bass. They were historically fished commercially, but in 1953 commercial fishing for Kelp Bass was banned.

Area fished: Kelp Bass are typically targeted over shallow reefs and kelp beds in coastal waters at depths up to 70.0 feet (21.3 meters).

Fishing season: Kelp Bass can be fished year-round.

Fishing gear: Kelp Bass are primarily caught using hook and line**,** though spears are also used.

Market(s): There is no market for Kelp Bass given the lack of a commercial fishery.

Current stock status: No formal stock assessment exists for Kelp Bass. Analysis of fishery-dependent and fishery-independent datasets along with environmental variables indicate abundance has declined concurrently with increases in exploitation. Since 2013, Kelp Bass landings and Catch Per Unit Effort have started to increase for Commercial Passenger Fishing Vessels and remained relatively stable for private/rental boats.

Management: Kelp Bass, along with Barred Sand Bass and Spotted Sand Bass, have been managed collectively since the early 1900s. Due to concerns about the status of both Kelp Bass and Barred Sand Bass, the current bag limit of five fish in aggregate and minimum size limit of 14.0 inches (35.6 centimeters) were established in 2013. As of 2018, fishery-independent data over the past several years have shown increased juvenile and adult Kelp Bass abundances at a few locations. Fishery-dependent data indicate slight increases for Kelp Bass; however, additional management measures may be necessary if the increased size limit and lower bag limit established in 2013 do not prove to be sufficient to protect the stock. To best support a stable Kelp Bass population and sustainable sport fishery, decisions on the specific management measures are pending the results of various models and fishery-independent data analyses.

1. The Species

1.1. Natural History

1.1.1. Species Description

Kelp Bass (*Paralabrax clathratus*), often referred to as calico bass, are one of the most common sea basses inhabiting southern California coastal waters along with two other species of bass, Barred Sand Bass (*Paralabrax nebulifer)* and Spotted Sand Bass (*Paralabrax maculatofasciatus*). They are the largest of the three species in the genus *Paralabrax*, growing up to 28.4 inches (in) (721.0 millimeters (mm)) in length (Miller and Lea 1972). They are olive to brown in color with angular white blotches and spots dorsally (Miller and Lea 1972). Spawning females will often lose their spots and become black, while males usually develop yellow-orange snouts and high-contrast, black-and-white breeding colors (Erisman and Allen 2005).

Figure 1-1. Adult male Kelp Bass displaying breeding colors (Photo Credit: Miranda Haggerty, CDFW).

1.1.2. Range, Distribution, and Movement

Kelp Bass range as far north as the Columbia River in Washington (Miller and Lea 1972) and as far south as Baja California (Figure 1-2), but are most common south of Point Conception (Eschmeyer and Herald 1999). They can be found from the surface to depths of 150 feet (ft) (46 meters (m)) (Miller and Lea 1972) but are most abundant from 9.0 to 70.0 ft (2.7 to 21.3 m) (Feder et al. 1974).

Figure 1-2. Range map for Kelp Bass.

The distance Kelp Bass move appears to be dependent on the habitat where they reside, with distance covered varying greatly between individuals and locations. Telemetry studies show high site fidelity with a small home range size of 33 to 11,224 square meters (m^2) (108 to 36,824 square feet (ft^2)). Individuals that moved the farthest inhabited artificial reefs over sand and appeared to travel between mooring blocks (Lowe et al. 2003). The first tagging studies of Kelp Bass found they made small-scale movements, with most tagged individuals recaptured at the initial tag site (Collyer and Young 1953; Young 1963). In an experiment that tagged and translocated Kelp Bass, only 8.5% of fish returned to their home site (Hartney 1996). Large sand channels could act as a movement barrier, as the spatial configuration of habitat structure is more important in predicting Kelp Bass abundance than kelp or bathymetry (Sievers et al. 2016). An ongoing tagging study also found that Kelp Bass have small home ranges, spending the majority of time within the site they were tagged (Semmens and Parnell 2014). While Kelp Bass are not known to migrate long distances for spawning like their congener, the Barred Sand Bass, increased vertical and horizontal movement is seen during the spawning season possibly to form spawning aggregations (Erisman and Allen 2006).

1.1.3. Reproduction, Fecundity, and Spawning Season

Kelp Bass have two distinct sexes, and release eggs and sperm into the water column where fertilization occurs (Smith and Young 1966; Oda et al. 1993; Sadovy and Domeier 2005; Erisman and Allen 2006). Kelp Bass spawn from April through November, peaking in the summer months (Collyer and Young 1953; Quast 1968; Lavenberg et al. 1986; Oda et al. 1993). They aggregate in kelp beds, over rocky reefs, and in open water at depths to 150.0 ft (45.7 m). Spawning groups can be anywhere from three to over 200 individuals, with several subgroups forming, each consisting of several males and one female (Erisman and Allen 2006). Erisman and

Allen (2006) found spawning activity revolved around sunset during the summer, but did not find a significant correlation between spawning periodicity and a lunar or semi-lunar cycle.

Kelp Bass larvae remain in the plankton for 25 to 36 days before new recruits are observed around 0.4 in (10.2 mm) standard length in shallow water habitats (subtidal to 60.0 ft (18.3 m)) with structure for sheltering such as kelp beds, drift algae, and invertebrate turf (Cordes and Allen 1997). Research suggests larval settlement displays a semi-lunar relationship (Cordes and Allen 1997; Findlay and Allen 2002) and spring tides may aid in successful larval transport (Thresher 1984; Cordes and Allen 1997; Findlay and Allen 2002; Erisman and Allen 2006).

1.1.4. Natural Mortality

Determining the natural mortality (M) of fish is important for understanding the health and productivity of their stocks. Natural mortality of a fish results from all causes of death not attributable to fishing such as old age, disease, predation, or environmental stress. Natural mortality is generally expressed as a rate that indicates the percentage of the population dying in a year. Fish with high natural mortality rates must replace themselves more often and thus tend to be more productive. Natural mortality along with fishing mortality result in the total mortality operating on the fish stock.

Estimating natural mortality is difficult and often relies on evaluation of life history traits, and several different methods have been developed. Jarvis et al. (2014) used growth parameters (L_∞ and k) and average water temperature (Pauly 1980) to estimate a rate for M of 16.3% annually. However, a study by Then et al. (2015) found that a method that used maximum age produced more reliable estimates of natural mortality. Using the maximum age ever observed in the population (34 years (yr)) suggests that the natural mortality is slightly higher, and that 17.6% of the Kelp Bass population dies from natural causes each year.

1.1.5. Individual Growth

Individual growth of fishes is quite variable, not only among different groups of species but also within the same species. Growth is often very rapid in young fish, but slows as adults approach their maximum size. Because growth is highly variable in Kelp Bass, the oldest fish may not be the largest. The International Game Fish Association World Record Kelp Bass was 14.5 pounds (lb) (6.58 kilograms (kg)) and 27 years-old, while the maximum observed age is 34 years (CDFG 2004) and the maximum length is 72.1 centimeters (cm) (28.0 in) (Love 2011). The von Bertalanffy Growth Model is most often used in fisheries management, but other growth functions may also be appropriate. Growth parameters have been calculated for Kelp Bass for both sexes combined by fitting data to the von Bertalanffy growth function:

$$L_t = L_\infty(1 - e^{-k(t-t_0)})$$

Where L_t is the length at age t, L_∞ is the maximum average length, k is the relative growth rate, t is the age of the fish, and t_0 is the theoretical age when the length of the fish is zero. The values of those estimated parameters are L_∞ = 69.8, k = 0.06, t_0 = -3.5 (Love et al. 1996).

The relationship between weight and length for Kelp Bass (both sexes combined) has also been modeled using the exponential equation:

$$W = aL^b$$

where W is the weight in grams, L is the Total Length (TL) in millimeters, a is a constant indicating the intercept, and b is a constant indicating the slope of the regression line (a=0.0000209, b=3.01) for Kelp Bass (Williams et al. 2013).

1.1.6. Size and Age at Maturity

Kelp Bass generally mature between the ages of 3 and 5 years and between 18.0 and 27.0 cm (7.1 and 11 in) TL. Size and age at first maturity for both males and females can occur at 18.0 cm (7.1 in) and 2-years-old. Fifty percent of males are mature at 22.0 cm (8.7 in) and females at 22.6 cm (9.0 in); 50% of both males and females are mature at 3 years of age. All males are mature by 26 cm (10 in) and 4 years and females by 27 cm (11 in) and 5 years (Love et al. 1996).

1.2. Population Status and Dynamics

No formal stock assessment exists for Kelp Bass in southern California. However, several data sources have indicated a substantial decline in Kelp Bass abundance from the early 1990s to 2012. After new regulations were implemented in 2013, Kelp Bass numbers have started to increase slightly (see section 1.2.1). The combination of increased protection of smaller size classes and favorable environmental conditions may have led to increased recruitment, which is described in the section below.

1.2.1. Abundance Estimates

Many fishery-independent surveys assessing fish assemblages across southern California find that Kelp Bass are one of the most abundant species. For example, Kelp Bass have historically and continue to be documented as the most abundant piscivorous fish off Catalina Island (Quast 1968; Froeschke et al. 2006). A southern California coastline study analyzing the impact of habitat structure on fish populations across kelp forests from Point Loma to Laguna Beach found Kelp Bass were present on 86% of all transects, second only to Señorita (*Oxyjulis californica)* (Sievers et al. 2016). They were also ranked as one of the most abundant species in eelgrass (Allen et al. 2002), subtidal surfgrass (Galst and Anderson 2008), and artificial breakwater habitats (Froeschke et al. 2005). Kelp Bass abundance and biomass are found to be greater inside than outside of Marine Protected Areas (MPAs) across southern California, indicating they respond well to protection from fishing (Froeschke et al. 2006; Tetreault and Ambrose 2007; Hamilton et al. 2010; Hastings et al. 2014).

There is no population estimate for Kelp Bass. Instead, a combination of fishery-dependent and fishery-independent datasets are used to track their abundance through time. Analysis of these datasets in combination with environmental variables indicate Kelp Bass abundance has declined concurrently with increases in exploitation (Erisman et al. 2011; Jarvis et al. 2014). Power plant entrapment monitoring occurred for almost four decades from 1972 to 2010 at three generating stations and found Kelp Bass abundance declined by 97% (Miller and Erisman 2014). The Vantuna Research Group at Occidental College, Los Angeles, California has conducted scuba diver transect surveys from 1974 to the present at King Harbor breakwater in Redondo Beach and at a kelp forest site off Palos Verdes (Pondella et al. 2002). Adult Kelp Bass abundances at both locations increased from 1974 into the early 1980s and declined precipitously by the early 1990s (Figure 1-3 A-B). As of 2016 abundances are still low at both locations, similar to the beginning of the time series. Juvenile Kelp Bass abundance has fluctuated through time as well, with juveniles typically occurring in higher annual densities than adult Kelp Bass since 2013 at Palos Verdes and since 1992 at King Harbor (Figure 1-3). From 2012 to 2016, juvenile abundance has increased by 78% at Palos Verdes and by 72% at King Harbor. The National Park Service has conducted a Channel Islands Kelp Forest Monitoring program since 1985 (Davis 1997). Off Santa Cruz and Anacapa Islands, adult Kelp Bass density was also the highest in the 1980s and declined in the 1990s (Figure 1-4). Although, unlike the mainland surveys, adult abundance at these island locations appears to be increasing since 2013. These fishery-independent indices reflect the trends in recreational catch, with Kelp Bass landings declining by 72% from 1982 to 2012 (Jarvis et al. 2014). The greater number of juveniles observed since 2013 could be reflective of the recent warmer water years, which favor Kelp Bass recruitment, or the increase in discarded Kelp Bass since the regulation change.

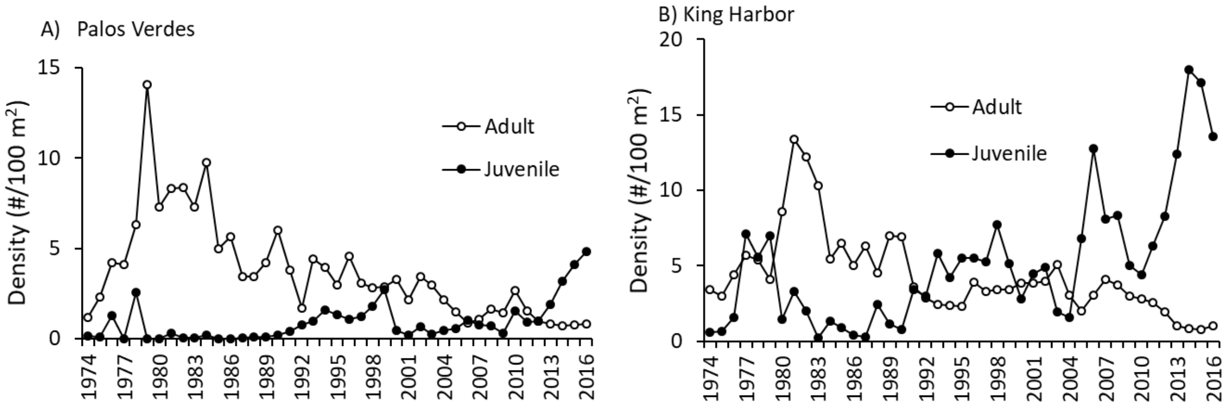

Figure 1-3. Annual trends in adult (>25 cm TL) and juvenile (≤25 cm TL) Kelp Bass abundance from 1974 to 2016 at A) Palos Verdes and B) King Harbor, Redondo Beach, LA County (Vantuna Research Group, Occidental College unpublished data).

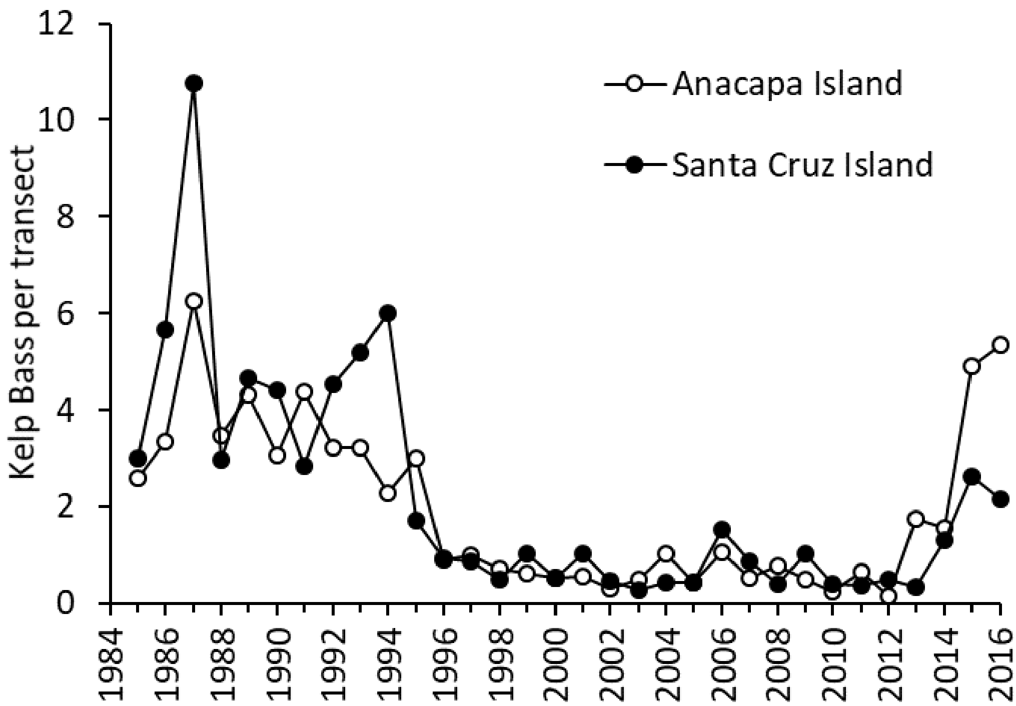

Figure 1-4. Annual trends in adult (>25 cm TL) Kelp Bass abundance from dive transects at Anacapa and Santa Cruz Islands, California from 1985 to 2016 (Kelp Forest Monitoring, National Parks Service unpublished data).

1.2.2. Age Structure of the Population

As there is no stock assessment for Kelp Bass, recreational catch data were used to assess the age structure of the population. Length data from retained catch from private/rental and Commercial Passenger Fishing Vessel (CPFV) modes were converted to ages using a length-age key. At least 12 age classes of Kelp Bass are represented in the catch from 1980 to 2017 (Figure 1-5). The proportion of fish in each age class of Kelp Bass catch fluctuated slightly through time; however, a large shift occurred in 2013 following the regulation change as expected. With the increase in the minimum size limit from 12.0 to 14.0 in (30.5 to 35.6 cm), Kelp Bass approximately 5 to 7-plus years-old would be discarded and no longer retained in the catch. The decrease in harvest of younger age classes allows for increased reproduction before recruitment to the fishery. The legal age classes have maintained a fairly equal distribution through time suggesting there is a healthy adult population structure.

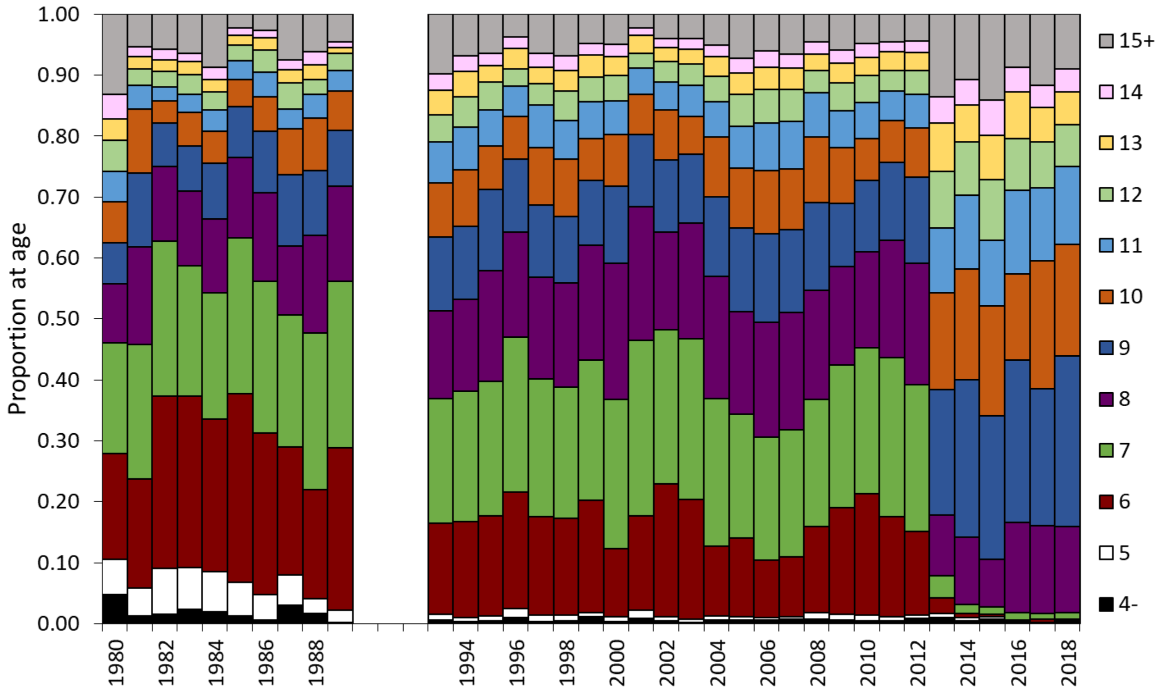

Figure 1-5. Age structure of harvested Kelp Bass (n = 80,809) from 1980 to 2018. Age classes were converted from length data of retained catch from all fishing modes. All fish older than 15 years and younger than 4 years are represented in summed categories,15+ and 4-, respectively. A size limit increase in 2013 altered the distribution of retained fish. No data collected from 1990 to 1992 (Recreational Fisheries Information Network (RecFIN) 2018).

1.3. Habitat

Kelp Bass are ubiquitous in most nearshore habitats in southern California and northern Baja California, including kelp forests, bays, and estuaries (Eschmeyer and Herald 1999). In a coast-wide synthesis, classifying all California marine fish species according to habitat affinity, Kelp Bass ranked as the second most abundant shallow water generalist after Black Surfperch (*Embiotoca jacksoni*) (Allen et al. 2006). With widespread occurrence across all major rocky and soft bottom habitats south of Point Conception, Kelp Bass were grouped in the “southern shallow rock sand” classification along with six other generalists including their congener the Barred Sand Bass and four species of surfperches. Kelp Bass size and abundance are greater in large, connected reefs compared to small isolated reefs, which could be because they have small home ranges and are not likely to cross large sand gaps (Sievers et al. 2016). Kelp Bass survivorship is reliant on kelp habitat, with survivorship decreasing at low kelp densities (White and Caselle 2008). Survivorship may decrease due to a decrease in refuges from predation or a decrease in kelp-associated prey, as higher density of Kelp Bass occurs on reefs with greater biomass of juvenile kelp fishes (Pondella et al. 2002). The fishery for Kelp Bass primarily occurs in kelp forest and rocky reef habitats.

1.4. Ecosystem Role

As Kelp Bass are one of the most abundant fishes in kelp forest ecosystems, there are multiple studies on their important role as generalist predators on community structure (section 1.4.2). To the Department’s knowledge, there is no direct research on fishery impacts to the ecosystem role of Kelp Bass, although it is possible overharvesting could disrupt their role as an abundant predator in the kelp forest system.

1.4.1. Associated Species

Kelp Bass primarily reside in rocky reef and kelp forest habitats. Other commonly co-occurring fish species in southern California kelp beds and rocky reefs include (Allen et al. 2006):

Table 1-1. Species co-occurring with Kelp Bass.

Species co-occurring with Kelp Bass
Barred Sand Bass (Paralabrax nebulifer)
Black Croaker (Cheilotrema saturnum)
Black Perch (Embiotoca jacksoni)
Blackeye Goby (Rhinogobiops nicholsii)
Blacksmith (Chromis punctipinnis)
California Hornshark (Heterodontus francisci)
California Moray (Gymnothorax mordax)
California Scorpionfish (Scorpaena guttata)
California Sheephead (Semicossyphus pulcher)
CO Turbot (Pleuronichthys coenosus)
Garibaldi (Hypsypops rubicundus)
Giant Kelpfish (Heterostichus rostratus)
Giant Sea Bass (Stereolepis gigas)
Halfmoon (Medialuna californiensis)
Jack Mackerel (Trachurus symmetricus)
Kelp Perch (Brachyistius frenatus)
Kelp Rockfish (Sebastes atrovirens)
Ocean Whitefish (Caulolatilus princeps)
Opaleye (Girella nigricans)
Pacific Barracuda (Sphyraenidae argentea)
Pile Perch (Rhacochilus vacca)
Rainbow Seaperch (Hypsurus caryi)
Rock Wrasse (Halichoeres semicinctus)
Rubberlip Seapearch (Rhacochilus toxotes)
Salema (Haemulon californiensis)
Sargo (Anisotremus davidsonii)
Señorita (Oxyjulis californica)
Swell Shark (Cephaloscyllium ventriosum)
Topsmelt (Atherinops affinis)
Treefish (Sebastes serriceps)
Walleye Surfperch (Hyperprosopon argenteum)
White Seabass (Atractoscion nobilis)

1.4.2. Predator-prey Interactions

Kelp Bass are generalist predators, and their diet changes throughout their life stages. They feed on multiple trophic levels, relying on kelp-associated invertebrates and kelp itself for a significant portion of their dietary carbon (Koenigs et al. 2015). Kelp Bass diet varies seasonally with availability of prey, consuming more plankton and kelp-associated invertebrates in the winter-spring months and more fish in the summer (Love and Ebeling 1978). As they become piscivorous adults, anchovies, Topsmelt (*Atherinops affinis*) and juvenile kelp forest fishes like Señorita and perches (various members of the Embioticidae family) become important prey sources (Quast 1968; Love and Ebeling 1978; Hobson and Chess 1986). In addition to fishes, adult Kelp Bass opportunistically exploit pelagic preys such as Red Crabs (*Pleuroncodes planipes*) and salps, as well as benthic foods such as brittle stars (*Ophiuroidea* spp.) (CDFW unpublished data). Their susceptibility to predation changes throughout life stages as well. As juveniles, Kelp Bass are prey to a suite of kelp forest fishes. The main predator of adult Kelp Bass inhabiting kelp forests is the protected Giant Sea Bass (*Stereolepis gigas*) (Love 2011), and with their populations rebounding, predation on Kelp Bass may increase (Pondella and Allen 2008).

As generalist predators, Kelp Bass play an important role in both kelp forest and eelgrass habitats. In eelgrass environments Kelp Bass eat primarily mesograzers, or small invertebrates less than 1 in in length that eat primarily plants and algae (Mendoza-Carranza and Rosales-Casian 2002), which can have indirect positive effects enhancing seagrass production (Lewis and Anderson 2012). As abundant piscivores, adult Kelp Bass are the most important predator of reef fishes surrounding Catalina Island (Steele 1997; Steele et al. 1998). They can structure local populations of various kelp forest fishes including Black Surfperch (Schmitt and Holbrook 1985); Kelp Perch (*Brachyistius frenatus*) (Anderson 2001); and rocky-reef fishes like Blue Banded and Blackeye Gobies (*Lythrypnus dalli* and *Rhinogobiops nicholsii*), respectively (Steele 1999; Gregor and Anderson 2016). Juvenile Kelp Bass in the kelp forest feed primarily on kelp-associated invertebrates, which can have indirect positive effects on kelp performance (Davenport and Anderson 2007).

1.5. Effects of Changing Oceanic Conditions

Oceanic changes due to climatic events impacting water temperature and nutrient availability such as El Niño Southern Oscillation (ENSO), the Pacific Decadal Oscillation (PDO) and the North Pacific Gyre Oscillation (NPGO) can have profound effects on fishes and fisheries. There may be long-term positive responses in bass populations to warm water regimes, as basses display significant correlation with the PDO (Hsieh et al. 2005). Larval survival is highest during extended periods of warmer than average Sea Surface Temperatures (SST) and lower during cooler water periods (Jarvis et al. 2014) (Figure 1-6). Genetic analyses indicate local environmental factors like temperature and current regimes play a larger role in Kelp

Bass recruitment than large-scale climate events such as ENSO cycles (Selkoe et al. 2007).

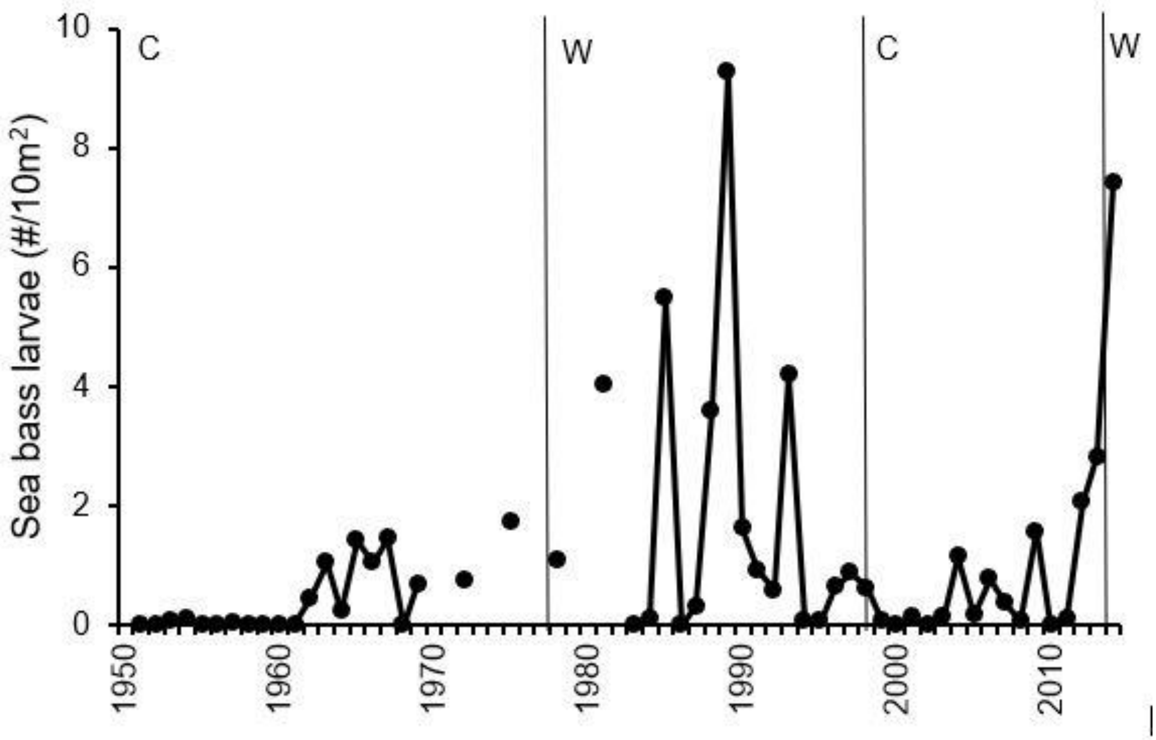

Figure 1-6. Annual variability in recruitment of sea bass (Barred Sand Bass, Kelp Bass, and Spotted Sand Bass) based on quarterly plankton tows by CalCOFI from 1951 to 2014. Warm and cool regimes were determined from trends in the PDO Index. W = warm regime and C = cold regime.

2. The Fishery

2.1. Location of the Fishery

Within California, Kelp Bass are relatively rare north of Point Conception (Eschmeyer and Herald 1999). They are typically targeted with hook and line gear over shallow reefs and kelp beds in coastal waters at depths up to 70.0 ft (21.3 m). They are also commonly caught at the offshore islands.

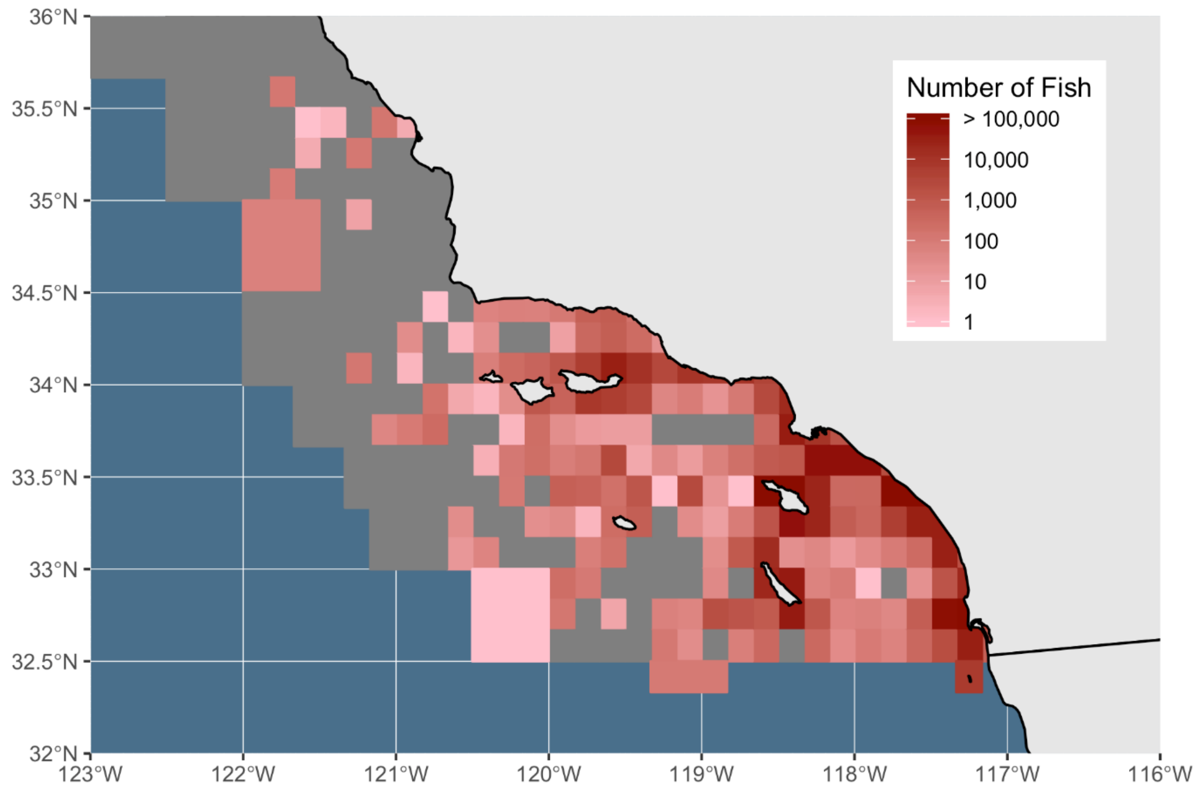

Figure 2-1. CPFV landings of Kelp Bass (kept and released) by block from 2013 to 2017 (CDFW Marine Log System (MLS) 2018). Grey area denotes fishing blocks where Kelp Bass were not landed.

2.2. Fishing Effort

2.2.1. Number of Vessels and Participants Over Time

Saltwater anglers fish for Kelp Bass from CPFVs, private vessels, shore, piers, and jetties. Most of the catch comes from CPFVs and private boats, with the split in landings from 2004 to 2017 being roughly 60% and 30%, respectively (Table 2-1). Since 1980, the number of vessels per year in the southern California CPFV fleet targeting Kelp Bass (at least one fish caught) ranged from 104 in 1991 to 180 in 2015.

Table 2-1. Percent of Kelp Bass catch (retained fish) in the recreational fishery by mode from 2004 to 2018 and the total number of Kelp Bass retained by all modes (RecFIN 2019).

Fishing mode	Percent of catch
Party/charter	60.5
Private/rental	33.7
Manmade/jetty	3.1
Beach/bank	2.7
Total fish retained	2,321,188

The annual number of CPFV trips targeting Kelp Bass remained relatively stable around an average of 9,300 trips per year through the late 1990s, peaking in 1997. Since the late 1990s there has been a decline, with small upticks in years 2001 and 2014-2015 (Figure 2-2).

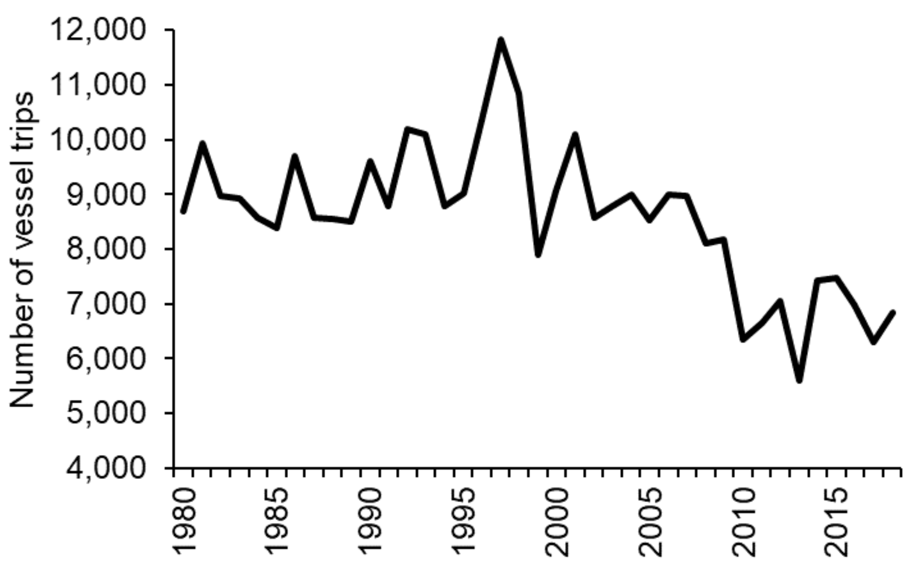

Figure 2-2. Number of CPFV trips in southern California targeting Kelp Bass (at least one caught) from 1980 to 2018 (CDFW MLS 2019).

2.2.2. Type, Amount, and Selectivity of Gear

Kelp Bass are caught mainly by hook and line, with a minor component taken by spear. Recreational anglers fishing from boat or shore may use any number of hooks and lines. On public piers, no person may use more than two rods and lines. Hook and line anglers typically use soft plastics and dead or live bait. Typical baits include squid, sardines, and anchovies.

The most common size of Kelp Bass caught by hook and line from 2013 to 2016 was 13.9 in (355.0 mm) and the average size was 14.1 in (359.0 mm) (RecFIN). However, these sizes may be slightly inflated since many fewer discarded fish were measured relative to those that were legal size and kept.

Depending on the type of hooks and baits used, Kelp Bass much smaller than the legal size limit can be caught (and then must be released). An ongoing Department study monitoring bass discard rates aboard CPFVs has recorded Kelp Bass as small as 4 in (105 mm) being caught and released. However, catching Kelp Bass that small is not common as the average size of Kelp Bass discarded is 11.7 in (297.0 mm) and the most frequently occurring size discarded is 12.6 in (320.0 mm).

2.3. Landings in the Recreational and Commercial Sectors

2.3.1. Recreational

Catch data for the recreational fishery are provided by two sources: (1) CPFV logbooks within the Department's Marine Logs System database (MLS) and (2) California Recreational Fisheries Survey (CRFS) estimates on all fishing modes available from the Recreational Fisheries Information Network (RecFIN) website. In this ESR, historical logbook data (Hill and Schneider 1999) are used to report trends in the "rock bass" (Barred Sand Bass, Kelp Bass, and Spotted Sand Bass) category on CPFVs from 1947 to 1980, CRFS data are used to summarize trends in the private/rental boat mode from 2004 to 2017, and MLS logbook data are used to summarize trends in CPFV catch from 1980 to 2017. For further information on these datasets please see section 4.2.1.

In southern California, Kelp Bass are caught year-round, but are most commonly fished during the summer months of June, July, and August (Figure 2-3).

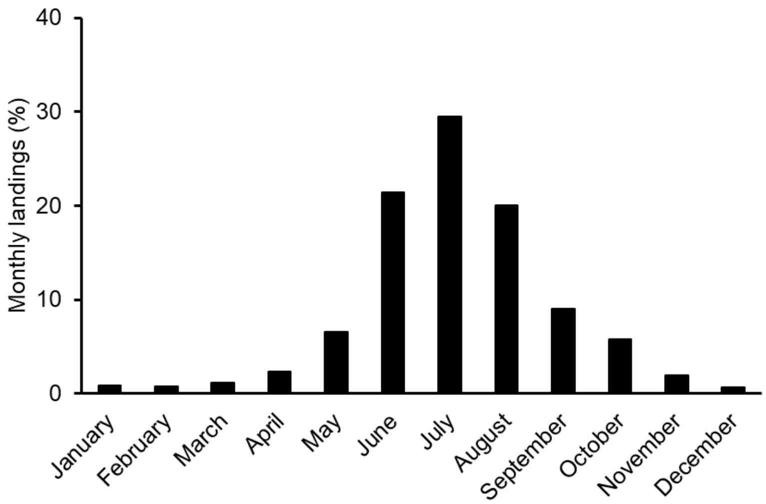

Figure 2-3. Proportion of the yearly CPFV landings of Kelp Bass (kept fish) by month in southern California from 2013 to 2017 (CDFW MLS 2018).

Kelp Bass commonly ranked among the top ten species in landings since 1980 (Jarvis et al. 2014). A decrease in ranking from ninth in 2012 to 17th in 2013 is mostly reflective of the decrease in harvested bass due to the increase (from 12.0 to 14.0 in (30.5 to 35.6 cm) in the legal size limit implemented in 2013 (Figure 2-4). Since 2013, rankings of Kelp Bass landings have increased, fluctuating from year to year.

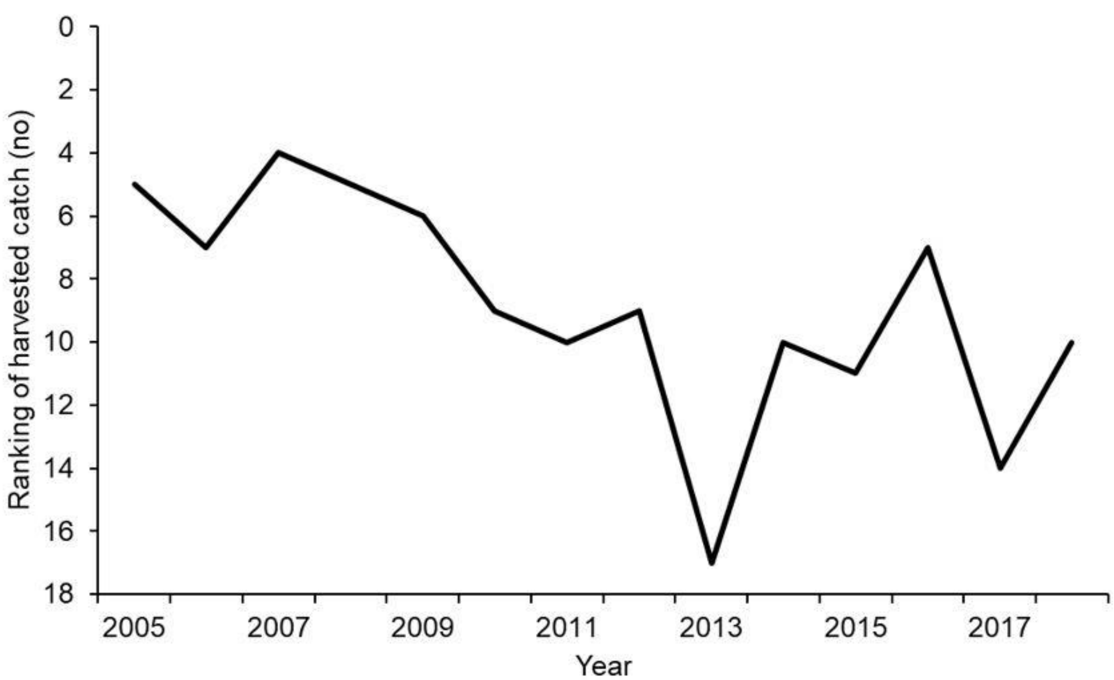

Figure 2-4. Ranking of Kelp Bass catch relative to other finfish species in southern California from 2005 to 2018. Results are based on the estimated retained catch for all fishing modes (RecFIN 2019).

Since historical logbook data are summarized by month and fishing block, effort estimates by trip and specific species cannot be made. Therefore, this Catch Per Unit Effort (CPUE) was calculated as the total number of rock bass caught in all blocks divided by the total number of anglers. CPUE from current CPFV logs was determined by dividing the total number of Kelp Bass caught each year by the total number of anglers aboard trips where at least one Kelp Bass was caught.

Trends in historical CPFV landings and CPUE (fish/angler) for rock bass have generally fluctuated together (Figure 2-5A). After the regulation changes in the 1950s (see Table 3-1), both landings and CPUE reached their peaks in the 1960s and then declined substantially in the 1970s. Similarly, current landings and CPUE for Kelp Bass also varied together (Figure 2-5B). Kelp Bass catch and CPUE for CPFVs gradually declined from 1992 to 2012 (70% and 48%, respectively). Kelp Bass catch estimates for private/rental boats in southern California show a steady decline of 76% from 2004 to 2012, with a 25% decline in CPUE (Figure 2-5C).

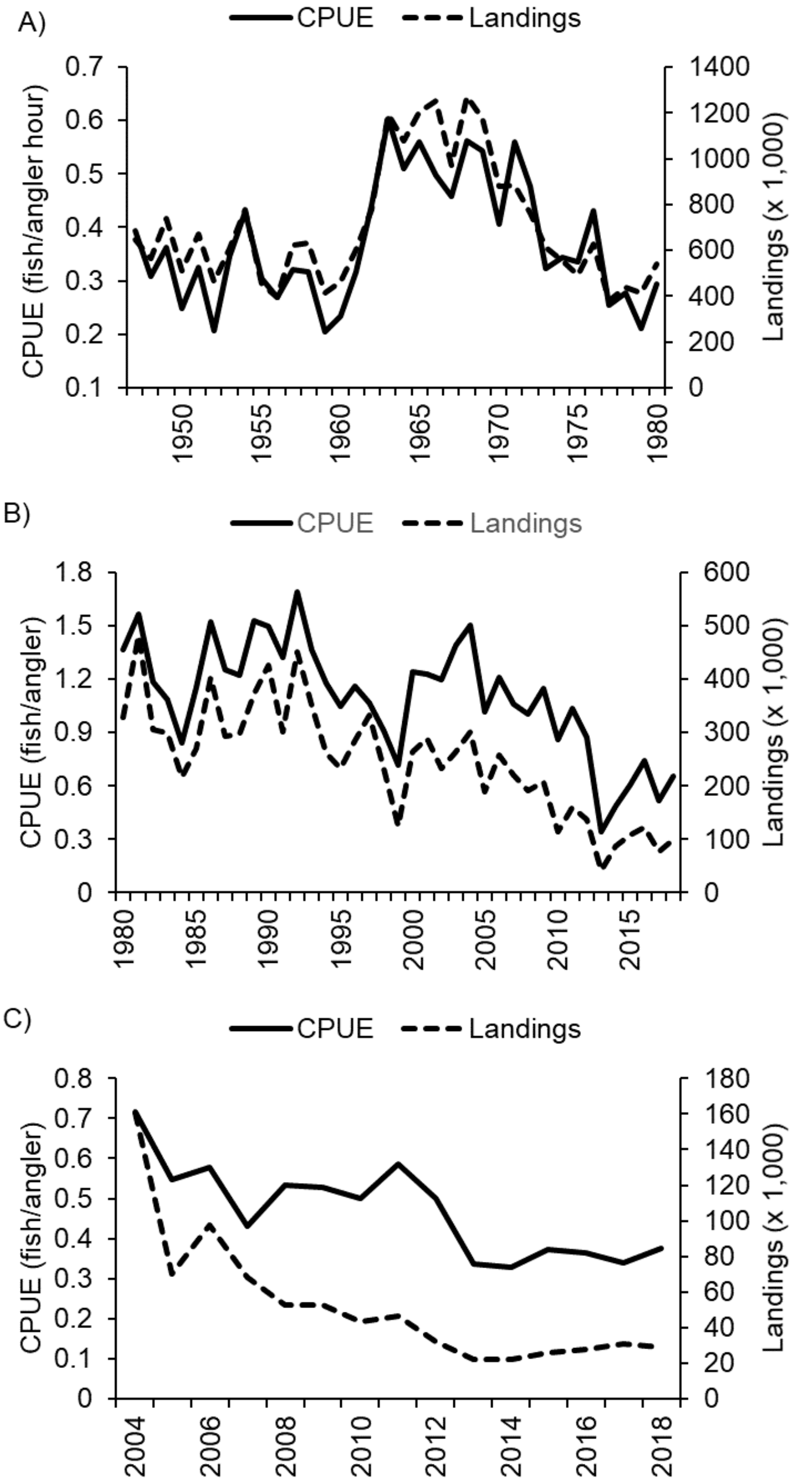

Figure 2-5. CPUE (solid line) and landings (hashed line) of A) rock bass (Barred Sand Bass, Kelp Bass, and Spotted Sand Bass) retained on CPFV trips from 1947 to 1980 (CDFW MLS 2018), B) Kelp Bass retained on CPFV trips from 1980 to 2018 (CDFW MLS 2019), and C) Kelp Bass retained on private/rental boats from 2004 to 2018 (RecFIN 2019).

Landings decreased by 70% from 2012 to 2013 on CPFVs and by 30% on private/rental boats (Figure 2-5 B and C). This is largely due to the increase in the minimum size limit in early 2013 and associated increase in sublegal discards. Since 2013, CPFVs have begun to experience a small increase in landings and CPUE (Figure 2-5 B). This is a positive sign for the resource, though it is too early to know if this is resulting from the regulation change as it takes about 8 years for Kelp Bass just spawned to recruit into the fishery. For the private/rental boat mode, both landings and CPUE have remained relatively stable since the regulation changes went into effect (Figure 2-5 C).

2.3.2. Commercial

From the early 1900s to 1953, a small commercial fishery using primarily hand and set lines existed for the three sea bass species common to southern California: Kelp Bass, Barred Sand Bass, and Spotted Sand Bass. Historic Department records often combined landings for all three species into a “rock bass” category starting in 1916, though Kelp Bass and Barred Sand Bass made up the majority of the landings in this category. Landings were relatively high during World War I (1914 to 1918) because of the increased demand for food, as was the case for many other commercial fisheries in California. These landings dropped after the war ended and then rose again into the late 1920s. Afterward, landings began a general, continuous decline until the commercial take of sea basses was prohibited in 1953 (Figure 2-6) due to concerns about sustainability of this fishery (Young 1963).

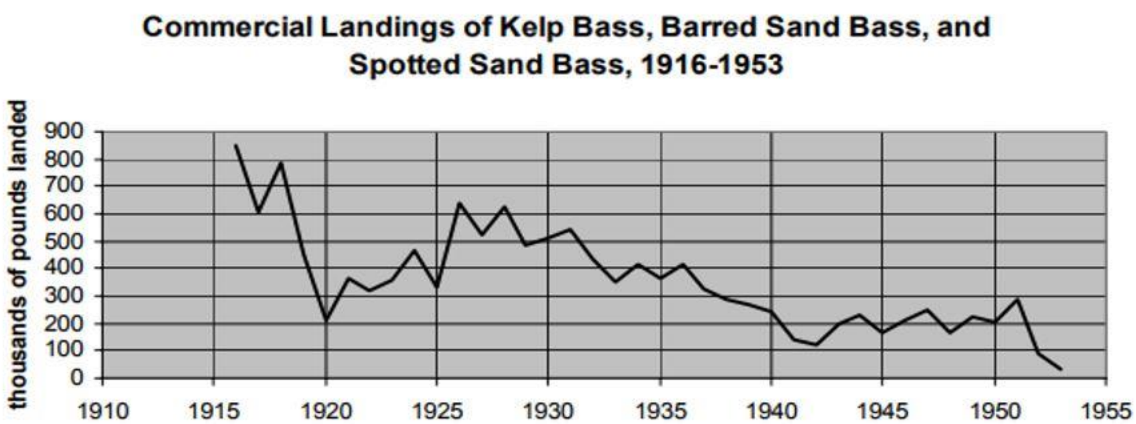

Figure 2-6. Annual commercial landings (lb) of sea basses (combined landings of Kelp Bass, Barred Sand Bass, and Spotted Sand Bass) from 1916 to 1953 (Reproduced from CDFG 2004).

2.4. Social and Economic Factors Related to the Fishery

Marine recreational fishing in general supports the economy through the contributions of various local businesses and other indirect, fishing related expenditures. The total economic contribution generated for California in 2011 was roughly $2.8 billion and 10,000 jobs (Lovell et al. 2013). An official socioeconomic analysis has never been completed for Kelp Bass; however, the sea bass fisheries play a vital role in southern California recreational fishing as Kelp Bass usually rank within the top ten sport fish species caught (Figure 2-4). Declines in Kelp Bass availability could negatively impact the southern California CPFV fishing industry and other associated businesses if other, equally desirable fishing opportunities are not available.

Recreational fishing is a popular pastime that spans generations and Kelp Bass are one of the most popular sport fish in southern California. A recent study assessed the impacts of the regulation change on the CPFV fishery and considered captains' perceptions of the fishery (Bellquist et al. 2017). The captains believed the new minimum size limit was their greatest challenge in targeting basses in 2013. Angler ridership and trip frequency decreased and so effort shifted from targeting basses to rockfishes. Despite the majority view that the regulation change had a large impact on both Kelp and Barred Sand Bass fishing, many of the captains believed that recreational fishing has minimal impacts on fish populations and the regulation change would not benefit the bass fisheries. These responses from a highly experienced portion of the recreational bass fishing community suggests that increasing public awareness on the impacts of fishing may be helpful for support of management decisions.

3. Management

3.1. Past and Current Management Measures

Kelp Bass, Barred Sand Bass, and Spotted Sand Bass have always been managed together as one group with a combination of minimum size and bag limits. The state Legislature limited the take of “kelp bass and rock bass” in 1939 with a 15-fish aggregate bag limit (Table 3-1). Over the next decade, the bag limit changed several times and a minimum size limit was introduced in 1953. The term “rock bass” was dropped from the regulations in 1957 and the minimum size limit increased over the next few years, until reaching 12.0 in (30.5 cm) where it remained for decades. This minimum size limit was determined from age, growth, and natural mortality data to yield the maximum weight for this fishery (Young 1963). There were a few more changes to the bag limit in the 1970s, but the next regulation update did not occur for nearly 40 years. In 2013, stricter size and bag limits were introduced to address concerns regarding the status of Barred Sand Bass and Kelp Bass populations.

Table 3-1. Historical record of southern California saltwater bass (*Paralabrax* spp.) minimum size and bag regulations (Adapted from Jarvis et al. 2014).

Year	Saltwater bass species listed	Regulation
1939	Kelp Bass, rock bass	Bag limit: 15 fish in aggregate
1949	Kelp Bass, rock bass	Bag limit: 10 fish in aggregate
1951	Kelp Bass, rock bass	Bag limit: 15 fish in aggregate, with not more than 10 of any one species
1953	Kelp Bass, rock bass, Barred Sand Bass, Spotted Sand Bass	Cannot be sold or purchased. Minimum size limit: 26.7 cm (10.5 in) TL
1957	Kelp Bass, Barred Sand Bass, and Spotted Sand Bass	Minimum size limit: 27.9 cm (11.0 in) TL
1958	Kelp Bass, Barred Sand Bass, and Spotted Sand Bass	Minimum size limit: 29.9 cm (11.5 in) TL
1959	Kelp Bass, Barred Sand Bass, and Spotted Sand Bass	Minimum size limit: 30.5 cm (12.0 in) TL
1972	Kelp Bass, Barred Sand Bass, and Spotted Sand Bass	Bag limit: 20 fish in aggregate, with not more than ten of any one species
1975	Kelp Bass, Barred Sand Bass, and Spotted Sand Bass	Bag limit: 10 fish in aggregate, with not more than ten of any one species
2013	Kelp Bass, Barred Sand Bass, and Spotted Sand Bass	Bag limit: Five fish in aggregate; Minimum size limit: 35.6 cm (14.0 in) TL

3.1.1. Overview and Rationale for the Current Management Framework

Minimum size limits are set to allow fish to live long enough to reproduce for one or more seasons before reaching a size at which they can be legally retained. The current size limit of 14.0 in (35.6 cm) corresponds with fish that are 7-plus years of age and allows for several years of spawning before fish can be legally taken by the fishery. Bag limits are typically utilized to limit the number of reproducing individuals that can be removed from the population. The current reduced bag limit from ten to five fish (in combination with Barred Sand Bass and Spotted Sand Bass) is designed to limit the impact of fishing on this stock.

3.1.1.1. Criteria to Identify When Fisheries Are Overfished or Subject to Overfishing, and Measures to Rebuild

The Department has not established overfishing criteria for the Kelp Bass fishery. There is no specific trigger for making a regulation change in this fishery and any decision to re-evaluate the current management strategy is based on supporting evidence from multiple sources. Prior to the regulation change in 2013 staff noted a concurrent and sustained drop in catch rates and relative fish abundance, paired with a potential recruitment failure, as described in Jarvis et al. (2014).

Staff continue to monitor catch, effort, and size trends annually utilizing both fishery-dependent and fishery-independent datasets. These data are evaluated relative to historic trends and environmental factors (Jarvis et al. 2014). A stock assessment and FMP have not been completed for the Kelp Bass resource. Sustainability of the fishery is currently being evaluated through various methods, including length at age-based models and the Data Limited Methods Toolkit to conduct a Management Strategy Evaluation (MSE) of alternative management procedures. Staff are also monitoring the effectiveness of the size and bag limit implemented in 2013 by sampling the number and size of Kelp Bass discarded in the CPFV fishery. Since more reproductively mature Kelp Bass are now left in the population (i.e. 12 to 14 in fish) we expect that more offspring are being produced. Thus, as these offspring reach a size that is susceptible to harvest, at 6 or 7 years of age, we expect to see a more even distribution of younger age classes of sublegal fish in the discards as the new recruits enter the fishery. As these fish reach legal size at about 8 years-old, an increase in the ratio of kept to discarded fish should also occur. Therefore, if the number of kept fish does not increase and we do not observe large cohorts of sublegal fish entering the fishery as discards in the 5 to 10 years following the regulation change, further regulation change may be needed.

3.1.1.2. Past and Current Stakeholder Involvement

Stakeholder involvement has occurred during regulation changes for the sea basses and while vetting the use of an Ecological Risk Assessment (ERA) tool. The last regulation change increased the minimum size limit and decreased the bag limit (§28.30, Title 14, CCR). Leading up to the regulation change various stakeholder groups including Tribes, CPFV operators, recreational anglers, spearfishers, Non-governmental Organizations (NGOs), other scientists, and the general public were consulted and given the opportunity to comment throughout the Commission process. A series of informative presentations by Department staff experts on the topic engaged stakeholders and stakeholder input was considered. The ERA tool was run on a group of test case species, including Kelp Bass, and several species experts, industry leaders, and user groups participated in workshops with Department scientists. Stakeholder input was utilized during the development and testing of the tool. A final report describing the testing of the ERA can be found here: http://www.oceansciencetrust.org/wp-content/uploads/2017/11/Ecological-Risk-Assessment-report-OST-2017.pdf.

To create effective future management strategies for Kelp Bass, the Department will continue to engage stakeholders when regulation changes or novel approaches to managing the fishery are being considered, when FMPs are being developed, and if new collaborative opportunities arise for research and monitoring.

3.1.2. Target Species

3.1.2.1. Limitations on Fishing for Target Species

3.1.2.1.1. Catch

The Department continues to manage the three sea bass species (Kelp Bass, Barred Sand Bass, Spotted Sand Bass) together, and there is a bag and possession limit of five fish in any combination of species (§28.30, Title 14, California Code of Regulations (CCR)).

3.1.2.1.2. Effort

There are no regulatory limitations on effort. Only a sport fishing license is required for recreational anglers not fishing off a pier.

3.1.2.1.3. Gear

Kelp Bass are taken only by hook and line and by spear. Recreational anglers fishing from boat or shore may use any number of hooks and lines, with the following exception: on public piers, no person may use more than two rods and lines.

3.1.2.1.4. Time

The Kelp Bass fishery is open year-round.

3.1.2.1.5. Sex

Both sexes of Kelp Bass may be taken in the recreational fishery. It is not possible to determine sex externally; however, spawning females and males can exhibit different colors and patterns.

3.1.2.1.6. Size

The Department continues to manage the three sea bass species together. For Kelp Bass, Barred Sand Bass and Spotted Sand Bass, there is a minimum size limit of 14.0 in (35.6 cm) TL or 10.0 in (25.4 cm) alternate length (defined as the length from the base of the foremost spine of the dorsal fin to the longest tip of the tail) (§28.30, Title 14, CCR). The three bass species also have a fillet length regulation that permits the filleting of legal-sized bass aboard vessels while at-sea. All species of bass fillets must be a minimum of 7.5 in (19.1 cm) length and bear intact a one in square patch of skin in order to aid in identifying the fish species for enforcement purposes (§27.65(1), Title 14, CCR).

3.1.2.1.7. Area

Aside from MPAs, there are no limitations on where fishing can occur for Kelp Bass.

3.1.2.1.8. Marine Protected Areas

Pursuant to the mandates of the Marine Life Protection Act (Fish and Game Code (FGC) §2850), the Department redesigned and expanded a network of regional MPAs in state waters from 2004 to 2012. The resulting network increased total MPA coverage from 2.7% to 16.1% of state waters. Along with the MPAs created in 2002 for waters surrounding the Santa Barbara Channel Islands, California now has a statewide scientifically-based ecologically connected network of 124 MPAs. The MPAs contain a wide variety of habitats and depth ranges. Although the MPA network was not designed to specifically benefit a single species such as Kelp Bass, 14% of shallow hard bottom habitats in southern California are within MPAs, which support the kelp forests and rocky reefs that constitute their primary habitat. Due to their limited home ranges Kelp Bass respond well to these areas of decreased fishing, and a multitude of studies have found Kelp Bass abundance and biomass are greater inside than outside of MPAs across southern California (Froeschke et al. 2006; Tetreault and Ambrose 2007; Hamilton et al. 2010; Hastings et al. 2014). For more information on the specific Southern California MPAs visit our website at https://www.wildlife.ca.gov/conservation/marine/mpas/network/southern-california

3.1.2.2. Description of and Rationale for Any Restricted Access Approach

The recreational Kelp Bass fishery is an open access fishery.

3.1.3. Bycatch

3.1.3.1. Amount and Type of Bycatch (Including Discards)

The Fish and Game Code (FGC §90.5) defines bycatch as “fish or other marine life that are taken in a fishery but which are not the target of the fishery.” Bycatch includes “discards,” defined as “fish that are taken in a fishery but are not retained because they are of an undesirable species, size, sex, or quality, or because they are required by law not to be retained” (FGC §91). The term “Bycatch” may include fish that, while not the target species, they are desirable and are thus retained as incidental catch.

To assess the most commonly caught species with Kelp Bass, all trips where at least one Kelp Bass was caught were analyzed. This eliminates offshore fishing trips that solely target pelagic species; however, it is not possible to avoid trips where effort is split between multiple habitats, and both nearshore and offshore species are landed on the same trip. The most common species caught in 2018 on CPFV trips where Kelp Bass was caught included Ocean Whitefish (*Caulolatilus princeps*), unspecified rockfishes, California Scorpionfish (*Scorpaena guttata*), Pacific Bonito (*Sarda chiliensis*), Barred Sand Bass, Halfmoon (*Medialuna californiensis*), Yellowtail (*Seriola lalandi*), California Sheephead (*Semicossyphus pulcher*), California Barracuda (*Sphyraena argentea*), and Pacific Mackerel (*Scomber japonicus*) (Table 3-2). Although Kelp Bass were caught on 100% of these trips and are the most abundant species caught, they may not always be the primary target. These other species may be primary targets or secondary targets on CPFV trips that are targeting Kelp Bass. Note that most of these species are also associated with Kelp Bass habitat (see section 1.4.1). However, species such as Pacific Mackerel and Bonito, which are more pelagic species, are also caught on the same trips as they often frequent kelp beds and rocky reef areas. All species listed in Table 3-2 have state or federal management measures in place.

Table 3-2. Number caught and percent of trips (frequency of occurrence) for the top ten most abundant species on CPFV trips (n=6,147) where at least one Kelp Bass was also caught in 2018 (CDFW MLS 2019).

Species	Number caught	Percent of trips	Number of Kelp Bass caught on associated trips
Kelp Bass	**289,419**	**100**	**289,419**
Ocean Whitefish	101,310	38	88,549
Unspecified rockfish	70,938	35	84,888
California Scorpionfish	52,588	20	47,932
Pacific Bonito	48,503	28	73,385
Barred Sand Bass	33,115	34	109,672
Halfmoon	24,827	14	56,677
Yellowtail	20,951	26	75,773
California Sheephead	18,843	38	122,257
California Barracuda	18,265	23	84,041
Pacific Mackerel	15,638	6.8	19,1943

Catching any species whose take is prohibited is of special concern. Of the species that are prohibited from recreational take, Giant Sea Bass and Garibaldi (*Hypsypops rubicundus*) have been recorded as caught and discarded on CPFV trips in 2018 where at least one Kelp Bass was also caught. No information is available on whether these fish were discarded dead or alive. However, the reported numbers and frequency of these occurrences are extremely low (Table 3-3). Giant Sea Bass bycatch does not seem to be a resource concern at this time as their populations appear to be increasing (House et al. 2016). Due to considerable outreach over the years, anglers are aware of their protected status and the importance of handling them carefully and releasing immediately.

Table 3-3. Species prohibited from recreational take that were caught aboard CPFV trips along with Kelp Bass in 2018 (CDFW MLS 2019).

Species	Number caught	Percent of trips
Giant Sea Bass	30	0.47
Garibaldi	15	0.07

Since the regulation change in 2013, the proportion of sublegal Kelp Bass discards has increased from an average of 89% for 2003 to 2012 to 97% for 2013 to 2018 (Figure 3-1 A). The annual number of discarded Kelp Bass on CPFV trips has increased from an average of 89,410 for 1995 to 2012 to 218,142 for 2013 to 2018 (Figure 3-1 B). The estimated number of discarded Kelp Bass has also increased, albeit less dramatically, on private/rental boat trips from an average of 235,763 for 2004 to 2012 to 262,950 for 2013 to 2018 (Figure 3-1 C).

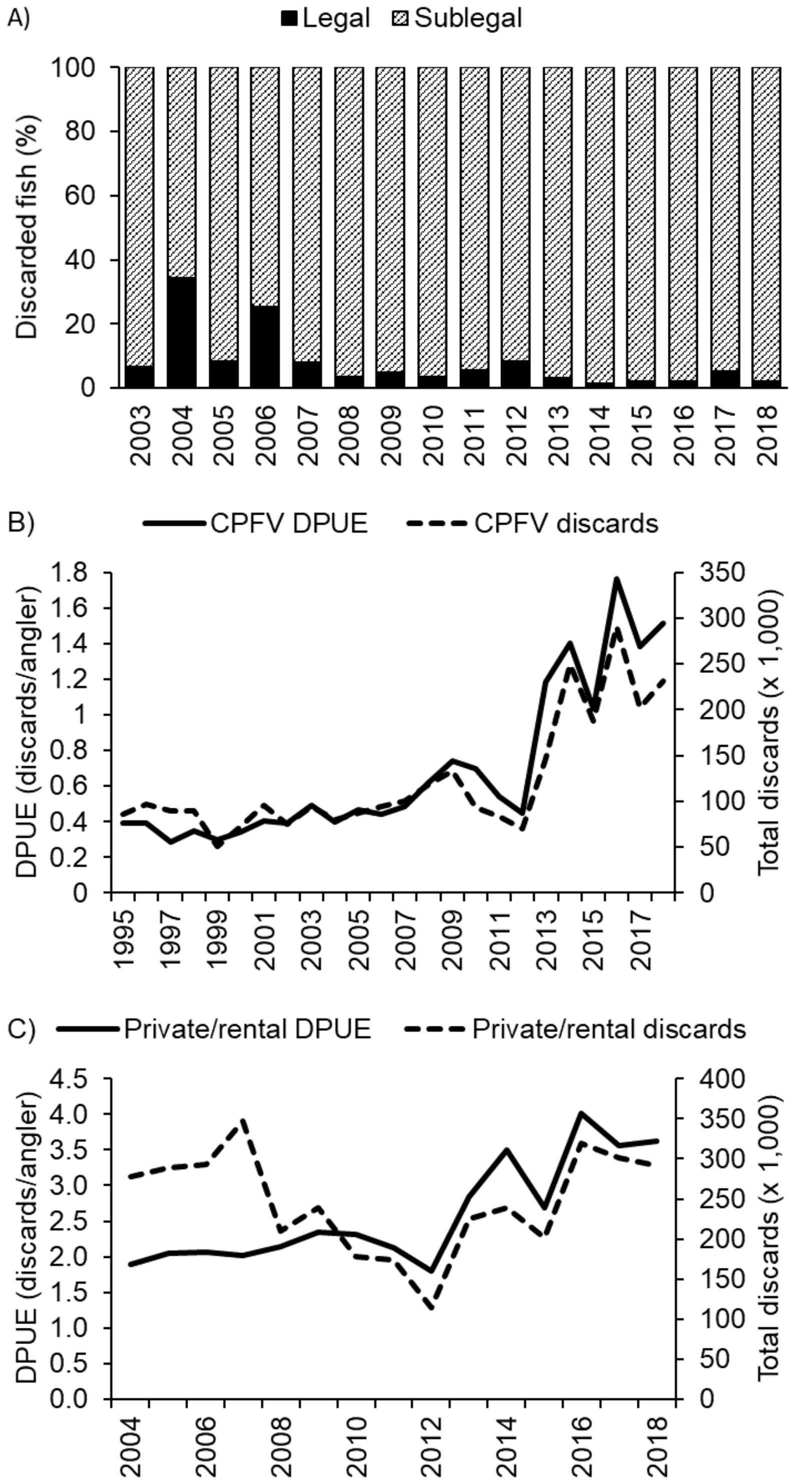

Figure 3-1. A) Annual trends in the proportion of sublegal and legal Kelp Bass discarded from CPFVs (RecFIN 2019) and annual trends in bycatch of Kelp Bass presented as Discards Per Unit Effort and the total number of discards (dashed line) for (B) CPFVs (CDFW MLS 2019) and (C) private/rental boats (RecFIN 2019).

Discard mortality is primarily caused by fishing-related trauma as well as predation from California Sea Lions (*Zalophus californianus*), sea birds, Harbor Seals (*Phoca vitulina*) and other marine life. Most of the Kelp Bass discards are 10.0 to 12.0 in (25.4 to 30.5 cm) and are sexually mature. Since both initial and short-term discard mortality is very low at 1.87% (Kelp Bass) and 3.1% (Kelp Bass, Barred Sand Bass, and Spotted Sand Bass combined) (Semmens and Parnell 2014) respectively, bycatch of sublegal discards is of minor concern. The Department has collected similar data from 2013 to 2018 and estimates initial discard mortality to be 1.72%; however, incidence of barotrauma was estimated at 14.0% and may increase short-term mortality.

Most discarded Kelp Bass are quickly released back into the water at the same location. Since the mortality rate is relatively low, it is unlikely there is any substantial impact to the Kelp Bass population or ecosystem. However, to better understand the total impacts of bycatch, further research on the long-term survivorship of discarded Kelp Bass is needed as current mortality estimates are only based on initial and short-term observations.

3.1.3.2. Assessment of Sustainability and Measures to Reduce Unacceptable Levels of Bycatch

As described above, bycatch caught in the CPFV fishery while targeting Kelp Bass along with other rocky reef associated species primarily consists of species that are monitored and managed separately. While some sensitive or protected species are caught in the CPFV fishery for Kelp Bass, the reported numbers caught per year are low, and all were released. This fishery has not had any adverse interactions with marine mammals and while seabirds are sometimes hooked by anglers or tangled in fishing line, further research is needed to determine the degree of impact to individual birds and their populations. While the proportion of Kelp Bass discarded is high, the available data suggest discard mortality is low. However, as mentioned in section 3.1.3.1, further information on the long-term survivorship of discards is needed to fully evaluate the effects on the population. For these reasons, the Department does not consider the amount of bycatch for the Kelp Bass fishery to be at an unacceptable level and measures have not been developed to reduce it.

3.1.4. Habitat

3.1.4.1. Description of Threats

Eelgrass beds, one of the primary habitats for juvenile Kelp Bass (Love 2011), are highly degraded for many reasons, including habitat fragmentation, coastal development, and urban and storm runoff decreasing water quality (Zedler 1996;

Lotze et al. 2006). Kelp Bass in seagrass and bay habitats may be particularly affected by high levels of contaminants, which can lower body condition and reproductive success (Cross and Hose 1989). Pollution from wastewater discharge can also have negative impacts on kelp forest habitats, but less than the impacts observed for bays and estuaries as environmental conditions play a larger role in kelp ecosystem health (North and Hubbs 1968; Schiff et al. 2000). Invasive species, climate change, and increased variability in sea surface temperatures may also have detrimental effects on the health of nearshore kelp forest and rocky reef ecosystems (Caselle et al. 2017; Provost et al. 2017; Ramírez-Valdez et al. 2017).

3.1.4.2. Measures to Minimize Any Adverse Effects on Habitat Caused by Fishing

The Kelp Bass fishery is mainly a hook and line recreational fishery; some spearfishing does occur. Adverse impacts of the Kelp Bass recreational hook and line fishery on kelp forest and rocky reef habitats are most likely insignificant. Some impact to kelp forests or marine invertebrates associated with rocky reefs can result from anchoring of vessels or fishing gear snagging on structure or organisms; however, this is likely minimal. The impacts of a hook and line fishery on habitats is likely very minor and measures to minimize them have not been developed.

3.2. Requirements for Person or Vessel Permits and Reasonable Fees

Unless recreationally fishing off a public pier, all anglers 16 years old or older are required to purchase a fishing license. A Recreational Ocean Enhancement Stamp (Validation) is required for any person taking fish south of Point Arquello (Santa Barbara County). Captains operating their vessels as CPFVs or private charters must purchase a permit. In 2019, the cost of an annual resident sport fishing license is $49.94, and an Ocean Enhancement Validation is $5.66 (Table 3-4). The most current license options and fees for the recreational fishery may be accessed at https://www.wildlife.ca.gov/Licensing/Fishing and https://www.wildlife.ca.gov/Licensing/Commercial/Descriptions.

Table 3-4. Annual sport fishing license fees from January 1 to December 31, 2019. Accessed June 24, 2019 at https://www.wildlife.ca.gov/Licensing/Fishing and https://www.wildlife.ca.gov/Licensing/Commercial/Descriptions.

License	Fee	Description
Commercial Passenger Fishing Vessel License	$379.00	Required for any boat from which persons are allowed to sport fish for a fee.
Resident Sport Fishing	$49.94	Required for any resident 16 yr of age or older to fish.
Recreational Non-resident Sport Fishing	$134.74	Required for any non-resident 16 yr of age or older to fish.
Recreation Ocean Enhancement Validation	$5.66	Required to fish in ocean waters south of Point Arguello (Santa Barbara County). An Ocean Enhancement Validation is not required when fishing under the authority of a One or Two-Day Sport Fishing License.
Reduced-Fee Sport Fishing License – Disabled Veteran	$7.47 at Department offices. $7.82 from license agents	Available for any resident or non-resident honorably discharged disabled veteran with a 50% or greater service-connected disability. After you prequalify for your first Disabled Veteran Reduced-Fee Sport Fishing License, you can purchase disabled veteran licenses anywhere licenses are sold.
Reduced-Fee Sport Fishing License – Recovering Service Member	$7.47	Available for any recovering service member of the US military. The Recovering Service Member Reduced-Fee Sport Fishing License is only available at Department License Sales Offices.
Reduced-Fee Sport Fishing License – Low Income Senior	$7.47	Available for low income California residents, 65 yr of age and older, who meet the specified annual income requirements. The Reduced-Fee Sport Fishing License for Low Income Seniors is only available at Department License Sales Offices.

4. Monitoring and Essential Fishery Information

4.1. Description of Relevant Essential Fishery Information

FGC §93 defines Essential Fishery Information (EFI) as “information about fish life history and habitat requirements; the status and trends of fish populations, fishing effort, and catch levels; fishery effects on age structure and on other marine living resources and users, and any other information related to the biology of a fish species or to taking in the fishery that is necessary to permit fisheries to be managed according to the requirements of this code”. There are many studies on life history EFI for Kelp Bass as described in section 1, including age and growth, reproduction, and movement. This Chapter summarizes the EFI that is routinely collected and used to monitor the health of the stock and ecosystem. The Department relies on a combination of fishery-dependent and fishery-independent sources to monitor the status of the Kelp Bass fishery.

4.2. Past and Ongoing Monitoring of the Fishery

4.2.1. Fishery-dependent Data Collection

Fishery-dependent data collected by the Department provides an excellent way to monitor fishing effort, catch levels, and the size structure of retained Kelp Bass. Fishery-dependent data are collected from CPFV logbooks, and from all fishing modes sampled by CRFS. Both CPFV logbook and CRFS data collected by the Department contribute valuable estimates of catch and effort that help staff monitor the status of Kelp Bass.

Beginning in 1935, CPFV operators were required to keep daily catch logs and submit them to the Department monthly. These data were collected continuously to present day, except for the years during World War II (1941 to 1946) when most CPFVs were not fishing (Hill and Schneider 1999). Logbook data have always included the date fishing occurred, port code, boat name, Department fishing block, angler effort, and the number of fishes kept by species, and after 1994 included discarded fish, target species, bait type, and sea surface temperature. However, Kelp Bass were initially recorded within the broader “rock bass” category (which also included Barred Sand Bass and Spotted Sand Bass) and were not consistently reported by species until 1975. Although initially recorded on paper, as of December 2017, 70% of all CPFV logs are voluntarily entered via the MLS electronic application, which is accessible to Department scientists.

All modes of recreational fishing were surveyed by the Marine Recreational Fisheries Statistics Survey (MRFSS) for estimates of catch and effort between 1979 and 2003.

The Pacific States Marine Fisheries Commission ran these surveys with both federal and state funding. A combination of dockside surveys, CPFV sampling, and phone interviews were used to generate the estimates. In January 2004, the Department implemented its own sampling survey, CRFS, to replace the MRFSS surveys using similar, but different methods.

Current CRFS estimates (2004 to 2018) use catch and effort data collected by samplers from all fishing modes (beach/bank, manmade/jetty structures, private/rental boats, and CPFVs). In addition, CRFS also collects size (length and weight) information on kept fish. Numbers of discards are also recorded for all modes and discard lengths are obtained opportunistically on CPFVs. Estimates from CRFS and MRFSS are not directly comparable due to differences in methodology, so only CRFS data are presented in this report. CRFS data on catch estimates and mortality are available electronically to the public within 40 days of collection on the updated RecFIN website (https://www.recfin.org).

To evaluate the effectiveness of the 2013 sea bass regulation change, the Department is conducting an ongoing study monitoring the bass discard rates aboard CPFVs. The purpose of this study is to collect the number, lengths, and incidence of barotrauma and mortality of discarded bass at various locations in southern California. This increase in monitoring of CPFV trips that are specifically targeting the basses will aid in evaluating the effectiveness of raising the minimum size limit from 12.0 to 14.0 in (30.5 to 35.6 cm). As of early 2019 the study has been collecting data for 5 years and the study will continue for the next 3 to 5 years. Data on barotrauma and mortality of discarded fish will fill valuable data gaps on fishing mortality that can be applied to stock assessments and fishery models. Data on the size and number of fishes discarded will be used to evaluate the effectiveness of the 2013 regulation change, as described in detail in section 3.1.1.1 and help inform the need for additional management measures.

4.2.2. Fishery-independent Data Collection

Fishery-independent data can provide a better, less biased assessment of relative abundance because sampling can be standardized and information on all life stages can be collected. In addition, trends in fishery-dependent data for this species can be masked by hyperstability, or artificially high catch rates, since anglers target aggregations rather than an evenly distributed population (Erisman et al. 2011).

Fishery-independent data on Kelp Bass are available from various sources and involve different temporal and spatial scales. Much of the data on Kelp Bass come from long-term monitoring studies looking at entire species assemblages where Kelp Bass is a primary component. For example, records of fish entrainment in the cooling water intakes of southern California's coastal electric generating stations provided a useful dataset of relative Kelp Bass abundance from 1979 to 2010 (Miller and Erisman 2014). However, these data became unavailable after 2012 following the shutdown of major power plants such as San Onofre Nuclear Generating Station. Quarterly plankton tows conducted by California Cooperative Oceanic Fisheries Investigations (CalCOFI) from 1951 to the present provide annual estimates of recruitment for several species, including basses (Jarvis et al. 2014). These data have limitations, however, since similarities in larval physiology prevent identification of the basses to individual species. Occidental College's Vantuna Research Group has conducted quarterly surveys of fish assemblages (including Kelp Bass) along the breakwater and artificial reef at King Harbor (Redondo Beach, California) since 1974 (Stephens Jr et al. 1994; Pondella et al. 2002). These surveys provide one of the few long-term fishery-independent datasets for the relative abundance of Kelp Bass in southern California. The National Park Service has conducted a Channel Islands Kelp Forest Monitoring program throughout the northern Channel Islands since 1985 (Davis 1997). The Partnership for Interdisciplinary Studies of Coastal Oceans (PISCO) has conducted a kelp forest monitoring program at over 100 locations across California since 1999. PISCO also deploys Standard Monitoring Units for the Recruitment of Fishes to assess settlement trends of kelp forest fishes in the Channel Islands since 2000 and has found Kelp Bass is consistently the most abundant settler (Caselle et al. 2010).

As a short-term project, the Department published a study investigating whether a non-lethal indicator of trophic level could be used to evaluate fishery health inside southern California MPAs, with Kelp Bass serving as the model species (Davis et al. 2018). The Department will continue to conduct research, monitoring, and collaborate with others on projects that collect Kelp Bass EFI.

5. Future Management Needs and Directions

5.1. Identification of Information Gaps

A multitude of previous studies is available on EFI for Kelp Bass (see section 1); however, additional EFI are necessary for effectively monitoring and evaluating the Kelp Bass resource. Although EFI on age and growth of Kelp Bass exists, the Department is updating this information with more current and larger sample sizes. Additionally, a better estimate of natural mortality is needed. There is also uncertainty regarding long-term mortality associated with hook and line catch and release practices. Additional research that would assist in effective management includes a socioeconomic analysis of the Kelp Bass fishery, comprising both charter and private/rental modes. Research on larval transport within the southern California Bight would also aid in our understanding of the connectedness of Kelp Bass populations (Table 5-1).

Table 5-1. Informational needs for the Kelp Bass fishery and their priority for management.

Type of information	Priority for management	How essential fishery information would support future management
Long term post-release mortality	High	Quantifying long-term discard mortality is necessary for a more accurate estimate of overall fishing mortality.
Formal stock assessment	High	Information used to estimate spawning stock biomass and maximum sustainable yield.
Updated estimate of natural mortality	Medium	Natural mortality estimates are used in the calculation of total mortality. Estimated total mortality rates are utilized in stock assessments and when modeling forward projections of the fishery.
Amount of catch attributed to research take (annually)	Low	Quantifying this type of catch will contribute to the annual estimate of the total number of removals from the population.
Updated length and weight at age	Low	Parameters calculated from this information will be used to calculate an updated growth curve.
Updated length and age at maturity	Low	Provides information about what size and age Kelp Bass first become mature, when 50% are mature, when most are expected to be mature, and any differences between sexes. Minimum size lengths are chosen based on these lengths to allow fish to spawn before they can be legally retained.

Type of information	Priority for management	How essential fishery information would support future management
Genetics	Low	Information used to assess the connectivity of populations and the degree of vulnerability of the species based on local population genetic profiles.
Estimate of amount of money the fishery contributes to California's economy	Low	This information would be the goal of a socioeconomic analysis that would be useful when assessing how changes in the fishery impact the economy.
Estimate of how changes in fishery affect CPFV industry	Low	Information useful when considering regulation changes and would inform a larger socioeconomic analysis of the fishery.
GIS analysis of catch in relation to habitat types and MPA locations	Low	Information used to determine what percentage of catch occurs in each habitat type. This helps to evaluate new MPAs relative to historic fishing.

A formal stock assessment of Kelp Bass using existing and new EFI would also be helpful in the sustainable management of the fishery. However, an effective stock assessment would depend on reliable estimates of fishery indicators from the beginning of the fishery, when fishing pressure was light, and these data are rarely available from recreational fisheries.

5.2. Research and Monitoring

5.2.1. Potential Strategies to Fill Information Gaps

Department staff will continue to utilize CPFV logbook and CRFS data to monitor Kelp Bass fishery trends. The Department will also continue to search for and incorporate any relevant results from other fishery-dependent or fishery-independent studies conducted by others. As mentioned above, additional fishery-independent indices of abundance for Kelp Bass will be important for monitoring future trends in the stock. This may require a combination of efforts led by the Department and independent researchers through various grants or other funding sources. Studies could include temporal surveys of the relative abundance and the size of Kelp Bass within kelp bed and other habitats in southern California. Moreover, an estimate of long-term discard mortality will be useful to the Department to understand whether restrictive size limits result in increased mortality of sublegal size classes. Research efforts like these may be particularly well suited for graduate studies at local universities.

5.2.2. Opportunities for Collaborative Fisheries Research

The Department has collaborated in the past and will continue to work with outside entities such as academic organizations, NGOs, citizen scientists, and both commercial and recreational fishery participants to help fill information gaps related to the management of state fisheries. The Department will also reach out to outside persons and agencies when appropriate while conducting or seeking out new fisheries research required for the management of Kelp Bass. Several of the information gaps identified above (section 5.1) are potential areas for collaboration. In particular, SCUBA surveys to determine Kelp Bass abundance and discard studies to determine long-term catch and release mortality are good subjects for collaborative studies, potentially involving both anglers and academic entities.

5.3. Opportunities for Future Management Changes

This section is intended to provide information on changes to the management of the fishery that may be appropriate, but does not represent a formal commitment by the Department to address those recommendations. ESRs are one of several tools designed to assist the Department in prioritizing efforts and the need for management changes in each fishery will be assessed in light of the current management system, risk posed to the stock and ecosystem, needs of other fisheries, existing and emerging priorities, as well as the availability of capacity and resources.

Unlike Barred Sand Bass, for which catch continues to decline after the new bag and size limits were implemented in 2013, Kelp Bass landings and CPUE have started to increase for CPFVs and remained relatively stable for private/rental boats. Because Kelp Bass form smaller and less predictable spawning aggregations than Barred Sand Bass, this seems to make them less vulnerable to overfishing and more responsive to current management actions. Since it will take about 8 years for individuals to recruit into the fishery with the current size limit, it may be too soon to estimate how much of the change in landings and CPUE can be attributed to regulation changes versus environmental conditions. The Department will continue to monitor landings and discard rates to stay informed of changes to the Kelp Bass fishery.

The Department is currently prioritizing fisheries within the MLMA 2018 Master Plan for Fisheries framework and exploring how to utilize an MSE approach with certain fisheries. MSE simulates the performance of a fishery in the future by testing a multitude of alternative management procedures against a set of performance metrics and evaluating the tradeoffs. The Department is currently developing a model of the Kelp Bass population to conduct an MSE using the Data Limited Toolkit platform. It is hoped this analysis will provide information about what management measures are most likely to meet management objectives, as well as the tradeoffs between different management measures. A formal stock assessment on the Kelp Bass fishery would also aid in the sustainable management of this fishery.

5.4. Climate Readiness

Little is known about how climate change may affect Kelp Bass populations and habitats. To incorporate climate readiness into Kelp Bass management it is important to increase our understanding of possible impacts of climate variability. California's coastal waters are already subject to high variability due to episodic events such as the ENSO, the PDO, and the NPGO. Climate change will bring even further uncertainty to these trends, with possible extreme implications for ecosystem function and fishery sustainability in coastal areas. To manage Kelp Bass populations effectively under climate change, it will be important to take a proactive approach to management. This may entail increased or targeted monitoring of populations and/or precautionary management measures until the uncertainties associated with climate change can be better understood.

Climate change that results in warmer ocean temperatures could have both positive and negative effects on Kelp Bass populations. Since bass recruitment declines during cold water periods and spikes during warmer water regimes (Jarvis et al. 2014), sustained warmer water periods may result in population growth and push the fishery farther north. However, warmer ocean temperatures can result in loss of kelp forest habitat (Wernberg et al. 2010), which could have a negative effect on Kelp Bass survival (White and Caselle 2008) and/or recruitment. Increased storm frequency and coastal runoff may have negative impacts on kelp forest habitats, which can affect entire community assemblages (Byrnes et al. 2011). Ocean acidification may also have a negative impact on prey availability for Kelp Bass, especially for hard-shelled invertebrates.

Protecting the health of key habitats for Kelp Bass such as kelp forests and rocky reefs is a priority for climate readiness. This might involve protection of spawning grounds, removal and monitoring for invasive species, and regulation of coastal runoff. Finally, increased monitoring of environmental variables, fish abundance, and distribution from all available data sources will be important to anticipate change and take proactive management actions.

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