

### 3.3.6 Rockfishes *Sebastes* spp.

Rockfishes *Sebastes* spp. belong to the family Scorpaenidae that contains two other genera: the scorpionfishes *Scorpaena* spp. and the thornyheads *Sebastolobus* spp. Scorpaenidae comprise the largest number of commercially and recreationally important California marine fish species. They are also abundant in nearshore California habitats and play important trophic and ecological roles in these communities. They comprise a large component of the shallow subtidal fish community, ranging from nearshore coastal habitats (e.g., kelp forests) to the continental shelf. The rockfishes are the most diverse genus in the Scorpaenidae with some 62 species reported from California coastal waters (Starr et al. 1998), approximately 85 percent of which are harvested in California commercial or sport fisheries.

#### 3.3.6.1 Kelp/Gopher/Black-and-Yellow (KGB) Rockfish Complex



Fishes that are classified into the kelp/gopher/black-and-yellow (KGB) rockfish complex pigment groupings (V\_De and V\_D\_) (Table 3-2) are also genetically similar (Vetter and Stannard 1999 in Tenera 2000a). Since most of the species in this complex have similar life histories and share the same adult habitats, the KGB complex can be considered an assemblage of nearshore, benthic, or epi-benthic rockfishes. In addition to the morphometric, meristic, and genetic similarities of their larval forms, they share similar ecological roles that form the basis for their combination into this complex.

Most members of the KGB complex dwell on or near the bottom of nearshore kelp beds and rocky reefs, with peak abundance found at less than 50 to 100 m (165 to 330 ft) deep (Love 1996). The notable exception to this distribution is the halfbanded rockfish (*Sebastes semicinctus*, which is commonly observed on hard and soft, flat bottom habitat in waters up to 402 m (1,325) deep (Miller and Lea 1972, Eschmeyer et al. 1983, Love

1996). Geographic ranges for all members of this group begin off central Baja California, Mexico, with the exception of quillback and China rockfishes (Miller and Lea 1972, Eschmeyer et al. 1983, Love 1996). These latter two species begin their distribution near San Miguel Island off southern California (Miller and Lea 1972, Eschmeyer et al. 1983, Love 1996). The northern distribution of this group ranges from Monterey Bay and San Francisco, California for halfbanded and calico, and to the northern Gulf of Alaska for brown, copper, and China rockfishes (Miller and Lea 1972, Eschmeyer et al. 1983, Love 1996).

Fishes with the most northerly distributions in this group typically attain both the greatest total lengths and ages for the complex. Brown, copper, quillback, and grass rockfishes can attain maximum lengths of greater than 50 cm (20 in.) (Miller and Lea 1972, Eschmeyer et al. 1983). Copper and quillback rockfishes may reach 41 years and 76 years, respectively, in the Canadian fishery (Yamanaka and Kronlund 1997). The smallest and shortest living rockfish of this group is the calico rockfish that attains a total length of 25 cm (10 in.) and has an estimated longevity of about 12 years (Chen 1971, Miller and Lea 1972, Eschmeyer et al. 1983). The calico rockfish also has the lowest fecundity recorded in the KGB complex at about 2,000 eggs per female at 50 percent maturity but ranging to as high as 113,000 eggs per female (Haldorson and Love 1991). The most fecund rockfish from this group is the grass rockfish with about 760,000 eggs for a 26-cm (10-in.) female (Love and Johnson 1999). The greatest age at 50 percent maturity is six to 11 years for quillback rockfish (Wyllie Echeverria 1987, Yamanaka and Kronlund 1997).

Reproductive capacity of rockfishes is directly related to size, with larger females carrying significantly more eggs than smaller females. Rockfishes are viviparous with internal fertilization (Yoklavich et al. 1996), and the female retains the eggs until she extrudes hundreds to millions (e.g., *Sebastes paucispinis*) (Moser 1967) of eyed, live larvae (Bloeser 1999). The larvae and juveniles can remain in the plankton from one month to approximately one year before settling into primarily benthic habitats as juveniles (Matarese et al. 1989, Moser 1996, Starr et al. 1998). This extended planktonic period makes environmental variation an important determinant of the population abundance of many rockfish species since their vulnerable life stages are exposed to potentially adverse conditions for greater periods of time. Once on the bottom, individuals of many species migrate to deeper water as they mature.

Little is known about the planktonic duration or natural mortality of the fish in the KGB complex. Planktonic duration was estimated for brown, calico, and gopher rockfishes at about three months, one to two months, and two to three months, respectively (Larson

1980, Moser and Butler 1981, Matarese et al. 1989, D. Woodbury 1999, NOAA, Tiburon Laboratories pers. comm.). Larval growth rates have been estimated for larval brown rockfish *Sebastes auriculatus* at 0.14 mm/day (Love and Johnson 1999, Yoklavich et al. 1996).

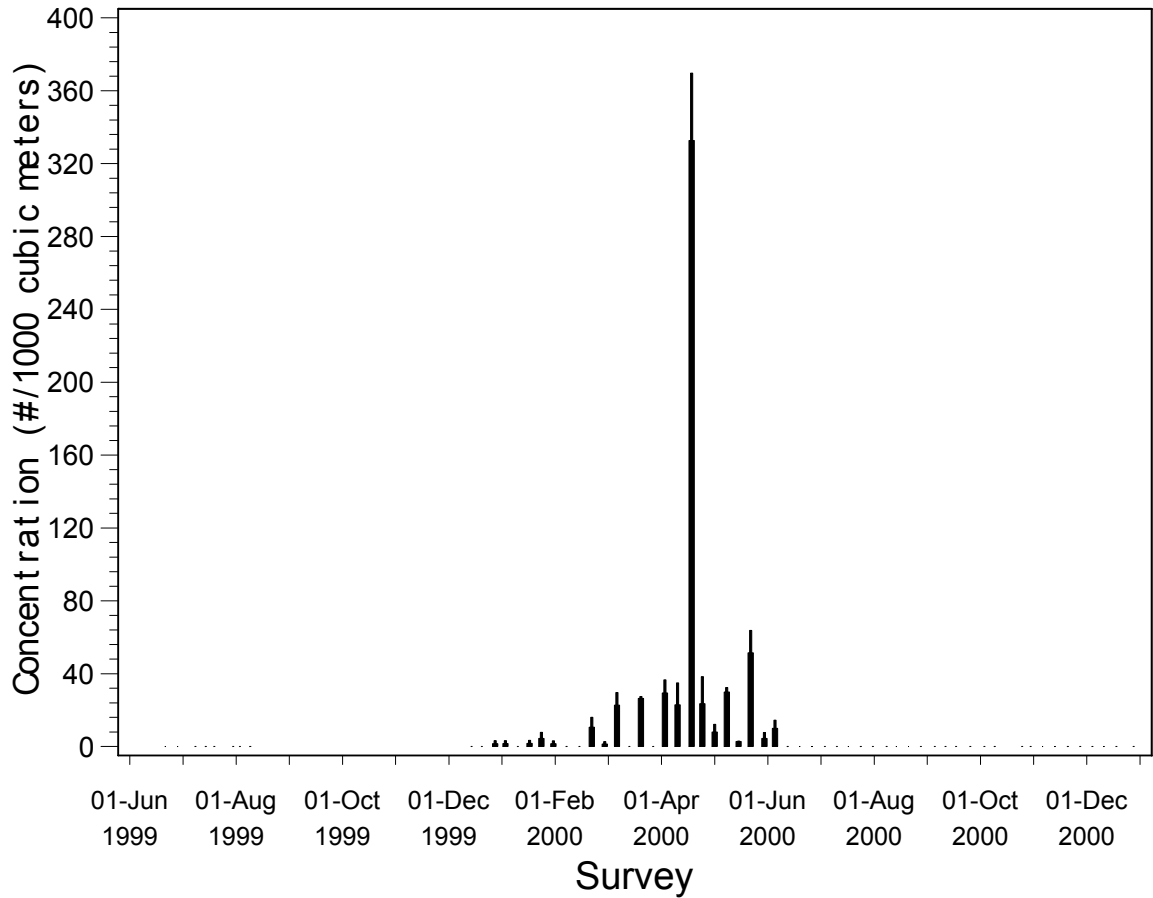
### **3.3.6.2 KGB Rockfish Complex Results**

Larval KGB rockfishes were collected at the MBPP intake station during the winter and spring of 1999 – 2000 (Figure 3-28). This is the period that larval rockfishes are typically abundant along the Pacific coast of the United States (Parrish et al. 1989). Occurrence of larval KGB rockfishes collected at the MBPP matches reported spawning periodicity of these species.

The length frequency distribution for a representative sample of KGB rockfish larvae showed a relatively narrow size range of 3.4 to 5.4 mm (0.13 to 0.21 in.) with an average size of 4.3 mm (0.17 in.) (Figure 3-29). These results indicate that the larvae are close to hatch size and subject to entrainment for a relatively short period of time.

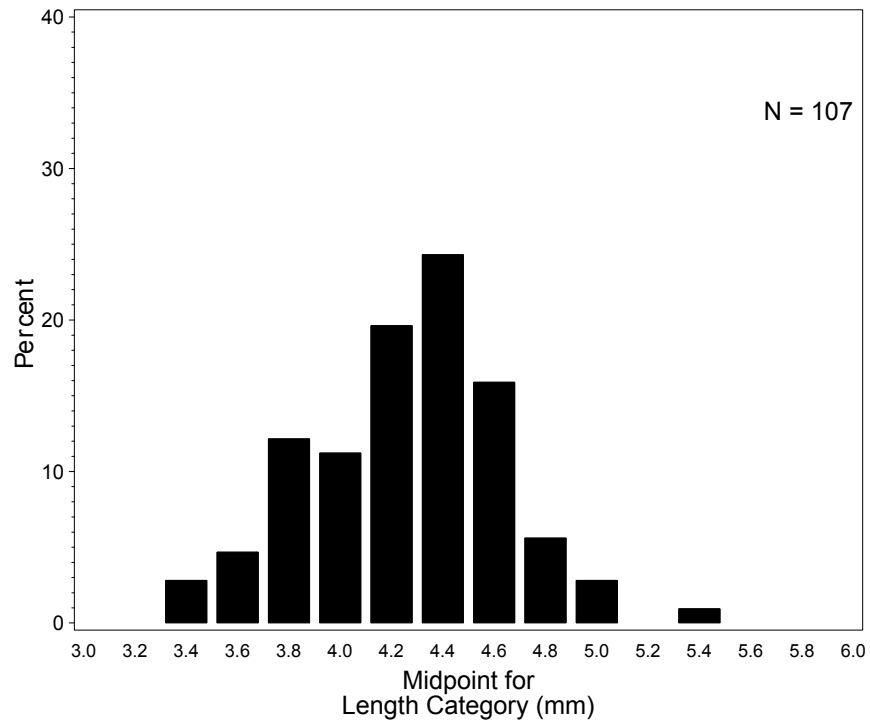
Results from source water surveys showed the same abundance peaks seen in samples collected at the MBPP intake station (Figure 3-30). Although not collected every month, KGB rockfish larvae were collected from all of the stations inside Morro Bay in paired surveys. During the weekly surveys at the MBPP intake, their occurrence was less consistent. They reached their greatest concentration at the Estero Bay Station 5 during the May survey when they were less common at the stations within Morro Bay.

Concentration ( $\#/m^3$ ) of larval KGB complex rockfishes was compared among stations for samples collected at ebb and flood tides (Figure 3-31). KGB rockfish larvae are probably in greater concentrations in offshore areas outside the bay and were only collected at Station 4 during one of the paired entrainment-source water surveys. As expected for a taxon with a primarily offshore distribution, there is no clear relationship between larval concentration and tidal current.

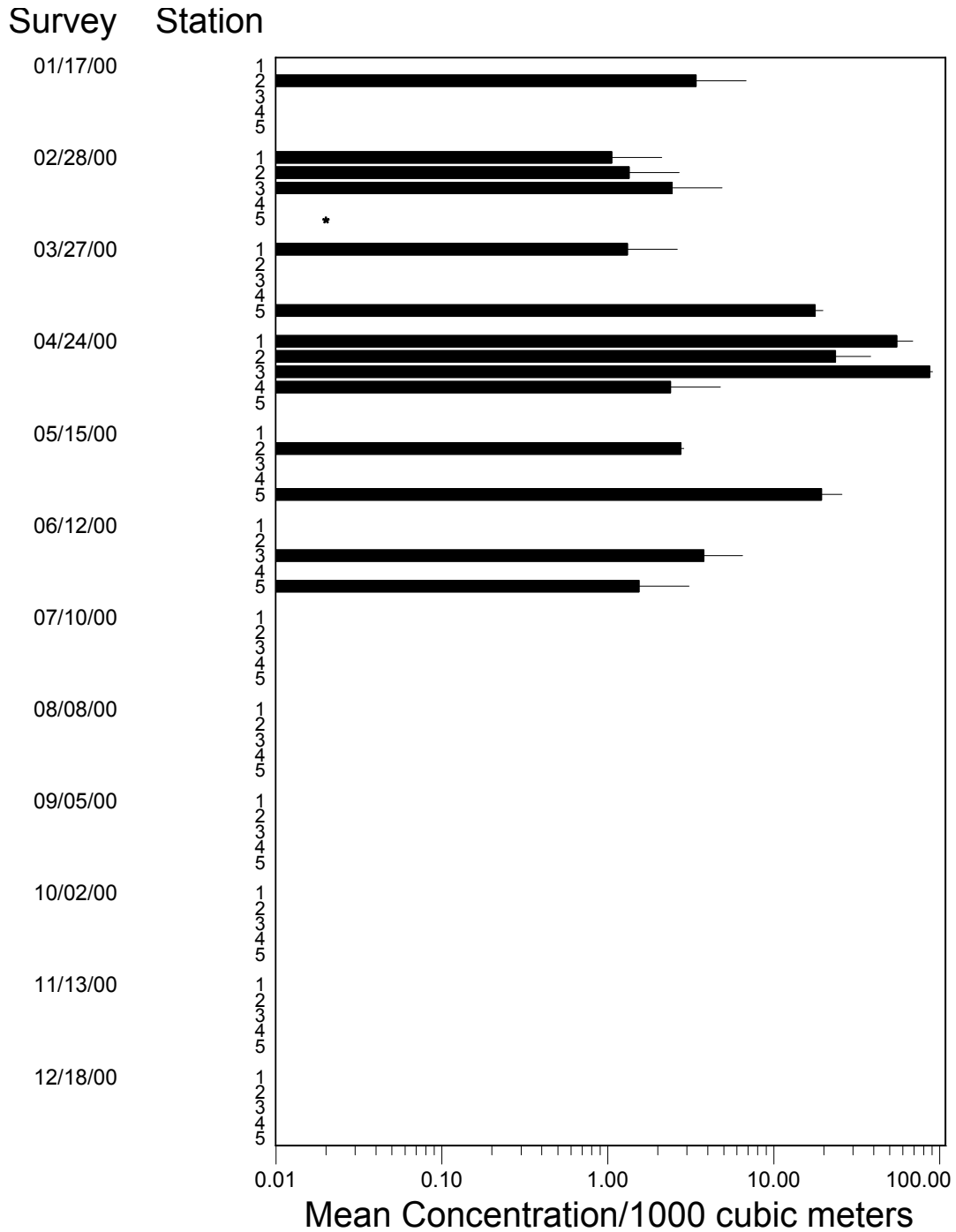


**Figure 3-28.** Weekly survey mean concentrations of larval KGB complex rockfishes (kelp/gopher/black-and-yellow) collected at the MBPP intake station with standard error indicated (+1 SE). Weekly surveys were collected from June 21 through August 10, 1999 and from December 14, 1999 through December 29, 2000.

Note: The October 16, 2000 survey was cancelled due to the unavailability of a boat.



**Figure 3-29.** Length frequency distribution (mm) for larval KGB rockfish collected at the MBPP intake station from January – December 2000. The frequency distribution is based on the lengths of a representative sample of approximately 100 larvae.

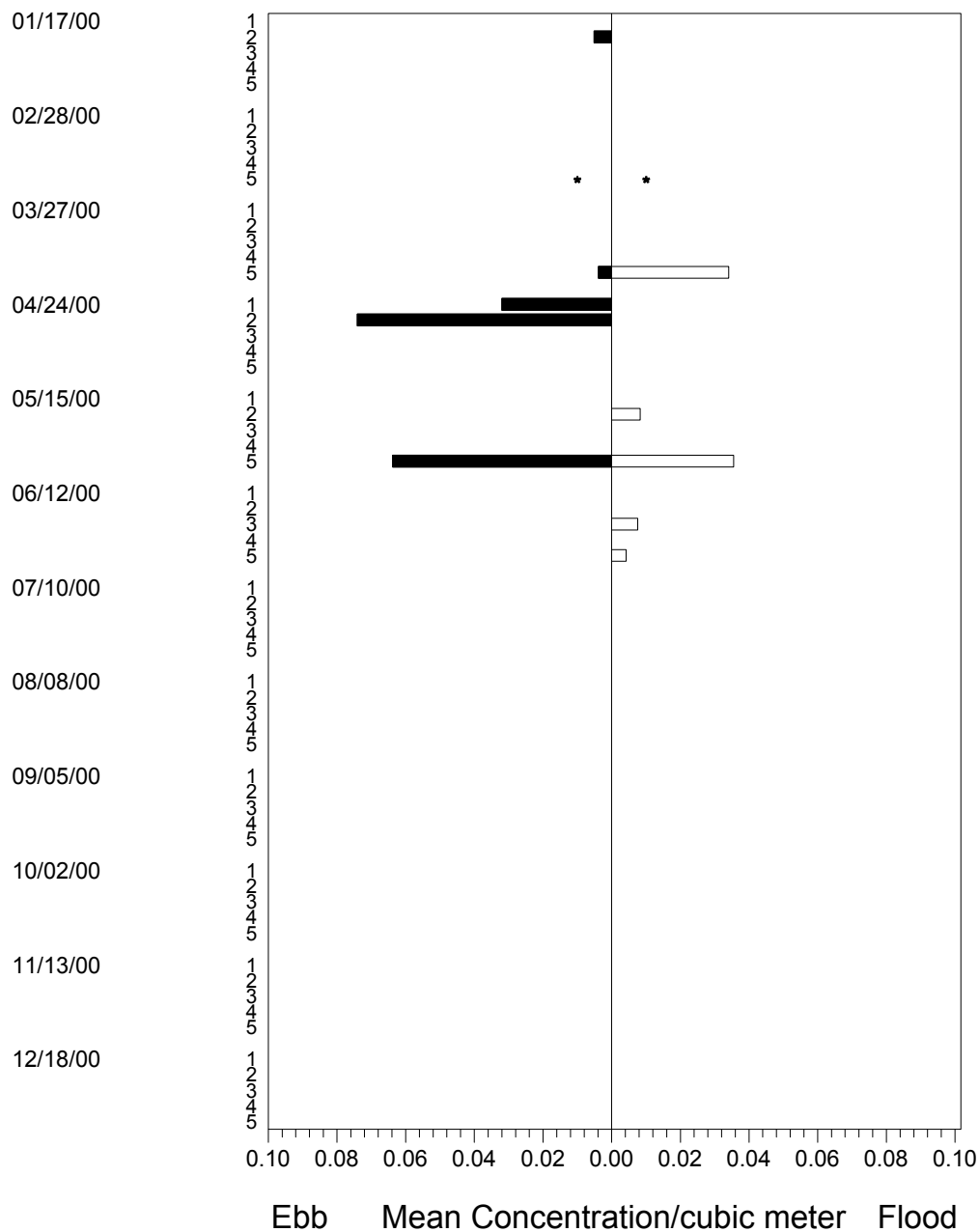


**Figure 3-30.** Mean larval KGB complex rockfishes concentration in monthly paired surveys at the MBPP intake (Station 2), Morro Bay source water (Stations 1, 3, and 4), and Estero Bay (Station 5) from January – December 2000 with standard error indicated (+1 SE).

Note: During the January 17, 2000 survey, source water stations 1, 3, 4, and 5 were sampled only in daylight hours. Beginning in February 2000 the sampling frequency was increased to cover a 24-hour period.

\* Estero Bay Station 5 could not be sampled in February 2000 due to unsafe sea conditions.

## Survey Station



**Figure 3-31.** Mean concentration of larval KGB rockfish complex from monthly paired surveys by tidal current (ebb – solid bars; flood – clear bars) and sampling station (Morro Bay stations 1–4 and Estero Bay Station 5) from January – December 2000.

Note: During the January 17, 2000 survey, source water stations 1, 3, 4, and 5 were sampled only in daylight hours. Beginning in February 2000 the sampling frequency was increased to cover a 24-hour period.

\*Estero Bay Station 5 could not be sampled in February 2000 due to unsafe sea conditions.

