



Relative Contribution of Local Recruitment to the San Francisco Bay California Halibut (*Paralichthys californicus*) Fishery Inside the Golden Gate



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Photo by CDFG

Introduction

- The California halibut (*Paralichthys californicus*) is a member of the subtropical faunal group that became common in the San Francisco Estuary (SFE) in the 1980s and 1990s, concurrent with the most recent warm-water regime.
- It spawns in shallow coastal waters and juveniles rear in very shallow subtidal and intertidal areas of bays and estuaries, and to a much lesser extent on the open coast.
- California halibut requires warm water for successful reproduction; In laboratory experiments, larval survival is 0 at day 17 in water temperatures less than or equal to 12°C (Gadomski and Caddell 1991).
- In the northern part of its range, including waters surrounding SFE, ocean temperatures rarely remain warm for an extended period of time. Therefore, successful spawning events are infrequent.

Methods

- The California Department of Fish and Game's (CDFG) San Francisco Bay Study (Bay Study) determines a juvenile halibut (<200mm index) annual abundance index inside SFE from monthly otter trawl sampling.
- Party boat (CPFV) log data from trips that targeted halibut was used to generate catch-per-unit-effort (CPUE) in #fish/AnglerHour for legal sized halibut caught inside SFE.
- Gulf of the Farallones Sea surface temperatures (SSTs, collected by PRBO Conservation Science) were summarized and provide an idea of oceanic conditions proximal to SFE.
- An index of relative abundance of California halibut spawning stock north of Point Conception was developed by summarizing trawl logbook CPUE (Maunder et. al. 2011).

Results

- Bay Study monthly trawl data showed only 4 successful recruitment periods inside SFE since 1980, all subsequent to extended periods of warm ocean temperatures in the Gulf of the Farallones (Figure 1).
- Magnitude of juvenile abundance indices appeared strongly correlated to abundance of spawning stock (trawl logbook index) during warm windows of spawning opportunity (Figure 1).
- Party boat data showed prolonged increases in both CPUE and harvest beginning 3 to 5 years after juvenile recruitment events in SFE (Figure 2).

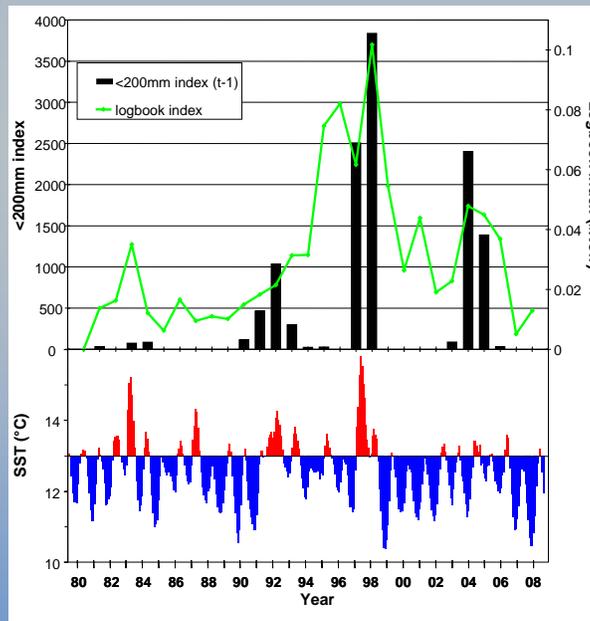


Figure 1. Annual abundance index of juvenile (<200mm) California halibut inside the Golden Gate, from Bay Study otter trawl data; Trawl logbook annual abundance index for California halibut north of Point Conception; 5-month running mean SST in the Gulf of the Farallones

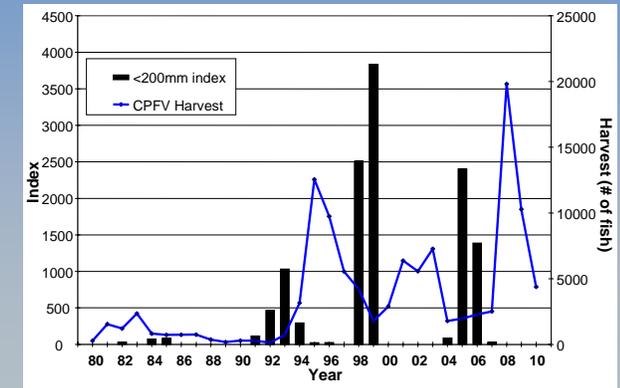


Figure 2. Annual abundance index of juvenile halibut inside the Golden Gate from Bay Study otter trawl data; Annual catch of California halibut by CPFV inside the Golden Gate

Discussion

Recruitment

- California halibut recruitment inside SFE is infrequent and episodic.
- Timing of California halibut recruitment inside the Bay can be predicted by considering ocean temperatures in the Gulf of the Farallones. All successful recruitment periods in this dataset, coincide with SSTs in the Gulf of the Farallones above 13°C for 4 months or longer. Actual temperature thresholds likely depend on exact timing and distribution of eggs, larvae and small juveniles.
- Relative magnitude of California halibut recruitment events inside SFE can be predicted by considering abundance of spawning stock in the regional vicinity of the SFE during these extended periods of warm SSTs.

Angling success

- Short term increases in angling success rates inside SFE can be predicted by local recruitment.
- Extended periods of warm SSTs at the Gulf of the Farallones paired with spawning stock abundance can be used to loosely predict increased angling success inside SFE 3 to 5 years in advance.

References

- Maunder, M., P. Reilly, T. Tanaka, G. Schmidt, K. Penttila. July 2011. Central California Stock Assessment of California Halibut. C1-C45
- Gadomski, Dena M., and Steven M. Caddell. 1991. Effects of temperature on early-life-history stages of California halibut *Paralichthys californicus*. Fishery Bulletin 89(4):567-576.