MOVEMENT PATTERNS OF STRIPED BASS (*Morone saxatilis*) IN CLIFTON COURT FOREBAY, CONTRA COSTA COUNTY, CALIFORNIA

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THESIS

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Abstract

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by

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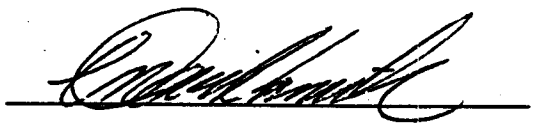
Movement patterns of striped bass relative to certain operational aspects of the State Water Project (SWP) were investigated in Clifton Court Forebay, near Byron, California. Thirty - one fish were surgically implanted with radio transmitters and monitored routinely from October 1984 through December 1985. Fish locations were analyzed and plotted with the aid of BASIC programs and BMDP statistical software. There was one known mortality due to surgery, and five fish were recaptured by anglers.

Analysis of swimming speeds was inconclusive due to insufficient data. Convex polygons depicting home range of fish movements reflected a great deal of variability in the size and shape of the area used by individuals. A habitat selectivity index indicated

seasonal preferences of striped bass for the vicinity of the impoundment intake gates and the California Aqueduct inlet channel area. A positive statistical relationship was found between the presence of fish in the intake gates area and the occurrence of SWP pumping. A positive relationship was also found for fish presence in the intake gates area when the gates were open.

Committee Chair's Signature of Approval: 

DISCUSSION

Effects of Transmitter Implantation

Numerous researchers have investigated the effects of implanting transmitters in fish. Although some studies have reported that implantation affects fish performance and survival negatively (McCleave and Stred 1975; Dombeck 1979; Manns and Whiteside 1979), others show that transmitters have little or no effect (Gallepp and Magnuson 1972; Freid, McCleave, and Stred 1976; Mellas and Haynes 1985). Tests by Smith (1979) demonstrated that swimming performance of striped bass was not significantly affected by transmitters inserted into the stomach.

One fish (No. 343) was known to have died as a result of surgery. Contact with two other fish (Nos. 813 and 915) was lost after one tracking session. Fish No. 915 was caught by an angler 7 mo after surgery. The recapture of this fish (and the others mentioned previously) in good condition, indicates that mortality due to surgery was negligible. Fish No. 813 may have left the forebay, been caught by an angler, or its transmitter may have failed.

Movement and Area Usage

Studies with similar management goals have been conducted in other impoundments. Smallmouth bass (Micropterus dolomieui) movement was influenced by fluctuations in water velocity and reservoir elevation (Hubert and Lackey 1980). Although Warden and Lorio (1975) found that water drawdown decreased largemouth bass (Micropterus salmoides) movement, it was probably not important to this study, since the range in forebay water elevation was only 1.2 m. Warden and Lorio (1975) also found that seasonal variation in water temperature affected movement, whereas environmental parameters such as barometric pressure and wind velocity or direction did not appear to be important.

Striped bass movement patterns and habitat selection in impoundments have been studied in detail by Schaich and Coutant (1980); Waddle, Coutant and Wilson (1980); and Cheek, Van den Avyle, and Coutant (1983). These authors found that striped bass habitat selection was primarily dependent on reservoir dissolved oxygen levels and water temperatures. Since the forebay is not thermally stratified and the minimum dissolved oxygen level measured was 6.1 ppt, it is

unlikely that these two factors influenced movements of striped bass in Clifton Court Forebay.

Striped bass movements in the forebay are more likely related to SWP operation. Although they did not explain why, Waddle et al. (1980) reported that Deppert (1978) found relative abundance of striped bass below a dam to be positively correlated to the flow rate, and that these fish were significantly more abundant during water release periods. Striped bass in the forebay were probably attracted to the flow when the intake gates were open. This could be explained by the large numbers of forage fish which the inflow from Old River contains (Calif. Dept. of Fish and Game 1981). The positive statistical significance of striped bass presence near the gates during SWP pumping, however is not readily explainable, but is probably due to the fact that SWP pumping occurred during almost 93% of the study period.

The seasonal differences in striped bass area usage illustrated by the HSI may due to the distribution and abundance of prey in the forebay. The HSI value for the gates area is high during winter and spring, whereas the other areas have relatively low values. During summer and fall, however, HSI values

for the gates area decrease, while the values increase in other areas. Striped bass are likely attracted to the gates area during winter and spring when the density of forage fish in the forebay is low Calif. Dept. of Fish and Game 1981). During summer and fall, however, the forebay provides a potential spawning ground for numerous species of fish. In addition, forage fish are more abundant in general during summer and fall, so striped bass would not need to concentrate in an area where fish are entrained to obtain enough food.

Swimming Speed

Swimming speed data were inconclusive due to a paucity of data. The samples, did, however, reflect the variability inherent in movement speed calculations observed by other researchers (Finlayson 1976; Smith 1979; Southall 1982; Hallberg and Trapp 1984).

CONCLUSIONS

Striped bass in Clifton Court Forebay appeared to utilize all parts of the forebay , at least to a limited degree. A significant number of contacts however occurred near the intake gates, predominantly during winter and spring. This indicates a removal method for striped bass concentrated during during these seasons in this area might prove more efficient than one encompassing the whole forebay. Although striped bass can immigrate into the forebay (as well as emigrate out) on a virtually continuous basis, the frequency with which study fish were located in this area warrants a test of removal methods.

More data might lead to more accurate conclusions about how environmental parameters affect striped bass movements, and might improve swimming speed information.

The transmitter implants worked well in these fish. The tracking system provided precision adequate to meet the study objectives. Transmitter reception over a greater distance, however, could reduce search time. Temperature and depth - sensing transmitters could verify whether or not these two factors influence

striped bass movements in the forebay. More intensive tracking could lead to better short-term movement information.