

**DESCRIPTIONS OF ANALYTICAL RELATIONSHIPS  
FOR EVALUATING  
STRIPED BASS ASSESSMENT VARIABLES**

**Resource Category:** Fisheries

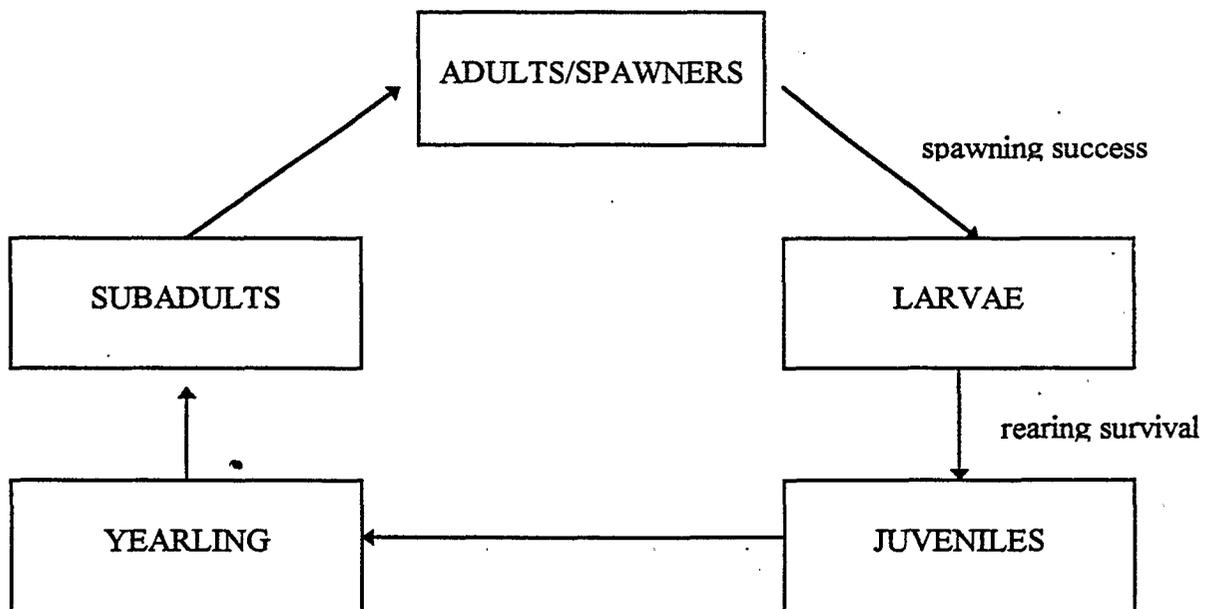
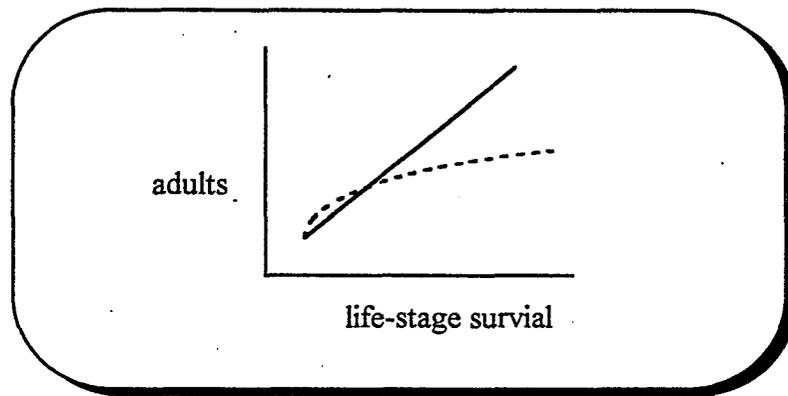
**Relationship:** Striped bass abundance vs. lifestage-specific survival rates

**Description:** The abundance of striped bass in the adult population will increase with increased production of eggs (through greater number of spawners), higher survival rates in all age classes (better transport flows, more physical habitat, greater food supply), and lower mortality rates (reduced diversions, screening diversions, reduced predator effect, improved harvest).

**Assumptions:** Lifestage-specific survival rates are independent and that improvements in one stage carry through later stages to adult population size.

**Basis:** Theoretical and lifestage survival estimates from survey data (Cal. and other systems).

**Reference:**



**Resource Category:** Fisheries - Striped Bass

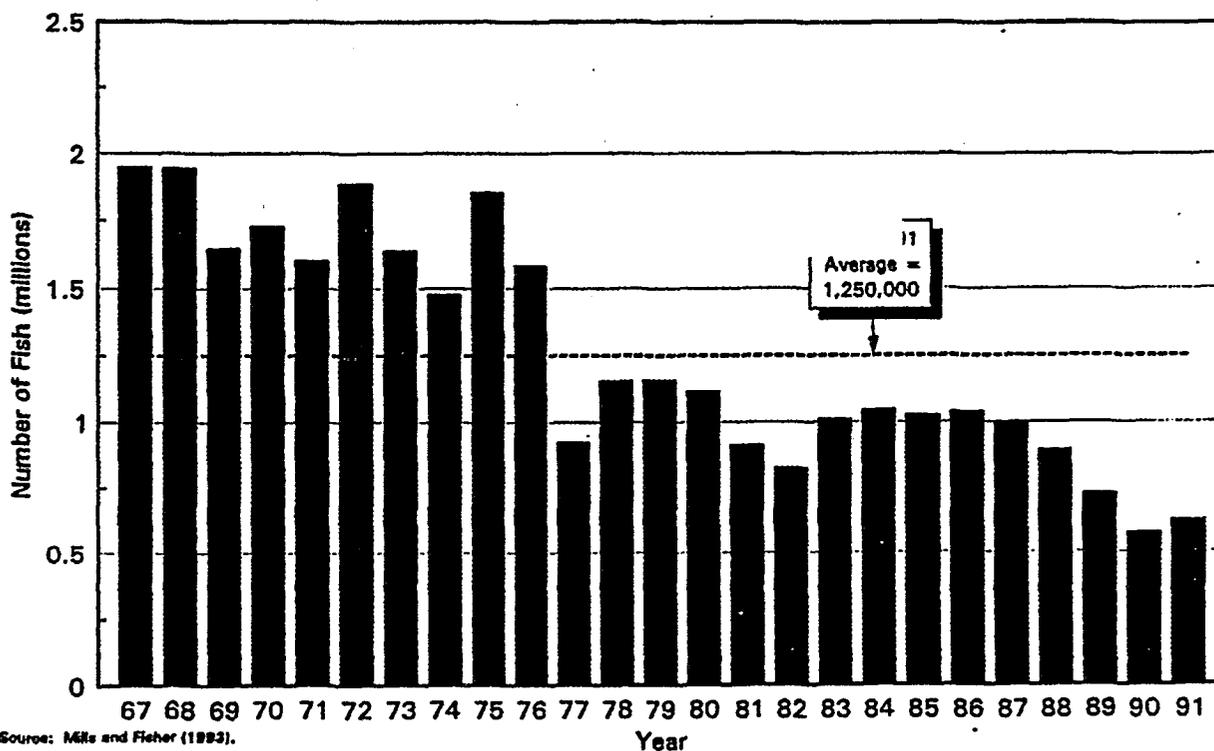
**Relationship:** Adult abundance from 1967-1991

**Description:** Striped bass adult population estimates.

**Assumptions:** Mark-recapture study provides unbiased and accurate estimate.

**Basis:** Marking and recapture study

**Reference:** U.S. Fish and Wildlife Service. 1995. Working paper on restoration needs: actions to double natural production of anadromous fish in the Central Valley of California. Volume 2. May 9, 1995. Prepared for the U.S. Fish and Wildlife Service under the direction of the Anadromous Fish Restoration Program Core Group. Stockton, CA.



**ANNUAL ESTIMATES OF ADULT STRIPED BASS ABUNDANCE  
IN THE CENTRAL VALLEY (1967-1991)**

**Resource Category:** Fisheries - Striped Bass

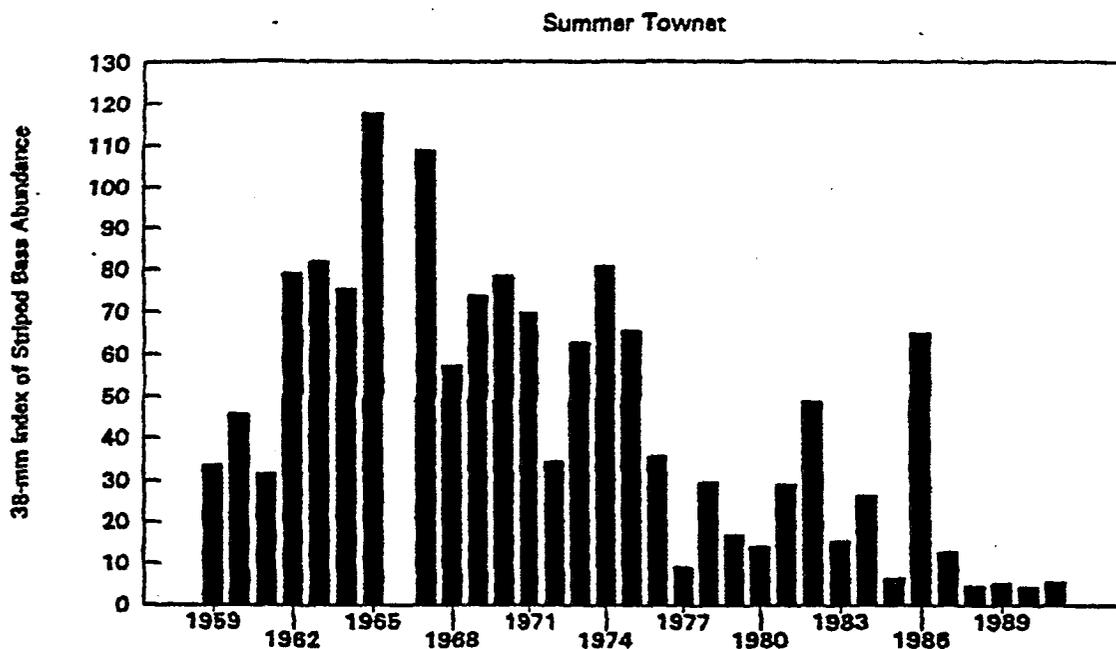
**Relationship:** Summer juvenile striped bass index of abundance from 1967-1991

**Description:** Striped bass juvenile abundance index.

**Assumptions:** Extrapolation of abundance of 38-mm striped bass from abundance index from in summer townet surveys.

**Basis:** Average catch index in two surveys with average lengths below and above 38 mm is used to extrapolate 38 mm abundance index.

**Reference:** U.S. Fish and Wildlife Service. 1995. Working paper on restoration needs: actions to double natural production of anadromous fish in the Central Valley of California. Volume 2. May 9, 1995. Prepared for the U.S. Fish and Wildlife Service under the direction of the Anadromous Fish Restoration Program Core Group. Stockton, CA.



**Resource Category:** Fisheries - Striped Bass

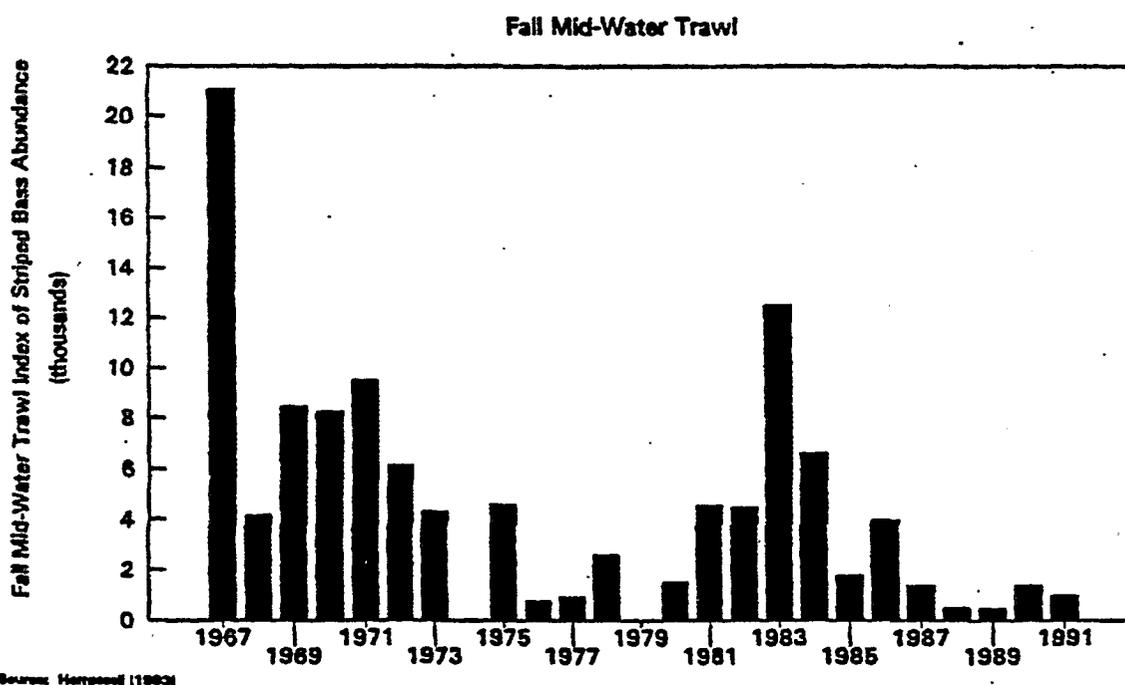
**Relationship:** Juvenile abundance from 1967-1991

**Description:** Striped bass juvenile catch index from fall mid-water trawl survey in Bay-Delta.

**Assumptions:** Catch patterns reflect patterns in abundance.

**Basis:** Catch in trawls.

**Reference:** U.S. Fish and Wildlife Service. 1995. Working paper on restoration needs: actions to double natural production of anadromous fish in the Central Valley of California. Volume 2. May 9, 1995. Prepared for the U.S. Fish and Wildlife Service under the direction of the Anadromous Fish Restoration Program Core Group. Stockton, CA.

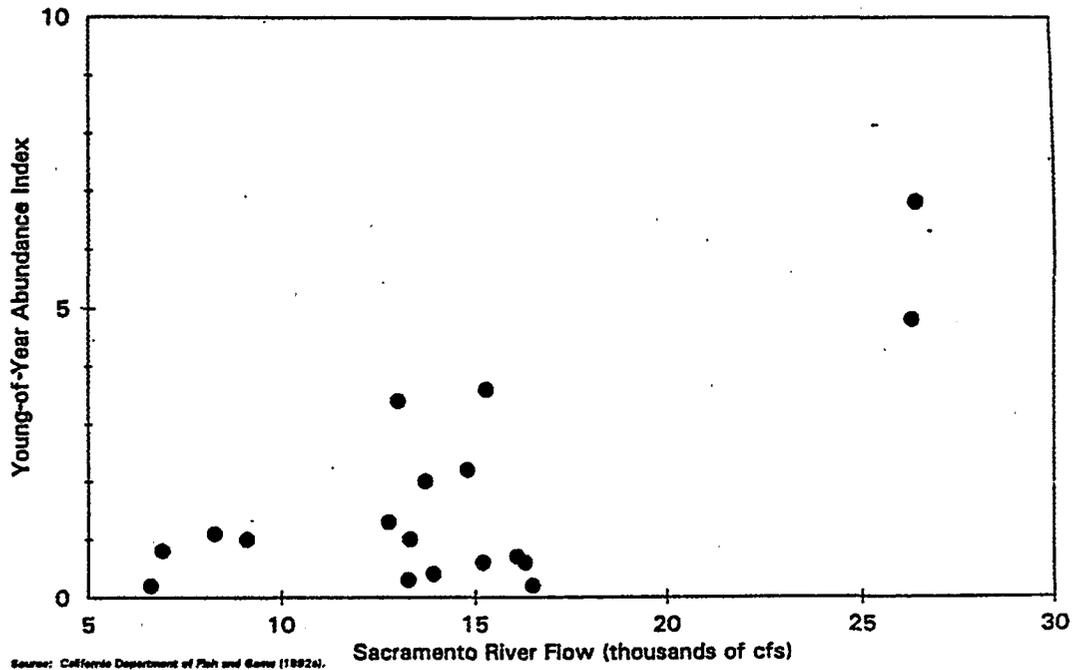


**YOUNG-OF-YEAR STRIPED BASS ABUNDANCE IN THE SACRAMENTO-SAN JOAQUIN ESTUARY (1959-1991)**

**Resource Category:** Fisheries - Striped Bass

**Relationship:** Survival of eggs to early larvae versus river flow.

**Reference:** U.S. Fish and Wildlife Service. 1995. Working paper on restoration needs: actions to double natural production of anadromous fish in the Central Valley of California. Volume 2. May 9, 1995. Prepared for the U.S. Fish and Wildlife Service under the direction of the Anadromous Fish Restoration Program Core Group. Stockton, CA.



**RELATIONSHIP BETWEEN SURVIVAL OF STRIPED BASS (EGGS TO 6MM)  
AND SACRAMENTO RIVER FLOW**

**Resource Category:** Fisheries - Striped Bass

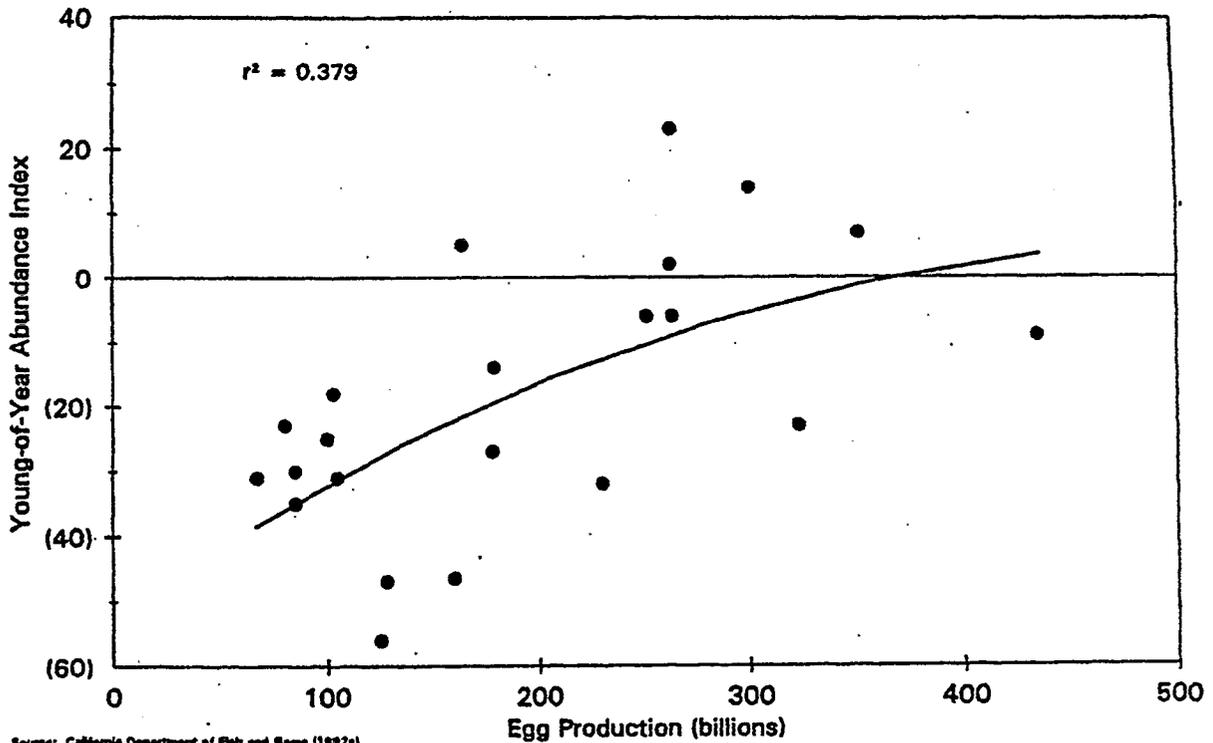
**Relationship:** Number of striped bass eggs produced is related to subsequent abundance of young in summer (38 mm summer townet index).

**Description:** Striped bass egg abundance is related to young production in a non-linear way.

**Assumptions:** Abundance indices reflect true abundance of the two life stages.

**Basis:** Young production is limited by the number of eggs produced in the population, but less so at higher adult (egg) numbers.

**Reference:** U.S. Fish and Wildlife Service. 1995. Working paper on restoration needs: actions to double natural production of anadromous fish in the Central Valley of California. Volume 2. May 9, 1995. Prepared for the U.S. Fish and Wildlife Service under the direction of the Anadromous Fish Restoration Program Core Group. Stockton, CA.



Source: California Department of Fish and Game (1992a)

**RELATIONSHIP BETWEEN YOUNG-OF-YEAR ABUNDANCE INDEX AND EGG PRODUCTION  
IN THE SACRAMENTO-SAN JOAQUIN ESTUARY**

**Resource Category:** Fisheries - Striped Bass

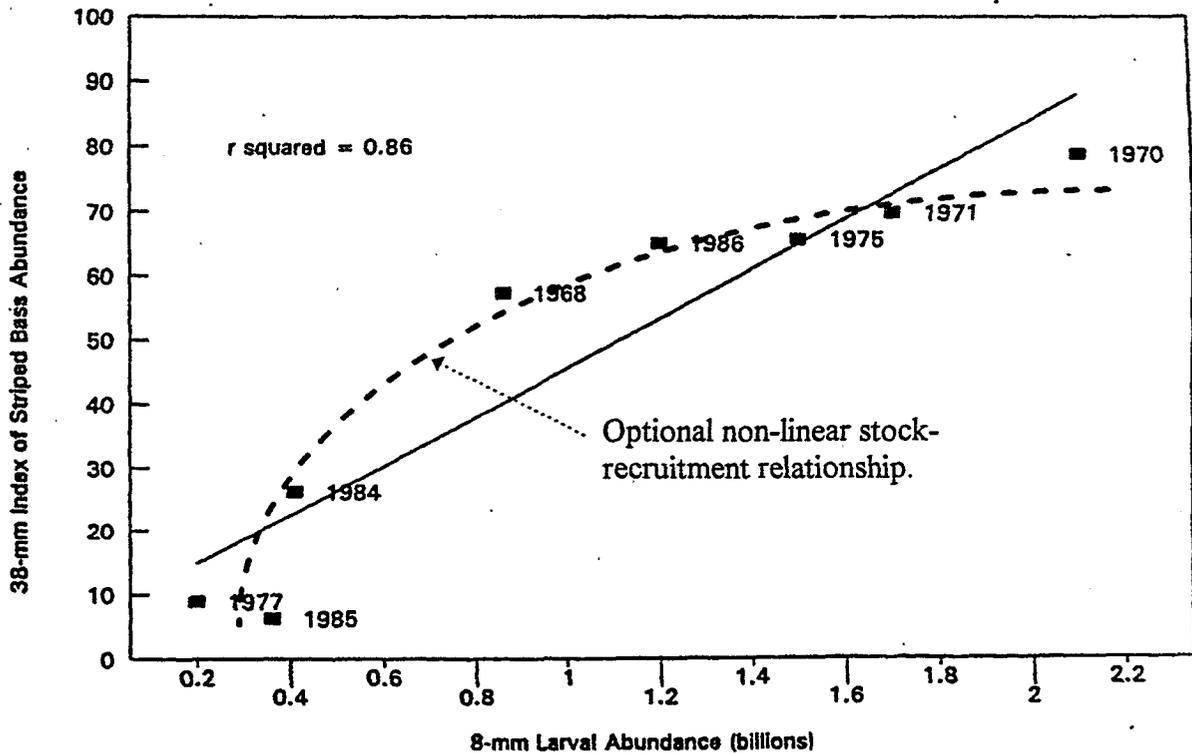
**Relationship:** Larvae-Juvenile abundance relationship for eight available years.

**Description:** Striped bass juvenile catch index from summer townet survey and striped bass larvae from egg and larvae survey in Bay-Delta.

**Assumptions:** Catch patterns reflect patterns in abundance and there is a linear relationship between the abundance of larvae and juveniles.

**Basis:** Catch in summer townet and egg and larvae surveys reflect lifestage abundance.

**Reference:** U.S. Fish and Wildlife Service. 1995. Working paper on restoration needs: actions to double natural production of anadromous fish in the Central Valley of California. Volume 2. May 9, 1995. Prepared for the U.S. Fish and Wildlife Service under the direction of the Anadromous Fish Restoration Program Core Group. Stockton, CA.



Source: Interagency Ecological Study Program (1987).

**RELATIONSHIP BETWEEN 8-MM LARVAL STRIPED BASS ABUNDANCE AND 38-MM JUVENILE STRIPED BASS ABUNDANCE**

**Resource Category:** Fisheries - Striped Bass

**Relationship:** Abundance vs. transport index

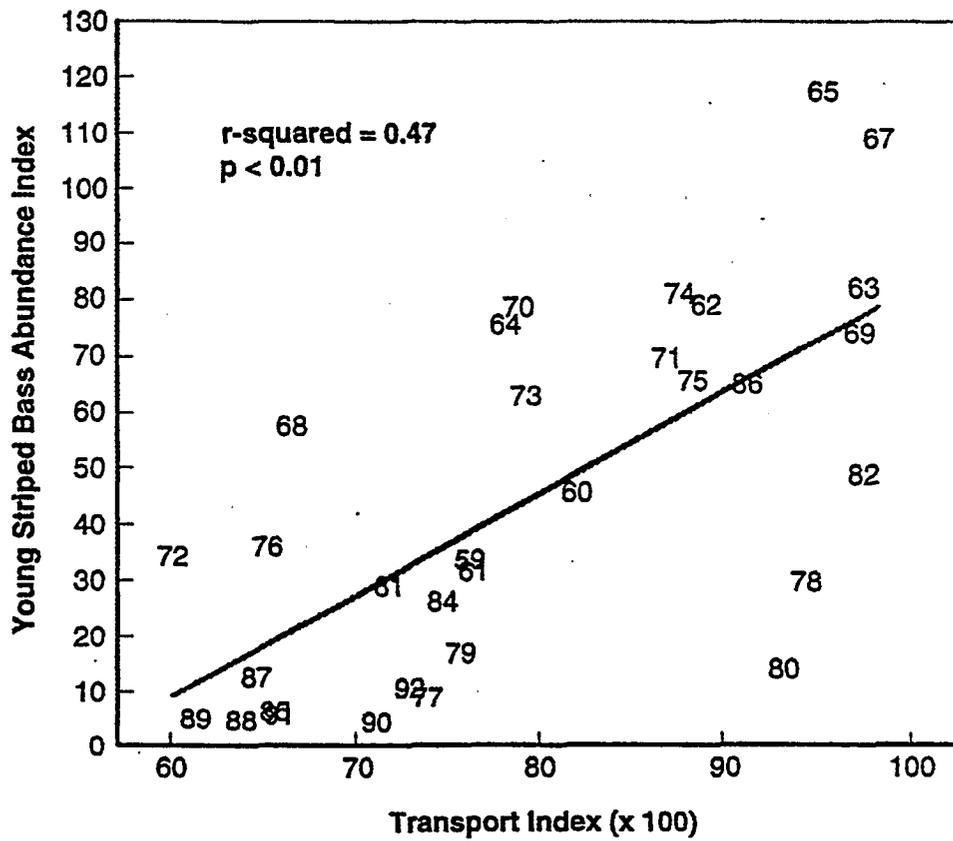
**Description:** Striped bass summer townet index versus transport index

**Assumptions:** Catch in townet survey reflects population abundance/production of young (juvenile) striped bass.

**Basis:** Catch in townet survey is related to outflow derived transport index.

**Reference:** CVPIA PEIS

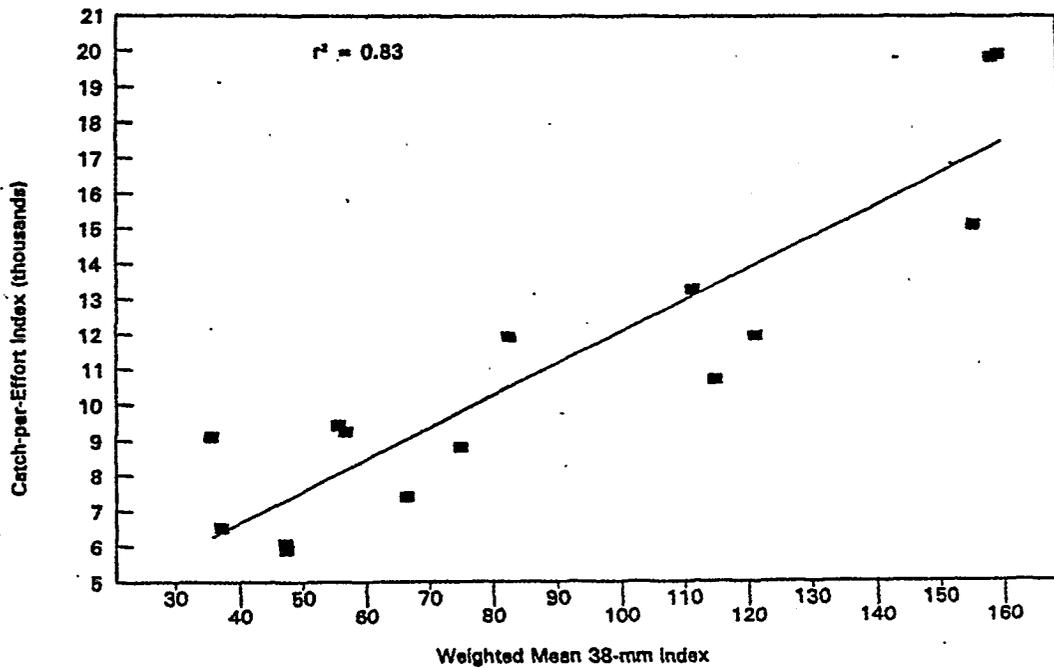
## TRANSPORT INDEX VERSUS YOUNG STRIPED BASS ABUNDANCE



**Resource Category:** Fisheries - Striped Bass

**Relationship:** Number of striped bass young and surviving adult population from these young.

**Reference:** U.S. Fish and Wildlife Service. 1995. Working paper on restoration needs: actions to double natural production of anadromous fish in the Central Valley of California. Volume 2. May 9, 1995. Prepared for the U.S. Fish and Wildlife Service under the direction of the Anadromous Fish Restoration Program Core Group. Stockton, CA.



Source: Kalish et al. (1992).

**RELATIONSHIP BETWEEN ADULT POPULATION ABUNDANCE (STRIPED BASS TAGGING STUDY CATCH-PER-EFFORT INDEX) AND WEIGHTED MEAN YOUNG-OF-YEAR INDEX 3-7 YEARS EARLIER**

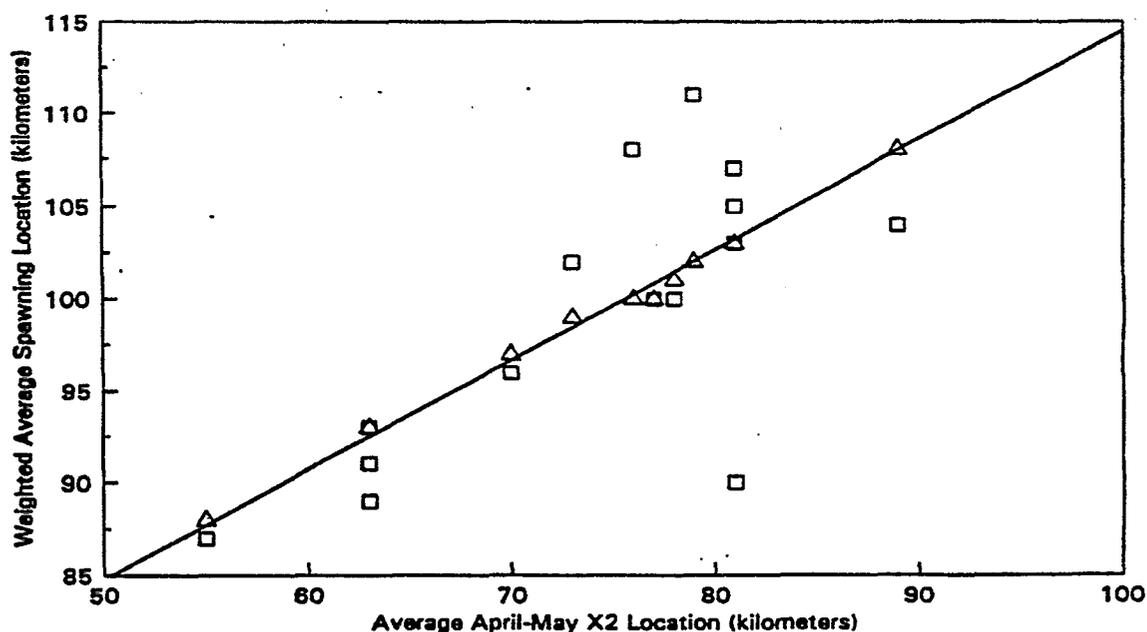
**Relationship and Category:** Striped bass spawning location - X2 position Fisheries

**Description:** The location of striped bass spawning is directly related to the position of the entrapment zone in April and May. Bass spawn further upstream when X2 is located further upstream. This affects egg survival, since eggs spawned farther upstream are more vulnerable to south Delta entrainment.

**Assumptions:**

**Basis:** Correlations of YOY striped bass distribution with the location of X2.

**Reference:** California Department of Fish and Game. 1987. Factors affecting striped bass abundance in the Sacramento-San Joaquin River system. (DFG Exhibit No. 25, State Water Resources Control Board, 1987 water quality water rights proceeding for the San Francisco Bay/Sacramento-San Joaquin Delta, Sacramento, CA; and Technical Report 20, interagency Ecological Studies Program for the Sacramento-San Joaquin Estuary.) Stockton, CA.



**RELATIONSHIP BETWEEN THE LOCATION OF STRIPED BASS SPAWNING IN THE LOWER SAN JOAQUIN RIVER PORTION OF THE DELTA AND THE LOCATION OF X2 (KILOMETERS FROM THE GOLDEN GATE BRIDGE) IN THE ESTUARY**

**Resource Category:** Fisheries - Striped Bass

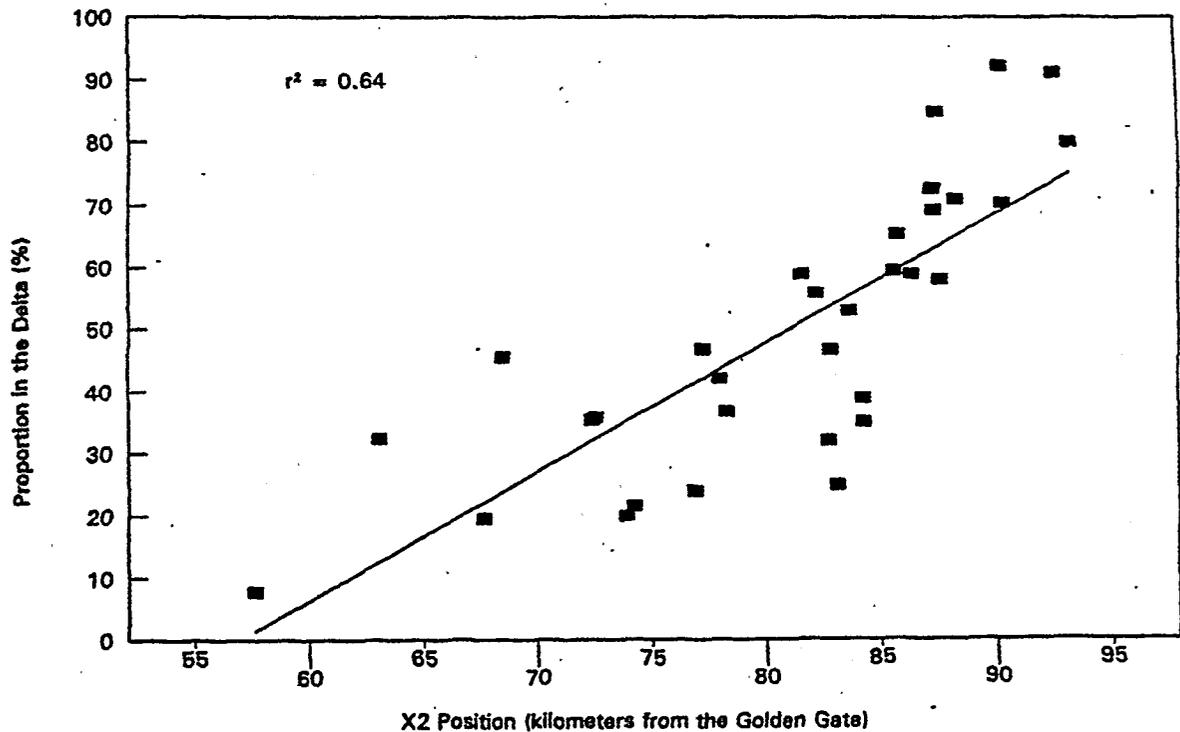
**Relationship:** Juvenile abundance in the Delta and Bay as a function of July X2 location (outflow).

**Description:** Proportion of striped bass juvenile catch index from summer townet survey in Delta.

**Assumptions:** Catch patterns reflect patterns in abundance. Juveniles distribute in Delta as a function of outflow.

**Basis:** Catch distribution in summer townet surveys that derive 38 mm index are affected by July outflow from the Delta.

**Reference:** U.S. Fish and Wildlife Service. 1995. Working paper on restoration needs: actions to double natural production of anadromous fish in the Central Valley of California. Volume 2. May 9, 1995. Prepared for the U.S. Fish and Wildlife Service under the direction of the Anadromous Fish Restoration Program Core Group. Stockton, CA.



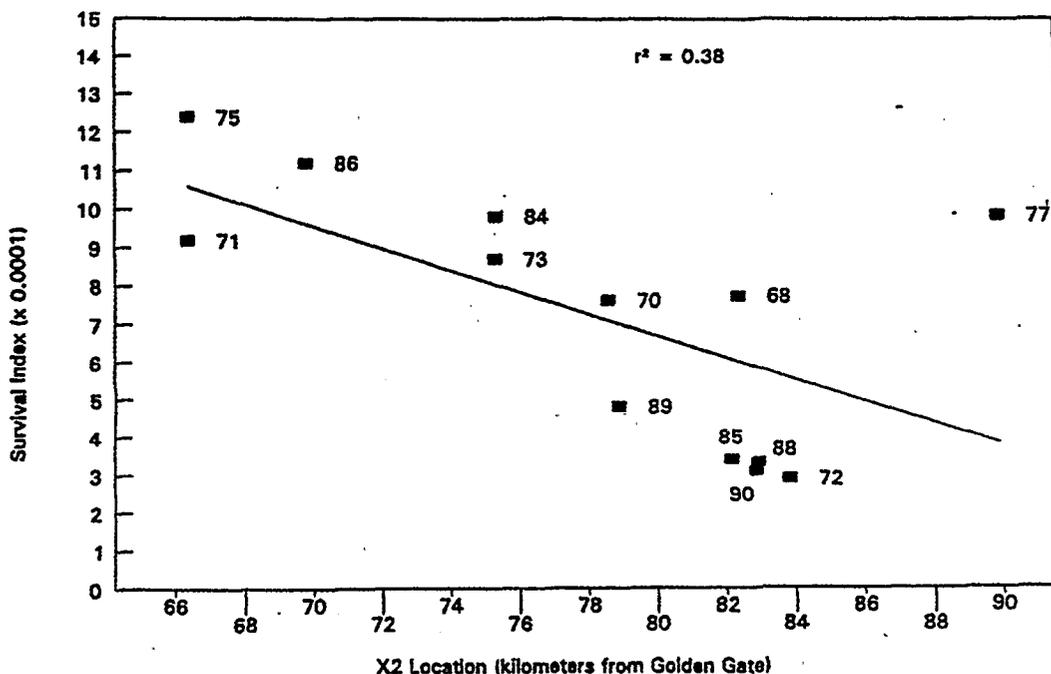
Source: Hargrave (1993).

**PROPORTION OF THE YOUNG-OF-YEAR STRIPED BASS POPULATION (38-MM INDEX) IN THE DELTA RELATIVE TO THE LOCATION OF X2 (2 PPT SALINITY OR ABOUT 3,000  $\mu$ S EC) IN JULY (1959-1991)**

**Resource Category: Fisheries - Striped Bass**

**Relationship:** Early larvae to juvenile survival versus location of X2 factor.

**Reference:** U.S. Fish and Wildlife Service. 1995. Working paper on restoration needs: actions to double natural production of anadromous fish in the Central Valley of California. Volume 2. May 9, 1995. Prepared for the U.S. Fish and Wildlife Service under the direction of the Anadromous Fish Restoration Program Core Group. Stockton, CA.



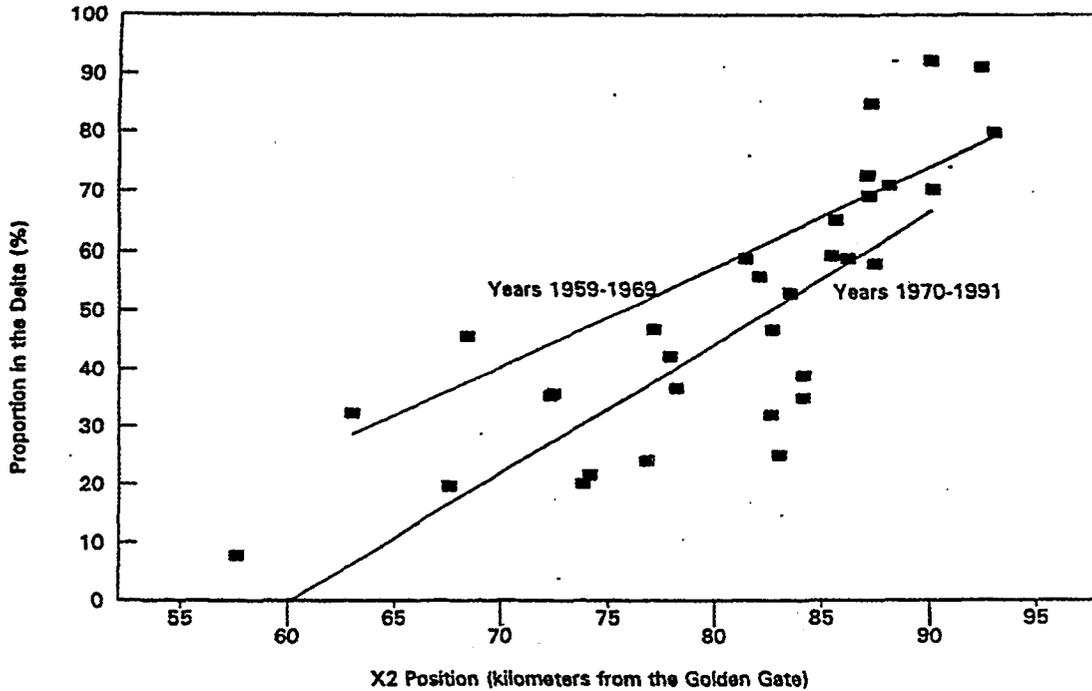
Source: California Department of Fish and Game (1982a).

**RELATIONSHIP BETWEEN THE SURVIVAL INDEX (FOR 9-MM TO 38-MM STRIPED BASS) AND THE LOCATION OF X2**

**Resource Category:** Fisheries - Striped Bass

**Relationship:** The proportion of the striped bass juvenile abundance index in the Delta as a function of X2 position.

**Reference:** U.S. Fish and Wildlife Service. 1995. Working paper on restoration needs: actions to double natural production of anadromous fish in the Central Valley of California. Volume 2. May 9, 1995. Prepared for the U.S. Fish and Wildlife Service under the direction of the Anadromous Fish Restoration Program Core Group. Stockton, CA.



Source: Hargrave (1993).

**COMPARISON OF THE 1959-1969 AND 1970-1991 RELATIONSHIPS  
BETWEEN THE PROPORTION OF STRIPED BASS IN THE DELTA  
AND THE LOCATION OF X2**

**Resource Category:** Fisheries - Striped Bass

**Description:** The amount of habitat for rearing juvenile striped bass in the Bay-Delta is a function of outflow as represented by location of X2.

**Assumptions:** Juvenile striped bass seek habitat in an optimal salinity range for optimal growth and survival.

**Basis:** Amount of habitat area is determined from salinity distribution maps under differing Delta outflows.

**Reference:** CVPIA PEIS

