Statement Presented by
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To
U.S. House of Representatives, Committee on Natural Resources
Subcommittee on Water and Power
Oversight Hearing on "Extinction is not a Sustainable Water Policy: The Bay Delta Crisis and the Implications for California Water Management"
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Vallejo City Council Chambers, Vallejo, California

I appreciate the opportunity to provide input to this Subcommittee on the important and urgent matter of declining fishery resources in the San Francisco Bay/San Joaquin Delta Estuary. Of particular concern to us is the recent serious and unexpected decline (approximately 90%) in young Delta smelt produced this season. As alarming as the reduced numbers are, this decline is part of a more generally observed decline in other important fish and aquatic resources in the estuary. Anadromous fish (steelhead and salmon), sport fish (striped bass), other native fishes, and some important fish food organisms (invertebrates) of the Delta are in serious trouble and have been receiving our attention in planning and regulatory activities. The California Department of Fish and Game is actively involved in efforts to determine causes, implement response measures within our authorities, and develop a long-term strategy for Delta sustainability. The Federal Government's involvement is crucial to developing a comprehensive and long term solution to fix the "broken Delta".

There are many causes for the fish and invertebrate declines and our understanding of these causes is limited. Our cooperative efforts to determine the causes of the decline have pointed towards invasive species, toxics, predation and water diversions as having primary roles in the declining health of the Delta. We continue to monitor, evaluate and explore these issues in order to make further scientifically justified determinations as to the role of each factor and how issues may be addressed in order to ensure future Delta health.

Governor Schwarzenegger has initiated a comprehensive Delta Vision effort to rethink what the Delta should look like in the future. A Blue Ribbon task force has begun meetings designed to lead towards recommendations for actions by the legislature and Governor. In addition, many state and federal agencies, along with a growing number of environmental groups, signed a formal Planning Agreement in September 2006 and are developing the Bay Delta Conservation Plan (BDCP) for at-risk fish species under the provisions of the State Natural Community Conservation Planning Act (NCCPA) and Section 10 of the federal Endangered Species Act. These efforts will provide a framework, plan, and commitment for future action.

Background- The Pelagic Organism Decline

The Interagency Ecological Program (IEP), a multi-agency state and federal group, has monitored and studied biological and hydrological resources in the Estuary for almost 40 years. The data set generated by the IEP is one of the most complete data sets documenting relationships between fish and aquatic resources and water development projects in the world. The information developed during this time has provided the foundation for our understanding of the ecological implications of water resources management in this system. In early 2005, scientists from our IEP first observed serious declines in Delta smelt and certain other pelagic fish species (see Figure 1). In response, directors of the state and federal water and fish agencies directed approximately $2.5 million for establishment of a Pelagic Organism Decline (POD) team to investigate the reasons for the decline. The POD team developed a study plan that identified three likely hypotheses responsible for the observed declines and embarked upon an aggressive and comprehensive effort to identify and address all likely causes for this decline. The three most likely stressors, possibly acting in concert, were identified as water diversions, invasive species/food chain changes, and toxics.

One year after the POD studies began, the team presented their first Synthesis Report and developed two scenarios among other possible causes: winter exports and bad environmental conditions in Suisun Bay. Data from the State and Federal water project facilities showed that water exports had increased during the winter months of November - March during the years of the pelagic organism decline (See Figure 2). Salvage data also showed that increased numbers of those fish showing the decline (Delta smelt, threadfin shad, striped bass and longfin smelt- see Figures 3 and 4) had also been taken in increasing numbers during that time. The second most likely hypothesis called the "Bad Suisun Bay Hypothesis", suggested that conditions in the Suisun Bay area, a prime nursery area for young fish, had changed in some way to reduce its capability to sustain fish populations. The report suggested that some undefined combination of food production, invertebrate grazing rates, salinity regime changes, and introduced exotic species may be responsible for the declines. At that time toxics were not implicated as a major influence in the observed declines.

During the end of the first year of the POD investigations, researchers were beginning to develop information that could be helpful in understanding the declines and also for managing conditions to potentially reduce impacts. In the fall of 2006, the CALFED Program hosted the Science Conference and two significant findings were presented. First, a University of California researcher (Dr. Bill Bennett) suggested that the delta smelt females that reproduced early in the spawning season seemed to be most important in contributing to the next generation of smelt. This became known as the "Big Momma Hypothesis". This suggested that more attention needed to be paid to water management earlier in the year than had been done heretofore. The second finding, by a USGS researcher (Dr. Pete Smith) suggested that there was a significant relationship between flows moving UPSTREAM toward the state and federal pumping plants in Old and Middle Rivers and fish caught later in the trawls surveys. In other words when flows upstream were greater, the negative impacts on smelt populations were greater. Both of

these findings would play a significant role in how fish and water agencies would manage the water projects in 2007.

During the 2006 water year, conditions were better and greater outflows moved the smelt further downstream in the estuary and away from the influence of the pumps. The abundance indices reflected a positive response and the numbers of Delta smelt increased slightly from the previous year. Things were looking slightly better for smelt.

2007 Activities

Water Diversions-Armed with new scientific findings, the fishery and water management agencies began to manage the water projects to facilitate protection of delta smelt and other aquatic resources in the estuary. The life cycle of Delta smelt (Figure5) was constantly considered in this process. Clearly water diversions from the Delta can cause direct and indirect mortality of Delta smelt and other aquatic organisms. For this reason, the Delta diversions of the State Water Project (SWP) and the Central Valley Project (CVP) are some of the most carefully regulated and monitored water diversions anywhere. Early in January 2007, a team of agency managers (Water Operations Management Team- WOMT) began operation of the state and federal pumping plants by trying to reduce upstream flows in Old and Middle rivers so that the important early reproducing smelt ("Big Mommas") would not be drawn upstream toward the pumps and potentially removed from the estuary. Pumping rates were reduced using assets from the Environmental Water Account (EWA). By late May, the WOMT used over 300 thousand acre feet of Environmental Water Account water to implement fish protection actions, primarily protecting the spawning females during January, February and March. During winter and early spring the projects reduced net upstream flow in Old and Middle Rivers and no delta smelt were observed at the State Water Project and only a few at the Federal facility. Conditions looked good and the new management tools (reducing Old and Middle river flows to protect spawning females) seemed to be providing the desired impact avoidance. Field surveys showed the spawning smelt still securely distributed in Cache Slough and the Sacramento Ship Channel- out of the influence of the pumping plants.

On about May 15, field surveys (the 20 mm survey) carried out to monitor the relative abundance of juvenile smelt produced in the system produced alarming results. Numbers of young smelt were about 90 % below our previous year's estimates (See Figure 6). More alarming was the fact that the young smelt were located in an area influenced by the pumps- the lower San Joaquin River! The WOMT immediately took action and reduced pumping significantly at the pumping plants. Diversions from the SWP facilities were reduced to 350 cubic feet per second (cfs), a 90 percent reduction from customary seasonal pumping levels, as a precaution. The federal CVP reduced pumping rates to 850 cfs. Additionally, WOMT ordered the Head of Old River Barrier culverts opened and

maintained flows in the Stanislaus River so that flows would remain higher in the San Joaquin River to help keep the young smelt from the pumps.

When greater smelt take occurred at the SWP intake facility in late May, DWR and the DFG jointly announced further curtailment of SWP Delta diversions and asked for voluntary curtailments by other Delta diverters. DWR stopped SWP Delta diversions entirely on May 31, 2007 for 12 days with future protective actions continuing to be guided by the best science and adaptive management. Other water diversions from the Delta are not monitored or regulated as carefully. Nevertheless, on June 1, 2007, DFG wrote to over 300 water diverters in the Delta asking them to "voluntarily cease or substantially reduce your diversions from the south delta channels..." DFG also restricted all non-essential scientific studies and fish sampling/monitoring that may incidentally take Delta smelt. Concurrently, the CVP reduced Delta diversions to the operation of a single pump, drawing about 850 cfs. After taking no smelt for two weeks, the CVP increased pumping to 2500 cfs on June 13, 2007. Nine hours later several smelt were taken at the Federal pumps, a clear indication that young smelt were still in the south delta area and caution regarding increased pumping should be used.

On June 17, 2007, the SWP and CVP increased pumping but still far below seasonal normal rates. Agency Directors became directly involved and daily operational decisions were made to reduce take of smelt at the facilities. As smelt grew and began to move downstream out of the influence of the pumps and temperatures approached the lethal limits of young smelt, pumping rates were allowed to increase to meet demands for water use in the state. As of June 27 some young smelt continued to be taken at the SWP.

Agency biologists studying the population dynamics of smelt now believe that the abundance of smelt in the estuary has reached such a low level that numbers are now being affected by the "stock recruitment relationship". In other words, the most important factor affecting smelt numbers is the number of juveniles produced by the adult females. During other times when populations are higher, this relationship is not as significant and other factors contribute to the regulation of abundance (these are discussed below). **Therefore, it is DFG's position that actions must be taken to protect as many individual smelt as can be through manipulation of the water projects. Each reproducing organism is important to the survival of the species.**

Invasive Species-The San Francisco Estuary has been called the most invaded estuary on earth. Among the hundreds of introduced species, many cause competition, predation, or habitat modification that are detrimental to Delta smelt and other pelagic fishes. Collectively all of these species are profoundly affecting the ecological functioning of the estuary. For example, the Asian clam Corbula, which became established in Suisun Bay in the 1980s is a filter feeder so effective and numerous that it can filter the entire volume of Suisun Bay in less than a day. This has had a devastating effect on the primary production of Suisun Bay. Further upstream the freshwater Asiatic clam, Corbicula, can

have a similar effect. In the late 1990s a new zooplankton Limnoithona invaded the estuary. This new zooplankton may not be a good food source for many important pelagic fish like Delta smelt and has replaced the smelt's preferred food source. Limnoithona is now the most abundant zooplankton in the estuary. This shift at the base of the food web may prove to be a major factor affecting Delta smelt. The toxic blue green algae Microcystis has increased in abundance in the past several years in the interior Delta causing concerns with both fish and human toxicity although none has been documented in this system. Other introduced species such as striped bass and black bass prey upon smelt directly. The Brazilian water weed Egeria, has also proliferated in recent years. This aquatic plant not only clogs water ways for boating but slows water velocity and allows suspended sediment to settle out. It is hypothesized that increased water clarity may reduce Delta smelt feeding success and increase predation upon them. Although eradication is impossible, DWR and the Department of Boating and Waterways are partnering to implement a control program for Egeria budgeted at $3 million per year.

DFG and DWR are working aggressively to prevent new invasions. The two agencies responded swiftly when the quagga mussel Dreissena was discovered in Lake Mead and the Colorado River. If this prolific filter feeder were to invade the estuary it would likely cause further alteration in the food web. Much more effort needs to be exerted in order to deal with the problem of introduced species.

Toxics-Since 2005, scientists have been conducting toxicity screening of the waters in the Delta and Suisun Bay as part of the IEP Pelagic Organism Decline (POD) studies. Studies in 2005 and 2006 focused on the summer months when juvenile smelt are present in the Delta. To better characterize toxicity during the smelt spawning period, bi-weekly sampling and aquatic toxicity testing was initiated in January 2007. Preliminary evidence indicates potential toxicity in the Delta this winter and spring. The most troubling fact about these detections is that they occurred in the spawning grounds for Delta smelt this year when both adults and their young were present. Even though the number of adult Delta smelt this year was a little larger than last, the number of young smelt collected this year was about 90 percent less than last year (see above discussion). Although there is no evidence of direct toxicity to the Delta smelt, Delta toxicity could affect smelt directly or affect food availability for the species.

Researchers have initiated toxicity testing using cultured Delta smelt and are collecting samples upstream of the toxic sites in an attempt to identify the source and cause of the toxicity. The State Water Resources Control Board (State Water Board) and the Central Valley Regional Water Quality Control Board are actively evaluating all of this year's information to identify any necessary actions to prevent this type of toxic effect on endangered species from happening again next year.

Other new research provides an anecdotal suggestion that episodic toxicity could play a role in smelt survival. A study tracking tagged salmon in the south Delta collected apparent evidence in May of extensive salmon smolt mortality in a single area. This kind of event, if proven to be related to toxics, has the potential to seriously affect a species such as the Delta smelt and warrants further investigation.

The State Water Board held a workshop on June 19, 2007 to receive recommendations, and information to support these recommendations, on immediate, short term actions it should consider to slow or stop the decline of smelt and to improve fishery resources. The State Water Board is looking for information on both water quality and flow-related actions. Any increased involvement on the part of the federal government in these efforts would be welcome.

Current Restoration Efforts

In addition to near-real time management of the Estuary through processes discussed above, DFG is also involved in larger scale ecosystem planning to enhance the estuary. Early implementation of the Ecosystem Restoration Program (ERP) began three years prior to the signing of the CALFED ROD in August 2000 in recognition that ecological systems take time to show change. In the first nine years of implementation, ERP has made significant progress in improving the natural system. ERP has awarded more than $615 million to 493 projects. To date, 276 projects or about 56 percent have been completed. Grant recipients reported approximately $285 million in matching funds, which resulted in a combined total of about $825 million spent on habitat and species associated with the Bay-Delta and its watersheds. Many ERP actions addressed priority Multi-Species Conservation Strategy (MSCS) species listed in the milestones. Restoration planning for the Suisun Marsh through the Suisun Charter process will result in the restoration and protection of 7,000 acres of wetlands in San Pablo Bay and Suisun Marsh, exceeding the Stage 1 target for tidal marsh restoration in San Pablo Bay. Restoration of tidal action to restore brackish marsh ecosystems within the next two years on the Blacklock property and Meins Landing will aid in the recovery of several listed and special status terrestrial and aquatic species. Restoration of tidal action and associated wetlands habitat on the 1,166 acre Dutch Slough Tidal Restoration Project will improve our understanding of ecological processes and how ecosystems function at different spatial scales.

The ERP has funded 82 fish screen projects to reduce mortality of salmonids. The ERP has also implemented channel and floodplain restoration projects to improve spawning and rearing habitat for salmonids including projects on key tributaries to the Sacramento and San Joaquin rivers. Removal of impediments to fish passage on Butte Creek, Clear Creek, and other Sacramento River tributaries has contributed to the rebounding of spring-run and fall run Chinook salmon populations observed in recent years. The Battle Creek Salmon and Steelhead Restoration Project is an exceptional conservation opportunity to reestablish 42 miles of prime and uniquely reliable salmon and steelhead habitat on Battle Creek and its tributaries. Successful implementation of this project will help restore populations of winter-run Chinook salmon, spring run Chinook salmon and steelhead, all of which are in danger or threatened with extinction as defined by the federal Endangered Species Act (FESA). Battle Creek offers this unique restoration opportunity because of its geology, hydrology, habitat suitability for several anadromous species, historical water allocation, and land use compatible with a restored stream environment. Of these qualities, the area's unique hydrology is perhaps the most important Battle Creek feature supporting its restoration potential. The Lower Yuba

River Accord EIR/EIS was released for public review on June 26th. The purpose of the Yuba Accord is to resolve instream flow issues associated with the operation of the Yuba River Development Project in a way that protects and enhances lower Yuba River fisheries, maintains local water-supply reliability and protects Sacramento-San Joaquin Delta fisheries. The ERP this year also funded the Narrows 2 bypass project on the Yuba River to protect habitat for the wild salmon and steelhead on the lower Yuba River.

Summary

This brief discussion of stressors, management actions, and organism responses is intended to convey our understanding that the pelagic organism decline, including the recent sharp drop in Delta smelt abundance, is an extremely complex phenomenon. We do not expect that the solution to such a complex problem lies in just one category of action. We will continue to be guided by the best science and adaptive management as our scientists work to understand the situation and our agencies seek solutions to Bay Delta problems both in the near-term and for the future.

Whatever actions we may take, we must include interests of all parties. As you know, there are no independent actions that can be taken in this complex system. Fishery agencies constantly balance needs of various listed species, and important non-listed species. Actions that affect the water projects also can potentially affect other users of water in the State including state and federal wildlife refuges. Before any actions are implemented careful consideration of associated fish and wildlife impacts is needed.

DFG is supportive of the federal government taking actions necessary to protect and restore the pelagic species and in particular the Delta smelt. We will work with you and others to accomplish this important result.

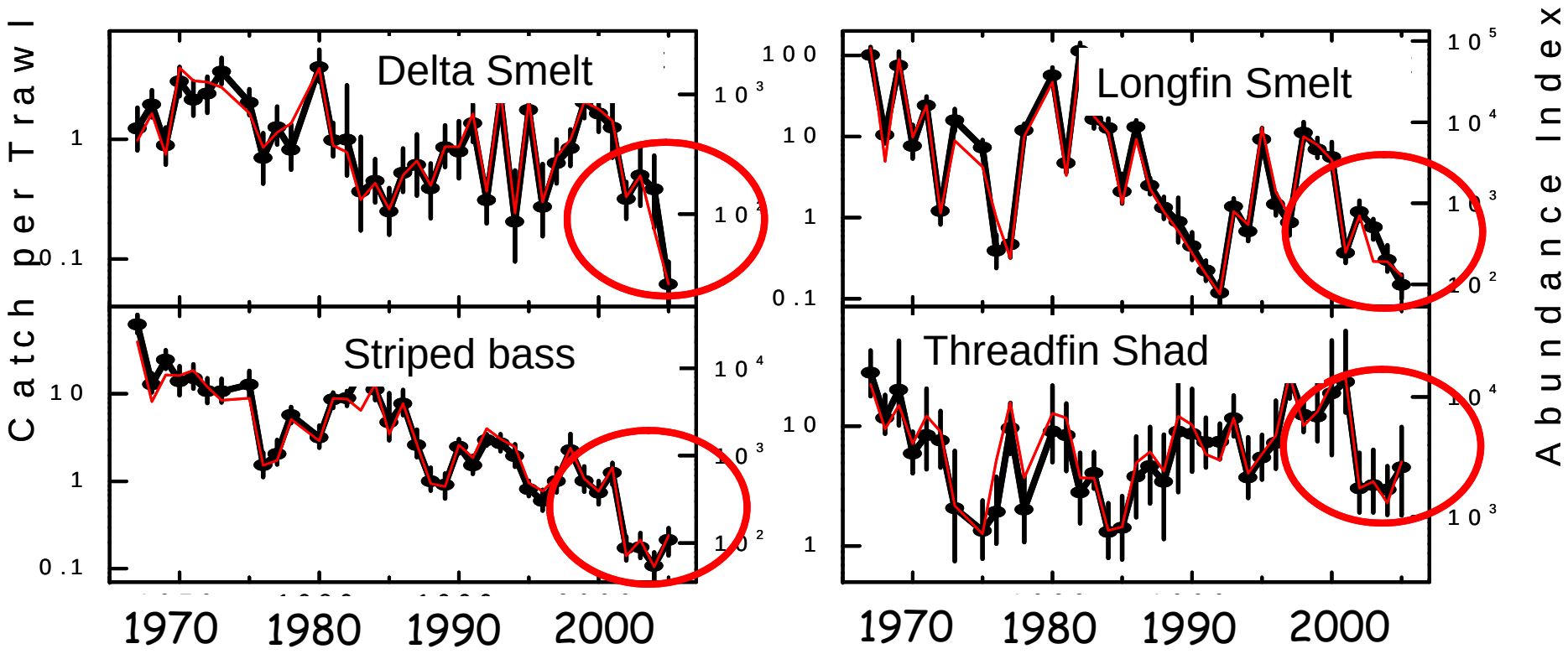


Figure 1. Annual abundance trends of four POD fishes based on Fall Midwater Trawl Survey data. Annual mean catch per trawl (black line) and annual abundance index (red line) are depicted.

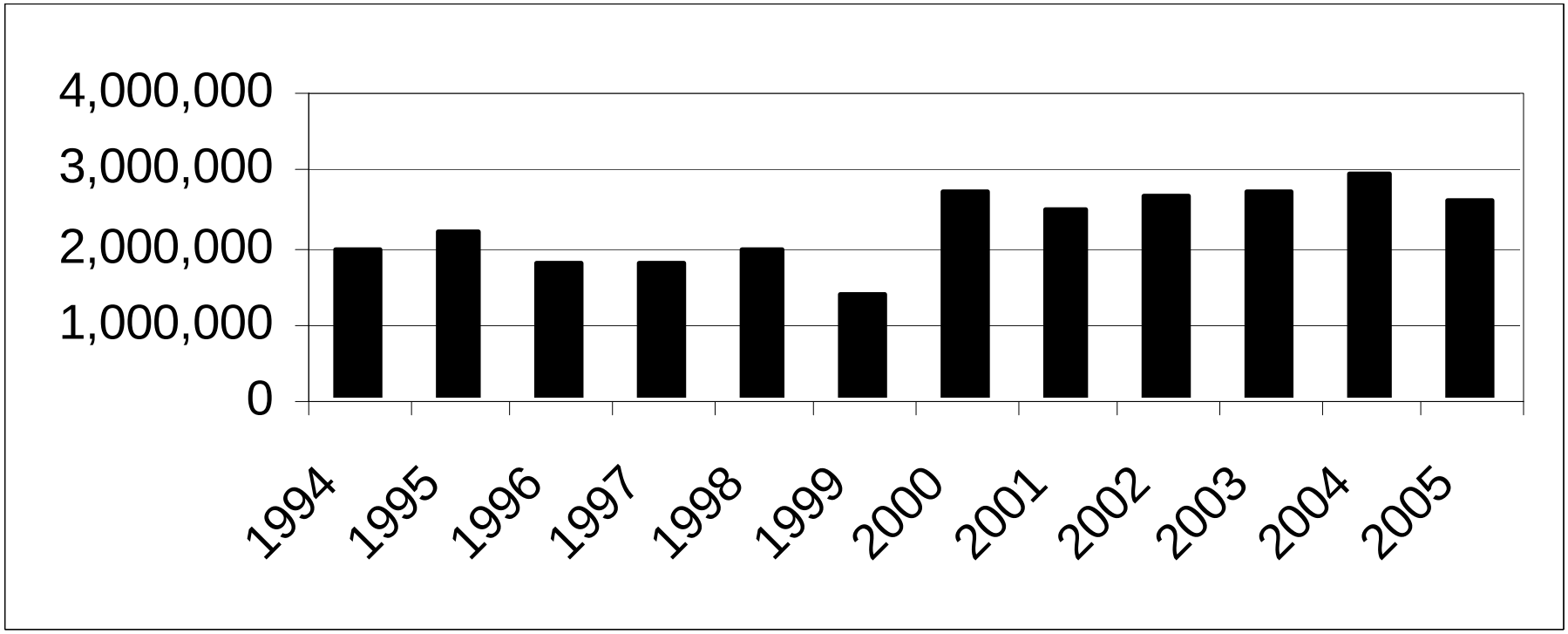


Figure 2. Total combined State Water Project and Central Valley Water Project winter exports (sum November through March) in acre feet plotted on year beginning in January.

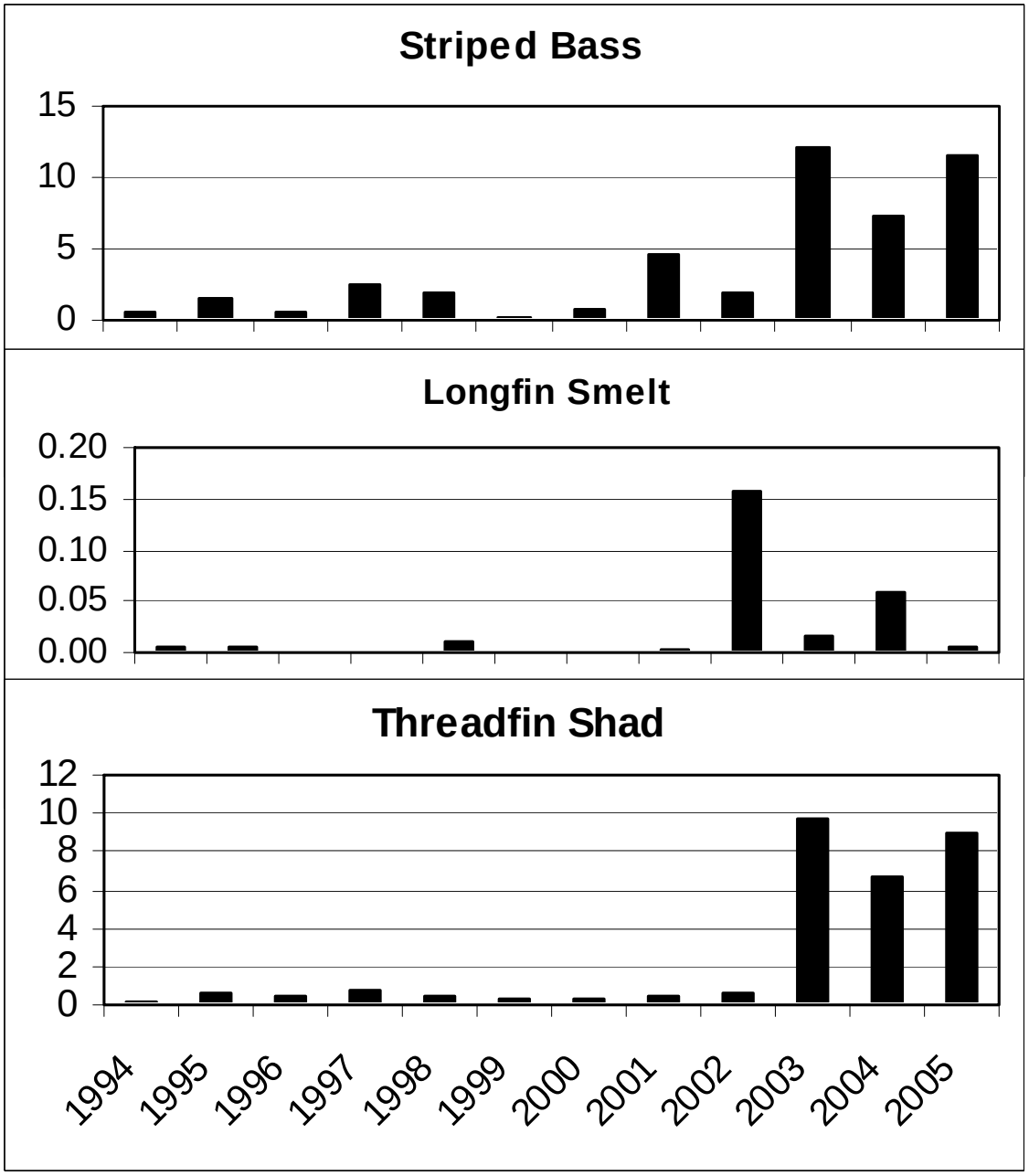


Figure 3. Winter salvage density (#/acre ft pumped) of three POD fishes scaled (divided) by the previous Fall Midwater Trawl abundance indices.

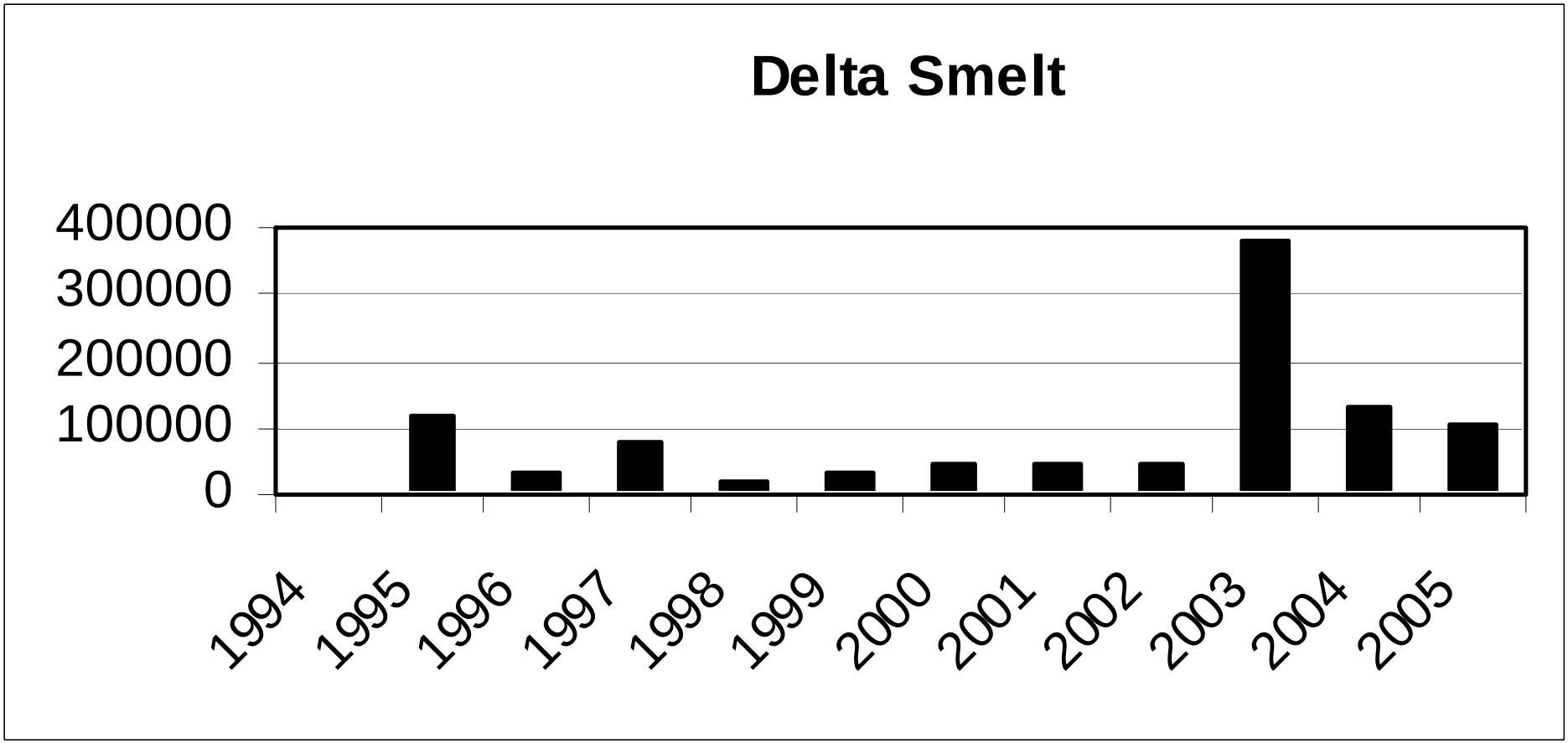


Figure 4. Winter salvage density (#/acre ft pumped) of delta smelt scaled (divided) by the previous Fall Midwater Trawl abundance indices.

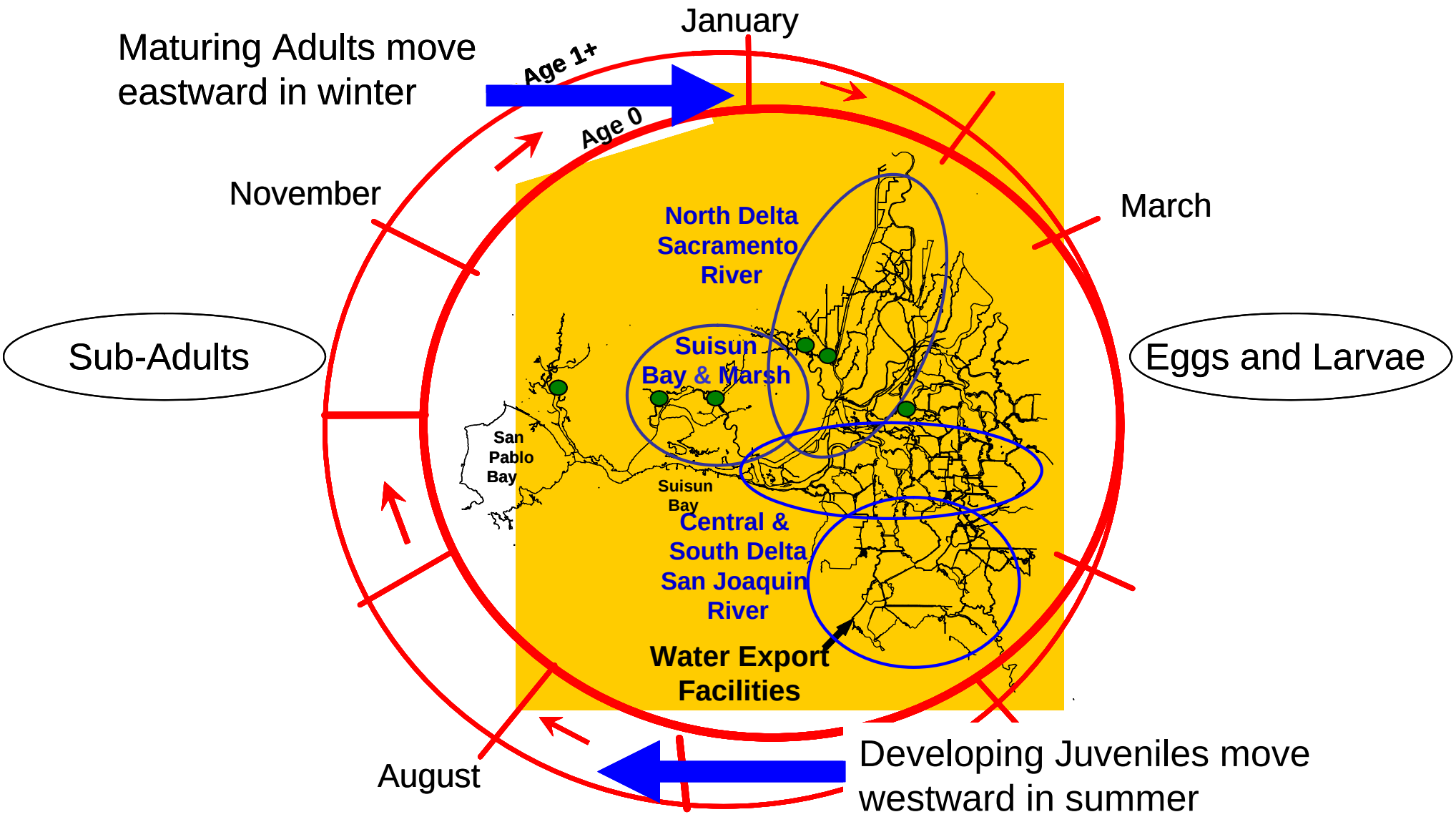
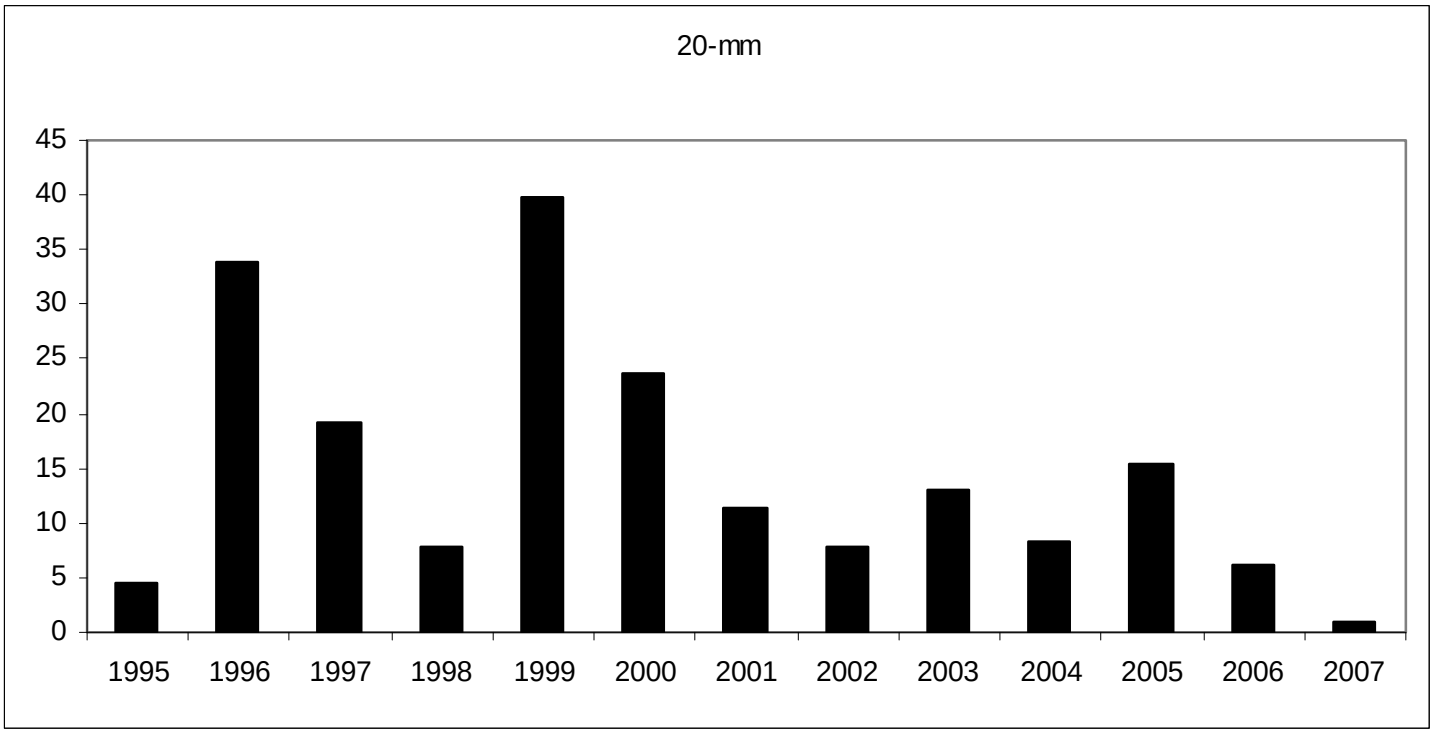


Figure 5. Delta smelt life history and general migration patterns: in winter and spring, maturing smelt move from the river confluence, Suisun Bay and Marsh eastward preparing to spawn, and become more vulnerable to entrainment by south delta export facilities. Subsequent progeny also remain vulnerable until they are able to swim and warm water temperatures drive them westward from the south delta.



Year	Index
1995	4.4
1996	33.9
1997	19.3
1998	7.7
1999	39.7
2000	23.8
2001	11.3
2002	7.7
2003	13.1
2004	8.2
2005	15.5
2006	6.2
2007	1.0

Figure 6. The 20mm survey delta smelt index by year, 1995-2007. Data processing for 2007 is not yet complete; data should be treated as preliminary and subject to revision.