Of Interest to Managers

Randall L. Brown, DWR

- Biologists and engineers working in the Bay-Delta now have access to daily outflow measurements calculated by the USGS using a dataset from a series of permanently installed flow monitoring devices. The data are available from February 1996 to date (page 3). These estimates supplement DAYFLOW values which are calculated from inflow, diversions, and estimated consumptive use in the Delta. The new data set is particularly useful when considering short-term flow effects such as movement of tagged salmon smolts released at a particular site.
- Mike Chotkowski of DFG has spent the past year looking at extensive records of fish occurrence in shallow waters around the Bay-Delta (page 12). In the table below, Perry Herrgesell and Mike condensed the occurrence data by habitat and native and introduced species. The data indicate that, although the percent non-native is somewhat variable in the system, in the Delta, non-natives far outnumber native fish in shallow water. This information should be considered when planning additional shallow water habitat to help restore native fishes.
- Suchanek and others (page 19) describe preliminary results of studies to determine the potential for transfer of mercury from Bay-Delta sediments and island soil into the food web. They did find that the methyl mercury in biota was not evenly distributed across the study area but some areas showed significant bioaccumulation. Mercury bioaccumulation should also be considered when planning for additional shallow water habitat.
- Hymanson and others (page 25) describe the results of their recent trip to China to learn more about the chinese mitten crab. From the information gained it appears that we should not be unduly concerned about health impacts from eating the crab (this species does not carry the lung fluke), and impacts to agriculture and levees. It also appears that movement of migrating adult crabs can be guided thus it may be possible to keep them away from fish facilities. The caveat is that the crab may not behave quite the same in China as it does in the United States.
- According to Rees (page 46), we now have at least three species of introduced jellyfish in the Bay-Delta. Although there have been no documented local impacts of these introductions, introduced jellyfish in other systems have severely disrupted the food webs.
- Whitener and Kennedy (page 50) examined fish use of flooded lands on the lower reaches of the Cosumnes River—one of the few Central Valley streams with no major dams in its watershed. They found that the system was complicated and changed almost daily. They recommended additional research before making any large-scale habitat restoration plans.

Table 1 Summary of shallow water habitat data review[a]

Type of Habitat	*Data Set*	*Native Species (%)*	*Non-native Species (%)*	*Native Individuals (%)*	*Non-native Individuals (%)*
Bay	1980 to 1986	57			
Delta and Lower Rivers	1994 to 1999	51			
Delta	1995 to 1999				
Mud/Sand		48	52	77.4	22.6
Bare Mud Flat		24	76	5.1	94.9
Vegetated Mud/Sand		38	62	5.8	94.2
Rip-rap, bare		34	66	11.6	88.4
Vegetated Rip-rap		34	66	5.3	94.7
Suisun Marsh Shallow Sloughs	1994 to 1997	46	54	37.0	63.0

[a] Based on information developed by Mike Chotkowski, DFG and IEP.

IEP Quarterly Highlights–January through June 1999

Delta Flow Measurement

Richard N. Oltmann, USGS

All of the UVM flow monitoring stations survived the winter high-flow period. However, there were periods when electronic or power supply problems resulted in missing data for three of the stations: San Joaquin River at Jersey Point (26 days during January; seven days from February through March); Middle River at Bacon Island (periodic short duration gaps during March and April); and Dutch Slough (six days due to vandals breaking into instrument shelter and stealing battery).

Daily Delta outflow that is measured indirectly using data from four UVM stations can be obtained from the IEP file server or the USGS Bay-Delta Hydrodynamics database. UVM-measured, Delta outflow data are available from 13 February 1996 to the present. UVM flow records are normally processed on a monthly basis and are available from the USGS database within two to four weeks after the end of each month (this includes the computation of daily Delta outflow). The flow data are then periodically transferred from the USGS database and loaded on to the IEP file server.

The tidal-flow data have been processed for the cooperative DWR and USGS hydrodynamic study of the confluence area of the Sacramento and San Joaquin Rivers (refer to previous issues of the *IEP Newsletter* for additional information on this study). Results of the September through December 1998 study were presented at last February's joint Bay-Delta Modeling Forum and IEP Workshop at Asilomar, and will soon be documented in a future *IEP Newsletter* article. The intent of the study was to develop three-month, tidal-flow hydrographs at nine locations within the confluence area using index-velocity measurements provided by ADCPs and S4s. Because of various problems, tidal-flow time series could only be calculated for six of the nine sites. However, flow relations between all of the monitoring sites were still ascertained by comparing successfully calculated flow time series with numerous flow measurements collected for calibration purposes at the sites where ADCP or S4 data were not available. The nine flow monitoring sites were (1) Sacramento River upstream of Point Sacramento, (2) San Joaquin River (and Broad Slough) upstream of Point Sacramento, (3) Montezuma Slough near Sacramento River, (4) Middle Slough (only calibration measurements), (5) New York Slough, (6) Sherman Lake at Sacramento River, (7) Sherman Lake at Broad Slough (west side of Sherman Lake - only calibration measurements), (8) Mayberry Slough, and (9) Mayberry Cut (only calibration measurements). The data collected from this study will be used in the current recalibration of the DSM2 model.

The USGS and DWR provided funding to expand the existing UVM tidal-flow monitoring network by three stations; however, two-beam side-looking ADCPs (SL-ADCP) will be used to provide index velocities instead of UVMs. The three selected SL-ADCP sites are (1) Grant Line Canal at Tracy Road Bridge, (2) Old River at the Highway 4 crossing, and (3) Old River just east of the temporary barrier location near Delta Mendota Canal. The Grant Line Canal station has been operational since 6 May 1999; several calibration measurements have been collected, but the station has not yet been calibrated. The SL-ADCPs for the other two sites recently arrived from the manufacturer and will be installed once we receive the necessary installation permits.

ADCPs were once again deployed this spring in the South Delta with the hope of producing three-month long tidal-flow time series. The ADCPs were deployed on 15 April and are scheduled to be retrieved on 12 and 13 July 1999. ADCPs were deployed at two of the sites where ADCPs have been deployed during the last two springs (Turner Cut and Middle River south of Columbia Cut) and at three new sites (False River, Connection Slough, and Old River at San Joaquin River at Webb Tract). Unlike the previous two springs, a tracer-dye study was not done this spring.

Rock Slough Monitoring Program

Jerry Morinaka, DFG

Fish entrainment sampling at the Rock Slough intake of the Contra Costa Canal resumed on 10 March. Sampling was suspended while the sampling equipment stolen

in December was replaced. We used a sieve-net to sample fish entrainment once a week from 10 March through June. The only fish species captured in March and April were adult white catfish (*Ictaluras catus*), bluegill (*Lepomis macrochirus*), and redear sunfish (*Lepomis microlophus*). Striped bass (*Morone saxatilis*), mean of 31 mm FL, largemouth bass (*Micropterus salmoides*), mean of 30 mm FL, and yellowfin goby (*Acanthogobius flavimanus*), mean of 30 mm FL were the predominant juvenile fish species captured in the sieve-net in May and June. Egg and larval net sampling was conducted at the Rock Slough intake starting in June. Bluegill, mean of 5 mm FL and striped bass, mean of 10 mm FL were the predominant larval species captured in the egg and larval net. No delta smelt were captured in the sieve-net or the egg and larval net.

Old River Fish Screen Facility (Los Vaqueros) Monitoring Program

Jerry Morinaka, DFG

We used sieve-nets to sample fish entrainment three times a week in front of and behind the fish screens at the Old River Fish Screen Facility from January through June. The sieve-net sampling in front of and behind the fish screens was conducted simultaneously; however, very few fish were captured. The fish captured behind the fish screens from January through the end of March were fish that were entrained at the larval stage and had grown up inside the facility. Prickly sculpin (*Cottus asper*), mean of 10 mm FL, and striped bass (*Morone saxatilis*), mean of 12 mm FL were the predominant species captured behind the fish screens in May and June. No delta smelt were captured in the sieve-nets during any of the sampling efforts.

Update on the Chinese Mitten Crab Habitat Use Study

Tanya Veldhuizen, DWR

The objective of the Chinese Mitten Crab Habitat Use Study is to determine the relative abundance of juvenile and adult mitten crabs among various habitat types (for example, intertidal vegetated, subtidal vegetated, and non-vegetated habitats) in the Sacramento-San Joaquin Delta. In March, we began conducting a pilot study to develop effective sampling methods. Formal data collection was scheduled to begin in July. However, due to the low abundance of mitten crabs in the Delta this past spring, gear effectiveness tests were inconclusive for most gear types. As a result, we have extended the pilot study through July. We are evaluating a variety of sampling techniques, including block net enclosures, baited traps, artificial substrates, and snorkeling transects. A variety of methods is required to effectively sample for mitten crabs due to the changing diet of the crabs (juveniles are herbivores and adults are omnivores) and the diversity of habitats being examined.

Pilot Survey of Gelatinous Zooplankton in the San Francisco Estuary

John Rees and Chris Kitting, CSU Hayward

The jellyfish sampling for the Napa River has been scheduled from May through November 1999. Sampling has been performed at two designated stations in May and June. No jellyfish have been collected to date. Zooplankton types sampled in May and June have included calanoid copepods (mostly nauplii and non-adult stages) and at least two species of crab zoeae.

Three species of introduced hydromedusae were found in the Napa River at a number of stations from August to November 1998. Little is known of the suite of environmental factors that stimulate release of jellyfish from the benthic polyps of these three introduced species or of those factors that enable large populations of planktonic medusae to become established. Adults of these three jellyfish species have been found in the estuary to date (1997 and 1998) in salinities ranging from about 2.0 to 10 ppt and temperatures ranging from about 16 to 24 °C. This has been a cool year to date (June) in general in the Bay Area, and the water temperature in the upper Napa River was 19 °C in mid-June. Polyps of one of the species (*Moerisia* sp.) has been kept in culture for about two years, in salinities of 8 to 10 ppt and temperatures of 17 to 20 °C.

Polyorchis penicillatus, a large native hydromedusa once common in San Francisco Bay and associated with eelgrass beds, was present at Alameda Point (the former Alameda Naval Air Station) from October 1998 through January 1999. We have monitored this jellyfish since 1995, where it occurs seasonally, from about October through February, at the surface. Monitoring to date has indicated that the appearance of *P. penicillatus* is correlated with higher salinity values (approximately >23 ppt) and the presence of concentrations of surface zooplankton. *Polyorchis penicillatus* was also collected over eelgrass near the Golden Gate Bridge in June.

Mysid Shrimp and Zooplankton

Jim Orsi, DFG

The introduced mysid shrimp, *Acanthomysis bowmani,* continued its dominance over the native *Neomysis mercedis* during the first half of 1999. *Neomysis* abundance did not exceed 1 organism/m^3 until May, when it reached 3 organisms/m^3 in Old River and in the San Joaquin River at Bradford Island. In June, *Neomysis* abundance declined. In comparison, peak abundance of *A. bowmani* was 28 organisms/m^3 in Suisun Slough in May. But last year in May, *A. bowmani* was about ten times as abundant as this year. However, its abundance did rise to about 100 organisms/m^3 in June at 6 mS/cm, so perhaps the timing of the peak is just different this year and a major decline has not occurred.

Limnoithona tetraspina was the dominant copepod in all months; however, the bloom that brought concentrations to >100,000 organisms/m^3 last spring was not repeated this year. *Eurytemora* was the second most abundant copepod in spring. It began to increase in March, peaked in April, and declined slightly in May, and steeply in June. Its peak location in May was in Disappointment Slough; high outflow probably kept its abundance down in the Sacramento and San Joaquin rivers. It was also abundant in Suisun Bay at about 6 mS/cm. In June, *Pseudodiaptomous forbesi* became the second most abundant copepod. It reached its peak abundance at 6 mS/cm, but had high abundance throughout most of Suisun Bay and the Delta. The native cyclopoids and diaptomids were not abundant in any location or month.

High spring outflow brought cladocerans into Suisun Bay. Their peak abundance, however, was in Disappointment Slough or in the San Joaquin River at Stockton in all months, as is usually the case.

Rotifers of the genus *Synchaeta* were the most abundant and reached densities of >100,000 organisms/m^3 in the Suisun Marsh sloughs in April.

San Francisco Bay Fisheries Monitoring

Kathy Hieb, DFG

The IEP Delta Outflow/San Francisco Bay Study has been routinely sampling fishes and macroinvertebrates in the bay since 1980. Spring catches give some indication of year class strength for many species, although we typically use at least six month's data to calculate annual abundance indices. For example, our June 1999 age-0 longfin smelt catches were the highest June catches for the study period. However, May 1999 longfin smelt catches were not exceptional, and several more months' data will be needed to reliably predict year class strength. Fish were distributed from Central to Suisun bays, with the highest catches in San Pablo Bay, another indication of a potentially strong year class.

Age-0 Pacific herring catches from April to June 1999 were similar to the 1998 catches for the same months, and comparable to other recent low abundance years. Fish were widely distributed from South to San Pablo bays.

The first age-0 Dungeness crabs were collected in May. Although May and June 1999 catches were higher than in 1998, when the index was 0, catches were lower than in 1997, the most recent year with a "good" year class. Crabs were collected from South to San Pablo bays and were still concentrated in the channels; by July, they should be common over the shoals, where they will rear for several months.

We are still seeing effects of the most recent El Niño, as shown by above average catches of several "southern" species. For example, our 1999 California halibut catches to date are the highest for the study period, slightly exceeding the 1993 catches (highest annual index).
Age-1, age-2, and age-3 fish dominated our 1999 catches and fish were distributed from South to San Pablo bays, with most collected in South Bay.

Pacific sardine catches were also high from April to June. We collected a record high number of sardines in April and catches declined in May and June. Most fish were collected in South and Central bays, often in mixed schools with age-0 Pacific herring.

Splittail Investigations

Randall Baxter and Gayle Garman, DFG

The field season began with holding-tank installation at Hood in November and ended with larval sampling in the lower Sutter Bypass as the floodplain drained in late April. This year's tasks included radio tagging and tracking adult splittail to their spawning grounds and a study of tag effects and sampling for adult and larval splittail on potential spawning grounds in the Sacramento River and Sutter Bypass.

During 21 weeks of hook-and-line sampling—late November to early April—at river mile 24.5 on the Sacramento River, 192 fish were landed, including 112 splittail. Among the splittail, 47 were at least 290 mm FL (the minimum size for radio tagging), and of these fish, 26 were radio tagged and released back to the river, five were stressed or injured and were released without tagging, and 16 were held for the tag effect study. Adult splittail were caught from the last week in November to the third week of March. The spawning migration peaked during the last 2 weeks in February and the first week in March, or immediately prior to their historic March through April peak spawning period. We also caught upstream migrant adult steelhead and Sacramento suckers in January and a few age-1 starry flounder from December to March. In all, 12 species were landed, of which half were native. Native species also accounted for 93% of the total catch. Improved efficiency or considerable additional sampling effort will be needed in the future to capture the target 70 splittail for radio tagging.

For the tag effects study, three 800 gallon tanks were installed at Hood and run from November to April. Splittail of tagging size were systematically assigned to one of five groups: internal radio tag, external radio tag, internal dummy tag, external dummy tag, and control. Dummy tags emulated the size and weight of real tags, and were implanted or attached following the same protocol. Tagging effects results were inconclusive due to control fish mortality and low sample sizes. The survival rates after more than 12 weeks of study were 60% for control fish ($n = 5$), 50% for internally tagged fish ($n = 6$), and 40% for externally tagged fish ($n = 5$). Most mortality occurred in January and February as a result of fungal and secondary bacterial infections. Future studies should use smaller tags, internal tags for migrating fish and external tags only for those captured near potential spawning grounds to improve survival and for normal migratory behavior.

Radio tracking success declined in 1999 when migrating fish were tagged in the Sacramento River compared to 1996 when fish were tagged on the spawning grounds. In 1999, 13 of 28 tagged fish were tracked, including two fish tagged in the Sutter Bypass. A couple of factors influenced our ability to track. First, most fish dropped downstream after tagging, and many may have remained in the Delta because they were not detected again. Second, receiver performance declined rapidly during the season with one receiver failing. Smaller tags and new reception testing protocols should improve our success in the future.

Gill net sampling on the Sutter Bypass floodplain never encountered a concentration of adult splittail, though some were caught individually. This resulted in part from reduced effort and effectiveness related to ubiquitous cockle-burrs entangling nets and holding nets off the bottom. Larvae sampling was not affected by cockleburrs, but also failed to detect any specific spawning areas. However, late stage larvae and small juveniles were collected from two cross channels draining the lower Sutter Bypass and from a location in Butte Slough, at the top of the Sutter Bypass east of Colusa. Though no new spawning areas were detected, sampling did confirm splittail spawned somewhere in the lower Sutter Bypass and Butte Slough in 1999.

Suisun Marsh Salinity Control Gates Salmon Passage Evaluation

Bob Fujimura, DFG

We are continuing the postsurvey processing and analysis of the telemetry data for the 1998 Suisun Marsh Salinity Control Gates (SMSCG) Monitoring Study. In the fall 1998, 198 adult chinook salmon were caught, tagged with ultrasonic transmitters, and monitored for passage through the SMSCG during three operational phases. The major objective was to evaluate the effectiveness of horizontal passage slots in the flashboard portion of the structure.

Data analysis and interpretation have been hampered due to excessive noise in the last phase of the study. The telemetry equipment manufacturer is leading the data filtering effort. We are working with a DWR programmer to develop data processing routines to simplify the tedious process of manually interpreting the telemetry data. Preliminary results indicate that most tagged fish swam between 5 and 20 feet below the water surface. Similar to previous telemetry studies, fewer fish passed when the gates were operational and no passage slots were provided compared to when the gates were open and the flashboards were removed. The depth recording tags were the most affected by the noise interference.

Based on our initial results, plans for the fall 1999 SMSCG monitoring program will include (1) detailed presurvey mapping of the reception range of the fixed hydrophones at the SMSCG, (2) reduced number of depth tags used, and (3) redeployment of some receivers further away from the structure. Preparation for the 1999 SMSCG monitoring study began this spring.

Juvenile Chinook Salmon Telemetry Evaluation

Bob Fujimura, DFG

We conducted the second year of our evaluation of miniature telemetry transmitters to track juvenile salmon through the Delta. Juvenile chinook salmon (mean length = 147 mm) from Coleman National Fish Hatchery were implanted with dummy (nonfunctional) tags and were held a holding facility at Hood. The dummy tags corresponded to the smallest ultrasonic transmitters currently available. Two methods of tag implantation were examined and fish were held for over 14 days during the winter of 1999. Although the captive fish experienced some disease problems, no obvious differences were observed between the tagged fish and their controls. Gastric implantation was selected for future work with juvenile chinook salmon due to its reduced stress on fish and its simplified procedure compared to surgical implantation.

Prior to a planned field pilot study, we conducted a second dummy tag experiment. In spring 1999, we used smaller Nimbus Fish Hatchery fish (mean length = 105 mm) in a similar experiment at the DFG Fish Health Laboratory in Rancho Cordova. Increased mortality of gastric implanted fish occurred and many of the tagged fish swam abnormally for several days. High tag-to-body weight ratio was the likely cause of these adverse effects. Based on the 1999 results, field trials using fish tagged with functional tags at Three Mile Slough were cancelled this year. Biologist Doug Killam will be preparing a detailed summary of the 1999 research.

Fish Salvage Facility Handling and Transport Evaluation

Bob Fujimura, DFG

We begin a series of weekly experiments at the DWR Skinner Fish Protective Facility (SFPF) in spring 1999. The major objective of the 1999 experiments is to obtain estimates of acute mortality associated with current handling and trucking procedures with emphasis on delta smelt and splittail. The goals of the program are to obtain baseline information on the mortality rates and to examine methods to improve the survival of handled and trucked juvenile fish.

The study design was based on previous work done at the SFPF in the 1980s where the acute mortality of six common fish was examined. Fish are held for 48 hours after undergoing standard handling or trucking procedures in 460 L holding tanks. Control fish are obtained prior to these activities and held under the same holding conditions. Dead fish are collected and counted at the beginning, middle, and end of the holding period. The number, size, and the species composition of the remaining fish are recorded at the end of the experimental period.

Up to four experiments are scheduled each week. Sudden changes in the salvage or pumping operations or lack of sufficient numbers of salvage fish have reduced the numbers of tests attempted or completed this season. Approximately 40 experiments have been completed by mid-June and testing will end by July 1. Problems encountered during the study include the design of suitable sampling and crowding devices, and the coordination of the testing schedule with the salvage operation schedules. Information has been obtained on juvenile chinook salmon, steelhead, splittail, delta smelt, and catfish. Data entry and processing of test information have begun.

Yolo Bypass Study

Ted Sommer and Bill Harrell, DWR

For the fifth consecutive year, the Yolo Bypass was inundated in 1999. The major period of inundation from

the Sacramento River basin via Fremont Weir was 11 February to 8 March, although Cache Creek flows created important spring inundation pulses. Our field effort was substantially reduced over 1998, but the study continues to yield interesting results.

A screw trap was operated at the base of the Toe Drain during December 1998 to June 1999. Peak salmon catch was observed during floodplain drainage, similar to emigration trends during two moderate (<50,000 ft^3/s) spring 1998 flow pulses. These observations contrast with the flow event of February 1998 (>200,000 ft^3/s), when emigration rates were closely correlated with flow. Based on these results, we hypothesize that floodplain residence time of young salmon is longer with low-to-moderate flow pulses. Salmon growth appeared to be relatively good in beach seine sampling, although comparable data have not yet been analyzed for the adjacent Sacramento River. After the first major period of the floodplain drainage in March, stranding rates were relatively high in isolated and non-isolated Yolo Bypass ponds until the spring Cache Creek flow pulses stimulated downstream migration. We do not know whether many of these fish would have eventually emigrated from ponds adjacent to the Toe Drain in the absence of the Cache Creek pulse.

In February, we released two groups of 100,000 coded-wire-tag (CWT) salmon fry in Yolo Bypass (Fremont Weir) and Sacramento River (Elkhorn Boat Ramp). A prominent emigration pulse of tagged fish was observed in the following one to two months at the Toe Drain screw trap. Our CWT releases are still being captured in the Delta at Chipps Island. However, the preliminary CWT recoveries to date suggest higher growth and survival rates for the Yolo Bypass release group. There is some evidence that the Sacramento release group may have strayed to a greater extent based on the capture of individuals in the American River and Delta Fish Facilities.

Fish species composition was surprisingly similar to 1998. Some notable differences include more inland silverside in 1999 but substantially fewer carp and splittail. The lower catch of splittail occurred despite a fairly favorable hydrology, raising the issue of whether it is reasonable to expect consecutive years with major spawning events. Both 1995 and 1998 produced phenomenal splittail year classes, yet the following reasonably wet years (1996 and 1999) apparently resulted in only modest spawning success.

Predicting the Evolution of Ecological Functions of Restored Diked Wetlands in the Sacramento-San Joaquin Delta: BREACH study

Lenny Grimaldo, Robert Miller, and Chris Peregrin, DWR

We continued bimonthly sampling for larval and juvenile fish in winter and spring 1999. Similar to 1998, we reported high densities of native fish during early March and April. In contrast, densities of introduced fish were low during March and April and high during late May and June. In February, we captured juvenile chinook salmon at Venice Cut Island, Mildred Island, and Lower Mandeville Tip. In April and May, we collected delta smelt larvae at all study sites in the central Delta. Data collection will continue through June 1999.

In May and June, we conducted experiments at Lower Mandeville Tip, Venice Cut Island, and Old Prospect Island to examine relative predation risks to salmon occupying vegetated and unvegetated shallow water habitats.

Data analyses will begin in July 1999. We plan to produce an interim report, summarizing 1998 results, in July 1999. We anticipate completion of a final report by the end of 1999.

Pesticide Concentrations and Duration in Delta Smelt Spawning and Nursery Habitat

Kathryn M. Kuivila, Catherine A. Ruhl, and David H. Schoellhamer, USGS

A two-year study to determine exposure of delta smelt to potentially toxic dissolved pesticides during vulnerable egg and larval stages began in 1998. Hydrodynamic and pesticide concentration data are being collected in early spring in the northwestern Delta, a primary spawning area for delta smelt, in coordination with the California Department of Fish and Game.

Water samples were collected weekly for pesticide analyses from April through June 1998 at Cache, Lindsey, and Barker Sloughs. Molinate, thiobencarb, and carbofuran—pesticides applied to rice—were detected at both Cache and Lindsey sloughs in May, but not at Barker Slough. During the sampling period, an instrument package to monitor water velocity and depth was deployed in Lindsey Slough. These hydrodynamic data will be used to estimate residence times of water parcels containing pesticides and, therefore, potential pesticide exposure times for delta smelt. From June through August, additional water samples for dissolved pesticides were collected in Suisun Bay near the Reserve Fleet at salinities of 2 ppt, thought to be the salinity of maximum larval fish abundance. The 1998 results will be described in a future *IEP Newsletter* article.

In spring 1999, a hydrodynamic instrument package collected data in Cache Slough. Weekly water samples for dissolved pesticides were collected from April through June at Cache and Lindsey sloughs and at a new site on the Napa River. The 2 ppt sampling in Suisun Bay began in June and has been expanded to include the Reserve Fleet site and an additional site at Mallard Island.

Juvenile Salmon Monitoring

Rick Burmester, USFWS

The US Fish and Wildlife Service, Sacramento-San Joaquin Estuary Fishery Resource Office (SSJEFRO) increased beach seining efforts by seining the San Joaquin River in January, where 1,046 fall/spring-run chinook have been captured to date. (Salmon race from Fisher size curves.) Only 201 fall-run chinook were captured from January through June 1998. Sacramento River and Delta area seining continued with 84 winter-run chinook captured between January and 25 March, when the final winter-run-sized chinook (99 mm) was seen in the Delta at Brannon Island. One brood year (BY) 1998 late-fall chinook (118 mm) was captured at Discovery Park, and 17 BY 1999 late-fall chinook were caught in April and May—all but one at Sacramento River seine sites. Since January, 9,817 fall/spring-run chinook have been captured in Sacramento River and Delta area seines. This compares to 8,605 fall/spring-run chinook captured during the same time period with similar effort in 1998. The newly restarted San Francisco Bay area seine has captured 11 fall/spring-run chinook since January, mostly from McNear's Beach.

The SSJEFRO conducted Kodiak trawling at Mossdale until 31 March, then DFG, Region 4 continued on 1 April. Through mid-June, two winter-run-sized chinook and 1,321 fall/spring-run chinook were captured. The two winter-run-sized chinook were most likely San Joaquin River yearling fall-run chinook, indicating that some of the winter-run-sized salmon seen at the fish salvage facilities could be fast growing San Joaquin River fall-run chinook.

At Sacramento, the Kodiak trawl was conducted from January through March, and captured 20 BY 1999 winter-run chinook and 5,572 fall/spring-run chinook, compared to 38 winter-run, and 6,007 fall/spring-run captured over the same period in 1998. The midwater trawl replaced the Kodiak at the end of March to match historical efforts for the fall-run emigration. The midwater trawl has captured three BY 1998 winter-run chinook (in April), three late-fall chinook, and 6,592 fall/spring-run chinook. During the same period last year, five winter-run, two late-fall run, and 3,482 fall/spring-run chinook were captured.

From 3 January through 21 June, trawling at Chipps Island has produced 145 winter-run, five BY 1998 late-fall run, and 14,301 fall/spring-run chinook, compared with 121 winter-run, 12 late-fall run, and 33,226 fall/spring-run last year. High winds, vessel problems, and delta smelt catches during March and again at the end of June caused downtime, and contributed to the lower catches at Chipps Island this year. Beginning on 22 April and continuing through 22 May, efforts increased from 10 to 20 tows per day for the recovery of VAMP-related coded wire-tagged (CWT) fish. This was the second year (also in 1998) of this double effort, an increase over that done historically at this time of year.

Information from recoveries of CWT salmon will continue to be processed through the summer. There were approximately 1,500 CWT salmon from Chipps Island, 2000 from the State and federal facilities, and 1,000 from Sacramento trawl, beach seining, and Real Time Monitoring. The VAMP-related CWT recovery effort at Jersey Point collected about 1,000 CWT fish before being discontinued on 6 May due to delta smelt catches.

See the USFWS-Stockton summary report at http://165.235.108.8/usfws/monitoring/report.asp.

Juvenile Sturgeon Setline Survey

Raymond Schaffter, DFG

We conducted a full (21 stations) overnight setline survey during March and an abbreviated setline survey (six stations) in early June. This early sampling for juvenile sturgeon is an attempt to avoid the bait loss caused by adult Chinese mitten crabs that we experienced during our normal July to November sampling period in 1998. We caught few sturgeon in late summer and fall sampling in 1998 because of bait loss.

We caught 69 juvenile white sturgeon between 54 and 117 cm total length during the March survey. Bait generally remained on more than half of the hooks at 17 stations from the west Delta to Suisun Bay; bait loss was more severe (20% to 0% of hooks retained bait after overnight sets) at four stations in Carquinez Strait and San Pablo Bay. Surface specific conductance ranged from 135 to 270 mS/cm at the upstream locations where mitten crab activity was low and 510 to 1450 mS/cm downstream where mitten crab activity was severe. The average catch of 3.5 fish per setline was less than pre-mitten crab (1996 to 1997) catch of 5.1, and only two sturgeon were captured at the four sites where crab activity was considered severe.

We caught 34 juvenile white sturgeon at six sites between Broad Slough and Suisun Bay in June. The only crab activity was noted at a single station in north Honker Bay where about half of the hooks retained bait after an overnight set. This was also the location where almost half (15) of the juvenile sturgeon were caught in June. Surface specific conductance ranged from 225 to 4,180 mS/cm at sites sampled in June. We will conduct a full setline survey from Sherman Island to San Pablo Bay in mid-July.

Delta Smelt Update

Heather McIntire, DFG

Delta smelt spawned primarily in the south and central Delta and then remained in the area for an unusually long time. High densities near the SWP and CVP resulted in the "red light" take limit being exceeded in May and June. Exports were reduced and remained low through June. Delta smelt densities began to decline in the central and south Delta near the end of June and pumping resumed with maximum exports being anticipated by 1 July. (For additional information see article on page 33, this issue.)

The first six of eight 20 mm surveys are completed and results are posted on the 20 mm homepage at http://www2.Delta.dfg.ca.gov/data/20mm. The DFG lab sorted, identified, and measured 80,734 fish within 24 hours of collection. Additional 20 mm sampling was requested by DWR and USBR in the south Delta, Victoria Canal, Grant Line Canal, and near Clifton Court Forebay. These results are also available on the 20 mm homepage.

Cache Slough was not a major spawning ground this year. Egg and Larval Entrainment Monitoring in Cache Slough will continue until 16 July. Twenty-seven delta smelt were identified from 20,495 fish collected.

Young Fish Investigations

Lee Miller, DFG

Staff is currently working to complete several papers. One paper describes the distribution of *Gammarus daiberi*, an introduced amphipod, and amphipods of the genus *Corophium*. This paper is based on egg and larva sampling done from 1990 to 1993. Another paper describes factors affecting striped bass growth and mortality rates is partially complete. Staff striped bass biologists are reviewing the draft. A modeling analysis of striped bass cohort mortality through age three has been drafted and is in progress. It will be useful in evaluating the net efficiency of some of the monitoring surveys. Another paper describes changes in the diet of juvenile striped bass in relation to changes in food availability and fish size. A technical report on the inventory of fish survey data for shallow water habitats is being prepared for review.

The summer townet survey, which is used to index the abundance of young striped bass and delta smelt, started 5 July. The survey started two weeks later than in the recent past because of below average spring temperatures. This late starting date (and the 20 mm survey continuing through July) has postponed the start of the fall midwater trawl survey to 7 September.

IEP Field Crew Rescues Boat Owners and Boat

Chuck Armor, DFG

On 2 June, while trawling for emigrant salmon in the Sacramento River near Sacramento as part of an Interagency Ecological Program monitoring effort, DFG boat operator Dick Fenner and crew, Amy Buhlet (USFWS) and Mike Robinson (DWR), responded to a May Day distress call from the vessel *Ring-A-Ding-Ding*. The vessel was without power and was rapidly taking on water. Mr. Fenner, using his knowledge of the area, towed the vessel to a nearby sandbar where it was beached, thus saving it from sinking in the center of the river. While on the sandbar the stern of the vessel continued to take on water despite the efforts of the bilge pump and bailing by the crew and boat owners. Mr. Fenner determine the problem was a broken drive shaft and skillfully plugged the hole allowing the crew to complete bailing the boat out and thus keeping the vessel afloat. Throughout all of this, Mr. Fenner and his crew stayed with the vessel and its owners until Vessel Assist arrived. To quote from the letter received from the boat owners:

We want to be clear in indicating what the circumstances were. Though the water was not high, the flow was full and the current was strong. The water temperature was in the 50s. We had a full tank of gas—over 120 gallons. By ourselves, assisted only by our bilge pump, we could not have kept the boat from sinking. Once the water reached the gas tank and the engine—and it was rapidly on its way—in fact, the rear part of the engine was submerged, the boat would have sunk like a stone, stern first. We would have been in the water. And though we were both wearing life jackets, in the cold water, the strong current, with a number of major snags in the immediate vicinity, our lives very definitely would have been in jeopardy.

Mr. Fenner's quick response, his assessment of the situation, his skillful seamanship saved our boat and rescued us from a perilous situation. His clear thinking, familiarity with water craft, and on-the-spot inventiveness saved the stern of our boat from submerging once he has us out of harm's way. Throughout all this action, Mr. Fenner was polite, thoughtful, warm, and reassuring. Not once did he give even a hint that our debacle in any way inconvenienced him.

We owe the survival of our boat, and most likely ourselves, to the selfless, informed and effective action of Richard Fenner, Amy Buhlet and Mike Robinson.

Thank you does not convey the depth of our feelings or the sincerity of our respect. But it is all we have. Thank you, thank you, thank you.

Sincerely, David and Judy Covin

DFG's Dale Sweetnam Has Transferred to Fort Bragg

Chuck Armor, DFG

Dale Sweetnam, leader of the Delta Smelt Project since its inception in 1992, is transferring to a California Department of Fish and Game (DFG) position in Fort Bragg to work on nearshore finfish and invertebrates. He will be conducting research to meet requirements of the Marinelife Management Act.

Dale played a major role in the DFG delta smelt status review which led to its listing as a State threatened species in 1993, and he has been instrumental in designing surveys to monitor smelt abundance and distribution, sometimes on a "real-time basis." For example, the 20 mm survey, which he initiated, has effectively been used to ascertain the distribution and abundance of young delta smelt in the spring and summer. This information, in turn, has been used to evaluate and modify water project operations to minimize "take" of delta smelt by the projects. Dale also has participated in diet studies and other investigations on habitat use by delta smelt. He has been a major player, through various assignments with the Interagency Ecological Program (IEP) and CALFED, in developing the delta smelt recovery plan and other concepts for smelt protection and habitat improvement.

Dale brought excellent computer and organizational skills to the IEP, and is noted for rapidly turning recently collected data into colorful, useful graphs on the IEP Internet site. Dale has earned the respect of all who have worked with him. Despite pressures that come with being on the delta smelt "hot seat" he has remained cool and congenial. His co-workers in the IEP wish Dale success in his new position.