

**Comments and Responses to the South Delta Fish Facilities Forum
Requests for Input on Action Recommendations (SDFF Meeting on November 3,
2003)**

Charles Liston¹, Ph..D.
Research Aquatic Scientist

**Develop and Test New Fish Screen and Fish Collection Technologies in a
Demonstration Facility – Tracy Fish Test Facility (TFTF) or Tracy Demonstration
Fish Facility (TDFF)**

This proposal addresses the interagency acknowledged inadequacies of existing 1950's style and design of the operating fish salvage facilities for the CVP and SWP. Over the past 6 years, designs and concepts for improved facilities that address modern challenges in the south Delta have been developed through interagency CALFED sanctioned teams and committees, with the USBR as lead agency. Fiscal limitations have continued to direct thinking in recent years, and a smaller version of an earlier test facility, now known as the TDFF, is the latest design for consideration. A detailed concept report was presented to the SDFF and has been circulated to all interested parties.

Comments/Concerns

*Replacements or significant retrofits for existing facilities require testing in place with a demonstration/test facility. Presently, many components of the TDFF (i.e., fish lift systems, screens, debris cleaners, fish sorters, off-loading mechanisms, new holding tanks) are under tests as individual components. The TDFF would link all systems and test them for operational efficiency and fish friendliness together. This is strongly recommended before major facilities are considered for the south Delta.

*Even with existing levels of water diversions, many, many fish of all species are lost through louvers and thus sent down the canals, lost to the Delta forever. Methods can be significantly improved for recovering fish, which would support all uses of the Delta water in the long run.

*This program is a critical path towards more enlightened and balanced use of Delta resources

*One of the major concerns is that there is some push to implement large facilities before adequate real world tests are undertaken. R&D can be quite costly, but the need to minimize uncertainties about these large systems is critical.

*Another concern is further delay in a program that is trying to address decades old problems in the fish salvage systems. Each delay pushes schedules outward and serves no one well, in my opinion.

*Decision makers need to realize that, even with a green light given to develop,

construct, and test a TDFE today, it takes considerable time for the system to be available for testing. It may be ready by early 2006 for initial tests if direction is given to proceed.

*With monies already allocated to develop and evaluate a test facility, this path has clearly been recognized long ago as appropriate to pursue for the best interests of Delta resources and use. Given the recent refinements for the facility, demanded by fiscal limitations of recent times, I believe the TDFE concepts have undergone excellent modifications that will serve even better a “science based” approach to technology development than did earlier, larger versions.

General

TDFE should proceed in all haste, and could be developed in parallel with two other suggested programs: The CHTR program and the South Delta Fisheries and Hydrodynamic studies (see comments on these studies below).

Improve Existing Fish Facilities

Essentially, this work is now on-going but limited by the constraints of the old systems, and the fact that they are “production level” facilities, not easily amenable to alteration for obvious reasons.

Concerns/Comments

*It is difficult to see how we will make a major leap from the old louver technology to more refined systems with significantly better fish recoveries. More creative things can be done, and would be if this approach is taken. However, the facilities are aging, and were not developed to meet many of the challenges of today.

*A much better approach is to continue working to improve existing facilities, but developing the new test facility alongside to serve the future better.

*Someone with the proper authority needs to interpret the CVPIA act more so we all can get a clearer understanding whether improvement or replacement of facilities is the legal route. If improvement is OK, then to what level? With new technology or with old?

Collection, Holding, Transportation and Release (CHTR) Studies

These studies were judged important and were initiated because of problems with survival of delta smelt during the holding, transport and release activities of the fish salvage programs. Studies were identified by CDF&G and are undergoing further definition by DWR at this moment.

Comments/Concerns

_____ *These studies could have been better defined from the start by reviewing all the existing research that is ongoing about salvage facilities, acquiring a better sense of where the strengths of existing programs are, what existing programs are addressing, and most important, where the largest data gaps are or will be in the next several years. The largest unknowns are really associated with the transport and release activities for, not just Delta smelt, but all species impacted. The program could have been given more focus by essentially calling it the TR studies, I believe. Though some work in holding tanks prior to transport is important and should be incorporated, quite a bit of that work is ongoing or planned with other programs. The three agencies involved in portions of this work – USBR, CFG, and DWR, have an excellent opportunity for complimentary research and to assure that resources are best allocated to solve the problems.

*This program is essential and should go forward not only with an assessment of the existing practices but with an eye towards future transport and release research integrated with new technologies planned under the Tracy Demonstration Fish Facility (TDF). There is the possibility that materials for transport and release could change in the future, and that experimental release sites could be available for testing.

*Presently, DF&G has been given the responsibility for overseeing and coordinating this work. As one of the participants in the research activities, this interagency affair could possibly be assisted also by a chosen representative of CALFED to help in the coordination? It may help facilitate decisions on how studies are implemented and could serve as an oversight function to assure minimal overlap of studies.

*To achieve timely results pertinent to the questions, and to develop complimentary studies, the three agency efforts could be associated as follows:

Collection and Holding; Fish Transfer to Transport Means – USBR
Holding and Transport – CF&G
Transport and Release – DWR

General

_____ These studies should not be restricted just to Delta smelt. My sense is that we need improvement for a number of species, especially how and where they are released. We should be attempting to minimize the chances for listing of presently “non-listed species of concern (like splittail), as well as attempting to save and hopefully de-list the “listed” species such as Delta smelt and salmon.

Clifton Court Forebay “Short Circuit” Alternative

Basically, this option would result in initially no new fish protection/salvage facilities, but would route flows into the existing Skinner fish salvage system through a compressed version of the existing Clifton Court Forebay. Flows would be developed by a low-head pumping plant situated behind the existing louver structures. This closely resembles the present Tracy system but would be bigger (higher flows). Skinner would now be subject to tidal influences, and Banks Pumping Plant would then draw upon the “afterbay”.

Problems/Concerns

*Though major deficiencies of existing louver facilities at both State and Federal fish salvage systems are well documented and have been known by regulatory and water development agencies, and CALFED, for years, this plan addresses this only as a side issue and holds out only the “possibility” of improving louver salvage facilities after the big canal is dug and the system is operating.

*The belief that by squeezing volumes of moving water now flowing through a large lake-like environment into smaller volumes that must traverse a long canal will significantly reduce predation is simply not tested. The opposite could occur where predator and prey are now even closer together, where the prey have even fewer lateral escape routes. Nearby mark/recapture data from the Contra Costa Canal (CDFG) indicate a very large loss (not recaptured) of prey fish upstream of a pumping plant. Data there indicate that predation could be very great in the proposed inlet canal for Skinner.

*Large numbers of small sized individuals of many species (>20 mm), some listed, some not (juvenile salmon, striped bass, Delta smelt, splittail, threadfin shad, American shad, catfish, others) slip through present louver systems and are thus not recovered for the Delta ecosystem. Even if these small fish escape predation in the long canal, many will slip into the intakes of the low head pumps and either be killed there (if the pumps are not fish friendly) or will accumulate in the forebay to either succumb there or to be drawn down into Banks pumping plant. Attempts to prevent these losses have been the driving force behind the multi-year CALFED sponsored initiatives to design and test better fish salvage processes.

*As proposed, this appears as a \$200 million dollar experiment, creating major disruptions to existing systems through the construction process, based on almost no knowledge that it will work the way it is proposed to reduce fish predation. If it did not reduce fish loss, or if fish loss was actually increased, there would be very limited options available for changing or altering the system without great costs. This is outside any “science process” that CALFED BAY DELTA programs and projects are dedicated to.

*It is troubling that most of what this option is based upon is focused on data on juvenile Chinook salmon. What about all the other species we are concerned about? What

will happen to Delta smelt, splittail, striped bass, American shad, juvenile steelhead, threadfin shad, white catfish, young and adult sturgeon, some of the other 40+ species that may be encountered?

**Debris Issues* – Exotic debris species, especially *Egeria*, are an increasing menace to louver type fish facilities. Skinner facility, as much as Tracy, needs help on this big time. *Egeria* fouls the louvers badly but this option as presented would not address this for many years, if at all. We have been surprised at how positive barrier screen technology may potentially reduce the O & M of debris handling, just the opposite of what everyone was suggesting. Much work needs to be done on this, but the short circuit option by giving almost no priority to new technology such as some type of positive barrier screen technology offers little hope that these new developments would occur.

**Hydraulic Issues?* – This is not in my bag of expertise but it seems that much work needs to be done here before a “short circuit” option could ever be seriously considered. Perhaps enough is known about the local hydraulics, but others have expressed doubts.

Much more research/technology development/analyses need to be performed before sinking \$200 million into this project.

For starters, in-canal predation rates, determined through experimentation, need to be conducted on several small prey species to get at the main driving force for this option “the belief that we can reduce predation significantly through compaction of inflowing waters to the Skinner facility”. Under the present plan, we have a hypothesis offered but we just accept it as good, without testing it, and move on to developing and implementing a \$200 million project based on the belief that the hypothesis is correct. Is this really being considered as the best way to manage the public resources of water and fisheries? Again, we are not considering here much about the multi-species fish community that we impact in the Delta

So, in my view, the cart is very much before the horse here. The uncertainties are very large, and, as with Tracy, I would not promote a huge expenditure of monies developing new facilities without extensive tests and technology development both with lab models and with a fairly complete test system working in the real world of the Delta.

Alternative Fish Facilities and/or Barrier Operations

This proposal would result in a very huge blocking screen to keep out all fish from both SWP and CVP pumps. The authors put faith in believing that fish would ride with the flows, seek out the intakes to fish friendly lifts (presumably Archimedes?) associated with permanent barriers, and thus be lifted out and placed back into San Joaquin River flows heading down to the Delta. In essence, they are proposing a super bypass system.

Some Potential Problems and Concerns

*It would probably be difficult to get a majority of fish to go into the intakes of these lifts in a timely manner, except for small individuals rather at the mercy of the currents, and fish would likely mingle and concentrate below the lifts. A huge predator pool would likely develop. Even in flows heading towards trashracks of Tracy (3 ft/s) many fish both big and small are at times observed holding and refusing to go onto the system.

**Outfalls of the lifts* – It is well known, at least qualitatively, that predators hang out in high number near the existing CAP and SWP fish release sites in the Delta. Indications are that this would also occur significantly in outfalls of many lifts at the barriers, leading to increased predation.

*If the blocking fish screen would need to meet Delta smelt criteria, or juvenile salmonid criteria for allowable screen exposure times, it would be enormous and would require many internal bypasses. (Would hydraulic head need to be developed to drive each bypass? Would many internal fish friendly lifts, etc., be needed to drive the bypasses?) Cleaning this screen would be a full time job given the likely slow sweeping velocities.

*Have the hydraulics been figured out with this option? That's not my field but it appears that major channel alterations, involving in-Delta extensive dredging, would be required. Would that be permitted under existing laws, regulations? Someone needs to do major hydraulic evaluations if this option is taken seriously.

Many more studies/research needed (multi-year) before implementation

It would be very premature to accept this option before extensive studies/technology developments were undertaken. Just for starters, a large fish friendly pumping research system (Red Bluff like in size and scope?) would need to be installed and operated at a modified barrier to test even the feasibility of this component. Engineering and fisheries studies would need to be carried on for several years following construction. Near and far-field mass movements of fish of various species and sizes would need to be understood. We're probably talking upwards of 10 years for this package alone, including design, construction and evaluation years.

In summary, seems to me that a vast amount of R and D would be needed before this option could be considered as feasible or not.

South Delta Fisheries and Hydrodynamic Studies

These studies would apply advanced hydraulic assessment technologies to better understand the major flows in the south Delta in relation to water diversions, and would link with hydroacoustic fisheries assessments near diversions. A major goal, as I understand it, is to attempt to operate diversion facilities to avoid large entrainments of

fish that are rather at the mercy of the flows. If this were somehow possible and could be proven, then perhaps improvements in existing fish salvage facilities would not be needed? Losses now being experienced with existing 1950's technology facilities would then be acceptable?

Comments/Concerns

*Studies to better understand mass movements of water in the South Delta, related to any of the driving forces (precipitation, tides, small and large diversions, etc) seem to me valuable from an ecological and fisheries perspective. There seems to be a lot of work going on with this already (IEP programs?). We know quite a bit from years of fish salvage data and natural histories of the major fish species regarding the seasonal patterns of fish movements, spawning, appearances at the salvage facilities, etc. For example, if we could divert much of the annual needed water during July through October, we may avoid any significant entrainment of juveniles of listed species. These are just general patterns. Fine tuning the amounts of diversions intimately with fish appearances in the south Delta within all seasons (months) seems very out of reach given the realities of increasing water demands.

*Linking new information on mass movements of water with fish movements is the difficult connection. The hydroacoustic sampling has many limitations in debris laden, naturally noisy environments, and species determinations are usually impossible from acoustic signals (sound signals reflected back to a receiver, thus recorded and measured for "target strength"). A troubling aspect of the study as presented was that concurrent fish salvage data would be used to sort of calibrate the findings of the acoustics used near the Clifton Court Intake. Unless extensive netting could be done at the intake while acoustics were being applied, I don't believe the proper calibrations could occur. A much better place determining the accuracy and effectiveness of the acoustics would be Tracy intake where water is constantly flowing and more accurate netting could possibly be implemented. This was suggested at a recent SDFP meeting.

*Much of what is behind this study is the belief that "fish just go with the flow". Earlier studies of movements of downstream migrating salmon smolts seem to confirm this, as one would expect. However, unless we are focusing on the very early larval stages of fish (8mm or less) that are in the pelagic zones, this premise is doubtful. Fish do end up at the large south Delta water diversions by the millions, but the driving forces that result in this are not that well understood. Directions and flows surely count, but so do diel behavior patterns, food foraging patterns, spawning imperatives (for example, small adult Delta smelt somehow make the movement upstream against currents to spawn in the upper reaches of the Delta).

*Another concern is that reports have recently been presented that portend to demonstrate "areas of influence" impacted by the south Delta water diversions by assuming strictly a hydrodynamic aspect to it all. Those reports are misleading when biological aspects are factored in. Simple ovals are drawn on a map of the south Delta delineating the so called areas of influence. The south Delta diversions clearly have

biological influences far beyond these physical ovals, though the real impacts on the Delta fisheries are always debatable. For example, juvenile salmon tagged and released at Coleman hatchery far up the Sacramento River do appear in the fish salvages. 'Adult Delta smelt migrating from far down the Delta do appear in the fish salvage. Longfin smelt, supposedly associated more towards the lower Delta do appear in the salvage. On and on. This study needs to recognize this and put as much emphasis and thinking on the "long reach" of the diversions from a biological standpoint as on physical movements of water.

*The study appears to be going back to earlier attempts to do "real time" monitoring" for determining when concentrations of fish were passing an area (i.e., striped bass eggs and larvae moving down the Sacramento River in spring) so gates could be closed, possible water diversions could be constrained and tuned to these data. I don't believe the water user communities ever accepted this as a tool for directing their water diversions patterns. Even in such a clear case as the small Contra Costa Canal (Rock Slough), where appearances of sensitive species could be fairly easily determined, the options for flexibility in water diversions to avoid entrainment could not be considered.

General

Refinements in knowledge about water movements in the south Delta are valuable. Linking a solid fish entrainment monitoring program (netting) directly at one of the large intakes could be much more useful than hydroacoustics I believe. Again, the noisy and debris laden south Delta with many species and sizes of concern lead to this recommendation. Also, much more use could be made of the Tracy fish salvage records to better understand the patterns when fish come in, especially monthly and daily (daytime vs. night) patterns. A good start on this was made and recorded in volume 4 of the Tracy report series (seasonal and diel patterns of entrainment over two different years, dry and wet, for Delta smelt, juvenile salmon, steelhead, splittail, American shad). More analyses of the salvage data, along with extensive entrainment monitoring during hydraulic assessment water movement, could provide for a stronger study than planned, I believe.

This study, with variations mentioned above, could go forward but only parallel with the fish salvage improvement technology developments (TDFP actions). It is fairly clear that existing patterns of water diversions in the south Delta will continue for many years. A combination of newer, improved technology for recovering and redistributing entrained fish, along with new knowledge for potentially lessening fish entrainment through water flow manipulation tuned to fish movements, may be the best approach.

¹Views, comments and opinions expressed here are those of Charles Liston and may or may not reflect views, comments and opinions of any agency or party associated with the South Delta Fish Facilities projects and programs.