June 10, 2013

Charlton H. Bonham, Director
California Department of Fish and Wildlife
1416 Ninth Street, 12th Floor
Sacramento, CA 95814

RE: CESA ITP NO. 2081-2009-001-03

Dear Director Bonham,

We are writing to inform you of new scientific information and changed conditions regarding longfin smelt. Based on this new information and changed conditions, it is our view that the Department of Fish and Wildlife (DFW) must take immediate action to review and modify existing protections for this state-listed species in order to prevent its extinction and fully mitigate impacts of Delta water operations, consistent with the provision for amending those protections in the current Interim Take Permit (ITP).

1. Introduction and summary

On February 23, 2009, pursuant to its California Endangered Species Act (CESA) authority, CDFW issued ITP No. 2081-2009-001-003 covering take of longfin smelt (*Spirinchus thaleichthys*) by the California State Water Project Delta Facilities and Operations. The ITP explicitly states that,

> *This Permit may be amended without the concurrence of the Permittee if [DFW] determines that continued implementation of the Project under existing Permit conditions would jeopardize the continued existence of a Covered Species or that Project changes or changed biological conditions necessitate a Permit amendment to ensure that impacts to the Covered Species are minimized and fully mitigated.*

ITP at p. 18[1]. Substantial new scientific information regarding the status and life history requirements of the species, and significantly changed biological and regulatory conditions since the issuance of the ITP, indicate that the continued existence of longfin smelt is in jeopardy and that more effective actions must be adopted to minimize and fully mitigate impacts to the species. Given the continuing decline in longfin smelt abundance despite adoption of the ITP in 2009, and the substantial new scientific information that is available, our organizations urge you to immediately initiate a review of ITP and adopt amendments in a timely manner as appropriate to prevent extinction, fully mitigate impacts, and provide adequate conditions for the continued existence of longfin smelt in the San Francisco Bay-Delta estuary.

Since the adoption of the ITP, longfin smelt abundance has remained at near-extinction levels, and the 2012 fall midwater trawl index was the second lowest on record since 1967 (http://www.dfg.ca.gov/delta/data/fmwt/Indices/sld003.asp). Last year's events amply demonstrate the inadequacy of the ITP's protections for longfin smelt and the need for significantly increased outflow requirements, restrictions on negative OMR flows, and limits and triggers relating to entrainment. The 2012 salvage of larval and juvenile longfin through the end of April was the second highest on record in the last two decades, and salvage through the end of May was the fifth highest. Furthermore, salvage of longfin smelt juveniles in 2013 already exceeds total salvage for more than two-thirds of years in the 1993-2008 period. As a result, implementing the provisions of the ITP does not appear to adequately minimize take of the species and appear unlikely to prevent the continuing decline and likely extinction of longfin smelt.

In summary, new scientific information indicates that:

- Longfin smelt adults are vulnerable to high levels of take after February and/or after the first Age-0 longfin smelt are detected, when the ITP's adult take provisions expire.
- The ITP's triggers for action do not accurately reflect actual levels of entrainment risk.
- Pre-screen losses of longfin smelt are likely occurring at levels up to two orders of magnitude higher than assumed in the ITP, based on published research regarding pre-screen losses of delta smelt.

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[1] Under CESA, a permit must minimize and fully mitigate impacts, and no permit may be issued that jeopardizes the continued existence of a species. Fish and Game Code §§ 2081(b)(2) and (c). In addition, CESA regulations require that, "The Department shall amend a permit as required by law regardless of whether the permittee concurs with such amendment." 14 Cal. Code. Regs. § 783.6(c)(2).

- Negative OMR flows routinely experienced and permissible under the ITP during the spring period are likely to result in high levels of entrainment of all longfin smelt life stages.

- Flow manipulations to position X2 at desired locations could distribute the longfin population to better minimize the risk of entrainment from the South Delta pumps.

- There are statistically significant flow thresholds associated with positive population growth of longfin smelt and substantial evidence that reduced spring outflow is primary driver of longfin smelt abundance.

Furthermore, changed regulatory conditions since the adoption of the ITP mean that other permitting processes are not likely to provide increased protection for longfin smelt based on this new information in the foreseeable future:

- The U.S. Fish and Wildlife Service determined in a 2012 listing decision that new federal actions to improve spring Delta outflow conditions for longfin smelt are warranted but precluded under the federal Endangered Species Act.

- The State Water Resources Control Board has received new information from CDFW and others regarding the need for significant improvements in spring Delta outflow and other conditions to benefit longfin smelt, but despite initiating its review of current requirements in 2009 a water rights decision is not expected to be adopted before 2018 and potentially much later.

Based on this new scientific information and changed conditions, we recommend that DFW consider revising the ITP to include:

- Establishment of numeric incidental take limits for adult and juvenile longfin smelt and stronger triggers for action, primarily intended to prevent entrainment of longfin smelt in the spring period.

- More restrictive limits on negative OMR flows in the spring period of drier years when longfin smelt are at greatest risk of entrainment.

- Improved Delta outflows in the spring period to ensure more desirable distribution of longfin smelt populations (i.e. in areas of reduced exposure to entrainment risk).

- Improved Delta outflows in the spring period to support the potential for positive population growth of longfin smelt in most years and avoid likely population declines; this measure would be the most effective by far in helping to establish viable longfin smelt populations, provide full mitigation of water operation impacts, and obviate the need to invoke entrainment-related actions in most circumstances.

2. New scientific information

Pursuant to the California Endangered Species Act, the terms and conditions of the ITP must minimize take of the species, fully mitigate the impacts of take on the species, and ensure that the project does not jeopardize the continued existence of the species. Cal. Fish and Game Code § 2081. The ITP includes provisions in section 5, 6 and 7 to address these statutory requirements. However, new scientific information strongly suggests that the conditions in the ITP are inadequate to meet these requirements.

Indeed, various measures of the annual proportional impact of salvage on the longfin smelt population (i.e. standardizing raw salvage by the size of the population experiencing this source of mortality) strongly suggest that, in the past two years, these impacts have been among the most severe recorded in the past two decades (Table 1).

The provisions of Section 5 of the ITP primarily address salvage mortality that occurs as a direct result of export operations. One study finalized after the ITP was issued found that salvage of longfin smelt adults and juveniles is significantly and negatively correlated with Old and Middle River (OMR) flows (Grimaldo et al 2009). Another study indicates that combined SWP/Central Valley Project (CVP) exports are significantly correlated with salvage and strongly suggests that salvage- and entrainment-related mortality are important impacts to longfin smelt populations in certain years (Rosenfield 2010). Both these studies confirm that it is appropriate to manage direct entrainment, export levels and OMR flows in order to limit salvage.

Salvage rates in 2012 present new evidence that the current ITP restrictions (as well as the export management prescriptions contained in the 2008 Delta smelt biological opinion) are insufficient to minimize take, fully mitigate impacts and avoid jeopardy to longfin smelt. The 2012 salvage of larval and juvenile longfin through the end of April was the second highest on record in the last two decades and salvage through the end of May the fifth highest (http://www.dfg.ca.gov/delta/apps/salvage/SalvageExportCalendar.aspx).

Specifically, this new information indicates that:

- Time periods and take thresholds identified in the ITP for regulating adult vs. juvenile/larval entrainment are too narrow to fully protect the adult life stage; and,

- The specific limits on negative OMR in the ITP are insufficient to protect longfin smelt from high levels of entrainment.

Second, findings published both prior to (as the ITP Effects Analysis acknowledges, e.g., at pp. 3-4)) and since issuance of the ITP indicate that entrainment risk is greatest when Delta outflows are low in the late-winter/spring period, presumably because the distribution of longfin smelt larvae and juveniles closely tracks the position of the Low Salinity Zone (as indexed by X2). X2 position and distribution is a function of Delta outflow conditions that are partially under SWP

Table 1: Total annual longfin smelt salvage (all age groups, CVP and SWP combined) and rank of proportional impact, 1993-2013 (1= highest proportional impact). Proportional impact is estimated three different ways, as total annual salvage divided by either (a) the FMWT longfin smelt index from the prior fall (b) the FMWT index two years prior to the salvage year, and (c) the sum of the two previous years' FMWT indices. The first method (4th column from left) is analogous to that used in the Effects Analysis for the 2009 ITP. The second analysis (5th column) reflects the two-year life cycle of longfin smelt (spawners in any given year are indexed by the abundance of 1-yr old fish from the previous year). The third method (6th column) reflects the findings of Nobriga and Rosenfield (*in review*) that longfin smelt stock is well-approximated by the sum of the previous two years' FMWT index. The results indicate that proportional salvage impacts in 2012 and 2013 were in the top 67-86% of the past 21 years[2].

Year	**Salvage** (Total Combined)	**Rank Salvage** (Total Combined)	**Rank** [Salvage:1-yr Prev FMWT]	**Rank** [Salvage:2-yr Prev FMWT]	**Rank** [Salvage:1+2-yr Prev FMWT]
1993	643	13	4	6	5
1994	6411	3	5	1	2
1995	112	16	16	18	17
1996	293	14	19	14	19
1997	1132	8	12	19	15
1998	742	12	11	13	11
1999	805	11	17	10	16
2000	1908	6	15	16	14
2001	6642	2	9	9	8
2002	97650	1	1	2	1
2003	5316	4	7	3	4
2004	981	9	8	8	7
2005	219	15	10	15	12
2006	0	21	21	21	21
2007	96	17	18	12	18
2008	1482	7	2	11	9
2009	88.8	18	13	5	10
2010	35.2	19	14	17	13
2011	4	20	20	20	20
2012	3740	5	6	4	3
2013 (thru 6/4)	900.17	10	3	7	6

[2] Use of these methods to approximate proportional salvage impacts does not necessarily imply that any of them are the best measure of proportional impact. However, any measure of proportional salvage impact must incorporate both salvage and stock population; thus the relative ranking of annual impacts is expected to be roughly correct.

and CVP control via reservoir releases and export operations (in addition to factors like tides and Delta bathymetry, which are not completely under human control but are predictable), and therefore can be managed to prevent proportionately high levels of entrainment. Specifically, the new information indicates that the ITP regulations of operations should be modified to provide:

- Stronger protections for longfin smelt larvae and juveniles that rear in the southern Delta during winter/spring periods when Delta outflows are low; and,

- Improved Delta outflows (increased reservoir releases and/or decreased exports) during months and under conditions where longfin smelt would be under high risk of entrainment.

Third, it is well known (and increasingly well documented since issuance of the ITP in 2009) that longfin smelt populations respond strongly and positively to increased freshwater flows out of the Delta in the winter (Rosenfield and Baxter 2007) and/or spring periods (Jassby et al. 1995; Kimmerer 2002; Sommer et al. 2007; Kimmerer et al. 2009; Mac Nally et al. 2010; Thomson et al. 2010; USFWS 2012; Nobriga and Rosenfield, *in review*). DFW's longfin smelt conceptual model (Rosenfield 2010) clearly identifies Delta freshwater outflows in the winter and spring as drivers of "high" importance to longfin smelt in the Bay-Delta estuary. This new information indicates that the ITP should be modified to ensure operations that provide:

- Improved Delta outflows (increased reservoir releases and/or decreased exports) during spring months (March to May), which strongly correlate with changes in abundance and population growth of longfin smelt.

Each of these three issues is discussed further below in depth.

<u>A. Time periods and take thresholds identified in the ITP for regulating adult salvage are too narrow to fully protect the adult life stage</u>

> In section 5.1, the ITP defines December through February as the period of adult take. Provisions in section 5.1 appear to expire (switching to protections in section 5.2 intended to benefit larvae and YOY juveniles) once spawning has begun. The onset of spawning is by no means protective of the main body of spawning adults, which are likely to spawn later. Indeed, the December-February time period is an artificial and arbitrarily short period of protection for spawning adult LFS. The CDFW conceptual model for longfin smelt life history clearly states that, *"Significant Age 1+ [Adult] LFS entrainment at CVP/SWP facilities has occurred in months between December and June."* (Rosenfield 2010, p. 21)

Whereas the conceptual model identifies December and January as the typical period of greatest adult entrainment, the year with the greatest entrainment on record (2002) showed significant entrainment from March to July (entrainment from May to July was probably increased by counts of developing YOY LFS, but these fish are usually too small to count in March and April). In its 2012 notice regarding listing of longfin smelt, the U.S. Fish and Wildlife Service (USFWS) found that, "*Longfin smelt in the Bay-Delta may spawn as early as November and as late as June, although spawning typically occurs from January to April.*" (USFWS 2012, p. 8)

Furthermore, since larvae are detected in the Delta (though not enumerated at the salvage facilities) between January and June (Rosenfield 2010; CDFG 2010), detection of spawning clearly does not indicate the end of the period where adult longfin smelt need protection.

Delta water project operations in 2012 clearly demonstrate that the ITP's Cumulative Salvage Index [(CSI); (total salvage Dec-Feb)/prev. FMWT index] trigger is not sufficiently protective of adult longfin smelt. A CSI of >5 triggers WOMT flow advice regarding limits for negative OMR flows. Salvage through March of 2012 was the highest on record for the period 1993-2012; none of the salvaged fish was identified as an adult. Yet, even if all the longfin smelt salvaged in that period were adults, the CSI as calculated in the ITP would have been only about half of the threshold for action under the ITP. Surely, an ITP that allows double 2012's record salvage cannot be considered sufficiently protective of a species protected under CESA.

A second phenomenon that can trigger action under Section 5.1 to protect adult longfin smelt is sampling data that indicates entrainment risk for this species is high. New information casts doubt on whether current sampling programs can reliably detect a high entrainment risk when population abundance is so severely depressed. As can be seen from the inability of the Spring Kodiak Trawl to detect Delta smelt in the south Delta during 2013 that were subsequently salvaged at the pumps, it is quite possible for smelt entrainment rates to reach critical levels when few or no smelt are detected by relevant south Delta sampling programs; this failure likely occurs because the sampling technologies deployed are designed to detect large numbers of fish and may not be reliable when fish densities drop below a critical (and as yet unknown) threshold.

Entrainment can cause a significant impact on longfin smelt abundance. Another recent finding reveals that high rates of entrainment of Delta smelt could be simultaneously undetectable using linear statistical techniques and catastrophic for that population (Kimmerer 2011). There is no reason to believe that the new findings for Delta smelt would not apply to longfin entrainment impacts[3]; namely that entrainment impacts are periodically severe but may be undetectable using common statistical tools (Nobriga and Rosenfield, *in review*). Of course, even if the CSI limit for adult longfin smelt had been exceeded in 2012 or sampling data had indicated that longfin smelt distribution put them at risk for high rates of entrainment, the ITP does not require any protective action that would reduce entrainment. As a result, the ITP's inaccurately triggered and unclear prescription for action to protect longfin smelt from potentially catastrophic levels of salvage is not adequate to prevent high levels of take that increasingly jeopardize this species.

Furthermore, the ITP provides insufficient protection to longfin smelt populations because its CSI limit is premised on assumptions regarding the ratio of pre-screen loss:salvage that recently

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[3] Indeed, the ITP's Findings identify Delta smelt salvage dynamics as a proxy for longfin smelt salvage. Findings at p. 5.

published papers suggest may be far too low. Specifically, Table 1 of the ITP's Effects Analysis indicates, correctly, that longfin smelt pre-screen mortality is unquantified; the ITP indicates that this factor affecting longfin smelt entrainment and salvage estimates is assumed to be similar to that determined for other fishes in the Delta. Since publication of the ITP's Effects Analysis, Castillo et al (2012) conducted mark-recapture experiments with cultured Delta smelt; they found pre-screen losses were between 94.3% and 99.9%. These results suggest that the number of longfin smelt that appear in salvage must be multiplied by a factor between 17.5 and 1,000 to determine the total number of fish lost within the channels that are part of the Delta export facilities' infrastructure. Furthermore, the ITP provides no documentation for its estimate of post-screen survival, but these estimates (78% and 58%, depending on body size) seem extremely high for fragile fish such as longfin smelt or delta smelt. In sum, new information strongly suggests that the number of adult longfin smelt killed for each fish that is salvaged likely exceeds – and perhaps by more than 2 orders of magnitude – the number assumed in the ITP effects analysis.

Based on this new scientific information, we strongly recommend that the ITP should be revised to include protective, numeric take limits and stronger triggers for action that more accurately reflect the effects of entrainment on the viability of longfin smelt and more effectively minimize take of longfin smelt.

B. <u>Limits on negative OMR are insufficient to protect longfin smelt larvae, juveniles, and adults from high levels of entrainment-related mortality</u>

The ITP establishes an OMR range of -1,250 to -5,000 cfs when Condition 5.2 is in effect, and the anticipated schedule of OMR advice that may be offered when Condition 5.2 is in force is:

- Jan-Mar: OMR limits may be set <-1,250 thru -5,000 cfs
- Apr-May: OMR limits may be set <-2,000 thru -5,000 cfs
- June: OMR limit may be set <-5,000 cfs

As demonstrated in 2012 and borne out again this year, the remedies envisioned by Section 5.2 of the ITP are insufficient to protect larval and juvenile (Age 0) longfin smelt. All of the entrainment recorded in 2012 and 2013 occurred when average OMR flow rates were substantially more positive than the – 5000 cfs permissible under the current ITP. The ITP's anticipated restrictions on negative OMR flows diminish progressively throughout the winter and spring, just as post-larval longfin are expected to become more abundant (April-June). In fact, the most positive OMR flows in April-May under the ITP (-2000 cfs) represent the level at (and below) which DFW's own modeling found a high risk of entrainment for longfin smelt juveniles and larvae: *"Juvenile longfin smelt salvage increased rapidly as OMR became more negative than -2,000 cfs."* (CDFG 2010, p. 66, citing CDFG 2009). Thus, CDFW's own subsequent analyses indicate that high levels of entrainment may routinely occur under the provisions of the ITP.

Grimaldo et al. 2009 clearly documented that salvage increases logarithmically as OMR flows become increasingly negative – their simple relationship was highly significant and explained 68% of the year to year variance in total longfin smelt entrainment. Similarly, Rosenfield (2010; Figure 11) documented that adult longfin smelt entrainment was strongly and positively correlated ($R^2 = 0.42$; $p = 0.009$) with combined export rates of the SWP and CVP facilities in the south Delta.

The 2012 and 2013 longfin smelt entrainment data, CDFW's modeling, and biological objectives for longfin smelt (CDFG 2010), the strong correlations between Delta flow conditions and salvage found in the historical record (e.g. Grimaldo et al. 2009), and the longfin smelt conceptual life history model (Rosenfield 2010), all strongly support a finding that the ITP's regulation of negative OMR flows is insufficient to protect adult, juvenile, and larval longfin smelt, particularly in winters and springs with low Delta outflows (see below). Indeed, in its 2012 comments to the SWRCB in the Bay-Delta proceedings, CDFW recommended that:

> - *At no time should OMR flows be more negative than -5,000 cfs during the period between December and May.*
>
> - *During critical and dry years and when longfin Fall Midwater Trawl (FMWT) index is more than 500, OMR flows should be more positive than -1500 cfs during the period between April and May.*
>
> - *During critical and dry years and when longfin FMWT index is less than 500, OMR flows should be positive during the period between April and May.*

(CDFG 2012b, pp. 2-3).

Based on this new scientific information and the Department's most recent findings, we strongly recommend that the ITP should be revised to include more protective limits on negative OMR flows.

C. <u>The ITP lacks operational limits to provide sufficient Delta outflow to minimize take</u>

Once longfin smelt are located in the vicinity of the south Delta, adequate regulation of OMR flows as recommended above is a feasible and reasonable approach to limiting salvage at the SWP export facilities. However, avoiding dense aggregations of longfin smelt in close proximity to the export facilities altogether is a far more effective strategy to avoid entrainment risks and mitigate SWP impacts to longfin smelt populations. A number of analyses published since the ITP was issued support the finding that the distribution and entrainment rates of longfin smelt larval and young juveniles, and potentially spawning adults, are closely tied to the position of the Low Salinity Zone (as measured by X2) in particular. CDFG 2010 states:

> *Larval distribution is related to winter-spring outflow and initially closely associated with the position of X2 (DFG 1992a, Baxter 1999a, Dege and Brown*

> *2004); that is, larvae are transported farther downstream when outflow increases and X2 is shifted downstream*.

(CDFG 2010, p. 63). In addition, the Department found that,

> *DFG (2009b) found that as X2 shifted downstream during the period from January through May, juvenile longfin smelt salvage declined. This may result from the circumstance that during low outflow years spawning occurs higher in the system, placing adults and subsequent larvae and juveniles closer to the pumps, and transport flows are not present to move larvae away from the pumps. Also, negative net OMR flows can either passively draw fish, particularly larvae, to the pumps or at high levels miscue adults and juveniles as to the direction downstream. A consequence is that juvenile longfin smelt are mostly in danger of entrainment at the CVP and SWP pumping facilities during low outflow years with high net negative OMR flows.*

(CDFG 2010, pp. 65-6).

In 2012, USFWS issued a 12-month finding in response to a petition to list the San Francisco Bay-Delta population of longfin smelt under the federal ESA (USFWS, 2012). (USFWS determined that this population of longfin smelt warranted listing as a threatened species, though administrative and budget priorities precluded formal listing at this time). In describing the threats to this species in the Bay-Delta, USFWS concluded:

> *…during low outflow periods, negative effects of reduced transport and dispersal, reduced turbidity, and potentially increased loss of larvae to predation and increased loss at the export facilities result in lower young-of-the-year recruitment.*

(USFWS 2012, p. 38).

The 12-month finding goes on to describe the effect of freshwater flow on longfin smelt populations and, in particular, the effect of water diversions on longfin smelt success:

> *Because longfin smelt spawn in freshwater, they must migrate farther upstream to spawn as flow reductions alter the position of X_2 and the low-salinity zone moves upstream. Longer migration distances into the Bay-Delta make longfin smelt more susceptible to entrainment in the State and Federal water pumps (see Factor E: Entrainment Losses).*

(USFWS 2012, p. 39).

The CDFW model presented a conceptual model and analysis of longfin smelt distribution and entrainment that further supports these conclusions (Rosenfield 2010). These results suggest that it is possible to manipulate water operations in most years such that the danger of longfin smelt entrainment into the south Delta is significantly reduced. Unfortunately, the current ITP does not include any actions to manipulate flows to avoid distributing longfin smelt in areas of high entrainment risk altogether.

Based on the new scientific information described above, we strongly recommend that the ITP should be revised to require greater Delta outflows during the March – May period, and potentially at other times, to prevent entrainment of longfin smelt larvae and juveniles into the South Delta and subsequent increased mortality due in part to (but not limited to) salvage and pre-screen losses.

D. The ITP lacks operational measures to provide sufficient Delta outflow to avoid jeopardizing the species and to fully mitigate impacts

Sections 5 and 6 of the ITP focus on mitigating and/or avoiding direct mortality associated with entrainment, salvage, and pre-screen loss at the south Delta export facilities. However, salvage mortality is far from the only or most significant impact to longfin smelt populations caused by operations of the SWP and CVP. It is well known (and increasingly well documented since issuance of the ITP in 2009) that the abundance of longfin smelt populations responds strongly and positively to increased freshwater flows out of the Delta in the winter (Rosenfield and Baxter 2007) and/or spring periods (Jassby et al. 1995; Kimmerer 2002; Sommer et al. 2007; Kimmerer et al. 2009; Mac Nally et al. 2010; Thomson et al. 2010; USFWS 2012; Nobriga and Rosenfield, *in review*) and that reduced levels of outflow are highly likely to result in lower abundance. CDFW's longfin smelt conceptual model clearly identifies Delta freshwater outflows in the winter and spring as drivers of "high" importance to longfin smelt in the Bay-Delta estuary. These relationships are regarded as "highly certain" and are believed to contribute to other potential drivers of the population including entrainment (see above) and food web productivity (Rosenfield 2010). In its recent review of the status of longfin smelt USFWS concluded that "increased Delta outflow during the winter and spring is the largest factor positively affecting longfin smelt abundance" (USFWS 2012). There is no more scientifically certain or effective approach to avoid jeopardizing the species and to fully mitigate the impacts of the SWP on longfin smelt populations than maintaining Delta outflow at levels sufficient to produce sustained population growth until population dynamics of the species approximate those of the 1967-1984 period (cf. USFWS 1995).

Recent analyses confirm that export and storage operations of the SWP and CVP have had and continue to have a major impact on Delta outflows in the winter and spring of most years (Fleenor et al. 2010; Enright and Culberson 2010; SWRCB 2010; NRC 2012; FWS 2012). The reduction of Delta outflow by millions of acre-feet of water every winter and spring has been linked to severe impacts on longfin smelt populations in many recent analyses (e.g. Thomson et al. 2010; NRC 2012[4]; Nobriga and Rosenfield *in review)*.

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[4] Specifically, the NRC (2012) report stated: *"... while the mechanisms behind the influence the of position of X2 on the abundance of a variety of biota remain hypothetical, the statistical relations reported in several papers show that abundance of a number of species at different trophic levels found in the Delta and San Francisco Bay is higher*

In 2012, USFWS issued a 12-month finding in response to a petition to list the San Francisco Bay-Delta population of longfin smelt under the federal ESA (USFWS, 2012). (USFWS determined that this population of longfin smelt warranted listing as a threatened species, though administrative and budget priorities precluded formal listing at this time). In describing the threats to this species in the Bay-Delta, USFWS concluded:

> *In the Bay-Delta estuary, increased Delta outflow during the winter and spring is the largest factor positively affecting longfin smelt abundance … During high outflow periods, larvae presumably benefit from increased transport and dispersal downstream, increased food production, reduced predation through increased turbidity, and reduced loss to entrainment due to a westward shift in the boundary of spawning habitat and strong downstream transport of larvae (CFDG 1992; Hieb and Baxter 1993; CDFG 2009a).*

(USFWS 2012, p. 38). The 12-month finding goes on to describe the effect of freshwater flow on longfin smelt populations and, in particular, the effect of water diversions on longfin smelt success:

> *Because longfin smelt spawn in freshwater, they must migrate farther upstream to spawn as flow reductions alter the position of X_2 and the low-salinity zone moves upstream... In periods with greater freshwater flow into the Delta, X_2 is pushed farther downstream (seaward); in periods with low flows, X_2 is positioned farther landward (upstream) in the estuary and into the Delta. Not only is longfin smelt abundance in the Bay-Delta strongly correlated with Delta inflow and X_2, but the spatial distribution of longfin smelt larvae is also strongly associated with X_2. As longfin hatch into larvae, they move from the areas where they are spawned and orient themselves just downstream of X_2. Larval winter spring habitat varies with outflow and with the location of X_2, and has been reduced since the 1990s due to a general upstream shift in the location of X_2. The amount of rearing habitat (salinity between 0.1 and 18 ppt) is also presumed to vary with the location of X_2. However, as previously stated, the location of X_2 is of particular importance to the distribution of newly-hatched larvae and spawning adults. The influence of water project operations from November through April, when spawning adults and newly-hatched larvae are oriented to X_2, is greater in drier years than in wetter years.*

(USFWS 2012, p. 39).

In its 2012 comments to the State Water Resources Control Board (SWRCB) regarding ecosystem changes and the low salinity zone, CDFW summarized important new information regarding the importance of spring outflows to longfin smelt:

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when X2 is farther downstream. This implies that sufficient reductions in outflow due to diversions would tend to reduce the abundance of these organisms." [(p. 60]).

> *Thomson et al. 2010 provides a different analytical approach (using Bayesian model selection with linear regression vs. straight linear regression) that again identified spring flows (modeled as mean March-May X2 location) as being a principal driver of longfin smelt abundance. Longfin smelt abundance showed a long-term decline except during periods of good spring outflow. In addition, the researchers found — at an estuary wide scale — that abiotic factors appeared to have a stronger influence on interannual fish variation, concluding that targeted manipulation of abiotic variables, including flows and exports, could be used to influence fish abundances (Thomson et al. 2010, p. 1445). Mac Nally et al. 2010 (p. 1424) also identified strong data support for large values of spring X2 (upstream location, low outflow) being negatively related to the abundances of longfin smelt, biomass of calanoid copepods (longfin smelt food) during spring and biomass of mysids (another longfin smelt food). The Department's conclusion is that relatively low levels of Delta outflow in spring result in reduced abundance of longfin smelt and reduced biomass of longfin smelt prey organisms.*

(CDFG 2012a, p. 2).

Based in part on this new information, CDFW recommended to the SWRCB that "low salinity habitat [be provided] for longfin smelt in Suisun Bay (and farther downstream) by maintaining X2 between 64 km and 75 km between January and June" and that '[d]epending on year type, sufficient water flow [be provided] to increase abundance of longfin smelt to pre-1987 abundance levels" (CDFG 2012b, p. 2).

CDFG 2012a also noted that "promising preliminary analysis is being conducted that seeks specifically to remove clam introduction and POD effects on adult stock from abundance trends and, thus, identify the winter through spring flow levels required to achieve year-over-year positive stock recruitment trends that would lead to positive population growth" (p. 5). The results of these analyses (Nobriga and Rosenfield, *in review*) clearly demonstrate that freshwater flow is not simply correlated with longfin smelt abundance indices (as numerous papers have documented over the past ~30 years), but that spring Delta flow is also strongly correlated with the intergenerational change in population abundance (as indexed by the Fall Midwater Trawl). Indeed, spring Delta outflow and prior abundance (at either a 2-yr or 1+2-yr timestep) explain the vast majority of variance in population growth over the past 45 years. Additional, non-flow related variance was detected after the mid-1990s, likely a result of the decline in food web production at that time (see also Thomson et al. 2010). However, even the effect of foodweb suppression (e.g. by the overbite clam or nutrient concentrations or ratios) appears to be modulated by freshwater flow; above a certain level of freshwater outflow (~26.6Kcfs) in the March – May period, the recent constraints on longfin smelt population growth appear to be relaxed. As outflows increase above this threshold, inter-generation population growth occurs more frequently, with positive growth occurring almost always at or above mean March-May outflow of ~45Kcfs (Nobriga and Rosenfield, *in review*). Providing freshwater flow conditions in the winter and spring that usually exceed the lower threshold and frequently exceed the higher threshold is the most reliable, effective and scientifically defensible way to fully mitigate SWP (and CVP) impacts.

The effects analysis for the ITP acknowledges that the changes in outflow are an adverse indirect effect of the State Water Project on longfin smelt abundance, but it focuses on food web effects of reduced outflow as the primary potential mechanism for such effects (see Effects Analysis at p. 49). As a result, therefore, Section 7 of the ITP relies solely on restoration of 800 acres of inter-tidal and sub-tidal habitat to fully mitigate SWP impacts. A number of analyses of both pelagic species life history and habitat restoration effects since 2009 draw into question the assumption underlying this requirement (namely: shallow water habitats produce direct, measureable benefits to longfin smelt, which orient primarily towards pelagic and deepwater environments). After a larval period where they feed endogenously and their movements are more or less planktonic, longfin smelt mature into juvenile fish that aggregate in deepwater habitats (Rosenfield 2010; see also Rosenfield and Baxter 2007). There is no evidence that physical habitat restoration (i.e., modification of the land-water interface) will produce any benefit to longfin smelt or that the hypothesized benefits of restored tidal habitat (e.g., food production and export) could offset the continuing impacts associated with insufficient Delta outflows. In the years since the adoption of the ITP in 2009 CDFW has questioned the merit of relying on wetland habitat restoration to provide benefits to longfin smelt in the Bay Delta Conservation Plan (BDCP) process:

> *"What happens to early life stages in the plan area (e.g. winter-spring Delta outflow) largely determines cohort, and ultimately population, abundance." (p. 5.5.2.2)*
>
> *"The population has declined by 95% since 1967 with little concomitant change in this* [shallow-water] *habitat, so it seems highly unlikely that increasing it will have much affect on the population." (p. 5.5.2.12)*
>
> *"A high positive change in the habitat is certain, but the change is unlikely to be reflected in the population, given the absence of data suggesting the habitat has or is limiting the population." (p. 5.5.2.13)*

(CDFW, 2013). Similarly, the National Research Council questioned the conceptual model that would support similar actions to benefit Delta smelt and other pelagic fish species in the Bay-Delta (NRC 2010; NRC 2012).

It is possible that future habitat restoration projects conducted on an experimental basis may provide evidence of benefits to pelagic species, but until such benefits have been demonstrated the ITP should no longer rely on the assumption that habitat restoration will be effective in mitigating impacts to longfin smelt in lieu of improvements to Delta outflows. We also note that 800 acres may be sufficient for a pilot project to investigate the potential benefits and pitfalls of habitat restoration for longfin smelt and other pelagic species but are not likely to provide benefits on any meaningful scale to fully mitigate Delta water operation impacts even if the hypothesized benefits were substantiated (contrast this provision of the ITP with the requirement to restore 8,000 acres of habitat in the federal biological opinion for delta smelt) .

The new scientific information demonstrates that the indirect effects of SWP operations on longfin smelt are substantially greater than those identified in the ITP and effects analysis, and that these indirect effects of reduced outflow during the spring period are likely the largest factor affecting abundance of longfin smelt (Mac Nally et al. 2010; Thomson et al. 2010; USFWS 2012: NRC 2012; Nobriga and Rosenfield *in review*). The new scientific information calls into question several of the Department's CESA findings in the ITP, including a lack of findings on the indirect effects of SWP operations on outflow and longfin smelt abundance, and the Department's specific findings that:

- "the indirect effects of the pumps also impact longfin smelt, to a lesser degree [than direct entrainment effects]" (p. 5);
- the habitat restoration measures in the ITP are intended to minimize and mitigate the loss of longfin smelt at the pumps after implementation of the other measures in the ITP, rather than to mitigate the indirect effects of reduced outflow (p. 8); and,
- only a "moderate part of the species range was affected, and a small part of the species population" is affected by SWP operations (p. 12).

The ITP must fully mitigate and minimize the indirect and direct effects of the SWP on longfin smelt (see Cal. Code Regs. § 783.4(a)(2)), and this new scientific information demonstrates that the protections for longfin smelt under the ITP do not fully mitigate these indirect effects and result in operations of the SWP continuing to jeopardize the continued existence of the species.

Based on the new scientific information described above, we strongly recommend that the ITP be revised to modify SWP (and CVP) operations as appropriate to provide sufficient winter – spring Delta outflows to allow for potential positive longfin smelt population growth in a majority of years. We also recommend that the tidal marsh habitat restoration provision of the ITP be redefined as a pilot project to evaluate the potential effects on longfin smelt and that language clarifying the design elements and implementation timeframe for tidal marsh habitat restoration be added to the ITP.

3. Changed regulatory circumstances

A. Status of federal protections for longfin smelt

In 2012, USFWS issued a 12-month finding in response to a petition to list the San Francisco Bay-Delta population of longfin smelt under the federal ESA (USFWS, 2012). USFWS determined that this population of longfin smelt warranted listing as a threatened species, though administrative and budget priorities precluded formal listing at this time.

USFWS specifically found that existing reductions in outflow pose a significant threat to longfin smelt and that there is a "lack of effective control mechanisms" to limit diversions that reduce

Delta outflow. (FWS 2012, p. 108) Similarly, despite protections for longfin smelt under CESA and other state and federal laws, USFWS found that,

> *A number of Federal and State regulatory mechanisms exist that can provide some protections for the Bay-Delta DPS of longfin smelt. However, the continued decline in longfin smelt trend indicators suggests that existing regulatory mechanisms, as currently implemented, are not adequate to reduce threats to the species. Therefore, based on a review of the best scientific information available, we conclude that existing regulatory mechanisms are not sufficient to protect the species.*

(FWS 2012, p. 119). Reduction in delta outflow under existing regulatory mechanisms is a primary factor in the continued decline of delta smelt, and these findings clearly indicate that the primary actions identified by USFWS to protect longfin smelt would involve increasing spring Delta outflows in order to support increased abundance and in order to provide for better distribution away from areas of high entrainment risk, especially in drier years. Unfortunately, and perhaps tragically, USFWS will not be implementing these necessary actions in the foreseeable future due to administrative and budgetary constraints.

This finding by USFWS is in and of itself clear evidence that the ITP is not meeting the requirements of CESA to minimize and fully mitigate impacts to longfin smelt. It also represents a changed regulatory circumstance, wherein USFWS finds existing protections inadequate but is unable to replace them with adequate protections at the current time. Therefore, we strongly recommend that CDFW take those actions from which USFWS is currently precluded and revise the ITP accordingly to modify existing regulatory mechanisms to prevent and reverse the reduction in Delta outflow in order to protect longfin smelt, as recommended by USFWS.

B. Bay-Delta proceedings

In 2009, the SWRCB initiated a review of the water quality objectives contained in the Bay-Delta Water Quality Plan (WQCP). Since then, as part of Phase 2 of that review, the SWRCB has received overwhelming evidence and strong recommendations from fishery agencies and others regarding the need for improved spring outflows and more restrictive export criteria to support fish and wildlife beneficial uses of the estuary, many of which directly address the specific needs of longfin smelt. In its written comments for the Phase 2 workshops, CDFW made the following recommendations:

> *"• Provide low salinity habitat for longfin smelt in Suisun Bay (and farther downstream) by maintaining X2 between 64 km and 75 km between January and June.*
>
> *• Depending on year type, provide sufficient water flow to increase abundance of longfin smelt to pre-1987 abundance levels.*
>
> *• At no time should OMR flows be more negative than -5,000 cfs during the*

period between December and May.

- *During critical and dry years and when longfin Fall Midwater Trawl (FMWT) index is more than 500, OMR flows should be more positive than -1500 cfs during the period between April and May.*

- *During critical and dry years and when longfin FMWT index is less than 500, OMR flows should be positive during the period between April and May.*

The longfin smelt is an anadromous species for which annual juvenile production is strongly, positively correlated with levels of winter-spring outflow and X2 position. The Department's flow recommendations are intended to provide sufficient levels of winter-spring (January–June) outflow, and a sufficiently seaward X2, to ensure annual production levels capable of sustaining and growing the Bay-Delta population. Migrating adult longfin smelt, and their larval offspring, are potentially subject to substantial levels of entrainment at the CVP and SWP water export facilities, particularly in drier years when they tend to be distributed further upstream. The Department has therefore recommended limiting OMR reverse flows during the period between January and June."

(CDFG 2012b, pp. 2-3).

In the venue of the Phase 2 review, CDFW has clearly acknowledged the relevance of new scientific information and used it as the basis for making strong recommendations for amending the existing, insufficiently protective water quality objectives in the Bay-Delta WQCP. Unfortunately, the Bay-Delta proceedings – which began in 2009 and could have resulted in a water rights decision by 2014 – have been subject to numerous delays in meeting deadlines, and are not likely to result in the adoption of a water rights decision by the SWRCB in less than five years from the present date, and potentially significantly longer. Unfortunately, the species cannot afford to wait for the completion of the SWRCB proceedings in order to secure conditions under which it may continue to survive, let alone thrive. Given the current status and trends in population abundance, incidental take, and flow-related habitat conditions associated with longfin smelt, we strongly urge you to apply DFW's Phase 2 recommendations as appropriate in modifying the ITP in order to provide adequate protection for this species.

4. Conclusion

In conclusion, we want to emphasize to you that longfin smelt are at very high risk of extinction, that new scientific information and changed circumstances clearly demonstrate that the ITP's current provisions are simply not adequate to prevent the extinction of this species or to minimize and fully mitigate impacts to the species sufficient to maintain viable longfin smelt populations into the future, and therefore the provision calling for amendment of the ITP when "continued implementation of the Project under existing Permit conditions would jeopardize the continued existence of a covered species or …Project changes or changed biological conditions necessitate a Permit amendment to ensure that impacts to the Covered Species are minimized and fully mitigated" has been triggered. In short, the ITP no longer meets the minimum requirements of CESA, and consequently CDFW must re-evaluate and revise the ITP as required by the permit conditions and existing law.

Thank you for your consideration of our request. Our organizations are willing and ready to work closely with the Department to identify more protective provisions that should be incorporated into a revised ITP that will meet CESA requirements. Please contact us at your earliest convenience to discuss how we may work together to ensure the continued survival of longfin smelt.

Sincerely,

Gary Bobker
The Bay Institute

Doug Obegi
Natural Resources Defense Council

Jeff Miller
Center for Biological Diversity

Kim Delfino
Defenders of Wildlife

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