EARTHJUSTICE

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September 6, 2016

Mr. Herb Pollard, Chair
Pacific Fishery Management Council
7700 NE Ambassador Place, Suite 101
Portland, OR 97220

RE: Agenda Items E.2 and E.3 – Stock Assessment Workshop Report and Anchovy Management Update

Dear Chair Pollard and Council Members:

We write with respect to the Stock Assessment Workshop Report and Anchovy Management Update that the Pacific Fishery Management Council (Council) will consider at its September 2016 meeting. Earthjustice and Oceana join and endorse the substantive comments submitted by our organizations, The Pew Charitable Trusts (Pew), and Audubon California. We reiterate here our appreciation for the Council's direction to the Coastal Pelagic Species (CPS) Management Team to explore alternative management and policy approaches for the central subpopulation of northern anchovy. Attached are two letters providing more detail in support of our joint request to the Council.

Our organizations, along with Pew, provided comments on the August 3, 2016 draft white paper describing management options for northern anchovy. These comments specifically address the scope of management alternatives provided by the CPS Fishery Management Plan (FMP). In December 2015, our organizations also commented on proposed multi-year specifications for monitored and prohibited harvest species stocks managed under the CPS FMP. There, we supported the Council moving northern anchovy into active management and described in detail the scientific basis for reducing the proposed annual catch limit for the central subpopulation of northern anchovy. We also provided an analysis of why the 1991 bioeconomic model on which management reference points are based results in an overfishing level and allowable biological catch that are too high for this stock's currently estimated biomass. In addition, the letter includes information in support of time and area closures to help ensure an adequate forage reserve of northern anchovy for dependent predators. Because the letter was submitted to NMFS, not the Council, we attach it here. We ask that the Council consider the information provided in both letters to inform its guidance to NMFS on future stock assessment priorities and anchovy fishery management.

Sincerely,

Geoffrey G. Shester, Ph.D.
California Program Director
Oceana

Andrea A. Treece
Staff Attorney, Oceans Program
Earthjustice

August 9, 2016

Mr. Kerry Griffin
Staff Officer, Coastal Pelagic Species
Pacific Fishery Management Council
7700 NE Ambassador Place, Suite 101
Portland, OR 97220-1384

Dear Mr. Griffin:

We write to provide comments on the August 3, 2016 draft white paper describing management options for northern anchovy.[1] The Pacific Fishery Management Council (Council) requested the Coastal Pelagic Species (CPS) Management Team's input because the Council is concerned that the biomass of northern anchovy is declining at the same time landings are increasing.[2] Dependent predators bear the consequences of this decline. In recent years, brown pelicans have experienced adult mortality events, anomalous feeding behavior, and poor reproductive success in the United States and Mexico.[3] Analyses show a decline in seabird abundance that is attributable to declines in anchovy abundance and availability.[4] And a 2016 study led by federal scientists found that the unprecedented, unusual mortality event that California sea lions have undergone for the last four years is specifically tied to the unavailability of sardine and anchovy.[5] We appreciate the Council initiating a review of management options and urge the Council to take immediate action to address significant declines in anchovy abundance and associated ecological concerns.

The Management Team's draft paper describes alternative management and policy approaches for northern anchovy, including moving northern anchovy from monitored to active management status. One of the goals of the paper is to "present the various options/pathways within the Fishery Management Plan (FMP), should the Council choose to change any elements of the current management approach for northern anchovy."[6] The FMP appears to provide broader and more efficient authority to improve management than the options presented in the draft paper. We request that the Management Team incorporate this flexibility in the final paper submitted to the Council.

[1] Coastal Pelagic Species Management Team White Paper on Management Options for Northern Anchovy (CPS MT Draft White Paper) (Aug. 3, 2016), *available at* http://www.pcouncil.org/wp-content/uploads/2016/08/CPSMT_DRAFT_Northern_Anchovy_WhitePaper_August_1.pdf.
[2] *Id.* at 1.
[3] Pacific Fishery Management Council, June 2015, Agenda Item G.3.a, USFWS Report.
[4] Sydeman, W. et al. 2015. Climate-ecosystem change off southern California: Time-dependent seabird predator-prey numerical responses. Deep-Sea Research II 112:158-170
[5] NOAA Fisheries, Southwest Fisheries Science Center, Food Limitation Linked to Record California Sea Lion Strandings (March 1, 2016), *available at* https://swfsc.noaa.gov/news.aspx?ParentMenuId=39&id=21588.
[6] CPS MT Draft White Paper at 1.

The paper describes two management options for northern anchovy: retaining monitored status or moving northern anchovy to active management status. According to the white paper, if monitored status were retained, amending the overfishing limit (OFL) and allowable biological catch (ABC) "would require additional meetings, and possibly [a management strategy evaluation]-like process," while amending the annual catch limit (ACL) or annual catch target (ACT) "could be done in a two meeting process."[7] If anchovy are moved to active management, the Council must "determine whether to use the default harvest control rule (HCR), or whether to develop a stock-specific HCR," both of which would require "a significant amount of work . . . to establish the HCR parameters."[8] If the Council decides to retain monitored status for this stock, or move it to active status while retaining the default control rule, the FMP provides the Council with authority to promptly update the stock's OFL, ABC, and ACL to reflect new biomass data. Therefore, it is unclear how the Management Team derived the anticipated schedule and associated workload for the described management options.

Routine management measures "are those the Council determines likely to be adjusted annually or more frequently."[9] Routine management measures may be modified through a single meeting and one Federal Register notice procedure.[10] The following measures are classified as routine management measures for CPS stocks in the most current FMP:

1. Reallocation of surplus incidental harvest guideline to the directed fishery (all species and fishery segments).
2. Inseason changes in the incidental catch allowance.
3. Specification of annual harvest guidelines, annual catch limits, annual catch targets, or quotas.[11]

This list differs from the CPS FMP as amended through Amendment 13. Prior to Amendment 14, specification of an annual OFL and ABC were also listed as routine management measures; in fact, OFL and ABC were added as routine measures by Amendment 13.[12] Both OFL and ABC dropped off the list of routine measures in the FMP as amended by Amendment 14, and remained off the list in the FMP as amended by Amendment 15. Because these changes were not flagged in Amendment 14 or 15, or in Federal Register notices for those amendments, there was no public notice or opportunity for comment. It is now unclear whether OFLs qualify as routine measures. This is important because under the CPS FMP, the ACL for monitored stocks is calculated by setting it equal to the ABC, which is equal to OFL*0.25, or as reduced by optimum yield considerations.[13] In other words, as CPS stocks are currently managed, the ability to update the ACL depends on an OFL that reflects updated stock specific abundance data. Removing the OFL from routine measures and requiring managers to go through a separate process to update the OFL may make it more difficult to adjust the ACL (which is clearly a routine management change). Under the current FMP, adjustments to both the OFL and ACL should be a straightforward matter of applying the best available scientific data on abundance to the

[7] *Id.* at 3. The FMP does not include any reference to MSE or an MSE-like process.
[8] *Id.*
[9] Coastal Pelagic Species Fishery Management Plan (as amended through Amendment 15) 15 (Feb. 2016).
[10] *Id.* at 14-15.
[11] *Id.* at 16.
[12] Coastal Pelagic Species Fishery Management Plan (as amended through Amendment 13) 15 (Sept. 2011).
[13] Coastal Pelagic Species Fishery Management Plan (as amended through Amendment 15) 40.

formulas. We suggest that the Management Team highlight this issue so that the Council and the National Oceanic and Atmospheric Administration's Fisheries Service (NOAA Fisheries) may correct this apparent error and clarify, through an open and transparent public process, whether specifying OFL and ABC are routine management measures under the CPS FMP.

The FMP makes clear that the Council may adjust reference points for monitored stocks quickly and easily, including through the annual specification process—"[s]tock specific MSY proxies, ABC, and ACLs can be revised based on the best available science as recommended by the [Science and Statistical Committee] and as adopted through the annual harvest specification process, and will be reported in the CPS [Stock Assessment and Fishery Evaluation]."[14]

Any interpretation to the contrary illustrates the need to remove the monitored category from the CPS FMP altogether. Removal of this category would be consistent with the Magnuson-Stevens Fishery Conservation and Management Act (MSA), which does not include a monitored category for stocks in a fishery. National Standard 1 (NS 1) states that "[a]s a default, all stocks in an FMP are considered to be 'in the fishery' unless they are identified as [ecosystem component] species through an FMP amendment process."[15] NS1 further states that FMPs must include status determination criteria, MSY and OY specifications, an ABC control rule, mechanisms for specifying ACLs, and accountability measures for all stocks in the fishery.[16] Therefore, a stock is either in the fishery and these requirements must be met, or a stock is an ecosystem component species. Ecosystem component species are generally not retained for any purpose, and the Council and NOAA Fisheries cannot authorize a directed fishery for them.[17] Because MSA management requirements are not being met for monitored CPS stocks, the Council should remove this management category from the CPS FMP. As indicated in the white paper, the Council could opt to amend the FMP to do so.[18]

Regardless of whether changes to the OFL and ABC are considered routine management measures, the process for making such changes does not require a protracted effort. The default control rules and overfishing specifications are currently used for monitored stocks.[19] "In general, OFLs for CPS are based on MSY or MSY proxy harvest rates applied to the best available estimate of biomass."[20] For these stocks, the OFL is based on species-specific MSY proxies.[21] "Stock specific MSY proxies, ABC, and ACLs can be revised based on the best available science as recommended by the [Science and Statistical Committee] and as adopted through the annual harvest specification process . . . ."[22] Because the FMP does not specify an MSY harvest rate for the central subpopulation, the Council must establish this rate before it can calculate a new OFL. This effort may be facilitated by the fact that the Council and NOAA

[14] *Id.*
[15] 50 C.F.R. § 600.310(d)(1).
[16] 50 C.F.R. § 600.310(c)(1-6)
[17] Under the CPS FMP, monitored stocks are subject to directed fisheries and are retained for use, and therefore do not qualify as ecosystem component species.
[18] Coastal Pelagic Species Management Team White Paper on Management Options for Northern Anchovy 4 (Aug. 3, 2016).
[19] *Id.* at 40.
[20] *Id.* at 35.
[21] *Id*.
[22] *Id.*

Fisheries recently set an MSY proxy rate for the northern subpopulation.[23] This value may be appropriate for the central subpopulation unless there is some indication that productivity of this stock differs from the northern subpopulation. Once this rate is confirmed, it may be applied to the OFL formula to arrive at ABC and ACL calculations. It is unclear based on the CPS FMP why this would require several Council meetings.

In addition to setting harvest guidelines, ACLs, ACTs, or harvest quotas, the FMP describes the point-of-concern process as "the Council's primary tool . . . for exercising resource stewardship responsibilities."[24] This process is "intended to foster continuous and vigilant review of . . . CPS stocks and fisheries," and "to prevent overfishing or any other resource damages."[25] This review requires the CPS Management Team to use "the most current catch, effort, abundance and other relevant data from the fishery."[26] If the Management Team finds that a point-of-concern is occurring or is expected to occur, it will determine whether a resource conservation or ecological issue exists and will provide its findings at the next Council meeting.[27] It will also provide "its recommendation, rationale, and analysis for appropriate management measures" to "address the issue."[28] Through this process, "the Council may act quickly and directly to address resource conservation or ecological issues."[29] This process specifically allows the Council to adjust OFLs, ABC control rules, and other reference points to reflect best available science.[30] It also allows the Council to reassign monitored stocks to active management "on short notice."[31]

Finally, we support a recommendation made during the Management Team's webinar on August 3, 2016[32] to include in the white paper a description of how northern anchovy were managed prior to Amendment 8 of the CPS FMP. Information about the development and application of this pre-Amendment 8 management framework, wherein northern anchovy were actively managed via a species-specific harvest control rule, could be useful to the Council as it considers its options for managing this vital prey species going forward.

[23] Coastal Pelagic Species Fishery Management Plan (as amended through Amendment 14) (June 2015).
[24] Coastal Pelagic Species Fishery Management Plan (as amended through Amendment 15) 16 (Feb. 2016).
[25] *Id.*
[26] *Id.*
[27] *Id.*
[28] *Id.*
[29] *Id.*
[30] *Id.* at 18.
[31] *Id.* at 10. The types of actions and procedures under the point-of-concern framework range from automatic actions to full rulemakings, which ordinarily require two Council meetings and two Federal Register notices. *Id.* at 14-15.
[32] Pacific Fishery Management Council, "Coastal Pelagic Species Management Team to Meet via Webinar," at http://www.pcouncil.org/2016/06/43030/coastal-pelagic-species-management-team-to-meet-via-webinar/

Thank you for the opportunity to comment on the draft white paper. We request that you incorporate this feedback into the final white paper to inform the Council of the full breadth of its authority under the CPS FMP to quickly and efficiently update the OFL, ABC, and ACL for northern anchovy based on best available science.

Sincerely,

Deputy Vice President, Pacific
Oceana

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Staff Attorney, Oceans Program
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Paul Shively, Project Director
U.S. Oceans, Pacific
The Pew Charitable Trusts

EARTHJUSTICE OCEANA Protecting the World's Oceans

December 21, 2015

William W. Stelle, Jr.
Regional Administrator
West Coast Region
National Marine Fisheries Service
7600 Sand Point Way NE
Seattle, WA 98115-0070
Attn: Joshua Lindsay

RE: RIN 0648-XC808; Fisheries off West Coast States; Coastal Pelagic Species Fisheries; Multi-Year Specifications for Monitored and Prohibited Harvest Species Stock Categories

Dear Mr. Stelle:

The proposed rule sets multi-year harvest specifications for species management under the Coastal Pelagic Species (CPS) Fishery Management Plan (FMP). Specifically, the National Marine Fisheries Service (NMFS) proposes to implement annual catch limits (ACL) for jack mackerel, the northern subpopulation of northern anchovy, the central subpopulation of northern anchovy, and krill. NMFS also proposes an overfishing limit (OFL), acceptable biological catch (ABC), and annual catch target (ACT) for the northern subpopulation of northern anchovy. Harvest specifications for these critically important forage fish must be based on best available science, must prevent overfishing, and must account for ecosystem and ecological considerations, including prevailing El Niño conditions, in order to achieve optimum yield. Moreover, the agency should consider appropriate time and area closures to ensure these stocks are available for dependent predators. Because of these species' classification as "monitored" stocks, NMFS asserts they are not subject to regular stock assessments or annual adjustments. Therefore, it is even more important for the agency to set specifications that will prevent overfishing by appropriately accounting for both management and scientific uncertainty. We support recent statements at the Pacific Fishery Management Council (Council) that it will consider moving northern anchovy into "active" management, meaning that it would be regularly assessed and catch levels would be regularly adjusted via a comprehensive harvest control rule.

The health and biodiversity of marine invertebrates, fish, mammals, and seabirds depend on a vibrant and productive ocean food web. The abundance of small pelagic schooling fish, including sardines, herring, anchovy and smelts, and invertebrates like krill and squid, is critically important. These are the primary prey or "forage" for many larger species of fish and wildlife in the California Current marine ecosystem (CCE). Northern anchovy is a keystone forage species in the CCE. They are preyed upon by a wide variety of marine wildlife, including commercially and recreationally valuable fish, mammals, and sea birds. Forage species play an immense role in supporting the productivity and sustainability of other commercially and recreationally important fish species, including species managed by NMFS and the Council in the Groundfish, Highly Migratory Species, and Salmon FMPs. According to diet studies of 32

different marine predators conducted over multiple regions and multiple years, anchovy over all others may be the most important forage fish throughout the CCE.[1]

Even more so than other species, forage fish like anchovy are highly vulnerable to overfishing and collapse.[2] A recent study of forage species around the world, including northern anchovy, found that fishing forage species during a decline can increase the rate and magnitude of population collapses.[3] Another study published in the journal *Science* looked at the impacts of fishing forage species on seabird predators, and concluded that forage fish populations should be kept above one third of historic maximum levels to sustain seabird productivity over the long-term.[4]

Recent scientific information indicates that the entire CPS assemblage is at low levels. Koslow et al. (2015) reported a 72% decline in the abundance of larval fish in the CalCOFI time series between the decades of 1972 to 1981 and 2002 to 2011, concluding that "much of this decline can be attributed to the decline of northern anchovy and Pacific hake, the 2 most abundant larval fishes in the CalCOFI dataset."[5] McClatchie et al. (2015) further analyzed this information and concluded that "fish declines off southern California are largely driven by commercially exploited forage fishes," specifically "anchovy, hake, sardine, & jack mackerel."[6]

In addition, the following chart (Figure 1) summarizing abundance indices indicates that the four main targeted forage fish species (Pacific sardines, northern anchovy [central subpopulation], Pacific herring, and Pacific mackerel) are currently all well below their average levels since 1980. In addition, the ongoing El Niño event is widely predicted to reduce the availability of market squid. Therefore, there is an unusual paucity of forage species in the CCE, as potential substitute prey items are not available for species that rely on sardines and anchovies. The lack of available substitute species should be considered in setting catch levels for all CPS species, including monitored stocks. This is a relevant ecological factor. The agency must account for predator needs and forage shortages when setting management measures and ensuring they are consistent with optimum yield. This information is also important in determining whether management measures are meeting the CPS FMP goal to ensure adequate forage for dependent predators.

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[1] Ainley, D. et al. 2015. California current system – predators and the preyscape. *Journal of Marine Systems* 146: 1-2.

[2] See Pinsky et al. 2011. Unexpected patterns of fisheries collapse in the world's ocean. PNAS: 108(20):8317-8322 and Lenfest Forage Fish Task Force Report: Pikitch et al. 2012. Little Fish, Big Impact: Managing a Crucial Link in Ocean Food Webs. Lenfest Ocean Program. Washington, DC. 108 pp.

[3] Essington et al. 2015. *Fishing amplifies forage fish population collapses*, PNAS Early Edition, available at http://www.pnas.org/content/early/2015/04/01/1422020112.full.pdf.

[4] Curry, P.M., I.L. Boyd, S. Bonhommeau, T. Anker-Nilssen, R.J.M. Crawford, R.W. Furness, J.A. Mills, E.J. Murphy, H. Österblom, M. Paleczny, J.F. Piatt, J.P. Roux, L. Shannon, and W.J. Sydeman. 2011. Global Seabird Response to Forage Fish Depletion – One-Third for the Birds. Science (334)6063 1703-1706 (attached).

[5] Koslow, J.A., Miller, E.F., and McGowan, J.A. 2015. Dramatic declines in coastal and oceanic fish communities off California. 2015. Marine Ecology Progress Series 538:221-227.

[6] McClatchie, S. Thompson, A.R., Bograd, S.J., Siedlecki, S., Alin, S.R., Bowlin, N., and Watson, W. 2015. Fish diversity and corrosive Pacific Equatorial Water in the southern California Current System. Presentation at CalCOFI Annual Conference, December 15, 2015, Moss Landing, CA.

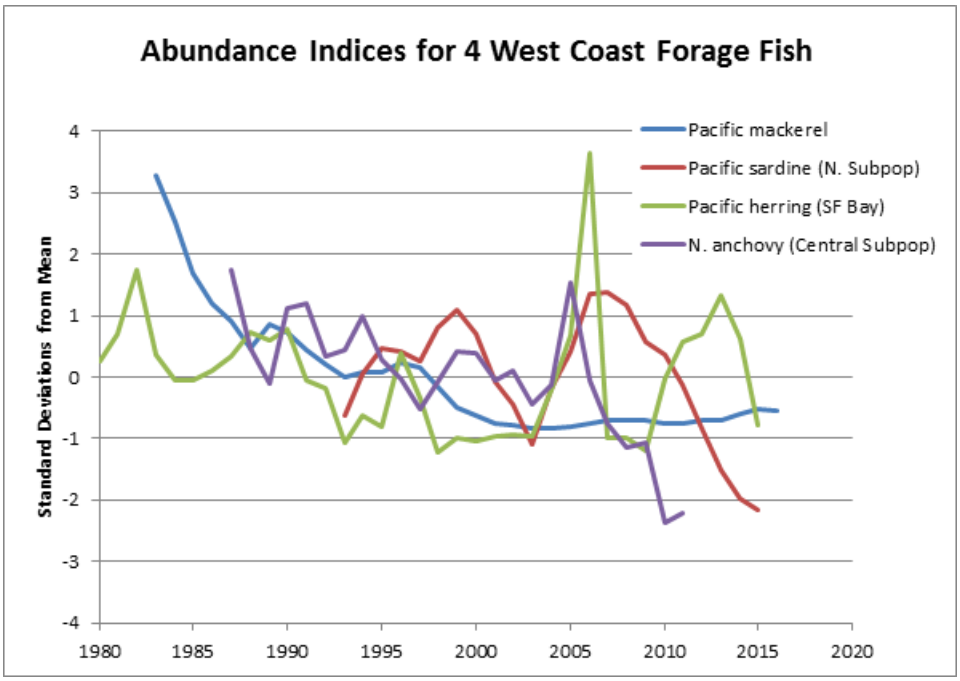

Figure 1: Standardized abundance of Pacific mackerel, Pacific sardine (NSP), Pacific herring (San Francisco Bay), and Northern anchovy (central subpopulation) relative to their mean values since 1980.
Data sources: 2015 Pacific mackerel stock assessment (1984-2015)[7], 2015 Pacific sardine stock assessment (1992-2015)[8], 2015 San Francisco Bay Herring Population Estimate (1980-2015)[9], Sydeman et al. 2015 anchovy larval spring surveys (1987-2011).[10]

I. Central Subpopulation of Northern Anchovy

A. The Annual Catch Limit, Allowable Biological Catch, and Overfishing Limit Must Be Based on the Best Scientific Information Currently Available

1. The Best Available Science Requirement Under the MSA

The Magnuson-Stevens Act requires that "[c]onservation and management measures [are] based on the best scientific information available."[11] Courts have emphasized that NMFS

[7] Crone P. & Hill K.T. 2015. Pacific mackerel (Scomber japonicas) stock assessment for USA management in the 2015-16 fishing year. May 2015. PFMC Agenda Item G.2.a.
[8] Hill et al. April 2015. Assessment of the Pacific sardine resource in 2015 for USA management in 2015-16. Agenda Item G.1.a. http://www.pcouncil.org/wp-content/uploads/2015/03/G1a_ExecSumSardine_Assessment_Print_APR2015BB.pdf
[9] Draft Supplemental Environmental Document: Pacific Herring Commercial Fishing Regulations. SCH No. 98052052. California Department of Fish and Wildlife. https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=99472&inline
[10] Sydeman, W.J., Thompson, S.A., Santora, J.A., Koslow, J.A., Goericke, R., and Ohman, M.D. 2015. Climate-ecosystem change off Southern California: Time-dependent seabird predator-prey numerical responses. Deep Sea Research II. 112:158-170.
[11] 16 U.S.C. § 1851(a)(2).

"must utilize the best scientific data *available*, not the best scientific data *possible*."[12] In other words, NMFS may not decline to take actions to conserve and manage the fishery on the basis that the available information is uncertain or could be improved by more research or analysis. "It is well settled . . . that the Secretary can act when the available science is incomplete or imperfect, even where concerns have been raised about the accuracy of the methods or models employed."[13] The agency has a particular responsibility to take "urgent action" in times when immediate measures are needed to conserve a stock. In such instances, NMFS must act even if the data are "incomplete or imperfect."[14]

When taking management action, NMFS must make "a thorough review of all the relevant information available at the time. NMFS may not disregard superior data in reaching its conclusion."[15] Continued reliance on information that the agency knows is outdated and inaccurate would be arbitrary and capricious.[16]

In evaluating best available science, NMFS must determine whether the new information presented is better than the information on which it currently relies—*i.e.*, is it more recent and more likely to give an accurate estimate of anchovy abundance. The agency currently relies on an abundance estimate that is nearly a quarter century old and is called into question by every source of recent data. The new information presented herein is better than the stale information upon which the agency now bases its management decisions. NMFS must take management action in accordance with the best scientific information currently available.

2. The Best Available Science Indicates that Anchovy Abundance Is and Is Likely to Be Too Low to Support NMFS's Proposed Annual Catch Limit, and that the OFL and ABC Are Too High

The proposed annual catch limit for the central subpopulation of northern anchovy is based on a maximum sustainable yield (MSY) estimate originally published in 1991 as part of a northern anchovy bio-economic model that was never intended to be used for management purposes as a static biomass estimate with a corresponding static MSY estimate.[17] Conrad (1991) noted:

> The concept of maximum sustainable yield (MSY) is no longer regarded as an appropriate management objective in a stochastic environment. If it is maintained for any length of time it can result in depletion of a fish stock… The MSY value

[12] *Blue Water Fishermen's Assn. v. Nat'l Marine Fisheries Serv.*, 226 F.Supp.2d 330, 338 (D. Mass. 2002) (quoting *Building Indus, Ass'n of Superior California v. Norton*, 247 F.3d 1241, 1246-47 (D.C.Cir.2001)) (emphasis in original).
[13] *General Category Scallop Fishermen v. Secretary, U.S. Dept. of Commerce*, 635 F.3d 106, 115 (3rd Cir.2011) (citing *North Carolina Fisheries Ass'n, Inc. v. Gutierrez*, 518 F.Supp.2d 62, 85 (D.D.C. 2007)).
[14] *Massachusetts v. Pritzker*, 10 F. Supp. 3d 208, 220 (D. Mass. 2014).
[15] *Guindon v. Pritzker*, 31 F. Supp. 3d 169, 195-96 (D.D.C. 2014) (quotations and citations omitted).
[16] *Ctr. for Biological Diversity v. Lohn*, 296 F. Supp. 2d 1223, 1240 (W.D. Wash. 2003) (finding that NMFS must take action in accord with the Endangered Species Act best available science requirement "without reliance upon science that its own scientists unanimously agreed is inaccurate").
[17] Conrad, J.M. 1991.A Bioeconomic Analysis of the Northern Anchovy. Working paper in agricultural economics. Department of Agricultural Economics. New York State College, Ithaca New York, and, PFMC. 1998. Coastal Pelagic Species Fishery Management Plan Amendment 8. Appendix B, at 104.

presented here is offered only as a means of comparing the present model with previous models of the central subpopulation of northern anchovy.[18]

That Conrad (1991) estimate of the biomass that produces MSY (B_{MSY}) and the corresponding MSY value were published by the Council in its 1998 amendment to the CPS FMP and used to calculate a U.S. allowable biological catch (ABC), with the understandable caveat that it would be "advisable to assess the status of the central subpopulation on some periodic basis."[19] As published in Conrad (1991) and in Amendment 8 to the CPS FMP, B_{MSY} for this central anchovy subpopulation was at the time estimated to be 733,000 mt, with a corresponding stock specific MSY value of 123,000 mt. In CPS FMP Amendment 8, the U.S. ABC was then calculated to be 25,000 mt based on the default control rule for "monitored" CPS stocks (25% MSY) and the proportion of the stock expected to be in U.S. waters (82%).[20]

In 1995, Jacobson et al.[21] published a biomass-based assessment of the northern anchovy central subpopulation, but there was not another abundance estimate available for the next 20 years. In October 2015, MacCall et al. (2016) submitted a draft manuscript of their anchovy assessment to the Council (in press at that time) entitled, "Recent collapse of northern anchovy biomass off California."[22] That study used recent scientific data through 2011 to estimate the biomass of the central northern anchovy subpopulation. Using methods consistent with (and even considered an improvement upon by the SSC) methods previously used to estimate abundance for use in management prior to Amendment 8, the authors found the northern anchovy spawning biomass off California collapsed to lower than 20,000 mt from 2009 to 2011 – roughly 3% of the B_{MSY} value set in CPS FMP Amendment 8 and still used as the basis for the proposed specifications in this proposed rule, including the OFL, ABC, and ACL. Despite this recent and available science, the proposed rule is based on the theoretical MSY estimates in the1991 bioeconomic model and Amendment 8 to the CPS FMP.

Northern anchovy are a short-lived species that can experience quick and substantial natural fluctuations in abundance. It is possible that anchovy abundance has either increased or decreased since 2011, the last year of data included in the MacCall et al. (2016) abundance estimate, however the authors indicated there was no sign of significant recovery as of 2015. By contrast, the abundance estimate that NMFS uses as the basis for its proposed annual catch limit is based on a theoretical MSY value derived from a bioeconomic model published in 1991, which itself was based on data from the previous decades under very different biological and oceanographic conditions to the present. That estimate is widely acknowledged to be stale, demonstrably wrong, and certainly not indicative of current biomass. In addition, other lines of evidence point to a low anchovy spawning biomass and the likelihood that it will continue to be low. As explained in more detail below, recent egg and larval studies show a marked decline,

[18] *Id.*
[19] PFMC. 1998. Coastal Pelagic Species Fishery Management Plan Amendment 8. Appendix B, at 104
[20] *Id.*
[21] Jacobson, L.D., Lo, N.C.H., Herrick Jr., S.F., Bishop, T., 1995. Spawning stock biomass of the northern anchovy in 1995 and status of the coastal pelagic fishery during 1994 , Administrative Report LJ-95-11, National Marine Fisheries Service.
[22] MacCall, A.D., W.J. Sydeman, P.C. Davison, J.A. Thayer. (2016). Recent collapse of northern anchovy biomass off California. Fisheries Research 175: 87-94.

and 2012-2015 aerial and vessel surveys from Point Conception to the Mexico border showed only small schools of anchovy.[23] Predators that rely on anchovy in the California Current Ecosystem are showing signs of stress, specifically tied to low prey availability. Brown pelicans have experienced adult mortality events, anomalous feeding behavior, and poor reproductive success in the United States and Mexico.[24] Recent analyses show a decline in seabird abundance is attributable to declines in anchovy abundance and availability, and California sea lions have undergone unusual mortality events for the last three years.[25] Moreover, the ecosystem is experiencing a significant El Niño event, which brings ocean conditions known to be adverse for anchovy survival and reproduction.[26]

a. Survey Indices of Anchovy Egg, Larval, and Adult Anchovy Abundances

Survey cruises conducted by the Southwest Fishery Science Center detected no anchovy eggs in 2010, 2012, and 2013, and detected very low numbers in 2011,[27,28] suggesting a downward trend in abundance. One of the major findings for the Southern California Current in the 2013 Integrated Ecosystem Assessment, based on CalCOFI abundance surveys, was that "larval anchovy abundance continued a declining trend over the last thirty years to the lowest abundance since 1951."[29] This pattern of anchovy decline was also evident in rockfish recruitment surveys through 2014, as presented in the latest "State of the California Current" CalCOFI Report.[30] In June 2015, the California Department of Fish and Wildlife (CDFW) presented the results of three years of coastal transect aerial and vessel surveys conducted in collaboration with the California Wetfish Producers Association. Aerial and vessel surveys conducted in 2012-2015 from Point Conception to the Mexico border found only small schools of anchovy, as well as mixed anchovy/sardines, ranging from 490 - 5,000 tons.[31] Sydeman et al. (2015) concluded that "Nearshore forage fish, dominated by northern anchovy (*Engraulis*

[23] NOAA Fisheries, Southwest Fishery Science Center, Continuous Underway Fish Egg Sampler Distribution Maps for Sardine, Anchovy, and Jack Mackerel; MacCall, A.D., W.J. Sydeman, P.C. Davison, J.A. Thayer. (2016). Recent collapse of northern anchovy biomass off California (submitted to Pacific Fishery Management Council, Agenda Item H.3.b Public Comment p. 406-37); Wells, B.K. et al. 2013. CCIEA Phase III Report 2013: Ecosystem Components, Fisheries – Coastal Pelagic and Forage Fishes, page C-12; Pacific Fishery Management Council, June 2015, Agenda Item G.3.a, Supplemental CDFW Report; *See also* Koslow, J. A., E.F. Miller, J.A. McGowan. Dramatic declines in coastal and oceanic fish communities off California (Oct. 2015).

[24] Pacific Fishery Management Council, June 2015, Agenda Item G.3.a, USFWS Report.

[25] Sydeman, W. et al. 2015. Climate-ecosystem change off southern California: Time-dependent seabird predator-prey numerical responses. Deep-Sea Research II 112:158-170; NOAA Fisheries: 2013-2015 California Sea Lion Unusual Mortality Event in California. http://nmfs.noaa.gov/pr/health/mmume/californiasealions2013.htm and http://www.westcoast.fisheries.noaa.gov/mediacenter/faq_2015_ca_sea_lion_strandings.pdf.

[26] NOAA NWS Climate Prediction Center. 10 December 2015. ENSO Alert System Status: "El Niño Advisory - Synopsis: El Niño is expected to remain strong through the Northern Hemisphere winter 2015-16. http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/enso_advisory/ensodisc.html

[27] NOAA Fisheries, Southwest Fishery Science Center, Continuous Underway Fish Egg Sampler Distribution Maps for Sardine, Anchovy, and Jack Mackerel

[28] MacCall, A. D., W. J. Sydeman, P. C. Davison, J. A. Thayer. (2016). Recent Collapse of Northern Anchovy off California. Fisheries Research 175: 87-94.

[29] Wells, B. K. et al. 2013. CCIEA Phase III Report 2013: Ecosystem Components, Fisheries – Coastal Pelagic and Forage Fishes, page C-12.

[30] Leising, A. W. et al. 2014. State of the California Current 2013-14: El Nino Looming. CalCOFI Rep., Vol 55, Figure 22.

[31] Pacific Fishery Management Council, June 2015, Agenda Item G.3.a, Supplemental CDFW Report.

mordax) as well as offshore mesopelagic species, show declines in relative abundance over [the 1987 through 2011] period."[32]

At the November 2015 Council meeting, SWFSC staff reported seeing increased numbers of anchovy young of the year along the coast, and a continued scarcity of anchovy eggs and adults through the 2015 surveys. The significance of these observations, however, remains to be seen. Staff were unable to offer any estimate of egg and larvae abundance, or any predictions as to how many – if any – of these eggs and larvae would recruit to the spawning population, and cautioned against the use or interpretation of such information in management.

It has been widely recognized for decades by fishery managers worldwide, and explicitly in the CPS FMP, that it is inappropriate for fishery managers to use young of the year estimates to set harvest rules. The reason is that young of the year estimates do not predict actual recruitment of adult fish. Specifically, the CPS FMP for Pacific sardines bases OFLs, ABCs, ACLs, and harvest guidelines (HGs) on Age 1+ biomass, specifically excluding young of the year (age 0) fish.[33] Likewise for northern anchovy, the harvest control rule prior to Amendment 8 (From 1983 until 1990) used Spawning Stock Biomass to determine the quota,[34] and young of the year are specifically excluded because they are not part of the spawning stock. In fact, the currently proposed OFL and ABC for northern anchovy were based on Conrad (1991), which used estimated spawning stock biomass, also excluding young of the year.

The Pacific is currently experiencing the second consecutive year of El Niño conditions, characterized by unusually warm water temperatures, reduced upwelling and changes in plankton composition and abundance. The conditions predicted for 2016 are thought to be among the strongest El Niño events in recorded history. In the past, El Niño conditions such as these we are seeing now have resulted in increased juvenile anchovy mortality, reduced fecundity and reduced growth.[35] The strong El Niño from 1982-1984, for example, was followed by significantly reduced northern anchovy catch levels.[36] These unfavorable conditions make it less likely that the reported increase in larvae offshore will yield an increase in the spawning biomass of anchovy, and the most likely response consistent with previous history will be a decrease in northern anchovy abundance. In response, NMFS should take management action consistent with preserving the resilience of this environmentally-driven population.

[32] Sydeman, W.J., Thompson, S.A., Santora, J.A., Koslow, J.A., Goericke, R., and Ohman, M.D. 2015. Climate-ecosystem change off Southern California: Time-dependent seabird predator-prey numerical responses. Deep Sea Research II. 112:158-170.
[33] CPS FMP Section 4.6.2 beginning at 39.
[34] Conrad 1991.
[35] Fiedler, P.C., R.D. Methot, and R.P. Hewitt. 1986. Effects of California El Nino 1982-1984 in the northern anchovy. Journal of Marine Research. 44, 317-338.
[36] Pacific Fishery Management Council. 2014. Status of the Pacific Coast CPS Fishery and Recommended Acceptable Biological Catches. Stock Assessment and Fishery Evaluation. PFMC December 2014, at 54.

b. The Most Recent Abundance Estimate from MacCall et al. (2016): Recent Collapse of Northern Anchovy Biomass off California[37]

The MacCall et al. (2016) study provides an estimate of stock abundance using an approach that accounts for seasonal variations in spawning, trends in the timing of spawning, and the tendency of anchovy to contract into nearshore areas at times of low abundance.[38] At the November 2015 Council meeting, the SSC agreed that this approach improves upon past analyses which do not account for the fact that CalCOFI sampling stations exist in higher densities in the nearshore region favored by anchovies at low population sizes, leading to a "hyperstability bias." The area-weighted approach to correct this issue was recognized by the SSC as an improvement over previous methods and is now being used by NMFS scientists to estimate abundance of jack mackerel within the CalCOFI survey area.[39] MacCall et al. (2016) found that "anchovy biomasses estimated for 2009-2011 are the lowest seen in 60 years,"[40] and that, based on egg surveys conducted since 2011, "there has been no substantial recovery of the anchovy population as of 2015."[41] The study also noted that "recent anecdotal reports of substantial nearshore anchovy abundance" likely resulted from "much of the remnant population [concentrating] close to shore, making them unusually visible to the public and giving a mistaken impression of abundance."[42] These results are consistent with and validate the other recent information sources described above in Section a.

c. Predator Response and Impacts

Predators that rely on anchovy in the CCE are showing signs of stress. These include brown pelican, which have experienced adult mortality events, anomalous feeding behavior such as the predation of common murre chicks, and poor reproductive success in the U.S. and Mexico.[43] As a result, the USFWS recently requested that the Council consider adopting interim management measures regarding the harvest of the central subpopulation of northern anchovy out of concern that continued fishing pressure may affect the ability of the stock to support dependent predators.[44] Recently published analyses of seabird and forage fish distribution and abundance in the CCE show that a substantial decline in seabird abundance in the northern portion of the southern CCE (from around Point Conception, California, northward) – a rate of decline of 2.2% per year from 1987-2011 – is attributable to declines in anchovy abundance and availability.[45] California sea lions have also undergone Unusual Mortality Events in 2013, 2014,

[37] MacCall, A. D., W. J. Sydeman, P. C. Davison, J. A. Thayer. 2016.Recent Collapse of Northern Anchovy Biomass off California. Fisheries Research. 175: 87-94.
[38] MacCall, A. 1990. Dynamic geography of marine fish populations. University of Washington Press..
[39] Weber, E.D. 2015. Larval production and habitat distribution of Jack mackerel Trachurus symmetricus in the Southern California Bight. Presentation at Annual CalCOFI Conference, December 14, 2015.
[40] MacCall, A. D., W. J. Sydeman, P. C. Davison, J. A. Thayer. 2016. Recent Collapse of Northern Anchovy Biomass off California. Fisheries Research. 175:87-94.
[41] *Id.*
[42] *Id.*
[43] Pacific Fishery Management Council, June 2015, Agenda Item G.3.a, USFWS Report.
[44] Letter from United States Fish and Wildlife Service to Dorothy Lowman, Pacific Fishery Management Council 1 (Nov. 12, 2015), available at Fishery Management Council, November 2015, Agenda Item H.3.a. Supplemental USFWS Report. http://www.pcouncil.org/wp-content/uploads/2015/11/H3a_Sup_USFWS_LTR_Nov2015BB.pdf.
[45] Sydeman,W. et al. 2015. Climate–ecosystem change off southern California: Time-dependent seabird predator–prey numerical responses. Deep-Sea Research II 112:158-170.

and 2015, linked to low anchovy and sardine abundance.[46] McClatchie et al. (in press), for example, report that the increased mortality and starvation of California sea lion pups born at the Channel Islands is directly related to the decline of high quality forage – sardine and anchovy – available to breeding female California sea lions.[47]

The most recent information available indicates that the starvation of dependent predators is the worst is has been in decades, and it is expected to be worse in 2016. The leading pinniped researcher from NMFS, Sharon Melin, recently described the situation for the San Francisco Chronicle:

> California sea lion pups weighed this fall at their rookeries on San Miguel Island were 31 percent below their normal weight — the lowest average weight in 41 years of testing, said Sharon Melin, a research biologist for the National Oceanic and Atmospheric Administration.
>
> Northern fur seal pups were 33 percent below their typical weight, she said, the third-lowest mark recorded and the second year in a row that severely low weights have been documented in 3-month-old pups, which are measured annually on the Channel Islands sanctuary.
>
> Between January through May 2015, marine biologists collected 3,340 sick, starving and dead sea lions that washed ashore in Central and Southern California, and "Based on the condition of the pups we saw in September and October, we would anticipate there will be at least as many strandings this winter," Melin said, adding that she expects sea lions to start beaching themselves in coming weeks and continue into April, when the pups typically wean from their mothers. [48]

B. The Annual Catch Limit Must Prevent Overfishing and Satisfy the Optimum Yield Requirement to Account for Importance of Anchovy to the Marine Ecosystem and Other Fisheries

NMFS must ensure that the annual catch limit satisfies the MSA's requirement that "[c]onservation and management measures shall prevent overfishing while achieving, on a continuing basis, the optimum yield from each fishery…."[49] MSA regulations define maximum sustainable yield as the "largest long-term average catch or yield that can be taken from a stock or stock complex under prevailing ecological, environmental conditions and fishery

[46] NOAA Fisheries: 2013-2015 California Sea Lion Unusual Mortality Event in California. http://www.nmfs.noaa.gov/pr/health/mmume/californiasealions2013.htm and http://www.westcoast.fisheries.noaa.gov/mediacenter/faq_2015_ca_sea_lion_strandings.pdf

[47] McClatchie, S. et al. (in press). Food limitation of sea lion pups and the decline of forage off central and southern California. Available at: https://www.researchgate.net/publication/267899031_Food_limitation_of_sea_lion_pups_and_the_decline_of_forage_off_central_and_southern_California.

[48] Fimrite, P. December 10, 2015. Sea lions in trouble, again, off California coast. San Francisco Chronicle. Available at: http://www.sfgate.com/bayarea/article/Sea-lions-in-trouble-again-off-California-coast-6690177.php.

[49] 16 U.S.C. § 1851(a)(1).

technological characteristics . . . and the distribution of catch among fleets."[50] "Overfishing" and "overfished" mean "a rate or level of fishing mortality that jeopardizes the capacity of a fishery to produce the maximum sustainable yield on a continuing basis.[51] The statute itself defines "optimum yield" as the "amount of fish which will provide the greatest overall benefit to the Nation . . . taking into account the protection of marine ecosystems," and states that optimum yield is to be based on maximum sustainable yield "as reduced by any relevant economic, social, or ecological factor."[52]

The NS1 guidelines direct fishery managers to establish annual catch limits with reference to the OFL and ABC.[53] Specifically, the ABC sets an upper bound on the ACL. Therefore, if the OFL and/or ABC are set too high based on flawed or outdated information, it allows the ACL to be set at levels that fail to prevent overfishing as required by the MSA. Together, these measures are designed to prevent overfishing by setting a reference point to identify when overfishing is occurring and accounting for scientific uncertainty in estimating the OFL. In addition to preventing overfishing, the annual catch limit must achieve optimum yield on a continuing basis, and thus must also account separately for reductions in catch necessary to meet ecological, economic, and social needs.[54]

NMFS must set OFL, ABC, and ACL based on the best science currently available. While NMFS has not proposed to revise the OFL or ABC in the proposed rule, these measures are directly related to the ACL and specifying them correctly, based on current data and scientific understanding, is essential to meeting NMFS's responsibility to prevent overfishing. The information provided above indicates that the OFL and ABC are set incorrectly and must be revised. NMFS cannot meet that responsibility by relying on outdated, incorrect values for the OFL and ABC, particularly when those values are based on the assumption that anchovies are at more than 10 times their actual recent abundance. In the table below, we present the value that the FMP's OFL formula (F_{MSY} fishing rate from Conrad (1991) of 16.8% multiplied by the estimated spawning stock biomass) would produce if it the OFL were recalculated using the best available abundance estimate.

The ABC must similarly be updated based on recent abundance information. The table below presents a revised value for ABC based on applying the best available data to the ABC formula set forth in the FMP. We further note, however, that the best available science shows that anchovy abundance can and does fluctuate by much more than 75%. In fact, anchovy abundance dropped by 99% between 2005 and 2009. Consequently, a 75% buffer may frequently allow fishing rates well above MSY levels and even well above the entire population size.

The fact that the stock can experience such rapid, dramatic changes translates into very large uncertainty in the OFL value, especially when the OFL is set based on a historic average biomass under a hypothetical MSY fishing rate rather than current biomass estimates. That problem is magnified by the fact that NMFS does not assess the anchovy stock on a regular

[50] 50 CFR § 600.310(e)(1)(i)(A).
[51] 16 U.S.C. § 1802(34).
[52] 16 U.S.C. § 1802(33)(A)-(B).
[53] 50 C.F.R. § 600.310(b)(2)(ii).
[54] 16 U.S.C. § 1851(a)(1); 50 C.F.R. § 600.310(e)(3)(ii).

basis. In order to account for scientific uncertainty and reflect the best available science on changes in anchovy abundance, NMFS should set a significantly higher uncertainty buffer reflecting the known range of natural fluctuations, such that the ABC would never be set in excess of the MSY of the stock when it is at the minimum end of its natural range based on known population dynamics and set a corresponding lower ABC.

The proposed ACL, which is potentially greater than the entire central subpopulation of northern anchovy, is inconsistent with preventing overfishing or achieving optimum yield.

F_{MSY} Rate (derived from Conrad (1991), CPS FMP Amendment 8 as MSY/B_{MSY})*	16.8%	
ABC/OFL for Monitored Stocks*	25%	
U.S. DISTRIBUTION*	82%	
	Proposed Specifications based on biomass and parameters from Conrad (1991) & CPS FMP (1998, 2011) (metric tons)	Alternative Specifications using most recent biomass estimate from MacCall et al. (2016) (metric tons)
BIOMASS (B)	733,000	20,000
MSY and OFL	123,000	3,360
ABC	31,000	840
U.S. ABC	25,000	689

*Existing parameters from CPS FMP

Using the most recent upper biomass estimate of 20,000 metric tons (MacCall et al. (2016)) and applying an F_{MSY} rate of 16.8% – calculated based on the B_{MSY} and MSY values in Conrad (1991) as applied in the CPS FMP, Amendment 8 – one could calculate a current MSY and OFL of 3,360 mt. Based on best available science, the total ABC should therefore be around 840 mt (25% of MSY for monitored stocks) with a U.S. ABC of 689 mt (applying the 82% distribution factor to the total ABC).

NMFS must set OFL, ABC, and ACL based on the best science currently available. In addition to the updated abundance estimate described above, there are well established proxies for MSY in the scientific literature for data-poor situations. Notable among these is the National Standard 1 Guidance provided by Restrepo et al. (1998), which states:

> If there is no reliable information available to estimate fishing mortality or biomass reference points, it may be reasonable to use the historical average catch

> as a proxy for MSY, taking care to select a period when there is no evidence that abundance was declining.
>
> Recommended data-poor defaults
>
> In data-poor cases it is recommended that the default limit control rule be implemented by multiplying the average catch from a time period when there is no quantitative or qualitative evidence of declining abundance ("Recent Catch") by a factor depending on a qualitative estimate of relative stock size:
>
> Above B_{MSY}: Limit catch = 1.00*(Recent catch).
> Above MSST but below B_{MSY}: Limit catch = 0.67*(Recent catch).
> Below MSST (i.e., overfished): Limit catch = 0.33*(Recent catch)." [55]

Because the current stock clearly is well below the B_{MSY} of 733,000 mt, likely below the MSST of 50,000 mt based on the most recent biomass estimate, and there is no information suggesting the stock is above the MSST, the limit control rule should be the recent catch multiplied by a factor of 0.33.[56] Using recent catch from the last 5 years or the last 10 years, the limit reference points would be as follows:

Multiplier	**1**	**0.67**	**0.33**
2004-2014 Average Landings	7,365	4,935	2,431
2009-2014 Average landings	4,263	2,856	1,407

Table: Average (mean) landings (metric tons) of northern anchovy in California derived from reported information 2014 CPS SAFE Report[57] and CDFW CPS Landing Summaries,[58] and resulting limit reference points using data-poor defaults from Restrepo et al. 1998.

Using 5 or 10-year recent average landings and the multipliers (0.33 and 0.67) for when the stock is below B_{MSY}, the limit reference points (MSY proxies) under the Restrepo et al. (1998) recommended methodology result in a range from 1,407 mt to 4,935 mt. The best available information indicates the stock is likely below MSST, and that a decline occurred in the period prior to 2009. Therefore, the use of a 0.33 multiplier and recent landings post-2009 would be the most appropriate application of the Restrepo et al. (1998) default recommendations for a data-poor stock to the current information available for northern anchovy. In addition to being consistent with the Restrepo et al. (1998) method, basing catch limits on recent average catch

[55] Restrepo et al. 1998 at p. 25-26. Technical Guidance on the Use of Precautionary Approaches to Implementing National Standard 1 of the Maguson-Stevens Fishery Conservation and Management Act. NOAA Tech Memorandum. July 17, 1998. Available at: http://www.nmfs.noaa.gov/sfa/NSGtkgd.pdf.
[56] Under the terms of the *Oceana v. Pritzker* settlement agreement, NMFS must consider revising or establishing, as appropriate, minimum stock size thresholds for the central and northern subpopulations of anchovy, jack mackerel, Pacific mackerel, and Pacific sardine. Settlement Agreement between Oceana and NMFS, *Oceana v. Pritzker*, No. 13-16183 (9th Cir.) (June 2015), at 3.
[57] CPS SAFE Report 2014.
[58] CDFW Coastal Pelagic Species Landings Summaries. Available at: https://www.wildlife.ca.gov/Conservation/Marine/CPS-HMS/Landings.

would prevent increases in catch over recent levels, which would be a reasonable and prudent policy for this data-poor species that is demonstrating warning signs of low abundance.

The proposed specifications for this subpopulation do not include a CUTOFF biomass, which is widely recognized as a critical management tool to prevent overfishing in light of the dynamic nature of CPS stocks. All actively managed species in the CPS FMP (Pacific sardine and Pacific mackerel) have CUTOFFs, below which no directed fishing is allowed. Prior to Amendment 8, the northern anchovy FMP included a CUTOFF for the central subpopulation of northern anchovy of a spawning stock biomass of 300,000 mt, below which only a non-reduction harvest (such as pet food) was limited to 7,000 mt.[59] If spawning biomass fell below 50,000 mt for two years in a row, no harvest was allowed. [60]

NMFS has not explained its rationale for proposing an ABC and ACL of 25,000 mt. This level is much greater for this monitored stock than it would have been when the stock was actively managed. Using the recent MacCall et al. (2016) biomass estimate of 20,000 mt (well below the current MSST of 50,000 mt), there would be zero quota under the prior management regime, and under the MSA, a rebuilding plan would be required. Based on this estimate, the ABC and ACL for this stock under the default formula for monitored stocks in the CPS FMP would be 689 mt. And using the Restrepo method for data-poor stocks and an appropriate multiplier of .33 due to the stock being below MSST, the catch limit would be 1,407 mt. Based on these analyses, the OFL should be no greater than 3,360 mt and we recommend an ACL range of 0-1,400 mt.

C. NMFS Should Prohibit Targeted Fishing for Anchovy Near Brown Pelican Nesting Grounds During the Nesting/Fledging Season

The California brown pelican (*Pelecanus occidentalis californicus*) has experienced recent die-offs and breeding failures that are linked to a lack of adequate forage. Additional management measures are necessary to ensure that an adequate forage reserve of northern anchovy is maintained for this subspecies, as required to achieve optimum yield. The USFWS recently requested that the Council consider adopting interim management measures regarding the harvest of the central subpopulation of northern anchovy out of concern that continued fishing pressure may affect the ability of the stock to support dependent predators such as brown pelicans.[61]

The MSA requires NMFS to establish measures necessary and appropriate for the conservation and management of the fishery and ensure all measures achieve optimum yield by fully accounting for relevant ecological factors like predator needs. In addition, NMFS has explicit authority to "designate zones where, and periods when, fishing shall be limited, or shall not be permitted . . . ."[62] Any closure that prohibits "all fishing" must be based on best available

[59] Conrad 1991 at 3.
[60] *Id.*
[61] Letter from United States Fish and Wildlife Service to Dorothy Lowman, Pacific Fishery Management Council 1 (Nov. 12, 2015), available at Fishery Management Council, November 2015, Agenda Item H.3.a. Supplemental USFWS Report. http://www.pcouncil.org/wp-content/uploads/2015/11/H3a_Sup_USFWS_LTR_Nov2015BB.pdf.
[62] *Id*. § 1853(b)(2)(A).

science; include "criteria to assess the conservation benefit of the closed area;" establish "a timetable for review of the closed area's performance that is consistent with the purposes of the closed area;" and must be "based on an assessment of the benefits and impacts of the closure, including its size, in relation to other management measures . . . including the benefits and impacts of limiting access to: users of the area, overall fishing activity, fishery science, and fishery and marine conservation."[63] NMFS may also prescribe management measures that "conserve target and non-target species and habitats, considering the variety of ecological factors affecting fishery populations."[64]

The brown pelican was federally listed as endangered in 1970.[65] In 2009, the United States Fish and Wildlife Service (USFWS) delisted the California brown pelican, due, in part, to the determination that criterion 2 of the California brown pelican recovery plan had been met.[66] Criterion 2 requires an assurance of "long-term protection of adequate food supplies and essential nesting, roosting, and offshore habitat throughout the subspecies' range."[67] According to the final rule announcing delisting of the subspecies, food supplies are supposed to be assured by the CPS FMP.[68]

The California brown pelican breeds from the California Channel Islands to Guerrero, Mexico.[69] "Approximately 17 percent of the population nests in the [Southern California Bight] at five colonies."[70] The largest of the Southern California Bight breeding colonies is at Anacapa Island.[71] Anacapa Island consists of three islets, and lies approximately 23 kilometers offshore from Ventura, California in the Channel Islands National Park.[72]

In 2014, the majority of pelicans initiated nesting between early January and late April.[73] First egg-laying occurred in early January, first hatching in early February, and first fledging in late April.[74] The latest fledging occurred in early July, with a total pelican breeding season of approximately seven months.[75] California brown pelicans in the CCE prey on northern anchovies and other small schooling fish like sardines and Pacific mackerel.[76] "During the pre-breeding and breeding periods, [these] brown pelicans . . . are "heavily dependent on the availability of

[63] *Id.* § 1853(b)(2)(C).
[64] *Id.* at § 1853(b)(12).
[65] 35 Fed. Reg. 16,047 (Oct. 13, 1970).
[66] 74 Fed. Reg. 59,444 (Nov. 17, 2009).
[67] *Id.* at 59,450.
[68] *Id.*
[69] Letter from United States Fish and Wildlife Service to Dorothy Lowman, Pacific Fishery Management Council 1 (May 14, 2015), *citing* Anderson, D. W., et al. 2013 Size and Distribution of the California Brown Pelican Metapopulation in a Non-Enso Year; https://sora.unm.edu/sites/default/files/41_2_95-106.pdf.
[70] *Id.*
[71] Letter from United States Fish and Wildlife Service to Dorothy Lowman, Pacific Fishery Management Council 1 (May 14, 2015).
[72] Anderson, D. W., et al. 2013 Size and Distribution of the California Brown Pelican Metapopulation in a Non-Enso Year, at 4; https://sora.unm.edu/sites/default/files/41_2_95-106.pdf.
[73] *Id.* at 8.
[74] *Id.*
[75] *Id.*
[76] Letter from United States Fish and Wildlife Service to Dorothy Lowman, Pacific Fishery Management Council 1 (May 14, 2015).

anchovies."[77] "Northern anchovy availability within foraging distance of colonies is the most important factor influencing pelican breeding success within the [Southern California Bight] . . . . Waters within 30-50 kilometers of the colony are critically important for foraging, especially when young are being fed."[78]

The California brown pelican "has experienced unusual mortality events and a multi-year decline in breeding successes since delisting, both of which appear to be due to the lack of adequate forage."[79] Adult brown pelican mortality events were documented along the California and Oregon coasts in two events spanning December 2008 to March 2009, and January to February 2010, with emaciation or starvation listed as the primary cause of death for both.[80] They have also experienced years of poor breeding success at Anacapa Island beginning in 2009 and continuing through 2014.[81] In 2012, only five chicks are known to have fledged,[82] and in 2014, although breeding pair attendance was substantial, chick production was poor.[83]

As specified in the MSA,[84] and indicated in the proposed rule, monitored species stocks are subject to time and area closures. The best available science demonstrates that California brown pelicans are unable to find adequate forage in the vicinity (50 km) of their breeding colonies, leading to breeding failures. Anacapa Island and the waters surrounding it comprise the most important breeding colony in the Southern California Bight, and important to the entire population of brown pelicans. There is currently little to no northern anchovy fishery operating within these waters, though, these waters are historically part of anchovy fishing grounds and fishing could occur again in the future. Therefore, we request a seasonal closure of the northern anchovy fishery in the waters most critical to pelicans' foraging behavior and reproductive success. Based on the known foraging distance range of brown pelicans that are feeding their chicks, this closure should extend 50 kilometers from Anacapa Island, as depicted in Figure 2. The time period for the closure should include California brown pelicans' nesting and fledging seasons. Consequently, we request a closure to directed northern anchovy fishing in this area from January through July each year. This requested time and area closure satisfies the MSA criteria for doing so, and would help ensure that an adequate forage reserve of northern anchovy is maintained for these seabirds.

[77] *Id.*, *citing* Anderson, D.W., et al. 1982 Brown pelicans: influence of food supply on reproduction.
[78] *Id.*, *citing* Anderson, D.W., et al. 1982, USFWS 1983.
[79] *Id.*
[80] Letter from United States Fish and Wildlife Service to Dorothy Lowman, Pacific Fishery Management Council 2 (May 14, 2015).
[81] *Id.*
[82] *Id.*
[83] Harvey, A. L., and Mazurkiewicz, D.M. 2015 California Brown Pelican and Double-Crested Cormorant Breeding Colony Status on Anacapa Island, California in 2014 Determined by a Rapid Assessment Approach (finding an estimated 0.16 to 0.33 young fledged per nest attempt).
[84] While the MSA authorizes closures of "all fishing," here we are requesting closure of the directed fishery for the central subpopulation of northern anchovy stock only.

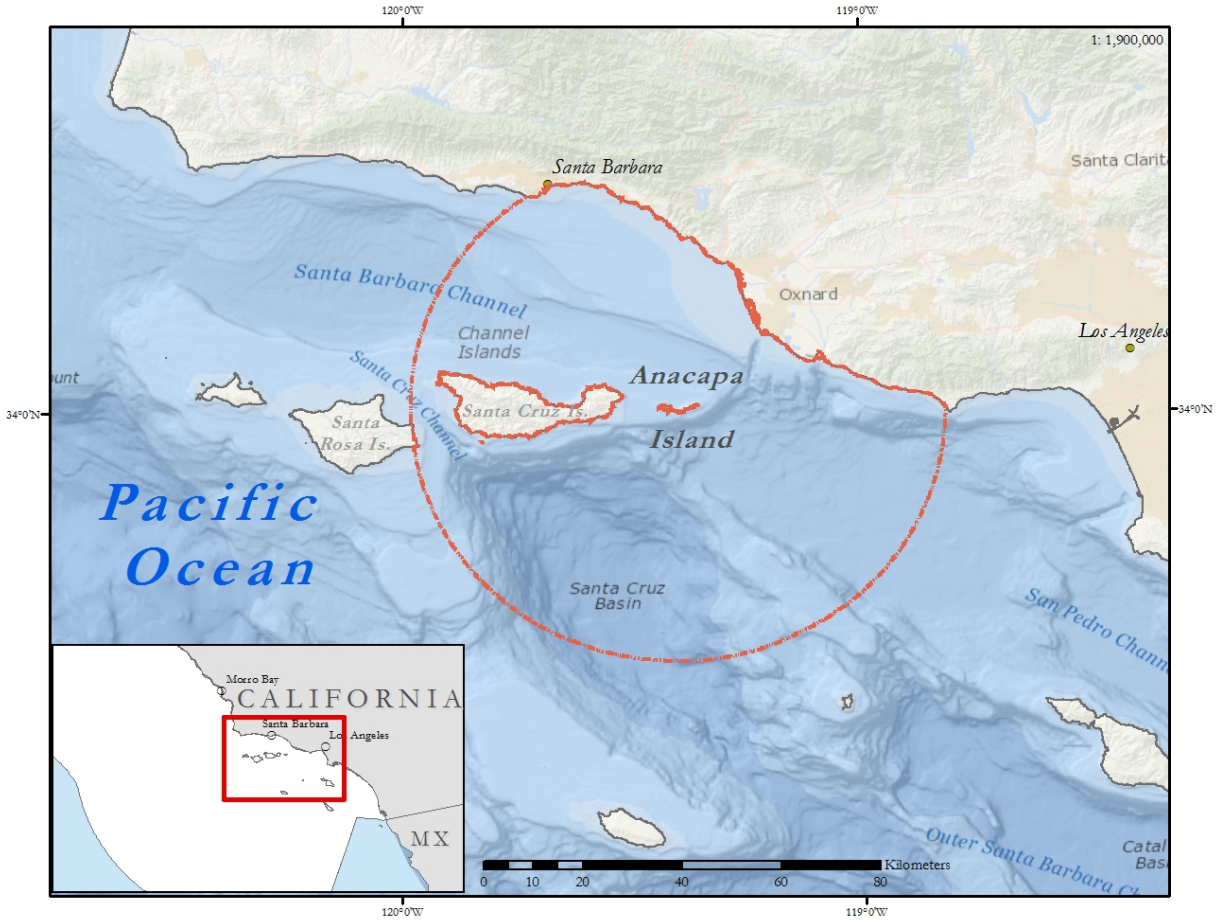

Figure 2. Proposed seasonal anchovy fishing closure during brown pelican nesting and fledging season (January-June) representing a 50 km buffer around Anacapa Island.

D. NMFS Should Prevent Localized Depletion of Northern Anchovy in Monterey Bay

According to CDFW data,[85] from 2012 to 2015, over 90% of the statewide anchovy landings in California have been taken in Northern California, and those are almost exclusively taken in Monterey Bay. This is explained by the fact that anchovy are at very low abundance in Southern California, and the only major fishing grounds are currently in Monterey Bay. This indicates that the current biological and oceanographic regime for the central subpopulation of northern anchovy is fundamentally different than it was when the stock was actively managed, or from the period on which the current proposed specifications are based (pre-1991), when the stock was primarily located in Southern California, and only a small relative fraction of the stock and the landings occurred in Monterey Bay. This is further evidence that the science underpinning the proposed specifications is no longer valid. NMFS has not considered the potential impacts of taking the entire anchovy quota in a small localized area of Monterey Bay,

[85] CDFW Coastal Pelagic Species Landings Summaries. Available at: https://www.wildlife.ca.gov/Conservation/Marine/CPS-HMS/Landings

far outside the Southern California Bight area in which the historic fishery occurred and on which the proposed specifications are based.

In 2015, CDFW Representative Marci Yaremko reported at the November 2015 Council meeting that over 99% of the 2015 landings to date had occurred in Monterey Bay. This raises concerns of localized depletion, particularly because Monterey Bay is a known foraging location for a wide suite of anchovy-dependent predators including ESA-listed humpback whales. Localized depletion by a fishery is widely recognized in the scientific literature to impact foraging by predators.[86] The Lenfest Forage Fish Task Force[87] highlighted these impacts and recommended consideration of spatial and temporal management. Such management might, for example, close forage fisheries during spawning season or around colonies of seabirds that rely heavily on forage fish.

Given the relatively small, concentrated area in Monterey Bay where anchovies and their predators have been located in the last several years, we are concerned about localized depletion of one of the few remaining locations where anchovies are concentrated, and the potential for competitive interference between anchovy fishing activities and anchovy dependent predators. Our concerns include both the removal of thousands of metric tons of forage fish during known foraging events, and the potential direct disturbance of foraging behavior caused by fishing activities.[88] These activities include the setting of nets that may actually interact with whales and the use of pinniped deterrent devices, which NMFS currently authorizes for use in commercial fishing operations (including anchovy purse seines). None of these impacts was considered or addressed in Amendment 13 or the associated Environmental Assessment, and the current proposed specifications contain no measures to address or prevent such impacts.

As specified in the MSA, and indicated in the proposed rule, monitored species stocks are subject to time and area closures. We request that NMFS consider temporal and spatial management measures to prevent localized impacts in Monterey Bay, including a time-area closure in Monterey Bay when humpback whales are present and a regional catch limit for this area (such as a separate ACL for Northern and Southern California).

E. NMFS Must Ensure that the Annual Catch Limit it Establishes Does Not Adversely Affect Species Protected under the Endangered Species Act

NMFS's proposed multiyear annual catch limit specification of 25,000 mt may have an adverse effect on marine predators listed under the Endangered Species Act (ESA), including Chinook salmon, California least tern, marbled murrelet, and humpback whales. Anchovy provides a critical food source for these species. Removing anchovy through fishing, particularly

[86] Bertrand et al. 2012. Local depletion by a fishery can affect seabird foraging. Journal of Applied Ecology 49:1168-1177.
[87] Lenfest Forage Fish Task Force Report: Pikitch et al. 2012. Little Fish, Big Impact: Managing a Crucial Link in Ocean Food Webs. Lenfest Ocean Program. Washington, DC. 108 pp.
[88] *See* letters to PFMC and NMFS from Diane Glim, American Cetacean Society; Nancy Black, Monterey Bay Whale Watch; Kate Spencer, Fast Raft Ocean Safaris on Monterey Bay; John Calambokidis, Cascadia Research Collective. Nov. 2015 PFMC Meeting Briefing Book, Agenda Item H.3b Public Comment, *available at* http://www.pcouncil.org/wp-content/uploads/2015/10/H3b_Public_Comment_FULL_ElectOnly_Nov2015BB.pdf and http://www.pcouncil.org/wp-content/uploads/2015/11/H3b_Sup_Public_Comment_5_Nov2015BB.pdf .

when alternate prey like Pacific sardine and Pacific mackerel are also scarce, poses a risk to these predators. Reducing availability of preferred (and more nutritious) food sources may decrease the listed predators' reproductive success and drive localized population declines. Furthermore, continuing to allow significant levels of catch during a time of low anchovy abundance increases the risk that the anchovy population will be unable to recover to a robust level in the near future, and thus increases the risk that marine predators will continue to experience food shortages in coming years.

ESA Section 7(a)(2) requires federal agencies to ensure that no action they authorize, fund, or carry out is likely to "jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of [critical habitat]."[89] Therefore, regulations implementing Section 7 provide that: "[e]ach Federal agency shall review its actions at the earliest possible time to determine whether any action *may affect* listed species or critical habitat. If such a determination is made, formal consultation is required . . . ."[90] The "may affect" standard "is a relatively low threshold for triggering consultation."[91] If the proposed action has a "possible" effect on listed species, the consultation requirement is triggered.[92] Formal consultation may only be avoided if, as a result of the preparation of a biological assessment under 50 C.F.R. § 402.12, or as a result of informal consultation under 50 C.F.R. § 402.13, "the Federal agency determines, with the written concurrence of [the Service], that the proposed action is not likely to adversely affect any listed species . . . ."[93]

Where the agency has previously completed ESA consultation on an action, it must reinitiate consultation when, among other circumstances, "new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered."[94] NMFS has not completed prior ESA consultation on the effects on listed marine predators of the proposed multi-year ACL levels for northern anchovy and other species in the CPS FMP. Even if it had, any prior look that NMFS took at the issue assumed that anchovy abundance was greater than an order of magnitude higher than the best available science indicates that it is now. New information, including egg, larval, and adult surveys, MacCall et al. (2016), and changes in marine predator behavior, reduced breeding success, and starvation events, strongly indicates that anchovies are at low abundance and current levels of fishing may have much more significant effects on listed predators than NMFS has considered in the past.

NMFS may be able to avoid undertaking formal ESA consultation if it specifies a very low annual catch limit for the central subpopulation of northern anchovy, such that it will not adversely affect listed predators. Based on the analyses presented above, that number would be no higher than 1,400 mt and could well be lower. The current science described above indicates that a substantially lower annual catch limit could be necessary to protect the forage base for listed species. NMFS should seek the advice of USFWS and the NMFS Office of Protected Resources to ensure that it specifies a sufficiently protective annual catch limit. Protection of

[89] 16 U.S.C. § 1536(a)(2).
[90] 50 C.F.R. § 402.14(a) (emphasis added).
[91] *Karuk Tribe of California v. United States Forest Service*,681 F.3d 1006, 1027 (9th Cir. 2012) (*en banc*).
[92] *Id., citing Cal ex. Rel. Lockyer v. U.S. Dep't of Agric.*, 575 F.3d 999, 1018 (9th Cir. 2009).
[93] 50 C.F.R. § 402.14(b).
[94] 50 C.F.R. § 402.16(b).

these predators requires – and would be best served by – immediate implementation of a very low catch limit that protects the forage base. Such action is consistent with case law requiring agencies to take management action that gives listed species the benefit of the doubt.[95]

F. Longer Term Management: Coastal Pelagic Species Must Be Regularly Assessed and a Comprehensive, Ecosystem-Based Management Regime Must Be Implemented Before Allowing Increased Catch Levels

The recent crash of the anchovy stock, food shortages among marine predators, and the inability of fishery managers to detect and quickly respond to those circumstances illustrate the inadequacy of the current "monitored" management framework. The CPS FMP's current management framework falls short of statutory requirements that every stock in the fishery have a specified optimum yield that accounts for relevant ecological, economic, and social factors; status determination criteria; acceptable biological catch that fully accounts for scientific uncertainty in determining the overfishing limit; and a mechanism for specifying annual catch limits that effectively prevent overfishing and measures to ensure accountability with it. In addition, the CPS FMP's approach to managing northern anchovy violates the MSA's requirement that management be based on best available science.

The current management framework for anchovy is fundamentally ill-suited to the biology and ecological role of this crucial species. Under the CPS FMP, the OFL, ABC, and ACL for northern anchovy are based on a wildly outdated abundance estimate that NMFS has not revisited in two decades. The FMP's management structure does not call for ever revisiting that number unless catch levels exceed 25,000 mt.[96] The current management framework provides no means to determine whether the stock is overfished and respond accordingly. As previously mentioned, there is no CUTOFF for northern anchovy, which is now established in the scientific literature as a critical tool to prevent fishery collapses of forage species. [97] In fact, Essington et al. (2015) found that the applications of CUTOFF to "a time series of stock biomass and fishing catches time series of stock biomass and fishing catches for simulated forage fish stocks led to a nearly 80% increase in minimum biomass levels and a 64% reduction in the number of collapsed stocks. In contrast, average catches were reduced very little (1.7%), because fishing closures allowed stocks to recover to higher abundance more quickly and catches were already low during these periods."[98]

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[95] The legislative history of the ESA shows that once a species is protected under the Act, federal agencies are required "to give the benefit of the doubt to the species." *E.g., Conner v. Burford*, 848 F.2d 1441, 1454 (9th Cir. 1988) (stating that "[t]o hold otherwise would eviscerate Congress' intent to 'give the benefit of the doubt to the species'"); *Sierra Club v. Marsh*, 816 F.2d 1376 (9th Cir. 1987) (explaining that "Congress clearly intended that the [agency] give the 'benefit of the doubt' to preserving endangered species"); *Ctr. for Biological Diversity v. Bureau of Land Mgmt.*, 422 F. Supp. 2d 1115 (N.D. Cal. 2006) (explaining that "[t]o the extent that there is any uncertainty as to what constitutes the best available scientific information, Congress intended 'to give the benefit of the doubt to the species'").

[96] CPS FMP 41 (Sept. 2011) (stating that the default ABC control rule would remain in place until the SSC recommends an alternate value based on the best available science, and that ACLs for monitored stocks are "specified for multiple years until such time as the species becomes Actively managed or new scientific information becomes available").

[97] Essington et al. 2015. *Fishing amplifies forage fish population collapses*, PNAS Early Edition, available at http://www.pnas.org/content/early/2015/04/01/1422020112.full.pdf.

[98] *Id.*

The CPS FMP does not explicitly or adequately consider whether predator needs are being met, whether other fisheries that target anchovy predators are being affected, or the potential for local depletion, as evidenced by the absence of this information in this proposed rule. Lastly, the 82% Distribution estimate for the Central Subpopulation of Northern anchovy is also extremely outdated, and conflicts with information indicating higher anchovy catches in Mexico than the U.S. in the late 1980s and 1990s. In short, the way the FMP currently manages anchovy is contrary to everything we know about this species, fails to prevent overfishing, and is not achieving optimum yield.

The well-established science on anchovy population dynamics demonstrates that anchovy abundance fluctuates considerably even in the absence of fishing, and more dramatically when fishing pressure is added to natural fluctuations. The best available science also demonstrates that anchovy abundance can decline by up to 99 percent in just a few years. Therefore, relying on a 75 percent "buffer" between the unrealistically high and outdated MSY estimate and the ABC to account for stock fluctuations is insufficient to prevent overfishing in accordance with the MSA. Further, the best available science tells us that relying on catch levels to detect a change in anchovy abundance is folly. Due to their schooling behavior and technological advances in fishing methods, catch per unit effort for anchovy usually remains steady or even increases even as the species' abundance plummets.[99] And despite the anchovy's extreme sensitivity to changes in ocean conditions and El Niño events, the FMP provides no mechanism for adjusting management measures in response to unfavorable ocean conditions.

Given the highly changeable nature of the anchovy population, NMFS's failure to conduct updated, regular stock assessments for northern anchovy renders it impossible to manage the fishery in a way that meets MSA requirements. It is impossible to prevent overfishing of northern anchovy without knowing – even within an order of magnitude – how many anchovy currently comprise the stock. It is similarly impossible to account for the needs of marine predators, including other commercial fisheries, and ensure that catch levels are consistent with optimum yield when the agency does not even know how catch levels compare to overall abundance of anchovy. Setting a multiyear ACL by reducing a historic, hypothetical OFL estimate by a 75 percent buffer cannot prevent overfishing or achieve optimum yield when the species plummets by well over 90 percent over several years, resulting in immediate food shortages and associated effects on marine predators.

We understand that the Council intends to consider a new management framework for northern anchovy in September 2016 that would move the stock from "monitored" to "actively managed," and that NMFS has committed to completing a stock assessment for the central subpopulation by fall 2016. We support these efforts and urge NMFS to support and expedite those efforts. Among other things, a lawful, scientifically based management framework for northern anchovy would include a harvest control rule with a high CUTOFF that would prevent overfishing and ensure adequate forage for marine predators. The use of a high CUTOFF (300,000 mt) was explicitly established to ensure adequate forage for the brown pelican[100] when

[99] Pikitch et al., 2012, *Little Fish, Big Impact: Managing a Crucial Link in Ocean Food Webs*, Lenfest Ocean Program, Washington, D.C., 108 pp.
[100] The brown pelican was a federally-listed endangered species from 1970-2009.

northern anchovy was actively managed (prior to Amendment 8). As explained in the current CPS FMP, "[t]he purpose of CUTOFF is to protect the stock when biomass is low . . . . The CUTOFF provides a buffer of spawning stock that is protected from fishing and available for use in rebuilding if a stock becomes overfished."[101] "CUTOFF is the lowest level of estimated biomass at which directed harvest is allowed."[102]

II. Northern Subpopulation of Northern Anchovy

As with the central subpopulation of northern anchovy, the best available scientific information on which the agency relies to manage the northern subpopulation has become stale. Because of high uncertainty in the available biomass estimates for the northern subpopulation of northern anchovy and large fluctuations in stock biomass that are known to occur in this species, NMFS should initiate a stock assessment for the northern subpopulation of northern anchovy in 2016 and modify management reference points for this stock accordingly.

Rather than adopt the default framework for setting an OFL for the northern subpopulation of northern anchovy, NMFS has set an OFL of 39,000 mt. This is based on multiplying "two separate estimates of biomass,"[103] averaging 130,000 mt, by an F_{MSY} of 0.3.[104] Previous estimates put spawning biomass at 87,000 mt to 116,000 mt, although these represented only "an educated guess."[105] NMFS applied an F_{MSY} of 0.3, which is the F_{MSY} for Pacific mackerel, "because, biologically, anchovy populations are likely to be as or more productive than Pacific mackerel."[106] We are concerned that NMFS has arbitrarily set the F_{MSY} for the northern subpopulation much higher than the F_{MSY} implicit in CPS FMP's OFL for the central subpopulation of 0.168. Using the MSY harvest rate provided by Conrad (1991), the OFL for the northern subpopulation would be 21,840 mt (130,000 mt multiplied by 0.168).

With an OFL of 39,000 mt and an uncertainty buffer of 75 percent, the proposed ABC for the northern subpopulation is 9,750 mt.[107] Although the ACL is equal to ABC under the FMP, NMFS proposes an Annual Catch Target (ACT) of 1,500 mt.[108] NMFS proposes this reduction from ACL "to further account for uncertainty surrounding the reference points for this stock, anchovy's role as forage, and because annual catch levels have been sustainably below the ACL."[109]

To prevent overfishing, NMFS must account for both scientific and management uncertainty. We support NMFS's decision to set an ACT that is greatly reduced from the ACL to

[101] CPS FMP at 38.
[102] *Id.*
[103] There are only two biomass estimates—one from the 1970s and the other from a 2008 acoustic survey conducted by the Southwest Fisheries Sceince Center. Fisheries Off West Coast States; Coastal Pelagic Species Fisheries; 80 Fed. Reg. 17,352, 17,353 (April 1, 2015).
[104] Fisheries Off West Coast States; Coastal Pelagic Species Fisheries; Multi-Year Specifications for Monitored and Prohibited Harvest Species Stock Categories, 80 Fed. Reg. 72,676, 72,678 (Nov. 20, 2015).
[105] CPS FMP, Amendment 8, App. B, at 104 (1998).
[106] Fisheries Off West Coast States; Coastal Pelagic Species Fisheries; Multi-Year Specifications for Monitored and Prohibited Harvest Species Stock Categories, 80 Fed. Reg. 72,676, 72,678 (Nov. 20, 2015).
[107] *Id.*
[108] *Id.*
[109] *Id.*

account for management uncertainty and forage considerations. NMFS has acknowledged scientific uncertainty surrounding this stock due to both the paucity of available biomass estimates and large fluctuations in stock biomass.[110] Setting an OFL that is based on outdated and uncertain biomass estimates, however, calls into question all management reference points that are based on these values. NMFS has not explained how it is appropriately accounting for this scientific uncertainty. Consequently, NMFS should initiate a stock assessment for the northern subpopulation of northern anchovy in 2016 and modify management reference points for this stock accordingly.

III. Jack Mackerel

Like the other monitored CPS stocks, the most recent biomass estimate for jack mackerel is so outdated that control rules and management reference points based thereon are fraught with doubt. The proposed rule relies on the default management framework to set the OFL for jack mackerel at 126,000 mt, the ABC at 31,000 mt (a 75 percent reduction from MSY), and the ACL at 31,000 mt.

This stock has not received much management attention due to low catches since 1990.[111] The most recent estimate of biomass was in 1983—more than three decades ago.[112] State fishery managers caution, however, that "[t]hese estimates must be viewed as tentative approximations of the population" because "at the time, the spawning frequency of jack mackerel was not known, and estimates were based on the spawning frequencies of northern anchovy" and because "estimates were derived from plankton surveys for eggs and larvae in the Southern California Bight, which did not cover the entire range of the spawning population, and assumptions were made for the contribution of older jack mackerel outside the survey area."[113] A later study using more accurate spawning frequency would have yielded a lower biomass in 1983, but no later biomass estimates have been produced since then.[114] This month, NMFS SWFSC scientist Edward Weber reported in his presentation at the CalCOFI conference that the most recent spring and summer larval surveys of jack mackerel within the Southern California Bight have remained at very low relative levels since their last noticeable peak in 2006, and are well below the levels observed in the 1950s -1980s period.[115]

As with both stocks of northern anchovy, NMFS has not explained how it is accounting for scientific uncertainty in implementing the jack mackerel stock's ACL, nor justified why a 75 percent ABC/OFL buffer is sufficient to prevent overfishing for this highly fluctuating stock,

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[110] Fisheries Off West Coast States; Coastal Pelagic Species Fisheries; 80 Fed. Reg. 17,352, 17,353 (April 1, 2015). (explaining that fixed biomass-based approach to specifying MSY "likely not [] appropriate" due to uncertainty in biomass estimates and fluctuations in stock).

[111] CPS FMP (Amendment 8 to the Northern Anchovy FMP), at 4-5 (Dec. 1998); CPS FMP 42 (Sept. 2011) (reciting same rationale from 1998 Amendment 8).

[112] California Department of Fish and Game, California's Living Marine Resources: A Status Report 310 (Dec. 2001), *referencing* MacCall, A.D., Stauffer, G.D. 1983 Biology and Fishery Potential of Jack Mackerel (*Trachurus symmetricus*).

[113] *Id.*

[114] *Id.*

[115] Weber, E.D. 2015. NMFS Southwest Fisheries Science Center. Larval production and habitat distribution of Jack mackerel (*Trachurus symmetricus*) in the Southern California Bight. Presentation at CalCOFI Conference, Moss Landing, CA, December 14, 2015.

which is also known to rapidly fluctuate by several orders of magnitude. Furthermore, the OFL is based on an estimated biomass from a period when jack mackerel were clearly far more abundant than they have been in recent years. Recent catch levels of jack mackerel have been on the order of 1,000 metric tons.[116] Therefore, consistent with other data poor stocks, setting an ACL in this range would much better reflect scientific guidance and best available science. Consequently, we recommend NMFS set the ACL for this stock at 1,000 tons.

IV. Krill

Consistent with Amendment 12 to the CPS FMP and the Council's Fishery Ecosystem Plan, we support the continued prohibition on krill fishing and the ACL of zero, as proposed.

V. Conclusion

NMFS must use best available science and must account for scientific and management uncertainties in setting catch levels for these CPS stocks. This is especially critical in light of indices of low relative abundance, insufficient forage for predators dependent on these stocks, and environmental conditions, including the warm water "blob" and the NOAA-declared El Niño event. We urge the agency to take action that appropriately accounts for ecosystem needs and ecological conditions. In order to prevent overfishing, achieve optimum yield, and move toward ecosystem-based fishery management, significant changes to this proposed rule are necessary. Properly conserving and managing forage species will help protect the food web of the diverse and wild California Current marine ecosystem. This will benefit the health of the ecosystem and enhance cultural, environmental, and economic benefits for ocean resources, for generations to come.

Sincerely,

Andrea A. Treece
Staff Attorney, Oceans Program
Earthjustice

Mariel J. Combs
Pacific Counsel, Oceana

Attachments

[116] *Id.*

Attachments:

1. MacCall, A.D., W.J. Sydeman, P.C. Davison, J.A. Thayer. (2016). Recent collapse of northern anchovy biomass off California. Fisheries Research 175, 97-94.

2. Ainley, D. et al. 2015. California current system – predators and the preyscape. *Journal of Marine Systems* 146: 1-2.

3. Lenfest Forage Fish Task Force. Pikitch et al. 2012. Little Fish, Big Impact: Managing a Crucial Link in Ocean Food Webs. Lenfest Ocean Program. Washington, DC. Summary.

4. Essington et al. 2015. Fishing amplifies forage fish population collapses, PNAS Early Edition, available at http://www.pnas.org/content/early/2015/04/01/1422020112.full.pdf.

5. Curry, P.M., I.L. Boyd, S. Bonhommeau, T. Anker-Nilssen, R.J.M. Crawford, R.W. Furness, J.A. Mills, E.J. Murphy, H. Österblom, M. Paleczny, J.F. Piatt, J.P. Roux, L. Shannon, and W.J. Sydeman. 2011. Global Seabird Response to Forage Fish Depletion – One-Third for the Birds. Science (334)6063 1703-1706.

6. McClatchie, S. et al. 2015. Food limitation of sea lion pups and the decline of forage off central and southern California. Available at: https://www.researchgate.net/publication/267899031_Food_limitation_of_sea_lion_pups_and_the_decline_of_forage_off_central_and_southern_California

7. Koslow, J.A., Miller, E.F., and McGowan, J.A. 2015. Dramatic declines in coastal and oceanic fish communities off California. 2015. Marine Ecology Progress Series 538:221-227.

8. Sydeman, W.J., Thompson, S.A., Santora, J.A., Koslow, J.A., Goericke, R., and Ohman, M.D. 2015. Climate-ecosystem change off Southern California: Time-dependent seabird predator-prey numerical responses. Deep Sea Research II. 112:158-170.

9. Conrad, J.M. 1991. A Bioeconomic Analysis of the Northern Anchovy. Working paper in agricultural economics. Department of Agricultural Economics. New York State College, Ithaca New York.

10. Restrepo et al. 1998. Technical Guidance on the Use of Precautionary Approaches to Implementing National Standard 1 of the Magnuson-Stevens Fishery Conservation and Management Act. NOAA Tech Memorandum. July 17, 1998. Available at: http://www.nmfs.noaa.gov/sfa/NSGtkgd.pdf .

11. Bertrand et al. 2012. Local depletion by a fishery can affect seabird foraging. Journal of Applied Ecology 49:1168-1177.

12. Fimrite, P. December 10, 2015. Sea lions in trouble, again, off California coast. San Francisco Chronicle. Available at: http://www.sfgate.com/bayarea/article/Sea-lions-in-trouble-again-off-California-coast-6690177.php.

13. Henry, S.P., 2015. Letter from Stephen P. Henry, United States Fish and Wildlife Service to Dorothy Lowman, Pacific Fishery Management Council (May 14, 2015).

14. Henry, S.P., 2015. Letter from Stephen P. Henry, United States Fish and Wildlife Service to Dorothy Lowman, Pacific Fishery Management Council (November 12, 2015).


September 6, 2016

Mr. Herb Pollard, Chair
Pacific Fishery Management Council
7700 NE Ambassador Place, Suite 101
Portland, OR 97220

RE: Agenda Items E.2 and E.3 – Stock Assessment Workshop Report and Anchovy Management Update

Dear Chair Pollard and Council Members:

We write with respect to the Stock Assessment Workshop Report and Anchovy Management Update that the Pacific Fishery Management Council (Council) will consider at its September 2016 meeting. We thank the Council for its November 2015 request to the National Oceanic and Atmospheric Administration's Fisheries Service (NOAA Fisheries) for a full stock assessment of northern anchovy, and for its direction to the Coastal Pelagic Species Management Team (CPSMT) to explore alternative management and policy approaches for the central subpopulation of northern anchovy, with a report back to the Council in Fall 2016.[1]

As the Council considers the CPSMT's report on anchovy management options, and in anticipation of the Council's adoption in November of an updated abundance estimate of the central subpopulation along with management measures for the 2017 fishing season, we request that the Council take the following actions at its September meeting:

- Initiate consideration of management options to lower the catch limit for the central subpopulation of northern anchovy, prior to the start of the 2017 fishing season, in order to prevent overfishing, ensure adequate forage for dependent predators, and reflect best available science, as required by the Magnuson-Stevens Fishery Conservation and Management Act (MSA).
- Commit to a process and timeline to develop an ecosystem-based management framework for sustainably managing northern anchovy (including an ecosystem-based harvest control rule with a sufficiently high CUTOFF) that both protects against overfishing and accounts for the needs and status of dependent predators; this framework should utilize new stock assessment methodologies recommended by a May 2016 data-

[1] Pacific Fishery Management Council, November 2015, November 2015 Council Meeting Decision Summary Document, at 4.

poor assessment workshop expert panel, along with data on California Current Ecosystem (CCE) predator/prey dynamics.
- Eliminate the monitored stock category from the Coastal Pelagic Species (CPS) FMP to ensure that adequate science and management attention is given to all CPS.

Below, we describe these recommendations in more detail, beginning with a summary of recent data regarding anchovy abundance and predator status in the CCE and a discussion of current status determination criteria and specifications for the central subpopulation.

Northern Anchovy and Predator Status in the California Current Ecosystem

As the Council is well aware, northern anchovy is a keystone forage species in the CCE and is preyed upon by a wide variety of marine wildlife, including commercially and recreationally valuable fish, mammals, and seabirds.[2] Anchovy is the single most important prey species for CCE seabirds[3] and first or second most important for the broader suite of marine predators, such as humpback whales, chinook salmon, dolphins, and pinnipeds.[4]

For several years, the undersigned organizations have expressed concerns to the Council about the status of anchovy and the lack of active management of this stock, especially in light of increased fishing effort.[5] More recently, our organizations, as well as the U.S. Fish and Wildlife Service (USFWS), have voiced concerns regarding low biomass of anchovy in the CCE and the associated impact on brown pelicans and other predators.[6, 7] The best available science on anchovy biomass[8] indicates that the central subpopulation has collapsed since 2009 and has not recovered as of 2016, despite a potential recruitment signal that occurred in 2015. This best available scientific information includes:

- A recently published scientific study from MacCall *et al.*,[9] which developed a method for creating a time series based on available survey information, concluded that the anchovy population had collapsed and presented a time series through 2011. MacCall *et al.* (2016) found that "anchovy biomasses estimated for 2009-2011 are the lowest seen in 60 years," and that, based on egg surveys conducted since 2011, "there has been no substantial recovery of the anchovy population as of 2015." The study also noted that "recent

[2] Pacific Fishery Management Council, July 2013, Ecosystem Initiatives Appendix to the Pacific Coast Fishery Ecosystem Plan, at A-11.
[3] Szoboszlai, A. et al. (In prep) Data synthesis for understanding predator forage needs: A case study from the California Current. *Ecological Archives*.
[4] Ainley, D. et al. 2015. California current system – predators and the preyscape. *Journal of Marine Systems* 146: 1-2.
[5] Pacific Fishery Management Council, November 2015, Public Comment under Agenda Item H.3; Pacific Fishery Management Council, June 2015, Supplemental Public Comment under Agenda Item G.3; Pacific Fishery Management Council, September 2014, Supplemental Public Comment under Agenda Item I.6.
[6] Pacific Fishery Management Council, June 2015, Agenda Item G.3.b, Supplemental Public Comment 2
[7] Pacific Fishery Management Council, June 2015, Agenda Item G.3.a, U.S. Fish and Wildlife Service Report.
[8] See comments from Earthjustice and Oceana re: RIN 0648-XC808; Fisheries off West Coast States; Coastal Pelagic Species Fisheries; Multi-Year Specifications for Monitored and Prohibited Harvest Species Stock Categories, December 2015, pages 5-9.
[9] MacCall, A. D., W. J. Sydeman, P. C. Davison, J. A. Thayer. 2016. Recent Collapse of Northern Anchovy Biomass off California. Fisheries Research. 175:87-94.

anecdotal reports of substantial nearshore anchovy abundance" likely resulted from "much of the remnant population [concentrating] close to shore, making them unusually visible to the public and giving a mistaken impression of abundance."[10]

- Since MacCall *et al.* (2016) was published, Southwest Fisheries Science Center (SWFSC) biologists presented an updated analysis using ichthyoplankton data from CalCOFI through summer 2015, showing continued low abundance.[11]
- Using the same method published in MacCall *et al.* (2016), the time series has now been updated through 2015. The resulting update estimated that in the past 7 years (2009-2015), point estimates for anchovy biomass averaged ~17,200 mt. In the past 4 years since the last anchovy biomass update (2012-2015), estimated biomass averaged ~18,200 mt.[12]
- Although the most recent 2016 CalCOFI data are not yet available, results from the Continuous Underway Fish Egg Sampler (CUFES) from recent surveys indicate egg distribution to be nearshore in a small area, with very low peaks of ~15 eggs/m^3. Thus, there has been no substantial recovery of the central subpopulation as of 2016.[13]
- For the Southern California Current, the 2013 Integrated Ecosystem Assessment, based on CalCOFI abundance surveys, concluded that "larval anchovy abundance continued a declining trend over the last thirty years to the lowest abundance since 1951."[14] This pattern of anchovy decline was also evident in rockfish recruitment surveys through 2014, as presented in the latest "State of the California Current" CalCOFI Report.[15]
- Aerial and vessel surveys conducted in 2012-2015 from Point Conception to the Mexico border found only small schools of anchovy, as well as mixed anchovy/sardines, ranging from 490 - 5,000 tons.[16]

With respect to predator response, recent analyses show a decline in seabird abundance that is attributable to declines in anchovy abundance and availability,[17] in addition to other predator impacts:

- Brown pelicans have experienced mortality events and breeding failures range-wide from 2008-2014, indicating the low availability of forage in the CCE.[18] Catastrophic breeding

[10] *Ibid*.
[11] Weber, Ed. Southwest Fishery Science Center. Egg and Larval Production of CPS in the California Current. Slides 15-18. Presented at May 2, 2016 CPS Assessment Workshop. Available at: ftp://ftp.pcouncil.org/pub/CPS%20Asssessment%20Workshop%202016/Draft%20Summaries%20&%20PPTs/Weber_CPS_assessments_workshop.pptx
[12] MacCall, Alec et al. *In Prep*. California Anchovy Population Remains Low, 2012-2015.
[13] Southwest Fishery Science Center. 2016 Sardine Survey Cruise. Preliminary data and results available at: https://swfsc.noaa.gov/textblock.aspx?Division=FRD&ParentMenuId=218&id=1340
[14] Wells, B. K. et al. 2013. CCIEA Phase III Report 2013: Ecosystem Components, Fisheries – Coastal Pelagic and Forage Fishes, at C-12.
[15] Leising, A. W. et al. 2014. State of the California Current 2013-14: El Nino Looming. CalCOFI Rep., Vol 55, Figure 22.
[16] Pacific Fishery Management Council, June 2015, Agenda Item G.3.a, Supplemental CDFW Report.
[17] Sydeman, W. et al. 2015. Climate-ecosystem change off southern California: Time-dependent seabird predator-prey numerical responses. Deep-Sea Research II 112:158-170
[18] Pacific Fishery Management Council, June 2015, Agenda Item G.3.a, USFWS Report.

failures have occurred from 2014-2016 in the Gulf of California,[19] which accounts for approximately 62% of the total California brown pelican breeding population.[20]

- In Fall 2015, an unprecedented die-off of primarily young-of-the-year common murres occurred along the Pacific Coast, resulting in beached bird rates 6-28 times higher than normal.[21] Northern anchovy typically represents at least 10% of the adult diet and (along with Pacific sardine) 53% of the chick diet.[22] Limited prey abundance or availability is believed to have been the primary cause of the event, although domoic acid exposure and increased murre population size may have been contributing factors as well.[23]
- A 2016 study led by federal scientists found that the unprecedented, unusual mortality event that California sea lions have undergone for the last four years is specifically tied to the unavailability of sardine and anchovy.[24]
- Declines in anchovy may also be impacting West Coast salmon fisheries given that, historically, this key prey species has comprised as much as 20% of the diet of salmon in the CCE.[25] Furthermore, when ocean conditions are poor, common murres in the central CCE tend to forage closer to shore and prey predominantly on anchovy as well as on juvenile salmonids at a rate of up to 9%.[26] With adult anchovy currently unavailable to common murres, predation pressure on salmon smolts may be increasing.

The Current U.S. OFL, ABC, and ACL Risks Overfishing

As described in Conrad (1991)[27] and in Amendment 8 to the CPS FMP, Bmsy for the central subpopulation of northern anchovy was at the time estimated to be 733,000 mt, with a corresponding stock specific MSY value of 123,000 mt (equal to 16.8% of BMSY). In CPS FMP Amendment 8, the U.S. Acceptable Biological Catch (ABC) was then calculated to be 25,000 mt, based on the default control rule for monitored CPS stocks (25% of MSY) and the proportion of the stock expected to be in U.S. waters (82%).[28] This long-term average definition of MSY

[19] D. Anderson, pers. comm.
[20] Anderson, D. W., et al. 2013. Size and Distribution of the California Brown Pelican Metapopulation in a Non-Enso Year, at 4.
[21] Gibble, C., K. Lindquist, R. Duerr, J. Lindsey, B. Bodenstein, R. Kudela, L. Henkel, J. Roletto, J. Lankton, J. Harvey. 2016. Investigation of a large-scale common murre (Uria aalge) mortality event in California in 2015. Pacific Seabird Group Annual Meeting, Oahu, HI. Poster.
[22] Roth, J.E., N. Nur, P. Warzybok, and W.J. Sydeman. 2008. Annual prey consumption of a dominant seabird, the common murre, in the California Current system. ICES *Journal of Marine Science* 65:1046-1056.
[23] Gibble et al. 2016
[24] McClatchie, S., J. field, A.R. Thompson, T. Gerrodette, M. Lowry, P.C. Fiedler, W. Watson, K.M. Nieto, and R.D. Vetter. 2016. Food limitation of sea lion pups and the decline of forage off central and southern California. Royal Society Open Science 3:150628.
[25] Koehn, L.E., T.E. Essington, K.N. Marshall, I.C. Kaplan, W.J. Sydeman, A.I. Szoboszlai, J.A. Thayer. 2016. Developing a high taxonomic resolution food web model to assess the functional role of forage fish in the California Current ecosystem. *Ecological Modelling* 335:87-100.
[26] Wells, B.K., J.A. Santora, M.J. Henderson, P. Warzybok, J. Jahncke, R.W. Bradley, D.D. Huff, I.D. Schroeder, P. Nelson, J.C. Field, D.G. Ainley. *In review*. Caught in the middle: Top-down impacts on salmon are dependent on bottom-up mechanisms. *Journal of Animal Ecology*.
[27] Conrad, J.M. 1991. A Bioeconomic Analysis of the Northern Anchovy. Working paper in agricultural economics. Department of Agricultural Economics. New York State College, Ithaca, New York.
[28] Pacific Fishery Management Council. 1998. Coastal Pelagic Species Fishery Management Plan Amendment 8. Appendix B, at 104

was developed using data from a stock that had not fallen below 299,000 mt.[29] New data, in prep now for publication, show the current status of the stock to be approximately 97% lower than the stock size upon which the current MSY proxy was calculated.[30] Therefore, a buffer of 25% below MSY does not account for the fact that this stock has recently declined by more than an order of magnitude. Furthermore, having a catch limit or ABC roughly equal to the estimated current stock size carries with it a significant risk of overfishing. Alternatively, using the Fmsy proxy for the northern subpopulation of northern anchovy of 0.3*BIOMASS, recently established in Amendment 14 to the CPS FMP,[31] and applying it to new data on current stock abundance, would result in a drastically reduced OFL.

Recommendations

Given this potential risk of overfishing, and in light of the scientific information discussed above regarding low anchovy biomass and associated predator impacts, we ask that the Council take action prior to the end of 2016 to protect against overfishing and ensure adequate forage for predators throughout the CCE, consistent with the MSA and the objectives of the CPS FMP.

Specifically, we request that the Council take the following actions at its September meeting:

A. Initiate consideration of the options described below to lower the catch limit for the central subpopulation of northern anchovy, prior to the start of the 2017 fishing season, in order to prevent overfishing, ensure adequate forage for dependent predators, and reflect best available science.

As mentioned above and in our previous comment letters on the subject, multiple lines of evidence strongly suggest that the central subpopulation has been in a collapsed condition over the last several years, and remains at very low levels today. While survey data from 2015 indicate that a large spawning event took place in the spring and summer of that year,[32] we are not aware of any data or information showing that the observed pulse of larval and young-of-the-year anchovy successfully recruited to the spawning population. Additionally, as discussed above, survey data from 2016 suggest that the central subpopulation continues to be at low abundance.[33] These concerns regarding stock status underpinned our recent requests to the Council and NOAA Fisheries to initiate a stock assessment for northern anchovy; to this end, we thank the Council for its November 2015 request to NOAA Fisheries to conduct a full assessment.

[29] Conrad 1991, Table 2.
[30] MacCall, Alec et al. *In Prep*. California Anchovy Population Remains Low, 2012-2015
[31] Pacific Fishery Management Council, Coastal Pelagic Species Fishery Management Plan (as amended through Amendment 14), June 2015.
[32] Pacific Fishery Management Council, November 2015, Agenda Item H.3.a, Supplemental SWFSC Report, "Southwest Fisheries Science Center Summary of Current Information Available on Coastal Pelagic Species with Emphasis on Northern Anchovy."
[33] MacCall, Alec et al. *In Prep*. California Anchovy Population Remains Low, 2012-2015; Southwest Fisheries Science Center. 2016 Sardine Survey Cruise. Preliminary data and results available at: https://swfsc.noaa.gov/textblock.aspx?Division=FRD&ParentMenuId=218&id=1340

As part of its November 2015 request to NOAA Fisheries, the Council also asked that SWFSC convene a scientific workshop (which was held in May 2016) to explore data-poor CPS assessment methodologies and to "develop the optimum approach for this stock assessment."[34] With respect to developing a stock assessment for the central subpopulation of northern anchovy in particular, the workshop's expert panel recommended that an integrated stock assessment model be developed in the next year or two. In addition, given that a model-based stock assessment will take some time to complete, the panel also recommended conducting an interim abundance estimate that can provide the Council with updated information on the status of the central subpopulation at its November 2016 meeting.[35]

This near-term abundance estimate is currently being developed by SWFSC, and it is expected to be completed in time for review by the Council's Scientific and Statistical Committee (SSC) prior to the November meeting. As such, it may provide additional information regarding the current status of the central subpopulation. We ask that the Council consider this forthcoming abundance estimate alongside the multiple lines of evidence that anchovy remains in a collapsed condition, as detailed above, to inform discussion of management measures in November.

Specifically, we request that the Council initiate consideration of reducing the catch limit for the central subpopulation, prior to the start of the 2017 fishing season, in order to protect both the stock and dependent predators and reflect best available science. While the northern anchovy population may be able to rebuild quickly from a collapsed condition under certain ocean conditions, such conditions are not currently present and it is uncertain when they may develop. In the meantime, as discussed above, it is predators that bear the primary consequences of declines in anchovy biomass.

Based on the existing default harvest control rule for monitored CPS stocks, the ACL for the central subpopulation of northern anchovy is 25,000 mt.[36] As previously described, under currently available estimates, this catch limit is not sufficiently precautionary, risks overfishing in excess of MSY, and may cause additional harm to predators. We identify three primary pathways for adjusting this catch limit in the near term in response to best available science, including the MacCall *et al.* 2016 estimates and related updates and the SWFSC's forthcoming abundance estimate:

1. Establish a new Overfishing Limit (OFL) and Acceptable Biological Catch (ABC) under the monitored stock default control rule, and adopt a new ACL that corresponds to the revised OFL and ABC.
2. Adopt a lower ACL or precautionary Annual Catch Target (ACT) as a routine management measure.
3. Adopt a lower ACL or precautionary ACT using the CPS FMP's point-of-concern framework.

[34] Pacific Fishery Management Council. November 2015. November 2015 Council Meeting Decision Summary Document, at 4.
[35] Pacific Fishery Management Council, June 2016, Supplemental Revised Informational Report 1, "Report of the NOAA Southwest Fisheries Science Center and Pacific Fishery Management Council Workshop on CPS Assessments," at 20-21.
[36] Pacific Fishery Management Council, December 2014, "Status of the Pacific Coast Coastal Pelagic Species Fishery and Recommended Accepted Biological Catches – Stock Assessment and Fishery Evaluation 2014," at 32.

Option 1 – Establish a new OFL and ABC based on updated abundance data

Of these approaches, Option 1 appears to provide the most straightforward and efficient path to reducing the catch limit. In describing the monitored stock control rule, the CPS FMP makes clear that the Council may adjust reference points for monitored stocks quickly and easily, including through the annual specification process: "Stock specific [Maximum Sustainable Yield (MSY)] proxies, ABC, and ACLs can be revised based on the best available science as recommended by the [Science and Statistical Committee] and as adopted through the annual harvest specification process, and will be reported in the CPS [Stock Assessment and Fishery Evaluation document]."[37] The CPS FMP provides the Council with the ability to revise the MSY proxy, ABC, and ACL based on the best available science, as part of the annual specification process – a process the Council has tentatively scheduled for the November meeting. We ask that the Council use the specification process to update these measures using the most recent abundance estimates from MacCall *et al.* and, if available, the SWFSC.

The CPS FMP describes OFLs for CPS as being "based on MSY or MSY proxy harvest rates applied to the best available estimate of biomass."[38] For northern anchovy, the OFL is based on a species-specific MSY proxy,[39] which, as mentioned above, can be revised through the annual harvest specifications process. Because the FMP does not specify an MSY harvest rate for the central subpopulation, the Council must either establish such a rate and apply it to a current biomass estimate, or establish a new MSY proxy based on the stock's current level. This effort may be facilitated by the fact that the Council and NOAA Fisheries recently set an MSY proxy rate for the northern subpopulation of northern anchovy.[40] This value may be appropriate for the central subpopulation as well, unless there is some indication that productivity of this stock differs from the northern subpopulation. Once this rate is confirmed, it may be applied to the OFL formula to arrive at ABC and ACL calculations.

In short, the CPS FMP provides the Council with the ability to adopt a revised OFL, ABC, and ACL for northern anchovy in the near term to reflect best available science. MacCall *et al*. 2016, as well as the updated time series and other information referenced in this letter, provide a new "best available estimate of biomass" to which an MSY proxy rate can be applied, and from which a new OFL can be calculated. In addition, SWFSC is scheduled to complete its updated abundance estimate prior to the November meeting. We encourage the Council to utilize its authority under the CPS FMP to make these adjustments to the OFL and ABC, thereby allowing for the adoption of a new ACL that is tiered to an updated estimate of biomass. Such a process could be completed at the November 2016 meeting, for implementation beginning January 1, 2017.

Option 2 – Adopt a lower ACL or ACT as a routine management measure

[37] Coastal Pelagic Species Fishery Management Plan (as amended through Amendment 15), February 2016, at 40.
[38] *Ibid*., at 35.
[39] *Ibid*., at 35.
[40] Coastal Pelagic Species Fishery Management Plan (as amended through Amendment 14), June 2015.

In addition to utilizing the annual specifications process to adjust the OFL and ABC, the Council also has the ability to adopt a lower ACL or precautionary ACT as a routine management measure. Routine management measures "are those the Council determines likely to be adjusted annually or more frequently."[41] Such measures may be modified through a single meeting and one Federal Register notice procedure.[42] The CPS FMP provides that the ACL may be equal to ABC or reduced by Optimum Yield (OY) considerations.[43] As discussed above, the ecological needs of dependent predators warrant such a reduction. Similarly, adding an ACT that is reduced from the central subpopulation's ACL of 25,000 mt could serve as an interim measure to help the Council meet its basic obligations under the MSA, which are reflected in at least two key goals of its CPS FMP: "to provide adequate forage for dependent predators" and "to prevent overfishing" in light of the stock likely being a very low relative levels.[44] Adopting an ACT for the central subpopulation also comports with Council guidance, which states that "[a]long with optimum yield (OY) considerations, an HG [Harvest Guideline] or ACT may be utilized below an ACL or sector-specific ACL to account for management uncertainty."[45] By way of recent example, the Council set an ACT below the ACL or Harvest Guideline for Pacific sardines in 2014 to take into account additional information highlighting concerns with the status of the stock.

While the Council could choose to reduce the catch limit through an updated ACL or ACT, we recommend that the Council adopt an updated ACL for several reasons. First, the FMP provides a formula to calculate a new ACL using available, updated abundance data. This provides a more reliable, science-based way to calculate a catch limit than selecting an ACT based on unspecified parameters. Second, the ACL formula also allows the Council to further reduce the catch limit if necessary in order to account for predator needs. Therefore, it provides a more nimble mechanism to factor in scientific information on both the level of fishing consistent with preventing overfishing and the level of fishing consistent with maintaining adequate forage for dependent predators. Third, the ACL is a well-known, readily enforceable mechanism that would not require the formulation of new accountability measures.

We note that ACLs and ACTs are included in the CPS FMP's list of routine management measures, though there is some confusion about whether OFLs and ABCs are part of this list as well. In reviewing the FMP's routine measure provisions, we noted an apparent error in the FMP as amended through Amendment 15. Amendment 13 explicitly added OFLs and ABCs to the list of routine measures in the FMP. This was a logical addition given the way ACLs are calculated using the default control rule formula for monitored CPS stocks. That is, the ACL calculation requires an ABC, which in turn depends on the OFL. Updating the ACL using the formula in the FMP therefore requires an updated OFL and ABC. It would make little sense to require a different, potentially more laborious procedure to update the OFL and ABC, which are needed to update the ACL, than is required to calculate the ACL itself; doing so would defeat the purpose

[41] Coastal Pelagic Species Fishery Management Plan (as amended through Amendment 15), Feb. 2016.
[42] *Ibid*., at 14-15.
[43] *Ibid*., at 40. Optimum yield takes into account the protection of marine ecosystems and "is prescribed on the basis of the maximum sustainable yield from the fishery, as reduced by any relevant social, economic, or ecological factor." MSA, 16 U.S.C. § 1802(33)(A)-(B).
[44] *Ibid*., at 13
[45] Pacific Fishery Management Council, December 2014, "Status of the Pacific Coast Coastal Pelagic Species Fishery and Recommended Accepted Biological Catches – Stock Assessment and Fishery Evaluation 2014," at 28.

of designating the ACL as a routine measure. However, OFLs and ABCs do not appear on the list of routine measures in the FMP as amended by Amendment 14, and remain off the list in the FMP as amended by Amendment 15. We have been unable to find any notice to the public or discussion of this change, or any indication that the change was made intentionally. It is currently unclear how and whether the Council might adopt a revised ACL as a routine management measure, despite its inclusion on the list of such measures. Regardless, adjustments to both the OFL and ACL should be a straightforward matter of applying the best available scientific data on abundance to the formulas adopted in the FMP. Looking forward, we ask that the Council and NOAA Fisheries correct the apparent error that was made in removing these measures from the list of routine management measures and confirm whether OFLs and ABCs are indeed routine management measures under the CPS FMP.

Option 3 – Utilize the point-of-concern framework

Another approach available to the Council for revising the central subpopulation's ACL (or adopting a more precautionary ACT) is the point-of-concern framework. In addition to setting harvest guidelines, ACLs, ACTs, or harvest quotas, the FMP describes the point-of-concern process as "the Council's primary tool . . . for exercising resource stewardship responsibilities."[46] This process is "intended to foster continuous and vigilant review of . . . CPS stocks and fisheries," and "to prevent overfishing or any other resource damages."[47] This review requires the CPSMT to use "the most current catch, effort, abundance and other relevant data from the fishery."[48] Available data indicate at least two FMP-specified criteria for invoking a point-of-concern are currently present, including:

- "An overfishing condition appears to be imminent or likely within two years;" and
- "Any adverse or significant change in ecological factors such as the availability of CPS forage for dependent species or in the status of a dependent species is discovered."

If the Management Team finds that a point-of-concern is occurring or is expected to occur, it will determine whether a resource conservation or ecological issue exists and will provide its findings at the next Council meeting.[49] It will also provide "its recommendation, rationale, and analysis for appropriate management measures" to "address the issue."[50] Through this process, "the Council may act quickly and directly to address resource conservation or ecological issues."[51] This process specifically allows the Council to adjust OFLs, ABC control rules, and other reference points to reflect best available science.[52] It also allows the Council to reassign monitored stocks to active management "on short notice."[53]

[46] Coastal Pelagic Species Fishery Management Plan (as amended through Amendment 15) at 16.
[47] *Ibid*.
[48] *Ibid*.
[49] *Ibid*.
[50] *Ibid*.
[51] *Ibid*.
[52] *Ibid*., at 18.
[53] *Ibid.*, at 10. The types of actions and procedures under the point-of-concern framework range from automatic actions to full rulemakings, which ordinarily require two Council meetings and two Federal Register notices. *Id.* at 14-15.

In summary, while the CPS FMP gives the Council the authority to adopt a revised ACL or ACT through the adjustment of routine management measures or via the point-of-concern framework, it may not be necessary to pursue either of these approaches given that the Council currently expects to consider updated biomass estimates for the central subpopulation at its November meeting. We suggest that Option 1 – establishing a new OFL and ABC, based on the best available scientific information, as part of the annual specifications process – remains the most direct approach to fulfilling the Council's responsibilities under the FMP. The most important consideration in choosing among the available pathways discussed above should be to select the most efficient option, based on the best available science, that would allow for the adoption in November of a lower 2017 catch limit for the central subpopulation of northern anchovy in order to meet the MSA's and CPS FMP's mandates to prevent overfishing and provide adequate forage for dependent predators.

B. Initiate an FMP amendment to eliminate the Monitored stock category from the CPS FMP.

We thank the Council for initiating a review of broader management options for northern anchovy, and the CPSMT for developing its August 2016 white paper laying out those options.[54] One of the management options described in the Management Team's white paper is a process for moving northern anchovy from Monitored to Active management status, which the CPS FMP characterizes as relatively straightforward:

> "Changes to the appropriate management category for each species can be made annually by the Council based on all available data, including ABC levels and MSY control rules, and the goals and objectives of this FMP. Changes in a management category may be accomplished according to any of the four procedures for establishing and adjusting management measures described…in Section 2.0 [automatic actions, notice actions, abbreviated rulemaking actions, and full rulemaking actions]. In addition, CPS in the Monitored management category can be reassigned to Active management on short notice under the point-of-concern framework."[55]

While we appreciate that there are several paths available to the Council for moving a species from Monitored to Active management status, we encourage the Council to instead begin a process to eliminate the Monitored stock category from the CPS FMP altogether. Removal of this category would be consistent with the MSA, which does not include a monitored category for stocks in a fishery. National Standard (NS) 1 states that "[a]s a default, all stocks in an FMP are considered to be 'in the fishery' unless they are identified as [ecosystem component] species through an FMP amendment process."[56] NS1 further states that FMPs must include status determination criteria, MSY and OY specifications, an ABC control rule, mechanisms for specifying ACLs, and accountability measures for all stocks in the fishery.[57] Therefore, a stock is in the fishery and these requirements must be met, or it is an ecosystem component species and

[54] Pacific Fishery Management Council, September 2016, Agenda Item E.3.a, Coastal Pelagic Species Management Team Report on Anchovy Management Update.
[55] Coastal Pelagic Species Fishery Management Plan (as amended through Amendment 15), at 10.
[56] 50 C.F.R. § 600.310(d)(1).
[57] 50 C.F.R. § 600.310(c)(1-6)

not the subject of a directed fishery, or it is classified as unmanaged. In order to increase the management and scientific attention paid to all CPS that are the subject of directed fisheries, including northern anchovy, the Council should remove the Monitored category from the CPS FMP. As indicated in the CPSMT's white paper, the Council could opt to amend the FMP to do so.[58]

Once such an FMP amendment has been adopted, all stocks in the CPS fishery that are not ecosystem component species would be categorized as Actively managed – or, in the absence of a Monitored category, simply "managed." This would allow the Council to ensure that adequate science and management attention is given to all CPS. However, we recognize that FMP amendments can require multiple Council meetings to complete, along with staff and advisory body resources. Given concerns regarding the current status of the stock and associated impacts to dependent predators, we suggest moving the central subpopulation of northern anchovy to active management status in the near term while the Council considers amending the CPS FMP to remove the Monitored stock category altogether.

C. Over the longer term, utilize new stock assessment methodologies recommended by the May 2016 data-poor assessment workshop, along with data on CCE predator/prey dynamics, to develop an ecosystem-based management framework for northern anchovy that considers and accounts for the needs and status of dependent predators.

In 2013, the Council's concerns over the status of northern anchovy, coupled with increased landings and the lack of a recent stock assessment, prompted the Council to recommend that NOAA Fisheries prioritize stock assessments for both the northern and central subpopulations within the following five years. In November 2015, with these assessments not yet scheduled, the Council requested that NOAA Fisheries conduct a full assessment for northern anchovy in advance of the November 2016 meeting, and that SWFSC convene a workshop to help inform the assessment's development.[59] As described above, the report stemming from that workshop, which was held in May 2016, included a near-term recommendation to develop an interim abundance estimate for the central subpopulation and a longer-term recommendation to develop an integrated model-based stock assessment for that stock.[60]

We believe that this two-phased approach will aid the Council in its efforts to make any needed adjustments to current catch limits prior to the 2017 fishing season, as well as in its work to manage the northern anchovy fishery with an ecosystem-based approach over the long term. In support of this latter objective, a full stock assessment based on the best scientific data available is a necessary step toward focusing increased management and science attention on both subpopulations of northern anchovy. Once completed, we request that this assessment be utilized – along with associated modeling data, specifically on CCE predator/prey dynamics – to develop a long-term strategy for sustainably managing this fishery, including adoption of an ecosystem-

[58] Pacific Fishery Management Council, September 2016, Agenda Item E.3.a, Coastal Pelagic Species Management Team Report on Anchovy Management Update.
[59] Pacific Fishery Management Council. November 2015. November 2015 Council Meeting Decision Summary Document, at 4.
[60] Pacific Fishery Management Council, June 2016, Supplemental Revised Informational Report 1, "Report of the NOAA Southwest Fisheries Science Center and Pacific Fishery Management Council Workshop on CPS Assessments," at 20-21.

based harvest control rule and CUTOFF that reflects current biological conditions. Newer and better information on northern anchovy will allow the Council to set biological reference points, status determination criteria, and catch levels for this stock with a much higher degree of certainty; prevent overfishing; better understand the cyclical nature of anchovy and its relationship to Pacific sardine; and maintain the role of northern anchovy in the CCE. Such a framework would account for ecosystem needs – with an emphasis on the forage requirements and status of dependent predators – as well as the social and economic factors consistent with achieving Optimum Yield, including the development of precautionary management measures.

Consideration of Time-Area Closures to Protect CPS-Dependent Predators

In order to fully account for the needs of dependent predators, as required by the MSA,[61] an ecosystem-based management framework for northern anchovy should also include consideration of time-area closures. There are two primary reasons for doing so: to account for anchovy's availability to central-place foragers such as brown pelican and common murre, which are heavily dependent on availability of northern anchovy within foraging distance of colonies; and to prevent localized depletion of anchovy in Monterey Bay. Key geographies in this regard are the Channel Islands, Farallon Islands, and Monterey Bay, all of which are globally Important Bird Areas.[62] In its June 2015 report to the Council, the USFWS noted that "northern anchovy availability within foraging distance of colonies is the most important factor influencing pelican breeding success within the Southern California Bight."[63] The USFWS further states in its September 2016 report to the Council that "we encourage the Council to consider measures based not only on biomass but also on the stock's spatial and temporal availability to marine predators."[64]

Monterey Bay, where 99% of 2015 anchovy landings occurred, is a key year-round foraging area for Pacific predators including commercially and recreationally important fish species.[65] There is precedent in the CPS FMP amendment process, as well as in existing state fisheries management, for time-area closures that are designed to protect forage for marine wildlife. In the CPS FMP, area closures were last formally considered in the process to develop the Amendment 5,[66] while in the State of California, regulations implementing the Market Squid FMP prohibit the squid fishery from using attracting lights in the entire Gulf of the Farallones National Marine Sanctuary, effectively excluding the fishery from this geography.

As the Council considers a process to develop a long-term ecosystem-based framework for sustainably managing the northern anchovy fishery, we recommend that such a strategy include

[61] 16 U.S.C. § 1802(33), 1851(a)(1); 50 C.F.R. 600.310(e)(3)(iii)(C).
[62] BirdLife International. 2016. Important Bird and Biodiversity Areas (IBAs).
[63] Pacific Fishery Management Council, June 2015, Agenda Item G.3.a, U.S. Fish and Wildlife Service Report.
[64] Pacific Fishery Management Council, September 2016, Agenda Item E.2.b, U.S. Fish and Wildlife Service Report.
[65] Block, B., Jonsen, I., Jorgensen, S., Winship, A., Shaffer, S., Bograd, S., Hazen, E. Foley, D., Breed, G., Harrison, A., Ganong, J., Swithenbank, A., Castleton, M., Dewar, H., Mate, B.. Shillinger, B., Schaefer, K., Benson, S., Weise, K., Henry, R., and D. Costa. 2011. Tracking apex marine predator movements in a dynamic ocean. *Nature* 475:86–90.
[66] Coastal Pelagic Species Fishery Management Plan (as amended through Amendment 15), at 5.

time-area closures as a tool to help ensure adequate forage for dependent predators while preventing localized depletion.

Conclusion

In conclusion, we request that the Council prepare now to take action at its November meeting to reduce the catch limit for the central subpopulation of northern anchovy, in advance of the 2017 fishing season, based on the best available science; utilize the results of a forthcoming stock assessment and associated modeling data to develop an ecosystem-based framework for sustainably managing the northern anchovy fishery over the long term; and initiate a process to remove the Monitored stock category from the CPS FMP.

Thank you for your consideration, and for your work to ensure sustainable fishing and healthy ocean ecosystems.

Sincerely,

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California Anchovy Population Remains Low, 2012-2015

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Introduction

Biomass estimates for the central subpopulation of northern anchovy (*Engraulis mordax*) in the California Current (MacCall et al. 2016) were revised and extended to 2011-2015 as additional data have become available.

Methods

Following the methods of MacCall et al. (2016), egg and larval sample densities from CalCOFI surveys for January and April were geo-spatially weighted, summed to obtain total abundance, developed into a combined index of productivity, and then calibrated to early 1980s absolute biomass estimates based on the Daily Egg Production Method (DEPM). DEPM estimates were corrected here prior to calibration. The erroneous value (used in all previous assessments) was due to the value having been reported in short tons, but then was assumed to be metric tons. Both egg and larval samples were used for biomass estimates in 1951-1999 and 2012-2015, although larval samples had to be dropped in 2000-2011 due to exceptionally low larvae:egg ratios (MacCall et al. 2016). For consistency, the extended estimates for 2012-2015 include only April data, as January data is available for only two years (2012-2013).

Results

Revised and extended anchovy biomass estimates with coefficients of variation are presented in Appendix I. The anchovy biomass remains very low and probably at an all time low of the history of CalCOFI sampling. Although the abundance estimates are imprecise at this low level, the biomass is almost certainly less than 100,000 mt.

Post-2011, the larvae:egg ratio returned to within mean values seen in 1951-1999. Therefore, both egg and larval samples were utilized for updating biomass estimates for 2012 through 2015.

The extended time series (2012-2015) shows that stock remains low after a collapse after 2005 (i.e., two orders of magnitude below the 2005 value). The CVs of recent biomass estimates are high (due to low numbers of positive stations, etc.), and therefore estimates for recent single years are imprecise and should not be used for interpretation. In the past 7 years, point estimates for anchovy biomass averaged ~17,200 mt. In the past 4 years since the last anchovy biomass update, estimated biomass averaged ~18,200 mt.

Discussion

Although the most recent 2016 CalCOFI data are not yet available, results from the Continuous Underway Fish Egg Sampler (CUFES) from recent surveys indicate egg

distribution nearshore in a small area, and very low peaks of ~15 eggs/m^2. Thus, there has been no substantial recovery in 2016.

Acknowledgements

We thank the Pew Charitable Trusts for funding this study. We also thank the many people who for decades have contributed to CalCOFI surveys, and who have made the data openly available for analysis.

Literature Cited

MacCall, A.D., W.J. Sydeman, P.C. Davison, J.A. Thayer. (2016) Recent collapse of northern anchovy biomass off California. *Fisheries Research* 175:87–94.

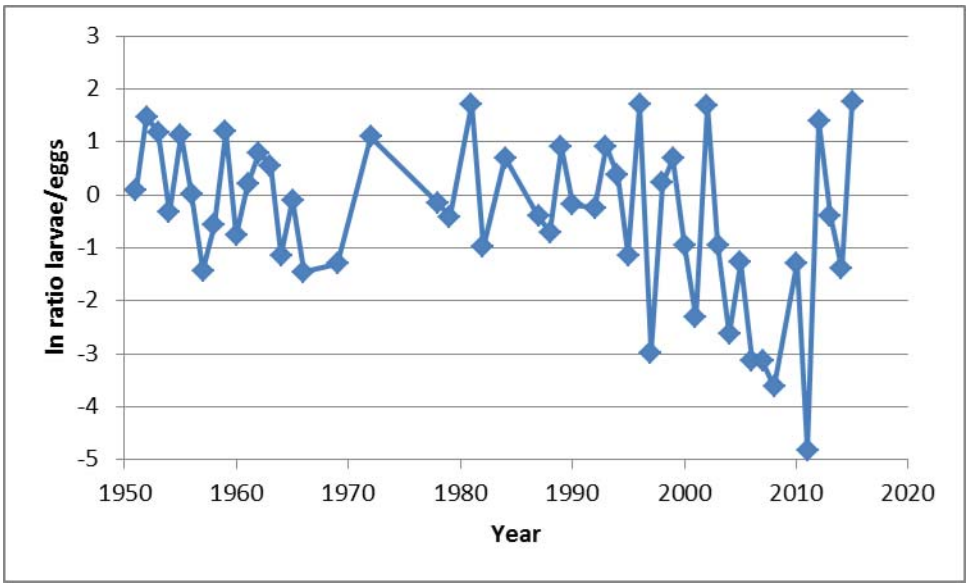

Figure 1. Years 2012-2015 do not show the anomalously low larval abundances seen in 2000-2011 when larval abundances were dropped from biomass calculations (MacCall et al. 2016). Starting in 2012, we can again use both egg and larval abundances to calculate anchovy biomass, as was done pre-2000.

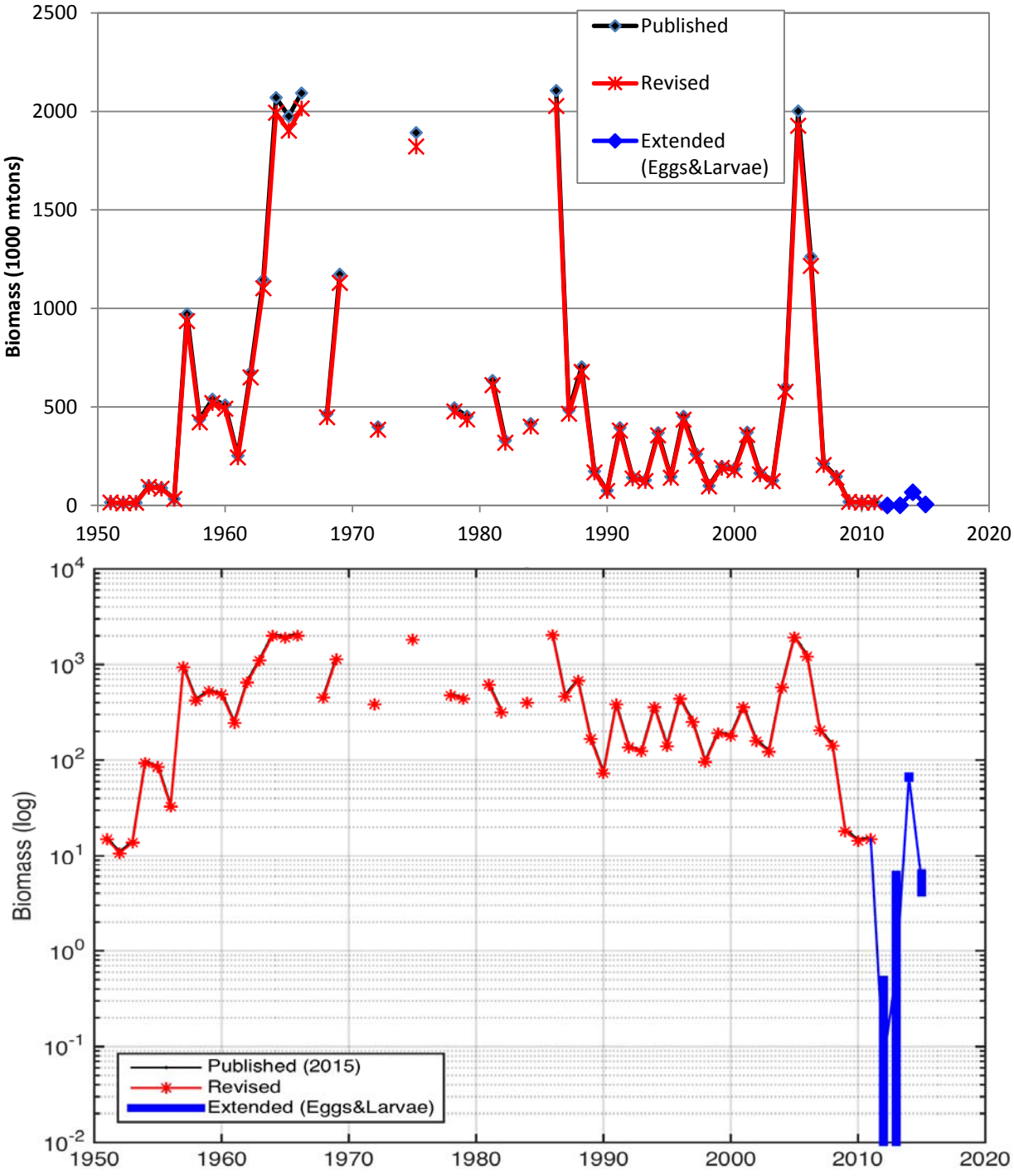

Figure. 2. Anchovy biomass estimates on (a) numeric and (b) log scale. As extended estimates have are based on few positive stations, CVs are imprecise. After removing larvae from estimates in 2000-2011, adding larvae back into estimates for 2012-2015 (blue lines) does not change the pattern, but does improve precision.

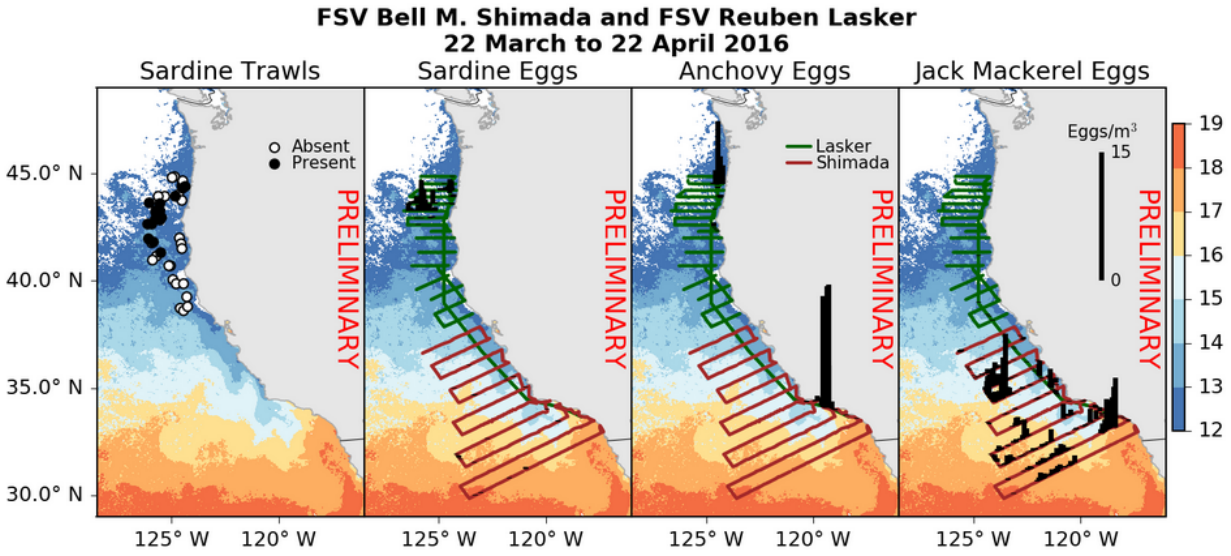

Figure. 3. Preliminary CUFES survey results from spring 2016 (https://swfsc.noaa.gov/textblock.aspx?Division=FRD&ParentMenuId=218&id=1340). Note the continued very nearshore distribution and low values of anchovy eggs.

Appendix I.

Table 1. Updated biomass values and coefficients of variation for the central subpopulation of northern anchovy. Blank cells indicate no data available. Note that both egg and larval abundances were used for estimating 1951-1999 and 2012-2015 (light gray), while larval abundances were dropped in 2000-2011 when larvae:egg ratios declined (dark gray).

	Published Values		New Values	
Year	Biomass (MT)	total CV	Biomass (MT)	total CV
1951	15.5	1.51	14.9	1.51
1952	11.1	1.78	10.7	1.78
1953	14.3	1.57	13.7	1.57
1954	97.5	0.62	93.8	0.61
1955	88.3	0.65	85.0	0.64
1956	34.0	1.02	32.8	1.02
1957	972.3	0.41	936.0	0.40
1958	438.3	0.32	422.0	0.31
1959	539.6	0.29	519.4	0.28
1960	510.0	0.30	491.0	0.29
1961	253.3	0.40	243.8	0.39
1962	675.2	0.27	650.0	0.26
1963	1145.4	0.23	1102.7	0.21
1964	2070.9	0.20	1993.7	0.18
1965	1976.3	0.20	1902.6	0.18
1966	2093.6	0.20	2015.5	0.18
1967				
1968	465.1	0.57	447.8	0.56
1969	1173.8	0.23	1130.1	0.21
1970				
1971				
1972	399.2	0.33	384.3	0.32
1973				
1974				
1975	1892.7	0.31	1822.1	0.30
1976				
1977				
1978	495.5	0.30	477.0	0.29
1979	453.1	0.31	436.2	0.30
1980				
1981	634.5	0.28	610.9	0.26
1982	330.5	0.67	318.2	0.66
1983				

Year	Published Values Biomass (MT)	total CV	New Values Biomass (MT)	total CV
1984	415.5	0.33	400.0	0.31
1985				
1986	2106.6	0.30	2028.0	0.28
1987	483.4	0.56	465.4	0.55
1988	703.9	0.27	677.6	0.25
1989	173.9	0.47	167.4	0.46
1990	76.0	1.36	73.2	1.36
1991	394.8	0.61	380.1	0.61
1992	142.2	0.52	136.9	0.51
1993	128.4	0.54	123.6	0.54
1994	369.4	0.34	355.6	0.33
1995	146.2	0.51	140.7	0.50
1996	452.6	0.31	435.7	0.30
1997	261.4	0.39	251.7	0.39
1998	100.0	0.61	96.3	0.60
1999	197.6	0.45	190.3	0.44
2000	186.2	0.88	179.3	0.87
2001	371.7	0.63	357.9	0.63
2002	164.3	0.93	158.1	0.93
2003	127.6	1.06	122.8	1.05
2004	599.6	0.50	577.2	0.50
2005	2002.5	0.30	1927.7	0.29
2006	1263.6	0.68	1216.4	0.68
2007	213.2	0.82	205.2	0.82
2008	146.6	0.99	141.1	0.98
2009	18.7	5.47	18.0	5.47
2010	15.0	3.06	14.4	3.06
2011	15.6	3.00	15.0	3.00
2012			0.07	0.44
2013			0.6	5.66
2014			66.9	1.47
2015			5.3	1.23