October 16, 2015

Ms. Dorothy Lowman, Chair
Pacific Fishery Management Council
1100 NE Ambassador Place, Suite 101
Portland, OR 97220

Re: Agenda Item H.3 (Anchovy General Status Overview)

Dear Chair Lowman and Council Members:

We write with respect to management of the federal fishery targeting the central and northern subpopulations of northern anchovy. As part of Agenda Items H.3, we reiterate our previous request that the Pacific Fishery Management Council (Council) task the National Oceanic and Atmospheric Administration's Fisheries Service (NOAA Fisheries) with initiating a full stock assessment for both subpopulations, with priority given to the central subpopulation for completion in 2016. More immediately, we ask that the Council provide a specific schedule for review by the Scientific and Statistical Committee (SSC) of all relevant scientific information on the stock status of the central subpopulation of northern anchovy, and that the Council consider interim management measures for this subpopulation based upon this SSC review as well as any and all information it has available at the time of Council discussion. We believe such interim measures are needed to prevent (or end) overfishing of this subpopulation of a critical prey species, which multiple lines of evidence show is in a collapsed condition. Finally, over the longer term we request that the Council utilize the completed stock assessment, along with information on California Current Ecosystem (CCE) predator/prey dynamics, to develop an ecosystem-based management framework for northern anchovy, including an updated harvest control rule.

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, as well as mammals and sea birds.[1] Anchovy is the single most important prey species for CCE seabirds[2] and first or second most important for the broader suite of marine predators, such as humpback

[1] Pacific Fishery Management Council. July 2013. Ecosystem Initiatives Appendix to the Pacific Coast Fishery Ecosystem Plan, page A-11.
[2] Szoboszlai, A. et al. (In prep) Data synthesis for understanding predator forage needs: A case study from the California Current. *Ecological Archives*.

whales, chinook salmon, dolphins, and pinnipeds.[3]

For several years, the undersigned organizations have expressed concerns to the Council about the status of anchovy and the lack of scientifically supported and legally required management measures for this stock, especially in light of increased fishing effort.[4] More recently, our organizations as well as the U.S. Fish & Wildlife Service (USFWS)[5] have voiced concerns regarding recent indications of low biomass of anchovy in the CCE and the associated impact on pelicans and other predators. We reiterate those concerns and also make further recommendations on the basis that a substantial body of information currently exists on the status of the central subpopulation of anchovy, via acoustic trawl and egg and larval survey time series; more recent aerial/vessel surveys; and a new abundance estimate, MacCall et al. (in review),[6] based on egg and larval survey time series. These multiple lines of evidence and analyses – coupled with documented impacts on dependent predators – strongly suggest the central subpopulation of northern anchovy (in central and southern California) is in a collapsed condition.

In light of the issues, questions, concerns, and requests raised by members of the public, USFWS, and the Council itself regarding the status of northern anchovy, we ask the Council to take the following actions at its November 2015 meeting:

- Provide a specific schedule for SSC review of all relevant scientific information on the status of the central subpopulation of northern anchovy, including but not limited to MacCall et al. (In review).
- Place on the Council's agenda consideration of new interim management measures for the central subpopulation of anchovy. Such interim measures may be needed to protect this critical prey species given the substantial body of evidence that the stock is in collapsed condition.
- Request that NOAA Fisheries immediately initiate a full stock assessment for the central subpopulation of northern anchovy and complete it by the end of 2016.
- State its intent, over the longer term, to utilize the information from this stock assessment, along with data on CCE predator/prey dynamics, to develop an ecosystem-based management framework for northern anchovy.

Below we discuss these recommendations in more detail.

Schedule SSC review of existing information regarding anchovy status to help inform Council evaluation of interim management measures

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

[4] PFMC. June, 2015. Supplemental Public Comment under Agenda Item G.3.; PFMC. September, 2014. Supplemental Public Comment under Agenda Item I.6.

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

[6] MacCall, A. D., W. J. Sydeman, P. C. Davison, J. A. Thayer. (In review). Non-Fishery Collapse of Northern Anchovy off California. *Fisheries Research*.

During the Workload Planning agenda item at the September 2015 meeting, the Council engaged in a lengthy discussion regarding the importance and utility of an SSC review of currently available data pertaining to northern anchovy.[7] During this discussion and associated public comment, multiple Council members and members of the public requested the Council consider the results of the MacCall et al. (in review) population estimate as well as other relevant data at the November 2015 meeting. An SSC review of these and other relevant data would provide the Council with an updated and more complete picture of the current status of northern anchovy pending completion of a stock assessment, thereby helping to inform any near-term actions the Council may take to prevent overfishing of this stock and ensure adequate forage for dependent predators. Existing lines of evidence include the following:

A. Egg and Larval Surveys

Survey cruises conducted by the Southwest Fishery Science Center have detected declining numbers of northern anchovy eggs in recent years. No anchovy eggs were seen in 2010, 2012, and 2013, and very low numbers were observed in 2011,[8,9]suggesting a downward trend in abundance. In particular, 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."[10] 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.[11]

In June 2015, in response to a request from the Council for an update on the current status and management of northern anchovy, 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 showed only small schools of anchovy, as well as mixed anchovy/sardines, ranging from 490 - 5,000 tons (N=20).[12] (Please see Table 1 in Appendix.)

B. MacCall et al. (in review): Non-Fishery Collapse of Northern Anchovy off California[13]

[7] Pacific Fishery Management Council, September 2015, Agenda Item C.6, Council Discussion [starting at 2:05]
[8] NOAA Fisheries, Southwest Fishery Science Center, Continuous Underway Fish Egg Sampler Distribution Maps for Sardine, Anchovy, and Jack Mackerel
[9] MacCall, A. D., W. J. Sydeman, P. C. Davison, J. A. Thayer. (In review). Non-Fishery Collapse of Northern Anchovy off California. *Fisheries Research*.
[10] Wells, B. K. et al. 2013. CCIEA Phase III Report 2013: Ecosystem Components, Fisheries – Coastal Pelagic and Forage Fishes, page C-12.
[11] Leising, A. W. et al. 2014. State of the California Current 2013-14: El Nino Looming. CalCOFI Rep., Vol 55, Figure 22.
[12] Pacific Fishery Management Council, June 2015, Agenda Item G.3.a, Supplemental CDFW Report.
[13] MacCall, A. D., W. J. Sydeman, P. C. Davison, J. A. Thayer. (In review). Non-Fishery Collapse of Northern Anchovy off California. *Fisheries Research*.

This new analysis (currently in review for publication in *Fisheries Research*) 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.[14] 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." MacCall et al. (in review) found:

> *"The estimated spawning biomass decreased by over 99 percent from 2005 to 2009, and merits the term 'collapse.'…The current anchovy biomass off southern California is estimated at less than 20,000 MT (CI < 100,000 MT), similar only to the inexplicably low biomasses seen in the early 1950s. Although current annual catch levels of a few thousand tons are small by historical standards, current exploitation rates could be high given the low stock abundance, and should be taken under consideration by fishery managers…. Anchovy spawning biomass was very low, 10,000-20,000 MT, in the early 1950s when CalCOFI sampling began. Abundance increased and fluctuated between 0.5 and 2 million MT from 1960 through 1990. After 1990, spawning biomass fluctuated around 200,000 tons, briefly increased in 2005-2006, then declined drastically over four years to below 20,000 tons from 2009-2011. CalCOFI ichthyoplankton data collected after 2011 are not yet available for analysis, but continuous underway egg sampling conducted during CalCOFI cruises indicates continued low abundance of anchovy through 2015 in both southern and central California."*

Also related to the hyperstability issue, MacCall et al. (in review) notes, "While there have been recent anecdotal reports of substantial nearshore anchovy abundance, we hypothesize that much of the remnant population is concentrated close to shore, making them unusually visible to the public and giving a mistaken impression of abundance."

The area-weighted biomass estimates used in MacCall et al. (in review) show the dramatic decline and collapse of the anchovy stock, compared with previous estimates of egg production rates that do not use the area-weighted approach, in addition to other methodological differences (Figure 1):

[14] MacCall, A. 1009. Dynamic geography of marine fish populations. University of Washington Press. Seattle, WA.

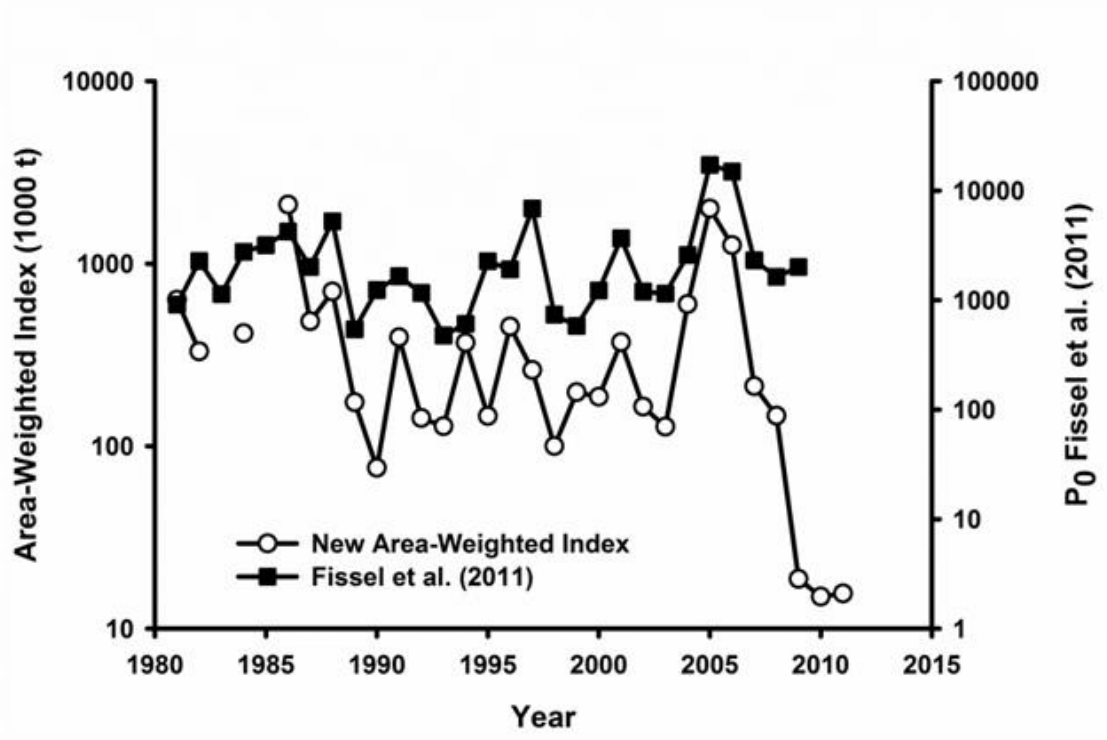

Figure 1 Comparison of time series of egg production rate (P0) estimates from Fissel et al. 550 (2011) with area-weighted biomass estimates, including additional values for 2010 and 2011. Logarithmic scale. (MacCall et al., in review)

In sum, MacCall et al. 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."

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.[15] 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.[16] California sea lions have also undergone Unusual Mortality Events in 2013, 2014, and 2015, linked to low anchovy and sardine abundance.[17]

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

[16] 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.

[17] 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

Add to the Council's agenda consideration of interim management measures for the central subpopulation of northern anchovy

The collapse of the anchovy stock warrants immediate Council consideration of interim management measures. In particular, the adoption of an annual catch target (ACT) that is reduced from the central subpopulation's current annual catch limit (ACL) of 25,000 metric tons (mt) may be needed to allow the Council to meet its basic obligations under the Magnuson-Stevens Fishery Conservation and Management Act, which are reflected in at least two key goals of its Coastal Pelagic Species (CPS) Fishery Management Plan (FMP): "to provide adequate forage for dependent predators" and to "prevent overfishing" in light of the stock potentially being at very low relative levels.[18] Adopting an ACT for the central subpopulation of northern anchovy also comports with Council guidance, which states that, "Along 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…"[19] We note, for example, that 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.

Further, commercial landings of northern anchovy have increased over the past several years (Figure 1).[20] As of October 15, 2015, the California Department of Fish and Wildlife has reported 13,508 metric tons of anchovy landed. Over 11,800 metric tons of that were landed in the first half of the year. However, fishing effort has picked up recently and roughly 1,700 metric tons have been landed since late September.[21] In light of recent information that indicates anchovy are at historically low levels, this current level of catch may exceed the maximum sustainable yield for this stock. Moreover, we note that northern anchovy, like many forage species, is especially vulnerable to fishing pressure at lower levels of abundance.[22,23] Because northern anchovy travel in schools that can be more easily caught and may concentrate in nearshore waters at times of low abundance and/or warm water conditions such as those currently occurring in the CCE, landings could continue to increase despite low abundance, a dynamic that has the potential to both mask and exacerbate further population declines.[24]

While the abovementioned SSC review of available information would help to inform the Council's deliberations on this matter, the Council does not need to wait for such a review to take precautionary action in light of new information. Ample information currently exists for the Council to consider establishing interim management measures in the near term. We recommend

[18] Pacific Fishery Management Council. September 2011. Coastal Pelagic Species Fishery Management Plan as amended through Amendment 13, page 12.
[19] Pacific Fishery Management Council. December 2014. Status of the Pacific Coast Coastal Pelagic Species Fishery and Recommended Acceptable Biological Catches, page 28.
[20] Pacific Fishery Management Council. June 2015. Agenda Item G.3.a, CPSMT Report.
[21] CDFW. Coastal Pelagic Species – Highly Migratory Species Project. October 2015.
[22] Essington, T., P. Moriarty, H. Froehlich, E. Hodgson, L. Koehn, K. Oken, M. Siple and C. Stawitz. 2015. Fishing amplifies forage fish population collapses. Proc. Nat. Acad. Sci. vol. 112 no. 21
[23] Pinsky, M. and D. Byler. 2015. Fishing, fast growth and climate variability increase the risk of collapse. Proceedings of the Royal Society B, August.
[24] Pikitch, E. et al. 2012. Little Fish, Big Impact: Managing a crucial link in ocean food webs. Lenfest Ocean Program. Washington, DC.

that the Council include on its agenda as soon as possible consideration of an ACT that is reduced from the ACL, based on the best available information regarding the current status of the central subpopulation of northern anchovy.

Request that NOAA Fisheries initiate a stock assessment for the central subpopulation of northern anchovy, to be completed in 2016

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. NOAA Fisheries indicated in November 2013 that it intended to begin work on this effort during 2015 and 2016,[25] but as the end of 2015 approaches, no assessment work has yet been scheduled. We urge the Council to formally request that NOAA Fisheries immediately initiate a stock assessment for the central subpopulation of northern anchovy (which was last assessed in 1995), to be completed in 2016, and followed by an assessment of the northern subpopulation.

Having current and reliable information on northern anchovy will allow the Council to act with greater certainty in setting catch levels that provide for sustainable fishing activity as well as for the maintenance of adequate forage for marine wildlife, key aspects of achieving optimum yield as well as key objectives of the CPS FMP.[26] This information will also advance the transition to ecosystem-based fishery management by providing resource managers with a clearer picture on coastal pelagic species abundance, forage availability, food web dynamics, and ultimately how our West Coast fisheries impact and are impacted by marine ecosystems.

To this end, a full and updated stock assessment is a necessary first step toward focusing increased management and science attention on both subpopulations of northern anchovy that occur off the U.S. West Coast. Once completed, this assessment should be utilized – along with associated modeling data – to develop a long-term strategy for sustainably managing the northern anchovy fishery, including adoption of an ecosystem-based harvest control rule that reflects current biological conditions as well as relevant optimum yield factors. 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 (or end) overfishing; better understand the cyclical nature of anchovy and its relationship to Pacific sardine; maintain the role of northern anchovy in the CCE; and achieve optimum yield. Such a framework would account for ecosystem needs as well as the social and economic factors consistent with achieving optimum yield, and include precautionary management measures.

In conclusion, we ask that the Council take action at its November 2015 meeting to establish a schedule for SSC review of existing information on anchovy status and abundance; add to the agenda consideration of interim management measures that may be necessary to prevent

[25] NOAA Fisheries. November 2013. PFMC Agenda Item E.1.c, Supplemental Southwest Fisheries Science Center PowerPoint

[26] PFMC. September 2011. Coastal Pelagic Species Fishery Management Plan as amended through Amendment 13, page 12.

overfishing and ensure an adequate forage base for dependent predators; and formally request a stock assessment for the central subpopulation of northern anchovy.

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

Sincerely,

Anna Weinstein
Marine Program Director
Audubon California

Andrea Treece
Staff Attorney
Earthjustice

Corey Ridings
Policy Analyst
Ocean Conservancy

Geoffrey Shester, Ph.D.
California Campaign Director
Oceana

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

Season	Total Estimate (mt)	Num. Sightings (Total)	Num. Sightings (w/Estimates)	Num. Sightings (w/o Estimates)	Avg mt/sighting	Species composition of sightings	
						Pure	Mixed
Summer 2012 (Jul-Aug)	0	1	0	1	N/A	1	-
Spring 2013 (Apr-May)	5,000	9	1	8	5,000	7	2
Summer 2013 (Aug-Oct)	14,532	7	5	2	2,906	4	3
Spring 2014 (May-Jun)	6,810	11	11	0	619	10	1
Summer 2014 (Aug)	980	2	2	0	490	2	-
TOTAL	27,322	30	20	11	911	24	6

Table 1 Summarized northern anchovy observations data from aerial transects by season, Summer 2012 – Summer 2014. All observations but one from summer 2014 were from coastal mainland transects. Spotter pilot estimates (metric tons), the number of total sightings, number of sightings with and without tonnage estimates, average mt per sighting, and the number of sightings per species composition categories (pure or mixed) are included. Mixed schools consisted of northern anchovy and Pacific sardine only. At http://www.pcouncil.org/wp-content/uploads/2015/06/G3a_Sup_CDFW_Rpt_JUN2015BB.pdf

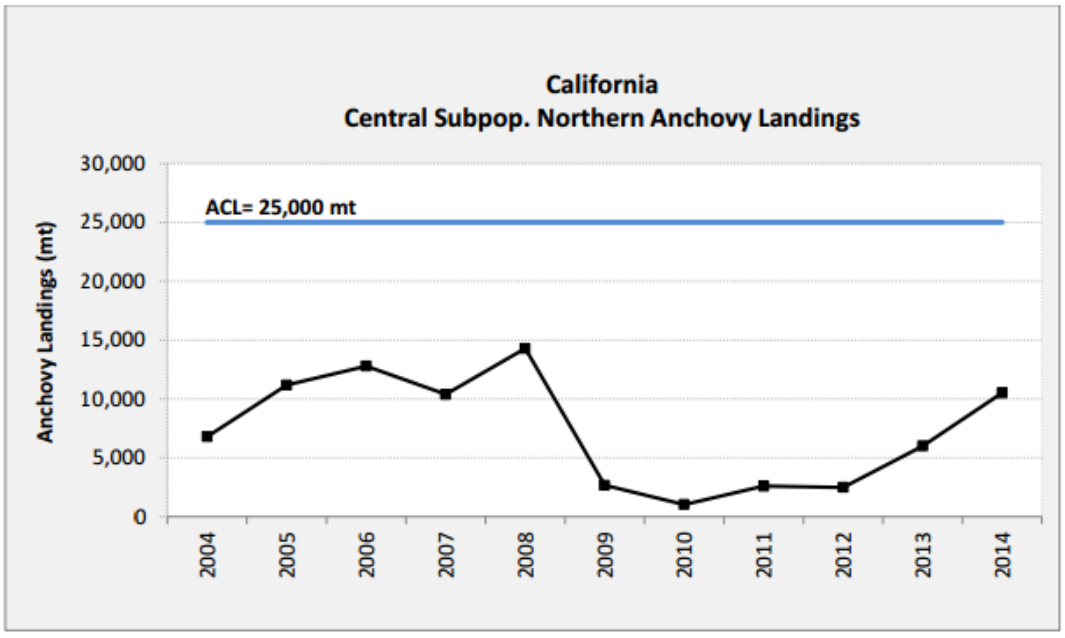

Figure 1. California Landings of Central Subpopulation Northern Anchovy 2004 – 2014; with the ACL of 25,000 mt.

http://www.pcouncil.org/wp-content/uploads/2015/05/G3a_CPSMT_Rpt_JUN2015BB.pdf