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March 29, 2018

Phil Anderson, Chair  
Pacific Fishery Management Council  
7700 NE Ambassador Place, Suite 101  
Portland, Oregon 97220-1384

**RE: Agenda Item C.3: Acoustic Trawl Survey Methodology Review**

Dear Chair Anderson,

We thank the Council, ATM Methodology Review panel, and Southwest Fisheries Science Center (SWFSC) acoustic team for their review of the use of the acoustic trawl survey method (ATM) to estimate the abundance of the five west coast stocks of CPS finfish (Pacific sardine, Pacific mackerel, jack mackerel, central subpopulation of northern anchovy [CSNA], and northern subpopulation of northern anchovy [NSNA]). Having attended all five days of the meeting, we commend the robust scrutiny the review panel applied and the quality of the presentations and responses provided by SWFSC.

The fundamental conclusion of the review panel was that there is no impediment to using annual ATM survey estimates to inform CPS management. While the review identified ways to further improve and reduce uncertainty in ATM estimates, the review did not find any fundamental flaws or systematic negative bias in the ATM estimates for any of the five CPS finfish species. The panel provided a helpful recommendation that any gaps in nearshore survey coverage can be addressed using standard extrapolation methods. Until the surveys are extended further inshore, this resolves any concerns that the survey is missing nearshore biomass. In addition, the panel unanimously concluded that ATM surveys can be used to directly inform management for all five CPS finfish stocks.

The ATM surveys provide the best available science to estimate current and annual abundance for CPS stocks.<sup>1</sup> The panel's findings regarding the utility of the ATM survey data has important ramifications for each CPS stock. For sardines, this confirms the continued use of ATM survey as a primary index of abundance in annual stock assessments and re-affirms the recent recommendations by stock assessment authors and the STAT team to use survey estimates directly to inform annual OFL, ABC, and ACLs with a January season start date. For Pacific mackerel, it confirms that the ATM survey can be used as a primary index of abundance in stock assessments, which is clearly a vast improvement over the current approach that relies primarily on reported catch in certain recreational fisheries. It also supports consideration of annual management based on survey estimates, similar to what stock assessment authors have recommended for future management of Pacific sardine.

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<sup>1</sup> This does not preclude the use of other data sources not evaluated in this methodology review. As indicated in the Oceana and Earthjustice March 30, 2018 letter to the Council on Agenda Item C.4, other sources of information such as published estimates using Daily Egg Production Methods may also constitute best available science for CSNA, and may be used in concert with ATM information in management.

Moving forward, we understand that the NMFS SWFSC plans to publish 2017 ATM survey estimates for all five CPS finfish stocks this summer 2018, and on an annual basis thereafter. This allows the PFMC an important opportunity to update its CPS FMP by incorporating annual biomass estimates directly into annual management specifications for CSNA, NSNA, and jack mackerel, and eliminating the unauthorized “monitored” stock category altogether. We encourage the Council to initiate a process to amend the FMP to use the available annual biomass estimates to directly inform management.

In summary, the 2018 ATM review further underscores that the question at hand is not *whether* ATM estimates should be used in management, but *how* they are used in management. The SWFSC has invested millions of taxpayer dollars and agency resources to develop a state of the art ATM survey, and those investments have paid off, providing the opportunity to actively manage all CPS stocks. The ATM review approval of the ATM data for use in management of all five CPS finfish is a tremendous accomplishment for the SWFSC acoustic team, which has been developing, testing, and improving ATM methods for West Coast CPS stocks for over 15 years.

Sincerely,

A handwritten signature in cursive script, appearing to read "Geoff Shester".

Geoff Shester, Ph.D.

California Campaign Director and Senior Scientist



Mr. Phil Anderson, Chair  
Pacific Fishery Management Council  
1100 NE Ambassador Place, #101  
Portland, OR 97220

March 30, 2018

Re: Agenda Items C.3—Acoustic Trawl Survey Methodology Review - Final Approval—and  
C.4—Process for Review of Reference Points for Monitored Stocks

Dear Mr. Anderson,

On behalf of our ~65,000 members, we thank the Council for its continued focus on updating assessment and management of northern anchovy, a critical forage species in the southern California Current Ecosystem (CCE). Our members care deeply about marine and coastal birds, including species that are critically dependent on northern anchovy: Pacific brown pelican, federally endangered California least tern, and sooty shearwater.

Since 2014, Audubon has requested the Council revise the existing management framework for anchovy commensurate with its importance to larger fish and other predators; the fact that it is actively fished; the tendency of the stock to undergo wide, rapid fluctuations; its recent prolonged collapse from 2009-2015; and its current estimated biomass at levels far below those used to derive current management measures.

Now, after considerable work by the Council, Scientific and Statistical Committee (SSC), NMFS, special review panels, and outside scientists, the Council and advisory bodies have all the tools needed to identify and adopt updated management reference points for the central subpopulation of northern anchovy (CSNA) and the northern subpopulation of northern anchovy (NSNA) for 2019. We urge no further delay in this action. As the SSC noted in 2010, “OFL and ABC [for CPS monitored species] should be updated when new biomass estimates or information on productivity become available.”<sup>1</sup>

These updates are badly needed to start to bring anchovy management into alignment with the Council’s broader goals of precautionary, ecosystem-based management, as well as the CPS Fishery Management Plan’s specific goals to prevent overfishing, achieve optimum yield, and provide adequate forage for dependent predators. The Council should also move forward with

<sup>1</sup> PFMC. 2010. Supplemental SSC report on Pacific sardine stock assessment and coastal pelagic species management measures for 2011. November.

developing a harvest control rule with cutoff, and with eliminating the Monitored Stock category from the CPS FMP. The Monitored Stock Category has proven extremely problematic, creating unnecessary confusion and delay with updating management of this actively fished species.

In sum, at this meeting we request the Council:

- Direct the SSC to provide the Council, by its November meeting, an updated OFL, ABC, and ACL for CSNA.
- Direct the Coastal Pelagic Species Management Team (CPSMT) to develop and recommend an annual specifications process to set OFL, ABC, and ACL for CSNA, NSNA, and jack mackerel.
- Initiate an FMP amendment to eliminate the Monitored Stock category from the CPS FMP, and manage all CPS stocks (other than Ecosystem Component Species) under the active management framework.
- Direct the CPSMT to produce at the an upcoming 2018 Council meeting a plan with timetable for development and Council adoption of a Harvest Control Rule including Cutoff for CSNA.

### **Recent Council and Advisory Group Actions to Update Management Measures for CSNA**

At its November 2016 meeting, the Council directed NMFS, the Scientific and Statistical Committee (SSC), the Coastal Pelagic Species Management Team (CPSMT), and the Coastal Pelagic Species Advisory Subpanel (CPSAS) to continue work to develop “an integrated stock assessment and procedures for setting and updating” an OFL, ABC, and MSST for the CSNA.<sup>2</sup> The Council also directed the SSC to identify alternative approaches for developing a revised OFL for the CSNA, and a process and timeline to consider OFL alternatives, for discussion at the April 2017 Council meeting.

At its April 2017 meeting, alternative approaches for developing a revised OFL for CSNA were summarized by the SSC and CPSM in a joint report,<sup>3</sup> and the Council provided further direction to the Scientific and Statistical Committee (SSC) to “evaluate the utility of ATM indices and the resulting abundance estimates to calculate a biomass estimate and an estimate of FMSY for CSNA.” The Council also scheduled for its April 2018 meeting an “Anchovy Abundance and Reference Point Update.”<sup>4</sup> At its September 2017 meeting, the Council approved Terms of Reference for a January, 2018 acoustic-trawl (AT) methodology review.

### **Tools now exist to generate a robust and updated OFL, ABC, and ACL for CSNA**

The Acoustic Trawl Methodology Review Panel concluded in its draft report posted to the March Briefing Book, that the AT cannot be used to estimate absolute abundance for any finfish in the CPSFMP, and that it can be used to estimate relative abundance for all finfish in the CPSFMP.

<sup>2</sup> PFMC, Draft Motion, Agenda Item G.4 (Nov. 2016), available at [http://www.pcouncil.org/wp-content/uploads/2016/11/G4\\_CouncilAction\\_NOV2016.pdf](http://www.pcouncil.org/wp-content/uploads/2016/11/G4_CouncilAction_NOV2016.pdf).

<sup>3</sup> PFMC. 2017. Joint Scientific Statistical Committee/Coastal Pelagic Species Management Team report on central subpopulation of northern anchovy overfishing limit process.

<sup>4</sup> PFMC, April 2017, Council Meeting Decision Summary Document at 5.

Underlying this conclusion and described in detail throughout the report are the weaknesses and limitations inherent to the method for all CPS finfish unless and until recommended improvements can be made to increase  $Q$  (catchability). In the case of northern anchovy, the report finds that biomass estimates from the survey can be used to directly inform management, as long as “*inshore areas are addressed*,” and following a Management Strategy Evaluation (MSE) (Table 3, pg. 30).

While MSE<sup>5</sup> will likely be an important part of developing a long-term, ecosystem based management framework for CSNA, including a harvest control rule and cutoff, it is not necessary for the immediate development of a new OFL, ABC, and ACL for CSNA. Underscoring this notion is the authors’ suggestion in the “Assessment of the Pacific Sardine resource in 2018 for U.S. management in 2018-19”<sup>6</sup> (pg 26) that sardine assessment in the future will be based primarily or completely on AT results:

*“Current management of the Pacific sardine population inhabiting the California Current of the northeast Pacific Ocean relies on an estimate of stock biomass (age-1+ fish in mt), which is needed for implementing an established harvest control rule policy for this species on an annual basis. It is important to note that the stock assessment team recommended that the preferred assessment approach for meeting the management goal was to use results from the acoustic-trawl (AT) survey alone, i.e., not results from an integrated population dynamics model.”*

According to Table 3 of the AT Review Panel report, the panel found the AT survey of similar utility for sardine and anchovy, with the caveat that for anchovy, inshore areas (outside of AT survey area) must be addressed. The Panel provides recommendations (pg 19) for conducting this extrapolation, including two that would be “*relatively easy to implement*.” Further increasing confidence in the AT survey for estimates of CSNA biomass, is the consistency of results between total biomass estimated from the AT survey, and spawning biomass from the CalCOFI ichthyoplankton-based model (i.e. MacCall et al. 2016) for 2015.<sup>7</sup>

In sum, key tools available for immediate development of a new OFL, ABC and ACL for CSNA are the AT abundance estimate are the AT results with biomass in inshore areas addressed; NMFS’ Minimum Stock Size Threshold Report finding an average  $F_{msy}$  of 0.266 for CSNA based on eight stock-recruitment relationships; and the OFL options report of the SSC and CPSMT. This toolbox allows the immediate use of the best available science to implement a priority for the Council: updated management of CSNA to ensure compliance with the goals of the CPS FMP.

These actions are urgently needed. CSNA was recently in a collapsed state, and the stock size remains low relative to historic abundances. Fishing on a fluctuating forage stock when it is at low abundance hinders recovery and can further deprive predators of food resources.<sup>8</sup> Any level of forage fish catch has the potential to be biologically significant when the stock is collapsed or

<sup>5</sup> The steps of MSE include: Develop an operating model that simulates what is known about the fishery based on the best available science. Develop a suite of Management Strategies (Data Collection, Assessment, HCR, and Management Action). Develop suite of uncertainty scenarios (alternative “states of nature”). Develop a suite of performance metrics to compare the outputs (these should reflect management objectives and risk tolerance.) Run Simulation tests. Compare the tradeoffs in performance of HCRs. (Valencia, S. 2018. Management Strategy Evaluation. Pacific Herring Fishery Management Plan for the State of California. Draft. Sacramento, CA)

<sup>6</sup> [https://www.pcouncil.org/wp-content/uploads/2018/03/C5\\_Att\\_1\\_FullElectricOnly\\_Sardine\\_Assessment\\_Apr2018BB.pdf](https://www.pcouncil.org/wp-content/uploads/2018/03/C5_Att_1_FullElectricOnly_Sardine_Assessment_Apr2018BB.pdf)

<sup>7</sup> Thayer, J. And W. Sydeman. 2016. Comparison of estimated biomass of CSNA. Public Comment on Agenda Item C.1.b. September, 2017.

<sup>8</sup> Essington et al. 2015. Fishing amplifies forage fish population collapses. Proceedings. Nat. Acad. Sci. May 26; 112(21): 6648–6652.

in a depressed state, or if fisheries are highly concentrated in an area important to central place foragers.<sup>9</sup> For 2012-2014, the four-year average of biomass in U.S. and Mexican waters in 2012-2015 was estimated by MacCall et al. to be 24,300 mt<sup>10</sup>. For 2015 and 2016, the NMFS Acoustic Trawl (AT) biomass estimate for the portion of the CSNA in U.S. waters was 31,427 mt and 151,558 mt, respectively,<sup>11,12</sup> and the preliminary 2017 biomass estimate is approximately 180,000 tons.<sup>13</sup> In contrast, between 1964-1990 the average CSNA biomass was 733,410 mt, with a range of 299,410 to 1,611,800 mt.<sup>14</sup> It is on this outdated, 1964-1990 information the current Maximum Sustainable Yield (MSY) of 123,336 mt for CSNA was derived.

Simultaneously, the Council should direct the CPSMT to develop and recommend an annual specifications process to set OFL, ABC, and ACL for CSNA, NSNA, and jack mackerel, as these are currently Monitored Species. Annual specifications are described in the SAFE (Stock Assessment and Fishery Evaluation) document for actively managed species (e.g., pg 37 of the current SAFE document for CPS). As the SSC noted in 2016, “in contrast with actively-managed CPS, there are currently no set procedures for setting and updating OFLs and acceptable biological catches for monitored species, including CSNA.”<sup>15</sup> The CPSMT should identify a procedure for these species, whether via routine management measures, point-of-concern, or other pathway.

### **Eliminate the Monitored Stock category from the CPS FMP, and manage all CPS stocks (other than Ecosystem Component Species) under the active management framework**

The Monitored Stock category has proven a major obstacle for managing CSNA responsibly. The distinction between Actively Managed and Monitored is a unique feature of the CPS FMP that appears to have no clear basis in the Magnuson-Stevens Act. If a stock is not classified as an Ecosystem Component Species or a Prohibited Harvest Species, it should be considered “managed” with the attendant measures and specifications associated with all managed FMP species. We were alarmed when in January, 2018 NMFS issued a Proposed Rule that would establish fixed multi-year annual catch limits for the finfish stocks in the monitored stock category. We urged NMFS to retract this rule as it would create an additional hindrance to Council action to put in place interim management measures as well as move toward a longer-term ecosystem-based management framework for the species that achieves Optimal Yield.

The proposed rule notes that “fisheries for monitored stocks do not have biologically significant catch levels and, therefore, do not require intensive harvest management.” This statement is problematic and highlights why these categories should be eliminated. The proposed rule provides no supporting evidence that fisheries for CSNA or other “monitored” stocks “do not

<sup>9</sup> Bertrand et al. 2012. Local depletion by a fishery can affect seabird foraging. *Journal of Applied Ecology* 49: 1168-1177.

<sup>10</sup> 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; Thayer, J.A., A.D. MacCall, P.C. Davison, W.J. Sydeman. 2017. California Anchovy Population Remains Low, 2012-2016. *CalCOFI Reports*, Vol. 58

<sup>11</sup> Zwolinski, J.P., Demer, D.A., Macewicz, B.J., Cutter, G.R., Mau, S. Murfin, D., Renfree, J.S., Sessions, T.S. and Stierhoff, K. (2016). The Distribution and Biomass of the Central-Stock Northern Anchovy During Summer 2015, Estimated from Acoustic-Trawl Sampling. Draft of NOAA Technical Memorandum November 2016, Appendix 1, available at [http://www.pcouncil.org/wp-content/uploads/2016/11/G4a\\_Sup\\_SWFSC\\_Rpt2\\_NOV2016BB.pdf](http://www.pcouncil.org/wp-content/uploads/2016/11/G4a_Sup_SWFSC_Rpt2_NOV2016BB.pdf)

<sup>12</sup> Distribution, biomass, and demography of the central-stock of northern anchovy during summer 2016, estimated from acoustic-trawl sampling. (2017) NOAA-TM-NMFS-SWFSC-572.

<sup>13</sup> NMFS. 2018. Review Panel for AT Methodology Workshop. La Jolla. January.

<sup>14</sup> Conrad, J.M. 1991. A bioeconomic analysis of the northern anchovy. Working paper in agricultural economics. CPAS FMP Amendment 8. Appendix B, pg 104.

<sup>15</sup> PPMC. November 2016. Agenda Item G.4.a. Supplemental Scientific and Statistical Committee Report.

have biologically significant catch levels, and therefore, do not require intensive harvest management.” As noted above, CSNA was recently in a collapsed state and the stock size remains low relative to historic abundances. The 25,000 mt ACL is 78% of NMFS’ 2015 biomass estimate of 31,427 mt, and is 16% of NMFS’ 2016 biomass estimate of 151,558 mt. In this light, it is difficult to understand how NMFS can assert that an ACL of 25,000 tons would not have the potential to be “biologically significant.” Actual fisheries landings for CSNA averaged approximately 8000 tons between 2006-2015. In 2015, landings exceeded 17,000 tons.<sup>16</sup>

### **Anchovy-dependent seabirds have been negatively impacted by the recent collapse and persistent low stock size of CSNA**

Northern anchovy is a keystone forage species in the California Current Ecosystem (CCE) and is preyed upon by a wide variety of marine wildlife, including commercially and recreationally valuable fish, mammals, and seabirds.<sup>17</sup> Anchovy is the single most important prey species for CCE seabirds.<sup>18</sup>

The recent collapse and low availability of anchovy has impacted seabirds and other marine wildlife, including the **California Brown Pelican Subspecies**, which is particularly dependent on anchovy. California brown pelicans were federally listed as endangered in 1970 and removed from the list in 2009 due to recovery. The U.S. Fish and Wildlife Service, in five detailed agency reports submitted to the Pacific Fishery Management Council between 2015 and 2017,<sup>19</sup> notes the CPS FMP must provide adequate forage for dependent predators, including the U.S. breeding population of California brown pelicans, which are “heavily dependent on the availability of anchovies... northern anchovy abundance within foraging distance from colonies is the most important factor influencing pelican breeding success within the Southern California Bight.” The Service notes that “as part of our decision to delist the California brown pelican, we determined that criterion 2 of the Recovery Plan was met because “food supplies are assured by the CPS FMP.” “

Within these reports, the Service describes unusually poor breeding success at the only U.S. breeding colony (the Channel Islands) as well as Unusual Mortality Events for the subspecies in 2009 through 2015. Breeding success in 2015 and 2016, while improved, still fell below long

<sup>16</sup> CDFW. December 89, 2015. 2015 Coastal Pelagic Species Landings Summary.

<sup>17</sup> Pacific Fishery Management Council, July 2013, Ecosystem Initiatives Appendix to the Pacific Coast Fishery Ecosystem Plan, at A-11.

<sup>18</sup> Szoboszlai, A. et al. 2016. Data synthesis for understanding predator forage needs: A case study from the California Current. Ecological Archives.

<sup>19</sup> U.S. Fish and Wildlife Service. 2015a. Letter to Pacific Fishery Management Council regarding Agenda Item G.3—Anchovy Update. Agenda Item G.3.a, USFWS Report, June 2015. 6 pp. [http://www.pcouncil.org/wp-content/uploads/2015/05/G3a\\_USFWS\\_Rpt\\_JUN2015BB.pdf](http://www.pcouncil.org/wp-content/uploads/2015/05/G3a_USFWS_Rpt_JUN2015BB.pdf).

U.S. Fish and Wildlife Service. 2015b. Letter to Pacific Fishery Management Council regarding Agenda Item H.3—Anchovy General Status Overview. Agenda Item H.3.a, Supplemental USFWS Report, November 2015. 4 pp. [http://www.pcouncil.org/wp-content/uploads/2015/11/H3a\\_Sup\\_USFWS\\_LTR\\_Nov2015BB.pdf](http://www.pcouncil.org/wp-content/uploads/2015/11/H3a_Sup_USFWS_LTR_Nov2015BB.pdf).

U.S. Fish and Wildlife Service. 2016a. Letter to Pacific Fishery Management Council regarding Agenda Items F.2 and F.3—Stock Assessment Workshop Report and Anchovy Management Update. Agenda Item E.2.b, USFWS Report, September 2016. 5 pp. [http://www.pcouncil.org/wp-content/uploads/2016/08/E2b\\_USFWS\\_Rpt\\_SEPT2016BB.pdf](http://www.pcouncil.org/wp-content/uploads/2016/08/E2b_USFWS_Rpt_SEPT2016BB.pdf).

U.S. Fish and Wildlife Service. 2016b. Letter to Pacific Fishery Management Council regarding Agenda Item G.4—Northern Anchovy Stock Assessment and Management Measures. Agenda Item G.4.a, Supplemental USFWS Report, November 2016. 6 pp. [http://www.pcouncil.org/wp-content/uploads/2016/11/G4a\\_Sup\\_USFWS\\_Ltr\\_NOV2016BB.pdf](http://www.pcouncil.org/wp-content/uploads/2016/11/G4a_Sup_USFWS_Ltr_NOV2016BB.pdf).

U.S. Fish and Wildlife Service. 2017. Letter to Pacific Fishery Management Council regarding Agenda Item C.1—Acoustic Trawl Survey Methodology Review Terms of Reference. Agenda Item C.1.a, Supplemental USFWS Report, September 2017. 6 pp. [http://www.pcouncil.org/wp-content/uploads/2017/09/C1a\\_Sup\\_USFWS\\_Rpt1\\_SEPT2017BB.pdf](http://www.pcouncil.org/wp-content/uploads/2017/09/C1a_Sup_USFWS_Rpt1_SEPT2017BB.pdf)

term means.<sup>20</sup> The Service also notes that “while the portion of the California brown pelican population in the Southern California Bight is approximately 17% of the entire population, these breeding colonies provide an important buffer for the population as a whole.” Pelicans have experienced similar declines in their core breeding range, the Gulf of California, where “... nest attempts have declined in the last decade, in especially extreme and unprecedented ways in a period of unusual warming in the last 3 years (2014–2016).”<sup>21</sup>

The recent collapse in anchovy stocks has negatively impacted **the federally endangered California least tern**, especially in southern California, where 87% of the total breeding population of ~4205 total pairs occurs.<sup>22</sup> Starting around 2009, the number of breeding pairs dramatically decreased from over 6600 to today’s levels (Figure 1). Age 1+ anchovy, and juvenile rockfish are the preferred prey of least terns, which also have an optimal foraging range restricted close to shore (within ~3.2 km). According to the California Department of Fish and Wildlife, “lack of sufficient foraging resources is widely thought to be a significant factor limiting California least tern population growth and warrants additional study.”<sup>23</sup> In addition to a more recent drop in breeding pairs, since 2001, overall productivity at least tern colonies south of Pt Conception has been well below the long term mean. This indicates that least terns are having difficulty locating preferred prey, and that preferred prey (age 1+ anchovies and rockfish) have likely become less abundant and/or more dispersed within the Southern California Bight. Research undertaken by Point Blue Conservation Science supports the hypothesis that occurrence of important prey for California least terns has decreased near colonies in the Southern California Bight, and this has negatively affected these colonies and driven down statewide breeding success (Figure 2). The optimal foraging range of terns provisioning young is ~3.2 km and adults bring a “single bill load” (one fish) back to the colony at a time.<sup>24</sup> Thus, least terns are highly dependent on fish close to the breeding colony while rearing chicks. An increase in diet diversity since 2000 indicates that least terns in southern California are relying more on alternative prey sources, including larval fish which are likely too small to effectively provision developing chicks.<sup>25</sup>

**Sooty shearwaters** feed primarily on anchovy, rockfish and squid when they migrate to the northern hemisphere in the off breeding season. Anchovy is the most energy-rich of these prey items and the most important prey shearwaters need to fatten before returning to breeding colonies in the southern hemisphere. Shearwaters concentrate to feed on anchovies in central and southern California, Oregon, and the Columbia River plume depending on season<sup>26,27</sup>

<sup>20</sup> Larramendy, P.T., J.A. Howard, A.J. DuVall, D.M. Mazurkiewicz, F. Gress, D.W. Anderson. 2018. Breeding Status of the California Brown Pelican on Anacapa and Santa Barbara Islands, California, in 2015 and 2016. Unpublished report, California Institute of Environmental Studies.

<sup>21</sup> Anderson, D.W., CR. Godlnez-Reyes, E. Velarde, R. Avalos-Tellez, D. Ramirez-Delgado, H. Moreno-Prado, T. Bowen, F. Gress, J. Trejo-Ventura, L. Adrean, L. Meltzer. 2017. Brown Pelicans, *Pelecanus occidentalis californicus* (Aves: Pelecanidae): Five decades with ENSO, dynamic nesting, and contemporary breeding status in the Gulf of California. *Ciencias Marinas* 43: 1—34. <http://dx.doi.org/10.1773/cm.v43i1.2710>.

<sup>22</sup> Robinette, D. et al. 2017. Recent Changes in Diet and Breeding Productivity for California Least Terns Breeding in Southern California. Point Blue Conservation Science.

<sup>23</sup> Frost, N. 2017. California Least Tern Breeding Survey, 2016 season. California Department of Fish and Wildlife. Nongame Wildlife Program, 2017-03

<sup>24</sup> Robinette, D. 2017. Pers. Comm

<sup>25</sup> Robinette, D. et al. 2017. CalCOFI presentation

<sup>26</sup> Briggs, K., and E. Chu. 1986. Sooty Shearwaters off California: distribution, abundance, and habitat use. *The Condor* 88:355-364.

<sup>27</sup> Che, E. 1984. Sooty Shearwaters off California: diet and energy gain, p. 64-71. In D. N. Nettleship, G. A. Sanger, and P. F. Springer [eds.], *Marine birds: their feeding ecology and commercial fisheries relationships*. Canadian Wildlife Service, Ottawa, Canada



Sooty shearwaters traverse the entire Pacific Ocean while integrating oceanic productivity over a global scale. Upon completion of breeding in the southern Pacific (New Zealand), shearwaters undertake their migration to one of three areas in the western, central, or eastern North Pacific: (i) Kuroshio and Oyashio Currents region off Japan and Kamchatka Peninsula, (ii) eastern Aleutian Islands and Gulf of Alaska region, or (iii) the California Current region. Sooty shearwater populations have declined in recent years both at breeding colonies in New Zealand and at wintering grounds in the eastern North Pacific. These trends were associated with concomitant increases in oceanic temperatures, which may have limited regional biological productivity.<sup>28</sup>

Northern anchovy typically represents at least 10% of **common murre** adult diet and (along with Pacific sardine) and 53% of the chick diet.<sup>29</sup> 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. Limited prey abundance or availability is believed to have been the primary cause of the event, although domoic acid exposure may have been contributing factors as well.<sup>30</sup>

Annual prey studies conducted since 1993 at Año Nuevo Island in central California show anchovy is the most important prey for **rhinoceros auklets**, making up 100% of chick diet in some years.<sup>31</sup> At the Farallon Islands, northern anchovy has historically been a very important component of diet for many seabirds including common murre, Brandt's cormorant, rhinoceros auklet and western gull. Prey consumption models suggest that Farallon seabirds alone can consume over 90,000 tons of anchovy per year. However, between 2009 and 2014, reflecting the collapse in stocks, anchovies were virtually absent from seabird diet. While some seabirds were able to partially compensate for this loss by switching to alternate prey, other species such as Brandt's cormorants and western gulls suffered extremely low breeding success and population declines.<sup>32</sup>

Thank you for your consideration of our comments, and for your commitment to conserving our marine resources.

Sincerely,



Anna Weinstein  
Marine Program Director

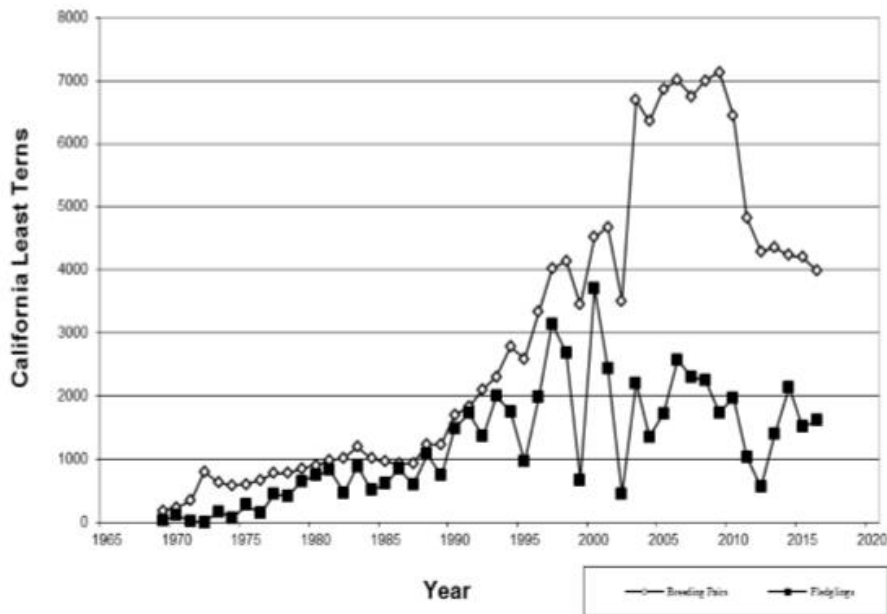
<sup>28</sup> Shaffer, S. et al. 2006. Migratory shearwaters integrate oceanic resources across the Pacific Ocean in an endless summer. PNAS August 22, 2006. 103 (34) 12799-12802.

<sup>29</sup> 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.

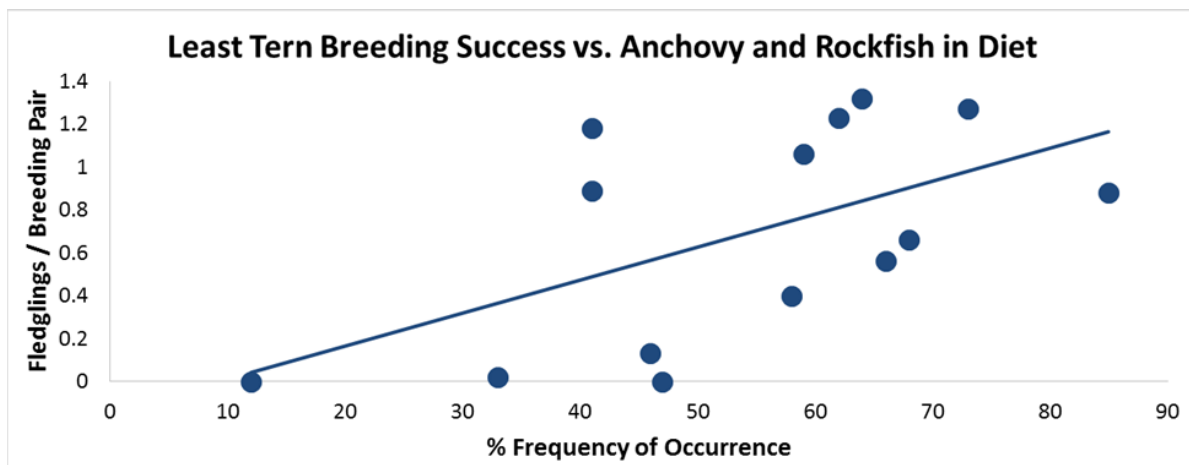
<sup>30</sup> Gible, C., K. Lindquist, R. Duerr, J. Lindsey, B. Bodenstein, R. Kudela, L. Henkel, J. Roletto, J. Lankton, J. Harvey. 2016. Investigation of a large-scale common murre (*Uria aalge*) mortality event in California in 2015. Pacific Seabird Group Annual Meeting, Oahu, HI. Poster.

<sup>31</sup> Carle, R. et al. 2014. Año Nuevo State Park. Seabird Conservation and Habitat Restoration: Report 2014.

<sup>32</sup> Warzybok P. 2016. Point Blue Conservation Science. Personal communication.



**Figure 1.** Minimum number of California least tern breeding pairs and fledglings in California during annual surveys, 1969-2016. Figure provided by the California Department of Fish and Wildlife.



**Figure 2.** Significant relationship of California least tern productivity with the presence of young-of-year rockfish and Age 1 anchovy in the diet. Figure provided by D. Robinette, Point Blue Conservation Science.



March 30, 2018

Mr. Phil Anderson, Chair  
Pacific Fishery Management Council  
7700 NE Ambassador Place, Suite 101  
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Re. PFMC Agenda Items C.3 – Acoustic Trawl Survey Methodology Review Final Approval  
and C.4 – Process for Review of Reference Points for Monitored Stocks

Dear Chair Anderson and Council Members:

I am writing on behalf of over 3,000 members of Sea and Sage Audubon Society (Sea and Sage) in Orange County, California. Our chapter has a long history of concern for, and active support of, the California Least Terns. In 1964 Sea and Sage helped to establish at the mouth of the Santa Ana River one of the first protected Least Tern colonies, which in 1973 became the first officially recognized tern colony under the Endangered Species Act.

We write today because we are concerned that the anchovy population, an important food source for the California Least Tern, is being managed using outdated information and measures. We encourage you to use the best available science to protect the anchovy populations.

In order to improve support of the numerous marine species and seabirds that rely on the northern anchovy, along with Audubon California, Sea and Sage asks that the Council take the following steps at the April 2018 Council Meeting:

- Using the recent efforts of the Council, SSC, NMFS, special review panels, and outside scientists, identify and adopt updated management reference points for CSNA and NSNA for 2019.
- Direct the SSC to provide the Council, by its November meeting, an updated OFL, ABC, and ACL for CSNA.
- Direct the CPSMT to develop and recommend an annual specifications process to set the OFL, ABC, and ACL for CSNA, NSNA, and jack mackerel.

- Initiate an FMP amendment to eliminate the Monitored Stock category from the CPS FMP, and manage all CPS stocks (other than Ecosystem Component Species) under the active management framework.
- Direct CPSMT to produce at the November 2018 Council meeting a plan with a timetable for development and Council adoption of a Harvest Control Rule including Cutoff for CSNA.

Thank you for your consideration. We appreciate the work you do to manage our marine resources sustainably.

Sincerely,



Susan Sheakley  
Chair of the Conservation Committee  
[www.seaandsageaudubon.org](http://www.seaandsageaudubon.org)