May 3, 2019

Mr. Chris Oliver
Assistant Administrator for Fisheries
NOAA Fisheries
1315 East-West Highway
Silver Spring, MD 20910

RE: Pacific sardine, declaration of overfishing and overfished

Dear Mr. Oliver:

On April 12, 2019, the Pacific Fishery Management Council adopted the 2019 Pacific sardine stock assessment,[1] which determined that the northern subpopulation of Pacific sardine is overfished. The 2019 assessment also indicates that the cumulative coastwide exploitation rate (including landings from Mexico and the U.S.) exceeded both the maximum sustainable yield and allowable biological catch (ABC) for the northern subpopulation of Pacific sardine in 2017 and 2018, meeting the definition of "overfishing" in the Pacific Coast Coastal Pelagic Species Fishery Management Plan (CPS FMP). In accordance with the Magnuson Stevens Fishery Conservation and Management Act (MSA), the National Marine Fisheries Service (NMFS) must immediately notify the Pacific Fishery Management Council (Council) that the northern subpopulation of Pacific sardine is overfished and request that the Council immediately develop measures to end overfishing and rebuild the stock. [2] In addition, because international fishing pressure on this Pacific sardine stock is a significant factor in the stock's overfished condition, NMFS must immediately take appropriate action at the international level to end overfishing.[3] Consistent with the requirements of the MSA, we request immediate action be taken to end overfishing in the fishery. Further, NMFS must implement conservation and management measures to rebuild Pacific sardine to biomass levels consistent with producing maximum sustainable yield (MSY) in as short a time as possible.

Oceana and Earthjustice have been deeply invested in the conservation and management of forage species off the U.S. West Coast for more than twelve years, and in particular, we have been closely involved in management issues surrounding Pacific sardine. Forage species, such as sardine, are critical to healthy ocean ecosystems and sustainable fisheries. We appreciated that the National Marine Fisheries Service and the Council acted quickly in 2015 to close the directed sardine fishery in accordance with the CPS FMP. However, we remain troubled by the agency's persistent denial and obfuscation about the status of the stock, at first claiming that the sardine stock was not collapsing[4] and

[1] Hill, KT, PR Crone, and JP Zwolinski (NMFS). 2019. Assessment of the Pacific sardine resource in 2019 for Management in 2019-20. Available: Agenda Item E.3, Supplemental REVISED Attachment 1 (Full Version Electronic Only)
[2] 16 U.S.C §§1854(e)(2) and (i), MSA § 304(e)(2) and § 304(i)
[3] 16 U.S.C. § 1854(i).
[4] Koch, K. Deputy Director, NOAA SWFSC. June 2013 letter and comments to the PFMC. Agenda Item I.4.c Supplemental SWFSC Report June 2013. Stating in response to published scientific literature predicting the sardine collapse, "*As stated last March 2012…the population of Pacific sardines…* ***is not currently in a state of imminent collapse as referenced in the PNAS article of March 2012.***"

then that overfishing was not occurring.[5] The agency has ignored and even refuted studies produced by its own scientists and published in the peer-reviewed literature regarding the collapse of the sardine population[6] and subsequent retrospective analyses indicating that exploitation rates exceeded MSY during the collapse (2011-2014). It is time to take immediate action at both the domestic and international level to rebuild the stock, and revise the Pacific sardine harvest control rule to prevent overfishing in the future.

1. Pacific sardine are overfished

The most recent stock assessment[7] finds the sardine population has collapsed by 98 percent since 2006 (figure 1). The NMFS 2019 assessment estimates the population dropped below the "cutoff" of 150,000 metric tons in early 2014, leading to the directed commercial sardine fishery being closed pursuant to the CPS FMP. In addition, the CPS FMP includes a Minimum Stock Size Threshold (MSST) of 50,000 mt for Pacific sardine. The MSST is the level of biomass below which the stock is overfished and below which the capacity of the stock to produce MSY on a continuing basis has been jeopardized.[8] When the stock falls below the MSST, it is overfished and NMFS is obligated to notify the Council of the stock's overfished status immediately. Notably, the 2019 stock assessment indicates that the stock is well below MSST now and has been below it since 2017 (figure 2).

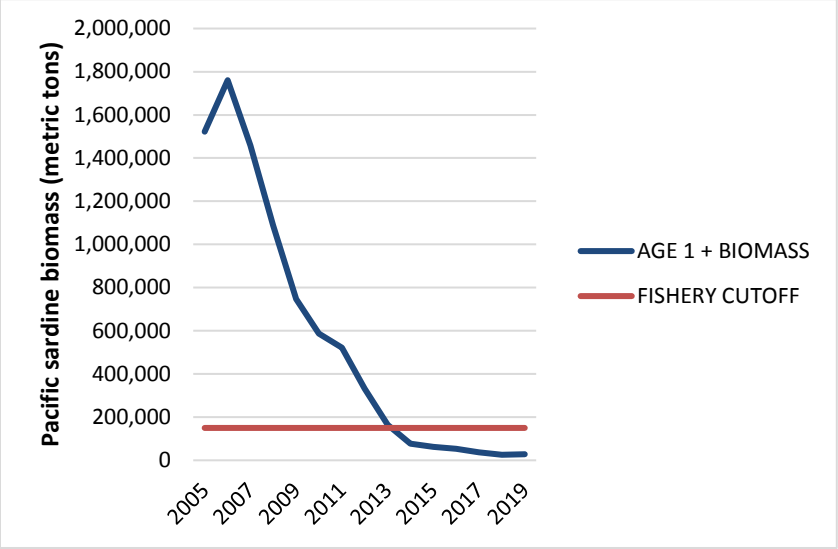

Figure 1. Pacific sardine biomass (age 1+) compared with the 150,000 mt fishery 'cutoff'. The population has collapsed 98% since 2006. Data from NMFS 2019 sardine assessment.

[5] Eileen Sobeck 2015 (National Marine Fisheries Service). Letter to S. Murray (Oceana). June 19, 2015. Stating, "Annual catch has never exceeded the harvest guidelines and overfishing has not occurred."
[6] Zwolinski, J and DA Demer. 2012. A cold oceanographic regime with high exploitation rates in the Northeast Pacific forecasts a collapse of the sardine stock. Proceedings of the National Academy of Sciences (PNAS) 109 (11). 4175-4180.
[7] NMFS 2019, *supra note* 1.
[8] 50 C.F.R. §600.310(e)(2)(E) and §600.310(e)(2)(F)

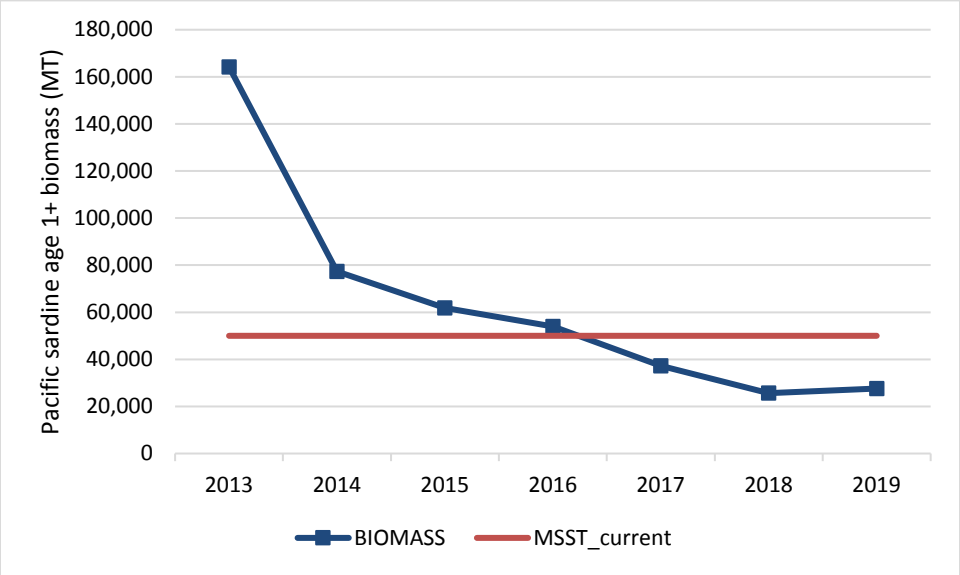

Figure 2. Pacific sardine age 1+ biomass (2013-2019) compared with the 50,000 mt overfished threshold (MSST). Data are from the NMFS 2019 sardine assessment.

2. Overfishing occurred during the sardine collapse and international overfishing is now occurring

The CPS FMP states, "By definition, overfishing occurs in a fishery whenever fishing occurs over a period of one year or more at a rate that is high enough to jeopardize the capacity of the stock to produce MSY on a continuing basis if applied in the long term."[9] The FMP also states, "Overfishing occurs whenever the total catch (U.S., Mexico, Canada, and international fisheries) exceeds ABC [allowable biological catch] or whenever fishing occurs at a rate that is high enough to jeopardize the capacity of the stock to produce MSY."[10] The Pacific sardine stock is experiencing overfishing under each of these definitions.

According to the 2019 stock assessment, the total catch by the U.S., Mexico, and Canada exceeded MSY in the years leading up to the collapse, beginning in 2010 and through 2014. More recently, the combined catch of Mexico and the U.S. exceeded the maximum fishing rate that would support the stock's ability to produce MSY in 2017 and 2018 (Figure 3). By definition, ABC is less than MSY, therefore the total catch also exceeded ABC.

From 2012 through 2014, annual U.S. and coastwide exploitation exceeded 25% of the total biomass, with coastwide exploitation peaking in 2013 at 44.5%. While the U.S. fishery never exceeded U.S. overfishing limits set at the time, we now know U.S. overfishing limits (OFL) and allowable biological catch (ABC) levels were consistently set too high and failed to prevent overfishing on a collapsing stock. This is especially concerning because while forage fish populations exhibit large natural fluctuations

[9] PFMC CPS FMP (February 2018) § *4.3 Definition of overfishing, at 36*
[10] PFMC CPS FMP (February 2018) § *4.6.1 Default CPS Harvest Control Rule, at 37. See also* 16 U.SC. § 1802(34) (MSA definition of "overfished" and "overfishing")

driven by environmental factors, excessive fishing on a declining forage fish population magnifies forage fish population collapse.[11]

Of immediate concern is that the Pacific sardine stock assessment shows that landings of northern subpopulation of Pacific sardines by the U.S. and Mexico exceeded MSY fishing rates in 2017 and 2018.[12] The NMFS Southwest Fisheries Science Center also identified an error in the acoustic trawl abundance estimate used in the 2018 stock assessment, which inflated the OFL and ABC by approximately 1,000 mt.[13] The 2019 assessment shows that the July 2018 biomass estimate in last year's assessment (52,065 mt) was approximately double the updated July 2018 biomass estimate calculated in the 2019 assessment (approx. 26,000 mt) (Figure 4). Therefore, in addition to the coastwide fishing rate exceeding MSY fishing rates (Figure 3), combined U.S. and Mexico sardine landings exceeded the OFL set at the time and what would amount to the corrected OFL.

As shown in various Pacific sardine simulation model runs[14], excessive fishing pressure— particularly during periods of low recruitment and/or abundance— can significantly exacerbate natural sardine population declines. Overfishing on a collapsed, overfished stock is of major concern. It can impede the recovery of the stock and the fishery, and recent management strategy evaluations indicate it can render the population extinct.[15]

Based on the best available science on the 2017 and 2018 total catch by the U.S., Mexico, and Canada relative to MSY in the approved 2019 stock assessment and the definition of overfishing in the CPS FMP, NMFS must immediately declare overfishing to be occurring on the northern subpopulation of Pacific sardine.

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[11] Essington et al. 2015. *Fishing amplifies forge fish population collapses*, PNAS Early Edition, available at http://www.pnas.org/content/early/2015/04/01/1422020112.full.pdf.
[12] NMFS 2019. Draft Pacific Sardine Stock Assessment showing at p14, showing Mexico with a 22.7% harvest rate in 2017 and a 35.1% harvest rate in 2018.
[13] NMFS 2019. NMFS Guidance on Process for Changing Stock Status, MSA requirements when a stock is declared overfished, and 2019-2020 sardine specifications. Agenda Item. E.3.a, Supplemental NMFS Report 1, April 2019. Available: https://www.pcouncil.org/wp-content/uploads/2019/04/E3a_Supp_NMFS_Rpt1_APR2019BB.pdf
[14] Hurtado-Ferro & Punt 2014. Revised Analyses Related to Pacific Sardine Harvest Parameters. Agenda Item I.1.b, March 2014 PFMC meeting.
[15] Hurtado-Ferro & Punt 2014. Revised Analyses Related to Pacific Sardine Harvest Parameters. Agenda Item I.1.b, March 2014 PFMC meeting.

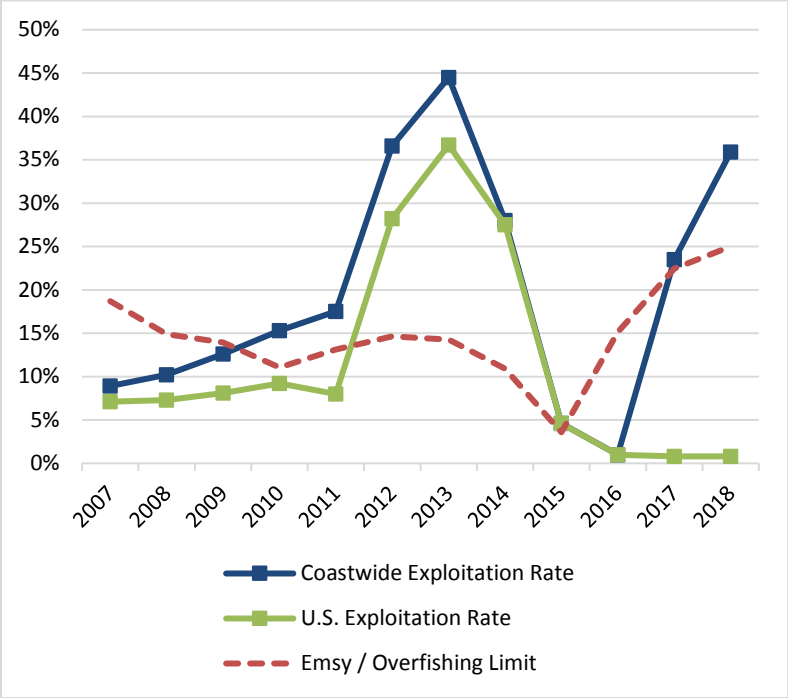

Figure 3. U.S. and coastwide (U.S., Mexico and Canada) Pacific sardine fishery exploitation rates compared with the E_{MSY} fishing rate (that uses the CalCOFI 3-year average index). Fishing rates exceeding E_{MSY} constitute overfishing. Data are from the NMFS 2019 sardine assessment.

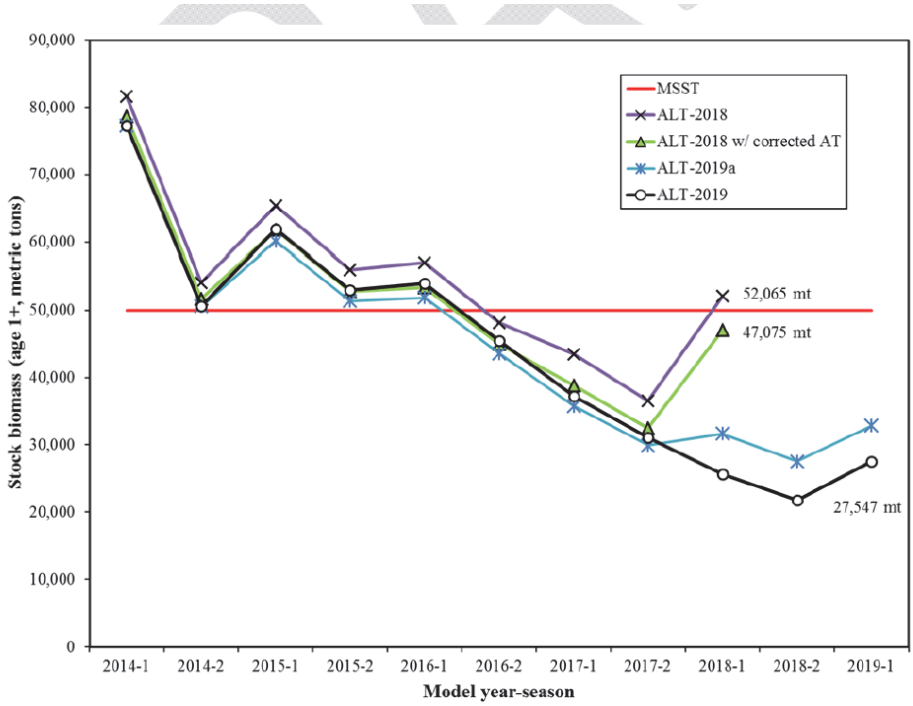

Figure 4. Estimated stock biomass (age 1+ fish, mt) time series from 2014-2019 (Fig 29b in NMFS 2019 Assessment)

3. NMFS must now notify the Council that the Pacific sardine population is overfished, international overfishing is occurring, and take steps to immediately end overfishing and rebuild the stock.

Under the MSA, "'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."[16] As explained above, the agency had enough information two years ago to determine that the stock was approaching an overfished condition[17] because abundance trends from past assessments clearly indicated the stock was heading toward the MSST or had already dropped below MSST. In fact, last year it was so apparent to all involved in CPS management that the stock was nearing the overfished threshold that Council rushed to approve FMP Amendment 17 to allow directed fishing in the live bait fishery should the stock be declared overfished. NMFS stated in the March 22, 2019 federal register notice for CPS FMP Amendment 17:

> "At the June 2018 Council meeting, in anticipation that the Northern subpopulation of Pacific sardine might be declared overfished if there were even a minor decline in the 2019 biomass estimate, the Council initiated an FMP amendment to address the prosecution of the live bait sector of the CPS fishery (primarily consisting of Pacific sardine and northern anchovy) after a stock is declared overfished."[18]

It should be alarming that NMFS reacted to the knowledge of sardine approaching an overfished condition not by notifying the Council of its obligations to end overfishing and rebuild, as required by the MSA, but by supporting an FMP amendment to remove existing protections for an overfished stock. Nevertheless, now that the stock is unequivocally below the MSST, "the Secretary shall i*mmediately* notify the appropriate Council and request that action be taken to end overfishing in the fishery and to implement conservation and management measures to rebuild affected stocks of fish."[19]

Generally, the MSA requires that within two years the Council (or Secretary) prepare and implement rebuilding plan for the fishery to end overfishing immediately and rebuild the stock.[20] The rebuilding plan shall "specify a time period for rebuilding the fishery that shall (i) be as short as possible, taking into account the status and biology of any overfished stocks of fish, the needs of fishing communities… and the interaction of the overfished stock of fish within the marine ecosystem; and (ii) not exceed 10 years, except in cases where the biology of the stock of fish, other environmental conditions, or management measures under an international agreement in which the United States participates dictate otherwise."[21]

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[16] 16 U.S.C. § 1802(34).
[17] 16 U.S.C 1854 MSA § 304(e)(1) "A fishery shall be classified as approaching a condition of being overfished if, based on trends in fishing effort, fishery resource size, and other appropriate factors, the Secretary estimates that the fishery will become overfished within two years."
[18] 84 Fed Reg 10,768 (March 22, 2019). Available: https://www.federalregister.gov/documents/2019/03/22/2019-05455/fisheries-off-west-coast-states-coastal-pelagic-species-fisheries-amendment-17-to-the-coastal
[19] 16 U.S.C 1854 MSA § 304(e)(2)
[20] 16 U.S.C 1854 MSA § 304(e)(3)
[21] 16 U.S.C 1854 MSA § 304(e)(4)

If NMFS determines that the stock is overfished due to excessive international fishing pressure and there are no management measures to end overfishing under an international agreement to which the United States is a party, the MSA requires immediate action to address the situation. NMFS must, "in cooperation with the Secretary of State, immediately take appropriate action at the international level to end the overfishing." Within one year, the Council must develop recommendations for domestic regulations to address the relative impact of fishing vessels of the United States on the stock and… develop and submit recommendations to the Secretary of State, and to the Congress, for international actions that will end overfishing in the fishery and rebuild…"[22] the Pacific sardine stock.

4. **Pacific sardine management reform is needed to prevent future overfishing and achieve optimum yield**

We repeatedly brought to the agency's and Council's attention the predicted sardine collapse[23] and the many shortcomings in sardine management[24] that led to catch levels exceeding MSY during this collapse, such as overly optimistic projections of recruitment in stock assessments, underestimating foreign catches due to the use of a constant 87% "distribution" parameter in U.S. management, an MSST not based on the best available science, and an incorrect temperature index that falsely predicted high sardine productivity as the population was collapsing,[25]among others.

The severity of the sardine collapse could have been reduced had there been a more precautionary harvest control rule in place, had the collapse been acknowledged earlier, and had the U.S. cooperatively managed the fishery with Mexico and Canada or acted independently in a manner to avoid international overfishing. Specifically, as recommended in Essington et al. 2015[26], cutoff levels set at approximately 50% of the mean unfished biomass would prevent fishing from exacerbating forage fish collapses, and Demer & Zwolinski 2017[27] provide a superior method to the current static 87% distribution for setting U.S. catch limits to achieve coastwide target catch rates. The closure of the directed sardine fishery now provides an opportunity to learn from this experience and focus agency resources on systemic improvements to the sardine harvest control rule. Please consider this information and direct your agency to undertake changes to Pacific sardine management and the treatment of published scientific literature and the advice and analysis of scientific experts within NMFS to prevent similar situations in the future.

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[22] 16 U.S.C 1854 MSA § 304(i)

[23] Zwolinski, J. and D.A. Demer. 2012. A cold oceanographic regime with high exploitation rates in the Northeast Pacific forecasts a collapse of the sardine stock. Proceedings of the National Academy of Sciences (PNAS) 109 (11). 4175-4180. Available at: http://www.pnas.org/content/early/2012/02/24/1113806109.full.pdf and PFMC, Agenda Item C.1b8, supplemental public comment. March 2012. http://www.pcouncil.org/wp-content/uploads/C1b_SUP_PC8_SHESTER_MAR2012BB.pdf

[24] E.g. Oceana (March 30, 2017) letter to Herb Pollard (PFMC) on Pacific sardine management, available: http://www.pcouncil.org/wp-content/uploads/2017/03/G5c_Sup_Pub_Cmnt2_Apr2017BB.pdf and Oceana (June 11, 2018) letter to Barry Thom (NMFS). RIN 0648-XG121; Fisheries Off West Coast States; Coastal Pelagic Species Fisheries; Annual Specifications. Available:

[25] Zwolinski, JP and DA Demer. 2019. Re-evaluation of the environmental dependence of Pacific sardine recruitment. Fisheries Research 216 (120-125).

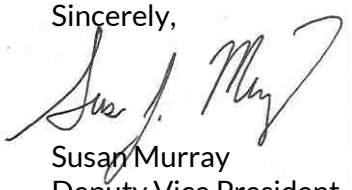
[26] Essington et al. 2015. *Fishing amplifies forge fish population collapses*, PNAS Early Edition, available at http://www.pnas.org/content/early/2015/04/01/1422020112.full.pdf.

[27] David A. Demer & Juan P. Zwolinski. 2017. A Method to Consistently Approach the Target Total Fishing Fraction of Pacific Sardine and Other Internationally Exploited Fish Stocks, North American Journal of Fisheries Management, 37:2, 284-293.

Importantly, at this time, the law is clear the agency must now immediately notify the Council that the stock is overfished, NMFS must immediately take action at the international level in coordination with the Secretary of State to end and prevent overfishing, and the Council must begin the process of developing a plan to end overfishing and rebuild the stock and amending its CPS FMP to fix the errors identified above that contributed to the collapse. We request that NMFS take rapid corrective action to end U.S and international overfishing, rebuild the sardine population and improve Pacific sardine management into the future.

Thank you for your commitment to sustainable fisheries, upholding the MSA, and your attention to this serious issue.

Sincerely,



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cc: Barry Thom, Regional Administrator, NMFS West Coast Region
Ryan Wulff, Assistant Regional Administrator, Sustainable Fisheries Division
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Chuck Tracy, Pacific Fishery Management Council, Executive Director