Agenda Item E.3.b
Public Comment
September 2016

CALIFORNIA WETFISH PRODUCERS ASSOCIATION
PO Box 1951 • Buellton, CA 93427 • Office: (805) 693-5430 • Mobile: (805) 350-3231 • Fax: (805) 686-9312 • www.californiawetfish.org

August 6, 2016

Mr. Herb Pollard, Chair
And Members of the Pacific Fishery Management Council
7700 NE Ambassador Place #200
Portland OR 97220-1384

RE: Agenda Item E.3.b. Anchovy Management Update

Dear Mr. Pollard and Council members,

As Executive Director of the California Wetfish Producers Association (CWPA), representing the majority of coastal pelagic species 'wetfish' fishermen and processors in California, I appreciate your consideration of the following points in the continuing discussion regarding anchovy management. These comments pertain specifically to the CPS Management Team White Paper on Management Options for Northern Anchovy (Agenda Item F.3).

The CPSMT points out that the Active Management category is for fisheries with significant catch levels that require intense harvest management procedures, such as annual stock assessments and annual harvest specifications. In contrast, the Monitored category is intended for lightly fished species where annual assessments are not necessary. "One of the goals of Active and Monitored management is to use available agency and Council resources in the most efficient manner…", according to the CPSMT White Paper.

Northern anchovy was relegated to Monitored status at the onset of Amendment 8, expressly because landings had shrunk dramatically from the heyday of the fishery, when large volumes of anchovy were landed primarily for reduction. As the CPSMT White Paper stated, "Catches of the three finfish stocks in the Monitored category (both substocks of northern anchovy, and jack mackerel) have remained **well below their respective ABC/ACL levels since implementation of the CPS FMP in 2000. Average catches over the last 10 years have been approximately 7,300 mt … for CSNA** [central substock of northern anchovy]… .

In the Appendix, reporting on recent landings, the White Paper noted the increase in CSNA landings in 2015, but stated, "…when higher value fisheries such as market squid and Pacific sardine are slow due to lack of availability to the fishery or season closures, northern anchovy landings tend to increase…". The team recognized this as the likely cause of the fluctuation in landings observed [in 2015]. This was definitely the case, with the sardine fishery closed, and squid on sabbatical due to El Niño. Those conditions have changed, however; squid have returned, and the CPS fleet is now primarily targeting squid.

Please recognize that catches have averaged less than half of the precautionary 25,000-mt limit for more than two decades. As Dr. Richard Parrish pointed out, "The fact that the stock remained in the 0.2 to 0.5 MMT range from 1990 to 2004, surged to over 2.0 MMT in just two years and then fell by more than an order of magnitude in the next couple of years does not appear to have been "monitored" or noticed. The anchovy fishery showed no response to the increased population; apparently the low price for anchovy, the lack of canning and fishmeal processing equipment and the small market for fresh or frozen anchovy is what has limited California landings for the last couple of decades. **Fishery management has had essentially no impact as the conservative annual quota was larger than the market."**

The reduction fishery is history now. However, **the anchovy fishery is still very important to California's historic wetfish fleet as a fishery of "last resort"** -- a target when no other CPS are available. A sharp reduction in existing harvest limits, precluding fishing opportunity to fish on anchovy in slack times, could be the proverbial last straw that curtails California's wetfish industry, the backbone of California's fishing economy.

Attached to this comment letter are excerpts from several sources, illustrating:
"… the biomass of the central stock of northern anchovy is extremely variable and that this variability occurs with and without a significant fishery on the stock. [Richard H. Parrish, Agenda Item H.3.b Supp. Public Comment 4, Nov 2015]

An excerpt from H.3.a SWFSC Report – Summary of Current Information Available on Anchovy, November 11, 2015 "… In 2015, the catch-per-tow of northern anchovy YOY increased to 2.6 and was at record levels over the 2015 sampling period, with the frequency of occurrence near 80% for the entire survey… This would suggest that 2015 summer anchovy spawning was widespread … " [Juvenile Rockfish Midwater Trawl survey for pelagic juvenile (young-of-the-year, YOY) rockfish - Central California Coast, May-June 2015 [pages 3-4]]

Even greater abundance is now reported by fishermen from northern to southern California. Hopefully the abundance that fishermen observe will also be documented in 2016 scientific surveys.

A recently study, *When does fishing forage species affect their predators?* Fisheries Research (Amsterdam). finds that variability in small coastal pelagic fish (i.e. anchovy and sardine) is controlled predominantly by the environment. Scientists concluded that patterns appear to be driven by both density-dependent and density-independent dynamics (Lindegren et al. 2013) and have been ongoing long before the presence of commercial fishing.

The study also shows that neither anchovy nor sardine abundance influences the rate of change in predator abundance (i.e. sea lion or brown pelican populations). **Management of CPS stocks is precautionary, conservative, and successful. Fishing pressure is generally negligible compared to the large-scale effects of environmental forcing.**

Clearly, there is no biological point of concern re: anchovy abundance, but there could be a serious socio-economic point of concern if the small harvest limit now allowed in the CSNA fishery is further restricted.

Therefore we recommend that the Council :

[1] retain the status quo management option for the CSNA fishery, with the current harvest specifications, which represent a reasonable average OFL and ultra precautionary harvest limit, in light of the variability in anchovy abundance and the negligible impact of the fishery.
[2] consider recent record anchovy recruitment and

[3] further recognize the need to expand surveys to completely assess biomass (both anchovy and sardine) in the nearshore, as well as the upper water column.

Neither the CalCOFI DEPM nor AT surveys, both designed primarily for sardine, effectively quantify the nearshore, thus have not measured the total abundance of anchovy (and sardine) that has been observed by fishermen since summer 2015. In fact, an interim assessment utilizing existing data, which excludes both the nearshore and evidence of recent recruitment, would seriously underestimate the current biomass.

One last point in considering Monitored vs. Active Management status, please consider the comment from Dr. Richard Parrish: **"Clearly the biomass variations … demonstrate that in the central stock of northern anchovy biomass estimates are worth very little for real time management if they are more than 1 year old."**
Annual stock assessments would be hugely expensive for a fishery that has averaged less than 10,000 mt per year over the past decade.

Fishery management has had essentially no impact as the conservative annual quota was larger than the market. This fishery should be allowed to continue under its current management framework.

Thanks very much for your consideration of these recommendations.

Our best regards,

Diane Pleschner-Steele

Diane Pleschner-Steele
Executive Director

From Richard H. Parrish, November 11, 2015 – Comments on Draft Paper "Non-Fishery Collapse of Northern Anchovy off California," MacCall, A.D. et al (Agenda Item H.3.b Supp. Public Comment 4, Nov 2015)

"…. **The analysis shows that the biomass of the central stock of northern anchovy is extremely variable and that this variability occurs with and without a significant fishery on the stock**. For example, their biomass estimates increase more than an order of magnitude in two years, from 128 TMT in 2003 to 2,002 TMT in 2005. They then fall an order of magnitude to 213 TMT in 2007 and then fall another order of magnitude to 19 TMT in 2009. This was during a period without a significant fishery.

The paper provides numerous examples where biomass changes by factors of 2-5 in a single year. **Clearly the biomass variations shown in the paper demonstrate that in the central stock of northern anchovy biomass estimates are worth very little for real time management if they are more than 1 year old. "**

The expansion and contraction of range is not as simple as stated in the MacCall et al paper because **geographical distribution is highly age-dependent in the northern anchovy. The bulk of the young-of-the year (YOY) and age 1 anchovy population is found much closer to shore than the older anchovies (Parrish et al 1985). Note that this occurred during the period of high anchovy biomass (i.e. the mid-1960s to the mid-1980s). During the peak of the anchovy fishery, YOY and age 1 anchovies were concentrated in the very near shore area (i.e. less than 50 fm. depth) and older anchovies were concentrated in deeper water and further offshore (Figure 7 and Table 6).** In other words it would take a year or two before a super abundant year-class would have significant biomass outside of the shelf break. This concept is relatively unimportant in the broad biomass trends seen in the paper but it could be very important in an expanded fishery where annual quota management of the stock would be required.

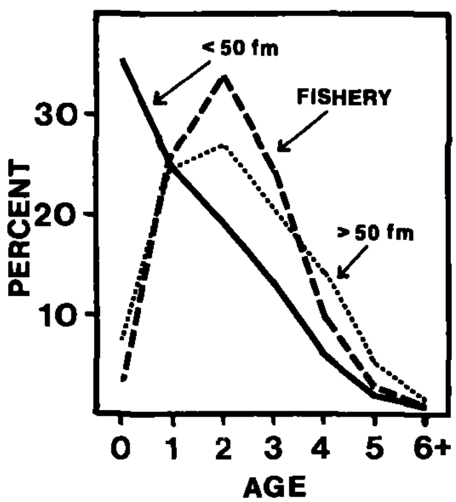


Figure 7. Comparison of the age composition of northern anchovies taken in the San Pedro purse seine fishery with those taken in areas with <50 fathoms and >50 fathoms of water in the mid·water trawl Sea Survey Program. (from Parrish et al 1985)

Conclusions:

The biomass estimates in the MacCall et al paper cannot be used to estimate the 2016 biomass of the northern stock of anchovy. The paper clearly shows that the population can increase, or decrease, an order of magnitude in two years. The last year of the biomass time series is 2011 and the last year-class in this estimate was the 2010 year-class. Essentially the entire spawning population of 2011 is now dead. Clearly with northern anchovy a 5-year-old biomass estimate is not significantly better at estimating current biomass than a 25 year old biomass estimate. …

… I agree that the recent central stock anchovy biomass in Southern California has been at a very low level; however, when the catches at the cold water edge of the anchovy's stocks range is greater than the minimum biomass estimate I have to wonder if geographical, seasonal, or environmental bias is causing problems.

From: A.D. MacCall et al/Fisheries Research 175 (2016) 87–94

Fig. 7. Comparison of new area weighted biomass estimates (circles) and corresponding biomass estimates from Jacobson et al., (1994) (squares, solid line) and Methot, (1989) (triangles, dotted line).

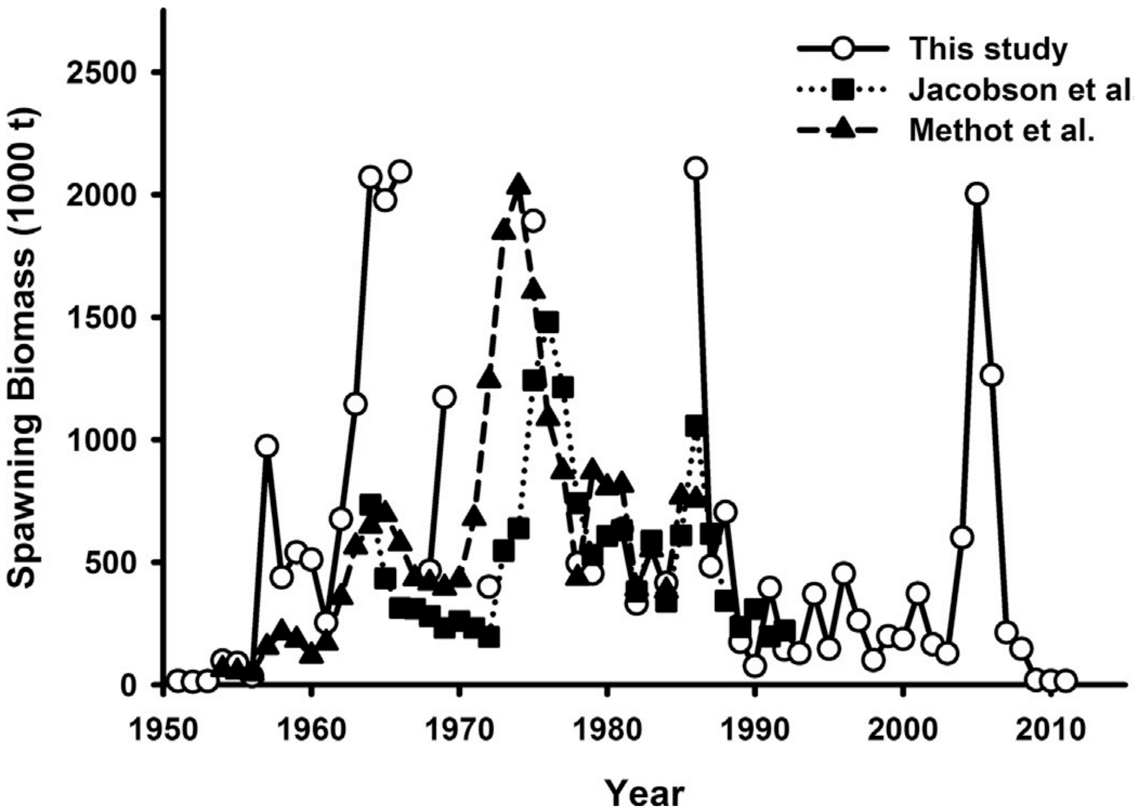
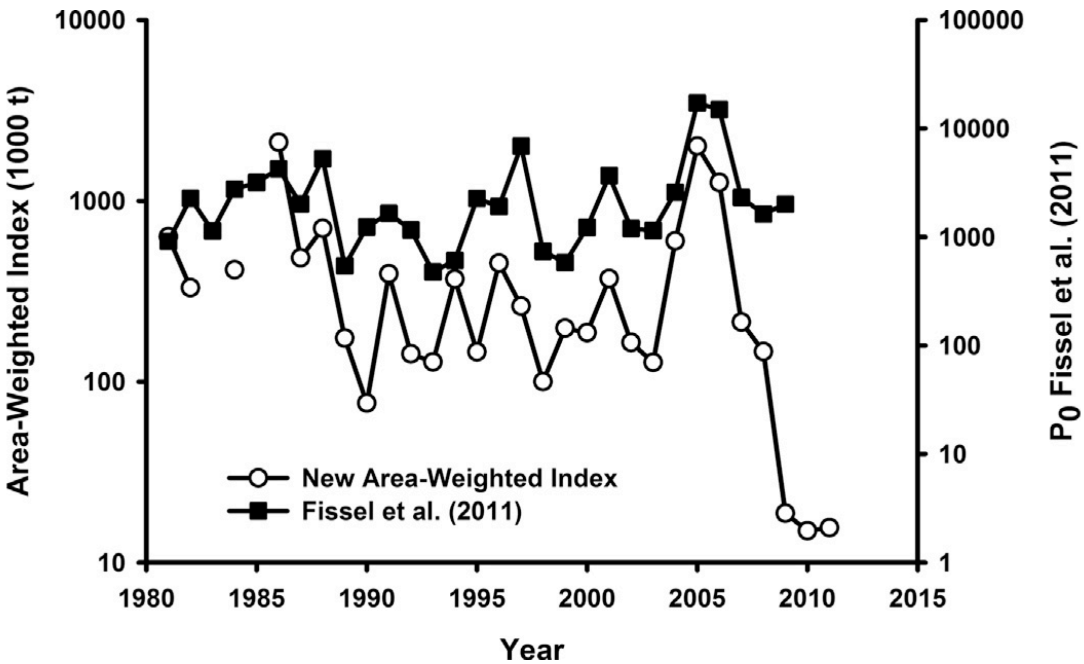


Fig. 9. Comparison of time series of egg production rate (P0) estimates from Fissel et al. (2011) with area-weighted biomass estimates, including additional values for2010 and 2011.



From H.3.a SWFSC Report – Summary of Current Information Available on Anchovy, November 11, 2015

Excerpts:

Winter 2015 CalCOFI, Spring 2015 CalCOFI-CPS Survey [page 2]

Recent shifts in CPS distributions in the CalCOFI data were reported in response to the 2013 Unusual Mortality Event (UME) of California Sea Lions (Figure 4). Pacific sardine have shifted distribution offshore during the period from 1996 to 2012, while the **distribution of northern anchovy may have shifted slightly inshore from 2007 to 2011** as reported in http://www.nmfs.noaa.gov/pr/health/mmume/casealion2013_investigation.htm.
However, anchovy populations have always been associated with nearshore waters at both high and low population levels and in offshore waters at high abundance levels due to inshore habitat limitations and transport from nearshore upwelling areas (Reiss, et al. 2008; Kramer and Alhstrom, 1968; Hewitt, 1980).

2015 Summer "SaKe" synoptic survey of the California Current [page 3]

Northern anchovy juveniles and adults (91 kg total) ranging in size from 30mm SL to 150mm SL were collected in 47 out of 160 trawls (29% frequency of occurrence) and collected from San Diego to Vancouver Island (Figure 5).

Densities and timing of anchovy eggs observed in the 2015 SaKe survey suggest that anchovy were spawning at multiple locations along the west coast as well as at different times during summer 2015. Anchovy eggs collected in three main concentrations suggest that anchovy spawning was occurring during June in the southern California Bight, in July off San Francisco, and off the Columbia River in August.

Juvenile Rockfish Midwater Trawl survey for pelagic juvenile (young-of-the-year, YOY) rockfish - Central California Coast, May-June 2015 [pages 3-4]

The abundance of adult Pacific sardine and northern anchovy remained very low, although **larval catches for both species were at high or record levels in most areas (Figure 7).**
Average adult northern anchovy catch-per-tow between 1983 and 2004 was 0.9, increasing to 2.12 in 2006, before declining to 0.19 in 2008. Between 1998 and 2014, average catch per tow of northern anchovy young-of-year

(YOY) was low (0.0015). **In 2015, the catch-per-tow of northern anchovy YOY increased to 2.6 and was at record levels over the 2015 sampling period, with the frequency of occurrence near 80% for the entire survey (Figure 8). This would suggest that 2015 summer anchovy spawning was widespread and not centered only in Monterey Bay.**

Conclusions [page 5]

However, the SWFSC agrees with the draft MacCall, et al. paper as included in the Briefing Book, as well as Koslow, et al. (2015), that **this is not a fishery-related decline**, and acknowledges that additional analyses of the complete CalCOFI dataset and other potential datasets is needed to fully document the extent of the decline. **It appears that northern anchovy distribution as well as other species may have shifted both spatially and temporally out of the normal CalCOFI sampling area in recent years** due to severe environmental changes (i.e., the "Warm Blob", the Pacific Decadal Oscillation, early El Niño effects) suggesting that the historical CalCOFI sampling grid in the Southern California Bight may not be adequately tracking the northward shift in anchovy abundance and distribution.

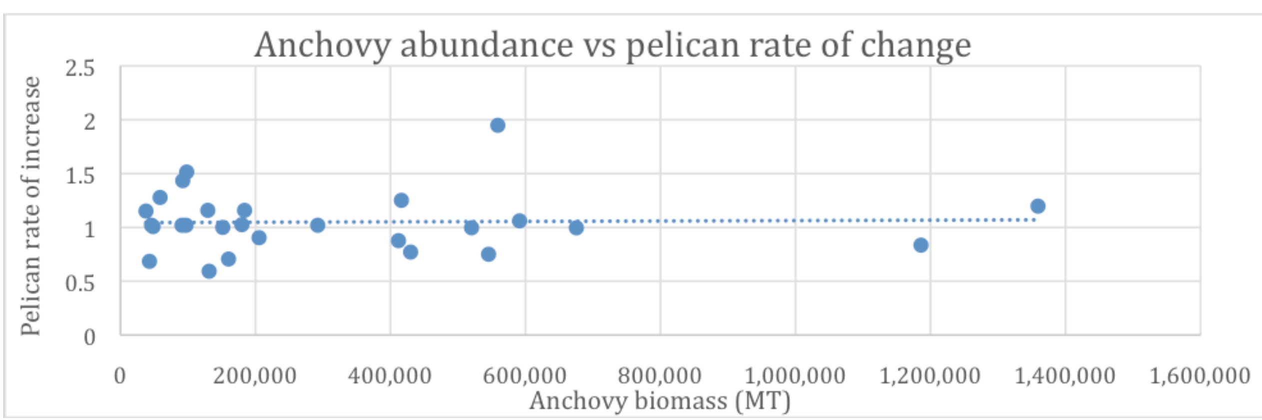
Finally, evidence of multiple spawning locations and high numbers of potential recruits of both northern anchovy subpopulations and Pacific sardine along the west coast suggests that 2015 may be a better year for CPS than has been observed in the past few years. However, while the increased recruitment signals are positive, it is premature to assess their overall contribution to the stock without conducting a formal stock assessment.

Prey abundance and predator rate of change in the California Current

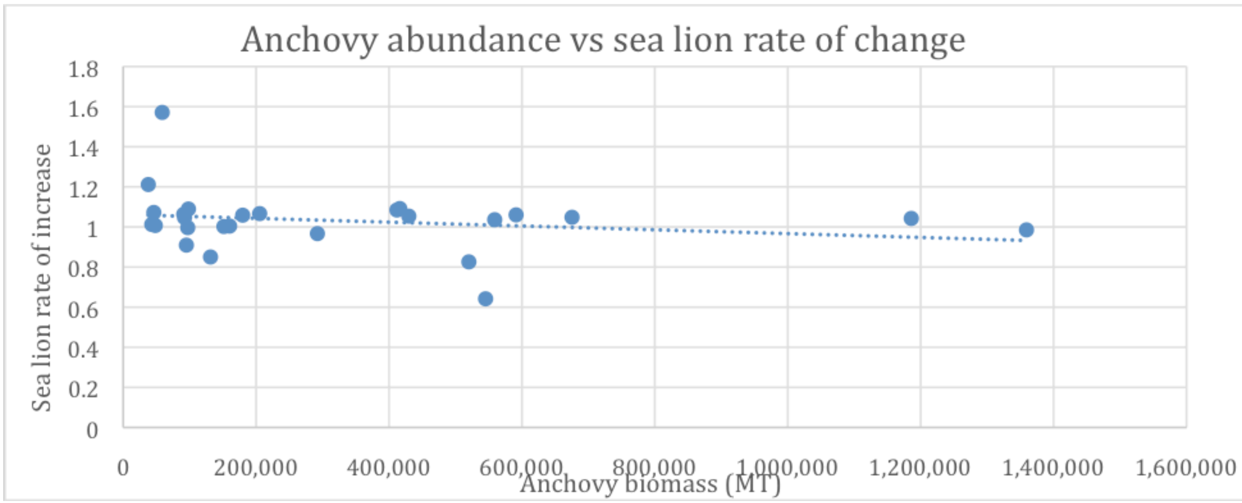
*The following information is from a manuscript by Hilborn, R., Amoroso, R, Bogazzi, E., Jensen, O.P.,Parma, A, Szuwalsky, C., Walters, C.J., submitted. *When does fishing forage species affect their predators?* Fisheries Research (Amsterdam).
Compiled by Joel VanNoord, supervising scientist for the California Wetfish Producers Association.

Neither anchovy nor sardine abundance influences the rate of change in either Sea Lion or Brown Pelican populations.

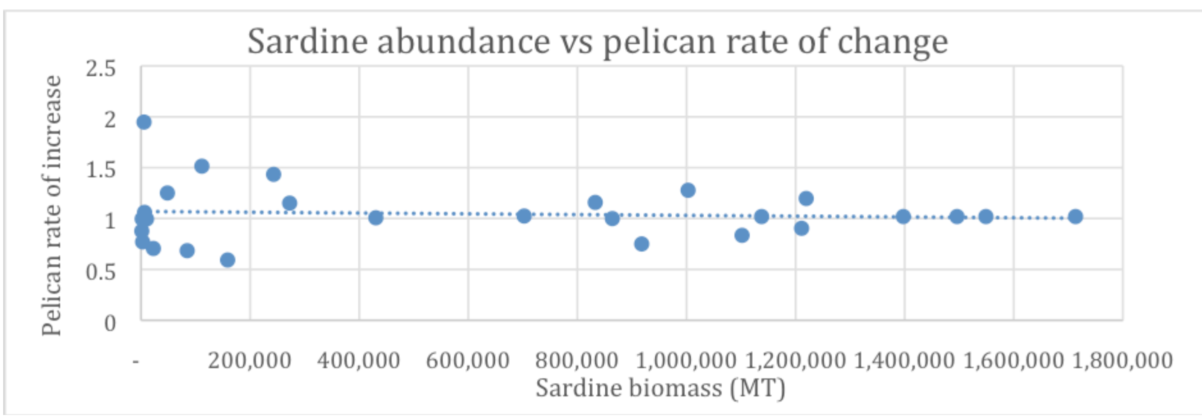
If anchovy or sardine populations controlled the growth rate of predators, we would expect an increasing population growth rate for predators with an increasing sardine or anchovy population. For example, the predator population would increase as more prey became available. Abundance data do not support this, however. We see a constant predator growth rate regardless of the population size of either anchovy or sardine.



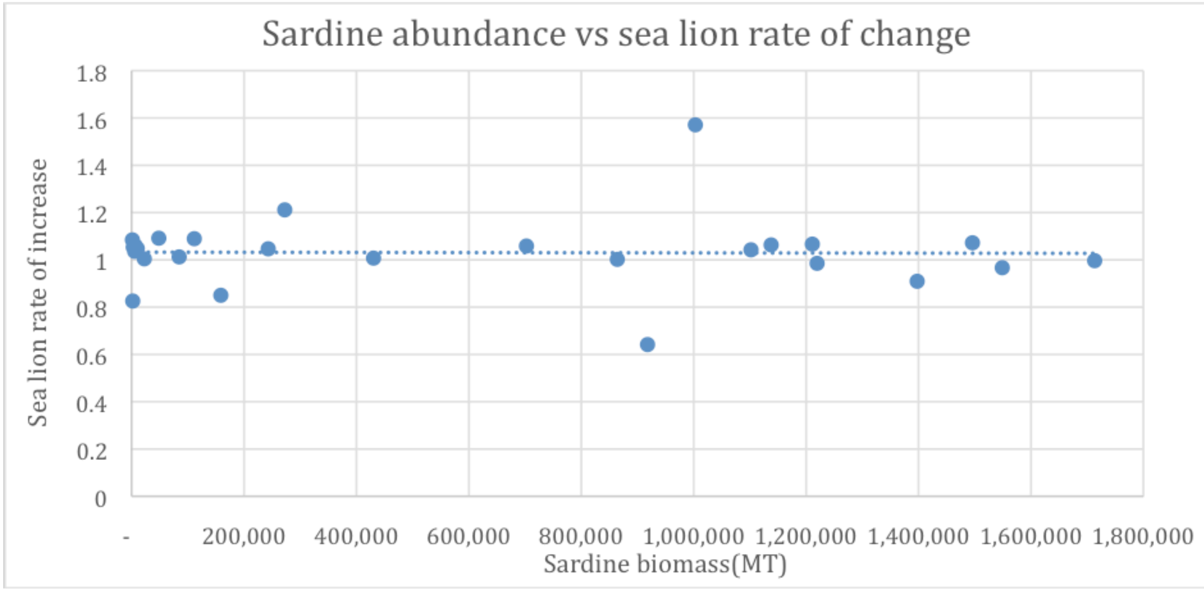
The estimated yearly biomass of the central subpopulation of northern anchovy ranged widely, from ~40,000 to nearly 1.4 million metric tons during the period from 1981-2009. Despite a wide range of anchovy prey available, the rate of increase of pelican nests remained unchanged during the same time period. A rate of change value of 1 indicates no change in the population. This pattern is similar for both predator and prey relationships, shown in the three graphs below.



The amount of anchovy prey available in the water also had little effect on the rate of change on the abundance of sea lion pup counts from 1981-2006.



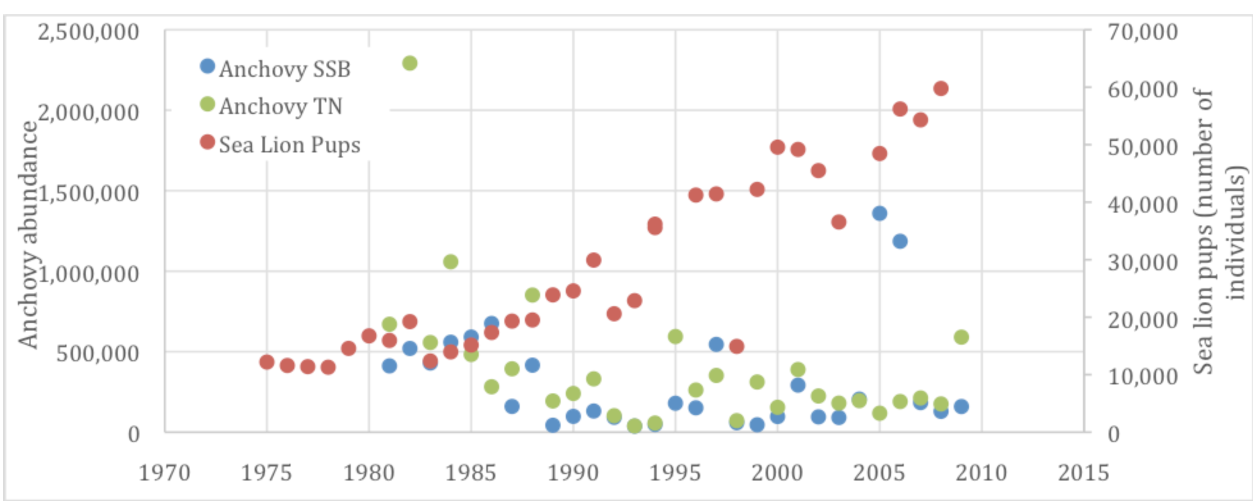
Sardine abundance ranged from < 7,000 to ~1,700,000 MT during the period from 1981-2007. Despite this wide range of estimated prey available in the water from year to year, the rate of change of pelican nests was not affected by this, meaning the growth rate was the same whether there were 7,000 MT of sardine, or 1,700,000 MT.



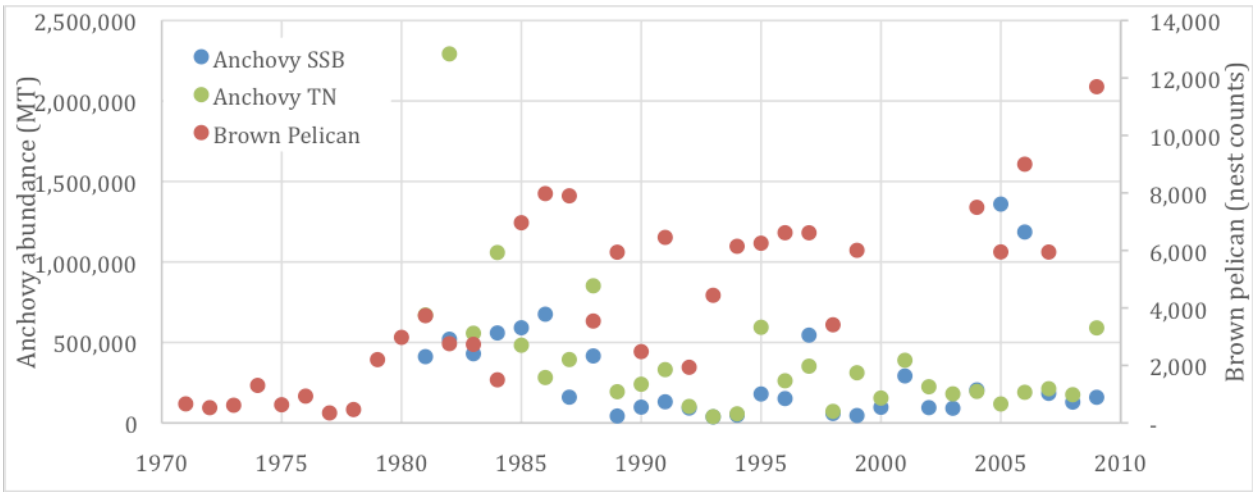
The amount of sardine prey available in the water also had little effect on the rate of change on the abundance of sea lion pup counts during the period from 1981-2006.

Predator populations increased while prey declined

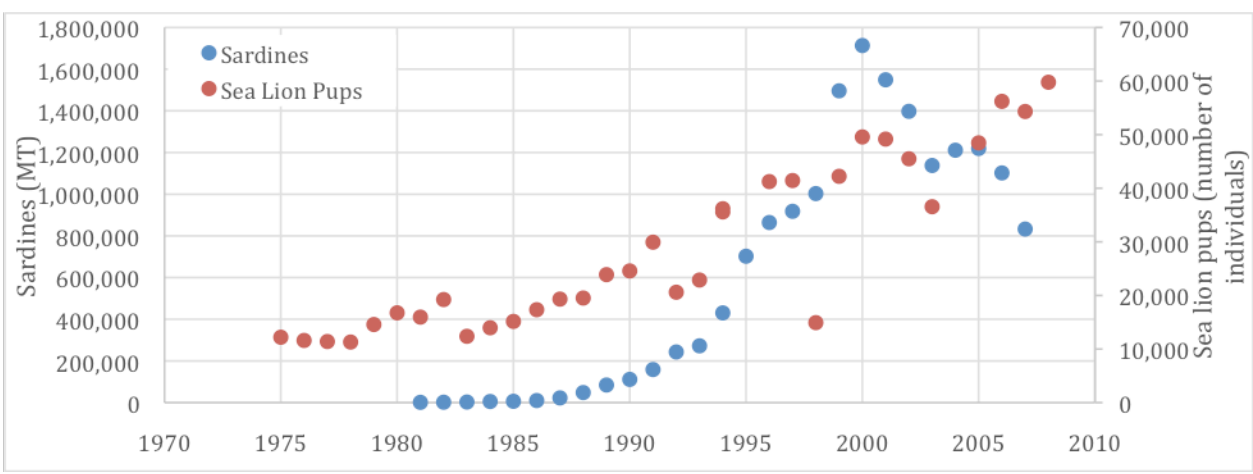
Sea Lion and Brown Pelican abundances have increased steadily from 1971 to 2009 despite declines and variability in anchovy and sardine populations. This is especially evident for anchovy populations, which seem to show an inverse relationship with sea lion pup counts. This shows a thriving predator population increasing over time, despite variability in prey populations and declines in anchovy abundance.



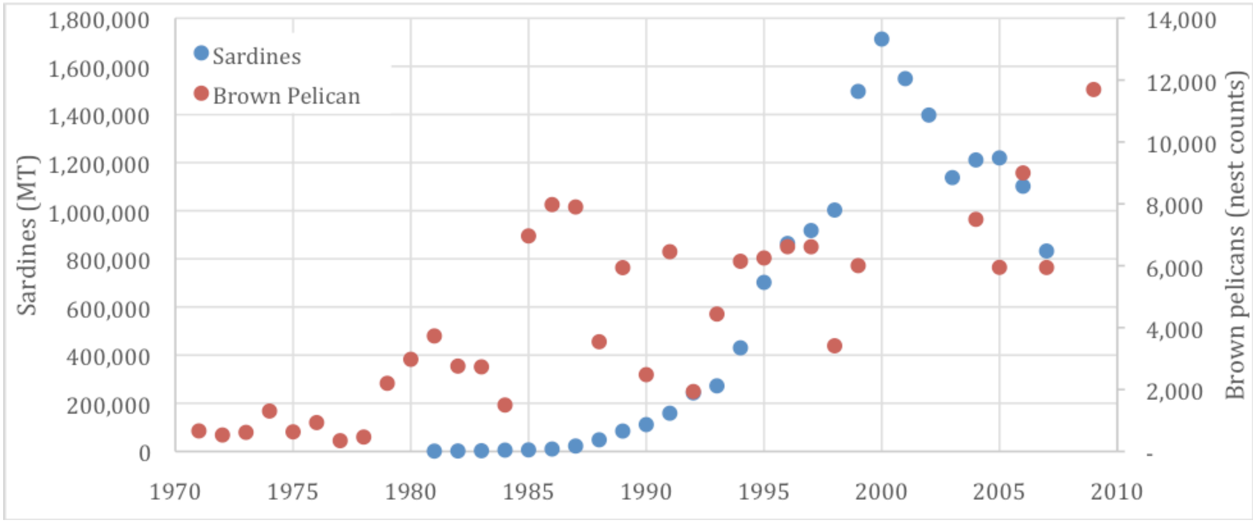
Sea lion pup counts increased dramatically from the 1970's to the present, despite an overall decrease in anchovy biomass available. The sea lion abundance increase is largely associated with the success of increased protections enacted with the 1972 Marine Mammal Protection Act. The major drop in sea lion pup counts seen in 1998 was largely attributed to warm ocean waters caused by the historically strong El Niño of 1997-98.SSB refers to spawning stock biomass, TN refers to total numbers.



Brown pelican nest counts were as low as 663 nests in the early 1970's. These low population levels are largely due to the widespread use of pesticides, such as DDT and dieldrin, which caused high hatching mortality due to a thinning of the egg shells. After the elimination of these pesticides, brown pelican nest counts rose dramatically during the 1980's to a high of ~12,000 nests in 2009, this is despite decreasing and variable anchovy population estimates, indicating that the population recovery was largely due to the removal of poisons from the environment, and not the availability of additional prey resources.



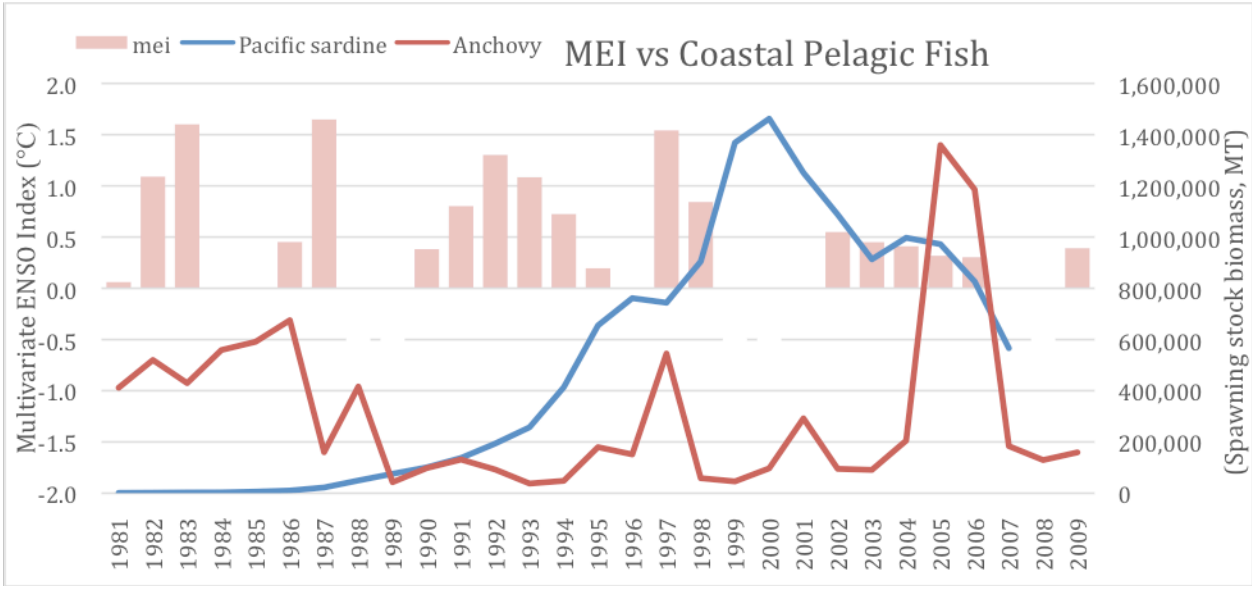
Sardine and sea lion pup counts were in sync from the 1980's through 2000, when the sardine population began to decline, largely due to a changing oceanographic regime. Despite this drop in sardine prey availability, sea lion pup counts continued to increase.



Brown pelican nest counts were very low in the 1970's, in large part to the widespread use of pesticides and such as DDT and dieldrin, which caused a thinning of pelican egg shells. After the elimination of these pesticides, brown pelican nest counts rose dramatically during the 1980's, a period when the sardine population was low. The brown pelican population then leveled off as the sardine population hit an estimated high in 2000 before dropping off again. Brown pelican nest counts were largely uninfluenced by sardine abundance.

Small coastal pelagic fish variability controlled by the environment

Anchovy and sardine are short-lived species that undergo periodic, asynchronous and large-scale population fluctuations that are driven by warm and cool phases of the El Niño Southern Oscillation and the Pacific Decadal Oscillation. We can see that in the time series below, where the anchovy population is initially high, drops, and begins to rebound. The sardine population is initially low, peaks in 2001, and begins to decline. This pattern has been ongoing long before the presence of commercial fishing. Lindegren et al. (2013) modeled the population fluctuation from the 1660's onward and found the same large-scale and asynchronous patterns of population expansion and contraction. **These patterns were concluded to be driven by both density-dependent and density-independent dynamics (Lindegren et al. 2013). Management of these stocks is precautionary, conservative, and successful. Fishing pressure is generally negligible compared to the large-scale effects of environmental forcing.**



Notes and sources of data:

Data prepared by:

Hilborn, R., Amoroso, R, Bogazzi, E., Jensen, O.P.,Parma, A, Szuwalsky, C., Walters, C.J. submitted. When does fishing forage species affect their predators? Fisheries Research (Amsterdam).

Brown Pelican: data were extracted from a graph reported at
http://www.esasuccess.org/birds.shtml

California Sea Lion:

Carreta, J. V, Forney, K. A, Oleson, E., Martien, K., Muto, M. M., Lowry, M. S., Barlow, J., Baker, J., Hanson, B., Lynch, D., Carswell, L., Brownell Jr., R., Robbins, J., Mattila, D. K., Ralls, K. and Hill, M. C. 2011. US. Pacific Marine Mammal Stock Assessments: 2011. NOAA-TM-NMFS-SWFSC-448. 356 pp.

Pacific Sardine:

Hill, K.T., Dorval, E., Lo, N. C. H., Macewicz, B. J., Show, C. and Felix-Uraga, R.. 2007. Assessment of the Pacific Sardine Resource in 2007 for U.S Management in 2008 .NOAA-TM-NMFS-SWFSC-41. 157 pp.

Northern Anchovy:

Fissel, B. E., N. C. H. Lo, and S.E. Herrick. 2011. Daily egg production, spawning biomass and recruitment for the central subpopulation of northern anchovy 1981–2009. CalCOFI Rep. 52:116-129.

Lindegren, M., Checkley, D.M. Jr., Rouyer, T., MacCall, A.D., Stenseth, N.C. 2013. Climate, fishing, and fluctuations of sardine and anchovy in the California Current. PNAS. 100:33, 13672-13677.

Abundance of anchovy and sardine correspond to the best estimates of the spawning biomass expressed in metric tons. In the case of the California Sea Lion, the preferred time series of abundance correspond to pups counts. For Brown Pelican, we used the number of nests as a proxy for abundance.

Rate of change for predators was calculated by subtracting the log of next year's abundance from the log of the current year's abundance estimate, divided by the number of years between counts, and then taking the exponentiation of that. So that,

$$Rate\ of\ Change = e^{\frac{\log abund.\,y2 - \log(abund.y1)}{y2 - y1}},$$

Where *e* is the exponential, abund.y2 is predator abundance in the subsequent year, abund.y1 is predator abundance in the current year, y2 is the subsequent year, and y1 is the current year.