

**Minutes for the Pacific Scientific Review Group Meeting  
Southwest Fisheries Science Center (Pacific Room), La Jolla, CA  
21-23 March 2018**

The 28<sup>th</sup> meeting of the Pacific Scientific Review Group (SRG) was held at the Southwest Fisheries Science Center, La Jolla, CA from 21-23 March 2018. SRG members present were Tim Ragen, John Calambokidis, Scott Baker, David Itano and Rebecca Lewison. New SRG member Simone Baumann-Pickering was not able to attend. Karin Forney served as rapporteur. Tim Ragen served as chairman of the SRG. The attending SRG members and other participants are listed in Appendix 1, review documents are listed in Appendix 2, and the agenda of the meeting is in Appendix 3.

### **General Topics**

Lisa Ballance welcomed SRG members and attendees. She also noted the recent changes in SRG membership, and emphasized the important contributions made by current and past SRG members. Following introductions by all attendees, Tim Ragen provided an overview of SRG procedures and the structure of the meeting.

### **Scientific Review Group Overview**

Karin Forney provided an introductory presentation with an overview of marine mammal stock assessments under the MMPA, and the role of the SRGs. The MMPA, as amended in 1994, includes specific language regarding information to include in marine mammal stock assessment reports, particularly the calculation of the Potential Biological Removal (PBR) for each stock. Beginning in 1994, a series of workshops have been held to establish and revise criteria for calculating the elements of PBR and for other aspects of marine mammal stock assessment. The most recent efforts resulted in the 2016 Guidelines for Assessing Marine Mammal stocks (GAMMS). The SRGs are an important part of the assessment process, providing expertise and review to the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (FWS) for assessment-related research and the stock assessment reports (SARs).

### **SRG Terms of Reference**

Shannon Bettridge provided details on the terms of reference (TOR) for SRGs. Three regional SRGs were established under the 1994 MMPA, but over time questions came up about the process for appointing members. NMFS recently implemented a national membership process, using other similar advisory groups as guidance. A third of SRG members are now reviewed annually, expertise gaps are identified, and new member nominations are solicited via Federal Register Notice. Members serve three-year terms, renewable up to two times. Scott Baker inquired how the 3-year term was decided upon, noting that this is a short period given the steep learning curve for new members. Bettridge indicated that the duration of a membership term will be reviewed soon as part of a planned TOR review.

### **Pacific SRG perspectives**

Ragen provided some additional perspectives from his experiences with the SRG, Marine Mammal Commission, and NMFS, and recognized the scientific excellence of all involved. He noted that the SRGs provide critiques of the science and management, but primarily they are tasked with providing advice to help guide and improve the marine mammal stock assessment process. The non-governmental perspective is a valuable part of this advisory role. The challenges of marine mammal assessment are difficult and take time to resolve, so a long-term perspective that keeps priorities and constraints in mind is essential. Rebecca Lewison expressed interest in providing an outside perspective, and wondered how the SRG would move forward given the recent turnover of members. David Itano added that he had not anticipated the mass

resignation or term outs of so many experienced individuals on the SRG so early in his term and had hoped to gain more from their expertise. He hoped that the current SRG members could advise on expertise that is needed on the SRG to allow the new membership to address the often complex issues. Itano has been involved in fisheries internationally, and commended the U.S. fisheries for their work to reduce bycatch and impacts on the ecosystem. John Calambokidis noted that it has been interesting to develop from a newcomer on the SRG not too many years ago to being the most senior member on the SRG. Being part of the SRG process with the individuals in the room has been very rewarding, and he also commended fisheries and NMFS for their efforts. The SARs are relied upon by students, other researchers, and other entities interested in marine mammals and are very valuable documents beyond their role in management. Calambokidis noted that some turnover in SRG members is important, but some of the changes made to the SRG processes by NMFS were controversial with the Pacific SRG. He agrees with the perspective of the SRG members who resigned over changes imposed by NMFS, because he believes it undermines the SRG's independence, which is key to its functioning. With more turnover and less experience, there is a tendency to defer to the agency, so having long-serving members is important and this is why he remained on the SRG. Calambokidis finds the meetings extremely valuable, and commends especially SWFSC and PIFSC for all the data and research that go into the SARs. Their approach and responsiveness to SRG ideas and requests have been very good, particularly on the science side. Scott Baker echoed the commendations for work done by the Science Centers, having served on the Program Review of Protected Species Science on Marine Mammals and Sea Turtles in 2015.

### **National Updates**

Bettridge provided an overview of several NMFS staffing changes. Chris Oliver is now Assistant Administrator for Fisheries, and he has particular expertise in Alaskan issues. There are several vacancies at NMFS Office of Protected Resources (PR), so several tasks have been delayed. Kristen Koch was just appointed Science Director of SWFSC, the SEFSC will also have a new director soon, and there is a new Atlantic Region Administrator. This turnover brings new perspectives and new interest in SRG. The Atlantic and Alaska SRG already met this year. The Atlantic SRG has had 1-2 new members appointed each year, and they have raised great new questions. North Atlantic right whales are currently a focal topic because of the declining population trend and the increase in strandings. The Alaska SRG has had a lot of retirements, so the recent meeting included only 2 of 8 members with prior experience. They also had discussion on how to move forward with new members and the member review process.

The government currently remains in a Continuing Resolution (CR) with no new budget information, creating instability that is disruptive. The most recent CR in February included an unusual requirement to waive the requirements of the MMPA for a planned sediment diversion and coastline redevelopment project in Louisiana. The motivation for this waiver was Barataria Bay, as the diversion will involve the bottlenose dolphins found there. Normally a waiver requires rule-making and administrative law review. A separate hearing is planned in the near future to address the MMPA, specifically regarding conflict with endangered species, tribal needs, and captive husbandry.

There are several other ongoing projects at PR. The unusual mortality event (UME) for Guadalupe fur seals that started in 2015 is still ongoing, and there have also been an unusual number of minke, humpback, and North Atlantic right whale strandings in the Atlantic. PR has initiated a review of the marine mammal serious injury policy, and if revisions are determined to be necessary, they will work with the Science Centers and SRGs to revise and update the policy. Guidelines for using non-lethal marine mammal deterrents are being developed and will

hopefully be published in the next year. Criteria developed in 1999 for negligible impact determinations for species listed under the Endangered Species Act (ESA) that are taken in commercial fisheries are also being reviewed, and revised criteria will be sent to the SRG for input when drafted. Lastly, PR has been working on an internal process for designating marine mammal stocks, as the MMPA does not provide specific guidance and there is a need to improve consistency and identify what types of science can be used to delineate stocks. Until the guidance is implemented, NMFS will not be designating any new stocks. The SRG will have an opportunity for review and input.

Scott Baker asked about the information included in the stock definition section of each SAR and Bettridge responded that the new guidelines will try to identify the necessary stock delineation details. Itano inquired about future Guidelines for Assessing Marine Mammal Stocks (GAMMS) processes, and Bettridge explained that the latest revision of the guidelines addressed seven of nine issues identified at the last workshop. Two remaining issues (outdated abundance estimates, and the 'likely to be listed' as strategic designation) will be worked out in the future. Ragen noted that an MMPA waiver does not mean the populations should not be monitored, and added that extensive research and baseline studies were integral to the assessment process as developed under the MMPA. He also requested that the Pacific SRG continue to be made aware of national issues, as they may have Pacific relevance as well.

Kristy Long gave an overview of 2018 List of Fisheries (LOF) changes, which only included re-categorization for one Alaska fishery and the CA/OR drift gillnet fishery. Calambokidis inquired why the Dungeness crab fisheries is a Cat II fishery despite high levels of whale entanglement. Long explained that the LOF can only use information on gear that is specifically identified as a particular fishery for the LOF tier analysis, and most of the entanglements reported in the SARs involve unknown gear. Calambokidis expressed concern that this creates a disincentive to identify gear. Long acknowledged this, and indicated that a peer-reviewed process for assigning unknown gear to fisheries would allow the information to be used. More importantly, she also noted that a re-classification from Category II to I would not change any requirements for the fishery or affect the process for addressing entanglements under MMPA section 118.

### **Pacific Islands Fishery/Management Updates**

Kevin Brindock provided an overview of Pacific Islands Regional Office (PIRO) management actions. A recovery plan is currently under development for the insular Main Hawaiian Islands (MHI) population of false killer whales, and a critical habitat rule is expected to be finalized by July 2018. Pacific Islands LOF changes will reflect that humpback whales are taken in the shallow-set longline fishery and include updates to the number of fishery participants.

The false killer whale Take Reduction Plan (TRP) was finalized in 2012 and became effective in 2013, with a short-term goal to reduce mortality and serious injury of the pelagic stock of false killer whales below PBR and a long-term goal to reduce below 10% of PBR. Currently, the PBR is calculated only for the EEZ, although the pelagic stock extends outside EEZ, so the TRP also includes a goal of not increasing takes outside of the EEZ. Patterns of false killer whale takes in recent years show high variability but no distinct trend. Post-TRP there have been more takes outside the EEZ (89% vs. 33% pre-TRP), and during this time there has also been an increase in fishing effort and a shift towards areas outside the EEZ. Active tension has been used more often (79%) than tie-off as handling technique to allow hooked animals to free themselves; however active tension includes a range of actions taken by vessel crew. Sample sizes are still too small to identify changes in interaction outcomes, but since the 2013 implementation of TRP measures requiring circle hooks with  $\leq 4.5$  mm wire diameter and stronger branchlines (to allow hooks to

straighten and pull out rather than have lines break), only about one third of lines have remained intact and only 11% of hooks have straightened. Injury determinations for false killer whales during 2013-2018 resulted in classification of 64% as serious injuries, 22% non-serious injuries, 8% deaths, and 6% for which injury severity could not be determined.

Itano expressed concern about handling measures that are not fully tested that put crew at risk and likely stress the animals, and noted that further testing of gear solutions should be done. Ragen asked about the range of pelagic false killer whales that interact with the longline fisheries, and Scott Baker wondered whether the false killer whales are depredating catch or bait and if there has been an increase that might indicate animals are learning. Erin Oleson clarified that the pelagic stock extends beyond the EEZ but its full geographic range is not known. Depredation is known to be involved but cannot always be determined. Photo-identification could help understand animal behavior, but not many individuals from the pelagic stock are known. Lewison agreed that there is a need to find a better mitigation approach that is safer for crew and more effective, as the TRP is not working.

Forney provided a brief overview of a TRP effectiveness analysis conducted last May in support of TRP monitoring efforts. Based on simulations, there is no evidence of a change in the rate of mortality and serious injury, or in the proportion of non-serious injuries. Itano noted that the mitigation strategy of the TRP to pair weak hooks with strong branchlines does not appear to be an effective mitigation strategy because few hooks actually straighten. This can increase the rate of mortality and serious injury if more animals are released with embedded hooks and trailing gear, opposite to TRP goals. He also reiterated the injury risks to crewmen when conforming to NOAA recommendations to tie off branchlines, because of the potential for the 45-g lead weight to spring back on release. Itano also noted that the procedure can cause additional stress to the animal. Jamie Marchetti provided an update of observer program coverage, observed marine mammal takes, and ongoing projects to develop and test electronic reporting and electronic monitoring systems. SRG members requested some additional detail on the information collected by observers.

### **Hawaiian monk seals**

Jason Baker presented updates on Hawaiian monk seal research conducted by numerous researchers (see background documents). He described a study being led by Albert Harting that is analyzing causes of death in the MHI, assigning probabilities to various causes and using a simulation study to estimate the effect of each cause of death on the population growth rate. The most prevalent causes are protozoal disease, anthropogenic trauma, and drowning (e.g. in gillnets). Hookings are very common but have a relatively lesser effect on population growth because many hookings are mitigated when seals are captured and hooks are removed. Without mitigation, hooking would have a considerably stronger influence. Drowning is difficult to determine as a cause of death, and Michelle Barbieri, DVM, is conducting a study to improve determination of probable or suspected drowning.

Age-dependent reproductive rates have been estimated for the MHI, Laysan Island, Lisianski Island, and French Frigate Shoals. Apparent differences could either be caused by actual variability in reproductive rates or biases in the data. In the MHI, unknown adult animals were assigned age 5 at first known reproduction, skewing the reproductive curve. Simulations based on histories of pupping, molt, etc. across multiple years subsequently allowed a probabilistic estimation of pupping rates, removing much of this bias. Rehabilitation efforts at The Marine Mammal Center's Ke Kai Ola facility have continued, with 23 patients so far and 100% success in transportation, rehabilitation, and release. Post-release survival is good for animals admitted at

age 1 or older. Although post-release survival of patients admitted to rehabilitation as pups is improved, it is still lower than desired. Following the design and initiation of a morbillivirus vaccination program, 79 individuals have been vaccinated in the MHI and 425 in the NWHI, without any documented adverse effects. During the 2018 field season, another 200-250 seals will be targeted for vaccination. Simulated disease outbreak scenarios show this should provide sufficient herd immunity. Additional studies include a reproductive hormone study funded by the NMFS Office of Science and Technology, and the full sequencing of the monk seal genome.

Scott Baker inquired whether toxoplasmosis is endemic and whether there is a vaccination. Jason Baker said there is no vaccine and once an animal is infected, the disease is fatal unless it remains latent. The disease is transmitted by feral cats, which are ubiquitous on the MHI, and eggs are very durable and can survive in seawater for a long time. Charles Littnan added that it is unclear how much of a threat this is to monk seals and what the triggers for infection are, but this is currently being examined using a grant from NIH. Co-infection with other diseases (e.g. *Sarcocystis*) may play a role.

Itano inquired whether ocean conditions have had large-scale effects, and Jason Baker confirmed that a relationship between large-scale oceanographic productivity and juvenile seal survival has been detected in the western portion of the NWHI, but no such relationship has been identified in other parts of the species' range. Lewison asked for clarification of the types of diseases that affect seals. Morbillivirus and canine distemper can kill seals; phocine distemper has killed many seals elsewhere but has not yet been detected in NWHI, so they are trying to prevent an outbreak in this naïve population. Baird asked for thoughts on whether cultural / hooking issues or disease were easier to address. Jason Baker commented that hooking is the easiest, because it can be mitigated. In contrast, cultural issues must be addressed long-term, and managing feral cats to reduce toxoplasmosis deaths is very difficult. Littnan added that fishermen are worried about prosecutions, but people are reporting hookings more over time. Scott Baker asked whether seals can infect each other with toxoplasmosis, and Littnan clarified that seals are 'dead-end' hosts, and only cats can create infectious eggs. Littnan responded that barbless circle hooks were distributed under a Section 6 grant, but there are cultural issues and it is not clear how ubiquitous barbless circle hook use is. Ragen added that there were not many monk seals in the MHI in the 1990s, and progress takes time. At the SRG's request, Jason Baker clarified details of the mortality levels reported in the SAR.

### **Pacific Islands Research and SARs**

Oleson provided an overview of the 2017 Hawaiian Islands Cetacean and Ecosystem Assessment Survey (HICEAS), which included a significant outreach effort. The project goals are to update cetacean abundance and density estimates, obtain information on population structure and range, and conduct ecosystem observations and other ancillary projects. The survey was the first of planned PacMAPPS (Pacific Marine Assessment Program for Protected Species) surveys, jointly funded by NOAA, the Bureau of Ocean Energy Management (BOEM) and U.S. Navy. In addition to standard effort throughout the EEZ, there was fine-scale coverage in the MHI because this area is of particular interest to the Navy and BOEM. The survey included visual and acoustic effort, and resulted in 23 species seen on-effort. For false killer whales, there was a special protocol with two data collection phases to account for wide-spread groups with multiple subgroups (e.g. 18 subgroups spread over 19.3 miles). In total, there were 27 sightings of false killer whales, including 15 systematic and non-systematic effort sightings that will contribute to the density estimation, and 12 off-effort sightings that are not suitable for density estimation. Efforts are currently underway to assign each sighting to stock (MHI, pelagic, or NWHI) based

on photo, biopsy, or (if those are not available), expert advice. The acoustic detections are being classified to species and localized relative to the vessel.

Other projects completed during the cruise included ecosystem sampling, deploying satellite tags (4 on false killer whales and 3 on pilot whales), conducting acoustic surveys using Drifting Acoustic Spar Buoy Recorders (DASBRs), making unmanned aircraft system (UAS) flights to assess body condition, and collecting water samples for environmental (e)DNA during beaked whale encounters. The project also refurbished Pacific Islands Passive Acoustic Network stations at Kona, Kauai, and Pearl & Hermes Reef, as well as a NOAA Ocean Noise reference station. The DASBRs provided many beaked whale detections of Blainville's, Cuvier's, and Longman's beaked whales as well as two other unidentified beaked whales. Planned summaries and analyses include a cruise report, abundance estimates, and habitat-based density estimates by April 2019. The density models will follow methods previously developed and published by Forney et al. 2015.

Calambokidis wondered how the sighting sample sizes compared to previous surveys, and Oleson indicated that the lower number of sperm whale and Bryde's whale sightings were surprising. Although there were a lot of false killer whale detections (visual and acoustic), it is not clear yet what that means with respect to density. Svein Fougner asked for clarification of what a 'sighting' is, and Oleson explained that it is a group of animals. Amanda Bradford added that this concept is a bit different within the abundance estimation framework for false killer whales, because the unit of analysis is the subgroup, not the sighting that can encompass multiple subgroups spread over large areas. Lewison inquired about the process of integrating the visual and acoustic surveys. Oleson noted that methods exist for sperm whales, but false killer whales and other species are more challenging. Ragen wondered what proportion of the stocks are found only in the survey area, and asked whether PIFSC has considered extending beyond the EEZ to learn more about stock distributions and the proportion of animals inside vs. outside the EEZ. Oleson explained that the insular stocks are contained within the EEZ, but for pelagic stocks we are only assessing part of the stock ranges. A 2005 survey (PICEAS) surveyed areas south of HI EEZ and in Palmyra and Johnston Atoll, but sample sizes were too low for separate estimates. Habitat-based density models are planned (by Elizabeth Becker) to address non-EEZ areas and provide a first-cut 'fishery-area' estimate for some species. Ragen also asked whether a suggestion from last year, to re-do the 2002 and 2010 analyses using consistent methods, was still planned. Oleson confirmed that they are currently making a research plan but noted that changes in protocols make this difficult for some species.

Oleson also summarized several other research activities. Additional DASBR deployments are planned for the Marianas Archipelago during summer 2018 to inform beaked whale abundance assessment, and the annual Marianas small-boat surveys initiated in 2010 will be continued in 2018. Winter small-boat surveys for humpback whales off Saipan in the Marianas have been conducted annually since 2015, and surveys conducted in Feb-Mar 2018 resulted in additional photo-identifications and tissue samples. PIFSC is working on building collaborations with researchers in Japan, Russia, the Philippines, and Russia to share data. So far they have identified matches to other breeding grounds at Okinawa and Ogasawara, and feeding grounds in the Commander Islands, Russia. PIFSC also maintains the Pacific Islands Passive Acoustic Network across Hawaii and other U.S. Pacific Islands; this network has amassed a large data set to look at cetacean distribution and population structure, especially for Blainville's beaked whale for which there is variability in click characteristics (esp. peak frequency and inter-pulse interval).

Lars Bejder provided an overview of 2010-2018 spinner dolphin research, focusing on the HI Island stock (one of 6 stocks in the Hawaiian Archipelago). Island-associated stocks have evolved a distinct diurnal behavioral pattern, foraging offshore at night and socializing/resting during the day in shallow bays. These sheltered bays have high human use, causing concerns especially off Big Island for at least the last 10 years. During 2005, NOAA published a notice of proposed rule-making implementing time-area closures in resting bays. In 2010, NOAA initiated a research program to inform time-area closures. Bejder's presentation focused on behavioral ecology, population size, daily behavioral repertoire, and quantifying the importance of resting base and the exposure of dolphins within the bays. During two years, over 200 photo-identification surveys were conducted on a rotating schedule across bays along the Kona coast. Mark rates (identifiable dolphins) were estimated two different ways. The cumulative discovery curve indicates that most animals were captured after 100 days, and the total first year estimate was 631 +/- 31 SE individuals. This is lower than previous estimates dating back to 1994. During the second year, a plateau was reached after about 130 sampling dates, and the estimate was about 668 with similar confidence intervals. Focal follows were also done on individuals to examine activity throughout the day in the bays. This confirmed that sheltered bays are critical for resting. The proportion of time animals are exposed to human activities are the greatest in the world, reaching >82% of the time within 100 m (vs. 9 - 58% within 100 - 500 m for all other studied populations). The data and results have been submitted to an IUCN task force working on designating important marine mammal areas (IMMA). NOAA is now considering a 50-yard approach limit rather than time area closures.

Scott Baker inquired whether abundance for the four bays could be estimated independently or whether there was a lot of interchange. Bejder indicated that the rates of exchange were high (~70%). Jay Barlow wondered whether the models were closed or open models between years, because seeing individuals multiple times within a year can affect estimates. Bejder clarified that the first 100 days was the first period, and from then until the start of the second sampling year was the second period. Ragen wondered whether there were any scientific components to establishing approach distance rules, as they are difficult to enforce and evaluate. Lars indicated that the NOAA approach rule was based on level B harassment. The data suggested that a time-area closure would be difficult to enforce, and people could be displaced to other areas where dolphins are. The 50-yard rules would mirror a rule for humpbacks that is enforced, but it is not clear how this would work for spinner dolphins. Bejder noted that the prohibition of kayaks resulted in more vessels, which were not prohibited.

Oleson reviewed changes to the Hawaiian spinner dolphin SAR (*PSRG-2018-02*). Known human-caused injuries have been included, but none of the fishery interactions could be attributed to a specific fishery. Abundance estimates,  $N_{\min}$ , and PBR for the Hawaiian Island stock have been updated based on Julian Tyne's analyses, and the stock remains non-strategic. Ragen noted that the change in numbers could be explained by use of other bays than those included in the abundance survey. Oleson said that the plan to evaluate effectiveness of a 50-yard rule would include sampling other bays, especially on the windward side. Baird noted that unintended consequences of the previous proposed rule included more vessels going offshore and swimming with other odontocetes off Kona, including beaked whales, spotted dolphins, pilot whales, etc. Bob Brownell commented that the abundance information presented in the SAR lacks context regarding the sampling differences. Several SRG members agreed that providing additional caveats and sampling details would be helpful. Ragen commented that the scarcity of information regarding fishery interactions suggests that better data are required to properly characterize the significance of fishery interactions, noting that the numbers are similar to those previously observed for monk seals. He also asked what proportion of Oleson's work is done as

a result of priorities vs. taking advantage of opportunities. Oleson explained that the different areas and species are prioritized, depending on what is known about fishery interactions, other sources of mortality, or other concerns. When there is an opportunity, efforts are focused there rather than in lower priority areas. Sometimes Navy priorities overlap with NMFS and this lends itself to focused efforts. Ragen commended the progress that has been made during the last 10-20 years, and Scott Baker echoed that tremendous research has been done. Scott Baker also inquired about humpback whale stock structure for the Western North Pacific DPS and whether it is likely that there are many whales in other areas of the Marianas. Oleson replied that she did not think the data are yet sufficient to address stock structure, and noted that a large part of the archipelago has not adequately been sampled, but it does not appear likely there would be large numbers of humpback whales elsewhere. Acoustic records recently collected for two years at Pagan may help assess relative occurrence further north in the archipelago. Bradford added that 43 non-calf whales have been photo-identified off Saipan, with 7 of them sighted in multiple years, so there appear to be low numbers of whales that keep coming back, including reproductive females.

Bradford provided an overview of the serious injury determination process and interactions in Hawaii and American Samoa fisheries (*PSRG-2018-09 & 10*). The process takes time and requires several review steps, resulting in about a 2-year delay from interaction to SAR publications (e.g. the 2018 SARs include serious injury determinations for 2012-2016). From 2007-2016, there were 102 marine mammal interactions in the deep-set longline fishery, 93 in the shallow-set longline fishery, and 25 in the American Samoa longline fishery. Injuries most commonly involved ingested gear, hooks left in the head / mouth, and/or trailing gear that can cause further injuries or death. The stranding networks also report whales that are observed entangled or struck by vessels, and occasionally other species documented with human-caused injuries. Bradford is currently working on finalizing and publishing the data through 2016 and requested feedback from the SRG regarding their interest in continuing to review all interactions. The SRG discussed the level of involvement in specific interactions vs criteria review and revision. Forney pointed out that the SRG originally had wanted to review how well the 2012 criteria work, but did not necessarily require review of all interactions once the process had been tested and evaluated. Long noted that the current procedural directive requires SRG review, and this provides important peer-review for the determinations. Several SRG members suggested that the SRG would review only the difficult injury determinations, and Forney noted that this could be part of the SRG review. Ragen added that the main questions are whether the criteria have adequate science to support a determination, e.g. for capture myopathy.

Baird presented background on marine mammal fishery interactions and depredation going back to at least the 1960s in nearshore waters of Hawai'i, and showed preliminary results from a recent study that developed a spatial overlap index to examine the likelihood of individual fishing vessels encountering false killer whales. This probability depends on false killer whale occurrence as well as the number of other fishing boats in an area. The index was scaled relative to Kona = 1.0, where the probability is low. The probability of a fisherman encountering false killer whales when catching fish is 8-11 times greater off leeward O'ahu, 36-65 times higher off Penguin Bank and Lāna'i, and >100 times greater off east O'ahu and north of Moloka'i, Maui and Hawai'i Island. These results can help guide efforts to include the fishermen that are most likely to experience interactions when working towards possible solutions, and if fisheries are monitored, the index can help identify the most important areas.

SRG members discussed potential trends in depredation around Hawaii and inquired about severity of injuries to animals. Baird noted that the line injuries are not likely serious and many individuals are seen for many years. Calambokidis cautioned that we only tend to see the

survivors, so our observations are not unbiased regarding survival of injured animals. Ragen noted that overlap between false killer whales and fishing is a first step, but behavioral factors also likely play an important role. Itano noted that the identification guide to blackfish produced by Robin Baird and made available to fishermen has been useful and supported further distribution of the guide to foster species-specific data. Scott Baker wondered whether foreign-flagged vessels operate in the fishing area. Oleson responded that foreign fleets do not operate within the EEZ but may be present on the high seas, and Fougner added that [www.iattc.org](http://www.iattc.org) provides tables and charts of estimated effort by 5 degree square in the Inter-American Tropical Tuna Commission area of jurisdiction. The Western and Central Pacific Fishery Commission compiles catch and effort data in the Western and Central Pacific.

### **Sea Otters**

Lilian Carswell (by phone) provided updates on southern sea otters. There is no SAR this year because there are no substantive changes. The annual surveys have continued and there was a recent meeting to consider alternate survey methods. There was an apparent drop in abundance last year (2017), but this could have been related to changes in kelp cover that make sea otters more difficult to detect. Carswell reviewed the limiting effect of California coastline morphology on sea otter population growth, based on work done by Tim Tinker. White shark bites, which have increased in recent years, also appear to limit expansion to the north and south. If the population reaches the recovery threshold (3-year average of 3090 otters), five key factors will be examined, and a rigorous analysis of population viability under potential management actions will be conducted. Carswell also reviewed the 1987-2012 translocation program, which was terminated because sea otters often tried to return to their original home range. The termination affected the Navy's exemption, but in 2017, they obtained a separate exemption that includes monitoring requirements. There have been a series of other legal challenges to the translocation program termination since 2013, but on March 1, 2018 all challenges were dismissed. New lawsuits could still be filed until Jan 19, 2019 when the statute of limitations runs out. Lewison inquired whether shark mortality is a factor in the northern sea otter population, and Carswell responded that she did not believe this was a factor. Scott Baker asked for additional details regarding the absence of sea otters in Oregon and lack of recolonization to that area. Carswell explained that past translocation efforts (during 1960s or 1970s) were not successful and the animals were thought to have moved north. Washington otters seem more likely to reach Oregon than southern sea otters. Ragen asked whether toxoplasmosis was a large problem for southern sea otters, and Carswell explained that it mainly affects sea otters that are already impacted by other factors so it is not a primary driver of population trends.

Deanna Lynch (by phone) reviewed the history of Washington sea otters and provided an update on the SAR, which is currently out for public comment. During the early 1900s, sea otters were extirpated from most of their range, and in 1969-70 59 sea otters were introduced from Alaska to the Olympic Peninsula. The stock is not listed under ESA, but it is considered endangered by Washington State. Annual surveys, conducted since 1989 using aerial and ground based counts, show that the population has grown at about 9% per year, to over 2000 animals in 2017. The range is centered at La Push and extends from Pillar Point in Straits of San Juan de Fuca to Cape Elizabeth, with occasional records south into Oregon. Causes of mortality during 2002-2017 are dominated by the parasite *Sarcocystis neurona* (>50%) but also include some human-caused mortality such as gillnet deaths, boat strikes, gunshots. Shark attacks have only been documented in Oregon, not Washington. Canine morbillivirus, toxoplasmosis, and leptospirosis have also occasionally been documented. Lewison inquired about the source of infectious disease, and Lynch explained that opossums carry some of these diseases, and rivers might carry infectious agents to areas where otters are exposed, but the precise source is not known.

## **West Coast Region Management Updates**

Penny Ruvelas provided an overview of staff at the West Coast Region (WCR) Protected Resources Division, which covers ESA issues and consultations for multiple taxa (from sea grass to blue whales) and is responsible for marine mammal conservation issues under MMPA. They also designate essential fish habitat and critical habitat for ESA-listed species. Lynne Barre provided an overview of southern resident killer whale (SRKW) recovery actions and lessons learned, including the importance of having an open, transparent process. Recently NOAA developed a SRKW action plan as part of the Species-in-the-Spotlight initiative. The plan involves understanding health, impact of vessels, prey resources and other factors. The WCR works closely with partners, including NOAA Science Centers and other scientists to conduct the science needed for recovery and management. The Puget Sound Partnership is working to restore Puget Sound, addressing pollution, salmon, oil spill response and killer whales. During the past years, there have been several health workshops to discuss needs, develop strategies and establish priorities to understand causes of decreased reproduction and increased mortality. Health assessments are being done via fecal sampling, photogrammetry, and necropsies of stranded animals. Vessel impacts are addressed by viewing guidelines and partners providing boater education. There are also tagging studies to understand the sound levels received by whales, and vessel regulations are currently being reviewed. There are ongoing efforts to recover salmon and develop priorities for action, particularly related to habitat, fisheries, hatcheries, and hydropower to make salmon more available to killer whales. Critical habitat was designated in 2006, with water quality, prey and passage identified as primary constituent elements. NMFS received a petition to revise critical habitat in 2014 and this is also currently under review.

Scott Baker wondered whether there has been a shift away from contaminants as cause of decline towards a hypothesis that prey availability is a primary driver, particularly the scarcity of larger fish. Barre clarified that recovery program addresses all threats because they can interact with one another in a cumulative way, so contaminants are still part of the focus. A recent paper that presented a model evaluating the various factors probably underestimated sub-lethal effects of contaminants. The prey issue is very complicated, involving specific salmon runs that are targeted by killer whales. Ragen noted that there should be broad concern about the way we manage southern resident killer whales because requiring management to be science-based can create a great burden of proof to demonstrate and understand the issues before management action is taken. The demography already indicates that the population is on a bad trajectory, and management cannot wait until the science is perfect. Barre responded that she is encouraged by the Governor's task force that is focused on taking specific actions. Ragen offered that the SRG could perhaps help to explain the difficulty of getting the precise answers that managers want.

Ruvelas provided an update on West Coast whale entanglements and ongoing efforts to reduce entanglements. In the last few years, entanglement reports have increased, particularly for humpback whales but recently also involving some blue whales. Data collection and disentanglement efforts have increased, and there has been an increased effort to understand drivers. Sources of entanglements are mostly unknown, but identified fisheries include Dungeness crab, spiny lobster, sablefish, coonstripe shrimp, spot prawn, and gillnets. These are mostly state-managed fisheries, except for the federally managed sablefish fishery. Efforts to address the entanglements have been led by the California Dungeness Crab Fishing Gear Working Group, established in 2015 and including fishermen, state and federal representatives, NGOs, and scientists. They have published a "Best Practices" guide and are developing a framework for assessing risks and implementing actions dynamically, depending on ocean conditions, whale distributions, and fishing patterns. A number of related research projects are

underway by SWFSC, NWFSC and other collaborators to support this risk assessment. The WCR has also reached out to other fisheries and states, and Oregon recently initiated a separate working group.

Scott Baker asked for clarification about whether the working group is a Take Reduction Team (TRT) and whether the State or NMFS is leading this effort. Ruvelas clarified that it is led by the State because the fishery is managed by the State, and that it is a TRT-like process so there are currently no plans to form a TRT. Calambokidis commended the efforts to improve disentanglement responses and wondered what proportion of animals are disentangled. Ruvelas indicated it was a relatively small number on the order of 7-9 per year. Calambokidis also noted that the reports are an absolute minimum because there are multiple ways in which entangled animals may not be reported (not seen, not identified, etc.). There are also large regional differences in reporting, based on the number of people on the water, so animals in some areas are less likely to be detected. Even without considering the under-reporting, the level of entanglements is highly likely to exceed PBR no matter how humpback whale stocks are delineated, and despite the lack of revised Draft 2018 SAR to present this. Barbara Taylor wondered how the State can authorize these fisheries to take ESA-listed species without a permit, and asked how this process fits into NOAA's authority over humpback whales. Ruvelas explained that States can apply for an incidental take permit under Section 10 (a)(1)(B) of the ESA for their actions that incidentally take listed species, and they have an obligation to do this; but they would have to include a plan to minimize and monitor takes as part of the application. The State of California is aware that there currently are unauthorized takes, and they seem to be developing a plan through their working group process. Once a plan is developed they could apply and the permit application could be evaluated by NMFS.

Other WCR activities include an updated blue whale recovery plan, which is being prepared and will be released for public comment in the near future. The Pacific Offshore Cetacean Take Reduction Plan has reduced takes of all species below PBR, and takes are below 10% for humpback and beaked whales but above 10% of PBR for sperm whales and pilot whales. The WCR Protected Resources Division is working closely with the Fishery Management Council and the Sustainable Fisheries Division to develop alternate fishing methods under exempted fishing permits (EFPs). These include deep-set buoy gear and deep-set linked buoy gear for two years. They are also evaluating EFPs for shallow-set (night-time) and deep-set (day-time) longlining that would take place west of 50 nmi and outside the Southern California Bight. The deep-set buoy gear catches swordfish of high quality with very little bycatch because the gear is rapidly deep-set, actively tended and animals can quickly be released. Linking the buoy gear is also being considered for federal waters, but the WCR is still trying to evaluate risk to protected species. The EFP fisheries will require skipper workshops and other regulatory measures.

An unusual mortality event (UME) thought to be caused mainly by ecological factors has continued for Guadalupe fur seals, although strandings appear to be declining. The UME for California sea lions has tapered off and a working group is currently evaluating whether to close the event. California sea lions were recently shown to be at their Optimum Sustainable Population (OSP), based on longterm monitoring of the population since the 1970s. Changes in oceanic conditions could affect this status in the future as sea surface temperatures correlate with sea lion demographic rates. Male California sea lions are still taking protected salmon at Ballard Locks, Bonneville Dam and in other areas, and 190 individual animals have been captured and moved to zoos/aquaria or killed under a Letter of Authorization issued under MMPA Section 120. Steller sea lions are also becoming involved in increasing numbers. The impact on salmonid populations has recently been evaluated in a study by the NWFSC, and studies are also underway

to examine how this affects fisheries and southern resident killer whales. Sea lion predation on salmon recently spread to Willamette Falls, OR and the State has requested a permit to deal with this.

### **CA/OR/WA Research & SARs**

Jeff Moore provided an overview of the planned 2018 CalCURCEAS survey, which is part of the PacMAPPS partnership with BOEM and the Navy. The survey will be a collaborative project conducted jointly by SWFSC's Marine Mammal and Turtle Division and Fishery Resources Division. Coastal pelagic fish species will be assessed using daytime and nighttime acoustic surveys and nighttime trawl sampling. Marine mammal operations will involve daytime line-transect effort for mammals, drifting acoustic buoy (DASBR) deployments, and coordinated small-boat sampling of large whales from shore by researchers with Cascadia Research Collective. The first 80 days will involve the joint fishery/mammal surveys along the shelf, followed by 60 days of dedicated marine-mammal surveys in offshore areas and off Baja California. Ragen asked whether the new administration threatens to change the PacMAPPS partnership, and Ballance responded that it would not.

Karen Martien provided a brief background of stocks under the MMPA. The Guidelines for Assessing Marine Mammal Stocks define a stock as a demographically independent population (DIP). If DIPs are not considered separately, this can lead to population declines or extirpation of populations. Under the ESA, the objective is to maintain diversity, and the distinct population segments need to be evolutionarily discrete. Under the MMPA, the objective is to maintain stocks as functioning elements of their ecosystem, and DIPs require a much lower level of population differentiation that is driven by dispersal rate. The types of information that can inform stock delineation include genetics, movement data, morphology, distribution and density, contaminants, stable isotopes, life history, etc. Ragen asked whether there were any examples of poorly defined stocks that may be putting populations at risk through localized impacts. Martien noted that the original SARs were mostly for broad areas because we were required to write SARs quickly and stock delineation information was lacking. For humpback whales there is now information that these broad stocks are no longer adequate.

Phil Morin provided an overview of several ongoing genetic studies. Harbor porpoise stock structure along the West Coast is being re-examined, building on past studies by Susan Chivers. Sampling has been expanded to include Alaska, and new strata include Southern California and Puget Sound. The same mtDNA sequences are being used as before, but new nuclear markers have been added to enhance the ability to detect differences and identify boundaries. Preliminary results suggest that some stock boundaries will change, but analyses are ongoing. Calambokidis wondered whether the long time period during which samples have been collected is a concern. Morin confirmed that there is concern, particularly since many of the samples come from episodic strandings, but noted that the analysis can explore whether time is a factor in describing variance. A second study is investigating whether there are multiple subspecies of pilot whale in the Pacific, building on Amy Van Cise's research published in 2016. There are two recognized forms (Naisa and Shiho), but there is also a third mitochondrial clade in the Pacific. The present study uses full mitogenome sequences and has provided a clearly resolved phylogeny that shows Shiho is found in the eastern Pacific, Naisa and the third clade are broadly distributed in central and western Pacific and Indian Ocean, and the Atlantic is separate. The third genetics study involves sperm whales, following up on past studies (including a 2011 paper by Sarah Mesnick) that found mtDNA and nuclear DNA differences in the Pacific. The global phylogeography indicates that Atlantic and Pacific sperm whales have high diversity with only one haplotype shared across ocean basins, suggesting a separate evolutionary history and that they should be

considered as DPS. Calambokidis asked for clarification on the lack of separation of sperm whale males from Alaska and the West Coast. Morin indicated that the males have been difficult to assign to populations in the past but using SNPs should allow this. Scott Baker commended Morin on the interesting presentation covering complicated data, and Ragen noted that these examples illustrate the challenge of identifying stocks for management.

Calambokidis provided information on humpback whales as background for a humpback whale genetics project presented by Martien. The most recent SAR shows a minimum average fishery mortality and serious injury of 7.6 whales per year for the most recent period (2011-2015), and a PBR of 11. Under the ESA, 14 DPSs including three in the eastern and central North Pacific were recently recognized; however, the exact boundary between the Mexican and Central American DPSs was unclear. More recent information that suggests a more northerly boundary. ESA status varies among breeding areas. Historic whaling data and the SPLASH study show different feeding areas, and movement data show connections between the breeding and feeding areas. California and Oregon feeding animals breed in Central America and along mainland Mexico and Baja California. Washington includes animals from Mexico and as well as some Hawaii whales. There is a latitudinal gradient in use of the US West Coast by the two DPSs, with the central American DPS found proportionally more frequently off southern and central California than farther north. Haplotypes of different whales also vary by latitude. Through 2016, there are 77 humpback whale entanglement records but only 15 of these have identification photos that would provide sighting histories, so assignment to DPS is difficult or impossible for most entangled whales. Martien then described a new project that will be started soon to use mitogenomics to identify which DPS individual humpbacks belong to. The study was motivated primarily by the Endangered status of the central American DPS, which has a low and incomplete estimate of about 400 animals. The existing genetic data are based primarily on mtDNA and allow correct assignment rates of about 79% for central America and 69% for Mexico. The new study will sequence the full mitogenome to identify the most informative sections for assigning to DPS, allowing cost-effective rapid processing of samples. John Calambokidis noted that analyzing samples from animals in feeding areas known to belong to the Mexican or central American DPS would provide slightly different information than an analysis of samples from breeding areas, relative to the goal of allowing identification on the feeding ground. Scott also noted that there are many more samples available now than were included in the published SPLASH study, particularly for the Mexican and Hawaiian DPS.

Eric Archer updated the SRG on a study of North Pacific fin whale population structure based on genetics and acoustics. At the taxonomic level, there are 3 recognized subspecies globally, but a recent analysis shows there may be another subspecies in the Eastern North Pacific. Three U.S. stocks are defined in the North Pacific (Alaska, Hawaii, West Coast), and the objective of the study was to examine whether different DPSs are warranted. There are some year-round fin whales off the West Coast, and other whales undergo long and short-scale movements. The mtDNA control region shows that the Gulf of California and the Southern California Bight are different from other regions, while there is little differentiation in Alaska. Boundaries for analysis strata are not clear, so the plan is to look at seasonal acoustic data on singing males to help identify stock boundaries. Fin whale song encompasses three clusters that provide insights into potential movements, and there is some consistency between acoustics and genetics. A workshop is planned in June 2018 to examine population structure using acoustics. Some hypotheses regarding movements among the three current stocks have been developed, and a pilot project for SNP genotyping is being initiated. Other sources of information will also be considered, including habitat models and photo-identification data.

Jim Carretta presented details for US West Coast Serious Injury Determinations. Information is derived primarily from strandings and at-sea reports, but also includes some research trawl captures of dolphins and pinnipeds. The most recent 5-year period, 2012-2016, includes 10 fin whales, 6 blue whales, 121 humpback whales, and 58 gray whales. Documented mortality and serious injury is below PBR for all species except humpback whales. However, detection rates for whales struck by vessel strikes were recently estimated to be only about 4-9% (Rockwood et al. 2017 study). Calambokidis noted that these detection rates are very consistent with those estimated elsewhere, and they match what one would expect relative to the inshore/offshore distribution of each whale species.

Carretta also presented updated bycatch estimates for the drift gillnet fishery, derived using the tree-based bycatch modeling method he developed in recent years using the package *RandomForest* in R. This method avoids problems that can happen using a ratio estimator when takes are rare and the 5-year average is still highly variable (e.g., sperm whales). The newer tree-based methods were tested using simulated data sets and performed well, estimating bycatch based on fishing and environmental variables identified as important in the tree-based analysis across all available years of data. Spatially, the probability of takes shows good concordance with areas of actual takes. Ragen wondered whether this method has been accepted in other regions and whether fishermen have bought in to the approach. Carretta indicated that the available data differ in some regions so the method may not always be appropriate. He also confirmed that the fisherman understood and accepted the analysis, because years with no observed takes that result in estimated bycatch are offset by a lower bycatch estimate in years with takes.

Carretta has also developed and tested a new method for prorating unidentified whale entanglements using a similar tree-based approach. The method assigns a probability for each species and performed well on test data. Calambokidis suggested that this method could also be used to assign entanglements from unidentified sources to individual fisheries, but Carretta explained that this is complicated by the fact that animals can drag gear over great distances. Calambokidis indicated that this approach is very valuable and gets us a step closer to accounting for all injuries and mortalities, but undetected entanglements are still not accounted for in the stock assessments. He wondered whether Carretta had a sense of how many entangled whales are never reported, and Carretta explained that this is very difficult to evaluate, because we have little information on the distribution of fishing gear. Calambokidis commented that scarring on live animals could help assess how often injuries are observed vs. unobserved in different areas (e.g. Monterey Bay vs. other areas). Carretta agreed that the photo identification data would be highly informative. Ragen commented that Carretta's and Jason Baker's approaches are a big improvement and commended both for their efforts.

Changes to four of the West Coast SARs were summarized by Carretta. California sea lions have been determined to be at OSP based on a study led by Jeff Laake. That study also showed that the multiplier from pups to total population size varies through time with changing ocean conditions. The fin whale SAR indicates that ship strike mortality represents approximately 0.5% of population size, and carcass recovery is estimated to be about 4%. For sei whales, there is a new abundance estimate for the eastern North Pacific stock which is found off the US West Coast. Ragen inquired about observations in gillnet fisheries and Jim responded that none of the species that interact with the gillnet fisheries have high take rates relative to PBR.

Dave Weller provided some context on gray whales and the SAR approach, particularly for western North Pacific (WNP) gray whales. The eastern North Pacific (ENP) stock currently is

estimated to have about 27,000 animals (up from 21,000 in 2014), while the WNP has 175 animals (up from 140 in 2014). The previous conventional wisdom was that there are two geographically distinct stocks in the eastern and western Pacific. But this changed in 2010-2011 when cross-basin movements of three whales tagged off Sakhalin were documented based on satellite telemetry. More recent matching via photos and biopsies has provided additional movement information, including movement from Sakhalin to Kamchatka, ENP, and Japan. The International Whaling Commission (IWC) has held four workshops (and a fifth is planned in March) to examine range-wide stock structure for gray whales. The WNP demographic unit might include whales from Sakhalin and Kamchatka combined, but a purely WNP breeding stock could still exist with fewer than 50 mature individuals. The genetic differences support the recognition of separate ENP and WNP stocks. The revised WNP SAR continues to use data from Sakhalin but the IWC assessment and recent workshop results are expected to possibly revise and refine gray whale stock structure. Scott Baker inquired about gray whale records off Japan, and Weller noted that there are a few strandings and recent sightings as well as older records. Ragen noted that there previously was concern about deploying satellite tags on WNP whales and exposure to risks in South China Sea. Weller indicated that there has not been funding to continue tagging, and noted the efficiency and lower-cost of basin wide photo-identification comparisons that have resulted in 30+ animals being matched between the WNP and ENP. Calambokidis asked whether any of the new information influenced Weller's perspective regarding the Pacific Coast Feeding Group (PCFG) and how it is included in the SAR. Quite a few entangled gray whales have been confirmed as PCFG whales, but this information has not always been fully captured in the SAR. Carretta explained that the SAR assigns human-caused mortality to PCFG or ENP stocks based on seasonal and geographical IWC definitions. Calambokidis asked to confer separately with Carretta because some entangled whales outside of the IWC definitions have also been determined to be PCFG based on photo-identification, and this should be updated in the SAR. Carretta welcomed the updated information.

Brad Hanson (by phone) provided a SRKW update. As of July 2017 the population declined to 77 whales, with no births and 6 deaths. The deaths included three post-reproductive females, one adult female and her dependent calf, and an adult male. Since then, there has been one additional death. The net productivity rate has declined to 0.1% in 2009-2011, and there is low female reproductive capacity into the future because <23-27% of the population is reproductive age females. The majority of females are overdue for reproduction, and the subadult sex ratio is skewed heavily towards males (9 females, 22 males). Human-caused mortality and serious injury includes one potential vessel strike mortality. There are also multiple habitat issues and risk factors including vessel disturbance, contaminants and prey availability. The stock is listed as endangered under ESA and thus is automatically strategic. Ragen noted that the demographic information is extremely informative (albeit depressing) and wondered whether Brad Hanson was involved with the Governor's task force. Hanson replied that Mike Ford will be participating and Hanson will continue to focus on the science. Ragen asked Hanson about collaborations and drawing on resources from other regions, and Hanson described several collaborative efforts, including health assessments with Holly Fearnbach (SWFSC), the development of a collaborative database, annual workshops, Dtag studies with Department of Fisheries and Ocean Canada to understand nighttime foraging, and National Fish and Wildlife Foundation funding to continue studies on the outer coast. Scott Baker wondered about competition with northern resident killer whales, and Hanson confirmed this is something to consider, as northern residents are commonly seen in inshore areas. Itano noted that there is well-known and productive salmon troll area west from Cape Flattery characterized by a forage-rich plateau feature and suggested that bathymetry could be helpful in understanding habitat use. Hanson responded that the satellite-tagged whales seemed to follow a well-defined path along the 56-m contour, and a

single track of northern resident killer whales showed use of offshore habitats. Taylor asked for thoughts on the demographic patterns, and Hanson responded that genetics and inbreeding are potential factors, and photogrammetric studies suggest that many pregnancies do not get carried to term. Ragen expressed concern about this population and thanked Hanson for his work to understand causes. Calambokidis inquired whether there are research needs that are not yet being addressed. Hanson responded that although a lot has been learned about summer diet, the whales' use patterns outside of their normal summer range is changing and poorly understood. We are now entering a period when salmon stocks are reduced along the West Coast, and the California drought might impact prey availability and killer whale movement patterns. So additional information on movements would be very useful. Calambokidis also asked whether there are any gaps that could help inform assumptions in the model examining relative impacts of different factors that was mentioned by Barre. Hanson responded that parameterizing the model is challenging, but models can be instructive even if they are imperfect. As we continue to get better information on where animals occur, what prey they are eating, and where the prey occurs, the models can be improved and re-evaluated.

### **Pacific SRG expertise needs**

The SRG members discussed expertise gaps in the current Pacific SRG, and identified the following priority areas:

- Marine mammal stock definition and assessment
- Abundance estimation
- West Coast and Alaska fisheries
- West Coast pinnipeds, including assessment, life history, ecology, and human-pinniped interactions (to replace expertise of previous members Jeffries, Hanan, Brown, Harvey).
- Ocean health and veterinary expertise, especially relative to disease and habitat change
- Fisheries oceanography and ecology – decadal and long-term understanding.
- Quantitative analysis skills, especially abundance and bycatch estimation, Bayesian methods, applications of new technologies, methods for data-limited circumstances.
- State marine mammal biologists and expertise on local issues, fisheries, etc.
- Science-management interface, e.g., management approaches with imperfect data.
- Interdisciplinary skills combining different fields of research

The SRG also noted that invited experts provide flexibility and additional perspectives, and considered that veterinary expertise could help inform serious injury determinations, especially when the existing criteria are insufficient to determine severity. Samantha Simmons suggested that individual experts often have broader skills than reflected in their CV and publication record, and it would be good to consider such other skills.

### **Recommendation discussion**

The SRG discussed the process for developing and following up on recommendations. Calambokidis noted that the SRG members discuss and draft recommendations but it is often good to get feedback from NMFS and FWS staff. Doug DeMaster added that prioritization of recommendations is often helpful, and Mike Seki agreed. Carretta requested that the SRG specifically comment on the Rockwood et al. 2017 publication and whether it should be included when the Draft 2017 SARs are finalized, since it is the best available information. The SRG confirmed that they are recommending that the 2017 SARs include a reference to the results of the Rockwood et al. 2017 publication. Long asked for clarification whether the estimated mortality and serious injury would also be changed, because the public would not have had a chance to review those numbers. Calambokidis clarified that for the 2017 SARs, the SRG

requests that the citation should be added but no change be made to the mortality and serious injury estimates. The SRG would like to have an opportunity to review the Rockwood et al. paper in more detail. Calambokidis noted that although there may be uncertainties in the Rockwood-derived total estimates, they are better than what is currently available. Sam Simmons was concerned about a delay until the 2019 SARs if this was indeed the best available science. Carretta offered to prepare draft 2018 SARs for humpback and blue whales as soon as possible, including details from the Rockwood et al. model. The SRG confirmed that they would like to review these additional draft SARs post-meeting so they can be included in the Draft 2018 SARs. They were also interested in an intersessional review of the Rockwood et al. 2017 model.

### **Topics, timing, and location of next meeting**

Based on the 3-year rotation between Southwest, Northwest, and Pacific Islands, the SRG suggested having the next meeting in Olympia. This would support a review of southern resident killer whale issues and also allow local invited experts to provide OR & WA expertise that was lost through the SRG member resignation. Oleson noted that there will be new abundance estimates for all species seen during the 2017 HICEAS cruise, so the SRG could review the draft abundance report. DeMaster also suggested that a tighter linkage among SRGs for transboundary stocks would be helpful, so perhaps an Alaska SRG member could attend the next Pacific SRG meeting and vice versa. Oleson agreed that species that move between Alaska and Hawaii may warrant further discussion, as some SARs are prepared by the Alaska Science Center and reviewed only by the Alaska SRG, and others are represented twice in the Pacific and Alaska SARs. Forney suggested that these species could perhaps be placed together on the agenda, and AK SRG members and NMFS staff could be invited to join meeting remotely. Bettridge added that there is also interest in having NMFS staff attend multiple SRG meetings and sharing SARs, as well as having SRG members attend Protected Species Assessment Workshops to offer opportunity for cross-pollination. She also reminded the Pacific SRG that they will need to decide on a new Chair.

The best time for the next Pacific SRG meeting was determined to be February 2019, with a few additional topics identified at this time:

- A presentation by NOAA on the MMPA Import Rule, including NOAA implementation.
- SRKW recovery efforts, prey enhancement, and pinniped predation/food web studies.
- U.S. West Coast humpback whale entanglements.

## APPENDIX 1

### Attendees - Pacific SRG Meeting, La Jolla, CA, 21-23 March 2018

(\*Indicates participation by phone/webinar)

#### Scientific Review Group - Pacific Region:

John Calambokidis	Cascadia Research
Tim Ragen	Marine Mammal Commission (retired)
David Itano	Hawaii and Western Pacific Fisheries Consultant
Scott Baker	Oregon State University
Rebecca Lewison	San Diego State University

#### Invited Participants and Observers:

##### *NMFS Southwest Fisheries Science Center*

Karen Martien, Karin Forney, Jim Carretta, Jeff Moore, Jenny McDaniels, Kristen Koch, Barb Taylor, Jay Barlow, Kelly Robertson, Brittany Hancock-Hanser, Phil Morin, Wayne Perryman, Eric Archer, Toby Garfield, Sarah Mesnick, Alex Curtis, Bob Brownell, Gaby Sera-Valentes, Paula Olson, Dave Weller, Aimee Lang\*

##### *NMFS Pacific Islands Fisheries Science Center*

Jason Baker, Amanda Bradford, Erin Oleson, Charles Littnan, Mike Seki

##### *NMFS Alaska Fisheries Science Center*

Doug DeMaster

##### *NMFS Northwest Fisheries Science Center*

Mark Strom, Brad Hanson\*, Kevin Werner\*

##### *NMFS West Coast Regional Office*

Penny Ruvelas, Laura McCue, Chris Yates, Tina Fahy\*, Lynne Barre\*, Nancy Young\*, Steve Stone\*, Lauren Saez\*

##### *NMFS Pacific Islands Region*

Kevin Brindock\*, Ann Garrett\*, Krista Graham\*, Jamie Marchetti\*, Jean Higgins\*, Susan Pultz\*

*NMFS Office of Science and Technology*  
Cisco Werner, Mridula Srinivasan\*, Matt Lettrich\*

##### *NMFS Office of Protected Resources*

Shannon Bettridge, Kristy Long, Lisa Lierheimer\*

##### *U.S. Fish and Wildlife Service*

Deanna Lynch\*, Lilian Carswell\*

##### *Marine Mammal Commission*

Dennis Heinemann, Samantha Simmons

##### *Other*

Robin Baird (*Cascadia Research Collective*)  
Shannon Atkinson (*University of Alaska*)  
Lars Bejder (*Hawaii Institute of Marine Biology*)  
Svein Fougner (*Hawaii Longline Association*)  
Ryan Steen\* (*Hawaii Longline Association*)  
Michael Scott (*Inter-American Tropical Tuna Commission and former Pacific SRG member*)  
Sara McDonald (*Monterey Bay Aquarium*)  
Sarah Courbis (*Ecology & Environment, Inc.*)  
Asuka Ishizaki\* (*Western Pacific Fishery Management Council*)  
Phil Fernandez (*Hawaii fisherman*)  
Jonathon Scordino\* (*Makah Tribe*)  
Brian Gruber\* (*Makah Tribe*)  
Jon Scordino\* (*Makah Tribe*)

**APPENDIX 2**  
**Pacific SRG Document List**  
**Pacific SRG Meeting 21-23 March 2018 (La Jolla, CA)**  
**Last revised: 03/20/2018**

Document No.	Title/Topic	Contributor(s)	Distribution Date
<b>Draft documents for Pacific SRG review (Not to be distributed outside NMFS/FWS and SRG)</b>			
PSRG-2018-01	U.S. West Coast SARs (Fin, Sei, and offshore killer whales; CA sea lion)	Carretta	2/27/2018
PSRG-2018-02	Pacific Islands - Spinner Dolphin SAR	Oleson	3/5/2018
PSRG-2018-03	Monk Seal SAR	Baker	2/27/2018
PSRG-2018-04	Southern Resident Killer Whale SAR	Hanson	2/27/2018
PSRG-2018-05	ENP and WNP Gray whale SARs	Weller	3/5/2018
PSRG-2018-06	Sources of human-related injury and mortality for U.S. Pacific west coast marine mammal stock assessments, 2012-2016.	Carretta	2/27/2018
PSRG-2018-07	Estimates of marine mammal, sea turtle, and seabird bycatch from the California large-mesh drift gillnet fishery: 1990-2016	Carretta	2/27/2018
PSRG-2018-08	A machine learning approach to infer species identification of 'unidentified' entangled whales	Carretta	2/27/2018
PSRG-2018-09	Spreadsheet: HI and AS longline_MM_interactions_2016_For_PSRG_Review	Bradford	2/27/2018
PSRG-2018-10	Injury Determinations for Marine Mammals Observed Interacting with Hawaii and American Samoa Longline Fisheries During 2015-2016	Bradford	2/27/2018
PSRG-2018-11	2018 List of Fisheries - Final	NMFS	2/27/2018
<b>Background Papers - FYI only</b>		<b>Submitted by</b>	
PSRG-2018-B01	Robinson et al. 2018. Model recommendations meet management reality: implementation and evaluation of a network-informed vaccination effort for endangered Hawaiian monk seals.	Baker	2/27/2018
PSRG-2018-B02	Baker et al. 2017. Modeling a morbillivirus outbreak in Hawaiian monk seals ( <i>Neomonachus schauinslandi</i> ) to aid in the design of mitigation programs	Baker	2/27/2018
PSRG-2018-B03	Harting et al. 2017. Estimating population size for Hawaiian monk seals using haulout data.	Baker	2/27/2018
PSRG-2018-B04	Norris et al. 2017. An integrated approach for assessing translocation as an effective conservation tool for Hawaiian monk seals.	Baker	2/27/2018
PSRG-2018-B05	Wilson et al. 2017. Movements and home ranges of monk seals in the main Hawaiian Islands.	Baker	2/27/2018
PSRG-2018-B06	Durban et al. 2017. Gray whale abundance estimates from shore-based counts off California in 2014/15 and 2015/2016.	Durban	2/27/2018
PSRG-2018-B07	Chasco et al. 2017 Competing tradeoffs between increasing marine mammal predation and fisheries harvest of Chinook salmon	Hanson	2/27/2018
PSRG-2018-B08	Holt et al. 2017 Noise levels received by endangered killer whales <i>Orcinus orca</i> before and after implementation of vessel regulations	Hanson	2/27/2018
PSRG-2018-B09	Mongillo et al 2016. Exposure to a Mixture of Toxic Chemicals: Implications for the Health of Endangered Southern Resident Killer Whales, TechMemo135	Hanson	2/27/2018
PSRG-2018-B10	Raverty et al. 2017 Respiratory Microbiome of Endangered Southern Resident Killer Whales and Microbiota of Surrounding Sea Surface Microlayer in the Eastern North Pacific	Hanson	2/27/2018
PSRG-2018-B11	Calambokidis et al. SC/A17/NP/10_North Pacific Humpback Trends	Calambokidis	3/15/2018
PSRG-2018-B12	Calambokidis et al. SC/A17/NP/13_West Coast Humpback Trends and Migrations	Calambokidis	3/15/2018
PSRG-2018-B13	Rockwood et al. 2017. Modeling blue, humpback and fin whale ship strike mortality on the U.S. West Coast	Carretta	3/15/2018
PSRG-2018-B14	Wasser et al. 2017. Population growth is limited by nutritional impacts on pregnancy success in endangered Southern Resident killer whales	Lierheimer	3/20/2018

**APPENDIX 3**  
**Pacific Scientific Review Group Meeting**  
**21-23 Mar 2018**  
**Southwest Fisheries Science Center (Pacific Room), La Jolla, CA**  
*Final Agenda (03/14/2018)*

---

**WEDNESDAY, 21 MARCH 2018**

---

**08:30 Welcome** – *Lisa Ballance*

**08:45 Introductions, New SRG Members** – *Tim Ragen, Acting Pacific SRG Chair*

**09:15 Scientific Review Group Overview**

- MMPA Stock Assessments and Responsibilities of the SRGs – *Karin Forney*
- Guiding documents (background docs on PBR, GAMMS, etc) – *Karin Forney*
- Terms of Reference – *Shannon Bettridge*
- Pacific SRG perspectives – *Tim Ragen*

**10:15 National Updates**

- National updates – *Shannon Bettridge*
- List of Fisheries (*PSRG-2018-11*) – *Kristy Long*

**11:00 Pacific Islands Fishery/Management Updates**

- False Killer Whale TRT Updates – *Kevin Brindock (by phone)/Karin Forney*
- Other Pacific Islands Management Updates – *Kevin Brindock – by phone*
- Pacific Islands Observer Program Updates – *Jamie Marchetti – by phone*

*[12:00-13:00 Lunch]*

**13:00 Hawaiian Monk Seals**

- Monk seal research updates and SAR (*PSRG-2018-03*) – *Jason Baker*

**13:45 Pacific Islands Research and SARs**

- HICEAS 2017 summary – *Erin Oleson*
- Other Pacific Islands cetacean research – *Erin Oleson*
- Hawaiian spinner dolphin research – *Erin Oleson/Lars Bejder*
- Hawaiian spinner dolphin SAR (*PSRG-2018-02*) – *Erin Oleson*
- Serious Injury Determinations (*PSRG-2018-09 & 10*) – *Amanda Bradford*
- Overlap between false killer whales and nearshore fisheries in Hawai'i – *Robin Baird*

**16:30 Review recommendations**

**17:00 Adjourn for day**

---

**THURSDAY, 22 MARCH 2018**

---

**08:30 Sea Otters**

- Southern sea otter updates – *Lilian Carswell, by phone*
- Washington sea otter updates – *Deanna Lynch, by phone*

**09:20 West Coast Region Management Updates**

- Southern resident killer whale updates – *Penny Ruvelas/Lynne Barre*
- West Coast Whale Entanglements – *Penny Ruvelas*
- Other West Coast Region Management Updates – *Penny Ruvelas*

**10:45 CA/OR/WA Research & SARs**

- CalCURCEAS/CPS Cruise 2018 – *Jeff Moore*
- West coast harbor porpoise genetics – *Phil Morin*
- Short-finned pilot whale & sperm whale global phylogeography – *Phil Morin*
- Humpback whale genetics – *Karen Martien/ John Calambokidis*
- North Pacific fin whale genetics – *Eric Archer*

[12:00-13:00 Lunch]

**13:00 CA/OR/WA Research & SARs (cont'd)**

- US West Coast Serious Injury Determinations (*PSRG-2018-06*) – *Jim Carretta*
- CA swordfish drift gillnet bycatch estimates (*PSRG-2018-07*) – *Jim Carretta*
- Prorating unidentified whale entanglements (*PSRG-2018-08*) – *Jim Carretta*
- U.S. West Coast SARs (*PSRG-2018-01*) – *Jim Carretta*
- Gray whale SARs (*PSRG-2018-05*) – *Dave Weller*
- SRKW research updates and SAR (*PSRG-2018-04*) – *Brad Hanson*

**15:00 SRG recommendations – Tim Ragen**

- Review previous Pacific SRG recommendations
- Identify and start drafting new recommendations

**17:00 Adjourn for day**

---

**FRIDAY, 23 MARCH 2018**

---

**08:30 Review/finalize SRG Recommendations****10:30 Pacific SRG expertise needs****11:30 Topics, timing, and location of next meeting****12:00 Adjourn 2018 PSRG meeting**