Minutes for the Pacific Scientific Review Group Meeting
Doubletree Hotel, Olympia, WA (Capitol Room)
5 - 7 March 2019

The 29th meeting of the Pacific Scientific Review Group (SRG) was held at the Doubletree Hotel, Olympia, WA from 5-7 March 2019. SRG members present were Scott Baker, Simone Baumann-Pickering, Lars Bejder, John Calambokidis, David Itano, Rebecca Lewison, and Leslie New. Tim Ragen joined the SRG as an invited expert. John Calambokidis served as Acting Chair of the SRG and Karin Forney served as rapporteur. 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.

Scientific Review Group – Closed Session
The meeting began with a 1-hr closed orientation session with new members, reviewing the history of the PSRG, Terms of Reference, meeting processes, and other SRG-internal matters. This closed session was attended only by SRG members and the NMFS Liaison to the Pacific SRG, Karin Forney.

Scientific Review Group and Terms of Reference Overview
Following a welcoming statement and introductions led by the Acting Chair, John Calambokidis, Karin Forney provided an overview of marine mammal stock assessments under the MMPA, guiding documents, and the role of the SRGs. The Marine Mammal Protection Act (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).

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 has 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. Meetings are scheduled annually, with additional inter-sessional conference calls or webinars, as needed. David Itano inquired about the process for updating and reviewing the TOR, and Bettridge indicated that this was open to discussion.

National Updates
Shannon Bettridge provided updates on the National Stock Policy and Negligible Impact Determination (NID) Policy. The long government shutdown has caused delays, with a cascading effect on the finalization of 2018 SARs and drafting of 2019 SARs. Scott Baker asked about MMPA stocks and Distinct Population Segments (DPS) under the ESA and the schedule for revising stocks. When DPSs and MMPA stocks do not align, the result is an unequal number of stocks and DPSs that overlap in complex ways. NMFS has been undertaking a process to redefine stocks under the MMPA for humpback whales, which led to an overarching examination of how stocks are delineated. The policy is not yet final, but will be presented (via webinar) when drafted, and any updates to the GAMMS would be published in Federal Register. The same applies to negligible impact determinations (NID) that are required for commercial fisheries that incidentally take ESA-listed marine mammals. Current criteria for making NIDs are inadequate, so they are being revised. The hope is to have a new policy with clearer guidance and flexibility on how to determine impacts. Tim Ragen commented that the underlying systems for managing marine mammals are complex and recognized the efforts and contributions of Shannon and other colleagues. He noted that the way stocks are defined can have pronounced impacts on the management.

Nina Young (by phone) gave an overview of the MMPA Import Rule. Since 1972, there has been a provision in the MMPA to prohibit the import of fishery products from nations with unsustainable marine mammal bycatch. To implement this provision, NMFS initiated rulemaking to reduce bycatch in international commercial fishing operations and establish rules for evaluating whether bycatch levels are comparable in effectiveness to US standards. The process includes consultations, review, progress reports, and comparability finding applications submitted by other nations. Effective January 1, 2017, there was a 5-year exemption period during which nations can classify their fisheries, develop a regulatory program, provide a 2019 progress report, and apply for a comparability finding. Fisheries are classified either as *exempt*, which is comparable to Category III with a remote likelihood of bycatch (<10% of bycatch limit) and not requiring a regulatory program, or *export* for fisheries with more than a remote likelihood (i.e., equivalent to Category I or II). To make a comparability finding (CF), nations are evaluated against the U.S. standard to determine whether their regulatory program is comparable in effectiveness. If a CF is denied or revoked, the U.S. prohibits import of fish and fish products from that fishery. Nations may re-apply for a CF at any time. One challenging component is the import through intermediary nations, which must demonstrate their product is not a prohibited product or that they have adequate tracking of the product to ensure that prohibited product is not exported to the United States. Currently, 138 nations have 910 exempt fisheries and 2,386 export fisheries. Overall, this process highlights the lack of bycatch information, with the greatest threat being gillnets in the Indian Ocean, and the lack of regulatory programs in most nations.

John Calambokidis wondered how the relative impact of bycatch on the status of marine mammal populations is considered. Nina Young clarified that the process follows the US approach. Scott Baker inquired about the task force looking at fraud in fisheries products, and Nina Young replied that she did not coordinate with that task force and that it is no longer active. Jay Barlow requested details on the comparability finding for fisheries operating in the northern Gulf of California, given the current court order banning imports from the vaquita range. Young clarified that Mexico has requested a CF for fisheries that do not harm vaquita, but the corvina fishery (within the vaquita range) was not provided a CF. David Itano noted the huge effort involved in this process, essentially making the US a major seafood certification entity. He also wondered whether the majority of the 2300+ export fisheries are lumped because of lack of information. Young confirmed that was the case and clarified that multi-species fisheries or fisheries with multiple gear types might be counted multiple times, the Progress Report is an effective tool to eliminate duplicative fisheries. Lars Bejder wondered what proportion of exports go to U.S. vs. other nations, and Nina Young indicated that it is highly variable but the US imports 80-90% of its fish products, with top importers including China, Indonesia, Thailand, Chile, India, Vietnam, Ecuador, Mexico, Russia, Japan, Philippines, Peru.

Shannon Bettridge provided an overview of the List of Fisheries (LOF), which is published annually. Currently, the 2019 LOF is in final clearance, and it includes three proposed changes: 1) indicating which stock(s) are driving the fishery's categorization 2) adding fin whale, Guadalupe fur seal, and *Mesoplodon* sp. to the Hawaii-based shallow set longline fishery, and 3) removing insular false killer whales from the Hawaii-based deep-set longline fishery. Tim Ragen inquired about the delay in reporting takes, which go back to 2012. Kristy Long clarified that the current LOF is based on the 2017 SAR, which includes data through 2015.

West Coast Whale Entanglement Updates

Dan Lawson and Doug Sandilands provided updates on West Coast whale entanglements and related NMFS/State actions. In recent years, there has been a significant increase in whale entanglements, especially humpback whales off California, but also blue whales since 2015. NMFS has increased the capacity to respond to entanglements and to process incoming data. Although most gear is not identified to a specific fishery, confirmed sources of entanglements are primarily Dungeness crab gear but also include other fixed-gear fisheries. Gear-marking discussions have been ongoing to increase our ability to identify fisheries. Preliminary 2018 data include 45 confirmed entanglement reports, with 11 gray whales, 33 humpback whales, and 1 fin whale. The 24 cases confirmed to fishery include 15 Dungeness crab (seven from CA, four from WA, two from OR, one for WA tribal fishery, and one unknown-origin).

There were also two humpbacks entangled in spot prawn gear, and three gray whales and four humpback whales entangled in gillnets during 2018. The increase in entanglements in recent years appears linked to a complex relationship between whale distribution, abundance and behavior, fishing effort, and public awareness. Better documentation has increased the ability to identify gear, but whales become entangled in many different ways, so there is no single simple fix.

There are recognized management issues for humpback whales, blue whales, and the Pacific Coast Feeding Group of gray whales. Humpback and blue whales are protected by ESA, and the States are currently moving towards a applying for an ESA Section 10 permit to authorize takes. There is also growing concern about public perception, which affects the market and creates pressure for disentanglement actions that are only possible in a small fraction of entanglements. NMFS is engaged in extensive outreach, a multi-stakeholder process in California to try to address this issue, and enhancing data collection and analysis of entanglement events for more detailed forensic review. NMFS also provides scientific expertise and management tool development for industry and the States. There is now a dedicated, coastwide network of fishermen who are working together to examine gear, evaluate new gear ideas, and make recommendations to management and industry. Recent CA legislation provided management authority to implement new surface gear regulations to reduce slack in vertical lines. Lars Bejder asked whether we know the fate of the majority of animals that are not disentangled, and Dan Lawson indicated that we have little information but post-entanglement sighting histories can help inform this. Tim Ragen asked Jim Carretta to comment on developing a correction for under-reporting of entanglements, and there was some discussion about this need.

Doug Sandilands provided an update on large whale responses in the Pacific Northwest, where entanglements increased markedly during 2018. Some potential reasons for the increase include increasing whale populations, movements of whales into different areas, and greater co-occurrence with gear (e.g. tribal fisheries in the San Juan Islands). Jay Barlow asked whether fishing effort has changed much, and Dan Lawson explained that effort has probably not increased, but there have been changes in distribution or timing. John Calambokidis asked whether gear is being set deeper, and Dan Lawson confirmed this has been suggested; however getting data has been challenging. Doug Sandilands noted that the level of reporting has increased as the entanglement-response network has expanded and become more organized. There is increasing concern about animal welfare as well as public safety, and documentation on entangled whales has improved during the past years, with helmet cameras, underwater assessments, drone footage, and better communication. On the East Coast, there is a repository of recovered gear, and the West Coast is working on this as well. Documentation and examination of the gear can provide information on how, when, where, and in what kind of gear the whales are getting entangled, as well which species, populations/stocks are involved and what the health impacts are for individual whales.

The network is also refining the ability to photograph entangled whale flukes underwater to allow matching of individuals. Preliminary data show that only half of humpback whale entanglements have photos, and only a third have identification-quality photos that would provide a high likelihood of matching to known individuals. The response network has been conducting outreach and training, so people on the water can respond appropriately. Challenges include late reporting, situations when vessels cannot stand by, and when ad-hoc responders end up leaving life-threatening gear on the whale. In the Pacific Northwest in 2018, there were responses to six live-entangled whale reports. In two cases, responders partially disentangled the whale, in the other four cases responders searched for the whale but were not able to relocate them. Additionally there were four dead entangled whales necropsied. Doug Sandilands made a comparison of responses in the Pacific Northwest in the past 3 years with responses that the Center for Coastal Studies (CCS) team conducted between 2011 and 2016. In the CCS response region there was an average of 14 entanglement reports per year vs. 10 per year in the Pacific Northwest. The proportion of reports that can be responded to is much lower because of the larger geographic response area and lack of full-time response team in the Pacific Northwest (6% of all reports disentangled and 50% disentangled where the team could respond) compared with the CCS team (42% of all reports disentangled and 78% disentangled where the team could respond). Having a vessel stand by is very

important for success, and working with vessel-based researchers (e.g. SWFSC CCES cruise) provides the opportunity to find more entangled whales, creates a greater chance of success for disentanglement and enhances the quality and quantity of data.

Kristy Long noted that there is new a national process underway to develop a protocol for identifying fishing gear taken off stranded or entangled animals. Scott Baker commented on the importance of identifying individuals and stocks of entangled whales, and wondered whether tissue samples are collected. Doug Sandilands clarified that this is a priority, but the responders are not necessarily trained for biopsy. John Calambokidis noted that there are also IACUC (Institutional Animal Care and Use Committee) concerns about taking samples from compromised animals, and some caveats were included in the permits. Simone Baumann-Pickering asked about non-biopsy samples, and Karen Martien clarified that the DNA quality is inferior for non-biopsies. David Itano inquired about making ropes more 'visible' and marking gear better. Doug Sandilands responded that acoustic deterrents are not known to be effective for reducing whale entanglements; some line color research has been done on right whales which has also shown limited efficacy to alert the whale to the presence of line. This assumes that the whale can avoid entanglement if it detects the line, but this may not necessarily be true. Tim Ragen asked for additional details on the ability to identify stocks, and expressed particular concern about West Coast humpback whales. John Calambokidis noted that better identification data will help us learn more about longterm outcomes. Tim Ragen also inquired how the effectiveness of the State working groups will be evaluated, and at what point NMFS would consider a Take Reduction Team (TRT) instead. Dan Lawson noted that the working group is still voluntary, and TRT funds are limited so it is unclear whether a TRT could be initiated. Rebecca Lewison requested that the SRG receive an update on ongoing efforts, perhaps via a presentation to the SRG by the State Working Groups. John Calambokidis wondered whether the entanglement spike has been considered as an Unusual Mortality Event (UME), and Dan Lawson responded that he was not aware of such a designation.

Other West Coast Region Management Updates

Penny Ruvelas provide additional West Coast management updates. The Pacific Offshore Cetacean Take Reduction Plan has met its short-term goal, as well as the long-term goal for all except sperm whales and pilot whales, as drift gillnet fishing effort has declined and reduced total bycatch. Exempted fishing permits (EFP) are underway (for deep-set buoy gear and linked deep-set buoy gear), and these new gear types have had very little protected species bycatch, with only 2 elephant seals and one loggerhead turtle caught and released alive. There is also a 2-year longline EFP for 45 deep-set longline sets and 45 shallow-set longline sets (333,000 hooks total). Up to one ESA-listed Guadalupe fur seal interaction is anticipated over the two years. The 2015 UME for Guadalupe fur seals has continued, and includes juvenile emaciated or health-compromised animals. A status review is currently underway for this threatened species. In contrast, the California sea lion UME is winding down. Under MMPA Section 120, authorizations to remove California sea lions to protect salmon in OR, WA and ID have resulted in the removal of 219 animals through 2018. Since 2009 there have also been 197 unauthorized sea lion gunshot cases in WA (7% of strandings) and 228 in OR (4% of strandings). Inside Puget Sound, there were 14 sea lion strandings during Sep 2018 – Jan 2019, with 50% gunshot cases. NMFS is currently coordinating with stranding network members and law enforcement. Tim Ragen wondered what proportion of cases are resolved by enforcement, and Lynn Barre indicated that very few are resolved.

Southern Resident Killer Whale (SRKW) Recovery Efforts

Lynne Barre presented an overview of the Washington Governor's Task Force to take action to support killer whale recovery, with the goals of supporting the implementation of the recovery action plan, monitoring and evaluating existing actions, and building on existing programs. The task force has a diverse membership (~45 people) with lots of public participation and three working groups to cover each of the recovery issues. Funding initiatives are ongoing, including some through the WA State legislative process. Recommendations have included increasing Chinook salmon abundance, decreasing disturbance from vessels, and reducing exposure to contaminants. The legislature is considering a bill implementing regulations on increasing viewing distances, adding a permitting system, and increasing enforcement and education. A suspension of whale watching on southern resident killer whales was also discussed but not

included, in part because there was no agreement on a protected area for killer whales. There is transboundary coordination with Canada to protect and recover killer whale populations. An emergency response to help a sick calf (J50) unfortunately gave the public the idea that we should be feeding southern resident killer whales; however, the goal is to enhance prey holistically, not feed wild animals. A summary of killer whale prey and times/places with food limitation was compiled to develop a list of priority salmon stocks to enhance, ranging from Puget Sound to central California. Vessel regulations are in place, and additional research on vessel disturbance is underway. The no-boat zones along the San Juan Islands were expanded in 2018, and there is a 'whale flag' to communicate the presence of whales so boaters can turn off echosounders and modify their behavior to reduce disturbance. These measures will be evaluated in the context of a petition to create a whale protection zone. Contaminants and health studies are being compiled into a database, and there are ongoing studies to assess health via photogrammetry, sampling and stranding investigations. NMFS is currently working on a revision to critical habitat that incorporates recent telemetry and other data.

SRKW Research Updates and SAR

Brad Hanson provided updates on population size, deaths, and births of SRKW; there are currently two whales of concern and the current N_{min} is 75. Maximum net productivity rates have changed over time; while Matkin et al. (2014) estimated 3.5% as the maximum rate for SRKW, it has been suggested that the northern resident killer whale growth rate of 3.1% is more appropriate. Brad Hanson is seeking SRG input on this. Recent research has included vessel disturbance and D-tag studies; studies of contaminants, body condition, and prey availability; small population studies to examine inbreeding and genetic variation among different killer whales; and a SRKW genome study. Body condition seems to show a declining trend, and Brad Hanson is currently working on wrapping up a manuscript on killer whale diet. Tim Ragen had concerns and questions about the prioritization and decisions regarding protected zones, given that task force recommendations will take time to implement and a few important things could be addressed quickly. Lynne Barre described the processes, limitations, and ongoing efforts. Tim Ragen expressed concern that the emphasis on long-term goals might prevent effective short-term steps to address the poor demographics of this extremely endangered population. John Calambokidis also wondered about effectiveness and constraints of the task force, and asked about the role of hatchery production. Lynne Barre indicated that there is stakeholder support for hatchery production, because this could enhance other ecosystem and fishery processes, but the details of hatchery timing and distribution are important. John Calambokidis noted that the culling of pinnipeds as predators of salmon was of interest to the SRG, and Lynne Barre responded that large culls are being discussed in British Columbia. Lars Bejder supported Tim Ragen and John Calambokidis' concerns about the seriousness of the situation and noted that methods of reducing whale-watching impacts are well understood. The spinner dolphin example illustrates that management measures become very inefficient when simple time-area closures are dismissed, especially since permitting is an intensive process.

PASCAL Beaked Whale Analyses

Jeff Moore presented an overview of acoustic data collected during the U.S. West Coast PASCAL cruise during 2016, using drifting passive acoustic recorders (DASBRs) developed by Jay Barlow. Jeff Moore summarized the analytical approach for processing these data and reviewed issues related to detectability of beaked whales during continuous dives. Whales are only detectable during parts of the dive (when they are facing the hydrophone), so the analysis requires a two-part detection-probability estimation process. Animals click about 29.5% of the time, and they are oriented in a way that makes them detectable during about 37% of their dive. The combined detection probability is relatively small (~10%), but acoustic beaked whale density estimation is more precise than visual surveys because of the greater number of acoustic detections. Preliminary analysis results show there are more Cuvier's beaked whales than previously estimated, and the estimates are more precise. However, there are several analytical complications caused by a 'blind spot' related to the orientation of animals relative to the DASBR, autocorrelation, and random DASBR effects. These will ultimately reduce precision somewhat, but the new estimates are still better than previous estimates. John Calambokidis noted that trends are usually the most important and suggested the acoustic estimates could provide more precise trend information. He also inquired whether there were estimates for *Mesoplodon* beaked whales. Jay Barlow clarified that we

do not have the dive data that is needed for a *Mesoplodon* estimate, although data from some of the DASBRs could potentially resolve depth distribution in the future. Scott Baker inquired about a release of multiple drifters to estimate detection probability, and Jay Barlow explained that an experiment with multiple floating drifters revealed that there was a very narrow beam angle of detection and animals move in a single direction for minutes at a time. Leslie New inquired about a number of Distance sampling assumptions and approaches, and Jeff Moore provide clarifications about the analysis, assumptions and additional analysis plans. David Itano wondered whether this approach could be applied to other species. Jeff Moore confirmed but noted that the detection-probability estimation process would need to be adapted on a species-specific basis.

CCES 2018 Cruise

Jeff Moore provided a summary of the California Current Ecosystem Survey (CCES) conducted in 2018 with support from NOAA, BOEM, and the U.S. Navy. The cruise objectives are to inform marine mammal stock assessments (population size and trends, stock structure), meet a variety of stakeholder needs for density and distribution data, and contribute to integrated ecosystem assessments. Previous surveys have had random-systematic coverage of the entire region, but CCES differed in that it was combined with a coastal pelagic fish stock (CPS) assessment because of funding and ship-time limitations. Visual marine mammal operations were conducted as usual during the daytime, but the acoustic array was replaced by DASBRs and small-boat sampling was outsourced to Cascadia Research Collective ('Cascadia'). Survey effort was concentrated over the continental shelf and driven largely by the CPS sampling constraints, leading to some poor-weather gaps. Overall, weather conditions were better than in previous years and 11,000 linear km of linear effort were completed. There were about twice as many sightings as on past cruises, mainly because of the shelf focus. Offshore species were under-represented and there were a greater number of sightings that could not fully be identified (e.g. *Delphinus* spp.). The spatially biased sampling design will require a reliance on model-based abundance estimation and the inclusion of survey data from previous years to provide broader habitat coverage. This will take about one year to complete. The SRG discussed the sampling bias and questioned whether the models will be able to produce estimates that are comparable to past years. Lars Bejder also inquired about the potential for resampling the same animals on the finer-scale lines. Jeff Moore indicated that resampling the same animals is only a problem for species that migrate in a systematic way, and this will need to be addressed in those cases.

Large Whale Photo-identification Studies

John Calambokidis provided additional details on the collaborative work conducted by Cascadia and related work under a separate ESA Section 6 grant. During late June-September, Cascadia staff obtained >1500 photo-identifications and 300 tissues samples from whales via small-boat sampling along the West Coast. Previous analyses showed an increase of humpback whale populations until late 2000s, then stabilizing of abundance, but recent data (pre-CCES) suggested a marked increase in humpback whale abundance off the U.S. West Coast (mainly CA and OR, because northern WA and BC are treated separately). This could indicate a population increase or effects of changes in the sampling and analysis (e.g. automatic matching, contributions from citizen science efforts such as happywhale.org that are concentrated in certain areas, etc). There are ongoing efforts to evaluate these changes and potential sources of bias. So far, the auto-matching does not appear to influence the estimate, while the happywhale.org contributions do influence the magnitude of the apparent increase. However, it is not clear whether this is a new bias or a change in a previous bias. The new CCES data will help address these questions because they include a wider range of regional sampling. Tim Ragen wondered whether the trend suggests an underestimate during the 2012-2013 period, as the current value is somewhat consistent with the longer-term trajectory. John Calambokidis noted that the validity of assumptions about mixing between areas could affect model results, and animals are expanding into new areas where they were not previously common (e.g. Salish Sea, Strait of Juan de Fuca). Cascadia deployed some tags to examine whale behavior in these new areas, and animals were feeding on a deep krill layer near the bottom. Tim Ragen wondered about stocks and DPSs, and John Calambokidis explained that our understanding of connections to wintering areas is improving, but we have little recent information from Central America. The abundance estimate for the Central America DPS is based on 2004-2006 data; thus

the estimate exceeds the time window (>8 years) considered valid for use in MMPA management. There are efforts to build collaborations in relationship to each of the recognized DPSs.

Genetics Research Updates

Karen Martien provided an overview of several ongoing genetics research projects. The Stock Delineation Handbook, focusing on the science of delineating stocks under the MMPA, is nearing completion and a final review is expected within the next month or so. Lab work is almost finished for an ongoing project to help resolve humpback whale DPS and stock designation, and analyses are planned for the coming months. The current stocks in the SARs that are not biologically sensible, given what we know about DPSs, and mtDNA allows assignment to breeding area with 80% accuracy. Scott Baker commented that the SPLASH project previously offered the possibility to look for variation across regions, but now he is involved in a complementary study looking at differentiation between the Central American and Mexican DPSs, which mix along the U.S. West Coast. For some individuals, we have greater confidence in association than for others, even with current tools. As samples and genetic analysis methods progress, our ability to differentiate individuals should improve. Karen Martien clarified that the ongoing project is focusing on migratory herds, which breed and feed in the same locations (e.g. Central America breeding whales that feed in CA and OR). The mainland Mexico DPS includes multiple migratory herds that go to different feeding destinations, so herds could represent a suitable aggregation unit for management. The current study is focused on whales off CA/OR and the Central American vs. Mexican DPS, so it will not resolve questions of origin for animals entangled off WA.

Scott Baker commented that the SPLASH data provide some ability to assign individuals from feeding grounds to DPSs. John Calambokidis was troubled by the disconnect between the ESA's DPS approach of looking at breeding areas, while animals are most loyal to feeding areas and this is where most impacts are occurring. There are statutory ESA constraints, but we need to maintain the MMPA perspective for effective management. Scott Baker noted that mixed-stock analyses assume animals are mixing randomly, so the strong foraging site fidelity with non-random mixing creates a bias. Tim Ragen added that stock identification has become primarily a biological question, while in the past, management issues were also considered. Shannon Bettridge agreed, but the management discussions are also still ongoing and important. Karen Martien briefly mentioned several other ongoing genetics studies on harbor porpoise, fin whales, and short-finned pilot whales. She indicated that preliminary results should be available by the next SRG meeting. The fin whale results might lead to an updated Status Review, depending on results. Shannon added that a 5-year review of globally listed fin whales was just completed, and there was a recommendation to down-list the species.

U.S. West Coast Serious Injury Determinations

Jim Carretta reviewed serious injury and mortality for 2013-2017 (PSRG-2019-06), focusing on large whales but noting that pinnipeds and small cetaceans are also included in the report. Jim recently published a machine-learning approach for assigning unidentified whales to candidate species probabilistically. During 2013-2017 there were 138 anthropogenic interactions with humpbacks, 60 interactions with gray whales, 10 with blue whales, and a few with fin whales. Simone Baumann-Pickering inquired about efforts to determine how the impacts are underestimated, and whether the analysis includes habitat, distance to shore, etc. John Calambokidis clarified that a total estimate is available for ship strikes (Rockwood et al. 2017), and Jim Carretta explained that additional data and analytical approaches are needed to estimate total entanglements. Doug Sandilands commented that data on entanglement scarring rates for East Coast whales suggest that about 10% of entanglements are reported. Lars Bejder noted that UAV are providing excellent data on scarring and this can help assess undetected entanglements and impacts. Doug Sandilands cautioned that the best view to assess the presence of entanglement scars on humpback whales (wrap or no-wrap) is from ahead of the whale looking backwards toward the fluke insertion, and aerial views do not provide the same level of a view of both the dorsal and ventral side of the peduncle and flukes to determine if the scar is associated with an entanglement and not from another source that could create a similar linear mark. SRG members discussed changes in whale distribution, fishing effort distribution and timing, and changes in the level of

reporting, which are all relevant factors. Kristy Long added the serious injury policy is currently undergoing review, and input or data are of great interest.

CA Swordfish Drift Gillnet Bycatch Estimates

Jim Carretta summarized his bycatch estimation report (PSRG-2019-07) that uses regression trees, and noted that some of the methodological details have been modified based on performance simulations, especially for rare events. In particular, the method of variable selection has been improved and is more inclusive. Variable selection is now based on minimizing the cross-validated error rate for bycatch presence / absence prediction, instead of only including 'significant' variables. The method still addresses zero-inflation of the data through amplifying the signal-to-noise ratio by bootstrap sampling equal sample sizes of fishing sets with and without bycatch, and then building many classification trees with cross-validation. This enables the identification of a greater number of significant variables, and improves overall accuracy. Tim Ragen asked about an apparent inconsistency between extrapolating to estimate total gillnet bycatch, but not for serious injury determinations. Jim Carretta clarified that the injury database is primarily opportunistic so there are no reliable covariate data with which to develop a model. He also noted that total effort is known in the DGN fishery, but not for opportunistic reporting of injuries. Tim Ragen acknowledged these constraints, but encouraged NMFS to try to move the injury assessments towards a similar framework.

West Coast Harbor Porpoise Trends

Karin Forney presented an overview of the results of a Bayesian trend analysis (PSRG-2019-08) in collaboration with Jeff Moore to examine harbor porpoise trends off California. Three of the four stocks have a long history of (varied) bycatch in gillnet fisheries, and the analysis examined abundance trends during and after bycatch periods for each stock. Coast-wide harbor porpoise surveys (flown since 1986) were combined with additional data from fine-scale leatherback turtle surveys for the analysis. The model was composed of a process model of exponential growth and an observation model based on line-transect sampling, and was fit using Markov chain Monte Carlo (MCMC). Results show that the Morro Bay stock has grown at an estimated rate of 9.7% since the early 1990s (from about 600 porpoises to over 4,000), suggesting that past bycatch impacts were greater than previously recognized. The Monterey Bay stock's growth rate was estimated to be 4.2% annually. The San Francisco / Russian River (SFRR) stock had equivocal results, with a population increase followed by an apparent decline. This decline might be related to the return of porpoises into San Francisco Bay, where aerial surveys are not practical. Off northern CA, where there was no historical bycatch, no population trend was identified. Combined, the results show that porpoise populations can recover if bycatch is eliminated, but recovery can take decades. The Morro Bay stock analysis has provided the first empirical estimate of R_{max} for a harbor porpoise population.

John Calambokidis asked how the method compares to traditional methods, and Karin Forney responded that the method provides greater power to detect trends and allows inclusion of additional fine-scale survey data. John suggested the method could be applied to other populations, such as WA state harbor porpoise. Leslie New requested that estimates for non-survey years be included in the plot, as this is one advantage of a Bayesian approach. She also inquired about the assumption of exponential growth for the Morro Bay stock, and wondered whether the population might be at carrying capacity while the model infers a continued increase. Jeff Moore clarified that growth is not forced year-to-year in the model, because error terms can be negative or positive. Further, the estimated population growth rate is consistent with the dramatic recovery seen in the Morro Bay population since 1986. Scott Baker noted that the initial Morro Bay decline illustrates how we can fail to detect impacts to cryptic species, and he was excited about the results showing recovery. Tim Ragen asked what we know about porpoise movements. Karen Martien provided additional details on past genetic studies and ongoing work by Phil Morin (SWFSC), noting that the current boundaries are in part based on low-density regions within a largely continuous range. John Calambokidis added that contaminants showed similar patterns to the original genetics studies. Karin Forney explained that some low-level movement is possible between the Monterey Bay and SFRR regions, but uncertainty remains. Scott Baker inquired about the increasing error bars in the estimates as the population increases. Karin Forney explained that variances increase with the

mean, but effort has also declined markedly in recent years despite the inclusion of leatherback survey data, contributing to greater uncertainty. The SRG noted that this illustrates the importance of regular surveys with adequate coverage. Simone Baumann-Pickering asked about acoustic abundance estimation. Karin Forney noted that density patterns from acoustic monitoring in Monterey Bay matched visual surveys, so there is potential for abundance estimation using an acoustic monitoring network; however, this may not be more cost-effective than aerial surveys.

U.S. West Coast Pinniped and Cetacean SARs

The SRG reviewed the Draft 2019 SARs (PSRG-2019-01) for Guadalupe fur seals, sperm whales, and harbor porpoises. Suggested changes included adding pup counts to the Guadalupe fur seal SAR figure, adding credible intervals for R_{max} in the harbor porpoise SARs, and clarifying that the Northern California porpoise trend is only for part of that stock's range. There was also some discussion about the large uncertainty in sperm whale estimates, but no SAR changes were identified.

Southern Sea Otter Updates and Revised SAR

Lilian Carswell (by phone) presented updates and a revised SAR (PSRG-2019-04) for southern sea otters. The threshold for delisting consideration (3,090) was met for the first time in 2018, and an ESA status assessment will be conducted soon, followed by a habitat-specific carrying capacity analysis and OSP determination. Litigation relative to the termination of the sea otter translocation program has ended as of January 2019. SAR updates include N_{min} = 2,986 and R_{max} = 6% for the mainland population, and N_{min} = 95 and R_{max} = 13% for San Nicolas Island. Anthropogenic mortality during 2013-2017 averaged 5.6/yr and included boat strikes, shootings, automobile and train strikes, research complications, and spiny lobster pot and hook-and-line fisheries. A more recent Monterey Bay entanglement in blue-green braided line caused severe tissue damage with a nearly circumferential wound that extended deep into the otter's muscle. Tim Ragen wondered how carrying capacity would be estimated. Lilian Carswell explained that previous analyses by Kristen Laidre did not consider estuaries as uniquely important habitat, but we now know they are and Tim Tinker is working on including these habitats and otherwise updating methods for estimating carrying capacity.

Washington Sea Otter Updates

Although there is no draft SAR this year, Deanna Lynch provided updates on the reintroduced WA sea otter population. Monitoring began in 1989, using ground observation and aerial counts. The otter's primary range is between Tatoosh Island and Cape Elizabeth, with extralimital otters in Puget Sound and as far south as Cape Arago, Oregon. The population size is about 2,058 with a 9.5% annual growth rate, but growth is slower in the northern portion where they were originally introduced. This might indicate that otters are approaching carrying capacity in the rocky-coastline areas. In the southern portion of their range, there are very large rafts and animals are found farther offshore. Dominant causes of mortality are infectious diseases (especially *Sarcocystis*). Human-caused mortality including gillnets, severe head trauma, and shootings are minor causes of mortality. In recent years, microcystin poisoning from an unidentified fresh-water source in Kalaloch area has also been documented. WA sea otters are on a 3-year SAR revision cycle, and the draft 2017 SAR is still under review following a public comment period in early 2018 and a revision in July 2018. The most recent SAR had N_{min} = 1,800, R_{max}=20%, Fr=0.1, and PBR=18. Total human-caused mortality and serious injury is at least 1/yr but it is not possible to evaluate ZMRG since this is a minimum. The stock is not listed under ESA, and the previous WA endangered status was recently changed to threatened, because the population has increased. They are still vulnerable to potential catastrophic impacts (e.g., oil spill). Their status relative to OSP is unknown because there is no adequate estimate of carrying capacity. The ongoing analyses by University of Washington PhD candidate are expected to provide a better estimate of carrying capacity. Scott Baker wondered whether there has been any modeling of the expansion rates (e.g. when will they reach Oregon). Deanna Lynch indicated that they seem to be filling in habitat in WA first, and a large area of sandy habitat might act as a dispersal barrier.

Pacific Islands Fishery/Management Updates

Ann Garrett reported that a recovery plan is under development for MHI insular false killer whales. The List of Fisheries has been updated to reflect changes in the shallow-set and deep-set longline fisheries. As part of the false killer whale take reduction plan (FKTRP), the Southern Exclusion Zone (SEZ) was closed for the second year in a row. The Pacific Islands Regional Office (PIRO) continues to work on a proposed rule for spinner dolphins, with a 50-yard approach limit and no swimming, and they are currently working through the comment responses. The Dolphin SMART program is also being revamped, with increased outreach and coordination with law enforcement. A close-approach regulation was implemented for humpback whales following delisting. In November 2018, PIRO convened a meeting to review potential causes of an apparent decline in HI humpback whales between 2015 and 2018 and to discuss research priorities. Participants examined whether this is a population decline or a change in habitat use. Research priorities include examining distribution shifts, body condition, and possible food sources. Informal working group efforts have continued on a variety of these topics. David Itano inquired about the process for re-opening the SEZ. Ann Garrett noted that the agency is reviewing the four criteria, and the TRT will be convened to make recommendations. Lars Bejder referred back to previous SRG recommendations for area closures to protect spinner dolphins, and expressed discouragement with the lack of progress over many years. The Dolphin SMART program in Florida was not efficient, and Lars Bejder questioned why so much effort is being put into this program in Hawaii rather than pursuing other actions that have been recommended. Ann Garrett responded that regulatory actions have slowed under this administration, and various lawsuits have taken resources and staff away from the spinner dolphin issue. PIRO has also found the public to be very responsive to details learned through the SMART program.

False Killer Whale Take Reduction Team (TRT)

Ann Garrett gave an overview of the FKWTRP, which included two gear requirements and a triggered closure area (SEZ). As of 2018, false killer whale interactions have not declined, and in April 2018, the TRT examined interaction outcomes and evaluated plan effectiveness. During 2018, 4 of 13 interactions were inside the U.S. EEZ, and the SEZ was closed from July through the end of the year. During 2019, the SEZ closed again on February 22 because of two serious injuries/mortalities, and NMFS is currently evaluating next steps. David Itano asked whether the FKWTRP emphasis remains on weak hooks and strong branchlines. Ann Garrett responded that the TRT is considering changes, and Ryan Steen clarified that the TRT is considering changes to wire diameter, not hook size. John Calambokidis asked for additional thoughts from other TRT members attending the SRG meeting. Dennis Heineman noted that the weak hook/strong branchline configuration is only one of three regulations, which also include handling techniques to encourage straightening of hooks and the SEZ closure. The team recently also considered adding the short-line fishery to the scope of the TRP. Robin Baird added that recent discussions have focused on crew training, but this is complicated by the many languages spoken and that fact that many crew members are not allowed on land when in port. The current FKWTRP training requirement is only for captains and owners. Ryan Steen added that the TRT agrees that improved training is needed, and gear changes and other measures were also discussed but no consensus was reached among TRT members at the meeting, but discussions are ongoing.

Hawaiian Monk Seal Research and SAR

Jason Baker provided an overview of monk seal research, noting that the Monk Seal Program Leader position is currently open, because Charles Littnan is now the Division Director. Population assessment activities in the program focus on demographic data from sighting histories, tagging, documented births/deaths, and necropsies, which are inputs to a population model. There are annual field camps at five locations in the Northwestern Hawaiian Islands (NWHI), but Midway and Necker and Nihoa have low levels of effort. In the Main Hawaiian Islands (MHI) sightings are derived from volunteers, the public and some directed effort. Abundance trends and precision vary across sites. The program has recently starting using UAS and last year obtained the first high quality UAS count at Necker Island; this offers new opportunities for sampling. Jason reviewed an analysis that was conducted previously to examine the relative importance of various mortality sources (see 2018 PSRG meeting summary). Analysis of 19 weaned pup translocations conducted during 2012 to 2014 demonstrate that these actions enhanced

survival. Scott Baker noted that human disease sources have become prominent for many species, and wondered how this factors into monk seal assessments relative to PBR. Jason Baker indicated that toxoplasmosis is transmitted by introduced cats, so these cases are human-related but in other cases, the link is not as clear. Shannon Bettridge added that disease mortality is only considered relative to PBR when a human link can be documented, but the information should be listed in the SAR for completeness. Tim Ragen commented that the translocations started in the early 1990s, and after some challenges, the program has figured out how to do this successfully. Lars Bejder asked whether the habitat section of the SAR should include the recent perturbation on East Island. Jason Baker responded that Trig Island was washed away by a hurricane, possibly causing the death of some pups. This information will be included in a future SAR and potential effects on demographics will be evaluated. It is not clear yet what the loss of those islands in 2018 will mean for the population. Pups born at Trig Island have been subject to very high shark predation risk for the past 20 years. It is possible that if mothers have their pups on other islets they may be more successful. Also, East Island may return to some degree due to accretion over the winter and spring. Lars Bejder inquired whether it is possible to read tags or identify animals using the UAVs, and Charles Littnan confirmed that this is possible because UAVs can fly low without disturbing the seals. They are also developing a small Bluetooth tag for turtles and monk seals that can be received by smart phones. Tags can last for many years, and stations can be added to the beaches to document when animals are present. Tim Ragen asked whether anything was being done about Tern Island entrapment hazards, and Charles Littnan explained that the gear was pulled out or lost during hurricane, but the hurricane likely exposed or created additional debris. The team will return in March to evaluate at that time.

The SRG reviewed the monk seal SAR and made suggestions to provide more information on cryptic mortality sources and to indicate disease mortality more clearly. Lars Bejder wondered whether unobserved anthropogenic mortality and serious injury could be estimated, given the extensive demographic data. Jason indicated he will propose some changes in next year's SAR, and noted that he is seeking input whether to include infectious disease as part of the anthropogenic mortality. The SRG was supportive of including human-related diseases, and John Calambokidis commended PIFSC on the progress that has been made with the monk seal program.

Marianas Islands Cetacean Research

Erin Oleson provide an overview of the materials in three SRG documents on cetacean research in the Marianas Islands. A variety of field sampling has taken place since 2010, including vessel surveys and passive acoustic monitoring. The results of a large photo-identification effort (PSRG-2019-12) to examine links for humpback whales in the Marianas appears to suggest this is a 'missing' breeding ground identified by the SPLASH study. Since 2015, small-boat surveys have sampled whales and documented small calves and competitive groups. There are 43 non-calves in catalog, and biopsy samples were obtained from 24 individuals. Sighting histories show site fidelity across years, and comparisons to other catalogs show matches to Ogasawara, Okinawa, Philippines, and Russia. Genetic analyses comparing haplotype frequencies for Marianas humpback whales showed little differentiation from Ogasawara and Russia, but significant differentiation to Philippines and Okinawa. John Calambokidis expressed skepticism that the Marianas humpbacks represented the missing breeding grounds, because the missing population was expected to number in the thousands, and the small number of IDs coupled with site fidelity and interchange with Okinawa and Philippines do not entirely fit the story. Erin Oleson responded that Marianas could be part of a larger, unknown population, and PIFSC is looking at additional areas to sample. An acoustic glider detected humpbacks east of the islands, far offshore, suggesting there still are other areas. Scott Baker added that the area along the seamount region is vast and sighting conditions are generally poor. The repeat sightings are often females with calves who might have very specific habitat preferences; however, even with the other areas, one might only expect to find about 1,000 whales, not the several thousand that are 'missing'.

Document PSRG-2019-11 reviews recent data on beaked whales in the Marianas relative to naval activities. There have not been many sightings of beaked whales, but there is a rich acoustic data set (DASBRs and HARPS). Anne Simonis has analyzed the HARP data sets, and the vast majority of

detections are *Mesoplodon densirostris*, along with few Cuvier's beaked whales and some 'Cross Seamount' beaked whales (BWC). In August 2011, there were two Cuvier's beaked whales stranding deaths, and data from two HARPs indicate mid-frequency active sonar with received levels between 116 and 160dB the day before. Sonar appears to be infrequent on the HARPs, but Anne Simonis analyzed the sonar in more detail and it was within or above the levels known to cause behavioral responses in BRS studies, but not high enough for temporary or permanent threshold shifts (TTS/PTS). Anne Simonis and Bob Brownell have compiled a timeline of all reported (named) Navy operations in Guam and Saipan relative to strandings. Not all strandings have associated named sonar events (including the August 2011 event recorded on the HARP), but 5/8 strandings (62%) were associated with naval operations. The SRG document is currently undergoing a courtesy review by the U.S. Navy, which maintains that sonar in the Marianas is much more frequent so the animals should have habituated as they have in Southern California. The SRG discussed various factors that could affect the detection of sonar and the likely exposure of individual beaked whales to sonar, and noted that bathymetric differences between Southern California and Marianas create different impacts to the animal. Scott Baker wondered whether there was any way to assess the potential unknown mortality (e.g. based on changes in click rates), because the documented strandings are a minimum and for assessments we need to know total impacts. Erin Oleson and Simone Baumann-Pickering indicated that it would be very difficult to detect changes in click rates. Jim Carretta suggested permuting stranding and sonar events to evaluate whether the 62% overlap were significant. Scott Baker asked whether any mass strandings were ever known to be unassociated with sonar, and Erin Oleson confirmed that all have had naval activities.

Document PSRG-2019-13 summarized additional research efforts, including ship-based survey work in 2015 and 2018, and small vessel surveys that yielded over 475 sightings and many photos, biopsies, visually verified acoustic recordings, and 45 satellite tag deployments. Spinner dolphins are by far the most commonly observed species, and Guam appears to have a demographically independent population from Rota and the '3-Islands' (Saipan, Tinian, Aquijan). Bottlenose dolphin samples all show some degree of Fraser's dolphin ancestry, but there is no evidence of population structure among islands. Short-finned pilot whale samples provide a complicated picture of potential population structure, perhaps similar to Hawaii. One large male had a considerable wound that was likely caused by fishing line, indicating fishery interactions that require additional research. Bryde's whales were recorded and found to be the source of unknown 'biotwang' sounds, and there was evidence of fishery interactions for this species. False killer whale sightings appear to indicate some site-fidelity to the archipelago. Future research and analysis needs include 1) a full, design-based ship survey (which is part of the PacMAPPS plan for 2021), 2) analysis of the HARP and DASBR data to detect baleen whales and odontocetes, and 3) continued satellite-tagging efforts. David Itano wondered whether there is enough information for SARs, and Erin responded that some of the catalogs might be suitable for mark-recapture abundance estimates, but there is limited information to develop SARs before the planned 2021 survey. Karin Forney noted that the original Hawaii SARs acknowledged the existence of species but had virtually no information on all the elements, and Shannon Bettridge added that having SARs with limited information is helpful to decision-makers and legislators who evaluate resource needs. Tim Ragen agreed that having SARs with the limited information would be helpful. Scott asked whether PacMAPPS is currently funded, and Erin confirmed that the Navy plans to support this effort. David Itano wondered whether the pilot whale injury could have been caused by a propeller rather than line, and Erin Oleson confirmed that the experts concluded the injury was most consistent with line.

Marine Mammal Health and Stranding Response Program (MMHSRP) serious injury determinations

Injury determinations have traditionally been reviewed by the SRG prior to the meetings via e-mail, but with prolonged government shutdown, this was not possible. Erin Oleson gave a brief overview of the interactions summarized in Documents PSRG-2019-09 & 10 and requested any feedback, comments, questions from the SRG. David Itano questioned the description of the mooring cable as a FAD, as this does not seem consistent with what is used, and he offered to be available for any potential consultations. Scott Baker inquired about the criteria used to establish whether reports are reliable. Erin said that reports are vetted by Amanda and other MMHSRP colleagues.

Updates on HICEAS 2017 Analysis, WHICEAS 2019 Survey

Erin Oleson reviewed recent and planned surveys around Hawaii. HICEAS 2017 was a 7-leg, large-scale survey of the U.S. EEZ around Hawaii (179 days). It represented the first PacMAPPS survey, with NMFS providing vessels and expertise and BOEM/Navy providing additional funding. The survey included standard visual and acoustic sampling, photo/biopsy efforts, seabird surveys, some oceanographic sampling, and a few ancillary projects (e.g. eDNA). A diverse suite of species was seen, including 12 false killer whale groups, which need to be assigned to stock based on tissue samples (if available) or some other method. Analyses were underway and planned to be completed by the SRG meeting, but the government shutdown interfered with this schedule and now the analyst (Amanda Bradford) is on maternity leave until May. Elizabeth Becker is working on habitat-based cetacean-density models within the EEZ, and she plans to develop model-based false killer whale estimates for the entire longline fishing area. A specific false killer whale protocol was used during HICEAS, and an analyst is currently working on methods to analyze the acoustic data (although this will not be part of the initial visual abundance estimate). Passive acoustic data from the HICEAS survey will be provided as sample data at the 2020 Detection, Classification, Localization and Density Estimation (DCLDE) workshop, to allow different investigators to apply different techniques. Nineteen DASBRs were deployed (although six were lost), yielding numerous beaked whale detections. A planned winter 2019 visual and acoustic survey of the Main Hawaiian Islands to assess migratory large whales and insular cetaceans had to be postponed until 2020 because of the shutdown and ship maintenance issues. As a result, other PacMAPPS surveys will be delayed by one year.

Other Pacific Islands Cetacean Research & Priorities

Erin Oleson described 14 acoustic monitoring sites that have been occupied since 2006, supporting a number of projects. Of particular interest is a machine-learning algorithm to identify cetacean sounds as part of Google's 'AI for Good' program. Ann Allen has annotated humpback whale calls, and now Google is developing a machine-learning approach to discriminate humpback whales from other baleen whales. There are still false detections, so Ann is working with Google to improve detection accuracy. Google is doing this free (for positive publicity), and they are extremely fast, having already processed 19 years of data. Ann is examining the detections identified by Google to evaluate whether there have been changes in humpback whale habitat use, and identified no clear patterns based on long-term records from Hawaii Island and Pearl & Hermes Reef. A second project involves characterizing geographic variation in Blainville's beaked whale echolocation clicks using automated detectors to identify potential population structure. Peak frequency and interclick intervals are common indicators of beaked whale species identification, but there are also regional within-species differences. Peak frequency increases at lower latitudes (where beaked whales are common), and the initial results suggested there might be migratory Blainville's beaked whales and identified locations of interest for additional analyses. HARP data from Kona (13 years), are being analyzed for all odontocetes, ambient noise, and anthropogenic sound sources as part of a national Soundscape exercise, using automated detectors developed by Simone Baumann-Pickering's group at SIO.

PIFSC has worked on developing a monitoring plan for MHI spinner dolphins, to obtain stock-wide abundance estimates and assess the overall health of spinner dolphin populations in support of management decision-making. The approach has four components including passive acoustic monitoring, line-transect abundance surveys, a one-year follow-up to the SAPPHIRE project to provide new mark-recapture estimates, and examining the age structure of spinner dolphins using UAS-based photogrammetry (in collaboration with Lars Bejder). The research has been delayed by the shutdown, but is expected to commence within the next year. UAS photos could potentially provide a quick indication of population health. A white paper that summarizes the research plan has been put together, and it is circulating among NMFS and potential funding entities. Tim Ragen inquired whether HICEAS provided any information on spinners in the NWHI, and Erin clarified that the large vessel could not access the very nearshore areas occupied by spinner dolphins. Tim Ragen further asked whether previous efforts to establish ecotourism in the NWHI had ended, and wondered whether stock structure is sufficiently well resolved to obtain good abundance estimates for management. Erin confirmed that ecotourism had ended,

and clarified that stock structure is reasonably well known but biopsy-sampling efforts will continue to increase sample sizes for analysis. Scott Baker commented that he appreciated the effort to collect the eDNA samples to try to identify the Cross Seamount Beaked whale, and noted that despite some contamination issues in the beaked whale samples (pig DNA), false killer whales were very likely detected in one of the deep-water samples. This shows the promise of eDNA technology, particularly when coupled with acoustics to confirm presence of individual species. Erin Oleson added that a few sea days are still available and additional sampling is planned, making sure the pig DNA issue is addressed. Karen Martien asked whether the false killer whale detection was in a frozen sample (Erin Oleson thought it was), and noted that there is a CTD lubricant derived from pigs. Leslie New commented on approaches to assess and avoid sample contamination using specialized sampling devices.

Hawaiian Spotted Dolphin Research Updates

Robin Baird gave an update on a new dolphin tagging method that uses a pole on bow-riding animals. The current design is only suitable for animals in a certain size range, but they are looking for funding to modify the design and Robin is interested in testing this new design on spinner dolphins. Document PSRG-2019-15 covers recent tagging results for spotted dolphins in the MHI. The four demographically independent spotted dolphin stocks are lacking abundance estimates, but applying the pelagic stock density to insular stocks yields a ballpark estimate of 920 spotted dolphins for the Hawaii Island stock. Recent models of relative abundance around the main Hawaiian Islands were developed based on a variety of sighting sources. Limpet tags were deployed on nine animals in seven different groups within all of the stock ranges, with a median attachment duration of 18 days. The insular stocks tended to stay close to areas where they were tagged, and there was no clear pattern with respect to depth or distance to shore, although there was a tendency to occur on the slopes. Individuals did cross outside of the stock boundaries, but all except one remained near the islands where they were tagged. The exception was one male dolphin tagged during summer, which traveled around Oahu and to the Island of Hawaii. Animals tagged off Kauai tended to spend time in deep water, and at a greater distance from shore than the other insular animals, and they were more wide-ranging like pelagic dolphins. Sample sizes are still small, but insular animals showed movements consistent with other insular dolphin stocks, and some revision of stock boundaries is suggested.

Document PSRG-2019-16 provides updates on spotted dolphin fishery interactions. Robin Baird reviewed the association between tunas and spotted dolphins. A lot of non-longline fishing takes place in Hawaii using a variety of gear in nearshore areas. These fisheries are considered Category III fisheries under the MMPA. Some of the fisheries were proposed to be Category II, but NMFs ultimately did not re-categorize these fisheries. Robin Baird's research seeks to collect systematic data that will allow quantification of interactions between spotted dolphins and fishing. The study also includes a mark-recapture study of vessels that fish in association with spotted dolphins. The greatest percentage of spotted dolphin groups are associated with fishing vessels off the island of Hawaii, but associations have also been documented off Oahu and Maui Nui. A discovery curve of the fishing vessels that are repeatedly seen with spotted dolphins is starting to level off, and mark-recapture analyses estimate there were 162 vessels fishing on dolphins in 2011-2012 and 336 in 2012-2013. No seasonal trend is apparent from April – December, when weather is suitable for sampling. Spotted dolphins associated with fishing have a more restricted distribution than overall spotted dolphin sightings, concentrating south of the Kona airport and along the shelf. When no fishing vessels are present, dolphins are spread broadly across depths and distance to shore. Dolphin groups with fishing vessels tend to be larger than those without, possibly reflecting their easier detection or an increased association with tunas. A variety of fishing methods are used when fishing on dolphins (e.g., trolling through groups or around them, re-positioning, circling the group). David Itano inquired about the hooked dolphin shown in Robin Baird's presentation, and suggested there would have been a larger lure if the dolphin had been hooked during fishing. He also commented that spotted dolphin hookings seem to be rare and unlikely to be a problem. Robin Baird responded that a few fishermen have confirmed that they have hooked one or two spotted dolphins, and it is difficult to assess the total magnitude of hookings without more detailed data. Simone Baumann-Pickering asked about vessel abundance patterns, and Robin Baird clarified that vessels are most abundant off Kona. However, it is difficult to obtain interaction data to understand how widespread

dolphin hookings are. Tim Ragen suggested that when there is evidence of interactions, fisheries should have the burden of demonstrating how significant these interactions are, rather than ignoring the issue because of lack of information. David Itano suggested that education would be better than regulatory approaches. Robin Baird noted that good estimates of abundance for the insular spotted dolphin stocks are also necessary to assess risk.

False killer Whale Research Updates

Robin Baird acknowledged the many scientists and citizen contributors to ongoing false killer whale research. During their field season, Cascadia had six false killer whale encounters representing four of five known social clusters and yielding >17,000 photos, 44 identifications of 42 individuals, and five biopsy samples including four individuals not previously sampled. Other contributors had 19 encounters of three clusters, adding 92 identifications of 54 individuals. The lower proportion of individuals reflects the spatially restricted opportunistic sampling. Recent research included drone photogrammetry and a breath sampling feasibility study to support health assessments. Five attempts yielded four samples that still need to be analyzed. Satellite tagging has taken place every year since 2007, and shows a bias towards females and Cluster 1. Three high-density areas off Kohala, Molokai and south of Lanai have been identified from the telemetry data. Biopsy samples collected from 133 known individual false killer whales are being analyzed for an epigenetic aging study, combining these data with photo ID and recent drone data.

Robin Baird also provided his perspective on the perils of using handling techniques as a solution to longline interactions (summarized in PSRG-2019-14), as recent analyses show that the TRP has not reduced interaction rates. Few observed interactions have resulted in straightened hooks or pullouts, as desired. Safety is a concern, and trials are underway to reduce the likelihood of hook snapback using a weight. There is also uncertainty whether crew behave differently when no observer is on board, which could create a bias in bycatch estimates based on the observed 20% of trips. Electronic monitoring is a potential way to document handling behavior on unobserved trips. Leslie New inquired whether every vessel would have electronic monitoring, or whether a subset would be monitored to reduce the magnitude of the potential bias. Robin Baird expressed a preference for 100% electronic monitoring, but suggested that a smaller sample could allow evaluation of potential observer effect and might provide incentives to crew for proper handling. Ryan Steen commented that there are different views about electronic monitoring on the TRT, and this is one of the contentious points of the ongoing negotiations.

Hook Strength Testing

In the past, the SRG has recommended that hook strength studies be conducted to evaluate the variation in hook performance. David Itano recently learned about some new hook strength tests that seemed relevant for the FKWTRP regulation on hook type and the assumed strength based on wire diameter. A colleague (Melanie Hutchinson) is testing hooks that meet the FKWTRP requirements relative to sharks, and she is examining corrosion rates in seawater. She records hook size and style, brand, shank diameter, and the breaking weight determined in a controlled manner using a specialized machine. David Itano ask the SRG whether these data are of interest, given the previous recommendations. Tim Ragen agreed that the data would be of interest, but cautioned that it is also important to know how each hook would perform in the field. David Itano noted that line breaking strength can also be tested; combined with the hook tests, this allows evaluation of tackle performance without risking the safety of fishermen in the field. Robin Baird provided some details on hook strength tests that had been done during the FKWTRP development, and noted that there was variation among hooks. The goal was to target a certain breaking strength, but the regulation was simplified to require a specific wire diameter, and this could allow fishermen to use stronger hooks with the same diameter. Dennis Heineman added that the hooks have to be strong enough to retain tunas and suggested that line and hooks should be tested together. Most fishermen use just a few different types of hooks. Erin noted that metallurgical properties of the hooks are important, and Tim Ragen suggested that hook strength might not be a real solution if there is a range of performance in the field.

Additional Draft 2019 SARs
Draft 2019 blue and humpback whale SARs could not be prepared for this SRG meeting, because the government shutdown prevented last year's drafts from being finalized in time. For this reason, Jim Carretta and Karin Forney offered to prepare draft 2019 SARs for these two species once the 2018 SARs have been finalized, likely by May 2019. John Calambokidis asked for clarification of the years covered in the current SAR, and Jim Carretta indicated that the 2018 SAR includes data through 2016. The SRG members agreed that updated humpback and blue whale SARs are important, and requested that these two SARs be prepared for review by e-mail or webinar during May.

Topics, timing, and location of next meeting
The SRG agreed to hold the next meeting in Hawaii, as early as possible in March. The schedule should try to work around the Council's Science and Statistical Committee Meeting, which is probably during the 2nd week of March. Erin Oleson also noted that Winter HICEAS survey is expected to end March 9.

Topics for next meeting:

- The SRG requested that NMFS & FWS review their recommendations when developing an agenda, so NMFs and FWS staff can provide updates on the recommendations and how they have/have not been addressed.
- Integrated update on FKWTRT progress on alternate gear and supporting research.
- Results of CCES analyses, including pros/cons of the merged fish and mammal survey
- New cetacean estimates for HAWAII (maybe intersessional webinar for background to allow incorporation in SARs).
- New abundance estimates and SARs for West Coast
- Model-based estimates and how to use them (e.g. false killer whale fishery-area estimate)
- Overview of ways data missing in SARs could be obtained (e.g. Pacific Islands SARs have a lot of unknown components)
- Potential new methodologies to fill in data gaps, especially as ship time has declined.
- Fishery impacts in the other Pacific Islands (outside of Hawaii)
- Update on CA/OR/WA Working Group efforts related to whale entanglement
- Update on MMPA Import Rule status

APPENDIX 1
Attendees - Pacific SRG Meeting, Olympia, WA, 5-7 March 2019
(*Indicates participation by phone/webinar)

Pacific Scientific Review Group:

John Calambokidis	Cascadia Research
David Itano	Hawaii and Western Pacific Fisheries Consultant
C. Scott Baker	Oregon State University
Rebecca Lewison	San Diego State University
Leslie New	Washington State University
Lars Bejder	University of Hawaii
Simone Baumann-Pickering	U.C. San Diego, Scripps Institution of Oceanography
Tim Ragen (Invited Expert)	Marine Mammal Commission (retired)

Participants and Observers:

NMFS Southwest Fisheries Science Center
Jay Barlow, Jim Carretta, Karin Forney, Aimee Lang, Robin LeRoux, Kristen Koch, Karen Martien, Jeff Moore

NMFS Pacific Islands Fisheries Science Center
Jason Baker, Charles Littnan, Erin Oleson, Anne Simonis*, Yonat Swimmer*

NMFS Alaska Fisheries Science Center
Marcia Muto

NMFS Northwest Fisheries Science Center
Mike Ford, Brad Hanson*, Kevin Werner

NMFS West Coast Regional Office
Lynne Barre, Lauren de Maio*, Mitch Dennis, Tina Fahy*, Dan Lawson, Laura McCue, Teresa Mongillo*, Penny Ruvelas*, Kristen Wilkinson*, Nancy Young

NMFS Pacific Islands Region
Ann Garrett

NMFS Office of Protected Resources
Shannon Bettridge, Ingrid Beidron*, Lisa Lierheimer*, Kristy Long

NMFS Office of Science and Technology
Mridula Srinivasan

NMFS Office of International Affairs
Nina Young*

U.S. Fish and Wildlife Service
Diane Bowen, Lilian Carswell*, Deanna Lynch

Marine Mammal Commission
Dennis Heinemann, Samantha Simmons

Cascadia Research Collective
David Anderson, Robin Baird, Elana Dobson, Kathleen Gill, Annette Harnish, Olivia Horwedel, Sabre Mahaffy, Alie Perez, Emilee Slaght, Alex Vanderzee

Other
Svein Fougner (*Hawaii Longline Association*)
Sarah Courbis* (*Ecology & Environment, Inc.*)
Asuka Ishizaki* (*Western Pacific Fishery Management Council*)
Doug Sandilands (*SR3*)
Liz Allyn* (*Makah Tribe*)
Brian Gruber* (*Makah Tribe*)
Jonathon Scordino* (*Makah Tribe*)

APPENDIX 2
Pacific SRG Document List
Pacific SRG Meeting 5-7 March 2019 (Olympia, WA)
Last revised: 03/04/2019

Document No.	Title/Topic	Contributor(s)	Distribution Date
Draft documents for Pacific SRG review (Not to be distributed outside NMFS/FWS and SRG)			
PSRG-2019-01	U.S. West Coast SARs (Guadalupe fur seal, sperm whale, harbor porpoise)	Carretta/Forney	2/27/2019
PSRG-2019-02	Southern Resident Killer Whale SAR	Hanson	2/27/2019
PSRG-2019-03	Monk Seal SAR	Baker	2/19/2019
PSRG-2019-04	Southern Sea Otter SAR	Carswell	2/26/2019
PSRG-2019-05	2018 PSRG Meeting Summary and Recommendations	Forney	2/26/2019
PSRG-2019-06	Sources of human-related injury and mortality for U.S. Pacific west coast marine mammal stock assessments	Carretta	2/19/2019
PSRG-2019-07	Estimates of marine mammal, sea turtle, and seabird bycatch from the California large-mesh drift gillnet fishery	Carretta	2/26/2019
PSRG-2019-08	A multi-decadal Bayesian trend analysis of harbor porpoise populations off California relative to past fishery bycatch.	Forney	2/26/2019
PSRG-2019-09	Bradford & Lyman. Injury determinations for humpback whales and other cetaceans reported to NOAA response networks in the Hawaiian Islands	Bradford	2/19/2019
PSRG-2019-10	Spreadsheets with details for MMHSRP SI determinations	Bradford	2/19/2019
PSRG-2019-11	Simonis et al. Mid-frequency active sonar associated with beaked whale stranding events in the Mariana Archipelago	Oleson	2/19/2019
PSRG-2019-12	Hill et al. The Mariana Archipelago: The missing breeding ground of endangered western North Pacific humpback whales (Megaptera novaeangliae)	Oleson	2/26/2019
PSRG-2019-13	Hill et al. PIFSC Mariana Archipelago Cetacean Research: a summary of available data and analyses.	Oleson	2/26/2019
PSRG-2019-14	The perils of relying on handling techniques to reduce false killer whale bycatch in a partially observed fishery: a fatal flaw in the false killer whale Take Reduction Plan?	Baird	2/19/2019
PSRG-2019-15	Movements of satellite-tagged pantropical spotted dolphins in Hawaiian waters in relation to stock boundaries	Baird	2/19/2019
PSRG-2019-16	Assessment of interactions between hook and line fisheries and pantropical spotted dolphins in Hawai‘i	Baird	2/19/2019
PSRG-2019-17	Survival of a common bottlenose dolphin calf with a gunshot wound to the melon	Baird/Harrish	2/19/2019
PSRG-2019-18	2019 Proposed List of Fisheries	NMFS	2/19/2019
Background Papers - FYI only		**Submitted by**	
PSRG-2019-B01	Baird, R.W. 2019. Behavior and ecology of not-so-social odontocetes: Cuvier’s and Blainville’s beaked whales. In Ethology and Behavioral Ecology of Toothed Whales and Dolphins, the Odontocetes. Edited by B. Wursig (in press).	Baird	2/19/2019
PSRG-2019-B02	Chasco et al. 2017 Estimates of Chinook salmon consumption in Washington State inland waters by four marine mammal predators from 1970 to 2015	Barre	2/27/2019
PSRG-2019-B03	Chasco et al. 2017 Competing tradeoffs between increasing marine mammal predation and fisheries harvest of Chinook salmon	Barre	2/27/2019
PSRG-2019-B04	Calambokidis - Progress report: Updates on humpback and other whale research	Calambokidis	3/4/2019

APPENDIX 3
Pacific Scientific Review Group Meeting
5 - 7 March 2019
Doubletree Hotel, Olympia, WA
Final Agenda (03/02/2019)

TUESDAY, 5 MARCH 2019

08:30 PSRG Closed Session

09:30 Welcome & Introductions – *John Calambokidis, Acting PSRG Chair*

09:45 Scientific Review Group Overview

- MMPA Stock Assessments, Guiding documents, and Role of SRGs – *Karin Forney*
- Terms of Reference – *Shannon Bettridge*

10:15 National Updates

- National Stock Policy and NID Policy– *Shannon Bettridge*
- MMPA Import Rule – *Shannon Bettridge/Nina Young (by phone)*
- List of Fisheries *(PSRG-2019-18) – Shannon Bettridge*

11:00 West Coast Region Management Updates

- West Coast Whale Entanglement Updates (esp. OR/WA) – *Dan Lawson/Doug Sandilands*
- Other West Coast Region Management Updates – *Penny Ruvelas*
- Southern resident killer whale recovery efforts – *Lynne Barre*

[12:30-13:45 Lunch]

13:45 CA/OR/WA Research & SARs

- SRKW research updates and SAR (*PSRG-2019-02) – Brad Hanson*
- PASCAL beaked whale analyses – *Jay Barlow/Jeff Moore*
- CalCURCEAS/CPS Cruise 2018 – *Jeff Moore*
- Large whale photo-ID studies – *John Calambokidis*
- Genetics research updates – *Karen Martien*
- US West Coast Serious Injury Determinations (*PSRG-2019-06) – Jim Carretta*
- CA swordfish drift gillnet bycatch estimates (*PSRG-2019-07) – Jim Carretta*
- West Coast harbor porpoise trends (*PSRG-2019-08) – Karin Forney*
- U.S. West Coast SARs (*PSRG-2019-01) – Jim Carretta / Karin Forney*

17:00 Adjourn for day

17:15 Cascadia Open House, with appetizers and drinks (218 ½ W 4th Ave, Olympia, 5-min walk)

WEDNESDAY, 6 MARCH 2019

08:30 Sea Otters

- Southern sea otter status update and revised SAR (*PSRG-2019-05) – Lilian Carswell, by phone*
- Washington sea otter updates – *Deanna Lynch*

09:15 Pacific Islands Fishery/Management Updates

- False Killer Whale Take Reduction Team Updates – *Ann Garrett*
- Pacific Islands Region MMPA and ESA Updates – *Ann Garrett*

10:30 Hawaiian Monk Seals – *Jason Baker*

- Monk seal research updates and SAR (*PSRG-2019-03)*

11:00 Pacific Islands Research and SARs

- Updates on HICEAS 2017 Analysis, WHICEAS 2019 Survey – *Erin Oleson*
- Marianas cetacean data and analyses (*PSRG-2019-11, 12 & 13)– Erin Oleson*

[12:15-13:30 Lunch]

13:30 Pacific Islands Research and SARs (cont'd

- MMHSRP serious injury determinations (*PSRG-2019-09 & 10) – Erin Oleson*
- Other Pacific Islands cetacean research & research priorities – *Erin Oleson*
- False killer whale research updates (*PSRG-2019-14*) – *Robin Baird*
- Spotted dolphin research updates (*PSRG-2019-15 & 16*) – *Robin Baird*

15:30 Review recommendations

17:00 Adjourn for day

THURSDAY, 7 MARCH 2019

08:30 Discuss whether additional SARs should be revised & reviewed by webinar

09:00 Review/finalize SRG Recommendations

- Review previous Pacific SRG recommendations *(PSRG-2019-04)*
- Identify and start drafting new recommendations

11:00 Topics, timing, and location of next meeting

11:30 PSRG Closed Session & Selection of Chair

12:30 Adjourn 2019 PSRG meeting