

Minutes for the Pacific Scientific Review Group Meeting 23-27 March 2020

The 30th meeting of the Pacific Scientific Review Group (SRG) was held as a multi-day on-line meeting using WebEx, instead of the planned 3-day in-person meeting in Honolulu, Hawaii, because travel was canceled as a consequence of the COVID-19 pandemic. All SRG members participated in the meeting: Scott Baker, Simone Baumann-Pickering, Lars Bejder, John Calambokidis, Doug DeMaster, David Itano, Rebecca Lewison, Leslie New, Daniel Palacios, and Tim Tinker. John Calambokidis served as Chair of the SRG, and Karin Forney facilitated the webinar, and Jim Carretta 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 closed orientation call on 23 March 2020, to introduce new members, review the meeting processes, and discuss other SRG-internal matters. This call was attended only by SRG members and the NMFS Liaison to the Pacific SRG, Karin Forney.

Management Applications of Marine Mammal Stock Assessment Review (SARs)

Shannon Bettridge reviewed the Marine Mammal Protection Act (MMPA) to provide high-level context for the SRG. Three explicit goals of the MMPA are to: 1) maintain stocks at Optimum Sustainable Population (OSP) levels and as functioning elements of their ecosystems; 2) restore depleted stocks to OSP levels; 3) reduce incidental mortality and serious injury to “insignificant levels approaching a zero mortality and serious injury rate” (ZMRG). Another, implicit goal is to minimize interference with commercial fishing while meeting the other goals. Marine mammal stock assessment reports (SARs) form the foundation of marine mammal management in the U.S. under MMPA Section 117, compiling the best available marine mammal stock assessment science. They are a resource for the agency and the public on recent, concise, peer-reviewed information about a stock. For example, SARs are used by MMPA permit applicants and by the permitting division when considering applications. The SRGs play an important role in reviewing SARs under MMPA, providing broad areas of expertise, including marine mammal biology and ecology, population dynamics and modeling, commercial fishing technology and practice, and other relevant disciplines to advise the Secretary on knowledge and data gaps to improve SAR quality and MMPA management. The SAR review cycle includes drafting of the SAR, SRG review, 90-day public comment review period, SAR finalization and addressing of public comments in FR notice. Annual SAR review and revision is prioritized based strategic vs non-strategic status and whether there is significant new information that affects the status of a stock. SRG responsibilities, including elements that the SRG review and advise on, are included in MMPA Sec. 117.

The MMPA mandates allow for marine mammal take exceptions while allowing populations to be maintained at OSP and ZMRG. The MMPA provides definitions of ‘strategic’, ‘depleted’, and ‘OSP’, which have statutory implications. If a species is depleted, then the National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (USFWS) may not provide a take waiver. For example, an application for take of Eastern North Pacific gray whales was allowed to proceed because the stock is not depleted, while importation of beluga whales from Canada was disallowed because the beluga stock is considered depleted. Take Reduction Teams are put in place under MMPA Sec. 118 to aid in the recovery of depleted stocks. The Potential Biological Removal (PBR) is used as an index for Take Reduction Plans and for the List of Fisheries, via a 2-tiered analysis across all fisheries that interact with stock. PBR is also currently used for negligible impact authorizations under the 101(a)(5)(e) process. Bettridge emphasized that the SRG is critical for reviewing the SAR elements, such as human-caused mortality and serious injury, PBR calculations, maximum growth rates (R_{max}), abundance, etc. MMPA permits for harassment and incidental take rely upon the information in SARs, e.g., how the stock is defined and what the abundance and bycatch trends are. SRG review of the SARs is considered peer-review, and the recommendations provided from the SRG are an important and valued part of the MMPA process.

National SAR topics

Zac Schakner reviewed the recent transfer of responsibility for SARs and SRGs from the Office of Protected Resources (OPR) to the Office of Science and Technology (S&T). This transfer is not expected to impact the SRG. Schakner also reviewed the Protected Species Toolbox (PST) funding initiative and the Protected Species Information System (PSIS), which tracks abundance and trend metrics for all taxa. The SAR editor, Jim Carretta, adds SAR data to PSIS every year. Turtle and fish researchers also add their relevant information. S&T is currently in the process of updating the SRG Terms of Reference, and comments will be solicited from the SRG. Scott Baker asked if the PSIS was publicly available. Schakner indicated that the database is not publicly available, but data can be requested through NMFS, e.g. which stocks have trend analyses. Baker further inquired about the lag time for incorporating bycatch estimates into the SARs, and whether there this lag could be reduced if there was, e.g., an Unusual Mortality Event (UME). Bettridge clarified that even if some UMEs may not yet be reflected in the most recent SAR, managers would be aware of the UME and would consider it in management decisions. Doug DeMaster asked if an overview of the number of SARs produced by each region and the % of SARs with a PBR could be provided to the SRG. Bettridge said she would work with Schakner to provide those data to the SRG. DeMaster also inquired about the process and priorities for the PST Program, and whether each region submits a proposal. Schakner noted that Mridula Srinivasan is the contact for this program, and Bettridge added that the funding is \$100K per Center per year, with proposals submitted on a 3-yr basis and a total budget of \$600K per year.

Ethical considerations for Scientific Review Groups

David Brodian reviewed ethical considerations for SRG members. He thanked SRG members for submitting financial disclosure reports and noted that they have been reviewed to ensure that no conflicts of interest exist. SRG members are considered government employees, so they cannot work on any government matters that would benefit themselves or their families. There are also ethical constraints on 'gifts', such as purchase of food. If there are any questions about potential conflict-of-interest issues, SRG members should reach out to Schakner or Brodian. John Calambokidis noted that a number of SRG members have contracts or grants from NOAA, because they are experts in subject matter needed by NOAA. Brodian clarified that the prohibition is limited, e.g., you could not represent your own organization or academic institution for an issue that the SRG is making recommendations on. Calambokidis underscored this with an example: if the SRG was considering a recommendation that could result in funding that would benefit an individual SRG member, then that SRG member would recuse themselves from making such a recommendation.

Stock Designation Policy (PSRG-2020-B01a, b)

Bettridge reviewed the Stock Designation Policy (SDP), which applies only to NMFS, not USFWS. This is primarily an internal communications policy to ensure that stock revisions are collaborative, repeatable, consistent, and transparent to the public. It also establishes a process to prioritize stock-structure science needs, and clarifies the roles of the science centers, regional offices, OPR and S&T. The role of the SRG has not changed as a result of the SDP. The role of the Science Centers is to identify demographically independent populations (DIPs). The question then becomes whether stocks can actually be managed at the DIP level. MMPA stocks are population units that comprise one or possibly more than one DIP. Pooling multiple DIPs into a single stock is never expected to be a permanent situation, and would require a working group to assess how to best manage the stock unit. The SARs should consider DIP-specific information where possible. If Distinct Population Segments (DPSs) are established under the ESA, stocks will align with DPSs unless there are compelling reasons not to. MMPA units should only include DIPs that belong to the same ESA-listed DPS. The SDP has a detailed flowchart for designating stocks. The Guidelines for Assessing Marine Mammal Stocks (GAMMS) need to be revised following public comment on proposed changes and will also include new language on N_{\min} and other SAR elements. Humpback whales will likely be the first species for which the new policy will be implemented.

Demographically Independent Population (DIP) Delineation Handbook

Karen Martien reviewed the DIP Delineation Handbook (PSRG-2020-B02), which was the product of a Stock Delineation Workshop. On key conclusion is that DIPs are the management unit required to keep

populations as ‘functioning elements of the ecosystem’, consistent with MMPA mandates. Martien demonstrated this concept using an example with 5 DIPs that are distributed in space and have limited dispersal between each DIP. If all anthropogenic removals are taken from a single DIP, this would result in a risk of extirpation of that DIP, because the PBR was based on the sum of all five DIPs combined. In the current GAMMS, a stock is defined as a DIP, lending further support for managing DIPs. The stock delineation handbook includes history of the ‘stock’ concept, a review of the different lines of evidence that can be used for stock delineation, a discussion of the relative strengths of these lines of evidence, and an assessment of the data availability for each line of evidence by stock. Lines of evidence for DIP delineation include acoustics, genetics, density hiatus, morphology, difference in abundance trends, and movement patterns. The relative strengths of these lines of evidence vary by population. For some populations, a given line of evidence may be considered ‘data poor’, but it can still represent the best available science. The report further describes Structured Expert Decision-Making in the context of assessing multiple lines of evidence. For management, it is important to document each DIP delineation review, to provide a logical trail of how a stock was delineated and to aid NMFS in consistently delineating stocks.

SRG Stock Discussion

Calambokidis noted that humpback whales and gray whales are of particular interest with regard to stock designation policy. Bettridge noted that humpbacks will be the first species assessed for stock revision, but first, DIPs have to be identified. Humpbacks represent a ‘data-rich’ example with regard to DIP delineation, but the agency is moving cautiously with current data in order to delineate stocks in the best manner. Work being done in the next year will be critical to this effort. Bettridge noted that the current stock delineation policy states that where DPSs are identified, MMPA stocks should be aligned with DPSs, unless there is a compelling reason not to do so. The SRG discussed the definition of ‘align’, and Martien noted that the default assumption of equating stocks with DPSs does not necessarily make scientific sense; there will be a working group for stock designation in the North Pacific and North Atlantic.

Based on his understanding that DPSs are defined by breeding area, which Bettridge confirmed, Calambokidis noted that for humpback and gray whales considerations based on breeding grounds may be inadequate, because the species spend most of their time on feeding grounds where anthropogenic threats are greatest and where the species are performing as ‘functioning elements of their ecosystem’. Leslie New reiterated Martien’s point that a feeding population could suffer a range contraction if management units are based on breeding ground DPSs and all anthropogenic removals occurred on one feeding ground with high site-fidelity. Martien noted that we would expect a DPS to contain multiple DIPs, and we would assess threats on feeding grounds to determine whether to combine DIPs into something that is equivalent to a DPS. Scott Baker asked about the relationship of DIPs to stocks. Bettridge indicated that where DIPs are identified that can be managed at that level, that is how stocks would be identified. If we cannot manage at that level, alternative approaches, such as combining DIPs would be considered. Currently, the U.S. West Coast humpback feeding group / stock includes multiple DPSs that must be reassessed for the presence of DIPs. Palacios asked for a specific example of a DPS that could contain multiple DIPs. Martien noted the concept of ‘migratory herds’, which are animals that use the same feeding and wintering grounds and are exposed to the same threats year-round. Data indicate that these migratory herds are demographically-independent.

The MMPA and ESA have different management objectives, so management takes place at different scales. The ESA is focused on maintaining genetic diversity and preventing extinction; thus, a species could potentially be extirpated from most of its range. Under the MMPA, management is focused at the ecosystem level (maintaining species as ‘functional elements of their ecosystem’), so stocks under the MMPA may be smaller and more geographically-restricted than ESA units. Bettridge said she would provide a 2008 paper that looked at different management units under ESA, Magnuson, and MMPA. Barbara Taylor noted that GAMMS have a history of long discussions about what constitutes a stock, and the current definition is that the: “population dynamics of the affected group is more a consequence of births and deaths within the group (internal dynamics) rather than immigration or emigration (external

dynamics). Thus, the exchange of individuals between population stocks is not great enough to prevent the depletion of one of the populations as a result of increased mortality or lower birth rates.”

The SRG engaged in additional discussion of the ‘compelling reasons’ why a DPS would not be considered a stock. Building on Martien’s 5-DIP example, Tim Tinker noted that from a metapopulation context, emigration from DIP#1 would not be sufficient to buffer against local depletion. Tinker inquired whether there are quantitative guidelines on emigration thresholds that provide buffers against local dynamics, or if the threshold would be tailored toward specific cases. Martien noted there is not a single threshold that can be applied in every case, because it depends on relative abundance of the dispersers, and the PBR guides what levels of removals are risk-averse. Tinker noted that DIP designation will sometimes be based on best professional opinion involving a continuous movement of animals between areas, and the SRG may recommend that more data be collected for particular cases. Martien noted the Alaska harbor seal example, where many DIPs were continuously spread across a large region, but NMFS had to identify boundaries to designate stocks that would meet management objectives without over-penalizing resource users.

Calambokidis asked for clarification that multiple DPSs would not be combined into a single stock, and Bettridge and Martien confirmed this was correct. Calambokidis also inquired about nuclear DNA vs mtDNA, and Martien noted that differential movements between sexes can complicate things. For example, gene flow on breeding grounds may be followed by maternally driven segregation on feeding grounds, so mtDNA is better for distinguishing demographic independence. In some cases, there may be no nuclear differentiation, but mtDNA identifies differences. The SRG previously recommended that NMFS reconsider how it treats Pacific Coast Feeding Group (PCFG) gray whales, but at the time NMFS did not feel a separate stock was warranted. Calambokidis noted that mtDNA differences for PCFG gray whales did not result in the recognition of a DIP for that population, and Martien commented that PCFG is a good example of a borderline case because dispersal values of PCFG gray whales straddle the threshold of what would be considered demographically independent. Standard genetic techniques cannot presently resolve this question.

David Itano asked about Central Pacific false killer whale stock designation around Hawaii. Erin Oleson noted that Main Hawaiian Island (MHI) killer whales went through a formal DPS designation process. Separate Northwestern Hawaiian Islands (NWHI) and Pelagic stocks are supported by genetics, movement patterns and other lines of evidence. Itano inquired whether these lines of evidence were considered strong, and Oleson confirmed that genetics and movements are considered strong lines of evidence for False killer whale FKW stock designation.

List of Fisheries (LOF)

Kristy Long summarized the annual review of the List of Fisheries (LOF) to assess the level of marine mammal takes in each fishery. Fisheries are assigned as Categories I, II or III based on frequency of marine mammal takes and the magnitude of takes as a percentage of PBR. There was only one U.S. West Coast change, with the CA/OR coonstripe fishery reclassified from Cat. III to Cat. II due to humpback interactions (1-50% of PBR), and a proposed renaming to ‘CA coonstripe fishery’. There were additional minor changes to the lists of marine mammal stocks killed or injured in various fisheries. Scott Baker asked how many fisheries are relevant to the Pacific SRG and Kristy clarified that it includes all state and federal fisheries in Hawaii, other U.S. Pacific Islands, and off the U.S. West Coast. DeMaster inquired about observer placement for fisheries that are re-categorized from Cat. II to Cat. I. Long replied that a majority of Cat. I fisheries are observed and those fisheries are prioritized for observation when resources become available.

MMPA Import Rule

Nations submitted their 2019 progress reports for the MMPA Import Rule and are working to provide the 2020 reports. A public comment period for foreign fisheries is open through May 2020. Calambokidis asked whether any import restrictions have resulted from this rule, or if we are still in the early stages of implementation? Lisa Lierheimer clarified that we are halfway through a 5-yr exemption period, and

import restrictions would be implemented in Jan. 2022 if certain metrics are not met. DeMaster inquired how countries would be compared, i.e. in the context of PBR, and Long explained that where there are shared transboundary stocks (e.g. CAN/USA North Atlantic right whales), we will examine abundance, PBR, and what is known about bycatch in other countries. Decisions will be made on a case-by-case basis by country. Itano asked how much information was available regarding foreign fisheries, and Long noted that we do not currently know much about foreign bycatch. Lierheimer added that after reviewing import rule progress reports, some nations that want to work with the U.S. are discussing data-gaps.

Calambokidis inquired whether there is any anecdotal evidence that the import rule process is changing fishery practices. Lierheimer noted that one example is that aquaculture fisheries cannot target pinnipeds for lethal removal. Itano noted that early Regional Fishery Management Organization reports vary widely in quality and completion.

SRG discussion

The SRG engaged in additional discussions regarding the DIP vs. DPS vs. stock question. Bettridge clarified for newer SRG members that recommendations need to be developed only by SRG members. DeMaster asked whether a summary of planned NMFS research could be provided. Oleson replied she will review planned and completed surveys during her presentation, and SWFSC has a slide on recent and future research as well. Scott Baker reiterated the need for information on research plans and Science Centers' partnerships with others, such as Navy and BOEM. Baker also asked for one additional LOF detail regarding the number of Category I fisheries the Pacific region. Long responded that the Hawaii deep-set pelagic longline fishery is currently the only Category I fishery.

Hawaiian Monk Seal

Jason Baker reviewed the Hawaiian monk seal SAR and document *PSRG-2020-05*, which summarizes human-caused mortality and serious injury. Although there were no unexpected changes in key numeric parameters for SAR, a change has been made in the way human-caused mortality is being documented. Tracy Mercer now assesses serious injury and mortality for Hawaiian monk seals (formerly John Henderson did this). The SAR includes standard fishery-related mortality for the most recent 5-yr period, and document *PSRG-2020-05* contains information on non-fishery related human-caused mortality and serious injury, including direct killings of seals around the main Hawaiian Islands. Toxoplasmosis cases are now considered human-caused mortalities, because the disease is a result of the human introduction of feral cats on the islands. Marine debris mortalities are tabulated separately from commercial fishery takes, as ghost gear cannot be attributed to any particular operating fishery.

Lars Bejder inquired about habitat issues in the SAR and asked what has happened to the islands that were wiped out by the hurricane. Jason Baker indicated that the loss of pupping habitat at French Frigate Shoals is a serious threat to the population. Calambokidis asked if any management actions will result from this habitat loss. Jason Baker noted that Tern Island has the most land area, with hurricane debris and a degrading seawall, but represents the most-important habitat left. There are discussions between Navy, USFWS, and EPA about doing environmental testing at Tern Island. Charles Littnan added that Tern Island has been considered as a Superfund site due to chemicals leaching into environment. Other management considerations include addressing sea-level rise at these islands, although there are no details on how this would be achieved. Calambokidis asked if the SRG could help via recommendations. Littnan noted that NMFS is motivated to deal with the current issues, including addressing loss of nesting habitat for green sea turtles and impacts to seabirds resulting from marine debris and habitat loss. Jason Baker noted that seals get stuck in the seawall at Tern Island, and having people present at Tern Island would help, but the USFWS living quarters were destroyed by the storm.

Itano approved of the separation of marine debris and commercial fishery takes in the SAR, and inquired about the future of the marine debris program. Littnan said they are still receiving funds from marine debris program, though it is costly to do meaningful fieldwork. Funds are being pooled across several years, so debris removal is ongoing but less frequent. Multiple non-governmental organizations (NGOs) have done some fundraising for the marine debris effort. Mike Seki noted that getting sea days on the NOAA Ship *Oscar Elton Sette* is becoming more difficult, and this is a limiting factor in marine debris removal efforts, so a charter vessel is being considered. Much of the debris has been at-sea for decades,

and removal efforts are undermined by newly deposited debris in-between removal efforts. Scott Baker asked about updates regarding the 2019 Pacific Islands Regional Office (PIRO) workshop on toxoplasmosis in monk seals. Michelle Barbieri responded that a toxoplasmosis management plan is being formulated between state partners and NGOs, including measures to deal with sources of feral cats, such as keeping cats indoors and preventing pet abandonment. There are also emerging efforts to reach out to ‘the cat side of the issue’ on toxoplasmosis. It was noted that the number of toxoplasmosis deaths are underrepresented because the report describes only acute events and may be ignoring chronic effects of toxoplasmosis on the monk seal population.

Hawaii false killer whale abundance estimates

Amanda Bradford summarized updated abundance estimates that were presented at an intersessional SRG meeting, and also included an overview of stock boundary revisions. Satellite telemetry data indicate the inner boundary for MHI false killer whales is not appropriate and should be removed. Bradford presented both design-based (line-transect) and model-based (habitat-based species distribution model [SDM]) approaches for abundance estimation, as described in document *PSRG-2020-06*. In these analyses, vessel attraction during of false killer whales is mitigated by using a half-normal detection function, and estimates of $g(0)$ are derived using the Barlow (2015) sea-state specific rescaling approach. Design-based abundance estimates for 2002, 2010, 2017 are quite variable, with overlapping confidence intervals. Model based estimates were developed by Elizabeth Becker from 1997-2017 survey data, using a suite of variables and Generalized Additive Models (GAMs) to estimate encounter rate and cluster size as a function of covariates. The greatest false killer whale densities were predicted for warm waters with shallow mixed layer depths and greater variability in sea surface temperature (SST). Model-based abundance predictions are similar during 2002, 2010 and 2017, contrasting with the variable design-based estimates. A ‘year’ covariate would allow the potential detection of trends with the model-based approach, but more data are needed to tease apart habitat variation, sampling variability, and potential multi-year trends. The SAR includes the more stable model-based estimates for PBR calculations.

Itano and Calambokidis expressed concern that when environmental stability declines, especially with SST changes, the SDMs may not capture changes in abundance. Becker clarified that SDMs can accurately predict abundance changes when SSTs change as long as the habitat associations have been accurately captured reasonably well. False killer whale abundances in the current analysis were stable because the habitat covariates were similar during the study period. Calambokidis asked how a big SST change, without a concomitant change in false killer whale abundance, would play out. Becker replied that the current model would, for example, likely predict lower-abundance if SST dropped markedly, but noted that the addition of new data reflecting such SST changes in an updated model would ameliorate this concern. Becker also emphasized that the SDMs are cross-validated across multiple years.

Calambokidis asked if a temporal variable might be appropriate given changes in the environment. Becker noted that due to sampling variability and patchiness from survey-to-survey, temporal variables tend not to do well for prediction. Karin Forney added that SDMs identify persistent species-environment relationships, which may change slightly over time, but typically are relatively stable. Detecting temporal changes requires a lot more data than are presently available. Tim Tinker suggested that the assumption of stable covariate-response associations should be explicitly-stated when reporting on SDMs. Leslie New commented that model-based approaches require assumptions about the environment, but in this case, the model-based abundance estimates are better because of the limited data available to ensure robust design-based estimation. Daniel Palacios noted that measures of primary productivity might be good predictors in the SDM, especially in this study area where productivity fronts vary interannually. Becker noted that remotely-sensed chlorophyll data were available and were offered to the model, but chlorophyll was not found to be a significant predictor. Robin Baird added that SST explained only 1% of the variance in the satellite tag data. Itano noted that the Western Pacific Fishery Management Council’s Science and Statistical Committee (SSC) recommended sensitivity analyses for the SDM approach. Scott Baker inquired whether new technology such as UAV (drones) would provide new estimates of group size, and if there was an independent way to assess subgroup size estimates. Bradford responded that the line-transect analysis approach uses subgroups as the detection unit (not overall group size), and there are

weather challenges with operating drones. Photo-identification could help refine group size estimates, although disturbance of the groups would be a confounding factor.

Other Hawaii cetacean abundance estimates

Bradford and Becker reviewed design-based (document *PSRG-2020-07*) and model-based (document *PSRG-2020-08*) abundance estimates, respectively, for other Hawaiian cetacean species based on 2002, 2010, and 2017 EEZ-wide surveys. The analyses included new estimates for 2017 and updated estimates for 2002 and 2010. Both SDM and multiple covariate line-transect methods were used to estimate model-based and design-based abundances. Some pooling was done for infrequently-sighted species to obtain adequate sample sizes for detection function estimation. Sea-state specific $g(0)$ estimates were derived following the Barlow et al. (2015) method. The number of sightings per survey ranged from 1 to 23 across all species, and the small number of sightings led to high coefficient of variation for the estimates, with little or no ability to detect trends. Model-based abundance was estimated and compared to the design-based estimates for eight species with sufficient sightings (ranging from 30 to 95): spotted dolphin, striped dolphin, rough-toothed dolphin, bottlenose dolphin, Risso's dolphin, short-finned pilot whale, sperm whale, and Bryde's whale. The remaining 14 species with smaller sample sizes have only design-based estimates. There was a large apparent increase in the abundance of Cuvier's beaked whale in 2017. Bradford requested SRG feedback on the use of model-based abundance estimates or design-based abundance estimates for MHI bottlenose and spotted dolphins, and the SRG agreed with the use of the design-based estimates. Tinker asked whether exploratory power analyses were done to determine how many years of data would be required to reliably detect trends. Bradford noted that they are investigating this issue, including what kind of simulations could be done to determine frequency-of-survey considerations.

Overview of PIFSC 2019-2021 Surveys

Oleson reviewed the Pacific Islands Fishery Science Center's (PIFSC) survey plans through 2022. Alaska, Southwest and Pacific Islands Science Centers have formed an assessment partnership with the Navy and BOEM called PACMAPPS (Pacific Marine Assessment Program for Protected Species). During 2014-2018, humpback whale presence in the MHI was unusually low and it is unknown whether this was caused by a decline or a change in distribution. To help address this, a winter survey (WHICEAS) with 51 sea days with 44 days of effort was just completed in March 2020. There were 310 cetacean sightings, and humpback whale photo matches were identified between MHI/NWHI and Canada. Drifting acoustic recorders (DASBRs) were also deployed during HICEAS 2020, with 11 of 14 successfully recovered. Biopsy opportunities were limited. A 60-day survey of the Guam/Marianas EEZ is planned for 2021. Scott Baker asked about the limited biopsy-sampling, and Erin Oleson clarified that this is a standard part of survey operations but it is weather dependent and opportunities were limited. Calambokidis noted that in addition to changes in distribution or abundance, the analysis should also investigate temporal changes (i.e. animals spending less time on breeding grounds).

Cetacean serious injury determinations

Bradford reviewed 2018 serious injury cases for the Hawaii and American Samoa based longline fisheries (document *PSRG-2020-09*) and asked for SRG feedback input or questions (there were none). Document *PSRG-2020-10* summarized 2018 serious injury determinations for humpback whales and other cetaceans based on stranding and entanglement data. All except four cetacean records involved vessel collisions or entanglements of humpbacks. Bradford noted that the summarized records represent opportunistic reports and thus underestimate total cases by an unknown amount. Simone Bauman-Pickering requested clarification of the cases that were prorated as 0.75 serious injuries, and Bradford explained that this value was derived from known-outcome cases. Bejder noted that more vessel strike data will be available, as cases that previously would have gone undetected are identified via UAS. He also suggested including a platform source for the serious injury records so that the level of underreporting could be assessed by injury type (e.g., vessel strike vs entanglement). Calambokidis inquired whether whales with older scars would be included in this database. Bradford noted that this question is being discussed within the Serious Injury working group, as animals that were struck long ago and survived should not be included. Bejder noted that a document on the injury severity of large whales, similar to what was done with the Hawaiian

monk seal cases, would be useful. Calambokidis commented that humpback whale scarring rates can approach 50% in some areas and agreed that UAS will be valuable for documenting additional cases. Bradford inquired whether the SRG would be willing to review the 2019 cases during post-meeting review and the SRG agreed.

Acoustic monitoring of false killer whales in the longline fishery

Oleson reviewed acoustic monitoring efforts for false killer whales in the longline fishery since 2014, in partnership with Hawaii Longline Association and the Pacific Islands Regional Office's Sustainable Fisheries program. Acoustic recorders were deployed on longline gear to characterize vessel sounds, false killer whale occurrence and behavior around the gear, and to identify potential acoustic cues. Multiple recorders were deployed per fishing set, as reported by Bayliss et al. (2017). In-water recorders were paired with in-air recorders to characterize the vessel sounds (e.g., spool, engine, hydraulics, haul-backs). False killer whale whistle and click detections peaked during the haul, and false killer whale presence near gear is much higher than implied by the depredation rates alone. DeMaster asked if active acoustics such as pingers are being considered. Oleson explained that a lot of deterrence work has been done, but pingers have not been successful and they are thought to represent an attractant. Based on satellite telemetry data, 10% of tagged false killer whales are within 100 km of fishing sets, and during the hauls, false killer whales rapidly approach vessels. Depredation is associated with a particular haul-back sound and long-range acoustic propagation appears to allow false killer whales to detect fishing activity. The next phase of the research will involve the identification of the acoustic cues false killer whales are using, and eliminating or dampening them. Calambokidis asked if the identified sound is louder than other recorded sounds. Oleson noted challenges associated with characterizing all the sounds and reducing instrument noise itself. Anne Simonis added that Aaron Thode at Scripps Institute of Oceanography has conducted a propagation analyses that indicates the shallow thermocline in the region likely allows vessel sounds to propagate for tens of km (up to 50 km).

Pacific Islands SAR review

Oleson reviewed the Hawaii cetacean SARs (document *PSRG-2020-01*). Most of the SARs were updated to include new abundance estimates and data through 2017. Design-based estimates are included in all of the SARs for which they are available, and nine SARs for species with sufficient sightings also include model-based estimates. When available, the model-based abundance estimate was used for PBR calculations, except for rough-toothed dolphin (because the model included only static variables), and for bottlenose and spotted dolphins (because no stock-specific estimates were available). Uncertainty estimates for model-based estimates included in the Draft SARs are still being developed and have not yet been incorporated in the drafts provided for SRG review. Calambokidis suggested that the ability of model-based estimates to detect trends should be considered more broadly in the SAR wording. Daniel Palacios noted that design-based estimates suffer from the same inability to capture trend information. Oleson agreed this is true, as indicated by the overlapping confidence intervals from design-based estimates as supporting evidence. At present, the available survey data do not yet allow estimation of trends using either design or model-based estimates. Tinker thought that a single sentence caveat for model-based estimates regarding their limitations on trend estimation would be appropriate in the SAR, but that this limitation could be relaxed over time as more data are collected. Rebecca Lewison agreed that all the SARs should have some caveat language to this effect. Leslie New noted that the audience for the SARs may not understand the subtleties of design-based vs model-based SARs as outlined in the reports. Calambokidis agreed with Palacios that the ability to detect trends is limited no matter what method is used.

Scott Baker asked whether the PBR value in the SAR is based on the design or model-based estimates or both. Oleson clarified that stocks for which the model-based abundance estimate is used to calculate PBR only use those model-based estimates, without including the design-based estimates. New suggested SARs should not include multiple PBRs, or figures showing both design and model-based estimates, and Bauman-Pickering agreed these would be more suitable for the cited publications than the SAR itself. She also noted that the model-based estimates are the more stable product in this case. Palacios also agreed that there should only be one estimate type in the SAR. Ryan Steen commented that the agency

should include both sets of estimates, erring on the side of transparency for management purposes. DeMaster also supported erring on the side of including more info. As the Pacific SAR editor, Carretta noted that there are precedents for including multiple estimate types in SARs (blue and humpback whales), but it is important to be explicit about why one estimate is chosen over another. Jeff Moore added that there is no reason trends cannot be explicitly derived for either type of estimate, and noted that, statistically, one should go with the best estimate, which is often model-based. Itano inquired how 30 sightings was considered enough for a robust model, and Becker replied that past experience has shown this is generally the minimum. Species with more complex habitat associations tend to require a greater number of sightings to yield a robust model than species with simpler habitat associations (fewer covariates in the model).

Oleson reviewed the changes to the SARs by stock. The estimates of mortality and serious injury in the SARs for the longline fishery are for the U.S. EEZ, but most fishing occurs outside of the U.S. EEZ. The False Killer Whale Take Reduction Team is reviewing take reduction measures, and the Southern Exclusion Zone is currently closed. Calambokidis inquired about the implications of the removal of the inshore boundary for the pelagic stock with respect to human-caused mortality. For the longline fishery, this makes no difference because of the longline exclusion zone around the MHI. However, there are nearshore fisheries that use gear that can cause injury or death to cetaceans, so spatial information on the relative densities of each stock are necessary to prorate these events appropriately. The pelagic false killer whale stock is not thought to occur in any appreciable numbers near MHI. Photo-identification studies have been used to develop mark-recapture abundance estimates for the MHI stock.

Baird commented on rough-toothed dolphin shootings around MHI, and Palacios asked that the SAR include more details on why dolphin injuries involving presence of barnacles on the mouth-line are considered human-related, as this is probably not common knowledge. Baird noted that photo-identification catalogs have provided information on mouth-line injuries for 5 or 6 different species, and in the absence of direct fishery observations this a key way to document hook and line interactions. Palacios asked about linkages to the Eastern Tropical Pacific (ETP) region in the abundance section, and asked that ETP estimates be included in the SAR where appropriate. Asuka Ishizaki inquired whether historic PBR calculations for false killer whales and other cetaceans would be revised given the change to model-based abundance estimates. Oleson and Carretta clarified that PBR is by design always evolving based on the best-available science available at any given time, and there is no precedent for doing a retrospective analyses of PBR within the SAR context.

West Coast Whale Entanglement Updates

Dan Lawson reviewed large whale entanglement numbers. The number of cases in 2019 was lower than in 2015, 2016, and 2018, and similar to the 2014 levels. This level is 2-3 times greater than the pre-2014 entanglement numbers. In California, litigation over the Dungeness crab fishery was settled in 2019, resulting in a statewide fishery delay to avoid the greatest entanglement risk during late fall. Washington has also implemented new regulations in their Dungeness crab fishery. As a result of the litigation, the three West Coast states are required to obtain a Section 10 Endangered Species Act Incidental take permit. NMFS has been working on tri-state coordination, but it has been challenging to standardize entanglement mitigation across the states. Mitigation elements include reduced pot limits, limits on number of buoys, line markings, and buoy pattern registrations.

NMFS efforts to help address whale entanglements have included a peer-reviewed publication on ecosystem changes that led to increased entanglement risk (Santora et al. 2020), and the development of a new habitat compression index that can help identify spatial risks. Lauren Saez lead-authored a NOAA Tech Memo on historic entanglement levels for all whale species, and there has been an increased emphasis on photo-identification of individual entangled whales. There is a joint West Coast Region (WCR) and Northwest/Southwest Fisheries Science Center risk assessment working group to examine fishing dynamics in space/time (Feist et al., manuscript in press) and evaluate the potential effectiveness of time, area and gear management measures. NMFS has conducted aerial surveys in central California to assess the spatial footprint of crab pots and whales to evaluate risk spatially. NMFS also continues to do

forensic research on entanglements, train entanglement responders, and conduct outreach to the public and industry. Scott Baker asked if data on the location of entanglements is available, to examine potential changes in the distribution of entanglements. Lawson noted that there has not been much change in the observed distribution. Calambokidis noted a large increase in entanglement reports in the Pacific Northwest during 2018, but indicated this may be due to the enhanced research effort associated with the 2018 California Current Ecosystem Survey (CCES). There is very little difference in scar frequency by latitude, suggesting that the amount of observation effort affects the number of entanglement reports.

Southern resident killer whale updates

Lynne Barre summarized the southern resident killer whales (SRKW) recovery program efforts. Critical Habitat was proposed in Sep. 2019, and NMFS is moving towards a final rule. Scoping meetings were held for potential regulations for vessels, and NMFS is working with Canada on 1-yr interim protection measures. A Washington task force report included issues such as human population growth, and climate change, and a Pacific Fishery Management Council working group is considering salmon habitat and restoration issues with respect to SRKW recovery. New asked if vessel regulations include recreational vessels, and Barre confirmed that regulations apply to both commercial and recreational vessels. Whale watching activities are temporarily on hold because of COVID-19. DeMaster noted that coordinating SRKW research is tricky, with states, federal agencies and academic institutions, and inquired how research /funding priorities are set. Brad Hanson explained that every winter and spring, the NWFSC, WCR, and academics meet to identify research priorities within the available funding constraints. Barre also noted that all permits require coordination between researchers, to reduce the number of approaching vessels and UAV activities.

Other West Coast Region Management Updates

Laura McCue reviewed other WCR management issues. The Pacific Offshore Cetacean Take Reduction Team is meeting its goals with respect to PBR. The exempted fishing program involving deep-set buoy gear to catch swordfish is progressing well, with no marine mammal interactions recorded. Guadalupe fur seals had an Unusual Mortality Event in 2019 (209 animals), and a status review is currently underway. Section 120 activities under the MMPA have removed 238 California sea lions, which is estimated to have saved 12,000 – 50,000 salmonids, with large decreases in salmonid consumption during 2019. Emerging industries that may have impacts on marine mammals include aquaculture in southern California and BOEM discussions about wind projects in central California. New asked if any other developments, such as hydropower are in the works. McCue responded that there are buoys collecting data, but no projects have started. Penny Ruvelas noted that their office occasionally hears of wave energy, but most projects are related to wind energy. Calambokidis asked about planned seismic surveys along US west coast, and Barre responded that HQ has the lead on permitting for seismic surveys under MMPA and ESA. NMFS is in contact with the National Science Foundation (acting agency) regarding the permit. Palacios asked what type of aquaculture is being planned, and McCue clarified that it is mainly for seaweed and shellfish. Itano asked whether the pinniped removal would continue every year, and McCue affirmed that the understanding it would be annual. DeMaster asked whether the eastern Steller stock is involved in depredation. McCue responded that the States have not applied for lethal removal and it is unknown whether this is being considered. Tinker asked about wind energy and whether there is coordination between marine mammal and seabird researchers; BOEM is coordinating with experts on all species.

Southern Resident Killer Whale research and SAR

Brad Hanson reviewed research updates and the SRKW SAR (document *PSRG-2020-03*). In the SAR, $N_{\min} = 73$ and the $PBR = 0.13$. There has been a net change of -2 animals, with 2 births, and 4 deaths between July 2018 and July 2019. After the July 2019 census, one additional male was lost, and no additional calves have been born. Hanson reviewed several R_{\max} options and requested SRG input on the most appropriate value to use. The deaths of L95 and J34 will be reclassified as human-caused mortalities. Studies on vessel disturbance, prey availability, a small population size genomic analyses, and contaminants are ongoing. Scott Baker asked who was coordinating the genetic studies, and Hanson clarified it was Mike Ford. DeMaster asked if there were things that should be done but are not, and

Hanson replied that they requested and received \$655K for SRKW projects, but their base funding is about half of what it was in 2007. Tinker asked if the list of research priorities can be shared and Hanson noted they were in the Recovery Plan. Calambokidis asked whether carryover funds were available from State salmon research, but this was not known. DeMaster noted that R_{max} should not be considered as an observed rate of increase, but a modeled estimate of the highest rate of growth at a low population size. The SRG agreed to review the R_{max} question and noted that the appropriate choice of R_{max} for killer whales has also come up within the Alaska SRG.

California Current Ecosystem Survey (CCES) 2018

Jeff Moore reviewed the CCES 2018 survey, which is the second schedule PACMAPPs survey and for which a draft NOAA Tech Memo is available. Compared to the historical, broad survey grids, the CCES 2018 effort was more spatially-restricted, because of operational constraints associated with this joint fish and marine mammal assessment. Nonetheless, the survey had the most sightings (~2000) of any of our surveys, reflecting the focus on shelf/slope waters where animal densities are greater. Completed effort extended from Vancouver Island, Canada to Baja California, Mexico. Drifting acoustic recorders (DASBRs) were deployed to allow the improved estimation of beaked whales density and abundance, with 15 of 22 deployed units retrieved. The survey included extensive coordination with Cascadia Research on humpback photo identification and biopsy sampling from small boats. Acoustic backscatter and prey sampling was also an important component of the survey. An analysis of the survey results is in progress, and Becker is developing model-based abundance estimates that should be completed by the next SRG meeting. Pros and of the CCES 2018 survey, which was constrained by the coastal fish stock transect design include: 1) the additional effort on the continental shelf and slope, leading to large sample sizes for the more nearshore species, 2) the research vessel was fully-utilized, 3) high-quality predator-prey co-occurrence data were collected along with the marine mammal data. Ship time is getting harder to obtain for marine mammal surveys, so this was an opportunistic gain, despite limitations. Cons of this survey are that the sampling of deep-water, offshore species suffered, and this type of survey forces more reliance on surface-density models that take more time and resources to develop. The limited offshore sampling may compromise the quality of the model-based abundance estimates for some species may. Scott Baker asked which species would be affected by the reduced offshore coverage. Moore responded that data on striped dolphins, fin whales and blue whales was reduced (spatially and absolutely) relative to past surveys. DASBR data is expected to compensate for the loss of sperm whale and beaked whale data. DeMaster asked whether and how SWFSC and the AKFSC's Marine Mammal Lab (MML) coordinate their marine mammal programs. The SWFSC pinniped survey work is being transferred to MML and PCFG gray whale research is supported by MML.

US West Coast Serious Injury Determinations

Carretta reviewed the 2014-2018 serious injury determinations, summarized in document *PSRG-2020-12*, with emphasis on the large whales. There were no SRG comments.

PCFG gray whale research and MMPA waiver process

Steve Stone reviewed the Makah Tribe's waiver request for hunting of gray whales. NOAA is awaiting word from the Administrative Law Judge on recommendations regarding how to proceed. Public comments on the proposed hunt have also been received. Moving forward, there would also be a MMPA permitting processes and Whaling Convention Act authorization. The International Whaling Commission (IWC) noted that hunt proposal met their goals for conservation. Calambokidis inquired about the alternate year hunt schedule, and Stone indicated that even years would have Dec - May hunts while in odd years the hunt would be restricted to July- Oct to avoid Western North Pacific (WNP) gray whales. Scott Baker asked about stock differentiation of western and eastern North Pacific populations. Aimee Lang noted the IWC has considered a variety of stock structure hypotheses, and it is undecided whether the Pacific Coast Feeding Group (PCFG) represents a management unit. Calambokidis asked about advances in identifying internal vs. external recruitment for PCFG. Lang replied that the data have been generated and there will be a focus on identifying mother - offspring pairs. Taylor noted that the WNP differ in both mtDNA and nuclear DNA, while the PCFG differs to a small degree in mtDNA but has no significant differences in nuclear DNA.

U.S. West Coast fin and gray whale SARs

Carretta reviewed the U.S. West Coast Draft 2020 SARs (document *PSRG-2020-04*) that included fin and gray whales. Dan Palacios asked if acoustics is considered as a line-of-evidence for stock delineation with regard to the SAR. Carretta confirmed that it is considered a line-of-evidence for stock delineation, as reviewed by Karen Martien. Acoustic considerations are included in the Eastern North Pacific blue whale SAR. The fin whale SAR draft mentions acoustics as a line of evidence for delineating eastern and western North Pacific fin whale stocks (Mizroch et al. 2009), but there are more-recent publications on the subject and Carretta agreed to update the SAR with the newer information.

Overview of West Coast humpback whale research

Moore provided an overview of current humpback research, including spatial risk analyses, genetic studies, photo-identification for mark-recapture, and hormone analyses. Forney summarized a new year-round humpback whale spatial density model, which was developed to support entanglement risk assessments. The model includes bathymetry and three dynamic predictors (sea surface temperature, sea surface height, and mixed layer depth) as habitat covariates, and it successfully captures the disruption of the seasonal humpback migration during the 2014-2016 marine heat-wave years. This disruption led to greater spatiotemporal overlap with pot/trap fisheries and contributed to the large increase in humpback whale entanglements.

Genetic assignment of humpback whales to Distinct Population Segment (DPS)

Martien reviewed the genetic characterization of migratory herds of humpback whales off California and Oregon using mitogenome sequences (document *PSRG-2020-11*). She emphasized that the focus for conservation, research, and management should be migratory herds and not DPSs, because migratory herds are likely to be demographically independent. The definition provided for a migratory herd was “a group of animals that share the same feeding ground, wintering ground, and migratory route, and therefore are exposed to the same environmental conditions and threats throughout the entire year.” Off California and Oregon, the migratory herds are referred to as ‘Central America’ and ‘Mainland Mexico’. Martien noted that migratory herds are the starting point for any assessment and contrasted ESA and MMPA approaches for management in this context. Under the ESA, a relevant management question regarding entanglements is “How are entanglements in CA/OR waters distributed between the Mexico and Central America DPSs?”. In contrast, the MMPA asks the management question, “What is the abundance of the Central America DIP/stock/DPS?”. Both questions require prorating abundance and entanglements to the two herds that occur on the CA/OR feeding ground. DIPs have not yet been delineated for U.S. West Coast humpback whales, but Martien provided a hypothetical example showing 5 different feeding groups (= migratory herds) that comprise the Mexico DPS. Abundance of this DPS can be estimated as the number of whales that winter in Mexico (which is the sum of the five herd), or by estimating the abundance of each of the five herds separately. Logistically it is challenging to survey breeding grounds for overall DPS abundance in the eastern Pacific, given vessel resources.

Martien presented results of a study attempting to characterize the two CA/OR herds (Mainland Mexico and Central America) genetically. For the control region, 77% of individuals share a haplotype between Mainland Mexico and Central America herds. For the full mitogenome, 63% of individuals share a haplotype. Martien examined differences a) between herds and b) between herds and their DPS, to help improve DPS assignments. The two CA/OR herds are statistically significantly different from each other using both control region and full mitogenome methods. However random forest assignment to migratory herds had high predictive error rates (~44%) due to the large number of shared haplotypes, indicating that mtDNA is insufficient for herd assignment. Control region sequences for both CA/OR herds are also statistically significantly different from the Mainland Mexico wintering ground samples. Random forest assignment to wintering grounds performed better, with a ~28% error rate. The take-home message from these analyses is that using wintering grounds instead of herds as the reference populations would have yielded erroneous results (e.g., using the Mexico wintering ground samples to assign migratory herds resulted in a 44% error rate).

Martien reported that 293 humpback samples were collected during the CCES 2018 cruise (66 from Washington state and 227 from CA/OR). These samples were compared to the 2004-2006 SPLASH (“Structure of Populations, Levels of Abundance and Status of Humpbacks” project) samples for CA/OR to identify potential temporal differences, and no statistically significant differences were found. There may be some photo-identification bias for mainland Mexico. Given that CA/OR is a combination of Central America and Mainland Mexico, there should be 0-10% of haplotype ‘A’, but there was 17%. Central America animals have to pass by mainland Mexico during migration, so some Central America whales may have been misidentified as mainland Mexico animals. Future analyses are planned, including the nuclear DNA characterization of West Coast herds using a large panel of single nucleotide polymorphism (SNP) loci to address several questions: Is nuclear differentiation between herds greater than mitochondrial differentiation? Can we achieve higher assignment success with nuclear data? Are herds differentiated from their winter ground/DPS in their nuclear genomes? If so, this would suggest substantial breeding occurs during migration. Calambokidis noted that perhaps animals are not being sampled in an unbiased manner, especially if whales are spatially-segregated on finer scales than expected. Palacios asked if the herd concept had terrestrial analogs, and Taylor confirmed that migratory herds of humpbacks are analogous to caribou and wildebeest herds that respectively share their ranges during part of the year. Palacios added that this concept is consistent with humpback telemetry data.

DPS Assignment using microsatellite loci

Scott Baker reviewed graduate student Karen Lohman’s analysis of humpback whale microsatellite loci. The SPLASH results documented genetic differentiation *a priori* strata and allowed for identification of four DPSs based on breeding grounds (Central America, Mexico, Hawaii, and Western North Pacific). With increased sample sizes, they have examined fine-scale differentiation at the US West Coast feeding grounds. Population self-assignment to the four breeding grounds was tested using a Bayesian method, resulting in 88% correct assignment to central America DPS and 53% correct assignment to Mexico DPS. Sample sizes were increased by including ‘pseudo-reference’ samples of individuals sampled at the feeding grounds that have been photographed at a breeding area. Variability in assignments is sensitive to the sample size of the reference database, the number of loci (and variability therein), and the true underlying genetic differentiation of the breeding grounds. Off the U.S. West coast, the proportion of animals assigned to each DPS varies by latitude from 30.5 to 52 N. The proportion of whales assigned to Central America was greatest off California and least off British Columbia, while the opposite was the case for whales assigned to Hawaii. There is evidence that whales from southern Mexico are more closely-aligned with Central America than the rest of mainland Mexico.

Ongoing work includes the incorporation of photo-identification and telemetry data, and genomic methodology that is consistent with that used by Martien. Eric Archer asked whether a comparison was made between the pseudo-reference and SPLASH reference samples, and Scott Baker confirmed that no significant differences were identified. Palacios wondered whether heterogeneity in sampling may be an issue in the feeding areas, because some animals may spend more time close to shore. Calambokidis noted that sighting evidence indicates not much of an offshore distribution for humpback whales, but this would be a greater issue for more widespread species such as blue whales.

Humpback whale hormone analysis

Nick Kellar presented data on humpback whale pregnancy rates from hormone analyses. The mean pregnancy rate was 36%, with a surprising latitudinal cline: 12.5% off southern CA, 24% off northern CA, 48% off OR, and 44% off WA. Pregnancy rates also decline with time. Potential reasons for this time / location cline include 1) critical time where fetus’ may be aborted and there are no new conceptions; 2) variation in habitat quality; 3) population / demographic segregation. Blubber cortisol also increases with time and southward sampling. The highest levels of blubber cortisol are found in the San Francisco area, which may be related to the high levels of fishing and shipping activity. Pregnancy rates decline with increasing cortisol. Next steps for the analyses are to integrate pregnancy and cortisol data with the photo-identification data and to look at nutritional states vs. cortisol. These analyses will seek to distinguish whether patterns are spatial or temporal or both.

Photo identification analyses and new projects

Calambokidis reviewed the photo-identification data collected as part of the CCES 2018 survey, noting that document *PSRG-2020-15* has new abundance estimates. The sampling resulted in 1397 individual photo-identifications and 304 biopsy samples. A trend analysis indicates that the new abundance estimates are considerably higher than all previous years, with an apparent annual growth rate exceeding 7.5% off California and Oregon. A previously identified pause in the humpback whale growth rate may not have been real and instead may have been caused by sampling biases during some years. Faster growth rates were found off Washington and southern British Columbia. There is no evidence of a shift of humpback whales from Southeast Alaska to British Columbia/Washington, but this is being investigated.

Alexandra Curtis reviewed photo-identification data and research priorities with an emphasis on an updated assessment for the Central America DPS. Based on a randomization test of interannual sighting locations of individuals, the interannual sighting distances were found to be smaller than expected by random chance. Thus, it appears humpbacks are not randomly mixing on the Central American breeding grounds. Spatial mark-recapture methods will be used for assessing Central America whales using an open population model that incorporates information on where animals generally return to in the wintering grounds. This model can also be applied to U.S. West Coast whales. A lack of recent comprehensive effort off Central America is apparent from a decline in the percent of southern California sightings that match to Central America. SWFSC is supporting a new Central America photo-identification effort in 2021. A SPLASH 2 effort is also being planned, with the Office of Protected Resources providing support for a 2020 workshop on planning the sampling and assess data needs. Tinker asked whether Curtis would be integrating the CCES shipboard survey data into this model. Curtis indicated the survey data would not be included because the spatial line-transect coverage was quite variable and there seems to be better resolution with the photo-identification data. Scott Baker noted that haplotypes could be incorporated as covariates in the mark-recapture analysis using the program SURGE, and New confirmed this would be an appropriate analysis tool.

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. Oleson also noted that Winter HICEAS survey is expected to end March 9. A target date was set for the week of March 15, 2021.

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, 23-27 March 2020

Pacific Scientific Review Group:

John Calambokidis	Cascadia Research
Scott Baker	Oregon State University
Simone Baumann-Pickering	U.C. San Diego, Scripps Institution of Oceanography
Lars Bejder	University of Hawaii
Doug DeMaster	Marine Analytical Consultants
David Itano	Hawaii and Western Pacific Fisheries Consultant
Rebecca Lewison	San Diego State University
Leslie New	Washington State University
Daniel Palacios	Oregon State University
Tim Tinker	Nhydra Ecological Consulting

Participants and Observers:

	<i>NOAA General Counsel NW</i> Laurie Beal, Caitlin Imaki
<i>NMFS Southwest Fisheries Science Center</i> Eric Archer, Jay Barlow, Elizabeth Becker, Bob Brownell, Jim Carretta, Karin Forney, Brittany Hanser, Nick Kellar, Kristen Koch, Aimee Lang, Karen Martien, Jeff Moore, Robin LeRoux, Barbara Taylor, Dave Weller	<i>DOC General Counsel</i> David Brodian <i>U.S. Fish and Wildlife Service</i> Diane Bowen
<i>NMFS Pacific Islands Fisheries Science Center</i> Ann Allen, Jason Baker, Michelle Barbieri, Amanda Bradford, Marie Hill, Charles Littnan, Erin Oleson, Tracy Mercer, Mike Seki, Anne Simonis, Rebecca Walker	<i>Marine Mammal Commission</i> Dennis Heinemann, Samantha Simmons <i>Cascadia Research Collective</i> David Anderson, Robin Baird, Jordan Lerma, Sabre Mahaffy
<i>NMFS Alaska Fisheries Science Center</i> Bob DeLong, James Freed, Marcia Muto	<i>Scripps Institution of Oceanography</i> Annebelles Kok, Jenny Trickey
<i>NMFS Northwest Fisheries Science Center</i> Blake Feist, Brad Hanson	<i>Other</i> Svein Fougner (<i>Hawaii Longline Association</i>) Jonathan Gonzales (<i>Pacific Seafood</i>) Brian Gruber (<i>Makah Tribe</i>) Asuka Ishizaki (<i>Western Pacific Fishery Management Council</i>) Kate O'Connell (<i>Animal Welfare Institute</i>) Noah Oppenheim (<i>Pacific Coast Federation of Fishermen's Associations</i>) Margaret Owns (<i>Port Angeles</i>) D.J. Schubert (<i>Animal Welfare Institute</i>) Jon Scordino (<i>Makah Tribe</i>) Brett Sommermeyer (<i>Sea Shepherd</i>) Angela Sremba (<i>Pacific Marine Environmental Laboratory</i>) Ryan Steen (<i>Stoel Reeves</i>) Sharon Young (<i>Humane Society of the US</i>) Colleen Weiler (<i>Whale & Dolphin Conservation</i>)
<i>NMFS West Coast Regional Office</i> Lynne Barre, Lauren De Maio, Tina Fahy, Grace Ferrara, Dan Lawson, Laura McCue, Penny Ruvelas, Lauren Saez, Steve Stone, Kristen Wilkinson, Nancy Young	
<i>NMFS Pacific Islands Region</i> Kevin Brindock, Jeff Walters	
<i>NMFS Office of Protected Resources</i> Shannon Bettridge, Lisa Lierheimer, Kristy Long, Lisa Manning, Eric Patterson	
<i>NMFS Office of Science and Technology</i> Zac Shakner, Mridula Srinivasan	

APPENDIX 2

Pacific SRG Document List Pacific SRG Meeting 24-27 March 2020 (web-based meeting) Last revised: 03/02/2020

Document No.	Title/Topic	Contributor(s)	Distribution Date
Draft documents for Pacific SRG review (<i>Not to be distributed outside NMFS and SRG</i>)			
PSRG-2020-01	Pacific Islands SARs	Oleson	3/2/2020
PSRG-2020-02	Monk Seal SAR	Baker	3/2/2020
PSRG-2020-03	Southern Resident Killer Whale SAR	Hanson	3/2/2020
PSRG-2020-04	U.S. West Coast SARs (gray whales, fin whales)	Carretta	3/2/2020
PSRG-2020-05	Monk seal injury and mortality report	Mercer	3/2/2020
PSRG-2020-06	Abundance estimates of false killer whales in Hawaiian waters and the broader central Pacific	Bradford/Becker	3/2/2020
PSRG-2020-07	Design-based abundance estimates for cetaceans for 2002, 2010, and 2017	Bradford	3/2/2020
PSRG-2020-08	Habitat-based density models for cetaceans within U.S. Exclusive Economic Zone waters around the Hawaiian Archipelago	Becker	3/2/2020
PSRG-2020-09	Serious injury determinations for cetaceans bycaught in the Hawaii and American Samoa-based longline fisheries	Bradford	3/2/2020
PSRG-2020-10	Serious injury determinations for cetaceans reported to the Hawaii-based response networks	Bradford	3/2/2020
PSRG-2020-11	Progress report on genetic assignment of humpback whales from the California-Oregon feeding aggregation to the mainland Mexico and Central America wintering grounds	Martien	3/2/2020
PSRG-2020-12	Sources of human-related injury and mortality for U.S. Pacific west coast marine mammal stock assessments	Carretta	3/2/2020
PSRG-2020-13	Estimates of marine mammal, sea turtle, and seabird bycatch from the California large-mesh drift gillnet fishery	Carretta	3/2/2020
PSRG-2020-14	Spinner dolphin taxonomy	Brownell & Leslie	3/2/2020
PSRG-2020-15	Blue and humpback whale abundance estimates	Calambokidis and Barlow	3/2/2020
Background Papers - FYI only (not for SRG review but may be relevant to discussions)		Submitted by	
PSRG-2020-B01	a) National Stock Designation Policy and b) Draft Negligible Impact Determination Policy	Bettridge	3/2/2020
PSRG-2020-B02	Martien et al. 2019 DIP delineation handbook: a guide to using multiple lines of evidence to delineate demographically independent populations of marine mammals.	Martien	3/2/2020
PSRG-2020-B03	McCracken et al. 2019. Cetacean bycatch estimates for the Hawaii-based longline fisheries (2014-2018)	McCracken/Oleson	3/2/2020
PSRG-2020-B04	Barkley et al. 2019. Whistle classification of sympatric false killer whale populations in Hawaiian waters yields low accuracy rates. <i>Front. Mar. Sci.</i> 6:645. doi: 10.3389/fmars.2019.00645	Oleson	3/2/2020
PSRG-2020-B05	Observer Coverage Tool publication	Curtis	3/2/2020
PSRG-2020-B06	Simonis et al. 2020. Co-occurrence of beaked whale strandings and naval sonar in the Mariana Islands, Western Pacific.	Oleson	3/2/2020
PSRG-2020-B07	Hill et al. 2020. Found: a missing breeding ground for endangered western North Pacific humpback whales in the Mariana Archipelago	Oleson	3/2/2020
PSRG-2020-B08	Baird et al. 2019. Cooperative conservation and long-term management of false killer whales in Hawai'i: geospatial analyses of fisheries and satellite tag data to understand fishery interactions. (Available at http://www.cascadiaresearch.org/hawaiian-cetacean-studies/publications#reports)	Baird	3/2/2020
PSRG-2020-B09	California Current Ecosystem Survey Cruise Report	Moore	3/2/2020
PSRG-2020-B10	Van Cise et al. Oceanographic barriers, divergence, and admixture: phylogeography and taxonomy of two putative subspecies of short-finned pilot whale	Martien	3/2/2020
PSRG-2020-B11	Calambokidis et al. Pacific Coast Feeding Group gray whale abundance estimates	Calambokidis	3/2/2020

APPENDIX 3

Pacific Scientific Review Group (PSRG) Webinar Meeting, 24-27 March 2020

Final Agenda (03/22/2020)

--- All times are Pacific Daylight Time ---

TUESDAY, 24 MARCH 2020 – NATIONAL TOPICS

10:15 Participants, please connect to webinar to allow time for any issues to be resolved

10:30 Welcome, Webinar Overview – *John Calambokidis, PSRG Chair & Karin Forney* [15 min]

10:45 Scientific Review Group and Stock Assessment Report (SAR) Overview

- Management applications of marine mammal SARs – *Shannon Bettridge/Zac Shakner* [15 min]
- National SAR topics – *Zac Schakner* [15 min]
- Ethical considerations for Scientific Review Groups – *David Brodian* [10 min]
- SRG Discussion/Questions [20 min]

----Break [11:45-12:00]----

12:00 Stock Delineation Discussion

- Stock Designation Policy (*PSRG-2020-B01a,b*) – *Shannon Bettridge* [5 min]
- DIP Delineation Handbook (*PSRG-2020-B02*) – *Karen Martien* [5 min]
- SRG Stock Discussion [20 min]

12:30 MMPA Import Rule, LOF updates – *Kristy Long/Nina Young* [15 min]

12:45 SRG discussion/questions, as needed

13:45 Review tasks to do before tomorrow's webinar – *Karin Forney*

14:00 Adjourn

WEDNESDAY, 25 MARCH 2020 – PACIFIC ISLANDS TOPICS

10:00 Welcome, Webinar Overview – *John Calambokidis, PSRG Chair & Karin Forney*

10:15 Hawaiian Monk Seal SAR (*PSRG-2020-02, PSRG-2020-05*) – *Jason Baker* [15 min]

10:30 Pacific Islands Research (*PSRG-2020-06, PSRG-2020-07, PSRG-2020-08*)

- False killer whale abundance estimates and webinar summary – *Amanda Bradford* [30 min]
- Other Hawaii cetacean abundance estimates – *Amanda Bradford/Elizabeth Becker* [30 min]

----Break [11:30-11:45]----

- Overview of PIFSC 2019-2021 Surveys – *Erin Oleson/Kym Yano* [15 min]
- Cetacean serious injury determinations (*PSRG-2020-09, PSRG-2020-10*) – *Amanda Bradford* [10 min]
- Acoustic monitoring of false killer whales in the longline fishery – *Erin Oleson* [15 min]

12:30 Pacific Islands SAR review (*PSRG-2020-01*) – *Erin Oleson* [45 min]

13:15 SRG Discussion, document comments, recommendations – *John Calambokidis, PSRG Chair* [45 min]

14:00 Adjourn

SRG Documents no longer included on agenda, but SRG comments welcome:

PSRG-2020-B08 (HI False killer whales), Robin Baird

PSRG-2020-14 (Spinner dolphin taxonomy), Robert Brownell

PSRG-2020-B07 (Mariana humpback whales), Marie Hill / Erin Oleson

THURSDAY, 26 MARCH 2020 – U.S. West Coast Topics

10:00 Welcome, Webinar Overview – *John Calambokidis, PSRG Chair & Karin Forney*

10:15 West Coast Region Management Topics [45 min]

- West Coast Whale Entanglement Updates – *Dan Lawson/Laura McCue*
- Southern resident killer whale updates – *Lynne Barre/Laura McCue*
- Other West Coast Region Management Updates – *Laura McCue/Penny Ruvelas*
- SRG Discussion/questions

11:00 West Coast Research

- Southern Resident Killer Whale research and SAR (*PSRG-2020-03*) – *Brad Hanson* [10 min]
- California Current Ecosystem Survey (CCES) 2018 – *Jeff Moore* [10 min]
- US West Coast Serious Injury Determinations, 2014-2018 (*PSRG-2020-12*) – *Jim Carretta* [5 min]
- PCFG gray whale research and MMPA waiver process – *John Calambokidis/Steve Stone* [10 min]
- West Coast Seismic Survey – *John Calambokidis* [10 min]

----Break [11:45-12:00]----

12:00 West Coast SARs

- U.S. West Coast fin and gray whale SARs (*PSRG-2020-04*) – *Jim Carretta* [30 min]

12:30 West Coast humpback whale research

- Overview of humpback whale research topics – *Jeff Moore* [15 min]
- Genetic assignment of humpbacks to Distinct Population Segment (DPS)
 - Using mitogenome sequences (PSRG-2020-11) – *Karen Martien* [10 min]
 - Using microsatellite loci – *Karen Lohman/Scott Baker* [10 min]
- Humpback whale hormone analysis – *Nick Kellar* [10 min]
- Photo ID analyses and new projects – *Jeff Moore/Alex Curtis/John Calambokidis* [30 min]

13:45 SRG Questions/Recommendations, as needed

14:00 Adjourn

SRG Documents no longer included on agenda, but SRG comments welcome:

PSRG-2020-13 (Drift gillnet bycatch estimates), Jim Carretta

PSRG-2020-15 (Blue whale abundance estimates), John Calambokidis

FRIDAY, 27 MARCH 2020 – SRG Discussions and Recommendations

10:00 Webinar Overview – *John Calambokidis, PSRG Chair* [15 min]

10:15 Other Discussion Topics

- Topics, timing, and location of next meeting [15 min]

10:30 SRG Discuss and Draft Recommendations

13:00 Adjourn PSRG meeting