POP Appendix #

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Over time, the Gulf of Alaska (GOA) bottom trawl survey has systematically identified certain habitats as untrawlable and subsequently eliminated these habitats from survey sampling. The label of “untrawlable” is a functional definition describing habitats that are unavailable to sample using survey gear while maintaining constant bottom contact. Previous work indicates untrawlable habitats are more likely to have greater depths and slopes (means, ranges, and maxima), higher rugosity, higher substrate hardness, and more rock/reef structures than trawlable habitats (Baker et al. 2019). Rockfish can be found in both trawlable and untrawlable habitats (Zimmermann 2003), but Jones et al. (2021) found increased densities for several rockfish species (*Sebastes* spp.) in untrawlable habitats. There has been speculation that estimates of abundance for rockfish species in the GOA are both imprecise and inaccurate because the trawl survey is generally unable to sample in areas where many of these species are most abundant, and habitats are thus not being sampled in proportion to their importance (Rooper and Martin 2012). One potential solution to this problem is to cooperatively collect data in untrawlable habitats with partners in the fishing industry, as industry boats successfully fish many areas that are unavailable to the bottom trawl survey.

Beginning in 2020, the Alaska Fisheries Science Center began pursuing cooperative work with the Gulf of Alaska fishing industry via the Science-Industry Rockfish Research Collaboration in Alaska (SIRRCA). Multi-stakeholder cooperative research programs like SIRRCA are valuable for fishery science; they can improve scientific surveys by sharing knowledge, building public engagement in the scientific process, and laying a foundation of mutual trust between managers and industry (Hartley and Robinson 2006). The first year of SIRRCA has laid a strong foundation based on close involvement of species assessors and continuous maintenance of relationships between scientists and stakeholders, which are important components of successful research collaborations (Steins et al. 2019).

Currently, Alaska commercial catch data are included as gross removals in stock assessments, along with some information about fish length, weight, age and sex, as reported by observers and industry participants. However, commercial fishing effort metrics (e.g., catch-per-unit-effort or regional biomass estimates) are rarely included in stock assessments because it is difficult to extract information about trends in abundance from non-standardized commercial fishery effort data (Maunder 2006), even though this effort may occur in areas not covered by a fishery-independent survey. SIRRCA aims to develop a solution for quantifying commercial fishery catch and effort data for several rockfish species, including POP. This work is focused on adding information from untrawlable habitats, aiming to supply valuable data to the stock assessment from areas not sampled in the survey. This cooperatively collected data will serve as a supplemental source of population abundance information and aid in understanding differences in catchability between different habitat types. Additionally, this work can inform how estimates of abundance are impacted by gear implementation in trawlable vs. untrawlable habitats.

Two SIRRCA scientists began cooperative data collection in summer 2021; sampling was conducted using many, but not all, aspects of GOA bottom trawl survey tows. Aspects of sampling design that were maintained in SIRRCA tows included duration (15 minutes), speed (2.8 – 3.2 knots), and contact with the seafloor (constant bottom contact maintained fur duration of the tow). Gear constituted the major sampling design difference between SIRRCA tows and GOA bottom trawl survey tows, as cooperative research tows were conducted using industry-owned and maintained nets that differ substantially from the government owned and maintained nets used in the survey. To account for these differences, SIRRCA conducted 28 tows to calibrate the fishing power and selectivity of the industry gear to the survey gear. Calibration tows were completed as close in time and space to survey tows as possible, with help from field party chiefs and captains conducting the 2021 bottom trawl survey. Additionally, SIRRCA completed tows in 2 untrawlable habitat stations as a proof-of-concept. While adding information on biomass in untrawlable habitats is a main goal of SIRRCA, calibrating industry gear to survey gear was prioritized in 2021. The underlying reasoning for this strategy is that GOA bottom trawl survey is on a biennial cycle, and thus the opportunity to calibrate industry and survey gear would not have occurred again until the 2023 survey.

Sampling of SIRRCA hauls was conducted in the factory of the catcher-processor vessels. Each cooperative research haul was whole-hauled for POP, northern and dusky rockfish; this means that each haul resulted in precise counts and weights for these 3 species. Length data was also collected; the sampling strategy was adjusted for the size of each tow where every fish was sampled for length if there was estimated to be less than 2000 of our target rockfish in a haul, and fish were subsampled at a rate of 1:10 if there were estimated to be over 2000 individuals (Table 1). Data collection was performed by the SIRRCA scientists (counts, lengths) and factory crew (weights). SIRRCA 2021 hauls totaled >78mt, including >38mt of POP.

We plan to conduct sampling focusing on experimental tows in untrawlable areas in 2022, and to conduct sampling in both trawlable and untrawlable areas concurrent with the GOA bottom trawl survey in 2023 and 2025. In the short term, we hope the data we collect will be useful in the assessment process by informing a prior on catchability. In the longer term, we hope the length and biomass data collected will be useful in the assessment process by facilitating the development of a separate index of relative rockfish abundance from untrawlable habitats, or by building a blended index of abundance using SIRRCA data and GOA bottom trawl survey data. We hope that our project will add to the recent efforts on behalf of scientists at the AFSC to understand differences in seafloor characteristics and fish densities between trawlable and untrawlable habitats (Baker et al. 2019, Jones et al. 2021, Steinessen et al. 2021) and that the continuation of cooperatively collected data will improve the accuracy and precision of future POP assessments.

Literature Cited

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Table 1: Preliminary data for Pacific Ocean perch from 2021 SIRRCA cooperative survey hauls.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Station sampled | Haul type | SIRRCA haul date | POP (kg) | POP (n) | Length sampling scheme |
| 166-73 | Calibration | 6/5/2021 | 2494.4 | 3640 | 1:10 |
| 171-96 | Calibration | 6/7/2021 | 2658.66 | 3159 | 1:10 |
| 192-94 | Calibration | 6/13/2021 | 323.14 | 436 | 1:1 |
| 196-88 | Calibration | 6/13/2021 | 146.2 | 187 | 1:1 |
| 194-89 | Calibration | 6/13/2021 | 19.56 | 25 | 1:1 |
| 191-86 | Calibration | 6/13/2021 | 349.65 | 549 | 1:1 |
| 175-79 | Calibration | 6/14/2021 | 1300.6 | 3027 | 1:10 |
| 174-77 | Calibration | 6/14/2021 | 1975.75 | 3889 | 1:10 |
| 174-78 | Calibration | 6/14/2021 | 2786.93 | 4685 | 1:10 |
| 158-69 | Calibration | 6/17/2021 | 538.17 | 692 | 1:1 |
| 142-58 | Calibration | 6/18/2021 | 235.6 | 420 | 1:1 |
| 144-58 | Calibration | 6/18/2021 | 5259.75 | 7931 | 1:10 |
| 134-57 | Calibration | 6/19/2021 | 318.78 | 679 | 1:1 |
| 136-55 | Calibration | 6/19/2021 | 265.54 | 379 | 1:1 |
| 235-149 | Calibration | 7/1/2021 | 392.98 | 433 | 1:1 |
| 237-150 | Calibration | 7/1/2021 | 7930.61 | 8805 | 1:10 |
| 239-145 | Calibration | 7/1/2021 | 3264.21 | 3848 | 1:10 |
| 243-147 | Calibration | 7/2/2021 | 1073.82 | 1307 | 1:10 |
| 245-146 | Calibration | 7/2/2021 | 64.64 | 84 | 1:1 |
| 249-147 | Calibration | 7/2/2021 | 1789.77 | 2274 | 1:10 |
| 239-132 | Calibration | 7/4/2021 | 1996.69 | 2832 | 1:10 |
| 131-55 | Experimental | 7/21/2021 | 2.8 | 5 | 1:1 |
| 131-55 | Experimental | 7/21/2021 | 646.82 | 2368 | 1:1 |
| 111-62 | Calibration | 7/22/2021 | 2.96 | 9 | 1:1 |
| 104-55 | Calibration | 7/22/2021 | 0 | 0 | N/A |
| 102-44 | Calibration | 7/22/2021 | 0.27 | 1 | 1:1 |
| 97-44 | Experimental | 7/22/2021 | 0 | 0 | N/A |
| 64-36 | Calibration | 7/23/2021 | 1.6 | 4 | 1:1 |
| 55-32 | Calibration | 7/23/2021 | 49.39 | 87 | 1:1 |
| 54-32 | Calibration | 7/23/2021 | 7.38 | 14 | 1:1 |
| 53-33 | Calibration | 7/23/2021 | 48.39 | 161 | 1:1 |
| 4-4 | Calibration | 7/24/2021 | 2565.09 | 3002 | 1:10 |