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## Evaluating discard mortality rates and developing best management practices in the Pacific halibut charter recreational fisheries

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### PURPOSE

To provide the RAB with a description of an ongoing study designed to improve our knowledge on discard mortality rates in the Pacific halibut charter recreational fishery.

### BACKGROUND

The Pacific halibut recreational fishery (combined guided and unguided) is an important contributor (20%) to the total fishery-induced mortality, with 3,473 metric tons (7.6 million pounds) of removals in 2021. Under current regulations, the number of fish captured, handled and discarded by the Pacific halibut recreational fisheries is significant. Capture-related events impose stress and injury to the fish and, consequently, decrease the survival of discarded fish. In contrast to the trawl and longline Pacific halibut fisheries, discard mortality rates (DMRs) have not been determined experimentally in the recreational fisheries and are currently based on DMR information generated from commercial gear using J-hooks combined with rates derived for other sport fisheries, and coarsely applied to recreational hook type and creel census data. This project aims at better understanding the role of fishing practices and capture conditions on injury profile, physiological stress levels and survival in the Pacific halibut recreational fisheries in order to estimate DMRs. Recent reductions in Pacific halibut catch limits place added importance for improved DMR estimates applied to the recreational fishery.

The primary components of this project were to: 1) collect information on hook types and sizes and handling practices used in the guided recreational Pacific halibut fisheries of the central and eastern Gulf of Alaska (IPHC Regulatory Areas 2C and 3A) that account for a significant portion (83%) of coastwide recreational mortalities; 2) quantify relationships between gear types employed and the size composition of captured Pacific halibut; 3) characterize injury profiles and physiological stress levels in relation to commonly-employed capture and handling protocols, and; 4) quantify and characterize survival of discarded Pacific halibut in order to evaluate the relative accuracy of currently-employed DMRs. Funding for these projects was provided by the National Fish and Wildlife Foundation (components 1-4) and the North Pacific Research Board (component 4).

### DISCUSSION

The first component of the existing project was initiated in May of 2019 and was composed of fleet outreach exercises that were conducted in the Alaskan ports of Homer, AK and Seward, AK in IPHC Regulatory Area 3A, and in Juneau, AK and Sitka, AK in IPHC Regulatory Area 2C. Working directly with each port's charter association and the ADF&G, stakeholder meetings were conducted in order to explain project objectives, solicit the involvement of local guided recreational fishing captains, receive feedback with respect to project logistics, and answer questions and concerns that fleet members might have regarding the work. This was followed by the distribution of a voluntary survey – developed in collaboration with the University of Alaska, Fairbanks – soliciting detailed information regarding gear configurations (hook types and sizes) employed and fish handling practices (e.g., fish manipulated by hand or net, hook-release

method, time out of water), that was administered to guided recreational fishing captains via the IPHC's commercial port sampling program over the course of the 2019 fishing season. Results showed that the guided recreational fleet predominantly uses circle hooks (75-100%), followed by jigs. Predominant hook release methods included reversing the hook (54%) or twisting the hook out with a gaff (40%), and the fish were generally handled by supporting both the head and tail (65%), while other discard techniques reported included handling by the operculum (10%) or by the tail alone (10%). The data obtained from the 2019 guided recreational fleet survey provided the basis for structuring the field work that was conducted during the summer of 2021.

The second component of the study was to conduct field studies informed by common gear and handling practices as determined by the fleet survey. The IPHC Secretariat chartered the guided recreational vessel F/V High Roller (operated by Alaska Premier Charters) from 21-27 May 2021 in IPHC Regulatory Area 2C (out of Sitka, AK). The research charter in IPHC Regulatory Area 3A (out of Seward, AK) was conducted on the fishing vessel Gray Light (operated by Graylight Fisheries) on 11-16 June 2021. The fishing vessels were required to fish 6 rods at a time, three (3) rigged with 12/0 circle hooks and three (3) rigged with 16/0 circle hooks to establish a comparison of the two most common gear types used in the Pacific halibut recreational fishery.

In IPHC Regulatory Area 2C, we captured, sampled and released 243 Pacific halibut that were on average  $80.1 \pm 19.0$  cm in fork length (range from 52 to 149 cm) and  $7.4 \pm 7.5$  Kg in weight (range from 1.5 to 49.75 Kg). In IPHC Regulatory Area 3A (Seward, AK), we captured, sampled, and released 118 Pacific halibut that were on average  $72.5 \pm 14.1$  cm in fork length (range from 42 to 110 cm) and  $5.0 \pm 3.3$  Kg in weight (range from 0.55 to 17 Kg). Therefore, a total of 361 Pacific halibut were captured, sampled, and released in the two research charters conducted.

For all Pacific halibut captured in IPHC regulatory area 2C, we recorded the time from hooking to release, length and weight, the injury code and release viability category using the standard IPHC criteria, and air and fish temperature. In addition, from each fish we collected a blood sample, measured somatic fat content with the use of a Distell Fat Meter, took a picture of the hooking injury, collected a fin clip for genetic sexing and tagged the fish with an opercular wire tag prior to release. Pacific halibut captured in IPHC Regulatory Area 3A were subjected to the same sampling protocol except for 80 fish that were tagged with acceleration-logging survivorship pop-up archival transmitting (sPAT) tags. sPAT-tagged fish were selected only among those fish that were classified in the "excellent" viability category and did not have a blood sample taken to minimize handling-related stress. The deployed sPAT tags were programmed to be released after 96 days.

Fish size distributions were nearly identical between the two IPHC Regulatory Areas. Hook size had no effect on fish size or injury distributions. Furthermore, the majority (97%) of Pacific halibut captured were classified in the Excellent viability category.

Using the collected blood samples, stress parameters measured in the plasma (i.e. blood constituents without red blood cells) of captured and released Pacific halibut included the stress hormone cortisol and the metabolites glucose and lactate. Plasma cortisol, glucose and lactate levels did not vary by release viability but appeared to increase with fight time, suggestive of a positive relationship between stress levels and fight time in recreationally captured Pacific halibut. Interestingly, the observed plasma cortisol, glucose and lactate levels were markedly lower than those measured in commercially caught individuals (data not shown).

To date, of the 281 fish that were tagged with opercular wire tags (243 fish in IPHC Regulatory Area 2C and 38 in IPHC Regulatory Area 3A) 28 tags have been recovered (19 from IPHC Regulatory Area 2C and 9 from IPHC Regulatory Area 3A).

Seventy-six (76) of the 80 sPAT tags provided useable data reports. Survival analysis (R package = "survival") produced a preliminary mortality rate estimate of 1.35% with a 95% CI of 0.0-3.95%. These are the first field corroborated estimates of recreational discard mortality and affirm the use of current recreational discard mortality estimation methodologies embedded in mortality estimates that feed into the SA and MSE process. Further analysis is being conducted on diurnal activity patterns overall, as well as in the periods shortly after capture and release, versus shortly before tag release, to determine if there are any typical patterns in activity rates as fish recover from the capture and release event.

#### **RECOMMENDATION**

That the RAB:

- 1) **NOTE** paper IPHC-2022-RAB023-10, which described studies designed to improve our estimates of discard mortality rates in the Pacific halibut charter recreational fishery.