Discard mortality rates and post-release survival in the directed Pacific halibut fishery

PREPARED BY: IPHC SECRETARIAT (C. DYKSTRA, 26 JANUARY 2018)

PURPOSE

To provide the RAB with a description of the studies designed to improve our knowledge on discard mortality rates in the directed longline Pacific halibut fishery and application of electronic monitoring.

BACKGROUND

Due to regulatory requirements, all Pacific halibut that are caught as sublegal size in the targeted fishery, and those exceeding quota limits of the vessel, cannot be retained and must be returned to the sea with minimal injury. However, through the process of capture and release, Pacific halibut incur a range of injuries and are subjected to a variety of factors that will affect their survival potential after release. Discard mortality rates (DMRs) are calculated from data collected by observers from the injury characteristics (also known as release vitality) of Pacific halibut post-capture and are used to estimate the percentage of incidentally-caught fish that are expected to die after release. Currently, post-capture DMR estimates are based on qualitative assessments of the physical condition of the fish (e.g., minor/moderate/severe/dead for longline gear) and have a certain degree of uncertainty associated with them, which in turn is a source of uncertainty in the estimation of total mortality within current International Pacific Halibut Commission (IPHC) stock assessment models. In practice, assigned DMRs and their uncertainty translate into *a priori* adjustments to expected mortality in each upcoming year, and to the catch limits that are thereafter assigned to each harvest sector. Given current low halibut yields relative to long-term mean productivity, uncertain estimates can result in undue hardship on some harvest sector(s) relative to others. Therefore, there is an urgent need to improve our estimates of DMR as well as to provide strategies to improve survival of incidentally-caught Pacific halibut after release.

Individual variability in terms of mortality after release to the sea is expected depending on the level of injuries and stresses incurred during the discarding process as well as on the basal physiological condition of the fish. Therefore, an accurate understanding of the types and relative levels of injuries and stresses that fish are exposed to during the discarding process in relation to the biological characteristics of the fish can be instrumental in helping better estimate the probability of survival during the discarding process. It has been well recognized that fish condition assessments that incorporate additional levels of information on the physiological characteristics of captured fish have improved the power to predict survival in discarded fish. It is important to indicate, on one hand, that the physiological condition of the captured fish may influence their susceptibility to the stress associated with capture and handling events and, hence, their potential for survival after release. On the other hand, different capture and handling procedures can elicit different physiological responses in the fish to cope with the ensuing stress, which may also influence their survival after release. These two aspects are important because they drive most of the variability associated with discard mortality.

Traditional observer programs require examining the fish (which includes looking at both sides of the fish, testing muscle tone and opercular responses) to determine vitality; something that cannot be achieved with cameras. Development of electronic monitoring (EM) systems as an alternative to human observers highlights a need to develop the capability to convert imagery into actionable data. It has been demonstrated (Smith et al. 2017) that EM provides information on Pacific halibut hook-release techniques (e.g., careful shake, gangion cut, hook stripper) for close to 95% of events, however the suite of vitalities incurred by each hook-release technique is unknown.

DISCUSSION

The main objective of the present project is to improve our understanding of the types and relative levels of injuries and stresses that fish are exposed to during the discarding process in relation to the biological characteristics of the fish in order to improve our estimates of the probability of survival during the discarding process. We will measure physiological indicators of stress and condition in a quantitative manner in relation to capture and handling events in order to understand their influence on mortality after release. Full condition assessments incorporating physiological parameters can then be used as a predictive tool to estimate DMRs if properly calibrated with the results of direct survival or behavioral studies (e.g., tagging and telemetry studies).

The work proposed involved the random assignment of hook-release methods: 5 skates of careful shaking, 2 skates of hook stripping, and 1 skate of gangion cutting per set, using a commercial fishing vessel operating in an area southeast of Chignik, AK. All captured Pacific halibut were measured, weighed, assessed for current hooking injury, and evaluated for vitality (or release condition). Pacific halibut less than or equal to 84 cm (33 inches) fork length (FL) were sampled (blood, tissue for genetic analysis, muscle fat content and body temperature) and ocean temperature was recorded using temperature data loggers attached to each set of gear. Fish survival is being assessed by the use of pop-up archival transmitting tags (sPAT) tags containing accelerometer sensors that were deployed randomly on Pacific halibut ≤ 84 cm FL in excellent release condition and by the use of wire tags on Pacific halibut ≤ 84 cm of any release condition. Electronic monitoring equipment was also deployed during the project to collect data on the accuracy of its ability to capture release methods.

RECOMMENDATION/S

That the RAB:

1) **NOTE** paper IPHC-2018-RAB019-10 which outlined the research project describing studies designed to improve our estimates of discard mortality rates in the directed Pacific halibut longline fishery.