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## **Fishery-independent setline survey design and implementation in 2017, including current and future expansions**

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### **PURPOSE**

To provide an overview of the IPHC's fishery-independent setline survey (FISS) design and implementation in 2017, including current and future expansions.

### **BACKGROUND**

The International Pacific Halibut Commission's (IPHC) fishery-independent setline survey (FISS or setline survey) provides catch information and biological data on Pacific halibut (*Hippoglossus stenolepis*) that are independently collected from the commercial fishery. These data, which are collected using standardized methods, bait, and gear during the summer of each year, provide an important comparison with data collected from the commercial fishery. The setline survey fishing effort is only a small fraction compared to the commercial effort and is restricted to the summer months. The commercial fishery is more variable in its gear composition and distribution of fishing effort over time, and presents a broad spatial and temporal sampling of the stock. Biological data collected on the setline survey (e.g. the size, age, and sex composition of Pacific halibut) are used to monitor changes in biomass, growth, and mortality in adult and sub-adult components of the Pacific halibut population. In addition, records of non-target species caught during setline survey operations provide insight into bait competition, rate of bait attacks, and serve as an index of abundance over time, making them valuable to the assessment, management, and avoidance of non-target species.

### **INTRODUCTION**

The IPHC fishery-independent setline survey (FISS) is a large-scale comprehensive annual survey that covers Pacific halibut grounds from the Bering Sea to California. The Commission has conducted fishery-independent setline surveys in selected areas during most years since 1963 (with a break from 1987 to 1992). Historical information regarding previous setline survey operations has been presented in IPHC Annual Reports and setline Survey Manuals 1963-1965, 1976-1986, and 1993-current; IPHC Report of Assessment and Research Activities documents 1993-2016; and IPHC Technical Reports 18 (Hoag et al. 1980) and 58 (Soderlund et al. 2012).

### **Design**

The IPHC's fishery-independent setline survey (FISS) design encompasses nearshore and offshore waters of California, Oregon, Washington, British Columbia, southeast Alaska, the central and western Gulf of Alaska, Aleutian Islands, and northern Bering Sea. The current station layout has been in place since 1998 (with some additions in 2006 (Bering Sea), and in 2011 (IPHC Regulatory Area 2A)).

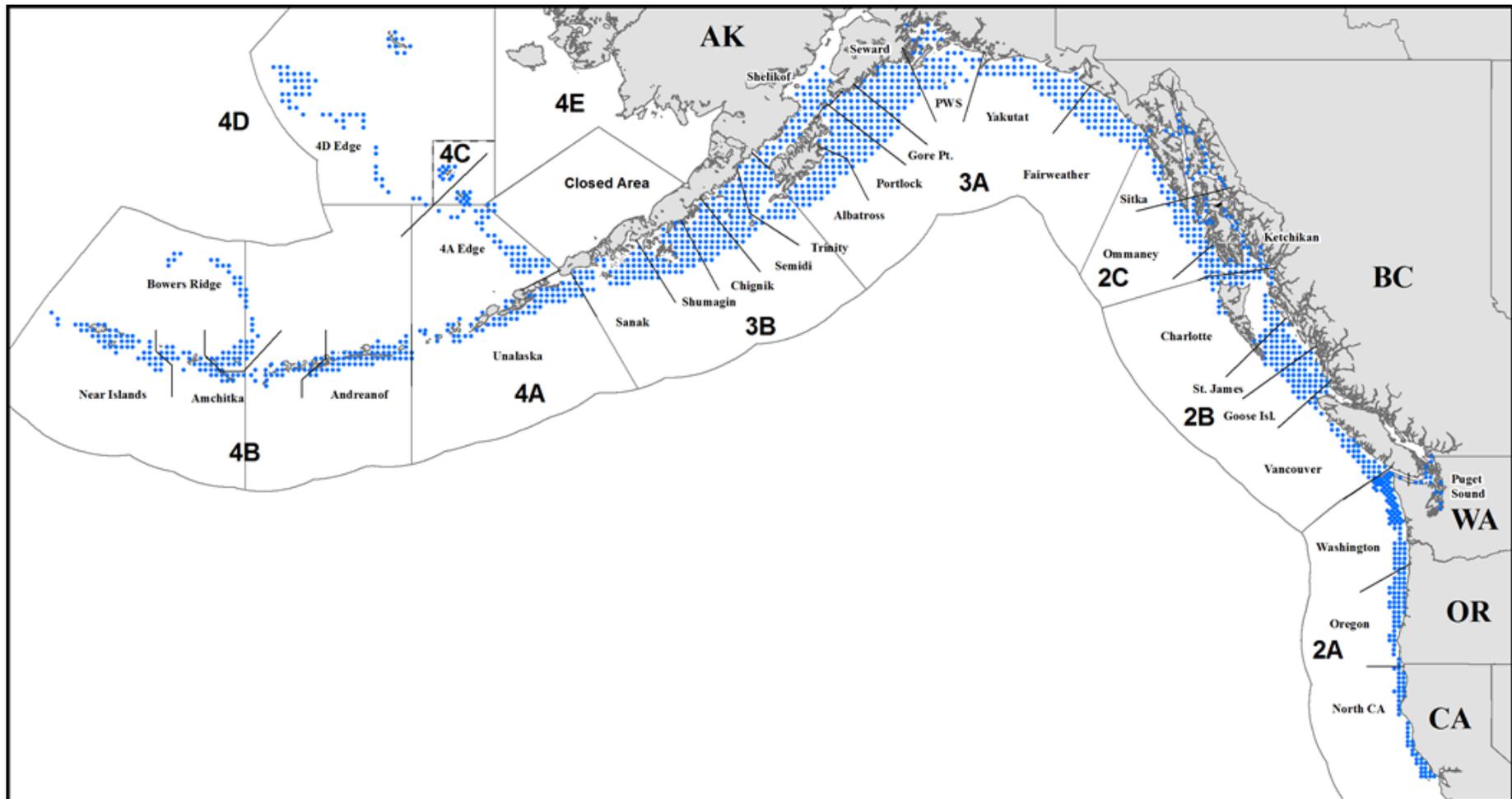
Annually fished setline survey stations are located on a 10 nmi by 10 nmi square grid within the depth range of 37-503 m (20-275 fm) in most areas. While the center of each station is within this depth range, parts of some sets may extend into shallower or deeper waters. In

addition to annually fished setline survey stations, the IPHC is currently undertaking a series of setline survey expansions into areas not fished as part of the annual grid as described later in this paper.

The IPHC Regulatory Areas are further divided into workable regions, called setline survey charter regions, each requiring between 16 and 39 charter days to complete. There are 27 standard charter regions. Figure 1 depicts the 2017 setline survey station positions, charter region divisions, and regulatory areas surveyed.

## **Implementation**

Fishing vessels are chosen through a competitive bid process each year where up to 3 regions per vessel are awarded and 10-15 vessels are chosen. In 2017, 12 vessels were chartered. The IPHC Secretariat annually employs 26-30 seasonal field biologists, called sea samplers. Each chartered fishing vessel carries 2-3 sea samplers in addition to their crew. These biologists collect the required catch data and biological samples, as well as, the setting and hauling data. The setline survey also facilitates special projects that are not directly associated with Pacific halibut stock assessment, yet are valuable to the IPHC and/or external agencies and researchers. There were 13 special projects in 2017. One of the largest projects was the collection of rockfish catch and biological information for Fisheries and Oceans Canada and the Pacific Halibut Management Association. The IPHC sea samplers on this project, working in Regulatory Area 2B, recorded round weight, round length, sex, maturity, and collected otoliths from all rockfish caught. Some of the other special research projects included Pacific halibut wire tagging, fish weights at-sea, environmental contaminants (heavy metal and organic pollutants) and *Ichthyophonous* sampling, as well as rockfish sampling in Washington.

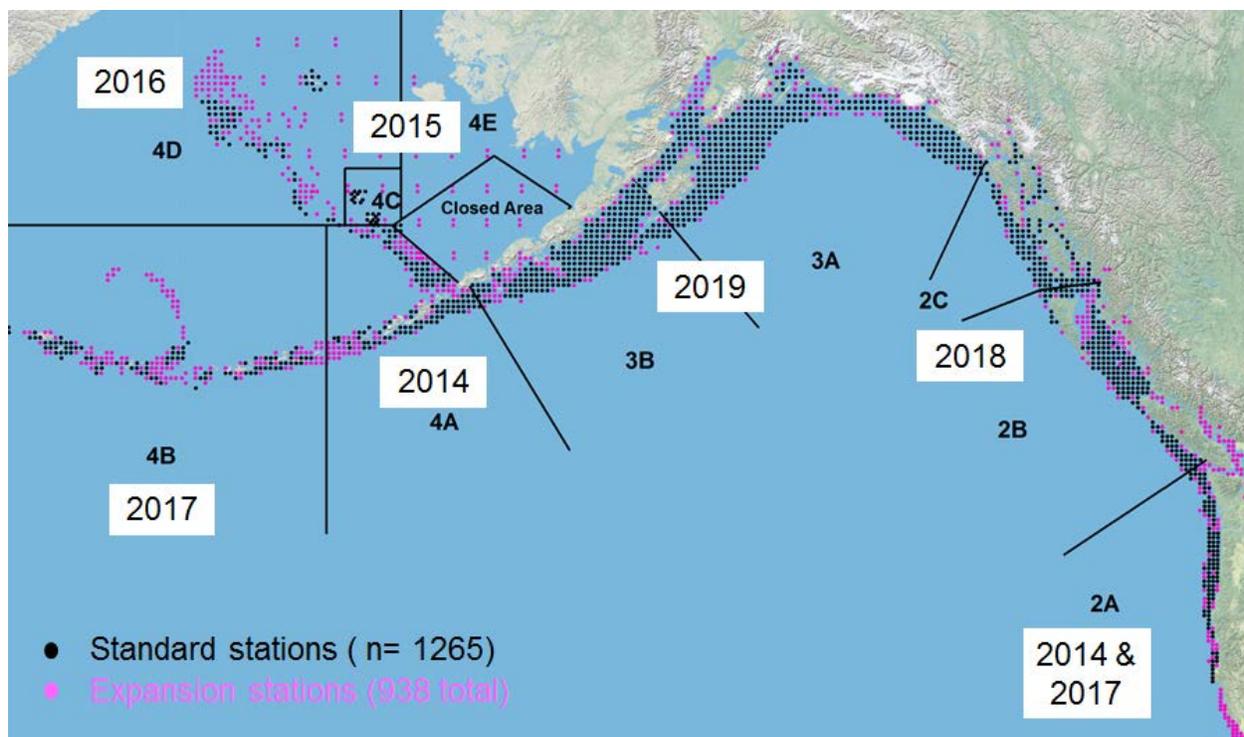


**Figure 1.** 2017 IPHC fishery-independent setline survey station positions, charter region divisions, and Regulatory Areas.



## Fishery-Independent Setline Survey (FISS) Expansion Stations

Since 2014, the IPHC has been sampling expansion setline survey stations in one or two IPHC Regulatory Areas each year (Figure 2). Commercial fishery data and other sources have shown the presence of Pacific halibut down to depths of 732 m (400 fm) and in waters shallower than 37 m (20 fm). Further, most IPHC Regulatory Areas have substantial gaps in station coverage within the standard 37-503 m depth range. The incomplete coverage of Pacific halibut habitat by the setline survey could potentially lead to biased estimates of the weight per unit effort (WPUE) and numbers per unit effort (NPUE) when used in the density indices for stock assessment modelling and for stock distribution estimation. For this reason, the IPHC has been undertaking a sequence of expansions since 2014 (following a 2011 pilot), with setline survey stations added to the standard grid to cover habitat not previously sampled.

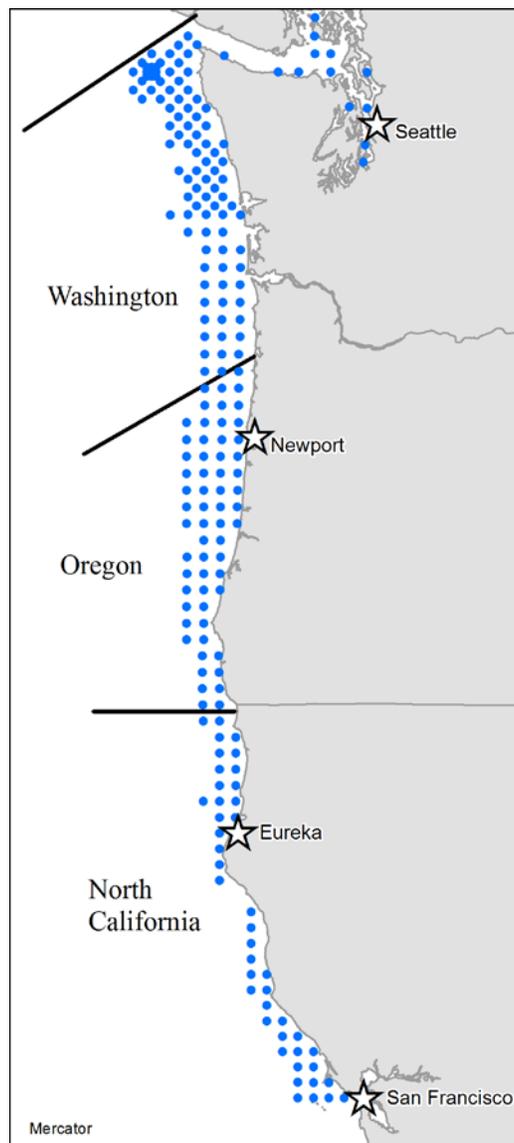


**Figure 2.** IPHC fishery-independent setline survey (FISS) expansion stations planned for 2014-2019.

### 2017 Fishery-Independent Setline Survey (FISS) Expansion in Regulatory Area 2A

This was the third year of expansion in IPHC Regulatory Area 2A which already had an expansion of the grid in Oregon down to 42° N latitude in 2011 and 2014, including Puget Sound in Washington. Northern California stations were first surveyed in 2013 down to 40° N latitude to investigate anecdotal reports of increasing Pacific halibut catches in the southern range. Northern California stations were again surveyed in the expansion in 2014, fishing as far south as 39° N latitude. In 2017, the expansion went further south to 37°45' N latitude (near San Francisco) and included Puget Sound. In addition, an ad-hoc densified grid expansion off the north Washington coast was surveyed for the first time in 2017 (per the ad-hoc Annual Meeting recommendation, AM093–Rec.03, and detailed in papers IPHC-2017-AM093-

06\_ADD\_1 and 2). A total of 212 stations were surveyed in Regulatory Area 2A in 2017, of which 108 were expansion stations, including 26 ad-hoc densified grid stations off the north Washington coast (Figure 3 & Table 1).



**Figure 3.** 2017 IPHC fishery independent setline survey stations in Regulatory Area 2A with charter regions.

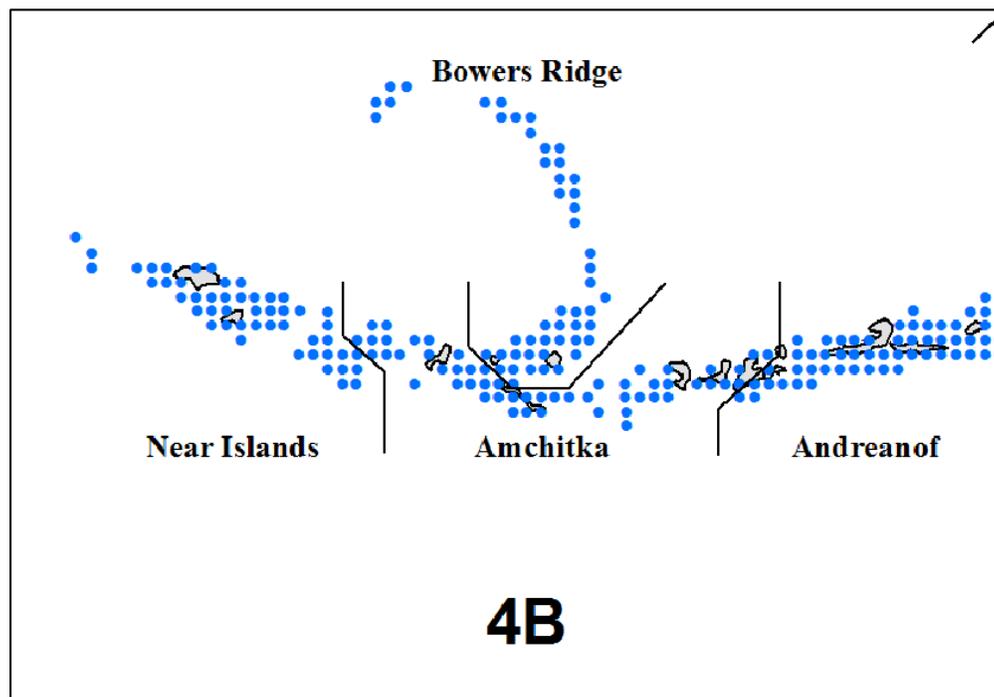
**Table 1.** IPHC Regulatory Area 2A setline survey charter regions and count by station type.

California	Station count
Expansion -Previously fished	27
New expansion	15*
Oregon	
Expansion	13
Standard grid	47
Washington	
Expansion	13
Densified grid	26
Standard grid	49
Rockfish Index	8

\*2 stations were not permitted because of habitat closures

### 2017 Fishery-Independent Setline Survey (FISS) Expansion in Regulatory Area 4B

The setline survey expansion in Regulatory Area 4B included 89 of the standard setline survey stations along with 113 expansion stations along the Aleutian chain out to Attu Island and north into Bowers Ridge (Figure 4). For logistical purposes, the Adak and Attu charter regions were divided into 4 charter areas with between 25 and 54 stations (Table 2).



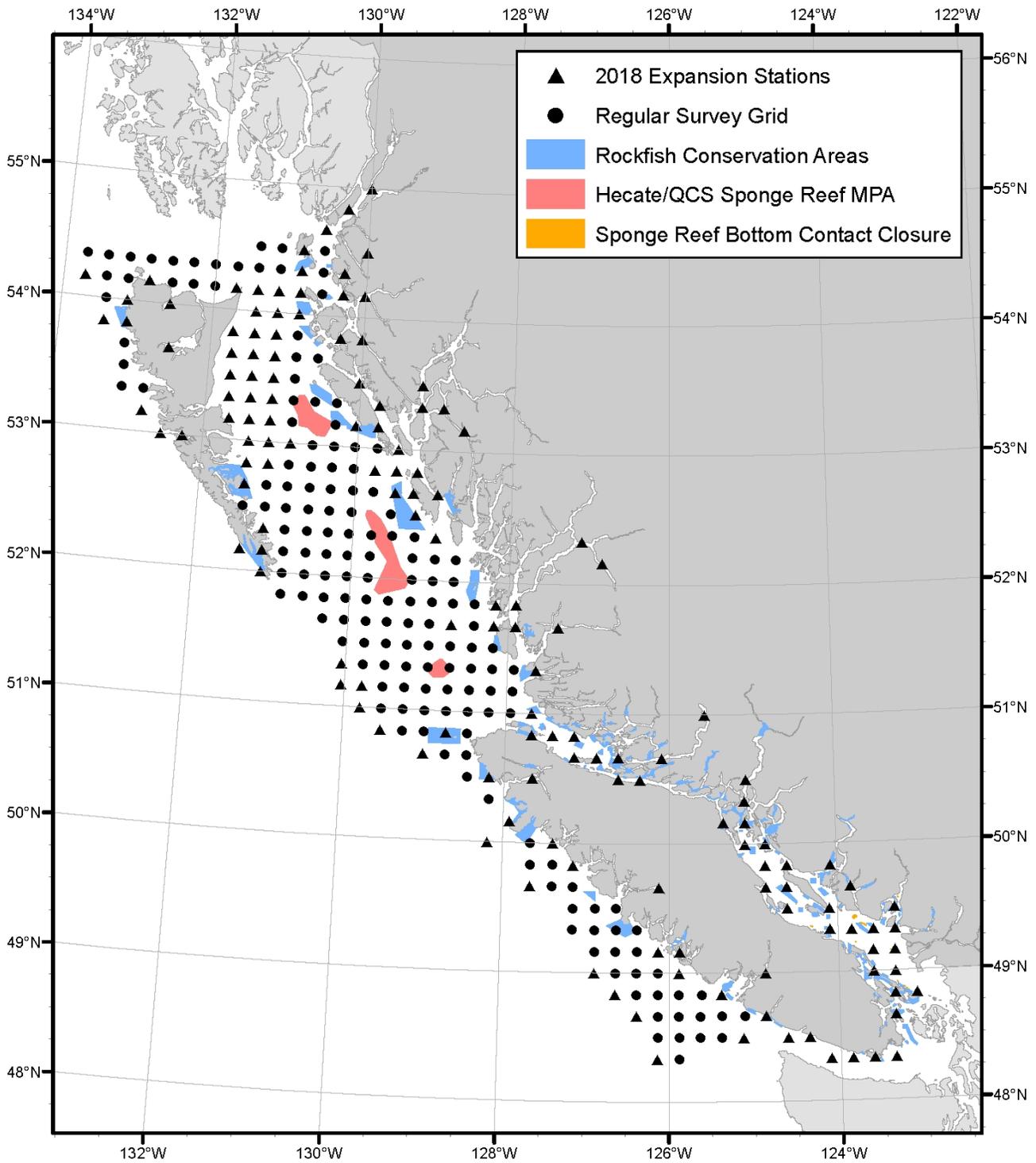
**Figure 4.** 2017 Fishery-independent setline survey stations in Regulatory Area 4B with charter regions.

**Table 2.** IPHC Regulatory Area 4B setline survey charter regions and count by station type.

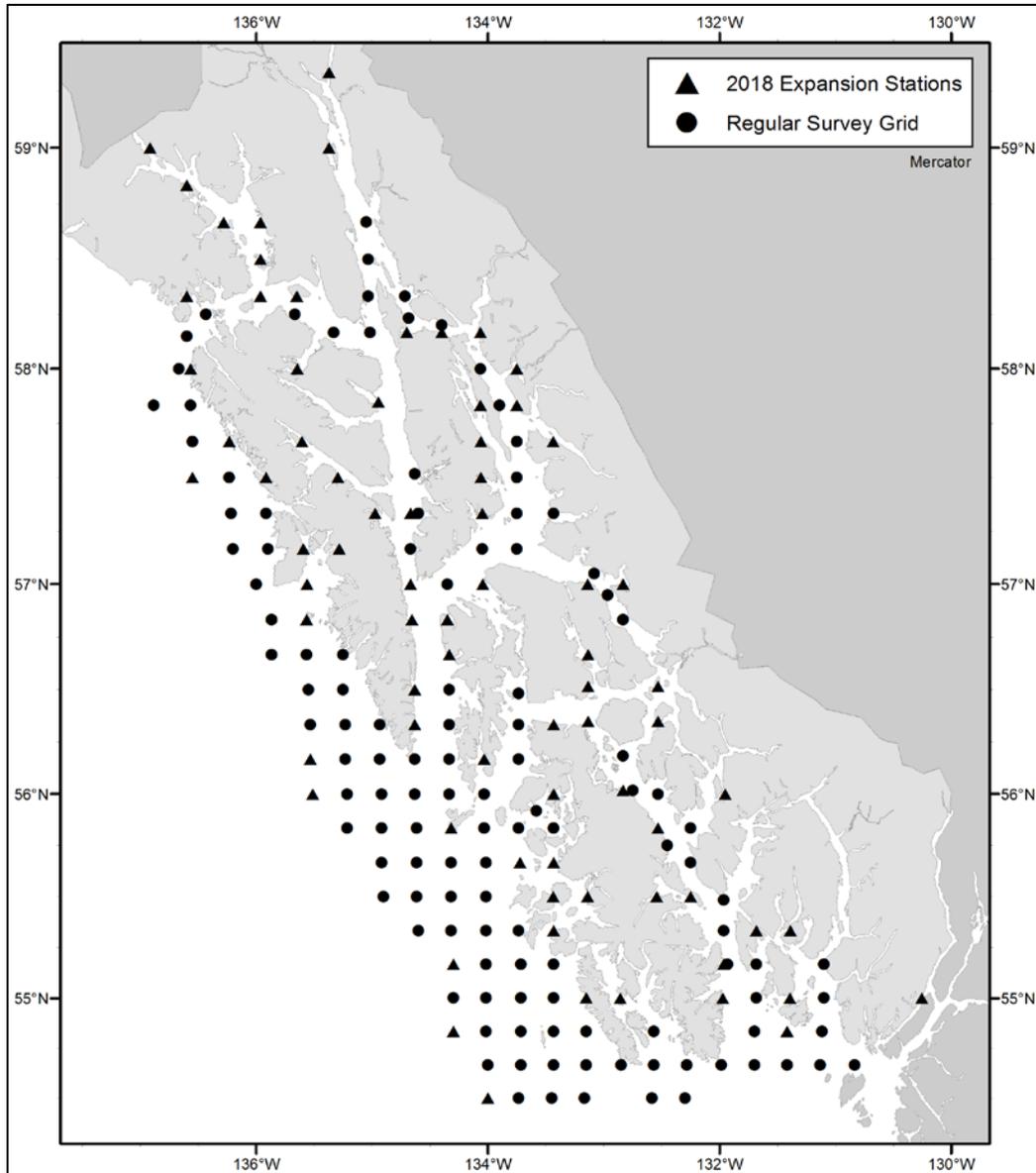
Andreanof	Station count
Expansion	28
Standard grid	26
Amchitka	
Expansion	31
Standard grid	18
Bowers South	
Expansion	13
Standard grid	12
Bowers North	
Expansion	24
Standard grid	1
Near Islands	
Expansion	17
Standard grid	32

### Future setline survey expansions

As shown in Figure 2, two more years remain to complete the setline survey expansions for each IPHC Regulatory Area. In 2018, the IPHC will be continuing with the setline survey expansion into Regulatory Areas 2B and 2C, as approved by the Commission in 2014. The IPHC has begun vetting the proposed setline survey stations with the respective State and Federal agencies. In some cases, this also involves special permitting requirements. There are 103 expansion stations planned in 2018 in Regulatory Area 2B and 55 in Area 2C (Figure 5 & 6).

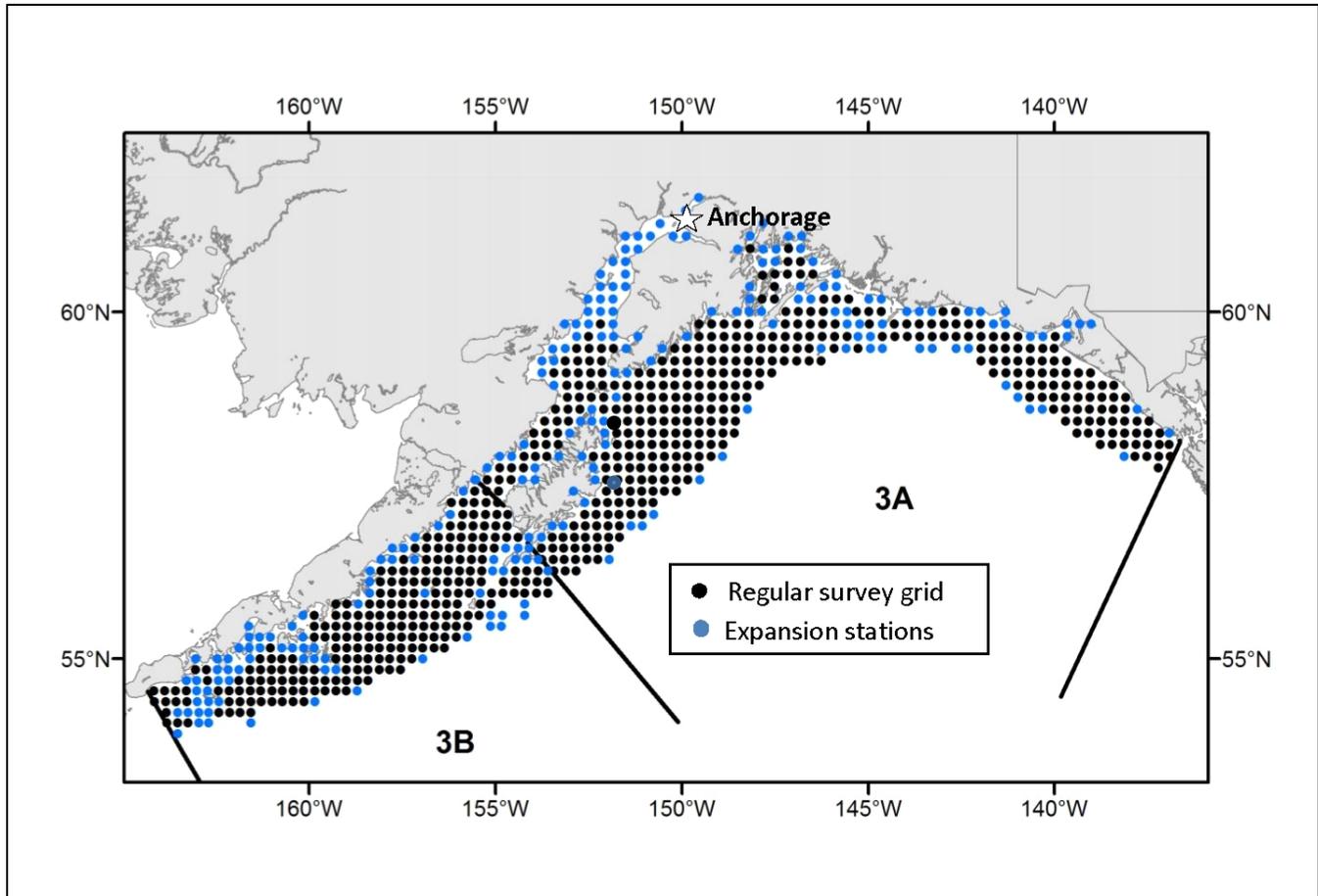


**Figure 5.** Proposed 2018 IPHC Regulatory Area 2B fishery-independent setline survey (FISS) stations.



**Figure 6.** Proposed 2018 IPHC Regulatory Area 2C fishery-independent setline survey (FISS) stations.

For the last year of the proposed expansions (2019), the IPHC plans to move into Regulatory Areas 3A and 3B where 95 and 68 stations are being proposed to be fished, respectively (Figure 7).



**Figure 7.** Proposed 2019 IPHC Regulatory Areas 3A and 3B fishery-independent setline survey (FISS) stations.

#### RECOMMENDATION/S

That the Commission:

- a) **NOTE** paper IPHC-2017-IM093-06 which provided an overview of the IPHC's fishery-independent setline survey (FISS) design and implementation in 2017, including current and future expansions.

#### REFERENCES

- Hoag, S. H., Williams, G. H., Myrhe, R. J., and McGregor, I. R. 1980. Halibut assessment data: Setline surveys in the north Pacific Ocean, 1963-1966 and 1976-1979. Int. Pac. Hal. Comm. Tech. Rep. 18.
- Soderlund, E., Randolph, D. L., and Dykstra, C. 2012. IPHC Setline Charters 1963 through 2003. Int. Pac. Hal. Comm. Tech. Rep. 58.

#### APPENDICES

None