Pacific Herring preliminary data summary for Area 27 2024

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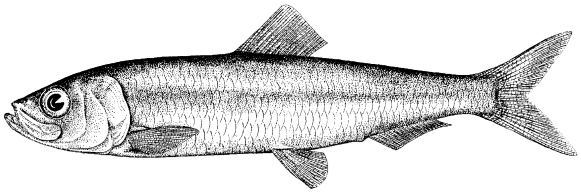

Pacific Herring (*Clupea pallasii*). Image credit: Fisheries and Oceans Canada.

Disclaimer This report contains preliminary data collected for Pacific Herring in 2024 in the Area 27 minor stock assessment region (SAR). These data may differ from data used and presented in the final stock assessment.

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1 Context

Pacific Herring (*Clupea pallasii*) in British Columbia are assessed as 5 major and 2 minor stock assessment regions (SARs), and data are collected and summarized on this scale (Table 1, Figure 1). Note that formal stock assessments are only done for major SARs. The Pacific Herring data collection program includes fishery-dependent and -independent data from 1951 to 2024. This includes annual time series of commercial catch data, biological samples (providing information on proportion-at-age and weight-at-age), and spawn index data conducted using a combination of surface and SCUBA surveys. In some areas, industry- and/or First Nations-operated in-season soundings programs are also conducted, and this information is used by resource managers, First Nations, and

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stakeholders to locate fish and identify areas of high and low Pacific Herring biomass to plan harvesting activities. In-season acoustic soundings are not used by stock assessment to inform the estimation of spawning biomass.

The following is a description of data collected for Pacific Herring in 2024 in the Area 27 minor SAR (Figure 2). Data collected outside the SAR boundary are not included in this summary, and are not used for the purposes of stock assessment. Although we summarise data at the scale of the SAR for stock assessments, we summarise data at finer spatial scales in this report: Locations are nested within Sections, Sections are nested within Statistical Areas, and Statistical Areas are nested within SARs (Table 2). Note that we refer to 'year' instead of 'herring season' in this report; therefore 2024 refers to the 2023/2024 Pacific Herring season.

2 Data collection programs

Shorebased divers surveyed spawn for 4 days from March 13th to March 16th.

3 Catch and biological samples

In the 1950s and 1960s, the reduction fishery dominated Pacific Herring catch; starting in the 1970s, catch has been predominantly from roe seine and gillnet fisheries. The reduction fishery is different from current fisheries in several ways. First, the reduction fishery caught Pacific Herring of all ages, whereas current fisheries target spawning (i.e., mature) fish. Thus, reduction fisheries included an unknown number of age-1 fish which are not typically caught in current fisheries. Second, the reduction fishery has some uncertainty regarding the quantity and location of catch; however catches have been resolved to SAR and Statistical Area using fish slips as best as possible. For the roe gillnet fishery, all Pacific Herring catch has been validated by a dockside monitoring program since 1998; the catch validation program started in 1999 for the roe seine fishery. Finally, the reduction fishery operated during the summer and winter months, whereas roe fisheries typically target spawning fish between February and April.

Landed commercial catch of Pacific Herring by year and fishery is shown in Table 3 and Figure 3. Total harvested spawn-on-kelp (SOK) in 2024 in the Area 27 minor SAR is shown in Table 4; we also calculate the estimated spawning biomass associated with SOK harvest. See the spawn index technical report for calculations to convert SOK harvest to spawning biomass. Incidental mortality from fisheries and aquaculture activities is shown in Figure 4.

In 2024, 0 Pacific Herring biological samples were collected and processed for the Area 27 minor SAR (Table 5, Table 6). Included herein are biological summaries of observed proportion-, number-, weight-, and length-at-age (Figure 5, Table 7, and Figure 6, respectively). Biological summaries only include samples collected using seine nets (commercial and test) due to size-selectivity of other gear types such as gillnet. Only representative biological samples are included, where 'representative' indicates whether the Pacific Herring sample in the set accurately reflects the larger Pacific Herring school.

4 Spawn survey data

Pacific Herring spawn surveys were conducted at 9 individual locations in 2024 in the Area 27 minor SAR (Table 8, and Figure 7). A summary of spawn from the last decade (2014 to 2023) is shown in Figure 8. Figure 9 shows spawn start date by decade and Statistical Area. Spawn surveys are conducted to estimate the spawn length, width, number of egg layers, and substrate type, and these data are used to estimate the index of spawning biomass (i.e., the spawn index; Figure 10, Figure 11, Figure 12, Figure 13, Table 9, and Figure 14). See the spawn index technical report for calculations to convert SOK harvest to spawning biomass. The 'spawn index' is not scaled by the spawn survey scaling parameter, q. Therefore, these data do not represent model estimates of spawning biomass, and are considered the minimum observed spawning biomass derived from egg counts. The spawn index has two distinct periods defined by the dominant coastwide survey method: surface surveys (1951 to 1987), and dive surveys (1988 to 2024).

Some Pacific Herring Sections contribute more than others to the total spawn index, and the percentage contributed by Section varies yearly (Figure 13b, Figure 15). For example, in 2024, Section 273 contributed the most to the spawn index (100%). As with Sections, some Statistical Areas contribute more than others to the total spawn index (Figure 13c, Figure 16). An animation shows the spawn index by spawn survey location from 1951 to 2024 (Figure 17).

5 First Nations observations

The following observations were contributed by representatives of First Nations communities. These observations provide context and perspectives to this data report. In some cases we make minor edits for clarity and brevity, but we do not change the intent or substance of responses.

- No observations were available at the time of distribution.

6 General observations

The following observations were reported by DFO Resource Management staff and DFO Science staff. These observations provide additional context to this data report.

- Spawn observed via satellite image in Klaskish Inlet, North of Matthews Island, Side Bay, and near Winter Harbour.
- Spawns occurring in remote or exposed areas were not surveyed due to dive resource limitations and inclement weather. These include Side Bay and Klaskish Inlet.

7 Tables

Table 1. Pacific Herring stock assessment regions (SARs) in British Columbia.

Name	Code	Type
Haida Gwaii	HG	Major
Prince Rupert District	PRD	Major
Central Coast	CC	Major
Strait of Georgia	SoG	Major
West Coast of Vancouver Island	WCVI	Major
Area 27	A27	Minor
Area 2 West	A2W	Minor

Table 2. Statistical Areas and Sections for Pacific Herring in the Area 27 minor stock assessment region (SAR).

Region	Statistical Area	Section
Area 27	27	270
Area 27	27	271
Area 27	27	272
Area 27	27	273
Area 27	27	274

Table 3. Total landed commercial catch of Pacific Herring in metric tonnes (t) by gear type in 2024 in the Area 27 minor stock assessment region (SAR). Legend: 'Other' represents the reduction (1951 to 1970 only), the food and bait, as well as the special use fishery; 'RoeSN' represents the roe seine fishery; and 'RoeGN' represents the roe gillnet fishery. Data from the spawn-on-kelp (SOK) fishery are not included. Note: data may be withheld due to privacy concerns (WP).

Gear	Catch (t)
Other	0
RoeSN	0
RoeGN	0

Table 4. Total harvested Pacific Herring spawn-on-kelp (SOK) in pounds (lb), and the associated estimate of spawning biomass in metric tonnes (t) from 2014 to 2024 in the Area 27 minor stock assessment region (SAR). See the spawn index technical report for calculations to convert SOK harvest to spawning biomass. Note: data may be withheld due to privacy concerns (WP).

Year	Harvest (lb)	Spawning biomass (t)
2014	WP	WP
2015	0	0
2016	0	0
2017	0	0
2018	0	0
2019	0	0
2020	0	0
2021	0	0
2022	0	0
2023	0	0
2024	0	0

Table 5. Number of Pacific Herring biological samples processed from 2014 to 2024 in the Area 27 minor stock assessment region (SAR). Each sample is approximately 100 fish. Note: Nearshore samples are not used in stock assessments.

	Number of samples			
Year	Commercial	Test	Nearshore	Total
2014	0	0	0	0
2015	0	0	0	0
2016	0	0	0	0
2017	0	0	0	0
2018	0	0	0	0
2019	0	0	0	0
2020	0	0	0	0
2021	0	0	0	0
2022	0	0	0	0
2023	0	0	0	0
2024	0	0	0	0

Table 6. Number and type of Pacific Herring biological samples processed in 2024 in the Area 27 minor stock assessment region (SAR). Each sample is approximately 100 fish.

Type	Gear	Use	Number of samples
NA	NA	NA	0

Table 7. Observed proportion-at-age for Pacific Herring from 2014 to 2024 in the Area 27 minor stock assessment region (SAR). The age-10 class is a 'plus group' which includes fish ages 10 and older.

	Proportion-at-age								
Year	2	3	4	5	6	7	8	9	10
2014	NA	NA	NA	NA	NA	NA	NA	NA	NA
2015	NA	NA	NA	NA	NA	NA	NA	NA	NA
2016	NA	NA	NA	NA	NA	NA	NA	NA	NA
2017	NA	NA	NA	NA	NA	NA	NA	NA	NA
2018	NA	NA	NA	NA	NA	NA	NA	NA	NA
2019	NA	NA	NA	NA	NA	NA	NA	NA	NA
2020	NA	NA	NA	NA	NA	NA	NA	NA	NA
2021	NA	NA	NA	NA	NA	NA	NA	NA	NA
2022	NA	NA	NA	NA	NA	NA	NA	NA	NA
2023	NA	NA	NA	NA	NA	NA	NA	NA	NA
2024	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 8. Pacific Herring spawn survey locations, start date, and spawn index in metric tonnes (t) in 2024 in the Area 27 minor stock assessment region (SAR). The 'spawn index' is not scaled by the spawn survey scaling parameter, q. Missing spawn index values indicate incomplete surveys (NAs).

Statistical Area	Section	Location name	Start date	Spawn index (t)
27	272	Klaskish Inlt	March 03	NA
27	272	Side Bay	March 06	NA
27	273	Browning Inlt	March 03	765
27	273	Flint Rk	March 03	921
27	273	Forward Inlt	March 03	966
27	273	Hazard Pt	March 03	3,806
27	273	Matthews Is	March 03	1,133
27	273	North Hrbr	March 03	1,155
27	273	Quashtin Cr	March 03	23

Table 9. Summary of Pacific Herring spawn survey data from 2014 to 2024 in the Area 27 minor stock assessment region (SAR). The spawn index has two distinct periods defined by the dominant coastwide survey method: surface surveys (1951 to 1987), and dive surveys (1988 to 2024). The 'spawn index' is not scaled by the spawn survey scaling parameter, q. Units: metres (m), and metric tonnes (t).

Year	Total length (m)	Mean width (m)	Mean number of egg layers	Spawn index (t)
2014	7,575	101	0.9	1,306
2015	9,800	37	1.1	2,168
2016	11,375	52	0.4	813
2017	350	45	0.4	26
2018	6,350	100	1.0	1,044
2019	5,250	50	0.2	191
2020	NA	NA	NA	NA
2021	6,325	51	1.1	1,653
2022	NA	NA	NA	NA
2023	19,950	95	1.9	13,511
2024	12,600	136	1.6	8,773

8 Figures

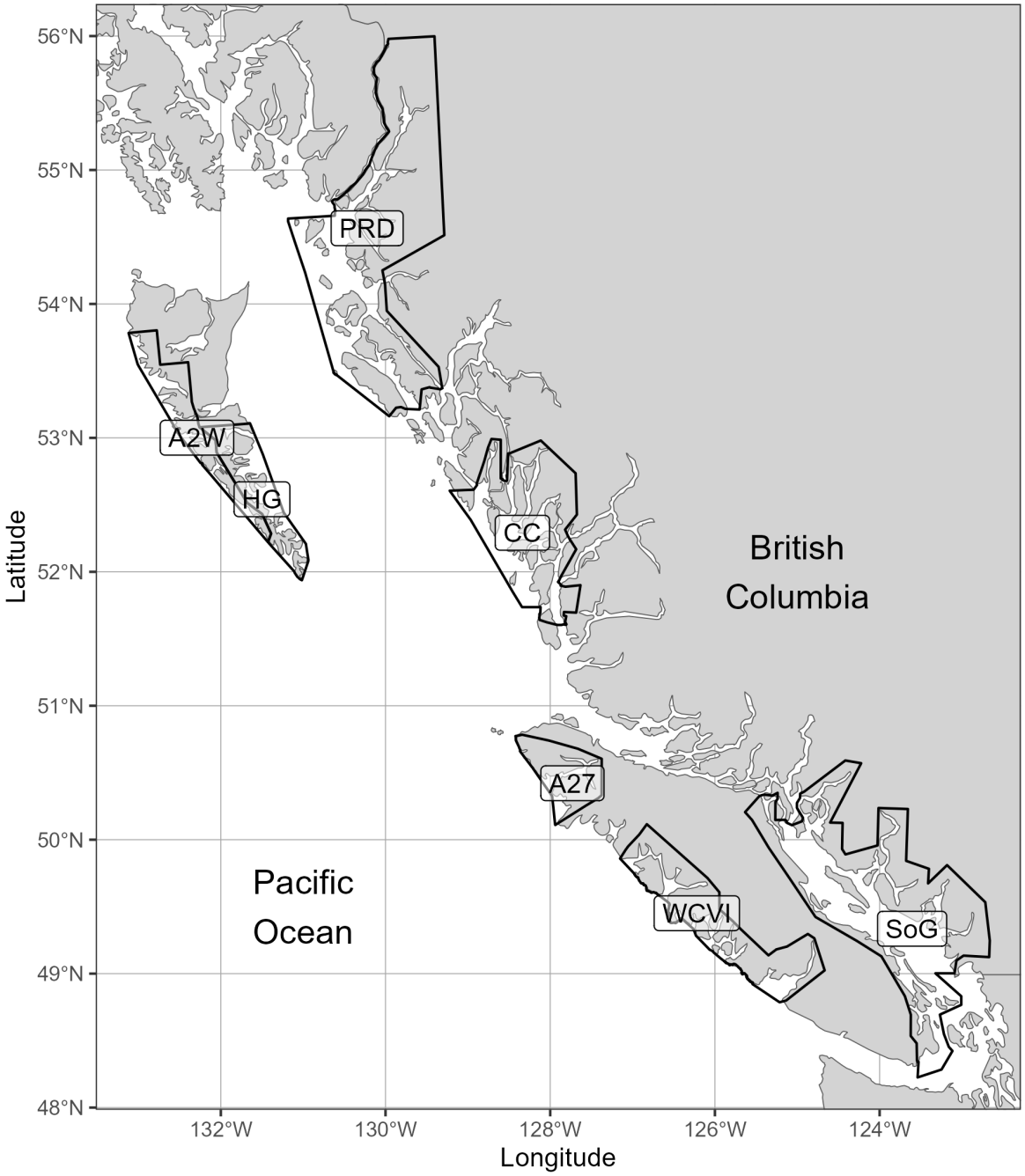

Figure 1. Boundaries for the Pacific Herring stock assessment regions (SARs) in British Columbia. There are 5 major SARs: Haida Gwaii (HG), Prince Rupert District (PRD), Central Coast (CC), Strait of Georgia (SoG), and West Coast of Vancouver Island (WCVI). There are 2 minor SARs: Area 27 (A27) and Area 2 West (A2W). Units: kilometres (km).

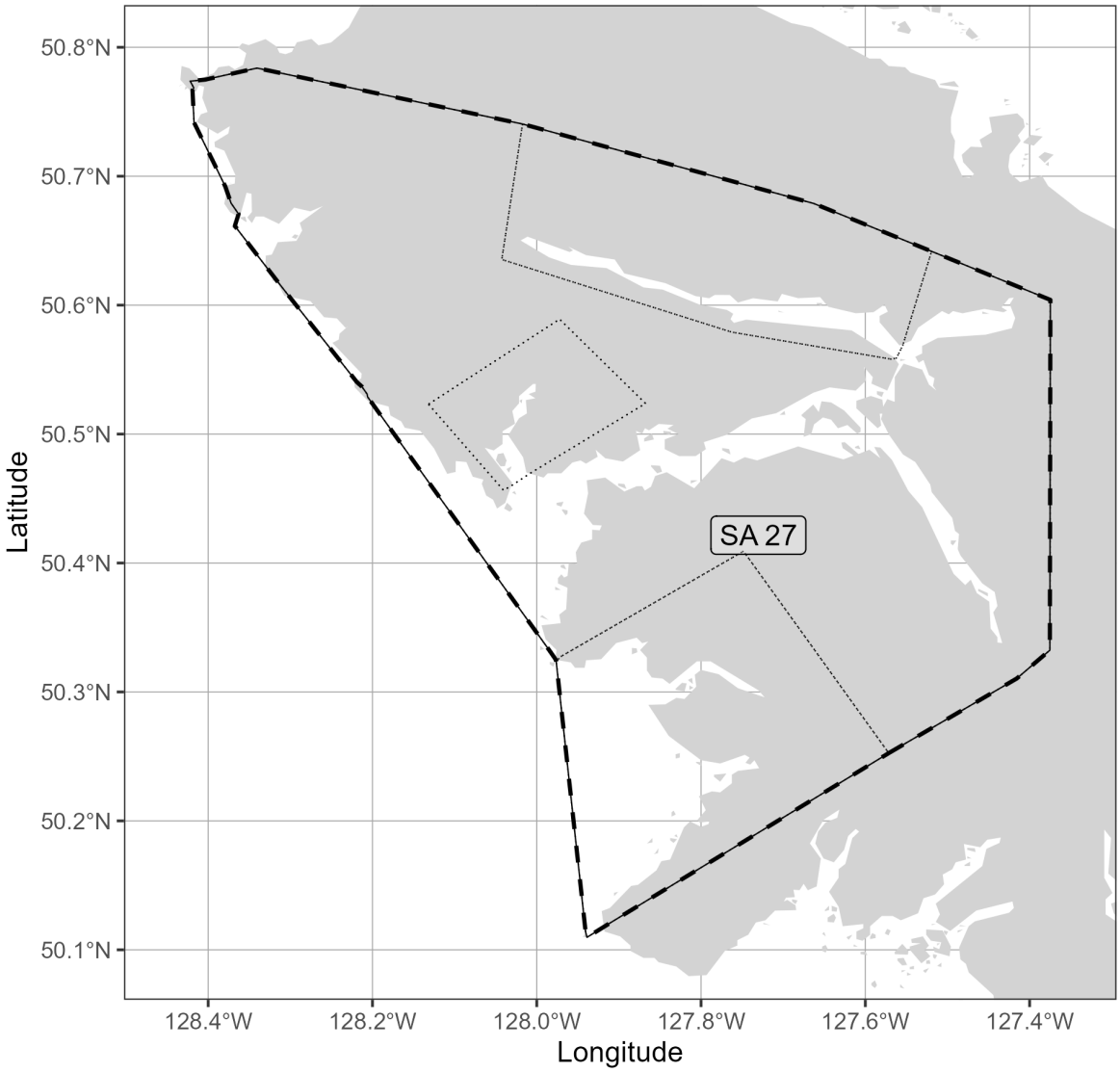

Figure 2. Boundaries for the Area 27 minor stock assessment region (SAR; thick dashed lines), associated Statistical Areas (SA; thin solid lines), and associated Sections (thin dotted lines). Units: kilometres (km).

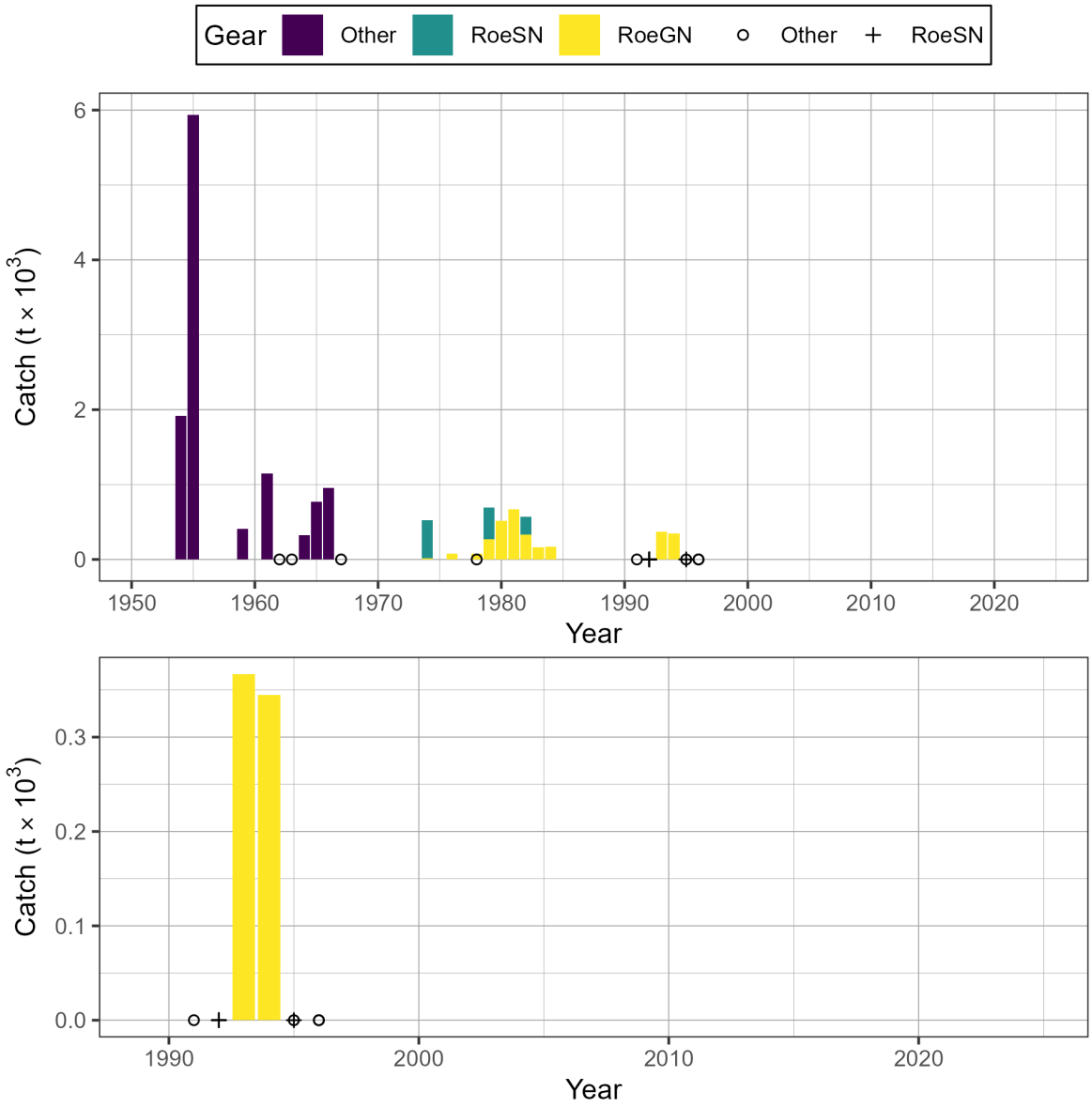

Figure 3. Time series of total landed catch in thousands of metric tonnes ($t \times 10^3$) of Pacific Herring by gear type from 1951 to 2024 in the Area 27 minor stock assessment region (SAR). Legend: 'Other' represents the reduction (1951 to 1970 only), the food and bait, as well as the special use fishery; 'RoeSN' represents the roe seine fishery; and 'RoeGN' represents the roe gillnet fishery. Data from the spawn-on-kelp (SOK) fishery are not included. Bottom panel shows catch since 1989 in more detail. Note: symbols indicate years in which catch by gear type (i.e., Other, RoeSN, RoeGN) is withheld due to privacy concerns.

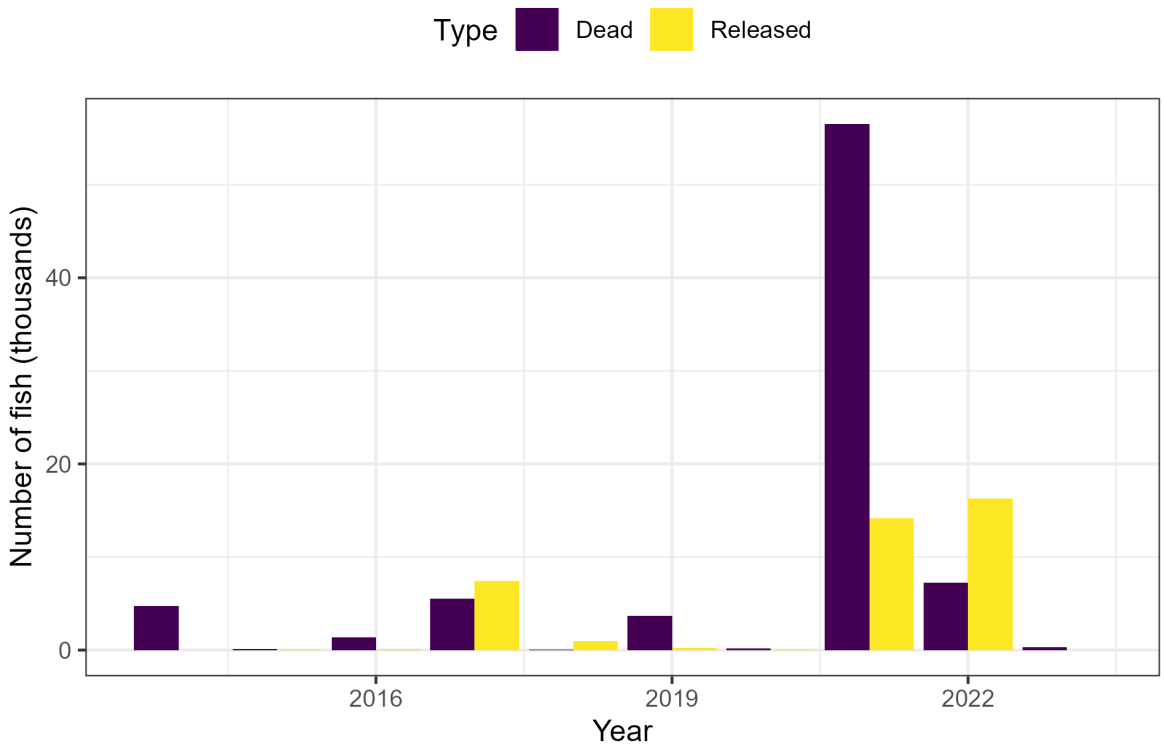

Figure 4. Incidental Pacific Herring mortality in aquaculture activities in thousands of fish from 2014 to 2024 in the Area 27 minor stock assessment region (SAR). Note: figure may include data outside SAR boundaries.

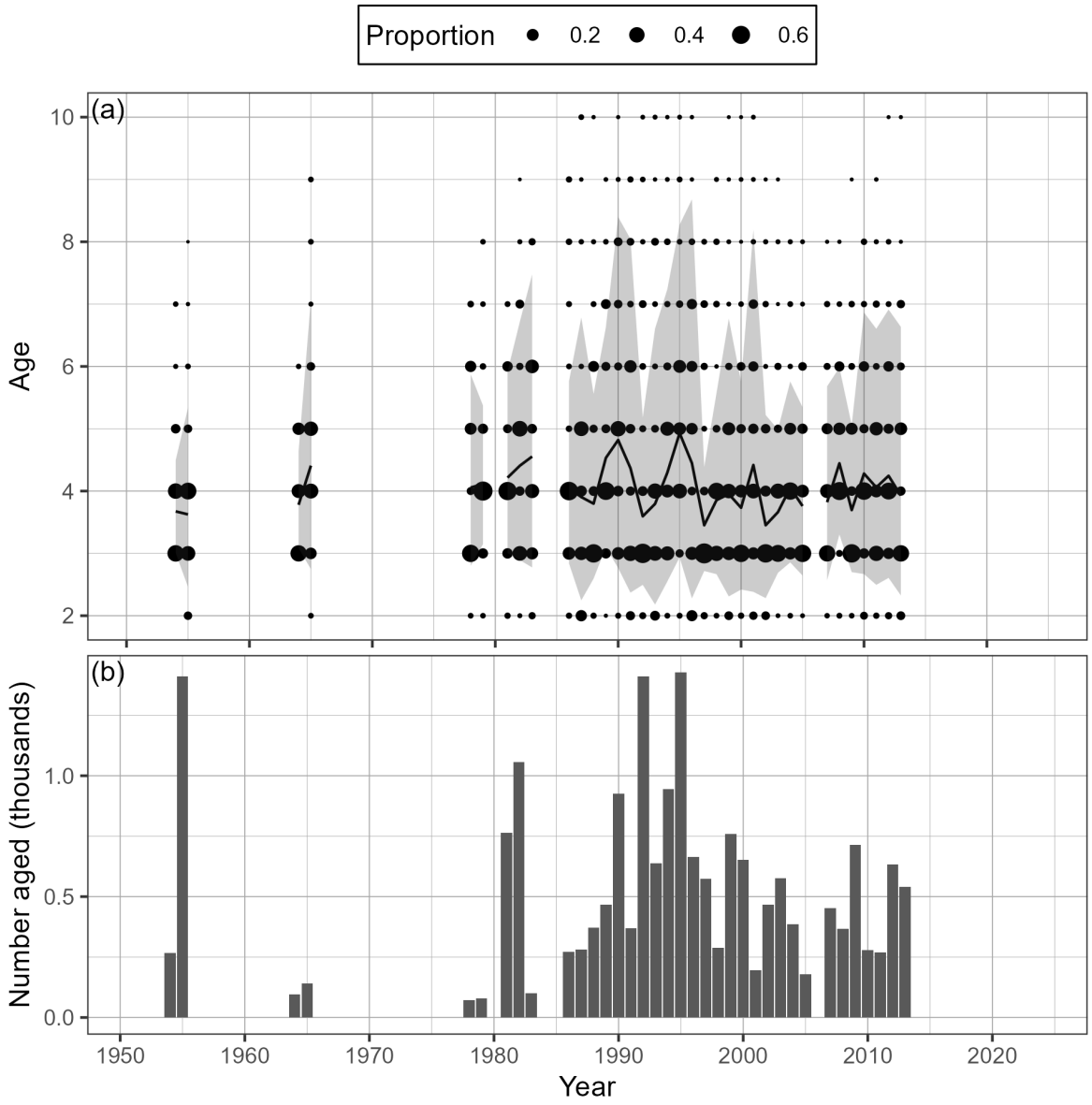

Figure 5. Time series of observed proportion-at-age (a) and number aged in thousands (b) of Pacific Herring from 1951 to 2024 in the Area 27 minor stock assessment region (SAR). The black line is the mean age, and the shaded area is the approximate 90% distribution. Biological summaries only include samples collected using seine nets (commercial and test) due to size-selectivity of other gear types such as gillnet. The age-10 class is a 'plus group' which includes fish ages 10 and older.

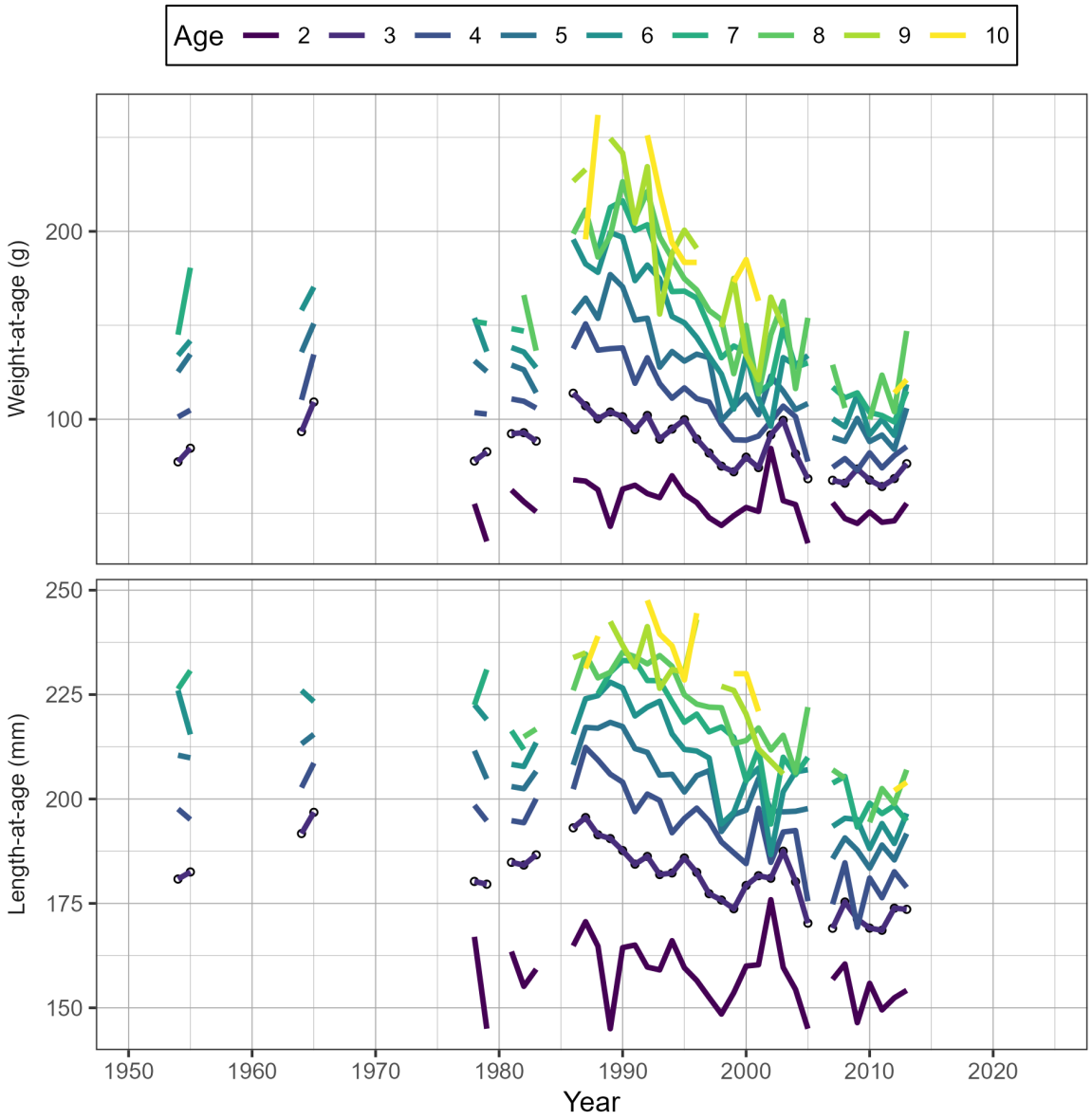

Figure 6. Time series of weight-at-age in grams (g) and length-at-age in milimetres (mm) for Pacific Herring from 1951 to 2024 in the Area 27 minor stock assessment region (SAR). Age-3 fish are indicated by circles. Biological summaries only include samples collected using seine nets (commercial and test) due to size-selectivity of other gear types such as gillnet. The age-10 class is a 'plus group' which includes fish ages 10 and older.

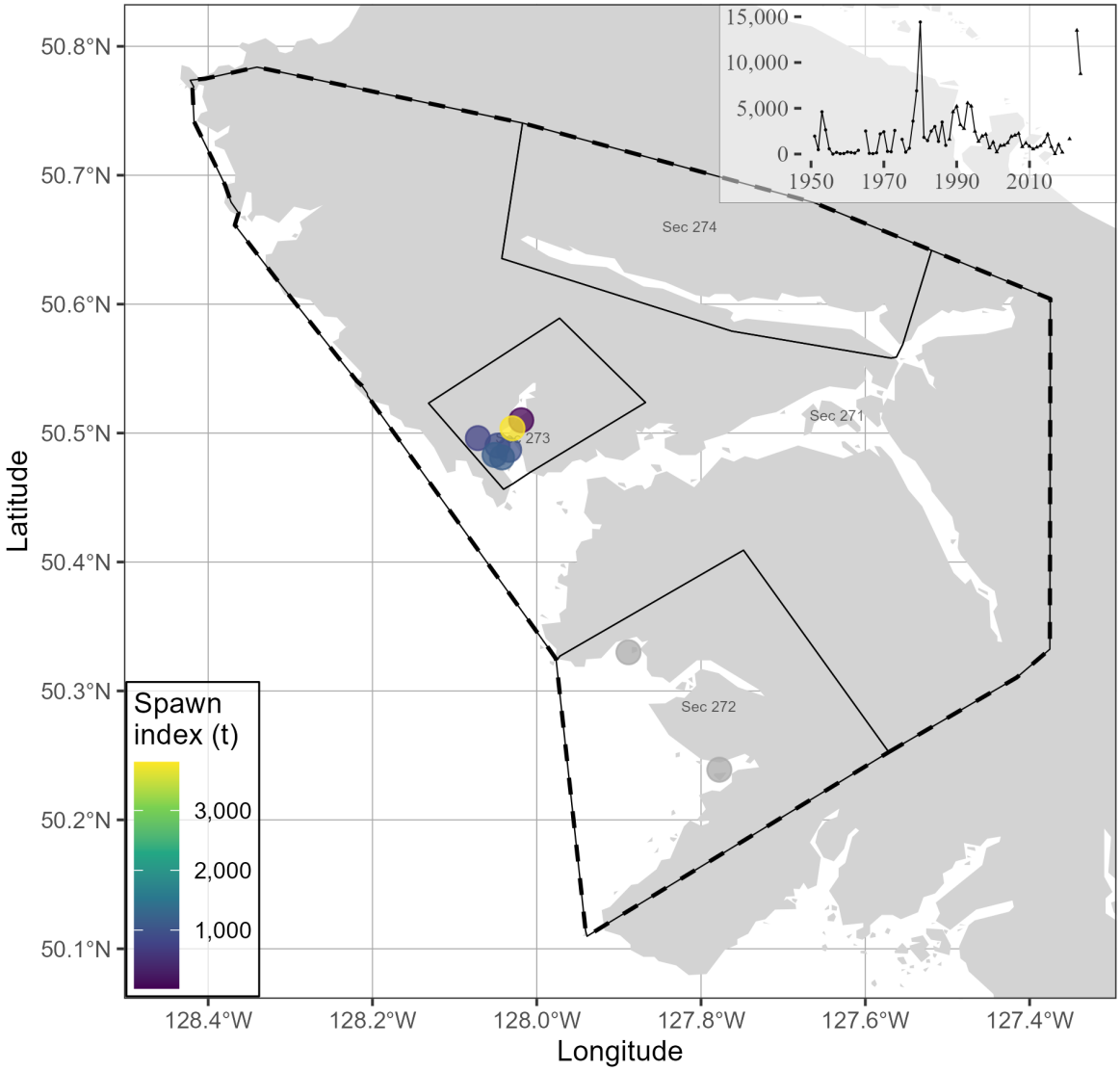

Figure 7. Pacific Herring spawn survey locations, and spawn index in metric tonnes (t) in 2024 in the Area 27 minor stock assessment region (SAR; thick dashed lines), and associated Sections (Sec; thin solid lines). The 'spawn index' is not scaled by the spawn survey scaling parameter, q. Missing spawn index values indicate incomplete surveys (grey circles). Inset tracks the total spawn index. Units: kilometres (km).

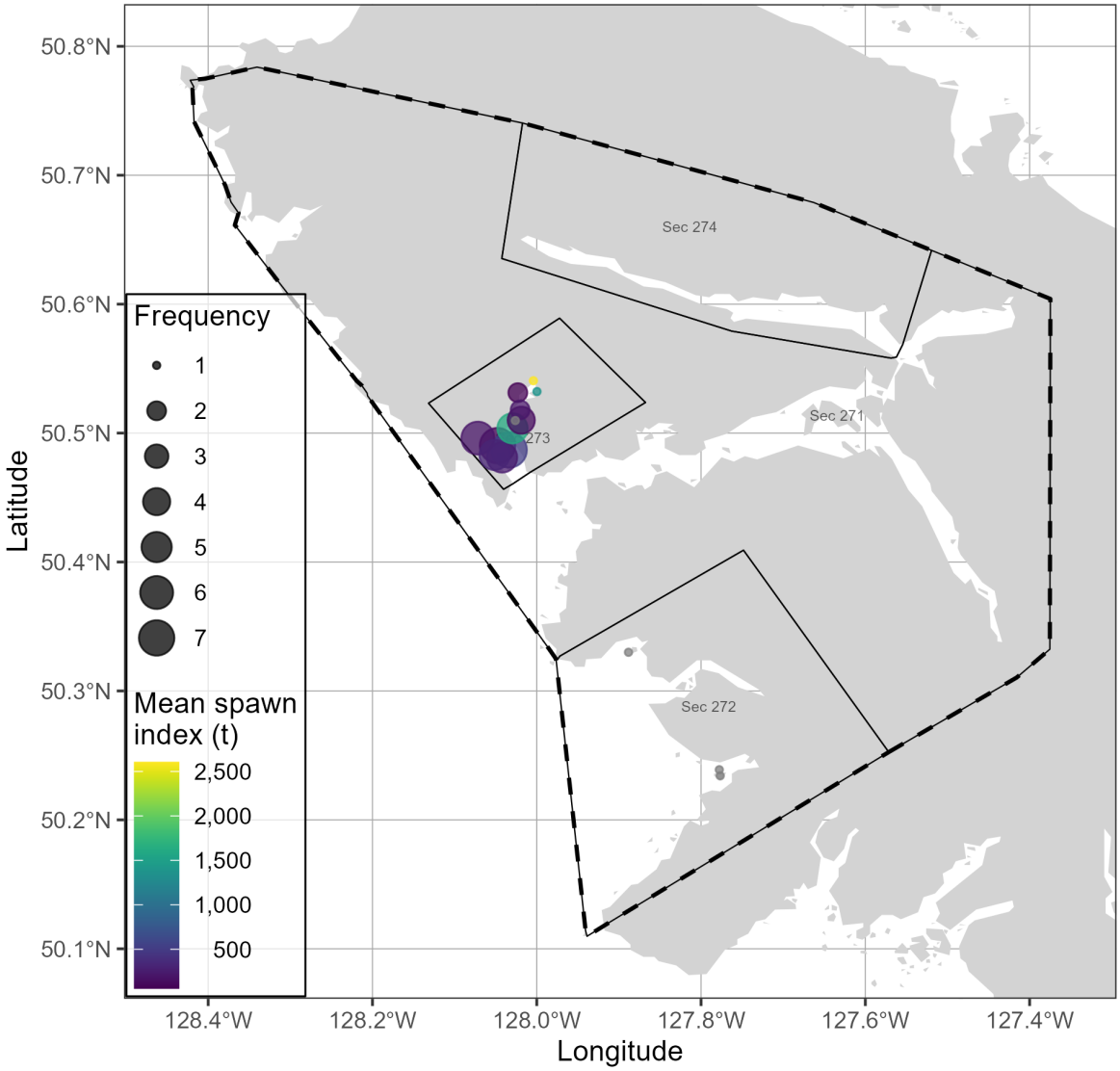

Figure 8. Pacific Herring spawn survey locations, mean spawn index in metric tonnes (t), and spawn frequency from 2014 to 2023 in the Area 27 minor stock assessment region (SAR; thick dashed lines), and associated Sections (Sec; thin solid lines). The 'spawn index' is not scaled by the spawn survey scaling parameter, q. Missing spawn index values indicate incomplete surveys (grey circles). Units: kilometres (km).

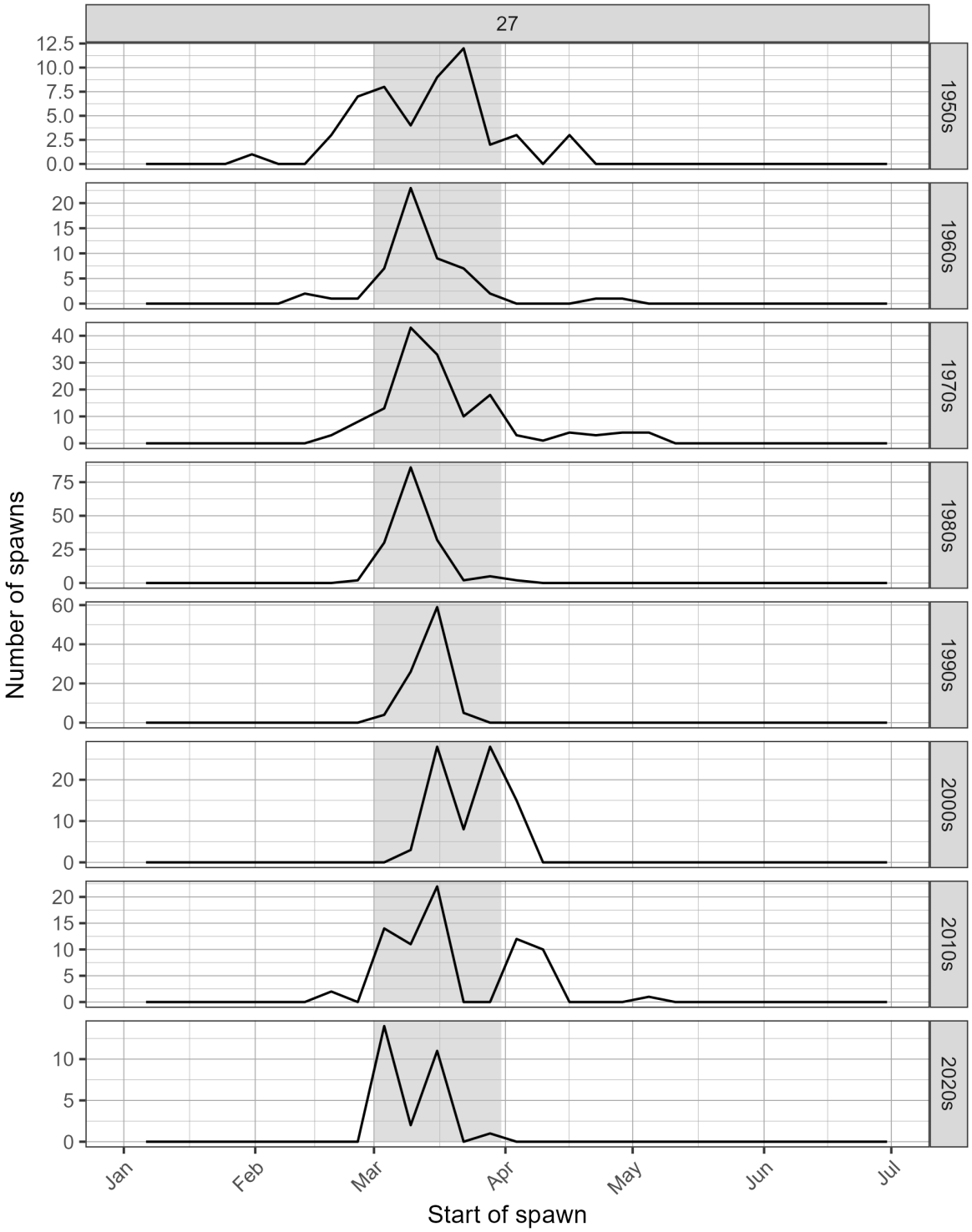

Figure 9. Pacific Herring spawn start date by decade and Statistical Area. Grey shaded regions indicate March 1st to 31st. Note that spawn size and intensity varies; therefore the number of spawns is not directly proportional to spawn extent or biomass.

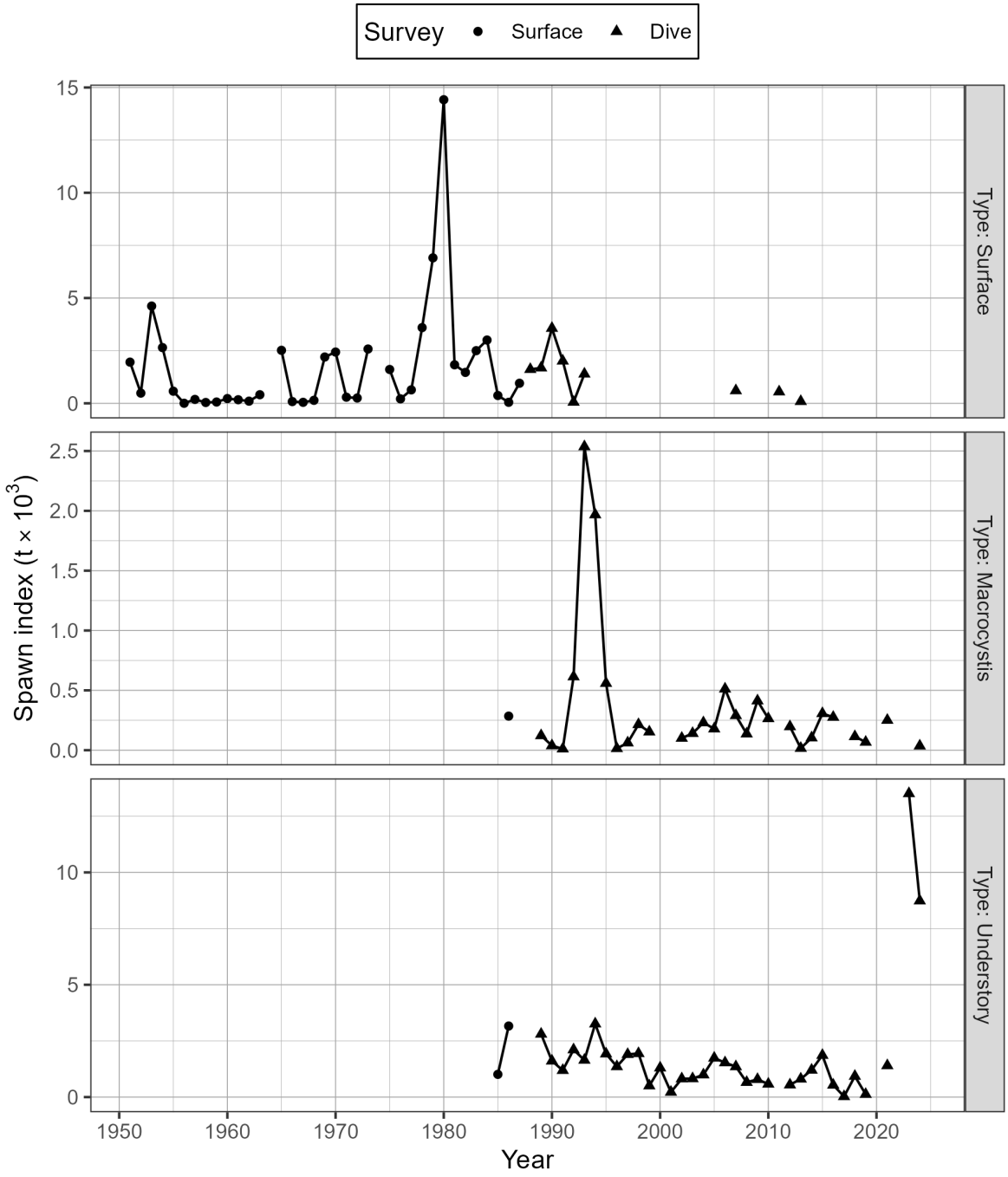

Figure 10. Time series of spawn index in thousands of metric tonnes ($t \times 10^3$) by type for Pacific Herring from 1951 to 2024 in the Area 27 minor stock assessment region (SAR). There are three types of spawn survey observations: observations of spawn taken from the surface usually at low tide, underwater observations of spawn on giant kelp, Macrocystis (*Macrocystis* spp.), and underwater observations of spawn on other types of algae and the substrate, which we refer to as 'understory.' The spawn index has two distinct periods defined by the dominant coastwide survey method: surface surveys (1951 to 1987), and dive surveys (1988 to 2024).

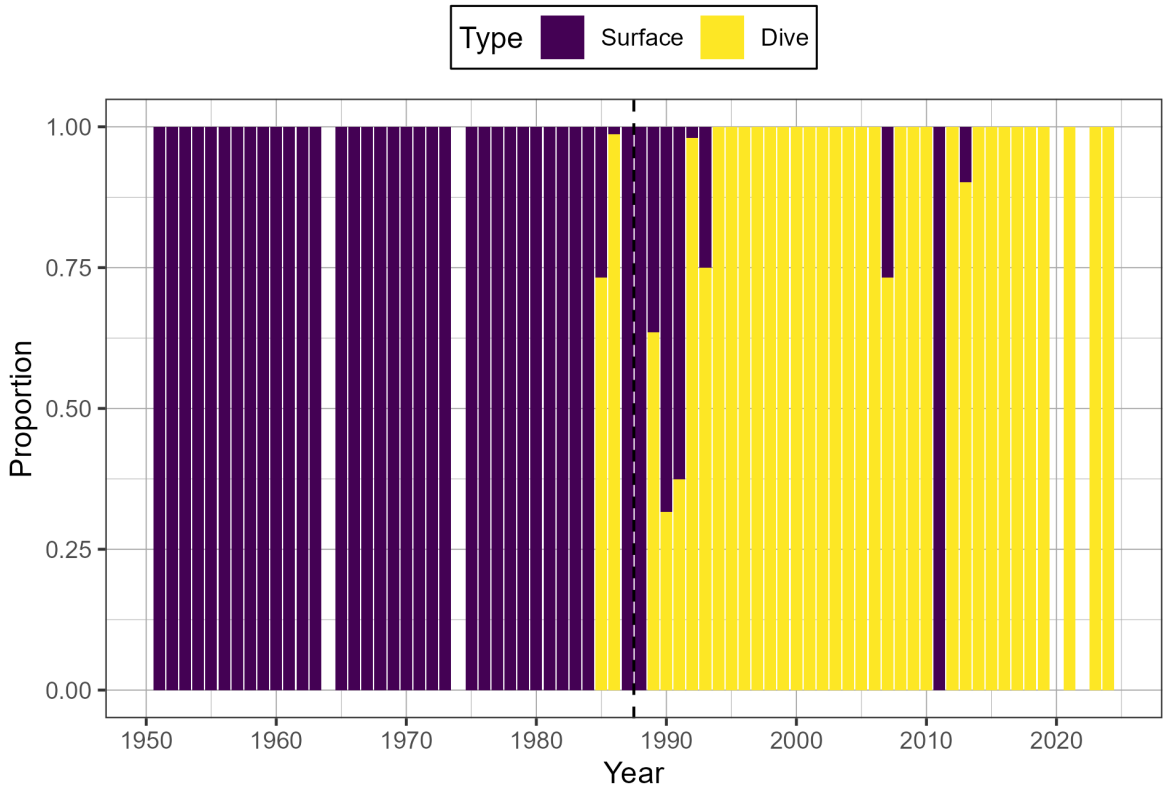

Figure 11. Time series of proportion of spawn index by surface and dive surveys for Pacific Herring from 1951 to 2024 in the Area 27 minor stock assessment region (SAR). The spawn index has two distinct periods defined by the dominant coastwide survey method: surface surveys (1951 to 1987), and dive surveys (1988 to 2024).

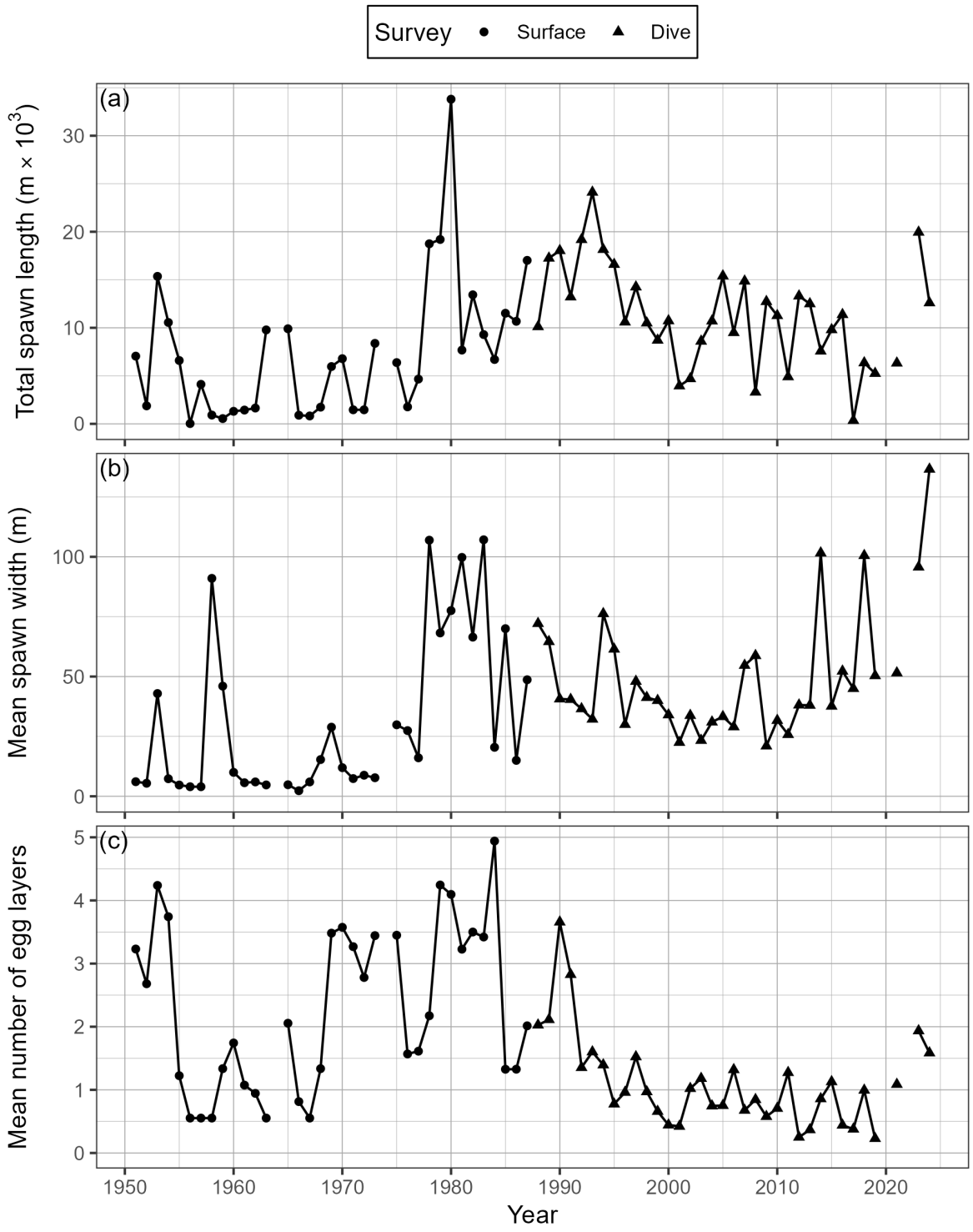

Figure 12. Time series of total spawn length in thousands of metres ($m \times 10^3$; panel a), mean spawn width in metres (b), and mean number of egg layers (c) for Pacific Herring from 1951 to 2024 in the Area 27 minor stock assessment region (SAR). The spawn index has two distinct periods defined by the dominant coastwide survey method: surface surveys (1951 to 1987), and dive surveys (1988 to 2024).

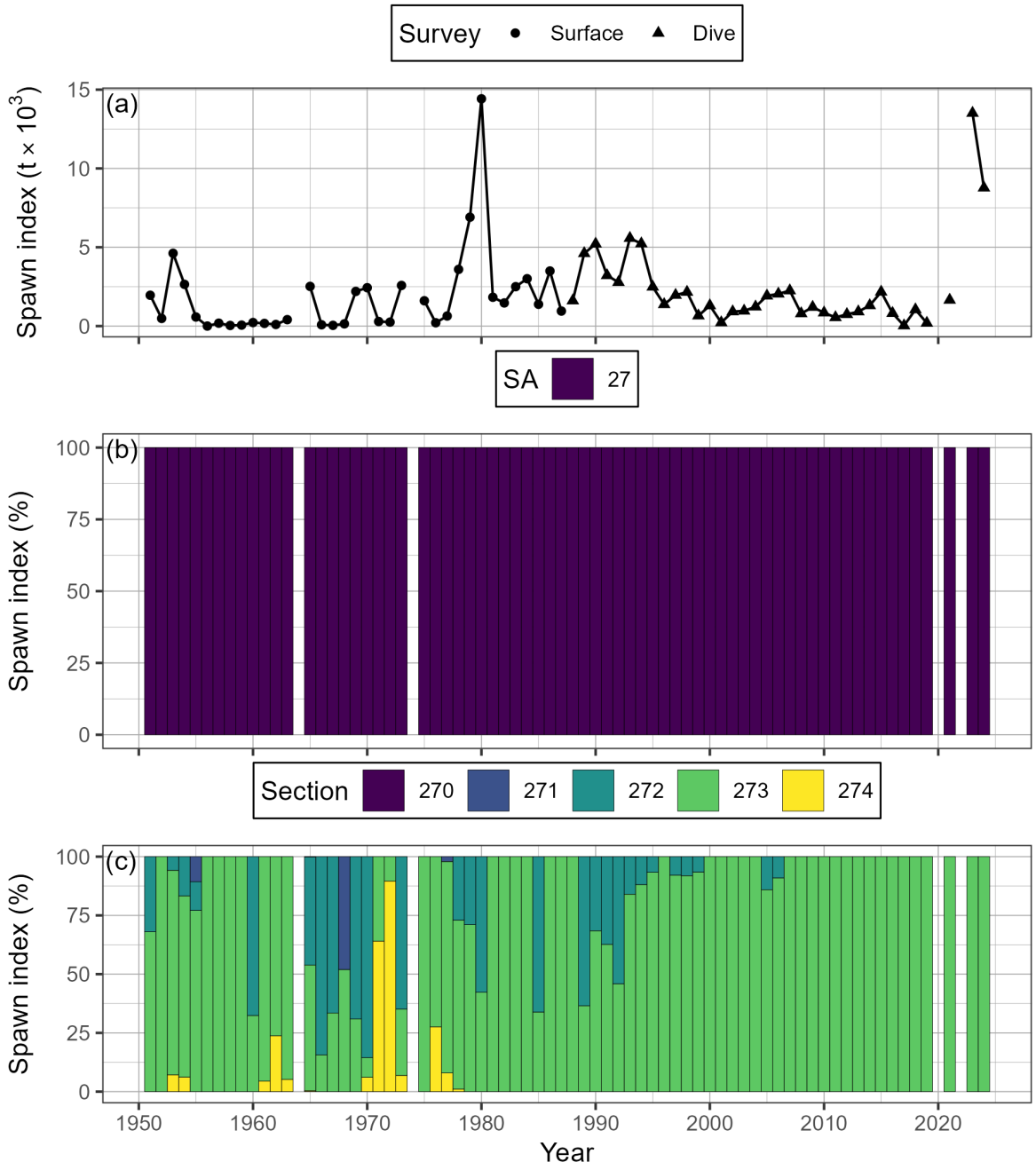

Figure 13. Time series of spawn index in thousands of metric tonnes ($t \times 10^3$) for Pacific Herring from 1951 to 2024 in the Area 27 minor stock assessment region (SAR; panel a), as well as percent contributed by Statistical Area (SA), and Section (b, & c, respectively). The spawn index has two distinct periods defined by the dominant coastwide survey method: surface surveys (1951 to 1987), and dive surveys (1988 to 2024). Note that spawn surveys in the dive survey period (1988 to 2024) are a combination of surface and dive surveys (Figures 10 and 11). The 'spawn index' is not scaled by the spawn survey scaling parameter, q.

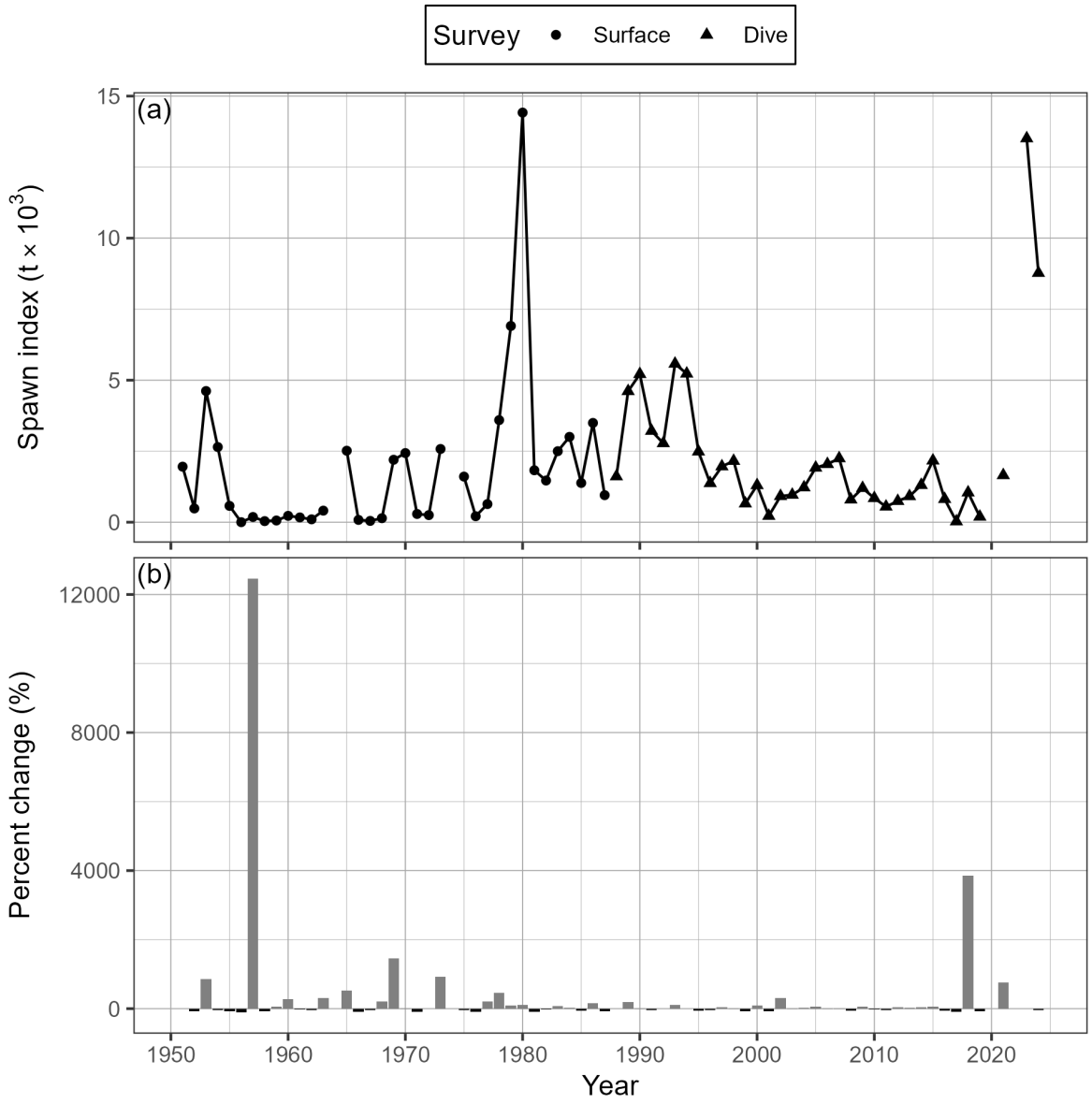

Figure 14. Time series of spawn index in thousands of metric tonnes ($t \times 10^3$) for Pacific Herring from 1951 to 2024 in the Area 27 minor stock assessment region (SAR; panel a), and percent change (b). Percent change is $\delta_t = \frac{\alpha_t - \alpha_{t-1}}{\alpha_{t-1}}$ where α_t is the spawn index in year t. The spawn index has two distinct periods defined by the dominant coastwide survey method: surface surveys (1951 to 1987), and dive surveys (1988 to 2024). The 'spawn index' is not scaled by the spawn survey scaling parameter, q. Note that spawn surveys in the dive survey period (1988 to 2024) are a combination of surface and dive surveys (Figures 10 and 11).

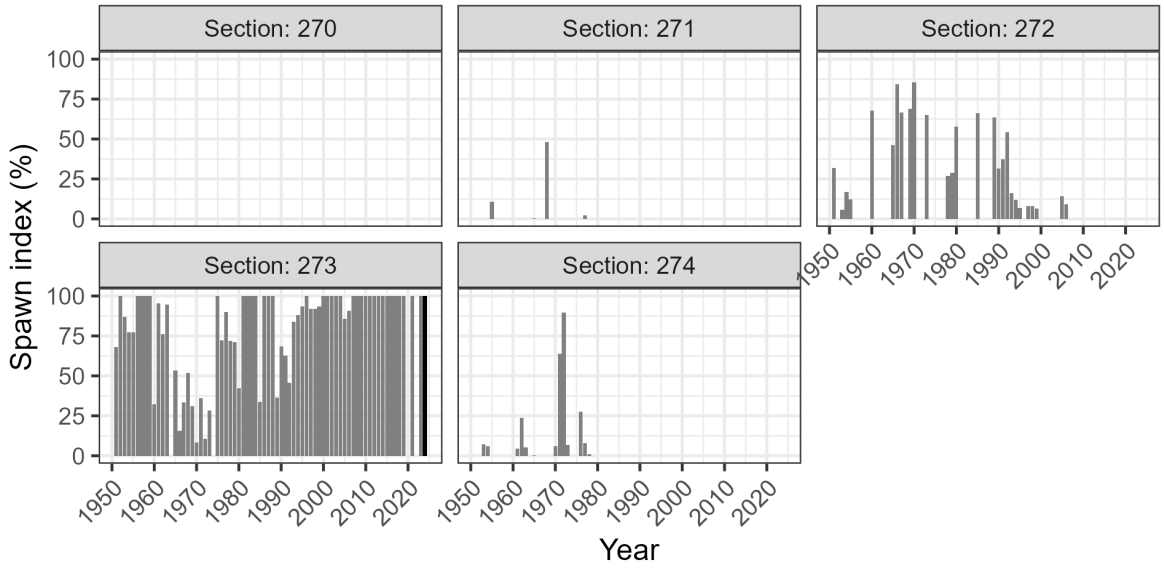

Figure 15. Time series of percent of spawn index by Section for Pacific Herring from 1951 to 2024 in the Area 27 minor stock assessment region (SAR). The year 2024 has a darker bar to facilitate interpretation. The spawn index has two distinct periods defined by the dominant coastwide survey method: surface surveys (1951 to 1987), and dive surveys (1988 to 2024). The 'spawn index' is not scaled by the spawn survey scaling parameter, q.

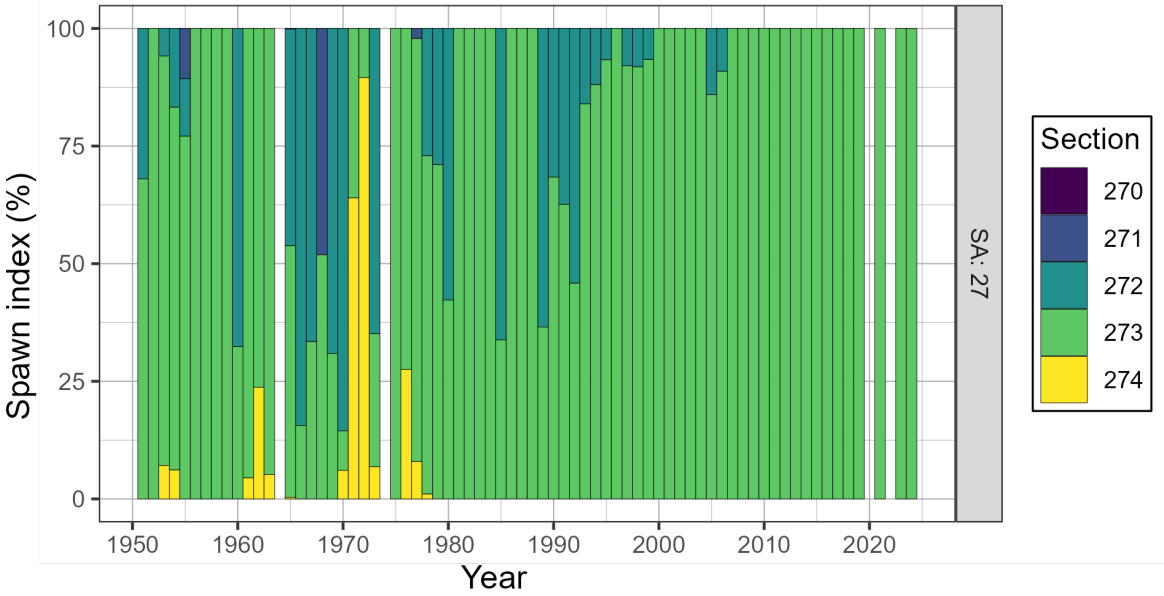

Figure 16. Time series of percent of spawn index by Statistical Area (SA) and Section for Pacific Herring from 1951 to 2024 in the Area 27 minor stock assessment region (SAR). The spawn index has two distinct periods defined by the dominant coastwide survey method: surface surveys (1951 to 1987), and dive surveys (1988 to 2024). The 'spawn index' is not scaled by the spawn survey scaling parameter, q.

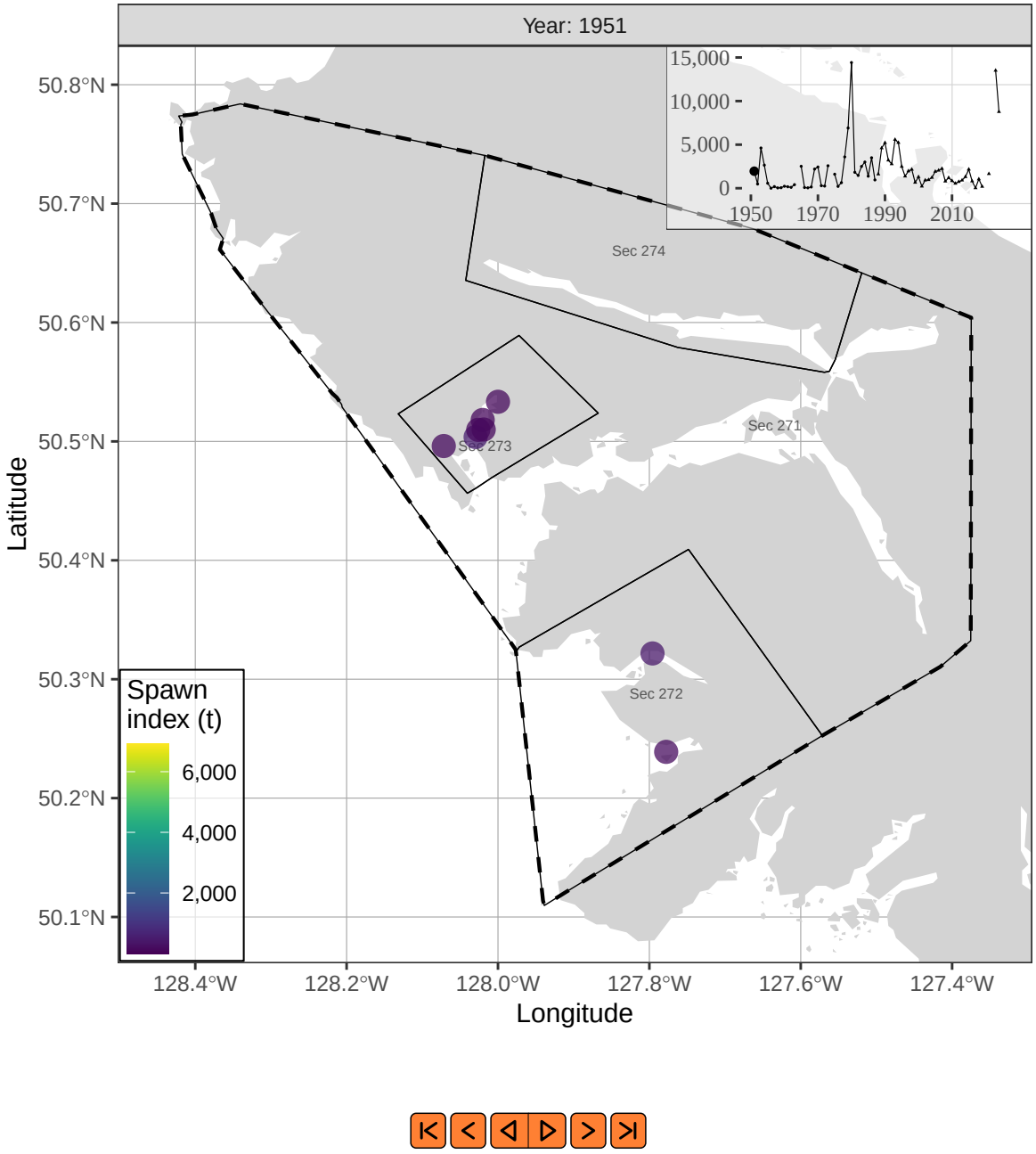

Figure 17. Animation of Pacific Herring spawn index in metric tonnes (t) by Location from 1951 to 2024 in the Area 27 minor stock assessment region (SAR; thick dashed lines), and associated Sections (Sec; thin solid lines). The spawn index has two distinct periods defined by the dominant coastwide survey method: surface surveys (1951 to 1987), and dive surveys (1988 to 2024). The 'spawn index' is not scaled by the spawn survey scaling parameter, q. Missing spawn index values indicate incomplete surveys (grey circles). Inset tracks the total spawn index. Units: kilometres (km). View the animation: download the report, open with Adobe, enable Java, and click "play".