



4VWX SILVER HAKE (*MERLUCCIUS BILINEARIS*) STOCK STATUS UPDATE IN 2025

CONTEXT

The Fisheries Management Branch of Fisheries and Oceans Canada (DFO) requested a stock status update of Scotian Shelf Silver Hake (*Merluccius bilinearis*) in the NAFO Divisions 4VWX management area and catch advice for the 2026/27 fishing year.

This Fisheries Science Response is from the regional peer review meeting of December 2-3, 2025, on the Stock Status Update for Silver Hake in NAFO Divisions 4VWX.

SCIENCE ADVICE

Status

- The 2025 biomass is above the USR (80% B_{MSY}), placing the stock in the healthy zone with a very high probability.

Trends

- The biomass estimates have declined since the recent 2023 peak.
- Recruitment has been above the long-term mean of the time series since 2013, except for the last two years.
- Fishing mortality has remained below the limit removal reference (F_{MSY}).

Ecosystem and Climate Change Considerations

- Although landings have been constrained by market conditions, environmental factors may also be driving the distribution of Age 1 recruits.

Stock Advice

- Based on model projections for each landings scenario, the probability of biomass falling below the USR remains below 17.5% for 2026 and 2027. The current TAC of 15,000 t is appropriate given stock status.

BASIS FOR ASSESSMENT

Assessment Details

An analytical reconstruction of population trends based on commercial landings and DFO Maritimes Summer Ecosystem Research Vessel Survey (DFO Summer RV Survey) data from 1993–2011 was developed through the 2012 framework process, using a logistic biomass dynamics model (Cook 2013, Stone et al. 2013, DFO 2013).

Year Assessment Approach was Approved

2012 (Cook 2013, Stone et al. 2013, DFO 2013)

Assessment Type

Interim Year Update

Most Recent Assessment Date

1. Last Full Assessment: 2012 (DFO 2013)
2. Last Interim-Year Update: 2022 (DFO 2023)

Stock Assessment Approach

1. Single Stock Assessment Model
2. Biomass Dynamics Model

Stock Structure Assumption

The stock assessment uses strata 440–483 from the DFO Summer RV Survey index. Strata from the Bay of Fundy (484–495) are excluded because Silver Hake from the Bay of Fundy were determined to be more associated with the Georges Bank/Gulf of Maine stock than the Scotian Shelf stock (DFO 2013).

Reference Points

- Limit Reference Point (LRP): 27 kt (40% B_{MSY})
- Upper Stock Reference (USR): 55 kt (80% B_{MSY})
- Removal Reference (RR): 0.35 (F_{MSY})

Data

- DFO Summer RV Survey index and length data (1970–2025)
- Canadian commercial fishery catch (1977–2025)

Data changes: The DFO Summer RV Survey was completed in 2021, 2024 and 2025 with a new vessel and new gear. Length-based conversion factors were developed to allow comparisons between data collected using the new vessel and gear and data collected from previous vessels. Conversion factors are applied to make units in CCGS Needler WIIA equivalent (Yin et al. 2025). Due to incomplete coverage of the stock area by the DFO Summer RV Surveys, biomass indices for 2018, 2021, and 2022 are not comparable to others in the time series and are excluded.

ASSESSMENT

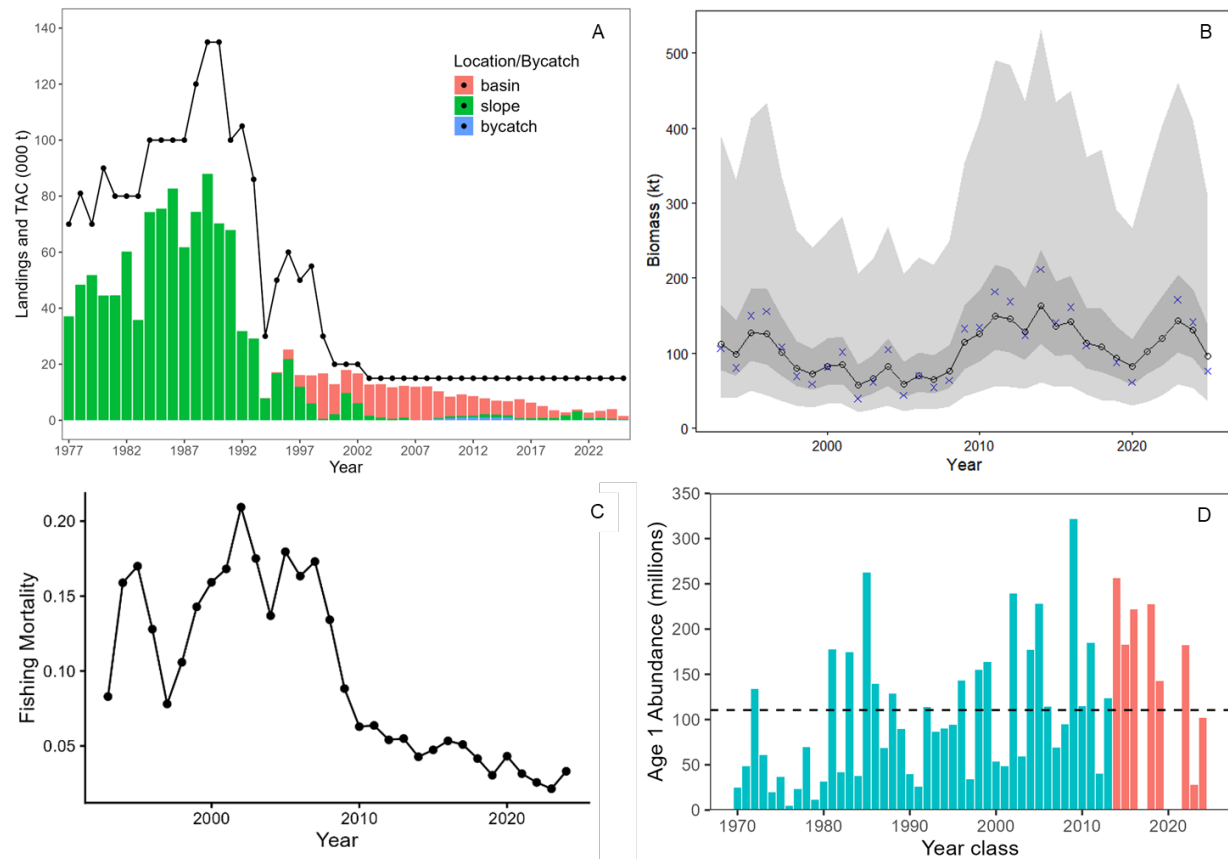


Figure 1. (A) Catch and Total Allowable Catch, (B) Model-estimated biomass (with 50% credible intervals (CI) in dark grey shading and 95% CI in light grey) alongside the q -adjusted annual survey biomass (blue X), (C) Fishing mortality, (D) Recruitment (numbers) based on DFO Summer RV Survey relative to the long-term mean (1970–2025). Since 2014, age 1 fish are estimated by length frequencies (fish <23 cm). No recruitment estimates available for 2018, 2021, and 2022 due to incomplete survey coverage.

Stock Status and Trends

Biomass:

Biomass estimates from the population model were above 100,000 tonnes (t) from 2009 to 2018, with a steady decline from 2014 to 2020. Since 2020, biomass estimates increased until 2023, followed by a decline for 2024 and 2025 (Figure 1B). The 2025 estimate of population biomass is 95,730 t.

Recruitment:

Age data from the commercial fishery or DFO Summer RV Survey have not been available since 2014, but year classes are visible as distinct modes in the survey length frequency data. Total stratified number of fish <23 cm provides a proxy for Age 1 numbers, and is used as a recruitment index (Branton et al. 1997, Stone et al. 2013). Recruitment over the time period is variable; however, estimated recruitment has generally been above the long-term mean of the time series since 2013 (Figure 1D) except for the last two years.

Fishing Mortality:

Fishing mortality (F) has remained below the F_{MSY} for the period covered by the model (1993–2025, Figure 1C). The 2025 estimate of F is 0.033 and the ratio of the current F over F_{MSY} is 0.09.

Current Status

Based on the population model, the stock remains in the healthy zone, with biomass above the USR of 80% B_{MSY} with a very high probability (>0.99 ; Figure 2).

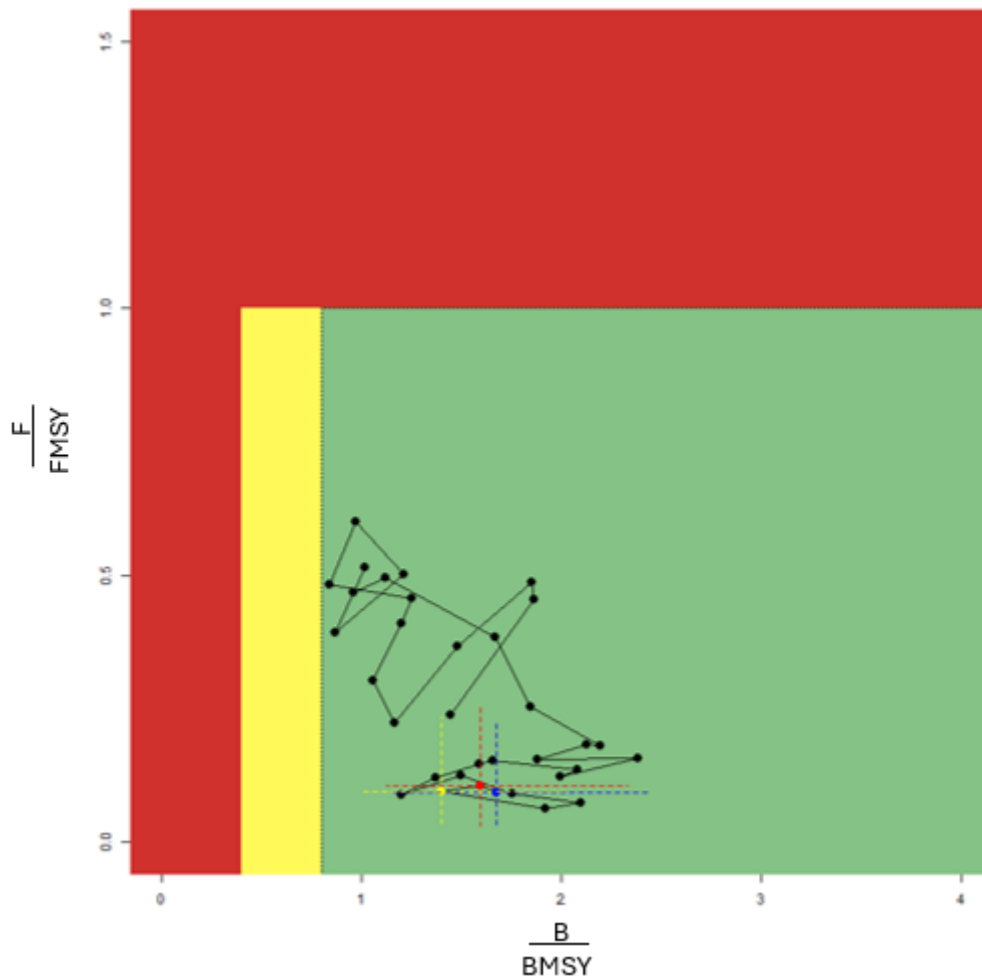


Figure 2. Phase plot of the ratio of fishing mortality (F) to fishing mortality at maximum sustainable yield (F_{MSY}), and biomass (B) to biomass at maximum sustainable yield (B_{MSY}). Colours reflect stock status: red- critical, yellow- cautious, and green- healthy. The yellow dot represents the 2025 biomass and fishing mortality from the population model. The red dot indicates projected biomass and exploitation with an assumed catch of 3,540 t for the July 2025 to June 2026 period. The blue dot represents projected biomass and exploitation at an assumed catch of 3,540 t (status quo) from July 2026 to June 2027. Dashed lines represent the 25% and 75% credible intervals around the projected estimates.

History of Landings, TAC, and Catch Advice

The TAC has been set at 15,000 t since 2003, but landings have been consistently lower, averaging about 3,367 t for the fishing years 2022/2023–2024/2025. Consistent landings below

the TAC are thought to be a consequence of market conditions and the reduced effort directed at this species, rather than low abundance (Stone et al. 2013). Landings in the fishing years 2023/2024 and 2024/2025 were 3,300 t and 4,000 t, respectively (Table 1, Figure 1A). Since the early 2000s, catches of Silver Hake have come predominantly from LaHave and Emerald basins, with an increase in catches from the slope areas in 2020 and 2021 (Figure 1A).

Table 1. Landings and Total Allowable Catch (TAC) of Scotian Shelf Silver Hake in 4VWX (thousands of tonnes).

Year	1970–79	1980–89	1990–99 ³	2000–09 ⁴	2010–19	2020	2021	2022	2023	2024	2025 ⁵
TAC	90.2 ¹	98.5	53.3	16.5	15	15	15	15	15	15	15
Canada ²	0	0	3.7	13	7.0	2.9	3.9	2.8	3.3	4.0	1.6
Foreign	115.6	64.2	27.8	0	0	0	0	0	0	0	0
Total	115.6	64.2	31.5	13	7.0	2.9	3.9	2.8	3.3	4.0	1.6

¹Average TAC for 1974–79 period; ²Includes developmental allocations fished by foreign flagged vessels, ending in 2004; ³Fishing year, landings, and TAC refer to the 15 month period from January 1, 1999 to March 31, 2000; ⁴Commencing in 2000, fishing year, landings, and TAC refer to the period from April 1st of the current year to March 31st of the following year; ⁵ partial landings extracted October 2025.

Ecosystem and Climate Change Considerations

Silver Hake are a widely distributed gadoid fish that range from Cape Hatteras to the Grand Banks including the Gulf of St. Lawrence. The distribution of these demersal-pelagic fish are closely associated with bottom water temperatures between 5–12°C for juveniles, 7–10°C for adults, and warmer (>10°C) waters for spawning. A self-reproducing population occurs on the Scotian Shelf with depth preferences over 120 m in the NAFO divisions 4VWX (Rikhter et al. 2001).

Historically, adult Silver Hake within these NAFO divisions predominantly aggregated along the warm slope waters of the shelf and inside the Emerald and LaHave basins. In 2020 and 2021, landings from the Emerald and LaHave basins decreased which may be due to water temperatures within these areas reaching the upper limits of the species' preferred range (Figure 1A). Since 2024, bottom temperatures in Emerald Basin appear to be decreasing from those highs. From July to September, Silver Hake migrate to shallower (30–40 m), warmer (>10°C) waters surrounding the Emerald and Sable Island banks for spawning (Rikhter et al. 2001).

Projections

Four landings scenarios were explored to provide one- and two-year projections (Table 2). General productivity dynamics were assumed to continue into the projections. Compared to 2025 projections, biomass and exploitation are projected to remain similar in 2026. The probability of falling below the USR ranged from 5.1% to 10.3% in 2026 projections and from 6.8% to 17.5% in 2027 projections (Tables 2 and 3).

Table 2. Impact of four catch scenarios on projected biomass (kt) and fishing mortality estimates, and probability of population declining below biomass at maximum sustainable yield (B_{MSY}), July 2025 to June 2026. 50% CI is credible interval.

Landings for Projections (kt)	Fishing Mortality	Median Biomass 2026 (kt)	50% CI Biomass 2026	Probability of 2026 Biomass Falling Below:	
				80% of B_{MSY}	40% of B_{MSY}
3.54 ¹	0.028	129	89–189	0.051	0.003
12	0.107	119	81–178	0.079	0.004
15	0.139	115	78–173	0.094	0.006
18	0.175	112	75–171	0.103	0.007

¹ 2022–2024 average landings

Table 3. Impact of four catch scenarios on projected biomass (kt) and fishing mortality estimates, and probability of population declining below biomass at maximum sustainable yield (B_{MSY}), July 2026 to June 2027. 50% CI is credible interval.

Landings for Projections (kt)	Fishing Mortality	Median Biomass 2027 (kt)	50% CI Biomass 2027	Probability of 2027 Biomass Falling Below:	
				80% of B_{MSY}	40% of B_{MSY}
3.54 ¹	0.029	123	84–183	0.068	0.009
12	0.114	111	74–166	0.118	0.016
15	0.154	105	69–162	0.147	0.022
18	0.194	102	65–159	0.175	0.027

¹ 2022–2024 average landings

SOURCES OF UNCERTAINTY

Only the DFO Summer RV Survey strata 440–483 were used, excluding data from the Bay of Fundy. The boundary between the Scotian Shelf and Bay of Fundy Silver Hake stocks is imprecise and may vary from year to year. The DFO Summer RV Survey coverage was incomplete in 2018, 2021, and 2022, and as a result, the survey biomass estimates for these years were not included in the updated model. This exclusion is not expected to impact the advice.

Dynamics of a logistic biomass model may not closely track the dynamics of the population. The biomass dynamic model integrates all population processes into two estimated parameters, as such recruitment and growth across the projected years do not account for variability in year-class strength. The ability of the model to describe future biomass more than one year ahead is uncertain given that Silver Hake have highly variable recruitment patterns, and the fishery is based on recruiting individuals (age 1 fish).

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