# 15. Assessment of the Thornyhead stock complex in the Gulf of Alaska

Kevin A. Siwicke and Katy B. Echave

November 2026

*With contributions from:*

Bridget Ferriss

This report may be cited as:

Siwicke, K. A., and K. B. Echave, 2026. Assessment of the Thornyhead stock complex in the Gulf of Alaska. North Pacific Fishery Management Council, Anchorage, AK. Available from https://www.npfmc.org/library/safe-reports/

# Executive Summary

The Gulf of Alaska (GOA) thornyhead complex is assessed on a biennial schedule in even-numbered years and is managed as a Tier 5 stock. For this on-cycle year, we conducted a full assessment. We incorporate new survey biomass from the 2025 Alaska Fisheries Science Center (AFSC) bottom trawl survey (BTS), new relative population weights (RPWs) from the 2025 longline survey (LLS), and update auxiliary data sources.

The current method for estimating the overfishing limit (OFL) and acceptable biological catch (ABC) uses AFSC BTS and LLS data in the random effects model (REMA; Hulson et al. 2021, Echave et al. 2022) run with the *rema* package (Sullivan et al. 2022a). Biomass estimates by western, central, and eastern GOA management areas (i.e., WGOA, CGOA, and EGOA) from REMA were summed to obtain GOA-wide biomass. The base model (Model 24.2) estimated one shared process error, one shared scaling coefficient, and additional observation error parameters for each survey (Siwicke et al. 2024). There were some minor changes to the *rema* package parameterization of additional observation error, so the continuity model being brought forward (Model 24.2a) uses the updated version of the *rema* package. This model cannot accept 2025 BTS data due to the redesign of the GOA BTS (Oyafuso et al. 2022), but 2025 LLS data was updated for this model.

Changes related to redesign of the BTS in the GOA necessitated aggregation of BTS data into two depth bins (0–700 m and 701–1000 m) rather than the previously accepted three (0–500 m, 501–700 m, and 701–1000 m). Three alternatives that accomplished this were presented to the 2026 September GOA Plan Team (see bridging from previously accepted Model 24.2 to Model 24.2f which is named Model 26 herein). Model 26 drops BTS data from 0–500 m from 1990, 1993, 1996, and 2001 because 501–700 m was not concurrently sampled in those years. Model 26 includes updated 2025 BTS and 2025 LLS estimates and will allow us to continue including the BTS estimates into the future, while Model 24.2a would not.

## Summary of Changes in Assessment Inputs

### *Changes in Input Data*

1. RPWs and errors estimated from the GOA LLS were updated.
2. Biomass and errors estimated from the GOA BTS were updated.

### *Changes in Assessment Methodology*

The methodology used to estimate exploitable biomass to calculate ABC and OFL values for the 2027 fishery required a change of the BTS depth strata used in the model to accommodate the 2025 BTS redesign. The continuity Model 24.2a partitioned W/C/E GOA biomass estimates from the BTS into three depth strata (0–500 m, 501–700 m, and 701-1000 m) because the survey occasionally sampled only to 500 m or 700 m and only rarely reached 1000 m (Siwicke et al. 2024). This allowed the REMA model to estimate biomass at these deeper depths (where there is measurable thornyhead biomass) when it was not sampled. The model is also informed by the LLS which samples 151–1000 m. The redesign of the GOA BTS in 2025 resulted in several new depth strata that span across 500 m (e.g., 151–700 m and 226–700 m; Oyafuso et al. 2022). Therefore, the status quo model cannot simply be run with updated BTS data. Combining 0–500 m and 501–700 m into one stratum (0–700 m) is relatively simple and maintains a similar model structure. However, in 1990, 1993, 1996, and 2001 the BTS only sampled 0–500 m, and the EGOA was not sampled at all in 2001. The continuity model cannot be updated for this cycle with new BTS data from 2025 because of this survey redesign. The GOA Groundfish Plan Team and the SSC

requested that Model 26, which drops BTS data from 1990, 1993, 1996, and 2001 when the survey sampled 0–500 m but not 501–700 m, be brought forward.

## Summary of Results

For the 2027 fishery, we recommend the maximum allowable ABC of 1,182 t for thornyhead rockfish. This ABC is a decrease of 11.7% from the 2026 ABC of 1,338 t. The OFL is 1,575 t. Reference values for thornyhead rockfish are summarized in the following table, with the recommended ABC and OFL values in bold. The stock was not subjected to overfishing last year.

| | As estimated or *specified in 2024* for: | | As estimated or *recommended this* year for: | |
|---|---|---|---|---|
| **Quantity** | 2025 | 2026 | 2027 | 2028 |
| *M* (natural mortality rate) | 0.03 | 0.03 | 0.03 | 0.03 |
| Tier | 5 | 5 | 5 | 5 |
| Biomass (t) | 59,459 | 59,459 | 52,513 | 52,513 |
| $F_{OFL}$ | 0.03 | 0.03 | 0.03 | 0.03 |
| $maxF_{ABC}$ | 0.0225 | 0.0225 | 0.0225 | 0.0225 |
| $F_{ABC}$ | 0.0225 | 0.0225 | 0.0225 | 0.0225 |
| OFL (t) | 1,784 | 1,784 | **1,575** | 1,575 |
| maxABC (t) | 1,338 | 1,338 | 1,182 | 1,182 |
| ABC (t) | 1,338 | 1,338 | **1,182** | 1,182 |
| | As determined *in 2024* for: | | As determined *this* year for: | |
| **Status** | 2023 | 2024 | 2025 | 2026 |
| Overfishing | No | n/a | No | n/a |

## Summaries for Plan Team

Thornyhead biomass, OFL, ABC, total allowable catch (TAC), and catch (values in t) for each year corresponds to projections from the assessment year used to set specifications for that year. Catch data was accessed October 1, 2026.

| Year | Biomass | OFL | ABC | TAC | Catch |
|---|---|---|---|---|---|
| 2025 | 59,459 | 1,784 | 1,338 | 1,338 | 130 |
| 2026 | 59,459 | 1,784 | 1,338 | 1,338 | 182 |
| 2027 | 52,513 | 1,575 | 1,182 | | |
| 2028 | 52,513 | 1,575 | 1,182 | | |

The recommended area apportionments based on the Model 26 estimates (see Spatial Apportionment: Biologically-informed Recommended Distributions section for details) are as follows:

| Year | WGOA | CGOA | EGOA | Total |
|---|---|---|---|---|
| 2027 | 266 | 527 | 389 | 1,182 |
| 2028 | 266 | 527 | 389 | 1,182 |

## Responses to SSC/Plan Team Comments in General

*"The Teams requested that, when available, documentation describing the rationale for when and how a BRD is specified be provided to the authors and the Teams. This information may also be useful to include in the SAFE intro to provide guidance for when the distribution of potential catch might be flexible (i.e., exceed an area's BRD) based on the level of reliability or importance of a BRD."* (Joint GPT, Sept 2025)

**We continue to estimate biologically-informed regional distributions (BRD) of ABC using REMA model estimates by region.**

*"The SSC reiterates from their June 2025 minutes that harvest should generally reflect stock distribution, especially when stock structure and spatial ecology are uncertain. This approach helps maintain biocomplexity, reproductive potential, and fishing opportunities."* (SSC, October 2025)

**Our previously accepted and current method for calculating a BRD of ABC uses the proportions of the REMA model estimates by area, which achieves this. We note that there is no evidence for stock structure of shortspine thornyhead.**

*"Uncertainty of BRDs, particularly for areas with sparse data (e.g., Aleutians), should be quantified and communicated alongside point estimates in the stock assessment."* (SSC, October 2025)

**We will await guidance on the best approach to characterizing uncertainty in BRDs.**

*"New methods (e.g., REMA, VAST, spatio-temporal apportionment tools) should continue to be developed and brought forward for GPT and SSC review per the status quo."* (SSC, October 2025)

**We are hoping to explore a model-based index for BTS data with a depth covariate in the next assessment cycle.**

*"Specifically, for the stocks where the Council requests information related to flexibility in spatial apportionments, either identified by the Council in October 2025 or if the Council identifies additional stocks at this October 2026 meeting, the SSC requests that assessment authors include in December 2026:*

1. *A table showing BRDs (from 2026) and subarea ABCs (from 2025 and earlier) for the last 10 years, their associated CV if available, and the catch within each region.*
2. *State whether a stock structure template has been completed for the stock, and, if so, a link to the document.*
3. *Describe other factors relevant to spatial allocation, such as longevity, movement rates, natural mortality, discard mortality, etc."*

**We have a table with historical regional TACs and catch (Table 15.2), we have included a link to the 2024 assessment with a spatial stock structure appendix and described tagging of thornyheads.**

*"The SSC requests that during the next operational assessment for deep species such as Dover sole, authors specifically examine and describe how the historical survey estimation methodology and estimates compare with those under the new survey design and highlight impacts to the assessment." (SSC, June 2026)*

**Historical survey estimates have been problematic for thornyheads because they did not account for missing deep strata biomass estimates for years that only sampled to 500 m or 700 m, and when**

**a deep stratum only had one station (two stations was the minimum, but towing deep is challenging and occasionally only one station was successful) and thus contributed no error to estimates. The redesign is still unlikely to sample > 700 m, but the minimum number of stations in a stratum is now four. The assessment model has accounted for these issues historically by stratifying the trawl data, including the LLS, and adding error to single station estimates. This assessment specifically addresses how the redesign impacted the previous method and provides a similar path forward.**

## Responses to SSC/Plan Team Comments Specific to Assessment

*"The Team recommended bringing Model 24.2f forward in November. The base model cannot be updated for 2026 because of the change in survey stratification. The Team therefore also recommended bringing Models 23 A–F forward as continuity models."* (GOA PT, September 2026)

*"This model, Model 24.2f, was recommended by the author and the GOA GPT to carry forward as the final assessment model. The SSC agrees with this recommendation. To reduce confusion, the SSC recommends that models with the new two-stratum structure be renumbered to 26.x."* (SSC, October 2026)

*"For a continuity model, the SSC recommends using only Model 24.2a, which updates the previously accepted model to the latest version of the REMA model, but does not incorporate the 2025 survey data. This differs from the GOA GPT recommendation, which included all models 24.2a-f."* (SSC, October 2026)

**In response to the three comments above, we have presented Model 24.2a as the continuity model, and we did update the LLS data with 2025 data but not the BTS. Because there is only one new model being brought forward, what was Model 24.2f is being called Model 26 in this assessment.**

*"The SSC notes that the 700-1000 m depth stratum REMA model is based on the five surveys that surveyed these depths, and the last survey was in 2015. There are no plans to survey this depth stratum in the future, so consequently the biomass estimates for this depth stratum will become increasingly uncertain."* (SSC, October 2026)

**We recognize the BTS is unlikely to survey deeper than 700 m in the future, but the LLS has always and will continue to include data from 700 to 1,000 m. If we were to drop this depth strata from the model, the surveys would not be able to align by depths, because the LLS has a depth stratum from 600 to 800 m. Finally, the GOA biomass estimate would be lowered as the BTS is determining the absolute biomass scale.**

*"Longspine thornyheads are considered much less abundant than shortspine thornyhead in Alaskan waters, but this is not well documented in the assessment. The SSC requests that the relative abundance of longspine and shortspine thornyheads be reported for the bottom trawl survey and from observer catch sampling."* (SSC, October 2026)

**We have added this information to the introduction.**

*"The SSC noted that the maxABC is a decrease of 17.8% from the 2024 maxABC specification. Given the declining trends in biomass and survey indices in recent years, the SSC recommends bringing forward available survey indices for GOA GPT review in September 2025."* (SSC, December 2024)

**This did not occur in 2025, but these updated indices are in this assessment.**

# Introduction

Thornyheads (*Sebastolobus* species) are groundfish belonging to the family Scorpaenidae, which contains the rockfishes. The family Scorpaenidae is characterized morphologically within the order by venomous dorsal, anal, and pelvic spines, numerous spines in general, and internal fertilization of eggs. Thornyheads are oviparous, releasing fertilized eggs in floating gelatinous masses, and lack a swim bladder, while "true" rockfish in the genus *Sebaste*s are ovoviviparous, live-bearing fish, and have a swim bladder. There are three species in the genus *Sebastolobus*: the shortspine thornyhead *Sebastolobus alascanus*, the longspine thornyhead *S. altivelis*, and the broadfin thornyhead *S. macrochir* (Eschmeyer et al. 1983, Love et al. 2002). The broadfin thornyhead is not part of the GOA thornyhead complex because they are not believed to occupy the GOA. The longfin thornyhead is included in the complex, but shortspine thornyhead is the only species included in the assessment model because in the last decade they make up over 99% of thornyhead weight in observer/EM data, approximately 98% of BTS biomass of thornyheads, and approximately 99.5% of LLS RPWs.

## *General Distribution*

Thornyheads are distributed in deep water habitats throughout the north Pacific Ocean, although juveniles can be found in shallower habitats. The range of the shortspine thornyhead extends from 17 to 1,524 m in depth and along the Pacific Rim from the Seas of Okhotsk and Japan in the western north Pacific, throughout the Aleutian Islands, Bering Sea, GOA, and south to Baja California in the eastern north Pacific (Love et al. 2005). Shortspine thornyheads are considered most abundant from the Northern Kuril Islands to southern California. They are generally concentrated between depths of 150 and 450 m in northern waters and in deeper habitats up to 1,000 m in the southern portion of their range (Love et al. 2002).

The longspine thornyhead is found in the eastern north Pacific Ocean, where it ranges from the Shumagin Islands in the GOA south to Baja California. Longspine thornyheads are generally found in deeper habitats ranging from 201 to 1,756 m (Love et al. 2005). They are commonly found deeper than 500 m throughout their range. Off the California coast, the longspine thornyhead is a dominant species in the 500 to 1,000-m depth range, which is also a zone of minimal oxygen (Love et al. 2002).

## *Life History Information*

Shortspine thornyhead are thought to spawn between April and July in the GOA and between December and May along the U.S. west coast (Pearson and Gunderson 2003). It is unknown when longspine thornyheads spawn in the Alaskan portion of their range, although they are reported to spawn between January and April on the U.S. West coast (Pearson and Gunderson 2003). Thornyheads spawn a bilobed mass of fertilized eggs which floats in the water column (Love et al. 2002). Once the pelagic egg masses hatch, larval and juvenile thornyheads spend far more time in a pelagic life stage than the young-of-year rockfish in the genus *Sebastes* (Love et al. 2002). Shortspine thornyhead spend 14 to 15 months in a pelagic phase, and longspine thornyhead juveniles spend up to 20 months in a pelagic phase before they settle into benthic habitat (Moser 1974). While shortspine thornyhead juveniles tend to settle into relatively shallow benthic habitats between 100 and 600 m and then migrate deeper as they grow, longspine thornyhead juveniles settle into adult longspine habitat depths of 600 to 1,200 m (Moser 1974, Wakefiled 1990).

Once in benthic habitats, both shortspine and longspine thornyheads associate with hard muddy substrates, sometimes near rocks or gravel, and distribute themselves relatively evenly across this habitat, appearing to prefer minimal interactions with individuals of the same species (Wakefield 1990). Research focusing on non-trawlable habitats found rockfish species often associate with biogenic structure (seafloor

relief; Du Preez and Tunnicliffe 2011, Laman et al. 2015), and that thornyhead rockfish are often found in both trawlable and untrawlable habitats (Rooper and Martin 2012, Rooper et al. 2012). Several of these studies are notable as results indicate adult thornyhead biomass may be underestimated by traditional bottom trawl surveys because of issues with extrapolating survey catch estimates to untrawlable habitat (Jones et al. 2012; Rooper et al. 2012). Mean abundance of shortspine thornyheads estimated in submersible surveys were several times higher than those estimated from trawl surveys (Else et al. 2002). They have very sedentary habits and are most often observed resting on the bottom in small depressions, especially longspine thornyheads, which occupy a zone of minimal oxygen at their preferred depths (Love et al. 2002).

Thornyheads generally live longer than most other commercially exploited groundfish. Shortspine thornyheads may live upwards of 80 to 100 years with the larger-growing females reaching sizes up to 80-cm fork length (Love et al. 2002). Longspine thornyheads are generally smaller, reaching maximum sizes less than 40 cm and maximum ages of at least 45 years (Love et al. 2002).

### *Prey and Predators*

Diets of shortspine thornyheads are derived from stomach content collections taken in conjunction with the GOA BTS. Over 70% of adult shortspine thornyhead diet measured in the early 1990s was shrimp, including both commercial (Pandalid) shrimp and non-commercial (non-Pandalid shrimp) in equal proportions. Other important prey of shortspine thornyheads include crabs, zooplankton, amphipods, and other benthic invertebrates. Juvenile thornyheads have similar diets to adults, but in general prey mostly on invertebrates.

Shortspine thornyheads are consumed by a variety of piscivores, including arrowtooth flounder, sablefish, “toothed whales” (i.e., sperm whales), and sharks. Although, thornyheads are not a common prey item for these predators and make up less than 2% of their diets in the GOA. Juvenile shortspine thornyheads are thought to be consumed by adult thornyheads, but may be mitigated by ontogenetic movement into deeper waters (Jacobson and Vetter 1996).

### *Stock Structure*

The stock structure of GOA thornyhead was examined in Appendix 15A of the 2024 stock assessment (Siwicke et al. 2024). There are few data available to differentiate stocks across regions based on demographics, and what is known regarding movement and genetics indicates no stock structure for thornyhead rockfish in the GOA. Thornyheads are long-lived with a long generation time, but there is little information regarding spawning, reproduction, larval dispersal, or behavior. Length-weight relationships are similar among regions in the GOA. Harvest and trend data show consistent fishing effort with abundance distribution. Tagging studies indicate that large movements are possible, at times crossing management boundaries, but that most tagged shortspine thornyhead remain within their tagging location (Echave 2017). No spatial structure was observed in recent genetic analyses utilizing whole genome resequencing in shortspine thornyhead sampled from southern CA to the Bering Sea and Aleutian Islands, providing further evidence that gene flow is high in shortspine thornyhead across relatively large spatial scales (Baetscher et al. 2026); these results indicate that shortspine thornyhead represents a single genetic stock in Alaskan waters. For thornyheads, it is likely that areas that are locally depleted will be replenished by larval transport over longer timescales (decades, 100s of years). But in the short-term local depletion could cause reduced abundance because adult movement is low.

# Fishery and Management History

## *History*

Shortspine thornyheads are abundant throughout the GOA and are commonly caught by bottom trawls and longline gear. This species was seldom the target of a directed fishery. Thornyheads have probably been caught in the northeastern Pacific Ocean since the late 19th century, when commercial trawling by U.S. and Canadian fishermen began. In the mid-1960s Soviet fleets arrived in the EGOA (Chitwood 1969), where they were soon joined by vessels from Japan and the Republic of Korea. These fleets represented the first directed exploitation of GOA rockfish resources, primarily Pacific ocean perch *Sebastes alutus* and likely resulted in the first substantial catches of thornyheads as well. Today, thornyheads are one of the most valuable rockfish species, with most of the domestic harvest exported to Japan. Despite their high value, they are still managed as a "bycatch only" fishery in the GOA because they are nearly always taken in fisheries directed at sablefish *Anoplopoma fimbria* and other rockfish (*Sebastes* spp.). Although the thornyhead fishery is managed operationally as a "bycatch" fishery, the high value and desirability of shortspine thornyheads means they are still considered a "target" species for the purposes of management.

## *Management Measures*

After passage of the Fishery Conservation and Management Act (FCMA) in 1977, thornyheads were placed in the rockfish management group which contained all species of rockfish except Pacific ocean perch (Berger et al. 1986). In 1979, thornyhead rockfish were removed from the rockfish group and placed in the "other fish" group. Thornyhead rockfish became a reported species group in 1980. For the GOA, the "thornyheads" management unit is currently a species complex which includes shortspine thornyhead and longspine thornyhead. Thornyheads in the GOA have been managed as a single stock since 1980 (Ianelli and Ito 1995, Ianelli et al.1997). Since 1998, the NPFMC apportions the ABC and TAC for thornyhead rockfish in the GOA into three geographic management areas: the WGOA, CGOA, and EGOA. Bering Sea and Aleutian Islands (BSAI) shortspine thornyheads are managed as a separate stock from GOA thornyheads. Note that in the BSAI FMP, all thornyhead species are managed within the "Other rockfish" species complex.

In 2007, the CGOA Rockfish Pilot Program was implemented as a five-year test program to enhance resource conservation and improve economic efficiency for harvesters and processors who participate in the CGOA rockfish fishery. In 2012, the CGOA Rockfish Program was authorized for 10 years, and in 2021 this program was reauthorized without a sunset date. This is a rationalization program that provides quota shares to trawl catcher vessel and catcher processor cooperatives. The primary rockfish management groups are northern rockfish *Sebastes polyspinis*, Pacific ocean perch, and dusky rockfish *S. ciliates*. Thornyhead rockfish is a secondary species group that has an allocation of quota share which can be caught while fishing for the primary rockfish management groups and directed fishing on shortspine thornyheads exclusively is not permitted.

In 2020, Amendment 107 to the Fishery Management Plan for Groundfish required full retention of rockfish by catcher vessels using fixed gear while fishing for groundfish or halibut. A timeline of management measures that have affected thornyhead rockfish, along with corresponding GOA-wide annual catch and OFL/ABC/TAC levels are listed in Table 15.1.

The earliest available records of thornyhead catch begin in 1967, as published in French et al. (1977). Rockfish catch peaked in 1965 when foreign fleets occupied Alaska waters, with nearly 350,000 t removed (Ito 1982). However, records of catch and bycatch from this fishery were insufficient for precise estimation of historical catch for thornyheads. Active data collection began as part of the U.S. Foreign

Fisheries Observer Program in 1977, when the thornyhead catch in the GOA was estimated at 1,317 t. Catch estimates from 1977 to 1980 are based on the following reports: Wall et al. (1978, 1979, 1980, and 1981). Beginning in 1983, the observer program also estimated the catches of thornyheads in joint venture fisheries where U.S. catcher vessels delivered catch to foreign processor vessels, and beginning in 1984, thornyheads were identified as a separate entity in the U.S. domestic catch statistics. Data from 1981 to 1989 are based on reported domestic landings extracted from the Pacific Fishery Information Network (PacFIN) database and the reported foreign catch from the NMFS Observer Program. Catches from 1990 to 2002 are based on "blended" fishery observer and industry sources using an algorithm developed by the NMFS Alaska Regional Office (AKRO). Catches from 2003 to 2026 were provided by NMFS Regional Office Catch Accounting System (CAS) and accessed through the Alaska Fishery Information Network (AKFIN) database.

Catch trends for GOA thornyheads appear influenced primarily by management actions rather than from stock fluctuations. Catches of thornyheads in the GOA declined markedly in 1984 and 1985, mainly due to restrictions on foreign fisheries imposed by U.S. management policies. In 1985, the U.S. domestic catch surpassed the foreign catch for the first time. U.S. catches of thornyheads continued to increase, reaching a peak in 1989 with a total removal of 2,616 t. Catches have trended downwards since the early 1990s, except for a relatively higher and stable catch from 2013 to 2018; some of the lowest catches are in recent years (Table 15.1). Catches in recent years have generally been highest in the CGOA (Table 15.2).

Recent declines in thornyhead catch are related to the transition of the sablefish fishery from hook and line to pots. Use of pots for sablefish in the GOA was legalized in 2017, and by 2020, more sablefish were being caught by pots than hook and line (Cheng et al. 2024). Experimental studies comparing catch between hook and line and slinky pots on the AFSC LLS in 2021 found that slinky pots caught a lower proportion of non-sablefish species. Across all sets, 95–98% of all fish caught in pots were sablefish, whereas 79–87% of fish caught on hook-and-line sets were sablefish. The biggest species composition discrepancies between the two gear types were for giant grenadier and shortspine thornyhead; shortspine thornyhead made up 3 to 7% of the hook-and-line catches and only 0 to 0.2% of pot catches (Sullivan et al. 2022b). The spatial distribution of thornyhead catches in fixed gear (longline and pot) fisheries is predominantly in the EGOA, while the trawl catches are mainly in the CGOA and occasionally in the WGOA (Figure 15.1). Though hook and line made up a large historical proportion of thornyhead catch, most of the catch has shifted to trawl gear within the rockfish fishery in recent years (Tables 15.3 and 15.4). Most of the catches in the CGOA in the last few years is in the CGOA Rockfish Program which has been well below their TAC, and the CGOA TAC that is not given to the CGOA Rockfish Program is not being fully caught but was up in 2026 (Table 15.2, Figure 15.2). Since 2018, discards have dropped and stabilized at or below 50 t (Table 15.5). This can be somewhat attributed to a transition in sablefish from longline to pots as discussed above and to the regulatory change in March 2020 requiring full retention of rockfish by catcher vessels using fixed gear while fishing for groundfish or halibut.

Length composition data from the trawl and longline fisheries (1990–2026) indicate longline fisheries capture larger shortspine thornyheads than trawl fisheries (average length of 39.6 cm versus 28.2 cm), likely related to hook sizes too large for the smallest fish (Figure 15.3). Very few lengths from the GOA fishery have been recorded in recent years. Few age samples for this species have been collected from the fishery, and none have been aged.

Historically, except for the years 1992 to 1994, thornyhead total catch has been less than the ABC and TAC (Table 15.1). The high (relative to the TAC) thornyhead catches in 1992 to 1994 were attributed to high discards in the sablefish longline fishery during the years preceding the implementation of IFQs for sablefish in 1995. From 1980 to 1990, the ABCs and TACs were set at the estimate of maximum sustainable yield for thornyheads which was determined to be 3.8% of the 1987 estimated GOA biomass. The drop in ABC/TAC in 1991 was in response to a large decrease in estimated biomass from the GOA

BTS. The age-structured assessment model was suspended in 2003 due to uncertainty in the reliability of age and growth information. Consequently, a more conservative Tier 5 biomass-based approach for ABC and OFL specifications was adopted.

Survey catches of all thornyhead species are a very small component of overall removals, and recreational and other catches are assumed negligible. Estimates of non-commercial catches (research and sport) are given in Appendix 15A.

# Data

Time series of biomass for shortspine thornyhead were obtained from the following sources:

| Model | Source | Data | Years |
|---|---|---|---|
| M24.2a, M26 | AFSC GOA Longline Survey | Biomass Index | 1992–2023, 2025 |
| M24.2a | AFSC GOA Bottom Trawl Survey | Biomass Index | 1990–1999 (triennial), 2001–2023 (biennial) |
| M26 | AFSC GOA Bottom Trawl Survey | Biomass Index | 1999, 2003–2025 (biennial) |

## Survey

### *Longline Survey in the Gulf of Alaska*

The AFSC LLS has been conducted annually from 1988 to 2023. There was no survey in 2024. The LLS resumed in 2025 and going forward will sample the GOA ever other year in odd-numbered years. This survey samples the continental slope in the GOA, providing data to calculate relative abundance in this area (Rutecki et al. 2016, Siwicke and Malecha 2026). The survey is primarily directed at sablefish but also catches considerable numbers of thornyhead rockfish. The assessment model uses shortspine thornyhead RPWs beginning in 1992 from the AFSC LLS separated by management region (Table 15.6). The RPWs have declined across all regions in recent years; the exception being a large increase in the 2022 EGOA estimate which reversed in 2023 and a large increase in the WGOA in the 2025 survey (Table 15.6). Historically, there has been a considerable amount of fluctuation for thornyhead RPWs between adjacent years, and there was 21% increase in RPW estimate from 2023 to 2025 (Table 15.6). Spatially, the LLS catches shortspine thornyhead at nearly every station in the GOA, but the survey footprint only covers the continental shelf break from 151 to 1,000 m (Figure 15.4). Hook competition on the LLS with recently abundant sablefish has been discussed as a contributing factor to recent declines in thornyheads (Echave et al. 2022). Though not used in the assessment model, length composition data from the 1992–2025 LLS shows a stable mean length range between 35.2 and 38.3 cm (Figure 15.5). Overall, the LLS has caught shortspine thornyhead with a mean length of 36.4 cm (Figure 15.6). There is selectivity induced from the hook size, limiting the minimum size of shortspine thornyhead that can be sampled in the LLS, and this is not accounted for in the errors reported by the survey.

### *Trawl Survey in the Gulf of Alaska*

The AFSC BTS was conducted on a triennial basis in the GOA from 1984 through 1999, and these surveys became biennial starting in 2001. This survey employs standard NMFS Poly-Nor'eastern bottom trawl gear and provided biomass estimates using an "area-swept" methodology described in Wakabayashi et al. (1985). The BTS covered all areas of the GOA out to a depth of 500 m and in some years to 1,000 m, but the 2001 survey did not sample the EGOA. The 1990, 1993, 1996 and 2001 surveys did not survey depths > 500 m, and the 2003, 2011, 2013, 2017, 2019, 2021, 2023, and 2025 surveys did not survey depths > 700 m. It is evident from BTS results that a significant portion of the biomass of shortspine thornyheads exists at depths greater than 500 m (Table 15.7). In 1999, 2005, 2007, 2009, and 2015, the

surveys had the most extensive survey coverage of the primary thornyhead habitat (all depths sampled to 1,000 m). Biomass estimates for GOA thornyhead rockfish have sometimes shown rather large fluctuations between surveys (Table 15.7). The 2025 GOA biomass estimate decreased by 26% from the 2023 estimate, though the WGOA increased (Table 15.8). Spatial distributions of catches of thornyhead in the last three GOA BTSs indicate these species are rather evenly spread along an offshore band along the continental slope (Figure 15.4). Though not used in the assessment model, length compositions for thornyhead rockfish from the 1990–2025 BTS were generally consistent with means between 23.2 and 27.0 cm (Figure 15.7). The overall mean length for shortspine thornyhead captured by the BTS was 26.0 cm, which is smaller than the LLS (Figure 15.6).

Compared with many other rockfish species, the biomass estimates for thornyhead rockfish have historically been relatively precise with low CVs. The low CVs are consistent with this species being relatively evenly distributed on the sea floor. Despite the relatively precise biomass estimates, other factors could impact their reliability. Their main habitat is the upper continental slope at depths of 300–700 m. A considerable portion of this area is untrawlable by the survey's gear because of the area's steep and rocky bottom.

The GOA BTS was stratified beginning with the 2025 field season. The historical survey used 59 defined strata and Neyman allocation, whereas the revised design uses 28 strata based on NMFS statistical areas and an improved optimization procedure designed to minimize the coefficient of variation in biomass estimates across a suite of 15 groundfish species (Oyafuso et al. 2022). The restratification provides greater flexibility to accommodate potential changes in vessel availability and variable sampling resources. Evaluation of the new design has indicated changes in the scale of biomass estimates for some rockfish species, though these changes were unlikely due to redesign and more likely due to natural variation in these difficult to survey stocks (Laman et al. 2026).

# Analytic Approach

## Description of Model

Thornyhead biomass is estimated with a state-space random walk model fit with the *rema* R package (Sullivan et al. 2022a). Both BTS and LLS data affect the trends used to estimate the biomass and subsequent OFL/ABC. The application of the REMA model smooths trends in survey estimates. The process errors (step changes) from one year to the next are the random effects that are integrated over, and the process error variance terms are freely estimated. The observations can be irregularly spaced, so for years or strata with missing data, estimates can be made. Specified survey observation error terms (provided each year) effectively weight the survey estimates and can affect the predictions. Both Models 24.2a and 26 also estimate extra observation error for both the BTS and LLS. The only difference is the BTS input data, where Model 24.2a uses all BTS data from 1990 to 2023 (i.e., no data from 2025) and divides it into three depth strata (0–500m, 501–700m, and 701–1000m, Table 15.7) while Model 26 drops BTS data from 1990, 1993, 1996, and 2001 but includes 2025 and divides them into two depth strata (0–700m and 701–1000m, Table 15.8). The LLS RPWs are the same in both models (Table 15.6).

The Tier 5 estimate of the OFL is simply $M$ multiplied by the estimated exploitable biomass and under the FMP the maximum permissible ABC is 75% of OFL. Here we assume 0.03 as a value for M (see the Parameters Estimates section for how this estimate was derived).

Three models were presented with bridging at the September GOA groundfish Plan Team. Model 26 is being brought forward for this cycle.

# Results

The only parameter estimated independently of the assessment model is natural mortality (M). An M = 0.03 has been used for this stock for many years and is bracketed by various estimates in the literature. Recent radiometric analyses suggest that the maximum age is between 50 and 100 years (Kastelle et al. 2000, Cailliet et al. 2001), but these have high variance estimates due to sample pooling and other methodological issues. An analysis of reproductive information for Alaska and west coast populations also indicates that shortspine thornyheads are very long-lived (Pearson and Gunderson 2003). The longevity estimate was based on an empirically derived relationship between gonadosomatic index (GSI) and natural mortality (Gunderson 1997) and suggested much lower natural mortality rates (0.013–0.015) and therefore much higher maximum ages (250–313 years) than had ever been previously reported using any direct ageing method.

Results of an age study completed in August 2009 were limited as shortspine thornyheads are extremely difficult to age (Black 2009). Out of the 428 otoliths included in this study, an age was obtained for just over half of the samples. Approximately a quarter of the total number of otoliths (109 out of 428) were of a high enough clarity for ages to be considered reliable. Ageing confidence was found to decrease with fish age, compounding the difficulty in establishing a reasonable range of maximum ages. Maximum ages in this study were approximately 85 years, with the possibility of 100 years. These maximum ages are similar to other studies, including those that employed radiometric validation. All the samples for this study were selected from specimens >20 cm to obtain older aged individuals. Limited samples of this species were recently aged with confidence, but production aging is not occurring (Tenbrink 2025).

Although shortspine thornyheads are extremely difficult to age, studies seem to indicate that Miller's (1985) estimate of maximum age of 62 is low, and an estimate of $M = 0.07$ based on Ricker (1975) would be high. Conversely, the maximum ages implied by Pearson and Gunderson (2003, 250–313 years) may be high and infer natural mortality rates that may be inappropriately low. The maximum ages from Kline (1996) and Jacobson (1990) are 115 and 150 years, respectively. These maximum ages suggest natural mortality rates ranging from 0.027 to 0.036 if we apply the relationship developed by Hoenig (1983). Preliminary results from Black's (2009) work are in line with this estimate of $M$. Assuming $M = 0.03$ implies a longevity in the range of 125 years, which is bracketed by estimates derived from Jacobson (1990) and Kline (1996). Until we gather more information on shortspine thornyhead productivity, age, and growth in the GOA, we will continue to assume $M = 0.03$ is a reasonable estimate of $M$.

Fixed effects parameter estimates, for the bridging and candidate models in this analysis. Process error (PE) variances are listed first, followed by scaling parameters ($q$) and additional observation errors (+OE) by survey (i.e., bottom trawl survey = BTS and longline survey = LLS).

| Model | PE | $q$ | BTS+OE | LLS+OE |
|---|---|---|---|---|
| M24.2a | 0.16 | 0.60 | 0.14 | 0.07 |
| M26 | 0.13 | 0.59 | 0.10 | 0.07 |

The smaller process error and additional observation error in the BTS estimated by Model 26 are likely driven by dropping data from those partially sampled years (1990, 1993, 1996, and 2001) which had conflicted with the LLS estimates. Model fits to survey observations are shown for Model 24.2a (Figure 15.8) and Model 26 (Figure 15.9).

# Harvest Recommendations

Presently the Tier 5 approach is based solely on shortspine thornyheads; the rarely occurring longspine thornyheads are ignored. This is defensible because the latter are distributed deeper than where most fisheries operate. Also, the center of longspine thornyhead abundance appears to be off the U.S. West Coast and Alaskan waters may be near the limit of their range. In the future, if fisheries shift to deeper depths along the continental slope, and/or the catch of shortspine thornyheads increases dramatically, specific management measures for longspine thornyheads should be considered.

## Amendment 56 Reference Points

We recommend keeping thornyhead rockfish as "Tier 5" in the NPFMC definitions for ABC and OFL based on Amendment 56 to the GOA FMP. The population dynamics information available for Tier 5 species consists of reliable estimates of biomass and natural mortality $M$, and the definition states that for these species, the fishing rate that determines ABC (i.e., $F_{ABC}$) is $\leq 0.75*M$. Thus, the recommended $F_{ABC}$ for thornyhead rockfish is 0.0225 (i.e., 0.75 x $M$, where $M = 0.03$). The OFL for Tier 5 species is defined to occur at a harvest rate of $F = M$. As described in the previous section, the recommended REMA Model 26 was fit to the 1999–2025 (except for 2001) AFSC GOA BTS time-series of biomass values and estimates of uncertainty by region and depth strata (to account for missing survey data) and regional RPW indices from 1992 to 2025 AFSC LLS (with associated estimates of uncertainty; Figures 15.9 and 15.10). These regional biomass estimates from Model 26 were then summed to obtain 2027 GOA-wide biomass of 52,513 t (95% CI: [40,789, 67,607]; Table 15.9) for thornyhead rockfish (Figure 15.11).

## Specification of OFL and Maximum Permissible ABC

Applying the $F_{ABC}$ to the estimate of current exploitable biomass of 52,513 t (95% CI: [40,789, 67,607]) for thornyhead rockfish results in a GOA maximum permissible ABC of 1,182 t and OFL of 1,575 t for the 2027 fishery.

# Risk Table and ABC Recommendation

## Assessment Considerations

The GOA thornyhead stock complex assessment-related considerations score was Level 1: Normal. This is a Tier 5 species, meaning only reliable biomass estimates are available to calculate ABCs. The GOA thornyhead stock complex assessment is one of few Tier 5 assessments in Alaska that fits multiple abundance indices (BTS biomass estimates and LLS RPWs). In recent years, the BTS depth range has been restricted (the 1990, 1993, 1996, and 2001 surveys did not survey the depths >500 m, and the 2003, 2011, 2013, 2017, 2019, 2021, and 2023 surveys did not survey depths >700 m), which is thornyhead rockfish habitat. By including the LLS RPWs as an abundance index (which covers 151–1,000 m) and dividing the BTS into depth strata in the random effects model, we get informative biomass estimates for depths to 1,000 m. Inclusion of these two data sources has allowed for increased stability of biomass estimates and more consistent regional apportionments across time. This year we removed the BTS when it only partially sampled 0–700m (1990, 1993, 1996, and 2001) to accommodate the restratified survey which no longer has consistent depth breaks at 500 m.

## Population Dynamics Considerations

The GOA thornyhead stock complex population dynamics considerations score was Level 1: Normal. In general, very little is known regarding the life history of thornyhead, and current techniques do not produce reliable age estimates for the species, thus, we are unable to estimate recruitment with a statistical

model. Further, any data collected during larval cruises lump all rockfish species together and do not identify thornyheads to species. Recent trends in thornyhead biomass have declined more quickly than expected for a slow-growing long-lived species, but we do not know the mechanism. It is possible that the marine heatwave occurring from 2014 to 2016 (Bond et al. 2015) and again in 2019 (Amaya et al. 2020) could be influencing natural mortality, as the decline initiated around this time.

## Ecosystem Considerations

The GOA thornyhead rockfish ecosystem considerations score was Level 1: Normal. Slope benthic thermal conditions for adults in 2026 were unreported but shelf benthic temperatures ranged from cooler to warmer than average. The prey base for thornyhead rockfish is also poorly monitored but indicators of the GOA shelf forage fish and zooplankton were largely above average. Predation and competition are considered to remain moderate. We document concern due to the continued decline of sponges, which may be important habitat for thornyhead rockfish. There is a lack of a mechanistic understanding for the direct and indirect effects of environmental change on the survival and productivity of thornyhead rockfish.

Larval and pre-recruit ocean conditions in 2026 were cooler than 2025, but warmer surface waters in southeast AK and stronger circulation in the late spring/summer may have benefited larval rockfish survival (Jones et al., 2026, Danielson 2026, Worton 2026; in Ferriss 2026b). In 2025, spring larval surveys in Shelikof Strait observed above-average CPUE of larval rockfish, of a magnitude not recorded since 2011 (not identified to species; Rogers et al., 2025; in Ferriss 2026b), which may have benefited from warm spring/summer surface waters in the southeastern GOA and strong cross-shelf circulation transporting larvae to nearshore nursery habitat. Surface waters are predicted to warm with the development of a very strong El Niño in winter 2027, which may benefit age-0 rockfish survival (Lemagie, 2026; in Ferriss 2026b).

Benthic thermal conditions for adults (shortspine thornyhead: 100–600 m initially and move deeper as grow, and longspine thornyhead: 600–1,200m) are unknown in 2026 but shelf conditions in general were approximately cool to average in the WGOA and potentially warmer than average in the EGOA (satellite-derived data, Lemagie 2026; Seward Line, Danielson 2026, winter Shelikof survey, Jones et al., 2026; in Ferriss 2026b). AFSC BTS data revealed a general decrease in depth in shortspine thornyhead rockfish distribution since 2009 within the GOA, including from 2023 to 2025 (Dowlin et al.2025; in Ferriss 2026a); however, it is possible that fewer deep stations that have occurred during this time are influencing this trend. Thornyhead live in reduced oxygen environments (due to depth) and a decrease in dissolved oxygen in those habitats may drive shifts in distribution to shallower waters (unmonitored in the GOA but reported in other regions/species). The relative biomass index of sponges, structural habitat of importance, continues a multi-year trend of more than one standard deviation below average in 2025, observed in NOAA's bottom trawl (Conrath 2025; in Ferriss 2026a) and non-target catch (Whitehouse 2026; in Ferriss 2026b). El Niño conditions in 2027 are not expected to affect the slope habitat of shortspine thornyhead rockfish at their adult depths.

The prey base for adult thornyhead rockfish is largely unmonitored on the slope, however shelf conditions were potentially limiting in 2025 and productive in 2026. GOA forage fish prey base on the shelf was average to above average in 2026 (similar to 2024). Relative to the past few years, Southeast Alaska, Sitka, and Craig herring populations remained elevated, capelin populations are moderate, sand lance populations remain reduced, and eulachon populations show mixed trends (Whelan et al. 2026, Dressel et al., 2026, Pochardt et al. 2026, Arimitsu et al., 2026; in Ferriss 2026b). The reproductive success of piscivorous, diving seabirds (with an overlapping prey base with juvenile sablefish), was generally above average across the GOA (Drummond 2026, Whelan 2026; in Ferriss 2026b). Spring euphausiid biomass was above average in the CGOA (Seward Line, Hopcroft 2026; In Ferriss 2026b). Benthic slope prey is

not well monitored. Shelf benthic prey includes below-average tanner crab observations in the ADFG Kodiak survey (Worton 2026; in Ferriss 2026b) and 2025 was unchanged from 2023 (lower) in non-target catch of assorted benthic inverts (sea stars, small crabs, etc., Whitehouse 2026; in Ferriss 2026b). Other important prey of shortspine thornyhead rockfish include poorly monitored crabs, amphipods, and other benthic invertebrates (with juveniles more reliant on invertebrates).

There is no indication of increased predation or competition on thornyhead rockfish. Little is known about the impacts of predators, such as fish and marine mammals. However, survival of larvae is thought to be more related to the abundance and timing of prey availability than predation, due to the lack of rockfish as a prey item in diets. Competition for zooplankton in 2026 is a balance of increased zooplankton biomass, low returns of pink salmon in 2026 (Whitehouse 2026, Vulstek et al., 2026; in Ferriss 2026b) and relatively high abundance of other zooplanktivorous competitors include Pacific ocean perch and walleye pollock. Multiple large year classes of sablefish since 2016 are maturing and moving to adult slope habitat, potentially increasing the overlap in distribution and potential for competition.

### Fishery-informed Stock Considerations

The GOA thornyhead stock complex fishery-informed stock consideration score was Level 1: Normal. Thornyheads are generally retained as incidental catch. Catch of thornyheads in the GOA has remained relatively low in recent years. The primary reason for lower catch is the increase in the use of pot gear within the IFQ sablefish fishery which does not catch thornyheads as effectively as longline gear. Low catch of this non-directed fishery complex has historically remained below the TAC. Fisheries removals have been relatively low for the last 8 years, while biomass estimates have declined over that period. This suggests that fishing is not driving these observed declines.

*Summary and ABC Recommendation*

| Assessment-related considerations | Population dynamics considerations | Ecosystem considerations | Fishery-informed stock considerations |
|---|---|---|---|
| **Level 1:** Normal | **Level 1:** Normal | **Level 1:** Normal | **Level 1:** Normal |

The summarized results of the risk table suggest no need to set the ABC below the maximum permissible.

## Spatial Apportionment: Biologically-informed Recommended Distributions (BRDs)

We used the REMA model to estimate area-specific biomass estimates to apportion the GOA ABC of 1,182 t into BRDs. The fit of this model is shown in Figures 15.10 and 15.11 with values in Table 15.9. Historical TAC and catch by area are shown in Table 15.2. For 2027, the estimated BRDs of ABC are:

| Year | WGOA | CGOA | EGOA | Total |
|---|---|---|---|---|
| 2027 | 266 | 527 | 389 | 1,182 |
| 2028 | 266 | 527 | 389 | 1,182 |

## Status Determination

Based on Amendment 56 of the GOA FMP, overfishing for a Tier 5 complex, such as thornyheads, is defined to occur at a harvest rate of $F = M$. Therefore, applying the estimate of $M$ for thornyhead rockfish (0.03) to the estimate of current exploitable biomass (52,513 t) yields an OFL of 1,575 t for 2027. The

OFL in 2025 was 1,784 t while the catch was 130 t, so the GOA thornyhead complex is not subjected to overfishing.

## Data Gaps and Research Priorities

In 2024, REMA model validation was explored (Balstad et al. 2024). The current thornyhead model still estimates additional observation error for each survey, and the inclusion of these parameters causes identifiability issues and violates model assumptions. We will likely explore the use of a prior on the process error to keep it within expected values for a slow-growing long-lived species without estimating additional observation error. Alternatively, we will consider a minimum CV (e.g., 0.1 or 0.15) which would only inflate observation error on overly optimistic estimates but not reasonably large ones.

With recent changes to the BTS stratification, we have become interested in investigating a model-based index (e.g., using the r package *sdmTMB*), with depth as a covariate. We know thornyhead habitat includes deep waters >500 m, but the BTS does not sample these depths very much as they are a small fraction of the entire GOA. We hope to provide this comparison to design-based estimates for the next scheduled assessment in 2028.

Aging thornyheads continues to be a data gap. Recent work by Tenbrink (2025) suggests some confidence, but there is no production aging occurring currently.

## Acknowledgements

We thank the past developers of this stock assessment: Sarah Gaichas, Sandra Lowe, Jim Ianelli, Pete Hulson, and Jane Sullivan.

## Literature Cited

Baetscher, D. S., N. Howe, L. E. Timm, R. N. Lou, W. Cheng, J. R. Hyde, K. M. Nichols, G. L. Owens, P. H. Sudmant, and W. Larson. 2026. Cryptic Diversity and Patterns of Structure in Nine Species of North Pacific Rockfishes (*Sebastes* spp. and *Sebastolobus* spp.). Mol Ecol 35(20): p.e70601.

Balstad, L.J., J. Sullivan, and C. Monnahan. 2024. A Plain Language Guide to Model Validation in REMA. 2024 September Plan Team Document.

Berger, J. D, J. E. Smoker, and K. A. King. 1986. Foreign and joint venture catches and allocations in the Pacific Northwest and Alaska fishing area under the Magnuson Fishery Conservation and Management Act, 1977-84. NOAA Tech. Memo. NMFS F/NWC-99. 53p.

Black, B. 2009. Shortspine thornyhead ageing and chronology development. Report to the Alaska Fisheries Science Center, Age and Growth Lab, 7600 Sand Point Way NE, Seattle WA 98115.

Cailliet, G. M., A. H. Andrews, E. J. Burton, D. L. Watters, D. E. Kline, and L. A. Ferry-Grahan. 2001. Age determination and validation studies of marine fishes; do deep-dwellers live longer? Exp Gerontology 36:739–764.

Cheng, M. L., D. R. Goethel, and C. J. Cunningham. 2024. Addressing complex fleet structure in fishery stock assessment models: Accounting for a rapidly developing pot fishery for Alaska sablefish (*Anoplopoma fimbria*). Fish Res (271):1–15.

Chitwood, P. E. 1969. Japanese, Soviet, and South Korean fisheries off Alaska, development and history through l966. U.S. Fish Wildl. Serv., Circ. 310, 34 p.

Du Preez, C., and V. Tunnicliffe. 2011. Shortspine thornyhead and rockfish (Scorpaenidae) distribution in response to substratum, biogenic structures and trawling. Mar Ecol Prog Ser 425:217–231.

Echave, K. B. 2017. First results of the tagging of shortspine thornyhead, *Sebastolobus alascanus*, in Alaska. Fish Res 195:46–51.

Echave, K. B., K. A. Siwicke, J. Sullivan, B. Ferriss, and P. F. Hulson. 2022. Assessment of the Thornyhead stock complex in the Gulf of Alaska. North Pacific Fishery Management Council, Anchorage, AK. Available from https://www.npfmc.org/library/safe-reports/

Else, P., L. Haldorson, and K. Krieger. 2002. Shortspine thornyhead (*Sebastolobus alascanus*) abundance and habitat associations in the Gulf of Alaska. Fish Bull 100:193–199.

Eschmeyer, W. N., E. S. Herald, and H. Hammann. 1983. A Field Guide to Pacific Coast Fishes. Houghton Mifflin Co, Boston MA, 336 p.

Ferriss, B.E. 2026a. Abbreviated Ecosystem Status Report 2025: Gulf of Alaska, Stock Assessment and Fishery Evaluation Report for the Groundfish Resources of the Gulf of Alaska, North Pacific Fishery Management Council, 1007 West Third, Suite 400, Anchorage, Alaska 99501

Ferriss, B.E. 2026b. Ecosystem Status Report 2026: Gulf of Alaska, Stock Assessment and Fishery Evaluation Report for the Groundfish Resources of the Gulf of Alaska, North Pacific Fishery Management Council, 1007 West Third, Suite 400, Anchorage, Alaska 99501

French, R., J. Wall, and V. Wespestad. 1977. The catch of rockfish other than Pacific ocean perch by Japan and the USSR in the Gulf of Alaska. Document submitted to the annual meeting of the INPFC 1977. Northwest and Alaska Fish. Sci. Center, NMFS NOAA, 2725 Montlake Blvd. E. Seattle WA 98112.

Gunderson, D. R. 1997. Trade-off between reproductive effort and adult survival in oviparous and viviparous fishes. Can J Fish Aquat Sci 54:990–998.

Hoenig, J. M. 1983. Empirical use of longevity data to estimate mortality rates. Fish Bull 82: 898.903.

Hulson, P. J. F., K. B. Echave, P. D. Spencer, and J. N. Ianelli. 2021. Using multiple indices for biomass and apportionment estimation of Alaska groundfish stocks. U.S. Dep. Commer. NOAA Tech. Memo. NMFS-AFSC-414, 28 p.

Ianelli, J. N., and D. H. Ito. 1995. Thornyheads. *In*: Stock assessment and fishery evaluation report for the groundfish resources of the Gulf of Alaska as projected for 1996. Nov. 1995. N. Pac. Fish. Mgt. Council, P.O Box 103136, Anchorage, AK 99510.

Ianelli, J. N., D. H. Ito, and M. Martin. 1997. Thornyheads. *In*: Stock assessment and fishery evaluation report for the groundfish resources of the Gulf of Alaska as projected for 1998. Nov. 1997. N. Pac. Fish. Mgt. Council, P.O Box 103136, Anchorage, AK 99510.

Ito, D. H. 1982. A cohort analysis of Pacific Ocean perch stocks from the Gulf of Alaska and Bering Sea regions. Seattle: University of Washington Masters' Thesis, 157 pp.

Jacobson, L. D. 1990. Thornyheads--stock assessment for 1990. Appendix D. *In*: Status of the pacific coast groundfish fishery through 1990 and recommended acceptable biological catches for 1991. Pacific Fishery Management Council. Portland, Oregon.

Jacobson, L. D., and R. D. Vetter. 1996. Bathymetric demography and niche separation of thornyhead rockfish: *Sebastolobus alascanus* and *Sebastolobus altivelis*. Can J Fis. Aquat Sci 53:600–609.

Jones, D. T., C. D. Wilson, A. DeRobertis, C. N. Rooper, T. C. Weber, and J. L. Butler. 2012. Evaluation of rockfish abundance in untrawlable habitat: combining acoustic and complementary sampling tools. Fish Bull 110:332–343.

Kastelle, C. R., D. K. Kimura, and S. R. Jay. 2000. Using 210Pb/226Ra disequilibrium to validate conventional ages in Scorpaenids (genera *Sebastes* and *Sebastolobus*). Fish Res 46:299–312.

Kline, D. E. 1996. Radiochemical age verification for two deep-sea rockfishes *Sebastolobus altivelis* and *S. alascanus*. M.S. Thesis, San Jose State University, San Jose CA, 124 pp.

Laman, E. A., S. Kotwicki, and C. N. Rooper. 2015. Correlating environmental and biogenic factors with abundance and distribution of Pacific ocean perch (*Sebastes alutus*) in the Aleutian Islands, Alaska. Fish Bull 113:270–289.

Laman, N., P. Hulson, Z. Oyafuso, S. Rohan, M. C. Siple, M. Haltuch, C. Lunsford, and S. Kotwicki. 2026. Alaska Fisheries Science Center Gulf of Alaska Resource Assessment Survey Redesign and Optimization: Evaluation of 2025 Survey Results. 2026 June SSC GOA Survey Report.

Love, M. S., M. Yoklavich, and L. Thorsteinson. 2002. The rockfishes of the northeast Pacific. University of California Press, Berkeley CA, 405 p.

Love, M. S., C. W. Mecklenberg, T. A. Mecklenberg, and L. K. Thorsteinson. 2005. Resource inventory of marine and estuarine fishes of the West Coast and Alaska: a checklist of north Pacific and Arctic Ocean species from Baja California to the Alaska-Yukon Border. U.S. Department of the Interior, U.S. Geological Survey, Biological Resources Division, Seattle, Washington, 98104, OCS Study MMS 2005-030 and USGS/NBII 2005-001.

Miller, P. P. 1985. Life history study of the shortspine thornyhead, *Sebastolobus alascanus*, at Cape Ommaney, south-eastern Alaska. M.S. Thesis, Univ. Alaska, Fairbanks, AK, 61 p.

Moser, H. G. 1974. Development and distribution of larvae and juveniles of *Sebastolobus* (Pisces; family Scorpaenidae). Fish Bull 72:865–884

Oyafuso, Z.S., L. A.K. Barnett, M.C. Siple, and S. Kotwicki. 2022. A flexible approach to optimizing the Gulf of Alaska groundfish bottom trawl survey design for abundance estimation. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-AFSC-434, 142 p.

Pearson, K. E., and D. R. Gunderson, 2003. Reproductive biology and ecology of shortspine thornyhead rockfish (*Sebastolobus alascanus*) and longspine thornyhead rockfish (*S. altivelis*) from the northeastern Pacific Ocean. Environ Biol Fish 67:117–136.

Ricker, W. E. 1975. Computation and interpretation of biological statistics of fish populations. Bul. Fish. Res. Board Can. No. 191, 382 p.

Rooper, C. N. and M. H. Martin. 2012. Comparison of habitat-based indices of abundance with fishery-independent biomass estimates from bottom trawl surveys. Fish Bull 110:21–35.

Rooper, C. N., M. H. Martin, J. L Butler, D. T. Jones, and M. Zimmermann. 2012. Estimating species and size composition of rockfishes to verify targets in acoustic surveys of untrawlable areas. Fish Bull 110:317–331.

Rutecki, T. L., C. J. Rodgveller, and C. R. Lunsford. 2016. National Marine Fisheries Service longline survey data report and survey history, 1990–2014. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-AFSC-324, 329 p.

Siwicke, K. A., K. B. Echave, and B. Ferriss. 2024. Assessment of the Thornyhead stock complex in the Gulf of Alaska. North Pacific Fishery Management Council, Anchorage, AK. Available from https://www.npfmc.org/library/safe-reports/

Siwicke, K., and P. Malecha. 2026. The 2025 longline survey of the Gulf of Alaska on the FV Alaskan Leader: Cruise Report AL-25-01. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-AFSC-509, 32 p.

Sullivan, J. Y., C. Monnahan, P. Hulson, J. Ianelli, J. Thorson, and A. Havron. 2022a. REMA: a consensus version of the random effects model for ABC apportionment and Tier 4/5 assessments. Plan Team Report, Joint Groundfish Plan Teams, North Pacific Fishery Management Council. 605 W 4th Ave, Suite 306 Anchorage, AK 99501.

Sullivan, J., J. A. Dimond, and P. Malecha. 2022b. Slinky pot and hook-and-line comparison project during the experimental leg of the 2021 AFSC sablefish longline survey. AFSC Processed Rep. 2022-02, 18 p. Alaska Fish. Sci. Cent., NOAA, Natl. Mar. Fish. Serv., Auke Bay Laboratories, 17109 Pt. Lena Loop Road, Juneau, AK, 99801.

TenBrink, T., 2025. Reproductive biology and age at maturity of shortspine thornyhead (Sebastolobus alascanus) in Alaska. Fish Bull 123:235–250.

Wakabayashi, K., R. G. Bakkala, and M. S. Alton. 1985. Methods of the U.S.-Japan demersal trawl surveys. P. 7–29. *In* R.G. Bakkala and K. Wakabayashi (eds.), Results of cooperative U.S.-Japan groundfish investigations in the Bering Sea during May–August 1979. Int. North Pac. Fish. Comm., Bull. 44.

Wakefield, W. W. 1990. Patterns in the distribution of demersal fishes on the upper continental slope off central California with studies on the role of ontogenetic vertical migration in particle flux. PhD dissertation, University of California: San Diego, CA. 281 p.

Wall, J., R. French, R. Nelson Jr., and D. Hennick. 1978. Observations of foreign fishing fleets in the Gulf of Alaska, 1977. Document submitted to the annual meeting of the INPFC 1978. Northwest and Alaska Fish. Sci. Center, NMFS NOAA, 2725 Montlake Blvd. E. Seattle WA 98112.

Wall, J., R. French, and R. Nelson Jr. 1979. Observations of foreign fishing fleets in the Gulf of Alaska, 1978. Document submitted to the annual meeting of the INPFC 1979. Northwest and Alaska Fish. Sci. Center, NMFS NOAA, 2725 Montlake Blvd. E. Seattle WA 98112.

Wall, J., R. French, and R. Nelson Jr. 1980. Observations of foreign fishing fleets in the Gulf of Alaska, 1979. (Document submitted to the annual meeting of the INPFC, Anchorage, AK. Sept. 1979.) 78 p. Northwest and Alaska Fish. Sci. Center, NMFS NOAA, 2725 Montlake Blvd. E. Seattle WA 98112.

Wall, J., R. French, and R. Nelson Jr. 1981. Observations of foreign fishing fleets in the Gulf of Alaska, 1980. (Document submitted to the annual meeting of the INPFC, Vancouver, B.C., Canada. Sept. 1981.) Northwest and Alaska Fish. Sci. Center, NMFS NOAA, 2725 Montlake Blvd. E. Seattle WA 98112.

# Tables

**Table 15.1.** History of management measures with associated time series of catch (t), overfishing limit (OFL, t), acceptable biological catch (ABC, t), and total allowable catch (TAC, t) for Gulf of Alaska (GOA) thornyheads accessed on October 1, 2026.

| Year | Catch | OFL | ABC | TAC | Management measure |
|---|---|---|---|---|---|
| 1980 | 1,485 | | 3,750 | 3,750 | Thornyheads became a reported species group and managed as a single stock, while previously they were in the rockfish management group (1977) and then "other fish" (1979), with the TAC set GOA wide starting in 1979 |
| 1981 | 1,340 | | 3,750 | 3,750 | |
| 1982 | 787 | | 3,750 | 3,750 | |
| 1983 | 729 | | 3,750 | 3,750 | |
| 1984 | 208 | | 3,750 | 3,750 | |
| 1985 | 82 | | 3,750 | 3,750 | |
| 1986 | 714 | | 3,750 | 3,750 | |
| 1987 | 1,877 | | 3,750 | 3,750 | |
| 1988 | 2,181 | | 3,750 | 3,750 | |
| 1989 | 2,616 | | 3,800 | 3,800 | |
| 1990 | 1,576 | | 3,800 | 3,800 | |
| 1991 | 1,535 | | 1,798 | 1,398 | |
| 1992 | 2,025 | 2,440 | 1,798 | 1,798 | |
| 1993 | 1,337 | 1,441 | 1,180 | 1,062 | |
| 1994 | 1,236 | 1,440 | 1,180 | 1,180 | |
| 1995 | 1,027 | 2,660 | 1,900 | 1,900 | |
| 1996 | 1,013 | 2,200 | 1,560 | 1,248 | |
| 1997 | 1,109 | 2,400 | 1,700 | 1,700 | |
| 1998 | 1,149 | 2,840 | 2,000 | 2,000 | The NPFMC apportions the ABC and TAC into three geographic management areas: the Western, Central, and Eastern GOA |
| 1999 | 1,113 | 2,800 | 1,990 | 1,990 | |
| 2000 | 1,134 | 2,820 | 2,360 | 2,360 | Amendment 41 prohibited trawling in the Eastern GOA east of 140 degrees W |
| 2001 | 995 | 2,770 | 2,310 | 2,310 | |
| 2002 | 1,046 | 2,330 | 1,990 | 1,990 | |
| 2003 | 1,133 | 3,050 | 2,000 | 2,000 | Age-structured assessment model suspended, transition from Tier 3 to Tier 5 |
| 2004 | 823 | 2,590 | 1,940 | 1,940 | |
| 2005 | 720 | 2,590 | 1,940 | 1,940 | |
| 2006 | 781 | 2,945 | 2,209 | 2,209 | |
| 2007 | 798 | 2,945 | 2,209 | 2,209 | Amendment 68 creates the Central Gulf Rockfish Pilot Program |
| 2008 | 736 | 2,540 | 1,910 | 1,910 | |
| 2009 | 665 | 2,540 | 1,910 | 1,910 | |
| 2010 | 568 | 2,360 | 1,770 | 1,770 | |
| 2011 | 629 | 2,360 | 1,770 | 1,770 | |
| 2012 | 739 | 2,220 | 1,665 | 1,665 | The Central Gulf Rockfish Program is permanently put into place |
| 2013 | 1,117 | 2,220 | 1,665 | 1,665 | |
| 2014 | 1,116 | 2,454 | 1,841 | 1,841 | |
| 2015 | 1,008 | 2,454 | 1,841 | 1,841 | |
| 2016 | 1,111 | 2,615 | 1,961 | 1,961 | |
| 2017 | 1,002 | 2,615 | 1,961 | 1,961 | Pot gear was legalized in the Gulf of Alaska |
| 2018 | 1,179 | 2,717 | 2,038 | 2,038 | |
| 2019 | 764 | 2,688 | 2,016 | 2,016 | |

**Table 15.1.** cont.

| Year | Catch | OFL | ABC | TAC | Management Measure |
|---|---|---|---|---|---|
| 2020 | 453 | 2,688 | 2,016 | 2,016 | Amendment 107 requires GOA wide full retention of rockfish by catcher vessels using pot, hook-and-line, and jig gear while fishing for groundfish or halibut. |
| 2021 | 274 | 2,604 | 1,953 | 1,953 | |
| 2022 | 359 | 2,604 | 1,953 | 1,953 | |
| 2023 | 208 | 2,170 | 1,628 | 1,628 | |
| 2024 | 169 | 2,170 | 1,628 | 1,628 | |
| 2025 | 130 | 1,784 | 1,338 | 1,338 | |
| 2026 | 182 | 1,784 | 1,338 | 1,338 | |

**Table 15.2.** Total Allowable Catch (TAC) and catch (t) by management area in the Gulf of Alaska (GOA) for thornyheads, including the limits and catch in the Central GOA Rockfish Program (RP). Catch data was accessed on October 1, 2026.

| Year | WGOA | | CGOA | | | | EGOA | |
|---|---|---|---|---|---|---|---|---|
| | TAC | Catch | TAC | RP Limit | Catch | RP Catch | TAC | Catch |
| 1991 | | 689 | | | 596 | | | 250 |
| 1992 | | 249 | | | 1015 | | | 761 |
| 1993 | | 110 | | | 849 | | | 378 |
| 1994 | | 162 | | | 733 | | | 341 |
| 1995 | | 158 | | | 603 | | | 267 |
| 1996 | | 177 | | | 595 | | | 241 |
| 1997 | | 148 | | | 716 | | | 244 |
| 1998 | 250 | 238 | 710 | | 716 | | 1,040 | 195 |
| 1999 | 260 | 283 | 700 | | 583 | | 1,030 | 247 |
| 2000 | 430 | 340 | 990 | | 551 | | 940 | 244 |
| 2001 | 420 | 276 | 970 | | 523 | | 920 | 196 |
| 2002 | 360 | 372 | 840 | | 505 | | 790 | 169 |
| 2003 | 360 | 317 | 840 | | 715 | | 800 | 101 |
| 2004 | 410 | 276 | 1,010 | | 409 | | 520 | 138 |
| 2005 | 410 | 190 | 1,010 | | 391 | | 520 | 140 |
| 2006 | 513 | 197 | 989 | | 400 | | 707 | 184 |
| 2007 | 513 | 342 | 989 | 235 | 258 | 69 | 707 | 197 |
| 2008 | 267 | 270 | 860 | 194 | 299 | 58 | 783 | 167 |
| 2009 | 267 | 235 | 860 | 193 | 276 | 39 | 783 | 154 |
| 2010 | 425 | 140 | 637 | 194 | 278 | 81 | 708 | 151 |
| 2011 | 425 | 159 | 637 | 193 | 303 | 81 | 708 | 167 |
| 2012 | 150 | 171 | 766 | 263 | 345 | 84 | 749 | 222 |
| 2013 | 150 | 293 | 766 | 263 | 519 | 132 | 749 | 305 |
| 2014 | 235 | 239 | 875 | 300 | 660 | 189 | 731 | 217 |
| 2015 | 235 | 225 | 875 | 300 | 573 | 205 | 731 | 210 |
| 2016 | 291 | 198 | 988 | 339 | 691 | 295 | 682 | 221 |
| 2017 | 291 | 141 | 988 | 339 | 613 | 276 | 682 | 248 |
| 2018 | 344 | 172 | 921 | 316 | 684 | 264 | 773 | 322 |
| 2019 | 326 | 121 | 911 | 313 | 379 | 87 | 779 | 264 |
| 2020 | 326 | 49 | 911 | 313 | 206 | 113 | 779 | 198 |
| 2021 | 352 | 42 | 910 | 312 | 101 | 78 | 691 | 130 |
| 2022 | 352 | 110 | 910 | 312 | 173 | 112 | 691 | 76 |
| 2023 | 314 | 59 | 693 | 238 | 91 | 75 | 621 | 58 |
| 2024 | 314 | 37 | 693 | 238 | 65 | 51 | 621 | 66 |
| 2025 | 206 | 18 | 590 | 203 | 74 | 58 | 542 | 38 |
| 2026 | 206 | 36 | 590 | 203 | 113 | 61 | 542 | 32 |

**Table 15.3.** Estimated catch retained and discarded of Gulf of Alaska thornyheads (t) by gear type accessed on October 1, 2026.

| | Trawl gear | | | Longline gear | | |
|---|---|---|---|---|---|---|
| Year | Retained | Discarded | Total | Retained | Discarded | Total |
| 1982 | 669 | - | 669 | 118 | - | 118 |
| 1983 | 620 | - | 620 | 109 | - | 109 |
| 1984 | 177 | - | 177 | 31 | - | 31 |
| 1985 | 70 | - | 70 | 12 | - | 12 |
| 1986 | 607 | - | 607 | 107 | - | 107 |
| 1987 | 1,863 | - | 1,863 | 14 | - | 14 |
| 1988 | 2,132 | - | 2,132 | 49 | - | 49 |
| 1989 | 2,547 | - | 2,547 | 69 | - | 69 |
| 1990 | 1,233 | 38 | 1,271 | 284 | 20 | 304 |
| 1991 | 1188 | 60 | 1248 | 233 | 53 | 287 |
| 1992 | 1041 | 129 | 1169 | 499 | 356 | 855 |
| 1993 | 489 | 173 | 663 | 377 | 297 | 674 |
| 1994 | 488 | 222 | 710 | 250 | 277 | 527 |
| 1995 | 471 | 165 | 635 | 315 | 77 | 391 |
| 1996 | 435 | 170 | 606 | 313 | 94 | 407 |
| 1997 | 567 | 224 | 791 | 269 | 50 | 319 |
| 1998 | 625 | 112 | 737 | 363 | 49 | 412 |
| 1999 | 597 | 197 | 794 | 277 | 42 | 320 |
| 2000 | 557 | 92 | 649 | 397 | 75 | 472 |
| 2001 | 479 | 52 | 532 | 425 | 37 | 462 |
| 2002 | 500 | 89 | 589 | 410 | 46 | 457 |
| 2003 | 705 | 70 | 775 | 321 | 36 | 357 |
| 2004 | 414 | 66 | 480 | 314 | 30 | 343 |
| 2005 | 333 | 27 | 360 | 319 | 41 | 360 |
| 2006 | 297 | 60 | 357 | 387 | 37 | 424 |
| 2007 | 368 | 11 | 379 | 370 | 49 | 419 |
| 2008 | 318 | 29 | 347 | 330 | 59 | 390 |
| 2009 | 252 | 25 | 277 | 320 | 69 | 388 |
| 2010 | 179 | 15 | 193 | 316 | 59 | 375 |
| 2011 | 215 | 31 | 245 | 324 | 59 | 384 |
| 2012 | 141 | 57 | 197 | 426 | 115 | 542 |
| 2013 | 199 | 17 | 216 | 477 | 424 | 901 |
| 2014 | 461 | 16 | 477 | 457 | 182 | 639 |
| 2015 | 317 | 27 | 344 | 459 | 205 | 664 |
| 2016 | 411 | 69 | 480 | 454 | 177 | 631 |
| 2017 | 379 | 26 | 406 | 434 | 161 | 596 |
| 2018 | 424 | 51 | 474 | 494 | 209 | 703 |
| 2019 | 294 | 18 | 312 | 377 | 73 | 451 |
| 2020 | 192 | 11 | 203 | 225 | 18 | 243 |
| 2021 | 137 | 9 | 147 | 109 | 11 | 120 |
| 2022 | 254 | 23 | 277 | 69 | 6 | 75 |
| 2023 | 130 | 8 | 139 | 52 | 11 | 63 |
| 2024 | 99 | 14 | 113 | 41 | 11 | 52 |
| 2025 | 79 | 11 | 90 | 24 | 11 | 35 |
| 2026 | 115 | 41 | 156 | 15 | 6 | 21 |

**Table 15.4.** Estimated catch (t) of thornyhead rockfish in the Gulf of Alaska by target fishery accessed on October 1, 2026.

| Year | Rockfish | Sablefish | Flatfish | Halibut | Other |
|---|---|---|---|---|---|
| 2005 | 322 | 337 | 35 | 21 | 6 |
| 2006 | 312 | 386 | 52 | 31 | 1 |
| 2007 | 300 | 398 | 50 | 42 | 8 |
| 2008 | 248 | 389 | 62 | 30 | 8 |
| 2009 | 177 | 371 | 69 | 40 | 8 |
| 2010 | 106 | 367 | 57 | 32 | 6 |
| 2011 | 161 | 381 | 52 | 26 | 10 |
| 2012 | 129 | 539 | 45 | 23 | 4 |
| 2013 | 108 | 898 | 62 | 40 | 9 |
| 2014 | 244 | 634 | 143 | 33 | 62 |
| 2015 | 220 | 655 | 61 | 41 | 31 |
| 2016 | 337 | 620 | 27 | 38 | 89 |
| 2017 | 363 | 555 | 20 | 33 | 31 |
| 2018 | 362 | 711 | 55 | 45 | 6 |
| 2019 | 177 | 429 | 12 | 31 | 2 |
| 2020 | 138 | 246 | 55 | 14 | 0 |
| 2021 | 113 | 121 | 24 | 12 | 3 |
| 2022 | 215 | 88 | 40 | 10 | 6 |
| 2023 | 123 | 67 | 1 | 8 | 9 |
| 2024 | 88 | 63 | 3 | 9 | 6 |
| 2025 | 57 | 52 | 8 | 5 | 8 |
| 2026 | 84 | 67 | 23 | 6 | 2 |

**Table 15.5.** Estimated Gulf of Alaska (GOA) thornyhead discards (t) by target fishery accessed on October 1, 2026.

| Year | Rockfish | Sablefish | Flatfish | Halibut | Other | GOA Total | GOA Rate |
|---|---|---|---|---|---|---|---|
| 2005 | 23 | 38 | 4 | 2 | 0 | 68 | 9.5% |
| 2006 | 56 | 36 | 3 | < 1 | < 1 | 97 | 12.4% |
| 2007 | 4 | 40 | 5 | 11 | < 1 | 60 | 7.5% |
| 2008 | 16 | 63 | 8 | < 1 | 1 | 88 | 12.0% |
| 2009 | 18 | 64 | 2 | 9 | < 1 | 94 | 14.1% |
| 2010 | 7 | 57 | 5 | 4 | < 1 | 73 | 12.9% |
| 2011 | 19 | 62 | 7 | < 1 | 1 | 90 | 14.3% |
| 2012 | 21 | 119 | 31 | 0 | < 1 | 172 | 23.3% |
| 2013 | 5 | 419 | 2 | 10 | 5 | 441 | 39.5% |
| 2014 | 10 | 176 | 2 | 8 | 2 | 198 | 17.8% |
| 2015 | 11 | 199 | 6 | 12 | 5 | 232 | 23.0% |
| 2016 | 7 | 179 | 2 | 5 | 53 | 246 | 22.1% |
| 2017 | 23 | 149 | 3 | 6 | 7 | 188 | 18.7% |
| 2018 | 20 | 231 | < 1 | 9 | < 1 | 260 | 22.1% |
| 2019 | 13 | 70 | 4 | 4 | < 1 | 92 | 12.0% |
| 2020 | 8 | 19 | 3 | < 1 | < 1 | 30 | 6.7% |
| 2021 | 6 | 12 | 1 | 2 | < 1 | 21 | 7.9% |
| 2022 | 12 | 11 | 4 | 1 | 2 | 30 | 8.4% |
| 2023 | 5 | 6 | 1 | 2 | 7 | 21 | 9.9% |
| 2024 | 10 | 6 | 1 | 3 | 6 | 26 | 15.5% |
| 2025 | 2 | 16 | <1 | <1 | 5 | 24 | 18.3% |
| 2026 | 12 | 31 | 2 | 3 | 1 | 49 | 26.5% |

**Table 15.6.** Design-based estimates with coefficient of variation (CV) of Gulf of Alaska shortspine thornyhead relative population weight (RPW) by management region (western, central and eastern GOA or WGOA, CGOA, and EGOA) covering 151–1000 m along the continental shelf break. These are inputs used in both models provided by the Alaska Fisheries Science Center longline survey.

| Year | WGOA | CGOA | EGOA |
|---|---|---|---|
| 1992 | 11,390 (0.122) | 20,697 (0.123) | 11,508 (0.092) |
| 1993 | 8,308 (0.146) | 16,337 (0.206) | 16,280 (0.087) |
| 1994 | 8,849 (0.198) | 16,017 (0.162) | 11,420 (0.097) |
| 1995 | 8,585 (0.143) | 13,043 (0.164) | 15,391 (0.095) |
| 1996 | 10,650 (0.122) | 17,215 (0.156) | 17,773 (0.091) |
| 1997 | 5,721 (0.113) | 15,449 (0.173) | 20,537 (0.082) |
| 1998 | 7,712 (0.101) | 18,083 (0.104) | 17,280 (0.058) |
| 1999 | 6,309 (0.148) | 23,834 (0.114) | 18,512 (0.102) |
| 2000 | 6,043 (0.158) | 16,954 (0.162) | 18,619 (0.100) |
| 2001 | 7,352 (0.176) | 31,076 (0.137) | 23,071 (0.075) |
| 2002 | 13,157 (0.282) | 23,109 (0.115) | 16,872 (0.083) |
| 2003 | 8,807 (0.178) | 22,861 (0.103) | 16,468 (0.087) |
| 2004 | 7,566 (0.164) | 14,944 (0.087) | 12,631 (0.107) |
| 2005 | 9,922 (0.306) | 19,580 (0.151) | 17,418 (0.098) |
| 2006 | 7,514 (0.170) | 19,550 (0.113) | 19,307 (0.090) |
| 2007 | 7,676 (0.204) | 18,925 (0.144) | 19,878 (0.065) |
| 2008 | 9,943 (0.233) | 27,239 (0.130) | 25,211 (0.104) |
| 2009 | 11,290 (0.155) | 19,802 (0.195) | 18,339 (0.080) |
| 2010 | 14,504 (0.254) | 24,000 (0.132) | 26,361 (0.090) |
| 2011 | 9,208 (0.210) | 23,041 (0.122) | 21,823 (0.074) |
| 2012 | 6,860 (0.168) | 26,388 (0.099) | 22,553 (0.092) |
| 2013 | 12,085 (0.116) | 31,873 (0.134) | 26,493 (0.058) |
| 2014 | 12,420 (0.155) | 27,897 (0.213) | 21,839 (0.093) |
| 2015 | 12,389 (0.159) | 27,130 (0.107) | 19,669 (0.076) |
| 2016 | 13,473 (0.170) | 19,793 (0.076) | 22,031 (0.093) |
| 2017 | 13,429 (0.177) | 25,866 (0.077) | 21,605 (0.115) |
| 2018 | 13,652 (0.223) | 19,637 (0.097) | 22,453 (0.085) |
| 2019 | 18,104 (0.285) | 19,329 (0.117) | 18,684 (0.050) |
| 2020 | 9,469 (0.158) | 18,657 (0.203) | 13,300 (0.062) |
| 2021 | 7,885 (0.093) | 16,328 (0.104) | 11,081 (0.059) |
| 2022 | 6,740 (0.230) | 16,028 (0.105) | 20,701 (0.093) |
| 2023 | 5,192 (0.153) | 10,805 (0.144) | 10,699 (0.076) |
| 2025 | 11,807 (0.336) | 12,301 (0.162) | 8,078 (0.085) |

**Table 15.7.** Design-based estimates with coefficient of variation (CV) of Gulf of Alaska shortspine thornyhead biomass (t) by management region (western, central and eastern GOA or WGOA, CGOA, and EGOA) and 3-trawl depth strata through 2023. These are inputs used for continuity Model 26 provided by the Alaska Fisheries Science Center bottom trawl survey. Note that there are no 2025 data because it can no longer be separated into these depth bins starting in that year.

| Year | WGOA | | | CGOA | | | EGOA | | |
|---|---|---|---|---|---|---|---|---|---|
| | 0–500 m | 501–700 m | 701–1000 m | 0–500 m | 501–700 m | 701–1000 m | 0–500 m | 501–700 m | 701–1000 m |
| 1990 | 1,679 (0.401) | - | - | 5,941 (0.250) | - | - | 11,709 (0.106) | - | - |
| 1993 | 3,706 (0.222) | - | - | 12,508 (0.164) | - | - | 15,201 (0.081) | - | - |
| 1996 | 8,041 (0.150) | - | - | 19,030 (0.102) | - | - | 24,308 (0.119) | - | - |
| 1999 | 7,028 (0.232) | 5,389 (0.153) | 1,678 (0.500) | 22,934 (0.085) | 6,725 (0.141) | 2,930 (0.153) | 25,270 (0.102) | 2,834 (0.214) | 1,921 (0.344) |
| 2001 | 8,752 (0.171) | - | - | 19,905 (0.082) | - | - | - | - | - |
| 2003 | 15,032 (0.176) | 5,887 (0.290) | - | 42,784 (0.141) | 10,462 (0.413) | - | 22,055 (0.080) | 5,005 (0.234) | - |
| 2005 | 12,345 (0.163) | 6,377 (0.080) | 3,277 (0.239) | 27,420 (0.068) | 6,728 (0.124) | 8,262 (0.197) | 22,593 (0.066) | 5,104 (0.176) | 2,406 (0.256) |
| 2007 | 7,619 (0.140) | 2,590 (0.145) | 1,943 (0.096) | 20,905 (0.091) | 8,962 (0.176) | 7,736 (0.145) | 25,344 (0.111) | 4,855 (0.203) | 4,239 (0.191) |
| 2009 | 12,462 (0.207) | 5,605 (0.222) | 719 (0.549) | 19,721 (0.088) | 5,365 (0.225) | 3,469 (0.361) | 19,457 (0.068) | 6,809 (0.139) | 4,819 (0.451) |
| 2011 | 3,545 (0.163) | 2,272 (0.664) | - | 21,166 (0.109) | 6,885 (0.134) | - | 24,370 (0.116) | 4,330 (0.184) | - |
| 2013 | 6,475 (0.203) | 2,739 (0.085) | - | 23,854 (0.122) | 8,195 (0.262) | - | 24,677 (0.113) | 3,561 (0.121) | - |
| 2015 | 9,651 (0.163) | 2,733 (0.195) | 1,147 (0.986) | 33,019 (0.125) | 4,666 (0.126) | 7,214 (0.091) | 22,323 (0.114) | 4,365 (0.302) | 3,684 (0.452) |
| 2017 | 12,192 (0.201) | 2,740 (0.387) | - | 28,584 (0.110) | 4,845 (0.172) | - | 27,078 (0.131) | 4,298 (0.151) | - |
| 2019 | 10,794 (0.135) | 7,992 (0.480) | - | 27,597 (0.107) | 6,015 (0.340) | - | 21,961 (0.139) | 3,820 (0.176) | - |
| 2021 | 10,420 (0.369) | 4,269 (0.201) | - | 21,381 (0.139) | 7,601 (0.191) | - | 18,802 (0.105) | 5,437 (0.409) | - |
| 2023 | 5,081 (0.200) | 971 (0.031) | - | 19,663 (0.289) | 7,196 (0.435) | - | 18,419 (0.146) | 5,593 (0.082) | - |

**Table 15.8.** Design-based estimates with coefficient of variation (CV) of Gulf of Alaska shortspine thornyhead biomass (t) by management region (western, central and eastern GOA or WGOA, CGOA, and EGOA) and depth strata. These are inputs for Model 26 provided by the Alaska Fisheries Science Center bottom trawl survey.

| Year | WGOA | | CGOA | | EGOA | |
|---|---|---|---|---|---|---|
| | 0–700 m | 701–1000 m | 0–700 m | 701–1000 m | 0–700 m | 701–1000 m |
| 1999 | 12,417 (0.147) | 1,678 (0.500) | 29,658 (0.073) | 2,930 (0.153) | 28,104 (0.094) | 1,921 (0.344) |
| 2003 | 20,919 (0.151) | - | 53,246 (0.139) | - | 27,060 (0.078) | - |
| 2005 | 18,722 (0.111) | 3,277 (0.239) | 34,148 (0.060) | 8,262 (0.197) | 27,697 (0.063) | 2,406 (0.256) |
| 2007 | 10,209 (0.111) | 1,943 (0.096) | 29,866 (0.082) | 7,736 (0.145) | 30,199 (0.098) | 4,239 (0.191) |
| 2009 | 18,068 (0.159) | 719 (0.549) | 25,086 (0.084) | 3,469 (0.361) | 26,266 (0.062) | 4,819 (0.451) |
| 2011 | 5,817 (0.278) | - | 28,050 (0.089) | - | 28,700 (0.102) | - |
| 2013 | 9,214 (0.145) | - | 32,049 (0.113) | - | 28,238 (0.100) | - |
| 2015 | 12,383 (0.134) | 1,147 (0.986) | 37,685 (0.111) | 7,214 (0.091) | 26,689 (0.107) | 3,684 (0.452) |
| 2017 | 14,932 (0.179) | - | 33,428 (0.097) | - | 31,375 (0.115) | - |
| 2019 | 18,786 (0.219) | - | 33,611 (0.107) | - | 25,781 (0.121) | - |
| 2021 | 14,689 (0.268) | - | 28,981 (0.114) | - | 24,239 (0.123) | - |
| 2023 | 6,053 (0.168) | - | 26,859 (0.242) | - | 24,013 (0.114) | - |
| 2025 | 8,425 (0.258) | - | 17,494 (0.182) | - | 16,409 (0.177) | - |

**Table 15.9.** Time series of estimated exploitable biomass using the random effects Model 26 for the Western Gulf of Alaska (WGOA), Central Gulf of Alaska (CGOA), Eastern Gulf of Alaska (EGOA), and the GOA-wide total (GOA Total), with 95% lower (LCI) and upper confidence intervals (UCI).

| Year | WGOA | CGOA | EGOA | GOA Total | LCI | UCI |
|---|---|---|---|---|---|---|
| 1992 | 16,541 | 31,012 | 22,388 | 69,941 | 59,080 | 82,799 |
| 1993 | 15,599 | 29,614 | 24,046 | 69,259 | 59,330 | 80,849 |
| 1994 | 15,145 | 28,610 | 23,828 | 67,582 | 58,100 | 78,612 |
| 1995 | 14,723 | 27,984 | 26,179 | 68,885 | 59,524 | 79,719 |
| 1996 | 14,351 | 28,974 | 28,787 | 72,113 | 62,604 | 83,065 |
| 1997 | 12,870 | 29,922 | 30,819 | 73,611 | 64,099 | 84,533 |
| 1998 | 12,884 | 31,850 | 30,486 | 75,220 | 66,133 | 85,557 |
| 1999 | 12,798 | 34,459 | 31,170 | 78,428 | 69,707 | 88,239 |
| 2000 | 12,965 | 35,759 | 32,025 | 80,750 | 70,583 | 92,381 |
| 2001 | 13,926 | 39,221 | 33,095 | 86,242 | 74,636 | 99,653 |
| 2002 | 15,324 | 39,076 | 30,418 | 84,819 | 74,146 | 97,029 |
| 2003 | 16,173 | 38,873 | 29,005 | 84,051 | 74,223 | 95,181 |
| 2004 | 15,844 | 34,538 | 27,809 | 78,191 | 68,189 | 89,660 |
| 2005 | 16,336 | 36,066 | 29,938 | 82,341 | 73,459 | 92,296 |
| 2006 | 15,213 | 35,592 | 32,000 | 82,804 | 73,447 | 93,354 |
| 2007 | 14,751 | 36,028 | 33,727 | 84,506 | 75,772 | 94,247 |
| 2008 | 15,753 | 37,141 | 35,374 | 88,268 | 77,815 | 100,125 |
| 2009 | 16,660 | 35,772 | 33,918 | 86,350 | 76,995 | 96,842 |
| 2010 | 16,290 | 37,581 | 37,101 | 90,971 | 79,901 | 103,576 |
| 2011 | 15,095 | 38,504 | 36,584 | 90,182 | 80,044 | 101,605 |
| 2012 | 15,160 | 41,322 | 37,611 | 94,093 | 82,679 | 107,081 |
| 2013 | 16,186 | 42,775 | 38,266 | 97,227 | 85,436 | 110,645 |
| 2014 | 17,486 | 42,752 | 36,510 | 96,747 | 84,584 | 110,660 |
| 2015 | 17,967 | 42,023 | 34,522 | 94,512 | 84,073 | 106,246 |
| 2016 | 18,939 | 38,764 | 35,190 | 92,894 | 82,191 | 104,990 |
| 2017 | 19,081 | 38,869 | 34,690 | 92,641 | 81,999 | 104,664 |
| 2018 | 18,895 | 36,016 | 33,436 | 88,348 | 77,623 | 100,554 |
| 2019 | 18,106 | 34,527 | 29,784 | 82,416 | 73,068 | 92,959 |
| 2020 | 15,973 | 32,098 | 25,232 | 73,304 | 64,464 | 83,355 |
| 2021 | 14,092 | 29,907 | 23,331 | 67,331 | 59,464 | 76,238 |
| 2022 | 12,472 | 27,401 | 24,546 | 64,419 | 56,591 | 73,330 |
| 2023 | 11,197 | 25,177 | 21,427 | 57,800 | 49,913 | 66,933 |
| 2024 | 11,493 | 24,286 | 19,234 | 55,013 | 46,265 | 65,415 |
| 2025 | 11,799 | 23,431 | 17,284 | 52,513 | 43,924 | 62,781 |
| 2026 | 11,799 | 23,431 | 17,284 | 52,513 | 42,194 | 65,355 |
| 2027 | 11,799 | 23,431 | 17,284 | 52,513 | 40,789 | 67,607 |

# Figures

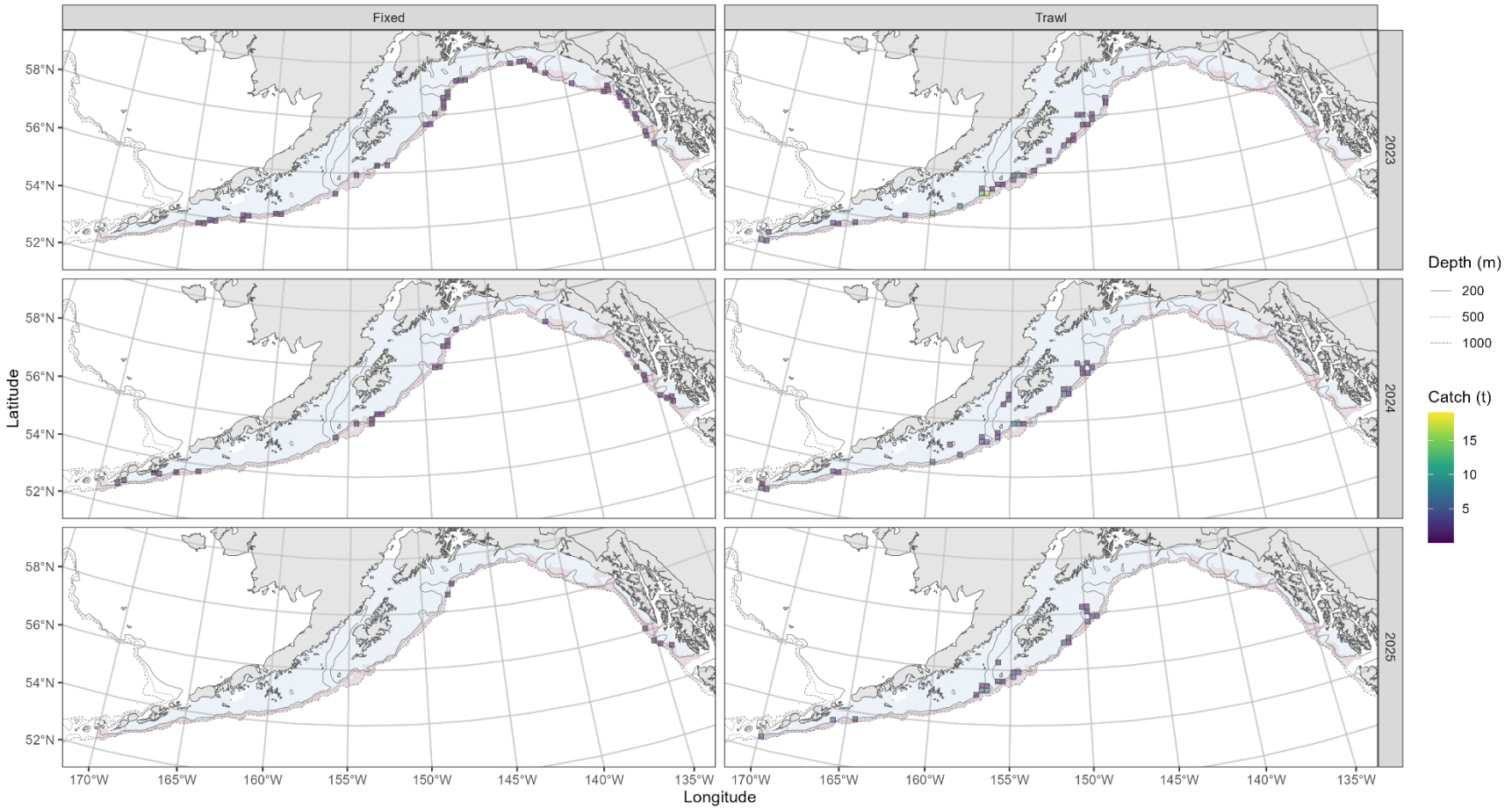



**Figure 15.1.** Spatial distribution of observed thornyhead rockfish catch in fixed gear (left column, longline and pot) trawl (right column, pelagic and benthic) fisheries in the GOA from 2023 to 2025. Colored cells (400km$^2$) indicate the summarized non-confidential observed catch data where any catch within the inside waters of Southeast are not within federal waters. Data provided by the Fisheries Monitoring and Analysis division website, accessed October 28, 2026 (https://www.fisheries.noaa.gov/resource/map/alaska-groundfish-fishery-observer-data-map). Observed catch overlays bottom trawl survey and longline survey footprints in light blue and red, respectively.

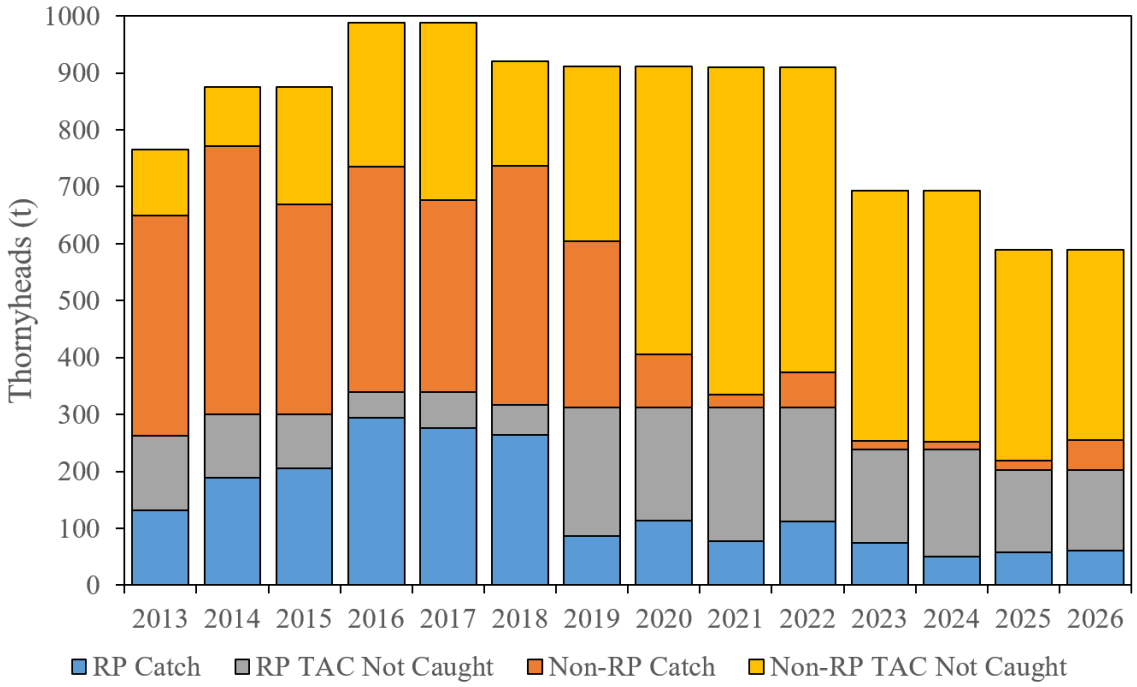



**Figure 15.2.** Total allowable catch (TAC) of thornyhead in the Central Gulf of Alaska (CGOA) separated by catch in the CGOA Rockfish Program (RP Catch, blue), CGOA Rockfish Program TAC not caught (RP TAC Not Caught, grey), catch outside of the CGOA Rockfish Program (Non-RP catch, orange), and TAC not caught outside of the CGOA Rockfish Program (Non-RP TAC Not Caught, yellow). Accessed on October 1, 2026.

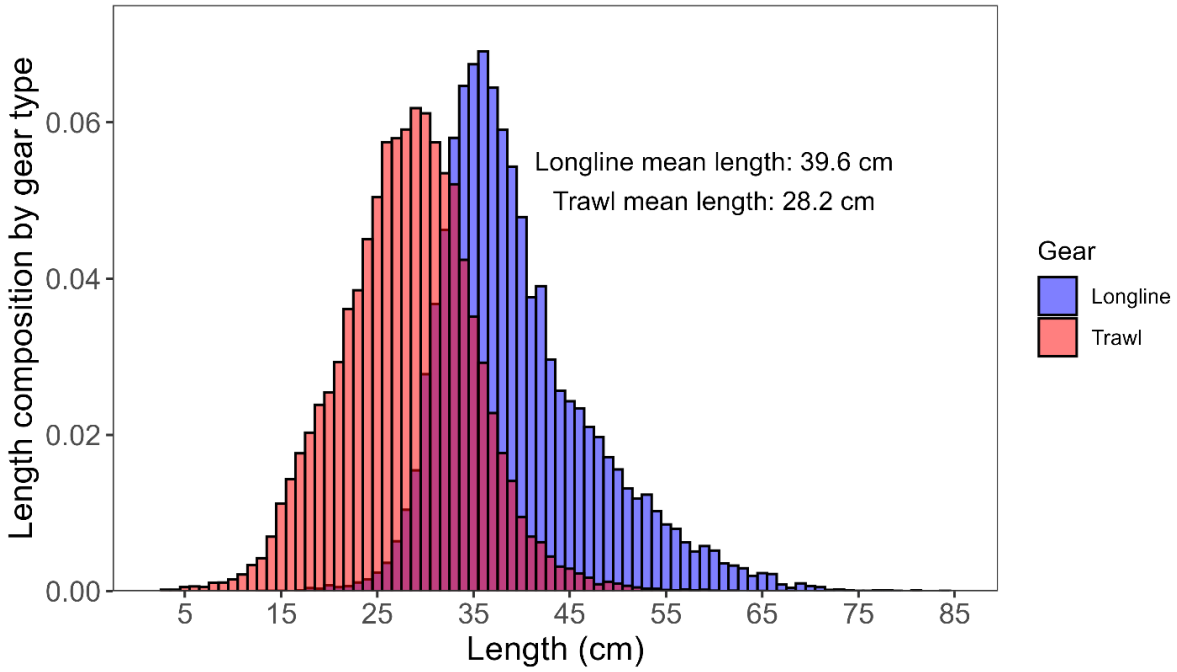



**Figure 15.3.** Comparison of shortspine thornyhead length composition from trawl (red) and longline (blue) fisheries using data from 1990 to 2026.

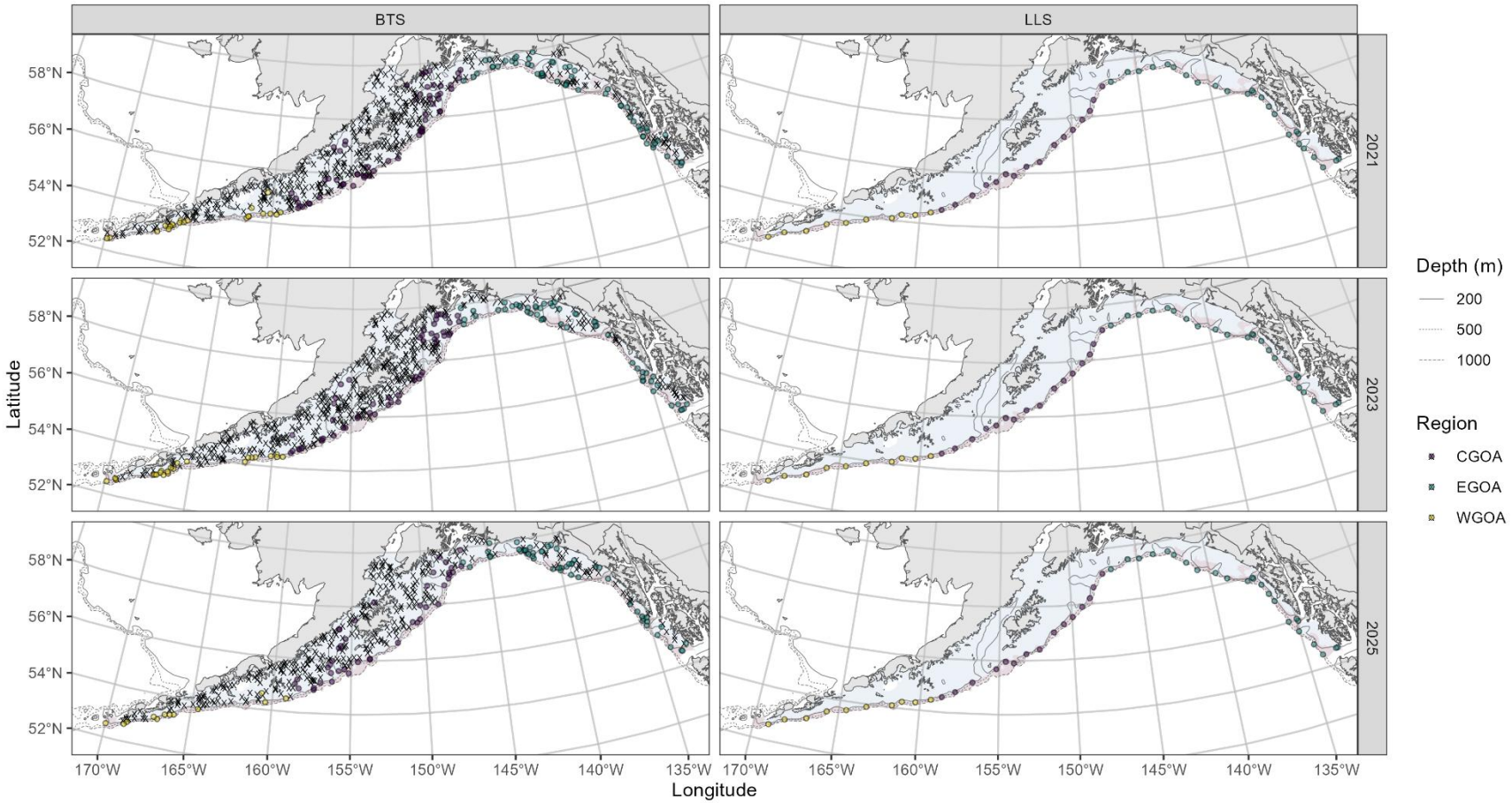



**Figure 15.4.** Spatial distribution of thornyhead rockfish presence (filled circle, where color indicates management region) and absence (X) in the Gulf of Alaska 2021, 2023, and 2025 Alaska Fisheries Science Center bottom trawl survey (BTS, left column) and longline survey (LLS, right column). Light blue indicates BTS footprint, while light red indicates the LLS footprint.

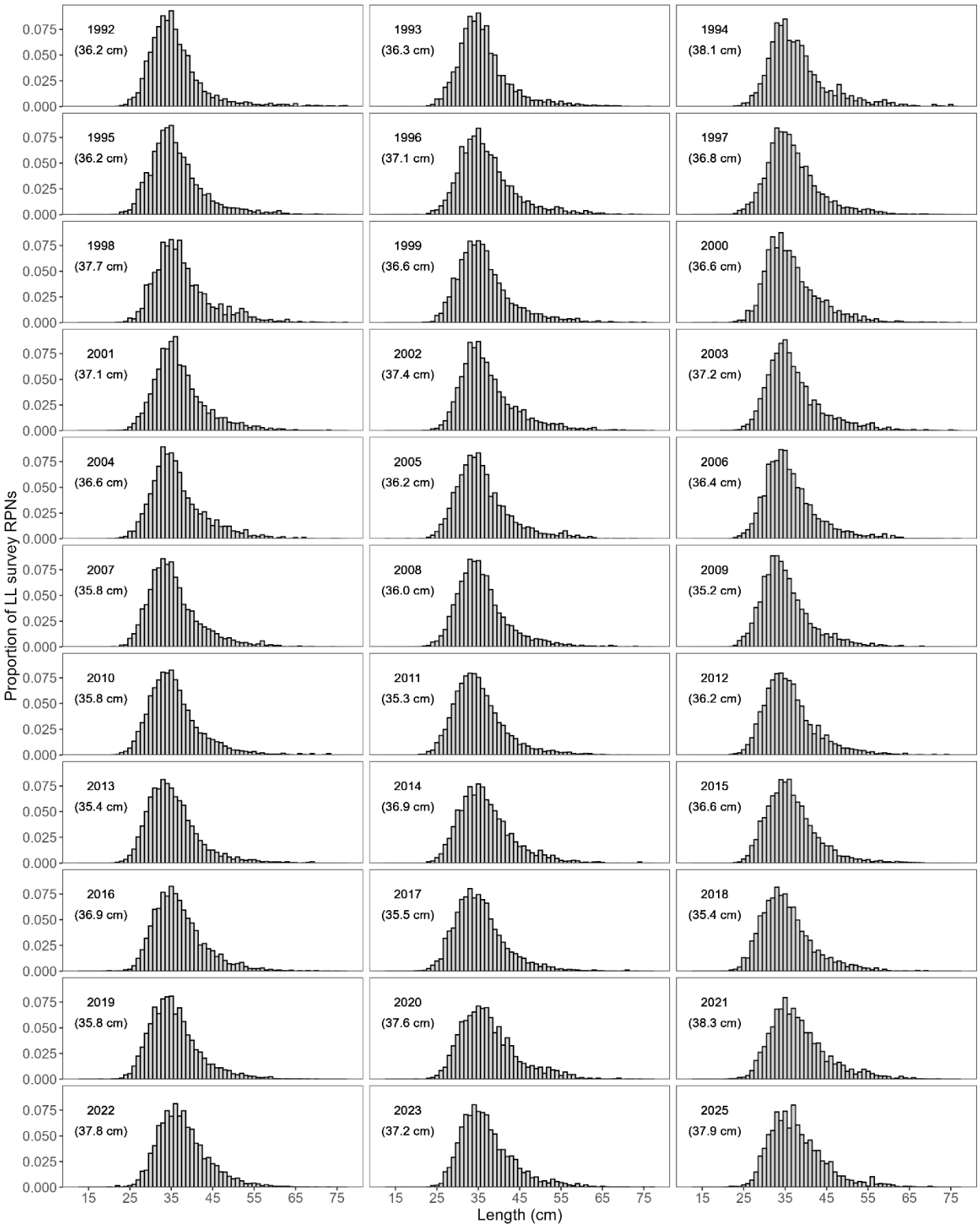



**Figure 15.5.** Size composition of the estimated population of shortspine thornyhead in the Gulf of Alaska based on the Alaska Fisheries Science Center longline surveys conducted between 1992 and 2025, and annual mean lengths shown in parentheses.

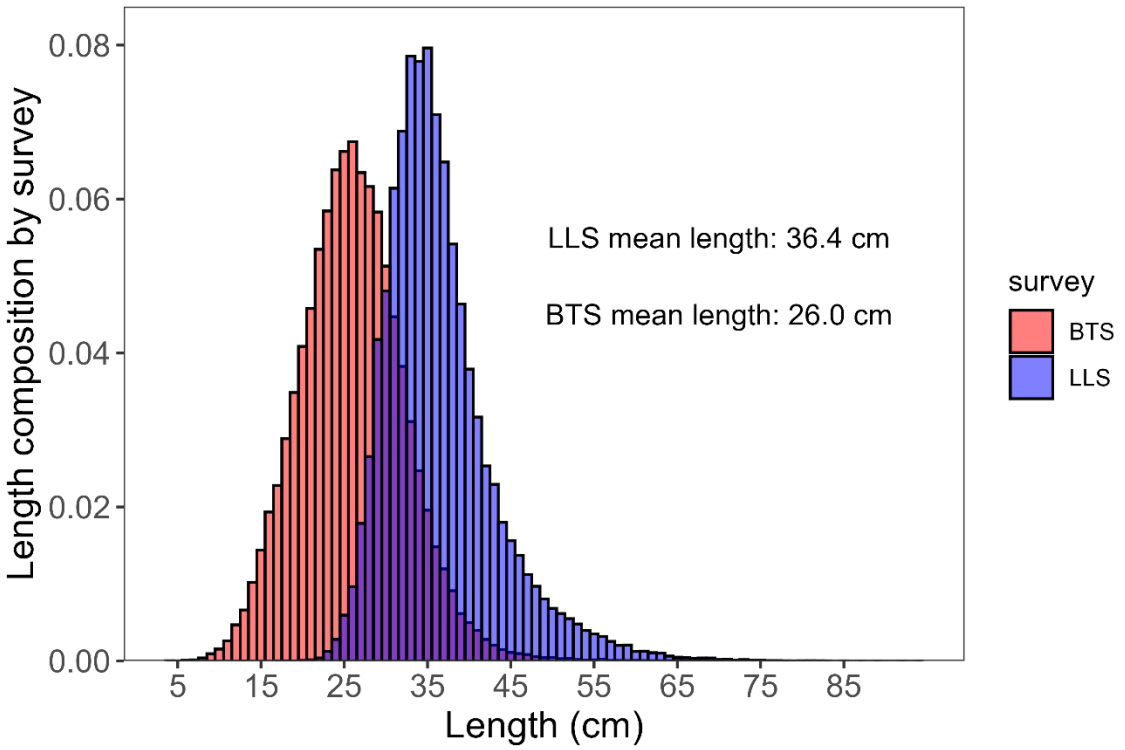



**Figure 15.6.** Comparison of size composition of the estimated population of shortspine thornyhead in the Gulf of Alaska based on Alaska Fisheries Science Center bottom trawl survey (BTS, red) and longline survey (LLS, blue).

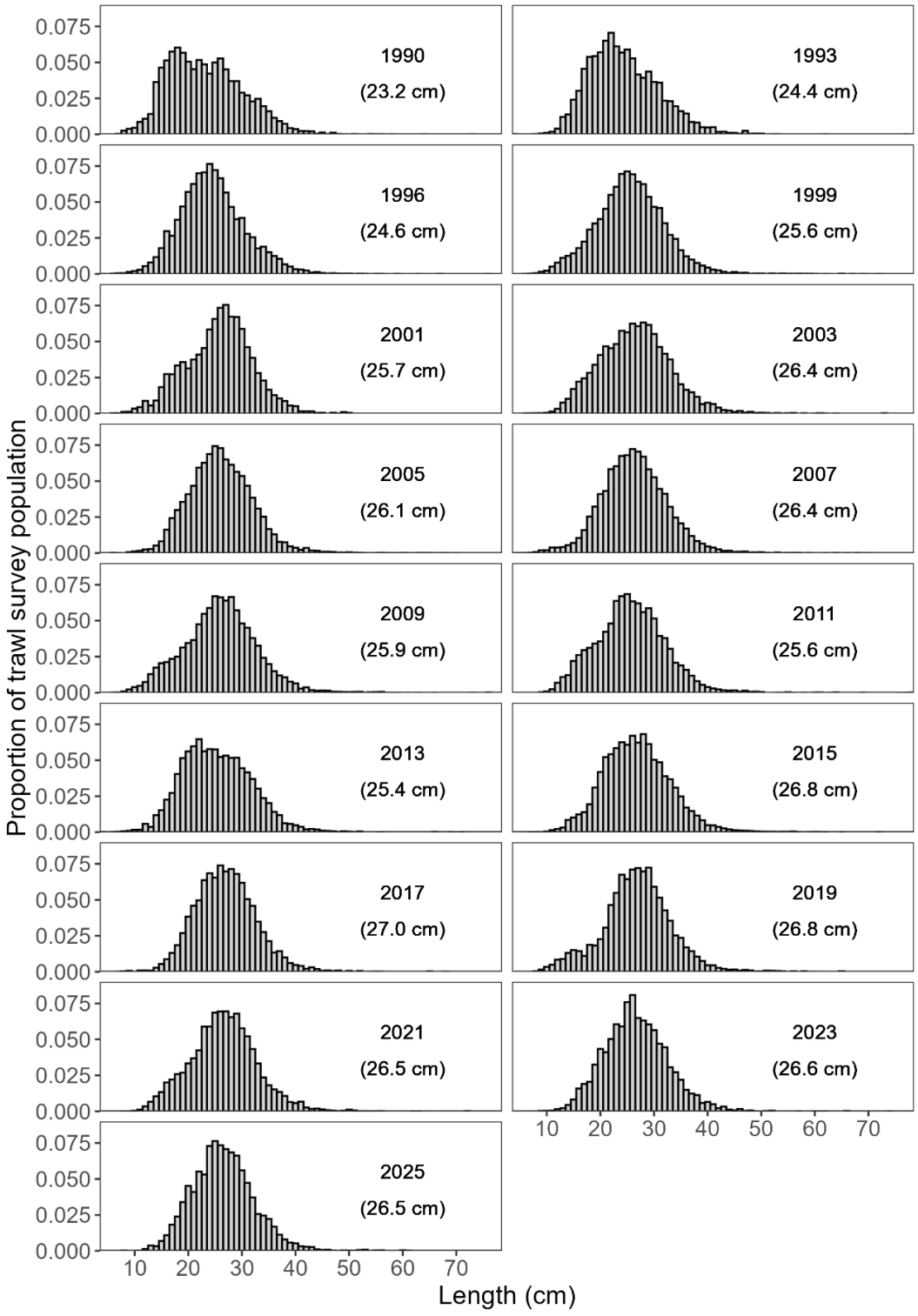



**Figure 15.7.** Size composition of the estimated population of shortspine thornyhead in the Gulf of Alaska based on Alaska Fisheries Science Center bottom trawl surveys conducted between 1990 and 2025, and annual mean lengths shown in parentheses.

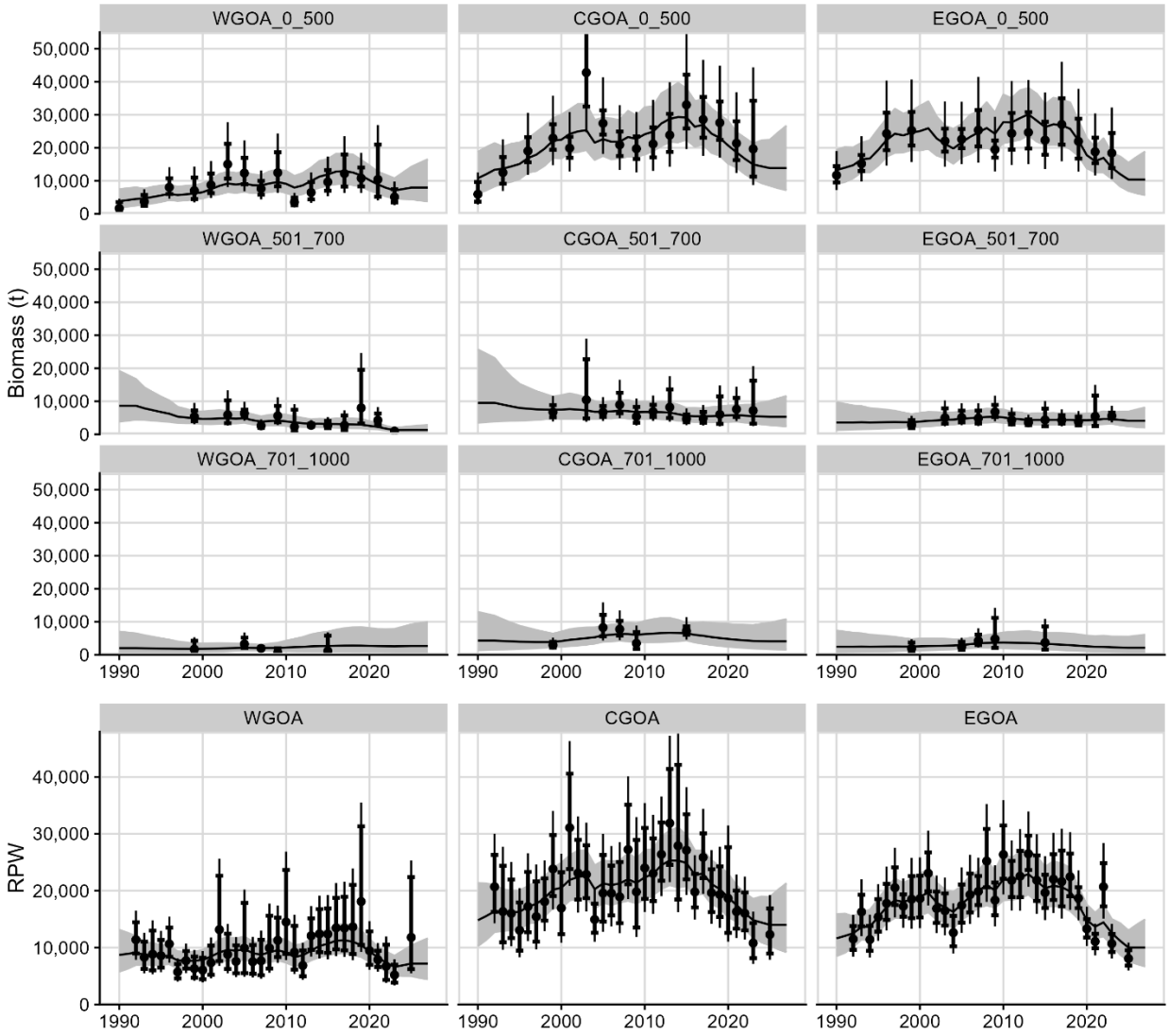



**Figure 15.8.** Gulf of Alaska shortspine thornyhead random effects model results by survey and strata (solid lines with 95% confidence intervals in shaded regions) for continuity Model 24.2a. Fits are to design-based survey estimates from the Alaska Fisheries Science Center bottom trawl survey (biomass by region and respective depth strata) and longline survey (relative population weights or RPW) with points indicating point estimates, bolded vertical bars indicating survey-estimated error, and thin vertical bar indicating estimated additional observation error.

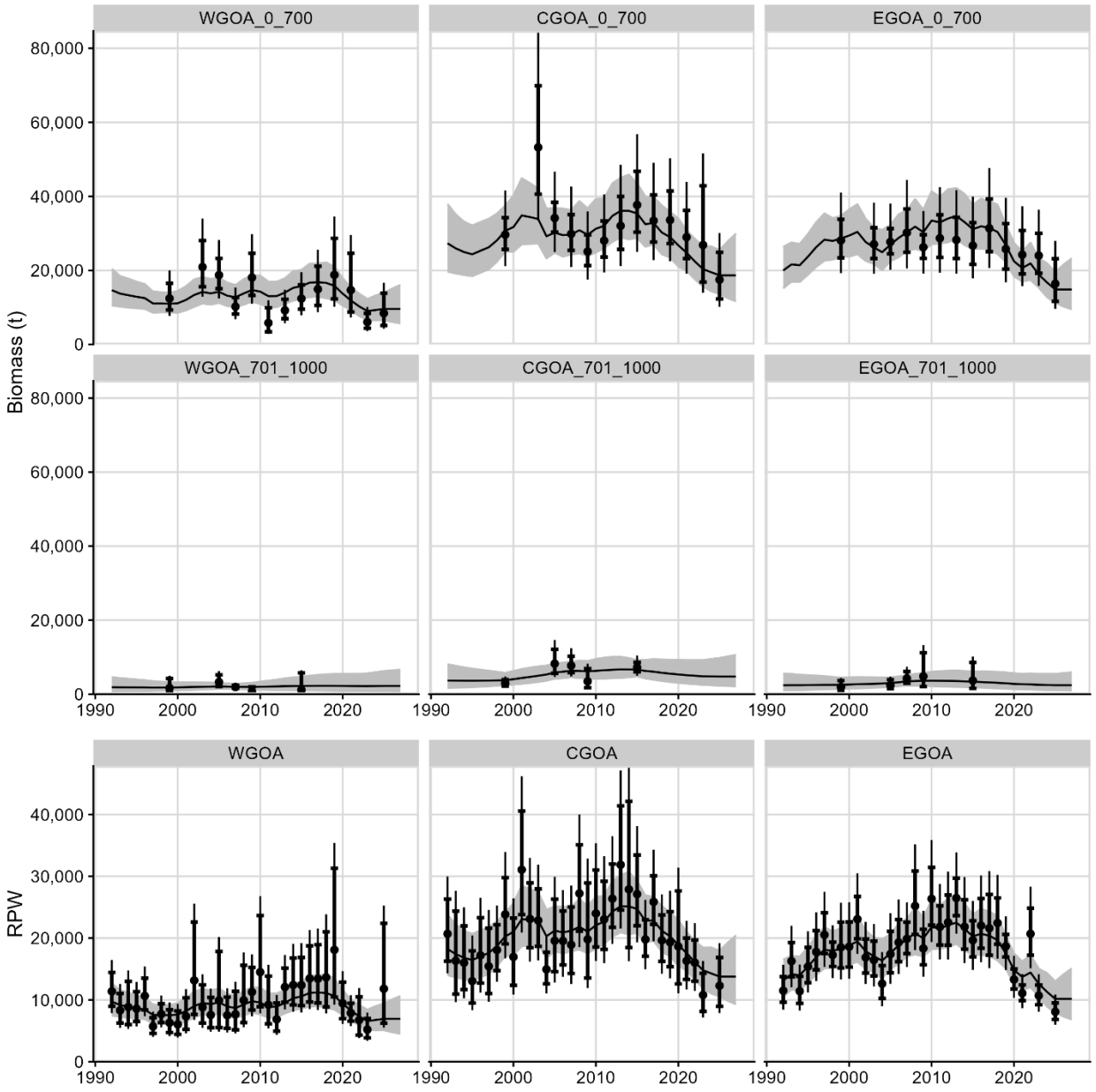



**Figure 15.9.** Gulf of Alaska shortspine thornyhead random effects model results by survey and strata (solid lines with 95% confidence intervals in shaded regions) for recommended Model 26. Fits are to design-based survey estimates from the Alaska Fisheries Science Center bottom trawl survey (biomass by region and respective depth strata) and longline survey (relative population weights or RPW) with points indicating point estimates, bolded vertical bars indicating survey-estimated error, and thin vertical bar indicating estimated additional observation error.

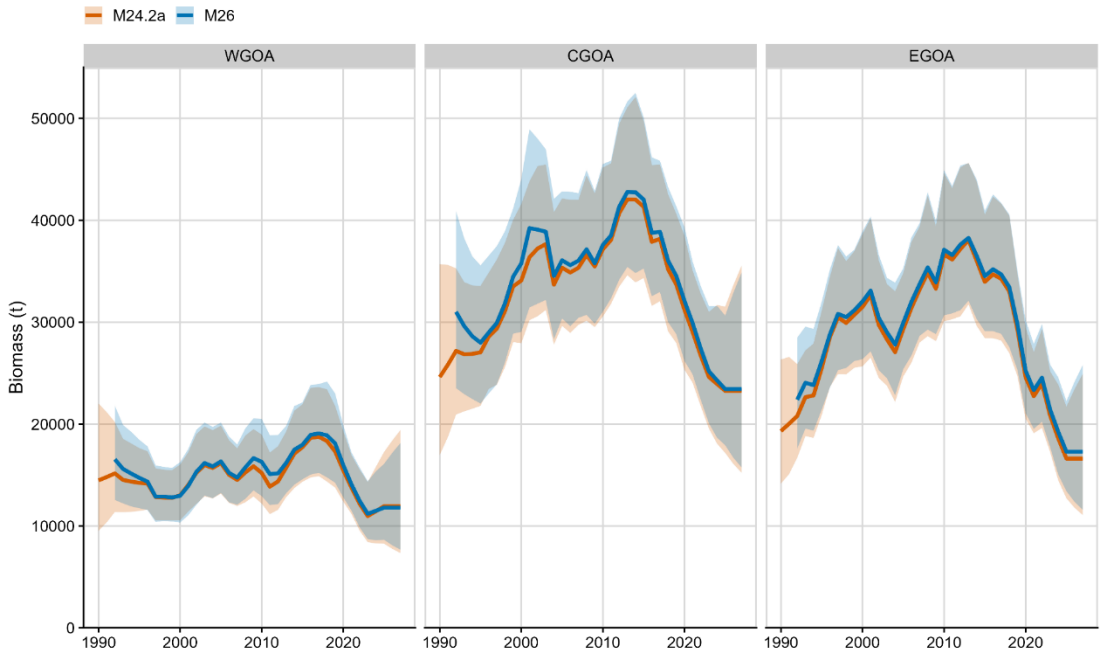



**Figure 15.10.** Gulf of Alaska shortspine thornyhead random effects model results by region (solid lines with 95% confidence intervals in shaded regions) for continuity model Model 24.2a (orange) and the recommended Model 26 (blue). Fits are to design-based survey estimates from the Alaska Fisheries Science Center bottom trawl survey (biomass by region and respective depth strata) and longline survey (relative population weights).

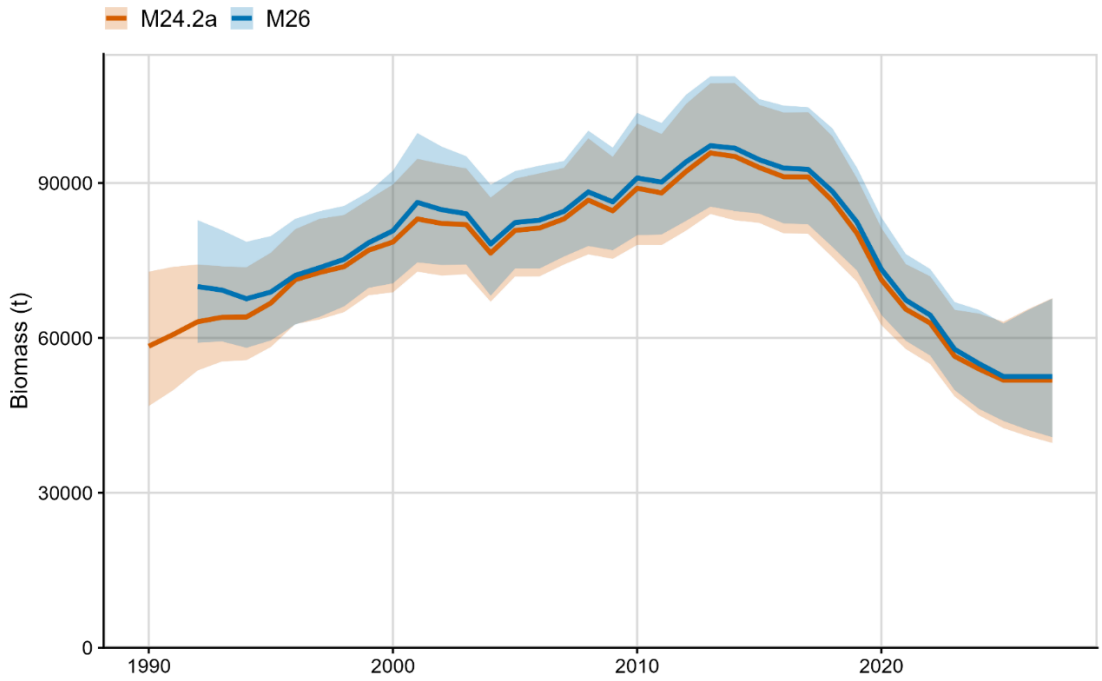



**Figure 15.11.** Gulf of Alaska shortspine thornyhead random effects model results (solid lines with 95% confidence intervals in shaded regions) for continuity model Model 24.2a (orange) and the recommended Model 26 (blue).

# Appendix 15A: Supplemental Catch Data

To comply with the Annual Catch Limit (ACL) requirements, non-commercial removals in the Gulf of Alaska (GOA) are presented. Non-commercial removals are estimated total removals that do not occur during directed groundfish fishing activities (Table 15A.1). This includes removals incurred during research, subsistence, personal use, recreational, and exempted fishing permit activities, but does not include removals taken in fisheries other than those managed under the groundfish FMP. These estimates represent additional sources of removals to the existing Catch Accounting System estimates.

Research catches of thornyhead rockfish for the years 1982–2025 are listed in Table 15A.1. Although data were not available for a complete accounting of all research catches, the values in the table indicate that generally these catches have been modest. Most research removals of thornyhead rockfish are taken by the Alaska Fisheries Science Center's (AFSC) longline survey (LLS). Other research activities that harvest minor amounts of thornyhead rockfish include bottom trawl surveys (BTS) conducted by the AFSC, the Alaska Department of Fish and Game (ADFG), and the International Pacific Halibut Commission's (IPHC) LLS. There are no records of recreational harvest or harvest that was non-research related. The non-commercial removals show that a total of approximately 8 t of thornyhead rockfish was taken in 2025 during research cruises (Table 15A.1). This total is approximately 0.5% of the ABC (1,338 t) and 6.2% of the commercial catch (130 t) for thornyhead rockfish in 2025. Therefore, this presents no risk to the thornyhead stock complex especially because commercial catches in recent years have been much less than ABC.

**Table 15A.1.** Research catches of GOA thornyheads (t). Estimates from IPHC survey and "other" sources only available since 2010.

| Year | AFSC LLS | AFSC BTS | Japan/US LLS | IPHC LLS | Other | Total |
|---|---|---|---|---|---|---|
| 1982 | | 6 | 4 | | | 10 |
| 1983 | | 1 | 4 | | | 5 |
| 1984 | | 24 | 3 | | | 27 |
| 1985 | | 12 | 4 | | | 16 |
| 1986 | | 2 | 4 | | | 5 |
| 1987 | | 17 | 4 | | | 20 |
| 1988 | 2 | 0 | 5 | | | 7 |
| 1989 | 3 | 0 | 5 | | | 8 |
| 1990 | 3 | 4 | 4 | | | 11 |
| 1991 | 4 | | 3 | | | 7 |
| 1992 | 5 | | 4 | | | 9 |
| 1993 | 5 | 5 | 4 | | | 14 |
| 1994 | 4 | | 5 | | | 9 |
| 1995 | 5 | | | | | 5 |
| 1996 | 6 | 6 | | | | 12 |
| 1997 | 6 | | | | | 6 |
| 1998 | 6 | 9 | | | | 15 |
| 1999 | 6 | 23 | | | | 29 |
| 2000 | 5 | | | | | 5 |
| 2001 | 7 | 2 | | | | 9 |
| 2002 | 5 | | | | | 5 |
| 2003 | 5 | 7 | | | | 12 |
| 2004 | 4 | | | | | 4 |
| 2005 | 5 | 9 | | | | 14 |
| 2006 | 5 | | | | | 5 |
| 2007 | 5 | 9 | | | | 14 |
| 2008 | 7 | | | | | 7 |
| 2009 | 6 | 7 | | | | 13 |
| 2010 | 9 | <1 | | <1 | <1 | 9 |
| 2011 | 10 | 4 | | <1 | <1 | 14 |
| 2012 | 9 | | | <1 | <1 | 9 |
| 2013 | 13 | 4 | | <1 | <1 | 17 |
| 2014 | 10 | | | <1 | <1 | 10 |
| 2015 | 10 | 8 | | <1 | | 19 |
| 2016 | 9 | | | <1 | | 9 |
| 2017 | 11 | 5 | | <1 | <1 | 16 |
| 2018 | 9 | | | <1 | <1 | 9 |
| 2019 | 9 | 4 | | 1 | <1 | 14 |
| 2020 | 7 | | | <1 | <1 | 7 |
| 2021 | 6 | 4 | | <1 | <1 | 10 |
| 2022 | 9 | | | <1 | <1 | 9 |
| 2023 | 5 | 2 | | <1 | <1 | 8 |
| 2024 | | | | <1 | <1 | 1 |
| 2025 | 4 | 2 | | <1 | 2 | 8 |