18. Assessment of the Skates Stock Complex in the Gulf of Alaska

Lee Cronin-Fine

September 2026

This report may be cited as:
Cronin-Fine. L, 2026. Assessment of the Skates 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 skate complex in the Gulf of Alaska (GOA) is assessed on a two-year cycle and is managed as three separate units: Big skate (*Beringraja binoculata*), Longnose skate (*Raja rhina*) and "Other skates". Big and Longnose skates have GOA-wide overfishing limits (OFLs) while the Acceptable Biological Catch (ABC) is apportioned into biologically-informed recommended distributions (BRDs) which are region specific (western [WGOA], central [CGOA], and eastern [EGOA]). Remaining skate species are managed as an "Other skates" group, with GOA-wide harvest specifications. All GOA skates are managed under Tier 5, where OFL and ABC are based on survey biomass estimates and a natural mortality rate (*M*).

Summary of Changes in Assessment Inputs

Changes in the input data:

1. Updated catch estimates from 2025 and 2026 (as of August 19, 2026).

2. New biomass estimates from the 2025 GOA bottom trawl survey.

Changes in the assessment methodology:

No changes were made to the assessment methodology.

Summary of Results

For the 2027 fishery, the recommended maximum allowable ABCs from the Tier 5 specifications are: 2,791 t for Big skate, 2,678 t for Longnose skates, and 833 t for Other skates. The recommended OFL values are: 3,721 t for Big skate, 3,572 t for Longnose skates, and 1,111 t for Other skates. Reference values for all skates are summarized in the following tables, with the recommended OFL, ABC and BRD values for 2027 in bold. The stock is not being subject to overfishing in 2026.

Big skate (*Beringraja binoculata*)					
		As estimated or *specified last* year for:		As estimated or *recommended this* year for:	
Quantity		2024	2025	**2027**	2028
M (natural mortality rate)		0.1	0.1	0.1	0.1
Tier		5	5	5	5
Biomass (t)	W	9,934	9,934	7,556	7,556
	C	23,325	23,325	23,945	23,945
	E	4,544	4,544	5,711	5,711
	GOA Wide	37,802	37,802	37,212	37,212
F_{OFL}		0.1	0.1	0.1	0.1
$maxF_{ABC}$		0.075	0.075	0.075	0.075
F_{ABC}		0.075	0.075	0.075	0.075
OFL (t)	GOA Wide	3,780	3,780	**3,721**	3,721
*max*ABC (t)	GOA Wide	2,835	2,835	2,791	2,791
ABC (t)	GOA Wide	2,835	2,835	**2,791**	2,791
BRD (t)	W	745	745	**567**	567
	C	1,749	1,749	**1,796**	1,796
	E	341	341	**428**	428
		As determined *last* full assessment for:		As determined *this* year for:	
Status		2022	2023	2025	2026
Overfishing?		No	n/a	No	n/a

Longnose skate (*Raja rhina*)					
		As estimated or *specified last* year for:		As estimated or *recommended this* year for:	
Quantity		2024	2025	**2027**	2028
M (natural mortality rate)		0.1	0.1	0.1	0.1
Tier		5	5	5	5
Biomass (t)	W	1,384	1,384	740	740
	C	25,249	25,249	26,953	26,953
	E	7,172	7,172	8,029	8,029
	GOA Wide	33,804	33,804	35,721	35,721
F_{OFL}		0.1	0.1	0.1	0.1
$maxF_{ABC}$		0.075	0.075	0.075	0.075
F_{ABC}		0.075	0.075	0.075	0.075
OFL (t)	GOA Wide	3,380	3,380	**3,572**	3,572
*max*ABC (t)	GOA Wide	2,536	2,536	2,678	2,678

Longnose skate (*Raja rhina*)					
		As estimated or *specified last* year for:		As estimated or *recommended this* year for:	
Quantity		2024	2025	**2027**	2028
ABC (t)	GOA Wide	2,536	2,536	**2,678**	2,678
BRD (t)	W	104	104	**55**	55
	C	1,894	1,894	**2,021**	2,021
	E	538	538	**602**	602
		As determined *last* full assessment for:		As determined *this* year for:	
Status		2022	2023	2025	2026
Overfishing?		No	n/a	No	n/a

Other skates (*Bathyraja*)				
	As estimated or *specified last* year for:		**As estimated or *recommended this* year for:**	
Quantity	2024	2025	**2027**	2028
M (natural mortality rate)	0.1	0.1	0.1	0.1
Tier	5	5	5	5
Biomass (t)	8,673	8,673	11,106	11,106
F_{OFL}	0.1	0.1	0.1	0.1
$maxF_{ABC}$	0.075	0.075	0.075	0.075
F_{ABC}	0.075	0.075	0.075	0.075
OFL (t)	867	867	**1,111**	1,111
*max*ABC (t)	650	650	833	833
ABC (t)	650	650	**833**	833
	As determined *last* full assessment for:		As determined *this* year for:	
Status	2022	2023	2025	2026
Overfishing?	No	n/a	No	n/a

Responses to SSC and Plan Team Comments on Assessments in General

There were no comments related to this assessment from the SSC or Plan Team.

Responses to SSC and Plan Team Comments Specific to this Assessment

"The SSC notes that recent tagging work suggests connectivity between the GOA and Bering Sea for big skates, and area-specific survey trends appear to be flat in the western GOA. The SSC recommends the

GOA and BSAI authors coordinate to update the stock structure template for these species and assess assumptions regarding M."

"The SSC recommends the authors include a table of apportionment percentages and tonnage."

"The SSC recommends the authors include information on retention percentages for each management area, noting recent increases in catch in the eastern GOA."

All comments for this assessment were overlooked and will be addressed in the next operational assessment.

Introduction

The full introduction can be found in the 2021 GOA skate assessment (Ormseth 2021). What follows is an abbreviation of the 2021 introduction.

Description, scientific names, and general distribution

Skates (family *Rajidae*) are flat-bodied cartilaginous fishes related to sharks. At least 15 species of skates in four genera (*Raja*, *Beringraja*, *Bathyraja*, and *Amblyraja*) are commonly found in Alaskan waters ranging from shallow inshore waters to very deep benthic habitats (Eschmeyer *et al.* 1983; Stevenson *et al.* 2007). In the GOA, the most common skate species are the Longnose skate (*Raja rhina*) and the Big skate (*Beringraja binoculata*). The Big skate range extends from the Bering Sea to southern Baja California in depths from 2 to 800 m. The Longnose skate has a similar range, from the southeastern Bering Sea to Baja California in 9 to 1,069 m depths (Love *et al.* 2005). While these two species have wide depth ranges, they are generally found in shallow waters in the GOA. The remaining 13 species, all from the family *Bathyraja*, are treated as one group called "Other skates" in this assessment since they are markedly less common. Within this group, the three most common species are the Aleutian skate (*B. aleutica*), the Alaska skate (*B. parmifera*), and the Bering skate (*B. interrupta*). The Aleutian skate can be found throughout the north Pacific from northern Japan to northern California in waters 16 to 1,602 m deep. The Alaska skate is restricted to higher latitudes from the Sea of Okhotsk to the eastern Gulf of Alaska in depths from 17-392 m (Stevenson *et al.* 2007). The range for Bering skate is difficult to determine at this time as it may actually be a complex of species, with each individual species occupying a different part of its general range from the western Bering Sea to southern California (Love *et al.* 2005; Stevenson *et al.* 2007).

The species within the skate assessment occupy different habitats and regions within the GOA groundfish Fishery Management Plan. This assessment distinguishes habitat primarily by depth for GOA skates. The highest biomass of skates is found in the shallowest continental shelf waters of less than 100-m depth and is normally dominated by Big skates, while Longnose skates are the most abundant species in the 101-200 m depth zone. Skates in the *Bathyraja* genus are dominant in the deeper waters extending from 200 to 1000 m or more in depth. These depth distributions are reflected in the spatial distribution of GOA skates. Big skates are located inshore and are most abundant in the central and western GOA. Longnose skates are located further offshore and are relatively less abundant in the western GOA.

Life history and stock structure

Skate life cycles are similar to sharks, with relatively low fecundity and slow growth whose population stability depends on high survival rates of a few well-developed offspring (Moyle and Cech 1996). Sharks and skates in general have been classified as "equilibrium" life history strategists, with very low intrinsic rates of population increase implying that sustainable harvest is possible only at very low to moderate fishing mortality rates (King and McFarlane 2003). Within this general equilibrium life history strategy,

there can still be considerable variability between skate species in terms of life history parameters (Walker and Hislop 1998).

While smaller-sized skate species have been observed to be somewhat more productive, large skate species with late maturation (11+ years) are more vulnerable to heavy fishing pressure (Walker and Hislop 1998; Frisk *et al.* 2001, 2002). Several studies have explored the effects of fishing on a variety of skate species to determine which life-history traits and stages are the most important for management. Age and size at maturity and adult size/longevity appear to be better predictors of resilience to fishing pressure than fecundity or egg survival. Skate species with the largest adult body sizes (and the empirically related large size/age at maturity, Frisk *et al.* (2001)) were least resilient to high fishing mortality rates. This is often attributed to the long juvenile stage during which relatively large yet immature skates are exposed to fishing mortality. After an extensive review of population information for many elasmobranch species, Frisk *et al.* (2001) recommended that precautionary management be implemented especially for the conservation of large species.

Fishery

A full description of the fishery history can be found in the 2021 GOA skate assessment (Ormseth 2021). What follows are any recent significant changes to the fishery or management measures.

Directed fishery, bycatch, and discards in federal waters

There has been no directed fishery for skates since 2005. There are incidental catches of skate in other fisheries such as arrowtooth flounder and Pacific Cod.

Management measures and history

Since 2005, Big and Longnose skates have had BRDs for the WGOA, CGOA and EGOA to address concerns about disproportionate harvest of skates. Other skates continue to be managed as a Gulf-wide species complex because they are not generally retained and are difficult to distinguish at the species level. See Tables 18-1, -2 and -3 and Figures 18-1 and -2 for a time series of the total catch, TAC (total and BRD), ABC (total and BRD) and OFL for the three assessment groups.

Data

Fishery

Catch

See Tables 18-1, -2 and -3 and Figures 18-1 and -2 for a time series of the total catch for the three units within the skate complex from 2005 to 2026. 2026 catch is updated through August 19, 2026.

Age and Size Composition

Fishery observers have been collecting length composition data since 2009. However, they are not used to determine stock status for any of the three units within the skate complex.

Survey

While both the AFSC longline and bottom trawl surveys capture skates, the GOA bottom trawl survey (1990-2025) is the only survey index used for the assessment of the GOA skate complex because of its

more comprehensive spatial coverage. Information on the other potential indices can be found in the 2021 GOA skate assessment (Ormseth 2021).

AFSC bottom trawl survey biomass estimates

The AFSC bottom trawl survey was a triennial survey until 2003 when it became biannual. Biomass estimates from the survey for all three units within the skate complex can be found in Table 18-4. Survey biomass estimates for Big and Longnose skates have been relatively stable for the past five years with little evidence of the population increasing or decreasing (Figure 18-3). The 2025 survey biomass estimate for Big skate decreased by 3.6% while the Longnose survey biomass estimate increased by 15.3% from 2023. Both are well within the 2023 survey biomass estimated confidence intervals (Figure 18-3). Other skates biomass declined from 2013 to 2019 and has remained around that low level ever since. The 2025 Other skate survey biomass estimate increased by 29.9% from 2023 yet it still appears to be at that low level (Figure 18-3).

Big and Longnose skate are most abundant in the CGOA (Tables 18-5 and -6). Smaller yet similar abundances of Big skate were observed in the WGOA and EGOA in 2025 (6,396 t and 6,103 t, respectively; Table 18-5). Survey biomass estimates of Big skate over the past 5 years in the CGOA and WGOA have been relatively stable, while the EGOA has experienced more variability. The EGOA survey biomass estimate increased 92.3% in 2025 after experiencing declines from 2019 - 2023 (Figure 18-4).

After the CGOA, Longnose skate are most abundant in the EGOA (8,409 t in 2025), with significantly smaller biomass observed in the WGOA 444 t (Figure 18-5). The WGOA population has been declining since 2021, however its' biomass has always been significantly smaller than CGOA and EGOA (Figure 18-5).

Analytical approach

The GOA skate complex is managed as a Tier 5 stock which require reliable biomass estimates. For Big and Longnose skates, two Random Effects Multi-area models (REMA) within the REMA model R package (Sullivan *et al.* 2022) were fit to the time series of bottom trawl survey estimated biomass (1990 – 2025). The first was fit to the GOA-wide bottom trawl survey biomass estimates and is used to determine the OFL and ABC. The second fits area-specific (WGOA, CGOA and EGOA) bottom trawl survey biomass estimates. The proportion of biomass in each area is determined from the area-specific fits. These proportions are multiplied by the GOA-wide fit from the first model to determine the biomass in each area. These area specific biomass values are used to calculate the BRDs. The confidence intervals for the area-specific biomass are determined by assuming the standard error of the log of the proportion by region multiplied by the GOA-wide biomass was equivalent to the standard error of the log of the region specific biomass determined by the region specific REMA model. For Other skates, a single REMA model was fit to the GOA-wide time series from the bottom trawl survey biomass estimates (1990 - 2025). We continue to use the 2023 accepted model (Cronin-Fine 2023).

The Tier 5 estimate of the OFL is simply natural mortality (M) multiplied by the estimated exploitable biomass. The maximum permissible ABC is 75% of OFL.

Results

Parameters

The only parameter estimated independently of the assessment is natural mortality (M). It is set to a value of 0.1 for all three units within the skate complex. This value was set in 2003 and has been used in GOA skate assessments ever since (Ormseth 2019).

REMA Results

GOA-wide predicted biomass for all skate species remains stable from 2023 (Figure 18-3): estimated biomass for Big skate decreased by 1.6% (37,802 t to 37,212 t), increased by 5.7% (33,804 t to 35,721 t) for Longnose skate, and increased by 28.1% (8,673 t to 11,106 t) for Other skates. Other skates had a large decline from 2013 to 2019 and have remained low ever since.

Regional biomass estimates for Big and Longnose skates can be used to determine whether changes to the population biomass are GOA-wide or region specific. For Big skate, both the CGOA and EGOA projected biomass increased from 2023: CGOA biomass increase by 2.7% (23,325 t to 23,945 t) and EGOA increased by 25.7% (4,544 t to 5,711 t). The projected biomass for WGOA decreased by 23.9% (9,934 t to 7,556 t). In general, the Big skate population appears relatively stable. The WGOA biomass has shown variability but has been relatively stable since 2019 with observed biomass index error bars overlapping since 2019 (Figure 18-4). Biomass in the EGOA declined from 2019 to 2023 but increased in 2025. There is not enough information to say whether this increase will persist in future surveys.

All regional biomass estimates for Longnose skate increased from 2023 except for the WGOA (1,384 t to 740 t, a 46.5% decrease for WGOA, 25,249 t to 26,953 t, a 6.7% increase for CGOA and 7,172 t to 8,029 t, a 11.9% increase for EGOA). The WGOA biomass has been declining since 2021; however the smallest portion of the Longnose skate population lives in WGOA with the majority in CGOA (Figure 18-5). Catch in all regions have remained below their respective BRDs since 2023, when the EGOA catch exceeded the BRD Figure 18-2). Though the EGOA catch exceeded the BRD in 2023, there is no sign that the EGOA biomass is declining. It appears to be increasing.

Harvest Recommendations

Amendment 56 Reference Points

All three species within the skate complex are assessed as Tier 5 stocks. Harvest recommendations are based on an estimated biomass time series (B_{est}) and are calculated as follows; $F_{OFL} = M$, $OFL = F_{OFL} * B_{est}$ and $ABC_{max} = 0.75 * OFL$ where ABC_{max} is the maximum permissible ABC and $M = 0.1$.

Specification of OFL and Maximum Permissible ABC

Big skate

The REMA model biomass estimate of Big skate for 2027 is 37,212 t, with an OFL = 3,721 t and ABC_{max} = 2,791 t.

Longnose skate

The REMA model biomass estimate of Longnose skate for 2027 is 35,721 t, with an OFL = 3,572 t and ABC_{max} = 2,678 t.

Other skates

The REMA model estimate of Other skate biomass for 2027 is 11,106 t, with an OFL = 1,111 t and ABC_{max} = 833 t.

Risk Table and ABC recommendation

The following template is used to complete the risk table:

	Assessment-related considerations	*Population dynamics considerations*	*Environmental/ecosystem considerations*	*Fishery Performance*
Level 1: No Conern	Typical to moderately increased uncertainty/minor unresolved issues in assessment.	Stock trends are typical for the stock; recent recruitment is within normal range.	No apparent environmental/ecosystem concerns	No apparent fishery/resource-use performance and/or behavior concerns
Level 2: Major Concern	Major problems with the stock assessment; very poor fits to data; high level of uncertainty; strong retrospective bias.	Stock trends are highly unusual; very rapid changes in stock abundance, or highly atypical recruitment patterns.	Multiple indicators showing consistent adverse signals a) across the same trophic level as the stock, and/or b) up or down trophic levels (i.e., predators and prey of the stock)	Multiple indicators showing consistent adverse signals a) across different sectors, and/or b) different gear types
Level 3: Extreme concern	Severe problems with the stock assessment; severe retrospective bias. Assessment considered unreliable.	Stock trends are unprecedented; More rapid changes in stock abundance than have ever been seen previously, or a very long stretch of poor recruitment compared to previous patterns.	Extreme anomalies in multiple ecosystem indicators that are highly likely to impact the stock; Potential for cascading effects on other ecosystem components	Extreme anomalies in multiple performance indicators that are highly likely to impact the stock

Evaluation of risk for GOA skates (all species) in 2026

Assessment-related considerations
Skates in the GOA are managed under Tier 5 and are thus by definition data-limited. Skate biomass is reliably estimated by the bottom trawl survey, and the REMA model performs well for all stocks and stock/region combinations. There are no considerations that would warrant reducing the ABC below maximum permissible. Rated Level 1, No Concern.

Population dynamics considerations
The GOA-wide biomass of Big and Longnose skates have been relatively stable since 2005. There is a slight concern regarding the decline in the WGOA Longnose skate biomass. The GOA-wide Longnose skate biomass looks stable and the WGOA biomass has always represented a smaller portion of the entire GOA-wide population. The biomass for Other skates has been stable since 2019. As a result of these observations there are no undue concerns regarding dynamics. Rated Level 1, No Concern.

Environmental/Ecosystem considerations
The most recent data available suggest an ecosystem risk Level 1 – Normal: “No apparent environmental/ecosystem concerns” given moderate environmental conditions, limited and mixed information on the abundance of prey, predators, and competitors, and a lack of a mechanistic understanding for the direct and indirect effects of environmental change on the survival and productivity of skates. The Skate complex is dominated in biomass by the Big skate (*Beringraja binoculata*) and

Longnose skate (*Raja rhina*), and also includes the Aleutian skate (*Bathyraja aleutica*), the Bering skate, (*B. interrupta*), and the Alaska skate, (*B. parmifera*). This summary of environmental considerations for the Skates complex is based on Big skate, a representative of the dominant species retained catch by biomass, and the minor species of skates (the Aleutian skate, *Bathyraja aleutica*, the Bering skate, *B. interrupta*, and the Alaska skate, *B. parmifera*).

Environment: It is reasonable to expect that the 2026 average ocean temperatures at depth on the shelf edge and shelf were adequate for skates, although optimal temperatures for skate life stages (all demersal) are not known (Callahan, PEEC (2026) and Danielson, PEEC (2026)). El Niño conditions may become apparent in the GOA during the winter and spring of 2027, including potentially warmer surface waters, increased eddy intensity, and changes in forage prey base. There are no documented direct connections between El Niño events and GOA skate population dynamics, however age-0 survival of the 2027 year class may increase with El Niño- related increases eddy kinetic energy and cross shelf circulation, providing better opportunities for larvae to move from slope habitat to optimal nursery habitat.

Prey: The status of skate prey is unknown in 2026 and below-average to average in 2025. Small skates typically consume small crustaceans and polychaetes, while larger skates consume shrimp, crab, and fishes. Benthic invertebrates (e.g., bivalves, brittle stars, hermit crabs, miscellaneous crabs, polychaetes) sampled in the GOA in 2025 remained at persistent decreased levels since 2018 (non-target catch; Whitehouse and Gaichas, in Ferriss (2026)). Shrimp biomass index was close to the long-term mean in 2025 (AFSC bottom trawl survey; Friedman, in Ferriss (2026)). Tanner crab decreased from previous years around Kodiak in 2025 (ADFG survey; Worton, in Ferriss (2026)).

Predators & Competitors: There is no cause to suspect increased predation or competitive pressure on the skate complex. Primary predators of skates include Pacific cod and Pacific halibut, for larval skates, and marine mammals (including sperm whales, sea lions) and dogfish, for adult skates. Pacific cod and Pacific halibut populations remain at relatively low abundance (Hulson *et al.* (2026)). Populations of Steller sea lions have stabilized (eastern GOA) or remain greatly reduced (western GOA) (Sweeney and Gelatt, in Ferriss (2026)). Sperm whale populations are not well known but not expected to have changed. Competitors with overlapping habitat and diets, may include deepwater flatfish (Dover sole) and rex sole.

Fishery performance
As a nontarget stock, catches of skates in the GOA are influenced by their abundance and by the behavior of target fisheries. Recent changes in maximum retention amounts appear to have reduced targeting and retention of skates. Rated Level 1, No Concern.

Summary of risk evaluation: Proper evaluation of risk is difficult for a data-limited stock. However, the available data suggest no concerns that rise above Level 1. No reduction to maximum ABC is recommended.

Summary and ABC recommendation

Assessment-related considerations	*Population dynamics considerations*	*Environmental/ecosystem considerations*	*Fishery Performance*
Level 1: No Concern	Level 1: No Concern	Level 1: No Concern	Level 1: No Concern

Spatial Apportionment: Biologically-informed Recommended Distributions (BRDs)

Since 2005, Big and Longnose skates have had BRDs for the WGOA, CGOA and EGOA to address concerns about disproportionate harvest of skates in each area.

For Big skate, the regional biomass estimates are 7,556 t for the WGOA (20.3% of total); 23,945 t for the CGOA (64.3% of total); and 5,711 t for the EGOA (15.3%). The resulting region-specific ABCs are 567 t for the WGOA; 1,796 t for the CGOA; and 428 t for the EGOA. All regional catches for Big skate from 2025 were below their BRDs (Figure 18-2).

For Longnose skate, the regional biomass estimates are 740 t for the WGOA (2.1% of total); 26,953 t for the CGOA (75.5% of total); and 8,029 t for the EGOA (22.5% of total). The resulting region-specific ABCs are 55 t for the WGOA; 2,021 t for the CGOA; and 602 t for the EGOA. All regional catches for Longnose skate from 2025 were below their BRDs (Figure 18-2).

Status Determination

None of the three assessment groups experienced overfishing in 2025. This statement was determined by comparing the catch in 2025 to the associated OFL. For Big skate, the catch and OFL were 1,903 t and 3,780 t. For Longnose skate, the catch and OFL were 1,278 t and 3,380 t and for Other skates, the catch and OFL were 591 t and 887 t.

Ecosystem Considerations

A full description of the ecosystem considerations can be found in the 2021 GOA skate assessment (Ormseth 2021). There is also a thorough ecological description in the **Risk Table and ABC recommendation** segment under the **Results** section.

Data Gaps and Research Priorities

A full description of the data gaps and research priorities can be found in the 2021 GOA skate assessment (Ormseth 2021). What follows is an abbreviation from the 2021 GOA skate assessment.

It appears that a larger proportion of skate mortality in the GOA comes from fishing mortality rather than predation. Therefore, the highest priority research should continue to focus on direct fishing effects. It is also important to continue research on the productive capacity of skate populations, including information on age, growth, maturity, fecundity, and habitat associations.

References

Cronin-Fine, L. (2023) Assessment of the skate stock complex in the Gulf of Alaska. In: *Stock assessment and fishery evaluation report for the groundfish resources of the Gulf of Alaska*. North Pacific Fishery Management Council, Anchorage, AK.

Eschmeyer, W.N., Herald, E.S. and Hammann, H. (1983) A field guide to pacific coast fishes of north america.Houghton Mifflin Co., Boston, p 336.

Ferriss, B.E. (2026) Abbreviated 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.

Frisk, M.G., J., M.T. and J., F.M. (2001) Estimation and analysis of biological parameters in elasmobranch fishes: a comparative life history study. *Canadian Journal of Fisheries and Aquatic Sciences Science* 58, 969–981.

Frisk, M.G., J., M.T. and J., F.M. (2002) The population dynamics of little skate *Leucoraja erinacea*, winter skate *Leucoraja ocellata*, and barndoor skate *Dipturus leavis*: predicting exploitation limits using matrix analysis. *ICES Journal of Marine Science* 59, 576–586.

Hulson, P.F., Barbeaux, S.J., Ferriss, B., et al. (2026) Assessment of the Pacific cod stock in the Gulf of Alaska.North Pacific Fishery Management Council, Anchorage, AK.

King, J.R. and McFarlane, G.A. (2003) Marine fish life history strategies: applications to fishery management. *Fisheries Management and Ecology* 10, 249–264.

Love, M.S., Mecklenberg, C.W., Mecklenberg, T.A. and Thorsteinson, L.K. (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; USGS/NBII 2005-001.

Moyle, P.B. and Cech, J.J., Jr (1996) Fishes, an introduction to ichthyology. Third. Prentice Hall, New Jersy, p 590.

Ormseth, O.A. (2021) Assessment of the skate stock complex in the Gulf of Alaska. In: *Stock assessment and fishery evaluation report for the groundfish resources of the Gulf of Alaska*. North Pacific Fishery Management Council, Anchorage, AK.

Ormseth, O.A. (2019) Assessment of the skate stock complex in the Gulf of Alaska. In: *Stock assessment and fishery evaluation report for the groundfish resources of the Gulf of Alaska*. North Pacific Fishery Management Council, Anchorage, AK.

PEEC (2026) Preview of Ecosystem and Economic Conditions Workshop. NOAA Alaska Fisheries. May 25-28.

Stevenson, D.E., Orr, J.W., R, H.G. and McEachran, J.D. (2007) Field guide to sharks skates and ratfish of Alaska. Alaska Sea Grant.

Sullivan, J., Monnahan, C., Hulson, P., Ianelli, J., Thorson, J. and Havron, A. (2022) 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.

Walker, P.A. and Hislop, R.G. (1998) Sensitive skates or resilient rays? Spatial and temporal shifts in ray species composition in the central and north-western North Sea between 1930 and the present day. *ICES Journal of Marine Science* 55, 392–402.

Tables

Table 18-1. Harvest specifications and catch (t) for Big skates in the GOA, 2005-2026 (the current management regime for GOA skates was initiated in 2005). W (Western), C (Central) and E (Eastern) indicate the three BRD regions. Total is the total value in the GOA and R is the percent of Total Catch retained.

	Catch					OFL	ABC				TAC			
Year	W	C	E	Total	R	Total	W	C	E	Total	W	C	E	Total
2005	26	811	65	903	72%	5,332	727	2,463	809	3,999	727	2,463	809	3,999
2006	72	1,272	344	1,688	54%	4,726	695	2,250	599	3,544	695	2,250	599	3,544
2007	69	1,518	8	1,594	49%	4,726	695	2,250	599	3,544	695	2,250	599	3,544
2008	132	1,241	45	1,418	70%	4,398	632	2,065	633	3,330	632	2,065	633	3,330
2009	79	1,903	100	2,082	70%	4,398	632	2,065	633	3,330	632	2,065	633	3,330
2010	148	2,236	149	2,533	71%	4,438	598	2,049	681	3,328	598	2,049	681	3,328
2011	110	2,109	90	2,309	80%	4,438	598	2,049	681	3,328	598	2,049	681	3,328
2012	66	1,902	38	2,005	94%	5,023	469	1,793	1,505	3,767	469	1,793	1,505	3,767
2013	121	2,321	91	2,533	62%	5,023	469	1,793	1,505	3,767	469	1,793	1,505	3,767
2014	159	1,396	99	1,654	26%	5,016	589	1,532	1,641	3,762	589	1,532	1,641	3,762
2015	236	1,211	56	1,503	16%	5,016	731	1,257	1,267	3,255	731	1,257	1,267	3,255
2016	167	1,854	50	2,071	33%	5,086	908	1,850	1,056	3,814	908	1,850	1,056	3,814
2017	194	1,453	84	1,730	32%	5,086	908	1,850	1,056	3,814	908	1,850	1,056	3,814
2018	303	929	78	1,310	39%	3,797	504	1,774	570	2,848	504	1,774	570	2,848
2019	132	1,117	102	1,350	48%	3,797	504	1,774	570	2,848	504	1,774	570	2,848
2020	31	811	180	1,023	54%	4,278	758	1,560	890	3,208	758	1,560	890	3,208
2021	126	429	189	744	16%	4,278	758	1,560	890	3,208	758	1,560	890	3,208
2022	164	779	100	1,044	15%	3,822	591	1,482	794	2,867	591	1,482	794	2,867
2023	163	876	234	1,273	20%	3,822	591	1,482	794	2,867	591	1,482	794	2,867
2024	191	1,097	195	1,483	19%	3,780	745	1,749	341	2,835	745	1,749	341	2,835
2025	83	1,678	142	1,903	25%	3,780	745	1,749	341	2,835	745	1,749	341	2,835
2026	58	566	116	740	41%	3,780	745	1,749	341	2,835	745	1,749	341	2,835

Table 18-2. Harvest specifications and catch (t) for Longnose skates in the GOA, 2005-2026 (the current management regime for GOA skates was initiated in 2005). W (Western), C (Central) and E (Eastern) indicate the three BRD regions. Total is the total value in the GOA and R is the percent of Total Catch retained.

	Catch					OFL	ABC				TAC			
Year	W	C	E	Total	R	Total	W	C	E	Total	W	C	E	Total
2005	37	993	162	1,192	70%	3,757	66	1,972	780	2,818	66	1,972	780	2,818
2006	57	682	219	957	32%	3,860	65	1,969	861	2,895	65	1,969	861	2,895
2007	76	978	342	1,396	29%	3,860	65	1,969	861	2,895	65	1,969	861	2,895
2008	34	965	113	1,112	59%	3,849	78	2,041	768	2,887	78	2,041	768	2,887
2009	79	1,096	244	1,419	45%	3,849	78	2,041	768	2,887	78	2,041	768	2,887
2010	106	868	131	1,106	63%	3,803	81	2,009	762	2,852	81	2,009	762	2,852
2011	70	898	74	1,042	60%	3,803	81	2,009	762	2,852	81	2,009	762	2,852
2012	39	802	93	934	70%	3,500	70	1,879	676	2,625	70	1,879	676	2,625
2013	86	1,267	443	1,797	37%	3,500	70	1,879	676	2,625	70	1,879	676	2,625
2014	59	1,159	336	1,554	55%	3,835	107	1,935	834	2,876	107	1,935	834	2,876
2015	137	1,173	349	1,660	53%	3,835	152	2,090	976	3,218	152	2,090	976	3,218
2016	155	889	348	1,391	33%	4,274	61	2,513	632	3,206	61	2,513	632	3,206
2017	189	766	316	1,271	26%	4,274	61	2,513	632	3,206	61	2,513	632	3,206
2018	57	593	233	882	33%	4,763	149	2,804	619	3,572	149	2,804	619	3,572
2019	60	630	318	1,008	29%	4,763	149	2,804	619	3,572	149	2,804	619	3,572
2020	21	363	265	648	30%	3,449	158	1,875	554	2,587	158	1,875	554	2,587
2021	40	522	470	1,032	9%	3,449	158	1,875	554	2,587	158	1,875	554	2,587
2022	68	515	412	996	8%	3,616	151	2,044	517	2,712	151	2,044	517	2,712
2023	80	457	644	1,181	8%	3,616	151	2,044	517	2,712	151	2,044	517	2,712
2024	57	729	461	1,246	8%	3,380	104	1,894	538	2,536	104	1,894	538	2,536
2025	62	719	497	1,278	11%	3,380	104	1,894	538	2,536	104	1,894	538	2,536
2026	30	492	371	893	13%	3,380	104	1,894	538	2,536	104	1,894	538	2,536

Table 18-3. Harvest specifications and catch (t) for Other skates in the GOA, 2005-2026 (the current management regime for GOA skates was initiated in 2005). Retained is the percent of Catch retained.

Year	Catch	Retained	OFL	ABC	TAC
2005	711	16%	1,769	1,327	1,327
2006	1,393	19%	2,156	1,617	1,617
2007	1,257	20%	2,156	1,617	1,617
2008	1,374	15%	2,806	2,104	2,104
2009	1,548	13%	2,806	2,104	2,104
2010	1,496	15%	2,791	2,093	2,093
2011	1,388	16%	2,791	2,093	2,093
2012	1,207	13%	2,706	2,030	2,030
2013	1,903	2%	2,706	2,030	2,030
2014	1,896	6%	2,652	1,989	1,989
2015	1,775	6%	2,652	2,235	2,235
2016	1,637	6%	2,558	1,919	1,919
2017	1,665	7%	2,558	1,919	1,919
2018	746	6%	1,845	1,384	1,384
2019	898	8%	1,845	1,384	1,384
2020	487	1%	1,166	875	875
2021	732	4%	1,166	875	875
2022	978	10%	1,311	984	984
2023	612	9%	1,311	984	984
2024	690	6%	887	665	665
2025	591	3%	887	665	665
2026	329	8%	887	665	665

Table 18-4. Gulf-wide biomass estimates (t) and coefficients of variation (CV) for the three assessment groups in the Gulf of Alaska from 1990-2026. Observed are biomass estimates from the AFSC bottom trawl survey and the Predicted are biomass estimates from the random effects model fitted to the survey time series (REMA model). L95% and U95% are the bounds of the 95% confidence interval for the predicted index.

	Big Skate					Longnose Skate					Other Skate				
	Observed		Predicted			Observed		Predicted			Observed		Predicted		
Year	Index	CV	Index	L95%	U95%	Index	CV	Index	L95%	U95%	Index	CV	Index	L95%	U95%
1990	22,222	0.25	35,948	23,013	56,152	11,940	0.22	15,218	10,805	21,433	10,558	0.32	8,487	4,655	15,474
1991			36,941	25,254	54,036			16,253	11,773	22,437			3,802	1,312	11,015
1992			37,961	27,670	52,080			17,358	13,102	22,996			1,703	563	5,152
1993	39,156	0.18	39,010	30,235	50,331	17,682	0.12	18,538	15,077	22,795	460	0.45	763	342	1,701
1994			40,071	31,966	50,233			20,648	16,110	26,465			896	289	2,776
1995			41,162	33,574	50,465			22,998	17,953	29,462			1,052	352	3,143
1996	42,887	0.18	42,282	34,951	51,151	25,797	0.14	25,616	20,870	31,442	974	0.35	1,235	657	2,324
1997			43,363	35,263	53,323			28,391	22,095	36,482			3,029	1,070	8,576
1998			44,472	35,363	55,926			31,466	24,380	40,612			7,427	2,778	19,854
1999	55,139	0.16	45,608	35,305	58,919	38,998	0.14	34,875	27,970	43,484	18,805	0.12	18,210	14,552	22,788
2000			45,640	35,333	58,953			35,829	27,556	46,586			18,979	6,830	52,735
2001			45,671	35,520	58,723			36,809	28,175	48,089			19,779	6,121	63,917
2002			45,702	35,877	58,217			37,816	29,831	47,938			20,614	7,419	57,280
2003	54,583	0.16	45,733	36,432	57,409	39,223	0.09	38,850	33,348	45,261	21,385	0.12	21,484	17,168	26,885
2004			44,733	36,934	54,178			39,314	32,351	47,774			25,275	10,949	58,346
2005	38,831	0.16	43,754	37,029	51,701	41,085	0.08	39,783	34,662	45,660	29,869	0.11	29,735	23,967	36,891
2006			43,484	36,591	51,676			37,803	31,068	45,998			30,837	13,375	71,099
2007	38,687	0.20	43,216	36,445	51,245	34,249	0.11	35,922	30,546	42,245	32,121	0.11	31,981	26,037	39,281
2008			43,379	36,390	51,709			36,054	29,539	44,006			28,963	12,547	66,857
2009	44,100	0.16	43,542	36,521	51,913	36,333	0.09	36,186	31,281	41,860	26,239	0.12	26,230	20,779	33,111
2010			43,632	35,984	52,906			36,079	29,490	44,142			23,562	10,211	54,366
2011	66,515	0.37	43,722	35,630	53,652	33,473	0.11	35,973	30,332	42,663	20,982	0.10	21,164	17,345	25,825
2012			43,328	35,428	52,988			38,597	31,440	47,383			25,327	10,986	58,384
2013	33,942	0.26	42,937	35,421	52,048	43,997	0.11	41,413	35,142	48,803	30,619	0.11	30,307	24,324	37,762
2014			43,068	35,179	52,725			41,393	33,852	50,614			27,530	11,935	63,505
2015	57,645	0.17	43,199	35,006	53,310	41,409	0.09	41,373	35,637	48,032	25,074	0.11	25,008	20,298	30,811
2016			41,856	34,937	50,145			41,295	33,326	51,171			20,981	9,078	48,490
2017	32,695	0.18	40,554	34,218	48,064	49,025	0.17	41,218	33,506	50,705	17,666	0.13	17,602	13,753	22,528
2018			40,244	33,840	47,859			37,830	30,468	46,970			13,673	5,884	31,774
2019	44,593	0.16	39,935	33,744	47,263	32,002	0.11	34,721	29,373	41,043	10,395	0.15	10,622	8,023	14,062
2020			39,046	32,399	47,056			35,086	28,582	43,068			11,711	5,001	27,425
2021	31,429	0.21	38,176	31,041	46,950	36,357	0.11	35,454	30,137	41,710	13,249	0.18	12,912	9,254	18,017
2022			37,895	30,557	46,996			34,794	28,325	42,741			10,656	4,547	24,971
2023	36,839	0.19	37,617	30,253	46,774	32,990	0.10	34,146	28,850	40,415	8,620	0.15	8,794	6,596	11,725
2024			37,414	29,659	47,196			34,925	27,480	44,387			9,883	4,233	23,074
2025	35,528	0.17	37,212	29,209	47,408	38,038	0.19	35,721	27,493	46,413	11,193	0.15	11,106	8,268	14,918
2026			37,212	28,465	48,647			35,721	25,303	50,430			11,106	3,349	36,836
2027			37,212	27,802	49,806			35,721	23,673	53,902			11,106	2,091	58,981
2028			37,212	27,203	50,903			35,721	22,356	57,076			11,106	1,452	84,928

Table 18-5. Big skate biomass estimates (t) and coefficients of variation (CV) for the three Gulf of Alaska regions from 1990-2026. Observed are biomass estimates from the AFSC bottom trawl survey and Predicted are the region specific predicted biomass produced from the random effects model fitted to the survey time series (REMA model). L95% and U95% are the bounds of the 95% confidence interval for the predicted index.

	Western					Central					Eastern				
	Observed		Predicted			Observed		Predicted			Observed		Predicted		
Year	Index	CV	Index	L95%	U95%	Index	CV	Index	L95%	U95%	Index	CV	Index	L95%	U95%
1990	1,704	0.46	2,559	1,216	5,385	9,049	0.35	19,832	10,949	35,921	11,469	0.39	13,557	7,065	26,013
1991			2,742	1,290	5,827			20,885	12,733	34,254			13,314	6,142	28,860
1992			2,935	1,443	5,971			21,967	14,814	32,574			13,060	6,097	27,973
1993	1,895	0.37	3,137	1,719	5,726	21,491	0.18	23,077	17,269	30,839	15,770	0.37	12,795	6,966	23,502
1994			4,511	2,416	8,423			25,667	19,020	34,636			9,894	4,811	20,347
1995			6,254	3,339	11,713			27,530	20,546	36,889			7,378	3,626	15,010
1996	13,160	0.41	8,390	4,555	15,454	26,368	0.19	28,569	21,866	37,327	3,359	0.30	5,323	3,014	9,399
1997			8,505	4,466	16,199			28,615	21,018	38,959			6,242	3,023	12,891
1998			8,596	4,721	15,653			28,576	20,615	39,613			7,299	3,427	15,545
1999	9,461	0.27	8,660	5,504	13,624	33,827	0.20	28,443	20,544	39,379	11,851	0.46	8,506	4,315	16,765
2000			8,676	4,807	15,657			28,384	19,962	40,359			8,580	3,756	19,601
2001			8,691	4,637	16,291			28,325	19,801	40,519			8,654	3,665	20,437
2002			8,707	4,843	15,653			28,265	20,029	39,890			8,730	3,953	19,279
2003	9,269	0.29	8,722	5,601	13,583	33,585	0.22	28,206	20,712	38,411	11,730	0.38	8,805	4,870	15,921
2004			8,964	5,329	15,079			28,380	21,152	38,077			7,389	3,805	14,349
2005	9,519	0.32	9,167	5,837	14,398	25,421	0.21	28,416	21,960	36,772	3,891	0.36	6,170	3,419	11,134
2006			8,346	4,855	14,348			27,701	20,957	36,616			7,437	3,838	14,410
2007	5,835	0.44	7,538	4,502	12,621	24,285	0.27	26,787	20,495	35,011	8,567	0.35	8,891	5,296	14,928
2008			7,285	4,174	12,716			25,847	19,598	34,090			10,247	5,433	19,327
2009	6,609	0.37	7,001	4,327	11,328	26,544	0.22	24,799	19,268	31,918	10,948	0.32	11,742	7,149	19,284
2010			6,757	3,977	11,481			22,845	17,599	29,655			14,030	6,830	28,820
2011	6,249	0.30	6,432	4,139	9,995	21,642	0.17	20,756	16,340	26,364	38,624	0.63	16,535	7,562	36,152
2012			7,079	4,223	11,865			20,579	15,342	27,604			15,670	7,055	34,802
2013	6,503	0.33	7,771	4,996	12,088	12,752	0.21	20,353	14,691	28,196	14,687	0.56	14,813	7,413	29,600
2014			8,749	5,323	14,381			21,500	16,519	27,984			12,818	6,038	27,211
2015	13,315	0.25	9,748	6,451	14,729	31,819	0.19	22,475	17,168	29,422	12,511	0.56	10,976	5,607	21,487
2016			8,724	5,347	14,233			23,114	17,548	30,445			10,018	4,774	21,024
2017	5,012	0.30	7,775	4,951	12,209	22,756	0.21	23,673	18,372	30,505	4,927	0.55	9,106	4,637	17,882
2018			8,573	5,168	14,221			21,884	16,571	28,899			9,787	5,037	19,017
2019	13,430	0.31	9,390	5,946	14,828	18,274	0.25	20,095	15,178	26,606	12,890	0.28	10,450	6,481	16,850
2020			8,836	5,264	14,832			21,072	15,583	28,495			9,137	4,735	17,634
2021	6,243	0.32	8,266	5,242	13,034	16,740	0.28	21,967	16,356	29,503	8,446	0.51	7,943	4,326	14,584
2022			8,678	5,016	15,013			23,010	17,223	30,743			6,207	3,151	12,226
2023	11,163	0.48	9,004	5,310	15,266	22,502	0.20	23,820	18,301	31,004	3,174	0.34	4,793	2,707	8,487
2024			8,259	4,732	14,416			23,915	17,715	32,285			5,239	2,584	10,624
2025	6,396	0.28	7,556	4,682	12,194	23,029	0.22	23,945	17,541	32,686	6,103	0.46	5,711	2,870	11,365
2026			7,556	3,716	15,364			23,945	16,270	35,239			5,711	2,144	15,214
2027			7,556	3,127	18,257			23,945	15,280	37,523			5,711	1,716	19,013
2028			7,556	2,708	21,082			23,945	14,462	39,646			5,711	1,422	22,937

Table 18-6. Longnose skate biomass estimates (t) and coefficients of variation (CV) for the three Gulf of Alaska regions from 1990-2026. Observed are biomass estimates from the AFSC bottom trawl survey and Predicted are the region specific predicted biomass produced from the random effects model fitted to the survey time series (REMA model). L95% and U95% are the bounds of the 95% confidence interval for the predicted index.

	Western					Central					Eastern				
	Observed		Predicted			Observed		Predicted			Observed		Predicted		
Year	Index	CV	Index	L95%	U95%	Index	CV	Index	L95%	U95%	Index	CV	Index	L95%	U95%
1990	1,031	0.71	509	193	1,338	8,661	0.29	12,054	8,036	18,083	2,249	0.26	2,655	1,734	4,064
1991			433	165	1,134			12,883	8,925	18,594			2,937	1,914	4,509
1992			367	136	992			13,745	10,024	18,848			3,245	2,194	4,800
1993	105	0.72	311	109	893	14,056	0.15	14,647	11,477	18,692	3,520	0.19	3,580	2,651	4,835
1994			352	125	994			16,215	12,437	21,140			4,081	2,845	5,854
1995			398	150	1,055			17,949	13,821	23,310			4,652	3,259	6,638
1996	280	0.64	450	192	1,055	20,227	0.17	19,865	15,769	25,024	5,290	0.18	5,301	4,000	7,025
1997			590	257	1,354			21,781	16,693	28,421			6,020	4,232	8,562
1998			772	345	1,729			23,863	18,156	31,365			6,831	4,805	9,711
1999	1,734	0.52	1,010	465	2,196	29,730	0.18	26,121	20,240	33,710	7,534	0.18	7,744	5,854	10,243
2000			1,005	435	2,325			26,293	19,926	34,695			8,531	5,910	12,314
2001			999	433	2,302			26,427	20,088	34,766			9,384	6,350	13,866
2002			991	461	2,131			26,519	20,756	33,883			10,306	7,173	14,807
2003	779	0.45	981	534	1,804	25,601	0.12	26,569	22,257	31,718	12,843	0.15	11,300	8,650	14,762
2004			1,116	580	2,147			27,579	22,546	33,735			10,619	7,750	14,549
2005	1,717	0.36	1,267	720	2,230	29,689	0.09	28,560	24,476	33,326	9,679	0.18	9,956	7,630	12,990
2006			1,083	570	2,061			27,348	22,414	33,368			9,372	6,740	13,031
2007	630	0.47	926	493	1,741	25,982	0.12	26,177	22,061	31,061	7,637	0.24	8,819	6,488	11,989
2008			999	494	2,022			25,933	21,202	31,719			9,122	6,545	12,714
2009	1,217	0.64	1,078	559	2,077	25,460	0.10	25,677	21,888	30,122	9,656	0.19	9,431	7,185	12,379
2010			1,108	558	2,204			25,486	20,669	31,426			9,485	6,882	13,071
2011	946	0.43	1,140	638	2,036	23,496	0.14	25,295	20,821	30,730	9,032	0.20	9,538	7,259	12,534
2012			1,352	725	2,521			26,956	21,685	33,508			10,289	7,468	14,176
2013	2,100	0.32	1,603	956	2,689	28,141	0.14	28,715	23,817	34,619	13,756	0.17	11,095	8,390	14,673
2014			1,396	752	2,592			30,417	24,686	37,478			9,580	6,927	13,249
2015	708	0.43	1,206	645	2,253	34,075	0.10	31,962	26,932	37,930	6,627	0.22	8,206	6,085	11,066
2016			1,478	797	2,739			31,718	25,313	39,744			8,100	5,780	11,351
2017	2,027	0.31	1,808	1,117	2,926	38,937	0.20	31,427	25,094	39,358	8,061	0.22	7,983	5,945	10,720
2018			1,854	998	3,445			28,400	22,667	35,582			7,576	5,460	10,513
2019	2,216	0.38	1,900	1,090	3,311	22,624	0.13	25,638	21,105	31,145	7,161	0.18	7,183	5,482	9,410
2020			1,797	949	3,405			26,177	21,139	32,416			7,112	5,080	9,956
2021	2,034	0.35	1,699	997	2,897	27,953	0.12	26,717	22,379	31,895	6,369	0.27	7,038	5,115	9,685
2022			1,353	719	2,544			26,217	21,173	32,462			7,224	5,119	10,195
2023	1,024	0.42	1,075	593	1,948	24,619	0.12	25,672	21,193	31,098	7,347	0.21	7,400	5,515	9,928
2024			892	405	1,967			26,320	20,362	34,022			7,712	5,437	10,939
2025	444	0.57	740	300	1,822	29,185	0.24	26,953	20,182	35,995	8,409	0.21	8,029	5,752	11,207
2026			740	245	2,234			26,953	18,794	38,652			8,029	5,025	12,829
2027			740	206	2,653			26,953	17,712	41,014			8,029	4,528	14,236
2028			740	177	3,086			26,953	16,816	43,199			8,029	4,147	15,545

Figures

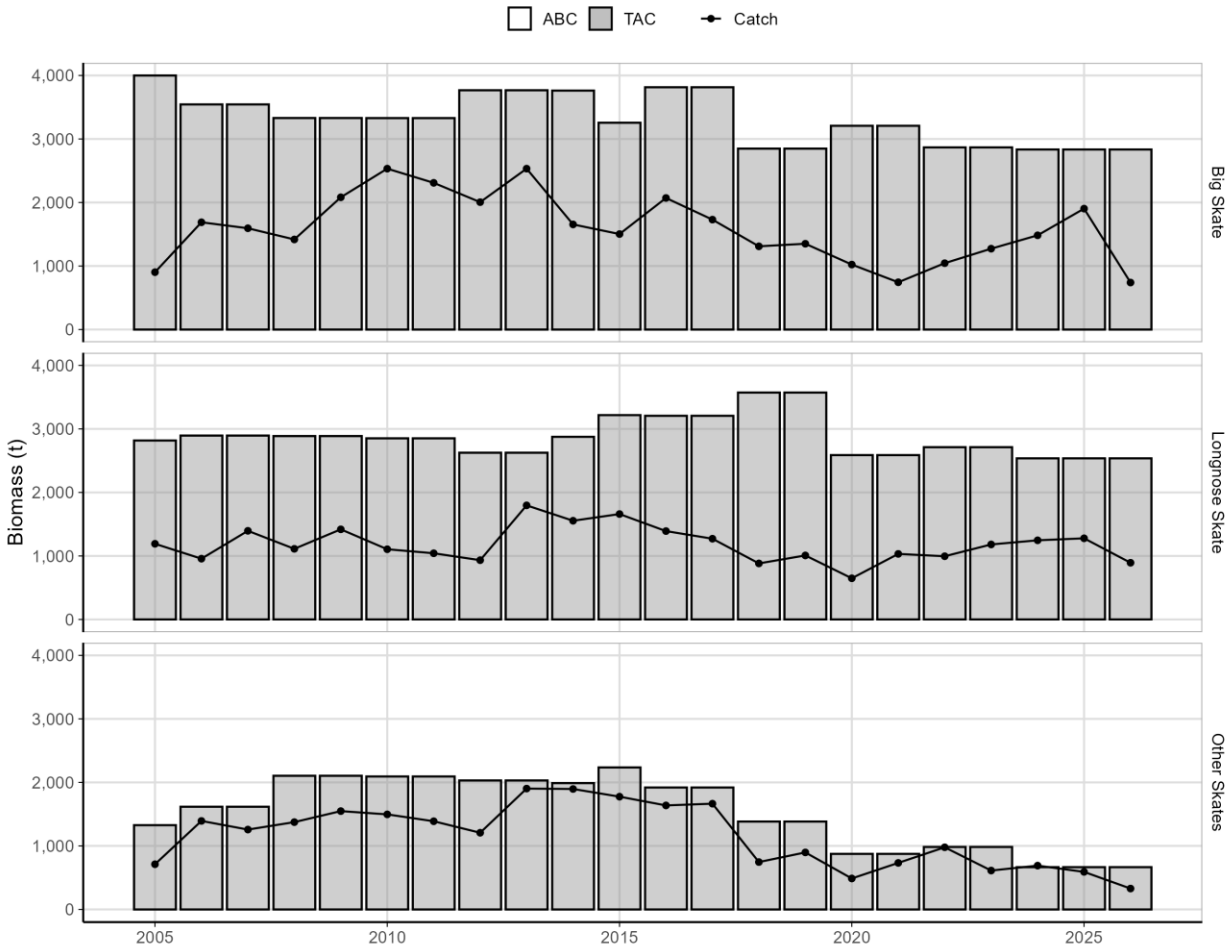

Figure 18-1. Catch, ABC and TAC for Big, Longnose and Other skates from 2005-2026. If the ABC is not visible, it means the TAC equals the ABC for that year.

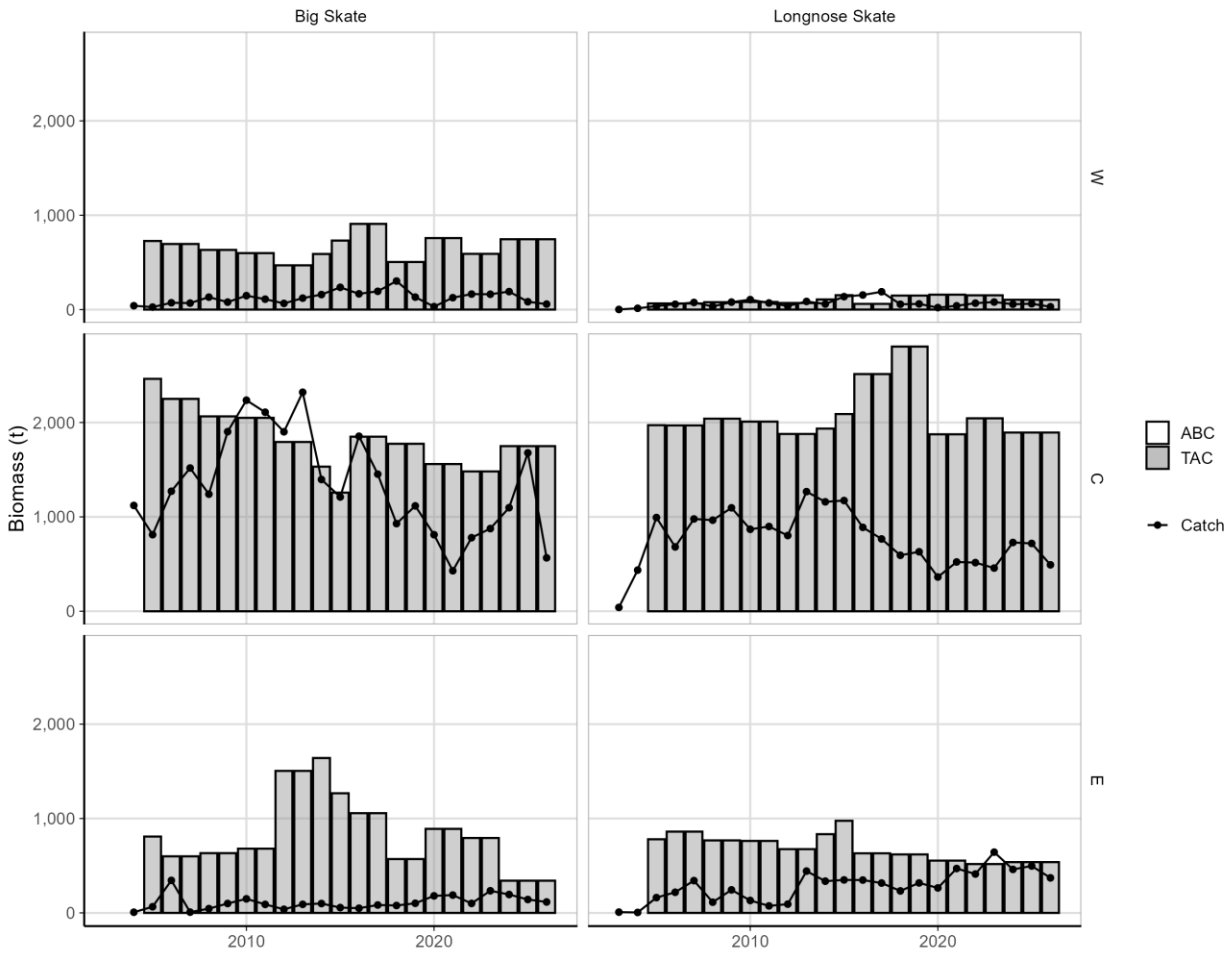

Figure 18-2. Catch, ABC and TAC in the three Gulf of Alaska regions (Western [W], Central [C], and Eastern [E]) for Big and Longnose skates from 2005-2026. If the ABC is not visible, it means the TAC equals the ABC for that year.

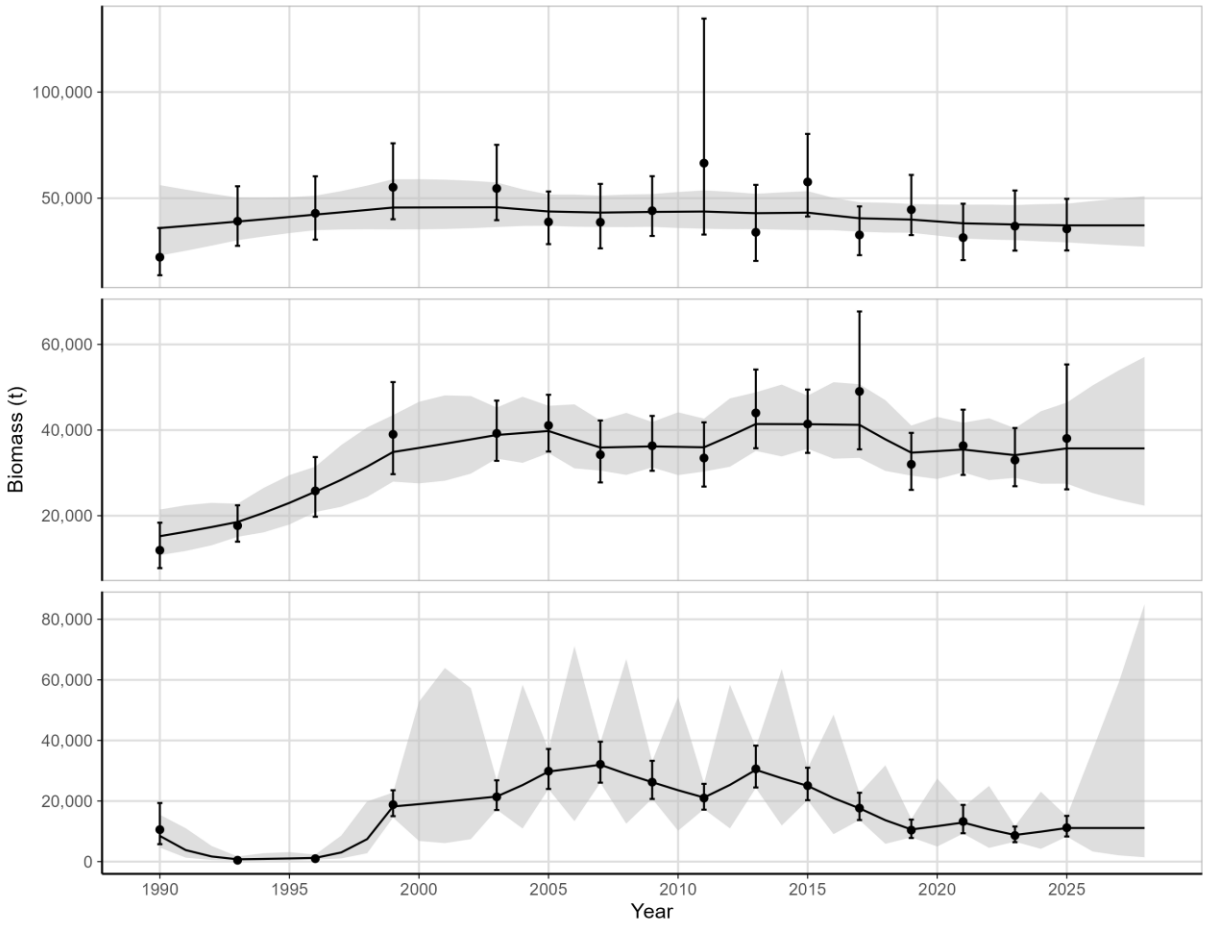

Figure 18-3. Biomass estimates (t) for Big skate (top), Longnose skates (middle), and Other skates (bottom) in the Gulf of Alaska between 1990-2028, from the AFSC bottom trawl survey (dots) and the random-effects model (RE) (black line). The grey shaded region is 95% confidence interval (in log-space) from the REMA model while the error bars are the 95% confidence interval (in log-space) from the survey. Note that vertical scales differ between the plots.

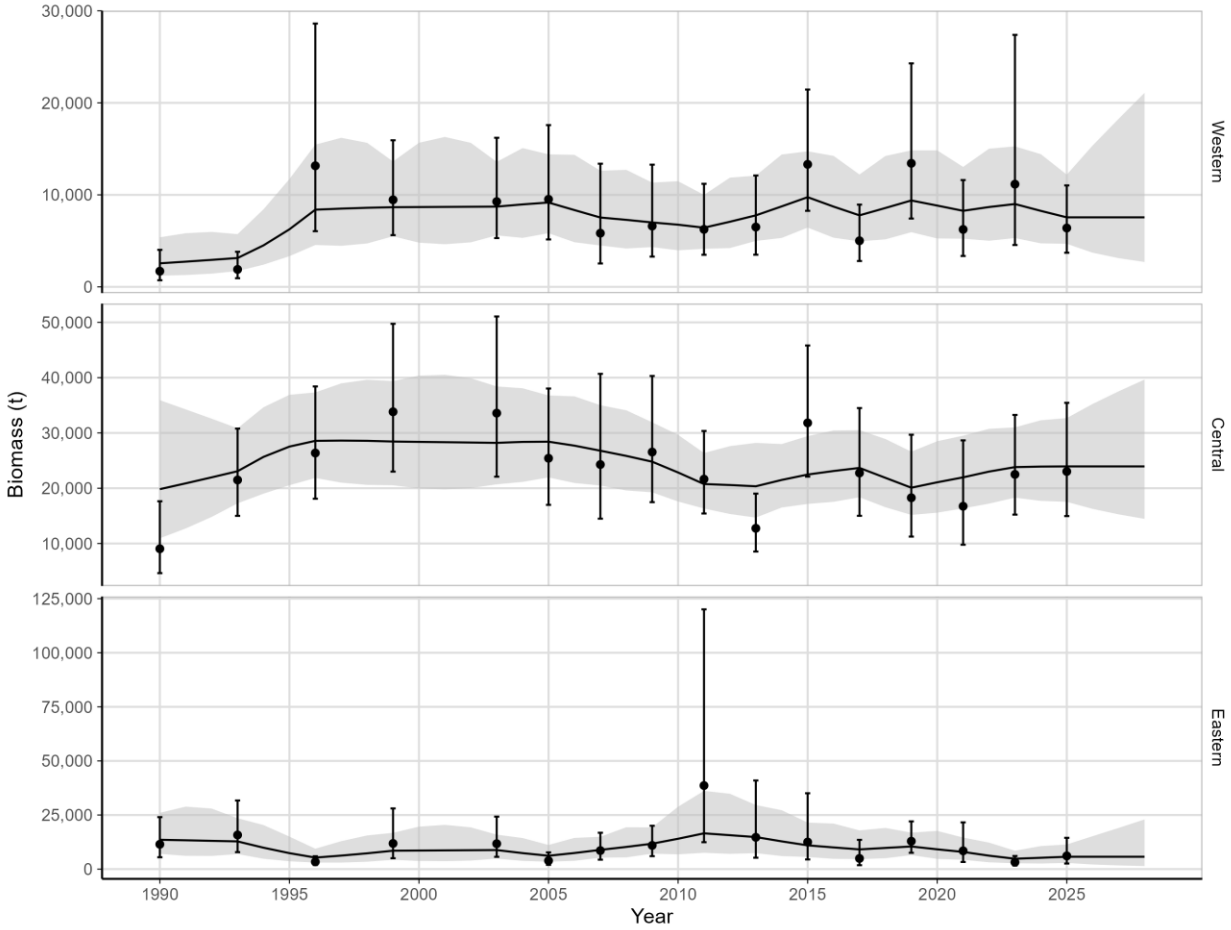

Figure 18-4. Random effects (REMA) model fits to Gulf of Alaska (GOA) Big skate bottom trawl survey biomass by western, central, and eastern GOA management area, where the points are the design-based survey estimates and the black line is the model prediction. The grey shaded region is 95% confidence interval (in log-space) calculated using values from REMA while the error bars are the 95% confidence interval (in log-space) from the survey. Note that vertical scales differ between the plots.

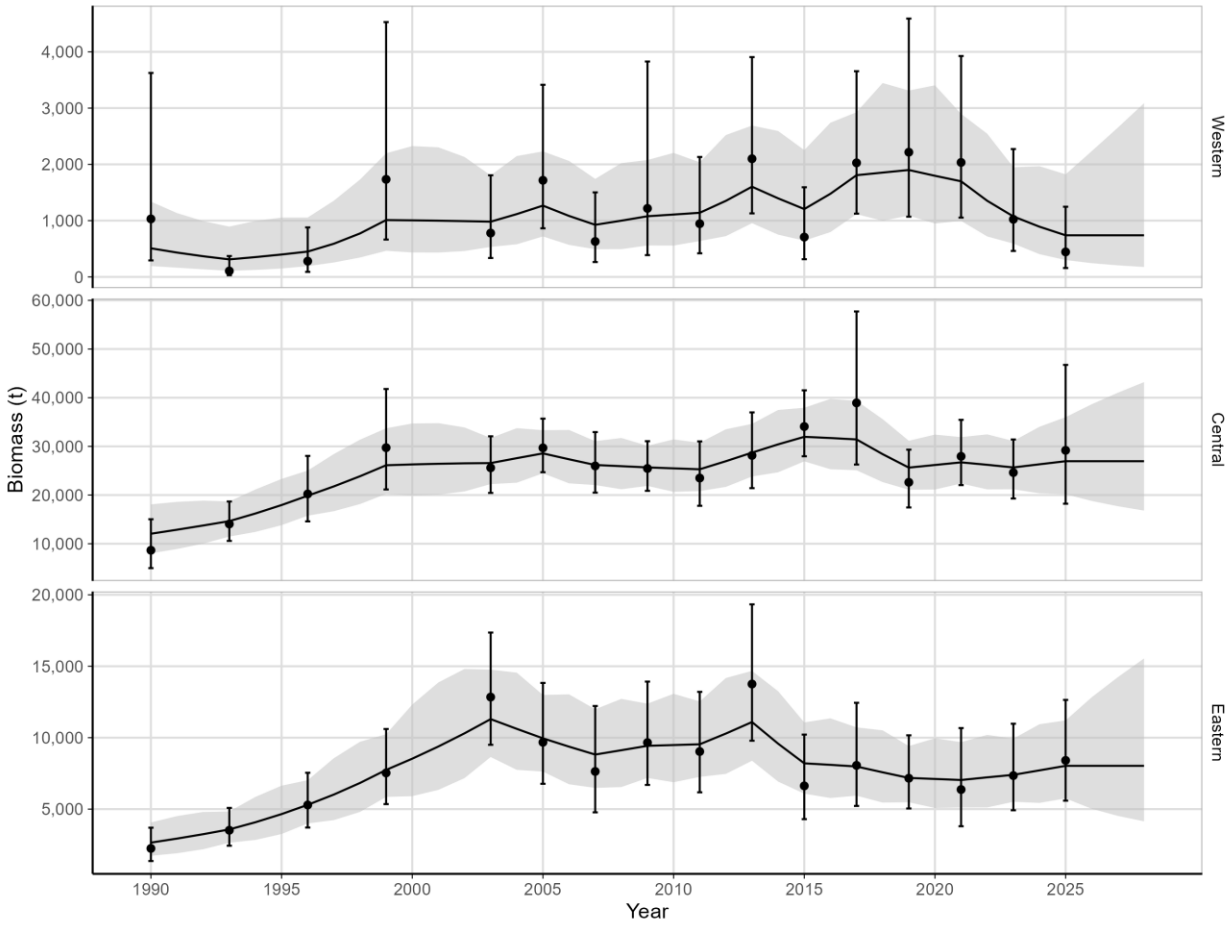

Figure 18-5. Random effects (REMA) model fits to Gulf of Alaska (GOA) Longnose skate bottom trawl survey biomass by western, central, and eastern GOA management area, where the points are the design-based survey estimates and the black line is the model prediction. The grey shaded region is 95% confidence interval (in log-space) calculated using values from REMA while the error bars are the 95% confidence interval (in log-space) from the survey. Note that vertical scales differ between the plots.