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Recommended Harvest Strategy for Aleutian Islands Golden King Crab

by

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February 2019

Alaska Department of Fish and Game **Divisions of Sport Fish and Commercial Fisheries**

Symbols and Abbreviations

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Weights and measures (metric)

centimeter	cm
deciliter	dL
gram	g
hectare	ha
kilogram	kg
kilometer	km
liter	L
meter	m
milliliter	mL
millimeter	mm

Weights and measures (English)

cubic feet per second	ft^3/s
foot	ft
gallon	gal
inch	in
mile	mi
nautical mile	nmi
ounce	oz
pound	lb
quart	qt
yard	yd

Time and temperature

day	d
degrees Celsius	°C
degrees Fahrenheit	°F
degrees kelvin	K
hour	h
minute	min
second	s

Physics and chemistry

all atomic symbols	
alternating current	AC
ampere	A
calorie	cal
direct current	DC
hertz	Hz
horsepower	hp
hydrogen ion activity (negative log of)	pH
parts per million	ppm
parts per thousand	ppt, ‰
volts	V
watts	W

General

Alaska Administrative Code	AAC
all commonly accepted abbreviations	e.g., Mr., Mrs., AM, PM, etc.
all commonly accepted professional titles	e.g., Dr., Ph.D., R.N., etc.
at	@
compass directions:	
east	E
north	N
south	S
west	W
copyright	©
corporate suffixes:	
Company	Co.
Corporation	Corp.
Incorporated	Inc.
Limited	Ltd.
District of Columbia	D.C.
et alii (and others)	et al.
et cetera (and so forth)	etc.
exempli gratia (for example)	e.g.
Federal Information Code	FIC
id est (that is)	i.e.
latitude or longitude	lat or long
monetary symbols (U.S.)	$, ¢
months (tables and figures): first three letters	Jan,...,Dec
registered trademark	®
trademark	™
United States (adjective)	U.S.
United States of America (noun)	USA
U.S.C.	United States Code
U.S. state	use two-letter abbreviations (e.g., AK, WA)

Mathematics, statistics

all standard mathematical signs, symbols and abbreviations	
alternate hypothesis	H_A
base of natural logarithm	*e*
catch per unit effort	CPUE
coefficient of variation	CV
common test statistics	(F, t, χ^2, etc.)
confidence interval	CI
correlation coefficient (multiple)	R
correlation coefficient (simple)	r
covariance	cov
degree (angular)	°
degrees of freedom	df
expected value	*E*
greater than	>
greater than or equal to	≥
harvest per unit effort	HPUE
less than	<
less than or equal to	≤
logarithm (natural)	ln
logarithm (base 10)	log
logarithm (specify base)	log_2, etc.
minute (angular)	'
not significant	NS
null hypothesis	H_O
percent	%
probability	P
probability of a type I error (rejection of the null hypothesis when true)	α
probability of a type II error (acceptance of the null hypothesis when false)	β
second (angular)	"
standard deviation	SD
standard error	SE
variance	
population	Var
sample	var

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RECOMMENDED HARVEST STRATEGY FOR ALEUTIAN ISLANDS GOLDEN KING CRAB

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TABLE OF CONTENTS

Page

LIST OF TABLES

Table **Page**

LIST OF FIGURES

Figure **Page**

LIST OF FIGURES (Continued)

Figure **Page**

LIST OF APPENDICES

Appendix **Page**

ABSTRACT

Golden king crab (*Lithodes aequispinus*) occur in disjunct spatial distributions from the Japan Sea to the northern Bering Sea (ca. 61° N latitude) and as far south as northern British Columbia, with commercial concentrations throughout the Aleutian Islands. The Aleutian Islands golden king crab (AIGKC) fishery is managed in two separate areas east (eastern Aleutian golden, EAG) and west (western Aleutian golden, WAG) of 174° W long with total allowable catch (TAC) fixed in regulation for each area with the intent to develop an abundance-based harvest strategy once a stock assessment model is established. The recently accepted a male-only, size-based stock assessment model provides population abundance estimates that were not previously available. We conducted 30-year forecast simulations (500 replicates) to evaluate how thirteen different harvest policies affect stock sustainability and productivity by comparing conservation (overfished, overfishing, stock status) and economic (fishery closures, catch, catch variation, fishing effort) criteria. All harvest policies we compared included three components: 1) a threshold for opening and closing the fishery based on mature male abundance, 2) an exploitation rate on mature male abundance, and 3) a maximum allowable exploitation rate on legal size males. TACs are determined separately for the EAG and WAG, thus we independently evaluated the various harvest policies for each area. The recommended harvest policy includes a threshold for opening the fishery of 25% of the long-term average of mature male abundance (1985-2017), a moderate exploitation rate on mature male abundance (see final action for specific exploitation rates), and a 25% maximum exploitation rate on legal male abundance for both areas. Our analysis suggests that these policies balance the tradeoff between conservation and economic considerations.

Key words: Aleutian Islands, Golden king crab, harvest strategy, total allowable catch.

INTRODUCTION

BACKGROUND

Golden king crab (*Lithodes aequispinus*), also called brown king crab, occur in disjunct spatial distributions from the Japan Sea to the northern Bering Sea (ca. 61° N latitude) and as far south as northern British Columbia. Commercial concentrations occur throughout the Aleutian Islands, generally in high-relief habitat such as inter-island passes, on various sea mounts, at depths of 300–1,000 m and on structurally complex bottom types. Golden king crabs go through four lecithotrophic (non-feeding) larval stages before molting to the post-larval glaucothoe stage. Glaucothoe then molt into the first juvenile instar (C1) where they take an adult-like form. The depth distribution of larvae is unknown due to lack of plankton samples containing golden king crab larvae (Shirley and Zhou 1997); however, relative behavioral inactivity (Shirley and Zhou 1997) and the lecithotrophic nature of larvae could be indicative of a more benthic vertical distribution. A demersal larval distribution may imply limited horizontal transport, yet a recent study (NPRB Project 1526) failed to detect population genetic structure across a broad spatial extend, suggesting some larval drift and connectivity among Aleutian Islands subregions.

The Aleutian Islands golden king crab fishery has evolved over the years but began in the Dutch Harbor Area in 1961 and in Adak Area in 1975/76 as incidental catch to the red king crab fishery. Directed golden king crab landings were first reported in the 1981/82 and were harvested in two directed fisheries occurring in the Adak and Dutch Harbor Registration Areas divided at 171° W longitude until the 1996/97 season. The fishery was managed with size, sex, and season restrictions and harvest levels were based on catch in prior seasons (Leon et al. 2017). In March 1996 the Alaska Board of Fisheries (BOF) replaced the Adak and Dutch Harbor areas with the newly created Aleutian Islands Registration Area O and directed the Alaska Department of Fish and Game (ADF&G) to manage the golden king crab fishery in the areas east and west of 174°W longitude (Figure 1). That re-designation of management areas was intended to more accurately reflect golden king crab stock distribution, coherent with the longitudinal pattern in fishery production prior to 1996/97. While Aleutian Island golden king crab is considered one stock, the fishery has been managed in two areas separated at 174° W longitude since the 1996/97 season. Hereafter, the stock segment east of 174° W longitude is referred to as EAG (i.e., “eastern Aleutian goldens”) and the stock segment west of 174° W longitude is referred to as WAG (i.e., “western Aleutian goldens”). Since the 1996/97 season, the EAG and WAG fisheries have been managed under a constant-catch harvest strategy, thus retained catch remained relatively stable (Figure 2). Beginning in 2005/06 the Aleutian Islands golden king crab fishery has been prosecuted under the Crab Rationalization Program, which resulted in dramatic changes in fishing practices; most notably, reduced fleet size and increased average pot soak time. The EAG fleet decreased from an average of 16 vessels to an average of 4 vessels, while the WAG fleet size decreased from an average of 9 vessels prior to 2 vessels. Average soak times increased from 4 to 15 days east of 174° W long and from 9 to 24 days west of 174° W long, which enabled crab to “self-sort” on bottom, reducing on-deck sorting time and bycatch of sublegal and female crab.

The Aleutian Islands king crab stock boundary is defined by the boundaries of the Aleutian Islands king crab Registration Area O (Figure 2), as described in ADF&G (2017):

> Registration Area O has as its eastern boundary the longitude of Scotch Cap Light (164°44.72′W long), its western boundary the Maritime Boundary Agreement Line that is described in the text of and depicted in the annex to the Maritime Boundary Agreement between the United States and the Union of Soviet Socialist Republics signed in Washington, June 1, 1990, and as that Maritime Boundary Agreement Line is depicted on NOAA *Chart #513* (7th Edition, June 2004) and NOAA *Chart #514* (7th Edition, January 2004), adopted by reference, and its northern boundary a line from Cape Sarichef (54°36′N lat) to 171°W long, north to 55°30′N lat, and west to the Maritime Boundary Agreement Line.

PURPOSE

The purpose of this report is to provide the basis for a recommended AIGKC harvest strategy. We provide a brief history of the fishery, an overview of the fishery management goals and objectives, and the need for an updated harvest strategy. We describe the harvest strategies we evaluated, the newly adopted stock assessment model, and the forecast simulation methods. Finally, we describe the simulation results and provide our recommended policies.

FEDERAL-STATE CO-MANAGEMENT

The North Pacific Fishery Management Council (NPFMC) Fishery Management Plan (FMP) for Bering Sea/Aleutian Islands (BSAI) king and Tanner crabs establishes a State/Federal cooperative management regime that defers crab management to the State of Alaska with Federal oversight (NPFMC 2011). The FMP applies to 10 king and Tanner crab stocks in the BSAI: four red king crab *Paralithodes camtschaticus* stocks (Bristol Bay, Pribilof Islands, Norton Sound, and Adak); two blue king crab *P. platypus* stocks (St. Matthew Island and Pribilof Islands); two golden king crab stocks (Aleutian Islands and Pribilof Islands); the EBS Tanner crab *Chionoecetes bairdi* stock; and the EBS snow crab *C. opilio* stock. Status determination criteria for crab stocks are annually calculated using a five-tier system that accommodates varying levels of uncertainty of information. Under the five-tier system, overfishing levels (OFL) and acceptable biological catch (ABC) levels are annually formulated. The OFL equals maximum sustainable yield (MSY) and is derived through the annual assessment process, under the framework of the tier system. The ABC is typically set below the OFL to account for "the scientific uncertainty in the estimate of OFL and any other specified scientific uncertainty" (NPFMC 2011).

Under the FMP's cooperative management regime, annual harvest levels and other management actions for the FMP crab stocks are determined by ADF&G according to State commercial fishery regulations established by the BOF and the guidance provided by the BOF Policy on King and Tanner Crab Resource Management Goal and Benefits, subject to the constraint that such harvest levels and management actions are consistent with provisions of the FMP, the national standards of the Magnuson-Stevens Fishery Conservation and Management Act (MSA), and other applicable federal laws. FMP Amendment 38 established the optimum yield (OY) for each crab stock as a range from 0 pounds to less than the OFL. That definition of the OY range enables the State to determine appropriate harvest levels, either as a total allowable catch (TAC) for the fisheries included in the federal Crab Rationalization Program or as a guideline harvest level (GHL) for the non-rationalized fisheries, below the OFL to prevent overfishing or to address other possible impacts to the reproductive potential of a stock that are not accounted for in the federal determination of the OFL. Hence ADF&G has the responsibility under Amendment 38 to not only establish the annual harvest level for each of the FMP stocks sufficiently below the ABC so that the sum of all sources of fishing mortality (including retained catch, cost-recovery fisheries, bycatch mortality in the directed fishery, and bycatch mortality in all non-directed fisheries) do not exceed the ABC, but to also account for numerous other factors and OY considerations, including scientific uncertainty not already accounted for in the ABC itself.

Until 2017, Aleutian Islands golden king crab was classified as a Tier 5 stock where the OFL was based on average catch from a representative period of years that are indicative of production potential of the stock. A size structured assessment model based solely on fisheries data has been under development for several years and was formally accepted in 2016 for OFL and ABC setting for the 2017/18 season. The CPT in January 2017 and SSC in February 2017 recommended to using the Tier 3 procedure to set the OFL and ABC.

The FMP authorizes the State to set preseason TACs under State regulations. Currently, the Aleutian Islands golden king crab annual TAC is set by state regulation (5 AAC 34.612 *Harvest Levels for Golden King Crab in Registration Area O*), as approved by the BOF is March 2012:

> (a) Until the Aleutian Islands golden king crab stock assessment model and a state regulatory harvest strategy are established, the harvest levels for the Registration Area O golden king crab fishery are as follows:
>
> > (1) east of 174° W long (EAG): 3.31 million pounds; and
> >
> > (2) west of 174° W long (WAG): 2.98 million pounds;
>
> (b) The department may reduce[1] the harvest levels in (a) of this section based on the best scientific information available, in considering the reliability of estimates and performance measures, uncertainty as necessary to avoid overfishing, and any other factors necessary to be consistent with sustained yield principles.

[1] The word "modify" was adopted by the BOF before the 2018/19 fishing season to allow greater flexibility in TAC setting prior to the acceptance of a harvest strategy but when population abundance estimates from the accepted stock assessment model may suggest TAC increases are warranted.

Regulation (5 AAC 34.610 (b)) sets the commercial fishing season for golden king crab in the Aleutian Islands Area as 1 August through 30 April. That regulatory fishing season became effective in 2015/16 (the commercial fishing season was set in regulation as 15 August through 15 May during 2005/06–2014/15).

Current regulations (5 AAC 39.645 (d)(4)(A)) stipulate that onboard observers are required on catcher vessels during the time that at least 50% of the retained catch is captured in each of the three trimesters of the 9-month fishing season. Onboard observers are required on catcher-processors at all times during the fishing season.

Additional management measures include only males of a minimum size may be retained by the commercial golden king crab fishery in the Aleutian Islands Area. By SOA regulation (5 AAC 34.620 (b)), the minimum legal-size limit is 6.0 inches (152.4 mm) carapace width (CW), including spines, which is at least one annual molt increment larger than the 50% maturity length of 120.8 mm carapace length (CL) for males estimated by Otto and Cummiskey 1985. A CL ≥136 mm is used to identify legal-size males when CW measurements are not available (Table 3-5 in NPFMC 2007). Note that size limit for golden king crab has been 6.0 inches (152.4 mm) CW for the entire Aleutian Islands Area since the 1985/86 season. Prior to the 1985/86 season, the legal-size limit was 6.5 inches (165.1 mm) CW for at least one of the now-defunct Adak or Dutch Harbor Registration Areas.

MANAGEMENT GOALS AND OBJECTIVES

An optimal harvest strategy for any fishery resource depends on fishery management goals and objectives. The management goal in the FMP is to maximize the overall long-term benefit to the nation of BSAI king and Tanner crab stocks by coordinated federal and state management, consistent with responsible stewardship for conservation of the crab resources and their habitats. Within the scope of the management goal, the FMP identifies seven management objectives, which conforms to the Magnuson–Stevens Act national standards (NPFMC 2011).

Biological Conservation Objective: Ensure the long-term reproductive viability of king and Tanner crab populations.

Economic and Social Objective: Maximize economic and social benefits to the nation over time.

Gear Conflict Objective: Minimize gear conflict among fisheries.

Habitat Objective: Preserve the quality and extent of suitable habitat.

Vessel Safety Objective: Provide public access to the regulatory process for vessel safety considerations.

Due Process Objective: Ensure that access to the regulatory process and opportunity for redress are available to interested parties.

Research and Management Objective: Provide fisheries research, data collection, and analysis to ensure a sound information base for management decisions.

In March 1990, the BOF adopted a fishery management policy for king and Tanner crabs (ADF&G 1990; and listed in ADF&G 2017). The goal of the policy is to maintain and improve crab resources for the greater overall benefit to Alaska and the nation. Achievement of this goal is constrained by the need to minimize: (1) risk of irreversible adverse effects on reproductive potential; (2) harvest during biologically sensitive periods; (3) adverse effects on non-targeted portions of the stock; and

(4) adverse interactions with other stocks and fisheries. The policy endeavors to maintain a healthy stock, provide for a sustained and reliable supply of high-quality product that leads to substantial and stable employment, and provide for subsistence and personal use of the resource. In brief, the BOF specified a series of policies to protect the crab stock and provide optimum utilization:

- Maintain stocks of multiple sizes and ages of mature crabs to sustain reproductive viability and to reduce industrial dependency on annual recruitment;
- Routinely monitor crab resources so that harvests can be adjusted according to stock productivity;
- Protect stocks during biologically sensitive periods;
- Minimize handling mortality of non-legal crabs;
- Maintain adequate broodstock to rebuild the population when it is depressed;
- Establish management measures based on the best available information for each area; and
- Establish regulations which will help improve the socioeconomic aspects of management.

Current size-sex-season measures (i.e., harvest of only large males and no fishing during spring molting and mating periods) are generally consistent with these policies and are based on economic consideration of market value, protection of females, and allowance of at least one mating season for males. Other than the analysis described here, optimal harvest rates have not formally been evaluated for Aleutian Islands golden king crab. Our analysis evaluated criteria that parallel goals outlined in the Federal FMP and BOF fishery management policy for king and Tanner crabs. The BOF policy on king and Tanner crab management provides specific criteria under which alternative harvest strategies can be evaluated. The Magnuson–Stevens Fishery Conservation and Management Act provides additional criteria (NMFS 1996). In particular, National Standard 1 states that "conservation and management measures shall prevent overfishing while achieving, on a continuing basis, the optimal yield from each fishery."

HARVEST STRATEGY NEED

Aleutian Islands golden king crab does not have a fishery-independent bottom trawl survey, thus area-swept abundance estimates are not available as with other BSAI crab stocks. Prior to the formal acceptance of the stock assessment model by the NPFMC, stock size relative to B_{MSY} was unknown. The recently accepted AIGKC stock assessment model relies solely on fishery-dependent data; however, a time series of population abundance is estimated via model hindcasts. While fishery performance data can be used as an index for population fluctuations, absolute abundance estimates allow for calculations through variable or fixed exploitation rates so that the TAC can be scaled proportionately to stock status. The BOF intended that the fixed harvest levels in regulation 5 AAC 34.612 would remain stable "*until the Aleutian Islands golden king crab stock assessment model and a state regulatory harvest strategy are established*". The absence of a harvest strategy impeded the state's capability to increase harvest levels. Because model-based hindcast population estimates fluctuate over time yet historical harvest levels have been relatively static, the exploitation rates have varied among years and between areas from 1996 to 2018 (Figure 3). The average exploitation rate on mature males over the past 10 years was approximately 15% in the EAG and 23% in the WAG. The ability to annually adjust harvest levels scaled to population abundance fluctuations allows for better conservation of the resource and maximizes economic and social benefits. Prior to the acceptance of the stock assessment model, fixed harvest levels could only be reduced if fishery-dependent data (e.g., catch per unit effort, size distributions) cause concerns about stock conservation (ADF&G 2017).

HARVEST STRATEGY SCENARIOS

We compared thirteen harvest policies (Table 1). Each policy had three elements: 1) a threshold for opening or closing the directed fishery, 2) an exploitation rate on mature male abundance, and 3) a maximum exploitation rate on legal male abundance. For all scenarios, the directed fishery is prohibited if MMA/MMA_{AVE} <25%, which is consistent with the federal control rule were the overfishing level instantaneous fishing mortality (F_{OFL}) used in the calculation of the OFL equals zero when B/B_{MSY} is <25%. In all but one policy the exploitation rate on mature male abundance (MMA) increases linearly based on the ratio of the current year MMA relative to the long-term average MMA for the period 1985 to 2017 (MMA_{AVE}; Figure 4). The exploitation rate on mature males is then capped when $MMA/MMA_{AVE} \geq 1$. The maximum exploitation rate on legal male abundance provides an additional level of protection against over harvesting legal males in years when legal male abundance is low relative to the entire size range of mature male abundance and is common in other BSAI crab state harvest strategies. Typically, this situation occurs when the population trend is increasing from a period of low production (i.e., strong cohort of mature size males exists simultaneously as a senescing cohort of legal sized males). We estimated historical exploitation rates by comparing past GHL/TAC values with model hindcast estimates of mature male biomass in the associated year. Finally, we included policy 13, where the exploitation rate on mature male abundance is fixed at the estimated historical 10-year (2008-2018) average exploitation rate as a proxy for status quo (15% for EAG and 23% for WAG).

STOCK ASSESSMENT MODEL

The AIGKC stock assessment uses a male-only length-based model (Siddeek et al. 2018). Separate model simulations are conducted for the EAG and WAG. Because AIGKC is considered one stock but managed as two separate areas, the OFL and ABC are calculated for each management area separately, and then combined for a single stock OFL and ABC. The underlying population dynamics model is based on fisheries data alone and combines commercial retained catch, total catch, groundfish fishery discarded catch, standardized observer legal size catch-per-unit-effort (CPUE) indices, commercial fishery (fish ticket) CPUE indices, fishery retained catch size composition, total catch size composition, and tag recaptures by release-recapture length to estimate stock assessment parameters. Because of the lack of an annual stock survey, the assessment model relies heavily on standardized CPUE indices and catch and size composition information to determine the stock abundance trends in both regions. We assumed that the observer and fish ticket CPUE indices are linearly related to exploitable abundance. We fitted the observer and commercial fishery CPUE indices with estimated standard errors and an additional model estimated constant variance.

There were significant changes in fishing practice due to changes in management regulations (e.g., constant TAC since 1996/97 and crab rationalization since 2005/06), pot configuration (escape web on the pot door increased to 9-inch since 1999), and improved observer recording in Aleutian Islands golden king crab fisheries since 1998. These changes prompted consideration of two sets of catchability and total selectivity parameters with only one set of retention parameters for the periods 1985/86–2004/05 and 2005/06–2017/18. Tagging data were used to calculate the size transition matrix. To estimate the male mature biomass (MMB), we used the knife-edge 50% maturity based on the chela height and carapace length data analysis. To include a long time series of CPUE indices for stock abundance contrast, we also considered the 1985/86–1998/99 commercial fishery standardized CPUE indices as a separate likelihood component in all scenarios.

We kept *M* constant at 0.21/yr. The *M* value was the combined estimates for EAG and WAG. We assumed directed pot fishery discard mortality rate at 0.20/yr, overall groundfish fishery mortality rate at 0.65/yr [mean of groundfish pot fishery mortality (0.5/yr) and groundfish trawl fishery mortality (0.8/yr)], groundfish fishery selectivity at full selection for all length classes (selectivity = 1.0). A full description of the stock assessment model can be found in the 2018 Stock Assessment and Fishery Evaluation Report for the King and Tanner Crab Fisheries of the Bering Sea and Aleutian Islands Regions (Siddeek et al. 2018).

FORECAST SIMULATION METHOD

We simulated the future male stock abundances from the 2018 base assessment model (scenario 18_0) estimated abundances by length-class and parameters using ADMB (AD Model Builder, Fournier et al. 2012) and summarized using R (R Core Team. 2018. R version 3.5.1). We projected the abundances for 30 years with 500 random replicates under federal and state harvest control rules and estimated various management parameters: mature male biomass (MMB), mature male abundance (MMA), legal male biomass (LMB), overfishing level catch (OFL), acceptable biological catch (ABC), retained catch (RETC), total catch (TOTC), retained catch-per-unit effort (CPUE), relative fishing effort, stock status relative to the long-term average, and number of annual recruits to the model size-class (Recruit).

Future population projections primarily depend on future recruitment, but crab recruitment is difficult to predict. Therefore, annual recruitment for the projections was generated using two established stock-recruitment (SR) models: 1) Hockey Stick SR model and 2) Ricker SR model. Both the SR model generated recruitments and the terminal abundance in 2017 (another source of projection uncertainty) were randomized by a lognormal random error distribution. Because fisheries do not harvest the exact quantity of total allowable catch (TAC) prescribed each year, a normal random error (i.e., "implementation error") was added to the predicted RETC.

The simulation steps and associated equations are described in detail in Appendix A but are briefly described below:

1) We ran the assessment model scenario 18_0 (base model) from the start year to the terminal year (2017/18) of the data. Model equations are provided in Appendix A of Siddeek et al. 2018.
2) After estimating the abundances and parameters in step 1, we ran the forecast function (at the final phase of the AD Model Builder, ADMB optimization). In the forecast, we used a constant last 10-yr mean groundfish fishing mortality and a constant *M* of 0.21 yr^{-1}. The two established SR models: 1) Hockey Stick SR model and 2) Ricker SR model were used to integrate over alternative productivity hypotheses.
    a. We formulated the Hockey stick stock-recruit relationship with lognormal errors
    b. We reparametrized the Ricker stock-recruitment relationship with lognormal errors in terms of steepness parameter (h), equilibrium spawning biomass-per-recruit at an F (spr) and at F = 0 (spr0), and number of recruits at unfished equilibrium (R_0) following Martell et al. 2008 and Punt et al. 2012.
    c. Log normal estimation error was considered for the initial abundance estimate.
    d. Implementation error was considered by adding additional normal random errors to the retained catch.
    e. Because of uncertainty in the estimates, we explored the effects of variability in estimated recruit standard deviation and autocorrelation, steepness, and standard deviation of the catch implementation error on simulation results. We considered a low and high values

from the estimates for the recruitment variability. To reduce the number of model scenarios we only considered a low (zero) and estimated values for the catch implementation standard deviation. The variation of realized catch difference from TAC is relatively small (Appendix A). The total number of scenarios using different recruitment and implementation error values was 18 using the Hockey stick SR relationship and 54 using the Ricker SR relationship for each of the thirteen harvest policies (see Appendix A for details).

3) Projection:
   a. The federal overfishing levels (OFL and ABC: 75% of the OFL) are calculated for each area separately (as presented in this analysis) and then combined for total stock-level OFL and ABC (as presented in the SAFE). The area-specific OFL and ABC are important indicators for each management area, yet the combined stock-level OFL and ABC are the official benchmarks for which stock-level overfishing is measured within the federal process. To better understand how area-specific RETC interacts with area-specific OFL and ABC, we ran three sets of simulations under different harvest regimes for the EAG and WAG: 1) the estimated retained catch biomass was always less than the retained catch part of the federal ABC (simulation details in Appendix A); 2) the retained part of the estimated ABC at each projection year constrained the harvest rate by ABC/RETC (i.e., a proportional reduction) when the number of mature males available for harvest exceed the number of males in the retained catch part of the ABC, and 3) the estimated retained catch biomass was not limited by the retained catch part of the federal ABC. In addition to state harvest control rule, the federal control rule F (i.e., F_{ofl}) was also used to determine OFL and hence ABC in the simulations.
   b. We calculated Tier 3 retained catch part of ABC using federal F_{OFL}.
   c. We calculated MMB, MMA, LMB, and stock status.
   d. We calculated TOTC, RETC, RETC variability, CPUE, fishing effort index, and Recruit using state harvest control rule on MMA.
   e. We implemented the fishery and removed the retained catch (after adding the implementation error to retained catch) and directed bycatch (estimated using the average bycatch rates in EAG and WAG for the 2005/06-2017/18 fisheries) from the simulated population.
   f. We drew new recruitment numbers from the stock-recruitment models and distributed them to length bins.
   g. We updated the number-at-length.
4) We repeated step-3 for 30 years into the future.
5) We repeated steps 3 and 4 for a set number of 500 Monte Carlo trials, randomizing recruitment abundance and catch.
6) We considered both short term projection (1-8 years) and long-term projection (1-30 years) results of annual distribution of simulated MMB, LMB, MMA, RETC, CPUE, stock status, state harvest control rule, relative fishing effort, Recruit, and annual variability in retained catch (Punt et al. 2008) to calculate performance statistics.

We compared the harvest strategies using a 2-tier approach, which considered conservation and economic criteria separately for the EAG and WAG. The conservation criteria included the probability of the population being below the federal minimum stock size threshold (MSST; i.e., threshold for being “overfished”), the probability of the retained catch plus bycatch mortality exceeding the federal OFL, the probability of the retained catch plus bycatch mortality exceeding the federal ABC (i.e., OFL * 0.75), and the probability that MMB < B_{MSY}. The economic criteria included the probability of a fishery closure, average RETC, annual variability of RETC, probability of RETC < historic mean TAC, probability of RETC within a defined range (EAG: 4 mill lb ± 20%; WAG: 3 mill lb ± 20%), relative fishing effort (as defined by RETC/CPUE), average CPUE, the probability of that CPUE is less than the post-rationalization average CPUE, and the probability of MMA < MMA_{AVE}. Although the probability of MMB < B_{MSY} increased with increasing recruitment variability, results suggest that model simulations are generally robust to changes in recruitment parameter and catch implementation error values. As such, we focus on model scenarios that use "best estimates" of recruitment parameter and catch implementation error values for harvest strategy comparisons in this analysis. Results shown here are averages of the Ricker and Hockey stick simulation outputs. While total fishery mortality is limited by the *total combined* area-specific federal control rules (OFL and ABC), the individual area-specific federal control rules are important indicators of stock status within each management area. Because of this, we focus on results from harvest regime 2 described in section 3.a. above (i.e., proportional reduction of the harvest rate by ABC/RETC when the number of mature males available for harvest exceed the number of males in the retained catch part of the ABC) for this analysis as an approximation, but provide WAG results for harvest regimes 1 and 3 for certain metrics help refine policy recommendations (see policy selection section below). Additional details of the forecast simulations under harvest regime 1 are described in Appendix A.

PROJECTION RESULTS

We summarized projection results and computed probabilities in conservation and economic risk matrices in Tables 2–7, but qualitatively describe results below:

CONSERVATION CRITERIA

In both the EAG and WAG, probabilities of exceeding conservation thresholds were similar under both legal harvest caps (25% and 30% legal male abundance). The probability of being overfished (i.e., probability of MMB < MSST) and severely overfished (i.e., probability of MMB < 0.5 * MSST) was zero for the EAG and WAG in all policies we evaluated (Figure 5). The probability of exceeding the OFL was low in the EAG, except for the 30% ramps where the short and long-term probabilities of exceeding the OFL were 50% and 55% respectively (Figure 6). The 22.5% ramp had short and long-term probabilities of exceeding the OFL of 8% and 15% respectively. The 20% ramps had short and long-term probabilities of exceeding the OFL of 3% and 8% respectively. The probability of exceeding the OFL was less than approximately 3% for all other policies in the EAG. In the WAG, the 30% ramps had relatively high probabilities of exceeding the OFL at 95% (short-term) and 94% (long-term). Policy 13 (23% fixed harvest rate) had a short and long-term probability of exceeding the OFL of 24% and 32% respectively.

In the EAG, the probability of exceeding the ABC increased with increasing exploitation rate in mature male abundance under both legal caps, and short and long-term trends were similar (Figure 7). On average, the 30% legal caps yielded probabilities of exceeding the ABC of 100%. Probabilities of exceeding the ABC decreased with decreasing harvest rates. In the WAG, all policies with a harvest rate ≥17.5% had probabilities of exceeding the ABC ≥94% in both the short and long-term. The 15% ramps yielded probabilities of exceeding the ABC of 71% and 58% in the short and long-term respectively. The 10% and 12.5% ramps yielded probabilities of exceeding the ABC <5% % in the short and long-term.

In the EAG and WAG, the probability that MMB falls below B_{MSY} stock size (i.e., the stock size that results from fishing at F_{MSY}) generally increased with increasing exploitation rates on MMA (Figure 8). In the EAG, long-term probability of falling below B_{MSY} was <50% for all policies. In the WAG, the short and long-term probabilities of falling below B_{MSY} were 78–80% for the 30% ramps, 30–33% for the 23% fixed policy, and <13% for all other policies.

ECONOMIC CRITERIA

The probability of a fishery closure (i.e., when MMA < 0.25 * MMA_{AVE}) was zero for all policies for both management areas (Figure 9). In the EAG, the predicted short term RETC was higher compared to the long-term, whereas the short-term RETC las lower than the long-term catch in the WAG. In both areas, the predicted RETC was similar under both legal caps, implying that the legal caps were generally not limiting the harvest in any of the policies we evaluated. In both areas, predicted RETC increased with exploitation rates (Figure 11). In the EAG, average long-term RETC ranged from 3.13 million lbs under the most conservative policies to 4.25 million lbs under the most aggressive policies, whereas average long-term RETC ranged from 2.21 to 2.98 million lbs in the WAG.

Average annual variability in retained catch (calculated as the proportion of the RETC that changed from one year to the next) was relatively similar within each management area (EAG: ~11-12%; WAG: ~5-6%) with the exception of the 30% ramps, which yielded approximately 15% annual variability in the EAG and 8% annual variability in the WAG (Figure 10). Policies with a fixed exploitation rate (Policy 13) yielded the lowest relative annual catch variability: 9% in EAG and 4% in WAG. The probability of predicted RETC being below historic average TACs from 2005/06 to 2017/17 (EAG: 3.19 million lbs, WAG: 2.76 million lbs) generally decreased with increasing exploitation rates for both management areas (Figure 12). The predicted RETC generally stabilized after approximately 10 years. In the short-term, the probability of the predicted RETC being below the historical mean TAC was lower for EAG, but higher in the WAG (Figure 13). In the WAG, the probability of predicted RETC being below historic average TACs was >60% for ramps <20%.

We calculated the probability that the predicted RETC falls within a defined optimal TAC range for both management areas (EAG: 3.2 – 4.8 million lbs, WAG: 2.4 – 3.6 million lbs). In the EAG, the probabilities ranged from approximately 38% to 54%, while probabilities ranged from approximately 25% to 91% in the WAG (Figure 14). In both management areas, average CPUE decreased with increasing exploitation rate and RETC (Figures 15 and 16). Relative effort (as defined by RETC/CPUE) had to increase to yield greater values of retained catch (Figure 17), thus there was a tradeoff between relative effort and RETC. The probability that the predicted CPUE fall below the historical mean increased with increasing exploitation rates (Figure 18). Because the sloping control rules dictate the harvest rate on mature male abundance based on the current year estimate (MMA) relative to the historical long-term average (MMA_{AVE}), we evaluated the probability that MMA is below MMA_{AVE} to predict how often the maximum exploitation on MMA is achieved for a given ramp. In both management areas, the probability that MMA is below MMA_{AVE} increased with increasing exploitation rate under both legal caps (Figure 19).

The conservation and economic metrics were compiled and then grouped into three categories: conservation, catch, and catch stability (Table 6). We ranked the harvest strategies within each metric and averaged the ranks. The average ranks were scored relative to each other in each category (i.e., conservation, catch, catch stability), as depicted in the decision tables (Tables 7 and 8).

POLICY SELECTION

In the EAG, our analysis suggests that policies 4, 5, 9, 10, and 12 have the highest conservation risk with high probabilities of exceeding OFL/ABC. Policies 11 and 13 have moderate probability of exceeding ABC. Policies 1, 2, 6, and 7 have low probabilities of exceeding conservation thresholds, but may not optimize yield. Policies 3, 8, 11, and 13 are likely the best trade-off between meeting conservation objectives and optimizing yield for the EAG. These policies have moderate levels of conservation risk. Simulations predict long-term TACs range between 3.7 – 3.9 mill lbs with moderate annual variability (~11%), but without high increases in fishery effort relative to the 10% and 12.5% ramps. Furthermore, these control rules approximate historic exploitation rates and are consistent with MSA National Standards, FMP objectives, and the BOF policy on king and Tanner crab resources management. Of policies 3, 8, 11, and 13, policy 3 has the lowest probability of exceeding conservation thresholds. Additionally, industry feedback suggests policy 3 optimizes the tradeoff between catch and catch stability.

In the WAG, our analysis suggests that policies 5, 10, 12, and 13 have the highest conservation risk indicated by moderate/high probabilities of exceeding OFL. Policies 3–5 and 8–13 have probabilities of exceeding ABC >58%. Policies 1, 2, 6, and 7 have low probabilities of exceeding conservation thresholds, but had the lowest predicted retained catch. For example, the projected average difference in RETC between the most conservative policy (policy 1) and the most aggressive policy (policy 10) is approximately 0.77 million pounds, yet the average relative fishing effort in policy 10 is greater than two times that of policy 1 (see Figure 17). Either policy 3, 4, or 11 (15%, 20%, and 17.5% ramps with a 25% legal cap) are likely the best trade-off between conservation objectives, catch, and catch stability.

Simulations suggest similar annual variation in catch. Of policies 3, 4, and 11, policy 3 has the lowest probability of exceeding conservation thresholds; however, industry feedback suggests policies 4 and 11 are preferable due to increases in projected RETC. While policies 3, 4, and 11 yield long-term probabilities of exceeding the area-specific ABC >58%, their probability of exceeding the area-specific OFL is ≤1%. Assuming policy 3 in the EAG, the combined RETC plus estimated bycatch mortality are below the combined federal ABC and OFL under WAG policies 3, 4, or 11 regardless of whether the RETC is limited by the area-specific ABC or not (i.e., harvest regimes 1, 2, and 3; Figures 20-22). Harvest regime 1 (i.e., RETC is capped by the area-specific ABC) simulation results show that average RETC does not increase in policies with >20% exploitation rate on mature males (Figure 23), whereas harvest regime 3 simulation results show the long-term average RETC is slightly higher when WAG RETC is not limited by the area-specific ABC (Figure 24). Further, under harvest regime 3, the average RETC and probability of RETC exceeding the retain catch portion of the ABC decreases in policies with >20% exploitation rate on mature males (Figure 24), which may imply that 20% exploitation on mature males is approaching a tipping point where the population destabilizes and productivity declines. We recommend a range of exploitation rates on mature males from 15% to 20% with a 25% cap on legal male abundance (either policy 3, 4, or 11), with policy 3 having the lowest probability of exceeding conservation thresholds, but policies 4 and 11 better optimizing catch and catch stability. To minimize probability of negative population effects, we do not recommend polices with >20% exploitation on mature male abundance. These control rules are consistent with MSA National Standards, FMP objectives, and the BOF policy on king and Tanner crab resources management.

See staff comments for final action and regulatory language on proposal 179 here:

http://www.adfg.alaska.gov/index.cfm?adfg=fisheriesboard.meetinginfo&date=03-09-2019&meeting=anchorage

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TABLES

Table 1.–The thirteen harvest policies evaluated contained three components: 1) a threshold for opening and closing the fishery based on mature male abundance (i.e., 25% of MMA_{AVE}), 2) an exploitation rate on mature male abundance, and 3) a maximum allowable exploitation rate on legal size males. Policy 0 had a harvest rate of zero (i.e., no fishing). Policy 13 contains a fixed harvest rate on MMA rather than a decreasing harvest rate when MMA/MMA_{AVE} is less than 100%.

Policy	Time period for MMA_{AVE}	Exploitation rate on MMA $MMA/MMA_{AVE}\% < 100\%$	Exploitation rate on MMA $MMA/MMA_{AVE}\% \geq 100\%$	Max exploitation rate on legal abundance
0	1985-2017	0	0	0
1	1985-2017	MMA/MMA_{AVE} X 0.10	0.1	0.25
2	1985-2017	MMA/MMA_{AVE} X 0.125	0.125	0.25
3	1985-2017	MMA/MMA_{AVE} X 0.15	0.15	0.25
4	1985-2017	MMA/MMA_{AVE} X 0.20	0.2	0.25
5	1985-2017	MMA/MMA_{AVE} X 0.30	0.3	0.25
6	1985-2017	MMA/MMA_{AVE} X 0.10	0.1	0.3
7	1985-2017	MMA/MMA_{AVE} X 0.125	0.125	0.3
8	1985-2017	MMA/MMA_{AVE} X 0.15	0.15	0.3
9	1985-2017	MMA/MMA_{AVE} X 0.20	0.2	0.3
10	1985-2017	MMA/MMA_{AVE} X 0.30	0.3	0.3
11	1985-2017	MMA/MMA_{AVE} X 0.175	0.175	0.25
12	1985-2017	MMA/MMA_{AVE} X 0.225	0.225	0.25
13	1985-2017	EAG: 0.15, WAG: 0.23	EAG: 0.15, WAG: 0.23	none

Table 2.–EAG conservation risk matrix for five criteria considered. Values shown as probabilities. Short-term (years 1-8) and long-term (years 1-30) results are shown here. Green indicates <0.10 probability, orange indicates 0.10 – 0.40 probability, and red indicates >0.40 probability.

SHORT TERM (years 1-8)				**Overfished**	**Severely overfished**	**Overfishing (OFL)**	**Overfishing (ABC)**	**Below B_{MSY}**
Policy	**Description**	**HR ramp**	**Legal cap**	**Probability MMB<MSST**	**Probability MMB<0.5MSST**	**Probability RETC+Byc>OFL**	**Probability RETC+Byc>ABC**	**Probability MMB<MMB_{35}**
0	No fishing	0%	0%					
1	10% ramp, 25% L cap	10%	25%	0.000	0.000	0.000	0.001	0.001
2	12.5% ramp, 25% L cap	12.5%	25%	0.000	0.000	0.001	0.034	0.006
3	15% ramp, 25% L cap	15%	25%	0.000	0.000	0.003	0.289	0.025
4	20% ramp, 25% L cap	20%	25%	0.000	0.000	0.033	0.720	0.096
5	30% ramp, 25% L cap	30%	25%	0.000	0.000	0.502	0.993	0.262
6	10% ramp, 30% L cap	10%	30%	0.000	0.000	0.000	0.006	0.001
7	12.5% ramp, 30% L cap	12.5%	30%	0.000	0.000	0.001	0.048	0.006
8	15% ramp, 30% L cap	15%	30%	0.000	0.000	0.003	0.306	0.025
9	20% ramp, 30% L cap	20%	30%	0.000	0.000	0.036	0.740	0.097
10	30% ramp, 30% L cap	30%	30%	0.000	0.000	0.504	0.993	0.263
11	17.5% ramp, 25% L cap	17.5%	25%	0.000	0.000	0.013	0.523	0.058
12	22.5% ramp, 25% L cap	22.5%	25%	0.000	0.000	0.083	0.829	0.126
13	15% fixed, No L cap	15%	0%	0.000	0.000	0.003	0.337	0.054
LONG TERM (years 1-30)				**Overfished**	**Severely overfished**	**Overfishing (OFL)**	**Overfishing (ABC)**	**Below B_{MSY}**
Policy	**Description**	**HR ramp**	**Legal cap**	**Probability MMB<MSST**	**Probability MMB<0.5MSST**	**Probability RETC+Byc>OFL**	**Probability RETC+Byc>ABC**	**Probability MMB<MMB_{35}**
0	No fishing	0%	0%					
1	10% ramp, 25% L cap	10%	25%	0.000	0.000	0.000	0.004	0.018
2	12.5% ramp, 25% L cap	12.5%	25%	0.000	0.000	0.002	0.072	0.055
3	15% ramp, 25% L cap	15%	25%	0.000	0.000	0.008	0.293	0.127
4	20% ramp, 25% L cap	20%	25%	0.000	0.000	0.077	0.701	0.250
5	30% ramp, 25% L cap	30%	25%	0.000	0.000	0.549	0.994	0.497
6	10% ramp, 30% L cap	10%	30%	0.000	0.000	0.000	0.014	0.018
7	12.5% ramp, 30% L cap	12.5%	30%	0.000	0.000	0.002	0.094	0.055
8	15% ramp, 30% L cap	15%	30%	0.000	0.000	0.010	0.311	0.128
9	20% ramp, 30% L cap	20%	30%	0.000	0.000	0.081	0.713	0.252
10	30% ramp, 30% L cap	30%	30%	0.000	0.000	0.550	0.994	0.498
11	17.5% ramp, 25% L cap	17.5%	25%	0.000	0.000	0.032	0.511	0.199
12	22.5% ramp, 25% L cap	22.5%	25%	0.000	0.000	0.156	0.839	0.296
13	15% fixed, No L cap	15%	0%	0.000	0.000	0.014	0.464	0.201

Table 3.–WAG conservation risk matrix for five criteria considered. Values shown as probabilities. Short-term (years 1-8) and long-term (years 1-30) results are shown here. Green indicates <0.10 probability, orange indicates 0.10 – 0.40 probability, and red indicates >0.40 probability.

SHORT TERM (years 1-8)				**Overfished**	**Severely overfished**	**Overfishing (OFL)**	**Overfishing (ABC)**	**Below B_{MSY}**
Policy	**Description**	**HR ramp**	**Legal cap**	**Probability MMB<MSST**	**Probability MMB<0.5MSST**	**Probability RETC+Byc>OFL**	**Probability RETC+Byc>ABC**	**Probability $MMB<MMB_{35}$**
0	No fishing	0%	0%					
1	10% ramp, 25% L cap	10%	25%	0.000	0.000	0.000	0.000	0.000
2	12.5% ramp, 25% L cap	12.5%	25%	0.000	0.000	0.000	0.049	0.001
3	15% ramp, 25% L cap	15%	25%	0.000	0.000	0.000	0.707	0.021
4	20% ramp, 25% L cap	20%	25%	0.000	0.000	0.010	0.999	0.064
5	30% ramp, 25% L cap	30%	25%	0.000	0.000	0.952	1.000	0.797
6	10% ramp, 30% L cap	10%	30%	0.000	0.000	0.000	0.000	0.000
7	12.5% ramp, 30% L cap	12.5%	30%	0.000	0.000	0.000	0.049	0.001
8	15% ramp, 30% L cap	15%	30%	0.000	0.000	0.000	0.707	0.021
9	20% ramp, 30% L cap	20%	30%	0.000	0.000	0.011	0.999	0.064
10	30% ramp, 30% L cap	30%	30%	0.000	0.000	0.952	1.000	0.797
11	17.5% ramp, 25% L cap	17.5%	25%	0.000	0.000	0.000	0.965	0.051
12	22.5% ramp, 25% L cap	22.5%	25%	0.000	0.000	0.107	1.000	0.100
13	23% fixed, No L cap	23%	0%	0.000	0.000	0.244	1.000	0.298
LONG TERM (years 1-30)				**Overfished**	**Severely overfished**	**Overfishing (OFL)**	**Overfishing (ABC)**	**Below B_{MSY}**
Policy	**Description**	**HR ramp**	**Legal cap**	**Probability MMB<MSST**	**Probability MMB<0.5MSST**	**Probability RETC+Byc>OFL**	**Probability RETC+Byc>ABC**	**Probability $MMB<MMB_{35}$**
0	No fishing	0%	0%					
1	10% ramp, 25% L cap	10%	25%	0.000	0.000	0.000	0.000	0.000
2	12.5% ramp, 25% L cap	12.5%	25%	0.000	0.000	0.000	0.039	0.001
3	15% ramp, 25% L cap	15%	25%	0.000	0.000	0.000	0.583	0.026
4	20% ramp, 25% L cap	20%	25%	0.000	0.000	0.012	0.997	0.090
5	30% ramp, 25% L cap	30%	25%	0.000	0.000	0.938	1.000	0.773
6	10% ramp, 30% L cap	10%	30%	0.000	0.000	0.000	0.000	0.000
7	12.5% ramp, 30% L cap	12.5%	30%	0.000	0.000	0.000	0.039	0.001
8	15% ramp, 30% L cap	15%	30%	0.000	0.000	0.000	0.584	0.026
9	20% ramp, 30% L cap	20%	30%	0.000	0.000	0.013	0.997	0.090
10	30% ramp, 30% L cap	30%	30%	0.000	0.000	0.938	1.000	0.773
11	17.5% ramp, 25% L cap	17.5%	25%	0.000	0.000	0.001	0.936	0.069
12	22.5% ramp, 25% L cap	22.5%	25%	0.000	0.000	0.118	1.000	0.133
13	23% fixed, No L cap	23%	0%	0.000	0.000	0.316	1.000	0.334

Table 4.–EAG economic risk matrix for criteria considered. Units vary depending on the criteria. Ranks were given based on criterion goal. For example, the highest RETC was ranked “1”. Green indicates ranks 1–4, orange indicates ranks 5–9, and red indicates ranks 10–13.

SHORT TERM (years 1-8)		**Closures**	**Catch**	**Catch Variability**	**Relative TAC (1)**	**Relative TAC (2)**	**CPUE (1)**	**CPUE (2)**	**Relative effort**	**Stock Status**
Policy	**Description**	**Probability MMA <0.25MMA$_{AVE}$**	**Mean RETC (mill lb)**	**Proportion Variation**	**Probability TAC<Hist.$_{AVE}$**	**Probability LB <TAC<UB**	**Crab per pot^{-1}**	**Probability CPUE <Hist_CPUE**	**RETC / CPUE**	**Probability MMA <MMA$_{AVE}$**
0	No fishing									
1	10% ramp, 25% L cap	0.000	3.373		0.372	0.587	35.015	0.174	0.097	0.102
2	12.5% ramp, 25% L cap	0.000	3.871		0.181	0.724	32.447	0.308	0.119	0.177
3	15% ramp, 25% L cap	0.000	4.236		0.154	0.538	30.383	0.446	0.139	0.250
4	20% ramp, 25% L cap	0.000	4.605		0.128	0.348	27.898	0.607	0.165	0.331
5	30% ramp, 25% L cap	0.000	5.107		0.122	0.310	24.745	0.857	0.206	0.455
6	10% ramp, 30% L cap	0.000	3.374		0.372	0.587	35.011	0.174	0.097	0.102
7	12.5% ramp, 30% L cap	0.000	3.874		0.181	0.723	32.434	0.309	0.120	0.177
8	15% ramp, 30% L cap	0.000	4.243		0.153	0.536	30.351	0.447	0.140	0.251
9	20% ramp, 30% L cap	0.000	4.613		0.129	0.344	27.854	0.608	0.165	0.333
10	30% ramp, 30% L cap	0.000	5.109		0.123	0.308	24.731	0.857	0.206	0.456
11	17.5% ramp, 25% L cap	0.000	4.458		0.136	0.409	28.849	0.535	0.154	0.302
12	22.5% ramp, 25% L cap	0.000	4.737		0.124	0.327	27.203	0.687	0.174	0.358
13	15% fixed, No L cap	0.000	4.309		0.099	0.591	30.097	0.455	0.143	0.253

Table 4.–Page 2 of 2.

LONG TERM (years 1-30)		Closures	Catch	Catch Variability	Relative TAC (1)	Relative TAC (2)	CPUE (1)	CPUE (2)	Relative effort	Stock Status
Policy	**Description**	**Probability MMA <0.25MMA$_{AVE}$**	**Mean RETC (mill lb)**	**Proportion Variation**	**Probability TAC<Hist.$_{AVE}$**	**Probability LB<TAC<UB**	**crab per pot^{-1}**	**Probability CPUE <Hist_CPUE**	**RETC / CPUE**	**Probability MMA<MMA$_{AVE}$**
0	No fishing			0.000	1.000	0.000				
1	10% ramp, 25% L cap	0.000	3.131	0.114	0.538	0.416	32.517	0.466	0.096	0.239
2	12.5% ramp, 25% L cap	0.000	3.480	0.117	0.371	0.541	29.299	0.620	0.119	0.332
3	15% ramp, 25% L cap	0.000	3.713	0.114	0.336	0.492	27.065	0.722	0.137	0.405
4	20% ramp, 25% L cap	0.000	3.956	0.107	0.305	0.427	24.081	0.829	0.164	0.480
5	30% ramp, 25% L cap	0.000	4.249	0.158	0.283	0.387	20.556	0.933	0.207	0.623
6	10% ramp, 30% L cap	0.000	3.132	0.114	0.537	0.416	32.503	0.466	0.096	0.239
7	12.5% ramp, 30% L cap	0.000	3.483	0.118	0.369	0.542	29.261	0.621	0.119	0.333
8	15% ramp, 30% L cap	0.000	3.718	0.115	0.333	0.494	27.008	0.723	0.138	0.406
9	20% ramp, 30% L cap	0.000	3.960	0.108	0.306	0.425	24.030	0.830	0.165	0.482
10	30% ramp, 30% L cap	0.000	4.250	0.159	0.283	0.385	20.542	0.933	0.207	0.624
11	17.5% ramp, 25% L cap	0.000	3.858	0.106	0.316	0.452	25.318	0.785	0.152	0.450
12	22.5% ramp, 25% L cap	0.000	4.037	0.117	0.300	0.413	23.217	0.865	0.174	0.512
13	15% fixed, No L cap	0.000	3.787	0.090	0.306	0.523	26.239	0.728	0.144	0.415

Table 5.–WAG economic risk matrix for nine criteria considered. Units vary depending on the criteria. Ranks were given based on criterion goal. For example, the highest RETC was ranked “1”. Green indicates ranks 1–4, orange indicates ranks 5–9, and red indicates ranks 10–13.

SHORT TERM (years 1-8)		Closures	Catch	Catch Variability	Relative TAC (1)	Relative TAC (2)	CPUE (1)	CPUE (2)	Relative effort	Stock Status
Policy	Description	Probability MMA $<0.25MMA_{AVE}$	Mean RETC (mill lb)	Proportion Variation	Probability $TAC<Hist._{AVE}$	Probability LB <TAC<UB	crab pot^{-1}	Probability CPUE <Hist_CPUE	RETC / CPUE	Probability MMA $<MMA_{AVE}$
0	No fishing	0.000	0.000		1.000	0.000	0.000	1.000		
1	10% ramp, 25% L cap	0.000	2.014		0.992	0.082	21.491	0.238	0.094	0.055
2	12.5% ramp, 25% L cap	0.000	2.322		0.934	0.346	19.766	0.453	0.118	0.167
3	15% ramp, 25% L cap	0.000	2.516		0.835	0.648	18.605	0.747	0.135	0.348
4	20% ramp, 25% L cap	0.000	2.630		0.676	0.714	17.827	0.869	0.147	0.399
5	30% ramp, 25% L cap	0.000	3.027		0.245	0.888	14.959	0.998	0.203	0.832
6	10% ramp, 30% L cap	0.000	2.014		0.992	0.082	21.491	0.238	0.094	0.055
7	12.5% ramp, 30% L cap	0.000	2.322		0.933	0.347	19.765	0.453	0.120	0.167
8	15% ramp, 30% L cap	0.000	2.518		0.836	0.649	18.599	0.748	0.135	0.350
9	20% ramp, 30% L cap	0.000	2.631		0.673	0.715	17.820	0.871	0.148	0.400
10	30% ramp, 30% L cap	0.000	3.027		0.245	0.888	14.960	0.998	0.203	0.832
11	17.5% ramp, 25% L cap	0.000	2.577		0.778	0.691	18.218	0.804	0.141	0.382
12	22.5% ramp, 25% L cap	0.000	2.720		0.590	0.823	17.262	0.942	0.158	0.557
13	23% fixed, No L cap	0.000	2.817		0.368	0.945	16.575	0.952	0.170	0.647

Table 5.–Page 2 of 2.

LONG TERM (years 1-30)		Closures	Catch	Catch Variability	Relative TAC (1)	Relative TAC (2)	CPUE (1)	CPUE (2)	Relative effort	Stock Status
Policy	**Description**	**Probability MMA $<0.25MMA_{AVE}$**	**Mean RETC (mill lb)**	**Proportion Variation**	**Probability $TAC<Hist._{AVE}$**	**Probability LB <TAC<UB**	**crab pot^{-1}**	**Probability CPUE <Hist_CPUE**	**RETC / CPUE**	**Probability MMA $<MMA_{AVE}$**
0	No fishing	0.000	0.000	0.000	1.000	0.000	0.000	1.000		
1	10% ramp, 25% L cap	0.000	2.205	0.049	0.967	0.246	24.526	0.069	0.090	0.046
2	12.5% ramp, 25% L cap	0.000	2.468	0.053	0.825	0.575	21.663	0.206	0.114	0.150
3	15% ramp, 25% L cap	0.000	2.630	0.051	0.665	0.749	19.734	0.500	0.133	0.306
4	20% ramp, 25% L cap	0.000	2.723	0.049	0.531	0.773	18.365	0.722	0.148	0.383
5	30% ramp, 25% L cap	0.000	2.978	0.076	0.309	0.838	14.594	0.989	0.204	0.781
6	10% ramp, 30% L cap	0.000	2.205	0.049	0.967	0.246	24.526	0.069	0.090	0.046
7	12.5% ramp, 30% L cap	0.000	2.468	0.053	0.825	0.575	21.660	0.206	0.115	0.150
8	15% ramp, 30% L cap	0.000	2.631	0.051	0.664	0.750	19.714	0.503	0.134	0.307
9	20% ramp, 30% L cap	0.000	2.724	0.050	0.527	0.773	18.343	0.726	0.148	0.385
10	30% ramp, 30% L cap	0.000	2.978	0.076	0.309	0.838	14.593	0.989	0.204	0.781
11	17.5% ramp, 25% L cap	0.000	2.685	0.046	0.608	0.763	18.958	0.623	0.142	0.359
12	22.5% ramp, 25% L cap	0.000	2.781	0.064	0.487	0.800	17.632	0.846	0.158	0.478
13	23% fixed, No L cap	0.000	2.846	0.043	0.391	0.907	16.777	0.877	0.170	0.558

Table 6.–Criteria were grouped into three categories: conservation, catch, and catch stability. The below table shows the various metrics in each group.

Conservation		**Catch**		**Catch Stability**	
Metric	Unit	Metric	Unit	Metric	Unit
Overfished	Probability	Retained catch	Mill lb	Fishery closures	Probability
Severely overfished	Probability			Annual catch var	Proportion
Overfishing (OFL)	Probability			Relative TAC (1)	Probability
Overfishing (ABC)	Probability			Relative TAC (2)	Probability
Below B_{MSY}	Probability			CPUE (1)	crab pot^{-1}
				CPUE (2)	Probability
				Relative effort	RETC $CPUE^{-1}$
				Stock status	Probability

Table 7.–EAG decision matrix based on policy ranks within each category. Green indicates ranks 1–4, orange indicates ranks 5–9, and red indicates ranks 10–13.

SHORT TERM (years 1-8)						
Policy	**Description**	**HR ramp**	**Legal cap**	**Conservation**	**Catch**	**Catch Stability**
0	No fishing	0%	0%			
1	10% ramp, 25% L cap	10%	25%	1	13	1
2	12.5% ramp, 25% L cap	12.5%	25%	3	11	2
3	15% ramp, 25% L cap	15%	25%	5	9	6
4	20% ramp, 25% L cap	20%	25%	9	5	9
5	30% ramp, 25% L cap	30%	25%	12	2	12
6	10% ramp, 30% L cap	10%	30%	2	12	3
7	12.5% ramp, 30% L cap	12.5%	30%	4	10	4
8	15% ramp, 30% L cap	15%	30%	6	8	7
9	20% ramp, 30% L cap	20%	30%	10	4	10
10	30% ramp, 30% L cap	30%	30%	13	1	13
11	17.5% ramp, 25% L cap	17.5%	25%	8	6	8
12	22.5% ramp, 25% L cap	22.5%	25%	11	3	11
13	15% fixed, No L cap	15%	0%	7	7	5
LONG TERM (years 1-30)						
Policy	**Description**	**HR ramp**	**Legal cap**	**Conservation**	**Catch**	**Catch Stability**
0	No fishing	0%	0%			
1	10% ramp, 25% L cap	10%	25%	1	13	1
2	12.5% ramp, 25% L cap	12.5%	25%	3	11	2
3	15% ramp, 25% L cap	15%	25%	5	9	6
4	20% ramp, 25% L cap	20%	25%	9	5	9
5	30% ramp, 25% L cap	30%	25%	12	2	12
6	10% ramp, 30% L cap	10%	30%	2	12	3
7	12.5% ramp, 30% L cap	12.5%	30%	4	10	5
8	15% ramp, 30% L cap	15%	30%	6	8	7
9	20% ramp, 30% L cap	20%	30%	10	4	10
10	30% ramp, 30% L cap	30%	30%	13	1	13
11	17.5% ramp, 25% L cap	17.5%	25%	8	6	8
12	22.5% ramp, 25% L cap	22.5%	25%	11	3	11
13	15% fixed, No L cap	15%	0%	7	7	4

Table 8.–WAG decision matrix based on policy ranks within each category. Green indicates ranks 1–4, orange indicates ranks 5–9, and red indicates ranks 10–13.

SHORT TERM (years 1-8)						
Policy	**Description**	**HR ramp**	**Legal cap**	**Conservation**	**Catch**	**Catch Stability**
0	No fishing	0%	0%			
1	10% ramp, 25% L cap	10%	25%	1.5	13	1
2	12.5% ramp, 25% L cap	12.5%	25%	3.5	11	3.5
3	15% ramp, 25% L cap	15%	25%	5	9	5
4	20% ramp, 25% L cap	20%	25%	8	6	8
5	30% ramp, 25% L cap	30%	25%	12.5	1	13
6	10% ramp, 30% L cap	10%	30%	1.5	12	2
7	12.5% ramp, 30% L cap	12.5%	30%	3.5	10	3.5
8	15% ramp, 30% L cap	15%	30%	6	8	6
9	20% ramp, 30% L cap	20%	30%	9	5	9
10	30% ramp, 30% L cap	30%	30%	12.5	2	12
11	17.5% ramp, 25% L cap	17.5%	25%	7	7	7
12	22.5% ramp, 25% L cap	22.5%	25%	10	4	10.5
13	23% fixed, No L cap	23%	0%	11	3	10.5
LONG TERM (years 1-30)						
Policy	**Description**	**HR ramp**	**Legal cap**	**Conservation**	**Catch**	**Catch Stability**
0	No fishing	0%	0%			
1	10% ramp, 25% L cap	10%	25%	1.5	13	1
2	12.5% ramp, 25% L cap	12.5%	25%	3	11	3
3	15% ramp, 25% L cap	15%	25%	5	9	5
4	20% ramp, 25% L cap	20%	25%	8	6	6
5	30% ramp, 25% L cap	30%	25%	13	2	12
6	10% ramp, 30% L cap	10%	30%	1.5	12	2
7	12.5% ramp, 30% L cap	12.5%	30%	4	10	7
8	15% ramp, 30% L cap	15%	30%	6	8	8
9	20% ramp, 30% L cap	20%	30%	9	5	10
10	30% ramp, 30% L cap	30%	30%	12	1	13
11	17.5% ramp, 25% L cap	17.5%	25%	7	7	4
12	22.5% ramp, 25% L cap	22.5%	25%	10	4	11
13	23% fixed, No L cap	23%	0%	11	3	9

FIGURES

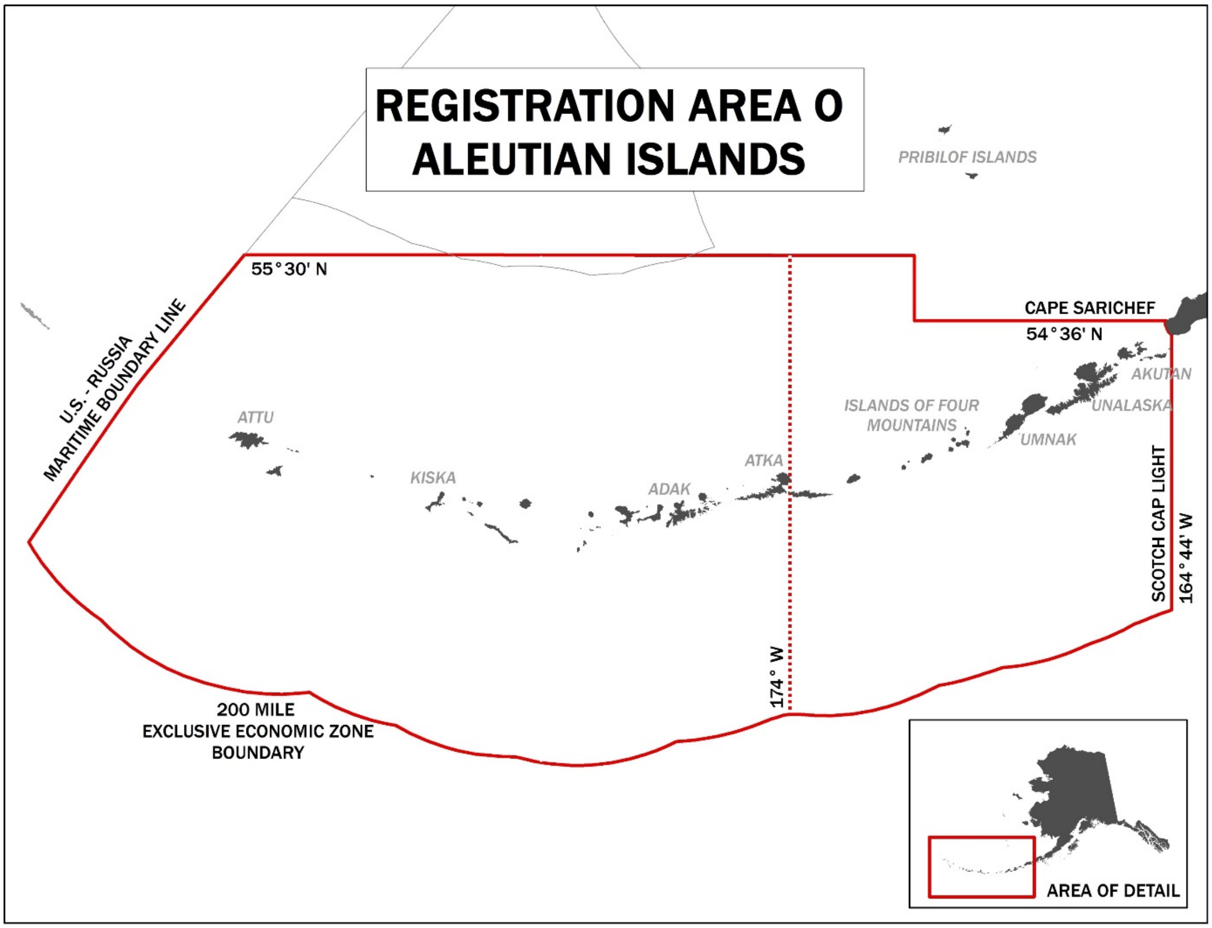


Figure 1.–Aleutian Islands, Area O, red and golden king crab management area.

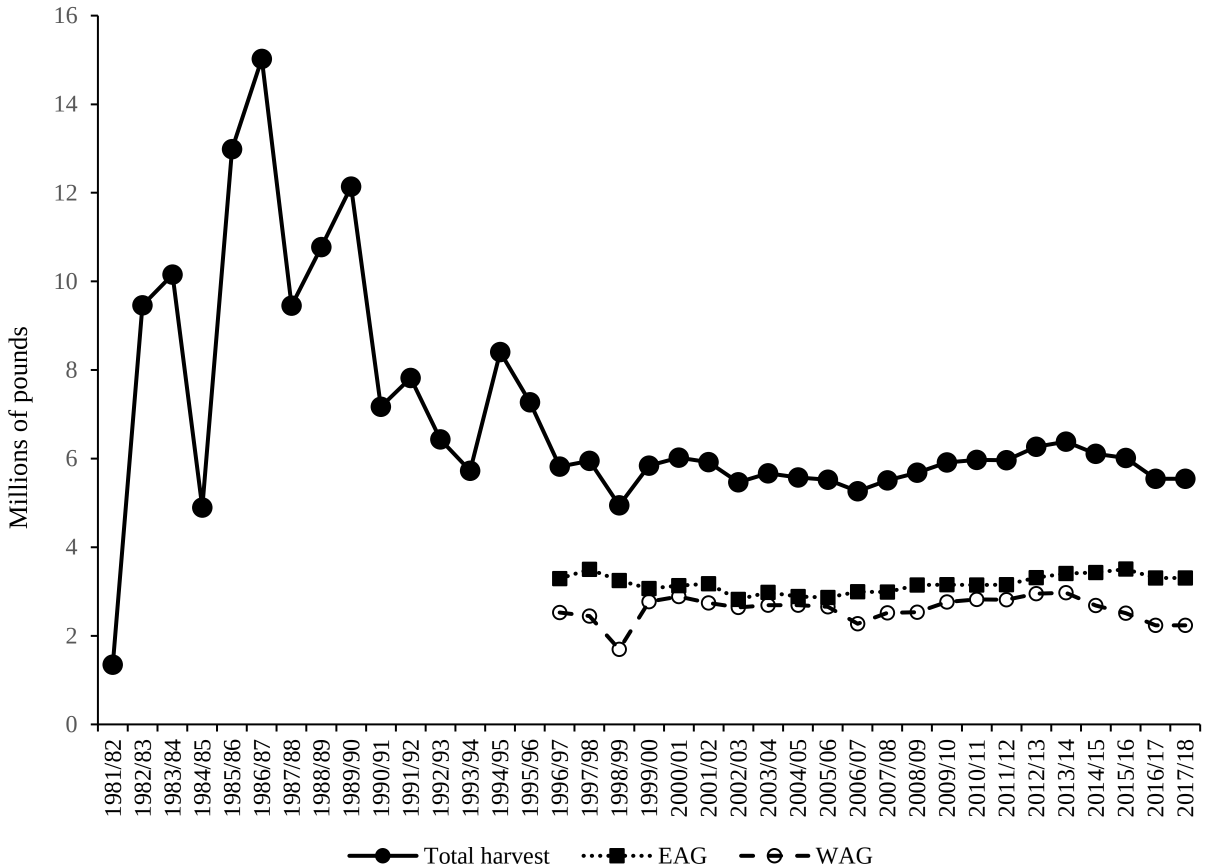


Figure 2.–Historical commercial harvest (from fish tickets) of Aleutian Islands golden king crab.

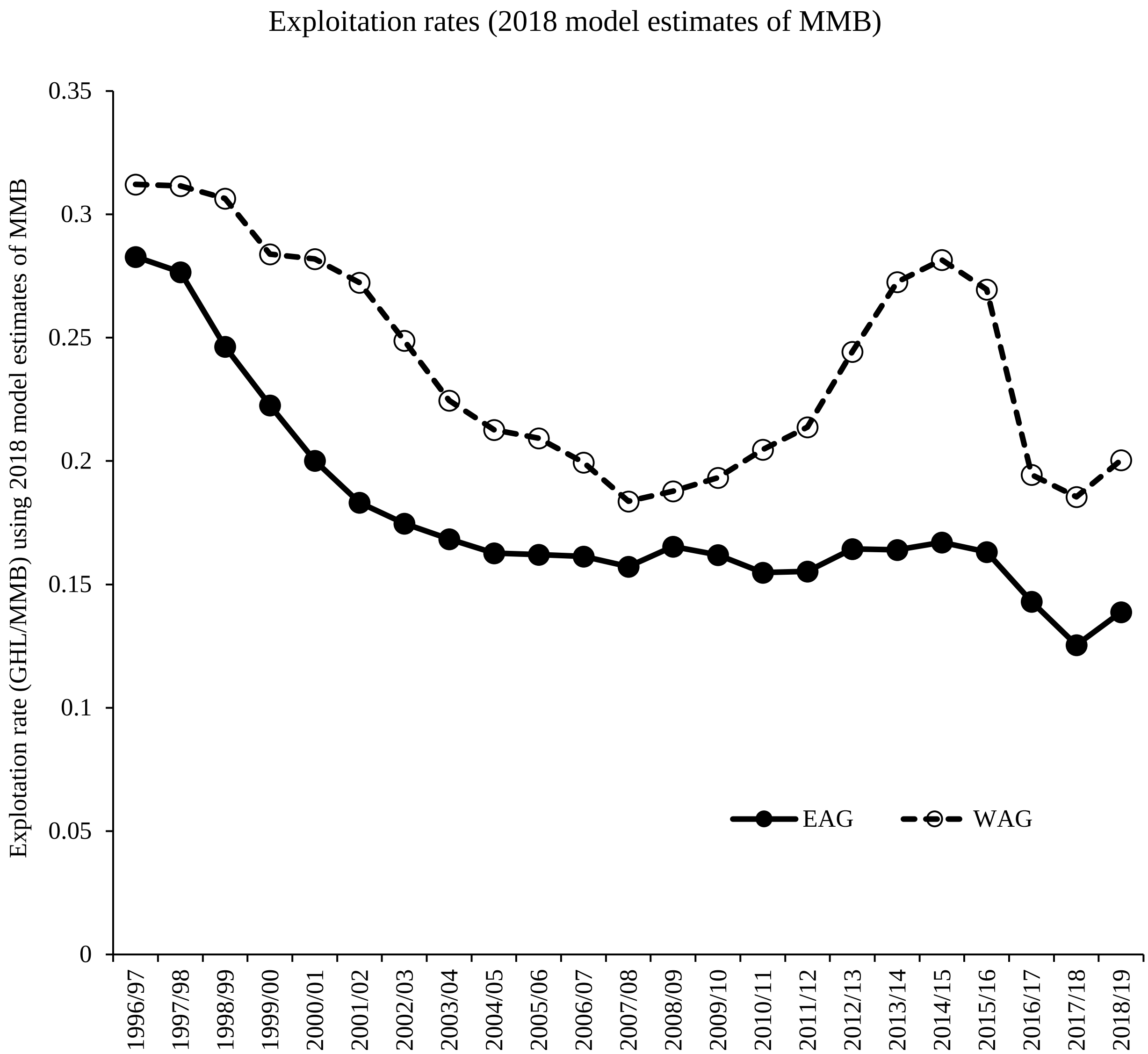


Figure 3.–Exploitation rates calculated from historical retained catch and population estimates from the 2018 AIGKC stock assessment model (Siddeek et al. 2018).

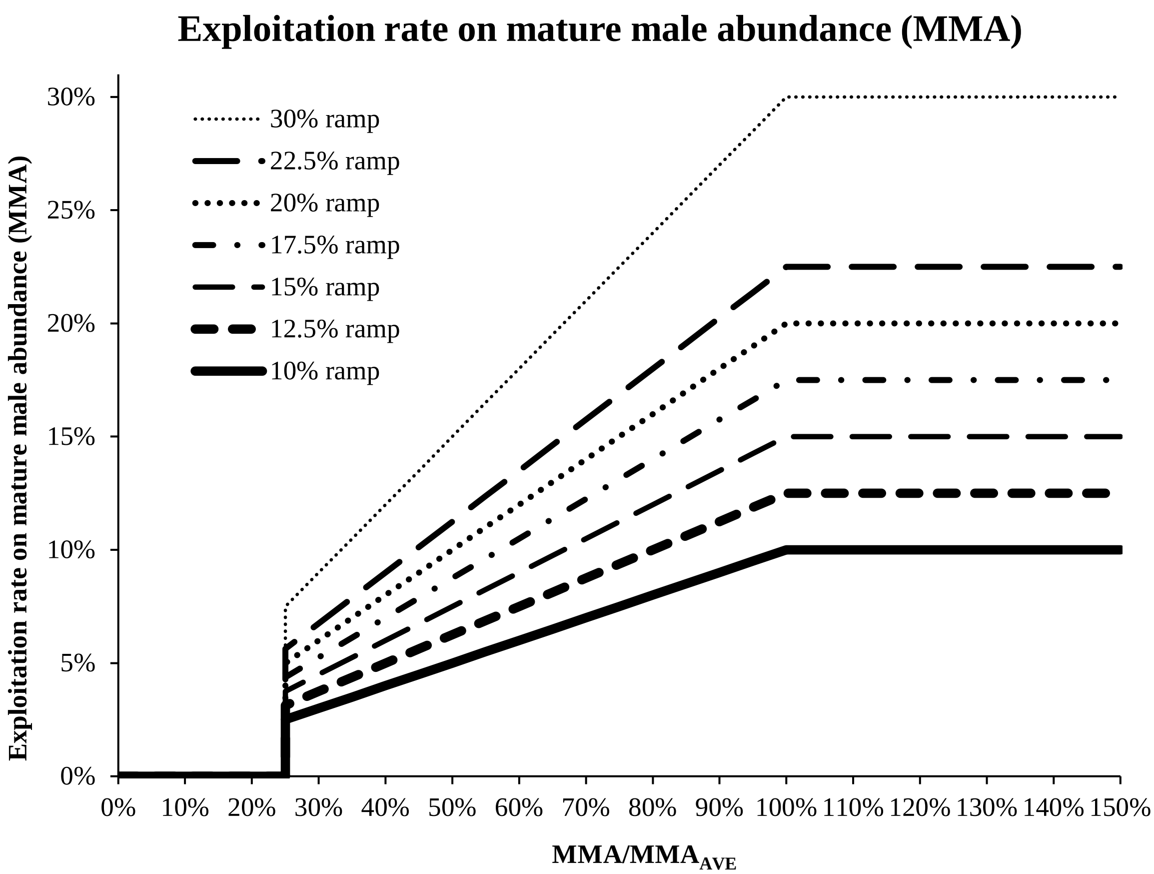
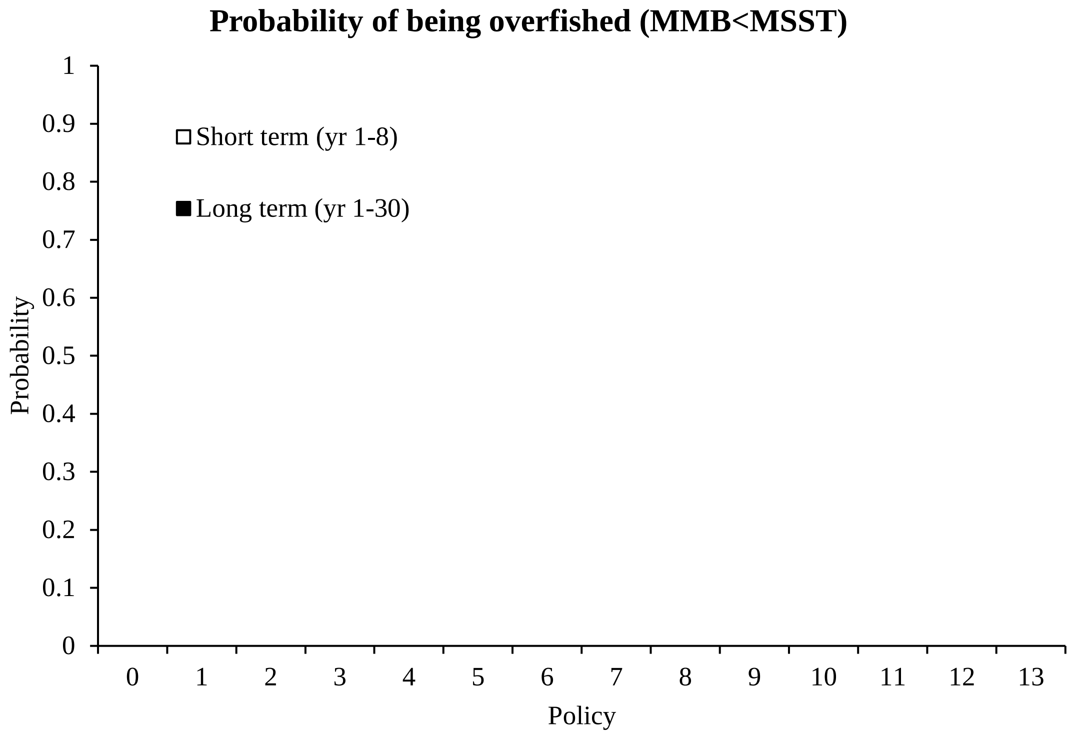


Figure 4.–Exploitation rates on mature male abundance (MMA, estimated by the stock assessment model). For each sloping control rule (i.e., "ramp"), the exploitation rate is determined based on the current year MMA relative to MMA_{AVE} (the mean value of MMA for the period 1985–2017).



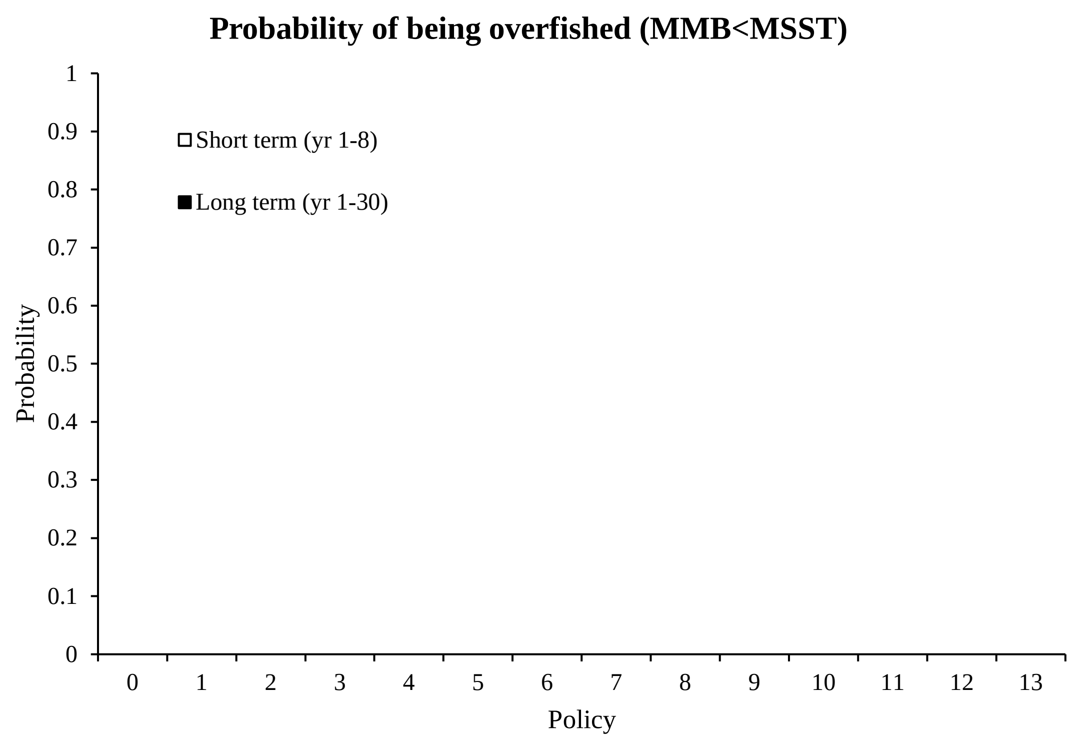
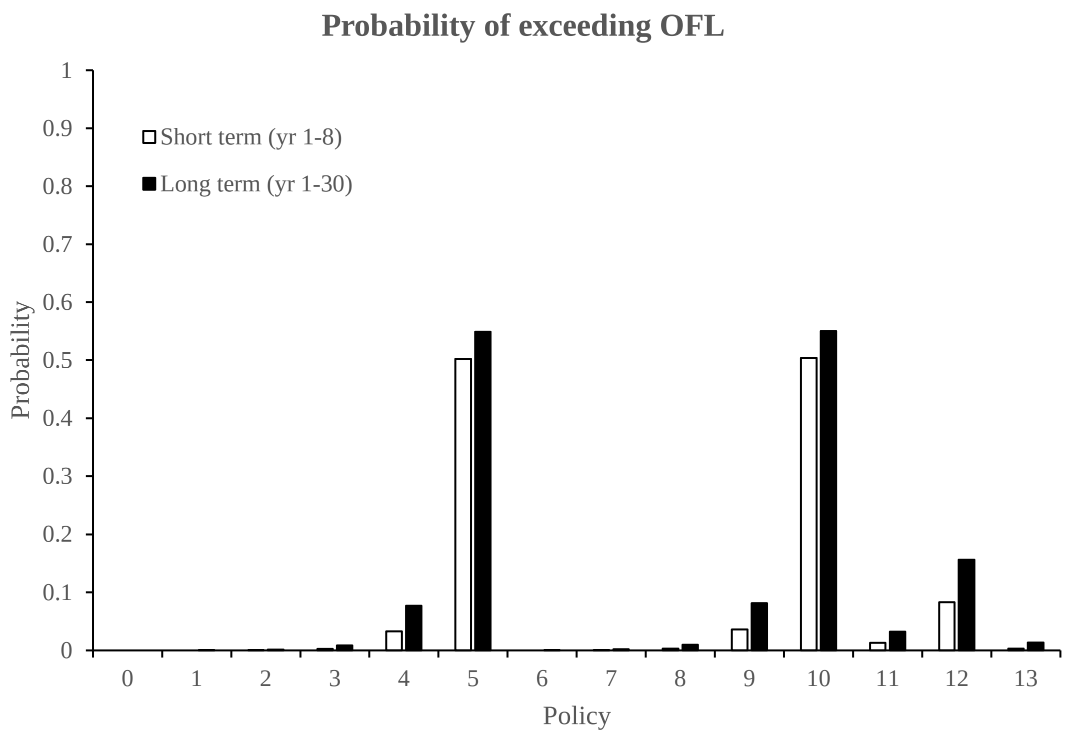


Figure 5.–Short (years 1-8) and long (years 1-30) term probability that MMB is less than the federal minimum stock size threshold (MSST) for each policy. Top: EAG, bottom: WAG.



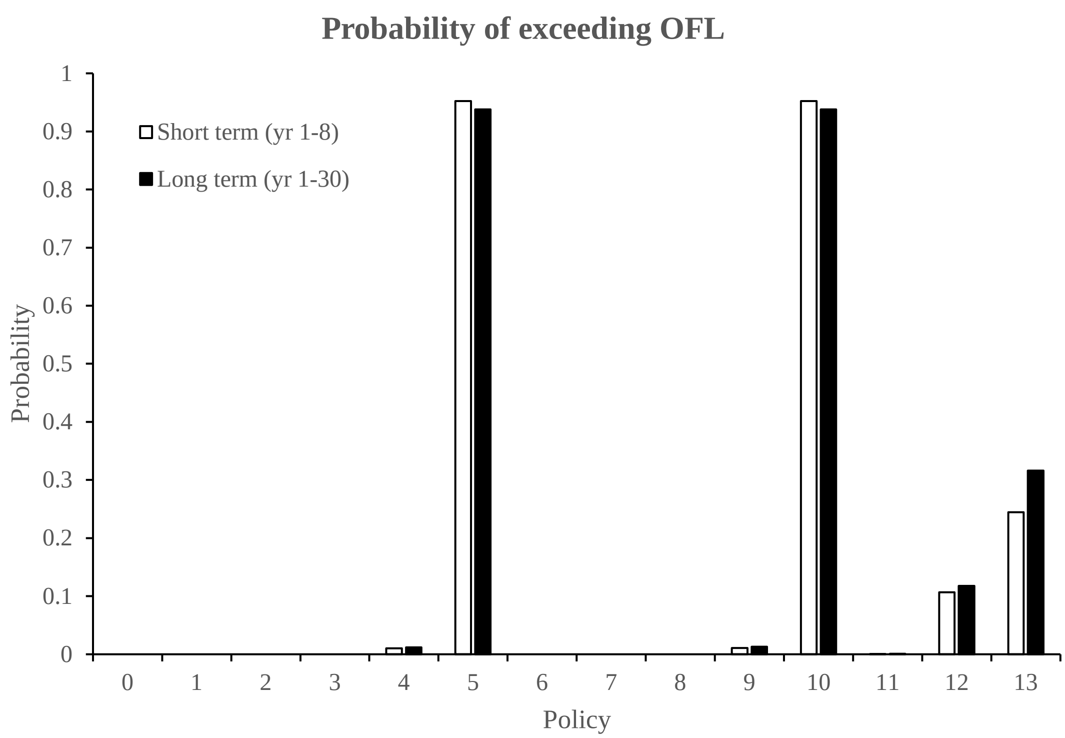


Figure 6.–Short (years 1-8) and long (years 1-30) term probability that retained catch plus bycatch mortality exceed the federal overfishing limit (OFL) for each policy. Top: EAG, bottom: WAG.

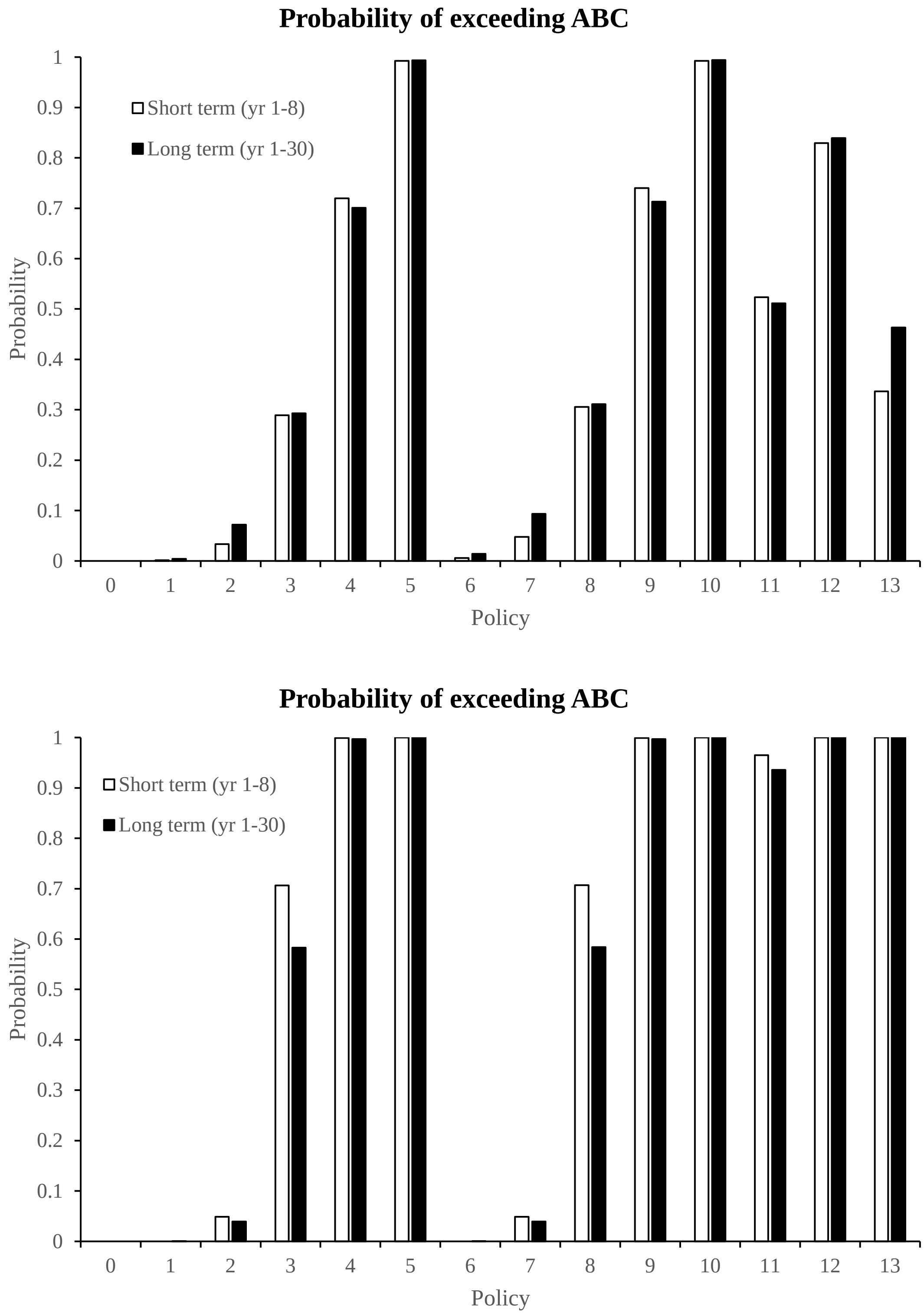
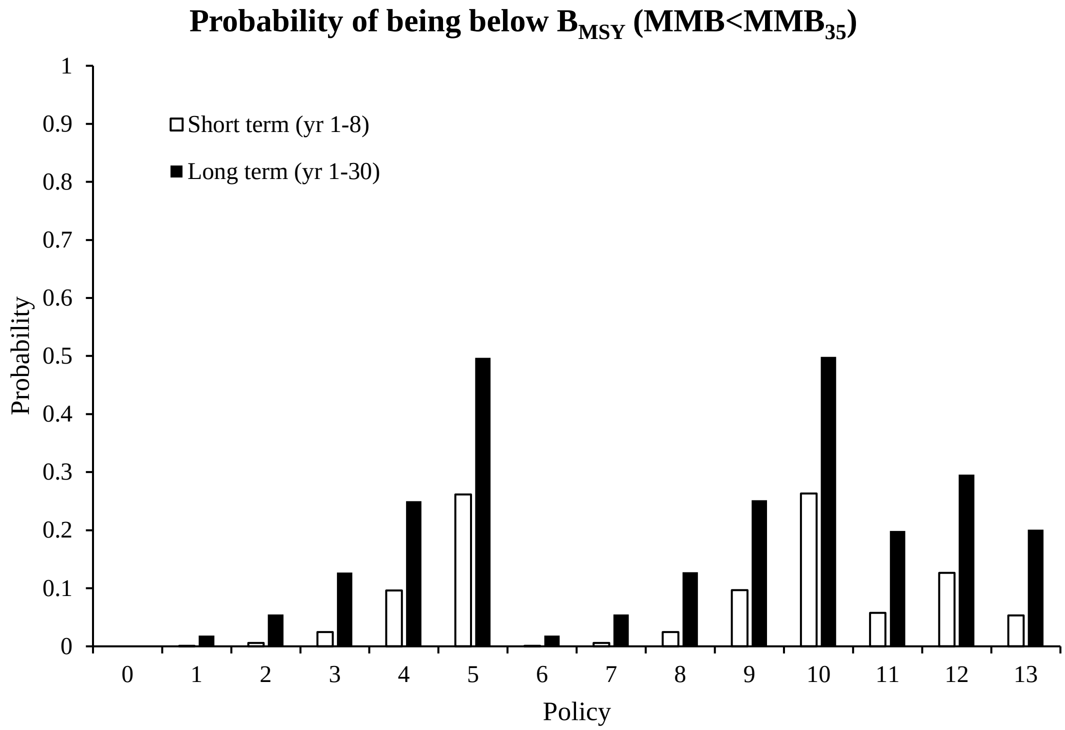


Figure 7.–Short (years 1-8) and long (years 1-30) term probability that retained catch plus bycatch mortality exceed the federal allowable biological catch (ABC) for each policy. Top: EAG, bottom: WAG.



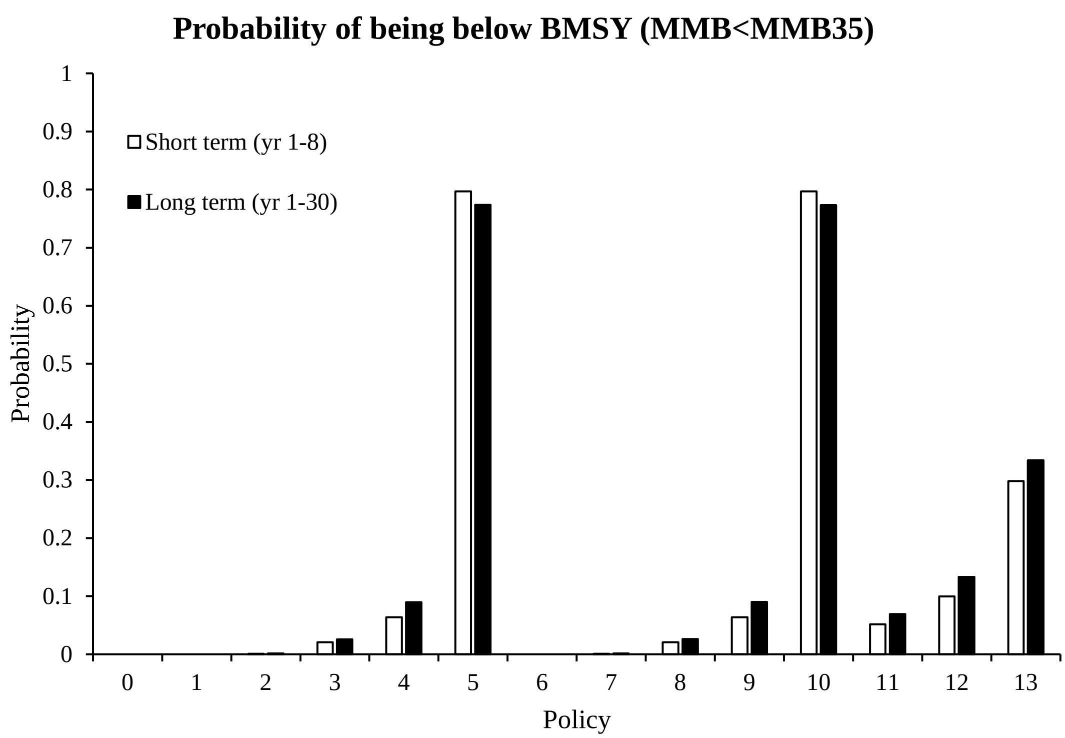
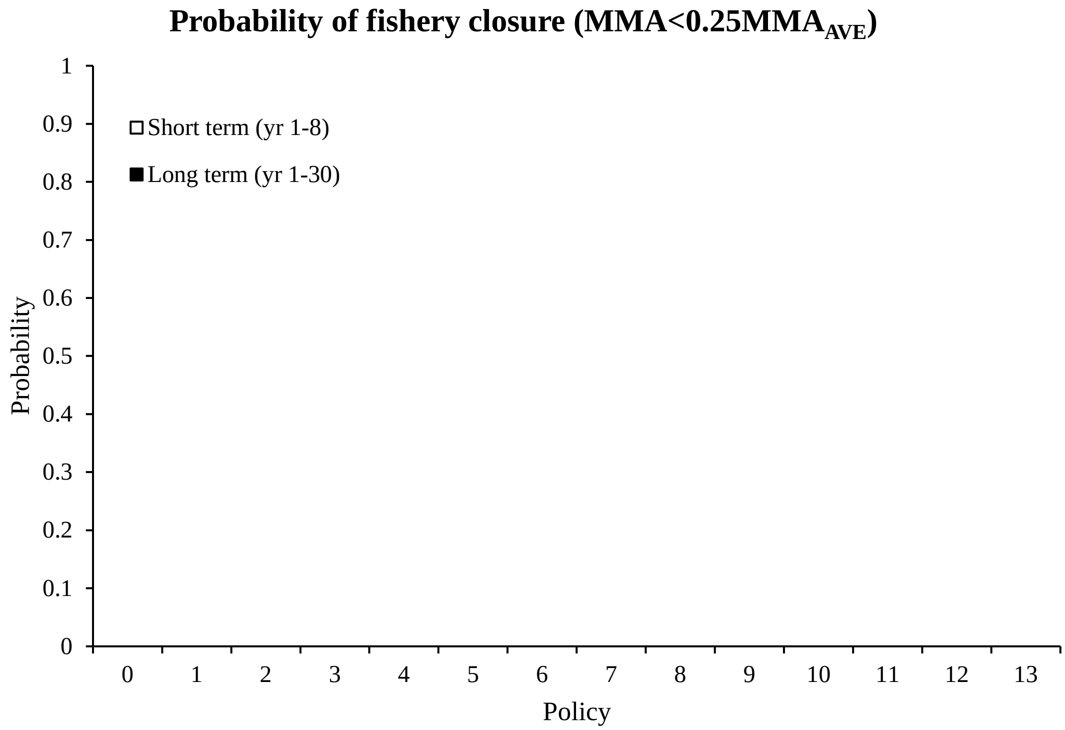


Figure 8.–Short (years 1-8) and long (years 1-30) term probability that mature male biomass (MMB) is below B_{35} (a proxy for B_{MSY}) for each policy. Top: EAG, bottom: WAG.



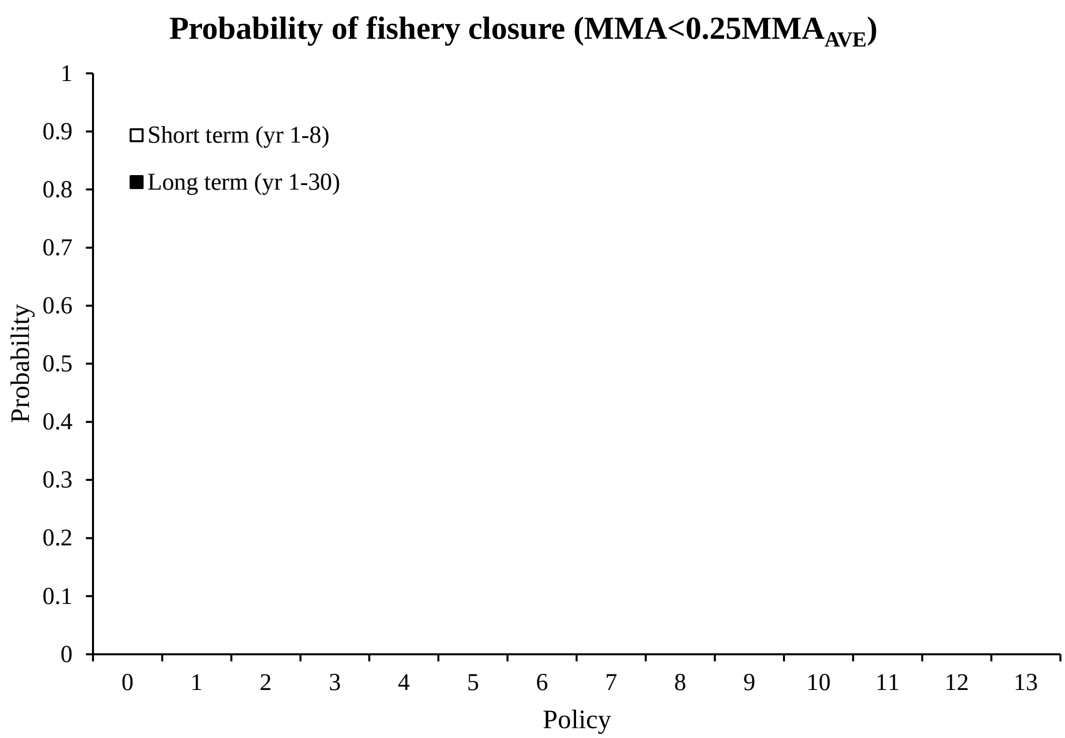
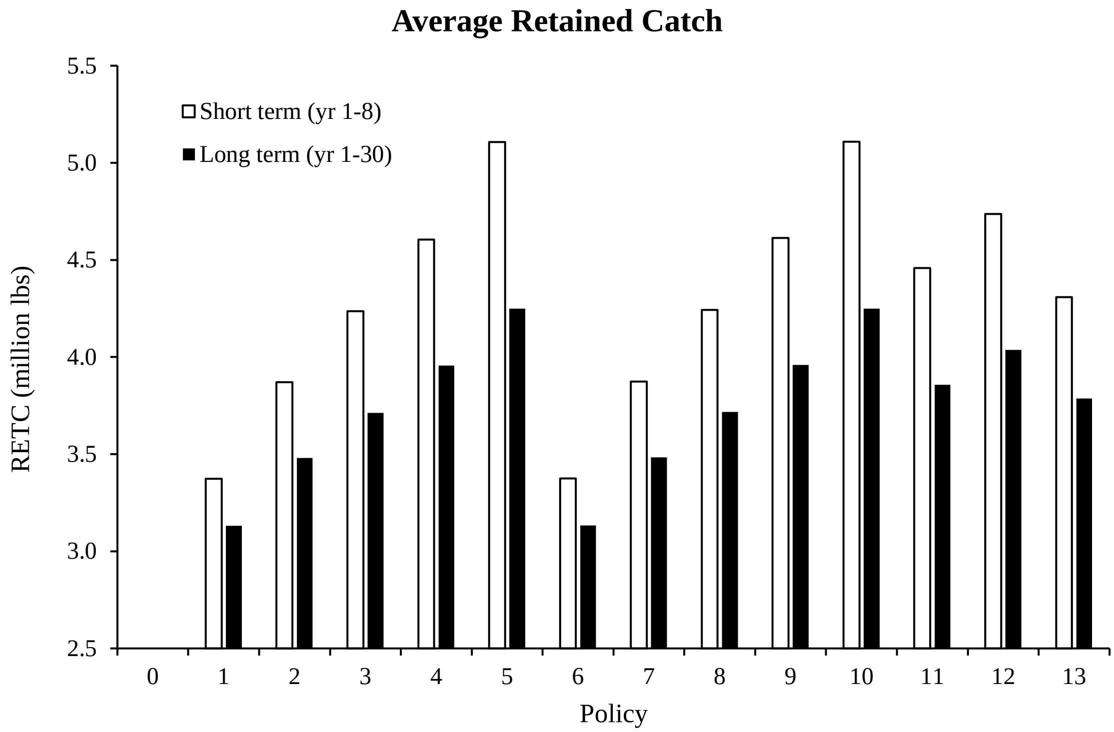


Figure 9.–Short (years 1-8) and long (years 1-30) term probability of fishery closures (i.e., when mature male abundance (MMA) is below 25% of the historical long-term average MMA from 1985-2017) for each policy. Top: EAG, bottom: WAG.



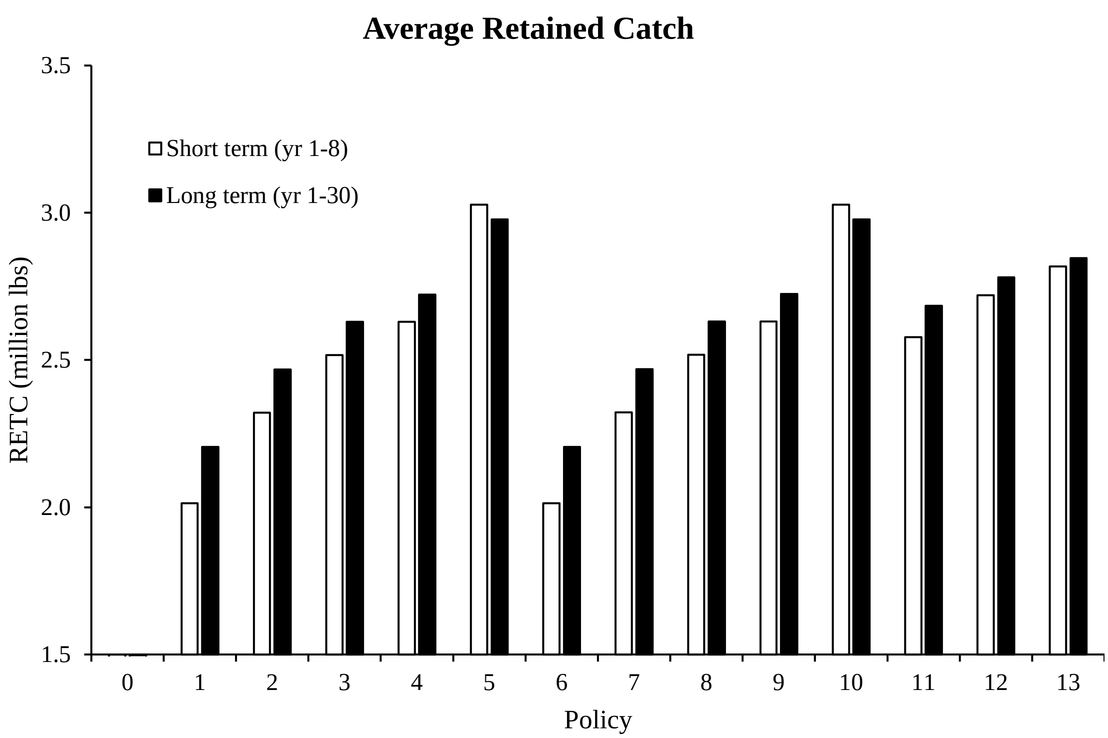


Figure 10.–Short (years 1-8) and long (years 1-30) term average retained catch for each policy. Top: EAG, bottom: WAG.

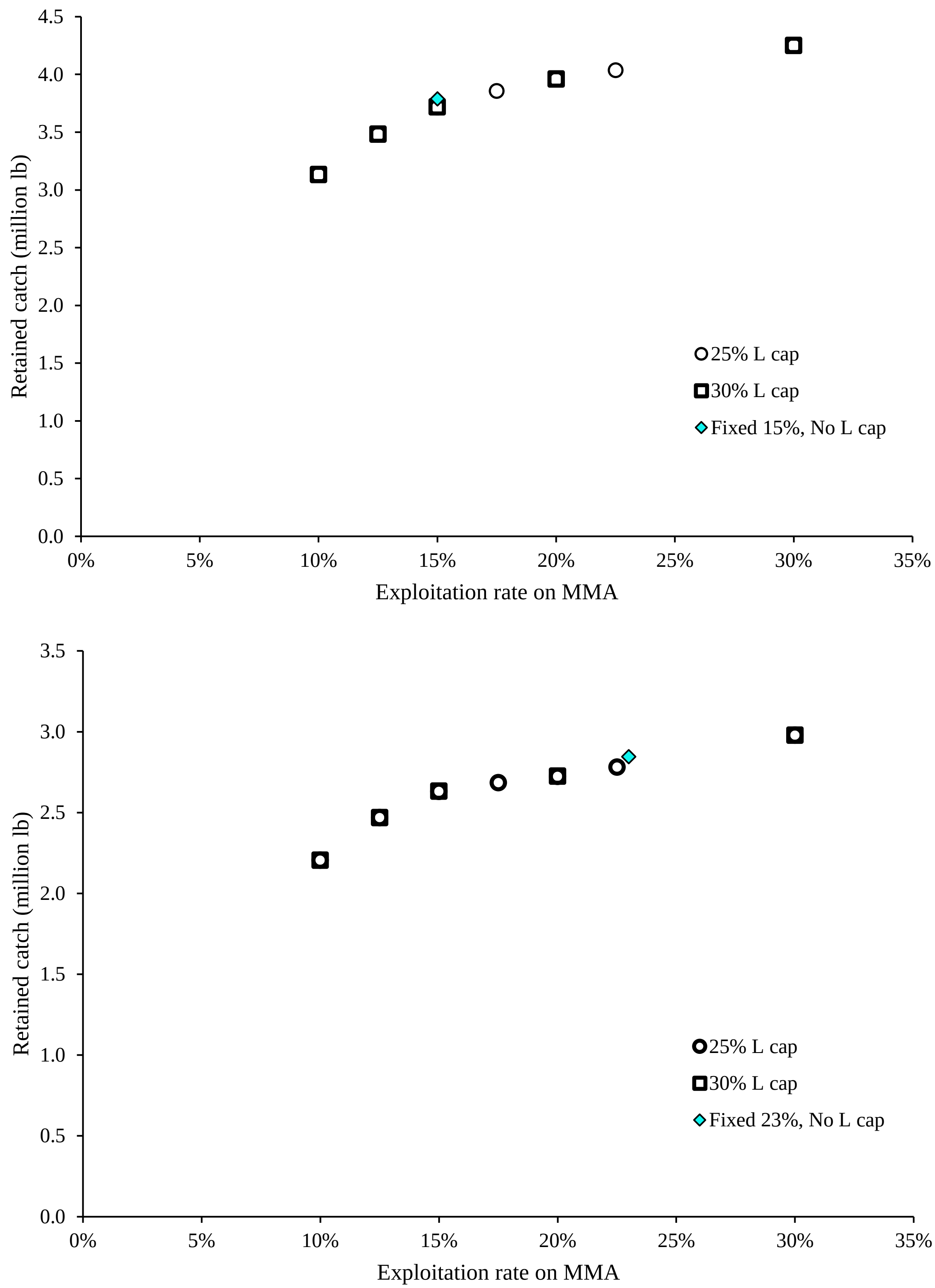
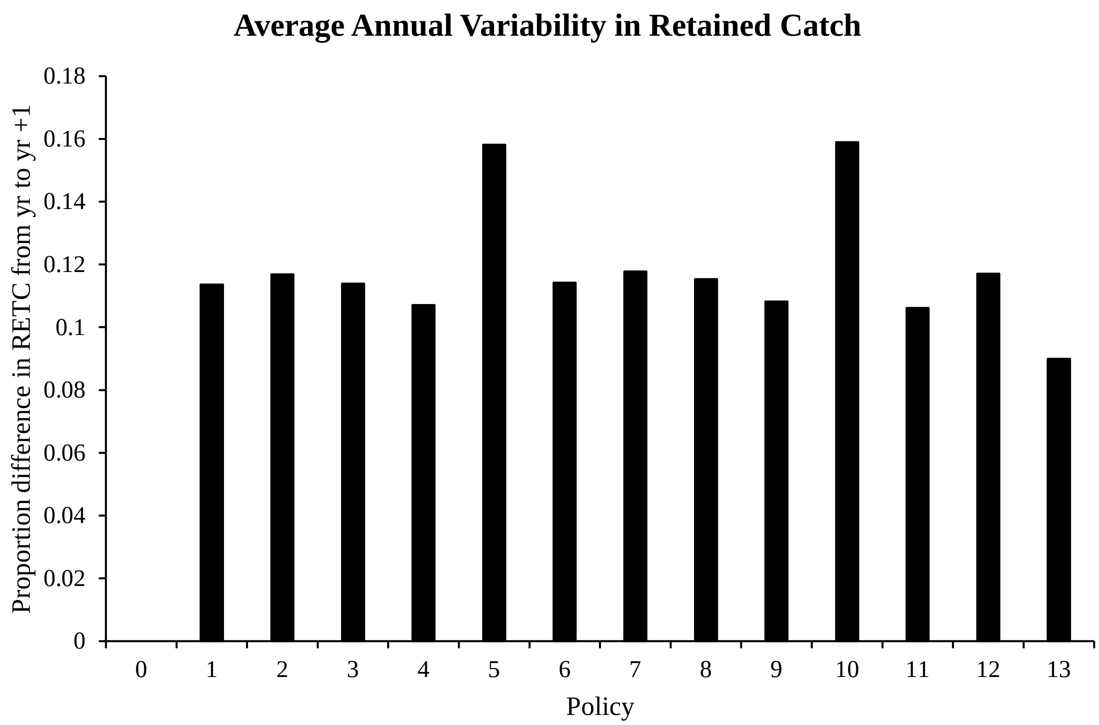


Figure 11.–Predicted long-term average retained catch at each exploitation rate on mature male abundance under a 25% and 30% cap on legal male abundance. Top: EAG, bottom: WAG.



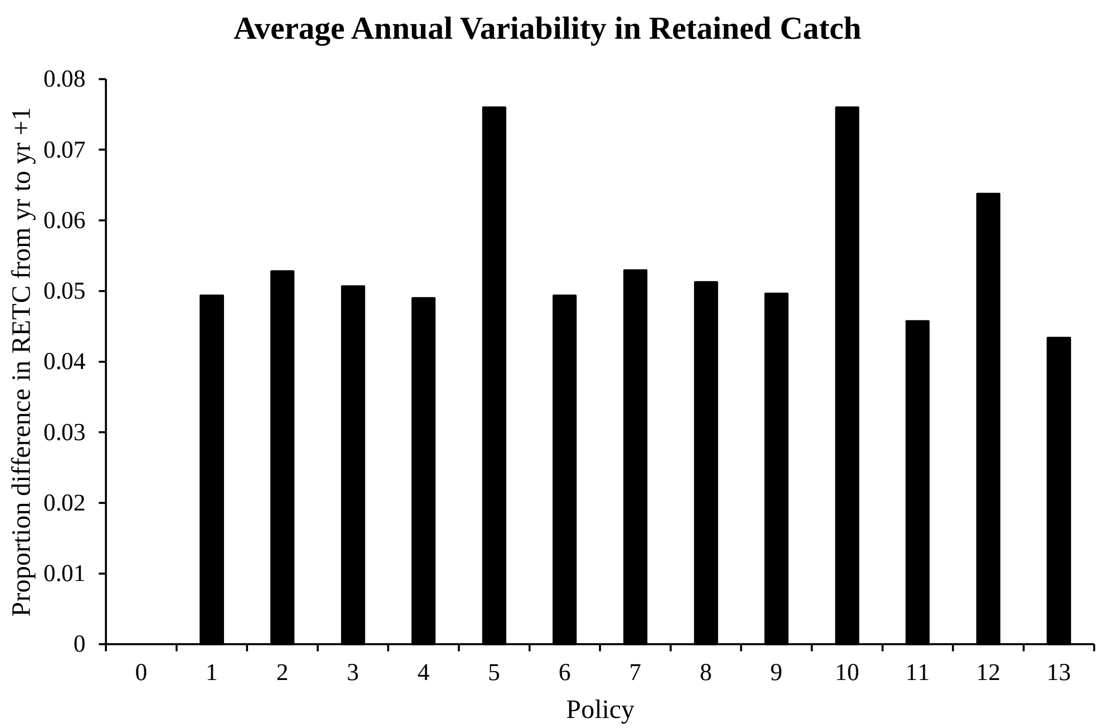
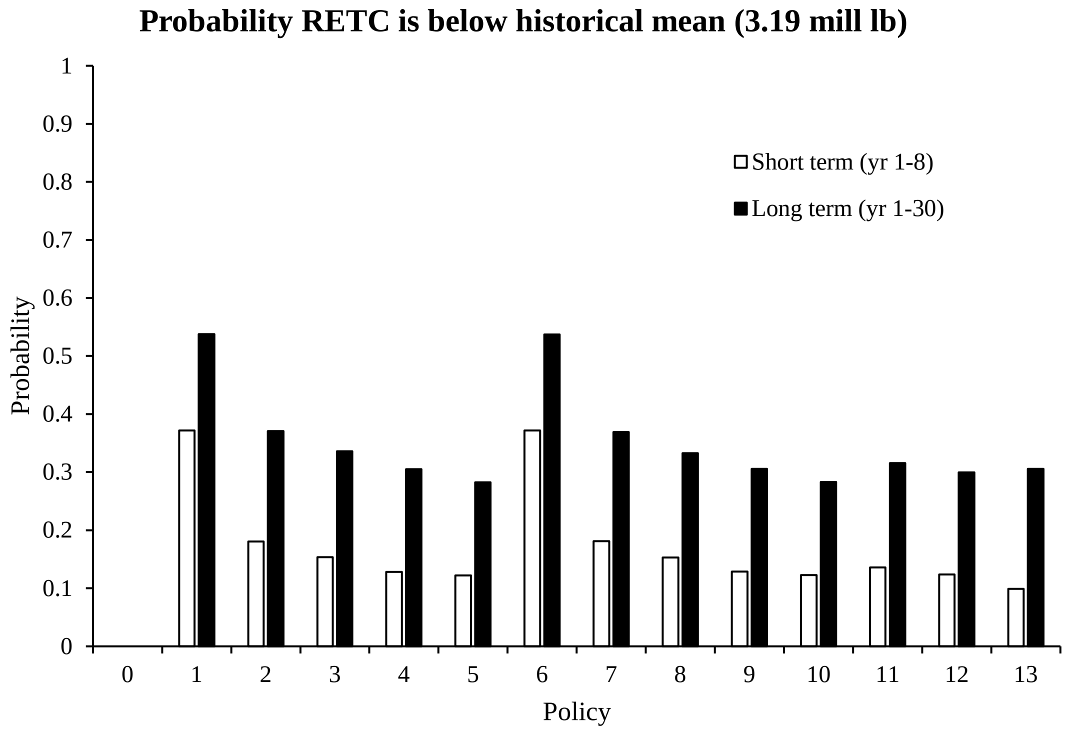


Figure 12.–Average annual variability in retained catch, as defined by the proportion of the retained catch that changed from one year to the next. Top: EAG, bottom: WAG.



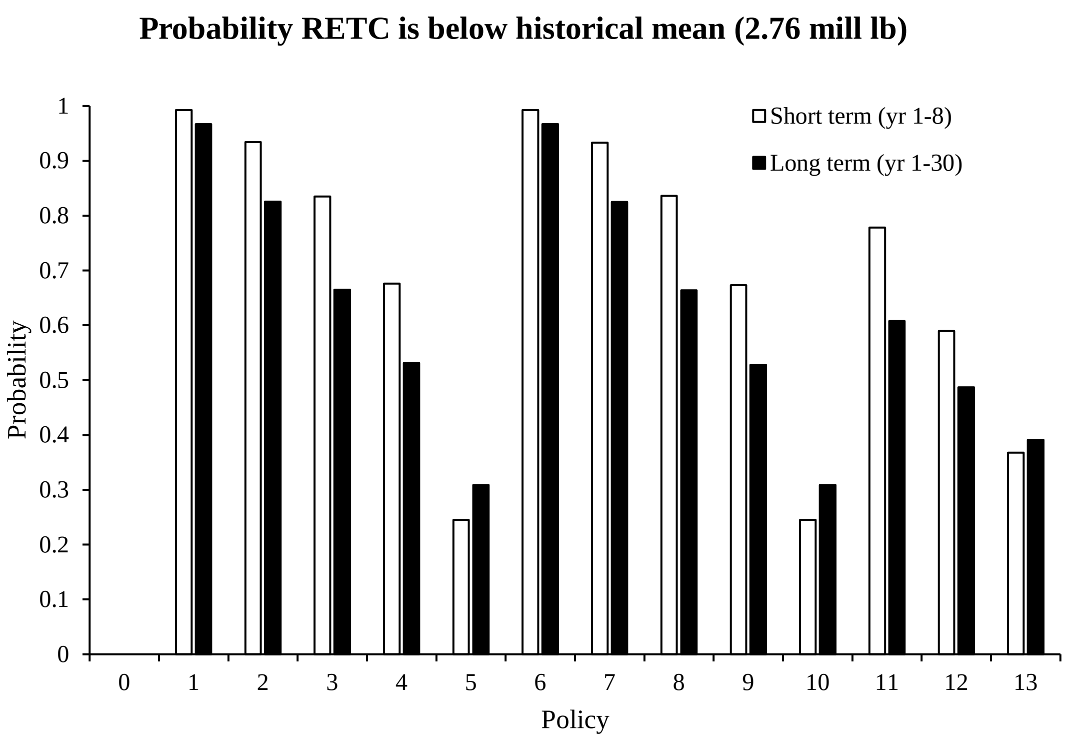
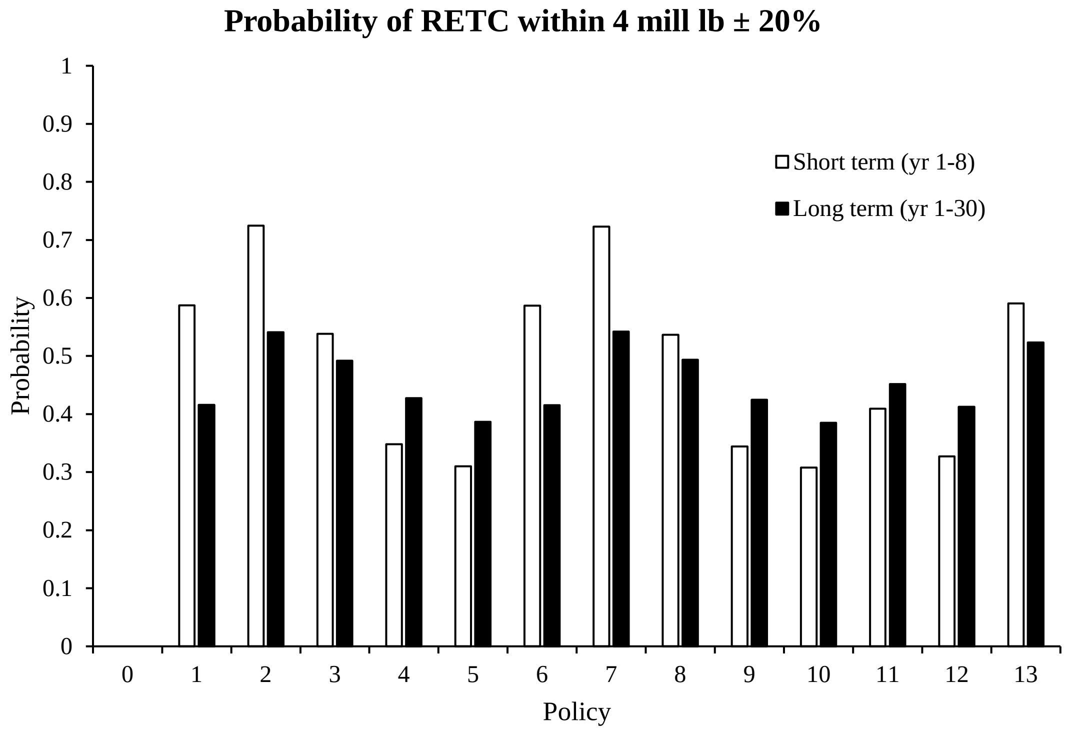


Figure 13.–Probability that the projected retained catch (RETC) is below the historical mean total allowable catch (TAC): EAG 3.19 million pounds, WAG 2.76 million pounds. Top: EAG, bottom: WAG.



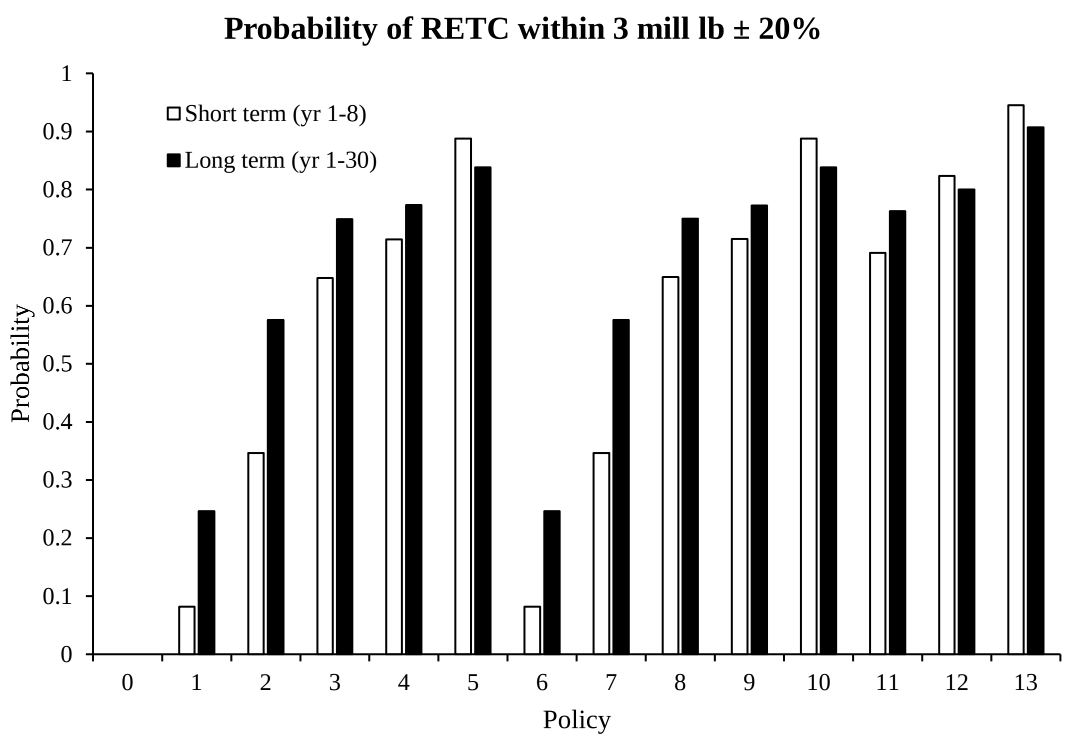


Figure 14.–Probability that the projected retained catch (RETC) falls within an optimal range: EAG 4 million pounds ± 20%, WAG 3 million pounds ± 20%. Top: EAG, bottom: WAG.

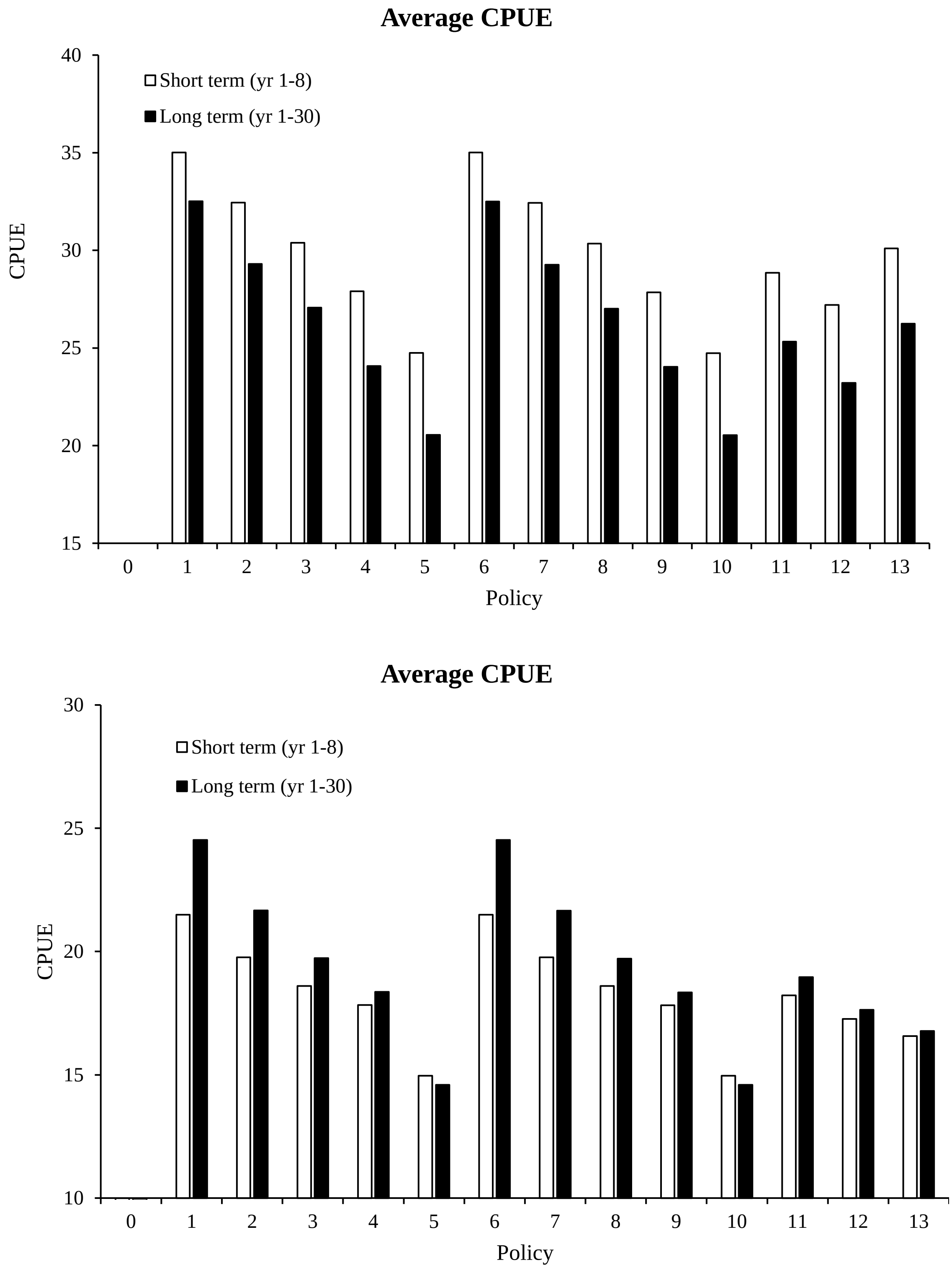


Figure 15.–Average projected catch per unit effort (CPUE). Top: EAG, bottom: WAG.

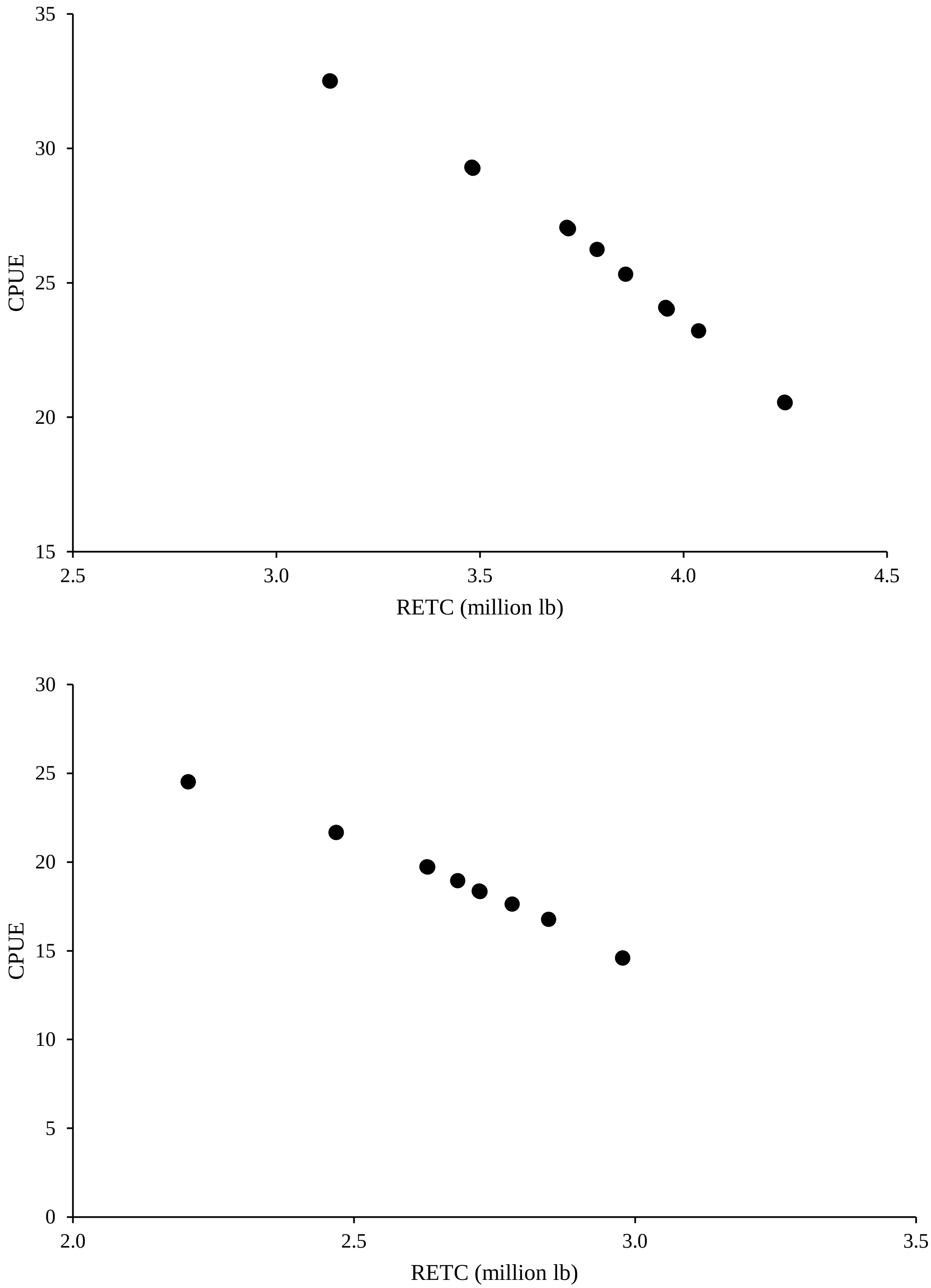
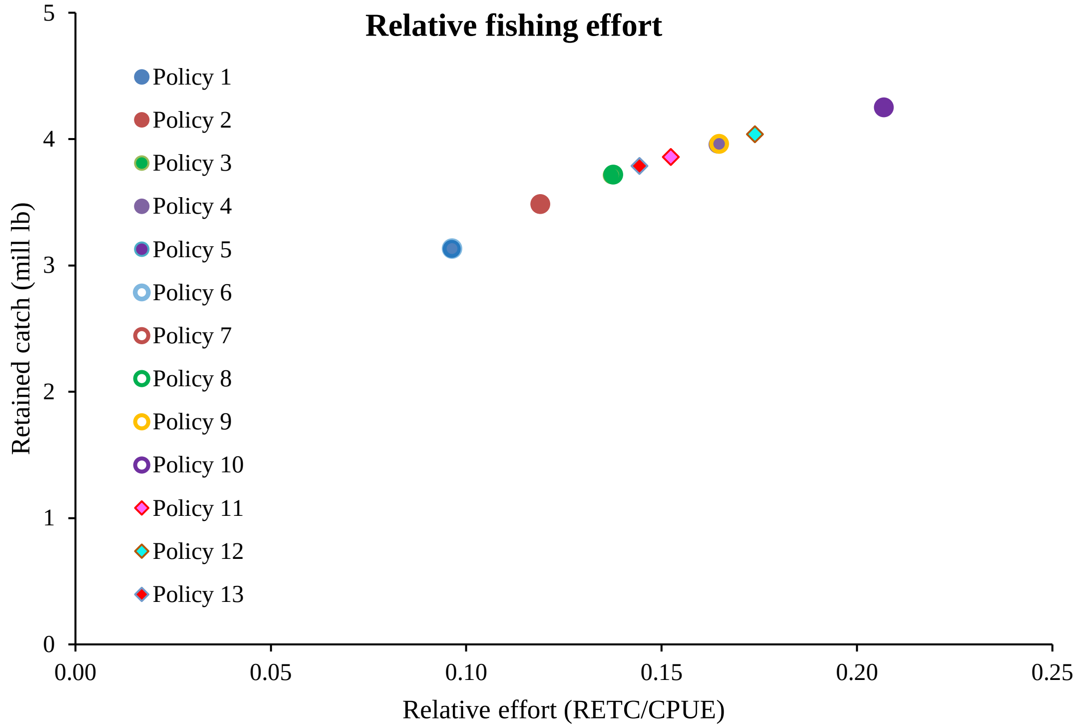


Figure 16.–Average projected catch per unit effort (CPUE) as a function of average projected retained catch (RETC, millions of pounds). Top: EAG, bottom: WAG.



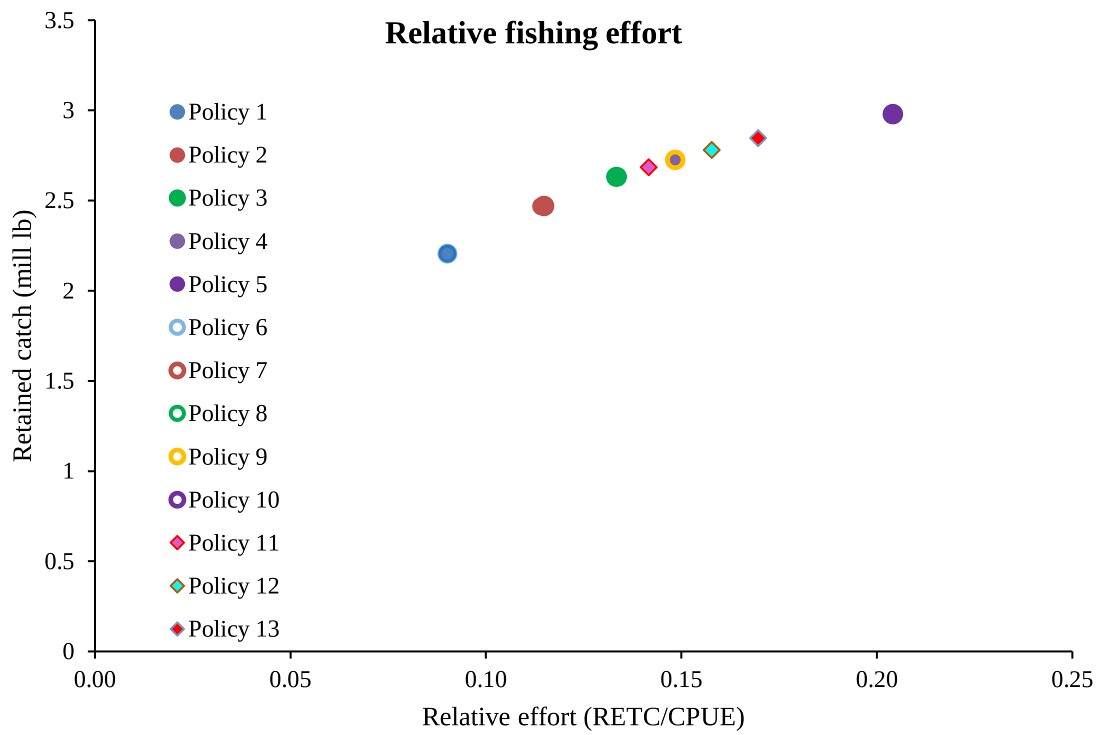
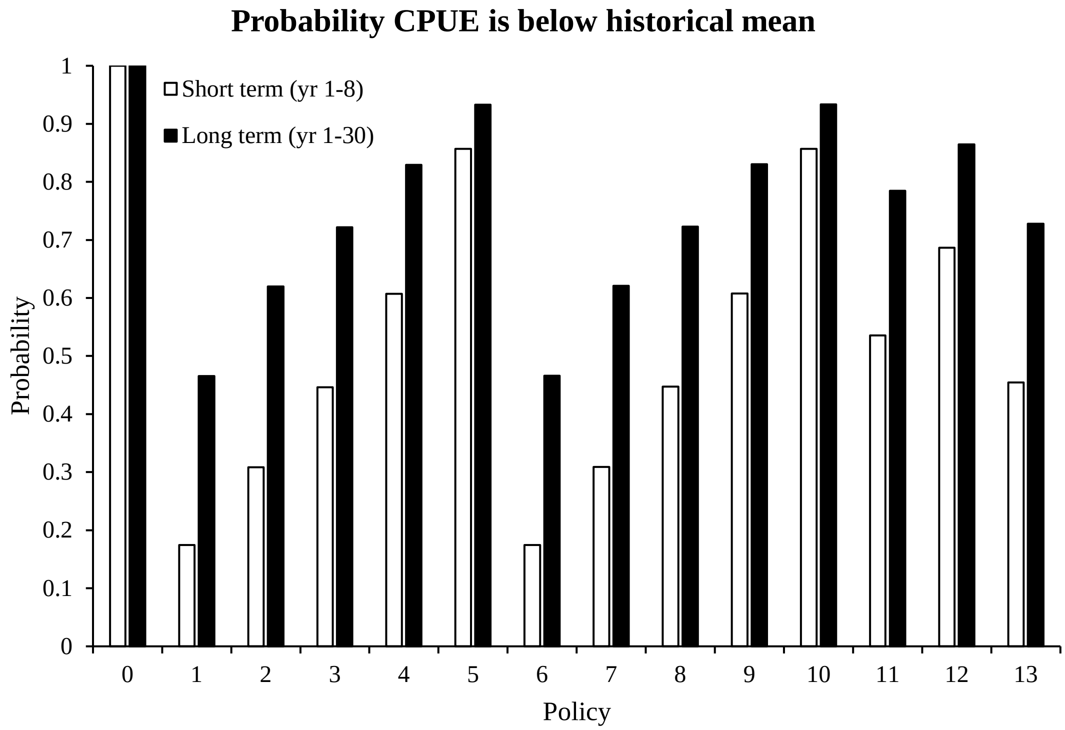


Figure 17.–Average projected retained catch (RETC) as a function of relative fishing effort as defined by RETC/CPUE. Top: EAG, bottom: WAG.



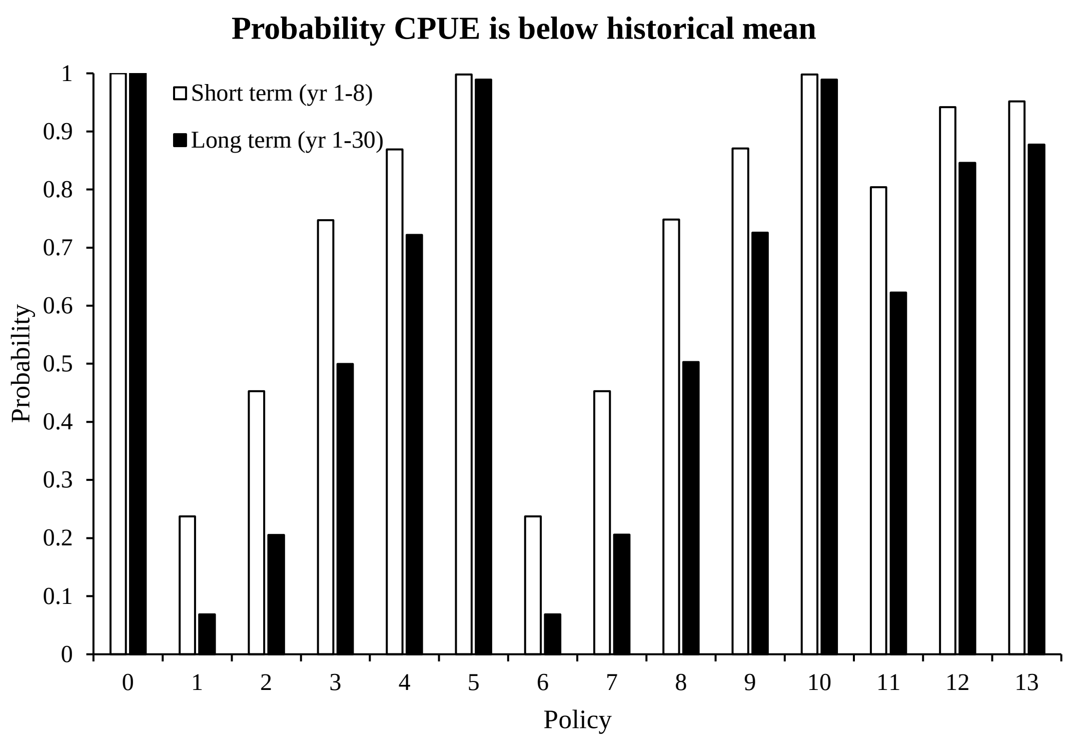
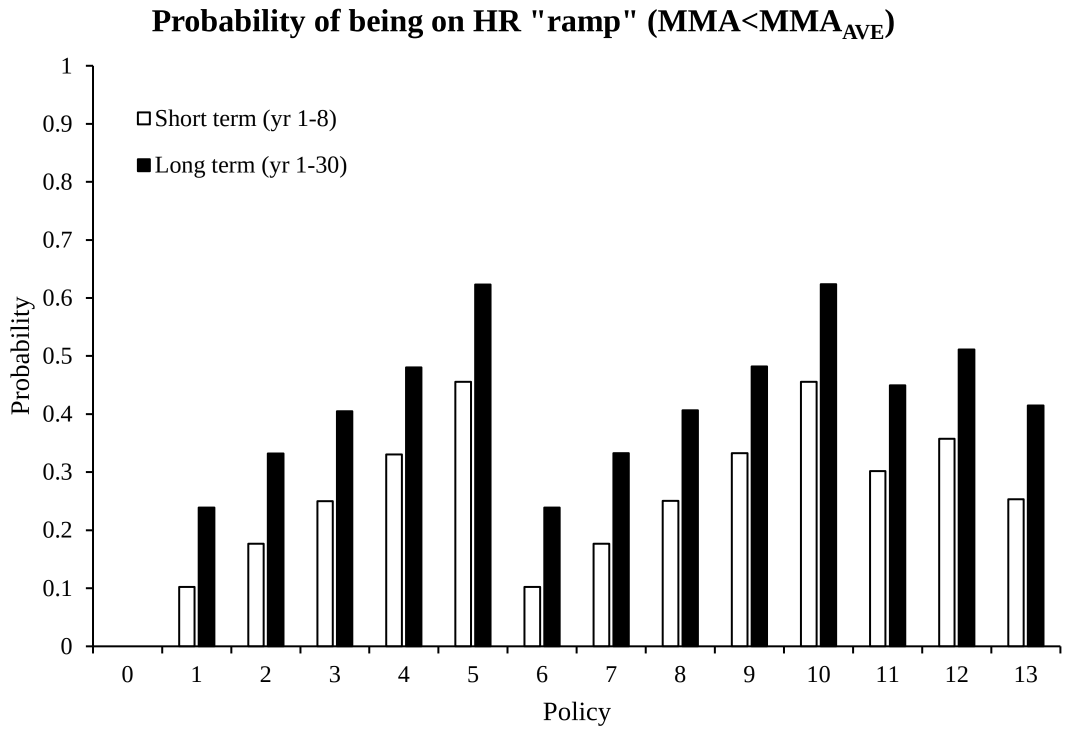


Figure 18.–Probability that the projected catch per unit effort (CPUE) is below historical average CPUE. Top: EAG, bottom: WAG.



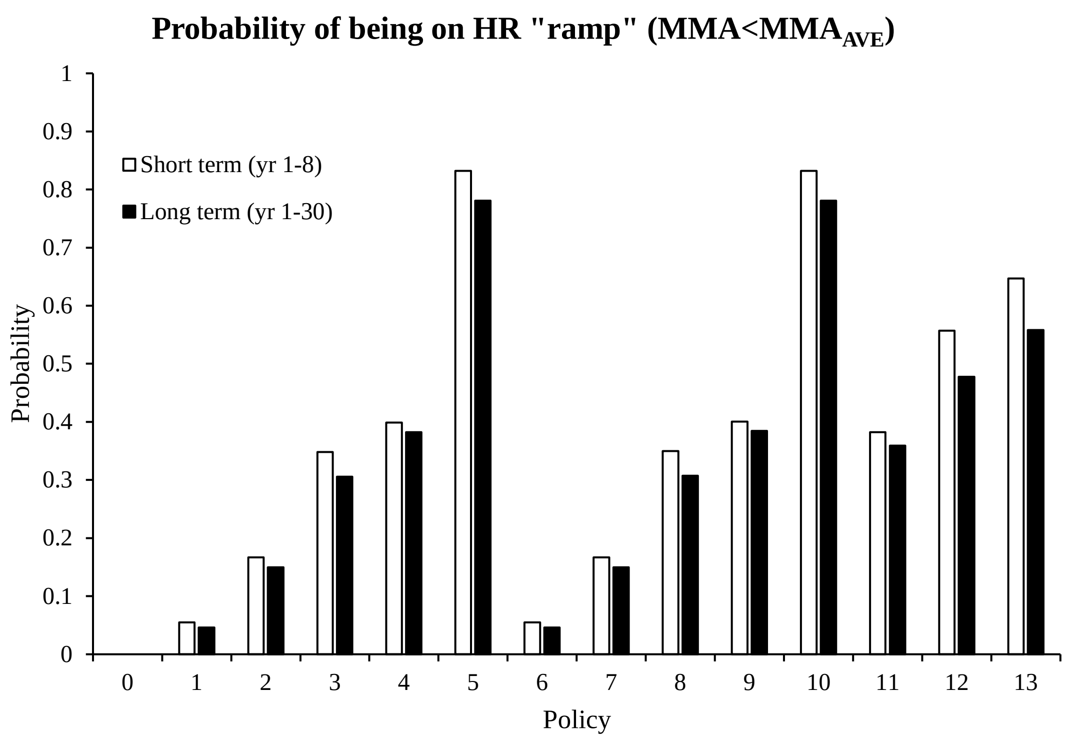


Figure 19.–Probability that the projected mature male abundance (MMA) is below the average model hindcast estimates of MMA for 1985–2017 (MMA_{AVE}). Top: EAG, bottom: WAG.

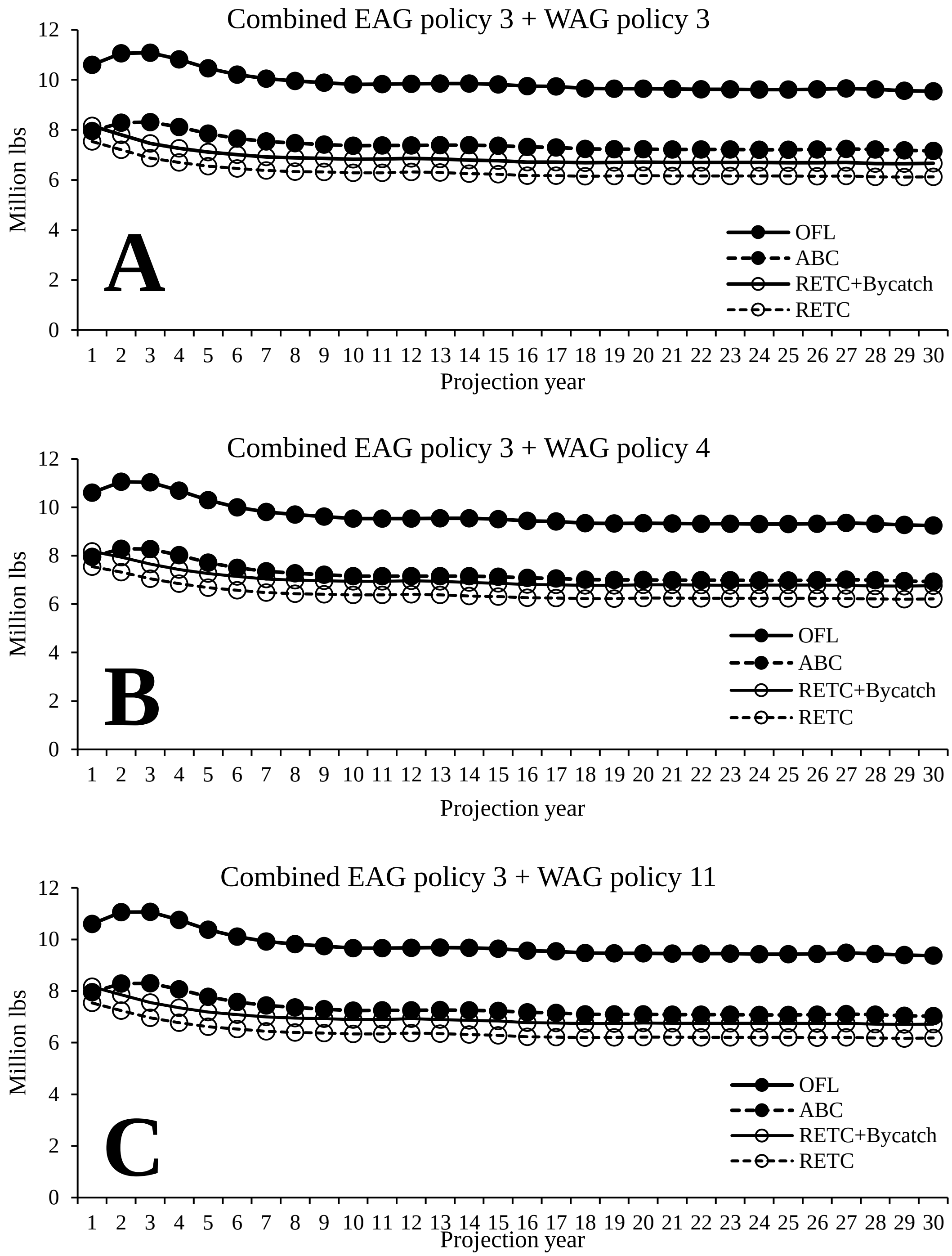


Figure 20.–Combined average projected federal overfishing level (OFL), federal acceptable biological catch (ABC; 0.75*OFL), retained catch (RETC) plus bycatch, and RETC only, assuming policy 3 in the EAG and policies 3 (A), 4 (B), or 11 (C) in the WAG for projection years 1–30. These results depict harvest regime 2 (i.e., proportional reduction of harvest rate by RETC/ABC) simulations.

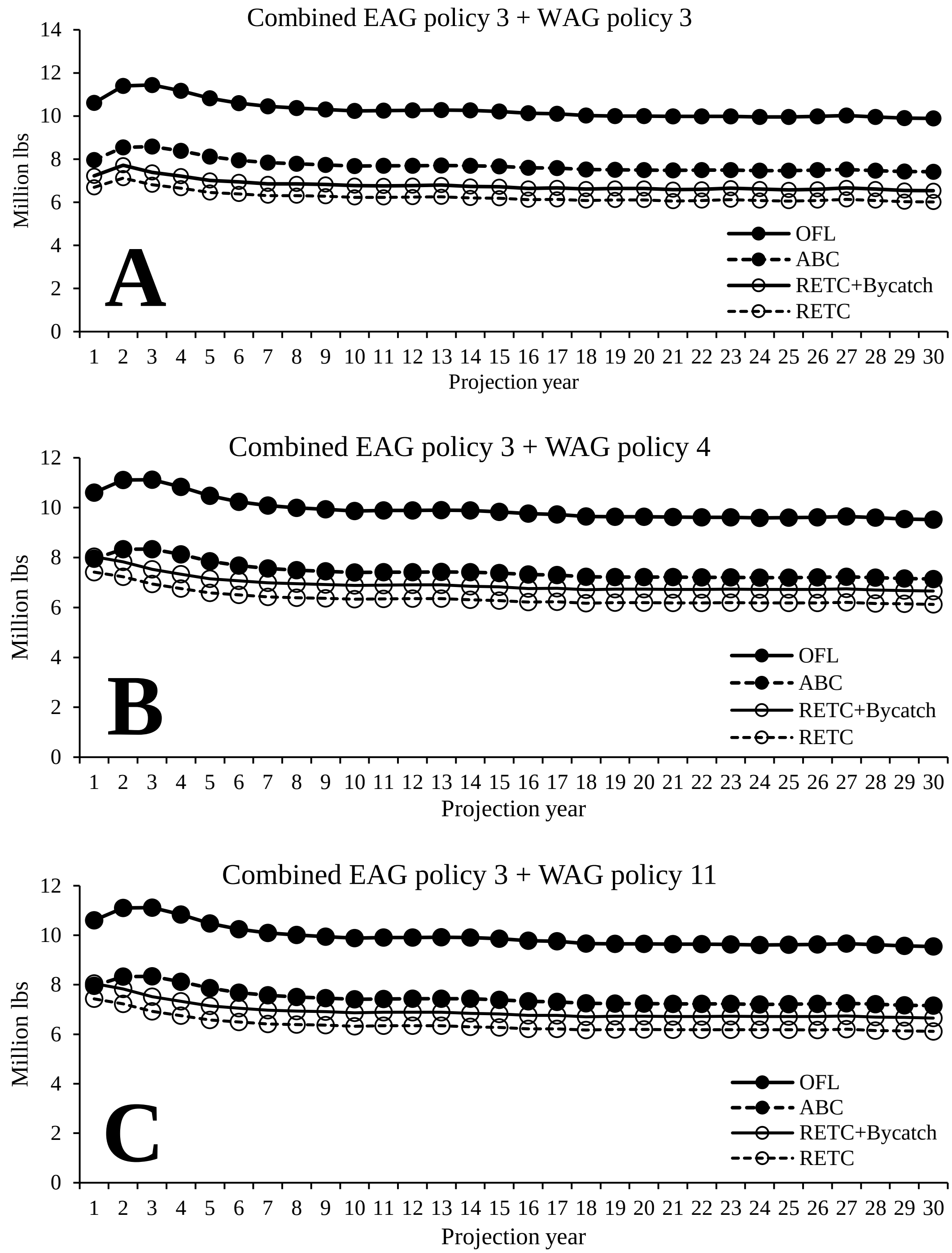


Figure 21.–Combined average projected federal overfishing level (OFL), federal acceptable biological catch (ABC; 0.75*OFL), retained catch (RETC) plus bycatch, and RETC only, assuming policy 3 in the EAG and policies 3 (A), 4 (B), or 11 (C) in the WAG for projection years 1–30. These results depict harvest regime 1 (i.e., RETC is capped by the area-specific ABC) simulations.

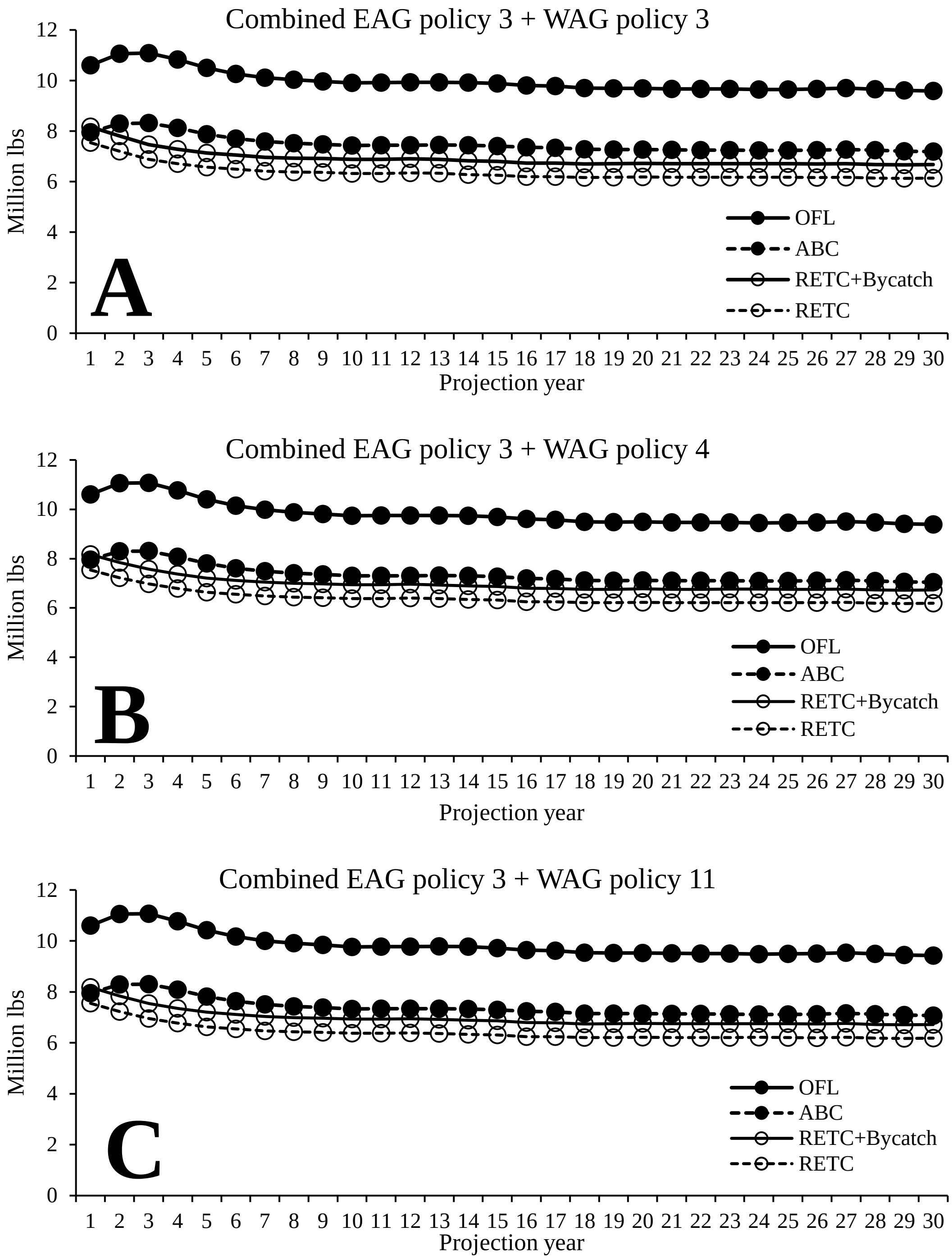


Figure 22.–Combined average projected federal overfishing level (OFL), federal acceptable biological catch (ABC; 0.75*OFL), retained catch (RETC) plus bycatch, and RETC only, assuming policy 3 in the EAG and policies 3 (A), 4 (B), or 11 (C) in the WAG for projection years 1–30. These results depict harvest regime 3 (i.e., RETC is not limited by the area-specific ABC) simulations.

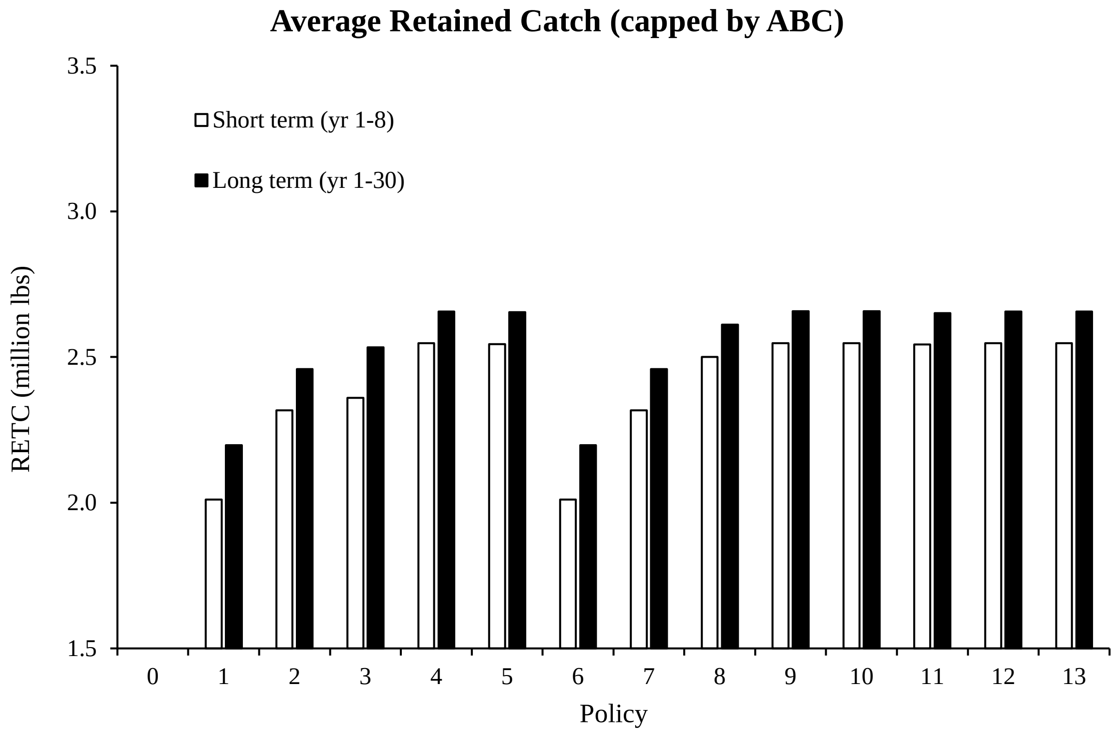
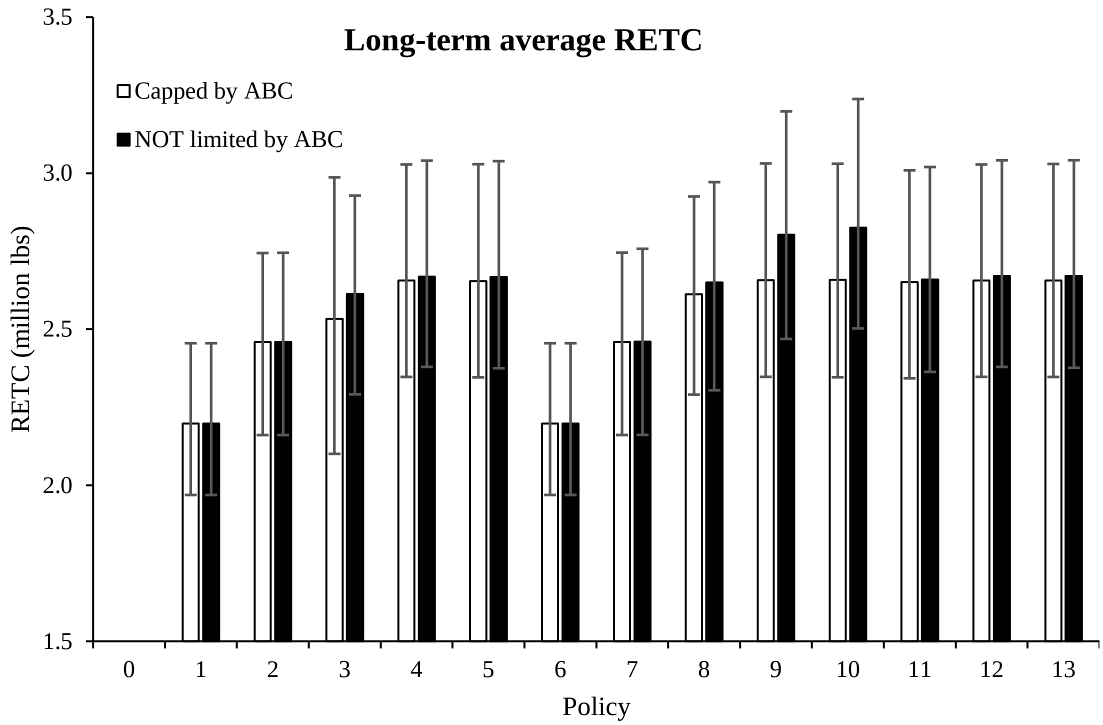


Figure 23.–WAG short (years 1-8) and long (years 1-30) term average retained catch for each policy under harvest regime 1 (i.e., RETC capped by the area-specific ABC).



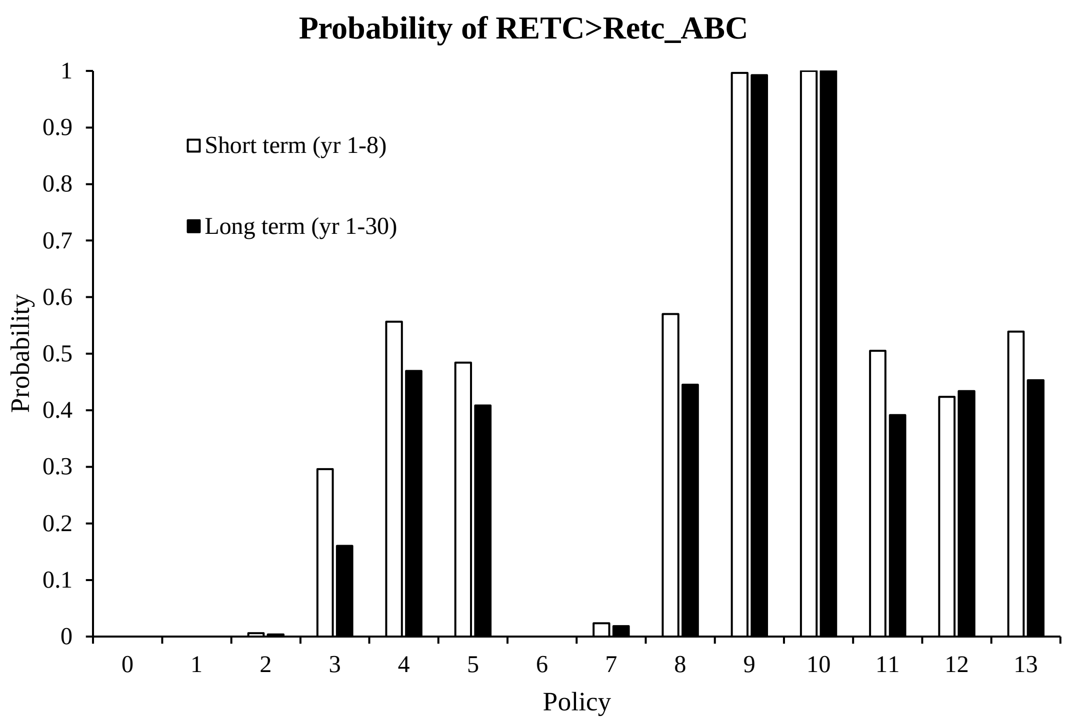


Figure 24.–TOP: WAG long-term (years 1-30) average retained catch (±95% CI) when retained catch was (white bars) and was not (black bars) limited by the area-specific ABC (harvest regimes 1 and 3). Bottom: WAG short (years 1-8) and long (years 1-30) term probability retained catch exceeds the retained catch portion of the federal allowable biological catch (ABC) for each policy under harvest regime 3 (i.e., RETC not limited by the area-specific ABC).

APPENDIX A. FORECAST SIMULATIONS AND OUTLOOK FOR ALEUTIAN ISLANDS GOLDEN KING CRAB UNDER PROPOSED STATE HARVEST STRATEGY

Appendix A1.–Forecast simulations and outlook for Aleutian Islands golden king crab under proposed state harvest strategy.

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Contribution to Daly et al. *In prep.* Aleutian Islands golden king crab state harvest strategy. Alaska Department of Fish and Game, Fishery Manuscript Series.

INTRODUCTION

The Aleutian Islands golden king crab (AIGKC) model-based assessment was accepted by the NPFMC in 2017 for annual overfishing level (OFL) and acceptable biological catch (ABC) determination. The fishery in the two management regions [east (EAG) and west (WAG) of 174-degree W longitude] is still managed by the constant harvest strategy. To use the assessment model estimated abundances in the calculation of total allowable catch (TAC), Alaska Department of Fish and Game (ADF&G) plans to submit a state harvest control rule (HCR) proposal to the Board of Fisheries (BOF) in March 2019. This report provides stochastic simulation results pertaining to the effects of different harvest policies on the sustainability and productivity of the two management areas.

SIMULATION METHOD

We simulated future male stock abundances from the 2018 base model (scenario 18_0 with up to 2017/18 data) estimated abundances by length-class and parameters. We projected the abundances for 30 years with 500 random replicates under state HCR and estimated various management parameters: mature male biomass (MMB), mature male abundance (MMA), legal male biomass (LMB), total catch (TOTC), retained catch (RETC), retained catch-per-unit effort (CPUE), number of annual recruits to the model size-class (Recruit), fishing mortality (F), and retained catch variability under Hockey Stick and Ricker stock-recruit (SR) models generated recruits. We used the Federal overfishing level fishing mortality from the base model to calculate OFL and ABC (75% of the OFL) and considered the MMB_{35} from the base model as the B_{MSY}. We also estimated the probability of MMA going below average MMA, MMB going below MMB_{MSY} (MMB_{35}), below MSST ($0.5MMB_{35}$, overfished), and half of MSST (severely overfished); and TOTC going above OFL (over fishing), and above ABC (75% of the OFL) under state HCR.

Future population projections primarily depend on future recruitment, but crab recruitment is difficult to predict. Therefore, annual recruitment for the projections was generated using two established SR models: 1) Hockey Stick SR model and 2) Ricker SR model. In addition to recruitment, the estimated terminal abundance (July 1, 2017) is another major source of uncertainty for the projections. Both the SR model generated recruitments and the terminal abundances were randomized by a lognormal random distribution. Because fisheries do not harvest the exact quantity of total allowable catch (TAC) prescribed each year, a normal random error was added to the predicted retained catch (i.e., the implementation error). Other restrictions on implementing the state HCR, such as sloping control rule, legal male catch cap, and predicted retained catch not to exceed retained catch part of ABC, are listed in Table 1.

Simulation steps

1) Run assessment model scenario 18_0 (base model) from the start year to the terminal year (2017/18 data). Model equations are provided in Appendix A of Siddeek et al. (2018).

2) After estimating the abundances and parameters in step 1, run the forecast function at the final phase of the ADMB optimization. In the forecast, we used a constant last 10-yr mean groundfish fishing mortality, a constant M of 0.21 yr^{-1}, and the two following SR models one at a time.

2.a)

i. Hockey Stick stock-recruitment (SR) relationship with lognormal errors was formulated as follows

$$R_{i+1,j} = b \times S_{i-k}\, e^{\varepsilon_i - \frac{\sigma_R^2}{2}} \qquad if\ S_{i-k} \le \min MMB \tag{1}$$

$$R_{i+1,j} = \bar{R} \times e^{\varepsilon_i - \frac{\sigma_R^2}{2}} \qquad if\ S_{i-k} > \min MMB$$

$$\epsilon_i = \rho\, \epsilon_{i-1} + e_i \qquad e_i \sim N(0, \sigma_R^2)$$

$$\sigma_{\epsilon_i}^2 = \frac{\sigma_R^2}{1-\rho^2}$$

where *b*, $\bar{R}$, σ_R, and ρ are slope, mean number of recruits for $S_{i-k} \ge \min MMB$, standard deviation, and first order autocorrelation parameters, respectively, and are estimated by Hockey Stick stock-recruitment model fitting to the data. S = mature male biomass (MMB), *k* = lag years to produce the recruitment from the spawning year, and i and j are projection year and simulation number, respectively.

We considered *k* =8 years based on the mean recruitment length. We used the mean growth increment ~14.5 mm CL to estimate the mean recruitment age. Thus,

(mean recruitment length: 108.949 mm for EAG and 109.035 mm for WAG) / 14.5 + 0.7 (brooding time to start of growth) ~ 8 years.

ii. Ricker stock-recruitment relationship with lognormal errors was reparametrized in terms of steepness parameter (h), equilibrium spawning biomass-per-recruit at an F (spr) and at F=0 (spr0), and number of recruits at unfished equilibrium (R_0). We followed the papers by Martell et al. (2007), Punt et al. (2008, 2012) and Subbey et al. (2014) to re-parameterize the Ricker stock-recruitment model.

$$R_{(i+1,j)} = \frac{ln\langle \frac{5h^{5/4}}{spr0} \times spr(i,j) \rangle}{\frac{ln\langle 5h^{5/4} \rangle}{spr0 \times R_0} \times spr(i,j)}\, e^{\varepsilon_i - \frac{\sigma_R^2}{2}} \tag{2}$$

where

$$\epsilon_i = \rho\, \epsilon_{i-1} + e_i \qquad e_i \sim N(0,\ \sigma_R^2)$$

$$\sigma_{\epsilon_i}^2 = \frac{\sigma_R^2}{1-\rho^2}$$

where σ_R and ρ are recruitment standard deviation and first order autocorrelation parameters, respectively.

The spr at F and spr_0 at F=0 were determined by equilibrium spawning biomass per recruit analysis, which does not require any stock-recruitment relationship hence any steepness parameter value.

The optimum steepness parameter (h) was determined by a two-step procedure:

i. Estimated the F_{35}, spr_{35} at $F=F_{35}$, and spr_0 at F=0 from equilibrium spawning biomass per recruit analysis.

ii. At $F = F_{35}$, estimated MMB (i.e. proxy MMB_{MSY}) for various h values using the spawner-recruit model (equation 2) with $spr=spr_{35}$ and without the error part, as well as the population reduction model (Appendix A in Siddeek et al., 2018). Estimated the optimum h as that produced $MMB = 0.35*MMB_0$, where MMB_0 is the equilibrium MMB at unfished level.

   Thus, the optimum steepness parameter ensures that the stock-recruitment model produces MMB_{35} at F_{35}.

The standard Ricker SR model ($R_i = a \times S_{i-k} \times e^{-b \times S_{i-k}}$) parameters, a and b, were estimated to predict the deterministic stock-recruitment curve as follows:

$$a = \frac{(5h)^{5/4}}{spr0} \qquad b = \frac{\frac{5}{4}\times \ln(5h)}{R_0 spr0}$$

2.b) Randomize the abundance (estimation error)

The lognormal random error to the initial abundance at each replication (j) is added in the following steps:

We first scaled the standard error based on the standard error of the terminal year abundance (i.e., CV= $\frac{Std.Error\ of\ terminal\ MMA}{terminal\ MMA}$). Then we added the lognormal random error to abundance as follows:

$$N_{1,j} = N_{1,j} e^{\varepsilon_j - \frac{\sigma_\varepsilon^2}{2}} \qquad (3)$$

where $\sigma_\varepsilon = \frac{Std.Error\ of\ terminal\ year\ MMA}{terminal\ year\ MMA}$

$N_{1,j}$= initial abundance to be randomized for jth replication; and MMA = mature male abundance (number of crab).

The log normal error to the abundance was implemented as follows:

$$N_{i=1} = N_{i=1}\, e^{normal\ random\ error\ (j)\frac{Std.Error\ terminal\ year\ MMA}{terminal\ year\ MMA} - \frac{\left(\frac{Std.\,Error\ terminal\ year\ MMA}{terminal\ year\ MMA}\right)^2}{2}} \qquad (4)$$

2.c) Randomize the retained catch (implementation error)

Implementation error was added to predicted retained catch (RETC) based on the variability between the TAC and realized RETC as follows:

$$RETC_{(i,j)}^{actual} = RETC_{(i,j)}^{Predicted} + \sigma_c \qquad (5)$$

where

$$\sigma_c = \frac{Standard\ deviation\ of\ (TAC_i - RETC_i)}{mean(TAC_i - RETC_i)}$$

The relative standard error σ_c was estimated considering the 1996/97 to 2017/18 seasons. We did not consider an autocorrelation parameter for simplicity.

2.d) Constraints on the predicted retained catch number and catch biomass under state HCR

$$RETC = \min(retained\ catch\ in\ number\ of\ crabs, x\%\ of\ legal\ male\ abundance) \qquad (6)$$

$$Retained\ catch\ biomass = \min(retained\ catch\ biomass, retained\ part\ of\ ABC) \qquad (7)$$

Constraints (6) and (7) were not considered for a special harvest policy number 13 (Table 1). In this policy, a constant harvest rate of 15% for EAG and 23% for WAG were applied when the MMA > 0.25*Average MMA. The average harvest rates were the estimates from actual harvest rates for the 2008/09 – 2018/19 seasons.

2.e) Because of uncertainty in the estimates, we explored the effects of variability in estimated recruit standard deviation and autocorrelation, steepness, and standard deviation of the catch implementation error on simulation results. We considered a low and a high value from the estimate for the recruitment variability. To reduce the number of model scenarios we only considered a low (zero) and the estimated value for the catch implementation standard deviation. Catch variability from TAC is relatively small. We grouped the range of parameter variability values into 18 scenarios for Hockey Stick SR (Tables 2 for EAG and 3 for WAG) and 54 scenarios for Ricker SR (Tables 4 for EAG and 5 WAG) models.

3. Projection

3.a) Federal overfishing level OFL and ABC catches are needed to assess the total catch (TOTC) determined by each state harvest control rule scenario (NPFMC, 2007). We used the retained catch part of the estimated ABC (75% of the OFL) at each projection year to constrain the predicted retained catch biomass below the retain catch part of ABC for all policies, but the special policy # 13 without any constraints.

The proposed state harvest control rule scenarios are listed in Table 1A.

Table 1A. Thirteen state harvest policies for the directed pot fishery were considered in the simulations. An additional policy with zero harvest rate was used as a control (altogether 14 policies).

Policy#	1	2	3	4	5	6	7
Time period for mean MMA[1] (MMA_{ave})	1985–2017	1985–2017	1985–2017	1985–2017	1985–2017	1985–2017	1985–2017
Threshold for opening/closing $\frac{MMA}{MMA_{ave}}\%$	25%	25%$_{e}$	25%	25%	25%	25%	25%
Exploitation rate on MMA when $\frac{MMA}{MMA_{ave}}\% < 100\%$	$\frac{MMA}{MMA_{ave}} \times 0.1$	$\frac{MMA}{MMA_{ave}} \times 0.125$	$\frac{MMA}{MMA_{ave}} \times 0.15$	$\frac{MMA}{MMA_{ave}} \times 0.20$	$\frac{MMA}{MMA_{ave}} \times 0.3$	$\frac{MMA}{MMA_{ave}} \times 0.1$	$\frac{MMA}{MMA_{ave}} \times 0.125$
Max Exploitation rate on MMA when $\frac{MMA}{MMA_{ave}}\% \geq 100\%$	10%	12.5%	15%	20%	30%	10%	12.5%
Max exploitation rate on legal male abundance	25%	25%	25%	25%	25%	30%	30%
Max exploitation rate	Retained Catch < Retained ABC	Retained Catch < Retained ABC	Retained Catch < Retained ABC	Retained Catch < Retained ABC	Retained Catch < Retained ABC	Retained Catch < Retained ABC	Retained Catch < Retained ABC

[1]MMA: mature male abundance (number of crab)

Table 1A. Page 2 of 2.

Policy#	8	9	10	11	12	13	0
Time period for mean MMA[1] (MMA_{ave})	1985–2017	1985–2017	1985–2017	1985–2017	1985–2017	1985–2017	N/A
Threshold for opening/closing $\frac{MMA}{MMA_{ave}}$%	25%	25%$_{e}$	25%	25%	25%	25%	N/A
Exploitation rate on MMA when $\frac{MMA}{MMA_{ave}}$%< 100%	$\frac{MMA}{MMA_{ave}} \times 0.15$	$\frac{MMA}{MMA_{ave}} \times 0.20$	$\frac{MMA}{MMA_{ave}} \times 0.30$	$\frac{MMA}{MMA_{ave}} \times 0.175$	$\frac{MMA}{MMA_{ave}} \times 0.225$	EAG .15 WAG .23	0
Max Exploitation rate on MMA when $\frac{MMA}{MMA_{ave}}$% ≥ 100%	15%	20%	30%	17.5%	22.5%	EAG 15% WAG 23%	0
Max exploitation rate on legal male abundance	30%	30%	30%	25%	25%	None	N/A
Max exploitation rate	Retained Catch < Retained ABC	Retained Catch < Retained ABC	Retained Catch < Retained ABC	Retained Catch < Retained ABC	Retained Catch < Retained ABC	None	N/A

[1]MMA: mature male abundance (number of crab)

Table 2A. Scenario parameters for Hockey Stick stock-recruit model projection for EAG. R_sigma; recruitment standard deviation; R_rho: recruitment autocorrelation; and C_sigma: catch difference standard deviation.

Scenario	R_sigma	R_rho	C_sigma
1	0.74698	0.28803	0.02057
2	0.25	0.28803	0.02057
3	1	0.28803	0.02057
4	0.74698	0	0.02057
5	0.25	0	0.02057
6	1	0	0.02057
7	0.74698	0.6	0.02057
8	0.25	0.6	0.02057
9	1	0.6	0.02057
10	0.74698	0.28803	0
11	0.25	0.28803	0
12	1	0.28803	0
13	0.74698	0	0
14	0.25	0	0
15	1	0	0
16	0.74698	0.6	0
17	0.25	0.6	0
18	1	0.6	0

Table 3A. Scenario parameters for Hockey Stick stock-recruit model projection for WAG. R_sigma; recruitment standard deviation; R_rho: recruitment autocorrelation; and C_sigma: catch difference standard deviation.

Scenario	R_sigma	R_rho	C_sigma
1	0.33733	0.25871	0.03797
2	0.25	0.25871	0.03797
3	1	0.25871	0.03797
4	0.33733	0	0.03797
5	0.25	0	0.03797
6	1	0	0.03797
7	0.33733	0.6	0.03797
8	0.25	0.6	0.03797
9	1	0.6	0.03797
10	0.33733	0.25871	0
11	0.25	0.25871	0
12	1	0.25871	0
13	0.33733	0	0
14	0.25	0	0
15	1	0	0
16	0.33733	0.6	0
17	0.25	0.6	0
18	1	0.6	0

Table 4A. Scenario parameters for Ricker stock-recruit model projection for EAG. R_sigma; recruitment standard deviation; R_rho: recruitment autocorrelation; C_sigma: catch difference standard deviation; and h: steepness.

Scenario	R_sigma	R_rho	C_sigma	h	Scenario	R_sigma	R_rho	C_sigma	h
1	0.74698	0.28803	0.02057	0.73	28	0.74698	0.28803	0	0.5
2	0.25	0.28803	0.02057	0.73	29	0.25	0.28803	0	0.5
3	1	0.28803	0.02057	0.73	30	1	0.28803	0	0.5
4	0.74698	0	0.02057	0.73	31	0.74698	0	0	0.5
5	0.25	0	0.02057	0.73	32	0.25	0	0	0.5
6	1	0	0.02057	0.73	33	1	0	0	0.5
7	0.74698	0.6	0.02057	0.73	34	0.74698	0.6	0	0.5
8	0.25	0.6	0.02057	0.73	35	0.25	0.6	0	0.5
9	1	0.6	0.02057	0.73	36	1	0.6	0	0.5
10	0.74698	0.28803	0	0.73	37	0.74698	0.28803	0.02057	1
11	0.25	0.28803	0	0.73	38	0.25	0.28803	0.02057	1
12	1	0.28803	0	0.73	39	1	0.28803	0.02057	1
13	0.74698	0	0	0.73	40	0.74698	0	0.02057	1
14	0.25	0	0	0.73	41	0.25	0	0.02057	1
15	1	0	0	0.73	42	1	0	0.02057	1
16	0.74698	0.6	0	0.73	43	0.74698	0.6	0.02057	1
17	0.25	0.6	0	0.73	44	0.25	0.6	0.02057	1
18	1	0.6	0	0.73	45	1	0.6	0.02057	1
19	0.74698	0.28803	0.02057	0.5	46	0.74698	0.28803	0	1
20	0.25	0.28803	0.02057	0.5	47	0.25	0.28803	0	1
21	1	0.28803	0.02057	0.5	48	1	0.28803	0	1
22	0.74698	0	0.02057	0.5	49	0.74698	0	0	1
23	0.25	0	0.02057	0.5	50	0.25	0	0	1
24	1	0	0.02057	0.5	51	1	0	0	1
25	0.74698	0.6	0.02057	0.5	52	0.74698	0.6	0	1
26	0.25	0.6	0.02057	0.5	53	0.25	0.6	0	1
27	1	0.6	0.02057	0.5	54	1	0.6	0	1

Table 5A. Scenario parameters for Ricker stock-recruit model projection for WAG. R_sigma; recruitment standard deviation; R_rho: recruitment autocorrelation; C_sigma: catch difference standard deviation; and h: steepness.

Scenario	R_sigma	R_rho	C_sigma	h	Scenario	R_sigma	R_rho	C_sigma	h
1	0.33733	0.25871	0.03797	0.73	28	0.33733	0.25871	0	0.5
2	0.25	0.25871	0.03797	0.73	29	0.25	0.25871	0	0.5
3	1	0.25871	0.03797	0.73	30	1	0.25871	0	0.5
4	0.33733	0	0.03797	0.73	31	0.33733	0	0	0.5
5	0.25	0	0.03797	0.73	32	0.25	0	0	0.5
6	1	0	0.03797	0.73	33	1	0	0	0.5
7	0.33733	0.6	0.03797	0.73	34	0.33733	0.6	0	0.5
8	0.25	0.6	0.03797	0.73	35	0.25	0.6	0	0.5
9	1	0.6	0.03797	0.73	36	1	0.6	0	0.5
10	0.33733	0.25871	0	0.73	37	0.33733	0.25871	0.03797	1
11	0.25	0.25871	0	0.73	38	0.25	0.25871	0.03797	1
12	1	0.25871	0	0.73	39	1	0.25871	0.03797	1
13	0.33733	0	0	0.73	40	0.33733	0	0.03797	1
14	0.25	0	0	0.73	41	0.25	0	0.03797	1
15	1	0	0	0.73	42	1	0	0.03797	1
16	0.33733	0.6	0	0.73	43	0.33733	0.6	0.03797	1
17	0.25	0.6	0	0.73	44	0.25	0.6	0.03797	1
18	1	0.6	0	0.73	45	1	0.6	0.03797	1
19	0.33733	0.25871	0.03797	0.5	46	0.33733	0.25871	0	1
20	0.25	0.25871	0.03797	0.5	47	0.25	0.25871	0	1
21	1	0.25871	0.03797	0.5	48	1	0.25871	0	1
22	0.33733	0	0.03797	0.5	49	0.33733	0	0	1
23	0.25	0	0.03797	0.5	50	0.25	0	0	1
24	1	0	0.03797	0.5	51	1	0	0	1
25	0.33733	0.6	0.03797	0.5	52	0.33733	0.6	0	1
26	0.25	0.6	0.03797	0.5	53	0.25	0.6	0	1
27	1	0.6	0.03797	0.5	54	1	0.6	0	1

The proposed state harvest rate (HR) was converted into directed pot fishery fishing mortality (F yr^{-1}) by a grid search method to satisfy:

$$HR = \frac{F \times total\ selectivity}{Z} \times (1. - e^{-Z}) \qquad (8)$$

where F (size invariable) and Z are fishing and total mortality, respectively. HR is re-estimated by the grid search function for F determination using

$$HR = \frac{Catch\ (number\ of\ crab)}{MMA} \qquad (9)$$

The F determined for a given state harvest rate was used in the population dynamics formula (see Appendix A; Siddeek et al., 2018).

The stock status for each projected year was determined by

$$Stock\ Status = \frac{MMA}{MMA_{ave}} \qquad (10)$$

Each scenario was replicated 500 times and projections made over 30 years beginning in 2017.

At each time step in the future:

3.b) Calculated MMB, MMA, LMB, and Stock Status.

3.c) Calculated OFL and ABC using Tier 3 F_{ofl}.

3.d) Calculated TOTC, RETC, CPUE, fishing mortality (F), and Recruit using state harvest control rule on MMA.

Note: Calculation formulas for 3.b), 3.c), and 3.d) are given either in this report or Appendix A of Siddeek et al. (2018).

3.e) Implemented the fishery and removed the total catch (after adding the implementation error to retained catch) and groundfish bycatch from the simulated population.

3.f) Drew new recruitment numbers from the stock-recruitment models and distributed them to length bins.

3.g) Updated the number-at-length.

4) Repeated step-3 for 30 years into the future.

5) Repeated steps 3 and 4 for 500 Monte Carlo trials, randomizing recruitment, initial abundance, and retained catch.

6) Used the annual distribution of simulated MMB, LMB, MMA, RETC, TOTC, CPUE, Stock Status, Recruit, F, and annual variability in retained catch to calculate performance statistics. Following Punt et al. (2008), absolute variation in annual retained catch for the 1-30yr projection time period was determined as follows:

$$Annual\ Catch\ Variation = \frac{\sum_y |RETC_y - RETC_{y-1}|}{\sum_y RETC_y} \qquad (11)$$

a) Mean and median annual MMB, MMA, LMB, RETC, TOTC, Stock Status, CPUE, F, and Recruit with standard errors by scenarios for each policy. We also calculated mean annual effort index by dividing mean RETC by mean CPUE. However, we did not provide the results in this Appendix, but used the estimates in the white paper. If needed, we can provide the results.

b) Mean and median annual catch variation by scenarios for each policy.

c) Probability that MMB < MMB_{35} (below MMB_{MSY}), < 0.5 MMB_{35} [i.e., minimum stock size threshold (MSST), overfished], and < 0.5MSST (severely overfished), MMA< MMA_{ave}, MMA< 0.25MMA_{ave}, TOTC>OFL, TOTC>ABC, RETC< $RETC_{ave}$, and CPUE<$CPUE_{ave}$ during the short (1 - 8yr)- and long (1 - 30yr)-term projection periods by scenarios for each policy.

The MMB_{35} estimates from the base model (18_0), averages of MMA, MMB, LMB, RETC, CPUE, and F are listed in Table 6.

d) Comparison of the trends in mean MMB, LMB, MMA, F, CPUE, and Stock Status relative to respective grand means during the 1-30yr projection period.

e) Trends in mean number of recruits during the 1-30yr projection period.

Although we estimated mean, median, standard deviation, and 95% confidence intervals for quantities of interest, in this Appendix, we discussed the results based on means. If needed, we can provide other results.

We used ADMB (Fournier et al., 2012) and R (R Core Team. 2018. R version 3.5.1) for simulation analyses and preparation of Figures and Tables.

Table 6A. Reference points and averages used in the evaluation of projection results' performances.

Item	EAG	WAG	Remarks
MMB_{35}	6823.342t	5208.385t	18_0 model
Mean RETC	1446.6t	1250.17t	2005/06 – 2017/18, post rationalization period
Mean MMA, MMA_{ave}	5.68186millions	4.17965millions	1985/86 – 2017/18
Mean MMB	7868.742t	5454.444t	1985/86 – 2017/18
Mean LMB	6298.277t	4251.638t	1985/86 – 2017/18
Mean F	$0.4467yr^{-1}$	$0.6606yr^{-1}$	1985/86 – 2017/18
Mean CPUE	31.3080	19.1961	2005/06 – 2017/18, post rationalization period

RESULTS

Stock Recruitment Fits

i) Hockey Stick SR model:

We fitted the Hockey Stick SR model to the stock assessment estimated MMB lagged by 8 years and number of annual recruits R (i.e., 1986-2009 MMB vs. 1994-2017 R) with the stick bending at the minimum observed MMB (EAG: 5131.63t, WAG: 3907.87t) values. The estimated parameters are:

Table 7A. Estimates of Hockey stick SR model parameters.

	EAG	WAG
Slope	0.000528	0.000508
Mean R for above minimum observed MMB (million crabs)	2.708355	1.985959
Recruitment standard deviation, $\boldsymbol{\sigma_R}$	0.746975	0.33733
Recruitment autocorrelation, $\boldsymbol{\rho}$	0.288031	0.258713

ii) Ricker SR model:

The estimated parameters of the reparametrized Ricker SR model are provided in Table 8.

Table 8A. Ricker SR model parameters.

	EAG	WAG
Steepness, h	0.7292	0.7282
F_{35} (yr^{-1})	0.644	0.596
spr_{35} (t)	2,611.779	2,613.439
spr_0 (t)	7,470.687	7,467.880
R_0 (mean number of recruits during 1987-2012, millions)	2.612527	1.992924
MMB_0 (t)	19,517.372	14,882.917

For status quo simulations, we used the Hockey Stick SR model estimated σ_R and ρ values for both Hockey Stick and Ricker SR models. Ranges of parameter values were used for sensitivity analysis (see Tables 2A to 5A).

The fits by the two SR models to the stock recruitment data are depicted in Figure 1A:

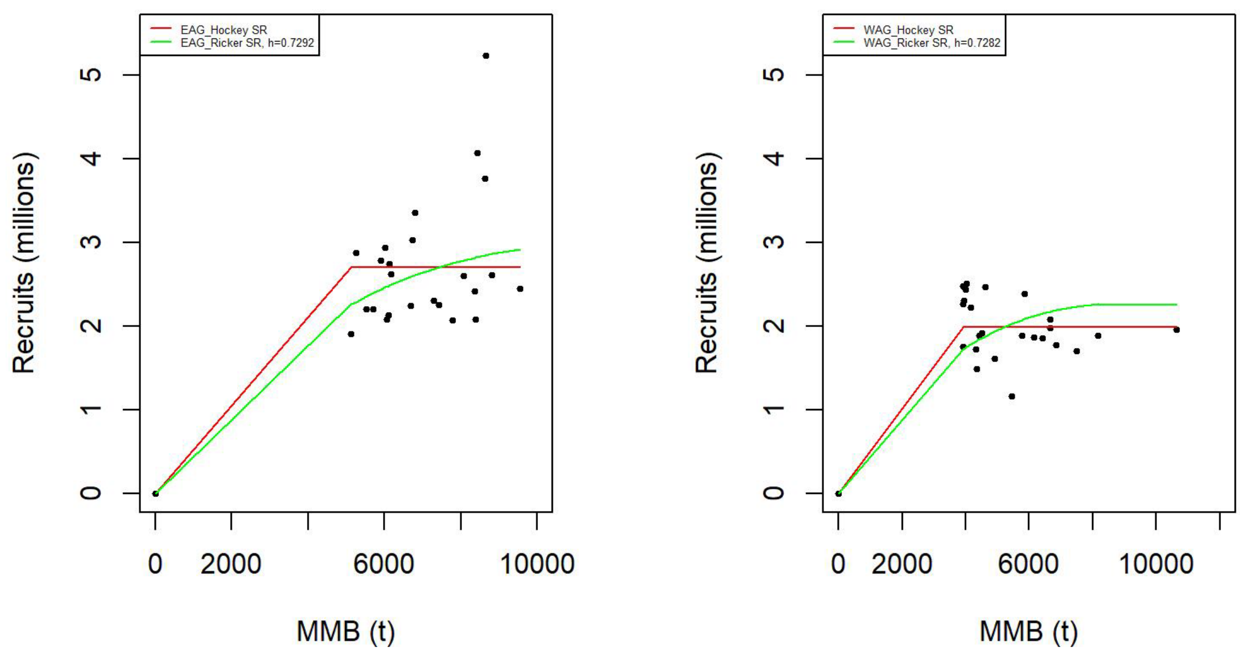

Figure 1A. Hockey Stick (red) and Ricker (green) stock recruitment model fitted to EAG (left panel) and WAG (right panel) MMB and recruit results from the 18_0 assessment model.

The scaled standard error estimates (CVs) for terminal abundance variability, equivalent to initial abundance variability for the projections (model estimation error) are:

WAG: σ_ε = 0.1582

EAG: σ_ε = 0.1817

The scaled standard error estimates (CVs) for the differences between TAC and actual harvest (implementation error) are:

WAG: σ_c = 0.0380

EAG: σ_c = 0.0206

Simulation results

First we investigated the short- and long-term probabilities (as %) of $MMA < MMA_{ave}$, $MMA < 0.25MMA_{ave}$, $MMB < MMB_{35}$, MMB<MSST, MMB<0.5MSST, TOTC>OFL, and TOTC>ABC under the zero harvest rate policy (Policy#0) with various scenarios of recruitment variations under Hockey Stick SR and Ricker SR models separately for EAG and WAG. The results did not show any abnormalities in the outcome from the projection codes (Tables 9 to 16). However, they indicated that when the stock productivity was low with low Ricker SR curve steepness (0.5), the probability of $MMA < MMA_{ave}$ mostly exceeded 30% (for Scenarios 19 to 36) in both regions, EAG and WAG. We then estimated the short- and long-term probabilities of the above management parameters as well as probabilities of $RETC < RETC_{ave}$ and $CPUE < CPUE_{ave}$ for the 13 State harvest policies (Table 1A) with 18 scenarios (Tables 2 and 3 for EAG and WAG, respectively) for Hockey Stick SR model projections and 54 scenarios (Tables 4 and 5 for EAG and WAG, respectively) for Ricker SR model projections. The reference points and the means of selected management parameters for comparing with the projection results are listed in Table 6A.

The short- and long-term probabilities of management parameters exceeding or going below the critical levels for the 13 policies are provided in Tables 17 to 80 for the two SR models for EAG and WAG. Policies 3 (0.15 harvest rate), 4 (0.2 harvest rate), and 11 (0.175 harvest rate) were identified to be appropriate candidates for consideration by the ADF&G and the fishing industry. Hence, we paid special attention to those policies and estimated short- and long-term probabilities for those (Tables 25-40 and 65-72) whereas we only estimated long-term probabilities for rest of the harvest policies.

We set an arbitrary probability (%) level of 50 to discuss the performance of each state harvest policy below:

EAG

Policy #1: Probabilities of $MMA < MMA_{ave}$, $MMA < 0.25MMA_{ave}$, $MMB < MMB_{35}$, MMB<MSST, MMB<0.5MSST, TOTC>OFL, and TOTC>ABC were low to 0 under Hockey Stick SR model projections. However, the harvest rate was not large enough to increase the RETC above $RETC_{ave}$ and CPUE approached $CPUE_{ave}$ for most scenarios (Table 17). The Ricker SR projections provided similar probabilities, but scenarios 19 to 36 with low productivity (steepness 0.5) produced above 50% probabilities of $MMA < MMA_{ave}$, $MMB < MMB_{35}$, $RETC < RETC_{ave}$, and $CPUE < CPUE_{ave}$. (Table 18A).

Policy #2: Probabilities of $MMA < MMA_{ave}$, $MMA < 0.25MMA_{ave}$, $MMB < MMB_{35}$, MMB<MSST, MMB<0.5MSST, TOTC>OFL, and TOTC>ABC were low to 0 under Hockey Stick SR model projections. However, the probabilities of $RETC < RETC_{ave}$ were below 50% except for scenarios 9 and 18 when the R_sigma and R_rho values were the largest. On the other hand, the probabilities of $CPUE < CPUE_{ave}$ were higher than 50% for all scenarios (Table 21A). The Ricker SR projections provided similar probabilities, but scenarios 19 to 36 with low productivity (steepness 0.5) produced above 50% of $MMA < MMA_{ave}$, $MMB < MMB_{35}$, $RETC < RETC_{ave}$, and $CPUE < CPUE_{ave}$. (Table 22A).

Policy #3: We estimated short- and long-term probabilities for this policy. The results were similar. Probabilities of $MMA < MMA_{ave}$, $MMA < 0.25MMA_{ave}$, $MMB < MMB_{35}$, MMB<MSST, MMB<0.5MSST, TOTC>OFL, TOTC>ABC, and $RETC < RETC_{ave}$ were low to 0 under Hockey Stick SR model projections. On the other hand, the probabilities of $CPUE < CPUE_{ave}$ were above 50% for some (in the short-term) or all (in the long-term) scenarios (Tables 25A and 26A). The Ricker SR projections provided similar probabilities, but scenarios 19 to 36 with low productivity (steepness 0.5) produced above 50% of $MMA < MMA_{ave}$, $MMB < MMB_{35}$, $RETC < RETC_{ave}$, and $CPUE < CPUE_{ave}$. Scenario 18 produced above 50% probabilities of $RETC < RETC_{ave}$ because of largest values of R_sigma and R_rho (Tables 27A and 28A).

Policy #4: We estimated short- and long-term probabilities for this policy. Probabilities of $MMA < MMA_{ave}$, $MMA < 0.25MMA_{ave}$, $MMB < MMB_{35}$, MMB<MSST, MMB<0.5MSST, TOTC>OFL, TOTC>ABC, and $RETC < RETC_{ave}$ were low to 0 under Hockey Stick SR model short-term projections (Table 33A). However, for long-term projections, scenarios 3, 9, 12, and 18 with the largest R_sigma value produced above 50%

probabilities of $MMA<MMA_{ave}$ (Table 34A). The probabilities of $CPUE < CPUE_{ave}$ were above 50% for all scenarios for both short- and long-term projections. The Ricker SR projections provided similar probabilities, but scenarios 19 to 36 with low steepness value (0.5) produced above 50% probabilities of $MMA<MMA_{ave}$, $MMB<MMB_{35}$, $RETC<RETC_{ave}$, and $CPUE<CPUE_{ave}$.. Scenario 18 produced above 50% probabilities of $RETC<RETC_{ave}$ because of largest values of R_sigma and R_rho (Tables 35A and 36A).

Policy #5: Probabilities of $MMA < MMA_{ave}$, $MMA<0.25MMA_{ave}$, $MMB<MMB_{35}$, $MMB<MSST$, $MMB<0.5MSST$, $TOTC>OFL$, $TOTC>ABC$, and $RETC<RETC_{ave}$ were low to 0 under Hockey Stick SR model projections (Table 41A). However, scenarios 3, 6, 9, 12, and 15 with the largest R_sigma value produced above 50% probabilities of $MMA<MMA_{ave}$. The probabilities of $CPUE < CPUE_{ave}$ were above 50% for all scenarios. The Ricker SR projections produced similar results, but scenarios 3, 6, 7, 9, 12,15, 16, and 18 to 36 with either largest R_sigma or lowest steepness value (0.5) produced above 50% probabilities of $MMA<MMA_{ave}$, $MMB<MMB_{35}$, and $RETC<RETC_{ave}$. The probabilities of $CPUE<CPUE_{ave}$ were above 50% for all scenarios. Some scenarios (e.g., 24, 30, and 33) produced above 10% probability of $MMB<MSST$. Thus, this policy appears to be too aggressive (Table 42A).

Policy #6: This policy is like Policy#1, but with the maximum exploitation cap of 30% on legal male abundance. Probabilities of $MMA < MMA_{ave}$, $MMA<0.25MMA_{ave}$, $MMB<MMB_{35}$, $MMB<MSST$, $MMB<0.5MSST$, $TOTC>OFL$, and $TOTC>ABC$ were low to 0 under Hockey Stick SR model projections. However, the harvest rate was not high enough to increase the RETC above $RETC_{ave}$. Above 50% probabilities of $CPUE<CPUE_{ave}$ were observed for some scenarios (Table 45). The Ricker SR projections provided similar probabilities, but scenarios 19 to 36 with low productivity (steepness 0.5) produced above 50% probabilities of $MMA<MMA_{ave}$ and $MMB<MMB_{35}$. The probabilities of $RETC<RETC_{ave}$ were above 50% for scenarios 1 to 36, but lower for other scenarios with high productivity (steepness 1). Scenarios 9 and 18 to 36 with either largest R_sigma value or lowest productivity (steepness 0.5) value produced above 50% probability of $CPUE<CPUE_{ave}$. (Table 46A).

Policy #7: This policy has the same maximum harvest rate as Policy#2, but with the maximum exploitation cap of 30% on legal male abundance. Probabilities of $MMA < MMA_{ave}$, $MMA<0.25MMA_{ave}$, $MMB<MMB_{35}$, $MMB<MSST$, $MMB<0.5MSST$, $TOTC>OFL$, and $TOTC>ABC$ were low to 0 under Hockey Stick SR model projections. The probabilities of $RETC<RETC_{ave}$ were above 50% for scenarios 9 and 18 with the largest R_sigma value. Above 50% probabilities of $CPUE<CPUE_{ave}$ were observed for all scenarios (Table 49A). The Ricker SR projections provided similar probabilities, but scenarios 19 to 36 with low productivity (steepness 0.5) produced above 50% probabilities of $MMA<MMA_{ave}$ and $MMB<MMB_{35}$. The probabilities of $RETC<RETC_{ave}$ were above 50% for scenarios 18 to 36. Scenarios 1 to 36 with moderate to low productivity (steepness < 1) and variable R_sigma and R_rho values produced above 50% probability of $CPUE<CPUE_{ave}$. (Table 50A).

Policy #8: This policy is like Policy#3, but with the maximum exploitation cap of 30% on legal male abundance. Probabilities of $MMA < MMA_{ave}$, $MMA<0.25MMA_{ave}$, $MMB<MMB_{35}$, $MMB<MSST$, $MMB<0.5MSST$, $TOTC>OFL$, $TOTC>ABC$, and $RETC<RETC_{ave}$ were low to 0 under Hockey Stick SR model projections. On the other hand, the probabilities of $CPUE < CPUE_{ave}$ were above 50% for all scenarios (Table 53A). The Ricker SR projections provided similar probabilities, but scenarios 19 to 36 with low productivity (steepness 0.5) produced above 50% probabilities of $MMA<MMA_{ave}$, $MMB<MMB_{35}$, and $RETC<RETC_{ave}$. Scenarios 1 to 36, 45, and 54 produced above 50% probabilities of $CPUE<CPUE_{ave}$. either because of moderate to low productivity or largest value of R_sigma. Scenario 18 produced above 50% probabilities of $MMA<MMA_{ave}$ because of largest values of R_sigma and R_rho (Table 54A).

Policy #9: This policy is like Policy#4, but with the maximum exploitation cap of 30% on legal male abundance. Probabilities of $MMA < MMA_{ave}$, $MMA<0.25MMA_{ave}$, $MMB<MMB_{35}$, $MMB<MSST$, $MMB<0.5MSST$, $TOTC>OFL$, $TOTC>ABC$, and $RETC<RETC_{ave}$ were low to 0 under Hockey Stick SR model. However, scenarios 3, 9, 12, and 18 with the largest R_sigma value produced above 50%

probabilities of $MMA<MMA_{ave}$. The probabilities of $CPUE < CPUE_{ave}$ were above 50% for all scenarios (Table 57A). The Ricker SR projections provided similar probabilities, but scenarios 19 to 36 with low productivity produced above 50% probabilities of $MMA<MMA_{ave}$, $MMB<MMB_{35}$, and $RETC<RETC_{ave}$. Scenario 18 produced above 50% probabilities of $MMA<MMA_{ave}$ because of largest values of R_sigma and R_rho (Table 58A).

Policy #10: This policy is like Policy#5, but with the maximum exploitation cap of 30% on legal male abundance. Probabilities of MMA $<MMA_{ave}$, $MMA<0.25MMA_{ave}$, $MMB<MMB_{35}$, MMB<MSST, MMB<0.5MSST, TOTC>OFL, TOTC>ABC, and $RETC<RETC_{ave}$ were low to 0 under Hockey Stick SR model projections. However, scenarios 3, 6, 9, 12, and 18 with the largest R_sigma value produced above 50% probabilities of $MMA<MMA_{ave}$. The probabilities of $CPUE < CPUE_{ave}$ were above 50% for all scenarios (Table 61A). The Ricker SR projections produced similar results, but scenarios 3, 6, 7, 9, 12,15, 16, and 18 to 36 with either high R_sigma value or low steepness value (0.5) produced above 50% probabilities of $MMA<MMA_{ave}$, $MMB<MMB_{35}$, and $RETC<RETC_{ave}$. The probabilities of $CPUE<CPUE_{ave}$ were above 50% for all scenarios. Some scenarios (e.g., 21,24, 27, 33, and 36) produced above 10% probability of MMB<MSST. Thus, this policy appears to be too aggressive (Table 62A).

Policy #11: We estimated short- and long-term probabilities for this policy. Probabilities of MMA $<MMA_{ave}$, $MMA<0.25MMA_{ave}$, $MMB<MMB_{35}$, MMB<MSST, MMB<0.5MSST, TOTC>OFL, TOTC>ABC, and $RETC<RETC_{ave}$ were low to 0 under Hockey Stick SR model short- term projections (Table 65A). However, for long-term projections, scenarios 9 and 18 with the largest R_sigma value produced above 50% probabilities of $MMA<MMA_{ave}$. The probabilities of $CPUE < CPUE_{ave}$ were above 50% for most or all scenarios for both short- and long-term projections (Tables 65A and 66A). The Ricker SR projections provided similar probabilities, but scenarios 19 to 36 with the low steepness value (0.5) produced above 50% probabilities of $MMA<MMA_{ave}$, $MMB<MMB_{35}$, and $RETC<RETC_{ave}$, Scenarios 1 to 36 for short-term projections and all scenarios for long-term projections produced above 50% probabilities of $CPUE<CPUE_{ave}$. Scenarios 9 and 18 produced above 50% probabilities of $MMA<MMA_{ave}$ because of largest values of R_sigma and R_rho (Tables 67A and 68A).

Policy #12: Probabilities of MMA $<MMA_{ave}$, $MMA<0.25MMA_{ave}$, $MMB<MMB_{35}$, MMB<MSST, MMB<0.5MSST, TOTC>OFL, TOTC>ABC, and $RETC<RETC_{ave}$ were low to 0 under Hockey Stick SR model projections. However, scenarios 3, 6, 9, 12, 15, and 18 with the largest R_sigma value produced above 50% probabilities of $MMA<MMA_{ave}$. The probabilities of $CPUE < CPUE_{ave}$ were above 50% for all scenarios (Table 73A). The Ricker SR projections produced similar results, but scenarios 3, 6, 9, 12,15, and 18 to 36 with either the largest R_sigma value or low steepness value (0.5) produced above 50% probabilities of $MMA<MMA_{ave}$. Scenarios 19 to 36 produced above 50% probabilities of $MMB<MMB_{35}$ and $RETC<RETC_{ave}$. The probabilities of $CPUE<CPUE_{ave}$ were above 50% for all scenarios. Some scenarios (e.g., 27 and 36) produced above 10% probability of MMB<MSST. Thus, this policy appears to be aggressive (Table 74A).

Policy #13: Probabilities of MMA $<MMA_{ave}$, $MMA<0.25MMA_{ave}$, $MMB<MMB_{35}$, MMB<MSST, MMB<0.5MSST, TOTC>OFL, TOTC>ABC, and $RETC<RETC_{ave}$ were low to 0 under Hockey Stick SR model projections. However, scenarios 9 and 18 with the largest R_sigma value produced above 50% probabilities of $MMA<MMA_{ave}$. The probabilities of $CPUE < CPUE_{ave}$ were above 50% for all scenarios (Table 77A). The Ricker SR projections produced similar results, but scenarios 9 and 18 to 36 with either the largest R_sigma value or low steepness value (0.5) produced above 50% probabilities of $MMA<MMA_{ave}$. Scenarios 19 to 36 produced above 50% probabilities of $MMB<MMB_{35}$ and $RETC<RETC_{ave}$. The probabilities of $CPUE<CPUE_{ave}$ were above 50% for scenarios 1 to 36, 45, and 54. Some scenarios (e.g., 21, 24, 27, 30, 33, and 36) produced above 10% probabilities of MMB<MSST. Thus, this policy appears to be aggressive (Table 78A).

We provide the trends in mean MMB, LMB, Stock Status, CPUE, state harvest rate equivalent F, and recruit during the long-term projection time period for polies# 0, l, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, and 13 for Scenario

1 (i.e., best estimates of recruitment, abundance, and catch implementation errors) in Figures 2 to 7 and 10 to 15 (alternate with Hockey Stick SR and Ricker SR models) for EAG. The trends in mean MMB, LMB, and Stock Status approach overall mean line and CPUE is lower than the mean line for the state harvest rate of 30%. Overall mean F lines were higher than the projection F lines for EAG.

Figures 8 and 9 for EAG depict the mean annual catch variation for all scenarios for Policy #3 (top) and Policy #4 (bottom) for the Hockey Stick and Ricker SR models, respectively. In general, catch variability was higher for EAG than WAG for both SR models.

WAG

Policy #1: Probabilities of $MMA < MMA_{ave}$, $MMA<0.25MMA_{ave}$, $MMB<MMB_{35}$, $MMB<MSST$, $MMB<0.5MSST$, $TOTC>OFL$, and $TOTC>ABC$ were low to 0 under Hockey Stick SR model projections. However, the harvest rate was not large enough to increase the RETC above $RETC_{ave}$. Below 50% probabilities of $CPUE<CPUE_{ave}$ were observed for all scenarios (Table 19A). The Ricker SR projections provided similar probabilities, but scenarios 19 to 36 with low productivity (steepness 0.5) produced above 50% probabilities of $MMA<MMA_{ave}$, $MMB<MMB_{35}$, and $CPUE<CPUE_{ave}$. Above 50% probabilities of $RETC>RETC_{ave}$ were observed for all scenarios (Table 20A).

Policy #2: Probabilities of $MMA < MMA_{ave}$, $MMA<0.25MMA_{ave}$, $MMB<MMB_{35}$, $MMB<MSST$, $MMB<0.5MSST$, $TOTC>OFL$, and $TOTC>ABC$ were low to 0 and probabilities of $CPUE<CPUE_{ave}$ were below 50% for all scenarios under Hockey Stick SR model projections. However, the probabilities of $RETC<RETC_{ave}$ were above 50% for all scenarios. Scenarios 9 and 18 with the largest R_sigma and R_rho values produced above 50% probabilities of $MMA<MMA_{ave}$. (Table 23A). The Ricker SR projections provided similar probabilities, but scenarios 19 to 36 with low productivity (steepness 0.5) produced above 50% of $MMA<MMA_{ave}$, $MMB<MMB_{35}$, and $CPUE<CPUE_{ave}$. Scenarios 1 to 36, 45, and 54 with either low productivity or highest R_sigma and R_rho values produced above 50% probabilities of $RETC<RETC_{ave}$ (Table 24A).

Policy #3: We estimated short- and long-term probabilities for this policy. The results were similar. Probabilities of $MMA < MMA_{ave}$, $MMA<0.25MMA_{ave}$, $MMB<MMB_{35}$, $MMB<MSST$, $MMB<0.5MSST$, $TOTC>OFL$, and $TOTC>ABC$ were low to 0 under Hockey Stick SR model projections. On the other hand, the probabilities of $RETC<RETC_{ave}$ and $CPUE < CPUE_{ave}$ were closer to or above 50% for all scenarios for both short- and long-term projections. Scenario 18 produced above 50% probabilities of $MMA<MMA_{ave}$ because of largest values of R_sigma and R_rho (Tables 29A and 30A). The Ricker SR projections provided similar probabilities, but scenarios 19 to 36 with low productivity (steepness 0.5) produced above 50% of $MMA<MMA_{ave}$, $MMB<MMB_{35}$, $RETC<RETC_{ave}$, and $CPUE<CPUE_{ave}$. Scenarios 37 to 53 produced below and scenarios 45 and 54 above 50% probabilities of $RETC<RETC_{ave}$ because of the former with high productivity and the latter with the largest values of R_sigma and R_rho. Scenarios 9, 12, and 18 also produced above 50% probabilities of $CPUE<CPUE_{ave}$ for the same reasons mentioned above (Tables 31A and 32A).

Policy #4: We estimated short- and long-term probabilities for this policy. Probabilities of $MMA < MMA_{ave}$, $MMA<0.25MMA_{ave}$, $MMB<MMB_{35}$, $MMB<MSST$, $MMB<0.5MSST$, $TOTC>OFL$, and $TOTC>ABC$ were low to 0, but probabilities of $RETC<RETC_{ave}$ and $CPUE<CPUE_{ave}$ were above 50% under Hockey Stick SR model for both short- and long-term projections. Scenarios 3, 6, 9, 12, 15, and 18 with the largest R_sigma value produced above 50% probabilities of $MMA<MMA_{ave}$. The probabilities of $CPUE < CPUE_{ave}$ were above 50% for all scenarios for both short- and long-term projections (Tables 37A and 38A). The Ricker SR projections provided similar probabilities, but scenarios 19 to 36 with low steepness value (0.5) produced above 50% probabilities of $MMA<MMA_{ave}$, $MMB<MMB_{35}$, $RETC<RETC_{ave}$, and $CPUE<CPUE_{ave}$. Scenarios 1 to 36 (and 54 for RETC) produced above 50% probabilities of $RETC<RETC_{ave}$ and $CPUE<CPUE_{ave}$. Scenarios 27 and 36 with low productivity and largest R_sigma value produced above 10% probability of $MMB<MSST$ under long-term projections (Tables 39A and 40A).

Policy #5: Probabilities of $MMA < MMA_{ave}$, $MMA < 0.25MMA_{ave}$, $MMB < MMB_{35}$, $MMB < MSST$, $MMB < 0.5MSST$, $TOTC > OFL$, and $TOTC > ABC$ were low to 0 under Hockey Stick SR model projections. However, scenarios 3, 9, 12, 15, and 18 with the largest R_sigma value produced above 50% probabilities of $MMA < MMA_{ave}$. The probabilities of $RETC < RETC_{ave}$ and $CPUE < CPUE_{ave}$ were above 50% for all scenarios (Table 43A). The Ricker SR projections produced similar results, but scenarios 3, 6, 9, 12,15, and 18 to 36 with either largest R_sigma or lowest steepness value (0.5) produced above 50% probabilities of $MMA < MMA_{ave}$, $MMB < MMB_{35}$, and $RETC < RETC_{ave}$. The probabilities of $RETC < RETCave$ and $CPUE < CPUE_{ave}$ were above 50% for 1 to 36, and 45 and 54 (for RETC) scenarios. Some scenarios (e.g., 21, 24, 27, 30, and 33) produced above 10% probability of $MMB < MSST$. Thus, this policy appears to be too aggressive (Table 44A).

Policy #6: This policy is like Policy#1, but with the maximum exploitation cap of 30% on legal male abundance. Probabilities of $MMA < MMA_{ave}$, $MMA < 0.25MMA_{ave}$, $MMB < MMB_{35}$, $MMB < MSST$, $MMB < 0.5MSST$, $TOTC > OFL$, and $TOTC > ABC$ were low to 0 under Hockey Stick SR model projections. The harvest rate was not high enough to increase the RETC above $RETC_{ave}$. However, below 50% probabilities of $CPUE < CPUE_{ave}$ were observed for all scenarios (Table 47A). The Ricker SR projections provided similar probabilities, but scenarios 19 to 36 with low productivity (steepness 0.5) produced above 50% probabilities of $MMA < MMA_{ave}$, $MMB < MMB_{35}$, and $CPUE < CPUE_{ave}$. The probabilities of $RETC < RETC_{ave}$ were above 50% for scenarios 1 to 36, but lower for other scenarios with high productivity (Table 48A).

Policy #7: This policy has the same maximum harvest rate as Policy#2, but with the maximum exploitation cap of 30% on legal male abundance. Probabilities of $MMA < MMA_{ave}$, $MMA < 0.25MMA_{ave}$, $MMB < MMB_{35}$, $MMB < MSST$, $MMB < 0.5MSST$, $TOTC > OFL$, and $TOTC > ABC$ were low to 0 under Hockey Stick SR model projections. The probabilities of $RETC < RETC_{ave}$ were above 50% for all scenarios. Below 50% probabilities of $CPUE < CPUE_{ave}$ were observed for all scenarios. Scenarios 9 and 18 produced above 50% probabilities of $MMA < MMA_{ave}$ with the largest R_sigma value (Table 51A). The Ricker SR projections provided similar probabilities, but scenarios 19 to 36 with low productivity (steepness 0.5) produced above 50% probabilities of $MMA < MMA_{ave}$, $MMB < MMB_{35}$, and $CPUE < CPUE_{ave}$. Scenarios 1 to 36, 45, and 54 produced above 50% probabilities of $RETC < RETC_{ave}$ either because of moderate to low productivity (steepness < 1) or large values of R_sigma and R_rho (Table 52A).

Policy #8: This policy is like Policy#3, but with the maximum exploitation cap of 30% on legal male abundance. Probabilities of $MMA < MMA_{ave}$, $MMA < 0.25MMA_{ave}$, $MMB < MMB_{35}$, $MMB < MSST$, $MMB < 0.5MSST$, $TOTC > OFL$, and $TOTC > ABC$ were low to 0 under Hockey Stick SR model projections. On the other hand, the probabilities of $RETC < RETC_{ave}$ and $CPUE < CPUE_{ave}$ were above 50% for all scenarios. Scenarios 9, 12, and 18 produced above 50% probabilities of $MMA < MMA_{ave}$ with the largest R_sigma value (Table 55A). The Ricker SR projections provided similar probabilities, but scenarios 18 to 36 with either low productivity (steepness 0.5) or largest R_sigma value produced above 50% probabilities of $MMA < MMA_{ave}$, and $MMB < MMB_{35.}$ Scenarios 1 to 36, and 54 produced above 50% probabilities of $RETC < RETC_{ave}$. either because of moderate to low productivity or largest value of R_sigma. Scenario 3, 6, 9, 12, 15, and 18 to 36 produced above 50% probabilities of $CPUE < CPUE_{ave}$ (Table 56A).

Policy #9: This policy is like Policy#4, but with the maximum exploitation cap of 30% on legal male abundance. Probabilities of $MMA < MMA_{ave}$, $MMA < 0.25MMA_{ave}$, $MMB < MMB_{35}$, $MMB < MSST$, $MMB < 0.5MSST$, $TOTC > OFL$, and $TOTC > ABC$ were low to 0 under Hockey Stick SR model. However, scenarios 3, 6, 9, 12, 15, and 18 with the largest R_sigma value produced above 50% probabilities of $MMA < MMA_{ave}$. The probabilities of $RETC < RETC_{ave}$ and $CPUE < CPUE_{ave}$ were above 50% for all scenarios (Table 59A). The Ricker SR projections provided similar probabilities, but scenarios 19 to 36 with low productivity produced above 50% probabilities of $MMA < MMA_{ave}$ and $MMB < MMB_{35}$. Scenarios 3, 6, 9, 12, and 18 produced above 50% probabilities of $MMA < MMA_{ave}$ because of largest values of R_sigma and R_rho. Scenarios 1 to 36, and 54 (for RETC) produced above 50% probabilities of $RETC < RETC_{ave}$ and $CPUE < CPUE_{ave}$ (Table 60A).

Policy #10: This policy is like Policy#5, but with the maximum exploitation cap of 30% on legal male abundance. Probabilities of MMA <MMA$_{ave}$, MMA<0.25MMA$_{ave}$, MMB<MMB$_{35}$, MMB<MSST, MMB<0.5MSST, TOTC>OFL, and TOTC>ABC were low to 0 under Hockey Stick SR model projections. However, scenarios 3, 6, 9, 12, and 18 with the largest R_sigma value produced above 50% probabilities of MMA<MMA$_{ave}$. The probabilities of RETC<RETC$_{ave}$ and CPUE < CPUE$_{ave}$ were above 50% for all scenarios (Table 63A). The Ricker SR projections produced similar results, but scenarios 3, 6, 7, 9, 12,15, and 18 to 36 with either high R_sigma value or low steepness value (0.5) produced above 50% probabilities of MMA<MMA$_{ave}$. scenarios 19 to 36 produced above 50% probabilities of MMB<MMB$_{35}$ and scenarios 1 to 36 and 54 produced above 50% probabilities of RETC<RETC$_{ave}$. and CPUE<CPUE$_{ave}$. Some scenarios (e.g., 21, 27, 30, 33, and 36) produced above 10% probability of MMB<MSST. Thus, this policy appears to be too aggressive (Table 64A).

Policy #11: We estimated short- and long-term probabilities for this policy. Probabilities of MMA <MMA$_{ave}$, MMA<0.25MMA$_{ave}$, MMB<MMB$_{35}$, MMB<MSST, MMB<0.5MSST, TOTC>OFL, and TOTC>ABC were low to 0, but probabilities of RETC<RETC$_{ave}$ and CPUE<CPUE$_{ave}$ were above 50% for all scenarios for the short- and long-term projections under Hockey Stick SR model. Scenarios 3, 6, 9, 12 (only for long-term), and 18 with the largest R_sigma value produced above 50% probabilities of MMA<MMA$_{ave}$ (Tables 69A and 70A). The Ricker SR projections provided similar probabilities, but scenarios 19 to 36 with the low steepness value (0.5) produced above 50% probabilities of MMA<MMA$_{ave}$, and MMB<MMB$_{35}$. Scenarios 1 to 36, 45 and 54 (only for RETC) produced above 50% probabilities of RETC<RETC$_{ave}$ and CPUE<CPUE$_{ave}$. Scenarios 3, 6 (only for short-term), 9, 12, and 18 with the largest R_sigma value produced above 50% probabilities of MMA<MMA$_{ave}$ (Tables 71A and 72A).

Policy #12: Probabilities of MMA <MMA$_{ave}$, MMA<0.25MMA$_{ave}$, MMB<MMB$_{35}$, MMB<MSST, MMB<0.5MSST, TOTC>OFL, and TOTC>ABC were low to 0, but probabilities of RETC<RETC$_{ave}$ and CPUE<CPUE$_{ave}$ were above 50% for all scenarios under Hockey Stick SR model projections. However, scenarios 3, 6, 9, 12, 15, and 18 with the largest R_sigma value produced above 50% probabilities of MMA<MMA$_{ave}$ (Table 75A). The Ricker SR projections produced similar results, but scenarios 3, 6, 9, 12,15. and 18 to 36 with either the largest R_sigma value or low steepness value (0.5) produced above 50% probabilities of MMA<MMA$_{ave}$. Scenarios 19 to 36 produced above 50% probabilities of MMB<MMB$_{35}$. Scenarios 1 to 36, 45, and 54 (only for RETC) produced above 50% probabilities of RETC<RETC$_{ave}$ and CPUE<CPUE$_{ave}$. Scenarios 27 and 36 produced above 10% probability of MMB<MSST. Thus, this policy appears to be aggressive (Table 76A).

Policy #13: Probabilities of MMA <MMA$_{ave}$, MMA<0.25MMA$_{ave}$, MMB<MMB$_{35}$, MMB<MSST, MMB<0.5MSST, TOTC>OFL, and TOTC>ABC were low to 0, but probabilities of RETC<RETCave and CPUE<CPUEave were above 50% for all scenarios under Hockey Stick SR model projections. However, scenarios 3, 6, 9, 12, 15, and 18 with the largest R_sigma value produced above 50% probabilities of MMA<MMA$_{ave}$ (Table 79A). The Ricker SR projections produced similar results, but scenarios 3, 6, 9, 12, 15, and 18 to 36 with either the largest R_sigma value or low steepness value (0.5) produced above 50% probabilities of MMA<MMA$_{ave}$. Scenarios 19 to 36 produced above 50% probabilities of MMB<MMB$_{35}$. The probabilities of RECT<RECT$_{ave}$ and CPUE<CPUE$_{ave}$ were above 50% for scenarios 1 to 36, 45 and 54 (only for RETC). Some scenarios (e.g., 21, 24, 27, 30, and 36) produced above 10% probabilities of MMB<MSST. Thus, this policy appears to be aggressive (Table 80A).

We provide the trends in mean MMB, LMB, Stock Status, CPUE, state harvest rate equivalent F, and recruit during the long-term projection time period for polies# 0, l, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, and 13 for Scenario 1 (i.e., best estimates of recruitment, abundance, and catch implementation errors) in Figures 16A to 21A and 24A to 29A for WAG. The trends in mean MMB, LMB, and Stock Status approach overall mean line and CPUE is lower than the mean line for the state harvest rate of 30%. Overall mean F lines were higher than the projection F lines for WAG

Figures 22 and 23 for WAG depict the mean annual catch variation for all scenarios for Policy #3 (top) and Policy #4 (bottom) for the Hockey Stick and Ricker SR models, respectively. In general, catch variability was lower for WAG than EAG for both SR models.

SUMMARY AND CONCLUSION

Because of uncertainty in any stock-recruitment model, we simulated different state harvest policy projections under two different stock recruitment models (Hockey Stick and Ricker) and varied the steepness (for Ricker model) and recruitment variability parameters to address this uncertainty. Both recruitment patterns however provided similar projection outcomes on various metrics.

We also considered initial abundance variability and catch implementation error in the projection simulations.

We can make the following conclusions from the simulation results:

1. The state harvest rate of 30% is too high to sustain stock productivity.
2. The simulation results support any harvest rates 20% or below. A 15% harvest rate for EAG and 15% to 20% harvest rate for WAG with the minimum MMA threshold of 25% average MMA and a maximum legal male harvest cap of 25% legal male abundance would be an option.
3. The white paper provides a detailed evaluation of conservation and economic metrics used for harvest policy recommendations.
4. A cautionary note: The current projection simulations considered a fixed set of parameter estimates from the 18_0 assessment model. We did not consider parameter variability in the (light) management strategy evaluation for simplicity.

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Table 9A. Probability (as %) that MMB < MMB_{35}, < 0.5 MMB_{35} (MSST), < 0.5MSST, MMA< MMA_{ave}, MMA< $0.25MMA_{ave}$, TOTC>OFL, and TOTC>ABC during the short-term (1 - 8yr) projection period for the state harvest control rule policy#0 (with the zero harvest rate) and scenarios 1 to 18 under Hockey Stick SR model generated recruitment for EAG. Individual estimate from 500 Monte Carlo trials and 1-8yr projection years was considered for probability estimation. Sc.: scenario.

MMA<MMA_{ave}	MMB<MMB_{35}	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	MMA<$0.25MMA_{ave}$	Sc.
0.05	0	0	0	0	0	0	1
0	0	0	0	0	0	0	2
0.775	0	0	0	0	0	0	3
0.025	0	0	0	0	0	0	4
0	0	0	0	0	0	0	5
0.6	0	0	0	0	0	0	6
0.3	0	0	0	0	0	0	7
0	0	0	0	0	0	0	8
2.625	0	0	0	0	0	0	9
0.05	0	0	0	0	0	0	10
0	0	0	0	0	0	0	11
0.725	0	0	0	0	0	0	12
0.025	0	0	0	0	0	0	13
0	0	0	0	0	0	0	14
0.625	0	0	0	0	0	0	15
0.325	0	0	0	0	0	0	16
0	0	0	0	0	0	0	17
2.575	0	0	0	0	0	0	18

Table 10A. Probability (as %) that MMB < MMB_{35}, < 0.5 MMB_{35} (MSST), < 0.5MSST, MMA< MMA_{ave}, MMA< $0.25MMA_{ave}$, TOTC>OFL, and TOTC>ABC during the short-term (1 - 8yr) projection period for the state harvest control rule policy#0 (with the zero harvest rate) and scenarios 1 to 54 under Ricker SR model generated recruitment for EAG. Individual estimate from 500 Monte Carlo trials and 1-8yr projection years was considered for probability estimation. Sc.: scenario.

$MMA<MMA_{ave}$	$MMB<MMB_{35}$	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	$MMA<0.25MMA_{ave}$	Sc.
0.05	0	0	0	0	0	0	1
0	0	0	0	0	0	0	2
0.975	0	0	0	0	0	0	3
0.025	0	0	0	0	0	0	4
0	0	0	0	0	0	0	5
0.675	0	0	0	0	0	0	6
0.45	0	0	0	0	0	0	7
0	0	0	0	0	0	0	8
2.9	0	0	0	0	0	0	9
0.075	0	0	0	0	0	0	10
0	0	0	0	0	0	0	11
0.975	0	0	0	0	0	0	12
0.05	0	0	0	0	0	0	13
0	0	0	0	0	0	0	14
0.675	0	0	0	0	0	0	15
0.475	0	0	0	0	0	0	16
0	0	0	0	0	0	0	17
2.8	0	0	0	0	0	0	18
33.725	0	0	0	0	0	0	19
35.8	0	0	0	0	0	0	20
34.875	0	0	0	0	0	0	21
33.7	0	0	0	0	0	0	22
35.875	0	0	0	0	0	0	23
34.775	0	0	0	0	0	0	24
34.25	0	0	0	0	0	0	25

Table 10A. Page 2 of 2.

$MMA < MMA_{ave}$	$MMB < MMB_{35}$	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	$MMA < 0.25MMA_{ave}$	Sc.
35.275	0	0	0	0	0	0	26
35.775	0	0	0	0	0	0	27
33.75	0	0	0	0	0	0	28
35.85	0	0	0	0	0	0	29
35.025	0	0	0	0	0	0	30
33.65	0	0	0	0	0	0	31
35.875	0	0	0	0	0	0	32
34.8	0	0	0	0	0	0	33
34.3	0	0	0	0	0	0	34
35.375	0	0	0	0	0	0	35
35.725	0	0	0	0	0	0	36
0	0	0	0	0	0	0	37
0	0	0	0	0	0	0	38
0.175	0	0	0	0	0	0	39
0	0	0	0	0	0	0	40
0	0	0	0	0	0	0	41
0.1	0	0	0	0	0	0	42
0.025	0	0	0	0	0	0	43
0	0	0	0	0	0	0	44
0.8	0	0	0	0	0	0	45
0	0	0	0	0	0	0	46
0	0	0	0	0	0	0	47
0.175	0	0	0	0	0	0	48
0	0	0	0	0	0	0	49
0	0	0	0	0	0	0	50
0.075	0	0	0	0	0	0	51
0.025	0	0	0	0	0	0	52
0	0	0	0	0	0	0	53
0.8	0	0	0	0	0	0	54

Table 11A. Probability (as %) that MMB < MMB_{35}, < 0.5 MMB_{35} (MSST), < 0.5MSST, MMA< MMA_{ave}, MMA< 0.25MMA_{ave}, TOTC>OFL, and TOTC>ABC during the long-term (1 - 30yr) projection period for the state harvest control rule policy#0 (with the zero harvest rate) and scenarios 1 to 18 under Hockey Stick SR model generated recruitment for EAG. Individual estimate from 500 Monte Carlo trials and 1-30yr projection years was considered for probability estimation. Sc.: scenario.

$MMA<MMA_{ave}$	$MMB<MMB_{35}$	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	$MMA<0.25MMA_{ave}$	Sc.
0.5333	0	0	0	0	0	0	1
0	0	0	0	0	0	0	2
3.8	0.0133	0	0	0	0	0	3
0.42	0	0	0	0	0	0	4
0	0	0	0	0	0	0	5
3.0333	0	0	0	0	0	0	6
1.96	0	0	0	0	0	0	7
0	0	0	0	0	0	0	8
9.28	0.2467	0	0	0	0	0	9
0.5267	0	0	0	0	0	0	10
0	0	0	0	0	0	0	11
3.8267	0.0133	0	0	0	0	0	12
0.4267	0	0	0	0	0	0	13
0	0	0	0	0	0	0	14
3.04	0	0	0	0	0	0	15
1.9933	0	0	0	0	0	0	16
0	0	0	0	0	0	0	17
9.3067	0.2533	0	0	0	0	0	18

Table 12A. Probability (as %) that MMB < MMB_{35}, < 0.5 MMB_{35} (MSST), < 0.5MSST, MMA< MMA_{ave}, MMA< $0.25MMA_{ave}$, TOTC>OFL, and TOTC>ABC during the long-term (1 - 30yr) projection period for the state harvest control rule policy#0 (with the zero harvest rate) and scenarios 1 to 54 under Ricker SR model generated recruitment for EAG. Individual estimate from 500 Monte Carlo trials and 1-30yr projection years was considered for probability estimation. Sc.: scenario

$MMA<MMA_{ave}$	$MMB<MMB_{35}$	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	$MMA<0.25MMA_{ave}$	Sc.
0.7667	0	0	0	0	0	0	1
0	0	0	0	0	0	0	2
4.5467	0.0133	0	0	0	0	0	3
0.5267	0	0	0	0	0	0	4
0	0	0	0	0	0	0	5
3.6867	0	0	0	0	0	0	6
2.5467	0	0	0	0	0	0	7
0	0	0	0	0	0	0	8
10.44	0.2467	0	0	0	0	0	9
0.76	0	0	0	0	0	0	10
0	0	0	0	0	0	0	11
4.5267	0.0067	0	0	0	0	0	12
0.5333	0	0	0	0	0	0	13
0	0	0	0	0	0	0	14
3.6533	0	0	0	0	0	0	15
2.5133	0	0	0	0	0	0	16
0	0	0	0	0	0	0	17
10.36	0.24	0	0	0	0	0	18
75.3467	10.7533	0	0	0	0	0	19
82.8467	0.0667	0	0	0	0	0	20
71.46	18.6	0	0	0	0	0	21
76.0067	9.7067	0	0	0	0	0	22
82.8733	0.0467	0	0	0	0	0	23
72.02	17.64	0	0	0	0	0	24
72.8267	15.6533	0	0	0	0	0	25

Table 12A. Page 2 of 2.

$MMA<MMA_{ave}$	$MMB<MMB_{35}$	$MMB<MSST$	$MMB<0.5MSST$	TOTC>OFL	TOTC>ABC	$MMA<0.25MMA_{ave}$	Sc.
82.58	0.2267	0	0	0	0	0	26
69.3733	23.4	0.0533	0	0	0	0	27
75.38	11.0067	0	0	0	0	0	28
82.86	0.0533	0	0	0	0	0	29
71.4733	18.8133	0	0	0	0	0	30
75.9933	9.8867	0	0	0	0	0	31
82.8733	0.0333	0	0	0	0	0	32
72.0533	17.5733	0	0	0	0	0	33
72.7867	15.8667	0	0	0	0	0	34
82.6133	0.2467	0	0	0	0	0	35
69.28	23.5	0.0533	0	0	0	0	36
0.0133	0	0	0	0	0	0	37
0	0	0	0	0	0	0	38
0.5867	0	0	0	0	0	0	39
0	0	0	0	0	0	0	40
0	0	0	0	0	0	0	41
0.4533	0	0	0	0	0	0	42
0.2333	0	0	0	0	0	0	43
0	0	0	0	0	0	0	44
2.5067	0.0133	0	0	0	0	0	45
0.0133	0	0	0	0	0	0	46
0	0	0	0	0	0	0	47
0.5933	0	0	0	0	0	0	48
0	0	0	0	0	0	0	49
0	0	0	0	0	0	0	50
0.4467	0	0	0	0	0	0	51
0.2333	0	0	0	0	0	0	52
0	0	0	0	0	0	0	53
2.52	0.0133	0	0	0	0	0	54

Table 13A. Probability (as %) that MMB < MMB_{35}, < 0.5 MMB_{35} (MSST), < 0.5MSST, MMA< MMA_{ave}, MMA< $0.25MMA_{ave}$, TOTC>OFL, and TOTC>ABC during the short-term (1 - 8yr) projection period for the state harvest control rule policy#0 (with the zero harvest rate) and scenarios 1 to 18 under Hockey Stick SR model generated recruitment for WAG. Individual estimate from 500 Monte Carlo trials and 1-8yr projection years was considered for probability estimation. Sc.: scenario.

MMA<MMA_{ave}	MMB<MMB_{35}	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	MMA<$0.25MMA_{ave}$	Sc.
0	0	0	0	0	0	0	1
0	0	0	0	0	0	0	2
6.075	0	0	0	0	0	0	3
0	0	0	0	0	0	0	4
0	0	0	0	0	0	0	5
5.325	0	0	0	0	0	0	6
0	0	0	0	0	0	0	7
0	0	0	0	0	0	0	8
11.6	0.025	0	0	0	0	0	9
0	0	0	0	0	0	0	10
0	0	0	0	0	0	0	11
6.025	0	0	0	0	0	0	12
0	0	0	0	0	0	0	13
0	0	0	0	0	0	0	14
5.25	0	0	0	0	0	0	15
0	0	0	0	0	0	0	16
0	0	0	0	0	0	0	17
11.85	0	0	0	0	0	0	18

Table 14A. Probability (as %) that MMB < MMB_{35}, < 0.5 MMB_{35} (MSST), < 0.5MSST, MMA< MMA_{ave}, MMA< $0.25MMA_{ave}$, TOTC>OFL, and TOTC>ABC during the short-term (1 - 8yr) projection period for the state harvest control rule policy#0 (with the zero harvest rate) and scenarios 1 to 54 under Ricker SR model generated recruitment for WAG. Individual estimate from 500 Monte Carlo trials and 1-8yr projection years was considered for probability estimation. Sc.: scenario.

MMA<MMA_{ave}	MMB<MMB_{35}	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	MMA<$0.25MMA_{ave}$	Sc.
0	0	0	0	0	0	0	1
0	0	0	0	0	0	0	2
5.925	0	0	0	0	0	0	3
0	0	0	0	0	0	0	4
0	0	0	0	0	0	0	5
5.075	0	0	0	0	0	0	6
0	0	0	0	0	0	0	7
0	0	0	0	0	0	0	8
11.45	0.025	0	0	0	0	0	9
0	0	0	0	0	0	0	10
0	0	0	0	0	0	0	11
5.775	0	0	0	0	0	0	12
0	0	0	0	0	0	0	13
0	0	0	0	0	0	0	14
5.075	0	0	0	0	0	0	15
0	0	0	0	0	0	0	16
0	0	0	0	0	0	0	17
11.625	0	0	0	0	0	0	18
62.25	0.575	0	0	0	0	0	19
62.325	0.2	0	0	0	0	0	20
60.45	6.775	0	0	0	0	0	21
62.175	0.55	0	0	0	0	0	22
62.375	0.175	0	0	0	0	0	23
60.55	6.45	0	0	0	0	0	24
62.05	1.225	0	0	0	0	0	25

Table 14A. Page 2 of 2.

$MMA < MMA_{ave}$	$MMB < MMB_{35}$	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	$MMA < 0.25MMA_{ave}$	Sc.
62.25	0.45	0	0	0	0	0	26
60.8	8.875	0	0	0	0	0	27
61.975	0.375	0	0	0	0	0	28
62.325	0.05	0	0	0	0	0	29
60.675	6.55	0	0	0	0	0	30
62.15	0.35	0	0	0	0	0	31
62.325	0.025	0	0	0	0	0	32
60.775	6.175	0	0	0	0	0	33
61.8	0.725	0	0	0	0	0	34
62.25	0.275	0	0	0	0	0	35
61	8.8	0	0	0	0	0	36
0	0	0	0	0	0	0	37
0	0	0	0	0	0	0	38
1.725	0	0	0	0	0	0	39
0	0	0	0	0	0	0	40
0	0	0	0	0	0	0	41
1.35	0	0	0	0	0	0	42
0	0	0	0	0	0	0	43
0	0	0	0	0	0	0	44
5.375	0	0	0	0	0	0	45
0	0	0	0	0	0	0	46
0	0	0	0	0	0	0	47
1.775	0	0	0	0	0	0	48
0	0	0	0	0	0	0	49
0	0	0	0	0	0	0	50
1.45	0	0	0	0	0	0	51
0	0	0	0	0	0	0	52
0	0	0	0	0	0	0	53
5.425	0	0	0	0	0	0	54

Table 15A. Probability (as %) that MMB < MMB_{35}, < 0.5 MMB_{35} (MSST), < 0.5MSST, MMA< MMA_{ave}, MMA< 0.25MMA_{ave}, TOTC>OFL, and TOTC>ABC, during the long-term (1 - 30yr) projection period for the state harvest control rule policy#0 (with the zero harvest rate) and scenarios 1 to 18 under Hockey Stick SR model generated recruitment for WAG. Individual estimate from 500 Monte Carlo trials and 1-30yr projection years was considered for probability estimation. Sc.: scenario.

MMA<MMA_{ave}	MMB<MMB_{35}	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	MMA<0.25MMA_{ave}	Sc.
0	0	0	0	0	0	0	1
0	0	0	0	0	0	0	2
5.7333	0.1	0	0	0	0	0	3
0	0	0	0	0	0	0	4
0	0	0	0	0	0	0	5
4.9467	0.0467	0	0	0	0	0	6
0	0	0	0	0	0	0	7
0	0	0	0	0	0	0	8
12.9133	0.5533	0	0	0	0	0	9
0	0	0	0	0	0	0	10
0	0	0	0	0	0	0	11
5.74	0.08	0	0	0	0	0	12
0	0	0	0	0	0	0	13
0	0	0	0	0	0	0	14
4.94	0.0333	0	0	0	0	0	15
0	0	0	0	0	0	0	16
0	0	0	0	0	0	0	17
13.0467	0.56	0	0	0	0	0	18

Table 16A. Probability (as %) that MMB < MMB_{35}, < 0.5 MMB_{35} (MSST), < 0.5MSST, MMA< MMA_{ave}, MMA< 0.25MMA_{ave}, TOTC>OFL, and TOTC>ABC during the long-term (1 - 30yr) projection period for the state harvest control rule policy#0 (with the zero harvest rate) and scenarios 1 to 54 under Ricker SR model generated recruitment for WAG. Individual estimate from 500 Monte Carlo trials and 1-30yr projection years was considered for probability estimation. Sc.: scenario.

$MMA<MMA_{ave}$	$MMB<MMB_{35}$	MMB < MSST	MMB < 0.5MSST	TOTC>OFL	TOTC>ABC	$MMA<0.25MMA_{ave}$	Sc.
0	0	0	0	0	0	0	1
0	0	0	0	0	0	0	2
5.48	0.0467	0	0	0	0	0	3
0	0	0	0	0	0	0	4
0	0	0	0	0	0	0	5
4.66	0.02	0	0	0	0	0	6
0	0	0	0	0	0	0	7
0	0	0	0	0	0	0	8
12.4	0.4533	0	0	0	0	0	9
0	0	0	0	0	0	0	10
0	0	0	0	0	0	0	11
5.48	0.04	0	0	0	0	0	12
0	0	0	0	0	0	0	13
0	0	0	0	0	0	0	14
4.6733	0.0133	0	0	0	0	0	15
0	0	0	0	0	0	0	16
0	0	0	0	0	0	0	17
12.44	0.4333	0	0	0	0	0	18
89.0467	5.2467	0	0	0	0	0	19
89.7533	3.9467	0	0	0	0	0	20
76.1867	24.82	0.0067	0	0	0	0	21
89.2	5.1067	0	0	0	0	0	22
89.7867	3.8733	0	0	0	0	0	23
76.6533	23.9067	0.0067	0	0	0	0	24
88.0467	6.84	0	0	0	0	0	25

Table 16A. Page 2 of 2.

MMA<MMA$_{ave}$	MMB<MMB$_{35}$	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	MMA<0.25MMA$_{ave}$	Sc.
89.4467	4.7133	0	0	0	0	0	26
73.92	30.06	0.12	0	0	0	0.0267	27
89.0133	5.1667	0	0	0	0	0	28
89.78	3.7467	0	0	0	0	0	29
76.1267	24.9467	0	0	0	0	0	30
89.1733	4.9067	0	0	0	0	0	31
89.84	3.6667	0	0	0	0	0	32
76.6933	24.04	0	0	0	0	0	33
88.0133	6.5933	0	0	0	0	0	34
89.46	4.5467	0	0	0	0	0	35
73.8933	30.0467	0.1067	0	0	0	0.02	36
0	0	0	0	0	0	0	37
0	0	0	0	0	0	0	38
1.0067	0	0	0	0	0	0	39
0	0	0	0	0	0	0	40
0	0	0	0	0	0	0	41
0.7467	0	0	0	0	0	0	42
0	0	0	0	0	0	0	43
0	0	0	0	0	0	0	44
3.6733	0.06	0	0	0	0	0	45
0	0	0	0	0	0	0	46
0	0	0	0	0	0	0	47
1.0067	0	0	0	0	0	0	48
0	0	0	0	0	0	0	49
0	0	0	0	0	0	0	50
0.76	0	0	0	0	0	0	51
0	0	0	0	0	0	0	52
0	0	0	0	0	0	0	53
3.7333	0.0667	0	0	0	0	0	54

Table 17A. Probability (as %) that MMB < MMB_{35}, < 0.5 MMB_{35} (MSST), < 0.5MSST, MMA< MMA_{ave}, MMA< 0.25MMA_{ave}, TOTC>OFL, TOTC>ABC, RETC< $RETC_{ave}$, and CPUE<$CPUE_{ave}$ during the long-term (1 - 30yr) projection period for the state harvest control rule policy#1 (with the 0.1 harvest rate) and scenarios 1 to 18 under Hockey Stick SR model generated recruitment for EAG. Individual estimate from 500 Monte Carlo trials and 1-30yr projection years was considered for probability estimation. Sc.: scenario.

MMA<MMA_{ave}	MMB<MMB_{35}	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	MMA<0.25MMA_{ave}	RETC<RETCave	CPUE<$CPUE_{ave}$	Sc.
22.7733	1.7267	0	0	0	0	0	52.1867	45.0867	1
0.6467	0	0	0	0	0	0	45.1867	38.8867	2
32.78	6.9067	0	0	0	0	0	55.7533	47.8533	3
21.3333	1.3267	0	0	0	0	0	51.78	44.8067	4
0.5067	0	0	0	0	0	0	45.02	38.7867	5
31.2667	5.6867	0	0	0	0	0	55.0933	47.5133	6
28.58	4.1333	0	0	0	0	0	54.1533	46.8867	7
1.8467	0	0	0	0	0	0	46.0333	39.68	8
39.3733	13.1267	0.0133	0	0	0	0	59.2	50.2333	9
22.7333	1.6733	0	0	0	0	0	52.2133	45.0867	10
0.64	0	0	0	0	0	0	45.4267	38.94	11
32.88	6.9533	0	0	0	0	0	55.8133	47.9133	12
21.42	1.32	0	0	0	0	0	51.88	44.8	13
0.5133	0	0	0	0	0	0	45.24	38.8733	14
31.2533	5.7133	0	0	0	0	0	55.1267	47.4733	15
28.6667	4.2133	0	0	0	0	0	54.18	46.8	16
1.8667	0	0	0	0	0	0	46.1067	39.7	17
39.3	13.1067	0.0133	0	0	0	0	59.22	50.2933	18

Table 18A. Probability (as %) that $MMB < MMB_{35}$, $< 0.5 MMB_{35}$ (MSST), < 0.5MSST, $MMA < MMA_{ave}$, $MMA < 0.25MMA_{ave}$, TOTC>OFL, TOTC>ABC, $RETC < RETC_{ave}$, and $CPUE < CPUE_{ave}$ during the long-term (1 - 30yr) projection period for the state harvest control rule policy#1 (with the 0.1 harvest rate) and scenarios 1 to 54 under Ricker SR model generated recruitment for EAG. Individual estimate from 500 Monte Carlo trials and 1-30yr projection years was considered for probability estimation. Sc.: scenario.

$MMA<MMA_{ave}$	$MMB<MMB_{35}$	$MMB<MSST$	$MMB<0.5MSST$	TOTC>OFL	TOTC>ABC	$MMA<0.25MMA_{ave}$	$RETC<RETC_{ave}$	$CPUE<CPUE_{ave}$	Sc.
25.08	1.8867	0	0	0	0	0	55.4133	47.9733	1
1.5533	0	0	0	0	0	0	56.9	49.0667	2
34.5133	7.0467	0	0	0	0	0	57.6067	49.5933	3
23.8333	1.4733	0	0	0	0	0	55.1133	47.8733	4
1.2267	0	0	0	0	0	0	57.24	49.3067	5
33.0067	5.9467	0	0	0	0	0	57.0933	49.3733	6
30.7067	4.36	0	0	0	0	0	56.5133	48.9733	7
3.4467	0	0	0	0	0	0	55.9733	48.3467	8
40.14	13.3133	0.0133	0	0	0	0	60.6	51.0533	9
25.12	1.92	0	0	0	0	0	55.42	48.0333	10
1.5467	0	0	0	0	0	0	57.0267	49.3333	11
34.5533	7.1733	0	0	0	0	0	57.6467	49.6933	12
23.8867	1.4733	0	0	0	0	0	55.1267	48.06	13
1.2733	0	0	0	0	0	0	57.2733	49.5667	14
32.9533	5.9667	0	0	0	0	0	57.1467	49.34	15
30.6667	4.42667	0	0	0	0	0	56.5267	48.92	16
3.4933	0	0	0	0	0	0	55.96	48.4467	17
40.14	13.3333	0.0067	0	0	0	0	60.54	51.12	18
86.1467	66.4133	0.0133	0	0	0	0	93.1133	82.9667	19
90	78.74	0	0	0	0	0	93.3333	83.3533	20
82.4133	63.0867	0.3333	0	0.0067	0.0067	0.0133	92.2333	81.2067	21
86.6867	66.9133	0.0133	0	0	0	0	93.18	83.14667	22
90	78.9067	0	0	0	0	0	93.3333	83.3533	23
83.02	63.5133	0.2333	0	0	0	0.0067	92.42	81.5933	24
83.9667	64.3533	0.12	0	0	0	0	92.66	82.06	25

Table 18A. Page 2 of 2.

MMA<MMA$_{ave}$	MMB<MMB$_{35}$	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	MMA<0.25MMA$_{ave}$	RETC<RETC$_{ave}$	CPUE<CPUE$_{ave}$	Sc.
90	77.58	0	0	0	0	0	93.3333	83.3933	26
80.0333	61.74	1.5933	0	0.0667	0.0667	0.16	90.9733	79.4	27
86.1533	66.5067	0.0133	0	0	0	0	93.1133	82.88	28
90	78.8	0	0	0	0	0	93.3333	83.3333	29
82.4667	63.1733	0.3667	0	0.0067	0.0067	0.0133	92.2067	81.1533	30
86.6933	67.0267	0.0133	0	0	0	0	93.18	83.0333	31
90	79.0133	0	0	0	0	0	93.3333	83.3333	32
83.0133	63.62	0.2	0	0	0	0.0067	92.4067	81.5	33
83.92	64.4533	0.1	0	0	0	0	92.6667	82.0133	34
90	77.5533	0	0	0	0	0	93.3333	83.3333	35
80.0133	61.82	1.5867	0	0.08	0.08	0.1667	90.9867	79.26	36
5.1867	0.1	0	0	0	0	0	21.0267	18.7267	37
0	0	0	0	0	0	0	0.1933	0.2533	38
14.3067	1.3333	0	0	0	0	0	32.2933	28.36	39
4.2267	0.0467	0	0	0	0	0	19.2533	17.48	40
0	0	0	0	0	0	0	0.1133	0.1733	41
12.58	0.98	0	0	0	0	0	30.48	26.7867	42
9.9933	0.5467	0	0	0	0	0	27.8733	24.4733	43
0	0	0	0	0	0	0	0.7	0.7933	44
22.8133	4.34	0	0	0	0	0	39.8933	34.06	45
5.1733	0.1067	0	0	0	0	0	20.9867	18.8267	46
0	0	0	0	0	0	0	0.18667	0.2667	47
14.2667	1.3533	0	0	0	0	0	32.3333	28.3533	48
4.2733	0.0533	0	0	0	0	0	19.34	17.62	49
0	0	0	0	0	0	0	0.12	0.1733	50
12.5467	1	0	0	0	0	0	30.5533	26.8067	51
10.04	0.5667	0	0	0	0	0	27.9533	24.5533	52
0	0	0	0	0	0	0	0.68	0.78	53
22.7933	4.4133	0	0	0	0	0	39.9733	33.98	54

Table 19A. Probability (as %) that MMB < MMB$_{35}$, < 0.5 MMB$_{35}$ (MSST), < 0.5MSST, MMA< MMA$_{ave}$, MMA< 0.25MMA$_{ave}$, TOTC>OFL, TOTC>ABC, RETC< RETC$_{ave}$, and CPUE<CPUE$_{ave}$ during the long-term (1 - 30yr) projection period for the state harvest control rule policy#1 (with the 0.1 harvest rate) and scenarios 1 to 18 under Hockey Stick SR model generated recruitment for WAG. Individual estimate from 500 Monte Carlo trials and 1-30yr projection years was considered for probability estimation. Sc.: scenario.

MMA<MMA$_{ave}$	MMB<MMB$_{35}$	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	MMA<0.25MMAave	RETC<RETC$_{ave}$	CPUE<CPUE$_{ave}$	Sc.
4.86	0	0	0	0	0	0	96.8733	6.94	1
1.24	0	0	0	0	0	0	99.1533	6.2	2
38.2	11.4667	0	0	0	0	0	82.1	28.7667	3
4.3067	0	0	0	0	0	0	97.1933	6.7667	4
1.06	0	0	0	0	0	0	99.2933	6.2667	5
36.9133	10.2267	0	0	0	0	0	82.36	27.4067	6
8.74	0.02	0	0	0	0	0	94.56	8.0333	7
3.1933	0	0	0	0	0	0	97.9667	6.5333	8
45.1333	19.6733	0.06	0	0	0	0	81.7067	35.4267	9
4.88	0	0	0	0	0	0	96.8867	7.2267	10
1.2133	0	0	0	0	0	0	99.1933	6.7267	11
38.38	11.5	0	0	0	0	0	82.1	29.3667	12
4.3267	0	0	0	0	0	0	97.28	7.1667	13
0.9933	0	0	0	0	0	0	99.34	6.7133	14
36.9133	10.24	0	0	0	0	0	82.3733	28.12	15
8.7933	0.02	0	0	0	0	0	94.7	8.4733	16
3.18	0	0	0	0	0	0	98.02	6.9667	17
45.1333	19.9	0.0533	0	0	0	0	81.7933	36.16	18

Table 20A. Probability (as %) that MMB < MMB_{35}, < 0.5 MMB_{35} (MSST), < 0.5MSST, MMA< MMA_{ave}, MMA< $0.25MMA_{ave}$, TOTC>OFL, TOTC>ABC, RETC< $RETC_{ave}$, and CPUE<$CPUE_{ave}$ during the long-term (1 - 30yr) projection period for the state harvest control rule policy#1 (with the 0.1 harvest rate) and scenarios 1 to 54 under Ricker SR model generated recruitment for WAG. Individual estimate from 500 Monte Carlo trials and 1-30yr projection years was considered for probability estimation. Sc.: scenario.

MMA<MMAave	MMB<MMB35	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	MMA<0.25MMAave	RETC<RETCave	CPUE<CPUEave	Sc.
4.3467	0	0	0	0	0	0	96.5	6.84	1
1.0867	0	0	0	0	0	0	99.04	6.2	2
36.3	9.92	0	0	0	0	0	81.2133	27.3267	3
3.7733	0	0	0	0	0	0	96.8667	6.7	4
0.9	0	0	0	0	0	0	99.1667	6.2	5
35.14	8.64	0	0	0	0	0	81.4267	26.1067	6
7.9667	0.0133	0	0	0	0	0	94.3	7.8733	7
2.8133	0	0	0	0	0	0	97.6267	6.4533	8
43.1133	17.62	0.02	0	0	0	0	80.6533	33.6733	9
4.36	0	0	0	0	0	0	96.4667	7.1733	10
1.0067	0	0	0	0	0	0	99.0467	6.72	11
36.52	9.9133	0	0	0	0	0	81.0533	28.02	12
3.8267	0	0	0	0	0	0	96.9	7.06	13
0.82	0	0	0	0	0	0	99.1933	6.7	14
35.1933	8.7667	0	0	0	0	0	81.3667	26.84	15
7.9933	0.0133	0	0	0	0	0	94.1	8.2067	16
2.88	0	0	0	0	0	0	97.6667	6.88	17
43.2133	17.8133	0.02	0	0	0	0	80.62	34.6133	18
95.6533	86.16	0	0	0	0	0	100	88.34	19
95.9067	88.0333	0	0	0	0	0	100	88.88	20
87.1867	71.6267	1.0067	0	0.0133	0.0133	0.0333	99.4933	76.8067	21
95.6733	86.46	0	0	0	0	0	100	88.4133	22
95.92	88.1333	0	0	0	0	0	100	88.9667	23
87.7133	72.0667	0.8	0	0.0133	0.0133	0.0333	99.5733	77.2133	24
95.3	84.1467	0	0	0	0	0	100	87.48	25

Table 20A. Page 2 of 2.

MMA<MMAave	MMB<MMB35	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	MMA<0.25MMAave	RETC<RETCave	CPUE<CPUEave	Sc.
95.7733	87.02	0	0	0	0	0	100	88.6467	26
84.9467	69.5	2.92	0	0.1533	0.1533	0.26	98.7867	74.66	27
95.8267	86.58	0	0	0	0	0	100	89.3	28
96.1267	88.4533	0	0	0	0	0	100	89.84	29
87.2267	71.74	0.9133	0	0.0067	0.0067	0.0333	99.5133	77.6667	30
95.8667	86.9	0	0	0	0	0	100	89.3667	31
96.1533	88.5667	0	0	0	0	0	100	89.88	32
87.76	72.2133	0.7133	0	0.0067	0.0067	0.02	99.5733	78.0867	33
95.4467	84.56	0	0	0	0	0	100	88.5133	34
95.9533	87.5133	0	0	0	0	0	100	89.5867	35
84.94	69.7333	2.8867	0	0.12	0.12	0.2267	98.7867	75.4867	36
0.0267	0	0	0	0	0	0	34.8267	6.4	37
0	0	0	0	0	0	0	29.2733	6.36	38
15.7533	2.1533	0	0	0	0	0	56.84	14.08	39
0.02	0	0	0	0	0	0	34.1267	6.4	40
0	0	0	0	0	0	0	28.6467	6.36	41
14.1733	1.6467	0	0	0	0	0	55.9667	13.3267	42
0.1467	0	0	0	0	0	0	38.46	6.4467	43
0.0067	0	0	0	0	0	0	32.4933	6.36	44
25.4533	6.5133	0	0	0	0	0	62.0933	20.6333	45
0.0333	0	0	0	0	0	0	35	6.6733	46
0	0	0	0	0	0	0	29.2867	6.6667	47
15.88	2.12667	0	0	0	0	0	56.8267	14.56	48
0.02	0	0	0	0	0	0	34.3867	6.6667	49
0	0	0	0	0	0	0	28.7533	6.6667	50
14.36	1.6733	0	0	0	0	0	55.9267	13.5533	51
0.1533	0	0	0	0	0	0	38.6733	6.68	52
0.0067	0	0	0	0	0	0	32.76	6.6667	53
25.5867	6.5933	0	0	0	0	0	62.1133	21.1667	54

Table 21A. Probability (as %) that MMB < MMB_{35}, < 0.5 MMB_{35} (MSST), < 0.5MSST, MMA< MMA_{ave}, MMA< 0.25MMA_{ave}, TOTC>OFL, TOTC>ABC, RETC< $RETC_{ave}$, and CPUE<$CPUE_{ave}$ during the long-term (1 - 30yr) projection period for the state harvest control rule policy#2 (with the 0.125 harvest rate) and scenarios 1 to 18 under Hockey Stick SR model generated recruitment for EAG. Individual estimate from 500 Monte Carlo trials and 1-30yr projection years was considered for probability estimation. Sc.: scenario.

MMA<MMA_{ave}	MMB<MMB_{35}	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	MMA<0.25MMA_{ave}	RETC<$RETC_{ave}$	CPUE<$CPUE_{ave}$	Sc.
31.7467	5.2667	0	0	0	0	0	36.06	60.4267	1
5.5267	0	0	0	0	0	0	10.8667	77.3	2
39.9333	13.7933	0	0	0	0	0	44.9667	58.66	3
30.5867	4.44	0	0	0	0	0	34.8133	60.9067	4
4.8667	0	0	0	0	0	0	10.0533	77.7733	5
38.84	12.2867	0	0	0	0	0	43.5467	58.7467	6
36.98	10.0067	0	0	0	0	0	41.4733	59.12	7
8.98	0	0	0	0	0	0	14.6467	74.7867	8
45.4867	20.78	0.0733	0	0	0	0	50.8667	58.8667	9
31.7667	5.38	0	0	0	0	0	36.0933	60.42667	10
5.5867	0	0	0	0	0	0	11.08	77.3667	11
40.08	13.8533	0	0	0	0	0	45.04	58.5667	12
30.6267	4.52	0	0	0	0	0	34.8867	60.9533	13
4.94	0	0	0	0	0	0	10.3333	77.7867	14
38.8533	12.2667	0	0	0	0	0	43.58	58.68	15
37.0467	10.08	0	0	0	0	0	41.5333	59.1133	16
9.1067	0	0	0	0	0	0	14.6733	74.8533	17
45.5267	20.8	0.06	0	0	0	0	50.94	58.9667	18

Table 22A. Probability (as %) that MMB < MMB_{35}, < 0.5 MMB_{35} (MSST), < 0.5MSST, MMA< MMA_{ave}, MMA< 0.25MMA_{ave}, TOTC>OFL, TOTC<ABC, RETC< $RETC_{ave}$, and CPUE<$CPUE_{ave}$ during the long-term (1 - 30yr) projection period for the state harvest control rule policy#2 (with the 0.125 harvest rate) and scenarios 1 to 54 under Ricker SR model generated recruitment for EAG. Individual estimate from 500 Monte Carlo trials and 1-30yr projection years was considered for probability estimation. Sc.: scenario.

MMA<MMA_{ave}	MMB<MMB_{35}	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	MMA<0.25MMA_{ave}	RETC<$RETC_{ave}$	CPUE<$CPUE_{ave}$	Sc.
34.5333	5.7933	0	0	0	0	0	39.0067	62.76	1
9.96	0	0	0	0	0	0	18.2667	79.76	2
41.16	14.1667	0	0	0	0	0	46.5267	59.9733	3
33.44	4.9467	0	0	0	0	0	38.04	63.40667	4
9.06	0	0	0	0	0	0	17.48	80.1733	5
40.16	12.66	0	0	0	0	0	45.38	60.2333	6
38.5667	10.4467	0	0	0	0	0	43.4933	60.86	7
13.4533	0	0	0	0	0	0	21.42	77.96	8
46.0733	20.7467	0.0467	0	0	0	0	51.86	59.5867	9
34.5	5.8667	0	0	0	0	0	39.12667	62.86	10
10	0	0	0	0	0	0	18.2933	79.68	11
41.2067	14.1667	0	0	0	0	0	46.6133	59.9133	12
33.4867	4.9733	0	0	0	0	0	38.1667	63.5333	13
9.1933	0	0	0	0	0	0	17.5467	80.0533	14
40.18	12.8533	0	0	0	0	0	45.52	60.2067	15
38.6933	10.5733	0	0	0	0	0	43.4667	60.8733	16
13.5267	0	0	0	0	0	0	21.66	78.1	17
46.06	20.74	0.0533	0	0	0	0	51.88	59.6733	18
87.5933	72.96	0.04	0	0	0	0	91.5133	85.8467	19
90.0333	83.12	0	0	0	0	0	91.7667	86.6667	20
84.3867	68.36	0.82	0	0.0067	0.0067	0.02	90.1067	84.0133	21
87.9533	73.78	0.0267	0	0	0	0	91.6	86.0067	22
90.0133	83.18	0	0	0	0	0	91.7533	86.6667	23
84.9467	68.9733	0.62	0	0.0067	0.00667	0.02	90.2933	84.3133	24
85.72	70.0667	0.3333	0	0	0	0.0067	90.7333	84.94	25

Table 22A. Page 2 of 2.

$MMA<MMA_{ave}$	$MMB<MMB_{35}$	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	$MMA<0.25MMA_{ave}$	$RETC<RETC_{ave}$	$CPUE<CPUE_{ave}$	Sc.
90.1	82.74	0	0	0	0	0	91.8267	86.6667	26
82.4867	66.1933	2.64	0	0.1133	0.1133	0.24	88.7667	82.28	27
87.6533	73.0333	0.0333	0	0	0	0	91.5467	85.8333	28
90.04	83.14	0	0	0	0	0	91.7667	86.6667	29
84.4	68.2733	0.8467	0	0.0067	0.0067	0.02	90.1133	84.02	30
88.0267	73.8533	0.02667	0	0	0	0	91.6	86	31
90.0333	83.2067	0	0	0	0	0	91.76	86.6667	32
84.94	68.9733	0.6067	0	0.0067	0.0067	0.02	90.3067	84.34	33
85.6867	70.1067	0.34	0	0	0	0	90.7467	84.9667	34
90.08	82.7267	0	0	0	0	0	91.8067	86.6667	35
82.4467	66.1733	2.7133	0	0.1	0.1	0.26	88.74667	82.34	36
9.56	0.54	0	0	0	0	0	10.56	34.2	37
0	0	0	0	0	0	0	0	9.8	38
20.4133	3.6067	0	0	0	0	0	22.5933	39.7867	39
8.2733	0.3867	0	0	0	0	0	9.2733	33.48	40
0	0	0	0	0	0	0	0	8.88	41
18.5	2.92	0	0	0	0	0	20.46	38.9267	42
15.6733	1.94	0	0	0	0	0	17.42	37.52	43
0.0133	0	0	0	0	0	0	0.0267	14.16	44
28.2733	8.7467	0	0	0	0	0	31.4867	43.4533	45
9.5467	0.5467	0	0	0	0	0	10.64	34.32	46
0	0	0	0	0	0	0	0	9.96	47
20.4133	3.6333	0	0	0	0	0	22.6467	39.8933	48
8.36	0.4133	0	0	0	0	0	9.38	33.5133	49
0	0	0	0	0	0	0	0	9.0133	50
18.56	2.92	0	0	0	0	0	20.5133	38.9667	51
15.7333	1.9133	0	0	0	0	0	17.4267	37.7	52
0.0133	0	0	0	0	0	0	0.0267	14.2667	53
28.2933	8.7533	0	0	0	0	0	31.5267	43.42	54

Table 23A. Probability (as %) that MMB < MMB_{35}, < 0.5 MMB_{35} (MSST), < 0.5MSST, MMA< MMA_{ave}, MMA< $0.25MMA_{ave}$, TOTC>OFL, TOTC>ABC, RETC< $RETC_{ave}$, and CPUE<$CPUE_{ave}$ during the long-term (1 - 30yr) projection period for the state harvest control rule policy#2 (with the 0.125 harvest rate) and scenarios 1 to 18 under Hockey Stick SR model generated recruitment for WAG. Individual estimate from 500 Monte Carlo trials and 1-30yr projection years was considered for probability estimation. Sc.: scenario.

MMA<MMA_{ave}	MMB<MMB_{35}	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	MMA<$0.25MMA_{ave}$	RETC<$RETC_{ave}$	CPUE<CPUEave	Sc.
15.6667	0.14	0	0	0	0	0	83.32	21.0333	1
8.2067	0	0	0	0	0	0	88.74	15.9067	2
45.6067	21.14	0	0	0	0	0	75.2667	42.12	3
14.6467	0.1133	0	0	0	0	0	83.8933	20.48	4
7.54	0	0	0	0	0	0	89.44	15.3733	5
44.7733	19.68	0	0	0	0	0	75.2	41.4133	6
20.88	0.6933	0	0	0	0	0	80.4933	24.7	7
12.72	0.04	0	0	0	0	0	85.2067	19.0133	8
51.14	29.46	0.1533	0	0	0	0	76.5667	46.4133	9
15.68	0.1733	0	0	0	0	0	83.4333	21.3533	10
8.32	0	0	0	0	0	0	89.2267	15.92	11
45.7533	21.2667	0	0	0	0	0	75.3133	42.5133	12
14.7267	0.1133	0	0	0	0	0	84.0333	20.6733	13
7.6	0	0	0	0	0	0	89.8533	15.4467	14
44.8	19.8867	0	0	0	0	0	75.2533	41.76	15
21	0.6467	0	0	0	0	0	80.6267	25.1267	16
12.8333	0.0467	0	0	0	0	0	85.42	19.1067	17
51.2467	29.6133	0.1267	0	0	0	0	76.62	46.6467	18

Table 24A. Probability (as %) that MMB < MMB_{35}, < 0.5 MMB_{35} (MSST), < 0.5MSST, MMA< MMA_{ave}, MMA< 0.25MMA_{ave}, TOTC>OFL, TOTC>ABC, RETC< $RETC_{ave}$, and CPUE<$CPUE_{ave}$ during the long-term (1 - 30yr) projection period for the state harvest control rule policy#2 (with the 0.125 harvest rate) and scenarios 1 to 54 under Ricker SR model generated recruitment for WAG. Individual estimate from 500 Monte Carlo trials and 1-30yr projection years was considered for probability estimation. Sc.: scenario.

MMA<MMA_{ave}	MMB<MMB_{35}	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	MMA<0.25MMAave	RETC<$RETC_{ave}$	CPUE<$CPUE_{ave}$	Sc.
14.2267	0.1	0	0	0	0	0	81.8933	20.0933	1
7.2733	0	0	0	0	0	0	87.0933	15.1667	2
43.7333	19.1067	0	0	0	0	0	73.7667	40.38	3
13.44	0.06	0	0	0	0	0	82.5	19.5333	4
6.6467	0	0	0	0	0	0	87.8533	14.7133	5
42.8333	17.6133	0	0	0	0	0	73.62	39.6733	6
19.26	0.5267	0	0	0	0	0	78.8733	23.5267	7
11.3533	0.02	0	0	0	0	0	83.7533	18.1467	8
49.1667	27.0467	0.1	0	0	0	0	75.0133	44.56	9
14.36	0.0867	0	0	0	0	0	81.9733	20.28	10
7.3	0	0	0	0	0	0	87.5867	15.28	11
43.7867	19.3667	0	0	0	0	0	73.78	40.72	12
13.4333	0.06	0	0	0	0	0	82.5733	19.6267	13
6.5533	0	0	0	0	0	0	88.2333	14.76	14
42.7867	17.8667	0	0	0	0	0	73.64	40.0333	15
19.32	0.46	0	0	0	0	0	78.96	23.7733	16
11.5933	0.0333	0	0	0	0	0	83.8267	18.1933	17
49.2	27.2333	0.06	0	0	0	0	75.16	44.66	18
96.5	90.1133	0	0	0	0	0	100	92.08	19
96.6667	90.6133	0	0	0	0	0	100	92.2933	20
88.3333	77.4333	2.2067	0	0.0333	0.0333	0.0733	98.9133	81.8133	21
96.5333	90.2267	0	0	0	0	0	100	92.1	22
96.6667	90.6133	0	0	0	0	0	100	92.2867	23
88.7	77.9467	1.8333	0	0.0333	0.0467	0.06	99.0933	82.3467	24
96.1533	89.4333	0.02	0	0	0	0	100	91.5733	25

Table 24A. Page 2 of 2.

$MMA<MMA_{ave}$	$MMB<MMB_{35}$	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	MMA<0.25MMAave	$RETC<RETC_{ave}$	$CPUE<CPUE_{ave}$	Sc.
96.6067	90.44	0	0	0	0	0	100	92.2	26
85.8667	75.0067	4.8067	0	0.2667	0.2733	0.38	97.9	79.4533	27
96.52	90.06	0	0	0	0	0	100	92.6467	28
96.6667	90.28	0	0	0	0	0	100	93.06	29
88.2667	77.7067	2.02	0	0.02	0.02	0.06	98.9333	82.2	30
96.54	90.1067	0	0	0	0	0	100	92.7267	31
96.6667	90.2733	0	0	0	0	0	100	93.0733	32
88.6867	78.22	1.8133	0	0.02	0.02	0.0467	99.0733	82.74	33
96.2	89.3933	0	0	0	0	0	100	92.1	34
96.6133	90.2067	0	0	0	0	0	100	92.86	35
85.8467	75.2067	4.8533	0	0.2	0.2067	0.3667	97.8933	79.6867	36
0.2667	0	0	0	0	0	0	17.8133	10.4533	37
0.02	0	0	0	0	0	0	14.6933	10.0933	38
22.2533	5.5333	0	0	0	0	0	49.6533	24.2667	39
0.1867	0	0	0	0	0	0	17.28	10.42	40
0.0067	0	0	0	0	0	0	14.4733	10.0933	41
20.5467	4.7467	0	0	0	0	0	48.4	23.0467	42
0.8667	0	0	0	0	0	0	21.2267	10.9867	43
0.12	0	0	0	0	0	0	16.4	10.2933	44
31.02	12.28	0	0	0	0	0	56.5867	30.46	45
0.2333	0	0	0	0	0	0	17.8467	10.78	46
0.02	0	0	0	0	0	0	14.5667	10.34	47
22.34	5.5333	0	0	0	0	0	49.7	24.4133	48
0.1733	0	0	0	0	0	0	17.34	10.7	49
0.0133	0	0	0	0	0	0	14.3533	10.34	50
20.6067	4.7267	0	0	0	0	0	48.52	23.4467	51
0.8867	0	0	0	0	0	0	21.2067	11.3067	52
0.12	0	0	0	0	0	0	16.42	10.56	53
31	12.36	0	0	0	0	0	56.7	30.7267	54

Table 25A. Probability (as %) that MMB < MMB_{35}, < 0.5 MMB_{35} (MSST), < 0.5MSST, MMA< MMA_{ave}, MMA< $0.25MMA_{ave}$, TOTC>OFL, TOTC>ABC, RETC< $RETC_{ave}$, and CPUE<$CPUE_{ave}$ during the short-term (1 - 8yr) projection period for the state harvest control rule policy#3 (with the 0.15 harvest rate) and scenarios 1 to 18 under Hockey Stick SR model generated recruitment for EAG. Individual estimate from 500 Monte Carlo trials and 1-8yr projection years was considered for probability estimation. Sc.: scenario.

MMA<MMA_{ave}	MMB<MMB_{35}	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	MMA<$0.25MMA_{ave}$	RETC<$RETC_{ave}$	CPUE<$CPUE_{ave}$	Sc.
23.725	2.375	0	0	0	0	0	14.35	43.7	1
4.9	0	0	0	0	0	0	0.6	53.725	2
30.725	5.525	0	0	0	0	0	23.05	42.025	3
22.9	1.9	0	0	0	0	0	13.15	44	4
4.25	0	0	0	0	0	0	0.45	53.9	5
29.775	4.9	0	0	0	0	0	21.8	42.25	6
28.2	4.025	0	0	0	0	0	19.775	42.575	7
6.675	0	0	0	0	0	0	1.15	52.525	8
35.475	9.725	0	0	0	0	0	28.6	41.8	9
23.75	2.3	0	0	0	0	0	14.25	43.85	10
4.775	0	0	0	0	0	0	0.55	53.525	11
30.775	5.475	0	0	0	0	0	23.075	42.225	12
23.125	1.9	0	0	0	0	0	13.275	44.15	13
4.275	0	0	0	0	0	0	0.375	53.725	14
29.825	4.85	0	0	0	0	0	21.6	42.325	15
28.275	3.95	0	0	0	0	0	19.8	42.675	16
6.65	0	0	0	0	0	0	1.075	52.475	17
35.275	9.8	0	0	0	0	0	28.675	41.65	18

Table 26A. Probability (as %) that MMB < MMB_{35}, < 0.5 MMB_{35} (MSST), < 0.5MSST, MMA< MMA_{ave}, MMA< $0.25MMA_{ave}$, TOTC>OFL, TOTC>ABC, RETC< $RETC_{ave}$, and CPUE<$CPUE_{ave}$ during the long-term (1 - 30yr) projection period for the state harvest control rule policy#3 (with the 0.15 harvest rate) and scenarios 1 to 18 under Hockey Stick SR model generated recruitment for EAG. Individual estimate from 500 Monte Carlo trials and 1-30yr projection years was considered for probability estimation. Sc.: scenario.

MMA<MMA_{ave}	MMB<MMB_{35}	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	MMA<$0.25MMA_{ave}$	RETC<$RETC_{ave}$	CPUE<$CPUE_{ave}$	Sc.
39.1333	12.38	0	0	0	0	0	33.76	70.19333	1
18.6533	0.02	0	0	0	0	0	6.04	87.1533	2
45.3467	21.2133	0	0	0	0	0	43.6267	65.8533	3
38.3333	11.1467	0	0	0	0	0	32.4	71.02	4
17.7933	0.0133	0	0	0	0	0	5.3267	87.3133	5
44.41333	19.78	0	0	0	0	0	42.32	66.3667	6
42.8333	17.7	0	0	0	0	0	40.0667	67.1867	7
22.18	0.2267	0	0	0	0	0	9.2267	85.96	8
49.78	27.96	0.1533	0	0	0	0	49.7067	64.8067	9
39.2067	12.46	0	0	0	0	0	33.8533	70.1867	10
18.62	0.04	0	0	0	0	0	6.1333	87.14	11
45.3533	21.24	0	0	0	0	0	43.76	65.9533	12
38.4	11.1533	0	0	0	0	0	32.4933	71.04	13
17.72	0.0133	0	0	0	0	0	5.3933	87.28	14
44.3733	19.78	0	0	0	0	0	42.3267	66.4333	15
42.8467	17.7	0	0	0	0	0	40.06	67.22	16
22.3533	0.2333	0	0	0	0	0	9.1867	85.9467	17
49.7467	28.0467	0.1667	0	0	0	0	49.7467	64.7533	18

Table 27A. Probability (as %) that MMB < MMB_{35}, < 0.5 MMB_{35} (MSST), < 0.5MSST, MMA< MMA_{ave}, MMA< 0.25MMA_{ave}, TOTC>OFL, TOTC>ABC, RETC< $RETC_{ave}$, and CPUE<$CPUE_{ave}$ during the short-term (1 - 8yr) projection period for the state harvest control rule policy#3 (with the 0.15 harvest rate) and scenarios 1 to 54 under Ricker SR model generated recruitment for EAG. Individual estimate from 500 Monte Carlo trials and 1-8yr projection years was considered for probability estimation. Sc.: scenario.

MMA<MMAave	MMB<MMB35	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	MMA<0.25MMAave	RETC<RETCave	CPUE<CPUEave	Sc.
25.975	2.675	0	0	0	0	0	16.35	44.625	1
7.15	0	0	0	0	0	0	0.975	54.225	2
32.25	6.1	0	0	0	0	0	24.525	42.65	3
25.05	2.4	0	0	0	0	0	15.025	44.9	4
6.8	0	0	0	0	0	0	0.875	54.45	5
31.175	5.425	0	0	0	0	0	23.325	42.95	6
29.7	4.525	0	0	0	0	0	21.475	43.3	7
9.15	0	0	0	0	0	0	1.95	53.4	8
36.55	10.525	0	0	0	0	0	30.05	42.15	9
26	2.725	0	0	0	0	0	16.3	44.675	10
7.225	0	0	0	0	0	0	0.95	53.975	11
32.2	6.1	0	0	0	0	0	24.6	42.575	12
25.125	2.375	0	0	0	0	0	14.9	45.15	13
6.675	0	0	0	0	0	0	0.875	54.125	14
31.225	5.4	0	0	0	0	0	23.45	42.925	15
29.725	4.525	0	0	0	0	0	21.425	43.2	16
9.125	0	0	0	0	0	0	1.825	53.325	17
36.675	10.625	0	0	0	0	0	30.025	42.1	18
72.15	43.4	0	0	0	0	0	63.275	50.675	19
73.575	42.125	0	0	0	0	0	62.5	50.025	20
71.5	43.325	0	0	0	0	0	64.05	50.875	21
72.275	43.425	0	0	0	0	0	63.2	50.7	22
73.65	42.025	0	0	0	0	0	62.5	50.025	23
71.625	43.1	0	0	0	0	0	63.95	50.85	24
71.75	43.2	0	0	0	0	0	63.625	50.9	25

Table 27A. Page 2 of 2.

MMA<MMAave	MMB<MMB35	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	MMA<0.25MMAave	RETC<RETCave	CPUE<CPUEave	Sc.
73.2	42.5	0	0	0	0	0	62.5	50.025	26
70.725	43	0	0	0	0	0	64.425	50.8	27
72.1	43.525	0	0	0	0	0	63.35	50.725	28
73.575	42.45	0	0	0	0	0	62.5	50	29
71.525	43.35	0	0	0	0	0	64	50.775	30
72.2	43.5	0	0	0	0	0	63.225	50.675	31
73.65	42.3	0	0	0	0	0	62.5	50	32
71.6	43.275	0	0	0	0	0	63.825	50.775	33
71.775	43.475	0	0	0	0	0	63.525	50.75	34
73.175	42.725	0	0	0	0	0	62.5	50	35
70.75	43.1	0	0	0	0	0	64.45	50.55	36
8.825	0.4	0	0	0	0	0	4.7	34.6	37
0	0	0	0	0	0	0	0	35.2	38
17.7	2.35	0	0	0	0	0	11.525	35.95	39
7.4	0.275	0	0	0	0	0	4.025	34.575	40
0	0	0	0	0	0	0	0	35.45	41
16.5	1.8	0	0	0	0	0	10.05	35.725	42
13.925	1.125	0	0	0	0	0	8.15	35.475	43
0.05	0	0	0	0	0	0	0	34.325	44
24.75	4.375	0	0	0	0	0	18.225	36.7	45
8.9	0.375	0	0	0	0	0	4.625	34.775	46
0	0	0	0	0	0	0	0	35.225	47
17.675	2.35	0	0	0	0	0	11.4	36.025	48
7.6	0.25	0	0	0	0	0	4	34.675	49
0	0	0	0	0	0	0	0	35.375	50
16.45	1.775	0	0	0	0	0	10.025	35.7	51
13.975	1.125	0	0	0	0	0	8.15	35.45	52
0.05	0	0	0	0	0	0	0	34.55	53
24.7	4.45	0	0	0	0	0	18.3	36.95	54

Table 28A. Probability (as %) that MMB < MMB_{35}, < 0.5 MMB_{35} (MSST), < 0.5MSST, MMA< MMA_{ave}, MMA< 0.25MMA_{ave}, TOTC>OFL, TOTC>ABC, RETC< $RETC_{ave}$, and CPUE<$CPUE_{ave}$ during the long-term (1 - 30yr) projection period for the state harvest control rule policy#3 (with the 0.15 harvest rate) and scenarios 1 to 54 under Ricker SR model generated recruitment for EAG. Individual estimate from 500 Monte Carlo trials and 1-30yr projection years was considered for probability estimation. Sc.: scenario.

MMA<MMA_{ave}	MMB<MMB_{35}	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	MMA<0.25MMA_{ave}	RETC<$RETC_{ave}$	CPUE<$CPUE_{ave}$	Sc.
41.08	13.26	0	0	0	0	0	36.6067	71.68	1
26.72	0.1067	0	0	0	0	0	10.22	87.5333	2
46.2133	21.5933	0	0	0	0	0	44.9067	66.7467	3
40.54	12.0933	0	0	0	0	0	35.4133	72.5533	4
26.12	0.0467	0	0	0	0	0	9.4267	87.7	5
45.3933	20.2867	0	0	0	0	0	43.7	67.22	6
44.04	18.3267	0	0	0	0	0	41.8	68.1533	7
29.12	0.38	0	0	0	0	0	13.5133	86.7333	8
50.0467	27.9533	0.0933	0	0	0	0	50.4733	64.9467	9
41.0733	13.3267	0	0	0	0	0	36.7	71.74	10
26.8067	0.1133	0	0	0	0	0	10.3	87.4533	11
46.2733	21.6067	0	0	0	0	0	44.9733	66.68	12
40.5267	12.2133	0	0	0	0	0	35.3667	72.6	13
26.1933	0.06	0	0	0	0	0	9.5067	87.62	14
45.4933	20.3	0	0	0	0	0	43.76	67.2667	15
44.06	18.3	0	0	0	0	0	41.9	68.14	16
29.1933	0.4	0	0	0	0	0	13.6333	86.7267	17
50.0733	28	0.1067	0	0	0	0	50.4333	64.92	18
88.9667	77.0067	0.2067	0	0	0	0	89.0933	86.2333	19
92.9533	84.5133	0	0	0	0	0	90	86.6733	20
85.5867	72.46	1.74	0	0.02	0.02	0.04	87.6267	84.6533	21
89.3733	77.68	0.1533	0	0	0	0	89.22	86.38	22
92.9733	84.5133	0	0	0	0	0	90	86.6733	23
86.1533	73.1	1.2867	0	0.0133	0.0133	0.0267	87.8933	84.9667	24
86.9267	74.04	0.86	0	0.0067	0.0067	0.02	88.2533	85.4867	25

Table 28A. Page 2 of 2.

$MMA<MMA_{ave}$	$MMB<MMB_{35}$	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	$MMA<0.25MMA_{ave}$	$RETC<RETC_{ave}$	$CPUE<CPUE_{ave}$	Sc.
92.8467	84.42	0	0	0	0	0	90	86.6733	26
83.58	70.1733	4.2933	0	0.2	0.2	0.4067	86.2133	83.0933	27
88.9333	77.04	0.1867	0	0	0	0	89.1333	86.2533	28
92.9533	84.6	0	0	0	0	0	90	86.6667	29
85.5867	72.5	1.7933	0	0.0133	0.0133	0.04	87.62	84.6067	30
89.34	77.6733	0.1067	0	0	0	0	89.24	86.38	31
92.9733	84.5867	0	0	0	0	0	90	86.6667	32
86.1467	73.1133	1.34	0	0.0133	0.0133	0.02	87.8533	84.96	33
86.9733	74.1533	0.88	0	0	0	0.02	88.2267	85.4467	34
92.84	84.4867	0	0	0	0	0	90	86.6667	35
83.5733	70.1267	4.36	0	0.1867	0.1867	0.3867	86.22	83.02	36
14.2733	1.9267	0	0	0	0	0	9.9333	46.2133	37
0.0267	0	0	0	0	0	0	0	49.2533	38
257	7.2933	0	0	0	0	0	21.8533	48.2533	39
12.8133	1.5	0	0	0	0	0	8.5333	46.0733	40
0.0133	0	0	0	0	0	0	0	49.68	41
23.86	6.0067	0	0	0	0	0	19.7133	47.92	42
21.0933	4.4667	0	0	0	0	0	16.66	47.3667	43
0.2467	0	0	0	0	0	0	0.0133	47.7933	44
32.8867	13.4733	0.0133	0	0	0	0	31.1933	50.2933	45
14.3667	1.8867	0	0	0	0	0	9.9667	46.28	46
0.0333	0	0	0	0	0	0	0	49.1667	47
25.2933	7.3533	0	0	0	0	0	21.8667	48.28	48
12.8867	1.4733	0	0	0	0	0	8.58	46.12	49
0.0133	0	0	0	0	0	0	0	49.64	50
23.9	6.06	0	0	0	0	0	19.8267	47.8267	51
21.02	4.5133	0	0	0	0	0	16.7267	47.2867	52
0.24	0	0	0	0	0	0	0.0133	47.6333	53
32.88	13.5467	0.0133	0	0	0	0	31.2133	50.4133	54

Table 29A. Probability (as %) that MMB < MMB_{35}, < 0.5 MMB_{35} (MSST), < 0.5MSST, MMA< MMA_{ave}, MMA< $0.25MMA_{ave}$, TOTC>OFL, TOTC>ABC, RETC< $RETC_{ave}$, and CPUE<$CPUE_{ave}$ during the short-term (1 - 8yr) projection period for the state harvest control rule policy#3 (with the 0.15 harvest rate) and scenarios 1 to 18 under Hockey Stick SR model generated recruitment for WAG. Individual estimate from 500 Monte Carlo trials and 1-8yr projection years was considered for probability estimation. Sc.: scenario.

MMA<MMA_{ave}	MMB<MMB_{35}	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	MMA<$0.25MMA_{ave}$	RETC<$RETC_{ave}$	CPUE<$CPUE_{ave}$	Sc.
24.35	1.425	0	0	0	0	0	78.45	62.275	1
18.525	0.3	0	0	0	0	0	76.3	63.425	2
47.225	21.925	0	0	0.15	1	0	84.2	64.8	3
23.35	1.2	0	0	0	0	0	78.15	62.2	4
17.7	0.25	0	0	0	0	0	75.95	63.55	5
46.45	20.6	0	0	0.1	0.9	0	83.9	64.725	6
28.225	2.75	0	0	0	0	0	80.2	62.325	7
21.65	0.925	0	0	0	0	0	77.75	62.475	8
51.4	28.875	0	0	0.45	2	0	84.575	65.7	9
24.9	1.225	0	0	0	0	0	78.85	63.325	10
18.25	0.075	0	0	0	0	0	76.35	63.45	11
47.475	21.875	0	0	0.175	1.075	0	84.275	66.525	12
23.825	1.075	0	0	0	0	0	78.5	63.3	13
17.4	0.05	0	0	0	0	0	75.925	63.4	14
46.475	20.675	0	0	0.1	0.9	0	84.05	66.425	15
28.75	2.625	0	0	0	0	0	80.475	63.775	16
22.15	0.65	0	0	0	0	0	77.75	63.275	17
51.675	28.475	0	0	0.45	1.95	0	84.7	66.7	18

Table 30A. Probability (as %) that MMB < MMB_{35}, < 0.5 MMB_{35} (MSST), < 0.5MSST, MMA< MMA_{ave}, MMA< 0.25MMA_{ave}, TOTC>OFL, TOTC>ABC, RETC< $RETC_{ave}$, and $CPUE<CPUE_{ave}$ during the long-term (1 - 30yr) projection period for the state harvest control rule policy#3 (with the 0.15 harvest rate) and scenarios 1 to 18 under Hockey Stick SR model generated recruitment for WAG. Individual estimate from 500 Monte Carlo trials and 1-30yr projection years was considered for probability estimation. Sc.: scenario.

$MMA<MMA_{ave}$	$MMB<MMB_{35}$	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	$MMA<0.25MMA_{ave}$	$RETC<RETC_{ave}$	$CPUE<CPUE_{ave}$	Sc.
26.18	2.3733	0	0	0	0	0	64.2267	45.5467	1
20.08	0.5933	0	0	0	0	0	62.02	46.4267	2
48.4067	27.2867	0.00667	0	0.2733	1.4267	0	71.7133	51.74	3
25.4267	2.0667	0	0	0	0	0	63.98	45.5333	4
19.4067	0.4933	0	0	0	0	0	61.66	46.7	5
47.6267	25.8867	0	0	0.2467	1.26	0	71.3667	51.3267	6
30.2867	4.3133	0	0	0	0	0	65.84	45.6533	7
23.8467	1.5333	0	0	0	0	0	63.4133	45.7667	8
53.26	34.66	0.3	0	0.76	2.76	0	73.3267	54.5267	9
26.7867	2.1667	0	0	0	0	0	64.4133	46.22	10
20.4933	0.4267	0	0	0	0	0	61.9133	46.9067	11
48.4867	27.2867	0.0067	0	0.2733	1.4467	0	71.84	52.4	12
26.047	1.8333	0	0	0	0	0	64.1667	46.3533	13
19.7933	0.32	0	0	0	0	0	61.58	46.94	14
47.5867	26.16	0	0	0.24667	1.28667	0	71.5133	51.9867	15
30.62	4.28	0	0	0	0	0	65.9533	46.2333	16
24.38	1.3267	0	0	0	0	0	63.56	46.1667	17
53.32	34.5	0.3	0	0.76	2.72	0	73.4267	54.9467	18

Table 31A. Probability (as %) that MMB < MMB_{35}, < 0.5 MMB_{35} (MSST), < 0.5MSST, MMA< MMA_{ave}, MMA< 0.25MMA_{ave}, TOTC>OFL, TOTC>ABC, RETC< $RETC_{ave}$, and CPUE<$CPUE_{ave}$ during the short-term (1 - 8yr) projection period for the state harvest control rule policy#3 (with the 0.15 harvest rate) and scenarios 1 to 54 under Ricker SR model generated recruitment for WAG. Individual estimate from 500 Monte Carlo trials and 1-8yr projection years was considered for probability estimation. Sc.: scenario.

MMA<MMA_{ave}	MMB<MMB_{35}	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	MMA<0.25MMA_{ave}	RETC<$RETC_{ave}$	CPUE<$CPUE_{ave}$	Sc.
29.8	1.825	0	0	0	0	0	84.075	73.35	1
23.65	0.275	0	0	0	0	0	85.3	74.6	2
50.1	26.1	0	0	0	0	0	84.675	69.925	3
29.15	1.55	0	0	0	0	0	84.125	73.5	4
22.85	0.225	0	0	0	0	0	85.425	74.675	5
49.325	24.825	0	0	0	0	0	84.575	70.1	6
33.625	3.8	0	0	0	0	0	83.4	72.475	7
27.675	1.125	0	0	0	0	0	84.425	73.7	8
53.55	32.575	0	0	0	0	0	85.6	69.525	9
29.95	1.6	0	0	0	0	0	84.4	74.075	10
23.825	0.2	0	0	0	0	0	85.475	75.5	11
50.25	26.45	0	0	0	0	0	84.6	70.875	12
29.475	1.425	0	0	0	0	0	84.6	74.2	13
23.075	0.1	0	0	0	0	0	85.8	75.65	14
49.4	25.3	0	0	0	0	0	84.55	70.9	15
33.675	3.5	0	0	0	0	0	83.9	73.05	16
28.1	1.05	0	0	0	0	0	84.9	74.65	17
53.7	32.675	0	0	0	0	0	85.8	69.75	18
87.5	74.65	0	0	0	0	0	100	82.25	19
87.5	74.875	0	0	0	0	0	100	82.225	20
86.25	72	1.225	0	0	0	0	99.95	80.525	21
87.5	74.65	0	0	0	0	0	100	82.275	22
87.5	74.925	0	0	0	0	0	100	82.15	23
86.35	72.175	1.075	0	0	0	0	99.95	80.775	24
87.5	74.45	0	0	0	0	0	100	82.175	25

Table 31A. Page 2 of 2.

MMA<MMA$_{ave}$	MMB<MMB$_{35}$	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	MMA<0.25MMA$_{ave}$	RETC<RETC$_{ave}$	CPUE<CPUE$_{ave}$	Sc.
87.5	74.7	0	0	0	0	0	100	82.325	26
85.3	71.075	2.125	0	0.025	0.025	0.125	99.825	79.575	27
87.5	74.85	0	0	0	0	0	100	77.25	28
87.5	75	0	0	0	0	0	100	75.875	29
86.25	71.975	1.05	0	0	0	0	99.95	78.45	30
87.5	74.875	0	0	0	0	0	100	77.1	31
87.5	75	0	0	0	0	0	100	75.8	32
86.35	72.175	0.9	0	0	0	0	99.975	78.675	33
87.5	74.65	0	0	0	0	0	100	77.75	34
87.5	74.95	0	0	0	0	0	100	76.875	35
85.3	70.95	1.925	0	0	0	0.1	99.825	77.525	36
3.225	0	0	0	0	0	0	52.1	47.55	37
0.9	0	0	0	0	0	0	48.6	44.325	38
33.35	12	0	0	0	0	0	74.075	62.625	39
2.9	0	0	0	0	0	0	51.775	47.225	40
0.775	0	0	0	0	0	0	48.25	44.15	41
32.025	10.925	0	0	0	0	0	73.3	62.075	42
6.15	0	0	0	0	0	0	55.425	50.175	43
2.25	0	0	0	0	0	0	50.5	46.35	44
40.45	19.975	0	0	0	0	0	77.575	63.775	45
3.225	0	0	0	0	0	0	52.225	47.6	46
0.875	0	0	0	0	0	0	48.05	44.275	47
33.25	12.2	0	0	0	0	0	74.175	62.875	48
2.9	0	0	0	0	0	0	51.8	46.9	49
0.8	0	0	0	0	0	0	47.9	44.025	50
31.9	11.125	0	0	0	0	0	73.325	62.525	51
6.175	0.025	0	0	0	0	0	55.2	50.375	52
2.25	0	0	0	0	0	0	50.5	46.175	53
40.5	20.2	0	0	0	0	0	77.525	64.775	54

Table 32A. Probability (as %) that $MMB < MMB_{35}$, $< 0.5\ MMB_{35}$ (MSST), < 0.5MSST, $MMA < MMA_{ave}$, $MMA < 0.25MMA_{ave}$, TOTC>OFL, TOTC>ABC, $RETC < RETC_{ave}$, and $CPUE < CPUE_{ave}$ during the long-term (1 - 30yr) projection period for the state harvest control rule policy#3 (with the 0.15 harvest rate) and scenarios 1 to 54 under Ricker SR model generated recruitment for WAG. Individual estimate from 500 Monte Carlo trials and 1-30yr projection years was considered for probability estimation. Sc.: scenario.

MMA<MMAave	MMB<MMB35	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	MMA<0.25MMAave	RETC<RETCave	CPUE<CPUEave	Sc.
27.9933	2.2133	0	0	0	0	0	66.4133	47.74	1
21.86	0.4667	0	0	0	0	0	67.2533	48.2467	2
48.2933	28.2133	0	0	0	0	0	69.4467	50.7867	3
27.3133	1.8533	0	0	0	0	0	66.5067	47.78	4
21.12	0.3933	0	0	0	0	0	67.4133	48.2733	5
47.4867	27	0	0	0	0	0	69.1	50.5133	6
32.02	4.3867	0	0	0	0	0	66.1133	47.52	7
25.8867	1.2667	0	0	0	0	0	66.6333	47.8067	8
52.58	34.8267	0.1533	0	0	0	0	71.5133	52.9133	9
28.38	2.0267	0	0	0	0	0	66.32	48.4	10
22.0733	0.3533	0	0	0	0	0	67.3067	48.9467	11
48.2933	28.34	0	0	0	0	0	69.5333	51.0533	12
27.8	1.76	0	0	0	0	0	66.4067	48.46	13
21.28	0.2733	0	0	0	0	0	67.5	49.0467	14
47.4667	27.22	0	0	0	0	0	69.24	50.72	15
32.0333	4.3733	0	0	0	0	0	66.1667	48.0267	16
26.14	1.2	0	0	0	0	0	66.6333	48.6	17
52.68	35.0267	0.1533	0	0	0	0	71.72	53.0733	18
96.48	92.7133	0.04	0	0	0	0	100	95.02	19
96.66	93.1867	0.0133	0	0	0	0	100	95.2533	20
88.4733	80.3867	3.9	0	0.0733	0.08	0.1133	98.22	85.3467	21
96.4933	92.7733	0.04	0	0	0	0	100	95.1	22
96.66	93.24	0.0133	0	0	0	0	100	95.24	23
88.86	80.96	3.48	0	0.0467	0.0733	0.0933	98.4267	85.8733	24
96.1667	91.9467	0.1067	0	0	0	0	100	94.6733	25

Table 32A. Page 2 of 2.

MMA<MMAave	MMB<MMB35	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	MMA<0.25MMAave	RETC<RETCave	CPUE<CPUEave	Sc.
96.5933	92.9733	0.0267	0	0	0	0	100	95.2133	26
86.14	77.8333	7.04	0	0.38	0.3867	0.5533	96.96	82.8067	27
96.46	92.8	0.0133	0	0	0	0	100	93.7733	28
96.66	93.2533	0	0	0	0.0067	0	100	93.56	29
88.3867	80.4467	3.8733	0	0.0533	0.0667	0.0867	98.2	84.9667	30
96.5	92.8667	0.0067	0	0	0	0	100	93.76	31
96.66	93.2867	0	0	0	0	0	100	93.54	32
88.8933	80.98	3.46	0	0.0333	0.0467	0.08	98.42	85.48	33
96.2	92.0533	0.0533	0	0	0.0067	0	100	93.5533	34
96.5933	93.04	0	0	0	0	0	100	93.78	35
86.1867	77.7867	7.1267	0	0.3533	0.42	0.5533	96.9667	82.2867	36
1.0933	0	0	0	0	0	0	14.8667	13.1867	37
0.2533	0	0	0	0	0	0	13.0867	11.8733	38
27.24	10.4933	0	0	0	0	0	46.5267	32.86	39
0.9667	0	0	0	0	0	0	14.6067	13.0067	40
0.2133	0	0	0	0	0	0	12.9467	11.8067	41
25.8333	9.3	0	0	0	0	0	45.2267	31.7867	42
2.36	0.0133	0	0	0	0	0	17.4333	14.7133	43
0.66	0	0	0	0	0	0	13.9933	12.6533	44
35.1467	18.6533	0.0267	0	0	0	0	53.9733	38.3267	45
1.1067	0	0	0	0	0	0	14.8933	13.22	46
0.2467	0	0	0	0	0	0	12.9333	11.86	47
27.3	10.6667	0	0	0	0	0	46.72	33.0667	48
0.9667	0	0	0	0	0	0	14.64	12.9467	49
0.2133	0	0	0	0	0	0	12.86	11.7733	50
25.82	9.5133	0	0	0	0	0	45.44	32.14	51
2.4	0.02	0	0	0	0	0	17.4333	14.8267	52
0.6867	0	0	0	0	0	0	13.9933	12.6133	53
35.2467	18.86	0.02	0	0	0	0	54.0133	38.68	54

Table 33A. Probability (as %) that MMB < MMB_{35}, < 0.5 MMB_{35} (MSST), < 0.5MSST, MMA< MMA_{ave}, MMA< 0.25MMA_{ave}, TOTC>OFL, TOTC>ABC, RETC< $RETC_{ave}$, and CPUE<$CPUE_{ave}$ during the short-term (1 - 8yr) projection period for the state harvest control rule policy#4 (with the 0.2 harvest rate) and scenarios 1 to 18 under Hockey Stick SR model generated recruitment for EAG. Individual estimate from 500 Monte Carlo trials and 1-8yr projection years was considered for probability estimation. Sc.: scenario.

MMA<MMA_{ave}	MMB<MMB_{35}	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	MMA<0.25MMA_{ave}	RETC<$RETC_{ave}$	CPUE<CPUEave	Sc.
30.925	8.575	0	0	0	0	0	12.875	52.225	1
11.25	0.275	0	0	0	0	0	0.525	62.325	2
37.125	14.375	0	0	0	0	0	21.575	50.475	3
30.025	7.925	0	0	0	0	0	11.6	52.6	4
10.55	0.175	0	0	0	0	0	0.45	62.425	5
36.075	13.5	0	0	0	0	0	20.275	50.725	6
34.975	12.15	0	0	0	0	0	17.95	51.325	7
14.075	0.6	0	0	0	0	0	1.15	61.325	8
41.1	19.175	0	0	0	0	0	27.05	50.025	9
30.925	8.725	0	0	0	0	0	12.95	51.875	10
11.35	0.225	0	0	0	0	0	0.525	61.975	11
37.2	14.475	0	0	0	0	0	21.7	50	12
30.1	7.8	0	0	0	0	0	11.875	52.15	13
10.475	0.125	0	0	0	0	0	0.375	62.075	14
36.175	13.575	0	0	0	0	0	20.475	50.25	15
34.975	12	0	0	0	0	0	18.15	50.7	16
14.1	0.65	0	0	0	0	0	1.1	61.075	17
41.075	19.25	0	0	0	0	0	27.075	49.75	18

Table 34A. Probability (as %) that MMB < MMB_{35}, < 0.5 MMB_{35} (MSST), < 0.5MSST, MMA< MMA_{ave}, MMA< 0.25MMA_{ave}, TOTC>OFL, TOTC>ABC, RETC< $RETC_{ave}$, and CPUE<$CPUE_{ave}$ during the long-term (1 - 30yr) projection period for the state harvest control rule policy#4 (with the 0.2 harvest rate) and scenarios 1 to 18 under Hockey Stick SR model generated recruitment for EAG. Individual estimate from 500 Monte Carlo trials and 1-30yr projection years was considered for probability estimation. Sc.: scenario.

MMA<MMA_{ave}	MMB<MMB_{35}	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	MMA<0.25MMAave	RETC<$RETC_{ave}$	CPUE<$CPUE_{ave}$	Sc.
44.7467	22.8067	0	0	0	0	0	34.0533	76.58	1
25.7133	1.4133	0	0	0	0	0	5.12	89.7067	2
50.4667	31.0867	0.0667	0	0	0	0	43.68	72.4067	3
44	21.7667	0	0	0	0	0	32.7467	77.2867	4
24.9	1.0533	0	0	0	0	0	4.4467	89.82	5
49.34	29.86	0.0267	0	0	0	0	42.2267	72.9933	6
48.14	27.8667	0	0	0	0	0	39.9133	73.9267	7
29.46	3.2067	0	0	0	0	0	8.5333	88.9067	8
54.3867	37.1	0.54	0	0	0	0	49.5867	70.9	9
44.8067	22.8733	0	0	0	0	0	34.1467	76.4333	10
25.8467	1.42	0	0	0	0	0	5.2067	89.6267	11
50.4267	31.14	0.06	0	0	0	0	43.62	72.2933	12
44.08	21.6867	0	0	0	0	0	32.78	77.1733	13
24.8733	1.0333	0	0	0	0	0	4.4733	89.74	14
49.3667	29.8867	0.0267	0	0	0	0	42.36	72.9133	15
48.12	27.8667	0	0	0	0	0	39.9733	73.8333	16
29.4933	3.2533	0	0	0	0	0	8.6733	88.86	17
54.4333	37.1533	0.5533	0	0	0	0	49.5533	70.8933	18

Table 35A. Probability (as %) that MMB < MMB$_{35}$, < 0.5 MMB$_{35}$ (MSST), < 0.5MSST, MMA< MMA$_{ave}$, MMA< 0.25MMA$_{ave}$, TOTC>OFL, TOTC>ABC, RETC< RETC$_{ave}$, and CPUE<CPUE$_{ave}$ during the short-term (1 - 8yr) projection period for the state harvest control rule policy#4 (with the 0.2 harvest rate) and scenarios 1 to 54 under Ricker SR model generated recruitment for EAG. Individual estimate from 500 Monte Carlo trials and 1-8yr projection years was considered for probability estimation. Sc.: scenario.

MMA<MMAave	MMB<MMB35	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	MMA<0.25MMAave	RETC<RETave	CPUE<CPUEave	Sc.
32.95	9.925	0	0	0	0	0	14.675	53.325	1
16.1	0.475	0	0	0	0	0	0.975	62.4	2
38.825	15.775	0	0	0	0	0	22.925	51.4	3
32.25	9.175	0	0	0	0	0	13.525	53.8	4
15.45	0.425	0	0	0	0	0	0.8	62.425	5
37.975	14.7	0	0	0	0	0	21.55	51.775	6
36.6	13.45	0	0	0	0	0	19.725	52.2	7
18.925	1.075	0	0	0	0	0	1.85	61.85	8
42.35	20.2	0	0	0	0	0	28.375	50.725	9
32.975	9.925	0	0	0	0	0	14.7	52.95	10
16.225	0.475	0	0	0	0	0	0.875	62.15	11
38.875	15.925	0	0	0	0	0	23	51.15	12
32.225	9.3	0	0	0	0	0	13.7	53.275	13
15.5	0.425	0	0	0	0	0	0.8	62.175	14
38.025	14.85	0	0	0	0	0	21.7	51.4	15
36.575	13.275	0	0	0	0	0	19.725	51.725	16
18.975	1.025	0	0	0	0	0	1.85	61.6	17
42.35	20.2	0	0	0	0	0	28.45	50.35	18
74.15	49.55	0	0	0	0	0	61.15	62.525	19
75	50	0	0	0	0	0	62.5	62.5	20
73.25	49.05	0.175	0	0	0	0	59.825	62.35	21
74.3	49.625	0	0	0	0	0	61.175	62.525	22
75	50	0	0	0	0	0	62.5	62.5	23
73.425	49.15	0.125	0	0	0	0	59.9	62.45	24
73.7	49.25	0.05	0	0	0	0	60.225	62.475	25

Table 35A. Page 2 of 2.

MMA<MMAave	MMB<MMB35	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	MMA<0.25MMAave	RETC<RETave	CPUE<CPUEave	Sc.
75	50	0	0	0	0	0	62.475	62.5	26
72.45	48.825	0.6	0	0	0	0	59.1	62.075	27
74.175	49.575	0	0	0	0	0	61	62.5	28
75	50	0	0	0	0	0	62.5	62.5	29
73.3	48.8	0.15	0	0	0	0	59.75	62.325	30
74.275	49.65	0	0	0	0	0	61.15	62.5	31
75	50	0	0	0	0	0	62.5	62.5	32
73.4	48.975	0.15	0	0	0	0	59.825	62.425	33
73.7	49.175	0.05	0	0	0	0	60.15	62.425	34
75	50	0	0	0	0	0	62.475	62.5	35
72.525	48.925	0.575	0	0	0	0	59.05	62.025	36
13.8	2.475	0	0	0	0	0	4.275	42.7	37
0.05	0	0	0	0	0	0	0	45.85	38
23.475	6.45	0	0	0	0	0	10.75	43.525	39
12.65	1.975	0	0	0	0	0	3.6	42.425	40
0.025	0	0	0	0	0	0	0	46.1	41
21.675	5.5	0	0	0	0	0	9.225	43.4	42
19.5	4.525	0	0	0	0	0	7.525	43.1	43
0.375	0	0	0	0	0	0	0	44.65	44
30.275	10.9	0	0	0	0	0	17.65	44.6	45
13.7	2.45	0	0	0	0	0	4.225	42.3	46
0.05	0	0	0	0	0	0	0	45.825	47
23.55	6.55	0	0	0	0	0	10.75	43.05	48
12.5	1.975	0	0	0	0	0	3.55	42.125	49
0.05	0	0	0	0	0	0	0	46.3	50
21.675	5.5	0	0	0	0	0	9.3	43	51
19.5	4.5	0	0	0	0	0	7.45	42.75	52
0.375	0	0	0	0	0	0	0	44.575	53
30.3	10.95	0	0	0	0	0	17.775	44.275	54

Table 36A. Probability (as %) that MMB < MMB_{35}, < 0.5 MMB_{35} (MSST), < 0.5MSST, MMA< MMA_{ave}, MMA< 0.25MMA_{ave}, TOTC>OFL, TOTC>ABC, RETC< $RETC_{ave}$, and CPUE<$CPUE_{ave}$ during the long-term (1 - 30yr) projection period for the state harvest control rule policy#4 (with the 0.2 harvest rate) and scenarios 1 to 54 under Ricker SR model generated recruitment for EAG. Individual estimate from 500 Monte Carlo trials and 1-30yr projection years was considered for probability estimation. Sc.: scenario.

MMA<MMAave	MMB<MMB35	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	MMA<0.25MMAave	RETC<RETCave	CPUE<CPUEave	Sc.
46.4533	24.1733	0	0	0	0	0	36.14	77.76	1
34.26	2.6733	0	0	0	0	0	8.7	89.8867	2
51.06	31.2333	0.04	0	0	0	0	44.3467	72.92	3
45.86	22.9667	0	0	0	0	0	34.8333	78.4067	4
33.7467	2.18	0	0	0	0	0	7.9133	89.9333	5
50.3867	30.0733	0.0133	0	0	0	0	43.1133	73.6	6
49.2067	28.54	0	0	0	0	0	41.2	74.56	7
36.2933	5.0667	0	0	0	0	0	12.6733	89.42	8
54.24	36.38	0.38	0	0	0	0	49.5733	70.92	9
46.4933	24.1733	0	0	0	0	0	36.1533	77.66	10
34.3333	2.6667	0	0	0	0	0	8.7733	89.8267	11
51.1	31.34	0.0467	0	0	0	0	44.3	72.8867	12
45.9067	22.98	0	0	0	0	0	35.0733	78.26	13
33.7133	2.1933	0	0	0	0	0	7.9467	89.86	14
50.4267	30.2067	0.0133	0	0	0	0	43.1733	73.52	15
49.2267	28.46	0	0	0	0	0	41.2267	74.4667	16
36.3067	5.0533	0	0	0	0	0	12.7867	89.3733	17
54.28	36.4267	0.3933	0	0	0	0	49.7133	70.8267	18
89.2067	79.2267	1.7933	0	0	0	0	87.7067	89.5133	19
93.3333	86.58	0.0067	0	0	0	0	90	90	20
85.9133	75.1133	5.02	0	0.04	0.04	0.1067	85.3867	88.04	21
89.6	79.7067	1.5	0	0	0	0	87.9333	89.6	22
93.3333	86.6067	0	0	0	0	0	90	90	23
86.3333	75.6867	4.2467	0	0.0267	0.0267	0.08	85.7067	88.3467	24
87.1667	76.6933	3.4533	0	0.0133	0.0133	0.0533	86.2867	88.82	25

Table 36A. Page 2 of 2.

MMA<MMAave	MMB<MMB35	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	MMA<0.25MMAave	RETC<RETCave	CPUE<CPUEave	Sc.
93.3133	86.3867	0.0267	0	0	0	0	89.9867	90	26
83.9133	72.98	8.8867	0	0.44	0.44	0.6533	83.7067	86.5267	27
89.2067	79.2067	1.76	0	0	0	0	87.6733	89.48	28
93.3333	86.5867	0	0	0	0	0	90	90	29
85.9333	75.0533	5.1333	0	0.04	0.04	0.1133	85.3733	88.02	30
89.6	79.8133	1.5133	0	0	0	0	87.9333	89.62	31
93.3333	86.6133	0	0	0	0	0	90	90	32
86.34	75.6733	4.3733	0	0.02	0.02	0.08	85.6867	88.34	33
87.1733	76.6067	3.4	0	0.0133	0.0133	0.0467	86.2667	88.8067	34
93.3133	86.3867	0.0133	0	0	0	0	89.9867	90	35
83.9333	72.98	8.9667	0	0.3933	0.3933	0.6933	83.6867	86.4867	36
19.4933	5.7467	0	0	0	0	0	10.64	55.3533	37
0.1933	0	0	0	0	0	0	0	60.1	38
30.6	13.8533	0	0	0	0	0	22.92	56.5067	39
17.9867	4.8533	0	0	0	0	0	9.2333	55.3267	40
0.12	0	0	0	0	0	0	0	60.58	41
28.8733	12.32	0	0	0	0	0	20.7333	56.24	42
26.3667	10.12	0	0	0	0	0	17.6267	55.8133	43
0.6933	0	0	0	0	0	0	0.02	58.62	44
37.9133	21.0133	0.0867	0	0	0	0	31.92	57.8933	45
19.5133	5.7867	0	0	0	0	0	10.7733	55.18	46
0.2	0	0	0	0	0	0	0	60.28	47
30.6333	13.9533	0	0	0	0	0	22.96	56.32	48
17.96	4.8667	0	0	0	0	0	9.3067	55.2467	49
0.14	0	0	0	0	0	0	0	60.8	50
28.8733	12.3467	0	0	0	0	0	20.8533	56.0533	51
26.2933	10.1533	0	0	0	0	0	17.6533	55.6133	52
0.7267	0	0	0	0	0	0	0.0267	58.66	53
37.9133	21.06	0.0867	0	0	0	0	31.9467	57.86	54

Table 37A. Probability (as %) that MMB < MMB_{35}, < 0.5 MMB_{35} (MSST), < 0.5MSST, MMA< MMA_{ave}, MMA< 0.25MMA_{ave}, TOTC>OFL, TOTC>ABC, RETC< $RETC_{ave}$, and CPUE<$CPUE_{ave}$ during the short-term (1 - 8yr) projection period for the state harvest control rule policy#4 (with the 0.2 harvest rate) and scenarios 1 to 18 under Hockey Stick SR model generated recruitment for WAG. Individual estimate from 500 Monte Carlo trials and 1-8yr projection years was considered for probability estimation. Sc.: scenario.

MMA<MMA_{ave}	MMB<MMB_{35}	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	MMA<0.25MMA_{ave}	RETC<$RETC_{ave}$	CPUE<$CPUE_{ave}$	Sc.
33.15	6.65	0	0	0	0	0	81.45	77.075	1
27.275	2.65	0	0	0	0	0	82.7	78.075	2
52.225	33.425	0	0	0	0	0	83.025	78.15	3
32.5	6.15	0	0	0	0	0	81.475	77.225	4
26.375	2.325	0	0	0	0	0	82.85	78.075	5
51.475	32.6	0	0	0	0	0	82.95	78	6
36.85	10.475	0	0	0	0	0	81.15	76.8	7
31.225	4.95	0	0	0	0	0	81.75	77.425	8
55.35	38.375	0.025	0	0	0	0	84.3	79.1	9
33.225	6.625	0	0	0	0	0	81.85	77.8	10
27.65	2.65	0	0	0	0	0	83.175	78.9	11
52.375	33.675	0	0	0	0	0	83.25	78.625	12
32.625	5.95	0	0	0	0	0	81.975	78	13
26.725	2.25	0	0	0	0	0	83.35	79	14
51.625	32.7	0	0	0	0	0	83.025	78.375	15
36.875	10.35	0	0	0	0	0	81.625	77.375	16
31.35	4.9	0	0	0	0	0	82.325	78.125	17
55.3	38.475	0.05	0	0	0	0	84.35	79.8	18

Table 38A. Probability (as %) that MMB < MMB_{35}, < 0.5 MMB_{35} (MSST), < 0.5MSST, MMA< MMA_{ave}, MMA< 0.25MMA_{ave}, TOTC>OFL, TOTC>ABC, RETC< $RETC_{ave}$, and CPUE<$CPUE_{ave}$ during the long-term (1 - 30yr) projection period for the state harvest control rule policy#4 (with the 0.2 harvest rate) and scenarios 1 to 18 under Hockey Stick SR model generated recruitment for WAG. Individual estimate from 500 Monte Carlo trials and 1-30yr projection years was considered for probability estimation. Sc.: scenario.

MMA<MMA_{ave}	MMB<MMB_{35}	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	MMA<0.25MMA_{ave}	RETC<$RETC_{ave}$	CPUE<$CPUE_{ave}$	Sc.
35.14	9.4733	0	0	0	0	0	64.5867	59.1933	1
28.58	3.7333	0	0	0	0	0	65.2067	59.38	2
54.1667	39.12	0.0933	0	0	0	0	70.42	62.0133	3
34.26	8.5667	0	0	0	0	0	64.6867	59.22	4
27.7533	3.24	0	0	0	0	0	65.3333	59.3933	5
53.34	38.2333	0.0733	0	0	0	0	70	61.86	6
38.6067	13.78	0	0	0	0	0	64.68	59.2	7
32.72	6.9667	0	0	0	0	0	64.78	59.32	8
58.3333	45.1	0.94	0	0	0.02	0	72.92	63.8867	9
35.1733	9.4533	0	0	0	0	0	64.7733	59.3933	10
28.86	3.7533	0	0	0	0	0	65.4467	59.6933	11
54.2733	39.1933	0.1067	0	0	0.0067	0	70.3933	62.14	12
34.46	8.6333	0	0	0	0	0	64.8133	59.3667	13
27.9667	3.2667	0	0	0	0	0	65.7067	59.7667	14
53.4933	38.2467	0.0533	0	0	0.0067	0	70.0067	61.9133	15
38.6467	13.9333	0	0	0	0	0	64.6733	59.3533	16
32.8533	7.14	0	0	0	0	0	65.1	59.4333	17
58.3333	45.06	0.9	0	0	0.02	0	72.9267	64.1133	18

Table 39A. Probability (as %) that MMB < MMB_{35}, < 0.5 MMB_{35} (MSST), < 0.5MSST, MMA< MMA_{ave}, MMA< 0.25MMA_{ave}, TOTC>OFL, TOTC>ABC, RETC< $RETC_{ave}$, and CPUE<$CPUE_{ave}$ during the short-term (1 - 8yr) projection period for the state harvest control rule policy#4 (with the 0.2 harvest rate) and scenarios 1 to 54 under Ricker SR model generated recruitment for WAG. Individual estimate from 500 Monte Carlo trials and 1-8yr projection years was considered for probability estimation. Sc.: scenario.

MMA<MMAave	MMB<MMB35	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	MMA<0.25MMAave	RETC<RETCave	CPUE<CPUEave	Sc.
31.95	6.175	0	0	0	0	0	80.4	76.475	1
25.6	2.45	0	0	0	0	0	81.625	76.95	2
51.75	33.05	0	0	0	0	0	82.95	77.825	3
31.35	5.75	0	0	0	0	0	80.6	76.425	4
24.875	2.075	0	0	0	0	0	81.875	77.075	5
51.025	32.325	0	0	0	0	0	82.85	77.75	6
36	9.925	0	0	0	0	0	80.325	76.3	7
29.925	4.625	0	0	0	0	0	80.775	76.75	8
55.025	38.2	0.025	0	0	0	0	84.1	79.05	9
31.875	6.025	0	0	0	0	0	81.35	77.275	10
25.975	2.325	0	0	0	0	0	82.35	77.925	11
51.825	33.3	0	0	0	0	0	83.05	78.425	12
31.325	5.55	0	0	0	0	0	81.025	77.275	13
25.05	2	0	0	0	0	0	82.725	78.15	14
50.975	32.475	0	0	0	0	0	82.85	78.275	15
35.825	9.65	0	0	0	0	0	81	76.75	16
30.05	4.675	0	0	0	0	0	81.525	77.425	17
55.1	38.25	0.025	0	0	0	0	84.15	79.65	18
87.5	75	0.425	0	0	0	0	100	99.375	19
87.5	75	0.175	0	0	0	0	100	99.425	20
86.275	73.525	4.875	0	0.025	0.025	0.075	99.875	98.05	21
87.5	75	0.375	0	0	0	0	100	99.4	22
87.5	75	0.175	0	0	0	0	100	99.425	23
86.375	73.65	4.45	0	0	0	0.05	99.925	98.15	24
87.5	75	0.65	0	0	0	0	100	99.3	25

Table 39A. Page 2 of 2.

MMA<MMAave	MMB<MMB35	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	MMA<0.25MMAave	RETC<RETCave	CPUE<CPUEave	Sc.
87.5	75	0.25	0	0	0	0	100	99.4	26
85.375	72.4	7.075	0	0.175	0.175	0.45	99.6	97.025	27
87.5	75	0.1	0	0	0	0	100	100	28
87.5	75	0	0	0	0	0	100	100	29
86.275	73.475	4.875	0	0.025	0.025	0.1	99.9	99.3	30
87.5	75	0.05	0	0	0	0	100	100	31
87.5	75	0	0	0	0	0	100	100	32
86.375	73.675	4.3	0	0	0	0.05	99.925	99.35	33
87.5	75	0.375	0	0	0	0	100	100	34
87.5	75	0.025	0	0	0	0	100	100	35
85.425	72.4	6.7	0	0.15	0.25	0.425	99.65	98.5	36
3.5	0.075	0	0	0	0	0	51.725	48.075	37
0.925	0	0	0	0	0	0	48.3	44.425	38
34.5	18.05	0	0	0	0	0	72.15	67.375	39
3.125	0.025	0	0	0	0	0	51.2	47.6	40
0.8	0	0	0	0	0	0	48.025	44.3	41
33.325	16.625	0	0	0	0	0	71.45	66.775	42
6.725	0.45	0	0	0	0	0	54.45	51.05	43
2.4	0.025	0	0	0	0	0	50.075	46.65	44
41.625	25.625	0	0	0	0	0	76.125	70.95	45
3.575	0.05	0	0	0	0	0	51.975	47.95	46
0.9	0	0	0	0	0	0	47.8	44.225	47
34.5	18.05	0	0	0	0	0	72.35	67.525	48
3.075	0.025	0	0	0	0	0	51.325	47.325	49
0.8	0	0	0	0	0	0	47.7	44.025	50
33.3	16.7	0	0	0	0	0	71.65	66.875	51
6.725	0.45	0	0	0	0	0	54.575	51.225	52
2.475	0.025	0	0	0	0	0	50.25	46.375	53
41.875	25.7	0	0	0	0	0	76.25	71.125	54

Table 40A. Probability (as %) that MMB < MMB_{35}, < 0.5 MMB_{35} (MSST), < 0.5MSST, MMA< MMA_{ave}, MMA< 0.25MMA_{ave}, TOTC>OFL, TOTC>ABC, RETC< $RETC_{ave}$, and CPUE<$CPUE_{ave}$ during the long-term (1 - 30yr) projection period for the state harvest control rule policy#4 (with the 0.2 harvest rate) and scenarios 1 to 54 under Ricker SR model generated recruitment for WAG. Individual estimate from 500 Monte Carlo trials and 1-30yr projection years was considered for probability estimation. Sc.: scenario.

MMA<MMAave	MMB<MMB35	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	MMA<0.25MMAave	RETC<RETCave	CPUE<CPUEave	Sc.
32.38	7.88	0	0	0	0	0	62.26	56.76	1
26.0933	2.9067	0	0	0	0	0	62.4067	56.6933	2
51.5	36.14	0.0667	0	0	0	0	68.1867	59.7467	3
31.7333	7.26	0	0	0	0	0	62.2733	56.7467	4
25.3	2.42	0	0	0	0	0	62.5333	56.5733	5
50.7	35.2733	0.0333	0	0	0.0067	0	67.8533	59.5333	6
36.2933	12.0067	0	0	0	0	0	62.2733	56.9	7
30.0933	5.9267	0	0	0	0	0	62.32	56.7133	8
55.6	41.7133	0.5333	0	0	0.02	0	70.5467	61.6	9
32.36	8.06	0	0	0	0	0	62.2533	57.0533	10
26.26	2.92667	0	0	0	0	0	62.8467	56.8867	11
51.5333	36.32	0.0533	0	0	0.0067	0	68.2933	60	12
31.7733	7.3333	0	0	0	0	0	62.2267	56.9667	13
25.3467	2.5133	0	0	0	0	0	63.0533	56.9	14
50.76	35.4333	0.02	0	0	0	0	67.9333	59.7267	15
36.24	11.9933	0	0	0	0	0	62.32	57.04	16
30.2867	5.9667	0	0	0	0	0	62.34	56.92	17
55.6333	41.8133	0.5067	0	0	0.0067	0	70.5333	61.8267	18
96.42	92.7267	1.3533	0	0	0.04	0	100	99.7467	19
96.6333	93.1933	0.9	0	0	0.0533	0	100	99.8467	20
88.3133	81.8133	7.8533	0	0.1733	0.3	0.2267	97.24	91.84	21
96.46	92.8133	1.2667	0	0	0.0467	0	100	99.7733	22
96.6467	93.22	0.8533	0	0	0.0667	0	100	99.8467	23
88.7333	82.3333	7.3133	0	0.1133	0.2333	0.16	97.4867	92.2733	24
96.02	91.9533	1.7933	0	0	0.04	0	99.98	99.4667	25

Table 40A. Page 2 of 2.

MMA<MMAave	MMB<MMB35	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	MMA<0.25MMAave	RETC<RETCave	CPUE<CPUEave	Sc.
96.52	92.9533	1.1333	0	0	0.0467	0	100	99.8267	26
86.1133	79.36	12.0867	0	0.7333	0.8867	0.9933	95.9733	89.1933	27
96.4067	92.7067	1.12	0	0	0.04	0	100	99.9333	28
96.6467	93.1933	0.56	0	0	0.04	0	100	100	29
88.3	81.7733	8.0067	0	0.1533	0.2267	0.22	97.2333	92.2533	30
96.44	92.84	1.0467	0	0	0.04	0	100	99.9467	31
96.6467	93.22	0.5133	0	0	0.0467	0	100	100	32
88.6667	82.3	7.2733	0	0.1	0.2	0.18	97.48	92.7267	33
95.9933	92.06	1.5267	0	0	0.0533	0	99.9733	99.66	34
96.5133	93.0067	0.8467	0	0	0.0733	0	100	99.9933	35
86.18	79.36	12.1533	0	0.74	0.8667	0.9733	95.9	89.7	36
1.4867	0.04	0	0	0	0	0	15.4133	14.0467	37
0.2667	0	0	0	0	0	0	13.12	12.0133	38
30.96	17.14	0	0	0	0	0	46.9467	40.3533	39
1.26	0.0267	0	0	0	0	0	15.0133	13.7733	40
0.2267	0	0	0	0	0	0	13.0067	11.9667	41
29.46	15.5867	0	0	0	0	0	45.62	39.2933	42
3.4267	0.3267	0	0	0	0	0	18.2333	16.6467	43
0.86	0.0067	0	0	0	0	0	14.2667	13.0867	44
38.7067	25.44	0.12	0	0	0	0	54.1467	46.2733	45
1.5133	0.0333	0	0	0	0	0	15.44	14.0867	46
0.26	0	0	0	0	0	0	13.0333	11.9733	47
30.94	17.22	0	0	0	0	0	46.9667	40.56	48
1.2467	0.02	0	0	0	0	0	15.08	13.6733	49
0.2267	0	0	0	0	0	0	12.9267	11.8733	50
29.4533	15.82	0	0	0	0	0	45.62	39.3867	51
3.4133	0.34	0	0	0	0	0	18.3933	16.8533	52
0.9133	0.0067	0	0	0	0	0	14.2733	13.0333	53
38.7867	25.4867	0.12	0	0	0.0133	0	54.18	46.5133	54

Table 41A. Probability (as %) that MMB < MMB_{35}, < 0.5 MMB_{35} (MSST), < 0.5MSST, MMA< MMA_{ave}, MMA< $0.25MMA_{ave}$, TOTC>OFL, TOTC>ABC, RETC< $RETC_{ave}$, and CPUE<$CPUE_{ave}$ during the long-term (1 - 30yr) projection period for the state harvest control rule policy#5 (with the 0.3 harvest rate) and scenarios 1 to 18 under Hockey Stick SR model generated recruitment for EAG. Individual estimate from 500 Monte Carlo trials and 1-30yr projection years was considered for probability estimation. Sc.: scenario.

MMA<MMAave	MMB<MMB35	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	MMA<0.25MMAave	RETC<RETCave	CPUE<CPUEave	Sc.
45.7533	26.1267	0	0	0	0	0	34.4467	77.34	1
25.5933	1.4533	0	0	0	0	0	5.3067	89.6533	2
52.1333	36.0333	0.2867	0	0	0	0	43.3733	74.2333	3
44.92	24.88	0	0	0	0	0	33.22	78.0133	4
24.7933	1.14667	0	0	0	0	0	4.52	89.78	5
51.0467	34.62	0.18	0	0	0	0	42.1267	74.5533	6
49.4533	32.2	0.0733	0	0	0	0	39.9933	75.2067	7
29.38	3.4533	0	0	0	0	0	8.8733	88.9	8
56.2667	42.54	1.7067	0	0.02	0.02	0.02	49.2333	73.2733	9
45.7667	26.1867	0	0	0	0	0	34.4533	77.02	10
25.6133	1.48	0	0	0	0	0	5.42	89.6	11
52.1067	36.0467	0.32	0	0	0	0	43.44	73.8533	12
45	24.9067	0	0	0	0	0	33.3	77.7333	13
24.7267	1.1267	0	0	0	0	0	4.6733	89.7333	14
51.0667	34.7133	0.2067	0	0	0	0	42.0267	7.2	15
49.44	32.12	0.0867	0	0	0	0	40.02	74.8733	16
29.3533	3.4733	0	0	0	0	0	8.9667	88.8267	17
56.2533	42.52	1.7	0	0.0133	0.0133	0.02	49.2	72.9533	18

Table 42A. Probability (as %) that MMB < MMB_{35}, < 0.5 MMB_{35} (MSST), < 0.5MSST, MMA< MMA_{ave}, MMA< 0.25MMA_{ave}, TOTC>OFL, TOTC>ABC, RETC< $RETC_{ave}$, and CPUE<$CPUE_{ave}$ during the long-term (1 - 30yr) projection period for the state harvest control rule policy#5 (with the 0.3 harvest rate) and scenarios 1 to 54 under Ricker SR model generated recruitment for EAG. Individual estimate from 500 Monte Carlo trials and 1-30yr projection years was considered for probability estimation. Sc.: scenario.

MMA<MMAave	MMB<MMB35	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	MMA<0.25MMAave	RETC<RETCave	CPUE<CPUEave	Sc.
47.1533	27.42	0	0	0	0	0	36.0867	78.48	1
34.16	2.7133	0	0	0	0	0	9.0067	89.8933	2
52.2	35.8933	0.24	0	0	0	0	43.58	74.36	3
46.5533	26.0933	0	0	0	0	0	34.9267	79.0133	4
33.5867	2.2067	0	0	0	0	0	8.18	89.9267	5
51.4467	34.6333	0.1467	0	0	0	0	42.5333	74.8467	6
50.1533	32.6667	0.0533	0	0	0	0	40.6667	75.7267	7
36.16	5.3667	0	0	0	0	0	13.0467	89.4133	8
55.6	41.1867	1.2267	0	0.0067	0.0067	0.0067	48.6533	73.1067	9
47.22	27.34	0	0	0	0	0	36.1533	78.22	10
34.0267	2.76	0	0	0	0	0	9.1133	89.82	11
52.22	35.8467	0.2467	0	0	0	0	43.66	74.0867	12
46.6067	26.0267	0	0	0	0	0	34.9733	78.7867	13
33.5867	2.2533	0	0	0	0	0	8.22	89.8467	14
51.48	34.6533	0.18	0	0	0	0	42.38	74.5067	15
50.16	32.5933	0.06	0	0	0	0	40.7133	75.3667	16
36.2333	5.3733	0	0	0	0	0	13.2333	89.34	17
55.6133	41.2267	1.2533	0	0.0067	0.0067	0.0067	48.6333	72.6933	18
88.96	82.26	6.9733	0	0.0067	0.0067	0.06	85.4533	90.04	19
93.3267	89.8067	4.02	0	0	0	0	87.5333	90.8133	20
85.6533	78.5	11.3	0	0.26	0.2667	0.4333	83.1467	88.6933	21
89.2867	82.8333	6.5533	0	0.02	0.02	0.0467	85.7733	90.2133	22
93.3267	89.8267	3.9933	0	0	0	0	87.5	90.8533	23
86.08	79.12	10.4133	0	0.1533	0.1667	0.3267	83.4933	89.0067	24
86.9467	79.9533	9.2933	0	0.1	0.12	0.18	84.1133	89.44	25

Table 42A. Page 2 of 2.

MMA<MMAave	MMB<MMB35	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	MMA<0.25MMAave	RETC<RETCave	CPUE<CPUEave	Sc.
93.26	89.5533	4.1133	0	0	0	0	87.6733	90.7667	26
83.6467	76.34	15.78	0	1.02	1.02	1.3867	81.5533	87.3067	27
88.96	82.26	6.9067	0	0.0067	0.0133	0.0533	85.46	89.5133	28
93.3267	89.8	3.9267	0	0	0	0	87.5267	90.0333	29
85.6867	78.4867	11.3467	0	0.2667	0.2733	0.4467	83.1467	88.2867	30
89.2667	82.82	6.56	0	0.0067	0.0067	0.0333	85.7733	89.66	31
93.3267	89.84	3.8933	0	0	0	0	87.4867	90.04	32
86.1	79.0867	10.4333	0	0.18	0.18	0.3133	83.4533	88.5867	33
86.94	79.9733	9.2933	0	0.0867	0.0867	0.2	84.1267	88.9667	34
93.26	89.5667	4.0267	0	0	0	0	87.6467	90.0067	35
83.7133	76.3667	16	0	0.9667	0.9867	1.3667	81.6267	86.9333	36
20.3467	7.5667	0	0	0	0	0	11.2733	56.3067	37
0.1933	0	0	0	0	0	0	0	59.44	38
31.9533	17.4	0.0333	0	0	0	0	23.5467	58.4333	39
18.6267	6.4533	0	0	0	0	0	9.9133	56.0533	40
0.12	0	0	0	0	0	0	0	59.9533	41
30.1533	15.5333	0.0067	0	0	0	0	21.54	57.9667	42
27.5333	12.9067	0	0	0	0	0	18.5867	57.3667	43
0.7133	0	0	0	0	0	0	0.02	58.1067	44
39.6267	25.8533	0.3333	0	0	0	0	31.96	60.4933	45
20.36	7.5467	0	0	0	0	0	11.3133	56.0267	46
0.1933	0	0	0	0	0	0	0	59.54	47
31.94	17.3867	0.02	0	0	0	0	23.6533	58.2	48
18.72	6.4533	0	0	0	0	0	10.0333	55.82	49
0.1267	0	0	0	0	0	0	0	60.0467	50
30.1733	15.5933	0.0067	0	0	0	0	21.58	57.7067	51
27.5133	12.84	0	0	0	0	0	18.7133	57.0867	52
0.72	0	0	0	0	0	0	0.0267	57.8467	53
39.6733	25.8467	0.3467	0	0	0	0	31.92	60.2267	54

Table 43A. Probability (as %) that MMB < MMB$_{35}$, < 0.5 MMB$_{35}$ (MSST), < 0.5MSST, MMA< MMA$_{ave}$, MMA< 0.25MMA$_{ave}$, TOTC>OFL, TOTC>ABC, RETC< RETC$_{ave}$, and CPUE<CPUE$_{ave}$ during the long-term (1 - 30yr) projection period for the state harvest control rule policy#5 (with the 0.3 harvest rate) and scenarios 1 to 18 under Hockey Stick SR model generated recruitment for WAG. Individual estimate from 500 Monte Carlo trials and 1-30yr projection years was considered for probability estimation. Sc.: scenario.

MMA<MMA$_{ave}$	MMB<MMB$_{35}$	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	MMA<0.25MMA$_{ave}$	RETC<RETC$_{ave}$	CPUE<CPUE$_{ave}$	Sc.
34.7	9.48	0	0	0	0	0	64.6533	58.2067	1
28.3067	3.7267	0	0	0	0	0	65.62	57.9533	2
55.4867	42.1067	0.4067	0	0	0.06	0	69.7533	64.6667	3
34.0333	8.6067	0	0	0	0	0	64.8133	58.14	4
27.4333	3.2333	0	0	0	0	0	65.6467	57.92	5
54.52	41.02	0.2733	0	0	0.0133	0	69.4	64.2667	6
38.4867	14.1867	0	0	0	0	0	64.6733	58.6067	7
32.42	7	0	0	0	0	0	64.8933	58.0533	8
59.7933	48.6067	2.1933	0	0.0467	0.14	0.0467	72.6467	67.4667	9
34.8933	9.5733	0	0	0	0	0	64.82	58.3467	10
28.5267	3.7067	0	0	0	0	0	65.86	58.1133	11
55.5333	42.2133	0.4067	0	0	0.0533	0	69.76	64.6467	12
34.1867	8.64	0	0	0	0	0	64.8667	58.3867	13
27.6533	3.2333	0	0	0	0	0	65.9533	58.1267	14
54.7133	40.9667	0.26	0	0	0.0067	0	69.4667	64.2733	15
38.52	14.2067	0	0	0	0	0	64.6667	58.64	16
32.6	7.1733	0	0	0	0	0	65.0333	58.3533	17
59.8133	48.6333	2.2267	0	0.0333	0.1	0.0333	72.76	67.58	18

Table 44A. Probability (as %) that MMB < MMB_{35}, < 0.5 MMB_{35} (MSST), < 0.5MSST, MMA< MMA_{ave}, MMA< 0.25MMA_{ave}, TOTC>OFL, TOTC>ABC, RETC< $RETC_{ave}$, and CPUE<$CPUE_{ave}$ during the long-term (1 - 30yr) projection period for the state harvest control rule policy#5 (with the 0.3 harvest rate) and scenarios 1 to 54 under Ricker SR model generated recruitment for WAG. Individual estimate from 500 Monte Carlo trials and 1-30yr projection years was considered for probability estimation. Sc.: scenario.

MMA<MMAave	MMB<MMB35	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	MMA<0.25MMAave	RETC<RETCave	CPUE<CPUEave	Sc.
32.2067	8.0133	0	0	0	0	0	62.3933	55.7667	1
25.7533	2.8533	0	0	0	0	0	63	55.2133	2
52.2867	38.74	0.26	0	0	0.0333	0	67.26	62.1467	3
31.4333	7.2867	0	0	0	0	0	62.38	55.5733	4
24.9667	2.4133	0	0	0	0	0	62.98	55.0267	5
51.4867	37.76	0.18	0	0	0.0133	0	66.9533	61.68	6
36.0933	12.32	0	0	0	0	0	62.4267	56.3533	7
29.86	5.9533	0	0	0	0	0	62.56	55.6267	8
56.7	44.6	1.2867	0	0.0133	0.1133	0.0133	70.0667	64.78	9
32.2333	8.0533	0	0	0	0	0	62.4933	56.0533	10
25.8933	2.9067	0	0	0	0	0	63.14	55.52	11
52.3533	38.8	0.2267	0	0	0.0267	0	67.28	62.2467	12
31.5933	7.42	0	0	0	0	0	62.6133	56	13
24.9467	2.5	0	0	0	0	0	63.2467	55.4867	14
51.5133	37.78	0.1867	0	0	0.02	0	66.96	61.8133	15
36.1133	12.32	0	0	0	0	0	62.3733	56.3867	16
30.0533	6.0067	0	0	0	0	0	62.5	55.82	17
56.7	44.66	1.28	0	0	0.06	0	69.9467	64.8	18
96.3467	92.5533	7.0133	0	0	0.3267	0	99.9933	99.92	19
96.6	93.1467	7.0067	0	0	0.2733	0	100	100	20
88.0533	82.3333	13.4467	0	0.5867	1.08	0.68	96.3267	93.22	21
96.3933	92.6533	7.0267	0	0	0.2667	0	100	99.9333	22
96.62	93.1533	7	0	0	0.3933	0	100	100	23
88.4333	82.72	12.8333	0	0.4867	1.0067	0.54	96.5933	93.5733	24
95.8467	91.7	7.2467	0	0	0.3467	0	99.9467	99.72	25

Table 44A. Page 2 of 2.

MMA<MMAave	MMB<MMB35	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	MMA<0.25MMAave	RETC<RETCave	CPUE<CPUEave	Sc.
96.4933	92.84	7.0333	0	0	0.2867	0	100	99.9733	26
86.04	80.0933	18.4067	0	1.6133	2.1067	1.7733	94.88	90.96	27
96.3467	92.5533	6.9267	0	0	0.3	0	99.9933	99.9467	28
96.6067	93.14	6.94	0	0	0.36	0	100	100	29
88.1133	82.2467	13.4867	0	0.5067	0.9133	0.6	96.34	93.26	30
96.4133	92.6267	6.9	0	0	0.2533	0	100	99.9467	31
96.6267	93.1533	6.9	0	0	0.2933	0	100	100	32
88.3867	82.6933	12.7733	0	0.38	0.8533	0.46	96.6267	93.6867	33
95.8067	91.72	7.0867	0	0	0.2933	0	99.94	99.72	34
96.4733	92.8867	6.9133	0	0	0.38	0	100	99.9867	35
86.0867	80.0533	18.4	0	1.58	2.0933	1.76	94.8533	90.9467	36
1.48	0.04	0	0	0	0	0	15.62	13.8867	37
0.26	0	0	0	0	0	0	13.2467	11.9267	38
31.9	19.28	0.02	0	0	0	0	46.86	42.4133	39
1.26	0.0267	0	0	0	0	0	15.2533	13.54	40
0.2267	0	0	0	0	0	0	13.1333	11.8333	41
30.4467	17.7	0.0133	0	0	0.02	0	45.7867	41.24	42
3.36	0.3667	0	0	0	0	0	18.5067	16.38	43
0.8533	0.0067	0	0	0	0	0	14.44	12.9333	44
40.06	28.3733	0.3933	0	0	0.0267	0	54.2333	49.2	45
1.5067	0.0333	0	0	0	0	0	15.6467	13.84	46
0.26	0	0	0	0	0	0	13.2333	11.9133	47
32	19.4267	0.02	0	0	0.0067	0	46.98	42.52	48
1.2333	0.02	0	0	0	0	0	15.24	13.44	49
0.2333	0	0	0	0	0	0	13.0533	11.76	50
30.5133	17.7733	0.0067	0	0	0.0067	0	45.8067	41.32	51
3.4133	0.3467	0	0	0	0	0	18.5	16.56	52
0.8867	0.0067	0	0	0	0	0	14.4867	12.84	53
40.1133	28.4333	0.3533	0	0	0.0333	0	54.14	49.2467	54

Table 45A. Probability (as %) that $MMB < MMB_{35}$, $< 0.5\ MMB_{35}$ (MSST), < 0.5MSST, $MMA < MMA_{ave}$, $MMA < 0.25MMA_{ave}$, TOTC>OFL, TOTC>ABC, $RETC < RETC_{ave}$, and $CPUE < CPUE_{ave}$ during the long-term (1 - 30yr) projection period for the state harvest control rule policy#6 (with the 0.1 harvest rate) and scenarios 1 to 18 under Hockey Stick SR model generated recruitment for EAG. Individual estimate from 500 Monte Carlo trials and 1-30yr projection years was considered for probability estimation. Sc.: scenario.

$MMA<MMA_{ave}$	$MMB<MMB_{35}$	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	$MMA<0.25MMA_{ave}$	$RETC<RETC_{ave}$	$CPUE<CPUE_{ave}$	Sc.
22.7867	1.726666667	0	0	0	0	0	52.12	45.1267	1
0.6467	0	0	0	0	0	0	45.1867	38.8867	2
32.8133	6.906666667	0	0	0	0	0	55.5867	47.6	3
21.3333	1.326666667	0	0	0	0	0	51.7733	44.8533	4
0.5067	0	0	0	0	0	0	45.02	38.7867	5
31.2933	5.693333333	0	0	0	0	0	54.96	47.58	6
28.5933	4.133333333	0	0	0	0	0	54.0333	46.9533	7
1.8467	0	0	0	0	0	0	46.0333	39.68	8
39.4267	13.14666667	0.0133	0	0	0	0	58.8667	50.3333	9
22.7333	1.673333333	0	0	0	0	0	52.1533	45.1133	10
0.64	0	0	0	0	0	0	45.4267	38.94	11
32.9067	6.953333333	0	0	0	0	0	55.6733	47.9867	12
21.4267	1.32	0	0	0	0	0	51.8867	44.8467	13
0.5133	0	0	0	0	0	0	45.24	38.8733	14
31.2667	5.713333333	0	0	0	0	0	54.9467	47.58	15
28.6733	4.213333333	0	0	0	0	0	54.08	46.8733	16
1.8667	0	0	0	0	0	0	46.1067	39.7	17
39.36	13.14	0.0133	0	0	0	0	58.92	50.5	18

Table 46A. Probability (as %) that MMB < MMB_{35}, < 0.5 MMB_{35} (MSST), < 0.5MSST, MMA< MMA_{ave}, MMA< 0.25MMA_{ave}, TOTC>OFL, TOTC>ABC, RETC< $RETC_{ave}$, and CPUE<CPUEave during the long-term (1 - 30yr) projection period for the state harvest control rule policy#6 (with the 0.1 harvest rate) and scenarios 1 to 54 under Ricker SR model generated recruitment for EAG. Individual estimate from 500 Monte Carlo trials and 1-30yr projection years was considered for probability estimation. Sc.: scenario.

MMA<MMAave	MMB<MMB35	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	MMA<0.25MMAave	RETC<RETCave	CPUE<CPUEave	Sc.
25.08	1.8867	0	0	0	0	0	55.38	48.0333	1
1.5533	0	0	0	0	0	0	56.9	49.0667	2
34.5133	7.0533	0	0	0	0	0	57.4333	49.7267	3
23.8333	1.4733	0	0	0	0	0	55.0467	47.94	4
1.2267	0	0	0	0	0	0	57.24	49.3067	5
33.0067	5.9467	0	0	0	0	0	56.9067	49.52	6
30.7267	4.3667	0	0	0	0	0	56.3933	49.02	7
3.4467	0	0	0	0	0	0	55.9733	48.3467	8
40.18	13.3467	0.0133	0	0	0	0	60.18	51.2067	9
25.12	1.92	0	0	0	0	0	55.3533	48.0867	10
1.5467	0	0	0	0	0	0	57.0267	49.3333	11
34.5733	7.18	0	0	0	0	0	57.4867	49.8133	12
23.8867	1.48	0	0	0	0	0	55.06	48.0867	13
1.2733	0	0	0	0	0	0	57.2733	49.5667	14
32.9667	5.9667	0	0	0	0	0	56.9933	49.46	15
30.7	4.42	0	0	0	0	0	56.3867	48.9733	16
3.4933	0	0	0	0	0	0	55.96	48.4467	17
40.1933	13.34	0.0067	0	0	0	0	60.1867	51.2867	18
86.1867	66.4467	0.0133	0	0	0	0	93.1267	82.98	19
90	78.74	0	0	0	0	0	93.3333	83.3533	20
82.48	63.14	0.3333	0	0.0067	0.0067	0.0133	92.2133	81.2467	21
86.7133	66.94	0.0133	0	0	0	0	93.1867	83.1533	22
90	78.9067	0	0	0	0	0	93.3333	83.3533	23
83.04	63.5467	0.2333	0	0	0	0.0067	92.4	81.6133	24
83.9933	64.4133	0.12	0	0	0	0	92.66	82.0733	25

Table 46A. Page 2 of 2.

MMA<MMAave	MMB<MMB35	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	MMA<0.25MMAave	RETC<RETCave	CPUE<CPUEave	Sc.
90	77.58	0	0	0	0	0	93.3333	83.3933	26
80.0533	61.8133	1.5933	0	0.0667	0.0667	0.16	90.96	79.4267	27
86.2067	66.54	0.0133	0	0	0	0	93.12	82.9	28
90	78.8	0	0	0	0	0	93.3333	83.3333	29
82.5133	63.2267	0.3667	0	0.0067	0.0067	0.0133	92.2067	81.18	30
86.7133	67.06	0.0133	0	0	0	0	93.18	83.0333	31
90	79.0133	0	0	0	0	0	93.3333	83.3333	32
83.0467	63.6733	0.2	0	0	0	0.0067	92.3867	81.5067	33
83.96	64.5067	0.1	0	0	0	0	92.6733	82.0267	34
90	77.5533	0	0	0	0	0	93.3333	83.3333	35
80.0133	61.92	1.5867	0	0.08	0.08	0.1667	90.9467	79.3133	36
5.1867	0.1	0	0	0	0	0	21.0267	18.7667	37
0	0	0	0	0	0	0	0.1933	0.2533	38
14.3067	1.3333	0	0	0	0	0	32.2467	28.4267	39
4.2267	0.0467	0	0	0	0	0	19.26	17.5333	40
0	0	0	0	0	0	0	0.1133	0.1733	41
12.5867	0.98	0	0	0	0	0	30.4133	26.8533	42
9.9933	0.5467	0	0	0	0	0	27.86	24.5533	43
0	0	0	0	0	0	0	0.7	0.7933	44
22.8333	4.34	0	0	0	0	0	39.7333	34.18	45
5.1733	0.1067	0	0	0	0	0	20.9733	18.8333	46
0	0	0	0	0	0	0	0.1867	0.2667	47
14.2667	1.36	0	0	0	0	0	32.2733	28.4133	48
4.2733	0.0533	0	0	0	0	0	19.3333	17.64	49
0	0	0	0	0	0	0	0.12	0.1733	50
12.5533	1	0	0	0	0	0	30.5	26.9133	51
10.0467	0.5667	0	0	0	0	0	27.94	24.6267	52
0	0	0	0	0	0	0	0.68	0.78	53
22.8333	4.4333	0	0	0	0	0	39.78	34.1267	54

Table 47A. Probability (as %) that MMB < MMB_{35}, < 0.5 MMB_{35} (MSST), < 0.5MSST, MMA< MMA_{ave}, MMA< 0.25MMA_{ave}, TOTC>OFL, TOTC>ABC, RETC< $RETC_{ave}$, and CPUE<CPUEave during the long-term (1 - 30yr) projection period for the state harvest control rule policy#6 (with the 0.1 harvest rate) and scenarios 1 to 18 under Hockey Stick SR model generated recruitment for WAG. Individual estimate from 500 Monte Carlo trials and 1-30yr projection years was considered for probability estimation. Sc.: scenario.

MMA<MMA_{ave}	MMB<MMB_{35}	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	MMA<0.25MMA_{ave}	RETC<$RETC_{ave}$	CPUE<$CPUE_{ave}$	Sc.
4.86	0	0	0	0	0	0	96.8733	6.94	1
1.24	0	0	0	0	0	0	99.1533	6.2	2
38.26	11.4867	0	0	0	0	0	81.9133	28.9067	3
4.3067	0	0	0	0	0	0	97.1933	6.7667	4
1.06	0	0	0	0	0	0	99.2933	6.2067	5
36.94	10.2333	0	0	0	0	0	82.1667	27.5267	6
8.74	0.02	0	0	0	0	0	94.56	8.0733	7
3.1933	0	0	0	0	0	0	97.9467	6.5333	8
45.1533	19.6733	0.06	0	0	0	0	81.4467	35.58	9
4.88	0	0	0	0	0	0	96.8867	7.2267	10
1.2133	0	0	0	0	0	0	99.1933	6.7267	11
38.4067	11.5067	0	0	0	0	0	81.8867	29.48	12
4.3267	0	0	0	0	0	0	97.28	7.1667	13
0.9933	0	0	0	0	0	0	99.34	6.7133	14
36.9333	10.2533	0	0	0	0	0	82.1067	28.2133	15
8.7933	0.02	0	0	0	0	0	94.7	8.48	16
3.18	0	0	0	0	0	0	98.02	6.9467	17
45.1933	19.92	0.0533	0	0	0	0	81.52	36.3067	18

Table 48A. Probability (as %) that MMB < MMB_{35}, < 0.5 MMB_{35} (MSST), < 0.5MSST, MMA< MMA_{ave}, MMA< 0.25MMA_{ave}, TOTC>OFL, TOTC>ABC, RETC< $RETC_{ave}$, and CPUE<CPUEave during the long-term (1 - 30yr) projection period for the state harvest control rule policy#6 (with the 0.1 harvest rate) and scenarios 1 to 54 under Ricker SR model generated recruitment for WAG. Individual estimate from 500 Monte Carlo trials and 1-30yr projection years was considered for probability estimation. Sc.: scenario.

MMA<MMAave	MMB<MMB35	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	MMA<0.25MMAave	RETC<RETCave	CPUE<CPUEave	Sc.
4.3467	0	0	0	0	0	0	96.5	6.84	1
1.0867	0	0	0	0	0	0	99.04	6.2	2
36.3067	9.92	0	0	0	0	0	80.9467	27.4	3
3.7733	0	0	0	0	0	0	96.8667	6.7	4
0.9	0	0	0	0	0	0	99.1667	6.2	5
35.1533	8.64	0	0	0	0	0	81.2067	26.2067	6
7.9667	0.0133	0	0	0	0	0	94.0467	7.8733	7
2.8133	0	0	0	0	0	0	97.6267	6.4533	8
43.1333	17.6333	0.02	0	0	0	0	80.4533	33.8133	9
4.36	0	0	0	0	0	0	96.4667	7.1733	10
1.0067	0	0	0	0	0	0	99.0467	6.72	11
36.5467	9.92	0	0	0	0	0	80.8133	28.1	12
3.8267	0	0	0	0	0	0	96.9	7.06	13
0.82	0	0	0	0	0	0	99.1933	6.7	14
35.2	8.7733	0	0	0	0	0	81.1333	26.8867	15
7.9933	0.0133	0	0	0	0	0	94.1	8.2067	16
2.88	0	0	0	0	0	0	97.6667	6.88	17
43.2533	17.8333	0.02	0	0	0	0	80.3267	34.7467	18
95.6533	86.16	0	0	0	0	0	100	88.34	19
95.9067	88.0333	0	0	0	0	0	100	88.88	20
87.2333	71.6667	1.0067	0	0.0133	0.0133	0.0333	99.5067	76.88	21
95.6733	86.46	0	0	0	0	0	100	88.4133	22
95.92	88.1333	0	0	0	0	0	100	88.9667	23
87.7667	72.1267	0.8	0	0.0133	0.0133	0.0333	99.5733	77.2533	24
95.3	84.1467	0	0	0	0	0	100	87.48	25

Table 48A. Page 2 of 2.

MMA<MMAave	MMB<MMB35	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	MMA<0.25MMAave	RETC<RETCave	CPUE<CPUEave	Sc.
95.7733	87.02	0	0	0	0	0	100	88.6467	26
84.9867	69.6067	2.92	0	0.1533	0.1533	0.26	98.7733	74.7133	27
95.8267	86.58	0	0	0	0	0	100	89.3	28
96.1267	88.4533	0	0	0	0	0	100	89.84	29
87.2533	71.8133	0.9133	0	0.0067	0.0067	0.0333	99.5133	77.7467	30
95.8667	86.9	0	0	0	0	0	100	89.3667	31
96.1533	88.5667	0	0	0	0	0	100	89.88	32
87.7933	72.2333	0.7133	0	0.0067	0.0067	0.02	99.58	78.1467	33
95.4467	84.56	0	0	0	0	0	100	88.5133	34
95.9533	87.5133	0	0	0	0	0	100	89.5867	35
84.9867	69.8	2.8867	0	0.12	0.12	0.2267	98.82	75.5867	36
0.0267	0	0	0	0	0	0	34.82	6.4	37
0	0	0	0	0	0	0	29.2733	6.36	38
15.78	2.1533	0	0	0	0	0	56.5467	14.1467	39
0.02	0	0	0	0	0	0	34.1267	6.4	40
0	0	0	0	0	0	0	28.6467	6.36	41
14.18	1.6533	0	0	0	0	0	55.7333	13.38	42
0.1467	0	0	0	0	0	0	38.4533	6.4467	43
0.0067	0	0	0	0	0	0	32.4933	6.36	44
25.4667	6.5267	0	0	0	0	0	61.7	20.7867	45
0.0333	0	0	0	0	0	0	35	6.6733	46
0	0	0	0	0	0	0	29.2867	6.6667	47
15.88	2.1267	0	0	0	0	0	56.4933	14.6267	48
0.02	0	0	0	0	0	0	34.3867	6.6667	49
0	0	0	0	0	0	0	28.7533	6.6667	50
14.3733	1.6733	0	0	0	0	0	55.6533	13.62	51
0.1533	0	0	0	0	0	0	38.6733	6.68	52
0.0067	0	0	0	0	0	0	32.76	6.6667	53
25.6133	6.6133	0	0	0	0	0	61.62	21.3267	54

Table 49A. Probability (as %) that MMB < MMB_{35}, < 0.5 MMB_{35} (MSST), < 0.5MSST, MMA< MMA_{ave}, MMA< 0.25MMA_{ave}, TOTC>OFL, TOTC>ABC, RETC< $RETC_{ave}$, and CPUE<CPUEave during the long-term (1 - 30yr) projection period for the state harvest control rule policy#7 (with the 0.125 harvest rate) and scenarios 1 to 18 under Hockey Stick SR model generated recruitment for EAG. Individual estimate from 500 Monte Carlo trials and 1-30yr projection years was considered for probability estimation. Sc.: scenario.

$MMA<MMA_{ave}$	$MMB<MMB_{35}$	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	$MMA<0.25MMA_{ave}$	$RETC<RETC_{ave}$	$CPUE<CPUE_{ave}$	Sc.
31.8467	5.2867	0	0	0	0	0	35.9067	60.58	1
5.5267	0	0	0	0	0	0	10.8667	77.3	2
40.04	13.8533	0	0	0	0	0	44.4933	58.9067	3
30.6333	4.46	0	0	0	0	0	34.56	61.0533	4
4.8667	0	0	0	0	0	0	10.0533	77.7733	5
38.9	12.34	0	0	0	0	0	43.0333	58.9733	6
37.0333	10.0133	0	0	0	0	0	41.12	59.34	7
8.98	0	0	0	0	0	0	14.6467	74.8	8
45.5667	20.82	0.0733	0	0	0	0	50.4733	59.2067	9
31.86	5.38	0	0	0	0	0	35.8467	60.58	10
5.5867	0	0	0	0	0	0	11.08	77.3467	11
40.1733	13.9267	0	0	0	0	0	44.4867	58.8067	12
30.6733	4.5267	0	0	0	0	0	34.6533	61.06	13
4.94	0	0	0	0	0	0	10.3333	77.7867	14
38.9467	12.32	0	0	0	0	0	43.0667	58.9267	15
37.08	10.0933	0	0	0	0	0	41.1533	59.3333	16
9.1067	0	0	0	0	0	0	14.6733	74.86	17
45.5867	20.8733	0.06	0	0	0	0	50.4933	59.3133	18

Table 50A. Probability (as %) that MMB < MMB_{35}, < 0.5 MMB_{35} (MSST), < 0.5MSST, MMA< MMA_{ave}, MMA< 0.25MMA_{ave}, TOTC>OFL, TOTC>ABC, RETC< $RETC_{ave}$, and CPUE<CPUEave during the long-term (1 - 30yr) projection period for the state harvest control rule policy#7 (with the 0.125 harvest rate) and scenarios 1 to 54 under Ricker SR model generated recruitment for EAG. Individual estimate from 500 Monte Carlo trials and 1-30yr projection years was considered for probability estimation. Sc.: scenario.

MMA<MMAave	MMB<MMB35	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	MMA<0.25MMAave	RETC<RETCave	CPUE<CPUEave	Sc.
34.6067	5.7933	0	0	0	0	0	38.72	62.9267	1
9.96	0	0	0	0	0	0	18.2667	79.76	2
41.26	14.2133	0	0	0	0	0	46.1133	60.1667	3
33.4933	4.9667	0	0	0	0	0	37.8	63.5867	4
9.06	0	0	0	0	0	0	17.48	80.1733	5
40.2333	12.7133	0	0	0	0	0	44.9667	60.48	6
38.64	10.4933	0	0	0	0	0	43.04	61.04	7
13.4533	0	0	0	0	0	0	21.4267	77.98	8
46.18	20.8267	0.0467	0	0	0	0	51.4	59.88	9
34.5733	5.8667	0	0	0	0	0	38.8333	63.04	10
10	0	0	0	0	0	0	18.2933	79.68	11
41.32	14.2667	0	0	0	0	0	46.18	60.1867	12
33.5333	4.9867	0	0	0	0	0	37.8733	63.6333	13
9.1933	0	0	0	0	0	0	17.5467	80.0533	14
40.2533	12.9	0	0	0	0	0	45.0867	60.44	15
38.7467	10.5933	0	0	0	0	0	43.1267	61.0933	16
13.5267	0	0	0	0	0	0	21.66	78.1067	17
46.1867	20.8133	0.0533	0	0	0	0	51.48	59.9267	18
87.6133	73.0467	0.04	0	0	0	0	91.4933	85.8533	19
90.0333	83.12	0	0	0	0	0	91.7667	86.6667	20
84.4267	68.4067	0.82	0	0.0067	0.0067	0.02	90.08	84.0333	21
88.02	73.7867	0.0267	0	0	0	0	91.5933	86.0133	22
90.0133	83.18	0	0	0	0	0	91.7533	86.6667	23
84.9733	69.0867	0.62	0	0.0067	0.0067	0.02	90.3267	84.3267	24
85.74	70.1467	0.3333	0	0	0	0.0067	90.7467	84.9733	25

Table 50A. Page 2 of 2.

MMA<MMAave	MMB<MMB35	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	MMA<0.25MMAave	RETC<RETCave	CPUE<CPUEave	Sc.
90.1	82.74	0	0	0	0	0	91.8267	86.6667	26
82.5467	66.3067	2.64	0	0.1133	0.1133	0.24	88.7667	82.3267	27
87.6933	73.0667	0.0333	0	0	0	0	91.5267	85.84	28
90.04	83.14	0	0	0	0	0	91.7667	86.6667	29
84.4267	68.3933	0.8467	0	0.0067	0.0067	0.02	90.1	84.0333	30
88.06	73.8867	0.0267	0	0	0	0	91.5867	86	31
90.0333	83.2067	0	0	0	0	0	91.76	86.6667	32
84.9533	69.1267	0.6067	0	0.0067	0.0067	0.02	90.3467	84.3467	33
85.72	70.2	0.34	0	0	0	0	90.76	84.9733	34
90.08	82.7267	0	0	0	0	0	91.8067	86.6667	35
82.52	66.2467	2.7133	0	0.1	0.1	0.26	88.74	82.38	36
9.5733	0.54	0	0	0	0	0	10.5067	34.4467	37
0	0	0	0	0	0	0	0	9.8067	38
20.44	3.62	0	0	0	0	0	22.3333	40.08	39
8.28	0.3867	0	0	0	0	0	9.1933	33.68	40
0	0	0	0	0	0	0	0	8.8867	41
18.5667	2.9267	0	0	0	0	0	20.2	39.1733	42
15.7133	1.96	0	0	0	0	0	17.2467	37.8067	43
0.0133	0	0	0	0	0	0	0.0267	14.1867	44
28.34	8.78	0	0	0	0	0	31.2	43.7333	45
9.5667	0.5467	0	0	0	0	0	10.56	34.5133	46
0	0	0	0	0	0	0	0	9.96	47
20.4733	3.6467	0	0	0	0	0	22.3933	40.1333	48
8.3667	0.4133	0	0	0	0	0	9.3133	33.7	49
0	0	0	0	0	0	0	0	9.0133	50
18.58	2.94	0	0	0	0	0	20.3	39.2	51
15.7533	1.92	0	0	0	0	0	17.2933	38	52
0.0133	0	0	0	0	0	0	0.0267	14.28	53
28.36	8.8067	0	0	0	0	0	31.2	43.7533	54

Table 51A. Probability (as %) that MMB < MMB_{35}, < 0.5 MMB_{35} (MSST), < 0.5MSST, MMA< MMA_{ave}, MMA< 0.25MMA_{ave}, TOTC>OFL, TOTC>ABC, RETC< $RETC_{ave}$, and CPUE<CPUEave during the long-term (1 - 30yr) projection period for the state harvest control rule policy#7 (with the 0.125 harvest rate) and scenarios 1 to 18 under Hockey Stick SR model generated recruitment for WAG. Individual estimate from 500 Monte Carlo trials and 1-30yr projection years was considered for probability estimation. Sc.: scenario.

MMA<MMA_{ave}	MMB<MMB_{35}	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	MMA<0.25MMA_{ave}	RETC<$RETC_{ave}$	CPUE<$CPUE_{ave}$	Sc.
15.6733	0.14	0	0	0	0	0	83.2867	21.0733	1
8.2133	0	0	0	0	0	0	88.7067	15.9067	2
45.6667	21.2	0	0	0	0	0	75.0067	42.3733	3
14.6467	0.1133	0	0	0	0	0	83.8533	20.5133	4
7.5467	0	0	0	0	0	0	89.42	15.3733	5
44.8267	19.7733	0	0	0	0	0	74.8933	41.6667	6
20.8867	0.6933	0	0	0	0	0	80.4067	24.76	7
12.72	0.04	0	0	0	0	0	85.1867	19.0467	8
51.2133	29.5667	0.1533	0	0	0	0	76.3467	46.7333	9
15.68	0.1733	0	0	0	0	0	83.3667	21.4067	10
8.32	0	0	0	0	0	0	89.2133	15.92	11
45.7933	21.3533	0	0	0	0	0	75.0933	42.78	12
14.7267	0.1133	0	0	0	0	0	84.0133	20.7133	13
7.6	0	0	0	0	0	0	89.84	15.46	14
44.8933	19.9533	0	0	0	0	0	74.9067	42.0467	15
21.0133	0.6467	0	0	0	0	0	80.58	25.2267	16
12.8333	0.0467	0	0	0	0	0	85.36	19.1333	17
51.3267	29.7333	0.1267	0	0	0	0	76.3933	46.9467	18

Table 52A. Probability (as %) that MMB < MMB_{35}, < 0.5 MMB_{35} (MSST), < 0.5MSST, MMA< MMA_{ave}, MMA< 0.25MMA_{ave}, TOTC>OFL, TOTC>ABC, RETC< $RETC_{ave}$, and CPUE<CPUEave during the long-term (1 - 30yr) projection period for the state harvest control rule policy#7 (with the 0.125 harvest rate) and scenarios 1 to 54 under Ricker SR model generated recruitment for WAG. Individual estimate from 500 Monte Carlo trials and 1-30yr projection years was considered for probability estimation. Sc.: scenario.

MMA<MMAave	MMB<MMB35	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	MMA<0.25MMAave	RETC<RETCave	CPUE<CPUEave	Sc.
14.2267	0.1	0	0	0	0	0	81.8533	20.1467	1
7.2733	0	0	0	0	0	0	87.0733	15.1867	2
43.84	19.1667	0	0	0	0	0	73.4733	40.68	3
13.44	0.06	0	0	0	0	0	82.4733	19.5733	4
6.6467	0	0	0	0	0	0	87.8333	14.7267	5
42.9067	17.6533	0	0	0	0	0	73.2467	39.9333	6
19.26	0.5267	0	0	0	0	0	78.7333	23.6	7
11.3533	0.02	0	0	0	0	0	83.74	18.1533	8
49.2467	27.1533	0.1	0	0	0	0	74.8133	44.82	9
14.36	0.0867	0	0	0	0	0	81.8867	20.28	10
7.3	0	0	0	0	0	0	87.56	15.28	11
43.88	19.4267	0	0	0	0	0	73.4667	41.02	12
13.44	0.06	0	0	0	0	0	82.5333	19.66	13
6.5533	0	0	0	0	0	0	88.2133	14.76	14
42.86	17.9533	0	0	0	0	0	73.3133	40.34	15
19.3333	0.46	0	0	0	0	0	78.86	23.8333	16
11.5933	0.0333	0	0	0	0	0	83.7867	18.1933	17
49.2667	27.3467	0.06	0	0	0	0	74.8733	44.92	18
96.5	90.12	0	0	0	0	0	100	92.08	19
96.6667	90.6133	0	0	0	0	0	100	92.2933	20
88.3733	77.52	2.2067	0	0.0333	0.0333	0.0733	98.92	81.8733	21
96.5333	90.2267	0	0	0	0	0	100	92.1	22
96.6667	90.6133	0	0	0	0	0	100	92.2867	23
88.7467	78.0333	1.8333	0	0.0333	0.0467	0.06	99.0933	82.4133	24
96.1467	89.44	0.02	0	0	0	0	100	91.5733	25

Table 52A. Page 2 of 2.

MMA<MMAave	MMB<MMB35	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	MMA<0.25MMAave	RETC<RETCave	CPUE<CPUEave	Sc.
96.6067	90.44	0	0	0	0	0	100	92.2	26
85.9	75.1133	4.8067	0	0.2667	0.2667	0.38	97.92	79.54	27
96.52	90.0533	0	0	0	0	0	100	92.6467	28
96.6667	90.28	0	0	0	0	0	100	93.06	29
88.3067	77.76	2.02	0	0.02	0.02	0.06	98.9467	82.28	30
96.54	90.1133	0	0	0	0	0	100	92.7267	31
96.6667	90.2733	0	0	0	0	0	100	93.0733	32
88.72	78.3133	1.8133	0	0.02	0.02	0.0467	99.0733	82.8333	33
96.2067	89.4	0	0	0	0	0	100	92.1067	34
96.6133	90.2067	0	0	0	0	0	100	92.86	35
85.9067	75.2933	4.8533	0	0.2	0.2067	0.3667	97.9133	79.78	36
0.2667	0	0	0	0	0	0	17.8133	10.46	37
0.02	0	0	0	0	0	0	14.6867	10.0933	38
22.32	5.54	0	0	0	0	0	49.1267	24.4467	39
0.1867	0	0	0	0	0	0	17.2733	10.4267	40
0.0067	0	0	0	0	0	0	14.4733	10.0933	41
20.5733	4.76	0	0	0	0	0	48.0467	23.34	42
0.8667	0	0	0	0	0	0	21.2067	11.0133	43
0.12	0	0	0	0	0	0	16.3867	10.2933	44
31.06	12.32	0	0	0	0	0	56.0533	30.7	45
0.2333	0	0	0	0	0	0	17.8133	10.78	46
0.02	0	0	0	0	0	0	14.5733	10.34	47
22.3933	5.56	0	0	0	0	0	49.3067	24.68	48
0.1733	0	0	0	0	0	0	17.2933	10.7	49
0.0133	0	0	0	0	0	0	14.3533	10.34	50
20.6533	4.74	0	0	0	0	0	48.1667	23.6733	51
0.8867	0	0	0	0	0	0	21.1867	11.3133	52
0.12	0	0	0	0	0	0	16.4	10.56	53
31.06	12.4067	0	0	0	0	0	56.1867	30.9333	54

Table 53A. Probability (as %) that MMB < MMB_{35}, < 0.5 MMB_{35} (MSST), < 0.5MSST, MMA< MMA_{ave}, MMA< 0.25MMA_{ave}, TOTC>OFL, TOTC>ABC, RETC< $RETC_{ave}$, and CPUE<CPUEave during the long-term (1 - 30yr) projection period for the state harvest control rule policy#8 (with the 0.15 harvest rate) and scenarios 1 to 18 under Hockey Stick SR model generated recruitment for EAG. Individual estimate from 500 Monte Carlo trials and 1-30yr projection years was considered for probability estimation. Sc.: scenario.

MMA<MMA_{ave}	MMB<MMB_{35}	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	MMA<0.25MMA_{ave}	RETC<$RETC_{ave}$	CPUE<$CPUE_{ave}$	Sc.
39.3	12.4067	0	0	0	0	0	33.58	70.3733	1
18.7067	0.02	0	0	0	0	0	6.0533	87.14	2
45.5333	21.3067	0	0	0	0	0	43.2467	66.0933	3
38.5	11.1867	0	0	0	0	0	32.02	71.22	4
17.84	0.0133	0	0	0	0	0	5.3267	87.32	5
44.54	19.88	0	0	0	0	0	42	66.5733	6
42.94	17.8267	0	0	0	0	0	39.7933	67.4133	7
22.2267	0.2267	0	0	0	0	0	9.2067	85.9533	8
49.9	28.0733	0.1533	0	0	0	0	49.2533	65.0067	9
39.3067	12.5	0	0	0	0	0	33.5867	70.38	10
18.68	0.04	0	0	0	0	0	6.1467	87.14	11
45.5733	21.3533	0	0	0	0	0	43.3333	66.1867	12
38.5933	11.24	0	0	0	0	0	32.1533	71.1733	13
17.7667	0.0133	0	0	0	0	0	5.3933	87.2733	14
44.5533	19.8867	0	0	0	0	0	41.8933	66.6467	15
42.9467	17.78	0	0	0	0	0	39.72	67.4333	16
22.38	0.2333	0	0	0	0	0	9.22	85.96	17
49.8867	28.1267	0.1667	0	0	0	0	49.3	64.9733	18

Table 54A. Probability (as %) that MMB < MMB_{35}, < 0.5 MMB_{35} (MSST), < 0.5MSST, MMA< MMA_{ave}, MMA< 0.25MMA_{ave}, TOTC>OFL, TOTC>ABC, RETC< $RETC_{ave}$, and CPUE<CPUEave during the long-term (1 - 30yr) projection period for the state harvest control rule policy#8 (with the 0.15 harvest rate) and scenarios 1 to 54 under Ricker SR model generated recruitment for EAG. Individual estimate from 500 Monte Carlo trials and 1-30yr projection years was considered for probability estimation. Sc.: scenario.

MMA<MMAave	MMB<MMB35	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	MMA<0.25MMAave	RETC<RETCave	CPUE<CPUEave	Sc.
41.22	13.32	0	0	0	0	0	36.2867	71.8333	1
26.7667	0.1067	0	0	0	0	0	10.2267	87.5333	2
46.4067	21.68	0	0	0	0	0	44.4467	66.94	3
40.6533	12.1	0	0	0	0	0	35.0667	72.76	4
26.1333	0.0467	0	0	0	0	0	9.42	87.7	5
45.54	20.3667	0	0	0	0	0	43.2267	67.4533	6
44.22	18.42	0	0	0	0	0	41.3533	68.42	7
29.1533	0.38	0	0	0	0	0	13.5333	86.7333	8
50.2267	28.0667	0.0933	0	0	0	0	49.9333	65.0933	9
41.2067	13.3867	0	0	0	0	0	36.3333	71.9067	10
26.8333	0.1133	0	0	0	0	0	10.3	87.4533	11
46.44	21.6933	0	0	0	0	0	44.5467	66.9	12
40.6267	12.2667	0	0	0	0	0	34.9867	72.7867	13
26.2333	0.06	0	0	0	0	0	9.5067	87.62	14
45.6133	20.4667	0	0	0	0	0	43.36	67.4933	15
44.2867	18.4333	0	0	0	0	0	41.4067	68.38	16
29.2133	0.4	0	0	0	0	0	13.5667	86.7267	17
50.2667	28.1333	0.1067	0	0	0	0	49.9733	65.16	18
88.9933	77.0467	0.2067	0	0	0	0	89.0867	86.24	19
92.9533	84.5133	0	0	0	0	0	90	86.6733	20
85.6533	72.5467	1.7467	0	0.02	0.02	0.04	87.64	84.6667	21
89.3867	77.7133	0.1533	0	0	0	0	89.2133	86.3867	22
92.9733	84.5133	0	0	0	0	0	90	86.6733	23
86.18	73.2	1.2867	0	0.0133	0.0133	0.0267	87.92	84.98	24
86.96	74.16	0.86	0	0.0067	0.0067	0.02	88.2667	85.4933	25

Table 54A. Page 2 of 2.

MMA<MMAave	MMB<MMB35	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	MMA<0.25MMAave	RETC<RETCave	CPUE<CPUEave	Sc.
92.8467	84.42	0	0	0	0	0	90	86.6733	26
83.62	70.2667	4.3	0	0.2	0.2	0.4067	86.2133	83.14	27
88.9467	77.06	0.1867	0	0	0	0	89.1333	86.2533	28
92.9533	84.6	0	0	0	0	0	90	86.6667	29
85.6067	72.5867	1.7933	0	0.0133	0.0133	0.04	87.6267	84.6533	30
89.3733	77.7067	0.1067	0	0	0	0	89.2467	86.38	31
92.9733	84.5867	0	0	0	0	0	90	86.6667	32
86.2	73.1933	1.34	0	0.0133	0.0133	0.02	87.8733	84.9867	33
86.9867	74.22	0.88	0	0	0	0.02	88.2333	85.46	34
92.84	84.4867	0	0	0	0	0	90	86.6667	35
83.6067	70.2333	4.36	0	0.1867	0.1867	0.3867	86.18	83.06	36
14.4	1.9333	0	0	0	0	0	9.7667	46.5	37
0.0267	0	0	0	0	0	0	0	49.3	38
25.38	7.34	0	0	0	0	0	21.5	48.5733	39
12.9067	1.5067	0	0	0	0	0	8.42	46.3667	40
0.0133	0	0	0	0	0	0	0	49.7	41
24	6.0467	0	0	0	0	0	19.5133	48.24	42
21.18	4.4733	0	0	0	0	0	16.38	47.6733	43
0.2467	0	0	0	0	0	0	0.0133	47.8667	44
33.0667	13.56	0.0133	0	0	0	0	30.6	50.6533	45
14.4667	1.92	0	0	0	0	0	9.8467	46.5533	46
0.0333	0	0	0	0	0	0	0	49.2	47
25.3733	7.38	0	0	0	0	0	21.52	48.6467	48
12.96	1.5067	0	0	0	0	0	8.4867	46.3733	49
0.0133	0	0	0	0	0	0	0	49.6533	50
23.9933	6.1333	0	0	0	0	0	19.5667	48.2333	51
21.1467	4.5267	0	0	0	0	0	16.4333	47.5933	52
0.24	0	0	0	0	0	0	0.0133	47.66	53
33.0467	13.6	0.0133	0	0	0	0	30.6467	50.7467	54

Table 55A. Probability (as %) that MMB < MMB_{35}, < 0.5 MMB_{35} (MSST), < 0.5MSST, MMA< MMA_{ave}, MMA< 0.25MMA_{ave}, TOTC>OFL, TOTC>ABC, RETC< $RETC_{ave}$, and CPUE<$CPUE_{ave}$ during the long-term (1 - 30yr) projection period for the state harvest control rule policy#8 (with the 0.15 harvest rate) and scenarios 1 to 18 under Hockey Stick SR model generated recruitment for WAG. Individual estimate from 500 Monte Carlo trials and 1-30yr projection years was considered for probability estimation. Sc.: scenario.

$MMA<MMA_{ave}$	$MMB<MMB_{35}$	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	$MMA<0.25MMA_{ave}$	$RETC<RETC_{ave}$	$CPUE<CPUE_{ave}$	Sc.
30.62	2.8	0	0	0	0	0	68.6	50.4333	1
24.3133	0.66	0	0	0	0	0	69.8	51.1733	2
50.76	30.8267	0.0133	0	0	0	0	71.1067	53.18	3
29.92	2.3933	0	0	0	0	0	68.8133	50.4467	4
23.5333	0.5533	0	0	0	0	0	70	51.3133	5
49.9467	29.4467	0	0	0	0	0	70.6733	52.8467	6
34.3133	5.26	0	0	0	0	0	68.14	50.1067	7
28.28	1.6933	0	0	0	0	0	69.02	50.6	8
55.0867	37.7933	0.3067	0	0	0.0067	0	73.2267	55.4333	9
30.86	2.66	0	0	0	0	0	68.7933	50.86	10
24.56	0.5467	0	0	0	0	0	69.9867	51.7667	11
50.8733	30.98	0.0067	0	0	0	0	71.0333	53.5667	12
30.1133	2.28	0	0	0	0	0	68.8333	51.0133	13
23.8133	0.44	0	0	0	0	0	70.1333	51.92	14
50.02	29.78	0	0	0	0	0	70.6533	53.2867	15
34.5733	5.3733	0	0	0	0	0	68.2533	50.5267	16
28.7067	1.66	0	0	0	0	0	69.1133	51.24	17
55.04	37.8133	0.3067	0	0	0	0	73.3267	55.6667	18

Table 56A. Probability (as %) that MMB < MMB$_{35}$, < 0.5 MMB$_{35}$ (MSST), < 0.5MSST, MMA< MMA$_{ave}$, MMA< 0.25MMA$_{ave}$, TOTC>OFL, TOTC>ABC, RETC< RETC$_{ave}$, and CPUE<CPUE$_{ave}$ during the long-term (1 - 30yr) projection period for the state harvest control rule policy#8 (with the 0.15 harvest rate) and scenarios 1 to 54 under Ricker SR model generated recruitment for WAG. Individual estimate from 500 Monte Carlo trials and 1-30yr projection years was considered for probability estimation. Sc.: scenario.

MMA<MMAave	MMB<MMB35	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	MMA<0.25MMAave	RETC<RETCave	CPUE<CPUEave	Sc.
28.1667	2.22	0	0	0	0	0	66.28	48.12	1
21.9933	0.4667	0	0	0	0	0	67.08	48.6533	2
48.4067	28.3467	0	0	0	0	0	69.1933	51.22	3
27.42	1.86	0	0	0	0	0	66.3133	48.12	4
21.2533	0.3933	0	0	0	0	0	67.2867	48.64	5
47.58	27.14	0	0	0	0	0	68.7933	50.92	6
32.1867	4.3933	0	0	0	0	0	65.96	47.84	7
25.9533	1.2667	0	0	0	0	0	66.5333	48.2467	8
52.76	34.9667	0.1533	0	0	0	0	71.3067	53.2867	9
28.4933	2.0267	0	0	0	0	0	66.1533	48.8067	10
22.2067	0.3533	0	0	0	0	0	67.14	49.28	11
48.44	28.4333	0	0	0	0	0	69.24	51.52	12
27.88	1.76	0	0	0	0	0	66.28	48.8533	13
21.44	0.2733	0	0	0	0	0	67.38	49.3667	14
47.6533	27.3333	0	0	0	0	0	69	51.1733	15
32.1867	4.4	0	0	0	0	0	65.9533	48.42	16
26.26	1.2	0	0	0	0	0	66.4333	49.02	17
52.8133	35.1867	0.1533	0	0	0	0	71.3267	53.5533	18
96.48	92.7133	0.04	0	0	0	0	100	95.0133	19
96.66	93.1867	0.0133	0	0	0	0	100	95.2533	20
88.4733	80.48	3.9	0	0.0733	0.0867	0.1133	98.2067	85.4467	21
96.4933	92.7667	0.04	0	0	0	0	100	95.1133	22
96.66	93.24	0.0133	0	0	0	0	100	95.24	23
88.8933	81.0133	3.48	0	0.0467	0.0733	0.0933	98.46	85.9667	24
96.16	91.94	0.1067	0	0	0	0	100	94.68	25

Table 56A. Page 2 of 2.

MMA<MMAave	MMB<MMB35	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	MMA<0.25MMAave	RETC<RETCave	CPUE<CPUEave	Sc.
96.5933	92.9667	0.0267	0	0	0	0	100	95.2067	26
86.18	77.9333	7.0467	0	0.38	0.3867	0.5533	97	82.8667	27
96.4667	92.8	0.0133	0	0	0	0	100	93.7733	28
96.66	93.2533	0	0	0	0.0067	0	100	93.56	29
88.42	80.52	3.8733	0	0.0533	0.0667	0.0867	98.1933	85.0667	30
96.5	92.8667	0.0067	0	0	0	0	100	93.76	31
96.66	93.2867	0	0	0	0	0	100	93.54	32
88.9133	81.0067	3.46	0	0.0333	0.0667	0.08	98.4267	85.54	33
96.2	92.0467	0.0533	0	0	0.0067	0	100	93.5533	34
96.5933	93.04	0	0	0	0	0	100	93.7667	35
86.2067	77.8867	7.1267	0	0.3533	0.4	0.5533	96.9933	82.3867	36
1.0933	0	0	0	0	0	0	14.84	13.2067	37
0.2533	0	0	0	0	0	0	13.0867	11.8667	38
27.4	10.5133	0	0	0	0	0	46.1	33.22	39
0.9667	0	0	0	0	0	0	14.6067	13.08	40
0.2133	0	0	0	0	0	0	12.94	11.7933	41
25.9667	9.3733	0	0	0	0	0	44.9	32.14	42
2.3467	0.0133	0	0	0	0	0	17.3667	14.8667	43
0.6533	0	0	0	0	0	0	14.0733	12.6733	44
35.3467	18.7733	0.0267	0	0	0	0	53.6133	38.7533	45
1.1067	0	0	0	0	0	0	14.8867	13.22	46
0.2467	0	0	0	0	0	0	12.9533	11.88	47
27.46	10.6867	0	0	0	0	0	46.2133	33.4733	48
0.96	0	0	0	0	0	0	14.6133	12.9533	49
0.2133	0	0	0	0	0	0	12.9067	11.7533	50
25.94	9.5467	0	0	0	0	0	44.9933	32.5733	51
2.4133	0.02	0	0	0	0	0	17.3733	14.9133	52
0.6867	0	0	0	0	0	0	14.0667	12.62	53
35.3867	18.94	0.02	0	0	0	0	53.6533	39.0467	54

Table 57A. Probability (as %) that MMB < MMB_{35}, < 0.5 MMB_{35} (MSST), < 0.5MSST, MMA< MMA_{ave}, MMA< 0.25MMA_{ave}, TOTC>OFL, TOTC>ABC, RETC< $RETC_{ave}$, and CPUE<$CPUE_{ave}$ during the long-term (1 - 30yr) projection period for the state harvest control rule policy#9 (with the 0.2 harvest rate) and scenarios 1 to 18 under Hockey Stick SR model generated recruitment for EAG. Individual estimate from 500 Monte Carlo trials and 1-30yr projection years was considered for probability estimation. Sc.: scenario.

MMA<MMA_{ave}	MMB<MMB_{35}	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	MMA<0.25MMA_{ave}	RETC<$RETC_{ave}$	CPUE<$CPUE_{ave}$	Sc.
44.9733	22.8733	0	0	0	0	0	33.8667	76.6867	1
25.7067	1.3733	0	0	0	0	0	5.1733	89.6667	2
50.7133	31.2867	0.0667	0	0	0	0	43.3733	72.6333	3
44.2267	21.86	0	0	0	0	0	32.5067	77.4267	4
24.86	1.0467	0	0	0	0	0	4.4333	89.7933	5
49.5333	29.9333	0.0267	0	0	0	0	41.8867	73.1467	6
48.3333	27.9667	0	0	0	0	0	39.5	74.1067	7
29.52	3.1933	0	0	0	0	0	8.58	88.8667	8
54.5667	37.2467	0.5467	0	0	0	0	49.36	71.1133	9
44.98	22.96	0	0	0	0	0	33.8267	76.5267	10
25.7867	1.42	0	0	0	0	0	5.2533	89.6133	11
50.6733	31.32	0.06	0	0	0	0	43.4067	72.5667	12
44.28	21.82	0	0	0	0	0	32.66	77.3467	13
24.7867	1.04	0	0	0	0	0	4.44	89.7533	14
49.5667	30.02	0.0267	0	0	0	0	42.0267	73.1333	15
48.3533	27.9733	0	0	0	0	0	39.5733	74.0067	16
29.4467	3.2733	0	0	0	0	0	8.5667	88.84	17
54.5467	37.3067	0.5533	0	0	0	0	49.2933	71.1267	18

Table 58A. Probability (as %) that $MMB < MMB_{35}$, $< 0.5\ MMB_{35}$ (MSST), $< 0.5MSST$, $MMA < MMA_{ave}$, $MMA < 0.25MMA_{ave}$, TOTC>OFL, TOTC>ABC, $RETC < RETC_{ave}$, and $CPUE < CPUE_{ave}$ during the long-term (1 - 30yr) projection period for the state harvest control rule policy#9 (with the 0.2 harvest rate) and scenarios 1 to 54 under Ricker SR model generated recruitment for EAG. Individual estimate from 500 Monte Carlo trials and 1-30yr projection years was considered for probability estimation. Sc.: scenario.

MMA<MMAave	MMB<MMB35	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	MMA<0.25MMAave	RETC<RETCave	CPUE<CPUEave	Sc.
46.6667	24.2867	0	0	0	0	0	35.8533	77.7933	1
34.2867	2.64	0	0	0	0	0	8.7933	89.8867	2
51.2467	31.4133	0.04	0	0	0	0	44.1067	73.1933	3
46.12	23.1	0	0	0	0	0	34.6267	78.4533	4
33.7267	2.1267	0	0	0	0	0	7.8933	89.9467	5
50.5467	30.2533	0.0133	0	0	0	0	42.7933	73.7467	6
49.3933	28.6467	0	0	0	0	0	40.92	74.7467	7
36.3533	5.0467	0	0	0	0	0	12.64	89.3933	8
54.4	36.5667	0.38	0	0	0	0	49.42	71.16	9
46.6867	24.2067	0	0	0	0	0	35.92	77.7533	10
34.38	2.66	0	0	0	0	0	8.8133	89.8267	11
51.2733	31.5133	0.0467	0	0	0	0	44.0067	73.1267	12
46.12	23.0533	0	0	0	0	0	34.76	78.3533	13
33.7333	2.2267	0	0	0	0	0	8.0533	89.86	14
50.58	30.3867	0.0133	0	0	0	0	42.8467	73.68	15
49.4333	28.5667	0	0	0	0	0	41.0267	74.6733	16
36.28	5.08	0	0	0	0	0	12.8133	89.3467	17
54.48	36.5867	0.3933	0	0	0	0	49.38	71.08	18
89.2133	79.2	1.7933	0	0	0	0	87.72	89.5133	19
93.3333	86.58	0.0067	0	0	0	0	90	90	20
85.9533	75.1533	5.0267	0	0.04	0.04	0.1067	85.4333	88.0467	21
89.6133	79.7667	1.5	0	0	0	0	88	89.6	22
93.3333	86.6067	0	0	0	0	0	90	90	23
86.36	75.7333	4.2467	0	0.0267	0.0267	0.08	85.74	88.3733	24
87.2	76.6867	3.4533	0	0.0133	0.0133	0.0533	86.3733	88.8333	25

Table 58A. Page 2 of 2.

MMA<MMAave	MMB<MMB35	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	MMA<0.25MMAave	RETC<RETCave	CPUE<CPUEave	Sc.
93.3133	86.3867	0.0267	0	0	0	0	89.98	90	26
83.9467	73.08	8.8867	0	0.44	0.44	0.6533	83.76	86.5467	27
89.2	79.2267	1.76	0	0	0	0	87.7133	89.4933	28
93.3333	86.5867	0	0	0	0	0	90	90	29
85.9467	75.1067	5.12	0	0.04	0.04	0.1133	85.3933	88.0267	30
89.6	79.82	1.5133	0	0	0	0	87.9667	89.62	31
93.3333	86.6133	0	0	0	0	0	90	90	32
86.3733	75.7133	4.3667	0	0.02	0.02	0.08	85.7533	88.3533	33
87.2267	76.6533	3.4	0	0.0133	0.0133	0.0467	86.3333	88.8467	34
93.3133	86.3867	0.0133	0	0	0	0	89.9867	90	35
83.9667	73.08	8.98	0	0.3933	0.3933	0.6933	83.7267	86.5267	36
19.7333	5.8	0	0	0	0	0	10.4267	55.7333	37
0.1933	0	0	0	0	0	0	0	59.96	38
30.7733	13.9667	0	0	0	0	0	22.3933	56.8733	39
18.2067	4.9133	0	0	0	0	0	8.9933	55.6867	40
0.1267	0	0	0	0	0	0	0	60.34	41
29.06	12.42	0	0	0	0	0	20.24	56.52	42
26.5067	10.18	0	0	0	0	0	17.24	56.1267	43
0.7133	0	0	0	0	0	0	0.0133	58.4	44
38.1333	21.18	0.0933	0	0	0	0	31.4667	58.38	45
19.76	5.8333	0	0	0	0	0	10.5467	55.5267	46
0.2	0	0	0	0	0	0	0	59.98	47
30.7667	14.06	0	0	0	0	0	22.4667	56.78	48
18.18	4.9067	0	0	0	0	0	9.1067	55.5333	49
0.14	0	0	0	0	0	0	0	60.3533	50
29.0733	12.4467	0	0	0	0	0	20.3467	56.4	51
26.5267	10.2	0	0	0	0	0	17.32	55.9667	52
0.7333	0	0	0	0	0	0	0.02	58.2867	53
38.14	21.2133	0.0867	0	0	0	0	31.6467	58.2867	54

Table 59A. Probability (as %) that MMB < MMB_{35}, < 0.5 MMB_{35} (MSST), < 0.5MSST, MMA< MMA_{ave}, MMA< 0.25MMA_{ave}, TOTC>OFL, TOTC>ABC, RETC< $RETC_{ave}$, and CPUE<$CPUE_{ave}$ during the long-term (1 - 30yr) projection period for the state harvest control rule policy#9 (with the 0.2 harvest rate) and scenarios 1 to 18 under Hockey Stick SR model generated recruitment for WAG. Individual estimate from 500 Monte Carlo trials and 1-30yr projection years was considered for probability estimation. Sc.: scenario.

MMA<MMA_{ave}	MMB<MMB_{35}	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	MMA<0.25MMA_{ave}	RETC<$RETC_{ave}$	CPUE<$CPUE_{ave}$	Sc.
35.3067	9.4	0	0	0	0	0	64.62	59.9	1
28.6933	3.7533	0	0	0	0	0	65.16	60.1867	2
54.36	39.28	0.0933	0	0	0	0	70.2267	62.6333	3
34.5067	8.5133	0	0	0	0	0	64.7267	60	4
27.84	3.1867	0	0	0	0	0	65.2467	60.2333	5
53.5	38.32	0.0733	0	0	0	0	69.8867	62.4333	6
38.7667	13.7133	0	0	0	0	0	64.5667	59.88	7
32.9067	6.96	0	0	0	0	0	64.66	60.0267	8
58.4733	45.3067	0.94	0	0	0.02	0	72.7533	64.3933	9
35.2933	9.4267	0	0	0	0	0	64.6533	60.0733	10
29.04	3.74	0	0	0	0	0	65.3	60.5	11
54.4533	39.3267	0.1067	0	0	0	0	70.2467	62.7733	12
34.6133	8.62	0	0	0	0	0	64.7	60.0867	13
28.1	3.2533	0	0	0	0	0	65.5867	60.54	14
53.6333	38.3467	0.0533	0	0	0.0133	0	69.86	62.5067	15
38.9067	13.88	0	0	0	0	0	64.58	60.12	16
33.1133	7.1533	0	0	0	0	0	64.9467	60.1867	17
58.4867	45.1867	0.9	0	0	0.04	0	72.7333	64.6933	18

Table 60A. Probability (as %) that MMB < MMB_{35}, < 0.5 MMB_{35} (MSST), < 0.5MSST, MMA< MMA_{ave}, MMA< 0.25MMA_{ave}, TOTC>OFL, TOTC>ABC, RETC< $RETC_{ave}$, and CPUE<$CPUE_{ave}$ during the long-term (1 - 30yr) projection period for the state harvest control rule policy#9 (with the 0.2 harvest rate) and scenarios 1 to 54 under Ricker SR model generated recruitment for WAG. Individual estimate from 500 Monte Carlo trials and 1-30yr projection years was considered for probability estimation. Sc.: scenario.

MMA<MMAave	MMB<MMB35	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	MMA<0.25MMAave	RETC<RETCave	CPUE<CPUEave	Sc.
32.62	7.9	0	0	0	0	0	62.0667	57.48	1
26.18	2.8733	0	0	0	0	0	62.32	57.4267	2
51.6667	36.3133	0.0667	0	0	0	0	68.0933	60.34	3
31.96	7.2867	0	0	0	0	0	62.1067	57.4733	4
25.4867	2.4667	0	0	0	0	0	62.4133	57.4933	5
50.9	35.3067	0.0333	0	0	0	0	67.86	60.1667	6
36.4133	12.0267	0	0	0	0	0	62.34	57.5667	7
30.18	5.8933	0	0	0	0	0	62.18	57.5067	8
55.7867	41.8333	0.5333	0	0	0.0133	0	70.3667	62.2467	9
32.6333	8	0	0	0	0	0	62.1333	57.82	10
26.4133	2.8933	0	0	0	0	0	62.4867	57.7933	11
51.7067	36.4267	0.0533	0	0	0.0067	0	68.2267	60.58	12
31.9667	7.3133	0	0	0	0	0	62.1533	57.8333	13
25.5333	2.4933	0	0	0	0	0	62.5267	57.8133	14
50.9667	35.5267	0.02	0	0	0	0	67.84	60.24	15
36.44	12.06	0	0	0	0	0	62.3133	57.74	16
30.5133	5.9267	0	0	0	0	0	62.3067	57.82	17
55.7867	41.98	0.52	0	0	0.0067	0	70.3667	62.3667	18
96.42	92.7533	1.36	0	0	0.0267	0	100	99.7333	19
96.64	93.2	0.9	0	0	0.04	0	100	99.84	20
88.34	81.9133	7.8533	0	0.1733	0.2933	0.2267	97.28	91.9867	21
96.46	92.8	1.2733	0	0	0.0667	0	100	99.76	22
96.6467	93.2267	0.84	0	0	0.04	0	100	99.84	23
88.74	82.3933	7.3067	0	0.1133	0.1933	0.16	97.5333	92.4	24
96.0333	91.9533	1.7933	0	0	0.06	0	99.98	99.4733	25

Table 60A. Page 2 of 2.

MMA<MMAave	MMB<MMB35	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	MMA<0.25MMAave	RETC<RETCave	CPUE<CPUEave	Sc.
96.52	92.9267	1.1333	0	0	0.0467	0	100	99.82	26
86.1667	79.38	12.0467	0	0.7333	0.8533	0.9933	96.0267	89.2667	27
96.4067	92.6933	1.1067	0	0	0.0267	0	100	99.9333	28
96.6467	93.18	0.56	0	0	0.0533	0	100	100	29
88.3	81.8333	7.9933	0	0.1533	0.1933	0.22	97.28	92.3533	30
96.44	92.82	1.0333	0	0	0.0333	0	100	99.9467	31
96.6467	93.22	0.5	0	0	0.04	0	100	100	32
88.7	82.3133	7.2867	0	0.1	0.1867	0.1733	97.52	92.82	33
95.9933	92.04	1.5267	0	0	0.0533	0	99.9733	99.66	34
96.52	92.9867	0.8333	0	0	0.0467	0	100	99.9933	35
86.2267	79.42	12.1533	0	0.7333	0.8467	0.9667	95.9933	89.8267	36
1.52	0.0333	0	0	0	0	0	15.4	14.2933	37
0.2667	0	0	0	0	0	0	13.1933	12.0933	38
31.0667	17.2867	0	0	0	0	0	46.44	40.9667	39
1.2733	0.0333	0	0	0	0	0	14.9667	13.9	40
0.22	0	0	0	0	0	0	13.0933	11.98	41
29.6	15.6733	0	0	0	0	0	45.26	39.98	42
3.5	0.34	0	0	0	0	0	18.2133	17.0467	43
0.8933	0.0067	0	0	0	0	0	14.2733	13.2533	44
38.92	25.5667	0.12	0	0	0	0	53.9267	46.96	45
1.5333	0.0333	0	0	0	0	0	15.4867	14.3267	46
0.2667	0	0	0	0	0	0	13.0933	12.0533	47
31.06	17.2733	0	0	0	0	0	46.62	41.22	48
1.2733	0.0267	0	0	0	0	0	15.0867	13.82	49
0.22	0	0	0	0	0	0	12.9533	11.92	50
29.7067	15.8733	0	0	0	0	0	45.3	40.1133	51
3.4933	0.3267	0	0	0	0	0	18.2933	17.2133	52
0.9067	0.0067	0	0	0	0	0	14.2933	13.1533	53
38.9467	25.68	0.12	0	0	0.0067	0	53.94	47.14	54

Table 61A. Probability (as %) that MMB < MMB_{35}, < 0.5 MMB_{35} (MSST), < 0.5MSST, MMA< MMA_{ave}, MMA< 0.25MMA_{ave}, TOTC>OFL, TOTC>ABC, RETC< $RETC_{ave}$, and CPUE<$CPUE_{ave}$ during the long-term (1 - 30yr) projection period for the state harvest control rule policy#10 (with the 0.3 harvest rate) and scenarios 1 to 18 under Hockey Stick SR model generated recruitment for EAG. Individual estimate from 500 Monte Carlo trials and 1-30yr projection years was considered for probability estimation. Sc.: scenario.

$MMA<MMA_{ave}$	$MMB<MMB_{35}$	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	$MMA<0.25MMA_{ave}$	$RETC<RETC_{ave}$	$CPUE<CPUE_{ave}$	Sc.
46.0467	26.2267	0	0	0	0	0	34.1267	77.5667	1
25.6067	1.4067	0	0	0	0	0	5.1667	89.6133	2
52.4533	36.1467	0.2933	0	0	0	0	43.14	74.58	3
45.1667	24.9667	0	0	0	0	0	32.88	78.1533	4
24.8133	1.0667	0	0	0	0	0	4.4467	89.78	5
51.3667	34.8267	0.1867	0	0	0	0	41.8533	74.8533	6
49.7333	32.3067	0.0733	0	0	0	0	39.78	75.4733	7
29.52	3.34	0	0	0	0	0	8.8467	88.86	8
56.5667	42.7067	1.7067	0	0.02	0.02	0.02	49.04	73.74	9
46.02	26.2067	0	0	0	0	0	34.1867	77.2267	10
25.7867	1.4467	0	0	0	0	0	5.3333	89.6	11
52.4733	36.22	0.3133	0	0	0	0	43.1933	74.24	12
45.1267	24.8933	0	0	0	0	0	32.94	77.9533	13
24.8733	1.0667	0	0	0	0	0	4.5467	89.74	14
51.42	34.8533	0.2067	0	0	0	0	41.8667	74.5733	15
49.7467	32.26	0.0867	0	0	0	0	39.7933	75.1667	16
29.5267	3.3867	0	0	0	0	0	8.8267	88.82	17
56.58	42.7067	1.7	0	0.0133	0.0133	0.02	49.1533	73.3733	18

Table 62A. Probability (as %) that MMB < MMB_{35}, < 0.5 MMB_{35} (MSST), < 0.5MSST, MMA< MMA_{ave}, MMA< 0.25MMA_{ave}, TOTC>OFL, TOTC>ABC, RETC< $RETC_{ave}$, and CPUE<$CPUE_{ave}$ during the long-term (1 - 30yr) projection period for the state harvest control rule policy#10 (with the 0.3 harvest rate) and scenarios 1 to 54 under Ricker SR model generated recruitment for EAG. Individual estimate from 500 Monte Carlo trials and 1-30yr projection years was considered for probability estimation. Sc.: scenario.

MMA<MMAave	MMB<MMB35	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	MMA<0.25MMAave	RETC<RETCave	CPUE<CPUEave	Sc.
47.4467	27.54	0	0	0	0	0	35.82	78.66	1
34.2133	2.6667	0	0	0	0	0	8.8533	89.86	2
52.4467	36.0667	0.2467	0	0	0	0	43.52	74.6267	3
46.8933	26.06	0	0	0	0	0	34.6867	79.14	4
33.6733	2.0867	0	0	0	0	0	8.04	89.92	5
51.6867	34.8467	0.1467	0	0	0	0	42.4267	75.1667	6
50.3933	32.76	0.0533	0	0	0	0	40.5	75.92	7
36.2867	5.3	0	0	0	0	0	12.9067	89.4	8
55.9533	41.46	1.2267	0	0.0067	0.0133	0.0067	48.48	73.4067	9
47.4267	27.44	0	0	0	0	0	35.9667	78.4	10
34.2933	2.7067	0	0	0	0	0	9.0867	89.8133	11
52.4467	36	0.2467	0	0	0	0	43.54	74.4267	12
46.8733	26.1	0	0	0	0	0	34.7467	78.94	13
33.7467	2.2	0	0	0	0	0	8.0333	89.84	14
51.7067	34.8133	0.18	0	0	0	0	42.3267	74.9	15
50.4533	32.7933	0.06	0	0	0	0	40.5267	75.6867	16
36.3333	5.2933	0	0	0	0	0	13.16	89.34	17
55.9533	41.4467	1.2533	0	0.0067	0.0067	0.0067	48.4867	73.12	18
88.9733	82.2667	6.9733	0	0.0067	0.0133	0.06	85.5267	90.0733	19
93.3267	89.8	4.0267	0	0	0	0	87.54	90.7467	20
85.6933	78.54	11.3133	0	0.26	0.26	0.4333	83.1667	88.78	21
89.3	82.8267	6.5467	0	0.02	0.02	0.0467	85.82	90.2333	22
93.3267	89.82	4	0	0	0	0	87.5067	90.74	23
86.1467	79.1867	10.4067	0	0.16	0.16	0.3267	83.5333	89.1133	24
86.9667	79.9933	9.3	0	0.1	0.1	0.1867	84.1933	89.4933	25

Table 62A. Page 2 of 2.

MMA<MMAave	MMB<MMB35	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	MMA<0.25MMAave	RETC<RETCave	CPUE<CPUEave	Sc.
93.26	89.5667	4.12	0	0	0	0	87.68	90.7333	26
83.6933	76.4133	15.7733	0	1.02	1.02	1.3867	81.62	87.3867	27
88.98	82.2733	6.9333	0	0.0067	0.0067	0.0533	85.56	89.6133	28
93.3267	89.8	3.9267	0	0	0	0	87.54	90.0067	29
85.7267	78.5733	11.38	0	0.2667	0.2733	0.4533	83.1733	88.3933	30
89.3067	82.8067	6.56	0	0.0067	0.0067	0.0333	85.84	89.7733	31
93.3267	89.8333	3.9	0	0	0	0	87.4867	90	32
86.16	79.1733	10.4333	0	0.1733	0.1733	0.3133	83.54	88.7133	33
86.9733	80.0067	9.2933	0	0.0867	0.0933	0.2	84.18	89.0733	34
93.26	89.5467	4.0333	0	0	0	0	87.66	90.0133	35
83.76	76.4533	16.0133	0	0.9667	0.98	1.3733	81.6667	87.0867	36
20.6733	7.6	0	0	0	0	0	10.94	56.7733	37
0.1867	0	0	0	0	0	0	0	59.1733	38
32.2933	17.5	0.0333	0	0	0	0	23.28	59.0933	39
18.9667	6.5067	0	0	0	0	0	9.5267	56.5267	40
0.1267	0	0	0	0	0	0	0	59.6667	41
30.5333	15.66	0.0067	0	0	0	0	21.1067	58.6133	42
27.82	12.9867	0	0	0	0	0	18.0133	57.8733	43
0.7333	0	0	0	0	0	0	0.0333	58.0067	44
40.0067	26.0467	0.3333	0	0	0	0	31.6	61.1333	45
20.6867	7.6133	0	0	0	0	0	11.0067	56.5533	46
0.1933	0	0	0	0	0	0	0	59.3667	47
32.3067	17.5467	0.02	0	0	0	0	23.32	58.86	48
19.0267	6.5333	0	0	0	0	0	9.58	56.3533	49
0.1267	0	0	0	0	0	0	0	59.7733	50
30.5533	15.78	0.0067	0	0	0	0	21.26	58.4733	51
27.86	12.96	0	0	0	0	0	18.2067	57.74	52
0.7333	0	0	0	0	0	0	0.04	57.88	53
40.0133	26.0267	0.3467	0	0	0	0	31.6333	60.8867	54

Table 63A. Probability (as %) that MMB < MMB_{35}, < 0.5 MMB_{35} (MSST), < 0.5MSST, MMA< MMA_{ave}, MMA< 0.25MMA_{ave}, TOTC>OFL, TOTC>ABC, RETC< $RETC_{ave}$, and CPUE<$CPUE_{ave}$ during the long-term (1 - 30yr) projection period for the state harvest control rule policy#10 (with the 0.3 harvest rate) and scenarios 1 to 18 under Hockey Stick SR model generated recruitment for WAG. Individual estimate from 500 Monte Carlo trials and 1-30yr projection years was considered for probability estimation. Sc.: scenario.

MMA<MMA_{ave}	MMB<MMB_{35}	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	MMA<0.25MMA_{ave}	RETC<$RETC_{ave}$	CPUE<$CPUE_{ave}$	Sc.
35.28	9.4467	0	0	0	0	0	64.3733	59.9333	1
28.5933	3.7267	0	0	0	0	0	65.06	60.12	2
55.7867	42.2733	0.4067	0	0	0.0533	0	69.8667	65.5267	3
34.5067	8.58	0	0	0	0	0	64.58	59.9	4
27.84	3.1333	0	0	0	0	0	65.2067	60.0867	5
54.8467	41.1667	0.2733	0	0	0.0267	0	69.4467	65.1667	6
38.8	14.0333	0	0	0	0	0	64.34	60.18	7
32.8333	6.9267	0	0	0	0	0	64.66	59.9467	8
60.0467	48.8467	2.2	0	0.0467	0.14	0.0467	72.6867	68.24	9
35.3267	9.42	0	0	0	0	0	64.6467	60.1	10
28.8667	3.6733	0	0	0	0	0	65.2933	60.3333	11
55.8667	42.4067	0.4133	0	0	0.0267	0	69.9467	65.5867	12
34.5267	8.6133	0	0	0	0	0	64.5867	60.0467	13
28.04	3.1867	0	0	0	0	0	65.56	60.3133	14
54.96	41.1267	0.26	0	0	0.0333	0	69.54	65.1867	15
38.8133	14.0867	0	0	0	0	0	64.4933	60.2267	16
32.9867	7.0933	0	0	0	0	0	64.9733	60.1067	17
60.0333	48.8267	2.2333	0	0.0333	0.14	0.0333	72.6267	68.4	18

Table 64A. Probability (as %) that MMB < MMB$_{35}$, < 0.5 MMB$_{35}$ (MSST), < 0.5MSST, MMA< MMA$_{ave}$, MMA< 0.25MMA$_{ave}$, TOTC>OFL, TOTC>ABC, RETC< RETC$_{ave}$, and CPUE<CPUEave during the long-term (1 - 30yr) projection period for the state harvest control rule policy#10 (with the 0.3 harvest rate) and scenarios 1 to 54 under Ricker SR model generated recruitment for WAG. Individual estimate from 500 Monte Carlo trials and 1-30yr projection years was considered for probability estimation. Sc.: scenario.

MMA<MMAave	MMB<MMB35	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	MMA<0.25MMAave	RETC<RETCave	CPUE<CPUEave	Sc.
32.5733	7.9333	0	0	0	0	0	62.0267	57.4933	1
26.16	2.7867	0	0	0	0	0	62.34	57.36	2
52.58	38.9267	0.2533	0	0	0.0267	0	67.3733	62.92	3
31.8667	7.32	0	0	0	0	0	62.0667	57.5	4
25.44	2.3533	0	0	0	0	0	62.3533	57.36	5
51.8133	37.8733	0.1867	0	0	0.04	0	66.9733	62.6333	6
36.3867	12.2133	0	0	0	0	0	62	57.7733	7
30.1733	5.88	0	0	0	0	0	62.2933	57.4933	8
56.9733	44.7533	1.2933	0	0.0133	0.1	0.0133	69.9467	65.5333	9
32.54	8.0533	0	0	0	0	0	62.0867	57.7867	10
26.2667	2.8867	0	0	0	0	0	62.3867	57.6867	11
52.66	38.9667	0.2267	0	0	0.0333	0	67.4333	63.14	12
31.9467	7.3133	0	0	0	0	0	62.3267	57.7467	13
25.4333	2.4733	0	0	0	0	0	62.7	57.7333	14
51.7933	37.9267	0.1933	0	0	0.02	0	67.0467	62.7667	15
36.2733	12.2533	0	0	0	0	0	62.1267	57.8867	16
30.5333	5.9333	0	0	0	0	0	62.1467	57.7933	17
56.9933	44.8133	1.2867	0	0	0.06	0	69.9867	65.64	18
96.34	92.5467	6.9933	0	0	0.3267	0	99.9933	99.92	19
96.6	93.14	7	0	0	0.3467	0	100	100	20
88.08	82.34	13.4467	0	0.5933	1.1067	0.6867	96.38	93.34	21
96.3867	92.6533	7.02	0	0	0.2467	0	99.9933	99.9333	22
96.62	93.1533	7.0067	0	0	0.36	0	100	100	23
88.4733	82.7733	12.82	0	0.4867	0.9333	0.54	96.6733	93.6733	24
95.84	91.6867	7.1933	0	0	0.3267	0	99.9533	99.74	25

Table 64A. Page 2 of 2.

MMA<MMAave	MMB<MMB35	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	MMA<0.25MMAave	RETC<RETCave	CPUE<CPUEave	Sc.
96.4933	92.8333	7.0133	0	0	0.1733	0	100	99.98	26
86.0933	80.1533	18.4133	0	1.5933	2.1133	1.7667	94.98	91.12	27
96.34 67	92.5533	6.92	0	0	0.32	0	99.9933	99.9467	28
96.6067	93.14	6.9	0	0	0.3667	0	100	100	29
88.12	82.32	13.4533	0	0.5	0.9333	0.5867	96.44	93.4333	30
96.4133	92.62	6.8933	0	0	0.2533	0	99.9933	99.9533	31
96.62	93.1467	6.8933	0	0	0.3467	0	100	100	32
88.42	82.74	12.7733	0	0.3733	0.8333	0.46	96.7	93.82	33
95.8	91.7333	7.08	0	0	0.2733	0	99.9533	99.72	34
96.4733	92.8733	6.8933	0	0	0.32	0	100	99.9867	35
86.12	80.12	18.4067	0	1.5867	2.04	1.7533	94.9867	91.22	36
1.5133	0.0333	0	0	0	0	0	15.38	14.2933	37
0.2467	0	0	0	0	0	0	13.16	12.06	38
32.2667	19.42	0.02	0	0	0.0067	0	46.6133	43.5733	39
1.2667	0.0333	0	0	0	0	0	15.02	13.92	40
0.22	0	0	0	0	0	0	13.0467	11.98	41
30.8333	17.8467	0.0133	0	0	0.0067	0	45.4667	42.3333	42
3.5267	0.3533	0	0	0	0	0	18.26	17.0467	43
0.8533	0.0067	0	0	0	0	0	14.3467	13.2067	44
40.3467	28.6	0.3933	0	0	0.0467	0	54	50.28	45
1.5467	0.0333	0	0	0	0	0	15.4333	14.3267	46
0.24	0	0	0	0	0	0	13.0533	12.0667	47
32.1733	19.5933	0.02	0	0	0.0067	0	46.7333	43.6867	48
1.2733	0.02	0	0	0	0	0	15.12	13.8733	49
0.22	0	0	0	0	0	0	12.96	11.92	50
30.84	17.9533	0.0067	0	0	0.0067	0	45.4333	42.5133	51
3.5	0.3333	0	0	0	0	0	18.3133	17.18	52
0.9	0.0067	0	0	0	0	0	14.2333	13.1133	53
40.4533	28.6467	0.3533	0	0	0.0333	0	54.08	50.22	54

Table 65A. Probability (as %) that MMB < MMB_{35}, < 0.5 MMB_{35} (MSST), < 0.5MSST, MMA< MMA_{ave}, MMA< 0.25MMA_{ave}, TOTC>OFL, TOTC>ABC, RETC< $RETC_{ave}$, and CPUE<$CPUE_{ave}$ during the short-term (1 - 8yr) projection period for the state harvest control rule policy#11 (with the 0.175 harvest rate) and scenarios 1 to 18 under Hockey Stick SR model generated recruitment for EAG. Individual estimate from 500 Monte Carlo trials and 1-8yr projection years was considered for probability estimation. Sc.: scenario.

MMA<MMA_{ave}	MMB<MMB_{35}	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	MMA<0.25MMA_{ave}	RETC<$RETC_{ave}$	CPUE<$CPUE_{ave}$	Sc.
28.8	5.375	0	0	0	0	0	13.125	51.35	1
10.075	0.025	0	0	0	0	0	0.225	62.05	2
35	10.625	0	0	0	0	0	22.025	49.2	3
27.975	4.725	0	0	0	0	0	12.125	51.6	4
9.55	0	0	0	0	0	0	0.15	62.2	5
34.075	9.9	0	0	0	0	0	20.65	49.425	6
32.525	8.4	0	0	0	0	0	18.35	49.775	7
12.45	0.125	0	0	0	0	0	0.975	61	8
39.1	14.825	0	0	0	0	0	27.575	48.75	9
28.875	5.175	0	0	0	0	0	13.175	51.175	10
10.1	0.025	0	0	0	0	0	0.225	61.95	11
34.825	10.925	0	0	0	0	0	22.2	49.125	12
27.85	4.725	0	0	0	0	0	12.025	51.575	13
9.55	0.025	0	0	0	0	0	0.125	62.075	14
34.075	9.9	0	0	0	0	0	20.85	49.4	15
32.525	8.475	0	0	0	0	0	18.325	49.8	16
12.4	0.125	0	0	0	0	0	1	60.925	17
39.075	14.875	0	0	0	0	0	27.55	48.85	18

Table 66A. Probability (as %) that MMB < MMB_{35}, < 0.5 MMB_{35} (MSST), < 0.5MSST, MMA< MMA_{ave}, MMA< 0.25MMA_{ave}, TOTC>OFL, TOTC>ABC, RETC< $RETC_{ave}$, and CPUE<$CPUE_{ave}$ during the long-term (1 - 30yr) projection period for the state harvest control rule policy#11 (with the 0.175 harvest rate) and scenarios 1 to 18 under Hockey Stick SR model generated recruitment for EAG. Individual estimate from 500 Monte Carlo trials and 1-30yr projection years was considered for probability estimation. Sc.: scenario.

MMA<MMA_{ave}	MMB<MMB_{35}	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	MMA<0.25MMA_{ave}	RETC<$RETC_{ave}$	CPUE<$CPUE_{ave}$	Sc.
43.08	19	0	0	0	0	0	34.08	75.0067	1
25.0667	0.8133	0	0	0	0	0	4.52	89.6267	2
48.6333	27.44	0.0267	0	0	0	0	43.7133	70.46	3
42.4	17.9267	0	0	0	0	0	32.8333	75.84	4
24.3867	0.6267	0	0	0	0	0	3.8333	89.74	5
47.6933	26.0133	0	0	0	0	0	42.38	71.04	6
46.3067	23.9267	0	0	0	0	0	39.96	71.9133	7
28.5733	1.98	0	0	0	0	0	8.06	88.7533	8
52.7	33.3	0.32	0	0	0	0	49.5467	68.9267	9
43.0933	18.9067	0	0	0	0	0	34.0533	74.9533	10
25.2133	0.8467	0	0	0	0	0	4.5667	89.5933	11
48.5733	27.52	0.0267	0	0	0	0	43.88	70.4667	12
42.34	17.9	0	0	0	0	0	32.8333	75.84	13
24.3333	0.6667	0	0	0	0	0	3.9133	89.72	14
47.7133	26.06	0	0	0	0	0	42.38	71.0467	15
46.32	23.9933	0	0	0	0	0	39.9	71.9867	16
28.5533	2.06	0	0	0	0	0	8.2067	88.74	17
52.74	33.3333	0.3467	0	0	0	0	49.6467	69.0467	18

Table 67A. Probability (as %) that MMB < MMB_{35}, < 0.5 MMB_{35} (MSST), < 0.5MSST, MMA< MMA_{ave}, MMA< 0.25MMA_{ave}, TOTC>OFL, TOTC>ABC, RETC< $RETC_{ave}$, and CPUE<$CPUE_{ave}$ during the short-term (1 - 8yr) projection period for the state harvest control rule policy#11 (with the 0.175 harvest rate) and scenarios 1 to 54 under Ricker SR model generated recruitment for EAG. Individual estimate from 500 Monte Carlo trials and 1-8yr projection years was considered for probability estimation. Sc.: scenario.

MMA<MMAave	MMB<MMB35	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	MMA<0.25MMAave	RETC<RETCave	CPUE<CPUEave	Sc.
30.825	6.025	0	0	0	0	0	14.75	52.175	1
14.25	0.05	0	0	0	0	0	0.7	62.175	2
36.725	11.775	0	0	0	0	0	23.65	49.8	3
30.1	5.575	0	0	0	0	0	13.675	52.55	4
13.825	0.025	0	0	0	0	0	0.625	62.225	5
35.7	10.95	0	0	0	0	0	22.25	50.075	6
34.125	9.475	0	0	0	0	0	20.225	50.65	7
16.9	0.275	0	0	0	0	0	1.275	61.525	8
40.475	16	0	0	0	0	0	28.875	49.375	9
30.8	6.05	0	0	0	0	0	14.85	52.25	10
14.35	0.05	0	0	0	0	0	0.65	62.1	11
36.675	11.95	0	0	0	0	0	23.7	49.95	12
30.1	5.675	0	0	0	0	0	13.675	52.575	13
13.75	0.05	0	0	0	0	0	0.5	62.15	14
35.475	10.975	0	0	0	0	0	22.425	50.1	15
34.2	9.6	0	0	0	0	0	20.325	50.7	16
16.775	0.2	0	0	0	0	0	1.225	61.425	17
40.35	16.125	0	0	0	0	0	28.9	49.5	18
73.5	48.325	0	0	0	0	0	61.675	62.4	19
75	50	0	0	0	0	0	62.5	62.5	20
72.675	47.1	0	0	0	0	0	60.525	62	21
73.65	48.475	0	0	0	0	0	61.8	62.45	22
75	50	0	0	0	0	0	62.5	62.5	23
72.8	47.225	0	0	0	0	0	60.725	62.1	24
73.1	47.575	0	0	0	0	0	61	62.225	25

Table 67A. Page 2 of 2.

MMA<MMAave	MMB<MMB35	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	MMA<0.25MMAave	RETC<RETCave	CPUE<CPUEave	Sc.
74.925	50	0	0	0	0	0	62.5	62.5	26
71.9	46.325	0.05	0	0	0	0	59.625	61.5	27
73.5	48.275	0	0	0	0	0	61.65	62.475	28
75	50	0	0	0	0	0	62.5	62.5	29
72.575	47.1	0	0	0	0	0	60.5	62.2	30
73.6	48.475	0	0	0	0	0	61.725	62.475	31
75	50	0	0	0	0	0	62.5	62.5	32
72.775	47.35	0	0	0	0	0	60.725	62.25	33
73.05	47.7	0	0	0	0	0	60.95	62.375	34
74.95	50	0	0	0	0	0	62.5	62.5	35
71.875	46.3	0.05	0	0	0	0	59.6	61.85	36
12.075	1.3	0	0	0	0	0	4.525	41.45	37
0.025	0	0	0	0	0	0	0	45.65	38
21.3	4.275	0	0	0	0	0	10.575	42.05	39
10.925	0.975	0	0	0	0	0	3.425	41.375	40
0	0	0	0	0	0	0	0	46.025	41
19.9	3.775	0	0	0	0	0	9.5	41.95	42
17.85	3.05	0	0	0	0	0	7.5	41.8	43
0.325	0	0	0	0	0	0	0	44.375	44
28.225	7.825	0	0	0	0	0	17.6	43.15	45
12.075	1.275	0	0	0	0	0	4.45	41.275	46
0.025	0	0	0	0	0	0	0	45.875	47
21.4	4.225	0	0	0	0	0	10.725	42	48
10.925	1	0	0	0	0	0	3.475	41.225	49
0.025	0	0	0	0	0	0	0	46.175	50
19.875	3.775	0	0	0	0	0	9.425	41.85	51
17.9	2.95	0	0	0	0	0	7.45	41.8	52
0.3	0	0	0	0	0	0	0	44.25	53
28.3	7.775	0	0	0	0	0	17.8	43.15	54

Table 68A. Probability (as %) that MMB < MMB_{35}, < 0.5 MMB_{35} (MSST), < 0.5MSST, MMA< MMA_{ave}, MMA< $0.25MMA_{ave}$, TOTC>OFL, TOTC>ABC, RETC< $RETC_{ave}$, and CPUE<$CPUE_{ave}$ during the long-term (1 - 30yr) projection period for the state harvest control rule policy#11 (with the 0.175 harvest rate) and scenarios 1 to 54 under Ricker SR model generated recruitment for EAG. Individual estimate from 500 Monte Carlo trials and 1-30yr projection years was considered for probability estimation. Sc.: scenario.

MMA<MMAave	MMB<MMB35	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	MMA<0.25MMAave	RETC<RETave	CPUE<CPUEave	Sc.
44.7467	19.8733	0	0	0	0	0	36.16	76.2933	1
33.56	1.5	0	0	0	0	0	8.1867	89.82	2
49.4467	27.6467	0.0067	0	0	0	0	44.78	70.9	3
44.2933	18.8333	0	0	0	0	0	34.9867	77.1067	4
33.2133	1.24	0	0	0	0	0	7.3133	89.8733	5
48.64	26.52	0	0	0	0	0	43.5267	71.62	6
47.3467	24.68	0	0	0	0	0	41.6067	72.8533	7
35.46	3.1933	0	0	0	0	0	12.1533	89.26	8
52.8333	33.0267	0.24	0	0	0	0	50	69.16	9
44.7333	19.9267	0	0	0	0	0	36.2467	76.34	10
33.62	1.5933	0	0	0	0	0	8.3667	89.8133	11
49.4267	27.7267	0.0133	0	0	0	0	44.84	71.0067	12
44.2933	18.9067	0	0	0	0	0	34.9933	77.12	13
33.1933	1.24	0	0	0	0	0	7.3667	89.84	14
48.5667	26.6067	0	0	0	0	0	43.5533	71.7067	15
47.42	24.7133	0	0	0	0	0	41.7067	72.92	16
35.5	3.1733	0	0	0	0	0	12.1267	89.2467	17
52.8	33.1467	0.2467	0	0	0	0	49.9667	69.16	18
89.1467	78.74	0.7	0	0	0	0	88.2533	89.4333	19
93.3333	86.6133	0	0	0	0	0	90	90	20
85.84	74.18	3.24	0	0.0267	0.0267	0.08	86.1	87.8333	21
89.5667	79.3733	0.5267	0	0	0	0	88.4467	89.5467	22
93.3333	86.62	0	0	0	0	0	90	90	23
86.3333	74.8533	2.7067	0	0.02	0.02	0.06	86.4467	88.1333	24
87.18	75.9667	1.9133	0	0.0067	0.0067	0.0267	87.0267	88.64	25

Table 68A. Page 2 of 2.

MMA<MMAave	MMB<MMB35	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	MMA<0.25MMAave	RETC<RETave	CPUE<CPUEave	Sc.
93.3	86.4267	0	0	0	0	0	90	90	26
83.8467	71.9	6.4133	0	0.2867	0.2867	0.54	84.32	86.18	27
89.1867	78.72	0.76	0	0	0	0	88.2333	89.44	28
93.3333	86.62	0	0	0	0	0	90	90	29
85.7867	74.2133	3.2533	0	0.02	0.02	0.0733	86.08	87.8667	30
89.54	79.36	0.5133	0	0	0	0	88.4333	89.5533	31
93.3333	86.62	0	0	0	0	0	90	90	32
86.3067	74.86	2.6067	0	0.02	0.02	0.0533	86.46	88.18	33
87.16	75.9467	1.9067	0	0.0067	0.0067	0.0333	87.02	88.68	34
93.3067	86.44	0	0	0	0	0	90	90	35
83.8133	71.8933	6.5933	0	0.2867	0.2867	0.5333	84.3267	86.2467	36
17.7533	3.9533	0	0	0	0	0	10.28	53	37
0.1667	0	0	0	0	0	0	0	59.7667	38
28.6667	11.08	0	0	0	0	0	22.2933	53.88	39
16.3667	3.2667	0	0	0	0	0	8.7	52.92	40
0.0933	0	0	0	0	0	0	0	60.18	41
27.1	9.66	0	0	0	0	0	20.3733	53.7	42
24.5733	7.7067	0	0	0	0	0	17.0267	53.4733	43
0.6333	0	0	0	0	0	0	0.0067	58.0133	44
36.08	18	0.0467	0	0	0	0	31.5467	55.3467	45
17.82	3.9867	0	0	0	0	0	10.2333	52.9333	46
0.1667	0	0	0	0	0	0	0	59.9	47
28.68	11.0933	0	0	0	0	0	22.4533	53.8333	48
16.3933	3.3267	0	0	0	0	0	8.8467	53.0133	49
0.1067	0	0	0	0	0	0	0	60.2933	50
27.0467	9.7867	0	0	0	0	0	20.38	53.7533	51
24.5867	7.7133	0	0	0	0	0	17.1067	53.4933	52
0.66	0	0	0	0	0	0	0.0133	57.9067	53
36.1	18.08	0.0467	0	0	0	0	31.68	55.34	54

Table 69A. Probability (as %) that MMB < MMB_{35}, < 0.5 MMB_{35} (MSST), < 0.5MSST, MMA< MMA_{ave}, MMA< 0.25MMA_{ave}, TOTC>OFL, TOTC>ABC, RETC< $RETC_{ave}$, and CPUE<$CPUE_{ave}$ during the short-term (1 - 8yr) projection period for the state harvest control rule policy#11 (with the 0.175 harvest rate) and scenarios 1 to 18 under Hockey Stick SR model generated recruitment for WAG. Individual estimate from 500 Monte Carlo trials and 1-8yr projection years was considered for probability estimation. Sc.: scenario.

MMA<MMA_{ave}	MMB<MMB_{35}	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	MMA<0.25MMA_{ave}	RETC<$RETC_{ave}$	CPUE<$CPUE_{ave}$	Sc.
33.175	5.95	0	0	0	0	0	81.825	76.825	1
27.45	2.35	0	0	0	0	0	82.675	77.85	2
51.925	32.25	0	0	0	0	0	83.525	76.525	3
32.6	5.5	0	0	0	0	0	81.9	76.925	4
26.65	2.05	0	0	0	0	0	82.75	77.9	5
51.125	31.35	0	0	0	0	0	83.325	76.3	6
37	9.3	0	0	0	0	0	81.5	76.25	7
31.275	4.475	0	0	0	0	0	82.25	77.075	8
54.925	37.225	0	0	0	0	0	84.6	77.6	9
33.275	5.85	0	0	0	0	0	82.275	77.65	10
27.85	2.425	0	0	0	0	0	83.425	78.775	11
52	32.325	0	0	0	0	0	83.5	77.6	12
32.65	5.25	0	0	0	0	0	82.35	77.725	13
27.025	1.975	0	0	0	0	0	83.55	79.025	14
51.15	31.4	0	0	0	0	0	83.35	77.4	15
36.925	9.2	0	0	0	0	0	81.8	76.9	16
31.4	4.425	0	0	0	0	0	82.825	78	17
54.975	37.35	0	0	0	0	0	84.575	78.575	18

Table 70A. Probability (as %) that MMB < MMB_{35}, < 0.5 MMB_{35} (MSST), < 0.5MSST, MMA< MMA_{ave}, MMA< $0.25MMA_{ave}$, TOTC>OFL, TOTC>ABC, RETC< $RETC_{ave}$, and CPUE<$CPUE_{ave}$ during the long-term (1 - 30yr) projection period for the state harvest control rule policy#11 (with the 0.175 harvest rate) and scenarios 1 to 18 under Hockey Stick SR model generated recruitment for WAG. Individual estimate from 500 Monte Carlo trials and 1-30yr projection years was considered for probability estimation. Sc.: scenario.

MMA<MMA_{ave}	MMB<MMB_{35}	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	MMA<$0.25MMA_{ave}$	RETC<$RETC_{ave}$	CPUE<$CPUE_{ave}$	Sc.
34.8267	8.12	0	0	0	0	0	65.3533	58.1067	1
28.6	3.2133	0	0	0	0	0	65.6333	58.8733	2
53.0333	36.4933	0.06	0	0	0	0	70.4467	59.0133	3
34.0533	7.34	0	0	0	0	0	65.4267	58.2133	4
27.8133	2.7933	0	0	0	0	0	65.66	58.96	5
52.2333	35.4667	0.02	0	0	0	0	70.14	58.7	6
38.1867	11.8133	0	0	0	0	0	65.42	57.6267	7
32.52	5.9467	0	0	0	0	0	65.5267	58.3267	8
56.9867	42.6333	0.58	0	0	0	0	72.88	61.1267	9
34.8267	8.1867	0	0	0	0	0	65.32	58.28	10
28.76	3.26	0	0	0	0	0	65.8733	59.26	11
53.0933	36.6133	0.04	0	0	0	0	70.5667	59.1933	12
34.1667	7.4667	0	0	0	0	0	65.4267	58.4467	13
28.0067	2.8533	0	0	0	0	0	65.9133	59.3733	14
52.2467	35.4733	0.02	0	0	0.0067	0	70.1933	58.9667	15
38.1267	12.0867	0	0	0	0	0	65.46	57.8933	16
32.7067	6.0667	0	0	0	0	0	65.4933	58.6867	17
57.0133	42.5933	0.56	0	0	0.0067	0	73.0267	61.5133	18

Table 71A. Probability (as %) that MMB < MMB_{35}, < 0.5 MMB_{35} (MSST), < 0.5MSST, MMA< MMA_{ave}, MMA< 0.25MMA_{ave}, TOTC>OFL, TOTC>ABC, RETC< $RETC_{ave}$, and CPUE<$CPUE_{ave}$ during the short-term (1 - 8yr) projection period for the state harvest control rule policy#11 (with the 0.175 harvest rate) and scenarios 1 to 54 under Ricker SR model generated recruitment for WAG. Individual estimate from 500 Monte Carlo trials and 1-8yr projection years was considered for probability estimation. Sc.: scenario.

MMA<MMAave	MMB<MMB35	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	MMA<0.25MMAave	RETC<RETCave	CPUE<CPUEave	Sc.
31.95	5.55	0	0	0	0	0	81.125	76.025	1
25.7	2.05	0	0	0	0	0	81.625	77.05	2
51.3	32	0	0	0	0	0	83.325	76.325	3
31.375	5.1	0	0	0	0	0	81.125	76.175	4
25.05	1.85	0	0	0	0	0	81.725	77.05	5
50.65	30.95	0	0	0	0	0	83.1	76.175	6
35.875	8.75	0	0	0	0	0	80.875	75.8	7
29.825	4.125	0	0	0	0	0	81.1	76.45	8
54.675	36.975	0	0	0	0	0	84.5	77.35	9
32	5.325	0	0	0	0	0	81.5	76.8	10
26.175	2.075	0	0	0	0	0	82.325	77.825	11
51.525	32.05	0	0	0	0	0	83.45	77.325	12
31.5	4.825	0	0	0	0	0	81.725	77.15	13
25.2	1.775	0	0	0	0	0	82.475	77.95	14
50.7	31.025	0	0	0	0	0	83.175	77.15	15
35.925	8.55	0	0	0	0	0	81.175	76.075	16
30.125	4.025	0	0	0	0	0	82	77.225	17
54.75	37	0	0	0	0	0	84.4	78.35	18
87.5	75	0	0	0	0	0	100	97.525	19
87.5	75	0	0	0	0	0	100	97.5	20
86.275	73.2	2.475	0	0	0	0.05	99.925	94.7	21
87.5	75	0	0	0	0	0	100	97.5	22
87.5	75	0	0	0	0	0	100	97.5	23
86.375	73.425	2.3	0	0	0	0.025	99.925	94.875	24
87.5	74.95	0.1	0	0	0	0	100	97.425	25

Table 71A. Page 2 of 2.

MMA<MMAave	MMB<MMB35	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	MMA<0.25MMAave	RETC<RETCave	CPUE<CPUEave	Sc.
87.5	75	0	0	0	0	0	100	97.475	26
85.375	72.075	4.1	0	0.05	0.075	0.325	99.625	93.3	27
87.5	75	0	0	0	0	0	100	100	28
87.5	75	0	0	0	0	0	100	100	29
86.275	73.25	2.425	0	0	0	0.05	99.925	98.9	30
87.5	75	0	0	0	0	0	100	100	31
87.5	75	0	0	0	0	0	100	100	32
86.375	73.5	2.25	0	0	0	0.05	99.925	98.95	33
87.5	75	0.025	0	0	0	0	100	100	34
87.5	75	0	0	0	0	0	100	100	35
85.4	72.15	4.35	0	0.05	0.05	0.2	99.65	98.025	36
3.525	0.05	0	0	0	0	0	51.9	47.9	37
0.975	0	0	0	0	0	0	48.475	44.55	38
34.075	16.65	0	0	0	0	0	72.775	66.65	39
3.1	0.025	0	0	0	0	0	51.25	47.55	40
0.825	0	0	0	0	0	0	48.2	44.3	41
33	15.475	0	0	0	0	0	72.1	65.9	42
6.6	0.275	0	0	0	0	0	54.75	50.925	43
2.4	0	0	0	0	0	0	50.5	46.7	44
41.35	24.35	0	0	0	0	0	76.65	69.525	45
3.675	0.05	0	0	0	0	0	51.825	48	46
0.925	0	0	0	0	0	0	47.95	44.35	47
34.225	16.8	0	0	0	0	0	72.825	66.8	48
3.175	0.025	0	0	0	0	0	51.5	47.3	49
0.825	0	0	0	0	0	0	47.8	44.125	50
33.05	15.475	0	0	0	0	0	72.05	66.3	51
6.625	0.275	0	0	0	0	0	54.45	51.175	52
2.475	0.025	0	0	0	0	0	50.175	46.375	53
41.475	24.55	0	0	0	0	0	76.5	70.325	54

Table 72A. Probability (as %) that $MMB < MMB_{35}$, $< 0.5\ MMB_{35}$ (MSST), $< 0.5MSST$, $MMA < MMA_{ave}$, $MMA < 0.25MMA_{ave}$, TOTC>OFL, TOTC>ABC, $RETC < RETC_{ave}$, and $CPUE < CPUE_{ave}$ during the long-term (1 - 30yr) projection period for the state harvest control rule policy#11 (with the 0.175 harvest rate) and scenarios 1 to 54 under Ricker SR model generated recruitment for WAG. Individual estimate from 500 Monte Carlo trials and 1-30yr projection years was considered for probability estimation. Sc.: scenario.

MMA<MMAave	MMB<MMB35	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	MMA<0.25MMAave	RETC<RETCave	CPUE<CPUEave	Sc.
32.1733	6.6933	0	0	0	0	0	62.84	55.6667	1
26.0533	2.4067	0	0	0	0	0	63.02	56.2333	2
50.4867	33.7933	0.02	0	0	0	0	68.48	56.84	3
31.4533	6.0867	0	0	0	0	0	62.88	55.6	4
25.2733	2.0667	0	0	0	0	0	62.9667	56.32	5
49.8067	32.8067	0.0067	0	0	0	0	68.1467	56.4933	6
35.8067	10.2133	0	0	0	0	0	63.1267	55.36	7
29.92	4.98	0	0	0	0	0	62.8333	55.8533	8
54.42	39.3467	0.32	0	0	0	0	70.9133	58.8933	9
32.18	6.82	0	0	0	0	0	62.8933	55.96	10
26.2467	2.54	0	0	0	0	0	63.0133	56.5067	11
50.5533	33.7933	0.0133	0	0	0	0	68.54	57.08	12
31.5467	6.1267	0	0	0	0	0	62.8733	56.0333	13
25.2867	2.2	0	0	0	0	0	63.12	56.48	14
49.8	32.8467	0	0	0	0	0	68.2133	56.78	15
35.7867	10.3533	0	0	0	0	0	63.0533	55.4467	16
30.18	5.0267	0	0	0	0	0	62.9867	56.1467	17
54.5	39.4667	0.32	0	0	0.0067	0	70.9533	59.1733	18
96.4533	92.7733	0.3333	0	0	0.0133	0	100	99.22	19
96.6467	93.2333	0.1467	0	0	0.0067	0	100	99.3333	20
88.3667	81.38	5.8467	0	0.1067	0.1733	0.1533	97.6867	90.1667	21
96.48	92.8533	0.3067	0	0	0.0267	0	100	99.2533	22
96.66	93.2467	0.14	0	0	0.0067	0	100	99.3333	23
88.8533	81.9467	5.3867	0	0.08	0.1467	0.1133	97.8933	90.6933	24
96.1	92.0333	0.5733	0	0	0.0133	0	99.9867	98.8667	25

Table 72A. Page 2 of 2.

MMA<MMAave	MMB<MMB35	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	MMA<0.25MMAave	RETC<RETCave	CPUE<CPUEave	Sc.
96.54	93.02	0.28	0	0	0	0	100	99.2933	26
86.1267	78.84	9.5267	0	0.5467	0.7	0.82	96.3133	87.4467	27
96.4333	92.82	0.1933	0	0	0	0	100	99.8867	28
96.6467	93.2267	0.0467	0	0	0.02	0	100	100	29
88.3467	81.4467	5.8533	0	0.0733	0.1333	0.1733	97.68	91.36	30
96.46	92.8867	0.1467	0	0	0.02	0	100	99.9267	31
96.66	93.2733	0.0333	0	0	0.0067	0	100	100	32
88.7533	81.9667	5.3067	0	0.0733	0.12	0.12	97.8667	91.8267	33
96.0867	92.1467	0.4267	0	0	0.0067	0	99.9933	99.6	34
96.5533	93.0467	0.1	0	0	0	0	100	99.9733	35
86.2267	78.86	9.68	0	0.5333	0.62	0.7533	96.2533	88.8733	36
1.4333	0.0267	0	0	0	0	0	15.4133	14	37
0.2733	0	0	0	0	0	0	13.1667	12.0467	38
29.56	14.7933	0	0	0	0	0	46.8733	37.9	39
1.22	0.0133	0	0	0	0	0	15.0067	13.68	40
0.2333	0	0	0	0	0	0	13.0333	11.96	41
28.2733	13.36	0	0	0	0	0	45.3733	36.8	42
3.1933	0.2133	0	0	0	0	0	18.02	16.2733	43
0.8467	0	0	0	0	0	0	14.3	13.0533	44
37.3333	23.14	0.0667	0	0	0.0067	0	54.0933	43.4267	45
1.4733	0.02	0	0	0	0	0	15.36	14	46
0.26	0	0	0	0	0	0	13.0267	12.0067	47
29.6667	14.9267	0	0	0	0	0	46.76	37.9	48
1.2333	0.0133	0	0	0	0	0	14.9933	13.6067	49
0.2333	0	0	0	0	0	0	12.94	11.9067	50
28.2533	13.54	0	0	0	0	0	45.4067	36.9933	51
3.2333	0.2133	0	0	0	0	0	18.0267	16.4467	52
0.8667	0.0067	0	0	0	0	0	14.2133	13	53
37.36	23.2533	0.06	0	0	0	0	53.9933	43.8867	54

Table 73A. Probability (as %) that MMB < MMB_{35}, < 0.5 MMB_{35} (MSST), < 0.5MSST, MMA< MMA_{ave}, MMA< 0.25MMA_{ave}, TOTC>OFL, TOTC>ABC, RETC< $RETC_{ave}$, and CPUE<$CPUE_{ave}$ during the long-term (1 - 30yr) projection period for the state harvest control rule policy#12 (with the 0.225 harvest rate) and scenarios 1 to 18 under Hockey Stick SR model generated recruitment for EAG. Individual estimate from 500 Monte Carlo trials and 1-30yr projection years was considered for probability estimation. Sc.: scenario.

MMA<MMA_{ave}	MMB<MMB_{35}	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	MMA<0.25MMA_{ave}	RETC<$RETC_{ave}$	CPUE<$CPUE_{ave}$	Sc.
45.5333	24.84	0	0	0	0	0	34.3667	77.06	1
25.7133	1.46	0	0	0	0	0	5.14	89.6733	2
51.4133	33.56	0.1133	0	0	0	0	43.54	73.5067	3
44.7933	23.6467	0	0	0	0	0	32.9467	77.7933	4
24.9333	1.08	0	0	0	0	0	4.4867	89.7867	5
50.3467	32.18	0.0667	0	0	0	0	41.98	73.7667	6
48.8867	30.0467	0.0133	0	0	0	0	39.7933	74.6133	7
29.4733	3.44	0	0	0	0	0	8.8067	88.9133	8
55.3333	39.3	0.8867	0	0	0	0	49.5067	72.0733	9
45.5933	24.8733	0	0	0	0	0	34.36	76.7733	10
25.82	1.4667	0	0	0	0	0	5.2933	89.6	11
51.3933	33.5933	0.12	0	0	0	0	43.4733	73.2267	12
44.86	23.64	0	0	0	0	0	32.98	77.6067	13
24.8867	1.0667	0	0	0	0	0	4.4533	89.7333	14
50.38	32.2533	0.0533	0	0	0	0	42.0267	73.6467	15
48.8667	30.0933	0.0133	0	0	0	0	39.84	74.4467	16
29.42	3.46	0	0	0	0	0	8.8533	88.8333	17
55.3067	39.3133	0.9	0	0	0	0	49.48	71.9067	18

Table 74A. Probability (as %) that MMB < MMB_{35}, < 0.5 MMB_{35} (MSST), < 0.5MSST, MMA< MMA_{ave}, MMA< 0.25MMA_{ave}, TOTC>OFL, TOTC>ABC, RETC< $RETC_{ave}$, and CPUE<$CPUE_{ave}$ during the long-term (1 - 30yr) projection period for the state harvest control rule policy#12 (with the 0.225 harvest rate) and scenarios 1 to 54 under Ricker SR model generated recruitment for EAG. Individual estimate from 500 Monte Carlo trials and 1-30yr projection years was considered for probability estimation. Sc.: scenario.

MMA<MMAave	MMB<MMB35	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	MMA<0.25MMAave	RETC<RETCave	CPUE<CPUEave	Sc.
47.0267	26.0667	0	0	0	0	0	35.94	78.26	1
34.36	2.7867	0	0	0	0	0	8.8467	89.8933	2
51.7467	33.5667	0.0733	0	0	0	0	44.1	73.6533	3
46.4467	24.8933	0	0	0	0	0	34.8667	78.88	4
33.78	2.22	0	0	0	0	0	8.0133	89.96	5
51.0867	32.2667	0.0467	0	0	0	0	42.72	74.38	6
49.9267	30.52	0.0067	0	0	0	0	40.8333	75.1867	7
36.28	5.38	0	0	0	0	0	12.94	89.4267	8
55.0467	38.5	0.62	0	0	0	0	49.4	71.8733	9
47.0933	26.0067	0	0	0	0	0	36.2067	78.0133	10
34.3	2.7333	0	0	0	0	0	8.9933	89.82	11
51.7867	33.52	0.0933	0	0	0	0	44.1	73.4667	12
46.4867	24.9133	0	0	0	0	0	35.0067	78.6533	13
33.8133	2.32	0	0	0	0	0	8.02	89.86	14
51.1067	32.32	0.04	0	0	0	0	42.7867	74.0533	15
49.8733	30.6333	0.0067	0	0	0	0	40.8533	75.0333	16
36.2733	5.4	0	0	0	0	0	13.02	89.3667	17
55.04	38.5	0.62	0	0	0	0	49.44	71.7533	18
89.1333	80.4667	3.0733	0	0	0	0.0133	87.0333	89.4933	19
93.3267	86.6733	0.0667	0	0	0	0	89.9733	90	20
85.9133	76.86	6.9533	0	0.0667	0.0667	0.1667	84.8267	88.1733	21
89.4867	80.94	2.78	0	0	0	0	87.3	89.62	22
93.3333	86.68	0.0533	0	0	0	0	89.98	90	23
86.2867	77.4467	6.1867	0	0.0533	0.0533	0.1267	85.16	88.4667	24
87.18	78.24	5.0267	0	0.02	0.02	0.08	85.68	88.9067	25

Table 74A. Page 2 of 2.

MMA<MMAave	MMB<MMB35	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	MMA<0.25MMAave	RETC<RETCave	CPUE<CPUEave	Sc.
93.2933	86.54	0.1667	0	0	0	0	89.9133	90	26
83.84	74.8067	11.0133	0	0.5067	0.5067	0.84	83.06	86.6733	27
89.12	80.4133	3.0733	0	0	0	0.0133	86.9933	89.5067	28
93.3267	86.5933	0.06	0	0	0	0	89.9667	90	29
85.8933	76.8333	6.9733	0	0.06	0.06	0.1867	84.8333	88.1333	30
89.48	81.02	2.8333	0	0	0	0	87.3467	89.6133	31
93.3333	86.6333	0.0467	0	0	0	0	89.98	90	32
86.3267	77.4267	6.2067	0	0.0333	0.0333	0.1267	85.1467	88.44	33
87.1867	78.2333	5.0333	0	0.02	0.02	0.0667	85.6267	88.9	34
93.2933	86.4933	0.1667	0	0	0	0	89.9067	90	35
83.86	74.8667	11.0467	0	0.5467	0.5533	0.8533	83.08	86.62	36
20.1667	6.7533	0	0	0	0	0	10.9267	56.16	37
0.1933	0	0	0	0	0	0	0	59.7267	38
31.48	15.7933	0	0	0	0	0	23.1	57.5533	39
18.5333	5.7333	0	0	0	0	0	9.5933	55.9333	40
0.1267	0	0	0	0	0	0	0	60.16	41
29.82	14.0067	0	0	0	0	0	21.14	57.12	42
27.1467	11.56	0	0	0	0	0	18.02	56.8	43
0.7133	0	0	0	0	0	0	0.02	58.2333	44
38.9333	23.08	0.1467	0	0	0	0	32.0333	59.2867	45
20.1733	6.7467	0	0	0	0	0	10.9533	55.8333	46
0.2	0	0	0	0	0	0	0	59.7733	47
31.4867	15.8067	0	0	0	0	0	23.2133	57.36	48
18.5867	5.7533	0	0	0	0	0	9.58	55.72	49
0.14	0	0	0	0	0	0	0	60.2733	50
29.8067	14.0333	0	0	0	0	0	21.3267	57.0267	51
27.1533	11.5733	0	0	0	0	0	18.08	56.5733	52
0.7267	0	0	0	0	0	0	0.02	58.1067	53
38.9133	23.0533	0.14	0	0	0	0	32.1267	59.0733	54

Table 75A. Probability (as %) that $MMB < MMB_{35}$, $< 0.5\ MMB_{35}$ (MSST), < 0.5MSST, $MMA < MMA_{ave}$, $MMA < 0.25MMA_{ave}$, TOTC>OFL, TOTC>ABC, $RETC < RETC_{ave}$, and $CPUE<CPUE_{ave}$ during the long-term (1 - 30yr) projection period for the state harvest control rule policy#12 (with the 0.225 harvest rate) and scenarios 1 to 18 under Hockey Stick SR model generated recruitment for WAG. Individual estimate from 500 Monte Carlo trials and 1-30yr projection years was considered for probability estimation. Sc.: scenario.

$MMA<MMA_{ave}$	$MMB<MMB_{35}$	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	$MMA<0.25MMA_{ave}$	$RETC<RETC_{ave}$	$CPUE<CPUE_{ave}$	Sc.
35.0867	9.5267	0	0	0	0	0	64.6733	58.78	1
28.4867	3.8	0	0	0	0	0	65.2933	58.72	2
54.9533	40.7667	0.1867	0	0	0.0267	0	70.1933	63.34	3
34.2533	8.7133	0	0	0	0	0	64.6933	58.7267	4
27.7067	3.2467	0	0	0	0	0	65.4533	58.76	5
54.04	39.7267	0.1267	0	0	0.0067	0	69.8333	63.0867	6
38.66	14.18	0	0	0	0	0	64.56	59.0733	7
32.66	7.0267	0	0	0	0	0	64.6533	58.7133	8
59.06	46.7067	1.32	0	0	0.02	0	72.9133	65.6333	9
35.08	9.54	0	0	0	0	0	64.66	58.9533	10
28.7333	3.74	0	0	0	0	0	65.6133	58.9867	11
55.06	40.8933	0.2	0	0	0.0067	0	70.2133	63.5533	12
34.4267	8.7	0	0	0	0	0	64.72	58.96	13
27.94	3.2867	0	0	0	0	0	65.7267	58.9467	14
54.1933	39.74	0.1333	0	0	0	0	69.84	63.2733	15
38.6267	14.1867	0	0	0	0	0	64.62	59.1533	16
32.7867	7.1667	0	0	0	0	0	65.02	58.96	17
59.06	46.6867	1.28	0	0	0.0733	0	73.04	65.72	18

Table 76A. Probability (as %) that MMB < MMB_{35}, < 0.5 MMB_{35} (MSST), < 0.5MSST, MMA< MMA_{ave}, MMA< 0.25MMA_{ave}, TOTC>OFL, TOTC>ABC, RETC< $RETC_{ave}$, and CPUE<$CPUE_{ave}$ during the long-term (1 - 30yr) projection period for the state harvest control rule policy#12 (with the 0.225 harvest rate) and scenarios 1 to 54 under Ricker SR model generated recruitment for WAG. Individual estimate from 500 Monte Carlo trials and 1-30yr projection years was considered for probability estimation. Sc.: scenario.

MMA<MMAave	MMB<MMB35	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	MMA<0.25MMAave	RETC<RETCave	CPUE<CPUEave	Sc.
32.4267	8.0733	0	0	0	0	0	62.2267	56.2533	1
26.0533	2.88	0	0	0	0	0	62.4867	55.9267	2
52.0467	37.6467	0.0933	0	0	0.0267	0	67.9133	60.98	3
31.6533	7.3133	0	0	0	0	0	62.1067	56.26	4
25.2533	2.44	0	0	0	0	0	62.5333	55.9	5
51.2933	36.68	0.0667	0	0	0.02	0	67.5267	60.7	6
36.2867	12.32	0	0	0	0	0	62.26	56.7867	7
29.9867	6.0333	0	0	0	0	0	62.3867	56.2333	8
56.2533	43.0933	0.7933	0	0	0	0	70.3733	63.1533	9
32.3533	8.1733	0	0	0	0	0	62.3867	56.5667	10
26.2	2.94	0	0	0	0	0	62.9733	56.3467	11
52.14	37.64	0.1067	0	0	0.0133	0	67.8733	61.26	12
31.72	7.4067	0	0	0	0	0	62.2867	56.4867	13
25.26	2.5	0	0	0	0	0	63.02	56.28	14
51.32	36.6867	0.0533	0	0	0	0	67.5267	60.9333	15
36.26	12.3933	0	0	0	0	0	62.2933	56.7733	16
30.2933	6.04	0	0	0	0	0	62.36	56.4067	17
56.1933	43.1533	0.7467	0	0	0.04	0	70.4533	63.26	18
96.4	92.6867	3.08	0	0	0.0533	0	100	99.86	19
96.6267	93.1667	2.8067	0	0	0.0867	0	100	99.9533	20
88.2867	82.0067	9.8267	0	0.2333	0.4333	0.3333	96.9467	92.4533	21
96.44	92.7667	3.0533	0	0	0.1067	0	100	99.88	22
96.6333	93.1933	2.7733	0	0	0.1	0	100	99.9533	23
88.6067	82.54	9.2467	0	0.1667	0.32	0.2467	97.16	92.8133	24
95.9333	91.8733	3.4533	0	0	0.0733	0	99.9667	99.6533	25

Table 76A. Page 2 of 2.

MMA<MMAave	MMB<MMB35	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	MMA<0.25MMAave	RETC<RETCave	CPUE<CPUEave	Sc.
96.52	92.9	2.96	0	0	0.0667	0	100	99.9267	26
86.1533	79.68	14.1533	0	1.0267	1.26	1.1733	95.5533	89.9667	27
96.3933	92.6267	2.92	0	0	0.0867	0	100	99.9333	28
96.6267	93.1667	2.5	0	0	0.0667	0	100	100	29
88.24	81.9933	9.8333	0	0.1867	0.38	0.2733	96.92	92.7267	30
96.4133	92.7467	2.8467	0	0	0.0733	0	100	99.96	31
96.6467	93.1867	2.4667	0	0	0.0933	0	100	100	32
88.58	82.4533	9.3533	0	0.18	0.3933	0.24	97.1733	93.0733	33
95.9267	91.92	3.3333	0	0	0.0533	0	99.96	99.6933	34
96.4933	92.9533	2.7333	0	0	0.08	0	100	99.9867	35
86.24	79.6467	14.2467	0	0.94	1.1733	1.1533	95.5533	90.2333	36
1.5	0.0333	0	0	0	0	0	15.5	13.9533	37
0.26	0	0	0	0	0	0	13.2067	12.0067	38
31.5867	18.4	0	0	0	0	0	46.8333	41.48	39
1.2667	0.0333	0	0	0	0	0	15.1467	13.6667	40
0.2267	0	0	0	0	0	0	13.0533	11.92	41
30.26	16.8533	0	0	0	0	0	45.6533	40.48	42
3.4267	0.36	0	0	0	0	0	18.34	16.5333	43
0.86	0.0133	0	0	0	0	0	14.3333	12.9867	44
39.4533	26.8467	0.1933	0	0	0.0067	0	54.2133	47.7133	45
1.54	0.0333	0	0	0	0	0	15.5133	13.94	46
0.26	0	0	0	0	0	0	13.12	11.9733	47
31.6133	18.48	0	0	0	0	0	47.1	41.6733	48
1.2733	0.0267	0	0	0	0	0	15.1333	13.5333	49
0.2333	0	0	0	0	0	0	12.96	11.8467	50
30.2067	16.9733	0	0	0	0	0	45.64	40.6	51
3.46	0.34	0	0	0	0	0	18.46	16.7267	52
0.9133	0.0067	0	0	0	0	0	14.3733	12.96	53
39.4733	26.9	0.22	0	0	0.0067	0	54.3267	47.86	54

Table 77A. Probability (as %) that MMB < MMB_{35}, < 0.5 MMB_{35} (MSST), < 0.5MSST, MMA< MMA_{ave}, MMA< 0.25MMA_{ave}, TOTC>OFL, TOTC>ABC, RETC< $RETC_{ave}$, and CPUE<$CPUE_{ave}$ during the long-term (1 - 30yr) projection period for the state harvest control rule policy#13 (with the 0.15 harvest rate) and scenarios 1 to 18 under Hockey Stick SR model generated recruitment for EAG. Individual estimate from 500 Monte Carlo trials and 1-30yr projection years was considered for probability estimation. Sc.: scenario.

MMA<MMA_{ave}	MMB<MMB_{35}	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	MMA<0.25MMA_{ave}	RETC<$RETC_{ave}$	CPUE<$CPUE_{ave}$	Sc.
40	18.8933	0	0	0	0	0	31.7533	70.62	1
19.1067	0.58	0	0	0	0	0	3.2533	87.16	2
46.24	27.7667	0.2467	0	0	0	0	41.8267	66.94	3
39.1067	17.7533	0	0	0	0	0	30.4333	71.4333	4
18.2733	0.4667	0	0	0	0	0	2.7	87.3133	5
45.34	26.3933	0.18	0	0	0	0	40.16	67.3	6
43.6333	23.9667	0.0733	0	0	0	0	37.68	68.0133	7
22.7467	1.6333	0	0	0	0	0	5.9733	85.9733	8
50.7467	34.2067	1.6533	0	0.0067	0.0067	0.0133	48.1867	66.02	9
40.0133	18.96	0	0	0	0	0	31.8133	70.6733	10
19.0133	0.58	0	0	0	0	0	3.2933	87.14	11
46.2667	27.8067	0.2333	0	0	0	0	41.74	66.98	12
39.1533	17.76	0	0	0	0	0	30.5067	71.4133	13
18.1867	0.4733	0	0	0	0	0	2.7467	87.28	14
45.3733	26.4533	0.1867	0	0	0	0	40.2933	67.3933	15
43.6733	23.98	0.0733	0	0	0	0	37.6133	68.0933	16
22.96	1.6267	0	0	0	0	0	6.0133	85.9467	17
50.7133	34.2133	1.62	0	0.02	0.0267	0.02	48.2667	66.0733	18

Table 78A. Probability (as %) that MMB < MMB_{35}, < 0.5 MMB_{35} (MSST), < 0.5MSST, MMA< MMA_{ave}, MMA< 0.25MMA_{ave}, TOTC>OFL, TOTC>ABC, RETC< $RETC_{ave}$, and CPUE<CPUEave during the long-term (1 - 30yr) projection period for the state harvest control rule policy#13 (with the 0.15 harvest rate) and scenarios 1 to 54 under Ricker SR model generated recruitment for EAG. Individual estimate from 500 Monte Carlo trials and 1-30yr projection years was considered for probability estimation. Sc.: scenario.

MMA<MMAave	MMB<MMB35	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	MMA<0.25MMAave	RETC<RETCave	CPUE<CPUEave	Sc.
41.5	19.8867	0	0	0	0	0	33.7467	72.0067	1
27.4	1.26	0	0	0	0	0	5.9267	87.54	2
46.7133	27.78	0.2	0	0	0	0	42.4067	67.3533	3
40.94	18.8267	0	0	0	0	0	32.6333	72.8733	4
26.7	0.9933	0	0	0	0	0	5.3133	87.7	5
45.7733	26.4733	0.16	0	0	0	0	41.22	67.84	6
44.5067	24.5667	0.0533	0	0	0	0	38.9933	68.6267	7
29.6867	2.68	0	0	0	0	0	9.8533	86.7467	8
50.4667	33.3067	1.2	0	0	0	0	48.0733	65.7667	9
41.5067	19.9067	0	0	0	0	0	33.8533	72.1	10
27.4267	1.2333	0	0	0	0	0	6.0133	87.46	11
46.7067	27.7867	0.22	0	0	0	0	42.34	67.3333	12
40.9333	18.8467	0	0	0	0	0	32.6	72.98	13
26.8333	1.0267	0	0	0	0	0	5.4067	87.6267	14
45.8533	26.5133	0.16	0	0	0	0	41.02	67.8333	15
44.5333	24.6667	0.0533	0	0	0	0	39.04	68.7067	16
29.7933	2.6667	0	0	0	0	0	9.9733	86.7333	17
50.48	33.2933	1.18	0	0	0	0	48.0933	65.7667	18
88.2933	78.2733	6.2533	0	0.0067	0.0067	0.0533	87.9133	86.9667	19
92.9467	86.4867	2.4467	0	0	0	0	89.9933	87.3467	20
84.84	73.96	11.3067	0	0.22	0.24	0.38	85.64	85.2467	21
88.7133	78.9533	5.8	0	0.0067	0.0267	0.0333	88.14	87.1133	22
92.9667	86.5133	2.3933	0	0	0	0	89.9933	87.3267	23
85.3333	74.5733	10.2467	0	0.14	0.1467	0.3	86.0867	85.6467	24
86.1133	75.64	8.98	0	0.06	0.06	0.18	86.6133	86.16	25

Table 78A. Page 2 of 2.

MMA<MMAave	MMB<MMB35	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	MMA<0.25MMAave	RETC<RETCave	CPUE<CPUEave	Sc.
92.8	86.2667	2.7267	0	0	0	0	89.9867	87.4	26
82.7267	71.66	15.9867	0	0.92	0.94	1.3267	83.9533	83.6667	27
88.2533	78.3133	6.28	0	0	0.0067	0.0533	87.9067	86.7	28
92.9467	86.4933	2.48	0	0	0	0	89.9933	86.8333	29
84.8067	73.9333	11.2533	0	0.2267	0.2333	0.3933	85.6067	85.0333	30
88.6867	78.9533	5.8	0	0.0067	0.02	0.0267	88.14	86.88	31
92.9667	86.5133	2.4267	0	0	0	0	90	86.7867	32
85.3133	74.5333	10.2533	0	0.12	0.12	0.28	86.0733	85.4667	33
86.1267	75.5733	8.94	0	0.0533	0.0533	0.18	86.6133	85.96	34
92.78	86.28	2.7133	0	0	0	0	89.98	86.96	35
82.7533	71.7	15.9733	0	0.9067	0.92	1.3133	83.8933	83.48	36
14.6	3.6	0	0	0	0	0	8.34	46.5133	37
0.0267	0	0	0	0	0	0	0	49.2533	38
25.6533	10.9067	0.02	0	0	0	0	19.8733	48.82	39
13.06	3.0133	0	0	0	0	0	7.0733	46.2733	40
0.0133	0	0	0	0	0	0	0	49.68	41
24.2333	9.4933	0.0067	0	0	0	0	17.9533	48.4333	42
21.5067	7.4667	0	0	0	0	0	14.96	47.8	43
0.2467	0	0	0	0	0	0	0	47.7933	44
33.3267	17.8933	0.3267	0	0	0	0	29.2667	51.1333	45
14.6067	3.64	0	0	0	0	0	8.46	46.4933	46
0.0333	0	0	0	0	0	0	0	49.1667	47
25.6867	10.94	0.02	0	0	0	0	19.8867	48.8	48
13.1267	3.0133	0	0	0	0	0	7.1067	46.3	49
0.0133	0	0	0	0	0	0	0	49.64	50
24.2867	9.4867	0.0067	0	0	0	0	17.9533	48.3467	51
21.3933	7.54	0	0	0	0	0	15.0533	47.7333	52
0.24	0	0	0	0	0	0	0	47.6333	53
33.3067	17.8533	0.3267	0	0	0	0	29.48	51.2067	54

Table 79A. Probability (as %) that MMB < MMB_{35}, < 0.5 MMB_{35} (MSST), < 0.5MSST, MMA< MMA_{ave}, MMA< 0.25MMA_{ave}, TOTC>OFL, TOTC>ABC, RETC< $RETC_{ave}$, and CPUE<$CPUE_{ave}$ during the long-term (1 - 30yr) projection period for the state harvest control rule policy#13 (with the 0.23 harvest rate) and scenarios 1 to 18 under Hockey Stick SR model generated recruitment for WAG. Individual estimate from 500 Monte Carlo trials and 1-30yr projection years was considered for probability estimation. Sc.: scenario.

$MMA<MMA_{ave}$	$MMB<MMB_{35}$	$MMB<MSST$	$MMB<0.5MSST$	$TOTC>OFL$	$TOTC>ABC$	$MMA<0.25MMA_{ave}$	$RETC<RETC_{ave}$	$CPUE<CPUE_{ave}$	Sc.
35.0333	9.48	0	0	0	0	0	64.6133	58.8	1
28.5267	3.7867	0	0	0	0	0	65.32	58.7467	2
55.3733	42.0867	0.4333	0	0	0.04	0	69.4133	64.7133	3
34.24	8.7333	0	0	0	0	0	64.6	58.72	4
27.6267	3.22	0	0	0	0	0	65.5133	58.6867	5
54.44	40.9333	0.3067	0	0	0.0267	0	69.0333	64.3467	6
38.6533	14.1267	0	0	0	0	0	64.3533	59.06	7
32.5667	7.0333	0	0	0	0	0	64.7333	58.7667	8
59.5467	48.5333	2.42	0	0.0333	0.2	0.0333	71.9733	67.4467	9
35	9.5133	0	0	0	0	0	64.8867	58.92	10
28.62	3.74	0	0	0	0	0	65.6333	59.0067	11
55.4733	42.2	0.4667	0	0	0.02	0	69.6	64.78	12
34.32	8.6933	0	0	0	0	0	64.8267	58.9	13
27.84	3.2733	0	0	0	0	0	65.8	58.96	14
54.5733	40.94	0.2933	0	0	0.0333	0	69.1333	64.3733	15
38.5667	14.2333	0	0	0	0	0	64.4533	59.2133	16
32.7467	7.16	0	0	0	0	0	65.0533	58.9733	17
59.5533	48.5333	2.42	0	0.04	0.1733	0.04	72.0267	67.5933	18

Table 80A. Probability (as %) that MMB < MMB_{35}, < 0.5 MMB_{35} (MSST), < 0.5MSST, MMA< MMA_{ave}, MMA< 0.25MMA_{ave}, TOTC>OFL, TOTC>ABC, RETC< $RETC_{ave}$, and CPUE<$CPUE_{ave}$ during the long-term (1 - 30yr) projection period for the state harvest control rule policy#13 (with the 0.23 harvest rate) and scenarios 1 to 54 under Ricker SR model generated recruitment for WAG. Individual estimate from 500 Monte Carlo trials and 1-30yr projection years was considered for probability estimation. Sc.: scenario.

MMA<MMAave	MMB<MMB35	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	MMA<0.25MMAave	RETC<RETCave	CPUE<CPUEave	Sc.
32.3933	8.0867	0	0	0	0	0	62.3267	56.3533	1
26.0133	2.92	0	0	0	0	0	62.7467	55.96	2
52.2467	38.7467	0.2733	0	0	0.02	0	66.8933	62.1467	3
31.6267	7.3533	0	0	0	0	0	62.2467	56.2667	4
25.22	2.4733	0	0	0	0	0	62.76	55.88	5
51.44	37.7267	0.2	0	0	0.02	0	66.4933	61.7467	6
36.2333	12.34	0	0	0	0	0	62.2133	56.7267	7
30.0467	6.0133	0	0	0	0	0	62.2333	56.3333	8
56.3867	44.34	1.4733	0	0.0267	0.1267	0.0267	69.2133	64.74	9
32.44	8.1333	0	0	0	0	0	62.2467	56.5533	10
26.0267	2.8867	0	0	0	0	0	62.9667	56.2267	11
52.2533	38.7467	0.2733	0	0	0.04	0	66.96	62.32	12
31.6933	7.4133	0	0	0	0	0	62.2	56.5333	13
25.2067	2.54	0	0	0	0	0	62.9733	56.2267	14
51.4133	37.7467	0.2	0	0	0.0333	0	66.5267	61.92	15
36.1867	12.3667	0	0	0	0	0	62.1467	56.92	16
30.2333	6.0867	0	0	0	0	0	62.3467	56.5067	17
56.3667	44.4133	1.4133	0	0.0133	0.0933	0.0133	69.24	64.7533	18
96.3467	92.54	7.1333	0	0	0.2133	0	99.9933	99.9267	19
96.6067	93.14	6.9933	0	0	0.24	0	100	100	20
87.9933	82.34	14.7667	0	0.6933	1.1333	0.7667	96.1	93.3667	21
96.4	92.68	7.1067	0	0	0.2333	0	100	99.9333	22
96.62	93.1533	7.0067	0	0	0.1933	0	100	100	23
88.3067	82.7333	14.0267	0	0.64	1.16	0.74	96.38	93.72	24
95.8467	91.68	7.4067	0	0	0.1867	0	99.9467	99.7267	25

Table 80A. Page 2 of 2.

MMA<MMAave	MMB<MMB35	MMB<MSST	MMB<0.5MSST	TOTC>OFL	TOTC>ABC	MMA<0.25MMAave	RETC<RETCave	CPUE<CPUEave	Sc.
96.4933	92.84	7.1	0	0	0.2067	0	100	99.98	26
85.8933	80.0133	20.0867	0	1.9333	2.4667	2.0933	94.5	91.16	27
96.3467	92.5533	7.0133	0	0	0.3	0	99.9933	99.9467	28
96.6133	93.14	6.9	0	0	0.18	0	100	100	29
87.9933	82.2267	14.94	0	0.6267	1.12	0.6733	96.0867	93.4133	30
96.4133	92.6267	7	0	0	0.2933	0	99.9933	99.9467	31
96.6267	93.1533	6.8867	0	0	0.22	0	100	100	32
88.2933	82.6667	14.14	0	0.5533	1.0067	0.6	96.3733	93.8133	33
95.8133	91.72	7.2533	0	0	0.2	0	99.94	99.72	34
96.4733	92.8733	6.9533	0	0	0.1933	0	100	99.98	35
85.9667	79.9933	20.2333	0	1.8467	2.4067	1.9733	94.5133	91.18	36
1.48	0.0333	0	0	0	0	0	15.54	13.9133	37
0.2667	0	0	0	0	0	0	13.1867	11.9867	38
31.74	19.24	0.02	0	0	0.0133	0	46.44	42.34	39
1.2467	0.0333	0	0	0	0	0	15.1267	13.66	40
0.24	0	0	0	0	0	0	13.0733	11.8733	41
30.2933	17.64	0.0133	0	0	0.02	0	45.2733	41.2667	42
3.3933	0.3467	0	0	0	0	0	18.3067	16.4867	43
0.8533	0.0067	0	0	0	0	0	14.4133	12.96	44
39.7067	28.2	0.4333	0	0	0.0333	0	53.3267	49.1333	45
1.5	0.0333	0	0	0	0	0	15.5733	14.02	46
0.26	0	0	0	0	0	0	13.12	11.98	47
31.7133	19.3333	0.02	0	0	0.0267	0	46.6667	42.52	48
1.2467	0.02	0	0	0	0	0	15.1267	13.5667	49
0.22	0	0	0	0	0	0	12.9667	11.86	50
30.3067	17.6867	0.0067	0	0	0	0	45.2467	41.3333	51
3.42	0.34	0	0	0	0	0	18.4133	16.7333	52
0.88	0.0067	0	0	0	0	0	14.3267	12.96	53
39.74	28.2867	0.4333	0	0	0.02	0	53.2933	49.16	54

Table 81A. Colors used to indicate the various policies in the following figures.

Policy #	Color
0	black
1	gray
2	orange
3	green
4	violet
5	Red
7	Orange
8	Green
9	Violet
10	Red
11	Dark green
13	blue

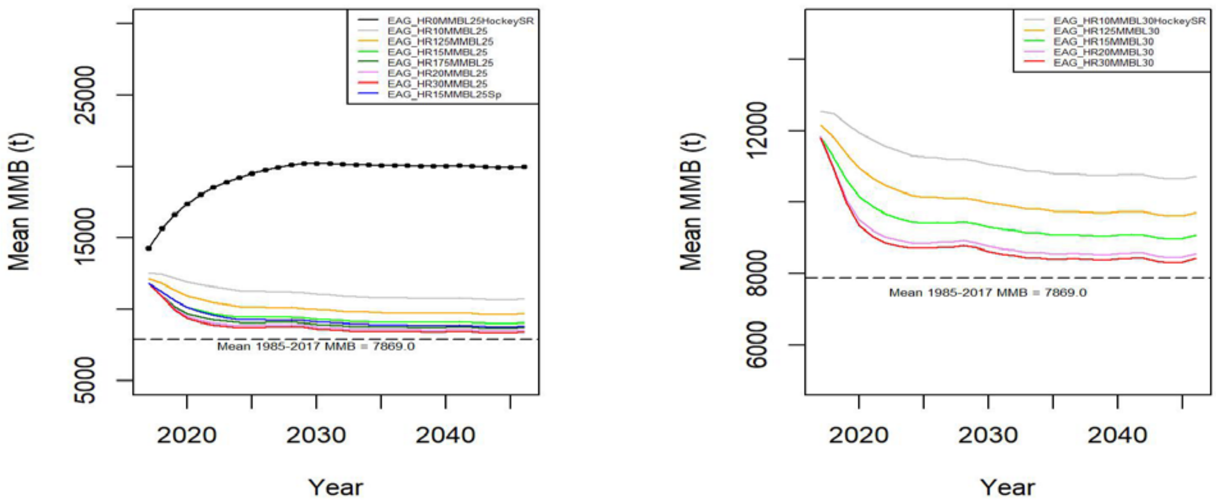

Figure 2A. Thirty-year MMB projections for selected 12 state harvest control rule policies with scenario 1 under Hockey Stick stock-recruit (SR) model generated recruits for EAG. Policy#0 (EAG_HR0MMBL25HockeySR) is the base policy with zero harvest rate and Policy#13 (EAG_HR15MMBL25Sp) is the scenario with a constant harvest rate of 0.15.

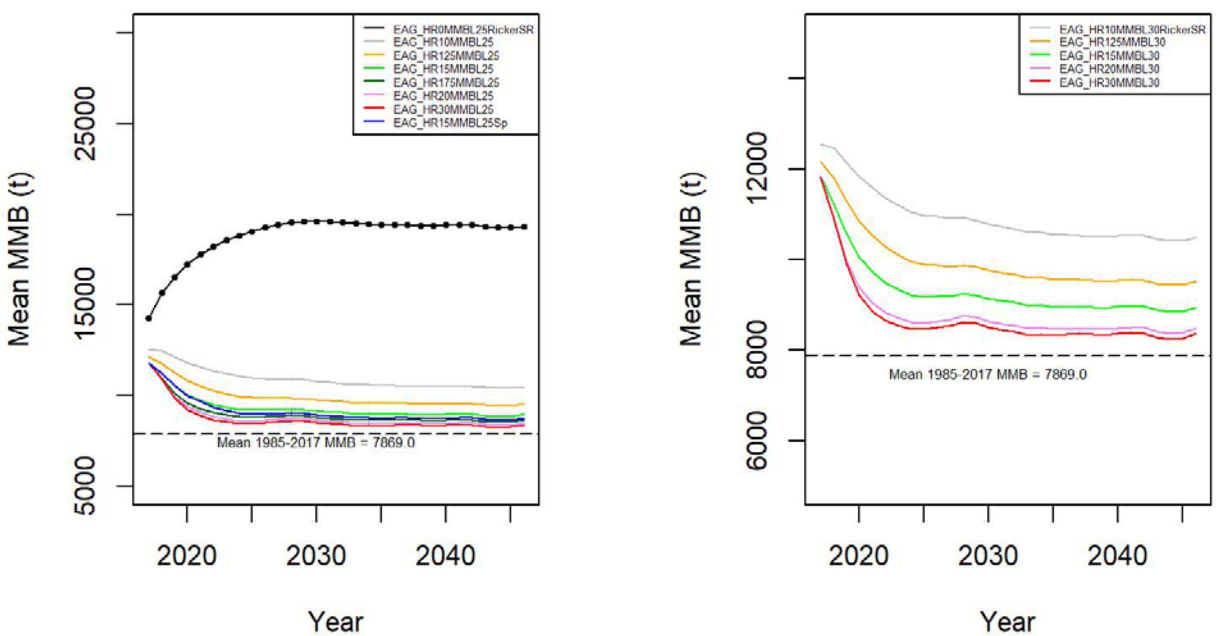

Figure 3A. Thirty-year MMB projections for selected 12 state harvest control rule policies with scenario 1 under Ricker stock-recruit (SR) model generated recruits for EAG. Policy#0 (EAG_HR0MMBL25RickerSR) is the base policy with zero harvest rate and Policy#13 (EAG_HR15MMBL25Sp) is the scenario with a constant harvest rate of 0.15.

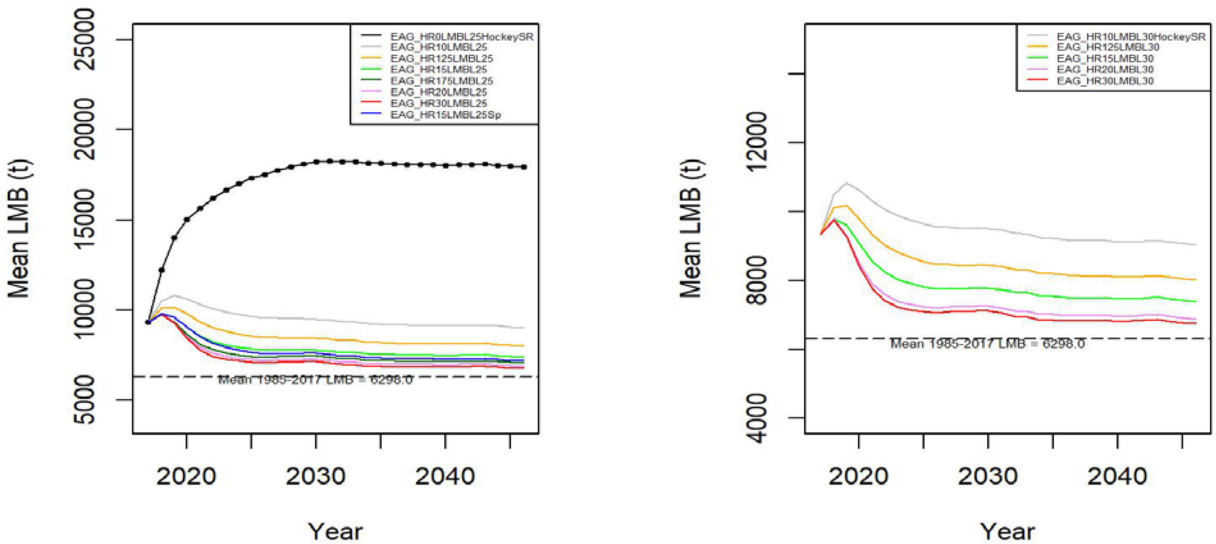

Figure 4A. Thirty-year LMB projections for selected 12 state harvest control rule policies with scenario 1 under Hockey Stick stock-recruit (SR) model generated recruits for EAG. Policy#0 (EAG_HR0LMBL25HockeySR) is the base policy with zero harvest rate and Policy#13 (EAG_HR15LMBL25Sp) is the scenario with a constant harvest rate of 0.15.

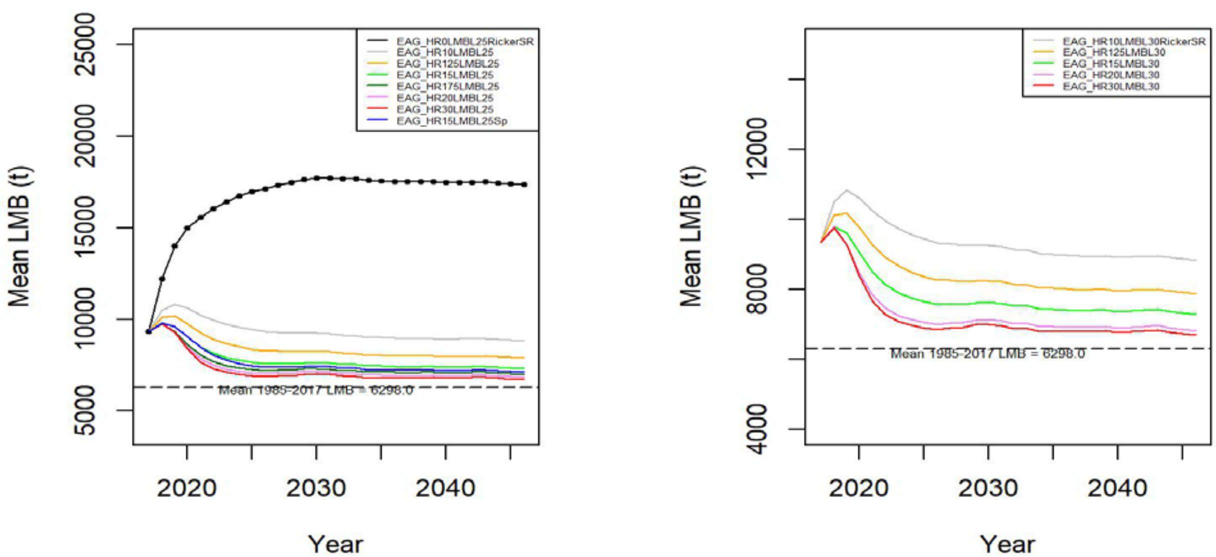

Figure 5A. Thirty-year LMB projections for selected 12 state harvest control rule policies with scenario 1 under Ricker stock-recruit (SR) model generated recruits for EAG. Policy#0 (EAG_HR0LMBL25RickerSR) is the base policy with zero harvest rate and Policy#13 (EAG_HR15LMBL25Sp) is the scenario with a constant harvest rate of 0.15.

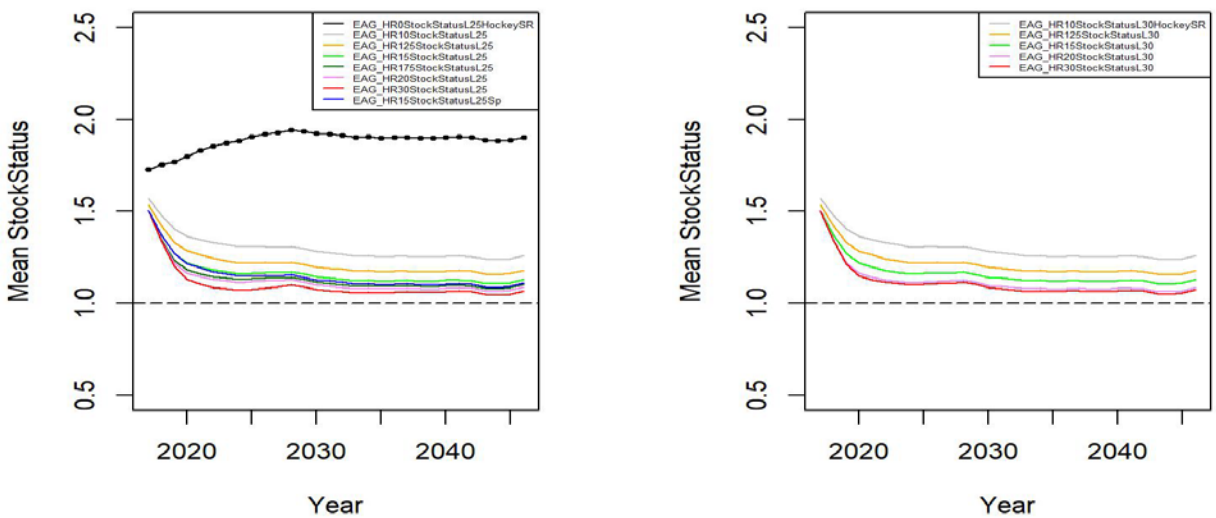

Figure 6A. Thirty-year Stock Status projections for selected 12 state harvest control rule policies with scenario 1 under Hockey Stick stock-recruit (SR) model generated recruits for EAG. Policy#0 (EAG_HR0StockStatusL25HockeySR) is the base policy with zero harvest rate and Policy#13 (EAG_HR15StockStatusL25Sp) is the scenario with a constant harvest rate of 0.15.

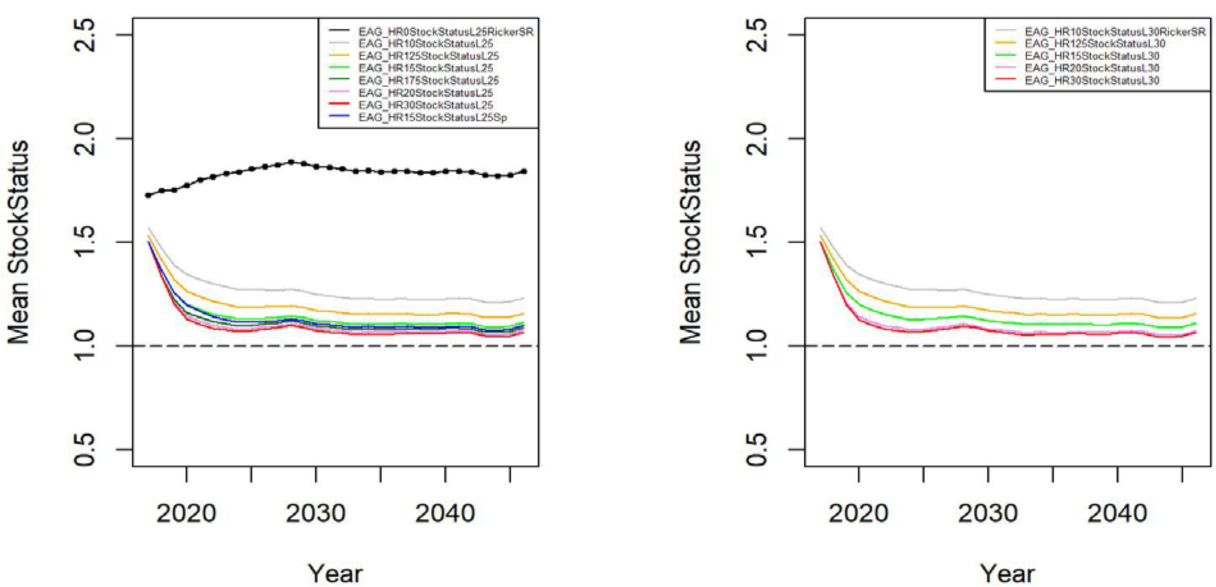

Figure 7A. Thirty-year Stock Status projections for selected 12 state harvest control rule policies with scenario 1 under Ricker stock-recruit (SR) model generated recruits for EAG. Policy#0 (EAG_HR0StockStatusL25RickerSR) is the base policy with zero harvest rate and Policy#13 (EAG_HR15StockStatusL25Sp) is the scenario with a constant harvest rate of 0.15.

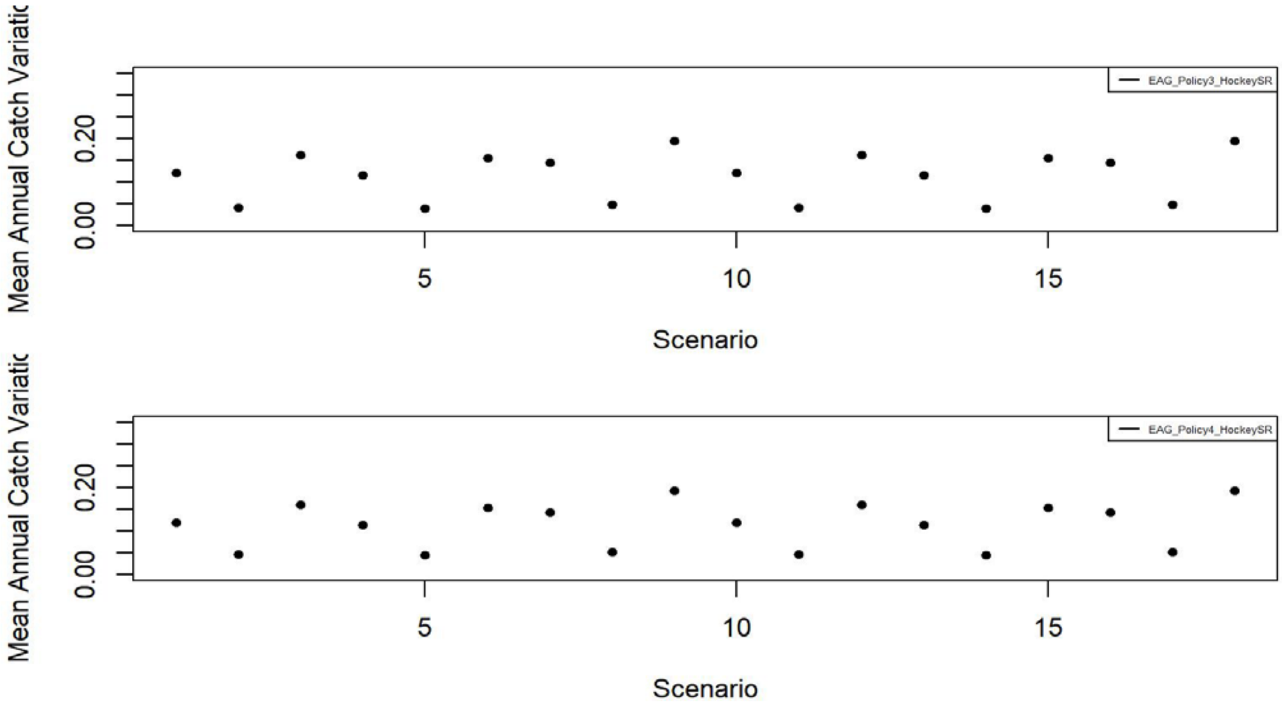

Figure 8A. Mean annual variation in catch (average of the absolute variation in catch over projection years 2- 30) for state harvest control rule policies 3 (top) and 4 (bottom) for 18 scenarios under Hockey Stick SR model generated recruits for EAG.

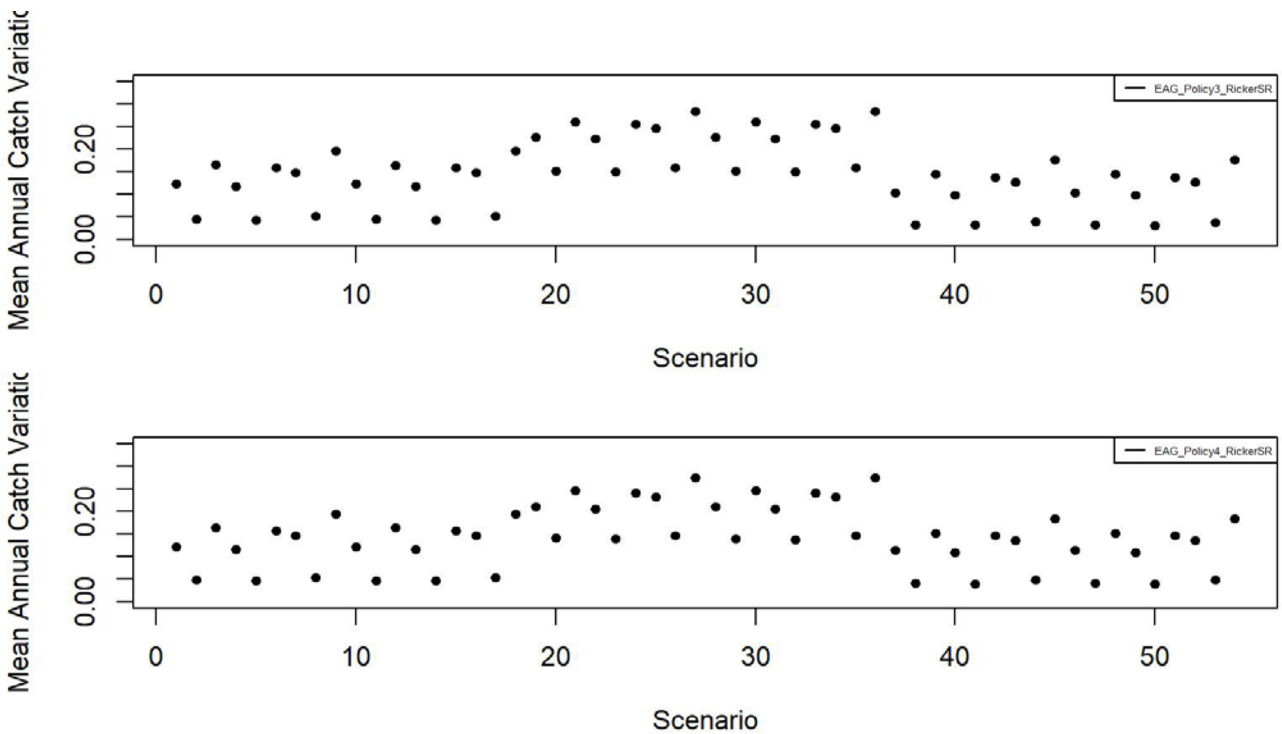

Figure 9A. Mean annual variation in catch (average of the absolute variation in catch over projection years 2- 30) for state harvest control rule policies 3 (top) and 4 (bottom) for 54 scenarios under Ricker SR model generated recruits for EAG.

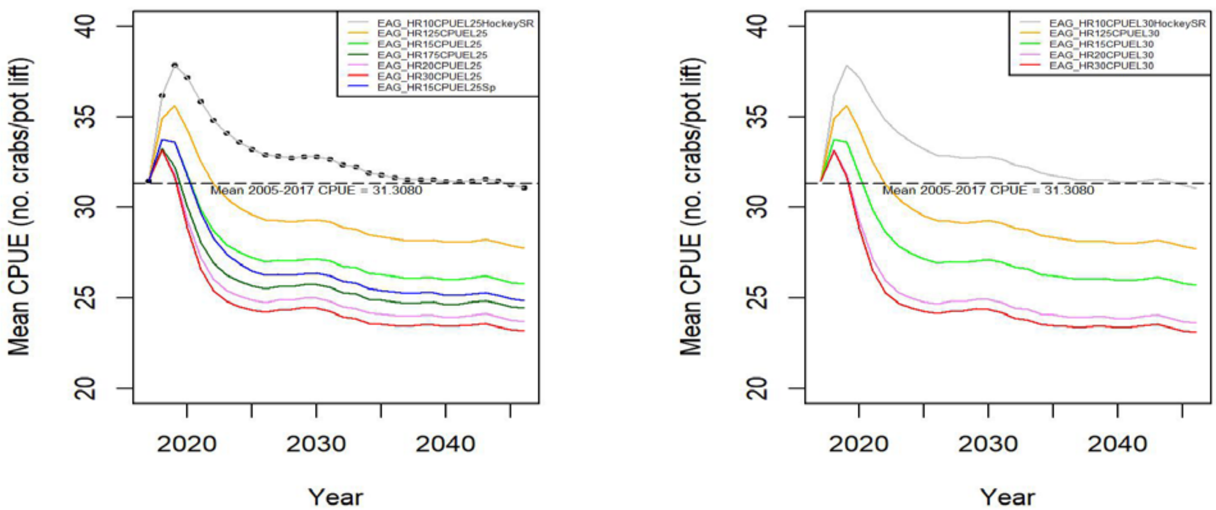

Figure 10A. Thirty-year CPUE projections for selected 12 state harvest control rule policies with scenario 1 under Hockey Stick stock-recruit (SR) model generated recruits for EAG. Policy#13 (EAG_HR15CPUEL25Sp) is the scenario with a constant harvest rate of 0.15.

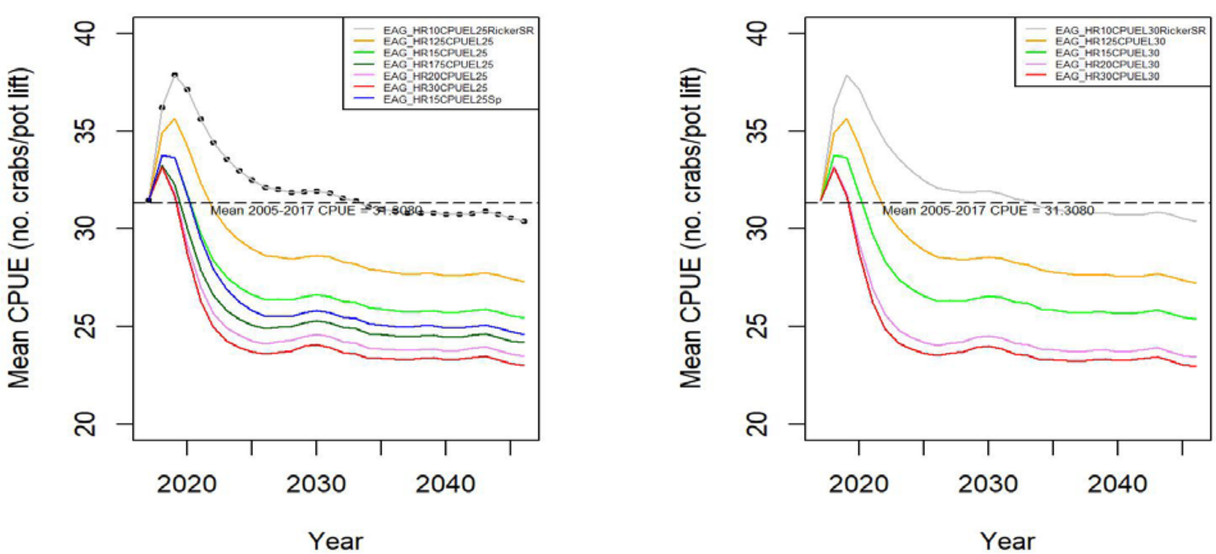

Figure 11A. Thirty-year CPUE projections for selected 12 state harvest control rule policies with scenario 1 under Ricker stock-recruit (SR) model generated recruits for EAG. Policy#13 (EAG_HR15CPUEL25Sp) is the scenario with a constant harvest rate of 0.15.

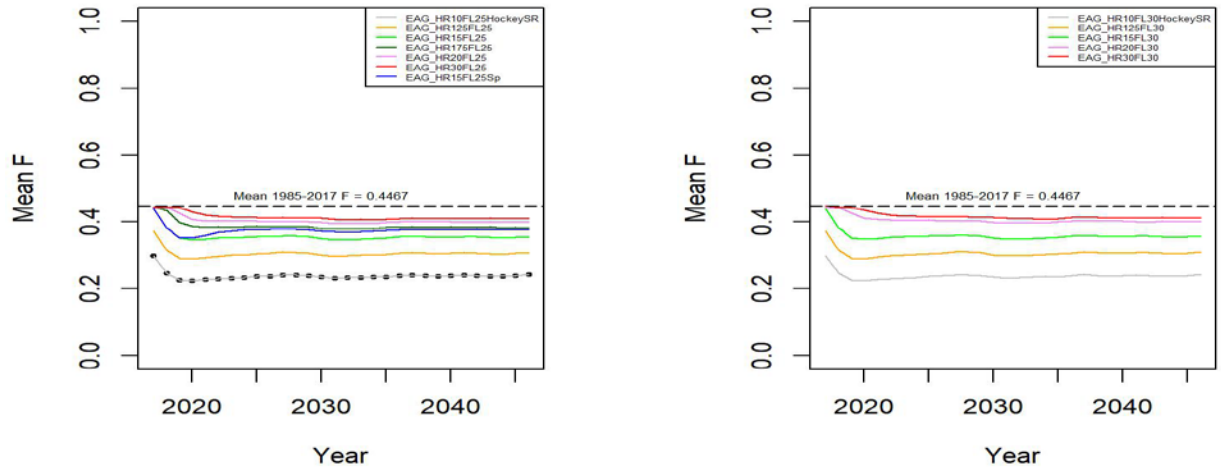

Figure 12A. Thirty-year total fishing mortality (F) projections for selected 12 state harvest control rule policies with scenario 1 under Hockey Stick stock-recruit (SR) model generated recruits for EAG. Policy#13 (EAG_HR15FL25Sp) is the scenario with a constant harvest rate of 0.15.

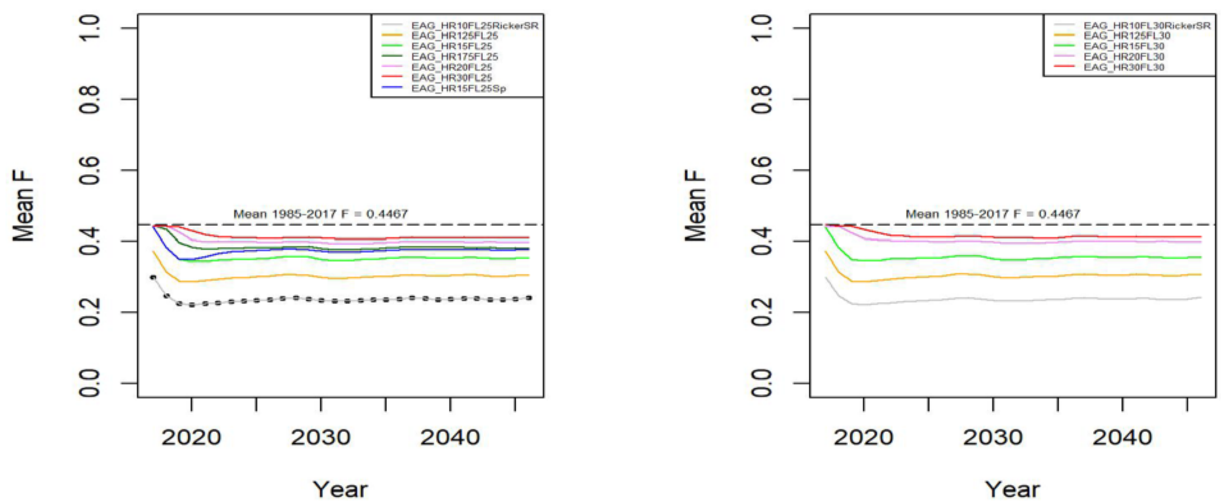

Figure 13A. Thirty-year total fishing mortality (F) projections for selected 12 state harvest control rule policies with scenario 1 under Ricker stock-recruit (SR) model generated recruits for EAG. Policy#13 (EAG_HR15FL25Sp) is the scenario with a constant harvest rate of 0.15.

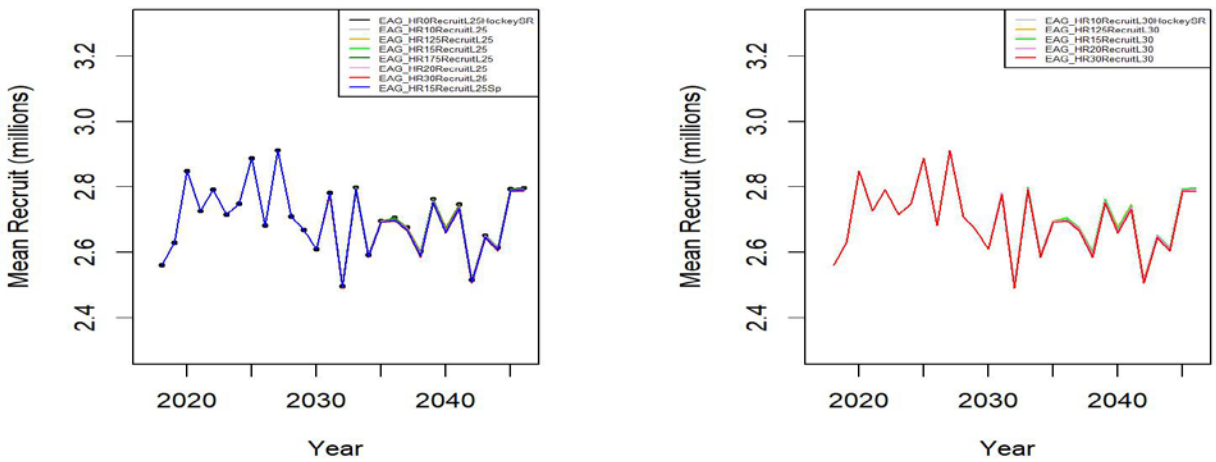

Figure 14A. Second to 30th-year recruit projections for selected 12 state harvest control rule policies with scenario 1 under Hockey Stick stock-recruit (SR) model generated recruits for EAG. Policy#0 (EAG_HR0RecruitL25HockeySR) is the base policy with zero harvest rate and Policy#13 (EAG_HR15RecruitL25Sp) is the scenario with a constant harvest rate of 0.15.

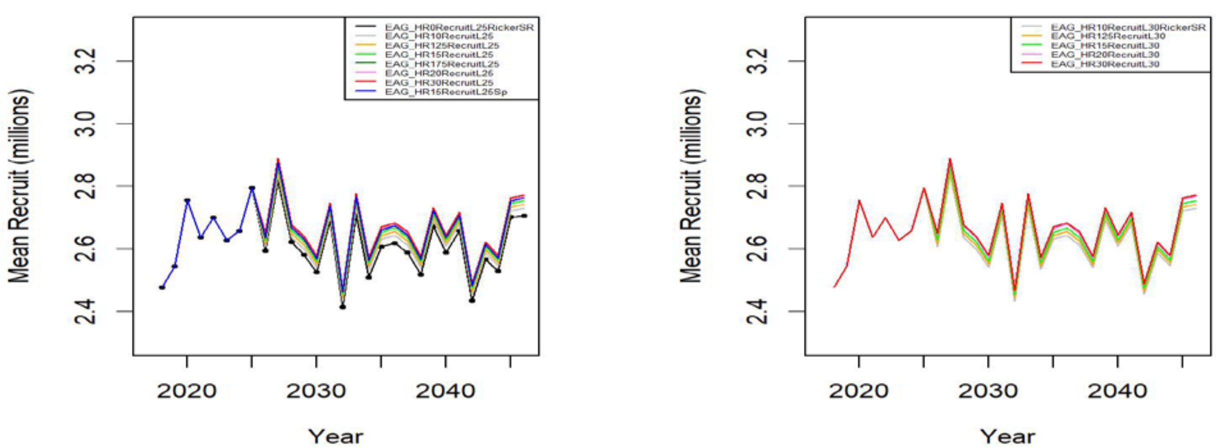

Figure 15A. Second to 30th-year recruit projections for selected 12 state harvest control rule policies with scenario 1 under Ricker stock-recruit (SR) model generated recruits for EAG. Policy#0 (EAG_HR0RecruitL25RickerSR) is the base policy with zero harvest rate and Policy#13 (EAG_HR15RecruitL25Sp) is the scenario with a constant harvest rate of 0.15.

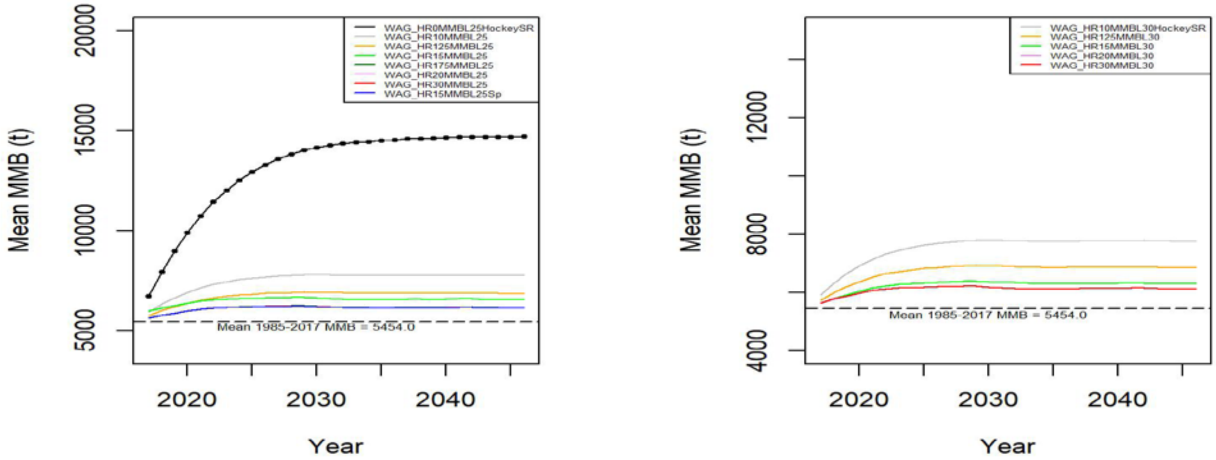

Figure 16A. Thirty-year MMB projections for selected 12 state harvest control rule policies with scenario 1 under Hockey Stick stock-recruit (SR) model generated recruits for WAG. Policy#0 (WAG_HR0MMBL25HockeySR) is the base policy with zero harvest rate and Policy#13 (WAG_HR15MMBL25Sp) is the scenario with a constant harvest rate of 0.23.

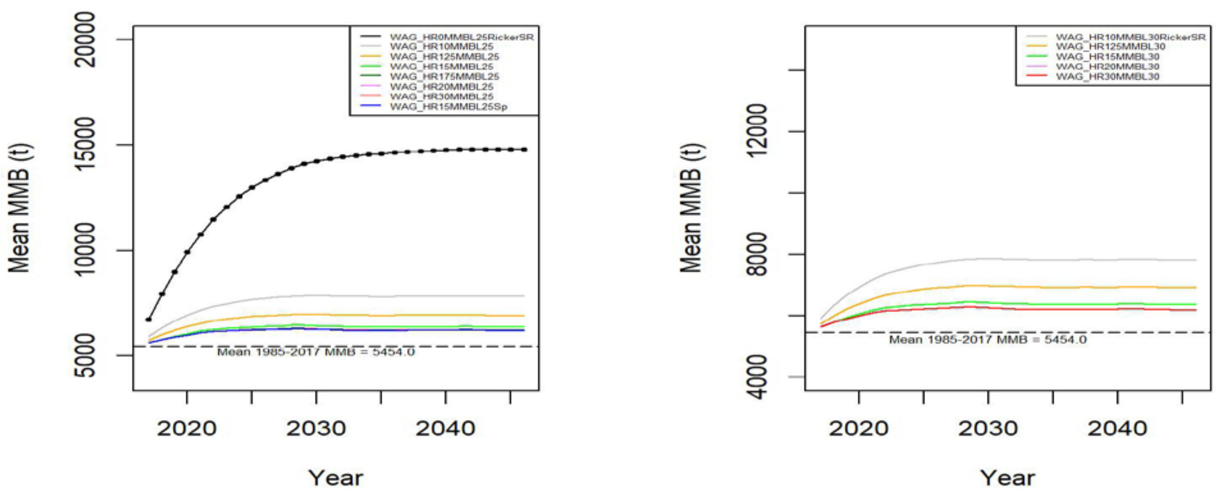

Figure 17A. Thirty-year MMB projections for selected 12 state harvest control rule policies with scenario 1 under Ricker stock-recruit (SR) model generated recruits for WAG. Policy#0 (WAG_HR0MMBL25RickerSR) is the base policy with zero harvest rate and Policy#13 (WAG_HR15MMBL25Sp) is the scenario with a constant harvest rate of 0.23.

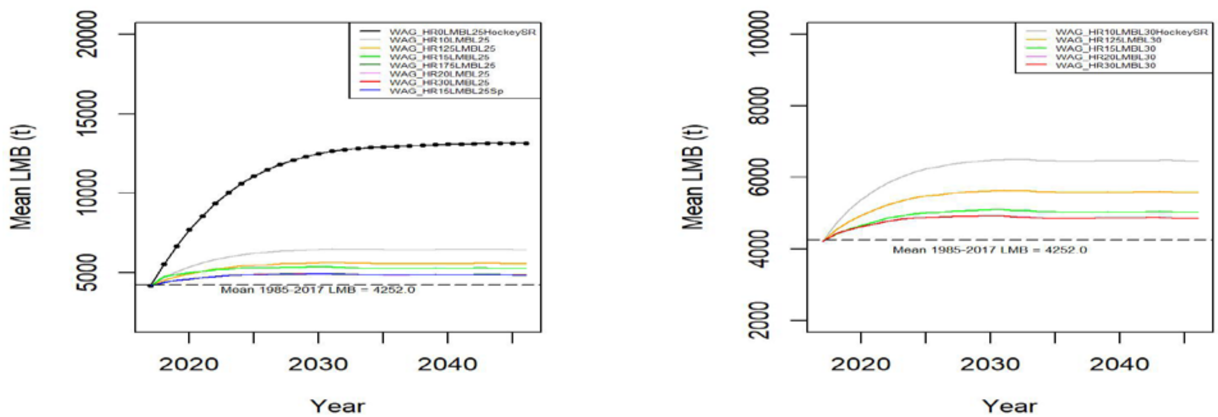

Figure 18A. Thirty-year LMB projections for selected 12 state harvest control rule policies with scenario 1 under Hockey Stick stock-recruit (SR) model generated recruits for WAG. Policy#0 (WAG_HR0LMBL25HockeySR) is the base policy with zero harvest rate and Policy#13 (WAG_HR15LMBL25Sp) is the scenario with a constant harvest rate of 0.23.

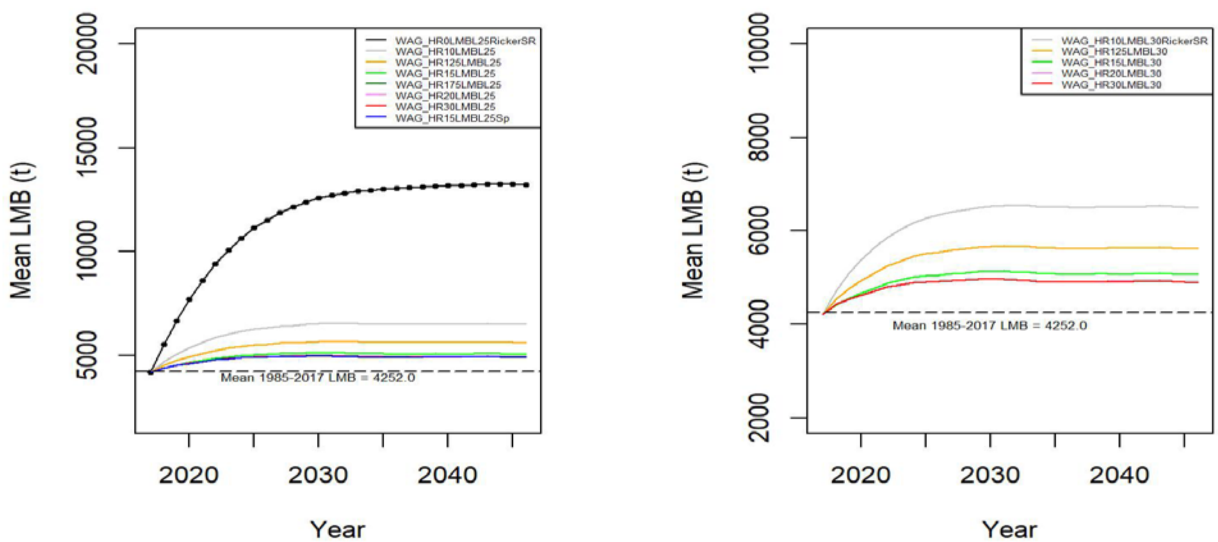

Figure 19A. Thirty-year LMB projections for selected 12 state harvest control rule policies with scenario 1 under Ricker stock-recruit (SR) model generated recruits for WAG. Policy#0 (WAG_HR0LMBL25RickerSR) is the base policy with zero harvest rate and Policy#13 (WAG_HR15LMBL25Sp) is the scenario with a constant harvest rate of 0.23.

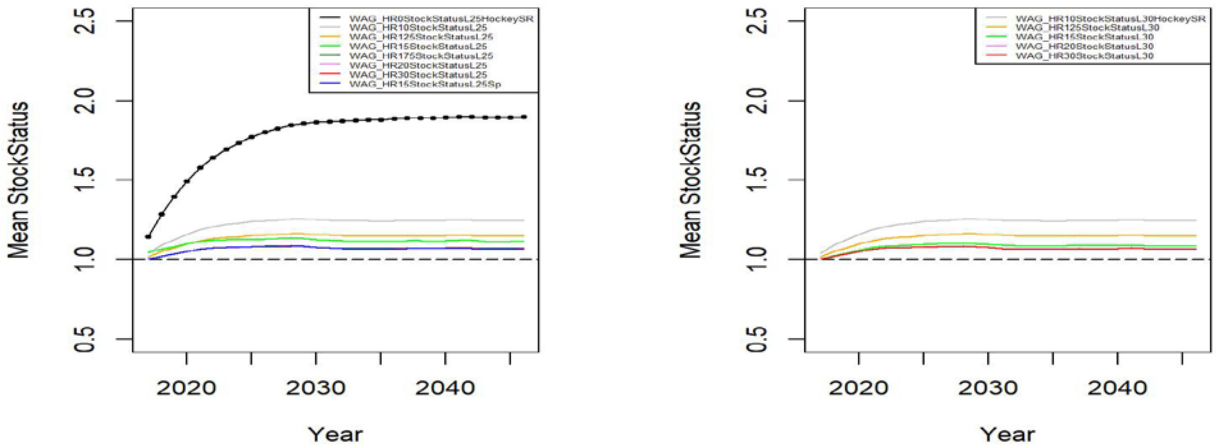

Figure 20A. Thirty-year Stock Status projections for selected 12 state harvest control rule policies with scenario 1 under Hockey Stick stock-recruit (SR) model generated recruits for WAG. Policy#0 (WAG_HR0StockStatusL25HockeySR) is the base policy with zero harvest rate and Policy#13 (WAG_HR15StockStatusL25Sp) is the scenario with a constant harvest rate of 0.23.

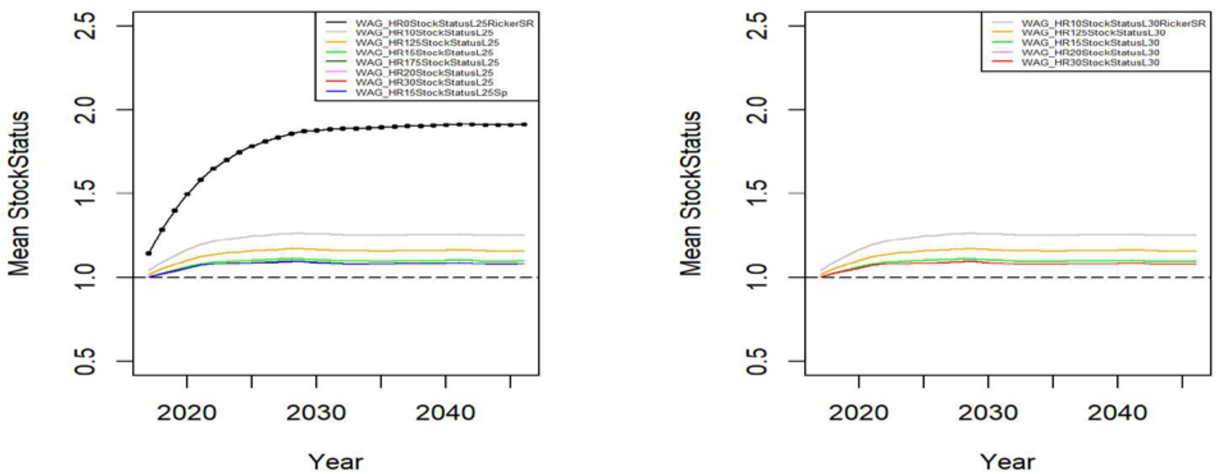

Figure 21A. Thirty-year Stock Status projections for selected 12 state harvest control rule policies with scenario 1 under Ricker stock-recruit (SR) model generated recruits for WAG. Policy#0 (WAG_HR0StockStatusL25RickerSR) is the base policy with zero harvest rate and Policy#13 (WAG_HR15StockStatusL25Sp) is the scenario with a constant harvest rate of 0.23.

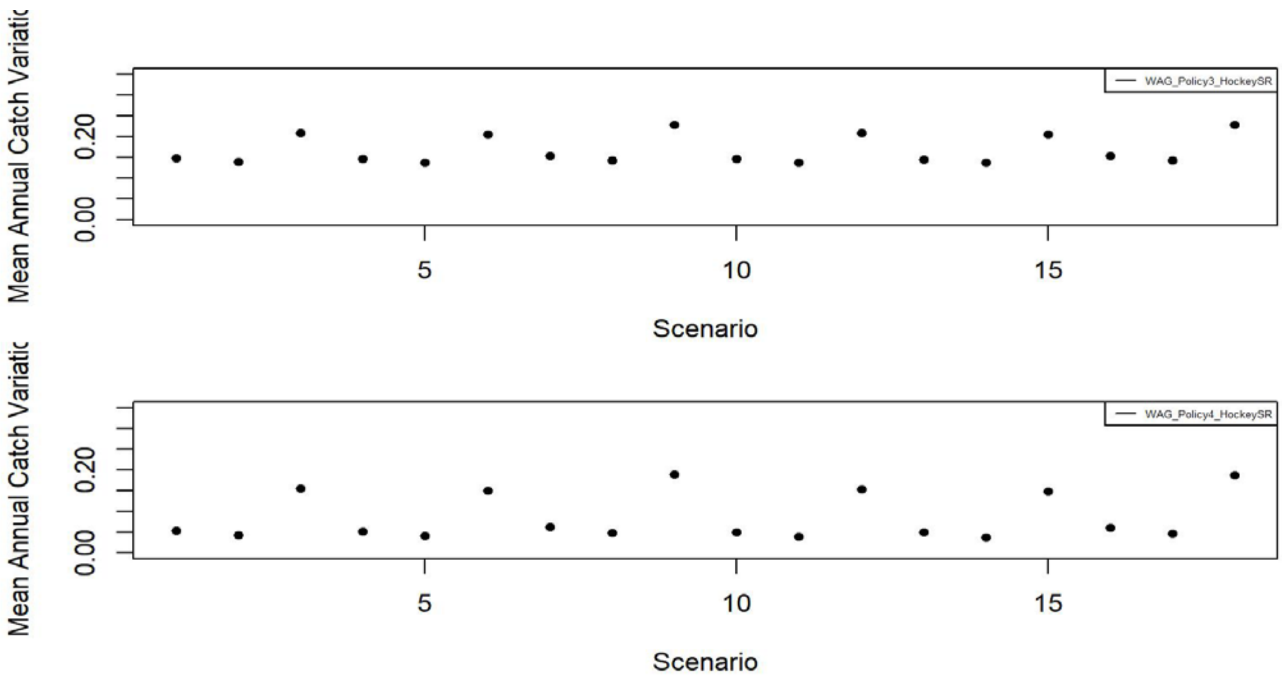

Figure 22A. Mean annual variation in catch (average of the absolute variation in catch over projection years 2- 30) for state harvest control rule policies 3 (top) and 4 (bottom) for 18 scenarios under Hockey Stick SR model generated recruits for WAG.

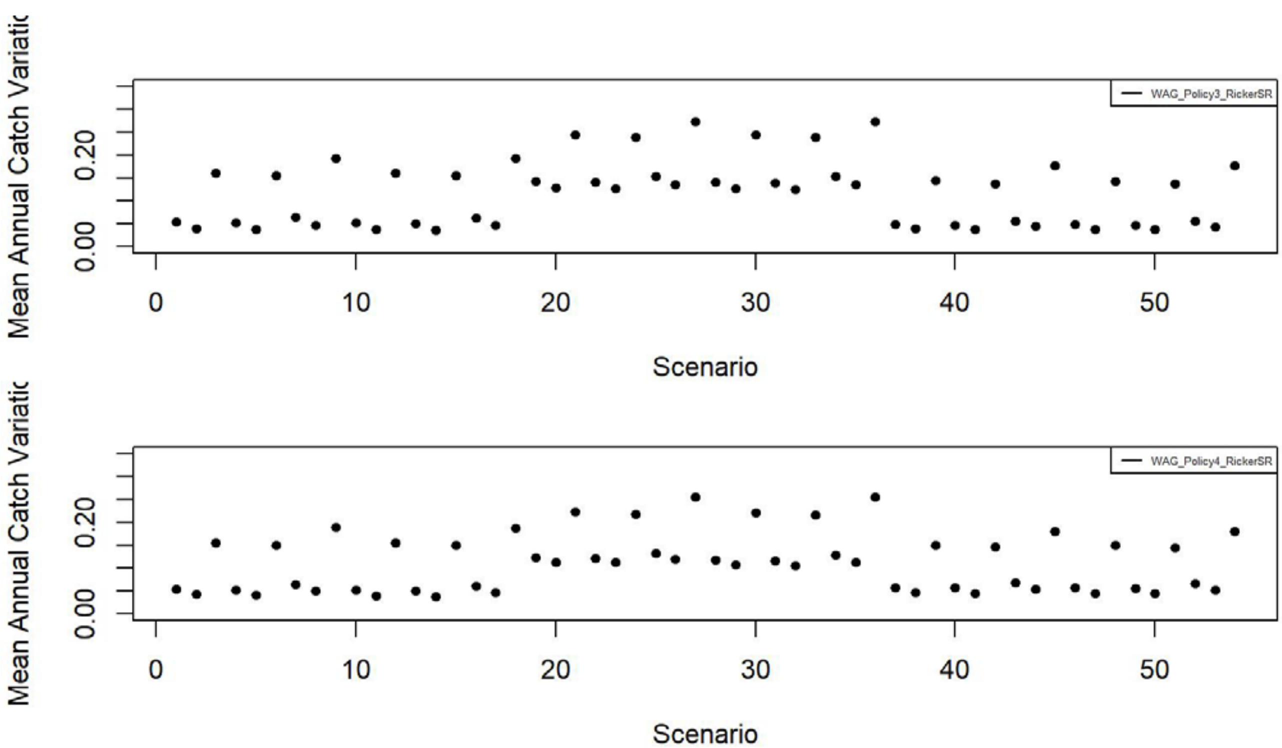

Figure 23A. Mean annual variation in catch (average of the absolute variation in catch over projection years 2- 30) for state harvest control rule policies 3 (top) and 4 (bottom) for 54 scenarios under Ricker SR model generated recruits for WAG.

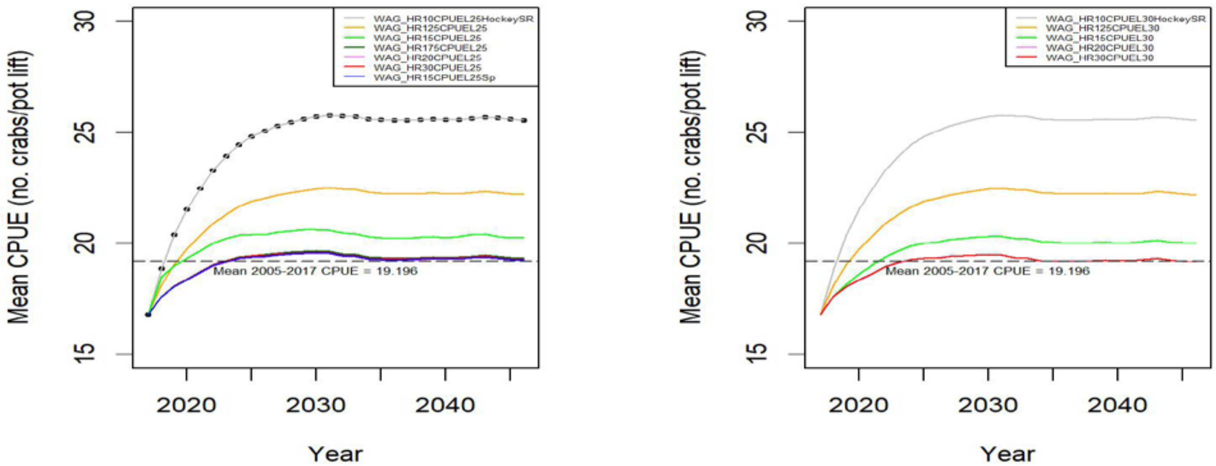

Figure 24A. Thirty-year CPUE projections for selected 12 state harvest control rule policies with scenario 1 under Hockey Stick stock-recruit (SR) model generated recruits for WAG. Policy#13 (WAG_HR15CPUEL25Sp) is the scenario with a constant harvest rate of 0.23.

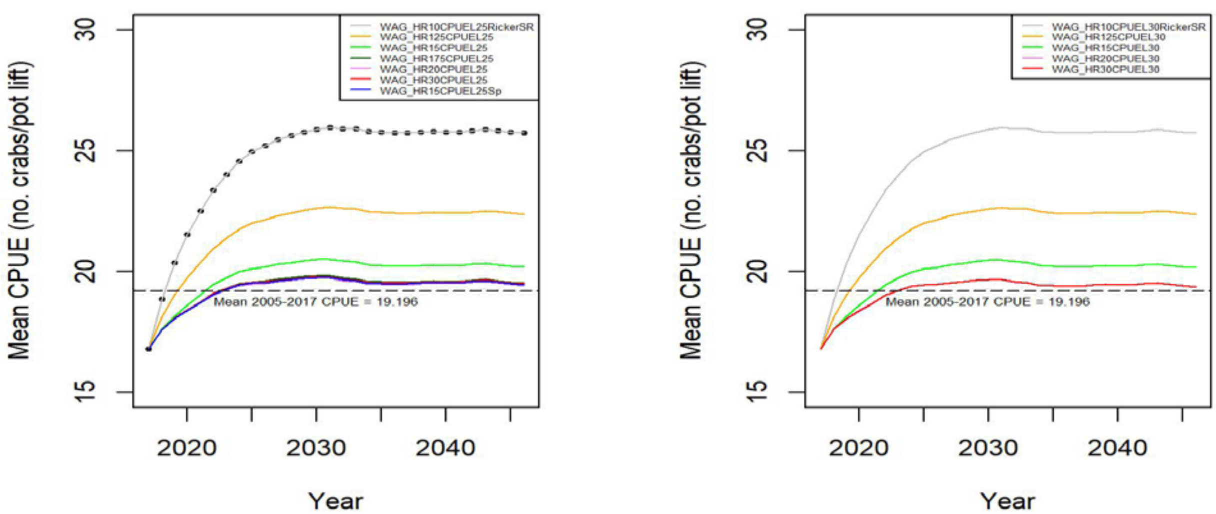

Figure 25A. Thirty-year CPUE projections for selected 12 state harvest control rule policies with scenario 1 under Ricker stock-recruit (SR) model generated recruits for WAG. Policy#13 (WAG_HR15CPUEL25Sp) is the scenario with a constant harvest rate of 0.23.

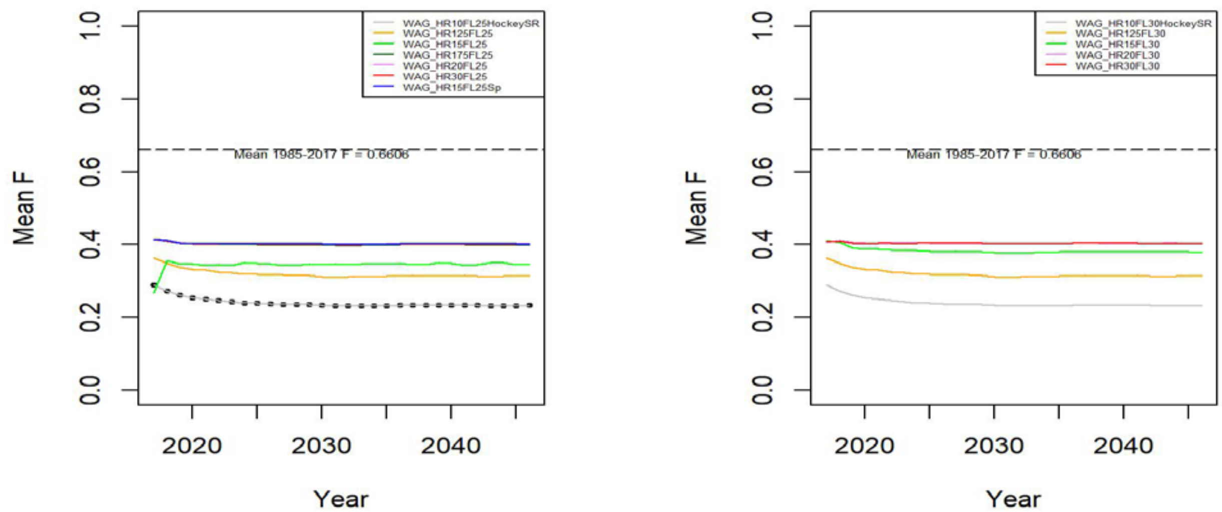

Figure 26A. Thirty-year total fishing mortality (F) projections for selected 12 state harvest control rule policies with scenario 1 under Hockey Stick stock-recruit (SR) model generated recruits for WAG. Policy#13 (WAG_HR15FL25Sp) is the scenario with a constant harvest rate of 0.23.

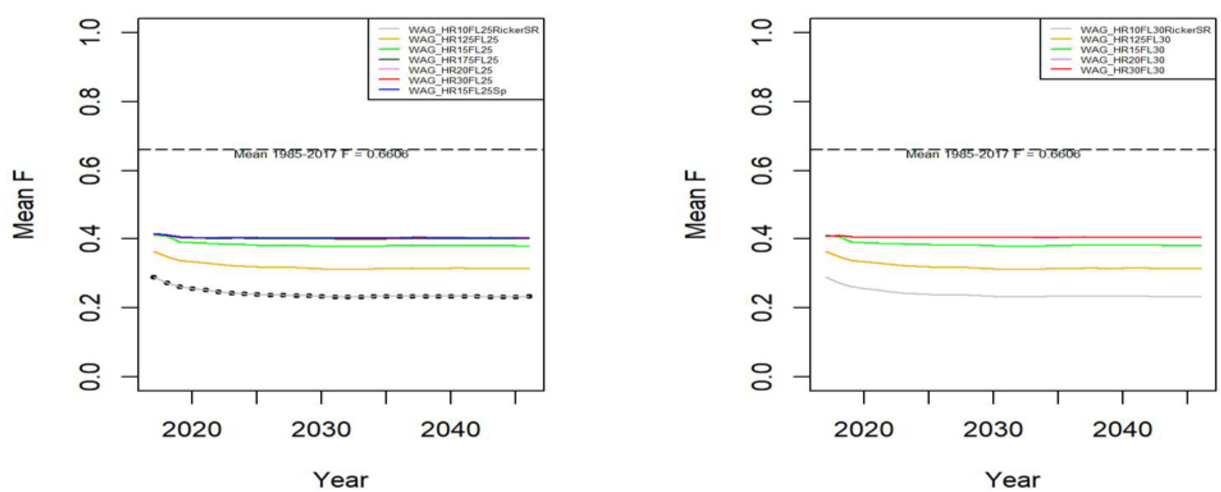

Figure 27A. Thirty-year total fishing mortality (F) projections for selected 12 state harvest control rule policies with scenario 1 under Ricker stock-recruit (SR) model generated recruits for WAG. Policy#13 (WAG_HR15FL25Sp) is the scenario with a constant harvest rate of 0.23.

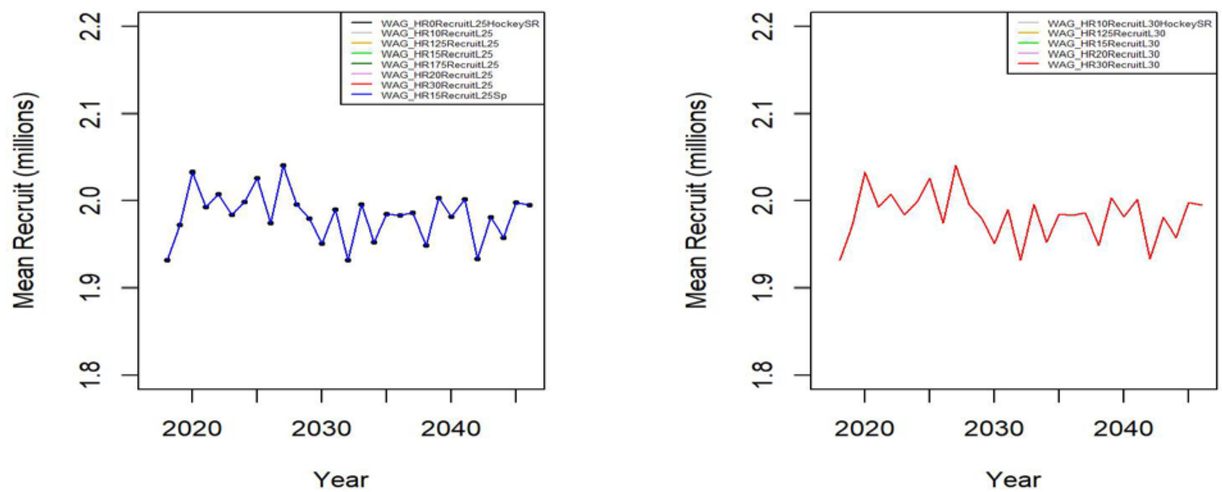

Figure 28A. Second to 30th-year recruit projections for selected 12 state harvest control rule policies with scenario 1 under Hockey Stick stock-recruit (SR) model generated recruits for WAG. Policy#0 (WAG_HR0RecruitL25HockeySR) is the base policy with zero harvest rate and Policy#13 (WAG_HR15RecruitL25Sp) is the scenario with a constant harvest rate of 0.23.

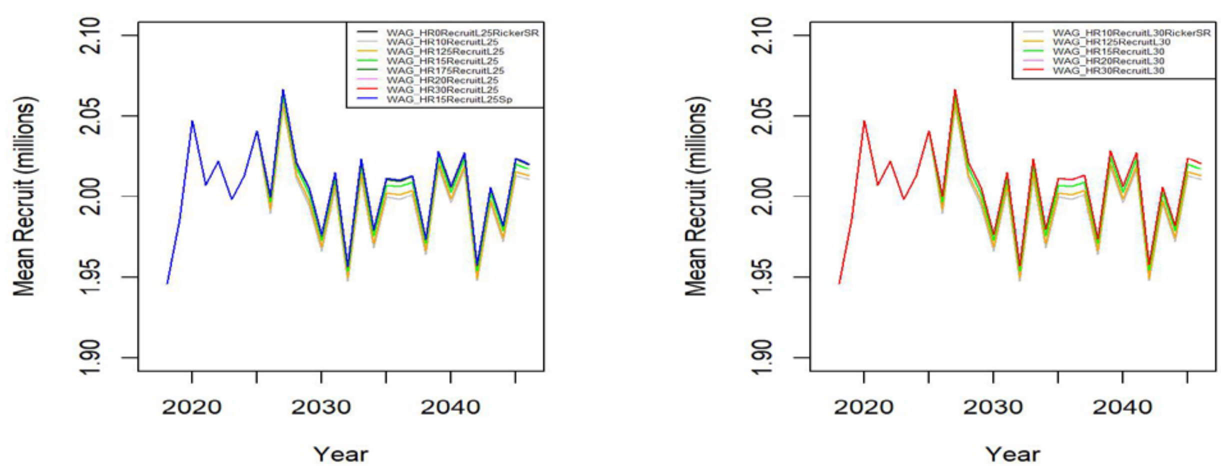

Figure 29A. Second to 30th-year recruit projections for selected 12 state harvest control rule policies with scenario 1 under Ricker stock-recruit (SR) model generated recruits for WAG. Policy#0 (WAG_HR0RecruitL25RickerSR) is the base policy with zero harvest rate. The zero harvest rate recruit trends are similar but 0.5 to 0.8 millions higher (out of the Y range). Policy#13 (WAG_HR15RecruitL25Sp) is the scenario with a constant harvest rate of 0.23.