GOA thornyheads

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Outline for today's presentation

1. Overview of the current model structure and data
2. Correction to the two-survey model
3. Alternative models (p. 15)
    a. Bridge from ADMB to TMB using *rema* R package
    b. Impact of adding new data up to 2021
    c. New models with additional observation error estimated
4. Results and recommendations
5. Good news in 2022 and some info about catch trends

Link to Plan Team report (Appendix A)

GOA thornyhead uses the two survey version of the random effects model (REMA)

GOA bottom trawl survey (BTS) biomass			Longline survey (LLS) relative population weights (RPW)
CGOA 0-500 m	CGOA 501-700 m	CGOA 701-1000 m	CGOA
EGOA 0-500 m	EGOA 501-700 m	EGOA 701-1000 m	EGOA
WGOA 0-500 m	WGOA 501-700 m	WGOA 701-1000 m	WGOA

- 1996 and 2001 surveys did not survey the depths >500 m
- 2003, 2011, 2013, 2017, and 2019 surveys did not survey depths >700 m
- 2001 no sampling in EGOA

Echave et al. 2018, Hulson et al. 2021; p. 17

Model 18 (Echave et al. 2018)

Four fixed effects parameters estimated:

1. Three process errors: WGOA, CGOA, and EGOA
2. One scaling parameter *q* shared across all LLS strata

While developing the R package *rema* we identified an error in the ADMB code

$$\hat{I}_t = q e^{\hat{B}_t}$$ → **Incorrectly defined outside (instead of inside) the SEPARABLE_FUNCTION** → **Failure of the Laplace approximation**

Joint GPT presentation slides, p. 5-6

Alternative models (p. 15)

Data up to 2020:

Model 18: current ADMB model

Model 22.1.a: corrected Model 18 in TMB

Data up to 2021 + LLS database updates:

Model 22.1.b: same as Model 22.1.a with new data

Model 22.2.a: additional obs error on BTS

Model 22.2.b: additional obs error on LLS

Model 22.2.c: additional obs error on BTS + LLS

Model 23: BTS only

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Impact of ADMB error

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Impact of adding new data

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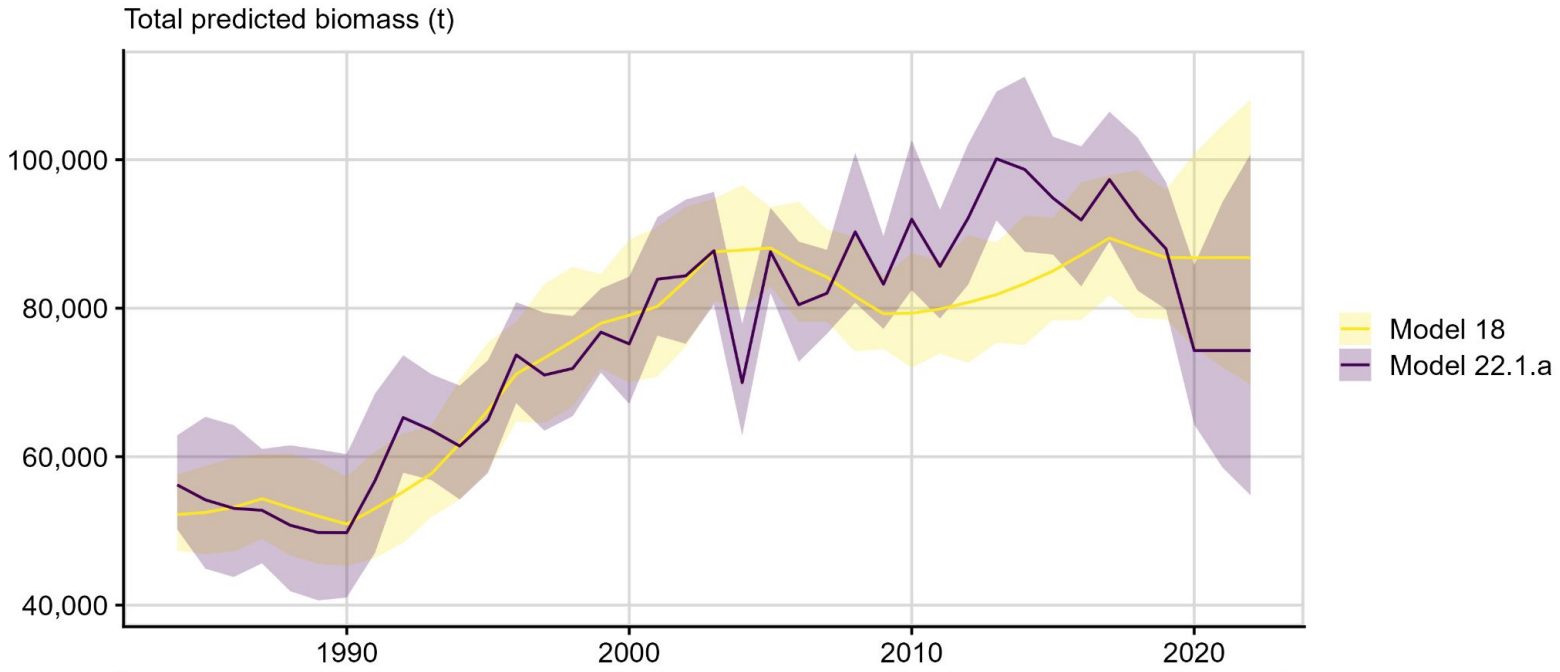
Impact of estimating extra observation error

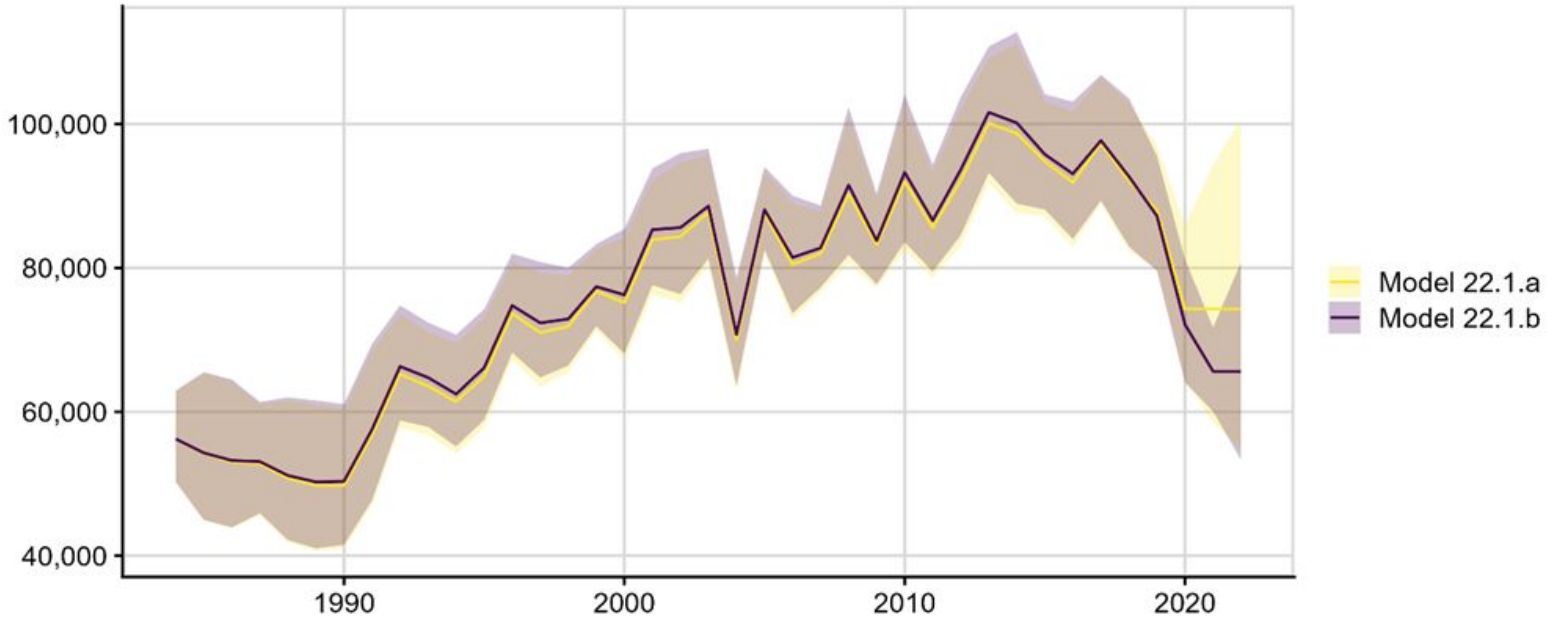
Model 23: BTS only

Impact of removing the LLS

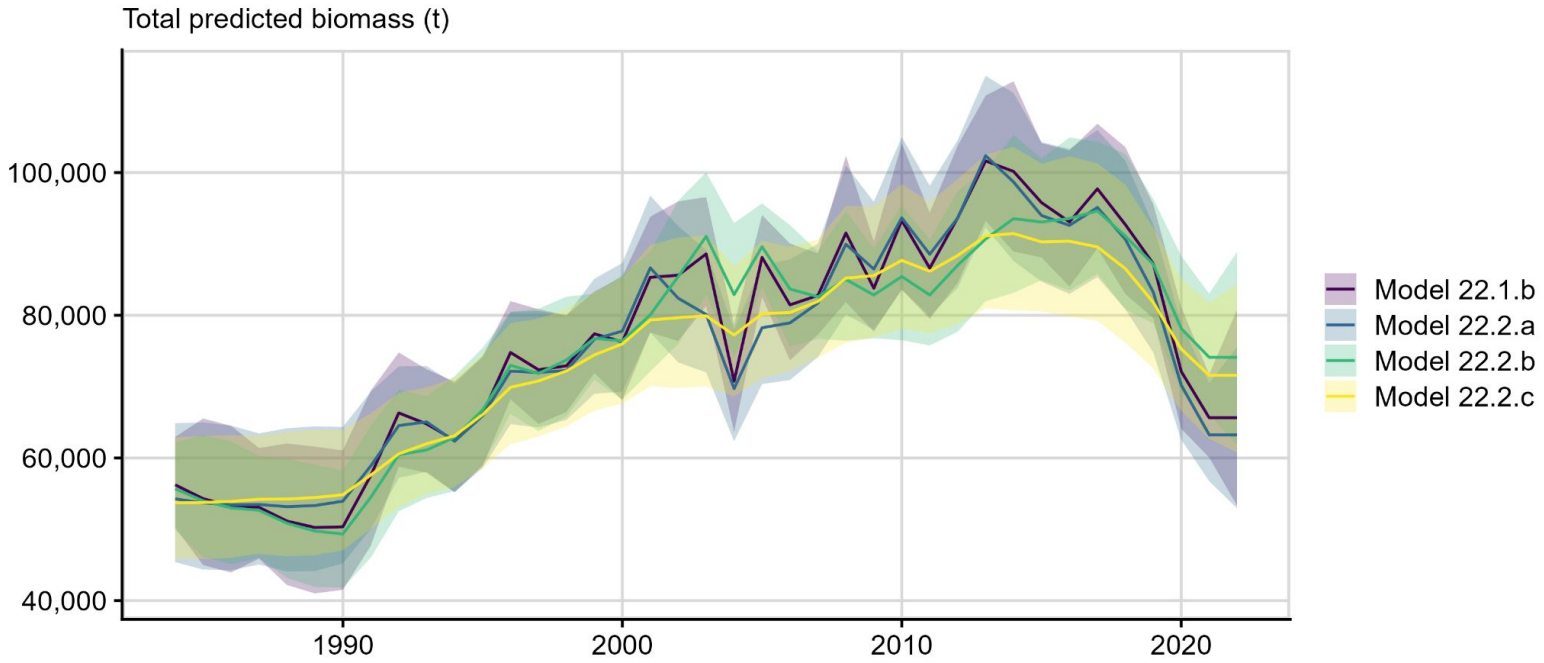
Impact of ADMB error



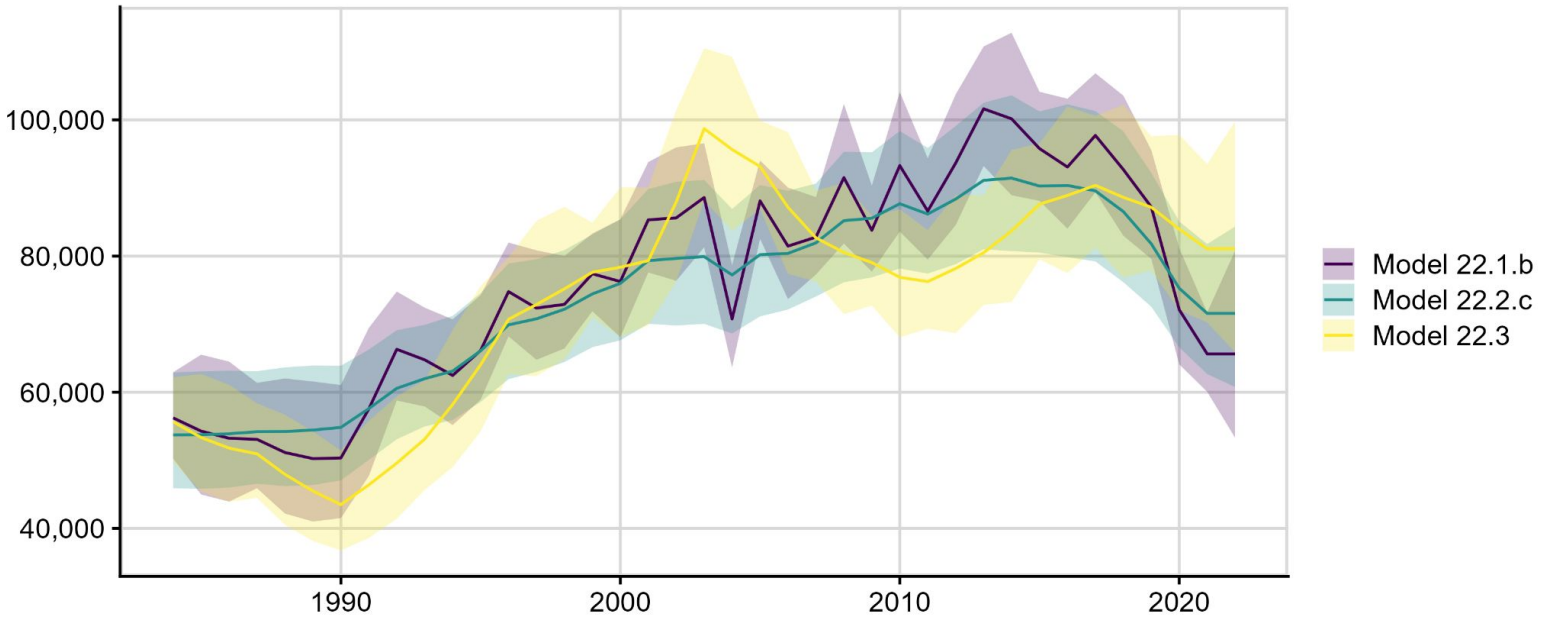
Impact of new data



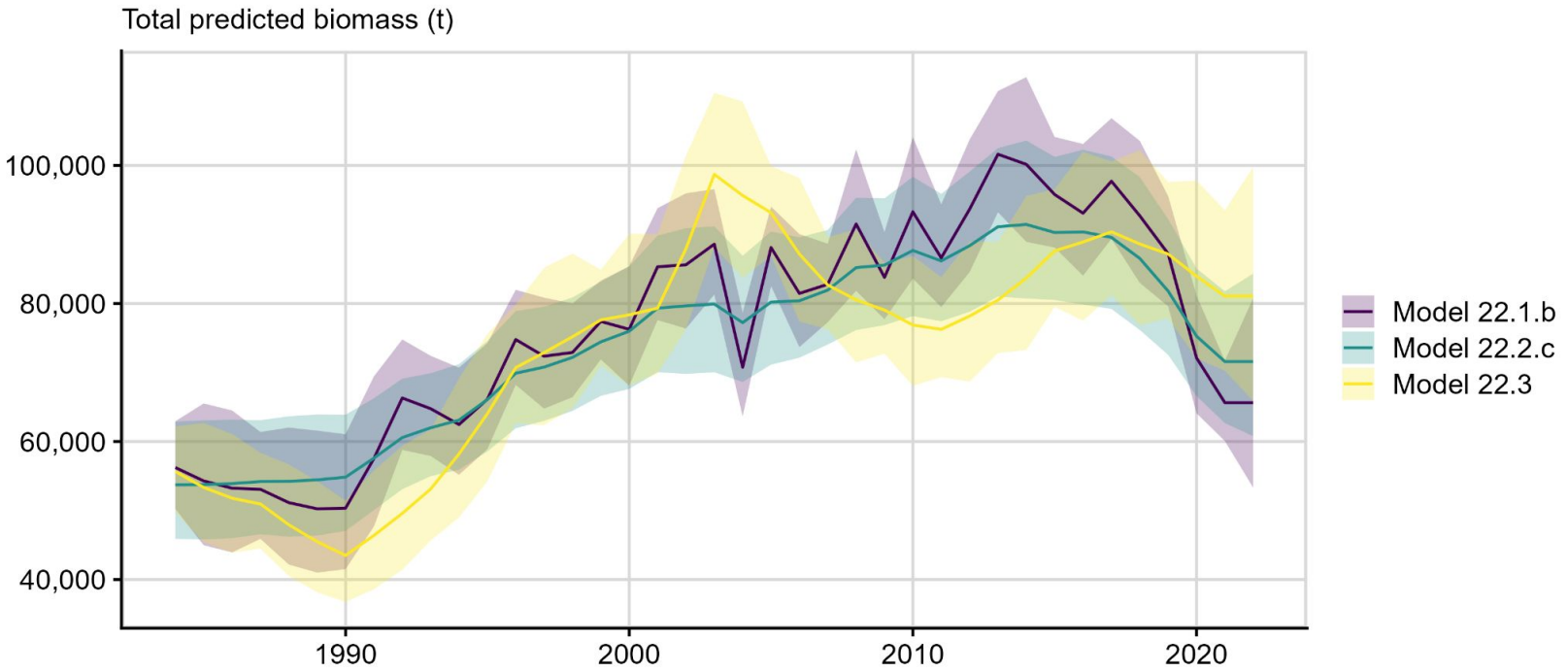
Impact of estimating extra observation error



Impact of removing the LLS



Model selection based on biological realism and AIC



Model	NLL	Npar	AIC	Δ AIC
Model 22.2.c	52.3	6	116.7	0
Model 22.2.b	57.1	5	124.3	7.6
Model 22.2.a	60.1	5	130.2	13.5
Model 22.1.b	68.6	4	145.2	28.5

Model correction resulted in a 14.4% decrease in 2020 biomass:

Model	Year	Biomass (t)	OFL (t)	max ABC (t)
Model 18	2020	86,802	2,604	1,953
Model 22.1.a	2020	74,296	2,229	1,672

Adding 2021 data resulted in the following biomass for 2022:

Model	Year	Biomass (t)	OFL (t)	max ABC (t)
Model 22.1.b	2022	65,631	1,969	1,477
Model 22.2.a	2022	63,241	1,897	1,423
Model 22.2.b	2022	74,108	2,223	1,667
Model 22.2.c	**2022**	**71,584**	**2,148**	**1,611**
Model 22.3	2022	81,061	2,432	1,824

Author-preferred model in bold. p. 16

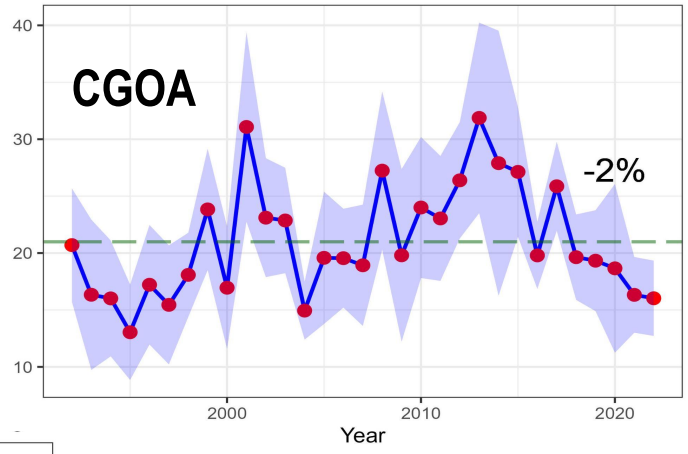
Apportionment

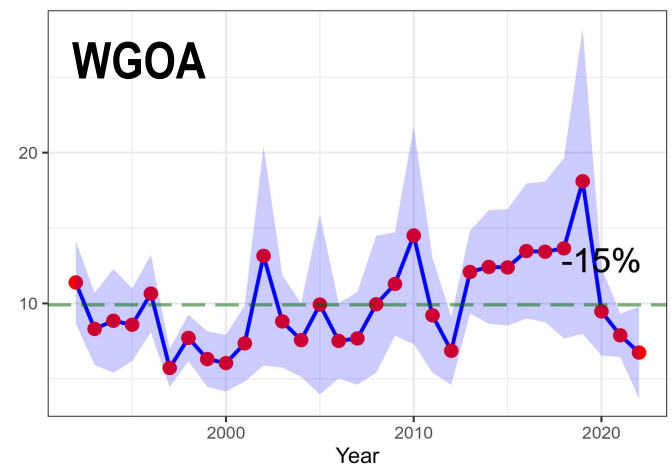
Model	Year	EGOA	CGOA	WGOA
Model 18	2020	35.4%	46.6%	18.0%
Model 22.1.a	2020	30.6%	45.6%	23.8%
Model 22.1.b	2022	32.0%	46.4%	21.6%
Model 22.2.a	2022	30.9%	47.1%	22.1%
Model 22.2.b	2022	34.2%	44.8%	21.0%
Model 22.2.c	**2022**	**32.6%**	**46.1%**	**21.2%**
Model 22.3	2022	34.7%	45.3%	19.9%

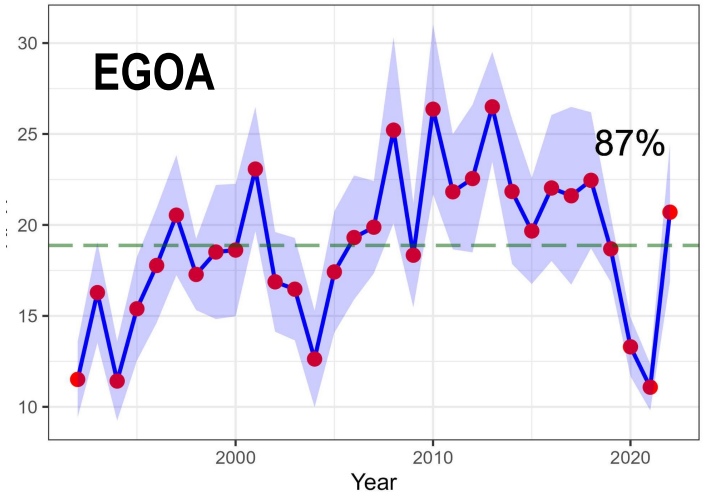
Recommendations

1. Omit Model 18 due to error and replace with suite of corrected models coded in TMB using *rema*
2. Preferred model is Model 22.2.c (extra BTS + LLS obs error)
3. Caution against reverting back to single-survey model

New LLS RPWs for 2022







Decreases in catch attributed to rapid increases in pot use (especially slinky pots) since 2017