ICES 2019 ASC Theme session N. ICES CM:426

Testing management advice procedures for short-lived data limited stocks in Category 3

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ICES APPROACH FOR CATEGORY 3 STOCKS

ICES Category 3: Stocks for which survey-based assessments indicate trends

HARVEST CONTROL RULE	UNCERTAINTY CAP	PRECAUTIONARY BUFFER
2-over-3 $C_{y+1} = C_y \frac{\frac{\sum_{i=y-2}^{y-1} I_i}{2}}{\frac{\sum_{i=y-5}^{y-3} I_i}{3}}$	a change limit of ±20% is used to avoid methods being susceptible to noise	A precautionary margin of −20% is applied for those cases when it is likely that F>Fmsy or when the stock status relative to candidate reference points for stock size or exploitation is unknown

Really 5 years??!! I'm dead by then!

But, my interanual variations are much larger than that!

Do I need that??

larger variability Could it be allowed?

ALTERNATIVE HCR: 1- over-2

Applied to several stocks (anchovy & sprat)

$$C_{y+1} = C_y \cdot \frac{\hat{I}_y}{\frac{\sum_{i=y-2}^{y-1} I_i}{2}}$$

OBJECTIVE MSE TO EVALUATE HCR (2/3) vs (1/2) for DL Short Lived Stocks for different Timing of advice /Initial Catch & Buffer/ Uncertainty Cap…

METHOD: FLBEIA MSE

MANAGEMENT STRATEGY EVALUATION

OPERATING MODEL and OBSERVATION 72 OPTIONS

MANAGEMENT PROCEDURE 289 OPTIONS (**subset selected here**)

LIFE HISTORY	Stock Type 1 & Type 2
SIGMA SR MODEL	0.5 , 0.75 , 1
Fopt = Fmsy proxy	F(40%B0)
HISTORICAL F	05, 1 , 2 * Fmsy proxy
SIGMA INDEX	Low(0.25) / High(0.5) / IAV / 2·IAV

Stock types by life history: Type 1 / Type 2

stock types by groups of species	Anchovies/NWPout	Sprats&Sardines
Natural Mortality (Mean Survivorship)	High M (36%)	Medium M (57%)
Natural Mort. Pattern	Decreasing	Decreasing
Growth pattern &Length weight relationships	SpeciesSpecific	SpeciesSpecific
Maturity Ogive	Full at age 1 (1)	Half at age 1 (0.5)
Stock Recruitment relationships	Beverton & Holt	Beverton & Holt
Steepness	Medium (0.75)	Medium (0.75)
Virgin Biomass (B0)	100,000	100,000
Recruitment residuals Std. around S-R (sigma)	Low & Medium (0.5 & 0.75)	Low & Medium (0.5 & 0.75)
Autocorrelation in Residuals	0	0
Expected Interannual Variabiliyt (IAV)	0.36 - 0.8	0.16 - 0.39
Fishery Selectivity at age	Neutral (=Matur.)	Neutral (=Matur.)
Selected Fmsy as a function of Pop OM	Fmsy proxy F40%B0 = 1.2	Fmsy proxy F40%B0 =0.45

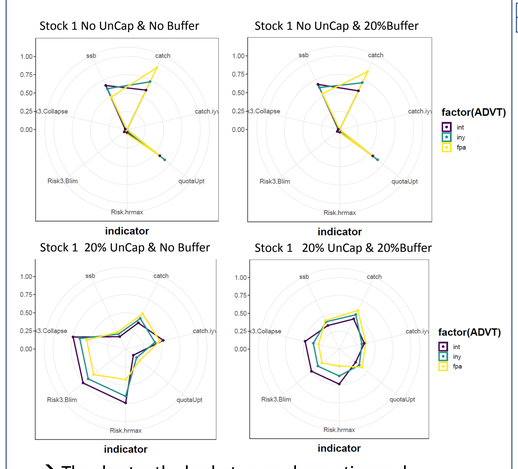
MANAGEMENT TYPE	**Interim year, In-year, Full pop**
HCR	**2o3, 1o2**, 1o3, 1o5
RULE INITIALIZATION	**Previous year catch (pyc), Perfect observation (pob), Recent Average (nin)**
UNCERTAINTY CAP	**20%, 50% 80%, No UnCap**
PRECAUTIONARY BUFFER	**No**, 20%

RESULTS

Long-term Sensitivity of HCR to:

Timing of advice (ADVT), Uncert-Cap & Buffer

Example HCR (1o2) for Perfect observation (pob) of Initial Catch

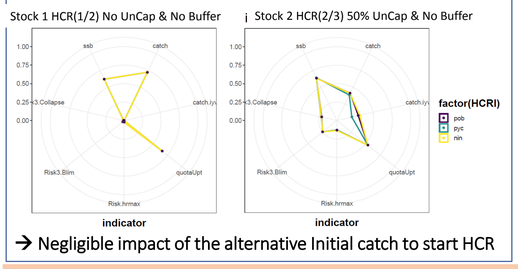


→ The shorter the lag between observation and management (Int>Iny<fpa) →bigger Catches and smaller risks

→ Applying a 20% buffer has no impact in long -erm performance with No Uncertainty Cap , but disminish risks when applying the 20% UnCap

Sensitivity to Initial Catch to start the HCR

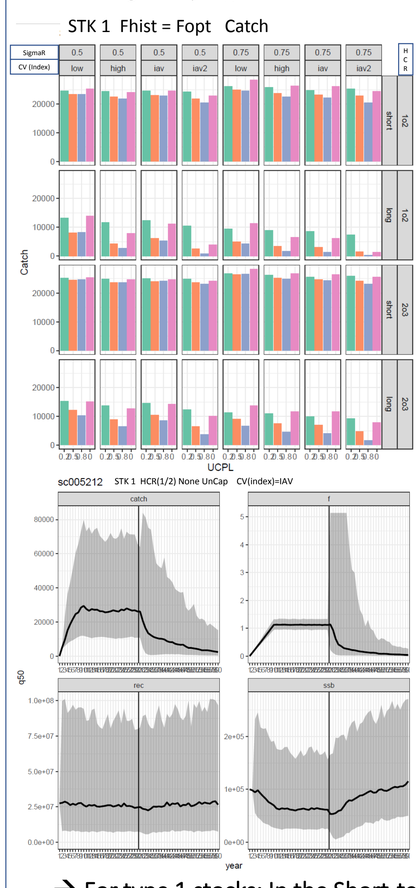
Either using: Previous year catch (pyc) ; recent mean harvest rate (nin) or Perfect Initialization with Catch at F40%B0 (pob)
Interim year Advice / No buffer / No Uncap



→ Negligible impact of the alternative Initial catch to start HCR

Relative Performance of HCRs for Anchovy/NWPout like stocks

For type 1 stosks optimally exploited in the past. For In Year advice (advice from 1st half of the year for July-June management year) / Initialization at Catch of recent mean harvest rate (nin) / No buffer



→ For type 1 stocks: In the Short-term HCR(1/2) overcomes HCR(2/3) as for the same level of catches have smaller risks, although above 0.05…

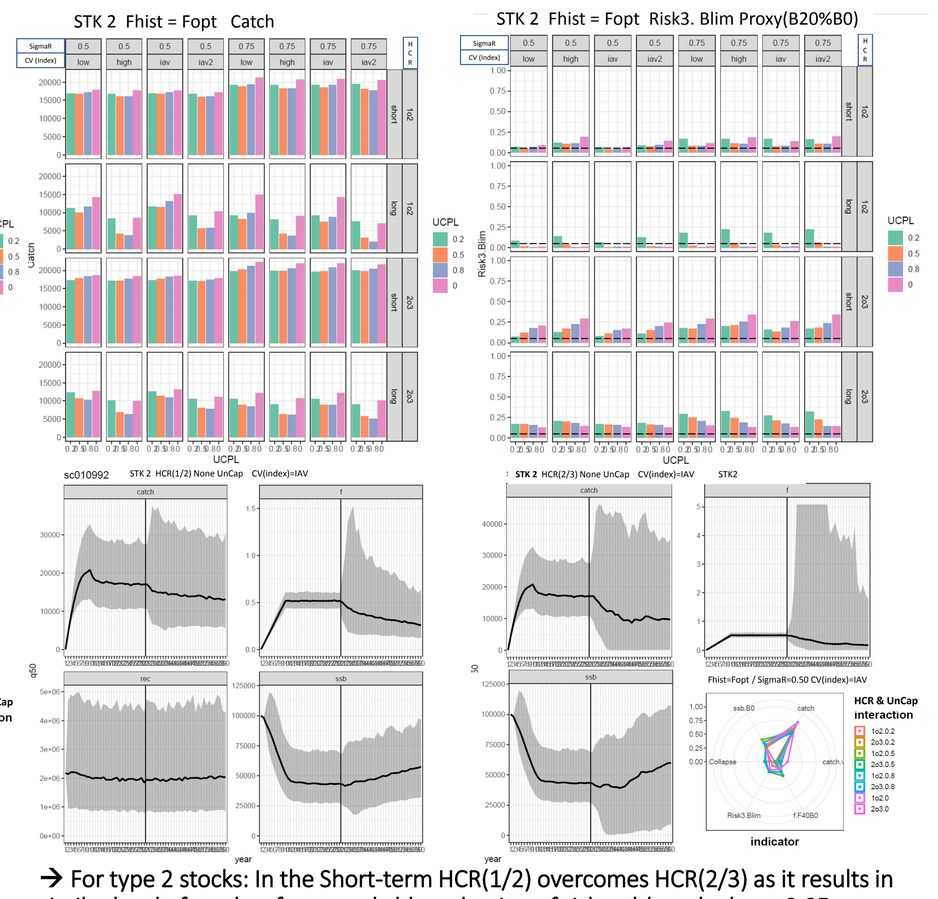
→ In the Long-term HCR(1/2) reduce strongly the catches and risks to 0.01

→ HCR(2/3) & No UnCap in Long-term results in better catches for risks ≈ 0.07-0.11

→ In LT 20% Uncertainty Cap results in much higher risks than weaker UnCaps.

Relative Performance of HCRs for Sardine/Sprat like stocks

For type 1 stocks optimally exploited in the past. For In Year advice (advice from 1st half of the year for July-June management year) / Initialization at Catch of recent mean harvest rate (nin) / No buffer



→ For type 2 stocks: In the Short-term HCR(1/2) overcomes HCR(2/3) as it results in similar level of catches for remarkable reduction of risks, although above 0.05… In those cases HCR(1/2) with 80% UnCap is worth considering as leads to 20%-30% reduction of risks for catches about 80% of No UnCap

→ In the Long-term HCR(1/2) with none UnCap overcomes HCR(2/3) with No UnCap because produce very similar catches and risks below 0.05, while 2/3 exceeds 0.12 risk

Only at Low Fhist (not shown) HCR(2/3) can overcome HCR(1/2) as it avoids major reduction of catches with risks around 0.05

CONCLUSION FOR SHORT LIVED DATA LIMITED STOCKS

→ In the Short-term HCR(1/2) with No UnCap overcomes HCR(2/3) with No UnCap as for the same level of catches have smaller risks, although above 0.05. For moderate IAV (stock type 2) 80%UnCap allows reducing risk for little loose of catches

→ For these stock being fully of highly exploited, Rules with a 20% UnCap produced in the short-term less catches and higher risks than HCR(1/2) with no UnCap

→ Recommendation: Start Management of Short-lived Data Limited stocks with HCR(1/2) No UnCap, or with 80% UnCap if IAV is moderate (IAV<0.4)

→ In the Long -term HCR(1/2) + No UnCap results always in low risks (<0.05), but for Anchovy like of stock (high IAV) HCR(2/3) with No UnCap achieves remarkable better catches for moderate risks (around 0.07 -0.12, depending upon historical F).

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