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On evaluation trials for West Greenland minke whales

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In this paper, I analyse and discuss a few aspects of the AWMP evaluation trials for common minke whales in the western North Atlantic. This is done to identify potential problems that may need to be solved, or at least discussed, before the trials can be used for an evaluation of candidate SLAs for common minke whales in West Greenland. The paper is based on the control program version that was released on April 17, 2018.

ABUNDANCE

The averages of the 95% CI for the historical abundance estimates in West and East Greenland are 3,368 to 21,111, and 1,636 to 8,343, with minimum estimates of 2,171 and 984, and maximum estimates of 32,400 and 10,900.

The 95% intervals, and minimum and maximum values, of the simulated abundances estimates in the corresponding areas from 1994 to 2115, and shown across trials in Table 1 for the cases where no future catches are taken. The complete distributions are shown in Fig. 1 and 2.

The distributions of simulated abundances are much wider that those of the historical estimates. As all these trials are increasing due to the absence of catches, it is intriguing that the 2.5th percentile of the simulations range from 16% to 58% of the average 2.5th for the historical estimates for West Greenland, and from 11% to 21% for East Greenland.

Trial	$WG_{2.5}$	$WG_{97.5}$	$CG_{2.5}$	$CG_{97.5}$	WG_{min}	WG_{max}	CG_{min}	CG_{max}
M01-1	847	37178	271	20311	346	67176	135	40038
M02-1	643	38341	192	23884	278	69569	84	45644
M03-1	1315	37048	280	19637	405	63334	132	38972
M04-1	1210	36527	333	18873	485	63691	165	37832
M05-1	1939	36086	336	18298	639	64021	147	37095
M06-1	701	37239	224	20835	277	64856	111	40906
M07-1	1149	36923	224	20327	370	62383	108	39830
M08-1	806	36836	207	22958	375	66024	91	43342
M09-1	546	38836	173	24133	229	70683	77	47733

Table 1: The 2.5th, 97.5th, minimum, and maximum of the simulated abundance distributions in WG and CG from 1994 to 2015 for 1% msyr trials with no future catches.

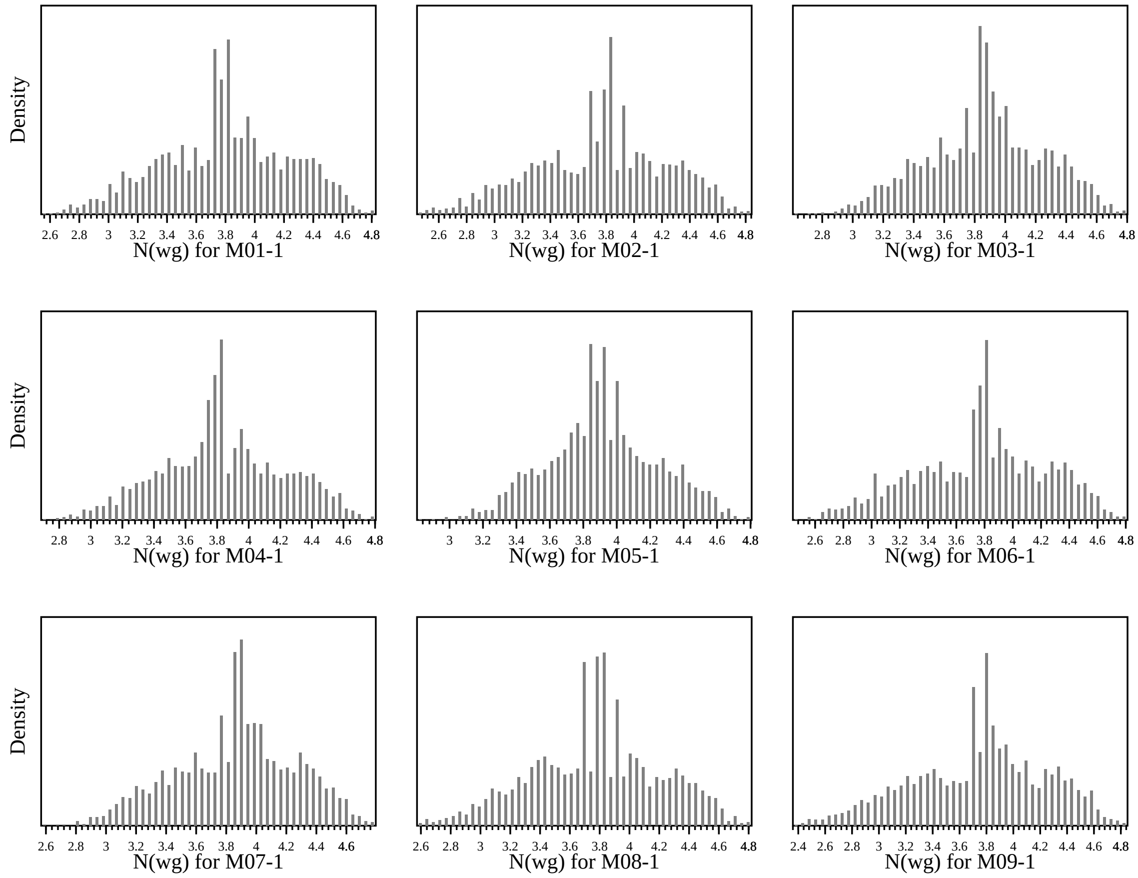

Figure 1: The distributions of the simulated abundance estimates from 1994 to 2115 for the West Greenland area (WG) across 1% msyr trials with no future catches.

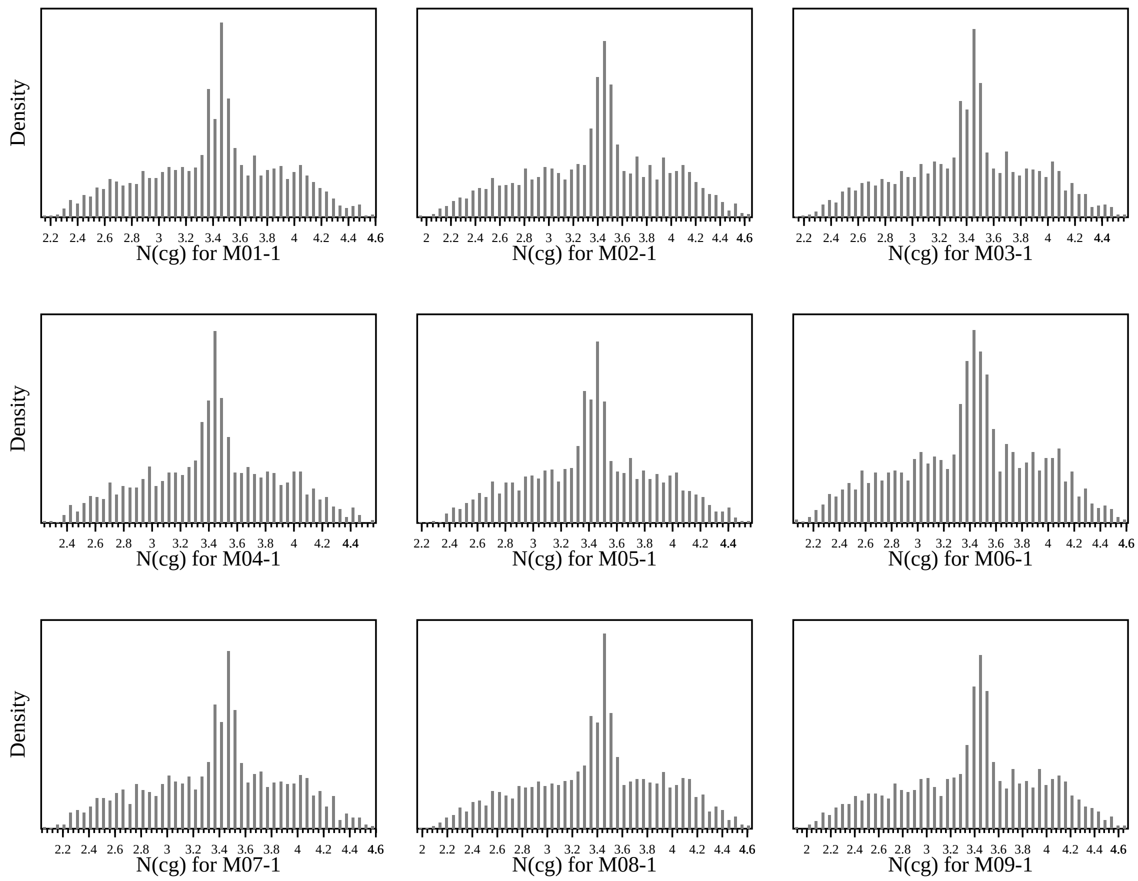

Figure 2: The distributions of the simulated abundance estimates from 1994 to 2115 for the East Greenland area (CG) across 1% msyr trials with no future catches.

RMP-AWMP INTERACTIONS

For a simulation of the M01-1A trial with a SLA that sets the strike limit in the West Greenland area, Fig. 3 to 4 show 12 iterations of takes in that area (dots) plus the associated takes (curve) from the West Greenland (W2) stock, for the case with RMP catches (Fig. 3) and the case with no commercial catches (Fig. 4).

The RMP is often elevating the takes from the West Greenland stock far beyond the AWMP catches. This raises the question of how to evaluate the conservation performance of a potential SLA. If the position of the Commission is that subsistence catches are prioritised over commercial catches, a way forward is to evaluate the SLA for the case with no commercial catches, leaving the RMP to adjust to the associated evaluation trials.

CATCH DROPOUTS

The simulated trajectories in Figs. 3 and 4 have catch dropouts, where the catch in the West Greenland area in a single year falls below the normal level of catches during a block period. This is e.g. evident for year 2020 in the first iteration with RMP catches, where the strike limit is 164 but the actual catch in the West Greenland area is 50.

These dropouts are (typically) related to a very low simulated abundance for the West Greenland area, with the abundance in 2020 being only 518 animals. It is clear that if, during the iteration of a trial, the strike limit in West Greenland exceeds the simulated number of animals in the area, the full strike limit cannot be taken. Yet, in 2020 for this particular iteration only 10% of the animals are taken despite of a strike limit for 32% of the animals. The major issue here may not be the 10%, but rather the frequent occurrence of an abundance in the West Greenland (and East Greenland) area/s that, in the absence of a declining trajectory, is far below the lower confidence intervals of the historical estimates.

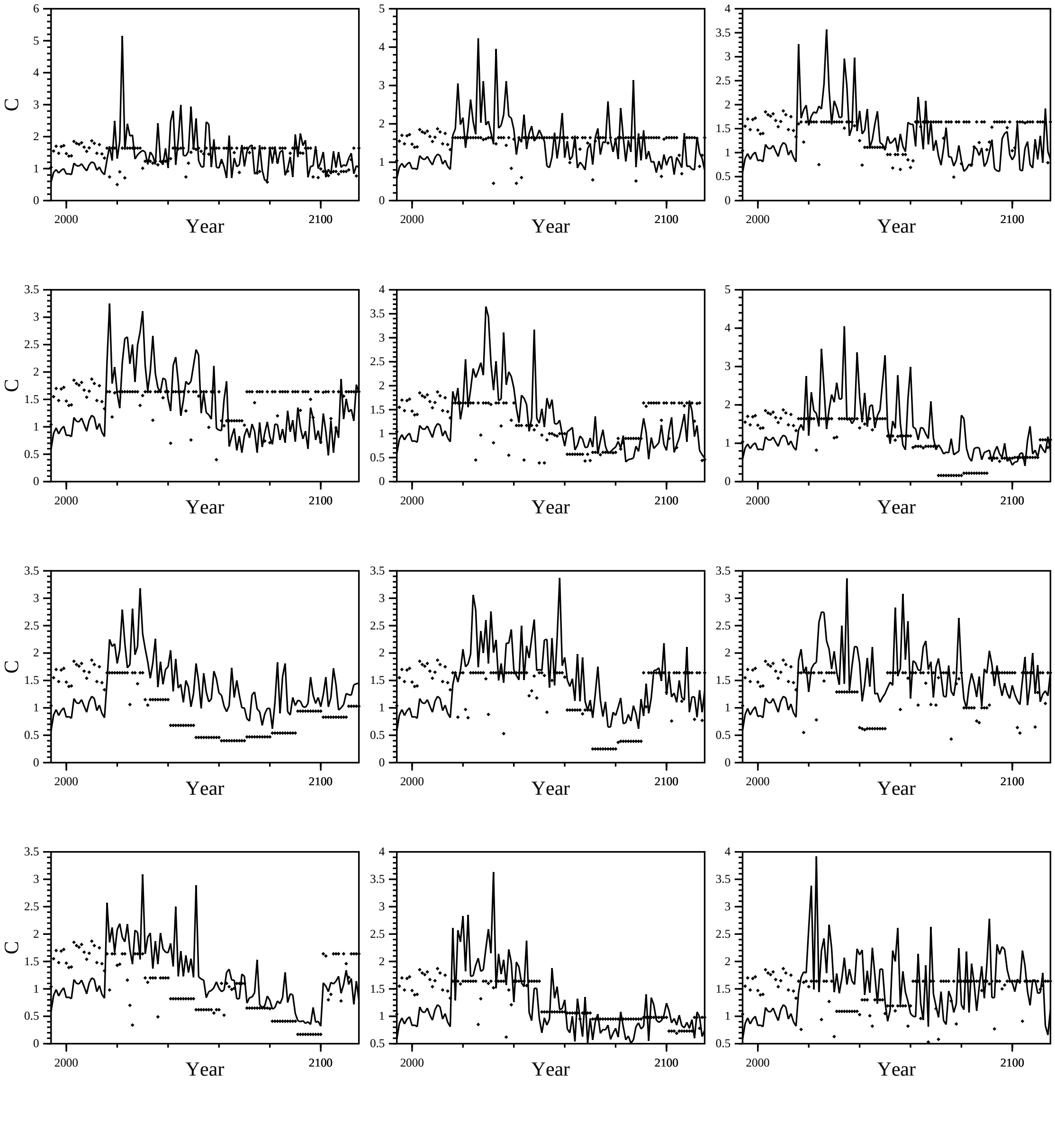

Figure 3: Catches (C=catches/100) in the West Greenland area (dots) and from the West Greenland stock (curve), for 12 iterations of M01-1A with RMP catches included.

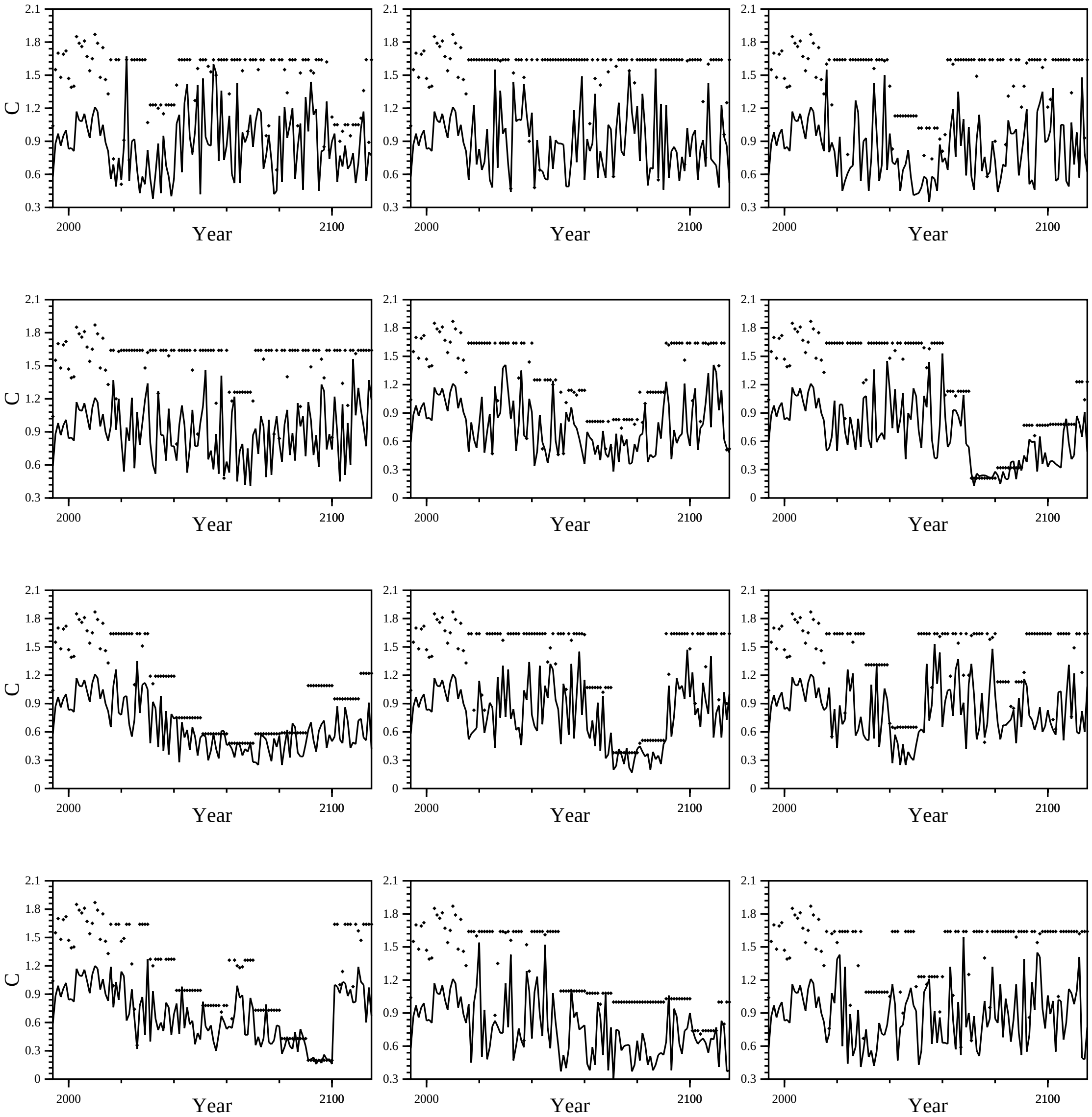

Figure 4: Catches (C=catches/100) in the West Greenland area (dots) and from the West Greenland stock (curve), for 12 iterations of M01-1A with no commercial takes.

SEX RATIOS

The models of the control program are constructed in a way where it allows for a sex specific mixing of animals to fit the sex ratios in the different areas. The dynamics of the sex ratio, however, is not forwarded as sex specific catches to the SLA. Rather the sex ratio of the future catches in the slause.dat file (and maybe also of the catches that are removed in the control program?) are set to some fixed value that reflects the recent sex ratio of the historical catches.

This is unfortunate as the dynamic of the sex ratios in the West Greenland area is a potential useful source of information for a SLA. The sex ratio in the harvest (as subtracted in an iteration and saved in the slause.dat file) should reflect the sex ratio in the area where the harvest takes place. And the sex ratio in that area should be a function of the sex ratio in the stocks and the sex specific probabilities that an individual of a given stock goes to that area. These probabilities should be determined e.g. from the sex ratio of the recent harvest given the abundances and sex ratios of the stocks during that period of the simulation. Then, when in the future the sex specific harvest is exploiting the different stocks, the sex ratios in the stocks will change (at least to a small degree), but not the probabilities that the individuals of the two sexes are moving to the different areas. The sex ratio in the harvest area will then change as a function of the changes in the sex ratios of the stocks.