Horse Mackerel Assessment sensitivity to include dual-rights vessels' nominal CPUE

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SUMMARY

Sensitivity of the baseline horse mackerel assessment (i.e. without allowing for special adjustments to account for the very low *Desert Diamond* CPUE for 2014 and 2015) to the inclusion of dual-rights vessels' nominal CPUE is investigated. This leads to slightly improved estimates of current biomass and stock status. The model is able to fit the 2014 and 2015 CPUE data points for these vessels reasonably without the need for further model adjustment.

FISHERIES/2016/SEP/SWG-DM/52 provides results of the updated 2016 Horse Mackerel assessments. These assessments fit to various survey data and commercial standardised midwater CPUE from the *Desert Diamond*.

A previous SWG meeting recommended that assessment sensitivity should be examined to include fitting to nominal dual-rights vessels' CPUE data available for the 2007-2015 period (see Table 1 of FISHERIES/2016/OCT/SWG-DEM/60 for details; the "Whole Coast" average CPUE of this table first column) was recommended by the DWG to be the most suitable series to be used).

This document presents the results of this sensitivity analyses for the Base Case model, i.e. Variant 0 which refers to the model without any further extension to allow for a better fit to the low recent CPUE values.

As there are no CAL data available for the dual-rights vessels to be able to estimate their selectivity function independently, the *Desert Diamond's* mid-water selectivity function is assumed to apply to the dual-rights sector.

RESULTS

Table 1 reports the results of the updated 2016 assessment for Variant 0 for the cases where the dual-rights CPUE data are either excluded (as previously presented) or included in the model fitting procedure. Figure 1 compares the model fits to both the commercial midwater standardised CPUE data (top) and the dual-rights nominal CPUE data (bottom). Figure 2 compares the spawning biomass trajectories for the two models.

DISCUSSION

The dual-rights (nominal) CPUE data, whilst showing a decline for the 2014 and 2015 seasons, are certainly more optimistic than the commercial midwater (standardised) CPUE data for the *Desert Diamond* for which a very large CPUE reduction is evident for the 2014 and 2015 seasons. In fact, in order for the model to fit to these very low midwater CPUE data values in 2014 and 2015, quite strong assumptions have to be made (either greatly reduced catchability or a large mortality event in 2014). The model is however able to fit the more moderate decline in CPUE seen in the dual-rights vessels' data without making these strong assumptions.

Table 1 shows that the two models estimate similar values for MSY, but the current biomass and status estimated for the resource is slightly improved the dual-rights vessels' CPUE data are taken into account in the model fitting.

Table 1: Summary of results for the Base Case (Variant 0) 2016 updated assessments which either exclude or include the dual-rights vessels' nominal CPUE data in the model fitting procedure. For both variants q_{aut} = 0.75 and h = 0.75. "SR" and "CAL" refer to stock-recruitment and catch-at-length respectively. Biomass is reported in units of kilo tonnes.

	Excludes dual-rights vessels' CPUE in likelihood	Includes dual-rights vessels' CPUE in likelihood
-ln L :Total	-224.51	-235.76
-ln L :Spr survey	0.873	1.162
-ln L :Aut survey	-9.10	-8.32
-ln L :CPUE	-0.84	-0.42
-ln L :dual-rights	(-9.57)	-12.56
-ln L :CAL Spr survey	-46.38	-47.55
-ln L :CAL Aut survey	-87.68	-87.89
-ln L :CAL commercial	-65.73	-65.37
-ln L :SR residuals	-15.66	-14.80
K^{sp} (KT)	806	798
B_{2015}^{sp} (KT)	**535**	**559**
$MSYL^{sp}$ (KT)	200	197
MSY (KT)	60	60
B_{2015}^{sp}/K^{sp}	**0.663**	**0.700**
$B_{2015}^{sp}/MSYL^{sp}$	2.677	2.838
$MSYL^{sp}/K^{sp}$	0.248	0.247
q: Spr survey	0.760	0.779
q: CPUE (x10^{-6})	1.531	1.551
q: dual-rights (x10^{-6})	-	8.542

Figure 1: Base Case (Variant 0) Assessment model fits to the abundance indices – including and excluding dual-rights vessels' nominal CPUE data.
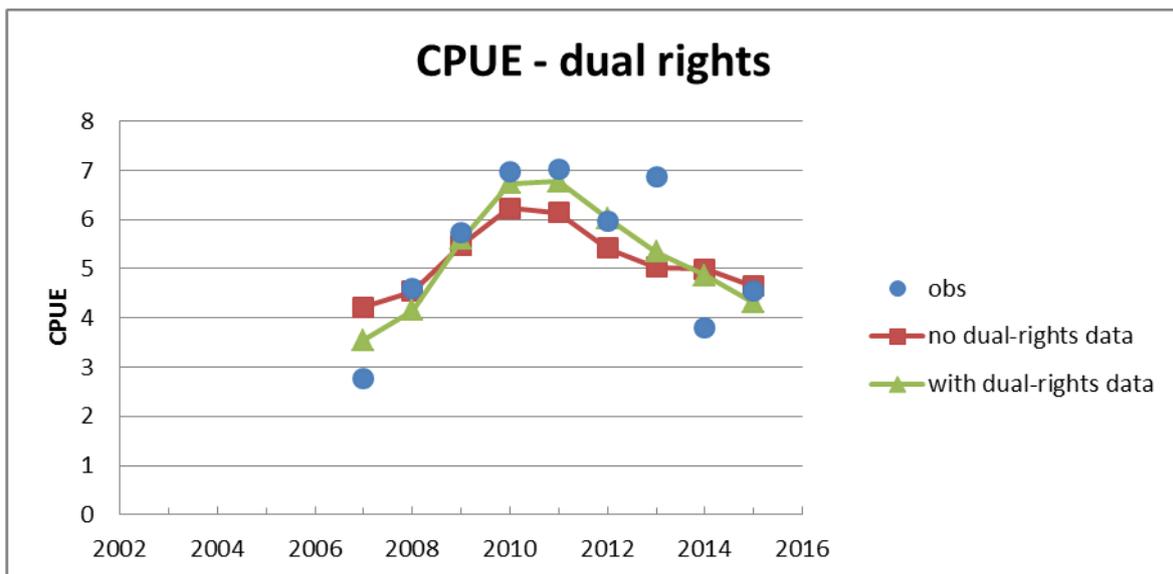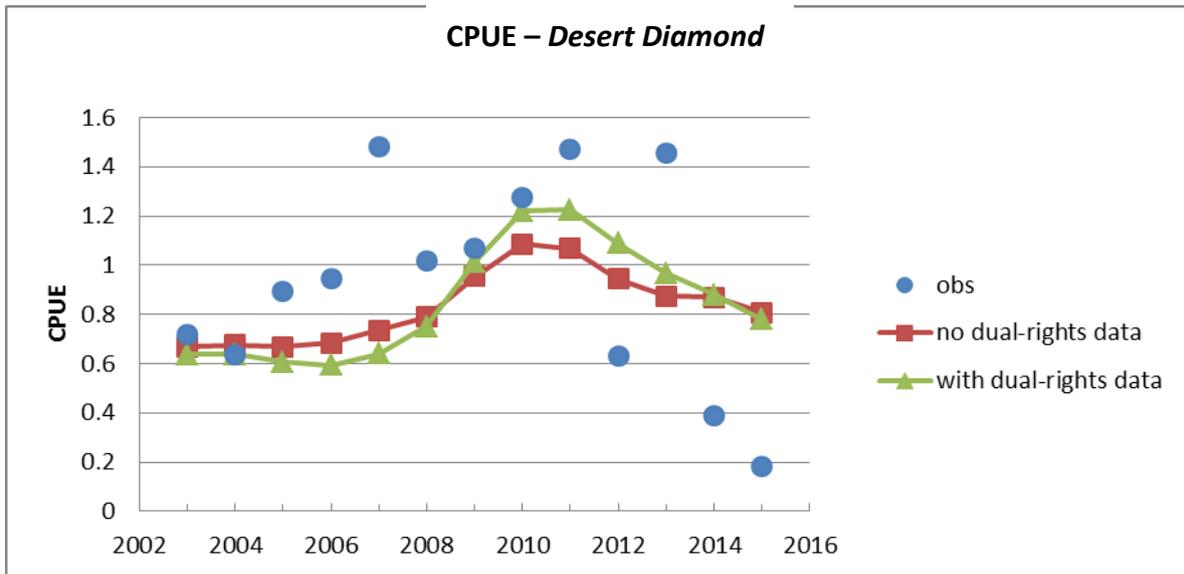
Figure 2: Estimated spawning biomass trends relative to pristine comparing the assessments which either include or exclude dual-rights vessels' CPUE data in the fit.