SOME INFORMATION RELATED TO MSYR, MSYL AND DENSITY-DEPENDENCE COMPONENTS IN RMP TRIALS

Andre E. Punt

There has been a lack of consistency in the choices made regarding the population component to which MSYL and density-dependence should relate when conducting simulation trials. Furthermore, although the Committee has clearly decided that MSYR=1% should pertain to harvesting of the total (1+) component of the population, no firm decision has been taken on whether MSYR=4% should pertain to harvesting of the mature female component of the population.

Yield curves have been developed to help understand the consequences of the tradeoffs associated with the available choices for the case MSYL=0.6. Figure 1 shows yield curves when $MSYR_{1+}$=1% for two choices for how density-dependence operates (on fecundity or natural mortality). The solid and dotted lines on each panel show the yield curves when MSYL and density-dependence pertain to the total (1+) component and the mature female component respectively (left and right panels). Figure 2 shows the same information as Figure 1, except that the results pertain to $MSYR_{mat}$ = 4%.

Some noteworthy features of the results:

- The yield curve for the 1+ population always lies to the right of that for the mature female component of the population.
- The difference between the two yield curves is very small for $MSYR_{1+}$=1%, but increases with MSYR
- The difference between the two yield curves is larger when density-dependence operates on fecundity rather than natural mortality.

The differences between the two yield curves also depend on the age-at-maturity (the differences are larger for higher ages-at-maturity) (Figure 3). Increasing $MSYR_{mat}$ to 7% (Figure 4) shows that for very high MSYR rates (and high ages-at-maturity), the MSYL in terms of the 1+ component of the population can approach (and even exceed[1]) K when density-dependence and MSYL pertain the mature female of the population. In contrast, defining MSYL and density-dependence in terms of the 1+ component of the population in this case leads to MSYL occurring at a very low proportion of K in terms of the mature female component of the population (Figure 4a).

[1] The “bend em with Beckham” yield function

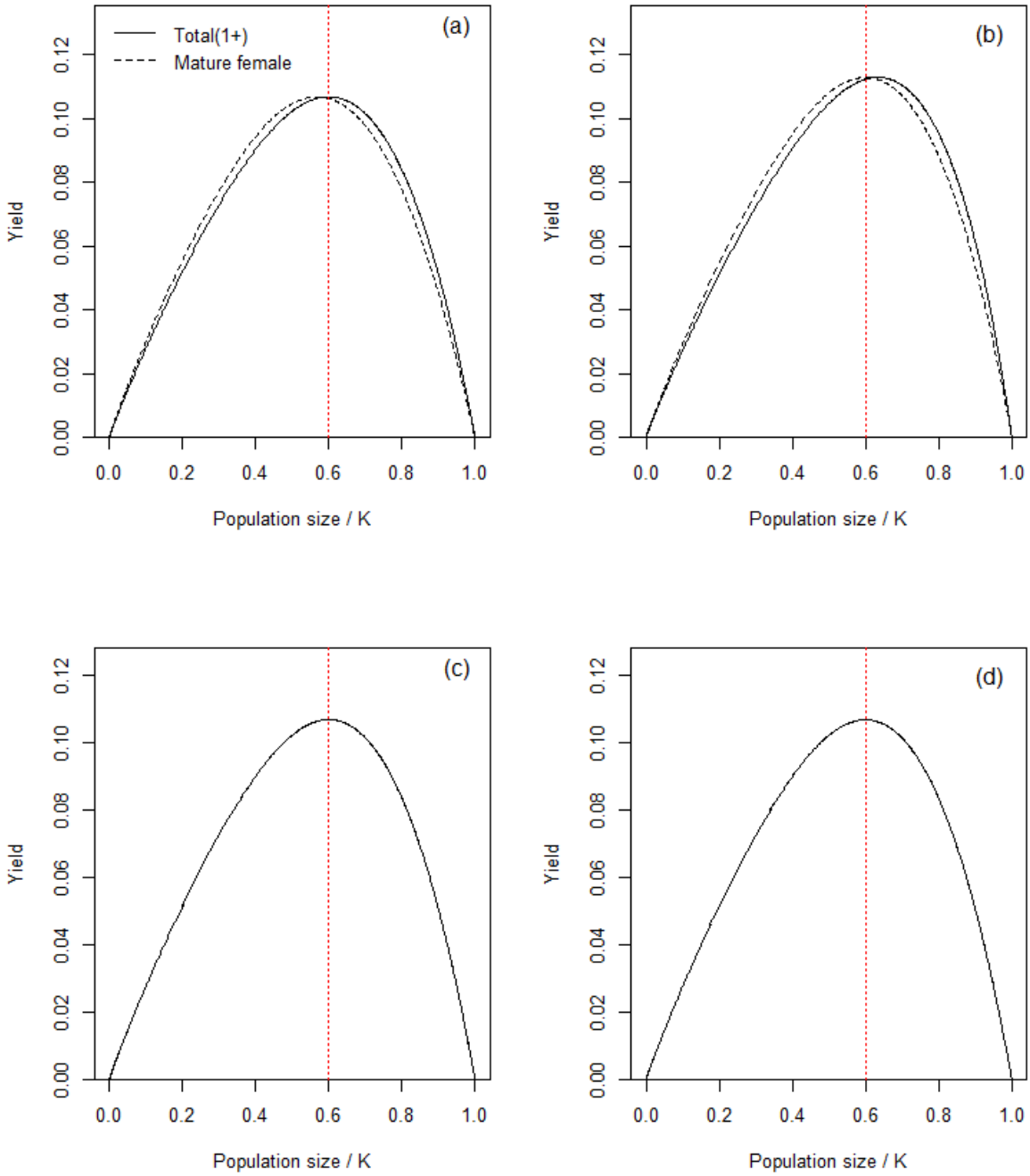

Figure 1. Yield curves (equilibrium catch vs population size expressed relative to K). MSYR = 1% pertains to harvesting of the 1+ component of the population. The upper and lower panels show results when density-dependence operates on fecundity and natural mortality respectively. The left and right panels respectively show results when MSYL and density-dependence pertain to the 1+ component of the population and the mature female component of the population.

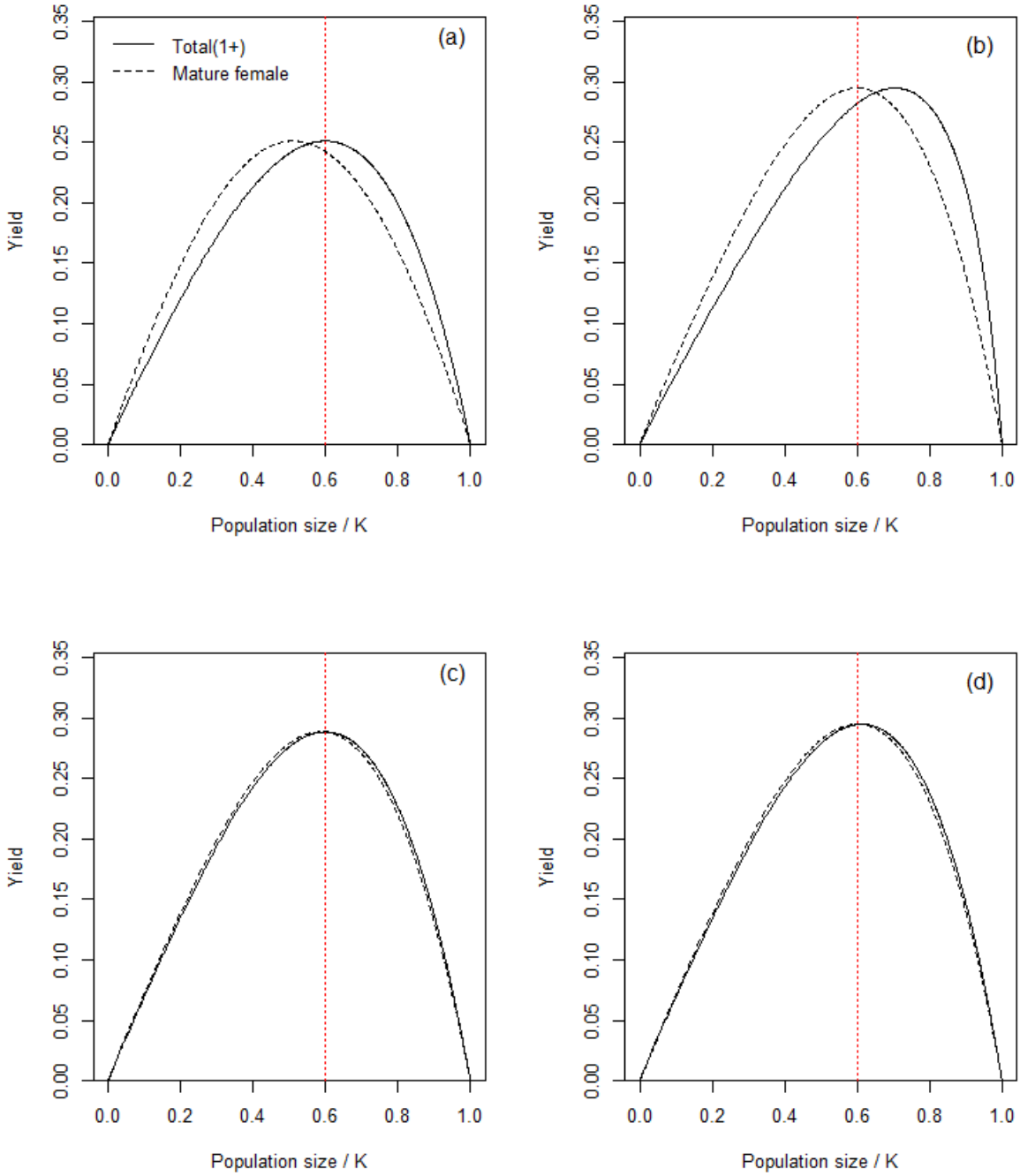

Figure 2. As for Figure 1, except that MSYR = 4% and pertains to harvesting of the mature female component of the population.

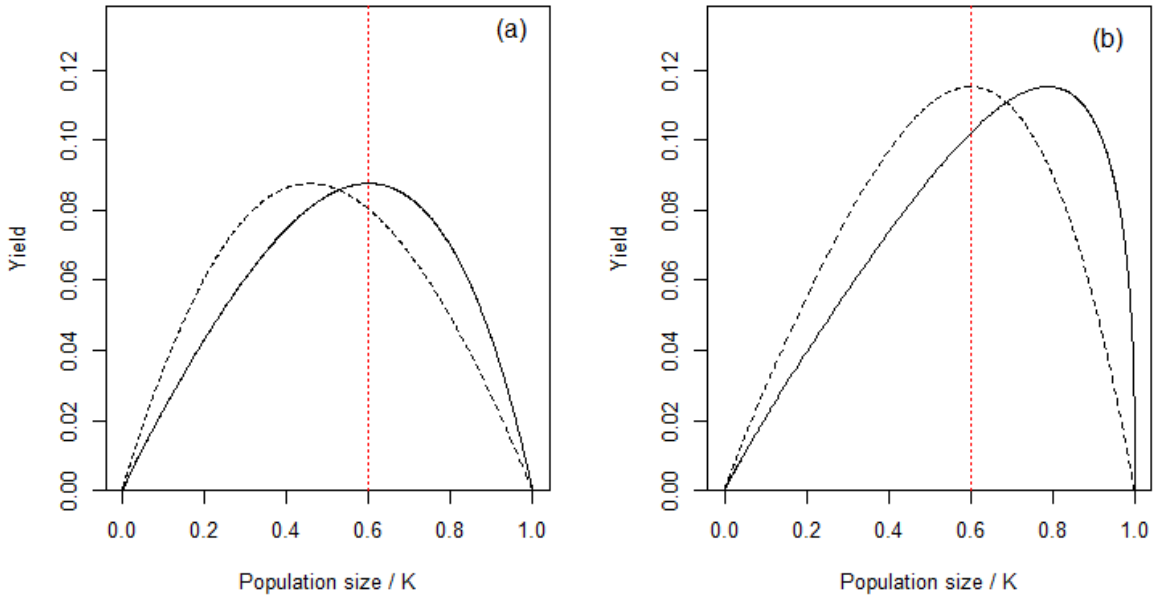

Figure 3. As for Figure 2, except that results are only shown for MSYR = 4% and the age-at-50%-maturity is increased from 7 to 19.

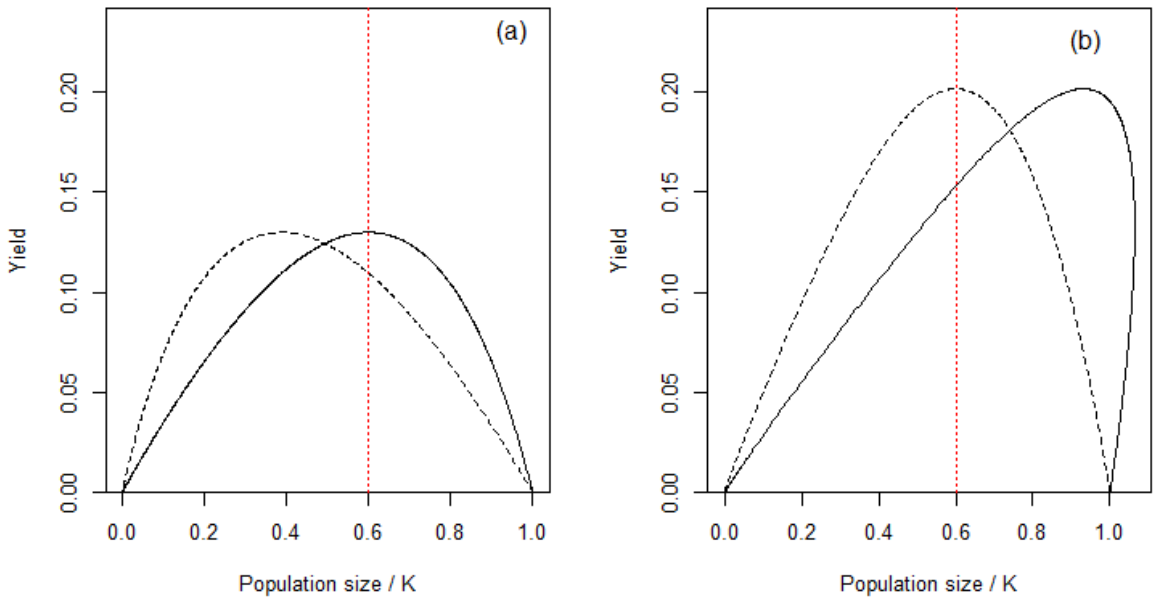

Figure 4. As for Figure 3, except that results are only shown for MSYR = 7%.