Summary of biological information used in assessment of the South African horse mackerel

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1. Growth curve – length at age

The current length-at-age relationship used in the South African horse mackerel assessment is taken from Kerstan 1999 (pers. commn) quoted in Horsten (1999). This relationship takes the form of a Von Bertalanffy growth curve:

$$l_a = l_\infty (1 - e^{-\kappa(a - t_0)})$$

where $l_\infty = 54.56$ (cm)
$\kappa = 0.183$ (yr^{-1})
$t_0 = -0.654$ (yr)

Figure 1a (top panel) illustrates this relationship. Note that males and females grow at the same rate (Hecht 1990).

Other growth curves have been reported e.g. Naish *et al.* (1991) (see Figure 1b), who report values of $l_\infty = 48.8$, $\kappa = 0.556$, and $t_0 = 0.229$. Kerstan and Leslie (1994) discuss differences among the growth constants given the various studies available at that time. The authors conclusions were that differences were the result of inadequate sampling efforts, long intervals between survey periods and differing ageing techniques.

2. Length-weight relationship

The length-weight relationship currently used for the South African horse mackerel is from Naish *et al.* (1991). The relationship between mass (g) and total length l (mm), derived from multiplicative regression, is described by Naish *et al.* (1991) by the equation: $W = \alpha l^b$

where $\alpha = 7.8 \times 10^{-6}$, $b = 3.011$ ($n = 881$, $r^2 = 0.969$)

Figure 1a (middle panel) illustrates this relationship.

3. Weight-at-age

This relationship used in the assessment is simply a combination of the above two relationships, i.e.:

$$W_a = 0.0078(54.1(1-e^{-0.183(a+0.654)}))^{3.0}$$

This defines the "begin-year" weight-at-age (in *g*)

The assessment model also requires the "mid-year" weights-at-age (W_a^{mid}), which are calculated as $W_a^{mid} = 0.0078(54.1(1-e^{-0.183((a+0.5)+0.654)}))^{3.0}$.

Note that the parameter *b* from the length-weight relationship is taken to be 3.0 (not 3.011 as in Naish *et al.* (1991)) in the current assessment.

Figure 1a (bottom panel) illustrates this relationship.

4. Fecundity – age at maturity

Kerstan and Leslie (1994) report that reported lengths at 50% maturity vary between 32 and 43 cm (TL). The high variation is considered probably to be a consequence of small sample sizes and non-representative seasonal and areal coverage.

The current assessment assumes age-at-maturity to be the age corresponding to 100% sexual maturity, which is assumed (for this fishery) to be described by a knife-edge function of age. For South African horse mackerel, age-at-maturity is assumed to be 3 years (R.W. Leslie pers. commn in Butterworth and Clarke 1996).

5. Natural Mortality

Natural mortality is assumed to constant for all ages. The base case value used for the South African horse mackerel assessment is $M = 0.3$. Natural mortality was estimated by Payne (1986) to be 0.35. This value was based on the growth parameters given in Hecht (1976) and calculated using Pauly's (Pauly 1980) equation, incorporating mean bottom-water temperature from Payne's surveys. Kinloch *et al.* (1986) suggested this value to be reasonable in their VPA results.

References

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Figure 1: Length-at-age, length-weight relationship and (begin-year) weight-at-age for South African horse mackerel.

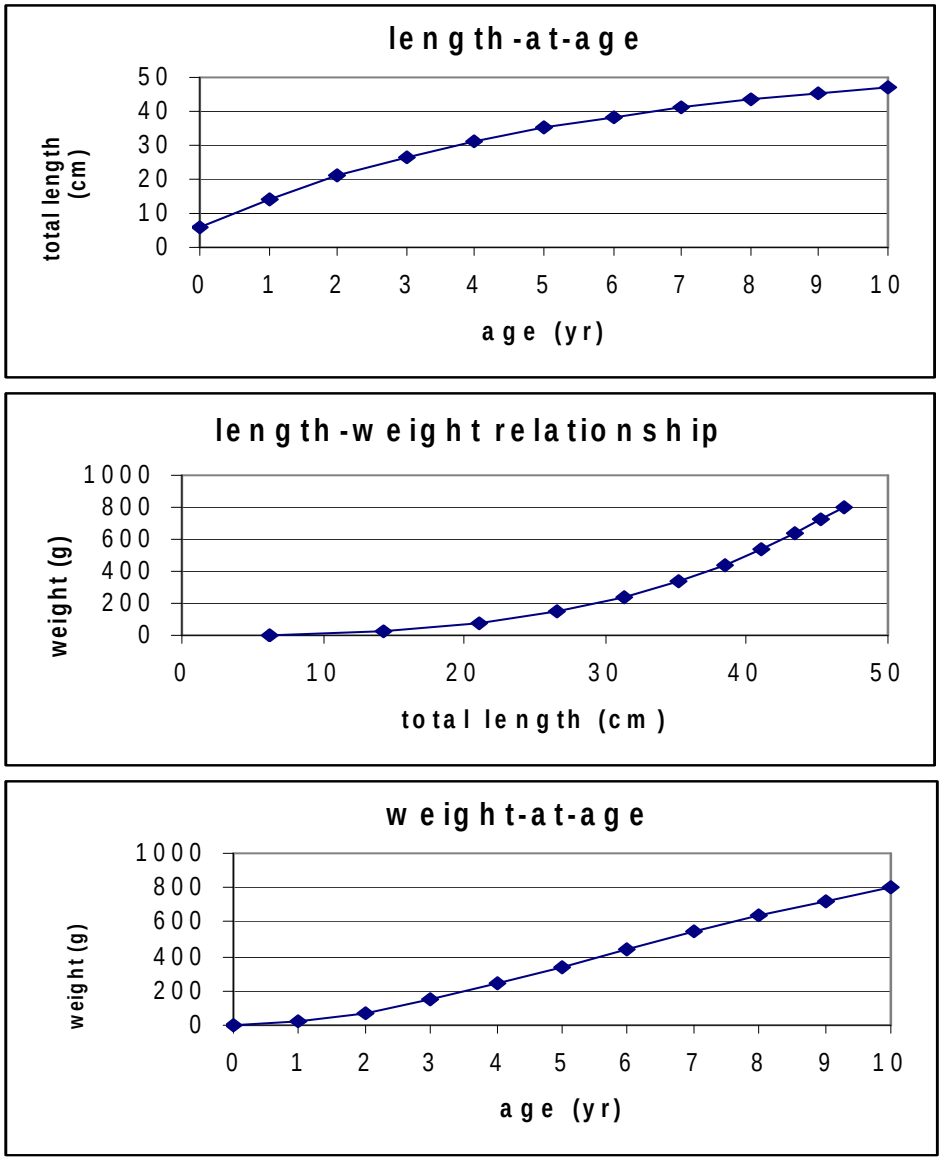

Figure 1b: Naish *et al.* (1991) growth curves.