Federal Agency for Fisheries of the Russian Federation

PRELIMINARY NAVARIN WALLEYE POLLOCK (*THERAGRA CHALCOGRAMMA)* STOCK ASSESMENT

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By

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As previously, assessment was undertaken by the model belonging to ISVPA group (Vasilyev 2001, 2003). A group of separable cohort model, named ISVPA, may serve as an example of comparatively simple stochastic separable cohort models, but including some principles of robust statistics (see also ICES 2004).

This year the so called effort-controlled version of the model was used. This version implies that errors in model approximation of catch-at-age data can be attributed to errors in catch-at-age data (assuming that separable representation is true). As in the last year assessment, an additional condition was applied in order to help to get unique solution in situations of strongly noisy data. This condition consists in unbiased separable representation of fishing mortality coefficients.

Unlike previous assessments where single selection pattern was fitted, in this year assessment the change in selection in 2001 was taken into consideration by estimation of two respective selection patterns.

The loss function of the model was composed of components corresponding to catch-at-age (sum of squares of residuals in logarithmic catch-at-age) and to two sets of CPUE data (for big and medium size vessels) which were used as fishing stock biomass (FSB) indexes. Model-derived FSB values were calculated from abundance-at-age estimates in assumption that 0, 10, and 95 percents of fish are recruiting the FSB at ages 2, 3, and 4 respectively. Alder age groups were assumed totally belonging to FSB.

Profiles of components of the model loss function, as well as profile of the total loss function, are presented on figure 1 as a function of the effort factor value in the terminal year.

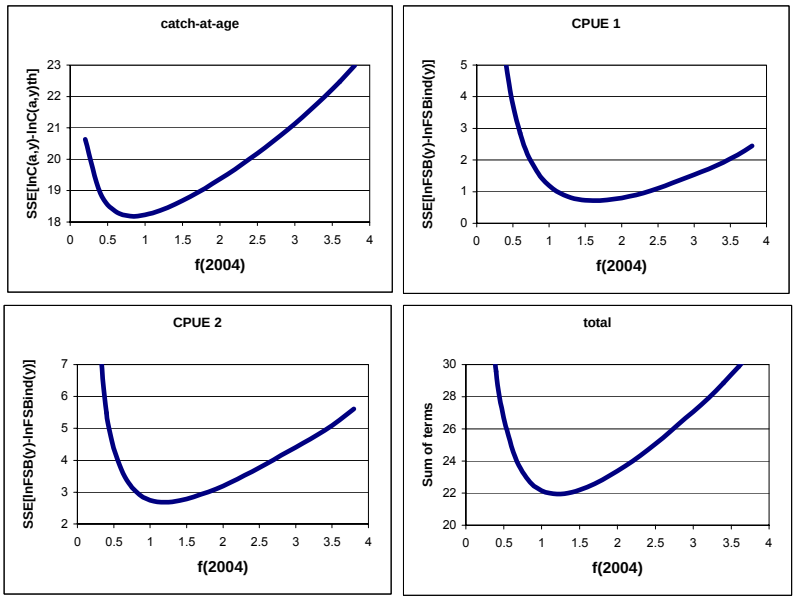

Figure 1. Profiles of components of the ISVPA loss function and of the total loss function.

As it can be seen, all components of the function reveal clear minima in rather similar positions, but catch-at-age data taken alone give somewhat lower estimate of fishing mortality in 2004 in comparison to overall data (compare figures titled “catch-at-age” and “total” on figure 1).

Retrospective runs undertaken with the same model assumptions (Fig. 2) show some instability because of shortening of the time interval used for estimation of the second selection pattern. Final year of each curve on the graph corresponds to the year taken as terminal one in the assessment.

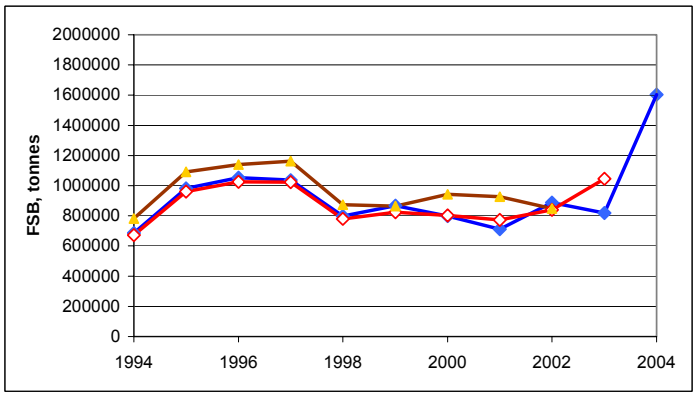

Figure 2. FSB estimates in the ISVPA retrospective runs.

Results of bootstrap (conditional parametric, lognormal error distribution in catch-at-age and in FSB index residuals was assumed) are presented on figures 3 and 4.

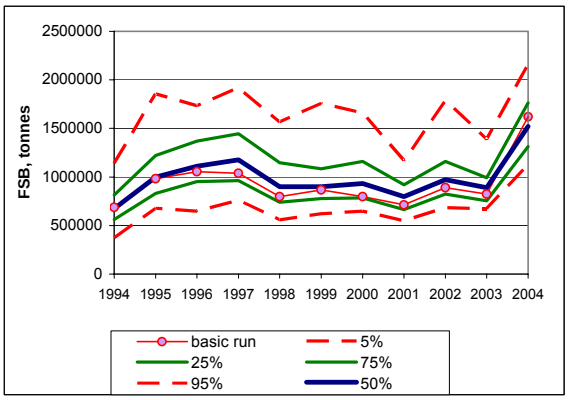

Figure 3. ISVPA bootstrap distribution for estimates of FSB.

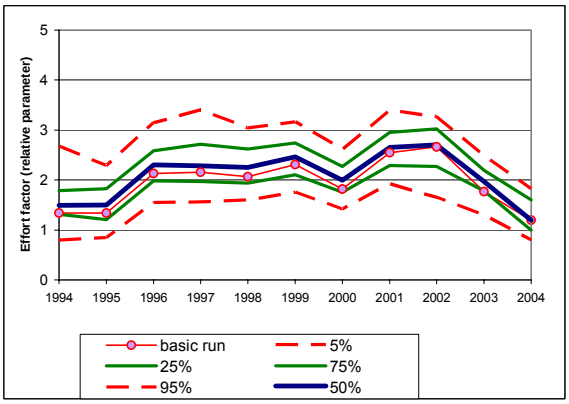

Figure 4. ISVPA bootstrap distribution for estimates of the effort factor (year-dependent factor in separable representation of fishing mortality when selections-at-age are normalized to 1 by sum).

Estimates of abundance-at-age, fishing stock biomass and fishing mortality (mean for age groups 3-6) from basic run of the model are presented in tables 1 and 2.

Table 1. Estimates of abundance-at-age, thousands tons.

year\age	2	3	4	5	6	7+
1994	2627.6	1438.0	740.1	284.7	156.2	109.5
1995	3740.2	1848.2	811.2	379.4	182.8	128.1
1996	3373.2	2630.5	1041.9	415.4	243.6	170.7
1997	5185.5	2268.1	1112.8	345.4	227.5	159.4
1998	3996.2	3481.7	949.8	362.8	188.1	0.0
1999	3010.5	2697.1	1513.1	329.0	201.4	0.0
2000	5547.9	2003.4	1056.0	440.4	173.1	0.0
2001	1755.5	3797.2	957.4	424.5	257.4	0.0
2002	4485.0	1151.4	1320.9	225.0	211.0	75.8
2003	4605.8	3076.3	690.4	700.0	61.8	53.4
2004	950.0	3266.1	2052.0	432.1	315.0	288.3

Table 2. Estimates of FSB and F(3-6), thousands tons.

	FSB	Catch	F(3-6)
1994	687	288.9	0.32
1995	981	427.3	0.32
1996	1053	753.0	0.58
1997	1037	735.0	0.59
1998	798	719.7	0.55
1999	867	639.0	0.65
2000	798	507.0	0.47
2001	712	526.0	0.76
2002	888	370.0	0.72
2003	820	411.2	0.40
2004	1602	380.0	0.25

As it can be seen, direct observations of strong 2000 and 2001 year classes, used for correction of the previous year assessment results, are supported now just by model assessment. This may be attributed to more correct model-derived estimates of selection pattern for last period of fishing (2001-2004).

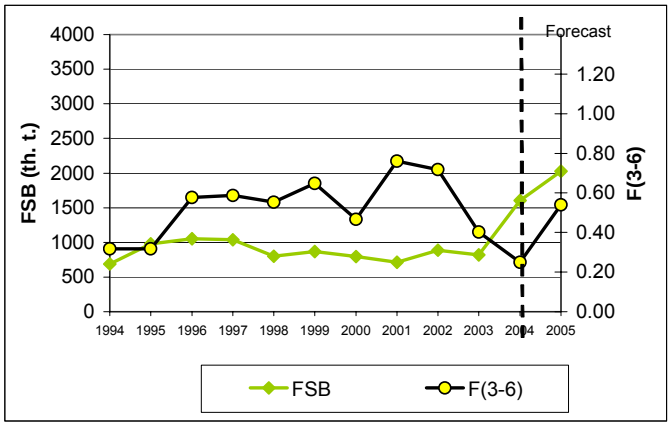

Figure 5. FSB and F(3-6), thousands tons.

In projection: Catch(2005)=TAC=550 000 t.
selection-at-age - average(2001-2004)
recruitment - geometric mean(1994-2004)
weight-at-age - average(1994-2004)
maturity-at-age - average(1994-2004)

Deterministic stock projection for 2005, calculated in assumption that catch in 2005 will be equal to TAC=550 000 tons, shows further rise in FSB. (Settings are listed in legend to figure 5).

References

Vasilyev 2001. Cohort models and analysis of commercial bioresources at informational supply deficit. Moscow, VNIRO Publishing, 2001. 98 pp.

Vasilyev 2003. Description of the ISVPA. Working document to the ICES Working group on methods of stock assessment. Copenhagen, 29.01.2003-5.02.2003.

ICES 2004. Report of the ICES Study Group on Assessment Methods Applicable to Assessment of Norwegian Spring-Spawning Herring and Blue Whiting Stocks (SGAMHBW).