

3.15 Pollock

Catch and Survey Indices

Pollock have been exploited by Canadian, USA and distant water fleets on the Scotian Shelf, in Gulf of Maine, and on Georges Bank. The total commercial catch from these areas increased from an annual average of 38,200 mt during 1972-76 to 68,800 mt in 1986 (Mayo *et al.* 1989), but has since declined to 10,000 - 15,000 mt per year. For the purposes of the present analysis, only catches from the Gulf of Maine and Georges Bank and west taken by all countries were included. Prior to 1976, fleets from all countries fished for pollock throughout the Scotian Shelf and Georges Bank, and in portions of the Gulf of Maine. Total landings increased from less than 10,000 mt per year during the 1960s to about 15,000 mt by the mid 1970s. Landings increased sharply during the late 1970s to over 20,000 mt per year, peaking at 26,500 mt in 1986 (Figure 3.15.1).

After this period of relatively high catches, total landings began to decline rapidly, and have averaged between 4,000 and 8,000 mt per year since 1994. Since 1984, the USA fishery has been restricted to areas of the Gulf of Maine and Georges Bank west of the line delimiting the USA and Canadian fishery zones. The Canadian fishery occurs primarily on the Scotian Shelf with some additional landings from Georges Bank east of the line delimiting the USA and Canadian fishery zones (Neilson *et al.* 1999).

Indices of relative biomass (ln re-transformed), derived from NEFSC autumn research vessel bottom trawl surveys have varied considerably since 1963 (Figure 3.15.1). Indices generally fluctuated between 2 and 5 kg per tow throughout most of the 1960s and 1970s, peaking at over 5-7 kg per tow during the mid-to-late 1970s, reflecting recruitment of several moderate-to strong year classes from the early 1970s. Strong year classes were also produced in 1979 and 1980, after which recruitment began to diminish during the 1980s. Biomass indices declined rapidly during the early 1980s, and continued to decline steadily through the early 1990s, reaching a minimum in 1994. Since 1994, biomass indices from the Gulf of Maine-Georges Bank region have gradually increased.

Stock Assessment

Pollock, *Pollachius virens* (L.) have generally been assessed as a unit stock from the eastern Scotian Shelf (NAFO Division 4V) to Georges Bank and the Gulf of Maine (Subarea 5). Canadian assessments (Neilson *et al.* 1999) treat the management unit within the Canadian EEZ separately. This stock was last assessed over its entire range *via* VPA in 1993 (Mayo and Figuerido 1993), and the results were reviewed at the 16th Northeast Regional Stock Assessment Workshop in 1993 (NEFSC 1993a, 1993b). At that time, spawning stock biomass had been declining since the mid-1980s, and was expected to reach its long-term average (144,000 mt). Fishing mortality was estimated to be 0.72 in 1992, above $F_{20\%}$ (0.65) and well above F_{med} (0.47).

The state of this stock was most recently evaluated in 2000 *via* index assessment (NEFSC 2001a). At that time, it was noted that biomass indices for the Gulf of Maine-Georges Bank portion of the stock, derived from NEFSC autumn bottom trawl surveys, had increased during

the mid-1970s, declined sharply during the 1980s, but have been gradually increasing since the mid-1990s.

Relative Exploitation Rate Analyses

An index of relative exploitation (catch/survey biomass index) corresponding to a replacement ratio of 1.0, as described in section 2.3, was developed for the portion of the unit stock of pollock within the USA EEZ. Autumn NEFSC survey biomass indices from the Gulf of Maine and Georges Bank region from 1963 through 2000 were used to calculate the replacement ratios, and the biomass indices and total landings from the same region were used to compute the relative exploitation rates (Figure 3.15.2). The relative exploitation rates (or relative F) may be considered a proxy for Fmsy for that portion of the pollock stock considered in this analysis.

Prior to the 1980s, a high proportion of the replacement ratios equaled or exceeded 1.0. During the 1980s and early 1990s, most of the replacement ratios were less than 1.0, with ratios greater than 1.0 appearing again by the late 1990s as the biomass indices began to gradually increase from the very low levels of the mid-1990s.

The relationship between replacement ratios and relative F was evaluated by a linear regression of the Log_e replacement ratio on Log_e relative F (Figure 3.15.2, Table 4.1.1) and the results were used to derive an estimate of relative F corresponding to a replacement ratio of 1.0. Results for pollock were significant ($p < 0.05$, Table 4.1.1.), and the estimate of the relative replacement F (F rel rep) has a low standard error compared to the point estimate (5.88). The regression indicates that, on average, when the relative F is greater than 5.88, the stock is not likely to replace itself in the long-term.

The data displayed in Figure 3.15.2 also provide a means to utilize the estimate of the Fmsy proxy (Relative F=5.88) to derive a biomass index which relates to the replacement ratios. In this case, it is evident that most of the replacement ratios at or above 1.0 occurred prior to the 1980s when the biomass index was greater than about 3.0. This index may be considered as the biomass proxy for Bmsy that corresponds to the relative F proxy for Fmsy.

Since the relative F relates the catch directly to survey biomass, the catch corresponding to the Bmsy proxy can be estimated from the relative F and the biomass index of Bmsy. For pollock, this computes to $3.0 * 5.88 = 17.64$, or 17,640 mt as a proxy for MSY. Results of these calculations are presented in Table 4.2.1.

Pollock (Subarea 5)

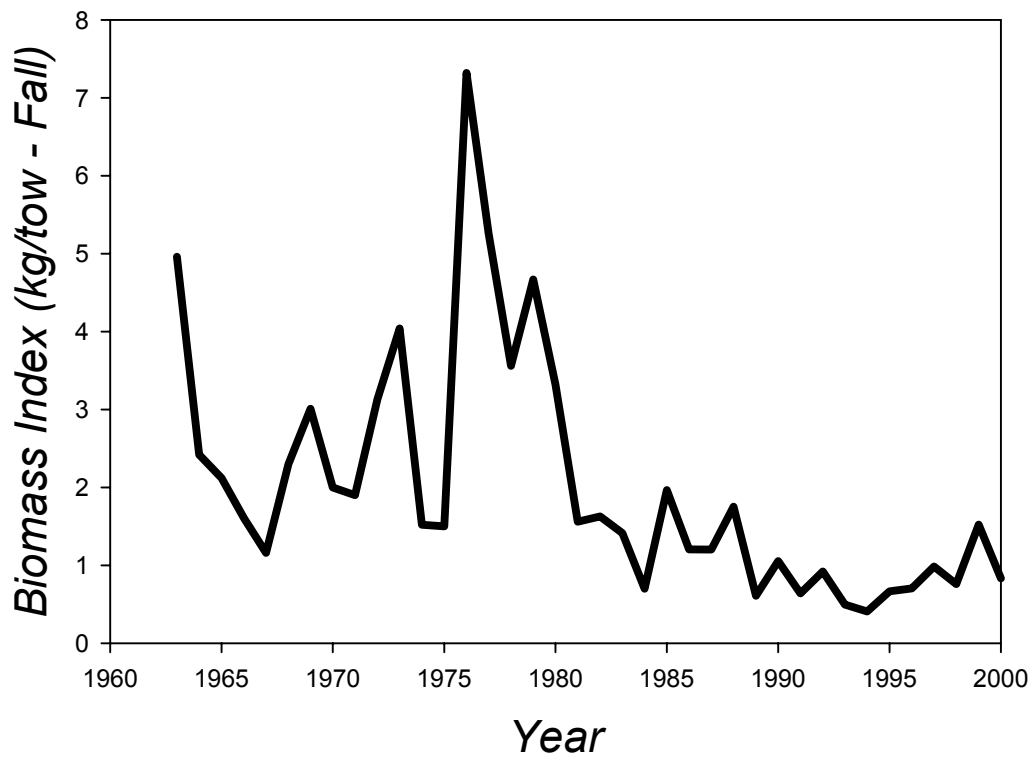


Figure 3.15.1. Landings and research vessel survey abundance indices for pollock.

Pollock (Area 5 & 6), Fall

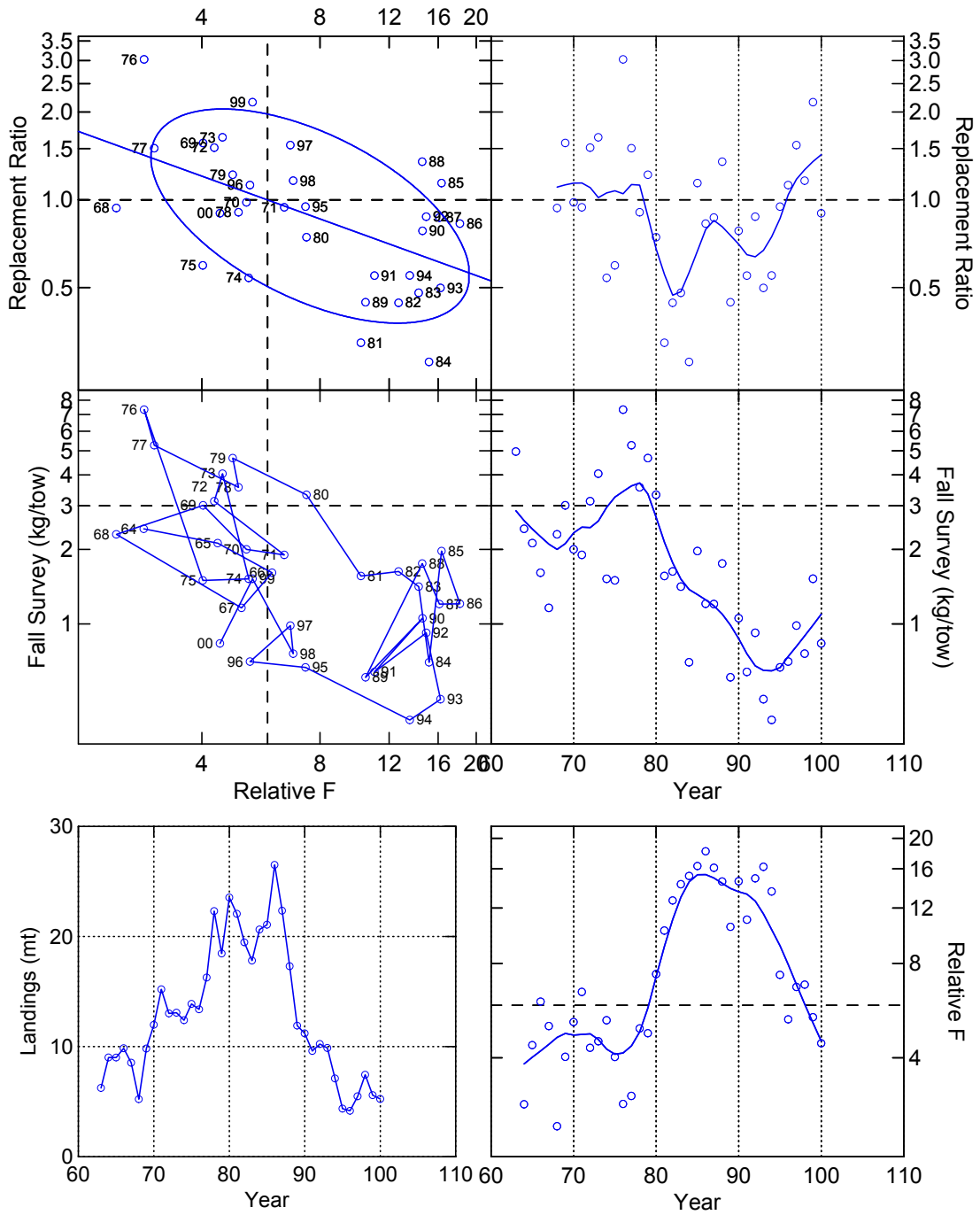


Figure 3.15.2. Trends in relative biomass, landings, fishing rate mortality rate indices (landings/survey index) and replacement ratios for pollock. Dashed lines indicate proposed biomass and fishing mortality rate proxies of B_{msy} and F_{msy} . Landings are all reported in Subareas 5&6, by all countries.