Extracted from Report of the Scientific Council, June 2014, SCS Doc. 14/17

(http://archive.nafo.int/open/sc/2014/scs14-17.pdf)

iii) Reference points for witch flounder in Div. 3NO (Item 6)

The Fisheries Commission requests the Scientific Council to provide reference points for Div. 3NO witch flounder including B_{lim}, B_{msy} and F_{msy} through modelling or proxies.

The Scientific Council responded:

The average of the two highest Canadian spring research vessel survey points from 1984-2013 is considered to be a proxy for B_{msy}. 30% of this average is considered to be a proxy for B_{lim}. Following the same logic, a proxy for F_{msy} ($=F_{lim}$) can be derived as 0.26 (based on catch/biomass ratio).

A variety of approaches were examined to determine limit reference points or proxies. A variety of formulations of a surplus production model in a Bayesian framework were examined but found not to be acceptable for determination of reference points at this time. Stock recruit data from the survey were considered but the early part of the time series which is comprised of surveys conducted with a gear that had a low catchability for small fish which meant that there were no recruitment indices during the time of higher stock size.

Another candidate for a proxy for a limit reference point is the lowest biomass from which there has previously been a rapid and sustained recovery ($B_{recover}$). However, this is a minimum standard for a reference point and not considered to be appropriate.

It was concluded that the best approach was to base the reference points on the longest survey series, the Canadian spring survey with the 1984-1990 estimates adjusted for depth coverage. The Canadian spring series is highly variable with large uncertainty in some years. However, it is the only index that extends from a period of higher stock size to the present. The Study Group on Limit Reference Points (SCS Doc. 04/12) determined that for data-poor stocks, "*the point at which a valid index of stock size has declined by 85% from the maximum observed index level provides a proxy for Blim, if that index of stock size commences prior to the start of the fishery. If the highest index of stock size is equal to B_{msy}, then it would be consistent for Blim to be 30% of that level. If the highest observed survey index is considered to be below B_{msy}, then this should be taken into account in a similar way".*

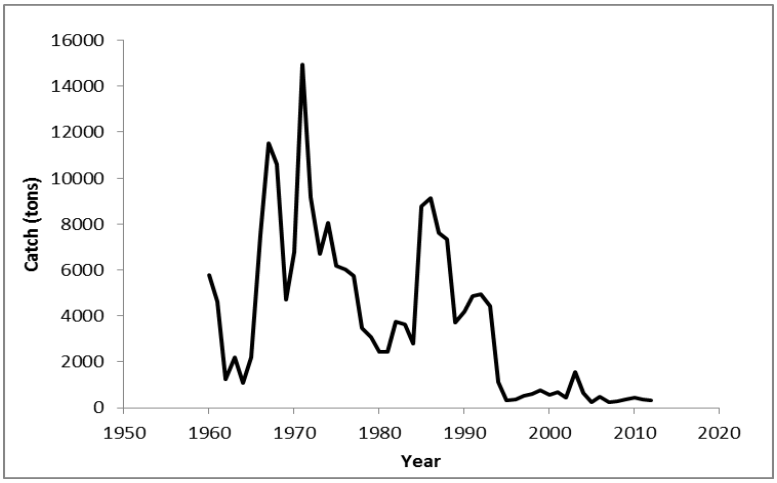

Fig. 3. Catch of Div. 3NO witch flounder.

The Canadian spring series begins in 1984. This is well after the beginning of the fishery on this stock (Fig. 3). The two highest Canadian spring research vessel survey points from 1984-2013 are considered to be a proxy for B_{msy}. 30% of this average is considered to be a proxy for B_{lim} (Fig. 4). Following the same logic, a proxy for F_{msy} ($=F_{lim}$)

can be derived as 0.26 (based on catch/biomass ratio) (Fig. 5). Given uncertainties about the true status of the stock relative to B_{msy} in the 1980s, the choice of the two highest points to provide a B_{msy} proxy was considered as the most precautionary approach (Fig. 6).

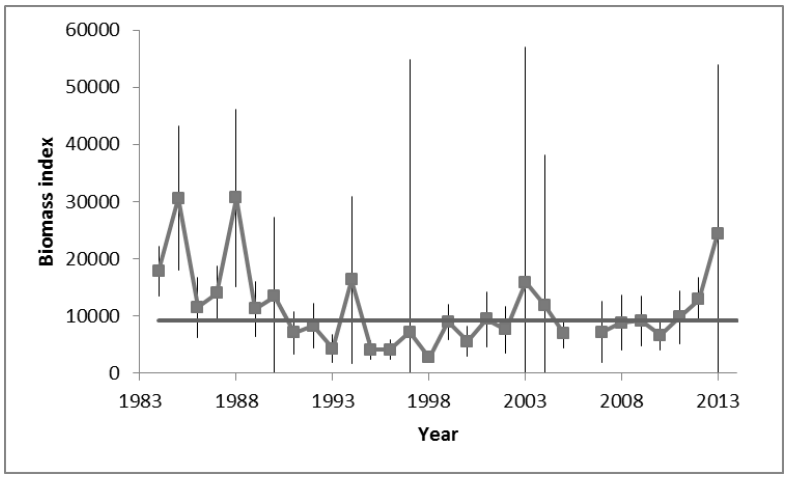

Fig. 4. Witch flounder in Div. 3NO: biomass index from Canadian spring surveys (95% confidence limits are given). Values are Campelen units or, prior to 1995, Campelen equivalent units. The horizontal line is B_{lim}.

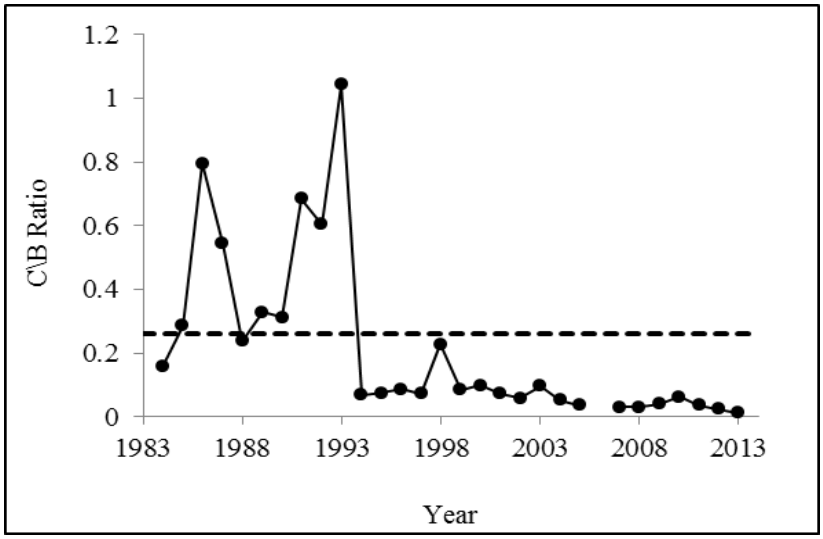

Fig. 5. Catch to biomass ratio for Div. 3NO witch flounder. The horizontal line is F_{lim}.

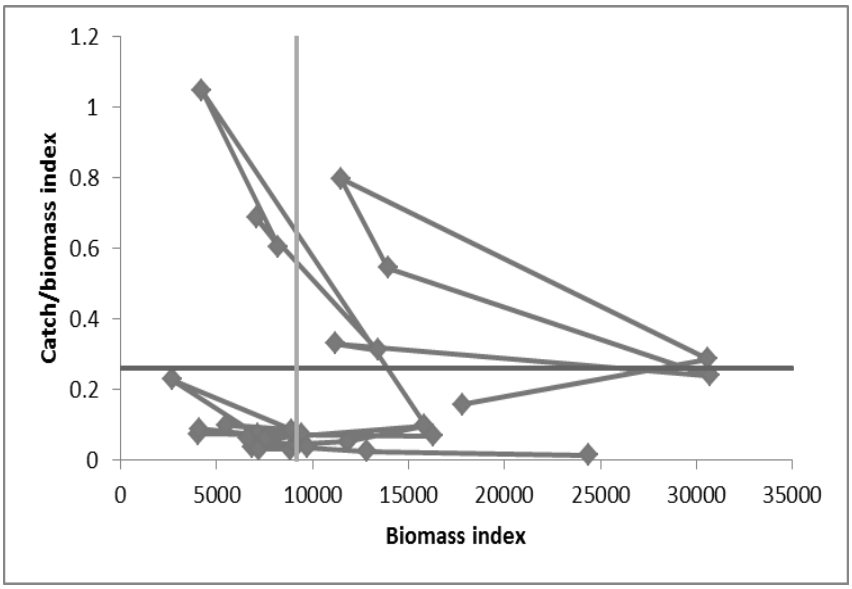

Fig. 6. Catch to biomass ratio and biomass index showing B_{lim} (vertical line) and F_{lim} (horizontal line)