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Comparison of Canadian and Spanish Survey Results for American Plaice and Yellowtail Flounder from the NAFO Regulatory Area in Divisions 3NO

by

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Abstract

Since 1995, a stratified random spring bottom trawl survey in the NAFO Regulatory Area (NRA) of Division 3NO has been carried out by Spain. This area is also surveyed in Canadian DFO's annual spring and fall surveys of the Grand Bank. In this paper, yellowtail flounder and American plaice biomass estimates are compared from Canadian spring surveys using *Campelen* gear and the Spanish survey's original bottom trawl net, *Pedreira*, as well as converted *Campelen* values from the Spanish surveys. In all gear type comparisons, there were similar trends in the survey series, although only one of four correlations of biomass estimates between surveys was significant. It is noted that both surveys indicate a general increase in biomass of American plaice and yellowtail flounder in the NRA of Div. 3NO. Differences in actual biomass levels are at least partially due to differences in the efficiency of the *Pedreira* and *Campelen* trawls. There was a low correlation in biomass estimates of both species between the portion of the Canadian surveys in the NRA and in the remainder of Div. 3LNO.

Materials and Methods

Biomass estimates ('000 tons) for yellowtail flounder (*Limanda ferruginea*) and American plaice (*Hippoglossoides platessoides*) were calculated from Canadian surveys covering Div. 3LNO in the spring of 1996-2001, using the swept area method. The area was calculated for each stratum in NAFO Div. 3NO, and the proportion of each stratum outside the 200-mile limit in the NRA in Div. 3NO was also calculated. This proportion was multiplied by the total biomass estimated for each stratum. These were then summed so that the total biomass outside the 200-mile limit (the NRA) in Div. 3NO from the Canadian survey could be compared to the Spanish survey biomass (Fig. 1).

Spanish surveys were carried out since 1995 on board the *C/V Playa de Menduiña*, using bottom trawl net type *Pedreira*. In 2001, comparative fishing trials were conducted to develop conversion factors between this gear type and the *Campelen* 1800 shrimp trawl, to which the survey will switch in 2002. Biomass estimates over the time series 1995-2001 are presented in Paz *et al*., 2002 (yellowtail flounder), González Troncoso *et al*., 2002 (American plaice) and Paz *et al*., 2002 (converted *Campelen* data for yellowtail flounder and American plaice).

Comparisons were made between the Canadian survey results from the NRA in Div 3NO with the Canadian results in the remainder of the surveys in Div. 3LNO. Comparisons were then made between the Canadian survey biomass estimates (in the NRA in Div. 3NO) for yellowtail flounder and American plaice from *Campelen* gear, using the swept area method, and the Spanish swept area biomass estimates from *Pedriera* gear. Finally, Canadian data were compared with the *Pedriera*-transformed biomass estimates in *Campelen* units.

Linear regression (Pearson coefficient) was used to evaluate the comparisons, in order to determine whether there was any relationship between the two sets of data.

Results and Discussion

The percent of the NAFO Regulatory Area compared to the stratified area on Div. 3LNO, based on the stratification used in both spring surveys, is found in Table 1. This number was calculated based on the proportion of stratum areas in the NRA, and is 11% of the total 3LNO area.

Comparisons within the Canadian survey

Table 2 shows the percent of the biomass (total 3LNO, and total 3NO) for yellowtail flounder and American plaice from the Canadian survey that were found in the NRA of Div. 3NO across the time series 1996-2001. There is little difference between the percentage of biomass of yellowtail flounder found outside the 200-mile limit of 3NO relative to the 3LNO total or the 3NO total, as there are relatively few yellowtail flounder in 3L. The percentage of American plaice biomass found outside the 200-mile limit in 3NO ranged from 16-37% of the 3LNO biomass, and 23-44% of the 3NO biomass. There was an increasing trend in both series for American plaice.

There appears to be some relationship in the Canadian surveys between biomass estimates outside 200 miles in Div. 3NO and biomass estimates in the remainder of Div. 3LNO (Fig. 2). However, the r^2 value for American plaice was 0.49 and was not significant ($p = 0.1232$). The r^2 value is slightly better for yellowtail flounder, at 0.58, but is still not significant ($p = 0.08$).

Campelen - Pedreira Comparison

For yellowtail flounder, Both Canadian surveys and Spanish surveys (*Pedreira* units), indicate an increase in estimates over the time series from 1996-2001, with a drop in biomass in 2000 (Fig. 3a). Linear regression of the estimates from both surveys indicate a linear relationship, with a significant ($p = 0.03$) r^2 value of 0.71 (Fig. 3b, Table 3).

For American plaice, both Canadian surveys and Spanish surveys (*Pedreira* units), indicate a general increase in biomass over the time series from 1996-2001, with the exception of 2001, in which the Spanish estimate drops slightly (Fig. 4a). Linear regression is not significant ($p = 0.1095$), with an r^2 value of 0.51 (Fig. 4b, Table 3).

Campelen – Campelen Comparison

For yellowtail flounder, Canadian surveys using *Campelen* gear and Spanish surveys using a weight-length conversion (González Troncoso *et al*., 2002), and *Pedreira-Campelen* conversion factors showed similar trends for the time series 1996-2000 (data was not available from Spanish 2001 survey) (Fig. 5a). Linear regression shows that the relationship is not significant ($p = 0.10$), with an r^2 value of 0.65. There is a drop in biomass in 2000 in both time series (Fig. 5b, Table 3).

For American plaice, Canadian surveys using *Campelen* gear and Spanish surveys using a weight-length conversion (González Troncoso *et al*., 2002), and *Pedreira-Campelen* conversion factors showed similar trends for the time series 1996-2000 for American plaice biomass (Fig. 6a). Linear regression shows no significant relationship between the to surveys ($p = 0.09$), however, with an r^2 of 0.65. As with yellowtail flounder, there is a drop in biomass estimated from the Canadian survey in 2000 (Fig. 6b, Table 3).

Figure 7 shows all comparisons normalized to the first point in each series. As noted in previous comparative fishing, the Spanish absolute values of biomass, using the *Pedreira* trawl are large compared to the Canadian *Campelen* survey. For American plaice, on average, the Spanish estimates are 8 times larger and for yellowtail flounder, are 6 times larger. Part of this is due to the fact that the *Campelen* is less efficient than the *Pedreira* gear (Paz *et al*., 2002); however, when biomass from both countries using *Campelen* gears are compared, the Spanish biomass estimate is still slightly larger. This may be due to differences in the rigging or configuration of the trawls used in each survey.

Conclusions

Overall, surveys from Canada and Spain in the NAFO Regulatory Area in Div. 3NO appear to show similar trends. Although the biomass of yellowtail flounder dropped in 2000, it seems to have rebounded in 2001 to the level of 1999 in both series. In general, American plaice biomass in the NRA increased over the time series, with slight drops in the Canadian surveys in 2000 and Spanish surveys in 2001.

Comparisons of Canadian biomass estimates of both flatfish species using *Campelen* gear and Spanish biomass estimates using both *Pedreira* and *Pedreira*-transformed *Campelen* data indicate that trends are the same.

Comparison of the Canadian data shows that biomass of American plaice and yellowtail flounder in the NRA in Div 3NO has increased more rapidly than the biomass in the remainder of the survey area in Div. 3LNO. The relationship between the biomass estimates from the two areas for both American plaice and yellowtail flounder is not significant.

References

González Troncoso, D., X. Paz, and E. Román. 2002. Abundance, biomass and population structure for American plaice from the surveys conducted by Spain in the NAFO Regulatory Area of Divisions 3NO, 1995-2001. NAFO SCR Doc. 02/2, Serial N4600.

Paz, X., D. González Troncoso, and E. Román. 2002. Yellowtail flounder data from the surveys conducted by Spain in the NAFO Regulatory Area of Divisions 3NO, 1995-2001. NAFO SCR Doc. 02/3, Serial No. N4601.

Paz, X., D. González Troncoso, P. Durán Muñoz. 2002. Comparative exercise of efficiency between C/V Playa de Menduina and R/V Vizconde de Eza in the NAFO Divisions 3NO in May 2001. NAFO SCR Doc. 02/5, Serial No. 4603.

TABLE 1. Percent of Canadian survey area outside the 200-mile limit.

Comparison	% Area
% of Div. 3LNO area which is outside 200-mile limit in Div. 3NO	11.0%
% of Div. 3NO area outside 200-mile limit	23.0%

TABLE 2. Percent biomass of yellowtail flounder and American plaice found outside the 200-mile limit in Div. 3NO, from Canadian surveys.

Year	Yellowtail flounder		American plaice	
	% of Div. 3LNO biomass outside 200 miles in Div. 3NO	% of Div. 3NO biomass outside 200-mile limit	% of Div. 3LNO biomass outside 200 miles in Div. 3NO	% of Div. 3NO biomass outside 200-mile limit
1996	18.5	18.6	16.0	22.6
1997	24.6	24.7	23.9	28.1
1998	27.1	27.2	20.7	25.5
1999	29.6	32.1	23.1	33.0
2000	15.4	16.4	26.2	34.7
2001	29.3	29.7	37.4	44.2

TABLE 3. Correlation coefficients between surveys and gear type conversions for yellowtail flounder and American plaice.

Comparison of biomass estimates from the NRA in Div. 3NO	Correlation	
	Yellowtail flounder	American plaice
Canadian survey (*Campelen*)/Spanish survey (*Pedreira*)	0.71	0.51
Canadian survey (*Campelen*)/Spanish survey (*Campelen*)	0.65	0.67

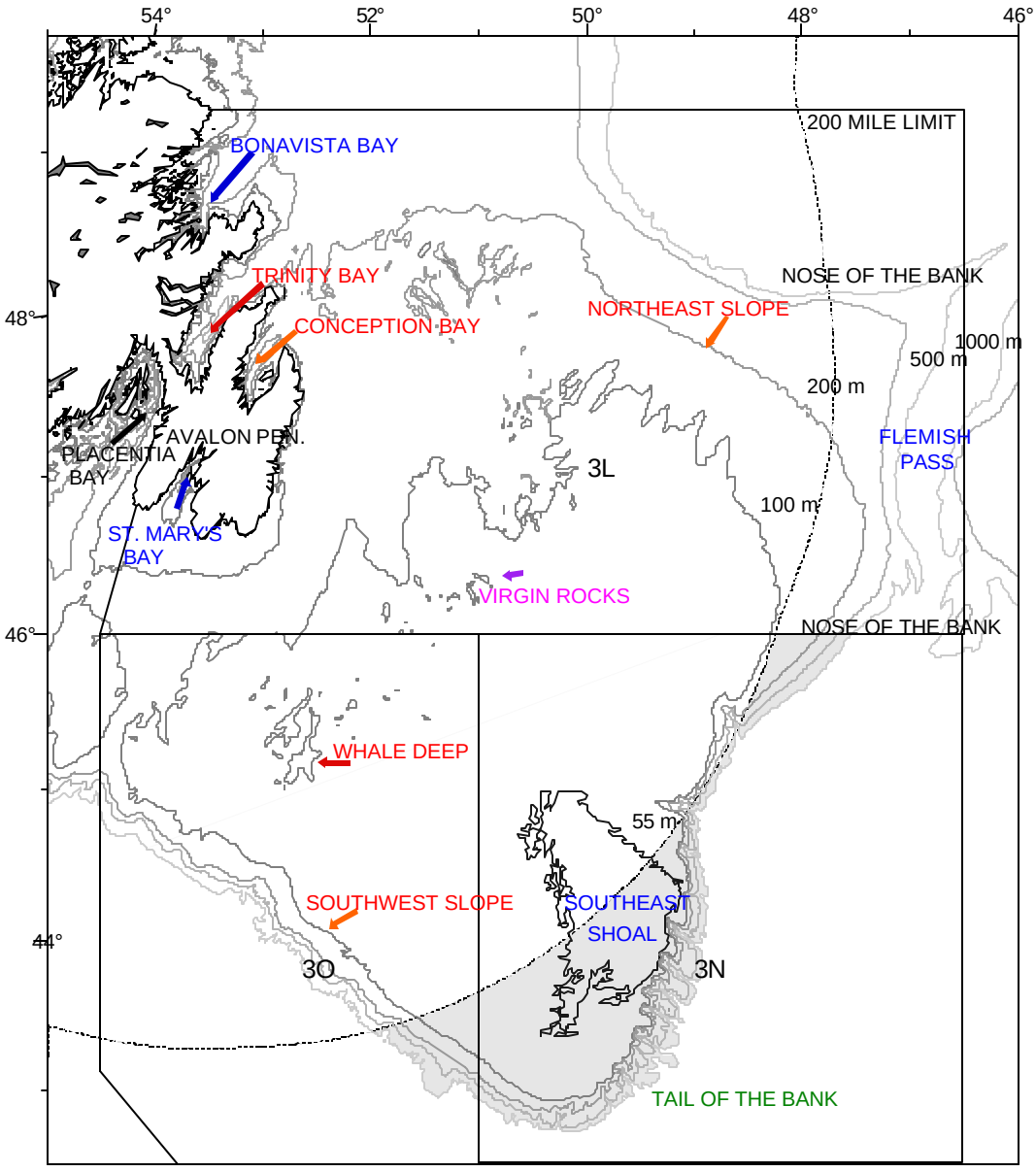

Fig. 1. Features of the Grand Bank, showing comparative area outside the 200-mile limit surveyed by the Spanish surveys.

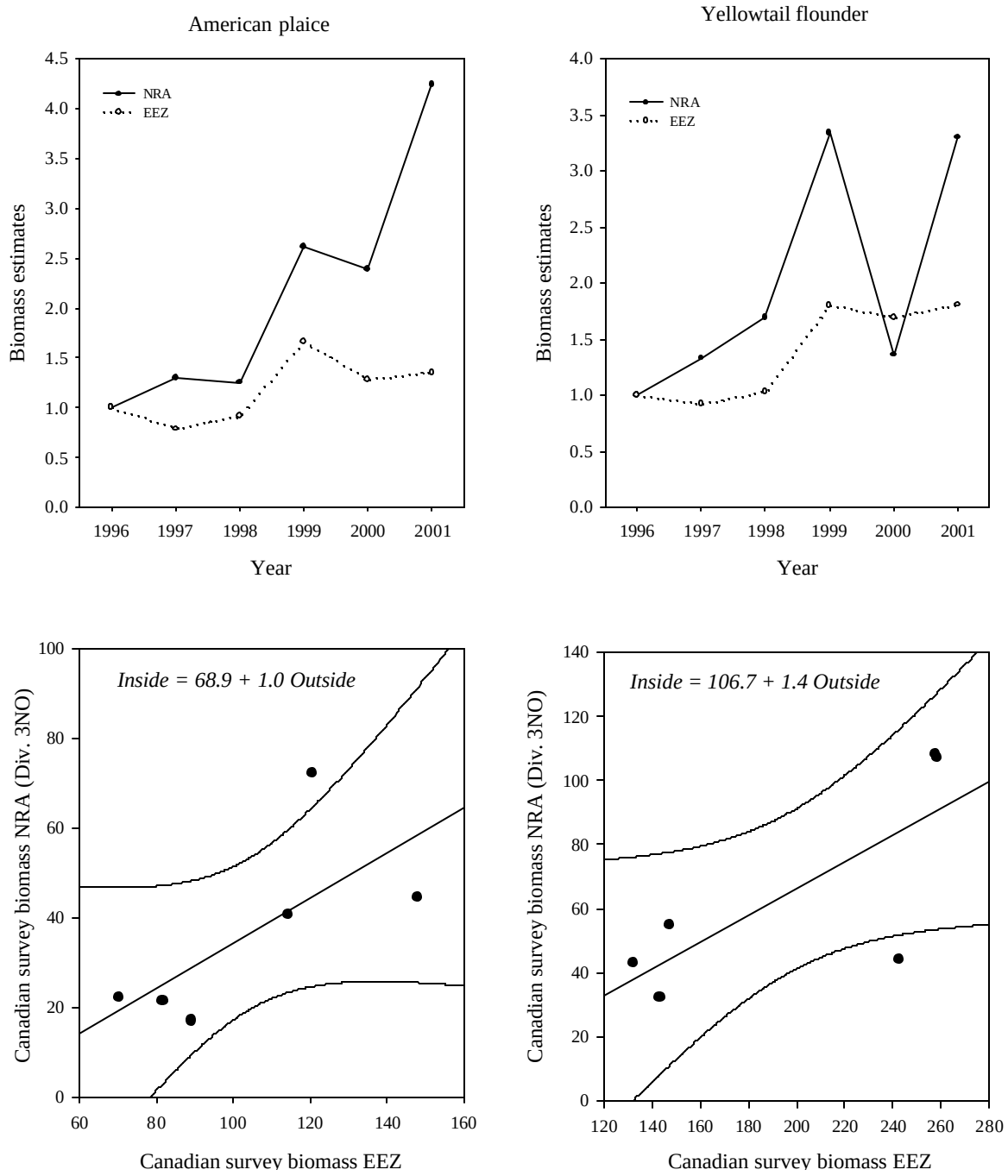

Fig. 2. Relationship between Canadian biomass estimates of American plaice and yellowtail flounder in the NAFO Regulatory Area in Div. 3NO to the remainder of the Canadian biomass estimate in Div. 3LNO, from 1996-2001.

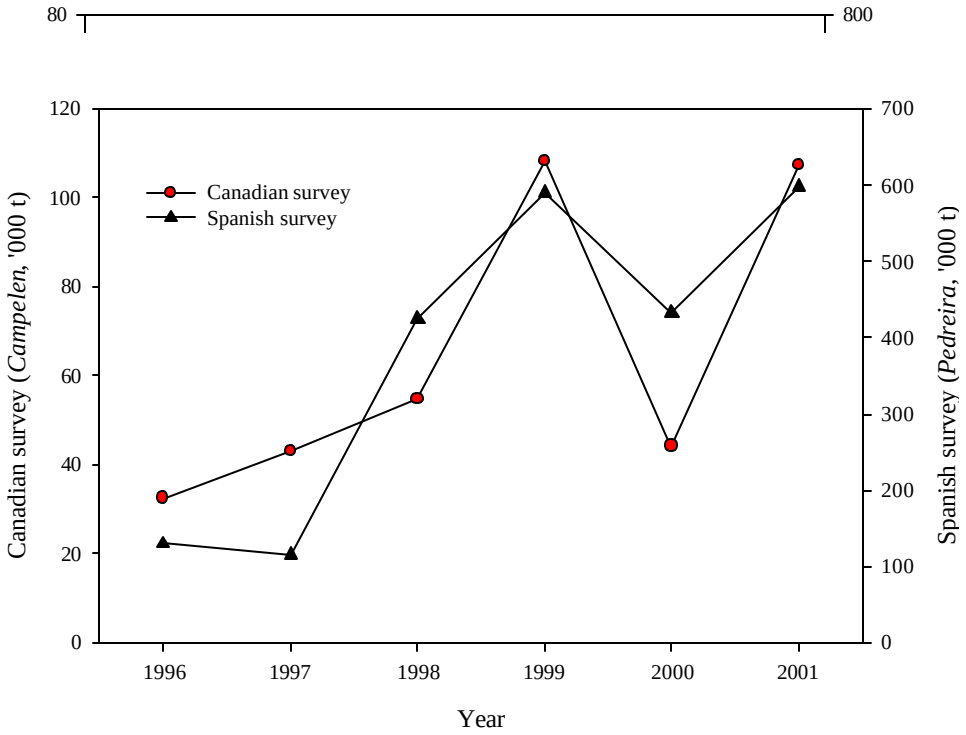

Fig. 3a. Comparison of Canadian survey biomass estimates (Div. 3NO outside 200 miles) of yellowtail flounder with Spanish survey biomass estimates (swept area method), in *Pedreira* units.

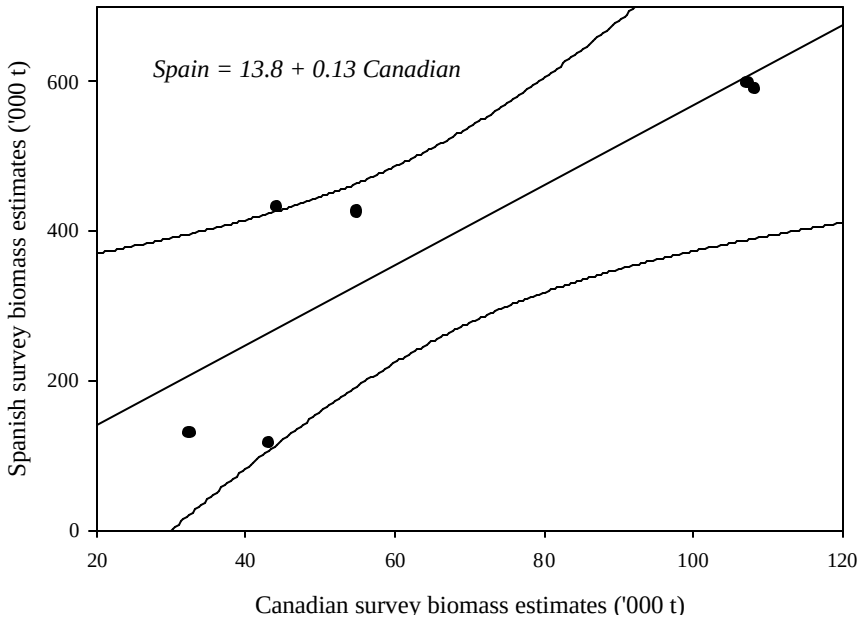

Fig. 3b. Linear regression of Canadian survey biomass estimates (Div. 3NO outside 200 miles) of yellowtail flounder with Spanish survey biomass estimates (swept area method), in *Pedreira* units.

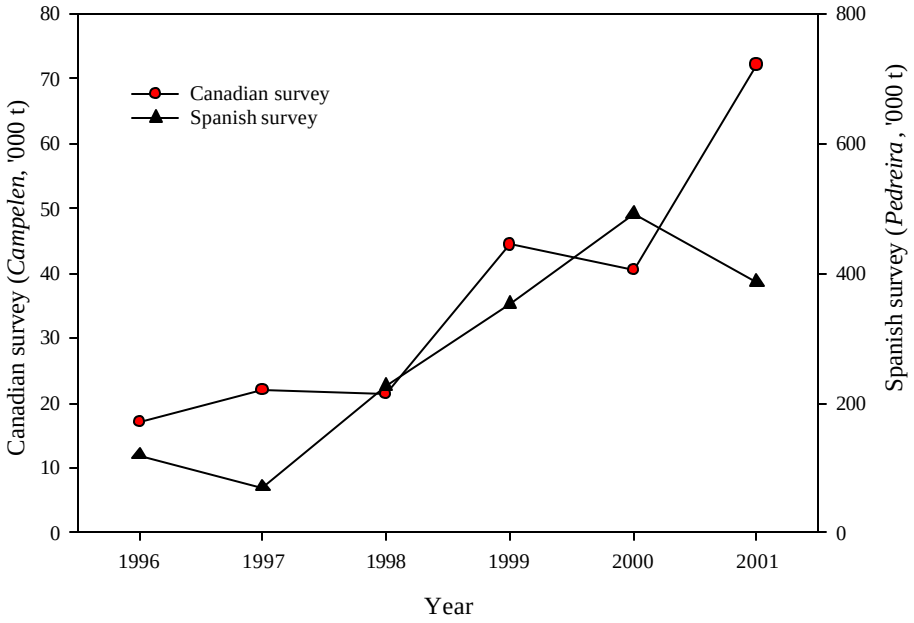

Fig. 4a. Comparison of Canadian survey biomass estimates (Div. 3NO outside 200 miles) of American plaice with Spanish survey biomass estimates (swept area method), in *Pedreira* units.

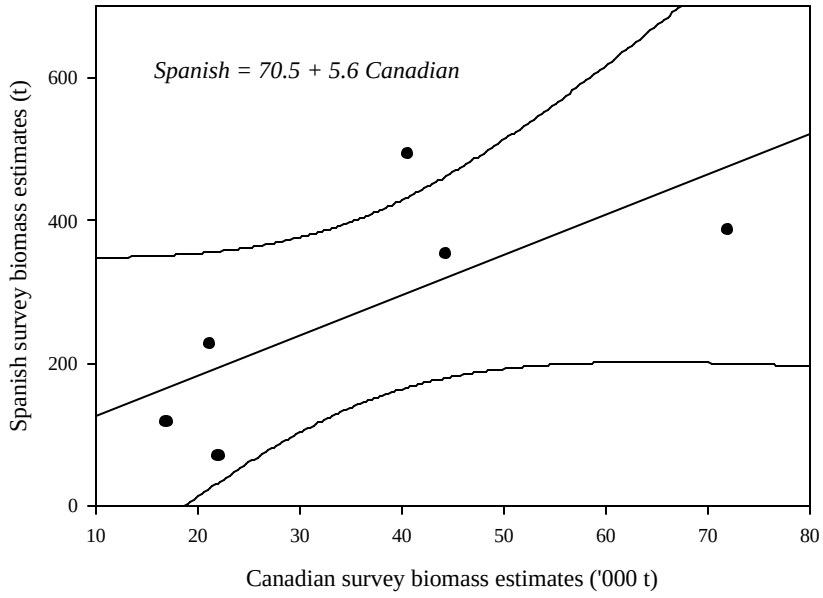

Fig. 4b. Linear regression of Canadian survey biomass estimates (Div. 3NO outside 200 miles) of American plaice with Spanish survey biomass estimates (swept area method), in *Pedreira* units.

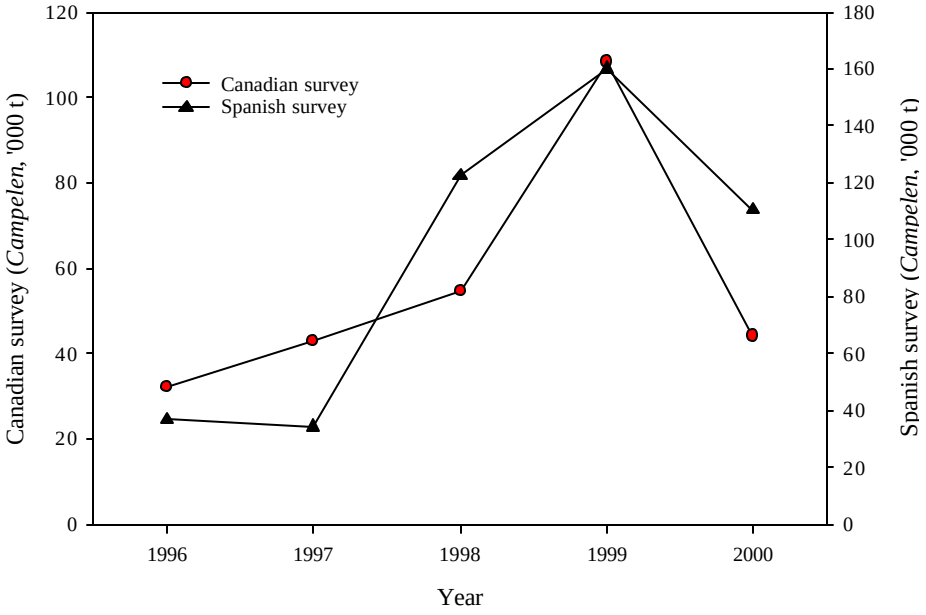

Fig. 5a. Comparison of Canadian survey biomass estimates (Div. 3NO outside 200 miles) of yellowtail flounder with Spanish survey biomass estimates (weight-length conversion), in *Pedreira*-transformed (*Campelen)* units.

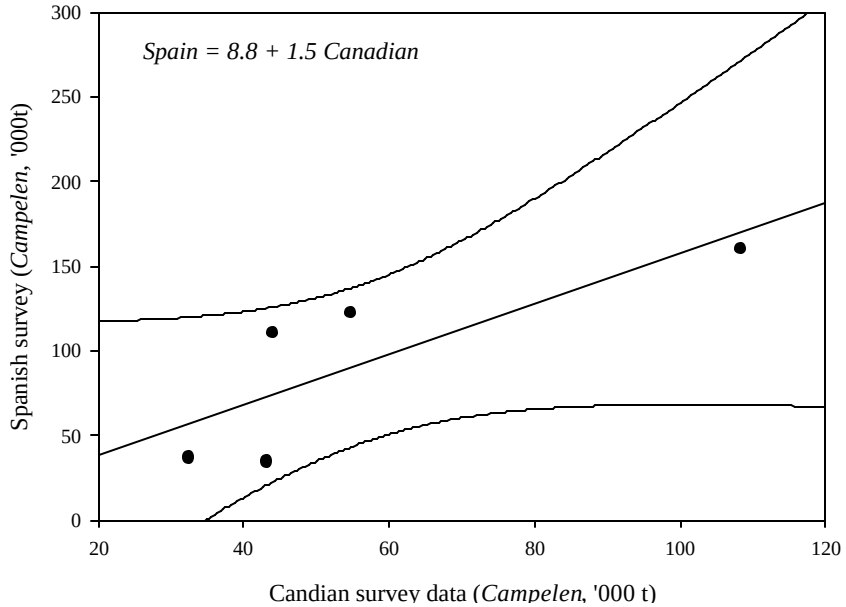

Fig. 5b. Linear regression of Canadian survey biomass estimates (Div. 3NO outside 200 miles) of yellowtail flounder with Spanish survey biomass estimates (weight-length conversion), in *Pedreira*-transformed (*Campelen*) units.

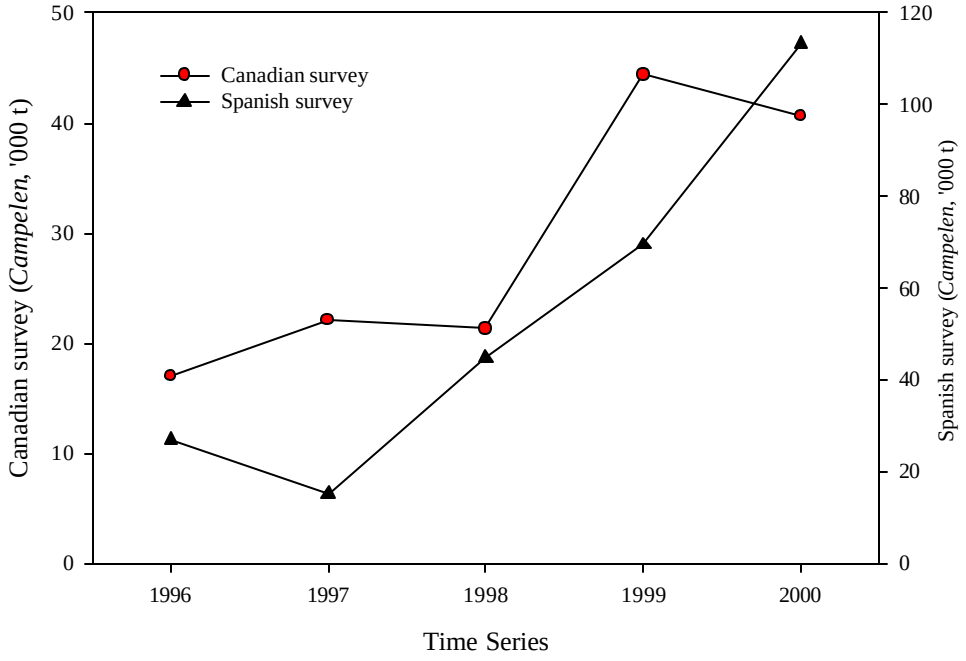

Fig. 6a. Comparison of Canadian survey biomass estimates (Div. 3NO outside 200 miles) of American plaice with Spanish survey biomass estimates (weight-length conversion), in *Pedreira*-transformed (*Campelen)* units.

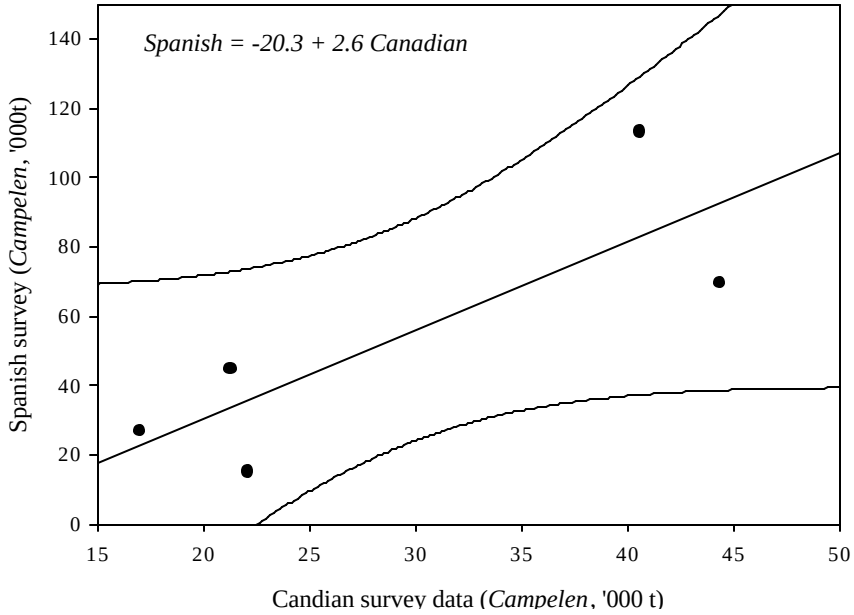

Fig. 6b. Linear regression of Canadian survey biomass estimates (Div. 3NO outside 200 miles) of American plaice with Spanish survey biomass estimates (swept area method), in *Pedreira*-transformed (*Campelen*) units.

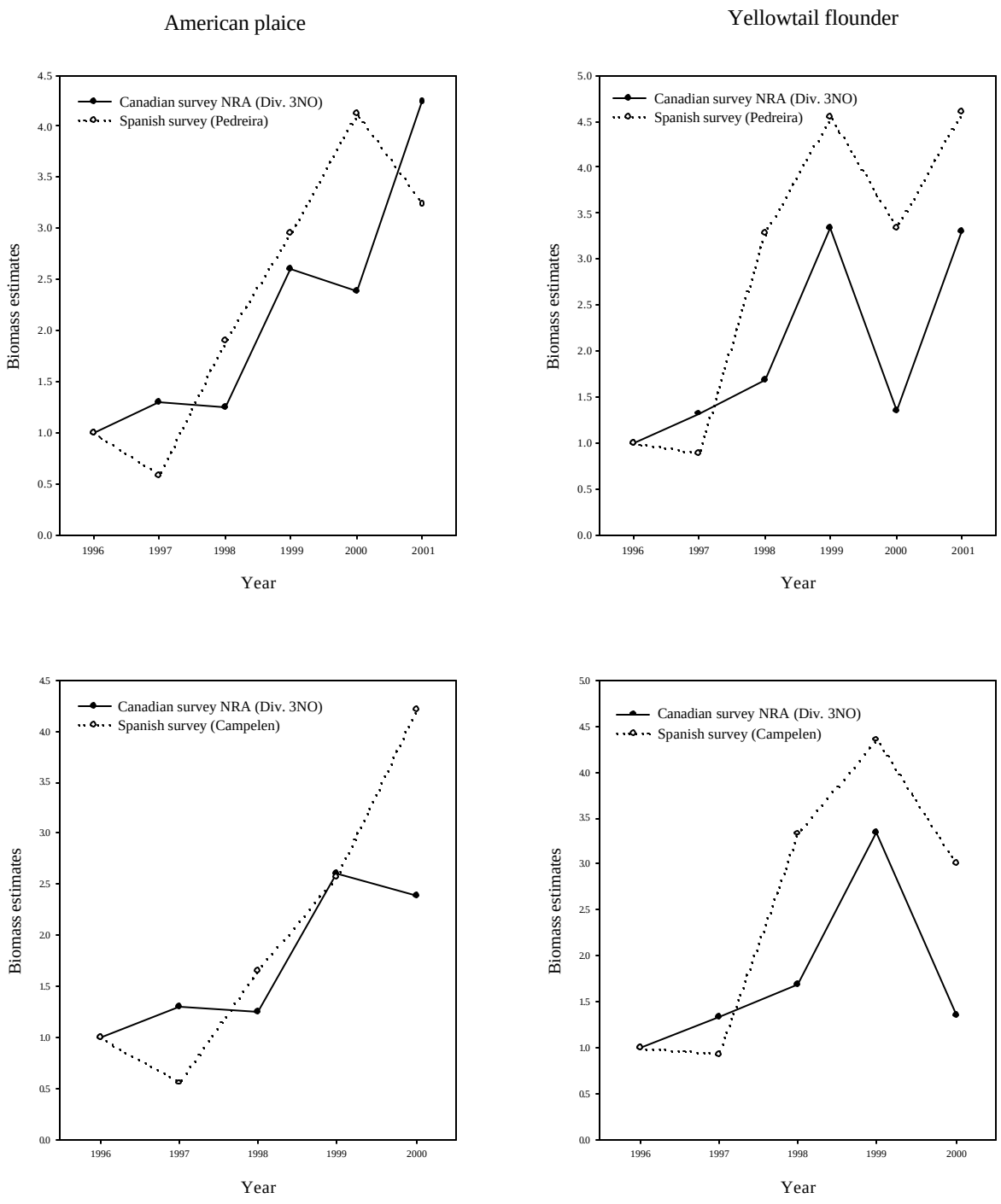

Fig. 7. Biomass estimates standardized by first year biomass estimate for each survey.