



ANNUAL MEETING - JUNE 1968

Comparative fishing by research vessels

A.T. Cameron and Walther Herwig

by A. W. May

Fisheries Research Board of Canada
Biological Station, St. John's, Newfoundland

and J. Messtorff

Bundesforschungsanstalt für Fischerei

Institut für Seefischerei

Bremenhaven, Fed. Rep. Germany

Introduction

Through research programs submitted to and distributed by ICNAF prior to the 1967 Annual Meeting, and personal contact at this Meeting, the authors found that the research vessels A.T. Cameron and Walther Herwig would be present off southern Labrador (Division 2J) at approximately the same time during the autumn of 1967. Preliminary plans for comparative fishing were made, and further details arranged through correspondence. It was found possible to overlap the cruise schedules by about 3 days, and the ships were in company, with the authors on board, from 20-22 October. Operations were hindered by bad weather, but 6 stations were fished together. Also, both ships occupied a series of hydrographic stations across Hamilton Inlet Bank, but at different times.

Ships, Gear and Methods

The two vessels are very different in size, fish by different methods (side versus stern), use different-sized nets and fish at different speeds. Fuller details are listed in Table 1.

At each station the ships fished a few hundred metres apart on parallel courses. Because of its greater towing speed, the Walther Herwig began each tow a short distance behind the A.T. Cameron, and finished a short distance ahead. All tows were of 30-minute duration. Direction of tow was chosen so as to minimize the depth range for each tow.

Length measurements were made on all individuals of the major species in the catches except for the redfish catches of stations 5 and 6 (Table 2). Random samples were measured by both vessels at station 5, and by the Walther Herwig at station 6. These were adjusted to total catch before comparison. Measurements on the A.T. Cameron were of fork length to the nearest cm, on the Walther Herwig total length to the cm below. No adjustments were made to these original measurements. However, it may be noted that the differences tend to cancel each other since total lengths were measured to the cm below, but fork lengths to the nearest cm.

Catch Comparisons

Positions and depths fished, and numbers and weights of the major species taken by each vessel are listed in Table 2. Cod, plaice and redfish only were sufficiently plentiful to give meaningful comparisons. Presence or absence in the catches of these and other species is noted in Table 3.

No comparison was possible for station 1 because of fouled gear by the Walther Herwig. In spite of this, it is curious that 20.5 kg (263 specimens) of the crab Chionoecetes opilio were taken at this station by the Walther Herwig, while none were captured by the A.T. Cameron.

As might be expected, the Walther Herwig consistently caught more of the major species, both by weight and numbers, than did the A.T. Cameron. Individual catch ratios were extremely variable, but on the average the Walther Herwig caught more than 4 times as much cod, about 1.5 times as much plaice, and between 1.25 and 1.5 times as much redfish.

Of greater interest are comparisons of average sizes caught. Average weights for each station are listed in Table 2, average lengths in Table 4, and length distributions plotted in Figure 1. Average weights of fish caught were very similar except for the small plaice catches of stations 2 and 6. Length distributions (Fig. 1) were generally very similar, in spite of some small catches. Statistical comparison of average lengths (Table 4) resulted in significant differences at the .01 level in 2 out of 9 comparisons, these being the small plaice catches of station 2 and the large redfish catches of station 5. In the first instance the difference was caused by a few large fish in the A.T. Cameron's catch; in the second instance by a secondary peak in the Walther Herwig's catch (Fig. 1).

Conclusion

The most important point to be noted from these comparisons is that two ships of widely differing characteristics, with different sized nets and different towing speeds, but with codend liners of equal mesh size, produced very similar size distributions in the catches, although the amount of comparative hauls as well as sometimes the catches were rather small. This was so in spite also of different methods of fish measurement, suggesting that the above factors do not lead to appreciable differences in estimating size composition.

Differences which do appear in Sampling Yearbooks between months and areas thus probably represent real temporal and spatial variation within the stocks, provided that selection properties of codend meshes are the same.

Hydrography

A line of stations from Seal Islands northeast across Hamilton Inlet Bank was occupied by the Walther Herwig on 19 - 20 October and by the A.T. Cameron on 26 - 27 October. Both vessels took temperatures at the following depths (metres) where these existed at the salinity: 0, 10, 20, 30, 50, 75, 100, 150, 200, 250, 300, 400, 600, 800, 1000. Temperature and salinity sections are shown in

Figures 2 and 3. The station numbers and positions shown in the figures correspond to each other as follows:

W.H.	-	-	397	396	395	392	391	390
A.T.C.	51	52	53	53A	54	55	55A	56

A comparison of the temperature conditions over the southern part of Hamilton Inlet Bank, as observed by both vessels one week apart, shows that the temperature distribution at the eastern slope of the bank remained very much the same with bottom temperatures of about 1°C in 200-250m increasing to over 4°C in 300-350m. The core of the cold Labrador water over the shallower part of the bank was of greater volume during the first series of observations with minimum temperatures of below 0°C. The differences in depths at corresponding stations 397 (W.H.) and 53 (A.T.C.) were due to irregular depth contours within short distances in this part of the bank.

The salinity distribution was determined by Walter Herwig only and it corresponds to the general pattern observed over the whole Labrador shelf by three more hydrographic sections taken by W.H. in Divisions 2H and 2G since 14 October 1967. These are published separately in Res. Doc. 68/8, part II.

Table 1. Characteristics of vessels and gear

	<u>A.T. Cameron</u>	<u>Walther Herwig</u>
Ship: Length overall	177 ft (54 m)	273 ft (83)
Displacement (gross tons)	750	1987
Horsepower	1000	2000
Type fishing	Side	Bottom
Speed of tow	3.5 Knots	4.5 Knots
Gear: Headrope length	79 ft (24.1 m)	102 ft (31.2 m)
Footrope length	100 ft (30.5 m)	140 ft (42.7 m)
Rollers	Rubber, 21 in	Wood + Iron, Ø 21 in
Net material	Courlene (polypropylene)	Perlon (polyamide)
Net mesh sizes	5 - 3 1/4 in (127-83 mm)	5 1/2 - 4 3/8 in (140-110 mm)
Codend material	Double Nylon (polyamide)	Double Perlon
Codend mesh size	3 1/4 in (83 mm)	4 3/8 in (110 mm)
Codend liner	Nylon 1 1/8 in (29 mm)	Perlon 1 1/4 in (32 mm)

Table 2.

Comparison of catches by A.T. Cameron and Walthers Herwig. W = weight (kg), N = number, AW = average weight. Position and depths given are those recorded independently by both vessels. Depths ranges fished at each station do not extend more than ± 10 m from the given depths.

Station	Depth (m)	Position	Cod			Flaice			Redfish			Total Catch all Species	
			ATC	WH	ATC	WH	ATC	WH	ATC	WH	ATC	WH	
2	250	53°26'N	W	574	22.7	12.0	0	0	0	0	0	135	709
		54°38'N	N	442	35	4C							
		AW	1.36	C.65	C.30								
3	205	54°01'N	W	170	81.6	151.0	0	0	0	0	0	150	394
		53°56'N	N	229	133	233							
		AW	C.95	C.61	C.50								
4	270	54°02'N	W	57	18.1	22.0	254	544	545	707			
		53°12'N	N	83	32	41	311	822					
		AW	0.64	0.55	0.54	0.82	0.66						
5	310	54°00'N	W	0	3.6	11.8	1151	1223	1191	1352			
		53°03'N	N	0	9	38	2578	2684					
		AW	0	0.40	0.31	0.45	0.46						
6	440	53°59'N	W	0	0.5	1.5	290	570	533	627			
		52°54'N	N	0	2	3	364	778					
		AW	0	0.25	0.40	0.80	0.73						
Total Weight			168	830.6	126.5	176.3	1695	2537	2194	3789			
Ratio WH/ATC			4.94	1.41	1.39	1.75							
Total Number			135	810	212	355	3253	4284	-	-			
Ratio WH/ATC			4.15	1.67	1.32	-	-	-	-	-			

Table 3. Fish species present in each catch.
Presence of the species is indicated by
+ for Walther Herwig and by
o for A.T. Cameron

Species	comparative catches					
	1	2	3	4	5	6
Cod, <u>Gadus morhua</u>	⊕	⊕	⊕	⊕	+	
Redfish, <u>Sebastes</u> sp.				⊕	⊕	⊕
Plaice, <u>Hippoglossoides platessoides</u>	⊕	⊕	⊕	⊕	⊕	⊕
Greenland halibut, <u>Reinhardtius hippoglossoides</u>	o	⊕	⊕	⊕	⊕	⊕
Witch flounder, <u>Gyptocephalus cynoglossus</u>	⊕		⊕			
Striped Wolffish, <u>Anarhichas lupus</u>	o	⊕	⊕		⊕	
Spotted Wolffish, <u>Anarhichas minor</u>		⊕	+	⊕	⊕	
Broadhead wolffish, <u>Anarhichas denticulatus</u>		⊕	⊕	⊕	⊕	⊕
Roughhead grenadier, <u>Marcoburus berglax</u>	⊕	⊕	⊕	⊕	⊕	⊕
Common grenadier, <u>Nezumia bairdii</u>						⊕
Roundnose grenadier, <u>Coryphacnoides rupestris</u>						⊕
Eelpouts, <u>Lycodes reticulatus</u> and <u>vahllei</u>	⊕	⊕	+	⊕	⊕	
Cusk, <u>Brosme brosme</u>						o
Thorny skate, <u>Raja radiata</u>	⊕	⊕	⊕	+		
Spinytail skate, <u>Raja spinicauda</u>					+	
Arctic sculpin, <u>Cottunculus microps</u>	+					
Hookeared sculpin, <u>Artediellus</u> sp.		⊕				
Capelin, <u>Mallotus villosus</u>			+			
Argentine, <u>Argentina</u> sp.						+
Sea snail, <u>Liparis</u> sp.		+				
Black dogfish, <u>Centroscyllium fabricii</u>						⊕
Scaled lancet fish, <u>Paralepis</u> sp.	o					
Common alligator fish, <u>Aspidophoroides monoptyerygius</u>		o				
Lantern fish						o

Table 4. Average lengths of fish from largest catches, with statistical comparisons. An asterisk (*) indicates a significant difference at the .01 level.

Species	Station		Number	Mean Length (cm)	Standard Deviation	Standard Error	t
Cod	2	ATC	25	48.88	10.94	2.19	.01
		WH	449	48.90	10.22	0.48	
	3	ATC	81	43.22	9.53	1.06	2.07
		WH	229	41.09	7.29	0.48	
	4	ATC	89	40.10	6.38	0.68	0.96
		WH	125	39.16	7.44	0.66	
Plaice	2	ATC	35	35.57	8.88	1.50	3.18*
		WH	40	30.05	5.80	0.92	
	3	ATC	133	36.92	8.67	0.75	0.24
		WH	233	37.14	8.30	0.54	
	4	ATC	33	36.70	6.91	1.20	0.38
		WH	41	36.07	6.97	1.09	
Redfish	4	ATC	311	37.22	5.75	0.32	2.7
		WH	822	36.40	5.80	0.20	
	5	ATC	2578	30.19	4.25	0.08	3.94*
		WH	2685	30.69	4.91	0.10	
	6	ATC	364	37.25	3.96	0.21	2.21
		WH	778	36.63	4.61	0.16	

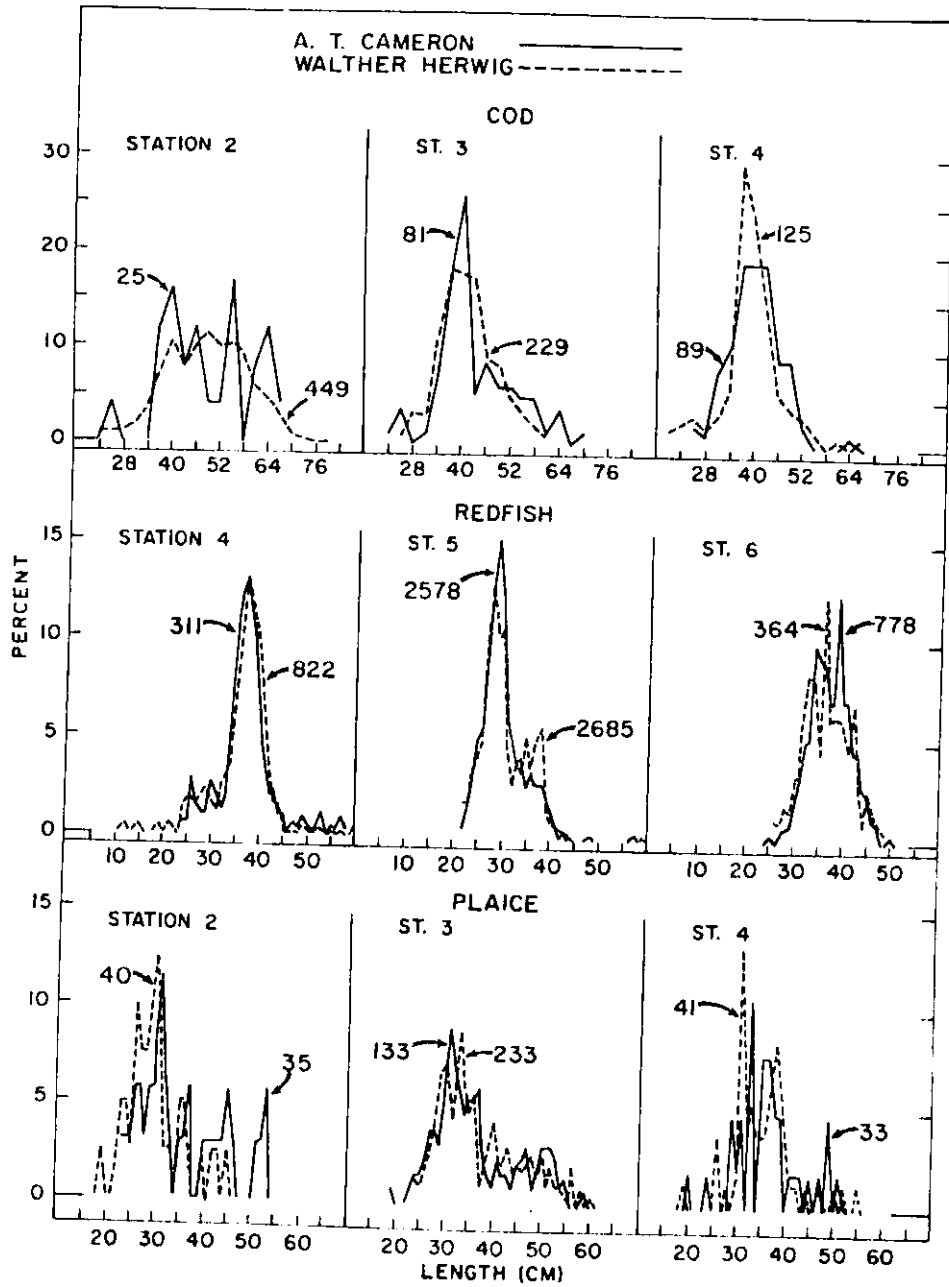


Figure 1. Length distributions from largest catches of major species.

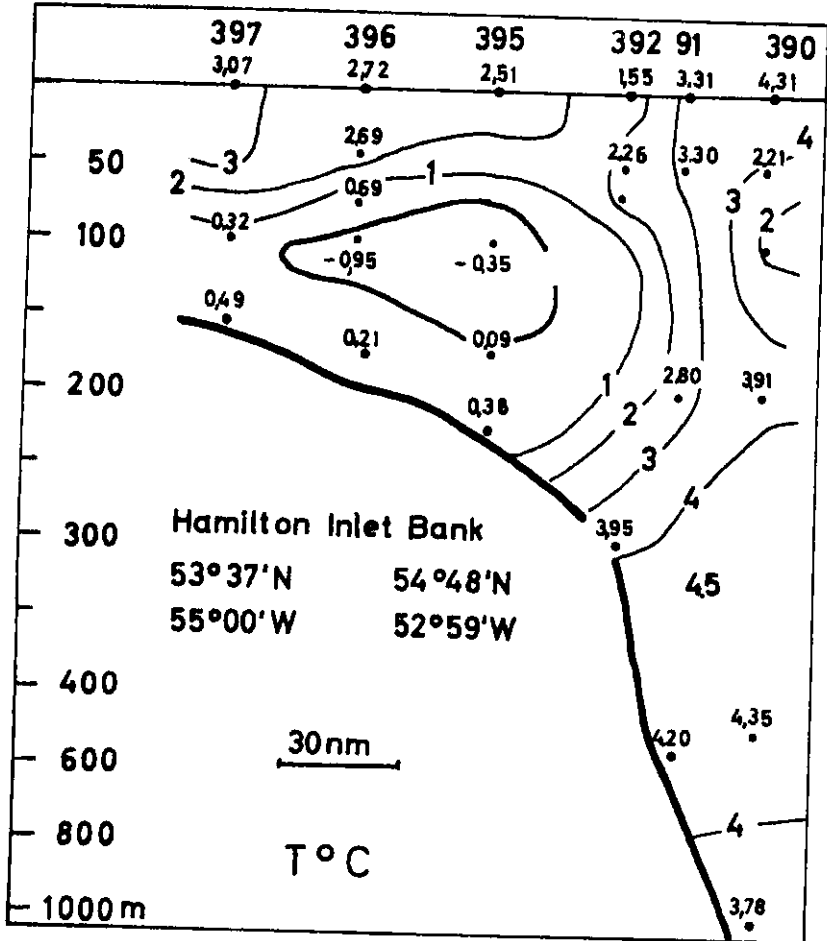
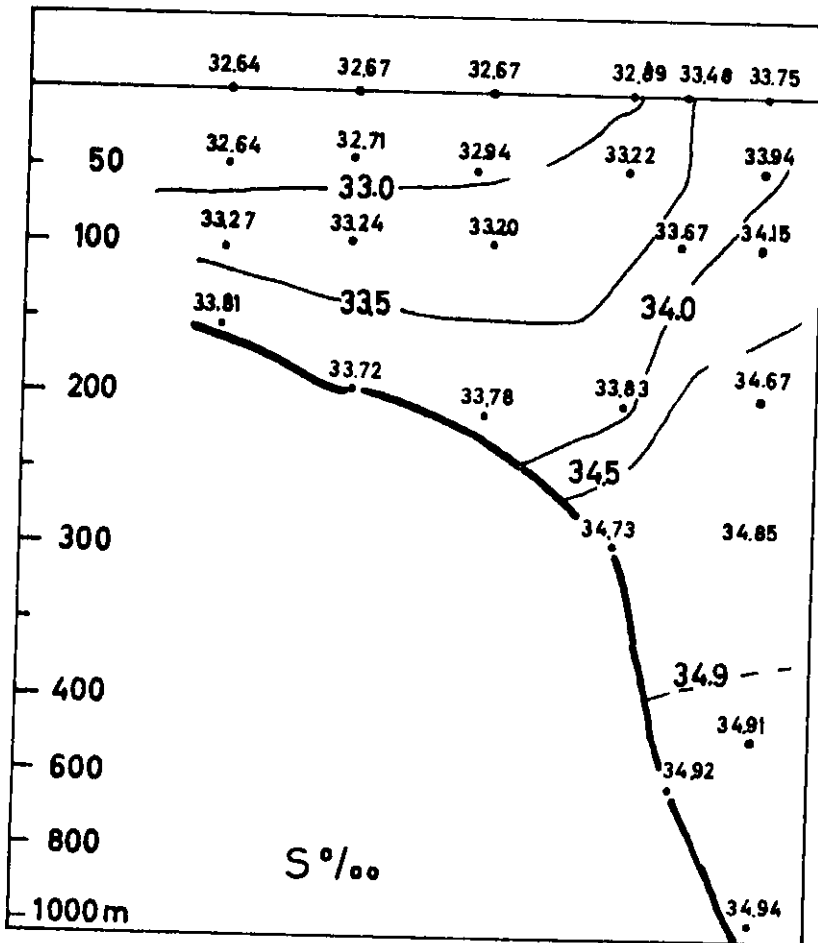


Fig. 2:

Temperature and salinity distribution over Hamilton Inlet Bank compiled from Walter Herwig data 19-20 October 1967.



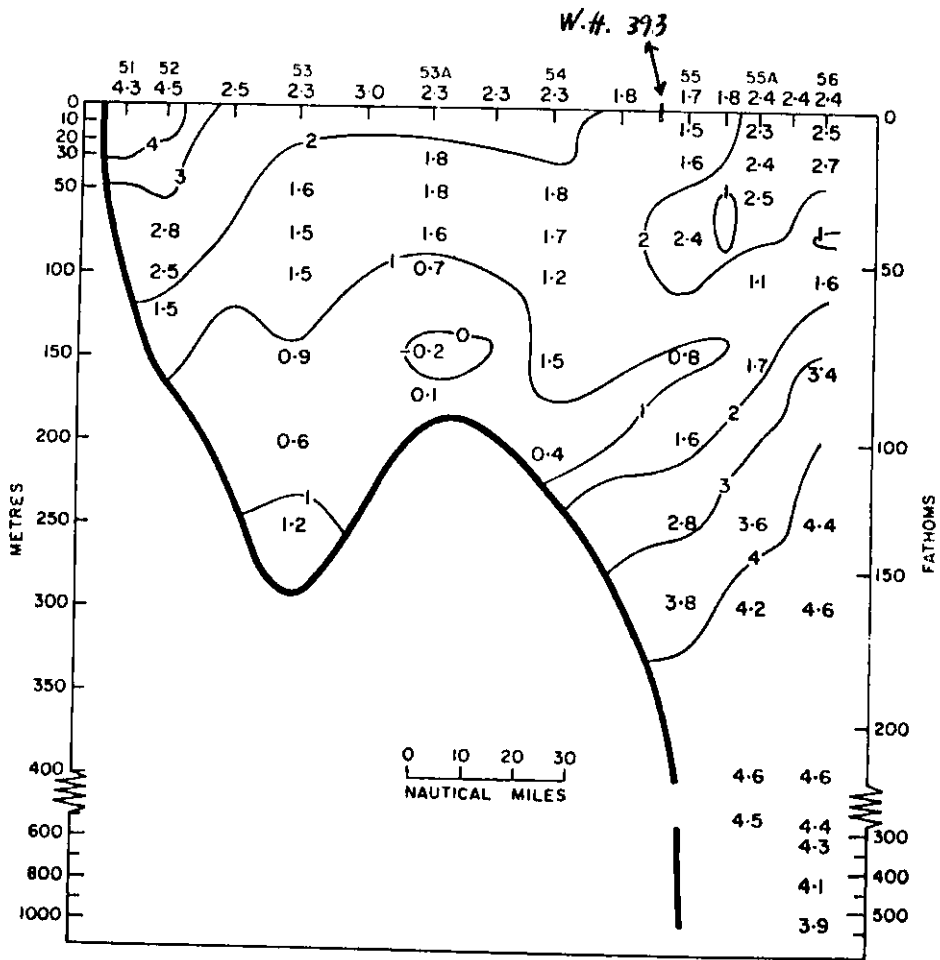


Fig 3:
Temperature distribution over Hamilton Inlet Bank
compiled from A.T. Cameron data, 26-27 October 1967