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ASSESSMENT OF THE NAFO DIVISION 4T SOUTHERN GULF OF
ST. LAWRENCE HERRING STOCK, 1994

BY

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Abstract

For the fall 4T herring stock, fishing mortalities from 1991 - 1994 were below target levels. Biomass (age 5+), in the past three years, has been the highest since 1978. This higher than average biomass has largely been the result of the strong 1987 year-class.

Fall 4T herring spawning stock prospects for 1995 are that the fall spawner TAC can remain at 80,800 tonnes and target fishing mortalities will be met. Prospects for the 1996 fishery depend on the strength of incoming year-classes. If these year-classes are average then the recommended fall spawner TAC would be 66,000 tonnes. Information from the acoustic and juvenile surveys indicates that the 1990 incoming year-class may be above average. This recommendation could be updated April 1996 when year-class strengths affecting the 1996 fishery are more evident.

For the spring 4T herring stock, it has not been possible to apply the methodology used on the fall spawning stock for obtaining quantitative biomass estimates. A qualitative method comparing the relative change in abundance indices each year is used to determine if current fishing levels are having an adverse affect on the stock. In recent years, changes in these indices are consistent with the view that current fishing levels are within conservation objectives. In 1994, an additional method using virtual population analysis with a range of terminal fishing mortalities from 0.1 to 0.6 was used to put a range around possible biomass estimates. This analysis supports the conclusion that conservation objectives are being met at current fishing levels.

Information from the acoustic and juvenile surveys indicates that abundance of the 1991 year-class of spring spawners is likely above average. An above average year-class entering the fishery as 4 year-olds suggests that a spring spawner TAC of 21,000 tonnes can be maintained in 1995. If incoming year-classes are average then the spring spawner TAC for 1996 may need to be lowered from the current level of 21,000 tonnes.

Résumé

La mortalité due à la pêche au sein du stock de hareng d'automne de la division 4T, entre 1991 et 1994, a été inférieure aux niveaux cibles. Au cours des trois dernières années, la biomasse (âge 5+) a été la plus élevée enregistrée depuis 1978, probablement à cause de la forte classe de 1987.

Les perspectives du stock de harengs reproducteurs d'automne de la division 4T pour 1995 sont les suivantes : le TAC de reproducteurs d'automne peut demeurer à 80 800 tonnes et le taux cible de mortalité par pêche sera atteint. Pour 1996, la pêche dépendra du recrutement des classes annuelles suivantes. Si l'effectif de ces classes annuelles se situe dans la moyenne, le TAC recommandé pour les reproducteurs d'automne serait alors de 66 000 tonnes. D'après l'information tirée des relevés acoustiques et de ceux des juvéniles, le recrutement de la classe de 1990 serait supérieur à la moyenne. Cette recommandation pourrait être réévaluée en avril 1996, quand les effectifs des classes annuelles qui auront une certaine influence sur la pêche de 1996 seront mieux connus.

Il n'a pas été possible d'appliquer la même méthode au stock de harengs de printemps de la division 4T qu'au stock de géniteurs d'automne afin d'obtenir une évaluation quantitative de la biomasse. On se sert d'une méthode qualitative qui permet de comparer les changements de l'indice d'abondance, d'une année à l'autre, de façon à déterminer si les niveaux actuels de pêche ont des effets néfastes sur le stock. Depuis quelques années, les changements qu'ont connus ces indices confirment que les niveaux de pêche actuels respectent les objectifs de conservation. En 1994, une autre méthode faisant appel à l'analyse de population virtuelle avec une échelle de valeurs de la mortalité par pêche de dernière année oscillant entre 0,1 et 0,6 a été utilisée pour tenter d'établir une échelle d'évaluations de la biomasse. Cette analyse vient confirmer que les objectifs de conservation sont atteints aux niveaux actuels d'exploitation.

L'information tirée des relevés acoustiques et de ceux des juvéniles révèle que l'abondance de la classe de 1991 de géniteurs de printemps est probablement supérieure à la moyenne. Une classe annuelle supérieure à la moyenne recrutée au sein de la population exploitable à l'âge de quatre ans, porte à croire que le TAC de reproducteurs de printemps de 21 000 tonnes peut être maintenu en 1995. Si les classes annuelles recrutées au sein du stock exploitable étaient moyennes, le TAC de reproducteurs de printemps pour 1996 devrait être abaissé par rapport au niveau actuel de 21 000 tonnes.

Table of Contents

Summary Sheets.....	4
Introduction.....	8
Description of the fishery.....	9
Target.....	10
Fishery Data.....	10
Research Data.....	11
Fall - Estimation of stock parameters.....	11
Fall - Assessment results.....	13
Fall - Ecological considerations.....	14
Fall - Future prospects.....	14
Fall - Management considerations.....	15
Spring - Estimation of stock parameters.....	17
Spring - Assessment results.....	19
Spring - Ecological considerations.....	20
Spring - Future prospects.....	20
Spring - Management considerations.....	20
Research recommendations.....	21
Acknowledgements.....	21
References.....	21
Fall - Tables.....	23
Spring - Tables.....	46
Fall - Figures.....	52
Spring - Figures.....	97
Appendix 1. Catch-at-age matrices.....	115

SUMMARY

4T Southern Gulf of St. Lawrence fall spawning herring

Year ¹	90	91	92	93	94	95	MIN ²	MAX ²	MEAN ²
Advice and TAC³									
4T Reference Level	53.7	53.7	60.0	81.3	81.3	80.8			
4T Advised Catch	53.7	53.7	60.0	81.3	81.3	80.8			
4Vn Advised Catch	4.2	4.2	4.2	4.2	4.2	4.2			
4T TAC	65.9	65.9	65.9	80.8	80.8	80.8			
4Vn TAC	4.2	4.2	4.2	4.2	4.2	4.2			
Total TAC	70.1	70.1	70.1	85.0	85.0	85.0			
Catches									
4T Gillnet	56.3	27.3	32.9	22.8	52.7		5.5	56.3	26.1
4T Purse Seine	6.5	6.0	5.4	5.4	6.1		1.9	25.5	8.6
4Vn Purse Seine	4.0	3.8	3.9	3.7	2.9		1.5	4.0	2.7
Total Catch	66.8	37.0	42.2	31.9	61.7		15.4	66.8	37.4
Assessment Results									
5+ Biomass	298	251	427	424	377		30	427	215
Mean F (5-9)	0.25	0.11	0.12	0.08	0.20		0.08	1.06	0.28

¹Reference level, TAC, and catch figures are in thousands of metric tonnes.

²Min, Mean, and Max values are from 1978 to 1994.

³4Vn advised catch of 4.2 is not divided into fall and spring spawners but 86% to 94% of the catch in 4Vn since 1987 has been fall spawners.

Description of Fishery: The increase in gillnet catches in 1994 was the result of improved market prices which were double those in 1993. The main issue in the 1994 fishery was the September 1 starting date for the fall purse seine fishery in Chaleur Bay. Gillnetters requested this opening be delayed. The seiner fishery opened on September 13, was suspended between September 17-20, and re-opened on September 21.

Target: The target fishing mortality was $F_{0.1} = 0.3$ or an exploitation rate of 26%.

Fishery Data: Catch-at-age matrices are derived from commercial sampling. Abundance indices are derived from gillnetter catch rates.

Research Data: Data on the relative abundance and distribution of 4T herring come from October acoustic surveys, December juvenile herring surveys, September and January groundfish surveys, and an August-September spawning bed survey. A one-night survey using two herring gillnetter boats was started in 1994 to supplement information from the October acoustic survey.

Estimation of Stock Parameters: The population model used to estimate biomass and fishing mortality is statistically valid. Since 1991, the 1987 year-class has carried the fishery.

Assessment Results: The fishing mortality is below the target level indicating conservation requirements are being met at current fishing levels. Biomass (age 5+), has been the highest since 1978.

Ecological Considerations: Mean weight of the stock has been lower than recent averages for the last four years.

Future Prospects: Target fishing mortalities will be met if the fall spawner TAC remains at 80,800 tonnes for 1995. If incoming year-classes are average then the TAC for 1996 would be 66,000 tonnes. Surveys indicate that the 1990 incoming year-class may be above average. These prospects can be re-evaluated in April 1996.

Management Considerations: Dumping as measured by index gillnetter reports indicate that less than 2% of the catch is dumped. At mesh sizes from 2 1/2" to 3" there is little difference in the length of fish that will be caught. A higher percentage of females cannot be expected from using 2 7/8" mesh compared to 2 5/8" mesh.

SOMMAIRE

Harengs reproducteurs d'automne de la division 4T, sud du golfe du Saint-Laurent

Année ¹	90	91	92	93	94	95	MIN ²	MAX ²	MOY ²
Conseils et TAC³									
4T, Niveau de référence	53,7	53,7	60,0	81,3	81,3	80,8			
4T, Captures conseillées	53,7	53,7	60,0	81,3	81,3	80,8			
4Vn, Captures conseillées	4,2	4,2	4,2	4,2	4,2	4,2			
4T, TPA	65,9	65,9	65,9	80,8	80,8	80,8			
4Vn, TPA	4,2	4,2	4,2	4,2	4,2	4,2			
TPA total	70,1	70,1	70,1	85,0	85,0	85,0			
Captures									
4T, Filets maillants	56,3	27,3	32,9	32,9	52,7		5,5	56,3	26,1
4T, Sennes coulissantes	6,5	6,0	5,4	5,4	6,1		1,9	25,5	8,6
4Vn, Sennes coulissantes	4,0	3,8	3,9	3,7	2,9		1,5	4,0	2,7
Captures totales	66,8	37,0	42,2	31,9	61,7		15,4	66,8	37,4
Résultats de l'évaluation⁴									
Biomasse 5+	298	251	427	424	377		30	427	215
F moyen (5-9)	0,25	0,11	0,12	0,08	0,20		0,08	1,06	0,28

¹ Le niveau de référence, le TAC et les captures sont en milliers de tonnes métriques.

² Les valeurs minimales, moyennes et maximales sont celles des années 1978 à 1994.

³ Les prises conseillées pour la sous-division 4Vn, de 4,2, ne sont pas réparties entre les générations d'automne et de printemps, mais 86 % à 94 % des prises dans la sous-division 4Vn depuis 1987 sont des reproducteurs d'automne.

Description de la pêche : L'augmentation des prises des pêcheurs aux filets maillants en 1994 résultait d'une amélioration des prix du marché, qui étaient le double de ceux de 1993. Le principal problème de la pêche en 1994 a été le choix du 1^{er} septembre comme point de départ de la saison de pêche d'automne à la senne coulissante dans la baie des Chaleurs. Les pêcheurs aux filets maillants ont demandé que le début de la saison soit reporté. La pêche à la senne a donc commencé le 13 septembre, a été interrompue entre le 17 et le 20 septembre et a repris le 21 septembre.

Objectif : Le taux de mortalité par pêche cible était de $F_{0,1} = 0,3$ ou un taux d'exploitation de 26 %.

Données sur la pêche : Les matrices des captures selon l'âge sont établies à partir d'un échantillonnage des prises commerciales. Les indices d'abondance sont tirés des taux de prises des pêcheurs aux filets maillants.

Données de recherche : Les données sur l'abondance relative et la répartition du hareng de la division 4T sont tirées du relevé acoustique d'octobre, du relevé de juvéniles de décembre, des relevés de poissons de fond de septembre et de janvier et des relevés des frayères en août-septembre. Un relevé d'une seule nuit, réalisé par deux bateaux de pêche du hareng aux filets maillants, a été entrepris en 1994 pour compléter l'information du relevé acoustique d'octobre.

Estimation des paramètres du stock : Le modèle de population utilisé pour évaluer la biomasse et la mortalité par pêche est statistiquement valable. Depuis 1991, la classe de 1987 soutient la pêche.

Résultats de l'évaluation : La mortalité par pêche est inférieure au niveau cible, ce qui révèle que les exigences de conservation sont respectées aux niveaux d'exploitation actuels. La biomasse (âge 5+) est la plus élevée jamais enregistrée depuis 1978.

Considérations d'ordre écologique : Le poids moyen du stock est inférieur aux moyennes récentes depuis quatre ans.

Perspectives : Le taux de mortalité par pêche cible sera atteint si le TAC de reproducteurs d'automne est maintenu à 80 000 tonnes pour 1995. Si les classes annuelles recrutées au sein du stock exploitable sont moyennes, le TAC de 1996 pourrait être de 66 000 tonnes. Selon les relevés, la classe de 1990 pourrait être supérieure à la moyenne. Ces perspectives seront réévaluées en avril 1996.

Considérations en matière de gestion : Les rejets en mer, évalués à partir des rapports des pêcheurs-repères aux filets maillants, indiquent que moins de 2 % des prises sont rejetées à l'eau. Avec un maillage qui varie entre 2 1/2 po et 3 po, il y a très peu de différences dans les longueurs des poissons capturés. On ne peut pas s'attendre à ce que le pourcentage de femelles soit plus élevé avec un maillage de 2 7/8 po par rapport à celui de 2 5/8 po.

SUMMARY

4T Southern Gulf of St. Lawrence spring spawning herring

Year ¹	90	91	92	93	94	95	MIN ²	MAX ²	MEAN ²
Advice and TAC³									
4T Reference Level	-	-	-	-	-	17.3- 20.0			
4T ADVISED CATCH	16.0	16.0	16.8	16.8	16.8	17.3- 21.0			
4T TAC	21.0	21.0	21.0	21.0	21.0	21.0			
Total TAC	21.0	21.0	21.0	21.0	21.0	21.0			
Catches									
4T Gillnet	9.9	12.8	12.7	15.5	20.2		5.5	20.2	10.8
4T Purse Seine	3.8	2.1	2.8	3.6	4.8		0.4	14.3	4.6
4Vn Purse Seine	0.7	1.0	0.3	0.2	0.3		0.2	1.5	0.9
Total Catch	14.4	15.8	15.8	19.3	25.3		7.0	25.3	16.3
Assessment Results⁴									
4+ Biomass	72-82	73-86	103- 129	92- 120	70-97		9-9	103- 129	59-67
Mean F (4-9)	0.20- 0.22	0.23- 0.27	0.15- 0.19	0.24- 0.31	0.28- 0.42		0.15- 0.19	1.97- 1.97	0.60- 0.62

¹Reference level, TAC, and catch figures are in thousands of metric tonnes.

²Min, Mean, and Max values are from 1978 to 1994.

³4Vn advised catch and TAC is indicated under fall spawners. The TAC has not been divided into spring and fall spawners but 86% to 94% of the catch in 4Vn since 1987 has been fall spawners.

⁴Ranges are estimates using Terminal Fs of 0.4 and 0.6 in a simple VPA.

Description of Fishery: Catch of spring spawners exceeded the TAC. Inshore fishers indicated that improved markets and availability of herring schools resulted in higher than expected catches. The major issue in the spring fishery was possible interference between gillnetters and purse seiners in the Magdalen Islands.

Target: The target fishing mortality was $F_{0.1} = 0.3$ or an exploitation rate of 26%.

Fishery Data: Catch-at-age matrices are derived from commercial sampling. Provincial Co-ordinator and index gillnetter data was found to be more representative of fishing activity than Purchase Slips.

Research Data: The proportion of spring and fall spawners in the October acoustic survey was used to estimate population size of spring spawners based on the fall spawner population estimate.

Estimation of Stock Parameters: There have been no significant differences in gillnet catch rates since 1988. The fall spawner method for estimating population numbers was not valid for spring spawners. An alternative, but less robust method was used to estimate spring spawner numbers.

Assessment Results: At current fishing levels the stock is being exploited at the target exploitation rate. Population trends were: (1) 1994 < 1993 < 1992 biomass, (2) biomass increased from 1991 to 1992 because of the 1988 year-class, and (3) average fishing mortality for ages 2-11 has been reduced considerably from the high levels from 1978-1982.

Ecological Considerations: Mean weight of the spring spawners has been < average in recent years.

Future Prospects: Surveys indicate that the abundance of the 1991 year-class is > average suggesting that the current TAC will meet conservation targets. If, however, the 1991 year-class is ≤ average then the TAC for 1996 will need to be lowered from the current level of 21,000 t.

Management Considerations: The proportion of spring spawners in purse seine catches varied from 60% to 90% from 1992-1994. In the past, (1978-1980) it was much more variable (29% to 85%).

SOMMAIRE

Harengs reproducteurs de printemps de la division 4T, sud du golfe du Saint-Laurent

Année ¹	90	91	92	93	94	95	MIN ²	MAX ²	MOY ²
Conseils et TAC³									
4T, Niveau de référence						17,3 - 20,0 -			
4T, Captures conseillées	16,0	16,0	16,8	16,8	16,8	17,3 21,0			
4T, TPA	21,0	21,0	21,0	21,0	21,0	21,0			
TPA total	21,0	21,0	21,0	21,0	21,0	21,0			
Captures									
4T, Filets maillants	9,9	12,8	12,7	15,5	20,2	5,5	20,2	10,8	
4T, Sennes coulissantes	3,8	2,1	2,8	3,6	4,8	0,4	14,3	4,6	
4Vn, Sennes coulissantes	0,7	1,0	0,3	0,2	0,3	0,2	1,5	0,9	
Captures totales	14,4	15,9	15,8	19,3	25,3	7,0	25,3	16,3	
Résultats de l'évaluation⁴									
Biomasse 4+	72-82	73-86	103- 129	92- 120	70-97	9-9	103-129	59-67	
F moyen (4-9)	0,20- 0,22	0,23- 0,27	0,15- 0,19	0,24- 0,31	0,28- 0,42	0,15- 0,19	1,97- 1,97	0,60- 0,62	

¹ Le niveau de référence, le TAC et les captures sont en milliers de tonnes métriques.

² Les valeurs minimales, moyennes et maximales sont celles des années 1978 à 1994.

³ Les captures conseillées et le TAC pour 4Vn figurent dans le tableau des reproducteurs d'automne. Le TAC n'a pas été divisé entre les reproducteurs de printemps et d'automne, mais 86 % à 94 % des prises dans la sous-division 4Vn depuis 1987 sont des reproducteurs d'automne.

⁴ Les échelles ont été calculées approximativement au moyen des valeurs de F de dernière année de 0,4 et 0,6, par une simple APV.

Description de la pêche : Les prises de reproducteurs de printemps ont dépassé le TAC. D'après les pêcheurs côtiers, l'amélioration du marché et la présence des bancs de harengs ont favorisé la capture d'un plus grand nombre de harengs que prévu. Le principal problème de la pêche de printemps était l'interférence possible entre les bateaux de pêche aux filets maillants et les senneurs aux îles-de-la-Madeleine.

Objectif : L'objectif de mortalité par pêche était de $F_{0,1} = 0,3$ ou un taux d'exploitation de 26 %.

Données sur la pêche : Les matrices des captures selon l'âge sont établies à partir d'un échantillonnage des prises commerciales. Les données du coordonnateur provincial et des pêcheurs-repères aux filets maillants se sont révélées plus représentatives de l'activité de pêche que les bordereaux d'achat.

Données de recherche : La proportion des reproducteurs de printemps et d'automne dans les résultats du relevé acoustique d'octobre a été utilisée pour évaluer la taille de la population de reproducteurs de printemps, basée sur l'estimation de la population de reproducteurs d'automne.

Estimation des paramètres du stock : Aucune différence importante n'a été observée dans les taux de capture des filets maillants depuis 1988. La méthode d'estimation de l'effectif utilisé pour les reproducteurs d'automne n'était pas valable

pour les géniteurs de printemps. Une autre méthode, moins fiable, cependant a été utilisée pour estimer le nombre de reproducteurs de printemps.

Résultats de l'évaluation : Aux niveaux actuels de pêche, le stock est exploité au taux cible. Les tendances de la population étaient donc : 1) biomasse de 1994 < 1993 < 1992, 2) la biomasse a augmenté entre 1991 et 1992 à cause de la classe de 1988 et 3) le taux moyen de mortalité par pêche pour les âges 2-11 a diminué considérablement par rapport aux niveaux élevés de 1978 à 1982.

Considérations d'ordre écologique : Le poids moyen des reproducteurs de printemps a été inférieur à la moyenne ces dernières années.

Perspectives : Les relevés indiquent que l'abondance de la classe de 1991 est supérieure à la moyenne, donc que le TAC permettra de respecter les objectifs de conservation. Toutefois, si la classe de 1991 se révélait plus petite ou égale à la moyenne, le TAC de 1996 devra être abaissé par rapport au niveau actuel de 21 000 tonnes.

Considérations en matière de gestion : La proportion de géniteurs de printemps dans les prises des senneurs a varié entre 60 % et 90 %, de 1992 à 1994. Par le passé (1978-1980), elle était beaucoup plus variable (29 % à 85 %).

Introduction

The purpose of this assessment is to provide estimates of Southern Gulf of St. Lawrence (4T) fall and spring herring biomass in 1994. A comparison of fishing mortality is made to the target $F_{0.1}=0.3$ or an exploitation rate of 26%.

Sections of this document which discuss fall and spring spawners together are **Description of the fishery**, **Target**, **Fishery Data**, **Research Data**, and **Research Recommendations**. Separate sections for fall and spring spawners are provided for **Estimation of stock parameters**, **Assessment results**, **Ecological considerations**, **Future prospects**, and **Management considerations**.

Issues addressed in the assessment for the fall spawning herring stock are:

1. the effect of trip limits and gear saturation on the fall abundance index derived from gillnet catch rates,
2. the percentage of dumping by the fall gillnet fleet,
3. selectivity of gillnets in the fall fishery,
4. purse seine catch composition, and
5. area effects on timing and size of fish as measured by length-frequency distributions.

Issues addressed for the spring spawning stock are:

1. the purse seine catch composition,
2. the effect on the spring abundance index of mis-reporting spring inshore purchase slips,
3. and the inability to obtain a quantitative biomass estimate using ADAPT-VPA procedures.

The incorporation of research abundance indices from acoustic, spawning bed, juvenile, and groundfish surveys is the last issue for both spawning stocks but is not addressed in detail in this assessment.

New analyses applied to issues for the fall spawning herring stock were:

1. frequency distributions of catch and catch rates in the fall gillnet fishery to investigate the effect of trip limits,
2. presentation of the amount of fish reported dumped by fall index gillnetters,
3. an examination of catches in research gillnets of various sizes to determine selectivity,
4. presentation of maturity stages of herring caught in purse seines by area and month to examine catch composition, and
5. length-frequency distributions using correspondence analysis to examine area differences.

New analyses applied to issues for the spring spawning herring stock were:

1. length-frequency distributions using correspondence analysis to examine area differences,
2. a comparison of timing of catches as recorded by Purchase Slips, index gillnetters, and the New Brunswick Provincial Co-ordinator for Escuminac and Southeast New Brunswick to investigate the possibility of mis-reporting on Purchase Slips, and

3. a virtual population analysis of spring herring at different assumed terminal fishing mortalities to provide possible bounds on stock biomass.

Description of the fishery

Southern Gulf of St. Lawrence herring are harvested by fixed gear in 4T and mobile gear in 4T and 4Vn (Fig. 1). Two stocks of herring are harvested in these fisheries. The spring spawning stock spawns before July 1 and the fall spawning stock after July 1.

Prior to 1967, Southern Gulf of St. Lawrence herring were exploited mainly by gillnets and average landings from 1935 to 1966 were 34,000 tonnes. In the mid 60s, a purse seine fishery was introduced and average landings were 166,000 tonnes from 1967 to 1972. Quotas were introduced in 1972 at 166,000 tonnes and reduced to 40,000 tonnes in 1973 (Fig. 2). Catches have been below the TAC since 1988 (Fig. 2).

The TAC for fall spawning herring was 65,900 tonnes from 1990 to 1992 and was raised to 80,800 tonnes for 1993 and 1994. In 1994, the total 4T catch of fall spawners was 58,754 tonnes, with 52,650 tonnes of this catch being caught in fixed gear (Table 1). Since 1981, over 80% of the catch has been by gillnetters (Table 1). Gillnet catches in 1994 were double those in 1993 (Table 1). This increase is attributed to improved price and roe markets (Table 2) resulting from the decline in catches in the Scotia-Fundy region. In the past, most fall gillnets have been 2 5/8 inch mesh but in recent years this percentage has dropped, primarily because of a move to larger mesh sizes (Fig. 3).

Purse seine catches of fall spawning herring in 1994 were almost 7,000 tonnes, similar to 1993 (Table 1). This catch represents about 40% of their quota (Table 3). In 4Vn, they caught about 3,200 tonnes of a 4,200 tonne quota (Table 1). Purse seine captains indicate that the main reason for catches being below the quota is the limited window of fishing opportunities provided to the fleet. They also, suggest that the effect of reduced fishing opportunities is compounded by 4T herring migrating earlier from 4T to 4Vn than in previous years. By the time the fleet moves to 4Vn, herring schools are too deep to fish with a purse seine.

Fall purse seine catches in 4T usually occurred near Grande Rivière or Miscou Bank in September. In October sets were also made in the Northern Gaspé and near Caraquet (Fig. 4).

The main issue in the fall fishery centered on the Acadian Peninsula and concerned the opening date of the large seiner fall fishery in Chaleur Bay. The seiner fishery opened on September 13 and was suspended subsequently from September 17-20 and re-opened on September 21. The inshore fishers were concerned that large seiner fishing activity would have a negative effect on their fishery. In general, inshore fishers were concerned that large seiners concentrate their activity in Chaleur Bay and that this concentration would lead to an over-exploitation of the local stock. The inshore catch in Chaleur Bay was about 34,000 tonnes, the best year since 1978, and exceeded the TAC for the area by about 2,500 tonnes (Table 3). This catch of 34,000 tonnes was 12,000 tonnes above the five-year mean (Table 4). The TAC was exceeded by 460

tonnes in the Magdalen Islands but in all remaining areas of the Southern Gulf of St. Lawrence catches were below the TAC (Table 3).

The TAC for spring spawning herring was 6,000 tonnes to 16,800 tonnes from 1985 to 1990. The TAC has been 21,000 tonnes since 1991. The total 4T catch of spring spawners was 24,965 tonnes, with 20,176 tonnes being caught by fixed gear (Table 1). Since 1981, from 70% to 90% of the spring spawner catch has been by gillnetters (Table 1). Inshore landings during the spring (19,014) were much higher than landings since 1987 (11,000 to 15,000 tonnes) (Table 1). Improved markets and availability of herring schools are two reasons given by inshore fishers for improved catches. Most spring gillnetters use 2 1/4 or 2 1/2 inch mesh (Fig. 5).

Issues raised by industry were that fishers from Chaleur Bay were concerned over the state of the resource in the spring fishery. They noted that improvement in catches is only observed along the Southeastern coast of New Brunswick. In contrast, landings in Chaleur Bay are lower than usual and stable in Pictou and Fisherman's Bank. Since 1985, spring inshore catches in Chaleur Bay (16B) have been between 1,400 and 6,600 tonnes. The five-year mean for Chaleur Bay is 2,600 tonnes with catches in 1994 at 1,550 tonnes (Table 4).

Inshore fishers from the Magdalen Islands expressed their concern over the large seiner herring fishery in the spring. In 1994, large seiners were fishing off Cape Breton in the spring (Fig. 6) as opposed to previous years when effort was concentrated near the 'edge' of the Laurentian Channel near the Magdalen Islands (Claytor et al. 1994). In spite of this change in location, inshore fishers from the Magdalen Islands noticed that their catches declined when the large seiners began fishing. Since 1992, the large seiners have fished in the spring in 4T. Spring seiner landings have increased from 1,120 tonnes in 1992 to 3,900 tonnes in 1994 (Table 1). This improvement in landings corresponds to an increase in fishing effort and a decrease in fishing activities in 4R. Spring inshore landings in the Magdalen Islands (16D) have been between 70 to 350 tonnes from 1985 to 1994, except 1993, when they were 885 tonnes (Table 4).

Target

The target fishing mortality was $F_{0.1}=0.3$ or an exploitation rate of 26%.

Fishery Data

Catch and weight-at-age matrices were derived from commercial sampling (Mowbray and Bourque 1994). These include combined 4T and 4Vn catches and were formed from three areas, 4Tmno, 4Tl, and 4Tfghjk (Fig. 1, Table 5, Appendix 1, Tables A-V.).

Abundance indices from gillnet fisheries come from purchase slip data and are calculated as catch/net-trip. A purchase slip equals one trip and the average number of nets is determined from a phone survey of gillnetters in 4T (LeBlanc and LeBlanc 1995) (Tables 6, 7).

Abundance indices were also derived from data provided by volunteer index gillnetters who kept daily records of total catch, catch sold, amount dumped, and catch kept for private use, local sale, or transfers to other boats. This

program has been in effect since 1986 for the fall and 1987 for the spring fisheries (Table 8). Catch rates using these data were catch/net.

The New Brunswick provincial government monitored catch in Escuminac (Statistical Districts 73-75) and Southeast New Brunswick (Statistical Districts 76-80) (Fig. 1) during the spring season. From 1987-1989 catches were recorded for each day and from 1990 to 1994 catches and number of fishers have been recorded daily.

Research Data

Data on the relative abundance and distribution of 4T herring come from acoustic surveys during October (LeBlanc et al. 1995), juvenile herring surveys in December (LeBlanc et al. 1995), a spawning bed survey at Fisherman's Bank, PEI in August and September (Cairns et al. 1993), and groundfish surveys in September and January (Sinclair et al. 1995).

In 1994, a snap shot survey employing the fishing fleet was begun to supplement data collected during the October acoustic survey. This survey used two gillnetter boats to survey an area on the west coast of Prince Edward Island in one night (October 13) (Fig. 7). The purpose of the survey was to obtain a presence/absence snapshot of herring schools in the area in one night. The gillnet boat sounders were used to identify herring schools and their locations, by Loran C bearings, were noted on a map. Transects were selected in advance and systematically placed about 1 mile apart and extended to 4 miles offshore. The number of transects chosen for the area was based on the number of miles a boat could cover in a 6 hour period. Including industry in the survey process will improve coverage of the 4T herring stock because the October acoustic survey does not include the west coast of Prince Edward Island or areas which are so shallow and close to shore. In 1995, we hope to continue this survey and expand it into one other area. The long-term intention is to build a time-series of data that can be included as part of the acoustic survey abundance index.

The distribution of herring in the September groundfish survey showed large concentrations in Chaleur Bay, North PEI, and East PEI. For the first time, the 1994 survey included and found herring concentrations in 4Vn (Fig. 8). In October, the acoustic research survey found herring well distributed throughout Chaleur Bay (Fig. 9). The December juvenile survey found most herring in the inner portion of Chaleur Bay (Fig. 10). The January 1995 groundfish survey found a similar distribution of herring to that observed in January, 1994 (Fig. 11).

Fall - Estimation of stock parameters

Catch-at-age matrices demonstrate the importance of year-class strength in supporting this fishery. In the early 80s, few ages were supporting the fishery. From 1986 to 1990, the 1980 and 1983 year-classes contributed to the fishery and there was a broad distribution of ages in the catch. Recently, these year-classes have almost completely passed through the fishery and since 1991, the 1987 year-class has carried the fishery (Fig. 12).

Catch-at-age by gear shows that smaller fish (age 2 and 3) have made up a lower percentage of the catch in the 1990s than the late 70s and early 80s (Fig. 13). Since 1990, the percentage of age 2 herring has been less than 1%

of the catch. Age 3 herring have been less than 10% of the catch since 1985, compared to up to 35% in 1980 (Fig. 13).

The fall abundance index used to tune the ADAPT formulation was derived from fall purchase slip catch rates. A multiplicative model was used to estimate these catch rates using year, district, and week effects. This model was identical to those used in past assessments (Claytor et al. 1994). This model was significant (Table 9) and residual and DFFITS analyses (SAS 1990) indicated there were no residual patterns or heavily influential data points (Fig. 14). Catch rates indicated two levels of abundance with the higher level from 1985 to the present. All years from 1985 to the present were significantly different from all years from 1978 to 1984 (Fig. 15).

A multiplicative model of fall index gillnetter catch rates was significant (Table 10). Residual and DFFITS analyses indicate there are no major problems with fitting the data to this model (Fig. 14). As for the purchase slip model there were no major changes in overall abundance since 1986 (Fig. 15).

Trip limits may have an effect on the interpretation of catch rates relative to abundance. These limits have been in effect in the fall gillnet fishery since 1987 and have been 9,000 kg (20,000 lbs) for all areas except Eastern PEI which has been 6,800 kg (15,000 lbs). The limit in Chaleur was increased to 11,000 kg (25,000 lbs) in 1994.

Frequency distributions of catch/trip and catch/net-trip indicate how trip limits affect fishing patterns and the catch rates used in the abundance indices. A truncated frequency distribution would indicate that fishing ceases when the trip limit is reached and that it is reached more often than would occur without the limit. Distribution of these indices did not appear to be truncated as a result of trip limits in any area (Figs. 16, 17, 18, 19). These distributions were based on pooled catch and effort data for each day, i.e., catch and effort for all boats fishing each day in a statistical district were added together. A stronger analysis requires the frequency distributions to be based on individual catches.

One method for examining the effects through individual boats and daily catches is to use the fall index gillnetter data. Participants in this program provide the number of nets and the number of sets made with these nets on a daily basis. Index gillnetters indicate some effects from trip limits on daily catches which occurred most often at the limits in both areas examined (Figs. 20). The catch rates, however, were not truncated or altered because of trip limits or gear saturation whether catch/net (Fig. 21) or catch/net-set (Fig. 22) were used to derive the catch rate. Data on the number of sets have only been collected since 1991. Interpretation of catch rates used to derive the fall abundance index does not appear to have been influenced by trip limits or gear saturation. Simulation studies were recommended to determine how difficult it would be to detect trip limit and gear saturation effects with these types of data.

Fall purchase slip catch rates were used to derive an age-disaggregated abundance index for fall spawners using the method described in previous assessments (Claytor et al. 1994) (Fig. 23, Table 11). Paloheimo Z's were calculated using this abundance index (Fig. 23).

Fall biomass was estimated using the ADAPT formulation in past assessments (Claytor et al. 1994) (Table 12). Parameter estimates were significant

($t < 2.00$) and correlations were low (Table 13). Observed vs. predicted plots by age generally indicate a lack of residual pattern (Fig. 24).

The high retrospective value observed in last years assessment indicating an over-estimate in the 1992 assessment, was much less this year and indicated that 1992 and 1993 population numbers were under-estimated in last years assessment of the 1993 fishery (Fig. 25). Retrospective analysis by age indicated a lack of pattern for most ages with some exceptions in the older ages (Fig. 26).

Fall 5+ biomass is about 375,000 tonnes and 7+ biomass is about 275,000 tonnes with recent increases a result of the large 1987 year class (Fig. 27). Fishing mortality at fully recruited ages was below target (Table 14).

Gillnet and acoustic survey catch-at-age matrices indicate that in three of the last five years full recruitment has occurred at age 7, but has occurred as late as age 8 or 9 (Table 15). Full recruitment estimated using mean F values from ADAPT from 1991 to 1993 indicate full recruitment occurs at age 7 (Table 15).

Fall - Assessment Results

ADAPT results indicate that fishing mortality is below target (Table 14) and the 5+ biomass, as a result of the 1987 year-class, is still above levels during the late 1980s (Fig. 27).

Stock recruitment analysis of the fall spawning stock indicates that Ricker and Beverton-Holt models do not describe this relationship better than the geometric mean of recruitment (Fig. 28) but that recruits/spawner declines rapidly with biomass (Fig. 29). It was noted during peer review that variation in recruitment of this stock seems to be much less than expected based on other herring stocks and that this might affect the degree of risk that managers may wish to take in exploiting a year-class as it moves through the fishery. It would be possible to explore this idea through simulation studies.

Other indices of abundance are consistent with the conclusion that stock size is higher now than in the late 70s and early 80s and that biomass has been stable since 1985. Incidental catch of herring in the September groundfish survey indicate low levels of abundance in the late 70s and early 80s with higher levels recently (Fig. 30). Indices derived from the acoustic and spawning bed surveys and from industry based indices based on the index gillnetters and the phone survey indicate little change in abundance in recent years (Fig. 30).

Two indices, the September groundfish survey and the phone survey of active gillnetters in the Gulf, were correlated with the fall abundance index based on catch rates determined from purchase slip data (Fig. 31). The groundfish survey covers periods of high and low abundance, 1978 to 1994, and the phone survey covers the period of high abundance from 1987 to 1994 (Fig. 30). The other indices, acoustic survey, spawning bed survey, and index gillnetters are not correlated with the purchase slip data. These indices have relatively little variation among years compared to the purchase slip index (Fig. 31).

Comments from fishers in the phone survey concerning trends in each area (Fig. 32) and during the stock status workshops (Science Branch 1995) were generally consistent with the view of high abundance. There were, however, areas of local concern. The most prominent among these were Miscou Bank where even though gillnetters exceeded the quota they felt that abundance has declined because the bank fishery at one time could support 400 boats where now only 200 boats can be supported. At Fisherman's Bank where effort has declined considerably, it is not understood why abundance has not increased instead of remaining stable as indicated by the spawning bed survey. These concerns need to be addressed and reconciled in future assessments.

Fall - Ecological Considerations

Mean weight of the stock has been lower than recent averages for the last four years (Fig. 33). Lower than average mean weights have occurred at low and high stock sizes so this trend does not seem to be related to changes in stock numbers (Fig. 34). Lower than average weights have also been observed for southern Gulf of St. Lawrence cod (Sinclair et al. 1995). Southern Gulf herring are above average in abundance and southern Gulf cod are below average in abundance. If the causes for the lower than average mean weights are the same in both stocks then these contrasting abundance trends but similar trends in mean weight, make it unlikely that the cause of the decline in herring mean weight is density dependent.

Fall - Future Prospects

Projections for 1995 were made by taking the beginning of the year biomass by age and subtracting losses from natural mortality (Table 12) and reported catches to determine expected beginning of the year numbers in 1995. The target fishing mortality $F_{0.1} = 0.3$ was applied to these numbers to determine the catch in 1995 that would correspond to this target. This procedure indicated that the TAC for 1995 at target levels would be 81,000 tonnes (Table 16). Input parameters to determine the target level were partial recruitment by age, average weights-at-age, and recruitments at ages 2 and 3. Partial recruitment values were derived from average fishing mortalities from 1992 to 1994. Age 2 and age 3 recruitment were the geometric mean for 1978 for age 2 and 1978 to 1992 for age 3 including the high values from the 1987 year-class estimates (Table 16). Stock recruitment analysis at the present time indicates that Ricker and Beverton-Holt models do not predict recruitment better than the geometric mean of recruitment.

Prospects for the 1996 fishery depend on predicting recruitment. Stock recruitment analysis indicates that except for the 1987 year-class, recruitment is relatively stable. Thus, mean recruitment is the best predictor of year-class. Indices of recruitment are being developed using research surveys but at present are not suitable for quantifiable forecasts. Information from the acoustic and juvenile surveys indicate that the 1990 year-class may be above average (Fig. 35). Using average recruitments and estimated 1995 numbers-at-age, the forecast for the 1996 fall spawner fishery would be 66,000 tonnes (Table 16). This forecast could be revised in next years assessment after the 1995 fishery and could be available by mid-April if assessments are prepared at the end of March as they were in 1995.

Fall - Management Considerations

Dumping

Dumping as measured by fall index gillnetter reports occurred when trip limits were reached regardless of area (Fig. 36). Dumping amounts to <1% for the entire fall inshore catch and about 2% of the catch at or above trip limits (Table 17). There were years and areas when the percent of dumping has been as high as 18% but these were rare (Table 17).

Area Similarities and Differences

Three characteristics were examined for differences among areas; catch timing, catch rates, and length-frequencies.

Average catch timing, as measured by day when 50% of the catch occurs, was similar among areas (Fig. 37). For all years of data, 1979-1994, Escuminac-West Prince Edward Island (WPEI) were correlated with each of the other areas (Fig. 38). When only years of high abundance were examined (1985-94) only Chaleur and Escuminac-WPEI were correlated (Fig. 38).

Abundance indices as measured by purchase slip catch rates were significantly correlated among all areas (Fig. 39). When index gillnetter catch rates for each area were used, only Nova Scotia and East Prince Edward Island (EPEI) were correlated (Fig. 39). Index gillnetter years cover only the periods of high abundance.

Correspondence analysis was used to characterize length-frequencies of samples by unit area and month. Data from three years, 1990, 1992, and 1993 were examined. In 1990 and 1993, samples from 4Tg and 4Th tended to be grouped together and 4Tmnol tended to be together. In 1992, differences among these groups were not as noticeable although some samples were quite distinct (Figs. 40).

Additional work is required before a basis for delineating and providing advice on separate areas within 4T can be achieved.

Gillnet selectivity

A selectivity experiment was conducted to estimate the change in catch composition that would be expected by using different mesh sizes in the fall inshore fishery. Mesh sizes from 2 inches to 3 inches were examined for effects on age composition, size composition, and percentage of females in the catch. The experiment consisted of fishing research gillnets on weekends at Fisherman's Bank, P.E.I. during the 1990 and 1991 commercial fishing seasons. These research gillnets were comprised of a string of five panels of mesh sizes 2, 2 1/4, 2 1/2, 2 3/4 and 3 inch. Nets were made of green multifilament nylon (210/9, knotted), and were rigged and fished in the same fashion as commercial gear. In 1991, a sixth panel identical to those used in the commercial fishery (2 5/8 inch monofilament nylon) was included in the research gillnet string. Panel order was randomized in 1991 but a fixed order (ascending mesh size) was used in 1990. A one meter gap was left between panels to reduce leading effects. The string of nets was fished once a night. For each panel, total catch weights were recorded (Fig. 41) and length

and girth of up to 200 fish were measured. In addition, a length stratified sub-sample (3 per 0.5 cm) was taken from each panel and frozen for later determination of sex, gonad maturity stage, age (from otoliths), gonad weight and total body weight.

In this analysis, we have taken the composite research catch (sum of the research gillnet catches by age or size) as an estimate of the population composition. Direct estimates of herring gillnet selectivity suggest that, for herring longer than 27 cm, composite research gillnet catch (of nets identical to those described above) duplicates the range and major modes of the length distribution in the population (Winters and Wheeler 1990). In 1990, the composite length distribution of research gillnets indicated that the population was composed primarily of herring greater than 33 cm. These fish were primarily from the 1983 year-class. In 1991, these large fish remained important but herring between 29 and 32 cm (1987 year-class) made up almost half the population (Fig. 42).

The composite populations (Fig. 42) were used to estimate the selectivity for each mesh size. This estimate was made by calculating the ratio of the proportion at age or size in a given panel to the proportion at age or size in the composite sample. A selectivity of one in this estimate means that the proportion caught is equivalent to the proportion in the population. The difference in selectivity values are indicative of the relative probability of capturing herring of a given size in each mesh. Variations in sex ratio among mesh sizes were examined and the results compared to those of daily samples taken from the commercial fishery.

The tested mesh sizes form three groups relative to fish length and mesh selectivity. These groups are 2 and 2 1/4 inch mesh, 2 1/2 to 2 3/4 inch mesh, and 3 inch mesh. The 2 and 2 1/4 inch mesh have a tendency to catch a larger proportion of 25 to 33 cm herring than are in the population but a smaller proportion of over 33 cm herring than are in the population. In 1991, however, these differences were slight for 2 1/4 inch mesh (Fig. 43). Selectivity of the 2 1/2 to 2 3/4 inch mesh tends to be at or above one for lengths > 32 cm. Exceptions to this trend are the low selectivities of 2 1/2 inch mesh above 38 cm (Fig. 43). Selectivity of the 3 inch mesh stays above 1 for fish larger than 34 cm (Fig. 43).

These selectivity curves mean that fishers using 2 1/2 to 3 inch mesh would have seen very little difference in their catches in 1990 and 1991 and would catch fish primarily between 33 and 38 cm (Fig. 44). The 3 inch mesh had a very low selectivity for fish under 33 cm and in 1991 very few of the large 1987 year-class were caught in this mesh compared to the 2 1/2 to 2 3/4 inch mesh (Fig. 44). A fisher using 2 inch mesh would primarily catch herring between 27 and 30 cm (Fig. 44). A more variable catch would occur using 2 1/4 inch mesh. Fish around 35 cm would be caught but smaller fish, around 30 cm would only be caught if available in large numbers as the 1987 year-class was in 1991 (Fig. 44).

Selectivity curves by age indicate that strong selection for age 3 and 4 herring occurs with small mesh sizes. For ages 6 to 9, the selectivity for meshes 2 1/2 to 3 inches was similar (Fig. 45). Most commercial fishers use 2 5/8 and 2 3/4 inch mesh (LeBlanc and LeBlanc 1995). These selectivity curves are consistent with the flat-topped partial recruitment vector used for projections.

The proportion of females in research panels tended to increase with mesh size in both years although in most cases the gain was relatively small (2-10 %) (Fig. 46). In most cases the variation in sex ratios between nights was greater than among meshes (Fig. 46). This temporal variation was also observed in the commercial fishery, where between day differences in sex ratios were as high as 30% (Fig. 47). An increase in the number of females caught cannot be expected when using mesh sizes between 2 1/2 and 3 inches.

Catch Composition

In all areas from September to October the majority of herring caught in the fall by purse seiners has been fall spawners (Table 18). The exceptions are in 4To where less than 50% of the herring caught in September in one year (1979) were fall spawners. The only purse seine sample from July was from 4T1 in 1978 where 46% of the catch was fall spawners (Table 18).

On average, about 6% of the fall spawners caught by purse seines from September to December, and sampled by regular port sampling procedures, were in spawning condition (Table 19). This level of spawning fish was also found by observers on board purse seines in 1994 during September and October. Purse seine activity during August in 1991 and 1992 in 4Tn (Chaleur Bay) was by small seiners fishing near the spawning grounds (Table 19). Catches by this small seiner are not indicative of those that would be made by large seiners fishing during August. Of the fall spawners sampled from the small seiner catch, an average of 98% of them were in spawning condition (Table 19).

Spring - Estimation of stock parameters

As for the fall spawners, the catch of spring spawners has also largely been driven by strong year-classes. In the early 80s, few ages supported the catch and stock size was low. In 1986, the 1982 year-class appeared and supported the catch until 1988. Another strong year-class did not appear until 1992 when the 1988 year-class began to move through the fishery. This year-class was still the major component of the catch in 1994 (Fig. 48).

Catch-at-age by gear indicates that in the late 70s and early 80s purse seine catches were composed primarily of 2 and 3 year-old herring, while inshore catches were composed primarily of 3 and 4 year-old herring (Fig. 49). The percentage of 6 to 10 year-old herring has been much higher in the catches since the mid 80s compared with earlier years (Fig. 49).

Multiplicative models, as for the fall inshore fishery, were used to analyze spring catch rates using purchase slip, index gillnetter, and provincial co-ordinator data. These models were identical to those used in past assessments and included year, district, and week effects. Catch rates from purchase slips were analyzed for all of 4T and separately for Escuminac and Southeast New Brunswick. A separate analysis for Escuminac and Southeast New Brunswick allowed a direct comparison between catch rates determined using Purchase Slip and Provincial Co-ordinator data.

Each of these models was significant (Tables 20-23) and no residual patterns or heavily influential data points were indicated by the residual and DFFITS analyses (Figs. 50, 51). Only the purchase slip model showed a significant change in catch rates with an increase from 1993 to 1994 (Fig. 52). This change was observed for an analysis based on all 4T areas and for

one based only on Escuminac - Southeast New Brunswick (Fig. 52). Catch rates from the Provincial Co-ordinator data indicate an increasing trend but no significant differences. The index gillnetter data indicates a slight declining trend but also no significant differences (Fig. 52). Catch rates were high during the first year of the program but have remained stable from 1988 - 1994 (Fig. 52).

A concern expressed during the 1994 peer review of the 1993 stock assessment was that the spring purchase slips were not a reliable indicator of catch rates or abundance because of mis-reporting. It was suggested that the Provincial Co-ordinator data would be useful to compare with purchase slips because the co-ordinator was on the dock each day observing catches and would be a more accurate estimate of daily catch than purchase slips. Index gillnetter reports would also be a useful comparison because they are voluntary and mis-reporting would not be expected. To examine this question the timing of purchase slip, index gillnetter, and provincial co-ordinator catches were compared. When these three data sets were compared, catches were standardized within each year to the highest weekly catches for each method. This procedure adjusted for major differences in catches between these methods.

Catches recorded by purchase slips and the Provincial Co-ordinator have been within 20% for each of the years that data have been recorded for Escuminac and Southeast New Brunswick (1990 - 1994) (Table 24). It may also be expected that if each fisher makes only one trip each day that effort recorded by these two methods would be similar or that if more than one trip were made each day that the purchase slips would record more effort than the co-ordinator. Effort levels have been within 20% except for 1994, when the co-ordinator program recorded 56% more effort (Table 24).

Timing of catches do not correspond between purchase slips and co-ordinator reports and catches in 1990, 1991, 1993, and 1994 were recorded for a much longer time period for purchase slips than co-ordinator data (Fig. 53). These trends were somewhat more pronounced for effort data (Fig. 54). Similar discrepancies between timing of catches occurred for index gillnetter reports and purchase slips (Fig. 55). In general, except for 1993, these differences were not present when comparisons between index gillnetters and the co-ordinator were made (Fig. 56). These results indicate that catches compiled from purchase slips are spread out longer than catches occur and that those compiled from purchase slips are not suitable as an index of abundance for spring spawners. The agreement between index gillnetters and Provincial Co-ordinator data indicated that these data are better indicators of fishing activity than purchase slips and would make better abundance indices for the spring stock.

Abundance indices were made using the co-ordinator and index gillnetter data. They generally show similar trends except for ages 7 and 8. For these ages, the index gillnetter data indicate no change in catch rate but the co-ordinator data indicate an increase in abundance for these ages in the last three years (Figs. 57). Co-ordinator data indicated a slight decline in total mortality while index data indicated an increase in total mortality from 1993 to 1994. Total mortality estimated from both sets of data was below the maximum mortalities estimated during the time period (Fig. 57).

An ADAPT formulation similar to the one used in the fall was attempted using the index gillnetter abundance index but could not be fit. The reason

for this lack of fit was not determined but is being investigated. As a result, a simple VPA was tried using a range of terminal F's from 0.1 to 0.6 to present a range of possible stock sizes for spring spawners. A partial recruitment vector estimated from gillnet and acoustic matrices using the same method as for the fall spawners was used in this analysis (Table 25).

This analysis indicates a range in 4+ biomass from 60,000 to 350,000 tonnes (Fig. 58).

Spring - Assessment Results

The simple virtual population analysis of the spring spawners is useful for examining consistent population trends regardless of the Terminal F assumption. The first of these trends is that the 1994 biomass is less than the 1993 biomass under all assumptions (Fig. 58). The second is that at the four highest Terminal Fs the biomass declined in 1993 from 1992 levels. The increase in biomass observed under each assumption from 1991 to 1992 is a result of the strong 1988 year-class, analogous to the increase observed in fall spawners from the 1987 year-class (Figs. 27, 58).

In addition, under each assumption the average fishing mortality for the spring stock, ages 2-11, has been reduced considerably from $F_s > 0.5$ in the late 70s and early 80s (Fig. 59). The fishing mortality of ages 2 and 3 have been reduced to nearly zero in recent years (Fig. 59). Consistent with the decline in biomass from 1993 to 1994 fishing mortality increased for ages 4 to 8 under all assumptions (Fig. 59).

Biomass estimates using each of the terminal F assumptions began to diverge by more than 10% in 1985. As a result, this analysis indicated that the 4+ biomass of spring spawners from 1978 to 1984 ranged from 9,000 tonnes in 1982 to 51,000 tonnes in 1984. The biomass range for 1994 varies from 70,000 tonnes to 350,000 tonnes (Fig. 58).

Providing advice on the TAC for the spring stock requires determining if a narrower and more likely biomass range can be identified. One method for doing this would be to assume that the percent of spring spawners observed in the total acoustic survey biomass index was representative of the percentage of spring spawners in the stock. Then by determining which spring VPA estimates fall within these percentages, a narrower range of possible spring biomass and fishing mortalities for 1994 could be identified.

Since 1991, the acoustic survey has occurred during October (LeBlanc et al. 1993; LeBlanc and Dale 1994; LeBlanc et al. 1995) and the percentage of spring spawners in the biomass estimate has ranged from 16% to 22% in the Chaleur Bay samples and 13% to 16% for the total 4T stock when the sampling in 4Vn is included (Table 26). These percentages provide a total range of 13% to 22% for spring spawners of the 4T stock from 1991 to 1994. The 22% estimate from Chaleur in 1994 is used because the survey did not cover 4Vn in 1994.

The spring spawner VPA estimates that occur within this range of percentages correspond to Terminal Fs for 1994 between 0.4 and 0.6 (Fig. 60) and a 4+ biomass between 70,000 tonnes to 97,000 tonnes (Fig. 58). Using the partial recruitment vector in Table 25 and this biomass range provides an estimate for the average fishing mortality in 1994, ages 2-11, between 0.24 and 0.36. The target fishing mortality, 0.3, is midway between these values.

Thus, current fishing levels are near conservation requirements for this stock.

Indices from the phone survey indicate a stable stock size since 1987 for spring spawners. Exceptions were slight declines in the Acadian Peninsula and increases in Escuminac (Fig. 61). These trends are consistent with Terminal Fs between 0.4 and 0.6, rather than lower Terminal Fs, which would indicate large increases in stock size have recently occurred.

Spring - Ecological Considerations

As for the fall stock, mean weight of spring spawners has been lower than average for the last four years (Fig. 62). Interpretations relative to changes in mean weight with respect to biomass must wait for improved biomass estimates of spring spawners.

Spring - Future Prospects

Projections for 1995 were made with the biomass estimates from the range of the most likely Terminal Fs from the simple VPA. An upper TAC was estimated using the Terminal F = 0.4 and a lower TAC was estimated using Terminal F = 0.6 biomass estimate. The method used for calculating beginning of the year numbers, age 2 and age 3 recruits, and partial recruitment was the same as for the fall spawners. These projections indicate that a TAC between 17,000 and 20,000 tonnes is most appropriate for 1995 (Table 27). These values are within 20% of the proposed 21,000 tonne TAC and do not warrant a change for 1995. If recruitment is average in the coming year, then the projected TACs for 1996 are more than 20% below the current level of 21,000 tonnes and a change may be warranted. As for the fall, this projection could be updated by April if the assessment of the 1995 fishery is prepared by the end of March as was the assessment of the 1994 fishery.

Information from the acoustic and juvenile surveys indicates that the 1991 spring year-class may be above average. These fish would enter the fishery as 4 year-olds in 1995 (Fig. 63).

Spring - Management Considerations

Area similarities and differences

Correspondence analysis was used to examine length-frequency differences among samples in the spring for 1990, 1992, and 1993. Centroid plots from this analysis indicate that 4Tmn are often most similar to each other as are 4Thl, and 4Tf (Fig. 64). The influence of mesh size differences among areas and the overlap of individual samples needs to be examined before these analyses can be interpreted with respect to stock differences among areas.

Catch composition

The proportion of spring spawners in spring purse seine catches has varied from 60% to 90% in recent years (1992 and 1994). In the past it was much more variable, 29% to 85% (1978 to 1980) (Table 28).

Research Recommendations

- (1) Improve sampling of the spring purse seine fishery, because the proportion of spring spawners changes.
- (2) Simulations to determine the data requirements for detecting gear saturation effects on catch rate in the gillnet fisheries.
- (3) Update yield per recruit analyses.
- (4) Correspondence analysis should be done to see if mesh size has an influence on the size distribution.
- (5) Examine changes in length and condition over time and initiate a program to examine fat content. Ensure that fishery effects are not part of the change.
- (6) Examine the spawning group and length frequency composition of herring caught in mackerel traps in Dingwall during the spring to improve information on stock composition in 4Vn during this time of year.

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Table 1. Catch (t) of 4T herring caught in spring and fall, by gear (fixed and mobile) and spawning group (as calculated by the GSI method). Catch (t) in 4Vn from the purse seine fishery (Nov-Mar) is assigned to a spawning group according to otolith characteristics up to 1991 inclusive. Catches are derived from purchase slips, and are provisional from 1992-1994; mobile gear landings for 1992 and 1993 are based on quota-monitoring reports.

YEAR ANNÉE	SPAWNING GROUP a/ GROUPE DE FRAI a	4T SPRING / PRINTEMPS		4T FALL / AUTOMNE		4T CATCH PRISES	4T TAC TPA	4Vn CATCH PRISES	4Vn TAC TPA	BIOMASS BIOMASSE
		Fixed Fixes	Mobile Mobiles	Fixed Fixes	Mobile Mobiles					
1978	P	8,098	6,277	109	8,047	22,531		1,168		
	A	449	1,770	5,032	23,708	30,959		1,681		60,228
	Total	8,547	8,047	5,141	31,755	53,490	55,000	2,849	8,000	
1979	P	7,089	6,951	282	5,821	20,143		1,426		
	A	535	6,951	5,793	14,798	28,077		1,484		41,311
	Total	7,624	13,902	6,075	20,619	48,220	55,000	2,910	3,000	
1980	P	7,216	6,123	306	4,519	18,164		1,348		
	A	56	7,794	6,239	10,293	24,382		2,503		30,123
	Total	7,272	13,917	6,545	14,812	42,546	55,000	3,851	4,500	
1981	P	7,028	10	665	938	8,641		1,374		
	A	473	11	10,560	2,250	13,294		2,060		29,722
	Total	7,501	21	11,225	3,188	21,935	16,000	3,434	3,000	
1982	P	5,872	29	332	335	6,568		1,549		
	A	51	33	12,650	2,243	14,977		1,971		64,070
	Total	5,923	62	12,982	2,578	21,545	15,000	3,520	3,000	
1983	P	8,211	9	425	1,047	9,692		1,154		
	A	312	10	13,415	2,442	16,179		2,826		90,130
	Total	8,523	19	13,840	3,489	25,871	20,000	3,980	5,000	
1984	P	5,001	2	481	387	5,871		1,138		
	A	281	2	15,493	1,891	17,667		2,787		146,102
	Total	5,282	4	15,974	2,278	23,538	19,000	3,925	3,500	
1985	P	6,535	0	4,018	2,036	12,589	6,000	1,006		
	A	682	0	19,689	4,986	25,357	26,500	2,464		246,100
	Total	7,217	0	23,707	7,022	37,946	32,500	3,470	3,500	
1986	P	8,015	0	3,249	4,026	15,290	7,200	1,262		
	A	535	0	36,642	6,889	44,066	36,200	3,090		267,869
	Total	8,550	0	39,891	10,915	59,356	43,400	4,352	4,200	
1987	P	10,789	0	2,417	4,393	17,599	8,200	332		
	A	970	0	49,711	9,341	60,022	64,600	2,040		274,409
	Total	11,759	0	52,128	13,734	77,621	72,800	2,372	4,200	

a P: Spring/Printemps; A: Fall/Automne

Table 1 (cont'd). Catch (t) of 4T herring caught in spring and fall, by gear and spawning group.

YEAR ANNÉE	SPAWNING GROUP */ GROUPE DE FRAI *	4T SPRING / PRINTEMPS		4T FALL / AUTOMNE		4T CATCH PRISES	4T TAC TPA	4Vn CATCH PRISES	4Vn TAC TPA	BIOMASS BIOMASSE
		Fixed Fixes	Mobile Mobiles	Fixed Fixes	Mobile Mobiles					
1988	P	11,541	0	3,278	6,644	21,463	12,800	257		
	A	1,346	1	37,933	10,887	50,167	66,100	2,315		316,397
	Total	12,887	1	41,211	17,531	71,630	78,900	2,572	4,200	
1989	P	10,441	0	1,564	4,138	16,143	16,800	212		
	A	652	0	32,285	10,131	43,068	70,100	1,905		315,459
	Total	11,093	0	33,849	14,269	59,211	86,900	2,117	4,200	
1990	P	8,520	1	1,331	3,815	13,667	21,000	706		
	A	540	0	55,790	6,494	62,824	65,900	4,005		297,942
	Total	9,060	1	57,121	10,309	76,491	86,900	4,711	4,200	
1991	P	12,586	17	178	2,095	14,876	21,000	957		
	A	306	1	26,966	5,964	33,237	65,900	3,832		250,690
	Total	12,892	18	27,144	8,059	48,113	86,900	4,789	4,200	
1992	P	12,438	952	239	1,850	15,479	21,000	296		
	A	37	168	32,840	5,265	38,310	65,900	3,932		426,667
	Total	12,475	1,121	33,079	7,115	53,790	86,900	4,228	4,200	
1993	P	14,584	2,175	917	1,388	19,064	21,000	219		
	A	598	541	22,181	4,840	28,160	80,800	3,736		424,287
	Total	15,182	2,716	23,098	6,228	47,224	101,800	3,955	4,200	
1994	P	18,754	2,910	1,422	1,879	24,965	21,000	324		
	A	260	1,023	52,390	5,081	58,754	80,800	2,920		376,563
	Total	19,014	3,933	53,812	6,960	83,719	101,800	3,244	4,200	

a P: Spring/Printemps; A: Fall/Automne

Table 2. Average price paid per pound to purse seiners and gillnetters in the Gulf Region. na = not available.

Year	Purse Seine (cents/lb)	Gillnets (cents/lb)
83	9.44	na/nd
84	8.08	na/nd
85	9.10	na/nd
86	8.07	na/nd
87	9.04	12.00
88	7.15	8.00
89	5.00	3.00-4.00
90	6.21	5.00-6.00
91	5.65	3.00-4.00
92	5.60	3.00-4.00
93	5.00	3.00-4.00
94	5.50	6.00-8.00

Table 3. Catch (tonnes) by season in fixed gear for 4T Southern Gulf of St. Lawrence herring. Catches compiled using ZIF raw data files for 1986, and 1988-1994. For 1987, catches purchase slip files were used.

SOUTHERN GULF OF ST. LAWRENCE TACs AND QUOTA ALLOCATIONS

Fishing Area	TAC (t)	Sharing TAC		Allocation (t)		Catch (t)	
		Inshore	Seiners	Inshore	Seiners	Inshore	Seiners
Spring 4T	21,000	80%	20%	16,800	4,200	18,809	3,933
Fall 4T	80,800	80%	20%	64,640	16,160	53,789	6,960
4Vn	4,200		100%		4,200		3,244
Total	106,000			81,440	24,560	72,598	14,137

FALL FISHERY

Area/Zone	Season/Saison	Weekend Closure/ Fermerture de fin de semaine	Vessel Limit/ Limite par bateau (lb)	TAC (t)/ TPA (t)	Catch (t)/ Prises (t)
INSHORE					
Isle Verte 16A	July 1-Dec 31	no	20,000	1,000	74
Baie des Chaleurs 16B	Aug 1-Dec 31	yes	25,000	31,550	34,310
Baie des Chaleurs 16B	Jul 1-Dec 31	no	25,000	950	163
Bait Fishery					
Escuminac 16C &	Aug 1-Dec 31	no	20,000	8,000	6,204
West PEI 16E					
Magdalen 16D	Aug 1-Dec 31	no	15,000	1,000	1,460
Pictou 16F	Jul 1-Dec 31	yes	20,000	11,070	8,095
Fisherman's Bank 16G	Aug 1-Dec 31	yes	15,000	11,070	3,483
Total Inshore				64,640	53,789
LARGE SEINERS					
All 4T	Sept - Dec			16,160	6,960
4Vn	Nov - Mar			4,200	3,244
Total L. Seiners				20,360	10,204
Grand Total				85,000	63,993

SPRING FISHERY

Area/Zone	Season/Saison	TAC (t)/ TPA (t)	Catch (t)/ Prises (t)
INSHORE			
Escuminac 16C	Jan 1-May 31	5,900	3,792
Remainder of 4T	Jan 1-May 31	8,900	10,288
Bait and Roe	June 1-June 30	2,000	4,729
Fisheries all 4T			
Total Inshore		16,800	18,809
LARGE SEINERS			
All 4T	Ap 1 - June 30	4,200	3,933
Grand Total		21,000	22,742

Table 4. Catch (tonnes) by season in fixed gear for 4T Southern Gulf of St. Lawrence herring. Catches compiled using ZIF raw data files for 1986, and 1988-1994. For 1987, catches purchase slip files were used.

FALL SEASON - FIXED GEAR

Year	Area							Total
	16A	16B	16C	16D	16E	16F	16G	
86	124	25959	93	0	1570	5816	6638	40199
87	208	31653	902	1	1090	9495	8660	52009
88	68	22111	1254	9	2591	9141	6102	41276
89	95	26431	1015	0	517	3160	2905	34123
90	110	31926	753	2	2405	10343	10957	56496
91	34	17181	1559	1	3242	1906	3122	27044
92	35	23559	1789	18	2540	1919	3160	33019
93	87	14597	3062	618	1977	935	1786	23062
94	74	34473	4086	1460	2118	8095	3483	53789
Mean 89-93	72	22739	1636	128	2136	3653	4386	34749

SPRING SEASON - FIXED GEAR

Year	Area							Total
	16A	16B	16C	16D	16E	16F	16G	
86	234	1439	2282	328	3731	66	266	8347
87	206	4089	3082	106	3841	134	38	11496
88	78	6616	3560	108	2041	158	122	12682
89	88	3827	1556	74	5080	134	62	10822
90	62	1715	2232	167	4285	141	17	8618
91	26	2139	5159	193	5018	127	16	12678
92	26	2856	4348	243	4699	146	54	12372
93	34	2377	4533	885	6893	200	124	15047
94	129	1550	6187	218	10499	154	71	18809
Mean 89-93	47	2583	3566	312	5195	150	55	11907

Table 5. Landings (t) for NAFO Division 4T by area, fishing season and gear type. Landings from 1992-1994 are provisional. Spring fishing: January-June, Fall fishing: July-December. %P: Percentage by numbers of spring spawners (P) in biological samples; N: sample size; NS: no sample available (*), or inadequate for one of the spawning groups (fall (A) or spring (P)).

	South/Sud (4Tf-4Tk)				Middle/Milieu (4T1)				North/Nord (4Tm-4To)			
	Spring/Printemps		Fall/Automne		Spring/Printemps		Fall/Automne		Spring/Printemps		Fall/Automne	
	Fixed/ Fixes	Mobile/ Mobiles	Fixed/ Fixes	Mobile/ Mobiles	Fixed/ Fixes	Mobile/ Mobiles	Fixed/ Fixes	Mobile/ Mobiles	Fixed/ Fixes	Mobile/ Mobiles	Fixed/ Fixes	Mobile/ Mobiles
1978 T	1,114	4,648	933	4,885	6,261	0	630	3,491	1,172	3,399	3,578	23,379
%P	99	78	0	32	93	--	6	25	100	78	2	24
N	4275	1090	121	516	489	--	*	292	89	*	945	1487
NS						*				*		
1979 T	1,241	13,901	2,305	78	5,246	0	1,069	5,738	1,137	0	2,701	14,803
%P	98	50	1	30	92	--	4	3	92	--	8	38
N	6081	1246	1311	*	499	--	193	345	*	--	287	3522
NS				*		P			*			
1980 T	1,994	13,897	2,786	320	3,604	20	1,826	793	1,674	0	1,933	13,699
%P	99	44	3	30	99	44	9	5	100	--	3	32
N	4780	1487	*	*	1100	*	186	97	298	--	297	2346
NS			*	*	A	*	P					
1981 T	2,386	21	3,272	3,081	4,028	0	2,381	14	1,087	0	5,572	93
%P	97	47	14	30	93	--	4	13	89	--	2	13
N	3157	*	399	*	494	--	694	*	1053	--	2291	759
NS		*		*			*		*			
1982 T	2,015	0	5,241	0	2,836	0	1,105	9	1,072	62	6,636	2,569
%P	98	--	0	--	100	--	0	13	99	47	5	13
N	4070	--	298	--	396	--	75	*	772	*	1867	798
NS							*	A				
1983 T	1,911	0	5,177	85	5,097	19	1,572	3,256	1,515	0	7,091	148
%P	97	--	0	30	95	47	9	30	100	--	4	30
N	*	--	812	*	683	*	175	*	114	--	1151	1200
NS	*			*		*		*				
1984 T	663	3	7,939	0	4,192	1	1,338	114	427	0	6,697	2,164
%P	88	47	1	--	96	47	0	17	92	--	6	17
N	157	*	459	--	*	*	405	*	143	--	1049	993
NS	*	P		*	*	*	*	*				
1985 T	2,352	0	9,362	0	3,902	0	1,413	0	963	0	12,932	7,022
%P	80	--	7	--	100	--	0	--	78	--	26	29
N	240	--	449	--	70	--	*	--	77	--	336	429
NS							*					
1986 T	3,336	0	12,265	44	3,389	0	1,570	0	1,825	0	26,056	10,871
%P	97	--	1	8	92	--	0	--	91	--	12	37
N	192	--	664	36	204	--	*	--	281	--	577	693
NS	A	P		P			*					
1987 T	3,611	0	18,232	78	3,749	0	1,974	13	4,399	0	31,922	13,643
%P	78	--	1	30	100	--	0	32	96	--	7	32
N	268	--	1724	*	230	--	32	*	328	--	1316	450
NS		P		*			*		*			
1988 T	2,091	0	15,080	224	4,047	0	3,797	1	6,749	0	22,334	17,306
%P	95	--	1	30	96	--	0	38	84	--	14	38
N	572	--	685	*	425	--	94	*	527	--	763	530
NS		P		*			*					

Table 5 (Cont'd). Landings (t) for NAFO Division 4T by area, fishing season and gear type.

South/Sud (4TF-4Tk)				Middle/Milieu (4T1)				North/Nord (4Tm-4To)				
Spring/Printemps		Fall/Automne		Spring/Printemps		Fall/Automne		Spring/Printemps		Fall/Automne		
Fixed/ Fixes	Mobile/ Mobiles	Fixed/ Fixes	Mobile/ Mobiles	Fixed/ Fixes	Mobile/ Mobiles	Fixed/ Fixes	Mobile/ Mobiles	Fixed/ Fixes	Mobile/ Mobiles	Fixed/ Fixes	Mobile/ Mobiles	
1989 T	5,134	0	6,219	0	2,138	0	1,560	0	3,821	0	26,071	14,269
%P	96	--	0	--	97	--	0	--	90	--	6	29
N	445	--	447	--	1027	--	*	--	517	--	1407	801
NS					*							
1990 T	4,326	0	23,088	0	2,760	0	2,990	0	1,974	1	31,043	10,309
%P	97	--	0	--	98	--	3	--	82	82	4	37
N	446	--	2612	--	338	--	153	--	367	*	2026	406
NS					A		P					
1991 T	4,386	0	4,993	0	6,267	0	4,372	0	2,239	18	17,779	8,059
%P	96	--	0	--	99	--	0	--	97	97	1	26
N	340	--	1579	--	629	--	261	--	737	*	1403	671
NS					A					*		
1992 T	3,683	1,121	5,244	0	5,827	0	3,892	7	2,965	23,943	7,108	
%P	99	85	0	--	100	--	0	26	100	--	1	26
N	586	247	566	--	542	--	63	*	242	--	1250	895
NS	A						*					
1993 T	5,528	2,148	2,148	0	6,305	0	4,820	0	3,349	--	15,330	6,228
%P	95	87	4	--	96	--	0	--	98	--	5	22
N	546	*	725	--	766	--	366	--	525	--	1012	309
NS		*									P	
1994 T	8,754	3,933	13,457	307	8,508	0	5,822	1	1,752	0	34,533	6,652
%P	98	74	8	27	99	--	0	27	100	--	1	27
N	655	262	463	*	855	--	97	*	368	--	610	720
NS	A			*	A			*				

Table 6. The number of nets per gillnetter used in each statistical district for the spring and fall fisheries.

Fall/Automne									
Statistical District/ District statistique	86	87	88	89	90	91	92	93	94
11	10	10	9	6	7	10	9	5	6
13	12	9	8	7	8	5	4	8	6
65	9	5	9	6	6	5	7	7	10
66	5	5	6	6	6	5	5	6	5
67	8	6	7	7	6	6	7	6	5
87	10	8	10	8	10	12	7	7	7
92	10	8	10	11	7	7	9	9	12

Spring/Printemps									
Statistical District/ District statistique	86	87	88	89	90	91	92	93	94
11	2	5	2	2	2	4	3	3	2
13	5	5	5	6	5	6	5	5	5
65	9	18	15	14	16	14	12	8	8
66	5	3	5	4	5	5	6	4	5
67	7	10	24	15	5	8	8	9	5
73	23	20	17	16	18	11	9	14	10
75	26	21	23	22	23	24	25	26	20
78	27	43	26	30	36	40	23	28	28
80	29	39	38	31	35	35	36	32	32
82	16	37	26	29	24	29	22	22	27
92	19	23	13	13	12	10	11	10	9

Table 7. Average number of nets used in 4T during fall and spring gillnet fisheries.

Year	Fall	Spring
78	11.4	29.4
79	11.9	34.4
80	10.4	20.2
81	9.6	18.6
82	9.0	20.4
83	7.3	22.5
84	5.3	26.5
85	5.2	37.2
86	5.2	26.6
87	4.7	23.9
88	5.0	19.9
89	5.3	26.6
90	5.2	29.4
91	5.0	27.6
92	5.0	22.7
93	5.4	24.0
94	5.4	22.9

Table 8. Number of participants in fall and spring index gillnetter programs by area. Acadian Peninsula includes statistical districts (63-70), Escuminac (71-76), Southeast New Brunswick (77-80), Nova Scotia (1-14 and 45-46), East PEI (85-88), and West PEI (82-83 and 92-96).

FALL INDEX GILLNETTER PROGRAM

Year	Location							Total
	Acadian Peninsula	Escuminac	Southeast New Bruns	Nova Scotia	East PEI	West PEI		
86	5	0	0	4	4	3		16
87	10	1	0	4	4	4		23
88	5	0	0	3	4	3		15
89	4	0	0	0	1	3		8
90	5	0	0	0	5	3		13
91	4	1	0	2	6	1		14
92	5	3	0	2	4	3		17
93	4	4	0	2	6	1		17
94	4	2	0	2	0	2		10

SPRING INDEX GILLNETTER PROGRAM

Year	Location							Total
	Acadian Peninsula	Escuminac	Southeast New Bruns	Nova Scotia	East PEI	West PEI		
87	3	1	0	1	0	2		7
88	4	4	3	2	0	0		13
89	3	3	2	1	0	2		11
90	5	3	2	1	0	2		13
91	6	1	4	1	0	1		13
92	6	4	1	0	0	2		13
93	5	1	3	1	0	1		11
94	6	3	1	1	0	3		14

Table 9. Fall gillnet fishery catch rate analysis for all of 4T using purchase slip data.
Reference categories were year 1987, statistical district 66, and week 4.

Fall/Automne Total

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	27	3900.84932	144.47590	181.188	0.0001
Error	2617	2086.74736	0.79738		
C Total	2644	5987.59668			
Root MSE		0.89296	R-square	0.6515	
Dep Mean		5.95905	Adj R-sq	0.6479	
C.V.		14.98498			

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > T
INTERCBP	1	7.428591	0.08547129	86.913	0.0001
YY78	1	-1.446829	0.14368507	-10.069	0.0001
YY79	1	-2.203171	0.11223193	-19.631	0.0001
YY80	1	-2.377953	0.11016946	-21.584	0.0001
YY81	1	-1.667429	0.09228368	-18.069	0.0001
YY82	1	-1.677515	0.09390900	-17.863	0.0001
YY83	1	-1.319166	0.09366698	-14.084	0.0001
YY84	1	-0.774707	0.09783720	-7.918	0.0001
YY85	1	-0.160627	0.10119643	-1.587	0.1126
YY86	1	-0.048983	0.10268400	-0.477	0.6334
YY88	1	-0.021607	0.10321974	-0.209	0.8342
YY89	1	0.160519	0.10803675	1.486	0.1375
YY90	1	0.161105	0.09818117	1.641	0.1009
YY91	1	0.259723	0.10573190	2.456	0.0141
YY92	1	0.285644	0.10085398	2.832	0.0047
YY93	1	0.084603	0.10370338	0.816	0.4147
YY94	1	0.186871	0.09134016	2.046	0.0409
D11	1	-0.757236	0.06022337	-12.574	0.0001
D13	1	-0.958161	0.09424483	-10.167	0.0001
D65	1	-1.001108	0.05521191	-18.132	0.0001
D67	1	-0.160058	0.06194930	-2.584	0.0098
D87	1	-0.228014	0.06139533	-3.714	0.0002
D92	1	-0.712353	0.07079484	-10.062	0.0001
W1	1	-1.134159	0.05842466	-19.412	0.0001
W2	1	-0.251362	0.05937262	-4.234	0.0001
W3	1	-0.087617	0.05566696	-1.574	0.1156
W5	1	-0.060266	0.06021515	-1.001	0.3170
W6	1	-0.600344	0.08209978	-7.312	0.0001

Table 10. Fall gillnet fishery catch rate analysis for index gillnetters. Reference categories were Year 1987, Week 4, and Statistical District 66.

Index Gillnetters/ Pêcheurs repères au filet amillant

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	15	105.31014	7.02068	11.175	0.0001
Error	1509	948.00913	0.62824		
C Total	1524	1053.31927			
Root MSE		0.79261	R-square	0.1000	
Dep Mean		7.00243	Adj R-sq	0.0910	
C.V.		11.31912			

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > T
INTERCEP	1	7.228405	0.06174046	117.077	0.0001
YY86	1	0.066224	0.07929504	0.835	0.4038
YY88	1	-0.186777	0.09221472	-2.025	0.0430
YY89	1	0.330507	0.11555631	2.860	0.0043
YY90	1	-0.028118	0.08247324	-0.341	0.7332
YY91	1	0.213498	0.08198859	2.604	0.0093
YY92	1	0.197080	0.07249610	2.718	0.0066
YY93	1	0.165988	0.07333617	2.263	0.0238
YY94	1	-0.015666	0.07912984	-0.198	0.8431
L4	1	-0.375572	0.06934117	-5.416	0.0001
L5	1	-0.413460	0.05560548	-7.436	0.0001
L6	1	-0.410490	0.05685247	-7.220	0.0001
W2	1	-0.416825	0.07552770	-5.519	0.0001
W3	1	-0.139260	0.05861789	-2.376	0.0176
W5	1	-0.001836	0.05553346	-0.033	0.9736
W6	1	-0.001471	0.07403603	-0.020	0.9842

Table 11. Fall abundance index used on ADAPT formulations. Fall index is derived from purchase slip catch rates (kg/net-trip).

		Fall																
Age/Age		78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94
1		0	38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2		9	0	2	14	0	0	0	0	16	1	0	0	1	0	5	0	0
3		373	20	293	247	79	35	70	115	104	395	73	26	193	19	33	9	0
4		576	420	192	1037	548	979	1808	909	2111	1886	1275	1239	1178	4705	1295	291	518
5		361	216	225	271	618	463	977	2521	1060	1493	2617	1935	1034	1220	5458	3546	693
6		85	123	37	106	180	638	604	1533	2211	1022	1263	2602	1472	872	1227	4355	2737
7		77	36	64	44	92	105	434	980	1236	1794	826	1233	2829	1286	738	720	3946
8		406	45	14	26	38	79	97	464	527	766	890	627	887	1585	899	378	691
9		12	37	9	11	14	24	33	125	300	463	434	792	478	577	940	437	546
10		16	12	11	10	4	6	15	75	22	225	171	292	520	287	458	233	545
11		197	23	4	4	2	8	7	16	44	93	101	227	282	541	674	332	798

Table 12. ADAPT input summary for fall herring Division 4T, 1994.

Parameters:

- year-class estimates: N_i $i=4-10$
- calibration constants: K_i $i=4-10$

Structure:

- F for oldest age group (11+) assumed equal to F at age 10 (CALC-F-OLD)
- model did not include an intercept term (tested and found to be non-significant)

Input:

- $catch_{i,t}$ and $weight_{i,t}$ $i=2-11+, t=1978-1994$
- log CPUE $_{i,t}$ (kg/net-trip) $i=2-11+, t=1978-1994$
- natural mortality=0.2

Objective function:

- minimize $\sum \sum (\text{observed log CPUE}_{i,t}) - (\text{predicted log CPUE}_{i,t})$

Summary:

- number of parameters: 14
- number of observations: 119

Table 13. Parameter estimates and correlations from Fall ADAPT analysis using fall catch rates from purchase slips as the abundance index.

approximate statistics assuming linearity near solution													
orthogonality offset 0.00098													
mean square residuals 0.16719													
Age	par est	std err	cv	t-stat	% bias								
4	108459.738	47532.6060	0.438251	2.281797	9.567059								
5	64471.2910	21828.5073	0.338577	2.953536	5.322949								
6	262637.071	75512.9155	0.287518	3.478042	3.710785								
7	400113.685	102999.987	0.257427	3.884599	2.886090								
8	64179.4903	15925.3936	0.248138	4.030010	2.524671								
9	38518.5531	9419.76151	0.244551	4.089122	2.309885								
10	42685.3827	9930.58516	0.232646	4.298375	2.054908								
4	0.004401	0.000473	0.107471	9.304828	0.431209								
5	0.006781	0.000713	0.105070	9.517442	0.486067								
6	0.007283	0.000756	0.103746	9.638929	0.515981								
7	0.008787	0.000903	0.102774	9.730075	0.535413								
8	0.010039	0.001024	0.102006	9.803311	0.550848								
9	0.009690	0.000981	0.101284	9.873232	0.555567								
10	0.010419	0.001047	0.100519	9.948326	0.541424								
parameter correlation matrix													
1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	1.00	0.05	0.04	0.03	0.03	0.02	-0.25	-0.02	-0.02	-0.01	-0.01	-0.01	0.00
2	0.05	1.00	0.06	0.05	0.04	0.04	0.03	-0.18	-0.20	-0.02	-0.02	-0.01	-0.00
3	0.04	0.06	1.00	0.06	0.05	0.04	-0.15	-0.16	-0.18	-0.02	-0.02	-0.01	-0.01
4	0.03	0.05	0.06	1.00	0.06	0.05	0.05	-0.14	-0.14	-0.15	-0.16	-0.02	-0.01
5	0.03	0.04	0.05	0.06	1.00	0.06	0.05	-0.12	-0.12	-0.13	-0.14	-0.15	-0.01
6	0.03	0.04	0.05	0.05	0.06	1.00	0.06	-0.10	-0.11	-0.12	-0.12	-0.14	-0.01
7	0.02	0.03	0.04	0.05	0.05	0.06	1.00	-0.09	-0.09	-0.10	-0.11	-0.11	-0.13
8	-0.25	-0.18	-0.15	-0.14	-0.12	-0.10	-0.09	1.00	0.09	0.09	0.07	0.05	0.04
9	-0.02	-0.20	-0.16	-0.14	-0.12	-0.11	-0.09	0.09	1.00	0.07	0.05	0.04	0.02
10	-0.02	-0.02	-0.18	-0.15	-0.13	-0.11	-0.10	0.07	0.07	1.00	0.06	0.04	0.03
11	-0.01	-0.02	-0.02	-0.16	-0.14	-0.12	-0.11	0.05	0.05	0.06	1.00	0.04	0.03
12	-0.01	-0.01	-0.02	-0.02	-0.15	-0.12	-0.11	0.04	0.04	0.04	0.04	1.00	0.03
13	-0.01	-0.01	-0.01	-0.01	-0.01	-0.14	-0.12	0.02	0.02	0.03	0.03	0.03	1.00
14	-0.00	-0.00	-0.01	-0.01	-0.01	-0.13	0.01	0.01	0.01	0.01	0.01	0.02	1.00
residuals for calibration index 1													
78	79	80	81	82	83	84	85	86	87	88	89	90	91
4	0.78	0.42	-0.19	0.38	-0.34	-0.26	-0.12	-0.32	0.48	-0.02	-0.11	0.26	0.08
5	0.12	0.18	0.04	0.17	-0.20	-0.64	-0.41	0.06	-0.31	0.05	0.20	0.17	-0.01
6	-0.54	-0.12	-0.83	-0.35	0.11	0.14	-0.14	0.28	0.20	-0.05	0.17	0.47	0.18
7	-0.56	-1.01	0.46	-0.36	-0.31	-0.25	-0.10	0.51	0.28	0.22	-0.05	0.31	0.89
8	1.07	-0.58	-0.68	0.26	-0.23	-0.23	-0.12	0.17	0.18	0.14	-0.21	-0.06	0.29
9	-0.66	-0.15	-0.82	0.14	0.27	-0.28	-0.78	0.58	0.16	0.64	0.07	0.07	0.16
10	0.27	1.15	0.51	0.08	-0.33	-0.12	-0.43	0.42	-0.77	0.33	0.14	0.08	0.08

Table 14. Population numbers and fishing mortalities from fall ADAPT analysis with catch rates from purchase slips as the abundance index.

Population Numbers

Age	Year																
	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94
2	145010	399548	345825	552080	856441	524475	571572	823621	609080	401624	461959	1896766	933734	176386	211059	41896	3318
3	150682	117325	319374	280346	451301	699305	428066	467031	673346	497755	328027	374345	1552289	764420	144413	172698	34258
4	100012	100209	81237	218041	219744	360153	564657	346085	377721	546644	397994	264359	305002	1263822	619878	117430	139452
5	79305	50583	53715	45700	146500	161288	269003	433700	267933	272813	407778	303718	200239	224336	978471	490718	91392
6	28177	39891	21457	26671	30513	101146	119597	202915	325652	196541	192342	290406	223585	139287	168852	737670	369431
7	22776	17896	14827	9491	18964	19912	69410	88242	147416	228159	133998	134022	205618	154448	105670	123351	561378
8	29567	13497	9587	3105	6555	13000	13979	50568	61355	95944	146147	89219	93721	114753	114933	77237	92216
9	4575	10813	6738	1826	1733	4293	9081	10090	35682	39339	58284	99301	60470	59173	80144	84421	57893
10	2515	1923	3283	1423	806	949	2978	6940	6503	23769	21614	37355	69404	37205	42450	55599	63994
11	29653	13107	1896	669	1253	1337	1544	3420	6938	9458	21136	27762	44929	74028	82175	85872	99028
Total 5+	196568	147710	111503	88885	206324	301925	485592	795875	851479	866023	981299	981783	897966	803230	1572695	1654868	1335332

Fishing Mortality

Age	Year																
	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94
2	0.01	0.02	0.01	0	0	0	0	0	0	0	0.01	0	0	0	0	0	0.01
3	0.21	0.17	0.18	0.04	0.03	0.01	0.01	0.01	0.02	0.02	0	0.01	0.01	0.01	0.01	0.01	0.01
4	0.48	0.42	0.38	0.2	0.11	0.09	0.06	0.06	0.13	0.09	0.07	0.08	0.11	0.06	0.03	0.05	0.16
5	0.49	0.66	0.5	0.2	0.17	0.1	0.08	0.09	0.11	0.15	0.14	0.11	0.16	0.08	0.08	0.08	0.21
6	0.25	0.79	0.62	0.14	0.23	0.18	0.1	0.12	0.16	0.18	0.16	0.15	0.17	0.08	0.11	0.07	0.18
7	0.32	0.42	1.36	0.17	0.18	0.15	0.12	0.16	0.23	0.25	0.21	0.16	0.38	0.1	0.11	0.09	0.17
8	0.81	0.49	1.46	0.38	0.22	0.16	0.13	0.15	0.24	0.3	0.19	0.19	0.26	0.16	0.11	0.09	0.19
9	0.67	0.99	1.35	0.62	0.4	0.17	0.07	0.24	0.21	0.4	0.24	0.16	0.29	0.13	0.17	0.08	0.24
10	0.71	1.9	1.88	0.32	0.24	0.2	0.08	0.21	0.16	0.26	0.24	0.18	0.24	0.11	0.18	0.12	0.21
11	0.71	1.9	1.88	0.32	0.24	0.2	0.08	0.21	0.16	0.26	0.24	0.18	0.24	0.11	0.18	0.12	0.21
Mean 7-9	0.60	0.63	1.39	0.39	0.27	0.16	0.11	0.18	0.23	0.32	0.21	0.17	0.31	0.13	0.13	0.09	0.20

Table 15. Partial recruitment estimated using gillnet and acoustic percentages at age.

SUMMARY

Age	Gillnet/ Acoustics						Fishing Mortality	
	Partial Recruitment						Mean	Part Rec
	90	91	92	93	94	Ave		
1	0.00	0.00	0.00	0.00	0.00	0.00		
2	0.00	0.00	0.00	0.00	0.00	0.00		
3	0.01	0.03	0.06	0.01	0.00	0.03		
4	0.08	0.30	0.22	0.03	0.06	0.18	0.08	0.74
5	0.44	0.31	0.51	0.17	0.25	0.33	0.09	0.79
6	0.46	0.47	0.51	0.07	1.00	0.35	0.10	0.89
7	1.00	1.00	0.74	0.06	1.00	0.60	0.12	1.00
8	1.00	1.00	0.61	1.00	1.00	0.87	0.13	1.00
9	1.00	1.00	1.00	1.00	1.00	1.00	0.13	1.00
10	1.00	1.00	1.00	1.00	1.00	1.00	0.13	1.00
11	1.00	1.00	1.00	1.00	1.00	1.00		

Year	Age	Gillnet	Acoustic	Gillnet/	Partial
		4T	4TVn	Acoustic	Recruitment
1994	1	0.00	0.58	0.00	0.00
	2	0.00	0.43	0.00	0.00
	3	0.00	1.31	0.00	0.00
	4	4.94	48.65	0.10	0.06
	5	6.62	15.33	0.43	0.25
	6	26.13	14.86	1.76	1.00
	7	37.67	15.23	2.47	1.00
	8	6.60	1.93	3.42	1.00
	9	5.21	1.03	5.06	1.00
	10	5.20	0.00	>12.00	1.00
	11	7.62	0.65	11.72	1.00

Table 16. Input values used to make projections for 1995 and 1996 catches at target fishing mortality rate.

Age	Beginning of Year Numbers		Average Weight	Partial Recruitment	Catch at F _{0.1}	
	1994	1995			1995	1996
3	377286	375687	0.14	0.03	7060	7041
4	139447	276018	0.19	0.54	10876	10364
5	91390	95583	0.23	0.85	4703	8627
6	369436	62139	0.26	0.88	3600	3477
7	561420	247831	0.28	0.95	16250	2509
8	92228	372587	0.31	1.00	27016	10899
9	57894	61207	0.33	1.00	4833	17846
10	63993	38421	0.33	1.00	3012	2910
11	99027	42469	0.36	1.00	3605	1978
Total					80955	65652

Table 17. Percent of catch dumped in fall Southern Gulf of St. Lawrence herring fishery as reported by index gillnetter participants for all trips and for trips when the boat limit was exceeded. Averages are amount dumped (kg) divided by total catch (kg). A blank indicates there were no participants in an area. A zero indicates there was no dumping.

All Trips

Year	Area				Average by Year
	Chaleur	Nova Scotia	EPEI	WPEI	
86	0.00	0.00	1.28	0.00	0.34
87	0.43	0.00	0.00	0.00	0.24
88	1.00	0.00	0.00	0.00	0.32
89	0.00		0.00	0.00	0.00
90	5.44		0.00	0.00	1.96
91	0.17	0.00	1.58	0.00	0.53
92	1.98	0.85	0.52	0.37	1.19
93	0.87	0.38	6.35	1.48	2.14
94	0.00	0.00		0.72	0.10
Average by Area	0.94	0.19	1.41	0.58	0.87

Trips Over the Boat Limit

Year	Area				Average by Year
	Chaleur	Nova Scotia	EPEI	WPEI	
86	0.00	0.00	0.00	0.00	0.00
87	0.00				0.00
88	3.22	0.00	0.00		1.92
89	0.00				0.00
90	13.90				13.90
91	0.48		0.00	0.00	0.25
92	5.99	8.97	0.00	16.67	6.04
93	1.66			18.37	4.97
94	0.00				0.00
Average by Area	2.01	0.88	0	3.91	2.12

Table 18. Spawning-group affinity of purse seine monthly catches by NAFO unit area, 1978-1994. All samples are from large seiners except those from August in 1991 and 1992. These August samples are from small seiners fishing near the spawning beds. Spawning-group affinity of fish caught in 4T is assigned by gonad maturity for spawning and spent fish (stages 6 and 7), otolith characteristics for juvenile fish (stages 1 and 2) and by McQuinn's (1989) Gonadosomatic Index (GSI) model for all remaining individuals. Spawning-group affinity of fish landed in 4Vn from 1978-1991 is assigned by gonad maturity for ripe, spawning and spent fish (stages 5, 6 and 7) and by otolith characteristics for all remaining individuals.

Fall fishery

Average Percentages

Month	Area							Total
	4Tf	4Tg	4Tl	4Tm	4Tn	4To	4Vn	
July			46					46
August					93			93
September	54	87		77	79	35		76
October		58	92	80	73	66	60	75
November			98	71	72		83	77
December					33		74	68
Total	54	72	88	77	73	58	77	73

Year Année	Month Mois	Percent Fall Spawners (& sample size) in Purse Seine Catches Pourcentage de géniteurs d'automne (et taille de l'échantillon) dans les prises à la senne coulissante						
		4Tf	4Tg	4Tl	4Tm	4Tn	4To	4Vn
1978	July Juillet			46 (94)				
	September Septembre		81 (234)			77 (598)		
	October Octobre			58 (282)	88 (198)		77 (689)	
	November Novembre					74 (200)		
1979	September Septembre					98 (99)	35 (200)	
	October Octobre			96 (299)		80 (1257)		
	November Novembre			100 (46)	43 (400)	60 (1168)		
	December Décembre					33 (398)	48 (291)	

Table 18. (cont'd). Spawning-group affinity of purse seine monthly catches by NAFO unit area, 1978-1994.

Fall fishery (cont'd)

Year Année	Month Mois	Percent Fall Spawners (& sample size) in Purse Seine Catches Pourcentage de géniteurs d'automne (et taille de l'échantillon) dans les prises à la senne coulissante					
		4Tf	4Tg	4Tl	4Tm	4Tn	4To
1980	October Octobre				76 (392)	68 (591)	62 (870)
	November Novembre			95 (97)	71 (199)	75 (294)	76 (168)
	December Décembre						70 (819)
1981	October Octobre				88 (298)	84 (261)	60 (65)
1982	September Septembre				94 (50)		
	October Octobre				83 (97)	88 (651)	
	November Novembre						55 (143)
	December Décembre						57 (171)
1983	September Septembre					98 (90)	
	October Octobre					67 (846)	
	November Novembre					62 (165)	
1984	October Octobre					83 (993)	
1985	October Octobre					71 (371)	
	November Novembre					76 (58)	
1986	September Septembre		92 (36)				
	October Octobre					63 (664)	
	November Novembre					52 (29)	

Table 18. (cont'd). Spawning-group affinity of purse seine monthly catches by NAFO unit area, 1978-1994.

Fall fishery (cont'd)

Year Année	Month Mois	Percent Fall Spawners (& sample size) in Purse Seine Catches Pourcentage de géniteurs d'automne (et taille de l'échantillon) dans les prises à la senne coulissante					
		4Tf	4Tg	4T1	4Tm	4Tn	4To
1987	October Octobre					69 (348)	
	November Novembre					68 (102)	82 (158)
	December Décembre						91 (110)
1988	October Octobre					63 (340)	
	November Novembre					59 (190)	94 (49)
	December Décembre						90 (333)
1989	October Octobre				70 (102)	70 (316)	
	November Novembre				68 (193)	75 (192)	
	December Décembre						90 (125)
1990	September Septembre				60 (37)		
	October Octobre					63 (369)	
1991	August Août					100 (35)	
	September Septembre					64 (127)	
	October Octobre				74 (82)	79 (205)	
	November Novembre					72 (111)	80 (196)
1992	August Août					85 (27)	
	September Septembre	54 (100)				79 (79)	
	October Octobre				98 (52)	83 (664)	
	November Novembre				100 (35)	97 (38)	93 (287)

Table 18. (cont'd). Spawning-group affinity of purse seine monthly catches by NAFO unit area, 1978-1994.

Fall fishery (cont'd)

Year Année	Month Mois	Percent Fall Spawners (& sample size) in Purse Seine Catches Pourcentage de géniteurs d'automne (et taille de l'échantillon) dans les prises à la senne coulissante					
		4Tf	4Tg	4Tl	4Tm	4Tn	4To
1993	September Septembre					69 (48)	
	October Octobre				72 (124)	56 (88)	
	November Novembre					98 (49)	94 (824)
1994	September Septembre					70 (302)	
	October Octobre				77 (77)	76 (299)	69 (42)
	November Novembre						90 (421)

Table 19. Spawning-group affinity and gonad maturity of purse seine monthly catches in Chaleur Bay (4Tm and 4Tn), 1978-1994. All samples are from large seiners except those for August 1991 and 1992, which are from small seiners fishing near spawning beds. Spawning-group affinity is classified by gonad maturity for spawning and spent fish (stages 6 and 7), otolith characteristics for juvenile fish (stages 1 and 2) and by McQuinn's (1989) Gonadosomatic Index model (GSI) for all remaining individuals. (P: Spring spawners; A: Fall spawners; N: sample size).

Average Percentages

Month	Spawning Group					Total Fall
	Spring	Maturing	Spawning	Spent		
August	8	0	98	2	92	
September	23	14	5	82	77	
October	21	36	1	63	79	
November	22	27	1	73	78	
December	60	18	0	82	40	
Total	22	26	6	68	78	

Annual and Monthly Variation

Year Année	Month Mois	%P (N)	%A		
			Maturing / en maturation	Spawning / en état de frai	Spent / épuisé
1978	September Septembre	21 (118)	16 (71)	12 (52)	73 (328)
	October Octobre	20 (127)	31 (156)	0 (0)	69 (342)
	November Novembre	28 (188)	33 (45)	0 (0)	67 (91)
	September Septembre	2 (2)	1 (1)	1 (1)	98 (95)
	October Octobre	17 (200)	29 (287)	0 (4)	71 (694)
	November Novembre	29 (109)	33 (257)	0 (0)	67 (524)
1979	December Décembre	60 (126)	18 (15)	0 (0)	82 (69)

Table 19 (cont'd). Spawning-group affinity and gonad maturity of purse seine monthly catches in Chaleur Bay (4Tm and 4To), 1978-1994.

Year Année	Month Mois	%P (N)	%A		
			Maturing / en maturation	Spawning / en état de frai	Spent / épuisé
1980	October Octobre	19 (104)	37 (162)	0 (0)	63 (275)
	November Novembre	21 (73)	17 (49)	0 (0)	83 (233)
1981	Octobre	16	24	0	76
	October	(76)	(95)	(0)	(303)
1982	September Septembre	11 (57)	18 (81)	3 (12)	80 (364)
	October Octobre	8 (3)	6 (2)	0 (0)	94 (32)
1983	September Septembre	1 (1)	13 (11)	15 (13)	72 (63)
	October Octobre	23 (112)	41 (151)	0 (1)	59 (221)
1984	November Novembre	16 (15)	23 (18)	1 (1)	76 (60)
	October Octobre	15 (135)	24 (183)	0 (3)	76 (574)
1985	October Octobre	19 (52)	25 (57)	3 (7)	72 (162)
	November Novembre	20 (49)	28 (11)	0 (0)	72 (28)
1986	October Octobre	30 (165)	45 (176)	2 (8)	53 (206)
	November Novembre	41 (9)	46 (6)	0 (0)	54 (7)
1987	October Octobre	31 (89)	58 (114)	2 (4)	40 (79)
	November Novembre	28 (23)	32 (19)	0 (0)	68 (41)
1988	Octobre	31	54	1	46
	October	(243)	(90)	(1)	(77)
	November Novembre	27 (29)	37 (29)	0 (0)	63 (49)

Table 19 (cont'd.). Spawning-group affinity and gonad maturity of purse seine monthly catches in Chaleur Bay (4Tm and 4To), 1978-1994.

Year Année	Month Mois	%P (N)	%A		
			Maturing / en maturation	Spawning / en état de frai	Spent / épuisé
1989	October Octobre	27 (102)	49 (135)	0 (1)	51 (142)
	November Novembre	25 (79)	32 (76)	0 (0)	68 (163)
1990	September Septembre	36 (9)	38 (6)	6 (1)	56 (9)
	October Octobre	26 (72)	48 (99)	5 (10)	47 (98)
1991	August Août	0 (35)	0 (0)	100 (35)	0 (0)
	September Septembre	35 (34)	18 (11)	3 (2)	79 (50)
1992	October Octobre	20 (50)	27 (55)	1 (1)	72 (145)
	November Novembre	25 (49)	34 (49)	0 (0)	66 (97)
1993	August Août	15 (4)	0 (0)	96 (22)	4 (1)
	September Septembre	22 (15)	0 (0)	2 (1)	98 (53)
1994	October Octobre	11 (68)	13 (71)	1 (7)	86 (487)
	November Novembre	1 (1)	4 (3)	0 (0)	96 (69)
1993	September Septembre	17 (6)	7 (2)	0 (0)	93 (28)
	October Octobre	27 (47)	59 (74)	0 (0)	41 (51)
1994	November Novembre	2 (1)	2 (1)	0 (0)	98 (43)
	September Septembre	62 (84)	12 (24)	1 (2)	87 (181)
	October Octobre	23 (85)	41 (113)	2 (5)	58 (161)

Table 20. Catch rates for all of 4T using purchase slip data. Reference categories were year 1988, statistical district 73, and week 4.

Spring All 4T					
Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	36	1964.63563	54.57321	75.836	0.0001
Error	2643	1901.96084	0.71962		
C Total	2679	3866.59647			
Root MSE		0.84831	R-square	0.5081	
Dep Mean		3.73477	Adj R-sq	0.5014	
C.V.		22.71371			
Parameter Estimates					
Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > T
INTERCEP	1	4.934035	0.07837840	62.951	0.0001
YY78	1	-1.202906	0.10360307	-11.611	0.0001
YY79	1	-1.645032	0.10299343	-15.972	0.0001
YY80	1	-1.511889	0.09642339	-15.680	0.0001
YY81	1	-1.093550	0.09613247	-11.375	0.0001
YY82	1	-0.661284	0.09575029	-6.906	0.0001
YY83	1	-0.793675	0.08336840	-9.520	0.0001
YY84	1	-0.537484	0.11691918	-4.597	0.0001
YY85	1	-0.826146	0.09564623	-8.638	0.0001
YY86	1	-0.388109	0.09855262	-3.938	0.0001
YY87	1	-0.176671	0.09083071	-1.945	0.0519
YY89	1	-0.369429	0.08588643	-4.301	0.0001
YY90	1	-0.658556	0.08920414	-7.383	0.0001
YY91	1	-0.146320	0.09171921	-1.595	0.1108
YY92	1	-0.077329	0.09085704	-0.851	0.3948
YY93	1	-0.051637	0.08870715	-0.582	0.5605
YY94	1	0.533414	0.08771869	6.081	0.0001
D11	1	-1.846328	0.30717210	-6.011	0.0001
D13	1	-1.671441	0.10674887	-15.658	0.0001
D63	1	0.755599	0.10200635	7.407	0.0001
D65	1	-0.726924	0.06608781	-10.999	0.0001
D66	1	-0.697165	0.12191190	-5.719	0.0001
D67	1	0.288131	0.15056260	1.914	0.0558
D75	1	-0.389027	0.10350228	-3.759	0.0002
D78	1	-0.177738	0.06676867	-2.662	0.0078
D80	1	0.014001	0.05871319	0.238	0.8115
D82	1	-1.103872	0.06069140	-18.188	0.0001
D83	1	-0.857727	0.06417781	-13.365	0.0001
D92	1	-0.857299	0.07446659	-11.513	0.0001
W1	1	-0.240409	0.29022834	-0.828	0.4076
W2	1	-0.225210	0.12819947	-1.757	0.0791
W3	1	-0.023669	0.05198425	-0.455	0.6489
W5	1	-0.030248	0.04552581	-0.664	0.5065
W6	1	-0.315518	0.05701552	-5.534	0.0001
W7	1	-1.085991	0.07241995	-14.996	0.0001
W8	1	-1.355404	0.07625070	-17.776	0.0001
W9	1	-0.834543	0.15296896	-5.456	0.0001

Table 21. Catch rates for Escuminac and Southeast New Brunswick using purchase slip data. Reference categories were year 1988, statistical district 73, and week 4.

Escuminac - Southeast New Brunswick (Purchase Slips)

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	22	834.84738	37.94761	69.956	0.0001
Error	1316	713.86564	0.54245		
C Total	1338	1548.71302			
Root MSE		0.73651	R-square	0.5391	
Dep Mean		4.17006	Adj R-sq	0.5314	
C.V.		17.66193			
Parameter Estimates					
Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > T
INTERCEP	1	5.128173	0.09906583	51.765	0.0001
YY78	1	-1.674965	0.13379583	-12.519	0.0001
YY79	1	-2.158241	0.12933223	-16.688	0.0001
YY80	1	-1.807178	0.11703623	-15.441	0.0001
YY81	1	-1.929840	0.12940638	-14.913	0.0001
YY82	1	-1.172369	0.11966911	-9.797	0.0001
YY83	1	-1.358196	0.11361538	-11.954	0.0001
YY84	1	-1.025010	0.17042868	-6.014	0.0001
YY85	1	-1.027805	0.12678431	-8.107	0.0001
YY86	1	-0.523130	0.13000078	-4.024	0.0001
YY87	1	-0.436327	0.12480619	-3.496	0.0005
YY89	1	-0.302073	0.11964225	-2.525	0.0117
YY90	1	-0.798258	0.11792176	-6.769	0.0001
YY91	1	-0.266787	0.12405363	-2.151	0.0317
YY92	1	0.217578	0.13239133	1.643	0.1005
YY93	1	0.047683	0.12084760	0.395	0.6932
YY94	1	0.479765	0.11837348	4.053	0.0001
A2	1	-0.113903	0.04295505	-2.652	0.0081
W2	1	0.046324	0.17866349	0.259	0.7955
W3	1	0.025886	0.05735515	0.451	0.6518
W5	1	-0.093646	0.05482340	-1.708	0.0878
W6	1	-0.316104	0.06794584	-4.652	0.0001
W7	1	-0.562832	0.09023789	-6.237	0.0001

Table 22. Catch rates for Escuminac and Southeast New Brunswick using Provincial Co-ordinator data. Reference categories were year 1994, area Escuminac, and week 4.

Escuminac - Southease New Brunswick (Provincial Co-ordinator)

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	10	160.71207	16.07121	13.470	0.0001
Error	259	309.01694	1.19312		
C Total	269	469.72901			
Root MSE		1.09230	R-square	0.3421	
Dep Mean		4.61738	Adj R-sq	0.3167	
C.V.		23.65624			
Parameter Estimates					
Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > T
INTERCEP	1	5.674981	0.18964411	29.924	0.0001
YY90	1	-0.883720	0.27099495	-3.261	0.0013
YY91	1	-0.453655	0.21093173	-2.151	0.0324
YY92	1	-0.407354	0.19721984	-2.065	0.0399
YY93	1	-0.165605	0.19524732	-0.848	0.3971
A2	1	-1.360378	0.13512642	-10.067	0.0001
W2	1	-0.572984	0.33366368	-1.717	0.0871
W3	1	-0.284871	0.20247718	-1.407	0.1606
W5	1	-0.185011	0.19323260	-0.957	0.3392
W6	1	-0.095085	0.21414215	-0.444	0.6574
W7	1	0.468987	0.35782667	1.311	0.1911

Table 23. Spring gillnet catch rate analysis for index gillnetters. Reference categories were Year 1988, statistical district 73, and week 4.

Index Gillnetters

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	21	503.77248	23.98917	10.917	0.0001
Error	1435	3153.30638	2.19743		
C Total	1456	3657.07886			
Root MSE		1.48237	R-square	0.1378	
Dep Mean		3.89995	Adj R-sq	0.1251	
C.V.		38.00998			
Parameter Estimates					
Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > T
INTERCEP	1	4.986726	0.14068798	35.445	0.0001
YY87	1	0.680703	0.22675410	3.002	0.0027
YY89	1	-0.248045	0.17230389	-1.440	0.1502
YY90	1	0.171335	0.18158567	0.944	0.3456
YY91	1	-0.073433	0.15599445	-0.471	0.6379
YY92	1	-0.169267	0.15094566	-1.121	0.2623
YY93	1	-0.006998	0.152477386	-0.046	0.9634
YY94	1	0.302987	0.15414542	-1.966	0.0495
D13	1	-0.812895	0.17866720	-4.550	0.0001
D63	1	-0.845054	0.11828891	-7.144	0.0001
D65	1	-1.369728	0.16894106	-8.108	0.0001
D66	1	0.383428	0.33097114	1.158	0.2469
D70	1	-1.042678	0.27634532	-3.773	0.0002
D75	1	0.842388	0.36009040	2.339	0.0195
D78	1	-1.110721	0.22191027	-5.005	0.0001
D80	1	-0.784269	0.12462559	-6.293	0.0001
D92	1	-1.474101	0.16500388	-8.934	0.0001
W2	1	-0.643468	0.21083523	-3.052	0.0023
W3	1	-0.543204	0.11075466	-4.905	0.0001
W5	1	-0.243780	0.10696955	-2.279	0.0228
W6	1	-0.570169	0.13570285	-4.202	0.0001
W7	1	-0.288876	0.19283465	-1.498	0.1343

Table 24. Catches in tonnes recorded by Purchase slips and Provincial Co-ordinator in Escuminac and Southeast New Brunswick. Effort is recorded as number of fishers by Provincial Co-ordinator and number of trips by Purchase Slips with each summed over the entire season. Effort was not recorded by the Provincial Co-ordinator until 1990. Only Escuminac catch is presented for 1987 to 1989 because Provincial Co-ordinator did not record Southeast New Brunswick catches until 1990.

Year	Catch			Effort		
	Purchase Slips	Provincial Co-ordinator	Percent Difference	Purchase Slips	Provincial Co-ordinator	Percent Difference
87	2854	2761	-3			
88	3438	2502	-27			
89	1347	2716	+102			
90	4502	4518	0	1735	1459	-16
91	8227	7618	-7	1768	1887	+7
92	6425	6590	+3	1274	1422	+12
93	8733	7075	-19	1864	1638	-12
94	12419	13163	+6	2031	3161	+56

Table 25. Partial recruitment for spring spawners estimated by dividing percent-at-age in gillnet catch-at-age by percent-at-age in acoustic survey catch-at-age.

Partial Recruitment							
Age	1990	1991	1992	1993	1994	Average	Standardized
1	0.00	0.00	0.00	0.00	0.00	0.00	0.0001
2	0.00	0.00	0.01	0.00	0.00	0.00	0.002
3	0.12	0.04	0.05	0.01	0.01	0.04	0.06
4	0.55	0.22	0.33	0.08	0.08	0.25	0.34
5	1.00	1.00	0.62	0.59	0.48	0.74	1.00
6	0.73	0.24	0.56	1.00	1.00	0.71	0.96
7	0.23	0.31	1.00		0.78	0.58	0.78
8	0.00	0.40	0.46		1.00	0.46	0.63
9	0.57	0.44	0.17		0.29	0.37	0.50
10	0.35	0.62	0.73		0.63	0.59	0.79
11	0.00	0.16			0.80	0.32	0.43

Table 26. Fall and spring spawning 4+ biomass estimates from acoustic surveys during October.

Year/ Année	Fall/ Automne			Spring/ Printmeps			Percent Spring/ Pourcentage Printemps		
	Chaleur	4Vn	Total	Chaleur	4Vn	Total	Chaleur	4Vn	Total
91	20249	4315	24565	3723	26	3749	16	1	13
92	98181	42478	140659	25978	857	26835	21	2	16
93	72456	10725	83181	13572	472	14044	16	4	14
94	36678			10275			22		

Table 27. Input values used to make projections for 1995 and 1996 catches for spring spawners at target fishing mortality rate $F_{0.1} = 0.3$ as the average fishing mortality for ages 3-11. Projections based on Terminal F assumptions for 1994 of $F = 0.6$ and $F = 0.4$ are shown.

Terminal F = 0.6

Age/ Âge	Beginning of Year Numbers			Catch at $F_{0.1}$		
	1994	1995	Average Weight	Partial Recruitment	1995	1996
3	113250	121910	0.14	0.06	2503	2518
4	44970	75611	0.17	0.34	4576	4734
5	78087	20206	0.19	1.00	1348	2505
6	138477	35939	0.22	0.96	2294	653
7	32354	71002	0.24	0.78	4232	1187
8	22025	18151	0.26	0.63	966	2257
9	7790	13359	0.30	0.50	1198	1038
10	4498	3970	0.30	0.79	211	391
11	11643	2845	0.32	0.43	0	0
Total					17326	15283

Terminal F = 0.4

Age/ Âge	Beginning of Year Numbers			Catch at $F_{0.1}$		
	1994	1995	Average Weight	Partial Recruitment	1995	1996
3	124712	135727	0.14	0.06	2786	2786
4	65337	86143	0.17	0.34	5213	5213
5	107217	24680	0.19	1.00	1646	2853
6	190750	43546	0.22	0.96	2779	798
7	45233	82989	0.24	0.78	4946	1439
8	31188	20589	0.26	0.63	1095	2638
9	11156	14764	0.30	0.50	1324	1177
10	6283	4650	0.30	0.79	247	432
11	16779	3101	0.32	0.43	0	0
Total					20037	17337

Table 28. Spawning-group affinity of purse seine monthly catches by NAFO unit area, 1978-1994. Spawning-group affinity of fish caught in 4T is assigned by gonad maturity for spawning and spent fish (stages 6 and 7), otolith characteristics for juvenile fish (stages 1 and 2) and by McQuinn's (1989) Gonadosomatic Index (GSI) model for all remaining individuals. Spawning-group affinity of fish landed in 4Vn from 1978-1991 is assigned by gonad maturity for ripe, spawning and spent fish (stages 5, 6 and 7) and by otolith characteristics for all remaining individuals.

Spring fishery

Year Année	Month Mois	Percent Spring Spawners (& sample size) in Purse Seine Catches Pourcentage de géniteurs de printemps (et taille de l'échantillon) dans les prises à la senne coulissante		
		4Tf	4Tg	4Vn
1978	April Avril	51 (100)		
	May Mai		81 (691)	85 (100)
1979	April Avril		45 (1048)	
	May Mai		73 (198)	
1980	January Janvier			45 (251)
	April Avril	29 (295)		47 (899)
	May Mai			49 (293)
1981	January Janvier			67 (184)
1992	June Juin	68 (246)		
1994	May Mai	63 (195)		70 (196)
	June Juin	89 (512)		

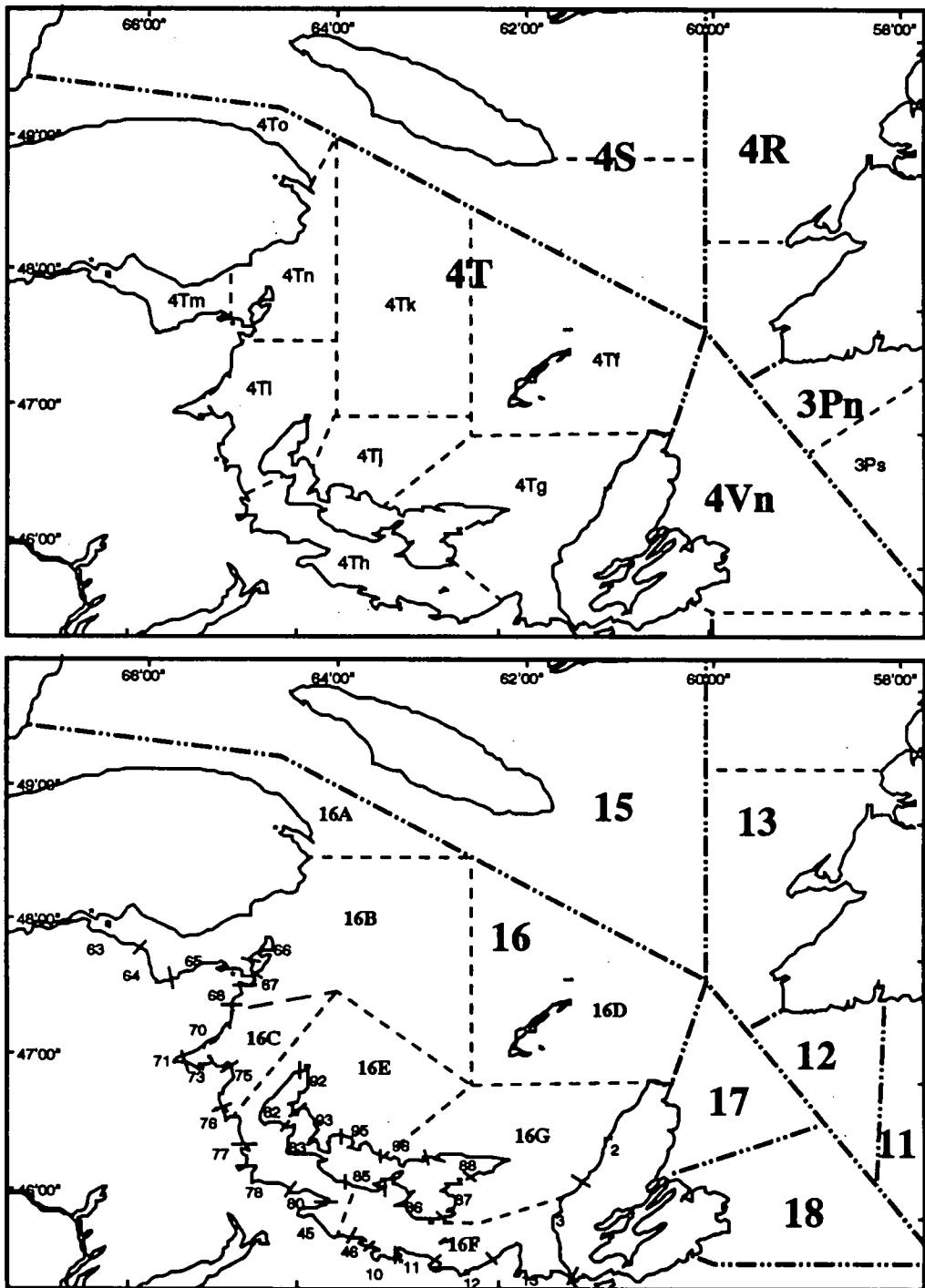


Fig. 1. Northwest Atlantic Fisheries Organization (NAFO) divisions and unit areas (upper), and Herring management zones (lower) in the Southern Gulf of St. Lawrence.

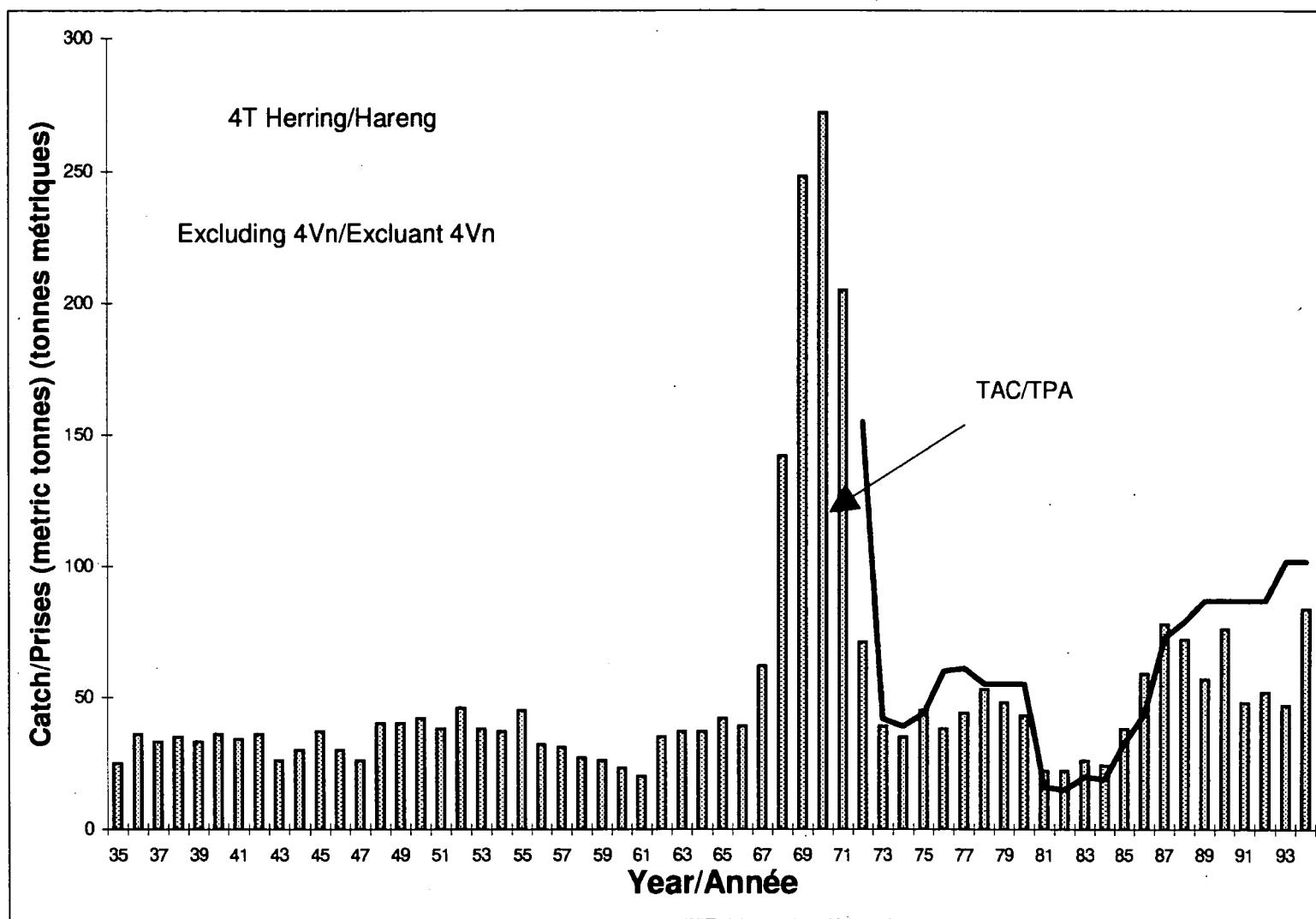


Fig. 2. Historical catches of 4T Southern Gulf of St. Lawrence herring, excluding 4Vn.

Fall/Automne
Gillnetter Telephone Survey / Sondage Téléphonique Filets Maillants

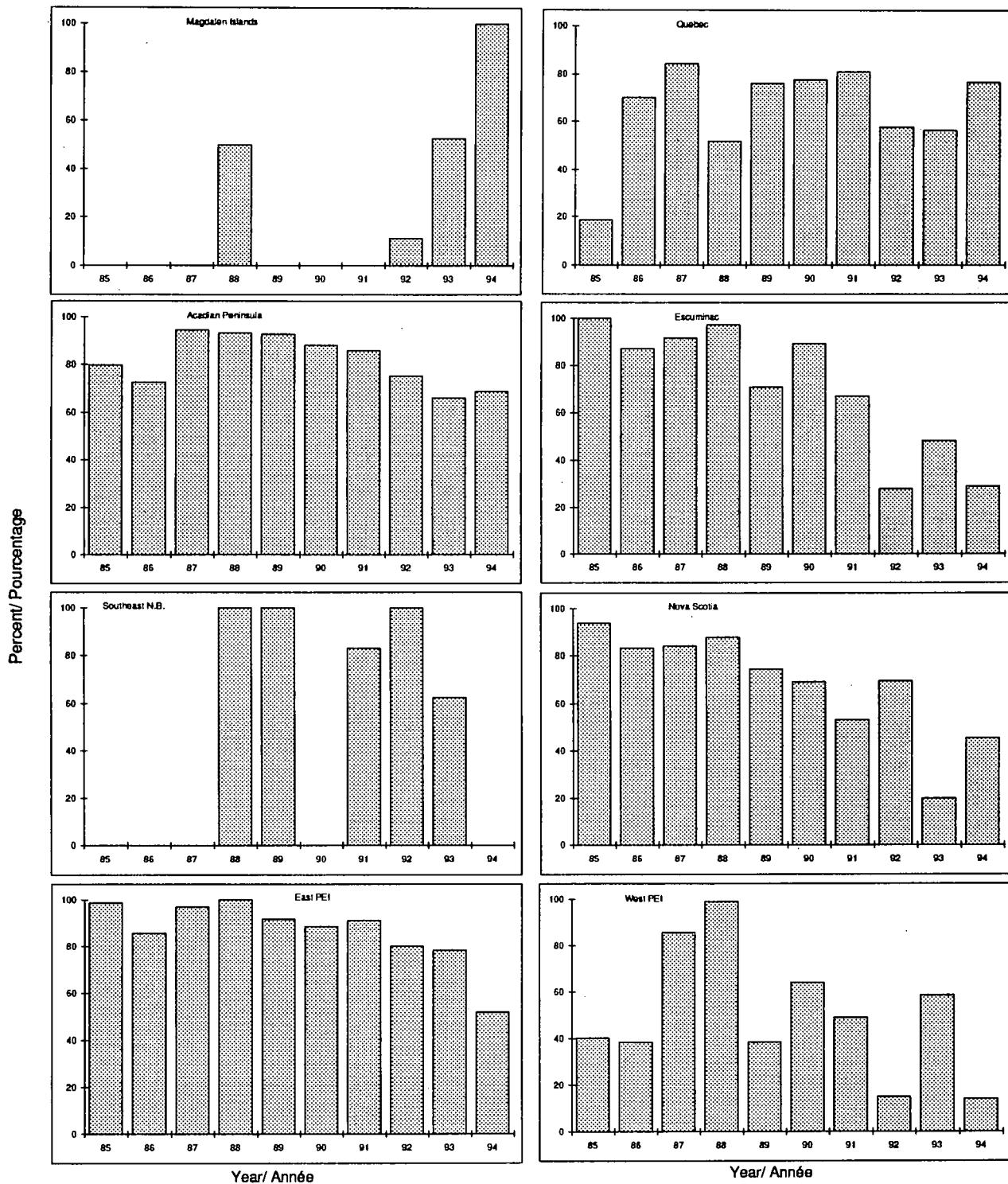
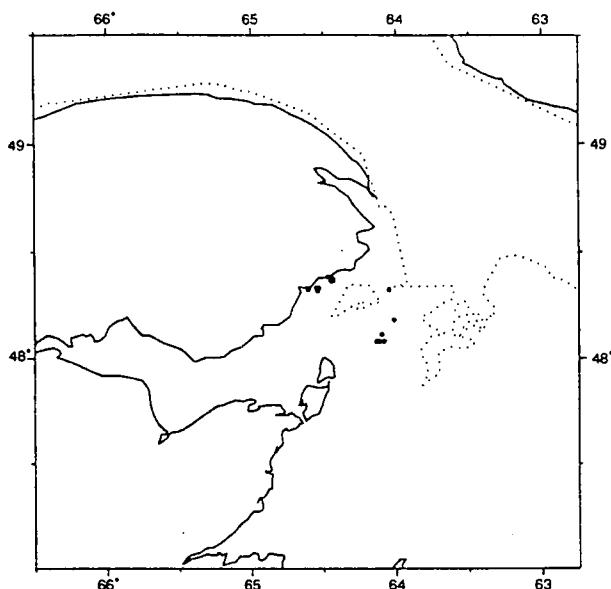
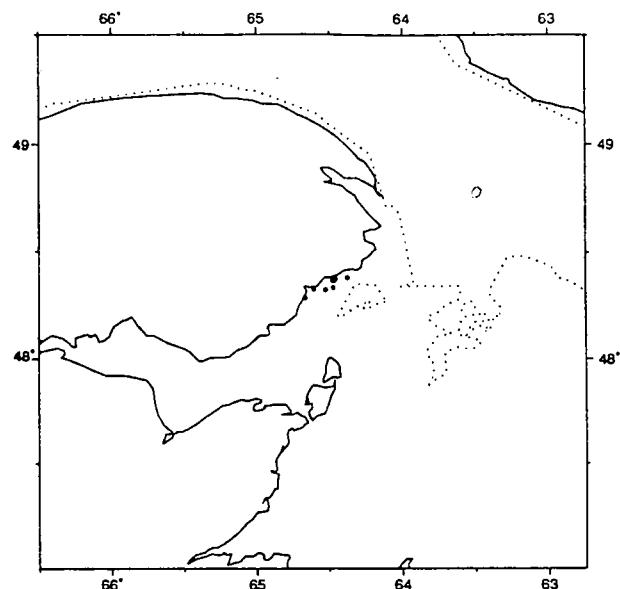


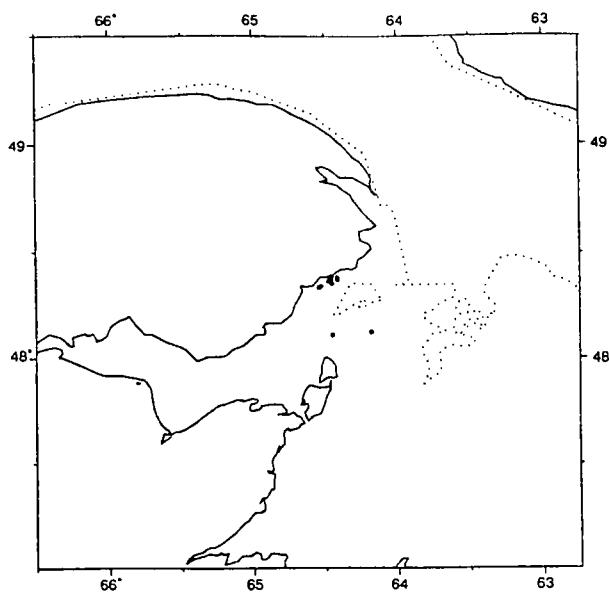
Fig. 3. Percent of nets fished that are 2 5/8 " mesh in the fall 4T fishery.



Location of herring sets by
seiners for Sep. 10 - Sep. 16,
1994

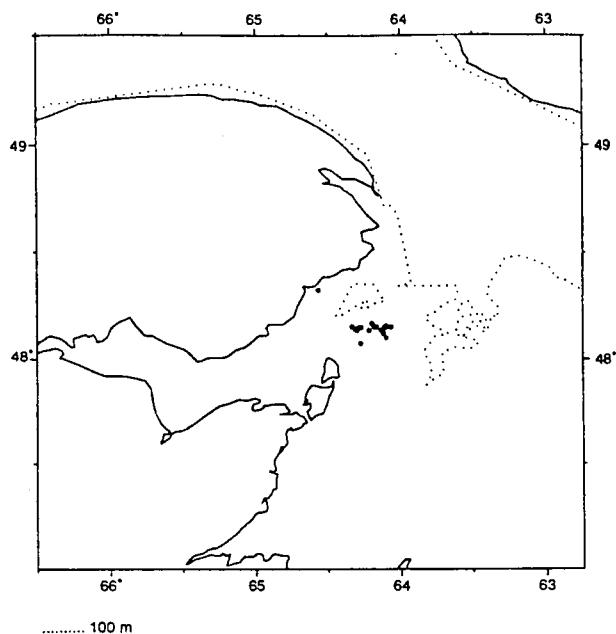


Location of herring sets by
seiners for Sep. 17 - Sep. 23,
1994

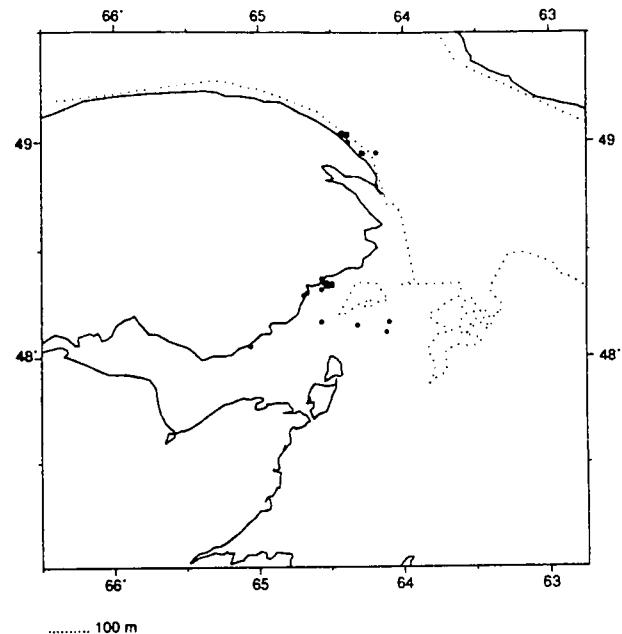


Location of herring sets by
seiners for Sep. 24 - Sep. 30,
1994

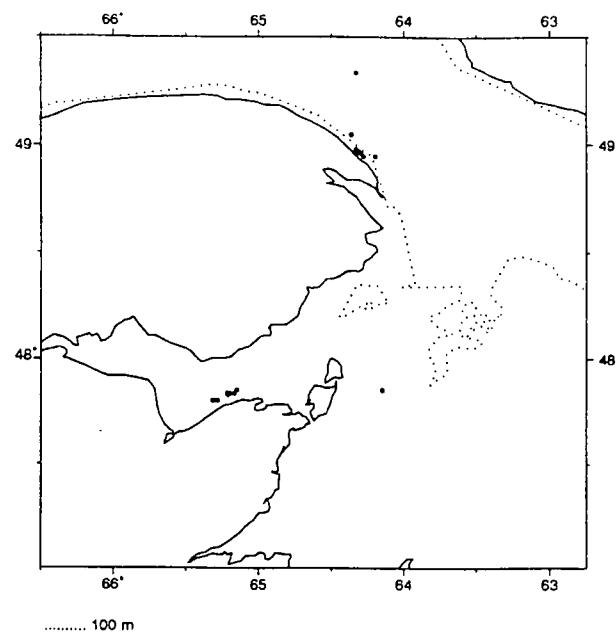
Fig. 4. Location of herring sets by seiners for Sep. 10 - Oct. 31, 1994.



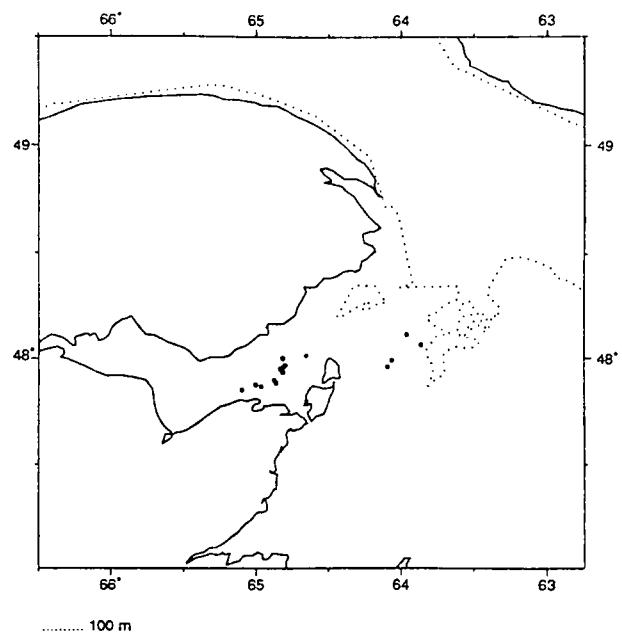
Location of herring sets by seiners for Oct 1 to Oct 7, 1994



Location of herring sets by seiners for Oct 8 to 14, 1994



Location of herring sets by seiners for Oct 15 to 21, 1994



Location of herring sets by seiners for Oct 22 to 31, 1994

Fig. 4. continued.

Spring / Printemps
Gillnetter Telephone Survey / Sondage Téléphonique Filets Maillants

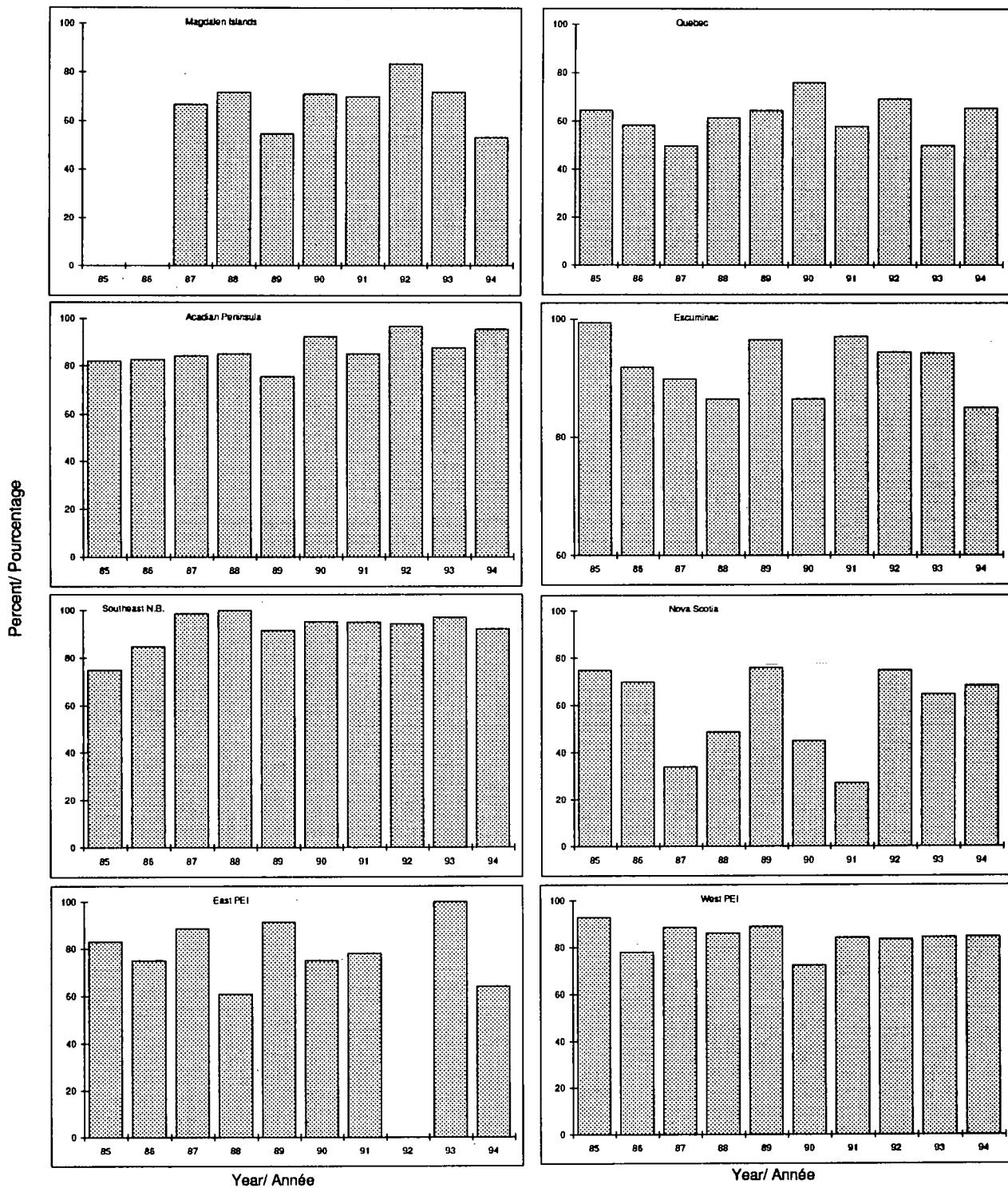
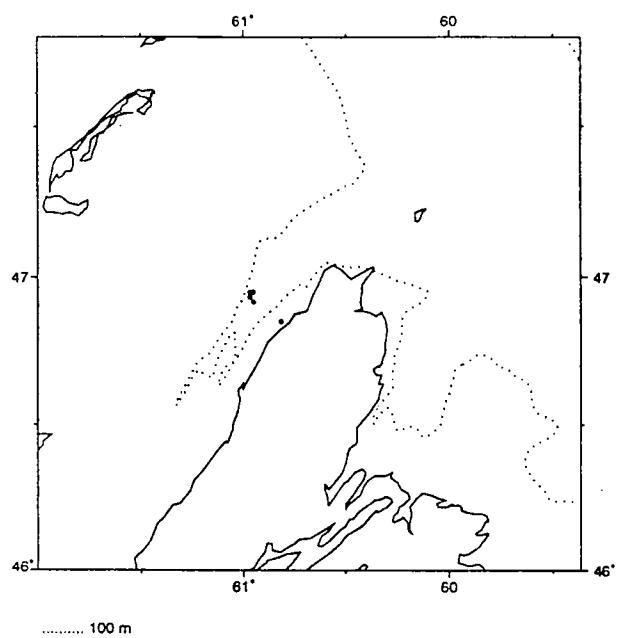
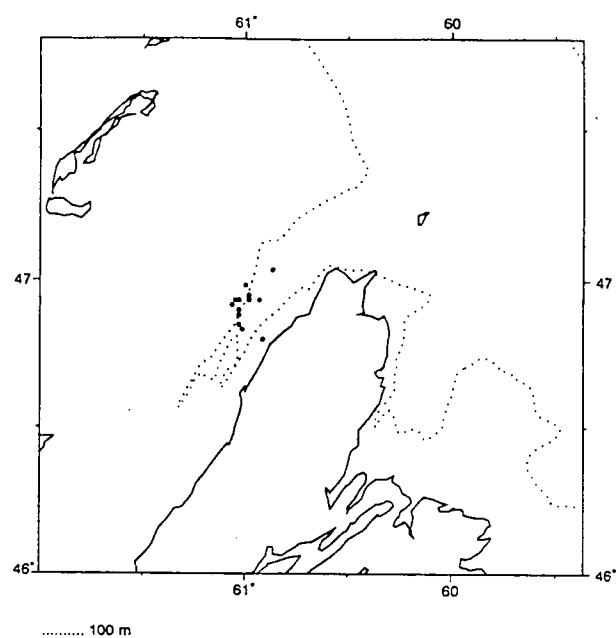


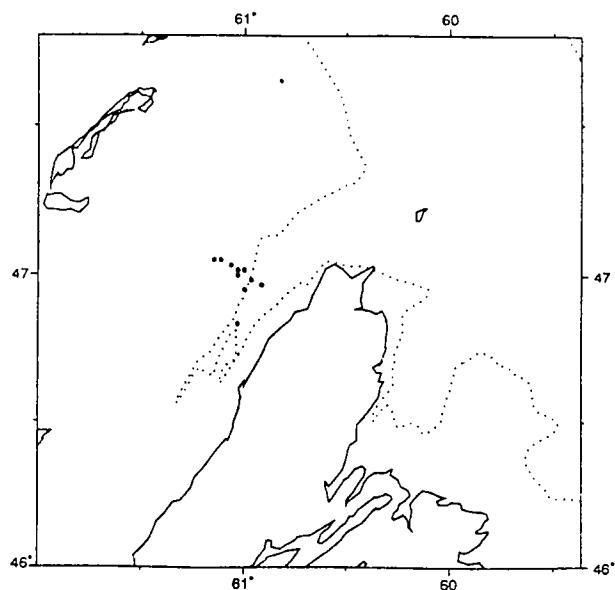
Fig. 5. Percent of nets fished that are between 2 1/4" and 2 1/2" mesh in the spring 4T fishery.



Location of herring sets by seiners for May 14 to 20, 1994



Location of herring sets by seiners for May 21 to 27, 1994



Location of herring sets by seiners for May 28 to June 3, 1994

Fig. 6. Location of herring sets by seiners for May 14 to June 3, 1994.

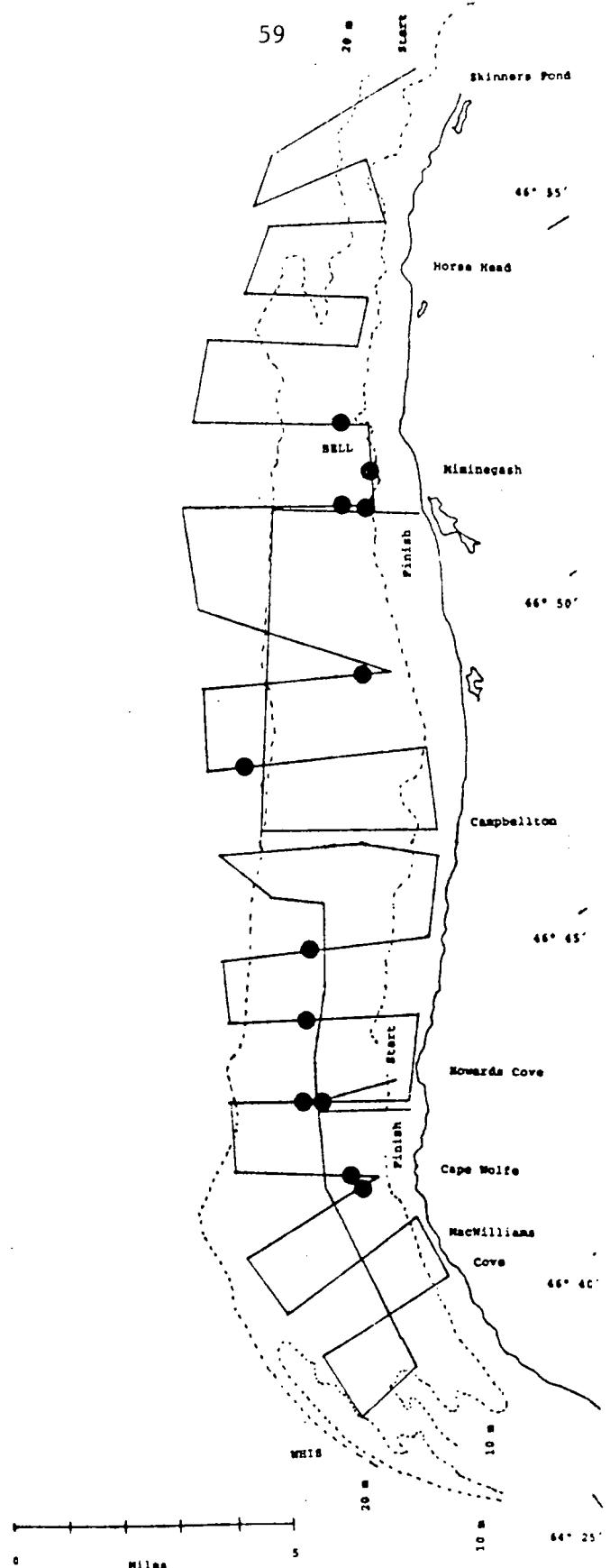


Fig. 7. Transects and herring locations during by herring gillnetters snapshot acoustic survey in West P.E.I. on October 13, 1994.

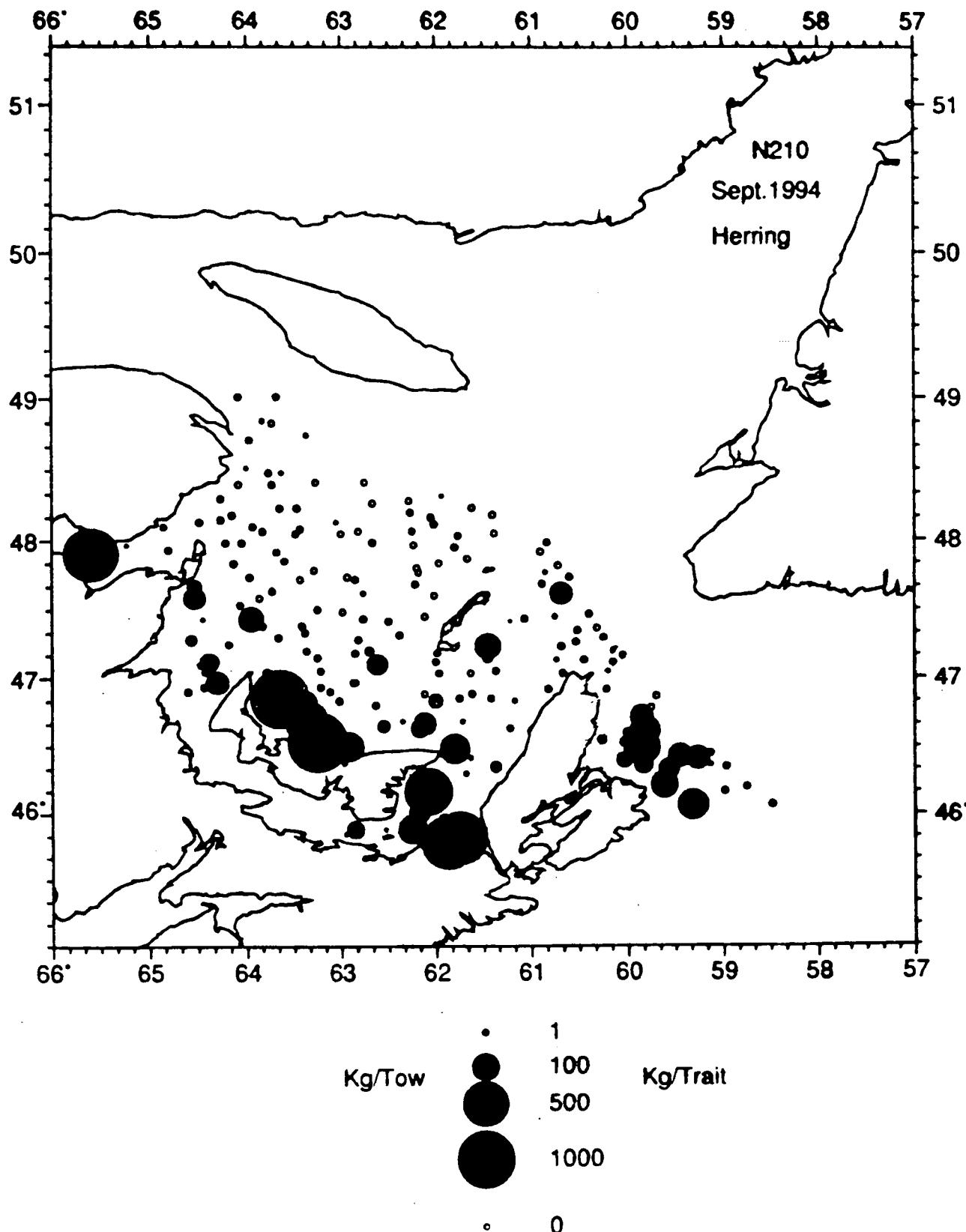


Fig. 8. Location of sets with herring during September 1994 groundfish survey.

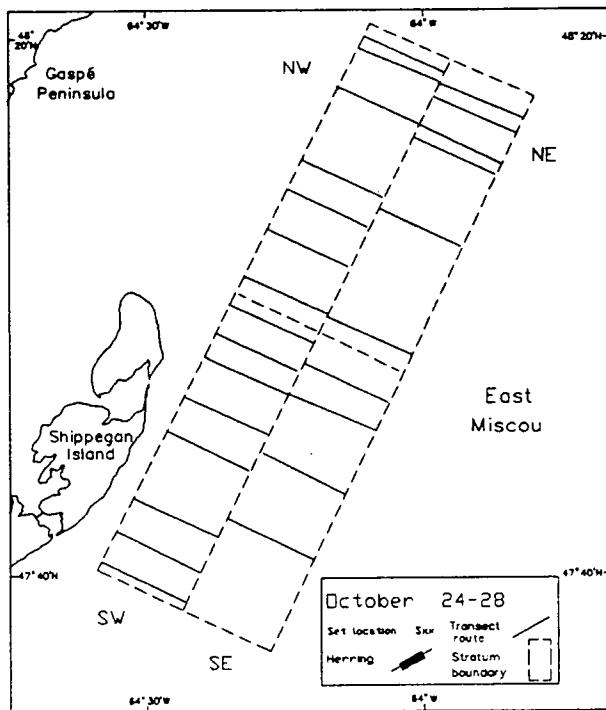
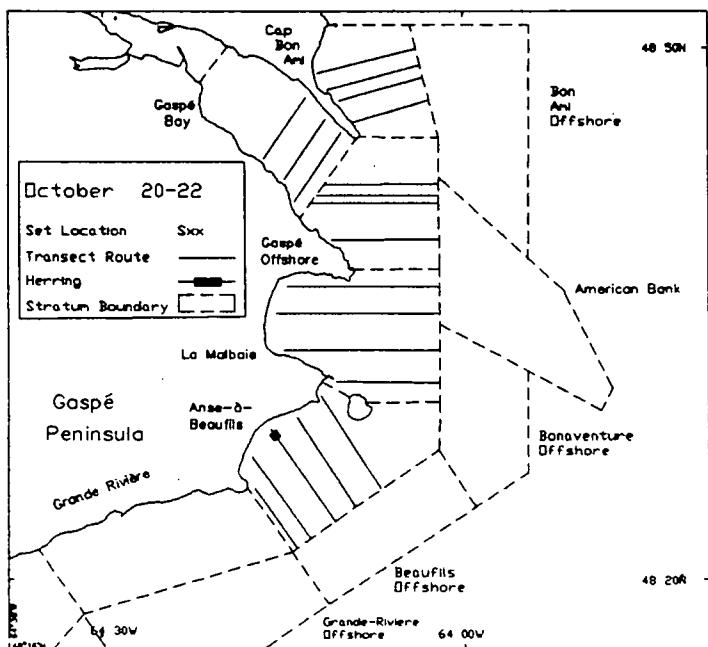
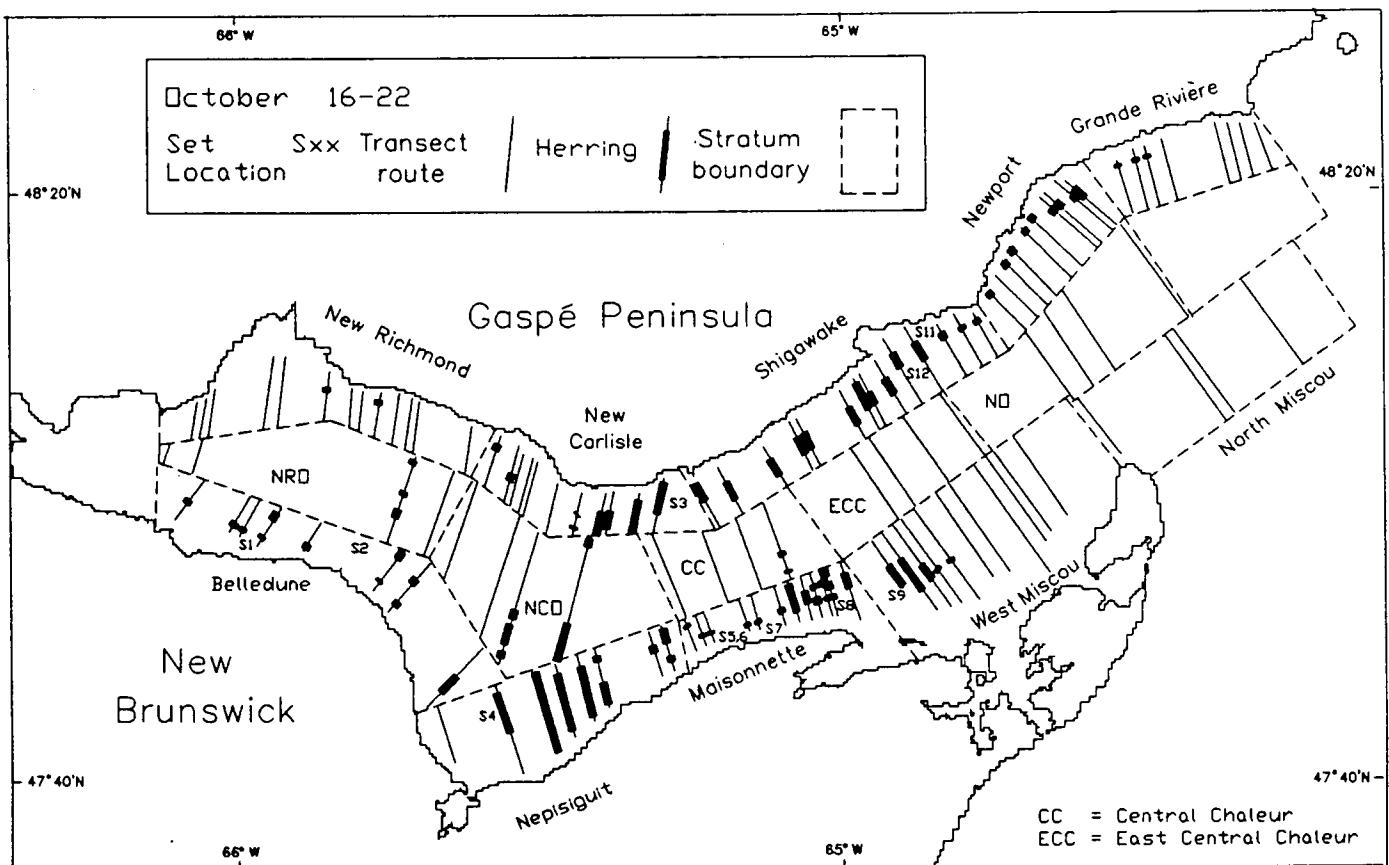


Fig. 9. Acoustic transects, herring distribution and set locations - Chaleur Bay, Gaspé and East Miscou, C139, October 16-28, 1994.

Dec 1994 Juvenile Herring (<25 cm) Survey.
Relevé de Hareng Juvenile (<25 cm) Dec. 1994.

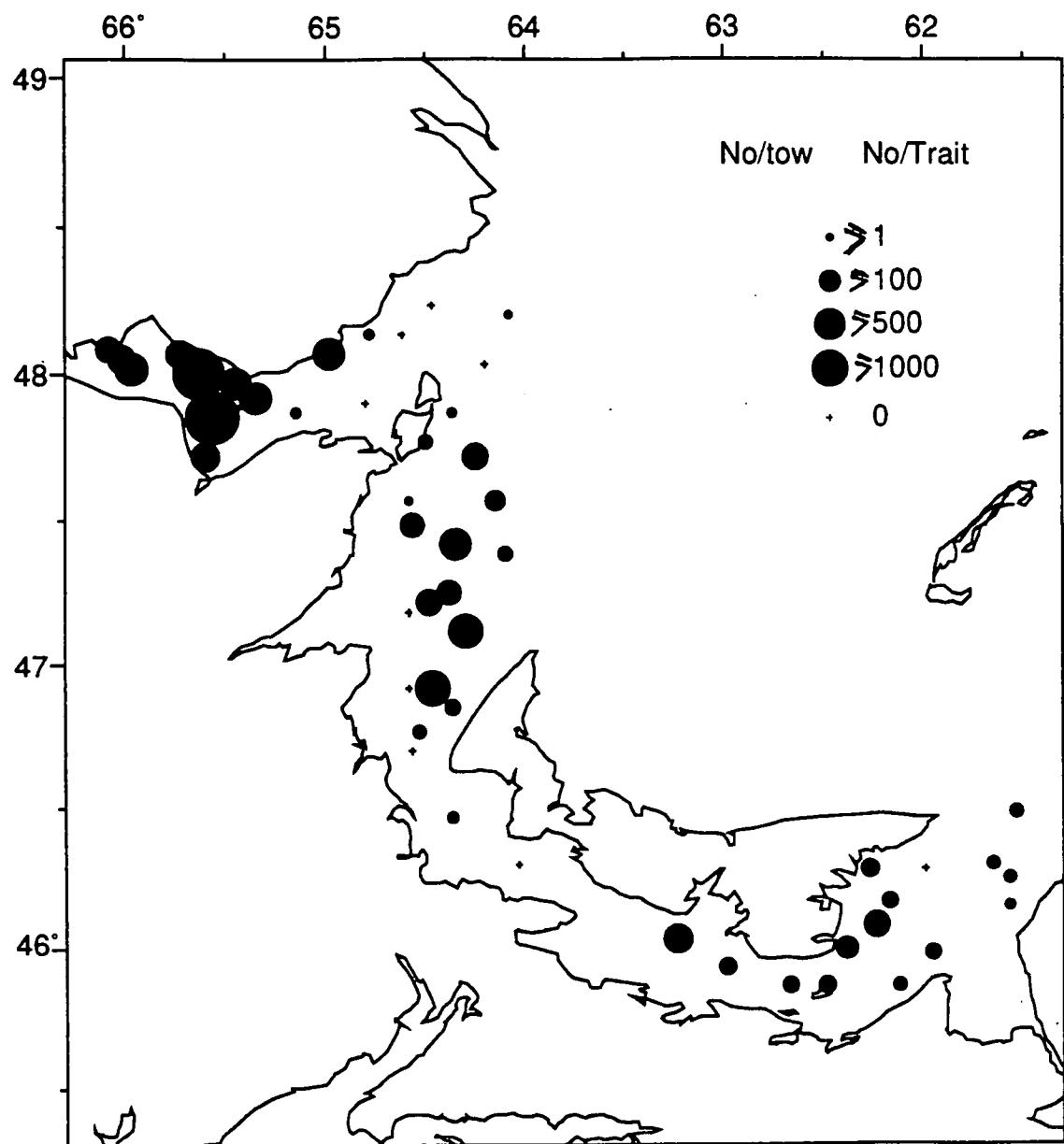


Fig. 10. Herring distribution during December, 1994 juvenile herring survey.

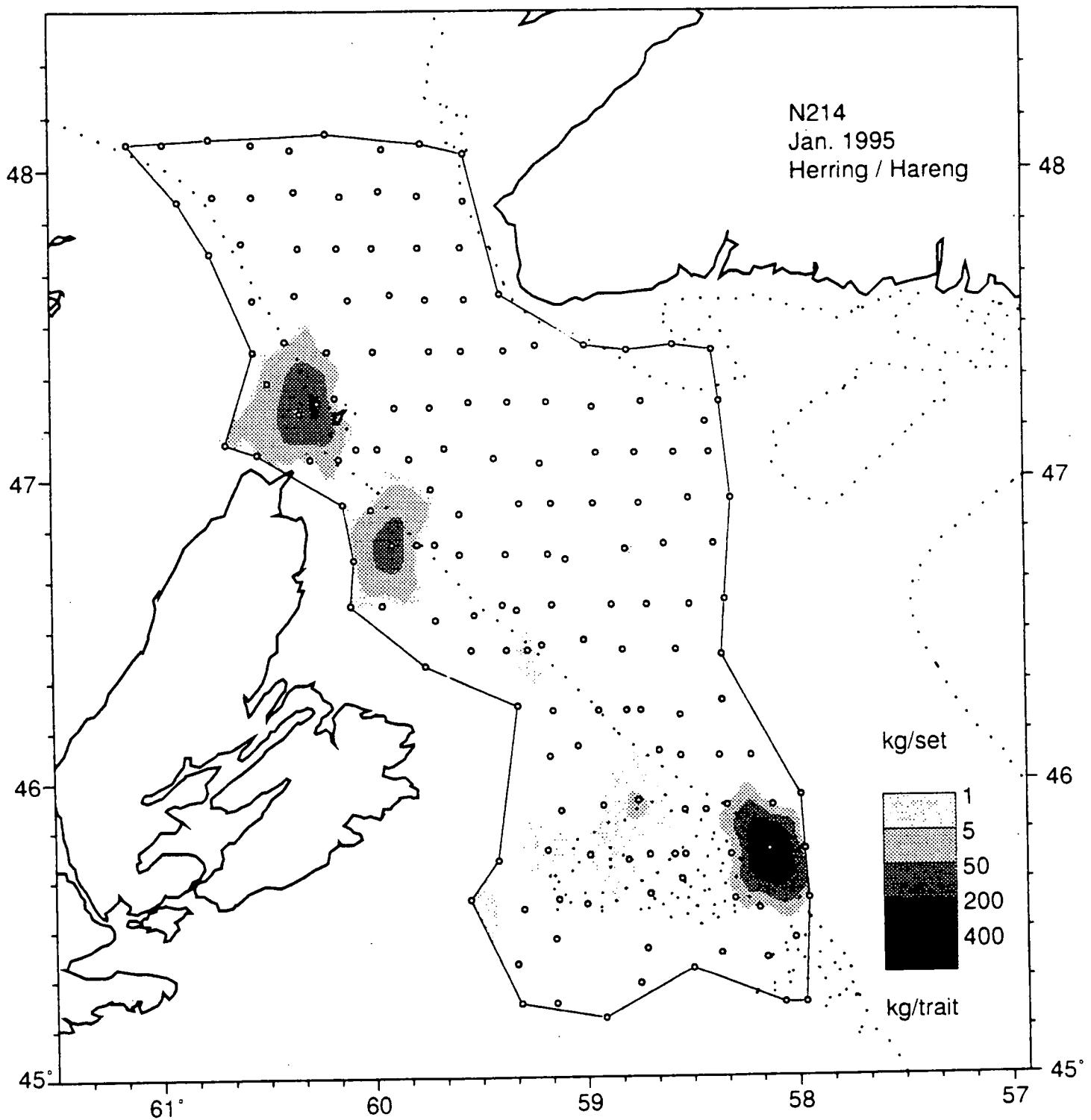


Fig. 11. Catches of herring (kg/standard tow) during the January 10-29, 1995, groundfish and herring survey in Cabot Strait (open circles indicate set locations, dotted line is 200 m contour).

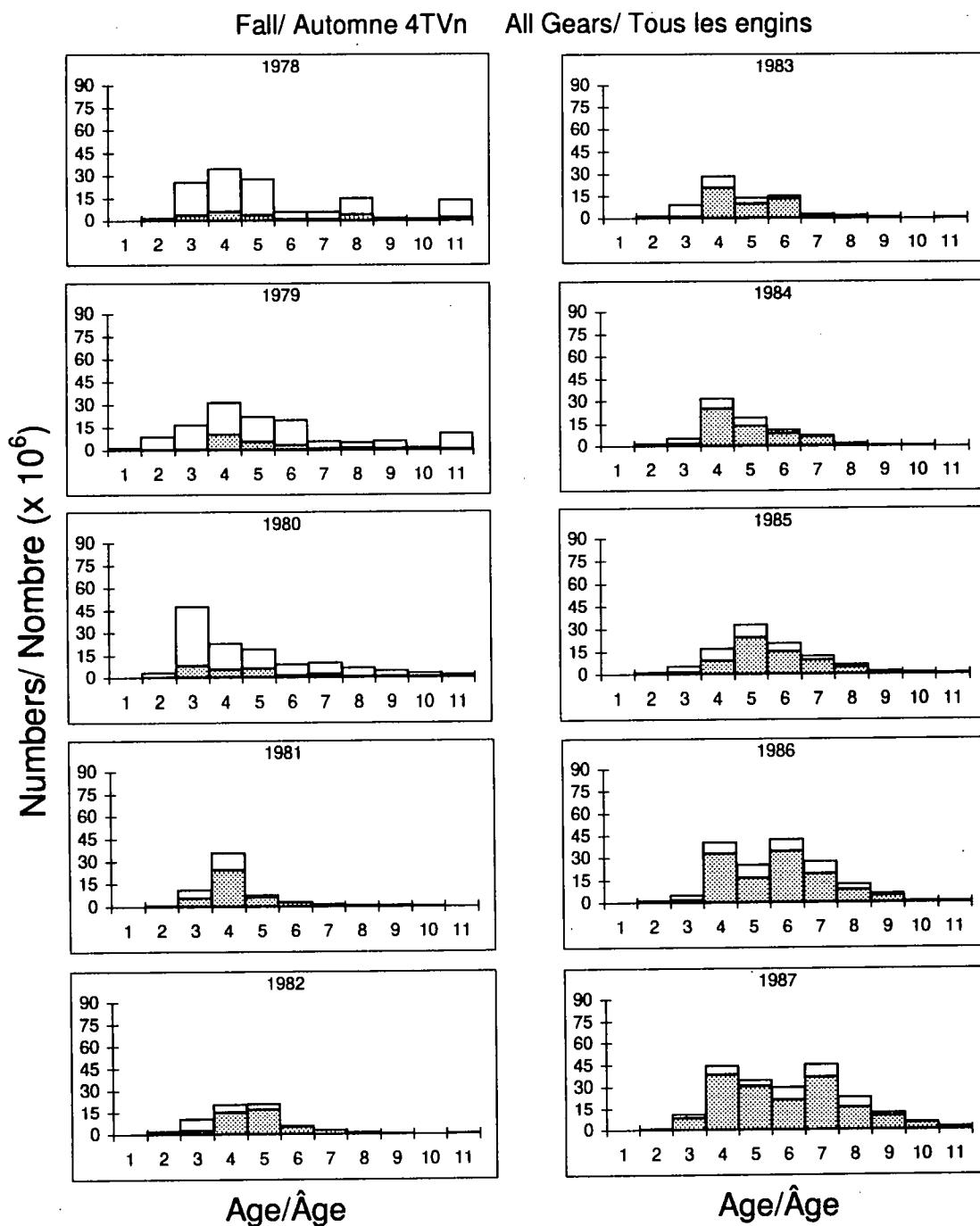


Fig. 12. Fall spawners catch-at-age all gears. Open bars are mobile gear catches, closed bars are fixed gear catches.

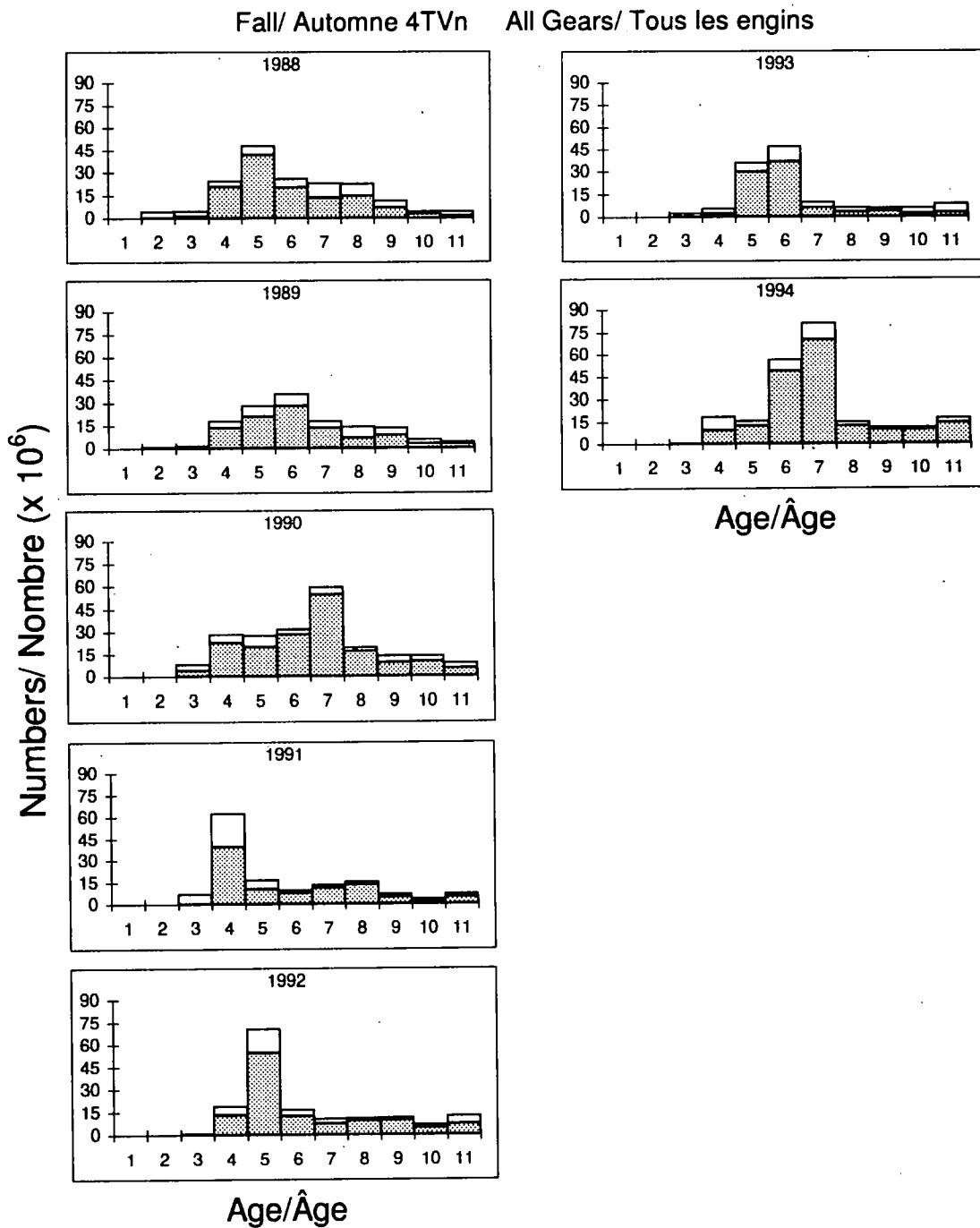


Fig. 12. (continued) Fall spawners catch-at-age all gears. Open bars are mobile gear catches, closed bars are fixed gear catches.

Fall/ Automne

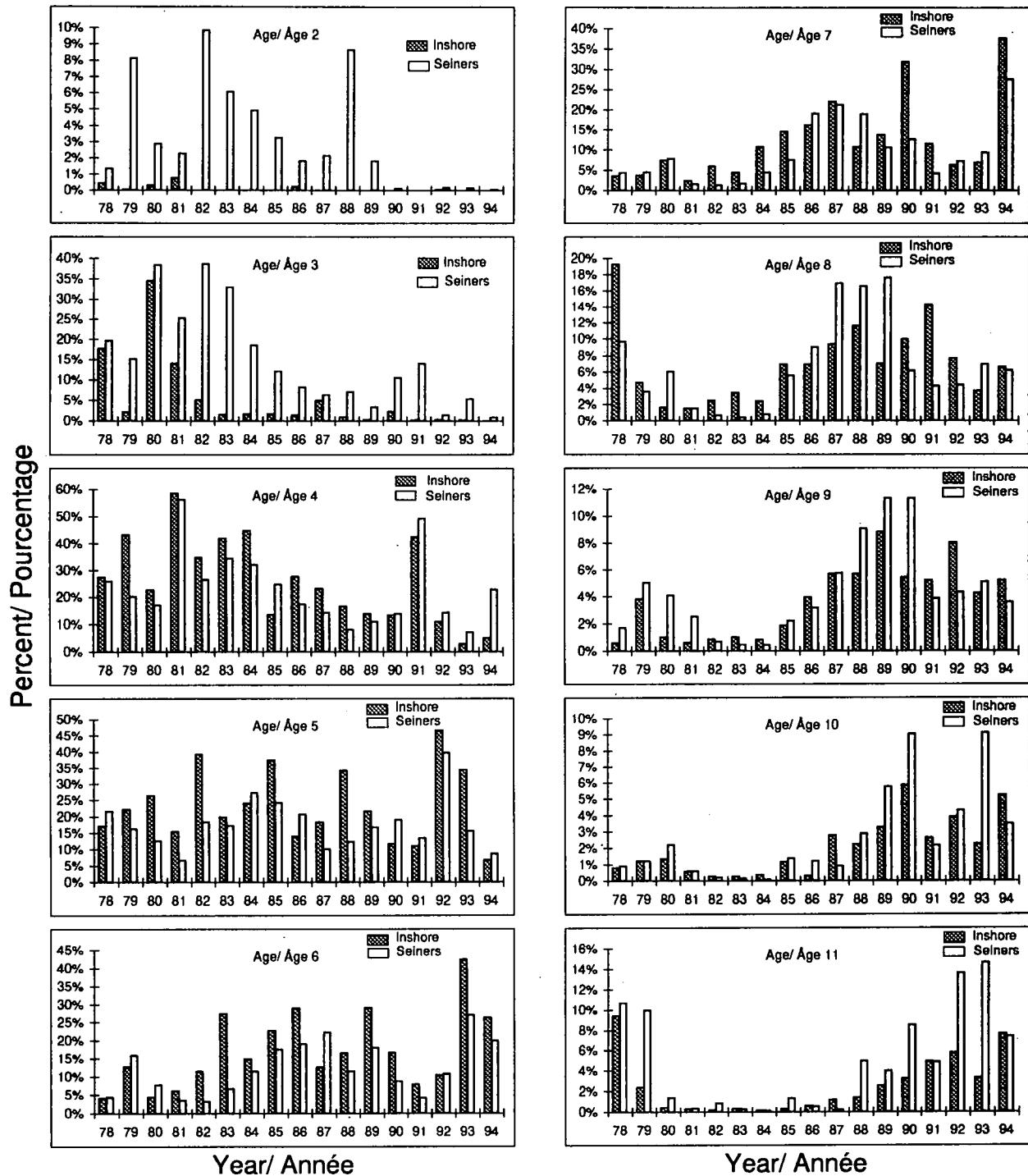


Fig. 13. Percent of catch by age for each year in inshore and seiner fleets for fall 4T herring catches.

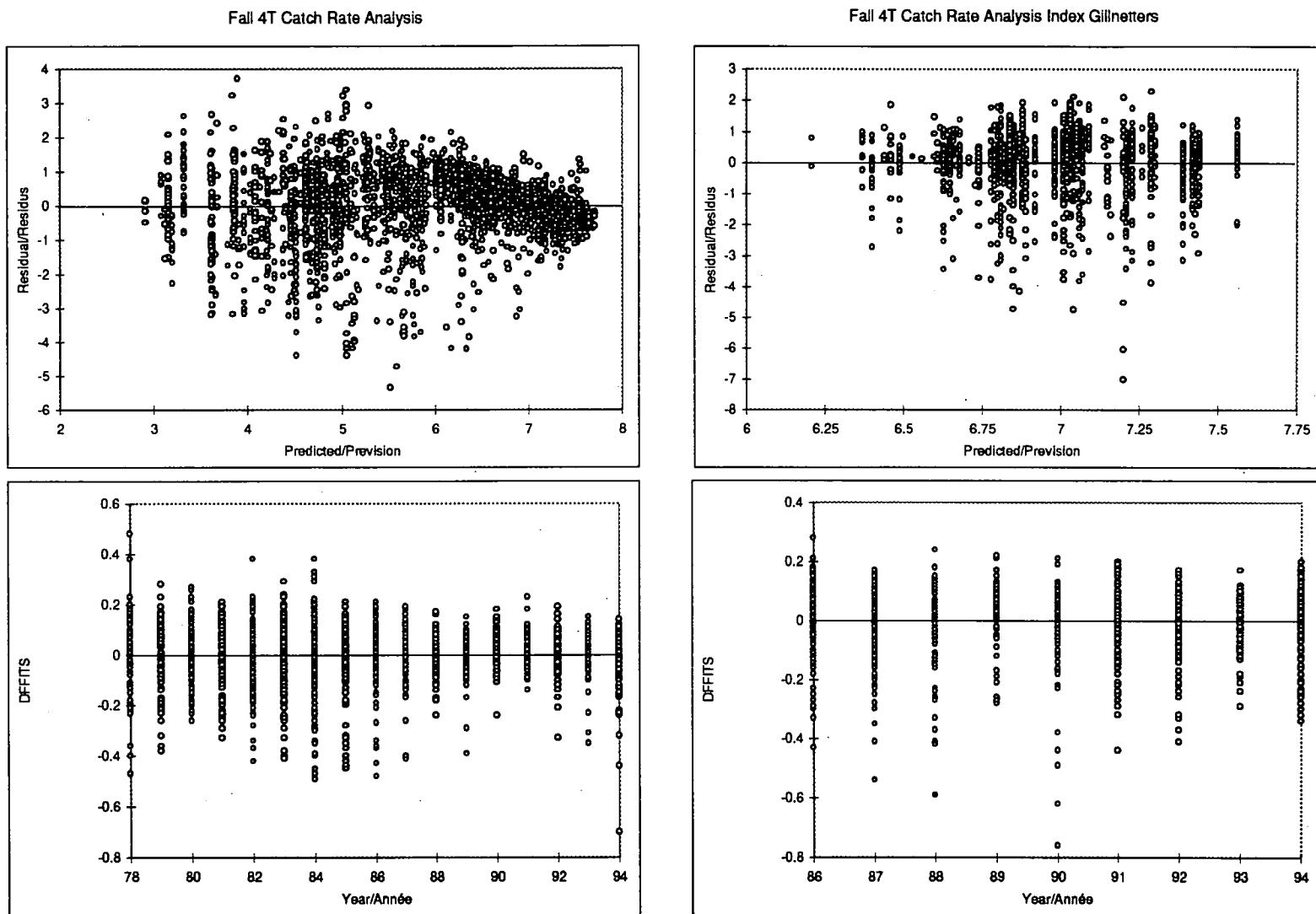


Fig. 14. Residual and DFFITS plots for fall catch rate analyses using purchase slips and index gillnetters.

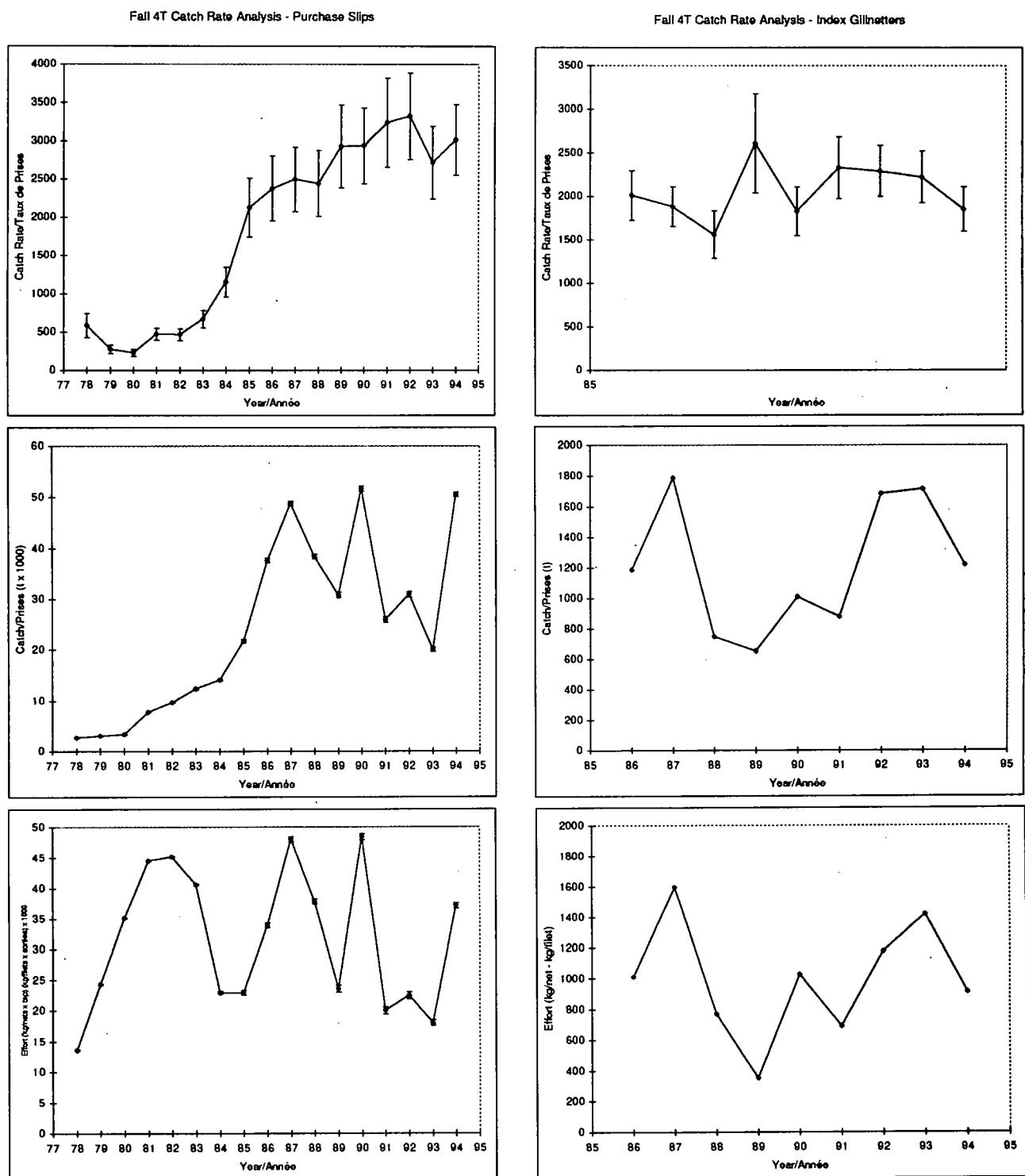


Fig. 15. Gillnet catch rate, catch, and effort for fall 4T fishery from purchase slips and index gillnetters.

Fall Purchase Slips/ Bordereaux d'achat, Automne

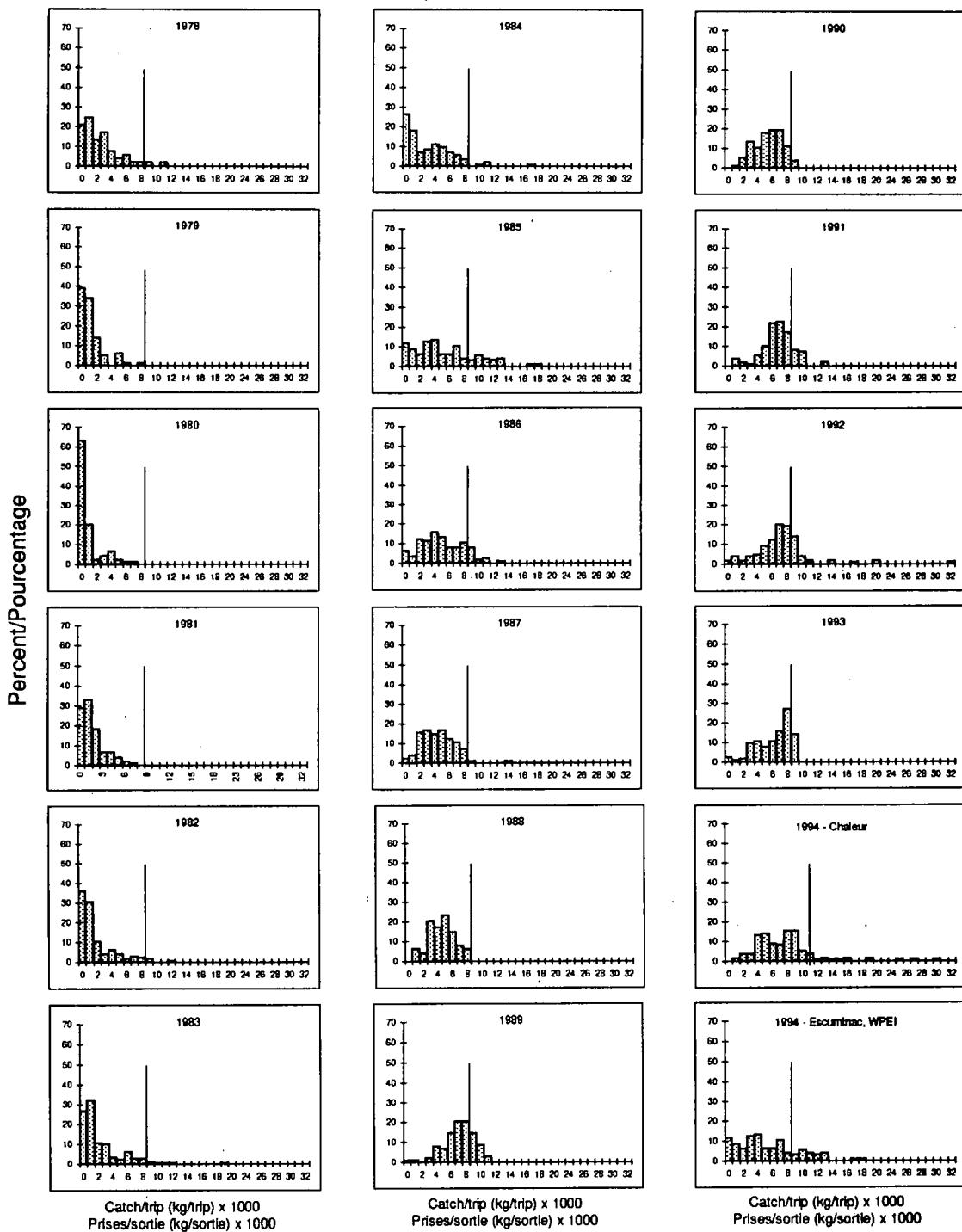


Fig. 16. Catch/trip in combined Chaleur, Nova Scotia, Escuminac-West PEI. Line shows boat limit which came into effect in 1987. These areas are combined because they had the same boat limits in each year except 1994.

Fall Purchase Slips/ Bordereaux d'achat, Automne

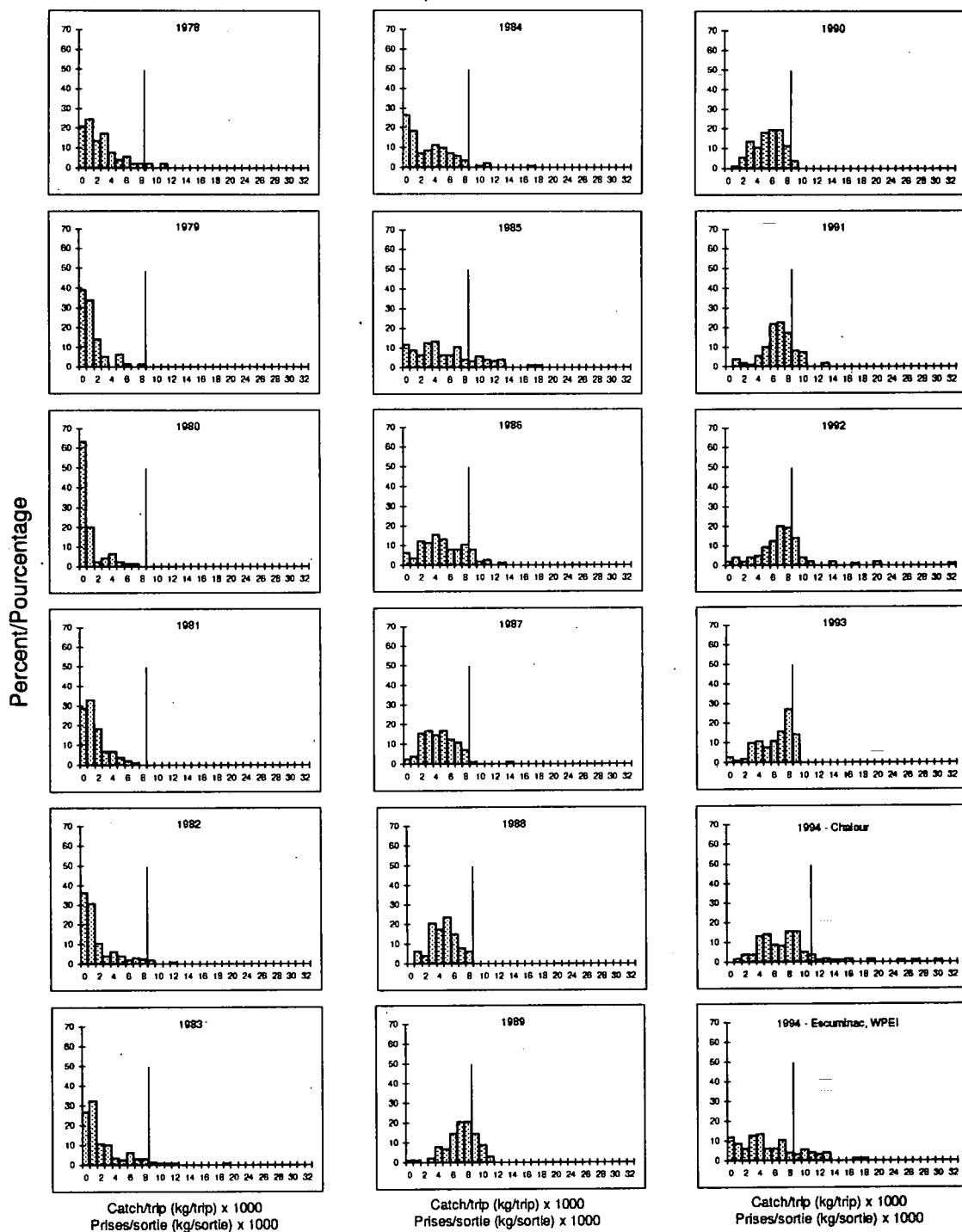


Fig. 17. Catch/trip in combined Chaleur, Nova Scotial, Escuminac-West PEI. Line shows boat limit which came into effect in 1987. These areas are combined because they had the same boat limits in each year except 1994.

Fall Purchase Slips/ Bordereaux d'achat, Automne
kg/net/trip - kg/filet/sortie

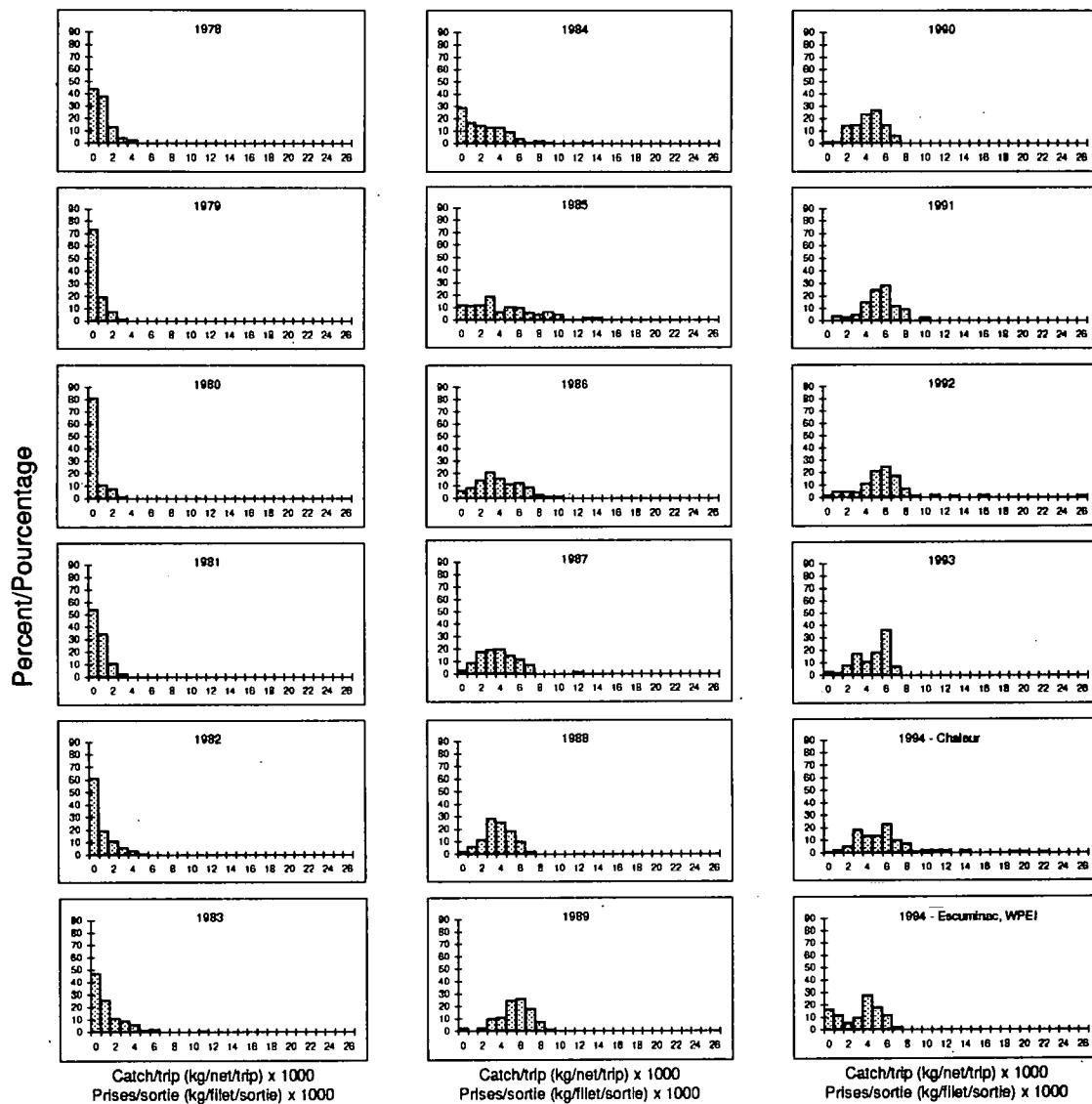


Fig. 18. Frequency distributions for fall catch rates (kg/net/trip) used in purchase slip model to derive fall abundance index for Chaleur, Escuminac, and West Prince Edward Island. These areas are grouped because they all had the same boat limits from 1987 to 1993. Boat limits differed for 1994 and were 25,000 pounds for Chaleur and 20,000 for Escuminac-WPEI.

Fall Purchase Slips/ Bordereaux d'achat, Automne (ka/net/trip - kg/filet/sortie)

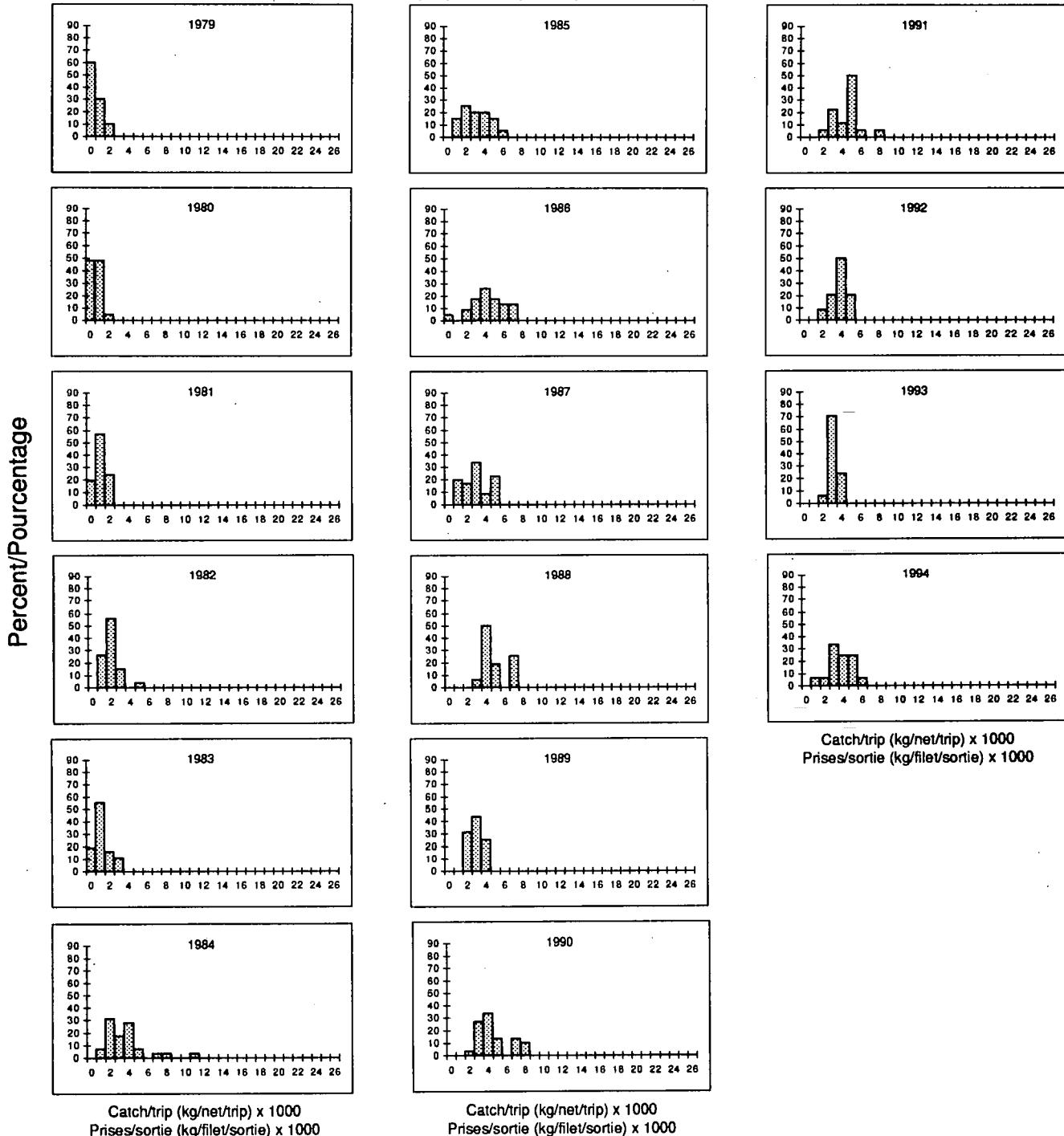


Fig. 19. Frequency distributions for fall catch rates (kg/net/trip) used in purchase slip model to derive fall abundance index for East Prince Edward Island. Boat limits for this area were 15,000 pounds from 1987 - 1994.

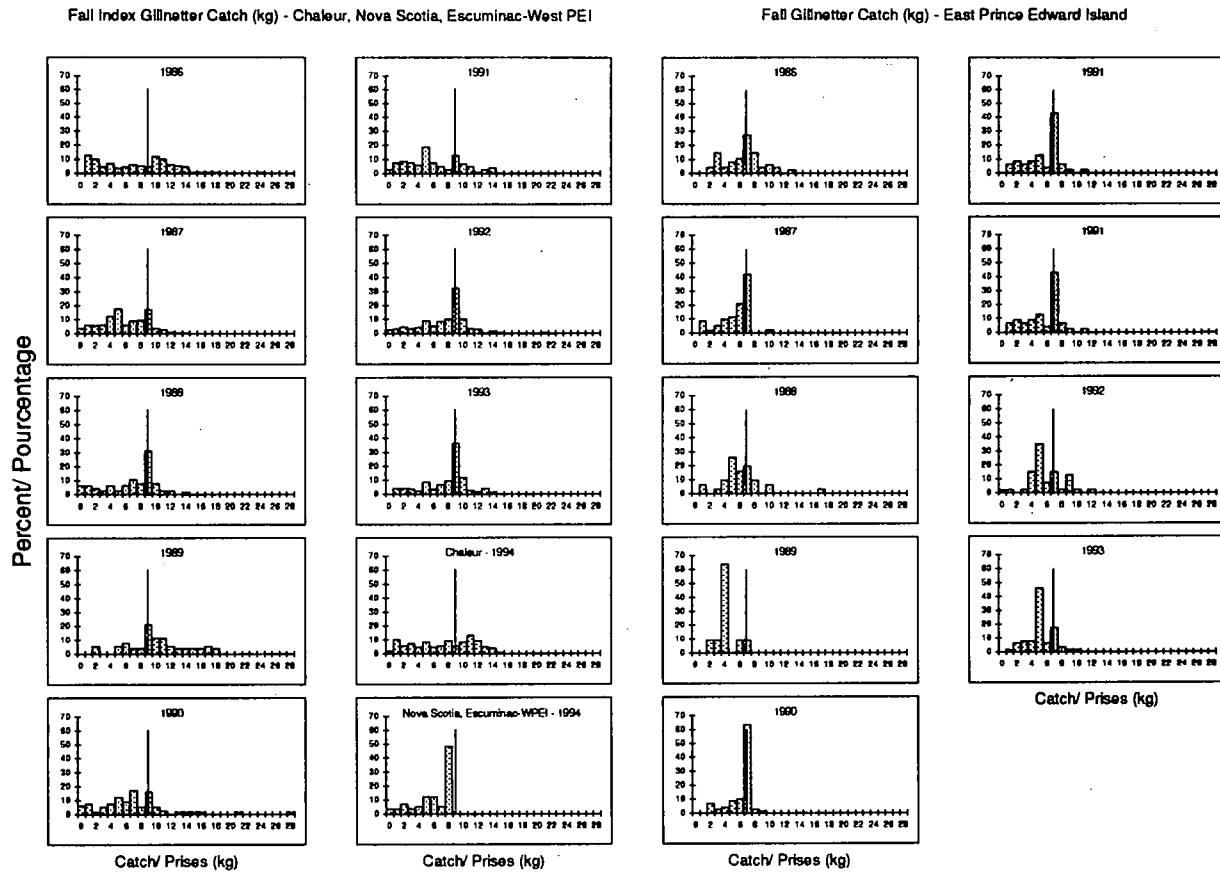


Fig. 20. Frequency distribution of catches by fall index gillnetter participants from the Southern Gulf of St. Lawrence. The line indicates the boat limits which came into effect in the indicated areas in 1987.

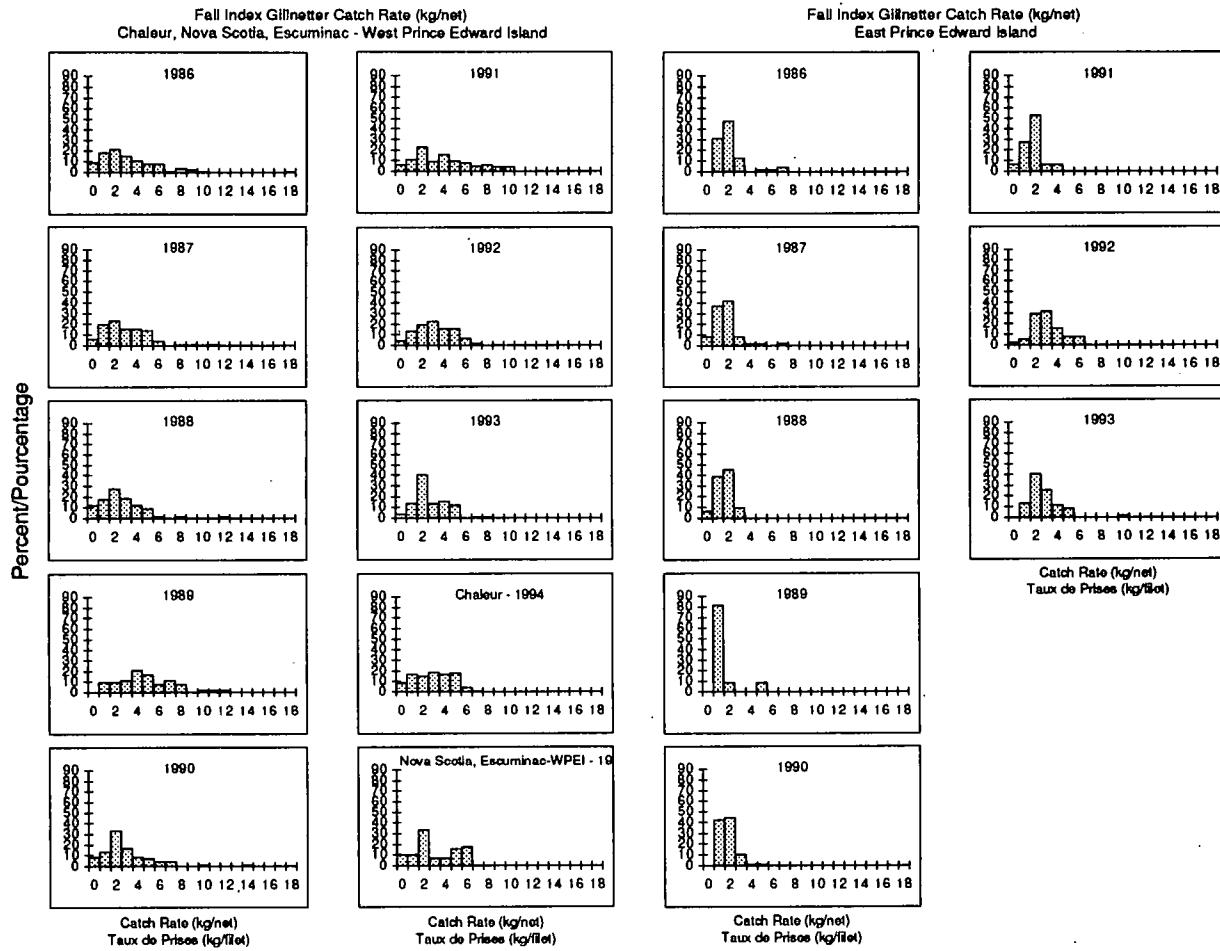


Fig. 21. Frequency distribution for catch rates (kg/net) for fall herring index gillnetter participants in Southern Gulf of St. Lawrence.

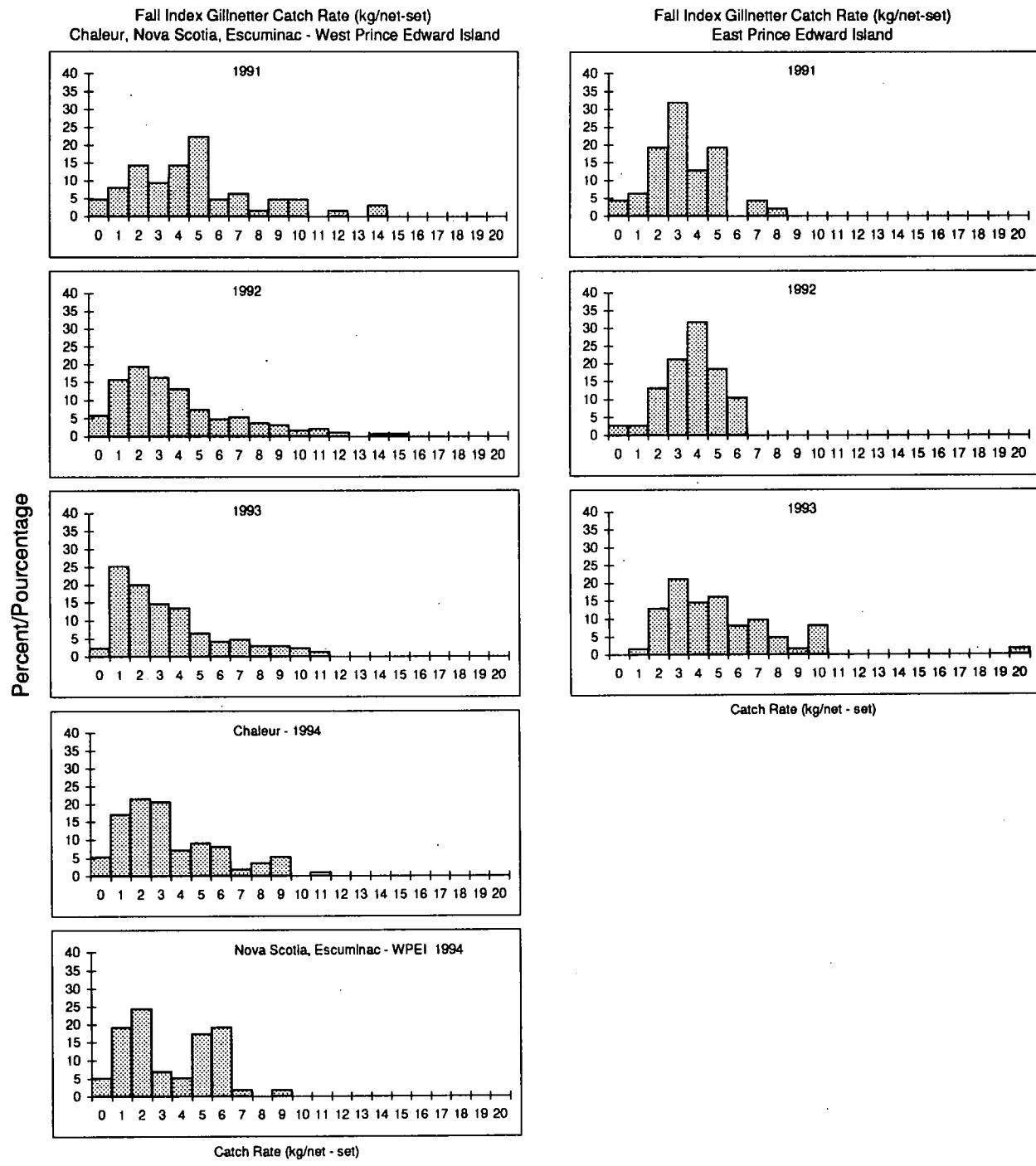


Fig. 22. Frequency distributions for catch rates (kg/net-set) for Southern Gulf of St. Lawrence fall index gillnetter participants.

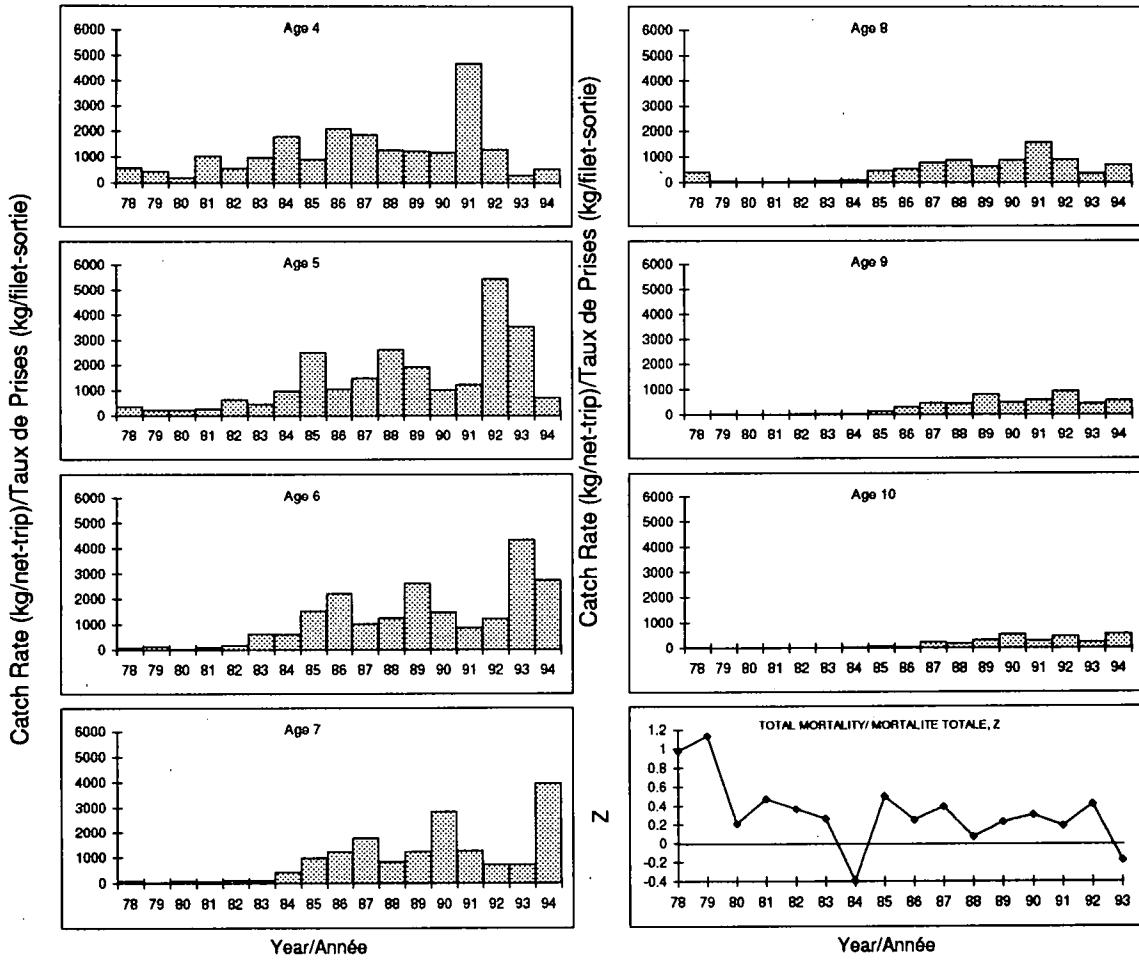


Fig. 23. Fall abundance index using purchase slip catch rates.

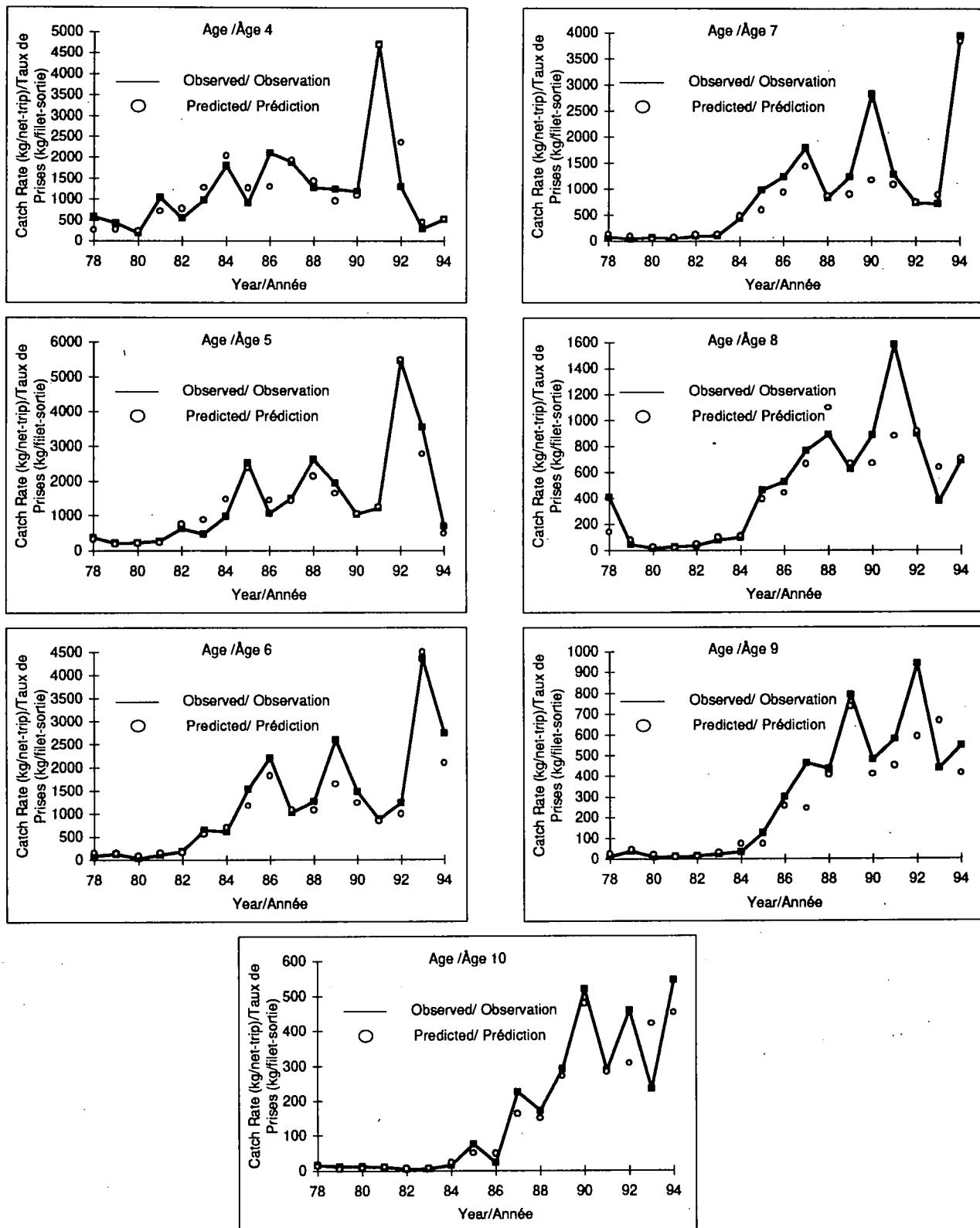


Fig. 24. Residuals from ADAPT analysis of fall spawners.

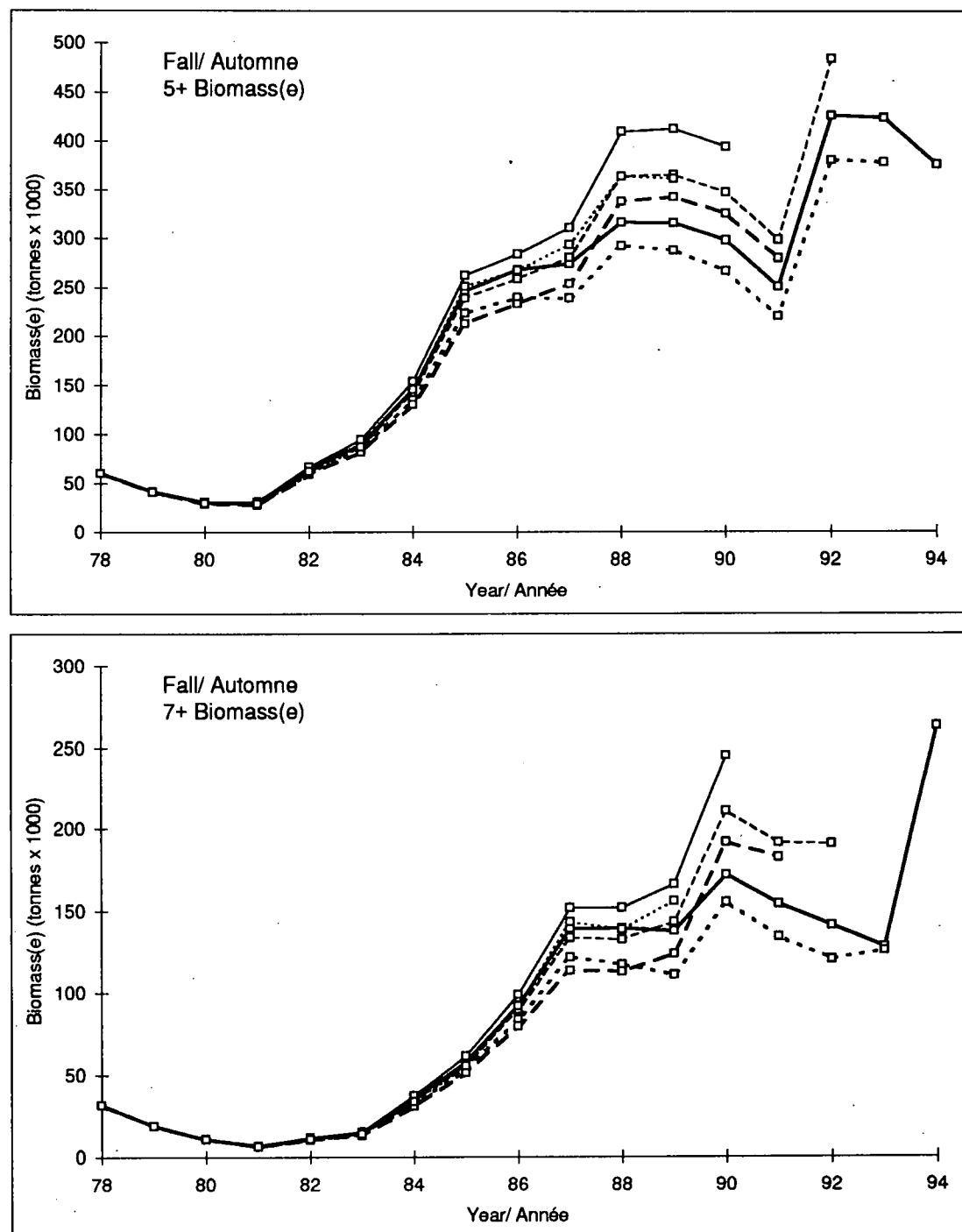


Fig. 25. Retrospective analysis of 5+ and 7+ biomass in tonnes from ADAPT analysis of fall spawners.

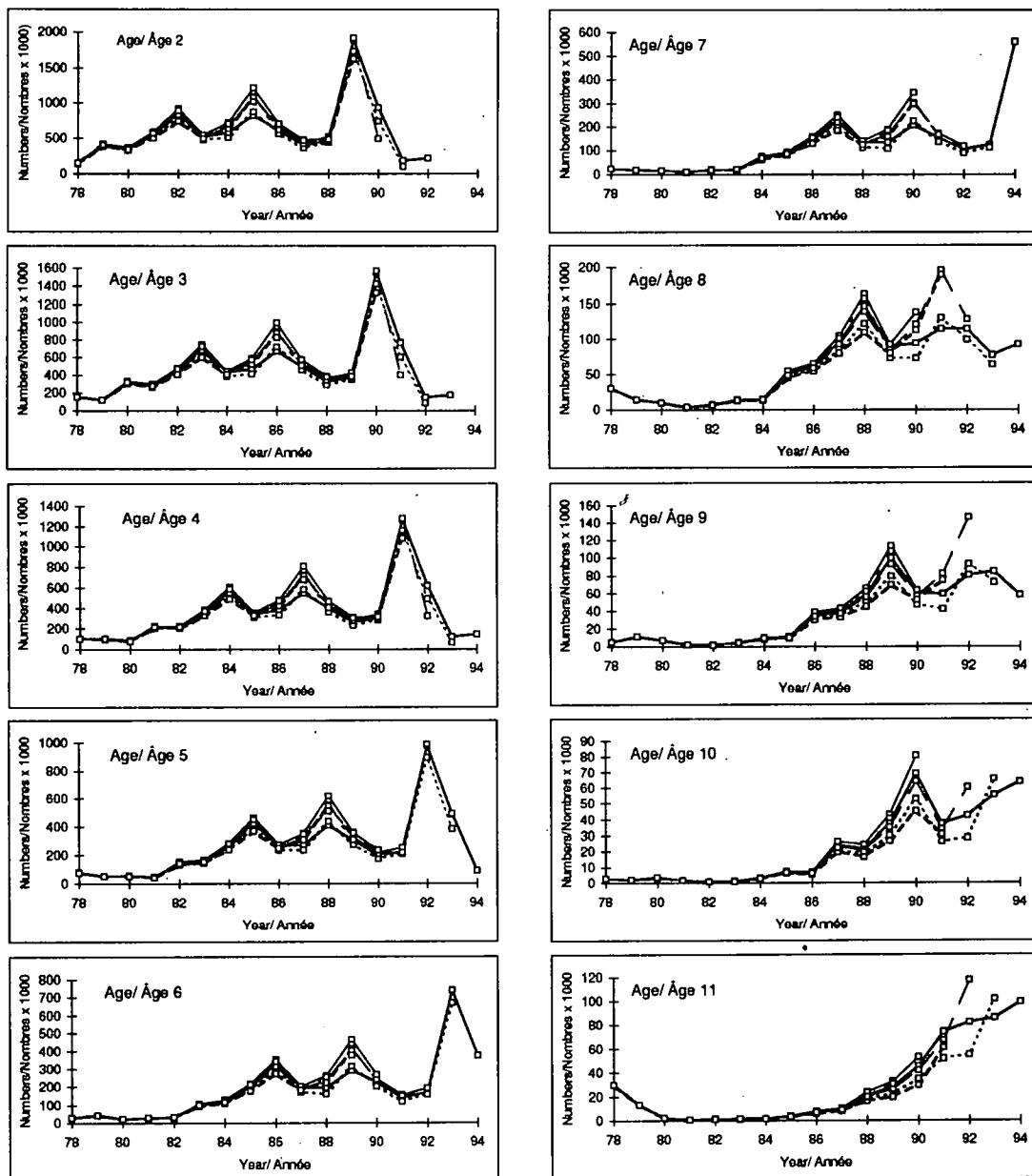


Fig. 26. Retrospective analysis by age from ADAPT analysis of fall spawners.

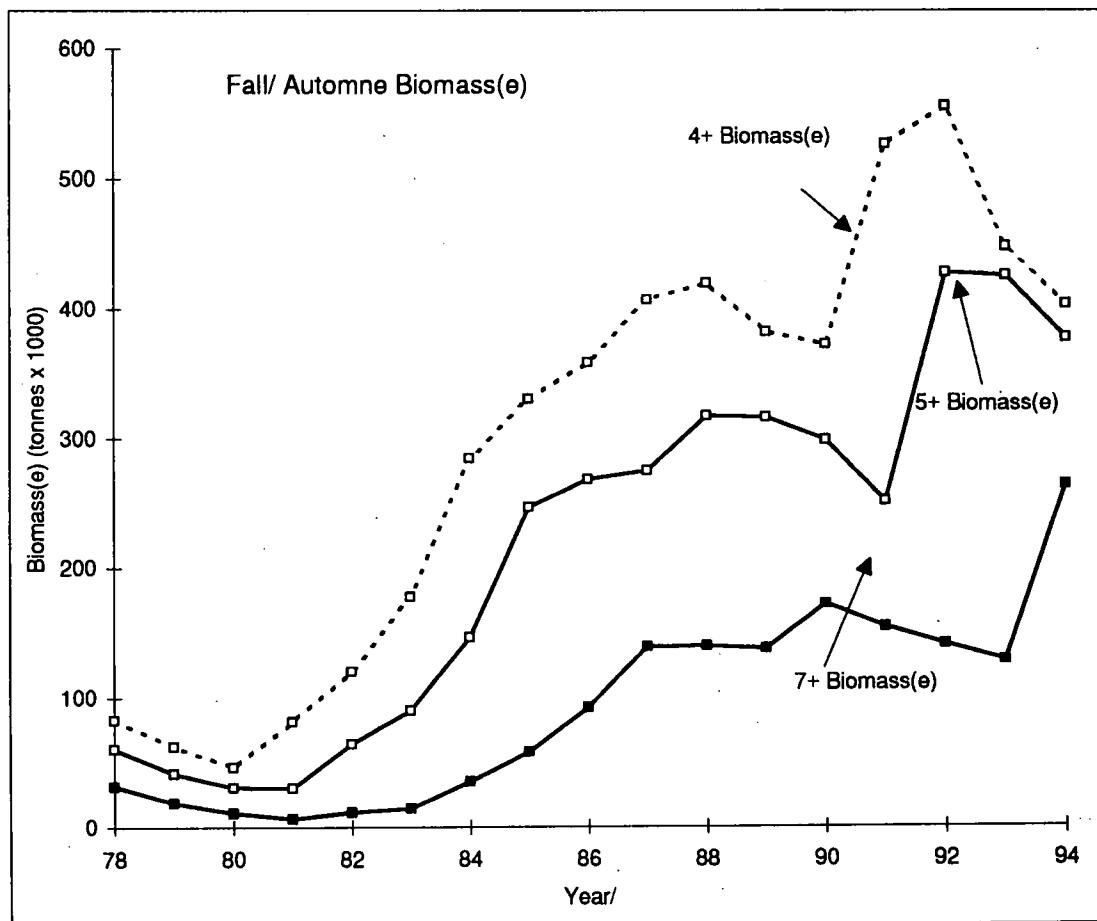


Fig. 27. Fall spawner 4+, 5+, and 7+ biomass estimates from ADAPT analysis.

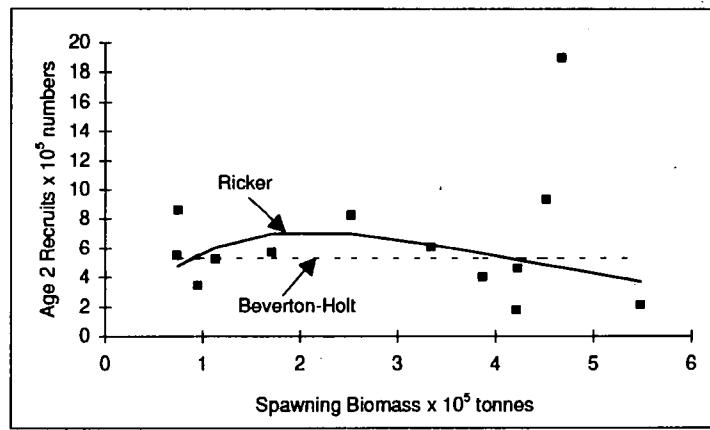


Fig. 28. Ricker and Beverton-Holt model fits to fall spawner stock-recruitment data.

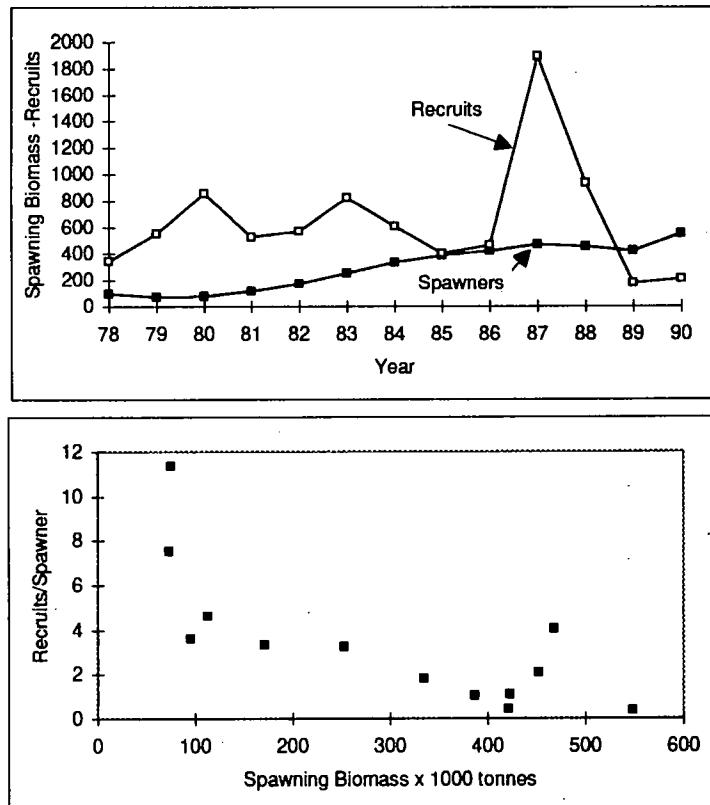


Fig. 29. Fall spawners recruits and spawning biomass over time and recruits/spawner against spawning biomass.

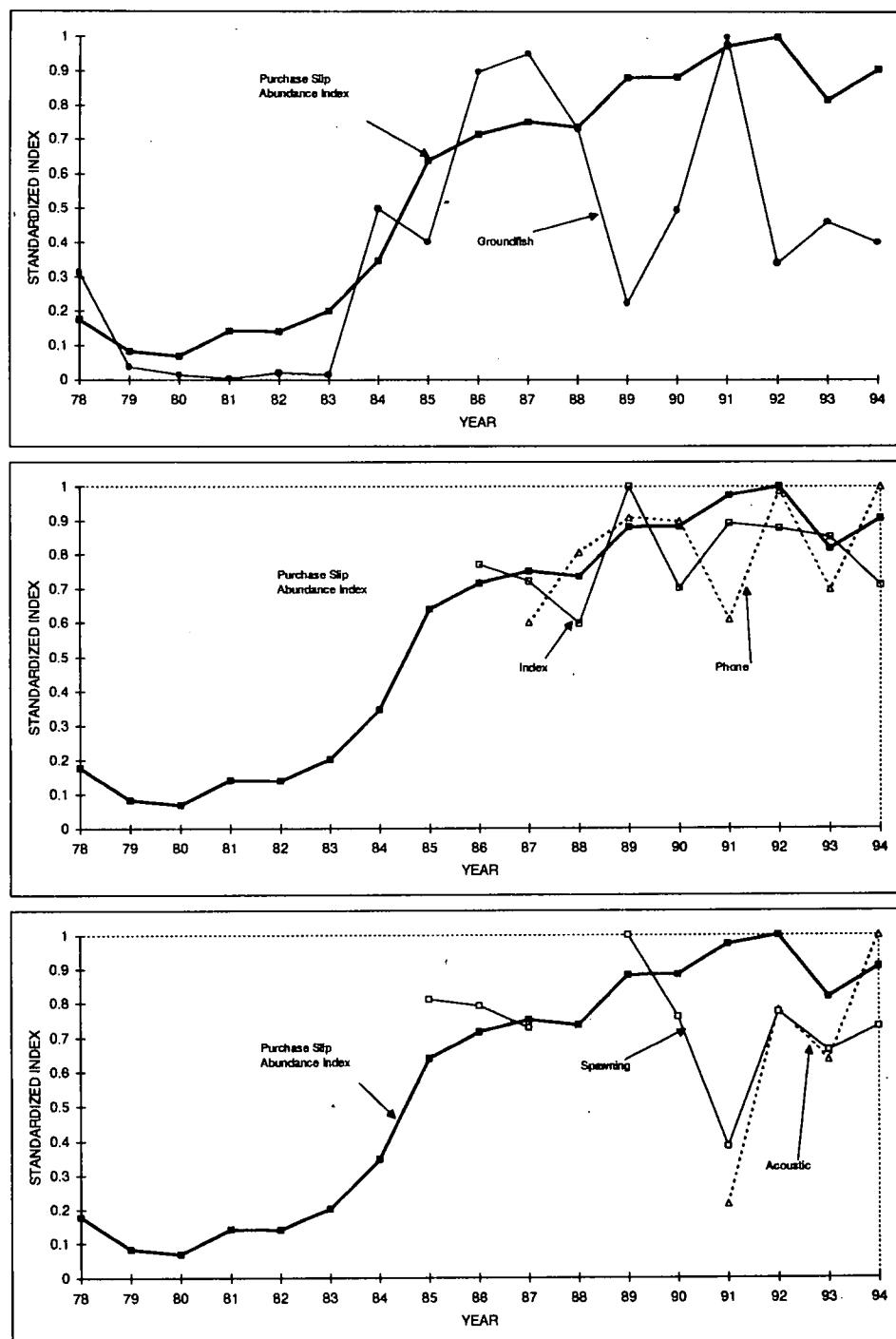


Fig. 30. Indices of herring population trends from Purchase Slip Abundance Index compared to herring caught in Groundfish research survey, indices from Index Gillnetter program, phone survey, Fisherman's Bank spawning bed survey, and fall Acoustic survey in Chaleur Bay.

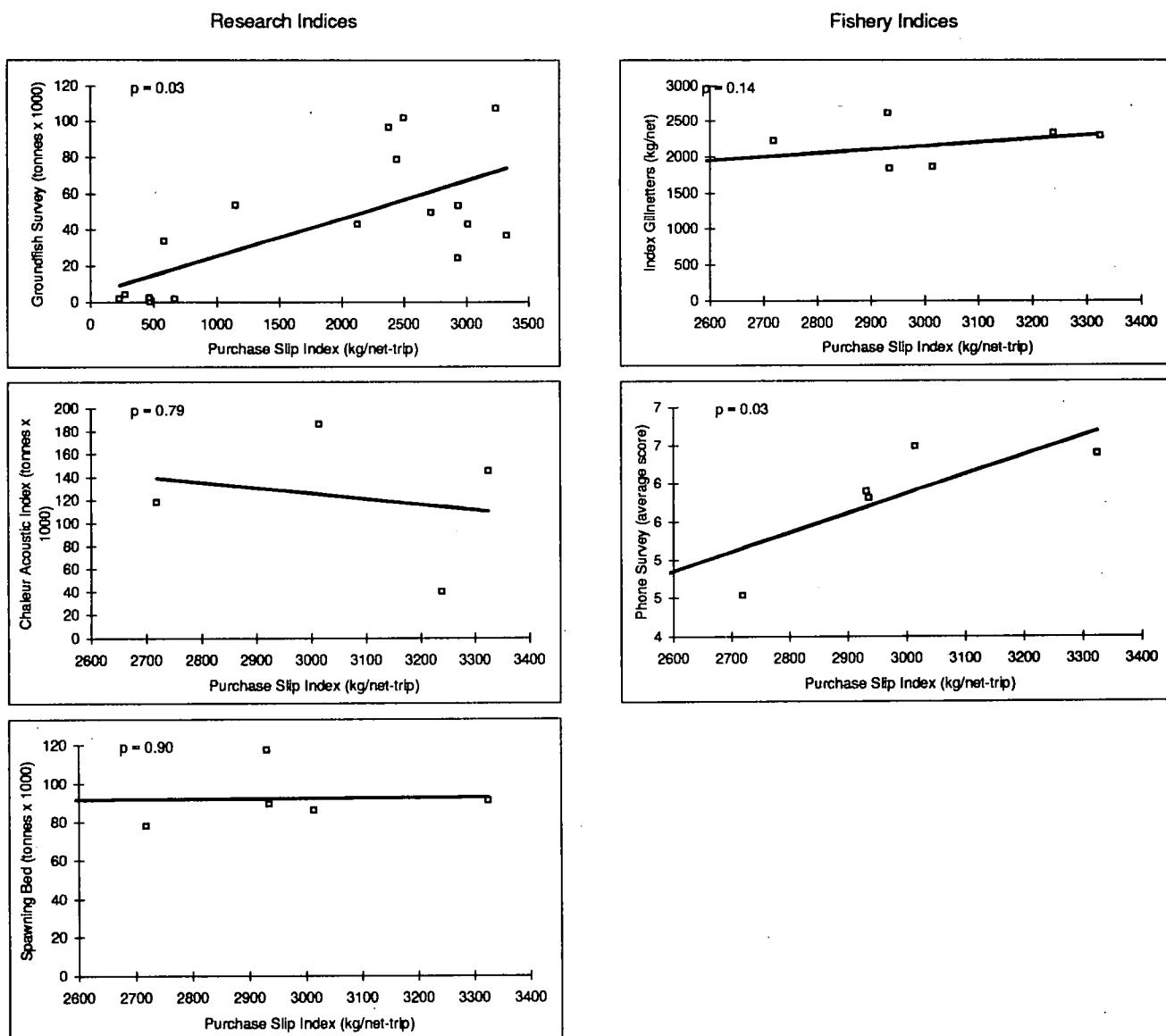


Fig. 31. Relationship between research and fishery indices and purchase slip abundance index for the fall herring Southern Gulf of St. Lawrence spawning stock.

INDEX

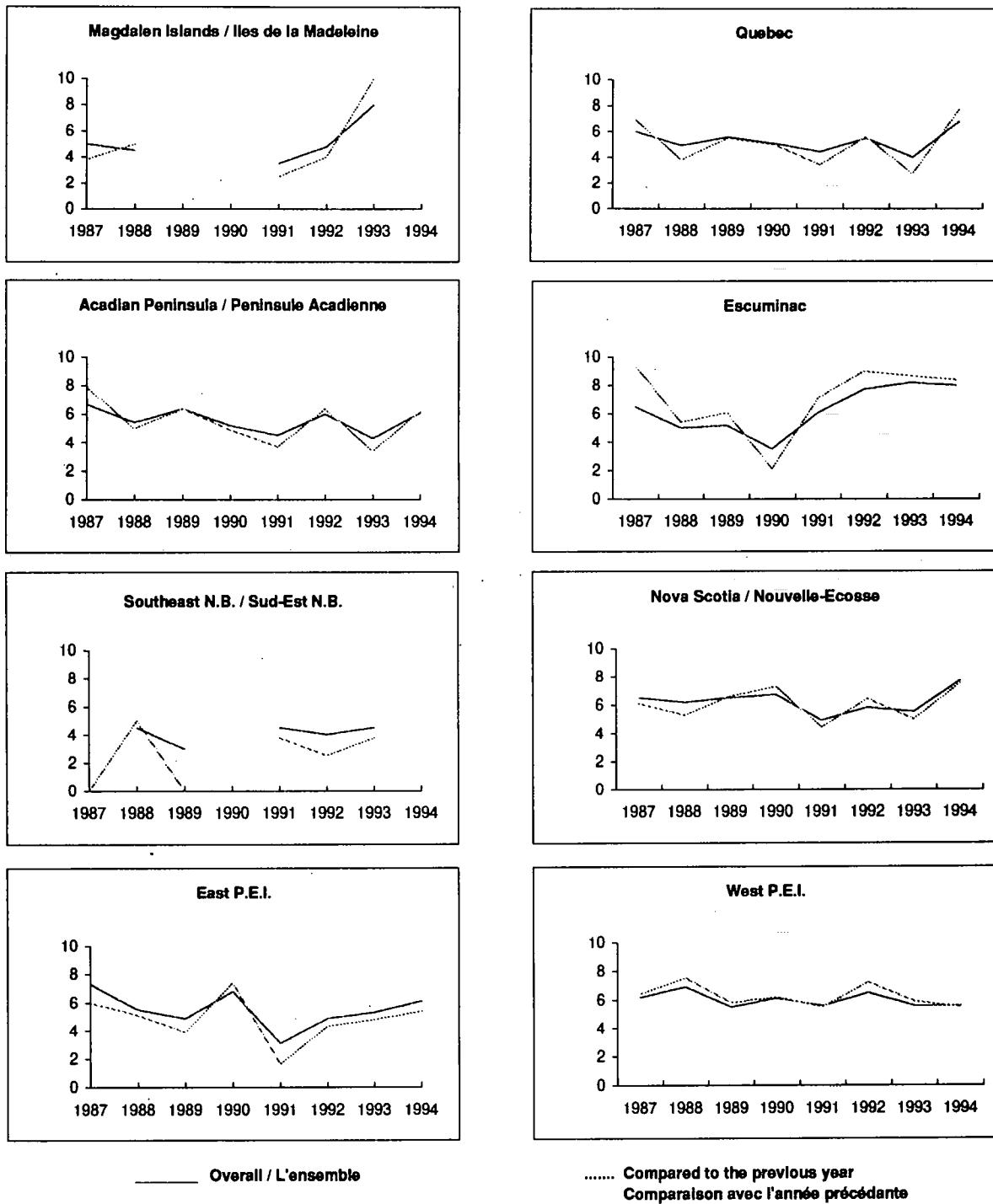


Fig. 32. Fall indices of abundance from phone survey by area.

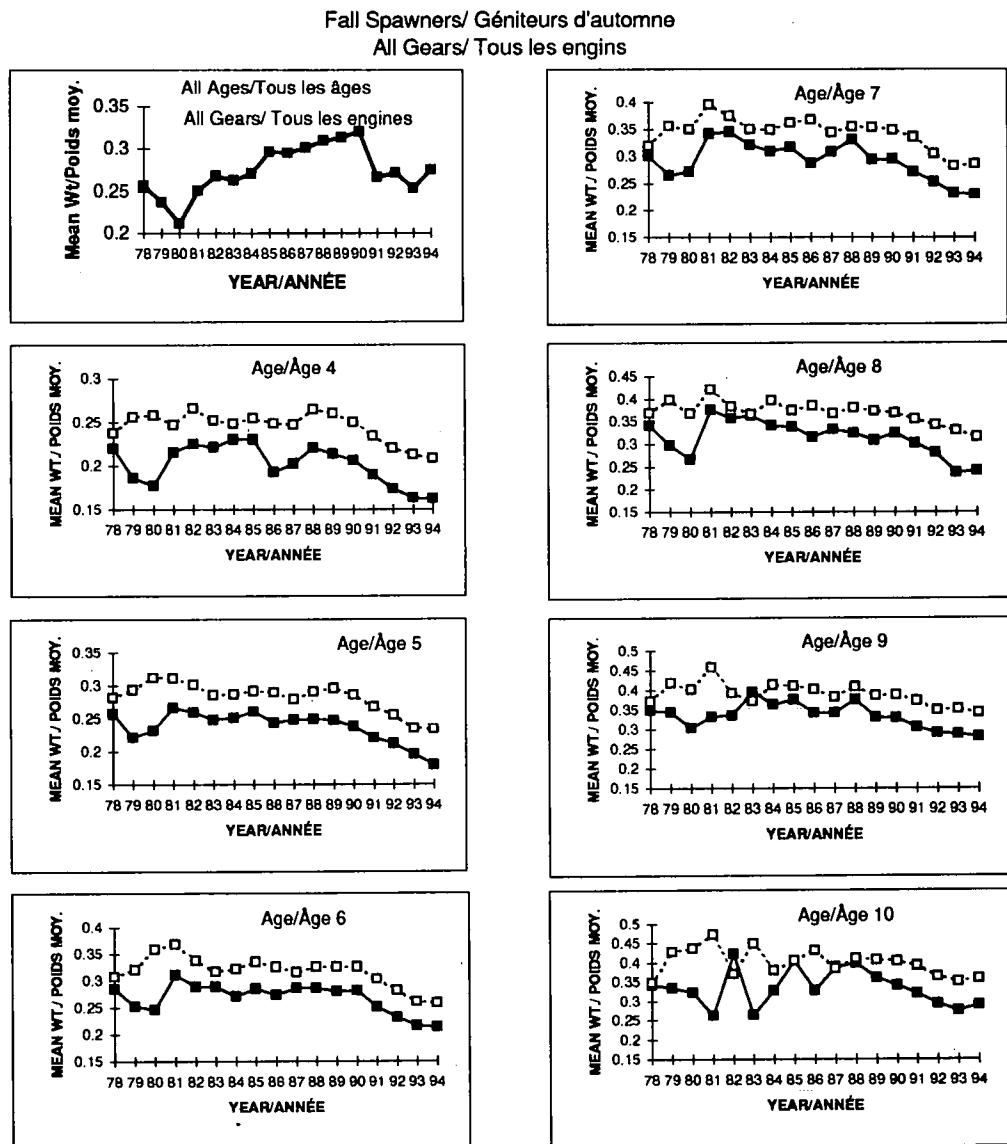


Fig. 33. Fall Spawners mean weight-at-age for all gears and for fixed and mobile gears, ages 4-10. Dotted line is fixed gear and solid line is mobile gear. Weight is in kilograms.

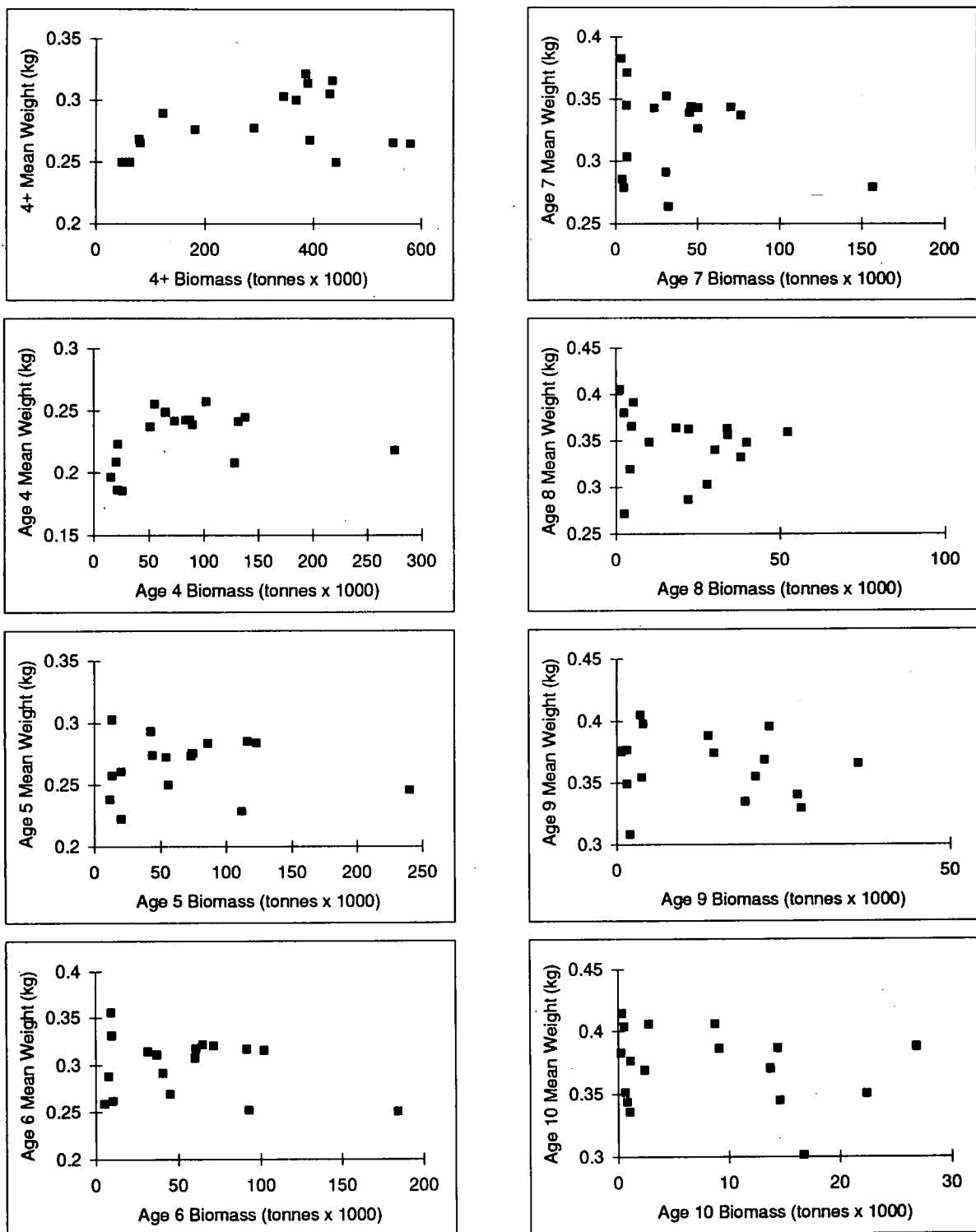


Fig. 34. Relationship between mean weight at age and biomass at age for fall spawning Southern Gulf of St. Lawrence herring. Biomass at age is calculated using ADAPT population estimates and weight-at-age matrix for all gears.

Chaleur - Fall Spawners/ Géniteur Automne

Juvenile Herring Survey - December
Relevé Harengos Juvenile Décembre

Acoustic Survey - October
Relevé Acoustique - Octobre

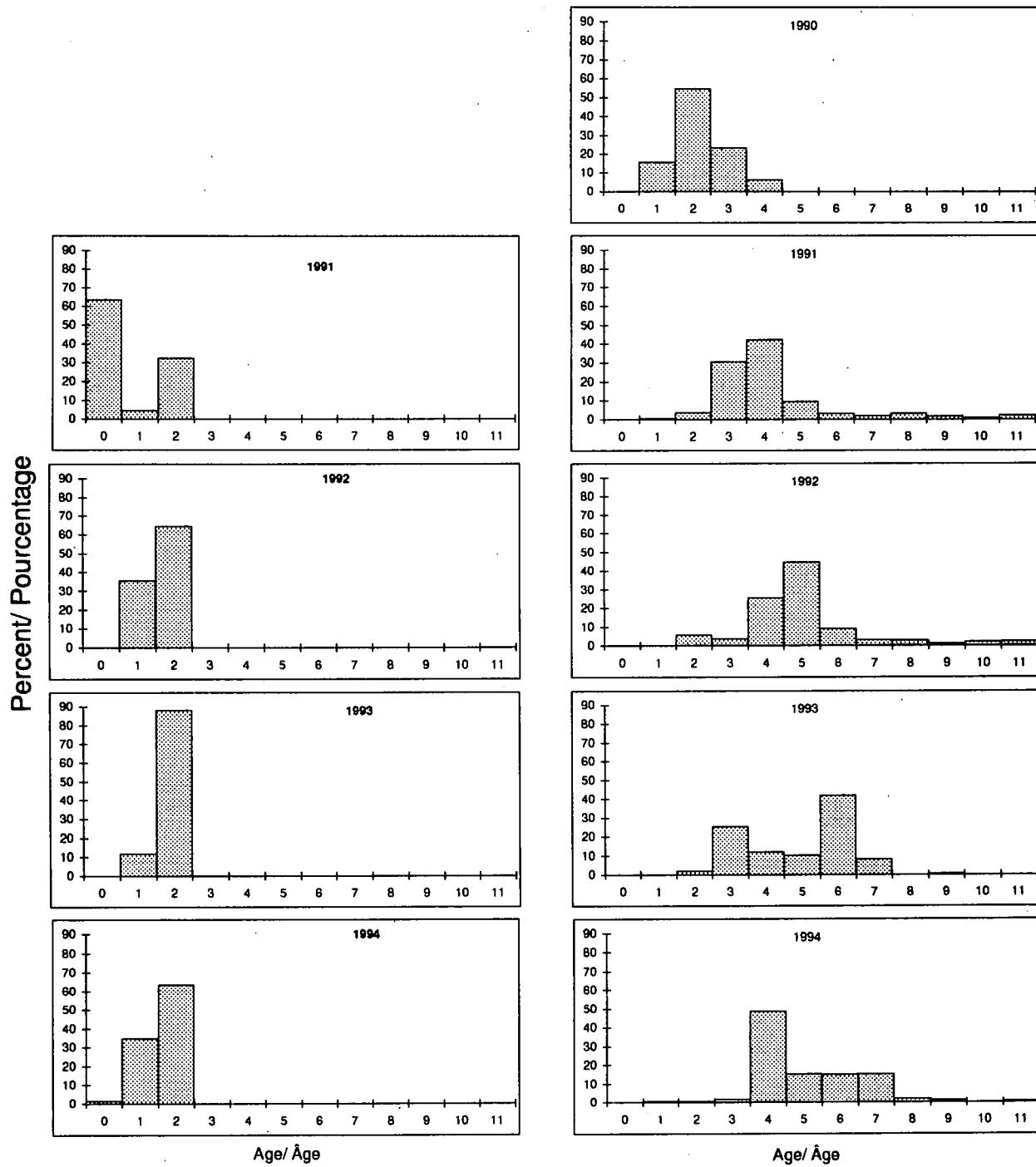


Fig. 35. Percentage numbers at age from December Juvenile and October Acoustic surveys, 1990 - 1994.

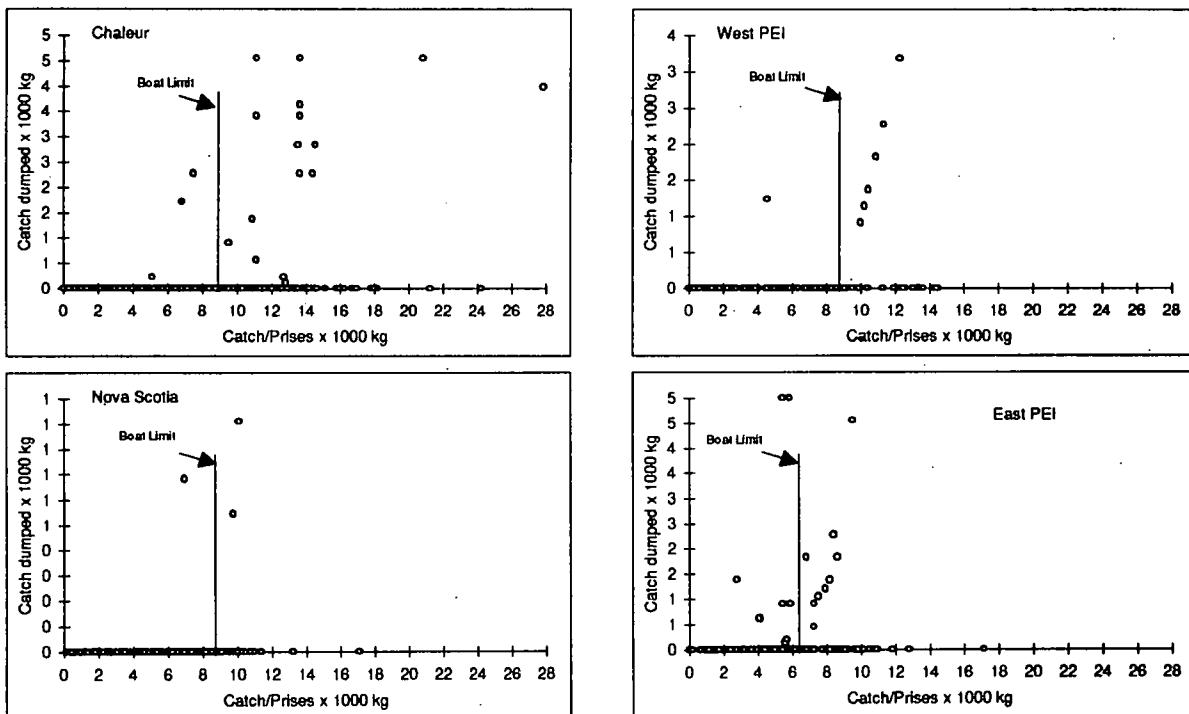


Fig. 36. Catch dumped in relation to amount of catch in four areas using index gillnetter data.

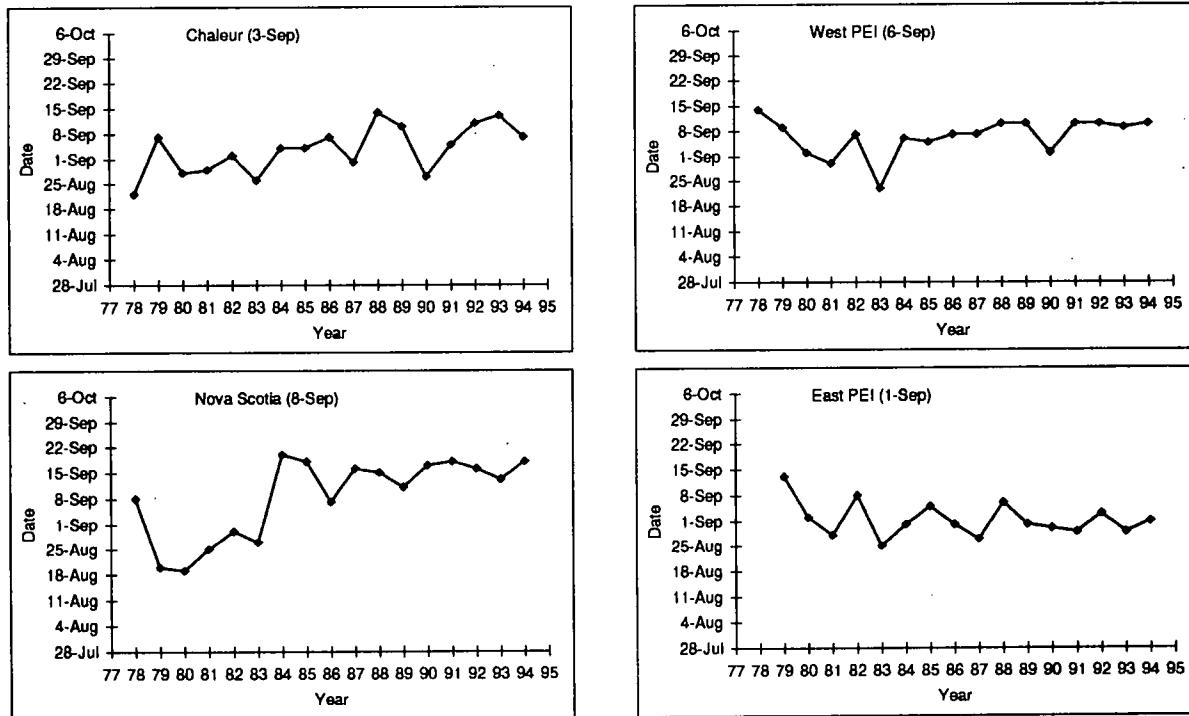


Fig. 37. Dates when 25%, 50%, and 75% of the catch were caught each year in the four indicated areas of the Southern Gulf of St. Lawrence. Line connects date when 50% of the herring were caught. Date in parentheses indicates average 50% date in each area.

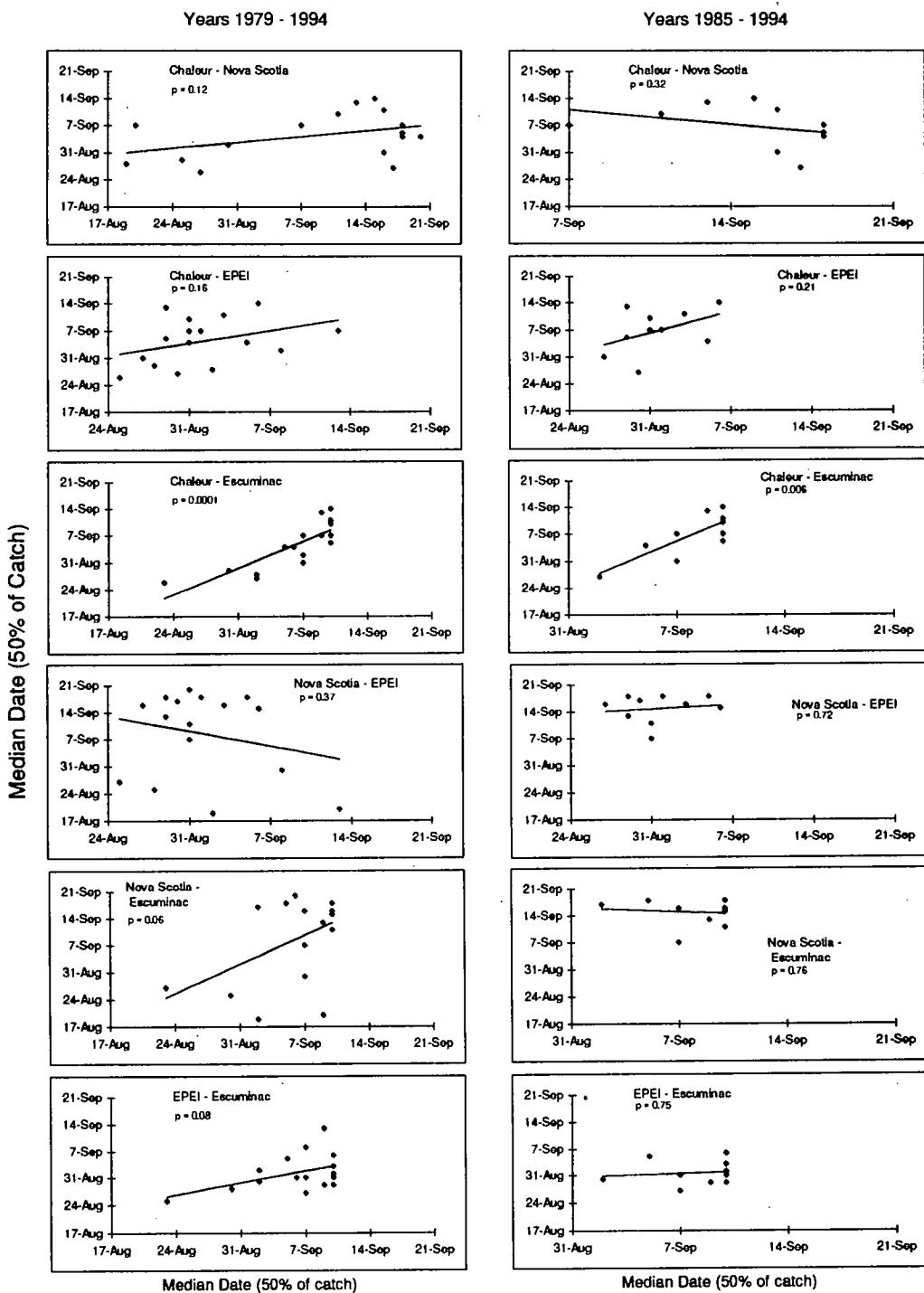


Fig. 38. Relationship between days when 50% of the herring were caught among four regions of the Southern Gulf of St. Lawrence. Short time series, 1985-1994, is concerned with the period of high abundance in the fall herring stock. The 1979-1994 time series includes periods of high and low abundance. Area indicated first is dependent variable, area indicated second is independent variable in the correlation analysis.

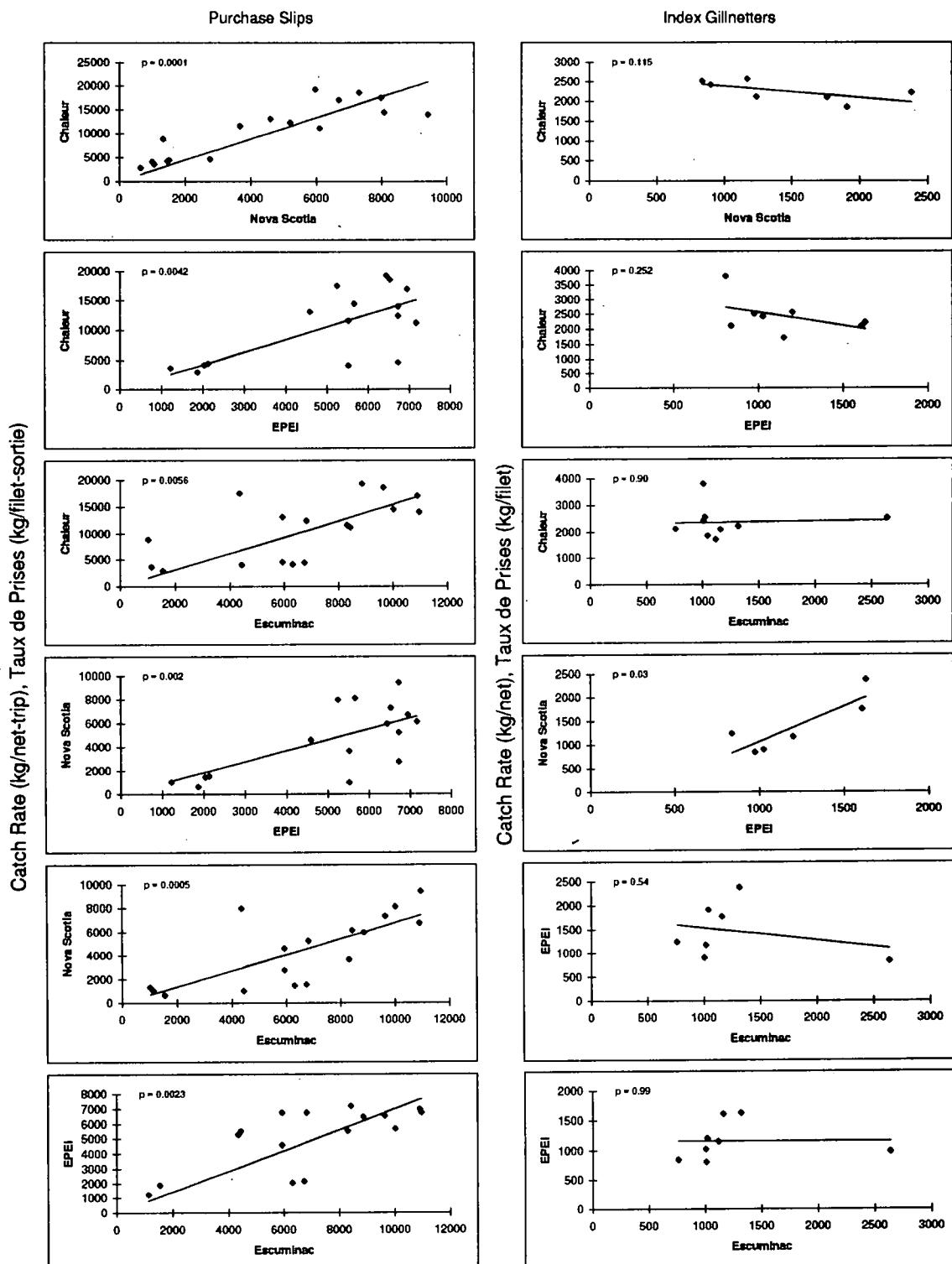


Fig. 39. Relationships among four areas of the Southern Gulf of St. Lawrence for catch rates as estimated using purchase slips and index gillnetters.

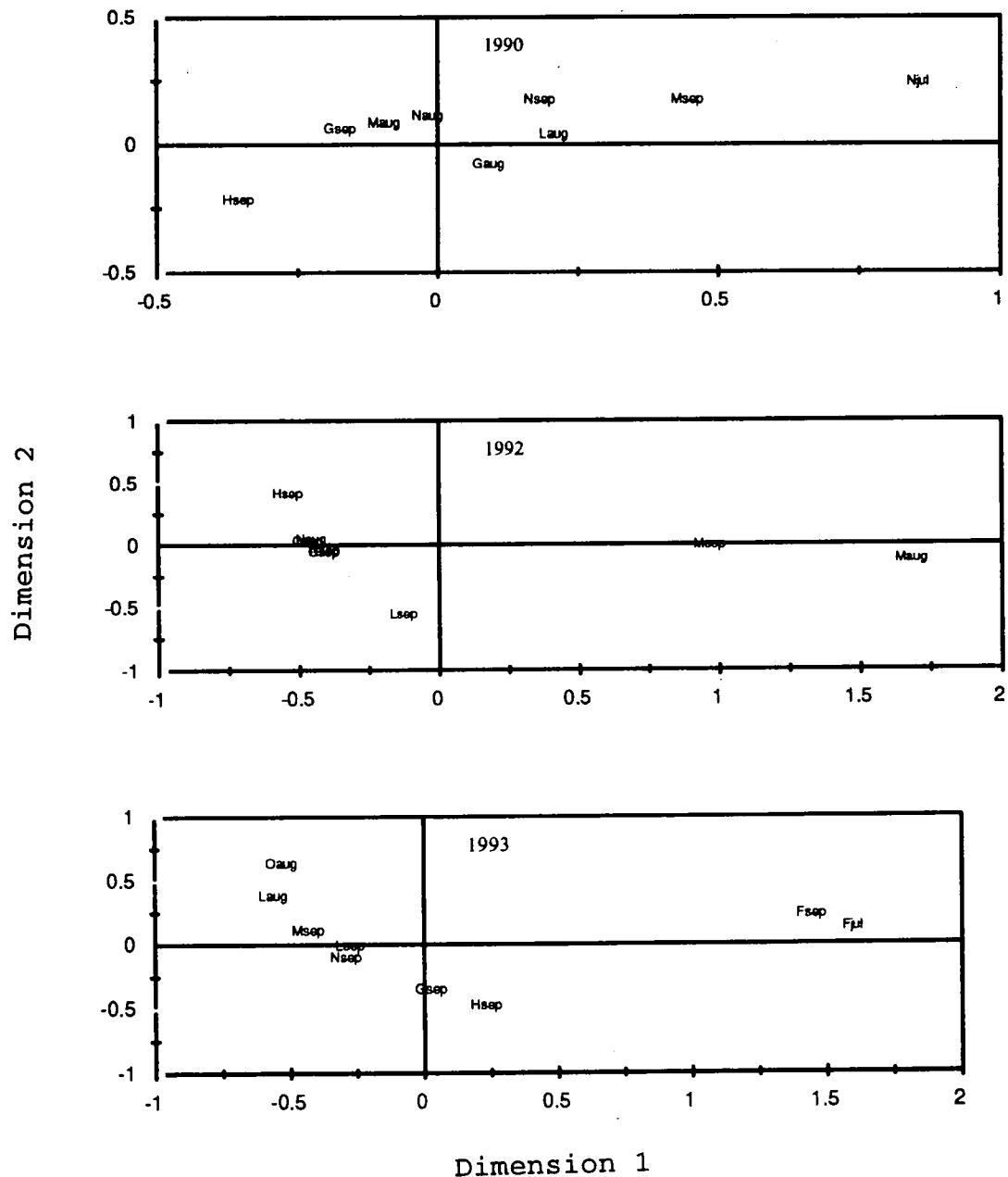


Fig. 40. Results of correspondence analysis for the fall spawners in 1990, 1992, and 1993. Capital letters indicate NAFO Divisions. Lower case letters indicate month.

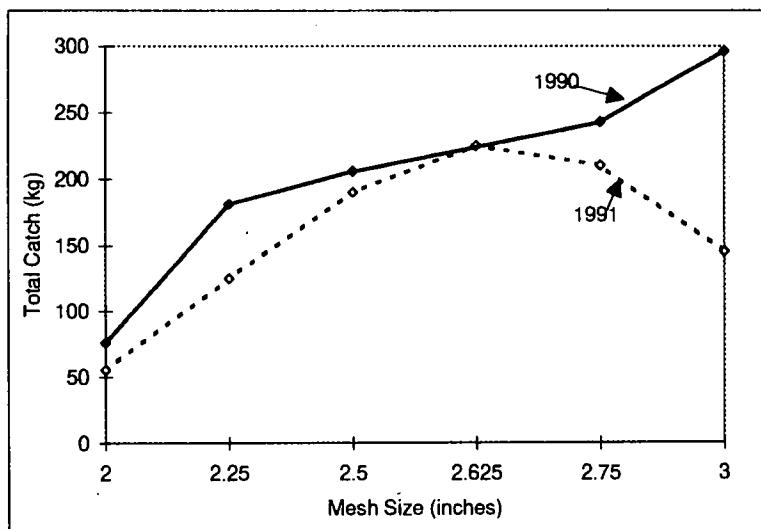


Figure 41. Total weight (kg) of Atlantic herring caught in research gillnets at Fisherman's Bank, P.E.I., in fall, 1990 and 1991.

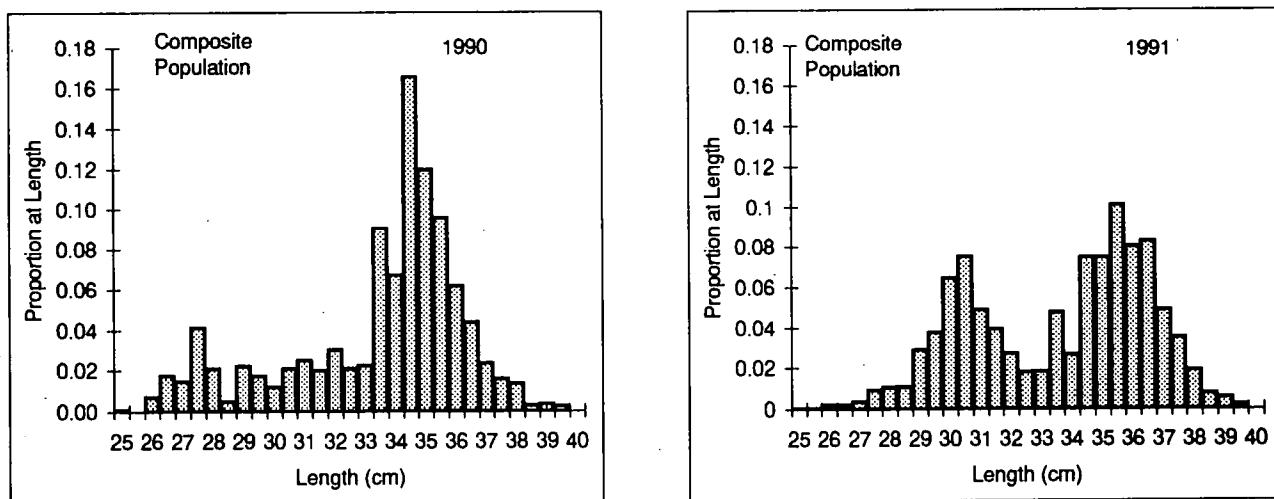


Figure 42. Proportion of population at each length class as estimated by summing all research gillnet catches to produce a composite population.

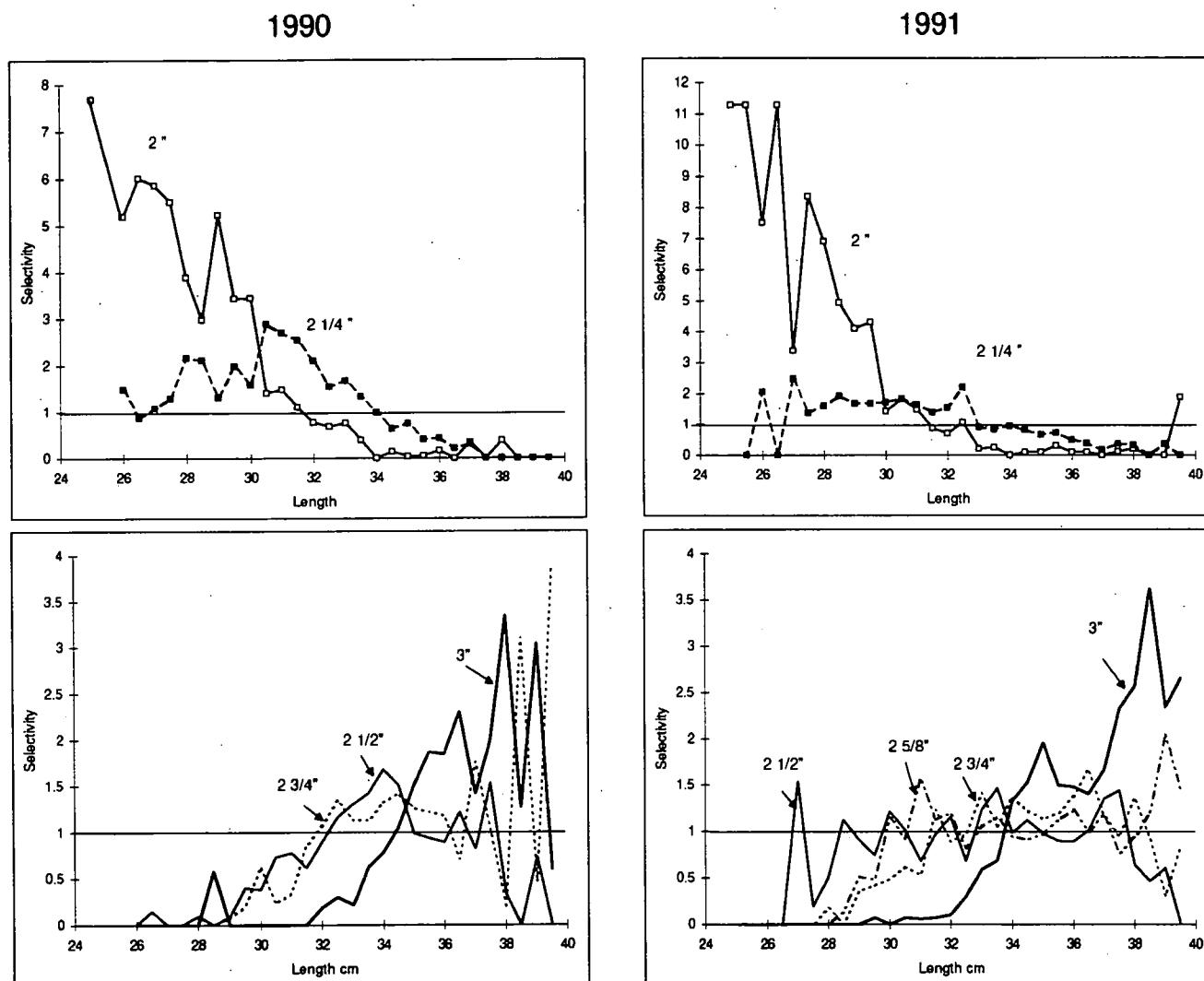


Fig. 43. Selectivity by mesh size for various lengths of herring in research samples at Fisherman's Bank, PEI. A selectivity of one means the proportion caught is equivalent to the proportion in the population.

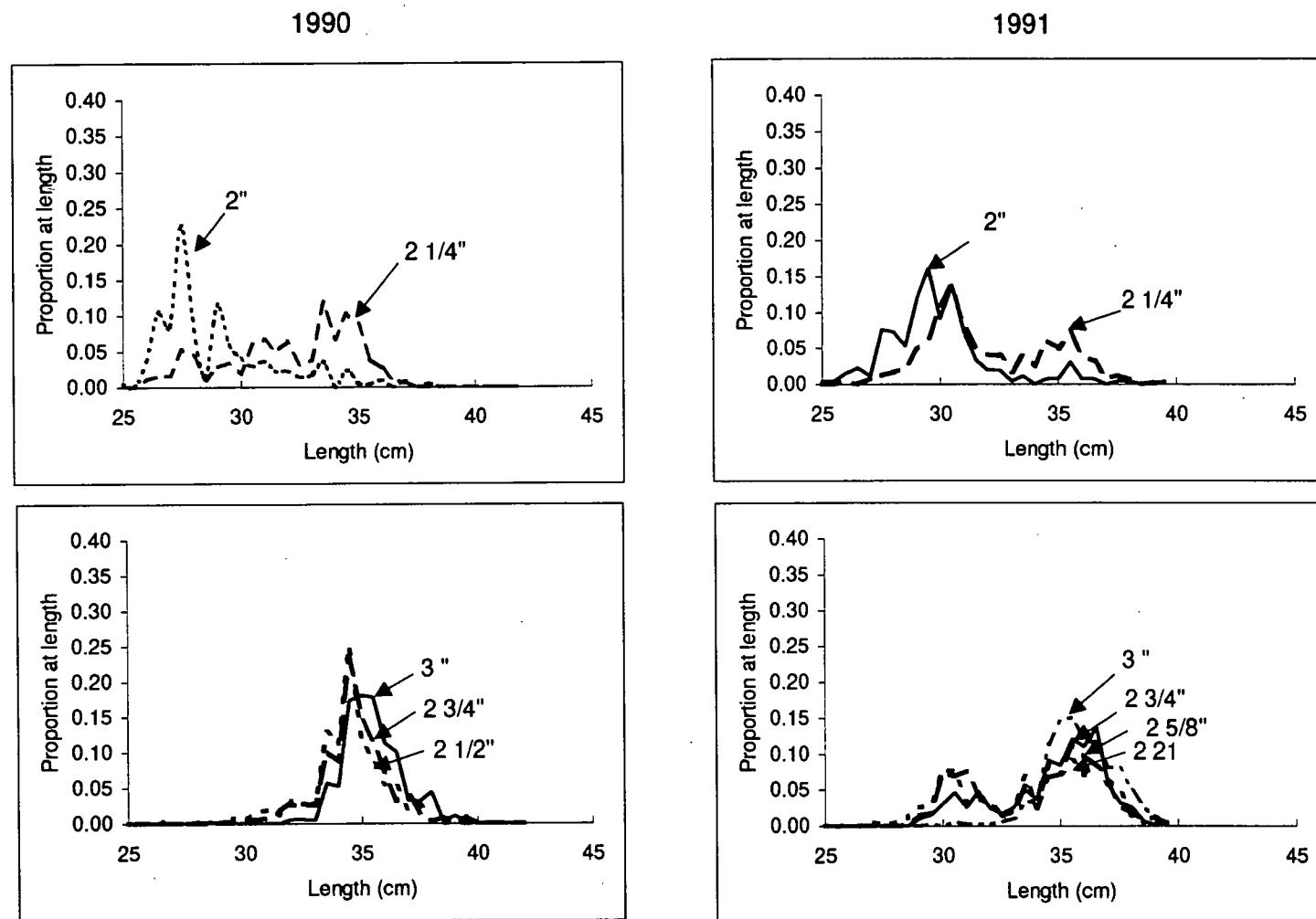


Figure 44. Proportion of herring caught at given lengths at each mesh size and proportion of herring at each length in population as estimated by sum of research samples.

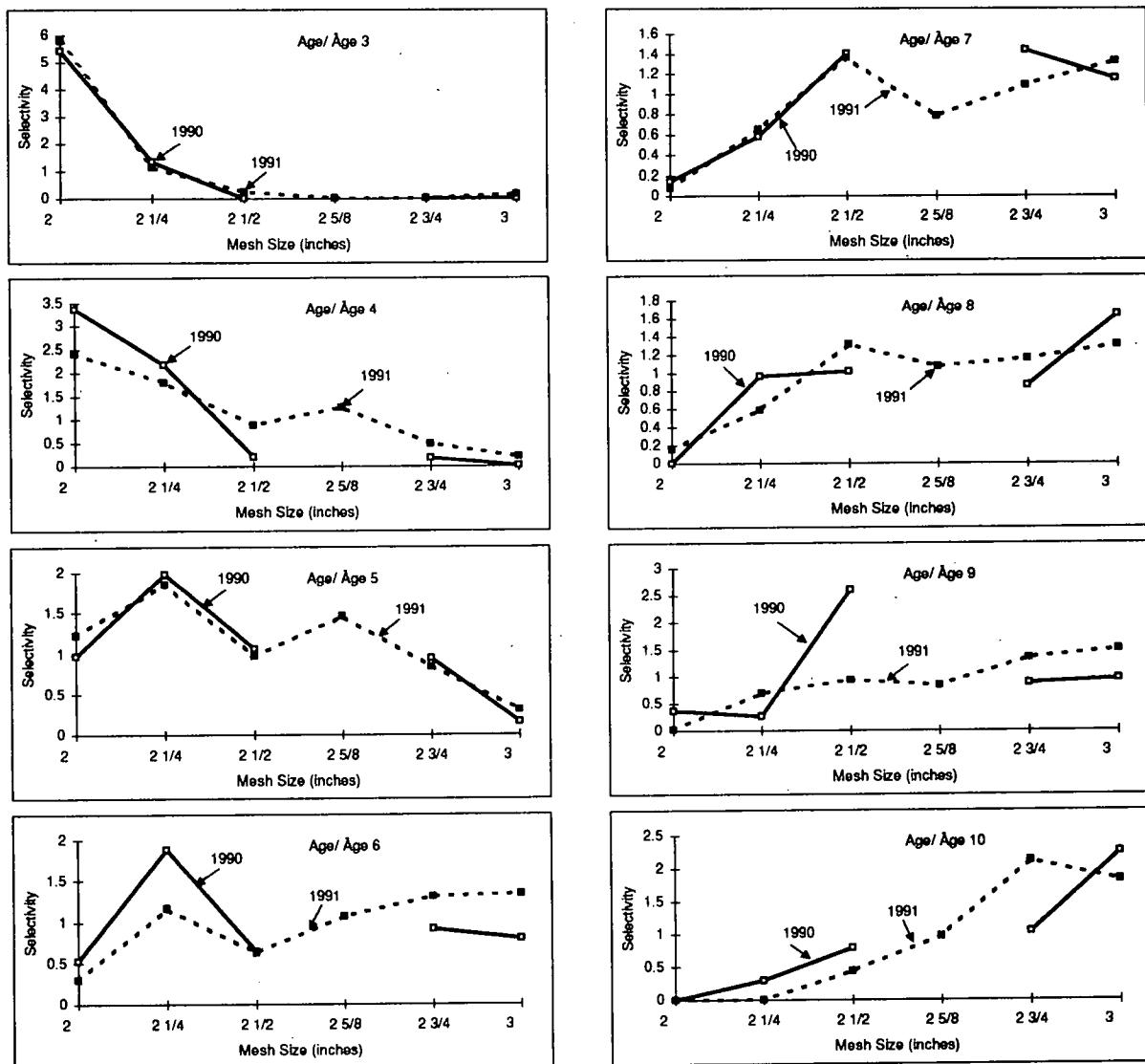


Fig. 45. Selectivity at age of fall spawning Atlantic herring caught in research gillnets at Fisherman's Bank, PEI, in fall 1990 and 1991. In 1990 there was no 2 5/8 inch mesh in the experiment.

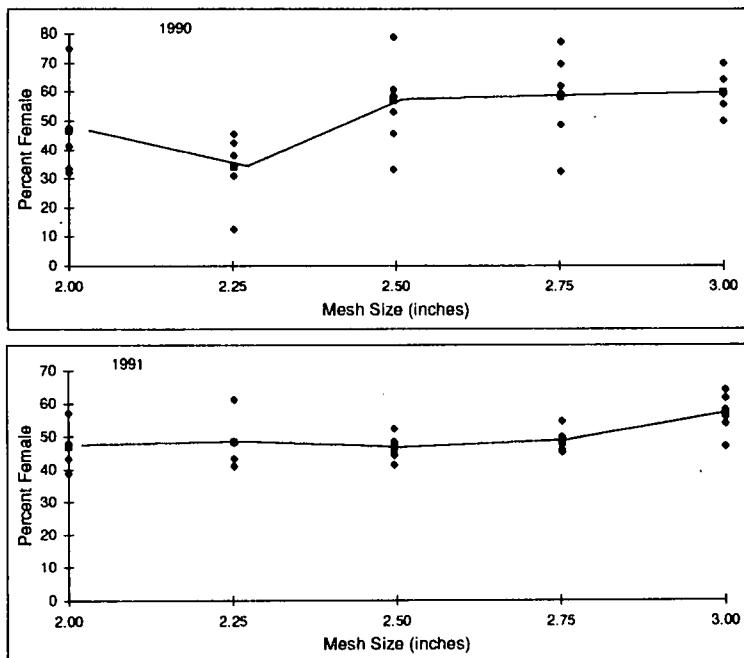


Figure 46. Percentage of females caught at various mesh sizes. Line connects average values for each mesh size. Diamonds represent individual nightly values.

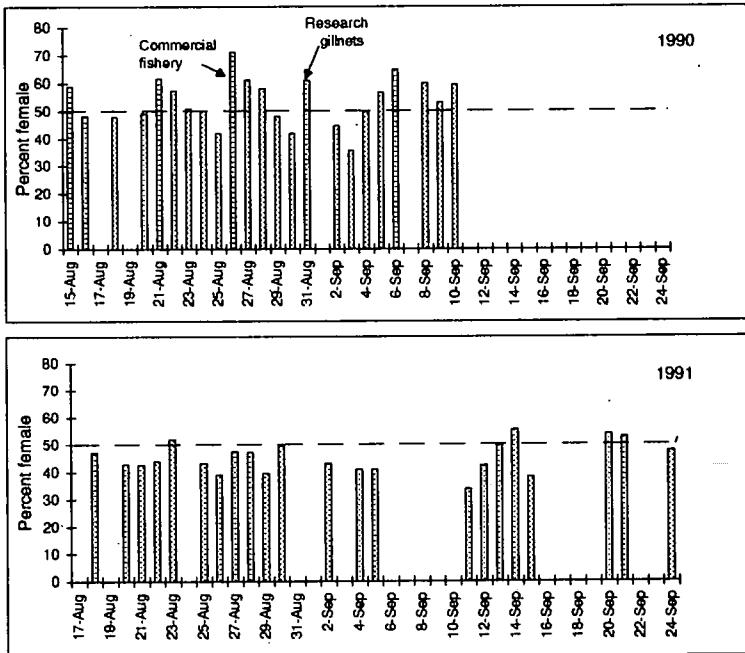


Fig. 47. Percent females from daily sampling of fall spawning herring caught by the commercial roe fishery, and with research gillnets at Fisherman's Bank, PEI in fall 1990 and 1991.

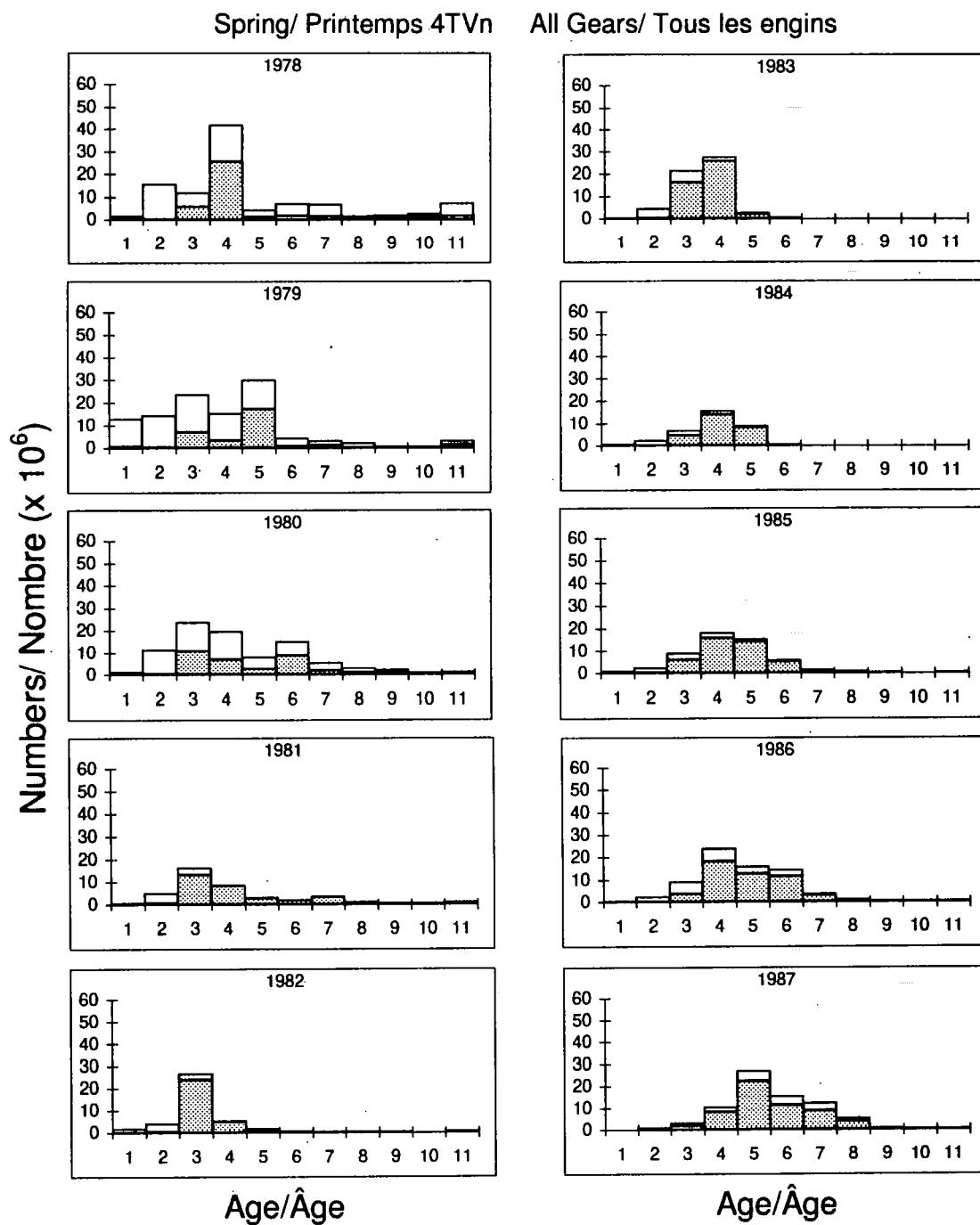


Fig. 48. Fall spawners catch-at-age all gears. Open bars are mobile gear catches, closed bars are fixed gear catches.

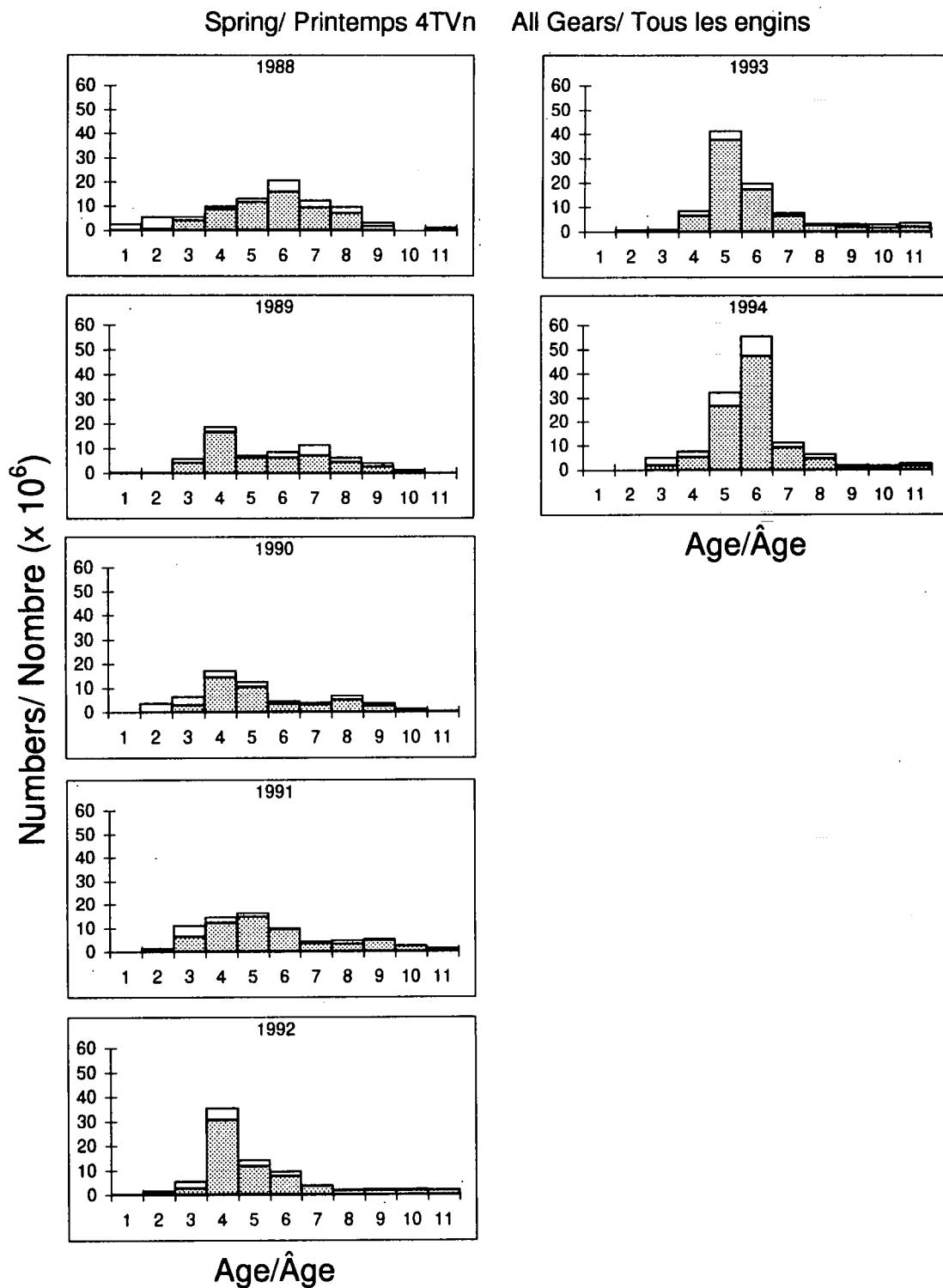


Fig. 48. (continued) Fall spawners catch-at-age all gears. Open bars are mobile gear catches, closed bars are fixed gear catches.

Spring/ Printemps

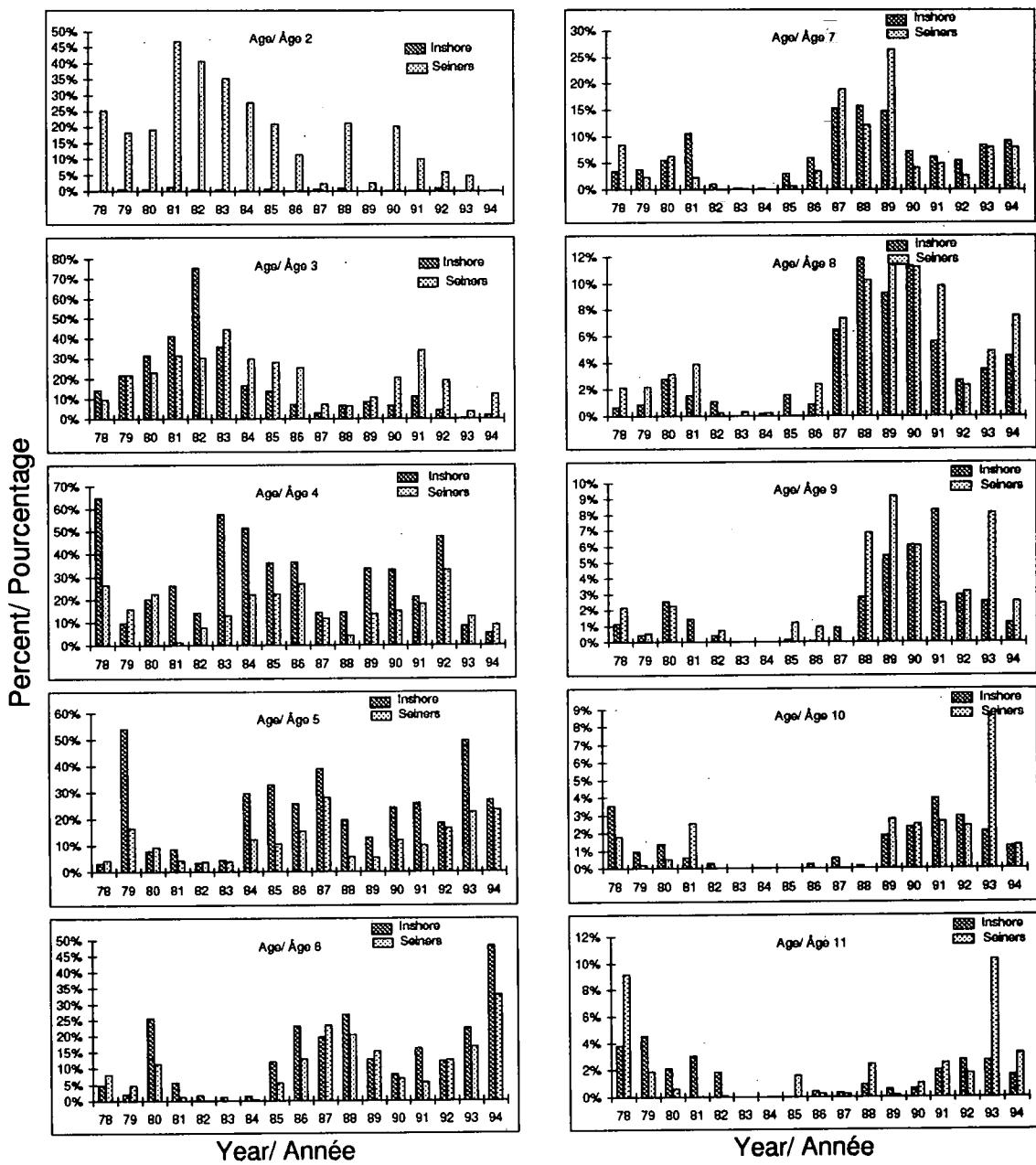
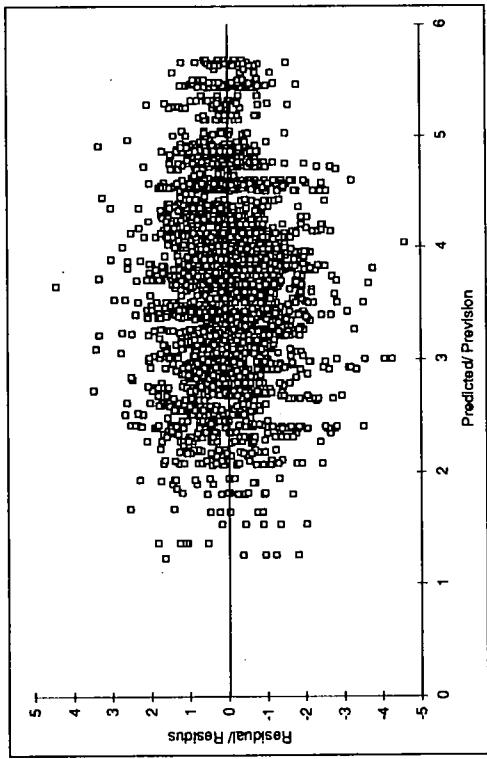


Fig. 49. Percent of catch by age for each year in inshore and seiner fleets for spring 4T herring catches.

Purchase Slips

Spring Catch Rate Analysis for All of 4T



Spring Catch Rate Analysis for Escuminac and Southeast NB

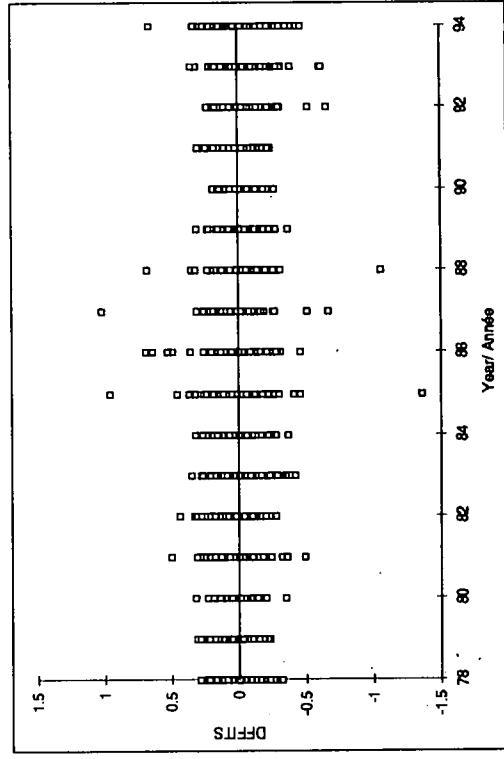
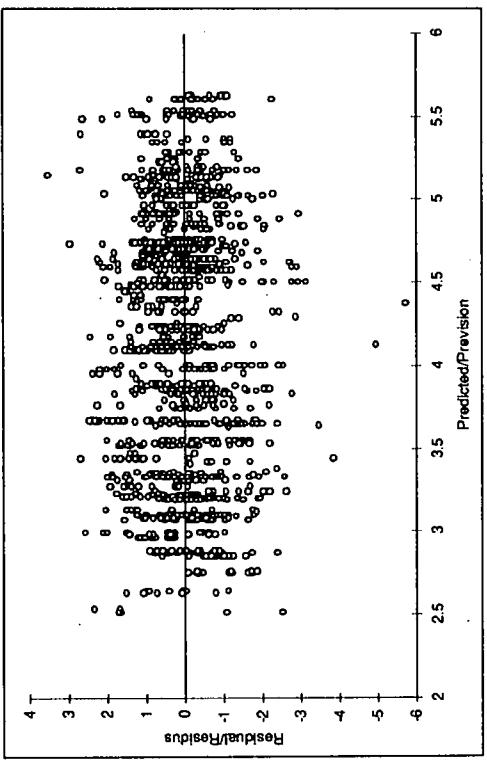
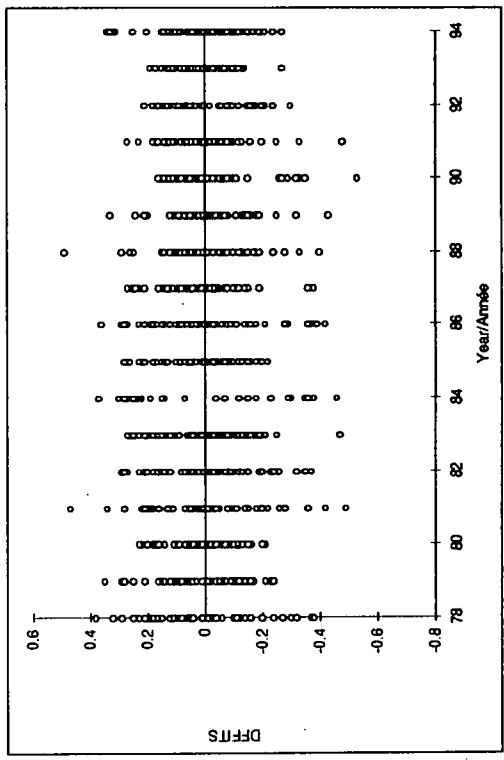
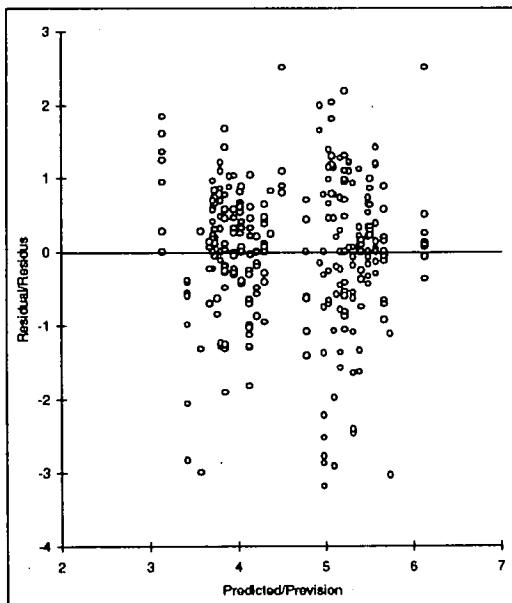


Fig. 50. Residual and DFFITS plots for spring catch rate analysis.



Escuminac - Southeast New Brunswick

Spring Provincial Co-ordinator



Spring Index Gillnetter

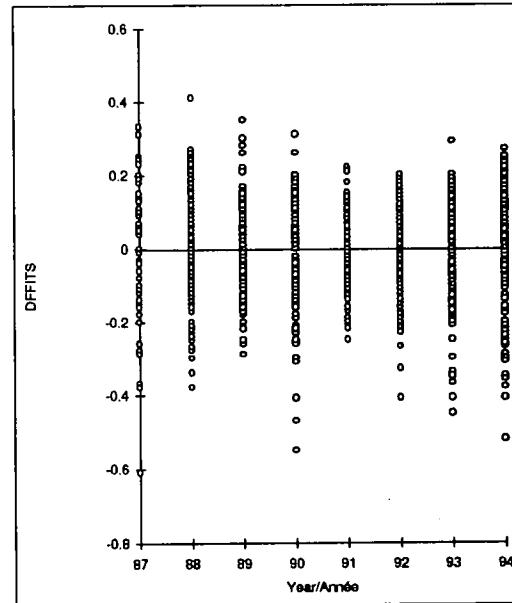
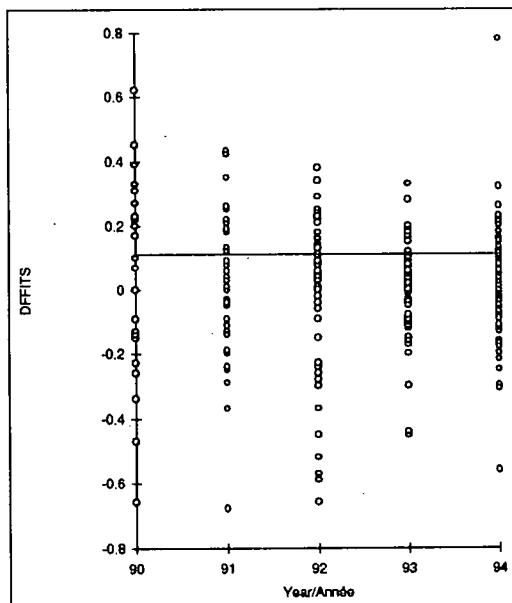
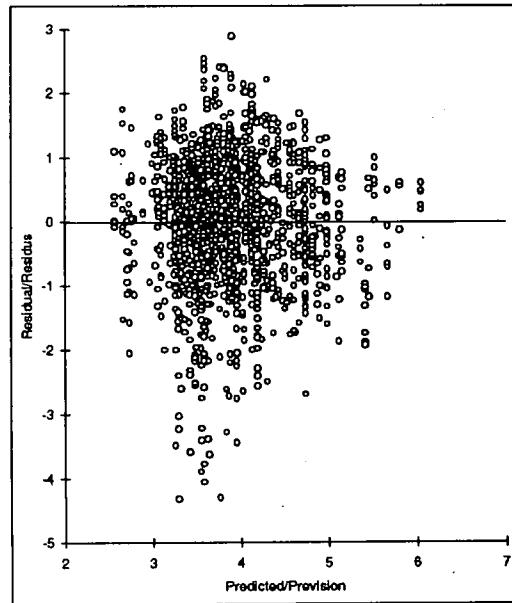


Fig. 51. Residual and DFFITS plots for spring catch rate analysis using Provincial Co-ordinator and Index Gillnetter data.

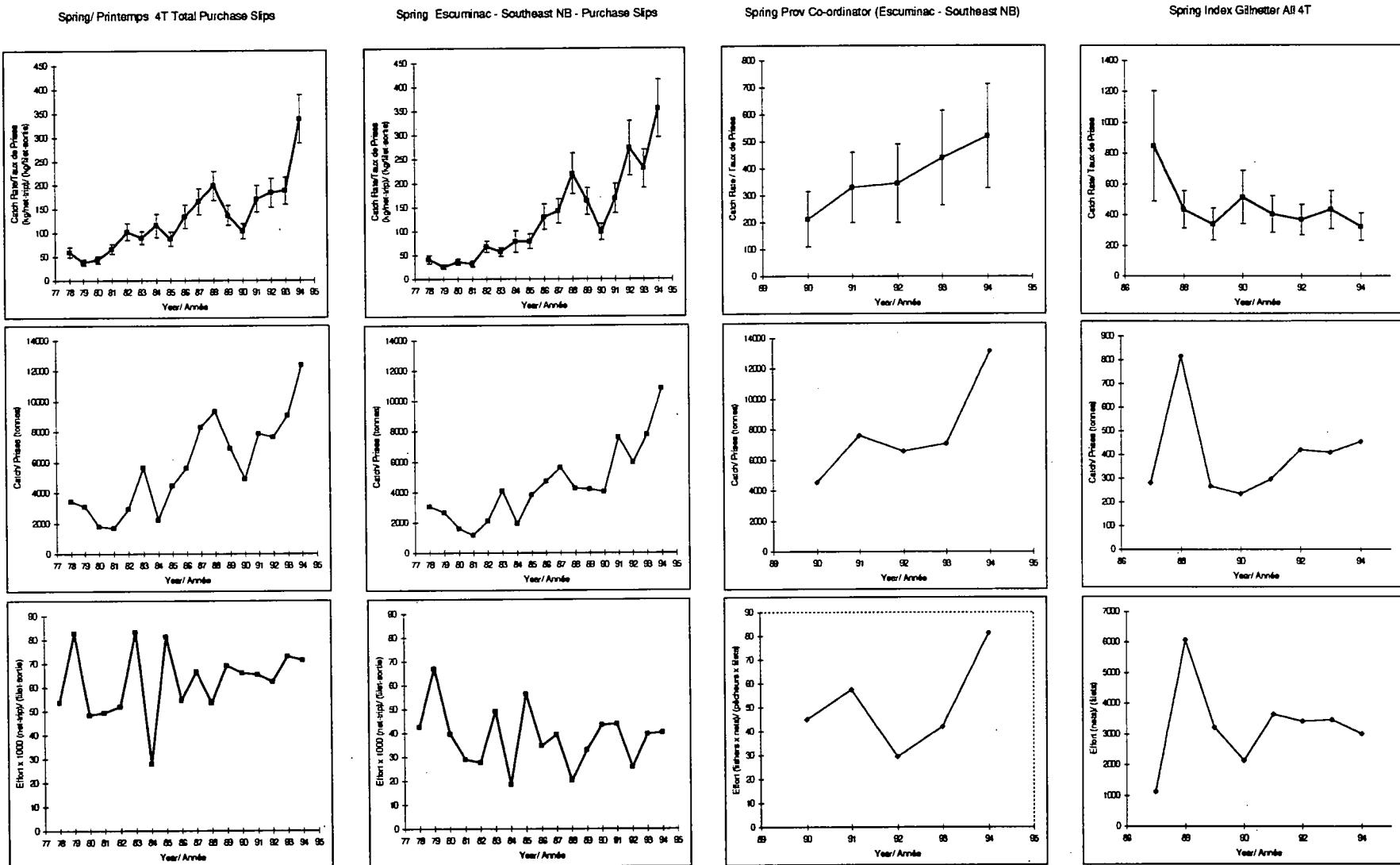


Fig. 52. Gillnet catch rate, catch, and effort for spring 4T gillnet fishery.

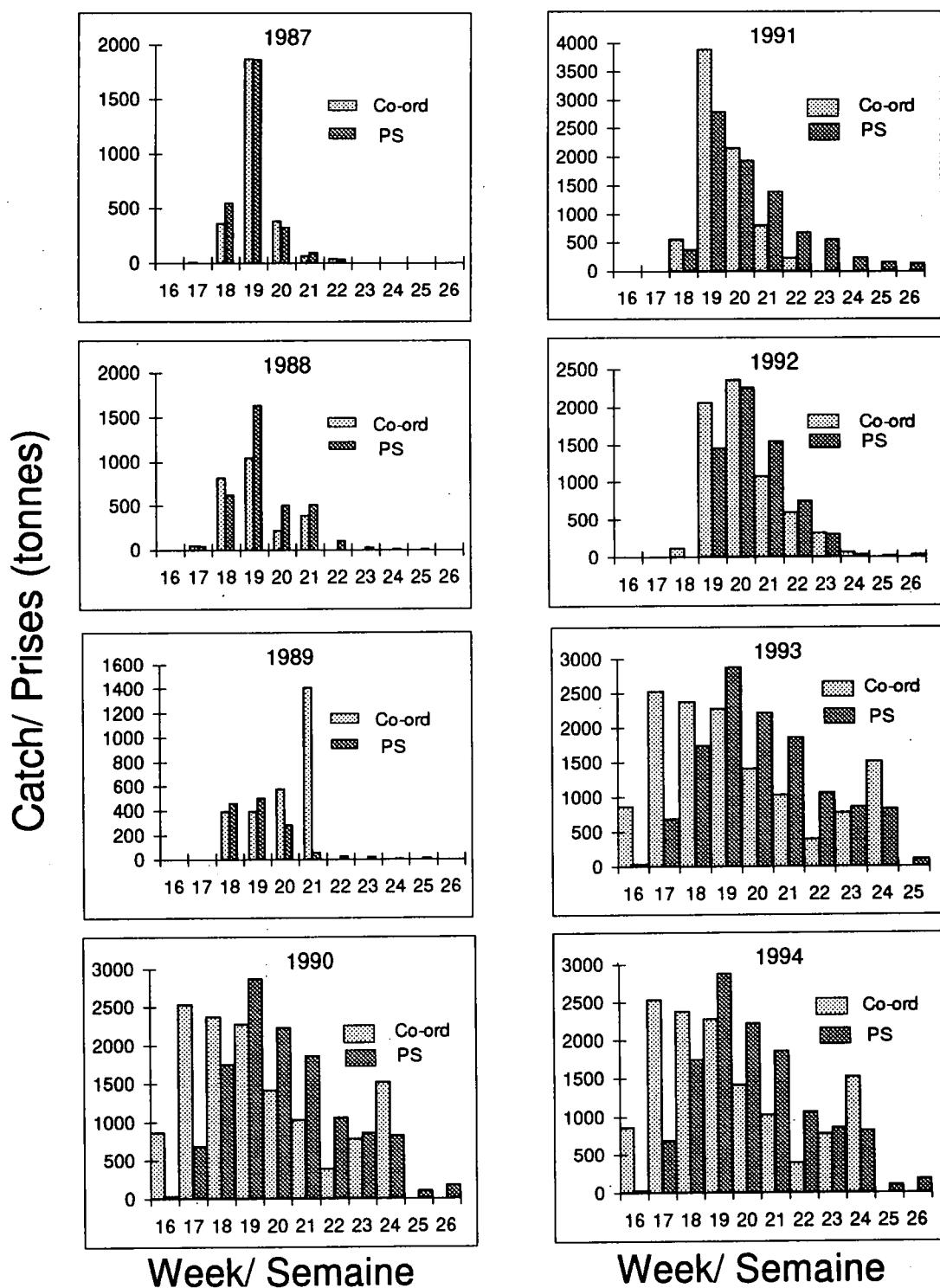


Fig. 53. Catch by week as recorded by Provincial Co-ordinator and Purchase slips in spring Escuminac - Southerst New Brunswick fishery.

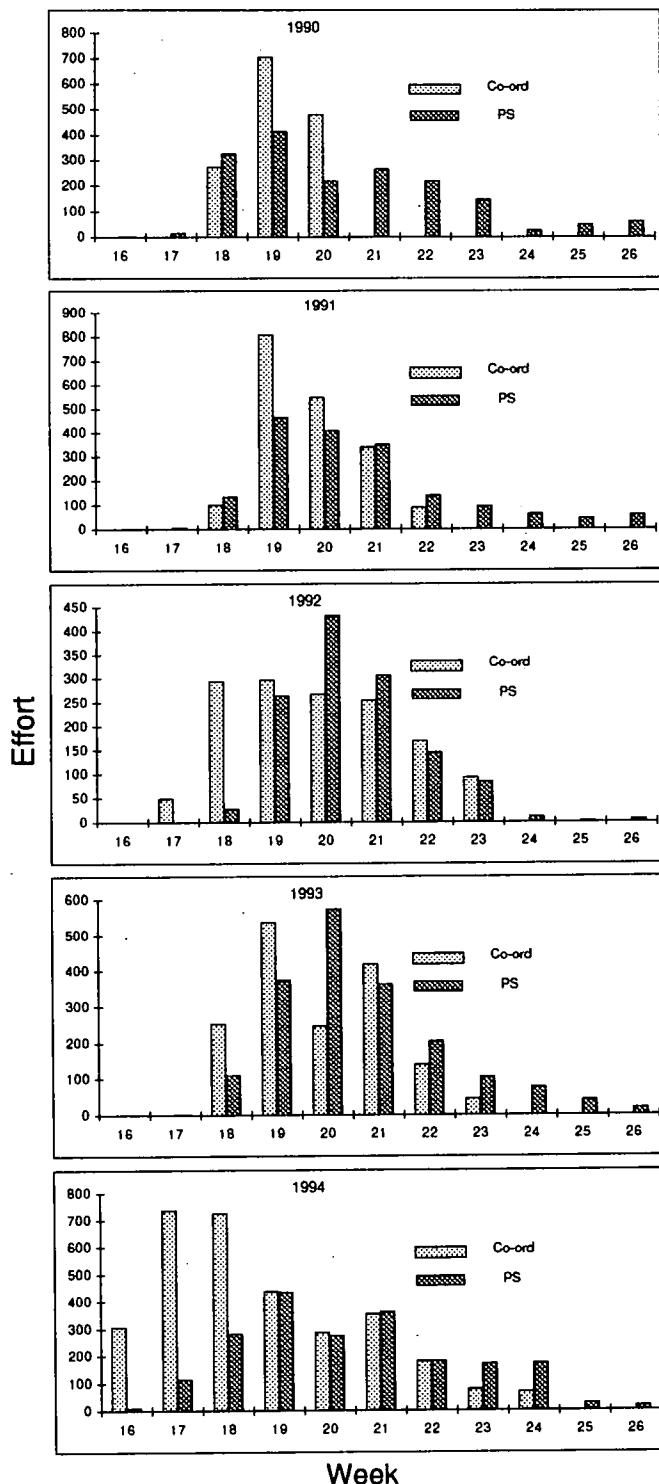


Fig. 54. Effort by week as recorded by purchase slips (trips) and Provincial Co-ordinator (fishers).

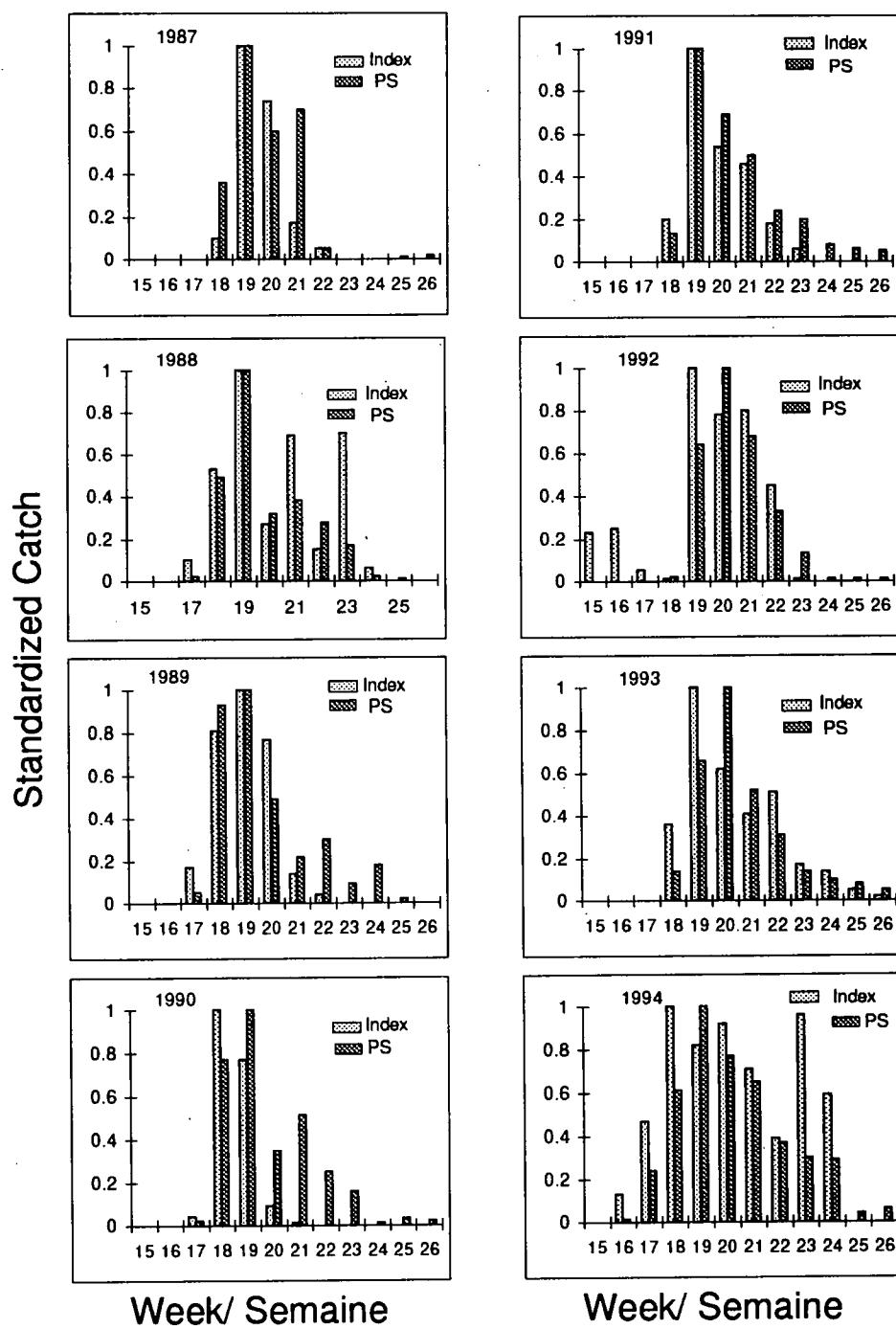


Fig. 55. Catch by week for spring index gillnetters and purchase slip data. Catch has been standardized to the highest weekly value within each type of data.

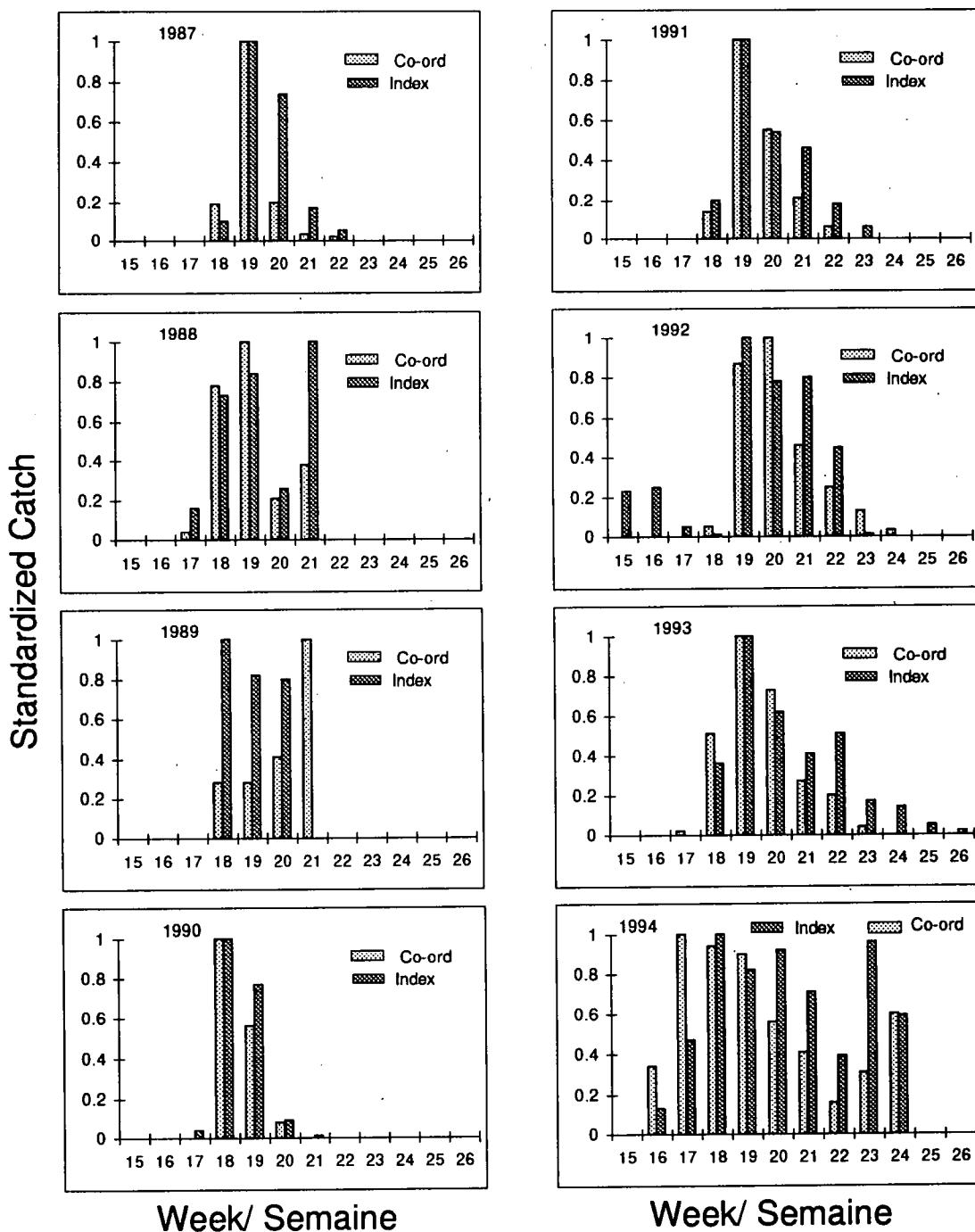


Fig. 56. Catch by week for spring index gillnetters and Provincial co-ordinator data. Catch has been standardized to the highest weekly value within each type of data.

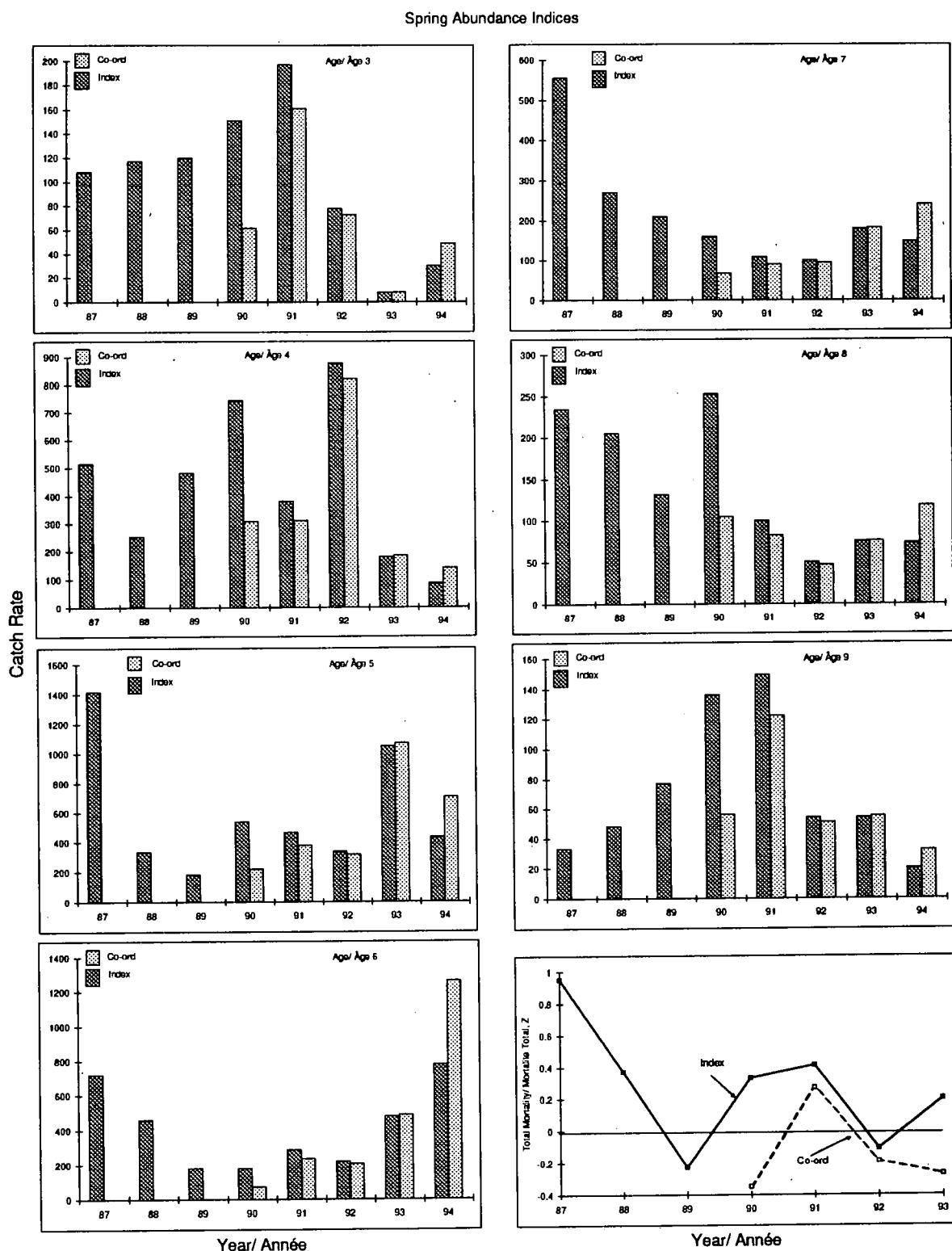


Fig. 57. Abundance index and total mortality estimates for spring spawners by age based on index gillnetter (Index) and Provincial Co-ordinator (Co-ord) programs. Catch rate index for index gillnetters is kg/net and (kg/fisherr) for Co-ordinator data.

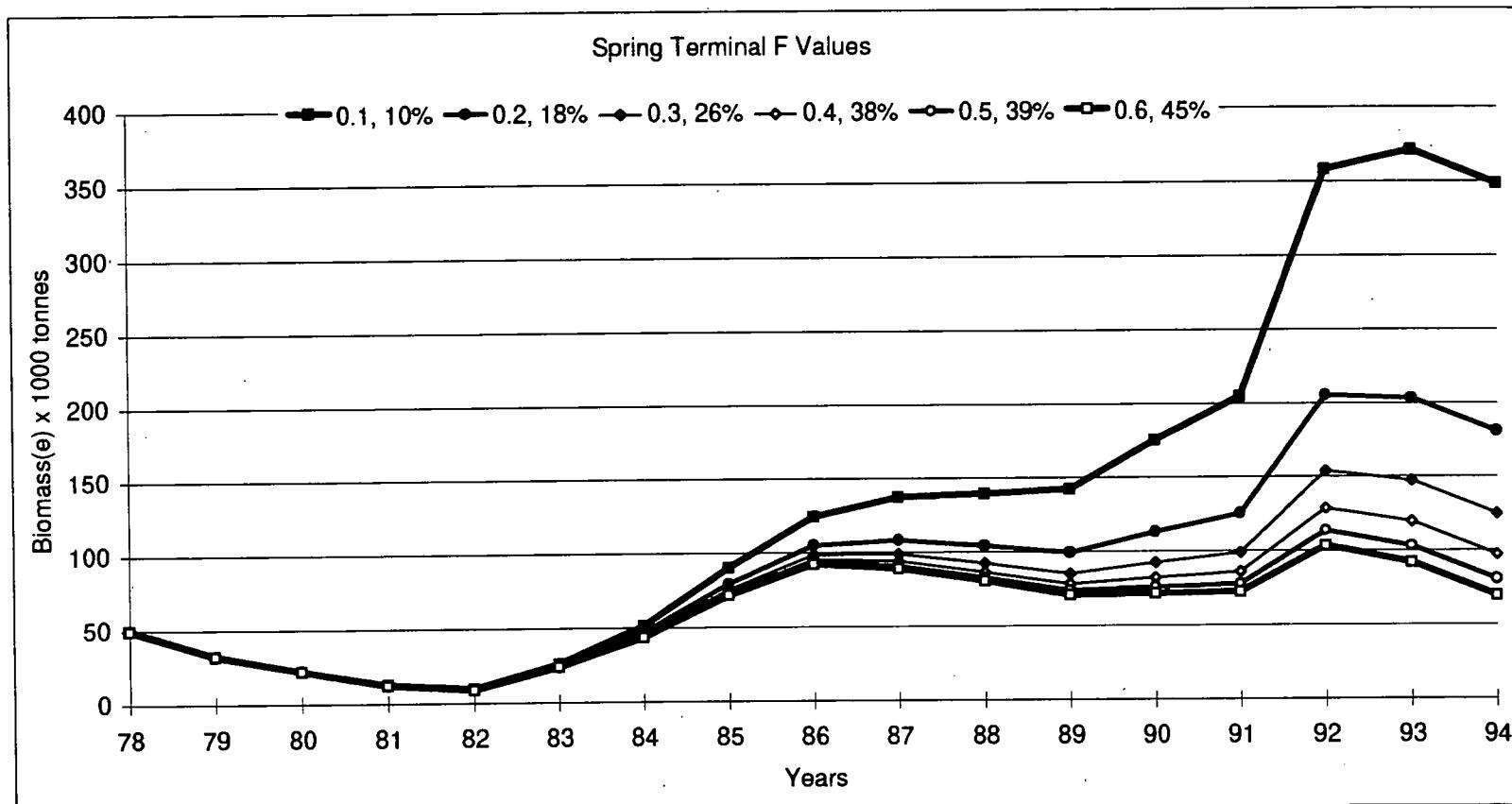


Fig. 58. Spring spawner 4+ biomass estimates using assumed terminal fishing mortalities from 0.1 to 0.6 one fully recruited age 5 spring spawners in a simple virtual population analysis. The percentages are exploitation rates resulting from each assumed fishing mortality.

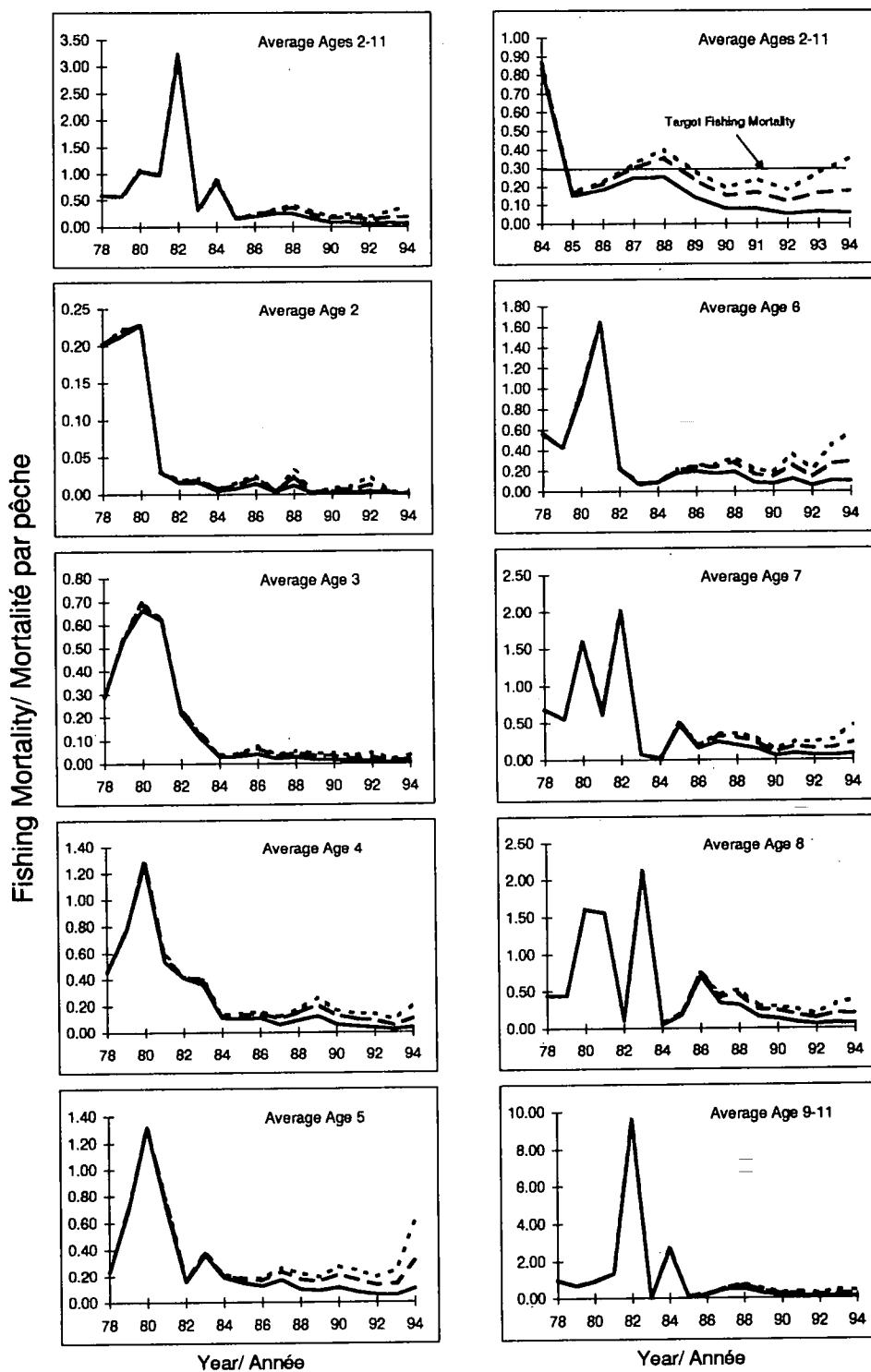


Fig. 59. Fishing mortalities estimated by virtual population analysis for spring spawners using terminal F_s of 0.6, 0.3, and 0.1.

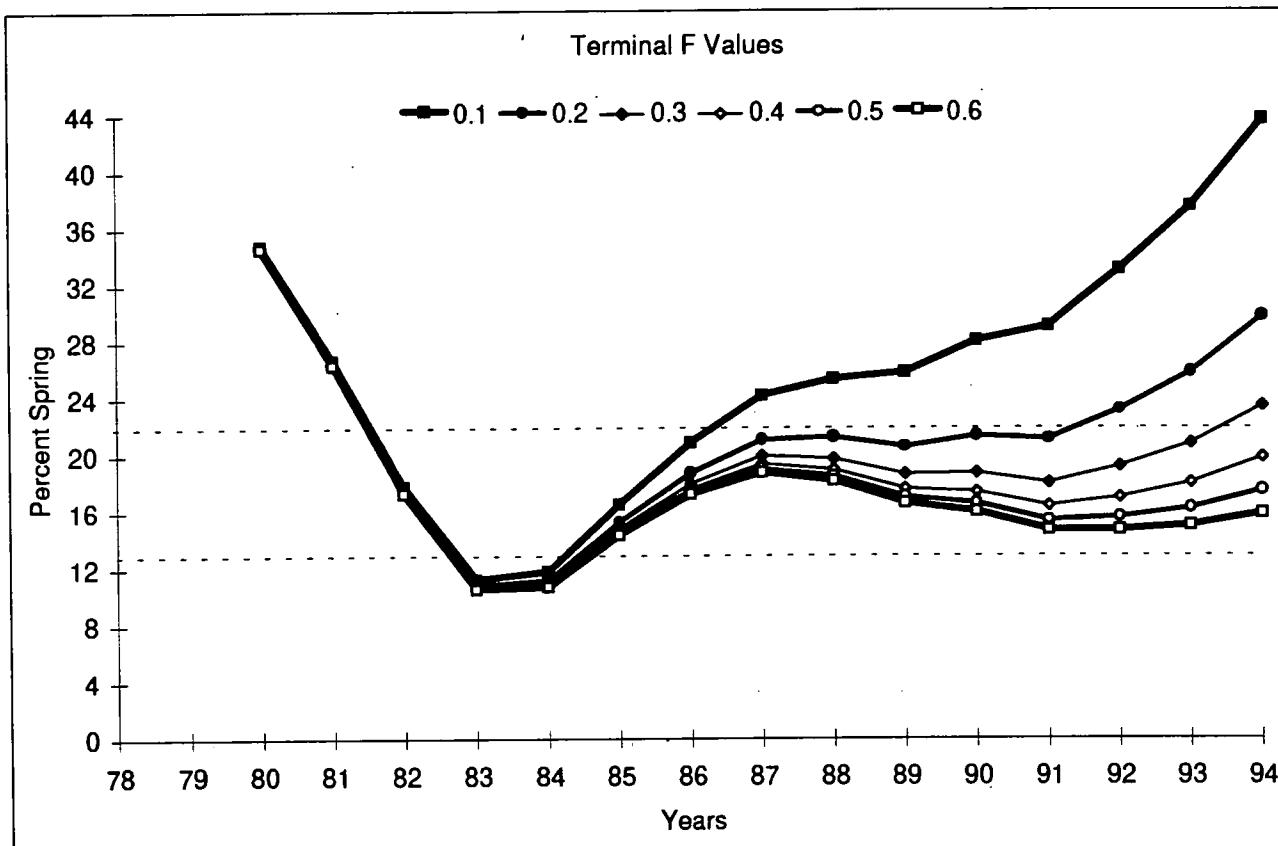


Fig. 60. Moving 3 year averages for percentage of population (spring + fall) that are spring spawners for 4+ biomass using Fall ADAPT results and Spring VPA results assuming a range of Terminal F values. Dotted lines show the range in spring percentages based on acoustic surveys from 1991 - 1994.

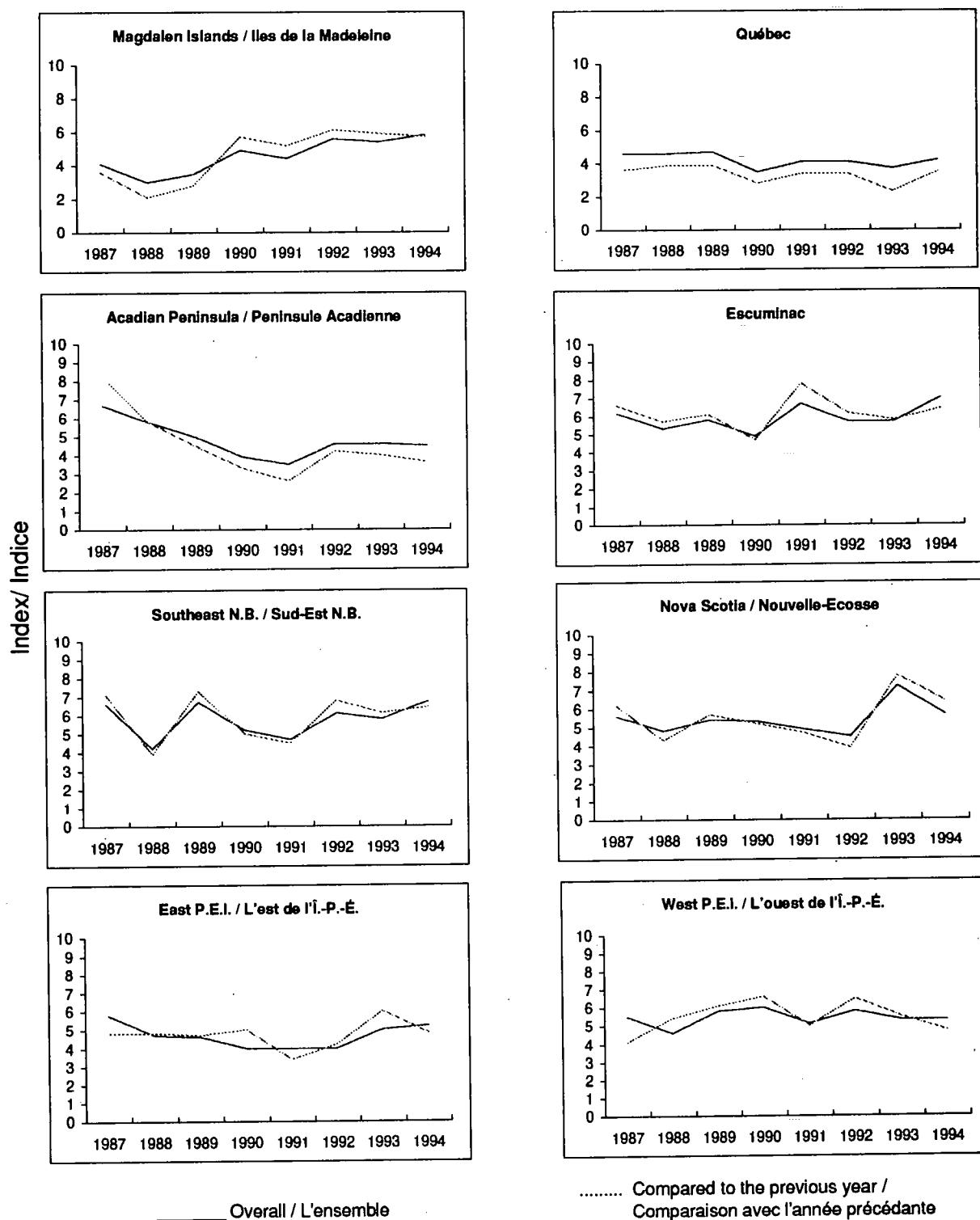


Figure 61. Spring indices of abundance from phone survey.

Spring Spawners/ Géniteurs de printemps
All Gears/ Tous les engins

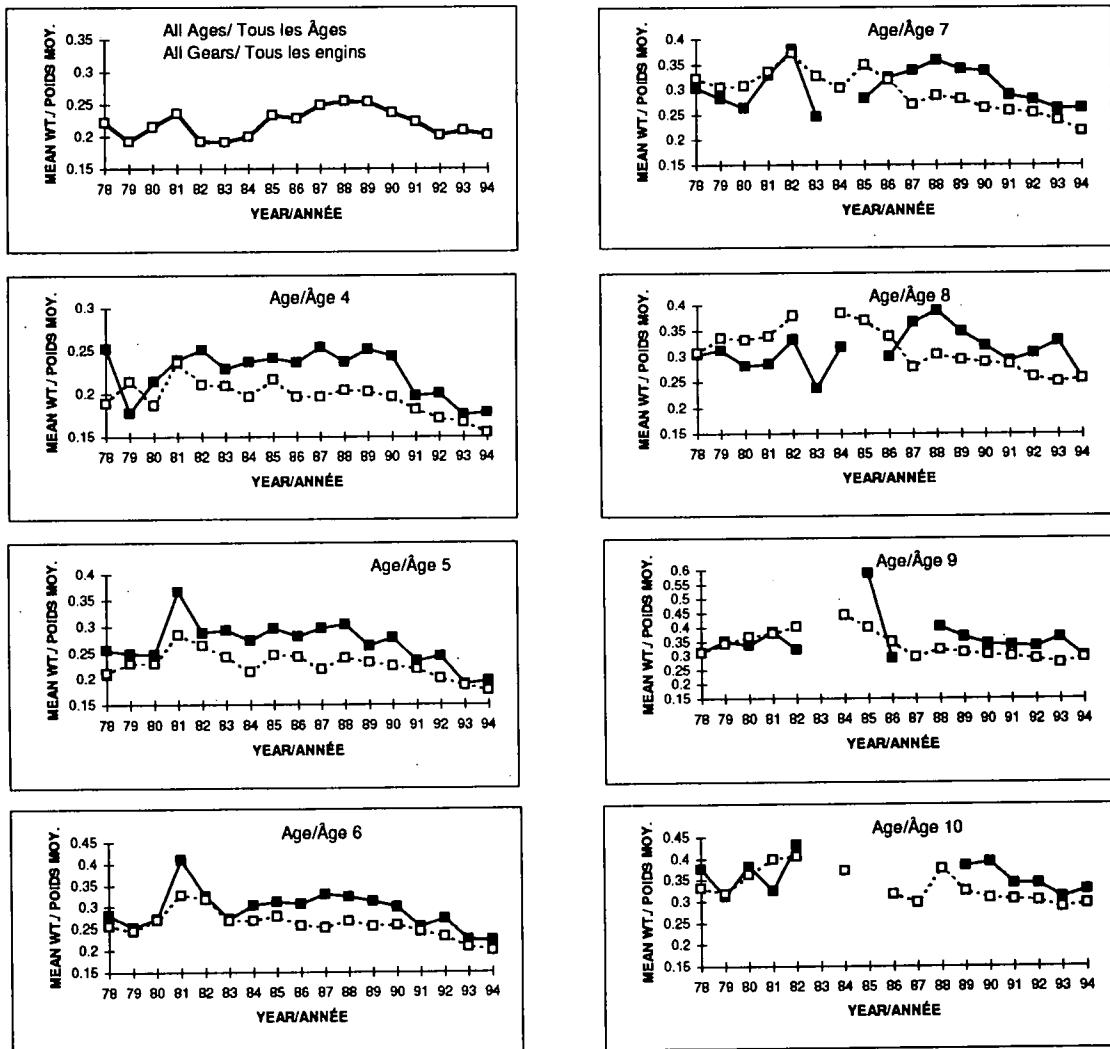


Fig. 62. Spring Spawners mean weight-at-age for all gears and for fixed and mobile gears, ages 4-10. Dotted line is fixed gear and solid line is mobile gear. Weight is in kilograms.

Chaleur - Spring Spawners/ Geniteur Printemps

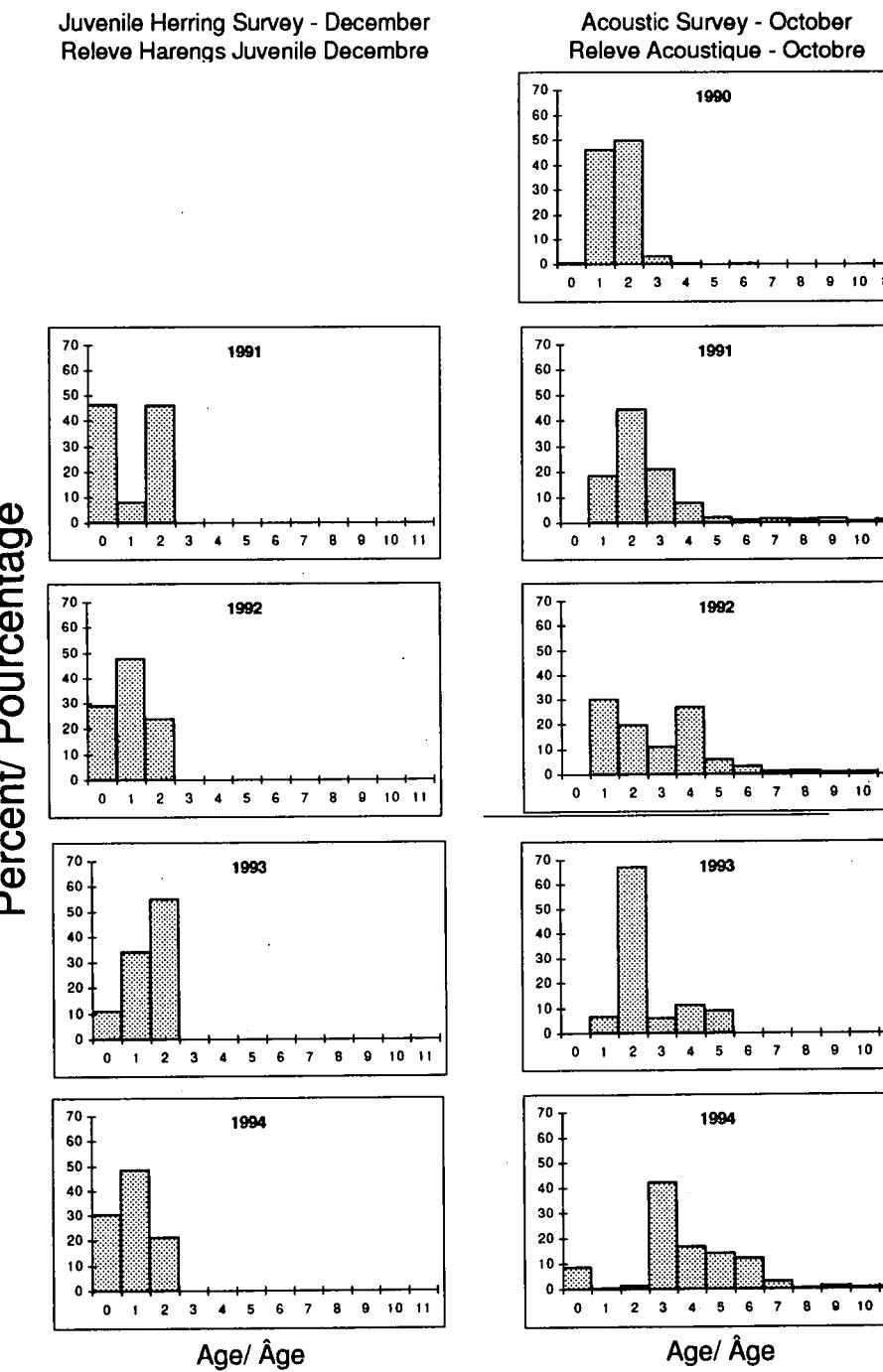


Fig. 63. Percentage numbers at age from December Juvenile and October Acoustic surveys, 1990 - 1994.

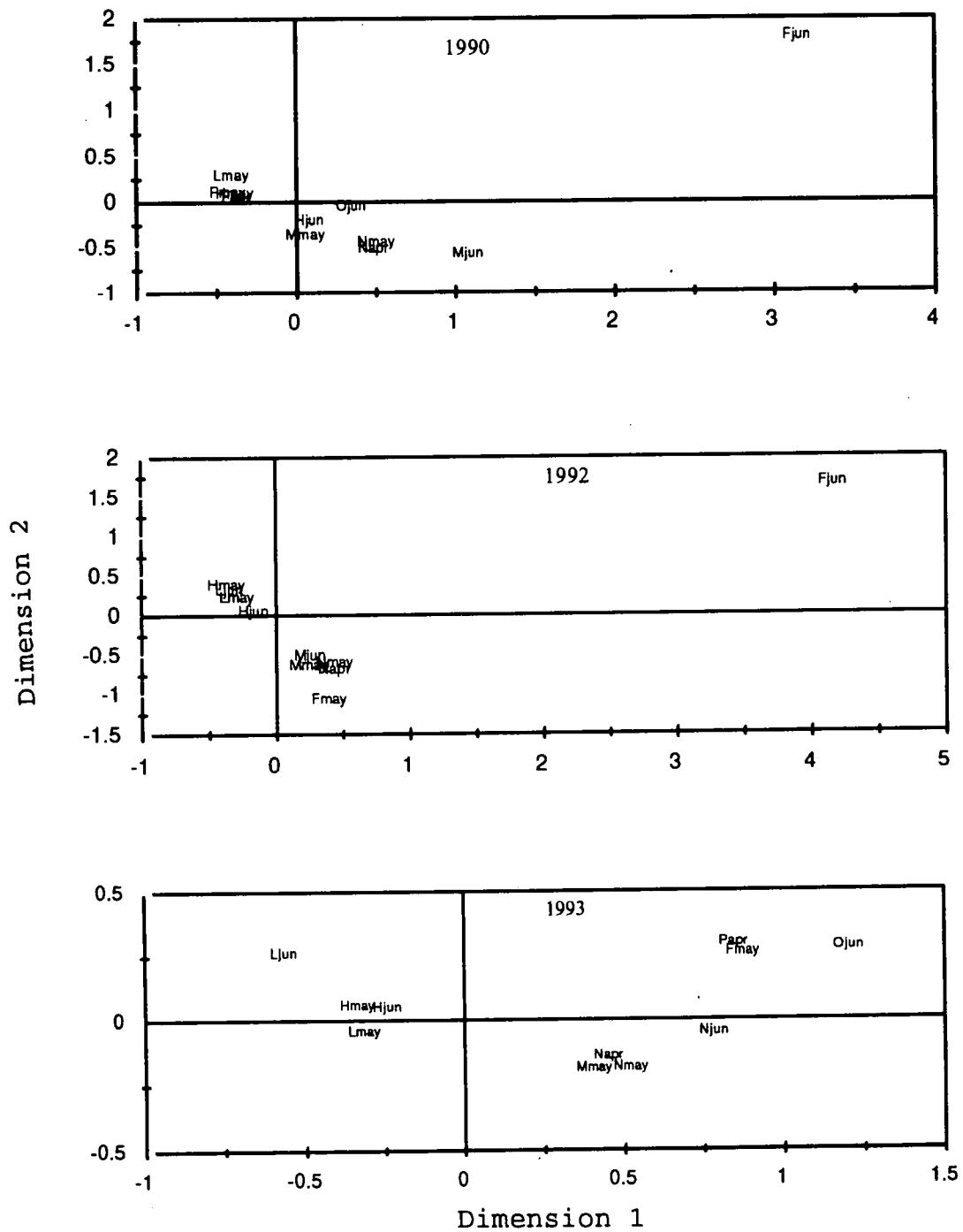


Fig. 64. Results of correspondence analysis for the spring spawners in 1990, 1992, and 1993. Capital letters indicate NAFO Divisions. Lower case letters are months.

Table A. Catch-at-age for 4T herring fall spawners by gear type, 1978-1994. Spawning-group affinity assigned by gonad maturity for spawning and spent fish (stages 6 and 7), by otolith characteristics for juvenile fish (stages 1 and 2) and by McQuinn's (1989) gonadosomatic index (GSI) for all remaining individuals. Numbers are in thousands of fish.

Tableau A. Prises selon l'âge pour les géniteurs d'automne dans 4T par type d'engin, 1978-1994. La saison de frai est classée selon la maturité des gonades pour les poissons en état de frai ou épuisés (stades 6 et 7), selon les caractéristiques des otolithes pour les juvéniles (stades 1 et 2), et selon le modèle d'indice gonadosomatique (IGS) de McQuinn (1989) pour le restant. En milliers de poissons.

FIXED GEAR - FALL SPAWNERS 4T
ENGINS FIXES - GÉNITEURS D'AUTOMNE 4T

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
1	0	904	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	82	8	64	322	0	0	0	0	253	15	0	19	0	52	0	0	0
3	3592	474	7965	5753	2154	720	963	1117	1627	8010	1165	280	3706	158	325	78	0
4	5548	9986	5224	24124	14985	20231	24882	8816	32871	38205	20432	13451	22572	39459	12879	2440	9158
5	3484	5132	6097	6313	16883	9570	13445	24441	16497	30249	41943	21013	19815	10235	54288	29704	12264
6	816	2924	994	2477	4922	13180	8306	14860	34428	20712	20253	28252	28214	7309	12201	36482	48412
7	745	865	1733	1027	2523	2168	5978	9498	19251	36337	13240	13385	54225	10784	7345	6034	69790
8	3911	1065	373	597	1050	1632	1335	4495	8212	15518	14266	6804	17002	13296	8943	3168	12224
9	117	879	232	258	371	486	456	1212	4666	9382	6953	8600	9163	4840	9347	3661	9658
10	157	278	304	239	117	124	200	727	341	4563	2738	3165	9958	2409	4554	1949	9640
11+	1903	545	96	102	62	160	91	159	692	1878	1623	2468	5404	4538	6705	2785	14115
	20355	23060	23082	41212	43067	48271	55656	65325	118838	164869	122613	97418	170079	93028	116639	86301	185262

MOBILE GEAR - FALL SPAWNERS 4T
ENGINS MOBILES - GÉNITEURS D'AUTOMNE 4T

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
1	0	240	140	0	0	0	0	0	0	65	0	0	0	0	0	0	0
2	1422	2728	2342	78	200	127	34	253	157	47	3842	726	43	0	61	22	0
3	21438	13283	36773	4518	5022	3343	332	2037	974	913	2650	840	3426	4343	545	1907	30
4	27443	20666	15048	4460	2494	4688	2456	4303	2238	1616	2925	3184	3211	17311	4586	2354	7200
5	23095	16756	12091	622	2463	2078	2914	5103	6335	2619	2753	5829	5909	3595	12545	4219	2676
6	4060	16686	7251	108	322	1045	1612	4897	6704	8300	3273	5054	2989	1189	2831	6213	5531
7	4319	4410	7455	317	110	182	564	1950	6332	7553	8828	4023	2287	1091	1435	1980	7850
8	10527	3702	5532	91	95	45	97	1760	2861	6263	7493	6706	1762	698	763	1265	1501
9	1449	5277	3328	267	102	25	33	601	1107	2161	4154	4308	3577	479	345	408	738
10	737	1249	1621	116	38	30	14	449	435	289	1234	2284	1848	456	725	2007	560
11+	11781	10464	896	64	121	19	1	372	210	60	2362	1366	297	536	1100	3152	1262
	106271	95461	92477	10641	10967	11582	8057	21725	27353	29821	39579	34320	25349	29698	24936	23527	27348

ALL GEARS - FALL SPAWNERS 4T
TOUS LES ENGINS - GÉNITEURS D'AUTOMNE 4T

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
1	0	1144	140	0	0	0	0	0	0	65	0	0	0	0	0	0	0
2	1504	2736	2406	400	200	127	34	253	410	62	3842	726	62	0	113	22	0
3	25030	13757	44738	10271	7176	4063	1295	3154	2601	8923	3815	1120	7132	4501	870	1985	30
4	32991	30652	20272	28584	17479	24919	27338	13119	35109	39821	23357	16635	25783	56770	17465	4794	16358
5	26579	21888	18188	6935	19346	11648	16359	29544	22832	32868	44696	26842	25724	13830	66833	33923	14940
6	4876	19610	8245	2585	5244	14225	9918	19757	41132	29012	23526	33306	31203	8498	15032	42695	53943
7	5064	5275	9188	1344	2633	2350	6542	11448	25583	43890	22068	17408	56512	11875	8780	8014	77640
8	14438	4767	5905	688	1145	1677	1432	6255	11073	21781	21759	13510	18764	13994	9706	4433	13725
9	1566	6156	3560	525	473	511	489	1813	5773	11543	11107	12908	12740	5319	9692	4069	10396
10	894	1527	1925	355	155	154	214	1176	776	4852	3972	5449	11806	2865	5279	3956	10200
11+	13684	11009	992	166	183	179	92	531	902	1938	3985	3834	5701	5074	7805	5937	15377
	126626	118521	115559	51853	54034	59853	63713	87050	146191	194690	162192	131738	195427	122726	141575	109828	212609

Table B. Weights-at-age (kg) for 4T herring fall spawners by gear type, 1978-1994. Spawning-group affinity assigned by gonad maturity for spawning and spent fish (stages 6 and 7), by otolith characteristics for juvenile fish (stages 1 and 2) and by McQuinn's (1989) gonadosomatic index (GSI) for all remaining individuals.

Tableau B. Poids selon l'âge (kg) pour les géniteurs d'automne dans 4T par type d'engin, 1978-1994. La saison de frai est classée selon la maturité des gonades pour les poissons en état de frai ou épuisés (stades 6 et 7), selon les caractéristiques des otolithes pour les juvéniles (stades 1 et 2), et selon le modèle d'indice gonadosomatique (IGS) de McQuinn (1989) pour le restant.

FIXED GEAR - FALL SPAWNERS 4T
ENGINS FIXES - GÉNITEURS D'AUTOMNE 4T

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
1	0.0000	0.0231	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	0.0787	0.1066	0.2115	0.1288	0.0000	0.0000	0.0000	0.0000	0.1793	0.1328	0.0000	0.0000	0.2675	0.0000	0.0658	0.0000	0.0000
3	0.1344	0.2015	0.2068	0.2048	0.2220	0.1908	0.2362	0.2573	0.1958	0.2347	0.2309	0.2260	0.2102	0.1959	0.1421	0.1596	0.0000
4	0.2371	0.2554	0.2577	0.2468	0.2660	0.2519	0.2484	0.2541	0.2485	0.2470	0.2645	0.2602	0.2499	0.2339	0.2202	0.2127	0.2085
5	0.2822	0.2934	0.3118	0.3101	0.3006	0.2853	0.2863	0.2917	0.2896	0.2789	0.2902	0.2955	0.2855	0.2675	0.2551	0.2349	0.2339
6	0.3074	0.3201	0.3587	0.3679	0.3370	0.3169	0.3219	0.3352	0.3248	0.3164	0.3252	0.3255	0.3248	0.3025	0.2818	0.2599	0.2583
7	0.3191	0.3553	0.3490	0.3950	0.3739	0.3493	0.3480	0.3611	0.3672	0.3434	0.3538	0.3532	0.3478	0.3360	0.3054	0.2822	0.2867
8	0.3687	0.3982	0.3672	0.4200	0.3825	0.3652	0.3974	0.3742	0.3848	0.3673	0.3794	0.3731	0.3684	0.3545	0.3423	0.3300	0.3150
9	0.3711	0.4171	0.4020	0.4585	0.3927	0.3724	0.4128	0.4102	0.4013	0.3818	0.4073	0.3847	0.3878	0.3732	0.3491	0.3520	0.3426
10	0.3479	0.4274	0.4354	0.4717	0.3700	0.4495	0.3794	0.4055	0.4315	0.3855	0.4095	0.4062	0.4038	0.3917	0.3640	0.3497	0.3589
10+	0.4324	0.4366	0.4310	0.5211	0.4674	0.4295	0.4896	0.4969	0.4337	0.4257	0.4381	0.4065	0.4319	0.4114	0.3987	0.3826	0.3837
	0.2770	0.2847	0.2718	0.2665	0.2963	0.2859	0.2848	0.3157	0.3117	0.3071	0.3196	0.3268	0.3309	0.2920	0.2835	0.2639	0.2878

MOBILE GEAR - FALL SPAWNERS 4T
ENGINS MOBILES - GÉNITEURS D'AUTOMNE 4T

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
1	0.0000	0.0692	0.0308	0.0000	0.0000	0.0000	0.0000	0.0000	0.0753	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	0.0996	0.1191	0.1032	0.1144	0.0960	0.1079	0.1109	0.1023	0.1065	0.1422	0.0959	0.1049	0.1081	0.0000	0.0661	0.0797	0.0000
3	0.1492	0.1514	0.1409	0.1789	0.1709	0.1734	0.1620	0.1886	0.1583	0.2033	0.1651	0.1585	0.1773	0.1541	0.1277	0.1432	0.1180
4	0.2186	0.1852	0.1682	0.2255	0.2109	0.2077	0.2116	0.2142	0.2143	0.2427	0.2250	0.2159	0.2088	0.1893	0.1724	0.1650	0.1628
5	0.2552	0.2204	0.2264	0.2500	0.2607	0.2343	0.2368	0.2556	0.2514	0.2683	0.2603	0.2490	0.2410	0.2178	0.2119	0.2020	0.1791
6	0.2749	0.2514	0.2376	0.2872	0.2817	0.2850	0.2594	0.2829	0.2767	0.2890	0.3050	0.2832	0.2834	0.2520	0.2270	0.2223	0.2136
7	0.2929	0.2588	0.2640	0.3410	0.3748	0.3185	0.3032	0.3170	0.2943	0.3148	0.3328	0.2946	0.3000	0.2784	0.2607	0.2375	0.2295
8	0.3396	0.2965	0.2513	0.2568	0.3549	0.3675	0.3313	0.3370	0.3224	0.3352	0.3240	0.3082	0.3278	0.3093	0.2861	0.2262	0.2384
9	0.3351	0.3440	0.2776	0.2607	0.3079	0.3648	0.3701	0.3754	0.3450	0.3435	0.3800	0.3297	0.3273	0.2955	0.3103	0.3588	0.2779
10	0.3217	0.3343	0.2875	0.2620	0.4223	0.2639	0.3278	0.4055	0.3288	0.4071	0.4042	0.3609	0.3388	0.3166	0.3030	0.2690	0.2742
11+	0.3914	0.3823	0.3587	0.2624	0.4439	0.4579	0.4236	0.4365	0.4098	0.4446	0.4108	0.3838	0.4150	0.3539	0.3448	0.3167	0.3200
	0.2496	0.2361	0.1891	0.2122	0.2108	0.2117	0.2365	0.2671	0.2740	0.3035	0.2930	0.2856	0.2658	0.2028	0.2191	0.2269	0.2106

ALL GEARS - FALL SPAWNERS 4T
TOUS LES ENGINS - GÉNITEURS D'AUTOMNE 4T

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
1	0.0000	0.0328	0.0308	0.0000	0.0000	0.0000	0.0000	0.0000	0.0753	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	0.0985	0.1191	0.1061	0.1260	0.0960	0.1079	0.1109	0.1023	0.1514	0.1399	0.0959	0.1049	0.1569	0.0000	0.0660	0.0797	0.0000
3	0.1471	0.1531	0.1526	0.1934	0.1862	0.1765	0.2172	0.2129	0.1818	0.2315	0.1852	0.1754	0.1944	0.1556	0.1331	0.1438	0.1180
4	0.2217	0.2081	0.1913	0.2435	0.2581	0.2436	0.2451	0.2410	0.2463	0.2468	0.2596	0.2517	0.2448	0.2203	0.2076	0.1893	0.1884
5	0.2587	0.2375	0.2550	0.3047	0.2955	0.2762	0.2775	0.2855	0.2790	0.2781	0.2884	0.2854	0.2753	0.2546	0.2470	0.2308	0.2241
6	0.2803	0.2616	0.2522	0.3645	0.3336	0.3146	0.3117	0.3222	0.3170	0.3086	0.3224	0.3191	0.3208	0.2954	0.2715	0.2544	0.2537
7	0.2968	0.2746	0.2800	0.3823	0.3739	0.3469	0.3441	0.3536	0.3492	0.3385	0.3454	0.3397	0.3459	0.3307	0.2981	0.2712	0.2809
8	0.3475	0.3192	0.2586	0.3984	0.3802	0.3653	0.3929	0.3637	0.3687	0.3581	0.3603	0.3409	0.3646	0.3522	0.3379	0.3004	0.3066
9	0.3378	0.3544	0.2857	0.3579	0.3744	0.3720	0.4099	0.3987	0.3905	0.3746	0.3971	0.3663	0.3708	0.3662	0.3477	0.3527	0.3380
10	0.3263	0.3512	0.3109	0.4032	0.3828	0.4133	0.3760	0.4055	0.3739	0.3868	0.4079	0.3872	0.3936	0.3797	0.3556	0.3088	0.3542
11+	0.3971	0.3850	0.3657	0.4214	0.4519	0.4325	0.4889	0.4546	0.4281	0.4219	0.3984	0.4310	0.4053	0.3911	0.3476	0.3785	
	0.2540	0.2456	0.2056	0.2554	0.2790	0.2715	0.3035	0.3046	0.3131	0.3160	0.3224	0.2704	0.2722	0.2560	0.2779		

Table C. Catch-at-age for 4T herring spring spawners by gear type, 1978-1994. Spawning-group affinity assigned by gonad maturity for spawning and spent fish (stages 6 and 7), by otolith characteristics for juvenile fish (stages 1 and 2) and by McQuinn's (1989) gonadosomatic index (GSI) for all remaining individuals. Numbers are in thousands of fish.

Tableau C. Prises selon l'âge pour les géniteurs de printemps dans 4T par type d'engin, 1978-1994. La saison de frai est classée selon la maturité des gonades pour les poissons en état de frai ou épuisés (stades 6 et 7), selon les caractéristiques des otolithes pour les juvéniles (stades 1 et 2), et selon le modèle d'indice gonadosomatique (IGS) de McQuinn (1989) pour le restant. En milliers de poissons.

FIXED GEAR - SPRING SPAWNERS 4T
ENGINS FIXES - GÉNITEURS DE PRINTEMPS 4T

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
1	0	425	0	14	10	0	0	0	0	0	59	0	0	0	53	0	0
2	14	198	169	394	162	248	84	330	10	271	501	0	104	65	619	6	0
3	5644	6922	10538	13093	23717	16174	4538	6009	3593	1684	4012	4093	2897	6293	2725	280	1817
4	25469	3140	6746	8353	4509	25937	13994	15844	18110	8051	8626	16434	14297	12101	30568	6477	5278
5	1255	17307	2632	2688	1066	2097	8044	14353	12735	22119	11447	6223	10323	14809	11750	37705	26443
6	1831	641	8501	1818	493	460	376	5198	11482	11213	15722	6114	3415	9180	7680	17143	47296
7	1391	1242	1824	3363	323	102	58	1304	2932	8669	9255	7153	3074	3488	3497	6448	9030
8	259	274	942	486	337	0	49	696	444	3676	7012	4491	4865	3201	1745	2676	4437
9	447	136	851	454	123	0	4	61	32	516	1651	2635	2609	4764	1888	1954	1198
10	1375	302	462	195	91	0	5	0	130	331	89	901	1000	2261	1888	1614	1225
11+	1496	1454	699	961	571	0	0	1	205	162	530	283	265	1138	1738	2023	1599
	39181	32041	33364	31819	31402	45018	27152	43796	49673	56692	58904	48327	42849	57299	64151	76326	98325

MOBILE GEAR - SPRING SPAWNERS 4T
ENGINS MOBILES - GÉNITEURS DE PRINTEMPS 4T

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
1	1421	6688	616	0	0	0	0	211	50	0	2447	332	30	0	61	1	0
2	14570	9040	8238	1854	716	737	91	1010	1433	183	4773	396	3245	1205	834	698	4
3	4931	16130	12223	1303	827	3640	287	1490	1154	397	1383	1545	2969	4574	2731	570	2611
4	15957	12113	12630	137	48	993	844	1454	4070	1525	860	1920	1966	1491	4645	1917	2082
5	2343	12527	5218	5	10	173	444	580	3132	4683	1235	757	1378	1089	2146	3344	5669
6	4474	3329	6158	101	6	1	20	511	2369	3825	4768	2098	832	637	1181	2355	7976
7	5128	1772	3526	229	4	16	0	58	719	3148	2815	4075	497	293	374	1115	1832
8	1189	1672	1740	389	19	36	15	0	82	1158	2382	1659	1890	198	329	644	1833
9	1314	411	1263	1	67	0	0	113	194	0	1617	1413	987	150	453	1283	558
10	1107	145	295	252	1	0	0	0	0	0	0	428	326	178	342	1360	326
11+	5596	1450	285	3	8	0	0	145	45	37	570	23	176	150	102	1621	811
	58030	65277	52192	4274	1706	5596	1701	5572	13248	14956	22850	14646	14296	9965	13198	14908	23702

ALL GEARS - SPRING SPAWNERS 4T
TOUS LES ENGINS - GÉNITEURS DE PRINTEMPS 4T

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
1	1421	7113	616	14	10	0	0	211	50	0	2506	332	30	0	114	1	0
2	14584	9238	8407	2248	878	985	175	1340	1443	454	5274	396	3349	1270	1453	704	4
3	10575	23052	22761	14396	24544	19814	4825	7499	4747	2081	5395	5638	5866	10867	5456	850	4428
4	41426	15253	19376	8490	4557	26930	14838	17298	22180	9576	9486	18354	16263	13592	35213	8394	7360
5	3598	29834	7850	2693	1076	2270	8488	14933	15867	26802	12682	6980	11701	15898	13896	41049	32112
6	6305	3970	14659	1919	499	461	396	5709	13851	15038	20490	8212	4247	9817	8861	19498	55272
7	6519	3014	5350	3592	327	118	58	1362	3651	11817	12070	11228	3571	3781	3871	7563	10862
8	1448	1946	2682	875	356	36	64	696	526	4834	9394	6150	6755	3399	2074	3320	6270
9	1761	547	2114	455	190	0	4	174	226	516	3268	4048	3596	4914	2341	3237	1756
10	2482	447	757	447	92	0	5	0	130	331	89	1329	1326	2439	2230	2974	1551
11+	7092	2904	984	964	579	0	0	146	250	199	1100	306	441	1288	1840	3644	2410
	97211	97318	85556	36093	33108	50614	28853	49368	62921	71648	81754	62973	57145	67265	77349	91234	122025

Table D. Weights-at-age (kg) for 4T herring spring spawners by gear type, 1978-1994. Spawning-group affinity assigned by gonad maturity for spawning and spent fish (stages 6 and 7), by otolith characteristics for juvenile fish (stages 1 and 2) and by McQuinn's (1989) gonadosomatic index (GSI) for all remaining individuals.

Tableau D. Poids selon l'âge (kg) pour les géniteurs de printemps dans 4T par type d'engin, 1978-1994. La saison de frai est classée selon la maturité des gonades pour les poissons en état de frai ou épuisés (stades 6 et 7), selon les caractéristiques des otolithes pour les juvéniles (stades 1 et 2), et selon le modèle d'indice gonadosomatique (IGS) de McQuinn (1989) pour le restant.

FIXED GEAR - SPRING SPAWNERS 4T
ENGINS FIXES - GÉNITEURS DE PRINTEMPS 4T

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
1	0.0000	0.0195	0.0000	0.1005	0.0366	0.0000	0.0000	0.0000	0.0000	0.0379	0.0000	0.0000	0.0000	0.0501	0.0000	0.0000	0.0000
2	0.1418	0.1608	0.1816	0.1397	0.1953	0.1721	0.0933	0.2132	0.1073	0.1513	0.0798	0.0000	0.1495	0.1483	0.1111	0.1240	0.0000
3	0.1478	0.1698	0.1674	0.1834	0.1745	0.1554	0.1764	0.1836	0.1603	0.1880	0.1605	0.1658	0.1599	0.1452	0.1421	0.1405	0.1494
4	0.1888	0.2139	0.1861	0.2358	0.2105	0.2084	0.1957	0.2161	0.1959	0.1959	0.2031	0.2019	0.1957	0.1812	0.1710	0.1667	0.1546
5	0.2109	0.2291	0.2284	0.2848	0.2640	0.2423	0.2137	0.2456	0.2419	0.2175	0.2402	0.2315	0.2242	0.2182	0.2002	0.1864	0.1773
6	0.2562	0.2441	0.2691	0.3269	0.3171	0.2675	0.2683	0.2789	0.2561	0.2520	0.2662	0.2552	0.2584	0.2437	0.2309	0.2069	0.1985
7	0.3221	0.3046	0.3067	0.3362	0.3717	0.3269	0.3029	0.3499	0.3194	0.2705	0.2875	0.2807	0.2640	0.2576	0.2537	0.2395	0.2183
8	0.3076	0.3362	0.3319	0.3393	0.3794	0.0000	0.3843	0.3705	0.3392	0.2781	0.3038	0.2939	0.2885	0.2855	0.2601	0.2505	0.2567
9	0.3114	0.3430	0.3678	0.3787	0.4026	0.0000	0.4429	0.4001	0.3486	0.2959	0.3233	0.3124	0.3060	0.2992	0.2886	0.2747	0.2942
10	0.3308	0.3174	0.3630	0.3986	0.4060	0.0000	0.3713	0.0000	0.3159	0.2964	0.3754	0.3238	0.3072	0.3041	0.3015	0.2864	0.2944
11+	0.3671	0.3529	0.3731	0.4082	0.4460	0.0000	0.0000	0.4913	0.4181	0.3913	0.3367	0.2978	0.3306	0.3208	0.3198	0.2949	0.3212
	0.2054	0.2227	0.2264	0.2428	0.1957	0.1916	0.1991	0.2354	0.2289	0.2338	0.2531	0.2385	0.2306	0.2247	0.1999	0.2031	0.1983

MOBILE GEAR - SPRING SPAWNERS 4T
ENGINS MOBILES - GÉNITEURS DE PRINTEMPS 4T

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
1	0.0790	0.0967	0.1054	0.0000	0.0000	0.0000	0.0859	0.0866	0.0000	0.0810	0.0882	0.0790	0.0000	0.0511	0.0609	0.0000	0.0974
2	0.1281	0.1510	0.1525	0.1749	0.1400	0.1432	0.1385	0.1583	0.1349	0.1893	0.1128	0.1716	0.1734	0.1483	0.1183	0.1167	0.0974
3	0.1725	0.1475	0.1579	0.2140	0.2127	0.1843	0.1872	0.2033	0.2102	0.1961	0.1733	0.2178	0.1957	0.1782	0.1470	0.1358	0.1516
4	0.2514	0.1774	0.2134	0.2389	0.2436	0.2159	0.2217	0.2319	0.2525	0.2733	0.2433	0.2586	0.2442	0.2076	0.1994	0.1737	0.1761
5	0.2462	0.2486	0.2455	0.2698	0.2744	0.2812	0.2529	0.2860	0.2816	0.2972	0.3109	0.2691	0.2791	0.2351	0.2440	0.1870	0.1957
6	0.2733	0.2412	0.2681	0.4102	0.3241	0.2731	0.3031	0.3112	0.3159	0.3299	0.3226	0.3166	0.3063	0.2545	0.2627	0.2192	0.2218
7	0.3026	0.2820	0.2633	0.3286	0.3796	0.2455	0.0000	0.2824	0.3241	0.3375	0.3603	0.3410	0.3444	0.3196	0.2805	0.2583	0.2608
8	0.2984	0.3122	0.2786	0.2846	0.3337	0.2375	0.3189	0.0000	0.3392	0.3713	0.3889	0.3543	0.3222	0.3406	0.3068	0.3287	0.2571
9	0.3121	0.3525	0.3357	0.3839	0.3221	0.0000	0.0000	0.5884	0.2910	0.0000	0.4024	0.3671	0.3427	0.3445	0.3332	0.3655	0.2993
10	0.3759	0.3115	0.3820	0.3251	0.4328	0.0000	0.0000	0.0000	0.0000	0.0000	0.3829	0.4084	0.3477	0.3412	0.3082	0.3274	
11+	0.3614	0.3917	0.3430	0.4081	0.4472	0.0000	0.0000	0.3466	0.3933	0.5328	0.4281	0.3838	0.3288	0.3797	0.3457	0.3254	0.3330
	0.2308	0.1875	0.2094	0.2218	0.1911	0.1880	0.2214	0.2290	0.2592	0.3139	0.2601	0.3050	0.2501	0.2060	0.2100	0.2380	0.2166

ALL GEARS - SPRING SPAWNERS 4T
TOUS LES ENGINS - GÉNITEURS DE PRINTEMPS 4T

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
1	0.0790	0.0921	0.1054	0.1005	0.0366	0.0000	0.0859	0.0866	0.0000	0.0800	0.0882	0.0790	0.0000	0.0506	0.0609	0.0000	0.0974
2	0.1281	0.1512	0.1531	0.1687	0.1502	0.1505	0.1168	0.1718	0.1347	0.1666	0.1097	0.1716	0.1727	0.1483	0.1152	0.1168	0.0974
3	0.1593	0.1542	0.1623	0.1862	0.1758	0.1607	0.1770	0.1875	0.1724	0.1895	0.1638	0.1800	0.1780	0.1591	0.1446	0.1373	0.1507
4	0.2129	0.1849	0.2039	0.2359	0.2108	0.2087	0.1972	0.2174	0.2063	0.2082	0.2067	0.2078	0.2016	0.1841	0.1747	0.1683	0.1607
5	0.2339	0.2373	0.2398	0.2848	0.2641	0.2453	0.2158	0.2472	0.2497	0.2314	0.2471	0.2356	0.2307	0.2194	0.2070	0.1864	0.1805
6	0.2683	0.2417	0.2687	0.3313	0.3172	0.2675	0.2701	0.2818	0.2663	0.2718	0.2793	0.2709	0.2678	0.2444	0.2351	0.2084	0.2019
7	0.3068	0.2913	0.2781	0.3357	0.3718	0.3159	0.3029	0.3470	0.3203	0.2883	0.3045	0.3026	0.2752	0.2624	0.2563	0.2423	0.2255
8	0.3000	0.3156	0.2973	0.3150	0.3770	0.2375	0.3690	0.3705	0.3392	0.3004	0.3254	0.3102	0.2979	0.2887	0.2675	0.2568	
9	0.3119	0.3501	0.3486	0.3787	0.3742	0.0000	0.4429	0.5224	0.2992	0.2959	0.3624	0.3315	0.3161	0.3006	0.2972	0.3107	0.2958
10	0.3509	0.3155	0.3704	0.3572	0.4063	0.0000	0.3713	0.0000	0.3159	0.2964	0.3754	0.3428	0.3321	0.3073	0.3076	0.2964	0.3013
11+	0.3626	0.3723	0.3644	0.4082	0.4460	0.0000	0.0000	0.3476	0.4136	0.4176	0.3841	0.3043	0.3299	0.3277	0.3212	0.3085	0.3252
	0.2206	0.1991	0.2160	0.2403	0.1955	0.1912	0.2004	0.2347	0.2353	0.2505	0.2551	0.2539	0.2219	0.2016	0.2088	0.2019	

Table E. Catch-at-age for fall and spring spawners caught by purse seines in 4Vn, 1978-1994. Spawning-group affinity for 1978-1991 assigned by gonad maturity for ripe, spawning and spent fish (stages 5, 6 and 7) and otolith characteristics for all remaining individuals. Starting in 1992, spawning-group affinity assigned by gonad maturity for spawning and spent fish (stages 6 and 7), by otolith characteristics for juvenile fish (stages 1 and 2) and by McQuinn's (1989) gonadosomatic index (GSI) model for all remaining individuals. Numbers are in thousands of fish.

Tableau E. Prises selon l'âge pour les géniteurs d'automne et de printemps capturés à l'aide de sennes coulissantes dans 4Vn, 1978-1994. De 1978 à 1991, la saison de frai est classée selon la maturité des gonades pour les poissons mûrs, en état de frai ou épuisés (stades 5, 6 et 7) et selon les caractéristiques des otolithes pour tous les autres individus. À partir de 1992, la saison de frai est classée selon la maturité des gonades pour les poissons en état de frai ou épuisés (stades 6 et 7), selon les caractéristiques des otolithes pour les juvéniles (stades 1 et 2), et selon le modèle d'indice gonadosomatique (IGS) de McQuinn (1989) pour le restant. En milliers de poissons.

FALL SPAWNERS 4Vn
GÉNITEURS D'AUTOMNE 4Vn

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
1	0	0	0	0	0	0	0	0	5	20	12	0	0	0	0	0	0
2	42	5827	628	377	1888	1352	997	827	604	816	441	26	0	0	0	25	15
3	563	2622	2865	541	3147	4652	3551	1987	2533	1613	833	559	697	2105	20	159	280
4	1601	656	2602	6800	3103	3651	4271	3920	5162	4138	1103	1408	2264	5406	1096	456	1964
5	1092	167	888	693	1428	2114	2790	2982	2394	1413	3328	1130	1524	2547	3273	1814	722
6	842	100	655	591	359	584	775	927	1375	735	2394	2443	413	750	1427	4357	2426
7	628	324	663	0	158	218	377	590	1770	1040	575	460	2716	856	1474	1687	3193
8	366	0	636	206	40	50	66	66	967	620	734	684	642	1266	990	1473	984
9	449	0	905	236	47	83	58	130	245	165	346	429	857	1309	1379	1594	695
10	280	0	638	0	0	0	0	0	75	75	183	123	1686	539	983	1564	829
11+	156	0	493	0	57	38	19	48	7	22	79	292	3033	1699	4317	2587	1689
	6019	9696	10973	9444	10227	12742	12904	11477	15137	10657	10028	7554	13833	16478	14959	15716	12798

SPRING SPAWNERS 4Vn
GÉNITEURS DE PRINTEMPS 4Vn

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
1	58	5679	349	595	1525	302	522	615	117	73	0	0	8	0	0	16	0
2	809	5007	2614	2829	3074	3383	1759	953	929	226	214	0	218	167	28	43	35
3	978	383	901	1833	1994	1561	1702	1129	4064	827	132	105	552	108	11	27	474
4	358	0	143	0	667	526	636	636	1466	441	145	180	608	990	74	51	187
5	330	0	117	438	362	289	371	418	0	0	127	99	701	289	182	176	138
6	455	298	277	0	0	0	0	0	265	64	0	219	333	134	573	265	208
7	0	0	0	0	0	0	0	0	0	0	59	0	218	381	0	150	183
8	114	0	43	0	0	0	0	0	0	413	67	29	109	35	1157	0	120
9	14	0	17	0	0	0	0	0	0	0	0	0	0	47	186	0	83
10	0	0	0	0	0	0	0	0	0	0	0	0	99	186	0	0	0
11+	32	0	55	0	0	0	0	0	0	0	0	0	0	0	194	148	0
	3148	11367	4516	5695	7622	6061	4990	3751	7254	1698	706	712	2821	3790	1016	848	1362

Table F. Weights-at-age (kg) for fall and spring spawners caught by purse seines in 4Vn, 1978-1994. Spawning-group affinity for 1978-1991 assigned by gonad maturity for ripe, spawning and spent fish (stages 5, 6 and 7) and otolith characteristics for all remaining individuals. Starting in 1992, spawning-group affinity assigned by gonad maturity for spawning and spent fish (stages 6 and 7), by otolith characteristics for juvenile fish (stages 1 and 2) and by McQuinn's (1989) gonadosomatic index (GSI) model for all remaining individuals.

Tableau E. Poids selon l'âge (kg) pour les géniteurs d'automne et de printemps capturés à l'aide de sennes coulissantes dans 4Vn, 1978-1994. De 1978 à 1991, la saison de frai est classée selon la maturité des gonades pour les poissons mûrs, en état de frai ou épuisés (stades 5, 6 et 7) et selon les caractéristiques des otolithes pour tous les autres individus. À partir de 1992, la saison de frai est classée selon la maturité des gonades pour les poissons en état de frai ou épuisés (stades 6 et 7), selon les caractéristiques des otolithes pour les juvéniles (stades 1 et 2), et selon le modèle d'indice gonadosomatique (IGS) de McQuinn (1989) pour le restant.

FALL SPAWNERS 4Vn
GÉNITEURS D'AUTOMNE 4Vn

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
1	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0378	0.0389	0.0349	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	0.1934	0.1067	0.1302	0.0803	0.1175	0.1409	0.1258	0.1144	0.0889	0.0750	0.0960	0.1197	0.0000	0.0000	0.0000	0.0280	0.0912
3	0.1832	0.1755	0.1648	0.1901	0.1951	0.1900	0.1992	0.2011	0.1481	0.1446	0.1589	0.1642	0.1726	0.1443	0.1322	0.1180	0.1393
4	0.2471	0.2262	0.2328	0.2089	0.2360	0.2382	0.2405	0.2471	0.1838	0.1862	0.2085	0.2077	0.2025	0.1915	0.1796	0.1531	0.1608
5	0.3042	0.2741	0.3035	0.2807	0.2571	0.2621	0.2655	0.2693	0.2202	0.2111	0.2395	0.2361	0.2240	0.2229	0.2087	0.1783	0.1800
6	0.3323	0.2979	0.3374	0.3149	0.2943	0.2957	0.2934	0.2983	0.2535	0.2543	0.2605	0.2743	0.2646	0.2477	0.2381	0.2044	0.2121
7	0.3562	0.3459	0.3655	0.0000	0.3250	0.3238	0.3194	0.3166	0.2601	0.2606	0.2943	0.2905	0.2924	0.2626	0.2468	0.2270	0.2295
8	0.3744	0.0000	0.3917	0.4284	0.3612	0.3602	0.3543	0.3513	0.2930	0.2968	0.3190	0.3096	0.3150	0.2972	0.2758	0.2455	0.2466
9	0.3880	0.0000	0.4000	0.4137	0.3958	0.4046	0.3591	0.3794	0.3277	0.3301	0.3331	0.3406	0.3360	0.3073	0.2856	0.2685	0.2822
10	0.3990	0.0000	0.4136	0.0000	0.0000	0.0000	0.0000	0.0000	0.3203	0.3179	0.3521	0.3371	0.3416	0.3206	0.2853	0.2827	0.2988
11+	0.4294	0.0000	0.4349	0.0000	0.4205	0.4193	0.4078	0.4213	0.4458	0.3924	0.3700	0.3477	0.3468	0.3544	0.3295	0.3105	0.3240
	0.3045	0.1462	0.2717	0.2245	0.2102	0.2204	0.2325	0.2459	0.2051	0.1964	0.2431	0.2593	0.2850	0.2349	0.2644	0.2368	0.2319

SPRING SPAWNERS 4Vn
GÉNITEURS DE PRINTEMPS 4Vn

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
1	0.0707	0.0966	0.1099	0.1057	0.0995	0.1183	0.0991	0.0895	0.0557	0.0571	0.0000	0.0000	0.0785	0.0000	0.0000	0.0586	0.0000
2	0.1738	0.1538	0.1556	0.1823	0.1655	0.1679	0.1693	0.1684	0.1207	0.1214	0.1230	0.0000	0.1571	0.0941	0.1402	0.0991	0.1511
3	0.2279	0.1809	0.2149	0.2299	0.2211	0.2198	0.2235	0.2342	0.1557	0.1579	0.1813	0.1447	0.2170	0.1126	0.1785	0.1631	0.1494
4	0.2903	0.0000	0.2753	0.0000	0.2517	0.2536	0.2571	0.2633	0.1920	0.1878	0.1976	0.1772	0.2421	0.1807	0.2072	0.2216	0.1947
5	0.3226	0.0000	0.3141	0.3689	0.2889	0.3005	0.2996	0.3125	0.0000	0.0000	0.2415	0.2127	0.2785	0.2277	0.2433	0.2329	0.1870
6	0.3702	0.3639	0.3833	0.0000	0.0000	0.0000	0.0000	0.0000	0.2279	0.2279	0.0000	0.2744	0.2802	0.2448	0.2938	0.2690	0.2203
7	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2872	0.0000	0.3185	0.2653	0.0000	0.2962	0.2959
8	0.3627	0.0000	0.3868	0.0000	0.0000	0.0000	0.0000	0.0000	0.2926	0.2941	0.3899	0.2785	0.2791	0.2824	0.0000	0.3421	0.2536
9	0.4796	0.0000	0.4831	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.3604	0.3349	0.0000	0.0000	0.2955
10	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.3409	0.3349	0.0000	0.0000	0.0000
11+	0.4330	0.0000	0.4411	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.3287	0.3919	0.0000	0.0000
	0.2568	0.1316	0.1927	0.2040	0.1802	0.1926	0.2013	0.2074	0.1674	0.1645	0.1952	0.2227	0.2555	0.2430	0.2873	0.2579	0.2030

Table G. Catch-at-age for 4T herring fall spawners, including those caught by purse seines in 4Vn, 1978-1994. Numbers are in thousands of fish.

Tableau G. Prises selon l'âge pour les géniteurs d'automne dans 4T, y compris ceux capturés à la senne coulissante dans 4Vn, 1978-1994. En milliers de poissons.

AGE	FIXED GEAR - FALL SPAWNERS 4TVn ENGINS FIXES - GÉNITEURS D'AUTOMNE 4TVn																
	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
1	0	904	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	82	8	64	322	0	0	0	0	253	15	0	0	19	0	52	0	0
3	3592	474	7965	5753	2154	720	963	1117	1627	8010	1165	280	3706	158	325	78	0
4	5548	9986	5224	24124	14985	20231	24882	8816	32871	38205	20432	13451	22572	39459	12879	2440	9158
5	3484	5132	6097	6313	16883	9570	13445	24441	16497	30249	41943	21013	19815	10235	54288	29704	12264
6	816	2924	994	2477	4922	13180	8306	14860	34428	20712	20253	28252	28214	7309	12201	36482	48412
7	745	865	1733	1027	2523	2168	5978	9498	19251	36337	13240	13385	54225	10784	7345	6034	69790
8	3911	1065	373	597	1050	1632	1335	4495	8212	15518	14266	6804	17002	13296	8943	3168	12224
9	117	879	232	258	371	486	456	1212	4666	9382	6953	8600	9163	4840	9347	3661	9658
10	157	278	304	239	117	124	200	727	341	4563	2738	3165	9958	2409	4554	1949	9640
11+	1903	545	96	102	62	160	91	159	692	1878	1623	2468	5404	4538	6705	2785	14115
	20355	23060	23082	41212	43067	48271	55656	65325	118838	164869	122613	97418	170079	93028	116639	86301	185262
AGE	MOBILE GEAR - FALL SPAWNERS 4TVn ENGINS MOBILES - GÉNITEURS D'AUTOMNE 4TVn																
	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
1	0	240	140	0	0	0	0	0	5	20	77	0	0	0	0	0	0
2	1464	8555	2970	455	2088	1479	1031	1080	761	863	4283	752	43	0	61	47	15
3	22001	15905	39638	5059	8169	7995	3883	4024	3507	2526	3483	1399	4123	6448	565	2066	310
4	29044	21322	17650	11260	5597	8339	6727	8223	7400	5754	4028	4592	5475	22717	5682	2810	9164
5	24187	16923	12979	1315	3891	4192	5704	8085	8729	4032	6081	6959	7433	6142	15818	6033	3398
6	4902	16786	7906	699	681	1629	2387	5824	8079	9035	5667	7497	3402	1939	4258	10570	7957
7	4947	4734	8118	317	268	400	941	2540	8102	8593	9403	4483	5003	1947	2909	3667	11043
8	10893	3702	6168	297	135	95	163	1826	3828	6883	8227	7390	2404	1964	1753	2738	2485
9	1898	5277	4233	503	149	108	91	731	1352	2326	4500	4737	4434	1788	1724	2002	1433
10	1017	1249	2259	116	38	30	14	449	510	364	1417	2407	3534	995	1708	3571	1389
11+	11937	10464	1389	64	178	57	20	420	217	82	2441	1658	3330	2235	5417	5739	2951
	112290	105157	103450	20085	21194	24324	20961	33202	42490	40478	49607	41874	39181	46175	39895	39243	40145
AGE	ALL GEARS - FALL SPAWNERS 4TVn TOUS LES ENGINS - GÉNITEURS D'AUTOMNE 4TVn																
	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
1	0	1144	143	0	0	0	0	0	5	20	77	0	0	0	0	0	0
2	1546	8563	3085	777	2088	1478	1031	1080	1014	879	4283	720	63	0	113	48	15
3	25594	16379	48009	10813	10324	8715	4847	5141	5134	10536	4649	1642	7830	6605	890	2145	309
4	34592	31309	23000	35384	20582	28585	31610	17039	40271	43959	24460	17904	28047	62176	18561	5251	18322
5	27672	22055	19127	7629	20775	13764	19149	32527	25225	34280	48025	27716	27248	16378	70106	35736	15662
6	5718	19709	8926	3175	5603	14811	10693	20685	42507	29747	25921	35527	31616	9248	16459	47052	56369
7	5692	5598	9984	1344	2792	2568	6919	12037	27353	44930	22644	17691	59229	12730	10254	9698	80833
8	14803	4766	6656	894	1186	1727	1498	6321	12040	22400	22494	13899	19406	15260	10696	5906	14710
9	2015	6156	4524	762	520	594	547	1943	6017	11708	11454	13148	13597	6627	11071	5663	11091
10	1174	1527	2595	355	155	154	214	1175	852	4926	4155	5471	13492	3404	6262	5519	11029
11+	13840	10409	1499	167	241	217	111	579	909	1960	4063	4066	8734	6773	12122	8524	17067
	132646	127615	127548	61300	64266	72613	76619	98527	161327	205345	172225	137784	209261	139202	156534	125542	225408

Table H. Weights-at-age (kg) for 4T herring fall spawners, including those caught by purse seines in 4Vn, 1978-1994.

Tableau H. Poids selon l'âge (kg) pour les géniteurs d'automne dans 4T, y compris ceux capturés à l'aide de sennes coulissantes dans 4Vn, 1978-1994.

FIXED GEAR - FALL SPAWNERS 4TVn
ENGINS FIXES - GÉNITEURS D'AUTOMNE 4TVn

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
1	0.0000	0.0231	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	0.0787	0.1066	0.2115	0.1288	0.0000	0.0000	0.0000	0.0000	0.1793	0.1328	0.0000	0.0000	0.2675	0.0000	0.0658	0.0000	0.0000
3	0.1344	0.2015	0.2068	0.2048	0.2220	0.1908	0.2362	0.2573	0.1958	0.2347	0.2309	0.2260	0.2102	0.1959	0.1421	0.1596	0.0000
4	0.2371	0.2554	0.2577	0.2468	0.2660	0.2519	0.2484	0.2541	0.2485	0.2470	0.2645	0.2602	0.2499	0.2339	0.2202	0.2127	0.2085
5	0.2822	0.2934	0.3118	0.3101	0.3006	0.2853	0.2863	0.2917	0.2896	0.2789	0.2902	0.2955	0.2855	0.2675	0.2551	0.2349	0.2339
6	0.3074	0.3201	0.3587	0.3679	0.3370	0.3169	0.3219	0.3352	0.3248	0.3164	0.3252	0.3255	0.3248	0.3025	0.2818	0.2599	0.2583
7	0.3191	0.3553	0.3490	0.3950	0.3739	0.3493	0.3480	0.3611	0.3672	0.3434	0.3538	0.3532	0.3478	0.3360	0.3054	0.2822	0.2867
8	0.3687	0.3982	0.3672	0.4200	0.3825	0.3652	0.3974	0.3742	0.3848	0.3673	0.3794	0.3731	0.3684	0.3545	0.3423	0.3300	0.3150
9	0.3711	0.4171	0.4020	0.4585	0.3927	0.3724	0.4128	0.4102	0.4013	0.3818	0.4073	0.3847	0.3878	0.3732	0.3491	0.3520	0.3426
10	0.3479	0.4274	0.4354	0.4717	0.3700	0.4495	0.3794	0.4055	0.4315	0.3855	0.4095	0.4062	0.4038	0.3917	0.3640	0.3497	0.3589
11+	0.4324	0.4366	0.4310	0.5211	0.4674	0.4295	0.4896	0.4969	0.4337	0.4257	0.4381	0.4065	0.4319	0.4114	0.3987	0.3826	0.3837
	0.2770	0.2847	0.2718	0.2665	0.2963	0.2859	0.2848	0.3157	0.3117	0.3071	0.3196	0.3268	0.3309	0.2920	0.2835	0.2639	0.2878

MOBILE GEAR - FALL SPAWNERS 4TVn
ENGINS MOBILES - GÉNITEURS D'AUTOMNE 4TVn

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
1	0.0000	0.0692	0.0308	0.0000	0.0000	0.0000	0.0000	0.0378	0.0389	0.0690	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	0.1023	0.1107	0.1089	0.0861	0.1154	0.1381	0.1253	0.1116	0.0925	0.0787	0.0959	0.1054	0.1081	0.0000	0.0661	0.0522	0.0912
3	0.1501	0.1554	0.1426	0.1801	0.1802	0.1831	0.1960	0.1948	0.1509	0.1658	0.1636	0.1608	0.1765	0.1509	0.1279	0.1413	0.1372
4	0.2202	0.1865	0.1777	0.2155	0.2248	0.2211	0.2299	0.2299	0.1930	0.2021	0.2205	0.2134	0.2062	0.1898	0.1738	0.1631	0.1624
5	0.2574	0.2209	0.2317	0.2662	0.2594	0.2483	0.2508	0.2607	0.2428	0.2483	0.2489	0.2469	0.2375	0.2199	0.2112	0.1949	0.1793
6	0.2848	0.2517	0.2459	0.3106	0.2883	0.2888	0.2704	0.2854	0.2728	0.2862	0.2862	0.2803	0.2811	0.2503	0.2307	0.2149	0.2131
7	0.3009	0.2648	0.2723	0.3410	0.3454	0.3214	0.3097	0.3169	0.2868	0.3082	0.3304	0.2942	0.2959	0.2715	0.2537	0.2327	0.2295
8	0.3408	0.2965	0.2658	0.3758	0.3568	0.3637	0.3406	0.3375	0.3150	0.3317	0.3236	0.3083	0.3244	0.3015	0.2803	0.2366	0.2416
9	0.3476	0.3440	0.3038	0.3325	0.3356	0.3954	0.3631	0.3761	0.3419	0.3425	0.3764	0.3307	0.3290	0.3041	0.2905	0.2870	0.2800
10	0.3430	0.3343	0.3231	0.2620	0.4223	0.2639	0.3278	0.4055	0.3276	0.3887	0.3975	0.3597	0.3401	0.3188	0.2928	0.2750	0.2889
11+	0.3919	0.3823	0.3857	0.2624	0.4364	0.4322	0.4086	0.4348	0.4110	0.4306	0.4095	0.3774	0.3529	0.3543	0.3326	0.3139	0.3223
	0.2525	0.2278	0.1979	0.2180	0.2105	0.2163	0.2341	0.2598	0.2495	0.2753	0.2829	0.2808	0.2726	0.2143	0.2361	0.2308	0.2173

ALL GEARS - FALL SPAWNERS 4TVn
TOUS LES ENGINS - GÉNITEURS D'AUTOMNE 4TVn

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
1	0.0000	0.0328	0.0308	0.0000	0.0000	0.0000	0.0000	0.0378	0.0389	0.0690	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	0.1011	0.1107	0.1110	0.1038	0.1154	0.1381	0.1253	0.1116	0.1142	0.0797	0.0959	0.1054	0.1576	0.0000	0.0661	0.0522	0.0912
3	0.1479	0.1567	0.1536	0.1932	0.1889	0.1837	0.2040	0.2083	0.1651	0.2182	0.1805	0.1719	0.1925	0.1520	0.1385	0.1419	0.1373
4	0.2229	0.2084	0.1962	0.2369	0.2548	0.2429	0.2445	0.2424	0.2383	0.2411	0.2573	0.2484	0.2414	0.2178	0.2077	0.1862	0.1854
5	0.2605	0.2378	0.2574	0.3024	0.2930	0.2740	0.2758	0.2839	0.2734	0.2753	0.2850	0.2837	0.2724	0.2496	0.2455	0.2281	0.2221
6	0.2880	0.2619	0.2586	0.3553	0.3311	0.3138	0.3104	0.3212	0.3149	0.3072	0.3167	0.3162	0.3201	0.2916	0.2689	0.2498	0.2519
7	0.3033	0.2787	0.2855	0.3823	0.3711	0.3449	0.3428	0.3518	0.3433	0.3367	0.3441	0.3388	0.3434	0.3261	0.2908	0.2635	0.2789
8	0.3482	0.3192	0.2712	0.4052	0.3796	0.3651	0.3912	0.3636	0.3626	0.3564	0.3590	0.3399	0.3629	0.3477	0.3321	0.2867	0.3026
9	0.3490	0.3544	0.3082	0.3750	0.3763	0.3766	0.4045	0.3974	0.3880	0.3740	0.3952	0.3659	0.3688	0.3546	0.3400	0.3290	0.3345
10	0.3436	0.3512	0.3356	0.4032	0.3827	0.4137	0.3762	0.4055	0.3693	0.3858	0.4053	0.3865	0.3871	0.3704	0.3446	0.3014	0.3501
11+	0.3976	0.3839	0.3882	0.4208	0.4444	0.4302	0.4747	0.4518	0.4282	0.4259	0.4209	0.3949	0.4018	0.3926	0.3692	0.3364	0.3731
	0.2563	0.2373	0.2114	0.2506	0.2680	0.2625	0.2709	0.2968	0.2953	0.3008	0.3091	0.3132	0.3200	0.2662	0.2724	0.2536	0.2753

Table I. Catch-at-age for 4T herring spring spawners, including those caught by purse seines in 4Vn, 1978-1994. Numbers are in thousands of fish.

Tableau I. Prises selon l'âge pour les géniteurs de printemps dans 4T, y compris ceux capturés à la senne coulissante dans 4Vn, 1978-1994. En milliers de poissons.

FIXED GEAR - SPRING SPAWNERS 4TVn
ENGINS FIXES - GÉNITEURS DE PRINTEMPS 4TVn

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
1	0	425	0	14	10	0	0	0	0	59	0	0	0	53	0	0	0
2	14	198	169	394	162	248	84	330	10	271	501	0	104	65	619	6	0
3	5644	6922	10538	13093	23717	16174	4538	6009	3593	1684	4012	4093	2897	6293	2725	280	1817
4	25469	3140	6746	8353	4509	25937	13994	15844	18110	8051	8626	16434	14297	12101	30568	6477	5278
5	1255	17307	2632	2688	1066	2097	8044	14353	12735	22119	11447	6223	10323	14809	11750	37705	26443
6	1831	641	8501	1818	493	460	376	5198	11482	11213	15722	6114	3415	9180	7680	17143	47296
7	1391	1242	1824	3363	323	102	58	1304	2932	8669	9255	7153	3074	3488	3497	6448	9030
8	259	274	942	486	337	0	49	696	444	3676	7012	4491	4865	3201	1745	2676	4437
9	447	136	851	454	123	0	4	61	32	516	1651	2635	2609	4764	1888	1954	1198
10	1375	302	462	195	91	0	5	0	130	331	89	901	1000	2261	1888	1614	1225
11+	1496	1454	699	961	571	0	0	1	205	162	530	283	265	1138	1738	2023	1599
	39181	32041	33364	31819	31402	45018	27152	43796	49673	56692	58904	48327	42849	57299	64151	76326	98325

MOBILE GEAR - SPRING SPAWNERS 4TVn
ENGINS MOBILES - GÉNITEURS DE PRINTEMPS 4TVn

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
1	1479	12367	965	595	1525	302	522	826	167	73	2447	332	38	0	61	17	0
2	15379	14047	10852	4683	3790	4120	1850	1963	2362	409	4987	396	3463	1372	862	741	39
3	5909	16513	13124	3136	2821	5201	1989	2619	5218	1224	1515	1650	3521	4682	2742	597	3085
4	16315	12113	12773	137	715	1519	1480	2090	5536	1966	1005	2100	2574	2481	4719	1968	2269
5	2673	12527	5335	443	372	462	815	998	3132	4683	1362	856	2079	1378	2328	3520	5807
6	4929	3627	6435	101	6	1	20	511	2634	3889	4768	2317	1165	771	1754	2620	8184
7	5128	1772	3526	229	4	16	0	58	719	3148	2874	4075	715	674	374	1265	2015
8	1303	1672	1783	389	19	36	15	0	495	1225	2411	1768	1925	1355	329	764	1886
9	1328	411	1280	1	67	0	0	113	194	0	1617	1413	1034	336	453	1283	641
10	1107	145	295	252	1	0	0	0	0	0	428	425	364	342	1360	326	
11+	5628	1450	340	3	8	0	0	145	45	37	570	23	176	344	250	1621	811
	61178	76644	56708	9969	9328	11657	6691	9323	20502	16654	23556	15358	17115	13757	14214	15756	25063

ALL GEARS - SPRING SPAWNERS 4TVn
TOUS LES ENGINS - GÉNITBURES DE PRINTEMPS 4TVn

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
1	1479	12792	965	609	1535	302	522	826	167	73	2506	332	38	0	114	17	0
2	15393	14245	11021	5077	3952	4368	1934	2293	2372	680	5488	396	3567	1437	1481	747	39
3	11553	23435	23662	16229	26538	21375	6527	8628	8811	2908	5527	5743	6418	10975	5467	877	4902
4	41784	15253	19519	8490	5224	27456	15474	17934	23646	10017	9631	18534	16871	14582	35287	8445	7547
5	3928	29834	7967	3131	1438	2559	8859	15351	15867	26802	12809	7079	12402	16187	14078	41225	32250
6	6760	4268	14936	1919	499	461	396	5709	14116	15102	20490	8431	4580	9951	9434	19763	55480
7	6519	3014	5350	3592	327	118	58	1362	3651	11817	12129	11228	3789	4162	3871	7713	11045
8	1562	1946	2725	875	356	36	64	696	939	4901	9423	6259	6790	4556	2074	3440	6323
9	1775	547	2131	455	190	0	4	174	226	516	3268	4048	3643	5100	2341	3237	1839
10	2482	447	757	447	92	0	5	0	130	331	89	1329	1425	2625	2230	2974	1551
11+	7124	2904	1039	964	579	0	0	146	250	199	1100	306	441	1482	1988	3644	2410
	100359	108685	90072	41788	40730	56675	33843	53119	70175	73346	82460	63685	59964	71057	78365	92082	123386

Table J. Weights-at-age (kg) for 4T herring spring spawners, including those caught by purse seines in 4Vn, 1978-1994.

Tableau J. Poids selon l'âge (kg) pour les géniteurs de printemps dans 4T, y compris ceux capturés à la senne coulissante dans 4Vn, 1978-1994.

FIXED GEAR - SPRING SPAWNERS 4TVn
ENGINS FIXES - GÉNITEURS DE PRINTEMPS 4TVn

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
1	0.0000	0.0195	0.0000	0.1005	0.0366	0.0000	0.0000	0.0000	0.0000	0.0379	0.0000	0.0000	0.0000	0.0501	0.0000	0.0000	0.0000
2	0.1418	0.1608	0.1816	0.1397	0.1953	0.1721	0.0933	0.2132	0.1073	0.1513	0.0798	0.0000	0.1495	0.1483	0.1111	0.1240	0.0000
3	0.1478	0.1698	0.1674	0.1834	0.1745	0.1554	0.1764	0.1836	0.1603	0.1880	0.1605	0.1658	0.1599	0.1452	0.1421	0.1405	0.1494
4	0.1888	0.2139	0.1861	0.2358	0.2105	0.2084	0.1957	0.2161	0.1959	0.1959	0.2031	0.2019	0.1957	0.1812	0.1710	0.1667	0.1546
5	0.2109	0.2291	0.2284	0.2848	0.2640	0.2423	0.2137	0.2456	0.2419	0.2175	0.2402	0.2315	0.2242	0.2182	0.2002	0.1864	0.1773
6	0.2562	0.2441	0.2691	0.3269	0.3171	0.2675	0.2683	0.2789	0.2561	0.2520	0.2662	0.2552	0.2584	0.2437	0.2309	0.2069	0.1985
7	0.3221	0.3046	0.3067	0.3362	0.3717	0.3269	0.3029	0.3499	0.3194	0.2705	0.2875	0.2807	0.2640	0.2576	0.2537	0.2395	0.2183
8	0.3076	0.3362	0.3319	0.3393	0.3794	0.0000	0.3843	0.3705	0.3392	0.2781	0.3038	0.2939	0.2885	0.2855	0.2601	0.2505	0.2567
9	0.3114	0.3430	0.3678	0.3787	0.4026	0.0000	0.4429	0.4001	0.3486	0.2959	0.3233	0.3124	0.3060	0.2992	0.2886	0.2747	0.2942
10	0.3308	0.3174	0.3630	0.3986	0.4060	0.0000	0.3713	0.0000	0.3159	0.2964	0.3754	0.3238	0.3072	0.3041	0.3015	0.2864	0.2944
11+	0.3671	0.3529	0.3731	0.4082	0.4460	0.0000	0.4913	0.4181	0.3913	0.3367	0.2978	0.3306	0.3208	0.3198	0.2949	0.3212	
	0.2054	0.2227	0.2264	0.2428	0.1957	0.1916	0.1991	0.2354	0.2289	0.2338	0.2531	0.2385	0.2306	0.2247	0.1999	0.2031	0.1983

MOBILE GEAR - SPRING SPAWNERS 4TVn
ENGINS MOBILES - GÉNITEURS DE PRINTEMPS 4TVn

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
1	0.0787	0.0967	0.1070	0.1057	0.0995	0.1183	0.0991	0.0886	0.0650	0.0571	0.0810	0.0882	0.0789	0.0000	0.0511	0.0587	0.0000
2	0.1305	0.1520	0.1532	0.1794	0.1607	0.1635	0.1678	0.1632	0.1293	0.1518	0.1132	0.1716	0.1724	0.1417	0.1190	0.1157	0.1456
3	0.1817	0.1483	0.1618	0.2233	0.2186	0.1950	0.2183	0.2166	0.1678	0.1703	0.1740	0.2131	0.1990	0.1767	0.1471	0.1370	0.1513
4	0.2523	0.1774	0.2141	0.2389	0.2512	0.2290	0.2369	0.2415	0.2365	0.2541	0.2367	0.2516	0.2437	0.1969	0.1995	0.1749	0.1776
5	0.2556	0.2486	0.2470	0.3678	0.2885	0.2933	0.2742	0.2971	0.2816	0.2972	0.3044	0.2626	0.2789	0.2335	0.2439	0.1893	0.1955
6	0.2822	0.2513	0.2731	0.4102	0.3241	0.2731	0.3031	0.3112	0.3070	0.3282	0.3226	0.3126	0.2988	0.2528	0.2729	0.2242	0.2218
7	0.3026	0.2820	0.2633	0.3286	0.3796	0.2455	0.0000	0.2824	0.3241	0.3375	0.3588	0.3410	0.3365	0.2889	0.2805	0.2628	0.2640
8	0.3040	0.3122	0.2812	0.2846	0.3337	0.2375	0.3189	0.0000	0.3003	0.3671	0.3889	0.3496	0.3214	0.2909	0.3068	0.3308	0.2570
9	0.3139	0.3525	0.3377	0.3839	0.3221	0.0000	0.0000	0.5884	0.2910	0.0000	0.4024	0.3671	0.3435	0.3392	0.3332	0.3655	0.2988
10	0.3759	0.3115	0.3820	0.3251	0.4328	0.0000	0.0000	0.0000	0.0000	0.0000	0.3829	0.3927	0.3412	0.3412	0.3082	0.3274	
11+	0.3618	0.3917	0.3589	0.4081	0.4472	0.0000	0.0000	0.3466	0.3933	0.5328	0.4281	0.3838	0.3288	0.3509	0.3731	0.3254	0.3330
	0.2322	0.1792	0.2080	0.2116	0.1822	0.1904	0.2064	0.2203	0.2267	0.2987	0.2581	0.3012	0.2510	0.2162	0.2156	0.2391	0.2159

ALL GEARS - SPRING SPAWNERS 4TVn
TOUS LES ENGINS - GÉNITEURS DE PRINTEMPS 4TVn

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
1	0.0787	0.0941	0.1070	0.1056	0.0991	0.1183	0.0991	0.0886	0.0650	0.0571	0.0800	0.0882	0.0789	0.0000	0.0506	0.0587	0.0000
2	0.1305	0.1521	0.1537	0.1763	0.1621	0.1640	0.1645	0.1704	0.1292	0.1516	0.1102	0.1716	0.1717	0.1420	0.1157	0.1158	0.1456
3	0.1651	0.1546	0.1643	0.1911	0.1792	0.1650	0.1891	0.1936	0.1647	0.1805	0.1642	0.1794	0.1814	0.1586	0.1447	0.1381	0.1506
4	0.2136	0.1849	0.2044	0.2359	0.2160	0.2096	0.1997	0.2190	0.2054	0.2073	0.2066	0.2075	0.2031	0.1839	0.1748	0.1686	0.1615
5	0.2414	0.2373	0.2409	0.2966	0.2703	0.2515	0.2193	0.2490	0.2497	0.2314	0.2470	0.2353	0.2334	0.2195	0.2075	0.1866	0.1805
6	0.2752	0.2502	0.2708	0.3313	0.3172	0.2675	0.2701	0.2818	0.2656	0.2716	0.2793	0.2710	0.2687	0.2444	0.2387	0.2092	0.2020
7	0.3068	0.2913	0.2781	0.3357	0.3718	0.3159	0.3029	0.3470	0.3203	0.2883	0.3044	0.3026	0.2777	0.2627	0.2563	0.2433	0.2267
8	0.3046	0.3156	0.2987	0.3150	0.3770	0.2375	0.3690	0.3705	0.3187	0.3003	0.3256	0.3096	0.2978	0.2871	0.2675	0.2684	0.2568
9	0.3132	0.3501	0.3497	0.3787	0.3742	0.0000	0.4429	0.5224	0.2992	0.2959	0.3624	0.3315	0.3167	0.3019	0.2972	0.3107	0.2958
10	0.3509	0.3155	0.3704	0.3572	0.4063	0.0000	0.3713	0.0000	0.3159	0.2964	0.3754	0.3428	0.3327	0.3093	0.3076	0.2964	0.3013
11+	0.3629	0.3723	0.3685	0.4082	0.4460	0.0000	0.0000	0.3476	0.4136	0.4176	0.3841	0.3043	0.3299	0.3278	0.3265	0.3085	0.3252
	0.2217	0.1920	0.2148	0.2354	0.1926	0.1914	0.2006	0.2328	0.2282	0.2485	0.2546	0.2536	0.2231	0.2027	0.2093	0.2019	

Table K. Catch-at-age for fall-spawning herring caught in NAFO unit areas 4Tm, 4Tn, and 4To, 1978-1994. Spawning-group affinity assigned by gonad maturity for spawning and spent fish (stages 6 and 7), by otolith characteristics for juvenile fish (stages 1 and 2) and by McQuinn's (1989) gonadosomatic index (GSI) for all remaining individuals. Numbers are in thousands of fish.

Tableau K. Prises selon l'âge pour les géniteurs d'automne capturés dans les sous-divisions de l'OPANO 4Tm, 4Tn et 4To, 1978-1994. La saison de frai est classée selon la maturité des gonades pour les poissons en état de frai ou épuisés (stades 6 et 7), selon les caractéristiques des otolithes pour les juvéniles (stades 1 et 2), et selon le modèle d'indice gonadosomatique (IGS) de McQuinn (1989) pour le restant. En milliers de poissons.

FIXED GEAR - FALL SPAWNERS 4Tm,n,o
ENGINS FIXES - GÉNITEURS D'AUTOMNE 4Tm,n,o

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	51	316	0	0	0	0	0	15	0	0	12	0	0	0	0
3	174	206	6356	4154	1773	7514	465	477	612	6652	144	266	2734	129	69	78	0
4	3421	3386	2151	12990	6040	11226	7388	3916	10839	25007	13441	11894	14849	28509	6044	2000	6671
5	2392	1368	2004	2735	11775	3995	6306	8758	10233	14716	22754	19054	12627	7159	37239	21146	10589
6	495	1605	3186	608	1643	8854	3264	7914	21638	13854	7813	20563	19767	5343	11045	24660	31682
7	414	281	852	285	283	920	3030	5641	15446	19049	7549	9916	20067	7945	6149	3741	47512
8	2627	635	159	146	186	382	615	2712	6322	8677	6330	5192	7888	7622	7191	1968	9532
9	57	541	185	73	71	103	78	693	3936	4922	3328	6244	5163	2398	5853	1730	7100
10	77	194	100	49	28	67	73	273	207	2471	1755	2673	5779	1123	3145	522	3194
11+	1205	230	0	37	53	73	56	108	496	639	1176	2232	3603	2177	5106	784	5264
	10862	8446	15044	21393	21852	33134	21275	30492	69729	96002	64290	78034	92489	62406	81841	56629	121546

MOBILE GEAR - FALL SPAWNERS 4Tm,n,o
ENGINS MOBILES - GÉNITEURS D'AUTOMNE 4Tm,n,o

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
1	0	239	0	0	0	0	0	0	0	0	64	0	0	0	0	0	0
2	96	2533	0	3	199	6	32	253	134	47	3790	726	43	0	61	16	0
3	3914	9020	0	157	5005	148	315	2037	860	906	2614	840	3426	4343	545	1899	30
4	16052	6394	0	155	2486	206	2333	4303	2155	1604	2885	3184	3211	17311	4424	2292	6396
5	20196	4508	0	21	2455	91	2762	5103	6324	2600	2716	5829	5909	3595	12412	3873	2368
6	3517	7102	0	3	321	46	1531	4897	6699	8242	3229	5054	2989	1189	2685	6129	4658
7	3936	1651	0	11	110	8	536	1950	6331	7500	8709	4023	2287	1091	1336	1870	6359
8	9137	1373	0	3	95	2	92	1760	2858	6219	7392	6706	1762	698	727	1152	1163
9	1294	1931	0	9	102	1	31	601	1106	2146	4098	4308	3577	479	306	293	584
10	225	329	0	4	38	1	13	449	435	287	1217	2284	1848	456	676	1800	433
11+	10609	3296	0	2	121	1	1	372	210	60	2330	1366	297	536	1084	2678	928
	68976	38376	0	368	10932	510	7646	21725	27112	29611	39044	34320	25349	29696	24256	22002	22919

ALL GEARS - FALL SPAWNERS 4Tm,n,o
TOUS LES ENGINS - GÉNITEURS D'AUTOMNE 4Tm,n,o

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
1	0	239	0	0	0	0	0	0	0	0	64	0	0	0	0	0	0
2	96	2533	51	319	199	6	32	253	134	62	3790	726	55	0	61	16	0
3	4088	9226	6356	4311	6778	7662	780	2514	1472	7558	2758	1106	6160	4472	614	1977	30
4	19473	9780	2151	13145	8526	11432	9721	8219	12994	26611	16326	15078	18060	45820	10468	4292	13067
5	22588	5876	2004	2756	14230	4086	9068	13861	16557	17316	25470	24883	18536	10754	49651	25019	12957
6	4012	8707	3186	611	1964	8900	4795	12811	28337	22096	11042	25617	22756	6532	13730	30789	36340
7	4350	1932	852	296	393	928	3566	7591	21777	26549	16258	13939	22354	9036	7485	5611	53871
8	11764	2008	159	149	281	384	707	4472	9180	14896	13722	11898	9650	8320	7918	3120	10695
9	1351	2472	185	82	173	104	109	1294	5042	7068	7426	10552	8740	2877	6159	2023	7684
10	302	523	100	53	66	68	86	722	642	2758	2972	4957	7627	1579	3821	2322	3627
11+	11814	3526	0	39	174	74	57	480	706	699	3506	3598	3900	2713	6190	3462	6192
	79838	46822	15044	21761	32784	33644	28921	52217	96841	125613	103334	112354	117838	92103	106097	78631	144463

Table L. Weights-at-age (kg) for fall-spawning herring caught in NAFO unit areas 4Tm, 4Tn, and 4To, 1978-1994. Spawning-group affinity assigned by gonad maturity for spawning and spent fish (stages 6 and 7), by otolith characteristics for juvenile fish (stages 1 and 2) and by McQuinn's (1989) gonadosomatic index (GSI) for all remaining individuals.

Tableau L. Poids selon l'âge (kg) pour les géniteurs d'automne capturés dans les sous-divisions de l'OPANO 4Tm, 4Tn et 4To, 1978-1994. La saison de frai est classée selon la maturité des gonades pour les poissons en état de frai ou épuisés (stades 6 et 7), selon les caractéristiques des otolithes pour les juvéniles (stades 1 et 2), et selon le modèle d'indice gonadosomatique (IGS) de McQuinn (1989) pour le restant.

FIXED GEAR - FALL SPAWNERS 4Tm,n,o
ENGINS FIXES - GÉNITEURS D'AUTOMNE 4Tm,n,o

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
1	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	0.0000	0.0000	0.1766	0.1305	0.0000	0.0000	0.0000	0.0000	0.1328	0.0000	0.0000	0.1492	0.0000	0.0000	0.0000	0.0000	0.0000
3	0.2026	0.2065	0.1838	0.2047	0.2239	0.1355	0.2425	0.2799	0.2214	0.2354	0.2113	0.2257	0.2165	0.1991	0.2267	0.1596	0.0000
4	0.2598	0.2640	0.2374	0.2565	0.2692	0.2486	0.2581	0.2551	0.2631	0.2512	0.2611	0.2609	0.2540	0.2330	0.2285	0.2122	0.2080
5	0.2954	0.3081	0.2908	0.3091	0.3000	0.2870	0.2983	0.3051	0.2939	0.2869	0.2870	0.2973	0.2891	0.2667	0.2576	0.2332	0.2328
6	0.3349	0.3277	0.2618	0.3622	0.3408	0.3222	0.3407	0.3479	0.3304	0.3217	0.3178	0.3277	0.3245	0.3021	0.2826	0.2610	0.2554
7	0.3446	0.3738	0.3279	0.4279	0.3748	0.3567	0.3553	0.3664	0.3700	0.3553	0.3486	0.3539	0.3492	0.3325	0.3095	0.2884	0.2844
8	0.3773	0.3969	0.3230	0.4634	0.4133	0.3939	0.3961	0.3795	0.3903	0.3804	0.3762	0.3716	0.3657	0.3527	0.3435	0.3348	0.3111
9	0.4221	0.4114	0.3694	0.4586	0.4194	0.3993	0.4537	0.4210	0.4031	0.3929	0.4069	0.3848	0.3828	0.3713	0.3535	0.3552	0.3470
10	0.3920	0.4280	0.4360	0.5027	0.4208	0.4965	0.3612	0.4377	0.4511	0.4085	0.4123	0.4062	0.4010	0.3832	0.3619	0.3265	0.3520
11+	0.4447	0.4363	0.0000	0.5208	0.4782	0.4527	0.4895	0.5081	0.4562	0.4387	0.4333	0.4042	0.4331	0.4078	0.4035	0.3687	0.3983
	0.3241	0.3134	0.2358	0.2597	0.2913	0.2533	0.3019	0.3319	0.3332	0.3106	0.3135	0.3254	0.3263	0.2841	0.2902	0.2581	0.2806

MOBILE GEAR - FALL SPAWNERS 4Tm,n,o
ENGINS MOBILES - GÉNITEURS D'AUTOMNE 4Tm,n,o

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
1	0.0000	0.0692	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0753	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	0.1957	0.1257	0.0000	0.1154	0.0960	0.1079	0.1109	0.1023	0.1053	0.1422	0.0959	0.1049	0.1081	0.0000	0.0661	0.0849	0.0000
3	0.1954	0.1853	0.0000	0.1789	0.1709	0.1734	0.1621	0.1886	0.1609	0.2033	0.1651	0.1585	0.1773	0.1541	0.1277	0.1432	0.1180
4	0.2322	0.2455	0.0000	0.2256	0.2109	0.2079	0.2116	0.2142	0.2250	0.2159	0.2088	0.1893	0.1733	0.1639	0.1644		
5	0.2567	0.2854	0.0000	0.2498	0.2607	0.2345	0.2369	0.2556	0.2515	0.2683	0.2603	0.2490	0.2410	0.2178	0.2119	0.1961	0.1809
6	0.2780	0.2799	0.0000	0.2863	0.2817	0.2854	0.2594	0.2829	0.2767	0.2890	0.3050	0.2832	0.2834	0.2520	0.2245	0.2214	0.2190
7	0.2936	0.2691	0.0000	0.3408	0.3748	0.3185	0.3032	0.3170	0.2943	0.3148	0.3328	0.2946	0.3000	0.2784	0.2584	0.2318	0.2284
8	0.3413	0.2974	0.0000	0.2547	0.3549	0.3675	0.3313	0.3370	0.3224	0.3352	0.3240	0.3082	0.3278	0.3093	0.2841	0.2116	0.2432
9	0.3400	0.3621	0.0000	0.2603	0.3079	0.3648	0.3701	0.3754	0.3451	0.3435	0.3800	0.3297	0.3273	0.2955	0.3089	0.3457	0.2851
10	0.3268	0.3477	0.0000	0.2620	0.4223	0.2639	0.3278	0.4055	0.3288	0.4071	0.4042	0.3609	0.3388	0.3166	0.3030	0.2539	0.2565
11+	0.3942	0.4044	0.0000	0.2566	0.4439	0.4579	0.4236	0.4365	0.4098	0.4446	0.4108	0.3838	0.4150	0.3539	0.3443	0.2972	0.3173
	0.2848	0.2567	0.0000	0.2117	0.2109	0.2117	0.2366	0.2671	0.2751	0.3035	0.2930	0.2856	0.2658	0.2028	0.2184	0.2180	0.2097

ALL GRARS - FALL SPAWNERS 4Tm,n,o
TOUS LES ENGINS - GÉNITEURS D'AUTOMNE 4Tm,n,o

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
1	0.0000	0.0692	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0753	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	0.1957	0.1257	0.1766	0.1304	0.0960	0.1079	0.1109	0.1023	0.1053	0.1399	0.0959	0.1049	0.1171	0.0000	0.0661	0.0849	0.0000
3	0.1957	0.1858	0.1838	0.2038	0.1848	0.1362	0.2100	0.2059	0.1861	0.2316	0.1675	0.1747	0.1947	0.1554	0.1388	0.1438	0.1180
4	0.2370	0.2519	0.2374	0.2561	0.2522	0.2479	0.2469	0.2337	0.2553	0.2507	0.2547	0.2514	0.2460	0.2165	0.2052	0.1864	0.1867
5	0.2608	0.2907	0.2908	0.3086	0.2932	0.2858	0.2796	0.2869	0.2777	0.2841	0.2842	0.2860	0.2738	0.2504	0.2462	0.2275	0.2233
6	0.2850	0.2887	0.2618	0.3618	0.3311	0.3220	0.3147	0.3231	0.3177	0.3095	0.3141	0.3189	0.3191	0.2930	0.2712	0.2531	0.2506
7	0.2985	0.2843	0.3279	0.4247	0.3748	0.3564	0.3475	0.3537	0.3480	0.3439	0.3401	0.3368	0.3442	0.3260	0.3004	0.2695	0.2778
8	0.3493	0.3289	0.3230	0.4592	0.3936	0.3938	0.3877	0.3628	0.3692	0.3615	0.3481	0.3359	0.3588	0.3491	0.3380	0.2893	0.3037
9	0.3435	0.3729	0.3694	0.4368	0.3537	0.3990	0.4299	0.3998	0.3904	0.3779	0.3921	0.3623	0.3601	0.3587	0.3513	0.3538	0.3423
10	0.3434	0.3775	0.4360	0.4845	0.4217	0.4931	0.3562	0.4177	0.3682	0.4084	0.4090	0.3853	0.3859	0.3640	0.3515	0.2702	0.3406
11+	0.3994	0.4065	0.0000	0.5073	0.4543	0.4528	0.4883	0.4526	0.4424	0.4392	0.4183	0.3965	0.4317	0.3972	0.3931	0.3134	0.3862
	0.2901	0.2669	0.2358	0.2589	0.2645	0.2527	0.2846	0.3049	0.3169	0.3089	0.3057	0.3133	0.2579	0.2738	0.2469	0.2694	

Table M. Catch-at-age for spring-spawning herring caught in NAFO unit areas 4Tm, 4Tn, and 4To, 1978-1994. Spawning-group affinity assigned by gonad maturity for spawning and spent fish (stages 6 and 7), by otolith characteristics for juvenile fish (stages 1 and 2) and by McQuinn's (1989) gonadosomatic index (GSI) for all remaining individuals. Numbers are in thousands of fish.

Tableau M. Prises selon l'âge pour les géniteurs de printemps capturés dans les sous-divisions de l'OPANO 4Tm, 4Tn et 4To, 1978-1994. La saison de frai est classée selon la maturité des gonades pour les poissons en état de frai ou épuisés (stades 6 et 7), selon les caractéristiques des otolithes pour les juvéniles (stades 1 et 2), et selon le modèle d'indice gonadosomatique (IGS) de McQuinn (1989) pour le restant. En milliers de poissons.

FIXED GEAR - SPRING SPAWNERS 4Tm,n,o
ENGINS FIXES - GÉNITEURS DE PRINTEMPS 4Tm,n,o

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
1	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	10	99	91	132	6	3	6	10	118	17	0	97	65	0	6	0
3	1147	1297	3329	1594	3708	7724	832	2044	1088	1014	741	852	366	441	72	40	2
4	4839	509	589	920	2157	2824	1478	4244	5113	2983	3650	1866	1864	1545	2522	1028	29
5	171	3190	371	241	198	466	752	3949	5339	8047	6362	2551	1580	1337	3536	4737	169
6	15	119	3085	241	106	45	92	1748	3497	5428	9251	2437	1267	1284	1748	5501	2715
7	29	132	357	1061	50	0	43	873	1805	5277	5892	3698	1278	960	1264	2364	2745
8	10	24	70	82	92	0	36	510	267	2317	4834	2571	2090	815	876	1099	1168
9	0	0	120	50	19	0	2	0	2	364	1377	1671	1282	1392	1177	1021	634
10	293	35	0	23	28	0	0	0	61	122	38	825	443	920	1125	965	559
11+	35	55	0	16	16	0	0	0	182	104	521	265	169	550	1048	1310	904
	6539	5371	8020	4327	6506	11065	3238	13374	17364	25774	32683	16736	10434	9308	13368	18071	8926

MOBILE GEAR - SPRING SPAWNERS 4Tm,n,o
ENGINS MOBILES - GÉNITEURS DE PRINTEMPS 4Tm,n,o

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
1	0	6282	0	0	0	0	0	211	50	0	2419	332	30	0	61	1	0
2	2038	7253	0	25	713	28	86	1010	1430	182	4719	396	3245	1205	834	698	4
3	1579	1313	0	18	824	140	270	1490	1152	395	1367	1545	2969	4574	1092	453	1584
4	12071	419	0	2	48	37	796	1454	4062	1516	850	1920	1966	1491	3508	1601	1088
5	1368	5489	0	0	10	7	418	580	3126	4656	1221	757	1378	1089	1375	1691	1101
6	2608	1406	0	1	6	0	19	511	2364	3803	4714	2098	832	637	752	710	3242
7	2300	1019	0	3	4	1	0	58	718	3129	2783	4075	497	293	157	493	662
8	609	635	0	5	19	1	14	0	82	1151	2355	1659	1890	198	120	84	268
9	593	130	0	0	67	0	0	113	194	0	1599	1413	987	150	301	35	191
10	893	67	0	3	1	0	0	0	0	0	0	428	326	178	323	634	90
11+	2369	432	0	0	8	0	0	145	45	37	564	23	176	150	94	410	174
	26428	24445	0	57	1700	214	1603	5572	13223	14869	22591	14646	14296	9965	8617	6810	8405

ALL GEARS - SPRING SPAWNERS 4Tm,n,o
TOUS LES ENGINS - GÉNITEURS DE PRINTEMPS 4Tm,n,o

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
1	0	6282	0	8	0	0	0	211	50	0	2419	332	30	0	61	1	0
2	2038	7263	99	116	845	34	89	1016	1440	300	4736	396	3342	1270	834	704	4
3	2726	2610	3329	1612	4532	7864	1102	3534	2240	1409	2108	2397	3335	5015	1164	493	1586
4	16910	928	589	922	2205	2861	2274	5698	9175	4499	4500	3786	3830	3036	6030	2629	1117
5	1539	8679	371	241	208	473	1170	4529	8465	12703	7583	3308	2958	2426	4911	6428	1270
6	2623	1525	3085	242	112	45	111	2259	5861	9231	13965	4535	2099	1921	2500	6211	5957
7	2329	1151	357	1064	54	1	43	931	2523	8406	8675	7773	1775	1253	1421	2857	3407
8	619	659	70	87	111	1	50	510	349	3468	7189	4230	3980	1013	996	1183	1436
9	593	130	120	50	86	0	2	113	196	364	2976	3084	2269	1542	1478	1056	825
10	1186	102	0	26	29	0	0	0	61	122	38	1253	769	1098	1448	1599	649
11+	2404	487	0	16	24	0	0	145	227	141	1085	288	345	700	1142	1720	1078
	32967	29816	8020	4384	8206	11279	4841	18946	30587	40643	55274	31382	24732	19274	21985	24881	17329

Table N. Weights-at-age (kg) for spring-spawning herring caught in NAFO unit areas 4Tm, 4Tn, and 4To, 1978-1994. Spawning-group affinity assigned by gonad maturity for spawning and spent fish (stages 6 and 7), by otolith characteristics for juvenile fish (stages 1 and 2) and by McQuinn's (1989) gonadosomatic index (GSI) for all remaining individuals.

Tableau N. Poids selon l'âge (kg) pour les géniteurs de printemps capturés dans les sous-divisions de l'OPANO 4Tm, 4Tn et 4To, 1978-1994. La saison de frai est classée selon la maturité des gonades pour les poissons en état de frai ou épuisés (stades 6 et 7), selon les caractéristiques des otolithes pour les juvéniles (stades 1 et 2), et selon le modèle d'indice gonadosomatique (IGS) de McQuinn (1989) pour le restant.

FIXED GEAR - SPRING SPAWNERS 4Tm,n,o
ENGINS FIXES - GÉNITEURS DE PRINTEMPS 4Tm,n,o

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
1	0.0000	0.0000	0.0000	0.1440	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	0.0000	0.1758	0.1790	0.1877	0.2089	0.1868	0.1554	0.1785	0.1073	0.2204	0.1576	0.0000	0.1495	0.1483	0.0000	0.1240	0.0000
3	0.1548	0.1742	0.1646	0.1989	0.1851	0.1381	0.2057	0.1971	0.2101	0.2064	0.1871	0.1901	0.1858	0.1716	0.1336	0.1706	0.1188
4	0.1836	0.2172	0.2025	0.2380	0.2200	0.2015	0.2085	0.2585	0.2333	0.2128	0.2249	0.2120	0.2167	0.1849	0.1835	0.1954	0.1585
5	0.2020	0.2344	0.2579	0.2733	0.2726	0.2735	0.2227	0.2972	0.2678	0.2310	0.2553	0.2410	0.2408	0.2192	0.2035	0.1917	0.1773
6	0.3098	0.2214	0.2611	0.3107	0.2917	0.2166	0.3039	0.3303	0.2768	0.2679	0.2723	0.2626	0.2909	0.2383	0.2263	0.2173	0.2076
7	0.3481	0.2993	0.3337	0.3288	0.3286	0.0000	0.3021	0.3749	0.3370	0.2781	0.2923	0.2844	0.2812	0.2599	0.2493	0.2409	0.2256
8	0.2285	0.3459	0.2998	0.3262	0.3185	0.0000	0.3857	0.3879	0.3451	0.2866	0.3060	0.2982	0.3000	0.2736	0.2731	0.2495	0.2751
9	0.0000	0.0000	0.3665	0.3443	0.3447	0.0000	0.4875	0.0000	0.4518	0.2909	0.3232	0.3111	0.3181	0.2896	0.2878	0.2698	0.2954
10	0.3441	0.3057	0.0000	0.3751	0.3471	0.0000	0.3733	0.0000	0.3233	0.3195	0.4114	0.3222	0.3076	0.2976	0.3040	0.2810	0.2950
11+	0.3897	0.3382	0.0000	0.4224	0.4051	0.0000	0.0000	0.4225	0.4192	0.3344	0.2928	0.3177	0.3080	0.3254	0.2818	0.3156	0.1884
	0.2215	0.2207	0.2550	0.2062	0.1603	0.2171	0.2824	0.2660	0.2523	0.2736	0.2685	0.2702	0.2459	0.2367	0.2253	0.2439	

MOBILE GEAR - SPRING SPAWNERS 4Tm,n,o
ENGINS MOBILES - GÉNITEURS DE PRINTEMPS 4Tm,n,o

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
1	0.0000	0.1005	0.0000	0.0000	0.0366	0.0000	0.0000	0.0859	0.0866	0.0000	0.0810	0.0882	0.0790	0.0000	0.0511	0.0609	0.0000
2	0.1880	0.1727	0.0000	0.1749	0.1400	0.1432	0.1385	0.1583	0.1349	0.1893	0.1128	0.1716	0.1734	0.1483	0.1183	0.1167	0.0974
3	0.2080	0.2286	0.0000	0.2143	0.2127	0.1843	0.1874	0.2033	0.2102	0.1961	0.1733	0.2178	0.1957	0.1782	0.1479	0.1454	0.1557
4	0.2585	0.2627	0.0000	0.2402	0.2436	0.2161	0.2218	0.2319	0.2525	0.2733	0.2433	0.2586	0.2442	0.2076	0.1988	0.1761	0.1872
5	0.2453	0.2930	0.0000	0.0000	0.2744	0.2819	0.2531	0.2860	0.2816	0.2972	0.3109	0.2691	0.2791	0.2351	0.2399	0.1865	0.2079
6	0.2707	0.2457	0.0000	0.4132	0.3241	0.0000	0.3031	0.3112	0.3159	0.3299	0.3226	0.3166	0.3063	0.2545	0.2600	0.2195	0.2375
7	0.3038	0.2805	0.0000	0.3282	0.3796	0.2448	0.0000	0.2824	0.3241	0.3375	0.3603	0.3410	0.3444	0.3196	0.2913	0.2598	0.2623
8	0.2898	0.2711	0.0000	0.2844	0.3337	0.2375	0.3189	0.0000	0.3392	0.3713	0.3889	0.3543	0.3222	0.3406	0.3219	0.3326	0.3012
9	0.3129	0.3073	0.0000	0.0000	0.3221	0.0000	0.0000	0.5884	0.2910	0.0000	0.4024	0.3671	0.3427	0.3445	0.3427	0.3651	0.2806
10	0.3918	0.3053	0.0000	0.3249	0.4328	0.0000	0.0000	0.0000	0.0000	0.0000	0.3829	0.4084	0.3477	0.3417	0.2807	0.3563	
11+	0.3603	0.4359	0.0000	0.0000	0.4472	0.0000	0.0000	0.3466	0.3933	0.5328	0.4281	0.3838	0.3288	0.3797	0.3413	0.3034	0.3277
	0.2701	0.2027	0.0000	0.2194	0.1911	0.1881	0.2215	0.2290	0.2592	0.3139	0.2601	0.3050	0.2501	0.2060	0.2107	0.2014	0.2197

ALL GEARS - SPRING SPAWNERS 4Tm,n,o
TOUS LES ENGINS - GÉNITEURS DE PRINTEMPS 4Tm,n,o

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
1	0.0000	0.1005	0.0000	0.1440	0.0000	0.0000	0.0000	0.0859	0.0866	0.0000	0.0810	0.0882	0.0790	0.0000	0.0511	0.0609	0.0000
2	0.1880	0.1727	0.1790	0.1849	0.1508	0.1509	0.1391	0.1584	0.1347	0.2015	0.1130	0.1716	0.1727	0.1483	0.1183	0.1168	0.0974
3	0.1856	0.2016	0.1646	0.1991	0.1901	0.1389	0.2012	0.1997	0.2102	0.2035	0.1782	0.2080	0.1946	0.1776	0.1470	0.1474	0.1557
4	0.2371	0.2377	0.2025	0.2380	0.2205	0.2017	0.2132	0.2517	0.2418	0.2332	0.2284	0.2356	0.2308	0.1960	0.1924	0.1836	0.1865
5	0.2405	0.2715	0.2579	0.2733	0.2727	0.2736	0.2338	0.2958	0.2729	0.2553	0.2643	0.2474	0.2586	0.2263	0.2137	0.1903	0.2038
6	0.2709	0.2438	0.2611	0.3111	0.2934	0.2166	0.3038	0.3260	0.2926	0.2934	0.2893	0.2876	0.2970	0.2437	0.2364	0.2176	0.2239
7	0.3044	0.2827	0.3337	0.3288	0.3324	0.2448	0.3021	0.3691	0.3333	0.3002	0.3141	0.3141	0.2989	0.2739	0.2539	0.2442	0.2327
8	0.2888	0.2738	0.2998	0.3238	0.3211	0.2375	0.3670	0.3879	0.3437	0.3147	0.3332	0.3202	0.3105	0.2867	0.2790	0.2554	0.2800
9	0.3129	0.3073	0.3665	0.3443	0.3271	0.0000	0.4875	0.5884	0.2926	0.2909	0.3658	0.3368	0.3288	0.2949	0.2990	0.2730	0.2920
10	0.3800	0.3054	0.0000	0.3693	0.3501	0.0000	0.0000	0.3233	0.3195	0.4114	0.3429	0.3503	0.3057	0.3124	0.2809	0.3035	
11+	0.3607	0.4249	0.0000	0.4224	0.4191	0.0000	0.0000	0.3466	0.4167	0.4490	0.3831	0.3001	0.3234	0.3267	0.2869	0.3176	0.2539
	0.2061	0.2207	0.2545	0.2031	0.1609	0.2186	0.2667	0.2749	0.2681	0.2855	0.2586	0.2253	0.2265	0.2188	0.2322		

Table O. Catch-at-age for fall-spawning herring caught in NAFO unit area 4T1, 1978-1994. Spawning-group affinity assigned by gonad maturity for spawning and spent fish (stages 6 and 7), by otolith characteristics for juvenile fish (stages 1 and 2) and by McQuinn's (1989) gonadosomatic index (GSI) for all remaining individuals. Numbers are in thousands of fish.

Tableau O. Prises selon l'âge pour les géniteurs d'automne capturés dans la sous-division de l'OPANO 4T1, 1978-1994. La saison de frai est classée selon la maturité des gonades pour les poissons en état de frai ou épuisés (stades 6 et 7), selon les caractéristiques des otolithes pour les juvéniles (stades 1 et 2), et selon le modèle d'indice gonadosomatique (IGS) de McQuinn (1989) pour le restant. En milliers de poissons.

FIXED GEAR - FALL SPAWNERS 4T1
ENGINS FIXES - GÉNITEURS D'AUTOMNE 4T1

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	29	70	288	1650	30	235	100	68	39	204	723	17	201	17	0	0	0
4	628	2212	1342	4362	1689	3406	1602	467	733	1184	2701	759	1899	5946	5026	325	931
5	520	1553	2103	1752	1475	1173	1755	1231	676	1669	2923	1348	1377	1386	9319	6654	1369
6	156	604	635	839	211	1373	789	1098	1455	335	2832	1326	1766	751	0	8626	7000
7	253	306	350	286	120	344	638	781	1050	2511	1092	646	2787	1637	595	1459	8657
8	1165	151	148	183	120	0	126	385	430	148	1159	332	630	1743	260	556	920
9	10	186	71	52	0	0	16	99	268	399	582	386	372	1208	122	362	269
10	81	35	54	118	0	0	15	39	14	204	29	172	363	517	215	504	437
11+	694	266	81	52	0	0	15	34	55	0	142	58	1210	237	681	707	
	3536	5383	5072	9294	3645	6531	5056	4183	4699	6709	12041	5128	9452	14414	15774	19167	20290

MOBILE GEAR - FALL SPAWNERS 4T1
ENGINS MOBILES - GÉNITEURS D'AUTOMNE 4T1

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	1	118	2	0	0	0	0	0	0	0	0	0	0
3	1665	231	284	24	17	3114	16	0	0	1	0	0	0	0	0	0	0
4	6494	1267	702	24	8	4368	122	0	0	2	0	0	0	0	0	0	0
5	1963	1917	744	3	8	1937	146	0	0	3	0	0	0	0	0	0	0
6	256	3262	661	1	1	974	81	0	0	8	0	0	0	0	0	0	0
7	0	863	115	2	0	170	28	0	0	7	0	0	0	0	0	0	0
8	727	851	70	0	0	42	5	0	0	6	0	0	0	0	0	0	0
9	0	2396	144	1	0	23	2	0	0	2	0	0	0	0	0	0	0
10	315	580	59	1	0	28	1	0	0	0	0	0	0	0	0	0	0
11+	92	5667	0	0	0	18	0	0	0	0	0	0	0	0	0	0	0
	11512	17034	2779	56	35	10792	403	0	0	29	0	0	0	0	0	0	0

ALL GEARS - FALL SPAWNERS 4T1
TOUS LES ENGINS - GÉNITEURS D'AUTOMNE 4T1

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	1	118	2	0	0	0	0	0	0	0	0	0	0
3	1694	301	572	1674	47	3349	116	68	39	205	723	17	201	17	0	0	0
4	7122	3479	2044	4386	1697	7774	1724	467	733	1186	2701	759	1899	5946	5026	325	931
5	2483	3470	2847	1755	1483	3110	1901	1231	676	1672	2923	1348	1377	1386	9319	6654	1369
6	412	3866	1296	840	212	2347	870	1098	1455	343	2832	1326	1766	751	0	8626	7000
7	253	1169	465	288	120	514	666	781	1050	2518	1092	646	2787	1637	595	1459	8657
8	1892	1002	218	183	120	42	131	385	430	154	1159	332	630	1743	260	556	920
9	10	2582	215	53	0	23	18	99	268	401	582	386	372	1208	122	362	269
10	396	615	113	119	0	28	16	39	14	204	29	172	363	517	215	504	437
11+	786	5933	81	52	0	18	15	15	34	55	0	142	58	1210	237	681	707
	15048	22417	7851	9350	3680	17323	5459	4183	4699	6738	12041	5128	9453	14415	15774	19167	20290

Table P. Weights-at-age (kg) for fall-spawning herring caught in NAFO unit area 4T1, 1978-1994. Spawning-group affinity assigned by gonad maturity for spawning and spent fish (stages 6 and 7), by otolith characteristics for juvenile fish (stages 1 and 2) and by McQuinn's (1989) gonadosomatic index (GSI) for all remaining individuals.

Tableau P. Poids selon l'âge (kg) pour les géniteurs d'automne capturés dans la sous-division de l'OPANO 4T1, 1978-1994. La saison de frai est classée selon la maturité des gonades pour les poissons en état de frai ou épuisés (stades 6 et 7), selon les caractéristiques des otolithes pour les juvéniles (stades 1 et 2), et selon le modèle d'indice gonadosomatique (IGS) de McQuinn (1989) pour le restant.

FIXED GEAR - FALL SPAWNERS 4T1
ENGINS FIXES - GÉNITEURS D'AUTOMNE 4T1

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
1	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3	0.2026	0.2395	0.2217	0.2233	0.2446	0.1805	0.2422	0.2806	0.2250	0.2480	0.2334	0.2257	0.1917	0.1864	0.0000	0.0000	0.0000
4	0.2567	0.2602	0.2802	0.2503	0.2721	0.2242	0.2557	0.2743	0.2635	0.2327	0.2768	0.2589	0.2380	0.2363	0.2178	0.2157	0.2084
5	0.2970	0.2966	0.3378	0.3133	0.3071	0.2789	0.2729	0.3068	0.2960	0.2617	0.3047	0.2919	0.2877	0.2781	0.2494	0.2413	0.2443
6	0.3148	0.2952	0.3768	0.3621	0.3706	0.3103	0.3250	0.3517	0.3313	0.3109	0.3566	0.3268	0.3252	0.3122	0.0000	0.2602	0.2693
7	0.2935	0.3305	0.3845	0.3970	0.4464	0.3690	0.3518	0.3699	0.3701	0.3338	0.3920	0.3524	0.3425	0.3540	0.2805	0.2657	0.3016
8	0.3587	0.3958	0.4093	0.4141	0.4464	0.0000	0.3952	0.3798	0.3903	0.3330	0.3957	0.3736	0.3685	0.3602	0.3398	0.3265	0.3345
9	0.4221	0.4242	0.4658	0.4984	0.0000	0.0000	0.4513	0.4210	0.4031	0.3654	0.4569	0.3890	0.3753	0.3741	0.3241	0.3407	0.3690
10	0.3060	0.3989	0.4453	0.4616	0.0000	0.0000	0.3602	0.4377	0.4511	0.2480	0.4008	0.4114	0.3992	0.4115	0.3892	0.3603	0.3934
11+	0.4111	0.4331	0.4429	0.5420	0.0000	0.0000	0.4947	0.5081	0.4562	0.4058	0.0000	0.4045	0.4152	0.4157	0.3983	0.3849	0.4284
	0.3329	0.2973	0.3308	0.2809	0.3032	0.2582	0.2895	0.3377	0.3342	0.2941	0.3306	0.3232	0.3127	0.3055	0.2467	0.2638	0.2911

MOBILE GEAR - FALL SPAWNERS 4T1
ENGINS MOBILES - GÉNITEURS D'AUTOMNE 4T1

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
1	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0753	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	0.0000	0.0000	0.0609	0.1154	0.0960	0.1079	0.1109	0.0000	0.0000	0.1422	0.0959	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3	0.1799	0.2010	0.1916	0.1789	0.1709	0.1734	0.1621	0.0000	0.0000	0.2033	0.1651	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
4	0.2233	0.2473	0.1991	0.2256	0.2120	0.2077	0.2115	0.0000	0.0000	0.2427	0.2250	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
5	0.2593	0.2729	0.2698	0.2498	0.2610	0.2343	0.2364	0.0000	0.0000	0.2683	0.2603	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
6	0.2854	0.2895	0.2570	0.2863	0.2827	0.2850	0.2593	0.0000	0.0000	0.2890	0.3050	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
7	0.0000	0.3134	0.3040	0.3408	0.3862	0.3185	0.3031	0.0000	0.0000	0.3148	0.3328	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
8	0.3419	0.3231	0.3366	0.2547	0.3559	0.3675	0.3313	0.0000	0.0000	0.3352	0.3240	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
9	0.0000	0.3352	0.3672	0.2603	0.3062	0.3648	0.3701	0.0000	0.0000	0.3435	0.3800	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
10	0.3225	0.3195	0.4002	0.2620	0.4239	0.2639	0.3278	0.0000	0.0000	0.4071	0.4042	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
11+	0.3981	0.3698	0.3915	0.2566	0.4461	0.4579	0.4236	0.0000	0.0000	0.4446	0.4108	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.2361	0.3203	0.2518	0.2134	0.2019	0.2117	0.2366	0.0000	0.0000	0.3003	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

ALL GEARS - FALL SPAWNERS 4T1
TOUS LES ENGINS - GÉNITEURS D'AUTOMNE 4T1

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
1	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	0.0000	0.0000	0.0000	0.0960	0.1079	0.1109	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3	0.1803	0.2100	0.2068	0.2227	0.2179	0.1739	0.2312	0.2806	0.2250	0.2478	0.2334	0.2257	0.1917	0.1864	0.0000	0.0000	0.0000
4	0.2262	0.2555	0.2523	0.2502	0.2718	0.2149	0.2526	0.2743	0.2635	0.2327	0.2768	0.2589	0.2380	0.2363	0.2178	0.2157	0.2084
5	0.2672	0.2835	0.3200	0.3132	0.3069	0.2511	0.2701	0.3068	0.2960	0.2617	0.3047	0.2919	0.2877	0.2781	0.2494	0.2413	0.2443
6	0.2965	0.2904	0.3157	0.3620	0.3702	0.2998	0.3189	0.3517	0.3313	0.3104	0.3566	0.3268	0.3252	0.3122	0.0000	0.2602	0.2693
7	0.2935	0.3179	0.3646	0.3966	0.4464	0.3523	0.3498	0.3699	0.3701	0.3337	0.3920	0.3524	0.3425	0.3540	0.2805	0.2657	0.3016
8	0.3522	0.3341	0.3860	0.4141	0.4464	0.3675	0.3928	0.3798	0.3903	0.3331	0.3957	0.3736	0.3685	0.3602	0.3398	0.3265	0.3345
9	0.4221	0.3416	0.3998	0.4939	0.0000	0.3648	0.4423	0.4210	0.4031	0.3653	0.4569	0.3890	0.3753	0.3741	0.3241	0.3407	0.3690
10	0.3191	0.3240	0.4218	0.4599	0.0000	0.2639	0.3582	0.4377	0.4511	0.2480	0.4008	0.4114	0.3992	0.4115	0.3892	0.3603	0.3934
11+	0.4096	0.3726	0.4429	0.5420	0.0000	0.4579	0.4947	0.5081	0.4562	0.4058	0.0000	0.4045	0.4152	0.4157	0.3983	0.3849	0.4284
	0.2589	0.3148	0.3028	0.2805	0.3023	0.2292	0.2856	0.3377	0.3342	0.2941	0.3306	0.3232	0.3127	0.3055	0.2467	0.2638	0.2911

Table Q. Catch-at-age for spring-spawning herring caught in NAFO unit area 4T1, 1978-1994. Spawning-group affinity assigned by gonad maturity for spawning and spent fish (stages 6 and 7), by otolith characteristics for juvenile fish (stages 1 and 2) and by McQuinn's (1989) gonadosomatic index (GSI) for all remaining individuals. Numbers are in thousands of fish.

Tableau Q. Prises selon l'âge pour les géniteurs de printemps capturés dans la sous-division de l'OPANO 4T1, 1978-1994. La saison de frai est classée selon la maturité des gonades pour les poissons en état de frai ou épuisés (stades 6 et 7), selon les caractéristiques des otolithes pour les juvéniles (stades 1 et 2), et selon le modèle d'indice gonadosomatique (IGS) de McQuinn (1989) pour le restant. En milliers de poissons.

FIXED GEAR - SPRING SPAWNERS 4T1
ENGINS FIXES - GÉNITEURS DE PRINTEMPS 4T1

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
1	0	319	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	144	0	247	0	211	0	129	0	0	14	0	7	0	0	0	0
3	4155	5409	6728	8441	15201	6228	2871	2766	2212	4	819	885	1241	2947	340	149	761
4	19229	2219	5318	4926	1369	16759	11055	7215	9234	1674	2544	3108	5313	7765	18270	2892	3005
5	930	12615	1508	1150	169	1194	6616	6573	2804	11035	3490	1045	1979	7958	6104	19146	10110
6	1333	367	3531	585	0	300	174	2514	3754	2764	5039	1188	931	3339	2687	6638	24567
7	1139	608	762	1136	0	74	4	0	141	1340	2446	2092	698	1386	1318	1327	3316
8	85	111	278	179	0	0	4	0	0	605	1335	542	1898	1740	472	675	1114
9	360	0	90	96	0	0	0	0	0	62	88	210	372	2405	461	318	230
10	463	160	32	49	0	0	3	0	59	5	22	48	72	801	578	348	211
11+	753	254	23	231	0	0	0	0	0	0	3	2	23	205	228	272	240
	28447	22206	18270	17040	16739	24766	20727	19197	18204	17489	15800	9120	12534	28546	30458	31765	43554

MOBILE GEAR - SPRING SPAWNERS 4T1
ENGINS MOBILES - GÉNITEURS DE PRINTEMPS 4T1

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
1	0	0	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	180	87	165	4	3	691	5	0	0	0	0	0	0	0	0	0	0
3	1224	0	83	3	3	3411	15	0	0	0	0	0	0	0	0	0	0
4	1791	0	27	0	0	932	45	0	0	1	0	0	0	0	0	0	0
5	91	500	15	0	0	162	24	0	0	4	0	0	0	0	0	0	0
6	167	200	94	0	0	1	1	0	0	3	0	0	0	0	0	0	0
7	60	130	68	0	0	15	0	0	0	3	0	0	0	0	0	0	0
8	0	0	31	1	0	34	1	0	0	1	0	0	0	0	0	0	0
9	0	0	17	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11+	151	34	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	3664	951	523	8	6	5246	91	0	0	12	0	0	0	0	0	0	0

ALL GEARS - SPRING SPAWNERS 4T1
TOUS LES ENGINS - GÉNITEURS DE PRINTEMPS 4T1

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
1	0	319	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	180	231	165	251	3	902	5	129	0	0	14	0	7	0	0	0	0
3	5379	5409	6811	8444	15204	9639	2886	2766	2212	4	819	885	1241	2947	340	149	761
4	21020	2219	5345	4926	1369	17691	11100	7215	9234	1675	2544	3108	5313	7765	18270	2892	3005
5	1021	13115	1523	1150	169	1356	6640	6573	2804	11039	3490	1045	1979	7958	6104	19146	10110
6	1500	567	3625	585	0	301	175	2514	3754	2767	5039	1188	931	3339	2687	6638	24567
7	1199	738	830	1136	0	89	4	0	141	1343	2446	2092	698	1386	1318	1327	3316
8	85	111	309	180	0	34	5	0	0	606	1335	542	1898	1740	472	675	1114
9	360	0	107	96	0	0	0	0	0	62	88	210	372	2405	461	318	230
10	463	160	36	49	0	0	3	0	59	5	22	48	72	801	578	348	211
11+	904	288	27	231	0	0	0	0	0	0	3	2	23	205	228	272	240
	32111	23157	18793	17048	16745	30012	20818	19197	18204	17501	15800	9120	12534	28546	30458	31765	43554

Table R. Weights-at-age (kg) for spring-spawning herring caught in NAFO unit area 4T1, 1978-1994. Spawning-group affinity assigned by gonad maturity for spawning and spent fish (stages 6 and 7), by otolith characteristics for juvenile fish (stages 1 and 2) and by McQuinn's (1989) gonadosomatic index (GSI) for all remaining individuals.

Tableau R. Poids selon l'âge (kg) pour les géniteurs de printemps capturés dans la sous-division de l'OPANO 4T1, 1978-1994. La saison de frai est classée selon la maturité des gonades pour les poissons en état de frai ou épuisés (stades 6 et 7), selon les caractéristiques des otolithes pour les juvéniles (stades 1 et 2), et selon le modèle d'indice gonadosomatique (IGS) de McQuinn (1989) pour le restant.

FIXED GEAR - SPRING SPAWNERS 4T1
ENGINS FIXES - GÉNITEURS DE PRINTEMPS 4T1

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
1	0.0000	0.0195	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	0.0000	0.1652	0.0000	0.1253	0.0000	0.1718	0.0000	0.1506	0.0000	0.0000	0.1631	0.0000	0.1499	0.0000	0.0000	0.0000	0.0000
3	0.1458	0.1694	0.1674	0.1810	0.1677	0.1718	0.1691	0.1715	0.1340	0.1322	0.1553	0.1493	0.1501	0.1431	0.1646	0.1309	0.1238
4	0.1894	0.2150	0.1813	0.2378	0.1837	0.2092	0.1926	0.1912	0.1687	0.1828	0.1993	0.1913	0.1968	0.1805	0.1712	0.1600	0.1576
5	0.2077	0.2259	0.2138	0.2834	0.2105	0.2343	0.2118	0.2151	0.2156	0.2090	0.2297	0.2136	0.2326	0.2189	0.1977	0.1869	0.1773
6	0.2473	0.2370	0.2669	0.3080	0.0000	0.2731	0.2676	0.2448	0.2319	0.2287	0.2597	0.2370	0.2486	0.2417	0.2287	0.1986	0.1982
7	0.3267	0.2993	0.2848	0.3265	0.0000	0.3269	0.3110	0.0000	0.3021	0.2479	0.2786	0.2713	0.2755	0.2410	0.2566	0.2407	0.2137
8	0.3106	0.3459	0.3245	0.3066	0.0000	0.0000	0.3465	0.0000	0.0000	0.2532	0.2992	0.2951	0.2808	0.2904	0.2388	0.2486	0.2580
9	0.3070	0.0000	0.4681	0.3801	0.0000	0.0000	0.0000	0.0000	0.0000	0.2702	0.2997	0.3075	0.3076	0.2976	0.2864	0.2749	0.2684
10	0.3292	0.3057	0.3448	0.4113	0.0000	0.0000	0.3733	0.0000	0.2897	0.3260	0.3448	0.3373	0.3176	0.3014	0.2943	0.2907	0.2951
11+	0.3738	0.3382	0.3996	0.4074	0.0000	0.0000	0.0000	0.0000	0.0000	0.5046	0.3458	0.3288	0.3291	0.3011	0.3033	0.3069	0.2008
											0.2445	0.2237	0.2230	0.2185	0.1913	0.1932	0.1934

MOBILE GEAR - SPRING SPAWNERS 4T1
ENGINS MOBILES - GÉNITEURS DE PRINTEMPS 4T1

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
1	0.0000	0.0000	0.1054	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0810	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	0.1763	0.1763	0.1625	0.1749	0.1400	0.1432	0.1385	0.0000	0.0000	0.1893	0.1128	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3	0.1856	0.0000	0.1914	0.2143	0.2150	0.1843	0.1870	0.0000	0.0000	0.1961	0.1733	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
4	0.2336	0.0000	0.2220	0.2402	0.2507	0.2159	0.2210	0.0000	0.0000	0.2733	0.2433	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
5	0.2105	0.2963	0.2654	0.0000	0.0000	0.2812	0.2519	0.0000	0.0000	0.2972	0.3109	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
6	0.2781	0.2847	0.2667	0.4132	0.0000	0.2731	0.3025	0.0000	0.3298	0.3226	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
7	0.2921	0.3538	0.2555	0.3282	0.0000	0.2455	0.0000	0.0000	0.3375	0.3603	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
8	0.0000	0.0000	0.2643	0.2844	0.3170	0.2375	0.3189	0.0000	0.0000	0.3713	0.3889	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
9	0.0000	0.0000	0.3018	0.0000	0.3200	0.0000	0.0000	0.0000	0.0000	0.0000	0.4024	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
10	0.0000	0.0000	0.3896	0.3249	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
11+	0.4332	0.4129	0.3058	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.5328	0.4281	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
										0.3196	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

ALL GEARS - SPRING SPAWNERS 4T1
TOUS LES ENGINS - GÉNITEURS DE PRINTEMPS 4T1

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
1	0.0000	0.0195	0.1054	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	0.1763	0.1694	0.1625	0.1261	0.1400	0.1499	0.1385	0.1506	0.0000	0.0000	0.1631	0.0000	0.1499	0.0000	0.0000	0.0000	0.0000
3	0.1549	0.1694	0.1677	0.1810	0.1677	0.1762	0.1692	0.1715	0.1340	0.1322	0.1553	0.1493	0.1501	0.1431	0.1646	0.1309	0.1238
4	0.1932	0.2150	0.1815	0.2378	0.1837	0.2096	0.1927	0.1912	0.1687	0.1829	0.1993	0.1913	0.1968	0.1805	0.1712	0.1600	0.1576
5	0.2079	0.2286	0.2143	0.2834	0.2105	0.2399	0.2119	0.2151	0.2156	0.2090	0.2297	0.2136	0.2326	0.2189	0.1977	0.1869	0.1773
6	0.2507	0.2538	0.2669	0.3080	0.0000	0.2731	0.2678	0.2448	0.2319	0.2288	0.2597	0.2370	0.2486	0.2417	0.2287	0.1986	0.1982
7	0.3250	0.3089	0.2824	0.3265	0.0000	0.3132	0.3110	0.0000	0.3021	0.2481	0.2786	0.2713	0.2755	0.2410	0.2566	0.2407	0.2137
8	0.3106	0.3459	0.3185	0.3065	0.0000	0.2375	0.3410	0.0000	0.0000	0.2534	0.2992	0.2951	0.2808	0.2904	0.2388	0.2486	0.2580
9	0.3070	0.0000	0.4417	0.3801	0.0000	0.0000	0.0000	0.0000	0.0000	0.2702	0.2997	0.3075	0.3076	0.2976	0.2864	0.2749	0.2684
10	0.3292	0.3057	0.3498	0.4113	0.0000	0.0000	0.3733	0.0000	0.2897	0.3260	0.3448	0.3373	0.3176	0.3014	0.2943	0.2907	0.2951
11+	0.3837	0.3470	0.3857	0.4074	0.0000	0.0000	0.0000	0.0000	0.0000	0.5046	0.3458	0.3288	0.3291	0.3011	0.3033	0.3069	0.2036
										0.2144	0.2445	0.2237	0.2230	0.2185	0.1913	0.1932	0.1934

Table S. Catch-at-age for fall-spawning herring caught in NAFO unit areas 4Tf, 4Tg, 4Th, 4Tj and 4Tk, 1978-1994. Spawning-group affinity assigned by gonad maturity for spawning and spent fish (stages 6 and 7), by otolith characteristics for juvenile fish (stages 1 and 2) and by McQuinn's (1989) gonadosomatic index (GSI) for all remaining individuals. Numbers are in thousands of fish.

Tableau S. Prises selon l'âge pour les géniteurs d'automne capturés dans les sous-divisions de l'OPANO 4Tf, 4Tg, 4Th, 4Tj et 4Tk, 1978-1994. La saison de fraî est classée selon la maturité des gonades pour les poissons en état de fraî ou épuisés (stades 6 et 7), selon les caractéristiques des otolithes pour les juvéniles (stades 1 et 2), et selon le modèle d'indice gonadosomatique (IGS) de McQuinn (1989) pour le restant. En milliers de poissons.

FIXED GEAR - FALL SPAWNERS 4Tf,g,h,j,k
ENGINS FIXES - GÉNITEURS D'AUTOMNE 4Tf,g,h,j,k

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
1	0	904	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	82	8	38	6	0	0	0	0	253	0	0	0	0	0	0	0	0
3	3389	198	4534	595	352	394	399	572	976	1154	299	11	771	11	0	0	0
4	1500	4388	2296	6479	7256	7897	15893	4433	21298	12014	4291	1460	5824	5004	1297	115	1555
5	573	2211	2363	1732	3633	4705	5384	14452	5587	13864	16267	1654	5812	1690	7469	1904	307
6	165	715	218	832	3068	2998	4253	5848	11335	6523	9609	7784	6681	1214	1106	3196	9730
7	78	278	821	395	2120	904	2310	3075	2755	14777	4599	3495	31371	1202	596	835	13621
8	118	279	136	267	744	1250	594	1398	1461	6693	6778	1609	8484	3932	1492	644	1772
9	51	153	96	133	299	384	362	420	462	4061	3043	2391	3629	1233	3372	1570	2288
10	0	48	151	72	89	57	112	415	120	1887	954	479	3816	769	1195	923	6009
11+	3	49	14	13	9	86	20	36	163	1184	447	219	1743	1152	1362	1319	8144
	5959	9231	10667	10524	17570	18675	29327	30649	4410	62157	46287	19102	68131	16208	17889	10506	43426

MOBILE GEAR - FALL SPAWNERS 4Tf,g,h,j,k
ENGINS MOBILES - GÉNITEURS D'AUTOMNE 4Tf,g,h,j,k

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
1	0	1	140	0	0	0	0	0	0	0	1	0	0	0	0	0	0
2	1326	195	2342	75	0	3	0	0	23	0	52	0	0	0	0	6	0
3	15859	4032	36489	4337	0	81	1	0	114	6	36	0	0	0	0	8	0
4	4897	13005	14346	4281	0	114	1	0	83	10	40	0	0	0	162	62	804
5	936	10331	11347	598	0	50	6	0	11	16	37	0	0	0	133	346	308
6	287	6322	6590	104	0	25	0	0	5	50	44	0	0	0	146	84	873
7	383	1896	7340	304	0	4	0	0	1	46	119	0	0	0	99	110	1491
8	663	1478	5462	88	0	1	0	0	3	38	101	0	0	0	36	113	338
9	155	950	3184	257	0	1	0	0	1	13	56	0	0	0	39	115	154
10	197	340	1562	111	0	1	0	0	0	2	17	0	0	0	49	207	127
11+	1080	1501	896	62	0	0	0	0	0	0	32	0	0	0	16	474	334
	25783	40051	89698	10217	0	280	8	0	241	181	535	0	0	0	680	1525	4429

ALL GEARS - FALL SPAWNERS 4Tf,g,h,j,k
TOUS LES ENGINS - GÉNITEURS D'AUTOMNE 4Tf,g,h,j,k

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
1	0	905	140	0	0	0	0	0	0	1	0	0	0	0	0	0	0
2	1408	203	2380	81	0	3	0	0	276	0	52	0	0	0	0	6	0
3	19248	4230	41023	4932	352	475	400	572	1090	1160	335	11	771	11	0	8	0
4	6397	17393	16642	10760	7256	8011	15894	4433	21381	12024	4331	1460	5824	5004	1459	177	2359
5	1509	12542	13710	2330	3633	4755	5390	14452	5598	13880	16304	1654	5812	1690	7602	2250	615
6	452	7037	6808	936	3068	3023	4253	5848	11340	6573	9653	7784	6681	1214	1252	3280	10603
7	461	2174	8161	699	2120	908	2310	3075	2756	14823	4718	3495	31371	1202	695	945	15112
8	781	1757	5598	355	744	1251	594	1398	1464	6731	6879	1609	8484	3932	1528	757	2110
9	206	1103	3280	390	299	385	362	420	463	4074	3099	2391	3629	1233	3411	1685	2442
10	197	388	1713	183	89	58	112	415	120	1889	971	479	3816	769	1244	1130	6136
11+	1083	1550	910	75	9	86	20	36	163	1184	479	219	1743	1152	1378	1793	8478
	31742	49282	100365	20741	17570	18955	29335	30649	44651	62338	46822	19102	68131	16207	18569	12031	47855

Table T. Weights-at-age (kg) for fall-spawning herring caught in NAFO unit areas 4Tf, 4Tg, 4Th, 4Tj and 4Tk, 1978-1994. Spawning-group affinity assigned by gonad maturity for spawning and spent fish (stages 6 and 7), by otolith characteristics for juvenile fish (stages 1 and 2) and by McQuinn's (1989) gonadosomatic index (GSI) for all remaining individuals.

Tableau T. Poids selon l'âge (kg) pour les géniteurs d'automne capturés dans les sous-divisions de l'OPANO 4Tf, 4Tg, 4Th, 4Tj et 4Tk, 1978-1994. La saison de frai est classée selon la maturité des gonades pour les poissons en état de frai ou épuisés (stades 6 et 7), selon les caractéristiques des otolithes pour les juvéniles (stades 1 et 2), et selon le modèle d'indice gonadosomatique (IGS) de McQuinn (1989) pour le restant.

FIXED GEAR - FALL SPAWNERS 4Tf,g,h,j,k
ENGINS FIXES - GÉNITEURS D'AUTOMNE 4Tf,g,h,j,k

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
1	0.0000	0.0231	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	0.0787	0.1066	0.2115	0.0354	0.0000	0.0000	0.0000	0.0000	0.1793	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3	0.1303	0.1828	0.2062	0.1951	0.2104	0.0000	0.2273	0.2357	0.1786	0.2283	0.2342	0.2327	0.1929	0.1736	0.0000	0.0000	0.0000
4	0.1773	0.2462	0.2498	0.2258	0.2619	0.1943	0.2431	0.2512	0.2405	0.2398	0.2673	0.2554	0.2433	0.2359	0.2197	0.2138	0.2106
5	0.2139	0.2820	0.2980	0.3249	0.3000	0.2514	0.2768	0.2822	0.2809	0.2726	0.2922	0.2784	0.2623	0.2532	0.2322	0.2269	
6	0.2182	0.3239	0.3243	0.3834	0.3327	0.2829	0.3069	0.3150	0.3133	0.3053	0.3219	0.3190	0.3254	0.2982	0.2793	0.2507	0.2601
7	0.2669	0.3640	0.3397	0.3803	0.3696	0.3041	0.3374	0.3493	0.3499	0.3297	0.3533	0.3516	0.3474	0.3342	0.2888	0.2837	0.2852
8	0.2765	0.4024	0.3385	0.4003	0.3645	0.3342	0.3992	0.3623	0.3596	0.3510	0.3796	0.3778	0.3709	0.3556	0.3369	0.3182	0.3259
9	0.3048	0.4285	0.3735	0.4429	0.3864	0.3564	0.4023	0.3900	0.3854	0.3699	0.3982	0.3838	0.3963	0.3760	0.3423	0.3511	0.3258
10	0.0000	0.04458	0.4316	0.4670	0.3538	0.3946	0.3937	0.3813	0.3956	0.3703	0.4045	0.4040	0.4084	0.3907	0.3651	0.3570	0.3600
11+	0.4085	0.4568	0.3638	0.4346	0.4004	0.4098	0.4862	0.4580	0.3605	0.4195	0.4509	0.4307	0.4299	0.4136	0.3810	0.3897	0.3704
	0.1582	0.2509	0.2552	0.2676	0.3011	0.2384	0.2716	0.2965	0.2755	0.3030	0.3254	0.3330	0.3397	0.3102	0.2946	0.2955	0.3066

MOBILE GEAR - FALL SPAWNERS 4Tf,g,h,j,k
ENGINS MOBILES - GÉNITEURS D'AUTOMNE 4Tf,g,h,j,k

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
1	0.0000	0.0692	0.0308	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0753	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	0.0926	0.0331	0.1032	0.1144	0.0000	0.1079	0.0000	0.0000	0.1136	0.1422	0.0959	0.0000	0.0000	0.0000	0.0000	0.0660	0.0000
3	0.1346	0.0727	0.1405	0.1789	0.0000	0.1734	0.1313	0.0000	0.1384	0.2033	0.1651	0.0000	0.0000	0.0000	0.0000	0.1380	0.0000
4	0.1678	0.1495	0.1667	0.2255	0.0000	0.2079	0.1665	0.0000	0.1686	0.2427	0.2250	0.0000	0.0000	0.0000	0.1478	0.2053	0.1503
5	0.2147	0.1823	0.2236	0.2500	0.0000	0.2345	0.1945	0.0000	0.1925	0.2683	0.2603	0.0000	0.0000	0.0000	0.2080	0.2686	0.1656
6	0.2279	0.1998	0.2357	0.2872	0.0000	0.2854	0.2497	0.0000	0.2450	0.2890	0.3050	0.0000	0.0000	0.0000	0.2722	0.2845	0.1902
7	0.2856	0.2250	0.2634	0.3410	0.0000	0.3185	0.2805	0.0000	0.2757	0.3148	0.3328	0.0000	0.0000	0.0000	0.2920	0.3343	0.2343
8	0.3142	0.2804	0.2502	0.2569	0.0000	0.3675	0.0000	0.0000	0.2886	0.3352	0.3240	0.0000	0.0000	0.0000	0.3255	0.3747	0.2220
9	0.2946	0.3294	0.2735	0.2607	0.0000	0.3648	0.3964	0.0000	0.2757	0.3435	0.3800	0.0000	0.0000	0.0000	0.3217	0.3922	0.2506
10	0.3146	0.3464	0.2832	0.2620	0.0000	0.2639	0.0000	0.0000	0.0000	0.4071	0.4042	0.0000	0.0000	0.0000	0.3024	0.4006	0.3347
11+	0.3636	0.3813	0.3587	0.2626	0.0000	0.4579	0.0000	0.0000	0.0000	0.4446	0.4108	0.0000	0.0000	0.0000	0.3816	0.4272	0.3274
	0.1615	0.1806	0.1872	0.2122	0.0000	0.2114	0.1831	0.0000	0.1541	0.3032	0.2929	0.0000	0.0000	0.0000	0.2433	0.3546	0.2151

ALL GEARS - FALL SPAWNERS 4Tf,g,h,j,k
TOUS LES ENGINS - GÉNITEURS D'AUTOMNE 4Tf,g,h,j,k

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
1	0.0000	0.0232	0.0308	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0753	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	0.0918	0.0360	0.1049	0.1085	0.0000	0.1079	0.0000	0.0000	0.1738	0.0000	0.0959	0.0000	0.0000	0.0000	0.0000	0.0660	0.0000
3	0.1338	0.0779	0.1478	0.1809	0.2104	0.0296	0.2271	0.2357	0.1744	0.2282	0.2268	0.2327	0.1929	0.1736	0.0000	0.1380	0.0000
4	0.1700	0.1739	0.1782	0.2257	0.2619	0.1945	0.2431	0.2512	0.2402	0.2398	0.2669	0.2554	0.2433	0.2359	0.2117	0.2108	0.1900
5	0.2144	0.1999	0.2364	0.3057	0.3000	0.2512	0.2767	0.2822	0.2807	0.2726	0.2921	0.2784	0.2772	0.2623	0.2524	0.2378	0.1962
6	0.2244	0.2124	0.2385	0.3727	0.3327	0.2829	0.3069	0.3150	0.3133	0.3052	0.3218	0.3190	0.3254	0.2982	0.2785	0.2516	0.2543
7	0.2824	0.2428	0.2711	0.3632	0.3696	0.3042	0.3374	0.3493	0.3499	0.3297	0.3528	0.3516	0.3474	0.3342	0.2893	0.2896	0.2802
8	0.3085	0.2998	0.2523	0.3648	0.3645	0.3342	0.3992	0.3623	0.3595	0.3509	0.3788	0.3778	0.3709	0.3556	0.3366	0.3266	0.3093
9	0.2971	0.3431	0.2764	0.3228	0.3864	0.3564	0.4023	0.3900	0.3852	0.3698	0.3979	0.3838	0.3963	0.3760	0.3421	0.3539	0.3211
10	0.3146	0.3587	0.2963	0.3427	0.3538	0.3923	0.3937	0.3813	0.3956	0.3703	0.4045	0.4040	0.4084	0.3907	0.3626	0.3650	0.3595
11+	0.3637	0.3837	0.3588	0.2924	0.4004	0.4098	0.4862	0.4580	0.3605	0.4195	0.4482	0.4307	0.4299	0.4136	0.3810	0.3996	0.3687
	0.1609	0.1938	0.1944	0.2403	0.3011	0.2380	0.2716	0.2965	0.2749	0.3030	0.3250	0.3330	0.3397	0.3102	0.2927	0.3030	0.2982

Table U. Catch-at-age for spring-spawning herring caught in NAFO unit areas 4Tf, 4Tg, 4Th, 4Tj and 4Tk, 1978-1994. Spawning-group affinity assigned by gonad maturity for spawning and spent fish (stages 6 and 7), by otolith characteristics for juvenile fish (stages 1 and 2) and by McQuinn's (1989) gonadosomatic index (GSI) for all remaining individuals. Numbers are in thousands of fish.

Tableau U. Prises selon l'âge pour les géniteurs de printemps capturés dans les sous-divisions de l'OPANO 4Tf, 4Tg, 4Th, 4Tj et 4Tk, 1978-1994. La saison de frai est classée selon la maturité des gonades pour les poissons en état de frai ou épuisés (stades 6 et 7), selon les caractéristiques des otolithes pour les juvéniles (stades 1 et 2), et selon le modèle d'indice gonadosomatique (IGS) de McQuinn (1989) pour le restant. En milliers de poissons.

FIXED GEAR - SPRING SPAWNERS 4Tf,g,h,j,k
ENGINS FIXES - GÉNITEURS DE PRINTEMPS 4Tf,g,h,j,k

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
1	0	481	0	5	10	0	0	0	0	59	0	0	0	0	0	0	0
2	14	1698	70	56	30	31	81	195	0	153	470	0	0	0	0	0	0
3	342	14821	481	3054	4808	2222	835	1198	293	665	2452	2356	1290	2905	1852	91	1054
4	1402	11692	840	2508	982	6354	1461	4384	3763	3394	2432	11460	7119	2792	9524	2557	2243
5	154	6512	753	1298	698	437	677	3832	4592	3037	1594	2627	6764	5514	2078	13821	16165
6	483	1717	1884	992	387	114	109	936	4231	3021	1433	2490	1217	4556	3246	5004	20015
7	223	618	705	1167	273	28	12	431	985	2053	916	1364	1099	1142	915	2758	2969
8	163	1034	594	225	245	0	9	186	177	754	843	1378	878	646	396	902	2155
9	87	280	641	308	104	0	2	61	30	91	186	754	956	967	251	615	334
10	619	77	430	124	62	0	2	0	10	203	29	28	486	539	185	301	455
11+	708	982	675	714	554	0	0	1	22	58	6	16	73	383	463	441	455
	4195	39912	7073	10451	8153	9186	3188	11224	14103	13429	10420	22473	19881	19445	18910	26490	45844

MOBILE GEAR - SPRING SPAWNERS 4Tf,g,h,j,k
ENGINS MOBILES - GÉNITEURS DE PRINTEMPS 4Tf,g,h,j,k

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
1	1421	406	601	0	0	0	0	0	0	0	28	0	0	0	0	0	0
2	12352	1700	8073	1825	0	18	0	0	3	1	54	0	0	0	0	0	0
3	2128	14817	12140	1282	0	89	2	0	2	2	16	0	0	0	1639	117	1027
4	2095	11694	12603	135	0	24	3	0	8	8	10	0	0	0	1137	316	994
5	884	6538	5203	5	0	4	2	0	6	23	14	0	0	0	771	1653	4568
6	1699	1723	6064	100	0	0	0	0	5	19	54	0	0	0	429	1645	4734
7	2768	623	3458	226	0	0	0	0	1	16	32	0	0	0	217	622	1170
8	580	1037	1709	383	0	1	0	0	0	6	27	0	0	0	209	560	1565
9	721	281	1246	1	0	0	0	0	0	0	18	0	0	0	152	1248	367
10	214	78	291	249	0	0	0	0	0	0	0	0	0	0	19	726	236
11+	3076	984	281	3	0	0	0	0	0	0	6	0	0	0	8	1211	637
	27938	39881	51669	4209	0	136	7	0	25	75	259	0	0	0	4581	8098	15298

ALL GEARS - SPRING SPAWNERS 4Tf,g,h,j,k
TOUS LES ENGINS - GÉNITEURS DE PRINTEMPS 4Tf,g,h,j,k

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
1	1421	887	601	5	10	0	0	0	0	0	87	0	0	0	0	0	0
2	12366	3398	8143	1881	30	49	81	195	3	154	524	0	0	0	0	0	0
3	2470	29638	12621	4336	4808	2311	837	1198	295	667	2468	2356	1290	2905	3491	208	2081
4	3497	23386	13443	2643	982	6378	1464	4384	3771	3402	2442	11460	7119	2792	10661	2873	3237
5	1038	13050	5956	1303	698	441	679	3832	4598	3060	1608	2627	6764	5514	2849	15474	20733
6	2182	3440	7948	1092	387	114	109	936	4236	3040	1487	2490	1217	4556	3675	6649	24749
7	2991	1241	4163	1393	273	28	12	431	986	2069	948	1364	1099	1142	1132	3380	4139
8	743	2071	2303	608	245	1	9	186	177	760	870	1378	878	646	605	1462	3720
9	808	561	1887	309	104	0	2	61	30	91	204	754	956	967	403	1863	701
10	833	155	721	373	62	0	2	0	10	203	29	28	486	539	204	1027	691
11+	3784	1966	956	717	554	0	0	1	22	58	12	16	73	383	471	1652	1092
	32133	79793	58742	14660	8153	9322	3195	11224	14128	13504	10679	22473	19882	19444	23491	34588	61143

Table V. Weights-at-age (kg) for spring-spawning herring caught in NAFO unit areas 4Tf, 4Tg, 4Th, 4Tj and 4Tk, 1978-1994. Spawning-group affinity assigned by gonad maturity for spawning and spent fish (stages 6 and 7), by otolith characteristics for juvenile fish (stages 1 and 2) and by McQuinn's (1989) gonadosomatic index (GSI) for all remaining individuals.

Tableau V. Poids selon l'âge (kg) pour les géniteurs de printemps capturés dans les sous-divisions de l'OPANO 4Tf, 4Tg, 4Th, 4Tj et 4Tk, 1978-1994. La saison de frai est classée selon la maturité des gonades pour les poissons en état de frai ou épuisés (stades 6 et 7), selon les caractéristiques des otolithes pour les juvéniles (stades 1 et 2), et selon le modèle d'indice gonadosomatique (IGS) de McQuinn (1989) pour le restant.

FIXED GEAR - SPRING SPAWNERS 4Tf,g,h,j,k
ENGINS FIXES - GÉNITEURS DE PRINTEMPS 4Tf,g,h,j,k

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
1	0.0000	0.0307	0.0000	0.0297	0.0366	0.0000	0.0000	0.0000	0.0000	0.0379	0.0000	.	.	0.0000	0.0000	.	.
2	0.1418	0.0568	0.1853	0.1247	0.1352	0.1716	0.0910	0.2557	0.0000	0.0981	0.0745	0.0000	.	.	0.0000	0.0000	.
3	0.1497	0.1403	0.1865	0.1821	0.0000	0.1699	0.1722	0.1888	0.1734	0.1603	0.1542	0.1632	0.1619	0.1433	0.1410	0.1431	0.1679
4	0.1989	0.1743	0.2055	0.2311	0.2272	0.2092	0.2059	0.2159	0.2120	0.1875	0.1743	0.2031	0.1894	0.1810	0.1679	0.1627	0.1504
5	0.2403	0.2074	0.2431	0.2882	0.2744	0.2310	0.2218	0.2447	0.2278	0.2129	0.2031	0.2295	0.2179	0.2170	0.2026	0.1888	0.1772
6	0.2788	0.2323	0.2864	0.3419	0.3241	0.2731	0.2392	0.2746	0.2604	0.2446	0.2499	0.2566	0.2321	0.2467	0.2353	0.2064	0.1975
7	0.2949	0.2694	0.3167	0.3524	0.3796	0.3269	0.3032	0.2992	0.2895	0.2657	0.2800	0.2851	0.2368	0.2757	0.2554	0.2378	0.2166
8	0.3107	0.3375	0.3391	0.3702	0.4022	0.0000	0.3936	0.3229	0.3302	0.2721	0.2991	0.2855	0.2780	0.2873	0.2567	0.2533	0.2461
9	0.3294	0.3735	0.3539	0.3839	0.4133	0.0000	0.4140	0.4001	0.3404	0.3333	0.3352	0.3168	0.2892	0.3168	0.2967	0.2828	0.3096
10	0.3256	0.3168	0.3644	0.3978	0.4328	0.0000	0.3668	0.0000	0.4220	0.2818	0.3522	0.3471	0.3054	0.3193	0.3085	0.2985	0.2933
11+	0.3598	0.3714	0.3722	0.4081	0.4472	0.0000	0.0000	0.4913	0.3830	0.3409	0.4621	0.3757	0.3610	0.3348	0.3162	0.3288	0.3398
	0.2634	0.1751	0.2909	0.2688	0.1305	0.2018	0.1998	0.2344	0.2384	0.2235	0.2020	0.2221	0.2147	0.2237	0.1935	0.2025	0.1941

MOBILE GEAR - SPRING SPAWNERS 4Tf,g,h,j,k
ENGINS MOBILES - GÉNITEURS DE PRINTEMPS 4Tf,g,h,j,k

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
1	0.0790	0.0387	0.1054	0.0297	0.0000	0.0000	0.0000	0.0866	0.0000	0.0810	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	0.1175	0.0572	0.1523	0.1749	0.0000	0.1432	0.0905	0.0000	0.1349	0.1893	0.1128	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3	0.1386	0.1403	0.1577	0.2140	0.0000	0.1843	0.1647	0.0000	0.2102	0.1961	0.1733	0.0000	0.0000	0.0000	0.1464	0.0987	0.1453
4	0.2254	0.1743	0.2134	0.2389	0.0000	0.2161	0.2034	0.0000	0.2525	0.2733	0.2433	0.0000	0.0000	0.0000	0.2011	0.1617	0.1640
5	0.2512	0.2077	0.2454	0.2698	0.0000	0.2819	0.2197	0.0000	0.2816	0.2972	0.3109	0.0000	0.0000	0.0000	0.2513	0.1875	0.1927
6	0.2768	0.2324	0.2681	0.4102	0.0000	0.0000	0.2283	0.0000	0.3159	0.3299	0.3226	0.0000	0.0000	0.0000	0.2673	0.2190	0.2111
7	0.3019	0.2695	0.2635	0.3286	0.0000	0.2448	0.3058	0.0000	0.3241	0.3375	0.3603	0.0000	0.0000	0.0000	0.2727	0.2571	0.2600
8	0.3075	0.3373	0.2789	0.2846	0.0000	0.2375	0.4161	0.0000	0.3392	0.3713	0.3889	0.0000	0.0000	0.0000	0.2981	0.3281	0.2495
9	0.3114	0.3734	0.3362	0.3839	0.0000	0.0000	0.4036	0.0000	0.2910	0.0000	0.4024	0.0000	0.0000	0.0000	0.3143	0.3655	0.3091
10	0.3098	0.3168	0.3819	0.3251	0.0000	0.0000	0.3668	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.3327	0.3322	0.3164
11+	0.3587	0.3715	0.3435	0.4081	0.0000	0.0000	0.0000	0.0000	0.3933	0.5328	0.4281	0.0000	0.0000	0.0000	0.3973	0.3329	0.3344
	0.1944	0.1756	0.2093	0.2219	0.0000	0.1877	0.1970	0.0000	0.2575	0.3133	0.2594	0.0000	0.0000	0.0000	0.2086	0.2688	0.2149

ALL GEARS - SPRING SPAWNERS 4Tf,g,h,j,k
TOUS LES ENGINS - GÉNITEURS DE PRINTEMPS 4Tf,g,h,j,k

AGE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
1	0.0790	0.0344	0.1054	0.0297	0.0366	0.0000	0.0000	0.0000	0.0000	0.0518	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	0.1175	0.0570	0.1526	0.1734	0.1352	0.1612	0.0910	0.2557	0.1349	0.0987	0.0784	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3	0.1401	0.1403	0.1588	0.1915	0.0000	0.1705	0.1722	0.1888	0.1736	0.1604	0.1543	0.1632	0.1619	0.1433	0.1435	0.1181	0.1567
4	0.2148	0.1743	0.2129	0.2315	0.2272	0.2092	0.2059	0.2159	0.2121	0.1877	0.1746	0.2031	0.1894	0.1810	0.1714	0.1626	0.1546
5	0.2496	0.2076	0.2451	0.2881	0.2744	0.2315	0.2218	0.2447	0.2279	0.2135	0.2040	0.2295	0.2179	0.2170	0.2158	0.1987	0.1806
6	0.2772	0.2324	0.2724	0.3482	0.3241	0.2731	0.2392	0.2746	0.2605	0.2451	0.2525	0.2566	0.2321	0.2467	0.2390	0.2095	0.2001
7	0.3014	0.2695	0.2725	0.3485	0.3796	0.3269	0.3032	0.2992	0.2895	0.2663	0.2827	0.2851	0.2368	0.2757	0.2587	0.2414	0.2289
8	0.3082	0.3374	0.2944	0.3163	0.4022	0.2375	0.3936	0.3229	0.3302	0.2729	0.3019	0.2855	0.2780	0.2873	0.2710	0.2820	0.2475
9	0.3133	0.3734	0.3422	0.3839	0.4133	0.0000	0.4140	0.4001	0.3404	0.3333	0.3411	0.3168	0.2892	0.3168	0.3033	0.3382	0.3093
10	0.3215	0.3168	0.3715	0.3493	0.4328	0.0000	0.3668	0.0000	0.4220	0.2818	0.3522	0.3471	0.3054	0.3193	0.3108	0.3223	0.3012
11+	0.3589	0.3715	0.3638	0.4081	0.4472	0.0000	0.0000	0.4913	0.3830	0.3409	0.4451	0.3757	0.3610	0.3348	0.3176	0.3318	0.3367
	0.2034	0.1753	0.2191	0.2554	0.1305	0.2016	0.1998	0.2344	0.2385	0.2240	0.2034	0.2221	0.2147	0.2237	0.1964	0.2180	0.1993