

Pacific Herring Coded Wire Tagging Study: 2006 Recoveries

L. Flostrand and J.F. Schweigert

Fisheries and Oceans Canada
Science Branch, Pacific Region
Pacific Biological Station
Nanaimo, British Columbia
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Fisheries and Oceans Canada
Science Branch, Pacific Region
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ABSTRACT

Flostrand, L., and Schweigert, J.F. 2007. Pacific herring coded wire tagging study: 2006 recoveries. *Can. Tech. Rep. Fish. Aquat. Sci.* 2771: viii + 32 p.

The results of searching Pacific herring landings from British Columbia roe fisheries in 2006 to recover coded wire tags are presented. It was estimated that 27% of the total British Columbia roe herring catch by weight, equivalent to approximately 6,069 metric tonnes, was searched for tags at three fish processing plants. Among the three stock assessment regions which had openings for roe herring, the percentages of regional catches searched for tags varied from 19.5 to 29.9%. A total of 546 tagged herring from six release years were recovered. With respect to year of release, there was 1 recovery from 1999; 3 recoveries from 2000; 30 from 2001; 86 from 2002; 159 from 2003 and 267 from 2004. A total of 52 inter-regional strays were observed and are described. From 2002 releases, 2 were from the Prince Rupert District and recovered in the Central Coast; 1 was from the Central Coast and recovered in the Prince Rupert District and 1 was from the Central Coast and recovered in the Strait of Georgia. From 2003 releases, 7 were from the Prince Rupert District and recovered in the Central Coast; 1 was from the Prince Rupert District and recovered in the Strait of Georgia; 3 were from the Central Coast and recovered in the Prince Rupert District and 6 were from the Central Coast and recovered in the Strait of Georgia. From the 2004 releases, 3 were from the Central Coast and recovered in the Prince Rupert District; 16 were from the Central Coast and recovered in the Strait of Georgia; 1 was from the west coast of Vancouver Island and recovered in the Prince Rupert District and 11 were from the west coast of Vancouver Island and recovered in the Strait of Georgia. In addition to regional strays, there were approximately 88 inter-area strays (with the same region of release and recovery) and there were 406 recoveries having the same area of release and recovery. Observed tag recovery data were related to roe herring catches by region, area(s) and gear type. Using data from specific recovery and release events, we derived estimates of the number of tagged herring recovered per number released, the number of tagged herring recovered per metric tonne of roe herring searched, the number of tagged herring removed by the 2006 roe herring fisheries and the number of tagged herring removed per number released. An additional experiment was conducted during the 2006 tag recovery season to investigate combined rates of tag detection and recovery efficiency in the fish plants. Trials were done by seeding tagged test specimens into catch lots of thawing fish prior to the processing stages of roe extraction. Adjusted estimates of combined tag detection and recovery efficiency ranged from 0.34 to 0.90, demonstrating considerable variability between fish plants and fishery catch lots.

RÉSUMÉ

Flostrand, L., et Schweigert, J.F. 2007. *Pacific herring coded wire tagging study: 2006 recoveries*. Can. Tech. Rep. Fish. Aquat. Sci. 2771: viii + 32 p.

Nous présentons les résultats de la recherche de harengs du Pacifique portant une micromarque magnétisée codée parmi les prises de harengs rogués réalisées en Colombie-Britannique en 2006. Nous estimons que 27,0 % (en poids) des prises totales, soit quelque 6 069 tonnes, ont été examinées dans trois usines de transformation du poisson, pour trouver celles qui portaient une micromarque. Parmi les trois régions côtières d'évaluation des stocks où la pêche du hareng rogué a été autorisée, le pourcentage des prises régionales soumises à cette recherche a varié de 19,5 à 29,9 %. Au total, 546 harengs qui ont été marqués en saison au cours des six années différentes ont été récupérés (un de 1999; 3 de 2000; 30 de 2001; 86 de 2002; 159 de 2003 et 267 de 2004). Cinquante-deux (52) de ces poissons ont été recapturés dans une région différente de celle où ils ont été marqués. Des harengs marqués en 2002, deux remis à l'eau dans le district de Prince Rupert ont été recapturés sur la côte centrale; un remis à l'eau sur la côte centrale a été recapturé dans le district de Prince Rupert; un remis à l'eau sur la côte centrale a été recapturé dans le district de Prince Rupert et remis à l'eau sur la côte centrale a été recapturé dans le détroit de Georgia. Des harengs marqués en 2003, 7 remis à l'eau dans le district de Prince Rupert ont été recapturés sur la côte centrale; un remis à l'eau dans le district de Prince Rupert a été recapturé dans le détroit de Georgia; trois remis à l'eau sur la côte centrale ont été recapturés dans le district de Prince Rupert et six remis à l'eau sur la côte centrale ont été recapturés dans le détroit de Georgia. Des harengs marqués en 2004, trois remis à l'eau sur la côte centrale ont été recapturés dans le district de Prince Rupert; 16 remis à l'eau sur la côte centrale ont été recapturés dans le détroit de Georgia; un remis à l'eau sur la côte Ouest de l'île de Vancouver a été recapturé dans le district de Prince Rupert et 11 remis à l'eau sur la côte Ouest de l'île de Vancouver ont été recapturés dans le détroit de Georgia. En plus de ces passages d'une région à l'autre, nous avons également observé environ 88 passages d'un secteur à l'autre (à l'intérieur d'une même région de marquage et de recapture). Quelque 406 harengs ont été recapturés au même endroit où ils avaient été remis à l'eau. Nous avons établi le rapport entre les données de harengs marqués récupérés et les prises de harengs rogués selon la région, le secteur et le type d'engin de pêche. À l'aide des données obtenues pour les marquages et les recaptures spécifiques, nous avons aussi estimé le nombre de harengs marqués récupérés par nombre remis à l'eau, le nombre de harengs marqués récupérés par tonne de harengs examinés, le nombre de harengs marqués capturés lors de la pêche de 2006 et le nombre de harengs marqués capturés par nombre remis à l'eau. Une expérience supplémentaire a été menée lors la saison de récupération des étiquettes en 2006 afin d'étudier les taux combinés de détection des étiquettes et de l'efficacité de la recapture dans les usines de transformation du poisson. Des essais ont été réalisés en introduisant des spécimens marqués dans les lots de

poisson congelé avant les étapes de l'extraction de la roque. Les estimations ajustées des taux combinés de détection des étiquettes et de l'efficacité de la récupération allaient de 0,34 à 0,90, ce qui démontre une variation considérable entre les usines de transformation.

INTRODUCTION

The application of coded wire tags (CWT) in Pacific herring began in 1999 and tag recovery from searching roe herring landings began in 2000. The primary purpose of the multi-year tagging study is to increase understanding of herring stock structure by observing inter-annual fidelity and dispersal patterns to spawning sites. Characterizing spatial and temporal patterns of spawning behaviour is critical to the effective management of the resource.

Pacific Fishery Management Area Regulations of the Canadian Fisheries Act identify 30 statistical (or management) areas along the British Columbia (BC) coast, herein referred to as areas, Figure 1. These areas are used for fishery management, enforcement and catch reporting purposes. Specifically for Pacific herring management and stock assessment purposes, there are five stock assessment regions, numerous area subdivisions, and several subdivisions within each area referred to as herring sections (Midgley 2003). The five Pacific herring stock assessment regions are comprised of: 1) the Queen Charlotte Islands (QCI), south-east portions of Area 2E; 2) the Prince Rupert District (PRD), Areas 3 to 5; 3) the Central Coast (CC), Area 7 and portions of 6 to 8; 4) the Strait of Georgia (SG), Areas 14 to 19 and portions of 13 and 29, and 5) the west coast of Vancouver Island (WCVI), Areas 23 to 25. For reporting purposes, all releases from Areas 3 to 5 were grouped with the PRD, all releases from Areas 6 to 9 were grouped with the CC, all releases from Areas 14, 16 and 17 were grouped with the SG and all releases from Areas 23 to 26 were grouped with the WCVI.

Prior to 2006, CWTs were applied in the QCI (1999), the SG (1999 to 2003), the PRD (2001 to 2003), the CC (2002 to 2004) and the WCVI (2004). In total 1,364,729 tags were released from 1999 to 2004. Prior to 2006, the searching of roe herring catches for CWTs occurred from 2000 to 2005 and estimates of roe herring searched for tags vary between fishing season, fishing location and gear type. From the 2000 to 2005 roe herring fisheries and tag recovery efforts, 5,462 inter-annual and 2,747 in-season tags were recovered from fish pieces in fish plants. Herring recovered in a different region from where they were tagged are referred to as inter-regional strays (or regional strays). With respect to year of recovery, 3 regional strays were observed in 2000, 1 regional stray was observed in 2001, 4 regional strays were observed in 2002, 41 regional strays were observed in each of 2003 and 2004 and 66 regional strays were observed in 2005. Herring recovered in the same region from where they were tagged but from a different area are referred to as inter-area strays (or area strays). Detailed information on tag release and tag recovery sampling from 1999 to 2005 can be found in Schweigert and Flostrand (2000) and Flostrand and Schweigert (2002, 2003, 2004, 2005, 2007).

The seeding of catch lots in fish plants prior to roe extraction and tag recovery sampling was done for the first time in 2006 to estimate tag detection and recovery efficiencies associated with processing effects, such as size sorting, roe extraction and product conveyance. During all tag recovery seasons (2000 to 2006), hourly recovery

unit tag detection and deflection tests were conducted by dropping seeded specimens on the conveyor belt immediately upstream of a recovery unit. Although results of the hourly test trials consistently indicate that recovery units detected and deflected seeded specimens, the trials do not provide information on tag retention and recovery sampling efficiency from other effects post capture. This report presents results of the 2006 Pacific herring CWT recovery sampling efforts and of the fish plant tag detection and efficiency experiment.

METHODS

RECOVERING TAGS FROM 2006 ROE HERRING LANDINGS

The methods applied to the 2006 tag recovery efforts were the same as previous years, using R9500 CWT detectors and deflector gates along conveyor belts at fish plants (Schweigert and Flostrand 2000; Flostrand and Schweigert 2002, 2003, 2004, 2005, 2007). The three fish plants housing the tag recovery equipment were Delta Pacific Seafoods Inc. (DPS and formerly named Icicle Seafoods Inc.), Canadian Fishing Company (CFC), and Bella Coola Fisheries Ltd. (BCF). In 2006, the QCI and WCVI stock assessment regions were closed for roe herring harvests, therefore CWT recovery efforts were focussed on searching representative portions of PRD, CC and SG landings. As in 2003 and 2004, no seined roe herring from Alaska was searched for tags. Tag recovery equipment operated from March 29 to June 8 and J.O. Thomas and Associates (JOT) were again contracted to: operate recovery units; collect recovered specimens, record results of equipment operation; verify catch information related to fish lot processing records and communicate processing schedules and equipment needs with plant staff. Logbooks were kept to document equipment settings, conveyor speeds and loading rates and test trials were conducted approximately every hour using seeded specimens to ensure that recovery units were in working order. Information pertaining to equipment operation is not presented in this report. Tag recovery field staff also removed gill tissue and rinsed each carcass of a putative tagged fish with water to remove possible sources of metal contamination prior to re-testing each specimen for the presence of a tag. This was done to reduce the number of false positive recoveries brought to the laboratory for CWT dissection. Roe herring catch records and CWT search data were compiled into a Microsoft Access database.

TAG RECOVERIES AND RECOVERY RATES

Tag recovery observations were used to calculate tag recovery rates (described as proportions or percentages), which were determined by relating the number of tags recovered from specific fisheries to the number of tags released from defined 1999 to 2004 release events. Each tag recovery rates was determined by:

$$RR = R / T$$

(1)

where

RR = tag recovery rate;

R = number of tags recovered by release year, region, and area and by recovery region, area and gear;

T = number of tags released by year, region and area.

Estimates of tag recovery densities were determined by relating the number of tag recoveries from specific fisheries to metric tonne (mt) quantities of roe herring searched. Each tag recovery density was determined by:

$$RD = R / S \quad (2)$$

where

RD = tags recovered per metric tonne of roe herring searched;

S = roe herring catch searched by region, area and gear.

TAG REMOVALS AND REMOVAL RATES

For each tag release event, the number of tagged herring removed from the population by each 2006 roe herring fishery was estimated by incorporating the estimated proportion of landed roe herring searched for tags (S/C) into the number of observed recoveries:

$$R' = R / (S/C) = (R*C) / S \quad (3)$$

where

R' = estimated number of tags removed;

C = total roe herring catch by region, area, and gear.

For each tag release event, the proportion of tagged fish removed from the population by each 2006 roe herring fishery was estimated as the tag removal rate. Each tag removal rate was estimated by:

$$RR' = R' / T = RR / (S/C) \quad (4)$$

where

RR' = estimated tag removal rate.

FISH PLANT SEEDING EXPERIMENT

A “seeding” experiment was conducted in 2006 at each of the three fish plants housing tag recovery equipment to investigate potential effects on tag detection and recovery efficiency from fish plant activities. The experiment consisted of seeding totes

of thawing herring with tagged and frozen adult herring (from 170 to 195 mm in length) at a storage stage prior to both roe extraction and tag recovery detection. Each tagged fish was placed in a separate tote of thawing herring in batch sizes of 5 to 15 fish and each batch represented a specific combination of fish plant, thaw date, catch lot (specific to offload vessel, fishery location and gear type), catch lot weight and tag code. Tag recovery efficiencies and catch search rates were proportional measurements applied to characterize results.

In total, 295 totes were seeded using 53 batches of fish. At BCF, gillnet and seine fishery lots each received 10 batches (50 totes) of seeding events. At CFC, 7 batches (55 totes) were seeded into gillnet lots and 11 batches (55 totes) were seeded into seine lots. At DPS, 7 batches (40 totes) were seeded into gillnet lots and 8 batches (45 totes) were seeded into seine lots. The type of information recorded with the recovery of a seeded fish was the same as for wild recaptures. To determine each unadjusted (raw) tag recovery efficiency (denoted by d_R), the number of seeded tagged fish recovered by seeding batch (denoted by R) was divided by the respective batch size (denoted by N):

$$d_R = R / N \quad (5)$$

Each of the fish plants had multiple automated roe extraction machines (generally from 3 to 10 depending on fish plant) operating simultaneously on different conveyor lines that converged upstream of the CWT recovery equipment. As a result, fish from different lots but from the same fishery (defined by location and gear type) could mix while being searched by tag recovery equipment. Therefore, seeded recoveries could appear to come from more than one catch lot. To adjust for inherent mixing of fish product on the conveyor lines, the thaw and search totals of the incidental catch lots were added to the thaw and search totals of the seeded lot to derive an adjusted search rate. Search rates (denoted by c) were used to correct for bias in measurements of raw tag recovery efficiencies. To estimate a search rate for each catch lot that was seeded, the estimated amount of catch searched by lot and processing date (denoted by C_{Search}) was divided by the respective thaw weight (denoted by C_{Thaw}):

$$c = C_{\text{Search}} / C_{\text{Thaw}} \quad (6)$$

Each measurement of tag recovery efficiency by seeding batch (d_R) was then divided by the respective search rate (c) to derive an adjusted estimate of tag detection and recovery efficiency (denoted by d_{Adj}):

$$d_{\text{Adj}} = d_R / c \quad (7)$$

thus, d_{Adj} is also equivalent to $(R * C_{\text{Thaw}}) / (N * C_{\text{Search}})$. If adjusted estimates were greater than 1.0 (i.e. where 1 = 100% efficiency), they were set to 1.0.

RESULTS

RECOVERING TAGS FROM 2006 ROE HERRING LANDINGS

The total BC catch of roe herring in 2006, including charter vessel catches, was 22,274 mt. Roe herring fishery landings and tag recoveries by region, area, gear, and search amounts at the three fish plants are summarized in Table 1. Fishery areas, dates and total landings are described below. The PRD gillnet fishery in Area 4 was from March 25 to 29 and 1,661.3 mt was landed. The PRD seine fishery in Area 5 was from March 23 to 24 and 956.7 mt was landed. The CC seine fishery in Area 7 was from March 21 to 28 and 3,071.8 mt was landed. The SG gillnet fishery in Areas 14 and 17 was from March 4 to 14 and 7,276.9 mt was landed (but only 34.5 mt of this harvest was from Area 17 and none of that was searched for CWT recovery). The SG seine fishery in Area 14 was from March 5 to 10 and 9,307.7 mt was landed.

An estimated 6,069.1 mt of the total 2006 BC roe herring catch was searched for CWTs, representing approximately 27% of the total landed catch. Regionally, approximately 19.5% of the PRD; 19.8% of the CC and 29.9% of the SG catches were searched for CWTs. The estimated percentages of landings searched, by region and fishing gear, were 15.8% of PRD gillnet; 25.7% of PRD seine; 19.8% of CC seine; 26.6% of SG gillnet and 32.4% of SG seine (Tables 1 to 6). From the 8,938.2 mt coast wide total of all gillnet landings, approximately 24.6% of that was searched for tagged fish. From the 13,336.2 mt coast wide total of all seine landings, approximately 29.0% of that was searched for tagged fish. The approximate amounts of roe herring searched at each of the fish plants was 2,596.4 mt at BCF, 1,948.7 mt at CFC and 1,525.9 mt at Icicle.

TAG RECOVERIES AND RECOVERY RATES

A total of 546 tags were recovered from the 2006 roe herring season. Table 1 presents summary information on tags recovered by recovery region, gear, area, fish plant, catch and search amounts and release year. Table 2 presents summary information on tags recovered by recovery region, area, gear, catch and search amounts, release year, release region, release area and number of tags released and Appendix B lists the number of recoveries by tagging set and release batch size. With respect to each year of release, there was 1 recovery from 1999; 3 recoveries from 2000; 30 from 2001; 86 from 2002; 159 from 2003 and 267 from 2004. A total of 52 inter-regional strays were recovered. From 2002 releases, 2 were from the PRD and recovered in the CC; 1 was from the CC and recovered in the PRD and 1 was from the CC and recovered in the SG. From 2003 releases, 7 were from the PRD and recovered in the CC; 1 was from the PRD and recovered in the SG; 3 were from the CC and recovered in the PRD and 6 were from the CC and recovered in the SG. From the 2004 releases, 3 were from the CC and recovered in the PRD; 16 were from the CC and recovered in the SG; 1 was from the WCVI and recovered in the PRD and 11 were from

the WCVI and recovered in the SG. In addition to regional strays, there were approximately 88 inter-area strays (with the same region of release and recovery) and there were approximately 406 recoveries having the same area of release and recovery. In addition to the observed 546 tag recoveries, 81 herring without tags were collected from the fish plants but were found to contain metal contamination (34 BCF, 24 CFC and 23 DPS) and 1 fish was lost prior to reading its tag code.

Many different combinations of inter-annual spawning patterns representing fidelity or straying at different liberty periods were observed from the sets of tag recoveries. The one seven-year at large and the 3 six-year at large recoveries were all released and recaptured in the SG. Out of the 30 five-year at large recoveries from 2001 releases, 21 were caught in the PRD and 9 were caught in the SG and no inter-regional strays were observed. Out of the 86 four-year at large recoveries from 2002 releases, 57 were caught in the PRD, 11 were caught in the CC and 18 were caught in the SG. Four of the four-year at large recoveries were inter-regional strays: 1 was an Area 6 release recaptured by seine in Area 5; 2 were Area 5 releases recaptured by seine in Area 7, and 1 was an Area 8 release recaptured by seine in Area 14. Out of the 159 three-year at large recoveries from 2003 releases, 78 were caught in the PRD, 44 were caught in the CC and 37 were caught in the SG. Seventeen of the three-year at large recoveries were inter-regional strays: 7 were Area 5 releases recaptured by seine in Area 7; 1 was an Area 5 release recaptured by gillnet in Area 14; 3 were Area 7 releases recaptured by seine in Area 5; 2 were Area 7 releases recaptured by gillnet in Area 14 and 2 were Area 7 releases recaptured by seine in Area 14; 1 was an Area 9 release recaptured by gillnet in Area 14 and 1 was an Area 9 release recaptured by seine in Area 14. Out of the 267 two-year at large recoveries from 2004 releases, 4 were caught in the PRD, 236 were caught in the CC and 27 were caught in the SG. Thirty-one of the two-year at large recoveries were inter-regional strays: 2 were Area 6 releases recaptured by gillnet in Area 4; 2 were Area 6 releases recaptured by seine in Area 14; 1 was an Area 7 release recaptured by seine in Area 5; 3 were Area 7 releases recaptured by seine in Area 14; 2 were Area 8 releases recaptured by gillnet in Area 14; 6 were Area 8 releases recaptured by seine in Area 14; 3 were Area 9 releases recaptured by seine in Area 14; 3 were Area 23 releases recaptured by gillnet in Area 14; 2 were Area 23 releases recaptured by seine in Area 14; 1 was an Area 24 release recaptured by gillnet in Area 14; 1 was an Area 24 release recaptured by seine in Area 14; 1 was an Area 26 release recaptured by seine in Area 5; 3 were Area 26 releases recaptured by gillnet in Area 14 and 1 was an Area 26 release recaptured by seine in Area 14.

Herring CWT recovery rates with respect to release and recovery events are presented in Table 3 and the sums of recovery rates by individual release event are described below. The seven and six-year at large tag recovery rates from 1999 and 2000 releases in Areas 14 and 17 were less than 0.01%. The five-year at large recovery rate for 2001 releases in Area 4 was 0.03%. Five-year at large recovery rates for 2001 releases in Areas 5 and 14 were 0.01% or less. Four-year at large recovery rates for 2002 releases in Areas 4, 5 and 5WI were 0.09, 0.05 and 0.01%, respectively. Four-year at large recovery rates for 2002 releases in Areas 6, 7, 8 and 14 were all

0.02%. Three-year at large recovery rates for 2003 releases in Areas 3; 5; 7; 8; 9; 14 and 16 were 0.03; 0.08; 0.05; 0.01; 0.03; 0.03 and 0%, respectively. Two-year at large recovery rates for 2002 releases in Areas 6; 7; 8; 9; 23; 24; 25 and 26 were 0.12; 0.17; 0.02; 0.02; 0.01; 0.01; 0 and 0.02%, respectively.

Recovery rate trends pertaining to intervals within tagging sessions of 2003 and 2004 releases are briefly summarized below (for more information refer to Appendix C). From 6 tagging sessions with only 2 intervals per session, a reduction in recovery rates from the first interval to the second occurred in 4 of the sessions. From 41 sessions with 3 or more intervals, 17 sessions showed no decline in recovery rates with increased interval number, 8 sessions had sequential declines in recovery rates with increased interval number and 16 sessions had non-sequential declines in rates (where the last interval's recovery rate was lower than the first but not lower than all intermediate intervals).

Tag recovery density estimates by each release event and by each 2006 roe herring fishery are presented in Table 4. By period of liberty, the seven-year and six-year at large SG homing recoveries that were recaptured by gillnet had tag density estimates of 0.001 or less. The tag density estimates for five-year at large recoveries from Area 4 releases recaptured by gillnet in Area 4 and by seine in Area 5 were 0.073 and 0.004, respectively. The tag density estimates for five-year at large recoveries from Area 5 releases recaptured by seine in Area 5 was 0.004. The tag density estimates for five-year at large recoveries from Area 14 releases recaptured in Area 14 by gillnet and seine were 0.004 and 0.001, respectively. The tag density estimates for four-year at large recoveries from Area 4 releases recaptured by gillnet in Area 4 and by seine in Area 5 were 0.156 and 0.012, respectively. The tag density estimates for four-year at large recoveries from Area 5 releases recaptured by gillnet in Area 4, by seine in Area 5 and by seine in Area 7 were 0.008, 0.037 and 0.003, respectively. The tag density estimate for the four-year at large recovery from an Area 5WI release recaptured by seine in Area 5 was 0.004. The tag density estimate for four-year at large recoveries from Area 6 releases recaptured by seine in Area 5 and Area 7 were 0.004 and 0.005, respectively. The tag density estimate for the four-year at large recoveries recaptured by seine in Area 7 was 0.008. The tag density estimates for four-year at large recoveries from Area 8 releases recaptured by seine in Area 7 and in Area 14 were 0.002 and less than 0.001, respectively. The tag density estimates for the four-year at large recoveries recaptured by gillnet and seine in Area 14 were 0.006 and 0.002, respectively. The tag density estimate for three-year at large recoveries from Area 3 releases recaptured by gillnet in Area 4 was 0.015. The tag density estimates for three-year at large recoveries from Area 5 releases recaptured by gillnet in Area 4, by seine in Area 5, by seine in Area 7 and by gillnet in Area 14 were 0.034, 0.252, 0.012 and 0.001, respectively. The tag density estimates for three-year at large recoveries from Area 7 releases recaptured by seine in Area 5, by seine in Area 7 and by gillnet and seine in Area 14 were 0.012, 0.054, 0.001 and 0.001, respectively. The tag density estimate for three-year at large recoveries from Area 8 releases recaptured by seine in Area 17 was 0.003. The tag density estimates for three-year at large recoveries from Area 9 releases

recaptured by seine in Area 7 and by gillnet and seine in Area 14 were 0.003, 0.001 and less than 0.001, respectively. The tag density estimates for three-year at large recoveries from Area 14 releases recaptured by gillnet and seine in Area 14 were 0.009 and 0.004, respectively. The tag density estimates for two-year at large recoveries from Area 6 releases recaptured by gillnet in Area 4 and by seine in Areas 7 and 14 were 0.008, 0.096 and 0.001, respectively. The tag density estimates for two-year at large recoveries from Area 7 releases recaptured by seine in Areas 5, 7 and 14 were 0.004, 0.288 and 0.001, respectively. The tag density estimates for two-year at large recoveries from Area 8 releases recaptured by seine in Area 7 and by gillnet and seine in Area 14 were 0.005, 0.001 and 0.002, respectively. The tag density estimates for two-year at large recoveries from Area 9 releases recaptured by seine in Area 14 was 0.001. The tag density estimates for two-year at large recoveries from Area 23 releases recaptured by gillnet and seine in Area 14 were 0.002 and 0.001, respectively. The tag density estimates for two-year at large recoveries from Area 24 releases recaptured by gillnet and seine in Area 14 were 0.001 and less than 0.001, respectively. The tag density estimates for two-year at large recoveries from Area 26 releases recaptured by seine in Area 5 and gillnet and seine in Area 14 were 0.004, 0.002 and less than 0.001, respectively.

TAG REMOVALS AND REMOVAL RATES

Estimates of CWT removals and removal rates by release event, area and fishing gear are presented in Tables 5 and 6, respectively. The estimate of the total number of tagged herring removed from the population in the 2006 roe herring fishery is 2,612. Removal estimates for 1999 to 2004 releases are 4; 12; 160; 446; 685 and 1,303, respectively (Table 5). Removal estimates by release and recovery event are given in Table 6. Estimates of tag removal rates ranged from 0 to 0.02%. Seven-year at large removal rates ranged from 0 to 0.02% and six-year at large removal rates were 0.01% or less. Five-year at large removal rates ranged from 0.02 to 0.19%. Four-year at large removal rates ranged from 0.04 to 0.55%. Three-year at large removal rates ranged from 0.04 to 0.35%. Two-year at large removal rates ranged from 0 to 0.83%.

FISH PLANT SEEDING EXPERIMENT

Results from the 2006 tag recovery seeding trials show that tag recovery efficiency varied by fish plant and gear type and notably low rates were observed at DPS (Table 7). Raw tag recovery efficiency observations by fish plant and gear type (denoted by d_R and derived using Equation 5) ranged from 0.28 to 0.87 and corresponding adjusted estimates of tag recovery efficiency (denoted by d_{Adj} and derived using Equation 6) ranged from 0.34 to 0.90. As a result of the mixing of catch lots during processing conveyance, 26 (13.2%) of the seeded recoveries were reported as coming from 11 catch lots differing from the ones into which they were seeded. At BCF, raw tag recovery efficiencies were 68% (R=34) for gillnet catch lots and 74% (R= 37) for

seine catch lots. These results correspond to search rate estimates of 91% for gillnet catch lots and 94% for seine catch lots, resulting in adjusted estimates of tag recovery efficiencies of 75% and 79%, respectively. By seeding batch, adjusted estimates of tag recovery efficiency at BCF varied from 41 to 100% for gillnet lots and from 20 to 100% for seine lots. At CFC, raw tag recovery efficiencies were 82% (R=45) for gillnet catch lots and 87% (R=48) for seine catch lots. These results correspond to search rate estimates of 97% for both gillnet and seine catch lots, resulting in adjusted estimates of tag recovery efficiencies of 84% and 90%, respectively. By seeding batch, adjusted estimates of tag recovery efficiency at CFC varied from 72 to 98% for gillnet lots and from 45 to 100% for seine lots. At DPS, raw tag recovery efficiencies were 28% (R=11) for gillnet catch lots and 49% (R=22) for seine catch lots. These results correspond to search rate estimates of 80% for gillnet catch lots and 78% for seine catch lots, resulting in adjusted tag recovery efficiencies of 34% and 63%, respectively. By seeding batch, adjusted estimates of tag recovery efficiency at DPS varied from 0 to 71% for gillnet lots and from 47 to 100% for seine lots.

DISCUSSION

From the total number of inter-annual tag recoveries collected in 2006, 9.5% represented inter-regional strays, which is higher than what has been observed in previous CWT recovery years. From the total numbers of inter-annual tag recoveries observed from 2000 to 2005, the percentages which were inter-regional strays were 2.3; 0.23; 0.6; 3.6; 3.3, and 3.1%, respectively. The relatively high percentage of inter-regional strays observed in the 2006 tag recovery year could in part be due to sampling bias resulting from the WCVI fishing closure, which eliminated any opportunity of recovering homing fish from 2004 WCVI releases. The percentage of inter-regional strays for all 2004 releases recovered in 2006 was 11.6% but the percentage of inter-regional strays for all 2003 releases recovered in 2006 was also notably high (10.7%) and, unlike the circumstances governing the WCVI, all regions of release in 2003 had roe herring tag recovery sampling in 2006. Furthermore, the percentage of inter-regional strays from 2002 releases was also relatively high (4.7%). Future work could be done to characterize release and recovery sampling intensities and tag recovery results to try to identify inter-regional movement patterns and intensities between recovery years, liberty periods and release events.

Similar to observations made from 2004 and 2005 tag recoveries, the 2006 tag recoveries which related to 2003 and 2004 batch releases with varying pre-tagging holding interval duration also showed some relatively low recovery rates from longer tag release holding periods. But trends from 2006 recoveries were less apparent than previous recovery years, somewhat due to several release sessions having zero recoveries for all intervals (Appendix C).

The variability in tag recovery efficiencies from the fish plant seeding trials is cause for concern. Although each tag recovery unit was consistently tested (hourly)

over the duration of the study to ensure that its operation was reliable, the 2006 catch lot seeding trials showed that combined effects from the processing stages caused tag detection and recovery to vary between 0.34 and 0.90. If the results of the 2006 test trials accurately depict undetected recovery efficiency variability on recaptured tagged herring from past tag recovery years, then confounding error of considerable magnitude would adhere to all sets of tag recovery results, thus biasing interpretations that stem from them.

We are uncertain as to why the maximum tag recovery efficiency did not exceed 0.90 (i.e. from seine landings at CFC). One attributing factor could be that seeded specimens were prepared using dead herring, therefore, no tissue healing could occur at the tag insertion site and thus seeded specimens would have been more prone to tag loss than wild releases. Additionally, unlike true product, seeded specimens were not stored in brine prior to roe extraction so their tissue would have been relatively fragile, which could also have contributed to tag loss. Unfortunately, the quality of specimens used in the 2006 seeding trials was not identical to the quality of fish undergoing all processing stages. It is also unfortunate that similar seeding trials were not conducted in previous tag recovery years in order to improve test trial methodology and the interpretation of test trial results.

Compared to the results from the other two fish plants, the lower tag recovery efficiencies at DPS were expected because this plant always had an additional processing stage called pre-sorting. Pre-sorting is the manual removal of male and small fish from conveyor loads prior to roe extraction and it is done to improve plant production by reducing processing loads through the automated roe extraction machines. For all tag recovery years and for all pertinent fisheries, reported estimates of DPS pre-sorted product by JOT staff were mostly in the range of 10 to 20% (based on tote weight and volume observations). However, differentials between DPS tag recovery test trial efficiencies and those of the other two plants were found to be 0.27 and 0.42 for gillnet catch lots and 0.16 and 0.27 for seine catch lots. One explanation for the discrepancies in tag recovery efficiencies between fish plants is that staff conducting tag recovery sampling at DPS missed or misinterpreted amounts of pre-sorted fish. They likely did misinterpret amounts because small fish have greater densities (numbers of fish per tote) than large fish and JOT estimates were based on tote volume and weight measurements rather than conversions that account for fish numbers or fish densities.

Due to the prevalence of roe herring fishery closures in some BC regions and the high operational costs associated with CWT release and recovery sampling, there are no plans to continue CWT sampling of Pacific herring in the near future. Future work will focus on analyzing results and developing analytical models. Future field observations into herring dispersal and stock structure will likely require applications of new technologies for marking or characterizing herring samples.

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Table 1. Summary of 2006 CWT recoveries by stock assessment region, fishing gear, statistical area, fish plant of recovery, catch searched for tags, total roe fishery catch, percent of total catch searched and tag release year.

Region	Gear	Area	Fish Plant	Catch (mt) Searched	Total (mt) Catch	% Catch Searched	CWT Recoveries by Release Year							
							1999	2000	2001	2002	2003	2004	All	
PRD	GN	4	BCF	264.0	1,661.3	15.9	-	-	19	43	13	2	77	
			SN	5	BCF	178.7	-	-	-	-	2	10	44	56
					CFC	67.1	-	-	-	-	4	21	2	27
		All	245.9	956.7	25.7	-	-	2	14	65	2	83		
	Both	4,5	All	509.8	2,618.0	19.5	-	-	21	57	78	4	160	
CC	SN	7	BCF	322.1	-	-	-	-	-	6	24	105	135	
			CFC	45.4	-	-	-	-	-	-	1	24	25	
			DPS	239.5	-	-	-	-	-	5	19	107	131	
			All	606.9	3,071.8	19.8	-	-	-	11	44	236	291	
SG	GN	14,17	BCF	820.1	-	-	-	-	3	3	10	5	21	
			CFC	706.7	-	-	1	2	3	4	9	4	23	
			DPS	407.3	-	-	-	1	1	4	2	8		
			All	1,934.2	7,276.9	26.6	1	3	7	11	21	9	52	
	SN	14	BCF	1,011.5	-	-	-	-	1	1	1	6	9	
			CFC	1,129.5	-	-	-	-	-	4	10	9	23	
			DPS	879.1	-	-	-	-	1	2	5	3	11	
			All	3,020.1	9,307.7	32.4	-	-	2	7	16	18	43	
	Both	14,17	All	4,954.2	16,584.6	29.9	1	3	9	18	37	27	95	

Table 1 (continued).

Region	Gear	Area	Fish Plant	Catch (mt) Searched	Total (mt) Catch	% Catch Searched	CWT Recoveries by Release Year						
							1999	2000	2001	2002	2003	2004	All
BC	Both	All	BCF	2,596.4	-	-	-	-	25	63	92	118	298
			CFC	1,948.7	-	-	1	2	3	12	41	39	98
			DPS	1,525.9	-	-	-	1	2	11	26	110	150
BC	GN	All	All	2,198.0	8,938.2	24.6	1	3	26	54	34	11	129
			SN	All	3,872.0	13,336.2	29.0	-	-	4	32	125	256
	Both	All	All	6,069.1	22,274.4	27.2	1	3	30	86	159	267	546

Table 2. Summary of 2006 CWT recoveries by assessment region, statistical area and fishing gear.

RECOVERY		Region	PRD	PRD	CC	SG	SG	Total	
	Area		4	5	7	14,17	14		
	Gear		GN	SN	SN	GN	SN		
	Total Catch (mt)		1,661.3	956.7	3,071.8	7,276.9	9,307.7	22,274.4	
	Catch Searched (mt)		264.0	245.9	606.9	1,934.2	3,020.1	6,069.1	
	Catch Searched (%)		15.9	25.7	19.8	26.6	32.4	27.2	
RELEASE									
Year	Region	Area	CWT						
1999	QCI	2E	6,175	-	-	-	-	-	
	SG	14	23,187	-	-	-	1	1	
	SG	17	14,266	-	-	-	-	-	
	SG ^w	14, 17	5,815	-	-	-	-	-	
1999/00	SG ^b	14, 17	7,141	-	-	-	-	-	
2000	SG	14	180,229	-	-	-	2	2	
	SG	17	58,994	-	-	-	1	1	
	SG ^w	14, 17	6,471	-	-	-	-	-	
2001	PRD	4	65,809	19	1	-	-	20	
	PRD	5	22,387	-	1	-	-	1	
	SG	14	60,558	-	-	-	7	2	
2002	PRD	4	48,960	41	3	-	-	44	
	PRD	5	25,701	2	9	2	-	13	
	PRD	5WI	11,081	-	1	-	-	1	
	CC	6	18,168	-	1	3	-	4	
	CC	7	31,027	-	-	5	-	5	
	CC	8	9,463	-	-	1	-	1	
	SG	14	83,528	-	-	-	11	6	
	PRD	3	15,066	4	-	-	-	4	
2003	PRD	5	96,434	9	62	7	1	79	
	CC	7	79,920	-	3	33	2	40	
	CC	8	27,453	-	-	2	-	2	
	CC	9	13,660	-	-	2	1	4	
	SG	14	89,247	-	-	-	17	13	
	SG	16	6,643	-	-	-	-	-	
	2004	CC	6	52,049	2	-	58	-	62
		CC	7	107,843	-	1	175	-	179
CC		8	44,614	-	-	3	2	6	
CC		9	17,770	-	-	-	-	3	
WCVI		23	33,608	-	-	-	3	2	
WCVI		24	32,421	-	-	-	1	1	
WCVI		25	38,601	-	-	-	-	-	
WCVI		26	27,181	-	1	-	3	1	
WCVI, CC ^w		8, 25	3,259	-	-	-	-	-	
All	All		1,364,729	77	83	291	52	43	

5WI refers to Wilson Inlet release event (southern PRD).

^w within year discrepancy (WYD); ^b between year discrepancy (BYD).

Table 3. Estimates of 2005 CWT recovery rates (percentage of the released tags recovered) by assessment region, statistical area and fishing gear.

RECOVERY		Region		PRD	PRD	CC	SG	SG	Total
		Area		4	5	7	14,17	14	
		Gear		GN	SN	SN	GN	SN	
		Total Catch (mt)		1,661.3	956.7	3,071.8	7,276.9	9,307.7	22,274.4
		Catch Searched (mt)		264.0	245.9	606.9	1,934.2	3,020.1	6,069.1
		Catch Searched (%)		15.9	25.7	19.8	26.6	32.4	27.2
RELEASE									
Year	Region	Area	CWT						
1999	QCI	2E	6,175	-	-	-	-	-	-
	SG	14	23,187	-	-	-	<0.01	-	<0.01
	SG	17	14,266	-	-	-	-	-	-
	SG ^w	14, 17	5,815	-	-	-	-	-	-
1999/00	SG ^b	14, 17	7,141	-	-	-	-	-	
2000	SG	14	180,229	-	-	-	<0.01	-	<0.01
	SG	17	58,994	-	-	-	<0.01	-	<0.01
	SG ^w	14, 17	6,471	-	-	-	-	-	-
2001	PRD	4	65,809	0.03	<0.01	-	-	-	0.03
	PRD	5	22,387	-	<0.01	-	-	-	<0.01
	SG	14	60,558	-	-	-	0.01	<0.01	0.01
2002	PRD	4	48,960	0.08	0.01	-	-	-	0.09
	PRD	5	25,701	0.01	0.04	0.01	-	-	0.05
	PRD	5WI	11,081	-	0.01	-	-	-	0.01
	CC	6	18,168	-	0.01	0.02	-	-	0.02
	CC	7	31,027	-	-	0.02	-	-	0.02
	CC	8	9,463	-	-	0.01	-	0.01	0.02
	SG	14	83,528	-	-	-	0.01	0.01	0.02
2003	PRD	3	15,066	0.03	-	-	-	-	0.03
	PRD	5	96,434	0.01	0.06	0.01	<0.01	-	0.08
	CC	7	79,920	-	<0.01	0.04	<0.01	<0.01	0.05
	CC	8	27,453	-	-	<0.01	-	-	0.01
	CC	9	13,660	-	-	0.01	0.01	0.01	0.03
	SG	14	89,247	-	-	-	0.02	0.01	0.03
2004	SG	16	6,643	-	-	-	-	-	-
	CC	6	52,049	<0.01	-	0.11	-	<0.01	0.12
	CC	7	107,843	-	<0.01	0.16	-	<0.01	0.17
	CC	8	44,614	-	-	0.01	<0.01	0.01	0.02
	CC	9	17,770	-	-	-	-	0.02	0.02
	WCVI	23	33,608	-	-	-	0.01	0.01	0.01
	WCVI	24	32,421	-	-	-	<0.01	<0.01	0.01
	WCVI	25	38,601	-	-	-	-	-	-
	WCVI	26	27,181	-	<0.01	-	0.01	<0.01	0.02
	WCVI, CC ^w	8, 25	3,259	-	-	-	-	-	-

5WI refers to Wilson Inlet release event (southern PRD).

^w within year discrepancy (WYD); ^b between year discrepancy (BYD).

Table 4. Estimates of 2006 tag densities (CWTs recovered per tonne of roe herring searched) by assessment region, statistical area and fishing gear.

RECOVERY		Region	PRD	PRD	CC	SG	SG	Total
	Area		4	5	7	14,17	14	
	Gear		GN	SN	SN	GN	SN	
	Total Catch (mt)		1,661.3	956.7	3,071.8	7,276.9	9,307.7	22,274.4
	Catch Searched (mt)		264.0	245.9	606.9	1,934.2	3,020.1	6,069.1
	Catch Searched (%)		15.9	25.7	19.8	26.6	32.4	27.2
RELEASE								
Year	Region	Area	CWT					
1999	QCI	2E	6,175	-	-	-	-	-
	SG	14	23,187	-	-	-	0.001	<0.001
	SG	17	14,266	-	-	-	-	-
	SG ^w	14, 17	5,815	-	-	-	-	-
1999/00	SG ^b	14, 17	7,141	-	-	-	-	-
2000	SG	14	180,229	-	-	-	0.001	<0.001
	SG	17	58,994	-	-	-	0.001	<0.001
	SG ^w	14, 17	6,471	-	-	-	-	-
2001	PRD	4	65,809	0.073	0.004	-	-	0.003
	PRD	5	22,387	-	0.004	-	-	<0.001
	SG	14	60,558	-	-	-	0.004	0.001
2002	PRD	4	48,960	0.156	0.012	-	-	0.007
	PRD	5	25,701	0.008	0.037	0.003	-	0.002
	PRD	5WI	11,081	-	0.004	-	-	<0.001
	CC	6	18,168	-	0.004	0.005	-	0.001
	CC	7	31,027	-	-	0.008	-	0.001
	CC	8	9,463	-	-	0.002	-	<0.001
	SG	14	83,528	-	-	-	0.006	0.002
2003	PRD	3	15,066	0.015	-	-	-	0.001
	PRD	5	96,434	0.034	0.252	0.012	0.001	0.013
	CC	7	79,920	-	0.012	0.054	0.001	0.001
	CC	8	27,453	-	-	0.003	-	<0.001
	CC	9	13,660	-	-	0.003	0.001	<0.001
	SG	14	89,247	-	-	-	0.009	0.004
	SG	16	6,643	-	-	-	-	-
2004	CC	6	52,049	0.008	-	0.096	-	0.001
	CC	7	107,843	-	0.004	0.288	-	0.001
	CC	8	44,614	-	-	0.005	0.001	0.002
	CC	9	17,770	-	-	-	-	<0.001
	WCVI	23	33,608	-	-	-	0.002	0.001
	WCVI	24	32,421	-	-	-	0.001	<0.001
	WCVI	25	38,601	-	-	-	-	-
	WCVI	26	27,181	-	0.004	-	0.002	<0.001
	WCVI, CC ^w	8, 25	3,259	-	-	-	-	-
All	All		1,364,729	0.294	0.338	0.479	0.027	0.014

5WI refers to Wilson Inlet release event (southern PRD).

^w within year discrepancy (WYD); ^b between year discrepancy (BYD).

Table 5. Estimates of 2006 CWT removals by assessment region, statistical area and fishing gear.

RECOVERY								
Region	PRD	PRD	CC	SG	SG	SG	Total	
Area	4	5	7	14,17	14			
Gear	GN	SN	SN	GN	SN			
Total Catch (mt)	1,661.3	956.7	3,071.8	7,276.9	9,307.7		22,274.4	
Catch Searched (mt)	264.0	245.9	606.9	1,934.2	3,020.1		6,069.1	
Catch Searched (%)	15.9	25.7	19.8	26.6	32.4		27.2	
RELEASE								
Year	Region	Area	CWT					
1999	QCI	2E	6,175	-	-	-	-	-
	SG	14	23,187	-	-	-	4	-
	SG	17	14,266	-	-	-	-	-
	SG ^w	14, 17	5,815	-	-	-	-	-
1999/00	SG ^b	14, 17	7,141	-	-	-	-	-
2000	SG	14	180,229	-	-	-	8	-
	SG	17	58,994	-	-	-	4	-
	SG ^w	14, 17	6,471	-	-	-	-	-
2001	PRD	4	65,809	120	4	-	-	-
	PRD	5	22,387	-	4	-	-	-
	SG	14	60,558	-	-	-	26	6
2002	PRD	4	48,960	260	12	-	-	-
	PRD	5	25,701	13	35	10	-	-
	PRD	5WI	11,081	-	4	-	-	-
	CC	6	18,168	-	4	15	-	-
	CC	7	31,027	-	-	25	-	-
	CC	8	9,463	-	-	5	-	3
	SG	14	83,528	-	-	-	41	18
	PRD	3	15,066	25	-	-	-	-
2003	PRD	5	96,434	57	241	35	4	-
	CC	7	79,920	-	12	167	8	6
	CC	8	27,453	-	-	10	-	-
	CC	9	13,660	-	-	10	4	3
	SG	14	89,247	-	-	-	64	40
	SG	16	6,643	-	-	-	-	-
	CC	6	52,049	13	-	294	-	6
	CC	7	107,843	-	4	886	-	9
2004	CC	8	44,614	-	-	15	8	18
	CC	9	17,770	-	-	-	-	9
	WCVI	23	33,608	-	-	-	11	6
	WCVI	24	32,421	-	-	-	4	3
	WCVI	25	38,601	-	-	-	-	-
	WCVI	26	27,181	-	4	-	11	3
	WCVI, CC ^w	8, 25	3,259	-	-	-	-	-
	All	All	1,364,729	488	323	1,473	196	133

5WI refers to Wilson Inlet release event (southern PRD).

^w within year discrepancy (WYD); ^b between year discrepancy (BYD).

Table 6. Estimates of 2006 CWT removal rates (percentage of the released tag removed) from all roe herring catches by assessment region, statistical area and fishing gear.

RECOVERY		Region	PRD	PRD	CC	SG	SG	Total
	Area		4	5	7	14,17	14	
	Gear		GN	SN	SN	GN	SN	
	Total Catch (mt)		1,661.3	956.7	3,071.8	7,276.9	9,307.7	22,274.4
	Catch Searched (mt)		264.0	245.9	606.9	1,934.2	3,020.1	6,069.1
	Catch Searched (%)		15.9	25.7	19.8	26.6	32.4	27.2
RELEASE								
Year	Region	Area	CWT					
1999	QCI	2E	6,175	-	-	-	-	-
	SG	14	23,187	-	-	-	0.02	0.02
	SG	17	14,266	-	-	-	-	-
	SG ^w	14, 17	5,815	-	-	-	-	-
1999/00	SG ^b	14, 17	7,141	-	-	-	-	-
2000	SG	14	180,229	-	-	-	<0.01	<0.01
	SG	17	58,994	-	-	-	0.01	0.01
	SG ^w	14, 17	6,471	-	-	-	-	-
2001	PRD	4	65,809	0.18	0.01	-	-	0.19
	PRD	5	22,387	-	0.02	-	-	0.02
	SG	14	60,558	-	-	-	0.04	0.01
2002	PRD	4	48,960	0.53	0.02	-	-	0.55
	PRD	5	25,701	0.05	0.14	0.04	-	0.22
	PRD	5WI	11,081	-	0.04	-	-	0.04
	CC	6	18,168	-	0.02	0.08	-	0.10
	CC	7	31,027	-	-	0.08	-	0.08
	CC	8	9,463	-	-	0.05	-	0.03
	CC	8	9,463	-	-	0.05	-	0.03
2003	SG	14	83,528	-	-	-	0.05	0.02
	PRD	3	15,066	0.17	-	-	-	0.17
	PRD	5	96,434	0.06	0.25	0.04	<0.01	0.35
	CC	7	79,920	-	0.01	0.21	0.01	0.01
	CC	8	27,453	-	-	0.04	-	0.04
	CC	9	13,660	-	-	0.07	0.03	0.02
	CC	9	13,660	-	-	0.07	0.03	0.02
2004	SG	14	89,247	-	-	-	0.07	0.04
	SG	16	6,643	-	-	-	-	-
	CC	6	52,049	0.02	-	0.56	-	0.01
	CC	7	107,843	-	<0.01	0.82	-	0.01
	CC	8	44,614	-	-	0.03	0.02	0.04
	CC	9	17,770	-	-	-	-	0.05
	WCVI	23	33,608	-	-	-	0.03	0.02
	WCVI	24	32,421	-	-	-	0.01	0.01
	WCVI	25	38,601	-	-	-	-	-
	WCVI	26	27,181	-	0.01	-	0.04	0.01
WCVI, CC ^w	8, 25	3,259	-	-	-	-	-	

5WI refers to Wilson Inlet release event (southern PRD).

^w within year discrepancy (WYD); ^b between year discrepancy (BYD).

Table 7. Tag recovery efficiencies from seeding batches of tagged fish into totes of thawing fish at fish plants housing tag recovery equipment.

Plant	Gear	SAR	Date Seeded	N	C _{Thaw}	Date Recovered	Lot Identifier	C _{Search}	R*	c	d _R	d _{Adj}
BCF	GN	SG	Apr. 28	5	61	May 1	4023	59	2	0.97	0.40	0.41
BCF	GN	PRD	May 2	5	62	May 5	6006	60	4	0.97	0.80	0.82
BCF	GN	SG	May 2	5	34	May 5	4008A	34	4	1.00	0.80	0.80
BCF	GN	SG	May 5	5	37	May 5	4052	37	5	1.00	1.00	1.00
BCF	GN	SG	May 5	5	24	May 8	4011A	24	4	1.00	0.80	0.80
BCF	GN	SG	May 5	5	42	May 8	4066 (4052)	10	2 (1)	0.24	0.40	1.00
BCF	GN	SG	May 9	5	43	May 12	4070	43	3	1.00	0.60	0.60
BCF	GN	SG	May 12	5	54	May 12	4052A	54	3	1.00	0.60	0.60
BCF	GN	SG	May 12	5	31	May 15	4046	25	2	0.81	0.40	0.49
BCF	GN	SG	May 12	5	67	May 15	4036	66	5	0.99	1.00	1.00
BCF	GN	ALL	ALL	50	455	ALL	ALL	412	34 (1)	0.91	0.68	0.75
BCF	SN	SG	Apr. 29	5	50	May 2	4509	47	3	0.94	0.60	0.64
BCF	SN	SG	Apr. 30	5	87	May 3	4509A (4511)	87	5 (1)	1.00	1.00	1.00
BCF	SN	SG	May 1	5	49	May 4	4520A	49	1	0.99	0.20	0.20
BCF	SN	SG	May 1	5	33	May 4	4506A	20	4	0.61	0.80	1.00
BCF	SN	SG	May 1	5	13	May 4	4504	13	4	0.99	0.80	0.81
BCF	SN	SG	May 6	5	25	May 9	4502	25	4	1.00	0.80	0.80
BCF	SN	PRD	May 6	5	62	May 9	6509	62	3	1.00	0.60	0.60
BCF	SN	SG	May 10	5	23	May 10	4513 (4503)	23	5 (1)	1.00	1.00	1.00
BCF	SN	SG	May 7	5	32	May 10	4503	23	3	0.72	0.60	0.83
BCF	SN	SG	May 7	5	31	May 10, 11	4504A	31	5	1.00	1.00	1.00
BCF	SN	ALL	ALL	50	405	ALL	ALL	380	37 (2)	0.94	0.74	0.79
CFC	GN	SG	May 2	5	28	May 4	10376	26	4	0.93	0.80	0.86
CFC	GN	SG	May 3	5	58	May 5	10393 (10395)	57	4 (1)	0.98	0.80	0.82
CFC	GN	SG	May 10	10	53	May 12	10392 (10205)	52	8 (1)	0.99	0.80	0.81
CFC	GN	SG	May 14	5	31	May 16	10353	30	4	0.98	0.80	0.81
CFC	GN	SG	May 14	5	26	May 16	10382	25	4	0.97	0.80	0.82
CFC	GN	SG	May 24	15	46	May 26	10079	44	14	0.96	0.93	0.98
CFC	GN	SG	May 24	10	26	May 24	10083	25	7	0.97	0.70	0.72
CFC	GN	SG	ALL	55	267	ALL	ALL	259	45 (2)	0.97	0.82	0.84

Table 7 (continued).

Plant	Gear	SAR	Date Seeded	N	C _{Thaw}	Date Recovered	Lot Identifier	C _{Search}	R*	c	d _R	d _{Adj}
CFC	SN	SG	Apr. 26	5	75	Apr. 28	10359	67	2	0.89	0.40	0.45
CFC	SN	SG	Apr. 30	5	39	May 2	10076 (10080)	39	5 (3)	0.99	1.00	1.00
CFC	SN	SG	May 1	5	30	May 3	10073 (10066)	30	5 (1)	0.99	1.00	1.00
CFC	SN	PRD	May 7	5	52	May 7	1992	51	4	0.99	0.80	0.81
CFC	SN	SG	May 8	5	61	May 10	10068 (10372)	60	5 (1)	0.99	1.00	1.00
CFC	SN	SG	May 9	5	31	May 11, 12	10372 (10392)	30	5 (1)	0.97	1.00	1.00
CFC	SN	SG	May 15	5	53	May 17	10358	51	4	0.96	0.80	0.83
CFC	SN	SG	May 16	5	33	May 18	10378 (10379)	33	4 (3)	1.00	0.80	0.80
CFC	SN	SG	May 17	5	50	May 19	10385	50	4	1.00	0.80	0.80
CFC	SN	CC	May 22	5	50	May 24	10087	50	5	0.99	1.00	1.00
CFC	SN	SG	May 23	5	19	May 25	10067 (U3706)	18	5 (5)	0.97	1.00	1.00
CFC	SN	ALL	ALL	55	493	ALL	ALL	479	48 (14)	0.97	0.87	0.90
DPS	GN	SG	May 10	10	30	May 12	10387	24	4	0.80	0.40	0.50
DPS	GN	SG	May 10	5	19	May 12	10216	16	1	0.86	0.20	0.23
DPS	GN	SG	May 10	5	26	May 12	10389	22	3	0.85	0.60	0.71
DPS	GN	SG	May 10	5	62	May 23	10060	55	0	0.89	0.00	0.00
DPS	GN	SG	May 24	5	28	May 26	10212	22	1	0.79	0.20	0.25
DPS	GN	SG	May 25	5	55	May 27	10061	45	1	0.82	0.20	0.24
DPS	GN	SG	May 25	5	27	May 27	10078	13	1	0.48	0.20	0.42
DPS	GN	SG	ALL	40	247	ALL	ALL	197	11	0.80	0.28	0.34
DPS	SN	SG	Apr. 27	5	61	Apr. 29, May 1	10055	50	2	0.82	0.40	0.49
DPS	SN	SG	May 1	5	55	May 3	10373	46	2	0.83	0.40	0.48
DPS	SN	SG	May 3	5	49	May 5	10367 (10368)	47	1 (1)	0.96	0.20	0.21
DPS	SN	SG	May 9	5	27	May 11	7001 (4507)	23	2 (2)	0.85	0.40	0.47
DPS	SN	SG	May 9	5	16	May 11	10365	13	4	0.81	0.80	0.98
DPS	SN	CC	May 13	10	67	May 15	10089 (10371)	34	6 (4)	0.51	0.60	1.00
DPS	SN	SG	May 27	5	25	May 29	10362	20	3	0.80	0.60	0.75
DPS	SN	SG	May 27	5	25	May 29	10207	20	2	0.80	0.40	0.50
DPS	SN	ALL	ALL	45	325	ALL	ALL	253	22 (7)	0.78	0.49	0.63

* Data in parentheses correspond to lot mixing during processing and tag recovery.

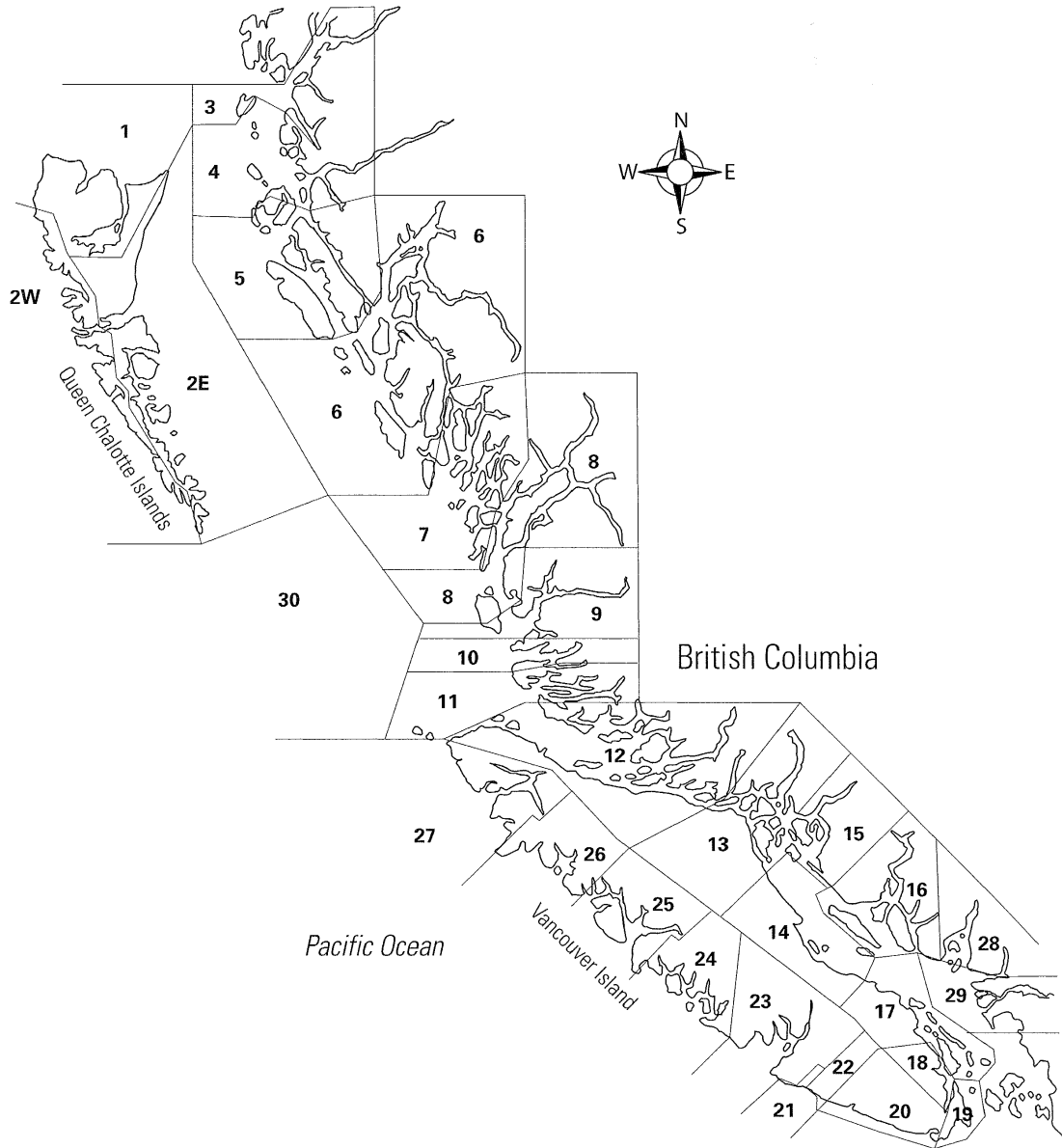


Figure 1. The coast of British Columbia, shown divided into representative inshore fisheries statistical (management) areas.

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Appendix A. Summary of 1999 to 2004 herring releases with binary tag code discrepancies and subsequent 2006 tag recoveries.

Discrepancy	Release year	Tag code	Set #	RelStat	Section	CWTs	2006 Recoveries	
Within year ^a	1999	18-12-13	13	14	143	3,310	0	
	1999	18-12-32	12	17	173	2,505	0	
	2000	18-12-19	14, 15	14	143	2,506	0	
	2000	02-12-12	21	14	143	9,108	0	
	2000	18-03-34	11	14	142	6,356	0	
	2000	18-42-17	16, 17	14	143	7,030	0	
	2000	18-34-42	19	14	142	511	0	
	2000	18-42-23	19	14	142	0	0	
	2000	02-13-12	5	14	142	3,017	0	
	2000	18-14-43	25	17	173	3,454	0	
	2000	18-34-35	13	14	143	2,024	0	
	2000	18-34-45	13	14	143	0	0	
	2000	18-31-11	27	17	172	3,312	0	
	2000	18-31-10	27	17	172	3,060	0	
	2003	18-45-61	15	7	076	868	1	
		18-45-61	16	7	074	1,121		
	2004	18-45-39	9	25	253	2,833	0	
		18-45-39	12	8	085	426	0	
		Total	14 codes				46,193	1
	Between years ^b	1999	18-08-48	1	14	142	2,587	
2000			30	17	172	952		
Subtotal						3,539	0	
1999		18-15-63	3	14	142	1,857		
2000			23, 24	17	173	1,745		
Subtotal						3,602	0	
	Total	2 codes				7,141	0	

^a Tag code mislabelling occurred between codes used within the same year and stock region.

Appendix B. Summary of herring CWT releases from 1999 to 2004 and subsequent 2006 tag recoveries by release set identification code (year and set number), release stock assessment region, release statistical area, release location, release date, code discrepancy and release batch size.

Set Id ^a	Region	Area	Location	Date	Disc ^b	Releases	Recoveries
1999-001	SG	14	Fillongley Park	02/03/1999	BYD	3,539	
1999-002	SG	14	Whalebone Point	04/03/1999		3,751	
1999-003	SG	14	Phipps Point	04/03/1999	BYD	3,602	
1999-004	SG	14	Bowser	05/03/1999		3,006	
1999-005	SG	14	Qualicum Bay	06/03/1999		3,590	
1999-006	SG	14	Qualicum Bay	06/03/1999		3,670	1
1999-007	SG	14	Metcalfe Bay	07/03/1999		675	
1999-008	SG	14	Chrome Island	09/03/1999		1,644	
1999-009	SG	17	Link Island	15/03/1999		1,964	
1999-010	SG	17	Jesse Island	15/03/1999		3,597	
1999-011	SG	17	McKay Point	16/03/1999		3,370	
1999-012	SG	17	Link Island	18/03/1999		913	
1999-012	SG	17	Link Island	18/03/1999	WYD	2,505	
1999-013	SG	14	French Creek	18/03/1999	WYD	3,310	
1999-014	SG	14	French Creek	19/03/1999		3,438	
1999-015	SG	14	French Creek	19/03/1999		3,413	
1999-016	SG	17	Link Island	20/03/1999		4,422	
1999-017	QC	02E	Wanderer Island	26/03/1999		1,141	
1999-018	QC	02E	Wanderer Island	27/03/1999		2,002	
1999-019	QC	02E	Wanderer Island	28/03/1999		3,032	
2000-001	SG	14	Fillongley Park	26/02/2000		18,963	
2000-003	SG	14	Fillongley Park	27/02/2000		13,472	
2000-004	SG	14	Big Qualicum	29/02/2000		13,304	
2000-005	SG	14	Boyle Point	03/03/2000	WYD	6,471	
2000-005	SG	14	Boyle Point	03/03/2000		4,809	
2000-006	SG	14	Boyle Point	03/03/2000		15,489	
2000-007	SG	14	Repulse Point	03/03/2000		13,180	1
2000-009	SG	14	Tribune Bay	05/03/2000		16,100	
2000-011	SG	14	Helliwell Park	06/03/2000		13,386	
2000-012	SG	14	Qualicum Bay	06/03/2000		4,750	
2000-013	SG	14	Parksville Bay	07/03/2000		7,963	
2000-014	SG	14	Parksville Bay	07/03/2000		18,379	1
2000-015	SG	14	Parksville Bay	07/03/2000		5,936	
2000-016	SG	14	French Creek	08/03/2000		2,109	
2000-017	SG	14	French Creek	08/03/2000		1,576	
2000-018	SG	14	French Creek	08/03/2000		9,662	
2000-019	SG	14	Longbeak Point	09/03/2000	WYD	511	
2000-019	SG	14	Longbeak Point	09/03/2000		10,358	
2000-020	SG	14	Longbeak Point	09/03/2000		8,623	
2000-021	SG	14	Northwest Bay	11/03/2000		1,659	

Appendix B (continued).

Set Id ^a	Region	Area	Location	Date	Disc ^b	Releases	Recoveries
2000-022	SG	17	Yellow Point	14/03/2000		8,258	
2000-023	SG	17	Link Island	14/03/2000		5,651	
2000-025	SG	17	Yellow Point	15/03/2000		3,426	1
2000-026	SG	17	Link Island	16/03/2000		7,074	
2000-027	SG	17	Hammond Bay	20/03/2000		10,035	
2000-028	SG	17	Mudge Island	21/03/2000		4,235	
2000-029	SG	17	Richard Point	22/03/2000		5,715	
2000-030	SG	17	Blunden Point	22/03/2000		4,517	
2000-031	SG	17	Icarus Point	23/03/2000		4,430	
2000-032	SG	17	Schooner Cove	24/03/2000		5,653	
2001-001	SG	14	Bowser	04/03/2001		8,457	
2001-003	SG	14	Bowser	04/03/2001		3,717	
2001-004	SG	14	Bowser	05/03/2001		3,113	1
2001-005	SG	14	Cape Lazo	05/03/2001		7,016	1
2001-006	SG	14	Cape Lazo	06/03/2001		8,090	3
2001-007	SG	14	Cape Lazo	06/03/2001		6,486	
2001-009	SG	14	Lambert Channel	07/03/2001		9,102	1
2001-012	SG	14	Little Qualicum River	08/03/2001		7,204	2
2001-013	SG	14	Qualicum Bay	08/03/2001		2,798	1
2001-016	SG	14	French Creek	10/03/2001		4,575	
2001-018	PRD	5	Kitkatla Inlet	22/03/2001		6,470	
2001-019	PRD	5	Kitkatla Inlet	22/03/2001		1,946	
2001-020	PRD	5	Kitkatla Inlet	22/03/2001		1,396	
2001-021	PRD	5	Kitkatla Inlet	23/03/2001		8,275	1
2001-023	PRD	5	Kitkatla Inlet	24/03/2001		4,300	
2001-024	PRD	4	Casey Cove	28/03/2001		4,170	
2001-025	PRD	4	Metford Island	28/03/2001		6,708	1
2001-026	PRD	4	Garden Island	29/03/2001		7,443	1
2001-027	PRD	4	Garden Island	30/03/2001		5,338	4
2001-028	PRD	4	Venn Pass	31/03/2001		6,384	1
2001-029	PRD	4	Venn Pass	31/03/2001		6,320	2
2001-030	PRD	4	Big Bay	31/03/2001		6,129	3
2001-031	PRD	4	Venn Pass	01/04/2001		12,508	4
2001-033	PRD	4	Venn Pass	02/04/2001		8,839	4
2001-035	PRD	4	Garden Island	02/04/2001		1,970	
2002-001	SG	14	Norris Rock	05/03/2002		3,908	
2002-002	SG	14	Gartley Point	06/03/2002		5,585	
2002-003	SG	14	Comox Bar	06/03/2002		4,123	
2002-004	SG	14	Seal Islets	08/03/2002		9,088	8
2002-005	SG	14	Longbeak Point	08/03/2002		7,339	2
2002-006	SG	14	Sandy Island	11/03/2002		10,345	2

Appendix B (continued).

Set Id ^a	Region	Area	Location	Date	Disc ^b	Releases	Recoveries
2002-007	SG	14	Comox Bar	11/03/2002		2,241	
2002-008	SG	14	Repulse Point	15/03/2002		2,695	
2002-009	SG	14	Gravelly Bay	15/03/2002		6,950	
2002-010	SG	14	French Creek	16/03/2002		4,002	1
2002-011	SG	14	French Creek	17/03/2002		8,248	
2002-012	SG	14	Shingle Spit	17/03/2002		10,738	4
2002-013	SG	14	Comox Bar	19/03/2002		8,266	
2002-014	CC	8	Pruth Bay	20/03/2002		1,771	
2002-015	CC	8	Pruth Bay	21/03/2002		7,692	2
2002-016	CC	7	Norman Morrison Bay	21/03/2002		7,772	
2002-017	CC	7	Berry Inlet	22/03/2002		8,359	3
2002-018	CC	7	Lockhart Bay	22/03/2002		7,161	
2002-019	CC	7	Spiller Channel	23/03/2002		7,735	2
2002-020	CC	6	Kitasu Bay	24/03/2002		9,042	2
2002-021	CC	6	Kitasu Bay	25/03/2002		9,126	2
2002-022	PRD	4	Swallow Island	26/03/2002		5,936	8
2002-023	PRD	4	Shattock Point	27/03/2002		8,186	11
2002-024	PRD	4	Shattock Point	27/03/2002		6,895	4
2002-025	PRD	4	Shattock Point	27/03/2002		6,933	2
2002-026	PRD	4	Anchor Shoal	28/03/2002		8,324	8
2002-027	PRD	4	Simpson Point	28/03/2002		8,126	9
2002-028	PRD	4	Whitecliff Island	28/03/2002		4,560	2
2002-029	PRD	5	Robert Island	31/03/2002		8,119	3
2002-030	PRD	5	Robert Island	01/04/2002		5,899	8
2002-031	PRD	5	Willis Bay	01/04/2002		2,651	1
2002-032	PRD	5	Willis Bay	01/04/2002		7,255	
2002-033	PRD	5	Willis Bay	02/04/2002		1,777	1
2002-034	PRD	5WI	Wilson Inlet	02/04/2002		11,081	1
2003-001	SG	16	Secret Cove	05/03/2003		6,643	
2003-002	SG	14	Madrona Point	07/03/2003		12,701	9
2003-003	SG	14	Madrona Point	07/03/2003		3,903	1
2003-004	SG	14	Mistaken Island	10/03/2003		11,433	3
2003-005	SG	14	Brant Point	11/03/2003		1,203	
2003-006	SG	14	Brant Point	11/03/2003		3,907	1
2003-007	SG	14	Baynes Sound	16/03/2003		11,272	1
2003-008	SG	14	Longbeak Point	16/03/2003		12,351	10
2003-009	SG	14	Longbeak Point	16/03/2003		8,337	2
2003-010	SG	14	Chrome Island	17/03/2003		11,372	3
2003-011	SG	14	Repulse Point	17/03/2003		12,768	
2003-012	CC	9	Goose Bay	20/03/2003		13,660	4
2003-013	CC	8	Storm Inlet	20/03/2003		15,423	1
2003-014	CC	8	Pruth Bay	21/03/2003		12,030	1

Appendix B (continued).

Set Id ^a	Region	Area	Location	Date	Disc ^b	Releases	Recoveries
2003-015	CC	7	Kildidt Sound	22/03/2003		9,132	5
2003-016	CC	7	Lockhart Bay	23/03/2003		13,542	4
2003-017	CC	7	SW Spiller Channel	23/03/2003		13,594	7
2003-018	CC	7	Neekas Inlet	24/03/2003		16,394	12
2003-019	CC	7	Berry Inlet	24/03/2003		11,739	4
2003-020	CC	7	East Higgins Pass	25/03/2003		15,519	8
2003-021	PRD	5	Gurd Point	27/03/2003		14,095	17
2003-022	PRD	5	Gurd Island (Nth)	27/03/2003		14,092	16
2003-023	PRD	5	Dries Inlet	27/03/2003		9,403	9
2003-024	PRD	3	Cunningham Pass	31/03/2003		15,066	4
2003-025	PRD	5	Robert Island	01/04/2003		15,291	9
2003-026	PRD	5	Kitkatla Inlet	01/04/2003		14,379	13
2003-027	PRD	5	Porcher Peninsula	02/04/2003		15,465	7
2003-028	PRD	5	Gurd Point	02/04/2003		13,709	8
2004-001	WCVI	23	SE Spilling Islets	04/03/2004		10,477	1
2004-002	WCVI	23	Mayne Bay	06/03/2004		8,401	
2004-003	WCVI	23	Saint Ines Island	07/03/2004		14,730	4
2004-004	WCVI	24	Shelter Inlet	10/03/2004		15,119	2
2004-005	WCVI	24	Shelter Inlet	11/03/2004		17,302	
2004-006	WCVI	26	Kyuquot Channel	13/03/2004		15,717	2
2004-007	WCVI	26	Crowther Channel	13/03/2004		11,464	3
2004-008	WCVI	25	Rosa Harbour	15/03/2004		16,576	
2004-009	WCVI	25	Rosa Harbour	16/03/2004		2,591	
2004-009	WCVI	25	Rosa Harbour	16/03/2004	WYD	3,259	
2004-010	WCVI	25	Rosa Harbour	17/03/2004		6,078	
2004-011	WCVI	25	Rosa Harbour	17/03/2004		13,356	
2004-012	CC	8	Pruth Bay	21/03/2004		18,223	3
2004-013	CC	8	Fairmile Passage	21/03/2004		12,004	3
2004-014	CC	8	Fairmile Passage	22/03/2004		14,387	5
2004-015	CC	6	Kitasu Bay	24/03/2004		17,332	19
2004-016	CC	6	Kitasu Bay	24/03/2004		18,393	20
2004-017	CC	6	Kitasu Bay	25/03/2004		16,324	23
2004-018	CC	7	Berry Inlet	25/03/2004		17,011	27
2004-019	CC	7	Berry Inlet	26/03/2004		19,228	25
2004-020	CC	7	Dundivan Inlet	27/03/2004		18,417	28
2004-021	CC	7	Tankeeah River	27/03/2004		13,659	17
2004-022	CC	7	Tankeeah River	28/03/2004		17,901	27
2004-023	CC	7	East Higgins Pass	30/03/2004		21,627	55
2004-024	CC	9	Goose Bay	31/03/2004		17,770	3
Totals						1,364,729	546

^a Set Id refers to release year and set number for first use of tag code in cases where multiple use occurred.

^b Disc indicates which sets had discrepant release information from multiple code use; BYD = between year discrepancies; WYD= within year discrepancies (Appendix A).

Appendix C. Summary of 2006 herring CWT recoveries and recovery rates from 2003 and 2004 tag release intervals by release set identification code (year and set number), release stock assessment region, release statistical area, release location and release batch size.

Set Id	Region	Area	Location	Interval	Releases	Recoveries	RR%
2003-001	SG	17	Secret Cove	1	3,821	0	0.00
				2	2,822	0	0.00
2003-002	SG	14	Madrona Point	1	4,282	5	0.12
				2	4,236	3	0.07
				3	4,183	1	0.02
2003-003	SG	14	Madrona Point	1	3,903	1	0.03
2003-004	SG	14	Mistaken Island	1	3,806	2	0.05
				2	3,711	0	0.00
				3	3,055	1	0.03
2003-005	SG	14	Brant Point	1	1,203	0	0.00
2003-006	SG	14	Brant Point	1	3,907	1	0.03
2003-007	SG	14	Baynes Sound	1	4,166	1	0.02
				2	4,083	0	0.00
				3	3,884	0	0.00
2003-008	SG	14	Longbeak Point	1	3,890	3	0.08
				2	4,375	6	0.14
				3	4,086	1	0.02
2003-009	SG	14	Longbeak Point	1	3,324	1	0.03
				2	5,013	1	0.02
2003-010	SG	14	Chrome Island	1	4,169	3	0.07
				2	3,352	0	0.00
				3	3,851	0	0.00
2003-011	SG	14	Repulse Point	1	4,237	0	0.00
				2	4,281	0	0.00
				3	4,250	0	0.00
2003-012	CC	9	Goose Bay	1	4,139	3	0.07
				2	3,809	1	0.03
				3	3,822	0	0.00
				4	1,890	0	0.00
2003-013	CC	8	Storm Inlet	1	3,916	0	0.00
				2	4,393	0	0.00
				3	4,338	0	0.00
				4	2,776	1	0.04
2003-014	CC	8	Pruth Bay	1	3,667	0	0.00
				2	3,722	1	0.03
				3	4,641	0	0.00

Appendix C (continued).

Set Id	Region	Area	Location	Interval	Releases	Recoveries	RR%
2003-015	CC	7	Kildidt Sound	1	3,654	3	0.08
				2	4,021	2	0.05
2003-016	CC	7	Lockhart Bay	1	3,866	1	0.03
				2	4,163	2	0.05
				3	4,309	1	0.02
				4	2,661	1	0.04
2003-017	CC	7	SW Spiller Channel	1	3,972	1	0.03
				2	5,347	1	0.02
				3	4,275	5	0.12
2003-018	CC	7	Neekas Inlet	1	5,687	3	0.05
				2	5,433	1	0.02
				3	4,043	4	0.10
				4	1,231	4	0.32
2003-019	CC	7	Berry Inlet	1	4,128	1	0.02
				2	5,141	2	0.04
				3	2,470	1	0.04
2003-020	CC	7	East Higgins Pass	1	4,786	3	0.06
				2	5,049	2	0.04
				3	3,874	3	0.08
				4	1,810	0	0.00
2003-021	PRD	5	Gurd Point	1	4,062	6	0.15
				2	6,194	8	0.13
				3	3,839	3	0.08
2003-022	PRD	5	Gurd Point	1	4,389	7	0.16
				2	6,184	5	0.08
				3	3,519	4	0.11
2003-023	PRD	5	Dries Inlet	1	4,859	6	0.12
				2	4,544	3	0.07
2003-024	PRD	3	Hook Point	1	4,400	2	0.05
				2	6,727	1	0.01
				3	3,939	1	0.03
2003-025	PRD	5	Robert Island	1	4,614	3	0.07
				2	6,624	4	0.06
				3	4,053	2	0.05
2003-026	PRD	5	Kitkatla Inlet	1	4,755	9	0.19
				2	6,222	2	0.03
				3	3,402	2	0.06

Appendix C (continued).

Set Id	Region	Area	Location	Interval	Releases	Recoveries	RR%
2003-027	PRD	5	Porcher Peninsula	1	4,621	4	0.09
				2	6,310	2	0.03
				3	4,534	1	0.02
2003-028	PRD	5	Gurd Point	1	4,787	2	0.04
				2	6,569	4	0.06
				3	2,353	2	0.08
2004-001	WCVI	23	SE Spilling Islets	1	3,585	0	0.00
				2	3,465	0	0.00
				3	3,427	1	0.03
2004-002	WCVI	23	Lyllall Point	1	3,954	0	0.00
				2	4,447	0	0.00
2004-003	WCVI	23	Saint Ines Island	1	4,045	1	0.02
				2	4,832	2	0.04
				3	5,034	1	0.02
				4	819	0	0.00
2004-004	WCVI	24	Steamer Cove	1	4,505	0	0.00
				2	4,805	1	0.02
				3	4,015	1	0.02
				4	1,794	0	0.00
2004-005	WCVI	24	Clio Island	1	4,143	0	0.00
				2	6,064	0	0.00
				3	4,176	0	0.00
				4	2,919	0	0.00
2004-006	WCVI	26	Kyuquot Channel	1	4,234	1	0.02
				2	6,251	1	0.02
				3	5,232	0	0.00
2004-007	WCVI	26	Crowther Channel	1	4,750	2	0.04
				2	6,714	1	0.01
2004-008	WCVI	25	Rosa Harbour	1	4,756	0	0.00
				2	4,391	0	0.00
				3	4,570	0	0.00
				4	2,859	0	0.00
2004-009	WCVI	25	Rosa Harbour	1	5,424	0	0.00
2004-010	WCVI	25	Rosa Harbour	1	6,078	0	0.00
2004-011	WCVI	25	Rosa Harbour	1	4,911	0	0.00
				2	4,545	0	0.00
				3	3,900	0	0.00

Appendix C (continued).

Set Id	Region	Area	Location	Interval	Releases	Recoveries	RR%
2004-012	CC	8	Pruth Bay	1	4,297	0	0.00
				2	5,106	1	0.02
				3	5,647	2	0.04
				4	4,025	0	0.00
2004-013	CC	8	Fairmile Passage	1	5,768	2	0.03
				2	4,808	1	0.02
				3	1,428	0	0.00
2004-014	CC	8	Fairmile Passage	1	5,171	3	0.06
				2	5,975	1	0.02
				3	3,241	1	0.03
2004-015	CC	6	Kitasu Bay	1	4,226	5	0.12
				2	5,342	7	0.13
				3	4,034	5	0.12
				4	3,730	2	0.05
2004-016	CC	6	Kitasu Bay	1	5,119	12	0.23
				2	5,953	3	0.05
				3	5,010	3	0.06
				4	2,311	2	0.09
2004-017	CC	6	Kitasu Bay	1	6,068	6	0.10
				2	4,245	9	0.21
				3	6,011	8	0.13
2004-018	CC	7	Berry Inlet	1	4,581	10	0.22
				2	6,646	9	0.14
				3	4,091	6	0.15
				4	1,693	2	0.12
2004-019	CC	7	Berry Inlet	1	5,439	11	0.20
				2	3,594	5	0.14
				3	4,987	4	0.08
				4	5,208	5	0.10
2004-020	CC	7	Dundivan Inlet	1	6,327	12	0.19
				2	6,165	11	0.18
				3	5,925	5	0.08
2004-021	CC	7	Tankeeah River	1	5,193	4	0.08
				2	4,295	5	0.12
				3	4,171	8	0.19
2004-022	CC	7	Tankeeah River	1	4,731	7	0.15
				2	6,630	11	0.17
				3	3,092	6	0.19
				4	3,448	3	0.09

Appendix C (continued).

Set Id	Region	Area	Location	Interval	Releases	Recoveries	RR%
2004-023	CC	7	East Higgins Pass	1	4,458	15	0.34
				2	6,022	17	0.28
				3	5,645	9	0.16
				4	5,502	14	0.25
2004-024	CC	9	Goose Bay	1	5,675	1	0.02
				2	4,240	0	0.00
				3	5,576	0	0.00
				4	2,279	2	0.09
Totals					686,195	427	0.06