MEMORANDUM

TO: Council, SSC and AP Members

FROM: Clarence G. Pautzke
Executive Director

DATE: April 14, 1998

SUBJECT: Bycatch Reduction Amendments

ESTIMATED TIME
6 HOURS
(all D-1 items)

ACTION REQUIRED

(a) Initial review of amendment to minimize BSAI chinook salmon bycatch.
(b) Initial review of amendment to prohibit bottom trawls for BSAI pollock fisheries.

BACKGROUND

The Magnuson-Stevens Act amendments emphasized the importance of bycatch effects on achieving sustainable fisheries. National Standard 9 mandates that conservation and management measures shall, to the extent practicable: (1) minimize bycatch; and (2) to the extent bycatch cannot be avoided, minimize the mortality of such bycatch. In addition, Section 303 of the Act was amended to add bycatch reduction incentives as a discretionary provision of FMPs. This provision reads that any FMP may "include, consistent with the other provisions of this Act, conservation and management measures that provide harvest incentives for participants within each gear group to employ fishing practices that result in lower levels of bycatch or in lower levels of the mortality of bycatch."

To comply with these provisions of the Act, the Council highlighted the need for additional bycatch management measures during the 1997 call for proposals. At the September meeting, the Council initiated development of several of the proposals received. Analyses of two proposals have been completed for initial review at this meeting.

(a) Chinook Salmon Bycatch

One of the proposals approved for analysis was a proposal to lower the chinook salmon bycatch limits that triggers a closure of the Chinook Salmon Savings Areas in the Bering Sea. This proposal, submitted by the Yukon River Drainage Fisheries Association, identified that the current bycatch trigger of 48,000 chinook salmon is inadequate and does not reduce chinook salmon bycatch. Additionally, bycatch of chinook salmon after April 15 does not apply towards the PSC limit that triggers a closure. Three alternatives and two options were examined, and they are the following:

> Alternative 1: No Action. Trawling is prohibited in the Chinook Salmon Savings Areas through April 15 upon attainment of a bycatch limit of 48,000 chinook salmon in the BSAI.

Alternative 2: Include salmon taken after April 15 towards the bycatch limit of 48,000 chinook salmon. The Chinook Salmon Savings Areas would close upon attainment of the bycatch limit, whenever this would occur. Hence these areas could close, or remained closed, during the pollock 'B' season.

Alternative 3: Reduce the trigger level to 36,000 chinook salmon in the BSAI. Trawling would be prohibited in the Chinook Salmon Savings Areas through April 15 upon attainment of a bycatch limit of 36,000 chinook salmon in the BSAI.

Option 1 (applicable to Alternatives 2 and 3): Seasonally allocate the PSC limit, such that there are separate triggers for the pollock 'A' and 'B' season.

Option 2 (applicable to Alternatives 2 and 3): Begin accounting towards the PSC limit at the start of the 'B' season (currently September 1), with the amount carried over to the next pollock 'A' season.

An executive summary of the analysis is attached as Item D-1(b)(1).

(b) Pollock Bottom Trawl Prohibition

Another proposal approved for analysis was to eliminate non-pelagic trawling for pollock in the BSAI to reduce halibut bycatch, and examine measures for reducing bycatch in the GOA pollock fishery. This proposal was submitted by the Alaska Marine Conservation Council. Although this action could be taken annually as part of the BSAI TAC specification process, this proposed plan amendment is to make this prohibition a permanent regulation. Two alternatives, with two options, were examined.

Alternative 1: No Action. Allocation of BSAI pollock quota among pelagic and non-pelagic trawl gear types can be established for the next fishing year during the annual specification process.

Alternative 2: Prohibit the use on non-pelagic trawls in the BSAI pollock fishery. Only pelagic trawl gear as defined in regulations could be used by vessels when engaged in a directed pollock fishery. Total bycatch limits for Prohibited Species (including 7.5% CDQ apportionment) would be reduced to reflect this gear prohibition. A regulatory change would be required to split out pollock from the pollock, Atka mackerel/other species category, for purposes of allocating PSC to the pelagic only trawl pollock fishery.

Option 1: Reduce PSC limit for halibut only (50 mt).
Option 2: Reduce PSC limit for halibut (50 mt), red king crab (1,000), C. bairdi crab (10,000), and C. opilio crab (27,000).

An executive summary of the analysis is attached as Item D-1(c)(1).

Executive Summary

The Magnuson-Stevens Act amendments emphasized the importance of bycatch effects on achieving sustainable fisheries. National Standard 9 mandates that conservation and management measures shall, to the extent practicable: (1) minimize bycatch; and (2) to the extent bycatch cannot be avoided, minimize the mortality of such bycatch. This Environmental Assessment/Regulatory Impact Review/Initial Regulatory Flexibility Analysis (EA/RIR/IRFA) addresses a proposal to minimize the incidental bycatch of chinook salmon in the groundfish trawl fisheries of the Bering Sea and Aleutian Islands. The following three alternatives were examined:

Alternative 1: No Action. Trawling is prohibited in the Chinook Salmon Savings Areas (CHSSA) through April 15 upon attainment of a bycatch limit of 48,000 chinook salmon in the BSAI.

Alternative 2: Include salmon taken after April 15 towards the bycatch limit of 48,000 chinook salmon. The Chinook Salmon Savings Areas would close upon attainment of the bycatch limit, whenever this would occur. Hence these areas could close, or remained closed, during the pollock 'B' season.

Alternative 3: Reduce the trigger level to 36,000 chinook salmon in the BSAI. Trawling would be prohibited in the Chinook Salmon Savings Areas through April 15 upon attainment of a bycatch limit of 36,000 chinook salmon in the BSAI.

> Option 1 (applicable to Alternatives 2 and 3): Seasonally allocate the PSC limit, such that there are separate triggers for the pollock 'A' and 'B' season.
>
> Option 2 (applicable to Alternatives 2 and 3): Begin accounting towards the PSC limit at the start of the 'B' season (currently September 1), with the amount carried over to the next pollock 'A' season.

Analysis of 1994-1997 observer data indicate that, regardless of season or year, the large majority of chinook salmon have been intercepted in the CHSSA. In the four years examined, the 48,000 cap was reached twice, and the 36,000 cap would have been reached in three of the four years. A 36,000 cap would have reduced the total number of chinook taken by 7% to 28% (3,000 to 18,000 salmon depending on the year and given low bycatch outside the CHSSA).

An accounting year beginning September 1, as suggested by Option 2, would better agree with the biology of the salmon in the Bering Sea. This is because juvenile salmon (those primarily taken as bycatch) enter the Bering Sea to feed in the autumn and remain thought the winter, later moving to other areas in the summer. If Option 2 had been in place, the 48,000 chinook cap would not have been reached in any of the four years (3 accounting years) examined. The potential cost of adopting Option 2 would be that chinook salmon taken in the 'B' season could impact the 'A' season by closing the CHSSA, an area that accounts for a relatively large portion of the 'A' season pollock catch. Most of the pollock catch has been taken from the CHSSA during the 'A' season, but in the 'B' season, most of the pollock catch comes from outside the CHSSA.

The analysis also indicated that the current CHSSA could be modified slightly. There tends to be high bycatch in the vicinity of the Pribilof Islands, but bycatch within specific blocks is not consistent. It appears from recent data that the two block area near the Pribilof Islands have not had high bycatch rates of chinook salmon. Hence, these two blocks could be removed from the CHSSA. Alternatively, additional blocks, one which is made up mostly of land on Unimak Island, showed consistently high bycatch rates of chinook salmon. Consideration should be given to adding this block, or perhaps other blocks, to the CHSSA.

Benefits of minimizing chinook salmon bycatch would accrue to those fishermen who target chinook salmon and sport and subsistence users of this resource. The most restrictive alternative (Alternative 3) would reduce total chinook bycatch in trawl fisheries by 3,000 - 18,000 salmon. It was estimated that the total benefits to western Alaska salmon fishermen would be in the range of $27,000 to $162,000.

The costs associated with Alternatives 2 and 3 are due to potential forgone catch, reduced CPUE, and operational costs of moving. Fishermen try to fish in areas and ways they can maximize the returns on their capitol; hence, forcing them to fish in non-optimal areas will result in lower CPUE and other costs. These costs could not be quantified in this analysis.

None of the alternatives are expected to have a significant impact on endangered, threatened, or candidate species, and none of the alternatives would affect takes of marine mammals. Actions taken to control chinook salmon bycatch in BSAI trawl fisheries will not alter the harvest of groundfish, but will reduce the incidental bycatch of juvenile chinook salmon.

None of the alternatives is expected to result in a "significant regulatory action" as defined in E.O. 12866.

None of the alternatives are likely to significantly affect the quality of the human environment, and the preparation of an environmental impact statement for the proposed action is not required by Section 102(2)(C) of the National Environmental Policy Act or its implementing regulations.

Executive Summary

The Magnuson-Stevens Act amendments emphasized the importance of bycatch effects on achieving sustainable fisheries. National Standard 9 mandates that conservation and management measures shall, to the extent practicable: (1) minimize bycatch; and (2) to the extent bycatch cannot be avoided, minimize the mortality of such bycatch. This Environmental Assessment/Regulatory Impact Review/Initial Regulatory Flexibility Analysis (EA/RIR/IRFA) addresses a proposal to prohibit the use of non-pelagic trawls in the directed pollock fisheries of the Bering Sea and Aleutian Islands. Two alternatives were analyzed.

Alternative 1: No Action. Allocation of BSAI pollock quota among pelagic and non-pelagic trawl gear types can be established for the next fishing year during the annual specification process.

Alternative 2: Prohibit the use on non-pelagic trawls in the BSAI pollock fishery. Only pelagic trawl gear as defined in regulations could be used by vessels when engaged in a directed pollock fishery. Total bycatch limits for Prohibited Species (including 7.5% CDQ apportionment) would be reduced to reflect this gear prohibition. A regulatory change would be required to split out pollock from the pollock, Atka mackerel/other species category, for purposes of allocating PSC to the pelagic only trawl pollock fishery.

Option 1:	Reduce PSC limit for halibut only (50 mt).
Option 2:	Reduce PSC limit for halibut (50 mt), red king crab (1,000), C. bairdi crab (10,000), and C. opilio crab (27,000).

A prohibition on non-pelagic trawling for BSAI pollock, under Alternative 2, would reduce PSC bycatch by about 50 mt of halibut mortality, 10,000 bairdi crab, 27,000 opilio crab, and 1,000 red king crab. The options to Alternative 2 include reducing the overall PSC limits for these species accordingly. Hence, under Option 1, the overall BSAI halibut bycatch limit would be reduced from 3,775 mt to 3,725 mt. Under Option 2, PSC limits for crab would also be reduced. Crab PSC limits would be first determined based on crab abundance, as currently regulated, and then reduced by the numbers indicated above. For example, if this regulation had been in place for 1998, the PSC limit for zone 1 red king crab would have been 99,000 animals.

This document also analyzes a regulatory amendment to split the pollock/Atka mackerel/other species category for purposes of allocating the PSC limits among fisheries. Of the options available to deal with the bycatch of halibut and crab caught incidentally by pelagic trawl gear, the option of splitting out pollock and having a separate category seems to be a straightforward method of accounting for bycatch. In 1998 for example, the pollock/Atka mackerel/other species category was allocated 350 mt of halibut, 155 mt of herring, 7,500 red king crab, 29,408 bairdi in zone 1, and 470,000 bairdi in zone 2. Under alternative 2, option 2, a split of the category would indicate that PSC limits for Atka mackerel/other species could be reduced, and the pollock fishery could then be allocated PSC based on what was predicted for a pelagic trawl only fishery. PSC limits for the pollock fishery would then be in the order of 175 mt of halibut, 30,000 bairdi, and 1,500 red king crabs.

One potential drawback of having a separate allocation of PSC to the pollock fishery is that, once the PSC limit is met, the pollock fishery is closed from fishing the applicable zone. This could have major economic consequences if the fishery is completely shut down from the BSAI due to attainment of the halibut PSC limit. To avoid this possibility, more PSC than required may be apportioned to the pollock category, and hence there may be impacts on other groundfish fisheries as well.

Another effect of Alternative 2 is a reduction in the bycatch of groundfish other than pollock in directed pollock fisheries. Much of this groundfish catch would be available to other fisheries. Analysis suggests that under Alternative 2, a total of 1,581 mt of groundfish would not be harvested incidental to BSAI pollock fisheries.

Most of this unused catch would be composed of Pacific cod, with smaller amounts of rock sole, arrowtooth flounder, yellowfin sole, and other species. However, slightly higher incidental catches of Greenland turbot, POP, Atka mackerel, and squid in the BSAI pollock fishery would be expected under alternative 2..

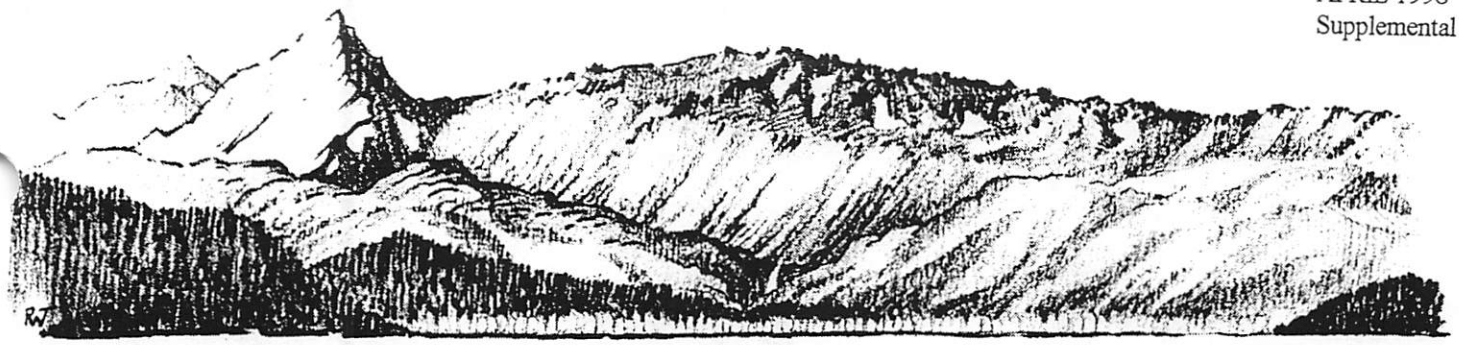
The benefits of reducing halibut bycatch would need to be weighed against the costs to the groundfish trawl and processing industry. Based on the data available, costs would be incurred primarily by catcher/processor vessels using non-pelagic gear. There may be costs associated with buying new trawls, upgrading horsepower in some cases, and unquantified yet substantial costs in terms of product production (particularly those vessels targeting larger pollock for fillet production) and markets. This analysis did show that larger pollock are taken with bottom trawl gear, and prohibiting this gear type would result in smaller pollock being taken, on average.

The effects of combining Alternative 2 with the IR/IU program are not completely predictable at this time. Nevertheless, anecdotal information suggests that the H&G fleet has not encountered high incidental catch rates of pollock this year. Hence, under Alternative 2, it is not likely that fishermen using non-pelagic gear targeting other groundfish species would have to discard pollock above the maximum retainable bycatch amount (20%).

None of the alternatives are expected to have a significant impact on endangered, threatened, or candidate species, and none of the alternatives would affect takes of marine mammals. Actions taken to prohibit the use of bottom trawls in the directed pollock fishery will not alter the harvest of groundfish, scallops, or salmon, but will reduce the incidental bycatch of halibut (and crab under option 2).

None of the alternatives is expected to result in a "significant regulatory action" as defined in E.O. 12866.

None of the alternatives are likely to significantly affect the quality of the human environment, and the preparation of an environmental impact statement for the proposed action is not required by Section 102(2)(C) of the National Environmental Policy Act or its implementing regulations.



Kachemak Bay Wilderness Lodge

April 5, 1998

Rick Lauber
NPFMC
605 W. Fourth Ave.
Anchorage, AK

Dear Council Members,

We want to thank you for your time and efforts at minimizing bycatch. It is our hope that you will adopt the proposal to ban bottom trawling for pollock in the Bering Sea.

The way vessels fish in the Bering Sea should be off bottom. It is important to minimize the total amount of bycatch occurring in the fisheries. The amount of bycatch saved must be subtrracted fom the total bycatch quota annualy divided among the groundfish fisheries..

Thank you fo initiating this new work and allowing public testimony.

Respectfully yours,

Michael and Diane McBride

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April 9, 1998

Mr. Rick Lauber
North Pacific Fishery Management Council
605 W. 4th Avenue, Suite 306
Anchorage, Alaska 99501

Dear. Mr. Lauber:

I want to thank you for the NPFMC's taking initiative to minimize bycatch. This issue is extremely important for all Alaskans. We see the effects of apparent depletion of fisheries in Alaska as well as in many other areas of the world. Even the runs of salmon in the Susitna drainage have decreased over the years. It is tempting to blame commercial fishing, but I understand the effects of water temperature, increased access by fishermen, and the effects of flooding are among the many factors involved in this complex issue. Still, we owe it to ourselves and to future generations to ensure that this renewable resource is maintained in a healthy fashion so that it remains renewable indefinitely.

The NPFMC will meet April 22 through 27 to review two proposals. I urge you to adopt the proposal to ban bottom trawling for pollock in the Bering Sea. All trawling for pollock must be fished *off bottom.* Vessels must actually change the way they fish rather than make cosmetic changes in the type of gear used. Additionally, the amount of bycatch saved by changing the way pollock vessels operate must be subtracted from the total bycatch quota annually divided among groundfish fisheries. It is not enough to simply take the bycatch saved in the pollock fishery and allow it to be used as bycatch in another fishery. The intent of the proposal, and the mandate in law, is to minimize the total amount of bycatch occurring in our fisheries.

It is also urgent that the proposal to lower the Chinook salmon bycatch allowance in the Bering Sea be adopted. The current bycatch cap of 48,000 Chinook salmon in the Bering Sea is too high. The cap does not limit the trawl fleet responsible for bycatch in any meaningful way. There are loopholes that allow the fleet to exceed the cap.

Please do not think that because our business is located on a fishing stream that I am simply looking out for our own interests. Having our business located on a fishing stream has only made me more aware of the issues concerned with habitat and fisheries; the effects of gradual depletion are already observable, and must be reversed for the benefit of all of us.

Thanks for your consideration.

Sincerely,

Sheila Lankford

Sheila Lankford
President and Manager

cc: Dale Bingham, Superintendent
Division of Parks and Recreation

Sandra Arnold
17160 Baronof Avenue
Eagle River, AK 99577
(907) 694-1716

April 9, 1998

Rick Lauber, Chair
North Pacific Fisheries Management Council
605 West 4th Avenue., Suite 306
Anchorage, AK 99501

Dear NPFMC,

I am an interested citizen concerned about the management and long-term viability of Alaska's fisheries. Please accept these comments on bycatch.

I fully support the proposal to prohibit bottom trawling for pollock in the Bering Sea. You are under a legal mandate to minimize bycatch, and this is one idea that can help the NPFMC comply. Eliminating the wasteful practice of bottom trawling will reduce bycatch of ecologically important species, and may also help to restore the biological vitality of the troubled Bering Sea.

Please note that trawling for pollock must be truly off bottom, and not illusions of gear and equipment. The way these ships fish must be fundamentally changed.

I would also advise the NPFMC not to insult the law and the public by simply shifting bycatch saved to another fisheries quota. The *total* bycatch in the North Pacific must be minimized.

Thank you for addressing these important issues, and for your consideration of these comments.

Sincerely,

Sandra Arnold

NPFMC Members:

Thank you for your efforts to reduce by-catch. I urge you to adopt the proposal which bans bottom trawling for pollock in the Bering Sea. Mandating that pollock is fished completely off-bottom will reduce significantly bycatch of halibut, crab & other non-commercial species that are important to the ecology of the ocean bottom.

The prolific waste of marine life is no longer an acceptable practise for this fishery.

Thank you for your consideration

Nancy Berland,
Concerned Citizen
Box 952
Haines, Ak 99827

D-1C

Willy Dunne

Naturalist Guide

PO Box 15043
Fritz Creek, AK 99603

Telephone (907) 235-7578
E-mail: wdunne@xyz.net

April 6, 1998

Rick Lauber, Chair
NPFMC
605 West 4th Ave., Ste. 306
Anchorage, AK 99501
FAX: (907)271-2817

Dear Council Members,

I am a former commercial fisherman and my family still derives income and sustenance from the North Pacific. I urge you to adopt the proposal before you to ban bottom trawling for pollock in the Bering Sea. Please ensure that all trawling for pollock be off the bottom in order to protect fisheries habitat and reduce bycatch. Please do not redistribute any reductions in bycatch to other fisheries. The mandate of the Magnuson-Stevens Act is to reduce total amount of bycatch in our fisheries.

Thank you for working to address this important issue and for the opportunity to comment.

Sincerely

Willy Dunne

Willy Dunne

D-1b

April 15, 1998

North Pacific Fishery Management Council
[illegible]
Post Office Box 103136
Anchorage, Alaska 99510
April 14, 1998

Re: Chinook Bycatch EA/RIR

Dear Rick,

A cap of 48,000 does not effect the trawl fishery in 9 of 10 years, but neither does it provide any benefit to the salmon fishery. The need to protect salmon is greater at lower levels of abundance when the cap is less likely to be reached. Changing the cap to 36,000 doesn't address this problem. However, if the cap is reached as the result of high bycatch in the pollock fishery, the major impact will fall upon the cod fishery.

Given the lack of ability to predict salmon abundance, it is not possible to implement a floating cap. ***Thus appropriate measures for salmon are those which encourage avoidance at all levels of abundance.*** The Salmon Research Foundation initiative was a step in the right direction. However, that effort was undermined by the adoption of a fixed cap, and by the NMFS decision to discontinue the posting of individual vessel counts of salmon bycatch.

A Superior Alternative

A superior alternative would be to encourage the fleet to avoid Chinook throughout the season in areas with a "Goodness/Badness index" that clearly exceeds than the overall BSAI rate (i.e.: the 1 1/2 blocks from 54.30 to 55.00 and from 165.30 to 167.00).

This alternative approach could have been accomplished through co-management using the Salmon Research Foundation initiative. The adoption of the 48,000 cap sent a signal that the Council had withdrawn its support for the SRF initiative, and that bycatch of up to 48,000 Chinook was OK. The alternatives in the draft EA/RIR do nothing to correct this situation.

There is an alternative to allowing a cap to be reached and then closing down large areas, but it is not considered in the draft EA/RIR. The alternative is to keep a relatively small area closed during pollock A-season based on an evaluation of the "Goodness/Badness index" of the individual blocks comprising the Chinook Savings Area.

Simplified Modeling of an Alternative "Small Hotspot" Approach

Attached to this letter is a spreadsheet summarizing bycatch rate information from a haul by haul data set provided by the observer program for the MW pollock fishery. The spreadsheet exercise demonstrates that closure of the worst 1 and 1/2 blocks could reduce Chinook bycatch by 25% at all levels of salmon abundance, while only re-distributing about 6% of the A-season pollock effort.

There are caveats attached to the modeling effort, which result from the constraint of working only with bycatch rates without having access to catch of groundfish by tow. Thus, the fields **"# of Chinook"** and **"Ave rate/100MT"** are products of simplifying assumptions.

Caveats:

- These data are based on rates in the 1990-1994 DAP observer data set. Because the actual numbers of fish and weight of catch are not publicly available, these numbers of Chinook are only an index based on the simplifying assumption that all hauls were of equal catch weight.
- The data set includes all observed MW pollock tows in the 1st quarters of 1990-1994. The **"#'s of Chinook"** are based on inclusion of all hauls from the 5 years and the assumption that all tows were 100 MT. While this simplification does not match reality, it is adequate to demonstrate the relative differences in rates by blocks and to calculate a Goodness/Badness index.
- The results are useful to review the relative differences between areas and management approaches. They are not intended to predict the actual total bycatch of Chinook in any given year.

The attached spreadsheet suggests that if block #1 and the western half of block #2 were closed to pollock fishing all A-season, and the effort from the 865 of 14,442 tows would be re-deployed proportionately to all of the remaining areas, there would be a savings of 15,211 Chinook from the hotspot, minus the additional 2,248 caught by effort re-deployed in the open area for a net savings of 12,963 Chinook.

Contrast the above savings to the current approach where the last 715 of 14,442 total tows for the season are re-deployed as the result of a 9 block closure upon reaching a trigger of 48,000 Chinook. There would be a savings of 2,502 Chinook, minus the additional 1,144 caught in the open areas after the closure of the nine blocks, for a net savings of 1,358 Chinook.

This simple spreadsheet model was prepared in 1995 when the Secretary was reviewing the Council's 48,000 cap. It would be appropriate to review more recent data and to use the approach to review the data on a year by year basis.

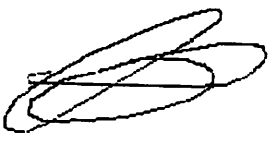
Conclusion

The draft EA/RIR doesn't include all reasonable alternative approaches to the problem. It continues the current approach of closing the barn door after the horse is out, and then punishing a scapegoat (i.e.: the cod fishery).

Thank you for your consideration of this issue.

Sincerely yours,

dave fraser



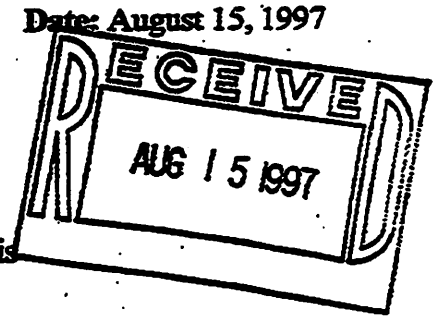
F/V Muir Milach
PO Box 771

Fishery Management Plan Amendment Proposal
North Pacific Fishery Management Council

Bycatch Avoidance

Name: Alaska Marine Conservation Council
Address: Box 101145, Anchorage, Alaska
Telephone: (907) 277-5357

Date: August 15, 1997



Fishery Management Plan: BSAI/GOA

Pelagic Only BSAI Pollock Fishery & GOA Analysis

Brief Statement of Proposal:

Convert to a pelagic-only pollock fishery in the Bering Sea defined by gear type and the operational definition of having fewer than 20 crab on board at any time while participating in the fishery. Both gear type and operational definition are required to address the principal issue in this instance. The matter at hand is *how gear is fished for pollock*, not simply what type of gear is used because pelagic gear can be used both on- and off-bottom.

In the 1998 groundfish specifications process, halibut bycatch previously allocated to the BSAI pollock fishery should be "zeroed-out" or eliminated. Pollock must be removed from the "pollock, Atka mackerel, other species" category in the allocations of halibut PSC so that its attendant halibut bycatch can be eliminated. Then, the Council must implement a regulatory amendment that prevents this halibut from being reallocated as bycatch to another groundfish fishery. For subsequent years, an amendment to the BSAI FMP must be adopted to create a pelagic-only (off-bottom) fishery for pollock. This last step will ensure sustained bycatch avoidance that would not be secured if this was left to the annual specifications process.

Implementing a BSAI pelagic-only pollock fishery may create some incentive for pollock fleet migration into the GOA. In recognition of this fact, disincentives to such migration are needed to accompany a BSAI pelagic-only pollock fishery.

A comparative analysis must be conducted of the GOA and BSAI pollock fisheries and fleets. Such an analysis will illuminate what can be done to minimize bycatch in the GOA and create a disincentive for pollock fleet migration from the BSAI. For example, if a GOA pelagic-only pollock fishery is not an appropriate method to minimize bycatch, a critical analysis may support alternative options such as new, different, or expanded time/area closures for the GOA pollock fleet.

Objectives of Proposal (What is the problem?):

Bycatch in the North Pacific groundfish fisheries remains unacceptably and unnecessarily high. The latest compiled public information (Pacific Associates, November, 1995) illustrates that in-

1994, the groundfish fleet caught and wasted nearly one billion pounds of fish as bycatch. These include fish that are the wrong size (juveniles), fish that are the wrong sex (males in a roe fishery) and fish that are the wrong species. In addition, there is an undetermined amount of sea life with no assigned commercial value that is discarded as bycatch. The effects of removing these sepcies from their vital role in the ecosystem are poorly understood. Excessive bycatch is a problem from ecological, economic and cultural perspectives.

Need and Justification for Council Action: (Why can't the problem be resolved through other channels?)—

The Council must adopt bycatch avoidance programs to achieve more selective fishing practices within our fisheries. This action is needed to resolve ecological and socioeconomic problems presented by excessive bycatch in our fisheries, and also to implement the bycatch avoidance requirements of the Magnuson-Stevens Fishery Conservation and Management Act.

The pollock fishery is the biggest single-species food fish fishery in the world. It is conducted with a low bycatch *rate*. This relatively low rate, however, belies the millions of pounds of fish harvested as bycatch every year in this fishery. Currently, over 90 percent of this fishery is prosecuted with the use of *pelagic*, or off-bottom nets. This demonstrates that groundfish catch will not be sacrificed by mandating 100% of the BSAI pollock fishery use pelagic nets and fish these nets off-bottom. Data from 1994 and 1995 show substantial amounts of crab and halibut will be avoided by switching to nets fishing off-bottom. Data from 1995 also indicate an off-bottom BSAI pollock fishery would result in less bycatch of salmon and herring. Equally important will be increased avoidance of non-commercial benthic species captured in nets fished on-bottom, and discarded as bycatch.

The International Pacific Halibut Commission (IPHC) has endorsed this as one way of reducing overall halibut mortality in the groundfish fisheries. By removing the amount of halibut bycatch currently allocated to the BSAI pollock fishery, a step toward achieving increased avoidance of halibut bycatch will be taken.

Foreseeable Impacts of Proposal: (Who wins, who loses?)

Halibut, crab, and other bottom-dwelling marine life, currently destroyed as bycatch in this intensive, industrialized fishery, will benefit. Fishermen will be able to harvest the full quota of pollock fishing off-bottom. In addition to the potential problem of fleet migration into the GOA discussed previously, we recognize a potential loss for a sector of the industry that favors larger pollock for the head & gut market. Smaller nearshore vessels with less horsepower may not be able to effectively fish larger off-bottom nets.

Are there Alternative Solutions? If so, what are they and why do you consider your proposal the best way of solving the problem?

This is not a comprehensive long-term solution to the bycatch problem which must ultimately be adopted. However, this proposal is an effective element of an overall bycatch avoidance plan that can be implemented before the statutory deadline.

Alaska Marine Conservation Council
P.O. Box 101145 Anchorage Alaska 99510
voice (907) 277-5357; fax (907) 277-5975; email: amcc@alaska.net

April 15, 1998

Rick Lauber, Chairman
NPFMC
605 West 4th Ave., Suite 306
Anchorage, AK 99501

RE: April 1998 agenda item D-1(c): BSAI pelagic pollock bycatch proposal

Dear Mr. Lauber:

The Alaska Marine Conservation Council appreciates this opportunity to comment upon the draft EA/RIR to reduce bycatch in the BSAI pollock fishery dated April 2, 1998. The analysis included in his document is very well done. However, the analysis fails to address the primary intent of the proposal and thus must be appropriately revised.

As stated in the original proposal submitted by AMCC, the intent of the proposal is to prohibit the practice of *bottom trawling* in the BSAI pollock fishery regardless of the type of gear used. The rationale was simple: pelagic gear can, and is according to this analysis, be used both on- and off-bottom, but the fishery can be successfully prosecuted entirely off-bottom with bycatch savings of halibut, crab, other groundfish, and other non-commercial benthic species. Rather than analyzing this issue, the present analysis discusses issues associated with prohibiting the use of bottom trawls in BSAI fisheries.

To clarify this matter for reviewers, and to appropriately revise the analysis for further consideration, we highlight the following aspects of, and statements in, the proposal which need to be revised:

- The title should read "prohibit the practice of bottom trawling..." rather than "prohibit the use of bottom trawls..."

- Page 3, purpose and need for action: Section 303(a)(11) of the Magnuson-Stevens Act should be cited after National Standard 9 as one of the more significant factors.

- Page 6, the last sentence under the heading "Gear" should be deleted. Most important for evaluating this proposal is the issue of *how* gear is fished, not *what* type of gear is used. This is necessary to address the essence of the problem this proposal attempts to address and which the analysis acknowledges: pelagic gear can, and is, fished on the bottom (last sentence, p. 6).

- Page 10, Section 1.3.5. The first sentence is inaccurate and misleading. A more appropriate sentence would read: "A restriction on bottom trawling in BSAI pollock fisheries would primarily be based on the premise that bycatch of halibut, crab, other groundfish, and other non-commercial benthic species can be significantly reduced while still allowing the full pollock quota to be harvested."

- Based on these changes in the intent and purpose of the proposal, changes in the quantitative aspects of the analysis will be required to more accurately reflect the bycatch savings to be gained from a BSAI pollock fishery prosecuted entirely off-bottom, and to more accurately reflect reasonable PSC limits for such a fishery.

Thank you for the opportunity to comment. We appreciate the Council's interest in minimizing bycatch and willingness to consider our proposal.

Sincerely,

Steve Ganey, Project Coordinator

Addendum to Draft EA/RIR for Council Review:
Minimize Chinook Salmon Bycatch in Groundfish Trawl Fisheries of the Bering Sea and Aleutian Islands

Analysis of individual 1/2° latitude by 1° longitude cells for chinook salmon bycatch "hot spots"

Cell specific catch and bycatch:

A grid of 1/2° latitude by 1° longitude cells was superimposed on the Bering Sea, and individual cells were given specific code numbers for identification (Figure 1). Cells of particular interest are the 9 cells comprising the Chinook Salmon Savings Area (CHSSA). The five contiguous blocks of the CHSSA near Unimak Island were coded as 200, 201, 227, 228 and 254. The two blocks bordering the west of NMFS statistical area 518 were coded as 118 and 144, and the two blocks near the Pribilof Islands were coded as 274 and 275.

The total number of chinook salmon observed by cell in the years 1994 – 1997 are provided in Figures 2 – 5. The top panel of each figure is for the pelagic pollock fishery, and the bottom panel in each figure is for the two pollock trawl fisheries, and the trawl fishery for Pacific cod. Target assignment is as discussed in the EA/RIR and based on dominant species catch. The top 10 cells for bycatch numbers are indicated by no shading, the top ten to twenty are indicated by light shading, and cells with no chinook salmon bycatch are indicated by dark shading.

In 1994 (Figure 2), the highest bycatch in the pelagic pollock fishery was in cell 201 of the CHSSA, with relatively high numbers in cells 227 and 228 as well. Outside of the CHSSA, cell 202 along the northwest edge of Unimak Island also had high numbers of bycatch. The highest cell in all three trawl fisheries was 228 indicating that the highest number of chinook salmon in the bottom trawl for pollock and Pacific cod fisheries was in this cell. The top cells in the CHSSA were 201, 227, 228 and 254, and outside the CHSSA was cell 202 near Unimak Island. Two cells to the north and west of the Pribilof Islands also experienced high bycatch.

The bycatch in 1995 was much lower than seen in previous or subsequent years (see EA/RIR). There was very little bycatch to the north and west of the Pribilof Islands in any fishery and most of the bycatch was encountered in cells 201, 227, 228 and 254 (Figure 3). The cells adjacent Area 518 (cells 118 and 144) experienced relatively high bycatch. As noted in the text of the EA/RIR, the bottom trawl for pollock and the Pacific cod fishery both experienced higher than normal bycatch levels in 1995. The bycatch was primarily in cells 228 (in CHSSA with 5,587 observed chinook) and in cell 255 (5,208 chinook).

The year 1996 was characterized by little bycatch outside of the vicinity of Unimak Island, with extremely high bycatch in the CHSSA (Figure 4). The pelagic pollock fishery observed approximately 16,000 chinook in cell 201 and 4,700 in cell 228. All fisheries combined observed approximately 18,000 chinook in cell 201 and 10,000 in cell 228.

The bycatch in 1997 was similar to 1996 in the high bycatch in cells 201 and 228, but also had relatively high bycatch to the north and west of the Pribilof Islands when compared to previous years (Figure 5). Approximately 8,500 chinook were taken in the pelagic pollock fishery in cell 201, and approximately 2,500 in cell 228. Subtracting these numbers from the three fisheries combined, the bottom trawl for pollock and Pacific cod fisheries took approximately 3,000 chinook in cell 201 and 4,000 chinook in cell 228.

In order to look for consistency in bycatch over all years, the combined (summed) catch and bycatch across the four years 1994 – 1997 are mapped in a gray-intensity scale for pelagic pollock in Figure 6 and for the pollock and Pacific cod trawl fisheries in Figure 7. The few cells with consistent effort to the north and west of the Pribilof Islands had little overall chinook salmon bycatch in the pelagic pollock fishery, making it difficult to choose specific cells as "hot spots" (Figure 6). Also, in spite of high catch levels across years, the area north of the CVOA (in bold lines) also had relatively low overall chinook salmon bycatch. Bycatch of chinook salmon is the highest in numbers in cells 201 and 228, with high bycatch also

totaled in cell 227. The pattern is similar for the trawl fisheries combined with the additional cells of 202 and 255 indicating higher bycatch in the bottom trawl for pollock and Pacific cod fisheries (Figure 7).

The percentage of chinook bycatch and groundfish catch taken by cell are provided as pie charts in Figures 8 – 15 for the pelagic pollock fishery and the trawl fisheries for pollock and Pacific cod combined during the years 1994 – 1997.

To summarize these figures, the chinook salmon bycatch was in highest proportion in cells 201, 227 and 228. Combined these cells accounted for 63%, 57%, 81% and 54% of the total observed chinook salmon bycatch from the pelagic pollock fishery in 1994, 1995, 1996 and 1997, respectively. These cells also generally represent the highest proportion of groundfish catch, and approximately 40%, 48%, 41% and 32% of the total groundfish catch in the pelagic pollock fishery came from these cells in 1994 – 1997, respectively. Noteworthy in the combined fisheries (Figure 11) in 1995, the high bycatch in the bottom trawl for pollock and Pacific cod fisheries in cell 255 accounted for 28% of the chinook salmon bycatch and 3% of the directed catch.

The importance of the three cells discussed above (201, 227 and 228) in addition to cell 202 to the bottom trawl fisheries is evident in the increasing percentage of total groundfish catch in each of these cells when compared to the pelagic pollock fishery. The bycatch in these fisheries tends to increase the percentage of chinook salmon bycatch in some cells compared to the pelagic pollock fishery, primarily in cell 228.

Cell specific bycatch rates:

Annual bycatch rates by cell over the entire year are provided in Figures 16 – 23 for the pelagic fishery and for the pollock and Pacific cod fisheries combined. The cells are ranked in order of decreasing salmon bycatch from left to right, and the legend order is the same as on the graph. The CHSSA cells are indicated by white coloring, and cells of possible interest such as cells 202 and 253 have been provided different shading as well. At the end of each series is the average computed as the average across all rates (excluding non-zero cells). The average is provided as and indicator, and is subject to effects of high rate values.

Whereas it might be expected that the bycatch of chinook salmon in the CHSSA is due to the amount of effort in these cells, it appears that the bycatch rates in the cells are also as high or higher than most other cells (particularly in 1994 and 1996 in the pelagic pollock fishery – Figures 16 and 20). Bycatch rates in the bottom trawl for pollock and Pacific cod fisheries tend to be more extreme and variable than those seen in the pelagic pollock fishery. The low bycatch in 1995 is coincident with low bycatch rates in the CHSSA with the exception of cells 118 and 144 adjacent to statarea 518. There do not appear to be cells with consistently high bycatch rates outside of the CHSSA.

Plots of individual cell bycatch rates by week were made. The tendency of the CHSSA blocks to have high rates was indicated in the graphs, and there did not appear to be other candidate blocks with consistently high bycatch rates from week to week or year to year. The graphs appear very jumbled and are not included in the present draft.

Simulated block closure:

The chinook salmon bycatch rates by cell and week in each year were used to estimate the impacts on chinook salmon due to closures of specific cells to the pelagic trawl for pollock, the fishery with the highest bycatch of chinook salmon. In a manner similar to the Bering Sea bycatch model, catch from closed cells in each week was allocated to open cells in proportion to the catch in the cell in that week. The bycatch rate from each cell and week was used to estimate the number of chinook salmon which would occur given closure of a specific cell, and transfer of the effort to other cells. This effort does not contain any of the economic information necessary to describe fisheries impacts. The intent of this exercise is to estimate chinook salmon bycatch given cell closures and the fact that additional effort in open cells would be likely to increase salmon bycatch in those cells. 1995 data was excluded from the analysis because of the low bycatch in that year.

In contrast with the Bering Sea bycatch model, caps were not employed in this version of the analysis. The simulation is as if the blocks were closed for the entire year. The simulation uses the catch and bycatch information supplied by NMFS Observer Program and the numbers have not been expanded to unobserved hauls. The fact that there has been no expansion may result in differences from results using the expanded bycatch numbers. The combinations of cell closures included because of a history of high bycatch are as follows along with the estimated bycatch with the closure in place:

Year	1994	1996	1997
Total observed bycatch	13,747	27,863	22,381
Close 201	11,110	18,733	18,500
Close 201 and 227	10,146	17,316	17,523
Close 201 and 228	10,637	16,531	18,402
Close 201, 227 and 228	9,366	13,979	16,951
Close 201, 227, 228 and 200	9,226	12,450	15,746
Close 201, 227, 228 and 202	7,346	20,692	19,188
Close 201, 227, 228, 200 and 202	10,146	17,316	17,523

The results are also provided in Figure 24. The largest reduction in all years comes from the closure of 201. Under all closure scenarios, there were open cells available to the pelagic pollock fishery, and no catch was foregone.

The table below provides the percentage drop in total chinook salmon bycatch due to the closure and the results are also provided in Figure 25. The greatest overall chinook salmon savings was seen in the combined closure of cells 201, 227, 228, and 200. The closure of 202 tended to reduce the savings because of the lower bycatch rates experienced in that cell.

Year	1994	1996	1997
Close 201	19%	33%	17%
Close 201 and 227	26%	38%	22%
Close 201 and 228	23%	41%	18%
Close 201, 227 and 228	32%	50%	24%
Close 201, 227, 228 and 200	33%	55%	30%
Close 201, 227, 228 and 202	47%	26%	14%
Close 201, 227, 228, 200 and 202	26%	38%	22%

Additional Information

Additional information provided in figures at the end of this document indicate by week and cell and fishery, the number of cells fished, the total catch and bycatch in each cell. A discussion will be included in future drafts of this document.

Cell Reference Numbers

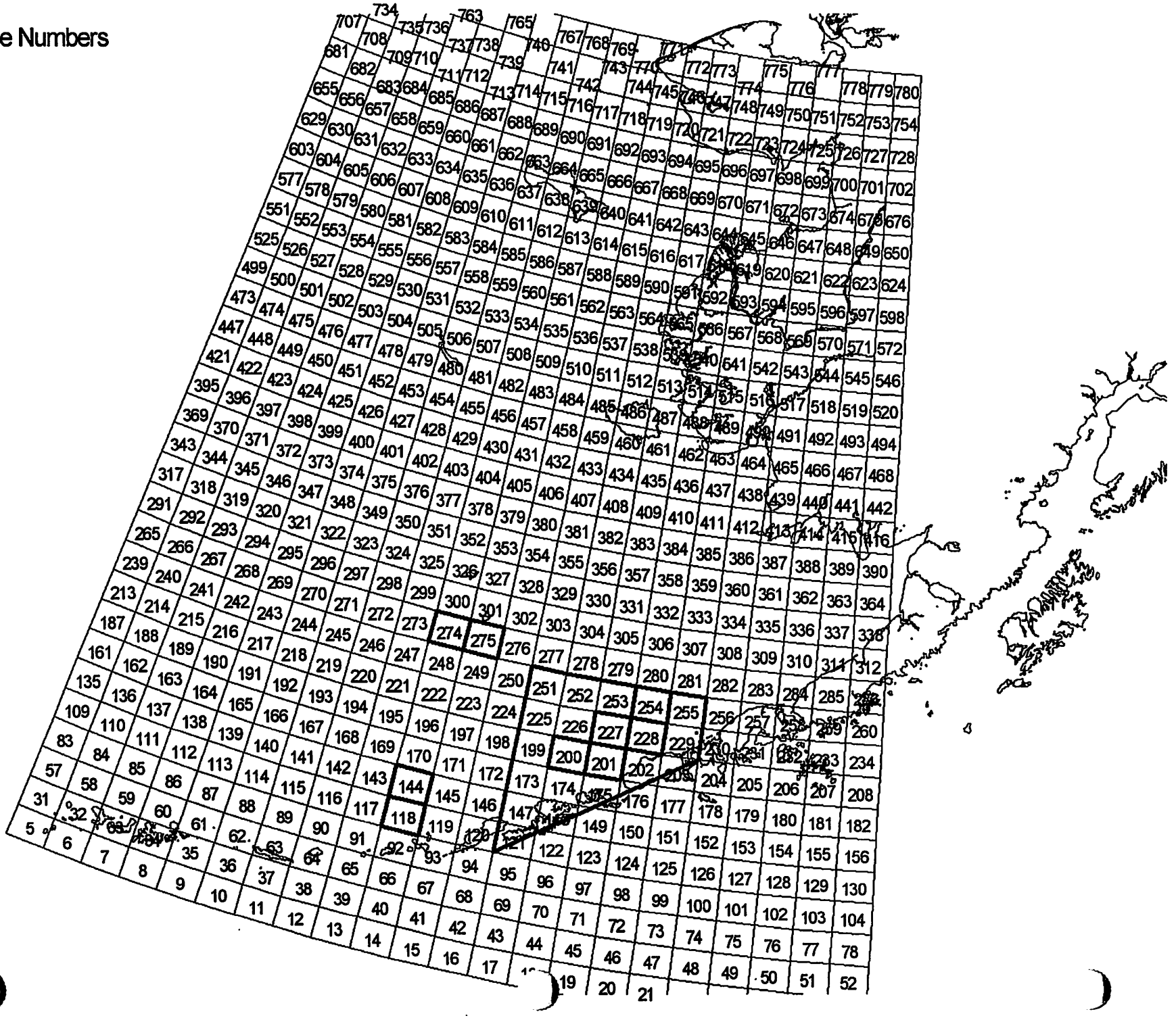


Figure 1

Figure 2

Number of observed chinook by block, 1994

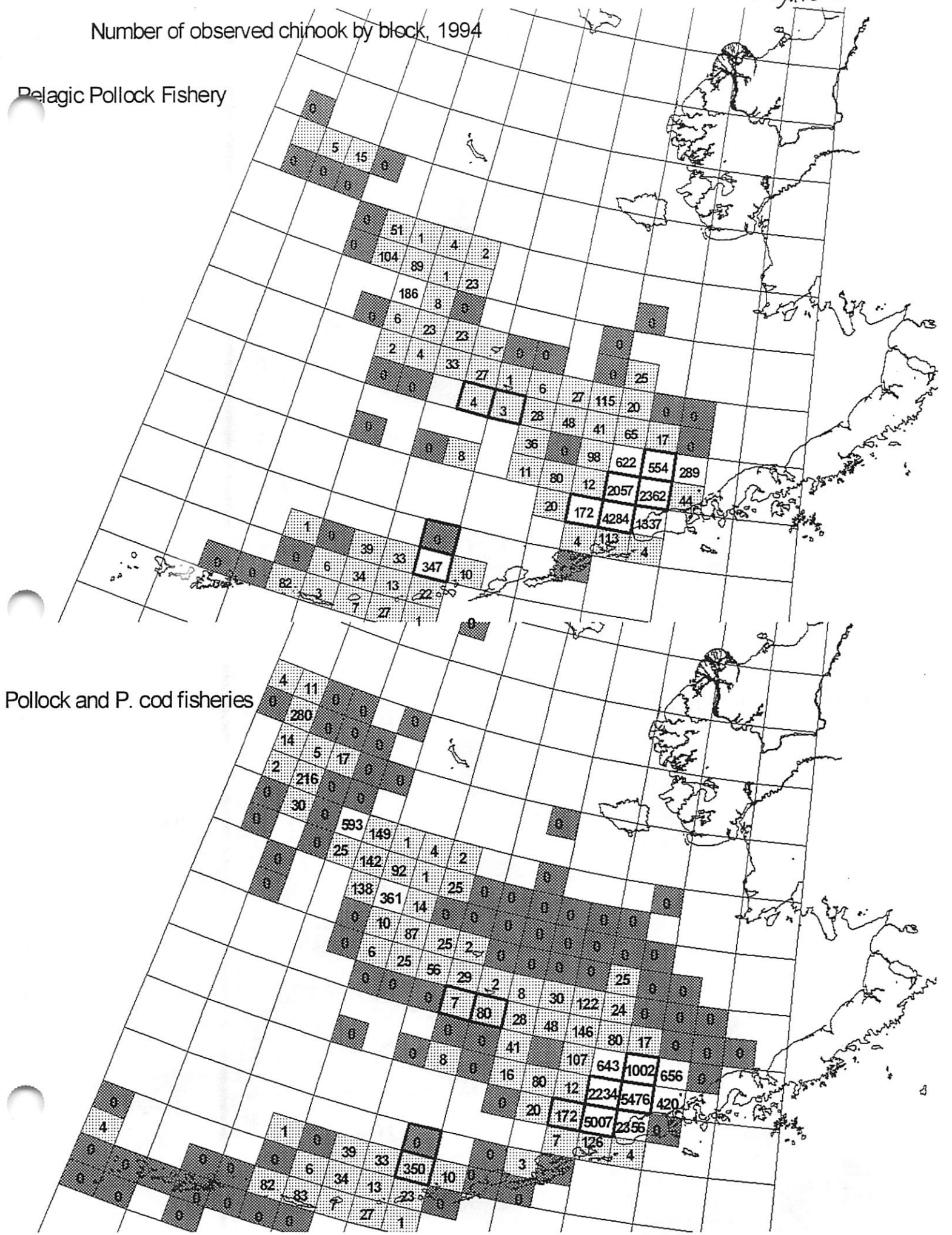
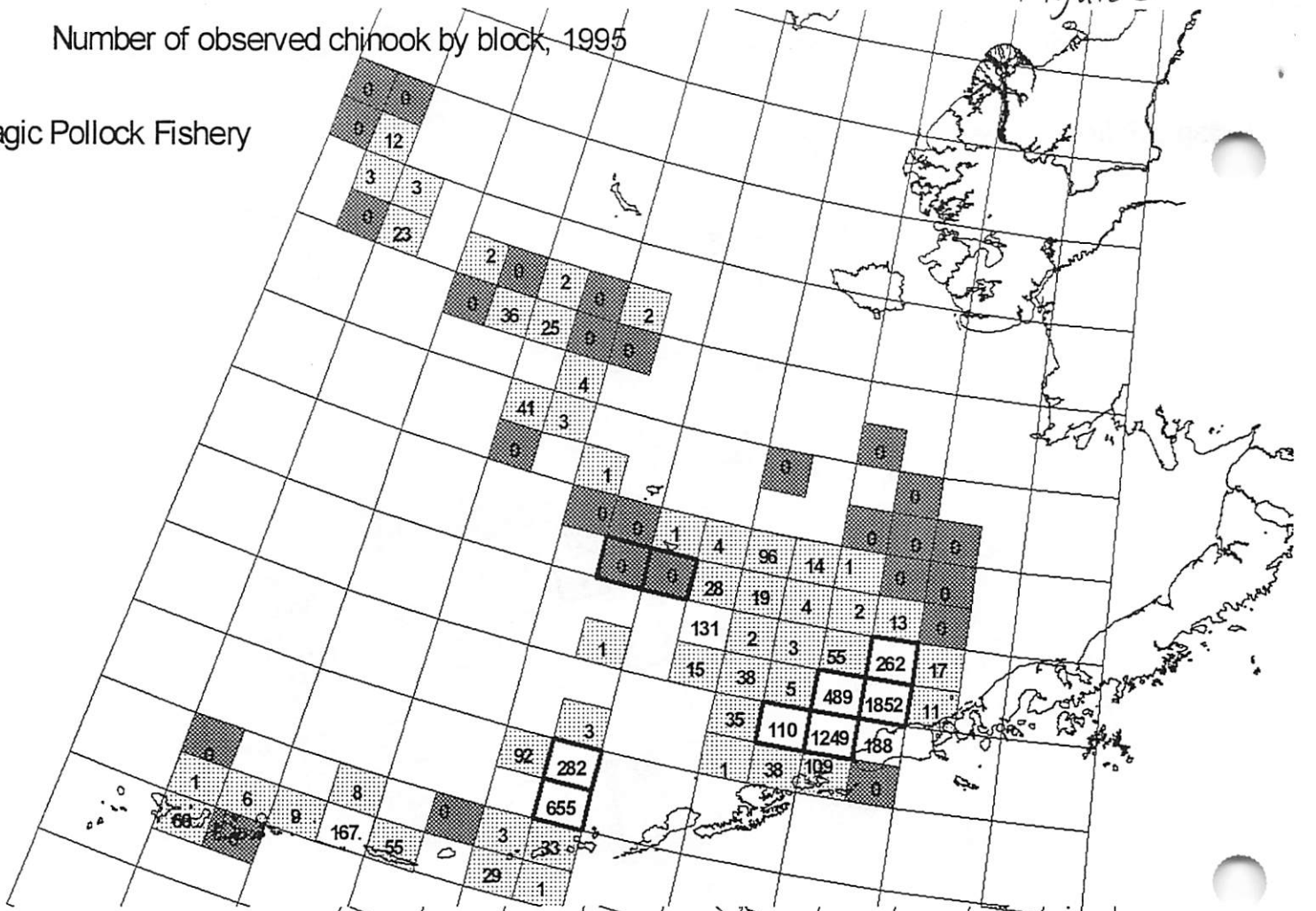


Figure 3

Number of observed chinook by block, 1995

Pelagic Pollock Fishery



Pollock and P. cod fisheries

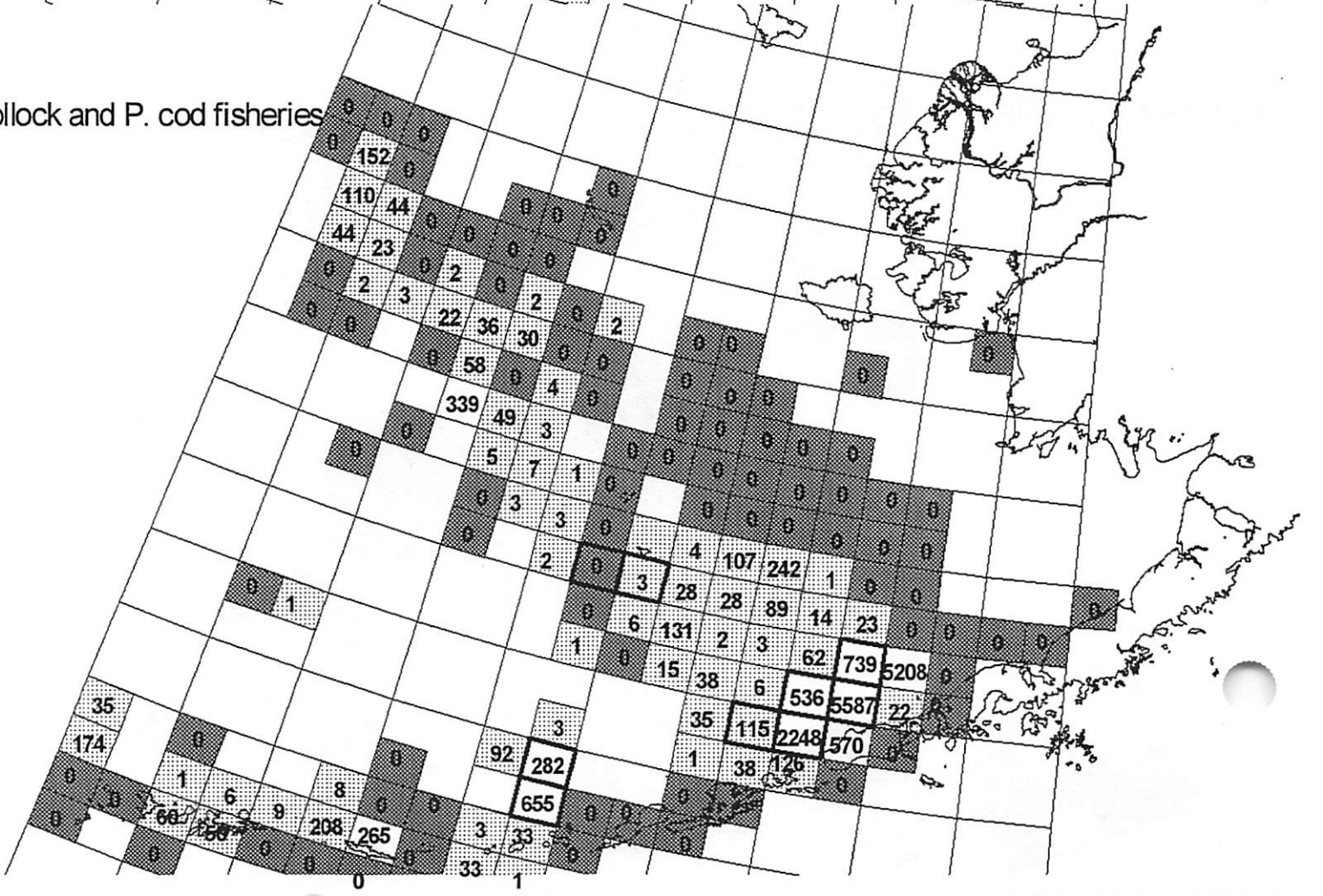


Figure 4

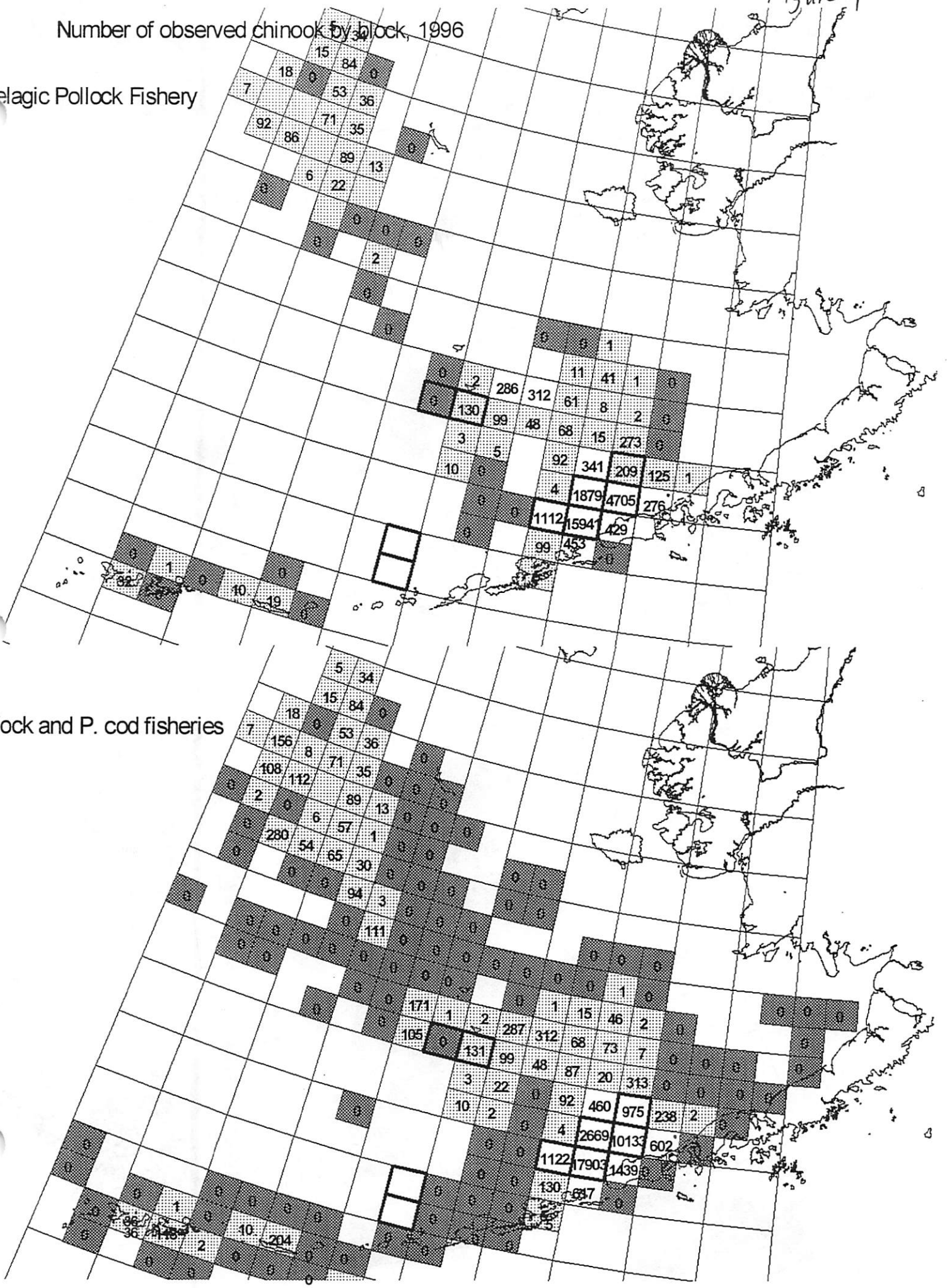
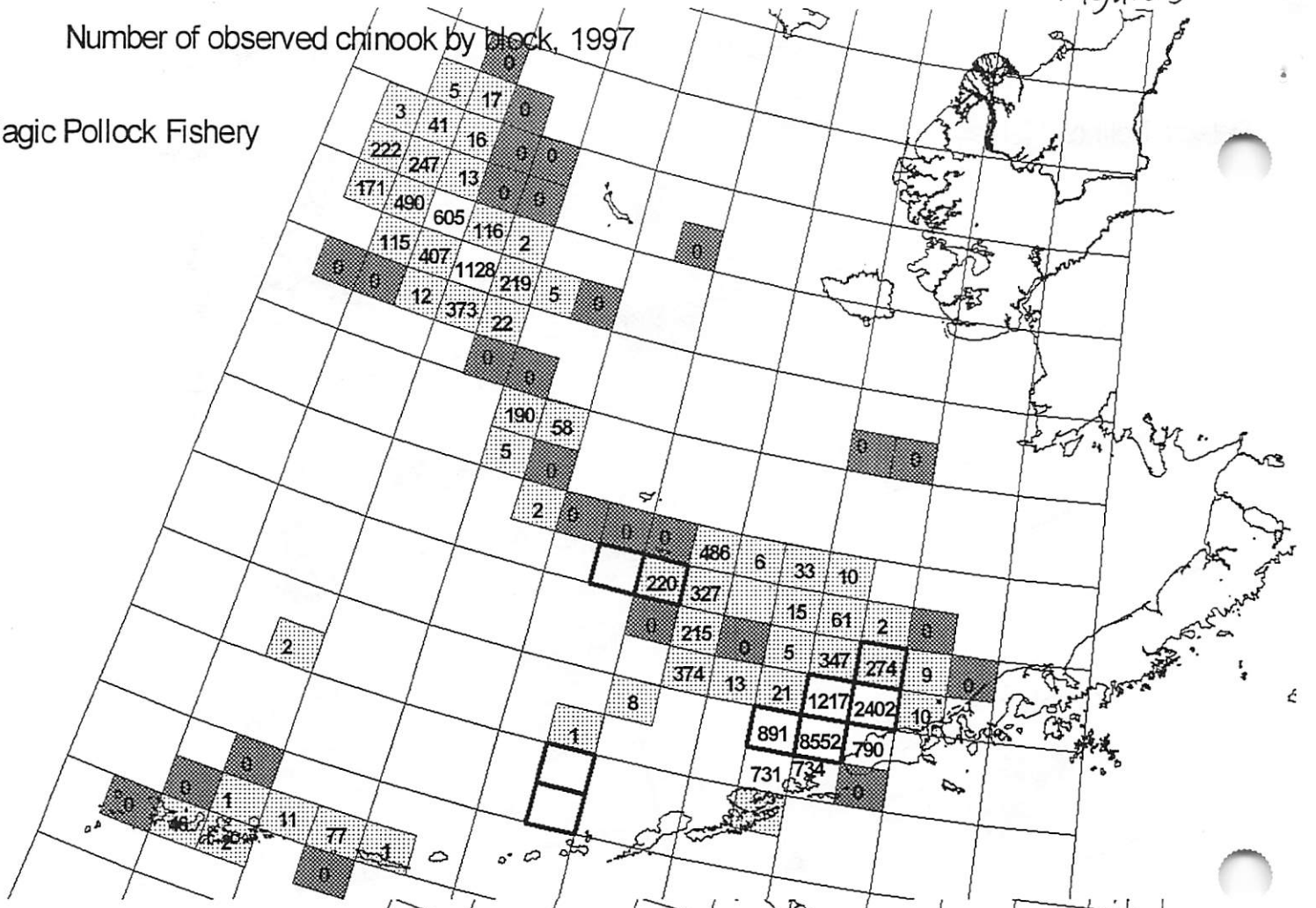

Number of observed chinook by block, 1996
Pelagic Pollock Fishery
Pollock and P. cod fisheries

Figure 5

Number of observed chinook by block, 1997

Pelagic Pollock Fishery



Pollock and P. cod fisheries

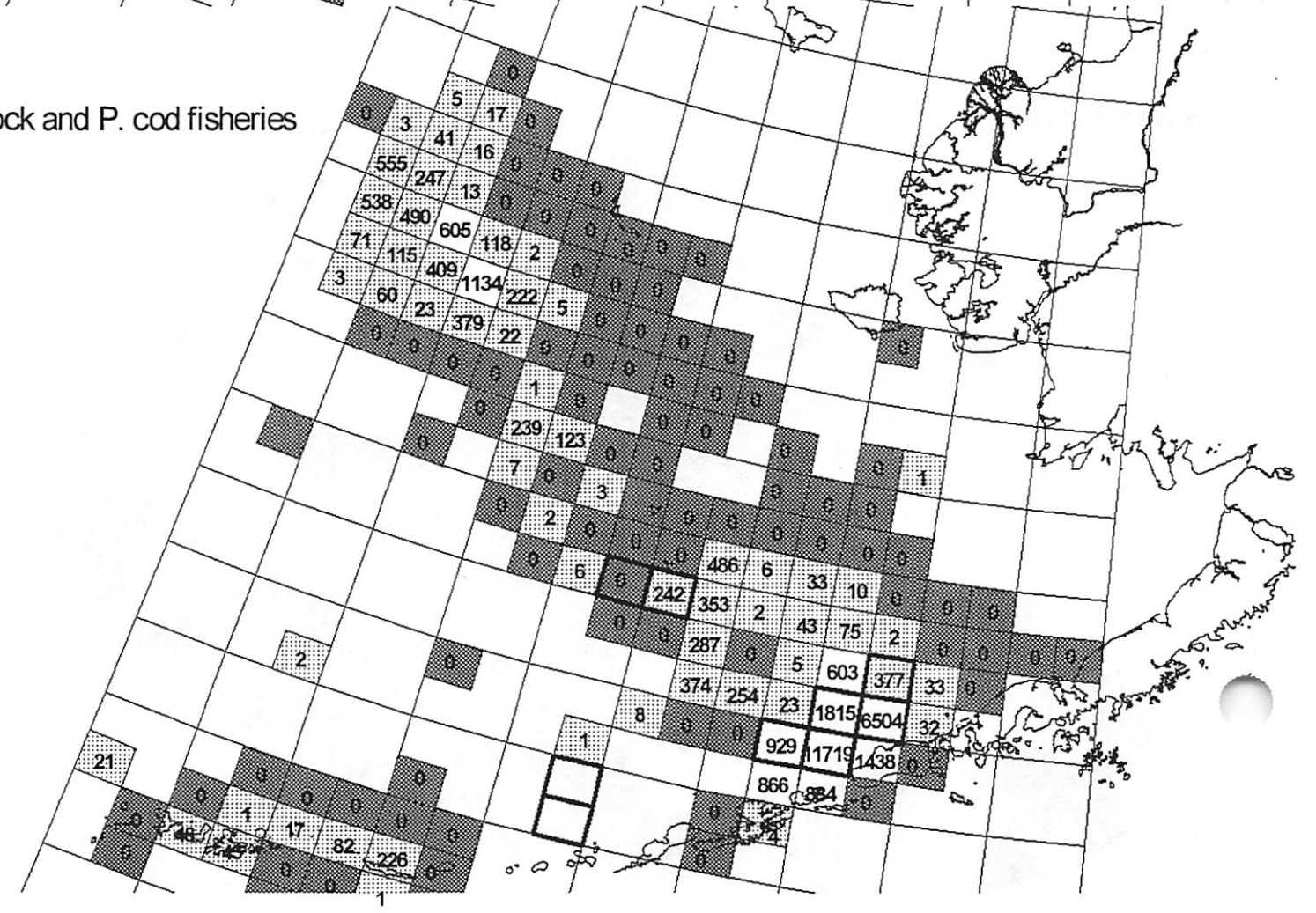
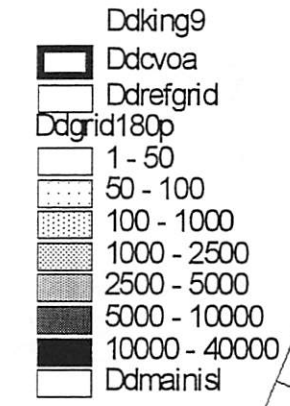
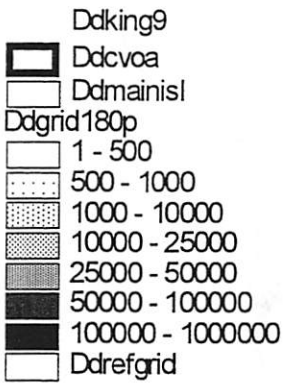


Figure 6

Pelagic Pollock: Cumulative catch and bycatch 1994-1997, numbers are number of years with non-zero catch.



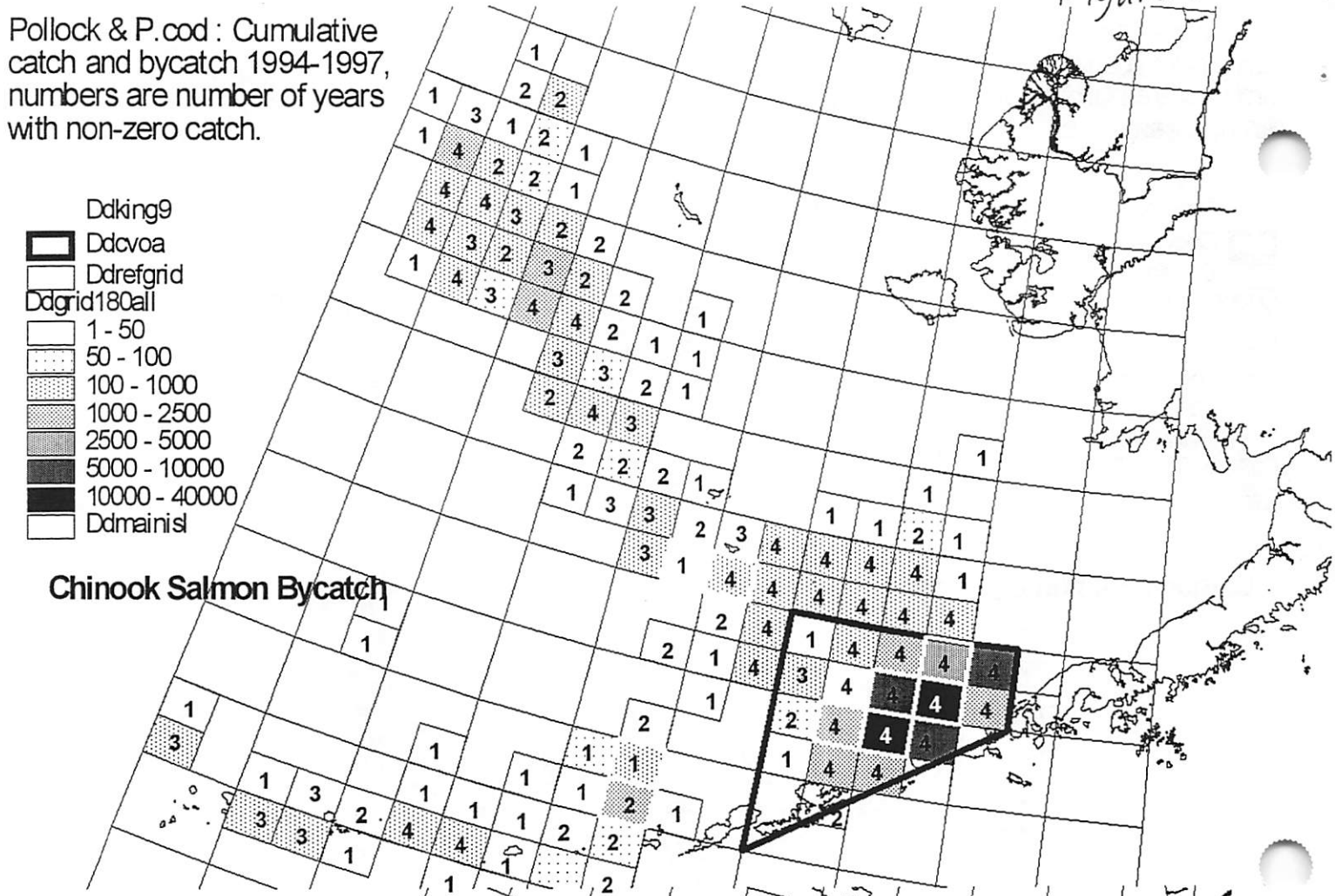
Chinook Salmon Bycatch



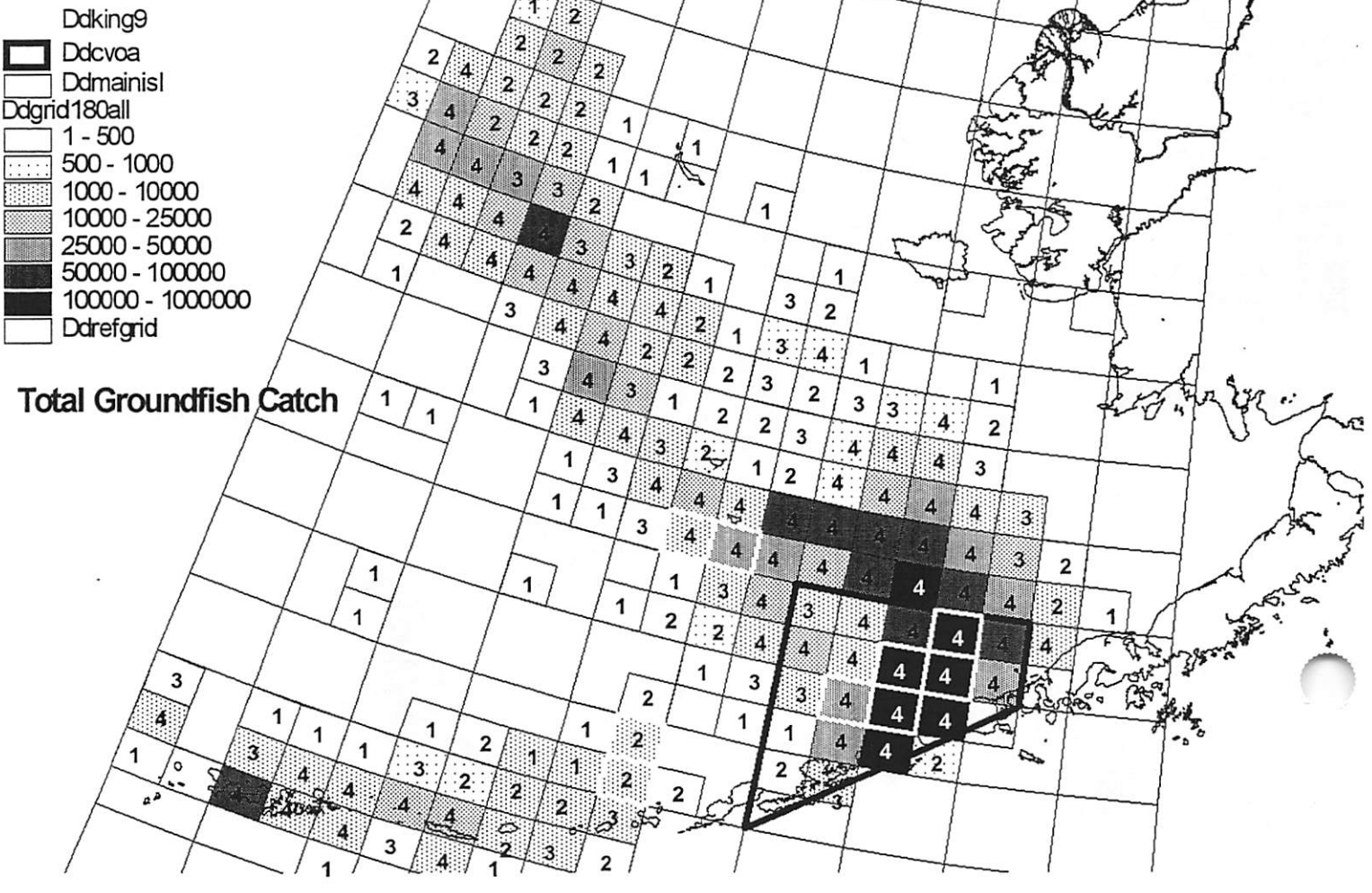
Total Groundfish Catch

Figure 7

Pollock & P.cod : Cumulative catch and bycatch 1994-1997, numbers are number of years with non-zero catch.



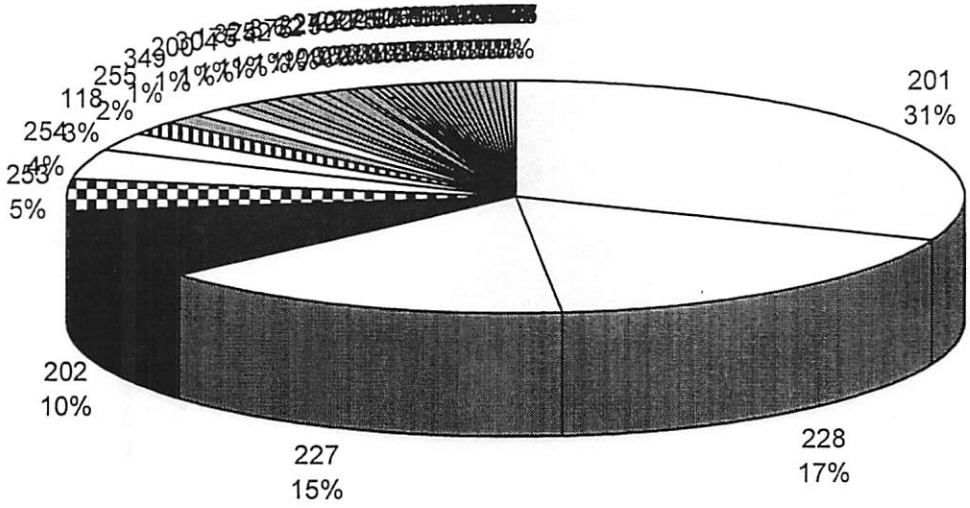
Chinook Salmon Bycatch



Total Groundfish Catch

Figure 8

Pelagic pollock fisheries, 1994 - Percentage of chinook bycatch by area. Cell codes as reference numbers.



Pelagic pollock fisheries, 1994 - Percentage of total groundfish catch by area. Cell codes as reference numbers.

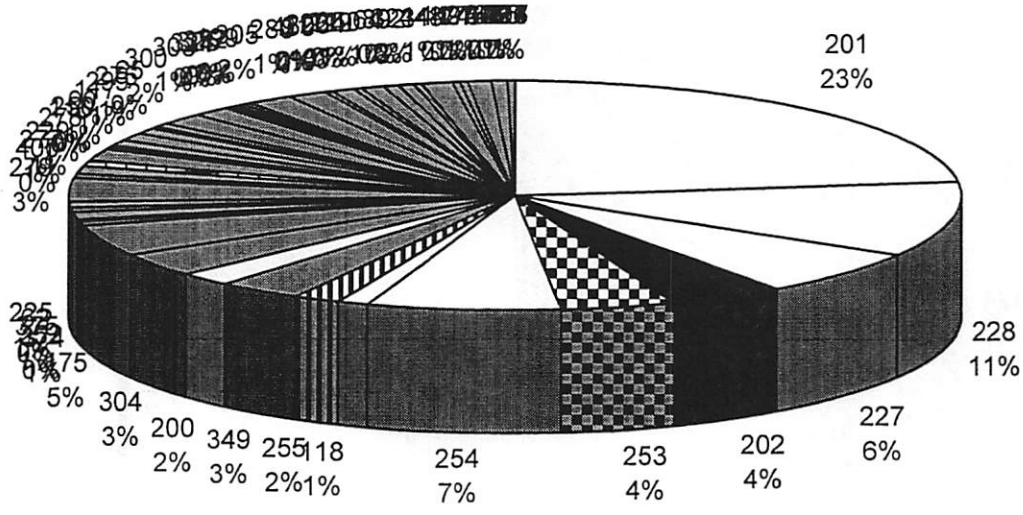
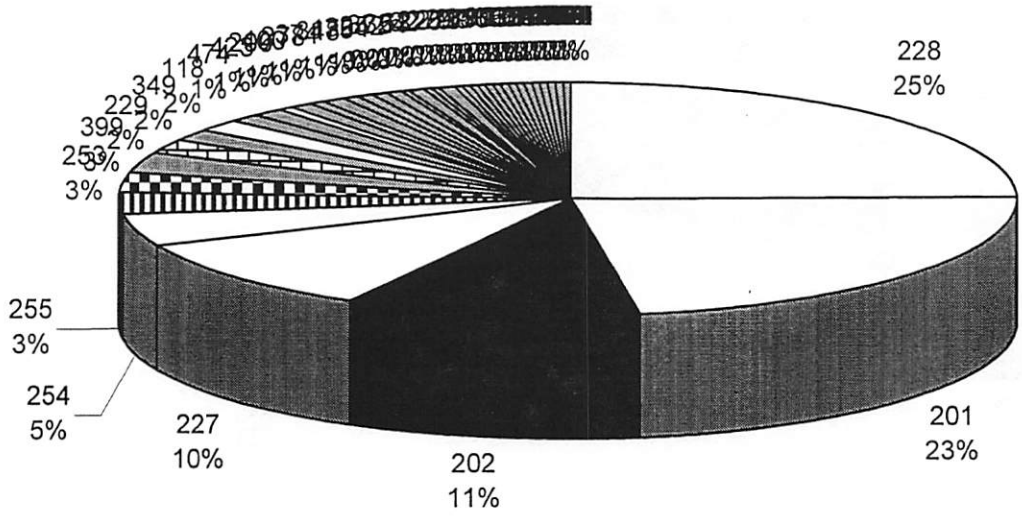


Figure 9

Pollock and P.cod fisheries, 1994 - Percentage of chinook bycatch by area. Cell codes as reference numbers.



Pollock and P.cod fisheries, 1994 - Percentage of total groundfish catch by area. Cell codes as reference numbers.

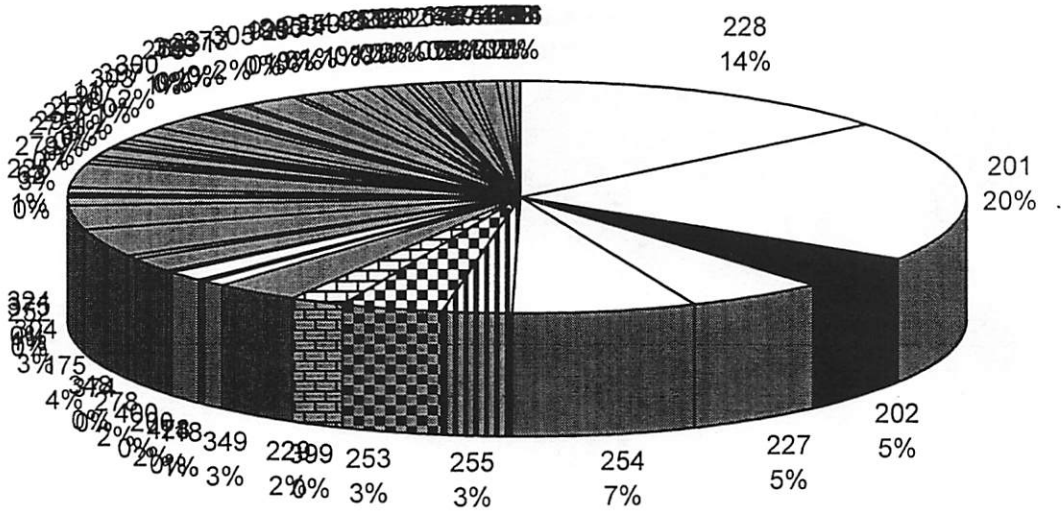
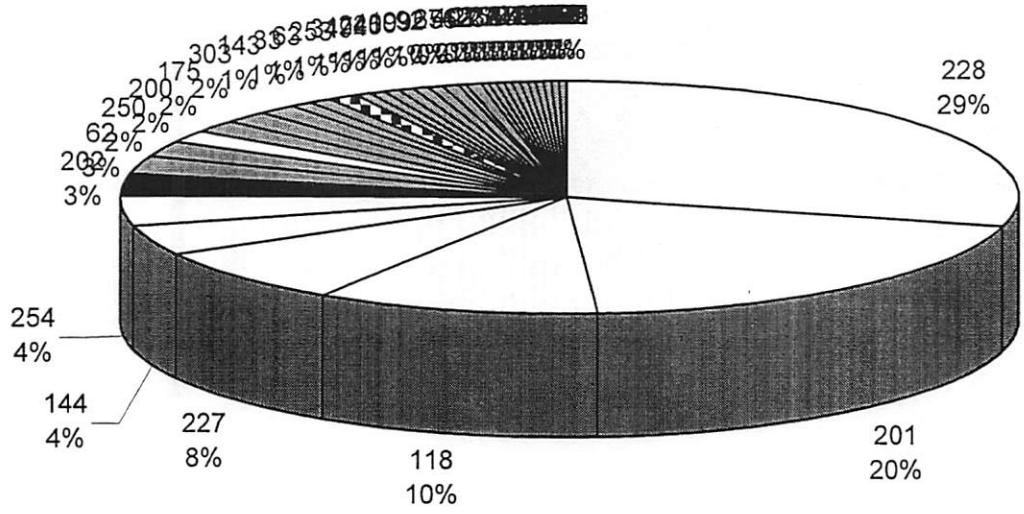


Figure 10

Pelagic pollock fisheries, 1995 - Percentage of chinook bycatch by area. Cell codes as reference numbers.



Pelagic pollock fisheries, 1995 - Percentage of total groundfish catch by area. Cell codes as reference numbers.

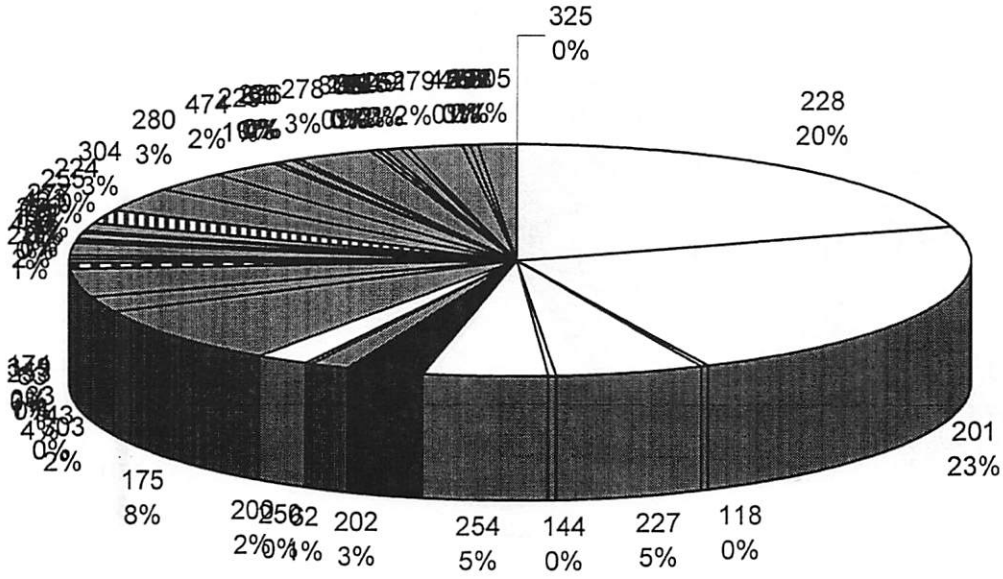
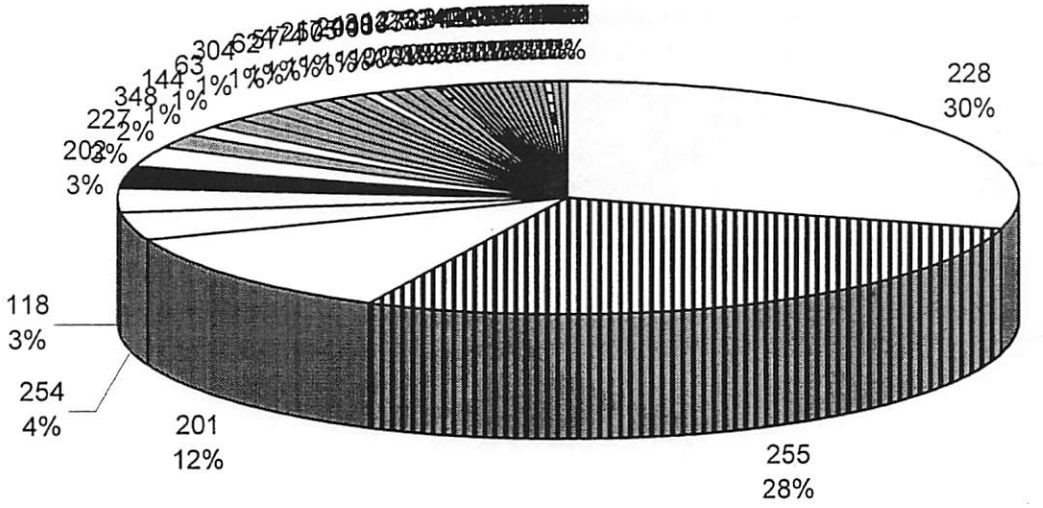


Figure 11

Pollock and P.cod fisheries, 1995 - Percentage of chinook bycatch by area. Cell codes as reference numbers.



Pollock and P.cod fisheries, 1995 - Percentage of total groundfish catch by area. Cell codes as reference numbers.

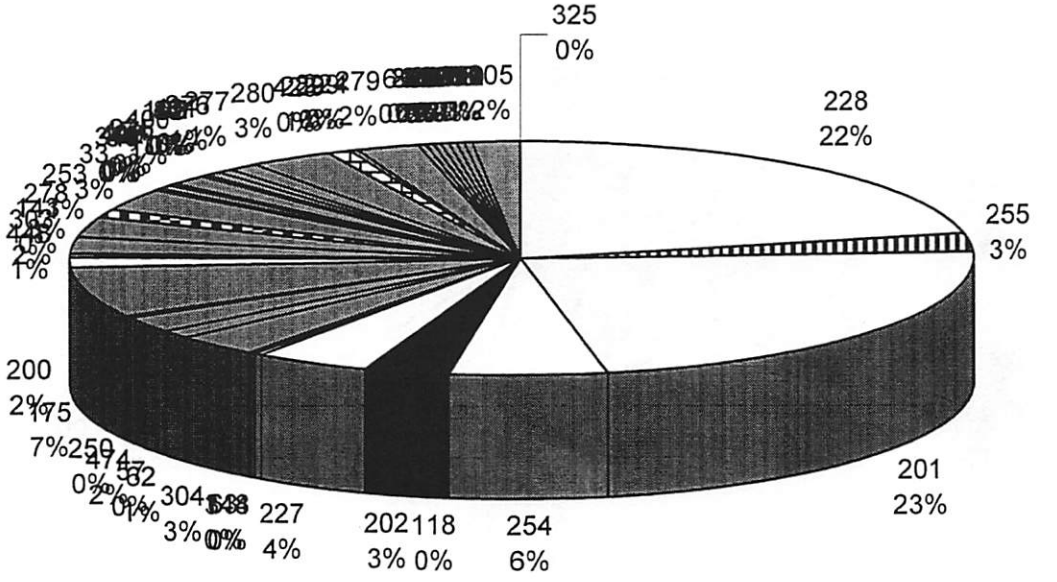
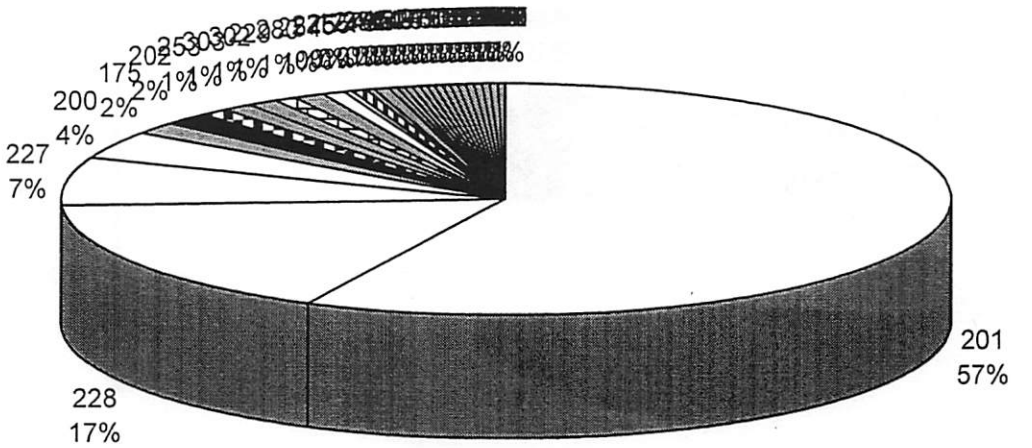


Figure 12

Pelagic pollock fisheries, 1996 - Percentage of chinook bycatch by area. Cell codes as reference numbers.



Pelagic pollock fisheries, 1996 - Percentage of total groundfish catch by area. Cell codes as reference numbers.

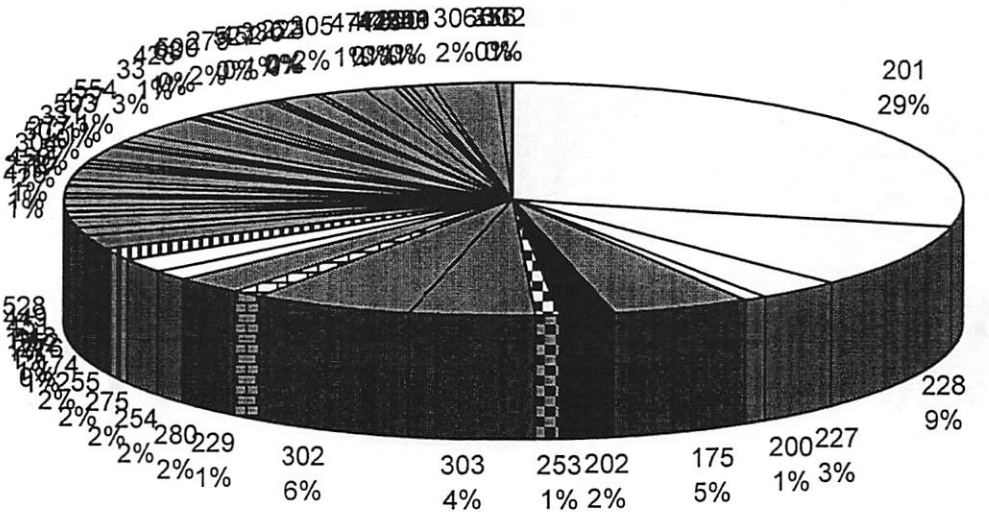
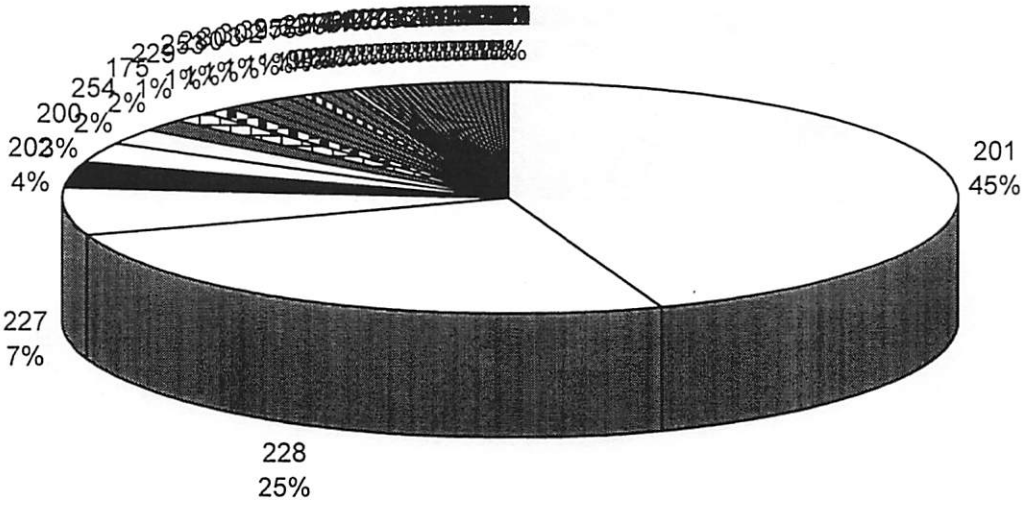


Figure 13

Pollock and P.cod fisheries, 1996 - Percentage of chinook bycatch by area. Cell codes as reference numbers.



Pollock and P.cod fisheries, 1996 - Percentage of total groundfish catch by area. Cell codes as reference numbers.

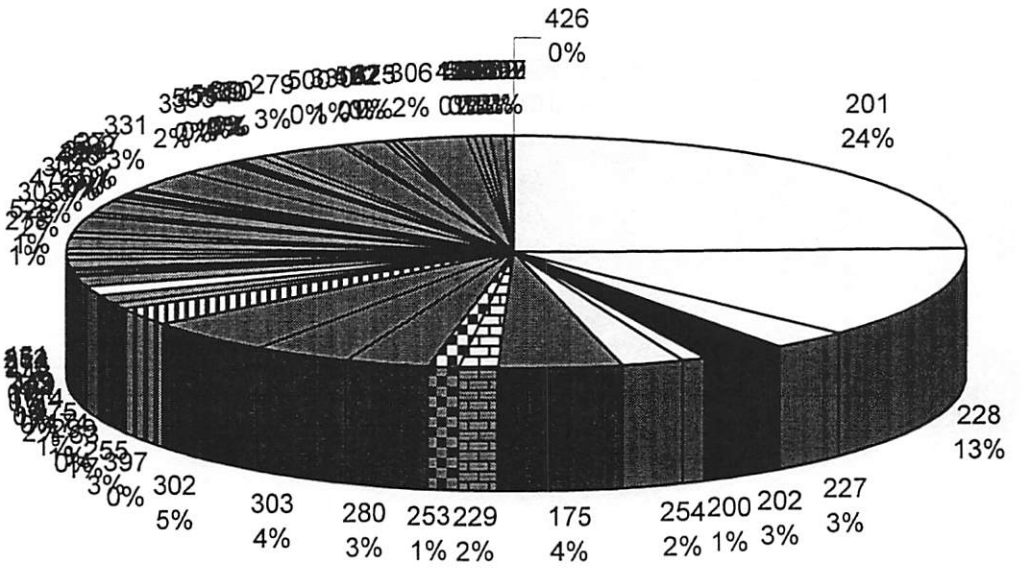
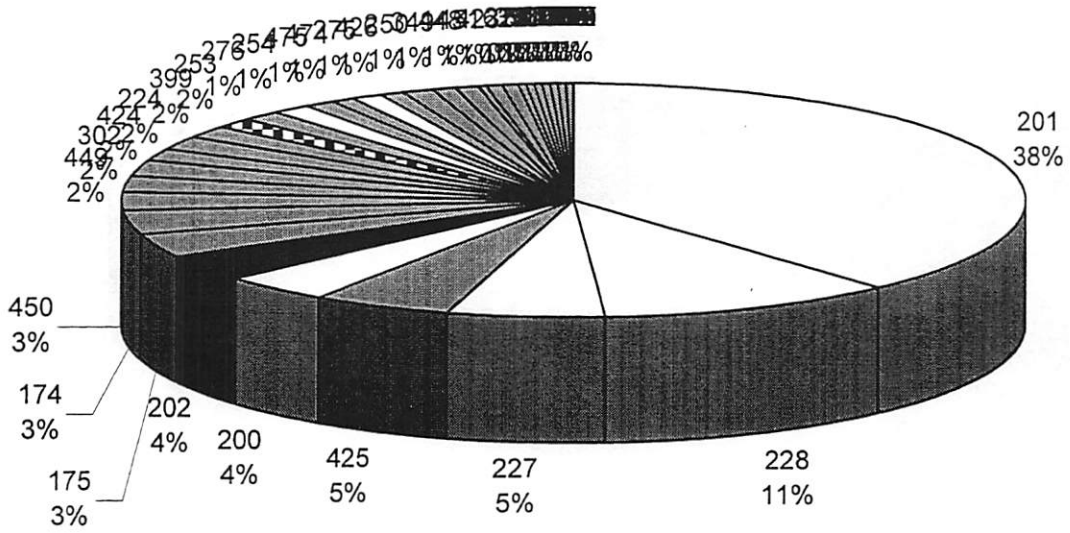


Figure 14

Pelagic pollock fisheries, 1997 - Percentage of chinook bycatch by area. Cell codes as reference numbers.



Pelagic pollock fisheries, 1997 - Percentage of total groundfish catch by area. Cell codes as reference numbers.

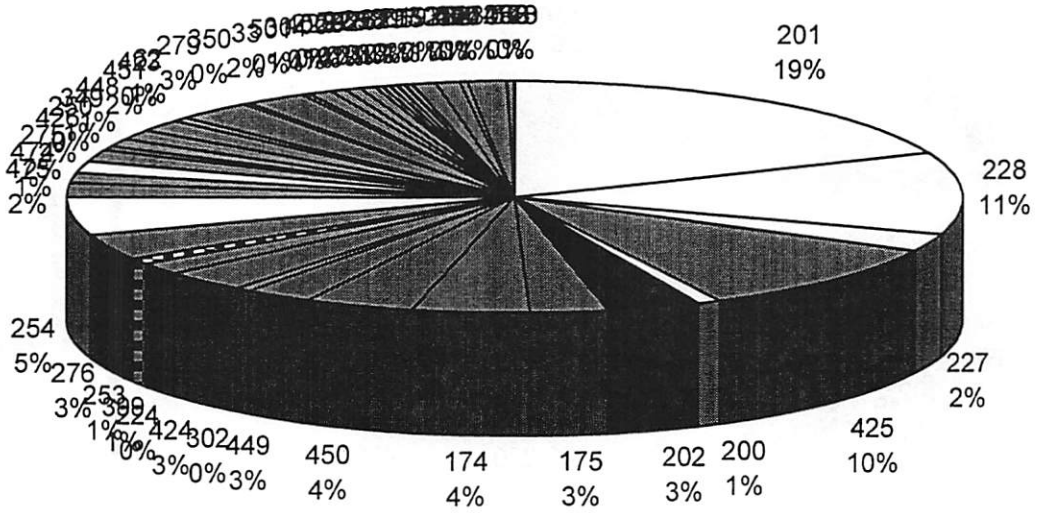
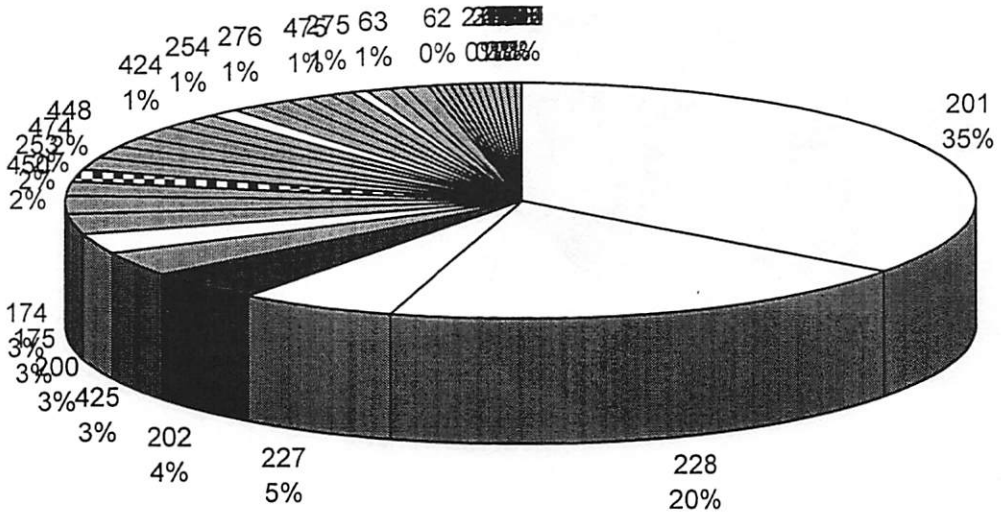
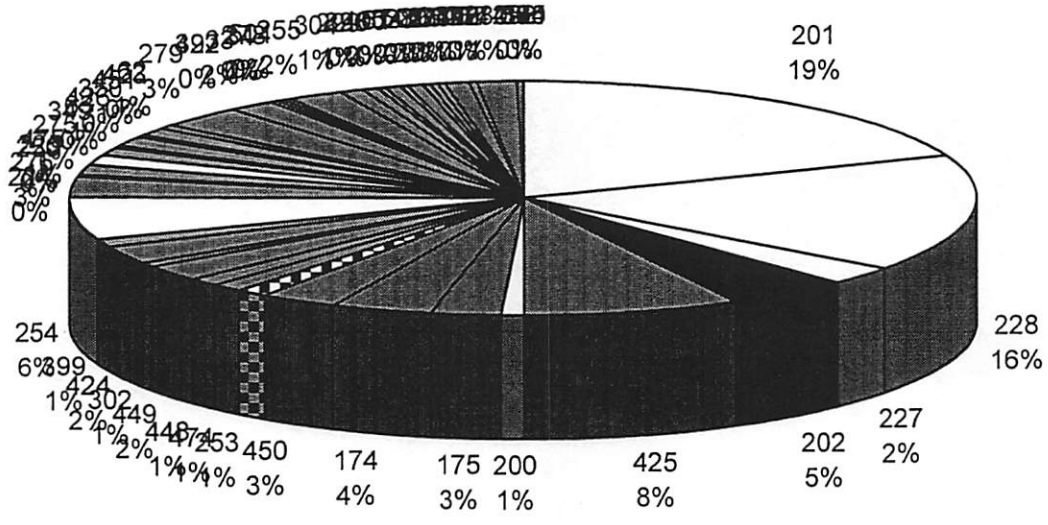


Figure 15

Pollock and P.cod fisheries, 1997 - Percentage of chinook bycatch by area. Cell codes as reference numbers.



Pollock and P.cod fisheries, 1997 - Percentage of total groundfish catch by area. Cell codes as reference numbers.



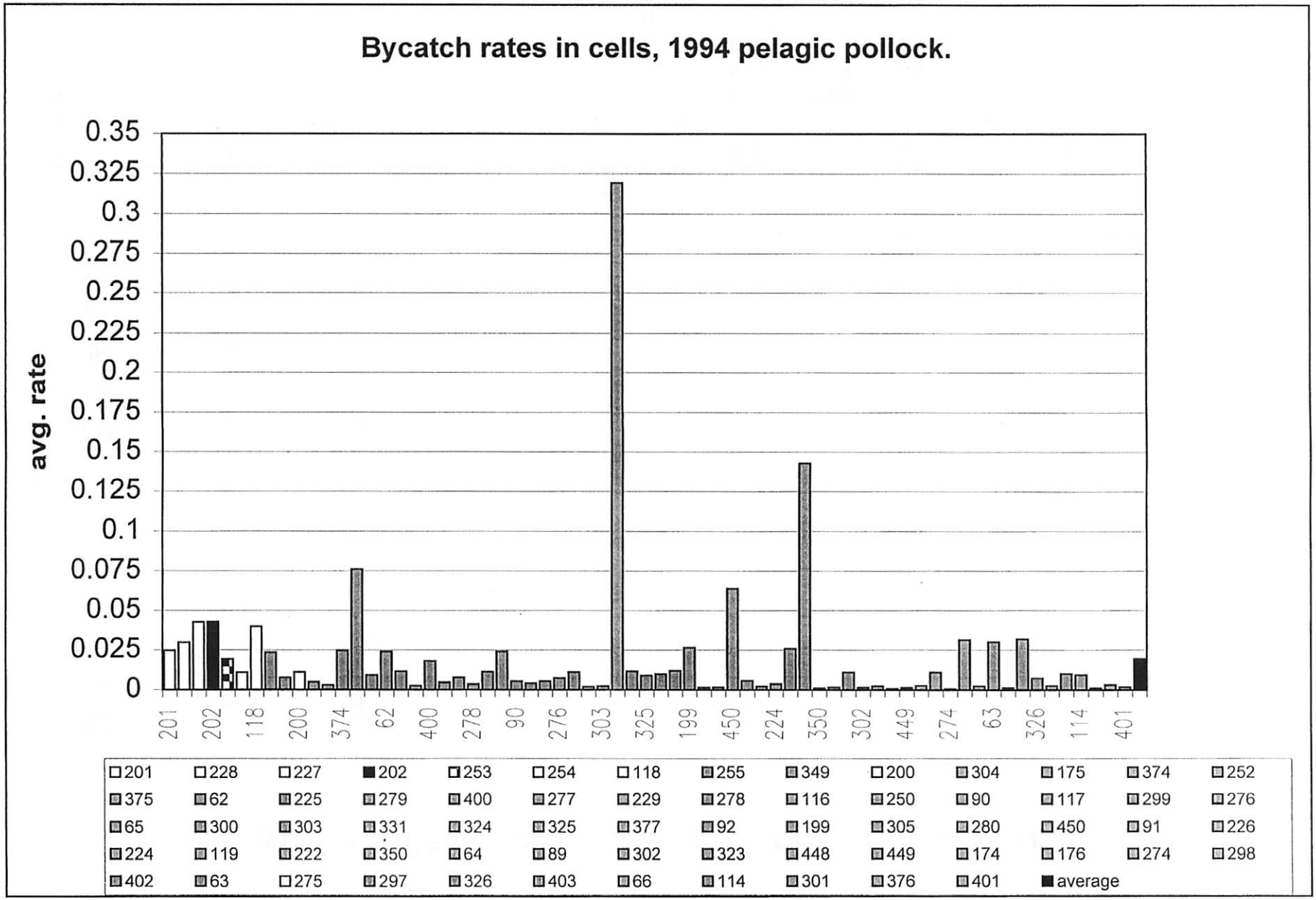

Bycatch rates in cells, 1994 pelagic pollock.
avg. rate
0.35
0.325
0.3
0.275
0.25
0.225
0.2
0.175
0.15
0.125
0.1
0.075
0.05
0.025
0
201 202 118 200 374 62 400 278 90 276 303 325 199 450 224 350 302 449 274 63 326 114 401
201 228 227 202 253 254 118 255 349 200 304 175 374 252
375 62 225 279 400 277 229 278 116 250 90 117 299 276
65 300 303 331 324 325 377 92 199 305 280 450 91 226
224 119 222 350 64 89 302 323 448 449 174 176 274 298
402 63 275 297 326 403 66 114 301 376 401 average

Figure 16

Bycatch rates in cells, 1994 pollock or P. cod hauls.

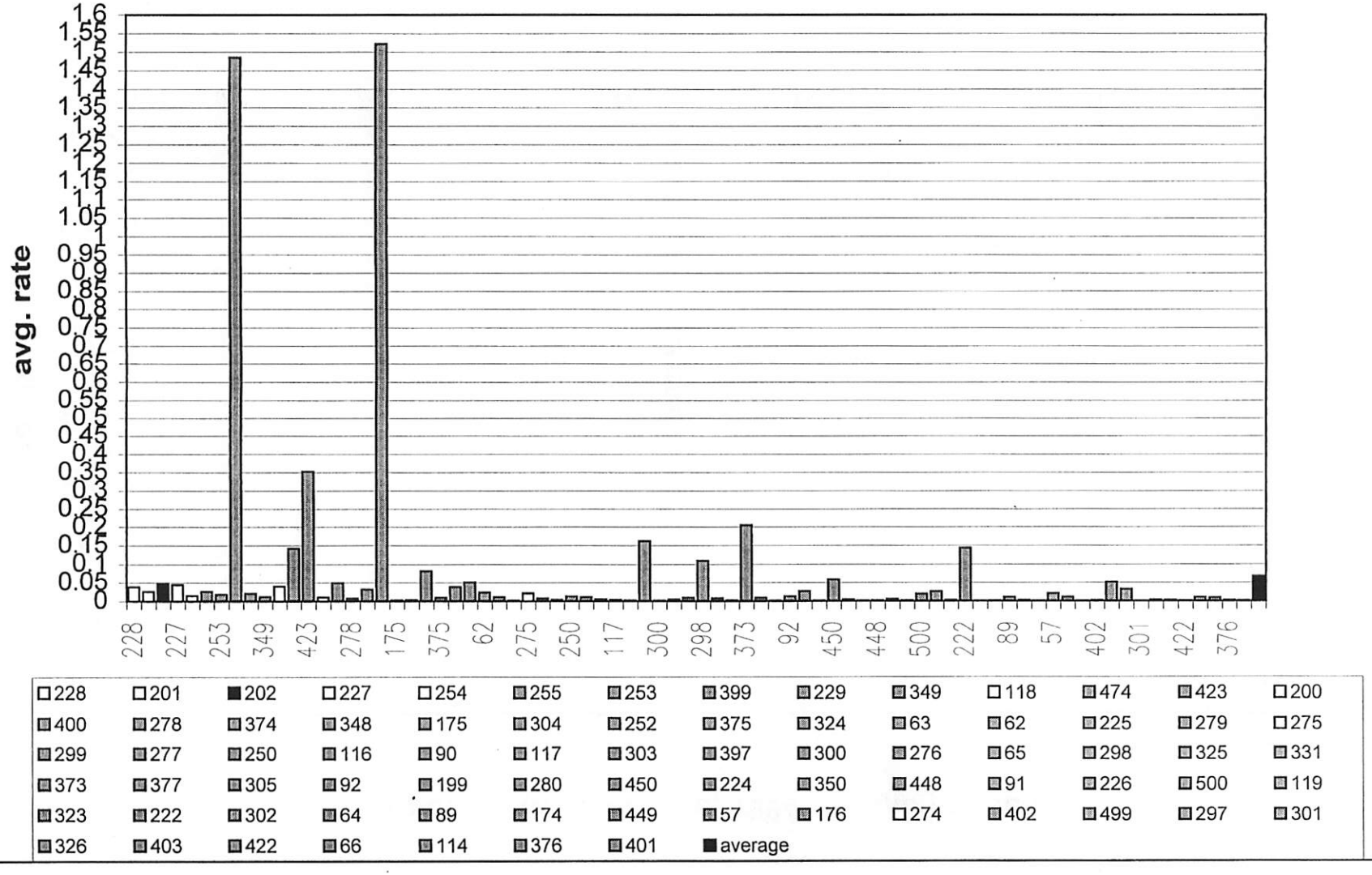


Figure 17

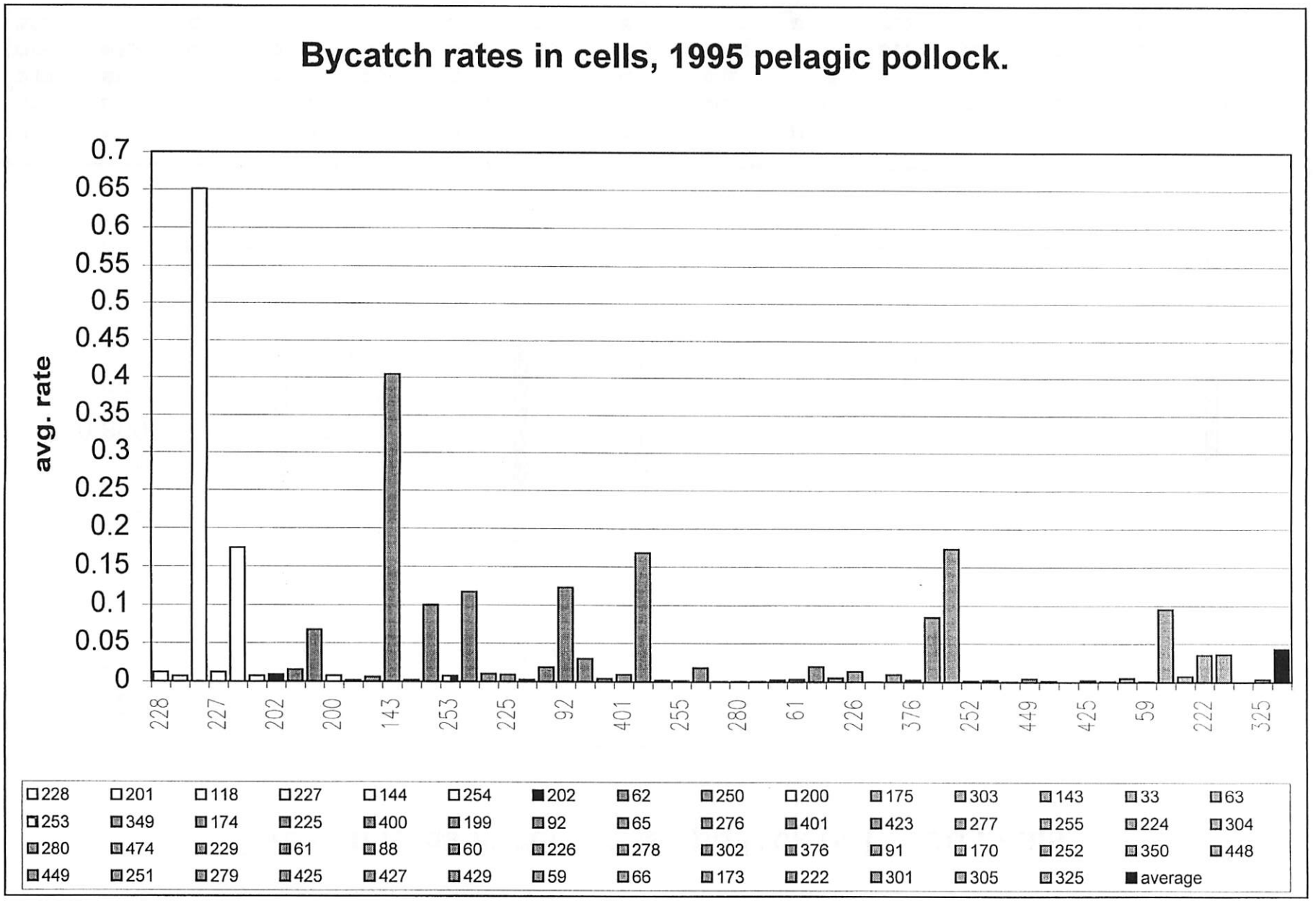

Bycatch rates in cells, 1995 pelagic pollock.
avg. rate
0.7
0.65
0.6
0.55
0.5
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
228
227
202
200
143
253
225
92
401
255
280
61
226
376
252
449
425
59
222
325
228 201 118 227 144 254 202 62 250 200 175 303 143 33 63
253 349 174 225 400 199 92 65 276 401 423 277 255 224 304
280 474 229 61 88 60 226 278 302 376 91 170 252 350 448
449 251 279 425 427 429 59 66 173 222 301 305 325 average

Figure 15

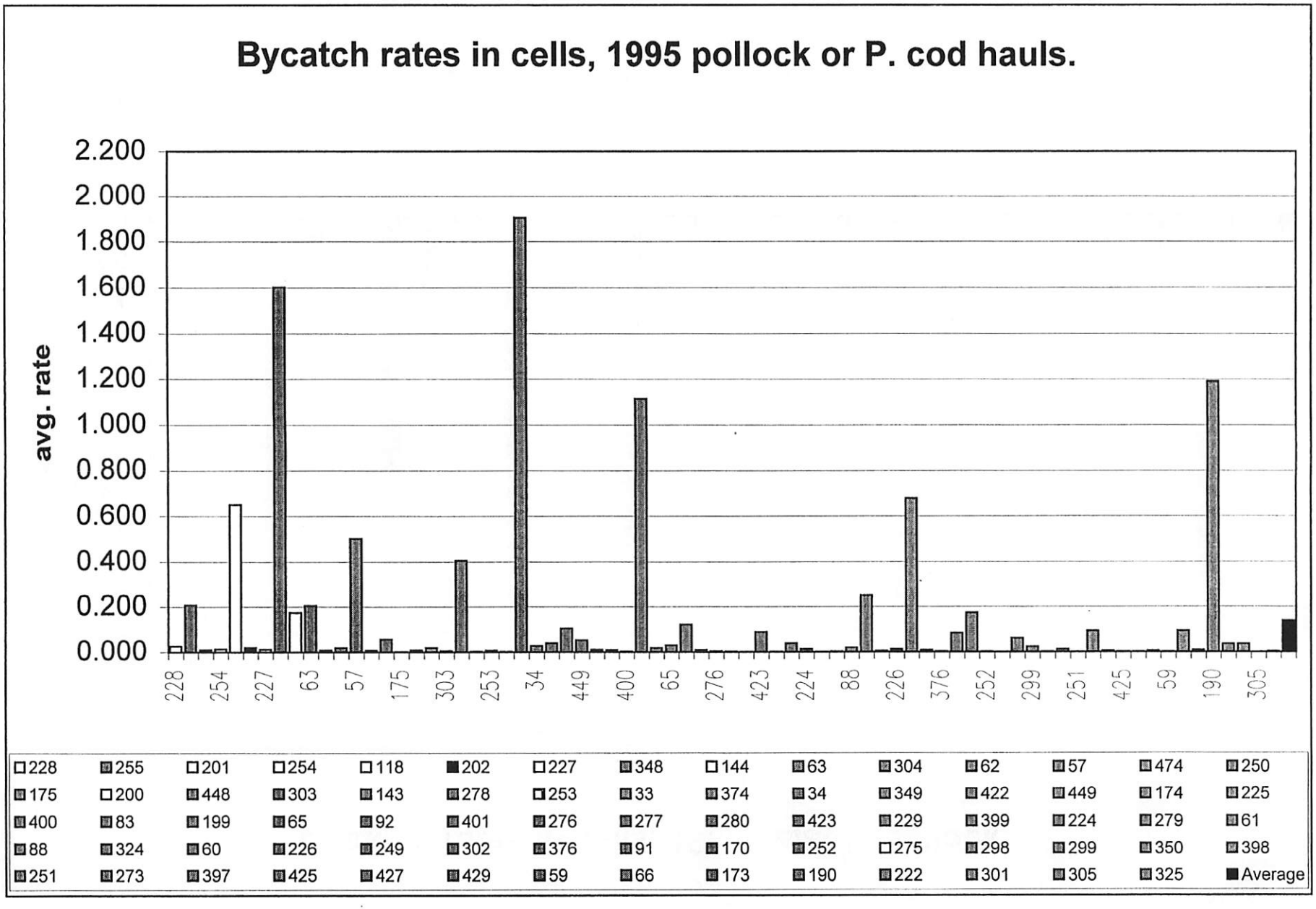

Bycatch rates in cells, 1995 pollock or P. cod hauls.
avg. rate
2.200
2.000
1.800
1.600
1.400
1.200
1.000
0.800
0.600
0.400
0.200
0.000
228 254 227 63 57 175 303 253 34 449 400 65 276 423 224 88 226 376 252 299 251 425 59 190 305
228 255 201 254 118 202 227 348 144 63 304 62 57 474 250
175 200 448 303 143 278 253 33 374 34 349 422 449 174 225
400 83 199 65 92 401 276 277 280 423 229 399 224 279 61
88 324 60 226 249 302 376 91 170 252 275 298 299 350 398
251 273 397 425 427 429 59 66 173 190 222 301 305 325 Average

Figure 19

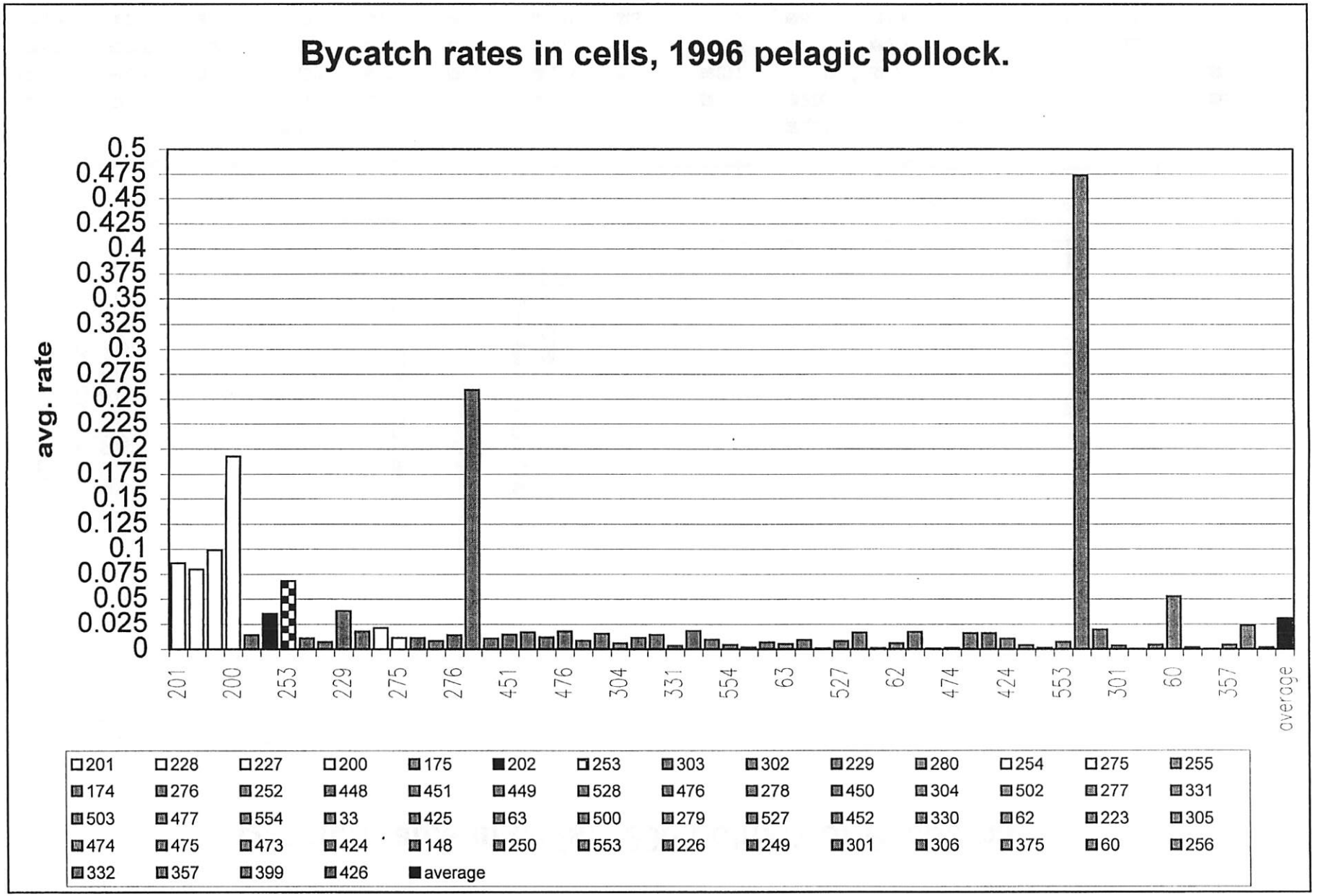
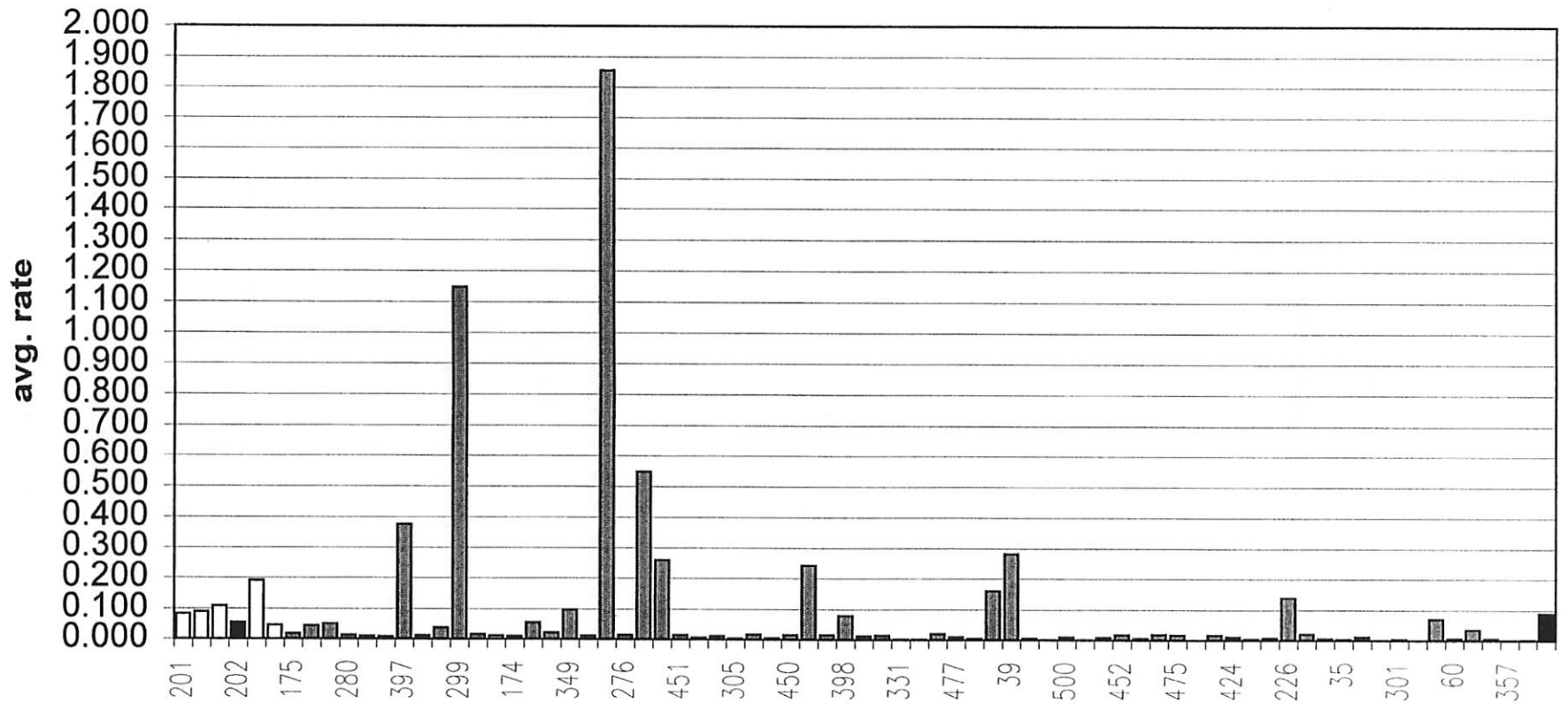

Bycatch rates in cells, 1996 pelagic pollock.
avg. rate
0.5
0.475
0.45
0.425
0.4
0.375
0.35
0.325
0.3
0.275
0.25
0.225
0.2
0.175
0.15
0.125
0.1
0.075
0.05
0.025
0
201
200
253
229
275
276
451
476
304
331
554
63
527
62
474
424
553
301
60
357
average
201 228 227 200 175 202 253 303 302 229 280 254 275 255
174 276 252 448 451 449 528 476 278 450 304 502 277 331
503 477 554 33 425 63 500 279 527 452 330 62 223 305
474 475 473 424 148 250 553 226 249 301 306 375 60 256
332 357 399 426 average

Figure 20

Bycatch rates in cells, 1996 pollock or P. cod hauls.



201	228	227	202	200	254	175	229	253	280	303	302	397	255	63
299	474	275	174	34	449	349	448	273	276	374	252	451	278	528
305	476	304	450	399	425	398	502	277	331	33	503	477	554	400
39	250	279	500	330	527	452	62	223	475	306	473	424	148	553
226	249	375	35	224	256	301	332	422	60	300	329	357	426	average

Figure 21.

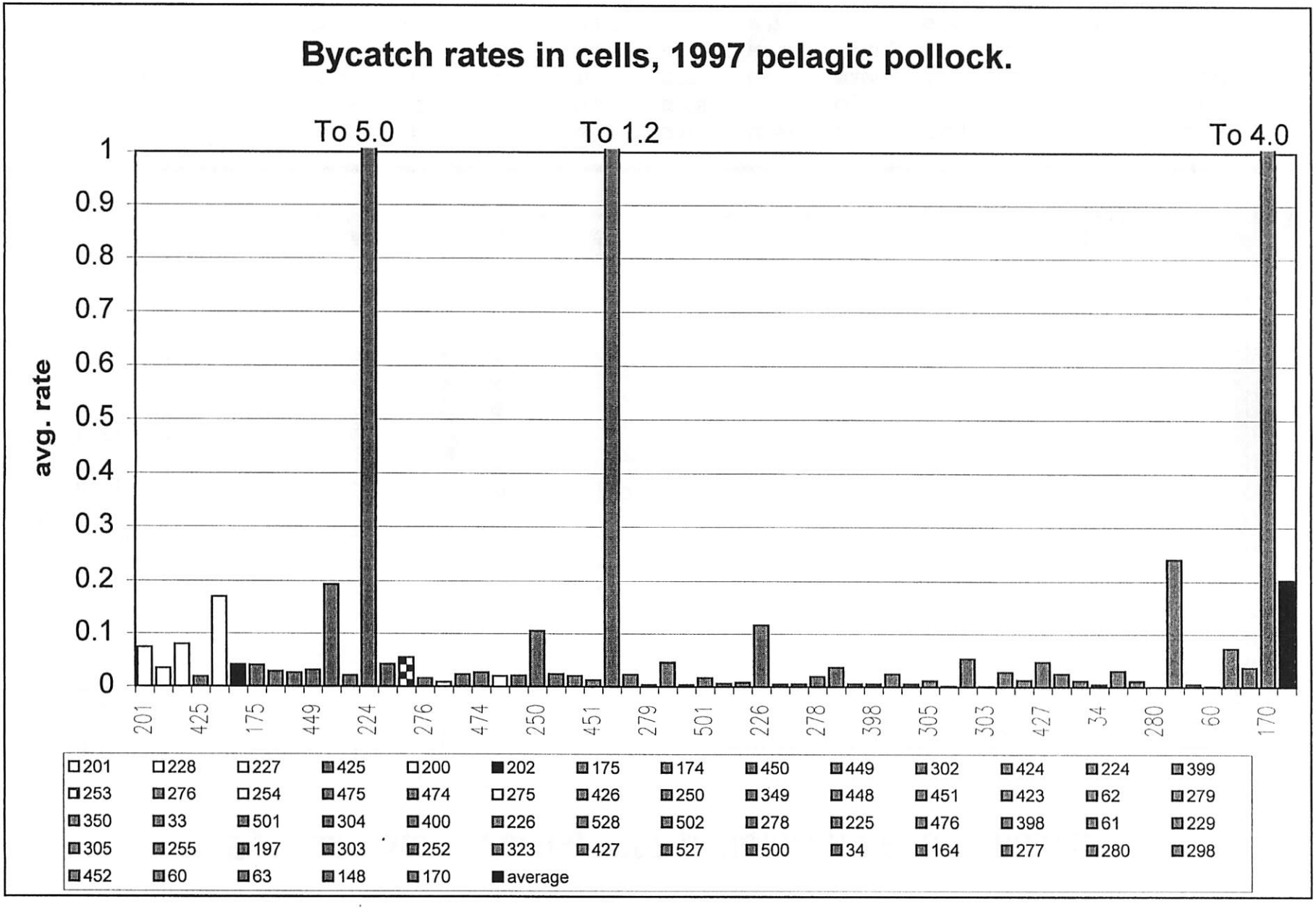

Bycatch rates in cells, 1997 pelagic pollock.
To 5.0
To 1.2
To 4.0
avg. rate
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
201 425 175 449 224 276 474 250 451 279 501 226 278 398 305 303 427 34 280 60 170
201 228 227 425 200 202 175 174 450 449 302 424 224 399
253 276 254 475 474 275 426 250 349 448 451 423 62 279
350 33 501 304 400 226 528 502 278 225 476 398 61 229
305 255 197 303 252 323 427 527 500 34 164 277 280 298
452 60 63 148 170 average

Figure 22

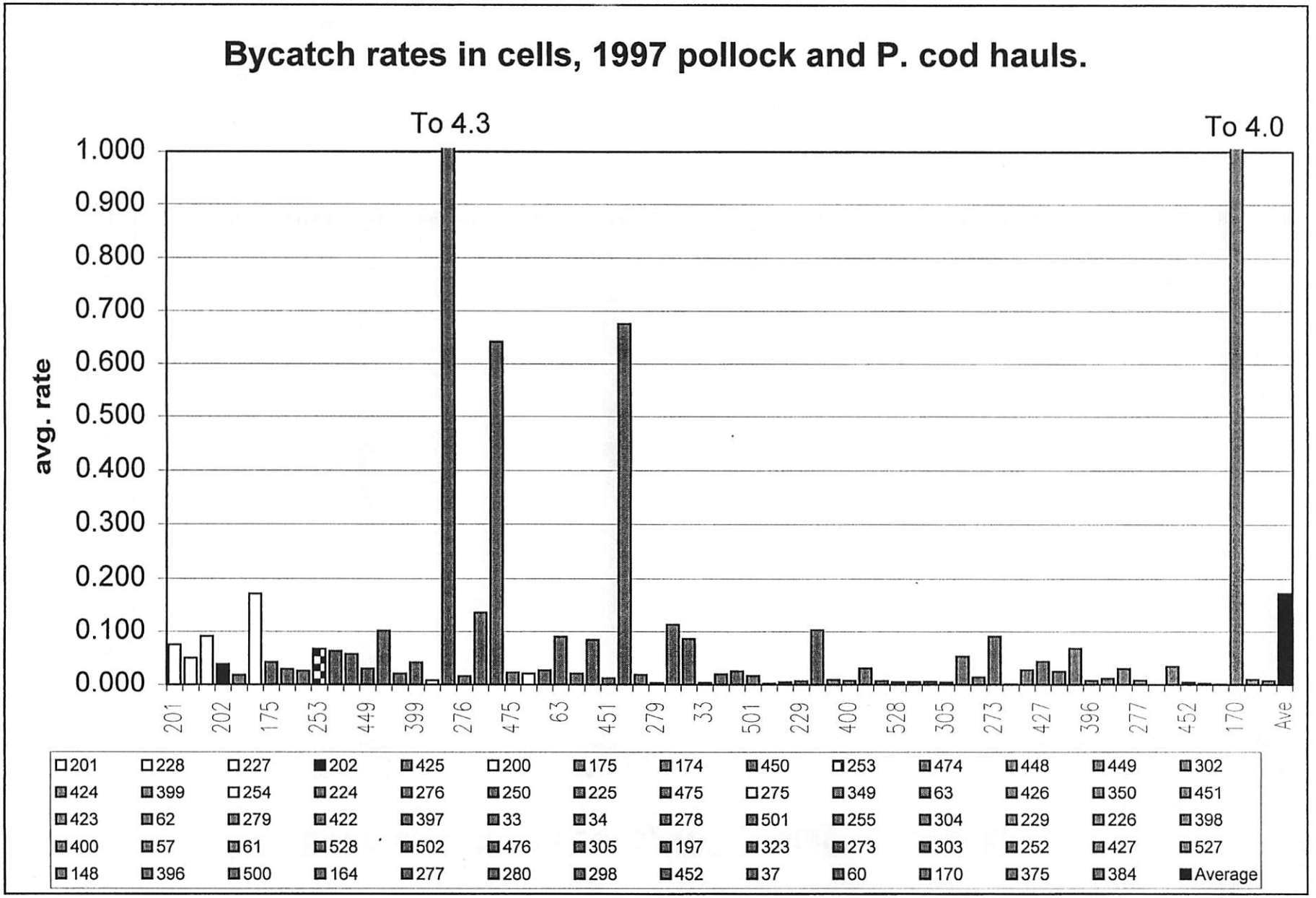

Bycatch rates in cells, 1997 pollock and P. cod hauls.
To 4.3
To 4.0
avg. rate
1.000
0.900
0.800
0.700
0.600
0.500
0.400
0.300
0.200
0.100
0.000
201 202 175 253 449 399 276 475 63 451 279 33 501 229 400 528 305 273 427 396 277 452 170 Ave
201 228 227 202 425 200 175 174 450 253 474 448 449 302
424 399 254 224 276 250 225 475 275 349 63 426 350 451
423 62 279 422 397 33 34 278 501 255 304 229 226 398
400 57 61 528 502 476 305 197 323 273 303 252 427 527
148 396 500 164 277 280 298 452 37 60 170 375 384 Average

Figure 23

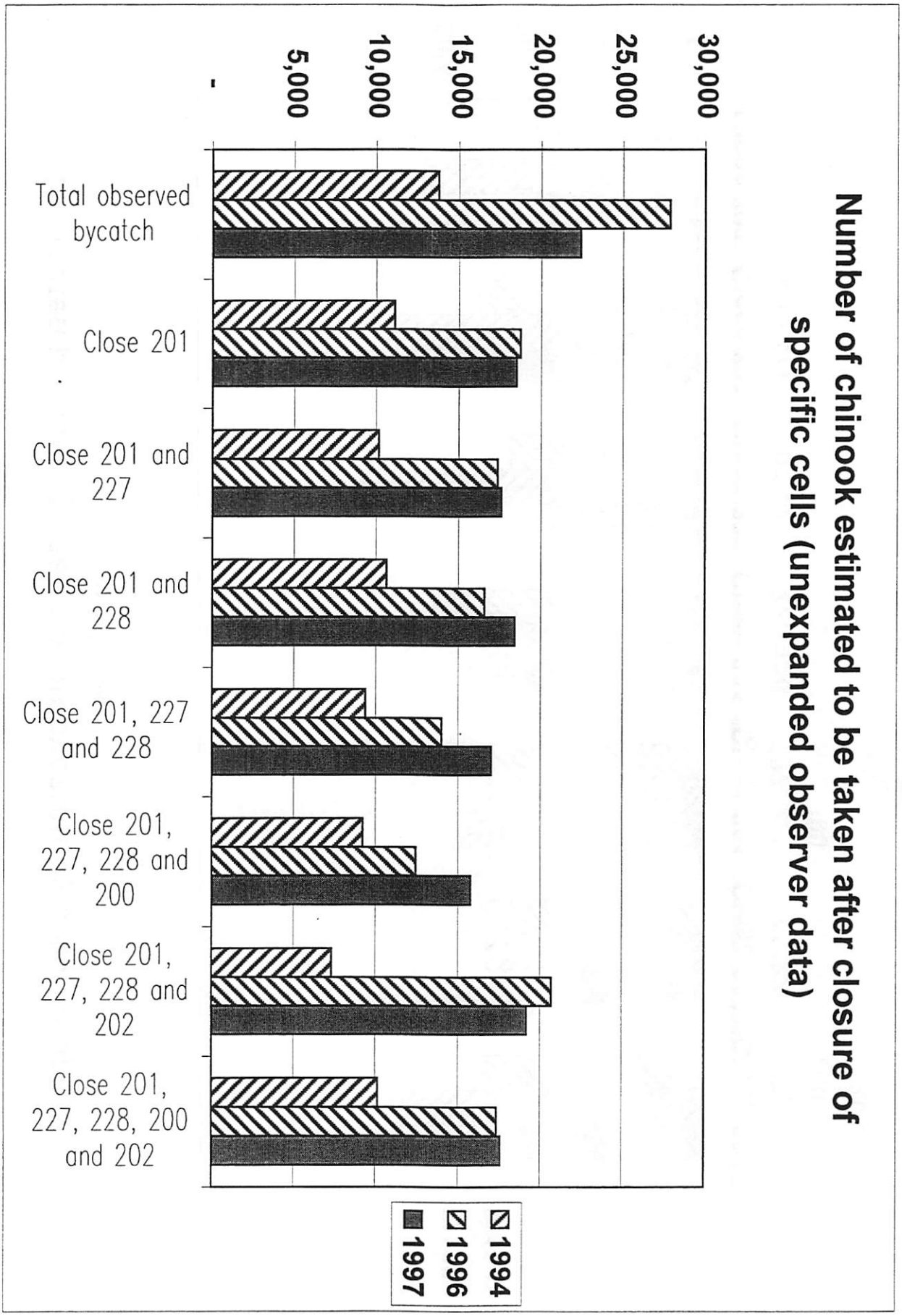

Number of chinook estimated to be taken after closure of specific cells (unexpanded observer data)
30,000
25,000
20,000
15,000
10,000
5,000
-
Total observed bycatch
Close 201
Close 201 and 227
Close 201 and 228
Close 201, 227 and 228
Close 201, 227, 228 and 200
Close 201, 227, 228 and 202
Close 201, 227, 228, 200 and 202
1994
1996
1997

Figure 24

Estimated percentage savings in bycatch by closure option and year.

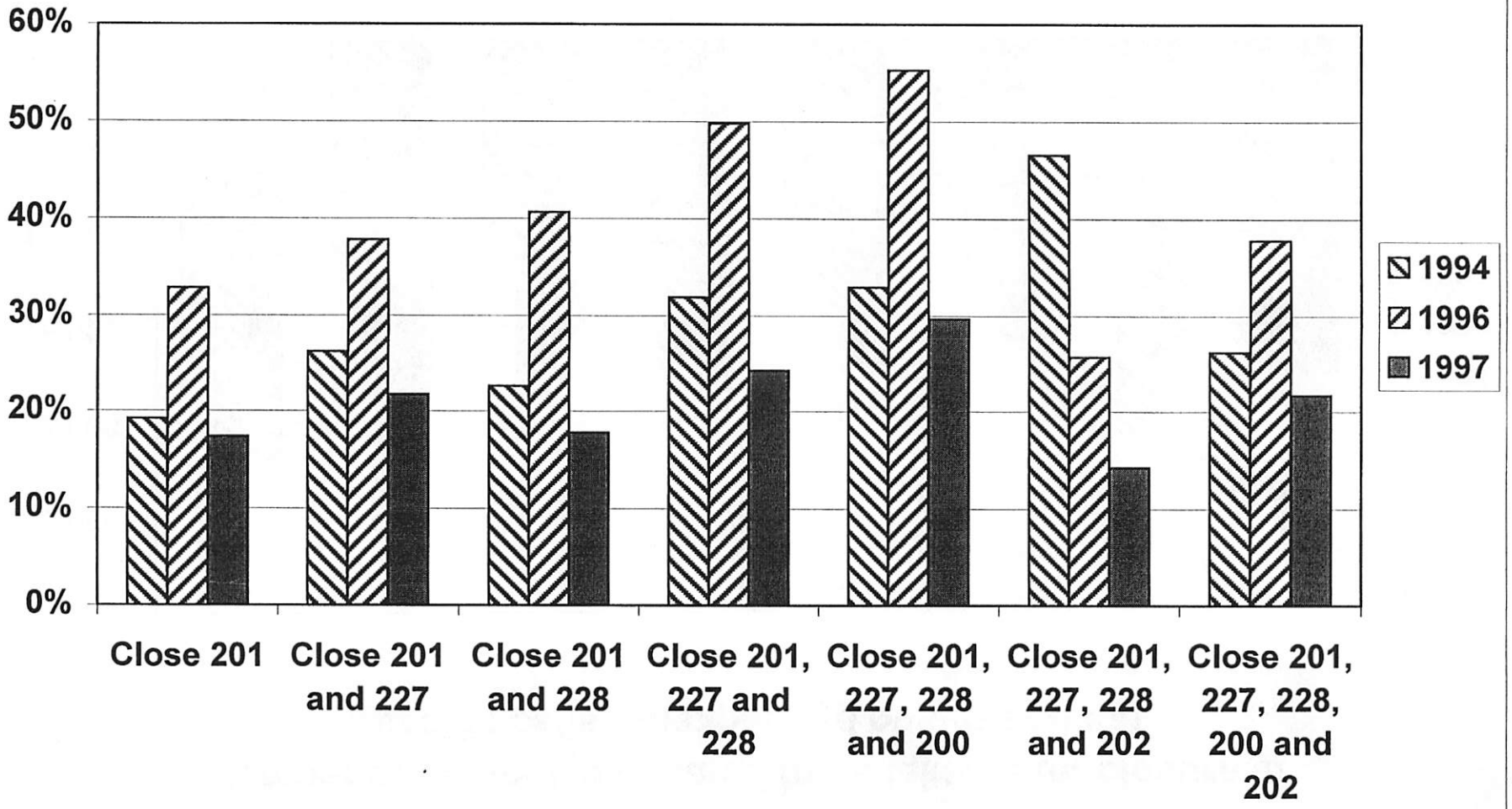
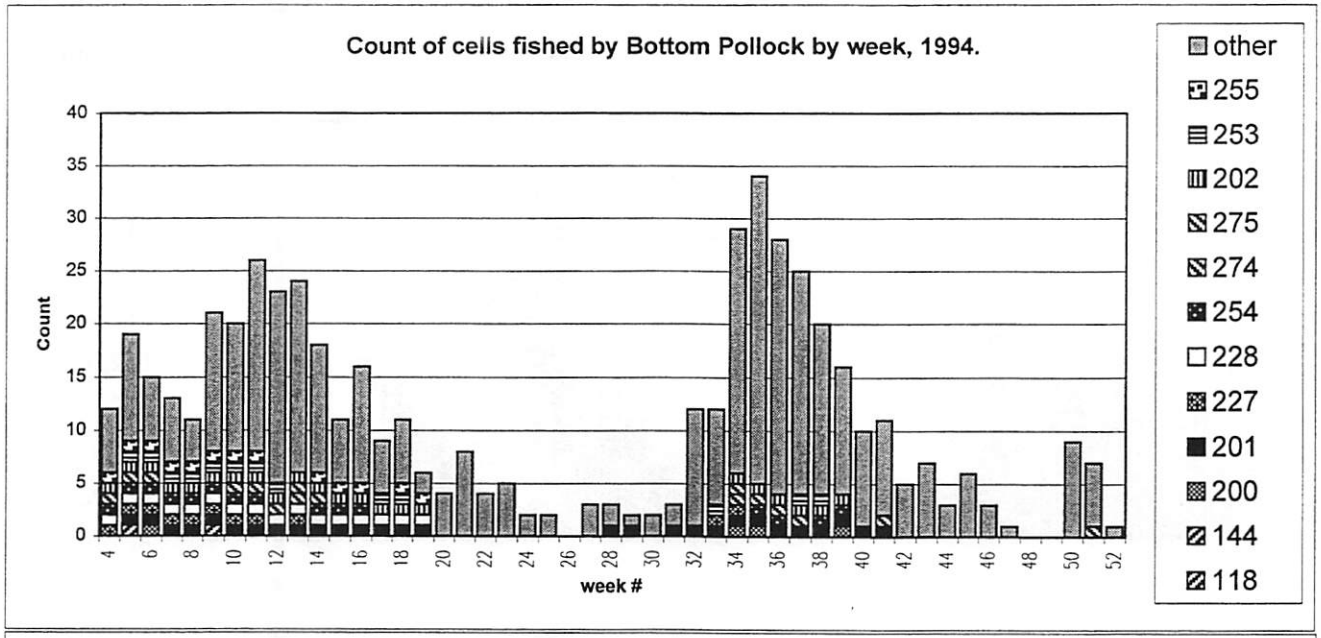
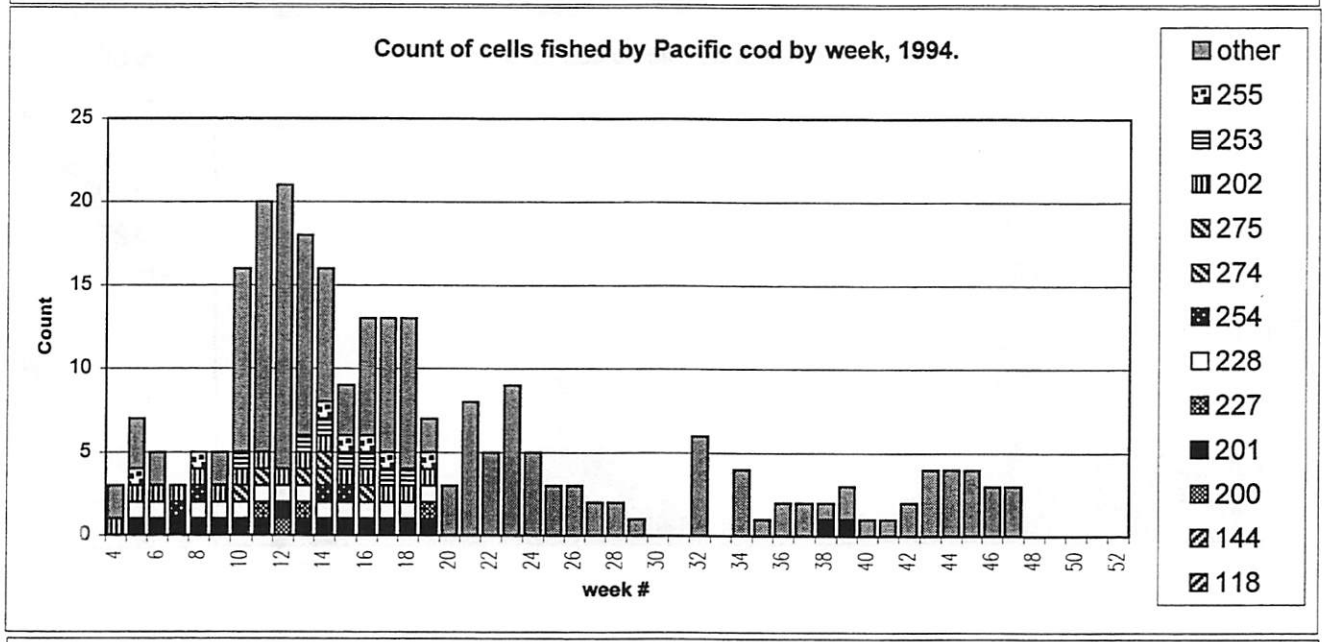


Figure 25

Figure 26


Count of cells fished by Bottom Pollock by week, 1994.
Count
week #
other
255
253
202
275
274
254
228
227
201
200
144
118


Count of cells fished by Pacific cod by week, 1994.
Count
week #
other
255
253
202
275
274
254
228
227
201
200
144
118

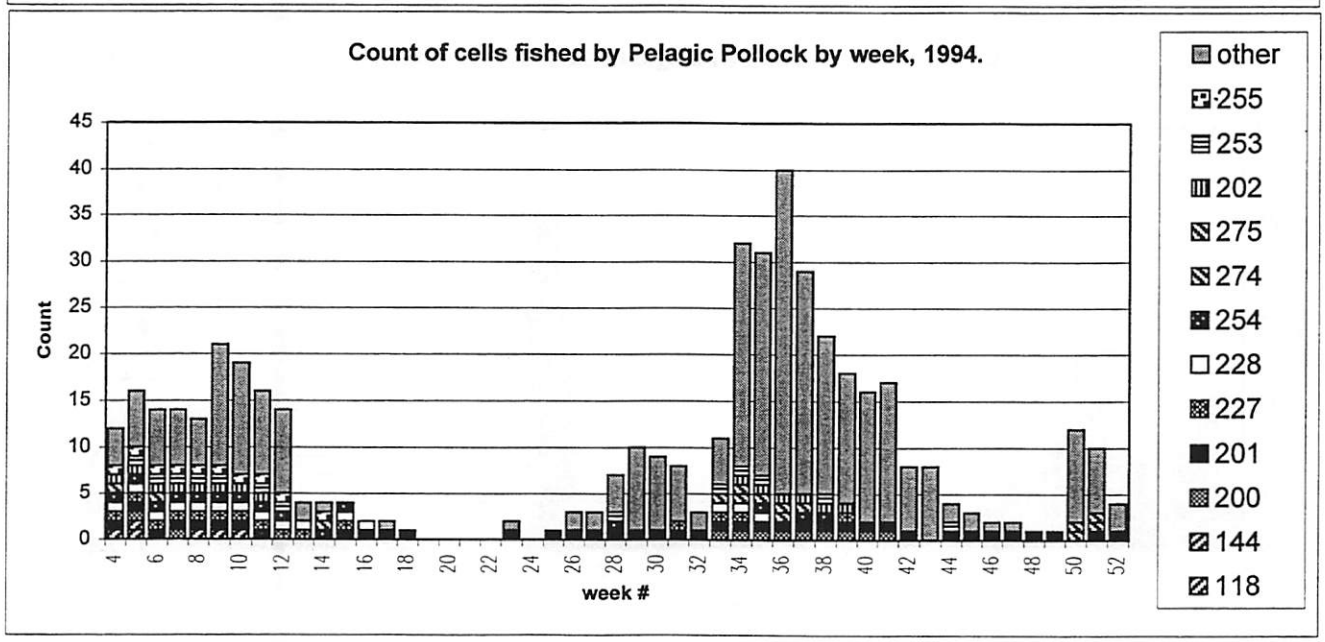
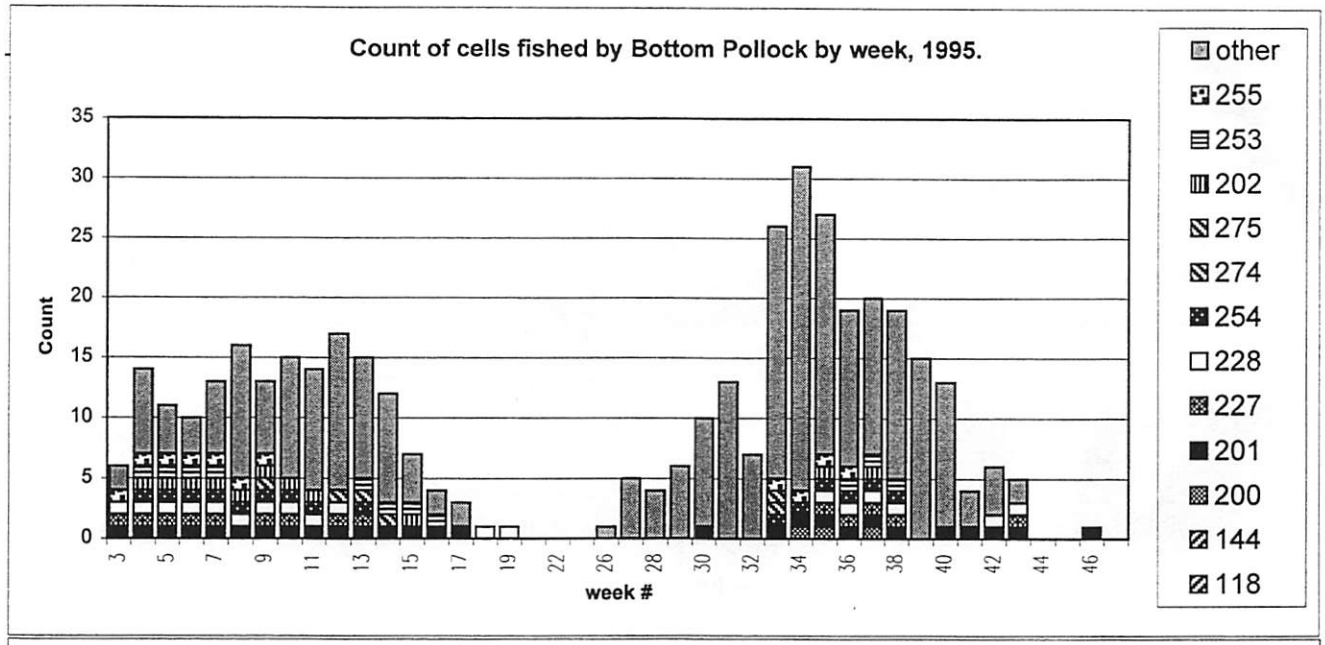
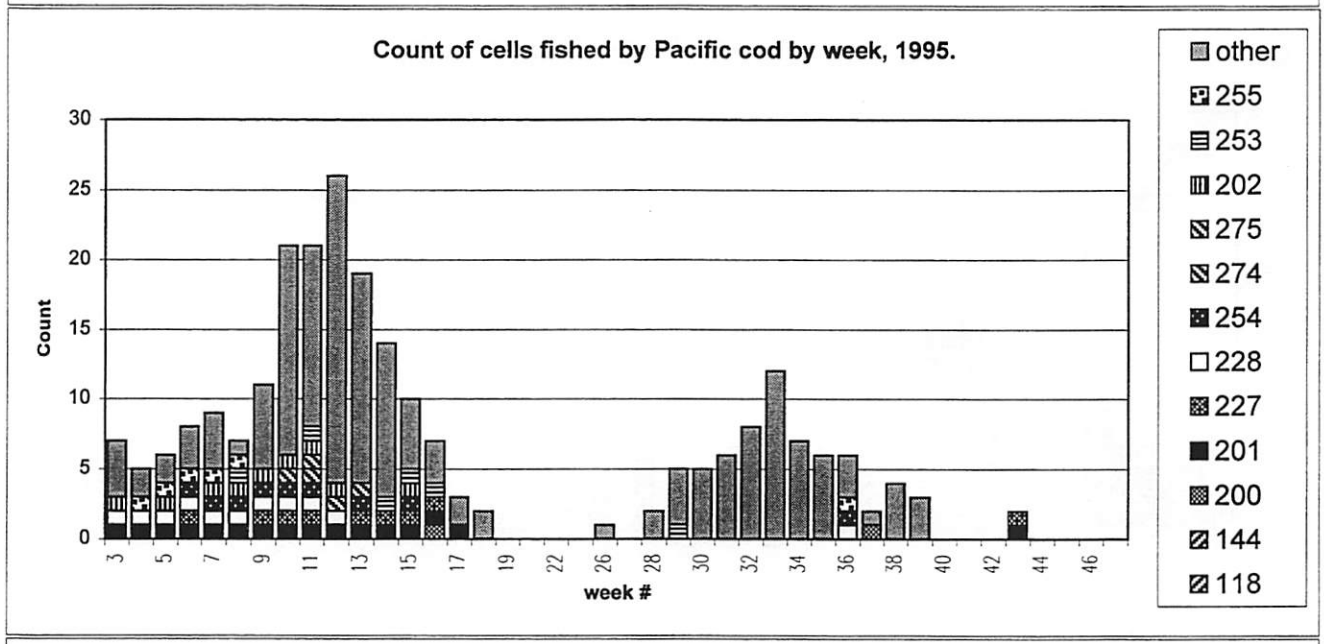

Count of cells fished by Pelagic Pollock by week, 1994.
Count
week #
other
255
253
202
275
274
254
228
227
201
200
144
118

Figure 27


Count of cells fished by Bottom Pollock by week, 1995.
Count
week #
other
255
253
202
275
274
254
228
227
201
200
144
118


Count of cells fished by Pacific cod by week, 1995.
Count
week #
other
255
253
202
275
274
254
228
227
201
200
144
118

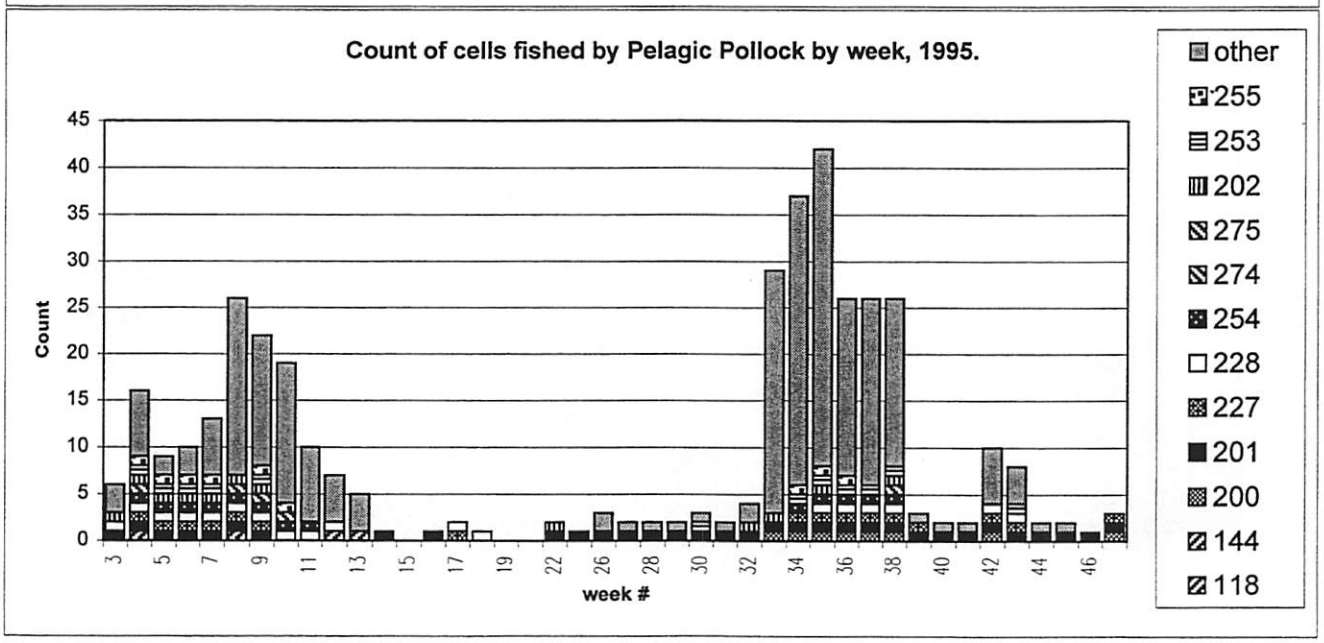
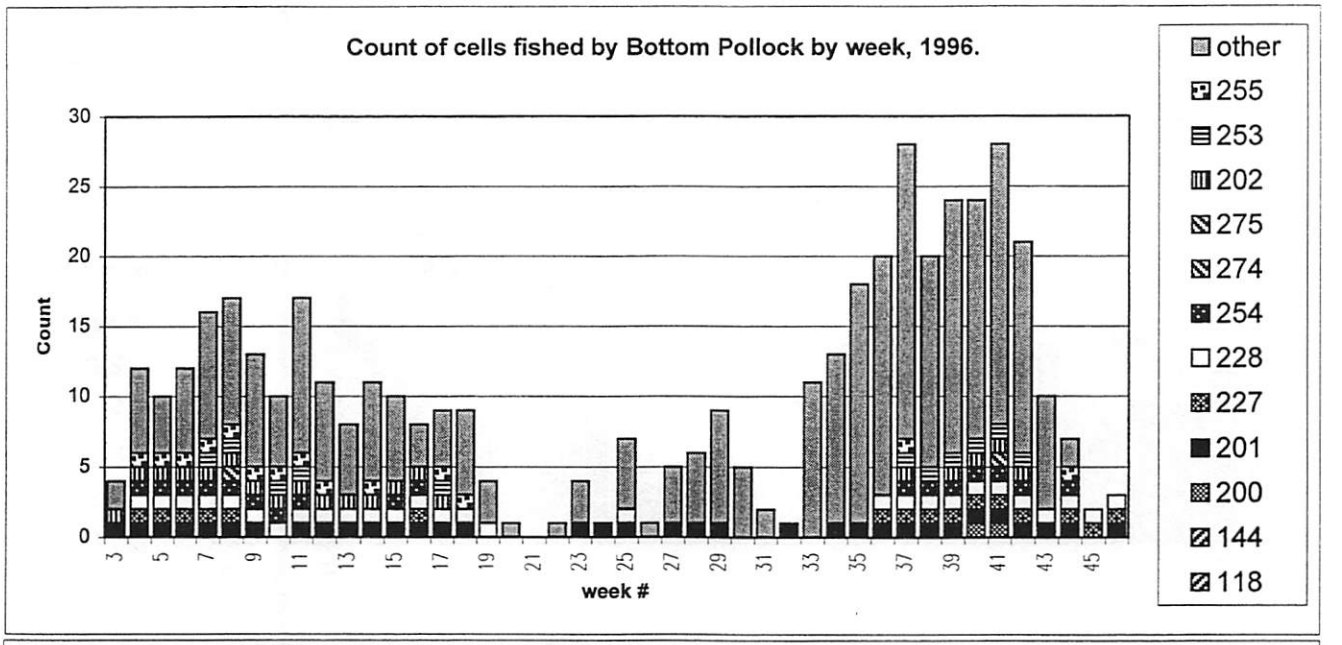
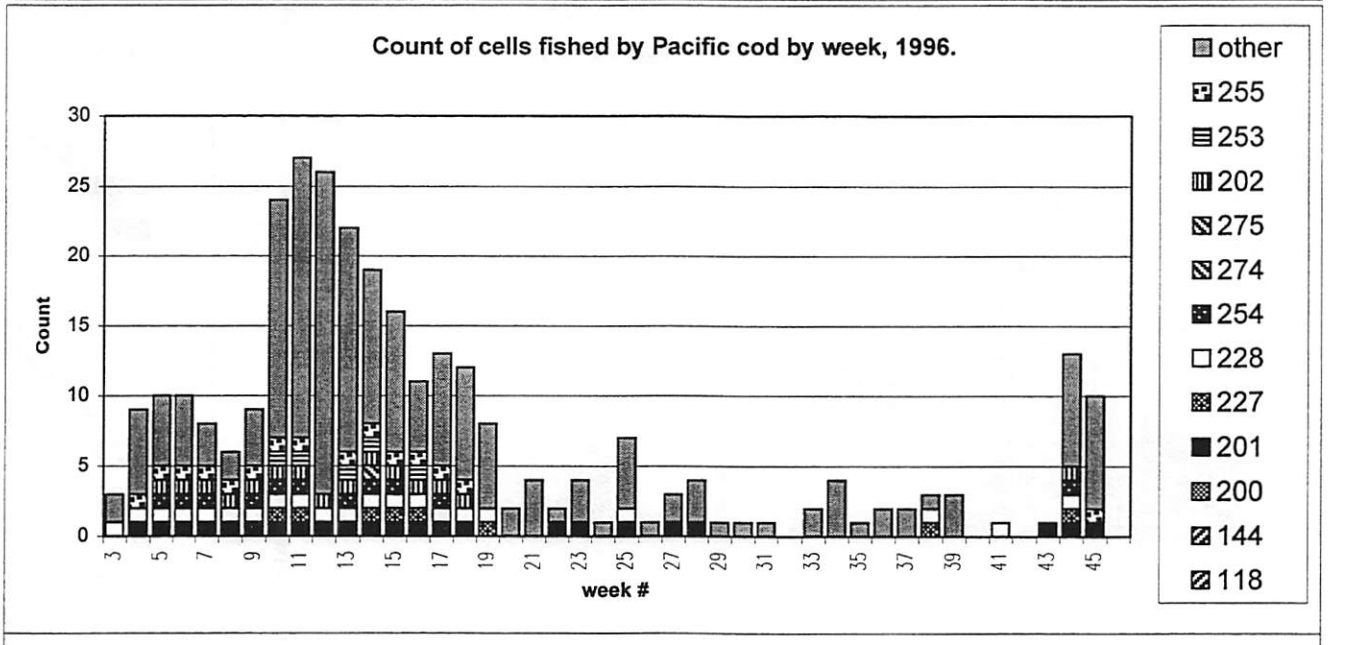

Count of cells fished by Pelagic Pollock by week, 1995.
Count
week #
other
255
253
202
275
274
254
228
227
201
200
144
118

Figure 28


Count of cells fished by Bottom Pollock by week, 1996.
Count
week #
other
255
253
202
275
274
254
228
227
201
200
144
118


Count of cells fished by Pacific cod by week, 1996.
Count
week #
other
255
253
202
275
274
254
228
227
201
200
144
118

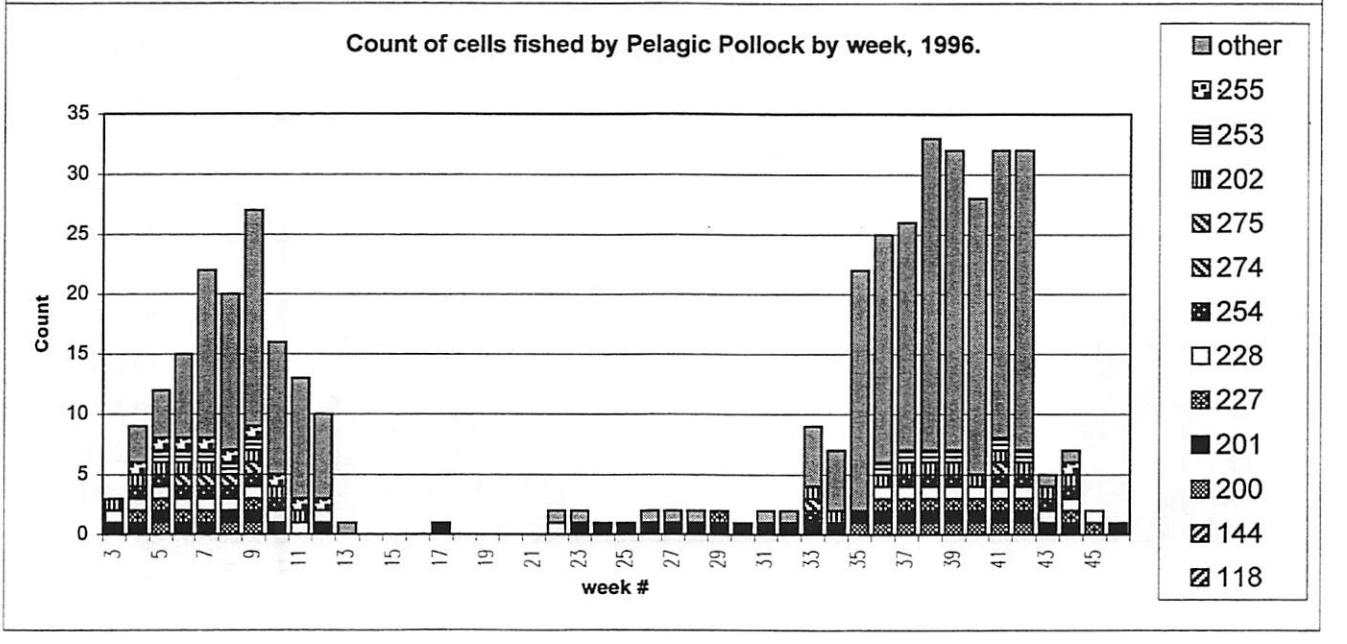
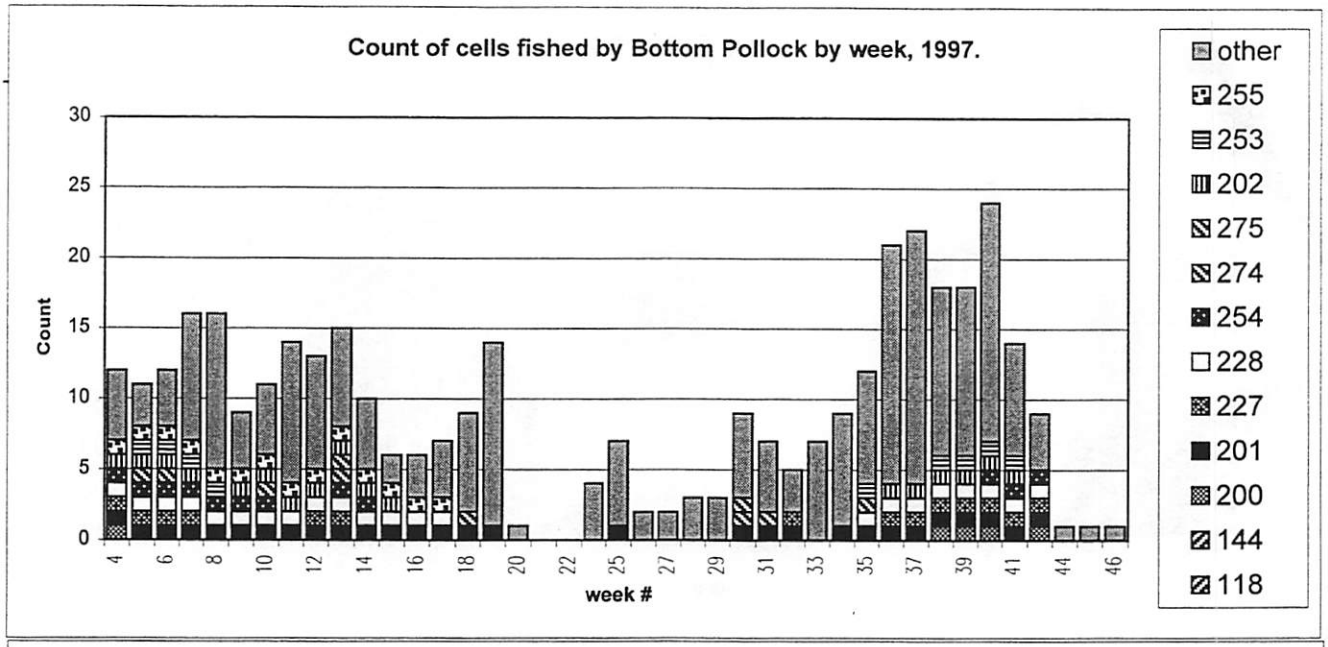
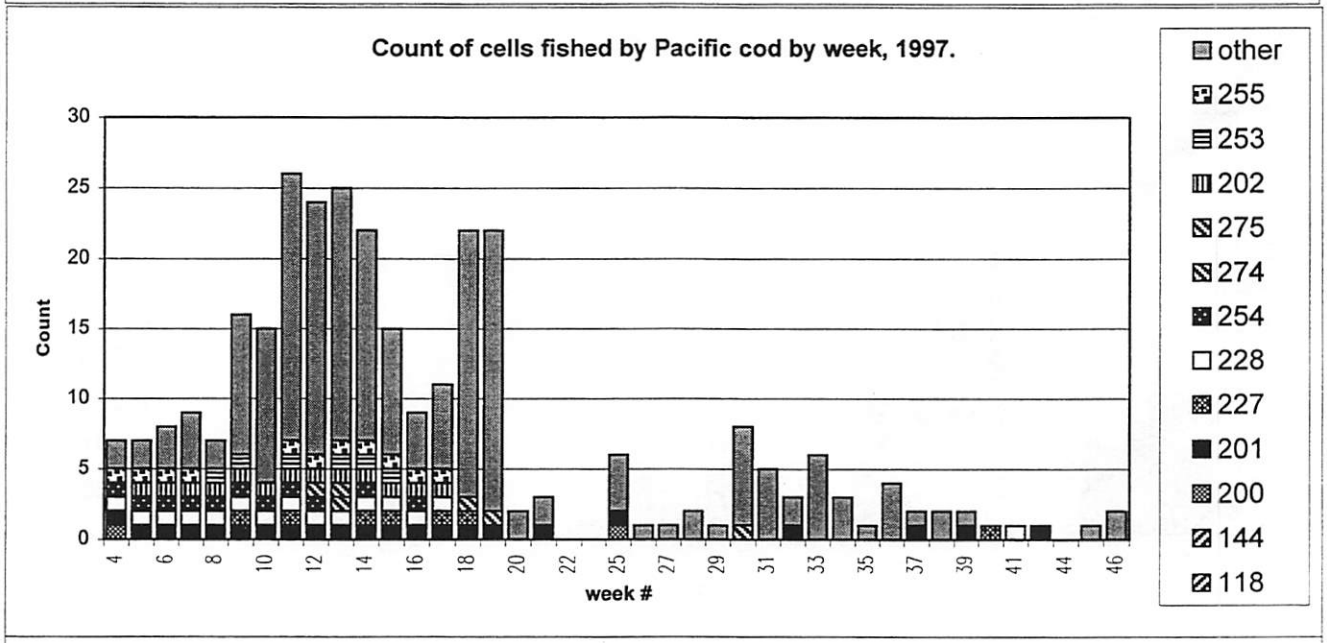

Count of cells fished by Pelagic Pollock by week, 1996.
Count
week #
other
255
253
202
275
274
254
228
227
201
200
144
118

Figure 29


Count of cells fished by Bottom Pollock by week, 1997.
Count
week #
other
255
253
202
275
274
254
228
227
201
200
144
118


Count of cells fished by Pacific cod by week, 1997.
Count
week #
other
255
253
202
275
274
254
228
227
201
200
144
118

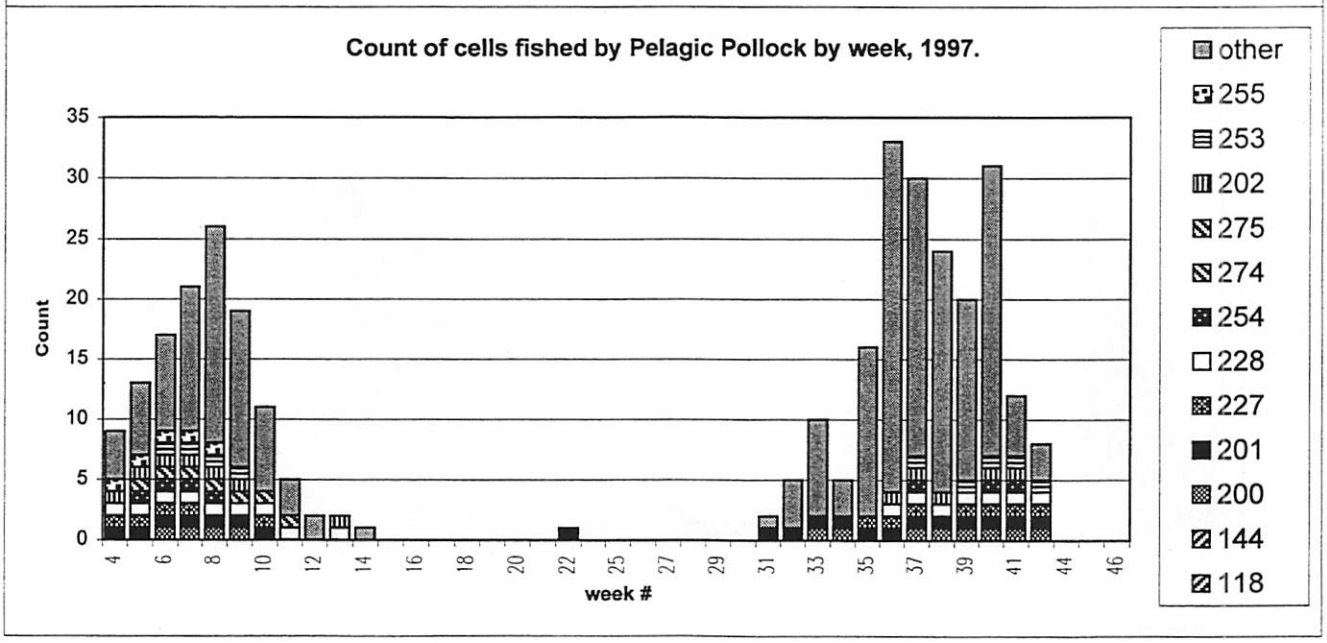
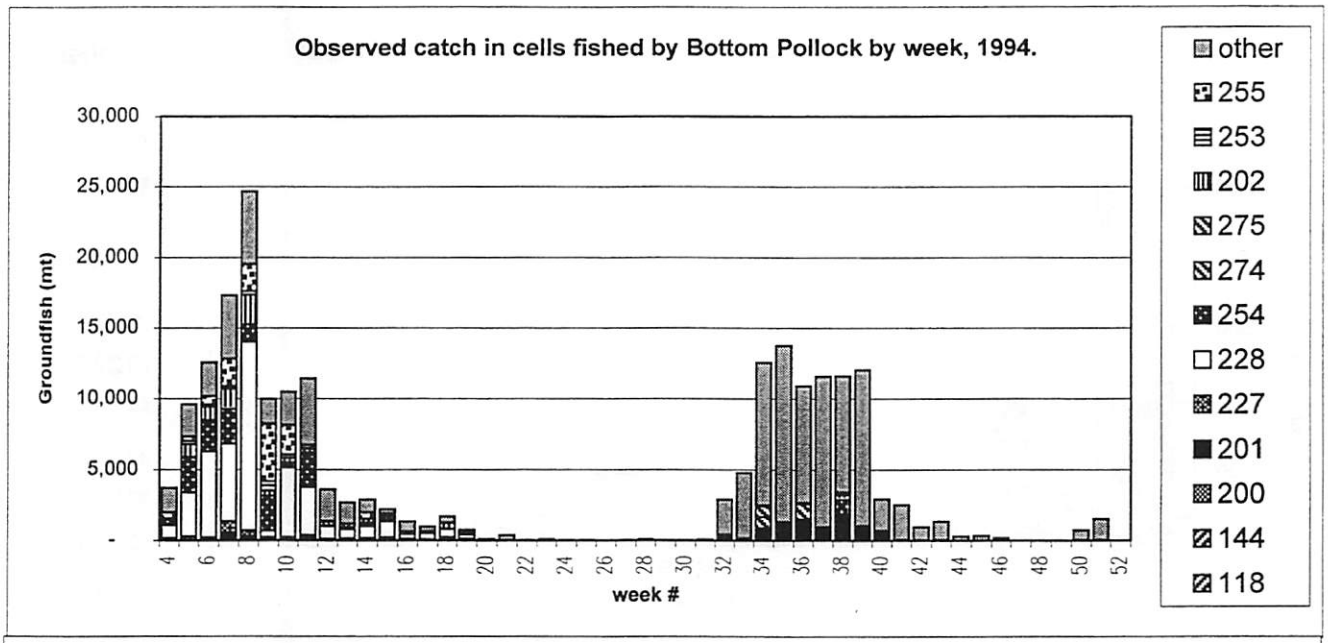
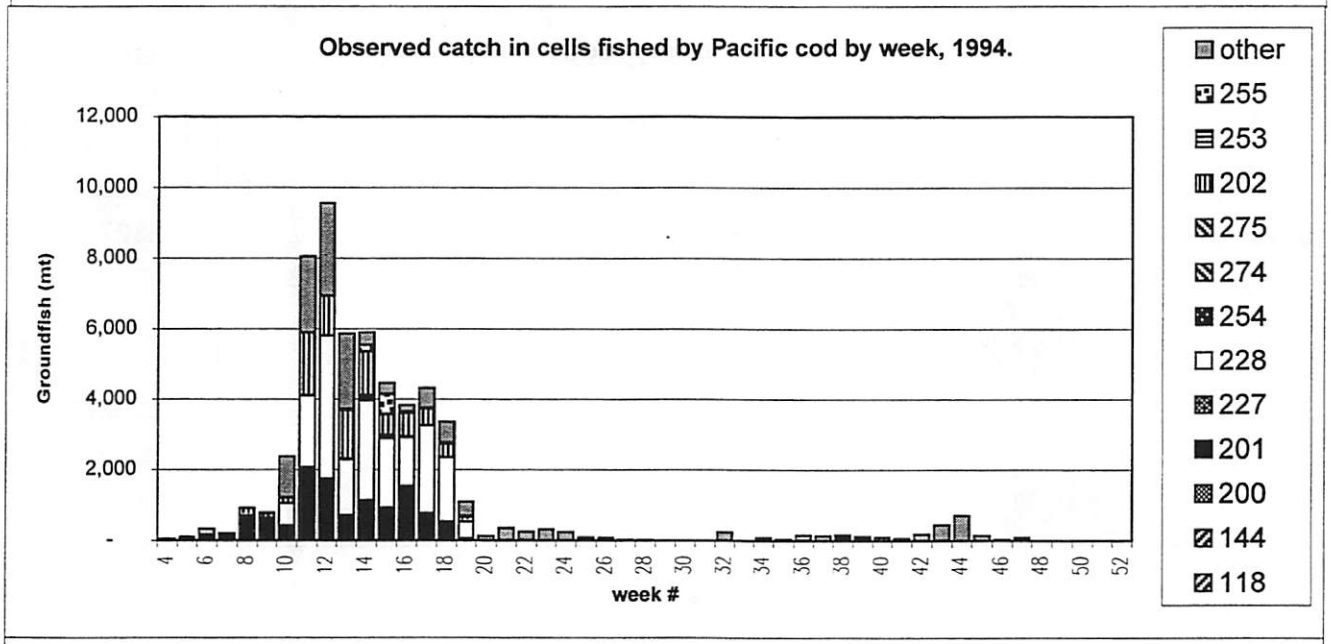

Count of cells fished by Pelagic Pollock by week, 1997.
Count
week #
other
255
253
202
275
274
254
228
227
201
200
144
118

Figure 30


Observed catch in cells fished by Bottom Pollock by week, 1994.
Groundfish (mt)
30,000
25,000
20,000
15,000
10,000
5,000
-
4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52
week #
other
255
253
202
275
274
254
228
227
201
200
144
118


Observed catch in cells fished by Pacific cod by week, 1994.
Groundfish (mt)
12,000
10,000
8,000
6,000
4,000
2,000
-
4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52
week #
other
255
253
202
275
274
254
228
227
201
200
144
118

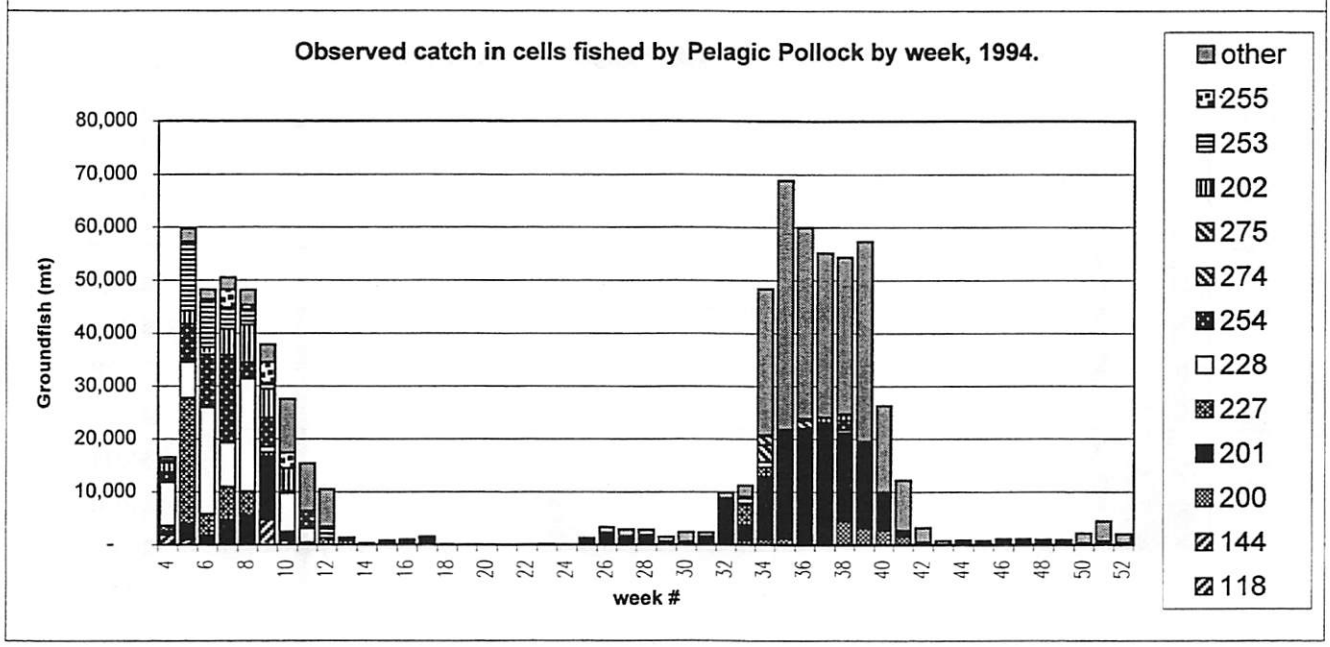
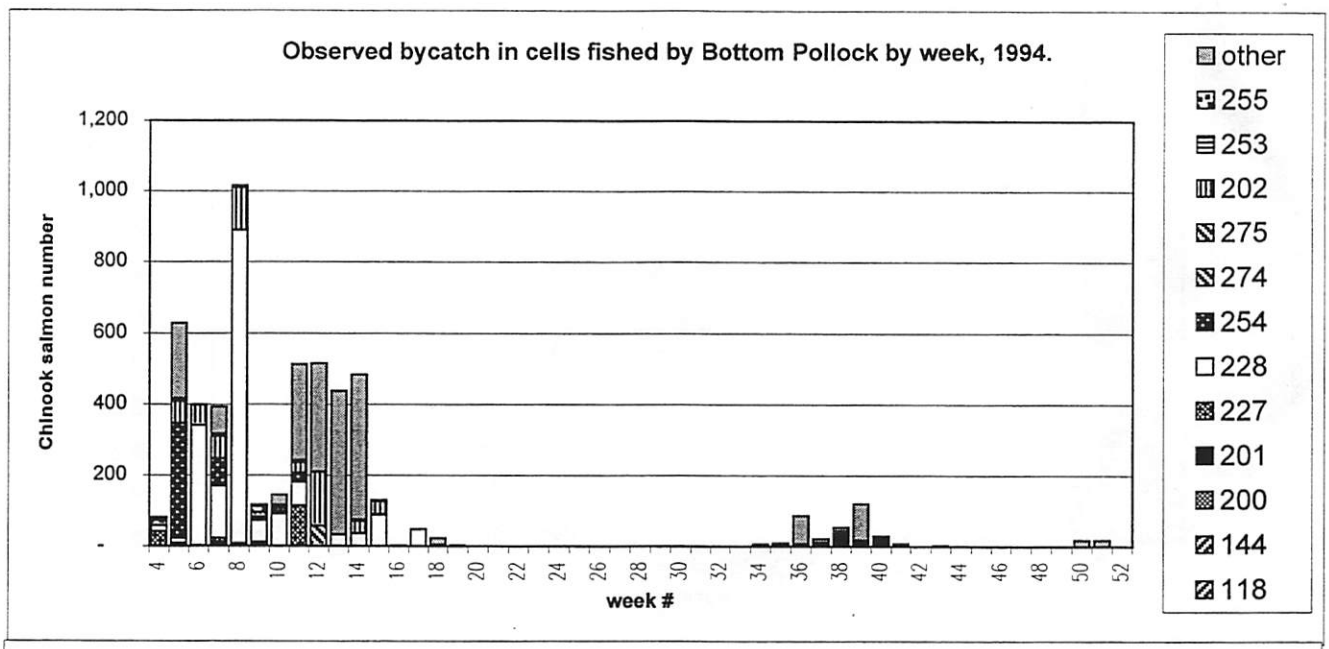
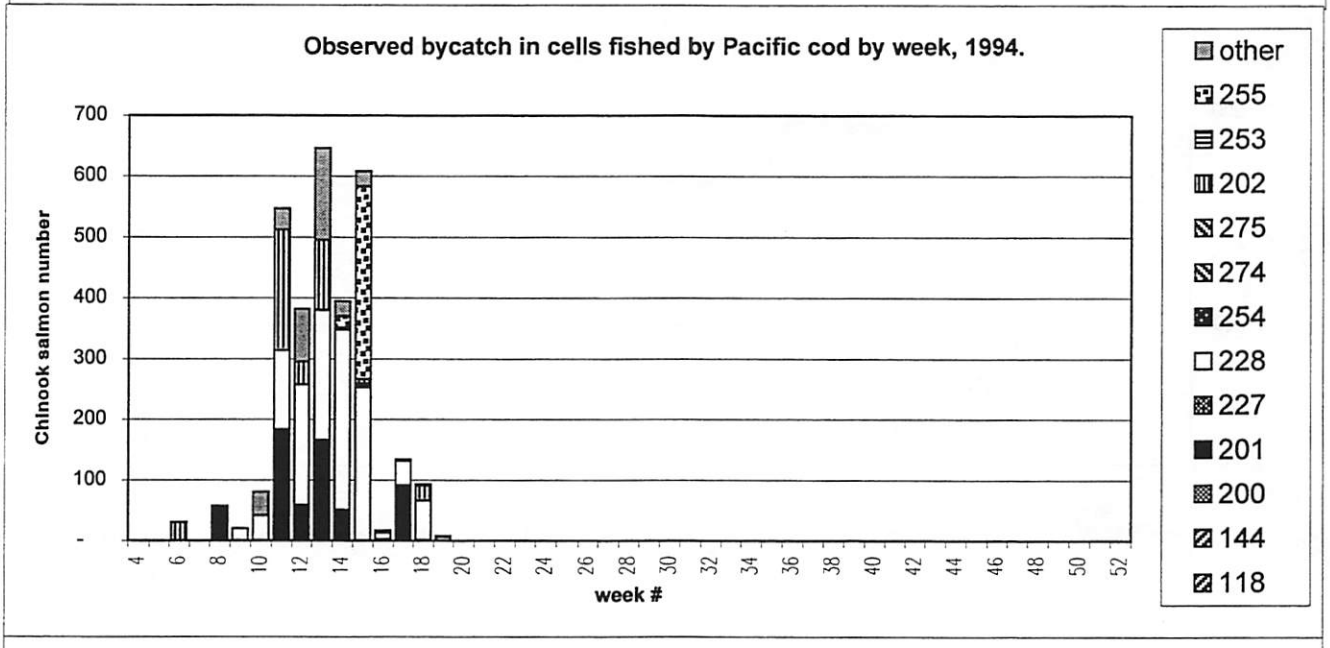

Observed catch in cells fished by Pelagic Pollock by week, 1994.
Groundfish (mt)
80,000
70,000
60,000
50,000
40,000
30,000
20,000
10,000
-
4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52
week #
other
255
253
202
275
274
254
228
227
201
200
144
118

Figure 31


Observed bycatch in cells fished by Bottom Pollock by week, 1994.
Chinook salmon number
1,200
1,000
800
600
400
200
-
4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52
week #
other
255
253
202
275
274
254
228
227
201
200
144
118


Observed bycatch in cells fished by Pacific cod by week, 1994.
Chinook salmon number
700
600
500
400
300
200
100
-
4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52
week #
other
255
253
202
275
274
254
228
227
201
200
144
118

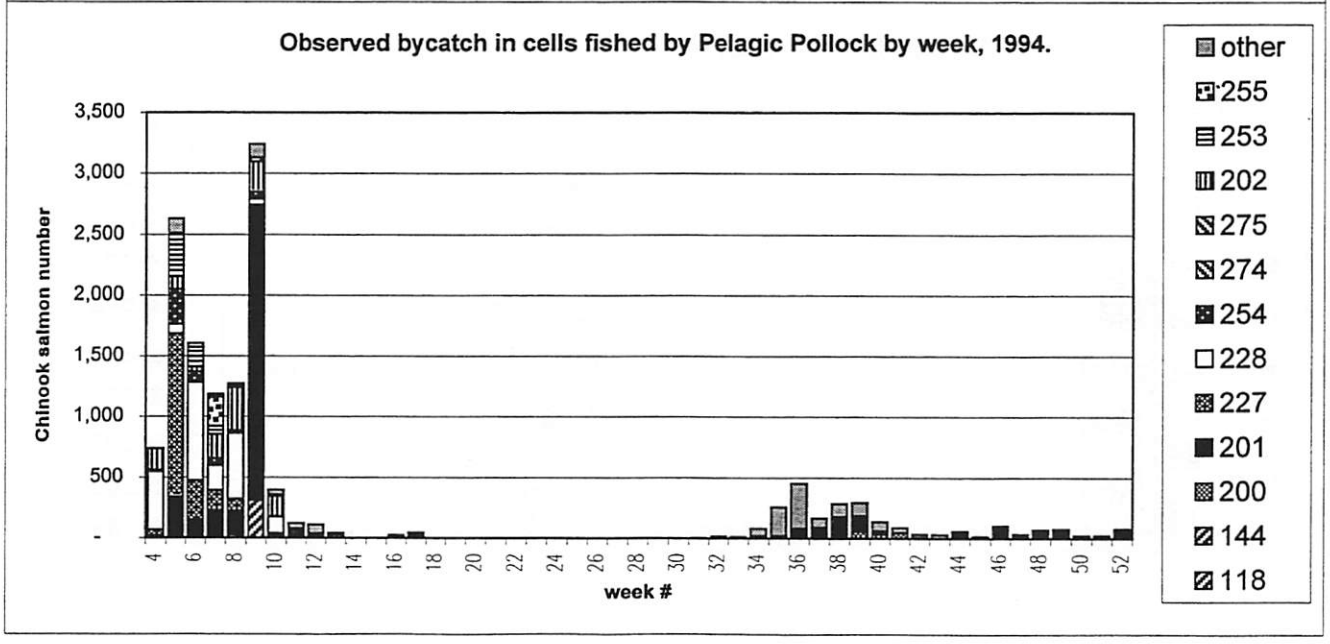
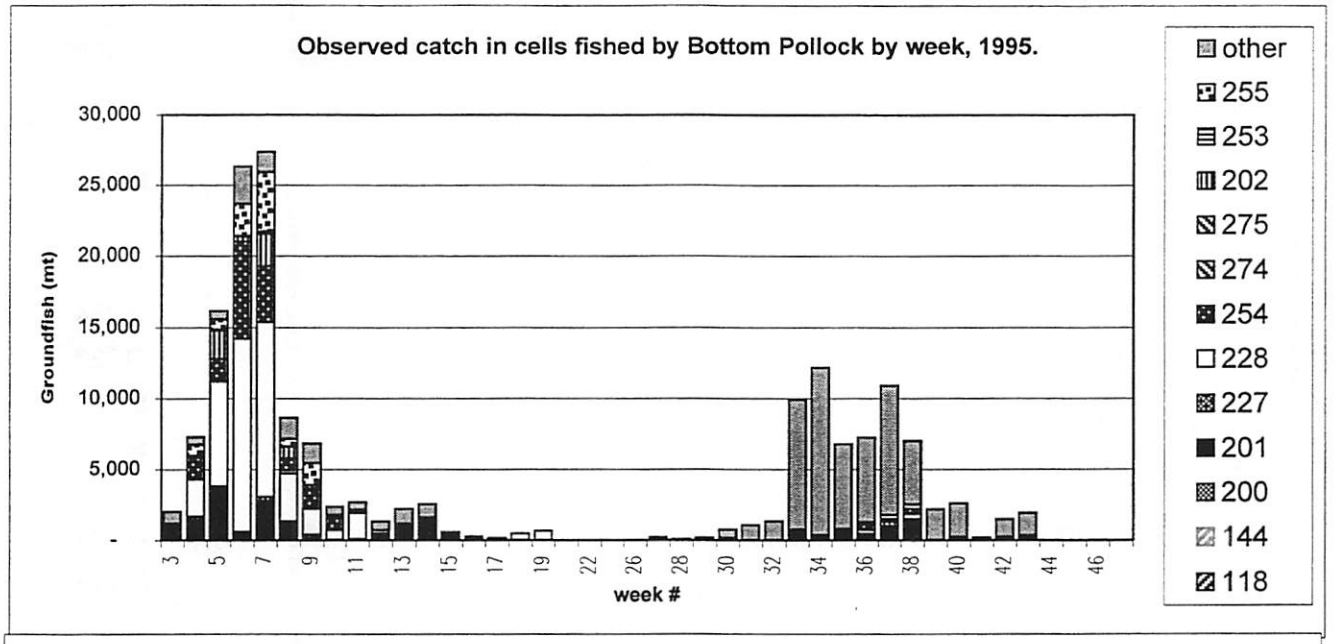
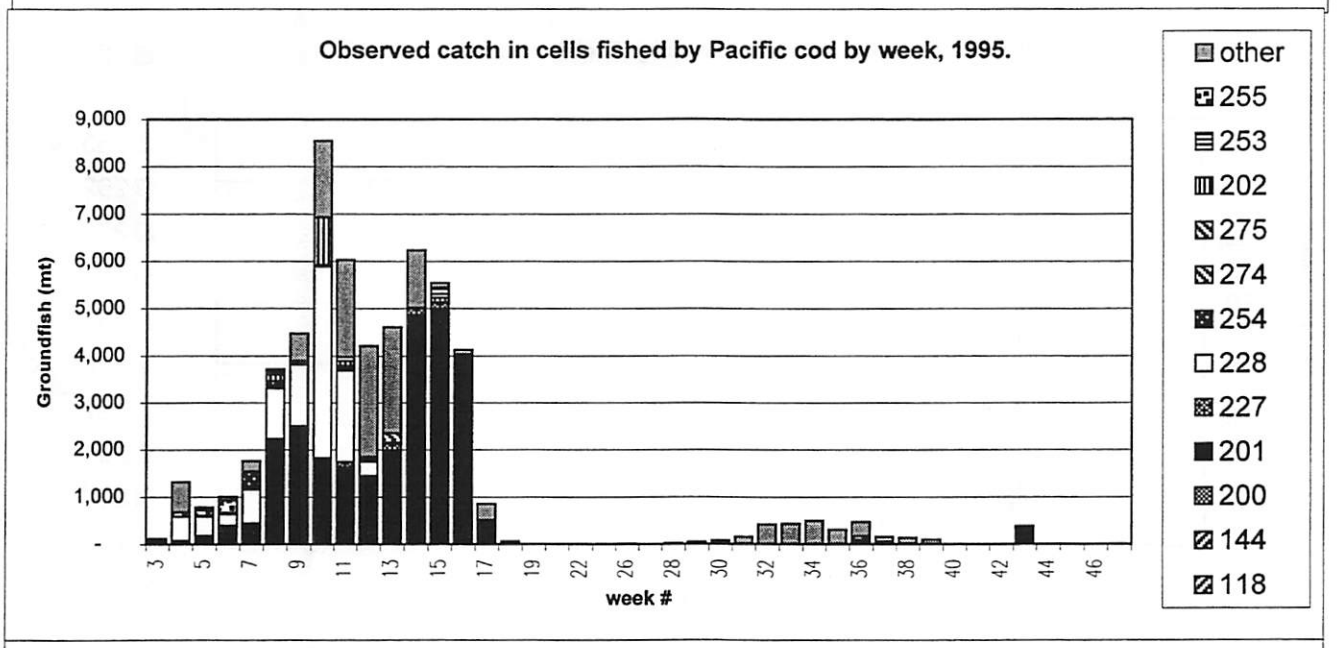

Observed bycatch in cells fished by Pelagic Pollock by week, 1994.
Chinook salmon number
3,500
3,000
2,500
2,000
1,500
1,000
500
-
4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52
week #
other
255
253
202
275
274
254
228
227
201
200
144
118

Figure 32


Observed catch in cells fished by Bottom Pollock by week, 1995.
Groundfish (mt)
30,000
25,000
20,000
15,000
10,000
5,000
-
3 5 7 9 11 13 15 17 19 22 26 28 30 32 34 36 38 40 42 44 46
week #
other
255
253
202
275
274
254
228
227
201
200
144
118


Observed catch in cells fished by Pacific cod by week, 1995.
Groundfish (mt)
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
-
3 5 7 9 11 13 15 17 19 22 26 28 30 32 34 36 38 40 42 44 46
week #
other
255
253
202
275
274
254
228
227
201
200
144
118

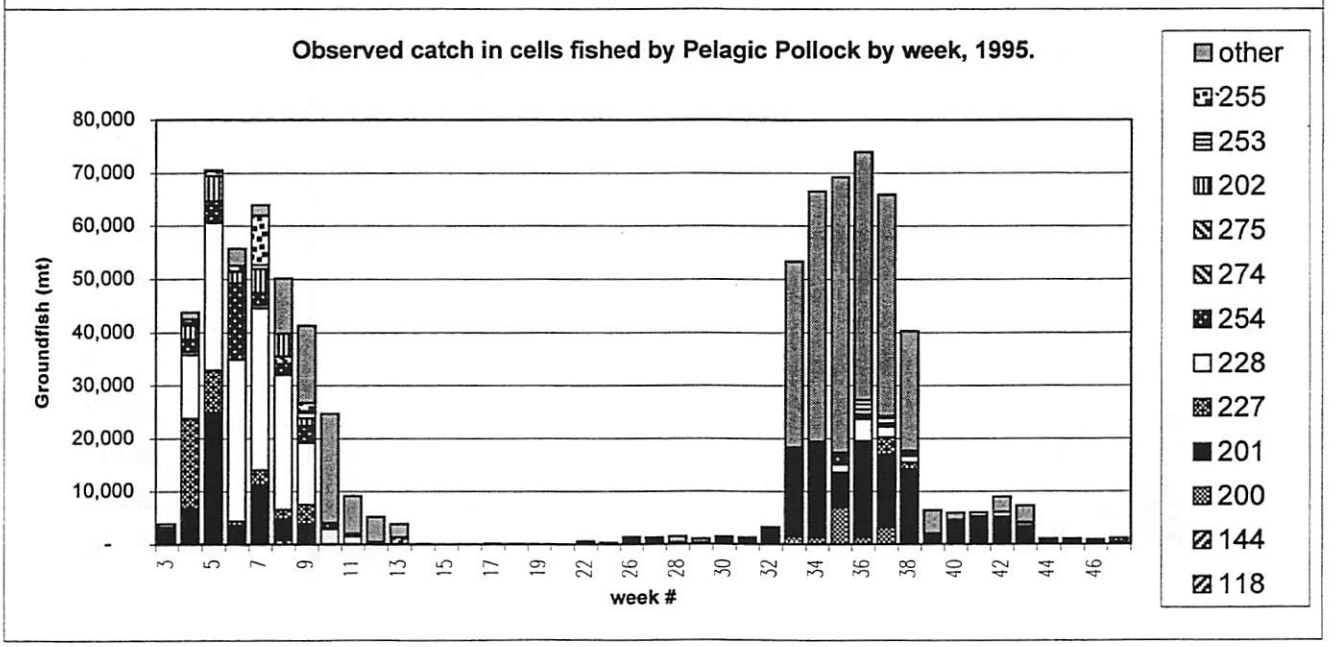
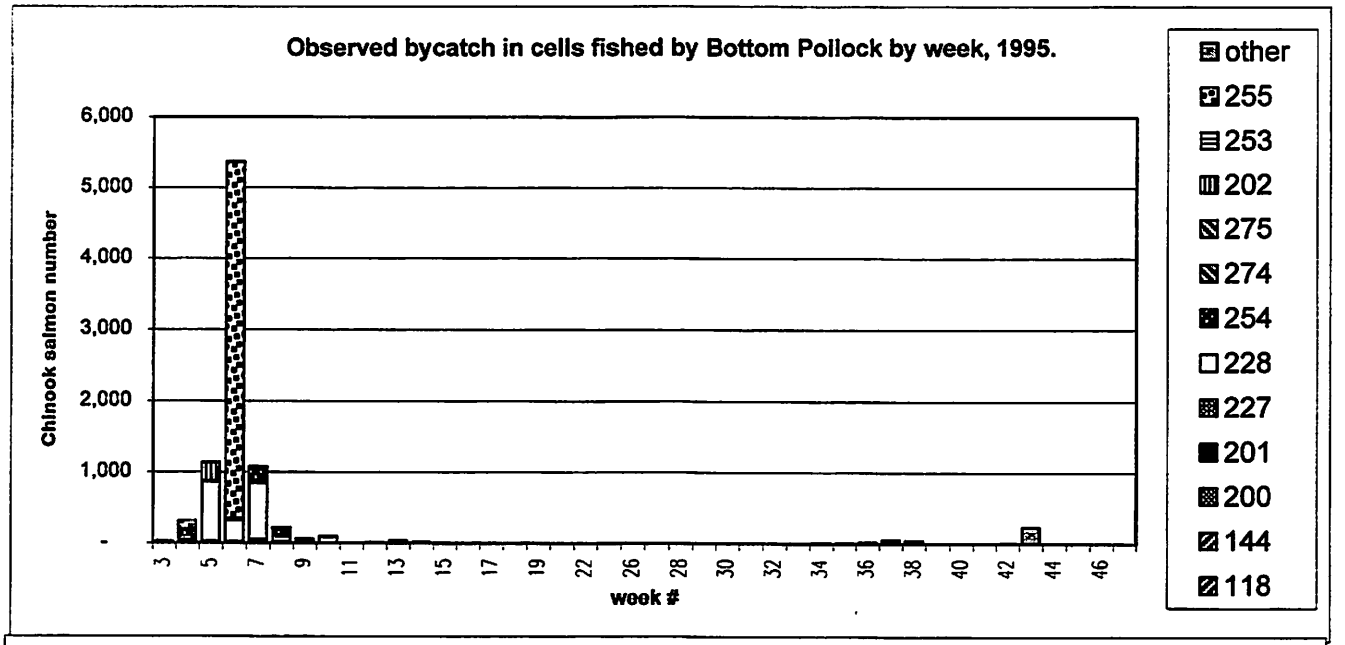
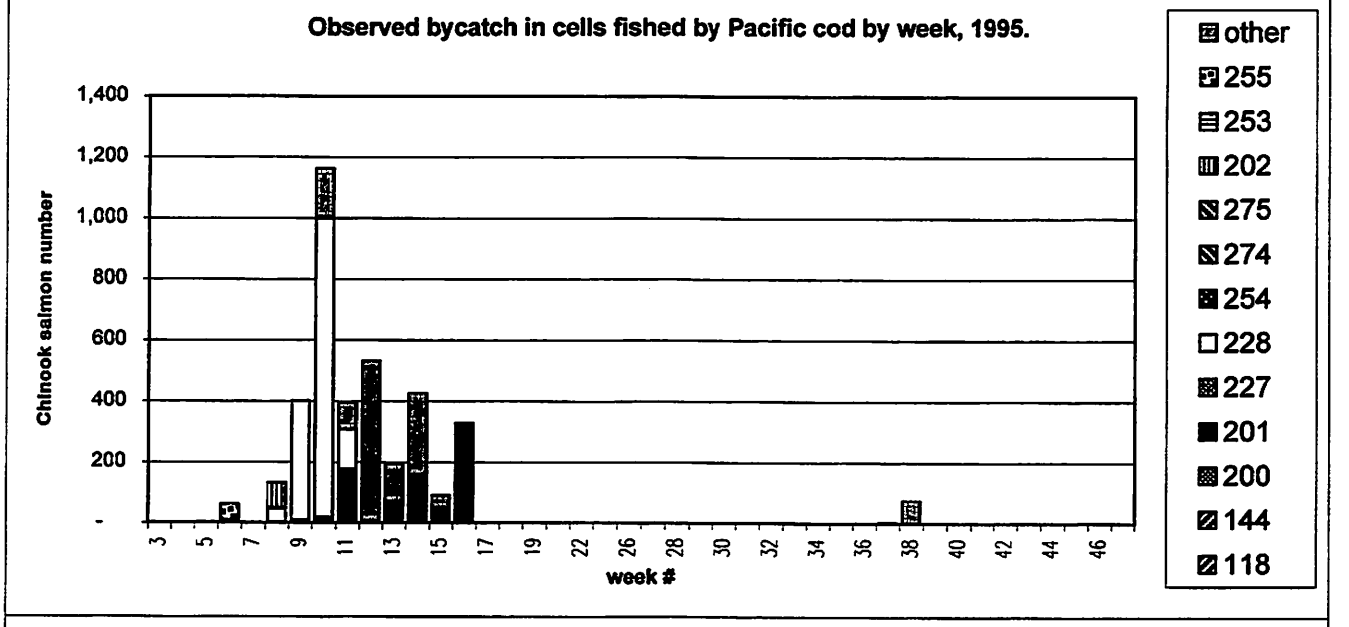

Observed catch in cells fished by Pelagic Pollock by week, 1995.
Groundfish (mt)
80,000
70,000
60,000
50,000
40,000
30,000
20,000
10,000
-
3 5 7 9 11 13 15 17 19 22 26 28 30 32 34 36 38 40 42 44 46
week #
other
255
253
202
275
274
254
228
227
201
200
144
118

Figure 33


Observed bycatch in cells fished by Bottom Pollock by week, 1995.
Chinook salmon number
6,000
5,000
4,000
3,000
2,000
1,000
-
3 5 7 9 11 13 15 17 19 22 26 28 30 32 34 36 38 40 42 44 46
week #
other
255
253
202
275
274
254
228
227
201
200
144
118


Observed bycatch in cells fished by Pacific cod by week, 1995.
Chinook salmon number
1,400
1,200
1,000
800
600
400
200
-
3 5 7 9 11 13 15 17 19 22 26 28 30 32 34 36 38 40 42 44 46
week #
other
255
253
202
275
274
254
228
227
201
200
144
118

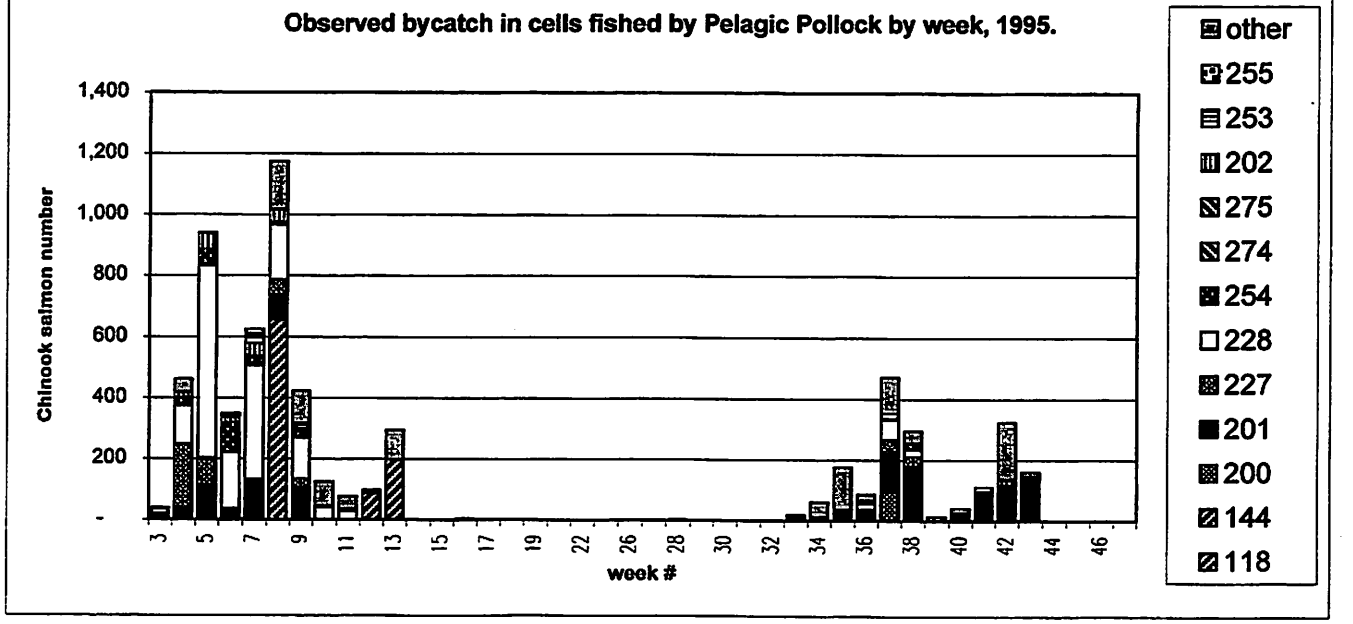
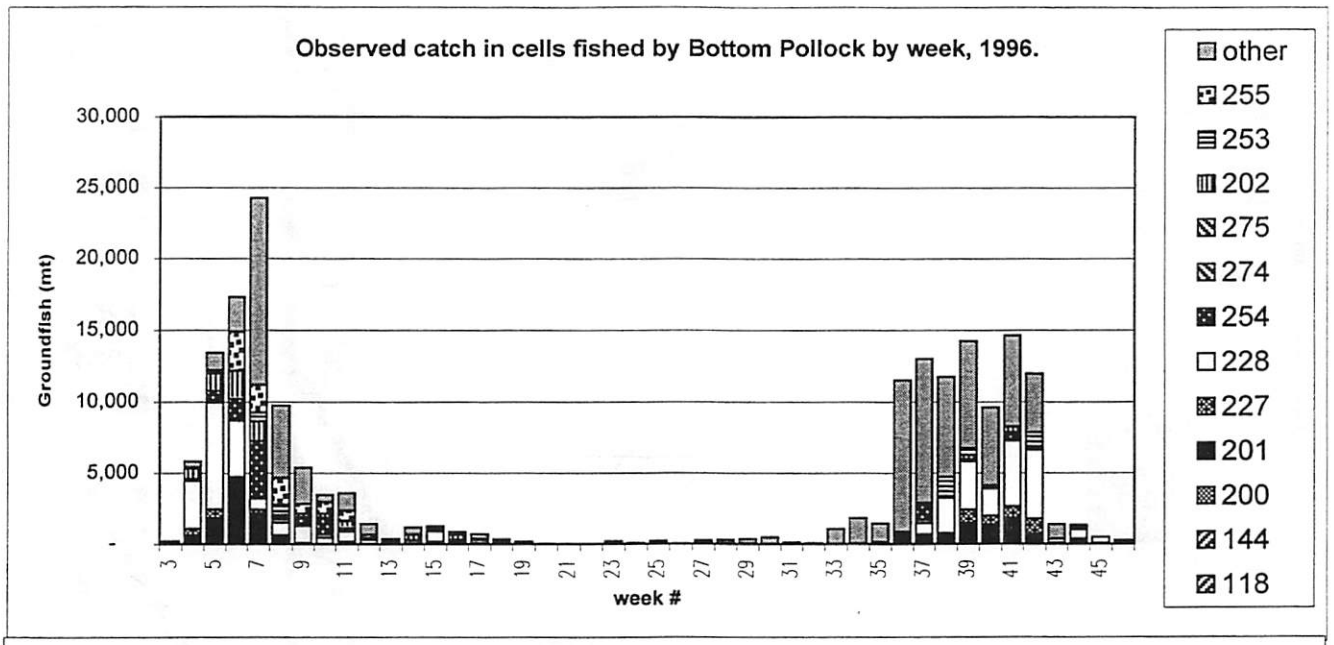
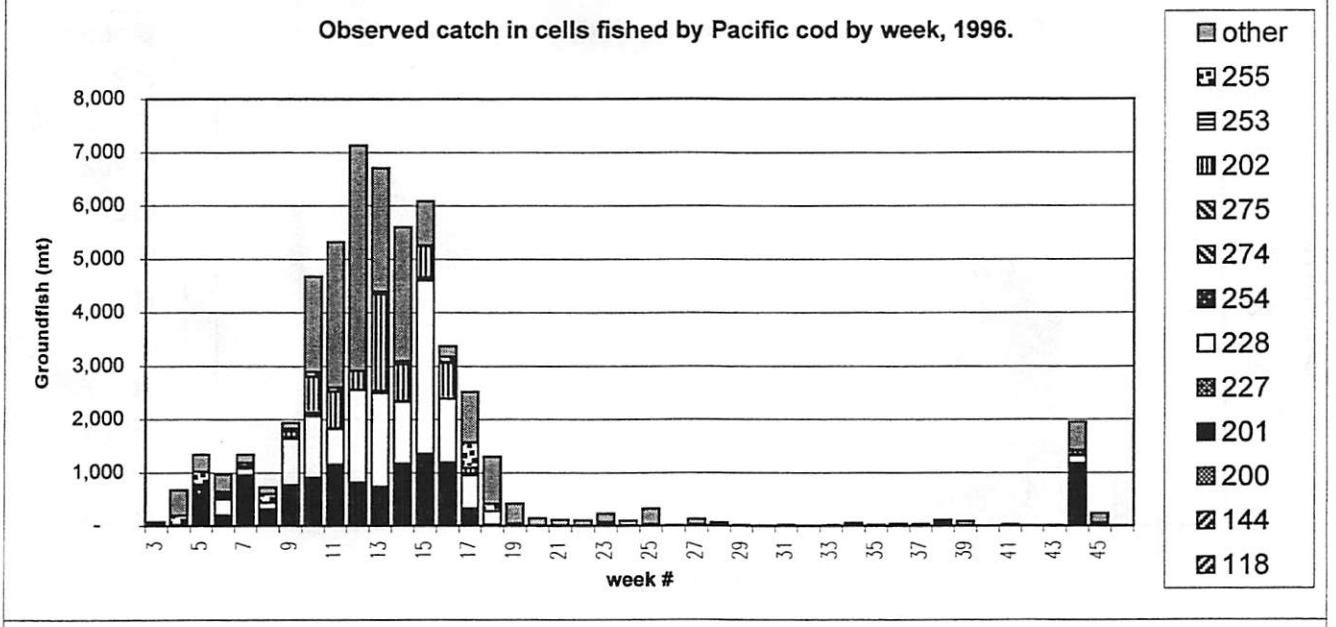

Observed bycatch in cells fished by Pelagic Pollock by week, 1995.
Chinook salmon number
1,400
1,200
1,000
800
600
400
200
-
3 5 7 9 11 13 15 17 19 22 26 28 30 32 34 36 38 40 42 44 46
week #
other
255
253
202
275
274
254
228
227
201
200
144
118

Figure 34


Observed catch in cells fished by Bottom Pollock by week, 1996.
Groundfish (mt)
30,000
25,000
20,000
15,000
10,000
5,000
-
3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39 41 43 45
week #
other
255
253
202
275
274
254
228
227
201
200
144
118


Observed catch in cells fished by Pacific cod by week, 1996.
Groundfish (mt)
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
-
3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39 41 43 45
week #
other
255
253
202
275
274
254
228
227
201
200
144
118

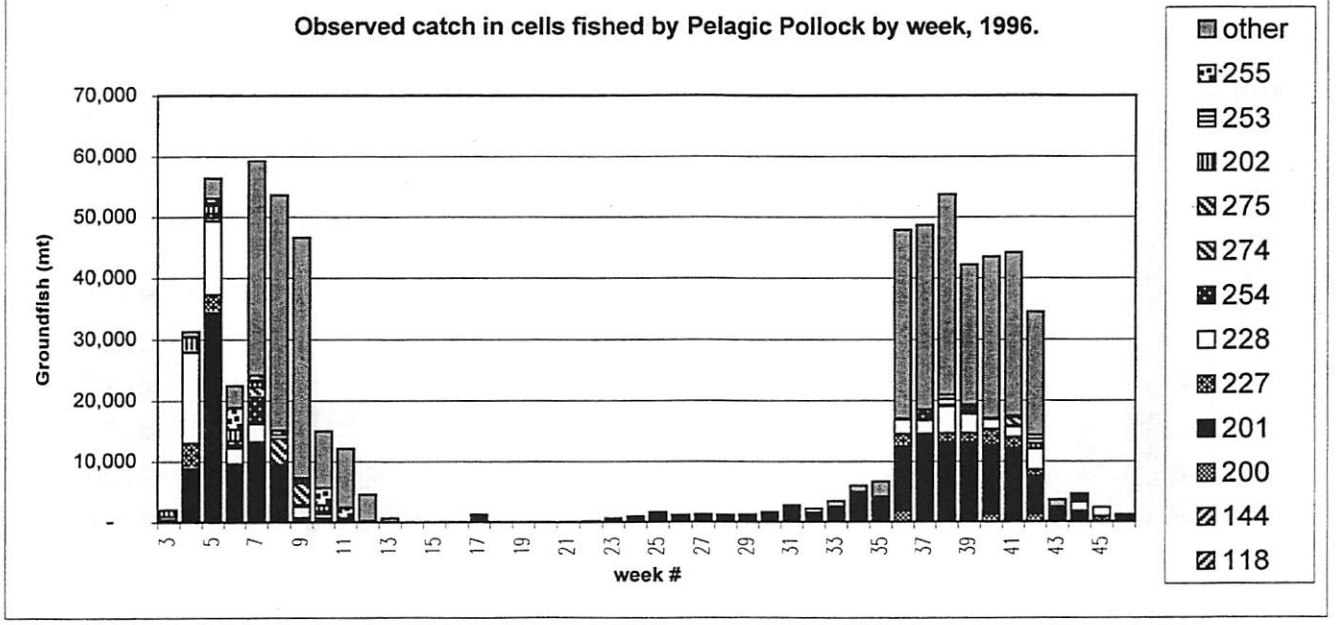
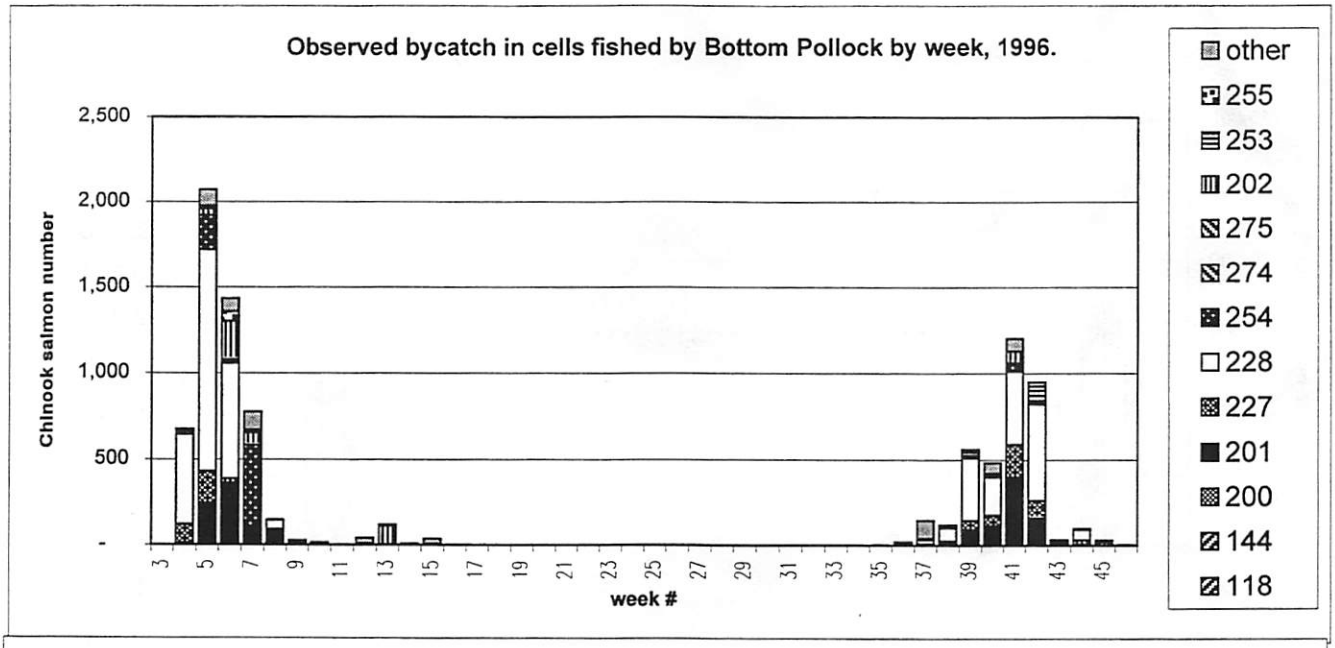
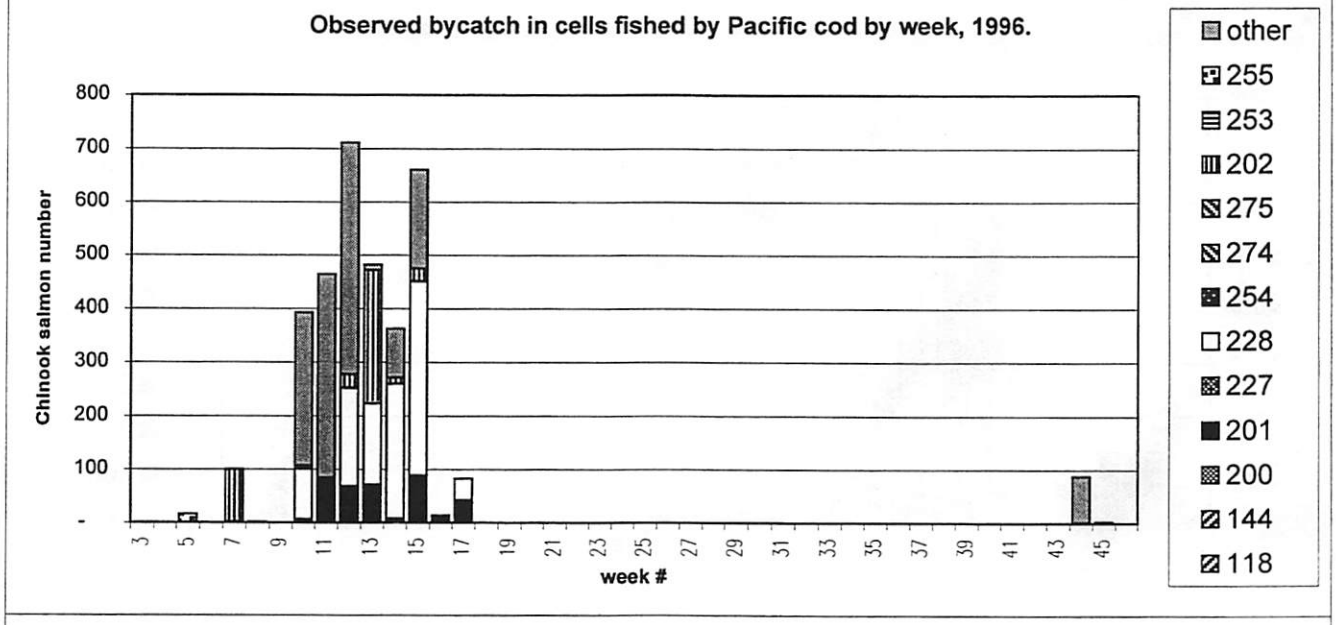

Observed catch in cells fished by Pelagic Pollock by week, 1996.
Groundfish (mt)
70,000
60,000
50,000
40,000
30,000
20,000
10,000
-
3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39 41 43 45
week #
other
255
253
202
275
274
254
228
227
201
200
144
118

Figure 35


Observed bycatch in cells fished by Bottom Pollock by week, 1996.
Chinook salmon number
2,500
2,000
1,500
1,000
500
-
3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39 41 43 45
week #
other
255
253
202
275
274
254
228
227
201
200
144
118


Observed bycatch in cells fished by Pacific cod by week, 1996.
Chinook salmon number
800
700
600
500
400
300
200
100
-
3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39 41 43 45
week #
other
255
253
202
275
274
254
228
227
201
200
144
118

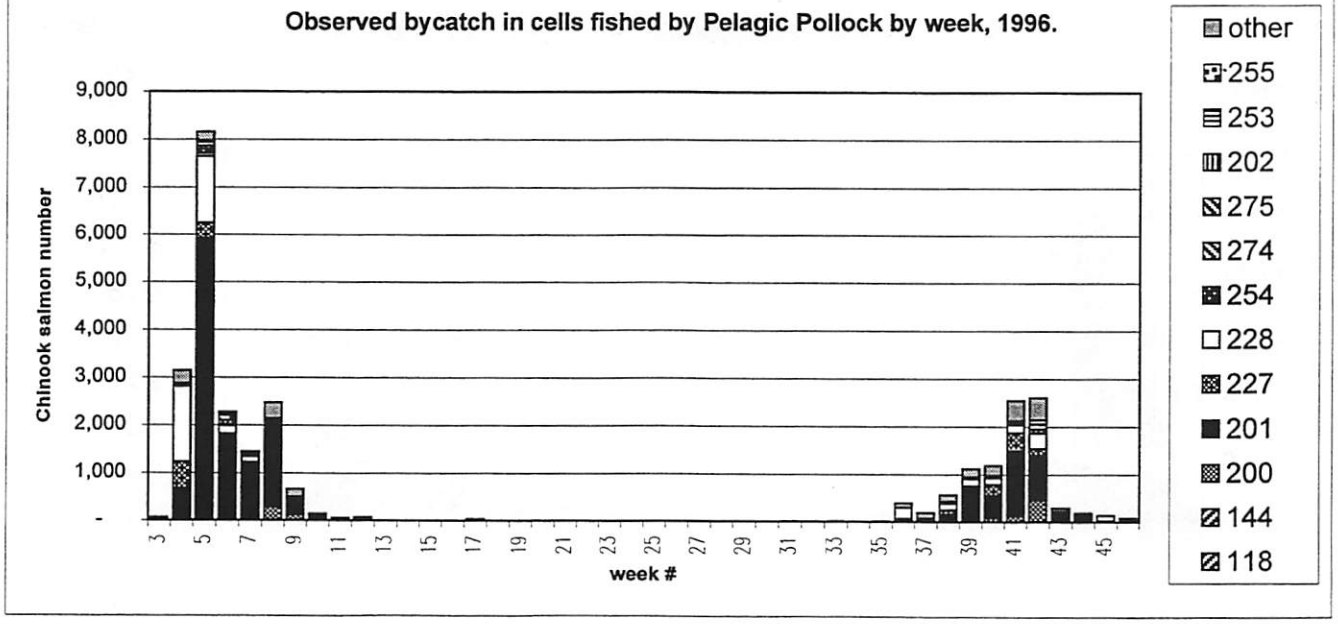
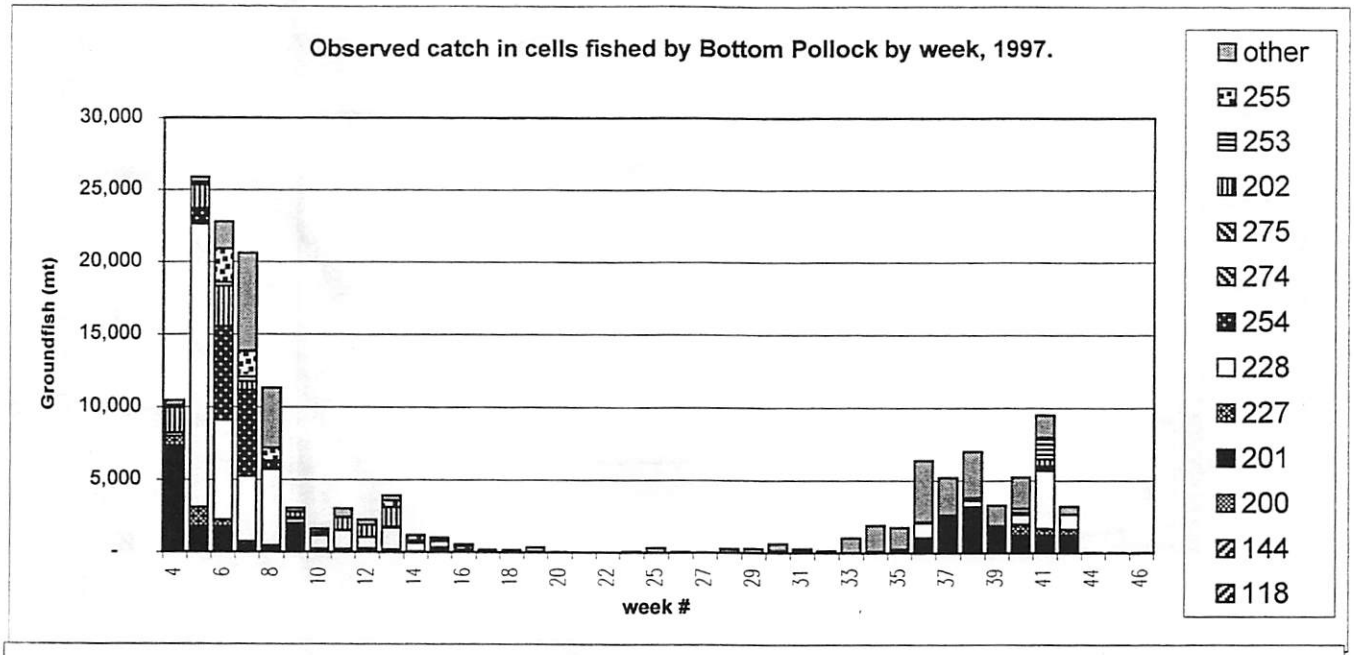
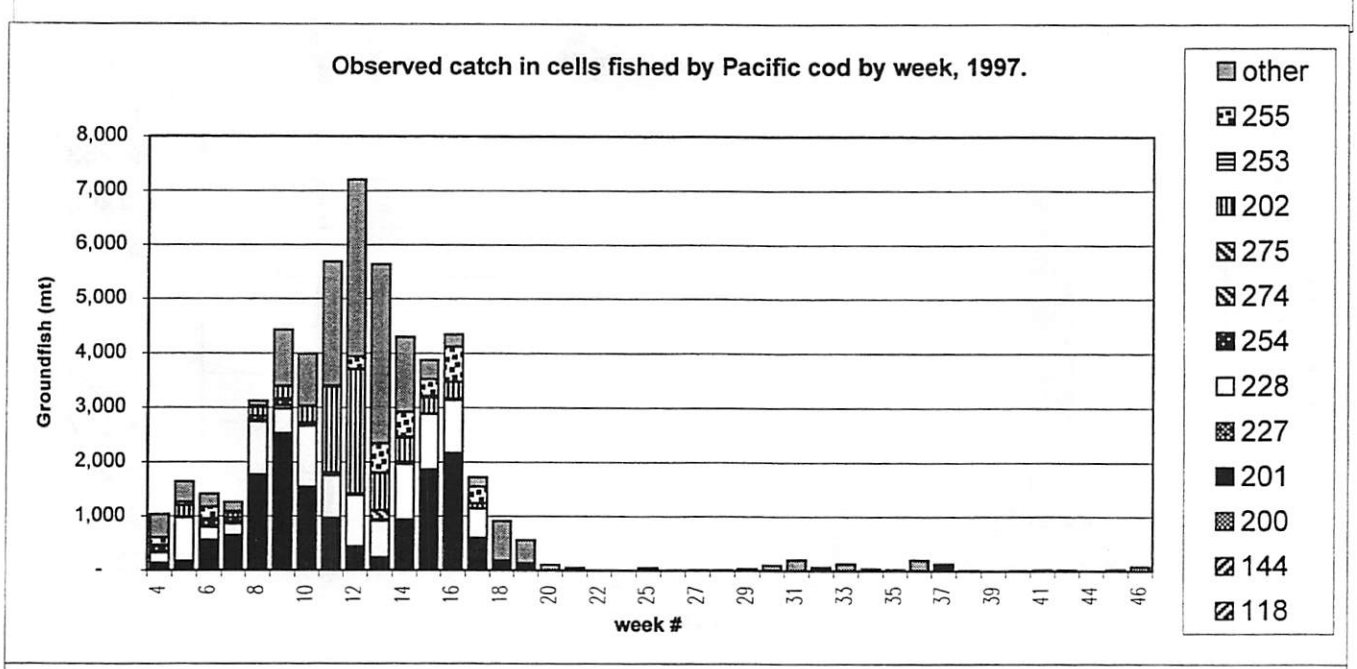

Observed bycatch in cells fished by Pelagic Pollock by week, 1996.
Chinook salmon number
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
-
3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39 41 43 45
week #
other
255
253
202
275
274
254
228
227
201
200
144
118

Figure 36


Observed catch in cells fished by Bottom Pollock by week, 1997.
Groundfish (mt)
30,000
25,000
20,000
15,000
10,000
5,000
-
4 6 8 10 12 14 16 18 20 22 25 27 29 31 33 35 37 39 41 44 46
week #
other
255
253
202
275
274
254
228
227
201
200
144
118


Observed catch in cells fished by Pacific cod by week, 1997.
Groundfish (mt)
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
-
4 6 8 10 12 14 16 18 20 22 25 27 29 31 33 35 37 39 41 44 46
week #
other
255
253
202
275
274
254
228
227
201
200
144
118

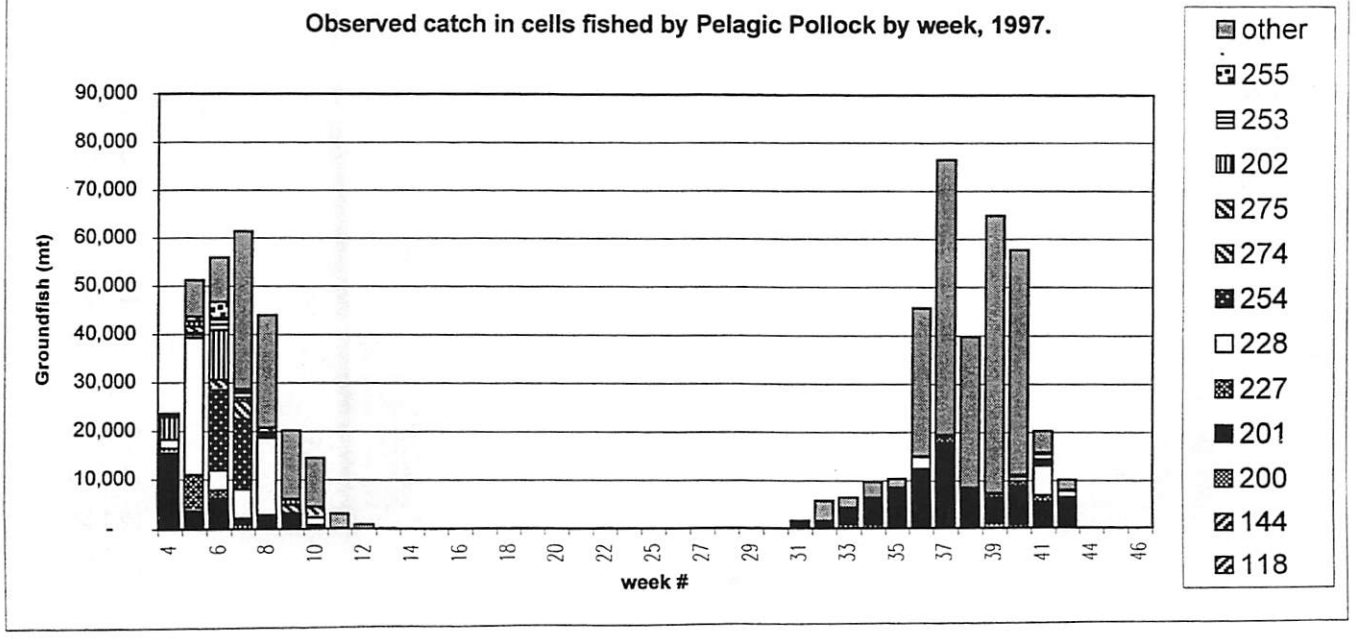
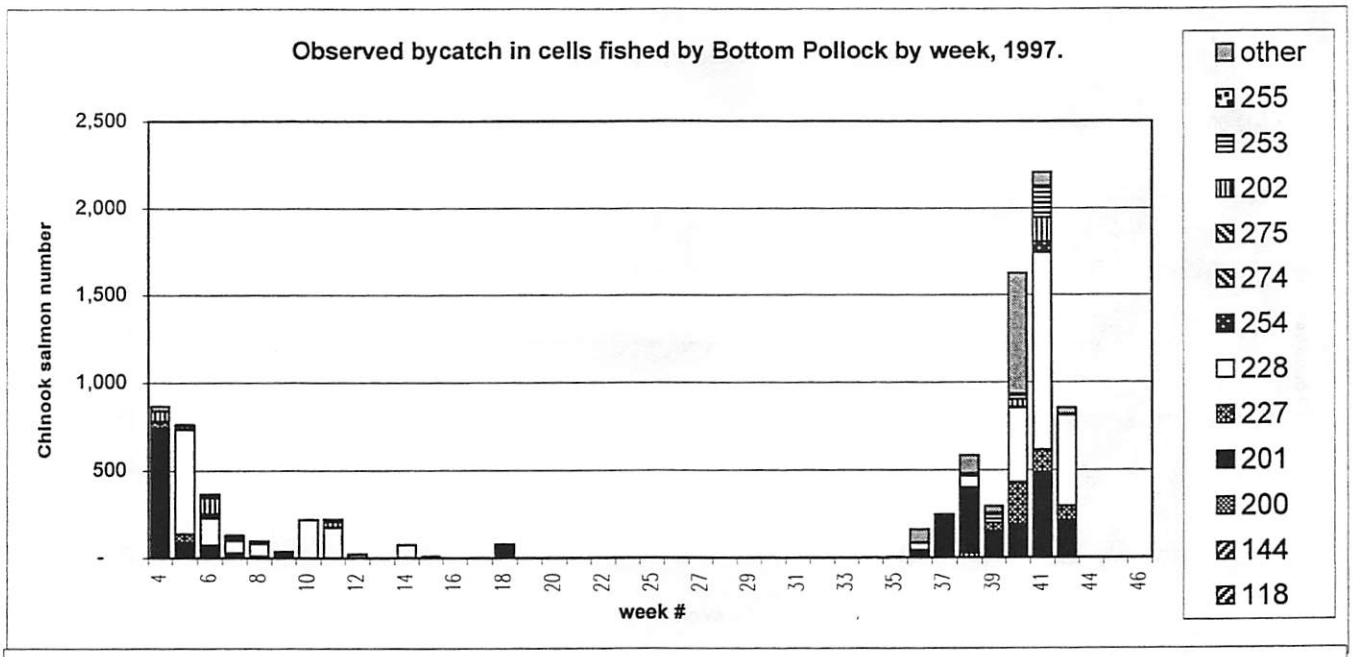
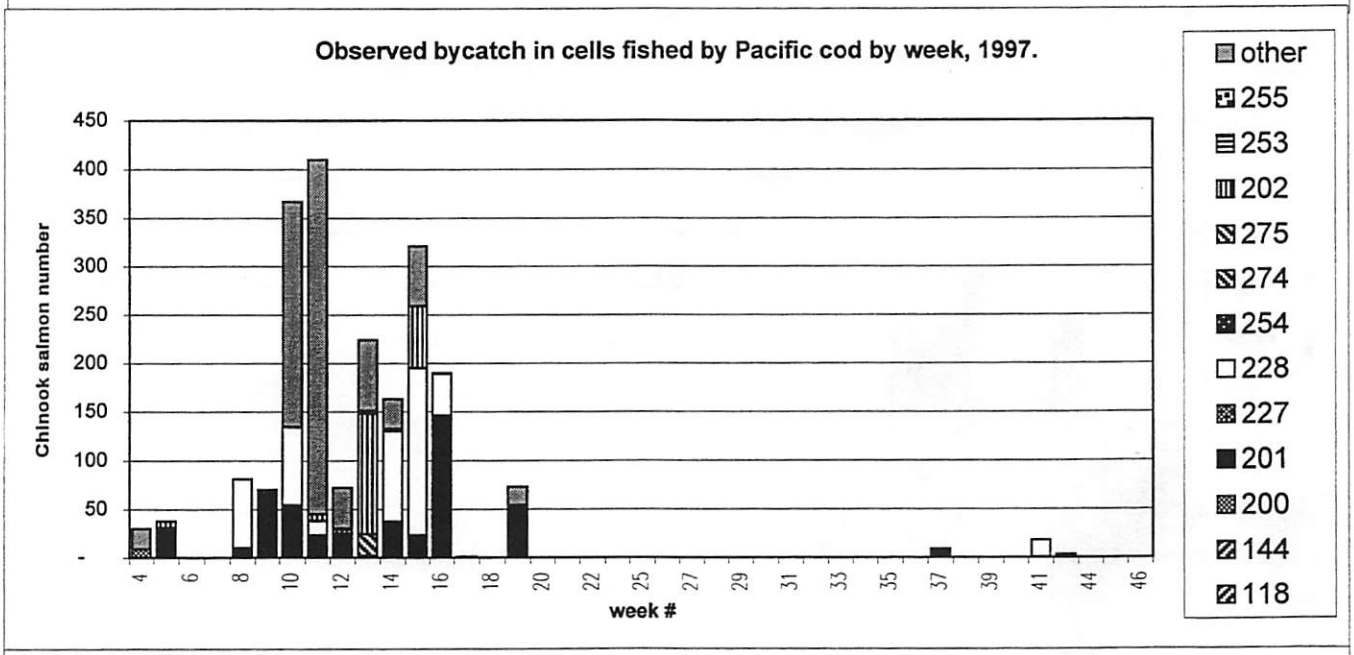
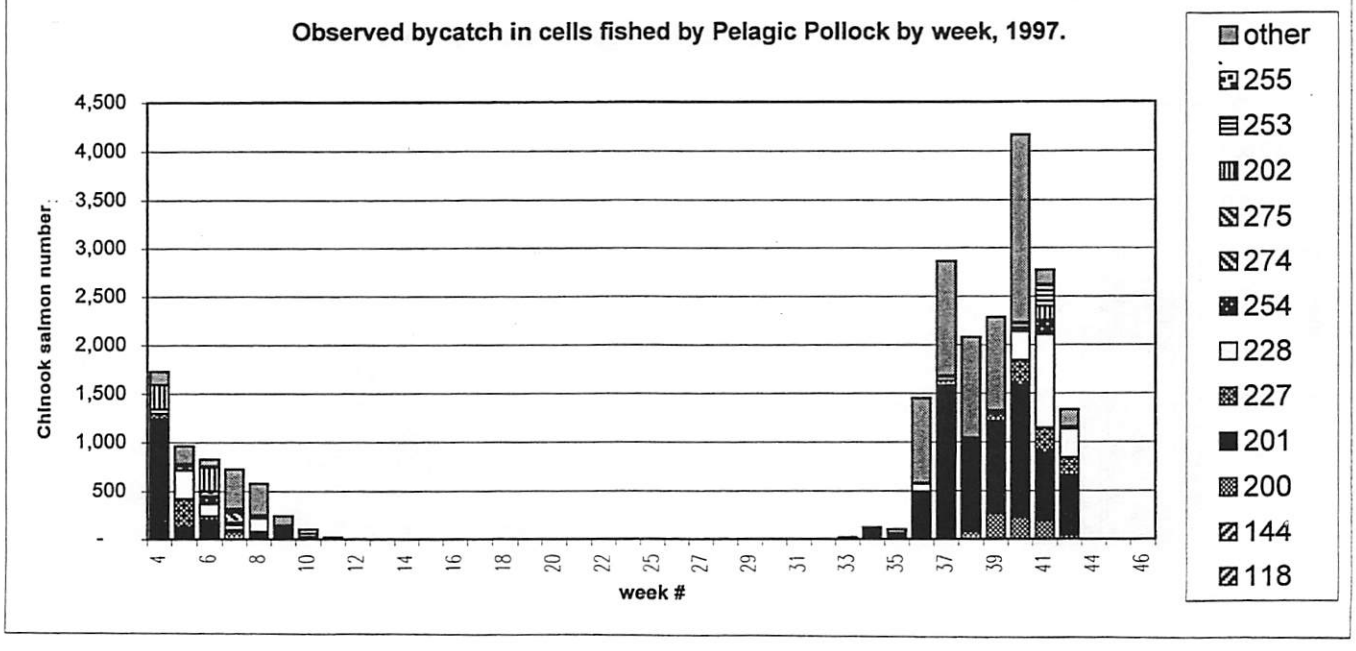

Observed catch in cells fished by Pelagic Pollock by week, 1997.
Groundfish (mt)
90,000
80,000
70,000
60,000
50,000
40,000
30,000
20,000
10,000
-
4 6 8 10 12 14 16 18 20 22 25 27 29 31 33 35 37 39 41 44 46
week #
other
255
253
202
275
274
254
228
227
201
200
144
118

Figure 37


Observed bycatch in cells fished by Bottom Pollock by week, 1997.
Chinook salmon number
2,500
2,000
1,500
1,000
500
-
4 6 8 10 12 14 16 18 20 22 25 27 29 31 33 35 37 39 41 44 46
week #
other
255
253
202
275
274
254
228
227
201
200
144
118


Observed bycatch in cells fished by Pacific cod by week, 1997.
Chinook salmon number
450
400
350
300
250
200
150
100
50
-
4 6 8 10 12 14 16 18 20 22 25 27 29 31 33 35 37 39 41 44 46
week #
other
255
253
202
275
274
254
228
227
201
200
144
118


Observed bycatch in cells fished by Pelagic Pollock by week, 1997.
Chinook salmon number
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
-
4 6 8 10 12 14 16 18 20 22 25 27 29 31 33 35 37 39 41 44 46
week #
other
255
253
202
275
274
254
228
227
201
200
144
118