

**Assessment and Management
of
Prince William Sound Walleye Pollock
for 1996**



by
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ABSTRACT

Prior to 1995, less than 4 metric tons (mt) of walleye pollock *Theragra chalcogramma* were annually harvested, mainly by jig and bottom trawl gear, from Prince William Sound (PWS), Alaska. A developing fishery using mid-water trawls harvested 2,900 mt of walleye pollock from PWS in 17 days during January and February 1995. Walleye pollock occurring in PWS during the summer were not included in either Gulf of Alaska assessments conducted by the National Marine Fisheries Service (NMFS) or the development of Gulf of Alaska management strategies. Walleye pollock managed in PWS under the authority of the Alaska Department of Fish and Game (ADF&G) should be limited to the resource not assessed by NMFS. To refine future management strategies for this fishery, I examined assessment survey data collected from PWS during summer 1989, spring 1994, and winter 1995. The spring 1994 estimate of 24,328 mt was thought to best represent the current summer population of walleye pollock. Assuming that recent trends in pollock abundance were consistent between PWS and the Gulf of Alaska, the PWS walleye pollock biomass has declined 37% since the 1994 survey. The 1995 biomass is projected to be 15,345 mt. An exploitation rate of 0.09, which yields a guideline harvest level of 1,400 mt, is recommended for the 1996 PWS mid-water trawl fishery. This will be consistent with the harvest rate applied to walleye pollock in the Gulf of Alaska. To adequately manage the 1996 PWS fishery, an emergency regulation is needed which places the fishery under the authority of a permit issued by the Commissioner of ADF&G. The regulation will require that fishing vessels be registered with ADF&G seven days prior to the season. The permit will require that ADF&G be provided with daily catch reports, and an ADF&G logbook be maintained while fishing and submitted to ADF&G following the closure of the fishery. The fishery will open 20 January 1996 and continue until the guideline harvest is reached. ADF&G plans to conduct catch sampling during the fishery and also conduct a summer assessment survey that will be comparable with the NMFS Gulf of Alaska survey.

KEY WORDS: commercial fishery, groundfish management, Prince William Sound, *Theragra chalcogramma*, walleye pollock

INTRODUCTION

Prior to 1995, less than 4 mt of walleye pollock *Theragra chalcogramma* were commercially harvested each year, mainly by jig and bottom trawl gear, within Prince William Sound, Alaska. In 1995 the annual harvest from this area increased dramatically with the landing of 2,900 mt of walleye pollock, mainly by mid-water trawl gear. The objectives of this report are to present information on the walleye pollock resource of Prince William Sound; to provide a description and summary of commercial harvests of this species for this area; and to make recommendations for the future management of this species in Prince William Sound, including research needs.

GENERAL BIOLOGY

Walleye pollock have been reported along the North American west coast from Carmel, central California, through the Bering Sea to St. Lawrence Island, and on the Asia coast to Kamchatka, the Okhotsk Sea, and the southern Sea of Japan (Hart 1973; Bakkala et al. 1986). Walleye pollock are generally considered to be semidemersal, inhabiting continental shelf and slope waters to depths of 650 m, but they may also be pelagic in some areas. Genetic differences between walleye pollock of the eastern and western Pacific, as well as regional differences in age, growth, morphometric, and meristic characteristics, suggest that multiple stocks exist (Okada, K. 1986).

Walleye pollock typically spawn in the first half of the calendar year, but may spawn later in the year at higher latitudes. The pelagic eggs are 1.35 to 1.45 mm in diameter. Age-0 walleye pollock in the Bering Sea typically occupy the upper 40 m of the water column until fall months when they begin a semidemersal existence (Traynor and Nelson 1983). Age-1 and -2 walleye pollock occupy discrete schools between 30 m and the bottom in the eastern Bering Sea. Age-1, -2, and -3 fish generally occur higher in the water column and are rarely captured in demersal trawls, while most fish age-4 and older are located closer to the bottom and are commonly captured in demersal trawls. In the Gulf of Alaska, age-1 and -2 walleye pollock are approximately 13 cm and 25 cm in length, respectively (Janusz 1986). Size at first maturity appears to be about 35 cm, which is usually attained at age-3.

The size, number, and variety of prey increase with walleye pollock size. Walleye pollock yolk-sac larvae, 3-6 mm in length, feed primarily on copepod nauplii (Nishiyama et al. 1986). Euphausiids and shrimp are important prey items for both juveniles and adults, particularly in the spring (Dwyer et al. 1986; Yang 1993). In summer, calanoid copepods and amphipods become an important component of the diet of small walleye pollock, while fishes are a major prey of large walleye pollock. In the Bering Sea during summer, age-0 walleye pollock were major prey items of larger walleye pollock (Livingston et al.

1993). By autumn cannibalism represented a major diet component of both large and small fish. In the Gulf of Alaska, a variety of fishes are consumed by walleye pollock during the summer, with the most important prey item often being capelin *Mallotus villosus*. In winter, fish again composed the greatest portion of the diet of walleye pollock, but only the larger individuals commonly preyed upon other walleye pollock.

MANAGEMENT AREA

Prince William Sound, Alaska, (PWS) is a complex fjord-type system located along the northern Gulf of Alaska (Muensch and Schmidt 1974). For groundfish management, the PWS Management Area is defined as all waters enclosed by lines drawn from Pt. Whiteshed to Pt. Bentinck, Cape Hinchinbrook to Zaikof Point, and Cape Cleare to Cape Puget (Figure 1). PWS is recognized as being internal waters of the State of Alaska, so groundfish harvests within PWS are under state, rather than federal, management authority.

CATCH HISTORY

Prior to 1995, annual commercial harvests of walleye pollock from PWS were less than 4 mt (Table 1; Bechtol 1995). These harvests were primarily taken incidentally by trawl or longline gear, although some directed effort with jig gear occurred in 1994 (Figure 2). Little information on at-sea discards has been obtained, but walleye pollock discards probably occur only at low levels on longline gear.

In January 1995, mid-water trawl vessels transiting the southwest portion of PWS observed sonar echoes from what appeared to be walleye pollock aggregations. Some vessel operators contacted the Alaska Department of Fish and Game (ADF&G) to determine whether the State would allow a directed walleye pollock fishery within PWS. Although ADF&G allows harvests of species for which surplus yield is available, little stock data was available and a harvest guideline had not previously been established for pollock in PWS (Bechtol 1995). Previous assessment surveys indicate that a resident walleye pollock population may occur within PWS (Parks and Zenger 1979; Haynes and Urban 1991). The most recent of these, a series of bottom trawl collections made during the summer of 1989 following the *T/V Exxon Valdez* oil spill, indicated that 9,500 mt of walleye pollock were in PWS at the time of the survey (Haynes and Urban 1991). Therefore, for the 1995 fishery ADF&G set a guideline harvest range of 950-2,000 mt of walleye pollock for mid-water trawl gear, based on an exploitation rate of 10-20% of the 1989 biomass estimate.

Mid-water trawl vessels began fishing in PWS on 31 January 1995. Given transit and offloading time, most vessels delivered to a shore-based processing plant once every three days during the first week of the fishery. Depending upon vessel size and hold capacity, each delivery usually consisted of 70 to 140 mt of walleye pollock which had been taken in one or two tows. Assuming this daily catch rate would be maintained, ADF&G staff estimated that the guideline harvest level would be reached after 17 days of fishing; a closure of the trawl fishery for pollock was announced for noon on 16 February. The actual total harvest achieved by nine vessels was 2,857 mt (6.2 million lb), about 43% greater than the upper end of the guideline harvest level. The larger than expected harvest was due to the arrival of additional fishing vessels and tenders during the latter portion of the fishery. An additional 98 mt of walleye pollock was landed during a combined test fishery and acoustic survey conducted by ADF&G in late February and early March 1995. Harvest of walleye pollock was not closed to other gear types since catches were expected to be small. The total PWS walleye pollock harvest through 31 October 1995 was 2,960 mt, which included about 4 mt landed by longline and jig gear as well as commercial and test fishing landings by mid-water trawl gear. Most of the total catch was processed as fillets, and the roe was also marketed.

MANAGEMENT CONSIDERATIONS

The 1995 mid-water trawl fishery for walleye pollock in PWS was a new fishery within state managed waters, so strategies for long-term management of this resource have not yet been developed. Although previous surveys suggested that a resident walleye pollock population may exist in PWS (Parks and Zenger 1979; Haynes and Urban 1991), the relationship between walleye pollock in PWS and those in the Gulf of Alaska is not clear. Even if walleye pollock occurring in PWS are a component of the Gulf of Alaska stock, the PWS component is not included in the National Marine Fisheries Service (NMFS) triennial trawl survey of the Gulf of Alaska, which is conducted during summer months (Chris Wilson, NMFS, Seattle, WA, personal communication). Therefore, it appears that a sustainable fishery for walleye pollock in PWS can be developed if 1) estimates of walleye pollock biomass can be obtained, 2) a conservative harvest guideline level is set, and 3) fishery management measures are developed which ensure harvests can be controlled.

Biomass Estimates from Surveys

1989 Spring Through Fall Trawl Surveys

Following the *M/V Exxon Valdez* oil spill, ADF&G and NMFS conducted two multi-species bottom trawl surveys of PWS in the summer of 1989 using a 400 mesh Eastern otter trawl to sample fishes in PWS (Haynes and Urban 1991). The first survey, designed to emulate a previous survey conducted in April 1978 (Parks and Zenger 1979), consisted of 61 successful hauls during 17 May through 23 June 1989. The second survey, based on a random stratified sampling design, consisted of 63 successful hauls during 7 August through 13 September 1989. Results, based on area swept expansions, indicated that 9,500 mt of walleye pollock were present in PWS. Actual walleye pollock biomass was probably greater because the semi-pelagic habits of this species may have made some component of the population unavailable to the trawl survey gear. Furthermore, this otter trawl gear did not have as high an opening as the high rise bottom trawls currently used in NMFS triennial surveys (Anne Hollowed, NMFS, Seattle, WA, personal communication), so abundance data collected in PWS are not directly comparable to data collected in the Gulf of Alaska.

1994 Spring Acoustic Survey

During early and late May 1994, an acoustic survey was conducted in PWS as part of the *Exxon Valdez* Trustee Council Sound Ecosystem Assessment (SEA) project. Expansion of survey data resulted in a walleye pollock biomass estimate of 24,328 mt within the 40-125 m depth range of PWS (Table 2; Jay Kirsch, Prince William Sound Science Center, Cordova, AK, personal communication). Several factors, however, make it difficult to assess the accuracy of this estimate. First, although sampling conducted during the acoustic survey indicated that walleye pollock were widely distributed at depths greater than 20 m, walleye pollock density (kg/surface area) above 40 m could not be estimated due to echo scattering by a plankton layer. Second, while the acoustic survey did not assess pollock biomass below 125 m, ADF&G bottom trawl surveys have shown walleye pollock to occur deeper than 125 m in PWS (personal observation). These two factors may have resulted in an underestimate of walleye pollock biomass in 1994. Although, the acoustic survey only covered western PWS, the errors introduced into the biomass estimate by directly extrapolating acoustic density estimates from western to eastern PWS are not known. However, walleye pollock have been captured since 1989 during ADF&G summer bottom trawl surveys in eastern PWS (personal observation).

1995 Winter Acoustic Survey

Because large commercial harvests of walleye pollock had never occurred within PWS, ADF&G worked with the Prince William Sound Science Center and the fishing industry to obtain more information on the abundance and distribution of walleye pollock after the 1995 winter fishery. Commercial vessels were used to catch walleye pollock and to conduct an acoustic survey using staff and equipment provided by the Prince William Sound Science Center. Captured walleye pollock were used to verify the identity of acoustic targets, and sale of these fish funded vessel charter costs. The survey involved two survey legs, with most of the survey effort focused in the southwest portion of PWS. The first leg, conducted from 24 to 25 February, provided a walleye pollock abundance estimate of 19,756 mt. The second leg, conducted from 28 February to 1 March, provided an estimate of 37,953 mt. During both legs, prespawning walleye pollock aggregations were concentrated in Port Bainbridge, Knight Island Passage, and Montague Strait (Figure 3). Scattered targets were observed in other areas of PWS, but were not included in the estimates. Rather than choosing among the two estimates, I used the average of the estimates from both legs, 28,855 mt, as the best estimate of walleye pollock prespawning biomass within PWS. This was done because of the wide range between estimates from the two legs. This range may indicate short-term spawning movement, and also that a portion of the prespawning aggregations surveyed within PWS could reside within the Gulf of Alaska the rest of the year.

Guideline Harvest Level

The 1989, 1994 and 1995 estimates of walleye pollock in PWS ranged from 9,500 mt in 1989 to 28,855 mt in 1995 (Table 2). Difference among these estimates may reflect changes in the population abundance, but may also be due to differences in survey seasons and methods. While the 1995 winter survey provided the most recent estimate of walleye pollock biomass in PWS, it represented a winter survey of a spawning aggregation and could have included a portion of the population already included within the NMFS Gulf of Alaska pollock assessment. The 1994 spring survey, although not as recent, provided an estimate of walleye pollock biomass which was not included in the NMFS Gulf of Alaska assessment. Therefore, the 1994 spring acoustic survey estimate of 24,328 mt will be used as the best estimate of walleye pollock biomass in PWS for the purpose of setting a harvest guideline level for 1996.

Neither a long history of catches nor population assessments are available for walleye pollock in PWS. However, information from the SEA program areas (Mark Willette, ADF&G, Cordova, AK, personal communication) indicates that walleye pollock in PWS have similar recruitment patterns to walleye pollock in the Gulf of Alaska, since the 1988 and 1994 year classes were very abundant in both areas. This similarity could be due to

the effects of large-scale environmental factors or may indicate a biological tie between walleye pollock in these two areas. In either case, it suggests that sustainable exploitation rates may be similar for both populations. Therefore, I assigned a guideline harvest level to walleye pollock in PWS using the method NMFS has used to set fishing rates for walleye pollock in federal waters of the Eastern Gulf of Alaska (Hollowed et al. 1995).

NMFS staff developed an index of the walleye pollock population in the Gulf of Alaska from data collected during the NMFS triennial trawl survey. This index, combined with fishery catch data, the Shelikof Strait spawning population estimate, and other data sources, was used to construct a stock synthesis model (Methot 1990) to annually estimate walleye pollock abundance in the Western and Central Gulf of Alaska regulatory areas. Modeling efforts have focused on these areas because a suitable time series of data were available and because these areas accounted for most of the Gulf of Alaska walleye pollock biomass. The allowable biological catch of the combined Western and Central Gulf of Alaska (ABC_{WC}) was set annually using an appropriate fishing rate (Hollowed et al. 1995). NMFS staff used triennial trawl survey indices to determine an allowable biological harvest for the Eastern Gulf of Alaska regulatory area (ABC_E) based on the abundance of pollock biomass in the Eastern (B_E) relative to the Western and Central (B_{WC}) regulatory areas:

$$ABC_E = ABC_{WC} * \frac{B_E}{B_{WC}}. \quad (1)$$

The values of B_E and B_{WC} were calculated after each triennial survey and then the ratio of B_E to B_{WC} typically applied to each year's ABC_{WC} until data are available from the next survey. The harvest level for the Eastern Gulf is added to the Western and Central allocations to give the total pollock harvest for the Gulf of Alaska. An underlying assumption is that the relative proportion of the walleye pollock biomass present in each regulatory area is constant between surveys.

Since the 1994 spring biomass in PWS ($B_{P,94}$) represents a component of the walleye pollock biomass not assessed by the NMFS triennial trawl surveys, a similar proportionality method can be used to estimate the 1996 walleye pollock biomass in PWS. In this case, the underlying assumption is that the relative proportion of the biomass in PWS would also be constant between triennial surveys so that:

$$B_{P,96} = B_{WC,96} * \frac{B_{P,94}}{B_{WC,94}}. \quad (2)$$

The stock synthesis model estimates the Western and Central pollock biomass to be 910,000 mt in 1994 and forecasts the 1996 population to be 574,000 (Hollowed et al. 1995). Using the PWS 1994 spring survey estimate from PWS, results in a projected 1996 PWS walleye pollock biomass ($B_{P,96}$) of

$$B_{P,96} = 574,000 * \frac{24,328}{910,000} \cong 15,345 \text{ mt.} \quad (3)$$

A variety of harvest exploitation rates have been applied to Gulf of Alaska groundfish resources. The current recommendation of the Gulf of Alaska Plan Team for walleye pollock harvests results in an exploitation rate of $\mu=52,000/574,000 = 0.09$ (Hollowed et al. 1995).

Application of this same exploitation rate to the PWS pollock biomass projection for 1996 results in a guideline harvest level of 1,400 mt. This harvest, while only about half of the 1995 PWS harvest, was set recognizing the potential relationship between PWS and Gulf of Alaska walleye pollock, and is also consistent with the recent decline in walleye pollock biomass in the Gulf of Alaska. The lack of information on this species in PWS, and the importance of this species in the marine ecosystem also dictate a cautious approach. For example, walleye pollock have been shown to be an important dietary item for several marine mammals, some of which are declining in abundance (Lloyd Lowry, ADF&G, Fairbanks, personal communication). Harbor seals, whose diet may include up to 30% juvenile walleye pollock, are declining in PWS, and Steller sea lions, with a diet that may approach 60% walleye pollock, are continuing to decline along much of the Alaskan coast. Steller sea lions have been listed as a "threatened" species under the Endangered Species Act, with a listing of "endangered" possible in the near future within some portions of the sea lion range.

Fishery Management

The fishing power of the mid-water trawl vessel will make it possible to harvest or exceed the relatively small guideline harvest level within a short time frame. To meet stock conservation needs and allow for an orderly harvest, it will be necessary to closely manage the 1996 PWS walleye pollock fishery. The following measures are proposed as management options for the 1996 fishery.

Fishing Season - The fishery will open at 12:00 noon on January 20, 1996, and will remain open until the harvest guideline is taken. This opening will coincide with openings in the adjacent federal waters. Time and area closures may be used to reduce the bycatch of non-target species.

Registration Deadline - Vessels operators will be required to register at least 7 days prior to the 20 January opening of the PWS walleye pollock fishery.

Commissioner's Permit - In order to maintain a manageable fishery that does not exceed the guideline harvest level and provides for the long-term sustainability of the PWS pollock resource, ADF&G staff will pursue an emergency regulation to place this fishery under the authority of a Commissioner's Permit. This permit,

which will also serve as an area registration, will tentatively include the following provisions:

1. Timely Catch Reporting - Timely catch reporting, either from the fishing vessel or through the vessel's processor, will be required. The reporting period will be determined after an estimate of effort is obtained.
2. Logbook Reporting - All vessels will be required to maintain logbooks while participating in this fishery.

Vessels participating in the PWS fishery that are registered to fish in federal waters for groundfish will be reminded to contact federal authorities regarding compliance with the federal logbook and federal observer programs.

Stock Assessment

To better assess PWS walleye pollock, ADF&G plans to expand its commercial catch sampling program and to conduct a summer survey. This work will be partially funded through the ADF&G test fish receipt program.

During the 1996 fishery, deliveries walleye pollock will be sampled to collect information on weight, length, sex, and age. Information on areas, depths and times fished will be obtained from confidential skipper interviews and vessel logbooks. Additionally, the number and weight of incidentally taken species will be estimated.

The fishing industry has expressed considerable interest in further assessing the PWS spawning aggregation. However, a survey of the winter aggregation may include walleye pollock biomass already assessed by NMFS and allocated to fisheries in federal waters. To estimate the PWS walleye pollock resource not accounted for during the NMFS triennial trawl survey, ADF&G will conduct a summer walleye pollock survey in PWS to correspond with the NMFS survey.

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Table 1. Annual commercial walleye pollock harvest from Prince William Sound, Alaska during 1987-1995.

| Year | Round Weight (metric tons) | | | Total |
|------|----------------------------|--------|-------|--------|
| | Longline | Trawl | Other | |
| 1987 | 0.4 | | | 0.4 |
| 1988 | 0.7 | | | 0.7 |
| 1989 | 0.2 | 0.4 | <0.1 | 0.7 |
| 1990 | 0.3 | 3.0 | | 3.3 |
| 1991 | | | | 0.0 |
| 1992 | <0.1 | 2.7 | | 2.7 |
| 1993 | 0.1 | 2.5 | | 2.6 |
| 1994 | <0.1 | | 2.5 | 2.5 |
| 1995 | 1.6 | 2954.5 | 2.2 | 2958.2 |

Table 2. (A) Walleye pollock biomass in Prince William Sound as estimated during 1989, 1994, and 1995 surveys, and (B) the estimated 1996 biomass and proposed 1996 harvest.

A. Prince William Sound pollock biomass estimated during 1989, 1994, and 1995 surveys.

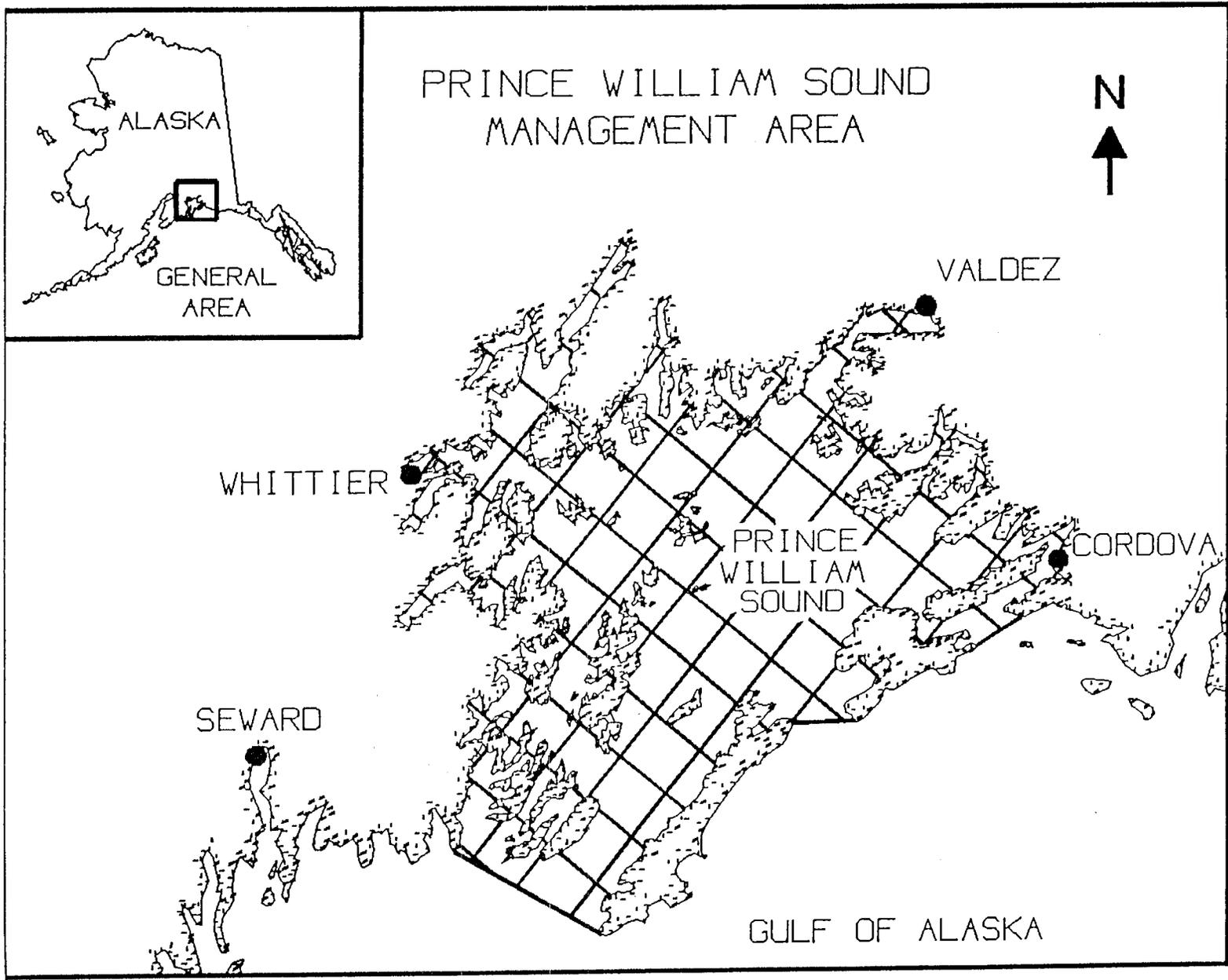
| Estimation Source | Survey Estimated Biomass (mt) | Comments |
|-------------------------------|-------------------------------|---|
| 1989 PWS Bottom Trawl Survey | 9,500 | Summer survey. |
| 1994 PWS Hydroacoustic Survey | 24,328 | Most recent non-winter survey. |
| 1995 PWS Hydroacoustic Survey | 28,855 | Winter survey, relationship to Gulf of Alaska population unknown. |

B. Prince William Sound pollock biomass forecast for 1996 and proposed 1996 harvest.

| | Forecast 1996 Biomass (mt) | 1996 Harvest (mt) | |
|---|----------------------------|-------------------|---|
| 1996 Biomass based on the 1994 PWS/WC ratio | 15,345 ^a | 1,390 | $\mu = 0.09$, similar to the federal Gulf of Alaska harvest rate |

PWS = Prince William Sound, WC = Western/Central Regulatory area of the Gulf of Alaska

$$^a B_{P,96} = B_{WC,96} * \frac{B_{P,94}}{B_{WC,94}} \cong 15,345 \text{ mt, where } B_{P,94} = 24,328 \text{ mt, } B_{WC,96} = 574,000 \text{ mt, and } B_{WC,94} = 910,000 \text{ mt.}$$



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Figure 1. Prince William Sound management area.

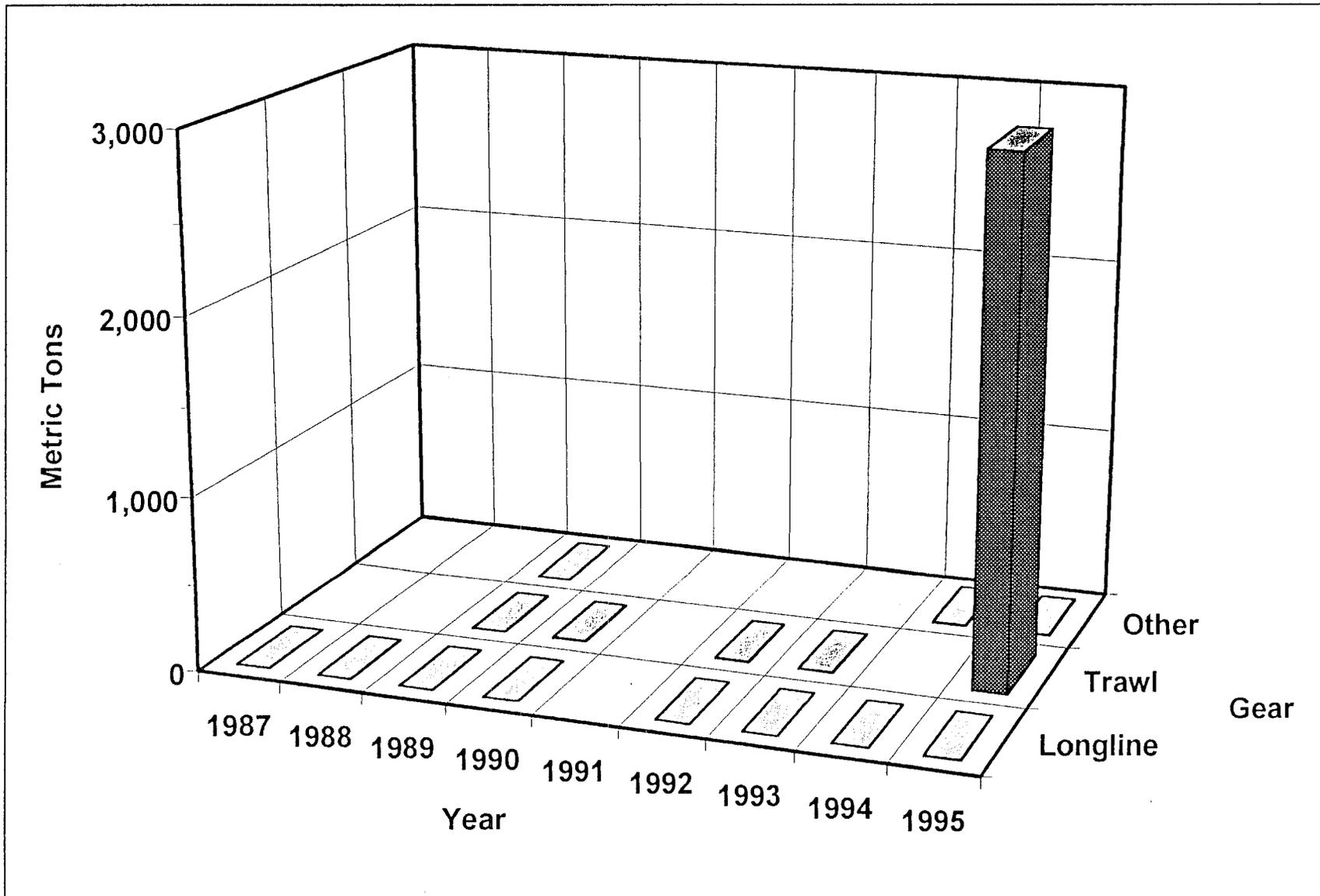


Figure 2. Commercial walleye pollock harvests by gear type from Prince William Sound during 1987 through 1995.

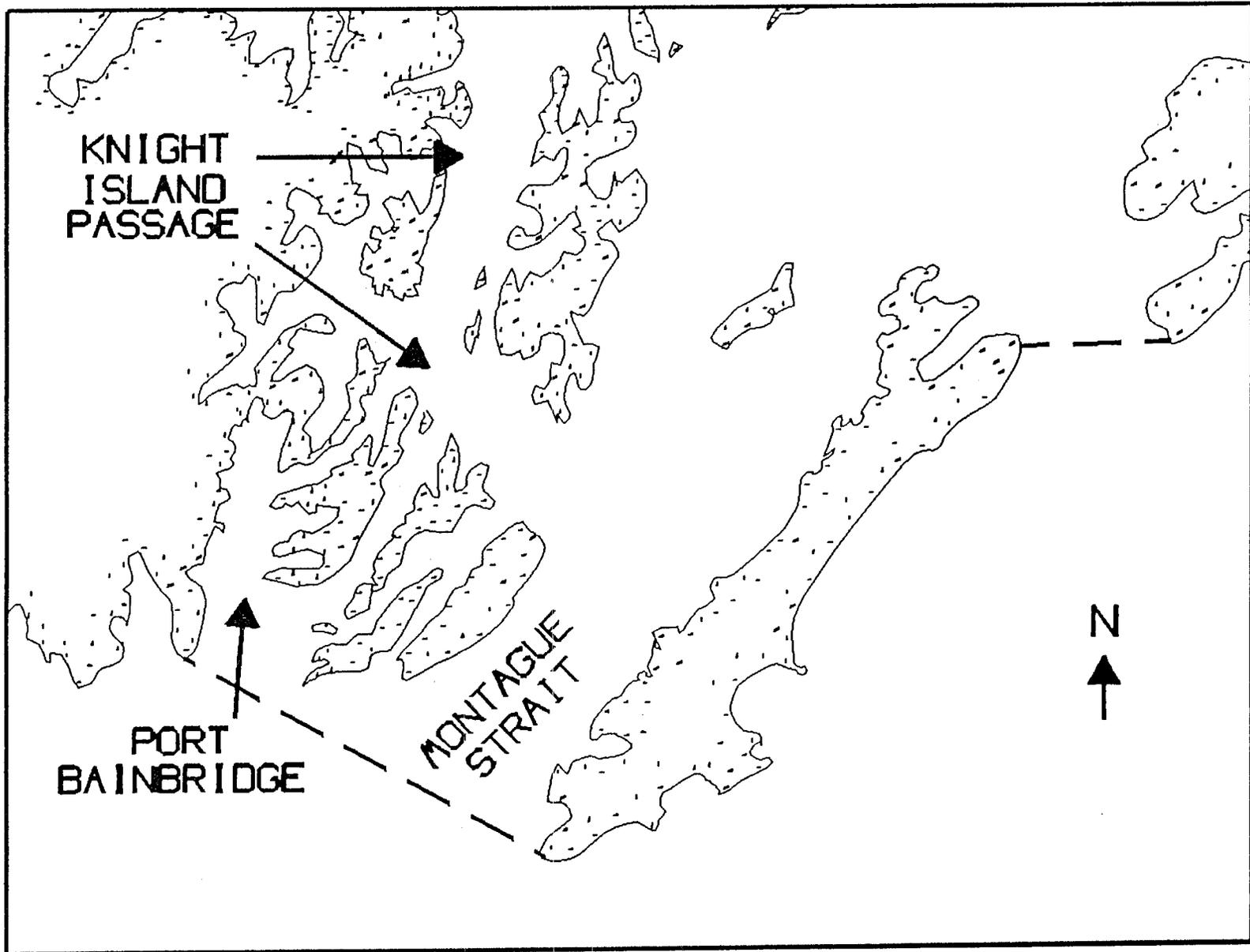


Figure 3. General area of focus for 1995 commercial walleye pollock fishery and 1995 winter hydroacoustic fishery.

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