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Preface

This bibliography contains "selected" citations from the literature on aquaculture in the Northeast Pacific region. Citations date from approximately 1974 to 1989, and are arranged alphabetically by the author's surname. An author index as well as a subject index to common aquaculture terms (selected from the title, abstract, and descriptor fields) are provided at the end of the bibliography.

Several computerized databases were searched for citations to the literature. As a result of utilizing different databases to compile this bibliography, formats for bibliographic entries may vary.

Databases accessed for relevant information include: 1)ASFA (Aquatic Sciences and Fisheries Abstracts) database, 1978-present, produced under contract to the Food and Agriculture Organization of the United Nations by Cambridge Scientific Abstracts (CSA) for a consortium of United Nations agencies and cooperating member states; 2) AGRICOLA (AGRICultural OnLine Access), 1979-present, an agricultural database produced by the National Agricultural Library (NAL); and 3)WLN (Western Library Network), an online bibliographic utility for cataloging western regional publications.

The geographic region covered includes the western coastal United States, Pacific coastal provinces of Canada, and those areas within the Northeast Pacific (delimited by 180 degrees longitude, 30 degrees North latitude, and the North American coast).

Subjects range from general aquaculture to ocean ranching, fish biology, and diseases as they relate to aquaculture applications.

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1
Aquaculture, a modern fish tale: seminar conducted by Water Resources Research Institute.
[Anonymous]
Source: Oregon State University, Corvallis, OR, 1979, 91 pp.
Descriptors: aquaculture

2
Aquaculture development in Southwest Washington Fisheries Production & Systems Planning.
[Anonymous]
Source: Fisheries Production & Systems Planning, 3675 S.E. Salmonberry Road, Port Orchard, WA 98366, 1981, 268 pp.
Descriptors: aquaculture

3
Aquaculture in B.C.: getting started.
[Anonymous]
Source: Province of British Columbia, Ministry of Agriculture and Fisheries, Victoria, 1987.
Descriptors: aquaculture

4
Aquaculture on the Sunshine Coast: a guide for prospective applicants.
[Anonymous]
Source: Ministry of Lands, Parks and Housing, Lower Mainland Regional Operations Division, Burnaby, B.C., 1986, 9 pp.
Descriptors: aquaculture

5
Aquaculture sites, habitat and species enhancement and rehabilitation projects, and their water quality and quality requirements for the south central Alaska region.
[Anonymous]
Source: Alaska Dept. of Fish and Game, Juneau, AK, 1979, 150 pp.
Descriptors: aquaculture

6
Columbia River Basin Fish and Wildlife Program: Issue paper 2, ocean survival/harvest controls.
[Anonymous]
Source: Northwest Power Planning Council, Portland, OR (USA), 1984, 23 pp.
Languages: English
Summary Languages: English
Document Type: Report
Report No.: DOE/NBM-4016406
NTIS Order No.: DE84016406/GAR.
ASFA Number: 115-09075

Abstract:

This paper examines the following issues related to the Columbia River Basin Fish and Wildlife Program's measures intended to counteract the pressure management agencies receive to relax regulations and allow increased catch: have the harvest management agencies implemented controls that are adequate to protect restoration of depressed salmon stocks in the Columbia Basin is restricting the construction of the Yakima hatchery and the John Day acclimation ponds an effective means of pressuring harvest management agencies to implement agencies to implement controls and would restrictions on other types of facilities or measures be more effective.

Descriptors: fishery management; policies; regulations; nature conservation; hatcheries
Geographic Descriptors: USA, Oregon, Columbia River basin
Taxonomic Descriptors: salmonidae

7
Columbia River Basin Fish and Wildlife Program: Issue paper 9B, resident fish.
[Anonymous]
Source: Northwest Power Planning Council, Portland, OR (USA), 1984, 18 pp.
Languages: English
Summary Languages: English
Document Type: Report
Report No.: DOE/NBM-4016410
NTIS Order No.: No.: DE84016410/GAR.
ASFA Number: 115-11399
Abstract:

The issue discussed is whether the Northwest Power Planning Council should add, delete, or modify measures in the Columbia River Basin Fish and Wildlife Program on resident fish hatcheries, habitat improvement, water purchases, enhancement opportunities and project operations.

Descriptors: nature conservation; habitat improvement; policies; fishery management; hatcheries
Geographic Descriptors: USA, Oregon, Columbia River basin
Environment: Fresh

8
Financing & incentives for aquaculture production in British Columbia.
[Anonymous]
Source: Province of British Columbia, Ministry of Agriculture and Food, Victoria, B.C., 1986, 38 pp.
Descriptors: aquaculture

9
Geothermal aquaculture project: Real Property Systems Inc., Harvey Basin, Oregon.
[Anonymous]
Source: Oregon Inst. of Tech., Klamath Falls (USA). Geo-Heat Cent, 1981, 33 pp.
Languages: English
Summary Languages: English
Document Type: Report

NTIS Order No.: DE82015110 DOE/ET/27256-T18; Contract FG06-79ET27256.
ASFA Number: 115-06785
Abstract:

Real Property Systems Inc. (RPS) owns two parcels in the vicinity of Harvey Lake, Oregon. One parcel is 120 acres in size, the other is 200 acres. A study concludes that the 200 acre parcel has the greater potential for geothermal development. RPS is interested in an aquaculture operation that produces fresh water prawns, (Macrobrachium rosenbergii) for the market. To supply the heat necessary to maintain the ideal temperature of 82 exp 0 F desired for these prawns, a geothermal resource having a 150 exp 0 F temperature or higher is needed. The best estimate is that 150 exp 0 F water can be found from minimum 1090 feet depth to 2625 feet, with no absolute assurances that sufficient quantities of geothermal waters exist without drilling for the same. This study undertakes the preliminary determination of project economics so that a decision can be made whether or not to proceed with exploratory drilling. The study is based on 10 acres of ponds, with a peak requirement of 2500 gpm of 150 exp 0 F geothermal water.

Descriptors: thermal aquaculture; geothermal energy; prawn culture
Geographic Descriptors: USA, Oregon, Harvey L.
Taxonomic Descriptors: Macrobrachium rosenbergii
Environment: Fresh

10
An Inquiry into finfish aquaculture in British Columbia: public record.
[Anonymous]
Source: Victoria: Queen's Printer for British Columbia, B.C., Finfish Aquaculture Inquiry, Vancouver, 1986, 3 volumes
Descriptors: aquaculture

11
Local government planning for coastal finfish aquaculture development.
[Anonymous]
Source: Development Services Branch, Ministry of Municipal Affairs, Victoria, B.C., 1987.
Descriptors: aquaculture

12
Proceedings: October 1974, [North Kitsap Marine Environmental Center] [Seaweed Farming in Puget Sound Seminar].
[Anonymous]
Source: Cooperative Extension Service, Washington State Univ., Pullman, WA, 1974, 41 pp.
Descriptors: algae culture

13
Review of salmon aquaculture.
[Anonymous]
Source: Senate Advisory Council, Alaska State Legislature, Pouch 5, Juneau, AK 99811, 1984, 305 pp.
Descriptors: fish culture

14
Washington State shellfish.
[Anonymous]
Source: Dept. of Fisheries, Olympia, WA, 1978, 55 pp.
Descriptors: shellfish culture

15
Pacific seaweed aquaculture: proceedings of a symposium on useful algae.
Abbott, Isabella A.; Foster, Michael S.; Eklund, Louise F.
Source: California Sea Grant College Program, Institute of Marine Resources, Univ. of California, La Jolla, CA, 1980, 228 pp.
Descriptors: algae culture

16
The Meadow Creek spawning channel.
Acara, A.H.
(Fisheries and Marine Service, Pacific Biological Station, Nanaimo, BC (Canada).)
Source: TECH. REP. FISH. MAR. SERV., (no. 744), November 1977, 96 pp.
Languages: English
Summary Languages: English; French
Document Type: Numerical Data; Bibliography; Report
ASFA Number: 108-09737
Abstract:

This report describes two years' operation of a salmonid enhancement program in the Duncan-Lardeau River system which flows into the north end of Kootenay Lake, British Columbia. The object of the Meadow Creek spawning channel was to replace the spawning ground of kokanee lost due to the construction of the Duncan Dam. This longest spawning channel in the world was the first built for a freshwater fish in British Columbia. Its total length was 3,358 m and the width was 10.4 1.8 m, providing 34,923 m(SUP-2) spawning area with an average grade of 0.25 percent. Screened gravel was laid to a depth of 23 cm (9 in). Different spawner and egg densities were compared to develop optimum operation and production criteria for the channel. Satisfactory survivals to the fry stage were obtained at 5.7 kokanee per m(SUP-2) (2.8 female per m(SUP-2)) as 70.8 fry per m(SUP-2). The operation of the channel as well as the rate of survival, egg incubation, emergence timing, size of the fry, discharge and temperature were studied in different sections of the channel during 1967 and 1968 as the basis for evaluation of the channel. Before construction of the spawning channel, the mean fry survival from egg deposition in Meadow Creek was 5.87 percent. Survival increased to 15.75 percent after the channel became operational. Fry survival in the channel was 25.67 percent in 1968 and 8.5 percent in 1969, during the first two years of channel production. Uncontrolled water flows during spawning and fry migration caused these relatively low fry survival rates. The quality of fish appeared similar to the Lardeau River fry and emergence occurred from mid-April to mid-June in a bimodal pattern. It was concluded, however, that fry production in 1967 and 1968 was greater than the production before loss of the natural spawning ground.

Descriptors: channels; spawning grounds
Geographic Descriptors: Canada, British Columbia
Taxonomic Descriptors: Oncorhynchus nerka

Environment: Fresh
Identifiers: spawning; anadromous species; fish culture; fishery engineering; environmental conditions; survival; fry; fish ponds; power plants

17
Spatial and temporal distribution of Chaetoceros convolutus within Queen Charlotte, Johnstone and Georgia Straits and their contiguous inlets.
Albright, L.J.; Balfry, S.K.; Pearse, G.; Link, M.
(Inst. Aquacult. Res., Dep. Biosci., Simon Fraser Univ., Burnaby, B.C. V5A 1S6, Canada)
Source: PROC. AQUACULT. INT. CONGR., 1988, p. 55.
Aquaculture International Congress and Exposition Vancouver, B.C. (Canada), September 6-9, 1988.
Languages: English Summary only.
Document Type: Conference; Summary; Book
ASFA Number: 119-01914
Abstract:

Losses of farmed salmonids due to Chaetoceros convolutus were heavy in the Northern Strait of Georgia and the Sechelt region (i.e. Jervis Inlet and associated waters) during the spring and fall of 1987 respectively. To aid the salmonid farming community in controlling losses due to this microalga a survey of 74 sample stations was carried out during spring 1988 in Queen Charlotte, Johnstone and Georgia Straits and their contiguous inlets. C. convolutus concentrations were greatest in the Sechelt region with lesser concentrations occurring in the Strait of Georgia. "Seed" populations were most evident in the waters of Jervis Inlet and in the Strait of Georgia. When environmental conditions are suitable these "seed" populations can quickly bloom.

Descriptors: poisonous organisms; spatial variations; temporal distribution; phytoplankton; algal blooms; cultured organisms
Geographic Descriptors: INE, Canada; INE, Queen Charlotte Strait; INE, Johnstone Strait; INE, Georgia Strait
Taxonomic Descriptors: Salmonidae; Chaetoceros convolutus
Environment: Marine

18
Successful development of a pink salmon broodstock husbandry program and facility design at Port San Juan in Prince William Sound, Alaska.
Allee, B.
(Prince William Sound Reg. Aquacult. Coop., Cordova, AK, USA)
Source: PUBL. WASH. SEA GRANT. SALMONID REPRODUCTION: AN INTERNATIONAL SYMPOSIUM, (1983), p. 31.
Salmonid Reproduction: An International Symposium Bellevue, WA (USA), October 31 - November 2, 1983.
Languages: English Summary only.
Document Type: Conference; Summary; Book
ASFA Number: 114-19232

Abstract:

Modifications each succeeding year have resulted in increased survival during maturation and improved egg viability. The present system incorporates volitional immigration from saltwater to freshwater during the maturation process. Data will be presented which summarizes maturation survival, egg viability and environmental parameters for eight specific brood years. Based upon this experience, a maturation program and facility design will be proposed for a 200-million pink and 100-million chum salmon egg capacity hatchery in Prince William Sound.

Descriptors: brood stocks; fish culture
Geographic Descriptors: INE, USA, Alaska
Taxonomic Descriptors: Salmonidae
Environment: Marine; Brackish; Fresh
Identifiers: progress reports

19

Aquaculture in the Pacific Northwest: an overview of salmon, trout, and oyster aquaculture in Idaho, Oregon, and Washington.

Anderson, Constance [et al.]
Source: The Associates, 3600 Main St., Suite 1B, Vancouver, WA, 1980, 135 pp.
Descriptors: oyster culture

20

Furunculosis in chinook salmon broodstock.

Armstrong, R.
(Agric. Canada Health Anim. Lab., 13-3071 No. 5 Rd., Richmond, B.C. V6X 2T4, Canada)
Source: CAN. VET. J. REV. VET. CAN., (1988), vol. 29 (5), pp. 460-461.
Languages: English
Summary Languages: English; French
Document Type: Journal Article
ASFA Number: 119-04276
Abstract:

A commercial hatchery on Vancouver Island experienced losses of 4-year-old female chinook broodstock in late October 1987. These fish had been transferred from the sea-pen site four weeks previously and maintained ground water at 10 degrees C. Four large female fish, almost or fully ripe, were found dead one morning in the holding tanks. Culture of tissue from the spleen and posterior kidney resulted in the isolation of pure cultures of Aeromonas salmonicida. Multifocal bacterial colonies were seen in the heart, kidney and spleen on histological sections. Furunculosis, as septicemia due to A. salmonicida is called, is a problem in freshwater finfish culture in B.C. Following diagnosis, the remaining broodstock were treated systemically with oxytetracycline. This was injected into the "dorsal sinus," or connective tissue between the epaxial muscles cranial to the dorsal fin.

Descriptors: brood stocks; fish kill; boil disease; hatcheries
Geographic Descriptors: Canada, British Columbia, Vancouver I.
Taxonomic Descriptors: Oncorhynchus tshawytscha

21
Salmon fry production in a gravel incubator hatchery, Auke Creek, Alaska, 1971-72.
Bailey, Jack E.; Taylor, Sidney G.
Source: United States Dept. of Commerce, National Oceanic and Atmospheric Admin., National Marine Fisheries Service, Seattle, 1974, 13 pp.
Descriptors: salmon culture

22
Japanese-style and gravel-box incubation of chum salmon (Oncorhynchus keta) compared at the fry stage.
Bams, R.A.
(Department of Fisheries and Oceans, Pacific Biological Station, Nanaimo, B.C. (Canada))
Source: CAN. TECH. REP. FISH. AQUAT. SCI., 1984, no. 1330, 27 pp.
Languages: English
Summary Languages: English; French
Document Type: Report
Report No.: ISSN 0706-6457
ASFA Number: 115-16335
Abstract:

Three successive broods of Big Qualicum River chum salmon (Oncorhynchus keta) were incubated and reared from fertilization to an early fry stage using two techniques: A Japanese-style hatchery technique (JSH), which uses ground water and keeper-channels, and a deep-substrate incubation technique (Box), which uses river water and a gravel medium. The combined effects of the higher temperatures and the lack of a deep gravel substrate resulted in time of development (to 50 percent emergence) being accelerated by 56 (plus or minus 1) days in all JSH groups. At emergence, JSH fry were smaller and less advanced than the Box fry but survivals were the same. The JSH fry were ponded and fed Oregon moist pellets for the 8-wk time period created by the differences in techniques. This resulted in substantial size gain of these fry at the time of emergence of the Box fry.

Descriptors: incubation; equipment
Geographic Descriptors: fish culture; evaluation; Canada, British Columbia
Taxonomic Descriptors: Oncorhynchus keta
Environment: Fresh

23
A method for pink salmon propagation.
Bams, R.A.; Crabtree, D.G.
Source: Research and Development Directorate, Pacific Biological Station, Nanaimo, B.C., 1976, 70 pp.
Descriptors: fish culture

24
Early marine mortality of marked juvenile chum salmon (Oncorhynchus keta) released into Hood Canal, Puget Sound, Washington, in 1980.
Bax, N.J.
(Fish. Res. Inst., Sch. Fish., Univ. Washington, Seattle, WA 98195, USA)
Source: CAN. J. FISH. AQUAT. SCI., (1983), vol. 40 (4), pp. 426-435.
Languages: English

Summary Languages: English; French
Document Type: Journal Article
ASFA Number: 114-07349
Abstract:

The average daily loss in numbers from a group of fluorescently marked, hatchery-reared, juvenile chum salmon (Oncorhynchus keta) remaining in the near shore zone following their release from the hatchery into southern Hood Canal, Washington State, was estimated at 38-49 percent. This estimated loss was then adjusted by the estimated maximum emigration of marked fish from the sampling area and the average daily mortality over a 2-day and a 4-day time period estimated at between 31 and 46 percent. These estimates are an order of magnitude higher than estimates of the average daily mortality of naturally emigrating juvenile pink salmon (O. gorbuscha) from the Bella Coola River, British Columbia, over a 40 day time period (Parker 1968). The two studies are contrasted and it is suggested that daily mortality is highly variable over the 40 day subsequent to saltwater entry, with mortality higher initially, particularly for those fish remaining close to their point of saltwater entry.

Descriptors: mortality; juveniles; marine environment; survival; marking; aquaculture
Geographic Descriptors: INE, USA, Puget Sound
Taxonomic Descriptors: Oncorhynchus keta; Oncorhynchus gorbuscha
Environment: Marine

25
Breeding for resistance to summertime mortality in the Pacific oyster (Crassostrea gigas).
Beattie, J. Hal [et al.]
Source: Washington Sea Grant Program, Division of Marine Resources, Univ. of Washington, Seattle, 1978, 13 pp.
Descriptors: oyster culture

26
Influence of time and size at release of juvenile coho salmon (Oncorhynchus kisutch) on returns at maturity.
Bilton, H.T.; Alderdice, D.F.; Schnute, J.T.
(Dep. Fish. Oceans, Resour., Serv. Branch, Pacific Biological Station, Nanaimo, B.C. V9R 5K6, Canada)
Source: CAN. J. FISH. AQUAT. SCI., (1982), vol. 39 (3), pp. 426-447.
Languages: English
Summary Languages: English; French
Document Type: Journal Article
ASFA Number: 112-15824
Abstract:

Juvenile coho salmon (Oncorhynchus kisutch) were raised in six ponds at Rosewall Creek, Vancouver Island, British Columbia, from which release were made at four times: April 14, May 12, June 10 and July 8, 1975. Prior to each release a portion of the juveniles in each pond were graded into three size groups (small, medium, large) based on size distributions in each pond. The juveniles were nose-tagged according to size group, pond, and release date, and marked by adipose fin removal. A total of 57 groups were released. Returns of adults and precocious males (jacks) to the weir and to the fishery (commercial, sport) were subjected to response surface analysis. Maximum adult returns of 43.5

Abstract (cont.):
percent, to the weir and fishery, were predicted for release of 25.1-g coho juveniles on the 173rd (Julian) day from January 1 (June 22, 1975). A significant interaction was noted between release time and size: maximum returns from early (April 14) release would be expected from release of 16- to 17-g juveniles.

Descriptors: tagging; migrations; anadromous species; sexual maturity; body size; survival
Taxonomic Descriptors: Oncorhynchus kisutch
Environment: Marine; Brackish; Fresh
Identifiers: release time and size

27
Returns of adult coho salmon in relation to mean size and time at release of juveniles.
Bilton, H.T.
(Department of Fisheries and Oceans, Nanaimo, B.C. (Canada). Pacific Biological Station)
Source: PACIFIC BIOLOGICAL STATION TECH. REP. FISH. MAR. SERV. (Canada), no. 832, November 1978, 77 pp.
Languages: English
Summary Languages: English; French
Document Type: Report
ASFA Number: 109-15291
Abstract:

Four releases of marked and nose-tagged coho salmon (Oncorhynchus kisutch) smolts were made from Rosewall Creek, Vancouver Island, in 1975. In autumn 1975, 1,417 tagged jacks (age 1.0) were recovered and in autumn 1976, 2,885 tagged adults (age 1.1) were recovered at Rosewall Creek. The yield of jack flesh was positively correlated with the size of smolt released. Not only did large smolts produce a greater percentage of jacks, they also were of a larger size. The production of jacks reduced the production of adults as there was a highly significant negative correlation between the percentage return of jacks and the percentage return of adults. Larger smolts at release did not produce more adults but did have a positive influence on adult size. Early release larger smolts returned as larger adults. On the basis of these data, an attempt was made to estimate the best size and time to release smolts. Three models were derived. The results indicated that if maximum production of adult biomass is the goal, then smolts should be released at a moderate size (around 19 g) late in the season (early June). Future production facilities should be built on sites having cooler water supplies, which would allow for later releases of fish at a smaller size. Release of fish at a smaller size would have the further advantage of increasing the rearing capability of the facility, and would also lead to a higher production of adult flesh. Use of cooler water for rearing would reduce the possibility of outbreak of disease which is frequently associated with rising temperatures.

Descriptors: fish culture; production (biological)
Geographic Descriptors: INE, Canada, British Columbia, Vancouver I.
Taxonomic Descriptors: Oncorhynchus kisutch
Environment: Marine
Identifiers: rearing; survival; body size; mathematical models

28
Returns of chinook salmon in relation to juvenile size at release.
Bilton, H.T.
(Department of Fisheries and Oceans, Nanaimo, B.C. (Canada). Pacific Biological Station)
Source: CAN. TECH. REP. FISH. AQUAT. SCI., no. 1245, 1984, 37 pp.
Languages: English
Summary Languages: English; French
Document Type: Report
Report No.: ISSN 0706-6465
ASFA Number: 114-21223
Abstract:

An experiment was conducted to determine the effect of size at release of juvenile chinook salmon (Oncorhynchus tshawytscha) on their subsequent survival, age at maturity, and growth. Larger juvenile sizes at release were achieved for the same length of rearing period by accelerating growth of fish in water at elevated temperatures. Three releases of marked and nose-tagged accelerated chinook salmon juvenile were made from the Big Qualicum hatchery site, Vancouver Island, June 12, 1976 April 20-26, 1977 and June 2-5, 1978. In the fall of each year from 1977 to 1982 a total of 311 marked adults were recovered at the big Qualicum River. In addition, 2,401 fish were estimated to have been caught by the fishery during 1977 to 1982. Analysis of these returns indicated that size at release had a significant affect on the percentage that returned.

Descriptors: body size; survival; stocking (organisms); fish culture
Geographic Descriptors: Canada, British Columbia, Vancouver I.
Taxonomic Descriptors: Oncorhynchus tshawytscha
Environment: Fresh

29
Increasing adult returns of hatchery-produced coho salmon through optimization of time and size at juvenile release.
Bilton, H.T.; Alderdice, D.F.; Schnute, J.
(Fish. and Oceans, Pacific Biological Station, Nanaimo, B.C., Canada)
Melteff, B.R.; Neve, R.A. [eds.]
Source: Alaska Sea Grant Rep. Alaska Sea Grant Program, Alaska University.
North Pacific Aquaculture Symposium Anchorage, AK (USA). Newport, OR (USA), 18 August 1980. 25 August 1980.
Proceedings of the North Pacific Aquaculture Symposium, 1982, pp. 171-181.
Languages: English
Summary Languages: English
Document Type: Conference; Report
Report No.: ASG-82-2
ASFA Number: 113-17098
Abstract:

Coho salmon yearlings were raised in six ponds at Rosewall Creek, Vancouver Island, British Columbia, from which releases were made at four times (14 April, 12 May, 10 June, 8 July 1975). Prior to each release, a portion of the juveniles in each pond were graded into three size groups on the basis of size distributions in each pond. Returns of adults and precocious males (jacks) to the weir and to the fishery were subjected to response surface analysis. There was a significant interaction between release time

Abstract (cont.):
and size: maximum returns from early releases would be expected from release of 16 to 17 g juveniles. Benefit-costs at the center of the time and size of release surface for maximum adult returns were estimated at 12.2:1.

Descriptors: stocking (organisms); aquaculture techniques; fishery development; body size; survival
Taxonomic Descriptors: Oncorhynchus kisutch
Environment: Marine; Fresh

30
Returns to the fishery and escapement of adult coho salmon from accelerated and normally reared juveniles.
Bilton, H.T.; Jenkinson, D.W.
(Department of Fisheries and Oceans, Nanaimo, BC (Canada). Pacific Biological Station.)
Source: CAN. TECH. REP. FISH. AQUAT. SCI., (no. 925), February 1980, 17 pp.
Languages: English
Summary Languages: English; French
Document Type: Book
ASFA Number: 111-00851
Abstract:

Under normal hatchery operations, juvenile Oncorhynchus kisutch are reared for at least 14 months before release to the sea as smolts. Reduction of the rearing period would reduce costs substantially. One means of reducing the rearing period would be to accelerate growth of the fish, resulting in the production of smolt-sized juveniles in a shorter period of time, at an earlier age. Such a technique also could have the advantage of increased generation time, whereby adults would mature in their second rather than in their third year of life. In the fall of 1973, an experiment to accelerate growth of coho was initiated at Rosewall Creek on Vancouver Island. During the winter of 1973-74, approximately 10,000 coho were accelerated to the smolt stage in 6 mo through control of temperature, photoperiod and feeding rate. These were marked, nose-tagged and released on June 10, 1974, along with approximately 12,000 normally reared (14 mo), nose-tagged coho. Early-maturing male (jack) and normal-sized (adult) coho originating from these releases were recovered in the escapement and in the fishery. The total return of adults from the accelerated release (3.3 percent) was much lower than the total return from the normal smolts (47.5 percent). Males predominated among adults from the accelerated smolts the reverse was true among adults from the normally reared smolts. Adults from the accelerated smolt release were smaller than those from the normal smolts. Hence the overall return of adults from normal smolts was 14 times that from accelerated smolts. Results of this study indicate that rearing of accelerated smolts is not economically feasible.

Descriptors: aquaculture techniques; fish culture
Geographic Descriptors: INE, Canada, Vancouver I.
Taxonomic Descriptors: Oncorhynchus kisutch
Identifiers: rearing; growth; Salmonidae; hatcheries; Pisces; economic feasibility

31
The influence of time and size at release of juvenile coho salmon (Oncorhynchus kisutch) on returns at maturity results of release from Quinsam River Hatchery, B.C., in 1980.
Bilton, H.T.; Morley, R.B.; Coburn, A.S.; Van Tyne, J.
(Department of Fisheries and Oceans, Nanaimo, B.C. (Canada). Pacific Biological Station)

Source: CAN. TECH. REP. FISH. AQUAT. SCI., 1306, 104 pp.
Languages: English
Summary Languages: English; French
Document Type: Report
Report No.: ISSN 0706-6457
ASFA Number: 115-11597
Abstract:

Releases of juvenile coho salmon (Oncorhynchus kisutch) were made from Quinsam River production hatchery, Vancouver Island, British Columbia, on April 20, May 10, May 30, and June 19, 1980. These fish had been graded into small, medium, and large size groups, nose-tagged, and marked by removal of the adipose fin. Each time-size combination was replicated three times giving a total of 36 groups. Returns of jacks (precocious males, age 1.0) and adults (age 1.1) to the hatchery and various fisheries were analyzed using both simple regression techniques and response surface analysis. Maximum adult returns (catch plus escapement) of 11.2 percent are predicted for release of 15.7 g juveniles on June 4 (Julian day 156). Since this weight is below the actual weight range tested for this date, a release weight of approximately 20 g is recommended until the lower weight, can be tested. Returns of approximately 10.2 percent are predicted for fish of this size. The effects of size at release were minor compared to those of time of release, with very little change in the optimum release weight over the season.

Descriptors: survival; stocking (organisms); seasonal variations; ocean ranching; hatcheries;
Geographic Descriptors: Canada, British Columbia
Taxonomic Descriptors: Oncorhynchus kisutch
Environment: Marine; Fresh
Identifiers: body size

32

Establishment of sockeye (Oncorhynchus nerka) and chinook (O. tshawytscha) salmon runs at Frazer Lake, Kodiak Island, Alaska.

Blackett, R.F.
(Fish. Rehab. Enhance. Dev. Div., Alaska Dep. Fish Game, Kodiak, AK 99615, USA)

Source: J. FISH. RES. BOARD CAN., (1979), vol. 36 (10), pp. 1265-1277.
Languages: English
Summary Languages: English; French
Document Type: Journal Article
ASFA Number: 110-06537
Abstract:

Runs of sockeye and chinook salmon were established at Frazer Lake by adult spawner transplants, fry plants, and eyed-egg plants. Falls in the lake outlet formed a barrier to natural ascent of anadromous fish until construction of a fishpass in 1962. Accounts of successful introduction and development of viable and self-sustaining runs of salmon where none previously existed and the lake was inaccessible are scarce in the history of salmon fisheries on the Pacific Coast. The first sockeye returning to Frazer Lake in 1956 were produced from egg plants in 1951. Annual sockeye returns have progressively increased over a 28-year period reaching record passage of 141,981 in 1978. Sockeye spawning has extended into new areas as returns increased. Spawning area capacity is projected to be sufficient for 365,000 sockeye while rearing area is estimated to be sufficient to support fry production from 400,000

Abstract (cont.):
sockeye. Sockeye returns per spawner have averaged 3.2 for six parent years (1966-71) in which returns are complete. A chinook run was created from plants of 160,000 fry over a 4-year period beginning in 1966. Chinook have returned to spawn in specific sites of fry release above the falls and in the lower river.

Descriptors: introduced species; stocking (organisms); aquaculture techniques; fish culture
Geographic Descriptors: USA, Alaska, Kodiak I., Fraser L.
Taxonomic Descriptors: Oncorhynchus nerka; Oncorhynchus tshawytscha
Environment: Fresh
Identifiers: aquaculture development; spawning; Salmonidae; spawning grounds; Pisces

33
Preliminary evaluation of pink (Oncorhynchus gorbuscha) and sockeye (O. nerka) salmon incubation and rearing in gravel incubators and troughs.
Blackett, Roger F.
Source: Alaska Dept. of Fish and Game, Juneau, AK, 1974, 32 pp.
Descriptors: fish culture

34
Microfiltration and ultraviolet irradiation to eliminate Ceratomyxa shasta (Myxozoa: Myxosporea), a salmonid pathogen, from Fraser River water, British Columbia.
Bower, S.M.; Margolis, L.
(Department of Fisheries and Oceans, Nanaimo, B.C. (Canada). Pacific Biological Station)
Source: CAN. TECH. REP. FISH. AQUAT. SCI., no. 1364, 1985, 14 pp.
Languages: English
Summary Languages: English; French
Document Type: Report
Report No.: ISSN 0706-6457
ASFA Number: 115-18229
Abstract:

Enteric infections of Ceratomyxa shasta developed in juvenile chinook salmon, Oncorhynchus tshawytscha, (from the Chehalis River hatchery, Fraser River) exposed to water pumped from the north arm of the Fraser River, British Columbia. After about 6 days of exposure to this water in late June 1983, fish began to die with heavy C. shasta infections during week 4 of incubation in C. shasta-free water. However, by late July mortalities occurred within two weeks of incubation after seven days of exposure. Ceratomyxa shasta was not detected in juvenile chinook salmon held for up to 48 days in turbid Fraser River water after filtration (25 mu m filters of No.16 silica sand) followed by ultraviolet irradiation (approximately equals 90,000 microwatts sec/cm super(2)).

Descriptors: parasitic diseases; water pollution treatment; ultraviolet radiation; water filtration; fish culture; juveniles; hatcheries
Geographic Descriptors: Canada, British Columbia, Fraser R.
Taxonomic Descriptors: Ceratomyxa shasta; Oncorhynchus tshawytscha
Environment: Fresh

35
Hatchery manual for the Pacific oyster.
Breese, Wilbur P.; Malouf, Robert E.
Source: Oregon State University, Corvallis, OR, 1975, 22 pp.
Descriptors: oyster culture

36
Intensive culture of the Pacific oyster, Crassostrea gigas (Thunberg), in heated effluents.
Breese, Wilbur P.; Malouf, Robert E.
Source: Sea Grant Communications, Oregon State Univ., Corvallis, OR, 1978, 41 pp.
Descriptors: oyster culture

37
Bristol Bay Imarpik, salmon enhancement.
Bristol Bay Native Association
Source: Bristol Bay Regional Advisory Council, State of Alaska, Dillingham, AK, 1978, 16 pp.
Descriptors: aquaculture

38
Siting culture operations for the Pacific oyster Crassostrea gigas.
Brown, J.R.; Roland, W.G.
Source: Province of British Columbia, Aquaculture and Commercial Fisheries Branch, Victoria, 1987.
Descriptors: oyster culture

39
Plankton samples in Campbell River and Discovery Passage in relation to juvenile chinook diets.
Brown, T.J.; McAllister, C.D.; Kask, B.A.
(Department of Fisheries and Oceans, Nanaimo, B.C. (Canada). Pacific Biological Station)
Source: CAN. MANUSCR. REP. FISH. AQUAT. SCI., no. 1915, 1987, 42 pp.
Languages: English
Summary Languages: English; French
Document Type: Report
Report No.: ISSN 0706-6473
ASFA Number: 119-04247
Abstract:

Zooplankton sampling was carried out in the Campbell River estuary and Discovery Passage (British Columbia) using Miller nets in 1983 and 1984. Five hundred sixty-four samples were collected from nine stations over 33 sampling periods. The estuarine zone macro-zooplankton was dominated by cladocerans and calanoid copepods while calanoid copepods and copepod nauplii were predominant in the transition zone. The marine zone was dominated by calanoids and eggs. The micro zooplankton was dominated by calanoid copepods and copepod nauplii in all three zones. The juvenile chinook salmon examined from the Campbell River area in 1983 and 1984 utilized four important food categories. Calanoids, amphipods, harpacticoids, and cladocerans were consumed by both the hatchery and wild chinook. The hatchery fish also ate cumacea while insects and decapod zoea were important in the wild chinook diets.

Descriptors: feeding behavior; stomach content; zooplankton; food availability; juveniles; fish culture
Geographic Descriptors: INE, Canada, British Columbia, Campbell Estuary; INE, Canada, British Columbia, Discovery Passage
Taxonomic Descriptors: Oncorhynchus tshawytscha
Environment: Marine; Fresh
Identifiers: biological sampling

40
Equipment for nori farming in Washington State.
Byce, William J. [et al.]
Source: Washington State, Dept. of Natural Resources, Olympia, 1984, 2 volumes in 1, (xi, 154 pp.).
Descriptors: algae culture

41
Nori farming in Washington State: Outdoor seeding, nursery culture.
Byse [sic], William J. [et al.]
Source: Washington State, Dept. of Natural Resources, Olympia, 1984, 2 volumes in 1, 154 pp.
Descriptors: algae culture

42
Oyster larvae mortality in south Puget Sound.
Cardwell, R.D.
(Washington Dep. Fish., Salmon Res. and Dev., Box 600, Pt. Whitney Road, Brinnon, WA 98320, USA)
Source: PROC. NATL. SHELLFISH. ASSOC. MD.
Presented at: NSA Pacific Coast Section Annual Meeting Tumwater, WA (USA), 1977, 68, pp. 88-89, (1978).
Languages: English Summary only.
Document Type: Conference; Summary; Journal Article
ASFA Number: 111-07473
Abstract:

In the summer, particularly late summer, marine waters from many areas of the Puget Sound basin as well as Willapa Bay are found to kill Crassostrea gigas embryos and larvae when samples of these waters are brought to the laboratory and used to culture newly-fertilized embryos for 48 hours. Oyster larvae mortality can occur in waters unaffected by point and non-point sources of pollution and is most severe and widely distributed in several inlets in inner-most Puget Sound (SPS). More than 15 years of biomonitoring the marine waters of SPS for acute toxicity to oyster embryos has disclosed the following: larval mortality is a seasonal phenomenon in Budd and Eld Inlets, appreciable (20 percent) mortality commences around June, peaks in late August to early September, and subsides in late October. The scope and severity of the mortality varies greatly between inlets. Within a particular inlet, mortality increases from the entrance to the head and varies significantly with water depth. Waters 10 to 30 ft in depth usually are more toxic than those at the surface. The evidence suggests that the toxicity is caused by toxic metabolites of natural planktonic constituents. Although more than one organisms is implicated, recent evidence suggests that high densities of the dinoflagellate Ceratium fusus can explain a significant percentage of the variation in larval mortality. Removal of most of the Ceratium by low pressure filtration through a 10 m screen greatly reduces toxicity.

Geographic Descriptors: INE, Puget Sound
Taxonomic Descriptors: Crassostrea gigas; Ceratium fusus
Environment: Marine; Brackish
Identifiers: Bivalvia; marine pollution; larvae; oyster culture

43
Experimental culture of mussels at Seabeck Bay.
Chaves, Linda
Source: Washington Sea Grant Program, Division of Marine Resources, Univ. of Washington, Seattle, WA, 1975, 8 pp.
Descriptors: shellfish culture

44
Shellfish & seaweed harvests of Puget Sound.
Cheney, Daniel P.; Mumford, Jr., Thomas F.
Source: Washington Sea Grant Program, Seattle, WA, 1986, 164 pp.
Descriptors: algae culture

45
Prospects for successful Manila clam seeding.
Chew, Kenneth K.
Source: Washington Sea Grant Program, Division of Marine Resources, Univ. of Washington, Seattle, WA, 1975, 15 pp.
Descriptors: shellfish culture

46
A review of West Coast oyster fisheries and the present impact of remote setting of oyster seed.
Chew, K.
(Sch. Fish., Univ. Washington, Seattle, WA 98195, USA)
Source: J. SHELLFISH RES., (1985), vol. 5 (1), p. 33.
Annu. Meet. National Shellfisheries Association Tampa, FL (USA), 25 June 1984
Languages: English Summary only.
Document Type: Conference; Summary; Journal Article
ASFA Number: 118-01175
Abstract:

A brief account is given on the trends in the oyster fisheries. The present fishery centers almost exclusively around the fresh market. In recent years, the demand for oysters on the East Coast of the United States has had some impact on production in the Pacific Northwest. The demands from both the East and West coasts have, in part, created a situation in which oysters may be harvested at an earlier age to accommodate the market. To complicate the situation further, the recent El Nino may have caused significant setbacks in the harvest of Pacific oysters from coastal bays such as Willapa Bay in Washington State, historically one of the most productive bays on the west coast. Problems and situations related to this climatic phenomenon will be discussed. Remote setting of eyed larvae for the

Abstract (cont.):

West Coast is a reality and adjustments by many of the oyster growers are being made to accommodate this latest technique for securing Pacific oyster seed. The potential of remote setting has essentially taken away most of the guess work related to securing adequate seed for growing in most of the areas along the Pacific coast of the United States.

Descriptors: oyster fisheries; oyster culture; aquaculture development; seed collection
Geographic Descriptors: INE, USA
Environment: Marine

47

Comparative resistance of Oregon (Big Creek) and British Columbia (Capilano) juvenile chinook salmon to the myxozoan pathogen, Ceratomyxa shasta, after laboratory exposure to Fraser River water.

Ching, H.L.

(Envirocon Ltd., No. 300 - 475 West Georgia St., Vancouver, B.C. V6B 4M9, Canada)

Source: CAN. J. ZOOL., (1984), vol. 62 (7), pp. 1423-1424.
Languages: English
Summary Languages: English; French
Document Type: Journal Article
ASFA Number: 115-04663
Abstract:

In laboratory experiment conducted in the fall 1983, Oregon (Big Creek) and British Columbia (Capilano) hatchery chinook salmon (Oncorhynchus tshawytscha) were exposed to Fraser River water containing the infectious stage of the myxozoan pathogen, Ceratomyxa shasta. The juvenile fish were exposed for 10 days. While only one of 21 Big Creek fish became infected, all 20 of the Capilano fish died of C. shasta within 40 days. The Big Creek fish demonstrated high resistance to the parasite while the Capilano fish had low resistance. These results were similar to those from field exposures in previous studies.

Descriptors: disease resistance; comparative studies
Taxonomic Descriptors: Ceratomyxa shasta; Oncorhynchus tshawytscha
Environment: Fresh
Identifiers: Oregon USA stocks; B.C. Canada stocks

48

Growth of Pacific oysters Crassostrea gigas and related fouling problems under tray culture at Seabeck Bay, Washington.

Clark, Michael P.; Chew, K.K.

(Coll. Fish., Univ. Washington, Seattle, WA, USA)

Source: PROC. NATL. SHELLFISH. ASSOC. MED., (1976), 66, pp. 34-41.
Languages: English
Summary Languages: English
Document Type: Journal Article
ASFA Number: 109-08873

Abstract:

Pacific oysters (C. gigas) were grown in Nestier trays under two different sets of conditions at Seabeck Bay on Hood Canal, Washington. One group of oysters was placed in trays that were suspended from a floating dock and were submerged at all times. The other group of oysters was placed in trays that were set out in the intertidal zone at the + 2-foot tide level where they were exposed to the air for some portion of each day. Growth and fouling data were collected monthly for each set of trays. Fouling was very pronounced on the dock trays and less on the beach trays. Growth patterns for the two different stations were also different. The oysters suspended from the dock grew well during the early months of the year, then ceased to grow in April or May, due to excessive fouling of the trays. The oysters on the beach showed no growth from January to April. Growth for these oysters started in April or May and continued throughout the summer well into the fall. Data from this study point out the importance of fouling organisms to this type of oyster culture and the different growth rates that can be obtained by placing the trays under different conditions at the same time.

Descriptors: fouling organisms; aquaculture techniques; growth
Geographic Descriptors: INE, USA, Washington, Seabeck Bay
Taxonomic Descriptors: Crassostrea gigas
Environment: Marine
Identifiers: fouling; aquaculture; problems

49
Pacific oyster breeding in British Columbia.
Cox, Robert K.; Clayton, W.E. Lorne
Source: Marine Resources Branch, Province of British Columbia, Victoria, 1982, 103 pp.
Descriptors: oyster culture

50
Potential for production of coho salmon (Oncorhynchus kisutch) in lakes with outlet barrier falls, southeastern Alaska.
Crone, Richard Allan
Source: thesis (Ph.D.), University of Michigan, 1981, 388 pp.
Descriptors: fish culture

51
The survival greenhouse: an eco-system approach to home food production.
DeKorne, James B.
Source: Peace Press, 1978, 165 pp.
Descriptors: fish culture

52
Nori aquaculture in Washington State.
Di Chiro, Giovanna
Source: Marine Land Management Division, Dept. of Natural Resources, Olympia, WA, 1981, 8 pp.
Descriptors: algae culture

53
Thyroid hormones in smoltification of anadromous salmonids.
Dickhoff, W.W.; Folmar, L.C.; Mighell, J.L.; Mahnken, C.V.W.
(Washington Univ., Dep. Zool., Seattle, WA 98105, USA)
Gorbman, A.; Melteff, B.R.; Link, M.; Neve, R.A. [eds.]
Source: PROCEEDINGS OF THE NORTH PACIFIC AQUACULTURE SYMPOSIUM, 1982, pp. 217-226. ALASKA SEA GRANT REP., ALASKA SEA GRANT PROGRAM, ALASKA UNIV.
North Pacific Aquaculture Symposium Anchorage, AK (USA). Newport, OR (USA), 18 August 1980. 25 August 1980.
Languages: English
Summary Languages: English
Document Type: Conference; Report
Report No.: ASG-82-2
ASFA Number: 113-17104
Abstract:

Analysis of plasma concentrations of thyroxine (T sub 4) and triiodothyronine (T sub 3) of smoltifying yearling coho salmon maintained at the Columbia River hatcheries has revealed a distinct springtime peak in plasma T sub 4. Groups of these hatchery-reared fish were transferred to seawater net-pens at the aquaculture facilities at Manchester, Washington at times corresponding to their hatchery release dates. Data regarding the percentage of surviving and smolted fish were collected throughout six months of seawater residence. These data were compared with various parameters of the freshwater T sub 4 peak. One aspect of the T sub 4 peak showed a significant correlation with survival of fish in seawater after six months. These data suggest that analysis of plasma T sub 4 of smolts in freshwater may provide a predictive index of their seawater performance.

Descriptors: anadromous species; hormones; smolts; hatcheries; thyroid gland
Taxonomic Descriptors: Salmonidae
Environment: Fresh

54
Aquaculture techniques--a production forecasting model for aquaculture systems.
Downey, P.C.; Klontz, G.W.
Source: Idaho Water and Energy Resources Research Institute, Univ. of Idaho, Moscow, ID, 1983, 18 pp.
Descriptors: aquaculture

55
A systems approach to aquaculture management: a production forecasting model.
Downey, Philip Carleton
Source: thesis (Ph.D.), University of Idaho, 1981, 275 pp.
Descriptors: aquaculture

56
Industrial organization of the B.C. salmon aquaculture industry: final report.
DPA Group Inc.
Source: DPA Group, Vancouver, B.C., 1986, vol. 1.
Descriptors: aquaculture

57
The development of an edible kelp culture technology for British Columbia.
Druehl, Louis D.
Source: Marine Resources Branch, Ministry of Environment, Province of British Columbia, Victoria, B.C., 1980-81, 3 volumes
Descriptors: algae culture

58
Seasonal growth of Laminaria groenlandica as a function of plant age.
Druehl, L.D.; Cabot, E.L.; Lloyd, K.E.
(Dep. Biol. Sci., Simon Fraser Univ., Burnaby, B.C. V5A 1S6, Canada)
Source: J. CAN. BOT., (1987), vol. 65 (8), pp. 1599-1604.
Languages: English
Summary Languages: English; French
Document Type: Journal Article
ASFA Number: 118-13149
Abstract:

The seasonal growth of Laminaria groenlandica (Laminariales, Phaeophyta) on the west coast of Vancouver Island, B.C., Canada, was investigated as a function of plant age, using plants maintained at a constant depth on rope structures. First-year plants, which become macroscopically visible in March, had a delayed seasonal peak of maximum blade size relative to the older year classes (April-May) which initiated growth in January. This resulted from the first-year plants' lower susceptibility to distal blade erosion and prolonged net growth season. All year classes obtained their greatest wet weight at the same time (July-August). For first-year plants, this represented a balance between blade erosion and elongation for older plants, storage product synthesis and blade thickening and elongation balanced against erosion appeared responsible for determining maximum biomass.

Descriptors: seasonal variations; growth; seaweed culture
Geographic Descriptors: INE, Canada, British Columbia, Vancouver I.
Taxonomic Descriptors: Laminaria groenlandica
Environment: Marine

59
Environmental and physiological aspects of growth and mortality of Mytilus edulis Linne at two locations in British Columbia.
Emmett, B.T.
(Archipelago Mar. Res., Victoria, B.C. V8P 5M3, Canada)
Source: J. SHELLFISH RES., (1985), vol. 5 (1), p. 52.
Annu. Meet. National Shellfisheries Association, West Coast Section Bellingham, WA (USA), 7 September 1984
Languages: English Summary only.
Document Type: Conference; Summary; Journal Article
ASFA Number: 118-01195

Abstract:

Populations of cultured mussels (Mytilus edulis) at a number of sites in British Columbia and Washington State experience high mortalities of an unknown origin during the second summer of growth. The present study examined the growth and mortality of two test populations of blue mussels on the east and west coasts of Vancouver Island. High mortalities of adult mussels occurred in both test populations over two successive summers (1982 and 1983). Environmental and biological data indicate that the cause of this mortality is complex. The following factors may contribute: overcrowding handling of mussels during the summer reproductive stress coupled with the concomitant rebuilding of glycogen stores warm water temperatures and/or low salinities during the summer and a proliferative blood-cell disorder. Several of these factors may act synergistically. The relative contribution of each factor may vary between grow-out sites.

Descriptors: mussel culture; mortality causes; environmental factors; animal physiology; handling; biological stress
Geographic Descriptors: Canada, British Columbia
Taxonomic Descriptors: Mytilus edulis
Environment: Marine

60
The relationship between summer mortality in cultured blue mussels Mytilus edulis and the annual cycling of energy storage products.
Emmett, B.T.; Baden, R.L.
(Archipelago Mar. Res., P.O. Box 6418, St. C. Victoria, B.C. V8X 5M3, Canada)
Source: J. SHELLFISH RES., (1984), vol. 4 (1), p. 110.
37. Annu. Convention of the Pacific Coast Oyster Growers Association and the Pacific Coast Section of the National Shellfisheries Association Tumwater, WA (USA), 9 September 1983
Languages: English Summary only. Rec'd. May 1987.
Document Type: Conference; Summary; Journal Article
ASFA Number: 118-05917
Abstract:

Populations of cultured blue mussels (Mytilus edulis) at a number of sites in British Columbia, Canada, and Washington, USA, experience high mortalities of an unknown origin during the second summer of growth. The growth and mortality of test populations of M. edulis were examined at two locations on the eastern and western coasts of Vancouver Island. British Columbia, over a 1-year period. Mussels were grown at the surface and at a depth of 5 m in both study locations. Glycogen, lipid, and protein levels in the test populations were measured throughout the year and environmental conditions, were monitored on each sampling date. Cumulative mortalities at both sites exceeded 70 percent over the summer and fall period. Mussels that were grown at the surface and at 5 m showed no distinct differences in patterns of growth and mortality. The mortalities were not directly correlated with either seasonal water temperature maxima or salinity minima. Spatfall from the more sheltered eastern Vancouver Island site indicated a protracted period of spawning from May until November. It is believed that this pattern of spawning may have contributed to the observed mortalities.

Descriptors: mussel culture; mortality causes; spawning; summer; glycogen; lipids; proteins
Geographic Descriptors: INE, Canada, British Columbia, INE, USA, Washington
Taxonomic Descriptors: Mytilus edulis
Environment: Marine

61
The reproductive and energy storage cycles of two populations of Mytilus edulis (Linne) from British Columbia.
Emmett, B.; Thompson, K.; Popham, J.D.
(Archipelago Mar. Res. 10, 1140 Fort St., Victoria, B.C. V8V 3K8, Canada)
Source: J. SHELLFISH RES., (1987), vol. 6 (1), pp. 29-36.
Languages: English
Summary Languages: English
Document Type: Bibliography; Journal Article
ASFA Number: 119-04331
Abstract:

The relationship between growth, mortality, reproductive and energy storage cycles was examined in two populations of cultured mussels (Mytilus edulis) situated in exposed (Mackenzie Anchorage) and sheltered (Departure Bay) habitats of the British Columbia coast. In both locations mussels grew to a mean length of similar to 50 mm within 14 to 16 mon. of settlement however, mortalities during the second summer exceeded 90 percent in both populations. Growth during this summer period was negligible. In both populations glycogen stores decreased in fall but were not accompanied by increasing lipid content. At Mackenzie Anchorage spawning activity and the rebuilding of glycogen stores occurred concurrently in May and June, and was followed by a second period of spawning in late August. In Departure Bay spawning occurred throughout the summer period and the rebuilding of glycogen stores did not occur until July. The high mortalities observed are related to reproductive stress and that the reproductive strategy of M. edulis on the west coast of North America emphasizes high reproductive output at an early age.

Descriptors: mussel culture; reproductive cycle; mortality; population dynamics; energy budget; lipids; glycogen
Geographic Descriptors: INE, Canada, British Columbia
Taxonomic Descriptors: Mytilus edulis
Environment: Marine

62
Predator-prey relationships for juvenile chinook salmon, Oncorhynchus tshawytscha, feeding on zooplankton in "in situ" enclosures.
English, K.K.
(LGL Ltd., 2453 Beacon Ave., Sidney, B.C. V8L 1X7, Canada)
Source: CAN. J. FISH. AQUAT. SCI., (1983), vol. 40 (3), pp. 287-297.
Languages: English
Summary Languages: English; French
Document Type: Journal Article
ASFA Number: 113-18261
Abstract:

Juvenile chinook salmon, Oncorhynchus tshawytscha, were raised in 90-m super(3) mesh enclosures in Saanich Inlet, B.C. The enclosures permitted ample water and zooplankton circulation while retaining 5-6 g juvenile salmon. Mean growth rate was 1.8 percent wet body weight/day over 6 weeks. Weekly growth rates ranged from 3.9 percent/day while food was abundant, to -0.5 percent/day when food was scarce. Zooplankton concentration inside and outside enclosures without fish were not significantly different. Organisms associated with the side of the enclosures (non-pelagic) were not a major contributor to the growth of the juvenile chinook. There was a strong relationship between the fish growth rates and the abundance of 1.4- to 4.5-mm zooplankton. The rates of a successful search varied

Abstract (cont.)

directly with the size and inherent contrast of a prey item. The minimum rate of successful search was 2.3 m super(3)/h for salmon feeding on 1.4- to 4.5-mm zooplankton concentrations that were 1/1000 of those required to sustain similar growth rates in tank experiments.

Descriptors: predators; juveniles; in situ density
Geographic Descriptors: INE, Canada, British Columbia, Sanich Inlet
Taxonomic Descriptors: Oncorhynchus tshawytscha
Environment: Marine; Brackish; Fresh
Identifiers: zooplankton

63
Aquaculture in British Columbia: an annotated bibliography (and a list of general aquaculture references).
Envirocon Limited
Source: Envirocon, Vancouver, B.C., 1984, 49 pp.
Descriptors: shellfish culture

64
Potential for viable aquaculture endeavors in British Columbia.
Envirocon Limited
Source: Envirocon, Vancouver, B.C., 1984., vol. 1, pp. 249-273.
Descriptors: shellfish culture

65
Indices of parr-smolt transformation in juvenile steelhead trout (Salmo gairdneri) undergoing volitional release at Cole Rivers Hatchery, Oregon.
Ewing, R.D.; Evenson, M.D.; Birks, E.K.; Hemmingsen, A.R.
(Oregon Dep. Fish and Wildl., 303 Extension Hall, Oregon State Univ., Corvallis, OR 97331, USA)
Source: AQUACULTURE, (1984), vol. 40 (3), pp. 209-221.
Languages: English
Summary Languages: English
Document Type: Journal Article
ASFA Number: 115-04596
Abstract:

Changes in common indices of parr -- smolt transformation were compared with the timing of outmigration of juvenile steelhead trout (Salmo gairdneri) from Cole Rivers Hatchery on the Rogue River, Oregon. Numbers of fish with silver coloration became maximal before the time of maximum migration. Nearly 80 percent of the migrating fish were entirely silvery (smolts) throughout the migration period, suggesting that silvering was associated with the migration process. Gill (Na+K)-ATPase activity reached a peak in non-migrant fish nearly two weeks before a peak in migrant fish was reached. Neither silvering nor gill (Na+K)-ATPase activity correlated well with maximum migration. Results suggested a number of physiological changes which occur in steelhead trout in the spring do not occur coincident with the onset of migration tendency.

Descriptors: fish physiology; catadromous migrations; smolts
Taxonomic Descriptors: Salmo gairdneri
Environment: Fresh

66
Trout nutrition.
Fairgrieve, William Thomas; Westgate, J.W.
Source: Oregon Dept. of Fish and Wildlife, Portland, OR, 1985, 27 pp.
Descriptors: fish culture

67
Density effects on performance to release of three size groups within populations of pond-reared juvenile coho salmon. Smolts released from Quinsam Hatchery in 1983.
Fagerlund, U.H.M.; McBride, J.R.; Dosanjh, B.S.; Bilton, H.T.; Morley, R.B.; van Tine, J.
(Department of Fisheries and Oceans, West Vancouver, B.C. (Canada))
Source: CAN. TECH. REP. FISH. AQUAT. SCI., no. 1337, 1984, 23 pp.
Languages: English
Summary Languages: English; French
Document Type: Report
Report No.: ISSN 0706-6457
ASFA Number: 115-16332
Abstract:

Juvenile coho salmon (Oncorhynchus kisutch) were reared for 12 months at four loading densities in Burrows' ponds at Quinsam Hatchery, Vancouver Island. Representative numbers from sub-populations of small, medium and large size fish were marked with individually coded nose tags and all fish were released at end of May, 1983. This report provides information regarding growth, size distribution, mortality, food consumption, food conversion efficiency, body composition, interrenal activity and plasma cortisol concentrations of fish in the four groups.

Descriptors: fish culture; stocking density; survival; density dependence; juveniles
Geographic Descriptors: Canada, British Columbia, Vancouver I.
Taxonomic Descriptors: Oncorhynchus kisutch
Environment: Fresh

68
Inches Creek chum pilot project, 1970-1978.
Fedorenko, A.Y.; Bailey, D.D.
(Department of Fisheries and Oceans, Vancouver, B.C. (Canada). Pacific Reg.)
Source: CAN. MANUSCR. REP. FISH. AQUAT. SCI., (No. 1562), April 1980, 54 pp.
Languages: English
Summary Languages: English; French
Document Type: Book
ASFA Number: 111-11530

Abstract:

The main objective of the Inches Creek chum facility was to evaluate the upwelling gravel incubation technique for Oncorhynchus keta production. In particular, the effects of different egg densities, flows, and the planting methods on egg-to-fry survival were tested. The mean annual production of 0.8 million chum fry represented an average egg-to-fry survival of 77 percent, or an 11-fold increase over the wild inches Creek fry survival. Mean size of unfed fry was 38.1 mm and 336 mg at release. Mean size of reared 1978 brood year fry was 55.3 mm and 1.3 g. To date, the project has succeeded in tripling the annual Inches Creek chum escapement to approximately 6-8000 adults since 1974. Marine survival arrival of combined wild and hatchery fry from Inches Creek was higher than that of the wild Fraser River chum fry (0.9-1.8 percent versus 0.4-1.0 percent). In future, all fry will be reared prior to release. Other changes include the use of surface-planting at higher egg densities instead of gravel-layer planting.

Descriptors: habitat improvement (physical); aquaculture techniques
Geographic Descriptors: Canada, British Columbia, Fraser R.
Taxonomic Descriptors: Oncorhynchus keta
Environment: Fresh
Identifiers: incubation; gravel; fish culture; Salmonidae; Pisces

69
Production of coho reared in sea-pens in Indian Arm, 1978 and 1979 brood years.
Fedorenko, A.Y.; Perry, E.A.
(Department of Fisheries and Oceans, Vancouver, B.C. (Canada). Pacific Reg)
Source: CAN. MANUSCR. REP. FISH. AQUAT. SCI., no. 1768, 1984, 60 pp.
Languages: English
Summary Languages: English; French
Document Type: Report
Report No.: ISSN 0706-6473
ASFA Number: 115-02014
Abstract:

During the fall of 1979 and 1980, approximately 120,000 and 100,000 coho Oncorhynchus kisutch fry respectively were transported form the Capilano hatchery to sea-pens in Indian Arm. Approximately 91,000 and 85,000 coho smolts were released in 1980 and 1981 respectively. Sea-pen rearing survivals averaged 76 percent and 86 percent for the 1978 and 1979 broods respectively. The estimated smolt-to-adult survivals for the respective broods, based on tag recovery, were 10.2 percent and 9.0 percent. The July release groups had the lowest marine survival and smallest adult size but both June and July groups contributed more to the local Georgia Strait sport fishery compared to the May group. The project failed to provide a year-round local sport fishery in Indian Arm but showed that release size and timing may affect coho marine survival and adult size.

Descriptors: fish culture; stocking (organisms)
Geographic Descriptors: INE, Canada, British Columbia, Indian Arm
Taxonomic Descriptors: Oncorhynchus kisutch
Environment: Marine

70
Technological aspects of oyster processing.
Fisheries Technology Division, B.C. Research
Source: B.C. Research, Vancouver, 1983, vol. 66 (10), 17 pp.
Descriptors: oyster culture

71
Proceedings of the Third Alaska Aquaculture Conference, Cordova, Alaska, April 27-28, 1982.
Frady, T.
Source: Alaska Sea Grant College Program, Univ. of Alaska, Fairbanks, AK, 1982, 138 pp.
Descriptors: fish culture

72
Big Qualicum River Salmon Development Project, volume 1: A biological assessment, 1959-1972.
Fraser, F.J.; Perry, E.A.; Lightly, D.T.
(Department of Fisheries and Oceans, New Westminster, B.C. (Canada). Pac. Reg.)
Source: CAN. TECH. REP. FISH. AQUAT. SCI., no. 1189, 1983, 216 pp.
Languages: English
Summary Languages: English; French Incl. tabular data.
Document Type: Numerical Data; Report
Report No.: ISSN 0706-6457
ASFA Number: 114-12051
Abstract:

This report describes the physical aspects of the Big Qualicum River Development Project designed primarily to increase chum freshwater survival analyses, the degree of flow and temperature regulation achieved, describes stream improvement techniques, assesses the response of chum salmon (Oncorhynchus keta), coho salmon (O. kitsutch), chinook salmon (O. tshawytscha) and steelhead (Salmo gairdneri), to management efforts by comparing pre-flow control (1959 - 1963) and post-flow control (1964 - 1972) biological parameters of these species documents the degree of success of the two artificial spawning channels compared to the natural but regulated river environment and reviews relevant aspects of the life history of above fish species.

Descriptors: habitat improvement; fishery management; fish culture; biological production; channel flow; spawning populations; channels
Geographic Descriptors: Canada, British Columbia, Big Qualicum R.
Taxonomic Descriptors: Salmonidae; Oncorhynchus keta; Oncorhynchus kisutch; Oncorhynchus tshawytscha; Salmo gairdneri
Environment: Fresh
Identifiers: PERT

73
Big Qualicum River Salmon Development Project, volume 3: Experimental rearing of chum salmon juveniles (Oncorhynchus keta) in fresh water (1968-70).
Fraser, F.J.; Bailey, D.D.; Wood, M.J.
(Fisheries and Marine Service, Vancouver, BC (Canada). Pacific Region.)
Source: TECH. REP. FISH. MAR. SERV. (CAN.), (no. 752), March 1978, 29 pp.

Languages: English
Summary Languages: English; French; Includes bibliography 39 ref.
Document Type: Bibliography; Report
ASFA Number: 110-11035
Abstract:

During the spring of 1968, 1969 and 1970 chum juveniles were captured and reared under semi-natural conditions for periods ranging from 38 to 54 days. Fry were fed Oregon Moist Pellet diet. A total of 3.9 million juveniles were returned to the system, averaging 2.10 g (six times heavier than normal migrant fry). Growth in weight ranged from 2.99 to 3.88 percent/day, wet weight food conversions from 1.87 to 2.99, and rearing mortalities from 14.9 percent to 48.9 percent. Fin-clips and oxytetracycline were used to mark reared groups. Release dates varied from June 5 to July 4. Migrant-to-adult survival for the 1968 brood was lower than wild survival (0.53 percent versus 0.65 percent) but survival for the 1969 brood was higher (0.94 percent versus 0.69 percent). Delay in juvenile release, relative to maximum local marine plankton abundance, is considered responsible for relatively low fingerling-to-adult survivals of reared groups.

Descriptors: fish culture; aquaculture techniques
Geographic Descriptors: Canada, British Columbia, Big Qualicum R.
Taxonomic Descriptors: Oncorhynchus keta
Environment: Fresh
Identifiers: rearing; growth; survival; mortality; diets; marking; osmoregulation; juveniles; Salmonidae; Pisces

74
Big Qualicum River Salmon Development Project, volume 4: Chum fry marine study.
Fraser, F.J.; Berry, S.J.; Allen, B.
(Fisheries and Marine Service, Vancouver, BC (Canada). Pacific Region.)
Source: TECH. REP. FISH. MAR. SERV. (CAN.), (no. 824), August 1979, 37 pp.
Languages: Spanish
Document Type: Bibliography; Report
ASFA Number: 110-11036
Abstract:

A marine study was undertaken during 1969 and 1970 to investigate the migration, feeding habits an sources of mortality for Big Qualicum chum (Oncorhynchus keta) fry. The results of this study indicate that these fry migrate in a north-westerly direction upon entering Georgia Strait. Evidence suggests that the waters around Denman and Hornby Islands are also utilized for rearing by pink (O. gorbuscha) and chum salmon juveniles migrating northwards from the Fraser River. A bimodal pattern of plankton abundance was recorded for both years, with peaks occurring in mid-June and early September. The downstream migration of the 1969 chum fry coincided closely with a time of maximum plankton levels, while the 1970 chum fry migration peaked approximately one month earlier. Plankton densities varied considerably between years. The salmonid fry examined appeared to be selective about their prey and the chum diet consisted largely of calanoid copepods, euphausiid nauplii and Oikopleura sp. A number of epibenthic organisms were also identified among the stomach contents. Sources of mortality were not established conclusively. Coho (O. kisutch) salmon and several species of piscivorous birds are thought to be the main predators.

Descriptors: migrations; feeding behavior
Geographic Descriptors: INE, Canada, Vancouver I., Big Qualicum R.
Taxonomic Descriptors: Oncorhynchus keta
Environment: Marine; Fresh
Identifiers: mortality; fry; zooplankton; food organisms; predation; marking; fish culture; Salmonidae; Pisces

75
Model of monthly marine growth and natural mortality for Babine Lake sockeye salmon (Oncorhynchus nerka).
Furnell, D.J.; Brett, J.R.
(Dep. Zool., Univ. British Columbia, 6270-University Blvd., Vancouver, B.C. V6T 1W5, Canada)
Source: CAN. J. FISH. AQUAT. SCI., (1986), vol. 43 (5), pp. 999-1004.
Languages: English
Summary Languages: English; French
Document Type: Journal Article
ASFA Number: 117-06786
Abstract:

Monthly marine growth and natural mortality rates were calculated for each major life history type of Babine Lake sockeye salmon (Oncorhynchus nerka) and compared with estimates by other methods. Growth rates were based on sizes at the beginning and end of each marine year and adjusted according to seasonal changes in environmental temperature. Temperature effects were derived from information on growth responses of cultured fish. Mortality estimates were based on a model which equates mortality rate to an inverse function of weight. Monthly sizes determined from the growth model were substituted into the mortality model, together with estimates of smolt and adult runs (catch plus escapement), to examine the population dynamics of an average Babine Lake smolt cohort. Using these prediction the authors suggest that 90 percent of natural mortality occurred during the first four months at sea.

Descriptors: growth curves; natural mortality; monthly; mathematical models; population dynamics; population structure; ranching
Geographic Descriptors: Canada, British Columbia, Babine Lake
Taxonomic Descriptors: Oncorhynchus nerka
Environment: Marine

76
The status of pen culture [i.e. culture] of salmonids with possible application in Alaska: final report.
Gard, Richard
Source: School of Fisheries and Science, University of Alaska, Juneau, 1985, 18 pp.
Descriptors: fish culture

77
The feasibility of the gooseneck barnacle Lepas anatifera as a candidate for mariculture.
Goldberg, H.; Zahradnik, J.W.
(Dep. Bio-Resour. Eng., Univ. British Columbia, 2357 Main Mall, Vancouver, B.C. V6T 1W5, Canada)
Source: J. SHELLFISH RES., (1984), vol. 4 (1), pp. 110-111.
37. Annu. Convention of the Pacific Coast Oyster Growers Association and the Pacific Coast Section of the National Shellfisheries Association Tumwater, WA (USA), 9 September 1983

Languages: English Summary only.
Document Type: Conference; Summary; Journal Article
ASFA Number: 118-05916
Abstract:

The acquisition of seed and the subsequent suspension culture of the gooseneck barnacle Lepas anatifera was investigated. Lepas anatifera successfully colonized the cultch (oyster shells, wooden dowelling, and rubber) that was developed at two locations off the western coast of Vancouver Island. The experiment indicated that growth rate may be site-specific and that areas of a high phytoplankton: zooplankton ratio may be a detriment to growth and timing of sexual maturation. At the densities studied, survival appeared to be proportional to density. Capitulum growth and weight gain were significantly greater for barnacles that were protected from predation within lantern nets than for those grown exposed on lines of oyster shells and wood dowelling. The mean total growth (capitulum plus peduncle) exceeded 4 cm in length within 17 to 23 weeks.

Descriptors: aquaculture products; feasibility studies; marine aquaculture; off-bottom culture; seed (aquaculture); seed collection; crustacean culture
Geographic Descriptors: INE, Canada, British Columbia
Taxonomic Descriptors: Lepas anatifera
Environment: Marine

78
Farmed salmon broodstock management.
Gordon, M.R. [et al.]
Source: B.C. Research, Vancouver, B.C., Canada, 1987, 1 vol.
Descriptors: fish culture

79
Scallops: potential for mariculture in British Columbia.
Hamilton, Linda D.
Source: Province of British Columbia, Victoria, 1981, pp. 16-17.
Descriptors: shellfish culture

80
Distribution of king crab, pandalid shrimp, and brachyuran crab larvae in Kachemak Bay, Alaska, 1972.
Haynes, E.V.; Wing, B.L.
(U.S. Natl. Mar. Fish. Service, Northwest and Alaska Fish. Cent., Auke Bay, AK 99821, USA)
Source: In: ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. U.S. National Oceanic and Atmospheric Administration, Boulder, CO. Environmental Research Laboratories, March 1977, vol. 10, pp. 417-451.
Languages: English
Document Type: Report
Report No.: NOAA/ERL-AR-77-10
ASFA Number: 108-11022

Abstract:

In 1971 the Northwest Fisheries Center Auke Bay Fisheries Laboratory began a comprehensive study on the larvae of king crab and shrimp in the Kachemak Bay, Alaska. In general, the study was designed to determine the distribution, abundance, and survival of the larvae and to develop appropriate methods for raising the larvae for laboratory studies. The first phase of the study was to determine the locations in Kachemak Bay where larvae are released and their subsequent dispersal from the releasing areas. Preliminary sampling began in spring 1971, primarily to standardize release. Sampling in 1972 was more extensive and was designed to determine the areas of release and the dispersal of larvae fromthe releasing areas. This report describes the distribution and dispersal of king crab zoeae in Kachemak Bay and compares their distribution with known patterns of water movement. The distribution of pandalid shrimp and brachyuran zoeae in Kachemak Bay are discussed. The charts showing distribution and abundance of zoeae were made by plotting the number of zoeae at each station and then drawing isopleths.

Descriptors: geographical distribution; invertebrate larvae; crustacean culture
Geographic Descriptors: INE, USA, Alaska, Kachemak Bay
Taxonomic Descriptors: Pandalus; Paralithodes; Brachyura
Environment: Marine
Identifiers: water circulation

81

The distribution and residency of juvenile Pacific salmon in the Strait of Georgia, British Columbia, in relation to foraging success.

Healey, M.C.
(Dep. Fish. and Oceans, Resour. Serv. Branch, Pacific Biological Station, Nanaimo, BC, Canada)
Melteff, B.R.; Neve, R.A. [eds.]

Source: ALASKA SEA GRANT REP. ALASKA SEA GRANT PROGRAM ALASKA UNIV. PROCEEDINGS OF THE NORTH PACIFIC AQUACULTURE SYMPOSIUM, 1982, pp. 61-69. North Pacific Aquaculture Symposium Anchorage, AK (USA). Newport, OR (USA), 18 August 1980. 25 August 1980
Languages: English
Summary Languages: English
Document Type: Conference; Report
Report No.: ASG-82-2
ASFA Number: 113-15982

Abstract:

This report summarizes information on the distribution and residency of juvenile salmon in the Strait of Georgia, British Columbia, and emphasizes circumstances in which distribution and residency appear to be related to foraging success. Occupation of estuaries and nearshore areas by pink, chum, and chinook fry during April and May appears not to be related to foraging success, nor does their movement away from shore in May and June, with the possible exception of the movement of chum out of rivermouth habitats. Departure of pink, chum, and sockeye from the Strait of Georgia in July, and the distribution of coho, chinook, and chum within the Strait in late summer, however, do appear related to foraging success.

Descriptors: feeding migrations; feeding behavior; juveniles; ecological distribution
Geographic Descriptors: INE, Georgia Strait

Taxonomic Descriptors: Oncorhynchus nerka; Oncorhynchus gorbuscha; Oncorhynchus kisutch; Oncorhynchus tshawytscha; Oncorhynchus keta
Environment: Marine
Identifiers: Oncorhynchus

82
Some effects of the marine environment on age at maturity and growth of chum salmon in Prince William Sound, Alaska.
Helle, J.H.
(Natl. Mar. Fish. Serv., Northwest and Alaska Fish. Cent., Auke Bay, AK, USA)
Melteff, B.R.; Neve, R.A. [eds.]
Source: ALASKA SEA GRANT REP. ALASKA SEA GRANT PROGRAM ALASKA UNIV. PROCEEDINGS OF THE NORTH PACIFIC AQUACULTURE SYMPOSIUM, 1982, p. 91. North Pacific Aquaculture Symposium Anchorage, AK (USA). Newport, OR (USA), 18 August 1980. 25 August 1980.
Languages: English Abstract only.
Document Type: Conference; Summary; Report
Report No.: ASG-82-2
ASFA Number: 113-16219
Abstract:

Influence of the marine environment on age and size at maturity, early marine growth, and abundance of chum salmon, Oncorhynchus keta, from Olsen Creek in Prince William Sound, Alaska, was studied during the years 1959-1978. Age composition of the spawners returning to Olsen Creek varied from year to year but they were predominantly 3-, 4-, and 5-year fish. Intraseasonally, age of new chum salmon spawners at Olsen Creek decreased as the season progressed. Size at maturity was related to sea-surface temperatures and marine weather parameters in the northern Gulf of Alaska and Prince William Sound during the year of return. Fluctuations in size at maturity were more similar between fish from different broods returning during the same year than between fish from the same broods maturing at different ages. A highly significant relationship was found between survival of progeny and mean size of the parents.

Descriptors: age composition; size distribution; spawning populations
Geographic Descriptors: INE, USA, Alaska
Taxonomic Descriptors: Oncorhynchus keta
Environment: Marine
Identifiers: environmental effects

83
Estimating natural and fishing mortalities of chinook salmon, Oncorhynchus tshawytscha, in the ocean, based on recoveries of marked fish.
Henry, K.A.
(U.S. National Marine Fisheries Service, Northwest and Alaska Fisheries Center, Seattle, WA 98112, USA)
Source: FISH. BULL., (1978), vol. 76 (1), pp. 45-57.
Languages: English
Summary Languages: English
Document Type: Journal Article
ASFA Number: 108-12058

Abstract:

In this paper the method of calculating estimates of fishing mortality (F) and natural mortality (M) occurring in the ocean for 1961 and 1962 brood Columbia River hatchery fall chinook salmon O. tshawytscha are given based on assumed values of the proportion of fish that mature annually (m) and on recoveries of marked fish. The advantages of this method over the method of assuming fixed natural mortality rates and back calculating estimates are discussed. It was possible to develop estimates of 1962 Spring Creek data up to the fourth year of life and to compare these estimates with values for the 1961 brood whereas no estimates had been possible with the back calculation method. Thus, estimates of M(SUB-1) are higher for the 1962 brood, estimates of M(SUB-2) are very similar for the two broods, and the estimates of M(SUB-3) are slightly higher for the 1962 brood. A major difference between the two methods is that natural mortality was assumed to be constant for the back calculation method whereas estimates of natural mortality were obtained separately each year using assumed proportions maturing. Thus, for the 1962 brood general marked fish, an M = 0.60 was used in the back calculation method while estimates of M(SUB-1) = 5.814, M(SUB-2) = 0.510, M(SUB-3) = 0.653, and M(SUB-4) = 0.727 were obtained by assuming varying proportions maturing. A series of graphs were developed that permit a quick analysis of any combination of proportions of fish maturing, fishing mortality, and natural mortality and which clearly depict the relationship between these various factors.

Descriptors: natural mortality; fishing mortality; methodology; tagging
Geographic Descriptors: INE, USA, Washington
Taxonomic Descriptors: Oncorhynchus tshawytscha
Environment: Marine

84
Blue mussel (Mytilus edulis) culture in south coastal British Columbia.
Heritage, G.D.
(DFO, Pacific Biological Station, Nanaimo, B.C., Canada V9R SK6)
Source: J. SHELLFISH RES., (1981), vol. 1 (1), pp. 132-133.
Annu. Meet. of the National Shellfisheries Association, West Coast Section Tumwater, WA (USA), 5 September 1980
Languages: English
Document Type: Conference; Summary; Journal Article
ASFA Number: 114-04656
Abstract:

A project to investigate the commercial feasibility of blue mussel (M. edulis) culture in British Columbia was begun in 1979 at eight locations. Biological parameters investigated were growth, mortalities, fouling, predation, and recruitment. Surveys of wild mussel beds showed that stocks of seed mussels suitable for culture in Netlon socks were plentiful only at a few locations in the Strait of Georgia but were common on the western coast of Vancouver Island. Wild mussels from the intertidal zone that were placed in Netlon socks and suspended from rafts grew to approximately 50 mm shell length in 12 months after suspension. Severe unexplained mortalities were experienced at all sites. The problems of heavy mortalities and predation must be overcome if commercial mussel culture is to become feasible in British Columbia. Some mechanization also is required for processing mussels in areas of heavy fouling. At present there are six mussel culture pilot projects (including the one described here) underway in British Columbia, and seven lease applications for mussel culture are pending.

Descriptors: mussel culture
Geographic Descriptors: INE, Canada, British Columbia
Taxonomic Descriptors: Mytilus edulis
Environment: Marine

85
Biological reconnaissance of Kitimat Chinook and results of pilot hatchery operations to May, 1980.
Hilland, R.T.; Farwell, M.K.; MacKinnon, C.N.
(Department of Fisheries and Oceans, Vancouver, B.C. (Canada). Pacific Region)
Source: MANUSCR. REP. FISH. MAR. SERV. (CAN.), no. 1502, 1981, 53 pp.
Languages: English
Summary Languages: English; French
Document Type: Book
ASFA Number: 112-11710
Abstract:

The results of chinook salmon (Oncorhynchus tshawytscha) studies conducted in the Kitimat Valley to May, 1980 are presented, along with relevant background data. Water quality parameters were determined for a number of potential hatchery supplies in the study area. Spawner characteristics were determined from both live and dead samples, age composition: 2.1 percent age 2 sub(1), 41.3 percent age 3 sub(1), 21 percent age 4 sub(1), 15.9 percent age 5 sub(1), 10.1 percent age 4 sub(2), 6.5 percent age 5 sub(2), 2.9 percent age 6 sub(2) sex-ratio: 2.07 males per female (2.48 males per female, excluding "jacks") fecundity: 8,000 eggs per female mean length: males 58.7 cm, females 73.3 cm mean weight: males 5.9 kg, females 8.6 kg. Differences in morphology and timing were not demonstrable in fish from the various tributaries. Since 1977, approximately 314,775 eggs have been incubated at a pilot hatchery 3 km from the mouth of the Kitimat River, 265,793 fry have been reared of which 185,294 were coded-wire tagged prior to release.

Descriptors: biological surveys; fish culture; hatcheries; population structure; fecundity; water quality; spawning migrations; rearing; tagging
Geographic Descriptors: Canada, British Columbia, Kitimat R.
Taxonomic Descriptors: Oncorhynchus tshawytscha
Environment: Marine; Fresh

86
Carrying capacities fo. rainbow trout in single-use water systems.
Hrusa, Christopher Travis
Source: thesis, (M.S.), University of Idaho, 1986, 78 pp.
Descriptors: fish culture

87
The production and marketing of tray-cultured raft oysters in British Columbia.
Humphries, M.
Source: Fishermen's Service Branch, Ottawa, 1976, 60 pp.
Descriptors: oyster culture

88
The aquaculture industry in Washington State: an economic overview.
Inveen, Daniel C.
Source: Washington State Dept. of Trade and Economic Development, 101 General Administration Bldg., AX-13, Olympia 98504-0613, Olympia, WA, 1987, 42 pp.
Descriptors: aquaculture

89
The utilization of Netarts Bay by juvenile chum salmon.
Isan, C.D.W.; Pearcy, W.G.
(Oregon State Univ., Corvallis (USA). Sea Grant Coll. Program)
Source: PUBL. OREG. STATE UNIV. SEA GRANT COLL. PROGRAM, 1985, 62 pp.
Languages: English
Summary Languages: English
Document Type: Report
Report No.: OREGSU-T-85-005
ASFA Number: 118-07303
Abstract:

The School of Oceanography, Oregon State University, initiated a study during the spring of 1984 to investigate the use of Netarts Bay by juvenile chum salmon (Oncorhynchus keta), and the potential of the bay as a nursery to produce juvenile chum salmon. Specific objectives the first year were to determine: the use of the estuary by hatchery and wild chum salmon, the residence time of chum salmon in Netarts Bay, and the size at which the fish emigrated from the bay. Objectives for the second year were similar and provided data necessary to assess interannual variation in patterns of estuarine use by juvenile chum salmon. This report presents methods and some preliminary results from the 1985 field season.

Descriptors: fish culture; estuaries; migrations; seasonal variations; abundance
Geographic Descriptors: INE, USA, Oregon, Netarts Bay
Taxonomic Descriptors: Oncorhynchus keta
Environment: Marine; Brackish

90
Puget Sound mussel studies.
Johnson, K.; Skidmore, D.
(Sch. Fish., Univ. Washington, Seattle, WA 98195, USA)
Source: J. SHELLFISH RES., (1982), vol. 2 (1), p. 120.
Annu. Meet. National Shellfish. Association, West Coast Section Portland, OR (USA), 4 September 1981
Languages: English Summary only.
Document Type: Conference; Summary; Journal Article
ASFA Number: 115-20234
Abstract:

Mussels from different populations in Puget Sound which were cultured at the same location differed in growth and survival rates. Penn Cove seed grew to a greater length in four months than did Dabob Bay seed, and Dabob Bay seed outgrew Budd Inlet seed at each of three locations in Puget Sound. The differences in growth and survival of mussel populations when held in similar environments suggest that

Abstract (cont.):
genetic differences may exist between mussel populations in Puget Sound. Mytilus californianus initially grows slower than M. edulis but seems to grow well once established. M. californianus also does not seem to exhibit the mass mortalities that M. edulis does in a side-by-side culture test.

Descriptors: mussel culture; population dynamics; survival
Geographic Descriptors: INE, Puget Sound
Taxonomic Descriptors: Mytilus
Environment: Marine

91
Comprehensive salmon plan for southeast Alaska: phase I; draft for review.
Alaska Regional Planning TeamsJoint Southeast Alaska Regional Planning Teams.
Source: The Teams, Juneau, Alaska, 1980, vol. xix (179), 95 pp.
Descriptors: fish culture

92
Methods for setting hatchery produced oyster larvae.
Jones, Bruce
Source: Marine Resources Branch, Ministry of Environment, Victoria, B.C., 1983, 94 pp.
Descriptors: oyster culture

93
Oyster culture in Washington - problems of shifting to domestically produced seed.
Jones, C.R.
(Washington State Dep. Fish., Brinnon, WA 98320, USA)
Source: PROC. NATL. SHELLFISH. ASSOC. MD, (1979), 69, pp. 195-196.
Presented at: 70. Annual Meeting of the National Shellfisheries Association New Orleans, LA (USA), 19 January 1978.
Languages: English Summary only.
Document Type: Conference; Summary; Journal Article
ASFA Number: 111-04214
Abstract:

In 1975, seed was obtained from Japan, Dabob Bay, and a hatchery. Experimental plots were established in three locations in Washington. Periodic measurements were made of seed growth and mortality over a 2-year period. At termination, the number of gallons of oyster meat from each group was determined. Results showed that under comparatively adverse conditions, Japanese seed could be expected to produce higher yields. However, yield from domestic seed could be substantially improved by minimal efforts to protect it from certain mortality-causing factors. There were also indications that Japanese seed was more susceptible to the Puget Sound adult summer mortality syndrome.

Geographic Descriptors: INE, USA, Washington
Taxonomic Descriptors: Ostreidae
Identifiers: oyster culture; growth; mortality; Bivalvia

94
Operation of the Sustaf 106 device for sorting pink salmon eggs.
Joyce, Timothy L.
Source: Alaska Dept. of Fish and Game, Division of Fisheries Rehabilitation, Enhancement and Development, P.O. Box 3-2000, Juneau, AK 99802, 1984, 26 pp.
Descriptors: fish culture

95
Nearshore epibenthos of the Campbell River estuary and Discovery Passage, 1982, in relation to juvenile chinook diets.
Kask, B.A.; Brown, T.J.; McAllister, C.D.
(Department of Fisheries and Oceans, Nanaimo, B.C. (Canada).)
Source: CAN. TECH. REP. FISH. AQUAT. SCI., no. 1449, Pacific Biological Station, 1986, 59 pp.
Languages: English
Summary Languages: English; French
Document Type: Report
Report No.: ISSN 0706-6457
ASFA Number: 117-00784
Abstract:

Following the experimental rehabilitation of the Campbell River Estuary in 1981-82, a program was begun to monitor the use of the new, as well as the established, habitats by juvenile salmonids, particularly wild and hatchery-reared chinook (Oncorhynchus tshawytscha). The role of each of the nearshore habitats in providing food for the young fish was also monitored using an epibenthic sled. From March to December 1982, 146 nearshore samples were collected from three different habitat areas -- estuarine, transition, and marine zones.

Descriptors: cultured organisms; natural populations; food organisms; juveniles; feeding behavior
Geographic Descriptors: INE, Canada, British Columbia, Campbell Estuary; INE, Canada, British Columbia, Discovery Passage
Taxonomic Descriptors: Oncorhynchus tshawytscha
Environment: Marine; Brackish

96
The 1975 crop of salmon reared on the Pacific Biological Station experimental fishfarm.
Kennedy, William A. [et al.]
Source: Pacific Biological Station, Nanaimo, B.C., 1976, 20 pp.
Descriptors: fish culture

97
Sablefish culture - final report.
Kennedy, William A.
Source: Fisheries Research Board of Canada, Pacific Biological Station, Nanaimo, B.C., 1974, 15 pp.
Descriptors: fish culture

98
Sustaf salmonid egg sorting machine workshop proceedings.
Kepshire, Bernard M.
Source: Alaska Dept. of Fish and Game, Division of Fisheries Rehabilitation, Enhancement & Development, P.O. Box 3-2000, Juneau, AK 99802, 1983, 26 pp.
Descriptors: fish culture

99
Pre-spawning mortality of pink salmon matured in salt water -- the Prince William Sound Aquaculture Corporation experiences 1975-79, and 1981 followup.
Kerns, C.L.
(Prince William Sound Aquaculture Corp., AK, USA)
Nosho, T. [ed.]
Source: PUBL. WASH. SEA GRANT, 1981, pp. 12-14.
SALMONID BROODSTOCK MATURATION. PROCEEDINGS OF WORKSHOPS HELD AT SEATTLE, WASHINGTON, MAY 20-22, 1980, AND MARCH 11, 1981.
Workshops on Salmonid Broodstock Maturation Seattle, WA (USA), 20 May 1980. 11 March 1981.
Languages: English
Document Type: Conference; Book
Report No.: WSG-WO-80-1
ASFA Number: 113-17058
Abstract:

It has been the experience of the Prince William Sound Aquaculture Corporation (PWSAC) that significant pre-spawning mortalities of maturing pink salmon Oncorhynchus gorbuscha can be expected with close, extended holding in salt water. The stress of the process appears to be non-sex specific and additive. Mortalities build gradually, reaching a maximum rate just before maturation. For each day of close confinement a one percent mortality can be expected. The disturbances and handling inherent with extended confinement, coupled with high water temperatures, can have severe consequences. Pink salmon allowed to swim unimpeded until shortly before maturation in moderate water temperatures, may, however, be held at high densities for short periods of time with minimal pre-spawning losses. Use of a corral is described and the results are reported in the 1981 followup.

Descriptors: mortality; spawning; cage culture; aquaculture techniques
Geographic Descriptors: INE, USA, Alaska
Taxonomic Descriptors: Oncorhynchus gorbuscha
Environment: Marine; Fresh

100
An applied coupled simulation-optimization model of water use efficiency in intensive fish culture systems.
Klontz, George
Source: Idaho Water and Energy Resources Research Institute, Univ. of Idaho, Moscow, ID, 1982, 91 pp.
Descriptors: aquaculture

101
Information on Columbia River salmon runs and fisheries.
Korn, L.
(Oregon Dep. Fish. Wildl., P.O. 3503, 506 SW Mill, Portland, OR 97208, USA)
Source: BULL. INPFC, (no.36). PUBL: International North Pacific Fisheries Commission, Vancouver B.C. (Canada), 1977, pp. 1-14 En.
Document Type: Numerical Data; Report
ASFA Number: 108-09947
Abstract:

There does not appear to be a trend in the magnitude of the spring chinook salmon (Oncorhynchus tshawytscha) run in the Columbia River. Construction of dams has depleted natural spawning areas and dams under construction and those planned will further reduce natural production and increase passage problems. Hatchery production is increasing and will be largely depended upon in future. Data on runs and catches indicate that the fish cannot be exploited beyond the present rate. Fall chinook runs entering the river stabilized at a relatively low level from 1951 to 1968 compared to those existing before 1951. Construction of dams did not appear to cause the initial decline of this fish. However, dams existing today have eliminated much of the fall chinook spawning habitat and additional dams will further depress natural production. Without successful artificial production to compensate for lost spawning areas and other problems caused by dams, a further decline in the run is due. Production of sockeye salmon (Oncorhynchus nerka) in the Columbia River is limited due to the small amount of spawning and rearing area available. Exploitation of this species is to some extent influenced by regulations for summer run chinooks, but generally appears to have been at a maximum level. In some years no fishing for sockeye salmon in the Columbia River can be allowed. Runs and catches of coho salmon (Oncorhynchus kisutch) have increased in recent years mainly due to hatchery production.

Descriptors: stock assessment; fishery management; spawning grounds; stocking (organisms)
Geographic Descriptors: USA, Washington, Columbia R.; Oregon
Taxonomic Descriptors: Oncorhynchus
Environment: Marine; Fresh
Identifiers: fishery surveys; fish catch statistics; exploitation; spawning migrations; mortality causes; environmental effects; dams; hatcheries; habitat improvement (physical)

102
Alaska salmon study: facilities review.
Kramer, Chin & Mayo, Inc.
Source: Kramer, Chin & Mayo, Seattle, 1975, 98 pp.
Descriptors: fish culture

103
Market analysis and preliminary economic analysis for products of the red seaweed Porphyra.
Kramer, Chin & Mayo, Inc.
Source: The Division, Olympia, WA, 1982, 200 pp.
Descriptors: algae culture

104
The Marine plant biomass of the Pacific Northwest coast.
Krauss, Robert W.
Source: Oregon State University Press, Corvallis, 1977, 397 pp.
Descriptors: algae culture

105
Preliminary study of low gamete viability in adult chum salmon (Oncorhynchus keta) held in sea-pens at Deserted Creek, Hisnit Inlet, B.C.
Lam, C.N.H.; Jensen, J.O.T.; Alderdice, D.F.
(Department of Fisheries and Oceans, Nanaimo, B.C. (Canada))
Source: CAN. TECH. REP. FISH. AQUAT. SCI., no. 1133, 1982, 56 pp.
Languages: English
Summary Languages: English; French
Document Type: Book
Report No.: ISSN 0706-6457
ASFA Number: 114-07105
Abstract:

Trials were conducted to determine the cause of high adult mortality and low gamete viability in maturing chum salmon (Oncorhynchus keta) held for hatchery broodstock in sea-pens in the estuary of Deserted Creek, Hisnit Inlet, B.C. In general gamete viability was low and highly variable during the initial holding phase when salinities were highest, and high with low variability during the final holding phase when salinities were substantially lower. In the initial phase there was a higher incidence of turgid, apparently water-hardened eggs in the coelomic cavity of ovulated females, and higher incidence of embryonical abnormalities among resulting fertilized eggs. It appears that final stages of adult maturation are concomitant with loss of ability to osmoregulate in sea water. Reduced holding salinities, during oocyte maturation appear necessary to minimize adult mortality and maintain high gamete viability.

Descriptors: gametogenesis; osmoregulation; marine aquaculture; sexual maturity; adults; fish eggs; mortality; hatcheries
Geographic Descriptors: INE, Canada, British Columbia, Hisnit Inlet
Taxonomic Descriptors: Oncorhynchus keta
Environment: Brackish

106
Differential use of the Campbell River Estuary, British Columbia, by wild and hatchery-reared juvenile chinook salmon (Oncorhynchus tshawytscha).
Levings, C.D.; McAllister, C.D.; Change, B.D.
(Dep. Fish. and Oceans, Fish. Res. Branch, Salmon Habitat Res. Sect., West Vancouver Lab., 4160 Marine Dr., West Vancouver, B.C. V7V 1N6, Canada)
Source: CAN. J. FISH. AQUAT. SCI., (1986), vol. 43 (7), pp. 1386-1397.
Languages: English
Summary Languages: English; French
Document Type: Journal Article
ASFA Number: 117-10496

Abstract:

From March 1982 to December 1983, juvenile chinook salmon (Oncorhynchus tshawytscha) were sampled by beach-seine in the Campbell River Estuary and adjacent waters of Discovery Passage in order to examine estuarine use by wild juvenile chinook entered the estuary as migrant fry and were present in the estuarine zone mainly in late April to June, in the transition zone in mid-May to July, and in the marine zone in July. Hatchery fish were released from early May to early July. Maximum catches of wild stocks were similar in the estuarine and transition zones, while the maximum catches of most hatchery stocks were higher in the transition zone. For both wild and hatchery chinook, catches in the marine zone were much lower than in the estuarine and transition zones.

Descriptors: migrations; nursery grounds; juveniles
Geographic Descriptors: INE, Canada, British Columbia, Campbell Estuary
Taxonomic Descriptors: Oncorhynchus tshawytscha
Environment: Brackish
Identifiers: cultured vs wild spawned

107
Results of two-boat trawling for juvenile salmonids in Discovery Passage and nearby channels, northern Strait of Georgia.
Levings, C.D.; Kotyk, M.
(Department of Fisheries and Oceans, West Vancouver, B.C. (Canada))
Source: CAN. MANUSCR. REP. FISH. AQUAT. SCI., no. 1730, 1983, 59 pp.
Languages: English
Summary Languages: English; French
Document Type: Report
Report No.: ISSN 0706-6473
ASFA Number: 114-09827
Abstract:

Chum, pink, coho, chinook, sockeye and steelhead juveniles (Oncorhynchus keta, O. gorbuscha, O. kisutch, O. tshawytscha, O. nerka and Salmo gairdneri respectively) were sampled with a two boat trawl in channels leading off the northern Strait of Georgia. Chum dominated the catches and peaked in abundance in late June, as did pinks. It is probable that the majority of the chum were from the Fraser system. Chinook and coho were less abundant and were primarily fish from Quinsam hatchery. Steelhead and sockeye were uncommon. Length frequency data are given for fish subsampled from the trawls. Judging from data obtained in June 1983, most of the chum migrating to sea from the northern Strait of Georgia use Discovery Passage. If stock composition were determined, Discovery Passage could be a useful monitoring location for migrating juvenile salmonids.

Descriptors: stock assessment; fish catch statistics; trawling; juveniles
Geographic Descriptors: INE, Georgia Strait
Taxonomic Descriptors: Salmonidae; Oncorhynchus keta; Oncorhynchus gorbuscha; Oncorhynchus kisutch; Oncorhynchus tshawytscha; Oncorhynchus nerka; Salmo gairdneri
Environment: Marine

108
Evaluation of enclosed floating culture of Gracilaria.
Lindsay, J.G.; Saunders, R.C.
Source: Marine Resources Branch, Ministry of Environment, Province of British Columbia, Victoria, B.C., 1980, 42 pp.
Descriptors: algae culture

109
Bird predation on juvenile salmonids in the Big Qualicum Estuary, Vancouver Island.
Mace, P.M.
(Department of Fisheries and Oceans, Vancouver, B.C. (Canada))
Source: CAN. TECH. REP. AQUAT. SCI., no. 1176, 1983, 89 pp.
Languages: English
Summary Languages: English; French
Document Type: Report
Report No.: ISSN 0706-6457
ASFA Number: 114-02135
Abstract:

The impact of piscivorous birds on hatchery-reared juvenile chinook (Oncorhynchus tshawytscha) and coho (O. kisutch) salmon in Big Qualicum River was investigated over three years (1979-81) to determine both the extent of predation and the most effective means by which it could be reduced. Recommendations for reducing bird predation on Big Qualicum chinook included: a delay in release until early or mid-June when migratory birds such as Arctic loons (Gavia arctica) have disappeared, restriction of releases to tides and times of day when birds are the least effective at feeding and a decrease in the length of release period to minimize the accumulation of predators, particularly Bonaparte's gulls (Larus philadelphia). Implementation of these recommendations in 1982 resulted in chinook predation rates that were only about 15 percent of those in 1980 and 5 percent of those in 1981.

Descriptors: predators; aquatic birds; fish culture
Geographic Descriptors: hatcheries; INE, Canada, British Columbia, Vancouver I., Big Qualicum Estuary
Taxonomic Descriptors: Larus philadelphia; Gavia arctica; Oncorhynchus tshawytscha; Oncorhynchus kisutch
Environment: Fresh
Identifiers: juveniles

110
Introduction to shellfish aquaculture in the Puget Sound region.
Magoon, Charles; Vining, Richard
Source: Division of Marine Land Management, State of Washington, Dept. of Natural Resources, Olympia, 1980, 68 pp.
Descriptors: aquaculture

111
Trends in Puget Sound and Columbia River coho salmon.
Mathews, S.B.
(Washington Univ., Fish. Res. Inst., Seattle, WA, USA)
McNeil, W.J.; Himsworth, D.C. [eds.]

Source: PROCEEDINGS OF A SYMPOSIUM ON SALMONID ECOSYSTEMS OF THE NORTH PACIFIC OCEAN, 1980, pp. 133-145.
Washington Univ., College of Fisheries Contrib. No. 524. Symposium on Salmonid Ecosystems of the North Pacific Ocean Otter Crest, OR (USA), May 1978.
Languages: English
Document Type: Conference; Book
Report No.: ISBN 0-87071-335-3
ASFA Number: 113-09195
Abstract:

Catches of chinook (Oncorhynchus tshawytscha) and coho (O. kisutch) from California, Oregon and Washington have increased during the past two decades due to substantial increases in hatchery production. This paper compares broad trends of coho production, catch, survival and size of adult fish in two major hatchery production areas: Puget Sound and the Columbia River. The purposes are to seek possible evidence of producing and releasing too many hatchery salmon to the ocean and/or overfishing, and to provide analyses that may improve harvest and enhancement strategies.

Descriptors: fishery statistics; stock assessment
Geographic Descriptors: INE, USA
Taxonomic Descriptors: Oncorhynchus tshawytscha

112
Babine Lake sockeye salmon (Oncorhynchus nerka) enhancement program: Testing some major assumptions.
McDonald, J.; Hume, J.M.
(Dep. Fish. Oceans, Fish. Res. Branch, Pacific Biological Station, Nanaimo, B.C. V9R 5K6, Canada)
Source: CAN. J. FISH. AQUAT. SCI., (1984), vol. 41 (1), pp. 70-92.
Languages: English
Summary Languages: English; French
Document Type: Journal Article
ASFA Number: 114-21205
Abstract:

The objective of the Babine Lake sockeye salmon (Oncorhynchus nerka) enhancement project was to increase fry outputs (and thus, smolt outputs and adult returns) by expanding and improving available spawning beds through the use of artificial spawning channels and related water flow control facilities. The project proceeded on four basic assumptions: (1) the artificial spawning channels would prove an effective means of producing sockeye fry, (2) the fry produced would be as viable as those produced from natural spawning beds, (3) the lake nursery area had the capacity to support larger juvenile populations, and (4) increased smolt outputs would result in increased adult returns. A before and after study has allowed these assumptions to be tested.

Descriptors: habitat improvement (physical); fishery management; spawning grounds; fish culture; survival; population dynamics; biological production
Geographic Descriptors: Canada, British Columbia, Babine L.; channels
Taxonomic Descriptors: Oncorhynchus nerka
Environment: Fresh

113
Ceratomyxa shasta noble, 1950 (Myxozoa: Myxosporea) present in the Fraser River system of British Columbia.
McDonald, T.E.
(Dep. Fish. Oceans, Fish. Res. Branch, Pacific Biological Station, Nanaimo, B.C. V9R 5K6, Canada)
Source: CAN. J. ZOOL., (1983), vol. 61 (9), pp. 1991-1994.
Languages: English
Summary Languages: English; French
Document Type: Journal Article
ASFA Number: 115-16322
Abstract:

An examination of 220 chinook salmon (Oncorhynchus tshawytscha),Canadaho salmon (O. kisutch), 145 steelhead trout (Salmo gairdneri), and 21 cutthroat trout (S. clarki) for Ceratomyxa shasta (Myxozoa: Myxosporea) from 16 localities in the Fraser River drainage, British Columbia, showed that at all sites examined these salmonid species were infected, and with a prevalence ranging between 11 and 100 percent. The study concludes that C. shasta, the causative agent of the salmonid disease ceratomyxosis, is widely distributed in the Fraser Canadage basin and discusses these results in relation to proposed fish culture in the region.

Descriptors: infectious diseases; fish culture
Geographic Descriptors: Canada, British Columbia, Fraser R.
Taxonomic Descriptors: Oncorhynchus tshawytscha; Oncorhynchus kisutch; Salmo gairdneri; Ceratomyxa shasta
Environment: Fresh
Identifiers: ceratomyxosis

114
The growth and regeneration of the rockweed Fucus distichus in Bristol Bay.
McConnaughey, John
Source: 1985, 106 pp.
Descriptors: algae culture

115
Adaptive and behavioral responses to artificial propagation in a stock of chum salmon, Oncorhynchus keta.
McNeil, W.J.
(Oregon State Unit., Mar. Sci. Cent., Newport, OR, USA)
Lannan, J.E.; Himsworth, D.C. [eds.]
Source: PROCEEDINGS OF A SYMPOSIUM ON SALMONID ECOSYSTEMS OF THE NORTH PACIFIC OCEAN, 1980, pp. 309-312.
Oregon Agric. Exper. Stn. Tech. Paper No. 4892. Symposium on Salmonid Ecosystems of the North Pacific Ocean Otter Crest, OR (USA), May 1978.
Languages: English
Document Type: Conference; Book
Report No.: ISBN 0-87071-335-3
ASFA Number: 113-09017

Abstract:

A pilot production program with chum salmon (O. keta) presented an opportunity to look for adaptive responses. Gametes were withdrawn from a vestigial, naturally-reproducing stock in Whiskey Creek, a tributary of Netarts Bay, Oregon. The fish have now been artificially propagated for two generations. This report describes selective processes and adaptive responses contributing to the evolution of this hatchery brood stock. Hatchery-produced fry entered the estuary somewhat earlier than fry produced in the natural habitat. A large proportion of hatchery-produced fish were recruited to the estuarine stock. The increased variation in size of out-migrant fry from the hatchery indicated qualitative as well as quantitative change in the stock's structure.

Descriptors: population characteristics; induced breeding; fish culture; survival
Geographic Descriptors: USA, Oregon
Taxonomic Descriptors: Oncorhynchus keta
Environment: Marine; Fresh

116
Salmon rancher's manual.
McNeil, William J.; Bailey, Jack E.
Source: Northwest Fisheries Center, Auke Bay Fisheries Laboratory, National Marine Fisheries Service, NOAA, Auke Bay, AK, 1975, 95 pp.
Descriptors: fish culture

117
Proceedings of the North Pacific Aquaculture Symposium: Anchorage, Alaska, August 18-21, 1980, Newport, Oregon, August 25-27, 1980.
Melteff, Brenda R.; Nev, Richard A.
Source: Alaska Sea Grant College Program, Univ. of Alaska, Fairbanks, AK, 1982, 379 pp.
Descriptors: aquaculture

118
Equipment and techniques for nori farming in Washington State.
Melvin, Donald J. [et al.]
Source: Washington State Dept. of Natural Resources, Olympia, 1986, vol. 1, 67 pp.
Descriptors: algae culture

119
Aspects of growth, and the effects of some environmental factors on pen-reared chinook salmon, Oncorhynchus tshawytscha (Walbaum), in Puget Sound, Washington.
Moring, John Richard
Source: thesis, University of Washington, 1973, 225 pp.
Descriptors: fish culture

120
A time and size at release study on chum salmon. Details of releases from Conuma Hatchery in the spring of 1985.
Morley, R.B.; Brouwer, D.
(Department of Fisheries and Oceans, Nanaimo, B.C. (Canada))
Source: CAN. MANUSCR. REP. FISH. AQUAT. SCI., no. 1901, 1986, 24 pp.
Languages: English
Summary Languages: English; French
Document Type: Report
Report No.: ISSN 0706-6473
ASFA Number: 118-17918
Abstract:

A study has been conducted at Conuma River hatchery, west coast of Vancouver Island, B.C., to measure the effects of time and size at release of juvenile chum salmon Oncorhynchus keta on their subsequent survival, growth, distribution, and age at maturity. In the spring of 1985 four releases (March 25, April 16, May 6, and May 27) of juveniles were made from the hatchery, the first consisting of two size categories, each of the remainder of three. An estimated total of 362,216 marked, validly tagged fry were released. Samples were obtained just prior to each release to provide information on long term tag retention, lengths and weights, sex ratios, health, and ability to adapt to seawater. This report provides a detailed description of the study and results of sampling up to and including release final results are dependent upon recovery of adults.

Descriptors: fish culture; anadromous species; population structure; population dynamics; tagging; hatcheries; spring
Geographic Descriptors: Canada, British Columbia, Conuma R.
Taxonomic Descriptors: Oncorhynchus keta
Environment: Fresh
Identifiers: release size; release time

121
Recent innovations in cultivation of Pacific molluscs.
Morse, D.E.; Chew, K.K.; Mann, R.
Source: Distributors for the United States and Canada, Elsevier Science Pub. Co., Amsterdam, New York, Elsevier, 1984.
Descriptors: shellfish culture

122
Seaweed Aquaculture Program.
Mumford, Jr., Thomas F.
Source: Washington State Dept. of Natural Resources, Olympia, WA, 42 pp.
Descriptors: algae culture

123
Temporal use of an Oregon estuary by hatchery and wild juvenile salmon.
Myers, K.W.; Horton, H.F.
(Oregon State Univ., Corvallis, OR 97331, USA)

Source: ESTUARIES, (1981), vol. 4 (3), p. 286.
6. Biennial International Estuarine Research Conference Gleneden Beach, OR (USA), 1-5 November 1981.
Languages: English Summary only.
Document Type: Conference; Summary; Journal Article
ASFA Number: 114-17068
Abstract:

This paper reports on the temporal use of Yaquina Bay, Oregon by accelerated growth (age 0) hatchery coho (Oncorhynchus kisutch) and wild salmon (O. sp.) juveniles. Length of residence of hatchery coho juveniles at nearshore study areas was modelled by equations of the form: N = N sub(0)e super(-kt). "Residency half-life" (N/N sub(0) = 1/2) ranged from 2 to 9 days for different release groups, and was longer for fish released earlier in the year (June-August) than for groups released later in the year (September-October). Wild populations of chum (O. keta)) coho were present at the study areas for 2-3 months (March-June), and wild chinook (O. tshawytscha) were present during nine months (January, April-November). Lack of overlap in peak abundances of wild chum (early April), coho (mid May), and chinook (mid July-early August) suggests interspecific temporal partitioning.

Descriptors: hatcheries; competition; exploitation
Geographic Descriptors: INE, USA, Oregon, Yaquina Bay; natural populations
Taxonomic Descriptors: Oncorhynchus kisutch; Oncorhynchus keta; Oncorhynchus tshawytscha; Oncorhynchus
Environment: Brackish
Identifiers: temporal distribution

124
Separation of some pink salmon (Oncorhynchus gorbuscha Walbaum) sub-populations in Prince William Sound, Alaska by length-weight relationships and horizontal starch gel electrophoresis.
Nickerson, R.B.
(Alaska Department of Fish and Game, Cordova (USA). Div. of Fisheries Rehabilitation, Enhancement and Development.)
Source: INF. LEAFL. ALASKA DEP. FISH GAME, (no. 181), May 1979, 36 pp.
Languages: English
Summary Languages: English
Document Type: Book
ASFA Number: 110-07360
Abstract:

The generation of a comprehensive salmon hatchery programme (public and private) in Alaska necessitates implementation of certain controls to maintain genetic integrity of local indigenous stock. Controls achieved by identification and classification of potential hatchery donor stock, environmental matching through categorization of stream-types, and coordination with an appropriate genetic policy are deemed essential. Prince William Sound pink salmon stocks (within and among systems) were separated to some extent by length-weight criteria, however, greater refinement of separations was accomplished with starch gel electrophoresis. Thirty-seven sub-populations of even-year pink salmon were reduced, by Roger's coefficient of genetic similarity, to seven stock types. Several protein variants were observed in this study which had never previously been observed in pink salmon.

Descriptors: stock identification; biochemical analysis
Geographic Descriptors: INE, USA, Alaska, Prince William Sound
Taxonomic Descriptors: Oncorhynchus gorbuscha
Environment: Marine
Identifiers: fish culture; Salmonidae; genetics; electrophoresis

125
Maturity condition of Bristol Bay sockeye salmon (Oncorhynchus nerka (Walbaum)) in summer in the eastern Bering Sea.
Nishiyama, T.
(Alaska Univ., Inst. Mar. Sci., Fairbanks, AK, USA)
Melteff, B.R.; Neve, R.A. [eds.]
Source: ALASKA SEA GRANT REP. ALASKA SEA GRANT PROGRAM ALASKA UNIV. PROCEEDINGS OF THE NORTH PACIFIC AQUACULTURE SYMPOSIUM, 1982, pp. 239-250. North Pacific Aquaculture Symposium Anchorage, AK (USA). Newport, OR (USA), 18 August 1980. 25 August 1980
Languages: English
Summary Languages: English
Document Type: Conference; Report
Report No.: ASG-82-2
ASFA Number: 113-16031
Abstract:

The interrelationships among seawater temperature, timing of spawning migration in the Kvichak River, growth rate and maturity condition in 2.2 age sockeye salmon were analyzed. The analyses were based on the data obtained from the central and southeastern Bering Sea from June through early July for an 8-year period from 1965 through 1972. An inverse correlation was found between the peak return data of sockeye salmon in the Kvichak River and the June mean water temperature in the study area. The peak return data was also related to the growth rate and maturity condition of the 2.2 age sockeye salmon in the ocean. In warm years, sockeye salmon with high growth rate, high maturity index, and low maturity increase rates returned earlier than those returning in cold water years.

Descriptors: sexual maturity; growth; temperature effects; spawning migrations
Geographic Descriptors: INE, Bering Sea
Taxonomic Descriptors: Oncorhynchus nerka
Environment: Marine

126
Juvenile current response, growth and maturity of above and below waterfall stocks of rainbow trout, Salmo gairdneri.
Northcote, T.G.
(Inst. Anim. Resource Ecol. Univ. British Columbia, 2075 Wesbrook Mall, Vancouver, B.C. V6T1W5, Canada)
Source: J. FISH BIOL., (1981), vol. 18 (6), pp. 741-751.
Languages: English
Summary Languages: English
Document Type: Journal Article
ASFA Number: 112-00900

Abstract:

Young rainbow trout were propagated from adults collected from above and below a waterfall, impassable to upstream fish migration on Kokanee Creek, tributary to Kootenay Lake, British Columbia. The two stocks of young (above and below waterfall) were reared in a hatchery under identical temperature, light and food conditions. Their directional response to water current was tested in a laboratory migration channel during their first summer and autumn, as well as the following spring. During tests in light, both stocks of young trout showed similar current responses, but in darkness the below-falls stock showed much more downstream movement in the autumn than did the above-falls stock. In addition, below-falls trout had a higher growth rate, were slightly heavier at the same length and matured earlier than the above-falls stock. The adaptive significance of these differences are discussed in relation to maintenance of trout populations above waterfalls and to selective pressures faced by migratory below-waterfall populations.

Descriptors: juveniles; growth; sexual maturity; migrations; population functions
Geographic Descriptors: Canada, British Columbia, Dodanee Creek
Taxonomic Descriptors: Salmo gairdneri
Environment: Fresh
Identifiers: water currents; waterfalls

127
Comprehensive salmon plan: Phase II, northern southeast Alaska.
Northern Southeast Regional Planning Team
Source: Dept. of Fish and Game, Juneau, AK, 1985, 148 pp.
Descriptors: fish culture

128
Clam and mussel harvesting industries in Washington State.
Oceanographic Institute of Washington for the Oceanographic Commission of Washington
Source: Oceanographic Commission of Washington, 152 Denny Way, Seattle, WA 98109, 1981, 362 pp.
Descriptors: shellfish culture

129
Chinook populations and sport fishing parameters of Kitimat Arm.
Oguss, E.
(Department of Fisheries and Oceans, Vancouver, B.C. (Canada). Pacific Reg)
Source: CAN. TECH. REP. FISH. AQUAT. SCI., no. 1117, 1982, 93 pp.
Languages: English
Summary Languages: English; French
Document Type: Book
Report No.: ISSN 0706-6457
ASFA Number: 114-05968

Abstract:

A heavily sport-fished population of chinook salmon (Oncorhynchus tshawytscha) rearing in the Kitimat Arm/Douglas Channel Area was studied using a mark-recapture method to estimate population size and migration patterns, and a creel census to monitor sport fishing. Floy tags were used to mark 1,427 immature chinook, predominantly 2 super(+)-age fish. Sport recaptures of tags provided a Petersen estimate of 55,000. Coded wire tags (CWT) and scale pattern data were used to estimate that 2,805 of these fish (5 percent) were from the Kitimat pilot hatchery; more than half (53 percent) were from other Canadian hatcheries; the remainder were wild or American hatchery fish. The sport harvest was 6,600 plus or minus 700, consisting predominantly of 2 sub(1) age fish.

Descriptors: population number; migrations; game fish; sport fishing statistics
Geographic Descriptors: natural populations; hatcheries; tagging; INE, Canada, British Columbia, Kitimat Arm
Taxonomic Descriptors: Oncorhynchus tshawytscha
Environment: Marine

130
Economic feasibility of private nonprofit salmon hatcheries: an introduction.
Orth, Franklin L.
Source: University of Alaska, School of Management, Fairbanks, 1975, 15 pp.
Descriptors: fish culture

131
Newport Aquaculture Lab.
Osmer, J.
Source: SEA TECHNOL., (1981), vol. 22 (5), p. 44.
Languages: English
Document Type: Journal Article
ASFA Number: 112-01352
Abstract:

The layout and activities of the aquaculture facility at the Newport Aquaculture Lab, Oregon, are described. Located on roughly two acres of land on Yaquina Bay, the new lab increased by a third the size of the existing Marine Science Center complex, which consists of an aquarium, offices, classrooms, laboratories and a library on a 50-acre site.

Descriptors: aquaculture; laboratory design
Geographic Descriptors: USA, Oregon
Identifiers: Newport Aquaculture Lab.

132
Alaska oyster grower's manual.
Page, Virginia Else [et al.]
Source: Univ. of Alaska, Alaska Sea Grant Program, Fairbanks, AK, 1987, 215 pp.
Descriptors: oyster culture

133
Washington's oyster industry: a documentary history.
Patterson, Nancy
Source: Office of the Secretary of State, Division of Archives & Records Management, 1987, 46 pp.
Descriptors: oyster culture

134
A preliminary study on rearing chum salmon, Oncorhynchus keta, in an artificial environment.
Paul, A.J.; Hood, D.W.; Nev, R.A.
Source: University of Alaska Sea Grant Program, Fairbanks, 1976, 5 pp.
Descriptors: fish culture

135
Policy and culture: The Bristol Bay case.
Petterson, J.S.
(Univ. California, Dep. Anthropol., San Diego, CA, USA)
Source: COAST. ZONE MANAGE. J., (1983), vol. 10 (4), pp. 313-330.
Languages: English
Summary Languages: English
Document Type: Journal Article
ASFA Number: 214-04045
Abstract:

This paper deals with the difficulties of implementing legislation in non-Western social and cultural contexts. The author presents an abbreviated case study of Alaska's effort to increase the economic returns of resident fishermen by restricting entry into state-controlled fisheries. This paper examines how the implicit objectives of Alaska's Limited Entry Act of 1973 were effectively obstructed by the regulatory policy and by the implementation process. The paper focuses on the impact of this policy on Native Americans of Bristol Bay, Alaska, the site of the largest commercial fishery in Alaska and the world's largest salmon runs. Presented are some of the reasons several hundred natives were ultimately excluded from participating in the local commercial fishery.

Descriptors: policies; fishery regulations
Geographic Descriptors: INE, Bristol Bay
Environment: Marine
Identifiers: legislation

136
Aquaculture in Alaska.
Pierce, Brad
Source: The Agency, 1987, 109 pp.
Descriptors: aquaculture

137
Oyster farming in British Columbia: a financial information guide.
Pobran, T.T.
Source: BC, Aquaculture and Commercial Fisheries Branch, Victoria, 1983, 77 pp.
Descriptors: oyster culture

138
Quality of salmon fry from gravel incubators.
Poon, Derek Clinton
Source: U.S. Dept. of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Northwest Fisheries Center, Seattle, WA, 1977, 253 pp.
Descriptors: fish culture

139
A guide to oyster-farming.
Quayle, D.B.; Smith, D.W.
Source: Marine Resources Branch, Dept. of Recreation and Travel Industry, Victoria, B.C., 1976, 54 pp.
Descriptors: oyster culture

140
Homing and straying in chinook salmon (Oncorhynchus tshawytscha) from Cowlitz River Hatchery, Washington.
Quinn, T.P.; Fresh, K.
(Dep. Fish. Oceans, Fish. Res. Branch, Pacific Biological Station, Nanaimo, B.C. V9R 5K6, Canada)
Source: CAN. J. FISH. AQUAT. SCI., (1984), vol. 41 (7), pp. 1078-1082.
Languages: English
Summary Languages: English; French
Document Type: Journal Article
ASFA Number: 114-22406
Abstract:

The patterns of homing and straying of spring chinook salmon (Oncorhynchus tshawytscha) from the Cowlitz River, Washington, were analyzed, based on coded wire tag recoveries. Out of an estimated escapement of 41,085 chinook salmon, 98.6 percent returned to Cowlitz River and the rest were recovered in other rivers. Almost all strays were within the Columbia River system, and most were found in the Lewis and Kalama rivers, upstream of cowlitz River. Straying was positively correlated with age at return.

Descriptors: orientation behavior; homing behavior; cultured organisms; fish culture
Geographic Descriptors: USA, Washington, Cowlitz R.; USA, Washington, Kalama R.; USA, Washington, Lewis R.; USA, Washington, Columbia R.
Taxonomic Descriptors: Oncorhynchus tshawytscha
Environment: Fresh

141
Homing of coho salmon (Oncorhynchus kisutch) exposed to morpholine.
Rehnberg, B.G.; Curtis, L.; Schreck, C.B.
(Oregon Coop. Fish. Res. Unit, Oregon State Univ., Corvallis, OR 97331, USA)
Source: AQUACULTURE, (1985), vol. 44 (3), pp. 253-255.
Languages: English
Summary Languages: English
Document Type: Journal Article
ASFA Number: 116-07387
Abstract:

Smolts of coho salmon (O. kisutch) were exposed to 5 x 10 super(-5) mg/l morpholine for 15 days and released into the Salmon River along with an unexposed control group. During the following two autumns, morpholine was introduced into the hatchery's fish ladder on various days and the return of experimental fish was recorded. The returns of morpholine-exposed and control fish were not statistically different. With morpholine present in the fish ladder, control fish were not repelled, and with morpholine absent from the ladder, morpholine-exposed fish returned as readily as control fish.

Descriptors: homing behavior; hatcheries; fish culture; chemical stimuli; olfaction
Geographic Descriptors: USA, Oregon, Salmon R.
Taxonomic Descriptors: Oncorhynchus kisutch
Environment: Marine; Brackish; Fresh
Identifiers: morpholine

142
Evaluation of transplanting Snake River steelhead trout to the Pahsimeroi River, 1978.
Reingold, M.
(Idaho Department of Fish and Game, Boise (USA))
Source: JOB PERFORMANCE REP. IDA. DEP. FISH GAME, Publ. by: IDFG Boise, ID (USA), January 1979, 19 pp.
Languages: English
Summary Languages: English
Document Type: Report
ASFA Number: 110-02705
Abstract:

Returning marked adult steelhead from 1976 feed experiments showed double the returns from smolts fed an Oregon Moist Pellet diet over those reared on dry feed. Grading steelhead smolts to favor fast growing 'leaders' in 1976 led to increased adult returns in 1978. Adult steelhead excess to program needs were transported and released in various locations in the Salmon River drainage. Many of these fish spawned successfully, close to the area of liberation, with some penetration into adjacent tributary streams. Spawn-taking procedures at the Pahsimeroi station were modified in 1978 with the goal of improving the hatchery product and increasing the smolt to adult return ratio. The steelhead sport fishery in the Salmon River for the 1977-78 fish run was one of the most intense and successful in many years. Check station data indicated that anglers fishing the Salmon River above the South Fork harvested an estimated 60 percent of the hatchery run (4,200 fish).

Descriptors: sport fishing statistics; stocking (organisms); feeds; fish culture
Geographic Descriptors: USA, Idaho
Taxonomic Descriptors: Salmo gairdneri
Environment: Fresh

143
Site comparison for the culture of the spot prawn Pandalus platyceros Brandt in and adjacent to salmon net pens.
Rensel, J.
(Coll. Fish., Univ. Washington, Seattle, WA, USA)
Source: PROC. NATL. SHELLFISH. ASSOC. MD, 66, 109, (1976).
Languages: English
Document Type: Summary; Journal Article
ASFA Number: 109-10040
Abstract:

Clam Bay and Henderson Inlet in the central and southern basins of Puget Sound, respectively, were compared as potential prawn aquaculture sites. Seasonally warmer waters of the latter site were conjectured to accelerate growth. Wild and laboratory reared prawns were held in nylon net pens with and without salmon and in benthic cages beneath commercial salmon net pens. Prawns were fed rawmussel (Mytilus edulis) and sea kelp (Nereocystis leutkeana), Oregon Moist Pellets (fish food) or geoduck clam (Panope generosa) processing wastes. Unsupplemented groups held in net pens and benthic cages could utilize fouling organisms or organic enrichment from the adjacent salmon pens. Growth and survival of juvenile prawns were significantly higher at Clam Bay than at Henderson Inlet. One-year-old prawns averaged 7.13 g which exceeded growth reported for wild populations off Vancouver Island, B.C. Rates of growth for Henderson Inlet benthic and Clam Bay surface yearlings were more rapid than the reported Vancouver Island populations with the exception of net pen, unsupplemented groups. Henderson Inlet surface waters were unsuitable for prawn culture due to extreme temperatures (21.9 C in early June), protozoan fouling and dense plankton blooms. During the summer season surface reared juveniles and yearlings experienced 70 percent and 100 percent mortality, respectively. Conversely, benthic caged prawns at 10 m had only 15 percent mortality during the same period. Differences in growth and survival and possible applications to commercial culture are discussed.

Descriptors: aquaculture development; crustacean culture; growth; aquaculture techniques
Geographic Descriptors: INE, Puget Sound
Taxonomic Descriptors: Pandalus platyceros
Environment: Marine
Identifiers: survival

144
Private nonprofit salmon hatcheries in Alaska.
Robinson, E. Thomas
Source: University of Alaska, School of Management, Fairbanks, 1976, 5 pp.
Descriptors: fish culture

145

Effects of fertilization of Little Togiak Lake on the food supply and growth of sockeye salmon. Rogers, D.E.; Rogers, B.J.; Hardy, F.J.

(Washington Univ., Fish. Res. Inst., Seattle, WA 98105, USA)

Melteff, B.R.; Neve, R.A. [eds.]

Source: ALASKA SEA GRANT REP. ALASKA SEA GRANT PROGRAM ALASKA UNIV. PROCEEDINGS OF THE NORTH PACIFIC AQUACULTURE SYMPOSIUM, 1982, pp. 125-142. North Pacific Aquaculture Symposium Anchorage, AK (USA). Newport, OR (USA), 18 August 1980. 25 August 1980.

Languages: English

Summary Languages: English

Document Type: Conference; Report

Report No.: ASG-82-2

ASFA Number: 113-17094

Abstract:

Juvenile sockeye salmon (Oncorhynchus nerka) in the Wood River lake system exhibit density-dependent growth and are among the smallest smolts produced in Bristol Bay. It was hypothesized that an increase in growth would be followed by an increase in survival and hence an increase in the abundance of returning adults. Little Togiak Lake was annually treated with various amounts of diammonium phosphate during the summers of 1974 to 1978 and the effects on fish growth phytoplankton, zooplankton, and chironomids were monitored. Following each year of fertilization, the smolts that migrated from Little Togiak Lake were larger than those from the other lakes in the system, indicating that growth was enhanced by fertilization.

Descriptors: food availability; growth; habitat improvement (fertilization)

Geographic Descriptors: INE, USA, Alaska, Little Togiak L.

Taxonomic Descriptors: Oncorhynchus nerka

Environment: Fresh

146

A progress report on the effect of rearing density on subsequent survival of Capilano coho.

Saundercock, F.K.; Stone, E.J.

(Fish. and Oceans, Salmonid Enhancement Prog., Vancouver, B.C., Canada)

Melteff, B.R.; Neve, R.A. [eds.]

Source: ALASKA SEA GRANT REP. ALASKA SEA GRANT PROGRAM ALASKA UNIV. PROCEEDINGS OF THE NORTH PACIFIC AQUACULTURE SYMPOSIUM, 1982, pp. 151. North Pacific Aquaculture Symposium Anchorage, AK (USA). Newport, OR (USA), 18 August 1980. 25 August 1980.

Languages: English Abstract only.

Document Type: Conference; Summary; Report

Report No.: ASG-82-2

ASFA Number: 113-17096

Abstract:

Two experiments were conducted at Capilano Salmon Hatchery, North Vancouver, B.C. to determine the effect of rearing density on subsequent survival to adult. The first experiment involved 1975 brood coho transferred as eyed eggs from the big Qualicum River. The second experiment utilized 1977 brood coho native to Capilano. Standard hatchery rearing practices were followed and all groups were maintained on OMP diet. To compare the relative survival between the different density groups it was decided to use only the number of marks observed in the fishery and escapement and not the expanded values adjusted for sampling rates in specific fisheries. For the range of densities tested, it is clear that a pond with half as many fish (low density) will produce just as many adult coho to the fishery and escapement as will a pond of fish reared at high density.

Descriptors: rearing; survival; stocking density; fish culture
Geographic Descriptors: Canada, British Columbia
Taxonomic Descriptors: Oncorhynchus kisutch
Environment: Marine; Fresh

147
Contribution of wild and hatchery-reared coho salmon, Oncorhynchus kisutch, to the Oregon ocean sport fishery.
Scarnecchia, D.L.; Wagner, H.H.
(Colorado Cooperative Fish. Res. Univ., Colorado State Univ., Fort Collins, CO 80523, USA)
Source: FISH. BULL., (1979), vol. 77 (3), pp. 617-623.
Languages: English
Summary Languages: English
Document Type: Journal Article
ASFA Number: 110-15030
Abstract:

Eight scale characters of known hatchery and wild coho salmon, O. kisutch, were compared, and a linear discriminant function was used to determine whether hatchery and wild adult coho salmon could be reliably separated on the basis of scale characteristics. Attempted separation was based upon known differences in rearing environments of hatchery and wild juvenile coho salmon and upon hatchery smolts being larger than wild smolts. Identifications were correct for 82 percent of the hatchery fish and 89 percent of the wild fish. Based on analysis of scales from adult coho salmon of unknown origin (hatchery or wild) and the estimated catch of marked, hatchery-reared coho salmon taken by the Oregon sport fishery, it was concluded that 75 percent of the fish caught in the ocean along the Oregon coast from mid-June to mid-September 1977 had been released as smolts from hatcheries. percentages of hatchery fish in the catch ranged from 85 near the mouth of the Columbia River to 61 at Winchester Bay on the central Oregon coast. Fisheries along the south and central Oregon coast may have had access to higher percentages of wild coho salmon after mid-August than prior to this time, probably because wild fish from coastal streams remained near these ports, whereas most fish destined for Columbia River hatcheries had already migrated northward.

Descriptors: sport fishing statistics; population characteristics
Geographic Descriptors: INE, USA, Oregon
Taxonomic Descriptors: Oncorhynchus kisutch
Environment: Marine
Identifiers: Salmonidae; Pisces

148
The salmon terminal fishery: A practical, comprehensive timing model.
Schnute, J.; Sibert, J.
(Dep. Fish. Oceans, Fish. Res. Branch, Pacific Biological Station, Nanaimo, B.C. V9R 5K6, Canada)
Source: CAN. J. FISH. AQUAT. SCI., (1983), vol. 40 (7), pp. 835-853.
Languages: English
Summary Languages: English; French
Document Type: Journal Article
ASFA Number: 113-19826
Abstract:

This paper presents a comprehensive model for analysis of data from a salmon terminal fishery. The model includes a new description of salmon run curves, tailored form earlier models of biological growth. It also includes a new equation to describe the process of fishing from a pool of fish that belong to various stages of the salmon run. It allows for variable run timing between fishery and hatchery, and it incorporates test fishery data in a systematic way. A likelihood function is derived that gives an objective criterion for estimating parameters associated with run timing, the fishery, and the test fishery. The model is applied to four years of historical data on the chinook (Oncorhynchus tshawytscha) fishery in Barkley Sound and Alberni Inlet, British Columbia, Canada. Run timing proves to be remarkably consistent from year to year. Time spent by the fish in the fishery is ill-determined from the data, but most other important parameters are relatively insensitive to this uncertainty.

Descriptors: salmon fisheries; mathematical models; fishery data; escapement; growth; migrations; fishery management; population number; fish catch statistics; catch/effort
Geographic Descriptors: INE, Canada, British Columbia, Barkley; INE, Canada, British Columbia, Sound Alberni Inlet
Taxonomic Descriptors: Oncorhynchus tshawytscha
Environment: Marine; Brackish; Fresh

149
Coastal aquaculture: proteins, profits and problems for a hungry world.
Shupe, Steven J.
Source: Oregon State Univ. Sea Grant College Program, Corvallis, OR, 1982, 30 pp.
Descriptors: aquaculture

150
Foraging success as a determinant of estuarine and nearshore carrying capacity of juvenile chum salmon (Oncorhynchus keta) in Hood Canal, Washington.
Simenstad, C.A.; Salo, E.O.
(Washington Univ., Fish. Res. Inst., Seattle, WA, USA)
Melteff, B.R.; Neve, R.A. [eds.]
Source: ALASKA SEA GRANT REP. ALASKA SEA GRANT PROGRAM ALASKA UNIV. PROCEEDINGS OF THE NORTH PACIFIC AQUACULTURE SYMPOSIUM, 1982, pp. 21-37. North Pacific Aquaculture Symposium Anchorage, AK (USA). Newport, OR (USA), 18 August 1980. 25 August 1980.
Languages: English
Summary Languages: English
Document Type: Conference; Report

Report No.: ASG-82-2
ASFA Number: 113-16179
Abstract:

Migration rate of and habitat selection by outmigrating chum salmon (Oncorhynchus keta) juveniles in Hood Canal relate directly to availability of preferred prey organisms. Juveniles entering the Canal early in the outmigration period (February and March), especially naturally spawned chums less than 40 mm LF, encounter relatively meager prey resources in shallow sublittoral and neritic habitats. Rapid migration rates (7 to 14 km/day) during this period suggest a behavioral response to low prey availability might be immediate migration into regions with more prey. In spring, epibenthic and neritic zooplankton increase, and migration rates decline (3 to 5 km/day) as the juvenile salmon spend more time foraging in estuarine and nearshore habitats. During this period they start eating epibenthic harpacticoid copepods and gammarid amphipods in shallow sublittoral habitats, but upon growing to 45 to 55 mm FL, move into neritic habitats and start eating pelagic and nektonic organisms such as calanoid copepods, hyperiid amphipods, and larvaceans.

Descriptors: fish culture; feeding behavior; migrations; food organisms
Geographic Descriptors: INE, USA, Washington
Taxonomic Descriptors: Oncorhynchus keta
Environment: Marine; Brackish; Fresh

151
Intertidal, longline culture of Mytilus edulis Linne in Puget Sound, Washington.
Skidmore, D.A.; Johnson, K.W.; Raven, G.W.
(Veliger Seafarms, Coupeville, WA 98239, USA)
Source: J. SHELLFISH RES., (1985), vol. 5 (1), p. 54.
Annu. Meet. National Shellfisheries Association, West Coast Section Bellingham, WA (USA), 7 September 1984
Languages: English Summary only.
Document Type: Conference; Summary; Journal Article
ASFA Number: 118-01243
Abstract:

Intertidal, longline systems, similar to those used in Grays Harbor for growing oysters, are presently being used to grow mussels (Mytilus edulis) at Race Lagoon, Whidbey Island, Washington. Seed mussels are caught on lines placed on racks in the intertidal zone. Once seeded the 30.5-m (100-ft) lines are attached to rows of PVC pipe inserted in the beach. Growth of mussels with this system is somewhat slower than mussels grown subtidally on rafts in nearby Penn Cove however, growth to harvest size is one year or less. Control of the spring settlement of barnacles seems to be the major obstacle at present.

Descriptors: mussel culture; off-bottom culture; aquaculture systems
Taxonomic Descriptors: Mytilus edulis
Environment: Marine
Identifiers: INE, USA, Washington, Whidbey I., Race Lagoon

152
The economic and biologic feasibility study of rearing chinook salmon, chum salmon and Pacific oysters at the Squaxin Island, Port Gamble and Skokomish Reservations: final report.
Washington, Inc.Small Tribes Organization of Western Washington, Inc.
Source: The Organization, Federal Way, WA, 1972, 50 pp.
Descriptors: shellfish culture

153
Analyzing a new marine business.
Smith, Frederick J.
Source: Oregon State Univ. Extension Service, Corvallis, OR, 1984, 12 pp.
Descriptors: aquaculture

154
Columbia River Fisheries Development Program annual report - F.Y. 1980.
Smith, R.Z.; Wold, E.
(National Marine Fisheries Serv., Portland, OR (USA). Envir. & Tech. Serv. Div)
Source: NOAA TECH. MEMO. PUBL: NOAA/NMFS, PORTLAND, OR (USA), 1981, 41 pp.
Languages: English
Document Type: Report
ASFA Number: 113-14960
Abstract:

The Columbia River Fisheries Development Program includes four major functions in resource development: (1) the protection and improvement of stream environment which included improvement of natural habitat, such as clearing obstructions form nearly 2,000 miles of tributary streams, building 87 fish ladders past natural barriers, and installation of 720 screens in irrigation diversion canals, (2) the production of fish in hatcheries which was accomplished by the construction or modernization of 22 hatcheries and seven rearing ponds located primarily on the lower Columbia River, (3) the conduct of evaluation and contribution studies related to Program activities, especially in the area of hatchery operations, and (4) the provision of design, operation, and maintenance criteria for fish passage and protective facilities required at water use projects to reduce losses of adult and juvenile salmonids. An estimated 114.6 million Pacific salmon and steelhead trout smolts were released in 1980. In most cases, returning adult fish supplied enough eggs to meet current production goals. However in May, mud flows resulting from the eruption of Mt. St. Helens destroyed the Toutle Hatchery causing the loss of coho smolts, coho fry, and fall chinook smolts.

Descriptors: annual reports; fishery management; hatcheries; pollution control; salmon culture; resource development
Geographic Descriptors: INE, USA, Washington; INE, USA, Oregon; INE, USA, Columbia R.
Taxonomic Descriptors: Salmonidae
Environment: Marine; Fresh

155
Artificial salmon spawning: a manual.
Smoker, William W.; Kerns, Curtis L.
Source: University of Alaska Sea Grant, [197?], 21 pp.
Descriptors: fish culture

156
Cold temperature limitation on growth of pink salmon fry.
Smoker, William W.
Source: School of Fisheries and Science, University of Alaska Juneau, 11120 Glacier Highway, Juneau, AK 99801, 1984, 8 pp.
Descriptors: fish culture

157
Synthetic and degradative processes in marine macrophytes.
Srivastava, L.M.
Source: W. de Gruyter, Berlin, New York, 1982, 296 pp.
Descriptors: algae culture

158
An assessment of the production and marketing of aquaculture products in the western region of the United States.
Stern, Henrietta; Ure, Lee J.
Source: The Foundation, Hawaii, 1984, vol. xvi (144), 13 pp.
Descriptors: aquaculture

159
Effects of several experimental diets on the growth of rainbow trout in salt water.
Sutterlin, Arnold M.; Barchard, H.; Melvin, G.
Source: Research and Development Directorate, Biological Station, St. Andrews, N.B., 1975, 8 pp.
Descriptors: fish culture

160
Genetic differentiation among seasonally distinct spawning populations of chum salmon, Oncorhynchus keta.
Tallman, R.F.
(Dep. Fish. and Oceans, Fish. Res. Branch, Pacific Biological Station, Namaimo, B.C. V9R 5K6, Canada)
Gall, G.A.E.; Busack, C.A. [eds.]
Source: AQUACULTURE, 1986, vol. 57 (1-4), pp. 211-217.
The Second International Symposium On Genetics In Aquaculture. 2. Int. Symp. on Genetics in Aquaculture. Davis, CA (USA), 1985
Languages: English
Summary Languages: English
Document Type: Book
ASFA Number: 118-07340

Abstract:

Fry from three Vancouver Island chum (Oncorhynchus keta) salmon populations were reared under identical conditions from egg onward to determine if genetic divergence occurs among populations that spawn in different seasons. Comparisons of genetic traits, such as incubation rate and external morphology, revealed significant differences between the autumn spawning stock and the two winter spawning stocks. At constant 6 degree C, simulated autumn spawning regime and simulated winter spawning regime incubation rates of winter stock embryos were more rapid than those of the autumn spawning population. Both genotype and genotype - environment interactions contribute to divergence among seasonally distinct spawning populations.

Descriptors: spawning seasons; spawning populations; population genetics; genotypes
Geographic Descriptors: INE, Canada, British Columbia, Vancouver I.
Taxonomic Descriptors: Oncorhynchus keta
Identifiers: variability

161
Salmon ranching.
Thorpe, J.E.
Source: Academic Press, London, New York, 1980, 441 pp.
Descriptors: fish culture

162
Effects of different coho stocking strategies on coho and cutthroat trout production in isolated headwater streams.
Tripp, D.; McCart, P.
(Department of Fisheries and Oceans, Vancouver, B.C. (Canada). Pac. Reg)
Source: CAN. TECH. REP. FISH. AQUAT. SCI., no. 1212, 1983, 187 pp.
Languages: English
Summary Languages: English; French
Document Type: Report
Report No.: ISSN 0706-6547
ASFA Number: 114-12194
Abstract:

In 1980, groups of hatchery reared coho salmon (Oncorhynchus kisutch) fry were released above impassable falls in two streams, Banon Creek and Bush Creek, draining the east coast of Vancouver Island, British Columbia. At the time of the release, the streams upstream of the falls were inhabited by a single species of fish, the cutthroat trout (Salmo clarki). The major objectives of the study were: first, to evaluate the effects of different stocking times and densities on coho salmon growth and survival; second, to evaluate the effects of different stream types and variations in cutthroat trout densities on coho salmon growth and survival and third, to evaluate the effects of various stocking strategies involving coho salmon on cutthroat trout production.

Descriptors: stocking (organisms); interspecific relationships; growth; survival; density dependence; fish culture
Geographic Descriptors: Canada, British Columbia, Vancouver I.
Taxonomic Descriptors: Oncorhynchus kisutch; Salmo clarki
Environment: Fresh

163
Pen rearing pink salmon fry (Oncorhynchus gorbuscha) using naturally available marine zooplankton.
Urquhart, D.L.; Barnard, D.R.
(Inst. Marine Science, Alaska Univ., Fairbanks, AK, USA)
Melteff, B.R. [ed.]
Source: PROCEEDINGS OF THE 29TH ALASKA SCIENCE CONFERENCE.
Presented at: 29. Alaska Science Conference, Fairbanks, AK (USA), 15 August 1978. Alaska Sea Grant Rep. Alaska Sea Grant Program Alaska Univ. In: ALASKA FISHERIES: 200 YEARS AND 200 MILES OF CHANGE. PUBL: Alaska Univ., Fairbanks (USA). Alaska Sea Grant Program, ASG, Fairbanks, AK (USA), August 1979, pp. 709-715.
Languages: English
Summary Languages: English
Document Type: Conference; Book
ASFA Number: 110-14759
Abstract:

Ancillary information concerning salt-water rearing of pink salmon fry was obtained from a study of their juvenile ecology in Prince William Sound, Alaska. Fry were held in small net pens and allowed to feed only on zooplankton able to pass through the mesh. Resulting measures of growth were substantial in one instance when a pen was moved in an area of upwelling and strong tidal currents. Preliminary results suggest strategic placements of pens may obviate the need for artificial food when rearing pink salmon.

Identifiers: hatcheries; Salmonidae; Pisces; fish culture
Geographic Descriptors: INE, USA, Alaska
Taxonomic Descriptors: Oncorhynchus gorbuscha
Environment: Marine

164
Environment and genetics shape evolution.
Vanderhorst, A.
(Salmon Troller, Nanaimo, B.C., Canada)
Source: SALMONID REPRODUCTION: AN INTERNATIONAL SYMPOSIUM, (1983), pp. 27-28.
Salmonid Reproduction: An International Symposium. Bellevue, WA (USA), 31 October - 2 November 1983. PUBL. WASH. SEA GRANT.
Languages: English Summary only.
Document Type: Conference; Summary; Book
ASFA Number: 114-19220
Abstract:

In the Vancouver Island troll fishery, a difference in size between marked hatchery Oncorhynchus kisutch and wild coho was determined. Work noting the relative size of all tagged fish caught and finding their origin was done. Hatchery fish from more recently constructed hatcheries (mainly Canadian) were larger than fish from older hatcheries (mainly American). Research and other literature were obtained to find if this had been appreciated by anyone else. Hatchery techniques of attempting to get excellent immediate returns were looked at. The creation by hatcheries of large numbers of jacks with the culling out of these jacks is suspected and questioned. Overall with the manipulation of the salmon's early life environment by hatcheries such as the use of rapid growth feeds and temperatures, the salmon are evolving into a lesser species.

Descriptors: fish culture; genetics; evolution; stock identification
Geographic Descriptors: INE, USA; INE, Canada
Taxonomic Descriptors: Oncorhynchus kisutch; Salmonidae
Environment: Marine; Brackish; Fresh

165
Homing and fisheries contribution of marked coho salmon, Oncorhynchus kisutch, released at two Columbia River locations.
Vreeland, R.R.; Wahle, R.J.
(Environ. and Tech. Serv. Div., Columbia River Fish. Dev. Prog., NMFS, NOAA, 847 N.E. 19th Ave., Suite 350, Portland, OR 97232, USA)
Source: FISH. BULL., (1983), vol. 81 (1), pp. 143-148.
Languages: English
Summary Languages: English
Document Type: Journal Article
ASFA Number: 115-03535
Abstract:

The authors conducted this study to confirm previous results on the feasibility of creating or enhancing a fishery in a specific area by releasing hatchery salmon (O. kisutch) into that area. They compared the location of return and contribution with the Pacific coast fisheries of coho salmon released at two locations on the Columbia River. Two groups each of about 100,000 1971-brood coho salmon at Willard National Fish Hatchery were fin clipped: In May 1973 one group was released at Youngs Bay near Astoria, Oregon, and the other at Willard Hatchery. Both groups were transported an equal time and distance prior to release to equalize any possible effects of transportation on survival.

Descriptors: homing behavior; anadromous migrations; hatcheries
Geographic Descriptors: INE, USA, Oregon, Columbia R.
Taxonomic Descriptors: Oncorhynchus kisutch
Environment: Marine; Brackish; Fresh

166
Comparison of seven types of oysters grown in Yaquina Bay, Oregon, from an oyster farmer's point of view.
Wachsmuth, L.J.
(Oregon Oyster Co., 208 S.W. Ankeny, Portland, OR 97204, USA)
Source: PROC. NATL. SHELLFISH ASSOC. MD.
Presented at: NSA West Coast Section Meeting Portland, OR (USA), 1978, 69, 206, (1979).
Languages: English Summary only.
Document Type: Conference; Summary; Journal Article
ASFA Number: 111-07946
Abstract:

The native Yaquina oyster (Ostrea lurida) is the worst commercial oyster for many reasons such as low survival rate, slowest growth, high production cost, and low commercial demand. The European oyster (Ostrea edulis), having the same characteristics and drawbacks (except a larger maximum growth size), is no better. The Eastern oyster (Crassostrea virginica) is basically a loser, since it has many of the same characteristics as the common Pacific oyster (Crassotrea gigas), but to a lesser degree of quality. For example, they grow longer, thinner, and with less meat. The common Pacific oyster is still the main

Abstract (cont.):

source of business since it is extremely hardy and also flexible in growout methods and marketing. The seed is comparatively easy and cheap to buy, does very well as a cocktail oyster for six to eight months of the year, is in high demand fresh in the shell, and grows fast for use as a larger oyster. The Kumamoto variety is irreplaceable and unsurpassed as a cocktail and halfshell oyster. Growing no longer than petite size, the flavor, texture and cooking characteristics make this oyster appealing even to those who dislike the Pacific oyster. Being in season all year ensures a steady business for the oyster grower. However, it is impossible to buy the seed. The Gigamoto variety, being a half-breed, seems to have equal characteristics of both. Being very easy to produce seed in the hatchery makes this oyster very promising for the future. The Sumino oyster is also very promising, except for cocktail and fresh shellstock use. The 50 percent faster growth rate than Gigas, its being in season all year, its nice flavor, and easy hatchery production makes this oyster most promising.

Geographic Descriptors: INE, USA, Oregon, Yaquina Bay
Taxonomic Descriptors: Ostreidae
Environment: Marine
Identifiers: Bivalvia; economic feasibility; aquaculture economics

167
Disaster ahead for the Yaquina Bay oyster industry?
Wachsmuth, L.
(Oregon Oyster Co., 208 SW Ankeny St., Portland, OR 97204, USA)
Source: J. SHELLFISH RES., (1983), vol. 3 (1), p. 115.
Annual Meet. National Shellfisheries Association, West Coast Section Olympia, WA (USA), 10 September 1982.
Languages: English Summary only.
Document Type: Conference; Summary; Journal Article
ASFA Number: 115-11720
Abstract:

After 115 years of fishing and farming, the future of Yaquina Bay is as uncertain and bleak as ever, with one exception. The current crisis seems to be of major proportions and threatens the future of oyster farming. Giant Pacific oysters, as of eight years ago, became stunted after the second year of growth, only putting on thick layers of blistered shells that were filled with a foul-smelling exudate. They seldom reached "medium" size even after six years. A change species of oysters to the Japanese oyster, Crassostrea ariakensis (Wakiya) (Ostrea/Crassostrea rivularis), which shows the following advantages: (1) 50 percent faster growth than C. gigas, thereby shortening the growth cycle by one year, (2) good flavor, (3) absence of the stunting and blistering problem, (4) larger maximum size than C. gigas, (5) higher spawning temperatures resulting in a firm and tasty meat during August and September, and (6) uniform shell shape and attractive interior shell surface is considered.

Descriptors: oyster culture; aquaculture development
Geographic Descriptors: INE, USA, Oregon
Taxonomic Descriptors: Crassostrea ariakensis
Environment: Marine

168

Areal distribution of marked Columbia River Basin spring chinook salmon recovered in fisheries and at parent hatcheries.

Wahle, R.J.; Chaney, E.; Pearson, R.E.
(Natl. Mar. Fish. Serv., Environ. Tech. Serv. Div., Portland, OR 97208, USA)

Source: MAR. FISH. REV., (1981), vol. 43 (12), pp. 1-9.
Languages: English
Summary Languages: English
Document Type: Journal Article
ASFA Number: 112-04387

Abstract:

In 1971-73 approximately 4.1 million juvenile anadromous spring chinook salmon, Oncorhynchus tshawytscha, of the 1970 and 1971 broods of 21 Columbia River Basin hatchery facilities were marked and released. Sampling for marked fish was conducted in 1972-77 in all majspawninge fisheries from Monterey, California, north along the Pacific coast of North America to Pelican, Alaska in main-stem Columbia River fisheries and at parent hatcheries. A total of 23,290 marked fish were recovered: 15,331 in marine fisheries, 2,400 in main-stem Columbia River fisheries, and 5,559 in parent hatcheries. In the aggregate, 93 percent of the fish recovered in marine fisheries were recovered north of the mouth of the Columbia River. However, the percentage of marked fish recovered in marine fisheries south of the Columbia River varied widely among hatchery areas: in the case of the Snake River hatchery area, for example, the proportion of marked 1970 brood fish recovered south of the Columbia River represented more than one-half of the marine recoveries.

Descriptors: tagging; anadromous migrations; geographical distribution
Geographic Descriptors: INE, Eastern Pacific
Taxonomic Descriptors: Oncorhynchus tshawytscha

169

Bioeconomic contribution of Columbia River hatchery fall chinook salmon, 1961 through 1964 broods, to the Pacific salmon fisheries.

Wahle, R.J.; Vreeland, R.R.
(U.S. National Marine Fisheries Service, Environmental and Technical Services Division, Portland, OR 97208, USA)

Source: FISH. BULL., (1978), vol. 76 (1), pp. 179-208.
Languages: English
Summary Languages: English
Document Type: Journal Article
ASFA Number: 108-12039

Abstract:

This experiment was designed to estimate the contribution to sport and commercial fisheries of the 1961 through 1964 broods of fall chinook salmon, Oncorhynchus tshawytscha, from rearing facilities on the Columbia River. These facilities reared 90 percent of the Columbia River hatchery fall chinook salmon during the four brood years. Marks common to all facilities were applied to 21.3 million of the 213 million 1961-64 brood fish released. Special marks were applied to 9.6 million fish at 11 of the study hatcheries. Sampling for the marks took place from 1963 through 1969. During the seven years of sampling, 65,620 chinook salmon with common and 22,090 fish with special marks were estimated to

Abstract (cont.):
have been caught in marine commercial and sport fisheries from Pelican, Alaska, to Avila Beach, California, and Columbia River fisheries. The potential contribution for the four broods from the 13 study facilities, after adjustment for the effects of marking, was 1,433,300 fish. The value of the contribution was estimated at $12,027,000. Costs applicable to rearing were $2,859,700, yielding an average benefit to cost ratio of 4.2 to 1. Benefit to cost ratios at the 11 special mark hatcheries ranged from 0.3 to 1 to 17.1 to 1.

Descriptors: stocking (organisms); fishery statistics
Geographic Descriptors: INE, USA, Columbia R.
Taxonomic Descriptors: Oncorhynchus tshawytscha
Environment: Marine
Identifiers: economics; fisheries; hatcheries

170
Contribution of 1960-63 brood hatchery-reared sockeye salmon, Oncorhynchus nerka, to the Columbia River commercial fishery.
Wahle, R.J.; Koski, R.O.; Smith, R.Z.
(US Natl. Mar. Fish. Serv., Environ. and Tech. Serv. Div., Portland, OR, USA)
Source: FISH. BULL., (1979), vol. 77 (1), pp. 229-242.
Languages: English
Summary Languages: English
Document Type: Journal Article
ASFA Number: 110-00696
Abstract:

A 4-year marking program was conducted at Leavenworth National Fish Hatchery, Leavenworth, Washington, to determine the contribution of hatchery sockeye Oregon salmon, to the Columbia River commercial fisheries and the economic feasibility of hatchery rearing of sockeye salmon. The study involved 1960 through 1963 brood-year fish. During the 4-year period, 1961-64, a total of 11.5 million fish were released, of which 3.4 million were marked by the removal of the adipose fin and part of one of the maxillary bones, the right maxillary for 1960 and 1962 broods and the left maxillary for 1961 and 1963 broods. Trapping at the lake outlet in the spring for the first two years indicated that two percent of the stocked fingerlings migrated. In 1964-67, recovery of marks from the commercial fishery on the Columbia below and the Indian fishery above Bonneville Dam showed that an average of 13.6 percent of the sockeye salmon catch was composed of fish raised at Leavenworth Hatchery. Adjusting for effects of marking, this represents an average fishery value per brood of $4,274.75. The average potential benefit/cost ratio for the 4-year program was 0.04 to 1. Because preliminary data indicated such a low benefit/cost ratio, sockeye salmon rearing at Leavenworth was radically decreased in 1966 and terminated in 1969.

Descriptors: stocking (organisms); economics
Geographic Descriptors: USA, Washington, Columbia R.
Taxonomic Descriptors: Oncorhynchus nerka

171
Establishment of nonindigenous runs of spring chinook salmon, Oncorhynchus tshawytscha, in the Wind River drainage of the Columbia River, 1955-63.
Wahle, R.J.; Chaney, E.
(Environ. & Technical Serv. Div., NOAA, 811 N.E. Oregon St., P.O. Box 4332, Portland, OR 97209, USA)
Source: FISH. BULL. SEATTLE., (1981), vol. 79 (3), pp. 507-516.
Languages: English
Summary Languages: English
Document Type: Journal Article
ASFA Number: 112-05348
Abstract:

In 1955, cooperating agencies of the Columbia River Fishery Development Program embarked upon a 9-year program to introduce nonindigenous spring chinook salmon, Oncorhynchus tshawytscha, into Wind River, a tributary of the Columbia River. The program consisted of: 1) construction of a fishway at an impassable falls on the lower Wind River, 2) transplantation of nonindigenous adult spring chinook salmon from the Columbia River to Carson National Fish Hatchery on the upper Wind River, and 3) rearing and release of juvenile spring chinook salmon into the Wind River. As a result of these activities, approximately 66,000 adult spring chinook salmon returned to Carson hatchery during 1959-79. Additional nonindigenous adult fish annually utilized natural spawning habitat of the Wind River drainage.

Descriptors: introduced species; programs; tributaries; fishways
Geographic Descriptors: USA, Oregon; USA, Idaho; USA, Washington
Taxonomic Descriptors: Oncorhynchus tshawytscha
Environment: Fresh

172
History of artificial propagation of coho salmon, Oncorhynchus kisutch, in the mid-Columbia River system.
Wahle, R.J.; Pearson, R.E.
(Rt. 2, P.O. Box 21, Yamhill, OR 97148, USA)
Source: MAR. FISH. REV., (1984), vol. 46 (3), pp. 34-43.
Languages: English
Summary Languages: English
Document Type: Journal Article
ASFA Number: 115-14114
Abstract:

The history of artificial propagation of coho salmon, O. kisutch in the mid-Columbia River region began in 1899 with the construction of salmon hatcheries on the Wenatchee and Methow Rivers by the Washington Department of Fish and Game. These early attempts at artificial propagation ended in 1931. In the early 1940's, the Federal Government, in a program to resume propagation activities in the region, built hatcheries on the Wenatchee, Entiat, and Methow Rivers. These hatcheries reared several species of salmon, but ceased work on coho salmon after 30-35 years and concentrated on other species. Meanwhile, in the early 1960's, the Washington Department of Fisheries began to rear coho salmon at new facilities along the mid-Columbia River. Since 1899, a total of over 65 million juvenile coho salmon have been artificially propagated in the mid-Columbia region and released into the Columbia River system.

Descriptors: fish culture; induced breeding; aquaculture techniques; hatcheries; historical account
Geographic Descriptors: USA, Washington, Columbia River
Taxonomic Descriptors: Oncorhynchus kisutch; Salmonidae
Environment: Marine; Brackish; Fresh

173
Survey of artificial production of anadromous salmonids in the Columbia River basin.
Washington, P.
(GAIA Northwest, Inc., Bothell, WA (USA))
Source: Final report, 1985, 1986, 228 pp.
Languages: English
Summary Languages: English
Document Type: Report
Report No.: DOE/BP/17100-1
NTIS Order No.: DE86008830/GAR.
ASFA Number: 117-15382
Abstract:

This report presents basic data on fish production, quality and quantity of water, cost and condition of facilities, and potential for expansion for fish propagation facilities in Oregon, Washington, and Idaho.

Descriptors: water quality; fish culture; aquaculture techniques; anadromous migrations; aquaculture economics
Geographic Descriptors: USA, Columbia R. basin
Taxonomic Descriptors: Salmonidae
Environment: Fresh

174
Nori farming and processing in Washington State.
Washington State Department of Natural Resources
Source: The Department, Olympia, WA, 1987, 87 pp.
Descriptors: algae culture

175
Rearing of chinook salmon in seawater net pens in southeastern Alaska.
Wertheimer, Alex C.; Martin, Roy M.
Source: Northwest and Alaska Fisheries Center, Auke Bay Laboratory, National Marine Fisheries Service, NOAA, P.O. Box 210155, Auke Bay, AK 99821, 1984, 7 pp.
Descriptors: fish culture

176
The utilization of Netarts Bay by juvenile chum salmon-1984.
Wilson, C.D.; Pearch, W.G.
(Oregon State Univ., Corvallis (USA). Sea Grant Coll Program)
Source: PUBL. OREG. STATE UNIV. SEA GRANT COLL. PROGRAM, 1985, 66 pp.
Languages: English

Summary Languages: English Field report.
Document Type: Report
Report No.: ORESU-T-85-002
ASFA Number: 116-04684
Abstract:

The School of Oceanography, Oregon State University, initiated a study during the spring of 1984 to investigate the utilization of Netarts Bay by juvenile chum salmon. Specific objectives the first year were to determine: the relative numbers of hatchery and wild chum salmon, the nursery areas utilized by hatchery and wild chum salmon, the residence time of chum salmon, and the size at which the fish emigrated from the bay. This report presents the methods and some preliminary results from the 1984 field season.

Descriptors: tagging; distribution records; migrations; anadramous species
Geographic Descriptors: INE, USA, Oregon, Netarts Bay
Taxonomic Descriptors: Oncorhynchus keta
Environment: Marine

177
Aggregative response of common mergansers (Mergus merganser): Predicting flock size and abundance on Vancouver Island salmon streams.
Wood, C.C.
(Dep. Fish. Oceans, Fish. Res. Branch, Pacific Biological Station, Nanaimo, B.C. V9R 5K6, Canada)
Source: CAN. J. FISH. AQUAT. SCI., (1985), vol. 42 (7), pp. 1259-1271.
Languages: English
Summary Languages: English; French
Document Type: Journal Article
ASFA Number: 115-17115
Abstract:

The abundance of common mergansers (Mergus merganser) was monitored on four salmon-producing streams on the east coast of Vancouver Island, B.C., during the spring and summer of 1980-83. Overall, merganser abundance declined steadily from March through June but increased following recruitment of juvenile birds. Mergansers congregated on streams where juvenile salmonid migrations were enhanced by hatcheries or spawning channels. Flock-size distributions predicted by an equilibrium arrival-departure model were consistent with those observed during May-mid-June, but not those during late June. The aggregation model provides a parsimonious explanation of merganser aggregation patterns during March-June and is a potentially useful tool for designing fish release schedules to minimize predation by mergansers.

Descriptors: population structure; population number; habitat selection; hatcheries; predation
Geographic Descriptors: Canada, British Columbia, Vancouver I.
Taxonomic Descriptors: Mergus merganser
Environment: Fresh
Identifiers: seasonal variations

178
Predation of juvenile Pacific salmon by the common merganser (Mergus merganser) on eastern Vancouver Island. 1: Predation during the seaward migration.
Wood, C.C.
(Dep. Fish. Oceans, Fish. Res. Branch, Pacific Biological Station, Nanaimo, B.C. V9R 5K6, Canada)
Source: CAN. J. FISH. AQUAT. SCI., (1987), vol. 44 (5), pp. 941-949.
Languages: English
Summary Languages: English; French
Document Type: Journal Article
ASFA Number: 118-03573
Abstract:

Predation of juvenile salmonids (Oncorhynchus) by the common merganser (Mergus merganser) was investigated during the period of seaward migration in two streams where fish populations are enhanced by spawning channels and hatcheries. Observation of foraging behavior and corp-gullet contents indicated that, during this period, mergansers foraging on freshwater reaches of the streams ate juvenile salmonids almost exclusively whereas those foraging on tidal waters rarely ate salmonids. Maximum rates of salmonid mortality were estimated by assessing merganser abundance and the pattern of foraging activity on fresh versus tidal waters. Bounds on maximum mortality rate by species for the entire migration period were computer under different hypotheses about the prey size-selection habits of mergansers maximum mortality rate did not exceed 10 percent for any salmonid species over the entire seaward migration.

Descriptors: predation; migrations; juveniles
Geographic Descriptors: INE, Canada, British Columbia, Vancouver I.
Taxonomic Descriptors: Mergus merganser; Oncorhynchus
Environment: Fresh

179
Concept proposal, private sturgeon propagation.
Wysong, Mark L.; Golfman, Sheila S.
Source: 1982, 46 pp.
Descriptors: fish culture

180
Importance of river migration to the development of seawater tolerance in Columbia River anadromous salmonids.
Zaugg, W.S.; Prentice, E.F.; Waknitz, F.W.
(Coast. Zone and Estuar. Stud. Div., NMFS, Northwest and Alaska Fish. Cent., 2725 Montlake Blvd. E., Seattle, WA 98112, USA)
Source: AQUACULTURE, (1985), vol. 51 (1), pp. 33-47.
Languages: English
Summary Languages: English
Document Type: Journal Article
ASFA Number: 117-01299

Abstract:

Gradually increasing levels of gill Na super(+)-K super(+) ATPase activity were observed in juvenile chinook, (Oncorhynchus tshawytscha), and coho, Oncorhynchus kisutch, salmon and steelhead trout, Salmo gairdneri, undergoing parr--smolt transformation in artificial rearing facilities on the Columbia River. Portions of the same populations released to migrate seaward, however, generally showed much greater increases in enzyme activity with time and distance from the release point. After migrating 714 km to the Columbia River estuary, spring chinook salmon had a mean gill Na super(+)-K super(+) ATPase activity 2.5 times greater than fish retained at the hatchery and 1.9 times greater than fish adapted to 28 ppt seawater for 208 days. Similar observations were made on coho salmon.

Descriptors: fish culture; catadromous migrations; enzymatic activity; salinity tolerance
Geographic Descriptors: INE, Canada, British Columbia
Taxonomic Descriptors: Salmo gairdneri; Oncorhynchus kisutch; Oncorhynchus tshawytscha
Environment: Fresh

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