

ALASKA LEGISLATURE COMMITTEE FILES 1991-1992 8672
7124 HOUSE RESOURCES

PROJECT OPERATIONAL PLAN: *title of POP, abbreviated if necessary*

State the specific objectives of this project beginning with the highest priority. This may be done by listing them numerically or in paragraph mode. In either case, use complete sentences. Avoid intangible objectives that can not be met; all objectives should be quantifiable and measurable. If sampling is involved to meet an objective, the objective statement should include infinitives such as "to estimate" or "to test." Other infinitives, such as "to assess," "to compare," "to determine," "to measure," and "to evaluate" are more ambiguous and have little statistical meaning.

For quantitative studies, objectives define estimates and tests that drive the project through determination of study design and sample sizes. The quality of the desired estimate or test may be specified through objective criteria that include precision of estimates or significance levels of hypothesis tests. For projects with quantitative objectives, project leaders should not hesitate to seek assistance from regional biometricians to help develop the objectives, criteria, study designs, and sample sizes. Two examples of quantitative objective statements with objective criteria follow.

Example 1: Parameter Estimation with Precision Requirement

The objective is to estimate the ...(statistic)... such that the estimate is within δ units (or δ percent) of the mean estimate of ...(parameter)... $(1-\alpha) \times 100$ percent of the time.

Specific example: The objective is to estimate the abundance of pre-emergent pink salmon fry such that the estimate is within 10% of the mean estimate of abundance 95% of the time.

Example 2: Hypothesis Testing

The objective is to test the hypothesis that there is no difference between ...(treatments)..., with probabilities of $\alpha = \dots$ and $\beta = \dots$ of detecting a difference of at least ...(units).

Specific example: The objective is to test the hypothesis that there are no differences between annual survival rates for tagged and untagged juvenile red king crab held in sea water tanks under identical conditions, with probabilities of $\alpha = 0.05$ and $\beta = 0.10$ of detecting a difference of at least 0.10 between survival rates.

For qualitative objectives or quantitative objectives in which the entire population is directly enumerated, objective criteria are unnecessary. Two examples of objectives without objective criteria follow.

Example 1: Entire Population Censused

Estimate total sockeye salmon escapements to Chilkoot and Chilkat Lakes from weir counts.

PROJECT OPERATIONAL PLAN: *title of POP, abbreviated if necessary*

Example 2: Qualitative Objective

Estimate the spatial distribution of vessel effort in the drift gillnet fishery in District 6 and 8 from daily aerial surveys.

METHODS

The Methods section should be written in a manner that it could be used, with minimal changes, as the Methods section in the final project report. Methods are developed to directly support Objectives. Under this section describe the study site, the sampling design, data collection procedures, parameter estimation techniques, analytical (descriptive and/or statistical) methods, and hypothesis tests. If desired, the Methods section may be divided into subheadings that represent different phases of the project, such as: study site, sampling design, and data analysis.

As a rule of thumb, the Methods should contain enough detail so that someone else could conduct the sampling program and data analysis. If the methods have been described in detail in another document, that document may be cited rather than repeating details in this POP. However, in such cases a brief overview should be given so the reader knows generally what methods are being employed. If an operational procedures manual has been prepared for field crews, this manual should be attached as an Appendix. In addition, data collection forms may be included in Appendices. If new estimation procedures have been developed, these may be presented in either the Methods section or in an Appendix depending upon the complexity of the derivation.

Careful thought should go into the study design, data collection procedures, and analytical methods. These methods should complement and support the stated objectives. While writing the POP, verify that all the data are relevant to the objectives of the study and that no essential data are omitted. It is preferable to give sample sizes based on objective criteria and a description of how they were derived. Procedures for sample size determination can be valuable to ascertain that a sufficiently large sample is collected to meet the desired precision of estimates or the desired significance levels for hypothesis testing. Sample size estimates may demonstrate that a project is under-funded to meet the stated objectives. On the other hand, these determinations may demonstrate that some parameters are over-sampled, and could reveal insight into cost- or time-savings. As with objectives, project leaders should not hesitate to seek assistance from regional biometricians to develop the Methods section of the POP.

LITERATURE CITED

Include only those references actually cited in the POP.

PROJECT OPERATIONAL PLAN: *title of POP, abbreviated if necessary*

SCHEDULES

Under this section list dates of field programs, sampling activities (if different), completion of data analysis, and presentations of findings (U.S./Canada meetings, Board of Fisheries meetings, etc.). "Personnel" refers to the individual or position responsible for that activity.

DATE(s) Personnel (optional) Activity

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REPORTS

Under this section list projected completion dates of first drafts of reports. Include both preliminary and final reports relevant to this project. List senior author first. See the report manual for a discussion of senior authorship.

DATE Author(s) Report

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·
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OTHER NECESSARY RESOURCES

This section is optional. Use it to list resources necessary to the success of the project but that are not paid for directly by the project. That is, do not include resources covered in the yellow book project pages attached as Appendix A. This could include vessel time, use of personnel not funded by the project, data collection activities by other projects, etc. Mention linkages to other POP's (titles and associated yellow book project numbers) that provide data or other support to this project.

APPENDICES

Appendix A should be the two page yellow book project description. Other appendices are optional, but, if included, shall be numbered consecutively as Appendix B, Appendix C, etc. These might include field manuals, data collection forms, derivations of estimates if not standard, and preliminary analyses not reported elsewhere, etc.

PROJECT OPERATIONAL PLAN: *title of POP, abbreviated if necessary*

Appendix A (p. 1 of 2)

YELLOWBOOK PAGE 1

04/28/1989

PROJECT TITLE: _____ PROJECT NUMBER: _____
 FISHERY UNIT: _____ REGION: _____
 COMPONENT: _____ BPS# _____ LEDGER CODE: _____
 SUBCOMPONENT: _____
 LOCATION: _____ LEGISLATIVE DIST: _____

PROGRAM ELEMENT: _____

FISHERIES AFFECTED: _____

USER GROUPS AFFECTED: _____

SPECIES AFFECTED: _____

PROJECT DESCRIPTION

[Succinctly explain why the project is needed and what it does. A brief and general statement of methods would be good, but do not expand upon statistical methods or other technical aspects of the project. This should be a description for the layman.] _____

PROJECT OBJECTIVES

[As with the project description, provide general descriptions, do not describe objectives as desired statistical results. In a general sense what do you hope to accomplish with the project?] _____

BUDGET MANAGER: _____

| BUDGET DETAIL: CODE/LINE ITEM | FY88 ALLOCATION | FY89 ALLOCATION | FY90 ALLOCATION | PAGE2 SUMMARY | |
|----------------------------------|--------------------|--------------------|--------------------|------------------|----------------|
| 100 PERSONAL SERV | _____ | _____ | _____ | computed | computed PFT |
| 200 TRAVEL | _____ | _____ | _____ | computed | computed Other |
| 300 CONTRACTUAL | _____ | _____ | _____ | computed | |
| 400 COMMODITIES | _____ | _____ | _____ | computed | |
| 500 EQUIPMENT | _____ | _____ | _____ | computed | |
| 700 GRANTS | _____ | *** | *** | computed | |
| PROJECT TOTALS: | _____ | _____ | _____ | computed | |
| FEDERAL RECEIPTS | _____ | _____ | _____ | _____ | OF TOTAL |
| GENERAL FUND | _____ | _____ | _____ | computed | |
| INTERAGENCY RECPTS | _____ | *** | *** | _____ | |
| PROGRAM RECEIPTS | _____ | _____ | _____ | _____ | |
| CIP FUNDS | _____ | *** | *** | _____ | |
| STAFF MONTHS | _____ | _____ | _____ | computed | |

REPORTING POLICIES AND PROCEDURES
FOR
THE DIVISION OF COMMERCIAL FISHERIES

SECOND EDITION

Alaska Department of Fish & Game
Division of Commercial Fisheries
Juneau, Alaska

September
- 1987 -

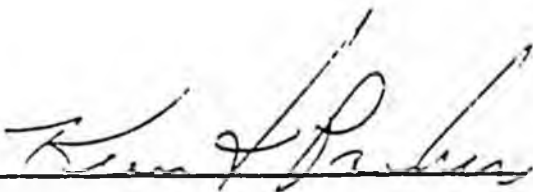
[THIS MANUAL IS
BEING REVISED, PER
DIRECTION OF THE
SDEC IN LATE 89/
EARLY 90.]

FOREWORD

Thanks to the outstanding initial manual prepared by Michele Joubert and June Grant, this manual represents our continuing efforts to upgrade the documentation of information collected and reported by the Division of Commercial Fisheries and to present that information in a manner that recognizes the conventions and protocols of our profession. To that end this manual primarily addresses the need for standards and general information which elucidate expectations of performance in reporting.

Authors are ultimately responsible for producing reports that conform to these expectations and are consistent with all sections of the manual. Those responsible for word processing and other clerical preparations, for conducting manuscript reviews, and for coordinating the reporting process primarily serve to assist the authors with specific tasks. These supportive responsibilities are therefore more limited in scope and have been explained in specific sections of the manual. The reporting policies in Section 1, the procedures throughout Part I and the reporting requirements in Parts II-IV confer job responsibilities and set reporting standards which the adoption of this manual have formalized.

The manual will be periodically updated to keep the division current with the reporting trends in the fisheries profession and with advances in publication technologies. The editorial staff will determine the substance and periodicity of these revisions.



Kenneth Parker, Director
Division of Commercial Fisheries

12/12/87

Date

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DRAFT

PART I - REPORTING POLICIES

1. MISSION STATEMENT

Scientific publications are the building blocks of science. Not only do they form the permanent scientific foundation upon which new research is constructed, but they are the tools enabling new findings to be authenticated by fellow scientists. The 1974 Federal Council of Science and Technology developed current government policy stating: "The publication of research results is an essential part of science." Without publications, research findings would not be distributed to those who need them, and authentication of results would be greatly hampered. Staff within the department and other agencies would not have the information they need to manage the resource. Regulatory boards would be unable to make informed decisions. Our ability to communicate our research for others to scrutinize and understand is a critical element in establishing our credibility and developing the support of our sister agencies. Poorly presented divisional publications would damage how we are perceived by those agencies and diminish our ability, both individually and as an agency, to influence decisions that affect the resources we manage.

Consequently, our divisional publications and reports must achieve the highest possible quality and accuracy, and our findings must be made available in a timely manner to those who need them.

2. REPORTING POLICIES

To accomplish that mission the following divisional policies are adopted:

- Policy 1. All information collected at state expense will be reported in a coherent manner within a reasonable period following its collection, and all reports prepared by division staff shall be submitted as a contribution to one of the division's report series (see Section 3.1 and *.*).
- Policy 2. All manuscripts entering one of the division's statewide publication series will undergo formal scientific review to enhance accuracy, lucidness, and complete-

ness; all unpublished reports will be included in a regional series and subjected to regional review (see Section 3.2).

Policy 3. All manuscripts prepared using state resources must be approved by the director, or his designee, prior to general distribution or submittal to an external publishing source (see Section 3.2).

✓ Policy 4. To protect the integrity of the scientific review process, all manuscripts in draft status (defined in Section 3.3) will be confidential unless otherwise allowed by the Director as specified in Section 3.3.

Policy 5. Manuscripts submitted for formal divisional review that are suitable for external rather than internal publication will be recommended for publication in journals or other appropriate sources, and the author will be given divisional support.

Policy 6. The Regional Research Supervisors and the Scientific Program Manager will serve as Associate Editors to assist the Editor resolve problems, develop needed policy, and maintain high standards for the division's reports and publications (see Section 3.4).

Policy 7. Manuscripts will be published in only one series (see Section 3.5; the Editor will determine the appropriate series for a manuscript based on its compatibility with the series definitions and criteria established in Sections 3.1 and *.*).

Policy 8. To promote professionalism and ensure proper credit for project work performed, guidelines in this manual for authorship and acknowledgments should be closely followed (see Section 3.6).

Policy 9. Electronic catalogs will be maintained for each report series to facilitate timely and thorough information retrieval (see Section 3.7).

Policy 10. Authors will be responsible for original through final manuscript preparations according to guidelines established in this manual.

Policy 11. All manuscripts must be submitted in *WordPerfect*. All reports or publications subjected to desktop publishing will be prepared using *Ventura*.

Policy 12. To achieve consistency with the Mission (Section 1.1), the Editor will strive to follow contemporary fishery reporting and publication trends.

3. POLICY EXPLANATIONS

3.1 PUBLICATION SERIES

All reports prepared by division staff shall be submitted as a contribution to one of five series: (1) Regional Information Reports, (2) Technical Fishery Reports, (3) Fishery Research Bulletins, (4) Special Publications, and (5) Professional Papers. The identifying characteristics and manu-

script preparation guidelines for each report series are described in **. A few publications (e.g., regulation books, special reprints of theses/dissertations, etc.) as well as general correspondence, meeting minutes, trip reports and other written materials identified by the Director will not be included in the above series.

3.2 REVIEW PROCESS

Regional Information Reports: Regional Information Reports will undergo regional reviews coordinated by the Regional Research Supervisor. In cases where timelines are limited, only cursory review may be possible.

Statewide Publication Series: The statewide publications (series other than Regional Information Reports) will undergo formal scientific review by peers and the division's Editor. The purpose of peer reviews is to assist the author in preparing publications and to enhance the overall quality of divisional publications.

The Editor is responsible for the form of all divisional publications as prescribed in this manual as well as selecting for publication only those manuscripts that achieve high scientific standards. Peer reviews for all manuscripts entering the statewide publication series will be coordinated, refereed, and, if necessary, streamlined on a case-by-case basis by the Editor. Those questions of style and usage in a gray area where several or more options exist, or otherwise unresolved by this manual, will be decided by the Editor. The Editor will also determine when a manuscript is ready for peer review; if it is not, he will return it to the author(s) and note the problems to be corrected.

At the Editor's discretion some reports, especially annual iterations of the same report, may be exempted from peer review and undergo editorial review only; otherwise all statewide publications will undergo formal scientific review, a process that includes the following chronology.

- (1) A review will be assigned to a given region or to headquarters based on the need to balance the review burden between regions according to the relative numbers of staff available. Most manuscripts will be assigned one reviewer, except that Fishery Research Bulletins will usually be assigned two reviewers. At the Editor's discretion reviews outside the division or the department may be solicited, especially for highly technical or specialized manuscripts.
- (2) The Regional Research Supervisor will be asked by the Editor to select a reviewer from suitable candidates within the region, taking into account the candidates' past review assignments, relative qualifications, and current work load, and the need to balance assignments as equitably as possible between the staff.
- (3) The selected reviewer will receive written notice of his assignment and will be allowed a reasonable period to complete the review. If the assignment or deadline create significant problems, the reviewer should immediately discuss the situation with the Regional Research Supervisor who will inform the Editor of any resulting changes or adjustments. Reviewer identity will not be revealed to the author(s) unless otherwise requested by the reviewer. However, anonymity cannot be completely

guaranteed because handwritten comments, word usage, and the reviewer's knowledge as expressed by his comments may sometimes reveal a reviewer's identity.

Each reviewer shall follow the review guidelines explained on the back side of the review request form and meet the review deadline stated in the cover memo. In addition, reviewers are expected to be thorough, constructive, and fair in their comments and avoid derogatory criticism.

- (4) Generally an author(s) should allow 2-3 months between manuscript submission to headquarters and the receipt of the peer/editorial comments. The Editor will, before returning the comments to the author, review the manuscript, screen the comments for potential conflicts or misdirection, and note any necessary corrections or explanations to the reviewer's comments.
- (5) Authors receiving review comments often give themselves a day or two between reviewing the comments and reworking the manuscript because initial reactions to comments may be more subjective than objective. Although a reviewer's comments may sometimes be technically inappropriate or incorrect, this may indicate reader confusion requiring increased clarity or explanation.
- (6) Authors having significant problems with reviewer comments, should discuss them with the Editor. Authors should submit, to the Editor, written rebuttals to significant or substantive comments not incorporated into their revisions. (This is consistent with the CBE Style Manual.)
- (8) If a recommendation not to publish a report is made, the Editor may solicit the opinion of the Associate Editors or other staff before acting on the recommendation.

Any professional associates within or outside the department whom the author wishes to have review his manuscript should be requested directly by the author. Resulting changes, along with any resulting from the regional review, must be completed before the manuscript is submitted to the Editor for formal review.

The only significant changes made in a manuscript after it has entered the formal review process should be those resulting from this process. If other significant changes are to be made outside formal peer review, the Editor should be informed of the changes made so that he can determine if additional review is required.

3.3 DISTRIBUTING DRAFT MANUSCRIPTS

Any pre-published manuscript is considered to be in draft status. In addition, any written internal (in-house) peer review that raises substantive concerns about a final, distributed divisional publication will place that manuscript in draft status until the author has completed any necessary changes or corrections.

The department and the author must have the right to thoroughly air and fully resolve differences of opinion on draft-status manuscripts. To make such information available to the public or other resource agencies before the scientific review process is complete, could compro-

mise the integrity of the scientific review process or needlessly make the department appear discordant. Therefore, all manuscripts in draft status will be treated as follows:

- (1) Both the review and the draft manuscript will not be released to the public without the Director's approval.
- (2) Reviews should be sent only to the Editor who will referee final resolution of the review with the author.
- (3) Any public requests for reviews or draft-status manuscripts shall be referred to the Editor who will inform the author and Director.
- (4) A review that is released to the public will be anonymous unless the individual preparing that review approves the release of his/her name.

If time constraints are a problem for a draft-status manuscript, the manuscript will be put on a fast-track review that will be completed in time to enable its target-date distribution in final form. If this is infeasible, the Director may allow distribution of a draft under one of two alternatives:

Option 1: The manuscript could be distributed as a draft with the cover source being identified as: "Fishery Research Bulletin Draft¹ No. ____" (note: modify accordingly for other series). The footnote should indicate that the report should not be cited until it is available in final form. The Editor will assign the draft number. The draft number and footnote must appear on all distributed copies. This will satisfy information distribution for ad hoc groups that need it, but it will flag the fact that the reporting requirement has not yet been satisfied. Concurrently, it will thwart inappropriate citation of the report. This is the preferred option.

Option 2: Federal aid reports have tight production deadlines, as well as constraints against submitting "drafts" in satisfaction of contract requirements. Draft reports may be submitted to the federal aid contractor with a special cover page that appropriately indicates that the report is the final report for the contract. The report should not be distributed elsewhere. The draft will subsequently undergo the formal review process and be published in one of the division's series.

3.4 REGIONAL RESEARCH SUPERVISOR RESPONSIBILITIES

The Regional Research Supervisors and the Scientific Program Manager will serve as Associate Editors; they will work with the Editor to (1) coordinate the peer review process in their region, and (2) develop publication policies for implementation by the Director and to identify and resolve reporting problems and procedures.

In addition, the Regional Research Supervisors are assigned the authority to (1) assign management or research staff within their region to conduct peer reviews, (2) instigate regional reviews deemed necessary before a manuscript is submitted to the Editor for processing, (3) manage the regional report series under the general direction of the Editor, and (4) assist authors with reporting.

Comprehensive Publications Policy for AFS

Clyde W. Voigtlander

During the tenure of Presidents Reinhart and Gerking, it became apparent that no comprehensive policy governing the production and quality of scientific publications existed within AFS. Moreover, it was perceived that piecemeal, specific-issue policy actions were not coping with the rapid increase in the number and variety of scientific publications and, in fact, might be contributing to the confusion. The charge to the Publications Overview Committee (POC) for the 1986-87 term was to develop a comprehensive policy. The following policy was approved by the Executive Committee (EXCOM) at the Society's annual meeting in Winston-Salem, North Carolina. Implementation of the policy will require membership approval of amendments to two sections of the AFS Bylaws at the annual meeting in Toronto.

Background

The number and variety of AFS scientific publications have increased substantially in the past 12 years. During that time, AFS has established the *North American Journal of Fisheries Management*, contracted to produce *The Progressive Fish-Culturist*, established *Fisheries*, and developed symposia proceedings, monographs, and special publications. While this development was occurring at the Society level, more and more subunits of the Society developed scientific publications; indications are that this trend is not waning.

During the development of this policy, POC consisted of Ira Adelman, Bruce Collette, Eugene Fritz, Gareth Goodchild, Gary Hergenrader, John Nickum, Charles Scalet, Judith Weis, and myself as Chair. POC examined existing policies and practices; we were aided, through material provided and comments on draft material, by Johanna Reinhart, Shelby Gerking, Managing Editor Robert Kendall, and AFS Constitutional Consultants Rich Gregory and Tom Powell. Elements of the proposed policy were reviewed and discussed by EXCOM at the mid-year meeting; all of the above-named individuals reviewed the final draft prior to its submittal to EXCOM.

What the Policy Does and What It Doesn't Do

In the most general terms, the policy establishes the responsibility and authority for quality control of AFS scientific and technical publications; specifically, this responsibility and authority rests with the managing editor. The policy applies to all scientific publications issued by, or on behalf of, AFS or its subunits; this means that it applies

to any scientific or technical publication bearing the Society's name or logo. The policy also reaffirms, in a formal manner, certain practices or traditions, e.g., publication ethics and peer review, that the Society and its subunits have long held.

The policy *does not* apply to routine communications, newsletters, directories, bibliographies, or reports by subunits or committees. The policy *does not* allow the managing editor to unilaterally determine what, in terms of new publications, will be printed, or what the financial arrangements of any such publication will be—these continue to be matters of negotiation, with final approval power vested in EXCOM.

Policy

Scientific and Technical Publications

- 1.0 The American Fisheries Society (AFS) believes that the effective communication of ideas and scientific findings is critical to the continued growth and development of the profession and its individual members and is therefore a fundamental characteristic of any professional scientific society. AFS seeks to publish relevant works in fisheries science, fisheries management, and related fields, to distribute these publications to the broadest possible audience, and to accomplish these ends in a cost-effective and self-supporting manner.
- 2.0 Description of AFS Publications
In fulfilling the above objectives, AFS publishes a bulletin, serial journals, symposia proceedings, monographs, special publications, and miscellaneous or *ad hoc* books; subunits of AFS also issue publications falling within these categories.
- 2.1 The Bulletin and Serial Journals.
 - 2.1.1 *Fisheries*
Frequency: Bimonthly
Distribution: All AFS members
Content and Scope:
 - (1) AFS news, editorials, presidential communications, announcements, committee reports, minutes of meetings.
 - (2) General interest and state-of-the-art articles on fisheries management, aquatic resources, professional responsibility, fisheries policies, education, administration, economics, and fisheries or aquatic resources-related philosophy. Articles in *Fisheries* are intended to be of broad, current interest, to provoke thought and debate on current resource issues, and to foster the continued education of fisheries professionals.

Clyde W. Voigtlander is an environmental scientist for the Environmental Quality Staff, Tennessee Valley Authority, Knoxville, TN 37902. He is completing his third year as chairman of the AFS Publications Overview Committee.

Editorial Policy and Standards:

Published annually as "Guide for Contributors" in Number 1.

2.1.2 *Transactions of the American Fisheries Society*

Frequency: Bimonthly

Distribution: By subscription

Content and Scope:

Original research, either basic or applied, in biology, genetics, physiology, ecology, population dynamics, economics, health, culture, and other topics germane to marine and freshwater finfish, shellfish, and their respective fisheries. Book reviews relevant to the above subject matter. Short special sections of related papers published occasionally.

Editorial Policy and Standards:

Published annually as "Guide for Authors" in Number 1.

2.1.3 *North American Journal of Fisheries Management*

Frequency: Quarterly

Distribution: By subscription

Content and Scope:

Original papers emphasizing the management of finfish and exploitable shellfish, including protection and enhancement of habitats, harvest allocation, economics of exploitation, sociology of resource users, and management-related research, law, policy or philosophy.

Editorial Policy and Standards:

Published annually as "Guide for Authors" in Number 1.

2.1.4 *The Progressive Fish-Culturist*

Frequency: Quarterly

Distribution: By subscription

Content and Scope:

Original papers in the broad area of applied aquaculture, including broodstock selection and spawning, genetics, nutrition and feeding, health, water quality, production technology, and management of culture facilities. Emphasis is on marine and freshwater species of current or potential importance to commercial production or aquatic resource management.

Editorial Policy and Standards:

Published annually as "Guide for Authors" in Number 1.

2.2 Symposium Proceedings

Frequency: Irregular, but have serial status

Distribution: Individual purchase; library subscribers receive one copy

Content and Scope:

Previously unpublished, thematically related contributions resulting from a symposium, workshop, or conference in a subject area defined in any of the serial journals (Section 2.1, above)

Editorial Policy and Standards:

Except in unusual circumstances, policies and standards of the appropriate journal apply. Full details appear in the specific Symposium Proceedings Pol-



THE STANDARD BY WHICH OTHERS ARE JUDGED

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icy, available from the managing editor or central office.

2.3 Monographs

Frequency: Irregular, but have serial status

Distribution: Individual purchase; library subscribers receive one copy.

Content and Scope:

Tightly focused, perceptive studies in subject areas as defined in Section 2.1, based on original research data. Secondary analyses or models based on existing literature that lead to new insights are acceptable.

Editorial Policy and Standards:

Journal standards apply; diverse authorships of individual chapters are permitted, subject to constraints defined in Content and Scope, above. Other details available from the managing editor.

2.4 Special Publications

Frequency: Irregular, but with serial status

Distribution: Individual purchase; library subscribers receive one copy.

Content and Scope:

General interest scientific and reference volumes in fisheries and aquatic resources which do not meet the content and scope requirements of Symposium Proceedings or Monographs, as defined above.

Editorial Policy and Standards:

Journal standards apply where appropriate; managing editor establishes specific standards where necessary.

2.5 Miscellaneous or *Ad Hoc* Publications

Frequency: Irregular

Distribution: Individual purchase

Content and Scope:

Products of policy or opportunity which do not qualify under 2.2, 2.3, or 2.4, above.

Editorial Policy and Standards: Not defined.

2.6 Subunit Publications

Divisions, Chapters, and Sections produce publications with serial or irregular frequency, ranging from proceedings of annual meetings to symposia, workshops, and techniques manuals. Distribution is variable, depending on the nature of the subunit issuing the publication. Content and scope likewise vary, but generally fall within the definitions of 2.1 through 2.4, above. Editorial policy and standards are established by the sponsoring subunit, subject to review and approval by the managing editor.

3.0 Scope and Application of the Policy

3.1 The following policy applies to all scientific publications issued by or on behalf of the American Fisheries Society (AFS) or its subunits, i.e., those scientific and technical publications bearing the AFS logo or which otherwise can be identified as being sponsored by AFS or any of its subunits.

3.2 Exceptions: The following policy does not apply to directories, bibliographies and other information or library aids, to routine membership communications (e.g., newsletters) of the Parent Society or any subunit, or to such periodic reports by subunits or by standing

or special committees as may be required by the Executive Committee of AFS or by the Executive Committee of any Division.

4.0 Editorial Control and Authority

4.1 Under Section 2 (a) (4) of the Bylaws of the American Fisheries Society, the executive director is responsible for *Fisheries* with respect to the appointment of editors, editorial policy, and content.

4.2 Under Section 3 (a) (1) and subsequent subsections of the same Bylaws, the managing editor is responsible for all other publications of the Society, as defined above in Section 3.0, to the extent defined in the following sections of this policy.

4.2.1 For publications by the Parent Society, the managing editor appoints editors for specific publications and oversees and approves the development and implementation of editorial policy and quality control.

4.2.2 For subunit publications, the managing editor reviews and approves the publication proposal with regard to editorial policy and standards and quality control. The managing editor, at the request of the sponsoring subunit, may also provide the necessary advice and assistance regarding scheduling, format, and printing.

4.2.3 In arriving at a decision to approve, the managing editor may consult with the Publications Overview Committee (POC).

4.2.4 In disapproving a publication proposal, the managing editor will present the reasons for such action, and will provide, if appropriate, advice on the procedures or actions necessary to merit approval.

4.2.5 Appeal of an adverse decision may be made to the Executive Committee of AFS, who may seek additional review and recommendations from POC.

4.2.6 For all such publications, one copy of the final product must be provided to the AFS central office and to the managing editor.

5.0 Control and Review of Quality and Standards

5.1 The managing editor, editors, and associate editors are responsible for establishing and maintaining high levels of quality with respect to scientific content and effective communication in the publication or publications under their control.

5.2 All prospective technical contributions to journals or to other volumes will be peer-reviewed, unless a specific waiver is granted by the managing editor.

5.2.1 Peer review usually will be conducted by two or more reviewers, acting independently.

5.2.2 For *Fisheries*, the same policy applies to contributed articles; the editor or executive director may waive the peer-review requirement for invited papers.

5.3 Peer-reviewers will have their anonymity protected, unless they specifically indicate otherwise.

5.4 Peer-reviewers shall not communicate with the authors of manuscripts under their review except

through, or with the permission of, the editor, until the manuscript has been accepted for publication.

- 5.5 Peer-reviewers shall not keep, copy, or distribute manuscripts sent to them for evaluation.
- 5.6 The Publications Overview Committee (POC) will perform periodic reviews of the content, quality, and editorial standards of AFS publications, and will report its findings and recommendations to the managing editor or executive director, as appropriate to their publications responsibilities.
 - 5.6.1 The managing editor or the executive director may request review by POC of specific publications within their purview.

6.0 Publication Ethics

- 6.1 Authors are expected to maintain high ethical standards with respect to extending appropriate credit and recognition to their colleagues and fellow contributors.
- 6.2 Dual publication, i.e., the replicate publication of the same data or information, is not allowed. A full discussion of this issue is found in *Transactions of the American Fisheries Society* 110:573-574, 1981; the policy enunciated in the referenced editorial is hereby extended to all AFS publications.
 - 6.2.1 Authors of manuscripts must state that ideas, data, and conclusions purported therein to be original are neither under simultaneous consideration by another publisher or for another AFS publication, nor previously published.
 - 6.2.2 All papers—whether published, in press, or under editorial review—that are closely related to the manuscript being submitted, must be documented in the manuscript or in correspondence to the editor. Reprints or preprints must be made available on request of the editor.
 - 6.2.3 Qualifications and exceptions to this policy are given in TAFS 110: 573-574, 1981.

7.0 New Publications and Publication Services

- 7.1 The American Fisheries Society will develop new publications as needs and opportunities occur. Expansion of the existing list of publications (Section 2) may occur as the result of development of a new publication series, assuming control of existing publications through contractual or other agreements, or by providing other information-transfer or information-retrieval services.
- 7.2 All proposals for new publications, either within or outside the scope defined in Section 2, must be approved by the Executive Committee, following recommendation by the executive director or managing editor and consultation with POC.
 - 7.2.1 In specific instances, or for specific types of publications, EXCOM may delegate this authority to the executive director or managing editor.
- 7.3 For all such publications the policies stated herein will apply.
- 7.4 The executive director is authorized to act for EXCOM in matters pertaining to translations of AFS publications to other languages, and obtaining translations

Bylaw Amendments

The process of bringing all Society scientific publications under one umbrella, and making the managing editor keeper of that umbrella, requires two changes in AFS Bylaws. After excruciatingly detailed review, our constitutional consultants recommend that the Bylaws be amended as outlined below. AFS members will be asked to approve these changes at the annual business meeting in Toronto.

1. Under Section 3. Duties of the Managing Editor and Editors.

OLD: a) advise and assist subunits in the publication programs, if requested.

NEW: (a) advise and assist subunits in producing their scientific and technical publications.

2. Under Section 5. Publications.

OLD: (d) Society subunits, separately or in combination, may produce, distribute, and charge for publications of their own. Each such publication is to be uniquely identified with the sponsoring subunit(s) unless the Executive Committee specifically approves it as a Society publication.

NEW: (d) Editorial standards and quality control procedures for each scientific and technical publication proposed by a subunit shall be reviewed and approved by the Managing Editor. The Managing Editor shall determine whether or not the publications submitted require such review and approval. Following such action, subunits may produce, distribute, and charge for their publications.

into English of appropriate writings in other languages.

8.0 Policy Review and Revision

- 8.1 The Publications Overview Committee, in conjunction with the managing editor, will conduct periodic reviews of this policy on its own initiative or at the direction of the president or EXCOM, and will report its findings and recommendations to EXCOM

9.0 Effective Date

- 9.1 Following approval by EXCOM, and passage of the amendments to the Bylaws, this policy shall become effective on October 1, 1988, or on the date of printing of the first issue of *Fisheries* or the AFS Diary thereafter in which the decision can expeditiously be printed
- 9.2 Revisions or amendments of this policy, following approval by EXCOM, will become effective on the date of printing in the next possible issue of *Fisheries* or other appropriate form of membership communication.

STATE OF ALASKA

DEPARTMENT OF FISH AND GAME

OFFICE OF THE COMMISSIONER

WALTER J. HICKEL, GOVERNOR

P.O. BOX 3-2000
JUNEAU, ALASKA 99802-2000
PHONE: (907) 465-4100

February 14, 1992

The Honorable Ivan M. Ivan
Alaska State Legislature
P.O. Box V
Juneau, AK 99811

Dear Representative Ivan:

Thank you for your request for information relating to a stock identification program for chum salmon catches in the South Peninsula June fishery (i.e., False Pass). I apologize for the delay in responding to your request; however, staff have needed some time to develop the feasibility and budget for the proposed study. The questions raised in your letter are answered in order.

Question 1. What is the Appropriate Stock Identification Method?
There are two alternative feasible methods for chum salmon stock identification in the False Pass fishery, tagging and genetic stock identification (GSI). These methods are comparable in costs; however, the GSI method is preferred.

The tagging method has several problems, which include:

1/ Stock composition estimates are sensitive to expansion factors (i.e., reported fraction, exploitation rate) that cannot be estimated for certain stocks (e.g., Russian stocks).

2/ Because the tagging method relies on fishermen to return recovered tags and associated information on time and location of recovery, stock composition estimates are sensitive to misreporting and underreporting of tags. Although independent fishery sampling programs can provide information that enables one to correct for these biases, it is impossible (within realistic budget constraints) to conduct independent sampling programs at sufficient levels of precision for all stocks that are known to occur in the False Pass chum catches.

3/ Tagging operations rely on chartering vessels participating in the fishery which are unavailable during fishery openings; also tagging cannot be conducted in adverse weather conditions. Because fishery openings and weather conditions cannot be predicted, it is difficult to control the number and timing of releases in order to meet the stringent sampling objectives necessary to ensure that estimates are representative of the actual fishery catches.

4/ Because of the difficulties in controlling the tagging operations, it is impossible to address fine detail (i.e., by time period, by gear type, by subareas, etc.) in the estimates of stock composition of fishery catches.

5/ Because catches in terminal areas are on mixtures of stocks from individual river systems within the drainage, the tagging method cannot provide estimates for individual river systems.

The above problems identified for the tagging method are not an issue with the GSI method. The genetic stock separation method is analogous to blood typing in humans, and can ascertain the origin of the fish by an array of genetic markers that are measured from tissues collected directly from the commercial catch. In addition to samples from the catch (i.e., mixture samples), the method requires baseline samples from spawning fish (so that we know the origin of these fish). Baseline samples would need to be collected for all stocks that are known to occur in the False Pass catches. Although the existing baseline of standard samples is extensive for chum salmon in the North Pacific Region, it is at the present time incomplete. Preliminary analysis of the incomplete baseline shows that we can identify certain aggregates of stocks (e.g., Yukon fall chums, Japanese hatchery chums, North Peninsula chums) based on their genetic characters. Because of this, we feel the GSI method offers great promise in identifying origins of catches in the False Pass fishery at a level of resolution that will help resolve conservation concerns and assist the Board of Fisheries in resolving allocation issues associated with this fishery.

Question 2. How Long Should a Stock ID Program be Carried Out?

Three years of information is necessary to evaluate the extent of the inter-annual variability in the stock specific vulnerability to the False Pass fishery.

Question 3. Should the Department be Charged with Undertaking Such a Study and What are the Estimated Costs.

If new funds were available, the department would undertake a genetic stock separation study for chum salmon taken in the False Pass fishery. We would propose to conduct a three-year GSI stock ID study for the False Pass fishery catches. The cost of the study is for Year 0 - \$48.1K, for Year 1 - \$674.1K, for Year 2 - \$520.4K, for Year 3 - \$560.0K, with a total cost of \$1,802.6K. Please note that our ability to conduct such a study also requires funding of a \$1.2 million CIP request to develop the Anchorage genetics laboratory. The laboratory presently is not large enough to handle the increased sample processing load necessary to conduct the False Pass stock ID project. We have put together a detailed proposal

and can make that available if necessary. Please note the proposed expenditures for years 2 and 3 reflect very liberal sample sizes for the False Pass fishery catches. It may be possible to reduce the sampling requirements as we develop the chum salmon baseline. The sample size required for resolution of stocks depends on how different the genetic characters are among stocks. These cannot be evaluated until the baseline of data is collected, processed, and analyzed.

There is a large amount of sampling required to conduct this project. The ability to conduct this sampling depends on the department's infrastructure of facilities and personnel. It would be very inefficient and expensive for a second party contractor to conduct such a study.

Question 4. Would the Department be receptive and supportive if a project is included in the operating or capital budget?

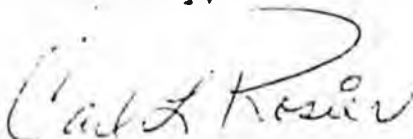
The project has a limited life span of three years and, as such, could be funded through either the operating or CIP budget. It is anticipated that analyses after the year 3 could be handled by positions that are currently in the base budget.

Question 5. Is there other information that has not been included in above answers?

At this time we have incomplete information to evaluate the stock resolution power of the GSI method for chum salmon. It is unknown as to whether the method will be able to address the entire suite of questions that have arisen in the Board of Fisheries deliberations. The resolution power of the method cannot be evaluated until the baseline of samples is complete and analyzed. Most of the proposed year 1 budget would be for collection, processing and analysis of the baseline. It might be appropriate to fund the project with the stipulation that the decision to continue funding would depend on the efficacy of the method as determined by analysis of the emerging baseline of standard samples.

Thank you for the opportunity to address this issue. If I can be of further assistance, please contact me.

Sincerely,



Carl L. Rosier
Commissioner

cc: Denby Lloyd
Doug Eggers

NEWS RELEASE

STATE OF ALASKA

OFFICE OF THE GOVERNOR
P.O. BOX A
JUNEAU, ALASKA 99811WALTER J. HICKEL
GOVERNOR

FOR INFORMATION CONTACT

JOHN MANLY
PRESS SECRETARY(907) 485-3500
FAX (907) 485-8300FOR RELEASE: February 12, 1992
No. 91-026

GOVERNOR APPLAUDS BOARD'S FALSE PASS DECISION; PROPOSES FUNDING FOR FISH MANAGEMENT

JUNEAU--Governor Walter J. Hickel today commended the Board of Fisheries on its unanimous decision to schedule a new hearing on the False Pass chum cap controversy. The board made the decision, at its regularly-scheduled meeting Sunday in Bethel, to hear the issue at its next meeting in March in Juneau.

"While I have been careful not to interfere in the allocation process of the board, the chum cap decision is too important not to fully consider all available information," Hickel said. "The board's decision will help maintain the public's confidence in the integrity of the board process."

The board will reconsider the issue based on scientific evidence affecting the interception of chum salmon destined for Norton Sound and the Yukon and Kuskokwim rivers.

Last November the board decided, in a controversial 4 to 3 vote, to raise the number of chum allowed to be taken in the June False Pass or Area M fishery, which actually targets sockeye salmon. The cap would be raised from 600,000 chum to as much as 900,000 for each of the next several years.

While considering decisions affecting fisheries throughout western and northwestern Alaska, the board on Sunday decided to review in detail recent information regarding a 1987 tagging study conducted by the Department of Fish and Game (ADF&G).

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Feb. 12, 1992

Hickel also announced that he will ask the legislature to fund a \$1.2 million capital project to set the stage for future identification of the source of fish in the False Pass area. The project would establish a genetic stock identification laboratory, the basic infrastructure needed to perform detailed identification of salmon taken in mixed stock fisheries. With added funding over the next three years, ADF&G would attempt to apportion the False Pass chum catch to rivers of origin in order to evaluate the impacts of the interception on those streams where the fish spawn.

The Governor is also considering adding money to ADF&G's operating budget to better assess run strength and escapement needs in Norton Sound and the Yukon River. A project is also being considered to reestablish a test fishery in the mouth of the Kuskokwim River that is used to gauge in-season salmon returns.

####

FY 93 CIP FISHERIES GENETICS LABORATORY - CF, FRED

This request expands the existing Anchorage genetics laboratory into a Fisheries Genetics Laboratory having the capability to produce genetic stock identification (GSI) data - data that describe the genetic identity of individual stocks of finfish and shellfish and permit identification of those stocks when they occur in complex mixtures. GSI data can improve fisheries management by providing in-season estimates of individual stocks, say salmon, harvested in mixed-stock areas and intercept fisheries such as Cook Inlet, Yukon River, and False Pass. Application of the GSI technique can also greatly assist the protection of wild stocks in the face of proposed increased hatchery production and harvest in southeast Alaska, Prince William Sound, and Kotzebue Sound, for example. Further, the GSI technique can identify stocks intercepted in high seas and other bycatch fisheries. And, it has proven very valuable for deterring illegal fishing by providing the capability to identify the origin of marine fish and shellfish suspected of being harvested from closed areas.

In brief, GSI is a new and highly effective tool that can be used for harvest management and stock protection, and the department desires to add this capability to its roster. We want to build a Fisheries Genetics Laboratory that can assist resolution of a variety of harvest management problems.

We are requesting 1,200.0 dollars. These monies will put in place the platform from which the GSI technique can be extended, with additional project dollars, to the harvest management problems at hand. These dollars put the capability in hand. Other dollars will be needed to extend or apply the capability to specific problems.

In order to establish the GSI laboratory capability, we need space, equipment, and personnel. Of the \$1,200.0, we would allocate 600.0 for space, 200.0 for equipment, and 400.0 to fund two new positions over a 3-yr period (afterwhich placed into the operational budgets of Commercial Fisheries and FRED Divisions). The laboratory would be located in Anchorage at our regional headquarters. In the building that houses our regional personnel, space is at a premium and no laboratory space is available to meet our needs. Our proposal is to remodel an existing shop and any other space that might become available in this building to laboratory space. We have a lot of equipment on hand already, but we do not have the devices required to analyze the tissue samples from which the genetic data are derived. This laboratory will generate a huge amount of data. We will hire a biometrician immediately so that the data storage, processing and analyses systems can grow from the ground-up right along with the physical platform. We will also hire a laboratory manager so that the system for handling thousands of samples interfaces right from the start with the data handling.

Arco

Briefing

CORPORATE FOCUS

Arco Proceeds With Ambitious Exploration Program

Despite Lower Earnings, Company Keeps a Long-Term Perspective

By FREDERICK ROSE

Staff Reporter of THE WALL STREET JOURNAL

LOS ANGELES—On a clear winter's day, Atlantic Richfield Co.'s chairman and chief executive officer, Lodwrick Cook, can see miles from his 51st floor office, to the mountains that rise east of Los Angeles.

A more important long-range view is far cloudier, this one economic. Yet major oil companies must plan far ahead on expenditures of billions of dollars for petroleum exploration and refinery modernization, commitments stretching well beyond the current economic horizon.

So even as earnings decline, Arco has embarked on an ambitious overseas oil exploration campaign and plans major refinery changes.

"We're trying not to yo-yo the company just because we're in a downturn," Mr. Cook tells a visitor after an early-morning exercise session. "We don't want to cut just to make the next few months look better."

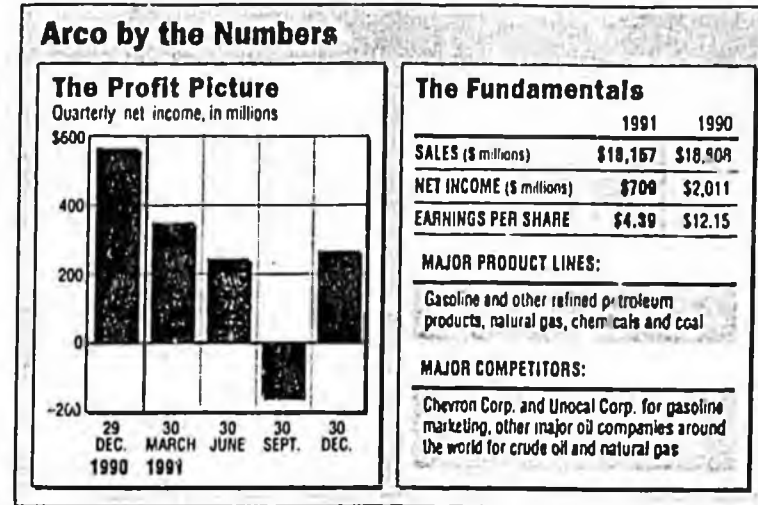
Though it has reduced its overall U.S. work force by about 7.5% because of problems in domestic natural gas markets, Arco has maintained its oil exploration and development budget this year at about \$1.32 billion. Moreover, it plans ambitious changes to its refineries to meet newly mandated standards for clean gasoline.

With earnings and cash flow off of late, the company has less financial maneuvering room than in past years, Mr. Cook concedes. "We have to manage ourselves through this recession, avoiding ways that damage the future," he adds.

The profit squeeze on oil companies has become even more apparent in recent days. On Monday, Arco reported a 53% plunge in fourth-quarter profit, to \$265 million, or \$1.67 a share. Revenue for the latest quarter fell 16% to \$4.83 billion. Other West Coast rivals were even more pressured. Chevron Corp.'s profit tumbled 94% from a year earlier. And Unocal Corp. had a \$16 million loss. Elsewhere, Exxon Corp. and Mobil Corp. recorded lower profit.

There has been "a dramatic change in the operating environment," Mr. Cook noted in reporting lower profit. Oil prices and particularly natural gas prices remain at low levels. Refining and marketing profits have narrowed substantially. And, though directors boosted Arco's dividend by 10% a year ago, they passed up the chance to do so again recently.

Now, Mr. Cook, who is 63 years old,



says he will stay two years past the company's mandatory retirement age of 65, holding the office through June 1995. "There are a lot of good challenges out there that need continuity," he says, "I think the board took that into account when deciding on this plan." Not incidentally, Mr. Cook hopes to be around for better times. "It gives us more time to get back on that northeast curve, which we like," he adds.

All of this is a sharp change from the recent past, when Arco posted record profit and its stock soared above competing oil companies. Through the 1980s, the company grabbed big chunks of the West's high-profit gasoline markets and became the region's largest vendor. Its marketing strength was balanced by the company's already formidable crude oil advantage from its stake in the giant oil field at Prudhoe Bay in Alaska.

Long-term questions lingered about Arco's Western focus and its reliance on Alaska's now-mature oil fields. But it was the recession and the company's lower profits that focused critics' attention on the company's long-term problems.

Even in tough economic times, Arco needs to pursue plans it made a while ago to improve both refining and marketing operations and to assure crude supplies for the last part of this decade and beyond.

Arco must spend \$800 million on its Los Angeles-area refinery alone, modernizing it to make the cleaner gasoline that will be required by California regulations in 1996. Arco has committed hundreds of millions

of dollars to sustaining oil production at Prudhoe Bay. But perhaps most important to the company's continued success, billions of dollars more will be poured into exploring for oil to replace now-dwindling Alaskan production.

These projects call for total corporate outlays of between \$2.5 billion and \$3 billion a year at least for the next several years, Mr. Cook says. That is somewhat higher than the \$2.4 billion total it plans to spend this year corporate-wide, including not only exploration and development but also refining and marketing.

"We're doing all the things we're supposed to be doing—thinking and planning long term," says Mr. Cook. But taking the long view can be painful in the short run, and thus the irony of Arco's plight.

Arco has taken a beating from investors, who have sent the once-favored oil stock sliding about 9.6% in the past three months, a drop nearly three times steeper than its peers, on average. Arco shares were quoted at \$108.125, down \$2.375 in late New York Stock Exchange trading yesterday.

Moody's Investors Service Inc. and Standard & Poor's Corp. both recently considered downgrading the company's debt. Though Moody's left its single-A-1 rating on Arco's \$5.6 billion in long-term debt, Standard & Poor's downgraded the corporate paper a notch, to single-A-1, its second-highest grade.

"Atlantic Richfield will walk a tight financial line over the next few years," Salomon Brothers analyst Bernard J. Picchli

predicted recently, adding that, after the company's big projects, "excess cash will not be very great."

Arco has carried a more heavily leveraged balance sheet than most other oil companies for some years. Debt at Sept. 30 made up about 47% of its overall capital, nearly twice the industry average of about 24%. "There's no question that we're more leveraged than some of our competitors," says Arco's chairman. "We feel comfortable there; this isn't a time to grow."

Leverage, says Mr. Cook, is part of Arco's tradition. "We like to feel under pressure," he adds. Indeed, in the 1970's, as it financed a sizable chunk of development of the Prudhoe Bay oil field and the 800-mile Trans-Alaska Pipeline System, Arco's balance sheet was burdened with loans. But, when operations started and cash poured in, debt dropped to 25% or so of overall capital. Then, in 1985, Arco nearly doubled its debt in a single stroke by borrowing billions of dollars to buy back about a quarter of its shares.

Analysts often have taken Arco to task even in the best of times. "Not long ago, everyone was worried that we would make a huge acquisition; now the complaint is that we have too much debt," Mr. Cook grouses. "It seems that analysts always need something to worry about."

Other major oil companies suffer a similar "Catch 22," notes William H. Brown III, analyst at Kidder, Peabody & Co. Big companies, he says, have big needs. While a single oil discovery may mean a huge jump in reserves for a small company, major companies' oil reserves are so big that a single roll of the dice won't do. Instead, it takes many successes to make meaningful additions. "There just has to be a minimum maintenance level of exploration spending," says Mr. Brown. So major oil companies haven't yet slashed capital outlays.

At the same time, there isn't much opportunity for day-to-day cost-cutting. As oil prices tumbled in the 1980s, producers slashed overhead and employment, cutting costs long before the recession hit. "These companies are reaching their terminal cost reductions—unless they sell assets or severely reduce operations," Mr. Brown says.

That could be in the cards for Arco. Although Mr. Cook thinks his company's course is set and is reluctant to "jerk the company around," he adds quickly: "If we find ourselves at the end of this year, and things haven't evolved as we anticipated, then we'll adjust."

Jim Davis
February 4, 1992
Address to Legislators

I very much appreciate the opportunity to talk to you today about the petroleum industry and the outlook for its future in Alaska.

As you may know, the suggestion for this informal briefing came from casual discussions last fall with several of the committee chairmen and ARCO Alaska's senior staff. It was suggested that the key House and Senate committees would benefit from an ARCO overview of the current state of the oil and gas industry in Alaska.

Given the sharp decline in the price of crude oil since those fall discussions, and its direct negative impact on the FY92 budget and the FY93 revenue projections, it seems particularly appropriate that we offer our thoughts to you today.

In particular I am going to concentrate on exploration, for it is the cornerstone and future of the industry. To state the obvious --you can't produce what you don't find. My job for ARCO is to find it.

I will offer you some reasons why a number of companies are abandoning Alaska exploration efforts--and why ARCO, the state's most active explorer, is continuing with its high level of effort. And I will suggest what the state can do to encourage other companies to invest in exploration in Alaska.

In view of the fact that more than 85 percent of the state's income comes from royalties and taxes on oil production, it is disturbing to see that the Alaskan rig count ended 1991 at its lowest level in 17 years. There is not much promise of improvement for 1992.

If the oil industry is to remain healthy in the long term, we must continue to explore for new sources of oil and we must be successful. We must efficiently maximize production from existing fields, and in the face of lower oil prices and tougher competition, we must cut the cost of doing business.

ARCO Alaska is doing all of these things.

In terms of exploration, ARCO plans to spend \$600 million in exploration in Alaska over the next five years. In 1992, we expect to see between 15 and 25 exploration wells drilled in Alaska, and ARCO will participate in 75 to 80 percent of those wells.

In Cook Inlet, there is cause to celebrate the discovery of oil at the Sunfish prospect. A jackup rig is overwintering at Nikiski to drill a followup well next summer, to further evaluate the discovery.

This winter, ARCO has five drilling rigs at work on exploration prospects-- the most activity of any company in Alaska. This includes the BLT well north of Anchorage, where we are looking for gas. This is a unique area in that the mineral ownership includes some private land. We have paid over \$400,000 to individuals for those rights. The state has also realized over \$2 million in lease bonuses. And the local economy benefits from 37 local people who are employed at the rig site, and more than \$1.5 million spent locally for services and supplies.

ARCO also is drilling the Cabot prospect in federal OCS waters offshore Barrow, which is the third Western Beaufort Sea exploratory well. If the Cabot well is not successful, it will may be the last in the area for some time.

And we recently spudded two wells in the Colville River delta, west of Kuparuk, which will be followed by three more wells this winter.

ARCO is looking for partners to explore the Kuvlum/Maktar prospect in the Eastern Beaufort. This prospect is important in proving up enough reserves in the area to justify shared production facilities and a pipeline to the trans Alaska pipeline. Unfortunately, several companies who had planned to participate have pulled out, and if that well isn't drilled this year, I fear it won't be drilled before leases expire. That could mean the end of activity in the Eastern Beaufort for the foreseeable future.

ARCO is the only company active in the interior basins. We have an agreement with Doyon in the Kandik Basin, near the Canadian border, where we have completed extensive geological studies and seismic and other geophysical studies. We are researching new drilling systems which are less costly and have less impact on the environment. We are looking for a partner to help us drill the prospects that have been identified.

This exploratory activity is aimed at preserving ARCO's future in Alaska.

Meanwhile, in order to maximize recovery from Prudhoe Bay, ARCO and its partners are making major investments, totaling more than \$2 billion, in gas handling facilities to make it possible to recover more oil from the reservoir.

When the field went on production in 1977, we expected ultimate recovery to be 9.6 billion barrels of oil. Today, we expect to recover more than 12 billion barrels. This increase didn't just happen. It is the result of aggressive investments in wells and facilities, technological advances, and the considerable efforts of a lot of people.

And we are cutting costs. Recently, we took the very painful step of cutting some 250 of our 2,900 Alaska employees. In addition, ARCO and BP are streamlining operations at Prudhoe Bay through consolidation and sharing of services. That meant the loss of 100 jobs, many of them contract employees.

Other oil companies, including many who do not have current production in Alaska, have announced in recent months they are giving up their exploration efforts in Alaska and intend to invest their exploration dollars in foreign countries.

This is disturbing news because it is in both the state's interest and ARCO's interest that Alaska maintain an aggressive exploration program, with a vigorous service industry supporting it.

You may wonder why ARCO wants competition in Alaska. First: given the high cost of exploration and the low chance of commercial success, we need partners to share the risk. Onshore, it costs from \$5 million to \$10 million to drill a single well; offshore, the cost can range from \$20 million to \$50 million or more. The only way to stay within a reasonable budget and still participate in a significant number of wells is to team up with other companies.

Second: Because of the way land is traditionally leased, in relatively small blocks, companies must form partnerships to create a leasehold large enough to justify an exploratory well. While we need such partnerships, coming to agreement on when a well will

be drilled, and how costs and production will be shared, is difficult, especially if the companies have differing views of Alaska.

Third: ARCO alone cannot support a viable service industry, to perform not only the actual exploration drilling but also to provide such services as earth moving, road building, well logging, well testing, camp building, seismic activities, and catering. As activity decreases, the cost of services increases, and so on. It's called a death spiral.

Now to a key question. Why is Alaska losing the battle for exploration capital?

To answer this question, we must understand a little about the exploration process. Exploration is a long term venture. Typically, it begins with broad regional geological studies of areas of considerable extent, involving areas of a few hundred miles square, or tens of millions of acres.

These studies reflect the fact that although the rocks have changed very little over human existence, our understanding of them is continually changing. To quote Parke Dickie, the pioneer petroleum geologist, "You can find oil in new places with old ideas, or in old places with new ideas. Seldom can you find oil in old places with old ideas. In the past, we thought we were running out of oil, but in fact we were running out of ideas." End of quote.

The next step in the exploration process is to conduct seismic and other geophysical studies over more local areas, tens of miles square, selected through geologic studies to be of the highest interest. Prospects identified then must pass rigorous economic screening before they are drilled. The economics include risk factors and costs of developing and marketing oil, if it is found.

This process takes at least five years, and must take place in advance of any lease sale. Once we are successful in acquiring leases through the competitive bid process, then the permitting process begins. An offshore well can require up to 30 permits or regulatory approvals from state, federal and local governments. Only when all approvals have been obtained can drilling begin. A delay of a few months can mean a year's delay in drilling where seasonal drilling restrictions are in effect.

The results of drilling that well, and perhaps others, are incorporated into existing geologic concepts and the process repeats itself.

If we are lucky and discover oil, another five to ten years will be needed for permits, design and construction to put the new field into production. Only then will we be in a position to begin to recoup the costs of exploration and initial development.

An example is ARCO's recent Sunfish discovery in the Cook Inlet. We began the basic studies four years ago, and developed new geologic concepts. In 1990, we tested these new geologic concepts by drilling the Sturgeon prospect at a cost of \$12 million. We didn't find oil, but it was a technical success because it confirmed these new concepts.

It encouraged us to drill the Sunfish prospect, at a cost of \$30 million. That was a successful test: We discovered oil! We are planning delineation drilling this year. If it is found to be economic, it will be five to ten years before production facilities are designed and the construction is completed.

Anything that adds uncertainty to this long-term process is undesirable because it increases the risk to the explorer and makes further exploration less desirable.

Uncertainty is one of the reasons the industry is exploring less in Alaska and the Lower 48 and is investing those dollars overseas. Just since 1985, the U. S. oil industry has increased its foreign investment from 40 percent to 80 percent of its total capital investment.

A recent Oil and Gas Investors article points out that democracies may seem inherently attractive and safe to Western eyes, yet they have a habit of making changes that affect the business community nearly as often as elections are held.

This is why the U.S. itself is increasingly regarded as being a high risk country compared to Canada, the U.K., or Indonesia, the article points out. "When viewing the spectrum of risks associated with foreign investment, the U.S. comes under a great deal of scrutiny. In terms of volatility and unpredictable tax law changes, the U.S. record is not the best." Unquote.

Uncertainty of regulation and increasing environmental costs could be added to this spectrum of risks. And exploration investments must be factored into companies' long-term planning.

Consider this analogy. Suppose you wanted to buy a lot on which to build a house five years from now. Say you had a choice between a subdivision in each of two towns. In one the town has committed to follow the building code standards that are recommended nationally and has a history of stable zoning and responsive permitting. The other has a history of imposing unique building codes, has no zoning, and is erratic in issuing building permits. Which lot would you buy? Would you even consider buying the latter lot?

The petroleum industry is faced with a similar decision. Generally speaking, an explorer overseas will know the taxation and permitting requirements prior to making any investment. In fact, foreign governments have shown willingness to be responsive to adverse conditions to accommodate marginal fields and hard economic times.

As an example: the government of Alberta has announced a royalty holiday for wells drilled in the next two years.

Companies also are not exploring in Alaska because they are being denied access to areas with oil potential, particularly federal lands onshore and offshore. Given the exploration process I have described, you can see it is impossible to know in advance precisely where your studies will lead you. Yet the federal government has withdrawn large blocks of acreage within offshore sale areas, leaving an unconnected collection of blocks. And the Coastal Plain of the Arctic National Wildlife Refuge, the most prospective onshore area in the U.S., continues to be off limits to exploration.

In the Lower 48, 40 per cent of the federal oil and gas lands on shore are now unavailable because of leasing moratoria or other restrictions. And there is a ban on offshore leasing from Maine to Florida and from Seattle to San Diego. For these reasons, the industry is not investing in pre-lease activities outside the Gulf of Mexico.

Industry has spent \$10 billion exploring the Alaskan OCS, through 1990, including 75 dry holes. More than \$6.5 billion of that went for

lease sale bonuses and rentals, while another \$3 billion went for actual drilling costs.

The majority of companies conducting Alaskan OCS exploration have had little participation in onshore drilling. Given the record of dry holes offshore, it should come as no surprise that these companies are reassessing their positions and are looking elsewhere.

Why isn't ARCO taking its exploration dollars out of the state?

Since the mid-eighties, we have had an exploration program balanced between the onshore and the offshore. With the troubles in the OCS, ARCO, unlike some of its competitors, was able to easily redirect efforts onshore.

We understand that exploration is a long term and technically based business. Over the past four years, ARCO has invested over 250 man years in basic regional studies of Alaska. This next summer marks the 37th consecutive year that ARCO has had geologic field parties. No other company matches that record. We believe these investments give us an edge over our competitors. This understanding has led us to aggressively invest in both state and federal acreage.

In addition, our people live and work in Alaska and are able to communicate routinely and in a timely way with the state agencies. But the most important reason ARCO maintains an aggressive exploration program in Alaska is that ARCO, or its predecessors, have had exploration success.

We made the discovery at Swanson River in 1957 that helped achieve statehood for Alaska. We also discovered Prudhoe Bay, Kuparuk, Lisburne, and Point McIntyre. Last fall, we announced a discovery at our Sunfish location in Cook Inlet. It was the first Cook Inlet oil discovery in 26 years.

ARCO is working hard to build a future here. Through continually evolving technology, we believe that Alaska offers a resource base that is as prospective as anywhere in the world. If we didn't, we would not be Alaska's most active explorer.

Let's look at Alaska's competitor countries overseas. Those countries offer a business environment that is compatible with the exploration process and encourages it.

They grant concessions on large contiguous blocks of acreage, from 250,000 acres to 25 million acres. Exploration rights are valid for a length of time that is appropriate to the process. Stipulations are known up front, including terms of operations, environmental requirements and development requirements. In addition, partnerships are known ahead of time as they are developed prior to joint bidding for the concessions.

Of course there are work requirements. But no company bids on these types of concessions unless they plan to conduct activities.

So what can the state do to reverse the trend to overseas investment?

For one thing, the state must be a strong advocate of a stable and truly area-wide federal OCS lease sale program in Alaska. And the state should also support the opening of the ANWR Coastal Plain-- not only for the windfall from bonuses it would receive, but because a discovery in ANWR could justify the construction of a pipeline to connect with the Trans Alaska Pipeline. Discoveries already made in the adjacent area appear to be too small to justify the costs of development. They most likely will not be developed unless additional reserves are found.

The state also must do more to entice explorers back onshore. While the state has done a good job in allowing access to state lands, and has provided reasonable stability in administrative processes, there is room for improvement.

We see a continual escalation of permitting requirements. Each additional permit is more stringent in its stipulations. The value of this escalation is doubtful, both from an environmental perspective and certainly from a cost/benefit viewpoint. As an example, it recently took three years to permit a new drill pad within the existing Kuparuk Field.

There is also opportunity to streamline the permitting process. More than time is lost in the maze of paperwork. ARCO employs 35 people full time, and others spend part of their time, to handle the permits

required to drill about a dozen exploratory wells each year, as well as for development projects in existing fields. If some of those people could be redirected to identifying exploration prospects, we could have a much better chance of finding the reserves both Alaska and ARCO need.

Another way the state could help is in encouraging the formation of exploration units. The exploration unit concept is a powerful way for the state to level the playing field in competition with other countries. It allows the combining of tracts with different expiration dates and different owners into a unit which is held together beyond individual lease expiration dates, as long as specified work is done.

We see the current process of forming units becoming more burdensome. What should take a week for administrative review by the state is now taking six months. The Legislature should let it be known that it supports this powerful concept and encourages the use of exploration units.

We are happy to hear that the state is considering the concession arrangement that is attracting capital overseas. The state and native corporations must work together, especially in the interior basins, to offer large blocks of land for exploration. It is an idea that could be used elsewhere in the state, in areas not adjacent to current production.

The completion of the state's land selections, which the Department of Natural Resources has identified as a top priority, offers a unique opportunity to aid the exploration process. Lands can be selected to preserve access to prospective oil and gas resources and for transportation corridors for pipelines, if exploration is successful.

It would be difficult to restore Alaska to previous high levels of exploration activity. But with the improvements I have suggested, I believe that the state can at least stem the tide of retreating exploration dollars and perhaps bring new life to Alaskan exploration.

I hope that this perspective is of help to you and I wish you all the best for this session. Thank you for your time and attention.

ARCO Alaska, Inc.
Post Office Box 100360
Anchorage, Alaska 99510-0360
Telephone 907 265 6468

RECEIVED JAN 14 1992



John C. Roots
Vice President

January 6, 1992

Representative Bill Hudson
Room 114, Capitol
P.O. Box V
Juneau, Alaska 99811

Representative Cliff Davidson
Room 108, Capitol
P.O. Box V
Juneau, Alaska 99811

Dear Bill and Cliff:

As you are aware, I have scheduled ARCO Alaska's Senior Vice President for Exploration, Jim Davis, to provide an informal briefing to the Senate Oil and Gas and Senate Resources Committees the morning of Tuesday, February 4, 1992. Jim will discuss significant oil and gas issues, including current exploration programs and recent discoveries in the Cook Inlet area. We would like to offer the same briefing to the House Oil and Gas Committee and House Resources Committee the afternoon of February 4. If this is convenient, I will make the arrangements with Jim.

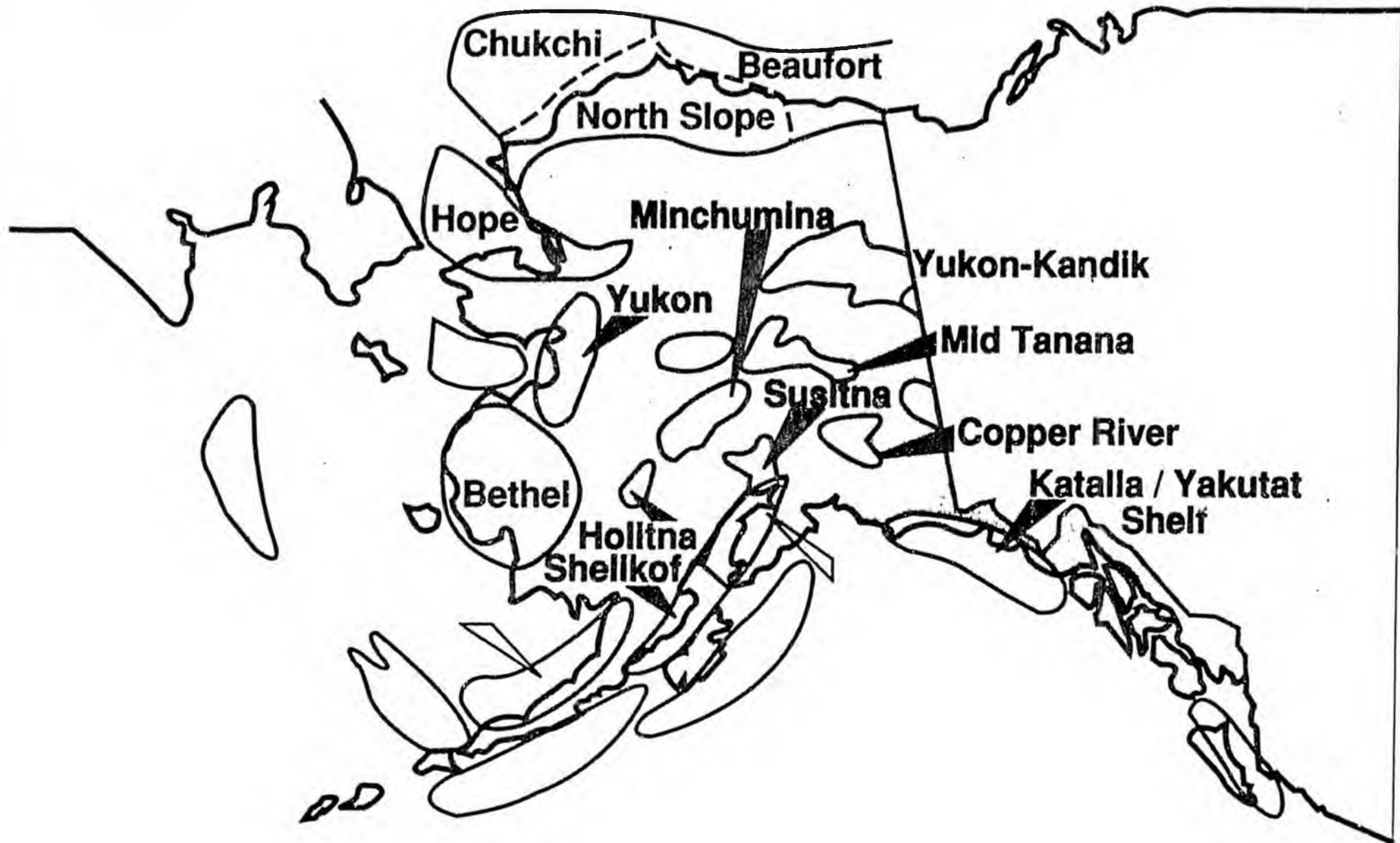
Sincerely,

Vice President
Political Affairs

sb

c: Senator Sam Cotten
Senator Lloyd Jones

Alaska Sedimentary Basins



CORRECTION

**THIS DOCUMENT
HAS BEEN REPHOTOGRAPHED
TO ASSURE LEGIBILITY**

ARCO Alaska, Inc.
Post Office Box 100360
Anchorage, Alaska 99510-0360
Telephone 907 265 6468

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Sincerely,

Vice President
Political Affairs

s b

c: Senator Sam Cotten
Senator Lloyd Jones



Alaska State Legislature

HOUSE OF REPRESENTATIVES

Official Business

State Capitol
Juneau, AK 99801-1182

January 24, 1992

Mr. John Roots,
Vice President
Political Affairs
ARCO Alaska, Inc.
Box 100360
Anchorage, Alaska 99510

Dear Mr. Roots:

As earlier discussed, the House Special Committee on Oil and Gas, jointly with the House Resources Committee, will be pleased to receive a briefing from Mr. Davis, ARCO Alaska's Senior Vice President for Exploration on February 4, 1992 at 3:00 p.m.

The issue of current exploration programs and recent discoveries in the Cook Inlet area are of extreme interest to both committees.

Respectfully,

Handwritten signature of Cliff Davidson.

Cliff Davidson, Chair
House Resources Committee

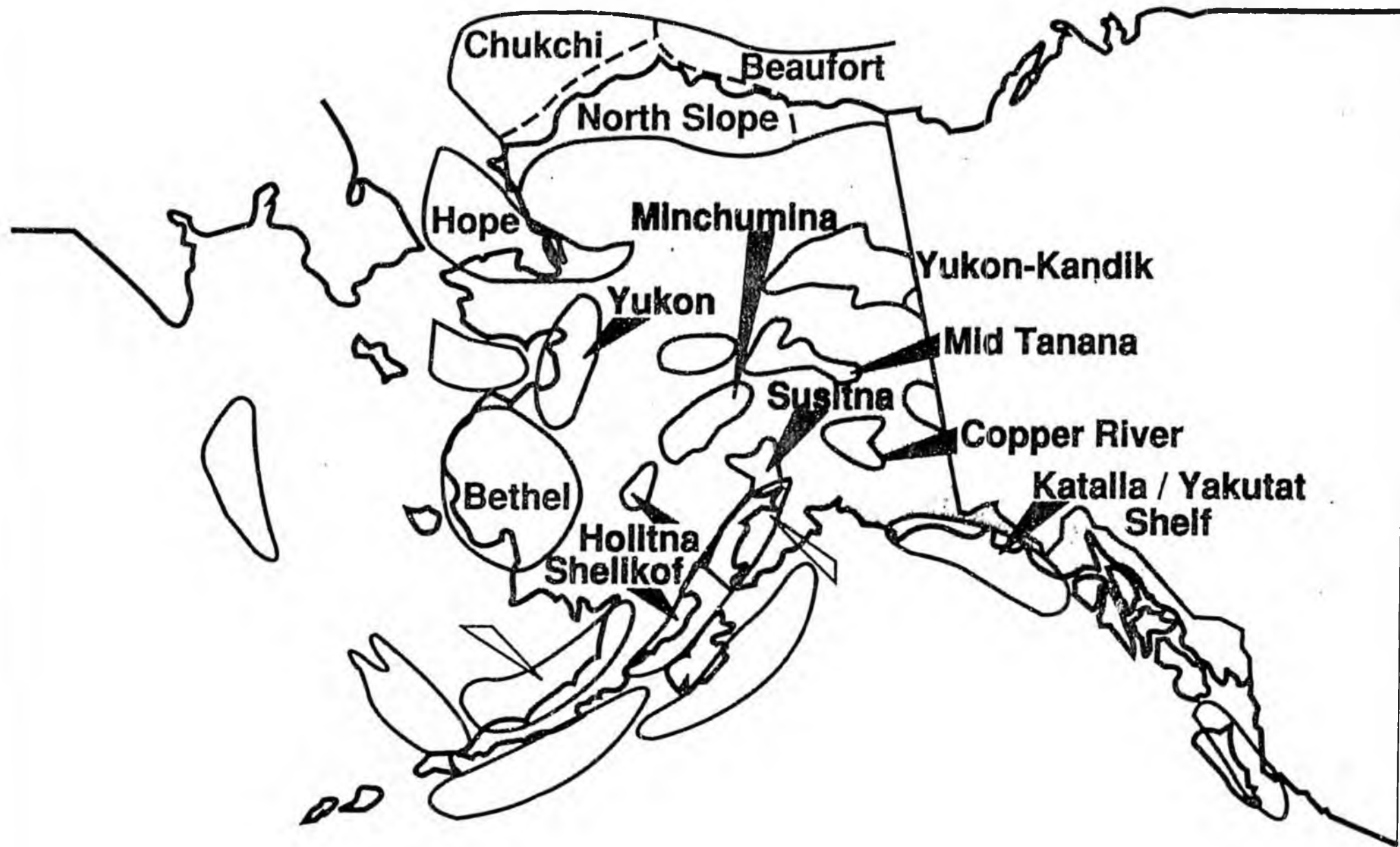
Handwritten signature of Bill Hudson.

Bill Hudson, Chair
House Special Committee on Oil
and Gas

:lh

cc: All Members Oil and Gas Committee
All Members House Resources Committee

Alaska Sedimentary Basins



ASMI

Salmon

2000

Report

4-10-91



SALMON 2000

HRES Subject file
"ASMI 2000"

March 22, 1991

Dear Alaskan:

Last spring, the Alaska Seafood Marketing Institute embarked on a major research project to try and quantify the changes in the world's salmon markets. The project was prompted by a request from Alaska State Senator Dick Eliason of Sitka and was directed by a special committee of the ASMI Board of Directors.

For the past several years, the Alaska salmon industry has been competing more fiercely in the markets with Atlantic and Pacific salmon raised on 'farms'—ocean pens that raise salmon in densities up to 20 fish per cubic yard. The growth of salmon farming has been explosive. What began as experimental technology in Norway has now been exported to Scotland, the Faroe Islands, Chile, Canada, Australia, New Zealand, France, the U.S. and other countries.

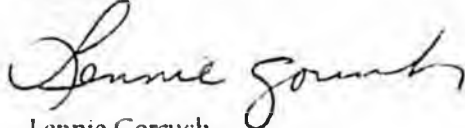
In 1980, salmon farmers produced about 1 percent of the world's supply of salmon. In 1990, salmon farmers produced about 30 percent of the world supply of salmon. In that same time frame, Alaska's share of the world production of salmon from our state's wild and natural stocks dropped from more than 40 percent to about 31 percent despite record salmon harvests in 1989 and 1990.

The Salmon 2000 project by ASMI examines what has happened in the last ten years and reviews what some experts expect will happen in the next ten years. While there is some original research, a large part of this report is the result of collating a great number of studies and reports and melding those findings into this report.

It is ASMI's hope that this information will be used by the industry, state policy makers and Alaskans to help craft our salmon marketing strategy for the future. Our marketing goals can only be reached through cooperative effort. Please don't hesitate to suggest ways to help us meet the large challenges ahead.

I look forward to your help.

Sincerely,



Lennie Gorsuch
ASMI Executive Director

SALMON 2000

Prepared by:

Alaska Seafood Marketing Institute

P.O. Box D

Juneau, Alaska 99811-0800

(907) 586-2902

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SALMON 2000

Executive Summary

OVERVIEW

Alaska salmon is losing ground at an alarming rate

After a decade of drastic change, the Alaska salmon industry is at a critical juncture. At the beginning of the decade, Alaska salmon harvests accounted for 41 percent of the world salmon supply. By the end of 1990, wild Alaska salmon accounted for just 31 percent of the world supply.

The decrease in Alaska's total market share occurred in spite of a 50 percent increase in Alaska's production during the same period. Alaska's dwindling market share is primarily due to the increase in production of farmed salmon, from 1 percent of world supply in 1980 to 30 percent today.

Pacific wild salmon faces many barriers, both domestically and overseas, to sustain or recapture an eroding market share. The biological resource is healthy—supply of wild Pacific salmon is abundant, stable, high in quality and value. But formerly secure markets for the product have slipped and continue to slip, and new ones must be developed.

FOREIGN MARKETS

Major Obstacles

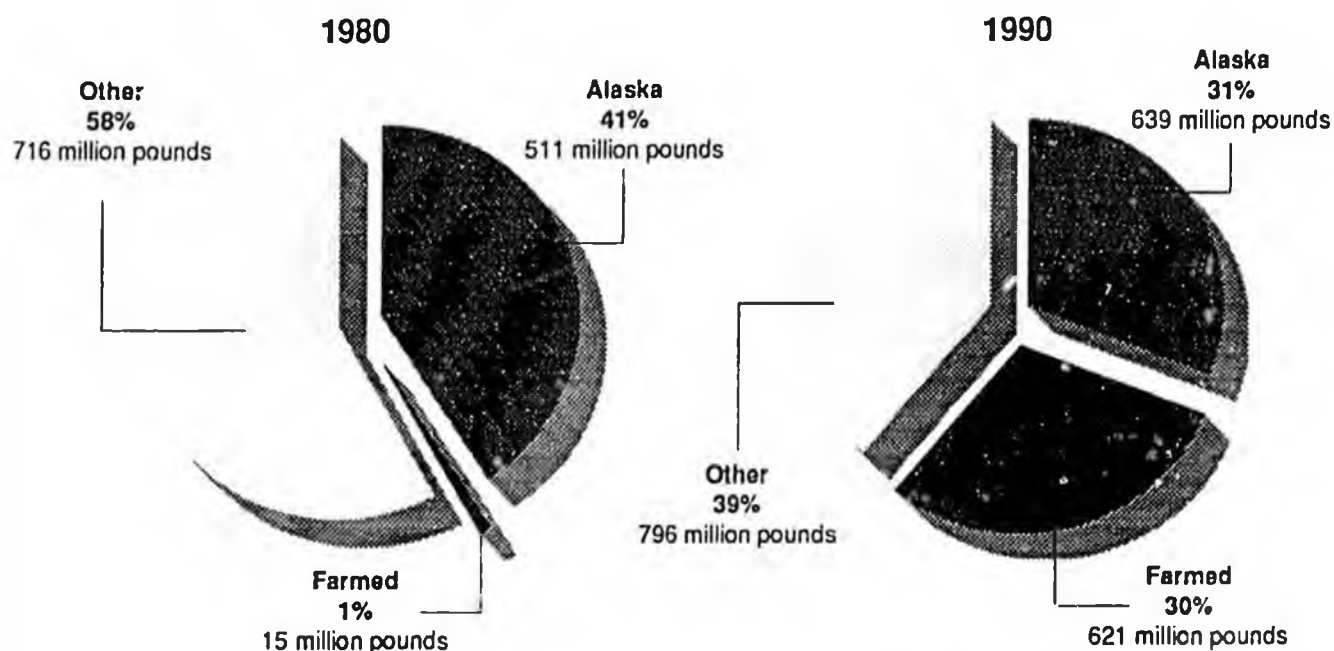
Farmed salmon surges to dominance in quantity and quality perceptions

Farm-produced salmon is chiefly responsible for the irrevocable changes that have left the industry virtually unrecognizable. At the beginning of the 1980s, commercial production of salmon on farms constituted 1 percent of total world production (and Alaska salmon 41 percent). Within the last 10 years, annual farmed salmon production has grown 31-fold, to 30 percent of total world production.

The dramatic rise in production and growing acceptance of farmed salmon as a source of fresh salmon represents the single greatest threat to Alaska salmon. The consistent year-round availability and quality of fresh-farmed salmon has made wild Alaska salmon, with its short fresh season and quality and supply inconsistencies, a secondary choice.

WORLD SALMON SUPPLY

Growth of Alaska and Farmed Relative to Total World Production



OVERSEAS MARKETS

Alaska must target foreign markets now controlled by farmed producers

Overseas, Alaska salmon's market challenges are occurring in France, Japan and the UK/Ireland—the most important world markets for the product—which are being flooded with farmed salmon.

France is the largest salmon market in Europe and the world's third largest (behind Japan and U.S.). During the past three years, farmed salmon has taken over the French market with an 86% market share. French imports of Norwegian subsidized farmed salmon increased by 60 percent in 1988, and imports of Alaska salmon decreased by 40 percent that same year.

Japan is the largest salmon market in the world. While Alaska has been able to hold its own against farmed production in Japan, farmed salmon has made inroads nonetheless. In 1985, non-U.S. imports represented 11 percent of Japan's total

salmon imports. By 1989, however, non-U.S. imports had nearly tripled to 30 percent. Meanwhile, U.S. market share in Japan declined 10 percent.

The 1989 overseas canned salmon markets saw a dip in canned salmon consumption primarily due to price.

There are new market opportunities for salmon, but fresh-farmed producers will have first cut because of the year-round availability, consistency, and product form flexibility over wild fresh/frozen salmon.

WORLDWIDE ASSISTANCE

Federal government increases assistance in Alaska's overseas battle

Alaska salmon is exposed to an extremely high level of competitive promotion and marketing subsidies. Leading world producers of farmed salmon spent a combined \$20 million promoting their product in 1990, Norway alone investing more than \$11 million. In comparison, ASMI spent \$6 million to promote fresh/frozen and canned salmon in foreign markets.

The federal government, recognizing the trade barriers, unfair competition and the number of subsidized suppliers that Alaska salmon faces overseas, and the urgent need to maintain the strongest possible presence abroad, has allocated \$8.8 million to help Alaska experts promote salmon in foreign markets in 1991—a dramatic jump from the \$1.5 million first granted in 1987.

ALLOCATION OF WORLDWIDE FUNDS

Alaska tailors special promotions to combat fierce competition overseas

Federal funds are used for a variety of programs addressing the overseas barriers to Alaska salmon. These include trade and retail promotions, product labeling programs, in-store demonstrations, point-of-purchase and informational materials, point-of-sale identification (i.e., "as seen on TV"), television advertising with retail tie-ins, consumer and trade print advertising, direct mail, public relations and trade shows.

Methods and media vary based upon the specific challenges in a particular market—the form of salmon being marketed; competitive promotional activities in that market and for that product form; and cultural perceptions, purchasing and eating habits.

ASMI's general export program also uses federal funds to conduct market research (on which to base future promotions,) and to conduct evaluations of ASMI's promotional activities. These activities to date have affected a marked increase in the number of Alaska salmon retail promotions, and a jump in consumer awareness of Alaska salmon to 3.5 times its pre-campaign level.

For a complete analysis of worldwide/foreign market issues, see Foreign Market Section.

THE DOMESTIC SITUATION

Fresh/Frozen

U.S. salmon consumption is up; imports capture the increase at Alaska's expense

The federal government has doubled the funds available to market Alaska salmon in threatened overseas markets this year by authorizing an \$8.8 million campaign. It is important to note that there has been no corresponding increase of effort in the domestic market.

While total U.S. salmon consumption reached a record high in 1989 of 368 million pounds (a 33 percent increase since 1985), that increase has been swallowed by imports at the expense of domestically produced salmon. Imports of farm-raised fresh salmon are up a whopping 267 percent, while U.S.-produced fresh/frozen supplies have tumbled 28 percent. Farmed salmon imports have been led by Canada, followed by Norway and Chile.

Farmed salmon is now beating Alaska on its own turf. Ocean-caught salmon represents 82 percent of the U.S. supply, but farm-raised imports have increased from 7 percent in 1985 to 17 percent in 1989.

Fresh rather than frozen salmon consumption is increasing, as evidenced by import figures, trade response and consumer preferences. Four out of five consumers use fresh salmon. This preference is further supported by the fact that 84 percent of all seafood sales are in fresh form, while only 16 percent are frozen.

While Alaska can offer a wide variety of species in frozen form, imports have the decisive advantage of being able to supply fresh salmon during most of the winter and spring months. Most Alaska salmon that is not canned, is inventoried and distributed frozen during off-season.

"In season" all year long— farmed imports have quality and freshness advantage

Because of farming, salmon is no longer a luxury commodity, and the market can "pick and choose" based on quality and availability. Market share gains for imports are clearly a result of the availability of fresh salmon on a year-round basis, despite their pricing disadvantage. Foreign producers import mostly fresh salmon. Whereas Alaska wild salmon are harvested in summer months and frozen for consumption during the rest of the year, farmed salmon can be harvested and sold fresh year-round.

Pricing: Situation is volatile

Pricing of salmon domestically is volatile. Many factors influence the pricing of fresh, frozen and canned salmon of the different species. Marketing distribution channels are complex, with many processors and middlemen that affect end-user pricing. Additionally, Alaska salmon has a short window of time "in season" when it offers a price advantage over foreign competitors. Farmed imports can offer fresh supply during the winter and spring months.

Canned**Consumption nose dived last decade;
recent increase won't offset huge inventories**

Canned salmon represents 59 percent of all retail salmon volume. U.S. per capita consumption of canned salmon declined 60 percent from 1980 to 1989, at the same time that catches of pink salmon—the majority of which is canned—increased approximately 50 percent. Another banner season for this species predicted in 1991 means current high inventories of pink salmon will remain for the foreseeable future. Further, high value species have declined by 16 percent as a share of total harvest, while low-value pinks represent nearly half of the domestic harvest.

Canned salmon's eight percent share of the foodservice market has not helped the situation. Fifty-two percent of this miniscule trade usage is in the non-commercial side of the business (hospitals, colleges, schools and company dining facilities). On the commercial side (restaurants, hotels), the bulk of the business is in smaller non-chain operations and recreational feeding (e.g., Disneyland, theme parks). Upscale restaurants that bake, broil and grill fish do not use canned salmon.

DOMESTIC PROBLEMS & OPPORTUNITIES**Dire straits at home and abroad—****Alaska salmon is in a dangerous position domestically**

Fresh farmed salmon has eaten steadily at the U.S. salmon market, just as it has taken a huge bite out of major foreign markets. Recognizing the danger to Alaska's premier seafood industry, government-supported worldwide promotions are in effect to combat this threat overseas. Now, Alaska salmon's slump on the home front urgently demands intensive domestic programs focused on increasing consumption of fresh/frozen and canned salmon.

Increasing domestic consumption can compensate for eroding foreign markets and offset both foreign and domestic losses. There are significant opportunities domestically to accomplish this by addressing those threats specific to U.S. salmon consumption. Some of these threats parallel the obstacles abroad, while others are indigenous to the domestic market.

Major Obstacles**U.S. trade prefers fresh
salmon; Alaska's fresh season restricted**

The trade's preference for fresh, based on perceived and actual consumer demand, places Alaska salmon at a disadvantage. The season for Alaska wild salmon is restricted to five months a year, and the trade prefers farm-raised salmon, available year-round. Import market gains reflect this preference. Both in-home and restaurant consumers choose fresh salmon over frozen. Since the bulk of Alaska salmon that is not canned is distributed in frozen form, negative perceptions regarding frozen salmon must be eliminated in order to survive competitive pressure from imported fresh salmon.

Canned consumption declining at alarming rate

Declining canned salmon consumption is another corrosive factor in the domestic market, since canned salmon represents half of Alaska salmon production. Canned salmon suffers from an "old-fashioned" image that limits its use to a few traditional dishes. Consumers do not seem to be aware of its nutritional value and both consumers and foodservice buyers perceive it to be inconvenient (bones and skin) and unappealing. Of the total salmon consumed in foodservice, only eight percent is canned.

Canned tuna is a formidable competitor. The per capita consumption of canned tuna has grown steadily over the past several years, and is currently over 10 times greater than canned salmon. In fact, tuna accounts for 25 percent of all fish and shellfish (U.S. per capita consumption) while canned salmon constitutes less than two percent.

An additional problem is the fact that distributors generally demand higher profit returns for canned salmon than for other types of canned seafood.

Consumers unclear how to choose, cook, benefit from salmon

Consumers lack knowledge in several areas which could make a difference in the demand for Alaska salmon domestically. This includes knowledge of the various salmon species and their qualities, preparation techniques and the superior health and nutritional benefits that Alaska fresh/frozen and canned salmon offer over other protein sources. Most consumers do not readily think of salmon when planning a seafood menu.

Uneducated trade is missed opportunity to reach consumer

Lack of education affects demand at the trade and retail levels as well. First, the trade is sensitive to the consumer's lack of awareness about Alaska fresh/frozen and canned salmon. Second, the trade has its own blind spots. Neither the retail nor foodservice trade are educated as to the best ways to maximize profit margins through effective merchandising, display, packaging and promotional campaigns.

Farmed highly favored for quality/consistency; foodservice usage is twice that of frozen

Negative quality perceptions present another potential barrier to increasing market share and consumption of Alaska salmon in the fresh/frozen category. Among the trade, the quality of farm-raised salmon is perceived to be superior to ocean-caught because it's harvested fresh year-round, offering consistent quality. This consistent quality is a result, in part, of mandatory grading standards in the farmed industry.

Some of the foodservice trade also negatively perceive how fresh/frozen Alaska salmon is handled from catch through distribution. While wild or ranched Pacific salmon are clearly at least equal in quality to farmed salmon when they are pulled

from the ocean, handling, packing and shipping can affect the quality of the product before it reaches its destination. For these reasons, foodservice favors fresh two-to-one over frozen.

Another obstacle is that consumers believe the taste of frozen is inferior to fresh salmon, despite flash-freezing techniques that protect the flavor and freshness and despite the fact that "fresh" fish may be several days old.

**Unpredictable wild harvests,
export increases cause inconsistent supply**

Supply unpredictability obstructs the trade's view of fresh/frozen as an alternative to farmed. While fresh farmed salmon is available consistently all year round from a variety of foreign suppliers, unpredictable wild harvests have caused inconsistent domestic supplies.

Also affecting domestic supply are seasonal premium foreign market prices for higher-end Pacific species, which encourage Alaska producers to export instead of selling domestically. Exports have reached record levels and now represent almost half of the total domestic harvest. U.S. salmon exports have continued to grow since 1985, increasing by 22 percent. As a result, Alaska's available domestic product mix has not been consistently competitive with the abundant, year-round supplies of imported high-quality farmed salmon.

**Alaska salmon
undistinguished by brand label**

As with other commodities where there is no "brand label", seafood brokers, distributors, importers and traders are not in the business of marketing "brands" of fresh/frozen salmon. As a result, there is no "consumer link" or identification between the product at the point of sale and its origin or "brand". Consumers looking for Alaska salmon therefore have a difficult time finding it at seafood counters or on menus.

For a complete analysis of domestic market issues, see Domestic Market Section.

OPPORTUNITIES

**Domestic situation offers openings
to address critical priority: increasing consumption**

Each of the previously-described barriers to strengthening the U.S market also represents an opportunity to build awareness of and demand for Alaska salmon, and to defend against foreign competition. With intensive informational/educational programs targeted to these opportunities, Alaska can stem the loss of consumer demand for its most abundant varieties and eventually take back its share of the domestic market.

Fresh/Frozen Opportunities

Targeting consumer plus trade is opportunity for Alaska

Raising general awareness of Alaska salmon and its superiority among trade groups and consumers is the most basic domestic opportunity. Alaska can target both groups to increase preference for Alaska salmon and build category consumption. Plus, Alaska can take the lead before other foreign competitors, such as Canada, begin to market aggressively in the U.S.

Wild salmon has positive image

Consumers who *are* aware of salmon-producing regions have positive perceptions of Alaska salmon. Meanwhile, there is confusion over the perceived benefits of farmed salmon.

It appears that wild salmon has a better reputation overall with consumers and in the domestic market than with trade and in the overseas markets. Capitalizing on the "natural" image of wild salmon is an opportunity to increase domestic consumption of Alaska salmon. Also, consumer preference for fresh creates an opportunity to emphasize the natural, fresh flavor of ocean-caught.

Salmon could be new favorite among seafood users

Targeting households that consume fish but not salmon represents a major opportunity. Salmon is consumed in only 40 percent of households. Tuna figures are much higher, with an estimated penetration of 98 percent of households.

Educate foodservice so they reach consumer

While only 35 percent of all foodservice operators currently include salmon on the menu, this level is up from 28 percent in 1982. An overall increase in fish consumption at restaurants (up 11 percent) means there is an opportunity to fill new demand with salmon.

The key opportunity in the foodservice trade is to educate operators on the quality and freshness of fresh/frozen methods (i.e., the superiority of flash-freezing) to increase the number of operators menuing Alaska frozen salmon, while creating stronger preference for Alaska-caught salmon. This is an excellent way to reach non-users who will try something new at a restaurant, but might not otherwise experiment with salmon at home.

Untapped potential in regions with below-average consumption

Several regions in the U.S. have very low usage of salmon compared to an average for the rest of the country. Once consumption of Alaska salmon among current users (canned and fresh/frozen) has been significantly increased, non-users represent a strong marketing opportunity, requiring specific programs to address their needs.

Appealing to a health-conscious America

Since there is still low awareness of Alaska salmon's nutritional benefits, a major educational opportunity exists for both fresh/frozen and canned. The consumer can be made aware of specific benefits, such as the product's low fat and cholesterol content as well as Omega-3 fatty acids that lower the risk of heart disease.

Seafood safety: Alaska inspection is a benefit, given high levels of consumer concern

Overall, seafood quality is a prime concern of the U.S. consumer. Unlike meat and poultry, fresh/frozen seafood does not undergo mandatory nationwide federal inspection. Alaska has what many in the industry consider to be a model seafood safety program—its own quality control programs directed by seafood safety experts. Stringent certification criteria must be met before operation and the programs have endorsement of the FDA, the agency responsible for most U.S. seafood inspection. Promotion of such programs can strengthen Alaska salmon quality perceptions among the trade and create some perceived advantage over foreign imports.

Canned Opportunities

The second key opportunity is to revitalize canned salmon consumption, as it represents half of all Alaska production.

Untapped markets for canned

The opportunity to develop consumption in additional markets is evidenced by the fact that only 22 domestic U.S. markets represent above or average consumption for canned salmon, and those 22 markets represent less than half the canned salmon sales volume. In other words, the few markets in which a lot of canned salmon is being eaten do not make up in volume for all the markets not consuming much canned salmon.

Canned has all the nutritional value of fresh/frozen

Canned salmon has health benefits and nutritional value which to date have not been effectively communicated to consumers or the trade.

Among producers, canned is Alaska's domain

The domestic canned salmon market is also an area where Alaska can dominate because canned salmon currently has little foreign competition. Therefore, increased consumption will benefit Alaska producers. This is an opportunity that needs to be addressed quickly, however, since several farmed salmon producers are beginning to experiment with canned processes.

Education is canned market's biggest opportunity

Given the low awareness of canned salmon as a useful product, there is plenty of room to grow in the minds of consumers and trade. Consumers can be educated on

how to prepare canned salmon to encourage main-dish usage. Stressing its convenience and providing contemporary recipes can also attract non-salmon users.

On the trade side, foodservice operators need to be educated on the convenience benefits of the product, and given new recipe ideas and serving suggestions. As operator interest increases, so will that of the distributor—who will get the product on foodservice menus.

Reach the restaurant, thus the consumer

Foodservice is an important market for both fresh/frozen and canned salmon—not only for its size, but because many consumers try different seafood for the first time at restaurants. Further developing this market can increase home consumption.

Canned is “Alaska brand”

Canned salmon also provides ample opportunity for branding—a powerful means of linking the product to its source that proves to be much more of a challenge with fresh/frozen. This will benefit fresh/frozen as well, because any program that gets the Alaska name in front of the salmon consumer will benefit both forms. Therefore, an investment in canned is an investment in Alaska salmon markets overall.

Promotional opportunities throughout the year

Grocery trade promotion drives consumption of canned salmon from January through March—leaving the balance of the year, for the most part, under-developed and under-marketed. Promotions to fill in the gaps can make canned salmon a year-round staple, rather than a Lent specialty.

WHERE DO WE GO FROM HERE?

An estimated 90 percent of Alaska's salmon production is either frozen or canned, so tackling the barriers facing these forms is critical to competitive, year-round distribution of Alaska product.

Foreign competitive efforts are focused on salmon exclusively, in contrast to Alaska's all-species approach. As a result, Alaska's salmon marketing impact is diluted and much lower than farmed producers on a spending-per-pound basis.

Below are key strategies that would work to increase domestic salmon consumption.

Program objectives

The goal of all programs is to establish a quality and value leadership position for Alaska salmon in all market segments—fresh/frozen, canned, foodservice and retail—and increase overall domestic usage.

Key proposed strategies

To increase trial and usage of Alaska salmon, we must implement a combination of targeted advertising, public relations and marketing programs. Year-round aware-

ness-building national media would target all salmon users—fresh, frozen, canned and restaurant. Preparation tips and recipes would be disseminated to foodservice and retail consumers through a variety of promotional methods and communicate health benefits of Alaska salmon.

Key program components would:

- Educate consumer on the quality and benefits of fresh/frozen Alaska salmon by focusing on natural flavor and health benefits.
- Educate trade that fresh/frozen is acceptable as an alternative to fresh.
- Build trade confidence that Alaska quality means profitability because the exceptional flavor of Alaska salmon enables premium pricing.
- Shift consumer perception of canned salmon from old-fashioned and inconvenient to contemporary and easy to prepare.
- Have menus identify and associate Alaska salmon with natural flavor, freshness and quality at the retail point of sale.

CONCLUSION

The face of the salmon industry has altered and Alaska must take aggressive action in new directions to shape its future—at home as well as abroad. Price, product form, demographics, packaging, transportation, growing and harvesting technologies, competitive marketing in this industry and other protein-source industries, and environmental factors all promise to continue to change and bring new challenges. Consumer awareness and acceptance of farmed salmon is likely to continue its rise, with active trade acceptance and heavy promotion. Building consumer and trade awareness and preference for Alaska salmon will be a necessary defense against this competitive pressure.

RESOURCE ANALYSIS:

Worldwide Salmon Production

OVERVIEW

Rise of farming was leading factor in decade that altered industry

At the beginning of the last decade, commercial production of salmon on farms was in its early stages. In 1980, just over 15 million pounds of salmon, mostly Atlantic salmon, were farm-raised.

The 15 million pounds of farm-produced salmon in 1980 constituted about 1 percent of the total world production of 1,242 million pounds. Alaska fishermen caught 511 million pounds in that year—41 percent of the total world production.

That was back in the days when "selling salmon was seen as more of an allocation to customers who clamored for the product," according to Michael Hunter of the Fisheries Council of British Columbia. But "that's not a luxury anymore," Hunter adds. Put most simply, it is not a luxury because of salmon aquaculture.

The National Marine Fisheries Service (U.S. Department of Commerce, NOAA) defines salmon aquaculture as "the partial or complete cultivation of the species in hatcheries or the sea. It includes at least two different processes: pen farming and ocean ranching. Pen farming is the commercial production to marketable size in total captivity. Ocean ranching is the private or government production of salmon in captivity to a certain stage at which it is released into the wild."

For the purposes of this report, the Alaska Seafood Marketing Institute will compare salmon capture fisheries (wild and ocean-ranching) with pen-farmed salmon production over the last decade, with some cautious predictions of production in the next decade.

Overall production surge absorbed to increasing degree by farmed

As the 1980s progressed, two general patterns emerged in the salmon industry. First, annual world production of salmon increased. The dismal production levels of the '70s were replaced in the '80s by a rising curve, beginning with a harvest level of more than 1,241 million pounds in 1980 and ending in 1989 with a harvest of 2,089 million pounds.

The second general pattern that emerged was the increase in production of farmed salmon—mostly Atlantics, but with some chinook and coho production as well. In 1980, 1 percent of world production of salmon was from farms. In 1989, 22 percent of world production was from farms and, in 1990, farmed salmon production almost matched the catch of Alaska wild salmon. Farmed production for 1990 is about 30 percent of total world production while Alaska production hovered around 31 percent of total world production.

World Salmon Production

| | World | Alaska | Farmed | AK % | Farmed % |
|------|---------------|-------------|-------------|------|----------|
| 1971 | 875,000,000 | 139,000,000 | 2,000,000 | 16% | - |
| 1976 | 878,000,000 | 245,000,000 | 4,000,000 | 28% | - |
| 1977 | 1,029,000,000 | 307,000,000 | 5,000,000 | 30% | 1% |
| 1978 | 969,000,000 | 389,000,000 | 8,000,000 | 40% | 1% |
| 1979 | 1,261,000,000 | 442,000,000 | 10,000,000 | 35% | 1% |
| 1980 | 1,242,000,000 | 511,000,000 | 15,000,000 | 41% | 1% |
| 1981 | 1,379,000,000 | 612,000,000 | 26,000,000 | 44% | 2% |
| 1982 | 1,307,000,000 | 562,000,000 | 33,000,000 | 43% | 3% |
| 1983 | 1,595,000,000 | 493,000,000 | 48,000,000 | 31% | 3% |
| 1984 | 1,512,000,000 | 661,000,000 | 74,000,000 | 44% | 5% |
| 1985 | 1,948,000,000 | 671,000,000 | 102,000,000 | 34% | 5% |
| 1986 | 1,458,000,000 | 590,000,000 | 156,000,000 | 41% | 11% |
| 1987 | 1,390,000,000 | 494,000,000 | 210,000,000 | 33% | 14% |
| 1988 | 1,726,000,000 | 527,000,000 | 319,000,000 | 30% | 18% |
| 1989 | 2,089,000,000 | 714,000,000 | 479,000,000 | 34% | 22% |
| 1990 | 2,056,000,000 | 639,000,000 | 621,000,000 | 29% | 28% |

Within the last ten years, annual farmed salmon production has grown 31-fold, from just over the 15 million pounds in 1980 to 479 million pounds in 1989. And, while the Norwegians dominate farmed salmon production (representing more than half of all farmed salmon production in 1989), there has been dramatic growth of farmed salmon production in several other countries—including Chile, Canada, Scotland and Japan.

Salmon Production by Major Producers (millions of pounds)

| | Norway | Scotland | Chile | Canada | U.S. | Japan |
|-------|--------|----------|-------|--------|------|-------|
| 1980 | 9.1 | 1.3 | 0 | .4 | .86 | 4 |
| 1981 | 18.5 | 2.9 | 0 | .46 | 1.9 | 2.5 |
| 1982 | 22.6 | 4.7 | .4 | .9 | 1.5 | 4.7 |
| 1983 | 37.4 | 5.6 | .2 | .68 | .8 | 3.9 |
| 1984 | 49 | 8.6 | .24 | .68 | 2.7 | 11 |
| 1985 | 63 | 15 | 1.1 | .9 | 4 | 14.1 |
| 1986 | 100.5 | 22.7 | 2.5 | 2.2 | 3 | 17.6 |
| 1987 | 123.6 | 27.9 | 2.6 | 6 | 5.5 | 26.8 |
| 1988 | 184 | 39.5 | 6.8 | 20 | 8.1 | 36 |
| 1989 | 252.7 | 68.2 | 18 | 38.8 | 12.3 | 40.9 |
| 1990* | 330 | 77 | 41.8 | 51.2 | 16.9 | 57.2 |
| 1992* | 286 | 94.6 | 58.3 | 72.6 | na | na |

High production, falling prices prompt Norwegians to scale back, but farming worldwide expected to continue gains

Toward the end of the 1980s, lower prices for farmed salmon caused some contraction in segments of the industry. Norwegian farmers shifted some production into frozen from fresh, and there has been consolidation of the industry in Canada and the United Kingdom (Scotland) due to business failures.

Early in 1990, the Norwegians began freezing farmed Atlantics so they could take some fish off the markets to shore up prices. The Norwegian Fish Farmers' Sales Organization also won government backing to limit production to 25kg of fish per cubic meter of water. It was reported that this would raise the average price by between NKR5.00 (about \$.95) and NKR10.00 (about \$1.80) during the year.

These recent actions were initiated because, while Norwegian salmon exports grew from 145 million pounds in 1988 to more than 209 million pounds in 1989, the average export value of the salmon fell from NKR46.39/kg (about \$8.80) to NKR36.39/kg (about \$6.90) for fresh, with some reports of ex-farm levels as low as NKR32.50/kg (about \$6.18). Norwegian industry officials also have announced plans to reduce farmed production from 330 million pounds in 1990 to 308 million pounds in 1991, and to 286 million pounds in 1992.

There is no indication, however, that other countries will curtail production at the same time the Norwegians are scaling back. In fact, production in other major salmon farming countries is increasing. The January/February 1991 issue of *Seafood Leader* predicts farmed salmon production could reach 1,100 million pounds by the year 2000—an amount nearly equivalent to 1980's total wild and farmed salmon production.

Farming explosion last decade was unpredictable

In academia and in the industry, there has been a reluctance to predict salmon market activity during the next several years, let alone to the year 2000. This reticence may be based in part upon the unpredictable changes of the last 10 years. Even as late as the mid '80s, prognosticators from the industry, fisheries bureaucracies and universities were underestimating the explosive dimensions of salmon farming growth.

An exhaustive review of reports written during the 1980s does not reveal any predictions regarding farmed salmon that accurately reflect the actual production levels reached by 1990. Some representative off-the-mark examples are:

- in November 1984, The National Marine Fisheries Service (NMFS) projected that by 1990 production of pen-reared salmon would reach 236 million pounds (this is less than half of most recent 1990 production estimates of nearly 621 million pounds);

- in March 1986, Patricia Lavin Riely and James Anderson of the University of Rhode Island predicted in a study for NMFS that total production of farmed salmon in 1990 would be 274 million pounds (this is also less than half of current 1990 production projections);
- in March 1988, the DPA Group of Vancouver B.C. predicted for the Department of Fisheries and Oceans in Canada that production of farmed salmon in 1990 would reach 379 million pounds (that prediction was shy of actual production by more than 220 million pounds);
- in April 1988, the Norwegian Ministry of Fisheries predicted that production of Atlantic salmon in Norway would be in the neighborhood of just over 220 million pounds in 1990 (1990 Norwegian production is now estimated to be 330 million pounds); and
- Dr. James Anderson of the University of Rhode Island in April 1988 estimated that world production of farmed salmon would be in the range of 411 to 489 million pounds by 1990 (his forecast for 1995 was between 452 to 534—still about 88 million pounds below what 1990 production will be).

While a review of these 1980s predictions may discourage further prognostication for the 1990s, some observations might still be made.

Wild/ranched growth potential remains, but there are limits

First, there are natural limitations on the harvest of wild and ranched salmon stocks. While nobody can say with certainty what those upper production limits may be, Peter Larkin of the University of British Columbia says ocean ranching could increase harvest of salmon using traditional means by up to 50 percent. He based that prediction on the success of the ranched Alaska pinks and Japanese chums.

British Columbia's Michael Hunter believes that B.C. and Alaska wild production will continue to improve over the production levels of the 1980s. He indicated in an early 1990 speech to an international gathering of salmon farmers (Salmon 90, held in Norway) that B.C. and Alaskan wild production could continue to grow another 20 to 25 percent during the 1990s.

In addition to growth in wild and ocean-ranched fisheries on the eastern edge of the North Pacific Rim, the Soviets expect growing harvests on the western edge. *Fishing News International* indicated in its June 1990 issue that the Soviet Union plans to increase enhancement efforts to boost total catch from 286 million pounds to 661 million pounds.

Wild Salmon Harvests (In millions of pounds)

| | U.S. | Canada | Japan | U.S.S.R. | Alaska |
|------|-------|--------|-------|----------|---------|
| 1980 | | | | | 510.4 |
| 1981 | | | | | 611.6 |
| 1983 | 639.3 | | | | 561 |
| 1984 | 691.4 | 110 | 373.4 | | 660 |
| 1985 | 726.9 | 239.8 | 488.4 | | 668.8 |
| 1986 | 658.5 | 220 | 409.2 | 176 | 589.6 |
| 1987 | 562 | 143 | 374 | | 492.8 |
| 1988 | 606.1 | 189.2 | 374 | | 525.8 |
| 1989 | 778.8 | 176 | 440 | 173.8 | 712.8 |
| 1990 | na | 191.4 | 484 | 286 | 700+(e) |

There is, however, an upper limit on wild and ranched production. Nobody knows the carrying capacity of the North Pacific but some suggest it is not unthinkable (with the extensive ocean ranching programs of Alaska, the U.S., Canada, the Soviet Union, and Japan) that international discussions on ocean 'grazing' rights may be in the not too distant future.

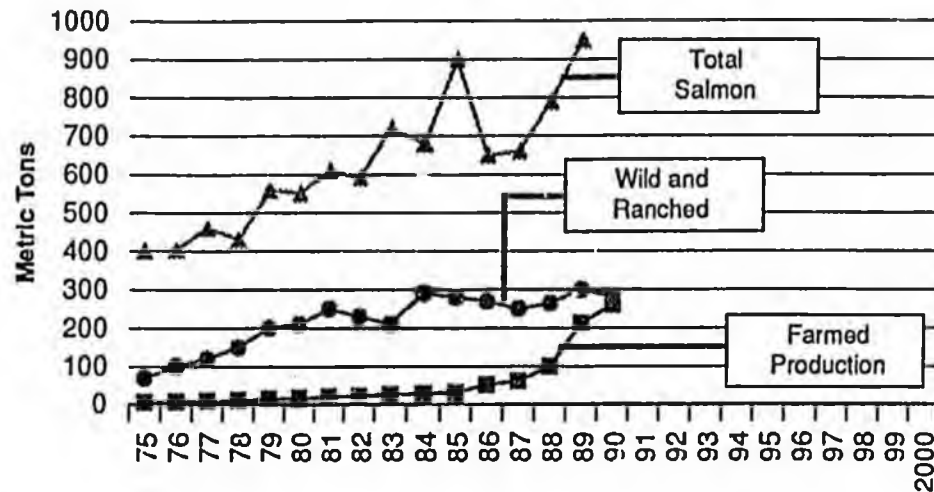
Farming's unlimited supply potential makes it permanent industry

Larkin does not see outer limits to aquaculture. At the September 1990 Aquaculture International gathering in Vancouver, Larkin noted it is "absolutely clear that (farmed) production will grow." He believes that there will be few exotic species farmed, but that those species in production now will continue to grow and that technology and breeding will improve for those established species.

The limits Larkin foresees for farmers are environmental. However, he adds that improving technology will allow mitigation of farming impacts. These mitigation measures may include moving farms offshore as pen technology improves.

World salmon supply—farmed and wild—booming overall today

The increase in production and world supply of salmon during the past decade is not solely attributable to the increased production of farmed salmon. Production of wild salmon has increased at a pace that *matches* increased farm production during the last several years. Between 1984 and 1989, production of wild and ranched salmon grew 286 million pounds. In that same time period, production of farmed salmon grew a total of 284 million pounds.



The world supply of salmon in 1990 will reach about 2,056 million pounds. According to an analysis by one of the Japanese fish trading firms (as reported by the Alaska State Office in Tokyo), demand for this year's salmon will be between 1,543 million pounds and 2,028 million pounds (286 to 418 million pounds for canned; 264 to 330 million pounds for the European market; 220 to 330 million pounds for the North American market; 661 to 771 million pounds for the Japanese market; and 110 to 154 million pounds for other markets). If the average demand of about 1,763 million pounds is harvested, there will be an oversupply of 440 million pounds of salmon in 1990.

THE SALMON LIFE CYCLE—WILD VS. FARMED

There are five commercially important Pacific species of salmon harvested in the wild (only negligible amounts of wild Atlantic salmon are harvested and marketed). Each Pacific species varies in size, shape, distribution, taste, texture and other attributes.

| Species | Weight | Protein (grams) | Fat (grams) | Calories |
|---------|--------|-----------------|-------------|----------|
| Chinook | 10-25 | 19 | 12 | 189 |
| Coho | 7-9 | 20 | 6 | 139 |
| Sockeye | 5-7 | 20 | 8 | 157 |
| Chum | 8-9 | 20 | 4 | 121 |
| Pink | 4-5 | 20 | 5 | 130 |

Adapted from: National Marine Fisheries Service and Alaska Fisheries Development Foundation, Commercial Fish Species of the Pacific West Coast and Alaska, Portland Or, 1982; Alaska Seafood Marketing Institute, Alaska Salmon, Juneau, AK 1982

Note: Protein, fat and calories are measured per 100-gram serving are average values for fresh/frozen and canned salmon

The life cycle of the typical Pacific salmon includes the laying and fertilization of eggs in rivers and streams in summer and fall. Alevin (fry with yolk sacs) hatch in the gravel and emerge into the stream where they live and feed for varying amounts of time. The fry become smolt when they change biologically to allow them to exist in saltwater (pinks and chums migrate to the ocean much more quickly than sockeye, kings and cohos). Salmon typically feed in the ocean between one to five years (depending on the species) before returning to their native streams to begin the cycle again.

While the consumers and markets understand how commercial harvesting of wild and ranched salmon occurs, there is less general understanding of the processes involved in farming salmon.

Farmed salmon production occurs in three distinct phases—hatchery, smolt and “grow-out”. In some farmed salmon-producing regions, governments allow vertical integration of these three phases. In others, the government prohibits vertical integration.

The hatchery phase includes the fertilization, incubation and hatching of eggs. The process requires water with a temperature of about 46 degrees Fahrenheit.

Smolt farms raise the fry until the process of smoltification occurs (the stage at which the fry can adapt to and live in saltwater). The hardiest smolt are coho salmon, with Atlantic salmon more prone to mortality during this stage. Pacific salmon smolt used by farmers (coho and king) are raised for four to 18 months and Atlantics for 18 to 20 months during this stage.

In the grow-out phase, smolts are placed in pens (usually net pens anchored in the ocean) where they are fed until harvesting. Some farmers have increased the pen densities of salmon to up to 25 kilograms per cubic meter, but Herrmann notes that a body of scientists recommends about 8 to 10 kilograms per cubic meter. John Forster of Sea Farms of Washington has noted that 15 to 20 is probably optimal.

Smolt are usually ready for harvesting one or two years after purchase. Prior to harvesting, farmed salmon are starved for about three days. When harvested, salmon are anesthetized in carbon dioxide solutions, and their throats are cut so they pump out their own blood.

FARMED SALMON PRODUCTION BY COUNTRY

Norway

Overview:

**From infancy to current boom,
ambitious Norway leads continued farming growth**

The lion's share of farmed salmon production over the past decade has been from

Norway. Norwegian salmon farmers dominated early in the decade and, even though several other countries have begun ambitious farming industries, the Norwegians by the end of the decade produced more than half of the world's farmed salmon. Because the Norwegians lead in the production of farmed salmon and are pioneers in pen-rearing technology, this report will deal extensively with the Norwegian experience and summarize other countries' production efforts.

Norway historically had a valuable wild Atlantic salmon fishery, but overfishing by high seas gillnetters and pollution depleted the wild runs. Farmed salmon proved to be an easy substitute, and by 1934 Norway was reportedly earning 17 percent of its fish revenues through salmon farms. By 1990, Norway had produced about 14 percent of the world salmon supply.

Fish farming in Norway goes back to 1912, when trout were first farmed in salt water. Norway's involvement with farmed salmon began in the 1960s. The Norwegian coast has optimal growing conditions because the gulf stream keeps temperature fluctuations in a rather narrow band and fjords provide protected waters for net pens. In addition to optimal environmental conditions, the farming, research and marketing structures created by the government encouraged steady and rational growth as well.

Government Involvement:

Ample government support for farming helped Norway to position of power in industry

Norwegian fish farmers are eligible for a variety of loans and other benefits from different government agencies. A major loan source is a rural development assistance program in coastal areas, where depopulation is a government concern. Fish farming is the only industry which keeps people from leaving those regions.

Odd Steinsbo, managing director of the Norwegian Fish Farmers' Sales Association (FFSA), has noted that the production of salmon is regulated by Norwegian law, and cannot begin without a license issued to the farm owner by authorities. Norwegian salmon economist Trond Bjørndahl has written that "licenses are awarded on the basis of the character of the applicant rather than the site." The objectives are to achieve balanced growth and a decentralized industry which can adapt to existing business structures in coastal areas. This control keeps fish farming units relatively small and ensures that they are owned and operated by local residents.

The Norwegian government also limits horizontal and vertical integration to keep farms small and locally operated. This ensures that the operators have a direct stake in the operation's success, but denies certain opportunities of scale.

Patricia Lavin Riely noted in her doctoral thesis (*An Economic Analysis of the Market for Atlantic Salmon Aquaculture*) that the Norwegian government successfully tied the rights to its valuable offshore oil leases to scientific research in several other fields—including aquaculture. This, she added, accounts for oil companies like British Petroleum and Mobil having some interest in the field of aquaculture.

The government also supports the salmon farming industry through research, training, extension services, breeding research and veterinary services. In 1984, a tax exemption was granted which allowed fish in the water to be valued at zero for tax purposes—even though the farmer could borrow on the value of fish in the water. In 1985, the government declared aquaculture one of the top four priorities for industrial research funds, according to Mark Herrmann author of a 1990 doctoral thesis on world salmon supplies and prices.

The extent of government involvement in the salmon farming industry led recently to a preliminary 2.45 percent "countervailing duty" by the U.S. Commerce Department on imports of Norwegian salmon. The Commerce Department listed six instances in which they found the Norwegian government subsidized the salmon farming industry, thereby lowering the cost of fish production and the break-even price on the wholesale market. The department is now performing a full-fledged investigation into the subsidy issue, and a final finding may have been made by the time this report is published.

Industry Outline:

Farmable conditions and resources brought

Norway to more than 30 times 1980's production levels

In addition to government assistance, Norway has a large pool of skilled labor (Herrmann reports 80 percent of those involved in salmon farming are fishermen or former fishermen) and an excellent transportation system supporting the industry. About 12,000 Norwegians are employed in the salmon farming industry. These attributes, coupled with government programs, have contributed greatly to the rapid growth of the farmed salmon industry in Norway.

In 1980, Norwegian salmon farms produced 9 million pounds of Atlantic salmon. By 1985, production had grown seven-fold to 63 million pounds and by 1989 had quadrupled from the 1985 level to 253 million pounds. Harvests in 1990 were about 330 million pounds but Kirstin Hille Valla, the Norwegian minister for the environment, was recently quoted in a NMFS publication as saying that "environmental and other problems related to fish farming would have to be addressed before renewed expansion could be considered."

By the end of 1989, there were 790 fish farms with a growing capacity of 308 to 330 million pounds. There also were 690 hatcheries (a small number of them produce most of the volume—216 million smolt per year). Until 1985, smolt production limited expansion but that year the government removed the licensing requirement and by 1988 there was an overproduction of smolt. A recent NMFS assessment of the salmon farming infrastructure in Norway ("European and Canadian Fisheries Developments", issued 11/90 and citing the "Lenka" report prepared by Norway's ministries of fisheries and environment) noted Norway has the capacity to boost annual production of farmed Atlantic salmon to 1,587 million pounds.

Because of artificial limitations on the size and ownership of fish farms in Norway, the Norwegian industry has begun making investments in farms in other countries—including Scotland, the U.S., Canada and Chile—where farm sizes are not controlled.

This export of technology, Herrmann notes, has been encouraged by the Norwegian government. The Norwegian Export Council in 1986 began subsidizing by 50 percent those firms exhibiting farm equipment at international trade shows and conferences.

**Most of Norway's fresh farmed
exported; supply to EEC is triple that of U.S.**

About 85 to 90 percent of Norway's production of salmon is exported, and the exports are generally fresh, top-quality Atlantic salmon. Herrmann reports, however, that Norwegians have now begun a limited canning operation in order to experiment in a new market niche. The European Economic Community is the largest importer of Norwegian farmed Atlantic salmon and EEC trade tariffs on value-added fish have helped ensure that limited value is added to Norwegian salmon exports.

The value of 1985 Norwegian salmon exports was \$152 million on exports of 85 million pounds. In 1988, Norway exported about 116 million pounds of fresh and frozen salmon to the EEC, about three times the amount of fresh and frozen salmon the U.S. exported to the EEC. In 1989, Norway exported about 220 million pounds of salmon worth \$585 million. France was the recipient of about 25 percent of Norway's exports, with Denmark close behind. Japan is growing rapidly as a client as well.

Norway's exports are highly seasonal, avoiding the peak Pacific salmon seasons while taking advantage of the holiday periods. Nearly 30 percent of Norway's fresh exports occur during November and December, while about five percent are shipped in August—the prime time harvest season for wild and ranched salmon.

During the past decade, exports of Norwegian salmon to U.S. markets have grown from a negligible amount at the beginning of the 1980s to more than 24 million pounds annually. The east coast of the United States absorbs most Norwegian imports, with the largest portion going to New York City.

**Norwegian industry is
organized on pricing, marketing, grading**

The FFSA (Norwegian Fish Farmers' Sales Association) was created in 1978 by the Norwegian parliament, and its membership is mandatory, with farmers and buyers both paying a 1.25 percent sales tax. The organization has several functions, including advertising. Most recently, the FFSA was responsible for buying farmed salmon during over-production for freezing and future sales.

The FFSA also sets minimum prices for salmon exports (the government will subsidize farmers if the price falls below the minimums). The minimum pricing has caused some divisiveness within the organization prompted by the over-production prob-

lems of 1989-1990. Some farmers wanted controls on production rather than price adjustments, but the FFSA contended quotas were not as efficient as adjustments in the price floors, according to Herrmann.

Numbers provided by Norwegians at a New York seafood show in October 1989 indicate a 1989 Norwegian marketing budget of \$9.2 million. Unconfirmed reports suggest the marketing budget for 1990 is about \$9.5 million (to move more than 220 million pounds of export salmon). The Norwegians maintain marketing offices in France, Spain, Germany and the U.S., with an increasing presence in Japan.

Salmon quality is a primary concern in Norway. There are three grades of salmon—superior grade, ordinary grade and production grade. Exports, Herrmann reports, are restricted to superior and ordinary grades. In 1985, 89 percent of the supply was of superior grade and eight percent was ordinary.

Superior grade salmon is free of blemishes and meets color and shape standards. Fat content for superior grade must be between 15 and 20 percent. Ordinary grade salmon may have some scale loss, be slightly irregular in shape or have small cuts. Most salmon consumed in Norway is of the ordinary grade.

Canada

Overview:

End of decade leap in production will bring farming to one-fourth of Canadian fishing industry

Canada's involvement in salmon farming increased dramatically between 1987 and 1990. Farmed salmon production jumped from 5 million pounds in 1987 to 20 million pounds in 1988, 38 million pounds in 1989 and an estimated 51 million pounds in 1990. During the first seven years of the decade, production had increased gradually from 350 thousand pounds in 1980 to about 2 million pounds in 1986. A report from the Canadian Department of Fisheries and Oceans (DFO) predicts that aquaculture production in Canada will, by the year 2000, make up at least 25 percent of the total landed value of all Canada's commercial fisheries.

Government Involvement:

Government accepts, supports "inevitable" future of salmon farming in Canada

The federal and provincial governments have been supportive of the farmed salmon industry. British Columbia and the federal government have designated aquaculture as a special emphasis area. Stephen White, an Alaska assistant attorney general, notes "political conditions in British Columbia seem to favor the industry. With a relatively small population and 60,000 miles of mostly wilderness coastline, salmon farming conflicts with few other marine users." White also notes that the commercial fishing industry has offered much resistance to salmon farmers.

Herrmann's thesis notes that a \$100,000 (Canadian) loan is available through the Aquaculture Incentive Program, with a five-year payback and the first three years

Interest-free. Other incentives include Economic Development Agency loans of up to \$150,000 (Canadian), new venture tax relief incentives and access to the British Columbia venture capital program with a 30 percent tax credit.

Herrmann also notes the difference in attitude between the United States and Canada when it comes to salmon farming. He quotes the president of the Prince Rupert Fishermen's Cooperative (a major fishermen's organization and B.C.'s second largest processor) who said "I think we're burying our heads in the sand if we think it (salmon farming) is going away. It's happening all around us." The co-op president added that aquaculture has great potential for small coastal communities.

Industry Outline:

Eastern Canada projections:

overcoming constraints for modest steady growth

In Atlantic Canada, the first significant salmon aquaculture development began in 1984 when a Norwegian firm, Stolt-Nielson Sea Farm A/S, built a \$2 million (Canadian) smolt hatchery in New Brunswick. The bulk of the salmon farming industry on Canada's eastern seaboard is centered on New Brunswick's Bay of Fundy. There are 49 salmon farms on the bay with a combined production capacity of 18 million pounds, although production in 1989 totaled 9 million pounds.

In Nova Scotia, there are 18 operating marine pen sites. However, only eight of these 18 grow a combination of salmon and rainbow trout and the other 10 grow only rainbows. Salmon production in this province totaled less than 330 thousand pounds in 1989 (up from 59 thousand pounds in 1988). Quebec and Prince Edward Island have one salmon rearing site apiece and both are land-based because of ice and winter water temperatures. The P.E.I. facility has experienced significant financial problems. Salmon aquaculture in Newfoundland is still experimental.

Canada's DFO estimates that the five eastern provinces will produce between 16 and 26 million pounds by 1995. The best prospects are in New Brunswick, followed by Nova Scotia and the other three provinces. By the year 2000, the DFO predicts production from eastern Canada at between 19 and 34 million pounds.

The DFO predictions for eastern Canada are premised on several assumptions. These assumptions are:

- current pen technology will remain prevalent (technological improvements would boost production);
- sites in New Brunswick will expand to an upper limit of 75 sites with a capacity of 28 million pounds;
- Nova Scotia will have a capacity of 1 to 4 million pounds by the year 2000; and
- by the year 2000, P.E.I., Quebec and Newfoundland will have a salmon capacity of between 1 and 3 million pounds.

Constraints the DFO sees for eastern Canada include:

- site availability and opposition from interest groups;
- low quality of smolts produced;
- production problems caused by disease; and
- financing constraints.

To balance constraints to expansion, proponents of the industry in eastern Canada believe they have numerous advantages: proximity to important salmon markets on the east coast of the U.S.; competitive labor prices and strong industrial support to lower production costs; and provincial and federal government regulations which are conducive to growth.

Western Canada contracting after decade of accelerated farming expansion

On Canada's west coast, the British Columbia farming industry has grown from four commercial farms in 1931 to 135 sites in 1989. Because of financial problems, the number of sites in 1990 dropped to about 120. In a U.S. Department of Commerce, National Marine Fisheries Service (NMFS) publication dated September 1990 (entitled *The Latest Developments in West European and Canadian Fisheries*), Dr. Ted Needham predicted that only 50 of the 80 salmon farming companies operating in British Columbia will survive 1990.

Norwegian ownership of one-third of B.C. farming suggests region will be major player

The NMFS publication does point out that the investment of about \$80 million (Canadian) by the Norwegians, or approximately one third of the \$250 million (Canadian) currently invested in salmon farming in B.C., illustrates the generally accepted belief in the industry's long-term viability.

In fact, B.C.'s growth in the mid-1980s is probably most attributable to the decision by Norwegian producers to seriously invest in the Pacific salmon aquaculture industry. With Norwegian involvement, the number of farms grew from four in 1981 to 36 in 1985 and jumped again in 1986 to 69 farms—10 with Norwegian backing. Most of the sites are along the Sechart Peninsula and on Vancouver Island. The farms generally employ three or four people and are capable of producing from 440,000 to 661,000 thousand pounds of salmon per year.

1989 production in British Columbia was approximately 27 million pounds, compared to 14 million pounds in 1988. Production in 1990 is expected to reach about 33 million pounds, though B.C. production for the first four months was ahead of predictions. Most of the B.C. production is chinook, with Atlantics running a distant second and coho far behind.

In British Columbia, king salmon mature in about 24 months, while cohos are ready to harvest after about 18 months. Herrmann notes the survival rate of B.C. Pacific salmon smolt is about 50 percent compared to a survival rate of Atlantic salmon smolt in Norway of about 70 percent. Plankton blooms are the largest cause of salmon loss in the province.

Industry association keeps B.C. organized, promoted

The British Columbia Salmon Farmers Association (BCSFA) was formed in 1984 to promote the province's salmon farm industry. The BCSFA represents 95 percent of the salmon farmers in the region, according to Herrmann, and administers functions that include egg allocation, husbandry workshops, communications, product identification, scientific research, quality programs and marketing programs. The budget for the BCSFA is reportedly \$1.5 million (Canadian) beginning in 1990, according to Herrmann.

Herrmann also reports the BCSFA has approved a seal of excellence which will have the words "Fresh Pacific Salmon Quality Approved by the British Columbia Salmon Farmers Association."

Factors support B.C.'s success, but far from "the next Norway"

Despite the rapid growth of salmon farming in British Columbia, the DFO describes the state of the industry as still developmental compared to Norwegian production. DFO is officially saying that the B.C. farming industry may be producing 132 million pounds by the year 2000.

Constraints on growth will be competition from other countries also trying to duplicate the Norwegians' success; control of production costs and profitability; blooms and disease problems; financing; and marketing competition.

On the other hand, the B.C. industry is close to one of the most important U.S. salmon markets, the B.C. coastline has many potential farm sites, there is a well-trained workforce, and a strong research/government support base for the industry.

Chile

Overview:

After long history of cultivation attempts, Chile hits salmon jackpot with farming last decade

For years Chile has been trying to develop local fisheries for salmonid species through stocking programs and enhancement efforts. Though climatic and environmental conditions for salmonids are excellent in Chile, salmonids are not native to Chile (or any other country south of the equator).

Beginning in 1905, trout and salmon were first introduced into Chile. The initial experiments with salmon were unsuccessful, but trout flourished. Rainbow trout were first farmed in 1975 and coho were cultivated beginning in 1979. Coho exports began in 1981 following a *one metric ton* harvest that year.

By 1986, production of farmed salmon in Chile had increased to 2 million pounds, and by 1989 production had grown to 16 million pounds. Production for 1990 is expected to be in the neighborhood of 41 million pounds—28 million pounds of coho and 13 million pounds of Atlantics.

Bill Atkinson's *News Report* (12/26/90) noted production in 1994 is expected to be in the neighborhood of 66 million pounds, with most of the expanded production coming from the cultivation of Atlantics. He indicated the Atlantics give the Chilean farmers year-round capability for exports.

Government Involvement:

Relatively neutral policies neither help nor hurt industry

Unlike other governments, Chile does not impose significant bureaucratic overhead, Herrmann reports. Herrmann also notes that there is little environmental opposition to salmon farms in Chile.

The Chilean government does not provide special incentives for farmers. The government agency in charge of fisheries is planning to enact administrative procedures to regulate the cultivation of salmon, including egg trade, diseases, smolts and salmon, according to Herrmann.

Industry Outline:

**Resources excellent, production low—
but market distance may negate price advantage**

Fixed costs are reasonable in Chile, and protected and inexpensive sites for pens are readily available. Low labor costs also keep production costs down. Herrmann notes that in Chile, lower production costs translate into lower stocking densities, which in turn translate into "healthier and less stressed fish." Another major advantage is absence of the devastating algae blooms experienced by other salmon farming countries.

The greatest disadvantage for Chilean farmers is the country's distance from major salmon markets. The closest market is Los Angeles and if air transportation costs rise more quickly than ground traffic, British Columbia farmers will have a significant advantage over Chile in supplying U.S. West Coast markets—despite Chile's lower production costs. The U.S. Department of Transportation noted that the transportation differential between British Columbia and Chile was \$.75 per pound in 1989, before the price of fuel oil skyrocketed due to Mideast tensions.

Chile's southern hemisphere experiment is being watched closely in salmon aquaculture circles. Chilean farmers contend that they can culture salmon at lower costs than other countries, thanks to availability of numerous suitable and inexpensive sites and lower feed costs than other nations (Chile is the largest exporter of fish meal in the world).

**Expansion of species
has given Chile a year-round market**

Most Chilean production of salmon is coho, though in the last few years production of Atlantics has leaped ten-fold from 370 thousand pounds in 1988 to more than 3 million pounds in 1989. Mastering the freshwater stage for Atlantics was a major impediment but, with the help of established European companies, that impediment is decreasing. Carlos Wurmman Gotfrit, director of marine resources for Fundacion Chile, predicts substantial farming of Atlantics—particularly after the 1990 season.

The Chilean farmers are also working with small amounts of chinook and cherry salmon (similar to pink salmon and indigenous to the Kamchatka Peninsula). In 1989, 127 thousand pounds of chinook were produced, and 33 thousand pounds of cherry salmon were harvested.

With the expansion of species under production, Chile has been able to supply salmon on a year-round basis. The coho are harvested between November and March (with heaviest production between December and February) and Atlantics and chinook are harvested all year long.

Up to 1989, about 320 sites belonging to 130 companies were licensed to grow salmon in either fresh or saltwater. From the licensed sites, around 170 are already working with sea pens, 34 are in juvenile production and seven are involved in ocean ranching. About two-thirds of the working farms plan for 661 thousand to 1 million pounds of production each year, while only five have plans to produce more than 2 million pounds per year.

Farmed salmon production is now centered on Chiloe Island. According to a report in *Seafood Business* (July/August 1990), the farms in Chile are carbon copies of farms in Norway, Scotland, the Faroe Islands and Iceland.

**Other farmed producers have
commitment to Chile—as investors or importer**

Recent notable developments in Chile include the involvement of foreign firms in the production of farmed salmon in Chile. Nippon Suisan Kaisha acquired Salmenes Antartica from Fundacion Chile and processed more than 4 million pounds in the 1988-89 season—making it the largest producer in the nation. Other foreign investment from Scotland, Norway, the U.S., Canada and Denmark also has gravitated to the Chilean salmon farming industry or affiliated industries such as feed production, consulting and others.

Japan has not only made major investments in the industry but is now the primary market for Chilean farmed salmon. Almost 62 percent of Chile's cultured salmon output went to Japan in 1989, compared to 35 percent in 1988. During the same period of time, exports of Chilean salmon to the U.S. slipped from 52 percent to 29 percent.

Japan gets increasing portion of its frozen supply from Chile

The shift in supply to Japan also has created a noticeable shift in product form from fresh salmon to frozen salmon—with the frozen salmon destined for the Japanese market. 1988 exports of fresh salmon comprised 57 percent of total exports, but only 31 percent was exported fresh in 1989. (Despite the drop in *percentage* of fresh salmon exported, increased Chilean production overall allowed exports of fresh salmon to increase 440 thousand pounds between 1988 and 1989.)

While the U.S. and Japan are the major markets for Chilean salmon, other markets also are reacting favorably to the Chilean product. Increased demand for aquaculture product and the strong reputation for the quality of Chilean coho is creating the demand. However, some U.S. markets reportedly question the reliability of supply because of the shift to the Japanese market.

Japanese imports of Chilean salmon for the first six months of 1990 totaled 20 million pounds, well ahead of projections that pegged Japanese imports from Chile at about 15 million pounds for the year. Chilean salmon farmers expressed concern to a *Seafood Business* writer about the world's oversupply situation and the fact that the Norwegians were targeting Japan, but were hopeful that the reddish flesh of their farmed coho would be more attractive to Japanese buyers.

Chilean salmon farmers closeknit, share pricing responsibility

Chilean farmers work together, as do the Norwegians, to set prices. Herrmann notes they meet twice each week to set minimum prices and achieve uniform prices for buyers.

There also are restrictions on quality written by the Association of Chilean Salmon Farmers (close to 90 percent of the farmers belong to the organization). Quality seals are awarded prior to export of the salmon.

Scotland

Overview:

Long history, significant growth place Scotland leadership close to Norway's

Scotland ranks second—after Norway—in the production of farmed salmon, and the value of Scottish farmed salmon is now greater than the value of beef or lamb production in Scotland. The farms are located in western Scotland, and the Orkney and Shetland Islands. The industry has created 6,300 jobs in remote areas of Scotland.

Salmon farming has a longer pedigree in Scotland than in most other countries. Unilever built a salmon farm in Scotland in 1969, and in the last decade there has been steady growth in production from about 1 million pounds in 1980 to 68 million pounds in 1989. Production in 1990 is projected to be about 77 million pounds.

Government Involvement:

The British government has adopted beneficial financing regimes for salmon farmers. Under the Fish Farming Scheme of 1984, the government is allowed to grant farmers up to five percent of the cost of an aquaculture project. Grants also have been available to farmers in underdeveloped areas of Scotland through the Industrial Development Act of 1982, the Integrated Development Program for the Western Isles and the Highlands and Islands Development Board.

Industry Outline:

Oversupply lessens impact of dramatic production growth

In 1989, there were a total of 66 Scottish companies operating more than 292 salmon farms. Saltwater pens produce the vast majority of salmon, though about 1 million pounds were produced in onshore systems using pumped seawater. Salmon smolt production was about 29 million pounds in 1989. A slight decrease in the production of smolt is expected this year.

Though Scotland's production of farmed salmon has grown dramatically in the past few years (salmon production in 1989 was 55 percent higher than in 1988), increased production costs and prices lower than those in 1989 will result in a 30 percent drop in revenues. Angus Morgan, chair of the Scottish Salmon Board, says the 30 percent increase in exports during 1989 helped the country's farmers weather the crisis in the salmon farming industry caused by "dumping" of Norwegian salmon on markets.

Morgan also noted there was a 15 percent increase in production costs for Scottish farmers. Seven Scottish salmon companies went into bankruptcy last year.

Scottish farmed salmon experiences increasing European popularity

Exports from Scotland are mainly to countries in the European Economic Community especially France which imported 16 million pounds in 1989 for an increase of about 40 percent over 1988. Scotland's salmon producers' association has a permanent promotions office in France. The Netherlands and Germany also are important overseas markets for Scottish salmon. Scotland's promotional budget is between \$5 and \$6 million for 1990.

Scottish fish farmers exported about 27 million pounds in 1989 worth about \$86 million. This is an increase of about 30 percent over 1988. Scottish salmon also increased sales in the UK, displacing about 4 million pounds of salmon imported from other countries worth \$11 million.

Japan

Overview:

Japanese experiments lead to success in farming ventures

The Japanese began experimenting with chum salmon culturing in 1876, and established the first chum hatchery in 1888—about the time cattle ranches and cowboys were flourishing in the western United States.

Though the salmon ranching program is well-established, salmon farming is relatively new. The Nichiro Fisheries Company cultured coho, chum, sockeye, pink, and chinook beginning in 1971, following loss of its salmon factory ship in a vessel reduction program.

In 1973, the company focused on coho because they were hardier than other species. In 1975, Nichiro turned to ocean pens after determining coho grew more slowly in freshwater and by 1978 the company had produced 992 thousand pounds of coho with an 80 percent survival rate from smolt to adult.

Government Involvement:

National commitment focused on well established wild ranching

In 1951, the Japanese government established the Aquatic Resources Conservation Act, which mandates that the Ministry of Agriculture, Forestry, and Fisheries administer a fish hatchery program.

The program was established to ensure that the country did not again experience the salmon shortages faced when salmon stocks were overfished. The act has led to a national salmon ranching program and the fry and returning fish belong to the Japanese government. The act also provides subsidies to private hatcheries and requires salmon fishermen to contribute to the hatchery program.

The Japanese government does not offer financial incentives to salmon farmers.

Industry Outline:

More Japanese firms venturing in, but farming still tiny factor in export/domestic consumption

Other companies besides Nichiro also began commercial farming of coho and the companies contracted out the production of salmon to about 350 firms in 1986 and 400 in 1987. The pen-raised coho are taken from the cages before the higher summer temperatures inflict crop mortality. Since summer also brings competition from other salmon and fish products (skipjack tuna and others), coho not marketed by early summer is often salted for sale in the fall. By 1986, less than 2 percent of the salmon consumed in Japan (between 771 and 881 million pounds annually) was produced in the nation's pens.

The Japanese market for Japan pen coho was in disarray in June of 1990, according to Bill Atkinson's *News Report* of July 4, 1990. He wrote that prices were expected to fall to about \$2.05 per pound because of high landings that year. Expected harvest of pen coho was 50 million pounds compared to 37 million pounds in 1989. Instead, prices held higher (between \$2.11 and \$2.32 for 4.5 pound and up) even though consumer demand was slow. To some extent, the prices holding high might be attributed to a typhoon that affected the availability of skipjack tuna and opened the way for farmed coho.

Production of pen coho is expected to reach 50 to 52 million pounds in the Sanriku region—significantly higher than the 37 million pounds in 1989. About 26 million pounds of this production was sold through the markets and the rest directly to users. In 1990, about 40 percent of the total landings of pen coho from this region was salted or frozen and the rest sold fresh. Production of pen coho in Iwate province was expected to reach 2 million pounds in 1990—a 10 percent increase over 1989 production.

A small amount of chinooks are being farmed and there are reports of experimentation with sockeyes. In addition, the Japanese government and Mitsubishi have begun a test project raising Atlantic salmon. Even though Japanese water conditions can become too warm for sensitive species, Atlantics were showing good survival rates.

OTHER COUNTRIES

Farmed salmon are also being produced in other countries, though on a much smaller scale than in Norway, Canada, Scotland, Japan and Chile. In some of the other countries and regions, production has some history; others have established salmon farms just recently.

Ireland, the Faroes, Iceland, the U.S., France, Sweden, Finland, Spain, France, Italy, Australia, and New Zealand are all producing various species of salmon on farms with varying degrees of success.

Ireland, Iceland and the Faroes all produce approximately 22 million pounds. The U.S. produced about 17 million pounds in 1990. U.S. production has mainly taken place in Maine and in Washington state.

Iceland

In Iceland, fish farming first began in the early 1980s. In 1984, a large land-based salmon farm was established as a joint Icelandic and Norwegian venture. The venture also produces smolt for its own use and for export.

The government of Iceland has not provided financial incentives to farmers, but loans are made through semi-public agencies and the Fisheries Development Fund.

Limiting factors for Iceland are the lack of protected fjords and the cold water temperatures during winter months.

Environmental conditions in Iceland have led to the world's largest dryland salmon farm, according to Herrmann. With the help of the Nordic Investment Bank, there are now about 15 dryland farms in the country.

Faroe Islands

Salmon farming began in 1980 in the Faroe Islands and there now exist more than 50 farms. The Faroese Home Rule Government has supported the industry through technical assistance and investment loans.

Most Faroese salmon is exported to Denmark. The industry is guided by an eight-member board that reviews sites, governs the production of smolt, provides environmental oversight, and governs the limited fresh water reserves.

One of the problems facing the Faroes is a shortage of smolts to stock the pens. Since imports of smolts have been prohibited by the government, annual domestic production will have to increase. The Faroese have a domestic supplier of feed, so feed is not expected to be a problem.

Ireland

Genetic characteristics peculiar to Ireland's farmed Atlantic salmon, coupled with the country's warm waters, are contributing factors to the higher percentage of small salmon, or grilse, produced in Ireland. Grilse is an Atlantic that undergoes the biological changes of spawning before reaching full size and seldom grows to six pounds. Norwegian joint ventures in Ireland have been working to lower the incidence of grilse.

The government does not provide incentives to salmon farmers, but does conduct research and licensing oversight. There is Norwegian investment in Ireland, and some Irish salmon is marketed through Norwegian companies. Ireland consumes about 20 percent of its domestic production; the rest is exported mainly to EEC countries, with a small amount going to the U.S.

Ireland's salmon production will ultimately be limited by the availability of suitable farming sites. There is environmental opposition to the utilization of many sites. Projections for 1990's harvest are about 30 million pounds.

Australia

Australian farmed salmon production is located in Tasmania. A few years ago, salmon farming was viewed as an answer to Tasmania's economic problems. However, financial problems and overproduction encouraged by an enthusiastic government caused prices to slip as producers battled for market shares. Subsequently, the two largest salmon farmers (with 60 percent of the production) have agreed to merge.

The merger means that Noraqua of Norway ends up with 50 percent of the newly formed company (Tassal). Noraqua, a subsidiary of a large Norwegian construction

and engineering firm, decided that the Tasmanian operation is the only one with the long-term profit potential and has closed down all of its other fish farms around the world.

The U.S. Department of Commerce reports that Tasmania may be one of the most promising salmon farming sites in the world. An Atlantic salmon can grow out from 9 to 11 pounds in 27-30 months in Tasmania, as compared with 36-41 months in Norway.

The Tasmanian farmers have a huge advantage in the domestic (Australian) market because government health authorities require all imported fresh fish to be heat-treated in a manner that harras the taste and increases costs. This means there is no importation of fresh fish into the Australian markets. There is no similar requirement in Australia mandating heat treatment for fresh fish that are exported from Australia.

New Zealand

New Zealand, like other southern hemisphere countries, does not have any indigenous salmon. Sockeyes and chinooks were originally introduced for a recreational fishery and Atlantics were also stocked in some lakes for recreational fishing.

Salmon farming in New Zealand was legalized in 1983 and production has increased steadily since then. Chinook has been the principal farmed salmon. To assist the establishment of a salmon farming industry, the government supplied farmers with two cycles of chinook smolts. Smolts are from the "wild" fishery and from the government hatchery.

New Zealand has several advantages in its salmon cultivation efforts—a good supply of unpolluted water and location in the southern hemisphere with seasons the reverse of northern hemisphere harvesting seasons. Distance from major markets is a major disadvantage. If Australia eliminated the import restrictions of fresh fish, New Zealand would be well placed for that market.

The New Zealand government does not provide special assistance to farmers other than the special tax benefits the government gives to all new industries. The government does, however, operate a salmon research station.

United States

Growth of salmon farming in the U.S. has been slow but steady. On a commercial basis, salmon farming has been occurring in the Puget Sound area of Washington state since the 1970s. Coho and Atlantics are the primary crop. While the waters of Puget Sound are often described as ideal for salmon fanning, there have been permitting delays and resistance from adjacent landowners.

On the East Coast of the U.S., production is mainly by one firm. Atlantics dominate the crop.

Outside these two states (Washington and Maine) there are only sporadic attempts at pen-raising salmon. Hawaii and California are experimenting with aquacultured salmon, and Oregon and Idaho have a few pan-sized coho operations. Some salmon is now being farmed in abandoned quarries in Minnesota's Iron Range.

Others

At this time, production in other countries is very low. France has just harvested the first crop of Atlantic salmon grown in a converted tanker off the coast. Other countries (Sweden, Finland, Spain, and Italy) are experimenting with farming technology as a possible prelude to engaging in the salmon farming industry.

COMMERCIAL SALMON PRODUCTION BY COUNTRY

United States

Alaska dominates domestic industry

Most salmon landed in the U.S. is landed in Alaska. (Note: commercially caught salmon consist of wild salmon and ranched salmon—hatchery salmon released to the wild.) Between 1980 and 1989, Alaska has accounted for between 87 percent (in 1987 and 1988) to 95 percent (in 1983 and 1984) of all U.S. salmon landings.

Percent of Alaska Landings vis-à-vis U.S. Landings

| | | Alaska | U.S. |
|------|-----|-------------|-------------|
| 1980 | 91% | 512,000,000 | 560,000,000 |
| 1981 | 91% | 611,000,000 | 672,000,000 |
| 1982 | 89% | 562,000,000 | 629,000,000 |
| 1983 | 95% | 621,000,000 | 652,000,000 |
| 1984 | 95% | 660,000,000 | 694,000,000 |
| 1985 | 90% | 669,000,000 | 747,000,000 |
| 1986 | 89% | 606,000,000 | 678,000,000 |
| 1987 | 87% | 490,000,000 | 563,000,000 |
| 1988 | 87% | 527,000,000 | 607,000,000 |
| 1989 | 91% | 714,000,000 | 787,000,000 |

In the 1980s, harvest of wild and ranched salmon in the U.S. ranged from a low of about 562 million pounds in 1980 and 1987 to a high of 787 million pounds in 1989. The 1980s were a vast improvement over the mid-1970s (1974-1977) when average salmon landings per year were about 262 million pounds. Alaska salmon harvests during the 1980s have ranged from 490 million pounds in 1987 to about 714 million pounds in 1989.

The vast majority of U.S. sockeye, pink and chum landings are from Alaska waters. During the last decade, Alaska also landed about 50 percent of the kings and 75 percent of the coho landed in the U.S.

Alaska Catch by Species

| | Reds | Pinks | Chums | Coho | Kings |
|------|-------------|--------------|--------------|-------------|--------------|
| 1980 | 187,000,000 | 217,000,000 | 71,000,000 | 22,000,000 | 12,000,000 |
| 1981 | 225,000,000 | 244,000,000 | 99,000,000 | 26,000,000 | 15,000,000 |
| 1982 | 109,000,000 | 219,000,000 | 90,000,000 | 46,000,000 | 16,000,000 |
| 1983 | 305,000,000 | 193,000,000 | 79,000,000 | 26,000,000 | 15,000,000 |
| 1984 | 222,000,000 | 276,000,000 | 104,000,000 | 44,000,000 | 12,000,000 |
| 1985 | 221,000,000 | 304,000,000 | 83,000,000 | 47,000,000 | 13,000,000 |
| 1986 | 196,000,000 | 259,000,000 | 93,000,000 | 46,000,000 | 11,000,000 |
| 1987 | 215,000,000 | 159,000,000 | 78,000,000 | 23,000,000 | 12,000,000 |
| 1988 | 185,000,000 | 176,000,000 | 121,000,000 | 33,000,000 | 10,000,000 |
| 1989 | 262,000,000 | 351,000,000 | 58,000,000 | 30,000,000 | 10,000,000 |
| 1990 | 309,000,000 | 265,000,000 | 58,000,000 | 33,000,000 | 10,000,000 |

British Columbia's Hunter, early in 1990, told salmon farmers in Norway that Alaska commercial catches would continue to grow during the coming decade. He predicted catches expanding by 20 to 25 percent by 2000. An economic model paid for by the Prince William Sound Aquaculture Association predicted increased salmon harvests of 10 to 20 percent from 1990 through 1998. That model was constructed by the Alaska Department of Fish and Game and the University of Alaska.

Canada

The harvest of wild and ranched Pacific salmon in Canada occurs along the coast of British Columbia. Generally, landings are differentiated along the coast by geographic areas: Queen Charlotte Islands; North Coast; West Coast of Vancouver Island; and the South Coast. Small amounts of salmon are harvested in Northern British Columbia in river systems that flow into Southeast Alaska (the Taku and Stikine Rivers).

The impact of hatchery-raised fish contributing to the commercial catch is much more limited than in Alaska or Japan where salmon ranching is much more developed.

During the mid-1970s, Canadian salmon harvests averaged about 123 million pounds per year (1974-1977). No harvest during that period exceeded 145 million pounds. During the 1980s, salmon harvests ranged from 110 million pounds in 1984 to 236 million pounds in 1985.