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INTERNATIONAL CENTER FOR LIVING  
AQUATIC RESOURCES MANAGEMENT

Title: THE SOUTHERN OCEAN SALMON PROJECT: PHASE III

Number: ICLARM 76/01

Duration: Five Years (1977 - 1981 inclusive)

Executing Agency: The International Center for Living Aquatic  
Resources Management

Counterpart Government Agency: Division Proteccion Pesquera (SAG)

Starting Date: January 1, 1977

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On behalf of the Executing Agency

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On behalf of the Government

Footnote: Phase I is complete  
Phase II is being finalized

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## I. PROJECT SUMMARY AND SUMMARY BUDGET

### The Government of Chile

Project Title: The Southern Ocean Salmon Project - Phase III

Number: ICLARM 76/01

Date of Preparation: September 1976

Proposed Starting Date: January 1, 1977

Proposed Duration: Five years, 1977 - 1981 inclusive

Proposed Government Counterpart Agency: Division Proteccion Pesquera, (SAG)

Support Requested: US\$5,367,365

Proposed Government Counterpart Contribution: Pesos (In kind)

#### A. Background

1. The extensive resources of krill and other small pelagic marine organisms in the Southern Ocean can make a significant contribution to the total world catch of marine products. To benefit from this resource, traditional fishing technology could be complemented by the emerging practice of ocean range management, which is proving effective in the northern hemisphere. The migratory Pacific salmon species, which have been widely transported and introduced and reared and manipulated to a high degree, could prove to be an efficient harvesting tool. They would contribute significantly to any economy when captured because of their high market value.
2. Salmonid species have been introduced randomly into the southern hemisphere before with moderate success. In order to seed the Southern Ocean with salmon, the prevailing ocean direction and current movements necessitate release of the salmon below Latitude 46° South. The natural geography of Chile makes it the most suitable country from which to release the first salmon smolts from a hatchery to be constructed in the Magallanes region.
3. The salmon hatchery will be supplied initially with eggs from the northern hemisphere until the returning adults contribute to the hatchery needs. The smolts will be fed with pelletized feed produced from local resources and later released



into the waters of the Magallanes province from a number of strategically located nursery sites. Returning fish will be trapped using the traditional traps operated for centuries in the northern hemisphere.

4. Because of the diversity of activities involved in the project, from engineering to economics, environmental impacts to oceanographics, and all the needs of the salmon themselves, a large international task force has been assembled to advise on the direction of the project over the five year development stage (Phase III). During the previous two stages (Phase I & II) the task force visited and toured the region extensively with the help of the Armada de Chile and the Fuerza Aerea de Chile. After the visits, they supported the hypothesis that the region could be seeded with salmon if attention was paid to strategic factors of, for example, current patterns, natural food availability, species selection and quality smolt production on a massive scale. The task force also selected the region in the Magallanes for location of the hatchery, subject to biological and engineering confirmation.

## B. The Project

5. The project objectives and activities conform to the national economic development policies and priorities as described by the Oficina de Planificacion Nacional (ODEPLAN) of Chile. The project is intended to assist the Government to strengthen its activities in fisheries development, particularly in the southern area of the country which is in need of improved economies.

6. The project has significant regional and international importance. It will demonstrate, if successful, increased food production from the sea through the manipulation of migratory stocks of desirable fishes. It could also institute the first ocean range management program as a model for the management of such stocks in other parts of the world.

7. The immediate objectives of the project are as follows:

- (i) To introduce selected species of Pacific salmon into the waters of the Southern Ocean from a point below latitude 46° South on the coast of South America, ideally the Magallanes region of Chile.
- (ii) To determine the physical and biological characteristics of the waters in the region to provide a basis for planning and timing of all future hatchery operations and release of smolts into nursery waters.
- (iii) To select an appropriate site and to design a hatchery for the total annual production of 100,000 lb. of released smolt, complete with mooring, power, incubation, rearing and sanitary



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systems, and personnel living quarters if necessary; to review and estimates costs; to design and construct nursery facilities for several other locations.

- (iv) To construct and operate the hatchery.
- (v) To assess probable adaptability of candidate seed stocks from the North Pacific, and to arrange for the purchase and supply of eggs each year to be shipped to the hatchery site in Chile.
- (vi) Rear the imported eggs to prime condition smolts and release into the channels when conditions are most favorable for nursery feeding.
- (vii) To establish in the region the capability for manufacturing the appropriate feeds for the operation of the hatchery and the nursery facilities.
- (viii) To conduct socioeconomic estimates of the impact of the fishery developing in the region, and to monitor the real impacts as they develop to enable the region to draw up plans for future expansion and management.
- (ix) To monitor the environmental impact of introducing an exotic species into the region by observing and recording population changes in fish predators and other fauna.
- (x) Establish and operate in the region a Management Center for evaluating continuously the ecological, social, and economic effects of ocean range use, and for developing and evaluating systems for managing resources.

The project activities will create a new fishery in the region and produce a wide variety of related data which will be used in planning and financing all expansion and future management.

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## C. Financial Data (Five years)

### 1. National Project Staff and Operations

Technical Working Group (290 man months)	391,005
Training, and Resident Field Staff (792 man months)	448,260
Travel and Allowances	152,940
Equipment and Supplies	141,300
Additional Costs (including hatchery construction, egg purchases and the delivery, and food for smolts)	<u>3,117,500</u>
Total	4,251,500

### 2. Consultants and Operations

Consultants (13) - (1,534 days)	299,700
Travel and Expenses (60 trips)	156,500
Staff Support and Supplies	<u>27,500</u>
Total	483,700

### 3. Ex-Patriate Staff and Operations

Project Manager and Staff	373,370
Communications, Publications and Supplies	55,280
Travel and Expenses	93,500
Emergency Fund	<u>110,510</u>
Total	632,660

### 4. Government Contributions\*\*

Project Director and Staff	
Administrative Staff	
General Supplies	
Buildings and Utilities	
Operations	
Travel and Allowances	
Total	

GRAND TOTAL

\*\* Excluding logistical support by Armada and Fuerza Aerea de Chile.



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## II. BACKGROUND AND SUPPORTING INFORMATION

### A. Justification for the Project

1. The Southern Ocean has the potential for contributing significantly to the annual world catch of fish which now stands at around 70 million metric tons per annum. Its resources are presently unexploited yet there is an immediate need for international agreement to regulate harvests and to set precedents for future management of the offshore fisheries.
2. Vast resources of krill exist in the waters of the Southern Ocean and there are strong international interests for their exploitation through the traditional fishing methods of harvesting. Interest in catching krill is not only confined to those seven nations which have territorial claims in the Antarctic continent. Resources exist beyond the 200-mile limit and are therefore in international waters. At least twelve nations have claimed the right to exercise jurisdiction in Antarctica under the Antarctic Treaty for peaceful uses only.
3. The reasons for the renewed interests in the exploitation of the Antarctic krill are the effects of recent changes to international fishing rights within 200-mile territorial waters, compelling a search for new offshore resources, and the size of the fishery estimated by some to be as high as 5 billion metric tons. A fraction of this total would make a significant contribution to world protein production in whatever form.
4. The present practice for harvesting krill is the traditional technology of off-shore trawling, and at least six nations have made exploratory cruises through the Southern Ocean waters. Antarctic waters are inhospitable places and the trawlers have to be large and powerful vessels to drag the fine nets. Krill also deteriorate rapidly once caught unless processed quickly. Consequently, mechanical harvesting is expensive and unlikely to be economic unless significant catches above 50 tons per vessel per day can be maintained.
5. The strategy proposed by the project is to seed the Southern Ocean with species of the Pacific salmon. These highly desirable fish would feed on the krill, and because of their migratory behavior, would lend themselves to enhancement and management programs from a number of suitable land bases. Losses of krill by conversion to salmon flesh would be more than compensated by the lower capital investment for hatcheries and traps compared with trawler factory ships and high running costs.



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6. The Pacific salmon have been selected as predators of krill because of their highly predictable migratory behavior and the existence of reliable rearing technology. These factors combine to make them readily susceptible to management.
7. Salmonids are not native to the Southern Hemisphere and, except for small stocks of salmon and sea-run trout introduced into New Zealand, Chile, and Tasmania, do not occur in significant numbers. However, the abundance of krill in the waters of the Southern Ocean, of demersal and pelagic galatheid crabs in the channels of the southern region of South America, and of the great volumes of fresh-water runoff from the continent mingling with the West Wind Drift and Falkland Current System, all combine to generate conditions that should make the Southern Ocean ideal range for salmon. The size and vigor of transplanted sea-run trout near the Strait of Magellan testify to the fitness of that environment for salmonid species.
8. Salmon fisheries could be generated in the sub-Antarctic regions by carefully chosen and timed large-scale introductions like those successfully undertaken by the Americans in the Great Lakes, the Russians in the Berents Sea, and the Norwegians along their extensive coastline. Since the fishery would develop on virgin stocks, there would be no established precedents or special interests to inhibit the development of an international system for rational management of the new salmon range in the Southern Ocean.
9. The key to the successful migration of salmon into the Southern Ocean would be the careful seeding of appropriate stocks from sites that would take advantage of the West Wind Drift. This westerly current is intercepted by the coast of Chile where it diverges north and south along the South American coastline. The point of divergence shifts seasonally but seems to lie between latitudes 35° and 45° South. Seaward migrating salmon released south of a latitude 46° South would be carried by the current into the cold highly productive waters of the region around the Antarctic Convergence.
10. The most suitable launching sites proposed for the first massive injections of young salmon into the system are the extensive fjords of Southern Chile, preferably close to the Magallanes region. The region is superb geographically and biologically, and typifies the salmon environment of the Northern Hemisphere. Other bases for Southern Ocean salmon introductions could be developed later in New Zealand, Argentina, the Falkland Islands, and possibly the Kerguelen Islands. However, environmental advantages and favorable logistics both point clearly to southern Chile as the best location for the first introductions.

## B. Project Framework

The Division Proteccion Pesquera, Servicio Agricola y Ganadero (SAG), Ministerio de Agricultura, will be the lead cooperating agency in Chile. The

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Division has been authorized by the Government to be responsible for the development and management of all freshwater and saltwater salmonid fisheries.

National experts will be utilized in all excerpts of the program through a counterpart Technical Working Group led by the Project Director or his delegate. These scientific and technical experts from Chile will be drawn from the Instituto de Fomento Pesquero (IFOP); the Corporation Nacional Forestal (CONAF); Universidad de Chile (UC); Universidad Catolica de Valparaiso (UCV); Instituto de Biologia Marina; Instituto de la Patagonia; and other similar organizations.

Additional expertise will be sought from government agencies involved in the development of fisheries programs; for example, the Comision Nacional de Investigacion Cientifica y Tecnologica (CONICYT); Consejo Nacional para la Alimentacion y Nutrition (CONPAN); and the Corporacion de Fomento de la Produccion (CORFO).

The project will also work closely with the Armada de Chile; the Instituto Hidrografico de la Armada; and the Fuerza Aerea de Chile.

## C. Provision of Government Support

During the project, the Government of Chile will continue to maintain its high level of technical and logistical support. This will be needed for all planning phases, site selection activities, construction, operation and management of plants. All plant will be operated by the Division Proteccion Pesquera (SAG), Ministerio de Agricultura; and related subprojects and research will be conducted through the Technical Working Group of national experts.

The Division Proteccion Pesquera will continue and upgrade its training programs in salmon technology at its various facilities, but particularly at the hatchery in Coyhaique, Aysen Province.

## D. Other Related Activities

The project will cooperate with other bilateral and multilateral agencies and assistance projects in the region concerned with rural development, economic development, and nutrition; for example, U. S. Agency for International Development projects with the Consejo Nacional para la Alimentation y Nutrition; the Japanese International Cooperation Agency with Division Proteccion Pesquera; and the regional and national projects of the United Nations Development Programme.

## E. Future Assistance

Assistance will continue to be requested from the International Center for Living Aquatic Resources Management, and other agencies such as the United



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Nations Development Programme, the U. S. Agency for International Development and respective development agencies of Japan, Norway, and Germany, for the expansion of the project into Phase IV (1982-86). Aid would also be required to increase training, and eventually to establish an International Regional Management Center for the overall regulation and management of the resources of the salmon fisheries of the Southern Ocean.

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## III. OBJECTIVES OF THE PROJECT

### A. Long-Range Objectives

The project objectives are both regional and national in scope. This long-range objectives are as follows:

- (i) Increase food production from the Southern Ocean through the manipulation of migratory stocks of desirable food fishes,
- (ii) Enhance economic development in the region,
- (iii) Institute the first ocean range management program as a model for the management of salmon stocks and other migratory fishes.

### B. Immediate Objectives - Phase III

The immediate objectives of the project Phase III are as follows:

- (i) To introduce selected species of Pacific salmon into the waters of the Southern Ocean from a point below latitude 46° South on the coast of South America, ideally the Magallanes region of Chile.
- (ii) To determine the physical and biological characteristics of the waters in the region to provide a basis for planning and timing of all future hatchery operations and release of smolts into nursery waters.
- (iii) To select an appropriate site and to design a hatchery for the total annual production of 100,000 lb. of released smolt, complete with mooring, power, incubation, rearing and sanitary systems, and personnel living quarters if necessary; to review and estimates costs; to design and construct nursery facilities for several other locations.
- (iv) To construct and operate the hatchery.
- (v) To assess probable adaptability of candidate seed stocks from the North Pacific, and to arrange for the purchase and supply of eggs each year to be shipped to the hatchery site in Chile.



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- (vi) Rear the imported eggs to prime condition smolts and release into the channels when conditions are most favorable for nursery feeding.
- (vii) To establish in the region the capability for manufacturing the appropriate feeds for the operation of the hatchery and the nursery facilities.
- (viii) To conduct socioeconomic estimates of the impact of the fishery developing in the region, and to monitor the real impacts as they develop to enable the region to draw up plans for future expansion and management.
- (ix) To monitor the environmental impact of introducing an exotic species into the region by observing and recording population changes in fish predators and other fauna.
- (x) Establish and operate in the region a Management Center for evaluating continuously the ecological, social, and economic effects of ocean range use, and for developing and evaluating systems for managing resources.

The project activities will create a new fishery in the region and produce a wide variety of related data which will be used in planning and financing all expansion and future management.

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## IV. PROJECT ACTIVITIES

### PLACE & TIME

#### A. Description of National Inputs

##### 1. Prerequisites

Preparatory work to be carried out by the Government counterpart agency (Division Proteccion Pesquera, SAG) to ensure the timely implementation of the project.

- |  |                           |           |
|--|---------------------------|-----------|
| (i) The Division will set up an office as a national center for the project.   | Santiago                  | Jan. 1977 |
| (ii) The Division will set up a regional office as a center for administration and project management.   | Punta Arenas              | Jan. 1977 |
| (iii) The Division will appoint senior persons as Project Director and Assistant Director.   | Santiago                  | Jan. 1977 |
| (iv) The Division will appoint an Administrative Aid to coordinate work through the regional office and to structure a system for the purchase and delivery of all equipment and supplies as specified by the project.   | Punta Arenas              | Jan. 1977 |
| (v) The Division will use whatever resources of its own are needed to acquire the property, land, access to coastal areas, and rights for all facilities needed and specified by the project as necessary.   | Santiago/<br>Punta Arenas | Jan. 1977 |
| (vi) The Division will lead the coordination and formulation of a national plan for the future management of all salmonid fisheries, and then lead in developing international use of the Southern Ocean resources for salmonid fishes through management. It will then interface the project with these national and international plans. | Santiago                  | Jan. 1977 |



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### 2. Administration and Organization

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| (i) The Division will recruit and assign the necessary administrative and organizational support for the Project Director, Administrative Aid, including administrative officers, mechanics, drivers, secretarial, and clerical workers. | Santiago/<br>Punta Arenas | Jan. 1977 |
| (ii) The Division will ensure that the offices are maintained and provided with utilities.   | Santiago/<br>Punta Arenas | Jan. 1977 |

### 3. Subcontracts

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|---|---------------------------|------------|
| (i) The Project Director and the Division will conduct or employ a counterpart Technical Working Group of national experts, and employ Resident Field Staff to conduct work specified by the Task Force of consultants under Objectives of Section 4 which follows. | Santiago                  | Jan. 1977  |
| (ii) The Project Director and the Division will undertake the nomination, and arrange the Fellowship and Awards, for prospective candidates to be Resident Field Staff following training abroad.   | Santiago/<br>Punta Arenas | Sept. 1977 |

### 4. Inputs Related to Immediate Objectives (not in order of priority)

Objective #1: To select an appropriate site for a 10 million smolt hatchery and to design the facility.

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|---|----------------------|------------|
| (i) Conduct final site surveys with consultant engineers and experts.               | Magallanes           | Sept. 1977 |
| (ii) Finalize site selection following land surveyors' and soil engineer's reports. | Seattle/<br>Santiago | Dec. 1977  |
| (iii) Prepare preliminary design plans for the hatchery.                            | Seattle/<br>Hawaii   | Sept. 1977 |
| (iv) Prepare hatchery operation plans.  | Seattle/<br>Hawaii   | Jan. 1977  |

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| (v) Review preliminary design plans and prepare the construction plans.   | Santiago                  | Jan. 1978 |
| (vi) Obtain all necessary permits for land use, water use, discharge of wastes, environmental impacts, land ownership, rights of access, titles, and deeds. | Punta Arenas/<br>Santiago | Jan. 1978 |
| (vii) Finalize cost estimates and write the contract form.  | Punta Arenas/<br>Santiago | Jan. 1978 |
| (viii) Contract for sealed bid.   | Punta Arenas              | Aug. 1978 |

Objective #2: To construct the proposed hatchery at the selected site with all the appropriate supporting facilities.

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|--|---------------------------|------------|
| (i) Select the contractor from responses to sealed bids.                                       | Punta Arenas/<br>Santiago | Aug. 1978  |
| (ii) Contractor to commence construction, complete and test-run all facilities and components. | Magallanes                | Sept. 1978 |

Objective #3: To operate the hatchery and produce smolts of different salmon species as desired with a target of up to 100,000 lb. of released smolt.

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|---|---|------------|
| (i) Recruit and train technical staff and hatchery operators for the project as early as possible.                                  | Punta Arenas/<br>Aysen/Santiago/<br>Seattle | June 1978  |
| (ii) Negotiate salmon egg supply from hatcheries on specific rivers in the Northern Hemisphere as directed by the Task Force.       | Santiago/<br>Seattle/<br>Hawaii             | April 1978 |
| (iii) Negotiate transportation through a collective point in the State of Washington where the eggs will be held over if necessary. | Santiago/<br>Seattle                        | April 1978 |



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| (iv) Transport eggs to the hatchery site, incubate and rear smolts.   | Seattle/Santiago/<br>Punta Arenas/<br>Magallanes | Nov. 1978 |
| (v) Organize releases from the selected nursery facilities located throughout the region, and plan sampling programs. | Magallanes/<br>Seattle                           | July 1979 |

Objective #4: To trap and record the returning adults, and obtain eggs for supply to the hatchery for subsequent rearing to smolts and release.

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|--|-------------------------------|-----------|
| (i) Design fish traps using traditional methods employed by the early salmon fishers of the Northern Hemisphere. | Seattle/Hawaii/<br>Magallanes | Jan. 1980 |
| (ii) Construct and locate traps in specified places.   | Magallanes                    | Oct. 1980 |
| (iii) Recruit and train manpower for seasonal use.   | Punta Arenas                  | June 1980 |
| (iv) Establish data bank of all returns, species morphometrics, fecundity.                                       | Santiago                      | Jan. 1981 |

Objective #5: To determine the physical, chemical and biological characteristics of the waters for the hatchery, and of the watersheds in the regions where the smolts will be released.

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|--|---------------------------|-----------|
| (i) Conduct systematic monthly sampling of automatic hydrographic and atmospheric monitors.  | Magallanes                | Jan. 1977 |
| (ii) Research all background hydrographic, hydrometric, meteorologic, and geographic data for the region.                            | Punta Arenas/<br>Santiago | Jan. 1977 |
| (iii) Describe all available aquatic food resources and seasonal variations of zooplankton in watersheds adjacent to release points. | Magallanes                | Jan. 1977 |

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| (iv) Collect and collate all data and deposit records with data bank. | Punta Arenas/<br>Santiago | Jan. 1977 |
|---|---------------------------|-----------|

Objective #6: To establish in the region the capability of producing artificial feed for salmon smolts.

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|--|--------------------------|------------|
| (i) Survey local resources of waste products for components of feedstuffs and costs. | Punta Arenas<br>Seattle  | Oct. 1977  |
| (ii) Formulate diets for smolts and compound diets.                                  | Punta Arenas/<br>Seattle | Jan. 1978  |
| (iii) Test diets and contact local producers.  | Punta Arenas/<br>Seattle | April 1978 |
| (iv) Annual production and delivery of pellets as specified (about 200,000 lb.)      | Punta Arenas             | Jan. 1977  |

Objective #7: To conduct socioeconomic evaluations of the impact of a sizeable fishery in the region to other fisheries, to national and international food industries, and to the local population; and to monitor events continuously.

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|---|-----------------------------------|-----------|
| (i) Evaluation of project effects in the region for scale of operation and with time. | Punta Arenas/<br>Santiago/Seattle | Jan. 1977 |
| (ii) Market planning and evaluation for projections of scale with time.               | Seattle                           | Jan. 1977 |
| (iii) Evaluation of project effects among related fishing and feed industries.        | Seattle                           | Jan. 1977 |

Objective #8: To determine the environmental impacts of introducing an exotic species into the waters of the region and the Southern Ocean.

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|---|---------------------------|-----------|
| (i) Conduct baseline research on the numbers and extent of aquatic animals likely to be affected by the introduction of the salmon. | Punta Arenas/<br>Santiago | Jan. 1978 |
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| (ii) Collect and collate all data and deposit records with the data bank. | Punta Arenas/<br>Santiago | Jan. 1978 |
| (iii) Monitor the region continuously.                                    | Punta Arenas              | Jan. 1978 |

Objective #9: To maintain all the necessary logistical support and supply lines needed by consultants and committee.

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|---|--|-----------|
| (i) Supply all expendable items of field instruments, tools, sampling equipment, and laboratory needs.          | Magallanes/<br>Punta Arenas/<br>Santiago | Jan. 1977 |
| (ii) Supply the nonexpendable items of vehicle and trailers, boats, weather station, and technical instruments. | Punta Arenas/<br>Santiago                | Jan. 1977 |
| (iii) Provide training materials, office equipment, and supplies.   | Santiago                                 | Jan. 1977 |
| (iv) Maintain all communications and utilities.   | Santiago                                 | Jan. 1977 |
| (v) Provide travel and per diem expenses for national staff.  | Santiago                                 | Jan. 1977 |
| (vi) Maintain a contingency for emergency use at the discretion of the Project Director.                        | Santiago                                 | Jan. 1977 |

## B. Description of Executing Agency Inputs

### 1. Prerequisites

Preparatory work to be carried out by the Executing Agency (ICLARM) to ensure the timely implementation of the project.

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| (i) ICLARM will appoint a Project Manager from its staff to be responsible for the coordination and management of the project on behalf of the Executing Agency. | Hawaii/<br>Santiago | Phase I |
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| (ii) ICLARM will assemble a Task Force of international consultants capable of responding to all the elements demanded by the project, and nominate one of its members as the Technical Team-leader.                           | Hawaii/<br>Seattle              | Phase I   |
| (iii) ICLARM will develop the Technical Project Documents and schedule the initial work plans during project development.  | Hawaii                          | Phase II  |
| (iv) ICLARM will undertake initial project development funding, disburse the funds, and assist the Government in obtaining major funding support for the project.  | Hawaii/<br>Santiago             | Phase II  |
| (v) Through ICLARM, the consultants will prepare detailed subprojects for attaining their specified objectives, and advise on the collection and collation of all data.  | Hawaii/<br>Seattle/<br>Santiago | Phase II  |
| (vi) ICLARM will support the development of any national and international management plans for a salmonid fishery in the Southern Ocean and relate to these plans to other management projects through information exchanges. | Hawaii/<br>Santiago             | Jan. 1977 |
2. Assignment of International Staff
- |  |        |         |
|--|--------|---------|
| (i) The Project Manager of ICLARM will be responsible for coordinating all program elements, general administration of the project, and disbursing funds specified by the project schedule; and liaison with the host Government, the Project Director and funding agencies. | Hawaii | Phase I |
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- (ii) **Technical Team Leader.** Seattle Phase I  
Selected from the Task Force of international consultants with wide experience in salmon technologies and fisheries management principles. Responsible for the coordinated technical inputs of the consultants and advising the Project Director, and counterpart Working Group on technical matters.
- (iii) **Task Force Consultants** Phase II  
Selected from international experts in the fields of salmon technologies and the related sciences to include production experts, hatchery engineers, hydrologists, oceanographers, biological oceanographers, fish pathologists, nutritionists, economists, environmental biologists, geneticists, and members of the industry associated with salmon fisheries. Responsible, through visits to the region when necessary, for designing and overseeing subprojects of their specialty within the overall project, reviewing all plans and data and responding to the requests of the Project Director, through the Technical Team-leader.
3. Provision for Training
- (i) **Fisheries Biologist (six positions)** Seattle June 1978  
Nominated by the national executing agency for training overseas under International Fellowship agreements to specialize in the handling and rearing of salmon, preferably at hatcheries under the authority of a Task Force member.
- (ii) **Fishermen (two positions)** Seattle June 1979  
Nominated by the national executing agency for vocational training where appropriate under International Training Awards to specialize in trapping and handling salmon.

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### C. Description of National Inputs in Kind

#### 1. Prerequisites

Preparatory work to be carried out (or already accomplished during Phase I and II) by the Government to ensure the timely implementation of the project.

(i) The Government will support the Project Director through all the Project Development Phase.	Santiago	Phase I & II
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(ii) The Government will nominate the Division Proteccion Pesquera (SAG) to be the executive lead agency representing the Government.	Santiago	Jan. 1977
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#### 2. Project Follow-up

(i) The Government will encourage the Division Proteccion Pesquera (SAG) to develop a National Fisheries Management Plan for Salmonids.	Santiago	Jan. 1977
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(ii) The Government will investigate international discussion for the formulation of an International Management Plan for the Salmonid Fishery of the Southern Ocean through an International Salmon Management Center located in South America.	Santiago	Jan. 1977
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# DRAFT

## V. BUDGET

### A. National Project Staff and Operations (In US \$ )

	1977	1978	1979	1980	1981	Totals
1. Technical Working Group						
Salary support	37,200	69,300	83,475	95,910	105,120	391,005
Man months	31	55	63	69	72	290
2. Training and Resident Field						
Staff Salary support	24,000	69,300	112,404	118,320	124,236	448,260
Man months	48	132	204	204	204	792
3. Travel and Allowances	16,200	41,735	43,955	24,555	26,495	152,940
4. Equipment & Supplies *	64,700	37,500	19,100	9,700	10,300	141,300
5. Additional Costs **	31,000	731,500	1,772,500	282,500	300,000	3,117,500
Grand Totals	173,100	949,335	2,031,434	530,985	566,151	4,251,005

Footnotes \* & \*\* : See itemized lists on pp 21 and 22

# DRAFT

## Section A Continued : Notes to Budget for National Project Staff and Operations

### Item # 4 : Equipment & Supplies

	1977	1978	1979	1980	1981
a) Weather station and instruments	15,000				
b) Hydrolaboratory (2)	16,000				
c) Zodiac boat and outboard	4,200				
d) Trawls and nets	800				
e) Productivity instruments	1,300				
f) Portable deck laboratory	1,500				
g) Echo sounder	2,600				
h) Winch and frame	5,300				
i) Ship modifications	10,000				
j) Hand instruments for fieldwork	1,000	1,000	600		
k) Fuel and maintenance shops	2,000	2,500	3,000	3,500	4,000
l) Laboratory instruments	5,000	5,000	500	1,700	550
m) Satellite recall stations (2) **		10,000	10,000		
n) Environmental impact apparatus		7,500	2,000		
o) General supplies and glassware		1,000	2,500	3,000	4,000
p) Printing and copying		500	500	1,500	1,750
q) Feed preparation equipment		10,000			
Sub-totals	64,700	37,500	19,100	9,700	10,300
				Total	141,300

Footnote \*\* If relevant to region and available



# DRAFT

## Section A Continued : Notes to Budget for National Project Staff and Operations

Item # 5 : Additional Costs	1977	1978	1979	1980	1981
a) Surveyor's report, and project development contract for hatchery construction	16,000				
b) Hatchery construction plans		40,000			
c) Hatchery construction		500,000	1,500,000		
d) Egg purchases		110,000	120,000	130,000	140,000
e) Egg delivery costs		55,000	60,000	65,000	70,000
f) Egg holding in US		25,000	27,500	30,000	32,500
g) Feed for smolts			50,000	52,500	55,000
h) Vehicle, boat & trailer	15,000	1,500	15,000	5,000	2,500
Sub-totals	31,000	731,500	1,772,500	282,500	300,000
			Total	3,117,500	

# DRAFT

## B. Consultants and Operations (In US \$ )

	1977	1978	1979	1980	1981	Totals
1. Consultants (13)						
Consultancy fees	46,500	74,025	54,400	67,275	57,500	299,700
Total man days	310	423	272	299	230	1534
2. Travel and Expenses	22,000	32,500	30,000	42,000	30,000	156,500
Trips to Chile	11	13	12	14	10	60
3. Staff support & supplies	500	25,000	500	500	1,000	27,500
Grand Totals	69,000	131,525	84,900	109,775	88,500	483,700

# DRAFT

## C. Ex-patriate Staff, and Operational Expenses (In US \$ )

	1977	1978	1979	1980	1981	Totals
Project Manager	24,000	50,400	52,460	55,560	58,340	240,760
Assistant (Santiago)	20,000	21,000	22,050	23,150	24,310	110,510
Clerical support	4,000	4,200	4,410	4,630	4,860	22,100
Communications	6,000	6,300	6,620	6,950	7,290	33,160
Copying & printing	2,000	2,100	2,210	2,320	2,430	11,060
General supplies	2,000	2,100	2,210	2,320	2,430	11,060
Travel & expenses	16,000	17,500	20,000	20,000	20,000	93,500
Emergency fund	20,000	21,000	22,500	23,150	24,310	110,510
Grand Totals	94,000	124,600	132,010	138,080	143,970	632,660



# DRAFT

## D. Government Contributions \*\*

	1977	1978	1979	1980	1981	Totals
1. Project Director and Staff						
2. Administrative Staff						
3. General Supplies						
4. Buildings and Utilities						
5. Operations						
6. Travel and Allowances						
Grand Totals						

Footnote \*\* : Excluding the logistical support from the Armada de Chile, and the Fuerza Aerea de Chile

# DRAFT

E. Summary Budget of Sections A - D inclusive (In US \$ )

	1977	1978	1979	1980	1981	Totals
A. National Project Staff & Operations	173,100	949,335	2,031,434	530,985	566,151	4,251,005
B. Consultants and Operations	69,000	131,525	84,900	109,775	88,500	483,700
C. Ex-patriate Staff & Operations	94,000	124,600	132,010	138,080	143,970	632,660
Project Funding Requested	336,100	1,205,460	2,248,344	778,840	798,621	<u>5,367,365</u>
D. Government Contribution						
TOTAL PROJECT FUNDING						

# DRAFT

## VI. OPERATIONAL FLOW CHARTS

### A. Project Counterpart Staff, Working Group & Training

	1977	1978	1979	1980	1981	Man Months
1. Project Director & Staff (Santiago)	****	****	****	****	****	
Administrative Aid (Punta Arenas)	****	****	****	****	****	
2. Technical Working Group						
Engineer		****	****	****	****	48
Hatchery Manager		**	**	**	**	24
Gear Technologist				**	****	18
Plantologist	**	**	**	**	**	30
Hydrobiologist	**	**	**	**	**	30
Food Technologist	**	**	****	****	****	44
Economist	**	**	*	*	*	15
Marine Biologist		**	**	**	**	24
Geographer		**	**	**	**	24
Marine Mammologist		**	**	**	**	24
3. Training and Resident Field Staff						
Engineer (1)			****	****	****	36
Hatchery Assistants (6)		****	****	****	****	264
Gear Technologists (2)			****	****	****	72
Field Biologists (4)	****	****	****	****	****	240
Food Technologists (1)			****	****	****	36
Environmentalists (3)		****	****	****	****	144

(\* = 3 months)



# DRAFT

## B. Consultant Support, and Operations

	1977	1978	1979	1980	1981
Joyner	*+**	*+**	*+**	*+**	*+**
Bienfang	*+	*+ *	*+ *	*+	*+
Calaprice		++	+	+**	+*
Combs	*+**	*+*	*+	*+	*+
Mahnken	*+**	*+ *	++	++	
Mayo	+**	++*	++*	++*	++*
McNeil		++	*	*+	+**
Novotny		++	*	*+	+**
Perrera	*+	++ *	++	++*	++**
Rothwell	*+**	*+**	*+**	++*	++
Senn		++	++*	*+**	+**
Spencer	+**	++**	++**	++**	+
Spinelli	*+**	*+**	*+	*+	+
Wood		++	++	*+	+**
Total field trips	( 11)	( 13)	( 12)	( 14)	( 10)
Total man days	(310)	(423)	(272)	(299)	(230)

Legend: \* = Field trips to Chile (Punta Arenas)  
+ = Home base support

C. List of Consultants

1. Technical Team Leader

T. Joyner Ph. D.	Oceanography	International Aquaculture Consultancy, Seattle
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2. General Consultants

P. K. Bienfang	Bio-oceanography (Phytoplankton)	Oceanic Institute Hawaii
J. R. Calaprice Ph. D.	Genetics	University of California Santa Barbara
E. R. Combs	Economics and Planning	E. R. Combs Seattle, Washington
C. V. W. Mahnken	Bio-oceanography (Zooplankton)	N. M. F. S. (NOAA) Seattle, Washington
R. D. Mayo	Civil and Sanitary Engineering	Kramer, Chin & Mayo Seattle, Washington
W. J. McNeil Ph. D.	Salmon Reproduction	N. M. F. S. (NOAA) Auke Bay, Alaska
C. E. Nash Ph. D.	Fish Culture and Management	Oceanic Institute Hawaii
A. J. Novotny	Salmon Production	N. M. F. S. (NOAA) Seattle, Washington
W. T. Pereyra Ph. D.	Gear Technology	N. M. F. S. (NOAA) Seattle, Washington
G. N. Rothwell	Structural Engineering	Oceanic Institute Hawaii
H. Senn	Hatchery Management	State Department of Fisheries, Washington
J. B. Spencer	Mechanical Engineering	International Aquaculture Consultancy, Isle of Man

# DRAFT

J. Spinelli

Food Technology

N. M. F. S. (NOAA)  
Seattle, Washington

J. W. Wood

Fish Pathology

State Department of  
Fisheries, Washington

D. Operational Flow Diagram

See Fold-out Figure on the following page.



1977  
1ST PROGRAM YEAR

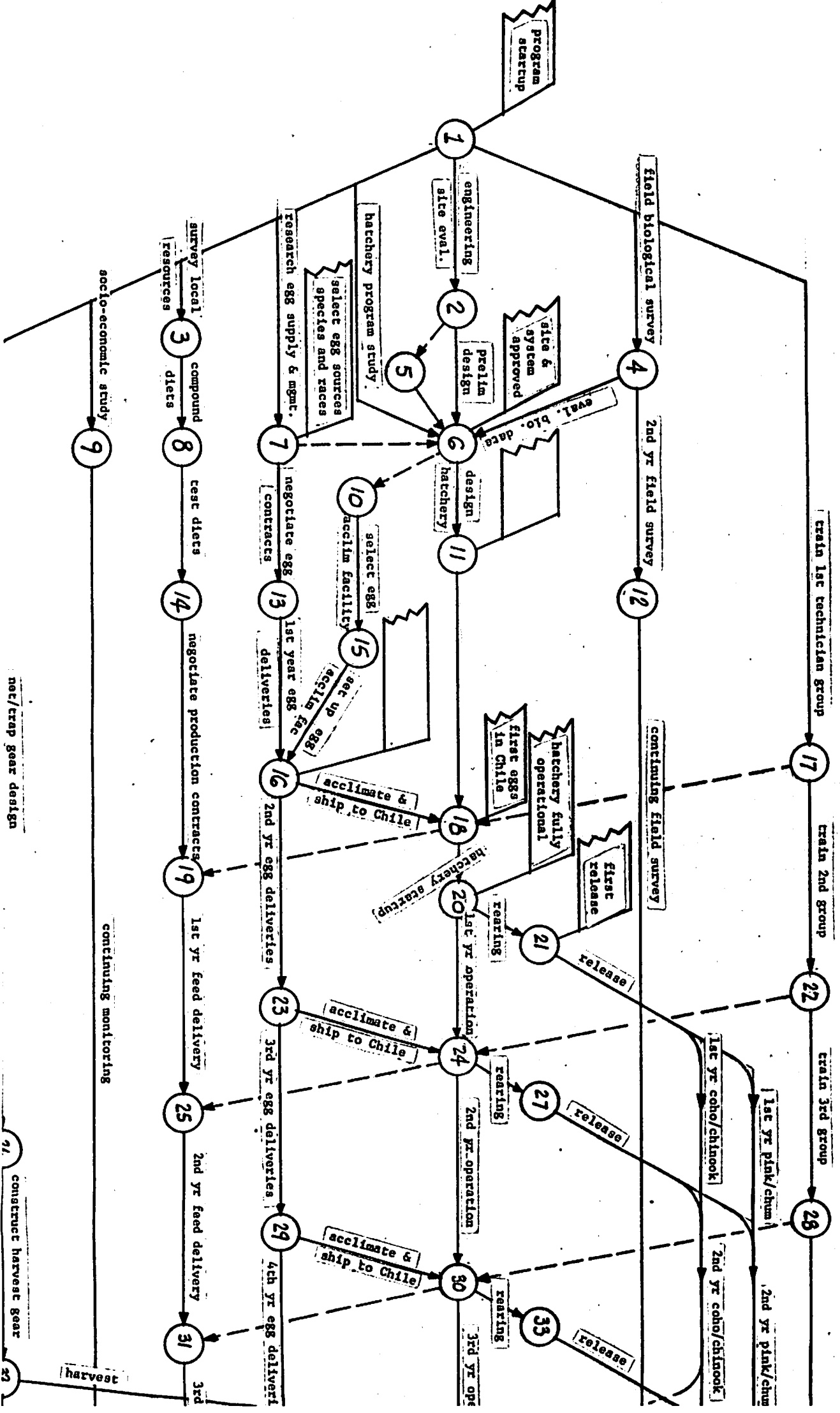
1978  
2ND PROGRAM YEAR

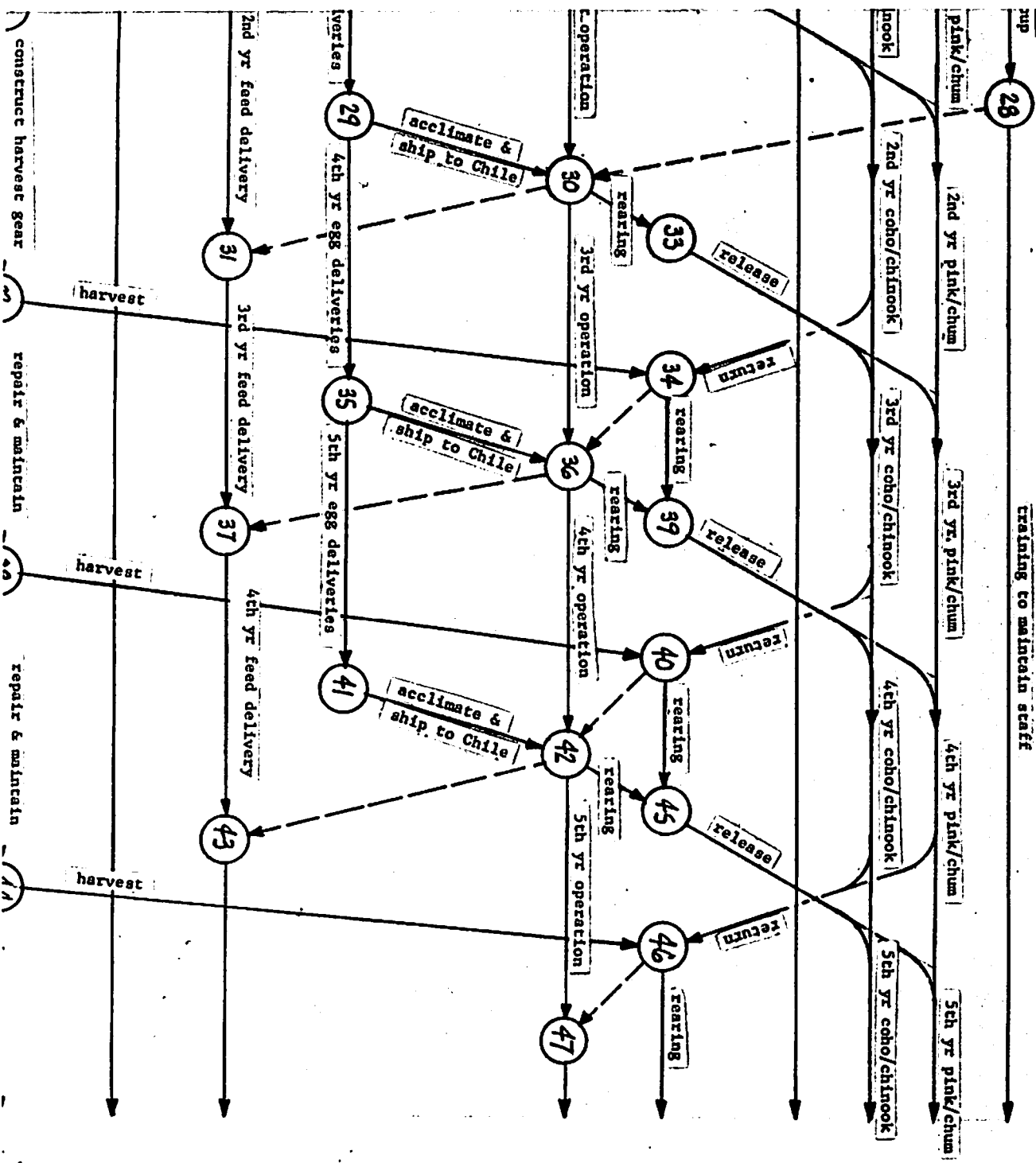
1979  
3RD PROGRAM YEAR

1980  
4TH PROGRAM YEAR

1981  
5TH PROGRAM YEAR

1982  
6TH PROGRAM YEAR





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