Proceedings of the International Pandalid Shrimp Symposium

February 13-15, 1979

Kodiak, Alaska

Sea Grant Report 81-3

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PROCEEDINGS OF THE INTERNATIONAL PANDALID SHRIMP SYMPOSIUM

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February 13-15, 1979

T. Frady
Editor

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Symposium Coordinator

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IN MEMORIAM
BIRGER RASMUSSEN

Dr. Birger Rasmussen died on December 10, 1978. He was 71 years old.

Birger Rasmussen studied marine biology at the College of Fisheries, University of Washington, from 1927 to 1931. He then returned to Norway and joined the Directorate of Fisheries in Bergen and started work on fisheries investigations in arctic waters. In 1938 he participated in an expedition to the Spitsbergen area where extensive material on the deep sea prawn, Pandalus borealis, was collected. Rasmussen analyzed the material and the results were published in 1942. This was the beginning of his research into the biology of the prawn. Several other publications dealing with the deep sea prawn in various fjords and coastal areas in Norway followed. In "On the Geographical Variations in Growth and Sexual Development of the Deep Sea Prawn (Pandalus borealis) Kr.", 1953, he compared material from different prawn populations distributed from southern Norway to the arctic waters of Spitsbergen and Jan Mayen. This study on the biology of the deep sea prawn and especially the variation in growth and sexual development was pioneer research. The results also have implications for management, which Rasmussen recognized in 1958, when he concluded that variation in growth and maturity will influence the productivity and renewal of the stocks and that therefore, the fishing intensity a stock can withstand may vary between prawn fields.

Birger Rasmussen's interests were very wide. He was particularly interested in arctic waters and their living resources. Shellfish, especially the deep sea prawn, continued to be one of his main interests throughout his life. He always took a practical approach to the various problems. In connection with the shrimp fishery, he was especially aware of the possibility of stabilizing or increasing the yield by mesh size regulations and of reducing the by-catch of young fish by making the shrimp trawl more selective.

He fulfilled an increasingly important task as advisor to the fisheries administration and other governmental bodies in Norway on a variety of problems ranging from the effect on the marine life of underwater explosions in connection with seismic investigations to the effect of trawling for seaweed on fish and shellfish. His interest in the shrimp investigations and fisheries did not suffer. He continued to take an active part in these throughout his career, and was always glad of opportunities to discuss the various aspects of shrimp biology and exploitation with his younger colleagues.

Øyvind Ulltang
1979

TABLE OF CONTENTS

FEBRUARY 13, 1979

Research Presentations and Panel Discussions

Current Stock Assessment

Quantitative Year-Class Analysis

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PAGE

Environmental Relations to Pandalid

FEBRUARY 13, 1979

INTRODUCTION
AND
KEYNOTE ADDRESS

WELCOME

Ronald O. Skoog
Commissioner
Alaska Department of Fish and Game
Juneau, Alaska

Fellow fisheries managers, scientists, processors and fishermen. I want to welcome you on the occasion of the convening of this truly international resource workshop. To those of you from outside Alaska and from other countries, special appreciation for your willingness to spend your valuable time to travel the long distance to share your knowledge with us. I have been forced by legislative commitments to remain in Juneau this week or I would have enjoyed being an active participant.

Alaska has a unique relationship to the sea and its resources. With 34,000 miles of shoreline and 547,000 square miles of continental shelf, Alaskans have a bountiful supply of fisheries resources at their doorstep. The relatively small residential population is largely coastal and dependent on commercial and subsistence fisheries to a major degree.

Fishing and related activities are the second largest source of employment in the state. In 1978 over 20,000 fishermen harvested over $800 million worth of fisheries products at a value to them of about $400 million.

This special dependence on renewable fisheries resources makes sound resource management a high priority to Alaskans. The Alaska Department of Fish and Game allocates the efforts of some 130 employees and over $9 million annually to commercial fisheries management and research. Permanent offices are maintained throughout the state and field activities carried out on most major bodies of fresh and salt water. Nevertheless the complexity of the resources managed coupled with the vast size of the state and our offshore areas results in many gaps in the knowledge required to manage these resources for the optimal public benefit.

You have convened to discuss one such problem area. Despite our serious efforts to maintain the Gulf of Alaska, shrimp stocks in the Kodiak Island/Alaska Peninsula area have declined drastically in abundance over the past few years. The reasons for this decline and its remedy are not clearly evident. We hope that by detailing our experiences and program for you and examining your areas of resource expertise, we can arrive at some new and innovative approaches to shrimp research and management. I wish you success in your deliberations over the next few days.

INTRODUCTION

Dayton L. Alverson
Director, Northwest and Alaska Fisheries Center
Seattle, Washington

Welcome to the International Pandalid Shrimp Workshop. This meeting is jointly sponsored by the North Pacific Fishery Management Council, the Alaska Department of Fish and Game, the University of Alaska Sea Grant Program and the National Marine Fisheries Service.

The objective of this workshop will be to review circumpolar pandalid shrimp research and management programs. Recent radical declines of pandalid shrimp in the Gulf of Alaska have prompted this meeting of pandalid specialists. We hope the participants can shed some light on the problems which have occurred worldwide in the attempt to study and optimize the harvest of pandalid shrimp.

The workshop will develop in a sequence of four major topics, beginning today with a worldwide review of catch histories and an overview of research and management. The latter portion of the afternoon and all of tomorrow will be devoted to in-depth discussion of research, including predator-prey relationships, stock assessment techniques, year-class abundance and environmental relationships. The third day will begin with industry panels dealing with the evolution of fishing gear and techniques and constraints of management on shrimp processing and the fishing industry. The remainder of the day will be devoted to the discussion of management strategies. This will include current management strategies and a discussion of their value and alternatives. Management implications of pandalid life history will also be considered. The workshop will conclude with the final panel on the need for management. The chairmen of the previous committees will sit on this panel and discuss the need for management and whether it can be successful with pandalid shrimp.

It is hoped that this workshop will be a mind expanding experience for all participants. In order to fully capitalize on the experience of our international colleagues, we must point out at this time that the focus of the workshop will be on the interactions of panel participants. The objective of this meeting is not to critique the Alaskan experience, but to review the international experience in pandalid shrimp research and management. This will enable everyone to learn from this experience.

We hope this meeting will establish a continuing forum for international pandalid workshops.

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KEYNOTE ADDRESS

A REVIEW OF PANDALID SHRIMP FISHERIES IN THE NORTHERN HEMISPHERE

James W. Balsiger
Northwest and Alaska Fisheries Center
National Marine Fisheries Service
Seattle, Washington

INTRODUCTION

Pandalid shrimps from four genera and some dozen species support fisheries throughout the world, but most of major commercial importance are found in cool, temperate and subarctic waters (Fox 1972). Catches of shrimp of all species, on a world basis, are dominated by those of the family Penaeidae which inhabit the warm, temperate and tropical waters of the world and in recent years have accounted for 85 to 90 percent of the annual world shrimp catch (FAO 1976). However, pandalid shrimps assume great regional importance wherever they are fished in the northern hemisphere, including well documented fisheries along the west coast of North America from California to Alaska, the east coast of North America from Maine to the maritime provinces of Canada, the west coast of Greenland, and in the Norwegian Sea and North Sea. Pandalid fisheries are also found in the northwestern Pacific Ocean, where they are fished by Japan, the Soviet Union, and Korea (Fox 1972), but we have not been able to document their magnitude and historical development. In addition, there are significant pandalid fisheries in the southern hemisphere off Chile and India, but they will not be discussed here.

IMPORTANCE

The growing importance of shrimp in today's fisheries can be demonstrated in two ways: by the production trends of the shrimp fleets, as discussed in later sections, and by examining the role of shrimp in the marketplace.

The determination of demand for and consumption of pandalid shrimp is confounded by the existence of separate product forms and markets for pandalid versus penaeid shrimps. Hemming (1971) observed that two distinct markets exist for the two types of shrimp and that demands and prices in the two markets appear to move independently. Yet, very little information is available in the literature to allow an analysis of pandalid shrimp disposition once it has been processed.

Figure 1 shows that United States annual consumption of all kinds of shrimp has climbed steadily from .9 lbs per capita in 1950 to nearly 2.25 lbs in 1977. Over this same period of time, per capita consumption of all seafoods has remained remarkably stable with some products declining and consumption of others increasing. Increased consumption of any product must be associated with increased supplies. Since 1950, supplies of practically all shellfish species have risen sharply (Whitaker 1971). In the case of shrimp, increased U.S. consumption has been associated with increased imports of penaeid shrimp to the U.S. from South America and Asia. Pandalid shrimp enter the U.S. market primarily as cocktail or salad shrimp (Orth et al. 1978).

GENERAL PRODUCTION TRENDS

All-nation production of seafood has remained very stable from 1970 to 1975 (FAO 1976), with a total annual all-species catch of about 70 million mt (Figure 2). Figure 2 also shows that over the same period of time, the all-nation catch of all shrimp increased approximately 25 percent from nearly 1 million mt in 1970 to 1.25 million mt in 1975. Pandalid shrimp catches were approximately 90,000 mt in 1970 and increased 50 percent to about 135,000 mt in 1975.

Most of the increases in pandalid catches came from the northwest Atlantic, where catches increased from about 21,000 mt in 1970 to 47,000 mt in 1975, and the northeast Pacific, where catches rose from 41,000 mt to 61,000 mt over the same period of time. The increased catches in the northwest Atlantic were shared by several countries (Canada, Faeroe Islands, Norway, Spain and Russia), while the United States accounted for the increases in the northeast Pacific (FAO 1976).

BIOLOGICAL FEATURES

The knowledge of the biology of pandalid shrimp has progressed rapidly since 1930, stimulated by rapidly developing commercial fisheries over a broad geographic area.

Shrimps of the family Pandalidae have the following taxonomic identities:

Phylum Arthropoda
Class Crustacea
Subclass Malacostraca
Order Decopoda
Suborder Natantia
Section Caridea
Family Pandalidae

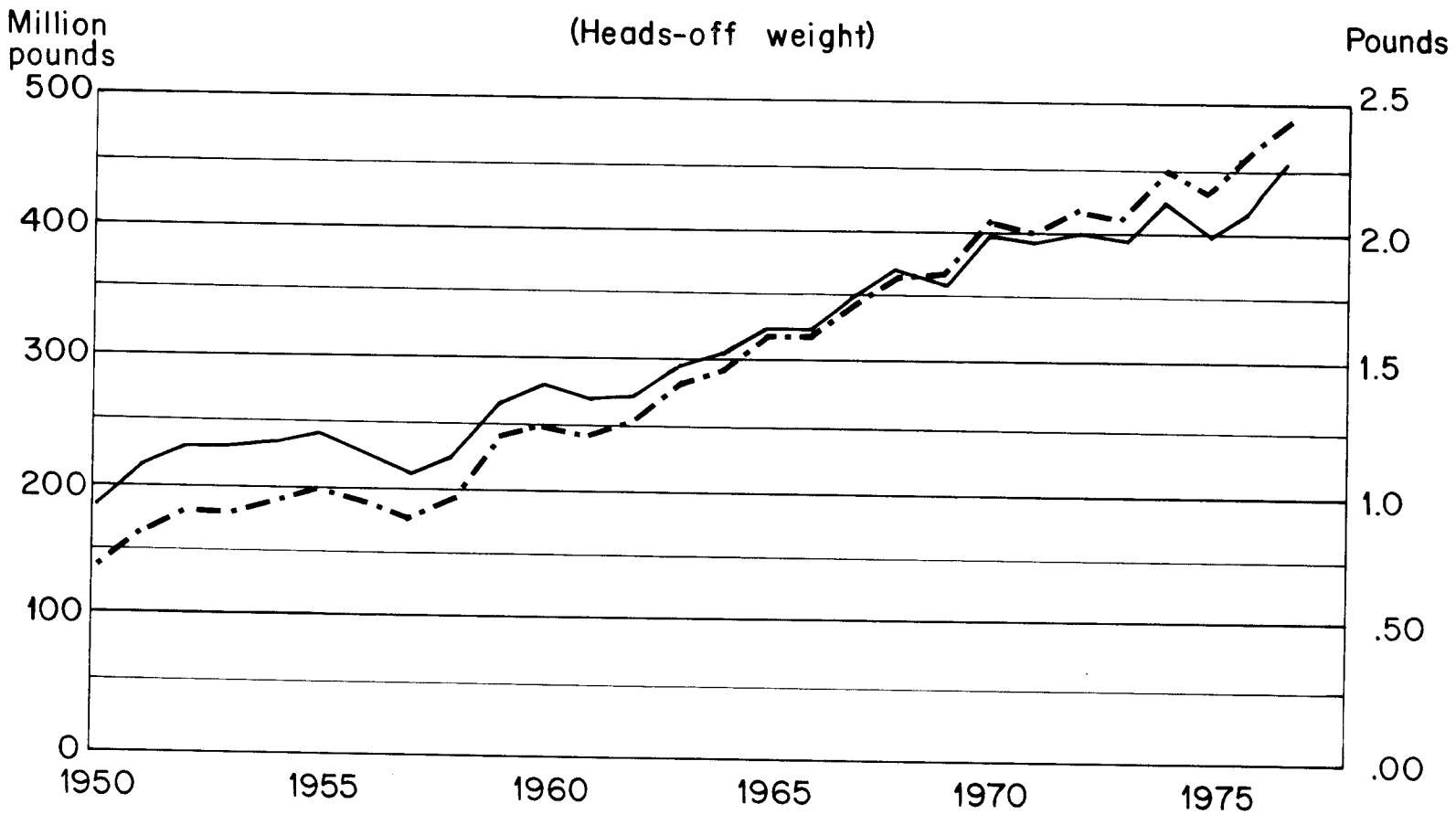

Figure 1. U.S. annual consumption of shrimp. (Whitaker 1971; U.S. Shellfish Market Review and Outlook)

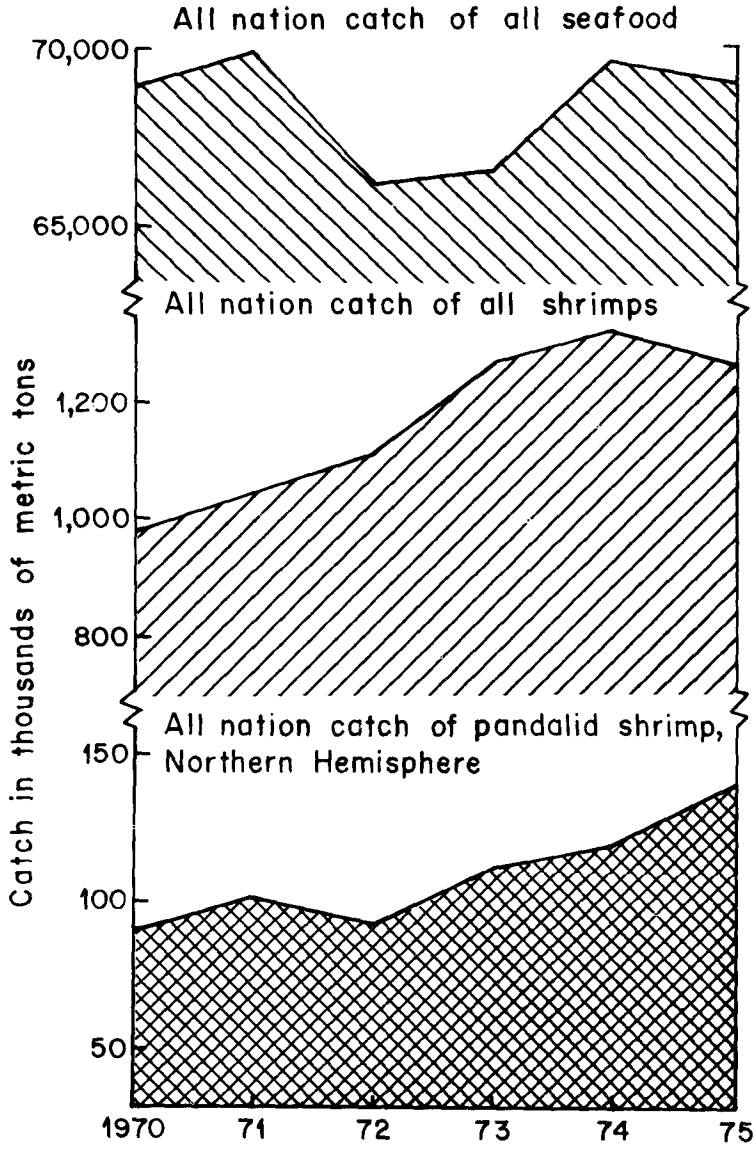

Figure 2. World production of seafood, shrimps and pandalid shrimp. (FAO 1976)

Fox (1972) provides the following table of commercially exploited pandalid shrimps.

SCIENTIFIC NAME	COMMON NAME
Heterocarpus grimaldii Milne-Edwards and Bouvier, 1900	none
H. reedi Bahamonde, 1955	nylon shrimp
Pandalopsis dispar Rathbun, 1902	sidestripe shrimp
Pandalus borealis Krøyer, 1938	Pink shrimp (U.S.A.), Deepwater prawn (Europe)
P. danae Stimpson, 1860	dock shrimp (U.S.A.), coonstripe shrimp (Canada)
P. goniurus Stimpson, 1860	humpy shrimp
P. hypsinotus Brandt, 1851	coonstripe shrimp (U.S.A.) humpback shrimp (Canada)
P. jordani Rathbun, 1902	ocean or smooth Pink shrimp
P. montagui Leach, 1814	Pink shrimp
P. platyceros Brandt, 1851	spot shrimp or prawn
P. prensor Stimpson, 1860	none
Plesionika edwardsii Brandt, 1851	none
P. martia Milne-Edwards, 1883	none

The following descriptions of general distribution of the pandalid species listed above are from Fox (1972), Ronholt (1963), Butler (1964), Wigley (1960), Berkeley (1930), Hancock and Henriquez (1968), NPFMC (1978), Mistakidis (1957).

Heterocarpus grimaldii is fished in the southeastern Atlantic Ocean from the coast of Portugal, the Azores, and along the north and west coasts of Africa as far south as Nigeria.

Heterocarpus reedi is found in the southeastern Pacific Ocean off the coast of Chile between 25° south and 39° south latitude and between 100 and 500 m in depth. Locations of highest abundance are between 29° south and 35° south latitude and at depths of 180 to 200 m. They are generally confined to a bottom of muddy sand, clay, or compacted clay.

Pandalopsis dispar is located from the Bering Sea near the Pribilof Islands to Oregon in depths from 37 to 642 m. The

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