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Scientific papers

INSTRUCTIONS FOR AUTHORS

GENERAL INFORMATION

The Bulletin of the Sea Fisheries Institute is a scientific journal which accepts papers from all over the world. Foreign authors are requested to submit their papers in English, the research staff of the SFI in Polish and authors not associated with the SFI in Polish and English.

Papers submitted to the Bulletin are classified according to the following three categories: 1) scientific papers, 2) short communications, 3) varia.

The Editorial Staff will accept a paper and assign it to one the above categories. Papers accepted for publication in the *Bulletin* may not be published elsewhere. Publication in the *Bulletin* is free of charge.

TYPESCRIPT FORM

Papers should be submitted in two copies of single-sided, double-spaced typescript on A4 paper and a diskette containing all the material in the article must be included. Words to be set in italic type, i.e. Latin names of species and genera, as well as symbols for the values of variables, should be underlined with a wavy line (~~~~~). No other underlineation should be used.

In the papers from categories 1 and 2, the following order is required:

1. **Title**: brief (up to 100 characters).
2. **First and last name of the author** and **the name of the affiliated institution**.
3. An **abstract** must precede every scientific paper, research report and other paper; length – one typewritten page at the most.
4. **Key words**: a few terms which enable a given paper to be found among computer files.
5. **Text.** The length of the typescript of papers from category 1 should not exceed 40 pages, and papers from category 2 – 15 pages. In papers from categories 1 and 2, the traditional division is used: 1) introduction, 2) materials and methods, 3) results, 4) discussion, 5) references. The results of measurements should be given in metric system units and their abbreviations should comply with the International System of Unit (SI).
6. **Acknowledgments** should be limited to the necessary minimum (the initials and the last name of the person they are addressed to, without listing scientific titles or names of institutions).
7. **References** should be put in alphabetical order, with the year of publication directly after the author's name and should list solely the papers referred to in the text. (e.g. Smith 1990). Titles of journals – in full form. Titles of papers – in the original language. The exception is titles in Russian which are in a non-Latin alphabet, such as Cyrilic, which should be translated into either English or Polish.
8. **Footnotes** should be marked with Arabic numerals in superscript (...[1]), and numbered in succession throughout the text, except for tables; footnote content should be on separate sheets of paper.
9. **Tables** should supplement, not duplicate, data contained in the text or figures. Tables should be numbered and each one should be on a separate sheet of paper. All tables must have titles; all references to them should be placed within the text. Each column in a table is supplied with a heading, explaining the content of the column. Footnotes in tables should be marked with letters in italics, in superscript (e. g. Years[a]), and their explanation should be placed under the table.
10. **Figures**. Successive numeration with a reference to each number in the text should be used. Captions must be on a separate sheet of paper. Abbreviations, terms and symbols used in figures must correspond to those used in the text. After scaling, each figure, placed on a separate sheet of paper and marked with a successive number and the author's name, must fit into a column of the *Bulletin*; this should be taken into account by using the appropriate thickness of lines and size of legends in the figures. Only computer generated figures are acceptable. Both a printout and a diskette are required. Papers can be illustrated with photographs in black and white or color. The total content of drawings and photographs must not exceed 30% of the paper.

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WSKAZÓWKI DLA AUTORÓW

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Prace złożone klasyfikowane są według trzech kategorii: 1) artykuły naukowe, 2) noty, 3) varia.

O przyjęciu pracy i zakwalifikowaniu jej do określonej kategorii decyduje Zespół Redakcyjny. Prace przyjęte do druku nie mogą być publikowane w innym czasopiśmie. Publikacja jest bezpłatna.

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Prace należy składać w 2 egzemplarzach maszynopisu pisanego jednostronnie, formatu A4, z podwójnym odstepem (konieczna jest dyskietka z całością materiału). Słowa, które powinny być złożone drukiem pochyłym (kursywą), tzn. łacińskie nazwy gatunków i rodzajów oraz symbole wielkości zmiennych należy podkreślić wężykiem (~~~~~). Innych podkreśleń nie należy stosować.

W pracach kategorii 1 i 2 obowiązuje następująca kolejność:

1. Tytuł: krótki (do 100 znaków).

2. Imię i nazwisko autora oraz **nazwa i adres instytucji macierzystej.**

3. Abstrakt musi poprzedzać każdy artykuł naukowy i notę; objętość – najwyżej 1 strona maszynopisu.

4. Słowa kluczowe: kilka pojęć pozwalających na odszukanie danej pracy w systemach komputerowych.

5. Tekst. Objętość maszynopisu prac kategorii 1 nie powinna przekraczać 40 stron, a kategorii 2 – 15 stron. W pracach kategorii 1 i 2 stosuje się tradycyjny podział: 1) wstęp, 2) materiał i metoda badań, 3) wyniki badań, 4) dyskusja, 5) bibliografia. Wyniki pomiarów należy podawać w jednostkach miar przyjętych w systemie metrycznym, a ich skróty – zgodnie z Międzynarodowym Układem Jednostek Miar (SI).

6. Podziękowania należy ograniczyć do niezbędnego minimum (inicjały imienia i nazwisko osoby, do której są adresowane, bez wymieniania tytułów naukowych i nazw instytucji).

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BULLETIN OF THE SEA FISHERIES INSTITUTE
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Poland and the United States' Cooperation in Fisheries Ecology: A Multidecadal Retrospective

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BACKGROUND

We enter the new millennium with compelling evidence of global environmental degradation. Coastal waters of North America and Europe are being subjected to increased stress from toxic effluents, habitat loss, excessive nutrient loadings, harmful algal blooms, emergent diseases, fallout from aerosol contaminants, and losses of fishery resources from environmental perturbations and overfishing. Excessive fishing effort was responsible for an unprecedented decline in the biomass of demersal and pelagic fish stocks off the northeast coast of the United States in the mid-1970s; the biomass of cod, haddock, and flounder was approximately 50 percent lower than during the previous decade. In recognition of the declining condition of the fish stocks of the U.S. northeast shelf, NOAA's National Marine Fisheries Service encouraged cooperative research and assessment studies between the Northeast Fisheries Science Center (NEFSC), Woods Hole, and fisheries research organizations of several other countries fishing intensively in the region, including Poland and the Sea Fisheries Institute (SFI) of Gdynia, Poland. Joint studies of the U.S. and Poland were directed toward recruitment studies of herring, mackerel, cod, and haddock with a focus on defining the spatial and temporal variability in annual spawning patterns. Studies were also conducted on sharks along the entire shelf-slope region of the northeast U.S. coast. Special attention was given in the study to the influence of oceanographic features on the seasonal and annual movements of the more abundant species.

THE PLANKTON CENTER

As one of the activities in a joint program of research in fisheries ecology focused on the productivity, growth, survival, and recruitment of the important pelagic and demersal species of the Northeast Shelf ecosystem, a plankton sorting and identification center was established by the SFI in 1974. The center, named the Plankton Sorting and Identification Center, is housed in a Polish government building located on the campus of the Agricultural Academy Faculty of Marine Fisheries in Szczecin, Poland.

The longest continuous collaborative effort between the U.S. and Poland in fisheries research has been on the early life stages of fish, and the zooplankton biomass and species that serve as their principal prey-field. From 1974 through 2000, the scientists and technicians of PSIC in Szczecin processed an average of 5000 zooplankton and ichthyoplankton samples annually. The approximately 130,000 zooplankton samples sorted, identified, and enumerated constitute a broad database of biomass, measured as displacement volume, and species biodiversity of the zooplankton and ichthyoplankton communities supporting the captive fisheries of the Northeast Shelf and the Southeast Shelf, the Gulf of Mexico, Gulf of Alaska, and East Bering Sea. The zooplankton and ichthyoplankton database has proven particularly useful in the development of a multisectoral Large Marine Ecosystem (LME) approach to fisheries assessment and management practices supported by the Global Environment Facility and other United Nations organizations (Sherman and Duda 1999). The "Productivity" module of the present LME project activity in Asia, Africa, Latin America, and eastern Europe was evolved from the early 1970s joint U.S.-Poland plankton assessment activities on the U.S. northeast shelf.

The Center initially supported joint U.S.-Polish larval herring surveys with systematic sorting and identification of samples from the northeast shelf. Key staff appointments to the Center were made in April and August 1974. Since that time, U.S. scientists have visited the Center to provide training in sorting and identification methodology; and Polish scientists have visited the U.S. to attend ichthyoplankton and zooplankton workshops in taxonomy and laboratory procedures.

The Center was initially staffed with five sorters, thirteen sorter-identifiers and two administrative assistants. The sorting staff was trained at the Faculty of Marine Fisheries in Szczecin. Thirteen of the scientific staff held M.S. degrees and five B.S. degrees in fisheries science and engineering. The operational plan included staffing for sorting up to 5000 samples annually. Dr. Leonard Ejsymont serves as the Director of the Center. The U.S. Project Officer is Dr. Kenneth Sherman, Northeast Fisheries Science Center, Narragansett, Rhode Island. Scientists from each country serve on the Advisory Board for the Center. The Advisory Board meets annually to review joint progress in advancing fisheries ecology studies, establish sorting priorities, and guide Center development.

Following an initial training period, systematic sorting was initiated in April 1975. During the first six months of operation, the Center processed approximately 1500 ichthyoplankton samples and separated and identified some 200,000 fish larvae and zooplankton constituents. In March 1976, the staff participated in an experiment designed to establish a quantitative basis for aliquoting ichthyoplankton samples. During the experiment, they separated and enumerated zooplankton from several hundred samples during a three-week period. The success of the experiment was largely due to their efforts. The principal sorting effort in 1976 was directed to larval herring samples collected during joint survey operations on the U.S. northeast shelf as part of a cooperative study of herring recruitment for the International Commission for the Northwest Atlantic Fisheries (ICNAF).

Over the past 25 years, a system has been developed for the rapid archiving and retrieval of data on fish eggs and larvae and zooplankton. The Sorting Center is provided with computer-generated printouts of station information (time, location, tow-type, depth), net tow data, and cruise track and station position plots for each of the survey cruises. Detailed results of the processing output are forwarded by the Sorting Center to participating NMFS Fisheries Centers for entry into electronic databases.

JOINT FISHERIES ECOLOGY STUDIES

Occasional research cooperation in fisheries between Poland and the United States was carried out before World War II, but joint coordinated study in fisheries ecology began with the visit to Woods Hole and Narragansett by the Polish scientists Dr. Kazimierz Siudziński and Bogdan Lubieniecki in 1972/73 to discuss potential fisheries ecology projects. In July 1974, Dr. Kenneth Sherman, the U.S. Project Officer, and Dr. Robert Edwards, the Director of NOAA/NMFS Northeast Fisheries Center, met Wojciech Polaczek, Director of the Polish Central Fisheries Board in Szczecin, to discuss the principles of scientific exchange between the two countries and reach agreement on the elements of a bilateral program. The first visitors from the Center to the U.S. under the agreement were Drs. Idzi Drzycimski and Leonard Ejsymont who visited the NEFC Narragansett (RI) and Woods Hole (MA) Laboratories in September 1974 for training in plankton taxonomy and orientation in laboratory procedures. From the U.S. side, David Kramer of the SWFC La Jolla (CA) visited the Center in October; and Robert Marak of NEFC Narragansett visited the Center in December 1974 to provide training in plankton sorting methods. R. Edwards and J. Suomala of NEFC Woods Hole (MA), and the U.S. consul from Poznań participated in the opening ceremonies of the Plankton Sorting and Identification Center in Szczecin in December 1974. Both parties agreed that a permanent Advisory Committee should be formed to ensure the full operational capability of the Center. Three scientists from each country served on the Advisory Committee for the Center. The first annual meeting of the Committee was held in Szczecin on August 26-28, 1975. In attendance were scientists from the U.S.: R. Edwards, K. Sherman and R. Marak, and from Poland: K. Siudziński, I. Drzycimski, and L. Ejsymont. Since 1975, the Committee has met annually to review progress in joint studies, establish plankton sorting priorities and guide program development. During the first meeting, the Advisory Committee considered a number of subjects including organizing an ICNAF workshop on Larval Herring Surveys in Szczecin.

RESEARCH VESSEL SURVEYS

Early on, as work under the agreement progressed, joint survey cruises were organized for the research vessels *Albatross IV*, *Wieczno* and *Prof. Siedlecki*, and for the commercial vessels *Lutjan* and *Admiral Arciszewski*. The Polish research vessels were deployed annually to collect thousands of plankton samples on the U.S. northeast shelf as part of the joint studies of larval fish recruitment and the biological and environmental processes controlling larval survival. The vessels also served as valuable research platforms for other ecological studies. In 1977, the R/V *Wieczno* participated in the biological damage assessment studies done following the grounding of the tanker *Argo Merchant* (which spilled some 7.7 million gallons of crude oil over important fish spawning grounds on the Nantucket Shoals). The Apex Predator Investigation of the Northeast Fisheries Science Center conducted joint studies with Polish scientists from 1976 to 1987. This work involved biological research on the migration, distribution, and reproductive habits of tunas and swordfish, with emphasis on several species of large sharks. Particularly notable with regard to this work was the cooperative research fishery for mackerel, under the BIOMAC Program, conducted by the NEFSC, the Polish Sea Fisheries Institute, and

the Gryf Deep Sea Fishing Company. Joint research was conducted from Polish vessels in the Gulf of Alaska and the East Bering Sea, with the Alaska Fisheries Science Center in support of fisheries management research. Cooperative fisheries and oceanographic research was also conducted by U.S. and Polish scientists in support of the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) Scientific Committee.

TRAINING AND MEETINGS: A CHRONOLOGY

(1) Joint Activities in the 1970s

The bilateral exchange of scientific personnel for training has been a regular practice since 1976. Elżbieta Kliś, Eulalia Mackus, L. Ejsymont, and Barbara Wolf participated in the MARMAP ichthyoplankton taxonomy training course conducted by Dr. Elbert Ahlstrom at the SWFC in La Jolla (CA). Romualda Kaczanowicz, Bożena Kaczmaruk, E. Mackus, and E. Kliś visited the NEFC MARMAP Field Group facility in Narragansett (RI) for training in fish taxonomy. Raymond Maurer, E. Ahlstrom, R. Marak, and Dr. K. Sherman visited the Center to provide training in zooplankton and ichthyoplankton sorting and identification. Other U.S. scientists, John Green, Edward Cohen, R. Maurer, and R. Marak, participated in the aliquoting experiment conducted at the Center in March 1976 on the efficiency of aliquoting plankton samples. In June 1976, the Center was host to environmental scientists from the ICNAF Environmental Subcommittee Working Group representing: Poland, U.S.A., the Federal Republic of Germany, and Canada. Other visitors to the Center included a group of German marine scientists, led by Professor G. Hempel, from the Institut für Meereskunde, Kiel, who arrived in August on the R/V *Alcor*. Dr. Lars Hernroth, a Swedish planktologist from the Institute of Marine Research Fisheries Board of Sweden, visited the Center in June 1976 to become acquainted with the Center's operations. Gunnar Joakimsson, a scientist from the University of Kiel, spent two months in residence at the Center from May through July 1977 working on the FRG ichthyoplankton samples. In September 1977, biologists from the Center: Halina Nowak, Maria Płocka, Wanda Kalandyk and Bożena Kaczmaruk spent two weeks at the NEFC facility in Narragansett to participate in a workshop on zooplankton taxonomy, ecology, and data processing. In November 1977, Dr. L. Ejsymont visited the SWFC in La Jolla (CA), the NEFC in Narragansett and the Woods Hole Laboratories to participate in cooperative scientific research on the problems of NW Atlantic fisheries with his U.S. colleagues. In June 1977, seven U.S. scientists visited Szczecin, participating in the Advisory Committee Annual Meeting and a Workshop on Georges Bank Larval Herring Studies. The Workshop was held at Szczecin on June 20-23, 1977. Participants included scientists from the SFI Rostock (GDR), the University of Kiel and the Fishery Sciences Institute – Hamburg (FRG); the SFI – Gdynia (Poland), AtlantNIRO, Kaliningrad (USSR), and the MARMAP Field Group – Narragansett, the NEFC Sandy Hook, and Woods Hole Laboratories (U.S.A.).

Dr. George Grice, a UNESCO observer, visited the Center in 1977. He presented the work of other UNESCO Sorting Centers in Cochin, Singapore, and Mexico City. Dr. Grice observed that the UNESCO Centers were organized to sort collections made on short-term multidisciplinary oceanographic expeditions to the Indian Ocean (Cochin), Kuroshio Current (Singapore), and Carribean-CICAR (Mexico City). In contrast, he found the Szczecin Center

unique in the application of sorting outputs to long term fishery ecosystem studies in the NW Atlantic.

In August 1978, four biologists from the Center: Janusz Różak, Hanna Fidelus-Ferlas, Barbara Kosiorowska, and Elżbieta Mazuchowska visited the NEFC Sandy Hook and Narragansett Laboratories for a one-month training in fish egg and larvae identification. During the same year, U.S. scientists: Richard Hennemuth, K. Sherman, R. Marak, John Pearce, Robert Learson, Wallace Smith, and H. Boyar visited the Center to advise on MARMAP operations. W. Smith visited the Center in May 1979 for two weeks to provide guidance in the identification of gadoid and anguillid larvae. In October 1979, Dr. R. Edwards, K. Sherman, R. Marak (NEFC), and Eileen Maturi (State Department) visited the Center following an ICES meeting in Warsaw; Sharon McLean, from the NEFC Oxford (MD) Laboratory visited in October 1979 to work on zooplankton pathology; Doris Finan, fishery biologist from the NEFC Sandy Hook, spent a 6-week period in October and November 1979 working with the Ichthyoplankton Group of the Center. Four biologists from the Center: Marek Baranowski, Małgorzata Konieczna, Renata Lipska, and Elżbieta Meller spent the month of August 1979 in NEFC Sandy Hook and Narragansett Laboratories studying fish egg identifications. Length frequency analyses were made comparing efficiencies in the use of an electronic counting and sizing system.

(2) Joint Activities in the 1980s

Wallace Smith of NEFC Sandy Hook Laboratory visited the Center in February 1980 to review operations and provide instruction in ichthyoplankton systematics and ecology. During the 6th Advisory Committee Meeting held at the NEFC in Narragansett from 19 to 23 May 1980, interest was expressed by the Northwest and Alaska Fisheries Center Seattle (WA) and the Southeast Fisheries Center Miami (FL) in having samples sorted for ichthyoplankton. This initiative was undertaken and was followed by a bilateral exchange of scientists: Drs. Arthur Kendall of the NWAFC Seattle (WA) and Reuben Lasker of the SWFC La Jolla (CA), and Thomas Potthoff of the SEFC Miami (FL) visited the Szczecin Center in October 1980; and Polish scientists: L. Ejsymont and Barbara Kosiorowska visited NWAFC Seattle Laboratory in November 1980 to work with American colleagues on fish larvae identification. In this way, all the American fisheries research centers – NEFC, SEFC, NWAFC and SWFC – became involved in coordinated scientific cooperation in fisheries ecology between the Sea Fisheries Institute in Gdynia and NOAA's NMFS. Earlier, Małgorzata Adamus and Eulalia Mackus-Baranowska, biologists from the Center, visited the Sandy Hook Laboratory in August 1980. Both worked exclusively on fish egg identifications under the guidance of Peter Berrien.

In 1981, a three person Pathobiology Group was formed at the Center to do conduct research on the parasites of two economically important fish species: Atlantic mackerel, *Scomber scombrus* from the Georges Bank area, and the European eel, *Anguilla anguilla*, from the Odra river estuary. In 1982, U.S. scientists: Drs. K. Sherman, R. Edwards, R. Hennemuth and Helen Mustafa visited Warsaw for a meeting with the staff of SFI. From the Polish side: Dr. L. Ejsymont and Hanna Fidelus-Ferlas visited SEFC Miami (FL) to attend a course of study on the systematics of fish eggs and larvae from the Gulf of Mexico and the Carribean under the guidance of Dr. W. Richards. In 1983, Anna Kodrzycka-Kogut and Witold Drozgowski, spent one month in the NWAFC Seattle (WA) attending a course of study on the systematics of fish eggs and larvae of the Gulf of Alaska and coastal waters off Oregon and Washington. In 1984, U.S. scientists:

Jean Dunn of the NWAFC in Seattle and Thomas Potthoff of the SEFC in Miami spent a one-month period in residence at the Center providing instruction on the systematics of fish eggs and larvae and completing predator-prey studies. In December 1985, Dorota Sujak and Małgorzata Kałuża visited the NWAFC in Seattle to attend a course of study on the systematics of fish eggs and larvae from the Gulf of Alaska and East Bering Sea. In May 1986, Kenneth Stuck, a biologist from the Gulf Coast Research Laboratory, Biloxi (MS) visited the Center to provide instruction in decapod sorting protocol.

In September 1987, W. Kalandyk visited the Gulf Coast Research Laboratory, Biloxi (MS) to learn the taxonomy of zooplankton from the Gulf of Mexico under the supervision of Ken Stuck. At the same time, M. Konieczna visited marine laboratories cooperating in the SEAMAP program, including the Archival Center in St. Petersburg (FL), the SEFC in Miami (FL), Louisiana State University, the State Laboratory of Charleston (SC), and the NMFS Laboratory in Beaufort (NC) to exchange information and receive training in ichthyoplankton systematics. In 1987, Iwona Ruminkiewicz was provided with training in the identification of Antarctic ichthyoplankton, zooplankton and micronecton at the NEFC Narragansett Laboratory. Additionally, Paweł Jędra worked with U.S. colleagues on fish larvae systematics at Sandy Hook Laboratory. In 1988, 400 Antarctic samples collected from R/V *Prof. Siedlecki* were successfully sorted and identified by the staff of the Center. In October 1987, Peter Berrien of Sandy Hook Laboratory spent a two- week period in Szczecin instructing staff on the protocols for BIOMAC sample processing, including the staging of mackerel eggs. In 1988, Beverley Vinter of the NWAFC in Seattle spent a month at the Center instructing staff on the protocol for ichthyoplankton sample processing; and Dr. Joanne Lyczkowski-Shultz of the SEFC in Pascagoula (MS) visited the Center for one month to work with Polish colleagues on sciaenid and carangid larvae. In 1989, Rene Eppi of the NOAA in Washington D.C. visited the Center and the Polish Fisheries Board to present a status report on the Maria Skłodowska-Curie Joint Fund II proposal between SFI and NMFS. Thereafter, the U.S.-Polish Joint Commission on Scientific and Technological Cooperation awarded grants to support joint research, entitled: "Analysis and Modeling of Multispecies Resources in Two Large Marine Ecosystems" (1973), and "Analysis and Modeling of Environment and Health of Two Large Marine Ecosystems" (1994-1995). During the same year, Drs. W. Richards from the SEFC in Miami, A. Kendall from the NWAFC in Seattle, and S. Kim of Korea visited Szczecin to observe the Center's operation.

On 6 October 1989, a celebration commemorating 15 years of joint research was held at the University of Szczecin. Dr. Kenneth Sherman was presented with a honoris causa doctorate by the University. Two biologists from the Center, M. Płocka and Stanisława Bartosiewicz visited the NWAFC in Seattle (WA) in July 1989 to consult with Dr. A. Kendall, B. Vinter, Deborah Blood and Deborah Siefert on taxonomic issues in zooplankton and ichthyoplankton.

(3) Joint Activities in the 1990s

In 1990, a new Branch of the Plankton Sorting Center with the addition of five new positions was established at the SFI, Gdynia. The Branch specializes in presorting fish eggs and larvae and processing Continuous Plankton Recorder (CPR) silks. In 1990, the Pacific Biological Station of the Canadian Fisheries and Oceans Department in Nanaimo, B.C expressed interest in having samples sorted for zooplankton and ichthyoplankton. This initiated the successful cooperation between the Center and Mr. William Shaw of PBS Nanaimo from 1991 to 1996.

In October 1993, training was provided to three scientists from the Center, L. Ejsymont, W. Kalandyk and K. Maśko, in collaboration with a plankton specialist, Andrew Warner of Plymouth (UK), in the methods for sorting and identifying plankton from fine mesh netting of the Continuous Plankton Recorder (CPR) system. The need for continuing time-series assessments of the changing state of marine ecosystems in relation to the sustainability of fisheries yields was discussed. W. Kalandyk and K. Maśko visited the NWAFC Laboratory in Seattle in October 1993 for additional training in Pacific zooplankton taxonomy and new methodologies. In 1994, the first "Skagex" zooplankton samples from the North Sea, Kattegat and Skagerrak were processed, on a noninterference basis, for the Royal Swedish Academy of Science Kristineberg Marine Research Station.

SUPPORT OF MAJOR FISHERY OCEANOGRAPHY PROGRAMS

Over the course of 25 years (1974 to 1999) of continuous cooperation, 43 scientists from the Center have visited the U.S. NMFS Centers and other MARMAP collaborators (federal, state, academic, private, and international) for advanced scientific and technical training in plankton identification and laboratory procedures. Of these, 20 biologists from the Center visited NEFSC in Narragansett and Sandy Hook; 5 biologists went to the SEFSC in Beaufort (NC), Biloxi (MS), Miami and St. Petersburg (FL); 5 biologists visited the SWFSC in La Jolla (CA), and 13 biologists went to the AFSC Laboratories in Seattle (WA). From the American side, 49 scientists visited the Center to attend annual Advisory Committee meetings, to provide training in sorting methodologies and identification of plankton, observe operations, and provide advice on fisheries assessment research.

The Plankton Sorting and Identification Center (PSIC) in 1999 was fully staffed (40 positions) and operating at maximum capability for processing plankton samples (ca. 6000 per year) from large marine ecosystems within the Exclusive Economic Zone of the United States. Several NOAA-NMFS projects are utilising the Center's expertise, including fisheries ecology programs in the Gulf of Alaska, East Bering Sea, Gulf of Mexico, Southeast U.S. Shelf, and Northeast U.S. Shelf. In collaboration with the National Science Foundation and the National Ocean Service Coastal Ocean Program, the NMFS Fisheries Science Centers are conducting studies focused on global climate change and coastal ocean processes that include SABRE focused on menhaden recruitment in the Southeast Shelf and Georges Bank GLOBEC, a study of ocean dynamics, the growth and survival of Atlantic cod, *Gadus morhua*, haddock *Melanogrammus aeglefinus*, eggs and larvae, and the population dynamics of their principal zooplankton prey, *Calanus finmarchicus* and *Pseudocalanus* spp. Activities in the Pacific include the Southeast Bering Sea Carrying Capacity (SEBSCC) program with a focus on examining the ecosystem of the Bering Sea and the role of walleye Pollock *Theragra chalcogramma* in the food web, and a study of the effects of El Niño on the Gulf of Alaska ecosystem. Other projects the Center has processed samples for include the ecosystem survey efforts to monitor the changing states and health of coastal ecosystems being undertaken by the NEFSC. The more detailed examination of SEFSC/SEAMAP collections is yielding new data on the ontogeny of marine fishes; this information will be included in a regional guide to the early life stages from the western central Atlantic. Since 1997, scientists from the Center have been applying

their expertise in plankton identification to the processing of NEFSC Continuous Plankton Recorder (CPR) silks at the Branch of the Center at the SFI Gdynia. Should a Baltic Large Marine Ecosystem program supported by the Global Environment Facility and World Bank be initiated by the Baltic States, Poland and the U.S. are prepared to offer their scientific and technical expertise to ensure that the "Productivity" module of the project is launched successfully. The five-year project is designed to initiate ecosystem-based assessment and management practices to the Baltic Sea Large Marine Ecosystem. Five countries, Estonia, Latvia, Lithuania, Poland, and Russia are expected to carry the program forward in the eastern Baltic with $16 millions in financial support from the Global Environment Facility.

RETROSPECTIVE

The joint Poland-U.S. Program has contributed to the study of fisheries ecology, through its support of a wide range of activities directed at improving the understanding of the biological and physical processes controlling the natural productivity of marine fisheries resources. The data provided through the combined efforts of the staff of NMFS and SFI scientists and technicians have led to discoveries of new resource potentials and improved assessment and management practices for initiating the recovery of depleted fish populations of the U.S. Northeast Shelf ecosystem.

Center data are used in estimating the size of the spawning biomass of important fishery resources. The Joint Program has compiled an unprecedented database on marine fish eggs and larvae. A large number of high quality scientific papers have been published based on the results of the Joint Program. The reports generated as the results of research done over the course of 25 years are not only of benefit to Polish and American marine scientists but are also relevant to the larger marine scientific community. The data collected and the studies performed over the years have added substantially to an improved understanding of environmental effects on the growth and survival of early life stages of fish. The combined efforts of the scientists and technicians, along with the willing assistance of the captains and crews of research vessels from both countries can be justly proud of their accomplishment in contributing to a more ecosystem-based assessment approach to fisheries science than has been generally practised during most of the twentieth century. The broad scope of the Joint Program in relation to fishery ecology studies is represented in the titles of reports and publications of the participating scientists (USPJS 2000). The Joint Program remains as an important source of early life history information on fish and fisheries as we enter the twenty-first century and the twenty-seventh year of Polish-United States co-operation in fisheries ecology.

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