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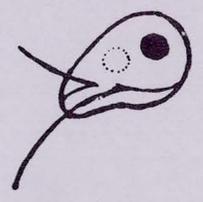
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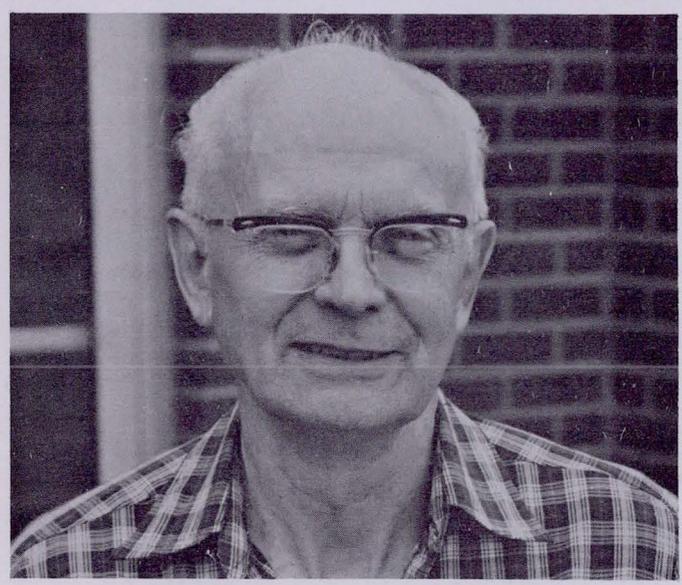


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January, 1984

12 (1)



**ON THE STATUS OF FHS/AFS**

*Glenn L. Hoffman, Ph.D., Parasitologist  
President FHS/AFS*

In 1972 a steering committee headed by Jim Warren founded the Fish Health Section/AFS and the first workshop was held August 12-16, 1974 in Denver. The initial thrust was to establish uniform technical procedures and professional standards in fish pathology. At the time I wouldn't admit it, but we needed both. However, due to the need of both and the enthusiasm of the steering committee (Warren, Amend, Bullock, Goede, Herman, Hicks, Klontz, McDaniel, Plumb, Summerfelt, and Wingfield) the seed sprouted a vine. FHS/AFS currently has 462 members, down 36 from a high of 498 in 1982. This is not a large professional society, but it is a viable and needed society. We are financially sound, but not wealthy. So, that is the good news. The bad news is that it takes work to maintain a healthy society and most of us are understaffed and underfinanced. If our society is to survive, the elected officers, appointed committees, and members must do their business in a professional manner. To help in these matters, Dr. Emmett Shotts, immediate past president, has aided me with making committee selections and reviewing our status. Emmett will head a Bylaws Committee which will evaluate our Bylaws and probably suggest some relatively minor, but helpful changes. Please lend your support in this and other FHS matters and remember that suggestions are welcome.

Status of FHS - p 1  
Honors - p 1  
Reflections Fish Par. p 9

**FROM THE EDITORS**

The editorship of the Newsletter has changed from the Northeast to the Northwest. This publication will now be edited by the triumvirate of Dave Ransom, John Rohovec, and Jim Winton. We realize this is unprecedented; however, as our first issue was being formulated, we became aware of the wisdom of this decision. Producing a newsletter of the quality to which the FHS has become accustomed is a highly demanding task. Our goal is to continue the tradition set by Peter Walker who took the Newsletter from photocopied sheets to one of the most professional newsletters of any society. In order to achieve this goal we need the assistance of all members of the Section. We feel that the Newsletter is the most visible arm of the FHS and its success (or failure) reflects the health of the organization. To avoid a Northwest-Salmonid bias we solicit submissions from everyone. We will accept long or short articles which are mailed to us or ones that are dictated via the telephone. The Newsletter will be published quarterly, in January, April, July, and October. Information for inclusion in an issue must be received one month prior to publication.

Workers in the fish health profession are, by training, analytical and capable of forming their own opinions. In each issue, space will be available for individuals to express their views on any area of fish health. We expect these "special contributions" or "guest editorials" to be an important addition to the Newsletter. The first Special Contribution appears in this issue and has, appropriately, been submitted by Dr. Glenn Hoffman, president of the Fish Health Section. Another innovation we are initiating is a section of very brief reports. The author of each submission will be identified.

The content of the Newsletter under our editorship may appear somewhat different and it will take a few issues for us to find a style comfortable to us and acceptable to you. However, we will try to maintain a high standard of professionalism. We anticipate hearing from you and wish you the best in the coming year.

DPR, JSR, JRW

**HONORS AND AWARDS**

Dr. Glenn Hoffman, president of the Fish Health Section, has been given the U.S. Department of the Interior Meritorious Service Award. The citation, signed by former Secretary of the Interior James Watt, recognizes Dr. Hoffman's long history of contribution to fish parasitology, including his research on whirling disease of salmon and the parasites of bait fishes. Also recognized were Dr. Hoffman's extensive role in teaching and in his authorship of the definitive reference **Parasites of North American Freshwater Fishes**.

## FHS OFFICERS AND COMMITTEES 1983-84

### EXECUTIVE COMMITTEE

#### Voting Members

Glenn Hoffman, Chairman  
Trevor Evelyn, President-Elect  
Emmett Shotts, Immediate Past President  
Doug Anderson, Secretary-Treasurer  
Jim Warren, Chairman, Nominating Committee

#### Non-voting Members (Chairmen of Standing Committees)

John Rohovec, Chairman, Newsletter and Publications Committee  
Tom Schwedler, Chairman, Awards Committee  
Howard Jackson, Chairman, Membership and Balloting Committee  
Paul Janeke, Chairman, Professional Standards Committee  
Kevin Amos, Chairman, Technical Procedures Committee  
*Doug Mitchum, Board of Certification*

### STANDING COMMITTEES

#### Nominating

Jim Warren, Chairman (elected)  
John Schachte  
Diane Elliott

#### Newsletter and Publications

John Rohovec, Chairman  
Dave Ransom  
Jim Winton  
Tom Wellborn  
Jack Gratzek

#### Membership and Balloting

Howard Jackson, Chairman  
Ron Goede

#### Technical Procedures

Kevin Amos, Chairman  
Emmett Shotts  
Ray Brunson  
Ken Johnson  
Ellis Wyatt

#### Professional Standards

Paul Janeke, Chairman  
Jim Carlisle  
Doug Mitchum  
Dave Ransom  
Bev Larson

#### Finance

Doug Anderson, Chairman  
Howard Jackson (Membership)  
John Rohovec (Newsletter)

#### Awards

Tom Schwedler, Chairman  
Emmett Shotts (two years)  
Dennis Anderson (three years)

### BOARD OF CERTIFICATION

(Elected)

Doug Mitchum, Chrm. (3 years)  
Tom Wellborn (1 year)  
Jim Warren (2 years)  
Gary Carmenisch (2 years)  
Kevin Amos (3 years)

### AD HOC COMMITTEES

(Appointed)

#### Archives

Joe Sullivan, Chairman

#### Bylaws

Emmett Shotts, Chairman  
Jim Warren  
Fred Meyer

#### Directory

Rowan Gould

#### Fish Health Evaluation

Ron Goede, Chairman  
others to be selected

#### International Meeting

Dick Heckman, Chairman  
Bill Rogers *Barry Hill (eng)*  
Leo Margolis *Dave Conroy (Venezuela)*  
~~two others to be selected~~

#### Program

Glenn Hoffman, Chairman  
Ken Johnson

#### Time and Place

Drew Mitchell, Chairman  
Billy Griffin  
Jimmy Camper

**June 26-27, 1984 Presumptive Diagnosis of IHN Virus in Salmonid Fish by Histological Techniques.** Workshop presented by C.E. Smith (USFWS) at the Oregon State University Marine Science Center, Newport, Oregon. Contact Don Kuntzelman, Fisheries Academy, Rt. 3 Box 49, Kearneysville, WV 25430 for further information.



**June 28-29, 1984 Western Fish Disease Workshop.** The twenty-fifth annual meeting will be held at Oregon State Univ. Contact John Rohovec, Dept. Microbiology, OSU, Corvallis, OR 97331 for information.



**July 10-12, 1984 Joint Meeting of the Fish Health Section of AFS and the Midwest Fish Disease Workshop.** The meetings will be held at the Sheraton Little Rock, Little Rock, Ark. This is the first call for papers. Several round-table discussions are being planned. It is hoped that these will include PKD, Therapy, Non-infectious Diseases, Catfish Hamburger Gill Disease, Inspection-Quarantine, Ceratomyxosis, and others. In addition, 15 min contributed papers will be welcome. For time and place contact Drew Mitchell or Billy Griffin, Fish Farming Exper. Sta., USFWS, PO Box 860, Stuttgart, AR 72610. For program information contact Glenn Hoffman or Ken Johnson, Rm 202 Nagle Hall, College Station, TX 77843.



**July 30-August 3, 1984 Annual Conference of the Wildlife Disease Association.** San Diego State University, San Diego, CA will be the meeting site. For more information contact Dr. Werner Heuschele, Research Dept., San Diego Zoo, PO Box 551, San Diego, CA 92112.



**September 8-12, 1985 Fish Immunology Sandy Hook (FISH).** This international meeting will be held at the Northeast Fisheries Center at Sandy Hook, NJ. FISH is designed "to bring together experts in the field; report on the latest research; exchange ideas; form new collaboration". For further information contact Dr. Joanne Stolen, NEFC, Sandy Hook Laboratory, Highlands, NJ 07732.



**September 1-7, 1984 Sixth International Congress of Virology.** Sendai, Japan will be the site for this meeting which will include a broad range of virological topics. Among these will be a session on Viruses of Aquatic and Marine Animals. Contact Ken Wolf, National Fisheries Center, Rt. 3, Box 40E, Kearneysville, WV 25430.



**September 4-12, 1984 International Conference on Biology of Pacific Salmon.** The conference will be held at the Empress Hotel, Victoria, British Columbia, Canada. It is anticipated that fish pathology will be a subject of discussion. Indicate your interest by submitting an abstract by April 1, 1984. Contact Dr. F.K. Sandercock, Fisheries and Oceans Canada, 1090 W. Pender St., Vancouver, B.C., Canada V6E 2P1.



## FUTURE EVENTS

**February 20-22, 1984 First Symposium of OIE Fish Disease Commission.** The International Office of Epizootics will sponsor this meeting in Paris. Applied immunology, *Aeromonas salmonicida*, and fish disease control will be topics. For information contact P. de Kinkelin, INRA, Route de Thiverval, F-78850, Thiverval Grignon, France.

**September 8-9, 1984 International Seminar on Fish Pathology.** To celebrate the 20th anniversary of the Society of Japanese Fish Pathologists, an international meeting will be held in Tokyo, Japan. Information is available from Dr. T. Sano, Laboratory of Fish Pathology, Tokyo University of Fisheries, 4-5-7 Konan Minato-ku, Tokyo 108, Japan.

## REPORTS FROM PAST MEETINGS

### Western Fish Disease Workshop

The 24th Annual Western Fish Disease Workshop was hosted by the University of California, Davis, June 22 and 23, 1983. Approximately 100 people registered for the day and one-half meeting. In addition to individual scientific papers, there were 3 panel discussions. The most lively discussion involved the PKD outbreak in Idaho and how the problem is being resolved (or not being resolved). However, the discussion on the need for a disease control policy for the Columbia River basin also drew lively debate. The social event of the meeting was the outdoor barbecue at the Putah Creek Lodge, sponsored by Wildlife Vaccines. It was good to see Ron Goede back in action and Doug Mitchum drew honors for traveling the longest distance. The Silver Anniversary of this group will be held next year at Oregon State University. Don Amend, Chairman.

### Midwest Fish Disease Workshop

Approximately 50 people attended the Midwest Fish Disease Workshop in Minneapolis, July 6 and 7, 1983. The status of most of the better known problems in fish culture as related to disease was represented by papers. There were good discussions which explored questions and added insights from those in attendance. D. Tave (Dept. of Fish & Wildlife, Univ. of Minn. St. Paul) raised the level of consciousness regarding U.S. trout and the small gene pool that exists among them. The situation is probably true of salmon in aquaculture and the remnants of endangered races of wild salmon stocks. A conscious effort to obtain funding for disease resistance breeding of all cultured fish was strongly indicated. The Minnesota DNR, Fisheries & Hatchery people contributed greatly to the program through papers and a symposium on the practical aspects of fish disease control in Minnesota State Hatcheries. M. Schalk, J. Bartos and C. Sommers (Univ. of Wisc., Milwaukee - Center for Great Lake Studies) discussed the results of some of their research on environmental stressors and their effect on the immune response. M. Ewing and colleagues (Oklahoma State Univ. - Dept. of Zoology & Veterinary Path.) had some new results on the early invasive stages of "Ich". It is possible that these understandings might lead to the use of better antigens for vaccine production. Obviously these are just a few of the highlights of the meeting. Grateful appreciation is extended to the presenters and the thoughtful interaction of the participants. Ellis Wyatt, Meeting Chairman.

### International Helgoland Symposium

The Tenth Helgoland International Symposium was held September 11-16, 1983. In 1983 the topic for this continuing series was "Diseases of Marine Organisms". This symposium which was held in Helgoland, Federal Republic of Germany had a participation of approximately 100 individuals representing almost 20 countries. Papers were presented on both infectious and non-infectious diseases of finfish and invertebrates. Diseases of marine plants were also discussed. In addition to scientific papers, there were poster sessions and informal discussions. The meeting convener was Professor O. Kinne of Biologische Anstalt Helgoland. The proceedings of the symposium will be published and available sometime in 1984.

### European Association of Fish Pathologists

The first international conference sponsored by the European Association of Fish Pathologists (EAFP) was held September 19-23, 1983 in Plymouth, England. Subjects of review papers included: developments in the chemotherapy of bacterial fish diseases, the current status of fish immunology and vaccination, viral diseases of marine and freshwater crustacea, parasitic and neoplastic diseases of shellfish, and pollution as a cause of fish diseases. The subjects of contributed papers were the gamut of fish health problems. Of special interest were proliferative kidney disease and the pathogenicity of *Aeromonas salmonicida*. It was also reported that *Yersinia ruckeri* has been isolated from fish in the UK, Spain, and Italy. Poster sessions and informal discussions completed the scientific portion of the meetings. The conference was well attended and in addition to Europeans, Australians, Japanese, and North American scientists participated. Colin Munn of Plymouth Polytechnic was the host. There are plans for the proceedings to be published.

The EAFP is a viable and seemingly healthy organization with goals not too different from those of the Fish Health Section.

### Japanese Society of Scientific Fisheries

Approximately 800 Japanese fisheries scientists gathered in Kyoto on October 8, 1983 for the annual meeting of the Japanese Society for Scientific Fisheries. The three day meeting was divided into several concurrent sessions to accommodate the approximately 650 papers which were presented. Fish pathology was represented by one of these sessions where 25 scientific reports were given. The research presented involved many aspects of fish health but was concentrated on diseases of commercially important species reared by Japanese aquaculture. Streptococcosis in yellowtail, edwardsiellosis in eel, and OMV in chum salmon generated the most interest. Abstracts (in Japanese) were available at the meetings.

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## PASSAGES

Dr. Donald Amend has moved from Davis, California to assume the position of Director of Operations, Southern Southeast Regional Aquaculture Association, P.O. Box 6916, Ketchikan, Alaska 99901. Phone 907-225-9605.

Jim Warren (USFWS) has been transferred to Fishery Assistance Office, 9317 Hwy 99, Suite I, Vancouver, WA 98665 as the region one fish health manager. He will serve as the executive secretary of the Pacific Northwest Fish Health Protection Committee. Sixteen private and non-private interest groups will be represented from WA, OR, ID, MT and B.C. Phone 206-696-7605.

Rick Nelson (USFWS) has been promoted to hatchery biologist and is transferring from Augusta, Maine to the National Fishery Research Laboratory, La Crosse, WI. Phone 608-783-6451.

Alaska Dept. of Fish & game has added a new virologist, Marie Frjed, ADF&F, 333 Raspberry Rd., Anchorage, AK. Phone 907-344-0541.

## NOMINATIONS SOUGHT

The awards committee is seeking nominations for the S.F. Snieszko Distinguished Service Award. The Distinguished Service Award is for outstanding accomplishments in the field of fish health. Selection of a candidate for the Distinguished Service Award will be based on merit qualifications of the nominee and should be included with the nomination.

Nomination should be received no later than February 1, 1984, by the awards committee. Submit nomination to:

Thomas E. Schwedler, Chairman  
Mississippi Cooperative  
Extension Service  
P.O. Box 68  
Stoneville, MS 38776

Emmett B. Shotts, Jr.  
University of Georgia  
Department of Medical  
Microbiology  
Athens, GA 30602

Dennis Anderson  
Fish Disease Control Center  
P.O. Box 917  
Fort Morgan, CO 80701

# PKD : A CONCERN

## EMBARGO PROPOSED AGAINST IDAHO AND COLUMBIA RIVER FISH

*Dennis Anderson, Fish Disease Control Center,  
Fort Morgan, CO*

The Fish Disease Subcommittee of the Colorado River Wildlife Council made a proposal in August for an embargo on live fish from the Columbia River Basin and all portions of the State of Idaho to protect Basin fishery resources from introduction of IHN virus and/or PKD. This was done to buy time until the situation can be fully evaluated and policy changes enacted. The proposed embargo was not enacted by the Council but each member state (WY, CO, UT, AZ, NM, NV, CA) was alerted to the potentials for introduction and each state then did send letters to all licensed fish growers in their respective jurisdictions to alert them and request their assistance in avoiding introduction of high risk fishes or eggs. Several of the individual member states did, in fact, put the proposed embargo into effect within their own jurisdictions.

At its annual meeting on November 14-16, the Fish Disease Subcommittee drafted proposed changes in the Council Fish Disease Policy to help mitigate the embargo conditions. These proposed changes, summarized below, will be presented to the full Council at its meeting in April 1984. If adopted at that meeting, the changes would go into effect July 1, 1984.

### PKD

1. Add to disease/pathogen list under prohibitive category (live fishes from known contaminated sources not permitted entry into Colorado River Basin); egg shipments from contaminated sources permitted only after eggs are treated with formalin at 1667 ppm for 15 minutes; depopulation/disinfection required at stations within Basin where disease occurs.

2. Stations where water temperatures do not exceed 52°F would not have to be inspected for PKD either within Basin or to ship into Basin.

- sample collection to occur between July 1 and September 30.
- attribute sampling at 2% assumed minimum incidence and 95% confidence by lot.
- lot defined as all fish in each separate water supply between ages of 3 and 14 months (if no fish between 3 and 14 months present then older fish should be sampled and younger fish should be tested only in cases where fish 3 months and older not present).
- samples to consist of four posterior kidney imprints per fish, air dried, methanol fixed and stained with Leishman-Giemsa by the procedure described on page 8 of Technical Paper number 89 of the U.S. Fish and Wildlife Service. Clinical Methods for the Assessment of the Effects of Environmental Stress on Fish Health" by Gary A. Wedemeyer and William T. Yasutake. 1977. 18 pp.
- examine 35 microscope fields per fish at 150-200X for presence or absence of PKD organism.

### IHN

IHN has been listed on the Colorado River Wildlife Council Fish Disease Policy since it went into effect on January 1, 1973. IHN is currently listed under the prohibitive category (depopulation/disinfection required at sites where identified within Basin and no eggs or fish from IHN contaminated sources are certified for entry into Basin).

Proposed changes include a requirement that no shipments of live salmonid eggs be certified for entry into the Basin unless the eggs are from a resident source of brood fish certified free of IHN by appropriate inspection of ovarian fluid. When inadequate numbers of female fish are present to achieve attribute sampling at the 2%/95% level, a combination of ovarian fluid from available females supplemented with spleen samples from ripe males will be acceptable.

Fish sources which have no broodstock and, therefore, cannot be certified through inspection of ovarian fluid will be certified for shipment in the Basin only if all lots of fish present on the facility can be traced back to original brood sources certified IHN free by means listed in the above paragraph.

Eggs and/or fish from wild or feral stocks must meet the same conditions as stated above for hatchery reared fishes. (For further information contact Bob Wiley, CRWC Fish Disease Subcommittee Chairman, Fishery Research Supervisor, WY Game and Fish, Route #2, Box 25, Laramie, WY 82070 or subcommittee members Dennis Anderson, Fish Disease Control Center, POB 917, Ft. Morgan, CO 80701; Marvin Burgoyne, Asst. Chief of Fisheries, NV Fish and Game, Box 10678, Reno, NV 89510; or Ron Goede, Experimental Fisheries Station, UT Division of Wildlife, Route #1, Box 254, Logan, UT 84321.)

## PROLIFERATIVE KIDNEY DISEASE IN IDAHO

*G.W. Klontz  
University of Idaho, College of Forestry  
Wildlife and Range Sciences, Moscow, Idaho*

Proliferative kidney disease (PKD), heretofore thought to be epidemic in Europe, has been diagnosed in at least three annually occurring episodes in rainbow trout in Idaho. During the 1983 episode the organism causing the disease, a protozoan whose name is not settled, was identified in rainbow trout raised at five commercial farms in Idaho. At one of the farms, 60-63% of the fish sampled (more than 200 total from 15 ponds) were heavily infected with the PKD-causing organism and there were no clinical signs of the disease. The mortality was 10-12 fish per day for the entire facility.

Epidemiological data evaluated thus far from PKD episodes in the United States and Europe indicate the following:

- Virtually all salmonids are susceptible to infection and subsequent disease.
- The clinical course of the disease is 3-4 months.
- The mortality is uncomplicated, i.e. no superinfections, cases have been 10-15% during the 3-4 month course.
- The incubation period is 45-70 days depending upon water temperature.
- From infection through remission the water temperature must exceed 15°C. The organism is extremely temperature sensitive.
- The fish on high planes of nutrition have higher degrees of infection but lower degrees of clinical disease than those fish on a low plane of nutrition.
- The salmonid is an aberrant blind host for the organism.
- Surviving infected fish exhibit a long-lasting immunity to reinfection by the PKD-causing organism.
- The PKD organism is apparently resident in the GI tracts of migratory fish-eating water fowl.
- There is no evidence to indicate that fish-to-fish transmission occurs.
- The organism is easily identified through kidney imprints and scrapings of the lower intestine of suspect fish.

# FOR NORTH AMERICA

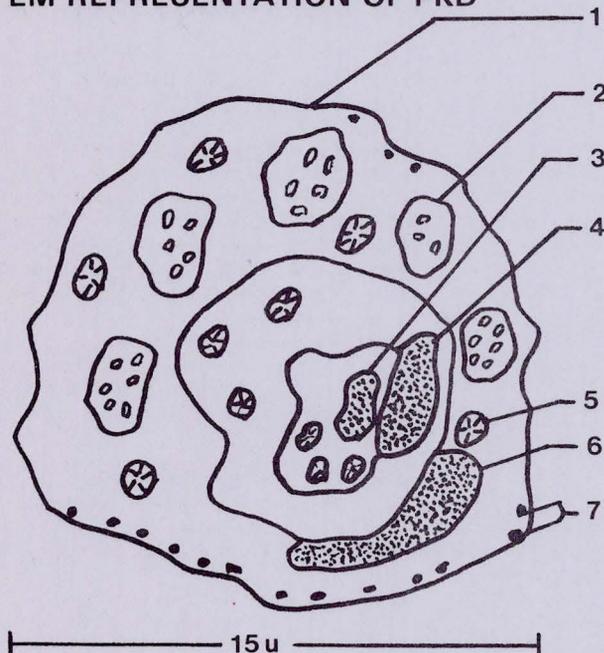
## PROLIFERATIVE KIDNEY DISEASE (PKD) - FIRST DETECTION IN PACIFIC SALMON

R.P. Hedrick, Bodega Marine Laboratory  
U.C. Davis, Bodega Bay, CA

Proliferative kidney disease (PKD) was detected for the first time at the California Department of Fish and Game (CDFG) Mad River Hatchery in June, 1983. Unusually high mortalities were observed in chinook salmon (*Oncorhynchus tshawytscha*) in late June. Several days later steelhead trout (*Salmo gairdneri*) also held at the hatchery began to die and these were followed by losses in coho salmon (*O. kisutch*) in adjacent raceways. Mortalities continued until October at which time all remaining fish were destroyed and the hatchery disinfected. Estimated losses to PKD in fish held at the hatchery were 95% (chinook) and 10% (coho) and 20% (steelhead). Unfortunately, before PKD infection was diagnosed, 1.3 million chinook salmon were released into the Mad and lower Klamath Rivers. Some of these fish were later recovered and found to harbor the parasite.

The potential impact of PKD on the Pacific salmon resource as demonstrated at Mad River Hatchery is alarming. The disease in these species shows certain differences from that reported among rainbow trout in Idaho. Studies on the disease in Pacific salmon are now underway at the University of California, Davis and CDFG.

### EM REPRESENTATION OF PKD



- 1) cell membrane of primary cell
- 2) vesicles
- 3) nucleus tertiary cell
- 4) nucleus secondary cell
- 5) mitochondria
- 6) nucleus primary cell
- 7) haplosporosomes

From California Aquaculture Newsletter CA83-5, Dec. 1983.

## FIRST REPORTED OUTBREAK OF PROLIFERATIVE KIDNEY DISEASE IN CANADA

T.G. Carey, National Registry of Fish Diseases  
Department of Fisheries and Oceans, Ottawa, Canada

Proliferative kidney disease has occurred at the federal Puntledge River Hatchery on the east coast of Vancouver Island, British Columbia. This outbreak has caused a low level mortality in a stock of steelhead trout fry being raised on Puntledge River water at that facility. Overall losses from the disease have been less than five percent. Clinical signs were first observed in the fry in August and no other pathogens appear to have been involved. The disease was not detected in pink, coho or chinook salmon being concurrently reared at the site.

The affected stock of steelhead at the Puntledge Hatchery has been quarantined and is being maintained under surveillance by fish health personnel from the Fisheries Research Branch, Nanaimo, B.C. An intensive review of samples from past disease problems at the hatchery have now identified the PKD organism in histological sections of steelhead and coho from 1982. All signs of the disease have now disappeared in the remaining fish although the disease may be present in a carrier state due to declining water temperatures. No releases from the hatchery are planned before May, 1984.

### THE EDITOR'S VIEW

Recent descriptions of the occurrence of proliferative kidney disease (PKD) in North America have caused concern among fish health specialists and fishery managers. Whether these diagnoses represent evidence for the recent introduction of PKD into North America and whether the disease represents a serious threat to our fisheries are subjects of controversy.

One fact which is not controversial is that the disease is untreatable and avoidance is the only known control measure. Most of the literature concerning PKD comes from Europe where outbreaks have now been reported in England, Scotland, Ireland, France, Germany, Italy and Denmark. In general, scientists in Europe agree that the disease represents a serious threat to stocks of fish and that more stringent control measures would have been beneficial.

In North America, reports concerning the severity of the disease have varied. In rainbow trout held at lower water temperatures the disease has not produced significant mortality; however, the report from California suggests that when this agent infects chinook salmon the results can be devastating. In addition, the impaired osmoregulatory function in anadromous fish is of special concern.

Obviously, more research is needed to resolve these questions. Until more information is available, the editors strongly encourage those actions necessary to prevent the further spread of this untreatable agent.

DPR JSR JRW

## VIRUS DETECTION IN RAINBOW TROUT

Robert A. Busch, Director of Research,  
Clear Springs Trout Company, Buhl, Idaho

A commercial production hatchery population of rainbow trout that survived natural hatchery epizootic infections of IPN and IHN viral diseases as fry and fingerlings was maintained at 14.5°C until sexual maturity and spawning at two years of age.

Monthly samples of indicator tissues from surviving fish from the time of the viral epizootic infections to spawning demonstrated the development of typical asymptomatic carrier state infections of the IPN virus. However, sixty days after the initial IHN epizootic, the virus could no longer be detected in the surviving population using routine microculture assay procedures and the CHSE cell line.

At the time of first sexual maturity and spawning at two years of age, reproductive fluids as well as paired homologous indicator tissues were sampled for the presence of virus. At this time, the carrier incidence for IPN virus was found to be 6.67% in males and 4.26% in females. As expected, IHN virus was again isolated from mature adults at the time of spawning. The carrier incidence for IHN virus was 2.56% in males and 2.84% in females. These results tend to give added proof that an assumed carrier incidence of 5% may be too high when establishing a sample size for viral disease inspection and certification purposes. It also again confirms that the presence of IHN virus, at least in rainbow trout at 14.5°C can only be determined during an active epizootic of the disease or at the time of spawning in the parents.

It was also noted that there was no correlation between the isolation of either IPN or IHN virus from reproductive fluids and the potential for isolation again from the homologous paired indicator tissues. At no time was the virus isolated from progeny fry under laboratory conditions of incubation regardless of the viral status of the parents.

A final observation of interest is that when ten males and ten females of the same stock were isolated from the remaining population at the first sign of reproductive fluid release and then monitored weekly for signs of virus in the reproductive fluids, all twenty fish remained negative for virus throughout the first eight to ten days (the time in which they would have normally been spawned). However, at fifteen days, one of the females sampled as IHN virus positive in the ovarian fluid and continued to be so for the next 21 days after which time the virus was again no longer detectable. This observation tends to indicate that the sampling of reproductive fluids at the normal time of spawning may not detect asymptomatic IHN virus carriers in a broodstock population.

The above reported results and observations are only preliminary in nature. We are planning to continue and expand this study in 1984 to confirm our findings.

## POSSIBLE NEW FUNGAL PATHOGEN OF CHINOOK SALMON IN SALTWATER

Lee Harrell, National Marine Fisheries Service,  
Manchester, WA

During a project for broodstock development, fall chinook salmon which had been held in saltwater for approximately one and one-half years encountered a potentially new pathogen. The organism caused a swelling of the kidney, stained PAS positive, and was detected in kidney smears. It was spherical, ranging in size from 1.6-4.7 microns, produced no hyphae and occurred intracellularly. The agent had characteristics similar to *Ichthyophonus*, but was much smaller. Material was sent to and examined by Dr. Glenn Hoffman who concurred that a fungus other than *Ichthyophonus* was present.

## IHN OUTBREAK IN COLORADO

Paul Jancke, USFWS, Fish Disease Center, Fort Morgan, CO

Infectious hematopoietic necrosis virus was isolated in early September from rainbow trout fingerlings at the Mt. Shavano State Fish hatchery near Salida, Colorado. This facility is located on the Arkansas River, utilizes river and spring water and provides fingerling trout to the Chalk Cliffs Rearing Unit (also operated by the CO DOW) which is located 15 miles NW on a tributary of the Arkansas River. IHN virus was not found at the Chalk Cliffs unit although trout were transferred from Mt. Shavano to Chalk Cliffs during the summer of 1983.

Three private hatcheries are located upstream from the Mt. Shavano SFH. IHN virus was not found in fish from these facilities. The effluents from two of these units enter directly into the water supply for the Mt. Shavano SFH.

In mid-September all fish (approximately 200,000 pounds) from the Mt. Shavano and Chalk Cliffs units were destroyed. The Colorado Division of Wildlife has purchased all fish present at the two private facilities immediately above the Mt. Shavano SFH and has stocked these fish in deadend waters in the southeastern part of the state.

The Mt. Shavano unit and both depopulated private hatcheries were disinfected. Chalk Cliffs Rearing Unit will be disinfected in January 1984.

This IHN outbreak was the second in Colorado (initial case 1972) and the first on the Arkansas River drainage.

## FISH RECOVER AFTER STARVATION

Ruth Williams and Nancy Wood, International Aquaculture  
Research Center, Hagerman, ID

Staff at International Aquaculture Research Center (ARC), Hagerman, Idaho, found that well-fed rainbow trout (10 g) could be held without feed for 39 to 74 days at 15°C. Mortality of 5% or less occurred during starvation, but fin nipping or other aggressive behavior was not observed. Fish starved for 39 days (21% wt loss) had little fat, enlarged and lumpy spleens, and thin body walls. Twenty-four days of feeding produced normal spleens, but adipose tissues and body walls remained light and thin. No mortality was observed after fish began feeding from demand feeders. Growth rates during recovery were higher than that typically seen (Table 1). Trout starved for 74 days (32% wt loss) and then put on demand feeders regained weight 1.8 times faster than non-starved trout of similar size. Both lots of starved trout required a minimum of ten days to regain lost weight. Starvation apparently is an alternative to maintenance diets if fish growth must be halted or retarded for management reasons.

Table 1. Starvation and Recovery of Rainbow Trout at 15°C

	Lot A	Lot B
Number of fish	90	200
Days starved	39	74
Days fed (recovery)	24	42
Days to return to 10g	12	10
Body weight (g)		
start of recovery	7.9 + 0.3	6.8
end of recovery	15.9 + 1.1	40.1
Total gain(g)	717	6660
Feed conversion	1.04	1.06
Growth rate (g/fish/day)*	0.33	0.79
Growth rate (g/fish/day)**	0.25	0.43

\*Rate for starved fish

\*\*Typical IARC growth curve of continually fed trout for the same initial size (7.9 and 6.8 g) and duration (24 and 42 days)

## SELENIUM CAUSING FISH MORTALITY

Steve Roberts, Washington Dept. of Game,  
East Wenatchee, WA

Egg and sac-fry mortality of 50 to 80% has been observed in progeny of domestic west slope cutthroat (*Salmo clarki lewisi*) broodstock. Mortality of 10 to 20% was noted in progeny of the same strain of wild fish. Analysis of protein, carbohydrate, fat, vitamins C and E, and selenium yielded no differences between eggs from wild or domestic broodstock except for selenium. Selenium concentration in eggs from domestic fish was 25 times that of wild fish eggs. In fact, the selenium level (5.1 ppm) was in the toxic range. Possibly selenium accumulation could be responsible for egg and fry mortality in Atlantic and coho salmon, and other broodstocks.

## MALACHITE GREEN — THE CONTINUING SAGA

Fred Meyer, National Fishery Research Laboratory  
La Crosse, Wisconsin

Fred Meyer and his colleagues reported in a recent issue of the Transactions of the American Fisheries Society that treatment of pregnant New Zealand rabbits and eggs of rainbow trout with malachite green oxalate resulted in significant indices of developmental anomalies. All levels of treatment affected fetal development in rabbits. The incidence of anomalies was about half that observed in thalidomide-treated positive controls and two to three times that in untreated controls. Some fetal toxicity was observed. Treatment of rainbow trout eggs with malachite green caused deformities at rates about three to five times that observed in untreated lots.

Although there are negative aspects concerning the use of malachite green, this compound is still the most effective and, in some instances, the only practical chemical available for fungus control. Approximately 80 compounds were tested by the La Crosse laboratory and none has proven to be a potential replacement.

Currently the Fish and Wildlife Service holds an investigation new animal drug permit from the FDA to allow collection of data associated with use of malachite green as a fungicide on returning adult salmon. Work has been initiated to investigate residues in tissue, eggs, and fry from treated adults. Similar work is also being done at the Fish Farming Experiment Station in Arkansas.

## BOOKS OF INTEREST

**Microscopic Anatomy of Salmonids: An Atlas.** W. T. Yasutake and J.H. Wales. U.S. Fish and Wildlife Service Resource Publication 150. Washington, D.C. 1983. 190 pp. No charge.

After ten years in preparation, this excellent reference is now available and will prove to be an essential addition to the library of anyone involved with fish histology. Several features of this book are worthy of mention. Most important is the superb quality of the photomicrographs and the care with which they have been selected. Rather than describe the structure of tissues and organ systems in detail, the authors provide a concise introduction to each system and follow it with outstanding illustrations carefully and fully captioned, the net effect being a book which shows, rather than tells, the reader.

Another important feature of this work is the extensive bibliography. The authors have included selected citations far in excess of those needed to support this work. The result is a reference which will be of real value to those readers needing to go into the literature in more detail.

Several other aspects of this work deserve mention including the high quality of black and white and color reproductions, a useful appendix of fixation and staining procedures, excellent organization and contributions of several workers. However, one of the most incredible features is the price. While supplies last, this atlas is available at no charge from Dr. William Yasutake, U.S. Fish and Wildlife Service, National Fisheries Research Center, Naval Support Activity, Bldg. 204, Seattle, WA 98115.

A companion volume, Histopathology of Selected Salmonid Diseases: A Color Atlas is in preparation. Dr. Yasutake says it will be completed within three years. After seeing this first work, the next one will be eagerly awaited.

James R. Winton

**A Guide to Integrated Fish Health Management in the Great Lakes Basin.** Edited by F.P. Meyer, J.W. Warren and T.G. Carey. Great Lakes Fishery Commission Special Publication 83-2. Ann Arbor, Michigan. 1983. 272 pp. No charge.

Here is another bargain in fish health literature. This unique volume is a source for information found nowhere else and is a combination of a hatchery manual and fish health text designed for both administrators and fish culturists. The book presents, as its title implies, an integrated approach to fish health management. The broad nature of the coverage comes from the experience of the 19 contributing authors. Jim Warren and the other members of the Great Lakes Fishery Commission have done an excellent job in pulling all the diverse material into a compact reference. While not designed to be a detailed treatise on any one topic, the book provides, as few others, a view of the total approach to managing fish stocks with fish health as an overall goal.

This book is available at no charge from the Great Lakes Fishery Commission, 1451 Green Road, Ann Arbor, Michigan 48105. It should be required reading for all administrators and fisheries workers.

James R. Winton

**Textbook of Fish Health.** G.W. Post. T.F.H. Publications, Neptune, New Jersey. 1983. 256pp. \$29.95

This book represents an important addition to the field of fish pathology and fills a long-standing need for a moderately-priced general introductory textbook. The author has managed to achieve a balance between exhaustive detail and the need to cover many topics. The work should be in the library of any fish health specialist who wishes a good general reference.

The organization of the book is logical and begins with an introductory chapter followed by sections on diagnosis of disease, control of disease, bacterial diseases, mycotic diseases, viral diseases, parasites, immunology, nutrition, neoplastic conditions, toxicology and miscellaneous maladies. Each disease is discussed in a well designed standard format giving a history, description of the etiological agent, geographical range, susceptible species, epizootiology, disease signs, diagnosis, therapy or control, prognosis, and practical aspects. A large center section with 32 pages of very good color photographs is also included and is a strong feature of the book.

If this book has a fault it is that most of the references are over five years old and some of the material is already dated. Also, certain areas seem a little less complete than others, but overall the author has done an excellent job. The book is recommended especially, for the purpose for which it was written, as an undergraduate or introductory text.

James R. Winton

The revised edition of the Manual of Compliance of the Canadian Fish Health Protection Regulation should be available in early 1984. Modifications have been made with methods but not with regulations. Dept. of Fisheries and Environment, Scientific Information and Publications, 116 Lisgar St., Ottawa, Canada K1A 0H3.

## BRIEF REPORTS

Preliminary experimental results indicate that injection of erythromycin phosphate into adult chinook salmon followed by oral administration of the drug to progeny can double marine survival when compared to untreated chinook known to be infected with *Renibacterium salmoninarum*. Mike Evenson, Oregon Department of Fish and Wildlife, Cole Rivers Hatchery, Trail, Oregon.

A natural infection of Arctic char with IPNV has been detected in the Rat River, a tributary of the Mackenzie system. These fish are anadromous, migrating into the Arctic Ocean and have been found along the coast of Alaska. This isolation may represent a true natural infection as no history of the introduction of rainbow or brook trout has been found. Epidemiological studies are required to examine additional stocks of fish. Tats Yamamoto, Brian Suter, University of Alberta, Edmonton, Alberta.

A study by the Washington Department of Fisheries in cooperation with the USFWS-Sandpoint Lab examining the carrier state of IHNV in adult sockeye salmon has met with great adversity. The experimental design called for individual female adults trapped as they left seawater to be held in freshwater quarantine to prevent horizontal transmission of virus. The adults will be held to sexual maturity, then assayed for viral infection. To date, only four females have ripened, and IHNV is yet to be isolated. Meanwhile, on the Cedar River (eventual destination of trapped sockeye), IHNV infection rate is approaching 100% in the spawning sockeye. Kevin Amos, WDF, Olympia, WA.

An effective aid to salmon enhancement was discovered when a newspaper used the story headline "Scientists find pollution-linked cancer in B.C. fish". Gordon Bell, Pacific Biological Station. Coincidentally, a newspaper in the Northwest ran "Tuberculosis found in Columbia River Salmon".

Protozoan parasites of the brain have been used for stock identification and fisheries management of sockeye salmon in B.C. L. Margolis, Pacific Biological Station.

Pre-spawning losses of adult salmon have been reduced through injection of oxytetracycline and erythromycin (combined). No teratogenic effects were observed. Gary Hoskins, Dorothee Kieser, Pacific Biological Station.

Salmon eggs have been experimentally infected, internally, with *Aeromonas salmonicida* and *Renibacterium salmoninarum* in order to test the efficiency of various disinfectants. Trevor Evelyn, Gina Prosperi-Porta, John Ketcheson, Pacific Biological Station.

Scientists at the Pacific Biological Station, Nanaimo, B.C., are concerned about poor bacteriological quality of Oregon Moist Pellets from both human and fish health points of view. Their inspection branch will monitor total viable, fecal coliform, and streptococcus counts.

Channel catfish have two types of immunoglobulin light chains. This may parallel the kappa and lambda light chains of higher vertebrates. Craig Lobb, Dept. of Microbiology, U. of MS Med. Ctr., Jackson, MS.

A new method involving embedding in agarose has been developed for examination of large leukocytes in catfish blood. Craig Lobb, Dept. of Microbiology, U of MS Med. Ctr., Jackson, MS.

Atypical *Aeromonas salmonicida* strains have been isolated from diseased herring held in saltwater impoundments. Gordon Bell, Garth Traxler, Pacific Biological Station.

Healing of simulated fishing gear wounds in chinook salmon is under study using histopathology. The purpose is to assist in identification of illegal fishing. Gordon Bell, John Bagshaw, Pacific Biological Station.

A number of members have indicated to the past president that the next revision of the fish health "Blue Book" should be in loose leaf form. This form would accommodate more frequent and less costly future revisions. E. Shotts, U. of Georgia, Athens, GA.

Guy Tebbit of Wildlife Vaccine Inc., Wheatridge, Colorado reports that his company has recently become associated with Patrick A. Smith and Aquaculture Vaccines Ltd. of London, England. This company is the first to license and market fish vaccines in the United Kingdom. The products available include bacterins against *Yersinia ruckeri*, *Vibrio anguillarum* and *Aeromonas salmonicida*.

A microcomputer program to store and summarize fish mortality has been developed for catfish. Software is available from Tom Wellborn, PO Box 405, MS State U., Starkville, MS.

Alaska Dept. of Fish & Game has tested three IHN isolates on four stocks of chum salmon. Mortality was 30-100% depending on the stock of fish and virus isolate. Roger Grischkowsky, ADF&G.

The Fish Health Protection Committee of The Saint Croix River has been formed. Members from Canada, Maine, and USFWS believe the committee will serve as a model for the Northeast. Hopefully, private parties will be involved in the future. Peter Walker, ME Dept. Inland Fish & Wdlf., Augusta, ME.

BKD is present in two of the nine State hatcheries in Maine. Both federal hatcheries in Maine have no BKD. Peter Walker, ME Dept. of Inland Fish & Wdlf., Augusta, ME.

*Lydia scyphidia* was treated with formalin; one hr. @ 1:4,000. R.I.P.

VEN, *Ceratomyxa shasta*, and *Dermocystidium sp.* were detected in wild adult pink salmon in the Frazer River. This appears to be the first record of VEN and *C. shasta* in feral pink salmon. Gordon Bell, Garth Traxler, Pacific Biological Station, Nanaimo, B.C.

Independent of Austin (FEMS microbiology letter, 1983 No. 17, p. 111) a relatively effective, simple, selective medium for culturing *Renibacterium salmoninarum* has been developed by supplementing Evelyn's KDM with 4 mg/l furazolidone and 15 mg/l polymixin-B-sulfate (both final concentration). Modifications are continuing. Gordon Bell, Pacific Biological Station.

## —Special Contribution—

### REFLECTIONS ON THE SCIENCE OF FISH PARASITOLOGY

Glenn L. Hoffman, Ph.D., Parasitologist  
President FHS/AFS  
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P.O. Box 860, Stuttgart, Ark. 72160

In this treatise I hope to touch on the highlights of freshwater fish parasitology, starting, not with year one, but 1758 when Linnaeus described the anchor parasite, *Lernaea cyprinacea*, (or was it *elegans*?). We're still arguing about that one! But not all name determinations have had such difficulties. Linnaeus described *L. cyprinacea* from *Carassius* (goldfish) and, according to Poddubnaya (1974) in U.S.S.R. it is found only on that fish. Leigh-Sharpe (1925) described *L. elegans* from eels; it is slightly different from *L. cyprinacea* in possessing Y-shaped dorsal anchor arms instead of T-shaped ones and has since been found on many species of fish (Poddubnaya, 1974) -- and so the search for the right names goes on. Names can be very important, but in this case we all know that the anchor parasite with the Y-shaped dorsal anchor arms is murder for scaled fish in fish culture when the water is above 20°C. If the anchor parasite population has not gotten too high we can kill the infective larvae with Masoten (F. Meyer, 1966) -- and that's about all the progress we've made in control since 1758. We have much more to learn. I've used *Lernaea* as an example of "I've got bad news and good news", in fish parasitology.

During the last part of the last century, German biologists were leading the world in research, and Bruno Hofer (1904) included certain fish parasites in his *Handbuch der Fischkrankheiten (Handbook of Fish Disease)*. For example, the causative agent of the salmonid whirling disease was described by Hofer in 1903 as *Myxobolus cerebralis* -- *cerebralis* because he found spores in brain squashes. His successor in Munich, Marianna Plehn, described the organism and disease more fully in 1905, and another famous German, W. Schaperclaus (1931), provided much more valuable information. The work on whirling disease, as with *Lernaea* continues in several labs in the United States and Europe. In Germany in many phases of fish parasitology, W. Schaperclaus (age 84), Odening, H.H. Reichenbach-Klinke, N. Amlacher, G. Schubert, and W. Korting and others maintain the German tradition in fish parasitology.

As another example of the continuing research on fish parasites I mention the story of *Posthodiplostomum minimum* (the white grub). In 1921 MacCallum described the adult from the intestine of a heron. Hughes described the metacercaria (white grub) from the body cavity of fish in Michigan. Ferguson (1936), Hoffman (1958) and others provided more information about the famous white grub, but I'm sure there is much more to learn, particularly about how to control the snail intermediate host.

And then there's PKD without even a generic name!

The father of North American fish parasitology, Dr. H.S. Davis (1875-1960) started his career describing important fish sporozoa from marine fishes. He soon switched to freshwater with his first freshwater fish parasite paper, "Sporulation and Development of the Cysts of a New Species of Myxosporidia, *Lentospora ovalis*" appearing in 1921. Following that was a long line of freshwater fish parasite publications; the most widely used was the disease section in his book, "Culture and Diseases of North American Freshwater Fish" (1953) -- this excellent publication is still an important reference.

During this same period in North America, and while Marianna Plehn in Germany was writing her 1924 book, *Praktikum der Fischkrankheiten (Practice of Fish Diseases)*, the "mother" of the American fish disease profession, Dr. Emmeline Moore, working for the state of New York, made great contributions on protozoan, helminthic, and many other fish disease problems. This was followed by parasite control publications by F. Fish (Seattle) and others.

Concurrent with this activity in America and Western Europe the science of fish parasitology was developing in the U.S.S.R. with E.M. Layman (1949) near Moscow publishing *Diseases of Fishes*, and V.A. Dogiel (1882-1955) founding the school of fish parasitology in Leningrad. Dogiel's excellent textbook was considered important enough to be translated into English by Oliver and Boyd Publishing Company (Z. Kabata translator). Because some North American and European fish parasites are identical or closely related, this book has been useful worldwide.

Dogiel's students, Bauer, Bychowski, Gusev, Markevich, Shulman, Petrushevski realizing the great need for a guide to the identification (diagnosis) of fish disease parasites, published *The Key to Fish Parasites of the U.S.S.R.* in 1962. The U.S. Fish and Wildlife Service translated and published the book, making it accessible to English-speaking scientists worldwide. This useful item, under Prof Bauer's guidance has been revised and is in press - I hope someone can find a way to have this version translated into English, too.

During this period, stimulated by Prof. L.O. Nolf, University of Iowa, and kindly assisted by Dr. S.F. Snieszko, Leetown, I accumulated enough reprints and 3 X 5 index card notes to publish *The Parasites of North American Freshwater Fishes* with information on 1000 species, and keys to the genera. Like the Russian guide, this book has found a worldwide usefulness. I hope to revise it as soon as time and facilities permit.

Fish parasite research is now so active in many countries that an informal international society has developed. New journals have appeared, and no doubt important books will come out of this work in the future. My own contacts include parasitologists in 69 countries; a wonderful exchange of information and scholarly consultation is occurring among scientists, for example, in U.S.A., Canada, Czechoslovakia, Poland, W. Germany, E. Germany, Sweden, France, Yugoslavia, Hungary, Italy, England, Scotland, Japan, Malaysia, India, Pakistan, Chile, Peru and Colombia. I'm sorry I have not enough space to mention each person by name.

This past August, at Ceske Budejovice, Czechoslovakia, 103 of these fish parasitologists gathered for the First International Symposium of Fish Parasitologists, organized by Jiri Lom, Frank Moravec and the rest of the Czechoslovakian Institute of Parasitology.

In many countries fish parasitology is included in a developed science and service of fish pathology (not histopathology only) -- a service that not only supports research, but provides diagnostic services to a variety of fish culturists and fishermen. As an example, let me very briefly describe the United States system. Under the impetus of Dr. Snieszko's friendly persuasion, a system similar to the diagnostic and extension service of the Department of Agriculture has been developing in the U.S. in recent years. Although progress has been delayed by recent government financial cutbacks, a healthy cooperation has developed between U.S.F.W.S. Researchers, U.S. Fish Hatchery Biologists, State Fisheries Pathologists, university professors and a multitude of bright young graduate students. A parallel development in fish pathology is occurring in other countries. Continuing such national and international work will provide information that will eventually help control and/or eradicate dangerous pathogens.

### FISH HEALTH NEWSLETTER

The Fish Health Newsletter is a quarterly publication of the Fish Health Section of the American Fisheries Society. Submissions of any length on a topic of interest to fish health specialists are encouraged and should be addressed to one of the editorial staff or to a member of the publication committee.

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