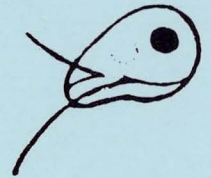


# FISH HEALTH SECTION

# A S F

# NEWS LETTER



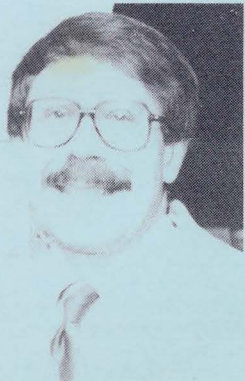
Volume 17, Number 4

*Smeszko award 1989 - Doug Anderson*

Fall 1989

## PRESIDENTIAL MESSAGE - PAST PRESIDENT

*Doug Anderson, President 1988-1989*  
*Fish Health Section/American Fisheries Society*



For 17 years the Fish Health Section has been prominent in leading communications in fishery research, product development, and field application of new techniques. In addition, and of increasing importance, we are continuing to recommend and design fish health guidelines and policies for governmental and private agencies. Our professional organization is highly respected, and we will carry on these responsibilities.

We have seen a continued growth in membership in our Section. The FISH HEALTH SECTION NEWSLETTER is a valuable communications tool, popular in fishery departments and agencies. A membership form was inserted in the spring issue and has also been distributed at various fishery meetings. There has been more involvement of the membership as committee work has increased. The committee chairpersons are taking on more responsibility in their own specialties.

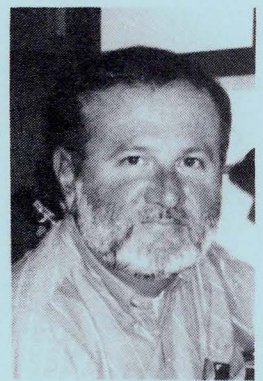
The first issue of the JOURNAL OF AQUATIC ANIMAL HEALTH has been issued with 1500 copies. Every member of the Fish Health Section should have received a copy. New subscribers are being solicited; a reduced rate is given to the FHS members. This professional journal will play a large role in the development of fish health. The journal editors, Bill Rogers, John Plumb and John Grizzle have established an important milestone in fish health.

The annual meeting, held for the first time in Annapolis, Maryland, was in conjunction with the Eastern Fish Health Workshop. The Program designed by Frank Hetrick representing the University of Maryland, Department of Microbiology, drew over 200 people, presenting 67 oral presentations and 20 posters. The success of the annual meeting was demonstrated also by the number of foreign representatives from England, Scotland, The Netherlands, and Thailand. The abstract booklet, although published for 25% over predicted attendance, was oversold by the end of the meetings.

Planning is important for long range development of the Fish Health Section. Although we are limited by the time we can donate, somehow workshops and special training sessions for our members must be designed and be made available for our profession. Sponsorship and promotion of certain specialty publications that may have pertinence for our members should be initiated. Also certification procedures for the Fish Health Inspector and Fish Pathologist need to be expedited and clarified. Our new president, John Schachte, is highly qualified; give him your support through the next year.

## PRESIDENTIAL MESSAGE - PRESENT

*John H. Schachte, President, 1989-1990*  
*Fish Health Section, American Fisheries Society*



It is both an honor and a privilege to have been chosen by the membership to serve as president of the Fish Health Section. However, with that honor comes a challenge to coordinate Section activities through what I sense as a year of transition. Specifically, I refer to several key areas of emphasis within the Section about which various segments of our membership have expressed concern. Among these are the Section's efforts to foster professionalism, provide information transfer and stimulate and maintain membership as it applies to all potential, and/or allied fish health disciplines.

During the last ten years, we have seen the difficult task of professional recognition for fish health inspectors and fish pathologists become a reality. The Section has also steadily improved both the quality and attendance at its annual meetings and most recently sponsored a journal devoted to fish health. Also, last year we experienced a concerted effort to increase our membership. In spite of these significant accomplishments and the dedicated efforts of many of our members, we are beginning to recognize specific problems that need our attention in the aforementioned areas. The certification program is evolving beyond the framework originally designed. As such it must become more flexible to meet changing needs. The newly organized Professional Standards Committee (PSC) is formulating new strategies as well as implementing changes in such areas as examination administration. Hopefully, new PSC initiatives such as in-service training and laboratory proficiency testing will be met with enthusiasm by our membership. Also this year we hope to make a concerted effort through our 1990 meeting program committee to appeal to and deliver a program to the broadest possible audience within the Section. Let me hasten to point out that no criticism of past efforts is intended. However, we now find professionals in such areas of expertise as molecular biology and veterinary pathologists and epidemiologists, to mention but a few, who are asking if the Fish Health Section is an appropriate forum for their interests and their work. I believe as do many of you, that it is. Accordingly, the Section needs your ideas and your talent to reach such potential members.

In closing let me say that a phrase frequently employed by athletes seems particularly appropriate for us today. That is "no pain, no gain". In other words, if we expect to experience growth in the Fish Health Section we must be willing to endure the accompanying discomforts that go with it. Please join me in minimizing this discomfort by your continued support of the Fish Health Section and your active involvement in its programs.

17(4)

1989

Frank P7,  
J. Camper 7

## FHS OFFICERS AND COMMITTEES 1989-1990

### EXECUTIVE COMMITTEE

#### Voting Members

John Schachte, Chair and President, FHS  
 Charlie Smith, President-Elect  
 Doug Anderson, Immediate Past President  
 Vicki Blazer, Secretary-Treasurer

**Non-Voting Members** (Chairs of Standing Committees)  
 Randy MacMillan, Newsletter and Publications Committee  
 Awards Committee - to be named  
 Kathy Hopper, Membership and Balloting Committee  
 John Cvitanich, Professional Standards Committee  
 Board of Certification - to be named  
 Rod Horner, Technical Procedures Committee  
 Archives Committee - Tony Amandi  
 Paul Reno, Time and Place Committee  
 Bill Rogers, Scientific Journal

### STANDING COMMITTEES

#### Nominating

Marshall beleau, Chair  
 Rich Holt (2 years)  
 Scott LaPatra (3 years)

#### Newsletter

Randy MacMillan, Chair  
 Members to be named.

#### Technical Procedures

Rod Horner, Chair  
 Kevin Amos  
 Dennis Anderson

#### Professional Standards

John Cvitanich, Chair  
 Mike Kent  
 Martin Chen  
 Roger Herman

#### Board of Certification

Chair to be named  
 Ted Meyers  
 Ralph Elston (2 years)  
 Paul Janeke (2 years)  
 John Hnath (3 years)  
 Ron Thune (3 years)

#### Finance

Vicki Blazer, Chair  
 Kathleen Hopper (Membership)

#### Awards

Chair to be named  
 John Fryer (1 years)  
 Fred Meyer (2 years)

#### Time and Place

Paul Reno, Chair  
 Ron Hedrick (1 year)  
 Ed Noga (2 years)

#### Archives

Tony Amandi, Chair  
 Glenn Hoffman

### AD HOC COMMITTEES

#### Program (1990 Meeting)

Paul Bowser, Chair  
 Rod Horner  
 Charlie Suppes  
 Joe Marcino

#### International Standards

Chair to be named  
 Bruce Nicholson  
 Barry Hill  
 Pierre de Kinkelin  
 Victoria Rasheed  
 Hisatsuga Wakabayashi

#### Procedures Evaluation

\*Emmett Shotts, Chair  
 (*Streptococcus, Lactobacillus*)  
 \*John Hawke  
 (*Edwardsiella ictaluri*)  
 \*Yolanda Brady (CCV)  
 Phyllis Barney  
 \*Cliff Starlipper (*Flexibacter*,  
 gill diseases)  
 Howard Jackson  
 Ron Hedrick  
 \*Diane Elliott  
 (*Aeromonas salmonicida*)  
 \*Robert Durborow  
 (Warmwater parasites)  
 \*Roselynn Stevenson  
 (*Yersinia ruckeri*)  
 Jeff Teska  
 \*Phil McAllister (VHSV)  
 \*Russ Kelly (IPNV)

#### Long Range Projects & Planning

Ron Hedrick  
 Standing Committee Chairs

#### Scientific Journal

Bill Rogers, Chair  
 John Plumb  
 John Grizzle

#### Blue Book Field Advisory

John Thoesen, Chair  
 \*Scott LaPatra (IHNV)  
 \*Jack Frimeth  
 (Coldwater parasites)  
 Chris Horsch  
 Diane Elliott  
 Steve Roberts (*Renibacterium*)  
 Jack Ganzhorn (*Vibrio*)

\*Designates Disease Committee Network Chairs

## FROM THE EDITORS

This copy of the Newsletter represents our final issue as editors. After six years, it is time for a change. Randy MacMillan (Drawer V, College of Veterinary Medicine, Mississippi State, MS 39762, phone 601-325-2432) has graciously agreed to assume our job with the first issue of next year and we are looking forward to retirement. During our term as co-editors (originally with the help of David Ransom) we tried to establish the Newsletter as a forum for both scientific and personal communications. We feel we have succeeded in the scientific arena as Newsletter articles are cited regularly in fish health publications. While we are delighted that the articles are of a quality worthy of reference, we have some concerns about this development as the Newsletter is not a peer-reviewed publication. On the personal front, we have not been very successful in stimulating controversy or opinion. With the exception of a few members who authored Special Contributions or wrote letters, the membership seems more interested in receiving information than in discussing fish health issues.

In addition to getting a copy of the Newsletter into your hands on a regular basis, we arranged for the printing and distribution of the Fish Health Section Membership Directory and the Fish Health Section Blue Book. We also obtained advertising in the Newsletter and Directory to help offset costs and established a method by which, for the first time, the Section made money from the Blue Book. In short, we feel our term as editors has been of value. Naturally, none of this would have been possible without the substantial support and assistance from the Section members. The Directory and Blue Book Committees worked hard to get their respective publications in print. Many of you sent articles to us of excellent quality that needed only minor editing. We appreciate your efforts.

During our term as editors, the Newsletter received an award from the AFS and we received many gratifying comments from Section members. These made our job easier and we hope you will provide Randy the same support you have given us. In fact, your efforts must continue if the Section is to maintain leadership in Fish Health. The Directory needs to be updated and the Blue Book is due for revision. You will have to keep sending articles for the Newsletter. The Newsletter is your publication. Remember that it is the appropriate forum to tell others what you are doing, what you have discovered, or what you think. With your direct involvement, the Newsletter can become even better. Thank you.

John Rohovec  
 Jim Winton

## ELECTION RESULTS

Kathy Hopper, chairman of the membership and ballot committee reports the results of the balloting for Fish Health Section elected positions. A total of 214 ballots were cast. The results are:

President-elect - Charlie Smith  
 Board of Certification - John Hnath, Ron Thune  
 Nominating Committee - Scott LaPatra

We extend congratulations to these individuals and appreciation to those who ran, for their willingness to serve the Section.

## US TITLE 50 TO BE REVISED

A notice by the US Fish and Wildlife Service of the intent to revise 50 CFR 16.13 was published on pages 33947-33949 of the Federal Register, Vol. 54, No. 158, August 17, 1989. The intent of this revision will be to update the regulations involving the importation of fish and fish eggs into the United States. As most of the Fish Health Section members are aware, these regulations have not been revised in the nearly 20 years since they were originally written. The new regulations will take into account recent knowledge about the presence and distribution of fish pathogens, and about improvements in methods for detection and control of these agents. While the formal comment period has expired, the process of revising these regulations will take time and involve several members of the Fish Health Section. The revision will be managed by Dr. John Nickum, Division of Fish Hatcheries, 820 ARLSQ, US Fish and Wildlife Service, 18th and C Streets NW, Washington, DC 20240. Telephone 703-358-1878.

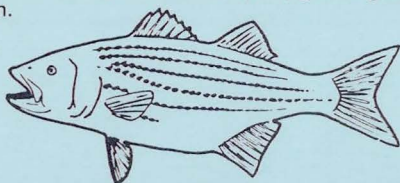
## BIOMED ANNOUNCES ACQUISITION BY A.L. LABORATORIES

Biomed, Inc. of Bellevue, Washington, has announced it was acquired by A.L. Laboratories, Inc. of Fort Lee, New Jersey. A.L. Laboratories manufactures and markets specialized generic pharmaceuticals and animal health micronutrients.

According to Biomed's founder, Dr. John Majnarich, it is a positive development for the company. The acquisition will make it possible for Biomed to expand its Research and Development departments, accelerating new products to the aquaculture industry, the fastest growing segment of agriculture in the United States.

Biomed has the only USDA-approved aquaculture bacterin production facility in the country. The company currently offers five products for use in commercial salmon and trout production. Several new products are scheduled for completion in 1990.

According to I. Roy Cohen, President and Chief Executive Officer of A.L. Laboratories, the acquisition will prove beneficial to both companies. The acquisition is a logical strategic extension to our company's animal health business. Even though Biomed's current operations are quite small compared with A.L. Laboratories (\$1.8 million in sales), they believe Biomed offers them entry into a new, rapidly growing segment of protein production.



## NEOPLASMS IN CULTURED HYBRID STRIPED BASS, *MORONE SAXATILIS* x *MORONE CHRYSOPS*

Arunthavarani Thiyagarajah, Alexander D. Munson,  
John R. MacMillan, and Brenda K. Nevels  
College of Veterinary Medicine  
Drawer V  
Mississippi State University  
Mississippi State, MS 39762

A persistent mortality has been observed in cultured hybrid striped bass, *Morone saxatilis* x *Morone chrysops* in Mississippi. Several genera of bacteria have been isolated from these fish including *Aeromonas sobria* and alpha hemolytic *Streptococcus* spp., not group D. Grossly, however, livers were pale and floated in formalin fixative. Two of seven fish, recently examined, had grossly visible hepatic neoplasms. Histological evaluation of all fish livers, gills and other visceral organs revealed the presence of neoplasms as follows: hepatocellular carcinomas (3/7), branchioblastomas (3/7) and widely disseminated lymphocystic lymphomas (2/7). Lymphoma cells were infiltrating into gills, anterior and posterior kidneys, livers that did not have hepatocellular neoplasms, iris, vitreous humor, retina, choroid gland of eye, mucosa, submucosa, and muscularis of the alimentary tract, gonad, atrium, ventricle and bulbus arteriosus of heart, and abdominal muscle. Pre-neoplastic lesions such as glycogen-rich foci, vacuolated-cell foci and basophilic foci were found in 3 fish including the ones that had hepatocellular neoplasms. Acinar cell hyperplasia of pancreas was found in one fish.

In addition to neoplasms, disseminated intravascular coagulation was present in gill, branchioblastomas, brain, gastric, intestinal, mesenteric and hepatic blood vessels. Chondroplasia and deformed cartilage of gill filaments were also present in these fish. Microscopic slides of these neoplasms have been deposited at the Registry of Tumors in Lower Animals, Smithsonian Institution, Washington, D.C., USA (RTLA 8755, 4764-4767.)

At this time it is not known whether the carcinogen is water-borne or feed related. Virus particles were not evident in ultrastructural preparations of the tumor tissue, and no virus was isolated in tissue cultures.

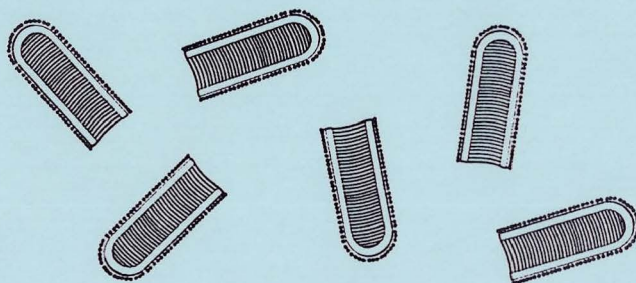
## MONOCLONAL ANTIBODIES RECOGNIZING THE NUCLEOPROTEIN OF IHNV DISTINGUISH BETWEEN ISOLATES OF THE VIRUS

S.S. Ristow, J.M. Arnzen, T. Cleveland and T. Fagerness  
Department of Animal Sciences  
Washington State University  
Pullman, WA 99164-6332

Monoclonal antibodies were produced to the nucleoproteins of several strains of infectious hematopoietic necrosis virus including Round Butte, Dworshak, Hagerman, Feather River, Cedar River and Coleman. A number of isolates classified by electrophoresis as types 1-5 by Hsu, Engelking and Leong [Applied Environmental Microbiology, 52, 1353, 1986] were tested by immunofluorescence with a panel of antinucleoprotein antibodies. Examples of the utility of a limited panel of these antibodies in distinguishing between isolates by indirect fluorescence is shown below in Table 1. In our hands, antibody 1NDW14D universally recognizes over a hundred IHNV isolates tested. Antibody 2NH105B identifies type 2 IHNV, while 2NCO42C identifies isolates within type 4. Monoclonal 1NH17W differentiates between isolates within electrophoretic types 1, 2, and 3, considerably expanding the number of types of IHNV which have previously been described. Analysis of IHNV isolates by immunofluorescence with the antinucleoprotein antibodies described here coupled with an analysis of the same isolates with serum neutralizing monoclonal antibodies to the glycoproteins, [Arakawa, Lannan and Winton, Fish Health Newsletter 14(3), 1, 1986] will allow further classification of the many strains of IHNV and aid fish health workers studying the epizootiology of IHNV.

Table 1. Indirect Immunofluorescence Tests on IHNV Isolates with anti-nucleoprotein antibodies.

ISOLATE	1NDW14D	2NH105B	1NH17W	2NCO42C
<b>Type I</b>				
Round Butte 1	+	-	+	-
Lake Auke	+	-	-	-
Tamgas Creek	+	-	+	-
Lake Nerka	+	-	-	-
Suttle Lake	+	-	+	-
<b>Type II</b>				
Hagerman 039-82SR	+	+	+	-
Clear Springs	+	+	-	-
Cowlitz 3	+	+	-	-
<b>Type III</b>				
Trinity River	+	-	-	-
Nan Scott Lake	+	-	-	-
Feather River	+	-	+	-
<b>Type IV</b>				
Coleman 2	+	-	+	+
Coleman 3	+	-	+	+
<b>Type V</b>				
Karluk River	+	-	+	-
Cedar River 2	+	-	+	-



## HOW DO ADULT SOCKEYE SALMON CONTRACT IHNV DISEASE?

R.A. Elston<sup>1</sup>, L.W. Harrell<sup>2</sup> and T.A. Flagg<sup>2</sup>

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Manchester, WA 98353

We reported earlier (FHS Newsletter, 16,2) the failure to detect infectious hematopoietic necrosis virus (IHNV) in spawning sockeye salmon which had been captured during migration and held to maturity in freshwater net pens. In that study, no naturally spawning sockeye salmon were tested for the virus. In a continuing study we made virological examinations of 336 Lake Wenatchee, Washington stock sockeye salmon spawned from net-pens in 1988 as well as 18 sockeye salmon which migrated upriver through Lake Wenatchee and were captured on spawning grounds.

Adult returning sockeye salmon (*Oncorhynchus nerka*) were captured by National Marine Fisheries Service personnel between 31 July and 5 August, 1988, at the Tumwater Dam on the Wenatchee River (about 20 miles downstream from Lake Wenatchee). After capture, the fish were transported to Lake Wenatchee where they were held in net-pens until maturity. The net-pen site was located about 300 yards from the mouth of the White River. Fish were spawned and samples collected for virological examination (n=336) at the Lake Wenatchee site from 20 September to 6 October 1988. In addition, five adult fish were captured from spawning grounds on the Little Wenatchee River, and 13 adult fish were captured from spawning grounds on the White River on 29 September and 5 October, respectively. Both of these capture sites were between one-half and three miles upstream from the mouth of these waterways on Lake Wenatchee.

Essentially, methods from the "Bluebook" (Amos, K.H. ed., 1985, Procedures for the detection and identification of certain fish pathogens. 3rd ed., Fish Health Section, American Fisheries Society) were used with the following specifics: all samples were evaluated individually on both EPC and CHSE-214 cells; both reproductive (1/2 and 1/10 dilutions) and spleen-kidney pool (1/20 and 1/80 dilutions) samples were evaluated; 209/336 Lake Wenatchee cultures were blind passed and all Little Wenatchee River and White River samples were subcultured. Selected individual tissue cultures which displayed cytopathic effect on primary and secondary cultures were tested for the presence of IHN virus using a serum neutralization procedure. Anti-IHN virus antiserum prepared against Cedar River, Washington IHN virus isolated from sockeye salmon, (kindly supplied by J. Winton, National Fisheries Research Center, U.S. Dept. Interior, Seattle, WA) was used in the neutralization procedure.

No IHN or other virus was detected in 335 tissue samples from fish spawned from net-pens in Lake Wenatchee. In one sample the tissue cultures were contaminated with bacteria and the cultures were discarded. Sixteen of 18 fish (89%) collected from the spawning grounds on the White River and Little Wenatchee River, both upstream from the Lake Wenatchee net-pen site, were positive for the virus. These tissue cultures displayed cytopathic effect (CPE) typical of that produced by IHN virus, with onset of CPE in 1.5 to 4 days in the original cultures. Following subculture, two samples of tissue culture fluid from fish from each river were verified to contain IHN virus by the serum neutralization method.

These results were consistent with 1987 results in which all 226 sockeye salmon spawned from net-pens in Lake Wenatchee were negative for the fish viruses. Importantly, the current study demonstrated that fish from the same population which reach spawning grounds naturally are infected with IHN virus at a high prevalence (89%). The sites from which positive fish were sampled were one to three miles from the net-pen site. Fry from both the 1987 and 1988 broods were monitored for health and tested for viruses and none have been found to date.

Several hypotheses can be advanced to explain the lack of detectable IHN virus in the net-pen fish in contrast to the typical observation of high levels of infection intensity and prevalence on sockeye salmon spawning grounds:

- 1) **Sockeye salmon may not be latently infected throughout their life span.** The IHN infection may result from exposure to the virus once the fish reach the spawning grounds. This hypothesis implies the presence of an alternative host for the virus which produces and sheds sufficient amount of virus to infect a high proportion of the population at the time the fish return to the spawning ground.
- 2) **The fish may be selectively infected with IHN at a very low rate prior to the time they reach the spawning grounds.** Under this hypothesis the carrier rate could have been so low in the currently reported study that more than 335 fish would have to have been sampled in order to detect the virus. However, based on the assumption of random sampling and a binomial distribution (with 335 fish sampled out of an assumed population of 8,000 fish) the probability that the population is greater than 99% disease free is at least 97%. Thus, we have established with 97% confidence that the population is at least 99% disease free. If there were actually a very low carrier rate, this hypothesis would require that the carriers be infected at a high enough intensity so they shed sufficient virus in order to infect the other fish on the spawning ground.
- 3) **A large proportion of sockeye may be latently infected with IHN prior to reaching the spawning ground.** Under this hypothesis, the stress of returning to the spawning ground would likely trigger the replication of virus to the relatively high titer seen in fish sampled from the spawning ground. This hypothesis implies that the salmon in the net-pens are not subjected to the same level of stress or whatever factors trigger the expression of viral replication and remain latently infected. Consequently, the tissue culture assays commonly employed to detect infected fish, as used in this study, are not sufficiently sensitive or appropriate to detect the virus in these fish.

A more definitive study will be required to validate any of the above hypotheses. However, the first hypothesis seems attractive at this point, given the lack of virus detected in 335 fish, the rapid infection of a high proportion of individuals on the spawning grounds and the apparent lack of virus in the brood.

This method of holding maturing fish in net-pens appears to be an important resource management tool for sockeye salmon. Previously, it has been believed that a high proportion of adult sockeye are infected with IHN virus and that the virus is transmitted to the fry. These studies have demonstrated that virus-free adult fish and reproductive products can be readily obtained and offspring safely reared. Thus, it is now possible to obtain sockeye salmon brood fish and utilize their offspring to restore depleted runs without fear of spreading IHN virus.

During the current year of sockeye salmon spawning and virological examination on this project, being conducted as the Newsletter goes to press, fish positive for IHN virus were found in the Lake Wenatchee net-pens. Virological results are not yet completed, but at least 25% of the adult fish appear to be positive for IHN. Adding to this unexpected result are the results for the upstream White River fish (n=23) in which no IHN was detected and the upstream Little Wenatchee fish (n=24) which were only 17% IHN positive in comparison with 1988 in which the overall spawning ground prevalence was 89%.

## VARIATION IN SENSITIVITY OF TWO FISH CELL LINES TO RHABDOVIRUS INFECTION

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Pacific Biological Station  
Nanaimo, B.C., Canada V9R 5K6  
and  
W.N. Batts  
National Fisheries Research Center  
Seattle, WA, USA 98115

While new techniques for detection of fish viruses have been developed, the direct isolation of viruses using cell cultures remains one of the most commonly used procedures in both diagnostic and research laboratories. Many factors can affect the sensitivity of cell cultures to infection and thus affect the efficiency of viral isolation. Although these factors are often discussed, few have been investigated experimentally.

Mycoplasma-free, certified fish cell lines are available from the American Type Culture Collection, Bethesda, Maryland; however, the majority of cell lines are exchanged among laboratories and are not routinely tested for contamination or viral sensitivity. No two facilities use identical reagents, supplies, or culture conditions, and over many passages, cell strains with different characteristics can develop. The sensitivity to infection by viruses is one property that can be affected by different culture conditions.

Following the isolation of viral hemorrhagic septicemia virus (VHSV) in Washington State, cultures of EPC and CHSE-214 cell lines from three laboratories in British Columbia were sent to the National Fisheries Research Center (NFRC) in Seattle for tests of their sensitivity to VHSV. We compared the cell strains from B.C. laboratories with strains from the NFRC for sensitivity to a European VHSV strain (F1) [VHSV-1] and two North American VHSV isolates (Orcas [VHSV-2] and Makah [VHSV-3]). Isolates of infectious hematopoietic necrosis virus (IHNV) and hiram rhabdovirus (HRV) were included for comparison. The cell cultures from the B.C. laboratories had been maintained separately for several years and the origins of the cells were not determined.

Suspensions of cells were seeded into 24-well multidishes. The cell monolayers were drained and treated with 100  $\mu$ L/well of 7% polyethylene glycol (PEG-20,000) for 30 min. Serial 10-fold dilutions of each virus were prepared in MEM-tris, and duplicate wells were inoculated with 100  $\mu$ L of each suspension. After adsorption for 1 h, we overlaid the cells with 1 mL of MEM containing methyl cellulose. Cultures were incubated for 10 d at 10°C and mean titers were calculated from duplicate wells.

The results demonstrate that large differences in plaquing efficiency can occur among strains of the same cell line maintained in different laboratories. The CHSE-214 cell strains showed considerable variation in their sensitivity to the VHSV and HRV isolates. Perhaps more importantly, the data confirm the significance of using the most sensitive cell line when examining fish for the presence of a specific fish virus. In extreme cases, the most sensitive EPC cell strains gave about 1000-fold higher plaquing efficiencies for VHSV and HRV than the least sensitive cultures of CHSE-214 cells.

When examining stocks of fish for a variety of viruses, more than one cell line should be used in order to maximize the chances of detecting any type of virus that may be present. When a search for a specific virus is being conducted, it should be noted that differences in sensitivity may exist among cultures of the same cell line maintained in different locations as well as among the different cell lines themselves.

Detection of fish rhabdoviruses using EPC and CHSE-214 cell lines from four laboratories. The virus titers are shown as log<sup>10</sup> pfu/lmL.

Cell line	VHSV-1	VHSV-2	VHSV-3	IHNVHRV
EPC-A	6.8	7.0	8.4	8.583
EPC-B	6.9	7.4	8.5	8.382
EPC-C	7.2	7.1	8.4	8.684
EPC-D	7.7	7.6	8.7	8.684
CHSE-214-A	6.2	5.4	6.4	6.657
CHSE-214-B	4.7	4.7	5.7	7.353
CHSE-214-C	5.7	5.2	6.1	7.354
CHSE-214-D	7.0	6.4	7.6	7.472

## A NEW EYE DISEASE OF PEN-REARED CHINOOK SALMON IN BRITISH COLUMBIA CAUSED BY THE CESTODE *GILQUINIA SQUALI*

M.L. Kent and L. Margolis  
Department of Fisheries and Oceans  
Biological Sciences Branch  
Pacific Biological Station  
Nanaimo, B.C., Canada V9R 5K6  
and  
J.W. Fournie  
U.S. Environmental Protection Agency  
Gulf Breeze, FL 32561

Eye infections by a juvenile stage (metacystode) of a well-known tapeworm, *Gilquinia squali* (Trypanorhyncha), were recently found to cause mortality of young chinook salmon, *Oncorhynchus tshawytscha*, at several seawater netpen sites in British Columbia. The disease was first noted in autumn 1988 and recurred in autumn 1989.

Affected fish were extremely lethargic. Moribund fish were easily collected near the bottom of the pens by divers, suggesting that the fish may be blind. However, moribund and dead fish were not emaciated and usually contained food in the stomach, indicating that affected fish continued to feed. In infected eyes, the lens often appeared normal, but in severely affected eyes it was opaque, suggesting cataractous changes. The tissue surrounding the lens was opaque and occasionally hemorrhagic. In extreme cases, the globe was ruptured and the lens was extruded. However, many fish died with the globe of the eye still intact. Dissection of affected eyes that were still intact revealed the metacystode in the vitreous humor.

Histological examination of infected eyes revealed an inflammatory infiltrate in the vitreous humor associated with the worm. Mild to severe folding of the retina, resulting in apparent retinal duplication was consistently present. The lens of eyes with cataractous changes exhibited thickening of the lens capsule, aberrant epithelial proliferation resulting in the formation of bladder cells, lysis of the lens fibers, and cortical liquefaction. Severely affected eyes exhibited hemorrhage in the globe and congestion of the choroid. Panophthalmitis was prominent in eyes in which the globe had ruptured. The optic nerve appeared unaffected when the globe was intact, and lesions were not observed in the brain. No significant histopathological changes were observed in the gills and visceral organs.

Many fish died with what appeared to be relatively minor eye lesions, and the actual mechanism of morbidity is unknown. However, we believe that the eye infections were the cause of the lethargy and death because examination of 10 moribund fish revealed eye infections in all fish, whereas 10 apparently healthy fish randomly selected from the same pen did not show the infection nor associated lesions.

The definitive host for *G. squali* is the dogfish, *Squalus acanthias*, in which the adult parasite is located in the gut. Metacystodes of the parasite have been reported from the aqueous and vitreous humors of North Sea whiting, *Merlangius merlangus*. On the Pacific coast, the metacystode has been reported in the muscle of sand dab, *Citharichthys stigmatæus*. The present report is the first for this cestode in a salmonid fish. The first intermediate host of *G. squali*, which is most likely a small crustacean, has yet to be identified. Dogfish are frequently found in or around netpens, thus providing the source of infection for the first intermediate host. The salmon then presumably contract the infection by ingesting infected crustaceans.

Future studies being considered include identification of the first intermediate host(s), determining the seasonality of the infection and the geographic distribution of the worm in dogfish and netpen-reared salmon, elucidating the pathogenesis of the disease and the migration pattern of the worm to the eye, and methods for treatment or prevention.



## POSITIONS AVAILABLE

Washington Department of Fisheries is establishing a register of qualified applicants for a Fish Pathologist 3 to be stationed in Wenatchee. The position will be responsible for fish disease diagnostics and fish health research at WDF-operated hatcheries in eastern Washington. Current salary range is \$26,000 - 33,000 per year. This register may be used to fill other positions with WDF or other Washington state agencies.

Further information and applications may be obtained from: Kevin Amos, Quality Control Supervisor, Washington Department of Fisheries, 115 General Administration Building, Olympia, WA 98504. Telephone (206) 586-2825.



Idaho Department of Fish and Game has an opening for a fishery pathologist. The position, which is located in Boise, has a salary range of \$896-1,201.60 every two weeks. Duties include monitoring fish health at department hatcheries, diagnosing and treating fish diseases and performing related duties. Application forms may be obtained from the Idaho Personnel Commission, 700 West State Street, Boise, ID 83720, telephone (208) 334-2263. Further information can be obtained from Keith Johnson, telephone (208) 939-2413. Closing date is November 10, 1989.



Oregon State University is conducting a search for an Assistant/Associate Professor of Microbiology (Tenure Track), in Fish and Shellfish Disease. Candidate will conduct research on fish and shellfish diseases; develop an independent research program; work collaboratively within the university and with industry and public agencies; and contribute to instructional programs and graduate education. Will be appointed to Coastal Oregon Marine Experiment Station, Newport, with academic appointment in Dept. of Microbiology. Salary commensurate with experience. To apply send curriculum vitae and three letters of reference to: Dr. Robert E. Olson, Search Committee Chairman, Hatfield Marine Science Center, Newport, OR 97365. Deadline: November 30, 1989. OSU is an AA/EO employer and complies with Sec. 504 of the Rehabilitation Act of 1973 and has a policy of being responsive to needs of dual career couples.



Microbiologist/Virologist. A full-time research assistant position to assist in the description of the epizootiology of a new fish virus is currently available in the Department of Microbiology at Oregon State University. Requires a B.S. in Microbiology or related field. Experience with virological techniques is necessary. Send a letter of application, curriculum vitae, and the names of three references to: Dr. J.S. Rohovec, Department of Microbiology, Nash Hall, Oregon State University, Corvallis, OR 97331-3804. Oregon State University is an AA/EO Employer and complies with Section 504 of the Rehabilitation Act of 1973 and has a policy of being responsive to the needs of dual-career couples.



Post-Doctoral position available immediately to characterize the virus which causes erythrocytic inclusion body syndrome in salmonid fish. Description of the epizootiology and development of diagnostic methodology are goals of the project. Ph.D. in Microbiology or related field required. Experience with virological and basic immunological techniques is required. Experience with biophysical techniques for characterization of viruses is preferred. Send a letter of application, curriculum vitae, and the names of three references to: Dr. J.S. Rohovec, Department of Microbiology, Nash Hall, Oregon State University, Corvallis, OR 97331-3804. Oregon State University is an AA/EO Employer and complies with Section 504 of the Rehabilitation Act of 1973 and has a policy of being responsive to the needs of dual-career couples.



Graduate Study Stipends. The Louisiana State University School of Veterinary Medicine offers advanced training stipends for both M.S. and Ph.D. applicants for studies on the molecular biology of bacterial diseases of aquatic animals, particularly the channel catfish. Ongoing research emphasizes studies on bacterial pathogenesis, vaccine development and host immunity to bacterial diseases. Projects utilize a variety of modern biotechnical procedures, including antigen analysis, monoclonal antibodies, and recombinant DNA. Training in the latest biotechnical techniques is conducted by a supportive, active faculty using state of the art equipment in spacious, new laboratories. Opportunities also exist for clinically related studies through the Aquatic Animal Disease Diagnostic Laboratory. Interested applicants should send a letter of inquiry, along with GRE scores and college transcripts, to Dr. Ron Thune, Department of Veterinary Microbiology and Parasitology, Louisiana State University, Baton Rouge, LA 70803. Phone (504) 346-3308. LSU is an equal opportunity employer.



Natural Resources Specialist 3 - Fish Health Assistant (Job Announcement Code: 90673) Wisconsin Department of Natural Resources, Bureau of Fisheries Management, Madison. Starting salary is \$1813 per month. This position has potential for advancement to the Natural Resource Specialist 4 level. Wisconsin's Fish Health Program is responsible for the health of fish reared at 14 state fish hatcheries as well as the health of wild fish stocks in Lakes Michigan and Superior and in inland waters. This is a newly created permanent position with responsibilities to include assisting the Fish Health Specialist with investigating epizootics at hatcheries or in wild stocks; providing diagnostic support for the statewide fish health program; maintaining the fish health lab and computerized databases; and conducting annual fish health inspections at state and private hatcheries. There will be opportunities to present papers at professional conferences and at informal meetings of local sportsmen. We are looking for a self motivated individual who has a strong background in microbiology and fish health and/or propagation. To apply, call or write for **Special Application & Examination Materials (Achievement History Questionnaire)** to Ruth Anderson, (608) 266-5898; DNR Personnel Office, P.O. Box 7921, Madison, WI 53707-7921. Deadline for returning completed materials is **November 30**. Questions regarding job duties, etc. may be directed to Susan Marcquenski, Fish Health Specialist at (608) 266-2871.



Extension Associate Position Available in the Fish Pathology Laboratory at Cornell University. Cornell's Fish Pathology Laboratory seeks a professional with expertise in fish disease diagnostic work. This scientist will assist in ongoing field and laboratory investigations regarding the health of feral and stocked fish in natural waters throughout New York State. The candidate will respond to inquiries by biologists and fishermen regarding lesions or mortalities observed in fish populations. The scientist will coordinate programs to educate regional biologists regarding fish diseases. The candidate will perform necropsies on fish, conduct ancillary diagnostic procedures such as bacteriology, virus isolations or parasite identification, and enter data into our computerized fish pathology data base. When time permits, the scientist will have an opportunity to participate in research investigating causes of specific fish diseases. The division of responsibilities will be approximately 70% diagnostic work, 20% extension and 10% collaborative research. The ideal candidate will be either a veterinarian, with fish disease experience as might be gained by participation in the Aquavet training course, or a fisheries scientist with a master's degree in fish diseases and 2 years of experience in fish diagnostic work. Applicants should submit a curriculum vitae and names of 3 references to Dr. Jan Spitsbergen, Department of Avian and Aquatic Animal Medicine, E120 Schurman Hall, New York State College of Veterinary Medicine, Cornell University, Ithaca, NY 14853.



## FISH HEALTH MANAGEMENT COURSE

Haywood Community College, in cooperation with the U.S. Fish and Wildlife Service will sponsor a course in Fish Health Management, February 12-16, 1990. Instruction is designed to give trout and salmon growers and hatchery workers basic information needed to maintain a practical fish health management program on their operation.

The course instructor will be Rick Nelson, Regional Fish Health Biologist in charge of the U.S. Fish and Wildlife Service's Fish Disease Control Center in LaCrosse, Wisconsin.

A \$15.00 registration fee will be charged on February 12. For more information or to pre-register, contact: Charles W. Johnson, Fishery Training Specialist, Haywood Community College, Freedlander Dr., Clyde, NC 28721. (704) 627-2821.

## ANNOUNCEMENT OF THE JOINT MEETING OF THE FISH HEALTH SECTION OF THE AMERICAN FISHERIES SOCIETY AND THE MIDWEST FISH DISEASE WORKSHOP

July 16-19, 1990  
Minneapolis, Minnesota USA

The Joint Meeting of the Fish Health Section of the American Fisheries Society and Midwest Fish Disease Workshop will be held in Minneapolis, Minnesota from July 16-19, 1989. It is not too early to begin consideration of submission of an abstract for this meeting. The general meeting schedule will have Monday, July 16, serve as a travel day with a reception in the early evening. Formal presentations will be on Tuesday, Wednesday, and Thursday, July 17-19. Although the nature of the program will be influenced by the type of abstracts submitted, we are looking to develop a program that will have a balance of basic and applied studies/presentations.

The 1990 meetings will be coordinated by Paul Bowser (General Meeting Chairman), Rod Horner and Charlie Suppes (MWFH Workshop Co-chairmen and Joe Marcino (Local Arrangements). Abstracts should be sent to Paul Bowser. A general time line for the meeting is as follows:

- June 15, 1990 - Submission deadline for abstracts (please note oral or poster presentation preference)
- July 1, 1990 - Notification of abstract acceptance

More detailed information of specific motel location, room rates, etc. will be provided when local arrangements have been firmed up (for more information contact: Dr. Paul R. Bowser, Department of Avian and Aquatic Animal Medicine, N.Y. State College of Veterinary Medicine, Cornell University, Ithaca, NY 14853).

## TWO TRANSLATED BOOKS AVAILABLE

Glenn L. Hoffman, USFWS (retired)  
Route 3 Box 36  
Kearneysville, WV 25430

A limited number of free copies of two recently translated books are available. They are:

1. Ginetsinskaya, T.A. 1968. Trematodes, Their Life Cycles, Biology and Evolution. TT79-52044, 325 pp.
2. Shulman, S.S. 1966. Myxosporidan Fauna of USSR. TT77-52043, 631 pp.

For free copies contact Drew Mitchell or Joyce Cooper, Fish Farming Experimental Laboratory, USFWS, Box 860, Stuttgart, AR 72160.

After free copies are gone, contact (1) US Department of Commerce, National Technical Information Service, Springfield, WV 22161, or (2) Amerind Publishing Co., Pvt., Ltd., 66 Janpeth, New Delhi 110001, India.

The publisher also has told us that Schaperclaus, W. (ed.) 1979 (with revisions: 1989), Fish Diseases, 2 vols. TT81-52150 will be available in the same way as the two books above in late 1989.

## PASSAGES

**Bill Eaton** has left Alaska to take a job as a fish pathologist in charge of virology for the Washington Department of Fisheries. His new address is: Washington Dept. of Fisheries, Olympia Fish Health Laboratory, Olympia, WA 98504. Phone: 206-586-4605.

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**Bob Busch** has left the Clear Springs Trout Company to become the new General Manager of Biomed, Inc. His address is Biomed, Inc., 1720 -130th Ave. N.E., Bellevue, WA 98005-2003. Phone: 206-882-0448.

\*\*\*\*\*

**Scott Foote** is the new fisheries biologist and project leader of the Coleman Fish Health Center at the Coleman National Fish Hatchery. His address is: Coleman Fish Health Center, Rt 1, Box 2105, Anderson, CA 96007. Phone: 916-365-4271.

\*\*\*\*\*

**Chris Horsch** is the new coordinator for instruction at the Fisheries Academy at Leetown. His address is: U.S. Fish and Wildlife Service Fisheries Academy, Rt. 3 Box 49, Kearneysville, WV 25430. Phone: 304-725-8461.

\*\*\*\*\*

**Bryan Quinton** has assumed the fish pathologist position made available by the retirement of Wayne Brunson. His address will be Washington Department of Wildlife, 600 Capitol Way N, Olympia, WA 98504-0091. Phone: 206-586-7342.

\*\*\*\*\*

**Craig Olson** is the new fish pathologist at the Northwest Indian Fish Commission. His address is: Northwest Indian Fish Commission, 6730 Martin Way E., Olympia, WA 98506. Phone: 206-438-1180.

\*\*\*\*\*

**Kathy Hopper** has been promoted (?) from virologist/pathologist to Resource Manager of the Washington Department of Fisheries. Her new telephone number is: 206-886-2075.

## IN MEMORIAM

### Jimmy Camper

Jimmy Camper, Hatchery Biologist for the Fish and Wildlife Service's Southeast Region, died on July 18, 1989. We have lost a valued colleague and a good practicing fish health diagnostician/hatchery biologist.

Jimmy's background was fish health, and he became the Southeast Region's first practicing hatchery biologist following his graduation from the Eastern Fish Disease Laboratory's second fish health long course class in 1958. For a number of years, he was the only practicing hatchery biologist in the Southeastern United States.

His efforts were instrumental in ending the "shotgun" approach to fish disease treatments in the Southeast.

His personal dedication, expertise, and personality instilled confidence in fish hatchery managers giving him an opportunity to implement a very effective disease identification and treatment program throughout national, state, and private hatcheries in the Southeast. He generously supplied research material to the Eastern Fish Disease Laboratory that resulted in several papers — one on *Tetrahymena* and another on the systemic fungi *Ajello*.

Despite his busy schedule, Jimmy found time to devote to students and younger colleagues. It was a natural consequence of this activity, that he taught courses in fish pathology and fish health management at the Fish and Wildlife Service's Warmwater In-Service Training school when it was located in Marion, Alabama, and at Haywood Community College, Clyde, North Carolina. His dedication, insight, and technical ability will be greatly missed.

D. Ivarie

**FISH HEALTH NEWSLETTER****Editors:**

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