FHS NEWSLETTER

FISH HEALTH SECTION - AMERICAN FISHERIES SOCIETY

Volume 22, Number 2 Page 1 Spring 1994

Susceptibility of Cutthroat Trout, Rainbow Trout, and Hybrids to Infectious Hematopoietic Necrosis

S.E. Lapatra, S.R Williams, J.E. Parson[a], G.R. Jones and W.O. McRoberts. Clear Springs Foods, Inc., Buhl, ID 83316 USA.

[a] present address Blue Lakes Trout Farm, Inc., Twin Falls, ID 83301 USA.

Studies have examined infectious hematopoietic necrosis virus (IHNV) susceptibility of rainbow trout (*Oncorhynchus mykiss*) strains and crosses with other trout species. Previous tests have examined interspecific and intergeneric hybrids of rainbow trout, coho salmon (*Oncorhynchus kisutch*) and brook trout (*Salvelinus fontinalis*). Coho salmon and brook trout juveniles were shown to be completely refractory or resistant to infectious hematopoietic necrosis (IHN). Hybrid animals also exhibited a significant increase in resistance compared to pure strains of rainbow trout, however, hybrid survival and growth rates were poor eliminating these as feasible crosses for an intensive aquaculture operation. Recent observations suggest that cutthroat trout (*Oncorhynchus clarki*) are less susceptible than a typical rainbow trout strain to IHNV. Furthermore, early survival and growth data from cutthroat X rainbow trout hybrids were comparable to pure strains of rainbow trout.

Preliminary studies were conducted on a small number of individuals produced by only a few parents. The study was recently repeated using gametes from 10 male and female cutthroat trout from Henry's Lake, Idaho, that were obtained from Idaho Department of Fish and Game and 10 male and female rainbow trout from Clear Springs Foods, Inc., broodstock. Pure species and reciprocal hybrid diploid crosses were made and fertilization, hatching, growth and IHN susceptibility were evaluated. Susceptibility studies of the treatment groups to a 1990 IHNV isolate (220-90; electropherotype 2) from the Hagerman Valley, Idaho, were conducted using a standardized waterborne exposure procedure at two different time points post-fertilization. Duplicate fish groups (n=25) were exposed to 10,000 plaque forming units (PFU)/ml in a volume of water that was 10X the total weight (in grams) of the fish. Virus exposures were conducted in a closed system for 1 h with aeration added. Each group was subsequently placed in separate 19 L aquaria receiving constant temperature (15 C), ultra-violet irradiated, single pass spring water and fed *ad libitum* (4X) daily. Mortality of fish in each test were monitored daily for 21-28 d after virus exposure. A minimum of 20% of each day's mortality was individually examined for virus by EPC cell plaque assay. Virus concentrations of whole fish or kidney-spleen-liver (KSL) homogenates were determined for some of the dead fish examined in each test. Cumulative percent mortality of replicates was analyzed using analysis of variance.

In the first study, diploid cutthroat trout and cutthroat trout female X rainbow trout male hybrids showed a significant ($p < .05$) increase in IHNV resistance when compared to pure diploid rainbow trout groups. Similar results were obtained when the study was repeated on larger sized fish from the same treatment groups (Table 1). Virus was isolated from 90% (139/155) of the dead fish examined. Virus concentrations detected in tissue homogenates ranged from $10^{2.5}$ to $>10^{7.3}$ PFU/g with a mean of $10^{5.4}$ PFU/g. Differences were not observed in prevalence or concentration of IHNV detected in dead fish from each cross.

In the second study survival of hybrids to eyed egg stage was comparable to pure species crosses (Table 2). Similar trends in virus susceptibility were also observed, however,

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variation in susceptibility was evident within each cross (Table 3). Virus was isolated from 95% (523/550) of the dead fish examined and concentrations of IHNV detected in tissue homogenates ranged from $10^{2.5}$ to $>10^{7.3}$ PFU/g with a mean of $10^{5.6}$ PFU/g.

Our results from tests examining the susceptibility of diploid cutthroat trout and cutthroat trout female X rainbow trout male hybrids to IHNV showed increased resistance to infection. Furthermore, early survival and growth data from cutthroat trout X rainbow trout hybrids were comparable to pure rainbow trout. Few reports have been published concerning cutthroat trout and IHNV. Parisot et al (1965) reported that cutthroat trout were refractory to IHNV from sockeye salmon (*Oncorhynchus nerka*) from two sources but they were susceptible up to 4 weeks of age to IHNV from chinook salmon (*Oncorhynchus tshawytscha*). Presumably the strains of IHNV used in those studies were electopherotype 1 and 3, respectively. Results from this study suggest that cutthroat trout are also susceptible to type 2 IHNV. Anadromous cutthroat trout adults at Cowlitz Hatchery in Washington have also been reported as virus carriers and IHNV has been implicated as the causative agent of low mortality (approximately 4%) in fry and fingerlings of the same species at this location.

Resistance within and among certain species of salmonids to virus infections has been observed. The potential for using selective breeding for virus resistance has been demonstrated for IHNV in sockeye salmon (McIntyre and Amend, 1978) but these approaches have not been fully exploited. Hybrids made between virus resistant and susceptible species have been tested and shown to have either complete or intermediate resistance to virus infections, however, hybrid survival and growth rates can be poor. Cutthroat trout X rainbow trout hybrids provide an alternative approach that may be feasible in intensive aquaculture situations.

References:

McIntyre, J.D. and D.F. Amend. 1978. Heritability of Tolerance for Infectious Hematopoietic Necrosis in Sockeye Salmon (*Oncorhynchus nerka*). Transactions of the American Fisheries Society 107: 305-308.

Parisot, T.J., W.T. Yasutake and G.W. Klontz. 1965. Virus diseases of the Salmonidae in the western United States. Annals of the New York Academy of Science 126: 502-519.

Table 1. Mean cumulative percent mortality (CPM) in duplicate groups of diploid rainbow trout, cutthroat trout, and reciprocal hybrids waterborne exposed to a 1990 isolate of infectious hematopoietic necrosis virus from the Hagerman Valley, Idaho at 10,000 plaque forming units/ml at two different time points post-fertilization. nm= no mortality.

100 Days Post-Fertilization

Fish Species	Mean Weight(g)	Infected CPM	Control CPM
Cutthroat trout	3.6	11 (5/45)	nm
Cutthroat trout X Rainbow trout	3.5	17 (8/47)	nm
Rainbow trout X Cutthroat trout	3.0	29 (14/48)	nm
Rainbow trout	3.7	50 (25/50)	nm

128 Days Post-Fertilization

Fish Species	Mean Weight(g)	Infected CPM	Control CPM
Cutthroat trout	7.1	16 (8/49)	nm
Cutthroat trout X Rainbow trout	8.6	2 (1/48)	nm
Rainbow trout X Cutthroat trout	6.4	24 (12/50)	nm
Rainbow trout	10.4	32 (16/50)	nm

Table 2. Survival to the eyed stage in five replicate groups obtained from individual matings that were done for cutthroat trout, rainbow trout, and reciprocal hybrid crosses.

	CT X CT			RB X RB		
REPLICATE	TOTAL EGGS	EYED EGGS	PERCENT SURVIVAL	TOTAL EGGS	EYED EGGS	PERCENT SURVIVA L
1	1648	1156	70.15	3157	3062	96.99
2	1930	1818	94.20	3919	1407	35.90
3	2262	2161	95.53	2416	2282	94.47
4	1490	1377	92.41	2816	1461	51.88
5	1877	1691	90.09	2069	1806	87.28
TOTAL	9207	8203		14737	1001 8	
PERCENT			89.10			67.98
	CT X RB			RB X CT		
REPLICATE	TOTAL EGGS	EYED EGGS	PERCENT SURVIVAL	TOTAL EGGS	EYED EGGS	PERCENT SURVIVA L
1	2566	881	34.33	3441	3121	90.70
2	2642	2310	81.43	3004	1551	51.63
3	2275	2001	87.95	2367	2272	95.99
4	2003	1649	82.32	2389	2170	90.83
5	2686	2625	97.77	1864	1654	88.73
TOTAL	12172	9466		13065	1076 8	
PERCENT			77.77			**82.42**

The Fish Health Section thanks for following companies for their financial support:

(Continued from page 3)

Table 3. Mean and range of cumulative percent mortality (CPM) and fish size in duplicate groups of diploid rainbow trout, cutthroat trout, and reciprocal hybrids at two different time points post-fertilization. Five individual matings were evaluated for each cross.

67 Days Post-Fertilization

Fish Species	Weight Mean	Weight Range	CPM Mean	CPM Range
Cutthroat trout	.44	.37-.49	53	10-96
Cutthroat trout X Rainbow trout	.45	.40-.49	28	23-34
Rainbow trout X Cutthroat trout	.42	.32-.56	45	23-69
Rainbow trout	.58	.43-.71	70	48-94

88 Days Post-Fertilization

Fish Species	Weight Mean	Weight Range	CPM Mean	CPM Range
Cutthroat trout	1.1	1.0-1.3	21	4-50
Cutthroat trout X Rainbow trout	1.1	1.0-1.6	32	12-41
Rainbow trout X Cutthroat trout	0.9	0.7-1.2	56	32-86
Rainbow trout	1.4	1.1-1.7	63	54-74

EDITOR'S NOTE

This issue of the Fish Health Section Newsletter marks the last for which I will serve as editor. Although editing and publishing the newsletter has been a labor of love (the key word being labor!), it is time to to take a breather after two years.

I've always felt that a good newsletter is an essential part of any effective organization, especially a diverse group such as the Fish Health Section. Our challenge in the future will be to continue to use the newsletter as a communication tool, while making use of new technology such as computers, information networks etc. We also need more participation from those involved in warm and cool water fish health .

I'd like to thank my co-editors, Leni Oman and Larisa Ford for all their help. Larisa has bravely volunteered to continue on as editor. Good Luck! I'd also like to thank Russ Lee for his help in folding, labeling and stamping, as well as Scott Lapatra for being so prompt in reimbursing me for all the expenses of publishing. Most of all, thanks to everyone who submitted articles to the newsletter.

Now I have to figure out how to spend all this free time I'm going to have!
Chris Wilson

Hydrogen Peroxide Toxicity Testing p

Steve Roberts, Washington Dept. of Wildlife, 1225 S. Mitchell, Liberty l

The toxicity of hydrogen peroxide was tested in a simulated hatchery treatment of brook, brown, and rainbow trout. Replicated groups of fifty fish were treated for three consecutive days with a one hour drip treatment of either 100 or 250 mg/L hydrogen peroxide. Replicate groups of untreated controls were also maintained. Mortalitiy was monitored for 14 days following the administration of the their treatment.

Fish sizes averaged 0.28 g for brook trout, 0.56 g for brown trout, and 0.95 g for rainbow trout. Water quality parameters were: water temperature 10.6 °C, ph 7.5 and alkalinity 139 mg/L.

No apparent toxicity was noted in all species tested with both 100 and 250 mg/L hydrogen peroxide with the exception of the 250 mg/L hydrogen peroxide treated rainbow trout (Table 1,2,3). In the rainbow trout treated with 250 mg/L hydrogen peroxide, four percent mortality occured in one replicate and no mortality in the other replicate. Caution should be exercised in treating diseased fish , other species, or with different environmental conditions.

Table 1. Brook trout treated with 100 and 250 mg/L hydrogen peroxide.

	Dose (mg/L)	Mortality (numbers)	Mortality (percentage)	Mean Mortality
Control Replicate 1	0	0/50	0%	1%
Control Replicate 2	0	1/50	2%	
H2O2 Replicate 1	100	0/50	0%	0%
H2O2 Replicate 2	100	0/50	0%	
H2O2 Replicate 1	250	0/50	0%	0%
H2O2 Replicate 2	250	0/50	0%	

Table 2. Brown trout treated with 100 and 250 mg/L hydrogen peroxide.

	Dose (mg/L)	Mortality (numbers)	Mortality (percentage)	Mean Mortality
Control Replicate 1	0	0/50	0%	0%
Control Replicate 2	0	0/50	0%	
H2O2 Replicate 1	100	0/50	0%	0%
H2O2 Replicate 2	100	0/50	0%	
H2O2 Replicate 1	250	0/50	0%	0%
H2O2 Replicate 2	250	0/50	0%	

Table 3. Rainbow trout treated with 100 and 250 mg/L hydrogen peroxide.

	Dose (mg/L)	Mortality (numbers)	Mortality (percentage)	Mean Mortality
Control Replicate 1	0	0/50	0%	0%
Control Replicate 2	0	0/50	0%	
H2O2 Replicate 1	100	0/50	0%	0%
H2O2 Replicate 2	100	0/50	0%	
H2O2 Replicate 1	250	2/50	4%	2%
H2O2 Replicate 2	250	0/50	0%	

Aeromonas hydrophila: A Mixed Bag.

Roberta Scott, Fish Health Technologist, Eagle Fish Laboratory, Rt 1, Eagle, ID 83616 USA.

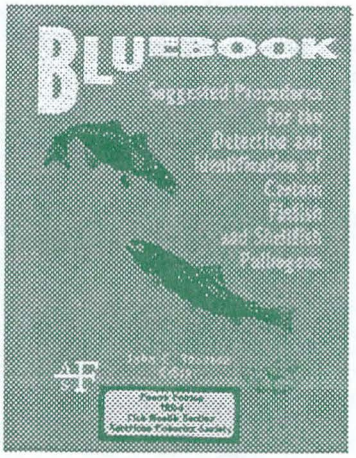
A diagnostic case from Nampa Hatchery, Idaho Department of Fish and Game, evidenced an interesting profile of two stains of *Aeromonas hydrophila.* Kidney samples from Manchester brown trout (*Salmo trutta)* were streaked on corresponding sections of both Trypticase Soy Agar (TSA) and Tryptone Yeast Extract with salts (TYES). Growth appeared by 48 hours on both media. The colonies appeared opaque, cream colored and mucoid TSA. Several of these colonies were diffuse at the periphery with a translucent orange appearance. The colonies on TYES appeared white and opaque in pure culture. The colonies from TSA with the orange periphery were subcultured to TSA, and grew colonies of distinctly different morphology. Each isolate was a Gram negative rod, motile, and oxidase positive. The three colony types were tested with biochemicals as indicated below:

	Isolate 1	**Isolate 2**	**Isolate 3**
Media	TSA	TSA	TYES
colony	cream	orange	white
NO_3	+	+	+
TRP	+	+	+
Glucose	+	+	+
ADH	+	+	+
Urease	-	-	-
Esculin	+	+	+
Gelatin	+	+	+
ONPG	+	+	+
H_2S	-	+	-
Voges-Proskauer	+	+	+
2,3-butandiol	+	+	+
Gas from glucose	+	+	+
Assimilation:			
Glucose	+	+	+
Arabinose	+	+	+
Mannose	+	+	+
Mannitol	+	+	+
N-Acetyl-D-glucoasmine	+	+	+
Maltose	+	+	+
D-gluconate	+	+	+
Caprate	+	+	+
Adipate	-	-	-
Malate	+	+	+
Citrate	-	+	+
Phenylacetate	-	-	-

Each isolate was tested for drug sensitivity by the Kirby Bauer disk sensitivity method as indicated below:

Oxytetracyline 30	25	Resistant	23
Erythomycin 15	Resistant	Resistant	Resistant
Oxolinic Acid 2	27	25	25
Kanamycin 5	Resistant	Resistant	Resistant
Neomycin 5	Resistant	Resistant	Resistant

In summary, the case presented two different strains of *A. hydrophila*, one being H_2S positive and oxytetracycline resistant. Isolates 1 and 3 were considered the same strain. The fish had flared opercules, but the gills appeared healthy. Also, mortality continued to rise. Doug Burton, Idaho Fish and Game, Resident Pathologist recommended changes in hatchery management such as: thinning, reducing stress, increasing the water flow and reducing feed. After these changes in this one experimental vat of Manchester brown trout, mortality decreased.



The Fish Health Section of the American Fisheries Society

Announces Publication of the

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Potential Methods for Control of Zebra Mussels in Aquaculture Facilities

Diane Waller, National Biological Survey, National Fisheries Research Center-La Crosse, P.O. Box 818, La Crosse, WI 54602-0818.

The zebra mussel, *Dreissena polymorpha*, threatens many private and public fish hatcheries. These facilities are vulnerable to clogged pipes and screens, but more importantly, their operations may allow the overland dispersal of mussels. The mussels may be inadvertently introduced into stocked streams, lakes, and ponds, and transported to other fish rearing facilities. Preliminary tests conducted at the National Fisheries Research Center at La Crosse, WI indicate that some chemicals and treatments currently in use by hatchery personnel may be effective for eliminating zebra mussels during fish transport and routine hatchery maintenance of plumbing, equipment, and ponds. Following is a list of tentative options for control of zebra mussels in hatchery operations based on results of preliminary tests. Further testing of all these treatments is recommended before they are routinely implemented.

Fish transport

1. Mussels > 2 mm - Visual inspection and filtration of the water is effective. No chemical treatments were 100% effective on adult mussels and 100% safe to all the fish species tested. Specific treatment options with salts include channel catfish, 1% potassium chloride for 12-24 h; Rainbow trout, 1% calcium chloride for 24 h. However, these treatments do not guarantee 100% mortality of juvenile and adult mussels and 0% mortality of fish.

2. Veligers and settlers - 1% sodium chloride for 24 h; 0.25% potassium chloride for 24 h, 0.5% for 6 h, or 1% for 1 h. A 1% treatment with calcium chloride for 24 h also appears effective but further testing of veligers is needed.

Pond treatment

The following treatments are effective for eliminating all life stages of the zebra mussel from ponds. This is presumably an option only after the pond has been harvested.

1. Rotenone at 1-5 mg/L for 24 h. Effective concentrations of rotenone should be verified prior to treatment. Since rotenone decomposes rapidly in warm water, higher concentrations may be necessary to achieve the desired level of toxicity.

2. Chelated copper at 2 mg/L for 48 h. Application of chelated copper as an algicide will help reduce zebra mussel populations in a pond, but may not eliminate 100% of the mussels. This concentration of copper was not harmful to bluegill in our studies. However, the toxicity of copper compounds varies significantly with pH. Effective concentrations should be verified prior to treatment if the pond.

Equipment disinfection

The following treatments are effective for killing all life stages of the mussel.

1. Immersion in hot water > 40 C for > 30 minutes.

2. Immersion in benzalkonium chloride at 10 mg/L for 24 h; 100 mg/L for 3 h; or 250 mg/L for 15 min. Benzalkonium chloride is very toxic to fish at 100 mg/L for > 15 min exposures and should not be used for zebra mussel control when fish are present.

The La Crosse Center has tested a limited number of fish species; the toxicity of some chemicals varies widely among species and should be verified with the species of concern before large-scale treatments are considered. Furthermore, all compounds were tested in laboratory well water at a constant temperature. Toxicity of many chemicals will depend on temperature and water chemistry such as pH, hardness, and alkalinity. The sensitivity of fish and zebra mussels will also vary among sources, seasons, and handling conditions. Therefore, implementation of any chemical treatment is not recommended without preliminary testing of the compound under the specific conditions in which it will be used.

PASSAGES

Doug Anderson Retires. After almost 30 years in Government service, Doug Anderson retired from the National Fish Health Research Laboratory, National Biological Survey (previously the U.S. Fish and Wildlife Service), in the Department of the Interior. Doug has been active in the Fish Health Section for many years and served as the Secretary-Treasurer from 1983-1987, President Elect and President from 1987-1989 and is a recipient the S.F. Snieszko Distinguished Service award. Doug plans to relocate to the Seattle area and remain active in research concerning fish immunology and development of diagnostic tests. We are wishing Doug good luck and best wishes in his new ventures!

ANNOUNCEMENTS

INTERNATIONAL SYMPOSIUM ON AQUATIC ANIMAL HEALTH

On behalf of the Fish Health Section of the American Fisheries Society and our co-sponsors, the Organizing Committee for the International Symposium in Aquatic Animal Health would like to extend an invitation to attend our meeting in Seattle, Washington, USA, on **September 4-8, 1994.** Please join us for what should be an excellent exchange of scientific information and a chance to meet new colleagues and renew friendships. **Because of limited space for hotel rooms early registration is strongly suggested.** Registration forms and payment should be sent to:

Ms. Lorna McAdam
Department of Medicine
School of Veterinary Medicine
University of California
Davis, California 95616 USA

SULLIVAN MEMORIAL MEMBERSHIP AWARD

The Carl Sullivan Memorial Membership Award was established in 1991 by the late Carl R. Sullivan, who served many years as the Executive Director of the American Fisheries Society, to support membership for non-North American fisheries scientists. At Mr. Sullivan's request, preference is given to Irish, Australian, English and other candidates from English-speaking countries, although candidates from other countries may be considered. The award is administered by the American Fisheries Society, and includes an annual membership in AFS and a year's subscription to one of the AFS peer-reviewed journals.

To qualify, applicants must submit a one-page letter describing professional goals and current efforts towards those goals. A brief statement of how membership in AFS would assist in meeting those goals should be included. While not required, a recommendation from a member of a professional fisheries organization or university is desirable.

Applications for the 1995 award should be submitted by August 1, 1994. Questions or applications for the 1995 award may be sent to Neil B. Armantrout, International Fisheries Section, P.O. Box 10582, Eugene, Oregon 97440, USA, fax (503)-683-6981 or American Fisheries Society, 5410 Grosvenor Lane, Suite 110, Bethesda, MD, 20814 USA, fax (301)-897-8096.

NOW AVAILABLE

SUGGESTED PROCEDURES FOR THE DETECTION AND IDENTIFICATION OF CERTAIN FINFISH AND SHELLFISH PATHOGENS
BLUE BOOK

The Fish Health Section of the American Fisheries Society and the Blue Book Committee are proud to announce that the Blue Book is complete and orders are being processed. Included in this newsletter is an order form with all the information needed to order your copy.

I would like to take this opportunity to thank the Blue Book Committee, the Technical Procedures Committee, the Sampling Committee (who wrote the General Sampling Chapter), all the authors, and all the people who helped review the Blue Book. A lot of time and effort went into the last 6 years and I think the Section should be proud of everyone's effort.

One of the most difficult parts of this revision was the consistency issues on fish health sampling. The General Sampling

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Chapter now represents a complete section on conducting fish health inspections. Inclusion of this chapter falls at an appropriate time with the concerns of the Aquatic Animal Health Committee and the concerns of other groups dealing with consistency. The General Sampling Chapter allows the consistency issue to be dealt with once and for all. If an inspection is done according to the Blue Book, then everyone will be providing the same type inspection and sampling methods.

Also, shellfish are now included which allows for a more central focus with our partners in shellfish disease work.
The loose-leaf format will allow for timely updates of procedures and information. Again, thank you to everyone who helped make this revision possible.

John C. Thoesen

POSITIONS AVAILABLE

Fish Research and Diagnostics

Associate/Full Professor-Tenure Track, Mississippi State University, Delta Research and Diagnostic Laboratory, Delta Branch Experiment Station, Stoneville, MS 38776. Duties include conducting catfish disease research (75%) and performing diagnostic services for the catfish industry (25%). The incumbent will supervise and coordinate research, extension and teaching activities of 2 to 4 professional staff and a variable number of graduate students.
Advanced training (MS, PhD or equivalent) in aquatic pathobiology required. Preference will be given to applicants with one or more of the following; DVM, ACVP certification, certified fish pathologist (or eligible) and broad experience in aquatic pathology. Ability to work with extension (MCES), experiment station (MAFES) and veterinary school (CVM) personnel is necessary.
Salary and rank dependent on qualifications and experience. Applications will be accepted until June 6, 1994, or until a suitable candidate is found. Qualified applicants should send a letter of application including a current curriculum vitae, transcripts, a statement of career goals, and the names and addresses of three references to: Dr. H. Graham Purchase, Director; Veterinary Medical Research, College of Veterinary Medicine, Box 9825, Mississippi State,MS 39762-9825.

Veterinary Fish Pathobiologist

Assistant/Associate Professor, Tenure-Track, College of Veterinary Medicine, Mississippi State University, MS 39762. Duties involve providing diagnostic service to the catfish industry and support for other activities of the diagnostic laboratories. Activities include receiving specimens, consultation with animal owners and farmers, necropsy, diagnoses, reporting results, and providing treatment recommendations. Responsibilities include obtaining the most recent and pertinent information for farmers from specialists throughout the country and providing it to them. The successful candidate will be expected to participate in both research and diagnostic activities on a 50/50 basis. Aquatic (catfish) pathobiology experience emphasizing toxicology, microbiology, immunology, parasitology, physiology, epidemiology, nutrition or management or any combination of these is desired. Advanced training (MS, PhD or equivalent) in pathobiology particularly in the aquatic area required. Preferred qualifications include DVM and experience in warm water (catfish) disease problems. ACVP or fish pathologist certification or eligibility desirable.
Salary and rank dependent on qualifications and experience. Applications will be accepted until June 15, 1994, or until a suitable candidate is found. Qualified applicants should send a letter of application including a current curriculum vitae, transcripts, a statement of career goals, and names and addresses of three references to: Dr. H. Graham Purchase, Director; Veterinary Medical Research, College of Veterinary Medicine, Box 9825, Mississippi State,MS 39762-9825.

POSITIONS WANTED: EXTERNSHIPS

Osnat Gazit, junior student in the School of Veterinary Medicine-Hebrew University, would like to pursue an externship in Aquatic Animal Diseases for 2-4 weeks between November 1994-November 1995.
If you have such programs available please send this information to:
Osnat Gazit
MOSHAV RAM-ON
No. 19205 ISRAEL
or fax: 972 2 814 360
(please write "for Osnat" on the cover sheet)

Eran Dvir, also a junior student in the School of Veterinary Medicine-Hebrew University, would like to pursue and externship in control of disease in fish and aquatic mammals for 2 weeks during the 1994/95 academic year.
You can contact Eran by writing to:
Eran Dvir
90 Dizingof St.
64332 Tel Aviv ISRAEL

Shira Shapira, also a junior at Hebrew University would like to pursue an externship or participate in a short course during the 1994/95 academic year.
Send registration information and program details to:
Shira Shapira
18 Yitzchak Ave.
Haifa, 34482
ISRAEL
or fax: 972-3-960-4079
Email: ovadia@bgumail.bgu.ac.il

MEETINGS

High Performance Fish: An International Fish Physiology Symposium. **July 16-21, 1994.** University of British Columbia, Vancouver, Canada. Contact:Don D. MacKinlay, Fisheries and Oceans, 555 West Hastings St., Vancouver V6B 5G3 CANADA; (604) 666-3520, (604) 666-3450 Fax

Annual Meeting of the Wildlife Diseases Association. **July 17-22, 1994.** Asilomer State Conference Center near Monterey, Ca. Contact: Dr. David Jessup (916) 355-0124.

The International Conference on Sturgeon Biodiversity and Conservation. **July 28-30, 1994.** American Museum of Natural History, New York, NY. Contact: The Hudson River Foundation, International Sturgeon Conference, 331 West 57th Street, Box 159, New York, NY 10019.

American Fisheries Society. **August 21-25, 1994.** Sheraton Hotel and World Trade Centre. Contact: Paul Brouha, AFS, 5310 Grosvenor Lane, Suite 110, Bethesda, MD 20814-2199; (301) 897-8616, (301) 897-8096 Fax.

International Symposium on Aquatic Animal Health. **September 4-8, 1994.** Seattle, WA. Contact: Ms. Lorna

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McAdam, Meeting Secretary, Dept. of Medicine, School of Veterinary Medicine, University of California, Davis, CA 95616. (916) 752-0414 Fax.

Fish Parasite Roundtable Discussion/Symposium ICOPA VIII. **October 10-14, 1994.** Izmir, Turkey. Contact: Professor, Dr. M. Ali Ozcel, Chairman of the Organizing Committee, ICOPA VIII, P.K. 81 35042, Bornova, Izmir, TURKEY. Anyone interested in ICOPA VIII and the session on fish parasites may obtain further information from Dr. Richard Heckman, Dept. of Zoology, Brigham Young University, Provo, UT 84602. FAX (801) 378-7499, Email: HeckmanR@FHS.BYU.EDU, Phone (801) 378-2495

Aquaculture '95. **February 1-4, 1995.** San Diego, Ca. **Abstract deadline: July 15, 1994.** Contact: Aquaculture '95, c/o Sea Fare expositions, Inc., 850 N.W. 45th street, Seattle, WA 98107.

Fourth Asian Fisheries Forum. **October 16-20, 1995.** Beijing, China. Contact: the China Society of Fisheries, 31 Min Feng Lane, Xidan, Beijing, CHINA. (861) 602-0794.

READ ** Fisheries 19(5): pages 24-27**

Two Fish Health Section members, Kevin Amos and Chris Wilson, have written essays on practicing fish health management from a Non-veterinarian and Veterinarian perspective. Jim Warren and Pete Walker expressed the federal and state perspective of fish health regulation in volume 19 (6): pages 22 - 24. Good Job guys!

New Journal
Russian Journal of Nematology

There is a new journal published in Moscow in which all articles are in English. The journal is a joint effort between scientists in England and Russia and contains articles pertaining to fish parasites. Summaries are in both English and Russian. Further information may be obtained by writing to:

Dr. S. E. Spriridonov
Russian Journal of Nematology
Instititute of Parasitology
Russian Academy of Sciences
Leninskii Prospect 33, 117071
Moscow, Russia

or

Dr. D.J.F. Brown
Scottish Crop Research Institute
Invergrowrie, Dundee
DD2 5DA, Scotland

Fish Health Section Newsletter

The Fish Health Section 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 with the understanding that material is not peer reviewed. Submissions (files on diskettee from most PC word processors preferred) should be addressed to the editors listed below:

Dr. Larisa Ford,editor
National Fish Health Research Laboratory
Box 700
Kearneysville, WV 25430
304-725-8461 ext. 225 Phone
304-725-8461 ext. 237 FAX

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