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IN THIS ISSUE:

SEAFDEC "Better life through aquaculture"

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DISEASE PREVENTION IN SHRIMP HATCHERIES

Disease prevention is a primary and cost-effective method in shrimp health management. To reduce the possibility of disease outbreaks. the **Fish Health Section** of the **Aquaculture Department** traced the development of diseases and came up with recommendations as guidelines in hatchery operations

Development of Disease. Disease develops through the interaction of the prawn (the host) the causal agent (the pathogen), and the environment. In the presence of a susceptible host. a pathogen and predisposing environmental conditions (poor water quality, inadequate food. frequent handling, overstocking), disease is very likely to occur Improved environmental conditions, healthy prawns and absence of disease agents would therefore lessen the chance of a disease outbreak.

The causal agents may be pathogenic organisms (viruses, bacteria, fungi protozoa helminths, microcrustaceans) or non-pathogenic adverse environmental conditions (extreme temperatures, low oxygen levels, chemical poisons). Living disease agents cause infectious diseases which generally result in gradual mortalities. Non-living disease agents cause non-infectious diseases that result in sudden mass mortalities.

The environment determines the balance between the prawn as host and the disease agent Microorganisms are always present in the water and some of them cause disease only when the prawn has been weakened through exposure to stressful environmental conditions

Hatchery personnel should realize that they themselves could transmit disease through their contaminated hands clothing, and footwear Also possible carriers of disease agents are equipment such as water pumps, blowers, pipes, and materials such as scoop nets water hoses pails, glasswares. Spawners, live natural food like diatoms, rotifers and brine shrimp, and artificial diets could also be vehicles of disease transmission.

Item One: Maintenance of Rearing Water

- Ensure that the hatchery site is provided with an abundant supply of pollution-free seawater and freshwater
- Install at seawater intake sand filters which will allow backwashing (Fig 1)
- Filter water with a fine net or cloth (Fig. 2) or cartridge filter before stocking in tanks Clean filters regularly
- Remove silt in water by sedimentation
- Disinfect sand-filtered water with 5-20 ppm available chlorine for at least 12 hours Calcium hypochlorite (powder form) or ordinary household bleach may be used

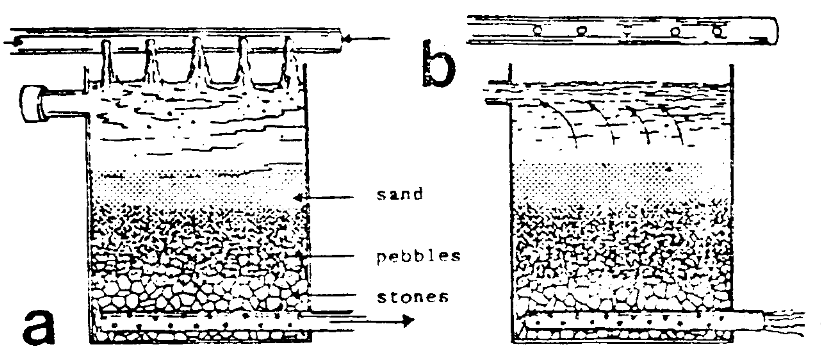


Fig 1 Sand filter system showing operational inlet flow (a) and reverse flow or backwashing (b)

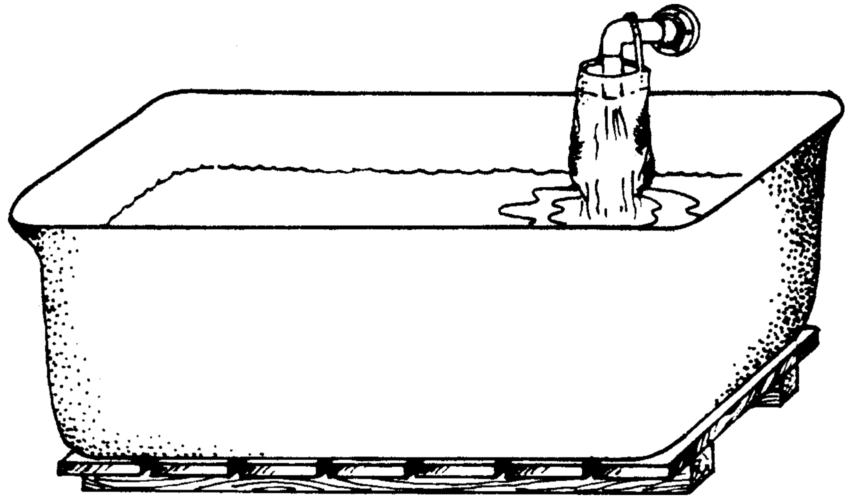


Fig. 2. Filtration of seawater using fine net.

- Sand-filtered water may also be sterilized with ultraviolet light.
- Aerate rearing water properly.
- Change water regularly (about 40-50% of total water volume daily) starting at Zoea I.
- Siphon off bottom sediments regularly to remove feces, organic debris, and uneaten feed and to minimize microbial multiplication.

Procedure for disinfecting rearing water with calcium hypochlorite (70% activity) is as follows:

1. Determine the amount of bleach powder required for the volume of rearing water (Table 1). Dissolve this amount first in a small volume of water (500 ml). For example, if the water volume is 0.5 ton or 500 liters and the desired concentration is 15 ppm, the amount of calcium hypochlorite needed is 10.8 g.

2. Fill the tank with the desired volume of water then add the calcium hypochlorite solution.

3. Allow chlorination of water for at least 12 hours and up to 24 hours, then check the residual chlorine level using portable kits available in the market. Neutralize remaining chlorine with equal amount of sodium thiosulfate ($Na_2S_2O_3$) before using the water.

Table 1. Guide for determining the amount of calcium hypochlorite powder (in grams) to be used for water disinfection

Water volume	*Chlorine concentration*			
tons (liters)	5 ppm	10 ppm	15 ppm	20 ppm
0.25 (250)	1.4	3.6	5.4	7.2
0.50 (500)	3.6	7.1	10.7	14.3
1.00 (1,000)	7.1	14.3	21.4	28.6
2.00 (2,000)	14.3	28.6	42.9	57.1
3.00 (3,000)	21.4	42.9	64.3	85.7
5.00 (5,000)	35.7	71.4	107.1	142.9
10.00 (10,000)	71.4	142.9	214.3	285.7

The amount of calcium hypochlorite may be multiplied by different factors to obtain other chlorine concentrations. Ex.: To obtain 400 ppm chlorine solution in 1 ton water, multiply 28.6 g by 20 or 14.3 g by 40.

4. For chlorination with ordinary household bleach (with 5% available chlorine), use Table 2 to determine the amount of bleach to be used for a desired volume of water, then follow steps 2 and 3.

Table 2. Guide for determining the amount of bleach solution (in milliliters) for water disinfection

Volume of water (tons)	*Chlorine concentration*			
	5 ppm	*10 ppm*	*15 ppm*	*20 ppm*
0.25	25	50	75	100
0.50	50	100	150	200
1.00	100	200	300	400
2.00	200	400	600	800
3.00	300	600	900	1,200
5.00	500	1,000	1,500	2,000
10.00	1,000	2,000	3,000	4,000

A flow-through water system may be adopted. There should be regular monitoring of rearing water quality parameters such as salinity, pH, dissolved oxygen, ammonia, and temperature (Table 3).

Table 3. Recommended safe levels of selected water quality for shrimp and prawn larvae

Parameter	Safe level
Salinity	30-35 ppt
pH	7.3-8.3
Dissolved oxygen	3.5 ppm (lower limit)
Ammonia (NH_3)	0.02 ppm (upper limit)
Temperature	27°-30°C

Item Two: Care of Equipment and Materials

- Provide properly labelled materials like beakers, scoop nets, pails, etc. for exclusive use in individual tanks.
- Materials like brushes, pails, scoop nets, water hoses, and glasswares may be disinfected in between use in different tanks by dipping in 400 ppm chlorine followed by a thorough rinse with clean freshwater.
- Coat wooden and concrete tanks with non-toxic epoxy paint.
- Disinfect tanks in between rearing periods.
- Use PVC or non-toxic plastic pipes, pails, and equipment parts.
- Backwash or clean filters regularly.
- Maintain equipment properly to prevent oil spill and contamination with corrosive metals.

Item Three: Disinfection of Tanks

1. Drain and rinse tank.
2. Scrub tank bottom and sidewalls using powdered detergent and stiff plastic brush (Fig. 4).
3. Rinse thoroughly to remove soap suds and loosened contaminants.

4. Disinfect with 100-200 ppm chlorine for 1 hour (see Tables 1 & 2). Scrub tank bottom and sidewalls again.
5. Rinse several times with clean freshwater.
6. Allow to dry under the sun and let stand for 1 or 2 days.

Item Four: Personnel Precautionary Measures

- Wash hands with soap and water before preparation and administration of feed and before other jobs are undertaken.
- Place disinfection rugs and trays for footwear or feet at the entrance of hatchery facilities using 200 ppm chlorine solution (4 ml bleach per liter solution) or 3% lysol solution (30 ml per liter solution) (Fig. 3). Wash rugs and change disinfectant regularly.
- Minimize entry of unauthorized personnel into hatchery premises.

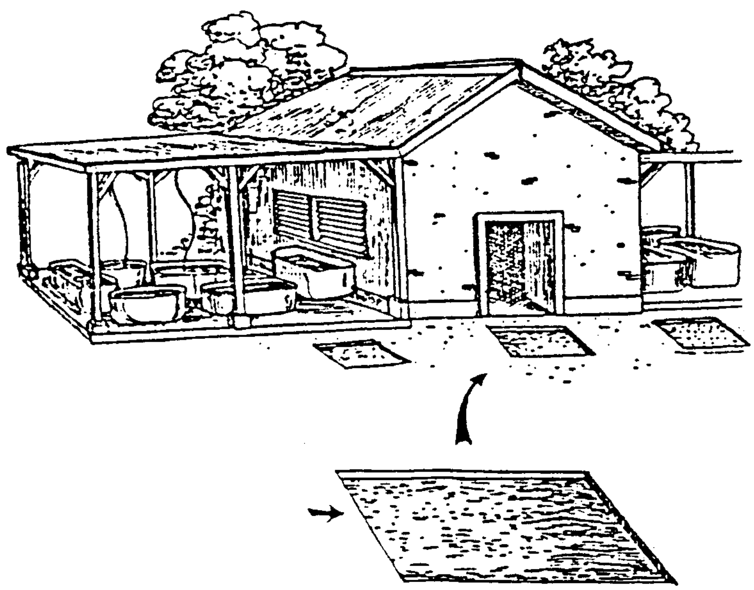


Fig. 3. Disinfection rugs and trays at entrances of hatchery facilities.

Item Five: Feeds and Feeding

- Use pure culture of the specific natural food for feeding.
- Do not use collapsed or old cultures for feeding.
- *Artemia* cysts may be decapsulated in chlorine solution.
- *Artemia* cysts may be disinfected in 10 ppm formalin (Table 4) or 30 ppm chlorine (Tables 1,2) bath for one hour just before hatching.
- Store commercially prepared diets and other feeds (egg yolk, mussel meat, etc.) in the freezer.

Item Six: Handling Spawners, Eggs, and Larvae

Spawners

- Use healthy spawners.
- Handle spawners with care.
- Provide flow-through water before spawning to remove surface contaminants.

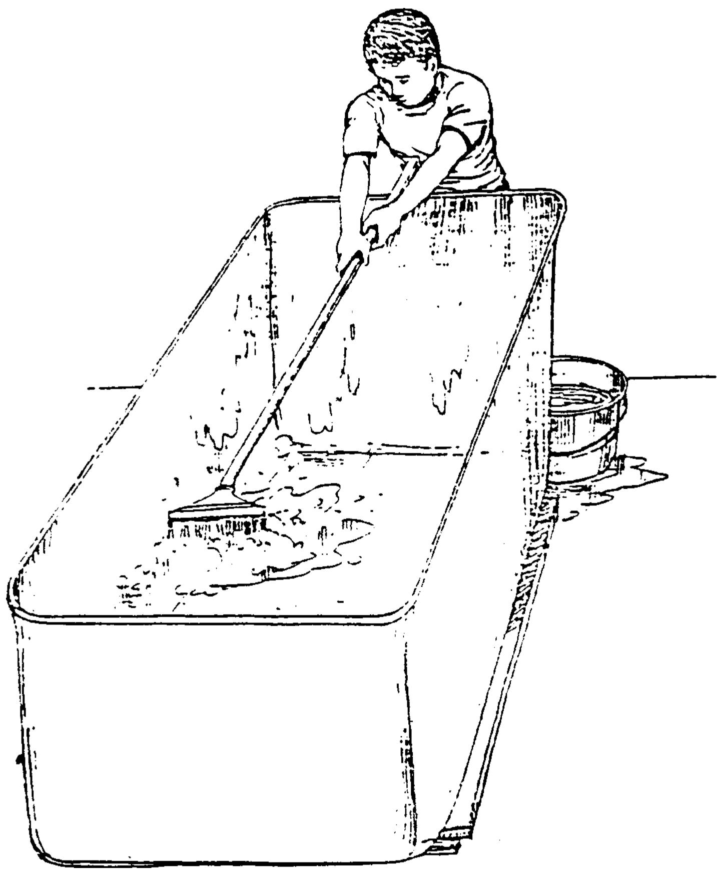


Fig. 4. Cleaning of rearing tank with stiff brush and detergent.

Table 4. Guide in the preparation of formalin solutions

Formalin concentration (ppm)	Volume of formalin solution (ml) per 10 liters	per 100 liters
10	0.1	1.0
100	1.0	10.0
500	5.0	50.0

A 37-40% formalin solution should be considered as 100% stock. If a white precipitate forms, filter the formalin stock before use. Dilute the solution in seawater.

- Spawn broodstock in individual tanks.
- Remove spawners immediately after spawning.
- If spent spawners are to be kept for rematuration, maintain and quarantine these in individual tanks for at least two weeks before stocking in broodstock tanks.

Eggs and Larvae

- Collect eggs using a fine-meshed (0.25 mm) nylon screen, then rinse several times with clean water.
- Eight hours before hatching, eggs may be disinfected for 2-4 hours with 20 ppm laundry detergent (Table 5), and then rinsed thoroughly with complete water change. Dissolve the

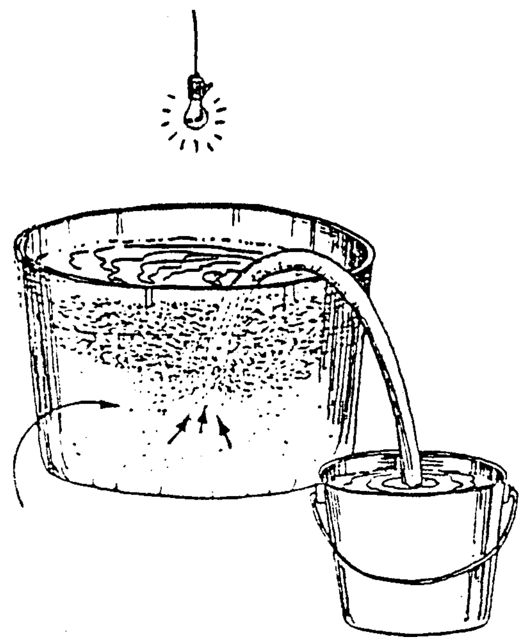


Fig. 5. Healthy nauplii are attracted to light.

detergent in a small amount of fresh water, add to the egg culture tank, and mix gently.

- Separate healthy nauplii from unhatched eggs and weak nauplii. Healthy nauplii are attracted to light (Fig. 5).
- Avoid overcrowding of larvae in rearing tanks. Optimum stocking density is 50,000 to 100,000 nauplii per ton and 10,000 to 30,000 postlarvae per ton.
- Monitor larval condition daily by visual and microscopic examination.

Table 5. Guide in the preparation of 20 ppm laundry detergent

Volume of rearing water (liters)	Amount of detergent (grams)
1	0.02
5	0.10
10	0.20
100	2.00
500	10.00
1,000	20.00

Item Seven: Useful Terms Defined

Backwash	: to clean by reversing water flow
Carrier	: one that transmits disease germs
Cartridge filter	: tubular filter device made up of spun polypropylene material inserted inside a filter housing case
Cross-contamination	: transmission of disease or disease agent from one tank to another
Debris	: organic waste from dead cells or unused food
Diagnosis	: the act of identifying the disease and its cause

Host	: organism (animal or plant) on which another organism depends for subsistence
Infectious	: transmissible from one diseased individual to another; contagious
Larvae	: newly hatched shrimps or prawns
Microorganism	: germ or organism that cannot be seen unless a microscope is used
Pathogen	: any disease-producing microorganism
ppm	: parts per million or milligrams per liter or grams per ton
ppt	: parts per thousand
Precipitate	: amorphous or crystalline solid that separates from the liquid
Quarantine	: isolation of material or animal to prevent the spread of infectious disease it carries
Residual	: remaining
Spawner	: adult female prawn capable of producing eggs
Susceptible	: easily affected by disease
UV	: ultraviolet radiation

Source: **Recommended Practices for Disease Prevention in Prawn and Shrimp Hatcheries** by G.D. Lio-Po et al.. Aquaculture Extension Pamphlet No. 3, SEAFDEC Aquaculture Department. Tigbauan, Iloilo, Philippines. May 1989.

ANTIBIOTICS IN HATCHERIES

The regular use of low concentrations of antibiotics has become widespread in penaeid shrimp hatcheries, but this practice induces the rapid development of antibiotic-resistant bacteria. The genus *Vibrio*, one of the groups of bacteria most affected by this practice, includes some potent human pathogens (disease-causing organisms) that associate with fish and shellfish, especially shrimp.

The first recorded use of antibiotics in the rearing of prawn larvae was in Tahiti for the culture of *Macrobrachium rosenbergii*. Since then the use of antibiotics in shrimp hatcheries has become widespread, although by no means universal.

Antibiotics are used in hatcheries to reduce mortalities either by controlling the general level of bacteria in the culture water or, more specifically, by controlling the level of *pathogenic* bacteria.

In larval culture of *M. rosenbergii*, comparisons were made between bacterial populations and pathology in two hatcheries, one using a green water system and the other a clear water system with water changes, plus antibiotics halfway through the cycle. The results were equivocal: one of the green water hatcheries had low bacterial counts and low incidence of pathology, while the other green water hatchery and the clearwater hatchery that used antibiotics were similar in terms of bacterial counts and numbers of larvae showing pathological signs.

There is no possible way that larvae can be reared in an environment that is free of bacteria, but the sources of bacteria can be reduced through water filtration, ultraviolet treatment, etc., and antibiotics are merely an additional weapon in this battle to control bacterial levels. But the question must be asked: Is this the right approach? At some point every organism must develop the ability to withstand attack by other organisms. Over-zealous protection from bacteria may be the last thing larval animals need for healthy development.

A controllable system. One of the problems of running a commercial hatchery is allowing for failure of larval batches. When antibiotics are used, failure is effectively written into the procedure because it is known that antibiotic resistance will develop and the hatchery must be shut down to be disinfected and dried out. If this drying out period is compared to the production time lost through batch failures that result when antibiotics are not used, there could well be little to choose between the two systems.

To develop a controllable system is a desirable objective. If failure of a larval batch is due to an imbalance between harmful and benign bacteria, it is quite conceivable that a "Probiotic" starter pack could be developed. This could seed culture water with such a concoction of non-toxic bacteria that the *Vibrios* and other pathogens would be unable to multiply sufficiently to cause harm.

Need for research. Like the weather, the prophylactic use of antibiotics in aquaculture is something that many people talk about but no one does anything about. Commercial aquaculturists have a good case for insisting that research on commercial problems should be relevant to the commercial situation.

There is also a reluctance in some countries for growers to take hatchery-reared larvae because they feel that they do not do as well in the ponds as wild larvae. It is conceivable that larvae reared in the presence of antibiotics are not as hardy or resistant as those from wild stock.

Is there an alternative to antibiotics that can routinely yield the shrimp production levels the antibiotic users are achieving now? For reasons of public health and public relations it is in everyone's interest to address this problem. At the very least, hatcheries should disinfect their discharge or discharge through sand filters. The safeguarding of discharges is a first step, but there really is a need for a reliable alternative to antibiotic treatment in the hatchery production system. Research must be done in commercial hatcheries on the quantification, replication and refinement of production methods that do not depend on antibiotics.

Source: Janet H. Brown. "Antibiotics: Their Use and Abuse in Aquaculture," **World Aquaculture**, Vol. 20(2), June 1989.

CONCERN ON ANTIBIOTICS

Experience overseas has shown that the indiscriminate use of antibiotics can rapidly lead to the evolution of antibiotic-resistant strains of bacteria.

To help avoid the inadvertent evolution of antibiotic-resistant bacterial strains the following code of practice for fish hatcheries has been suggested:

- The use of antibiotics should be avoided wherever possible.
- Non-antibiotic therapeutics - such as salt, formalin, malachite green and potassium permanganate - should be used to treat diseases caused by protozoan and metazoan parasites and fungi.
- Antibiotics should only be used where bacterial diseases have been diagnosed or are strongly suspected.
- If a bacterial infection is suspected, then a suitable qualified fish disease specialist should be consulted. Successful treatment of a bacterial infection will require a rapid, accurate diagnosis.

There is, however, also concern over the use of certain non-antibiotic therapeutics.

For example, malachite green is a potential carcinogen, mutagen and teratogen and, apart from the risk to health, there is a lack of information regarding its toxicity, residues, and metabolites.

Unfortunately, malachite green is often the only effective treatment against some diseases. But work is currently being undertaken in the United Stages to find an alternative to malachite green.

Source: **Austasia Aquaculture,** October 1990.

STREPTOCOCCOSIS - A NEW DISEASE IN AQUACULTURE

A number of countries have reported on a more regular basis large losses of farmed fish due to streptococcosis. In Japan and South Africa, streptococcosis is now considered to be one of the major diseases affecting key farmed species of fish and accounts for a significant proportion of fish lost to bacterial disease.

The disease is not restricted to a specific geographic region but appears to be widely distributed and has been reported also in Australia, Singapore, Israel, the United States, the United Kingdom, and Hungary.

In Australia, most of the research on this disease have been undertaken by the Fish Health Unit of the Department of Primary Industry, Tasmania, but significant contributions have been made by the Australian Fish Health Reference Laboratory and the National Key Centre for Teaching and Research in Aquaculture.

The pathogen. A characteristic feature of streptococcosis is the absence of a single clearly defined pathogen (disease-causing organism). The bacteria associated with the disease belong to the family Streptococcaceae which contains a diverse range of organisms in a number of different genera including *Streptococcus, Enterococcus,* and *Lactococcus.* Many of the species exist in close association with mammalian hosts including some potent pathogens capable of producing severe, and often fatal, septicaemias (overwhelming generalized infections).

The main groups of streptococci pathogenic to fish fall either into the enterococci group or the pyogenic group, of the Lancefield Group B and C streptococci. The most frequently isolated are the enterococci, which are frequently associated with the gastro-intestinal contents of many animals, and reported to occur in Australia, Japan, South Africa, and the United Kingdom. Bacteria within this group do not appear to be one single species but consist of several different, but loosely related types. A consistent feature of this group is their marked tolerance to heat, dessication and disinfectants, factors which greatly increase the difficulty of controlling the disease and achieving hygiene on an affected farm.

The disease in fish. Infection of fish with streptococci produces a typical septicaemia which could be seen as an overwhelming infection of the bloodstream. In acute cases, fish become dark, swim sluggishly and cease feeding; mortality levels in such situations may be high. Chronic infection may also occur and a prominent feature of this condition is the pronounced bilateral exophthalmia which frequently leads to complete degeneration of the eye. The pathogens appear to have a marked neurotropism and may be readily isolated from the brain; surviving fish may develop a scoliosis of the spine.

The range of fish affected. The known host range is not extensive but does include a number of commercially important species such as rainbow trout (*Oncorhynchus mykiss*), tilapia (*Tilapia nilotica*), yellowtail (*Seriola quinqueradiata*), eels (*Anguilla anguilla*), common carp (*Cyprinus carpio*), golden shiner (*Notemigonus crysoleucas*) and ayu (*Plecoglossus altivelis*).

In South Africa and Australia, rainbow trout is the commercial species most affected while in Japan, major losses are reported in commercial farms of ayu and yellowtail.

Treatment and control. Chemotherapy of streptococcal infections in fish has not been very successful. More research is required to properly determine all sources of infection but it is believed that infected fish and contaminated sediment are the greatest danger. Obviously, contaminated nets, grading tables, transporters and the like, pose a danger.

There is circumstantial evidence that pens and raceways do not provide a refuge for *Streptococcus* species biovar 1 and hence it should be possible to control, if not eliminate, the infection by raising fish in impervious impoundments. This is potentially possible because the bacterium does not appear to be transmitted with the egg. Such a strategy presupposes a source of uninfected water and no recirculation of water, especially from settling ponds.

There have been a number of attempts to produce a vaccine against streptococcosis, but to date, a practical, effective product has not been forthcoming.

Source: Jeremy Carson & Barry Munday, "Streptococcosis - an emerging disease in aquaculture," **Austasia Aquaculture,** October 1990.

ASEAN STRESSES PROTECTION OF COASTAL RESOURCES

Policymakers of the six Association of Southeast Asian Nations (ASEAN) member states, representatives of media, and international donor agencies stressed the urgent need to protect and manage the region's deteriorating coastal resources. In a resolution agreed upon during the first "Policy Conference on Managing ASEAN's Coastal Resources for Sustainable Development" held recently in Baguio City, Philippines, the forum collectively stated the importance of focusing worldwide concern on the plight of Southeast Asia's coastal resources and expressed its commitment to the integrated management and protection of these resources. International donor agencies, in turn, recognized the need to support coastal management programs, while media representatives agreed to promote community awareness of issues.

Philippine Science and Technology Secretary Ceferino Follosco said that 70% of ASEAN's population live in coastal areas which are vital to the economies of developing countries. "The success of industries such as aquaculture, fisheries, tourism, shipping, and oil and natural gas production is inextricably linked to the skillful management of coastal resources," Secretary Follosco said.

Studies, however, show that these vital coastal resources are being depleted. Poverty, increased commercial activity, and population pressures have led to overexploitation. Fish catches are declining due to heavy fishing and the use of indiscriminate and destructive fishing methods. Such methods, along with mining, logging and pollution have damaged coral reefs and degraded the marine ecosystem, endangering marine animals. Mangrove forests, which are important nursery grounds for aquatic animals, are being cleared for human settlement and aquaculture, especially shrimp farming.

The conference came up with a ten-point resolution, now known as the Baguio Resolution on Coastal Resources Management, by:

- endorsing policies that promote sustainable development;
- encouraging integrated and comprehensive coastal resource management plans;
- strengthening the capabilities of government and nongovernment organizations responsible for the management of coastal resources;

- relieving population pressures in coastal areas;
- enforcing regulations and schemes to promote sustainable uses of coastal resources;
- increasing awareness among coastal populations about their critical dependence on the continued productivity of coastal resources;
- promoting community-based participation in coastal areas;
- adopting policies and programmes to enable women to actively participate and contribute to the management of coastal resources;
- exploring ways for the public and private sectors to cooperate and benefit from efforts to sustain and develop coastal resources; and
- considering the implications of possible climate change and sea level rise.

The conference was organized by the International Center for Living Aquatic Resources Management (ICLARM) which, since 1986, has been coordinating the ASEAN/US Coastal Resources Management Project (CRMP), an international collaborative project financed by USAID to develop integrated coastal resources management plans in each of the six ASEAN countries.

Source: ICLARM Press Release, May 1990.

FISH SCRAPS IN COMPOSTING

Organic fertilizers not only bring the essential nutrients to the soil but also improve the texture and, above all, the ability of the land to retain moisture. It is particularly useful for areas in which a single-crop cultivation has exhausted the soil. In Sahelian Africa, the most common organic substances are dung, groundnut wastes, fish scraps, and various vegetable matter.

Source: **Tilapia Periodique**. January-March 1990.

LETTER TO THE EDITOR

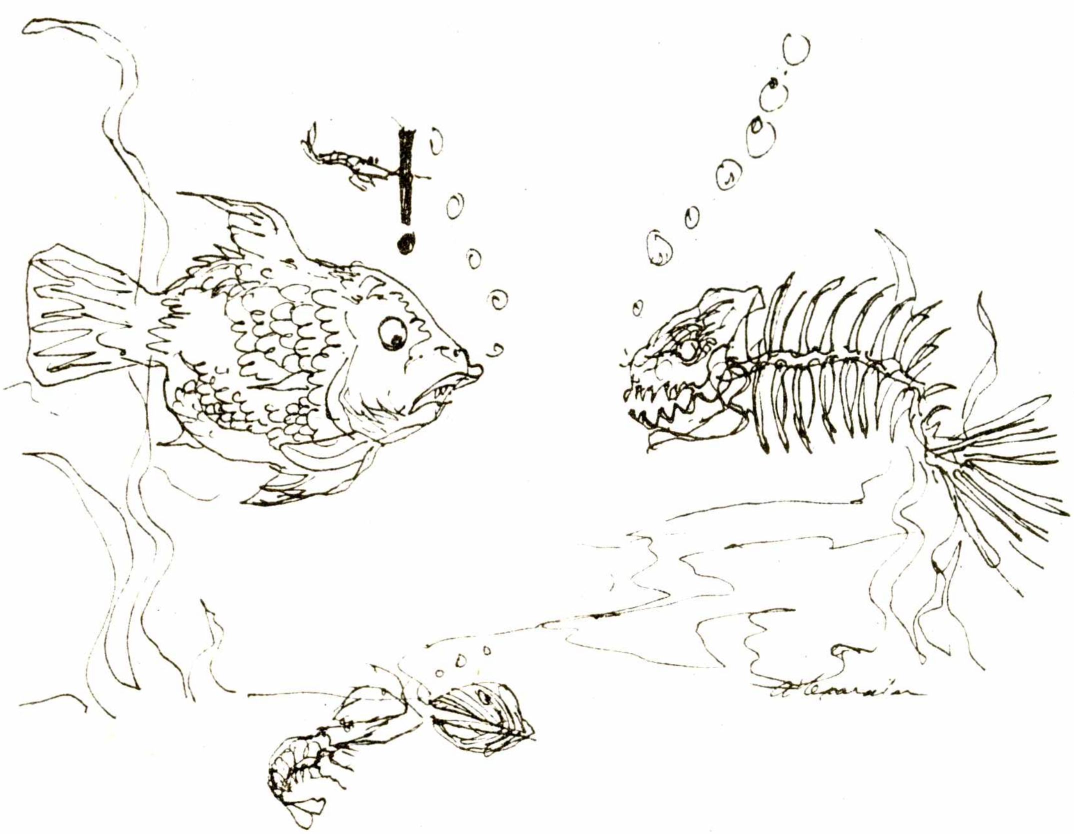
The Editor
Aqua Farm News

In behalf of the Department of Agriculture in Laguna, I would like to thank you and your staff for furnishing us a copy of your newsletter.

We found it very informative and relevant especially your articles on *Managing an Aquaculture Enterprise* of your July-August 1990 issue. Surely, our fishery technicians, fishermen, researchers, and farmers as a whole will benefit from your newsletter.

We hope to receive the future issues/copies of your newsletter.

Very truly yours,
(Sgd.) DR. LEONCIO D. REBONG, JR.
Provincial Agricultural Officer
Callos, Sta. Cruz, Laguna



Gosh! This should be reported to the Fish Health Section of SEAFDEC!

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