By and for the Big Island aquaculture community

Big Island Aquaculture News

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Announcements

Workshop [with correction]: *Introduction to Fish Breeding* On Saturday, April 29 [this is the correct date, not the one stated here last month], this free workshop will be presented at the Komohana Agricultural Complex in Hilo and the nearby UH Hilo farm. The session will begin with the biology of fish reproduction, and invited experts from the community will present practical examples of fish breeding strategies. The workshop will begin at 9:00 A.M., with doors opening at 8:30 for sign in and refreshments. Following a lunch break near noon (participants on their own), the session will continue at the farm with a demonstration of hormone-induced spawning of Chinese catfish. Participants will need their own transportation; car-pooling will be possible. For further information call Jim at 981-5199 or email *jszyper@hawaii.edu*.

Earlier this year, Dee Montgomery-Brock moved the operations of her CTSA Disease Management work from the State of Hawaii Aquaculture Development Program to the Oceanic Institute. Dee currently serves as a contract employee to OI. Dee will continue to work with the Hawaii aquaculture industry in matters concerning disease of fish and shrimp. If you need to reach Dee please E-mail her at *brock002@hawaii.rr.com*.

Information Sources

Seafood and Health From USDA CSREES (thanks to Max Mayeaux): "A new NOAA Web page provides information on the connection between seafood and health. NOAA's goal is to provide balanced information that puts the benefits and risks of seafood consumption into perspective to help consumers make educated decisions about their diet." Visit *www.nmfs.noaa.gov/seafood.htm*.

Updates

Fish Meal Substitution in Feeds It's a research world full of small gains and points of information. Having said that, few studies on this subject address complete replacement of fish meal with other protein sources, particularly with plant protein sources, except as one extreme in a series of treatments. This extreme often performs

Readers' contributions are invited with aloha, and much appreciated, though not all can be used. They may be mailed, faxed or emailed to the editor at this address. Contributors understand that materials may be edited for space and other considerations. This newsletter is part of a cooperative project funded by the University of Hawaii Sea Grant Extension Service, the UH Cooperative Extension Service, and the State of Hawaii Aquaculture Development Program.

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poorest of the set of treatments. It went a different way in a recent journal article. Gaber (2006) tested four diets with 100% of fish meal replaced by different plant protein sources for growth performance in juvenile Nile tilapia. The study had a narrowed purpose, namely to test whether an additional supplement, yucca powder, would facilitate utilization of proteins in the diets. Yucca powder is used in poultry feeds and is known to affect nitrogen metabolism. The 100% plant protein concept was also "hedged" by addition of the pure amino acids (AA's) lysine and methionine to all diets, giving the plant proteins (which might be deficient in these AA's) a better chance against fish meal. The study emphasis was on the effects of yucca on protein digestion, and this was apparently necessary to sort out a complicating factor. In a comparison of 5 diets all having added yucca and the AA's, 3 out of 4 100% plant protein diets did as well as the one with fish meal. This is good news for further feed development, and makes some sense because tilapia are omnivores with long guts that can digest plant material. The effect of yucca powder was large and significant. It made fish meal work better with it than without it, and made 3 of the plant meals (soybean meal, cottonseed meal, and sunflower meal) work as well as fish meal with yucca. Depending on the (unmentioned) practical availability and cost of the material - the researchers got it from Sigma Chemical Co. - it could become a factor in the future of feeds.

Reference:

Gaber, M.M., 2006. The effects of plant-protein-based diets supplemented with yucca on growth, digestibility, and chemical composition of Nile tilapia (*Oreochromis niloticus*, L) fingerlings. *J. World Aqua. Soc.* 37:74-81.

Introduction and Spread of Grass Carp

The present day concern about introduced species of animals and their effects on natural ecosystems includes the grass carp, as detailed in this newsletter some months ago. The spread of this species from the southern U.S. as far as the Great Lakes, and indeed introductions of other species followed by escapes and establishment in natural ecosystems, are sometimes blamed on private companies taking insufficient care. As it turns out, the "public sector" (government agencies) introduced the grass carp to the U.S., and presided over the first accidental releases. Mitchell and Kelly (2006) present a detailed history of the species in this country. The original introduction was made by the U.S. Fish and Wildlife Service Fish Farming Experimental Station at Stuttgart, Arkansas in 1963, followed by the first accidental release at the same location in 1966. The fish were and still are important for control of aquatic weeds without noxious chemicals. The authors point out that "From 1985 to 2005, more than 7 million triploid grass carp were shipped throughout the United States. With grass carp now officially recorded from 45 states it is important to be aware of ... the facts surrounding its introduction, early spread, present usage, and need." This .. "will allow for more rational decision to be made concerning the future of these fish." Triploid fish are the product of physical treatments of fertilized eggs that add an extra set of the natural chromosomes to the egg, rendering the adult fish sterile. Grass carp are permitted for importation to Hawaii, and are fairly regularly brought in for aquatic weed control. *Reference*:

Mitchell, A.J., and A.M. Kelly, 2006. The public sector role in the establishment of grass carp in the United States. *Fisheries* 31:113-121.

TECHNICAL NOTES

Is High Protein Feed Worth It?

Most commercial fish feeds contain 25-55% protein. The different percentages are intended for fish of different species and of different ages, based on research, but with the trends often extended to situations that the research didn't cover. The high protein feeds used for the marine carnivores moi and kahala in Hawaii were used initially because research showed that this was a good idea for mahimahi. High protein feeds are also used for larval and juvenile and breeder fish. Herbivores and omnivores in nature live on materials with low percentages of protein (plant material, detritus), and are presumed and observed to be okay with lower protein feeds.

Protein is necessary for growth, but it is the most expensive component of feeds, and its use is carefully controlled. The other major necessity, energy, is provided by the cheaper lipids (fats and oils) and carbohydrates (starches and sugars). Fish can and will "burn" protein for energy if necessary. Feed research works on the protein/energy ratio not only for cost efficiency, but also for health reasons. Too much protein can cause metabolic problems; too much lipid and carbohydrate can lead to fat deposits and liver problems. Carnivores are adapted to use lipids for calories (as in their prey) better than the others, which do not normally eat fatty foods. Starches, usually from wheat and corn, are used in most feeds to provide caloric energy.

A recent study of African cichlids, high-value freshwater ornamental fishes, illustrates these points (Royes et al. 2006). *Haplochromis ahli* is a carnivore, *Pseudotropheus socolofi* is an omnivore. They were fed four different diets: high protein (55%) high lipid (20%), high protein low lipid (9%), low protein (36%) high lipid, and low protein low lipid. The low lipid level is typical for food fish feed, but is higher than in aquarium maintenance feeds. The low protein level is higher than is often used for channel catfish and tilapia. The feeds were made in the laboratory, but handled similarly to commercial feeds and made into thin pellets of about 1 x 3 mm. Tests were done in 10-gallon aquariums, supported by a biological filter and UV sterilizer. The *P. socolofi* were stocked at 12 fish of 0.9g weight per tank, the *H. ahli* at 7 fish of 2g weight per tank. This was done to simulate the densities that an aquarium hobbyist might use, about 1 inch of fish per gallon of water. The fish grew to more than double their weight in 8 weeks, but the filtration system kept ammonia levels low.

The high protein high lipid diet produced the (slightly) greatest measured growth in both species, but both had excessively fatty livers, worst in the omnivore as could be expected. Both high protein diets were used inefficiently by both species, compared with the lower protein diets, regardless of lipid content. The cost of the wasted protein could be compared with commercial gain from the faster growth. The discussion suggested that the lower protein level would be best for both cost and water quality considerations, and the lower lipid level for cost and health considerations.

Different fish species can be more different or more similar than one might expect from taxonomic relationship or herbivore/carnivore habit. This study suggests that expensive feeds should be evaluated specifically for each species and situation.

Reference: Royes, J.B., D.J. Murie, and R. Francis-Floyd, 2006. Effects of varying dietary protein and lipid levels on growth performance and hepatocyte changes in juvenile African cichlids (*Pseudotropheus socolofi* and *Haplochromis ahli*). *J. World Aqua. Soc.* 37:48-59.