

suction and mechanical action to remove the cysts and other debris. An additional benefit is that the vacuum is also very effective at removing uneaten feed and faeces, resulting in improved water quality and probable other environmental and pathogenic benefits to the fish. A secondary and equally necessary device used in the trial was to line the concrete raceways with a special low adhesion polymer sheeting which eliminated the problems of cyst adhesion and the potential for cysts to settle and develop in the cracks and pores of the rough surface. A raceway system was used in the field trials, and other trials in lined ponds and tanks are about to commence. For further information please visit www.pisces-aqua.co.uk or contact Dr Andy Shinn / Dr Nick Taylor / Sara Picon Camacho in Parasitology at the Institute of Aquaculture (aps1@stir.ac.uk, nght1@stir.ac.uk) or Bob Bawden (bob@pisces-aqua.co.uk) at Pisces Engineering Ltd., Stirling.

Dr Gordon Bell

Blood fatty acids and phospholipase A2: £129,835 from the Scottish Executive
Preliminary research by a team of Scottish scientists has indicated a possible link between fatty acid deficiency and childhood autism. Fatty acids are required for the optimal function of cells and organs such as the brain and eyes as well as for fighting off infection. Results of a pilot study by researchers at the universities of Stirling and Edinburgh, in conjunction with the Royal Hospital for Sick Kids in Edinburgh and South Glasgow University Hospitals NHS Trust, suggest that the behaviour of fatty acids in the blood of children diagnosed with autism may differ from that of other children. The consortium has been awarded £125,335 by the Chief Scientist Office (CSO) to test this finding. The study will measure the blood fatty acid levels in 50 children with autism and compare them to samples from non-autistic children.

Professor Alan Teale

Transcriptomic Analysis of Host-Pathogen Relations. £550,154 from the BBSRC
Alan Teale, Randolph Richards, James Bron, and Bill Starkey have received a major award from the BBSRC to study the molecular basis of infectious pancreatic necrosis (IPN) in Atlantic salmon. The project will be performed in collaboration with FRS Marine Laboratory, Aberdeen, and the ARK Genomics facility at the Roslin Institute. The annual economic loss to the UK aquaculture industry resulting from IPN exceeds five million pounds. IPN virus may persist in surviving salmon and then spread to other susceptible fish, perpetuating IPN in both

farmed and wild salmon populations. The study will identify genes that are associated with resistance to IPN virus and with virus persistence and provide insight into the mechanisms of tissue damage occurring in IPN. The results of the study will contribute to salmon breeding programmes and to the rational development of tools for controlling IPN such as vaccines and sensitive diagnostic reagents.

Dr Douglas Tocher

Transcriptional control of polyunsaturated fatty. £280,241 from the BBSRC

Dr Douglas Tocher, Professor Alan Teale and Dr Michael Leaver will study genes and molecular control mechanisms involved in omega-3 polyunsaturated fatty acid synthesis in salmon and cod. Success in obtaining this award was undoubtedly assisted by the considerable investment in molecular technologies that recent refurbishments in the Institute have brought. The modernised laboratory suites and extensive new equipment will greatly facilitate the researchers in their investigations and the successful accomplishment of their research aims.

Fish are the only major dietary source for humans of health-promoting long-chain omega-3 fatty acids. With the decline of marine fisheries, farmed fish constitute an increasing proportion of the fish in the human diet. The high level of omega-3 fatty acids in farmed fish has been assured hitherto by the addition of fish oils derived from feed grade marine fisheries to aquaculture feeds. However, this is not sustainable in the longer term, and will constrain continuing growth of aquaculture activities, particularly with marine fish. Vegetable oils provide safe and sustainable alternatives to fish oil for aquaculture feeds, but they do not contain long-chain omega-3 fatty acids. If successful, this approach could lead to the development of sustainable aquaculture feeds, which, at the same time, will enable fish farmers to continue to produce fish rich in health-promoting omega-3 fatty acids for the human diet.

Dr Trevor Telfer

Development of GIS-based tool to assist planning. £19,934 from Scottish Aquaculture Research Forum.

Sustainable options for people, catchment and Aquatic Resources in China (SPEAR). £82,222 from the EC.

What should I eat... does the future look brighter for farmed fish?

Does eating more fish make you healthier or are you actually loading the dice against enjoying a ripe old age? Popular media has been full of claims and counter claims over the last few years and the conflicting advice available to consumers concerning their dietary choices is now causing stress to anxious shoppers as they nervously wheel their trolley down the supermarket aisle (see The Observer, 14th August 2005).

Should they load up with tins of canned tuna or will the benefits of all those lovely PUFAs (polyunsaturated fatty acids) be outweighed by the bio-accumulated mercury - a legacy of our rush to modern lifestyles. Will wild Alaskan salmon or farmed Scottish be best for keeping our arteries clean or will the PCBs (Polychlorinated Biphenyls) make us and our descendants sick? While the relative risk of individual factors have been discussed and the debate warmed up with the Hites et al paper¹ in early 2004, the jury is still out.

Clearly what is required is joined-up research that brings together risk analysis from a range of perspectives and mechanisms for this information to be made available to various stakeholders, especially consumers, in a way that is informative and trusted.

A recent paper² attempts to do this based on some assessment of composite benefit-risk by using dose curves. The outcomes are a sobering read for those that like their fish suppers and very worrying for those for whom fish are staple items.

Several thoughts occur. Aquaculture systems that can control the levels of good and bad things entering the fish we eat will be in a good position to compete with wild fish and alternatives in the medium to long term as awareness of the need for a holistic risk assessment grows. Secondly, capacity to assess risks and conduct joined up research is currently rather weak and needs to be strengthened through interdisciplinary approaches that bring together practitioners and researchers in aquaculture/fisheries science and human health. Thirdly, if we have a need to understand these issues now in the developed world where fish consumption

is relatively low, industrialising countries in Asia that consume very high levels of fish need to urgently consider potential health time bombs.

The Institute of Aquaculture, Departments of Marketing, Public Health and Media at Stirling have joined with colleagues at various groups within the Universities of Dundee and St Andrews to develop interdisciplinary capacity. As well as researching issues relating to food safety, the team will consider issues of environmental impact, aquaculture and fishery sustainability, how producers communicate with consumers in the modern media age and whether aquaculture products can (or should) be further engineered to meet consumer requirements (including taste). SHEFC, the body that supports higher education development in Scotland, have awarded a feasibility study, being coordinated by Stirling Aquaculture, that addresses the need and potential for such partnership. Immediate needs for such research are close to home but it is expected that such work has global implications.

¹Hites. RA, Foran, JA, Carpenter DO, Hamilton MV, Knuth, BA and Schwager SJ. 2004 Global assessment of organic contaminants in farmed salmon. *Science* 303, 5655, 226-229.

²Gochfeld M and Burger J. 2005. Goodfish/ Bad fish: A composite benefit-risk by dose curve. *Neurotoxicology* 26, 511-520.

Book Reviews

Aquatic Ecology of Rice Fields – A Global Perspective.
Edited by C.H. Fernando, Friedhelm Göltenboth and Josef Margraf (Volumes publishing, Kitecher, Ontario, Canada, 472p)

and

Culture of Fish in Ricefields.
Edited by Matthias Halwart and Modaduga Gupta (FAO and the WorldFish Center, 83 p.)

A joint review by Dave Little, Systems Group

In recent years there has been something of a drop-off in original articles about ricefields as aquaculture systems and the two following reviews borrow heavily from previous workshop/conference proceedings such from meetings in Ubon, Thailand in 1988¹, in Munoz, Philippines in 1989¹ and West Java in 1993². WorldFish Center, formerly ICLARM, has also been involved in field research in Bangladesh³ and the Philippines⁴ in recent years. In addition to this rice-fish in China, where the greatest area of culture and most dynamic development is believed to exist, was reviewed by MacKay in 1995⁵.

The Aquatic Ecology volume should be essential reading for those interested in sustainable agriculture and dispelling the fallacy of 'traditional rice monoculture' - until recent times rice was merely one product of many harvested from flooded, banded fields. The editors have pulled together contributions based on experience on four continents and included hitherto less available information from areas such as the former USSR. The book includes reviews of the limnology and applied ecology of ricefields, covering aspects such as nitrogen fixation and nutrient recycling together with a case study of the Ifugao rice terraces in the Philippines. The impacts of pesticides on rice field ecology and the public health implications of ricefields as habitats for mosquitoes are covered. Central to the volume is the role of fish,

both as natural stocks and culture interventions in ricefields. Herbert Fernando and his co-editors have done a great job in persuading key workers in the field to contribute but could, perhaps, have kept them from wandering off their real areas of expertise. On a more practical issue the volume is poorly proof edited with numerous typos throughout.

The book begins with a chapter by Charles Heckman whose detailed study on a single rice field in Northeast Thailand published in 1979 has been endlessly cited by field researchers working on rice fish. His contribution here is welcome but unfortunately an excellent ecological treatise becomes a critique of modern development politics and a somewhat uninformed one at that... 'in most tropical countries, limited monetary earnings make it difficult for most rural families to purchase food on the market'... a statement no longer true in crowded, joined up and dynamic societies in large areas of SE Asia. His assertion that 'a recent trend to replace rice fields with aquaculture ponds is just as undesirable as producing rice without fishes in the fields' also ignores the complexity of how aquaculture evolves and the interdependence of ricefields and pond-based aquaculture in many contexts.

The book has a few interesting surprises. Martin's chapter based on a community analysis of the Ifugao rice terraces in the Philippines outlines that the dreaded rice pest, the golden apple snail (*Pomacea canaliculata*), although common, appears to be currently less of a problem - indeed possibly an asset in this particular system; this is reassuring to those believing these pests are munching their way through the rice fields of Asia. Detailed studies of this sort that consider the whole ecosystem are very valuable, but no less interesting were the no-fish chapters on aquatic microbiology and benthos based on the Japanese experience. I particularly liked the nitrogen fixation chapter where the pros and cons of the 'biological way' are well stated but the reality of declining price of inorganic nitrogen means that it remains an approach in waiting. The public health implications of changes in rice field ecology/management are partially covered through a chapter on disease transmission (=mosquito vectors) by F.P. Amarasinghe. Pesticide use in rice fields, although greatly impacting on ecology (Lim), is having more direct impacts on human well-being through accidental and purposeful mis-use, but perhaps a fuller treatment of this would have exacerbated a tendency to wander off-piste.

continued on page 31

