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Overview and Opening Session
Aquaculture Europe 2008 was organised by the European Aquaculture Society (EAS) and hosted by Polskie Towarzystwo Rybackie (the Polish Fisheries Association). It was held in Krakow, Poland from September 15-18, 2008.

AE2008 was attended by more than 700 delegates from 55 countries. This document summarises the reports of the AE2008 Parallel Sessions, as received by the session chairs. Only very simple language editing has been made by the EAS secretariat. Not all sessions have been reported, hence unfortunately, there are gaps. Information is also provided on the winners of the AE2008 Poster Awards, as designated by the Session Chairs and Programme co-chairs.

AE2008 was opened by the EAS 2006-2008 President Laszlo Varadi and two important dignitaries provided opening addresses.

As Laszlo Varadi pointed out to delegates, “This is the first time that EAS has organised the Aquaculture Europe conference and an aquaculture trade exhibition using our own resources and not joining up with any other events. This is a great challenge but also a great opportunity for EAS to prove the strength of the Society, which contributes to European aquaculture development through special forums, where the conference and an important trade exhibition combine with special events and workshops to bring together stakeholders from all segments of European aquaculture”.

He reminded delegates that this is the second time in the history of EAS that the society has organised its event in a Central-Eastern European country. In 1996, Budapest hosted the Aquaculture Europe conference, which at that time was not linked with a trade exhibition. He added “After the enlargement of the European Union, the profile of the European aquaculture has been changed. Inland aquaculture - especially pond fish farming, the dominant type of aquaculture in Central-Eastern Europe – has become an important part of the whole European sector. Organising the Aquaculture Europe conference in Krakow, Poland reflects this change in European aquaculture and indicates the efforts of EAS to contribute to aquaculture development in the Central-Eastern European region”.

Ms. Hana Mandelikova of the European Commission Directorate for Maritime Affairs and Fisheries addressed the delegates and commented on the growing importance of aquaculture to deliver healthy and safe products which meet consumer demand and on our role to ensure that the growth of aquaculture is sustainable.

She also outlined some of the challenges “the most important of which is the sustainable management of resources. The competition for space is tough. The aquaculture sector often misses a level-playing field during the planning processes and finds it difficult to compete with other sectors. Aquaculture is an efficient water user and needs high quality water resources. The limited sources of feed and its costs affect the economic efficiency of production systems. However, by developing under those demanding conditions, the European research and technology will help aquaculture to grow more competitive and sustainable”.

She continued “Scientific research and technological innovation are fundamental to reach this objective. Therefore, the European Commission has continuously financially assisted this sector. During 2002 – 2006 98 million EUR have been allocated to 75 aquaculture projects. This year, our contribution to research will be 19 million EUR.”

The address on behalf of the Polish Ministry of Agriculture and Rural Development was given by Prof. Dr. hab. Stanisława Anna Okularczyk, Advisor to the Minister, who outlined some aspects of history of carp culture in the Central Europe and Poland, and development of modern techniques of culture of this species based on the method of Tomas Dubisz in Silesia region in the 19-th century. The first Polish language textbook on fish culture dates back to 16th century and contributed to fast growth of pond culture in the Southern part of Poland.

She emphasised importance of common carp production in Poland (15,000 tons annually) and most recent success of rainbow trout culture in Poland that now has reached 17,000 metric tons. She also acknowledged enormous financial support of the European Union that continues and the Ministry is vitally interested in diversification of aquaculture production and "environmentally" friendy methods of fish production.
AE2008 Thematic (Plenary) sessions

The AE2008 Thematic Sessions included presentations from 5 well-known speakers, each addressing key questions related to our management of resources.

Ian Johnston of the University of St. Andrews addressed the prospects for the application of basic research in fish morphology, physiology and genomics for understanding and influencing the domestication process in aquaculture. He reviewed knowledge on fish muscle growth and indicated significant potential for altering muscle structure with artificial selection regimes during domestication. He concluded by arguing that the aquaculture research community has been relatively slow to exploit the research opportunities offered by the zebra fish and other fish models.

Ron Hardy of the Aquaculture Research Institute, University of Idaho, presented the status of the use of plant proteins in fish diets. He focused on the trends in price of agriculture commodities – especially in the last two years – and their impact on fish meal and fish oil replacement.

Guido van den Thillart of the University of Leiden presented issues of importance for the sustainable culture of European eels in Europe. He addressed the possible causes of the collapsed eel population; the energy requirements and effect on maturation of simulated migration and technologies for artificial reproduction.

Carmen Popa of the Romanian National Agency for Fisheries and Aquaculture talked about water and its importance as the principal natural resource for all aquaculture activities. Using the example of the EU Water Framework Directive, she focused on the need for cross border management and our responsibilities to ensure that the future development of the sector is underpinned by our management of the resource.

Finally, Sunil Kadri of the University of Glasgow discussed the past, current and future trends in research on fish welfare – passing from research predominantly directed towards disease and transport in the later 80s to welfare friendly husbandry and slaughter in the 90s to operating welfare indicators today. He gave examples of tools that have been used to communicate welfare issues to policy makers and commented that future issues will focus on using a scientific approach and
recognition of need for ethical thinking to allow better engagement with industry, policy-makers and public in order to meet the needs of the fish and the expectations of the consumer.

The AE2008 trade exhibition showed new products and services presented by 80 exhibitors, mostly suppliers to the sector. It was the first time that EAS had organised the Aquaculture Europe exhibition using its own resources, and it was considered a success.

In addition to the conference and exhibition, participants had the opportunity to take part in workshops organized by the EAS Student Group, The EAS Thematic Group on Eels and the EU project FASTFISH. Furthermore, the annual meeting of the AQUA-TNET network was held just after the conference, on Friday, September 19.

Aquaculture Europe 2008 received kind financial support from the Polish Ministry of Agriculture and Rural Development, Intervet Schering Plough Animal Health, Aller Aqua and the Organisation for Economic Co-operation and Development. Their support confirmed that this new format Aquaculture Europe event puts the right focus on the partnership between science and industry, which is the principal objective of the European Aquaculture Society.

EAS looks forward to welcoming you in Trondheim, Norway to Aquaculture Europe 2009!
AE2008 Parallel Session Summaries

Technologies for more efficient water management
Session chair: Marco Saroglia (Italy).

10 oral presentations made up the session, with attendance of up to 60 persons at the different presentations. The topics of the presentations covered different aspects of technologies for water management and for sustainability evaluation. An overview:

An illuminating presentation by I. Seginer concerning the effect of temperature on gas exchange, reported a mathematic evaluation of the efficiency of airlift oxygenators and carbon dioxide removal. Evaluations on the effect of temperature on the relative cost of feeding and of water oxygenation were done and indications for optimal airlift choice were provided. Indications were also provided in order to optimize the airflow gas flow, once the airlift type is selected.

A technology for ranching and harvesting stocked fish, by training them to react to acoustic sounds, was presented by B. Zion. This technology offers new perspectives for marine cage aquaculture, and it is apparently applicable with success in lakes, coastal lagoons, etc. The presentation showed prospects of the technology, fish training procedures and how to maintain a trained behaviour for long periods.

A so called “chemical-free” water treatment system for fish farming was presented by A. Krivograd Klemencic. In spite of the questions that were put to the presenter, some uncertainty survived about the precise nature of the treatment/management and its effectiveness.

A number of talks concerning Recirculation Aquaculture Systems (RAS) followed, some of which provided new and innovative information.

- A new patented RAS technology was presented by B. Gemende. It consists of a direct assimilation of ammonia under aerobic conditions by heterotrophic bacteria like Pseudomonas sp or Bacillus sp., stimulated by addition of external carbon sources, such as saccharose.
- J.M. James stressed the problem of faecal physical quality, as a factor affected by the nature of proteins. It appeared that faecal matter produced by sea bass fed plant-protein substituted feeds contained a lower proportion of fine particles compared to controls fed with fish meal. It also appeared that de-hulled faba bean diet would be a promising protein source in term of effluent control in a RAS, resulting in a low mass of faecal matter in the colloidal size, while wheat gluten produced one of the lowest total mass of faecal matter among the tested diets.
- The example of a Danish RAS fish farm producing trout was reported by R.W. Lowitt. Data on the suspended solids, solids flow and percentage removal were reported, together with removal of BOD5, nitrogenous compounds and phosphorus, in a ratio with the feed input and fish production.
- Two talks were presented by C.I. Martins. In the first, she concluded that the stress occurring to Nile tilapia in a RAS tank, does not affect the feed intake and feeding motivation of other tilapia sharing the same RAS water. In the second paper, the same author a study on the
effect of water exchange rate in common carp embryonic and larval development. When the effects of an exchange rate of 30 l/kg feed was compared to a 1500 l/kg feed, results were somehow contradictory, as in the first case mortality was lower, but the number of malformations increased.

Consumer attitude toward **Integrated Multi-Trophic Aquaculture** products (IMTA) was reported by N. Ridler. There was concern that consumers may be apprehensive about mussels that have grown on the waste of salmon. Nevertheless, such mussels have higher meat yield and a survey has been tried to answer the question whether it can generate a premium price.

Finally a global analysis of the **sustainability of marine aquaculture** was presented by P. Trujillo. The Author presented a single mariculture sustainability index (MSI). The index is based on 13 indicators, covering ecological, economic and social aspects of the industry and involving 60 countries and 86 farmed species. A 10-year observation performance was presented, comparing MSI with other indicators – notably the environmental sustainability index (ESI) and the human development index (HDI). An interesting analysis of the potential sustainable development per country and species stimulated discussion with the audience.

**Multi-functional use of ponds in aquaculture and conservation of aquatic resources**  
**Session chair: Zdenek Adamek (Czech Republic).**

The oral presentations were focused basically on environmental issues related to pond farming. They stressed the importance of appropriate fish farming management targeted towards optimal and sustainable utilization of available food resources. It is considered as an extremely important issue at present, when we observe that the eutrophic conditions in quite a high proportion of carp ponds have fallen down to hypertrophy.

On the other hand, ponds provide a very suitable environment for piscivorous predators, both from the point of view of habitat diversity and food resources in particular. Resulting conflicts between the efforts for nature protection and pond management require a more sophisticated approach with respect to the protected species (otter, cormorant).

Environmental issues related to fish farming were surveyed with attention to utilization and efficiency of constructed wetlands for nutrient removal from sturgeon culture effluents. It seems (for many reasons) from the current data and approach to this topic, that the construction of wetlands is an extremely promising way to treat water effluents from fish farming facilities and the results presented fully correspond to these expectations.

Environmental aspects were raised in posters – they described them from the point of view of the EU Water Framework Directive (WFD) and human recreational aspects. New information was also presented on the farming prospects for a new, although non-native species – the brown bullhead, for aquaculture purposes.
Although not very numerous, the presentations and posters on pond aquaculture issues followed the most important trends in this farming technology – notably those of environmental aspects and of product diversification.

Diversification and domestication of fish species in aquaculture
Chair: Andrzej Pilarczyk (Poland)

The session consisted of eleven oral presentation and almost twenty posters covering a broad spectrum of subjects related to diversification and domestication of fish in aquaculture. More than half of the presentations concerned freshwater fish species, the remainder being marine organisms – mainly finfish, but also spider crabs and molluscs.

In the case of freshwater fishes – results of investigations on factors effecting natural waters restocking effectiveness were the most often showed.

The propagation of fishes was told over three times during the session. Interesting results were showed in the presentation entitled „First reproduction of captive-reared wreckfish (Polyprion americanus) using GnRH implants”.

Introduction of new species into inland aquaculture systems was mentioned twice. The paddlefish (Polyodon spathula) seems to be an excellent substitute of bighead carp in a sustainable, extensive carp pond culture in Central and Eastern Europe. Introduction of paddlefish allows to increase energy and nutrients utilization providing a high quality and valuable product and hence a fish farms’ profitability.

Domestication of new fish species has to take under consideration of regulations being in force in EU. However this aspect has been mentioned in one of the presentations.

Basing on the presentations content it can be concluded that the most of questions and challenges appearing in European aquaculture are solved with the genetic-based techniques. Genetic structure of domesticated fish species was mentioned in six presentation and posters. Most of them described genetic structure of the carp population. General conclusion from papers indicates the necessity of conducting genetic screening of stocked carp breeds before the decisions about their conservation status is made. Information on genetic diversity of broodstocks in aquaculture as well as genetic distance between two commercial and native turbot populations was presented. The recording microsatellite markers, PCR-RFLP analysis, defining of biochemical were the most often applied technique used in generic investigations.

Another important observation of the session is that the majority of the presentations and posters were prepared by young scientists - not necessarily very experienced yet, but very skilled and promising nevertheless.
Lunch on day 1 - a good time to catch up on the morning sessions and prepare for the afternoon ones.

AE2008 lunches promoted Polish aquaculture production and featured, trout, carp and pike-perch on the daily menu.
**European Eel conservation and culture**  
*Chair: Guido van den Thillart (The Netherlands)*

This featured strongly in AE2008, with a conference session as well as a special workshop, organised by the EAS Thematic Group on European Eel Reproduction, held on September 16th.

**The workshop**

The focus of this truly international workshop was on the current status of eel reproduction, which was well represented by the contributions of Jonna Tomkiewcz (European eel), Arjan Palstra (New Zealand Eel) and Katsumi Tsukamoto (Japanese Eel). Furthermore there was a lecture by S. Dufour on neuro-endocrine control of reproduction and one by J. Asturiano on cryo-preservation of eel sperm. The workshop was attended by more than 100 people and the lecture room was overcrowded, indicating the wide interest in this topic.

From the lecture of Tomkiewicz it was clear that reproduction of European eel is possible, but only up to the stage of feeding larvae. The high mortality of embryos and larvae is still the major problem as only very few survive longer than 5 days. Similar problems are observed with NZ eels, although the experience with this species is just starting. The advantage of this species in comparison with the other eel species is the advanced maturation stage, which requires a much shorter period for final maturation. The experience with Japanese eel reproduction is much further developed, Tsukamoto showed that his group is able to produce feeding larvae, although high mortality still occurs in the larval stage. His group is therefore very interested in the natural conditions of silver eel as well as in the natural food for leptocephali larvae.

The workshop resulted in fruitful discussions and many new contacts with European as well as with Japanese research groups.

**The conference session**

The conference session took place on September 17, and there were 13 oral and 7 poster presentations. The session was preceded by a plenary lecture by Guido van den Thillart (Towards a sustainable Eel aquaculture in Europe). This lecture pointed out that we should learn from nature – exactly the same message that was put forward by Katsumi Tsukamoto.

The life cycle of the eel is rather complex and scientists have been trying to control reproduction since 1938 (Fontaine). The simple fact that high mortality still occurs with eel larvae suggests that new ways have to be found. Van den Thillart showed that swimming already stimulates maturation in silver males and females, which was confirmed by the lecture of Tsukamoto. Obviously natural maturation is to be preferred above long term weekly injections with pituitary extracts. Tsukamoto also presented new information about the most likely food for the leptocephali larvae: marine snow. Marine snow is the product from jellyfish-like organisms that filter mainly phytoplankton. This product accumulates in very large quantities at a depth of about 150m, a thermo-salinity-cline in the oceans. It is also here that the larvae can be found.
Other topics discussed during the session were:

- The difference in maturation level between pre- and real migrating silver eels (Burgerhout);
- Hepatic vitellogenesis during early phase of maturation (Palstra);
- The changes in olfactory sensitivity, which are likely crucial in the mating process (Huertas);
- The possible role of high pressure (Sebert);
- Criteria for egg quality (Soerensen);
- Ultrasound for non-invasive scanning of gonad development (Buelund);
- Morphological changes in the head structure of glass eels (Ide) and of silver eels (Adriaens);
- Accumulation and impact of pollutants in Portugal (Guimares) and Netherlands (Kotterman);
- Eel population structure in France (Bevaqua) and Italy (Capoccioni).

During the discussions it became clear that there are many scientists involved in eel research, although they don’t often meet together as they tend to go to other meetings more directly related to their research field. Still it was obvious that there is a need to expend the network that was initiated last year in Istanbul at the AE2007 event. At that meeting, the workshop on eel reproduction produced the following statements:

- It was unanimously decided that there is a need to establish “an independent network on European Eel Reproduction for Conservation and Aquaculture”. This goal of the network is to bring scientists together and to stimulate collaborations, exchange information, promote interactions with other professionals, and to facilitate eel research in general.

- The stock of European eel has fallen to 1% of the levels recorded 30 years ago and there are no signs of recovery. This is of major concern to eel conservation, fisheries, aquaculture and industry given that they all rely completely on the wild stock for glass eels. As a consequence there is an urgent need to focus on spawner quality and reproduction of the
European eel. This is required to establish a self sustaining eel aquaculture industry and help save the species.

The above statement is supported by recent recommendations made by the ICES/EIFAC Eel Working Group (September 2007), which says that more research on eel reproduction and the effects of environmental contaminants on spawner quality is urgently needed.

As moderator of the EAS thematic group, Guido will continue his efforts to reach more people in Europe in order to expand the eel network on conservation & culture. Particularly since all European countries need to have and evaluate an eel conservation plan, a large network for information exchange will stimulate multi-disciplinary activities.

Tuna culture

Chair: Gregorio de Metrio (Italy)

The session dedicated to the tuna culture, despite including only five presentations, was rich in new information and attracted the attention of numerous conference participants. At the present, the subject of the session represents one of the main challenges for aquaculturists. In particular, the domestication of the bluefin tuna would help reduce the fishing pressure on this endangered, wonderful fish, as well as could expand remarkably the market of farmed fish.

All the scheduled presentations were regularly presented and the time schedule was perfectly respected.

The first communication: “Induction of spermiation, ovulation and spawning in Atlantic bluefin tuna Thunnus thynnus using GnRHa delivery systems” was presented by Dr. Costantinos Mylonas. In this paper the main results of the EU project REPRODOTT were reported. Dr. Mylonas showed the use of an ad hoc-designed GnRHa delivery system that allowed the successful induction of ovulation/spermiation and spawning in bluefin tuna reared in captivity in floating cages located in the South of Spain and in the South of Italy.

The second communication: “Lipoprotein lipase gene molecular characterization and its expression under different nutritional conditions in Pacific bluefin tuna Thunnus orientalis juveniles” was presented by Prof. Sawada. In this paper, further data regarding the experiments carried out in the Kinki University on Pacific bluefin tuna domestication were provided. Prof. Sawada showed interesting data on lipoprotein lipase gene molecular characterization as well as on its expression under different nutritional conditions. The experiments carried out by the Kinki University enhanced our understanding of lipid metabolism of cultured bluefin tuna and will help design an improved diet.

The third communication: “Eight years of research on bluefin tuna Thunnus thynnus culture at the Spanish Institute of Oceanography (IEO)” was presented by Dr. Fernando de la Gándara. This was a review paper on the research projects on bluefin tuna culture carried out in the last decade in Spain. It was stressed that the Spanish Institute of Oceanography intends to represent a leader Institution in the field of tuna aquaculture.
The fourth paper: “The aquaculture of Atlantic bluefin tuna *Thunnus thynnus* and its problems and difficulties in Turkey” was presented by Dr. Mehmet Gokoglu. The state of the art of the bluefin tuna culture in Turkey was shown. From this presentation it was possible to understand that no true aquaculture experiments are in progress in Turkey where only a fattening industry is present. For this industry only wild adult fish caught during the spawning periods are used. This kind of capture-based aquaculture is the main responsible for the reduction of the wild bluefin tuna stocks.

The last paper: “Bluefin tuna (*Thunnus thynnus* L.) culture: the Italian experience” was presented jointly by Dr. Aldo Corriero and Dr. Massimo Caggiano. In this paper recent results obtained in the framework of the Italian project ALLOTUNA were presented. For the first time a considerable number of oocytes (about 20 millions) were produced by captive-reared bluefin tuna using the tools developed within the EU project REPRODOTT described by Dr. Mylonas in the first presentation. Important data were recorded in order to understand optimal larval rearing condition that will be improved during the next experiments planned for the reproductive season 2009.

**Contributions in morphology, embryology and histology to aquaculture development**

**Chairs: Marta Jaroszewska (Poland) and Teresa Ostaszewska (Poland)**

During the session there was a vast array of studies presented by both basic biologists and aquaculture researchers. The majority of the presenters were young scientists who graduated in disciplines as diverse as horticulture, microbiology or insect biology, and now they work on fish morphology and development. For these people, who were attracted to the field of aquaculture, this session was the great opportunity to present the results of their studies, which were in large part their PhD thesis.

Embryological studies constituted the main domain of this session. Because the success in aquaculture is in large part related to fish feeding, the effect of feeding on broodstock is critical in determining viability in the early ontogenetic stages. Two topics were leading among the presented papers, larvae condition and alimentary tract development.

The results of the morphological studies on larvae were presented by Kjørsvik E. et al., who attempted to evaluate egg quality during a spawning season of Atlantic cod and to investigate the correlation between egg and larval quality. The results of morphometric measurements in eggs and larvae, as well as the behavioural observation, were presented. Histological and functional studies on alimentary tract development were performed by Falk Petersen and co-authors who presented the results on the digestive system development in two species of wolffish (*Anarhichas lupus* and *A. minor*). The presentation was supported by many illustrations, following sequentially the observed differentiation processes.

There was also the example of immuno-histochemical methods application in aquaculture studies on alimentary tract development of freshwater species. This approach was used to assess the influence of the diets on the structure of intestine during larval development in the pike-perch (*Sander lucioperca*). The criterion used was the difference in the rate of cell proliferation and apoptosis in the
intestinal epithelial cells, enterocytes. However, the development of the alimentary tract is dependent not only on the use of diets. As it was shown by Rekecki A. and co-authors, in the study on *Dicentrarchus labrax*, sea bass larvae, the germ-free (axenic) and conventional (xenic) conditions influence the development of the digestive tract.

In aquaculture, the range of the deformities is frequently observed during larval development, and it includes the soft tissues as well as the skeleton. But at present, the studies on this problem are not restricted just to morphological descriptions. As it was presented by Ytteborg E. et al., with the changes in the vertebral column, there are many environmental, nutritional and genetic factors that correlate. The effects of these factors, and the mechanisms could be explained at the molecular level.

The embryological studies included also the results of immunostaining and in situ hybridization to describe cellular processes taking place in the developing oocytes of sturgeon and paddlefish (Acipenseriformes) (Żelazowska et al). In order not to omit any important work presented during this session, it is necessary to mention the studies on body shape plasticity of zebrafish (*Danio rerio*) in response to different rearing temperatures conducted by Leris I. and co-authors.

This session demonstrated that fish embryological studies in the aquaculture are still "trendy". Future priorities need to consider employing, for instance, the immunocytochemistry and flow cytometry, as the newest and very useful tools for embryological studies. The results of embryological studies based on these techniques would be better connected with the results of situ hybridization and gene expression obtained by molecular biologists.

It is believed that there is a need to help young scientists to learn and use these methods. Those colleagues who are experienced in the aquaculture can provide the opportunity for young researchers to become a valuable part of the scientific community. To sum up, the session with this profile should be continued as part of EAS meetings, and it would be a great occasion to highlight the results in basic aspects of fish embryology and morphology, as well as to establish better communication between two generations of scientists.

Gamete physiology and methods of improvements in gamete biotechnology

Chair: Andrzej Ciereszko (Poland)

Main themes in the area of research

This session was focused on fish reproduction of male (10 presentations) and female (3 presentations) fish. Advances in sperm physiology were presented, especially regarding seasonal fluctuations in semen quality (sole, halibut), morphology and cytology, mechanisms of sperm motility activation and regulation (numerous marine and freshwater fish species) and methodology of sperm motility measurements using computerized systems. Studies of sperm aging were conducted with monitoring of apoptosis and DNA fragmentation. This knowledge allows better understanding of variability in reproduction capacity of fish maintained in captivity. New information concerning the acrosome reaction in sturgeon spermatozoa was provided and presence of this reaction in the egg micropyle has been demonstrated. New proteins of fish semen have been identified, such as
lipocalin-like protein with a possible role in controlling spermatogenesis and protection of spermatozoa against oxidative damage. Four presentations focused on sperm cryopreservation. Further improvements of sperm freezing/thawing protocols have been provided, for some fish species (halibut, pikeperch, catfish) fertilizing ability of cryopreserved semen has been found to be similar to fresh semen.

Advances in oocyte physiology obtained recently have been found to be significant. Genomic approach to vitelogenesis allowed identification of critical genes involved in synthesis of the vitellogenin in the liver of females and males exposed to estradiol. These data are important for the better understanding and control of egg production and egg quality in fish as well as disturbances to male reproduction caused by feminization, such as the effect of phytoestrogens. Several aquaporins (proteins involved in water movement through biological membranes) have been identified in fish oocytes. Control of these proteins may be critical for development of a successful procedure for the cryopreservation of fish ova and embryos.

Control of egg quality is of urgent importance for fish culturists. Attempts were made to develop simple morphological tests for fish oocytes. Distribution of lipid droplets appeared to be a promising parameter for quality control of salmonid eggs. However, the outcome of this test may vary in relation to environmental and genetic factors that need to be identified.

**What was missing**

New data on endocrinology and endocrinological manipulations were not presented. Such information is extremely important, because gamete production in aquaculture conditions relies mostly on hormonal stimulation of spawners. Additional challenges are related to the strict regulations concerning use of hormones in animal production.

No further improvements on fish biotechnology have been reported. These technologies, such as production of triploid or sex-reversed fish are already used; however the industry would benefit from better yield of production of such fish as well as better performance at conditions of aquaculture production.

**What next?**

Despite several achievements in the technology, sperm cryopreservation has not yet been implemented into aquaculture practice. In order to achieve this goal integration of fish breeders, reproduction physiologists and fish managers is necessary. The example of dairy industry has to be followed regarding the use of cryopreservation in breeding.

**Cryopreservation of fish ova and embryos** still remains a challenge and a breakthrough in this area is needed. Development of these methods will secure successful preservation of genetic variability of fish species and populations.

**Stem cell technology** needs to be introduced into fish breeding. Studies on this area have to be intensified to achieve progress observed in higher vertebrates.

There is also a need for **standardization of methodologies used in fish reproduction research**, especially regarding motility studies. Such standardization would facilitate comparative analysis of data.
Review of the results of the EU FP6 project REPROFISH
Chair: Olivier Kah (France)

Around 100 people in the morning, but down to 50-60 in the afternoon attended the session that went really well. All the speakers gave excellent presentations at the edge of the current state-of-the-art and made their best to highlight the recent progress and the remaining gas. Jean-Jacques Lareyre moderated a 30 minute general discussion (see below) with around 25-30 people. This discussion had to be interrupted because of time constraints.

The programme covered most relevant aspects of fish reproductive physiology from brain control to gamete biotechnology. Particular importance was given to the recent advances regarding identified bottlenecks in fish farming, the control of sex differentiation, puberty and spawning. In addition, Alexis Fostier presented a very stimulating lecture on the sometimes contradictory challenges that the European aquaculture industry has to face in terms of quality and sustainability.

The identification of new brain peptides, such as KISS-peptins, most likely activating the reproductive axis at puberty will certainly lead to a much better understanding of the interactions between growth, energy status and photoperiod that are likely the key to the control of the first maturation. This was covered by Olivier Kah, while Rüdiger Schulz presented recent basic advances regarding gonadal physiology and endocrine control of puberty. The practical control of puberty was discussed in two excellent talks by Geir Lasse Taranger in salmonids and Silvia Zanuy in sea bass, showing practical examples.

Light perception is emerging as a potential mechanism on which one may act to either boost or slow done sexual maturation. In a very elegant presentation Hervé Migaud pointed out inter species differences in terms of light sensitivity that have to be considered when attempting to use light to either boost or slow down sexual maturation in new species like cod for instance. Yann Guiguen presented a very comprehensive lecture on the key role of aromatase expression in sexual differentiation and the underlying mechanisms.
The control of spawning using GnRH was covered by Constantinos Mylonas who showed some recent successful applications in different species, including tuna, while Mirka Sokolowska gave a very interesting overview of the current practices to control reproduction in Polish aquaculture. Finally, Igor Babiak presented the current strategies currently developed with respect to germ cell control as an issue to problems of genetic transfer, sterility and control of sex.

More on the project and especially the deliverables it has produced at [www.reprofish.eu](http://www.reprofish.eu)
Basic and applied aspects of aquaculture nutrition
Chairs: Konrad Dabrowski (Poland) and Ingrid Lupatsch (Israel)

This session extended over 2 conference days. The first day was sponsored by OECD and chaired by Konrad Dabrowski. The second part was chaired by Ingrid Lupatsch and included additional 5 oral presentations and 42 posters.

Part I
Session sponsored by the Organisation for Economic Co-operation and Development.

Part II
In general it can be said that the emphasis in research moved from marine species to freshwater, which is of course a reflection of the location at which AE2008 was held. Many species were covered - among them pike-perch, common carp, tilapia, arctic char, trout and sturgeon – but also some marine species like penaeid shrimps and marine polychaetes.

As has been the case for some years, the main focus of research was on fish oil and fishmeal replacement and studying their effects on fish performance and quality of the final product. A series of presentations addressed the effects of replacing fish oil with plant oils in pike-perch and omnivores like carp and tilapia and their ability as freshwater fish to convert linoleic and linolenic aids into n-3 and n-6 highly unsaturated fatty acids (HUFAs). Some presentations emphasized the need for replacement of fish meal with traditional sources including soybean and legumes and others mentioned the potential of novel feed ingredients, such as krill meal or meal sourced from farmed polychaetes.

Thus the focus shifted from marine to freshwater species, but the same methodologies were used leaving similar problems to be overcome. However, a fair number of those replacement studies were done without assessing the requirements for protein and in the case of fish oil replacement requirements for lipid (energy) first. Especially as aquaculture is dealing with a variety of species, one has to bear in mind that not all fish are the same and the requirements and especially the ratio between energy and protein supply will be vastly different.
Recommendations for future research would be to quantify nutrient requirements of any new species first and to ensure, that requirements are based primarily on absolute intake levels and not on only on concentration or inclusion levels in the feed.
Health management
Chair: Patrick Smith (UK)

Session sponsored by Intervet Schering-Plough Animal Health

The oral session covered a range of viral, bacterial, parasitic and fungal diseases and covered the whole spectrum of disease management includes epidemiology, diagnostics, dietary control, antimicrobial treatment and vaccination. The papers presented were clear, well-illustrated and all to time.

Papers presented in the oral session, not surprisingly, featured emerging diseases which pose a threat to aquaculture in Eastern Europe and thus Koi herpes virus (KHV) featured prominently with papers on epidemiology, the evaluation of new diagnostic techniques and the monitoring of genetic resistance against the disease. Other papers examined the effect of probiotics, which is an emerging and increasingly important area of fish health management, and the application of two technologies which are at the “cutting edge” of vaccine development i.e. anti-parasite vaccines and oral vaccines.

However, there were a number of withdrawals which, in order to not allow the programme to get out of sequence, caused gaps which disrupted the session and depleted the audience. It is felt that the organisers should emphasise the importance of not withdrawing papers at short notice, which is not only discourteous to the organisers and audience in particular, but also detracts from the conference in general.

As with the oral section, the posters covered a broad spectrum of health-related technologies and treatments applied to a wide range of diseases in fish, shellfish and crustaceans. In general, the posters were well presented and made clear and easy reading. It was good to see that some of the posters recorded the application of new “cutting edge” technologies to diagnosis, treatment and prevention of fish diseases. The posters mirrored the oral session in that new developments such as the use of probiotics were described, as were more detailed studies of the mechanism of the immune response of fish and the effects of environmental factors and stressors on these.

Important areas such as new technologies for the disinfection of hatchery water were covered as was the application of new developments in diagnostic techniques e.g. the use of microfluid biochips.

Finally, while the application of new technologies was described, it was good to see a number of informative “back to basics” posters describing new diseases of existing farmed species and diseases of new emerging farmed species.
Welfare, including indicators and management protocols that promote fish welfare
Chair: Sunil Kadri (UK)

The welfare session comprised a collection of very good presentations and posters, comprising subjects as diverse as organic farming in the Philippines and playing music to fish!

The main focus of most of the poster papers was however the effect of the environment upon fish physiology, as was one of the oral presentations. In his plenary presentation on welfare, Sunil Kadri had suggested that the focus of welfare research had moved on from finding the ideal conditions for fish to developing on farm indicators for welfare monitoring – as outlined above however, this was not reflected in the posters presented at the meeting. Kadri went further in suggesting that welfare researchers must engage more actively with industry, regulators and even ethicists in order to bring their work into the realm to which it needs to be applied.

Work in this direction is most advanced in the EC sponsored Scientific Support for Policy projects, WEALTH and FASTFISH, both of which were presented at the meeting (WEALTH having been presented at a separate FASTFISH workshop). FASTFISH was presented by Tore Kristiansen of the Institute of Marine Research in Bergen, and demonstrated the development of welfare indicators for salmon and sea bass from sea cages and their incorporation into two welfare monitoring tools: Welfaremeter and Fasttool. The former can be found on the internet at www.imr.no/welfaremeter, where it is available for use by fish farmers who can enter environmental, production and biological data into an interface which provides a “traffic light” type of output on welfare status of the farm. This represents the current state of the art in bringing welfare research into the domain for which it is intended: daily use in aquaculture to improve the lives of the fish. The final stages of the project will focus on incorporating the two tools into one.

Another presentation, provided as a poster by Van de Vis et al., which has great potential to improve the lives (or in this case the death!) of fishes concerned, demonstrated stunning methodology for use in the slaughter of fish species for which there has been no such effective technology to date.

Other notable presentations included development of a behavioural feature (anticipation of feeding) as a welfare indicator in salmon, the effect of fish swimming behaviour upon currents within salmon cages, the effect of coping strategy on welfare in African catfish.

If there was a prize available for “best presentation” at EAS meetings, it would have to go to Professor Papatsougou of the Agricultural University of Athens. His presentation on the playing of music to fish attracted an audience sufficient to mean there was standing room only in the session. While the subject sounded rather gimmicky, Prof. Papatsougou not only demonstrated significant improvements in growth of several species exposed to the music of Mozart and Romanza, but he also delivered the lecture with the air and grace of a highly experienced lecturer, beginning with a discussion of vertebrate perception of music before moving to a description of his experiments.

Overall then, while the state of the art in terms of where welfare has got to and is going was certainly presented during the session, the posters reflected a continued assumption by some research groups that a lot of basic research and lab studies which may have some remote relationship with fish farming are still being promoted as being applied, and even as welfare research.
While there can be no doubt that we require a continuation of basic research in order to ensure that biological knowledge advances and feeds into the wealth of knowledge required in order to maintain and improve welfare on fish farms, it is possibly time that we confining the use of the term “welfare” research for description of basic and applied studies which can demonstrate a clear pathway to making a difference on fish farms, and that those who have collected and continue to collect a lot of research results of this type begin to bring these into the real world through initiatives which involve the aquaculture industry and its regulators.

After more than a decade of welfare research there are still very few researchers who can put their hand up and say that they have made a difference to the lives of fish in fish farms. It is high time that we work together to turn this around and make a difference.

**Processing, marketing, quality and safety**
Chair: Bahram Falahatkar (Iran)

This was the shortest session of Aquaculture Europe 2008, where just 2 oral presentations were given and 14 posters were on display.

The first speaker talked about marketing of common carp in Austria, with emphasis on fat content and fillet size. The results of this study suggested that the management practice is likely to be one of the key factors determining the fat content during culture period.

The second speaker presented consumer preferences for cultured sea bream price acceptance. The results showed that the safe and environment-friendly production practices and behaviour contribute to a more favourable attitude toward the aquaculture industry and thus, to a higher price acceptance for cultured fish.

Most of the posters focused on food safety regarding the fat content, meat quality and toxic metals concentrations and had specific objectives for providing high quality and safer fish to the consumers.

In conclusion, there are still more questions which should be answered for filling the gaps between methods of production, quality of products in aquaculture, and market acceptance. In closing, I would like to recommend that these types of studies, based on consumer needs, including good communication between aquaculture industry, processors, and consumers, are continued.
Sturgeon culture
Chair: Harald Rosenthal (Germany) and President of the World Sturgeon Conservation Society (WSCS)

The session was jointly organized by EAS and WSCS and was well attended, although the subject coverage was limited. A world-wide overview on the sturgeon culture development and a projected forecast was presented by Dr. Paolo Bronzi, indicating the growing interest in sturgeon culture while also identifying the options and limitations in order to bring some reality to some of the expectations raised by various sectors of the industry. The session received several contributions on diverse subject, some with highly innovative approaches to hormonal control of maturation, nutrition and growout strategies. Additional to the oral presentations there were seven posters dealing with diverse subjects ranging from histological investigation in relation to nutrition and disease, larval rearing and growth as well as with genetic markers to optimize brood stock monitoring.

The various discussions following the presentations revealed that our knowledge in sturgeon culture is still in need of extensive research on specific issues that are not typically addressed in common aquaculture sciences and this holds specifically for conservation culture.

The session contributions also demonstrated that sturgeon production through aquaculture is increasing rapidly for both meat and caviar products. This is in response to the drastic decline of sturgeon stocks world-wide. Although the analysis presented by WSCS in the introductory lecture on the status of sturgeon aquaculture indicates that market chances are fairly good for future development of the sturgeon culture industry, warnings were raised that the market will diversify into a smaller component for high-cost, traditional caviar products derived from key sturgeon species such as the beluga, while „new“ products from less valued sturgeon species will enter the market for which a new clientele will accept moderate price levels. Further, the present situation with an increasing number of fantasy-names for caviar products will not only confuse the traditional customer but also discredit the industry. The industry is well advised to be pro-active in supporting the initiatives by TRAFFIC, CITES, IUCN and WSCS for strict labelling and tight trade control in caviar products. Special attention was drawn to the recent publication on „Identification of Acipenseriformes species in Trade“ which is based on the outcome of a recent joint workshop organized by WSCS in conjunction with IUCN-CITES (published in Journal of Applied Ichthyology, vol 24, supplement 1, 2008).

The session also recognized the need for the development of brood stock management and juvenile rearing techniques for endangered sturgeon species. There is a need to produce juveniles with high fitness for survival in nature. It has to be realised that aquaculture production for commercial markets and aquaculture for species conservation require TOTALLY DIFFERENT strategic approaches and methods. While commercial production thrives mainly for best growth, good health and effective feed conversion, cultivation for conservation is NOT concerned with any of these priorities but aims at producing juveniles for fitness for survival in the receiving habitat. This requires due attention to maintain the genetic identity of the stocks to be supported (appropriate brood stock management to avoid inbreeding and outbreeding depression) and early exposure to natural stressors (avoiding domestication and sensory deprivation in the monotony often encountered in commercial aquaculture facilities).
General contributions

Session 1
Chairs: Branko Glamuznia and Otomar Linhart (Czech Republic)

The session comprised six presentations related to nutrition, growth and reproduction.

Smiley et al., ANALYSIS OF HYDROLYSATE MEALS MADE FROM ALASKAN PROCESSING BYPRODUCTS from Fisheries Industrial Technology Center, Univ. Alaska, Kodiak, AK, USA. Alaska annually processes 2.2 million tonnes of fish harvested for human food, generating 1.5 million tonnes of fish waste. They employ wet-reduction to manufacture co-products such as fishmeal, bone meal, fish oil and concentrated stick water.

Kwasek et al., THE INFLUENCE OF DIETARY LYSINE ON YELLOW PERCH MATURATION AND THE QUALITY OF SPERM from the Ohio State University, Department of Animal Sciences, Columbus, Ohio, USA. Previously was shown that yellow perch fed wheat gluten protein-based diets supplemented with free lysine achieved larger then yellow perch fed the same diet deficient in lysine. In study was demonstrated that lysine deficiency has an impact on overall gametogenesis and frequency of body deformities of this species with influences maturation of males and the quality of sperm.

Gokoglu et al., EFFECTS OF GARLIC EXTRACT ON THE QUALITY OF COATED SHRIMP DURING FROZEN STORAGE from Faculty of Agriculture University of Akdeniz, Antalya, Turkey. Finally the authors speculated that garlic extracts in coating mixture affected the quality of shrimp during frozen storage and that had protective effect against spoilage.

Trenovszki et al., INFLUENCE OF NUTRITION ON FATTY ACID AND CHEMICAL COMPOSITION OF COMMON CARP (CYPRINUS CARPIO L.) COMPARING FIVE HUNGARIAN FISH FARM FEEDING REGIME from Department of Fish Culture, Szent István University, Gödöllő, Hungary. Meat quality and fat content of carp stocks in ponds grown on feeds are factors determining the market value and quality as follow: The more cereal feeds were fed the more undesired saturated FA were found in fish. Carp reared based on natural food exhibit high contents of n-3 fatty acids in their muscle due to the consumed plankton or other smaller fish feed on plankton.

Santos et al., THE EFFECT OF DISSOLVED OXYGEN ON PERFORMANCE, ENERGY METABOLISM AND STRESS RESPONSES IN EUROPEAN SEA BASS. Aquaculture and Fisheries Group, Wageningen University, The Netherlands. In this study, the major cause of the reduction in growth was due to decline in feed intake with decreasing oxygen levels in the 5.5 and 4.0 mg per l. The decreased energy requirement for maintenance may be a result of the lower activity of fish at the lowest oxygen treatments. All results in this study indicated that chronic stressors could be affecting the response of seabass to an additional acute stress.

Vahabzadeh et al., EFFICACY OF RUTILLUS FRISII KUTUM ARTIFICIAL AND SEMI-ARTIFICIAL PROPAGATION METHODS. The author demonstrated methods of artificial and semi artificial spawning.
Session 2
Chairs: Elin Kjorsvik (Norway) and Karin Pittman (Norway)

This session covered some social, economic and environmental issues which accompany aquaculture development in Europe. The session was “system oriented” about economics, environment and management of resources, markets, and farms including land-based facilities. Eleven speakers contributed, and there were a variety of approaches from the monitoring, the management to modelling, all of which contribute to a biological production. The contributions clearly demonstrated that aquaculture as practiced in Europe is highly diverse, highly complex, capital and knowledge intensive, with a high risk and a high need for further research (banal but true....), and that the number of stakeholders related to this industry is very high.

Our impressions were that the issues raised in this session were far too important and interesting to be hidden under the headline “General contributions”. We suggest that future conferences should include sessions related to “Economics and resource management”, in order to focus more on these aspects which will be increasingly relevant for the further development of European aquaculture.

The systems described were highly variable, from land-based tanks with recirculated water to freshwater ponds and to marine coastal net pens, and from single species rearing to multitrophic multi-species production. Many stakeholders and levels of organization are operating around the farmers, pressing the need to propose zones for fish farming, not only in water but also on land. This extends the already complicated Integrated Coastal Zone Management policies to the terrestrial plane, and thus many agencies involved need to use the tools currently under development. Several speakers also claimed that economic and environmental considerations related to aquaculture must be integrated as they too ultimately affect profitability to society.

Aquaculture has presently not had a significant application of ecologically sustainable principles. The precautionary principle is used in the regulation of capture of wild animals, but to apply it to aquaculture we need to know what is currently often the unknown: the medium and longer term impacts of fish farming. Long term impacts were proposed to be mitigated perhaps by e.g. periphyton for waste treatment, water treatment and UV for nonchemical prevention of pathogens. However, highly site-specific data regarding fish species, feeding regimes, other plants etc is apparently always needed. Clearly more research is needed to expand the applicability of existing mathematical models, such as showing how a farm currently functions environmentally or economically, to predicting how it may optimize functions, and then expanding the model’s validity to predict how fish farming will impact the area.

The issues concentrated on either environmental compatibility of the farm, its economic viability current or future; versus the social acceptability of the activities themselves. Some questions can be raised: Can all aspects nonetheless be equated with economic outputs since they eventually affect profitability? There are short equations for profit but complex models for production: How much will a result change if a single parameter changes? How can farmers contribute to obtain general consensus of main bottlenecks in the industry? And can there be a “One-stop shop” for aquaculture-related information and possibly for aquaculture-related licenses and regulations?

There are obviously variations, omissions, and inaccuracies of classic models for measuring and mitigating effluents, and improvement in all aspects of aquaculture systems is possible. We expect much interesting activity within these topics over the coming years, and we look forward to a...
continued pursuit of data, verification of models and the generation of scientifically sound recommendations.

Session 3
Chair: Nigel Finn (Norway)

Ten presentations from each from separate countries discussed broad ranging elements of the aquaculture industry from Europe, the United States, Vietnam, Israel and Tasmania. In Eastern Europe a Delphi analysis based upon the expert opinion of 54 anonymous experts revealed that the major constraints for aquaculture development in this region are the input prices (costs) and the limited number of species available. The findings of this analysis are to be published in a forthcoming FAO paper and will summarise the policies that governments can implement to encourage aquaculture in Eastern Europe.

In three countries, Israel, Cyprus and Germany, the use of advanced computer algorithms are being developed as bioanalytical tools for the ornamental industry, for non-invasive biomass estimation and as an early-warning alarm system for high mortality rates, respectively. Israel appears to have the most advanced systems with modules already adopted for the highly labour-intensive activity of larval enumeration. Automated high-throughput electronic systems have demonstrated the required efficiency and accuracy demanded by ornamental fish producers. The system is being expanded to include automatic selective sorting of adults based upon secondary sexual characteristics and tail fin quality. With the rapid increase in computer power, the use of remote bio-sensing has great potential since it will likely become more efficient, mobile and affordable.

In Hungary, introduced alien species pose problems for semi-intensive aquaculture initiatives. Here pond production is hampered by competition from the alien species and efforts are underway to understand the ecology of such fishes in order to improve production methods. In Turkey and Tasmania, studies are improving knowledge regarding the nutritional requirements of introduced salmonid species such as rainbow trout and Atlantic salmon. Particularly in Turkey plant protein in the form of surplus (cheaper) red lentils can successfully replace fishmeal protein by up to 15% of the total dietary protein. Further studies are necessary to determine whether this replacement ratio can be increased.

In Tasmania, high seawater temperatures are proving challenging for the commercial production of Atlantic salmon. Research is determining whether classical diets can be optimised to the nutritional physiology in such restrictive thermal environments (18 - 21°C). Plant protein replacements from soybean and lupin up to 15% of total dietary protein have also been successfully tested, while the thermal influence on gut morphology appears to be an area requiring further investigation. Nutritional studies are also being conducted in Belgium where prebiotics (non-digestible food ingredients) are being tested as probiotic stimulants in sturgeons. Preliminary data indicate that prebiotics can selectively enrich probiotic bacteria in the intestine. The importance of such microflora for the digestive physiology of sturgeons remains to be evaluated.

In Vietnam new species are entering the production cycle. Here work on the quality of naturally spawned eggs of cobia is in its early stages. Current data indicate that larval quality is highest when broodstocks are fed raw fish containing increased dietary n-3 HUFA (0.93 – 1.85%), but lowest when
dietary levels of arachidonic acid (ARA) exceed 0.42% of the dry mass. The study confirms earlier reports where the absolute content of HUFA and appropriate ratio of DHA/EPA, EPA/ARA and n-3/n-6 in eggs reflects better quality of larvae for production.

In Puget Sound, western United States, the novel use of childrens’ plastic swimming pools has successfully been shown to be a commercially viable method of rearing Manila clams. The method is best for the nursery phase, where juveniles can be subsequently seeded on the foreshore. This approach is facilitated by the legal right to own small segments of the foreshore in the US, and the fact that few clams are poached by third parties. The method is directly transferable to other species and other regions of the world, and has the advantage of being cheap, flexible and mobile, as well as raising awareness for environmental concerns and school education programs.

Motivated, willing and friendly students are one of the success criteria for Aquaculture Europe events. AE2008 was lucky to have a great team, under the coordination of Karolina Kwasek – back row, third from the left. Photo courtesy of Yves Harache.
AE2008 Farmer’s Day  
**Chairs: Jacek Juchniewicz (Poland) and Miroslaw Kucynski (Poland)**

The Industry forum, or “Farmers’ Day” is an integral part of Aquaculture Europe events, bringing together fish farmers and scientists, and with the objectives of facilitating better understanding of modern aquaculture technologies, dissemination of research results and information exchange between different branches of aquaculture.

The AE2008 programme was made up of presentations focussing on various aspects of aquaculture in the region and including:

- Presentation of different forms of aquaculture activities from extensive and semi-intensive pond farming to RAS, touching environmental costs and benefits of ponds, recreational aquaculture, technology of industrial fish production and economy;
- Consumers’ perception of aquaculture;
- Analysis of the problems of aquaculture in Eastern and Central Europe;
- Feed costs as a result of global feed ingredients prices changes;
- New pathogens in trout culture and the ways of vaccination;
- EATP presentation
- Funds for Polish aquaculture producers.

The presentations were followed by a theatre performance “The story of Carp within Polish tradition and culture” given by children from the theatre group of the Primary School at Odrowaz (Poland).

*Photos courtesy of Pan Karp.*
The presentations and the discussion brought conclusions that confirm the very important role of pond (Carp) farming as a tool for biodiversity increase and better water management, but also the promotion of tradition and culture. It was recommended to disseminate those values of pond aquaculture in throughout Europe.

Research on consumers’ perception of aquaculture shown, that 2% of the population never consume fish, but 30% of the consumers cannot recognize whether fish consumed is either wild or cultured. The recommendation was formulated to create better information systems throughout the value chain.
EU Forum: European Community Research Programmes

Chairs Stamatis Varsamos (DG MARE) and Hallgeir Herikstad (DG Research)

The annual EAS conference constitutes an important event in the agenda of the European Commission’s services that are involved in issues linked to aquaculture and to related research activities. This always very popular, scientific meeting that brings together scientists focusing on aquaculture research is an excellent opportunity to stimulate interaction and two-way communication between EU officials, students, young and senior researchers.

It allows feeling the pulse of the aquaculture scientific community, being aware of new breakthroughs in basic and applied research, identifying trends and gaps in different scientific domains and getting a picture of the needs and constraints of researchers from all around Europe and beyond. It is also a very good occasion for the Commission to communicate its policies related to aquaculture, the challenges and the priorities identified for the sustainable development of the aquaculture sector, to encourage the involvement of scientists in the development and implementation of the 7th Framework Programme for Research and Technological Development (FP 7) and most importantly to receive directly feed-back from the scientific community on the EU actions and instruments mobilized in support to aquaculture research.

During the Aquaculture Europe 2008 event, the Commission presented its actions in support to aquaculture research in the context of the on-going revision of the EU strategy for the sustainable development of aquaculture and highlighted opportunities offered to the aquaculture research community within FP 7.

Aquaculture Research: The EU perspective.
S. Varsamos (DG MARE)

European aquaculture has a high potential for innovation and technological development and is supported by a very active and productive research community (driven by public and industrial stakeholders).

The European Union supports an integrated approach for aquaculture research to maximise synergies between Member States and Community efforts, to improve the dialogue between the scientific community, industry, policy makers and relevant stakeholders (see figure right) and to stimulate public and private investment in research technological development and innovation (RTDI).
Following a short overview of DG MARE's main tasks and activities, the presentation summarized the main EU policies which are related to aquaculture showing clearly that aquaculture is a multifaceted and complex issue. The main challenges that the European Commission has identified for the European aquaculture research were presented. One of these key challenges is to provide the knowledge-base required for the sustainable development of the European aquaculture sector, which calls for increased support to aquaculture research in areas such as control of the life cycle of cultured species, health & welfare, integration into the environment, development of new technologies and production systems, sustainable feeds, spatial planning and governance.

The 6th Framework Programme for Research and Technological Development (FP6: 2002-2006) offered opportunities for RTDI in aquaculture through a wide range of instruments including SMEs measures, Scientific Support to Policies (SSP), Priority 5 (Food Quality & Safety) etc. These opportunities and their outcomes were the main focus of the presentation. In particular, an overview of FP6 EU-funded projects relevant to each thematic session of the Aquaculture Europe 2008 conference was presented. Finally, the presentation highlighted changes in the Commission’s set up for fisheries and aquaculture research: the RTD component of DG MARE will be moved to DG RTD as by 1/01/2009.

Practical guide to EU funding for aquaculture research: Rules & Opportunities.
H. Herikstad (DG RTD)

This presentation focused on opportunities for aquaculture research within the 7th Framework Program. Following a brief description of the structure of FP7, the presentation described the main funding schemes and instruments. The main funding opportunities for aquaculture research within FP7 can be found, mainly in the Theme 2 “Food, Agriculture and Fisheries, and Biotechnology” of the Cooperation Programme and in Research for Infrastructures, Research for the benefit of SMEs and International Cooperation of the Capacities Programme. Moreover, opportunities for carrier development and mobility of researchers are provided by the Marie Curie Actions of the People Programme. The Competitiveness and Innovation Framework Programme can also provide opportunities for technological innovation and aquaculture applications. At last, but not least, some RTD-related activities (pilot projects, infrastructures etc) could be eligible for funding by structural funds.

Subsequently, the content of the WP 2009 of FP7 which provides several opportunities for aquaculture research was presented. Finally, a short overview of the process (and main players) that leads to the development of the Commission’s annual Work Programme was provided, to show the role of scientists and scientific networks in this process. An invitation to contribute actively to the definition of the research priorities, the annual Work Programme and the evaluation of proposals was made to the scientific community which is considered as a key partner by the Commission for the successful implementation of FP7.
**Discussion and feedback.**

The coming changes in the Commission’s set up for fisheries and aquaculture research with the transfer of the RTD component of DG MARE to DG RTD as by 1/01/2009, raised a lot of questions from the floor and during the whole event.

The Commission and its set up are constantly evolving to adapt to new challenges and to improve its efficiency. In any case, strong links between DG MARE and the new sector in charge of fisheries and aquaculture research in DG Research will be ensured. Several questions and comments focused on concerns about the future of fisheries and aquaculture research, the apparent decreased budget allocated to this field during the first FP7 calls and the increasing competition with other fields (agriculture, land animals culture etc...).

Finally, AE2007 attendees were particularly interested in the process of the elaboration of the calls and the evaluation of the projects within FP7.

Once again, the EAS conference through stimulating presentations and discussions has produced a valuable state of the art on a wide range of issues related to aquaculture, including diversification, gamete physiology, welfare, basic and applied nutrition, new technologies etc. and has contributed in pointing out gaps in research in these fields. It has also provided a forum with specific sessions for dissemination of results from EU-funded actions and projects (REPROFISH & FASTFISH).
The AE2008 President’s Reception
This was held at the Niepolomieca Castle, built by Kasimierz the Great in the 14th century and then rebuilt in Renaissance style. It was certainly a “royal” occasion.

Photos courtesy of Yves Harache, Alistair Lane and Pan Karp
Aquaculture Europe 2008 Poster Awards
EAS recognises the value of poster presentations in its Aquaculture Europe events, and makes awards (a voucher for the value of €250) for the Best Poster and the Best Student Poster.

Best Poster
The AE2008 Best Poster Award was awarded to Yi-Min Chen¹,*, Shu-Fen Chen², Chung-Kuang Lu³, Han-You Lin¹, Tzong-Yueh Chen¹ and Huey-Lang Yang¹ of the ¹Institute of Biotechnology, National Cheng Kung University, Tainan, Taiwan, ²Department of Health and Nutrition, Chia Nan University of Pharmacy and Science, Tainan, Taiwan and ³National Museum of Marine Biology and Aquarium, Pingtung, Taiwan for their poster entitled ISOLATION AND CHARACTERIZATION OF TAIWANESE THRAUSTOCHYTRID SPECIES: SCREENING OF STRAINS FOR DOCOSAHEXAENOIC ACID (DHA) PRODUCTION.

Abstract:
Twenty-six marine microbes identified as Traustochytrids (marine protists) were isolated from coastal area of Taiwan. They were screened in this research for DHA production potential according to their biomass, crude lipid content and fatty acid compositions. Results showed that under standard growth conditions, their biomass can reach to 30 ~ 180 mg L⁻¹, with lipid content ranging from 150 to 600 mg g⁻¹. Four distinct clusters of fatty acid profiles were discerned, with DHA comprising 15% ~ 58% of total fatty acids.

An Aplanochytrium yorkensis strain BL-10 was regarded as an ideal candidate for DHA production due to its high biomass and DHA content compared with other strains. The optimal fermentation conditions of the strain for DHA production are under investigation.
The American paddlefish has been introduced into Polish aquaculture in 1995 as a species suitable for breeding in polyculture with common carp. The paddlefish may become a popular addition to Polish fish farms as similar attempts in neighbouring countries have been successful.

In Poland, the paddlefish is reared in two farms: Pogórze and Wąsosze. The number of fish in both spawning stocks is small. Stock Pogórze consists of only 24 fish and is foreseen as a source of stocking material for future paddlefish aquaculture. Due to the small number of fish the stock is vulnerable to declining heterozygosity in future generations.

Assemblage of spawning pairs based on their phenotype may be biased because of a risk of crossing closely related individuals. Development of molecular technique allowing assembling spawning pairs based on their genetic characteristics provides a better way of maintaining genetic variation of the stock.

**Material and methods**

Biological material (fragments of fin tissues) was collected from all 24 individuals of the stock Pogórze. Before sampling all fish were marked using microchip tags. Collected tissues were preserved in 70% ethanol. DNA was extracted using Wizard Genomic Purification Kit (Promega – USA) applying manufacturer’s procedure modified by Kaczmarczyk et al. (2007).

Individual genetic characteristics were developed for each fish. The characteristic consisted of a list of alleles detected in nine polymorphic microsatellite loci: Psp 12, Psp 18, Psp 20, Psp 21, Psp 26, Psp 28, Psp 29 and Psp 31; sequences of microsatellites and their flanking regions were taken from gene bank and primer sequences were from Heist et al. (2002). Microsatellites and surrounding sequences were amplified using PCR technique. In each set the forward primers were labelled with appropriate phosphoramid
dyes allowing measurement of amplified fragments by using automatic DNA sequencer Beckman Coulter CEQ 8000.

Calculation of broodstock heterozygosity was conducted by using algorithm of Nei (1987) implemented to MSA software (Dieringer and Schlötterer 2003). Estimation of heterozygosity in the progeny of spawners was based on genetic differences between them. Calculations took into consideration only mature individuals (9 males and 10 females). A theoretical proportion of heterozygotic genotypes in the progeny of each possible male x female combination was estimated for a single locus and then the procedure was repeated for all loci. Obtained results were averaged and final value was equal to the proportion of heterozygotic individuals in the progeny of each spawning pair.

Results
All examined (eight) microsatellites were amplified, but only seven were genotyped successfully. Seven samples containing locus Psp 12 were not genotyped because of numerous stutter bands and this locus was excluded from further calculations.

Heterozygosity estimated for progeny that would be obtained from pairs of examined spawners varied from 0.27 to 0.68. In most of analyzed variants the expected heterozygosity was below the value specific for their parent’s generation (0.550). Only a few combinations provided equal or higher heterozygosity of progeny than that of their parents.

Discussion
A fish breeding centre in Pogórze is a first paddlefish farm in Europe where spawners assemblage based on their individual genetic differences has been accomplished. The heterozygosity of this stock is high and comparable to that of a wild population inhabiting Kaskasia river (Heist et al. 2002). It is important to maintain the heterozygosity of the Pogórze stock at a present level by appropriate assemblage of spawners. Random assemblage should be avoided because most variants would lead to the heterozygosity decline.

Acknowledgements
The authors are grateful to dr. Klaus Kohlmann and Petra Kersten (Berlin) for their help in fish genotyping by using automatic DNA sequencer CEQ 8000.

References

The PDF files of both posters are at www.easonline.org
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The AQUATT Board of Directors announced in September the establishment of an annual student award to be entitled "THE LINDSAY LAIRD STUDENT AWARD for INNOVATION IN AQUACULTURE", to be awarded for the most innovative poster (in English) submitted by a student at the Aquaculture Europe events, and which concerns research in any one of the following areas:

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- Stock production
- Fish diseases
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The Lindsay Laird award consists of a certificate and an award of a laptop (to the value of 750 euros) of the winner’s choice.

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