

PROGRESS REPORT OF THE “GENOMICS OF COMMON CARP AND OTHER CYPRINIDS” WORKING GROUP

In the frame of the project “Genomics of common carp and other cyprinids”, materials on research in the fields of genetics, selection and breeding in fish culture were collected from NACEE member institutions and evaluated in the period from October 2005 to August 2006.

In the period from 2001 to 2005, 19 scientific projects were implemented with a total cost of 1.2 million euros. The priority field in virtually all institutes was research on selection of common carp and herbivorous fishes. The results of the performed work were common carp breeds currently awaiting certification: the Lakhva scaly carp (Institute of Fisheries, Belarus), the Telenesti carp, resistant to infectious diseases (Fisheries Research Station, Moldova), as well as selected broodstocks of herbivorous, salmonid and acipenserid fish species and breeds in Russian Federation, Ukraine, Belarus, Moldova and Poland.

Significant attention was paid to introduction of modern molecular genetic methods into genetics and selection. Establishment of a gene bank of cultured fish breeds was started in Russian Federation (FCFGS, VNIRO), which currently has over 5 000 specimens. A genetically modified form of common carp has been created and is currently studied, the mechanism of sex determination is studied in sturgeons (All-Russian Research Institute of Freshwater Fish Farming). It is very important to note that this research is done in cooperation with institutes of the Russian Academy of Sciences. The immunological reaction of fish to parasites is studied (Institute of Ichthyobiology and Aquaculture of the Polish Academy of Sciences). In January 2006, three institutes of the Network started research in the frame of the EUROCARP Project, studying disease and stress resistance of common carp as a basis for selection of highly productive breeds adapted to various conditions of their environment.

In many institutes, work is done on establishing live gene bank collections of fishes that are currently in depressed state due to different anthropogenic factors. For the near future, there is a set objective of developing the methodological foundations for establishing and exploiting of gene bank collections on a state level (FCFGS).

In most of the countries, economic development is planned for five-year terms, in relation to which, implementation of 11 new scientific projects was started in 2006 with a total cost of over 2 million euros. Taking into consideration the characteristics of selection work, most of the research is continued with modified titles.

Analysis of the compiled coordination plan, from which, unfortunately, work performed in Hungary and the Czech Republic is missing (they did not submit the information), has shown that a certain parallelism of the thematics can be observed, the research is not identified methodologically and the obtained results are quite difficult to use in other countries, even in those with similar natural and climatic conditions.

In the conditions of limited financial, and lately, also research resources existing virtually in all countries, it seems rational to use the attached coordination plan for establishment of direct bi- or multilateral contacts for solving problems of fish culture in different countries. ***Initial discussions on this issue could be held in Dubrovnik during the Third Meeting of the Board of Directors. For success of such discussions, I consider it important to contact each other***

directly by e-mail during the next month for precisising the common interests and determination of near perspectives that could be further detailed in Dubrovnik.

The attached coordination plan should be a good basis for the determination of 2-3 priority research topics in the field of fish genetics and selection and breeding in aquaculture. These projects can then apply for financing to international organizations. *It would be very advisable if all NACEE members could send us by 15 September 2006 the titles of specific selection and genetic themes that should be priority topics in their opinion.*

Unfortunately, due to a number of objective and subjective reasons, we could not realize the decision on launching a programme for exchange of the gene bank material of different fish species and breeds, both because of scientific interest and for spreading highly productive fish breeds and crosses in the fish culture of the Central and Eastern European countries. *I consider it necessary to exchange opinions on the usefulness of launching such a programme during the Third Meeting of our Network. It is advisable to inform other members of our Network on these plans by 15 September, so that everyone could prepare to the discussion.*

Currently, there are officially over 40 breeds and other products of fish culture selection in the countries of the NACEE region, in relation to which, it seems extremely important and indispensable to compile, under the umbrella of NACEE, a Catalogue of Breeds and Domesticated Forms of Fishes that could be of interest to countries of other continents and to FAO. It could be possibly advisable to establish at NACEE a **Register of Selection Achievements in Fish Culture** agreed with the data of FAO, which will allow to realize breed selection processes on a common methodological basis and to have a credible common base of fish breeds existing in the world fish culture. *For compilation of such a catalogue, it is necessary to have a standardized format of describing selection achievements that is attached to this report for discussion by the institutes and subsequent presentation and approval at the working group meeting in Dubrovnik in September 2006.*

The Report of the Second Meeting of the NACEE Board of Directors includes as an annex the Planned Programme of Scientific, Technical and Economic Cooperation between Organisations, Enterprises and Firms of NACEE and NACA that was not discussed in detail at that meeting. *Taking into consideration the existing professional contacts between our regional networks, I consider it necessary to return to the discussion of this plan, as the Director General of NACA is expected to take part in the Third Meeting of the NACEE Board of Directors. In relation to this, I ask all colleagues to study the aforementioned Planned Programme of Cooperation and to have their own opinion on perspectives and realities of its implementation. It could be possibly extended, possibly reduced, etc.*

To conclude, we will have to discuss the following issues at the Meeting of the Working Group of Cyprinid Genomics during the Third Meeting of the NACEE Board of Directors in Dubrovnik:

1. Rationality of extending the scope of activity of the group to other fish species and breeds (salmonids, sturgeons, etc.) and changing the name of the group;
2. Determination of priority thematics in the fields of fish culture genetics, selection and breeding for possible project financing from FAO, EU and other funds interested in aquaculture development both on the territory of Central and Eastern Europe and other continents;
3. Perspectives of joint bilateral and multilateral implementation of certain projects and possible signing of protocols for such scientific cooperation for the near future.

Establishing of such consortiums during preparation of EU project proposals and determination of the winners is an EU practice;

4. Rationality and necessity of launching a network-wide exchange programme of gene bank material of cultured fish species and breeds;
5. Compiling a common catalogue of fish breeds, crosses and domesticated species existing at the research institutions and enterprises of Central and Eastern Europe and adopting a special form for presenting materials and their submitting to the Coordinating Institution. Establishment of a Fish Breed Register at NACEE;
6. Discussing with the representatives of NACA the Planned Programme of Future Cooperation between our networks.

Annexes to this Report:

- Annex 7.1.1. Coordination Plan;
- Annex 7.1.2. Draft of a special form for breed description;
- Annex 7.1.3. Plan of cooperation between NACEE and NACA

COORDINATION PLAN

No.	Name of the theme	Time frame	Research institution	Partners	Cost, thousand EUR	Expected results	Comments
1.	Establishment and utilization of highly productive elite broodstocks of common carp selected in Belarus	2001–2005	Institute of Fisheries of the National Academy of Sciences of Belarus, Minsk, Belarus	none	128.2	New selection achievement – the “Lakhva Scaly” carp breed. A 200-head broodstock of selected common carp	
2.	Establishment of a pedigree core broodstock of herbivorous fishes of Amur and Chinese lineage	2001–2005	Institute of Fisheries of the National Academy of Sciences of Belarus, Minsk, Belarus	none	50.8	Technological instructions on commercial use of the two-line broodstock of herbivorous fishes. A 200-head broodstock of two lineages of herbivorous fishes	
3.	Establishment of new broodstocks of acipenserid, herbivorous, cyprinid and commercially important fishes; development of recommendations for optimizing the rearing conditions of quality seed and market fish.	2001–2005	Fisheries Research Station, Chişinău, Moldova	none	51.7	New broodstocks of 4 th generation Telenesti carp resistant to infectious diseases and 6 th generation Cubolta scaly carp. Instructions on bonitation and guidelines on exploitation of new broodstocks. A broodstock of 6 th generation Mîndic mirror carp.	
4.	Integrated approach to the immune reaction of teleosts on parasites.	2002–2006	Institute of Ichthyobiology and Aquaculture of the Polish Academy of Sciences, Gołysz, Poland	EU-financed research programme	130.0	Demonstrating the role of natural antibiotics and transferrins, α -2-macroglobulin, the principal histocompatibility complex of common carp genes in reaction to bacterial/parasitic infections.	
5.	Biological and production characteristics of common carp lines.	2002–2006	Institute of Ichthyobiology and Aquaculture of the Polish Academy of Sciences, Gołysz, Poland	Institute of Animal Reproduction and Food Research of the Polish Academy of Sciences, Olsztyn, Poland	200.0	Determination of production characteristics of common carp lines suitable for pond aquaculture	

No.	Name of the theme	Time frame	Research institution	Partners	Cost, thousand EUR	Expected results	Comments
6.	Preservation of genetic resources by protection of endangered populations.	2002–2006	Institute of Ichthyobiology and Aquaculture of the Polish Academy of Sciences, Gołysz, Poland	Institute of Animal Reproduction and Food Research of the Polish Academy of Sciences, Olsztyn, Poland	51.0	The objective is the rehabilitation of 4 endangered and unique populations of common carp for prevention of disturbance of genetic diversity and loss of specific production characteristics.	
7.	A complex study of the genome of cultured fishes and development of DNA-diagnostics for determination of the breed of fish selected for reproduction	2004–2005	Federal Center of Fish Genetics and Selection, Ropsha, Russian Federation	Federal Research Institute for Fisheries and Oceanography (VNIRO), Moscow, Russian Federation	295.0	Electronic data bank on DNA-identification of cultured fishes. Draft methodological recommendations on use of DNA-diagnostics for determination of the breed of cyprinid, acipenserid and salmonid fishes selected for reproduction.	
8.	Research into and elaboration of methodological recommendations on use of molecular genetic methods during targeted selection of pedigree fish and other cultured animals	2005	Federal Center of Fish Genetics and Selection, Ropsha, Russian Federation	Federal Research Institute for Fisheries and Oceanography (VNIRO), Moscow, Russian Federation	14.7	Draft methodological recommendations on use of molecular genetic methods during targeted selection of pedigree fish and other cultured animals.	
9.	Study on the status of cultured fish breeds and work on improving their structure	2005	Federal Center of Fish Genetics and Selection, Ropsha, Russian Federation	none	73.5	Fisheries biological characterization of breeds of rainbow trout and Ropsha and Cherepet' carp and suggestions for their improvement.	
10.	Development of a technology for obtaining monosex (all-female) rainbow trout seed.	2004–2005	Federal Center of Fish Genetics and Selection, Ropsha, Russian Federation	none	14.7	Draft technology of obtaining monosex trout seed	
11.	Molecular genetic identification of transgenic individuals of common carp in the pedigree broodstock to be formed	2004–2005	Federal Research Institute for Fisheries and Oceanography (VNIRO), Moscow, Russian Federation	All-Russian Research Institute of Freshwater Fish Farming (VNIIPRKH), Rybnoe, Russian Federation	7.3	Analysis of the presence and heritability of a transgene (scGH) in successive generations of transgenic common carp	

No.	Name of the theme	Time frame	Research institution	Partners	Cost, thousand EUR	Expected results	Comments
12.	Molecular genetic analysis of experimental sturgeon offspring	2005	Federal Research Institute for Fisheries and Oceanography (VNIRO), Moscow, Russian Federation	All-Russian Research Institute of Freshwater Fish Farming (VNIIPRKH), Rybnoe, Russian Federation, N. K. Koltsov Institute of Development Biology, Moscow, Russian Federation	4.4	Application of molecular markers for identification of gynogenetic, androgenetic and clonal forms of sturgeons on the example of bester	
13.	Selection of herbivorous fishes (grass carp, silver carp, bighead carp) and establishment of highly productive first- and second-generation stocks	2004–2005	Institute of Fisheries of the Ukrainian Academy of Agrarian Sciences, Kiev, Ukraine	none	14.0	300-head broodstocks of the first and second selected generations	
14.	Increasing the productivity of cultured species on the basis of their genetic structure, selection and mass reproduction of cultured species using modern biotechnologies	2004–2005	Institute of Fisheries of the Ukrainian Academy of Agrarian Sciences, Kiev, Ukraine	none	90.0	Broodstocks of Ukrainian carp breeds obtained with the use of modern biotechnologies	
15.	Producing a new common carp type with few scales for Ukrainian fish farms	2004–2005	Institute of Fisheries of the Ukrainian Academy of Agrarian Sciences, Kiev, Ukraine	none	4.8	500-head broodstocks of the second and third selected generations of the new common carp type.	
16.	Producing and studying transgenic common carp modified with somatotropin genes	2003–2007	All-Russian Research Institute of Freshwater Fish Farming (VNIIPRKH), Rybnoe, Russian Federation	Federal Research Institute for Fisheries and Oceanography (VNIRO), Moscow, Russian Federation	89.0	A genetically modified common carp form, data on fisheries biological characteristics of transgenic carp	
17.	Development of methods for identification of pedigree production in fish culture	2003–2007	All-Russian Research Institute of Freshwater Fish Farming (VNIIPRKH), Rybnoe, Russian Federation	Institute of gene biology of the Russian Academy of Sciences, Moscow, Russian Federation	45.0	A system for identification of identification of pedigree production in fish culture	

No.	Name of the theme	Time frame	Research institution	Partners	Cost, thousand EUR	Expected results	Comments
18.	Study of the sex determination mechanism in sturgeons	2003–2007	All-Russian Research Institute of Freshwater Fish Farming (VNIIPRKH), Rybnoe, Russian Federation	N. K. Koltsov Institute of Development Biology, Moscow, Russian Federation	45.0	Data on the sex determination mechanism in sturgeons	
19.	Improvement of the methods of sperm cryoconservation and filling up the frozen gene bank of cultured, rare and endangered fish species	2003–2007	All-Russian Research Institute of Freshwater Fish Farming (VNIIPRKH), Rybnoe, Russian Federation	none	89.0	Frozen gene bank of cultured, rare and endangered fish species	
20.	Establishment and evaluation of a highly productive broodstock of the pedigree group of Tremlya carp	2006–2010	Institute of Fisheries of the National Academy of Sciences of Belarus, Minsk, Belarus	none	191.2	A highly productive pedigree group of Tremlya carp with a fecundity of 750,000 eggs and a productivity of no less than 65 mt.	
21.	Establishing a core stock of the mirror breed of Belarus carp with an increased general resistance	2006–2010	Institute of Fisheries of the National Academy of Sciences of Belarus, Minsk, Belarus	none	191.2	A core stock of the mirror breed of Belarus carp with an increased general resistance. A 200-head broodstock.	
22.	Establishing a broodstock of bighead and silver carps maturing in the 1 st and 2 nd decades of May with a shorter gap between spawning cycles and evaluate it genetically.	2006–2010	Institute of Fisheries of the National Academy of Sciences of Belarus, Minsk, Belarus	none	191.2	A 60-head broodstock of bighead and silver carps with a shorter gap between spawning cycles and maturing in the 1 st and 2 nd decades of May	
23.	Development of criteria for selection of common carp breeders on the basis of a complex of genetic and physiological indices	2006–2010	Institute of Fisheries of the National Academy of Sciences of Belarus, Minsk, Belarus	none	135.0	Methodology of evaluation of the sensitivity of common carp to different environmental factors.	

No.	Name of the theme	Time frame	Research institution	Partners	Cost, thousand EUR	Expected results	Comments
24.	Development of modern technologies for resource-saving exploitation of broodstocks of new common carp and herbivorous fish breeds and a mechanism for preservation and improvement of the gene pool of high-value species.	2006–2010	Fisheries Research Station, Chişinău, Moldova	none	18.3 in 2006	Fry of three new common carp breeds of the 5 th and 7 th selected generation. Recommendations on efficient and resource-saving carp fry rearing.	
25.	“SIXTH FRAMEWORK PROGRAMME. PRIORITY 8.1 Proposal/Contract No.: 0022665 ” Project Name “EUROCARP”: “Disease and Stress Resistant Com-mon Carp: Combining Quan-titative, Genomic and Proteo-mic and Immunological marker technologies to identify high performance strains, families and individu-als”	2006–2008	Federal Research Institute for Fisheries and Oceanography (VNIRO), Moscow, Russian Federation	Research Institute for Fisheries, Aquaculture and Irrigation (HAKI), Szarvas, Hungary; University of Stirling, Stirling, UK; Centre for Environment, Fisheries and Aquaculture Science, Weymouth, UK; University of Liverpool, Liverpool, UK; AKVAFORSK, Institute of Aquaculture Research, Ås, Norway; Federal Center of Fish Genetics and Selection, Ropsha, Russian Federation		Mapping of the attachment of specific QTLs to molecular markers of the nuclear (chromosomal) DNA of different breeds, lines and family groups of common carp (<i>Cyprinus carpio</i> L.) through analysis of the offspring using molecular genetic methods, including fragment analysis and sequencing, as well as biochemical typization and study of the immunological status of the offspring resulting from experimental diallelic crosses.	
26.	Research and development of methodological recommendations on establishment of state-level live and frozen gene bank collections of acipenserid, salmonid and cyprinid fishes with a potential for the aquaculture of Russian Federation	2006–2008	Federal Center of Fish Genetics and Selection, Ropsha, Russian Federation	Fisheries research institutions of Russian Federation	440.0	Draft methodological recommendations on establishment of gene bank collections of acipenserid, salmonid and cyprinid fishes. Draft legislation on state gene bank collections of fishes	

No.	Name of the theme	Time frame	Research institution	Partners	Cost, thousand EUR	Expected results	Comments
27.	Improvement of the gene pool of herbivorous fishes (grass carp, silver carp, bighead carp) and establishment of their heterogeneous second and third generation stocks	2006–2010	Institute of Fisheries of the Ukrainian Academy of Agrarian Sciences, Kiev, Ukraine	none	10.0 (2006)	400-head broodstocks of the second and third selected generations.	
28.	Creating experimental stocks of Ukrainian common carp breeds using modern cryobiotechnologies	2006–2010	Institute of Fisheries of the Ukrainian Academy of Agrarian Sciences, Kiev, Ukraine	none	60.0 (2006)	Experimental broodstocks of Ukrainian common carp breeds obtained using frozen sperm	
29.	Producing and consolidating a new type of common carp with few scales for fish farms of Ukraine	2006–2010	Institute of Fisheries of the Ukrainian Academy of Agrarian Sciences, Kiev, Ukraine	none	4.5	500-head broodstocks of the third and fourth selected generations of the new common carp type.	
30.	Development of methods and techniques of sturgeon selection and breeding	2007–2010	“BIOS” Research and Production Center for Sturgeon Breeding, Astrakhan, Russian Federation	none	90.0	Morphological and biological characterization of sturgeon breeders of different age during selection for breeding.	
31.	Development of methods for restoration of the genotype of rare and endangered sturgeon species and populations using methods of sperm cryoconservation and induced androgenesis	2006–2009	All-Russian Research Institute of Freshwater Fish Farming (VNIIPRKH), Rybnoe, Russian Federation	N. K. Koltsov Institute of Development Biology, Moscow, Russian Federation	31.0	A method for restoring the genotype of sturgeons from frozen spermia using the method of dispermic androgenesis	

**DRAFT FORMAT OF DESCRIPTION OF FISH BREEDS AND
DOMESTICATED FORMS**

1. Full name of the breed in Russian, English and Latin.
2. Developer, owner, patent owner, country.
3. Farms of origin, country.
4. Regionality (zonality, temperature demand).
5. Development history with scheme.
6. Technological characteristics:
 - 6.1. Exterior indices of breeders;
 - 6.2. Reproductive indices;
 - 6.3. Morphological indices of market-size fish;
 - 6.4. Fish breeding indices during market fish production.
7. Genetic characteristics.
8. Identification markers.
9. Crosses developed from the breed.
10. Countries of occurrence.
11. Volumes of market production.

Comment: The “Catalogue of fish breeds, crosses and domesticated forms in Russian Federation and the CIS” published by the Ministry of Agriculture of Russian Federation in 2001 can be considered as a model. This Catalogue was sent practically to all NACEE members for use in their work. Its content can be seen on the site of FCFGS (www.fsgcr.com). Of course, the format needs improvement and changing.

In addition to this Catalogue, Hungary, the Czech Republic and Poland have their own analogic catalogues. We ask all NACEE members having such publications to bring them to Dubrovnik for use during the discussions and elaboration of the final form of material collecting.

PLANNED PROGRAMME of scientific, technical and economic cooperation between NACEE and NACA

Number	Name of actions	Deadline of delivery	Responsible organisations		Results of actions
			NACEE	NACA	
I. Cooperation in the field of joint research					
1.1.	Performing molecular genetic analyses of the DNA of carps cultured in different South-East Asian countries.	2006-2007	FSGCR Center for Molecular Genetic Research, VNIRO		Data bank of the DNA of carps cultured in South-East Asian countries
1.2.	Development of express diagnostics for identification of geographic or breed origin of carp cultured in South-East Asian countries.	2006-2007	FSGCR Center for Molecular Genetic Research, VNIRO		Express diagnostics for identification of carp cultured in South-East Asian countries.
1.3.	Development of modern methods for fish selection and breeding work in conditions of tropical waters.	2006-2008	FSGCR VNIIPRH		Modern methodology for fish selection and breeding work in conditions of tropical waters.
1.4.	Research on fish diseases present in tropical waters and development of methods for their treatment and prevention.	2006-2008	VNIIPRH GosNIORH		Characterization of carp diseases present in tropical conditions and development of treatment and prevention measures.
1.5.	Development of medicinal feed formulae using raw materials and preparates produced in South-East Asia.	2007-2008	VNIIPRH		Formulae for medicinal fish feeds
II. Economic cooperation					
2.1.	Exporting stocking material of different carp varieties and of different age to fish farms of South-East Asian countries.	2006-2007	FSGCR VNIIPRH Timiryazev MSHA.		Larvae and fry.
2.2.	Study of South-East Asian fish farms for creation, on their basis, of regional fish nurseries for introduced carp varieties.	2006-2007	FSGCR VNIIPRH		Final report on fish farms and suggestions for establishment of regional fish nurseries.
2.3.	Study on the epizootic status of fish farms in South-East Asian countries and elaboration of measures for disease eradication using modern methods, vaccines and preparates.	2006-2007	VNIIPRH		Final report on the epizootic status of fish farms in South-East Asia.

Number	Name of actions	Deadline of delivery	Responsible organisations		Results of actions
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2.4.	Exporting medicinal preparates, vaccines and feeds for treatment and prevention of diseases in fish cultured in South-East Asian countries.	2006-2008	Aquatechnopark Ltd.		Medicinal feeds, preparates, vaccines.
III. Cooperation in the field of information exchange and specialist training					
3.1.	Exchange of scientific and technical literature and commercial information leaflets in the field of development of hydrobiont rearing, processing and transporting.	2006-2008	All NACEE member institutions.		Special scientific and technical literature.
3.2.	Expertise and extension in different branches of aquaculture development.	2006-2008	All NACEE member institutions.		Expert reports and consultations.
3.3.	Methodological and technical assistance to introduction of Russian carp varieties in South East Asian fish farms.	2006-2008	FSGCR VNIIPRH Timiryazev MSHA.		Consultations, methodological and technical assistance.
3.4.	Organizing training courses for specialists from South-East Asian fish farms.	2006-2008	FSGCR VNIIPRH Timiryazev MSHA.		Special courses of different levels for specialists.
3.5.	Practice of specialists from South-East Asian fish farms in Russian Federation and other countries of Central and Eastern Europe.	2006-2008	FSGCR VNIIPRH Timiryazev MSHA.		Practice for specialists.

NACEE: Network of Aquaculture Centres in Central-Eastern Europe

NACA: Network of Aquaculture Centres in Asia-Pacific

FSGCR: Federal Centre for Fish Genetics and Selection

VNIRO: Russian Federal Research Institute of Fisheries and Oceanography

VNIIPRH: Russian Federal Research Institute of Freshwater Fisheries

GosNIORH: State Research Institute of Lake and River Fisheries

Timiryazev MSHA: Timiryazev Agricultural Academy of Moscow

REPORT OF THE AD-HOC MEETING OF THE “GENOMICS OF COMMON CARP AND OTHER CYPRINIDS” WORKING GROUP

Agenda of the Meeting:

1. Results of implementation of the decisions of the Second Meeting of the Board of Directors of the Network of Aquaculture Centres in Central and Eastern Europe.
2. Main directions of activity in the 2006-2007

The Meeting was attended by leaders of the Institute of Fisheries of the National Academy of Sciences of Belarus, the Institute of Genetics and Cytology of the National Academy of Sciences of Belarus, the Institute of Fisheries and Aquaculture of Bulgaria, the Fisheries Research Station of Moldova, the Institute of Ichthyobiology and Aquaculture of the Polish Academy of Sciences, the Institute of Fisheries of the Ukrainian Academy of Agrarian Sciences, the Research Institute of Fish Culture and Hydrobiology of the University of South Bohemia and the Federal Centre of Fish Genetics and Selection of Russian Federation.

Information on the work done during the past period was presented by the coordinator of the work, representative of the Federal Centre of Fish Genetics and Selection, Andrey Bogeruk.

In the frame of the project „Genomics of common carp and other cyprinids”, materials on research in the fields of genetics, selection and breeding in fish culture were collected from NACEE member institutions and evaluated in the period from October 2005 to August 2006.

In the period from 2001 to 2005, NACEE member institutes implemented 19 scientific projects with a total cost of 1.2 million euros. The priority field in virtually all institutes was research on selection of common carp and herbivorous fishes. The results of the performed work were common carp breeds currently awaiting certification: the Lakhva scaly carp (Institute of Fisheries, Belarus), the Telenești carp, resistant to infectious diseases (Fisheries Research Station, Moldova), as well as selected broodstocks of herbivorous, salmonid and acipenserid fish species and breeds in Russian Federation, Ukraine, Belarus, Moldova and Poland.

Significant attention was paid to introduction of modern molecular genetic methods into fish genetics and selection. Establishment of a gene bank of cultured fish breeds was started in Russian Federation (FCFGS, VNIRO), which currently has over 5 000 specimens. A genetically modified form of common carp has been created and is currently studied, the mechanism of sex determination is studied in sturgeons (All-Russian Research Institute of Freshwater Fish Farming). It is very important to note that this research is done in cooperation with institutes of the Russian Academy of Sciences. The immunological reaction of fish to parasites is studied (Institute of Ichthyobiology and Aquaculture of the Polish Academy of Sciences). In January 2006, three institutes of the Network started research in the frame of the EUROCARP Project, studying disease and stress resistance of common carp as a basis for selection of highly productive breeds adapted to various conditions of their environment.

In many institutes, work is being done on establishing live gene bank collections of fishes that are currently in depressed state due to different anthropogenic factors. For the near future, there is a set objective of developing the methodological foundations for establishing and exploiting of gene bank collections on a state level (FCFGS).

Implementation of 11 new scientific projects was started in 2006 with a total cost of over 2 million euros.

Analysis of the compiled coordination plan sent to all institutes in the end of August, wherefrom, unfortunately, work performed in Hungary and the Czech Republic is missing (they did not submit the information), has shown that a certain parallelism of the thematic can be observed, research is not identified methodologically and the obtained results are quite difficult to use in other countries, even in those with similar natural and climatic conditions.

In the conditions of limited financial, and lately, also research resources existing virtually in all countries, it seems rational to use the attached coordination plan for establishment of direct bi- or multilateral contacts for solving problems of fish culture in different countries. In addition, the compiled coordination plan could be a good basis for the determination of two-three priority research topics in the field of fish genetics and selection and breeding in aquaculture. These projects can then apply for financing to international organizations.

Unfortunately, we could not realize the decision on launching a programme for exchange of gene bank material of different fish species and breeds, both because of scientific interest and for spreading highly productive fish breeds and crosses in the fish culture of the Central and Eastern European countries.

Currently, there are officially over 40 breeds and other products of fish culture selection in the countries of the NACEE region, in relation to which, it seems extremely important and indispensable to compile, under the umbrella of NACEE, a Catalogue of Breeds and Domesticated Forms of Fishes that could be used by countries of other continents and FAO.

The Report of the Second Meeting of the NACEE Board of Directors included as an annex the Planned Programme of Scientific, Technical and Economic Cooperation between Organisations, Enterprises and Firms of NACEE and NACA directed toward further strengthening of the NACEE-NACA collaboration, which was now presented for discussion.

Leaders of all research institutions present at the Working Group Meeting took part in the discussion of problems existing in research on genetics, selection and breeding in fish culture. After an exchange of opinions, participants of the Meeting agreed on the following:

1. Selection and genetic research and breeding work in fish culture should not be limited to cyprinid breeds only, interests of research on other families (salmonids, sturgeons, etc.) should also be taken into consideration.
2. It will be recommended to all NACEE member institutions to expand coordination of their fish genomics research with other NACEE member institutions, using the attached Coordination Plan for this purpose. Hungarian institutions and the Research Institute of Fish Culture and Hydrobiology of the University of South Bohemia will be requested to present their own thematic for inclusion into the general NACEE Coordination Plan.
3. The NACEE Coordinating Institution will be requested to use the Coordination Plan when negotiating with international organizations on financial support or inclusion of NACEE member institutions into international consortiums in this field or participation of researchers from NACEE member institutions in FAO technical assistance programmes to third countries.
4. Exchange of the gene bank material of different fish species and breeds should be done in the frame of bilateral agreements.
5. The proposal of the Federal Centre of Fish Genetics and Selection on compiling a Catalogue of Breeds, Crosses and Other Selection Achievements in Fish Culture under the

umbrella of NACEE in 2007 should be accepted. FCFGS will be requested to coordinate this work, while institutions owning different selection achievements should assist FCFGS in this task methodologically and practically.

6. The presented Planned Programme of Cooperation between NACEE and NACA in the Fields of Selection and Breeding in Fish Culture should be harmonized and the NACEE Coordinating Institution should be requested to make active efforts for practical implementation of this document important for both networks.