The re-introduction of the Allis shad (*Alosa alosa*) to the Rhine system
(LIFE06 NAT/D/000005)

Conservation-Plan for the after-LIFE period

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Düsseldorf, April 2011

1 Preface

This report is the last deliverable product of the LIFE Allis shad project. It present an assessment of the current situation after the projects official termination and aims on illuminating how the LIFE projects objections will be continued and how the progress and success will be monitored. Details on the monitoring measures can be found in the management plan.

2 Background and history of the project

Allis shad were widely distributed in Western Europe at the end of the 19th century. The distribution of this anadromous fish species ranged from Scotland in the North to Morocco in the South and in Germany and Allis shad occurred in all large rivers draining to the North Sea.

The fishery on Allis shad in spring was very important and freshly caught shads were sold on the market and in restaurants. In the last 100 years the distribution range of the species has decreased dramatically. Reasons for the decline included over fishing, water pollution, the construction of migration barriers and a deterioration of habitat as well. Today only a few shad are observed in the River Rhine and large populations only exist in France. As a consequence Allis shad is listed as priority species in Annex II and V of the Habitats Directive. In Germany Allis shad is listed as extinct or suffering from extinction in the Red List.

The overall objective of the project is the conservation and protection of Allis shad in Europe. In this European project with financial and practical support of three Rhine bordering countries (Netherlands, Germany, France) the project objective is the re-introduction of Allis shad in the Rhine System, which was the most important river system for Allis shad in its northern distribution range. One of the main challenges of the project was the development of mass production techniques for Allis shad breeding, the transfer in praxis and the breeding of up to 5 Million Allis shad larvae in the years 2008-2010. Adult shads for rearing of larvae were planned to be obtained from fish lifts at dams in the rivers Garonne (Golfech) and Dordogne (Tulières).The resulting numbers of mature Allis shad returning to the river Rhine can only be estimated because no other re-introduction projects have been conducted in Europe so far. According to experiences from the re-introduction of the closely related American shad (*Alosa sapidissima*) at the American East Coast the stocking of 5 million shad larvae can result in the return of up to 20.000 mature shads.

The first idea to restore Allis shad to the River Rhine was discussed during a meeting of the International Commission for the Protection of the River Rhine (ICPR) in the early nineties of the 20th century. At that time the possibility of a natural recovery of the species was not ruled out and the decision was to monitor the Allis shad abundance in the Rhine for another 10 years. However, at the beginning of the 21st century no significant improvement was observed and the Migratory Fish Program of North Rhine Westphalia started the first scientific exchange with French scientists of CEMAGREF on the re-introduction of the species to the River Rhine in 2002. In the years 2003-2005 a feasibility study according to the IUCN guidelines for re-introductions was conducted which included e.g. habitat, genetic, marking and breeding studies. As a result of this feasibility study the Life project was developed.

In 2006 the European Commission approved the ambitious LIFE Nature project and thus paved the way for re-introducing Allis shad populations for the first time Europe. The project gained support from the International Commission for the Protection of the River Rhine (ICPR) with members of all Rhine bordering countries, nature conservation and sport fishery organizations. In addition, the development of mass production and mass marking techniques can help to support

the conservation of Allis shad in Europe, if other European populations will suffer from extinction.

The beneficiary of the project was the Landesamt für Natur, Umwelt und Verbraucherschutz in NRW (LANUV), Fachbereich 26 Fischereiökologie. Project partners were CEMAGREF and MIAGDO in France and co-finanzing was contributed by the Hit Umwelt- und Naturschutz Stiftungs- GmbH, Bezirksregierung Düsseldorf, Rheinfischereigenossenschaft NRW, Hessisches Ministerium für Umwelt, ländlichen Raum und Verbraucherschutz and the Sportvisserij Nederland. Additionally the Conseil Regional d'Aquitaine, the Stiftung Wasserlauf, the Rhineland Fisheries Association from 1880, the Fisheries cooperative, and the Aquazoo/Löbbecke Museum supported the LIFE project in many respects,

3 Main achievements of the LIFE project

- Rearing techniques for Allis shad were developed and improved. The optimization of Allis shad mass production techniques started in the experimental facility of CEMAGREF in St. Seurin/Isle in the year 2007. The experiences gathered there were implemented into the LIFE Allis shad fish farm, which went into operation the first time in the shad spawning season 2008.

- A total of almost 5 Mio larvae were produced in the fish farm in Bruch from its start up in 2008 until 2010. At the same time survival rates could be due to improvements at all levels of the rearing process raised substantially and the net larval production per female spawner was more than doubled in the project duration.

- In order to be able to trace the fate of the fish and to assess the project's success one particular challenge was to develop a method which is suitable to mark the tiny larvae before releasing them into the wild. Application of the optimized marking led to a decrease of marking-related mortality to below 2%. The marks were clearly recognizable in juvenile shads exposed to natural conditions three to four months after marking.

- A transport method was developed which was proved to ensure a secure delivery of the larvae to their stocking destination without additional mortality. Larvae (5 to 15 thousand, depending on the size of larvae) are given in doubled plastic bags which are filled to one third with water and two thirds atmospheric oxygen and transported to Germany by means of refrigerated vans. Proceeding so no special fish transporters are needed and bags can be reloaded and transported with several vessels and easy to handle.

- Stocking operations could be optimized by first adapting the larvae to conditions of the stocking water and releasing them in habitats with a low expectable density of potential predators (apparently mainly YOY fish). Keeping the larvae in large round channel tanks supplied with water from the stocking water and fed with *Artemia* and releasing them after dusk, or if no such equipment can be used, releasing the larvae in open water habitats and (semi-) stagnant habitats were apparently most promising with this respect.

- Accompanying investigations revealed that the larvae drift downstream in the dark, however leave the drift with increasing distance from the site they were released and probably niche in habitats. Almost nothing was known about behavior and habitat use of YOY Allis shad so far.

- With the record of 30 juvenile Allis shad at the lower Rhine close upstream where it splits into the branches of the Delta Rhine, it could be proven that the stocked larvae grew into juveniles and migrated downstream like theoretically scheduled, an important milestone for the project was attained. Returning adults could however expected at earliest 3 years after stocking of larvae.

- Thanks to public relation works and a sound reflection in the mass media the public awareness for the Allis shad as well as the special situation of other diadromous fish could be raised enormously, particularly in Germany and the Netherlands.

The implementation of all projects measures was according to projects proposal successfully concluded in December 2010.

4 Challenges and opportunities for the after LIFE time

From other re-introduction programs, particularly from current shad programs in the US, it can be learned that reaching the long-term objective to establish an Allis shad population in the Rhine system, will require constancy and that stocking operations need to be continued for many years in order to provide a basis for a stock being large enough to sustain itself in the future. The projects' progress needs to be determined at different levels and monitoring measures suitable to perceive the expected successions should be provided. These measures need to be suitable to detect possible impairments or bottlenecks which might harm the project's success and to address and to improve the situation. Since it is rather difficult to monitor fish in large rivers in general, and when being subject to heavy navigation traffic like the Rhine in particular, monitoring schemes and information networks are required without additional costs. Finally, a schedule for at least qualitatively measurable milestones needs to be defined. Details on those schemes can be found in the management plan.

Unfortunately and unpredictably when the project application was submitted to the EU in 2005 the Allis shad population in the Gironde watershed, donor population for stocking the Rhine, suffered dramatically from 2006 onwards. Counting of adults at the fish lifts in Golfech (Garonne) and Tulières (Dordogne – out of order between 2006 and 2008), as well as landings of the local fishery and estimations of the spawning stocks downstream of the dams, indicate that the spawning run has decreased significantly and led to the announcement of a moratorium, which bans all fishing activities on Allis shad in the Gironde, the Garonne and the Dordogne. Despite the number of adults detected at the fish lifts and estimations of the spawning stock below the dams indicate, that the population had slightly recovered in 2009 and 2010, the stock is still far below its former size and the situation remains extremely concerning after all. The long-term success for the LIFE project will thus depend on the further developments with the Gironde populations. Not only because the larvae for stocking the Rhine system need to be obtained from the fish farm in Bruch for the coming years and a further decrease of the spawners stock will inevitably have consequences on the number of fish which can be taken from the Girondesystem for rearing of larvae. The identification of the causes for the decline is however rather a prerequisite to save the last Allis shad populations in Europe from the risk of extinction, as occurred in the Rhine system almost a hundred years ago, and to take measures to counteract this process, even with regard to the prospects of a future Rhine population.

Until recently, the Allis shad population of the Garonne – Dordogne watershed was considered as having the best status in Europe. It does not seem to have only 1 or 2 well identified reasons, but rather an addition of several causes, which together could lead to the decline of the return rates. There are 2 main hypotheses for the decline.

The first hypothesis is a reduction of the reproduction efficiency. Results from a small-fauna monitoring realized monthly since 1981 in the Gironde estuary seem to reveal a decrease in the abundance of young of the year Allis shad since 2002. The lack of relationship between reproductive stock and juvenile abundance could indicate a modification of the stock-recruitment phenomenon. A compensatory process can be excluded with regards to the

abundance of adults, not at a much higher level than during previous years. The most likely explanation is a problem during reproduction or/and freshwater early phase of larvae and juveniles.

This possible modification of stock-recruitment relationship could also be linked to the repartition of spawners on the migratory axis. Monitoring operations seem to indicate an increase of the proportion of shads on spawning grounds located on the lower parts of the rivers. Moreover, some atypical spawning grounds (concrete blocks and embedded substrate) were recently used by fish, which is susceptible to reduce reproduction efficiency (eggs or larvae survival). On the Dordogne axis, it has been observed for several years an increase of the proportion of fish resting on the lower part of the river in relation with attractiveness defaults of two fish ways. At now, less than 15% of fish are able to reach the upper part of the basin.

These problems of migration in relation with physical obstacles oblige many fish to spawn on the lower parts of the two rivers, where environmental conditions are probably not optimal.

The second hypothesis concerns fishery impacts. Fishery mortalities are quite stable for the last twelve years (1993 – 2004) with 300 000 fish per year. It represents a mean exploitation rate of about 55%. First analysis seem to indicate an increase of the exploitation rate these last years with 50 % over the period 1994 – 1999 vs 60% from 2000 to 2004. Moreover, this rate is probably underestimated because it does not take into account ocean fishery and all the catches in the Gironde estuary. Due to the high exploitation rates and the decrease in the spawning runs an Allis shad moratorium was established from 2008 onwards.

Nevertheless, ensuring long-term stocking measures in the Rhine -system requires to becoming increasingly independent from the donor population in France. On one hand for conservation purposes of the Gironde population and on the other hand aiming on supporting the development of population highly adopted to the situation in the Rhine system it is desirable to develop and to install a ex-situ stock facility in order to produce larvae for stocking the Rhine.

Following the management plan to the LIFE+ project it is proposed to continue the efforts of re-establishing an Allis shad population in the Rhine system for three full life-cycles, i.e. fifteen and until 2024 at least, respectively. Modifications from this scheme will depend on current developments and indications.

Since shads spend elongated periods of their life-cycle in estuarine habitats It is considered that shads more than other diadromous fish may require healthy estuarine conditions to build vital populations. Consequently increasing estuarine gradients in the Dutch Rhine delta may support the success of the LIFE Allis shad project substantially. Although an arrangement was made with Dutch authorities that the sluices at Haringvliet will be partially opened to enable a slight salt water intrusion and to re-establish a kind of estuarine conditions, this contract was skipped by the current Dutch government in the autumn of 2010. The further development is unclear.

5 Realization of after LIFE measures

Thanks to the approval of a LIFE+ project (LIFE09/NAT/DE/000008), which aims besides the restoration of the Allis shad in the Rhine-system on the conservation of the Gironde population, some of the measures carried out to achieve the LIFE Allis shad project's objectives, can be realized under the umbrella and with financial resources from the LIFE+ project. The project duration will be from January 2011 until December of 2015.

Furthermore due to the LIFE+ support many actions aiming on the continuation of the previous LIFE projects measures can be conducted by the staff of the project partners or external assistance. Besides the project partners CEMAGREF and MIGADO, which cooperation enabled us to implement the aims of the LIFE Allis shad project, for the LIFE+ project, further project partners have been won. This implies that for the next five years the continuation of the actions, with regard to the rearing of larval Allis shad, as well as stocking the Rhine and related monitoring investigations, can be financed and realized by the utilization and enlistment of approved and highly qualified staff members and external assistance, respectively. Consequently the conduction of most core actions is independent from voluntary contribution. Moreover, with regard to the improvements made on several fields during the LIFE project, it is to expect that expertise will further increase in the course of the continuation of the measures. This applies all the more since further expertise is expected to flow into the LIFE+ project due to the incorporation of experts from the additional project partners. Equipment purchased for the LIFE project will be even used for the implantation of the LIFE+ actions.

All competent authorities, regional institutions and stakeholders being involved or affected by the implementation and continuation of the LIFE project's actions signed the related forms of agreement in advance of the implementation of the LIFE project. These and additional institutions were involved or at least kept informed during the pre-submission phase and preparation of the LIFE+ project proposal, which provides the basis for the continuation of the actions. After all the implementation of the Allis shad project's aims still gains large and comprehensive support from all authorities, institutions and persons being affected by the related measures, as well as the general public and no obstacles became evident so far. Furthermore the transnational partnership between the German federal state Hessen (co-financer), the Region Aquitaine (co-financer), Netherland's authorities (e.g. co-financer Sportvisserij Nederland, intensive exchange between North Rhine-Westphalia and research and governmental institutions in the Netherlands in the Framework of the Migratory Fish Program) and support for the project from the Rhine bordering federal state Rhineland Palatinate, provides a sound basis even for a fruitful cooperation and chance to conquest obstacles which might arise unexpectedly.

Although many of the LIFE+ projects action aim mainly on the issues for the Gironde populations, dealing this issues implies benefits for the objective of restoring the Rhine population and will thus be treated here.

5.1 Continuation of larval production for stocking the Rhine

From all shad restoration programs currently underway in the United States the conclusion can be drawn that at least two decades are needed to achieve substantial recovery of lost populations. In order to achieve a large effective population size that can maintain itself with natural reproduction in the Rhine system, the actions started in the LIFE Project will be pursued and refined in future years. For the years 2011 until 2015 the stocking measures will be part of a LIFE+ project, in which inter alia the achievements and infrastructures are going to be used by the approved rearing team and 1,5 to 2,0 Mio Allis shad larvae will be reared and stocked to the Rhine system. Catch of adults at the fish lifts at Golfech and Tulières, the transport of genitors, and rearing and marking of larvae as well as the transport of larvae to Germany will be supervised and/ or conducted by the former LIFE project partner MIGADO. The fish farm in Bruch which was developed and established with financing coming from the LIFE project and the entire equipment will even henceforth be used for the production of larvae. Additionally rearing techniques will be established in Germany and it is planned to rearing an increasing amount of larvae at a fish farm in Germany from 2011 onwards. For the years after 2015 it is planned to integrate the measures into North Rhine-Westphalia's migratory fish program. The amount of larvae stocked to the Rhine-system for the next years strongly depends on the development of the donor populations from the Gironde watersheds. Unless the population won't decrease further, the amount of larvae produced in France and transferred to Germany will be as scheduled or could be even raised in case of a significant recovery of the donor population. From 2015 onwards it is scheduled to increase larval production in Germany. This is planned to be realized by obtaining sexual products for rearing from ex situ stocks and some day additionally from returning adults. The further continuation or modification of the schemes depends on how successes with regard to a significant increase of adult records, proofed natural spawning, increasing numbers of juvenile Allis shad from natural reproduction will be proofed and at latest adults from these will be found to return to the Rhine system.

Funding: LIFE+

Schedule: 2011-2024 (financing assured until 2015)

5.2 Development of techniques for the maintenance of ex-situ stocks and installation of an ex-situ stock facility in Germany

Ex situ stocks of endangered species are common tools for the conservation and/or restoration of populations and used in a lot of different taxa. They have proved to be very successful for the conservation and restoration of diadromous fish populations e.g. European sturgeon (*Acipenser sturio*) or Atlantic salmon (*Salmo salar*). The ex situ stock of the last population of the European sturgeon managed by the associated beneficiary CEMAGREF was able to produce offspring in the years 1995, 2007, 2008 and 2009 and juvenile sturgeon could be released in the GGD basin in France in the same years and also in the River Elbe in Germany for the first time in 2008. Ex situ stocks of Atlantic salmon are widely used in Salmon restoration projects in Europe and world-wide. For example, the Salmon ex situ stock managed by the coordinating beneficiary LANUV NRW will be the main source for the stocking material used for the River Sieg in North-Rhine-Westphalia in the next years. Only returning salmon to the River Sieg will be included in the ex situ stock and no wild fish from other populations are needed any more.

The previous Life project LIFE06 NAT/D/00005 (Re-introduction of Allis shad to the River Rhine System) was the first European project to restore an Allis shad population. In this project we only used wild fish from the rivers Garonne and Dordogne for the production of stocking material. For this reason, no experience with an Allis shad ex situ stock exists so far in Europe. However, Prof Han Ping Wang from Ohio State University, USA has established the techniques for the Chinese Reeve Shad (*Tenualosa reevesii*) and the American Shad (*Alosa sapidissima*) in the United States and China. The development and installation of an ex situ stock will have the following advantages:

- The number of mature Allis shad which have to be caught for shad production in France in the rivers Garonne and Dordogne can be reduced. This reduces the impact on the donor populations in the rivers Garonne and Dordogne which suffer from low spawning runs in recent years.
- After an increase of returning shads to the River Rhine these fish could be integrated in the ex situ stock. These retuning fish are especially valuable because they already have performed the long journey from sea water to fresh water and will successively replace fish originating directly from the Gironde population aiming on enhancing the adaptation process to the Rhine.
- The techniques for keeping an ex situ stock could be used in other European River Systems if important shad population will be under risk of extinction in the future.
- An ex situ stock is comparable with a gene bank and helps to conserve the species if there are problems in the environment.

To ensure the highest degree of success of the ex situ action it is planned one experimental rearing in La Rochelle, France and the pilot ex situ facility in Germany. By doing so, we are spreading the risk of rearing failures and the two sites can use exchange their experience and improve the ex situ techniques

Funding: LIFE+

Schedule: 2011-2015 (financing assured)

5.3 Continuation of stocking and monitoring measures

Stocking of the larvae delivered from the Allis shad fish farm in Bruch and an additional facility in Germany from 2011 onwards will be done based on the valuable experiences made during the LIFE project. Stocking and additional monitoring measures will be carried out by fisheries biologists (public tendering) to ensure that the stocking operations and habitat selection can be further optimized. At least a part of the release sites which have been regularly stocked during the LIFE projects duration (Erfeldener Altrhein, Hessen; River Sieg, NRW) will be used for future stocking operations, since (a) it can be concluded from the records of juvenile shads on their seaward migration in the autumn of 2010 that these sites were suitable for shads to survive and grow, and (b) long-term stocking operations may increase the chance of single adults to return and to be detected in the respective tributaries in the future. The continuation of stocking 1.5 to 2 Mio Allis shad larvae to the Rhine system is considered to increase the number of adult shad returners and thus to support developing the basis for a stock being large enough to reproduce successfully in the wild.

Funding: LIFE+

Schedule: 2011-2024 (financing assured until 2015)

5.4 Monitoring the survival, growth and seaward migration of YOY in the Rhine system

Knowledge on the habitat use, the survival during the freshwater phase, the migratory routes and optimally an assessment of the size of the stock before entering the sea is a prerequisite for measuring the projects process or to get ideas of possible bottlenecks that hamper sufficient recruitment and thus to consider modifications. Respective measures are however not subject of the LIFE+ project. Due to financial restrictions additional measures aiming on closing this information gap were brought on its way by mainly using existing infrastructures, like monitoring programmes of the authorities in Germany and the Netherlands.

In Germany particular stretches of waters stocked, i.e. the lower river Sieg, are subject to electric fishing surveys in several contexts. Such investigations will provide valuable data when fishing dates and sites can be arranged or even slightly modified with regard to purpose of the LIFE project. Additionally the Rhine and the stocked tributaries are subject to periodical investigations carried out by authorities of federal states (e.g. LANUV NRW department of fish ecology, field research team) themselves and data gathered will be forwarded to the project management on demand. At the German and the Dutch section of the river Rhine still some professional fishermen go out their daily business. Most of them are supervised by authorities (e.g. the Rhine fisheries cooperative North Rhine-Westphalia, the IMARES institute in the Netherlands) and many additionally work on a collaborative basis with research institutes, so that exceptional records are announced immediately and the data in general is forwarded to involved organisations on a regularly basis. These fishermen often use traditional gears and methods (fyke-nets, trawling, stow-nets, gill and drift nets), which are

different from those of the standard monitoring measures and thus better suited to detect individuals that prefer offshore habitats.

Although even in the Dutch Delta Rhine section some fishermen are still working, the fishing effort in the last years was reduced due to restrictions imposed with regards to the protection of silver eels, the target species of fyke- and stow-net fisheries. The same applies to measures carried out in the framework of monitoring investigations conducted by the Dutch authorities, which imply hauls with large trawl- or seine-nets, which are considered to be well suited to representatively cover the large Delta branches and lakes and thus to detect juvenile Allis shad when being conducted during the estuarine phase of the juvenile shads. An agreement was made that the Dutch authorities will be informed as soon as the first downstream migrating fish are detected in the German section in order to provide them with the opportunity to intensify and to specify their efforts. As between the authorities of the other federal states Germany along the Rhine, information on Allis shad records will be forwarded to the responsible authorities in North Rhine-Westphalia immediately. We are confident that these measures will provide proofs for juvenile Allis shads in the future particularly in the Netherlands, as they did with juvenile Twaite shad and North Sea houting, which exhibit close parallels with regard to their life-cycle and which stocks increased considerably in the recent years. Arrangements with the Dutch authorities were made, that conspicuous juveniles of the genus Alosa will be stored deep frozen and delivered to the responsible authorities in North Rhine-Westphalia for detailed investigations and inspections of the otoliths for OTC marks. Proceeding so, i.e. when OTC marks are missing it is expected to be furthermore able to receive first indications for successful reproduction of Allis shad in the wild.

Funding: unnecessary

Schedule: 2011-unlimited

5.5 Survey of the young-of-the-year (YOY) habitats on the Gironde watersheds

This action aims on the analysis of the number of YOY in the Gironde-Garonne-Dordogne (GGD) watershed and the development of abundance throughout the summer. The study will focus on the main spawning grounds of the Garonne and Dordogne rivers and nearby habitats (6) will be sampled by means of push-nets in order to detect preferred habitats of the YOY and to monitor abundance. This will be determined by means of parallel volumetric measurements which will be taken using a flow meter. Operations will be carried out at least once a week from July to October. Additional hydrographic parameters will be recorded either continuously or periodically at each site in order to characterize the habitat and detect possible impairments or bottlenecks. Trends of general abundance (number of fish/m^3) for both years and rivers will be determined and will be put in relation with spawning activity and hydrographic factors.

In final, analysis will be made to determine if natural recruitment on the spawning grounds studied (which are forced areas downstream dams) can explain the situation of shad on the basin

For sound management of the GGD shad population, in parallel with actions to reduce fishing catches (moratorium) or improve passages of obstacles, it appears particularly important to acquire a better understanding of the success of spawning activity in the GGD system. There are currently no available studies concerning the GGD basin. We plan to design and test an indicator of the abundance of Allis shad in the basin's principal reproduction areas. We shall take particular note of the findings of other studies, particularly those concerning the American shad *Alosa sapidissima*. The objective of this study will be to better characterize the YOY populations at different levels of the basin and to understand the relationship between estimates of spawning stock and the abundance of YOY. This operation will result in the construction of a network for monitoring recruitment across the entire GGD basin. No such network has ever been set up on any basin for *Alosa alosa*, but seems essential for managing the species.

Such an operation, carried out for a basin on the scale of GGD, could also be transferred to other French or European river systems, the Rhine in particular, once an Allis population has been re-established. Furthermore, exchange of information with monitoring measures in Germany (i.e. accompanying studies to assess stocking efficiency) will help to optimize stocking measures and to detect and to better protect habitats of the YOY in the Rhine and its tributaries.

Funding: LIFE+

Schedule: 2011-2015 (financing assured)

5.6 Detecting adult Allis shad returning to the Rhine system

Based on the likelihood that 250 larvae are required to produce one adult returner and on the stocking schemes carried out so far, an substantial increase of adult returners is to be expected from 2013 onwards. In the recent years single and up to seven Allis shads were observed at the monitoring stations of the fish passage facilities on the upper Rhine. Both, the Gambsheim and the downstream situated Iffezheim fish pass facilities are equipped with devices which allow determining each fish climbing the fish pass year round. Since the shads went so far upstream in the recent years (although suitable spawning sites are sufficiently available in stretches below), it seems probable that an increase of adults run will result in increasing shad records at the dams in the Upper Rhine section. Even the lowest weir at the river Sieg, to which Shad larvae had been stocked from 2008 onwards and into which thus adult shads might immigrate, is equipped with a modern fish pass facility and furthermore with a monitoring device, a VAKI counter and video surveillance device, being in operation year round. Even the fish pass at the lowest weir of the river Moselle will, after it has become modernized with regard to the requirements of migrating shad, be equipped with a VAKI counter device. Potential Allis shad recordings at these surveillance facilities will be immediately forwarded to the authorities in North Rhine-Westphalia. The lowest dam at the river Moselle will be equipped with a modernized fish way and a VAKI monitoring device in 2011.

Adult Allis shad are thus expected to appear in the by-catch of stow-, fyke-, and gill-net fisheries of fishermen in the Dutch and German section of the Rhine when their numbers will increase. Since a determination sheet helping to discriminate between the closely related Twaite and Allis shad was prepared during the LIFE-project and distributed to professional fishermen, the chance that potentially caught Allis shad will be identified correctly is enhanced. Notwithstanding in the latter years extraordinary or indefinable recordings were immediately reported to the national authorities.. Even the monitoring schemes of the Dutch authorities, e.g. the “Zeldzame Vissoorten” monitoring during which adult Twaite shad and houting had been recorded, are potentially well suited to detect adult Allis shad.

The project carrier of the Allis shad project, the LANUV NRW, is inter alia responsible for monitoring the fish fauna of the Rhine and electric fishing surveys on the Rhine are carried out on a regular basis. It is planned to extend, intensify and modify these surveys during the Allis shad upstream migration in May and June unless the discharge isn’t inappropriately high, e.g. by fishing at potential spawning habitats after dusk from 2013 onwards. Additional planning aims on the conduction of drift-net surveys with the assistance of the shipping authorities in order to rule shipping traffic flow at the bank site, where the drift-net survey conducted. This method and the way of cooperation had already been approved in former years. It is planned to intensify the investigation effort depending on the likelihood of returner rate and current indications. From the moment it will become possible to catch adult returners they will be transferred to the ex situ stock and breeding facilities for artificial rearing. It is planned to increasingly stock larvae reared from returners to the Rhine system.

Funding: unnecessary

Schedule: 2011-unlimited

5.7 Confirm use of shad spawning grounds/monitoring of spawning activities

Spawning of Allis shad in the Rhine-System is a prerequisite for the long-term aim to re-establish the species .The act of spawning in Allis shad is very noisy and thus theoretically quite well perceivable without additional gears. In France techniques have been developed with even allow to draw conclusions on the number of Allis shad involved in the spawning, the so-called “bull”, by acoustic surveillance measures. Hence an identification of a shad spawning site might turn out comparably simple. Despite the high number of potential spawning habitats, which have been mapped for the LIFE project, it is virtually impossible to monitor these sites over an extended period of some weeks and night per night in detail without an army of volunteers. Thus it is planned to gather indications, e.g. regarding conspicuous splashes during May and June nights, by raising the awareness of shareholder groups which are considered to be potentially present at the respective locations at nighttime anyway. This will be done by preparing specific information material and distribute this to anglers, and to distribute audio-visual material of bulls over the project’s homepage. In recent years the information flow from anglers to the fisheries associations and the Rhine fisheries cooperative, which both are involved into the Allis shad project, was repeatedly proved efficiently, so that good chances exist to get informed about striking spawning activities. Additionally it is planned to provide the offices of the water police, which are patrolling the entire Rhine stretch with demonstration material to enable the officers to potentially identify a bull and forward the location to the project management. After receiving such hints the respective sites will be more intensively inspected in the remaining spawning season. A duly observation/acoustic monitoring of pre-selected/reported potential spawning habitats by students is moreover a key tasks of a LIFE+ Allis shad project. In case of doubt additional electric fishing or drift netting surveys could be taken into account for proving the splashes to originate from Allis shad. Almost all habitats considered as potential Allis shad spawning sites are already under protection in the sense of the EU habitats directive. Identified spawning habitats will be put under protection immediately.

Funding: LIFE+/contribution of stakeholders/volunteers

Schedule: 2013- ? (financing assured 2013-2015)

5.8 Identification of migratory routes and improvement of migratory conditions

Adult shad returning to the Rhine system must find their way through the complex delta system in the Netherlands. Currently only the main entrance to the Rhine is open to migration. Dams along the River Lek at Driel, Amerongen and Hagestein have natural fish bypass channels. The furthest upstream project at Driel provides some flow control to the rivers Ijssel and Waal, both of which may be important migration corridors for Allis shad. Finally, large drainage sluices at Haringvliet, Volkerak and at other coastal entries, as they operate now, prevent saltwater intrusion and block fish migration through several historically important Rhine delta estuaries. Although an arrangement was made with Dutch authorities that the sluices at Haringvliet will be partially opened to enable a slight salt water intrusion and to re-establish a kind of estuarine conditions, this contract was skipped by the current Dutch government in the autumn of 2010. The further development is unclear. The authorities in North Rhine-Westphalia, accompanied by these of other rhinebordering states and the ICPR, are currently negotiating with the Dutch government to find a solution. The LANUV has demonstrated his point of view in interviews given to Dutch broadcasting companies and newspaper journalists in order to forward this to the Dutch public.

In April 2011 the Dutch government conducted a hearing of experts in order to develop alternative ideas to the original plan of opening Haringvliet sluices (“Kier”). From North Rhine-Westphalia Daniel Fey was entitled as the ICPR expert for the migratory fish who inter alia discussed detailed the requirements of Allis shad.

Atlantic salmon and sea trout, and more recently Houting are the focus of efforts to track fish through the complex system of tributaries and cross channels in the Rhine delta. Fish are purchased from commercial fishermen, surgically implanted with radio transmitters and recorded as they pass fixed receiving stations. Forty such stations are located from tidal barriers and lower Rhine delta tributaries in the Netherlands to near Bonn, Germany and the lower Rivers Lippe and Sieg. With such an elaborate concentration of radio receiving stations it may be possible in future years to apply this technology to shad. However, Allis shad is known to be even more sensitive and fragile compared to the species which have been subject to NEDAP trail implantations so far and it is not known how shads cope with the surgery. An experimentally transportation of adult Allis shads from France to the Netherlands and implanting them NEDAP transponder will be realized in the LIFE+ project. If it should turn out, that transportation of adults over such long distances and times is impossible or that political restrictions occur, it is planned to realize the study by means of returning adults to the Rhine system in future years. The results of this study are considered to identify the preferred migratory routes in order to monitor these more detailed in the future. Furthermore possible impairments occurring on the upstream route can provide a basis to improve the situation.

Funding: LIFE+

Schedule: 2012- 2013 (financing assured)

5.9 Improvement of fish passages in the Rhine system

Although habitat availability in the free flowing section of the Rhine is considered to maintain a self-sustaining Allis shad population, it is aspired to provide shads and other migratory fish access in the Upper Rhine and tributaries on a long term scale. The Upper Rhine upstream of Gambsheim and almost all tributaries are blocked by dams close the mouth into the Rhine. If at all, these are equipped with obsolete fish ways or those which were built for the purposes of salmon upstream migration, but most often untraceable or insufficiently passable for Allis shad. However, these fish ways could be substantially improved with better flow control to reduce turbulence, air entrainment and velocities between pools. If and when these facilities are rebuilt, pool sizes should be enlarged to provide more resting areas and care should be taken in properly siting entrances away from hydroelectric turbine discharges. For the construction of the new fish way at the lowest dam of the river Moselle at Koblenz, which is planned to go into operation in 2011, the state of the art knowledge on specific requirements of shads has already been taken into account. In the coming years it planned to modernize the dams along the German stretch of the river Moselle and to make them passable for migratory fish and explicitly even for Allis shad. The lowest fish pass at the River Main near Kostheim is currently subject to an assessment of functionality even in the light of long-term perspectives for anadromous fish like the Allis shad. Even the river Nahe is subject to a program aiming on making the river barrier-free for migratory fish like the Allis shad. In this context the weir in Bad Kreuznach will be equipped with a fish pass meeting the requirements of Allis shad. The knowledge on specific requirements of shads for fish passages will be further expanded through a visit of a expert team at American shad rivers in order to transfer the state-of-the-art know how to Europe as an action of the LIFE+ Allis shad project and taken into account for the construction and modernization of fish passages in actual and potential shad rivers (e.g. the Rhine).

Funding: LIFE+/not necessary

Schedule: 2012- 2013 (LIFE+ funding regarding improve of knowledge on state of the art fish pass design)

5.10 Water and emission control legal procedures

Concerning all procedures along the Rhine which may affect emissions, e.g. heating or sewage effluents, or building operations of any kind which may concern the requirements of migratory fish and explicitly the Allis shad, the interests of the LANUV must be taken into account. As a consequence to the increased public awareness and prominence of the LIFE project non-governmental organizations refer to possible impairments which might arise in conjunction with water utilization or hydraulic engineering affairs.

Funding: not necessary

Schedule: not limited

5.11 Raising public awareness

The Allis shad project has attracted a considerable interest from the broad public, stakeholders and other projects dealing with migratory fish or reintroducing species. The project's website has a crucial role with regard to keeping the project's objections in the public mind, for communicating the projects results and achievements, for providing contact details and enabling correspondence with the project management, and for making the projects outputs available for downloading. Following reports will be available for downloading after approval by the European Commission. These are

- technical reports on Allis shad rearing, marking and monitoring (in English and French, respectively)
- the layman's report (in German, English, French and Dutch)
- the After-LIFE Conservations Plan (in English)
- the Management-Plan (in English)
- the final report (in English)

The possibility of publishing scientific articles will be the subject of negotiations with the respective publishing companies. The LIFE project's website will be available under the former domain (www.alosa-alosa.eu) for at least the coming 5 years. Since the same domain will be used for communicating the aims, achievements and products of the subsequent LIFE+ Project, the LIFE website will be callable via a sub-menu, which will however contain the entire content of the LIFE projects duration, including the products.

All the LIFE projects objectives are even subject of the subsequent LIFE+ project and will thus be communicated by means of the public awareness measures there. These contain press conferences, media work, exhibitions, information boards, flyers brochures and documentaries.