HELLENIC CENTER OF MARINE RESEARCH -INSTITUTE OF INLAND WATERS - GREECE

INSTITUTO SUPERIOR DE AGRONOMIA, UNIVERSIDADE TÉCNICA DE LISBOA - PORTUGAL

Historical information and information on previous work done regarding fish in the rivers of Cyprus, and pre-selection of sampling sites

Submitted to:

WATER DEVELOPMENT DEPARTMENT,
MINISTRY OF AGRICULTURE,
NATURAL RESOURCES AND ENVIRONMENT,
REPUBLIC OF CYPRUS

Specialized Consultancy Services for the Assessment of Fish Assemblages in Cyprus Rivers – Implementation of the Directive 2000/60/EC

Contract No.: TAY 49/2010

1st Interim Report

June 2011 - Athens, Greece

This unpublished report should be cited as follows:

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PROJECT MISSION ABSTRACT

This is a research and development project designed to gain river ecosystem knowledge base-lines on inland waters fishes and to further improve biological assessment procedures to meet the needs of the Water Framework Directive (WFD) in Cyprus. The project was launched in February 2011 and has a duration of 17 months.

The WFD utilizes fish assemblages as biological quality elements (BQE) in running waters (rivers and streams) and inland waters fishes have never before been researched for this use in Cyprus. Due the island's species-poor native fish fauna and the prevalence of alien fish species that are often repeatedly stocked by humans, the Republic of Cyprus considers that it is not possible to base any type of ecological quality monitoring on solely on fish species. Consequently, "fish" as WFD biological quality elements are not monitored on the island. In this project we will investigate and evaluate the utilization of fish in assessment and monitoring procedures with scientific substantiation, as required by the European Commission.

This project comprises the following general attributes:

- The collection of information and data on fish populations in Cyprus rivers, including an in-depth review of the distribution and historical occurrence of fish; and, a systematic sampling survey focusing on 12 river catchments in the Republic of Cyprus;
- The organisation of the collected sampled ichthyological and environmental data in a database associated with cartographic reference (Geographic Information System);
- The presentation and systemization of the information and data in reports;
- The potential application of selected biological assessment methods to the collected samples and the evaluation of the results from the applied assessment methods;
- The formulation of conclusions and recommendations regarding the applicability of the BQE "fish" in Cyprus rivers for the assessment of their ecological status within the WFD application.

This project is undertaken within a collaboration between two research centres (contractor-subcontractor relationship). The Institute of Inland Waters, Hellenic Center for Marine Waters (HCMR, Greece) will take up overall management of the project and coordinate all field survey and

reporting activities, while the Instituto Superior de Agronomia, Universidade Técnica de Lisboa (ISA-UTL) will act as subcontractor, providing support on various analysis, index-testing, and other scientific aspects. The team of experts includes Dr. M.T. Ferreira from ISA-UTL (Portugal) and Dr. S. Zogaris from IIW-HCMR (Greece)[1]. Dr. S. Zogaris is project manager.

SUMMARY OF 1ST INTERIM REPORT SCOPE

One of the most important and most difficult aspects of building a practical assessment tool or properly applying pre-existing indexes based on the fish BQE is constructing reference base-lines of past "near-natural" fish communities. In Cyprus historical data on species presence, populations, and/or site-specific fish-species assemblage information are missing. Despite some fragmented details concerning recreational angling and stocking in the reservoirs, baseline information on fishes in rivers or wetlands has never been properly reviewed.

This report initiates this research activity and sets the base-line for systematic ichthyological inventory work within the scope of exploring the use of fish for bioassessment of river water bodies. This work focuses on site-based fish population and assemblage data primarily through sampling survey development. It organizes databases and geo-databases concerning fish, fish habitat and environmental degradation of sampled sites (in order to build a sound spatial framework for the sampling survey and for future surveys). Furthermore, this initial activity of the project reviews existing information (i.e. existing unpublished information) and initiates an interview survey (surveys to review historic conditions and fish occurrence in Cyprus rivers using a questionnaire). Every possible effort will be made to construct species assemblage reference condition attributes within the investigated water bodies of the studied streams; and obviously this kind of information will be built-up in incremental steps throughout the duration of the project.

This interim report was submitted immediately before field work and just after two months after the initiation report. Because of this it is necessary a brief outline and aspects of this work are still incomplete. Many aspects of the work will be augmented as research findings, interviews, and analyses proceed in the coming weeks.

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[1] *The full scientific team of 12 scientists, technicians and volunteer contributors is presented in Appendix III.*

During the period of this report, a research trip to Cyprus was conducted by Dr. S. Zogaris from the 5rd to the 10th of May 2011. The objective of this initial trip was to organize the implementation of the field sampling survey, to initially check sites for fish presence/absence; including the initial dispersal of simple questionnaires. During this initial reconnaissance survey, discussions with many individuals were made with respect for planning specific tasks and the overall smooth implementation of future sampling and information gathering. The specific approach was reviewed and discussed with Mr. Gerald Dőrflinger, Hydrologist at the Water Development Department and his staff on the 5th of May and during field work on the 9th of May 2011. The present report was compiled by the contributions of S. Zogaris, N. Koutsikos, Y. Chatzinikolaou, E.Economou, A.Economou and S. Giakoumi.

Finally we must extend our appreciation to three volunteer field workers, Mr. WRC Beaumont (Game & Wildlife Conservation Trust, UK), Aris Vidalis (Biodiveristy East, Cyprus) and Elena Economou for providing their assistance during field work. We are grateful to Smith-Root Inc. (Vancouver, Washington USA) for the free loan of their new LR-24 Backpack Electrofisher during the entire course of field sampling in the Spring of 2011.

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INSTITUTE OF INLAND WATERS

SECTION 1

This section of the report outlines aspects of fish species distributions, survey scheme and reports on specific priorities and progress within the first three work packages. This work includes the following work packages:

⇒ **Work package 1**: Geographical information compilation and initial literature survey.

⇒ **Work package 2:** Compilation and organization of historic ichthyological reference conditions and current knowledge on occurrence and distribution of fish in the rivers of Cyprus.

⇒ **Work package 3:** Review Investigation and pre-selection of sampling sites.

➢ **Work package 1**: Geographical information compilation and initial literature survey (2 Tasks).

- **Task 1:** Brief literature survey regarding fish assemblage distributions in Cyprus rivers (scientific literature, DFMR libraries, museum collections, unpublished site-based fish sampling etc.). Museum data/collections will be reviewed for collected materials in Cyprus as well as in museums/collections outside of Cyprus.

<u>Outline of Results</u>

Fish distribution data especially site-based data is largely not available for inland waters in Cyprus (with the exception of few irregular survey results from selected reservoirs). Literature and museum specimen data are still being reviewed and contacts with European ichthyologists about the Cyprus ichthyofauna have been made. No electrofishing in the rivers of Cyprus has ever been documented save for work conducted by Dr. S.Zogaris in the last three years (i.e. in a project for the Forestry Department). A compilation our initial findings concerning fish distributions, including sampling data from Zogaris' past surveys and from interviews provides presence/absence fish data for 53 inland water sites (initial data analysis in Section 2 below). A more extensive understanding of fish distributions will be developed as the literature review, sampling and interviews progress.

- **Task 2:** Collection of information on and examination of:

- the surface-water attributes of the river network.
- connectivity of the river network, information on barriers (dams, weirs, etc) and all anthropogenic water abstraction or other pressures that may impact natural surface hydrology.
- Current hydrology and flow regimes (cartography of all perennial stream stretches in the study river network).

Outline of Results

This includes the collection of information from site visits by the research team members to all rivers to be investigated and to all potential sampling sites and the compilation of all cartographic resources (GIS data) concerning surface hydrology, pressures, and other cartographic environmental data. GIS Data have been transferred from WDD to HCMR and a relational geodatabase is being developed. Meteorological data will be purchased from the relevant authorities by HCMR. Dr. Y. Chatzinikolaou (HCMR) is responsible for information management of the Database and he is assisted by other researchers also.

- **Work package 2:** Compilation and organization of historic ichthyological reference conditions and current knowledge on occurrence and distribution of fish in the rivers of Cyprus (2 Tasks).

- ***Task 1*:** Interviews with staff members of DFMR in order to ascertain as detailed as possible the past, present and future fish stocking programme in Cyprus rivers and reservoirs (which sites, which species, during what season, how often, by whom, etc.).

Outline of Results

This task is largely unfinished because only a few relevant DFMR personnel have been interviewed.

- ***Task 2*:** Interviews with employees of the WDD (in the Nicosia head offices and in the District Offices), of the Department of Forests, of the Game Service and of other Authorities, regarding the past and present existence and distribution of fish in Cyprus rivers.

Outline of Results

This task is largely unfinished because only a few relevant personell have been interviewed; some have responded to the questionnaires.

- ***Task 3*:** Interviews with local naturalists, fishing clubs, and other relevant resource-use associations, and other experts, regarding the past and present existence and distributions of fish in Cyprus rivers.

Outline of Results

This task is largely is still in progress. Several relevant local naturalists have been interviewed; several have responded to the questionnaire. Although some naturalists, one fishing club and visiting scientists have been contacted, the compilation and management of information of this type will take more time than originally envisioned. Most of this information will be compiled and completed by the end of September 2011.

➢ **Work package 3:** Review Investigation and pre-selection of sampling sites (2 Tasks).

- ***Task 1*:** A review and analysis of historical accounts of fish populations in Cyprus rivers in an effort to construct species assemblage reference condition attributes within the investigated water bodies of the studied streams.

Outline of Results

This task is largely unfinished. More work is needed to compile relevant historical resources (historical, grey literature, maps etc). Most of this information will be compiled and completed by the end of September 2011.

- ***Task 2*:** A review of stocking/species introduction practices in Cyprus (data available from DFMR archives). This will also take into account the influence of stocking in reservoirs on river fish populations (based on team expert-judgment).

Outline of Results

This is largely largely unfinished because only a few relevant DFMR personnel have been interviewed. Contacts have been established and some data have been provided already to HCMR. Most of this information will be compiled and completed by the end of October 2011.

SECTION 2

This section covers two aspects of the results of the project work so far. Initially a review of methods to be used and some initial analysis on fish data gathered so far. We are providing a initial analysis in order to assist in the discussion of a substantiated Cyprus position regarding the BQE "fish" in Cyprus rivers within the framework of the implementation of the WFD and the related Intercalibration Exercise. What follows is based on only a fraction of the material and sampling information already collected but could be instructional and useful.

Part One:

Fish sampling and collection of supporting data

This project is obligated to conduct fish sampling in twelve study rivers, primarily focusing on perennial stretches or formerly perennial reaches (i.e. reaches that are currently degraded due to water-transfers, engineering projects, and abstractions). This field work is obligated to cover four of Cyprus' nine hydrographical areas (see inception report).

Sampling for fish will take place using a two-tiered survey approach: a) Qualitative rapid sampling-observational records (accorded here as "investigative sampling") and b) standardized sampling electrofishing following standardized European bioassessment approaches (accorded here as "quantitative sampling"). Selecting sampling sites based on selecting representative river type segments, and macro-habitat categories in relation to biophysical and/or meso-habitat features is especially difficult in Mediterranean streams due to the remarkable heterogeneity and seasonal variability in lotic systems. The sampling site selection must make sure that there is coverage of all river water body biophysical units (usually given by changes in geology, river-branching order number and altitude/slope) and that some sites are in good/high condition (based

on a pre-classification of condition, using anthropogenic pressure analysis, literature review and expert judgment). This type of representative sampling regime must include sites in good and poor/bad condition (relative to anthropogenic pressures) for each of the river units/ water bodies (i.e. sub-region separations can be set, i.e. mountain east, mountain west, middle course and plain).

Also, whenever a site is sampled at a regulated river segment (degraded site; i.e. beneath a dam), a similar unregulated site should be sampled to compare assemblages of the fish and to explore pressure-specific impacts.This activity will organize and implement the fish sampling (population, fish assemblage data) and collection of all site-specific supporting environmental data. The approach in sampling for bioassessment capacity evaluation of the BQE fish will follow typical multimetric development approaches as the spatially-based approach in FAME or IBI approaches that have been developed for intra state applications.

This activity includes:

- **Work package 1**: Standardized fish survey sampling

Task 1: Investigative sampling:

- Investigative sampling for the species presence-absence status and longitudinal distribution of fish assemblages will take place along the entire accessible course of the investigated rivers. The objective of this rapid and extensive survey technique is to establish base-line knowledge and generalizations about species occurrence and distribution since the available knowledge base is severely limited. Technical instruments used to sample fish will include the following:
    - *Electro-fishing device, 2 piece backpack unit, battery-powered (Smith Root)*
    - *Fry nets*
    - *Snorkeling equipment (underwater observations in streams and selected reservoirs)*
    - *Digital Underwater Camera for underwater photography and video*

- ***Task 2***: Quantitative sampling:

When a site is known to have fish, the quantitative fish sampling campaign is initiated. Technical instruments used to sample fish will include the following:

- *Electro-fishing device, 2 piece backpack, battery-powered (Smith-Root)*

- Precise pre-selection of the exact sampling sites and communication of all suggested locations to the Contracting Authority for endorsement was initially called for but this kind of scheduling is difficult since knowledge of fish presence/absence directs sampling effort and sampling site network development. Because of this difficulty the field team is forced to move and do both qualitative and quantitative sampling based on what is discovered at "potential sites". If fish are not present habitat and degradation details of the site are recorded and new "potential sites" are scheduled. In this way day-to-day planning of sampling locations becomes the norm[2].

There will be one (1) fish sampling campaign which will be carried out within May and June 2011. If more visits are needed for field work (environmental degradation/pressure analysis or habitat parameter collections), more visits will be made to the study rivers in the near future. A very general outline of "potential site" numbers per study river is given in Table 1.

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[2] It is unfortunate that several of the study rivers flow into the territory occupied by the Turkish Armed Forces. The longitudinal connectivity with respect to the unobstructed connection to the sea is critical for understanding the problems facing catadromous and migratory species that are known to enter Cyprus rivers and this is why we seek to investigate the river-mouths and lower portions of most studied rivers (as well as other rivers in the general vicinity).

Table 1. Site characteristics and proposed minimum site sampling at 12 study rivers in Cyprus (no changes are noted relative to proposal in HCMR's 2010 tender).

1*	2*	3*	4*	5*	6*	7*
1	Diarizos River	Diarizos	1	7	2	3
2	Xeros River (Paphos)	Xeros	1	9	4	3
3	Pyrgos River	Pyrgos	0	1	3	2
4	Limnitis River	Limnitis	1	3	4	2
5	Kampos River	Kampos	0	1	2	2
6	Xeros River	Xeros	1	4	2	2
7	Marathasa River	Marathasa	1	4	1	2
8	Kargotis River	Kargotis	0	3	2	2
9	Germasogeia River	Germasogeia	1	8	1	3
10	Limnatis River	Kouris	1	10	1	2
11	Kouris River	Kouris	1	10	1	2
12	Kryos River	Kouris	1	10	0	2

***Legend to columns**:*

1. River numbers; 2. River name; 3. Catchment name; 4. Number of major river dams present on river; 5. Approximate number of fish species recorded in river catchment and associated reservoirs; 6. Qualitative and or quantitative samples already secured from the compilation and initial investigation (2009-2011); 7. Oringinal number of quantitative samples proposed in each particular river.

Number of samples

From Table 1 it is clear that the number of samples per river will surpass the number originally foreseen and this will provide added power to the analyses and interpretations.

Some details:

- On each of the above river catchments it is planned to quantitatively sample at least two sites, while at some river catchments at least three sites will be sampled.

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- Following from the above, the total number of quantitative samples becomes 30 at the minimum. Since these sites are combined with "no-fish" sites collected from the rapid qualitatitive survey the number of sites available for analysis within the sampling scheme rise to at least 50 (see Figure 2 for preliminary locations of 50 sites based on current understanding of the local spatial framework).
- It might be decided in the course of the project that some rivers be sampled more than twice while others will be sampled only once or not at all, keeping however the total number of samples above 30. This flexibility and ability to adjust locations of the samples is obviously needed due to the scant background knowledge on fish distributions.
- Finally, because exceedingly rare catadromous species (i.e. Eel) and other marine migrants use Cyprus lowland rivers (e.g. Mugilids), other sites beyond the contract's obligation will also be investigated for the presence and abundance of these native species.

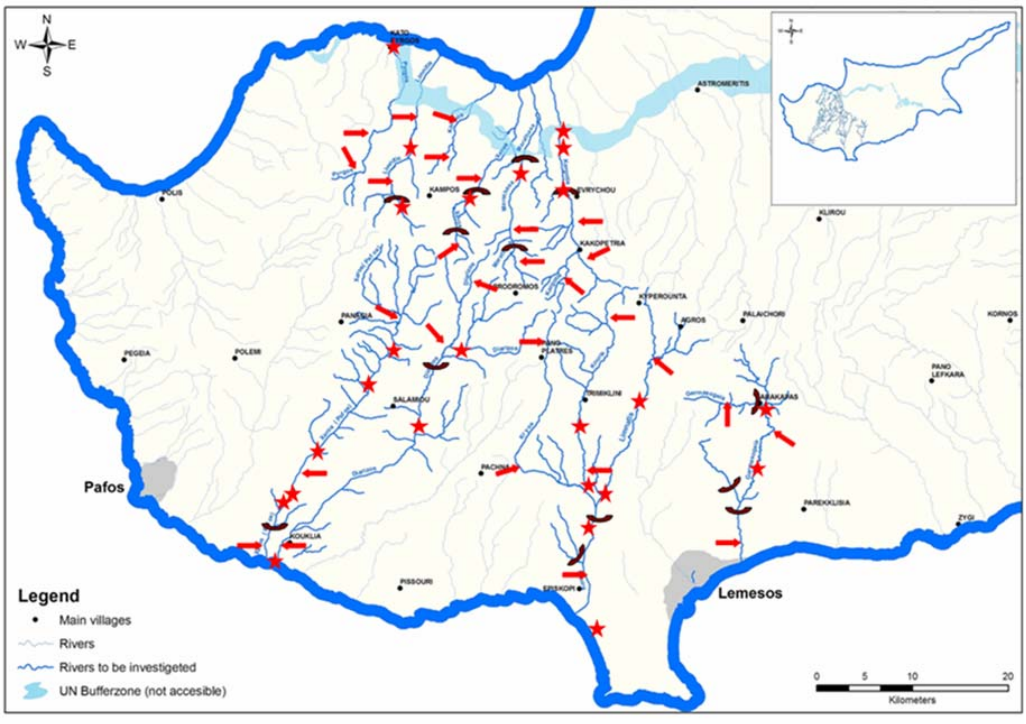

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Figure 1. 50 proposed sites for quantitative fish sampling in the rivers under study (red arrow symbols show initial sites proposed during the call; star symbols show new additions). (Map adapted from a document by the WDD Tender procedure document TAY 49/2010- 2010).

Quantitative fish sampling has to be performed according to:

- Quantitative fish sampling will rely solely on standardized electrofishing sampling. The standard CEN EN 14011 “Water quality - Sampling of fish with electricity”.
- Quantitive fish sampling will employ the “Standardized Sampling procedure” that was developed by the FAME project, which was subsequently adopted also by the EFI+ project.
- Stop nets will not be used; the sampling team will utilize natural or existing artificial barriers (drops, weirs, etc) instead to prevent fish from escaping within the sampled sites.
- A fry net will also be used to collect fish where conditions (e.g. high conductivity cannot allow electrofishing).

- The samplings will be undertaken in spring or early summer. The exact sampling time period will be chosen to allow catching YOY fish (young-of-year).
- All fish will be identified at least to the species level and to subspecies level where and if appropriate. Fish size-class and age-class classification will be determined for all caught fish. Size-class increments (i.e. not detailed increment measurements to the centimetre) allow a faster processing of the collected fish samples[3]. Nearly all fish will be returned alive to the exact place they were sampled.
- Some fish samples will be collected for laboratory analysis and genetic research (for investigating systematic).
- Where quantitative sampling will be carried out to derive absolute quantitative population estimates (i.e. depletion surveys), the data from the 1st run will be kept separate from the 2nd and later runs.
- All sampling sites have to be characterized according to “pre-classification ecological condition” addressing all parameters required by the Intercalibration Exercise and as a result, the data collected during the project will be compatible with the Common Fish Database kept for IC purposes at Cemagref/France. To accomplish this, the following information has to be collected as a minimum:

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[3] This method of rapidly counting and measuring specimens (to size-class) and to relative age-class is widely applied in Germany and on a research basins in Greece also. If fish samples a processed for counting and precise measuring outside the river channel (in containers and buckets and after treatment with anesthetics) the field processing may be two or three times longer.

- Fishing occasion data, site description & environmental variables.
- Pressures description (see below, Work package 2: Pressures).
- Fish catch data.
- Diadromous species data.
- Riparian zone condition data (using the QBR protocol)

o all sampling sites/stretches have to be characterized according to the "criteria for undisturbed sites" as used in the River Fish IC Exercise.

Protocols

Field protocols will follow the standardized method used the for the implementation of the WFD in Greece. Three protocols (habitat details, fish measurements and the QBR) will be implemented at each site. See Appendix I for protocol field sheets.

Initial Results of Activity 1

Collection of historical information and available knowledge regarding fish in Cyprus rivers

Data from available knowledge regarding fish in Cyprus rivers

Fish datasets from Cyprus

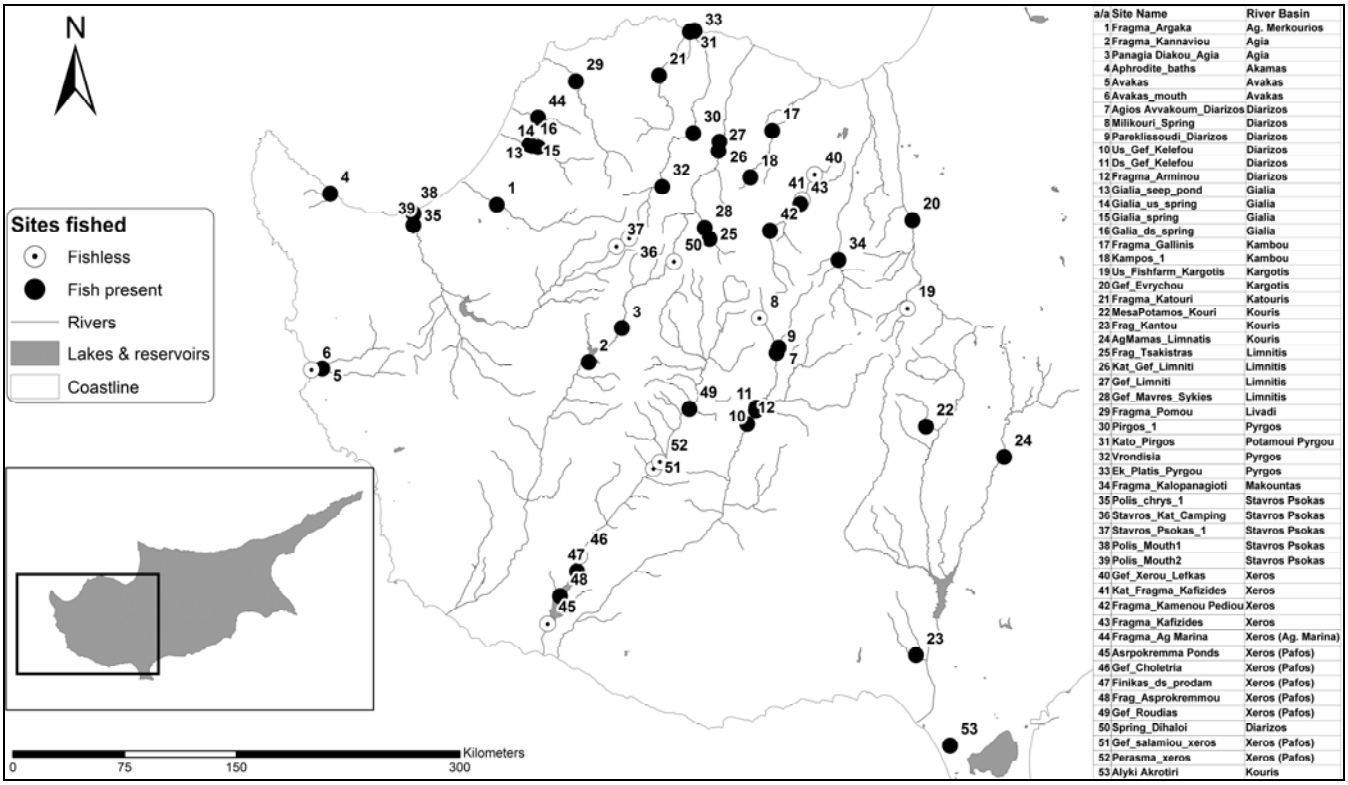
Fish sampling and collection of supporting data: initial descriptive analysis of present available information

We are providing a initial analysis in order to assist in the discussion of a substantiated Cyprus position regarding the BQE "fish" in Cyprus rivers within the framework of the implementation of the WFD and the related Intercalibration Exercise. What follows is based on only a fraction of the material and sampling information already collected but could be instructional and useful.

The species presence/absence data from the site-based work is primarily from the following projects:

1. *2009-2010. Consulting services for the application of articles 11,13 and 15 of the European Union Water Framework Directive (2000/60/EC) in the Republic of Cyprus. River Basin Management Pre-plan. Contract TAY-WDD 97/2007. Development Department, Ministry of Agriculture, Natural Resources and Environment. (S. Zogaris and Y. Michaelidis visited reservoirs, wetland and rivers in 2009).*
2. *2009-2011. Management of the Pafos Forest Reserve, Cyprus. Monitoring scheme development and aquatic fauna inventory. Funding: EEA Grant and the Republic of Cyprus. Participants: S. Gatzogiannis, SYSTADA, Kalisto. [**http://www.pafosforest.eu**]. (S. Zogaris and S.D. Zogaris visited rivers in 2010 and electrofished in the Pafos Forest).*
3. *Reconnaissance work for the present project (5-10th May 2011). This Project. (S. Zogaris and A. Vidalis visited and electrofished in 23 sites).*

At this point in the research of fish as BQEs in Cyprus it is not useful to rely solely on grey literature of other forms or historical information since even base-line information of species composition and distribution patterns is non-existent. In this short review we provide presence/absence data from 53 sites in western Cyprus many including the 12 study streams (see Figure 2). Some baseline patterns of species occurrence are presented; this will soon change with further field sampling.



a/a	Site Name	River Basin
1	Fragma_Argaka	Ag. Merkourios
2	Fragma_Kannaviou	Agia
3	Panagia Diakou_Agia	Agia
4	Aphrodite_baths	Akamas
5	Avakas	Avakas
6	Avakas_mouth	Avakas
7	Agios Avvakoum_Diarizos	Diarizos
8	Milikouri_Spring	Diarizos
9	Pareklissoudi_Diarizos	Diarizos
10	Us_Gef_Kelefou	Diarizos
11	Ds_Gef_Kelefou	Diarizos
12	Fragma_Arminou	Diarizos
13	Gialia_seep_pond	Gialia
14	Gialia_us_spring	Gialia
15	Gialia_spring	Gialia
16	Galia_ds_spring	Gialia
17	Fragma_Gallinis	Kambou
18	Kampos_1	Kambou
19	Us_Fishfarm_Kargotis	Kargotis
20	Gef_Evrychou	Kargotis
21	Fragma_Katouri	Katouris
22	MesaPotamos_Kouri	Kouris
23	Frag_Kantou	Kouris
24	AgMamas_Limnatis	Kouris
25	Frag_Tsakistras	Limnitis
26	Kat_Gef_Limniti	Limnitis
27	Gef_Limniti	Limnitis
28	Gef_Mavres_Sykies	Limnitis
29	Fragma_Pomou	Livadi
30	Pirgos_1	Pyrgos
31	Kato_Pirgos	Potamoui Pyrgou
32	Vrondisia	Pyrgos
33	Ek_Platis_Pyrgou	Pyrgos
34	Fragma_Kalopanagioti	Makountas
35	Polis_chrys_1	Stavros Psokas
36	Stavros_Kat_Camping	Stavros Psokas
37	Stavros_Psokas_1	Stavros Psokas
38	Polis_Mouth1	Stavros Psokas
39	Polis_Mouth2	Stavros Psokas
40	Gef_Xerou_Lefkas	Xeros
41	Kat_Fragma_Kafizides	Xeros
42	Fragma_Kamenou Pediou	Xeros
43	Fragma_Kafizides	Xeros
44	Fragma_Ag Marina	Xeros (Ag. Marina)
45	Asrpokremma Ponds	Xeros (Pafos)
46	Gef_Choletria	Xeros (Pafos)
47	Finikas_ds_prodam	Xeros (Pafos)
48	Frag_Asprokremmou	Xeros (Pafos)
49	Gef_Roudias	Xeros (Pafos)
50	Spring_Dihaloi	Diarizos
51	Gef_salamiou_xeros	Xeros (Pafos)
52	Perasma_xeros	Xeros (Pafos)
53	Alyki Akrotiri	Kouris

Figure 2. 53 sites where fish assemblage data has been collected, primarily through fish sampling during the last three years and confirmation through the literature and interviews. Sites that had no fish during sampling and where no information existed on previous fish presence are also shown.

Initially our review of the available information confirms the existence of 16 species of fish in the inland waters of western Cyprus (See Table 2). This number includes only four native taxa (Eel, *Aphanius fasciatus*, *Mugil cephalus, Mugilidae* sp). The Eel is especially widespread, but has seen a remarkable decline. Small populations do survive and enter streams in Cyprus (e.g. Stavros tis Psokas river at Polis; Diarizos river at Kisdasi and the Diarizos river-mouth wetlands). More native species will be found if more research is done on so-called "transitional waters[4]" (e.g. coastal lagoons, river mouths). One native species, *Salaria fluviatilis*, remains one of the great unanswered questions in modern Cypriot zoology – the species may even be extinct (see below).

All other fish species in Cyprus' inland waters are aliens, but some are naturalized and reproduce without anthropogenic stocking (or repeated introductions). Many of these species are dependent for survival on dam reservoirs. During the first part of this analysis the influence of dams (their reservoirs, and the longitudinal fragmentation) is investigated. River sampled sites are categorized based on their proximity to dams (and both the upstream and downstream influence is investigated in a superficial way). Some alien species are remarkably widespread. These include the following five most prominent (based on current information):

1. *Gambusia holbrooki* (Mosquito fish). Survives and reproduces in remarkable densities in many wetlands, slow flowing streams, in dams and below dams throughout the island. Should be considered a naturalized aliens since it has been in the areas stream system since the 1940s.
2. *Oncorhynchus mykiss* (Rainbow trout). A frequent escape form fish-farms and widely stocked for angling in cold-water streams and reservoirs. Possible reproduction may take place in the wild (i.e. Xeros river, upstream of Kafizes; Kryos river upstream of Platres).
3. *Cyprinus carpio* (Carp). Widely stocked for angling in reservoirs, probably includes self-reproducing populations (no evidence of this exists yet).
4. *Rutilus rutilus* (Roach). Large self-reproducing populations in reservoirs and in streams that confluence with reservoirs.

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[4] We consider transitional waters as within the realm of inland waters because they are the point of connection between rivers and and the coastal zone (they include coastal wetlands, coastal lagoon, river-mouths and estuaries).

5. *Salmo cf. trutta* (Brown Trout). Introduced in the 1940s. Aliens naturalized and a self reproducing population does exist at least on the upper Kouris and perhaps the Diarizos as well. Other coldwater streams may maintain naturalized populations also.

Table 2. Distribution of the 16 species in the 18 river basins of Cyprus based on information collected from a selected number of sites (53). The number of sites per basin that have been studied is indicated by the number in parenthesis beside river catchment name ().

	Anguilla anguilla	*Gambusia holbrooki*	*Oncorhynchos mykiss*	*Cyprinus carpio*	*Rutilus rutilus*	*Salmo cf. trutta*	*Micropterus salmoides*	*Ictalurus punctatus*	*Blicca bjoerkna*	*Alburnus alburnus*	*Lepomis gibbosus*	*Mugilidae sp.*	*Aphanius cf. fasciatus*	*Oreochromis sp.*	*Carassius cf. auratus*	*Mugil cephalus*	Sum species/ basin
Xeros (Pafos) (7)	♦	♦	♦	♦	♦	♦	♦	♦	♦					♦			10
Diarizos (7)	♦	♦	♦	♦	♦	♦			♦		♦						8
Ag. Merkourios (1)	♦	♦		♦	♦		♦	♦									6
Xeros (Ag. Marina) (1)	♦	♦		♦	♦		♦	♦									6
Agia (2)		♦	♦		♦					♦	♦						5
Kouris (4)		♦	♦			♦						♦	♦				5
Xeros (4)		♦	♦	♦	♦										♦		5
Makountas (1)		♦	♦	♦		♦				♦							5
Limnitis (4)	♦	♦	♦	♦													4
Livadi (1)		♦		♦	♦		♦										4
Stavros Psokas (5)	♦											♦				♦	3
Kargotis (2)	♦		♦														2
Katouris (1)	♦	♦															2
Akamas (1)	♦																1
Avakas (2)	♦																1
Gialia (4)	♦																1
Kambou (2)	♦																1
Pyrgos (4)	♦																1
Sum basins/species	13	11	8	8	7	4	4	3	2	2	2	2	1	1	1	1	

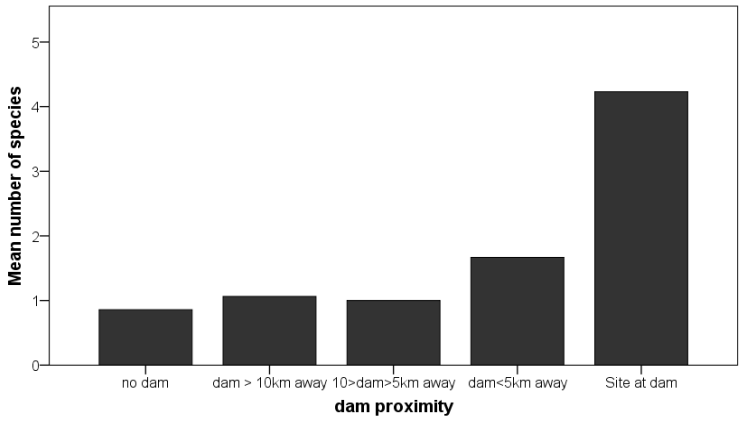

Figure 3. Mean number of species found at 53 sites in Cyprus' inland waters (data from electrofishing, interviews and literature are combined). Most fish species are restricted to the dams. In many instances barriers above the dam (e.g. pro-dam obstacles, wiers, bridges, road-passes etc) do not allow fish to move upstream of stream confluences.

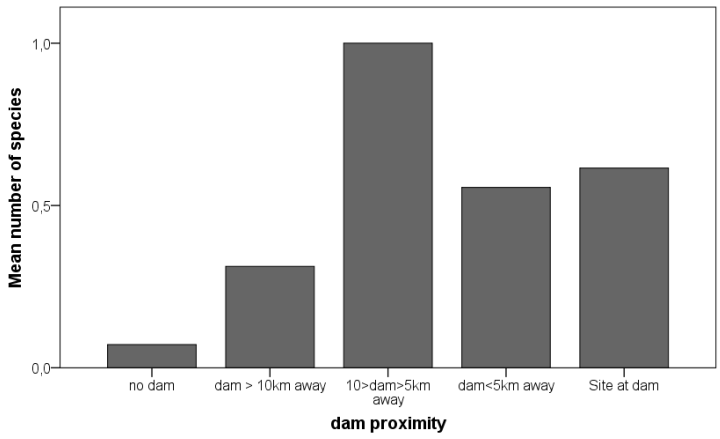

Figure 4. Mean number of species found at 53 sites in Cyprus' inland waters (data from electrofishing only is shown). Note that during these initial electrofishing samples dam reservoirs and sites very close to dams exhibit a lower number of fish species. This shows the weakness of solely utilizing back-pack eletrofishing for species recording since very limited access and catch-effectiveness result deeper waters (i.e. reservoir lakes, and deeper reaches near the river's confluence with the reservoirs). This proves that other sampling measures are needed beyond electrofishing for a more thorough ichthyological record.

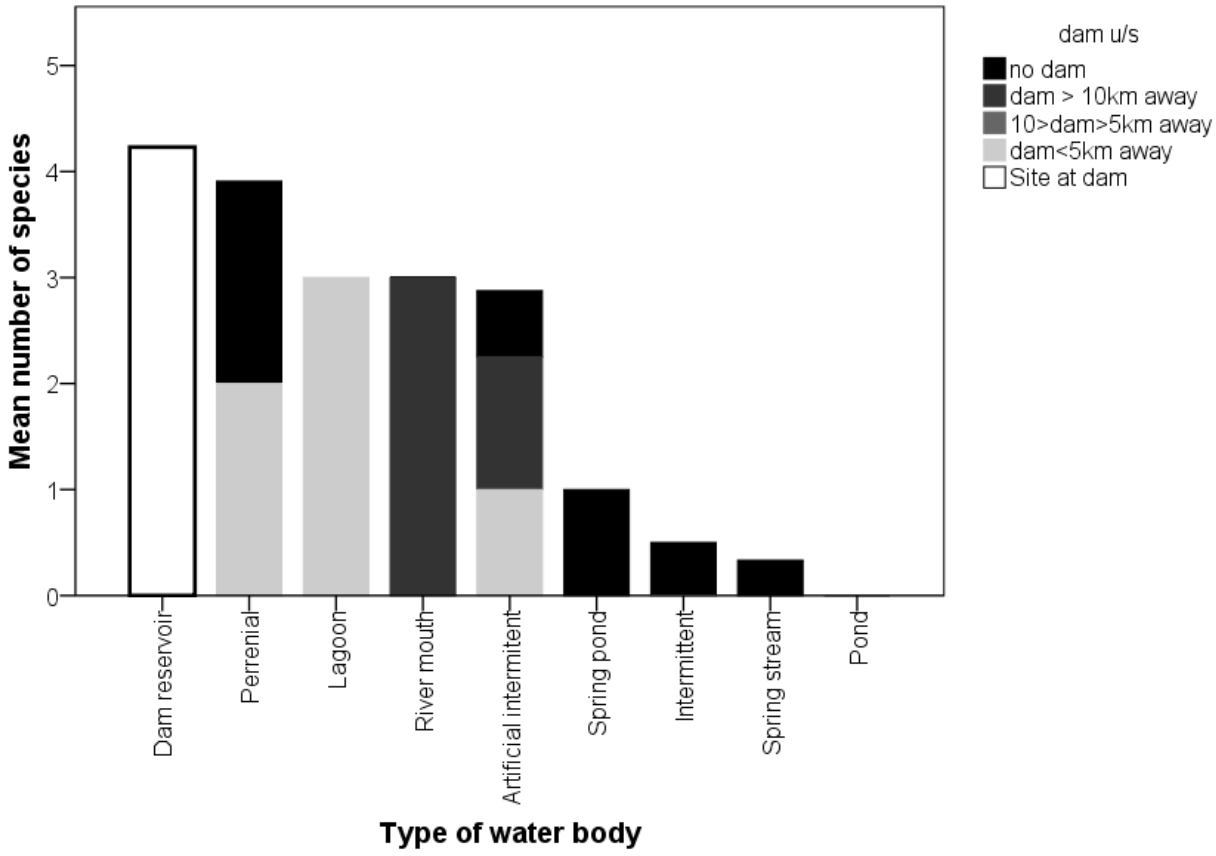

Figure 5. Mean number of species found at 53 sites in Cyprus' relative to the proximity of dams. Most species were documented in dam reservoirs and perennial streams. Very few species where found in isolated spring ponds, intermittent streams, or small spring-fed headwaters or ponds. This indicates that fragmentation and connectivity as well as surface water permanence may be important factors in maintaining fish populations.

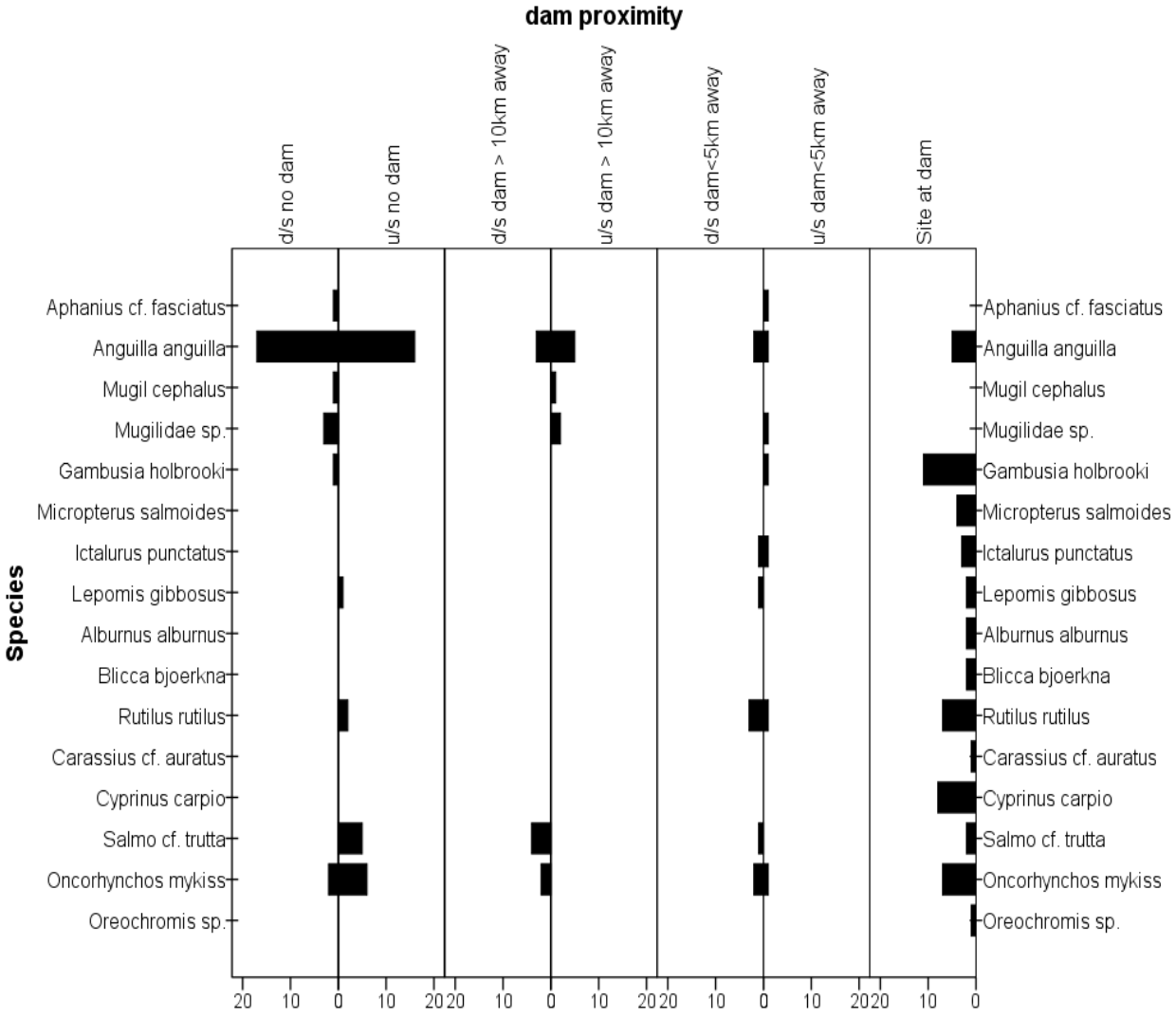

Figure 6. The frequency of occurrence of fish species in sites (N=53) relative the proximity of dams upstream and downstream of the investigated site. Eels and Salmonids (*Salmo cf. trutta, Oncorhynchos mykiss*) seem to shun dams. Many of the lacustrine or stagnophilic species (i.e. "lake fish") are found primarily or only within dam reservoirs and are not distributed in the river network within the specific system either upstream or downstream of the dam. The x axis of this plot shows the number of sites where a species was recorded either upstream (u/s) or downstream (d/s) of a dam.

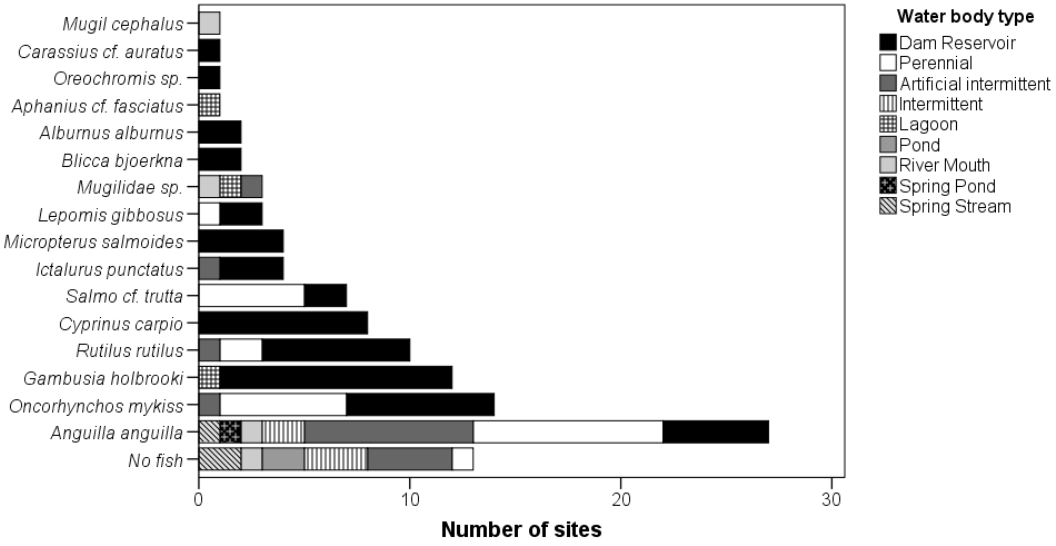

Figure 7. The relative frequency of occurrence of fish species (presence in number of sites) in relation to the water body type. Most species are found within dams and perennial water body types. Eels are found in a large variety of habitat types (and in many different sites) in contrast to other species.

Cyprus rivers and especially its reservoirs do have varied fish populations; and many are self-reproducing. Many of the streams in Cyprus could support both warm water and cold water fish populations. However, a lack of native freshwater fish characterize streams in Cyprus, but this may not have been the case in the past. Although part of our initial results are based solely on recent rapid sampling survey efforts (2008-2011), there is circumstantial evidence to show that some species of fish may have contracted their distribution ranges and may be extremely rare or critically threatened with extinction on the island. A case in point is the River Blenny *Salaria fluviatilis.* Bianco (1996) and Kottelat and Freyhof (2007) mention the existence of *Salaria fluviatilis* on Cyprus with collected material existing in the British Museum. *Salaria fluviatilis* was not found on our survey and few optimal natural habitats for the species seem to currently exist in the largely degraded lower stream courses of the island. A wider survey of water bodies on the island reveals that in the last three decades many spring-fed streams have been severely degraded or have been exploited for irrigation or tap-water uses throughout Cyprus. This sensitive freshwater species may have become extirpated from lowland river reaches due to the dam construction and over-exploitation of spring-fed lowland freshwater flows. *Salaria fluviatilis* requires

substantial stream stretches with perennial flowing waters and is very vulnerable to habitat changes and degradation of stream connectivity. Although this species is rarely mentioned in Cyprus natural history literature, it may represent one of the rarest native vertebrates on the island, if it still exists[5].

Other native species seem to be presently much rarer than reported by locals on the island, and this includes the Eel and other fish that enter freshwaters from the sea. Interviews with local residents strongly suggest that Eel were once much more common and widespread in most streams; particularly common in lowland areas but even in higher elevation streams, up to at least 700 m. elevation. Eels were widely fished for food by many villagers, a common fishing method was using plant-based poisons. *Styrax officinalis* fruit were widely employed to "poison" stream sites in order to stun and harvest eels. Of the 12 streams catchment studied in this survey most have high dams that may effectively block Eel passage. Most streams are effectively "starved" of their downstream summer flows due to water diversions for irrigation or water retained in dams, so lowland wetland and summer-refuge in-stream habitats for Eel have largely become unsuitable in the lowlands. Apart from the Eel there are very few places for euryhaline marine fish to enter rivers since natural flows to the sea are nearly all regulated (and rivers go artificially dry at their lowland portions during the summer). Of course, before 1970, several coastal wetlands and river mouths did have marine fish in freshwaters (mostly Grey-mullet Mugilidae sp.).

Our initial work shows several alien fish maintain populations in the dams and locally in the related water bodies (e.g. river reaches immediately upstream of the dam reservoirs). We found evidence of reproduction for several species, including species that are now widespread in lowland rivers (e.g. *Rutilus rutilis, Gambusia holbrooki,)*. The discovery of Brown Trout reproducing in the upper Kouris is the first documentation of wild Salminid reproduction on the island in recent times. The introduction of the Brown Trout is attributed to R.R. Waterer (Conservator of Forests, 1937-1950). This was considered an important accomplishment of the colonial government: The "successful introduction of Brown Trout into the mountain forest streams" probably took place in the mid 1940s (Thirgood 1987). The provenance of the Brown Trout of Cyprus remains a mystery and we are pursuing historic records and genetic investigations to explore this. We have no knowledge of the potential for the existence of native trout on Cyprus in the distant past, although native trout does

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[5] We propose that a special project should be launched to study the existence of the species within a pan-Cyprus survey of all wetland and spring-fed stream waters on the island. Obviously only local evidence of the species absence/presence status can be accomplished during the present study.

exist in other Mediterranean islands such as Corsica, Sardinia, Sicily, and may have existed until medieval period on Crete (Rackham and Moody 1996). It is presumed that native forms of the southern European trout migrated through the sea during the glacial periods, but this hypothesis needs further investigation. There are very few other ways that Cyprus could be colonized by freshwater fish – and little is known of the river conditions and flow patterns or confluences in this region during the Messinian Salinity Crisis (apprx. 5.2 Million year before present), when Cyprus was connected to the Asian mainland for a short period.

Humans may have transported freshwater fish (as they have reptiles and mammals) to Mediterranean islands many centuries or millennia ago. Both ancient Greece and the Roman Empire also have long histories of fish husbandry. It is interesting to trace these histories as they show that Europe has a tradition dating back at least 2000 years. Evidence from this time includes the description of Carp by Aristotle (384-322 BC) - kyprinos or kyprianos, derived from the Latin Cypria (secondary name for Aphrodite the god of love and fertility) a function of the fecund nature of the fish (Balon 1995). Both the Greeks and the Romans grew Carp, however thy confined themselves to the rearing of wild caught juveniles (Ackefors et al. 1994). More research is needed for establishing the history of fish introductions to the island.

This preliminary survey reveals remarkable gaps in current knowledge on fish distributions in Cyprus. Part of the reason for this is the depauperate native fish fauna in Cyprus' inland waters and until recently there was very little interest in alien fish species. Yet the issue of alien fish species has arisen to a very important parameter in assessment, monitoring and management worldwide. Aliens may alter ecosystems and controlling the spread of aliens in an important management and conservation priority for inland waters. There are many anthropgenic actions that allow alien fishes to enter Cyprus' inland waters. A fairly common accidental means by which aliens fishes are introduced is when species, most frequently cyprinids, are inadvertently transported with the juveniles of Carp *Cyprinus carpio* or Grass Carp *Ctenopharyngodon idella*. It has been documented that the Bleak *Alburnus alburnus* and Silver Bream *Abramis bjoerkna* have reached Cyprus in this way. Fish have been indiscriminately dispersed by humans in the dams of Cyprus primarily for amateur angling. But are alien species of practical interest as indicators for river ecosystem quality? - Or more specifically as BQEs within the WFD implementation framework on Cyprus?

The WFD does not explicitly require Member States to take account of alien species for the assessment of ecological status of their surface water bodies. As a result, most Member States developed ecological status assessment tools that do not directly account for the effects of alien species. However, the WFD does stipulate that the assessments should reflect the distraction from naturalness. Several countries do account for alien species explicitly, depending on the water body type considered. In most cases, this is done by attributing aliens a different score than native species in a metric, or by including alien species in comparisons with alien-free reference communities. Other countries classify their water bodies using the pressure-based tools, and subsequently downgrade the high (and good) ecological status water bodies to lower classes based on the presence of predefined high-impact species (i.e. certain widespread aliens). Generally there seems to be rise in the use of alien species as "indicators" (i.e. within metrics) or within indices in several European countries (Vandekerkhove & Cardoso 2010).

Ecological status assessments that are designed to detect anthropogenic pressures may in some cases reflect the pressure by alien species. Many Member States supported the implementation of a supplementary biopollution index, for example. This is an index that measures the pressure by alien species and that is an acceptable trade-off between practicability and accuracy. This index can be published alongside the values for the other pressure-based assessment methods. This approach would unambiguously demonstrate the magnitude of the issue of alien species in European water bodies and efforts have been taken to promote it (Vandekerkhove & Cardoso 2010).

Alien fish species are also used as metrics within Indices in North America and Australia where many river systems have very high proportions of alien fish. Kennard *et al.* (2005) conclude that "the potentially strong impact that many alien fish species can have on the biological integrity of natural aquatic ecosystems, together with their potential to be used as an initial basis to find out other forms of human disturbance impacts, suggest that some alien species can represent a reliable 'first cut' indicator of river health". In some river systems, aliens dominate, so the best approach if one needs to investigate fish as indicators is to research the potential for using aliens as indicators.

We envisage a potential "supplementary use" of fish (both aliens and natives) as indicators that may inform and complement water management and conservation on Cyprus. Also it should be said that some long-established aliens, or so-called "naturalized alien species" (such as the Brown Trout) may fill an important "vacant niche" that may have belonged to a fish species that has

become extinct in the historic past. The issue of “what is termed an alien” is still in active debate (e.g. Copp et al. 2005). Freshwater fish extinctions are frequent phenomena within island systems and natural re-colonization is extremely difficult, if not impossible. So in this respect, humans are vehicles for introducing or “re-introducing” fish that may evolve to have self-sustaining and resilient populations on an island that did have fish in he past. Over time these important elements of the aquatic fauna can become adequate indicators of aquatic ecosystem status. The particulars of potentially employing fish as indicators (for assessment, monitoring or to inform management measures) in Cyprus will be investigated immediately after the final sampling campaign.

SECTION 3

"The key issues identified and the proposed immediate actions and the priorities set"

Progress on critical issues concerning progress

The critical or key issues which are related to the achievement of the objectives of the Water Development Department may be outlined as follows:

1. Coordination, and inter-agency communication. Already contacts have been made with a large number of potential information sources, stakeholders and participants and this will further be exhibited in Activity 2. Between HCMR, ISA and WDD very frequent communication via e-mail and telephone contacts is made. ISA members have chosen not to participate during this spring sampling period, but the sampling results will be readily available and they will be responsible for parts of the statistical analyses, interpretation and other aspects of using fish as BQEs.
2. Ichthyological information acquisition. As already mentioned a small and simple questionnaire was created in late April 2011 for interviewing individuals about the native fish populations (principally the Eel). Members of the Forestry Department and other agencies have shown interest to help implement the application of the questionnaire (in order to establish past population status and former distributions of native Eels in lotic waters). Field work, archival research and further interviews have begun in early April 2011. Generally, a few aspects of information-gathering progress have been hampered by several unresolved needs. These pertain to information gathering from expert sources, libraries, museums etc. on Cyprus and abroad. Unfortunately it was not possible prepare for both field sampling and historical/literature research concurrently. This kind of research will be continued immediately after the field sampling campaign which is obviously top-priority during this period. This slight set-back in timing should not create any risk to the smooth development of the project.
3. Initial statements concerning the use of fishes as a BQE in Cyprus

It is not possible at this time to conclusively assess the use of fish as a BQE on Cyprus, but at least the potential to use fish as a supplementary element within biological assessment and water management is present. Very few stretches of the rivers investigated have self-reproducing populations of inland water fishes. We have poor knowledge of the variability in space and time of fish species assemblage attributes in the rivers in Cyprus, but some attributes of the fish assemblages may be predictably affected by anthropogenic pressures on aquatic ecosystems. For example, in Cyprus we can suggest that candidate ichthyological metrics for bioassessment may include the following: a) presence/absence of native populations of Eel (*Anguilla anguilla*); b) Reproduction of naturalized brown trout (a naturalized alien that has been on the island for at least 6 decades); c) Relative densities of invasive warm-water alien fish (especially widespread species); d) Species-richness of warm-water aliens that are tolerant to degraded conditions; e) Presence of migratory marine/transitional species in certain lowland river types; f) Presence of any native species.

Fish are suitable indicators of longitudinal fragmentation in lotic water bodies. And this type of anthropogenic pressure is widespread on Cyprus rivers because of many water abstractions “starving” downstream segments of water and connectivity barriers to longitudinal fish movement (such as dams, bridge bases, roads, river fords, and other smaller obstacles). We have initial data that shows that dams and their reservoirs play an important role in determining the fish assemblages of certain river stretches that are in proximity to the reservoirs (exhibited in part within this 1st Interim). Fish are also important in restoration measures applied downstream of dams and this definitely applies within Cyprus rivers. When wetland and lotic ecosystems are sustained by ecological flows below dams and managed in a healthy condition, they may be able to support important species or even native species (i.e Eel, River Blenny, marine transient species). Lastly the presence of alien fish should be recorded and assessed as is this is being practiced widely throughout Europe (e.g. through the supplementary biopollution index).

We envisage that by the end of the intensive sampling effort of late May-early June 2011 a better image of the value of fish as indicators for ecological quality assessment, monitoring and management will have arisen.

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APPENDIX I PROTOCOLS

Protocol 1. Habitat Details of Site

HCMR-IIW //Rapid Ichtyo-assessment Protocol /

1. Researcher		**2.Fisher:**	**3.Completed by:**
4.Sampling Site	Code	Name	**5.Date**
6.Hydrographic Basin		**7. Course**	

8. Location Descriptions (nearest village; distance from bridges...).	**9. Reference site** Yes ☐ No ☐	**10. Status site** ----------
11. GPS Coordinates	**12. Altitude**	
	13. Slope	

14. Time	Start		Finish	
15.Sampling Instruments		**16.Sampling Effort:** A B C D		
17. Fished length (m)		**18.Fished area (m^2)**		
19. Sampling details	☐ Whole ☐ other:			
20. Flow regime	Permanent	Summer dry	Winter dry	Episodic

21. SITE DIMENSIONS

LENGTH	
Width (m)	Left bank up to water
	Wetted width
	Right bank up to water

22.WIDTH (m) **23. DEPTH** (m)

<1	%	<0.25	%
1≤L<5	%	0.25≤P<0.5	%
5≤L<10	%	0.5≤P<1	%
10≤L<20	%	≥1	%
≥20	%	Mean	Max

24. SUBSTRATE (%)

Rock continuous		Sand <2mm	
Boulder >256mm		Silt	
		Clay	
Cobble 64-256mm		Organic	
Pebble 16-64mm		Artificial	
Gravel 2-16mm			

25. SHADEDNESS

Approximate % :	

26. WEATHER

27.VELOCITY (estim.)

< 0,1 m/s	
0,1-0,25 m/s	
0,25-0,5 m/s	
0,5-0,75 m/s	
0,75-1 m/s	
> 1 m/s	

28. PHYSICOCHEMICAL MEASUREMENTS

Conductivity (mS/m)		T° of air (° C)	
D.O.		T° of water (° C)	
PH		Turbidity	
Salinity			

29. HELOPHYTES		**30. BOTTOM VEGETATION**		**31. HABITAT TYPE %**	
Missing		Missing		Pool (deep/still)	
Isolated Rare		Algae/moss only		Glide (shallow/move)	
Sparce		Sparce		Run (deep/move)	
Intermidiate		Intermidiate		Riffle (shallow/rough)	
Rich		Rich		Rapid (steps/fast)	
Dominating sp.:		Dominating:		Other.....	

32.Important Pressures:

32.Fish habitat Details:

Cover types sampled: logs/large woody debris, deep pools, overhanging vegetation, boulders/ cobble, riffles, undercut banks, thick root mats, dense macrophytes beds, isolated/backwater pools, marshy fringes, other natural cover types

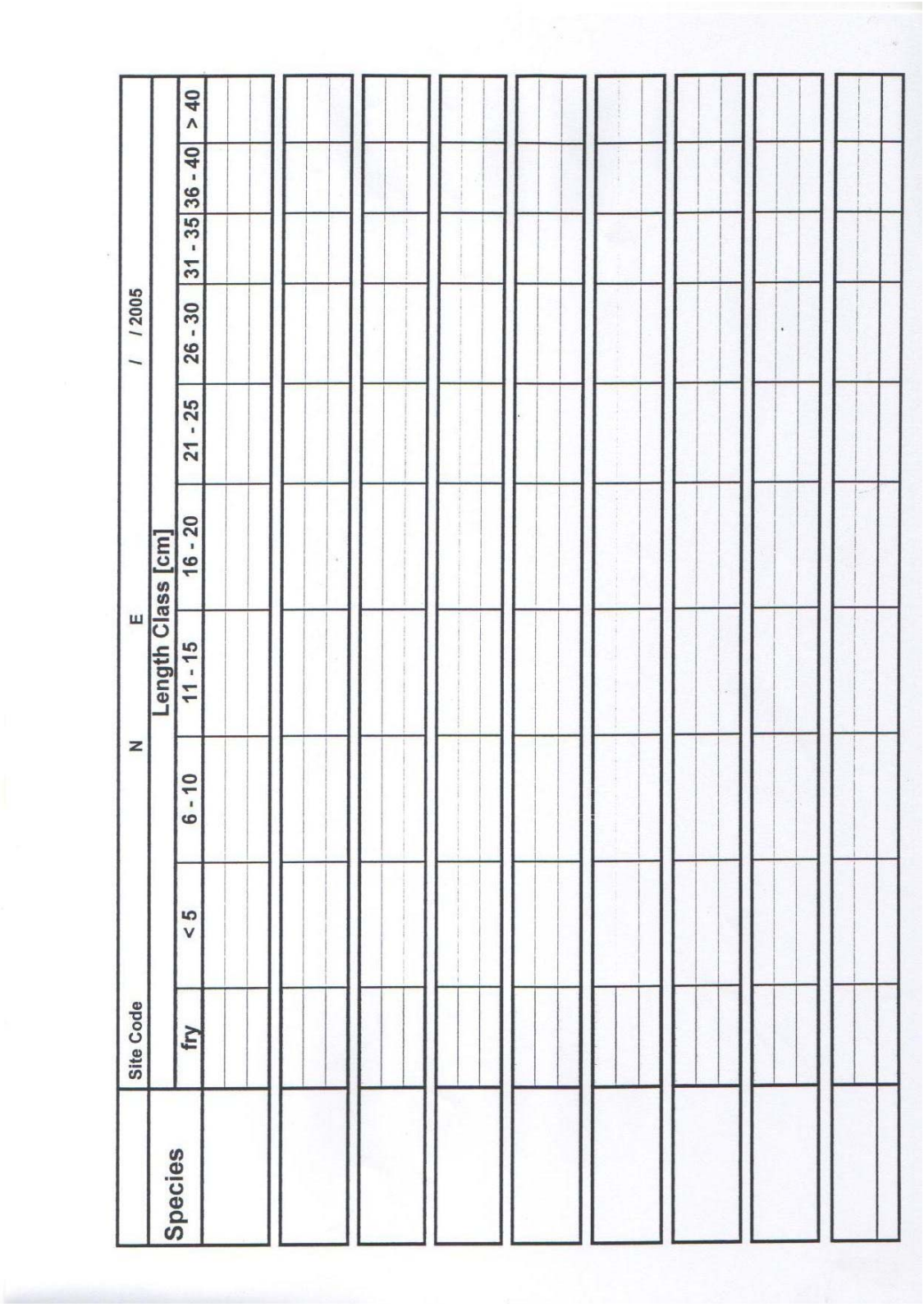
33.Other Notes/ Interviews: (hydrology, modifications, pollution, introductions, historical fish presence, fishing methods&activities)

34.Site drawing:

Upstream

Downstream

Protocol 2. Fish Measurement Details



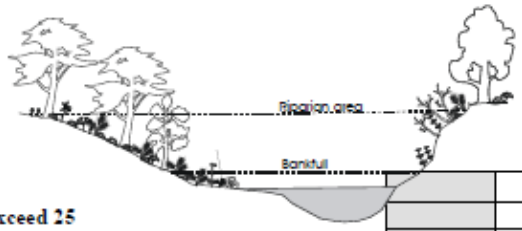
Species	Site Code	N	E	/ / 2005								
	Length Class [cm]											
	fry	< 5	6 - 10	11 - 15	16 - 20	21 - 25	26 - 30	31 - 35	36 - 40	> 40		

Protocol 3. QBR (Riparian Vegetation Habitat Assessment)

QBR INDEX

Field data sheet

Riparian habitat quality



Date	

The score for each part cannot be negative or exceed 25

Total riparian cover — Part 1 score

Score	
25	> 80 % of riparian cover (excluding annual plants)
10	50-80 % of riparian cover
5	10-50 % of riparian cover
0	< 10 % of riparian cover
+ 10	If connectivity between the riparian forest and the woodland is complete
+ 5	If connectivity is above 50%
- 5	Connectivity between 25 and 50%
-10	Connectivity below 25%

Cover structure — Part 2 score

Score	
25	> 75 % of tree cover
10	50-75 % of tree cover or 25-50 % of tree cover but 25 % covered by shrubs
5	Tree cover below 50 % but shrub cover between at least 10 and 25 %
0	Less than 10% of either tree or shrub cover
+ 10	At least 50 % of the channel has helophytes or shrubs
+ 5	25-50 % of the channel has helophytes or shrubs
+ 5	Trees and shrubs are in the same patches
- 5	Trees regularly distributed but shrub land is > 50 %Trees and shrubs distributed in separate patches,
- 5	without continuity
- 10	Trees distributed regularly, and shrub land < 50 %

*Cover quality (the geomorphologic type should first be stablished *)* — Part 3 score

Score		*Type 1*	*Type 2*	*Type 3*
25	Number of native tree species:	> 1	> 2	> 3
10	Number of native tree species:	1	2	3
5	Number of native tree species:	0	1	1 - 2
0	Absence of native trees	-		
+ 10	The tree community is continuous along the river and covers at least 75% of the edge riparian area			
+ 5	The tree community is nearly continuous and covers at least 50% of the riparian area			
+ 5	The riparian community is structured in a gallery			
+ 5	The number of shrub species is:	> 2	> 3	> 4
- 5	Presence of man-made buildings in the riparian area			
- 5	Presence of isolated species of non-native trees**			
- 10	Presence of communities of non-native trees			
- 10	Presence of garbage			

Channel alteration — Part 4 score

Score	
25	Unmodified river channel
10	Modified fluvial terraces, constraining the river channel
5	Channel modified by discontinuous rigid structures along the banks
0	Totally canalized river
- 10	River bed with rigid structures (e.g wells)
- 10	Transverse structures in the channel (e.g weirs)

Final score (sum of level scores)	

*** Type of the riparian habitat (to be applied in Part 3, cover quality)**

The score is obtained by adding the scores assigned to the left and right river banks according to their slope. This value can be modified when islands or hard substrata are present.

Slope and form of the riparian zone	River bank:	*Score* Left	Right
Very steep, vertical or even concave (slope > 75°) banks are not expected to be exceeded by large floods.		6	6
Similar to previous category but with a bankfull which differentiates the ordinary flooding zone from the main channel.		5	5
Slope of the banks between 45 and 75 °, with or without steps. Slope is the angle subtended by the line between the top of the riparian area and the edge of the ordinary flooding level of the river. (a > b)		3	3
Slope between 20 and 45 °, with or without steps. (a < b)		2	2
Slope < 20 °, large riparian zone.		1	1
Presence of one or several islands in the river			
Width of all the islands "a" > 5 m.		- 2	
Width of all islands "a" < 5 m.		- 1	
Percentage of hard substrata in which plants cannot root.			
> 80 %		Not applicable	
60 – 80 %		+ 6	
30 – 60 %		+ 4	
20 – 30 %		+ 2	
Total Score			

Geomorphologic type according to the total score

> 8	**Type 1**	Closed riparian habitats. Riparian forest, if present, reduced to a small strip. Headwaters.
5 to 8	**Type 2**	Headwaters or midland riparian habitats. Forest may be large and originally in gallery.
< 5	**Type 3**	Large riparian habitats, and potentially extensive forests. Lower courses.

**** Allochthonous trees species in the study area**
(These should be listed for each study area)
e. g. study area of Catalonia:
Populus deltoides
Populus x canadensis
Populus nigra ssp. italica
Salix babilonica
Ailanthus altissima
Celtis australis
Robinia pseudo-acacia
Platanus x hispanica
All fruit trees

APPENDIX II QUESTIONNAIRES

Questionnaire 1

ΥΠΟΥΡΓΕΙΟ ΠΑΙΔΕΙΑΣ, ΔΙΑ ΒΙΟΥ ΜΑΘΗΣΗΣ ΚΑΙ ΘΡΗΣΚΕΥΜΑΤΩΝ
ΓΕΝΙΚΗ ΓΡΑΜΜΑΤΕΙΑ ΕΡΕΥΝΑΣ ΚΑΙ ΤΕΧΝΟΛΟΓΙΑΣ

ΕΛ.ΚΕ.Θ.Ε.
ΕΛΛΗΝΙΚΟ ΚΕΝΤΡΟ ΘΑΛΑΣΣΙΩΝ ΕΡΕΥΝΩΝ

ΕΡΕΥΝΑ ΓΙΑ ΤΗΝ ΠΑΡΟΥΣΙΑ ΨΑΡΙΩΝ ΣΤΟΥΣ ΠΟΤΑΜΟΥΣ ΤΗΣ ΚΥΠΡΟΥ

ΕΡΩΤΗΜΑΤΟΛΟΓΙΟ

Το ερωτηματολόγιο αυτό αποτελεί στοιχείο έρευνας για την εφαρμογή της Οδηγίας Πλαίσιο Περι Υδάτων 2000/60 από το Τμήμα Αναπτύξεως Υδάτων (ΤΑΥ 49/2010).

Οδηγίες Συμπλήρωσης Ερωτηματολογίου: Παρακαλώ συμπληρώστε ένα ερωτηματολόγιο για κάθε ποταμιο σύστημα ή και κάθε ποτάμιο τμήμα που γνωρίζετε. Στις απλές απαντήσεις συμπληρώστε με "Χ", σε συγκεκριμένες ερωτήσεις απαντήστε γραπτώς στο κελί της ερώτησης. Αποστείλετε το ερωτηματολόγιο με ηλεκτρονικό ταχυδρομείο στον Δρ. Σταμάτη Ζόγκαρη (zogaris@ath.hcmr.gr).

Θα ενημερωθείτε περαιτέρω στη συνέχεια μέσω της διεύθυνσης ή της διεύθυνσης ηλεκτρονικού ταχυδρομείου σας.

Α. ΑΤΟΜΙΚΑ ΣΤΟΙΧΕΙΑ

Ονοματεπώνυμο (*Προαιρετικό*):	
Φύλο :	☐ Άνδρας ☐ Γυναίκα
Σε ποια κατηγορία ανήκετε ως προς την ηλικία ;	☐18-25, ☐25-35, ☐35-45, ☐45-55, ☐55-65, ☐65+
Διεύθυνση: ή Διεύθυνση ηλεκτρονικού ταχυδρομείου :	

Β. ΣΤΟΙΧΕΙΑ ΠΟΤΑΜΙΟΥ ΣΥΣΤΗΜΑΤΟΣ / ΤΜΗΜΑΤΟΣ

Ποταμός :	
Ποτάμιο Τμήμα: περιγραφή :	
Πλησιέστερος οικισμός :	

Γ. ΣΤΟΙΧΕΙΑ ΓΙΑ ΤΗΝ ΠΑΡΟΥΣΙΑ ΨΑΡΙΩΝ

1. Τι ψάρια έχει το ποτάμι / ποτάμιο τμήμα;

☐ Καθόλου Ψάρια
☐ Μόνο Χέλι
☐ Χέλι και άλλα ψάρια
☐ Άλλα ψάρια

Παρακαλώ διευκρινίστε:

1

2. Τι ψάρια είχε το ποτάμι κατά το παρελθόν;

☐ Καθόλου Ψάρια
☐ Μόνο Χέλι
☐ Χέλι και άλλα ψάρια
☐ Άλλα Ψάρια

Παρακαλώ διευκρινίστε:

3. Πότε είδατε τελευταία άγριο χέλι στην Κύπρο;

☐ Πριν το '50
☐ Πριν το '60
☐ Πριν το '70
☐ Πριν το '80
☐ Πριν το '90
☐ Πριν το 2000
☐ Άλλη δεκαετία / περίοδο, *Παρακαλώ διευκρινίστε:*
☐ *Δεν έχω δει ποτέ χέλι σε άγρια κατάσταση στην Κύπρο*

4. Έχετε ψαρέψει χέλια, αν ναι, πότε τελευταία;

☐ Ναι ☐ Όχι

Αν **ΝΑΙ**, πότε συγκεκριμένα;	
και με πια/ποιες τεχνικές αλίευσης;	

5. Πιο ήταν το υψηλότερο υψόμετρο που εντοπίσατε χέλια;

Συγκεκριμένα :	
Πλησιέστερο Χωριό :	

6. Σήμερα που έχετε υπόψη σας ότι έχει ακόμη χέλια;

Συγκεκριμένα :	
Πλησιέστερο Χωριό :	

7. Άλλες Παρατήρησεις:

Σας ευχαριστώ για τη συνεργασία σας

Δρ. Σταμάτης Ζόγκαρης

2

Questionnaire 2

ΥΠΟΥΡΓΕΙΟ ΠΑΙΔΕΙΑΣ, ΔΙΑ ΒΙΟΥ ΜΑΘΗΣΗΣ ΚΑΙ ΘΡΗΣΚΕΥΜΑΤΩΝ
ΓΕΝΙΚΗ ΓΡΑΜΜΑΤΕΙΑ ΕΡΕΥΝΑΣ ΚΑΙ ΤΕΧΝΟΛΟΓΙΑΣ

ΕΛ.ΚΕ.Θ.Ε.
ΕΛΛΗΝΙΚΟ ΚΕΝΤΡΟ ΘΑΛΑΣΣΙΩΝ ΕΡΕΥΝΩΝ

ΕΡΕΥΝΑ ΓΙΑ ΤΗΝ ΠΑΡΟΥΣΙΑ ΨΑΡΙΩΝ ΣΤΟΥΣ ΠΟΤΑΜΟΥΣ ΤΗΣ ΚΥΠΡΟΥ

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Θα ενημερωθείτε περαιτέρω στη συνέχεια μέσω της διεύθυνσης ή της διεύθυνσης ηλεκτρονικού ταχυδρομείου σας.

Α. ΑΤΟΜΙΚΑ ΣΤΟΙΧΕΙΑ

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Φύλο :	☐ Άνδρας ☐ Γυναίκα
Σε ποια κατηγορία ανήκετε ως προς την ηλικία ;	☐18-25, ☐25-35, ☐35-45, ☐45-55, ☐55-65, ☐65+
Διεύθυνση: ή Διεύθυνση ηλεκτρονικού ταχυδρομείου :	

Β. ΣΤΟΙΧΕΙΑ ΠΟΤΑΜΙΟΥ ΣΥΣΤΗΜΑΤΟΣ / ΤΜΗΜΑΤΟΣ

Ποταμός :	
Ποτάμιο Τμήμα: περιγραφή :	
Πλησιέστερος οικισμός :	

Γ. ΣΤΟΙΧΕΙΑ ΓΙΑ ΤΗΝ ΠΑΡΟΥΣΙΑ ΨΑΡΙΩΝ

1. Τι ψάρια έχει το ποτάμι / ποτάμιο τμήμα;

☐ Καθόλου Ψάρια
☐ Μόνο Χέλι
☐ Χέλι και άλλα ψάρια
☐ Άλλα ψάρια
Παρακαλώ διευκρινίστε:

2. Τι ψάρια είχε το ποτάμι κατά το παρελθόν;

☐ Καθόλου Ψάρια
☐ Μόνο Χέλι
☐ Χέλι και άλλα ψάρια
☐ Άλλα Ψάρια
Παρακαλώ διευκρινίστε:

1

3. Έχουν γίνει στον ποτάμιο τμήμα εισαγωγές ψαριών;

☐ Ναι ☐ Όχι

Αν **ΝΑΙ**, από ποιον οργανισμό;

και ποια είδη;

4. Γίνονται στο ποτάμιο τμήμα τονώσεις ψαριών (τακτικές εισαγωγές);

☐ Ναι ☐ Όχι

Αν **ΝΑΙ**, ποια δεκαετία;

☐ Πριν το '50
☐ Πριν το '60
☐ Πριν το '70
☐ Πριν το '80
☐ Πριν το '90
☐ Πριν το 2000
☐ Άλλη δεκαετία / περίοδο
Παρακαλώ διευκρινίστε:

5. Πότε είδατε τελευταία χέλι;

☐ Πριν το '50
☐ Πριν το '60
☐ Πριν το '70
☐ Πριν το '80
☐ Πριν το '90
☐ Πριν το 2000
☐ Δεν έχω δει ποτέ χέλι σε άγρια κατάσταση στην Κύπρο

6. Έχετε ψαρέψει χέλια, αν ναι, πότε τελευταία;

☐ Ναι ☐ Όχι

Αν **ΝΑΙ**, πότε συγκεκριμένα;	
και με πια/ποιες τεχνικές αλίευσης;	

7. Πιο ήταν το υψηλότερο υψόμετρο που εντοπίσατε χέλια;

Συγκεκριμένα :	
Πλησιέστερο Χωριό :	

8. Σήμερα που έχετε υπόψη σας ότι έχει ακόμη χέλια;

Συγκεκριμένα :	
Πλησιέστερο Χωριό :	

9. Με ποιους τρόπους ψαρεύεται το χέλι στην Κύπρο;

Συγκεκριμένα :

10. Σημειώστε τρεις παράγοντες που έχουν επηρεάσει την αφθονία/παρουσία του χελιού στην Κύπρο.

1.

2.

3.

11. Άλλες Παρατήρησεις:

Σας ευχαριστώ για τη συνεργασία σας
Δρ. Σταμάτης Ζόγκαρης

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APPENDIX III SCIENTIFIC TEAM

Table 1. Project Team.

Researcher	***Position in Project Team***	***Responsibilities-Duties***	***Person-months of employment***
Dr. Stamatis Zogaris	*Expert 2 Project Manager (Geographer-Biologist)*	*Project management; fish sampling and collection of river site characteristics*	*8*
Dr. Maria Teresa Ferreira	*Expert 1 Scientifically responsible expert (Hydrobiologist)*	*Freshwater ecosystem ecology research, sampling design scheme, applications of BQE fish in monitoring evaluations*	*7*
Dr. Alcibiades Economou	*Hydrobiologist-Ichthyologist*	*Design of river fish collection procedure; assessment and evaluation of BQE fish application*	*1*
Dr. Yorgos Chatzinikolaou	*Environmental Scientist-Biologist*	*Statistical analysis, Remote sensing and Cartographic analysis (GIS geodatabase), pressure analysis*	*4*
Sofia Giakoumi	*Ichthyologist*	*Ichthylogical sample processing, project logistics and project economic organization*	*2*
Nicholas Koutsikos	*Ichthyologist*	*GIS, sampling field work (fish, in-stream, riparian and pressures), database management, field logistics*	*4*
Leonidas Vardakas	*Ichthyologist*	*Literature survey, collection of information-interviews, database entry*	*1*
Dr. Nikolaos Skoulikidis	*Hydrogeologist*	*River ecological status based on biogeochemistry and pollution*	*1*
Dr. Eleni Kalogianni	*Biologist-Historian*	*literature and museum specimen survey, survey and interviews for historic reference condition development*	*1*
Dr. Pedro Segurado	*Biologist*	*Community ecology analysis (fish assemblages), spatial framework evaluations, species habitat-use; statistical analyses*	*3*

Dr. Jose Maria Santos	*Ichthyologist*	*Statistical analyses and remote sensing and Cartographic analysis, Index adaptations, evaluation of fish metric responses to river typology and pressures*	*3*
Volunteer Participants			
William RC Beaumont	*Ichthyologist*	*Field work, electrofishing.*	*-*
Elena Economou	*Political Scientist, MSc water management*	*Field work, electrofishing, sampling site research*	*-*