



**LIFE Nature project** “Marine Protected Areas in the Eastern Baltic Sea”  
Reference number: LIFE 05 NAT/LV/000100

**Action A5 – Fish community inventory**  
Action leader P4, Estonian Marine Institute, University of Tartu

**FINAL REPORT**

**Authors:**

**Markus Vetemaa**  
**Linus Ložys**  
**Atis Minde**

Reporting period: August 2005 – March 2008

Description of activities: The main aim of the action was to collect data about fish species most important from the point of view of nature conservation (like species listed in the Habitat Directive Annex II, Bern Convention, IUCN Red Data Book etc.). These species are as follows:

*Alosa fallax, Aspius aspius, Cobitis taenia, Coregonus albula, Coregonus lavaretus, Petromyzon marinus, Cottus gobio, Lampetra fluviatilis, Misgurnus fossilis, Pelecus cultratus, Lumpenus lampetraeformis, Pholis gunnellus, Trigloporus quadricornis, Myoxocephalus scorpius, Taurulus bubalis, Liparis liparis.*

In the text below these species are named as the project species

### **Activity 1 – Collection and analysis of existing data**

In the framework of this action national representatives collected data (December 2005-March 2006) based on which the joint report was prepared. Analysis of existing data revealed species and areas which needed more intensive new data collection. Activity was successfully implemented.

### **Activity 2 – Fish inventory in the project areas**

As finally agreed in the methodological meeting (Saaremaa, October 2005) during the duration of the project in all 13 study areas field works according to the agreed methods should be carried out at least twice: in cold water period (late autumn or early spring) and in warm water period (summer). In both cases minimum number of stations is 3 (consisting of nets 17 – 60 mm) and the total number of nights at least 3. So, minimum total number of stations should be at least 9. Work plan foresaw activities in altogether 29 study sites.

The activity was successfully implemented: During the duration of the project in all 13 study areas field works according to the agreed methods were carried out at least twice: during the cold water period (late autumn or early spring) and during the warm water period (summer).

During the preparation period of the project and after the collection of existing data the list of most important species (from the point of view of nature protection) was elaborated. In aim to collect data about these (first of all: abundance and distribution) field investigations were foreseen employing 3 main methods:

1) Gill net fishing using a large variety of mesh sizes (including multimesh gill nets)

2) Hand seining in very shallow coastal areas

3) Food analysis of predatory fish during regular commercial fish monitoring in order to obtain data on small-sized species. Some species of interest (like bullhead *Cottus gobio*, spined loach *Cobitis taenia*) are often food for bigger predator fish and can so easily be detected.

## Methodology of inventories    **Activity 1**

### Method 1: Gill net fishing using a large variety of mesh sizes (including multimesh gill nets)

Gill net fishing using a large variety of mesh sizes (including multimesh gill nets) was carried out according to the guidelines for coastal fish monitoring (THORESSON G. 1993. Guidelines for coastal monitoring. Kustrapport 1,1-35. Fiskeriverket, Sweden). Some changes were discussed between partners to adapt these methods better to the conditions in Estonia, Latvia and Lithuania.

In general, gill net fishing is used in all 3 countries also during the regular coastal fish monitoring. However, the mesh sizes in use differ between countries. In order to allow the data comparison not just between areas inside a country, but also between countries, minimum set on standardised mesh sizes was agreed: 17, 21.5, 25, 30, 33, 38, 50 mm from knot to knot. (Additional data collected differently by 3 countries enabled comparisons between the areas for in-country use). This set of nets is further referred as a “station”.

It was agreed that in each research area at least 1 site must be studied. In bigger areas 2 or more research sites are advisable. In total the number of research sites was agreed to be 29, while in some of them not all methods were applied (see Table below, location shown on Annex 1):

Number	Site	Area	Method
1	Vaindloo	1 EST	1,2,3
2	Käsmu	1 EST	1,2,3
3	Eru	1 EST	2
4	Pakri	2 EST	1,2,3
5	Matsalu inner bay	3 EST	1,2,3
6	Matsalu central bay	3 EST	1,2,3
7	Matsalu outer bay	3 EST	1,2,3
8	Saarnaki	3 EST	1,2,3
9	Sarve	3 EST	1,2,3
10	Parasmetsa	3 EST	2
11	Küdemä	4 EST	1,2,3
12	Vilsandi	4 EST	1,2,3
13	Kõiguste	5 EST	1,2,3
14	Laidevahe	6 EST	1,2
15	Mõntu	6 EST	1,2,3
16	Kuiviž i	7 LAT	1,2,3
17	Svē tciems	7 LAT	1,2,3
18	Engure	8 LAT	1,2,3
19	Mē rsrags	8 LAT	1,2,3
20	Kolka	9 LAT	1,2,3

21	Lielirbe	9 LAT	1,2,3
22	Jūrkalne	10 LAT	1,2,3
23	Akmeņrags	10 LAT	1,2,3
24	Jūrmalciems	11 LAT	1,2,3
25	Pape	11 LAT	1,2,3
26	Sventoji river entry	12 LIT	1,2,3
27	Monickes	12 LIT	1,2,3
28	Nemirseta	12 LIT	1,2,3
29	Neringa	13 LIT	1,2,3

Minimum effort for each of gill netting (method 1) sites was agreed to be as follows: 3 stations to be fished during 3 nights (i.e. in total 9 stations) twice per year (during cold and warm water period).

During the implementation of the activity the catch of each net was analyzed separately. This enabled better comparisons between the sites, areas and countries. The action was interested in results of the target species (most important from the point of view of nature conservation). However, the data about all fish species was anyway collected and stored.

#### Method 2: Hand seining in very shallow coastal areas

Several species listed in the project as most important (e.g. spined loach *Cobitis taenia*, bullhead *Cottus gobio*) are small and can not be targeted by usual coastal monitoring gill nets. Therefore another method – hand seining – was foreseen to collect data about these. During the methodological meeting it was agreed to purchase exactly analogous hand seines (which were finally made in Latvia) in aim to enable the data comparison between countries.

Hand seines were employed at least once in all research sites were also gill net fishing (excl. some sites in Estonia, then special site for hand seining was found nearby) carried out, and both during cold and warm water period. However, in many research sites the effort was much higher (in 6 sites in Estonia 12 times during 24 hours, i.e. after each 2 hours day-round).

#### Method 3: Food analysis of predator fish during regular commercial fish monitoring in order to obtain data on small-sized species.

The experience gathered during more than 10-year long series of coastal fish monitoring tells that the food analyses (prey fish) of predatory fish often indicates the main small-sized fish species in the area. Some species of interest (like bullhead, spined loach) are often food for bigger predatory fish like perch, pike, cod, salmon etc. and can so easily be detected.

The activity foresaw to analyze prey fish of all predatory fish obtained during the gill net fishing (method 1). Additionally, this method was employed as an extra also during other fish samplings (financed by national research programs, EIA's of industrial objects etc.) during the running time of action A5.

## **Conclusions about the methods:**

No changes in agreed methodology took place. The methods can be suggested also for further use in analogous fish research projects. The team believes that the existence or non-existence of species was sufficiently well reflected with applied methods. Naturally, some very rare species (not typical to the studied habitats) not obtained during the field works may still inhabit the study areas. However, the existence of such species are not of outmost importance, because the measures to protect such species can not be included into the (e.g.) management plans – it is most important to protect species in their typical habitats in which they depend on.

## **Inventory results**

**The table with the project species (species most important from the point of view of nature protection) and their existence by the study areas is presented at the end of the report A5. The data on relative abundance (if existing) is also included.**

### **1EST**

This area is situated in the central part of Gulf of Finland. Littoral area is narrow and water generally rather deep in comparison to the most of other Estonian areas. Area is rather homogenous. Most important project species in 1EST are bullhead, whitefish *Coregonus lavaretus* and vendace *Coregonus albula*. Historically the area was important for the sea-spawning whitefish. However, today this stock is almost entirely replaced by the (mostly Finnish) river-spawning whitefish. The data collected during the project hints that some last spawning areas might still function in the Käsnu and Eru bay. Fishery in the area targets mainly salmonids and is not impacting negatively the project species.

### **2EST**

The area is situated close to the mouth of Gulf of Finland. So, the salinity is higher than in 1EST, but lower than in other areas. The area is less important for the fishery – only few commercial fishermen work in the area. Like in the area 1EST also in this area most important project species is sea-spawning whitefish. One small remaining spawning area is situated in the south-eastern part of the Paldiski Bay. Some other project species were found too (see table at the end of the report). The abundance of bullhead is rather high, however, lower than in the project areas around Saaremaa island. All three species of the order Scorpaeniformes (shortspined sculpin *Myoxocephalus scorpius*, fourhorned sculpin *Triglopsis quadricornis* and longspined bullhead *Taurulus bubalis*) were recorded, but were not abundant. Due to the almost lacking coastal fishery this economic activity does not pose any threats to project species, even to whitefish.

### **3EST**

Väinameri (3EST) is the biggest and most heterogenous area not just in Estonia, but over all three countries. Some parts of the area are almost freshwater (like Saunja and Matsalu bay) while part of the area resembles

quite deep and open water of the e.g. 2EST or 6EST. In this area most of the project species were found (see table at the end). However, most important of these is spined loach. Before the results of the current project it was presumed that this freshwater species occurs in sea only seldom. Now it was demonstrated that in some parts of the Matsalu Bay the abundance is very high (tens and even sometimes hundreds of specimens were caught by one hand seine draw). So, it must be considered to be typical and important habitat for the species.

Historically sea-spawning whitefish has been important commercial species in the area. However, due to the eutrophication the abundance has strongly declined. Still, the project demonstrated the existence of the spawning ground close to Sarve peninsula (SE Hiiumaa island). By today proposal has been made to enlarge fishing ban in the area during the spawning period (October-November). Asp and ziege have been registered in the area. However, these are only few specimens which probably have migrated from other areas.

Väinameri was one of the most important fishing areas in Estonia during the soviet period. By today the fishing effort has decreased more than ten-fold. Fishing mortality caused by cormorants now surpasses several times this made by the commercial fishing gears. Therefore, fishery can not any more be considered as an important source of accidental bycatch of the protected (project) species.

In 3EST the last known by-catch of sturgeon *Acipenser sturio* (critically endangered in the Baltic Sea) took place. However, since this species is now probably extinct in Estonian waters, no fishing restrictions can help. Still, it is important to inform all fishermen (naturally, not only in this area) about the need to release all sturgeons immediately at the case of bycatch in the trap nets.

## **4EST**

The area is also rather heterogenous. While Kuusnõmme and Kihelkonna bays are rather shallow and sheltered areas, most of the territory of the area is still deep and open to the storms. In the area 4EST lies the second most important spawning ground of the sea-spawning whitefish (Kuusnõmme Bay). However, national fishing regulations are already banning the fishery in this area during the spawning time. So, no additional fishing restrictions are needed.

The area is also typical habitat for (Habitat Directive Annex II species) bullhead. Since the fishing does not impact this species due to the small body size, fishing restrictions are not needed. Big part of the area 4EST is covered by the Vilsandi national park. The protection regime of this park must guarantee the protection of the crucial habitats for this species (stony bottoms). Also, the species is sensitive and can be impacted by growing pollution.

In the open waters of the 4EST all 3 species of *Scorpaeniformes* can be found, and are rather abundant, especially during the cold-water period.

## **5EST**

Area 5EST is situated at the southern coast of island Saaremaa and it consists of multitude of small rather sheltered bays and open sea area around them. The bays resemble closed areas of 3EST, while open areas are similar to 2EST, 4EST and 6EST. In the sheltered areas spined loach can be found, while in the littoral areas of open sea bullhead is abundant. Other project species are not typical to this area. Still, some whitefish can be caught, but probably 5EST do not include important spawning areas of sea-spawning whitefish. In several bigger bays (like Laidevahe and Siiksaare bay) there is year-round commercial fishing ban. Therefore, the bays are important reproduction area of many commercial fish species, especially for cyprinids (however, not for the project species).

## **6EST**

This area lies against Latvian 9LAT (Irbe Strait). The results of the inventory were similar to the Latvian data. In general, the area is an important migration path for fish from Gulf of Riga to the open Baltic (Baltic Proper) and vice versa. Many fish species perform feeding migrations along the both coasts of the Irbe strait. No significant shallow-water spawning grounds are located in this area, as frequent strong currents openness to the storms cause sometimes massive sediment transport. During fish inventories 6 project species were found there twaite shad (*Alosa fallax*), Ziege (*Pelecus cultratus*), Whitefish, river lamprey *Lampetra fluviatilis*, bullhead and fourhorn sculpin. Fishery in this area targets mainly percids, cyprinids, herring and eel. Therefore an introduction of special management actions for protection of the project fish species is not needed

## **Conclusions: Estonia**

Due to the geographical differences (more sheltered bays and peninsulas, archipelagos) coastal small scale fishery (in comparison to the open-sea trawling) is more developed in Estonia than in Latvia and Lithuania. Due to this the knowledge on coastal littoral habitats and the fish species inhabiting such areas was higher if compared to other two project species. Therefore the inventories didn't provide such striking news like in other two countries (like recordings of new species, first indications on locations of spawning areas etc.). However, before this project the information on distribution of small-sized littoral species in the Estonian coastal waters was scarce. During the inventories all research areas were covered by standardised hand seine sampling twice per year. This provided first detailed information on comparative importance of different sea areas to spined loach and bullhead (species listed in Habitat Directive Annex II). It was found that the abundance of spined loach in Matsalu Bay (West-Estonia) is very high, which means that this sea area must be listed as one of the most important in Estonia for this species.

The project revealed that the population status of sea-spawning whitefish (threatened species in the Baltic Sea) is deteriorating. Viable populations could be found only in few remaining small bays in 4EST, 1EST and 2EST, while in some other areas historically important (especially 3EST) for that species reproduction has almost ceased. The main reason for that is

habitat change: whitefish needs sheltered bays with clean water and sand-gravel bottom. However, historically important spawning areas are overgrowing with vegetation due to the eutrophication.

The main outcome of the study is the conclusion that main threats for the project species in Estonia have changed: while historically fishery (both targeted fishery and bycatch) was the most important endangering factor, then today the most negative is the habitat change. Unfortunately, this problem can not be addressed in individual coastal areas separately, but must be solved internationally by the nations around the Baltic Sea.

## **7LAT**

Before the start of this project Latvian ichthyologists almost lacked the information about the fish communities in this area. During the inventories since 2005 we found only 3 project species in the area – river lamprey, shortspined sculpin and the spined loach. According to literature river lamprey usually occurs in the deepest part of coastal waters and performs seasonal migrations into the rivers for spawning. During sea period, the specimens are scattered and the abundance is low; therefore it was found only once during the inventories. However during spawning migrations they form great concentrations when entering and spawning in the rivers.

Latvian inventory data and the literature data suggest that short-spined sculpin is rare species in the 7LAT area and in Riga gulf in general and occur in coastal zone only during coldwater seasons.

Spined loach is a typical freshwater species and was never previously found in the Latvian coastal waters. In contrary to the previous knowledge we found one specimen in 7LAT area and suggest it may occur in low abundance in the coastal lagoons up North from Salacgrīva. The fact that this species is not by far as abundant here as in archipelago area in Estonian waters could be explained by less suitable habitat in Ainaži – Saulkrasti area. There are some shallow sheltered lagoons between Salacgrīva and Ainaži, however the environment may become too harsh during strong storms for this species.

Shortspined sculpin and spiny loach are not targeted by coastal fishery and almost never occur even as a bycatch. River lamprey is targeted by fishery during the spawning migration in rivers and is strictly regulated by national fishery legislation. However during the sea period river lamprey is not targeted by fishery and rarely occurs in bycatch. Taking into account all above mentioned only in case of spined loach special management measures directed to conservation of the shallow coastal lagoons may be required.

## **8LAT**

This was the least studied area in Latvian coastal zone before the LIFE project activities. During the inventories we found 3 project fish species in the area – sea spawning whitefish, fourhorned sculpin and shortspined sculpin.

Whitefish of different was found to present in comparatively high numbers in the stony areas in the 8LAT, especially during coldwater season. Putting together fish and habitat inventory data we have identified



locations in the 8LAT area where spawning of whitefish most likely takes place. It must be noted that these are the first findings of whitefish spawning grounds in Latvian coastal waters!

Fourhorned sculpin is according to the literature an arctic relic, one of the first fish species that inhabited Baltic Sea after its formation after the Ice Age. It is a common species in 8LAT, found mostly during coldwater season when it migrates from the deep to more shallow waters for spawning. We found this species in low numbers in locations with stones and/or gravel on the sea bottom.

Shortspined sculpin is rare species in the 8LAT area and occurs in coastal zone only during coldwater seasons. We did not find this species during the project activities; however we have registered this species in the area in previous studies.

None of the abovementioned species is targeted by fisheries. Whitefish is unknown species among local people and therefore has no market demand for it. It must be noted that all these 3 fish species need hard (stony or gravel) bottom for spawning. Therefore we recommend to include such locations in the protected area and to introduce appropriate management measures to preserve these habitats.

## **9LAT**

This area can be described as an important migration path for fish from Riga gulf to Baltic Proper and vice versa. Many fish perform also feeding migrations along the Irbe strait coast. But no significant spawning grounds are located in this area due to frequent strong currents and sediment transport. During fish inventories 5 project species were found there – twaite shad, ziege, whitefish, river lamprey and fourhorn sculpin. None of these fish species permanently live and/or spawn in the area. We believe they were brought here with currents or just passed during migrations and never are abundant in the area. The catch of river lamprey was only accidental. These fish are not targeted by fishery because of no commercial value and low abundance. Therefore an introduction of special management actions for protection of these fish species is not needed.

## **10LAT**

This is relatively small area with stony bottom located at the open Baltic coast. During the fish community inventory we found 4 of the fish species targeted by the project – longspined bullhead, shortspined sculpin, twaite shad and whitefish. The last two species we did find regularly also during 1998 - 2004. According to the existing literature and previously collected data longspined bullhead is a rare species in Latvia, so finding it in 10LAT can be considered as occasional. However, the last time this species was found in coastal fish surveys was in 1998 close to 10LAT. Our data show that twaite shad is commonly found in the area 10LAT but only at low abundance. So far there are no known spawning sites of twaite shad in Latvia and we believe that they all belong to the population of the Curonian lagoon. This theory is strengthened by fact that the occurrence of twaite shad near Latvian coast positively correlates with size of population in the Curonian lagoon. Shortspined sculpin is a common species in the Baltic and occurs during coldwater seasons in greater

numbers on preferably rocky bottom where it feeds and spawns. During warm water season these fish live in greater depth. Even if some specimens of whitefish were found regularly in the area, the number was low. It is not likely that this species spawns on the rocky bottom found in the 10LAT. We have never found small (young) whitefish in the area.

Results of the fish community inventories provided detailed information not only about the distribution and abundance of the target fish species in the project areas but also great amount of knowledge about fish communities in areas that were not previously studied at all. Concerning the fish species of community or national interest the data showed that these fish are rare in the project areas and as well as in Latvian coastal waters in general. Most of them are Atlantic species and the eastern part of Baltic sea being the border of their distribution area with low abundance. In other cases, the fish species proved to be common in certain seasons and project areas, however did not have spawning grounds in Latvian waters.

Intensity of the fishery in area 10LAT is very low and none of the 4 fish species is a target of fishery. In this respect we don't see any need for the special protection measures involving fishery. However we believe it is important to preserve the stony underwater habitats to ensure good conditions for feeding and spawning not only for species of community interest but also for other important fish species like European eel who occurs in 10 LAT in comparatively high abundance.

## **11LAT**

This was the best studied area in Latvia before the start of the LIFE project, mainly because of the of Butinge oil terminal in vicinity. During the inventory we found 4 project species: ziege, whitefish, twaite shad and shortspined sculpin.

Both ziege and whitefish are rare in the area because both belong and come from populations of Curonian lagoon because so far we have not found any evidence of spawning of these species near Latvian open Baltic coast. We believe that these specimens are carried with water currents or migrate to feed along the coast. Twaite shad also belongs to the Curonian lagoon population, but occur regularly, sometimes in greater abundance, also in 11LAT area during feeding migrations.

Shortspined sculpin is a common fish species in Nida-Bernāti area like in other parts of the open Baltic coast. During the coldwater season these fish form greater concentrations and ascend from the deep to more shallow coastal waters for spawning. As a spawning habitat this species needs hard sea bottom covered by stones, pebbles or gravel. Such habitats are widely found in the area of 11LAT. They are high quality spawning and/or feeding places not only for abovementioned fish species, but also for herring, turbot and European eel. Therefore, these habitats need to be preserved and special management measures should be implemented to ensure that.

As in other project sites, the intensity of coastal fishery is low and has a trend to decrease in importance year by year. Due to the fact that the fishery does not target any of the fish species in need for protection, we don't see a need for any additional fisheries restrictions in top of these already established by the Latvian national fisheries legislation.

Besides the fish species targeted by this project, we found during the fish inventories also an invasive fish species round goby (*Neogobius melanostomus*) in the area. We believe this fish can pose a threat to the local fish fauna in future, as it has happened already in some parts of Baltic sea near Polish coast. However so far there are no effective ways to restrict or prevent the invasion of this species.

## **Conclusions: Latvia**

Before the start of the LIFE project, the ichthyologists had only scarce and fragmented knowledge concerning the coastal fish communities in many parts of Latvian coastal waters. So, the inventories performed in the framework of the LIFE project can be described as the first comprehensive study covering almost whole Latvian coastal zone. Therefore it provided a lot of valuable information about the coastal fish communities. During fish inventories only some project species were recorded during the inventories. And only few of them occurred regularly and in high numbers. The reason is that the typical distribution area of these is located in other parts of the Baltic sea and/or there are not suitable habitats for these species at the Latvian coast of the Baltic sea.

It is common and widespread view that fishery has a very negative impact on the coastal fish. However, the present study didn't confirm this. By compiling our inventory data, data about fishery, and facts about the local fish markets, we concluded that coastal fishery decreases in importance and has actually little if any impact on the fish species that need protection. Also, the national fishery legislation includes already a lot of measures that ensure the protection of fish.

Another conclusion emerging is that the most important tool of nature protection must be the protection of habitats. Our data shows that in order to preserve rare and endangered fish species it is needed to protect vulnerable coastal habitats – underwater rocky reefs and underwater meadows. Such areas are most important feeding and spawning grounds for most of fish species.

## **12LIT**

12LIT zone is located in the northern part of Lithuanian coastal waters. There are stony in combination with sandy bottoms, often stony areas are covered by vegetation (especially in shallow water), 12LIT zone is more under influence of the water flowing out of the freshwater Curonian Lagoon if compared to 13LIT. Therefore, water temperatures and trophic status (eutrophication) is usually higher, while water transparency and salinity lower if compared to 13LIT. These physical water features depend on wind and current direction, however, northward currents in Lithuanian coastal waters usually dominate. 12LIT is essential area for herring spawning and better nursery area for most fish species juveniles if compared to 13LIT. Many fish species, especially freshwater species during warm water period, perform feeding migrations along the coast through 12LIT zone or even stay for some periods within it. During fish inventories 6 project species were found in 12LIT zone: twaite shad, whitefish, river lamprey, asp, shortspined sculpin and longspined bullhead.

During the fish inventory two new fish species were documented (in the 12LIT) for the first time in Lithuania: longspined sculpin and black goby (*Gobius niger*). One specimen of black goby was caught using beach seine to the north from Svetoji town in May 2007. In total six specimens of longspined bullhead were caught during the study period: two near the Nemirseta settlement in March 2006, two near Monciskes settlement in August and two specimens again near Nemirseta in March and June 2007. Both species are found in Latvia and are listed in the Red Book of Latvia.

Adult twaite shad is not very abundant in the 12LIT and is mainly found during spawning migration to the Curonian Lagoon; some twaite shad juveniles were caught in this zone during warm water surveys as well. Klaipeda strait is a gate for twaite shad during spawning migrations to the Curonian Lagoon. By-catch of twaite shad in the commercial fishery occurs in 12LIT, however, in much lower numbers if compared to 13 LIT zone. In the northern part of the Lithuania coastal zone Svetoji river flows into the Baltic Sea. This area and Klaipeda strait are important sites for river lamprey spawning migration. This species occur in the coastal waters during spawning migrations; however, commercial fishery does not cause significant threat for the species. Asp can be found in 12 LIT, but is rare (some specimens migrate out of the Curonian Lagoon, where their stocks are abundant) during warm water periods. Whitefish are regular but not abundant fish species in the area; this species could be found during their feeding migrations (April-May) or spawning migrations to the Curonian Lagoon (August-November), however during winter time the species is nearly absent. Shortspined sculpin are more abundant during cold water periods in the 12LIT (there are essential spawning grounds for the species on the stony bottom areas) if compared to 13LIT zone. Commercial fishery in this area is not targeting the species important from the point of view of nature protection, but can still create some bycatch.

### **13LIT**

13LIT is located in the southern part of Lithuanian coastal waters. In this area sandy bottoms prevail. The area is less influenced (if compared to 12LIT) by the freshwater flowing out from the Curonian Lagoon. Therefore, water temperature and the degree of eutrophication usually are lower, but water transparency and salinity higher. Due to such physical conditions in the area many fish species zone pass through 13LIT (migrate), but do not stay for long periods. In conclusion, ichthyofauna is more dynamic if compared to 12LIT. There are no good nursery areas and fish juveniles are not abundant; fish species diversity in hand seine catches is lower in comparison to 12LIT. However, 13LIT zone is more important for twaite shad spawning migrations to the Curonian Lagoon. Twaite shad are abundant during April-June. By-catch in the commercial fishery occurs in the northern part of the 13LIT zone with the highest numbers in the areas close to Klaipeda strait. During fish inventories beside twaite shad 3 other project species were found in 13LIT zone: whitefish, river lamprey and shortspined bullhead. Whitefish abundance is similar but lower if compared to 12LIT. Whitefish is most abundant in the area during the spring post-spawning migration (April-May) and at the end of summer and autumn during the spawning migration to the Curonian Lagoon. During winter it is nearly absent in the 12LIT zone.

## **Conclusions: Lithuania**

Implementation of the LIFE project was the first comprehensive study of fish communities in the Lithuanian coastal waters, since it covered both warm- and cold-water communities and applied different specially designed sampling methods to target both big- and small-sized fish species. During the study, comprehensive information about the coastal fish communities, their distribution, seasonal abundance and migrations was gained, including both commercial and non-commercial fish species. Two new species for Lithuania, longspined bullhead and black goby, were scientifically documented. However, snakeblenny, rock gunnel, fourhorned sculpin and striped seasnail were not found despite the expectations that they might exist in the study areas. The hypothesis on their occasional presence in the Lithuanian coastal waters was raised based on the so-called “anecdotal” information got mainly from fishermen. Some species, such as spined loach, vendace and mud loach were recorded (and also not expected) since they inhabit only coastal areas of less saline waters (like Latvia and especially Estonia). Ziege was not recorded during the project, however, this species could occasionally migrate out of the freshwater Curonian Lagoon (where the stock is very abundant). Sea lamprey is very rare species and as in the other project countries (LAT, EST) there are just few recorded events of catch in the literature.

Some rare species (e.g. shortspined sculpin and longspined bullhead) are not targeted by fishermen and therefore are not much affected by the commercial fishery; however, some improvement of fishermen knowledge about rare or endangered species could help to avoid accidental by-catch and to reduce even minor negative fisheries effect. Twaite shad is by lesser degree impacted by the bycatch events. However, the fishery regulations in the Lithuania coastal waters allow even targeted fishery on this species. Ban on the targeted Twaite shad fishing and technical measures regulating the fishery gears by seasons in particular areas could effectively minimize by-catch and conflict between fisheries and the species protection needs. Even if fishery impact rare and threatened species, other threats like degradation of feeding and/or spawning grounds due to human activities, dredging or damping, etc. are more important. Therefore it is important to protect habitats. In Lithuanian case potential pollution by accidents at Butinge oil terminal could cause great damage for habitats and as the result for protected species, especially for those which stay all year round in coastal areas or there are their spawning grounds located (especially in 12LIT zone).

### **Deliverables and products of the action**

The data collected during the implementation of the action (literature overview and new data collected through field works) is one input for the elaboration of the management plans. Besides this, one scientific publication has been published and four additional submitted to the scientific journals. It is planned to write additionally five scientific papers, which are currently under different stages of preparation.