



Assessing and enhancing ecosystem services provided by diadromous fishes in a climate change context

Deliverable title: Methodologies to assess ecosystem services provided by diadromous species

Deliverable reference: WP 4 – Action nr.2

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Subsidy contract n°	EAPA_18/2018
Programme priority	4. Enhancing biodiversity and the natural and cultural assets
Start date of project	1 st February 2019
End date of the project	31 st July 2022
Work package n°	4
Indicator	Number of technical and scientific publications produced
WP Leader	AZTI
Partners involved	AZTI, CEFAS, UoP-MI, MARETEC/IST-UL MARE-UE, CMVNC, EHEC-USC, INRAE, UFBLB, MNHN, IFI
Submission date (month)	March 2022

Dissemination level		
PU	Public	x
PP	Restricted to other programme participants (including the Programme Authorities)	
RE	Restricted to a group specified by the consortium (including the Programme Authorities)	
CO	Confidential, only for members of the consortium (including the Programme Authorities)	



EXECUTIVE SUMMARY

This research provides an overview of existing valuation methods/approaches used to monetarily assess the ecosystem services (ES) associated with diadromous fishes and lampreys. Only a limited range of values, mainly devoted to food provisioning and certain cultural ES, can be assessed based on real markets in which people's behaviour can be observed. In addition, revealing values that are also based on markets values but applying an indirect use of these are also considered. This research considers, for example, a replacement-cost approach to assess the nutrient transportation regulating ES. Moreover, the travel cost approach, through a survey, will be explored as a way for assessing recreational angling fisheries. Some of these previous values will also produce future cash flows for which valuation is a difficult task due to the necessity of finding an appropriate discount factor. The present value of any future cash flow depends on the time value of money but also people's risk aversion. Thus, a real option approach is used to catch the appropriate values. This research also considers those methods relying on the elicitation process using questionnaires, the so-called state-preference methods involving individual responders. A survey is used to estimate the willingness to pay as a common method to get a joint assessment of some cultural values related to traditional commercial fisheries (including the traditional know-how and the importance of the local identity). A second survey is also used to estimate the willingness to pay for a set of cultural ES (the natural see sight, the fishing technique, the cultural events, and gastronomy, or the brotherhood) related to the recreational fisheries (for a pilot study located in the Basque Country). These common structured methods introduce the empirical knowledge of stakeholders in a way providing a good contextualisation. Respondents' statements from surveys are combined with group statements thanks to the engagement of DiadES stakeholders across the whole research.

EXECUTIVE SUMMARY (SP)

Esta investigación ofrece una visión general de los tipos de métodos/enfoques de valoración existentes utilizados para evaluar monetariamente los servicios ecosistémicos (SE) de los peces diádromos. Sólo una gama limitada de valores, dedicados principalmente al aprovisionamiento de alimentos y a ciertos SE culturales, puede evaluarse sobre la base de mercados reales en los cuales se puede observar el comportamiento de las personas. Igualmente, se consideran los denominados valores revelados, que también se basan en los valores de los mercados, pero de forma indirecta. Así, por ejemplo, esta investigación considera el método de los costes evitados para evaluar el transporte de nutrientes, que es uno de los principales servicios de regulación evaluados. Igualmente, se implementará una encuesta a partir de la cuál obtener el valor de la pesca recreativa mediante el método del coste del viaje (valor revelado). Algunos de estos valores también producirán flujos de caja futuros siendo su valoración una tarea difícil, debido a la necesidad de encontrar un factor de descuento apropiado. El valor actual de cualquier flujo de caja futuro depende del valor temporal del dinero, pero también de la aversión al riesgo



de las personas. Por ello, se utiliza un enfoque de opciones reales para captar los valores adecuados. Esta investigación también considera los métodos que se basan en procesos de elicitación mediante cuestionarios. Se utiliza una encuesta para estimar la disposición a pagar como método común para obtener una evaluación conjunta de algunos valores culturales relacionados con la pesca comercial tradicional (incluidos los conocimientos tradicionales, la importancia de la identidad local). También se utiliza una segunda encuesta para estimar la disposición a pagar de un conjunto de SE culturales (la técnica de pesca, los eventos culturales y la gastronomía, o la hermandad alrededor de algunas especies) relacionados con la pesca recreativa (para un estudio piloto situado en el País Vasco). Estos métodos estructurados comunes introducen el conocimiento empírico de las partes interesadas de una manera que proporciona una buena contextualización. Los métodos estructurados comunes se combinan con las encuestas individuales gracias a la participación de los agentes finales a lo largo de la investigación.

EXECUTIVE SUMMARY (PT)

Este estudo apresenta uma visão geral dos métodos/abordagens de avaliação usados para estimar monetariamente os serviços de ecossistema (SE) providenciados pelos peixes diádromos. Apenas um número limitado de valores, essencialmente relacionados com o aprovisionamento alimentar e a certos SE culturais, pôde ser avaliado, de forma direta, com base em valores de mercado. Para os outros SE foi possível fazer uma avaliação considerando de forma indireta valores de mercado. O transporte de nutrientes, serviço de regulação, foi uma das situações em que esta abordagem indireta foi utilizada - com recurso ao método dos custos de substituição. De forma indireta foi, igualmente, estimado o valor da pesca recreativa por via do método do custo de viagem. Alguns destes valores produzirão também fluxos de caixa futuros, tornando a avaliação uma tarefa difícil devido à necessidade de encontrar um fator de desconto adequado. O valor presente de qualquer fluxo de caixa futuro depende do valor temporal do dinheiro, mas também da aversão ao risco das pessoas. Assim, foi utilizada uma “*abordagem de opção real*” para capturar os valores apropriados. O presente estudo também se socorreu dos métodos que dependem de um processo de licitação utilizando questionários (os chamados métodos das preferências reveladas). Um inquérito foi utilizado para estimar a disposição a pagar para obter uma avaliação conjunta dos SE culturais relacionados com a pesca comercial tradicional (incluindo o saber-fazer tradicional e a importância da identidade local). Um segundo inquérito foi utilizado para estimar a disposição a pagar por um conjunto de SE culturais (a paisagem, a técnica de pesca, os eventos culturais e a gastronomia, ou a irmandade) relacionados com a pesca recreativa (estudo piloto conduzido no País Basco e noutros locais da costa atlântica). Estes métodos estruturados comuns introduzem o conhecimento empírico dos interessados de uma forma que permite uma boa contextualização. As respostas obtidas através dos questionários foram combinadas com respostas coletivas graças ao envolvimento dos interessados identificadas no DiadES em toda a investigação.



EXECUTIVE SUMMARY (FR)

Ce rapport présente un panel de méthodes/approches existant pour évaluer monétairement les services écosystémiques rendus par les poissons migrateurs amphihalins dont les lamproies. Seulement une gamme limitée de valeurs, principalement en lien avec le service d'approvisionnement en nourriture et certains services culturels, a pu être estimée sur la base de marchés réels dans lesquels le comportement des gens peut être observé. De même, les valeurs basées sur les marchés mais indirectement sont aussi considérées dans ce travail. Cette étude propose, par exemple, la méthode du « coût de remplacement » pour évaluer le service de régulation en lien avec le transport de nutriments. Aussi, la méthode du « coût du trajet », via des enquêtes, est aussi explorée afin de fournir une évaluation de la valeur de la pêche récréative. Certaines de ces valeurs produiront des flux monétaires dans le futur mais leur évaluation n'est pas chose facile du fait de la nécessité de trouver un facteur de dépréciation approprié. La valeur actuelle de ces flux monétaires futures dépend de la valeur de l'argent à un temps donné mais aussi de l'aversion de la société vis-à-vis des risques encourus. De ce fait, une approche fondée sur les « options réelles » est utilisée pour évaluer correctement ces valeurs. Ce travail considère aussi des méthodes basées sur le processus d'élicitation via des questionnaires, plus précisément les méthodes dites à « préférences déclarées » impliquant des réponses individuelles. Une enquête est utilisée pour évaluer le « consentement à payer » afin d'obtenir une évaluation partagée de certaines valeurs culturelles associées à la pêche commerciale traditionnelle (incluant le savoir-faire traditionnel, l'importance de l'identité locale). Une seconde enquête est aussi mise en place pour évaluer le « consentement à payer » autour d'un ensemble de services culturels (en lien avec le panorama naturel, la technique de pêche, les événements culturels, la gastronomie, ou encore les confréries) pour la pêche récréative (pour un cas d'étude au Pays Basque et ailleurs sur la façade atlantique). Ces méthodes communes et structurées introduisent les connaissances empiriques des porteurs d'enjeux d'une manière qui permet une bonne contextualisation. Les déclarations des répondants aux enquêtes sont combinées aux déclarations du groupe "DiadES" grâce à l'engagement des porteurs d'enjeux durant l'ensemble de ces travaux de recherche.



1. INTRODUCTION

The rivers in the EU Atlantic Area (AA) support diadromous fish and lamprey populations (henceforth diadromous species), which provide numerous benefits to society known as ecosystem services (ES). These benefits include provisional values such as food, but also values of intrinsic (e.g., maintaining resources for future generations) and cultural importance (e.g., heritage). In this study, developed under the framework of the INTERREG AA DiadES Project, ES linked to diadromous species were identified through an extensive literature review and by consulting local stakeholders from case-study rivers across the AA (i.e., Gipuzkoa and Ulla rivers in Spain, the Loire River and Gironde-Garonne-Dordogne system in France, the Mondego and Minho rivers in Portugal, the Tamar, Frome and Taff rivers in the U.K, and the Three-sister catchment in Ireland.) (See Deliverable WP4.1).

The ES identified as relevant to diadromous species include food provision (provisioning service), nutrient exchanges between coastal and inland habitats (regulating service), and recreational fishing and tourism linked to the societal interest for diadromous species (cultural service). Whilst the contribution of diadromous species to supporting gastronomic festivals and knowledge systems (environmental education and research) also relates to cultural ES.

Quantifying the Total Economic Value (TEV) of ES is a complex task due to challenges encountered when trying to operationalise a common monetary assessment of the ES and obtain appropriate data. Data inaccessibility or lack of empirical evidence, given the lack of time-series of socio-economic data, are regularly cited in the case studies as the main barriers to TEV calculation. Therefore, to explore the socio-economic data availability, we organised interviews with stakeholders. It is important to point out the challenges associated with the data collection for the valuation of diadromous species. We follow the approach of Drakou et al. (2018), who has already identified key data related challenges:

(i) *Knowledge gaps.* The river and marine ecosystem components of ecological function and species interactions are discussed. A lack of scientific expertise and modelled data appears to be a very common gap across the case studies in the AA. And therefore, this important gap limits the possibility of providing an assessment of, for instance, most of the regulating ES. Also, it is difficult to overcome the understanding problem surrounding both the regulating and the cultural ES. Stakeholders find it difficult to understand the intermediate regulating ES and the cultural ES not based on markets (i.e., spiritual experience).

(ii) *Lack of data.* In general, the lack of both modelled and empirical data for each case study makes it difficult to derive the expected values of provisioning and cultural ES. Data collection, like the one underpinning this project, often occurs sporadically and is part of on-going research projects, which seldom have continuity in time and/or location. However, for a high-quality ES assessment and valuation, spatio-temporal data of good quality are essential. Therefore the lack of it is one of the main challenges to tackle. Moreover, data availability and quality differ highly between the indicators for each of the ES categories:



Provisioning ES. Both the temporal and spatial scales are often missing for indicators such as the biomass or abundance of fishes, catches or landings, and the costs of the commercial fisheries. Only for some of the diadromous species included in this research project, good spatial-temporal scale is available. For most of the others, however, it is often only possible to find, for example, catch data at particular times and places. It is even more difficult to find cost data for commercial fisheries. An economic data collection is needed to address these data gaps. However, it should be noted that this kind of survey faces its own challenges as existing data quality varies highly by species and case study. In addition, it is also often driven by monitoring programmes in place (i.e., part of a legal requirement) and may not be in the format needed for this project.

Cultural ES. Difficulties to access existing indicators regarding market and non-market values for certain cultural ES were pointed out. However, the key difficulty is implementing non-market valuation methodologies and assessments due to the high level of human (staff) and economic resources needed.

It can be difficult for stakeholders, scientists, and policymakers to overcome such challenges. The DiadES project represents the first attempt in the AA to support river stakeholders to enhance the comprehensible value attached to the diadromous species. We develop a broad monetary assessment covering the key AA rivers, where we value several ES by following a case-study approach but proposing the employment of commonly and homogeneous methodologies.

The main objective of this deliverable is to describe the methods and approaches applied to recognise the monetary values of ES. The field of valuation has grown substantially in the past 40 years, covering a huge range of valuation techniques required to decide which valuation technique is useful, the conditions under which they can be applied, and their underlying assumptions. This document synthesises the selected methods and how they were applied to be adapted to the valuation of diadromous species in the AA. Some questions guide the research: which valuation methods are applicable based on the ES nature and its associated limitations. For instance, considerable human (staff) and economic resources are needed to provide individual assessment for each ES, making it easier to produce a jointly based assessment. Moreover, which type of values are expected: the values are mainly monetary (absolute or rates), but some physical proxies were estimated. It is also important to specify under which socio-demographic and socio-ecological context the valuation methods were applied.

2. CASE STUDIES IN THE ATLANTIC AREA

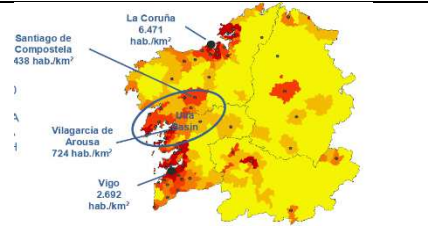


This research considers a set of well-defined nine case studies that engage stakeholders to share their empirical ES-related knowledge (EK) concerning those case studies. These case studies are: (1) the Ulla catchment, (2) Guipuzkoa rivers, (3) Minho catchment, (4) Mondego catchment, (5) Gironde-Garonne-Dordogne system; (6) Loire catchment, (7) Normand-Breton Bay or Gulf, (8) rivers Tamar, Frome, and Taff and (9) Waterford Harbour with the Three-sister catchment. A summary is provided per case study that

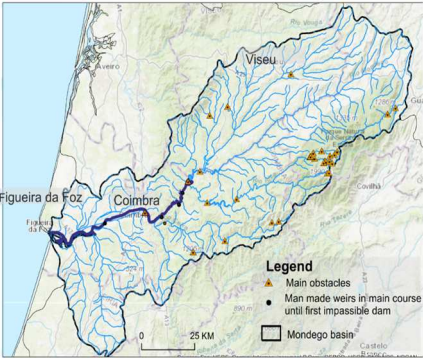
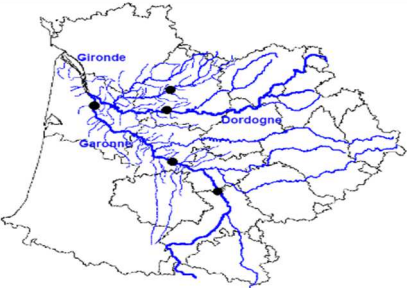


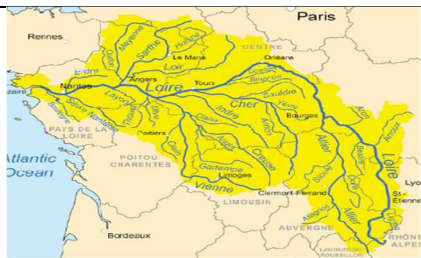
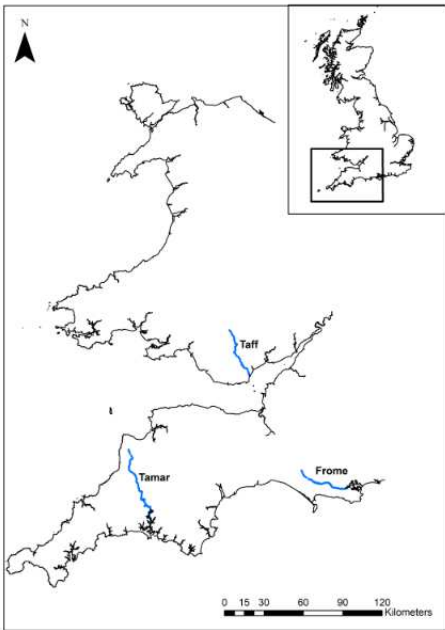
focuses on the ES by considering the key diadromous species relevant for each case study (see Table). The stakeholders' ES selection was not based on their use of the ES but their knowledge of the biological status of the diadromous species and their potential ES. The economic assessment of the ES identified by those stakeholders was based on both market data and non-market data reflecting the total economic value of the ES.

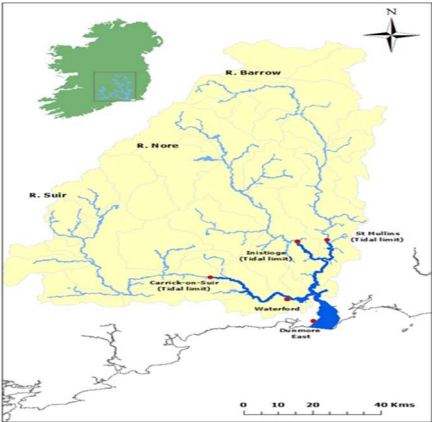


Table 1. Case studies in the Atlantic Area for which an assessment of the ecosystem services provided by diadromous species was proposed. No information was provided in the end for the Normand-Breton Gulf.

Case study	Provisioning ES	Cultural ES	Regulating ES
 <p>Ulla catchment</p>	<p>Several of the species of interest supported, in the past and also currently, the provision of ES in the area: sea lamprey (<i>Petromyzon marinus</i>), European eel (<i>Anguilla anguilla</i>), Atlantic salmon (<i>Salmo salar</i>), European flounder (<i>Platichthys flesus</i>), sea trout (<i>Salmo trutta</i>), and twaite shad (<i>Alosa fallax</i>). However, only three of these species are commercially exploited, supporting provisioning ES, and are relevant in terms of cultural ES: sea lamprey, European eel, and European flounder.</p>	<p>Gastronomy events and/or food festivals are significant in this case study. Also, the recreational fishery around the Atlantic salmon provides important cultural ES considering that the Ulla River is the second most important river in Galicia for recreational anglers.</p>	<p>Provide important regulating ES in the form of nutrient transportation. DiadES will provide an estimation of the nutrient transportation regulating service provided by allis shad (<i>Alosa alosa</i>) during their migration between continental and marine waters.</p>
 <p>Gipuzkoa rivers</p>	<p>Most diadromous species disappeared from the rivers of Gipuzkoa before the 1980s. Thus, all provisioning ES disappeared as the stocks no longer could support commercial fisheries.</p>	<p>The most important cultural ecosystem services identified are provided by the European eel. This stock supports activities such as gastronomy, recreational fisheries, environmental education, and scientific knowledge. Other non-market-based cultural ES services have been identified, such as natural heritage (the existence values around the diadromous species) and spiritual ES (the satisfaction of knowing that diadromous species are recolonising the rivers due to the increase of the habitat quality).</p>	<p>Provide important regulating ES in the form of nutrient transportation.</p>
 <p>Minho catchment</p>	<p>Sea lamprey, allis shad, and European eel are the species most targeted for commercial fisheries in the Minho River.</p>	<p>Allis shad, twaite shad, Atlantic salmon, and sea trout are targeted for recreational fishing in the River Minho. Allis shad, twaite shad, sea lamprey, European eel, and European flounder are associated with high gastronomic interest, with several annual gastronomic festivals taking place. Pesqueiras (traditional local stone structures for sea lamprey, allis shad, twaite shad, and Atlantic salmon) occurring in the upper part of the international Minho River. In Portugal and Spain,</p>	<p>Sea lamprey and European flounder have been reported as main players in nutrients and sediments distribution along the River Minho because of their dietary behaviour</p>

Case study	Provisioning ES	Cultural ES	Regulating ES
 <p>Mondego catchment</p>	<p>One hundred licensed fishers annually target sea lamprey and, in particular, allis shad and twaite shad in designated areas in the upper and lower estuary. Additionally, the European eel is also an important species for commercial fisheries in this river basin.</p>	<p>these structures are recognised as of high cultural heritage value.</p> <p>Amongst the diadromous species present in the Mondego River, sea lamprey, allis shad, and European eel are the most valued species and enrolled in several gastronomy events. The high emotional involvement of the population is highlighted by the existence of a sea lamprey brotherhood. Several previous or on-going research projects have targeted these fish populations through an integrated approach, namely sea lamprey, shad, eel, sea trout, and thinlip grey mullet (<i>Chelon ramada</i>). The heritage and cultural identity value around European eel and even more so the sea lamprey are highlighting how the species shaped local livelihoods and traditions that are still present in local communities.</p>	<p>A general agreement exists regarding the importance of diadromous species in nutrients and sediments distribution</p>
 <p>Gironde, Garonne and Dordogne system</p>	<p>Important diadromous species-related commercial fishing activities provide key food provisioning ES in the region. Sea lamprey, European glass eel, yellow eel, and allis shad have contributed to the food provision. Due to the favourable twaite shad stock evolution, currently providing under-documented and probably limited services, Option values will be used to assess the economic value attached to these future opportunities.</p>	<p>An important science and research activity around diadromous species is taking place in the area contributing to the cultural ES. European sturgeon followed to a lesser extent by European eel, salmon, sea trout, allis shad, twaite shad, sea lamprey, and river lamprey.</p>	<p>All diadromous species in the area were recognised as providing regulating ES. However, the present assessment will only provide the contribution for allis shad to the nutrient fluxes between marine and fresh waters.</p>

Case study	Provisioning ES	Cultural ES	Regulating ES
 <p>Loire catchment</p>	<p>Those diadromous species provide a large set of ES. For example, allis shad, twaite shad, sea lamprey, river lamprey, European eel, and thinlip grey mullet support food provisioning ES.</p>	<p>These species also contribute to the cultural ES, such as traditional know-how, and support gastronomy events and research-related activities.</p>	<p>All diadromous species in the area were recognized as providing regulating ES. However, the present assessment will only provide the contribution for allis shad to the nutrient fluxes between marine and fresh waters.</p>
<p>Tamar, Frome, and Taff rivers</p> 	<p>Tamar: ES are only associated with commercial landings of Atlantic salmon, European eel, and mullet, although landings of salmon and eel have ceased in most recent years due to regional and international declines in stocks.</p> <p>Frome: data on commercial catches, issued licenses, days fished for salmon are collected. Also, commercial catch of eel for the years 2005–2018.</p>	<p>Tamar: Cultural ES are supported by recreational fishing for salmon, sea trout (fly fishing), sea/estuary angling for flounder. Recent and historical fisheries for Atlantic salmon and European eel used traditional methods, with plans for the clinker-built vessels used in salmon netting held by the National Maritime Museum, Greenwich, London, due to their regional importance. The presence of diadromous species, such as salmon and sea trout, also supports cultural services, such as physical and experiential interaction with outdoor spaces, contributing to wellbeing benefits to river users, including walkers, boaters, kayakers, and education activities.</p> <p>Frome: recreational catch data on sea trout is collected by the EA and was provided for the year 2018-19 only. It is also important to the recreational fishers and the cultural value of traditional fishing (Poole harbour canoe) for thinlip grey mullet.</p> <p>Taff: Cultural ES provided by diadromous species, include recreational angling, with fly fishing for Atlantic salmon and migratory brown trout or sea</p>	<p>Tamar: Regulating ES, in particular exchange of nutrients from marine to freshwater environments, are provided by all diadromous species present in the Tamar site, as are roles in biological cycles and contribution of genetic material.</p>

		<p>trout supporting clubs and membership and a lot of interest. Diadromous species are also of interest to people undertaking recreational activities on the river, especially in Cardiff, where swimming, stand-up paddle boarding, and canoeing bring people into contact with diadromous species.</p>	
 <p>Waterford harbour and the Three-Sisters catchment</p>	<p>Provisioning services related to diadromous species were supported by salmon and eel populations. However, these services have declined due to conservation regulations linked to reduced regional and international fish populations. Commercial fishers in the region, based at ports such as Dunmore East, land insignificant catches of mullet and flounder. The commercial eel fishery was only carried out in a few locations in transitional waters and lagoons, with the majority of effort focused on lakes and rivers. Eel fishing in Waterford consisted of baited pots.</p>	<p>Commercial fishing for salmon in the region has, until 2014, supported culturally important traditional methods, whose origins can be traced back to the 1500s. This fishery supported the fishing method of 'snap netting,' using a net fished between two small flat bottomed narrow boats ('cotts') traditional to the Waterford area and the Three Sisters estuaries. This fishery operated exclusively for salmon, but shad (both twaite and small numbers of allis shad) comprised a bycatch. Cultural ES are also supported by leisure angling, in particular twaite shad, which is targeted by generalist and specialist anglers. In recent years, salmon fishing has been mainly limited to "catch and release."</p>	<p>All diadromous species in the area were recognized as providing regulating ES. However, the present assessment will only provide the contribution for allis shad to the nutrient fluxes between marine and fresh waters.</p>

3. METHODS DESCRIPTION

Valuation implies the application of methods to recognise values provided by diadromous species. These values might assist the design of policy tools and instruments for diadromous species conservation.

The DiadES project aims to assess the diadromous species physical biomass, which is what these species contribute to the aquatic ecosystems and their associated services. The physical biomass assessment in itself is not the objective of this chapter. This section focuses on the monetary assessment methods. The value of diadromous species can be derived from what is happening at markets (e.g., sales of fish for consumption and other cultural services). Therefore, this knowledge can be captured through behaviour or revealed preference methods. Diadromous species provide a range of monetary values that cannot be estimated through market observation alone. Thus, questionnaires were used to elicit these values, and under this approach, we applied the stated preferences methods. Statement-based methods allow the valuation of how a stakeholder or community holds the relative importance of diadromous species based on the statements made in response to the questionnaire. The stated preference methods, in contrast to the behaviour-based methods, allow the estimation of economic values based on real markets information (i.e., producers and consumers).

Choosing the right methods relied on the importance of the different ecosystem services provided by diadromous species, the data availability across the case studies, and the final purpose of the work. A summary schematic is presented in Figure 1.

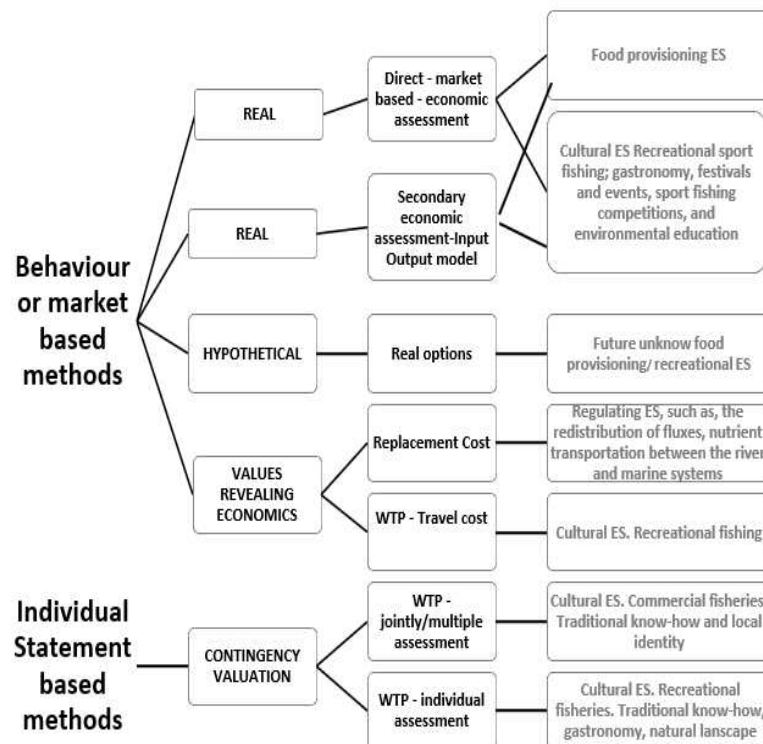


Figure 1. Valuation methods applied to diadromous species ES valuation

3.1 Behaviour or market-based methods

3.1.1 Direct economic assessment for food provisioning and cultural ES

Only a limited range of values can be assessed based on the market observation and, therefore, based on what people do at those markets: that is, people's behaviour in markets (first-sale prices, consumer's demands, producers' outputs). Thus, the information to provide economic assessment was derived from market available data. Table 2 summarises the data needed and used to provide an ES valuation based on market values directly coming from markets. The market method is used primarily for the monetary assessment of provisioning ES – fish food provisioning and for the qualitative and quantitative assessment of certain cultural ES.

Concerning food provisioning, the most common assessment is based on estimating landings of fishes caught valued at first-market prices. In some specific cases, cost information (including variable and fixed costs) was available but not generally used under the common approach followed by the DiadES project. That market-based assessment was completed with quantitative but descriptive indicators such as the number of commercial fishing licenses and vessels and jobs.

The provisioning ES value is said to be the “direct effect” from the commercial activity of diadromous species on the economy. However, the present research considered the multipliers from the input-output models of the different regional economies to assess the “secondary effects,” which implied the assessment of the economic impact on the regional economy due to the initial direct effect.

Market values were also obtained to assess certain cultural ES by following different approaches for identifying and valuing those cultural ES:

- (i) recreation sport fishing, which is assessed through the total expenditures needed to develop that activity, but also, using some proxies such as the purchase of permits or licenses or the number of boats and jobs. Multipliers effects were also estimated.
- (ii) gastronomy involving the species, the festivals or events, the art and folklore, which are assessed from retail prices at restaurants, or the number and expenditure due to gastronomic festivals or events.
- (iii) sport fishing competitions.
- (iv) potential for environmental education and research, which is assessed using public data on public projects funded on diadromous species and considering the public costs of different environmental education actions.

3.1.2 Secondary economic assessment for food provisioning and cultural ES

Multiplier effects were also estimated using the so-called Input-Output (IO) tables (Leontieff 1986). The provisioning ES value is said to be the “direct effect” from the commercial activity of diadromous species on the economy. However, this research considers the multipliers from the input-output models of the different regional economies to assess the “secondary effects,” which implies the assessment of the



economic impact on the regional economy due to the initial direct effect. Similarly, these IO models were used for getting the secondary effect attached to the market-based cultural ES.

However, although national input-output tables are commonly created by countries' statistics agencies, regional input-output tables are not common. Indeed, except for the cases studies of Galicia and the Basque Country, which publish regional IO tables, this information is not available for the remaining cases. In any case, it might be considered the option of using the national IO Tables as a proxy of the value.

3.1.3 Values revealing economics

3.1.3.1 A replacement cost approach – nutrient cycling service

The revealing values are also based on market values but apply an indirect use of these. This research involved a replacement cost approach to assess regulating ES, such as the redistribution of fluxes nutrient transportation between the river and marine systems. This is one of the most relevant regulating services attached to diadromous species. This research analyses the pilot case around this regulating service provided by allis shad (*Alosa alosa*) during their migration for the nine case studies considered in the DiadES project.

This species is involved in a nutrient transportation process in the water column (through reproduction activity and excretion) and between water and sediment (during excretion and decomposition). Shad provides nutrients to the water during their seasonal migrations. The total nutrient load, i.e., the amount of Nitrogen (N) and Phosphorus (P) supplied by shads, can be calculated in the nine watersheds. The total nutrient load imported into estuaries was calculated by summing the carcass decomposition from in-migrating spawners, their gamete emission, and their excretion. The total nutrient load exported from an estuary was calculated from the out-migrating juveniles. Subtracting exported load from the imported load provides the total nutrient load.

A nutrient calculator implemented in a mechanistic species-distribution model called GR3D (Global Repositioning Dynamics for Diadromous fish Distribution) was developed by INRAE (Poulet et al., 2021) to help understand the nutrient load associated with shad species. The routine automatically computes the nutrient load over time based on the number of living and dead individuals. Results were averaged over the 1900–1930 period, under no human-generated influences (Figure 2).



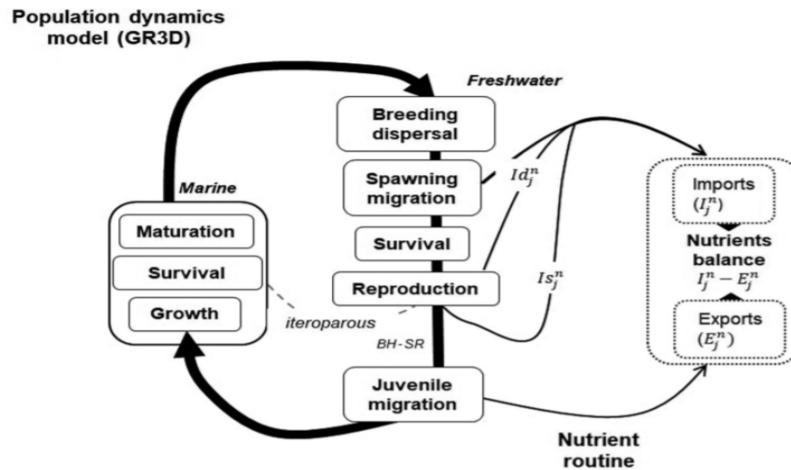


Figure 2. Structure of the GR3D from Poulet et al. (2021)

The replacement cost approach is a hypothetical approach based on indirect market prices selected in the context of this research to provide an economic assessment related to this service. Previous literature is scarce in this respect. Morton et al. (2017) utilised the price of fertilizer pellets applied during the restoration efforts on the Keogh River in British Columbia (Canada). No previous estimations were found for any diadromous species in any of the case studies selected across the Atlantic Area.

Given the broad dimension of this pilot study, a large approach was selected considering the composition of P and N in fertilizers. Commercial fertilisers exist in many different compounds and packages. The contents of these fertilisers and nutrient ratios are typically defined as required under European Union (EU) law. The European Commission (EC) instructed this research to consider Diammonium Phosphates (DAP) composed of 18% N and 46% P, Urea (Urea) composed of 46% N, and the Triple Super Phosphate (TSP) composed of 48% of P^2 . The fertilizer prices over the last decade showed a high correlation (70%) between the composed fertilizer DAP and the TSP prices, and, as it is expected, go down until the 30% correlation between DAP and UREA (Source: Index Mundi with fertilizer week, fertilizer international and the World Bank).

3.1.3.2 A recreational angling survey - Willingness to Pay (WTP) and other features

This research designed and developed a set of nine questionnaires to assess the cultural ES related to the most important ES provided by diadromous species across the AA, that is, the recreational sport fishing (angling) service. An indirect method was used to estimate ES based on the relationship between fishers and the activity itself, the behaviour through transactions identified in some measured costs,

² <https://ec.europa.eu/info/food-farming-fisheries/trade/agriculture-markets-and-prices>

the travel costs incurred to develop the sport fishing activity. The fisher's willingness to pay or to incur cost of travel reflects their interest and their willingness to provide money to enjoy the sport fishing experience.

The DiadES project designed a common survey to be developed across the case studies in the AA, which includes questions to apply the travel cost method. The questionnaire included the *background and activity* with a set of 14 questions covering topics such as: (i) the personal attitude to nature and outdoor recreation; (ii) the choice of fishers concerning the natural aquatic system (coastal and sea areas, or rivers) to develop the activity and the target species mostly captured; (iii) data on the fishing activity (catch and release, fishing effort -days, hours-); (iv) the most visited rivers across the AA; and (v) the identification of the factors that motivate fishers (i.e., to spend time with family and friends, for the fishing experience, or to eat fish caught by themselves). This first block of information is followed by a second one composed of four additional questions related to the *economic issues*. This section includes questions on how much fishers expend on fishing trips. The survey finishes with socio-economic and socio-demographic questions. The questionnaire template can be found in Appendix A, general enough to be applied elsewhere; The specific example given was the one for the U.K. case studies. The survey was used for 3 case studies over 9.



DiadES WP 4 – Action 2 – Methodologies to assess the ecosystem services provided by diadromous species

Table 2. Data (variables, indicators, models) based on markets required to estimate ES provided by diadromous species

ES identification			
ES classification	CICES 5.1 Division/group/class	ES	Data/indicators/models
Provisioning services	Biomass (wild animals and their outputs)	Food provision	<ul style="list-style-type: none"> - 1.1 Biomass or abundance of fishes (from biological models) - 1.2 Estimated harvest based on official reporting - 1.3 Market prices (first sales prices) – catch and/or prices - 1.4 Cost information on the commercial diadromous fisheries (fixed/variables costs) - 1.5 Others: descriptor indicators such as number of jobs, vessels, and licenses - 1.6 Others: Input-output general models: multiplier effects for the catchment areas
Cultural services	Physical and experiential interactions with the natural environment	Recreation sport fishing	<ul style="list-style-type: none"> - 2.1 Total expenditure needed to develop the recreational fishery (for each species). In some cases, more than one species is part of the same recreational fishery - 2.2 Proxies: rent or purchase of permits before recreational fishing – sale of fishing licenses, number boats, jobs. - 2.3 Others: Input-output general models: multiplier effects - 2.4 Willingness to Pay (WTP) (travel cost methodology)
	Intellectual and representative interactions with the natural environment	Sport fishing competitions	<ul style="list-style-type: none"> - 3.1 Total expenditure based on market values
	Intellectual and representative interactions with the natural environment – Characteristics of living systems that are resonant in terms of culture or heritage	Gastronomy around species and emotional brotherhood	<ul style="list-style-type: none"> - 4.1 Market values for Gastronomy: - 4.2 Retail prices at restaurants - 4.3 Quantity (Kg) sold at restaurants - 4.4 Number of gastronomic festivals or events
		Gastronomic festivals or events	<ul style="list-style-type: none"> - 4.5 Number of people attending/participants the festival or events - 4.6 Expenditure related to the festival or event - 4.7 Number of representations of Art and folklore
		Art and folklore	<ul style="list-style-type: none"> - 4.8 Others: Input-output general models: multiplier effects
Regulating services	Characteristics of living systems that enable scientific investigation or the creation of traditional ecological knowledge	The potential for environmental education and research	<ul style="list-style-type: none"> - 5.1 Publicly available data on public projects financed on diadromous - 5.2 Publicly available data on environmental education action costs - 5.3 Private cost on different environmental education actions - 5.4 Other descriptor indicators such as the number of beneficiaries/participants from the environmental education actions - 5.5 Others: Input-output general models: multiplier effects
	Characteristics of living systems that enable education and training		
Regulating services	Redistribution of fluxes, nutrient regulation (i.e., energy and matter, upstream, downstream inputs)		<ul style="list-style-type: none"> - 6.1 A replacement cost approach will be used (estimating the cost of replacing the provided services) - 6.2 Nutrients transportation (amount of net imported nutrient – nitrogen...) - 6.3 General prices of fertilisers (nitrogen-based fertilisers, ...) or alternatively



3.1.4 Option Value: future unknown ES (food provisioning, recreational fishing)

The value of an asset stems from its future cash flows. As long as the latter are certain, the valuation problem comes down to identifying the appropriate discount factors to translate these future cash flows into their present equivalents. Abadie and Chamorro (2013) explain how the uncertainty in future cash flows raises two issues. First, the present value of future cash flows depends not only on the time value of money but also on investors' risk aversion. Thus, these authors state that either discount factors are enhanced to take account also of suitable risk premiums, or it is replaced the anticipated flows by their certainty equivalents. However, deriving risk premiums becomes burdensome when the cash flows are a non-linear function of the underlying stochastic variable.

Given the uncertainty surrounding the exploitation of diadromous species for which stock and future market prices are unknown, the future (i.e., food provisioning and recreational) values do not depend exclusively on past information but more on future information. American options, which can be exercised at any time up to expiration, are used as the economic tool to estimate those future values. This research followed Longstaff and Schwartz (2001), who presented a powerful new approach for valuing American options, the so-called Least Squares Monte Carlo approach. At any time prior to the option maturity, the holder compares the payoff from immediate exercise with the expected payoff from continuation (i.e., from keeping the option unexercised). Maximising the value of the option entails choosing the optimal time to exercise it, which is the first time that the exercise value surpasses the continuation value. The optimal exercise strategy is thus determined by the conditional expected payoff from keeping the option alive. To estimate this conditional expectation, first one runs a number of simulation paths of the state variables; second, then one determines the optimal exercise time by backward induction. At any point in time (starting from the end), each path generates one observation on the optimality of exercising or not for that path. Using cross-sectional regressions, it is possible to estimate when it is optimal to exercise for a given date and state variable values by using least squares and solve recursively backward. European call options will also be estimated to learn the early exercise price.

The present project developed some pilot studies to calculate the option value for specific ES. Take, for instance, the future option value of European eel recreational fisheries in Gipuzkoa rivers or the future value of food provisioning from allis shad in the Gironde-Garonne-Dordogne system if the population is recovering.

3.2 Statement-based methods for cultural ecosystem services

These methods describe the valuation process followed, including the elicitation process and the value indicator used, to articulate the final monetary value. A set of surveys or questionnaires to elicit market values was developed. The methods using questionnaires are called stated preference methods.



The elicitation process was developed using a set of multidisciplinary questionnaires involving individual respondents (Fischhoff, 1991; Satterfield, 2001). The questionnaires were built to cover, on the one hand, a set of informative questions (narratives on the different cultural ecosystem services – non-market based) and, on the other hand, a set of questions that value outputs. They will help, when applying a contingency valuation, to get knowledge on the intrinsic value of certain cultural ES. Two different questionnaires were designed, although necessary adaptations were introduced across case studies. The first one was designed to catch the cultural value of the commercial fisheries for diadromous species, whereas the second one was focused on the value of cultural aspects attached to recreational fisheries for diadromous species.

The templates of the surveys are provided in Appendix B – including commercial fisheries-related 7 surveys – and Appendix C – including one additional survey for the Gipuzkoan rivers (Spain) of the recreational fishery for diadromous species. The description of the surveys and the cultural ES considered are explained in the following subsections.

Economic valuation method

To estimate the economic value of the cultural services attached to commercial and recreational fisheries, a contingent valuation exercise was implemented (Alberini and Kahn, 2006). Respondents were asked about their willingness to pay (WTP) for preserving the existence of certain commercial fisheries or recreational fisheries (depending on the case study). The payment proposed was a ‘once in a lifetime donation,’ and the money raised would be exclusively used for that program. Respondents were presented with a payment card (ranging from €1 to €xx) to select their maximum willingness to make. The resulting interval that bounds the respondents’ choices was modelled using the analytical approach developed for payment cards by Cameron and Huppert (1989). In this framework, the WTP of the individual i is assumed to be comprised between the lower ($A_i LOW$) and the upper ($A_i UP$) intervals around its stated WTP from the choice card:

$$A_i LOW < WTP_i < A_i UP$$

Thus, the probability that the WTP_i lies between $A_i LOW$ and $A_i UP$ will be:

$$\Pr(A_i LOW < WTP_i < A_i UP) = F(A_i UP) - F(A_i LOW)$$

where F is the cumulative distribution function for WTP_i . Therefore, the respondent’s WTP was estimated using the log-likelihood function:

$$\ln(L) = \sum_{i=1}^n \ln[F(A_i UP) - F(A_i LOW)]$$

where n is the number of individuals in the sample, respondents



To obtain some degree of heterogeneity, an explanatory analysis of the WTP was performed using a set of socio-economic variables (age, monthly salary, educational level). Those variables measured qualitatively were categorised.

Those individuals/respondents with $WTP = 0 \text{ €}$ were identified as true zeros, but they were included in the average WTP calculation. The average WTP was estimated as $-\ln(1 + \exp(a))/\beta$, where a represents the 'grand' constant (Domínguez-Torreiro and Soliño, 2015) and β the coefficient associated with the bid. The 95% confidence interval for the average WTP was estimated using the Krinsky and Robb (1986) bootstrapping technique with 1000 replications.

3.2.1 Willingness to Pay (WTP) – cultural services of traditional commercial fisheries know-how and local identity

Within the context of the economic assessment for this project, the survey used for each case study included around 40 questions, depending on the case study. The survey had not only the questions from which information is derived to develop the economic assessment but also questions to describe the context under which the evaluation was carried out. Initially, a set of general questions was posed to know the connection of the respondents to the rivers/coastal areas and the surveyed commercial fisheries: i) about the family/friends connection with the fishing industry; ii) knowledge about commercial fishing itself; iii) how many times the respondents walk or drive along the surveyed areas, even if the respondents have ever noticed the fishermen's fishing gears; and iv) the activity (fishers unloading their catch or fishing in their boats). The survey also identified the extent of the respondents' affinity to ports, commercial fisheries and their importance for the local economy and the local identity, amongst other aspects. After the general overview questions, the respondents were informed about the necessity of investing to maintain the presence of traditional commercial boats, fishing techniques, and fishers in the different surveyed areas. Respondents were asked about their willingness to pay to keep those fisheries as a feature of the various ports, harbours, coastal regions. Also, they were requested about the primary reason when they were not willing to contribute. Lastly, the survey introduced some additional socio-demographic questions.

It is key to remark about the temporal scale of the evaluation that was done once based on the outputs get in 2021. Thus, a static photo "snapshot" was produced. In the DiadES case studies for which a survey has been designed and implemented (Table), a total number of 7 surveys were distributed between Spain (2), Portugal (3), France (1), and the UK (1).

Multiple valuation is a key aspect of this research, aiming to obtain multiple values using a joint valuation process. Through these surveys, a joint assessment was performed to determine the cultural value related to the traditional commercial fisheries, including the traditional know-how (specific fishing techniques are used and valued) and the importance of the local identity. The methodology is bringing these cultural values together. However, even when the method avoids explicit weighting, individuals were implicitly



required to introduce weighting indirectly when they rank options. Respondents should specify why they chose to make a payment but also, they answered a specific question designed to rank some options helping to apply a potential weighting.

An example taken from the River Frome case study questionnaire is provided below:

I chose to make a payment because I like seeing traditional fishers and their boats out in the harbour.
 I chose to make a payment because I like to know that there is traditional fishing taking place in Poole Harbour.
 I chose to make a payment because I like seeing the fishing gear on the quayside.
 I chose to make a payment because I like seeing the traditional fishing boats moored in or near the Fisherman's Quay.
 I chose to make a payment because I like to watch the fishing boats leaving from and returning to the Fisherman's Quay.
 I chose to make a payment because I like to watch the fisher's landing their catch.
 I chose to make a payment because traditional commercial fishing is part of Poole's identity.
 I chose to make a payment because Poole would not be the same without traditional fishers working in the harbour.
 I chose to make a payment because I want to eat locally caught mullet.
 I chose to make a payment because it attracts tourists and is important for the local economy.

Table 3. List of DiadES case studies included in the cultural heritage analysis of commercial fisheries

Nb	Case Study	Commercial fisheries and target species	Main purpose and willing to pay as a one-time payment to
1	Minho catchment_1	Traditional commercial fishing of sável, mixão, and lampreia in the River Minho by boat. In particular, the questionnaire focuses on the boats moored on the Portuguese side of Minho between Caminha and Valença, the fishing gears used ("lamprey", "trammel net", "canvas" and "tela") and the fishers who practice such boat fishing.	The Rio Minho Fisheries Fund to Minho River can build new markets along the Minho River and implement the new system of certification of authenticity and thus ensure that the fleets dedicated to traditional fishing of sável, mixão, and lampreia fishery is maintained and, at the same time, ensure that the boats, nets, and fishers remain a feature of the Rio Minho
2	Minho catchment_2	<i>Pesqueiras</i> are stone walls built in the River Minho in the Middle Ages. The lampreys swim between the spaces defined by the <i>pesqueiras</i> and are captured by means of artisanal fishing nets called <i>botirão</i> and <i>cabaceira</i> and that the fishers place in the space defined by the <i>pesqueiras</i> .	Minho River Fisheries Fund to conceptualise and implement training programmes for the local population to ensure the future continuity of traditional lamprey fishing by the <i>pesqueiras</i> .
3	Mondego catchment	Traditional fishing of lampreia and sável, using a vessel in the Mondego River. In particular, the questionnaire focuses on commercial fishing boats using jiggers, gillnets and driftnets gillnets and trammel nets for lamprey and shad fishing and that dock at Gala Harbour.	Mondego River Fisheries Fund to Rio Mondego can ensure that the small port of Gala has the infrastructure to support the professional lamprey and shad fishing fleet on the Mondego River, ensuring that the boats, fishing nets and fishers will remain a feature of the Mondego River.
4	Garonne/Gironde/ Dordogne system	Commercial fishing in the Gironde estuary and the Garonne and Dordogne rivers, i.e., from Royan in the west to Casseuil (Garonne River) and Castillon-la-Bataille (Dordogne River) in the East, including the Isle to Coutras. This survey focuses on fishing ports in the estuary and home ports and pontoons in the river area.	Ensure that fishing harbours/ports, moorings and pontoons can continue to accommodate professional fishers on the Gironde estuary and the Garonne, Dordogne, and Isle rivers, allowing boats, gear and fishers to remain a significant feature of this geographical area.
5	Frome river	This survey relates to traditional commercial fishing in Poole Harbour, and, to the Fisherman's Quay next to The Quay, where the harbour's fishing boats are moored.	Maintain the fisheries infrastructure in the Fisherman's Quay, so that it can host a traditional commercial fishing fleet, allowing traditional fishing boats, nets, and fishers to remain a feature of Poole Harbour.
6	Ulla catchment_1	Commercial fishing vessels that dock in the ports of Carril, Rianxo and Pontecesures, the fishing gear used and the fishers working on these vessels.	The <i>Patronato del Rio Ulla</i> to ensure that the ports of Carril, Rianxo and Pontecesures can host a commercial lamprey/eel/solla fishing fleet on the River Ulla, allowing these fishing boats, nets, and fishers to remain a feature of the River Ulla.
7	Ulla catchment_2	Traditional artisanal sea lamprey fishery in the river Ulla by means of <i>pesqueiras</i> in the area between Pontecesures and Herbón.	The <i>Patronato del Rio Ulla</i> to finance the maintenance of the <i>pesqueiras</i> and ensure that the traditional small-scale sea lamprey fishery can continue.



3.2.2 Willingness to Pay (WTP) – cultural services of recreational fisheries in Gipuzkoa Rivers

A second survey was designed as a pilot study covering several cultural values related to the recreational fisheries for European eel developed in the Basque Country (Gipuzkoa Rivers). This pilot study is important to emphasise the high relevance of these cultural values even though there are no commercial fisheries, which are completely forbidden in the Basque Country. The survey considered the rivers Deba, Urola, Oria, Urumea, Oiartzun, and Bidasoa, in the Basque Country, considered the "cradle of the eel", where European eel fishing is a traditional activity that has been practised for many centuries. The name "anguleros" is attributed to those who catch European eels with the help of a wooden sieve ("cedazo") and a lantern along the rivers. Originally, the consumption of eels was a practice exclusive to the Basque Country, but it later spread to the rest of Spain and the Atlantic Area.

The survey started getting evidence about the respondents' knowledge about the recreational fishery of the European eel in the Gipuzkoa rivers. Later, the survey introduced one by one some of the main cultural elements concerning the recreational fishery: (i) the fishing technique used from ship and shore; (ii) cultural events, gastronomy, and brotherhood around the European eel; (iii) the natural see sight, the natural landscape and it together with the boats (alone) or even, the fishers in their boats. For each of those cultural elements, the respondents stated their willingness to pay to protect and maintain these elements and provide reasons for a zero value. The survey finished by introducing some additional socio-demographic questions (Table), producing a value for each cultural element in a disaggregated way for each listed cultural ES. This assessment was carried out in this manner once in 2021.

Table 4. Pilot study: cultural heritage of European eel recreational fisheries in the Gipuzkoa rivers

No.	Case Study	European eel recreational fishery	Main purpose and willing to pay a regular payment to
1	Gipuzkoa rivers	Fishing methods are mostly artisanal and specific to the capture of eels, being carried out from the shore (land) or small boats. The main fishing gear used is the traditional <i>cedazo</i> or <i>baia</i> , which consists of a frame (circular or rectangular) that holds taut a fine mesh (metal or plastic) and is attached to a wooden hand.	Guarantee the existence and conservation of recreational fishing using boat-based traps (<i>cedazos</i>)
2			Guarantee the existence and conservation of recreational fishing from the shore-based on traps (<i>cedazos</i>)
3		Festive events, brotherhoods (gastronomic societies), authentic gastronomy culture around the European eel in the Basque Country.	To enjoy in adequate conditions and without overcrowding each of the festive events and social practices
		The natural landscape itself with the traditional boats provides an important cultural service. The last kilometers of the river Oria before it flows into the sea have been the scene of intense fishing activity for centuries around European eel and even salmon.	To discover and enjoy the fishing landscape with traditional boats with adequate services and conditions; and without overcrowding



3.2.3 Group-statement through stakeholder engagement

This research follows a mixed approach in which common structured methods (see previous sub-sections) are used as key tools to conduct the economic assessment. Still, those methods were introduced in a manner that integrates the empirical knowledge (narratives) of the involved stakeholders. Thus, both quantitative and contextualising qualitative information are produced. Respondents' statements from surveys are combined with group-statements. Indeed, from the beginning of the project, interactions between the scientists (providing economic values) and the rest of the participants (including administrations, fishing sectors, and biologists) have been very important in identifying benefits but also some problems. Participant engagement has followed an interactive-deliberative process that includes repeated interaction in relation to the preliminary identification of the ES, which later are evaluated in economic terms. The group discussions began with the organisation of a focus group in which an initial identification of the ES for each case study was developed. Minimum information on ES literature (concepts and classification) was provided to all stakeholders during the focus group to follow an informed-oriented focus group. All participants had experience working with diadromous species in each geographical region but did not have previous knowledge of ES. After that initial stage, information for each case study was collected and used to develop a description of the case study, the biological state of the diadromous species, and the ecosystem services potentially associated with each case study (see Deliverable WP6.3). In addition, a set of specific questions was completed by the group related to (i) species supporting ES; (ii) the human activities supporting ES; (iii) the existence or not of previous economic values concerning the different ES, (iv) the stakeholders' groups involved (i.e., non-governmental organisations, government administrations, fishers, scientists); (v) the identification of the trade-offs between ES related activities and other activities using the same habitats (e.g., environmental impacts affecting the ES) and finally, and (vi) new opportunities in the region associated to the identification and evaluation of the ES. These questions are broadly explained in DiadES *Deliverable 6.3. Case study description and ecosystem services data collection*.

Around 40 stakeholders took part across the different stages of the research, that is, environmental and fisheries authorities and agencies (18), Non-Governmental Organizations, NGOs (2), fishers (2), and anglers' federations (4) completed by the biologists (15). These stakeholders participated in the project either as data and knowledge providers and/or just attended the organised meetings to get information about the project outputs.

4. Conclusions

The valuation of the ecosystem services associated with diadromous species implies using a range of methods with which an explicit monetary assessment can be provided. The methods exposed are not new, but the novelty relies on their application to the diadromous species in the AA. Integration of the different



values is a difficult but desirable task, providing policy makers with a comprehensive output. The use of statement-based valuation techniques can complement the most traditional market-based valuation, but the quality of the valuation is highly dependent on the elicitation procedure. Moreover, another improvement is linked to stakeholder involvement. The methodological approach followed here has contributed to the development of a more participatory approach, which engages stakeholders (both internal and external of the project partnership) from the beginning of the study. Therefore, the individual answers from designed surveys are also complemented with a group statement.

5. Acknowledgments

The authors are grateful for the support of the survey from the Rivers Trust, Angling Trust, and the National Mullet Club as well as the Poole and District Fishermen's Association and Poole Harbour Commissioners in the U.K. The partnership also wants to thank Jacqueline Rabic (aadpped33), Emilie Rapet (aadpped33), and Lis Mas (CAPENA) for their expertise on the commercial fisheries survey for the Gironde-Garonne-Dordogne case study.



6. References

- Alberini, A., Kahn, J.R., 2006. Handbook on Contingent Valuation. <http://dx.doi.org/10.4337/9781845427917>. North 449
- Cameron, T.A., Huppert, D.D., 1989. OLS versus ML estimation of non-market resource values with payment card interval data. *Journal of Environmental Economics and Management* 17, 230-246.
- Domínguez-Torreiro, M., Soliño, M., 2015. Dealing with uncertainty in public preferences for rural development policies: a contingent valuation survey. *Reg. Stud.* 49, 555–567. <http://dx.doi.org/10.1080/00343404.2013.783694>.
- Krinsky, I., Robb, A.L., 1986. On approximating the statistical properties of elasticities. *Rev. Econ. Stat.* 68, 715–719. <http://dx.doi.org/10.2307/1924536>.
- Leontief, W. ed., 1986. Input-output economics. Oxford University Press.
- Longstaff, F. A., & Schwartz, E. S. (2001). Valuing American options by simulation : a simple least-squares approach. *The review of financial studies*, 14(1), 113-147.
- Mitchell, R.C., Carson, R.T., 1989. Using Surveys to Value Public Goods : The Contingent Valuation Method. Resources for the Future, Washington, DC.
- Morton, C., Knowler, D., Brugere, C., Lymer, D., and D. Bartley., 2017. Valuation of fish production services in river basins : A case study of the Columbia River, *Ecosystem Services*, Volume 24, 2017, Pages 101-113, ISSN 2212-0416. <https://doi.org/10.1016/j.ecoser.2017.02.007>.
- Poulet C., Barber-O'Malley B., Lassalle G., and Lambert P. Quantification of land–sea nutrient fluxes supplied by allis shad across the species' range. *Canadian Journal of Fisheries and Aquatic Sciences*, 2021. <https://doi.org/10.1139/cjfas-2021-0012>



Appendix A. Recreational angling survey

Date and Survey identification (*date and individual number – please add today's date and an ID number, eg using your parents initials and a memorable house or flat number (e.g. MAWA3). Surveys and data are anonymous, the survey ID you provide will allow you to identify your data if you want it withdrawn at a later date*).

Please read the following:

This survey is being carried out under the EU INTERREG Atlantic Area Programme funded project DiadES which is focussed on management of diadromous species (species migrating between sea and river for growth and reproduction). By participating in this survey, you, as stakeholder, are given the opportunity to contribute to shaping future management policies for these resources.

The survey should take 10 minutes. Answers given will **remain confidential** and only anonymised and grouped data will be used in the analysis and reporting. By taking part in this survey, you are consenting to your data being used as part of this study. You have the right to withdraw from this survey or to request your data are removed from the project up until 30 April 2021 by emailing your request and the **survey date and survey identification** of your questionnaire to: DiadES@cefas.co.uk. You do not have to answer any individual question if you do not wish to do so.

By completing this survey, you acknowledge that you have read and understood the information provided above, that you willingly agree to participate, and that you may withdraw your consent before 30 April 2021 and discontinue participation if you wish.

The DiadES project

DiadES aims to assess and enhance ecosystem services (e.g. income, food provision, recreation) provided by diadromous species in the Atlantic Area (shads, lampreys, eel, salmon, trout & mullet), and in parallel, the conservation status of these species, by explicitly considering for their future management the expected impacts of climate change on their distributions. These services could be threatened by climate change due to spatial reallocation of fish and related benefits.

This survey is intended to provide information on the contribution of migratory species to recreational fishing activity and the therewith associated economic and social benefits.



Section 1: Background and activity					
1. What is your personal attitude to nature and outdoor recreation? (please tick strongly agree – strongly disagree for each one)	<i>Strongly agree</i>	<i>Agree</i>	<i>Neutral</i>	<i>Disagree</i>	<i>Strongly disagree</i>
1.1 I like outdoor recreation					
1.2 Nature and environment are important issues to me					
1.3 Humans can be well off without ever going out into the natural environment.					
<p>2. Did you go fishing for recreation (whatever the species targeted) at least once during the last 12 months previous to the Covid19-lockdown? Tick your choice.</p> <p>2.1. Yes. Please, continue to question 3. £</p> <p>2.2. No, but someone else in our household did. Please, go to question 19. £</p> <p>2.3. No and neither did anyone in our household. Please, go to question 19. £</p>					
<p>3. Recreational fishing stratification:</p> <p>3.1. Fishing platform:</p> <p><input type="checkbox"/> From shore</p> <p><input type="checkbox"/> From riverbank</p> <p><input type="checkbox"/> From boat</p> <p>3.2 Fishing gears</p> <p><input type="checkbox"/> Rod & line (angling)</p> <p><input type="checkbox"/> Others (e.g., nets, pots or traps) Please, specify: _____</p>					
<p>4. Do you practice catch and release? £Yes £ No</p> <p>Specify species for which you practice catch & release: _____</p>					
<p>5.1. If we define a fishing day as "a day when you carry out angling/fishing activities, regardless of how many hours per day". Approximately how many days did you go angling/fishing during the last 12 months previous to the Covid19-lockdown?</p>			<p>_____ days</p>		
<p>5.2. How many hours on average do you spend angling/ fishing on a typical fishing day trip?</p>			<p>_____ hours/day</p>		
<p>6. How many of the fishing days mentioned in 5.1. did you spend in coastal and sea areas, or rivers?</p> <p>Write "0" for the types of fishing you did not perform.</p>					



£ Coastal/estuary area: _____ days

£ Open sea area: _____ days

£ River: _____ days

7. Have you ever fished/angled at one of the following rivers? If yes, how many days (approximately) during the last 12 months previous to the Covid19-lockdown?

£ Gipuzkoan rivers: _____ days
_____ days

£ Mondego catchment: _____ days

£ Gironde:

£ Minho catchment: _____ days
_____ days

£ Ulla Catchment: _____ days

£ Garonne:

£ Waterford: _____ days
_____ days

£ Dordogne: _____ days

£ Loire catchment:

£ Tamar: _____ days
days

£ Frome: _____ days

£ Taff: _____

£ Normand-Breton Bay/Gulf: _____ days

8. Which of the following species do you catch in general? *Please tick the relevant species. If you only ticked 'other' please go to question 19.*

£ Allis shad (*Alosa alosa*)

£ Twaite shad (*Alosa fallax*)

£ Sea/marine lamprey (*Petromyzon marinus*)

£ River lamprey (*Lampetra fluviatilis*)

£ Eel (*Anguilla Anguilla*)

£ Thin-lipped mullet (*Chelon ramada*)

£ Salmon (*Salmo salar*)

£ Trout/Sea trout (*Salmo trutta*)

£ European Sturgeon (*Acipenser sturio*)

£ Smelt (*Osmerus eperlanus*)

£ European Flounder (*Platichthys flesus*)

£ Others: _____

9.1. Which are the top 3 species you target in general? In order of importance to you

1. _____

2. _____

3. _____



<p>9.2 If you would have to rank the species listed in question 8, what would be the top 3 of these species? In order of importance to you</p> <p>1. _____</p> <p>2. _____</p> <p>3. _____</p>	
<p>10. For the 3 main species of the one listed in question 8, what has been your average catch per day in the last 12 months previous to the Covid19-lockdown? (or weight)</p> <p>1. _____</p> <p>2. _____</p> <p>3. _____</p>	<p>Number of fish _____</p> <p>Weight _____ Kg</p> <p>Number of fish _____</p> <p>Weight _____ Kg</p> <p>Number of fish _____</p> <p>Weight _____ Kg</p>
<p>11.1. Do you have a favourite spot to fish for the species of question 8 in the catchment mentioned in question 7? If yes, which one?</p> <p>11.2. How much time does it usually take you to reach this spot?</p> <p>11.3. How many of your fishing days (Question 4.1.) in the last 12 months previous to the Covid19-lockdown have you spent fishing in that spot?</p> <p>11.4 Is this the spot you fish/angle most often?</p>	<p>Location: _____</p> <p>_____ minutes</p> <p>_____ days</p> <p>£ Yes £ No</p>
<p>12. Please indicate from the options below what you would do in the future if your preferred target species (the one listed in question 8) becomes unavailable at your favourite spot (Question 11).</p> <p>£ Target another species at my favourite spot</p>	



£ Fish another river for the same species					
£ Stop fishing/angling					
13. If your preferred target species of the one listed in question 8 would be in the future not available for you to catch, would you still spend the same amount of money on angling?					
£ Definitely yes		£ Probably yes		£ Unsure now	
£ Definitely not		£ Probably not		£ Unsure now	
14. To what extent do you agree that each of the factors below motivates you to fish/angle (please tick strongly agree – strongly disagree for each one):	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
14.1. To learn more about fishing and improve my skills					
14.2. To spend time with family and/or friends					
14.3. For the fishing experience					
14.4. To enjoy the natural environment/spend time outdoors					
14.5. To eat fish, I caught by myself					
14.6. To teach my children fishing					
14.7. To relax and improve my wellbeing					

Section 2. Economic indicators	
15. On average, how much did you spend on each fishing trip on the following previous to the Covid19-lockdown? DO NOT count the cost of items that last for a year or more, e.g. gear (rods, nets), fishing clothes and boats.	
Accommodation including camping	£/€ _____
Meals and drinks served in pub, café etc	£/€ _____
Food and drinks bought in store	£/€ _____
Public transport and vehicle hire	£/€ _____
Fuel	£/€ _____
Parking	£/€ _____



<p><i>Bait</i></p> <p><i>Daily permit/license (if applicable)</i></p>	<p>£/€ _____</p> <p>£/€ _____</p>
<p>16. Approximately, how much did you spend on specialist CLOTHING AND ACCESSORIES in the past 12 months previous to the Covid19-lockdown to your fishing activity? (excluding fashion clothing)</p>	<p>£/€ _____</p>
<p>17. Approximately, how much did you spend on TACKLE AND EQUIPMENT in the past 12 months previous to the Covid19-lockdown?</p> <p>For example: rods, reels, lures, hooks, weights, lines, flies, fly-tying equipment, nets and other fishing equipment, such as holdalls, boxes, umbrellas and fishing seats. Please DO NOT INCLUDE non-equipment items such as bait, accommodation, meals, transport, boat hire, day permits or licences.</p>	<p>£/€ _____</p>
<p>18. How much did you spend on an annual licence in the past 12 months previous to the Covid19-lockdown?</p>	



Section 3. Personal information	
19. Please select your age category	
<input type="checkbox"/> 18-24 <input type="checkbox"/> 25-34 <input type="checkbox"/> 35-44 <input type="checkbox"/> 45-54 <input type="checkbox"/> 55-64 <input type="checkbox"/> Over 65	
20. Please indicate your gender	
<input type="checkbox"/> male <input type="checkbox"/> female <input type="checkbox"/> others <input type="checkbox"/> prefer not to say.	
21. How many persons are there in your household including yourself? A household is a group of people living in the same address	_____ persons
22. How many of your household members (including yourself) participate in recreational fishing/angling (any method)?	_____ persons
23. How would you describe your residential environment from the options below?	
<input type="checkbox"/> Urban <input type="checkbox"/> Semi-Urban <input type="checkbox"/> Rural	
24. Approximately, how much did you and your household earned in gross income (i.e. before income taxes) in the past 12 months? Please select the relevant band.	
<input type="checkbox"/> Less than €/£25,000 <input type="checkbox"/> €/£25,001-50,000 <input type="checkbox"/> €/£50,001-75,000 <input type="checkbox"/> €/£75,001-100,000 <input type="checkbox"/> > €/£100,000 <input type="checkbox"/> Don't wish to say	

Thank you for your time completing the survey. Please be assured that your details will remain completely confidential. As part of the DiadES project we hope to be able to provide updates on the project through the project website, www.diades.eu. As mentioned in the information page of you have any concern over how your anonymous information is used or wish to withdraw the information you have provided from the study please contact DiadES@cefas.co.uk by April 2021.

This survey should be completed by the end of April 2021.

If you want to be informed about the outcome of the survey and keep in touch with studies on recreational angling, please provide us your e-mail address. This is purely voluntary and will not impact your anonymity of the survey.



Appendix B. Commercial fisheries: cultural ecosystem services survey

The seven surveys related to the commercial fisheries can be found in a separate file “All_surveys.pdf”



Appendix C. Recreational fisheries: cultural ecosystem services survey (pilot study – Gipuzkoan Rivers)

VALORACIÓN DEL PATRIMONIO CULTURAL DE LA PESCA ARTESANAL RECREATIVA DE ANGULA EN EL PAÍS VASCO

PROYECTO DIADES

Esta encuesta forma parte de un estudio de investigación científica sobre **el valor económico del patrimonio cultural de las pesquerías recreativas de angula en los ríos de Gipuzkoa**. El estudio forma parte de un proyecto de investigación más amplio, *DiadES* (www.diades.eu) que lleva a cabo el centro tecnológico AZTI en colaboración con varios socios del Reino Unido, Irlanda, Francia y Portugal. La investigación está financiada por el programa Interreg Espacio Atlántico de la UE.



SECCIÓN 1. MÉTODO DE VALORACIÓN CONTINGENTE

Introducción

El área objeto de estudio en este cuestionario comprende los ríos guipuzcoanos Deba, Urola, Oria, Urumea, Oiartzun y Bidasoa, los cuales cubren una pequeña área territorial con 719.282 habitantes (Imagen 1)



Imagen 1. Ríos de Gipuzkoa

En Euskadi, considerado la “cuna de la angula”, la pesca de la angula es una actividad tradicional practicada desde hace muchos siglos, denominándose "anguleros" a aquellas personas que capturando angulas con ayuda de un cedazo de madera y un farol por las orillas de los ríos. Originalmente el consumo de angulas fue una práctica exclusiva del País Vasco, aunque luego se extendió al resto del estado. Los ríos de Euskadi que se citaban como los más importantes para la captura de angulas en tiempos previos a la industrialización del País Vasco eran el Bidasoa, Urumea, Oria, Deba y la ría de Bilbao.

La tradición de la pesca de angulas se ha ido perdiendo a lo largo del siglo XX. Aunque no hay datos al respecto, los anguleros más veteranos dicen que hay muchas menos angulas y anguleros hoy en día que hace 30 años. Los métodos de pesca han evolucionado poco y aún mantienen su carácter tradicional. Los anguleros, su uso del euskera y, el empleo de métodos de pesca tradicionales, que utilizan desde la orilla o desde embarcaciones de pequeño tamaño, así como, la gran tradición gastronómica, constituyen su esencia cultural.

Estos elementos culturales son una indudable fuente de valor que ha de ser tenida en consideración por nuestros gestores públicos. Sin embargo, esto no es siempre así **poniendo en riesgo su propia existencia. La pérdida de las tradiciones es muy acusada en el País Vasco y es por ello que necesita ser protegida.**

Marco institucional del mercado



Una forma de garantizar la conservación, preservación y uso sostenible del patrimonio cultural y natural asociado a la actividad pesquera artesanal vasca podría ser la creación de un consorcio de entidades públicas y/o privadas sin ánimo de lucro que velaran por el mismo financiados por distintas tasas o tarifas.

0. ¿Sabe que en los ríos de Gipuzkoa se practica pesca recreativa de angula?

- Sí
- No

Productos y servicios ofrecidos

A continuación, le describimos algunos ejemplos de elementos culturales relacionadas con la pesca artesanal que usted puede encontrar en los ríos Gipuzkoanos.

Métodos de pesca

Los métodos de pesca son mayormente artesanales y específicos para la captura de angulas, realizándose desde la orilla (tierra) o desde embarcaciones de pequeño tamaño. El principal arte de pesca utilizado es el tradicional cedazo o baia, que consiste en un marco (circular o rectangular) que sostiene tensa una malla fina (metálica o plástica) y está sujeto a un mango de madera (*Imagen 2*).



Imagen 2. Técnicas de pesca empleadas en el País Vasco

Valor de existencia de la actividad utilizando cedazos desde embarcación

1. ¿Estaría usted dispuesta o dispuesto a pagar una tasa/tarifa anual periódica que garantizara la existencia y conservación de la actividad pesquera recreativa utilizando cedazos desde embarcación?

1.1. Sí ☐

1.2. No ☐



2. (Sólo si la pregunta P.1=NO) ¿Cuál es la razón principal por la que no está dispuesto a contribuir?

	Sí	No
– No es mi responsabilidad para mantener la presencia de los barcos de pesca tradicionales, los métodos de pesca y los pescadores “anguleros”	1	2
– No creo que la pesca recreativa tradicional de los ríos Oria y Urola requiera apoyo financiero.	1	2
– Apoyo la pesca tradicional en los ríos de Gipuzkoa, pero no estoy interesado en aportar una contribución financiera.	1	2
– Me gustaría, pero no puedo permitirme hacer un pago.	1	2
– Otras → _____	1	2

3. Sólo si la pregunta P.1 es (Sí). ¿Qué importe estaría dispuesta o dispuesto a pagar (una tarifa/tasa anual periódica) en el caso de que fuera residente si no lo es?

€1	€2	€3	€4	€5
€6	€7	€8	€9	€10
€15	€20	€25	€30	€35
€40	€45	€50	€60	€70
€80	€90	€100	€125	€150
€175	€200	€225	€250	€275
€300	€325	€350	€375	€400
Otro valor, especifique por favor: € _____				

4. Ahora nos gustaría conocer su opinión respecto a la elección de su donación.

	Muy de acuerdo	De acuerdo	Ni de acuerdo ni en desacuerdo (neutral)	No está de acuerdo	Muy en desacuerdo	No sabe
4.1 Elegí donar porque me gusta ver a los pescadores tradicionales y sus barcos en el río Oria/Urola.	1	2	3	4	5	6
4.2 Decidí donar porque me gusta saber que hay pesca tradicional recreativa en el río Oria y Urola	1	2	3	4	5	6
4.3 Elegí donar porque me gusta ver los aparejos tradicionales de pesca en los barcos	1	2	3	4	5	6
4.4 Elegí donar porque la pesca recreativa tradicional forma parte de la identidad local de las zonas que rodean	1	2	3	4	5	6



los ríos Oria y Urola y emblemático de Gipuzkoa y del País Vasco						
4.5 Elegí donar porque la presencia de barcos de pesca, métodos tradicionales y pescadores “anguleros” atrae a los turistas y es importante para la economía local.	1	2	3	4	5	6

5. ¿Quién considera que debería gestionar el cobro y destino de esta tasa o tarifa?
- 5.1. El Ayuntamiento del municipio o alguna otra entidad pública
☐
- 5.2. Un consorcio de asociaciones privadas sin ánimo de lucro VINCULADAS O NO AL SECTOR RECREATIVO ANGULERO
☐
- 5.3. Un consorcio de entidades públicas y asociaciones privadas sin ánimo de lucro
☐
- 5.4. Otro: _____

Valor de existencia de la actividad utilizando cedazos desde tierra

6. ¿Estaría usted dispuesta o dispuesto a pagar una tasa/tarifa anual periódica que garantizara la existencia y conservación de la actividad pesquera recreativa utilizando cedazos desde tierra?
- 6.1. Sí ☐
- 6.2. No ☐
7. (Sólo si la pregunta P.6=NO) ¿Cuál es la razón principal por la que no está dispuesto a contribuir?

	Sí	No
– No es mi responsabilidad para mantener la presencia de los métodos de pesca desde tierra y los pescadores “anguleros”	1	2
– No creo que la pesca recreativa tradicional de angula desde tierra desarrollada en los ríos de Guipuzkoa requiera apoyo financiero.	1	2
– Apoyo la pesca tradicional de angula desde tierra pero, no estoy interesado en aportar una contribución financiera.	1	2
– Me gustaría, pero no puedo permitirme hacer un pago.	1	2
– Otras → _____	1	2

8. Sólo si la pregunta P.6 es (Sí). ¿Qué importe estaría dispuesta o dispuesto a pagar (una tarifa/tasa anual periódica por persona residente)?



€1	€2	€3	€4	€5
€6	€7	€8	€9	€10
€15	€20	€25	€30	€35
€40	€45	€50	€60	€70
€80	€90	€100	€125	€150
€175	€200	€225	€250	€275
€300	€325	€350	€375	€400
Otro valor, especifique por favor: € _____				

9. Ahora nos gustaría conocer su opinión respecto a la elección de su donación.

	Muy de acuerdo	De acuerdo	Ni de acuerdo ni en desacuerdo (neutral)	No está de acuerdo	Muy en desacuerdo	No sabe
9.1 Elegí donar porque me gusta ver a los pescadores tradicionales y sus métodos de pesca de angula en los ríos de Gipuzkoa	1	2	3	4	5	6
9.2 Decidí donar porque me gusta saber que hay pesca tradicional recreativa de angula	1	2	3	4	5	6
9.3 Elegí donar porque me gusta ver los aparejos de pesca que utilizan los anguleros desde tierra	1	2	3	4	5	6
9.4 Elegí donar porque la pesca recreativa tradicional desde tierra forma parte de la identidad local de Gipuzkoa y de todo el País Vasco	1	2	3	4	5	6
9.5 Elegí donar porque la presencia de los métodos tradicionales y pescadores atrae a los turistas alrededor de la cultura vasca y es importante para la economía local.	1	2	3	4	5	6

10. ¿Quién considera que debería gestionar el cobro y destino de esta tasa o tarifa?

10.1. El Ayuntamiento del municipio o alguna otra entidad pública

☐

10.2. Un consorcio de asociaciones privadas sin ánimo de lucro

☐

10.3. Un consorcio de entidades públicas y asociaciones privadas sin ánimo de lucro

☐

10.4. Otro: _____

- **Tradición angulera: eventos festivos, hermandades, gastronomía,....**



- ✓ **Sociedades gastronómicas.** El producto se empezó a pagar tan alto que se redujo el consumo de angula en el País Vasco, sin embargo, su tradición es tan fuerte que es bastante corriente organizar alguna comida especial en alguna sociedad gastronómica, para cocinarla y comerla junto con los amigos.
- ✓ **Eventos festivos.** Aunque hace décadas era habitual celebrar “el día de San Sebastián” degustando una cazuelita de angulas, plato protagonista de la fiesta patronal y su famosa tamborrada. Hoy día, debido a su elevado precio, solo unas pocas sociedades gastronómicas y familias mantienen la tradición.
- ✓ **Auténtica cultura gastronómica en el País Vasco**



Imagen 3. Tradición cultural (angulas ligadas al día de San Sebastián, cultura gastronómica en hogares, restaurantes y sociedades gastronómicas)

Valor de uso de la cultura inmaterial local asociada a las angulas: cultura angulera

11. ¿Si viviera o visitara el País Vasco, estaría usted dispuesta o dispuesto a pagar una tasa por disfrutar en condiciones adecuadas y sin masificación de cada uno de los eventos festivos, y prácticas sociales gastronómicas que se desarrollan alrededor de la angula?

11.1. Sí ☐



11.2. No ☐

12. ¿Sólo si la pregunta P.11 es (Sí). ¿Qué tasa estaría dispuesta o dispuesto a pagar POR EVENTO Y PERSONA VISITANTE?

€1	€2	€3	€4	€5
€6	€7	€8	€9	€10
€15	€20	€25	€30	€35
€40	€45	€50	€60	€70
€80	€90	€100	€125	€150
€175	€200	€225	€250	€275
€300	€325	€350	€375	€400
Otro valor, especifique por favor: €_____				

13. ¿Quién considera que debería gestionar el cobro y destino de esta tasa o tarifa?

13.1. El Ayuntamiento del municipio o alguna otra entidad pública

☐

13.2. Un consorcio de asociaciones privadas sin ánimo de lucro

☐

13.3. Un consorcio de entidades públicas y asociaciones privadas sin ánimo de lucro

☐

13.4. Otro: _____

- **El paisaje en los ríos de Gipuzkoa**

El propio paisaje natural con las embarcaciones tradicionales arroja un importante servicio cultural. Los últimos kilómetros del río Oria antes de su desembocadura en el mar han sido escenario durante siglos de una intensa actividad pesquera de angulas e incluso de salmones (Imagen 4 and Imagen 4).





Imagen 4. Embarcación tradicional



Imagen 5. Paisaje natural Río Oria

Valor de uso recreativo de los paisajes asociados a la pesca recreativa artesanal de angula

14. ¿Si **viviera o visitara** la costa vasca, estaría usted dispuesta o dispuesto a pagar una tasa/tarifa por descubrir y disfrutar del paisaje pesquero con las embarcaciones tradicionales con servicios y condiciones adecuadas; y sin masificación?

14.1. Sí ☐

14.2. No ☐

15. **¿Sólo si la pregunta P.14 es (Sí).** ¿Qué tasa estaría dispuesta o dispuesto a pagar?

€1		€2	€3	€4	€5
€6		€7	€8	€9	€10
€15		€20	€25	€30	€35
€40		€45	€50	€60	€70
€80		€90	€100	€125	€150
€175		€200	€225	€250	€275
€300		€325	€350	€375	€400
Otro valor, especifique por favor: €_____					

16. ¿Quién considera que debería gestionar el cobro y destino de esta tasa o tarifa?



16.1. El Ayuntamiento del municipio o alguna otra entidad pública

☐

16.2. Un consorcio de asociaciones privadas sin ánimo de lucro

☐

16.3. Un consorcio de entidades públicas y asociaciones privadas sin ánimo de lucro

☐

16.4. Otro: _____

Valor de legado de la actividad pesquera artesanal de angula

17. ¿Estaría usted dispuesta o dispuesto a pagar una tasa/tarifa anual periódica que **ayudara a salvaguardar la actividad pesquera artesanal recreativa de angula, el autoconsumo de angula** y preservarla para las generaciones venideras **si residiera** en la costa vasca)?

17.1. Sí ☐

17.2. No ☐

18. **Sólo si la pregunta P.17 es (Sí).** ¿Qué tasa estaría dispuesta o dispuesto a pagar?

€1		€2	€3	€4	€5
€6		€7	€8	€9	€10
€15		€20	€25	€30	€35
€40		€45	€50	€60	€70
€80		€90	€100	€125	€150
€175		€200	€225	€250	€275
€300		€325	€350	€375	€400
	Otro valor, especifique por favor: €_____				

19. ¿Quién considera que debería gestionar el cobro y destino de esta tasa o tarifa?

19.1. El Ayuntamiento del municipio o alguna otra entidad pública

☐

19.2. Un consorcio de asociaciones privadas sin ánimo de lucro

☐

19.3. Un consorcio de entidades públicas y asociaciones privadas sin ánimo de lucro

☐

19.4. Otro: _____



SECCIÓN 2. MÉTODO DEL COSTE DE VIAJE

20. ¿Ha visitado usted los ríos de Gipuzkoa por ocio en alguna ocasión?
- 20.1. Sí ☐
- 20.2. No, he visitado este entorno por motivos laborales ☐
- 20.3. No, no he estado nunca ☐
- (En caso afirmativo, responder las preguntas 21 a 32)
21. ¿Cuántas veces ha visitado el entorno de los ríos de Gipuzkoa por motivos de ocio?
- 21.1. Una sola vez ☐
- 21.2. De 2 a 3 veces ☐
- 21.3. De 3 a 6 veces ☐
- 21.4. De 6 a 10 veces ☐
- 21.5. Más de 10 veces. ¿Cuántas? _____
22. Indique qué ríos ha visitado:
- 22.1. Oria
- 22.2. Urola
- 22.3.
- 22.4. Otros (especificar): _____
23. Si viaja/viajó usted acompañado, indique cuántas personas procedentes de su familia o del mismo lugar de origen le acompañan en el viaje (rodee con un círculo la opción elegida).
- 23.1. 1
- 23.2. 2
- 23.3. 3
- 23.4. 4
- 23.5. Más de 4. ¿Cuántas? _____
24. ¿Cuánto tiempo duró su visita?
- 24.1. Un solo día ☐
- 24.2. De 2 a 3 días ☐
- 24.3. De 3 a 6 días ☐
- 24.4. De 6 a 10 días ☐
- 24.5. Más de 10 días. ¿Cuántos? _____
25. ¿Qué medio de transporte ha empleado/empleó para ir?
- 25.1. Ferrocarril ☐
- 25.2. Automóvil ☐



- 25.3. Autobús ☐
- 25.4. Otros (especificar): _____
26. ¿Cuál ha sido el gasto de desplazamiento medio por persona (sin alojamiento ni manutención)?
- 26.1. Menos de 20 € ☐
- 26.2. De 20 a 50 € ☐
- 26.3. De 51 a 75 € ☐
- 26.4. De 76 a 100 € ☐
- 26.5. De 101 a 125 € ☐
- 26.6. De 126 a 150 € ☐
- 26.7. De 150 € a 200 € ☐
- 26.8. Más de 200 €. ¿Cuánto? _____
27. Si ha comido ¿Cuál ha sido el gasto diario medio por comida (almuerzo o cena) y persona en su visita?
- 27.1. Menos de 20 € ☐
- 27.2. De 20 a 50 € ☐
- 27.3. De 51 a 75 € ☐
- 27.4. Más de 75 €. ¿Cuánto? _____
- 27.5. No comí.
28. Si ha pernoctado ¿Cuál ha sido el gasto diario medio del alojamiento por persona en su visita al entorno de los ríos de Gipuzkoa?
- 28.1. Menos de 20 € ☐
- 28.2. De 20 a 50 € ☐
- 28.3. De 51 a 75 € ☐
- 28.4. De 76 a 100 € ☐
- 28.5. De 101 a 125 € ☐
- 28.6. De 126 a 150 € ☐
- 28.7. Más de 150 €. ¿Cuánto? _____
- 28.8. No dormí
29. ¿Durante su estancia en la costa vasca ha visitado o participado de alguno de los siguientes elementos culturales y/o naturales asociados a la actividad pesquera artesanal angulera? (señale todas las necesarias)
- 29.1. Visitó los ríos donde se puede ver las embarcaciones tradicionales y los artes de pesca empleados



29.2. Visitó o participó en algún evento festivo

☐

29.3. Disfrutó de un paseo/visita con vistas del paisaje de los ríos de Gipuzkoa

☐

29.4. Disfrutó de la gastronomía (ej. Restaurantes, sociedades gastronómicas)

☐

29.5. No he visitado / experimentado ninguno de los elementos anteriores

☐

30. Además de los gastos anteriores ¿Ha pagado algo más para visitar/ experimentar los elementos culturales y naturales asociados a la actividad pesquera artesanal listados en la pregunta anterior?

30.1. No, no he pagado nada más

☐

30.2. Menos de 1 €

☐

30.3. De 1 a 3 €

☐

30.4. De 4 a 5 €

☐

30.5. De 6 a 10 €

☐

30.6. Más de 10 €. ¿Cuánto?

31. Además de las experiencias o visitas indicadas en la pregunta anterior ¿qué ha visitado / experimentado en su visita a la costa vasca? (señale todas las necesarias)

31.1. Las playas de la costa vasca

☐

31.2. Los bares/restaurantes de la costa vasca

☐

31.3. He ido a la costa vasca a practicar la pesca recreativa

☐

31.4. Otras. ¿Cuáles?

CLASIFICACIÓN ESTADÍSTICA (¿Convendría que la encuesta sólo se destinara a mayores de 18 años?)

32. ¿Cuántos años tiene?

32.1. Menos de 20 años

☐

- 32.2. De 20 a 35 ☐
- 32.3. De 36 a 50 ☐
- 32.4. De 51 a 65 ☐
- 32.5. Más de 65 ☐
33. ¿Cuál es su género?
- 33.1. Hombre ☐
- 33.2. Mujer ☐
34. ¿Cuál es su nacionalidad?
- 34.1. Español ☐
- 34.2. Extranjero. ¿Cuál? _____
35. Indique el código postal en el que se encuentra su residencia habitual
- 35.1. _____
36. ¿Cuáles son sus estudios?
- 36.1. Sin estudios ☐
- 36.2. Estudios primarios o equivalentes ☐
- 36.3. Estudios Secundarios o equivalentes ☐
- 36.4. Ciclo Formativo de grado medio o equivalente ☐
- 36.5. Bachiller o equivalente ☐
- 36.6. Ciclo Formativo de grado superior o equivalente ☐
- 36.7. Grado /Licenciado/Diplomado/Ingeniero o equivalente ☐
- 36.8. Postgrado o equivalente ☐
37. Marque lo correcto respecto a su situación laboral o profesional

– Profesional autónomo	1	– Estudiante	4
– Empleado/a	2	– Jubilado/a	5
– Desempleado/a	3	– Otros (especificar)	6

38. ¿Cuáles son los ingresos anual netos de impuestos y seguridad social de su unidad familiar?

– Menos de 10.000 euros	1	– Entre 30.001 y 40.000 euros	4
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– Entre 10.000 y 20.000 euros	2	– Más de 40.000 euros	5
– Entre 20.001 y 30.000 euros	3		

