# Fith Report

## of the implementation of the FIP

## Spanish crayfish, *Procambarus clarkii*, with fyke nets & traps in Andalusia and Extremadura

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## Contents

# 1 Executive Summary

The 2023 FIP activities started in May in Extremadura, corresponding with the beginning of the fishing season. Fieldwork and data collection were conducted following the Guadiana basin fishery using traps. Fieldwork took place in May, June and July at Montijo and Orellana la Vieja, two Guadiana lakes in Extremadura. No sampling occurred in Andalusia in 2023 due to the absence of rice field farming caused by the prolonged drought that has occurred in the region over the past two years. Nevertheless, a summary of previous sampling results from Andalusia is presented. The results from both regions are presented and discussed by MSC principle. Several noteworthy points emerged from this preliminary assessment in the Extremadura 2023 season. Notably, there was a low proportion of bycatch of pumpkinseed juveniles at Guadiana lakes, and sardine was found to be used as bait in addition to chicken and fruit, as noted in previous reports. The results also indicate a slightly higher number of females in the trap catch sample and a normal distribution of crayfish length frequencies. It is noted that to comprehensively evaluate the crayfish fishery, further work and additional data collection are imperative, particularly at the ponds in the Guadiana Basin. Additionally, more effective stakeholder engagement, particularly with administration and fishers, is essential.

# 2 Introduction

The following document represents the fifth report of the Spanish crayfish (*Procambarus clarkia)* FIP. In previous reports, a description of the fisheries, its socio-economic importance, and also crayfish biological and ecological aspects were presented. In this year report, the 2023 FIP activities, which occurred only in Extremadura, are detailed jointly with a recap of the 2021-2022 FIP activities in Andalusia.

The report is divided in chapters: one chapter for the work plan (Chapter 3), two chapters for Andalusia and Extremadura regions (Chapter 4 and 5), one for producer data analysis (Chapter 6), and two for final remarks and conclusion (Chapter 7 and 8). In chapters 4 and 5 the results, main achievements and limitations are presented with regards to the specific characteristics of each region, as well as its strengths and weaknesses by MSC Principles FIP Actions.

## 3 2023 Work plan

The 2023 FIP activities started in May. The following planned FIP tasks were carried out:

**Experimental planning (Started May 2023 – October 2023)**

- Defining sampling areas, methodology and adapt methods
- Preparing sampling material

**Data collection *in situ* (Started May 2023 – October 2023)**

- Collecting crayfish biological data (size, total weight, sex, behavior, habitat, geographic position) and crayfish trap fishery bycatch

**Data analyses (Started May 2023 – December 2023)**

- Biological data compilation and analysis
- Review of sampling planning
- Bycatch identification and characterization.

**Stakeholder mapping and engagement (Started May 2023 – December 2023)**

- Fishers' engagement and participation in data collection.
- Municipalities' engagement in enabling historical data on crayfish captures.

**Reporting and project management (Started May 2023 – April 2024)**

- Drafting report
- Managing activities
- FIP reporting (July, April)

## 4 Crayfish fishery in Andalucía

The crayfish fishery in Andalusia operates under the regulatory framework outlined in the Order of 3rd August 2016[1], which governs the species control plan for Marisma del Guadalquivir and

[1] https://www.juntadeandalucia.es/boja/2016/152/BOJA16-152-00030-14325-01_00096695.pdf, downloaded 20/10/2021

the broader management strategy for the region. This fishery contributes significantly to the national crayfish production, supplying approximately 50%. However, there are no formal fisher associations or other business organizations dedicated to the crayfish fishery in this area, and the precise number of fishers operating remains unknown. Fishing activity in Andalusia is characterized by the use of fyke nets that are set in the rice fields of Isla Mayor, during a period of 48 hours. Sampling in Andalusia was not conducted in 2023 due to the absence of rice field cultivation, due to a prolonged drought spanning nearly two years in the area.

## 4.1 2021-2022 Results Summary

In 2021, only one site visit for sampling occurred, during which measurements were randomly taken from several fyke nets, resulting in a total of 175 individuals measured. In 2022, two site visits were conducted, with a total of 1154 individuals measured (402 during the first visit and 752 during the second), as detailed in the 3rd FIP Report. Analysis of the data from both seasons indicates that the crayfish population exhibits a balanced sex ratio, with a close-to-equal proportion of females and males. Additionally, individual sizes remained consistent between the two years. However, the estimated catch per unit effort (CPUE) in kilograms was higher in the 2021 season at 3 kg per fyke net, compared to 1.9 kg in 2022.

Bycatch was assessed from all 200 fyke nets hauled, during the two visits in 2022, and was very low. Only 1 individual of blue crab, a prolific invasive species in the region, was found caught in the fyke nets. A total of 100 common carps were collected in all 200 fyke nets, less than in the 2021 season with 167 individuals, with an average size of 6.5 cm, corresponding to an early age of juvenile phase, as also detailed in the 3rd FIP report.

## 4.2 Achievements and limitations

### *4.2.1 Principle 1 – Stock Status*

The fact that only one fisher was accompanied throughout the 2021 and 2022 sampling seasons poses challenges for accurately assessing key issues, such as the extent of fishing areas covered and the number of fishing gears used, which are critical for conducting Actions 1, 2 and 4 of Principle 1. Furthermore, the sampling area was small to fully comprehend the scope of the fishery.

Table 1. Principle 1 Actions

| Principle 1 actions (Stock status) |
|---|
| Action 1: Gathering of information |
| Action 2: Assessment of stock status |
| Action 3: Management |
| Action 4: Monitoring |

### *4.2.2 Principle 2 – Ecosystem Impacts*

To gain a more comprehensive understanding of the distribution of bycatch across the fishing area, additional fieldwork is necessary. Nonetheless, both assessments indicate that the bycatch from fyke nets is notably minimal, particularly considering the presence of common carp, an abundant invasive species in the region. The estimated proportion of common carp caught in relation to total crayfish catches is approximately 1%. Also, no interactions with ETP species were observed, or reported by the fisher, and no bait is used. These observations positively addresses Actions 1, 3 and 4.

As crayfish is an invasive species, Annex SD from MSC Fishery Standard could be applied, where if primary or secondary species (Action 1 and 2) are also non-native, the impact of the fishery does not need to be scored against the respective PIs. However, one fisher activity is not enough to characterise the fishing impacts on bycatch species, but also on the wider habitat and ecosystem impacts (Actions 5, 6 and 7).

Table 2. Principle 2 Actions

| Principle 2 actions (Ecosystem impacts) |
|---|
| Action 1: Bycatch |
| Action 2: Catch records |
| Action 3: ETP interactions |
| Action 4: Bait species |

| |
|---|
| Action 5: Ecosystem |
| Action 6: Habitats: Traps and fyke nets |
| Action 7: Habitats: Mapping |
| Action 8: Habitats: Management |

### *4.2.3 Principle 3 – Management of the fishery*

Stakeholder mapping and engagement activities were planned to focus on contacting central and regional government representatives to initiate a round of meeting in 2023 to introduce the FIP, as described in the 3rd FIP report. However, due to the lack of catches from Andalusia, and the redirection of efforts, little progress was made in engaging fishers and government agencies. Nevertheless, a Compromise of Good Practices between fishers and Alfocan was drafted, which is currently in use already, positively addressing Action 2. In addition, it has been known that South Ocean also follows a Compromise of Good Practices between the company and the fishers.

Table 3. Principle 3 Actions

| **Principle 3 actions (Management of the fishery)** |
|---|
| Action 1: Identification of stakeholders |
| Action 2: Organization of fishermen |
| Action 3: Consultation |
| Action 4: Agreements on management measures |
| Action 5: Crayfish fishery management plan |
| Action 6: Consultancy services |

## 5 Crayfish fishery in Extremadura

The crayfish fishery in Extremadura is governed by the Resolution of 25th October 2016, which outlines the control plan for the region. This fishery contributes approximately 25% of the national crayfish production. There are no formal fisher associations or other business

organizations dedicated to the crayfish fishery in this area, and the exact number of fishers operating remains unknown.

Fishing activity in Extremadura primarily involves the use of traps deployed in Guadiana's lake at Orellana la Vieja over a 24-hour period (refer to Fig. 1), as well as in small ponds across the region, similar to the lake where the initial site visit in May 2023 occurred (refer to Fig. 2). Depending on crayfish abundance, the traps in these ponds may remain in the water for up to 48 hours. The extension and number of ponds used in the crayfish fishery are unknown. Considering that only one pond was sampled on May 30, 2023, as described in 4th FIP report, and no other site visits to the ponds were conducted after, these will not be discussed further in this report.

Regarding bait, fruits and raw chicken were commonly used in Orellana la Vieja, but observations in 2023 reveal the use of sardines purchased from Vigo.


**Fig. 1** – Fishing area in Guadiana's Basin at Orellana La Vieja, Extremadura region.


**Fig. 2** – Fishing pond in Guadiana's Basin at Montijo, Extremadura region.

## 5.1 2023 Results – Orellana Lake

Two site visits were conducted in Orellana la Vieja, the first one on 27th of June (described in 4th FIP Report), and a second on 18th of July, where traps catch data were collected by accompanying two fishers during their fishing activities side-by-side in another vessel. The following data were collected for each trap: crayfish size, sex, number of individuals, bycatch number and size if present, bait used and GPS position.

The experimental design drafted included the collection of data from sets of traps of different fishers in order to have catch composition in different fishing locations. However, it was only possible to follow one fisher at the time, in a total of two fishers in the 2023 season, which is not sufficient to characterize the fishery.

Fishers from Orellana lake collect between 100 to 200 traps per fishing day, but it was only possible to sample around 15% of traps due to the time required to measure each crayfish, while trying to minimise interference in the fisher normal activity.

Since the results from the first site visit were already described in the 4th FIP Report, only the results of the second visit in Orellana are described in this report, and an overall comparison between results from seasons 2022 and 2023 is presented.

### 5.1.1 Second Site Visit – 18 July 2023

During the second visit one new fisher was accompanied and 15 of the 100 traps collected were sampled, corresponding to a total 504 individuals measured. The total weight of the catch was not possible to obtain from the fisher.

#### 5.1.1.1 Sex Ratio

Overall the number of crayfish female sampled are slightly higher than the number of males, with a total of 57% of female sampled (286 individuals) and 43% males (218 individuals) (Fig. 3).

When analysing each trap in detail, the proportion of males and females were balanced indicating a good sex distribution of the species.

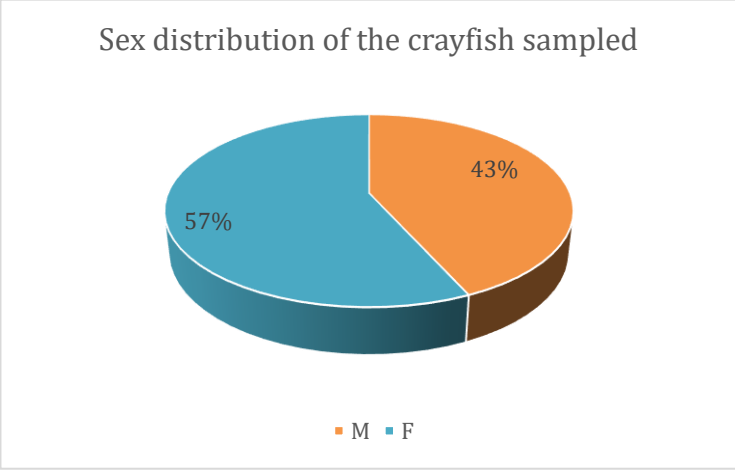



Fig. 3 – Overall sex ratio sampled.

#### 5.1.1.2 Catch per Unit of Effort – CPUE

CPUE was only possible to calculate in number, since the total weight of the catch and the average weight of the traps were not available. The catch at each traps shows that there is a predominance of traps with approximately 30 individuals, except for trap number one which caught 52 individuals, and trap number 15 with 19 (Fig.4).

a) *CPUE in number*

$$CPUE(number) = \frac{total\ number\ of\ individuals}{total\ number\ of\ traps}$$

*Total number of individuals sampled = 504*

*Total number of traps sampled = 15* *CPUE = 33,6*

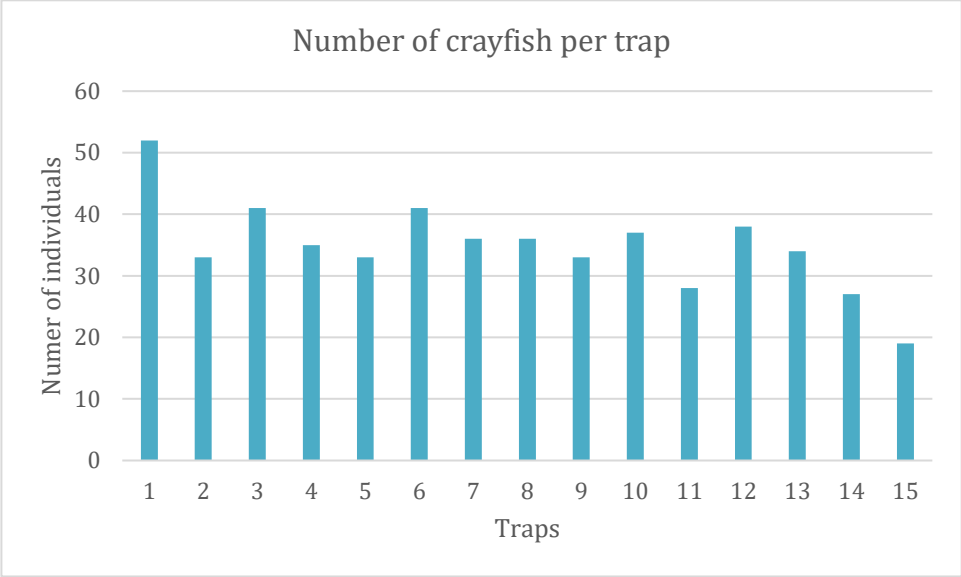
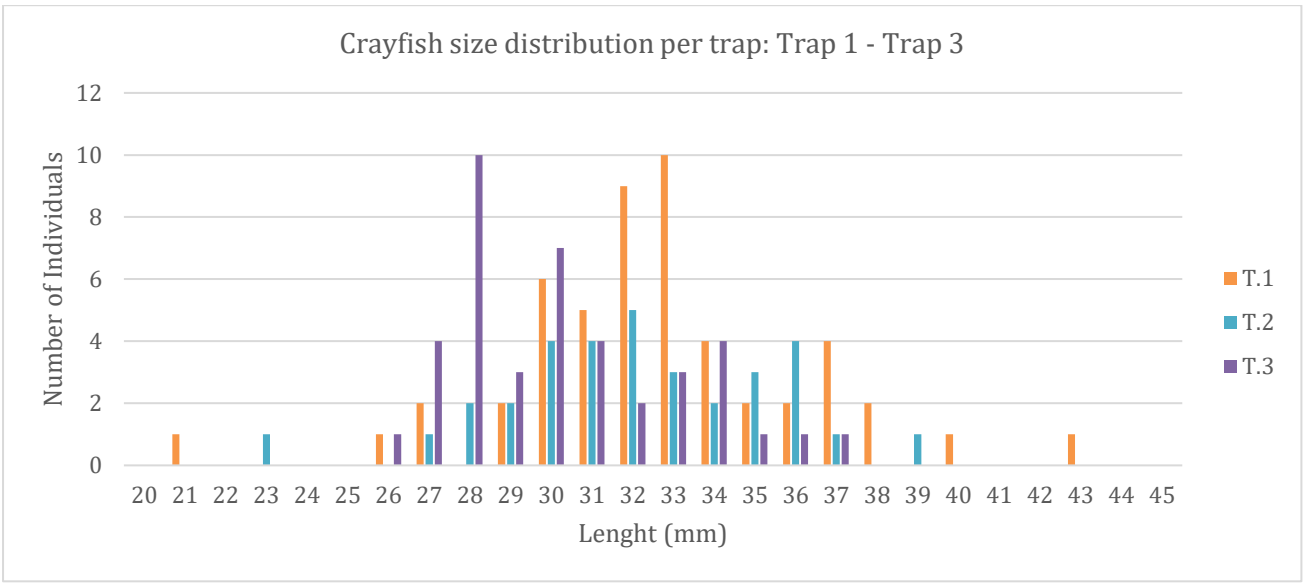



Fig. 4 – Number of individuals per trap.

Results shows that each trap harvest in average 40 individuals during the 48 hours fishing at the lake, with a higher peak in trap number 1 with 52 individuals, and a lower in trap number 15 with 19 individuals. Traps sampled presented a homogenous number of crayfish between 30 and 40 individuals per trap (Fig.4). This results, excluding traps number 1 and 15, are closer to the CPUE calculated for 2022 (CPUE=40.2, see 2nd FIP report), with 21 traps sampled.

#### *5.1.1.3 Length frequency*

Catches were distributed between 21 and 43 mm, with the majority of individuals with sizes between 25 and 38 mm, indicating that the catch was mainly composed of young adult individuals, aged under 250 days.



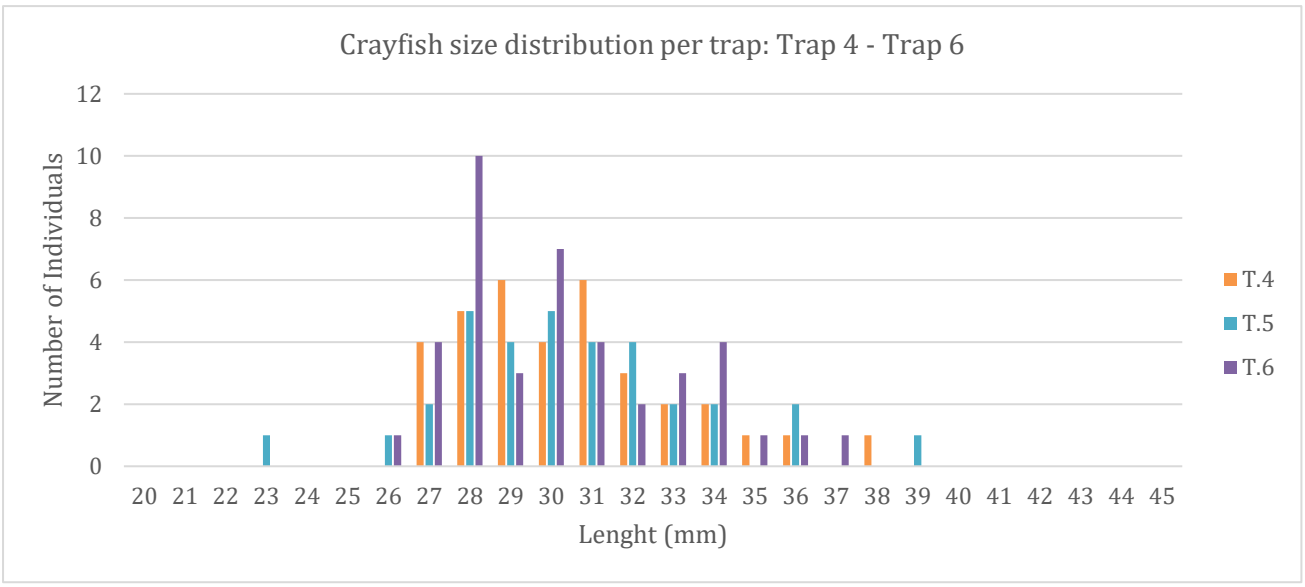
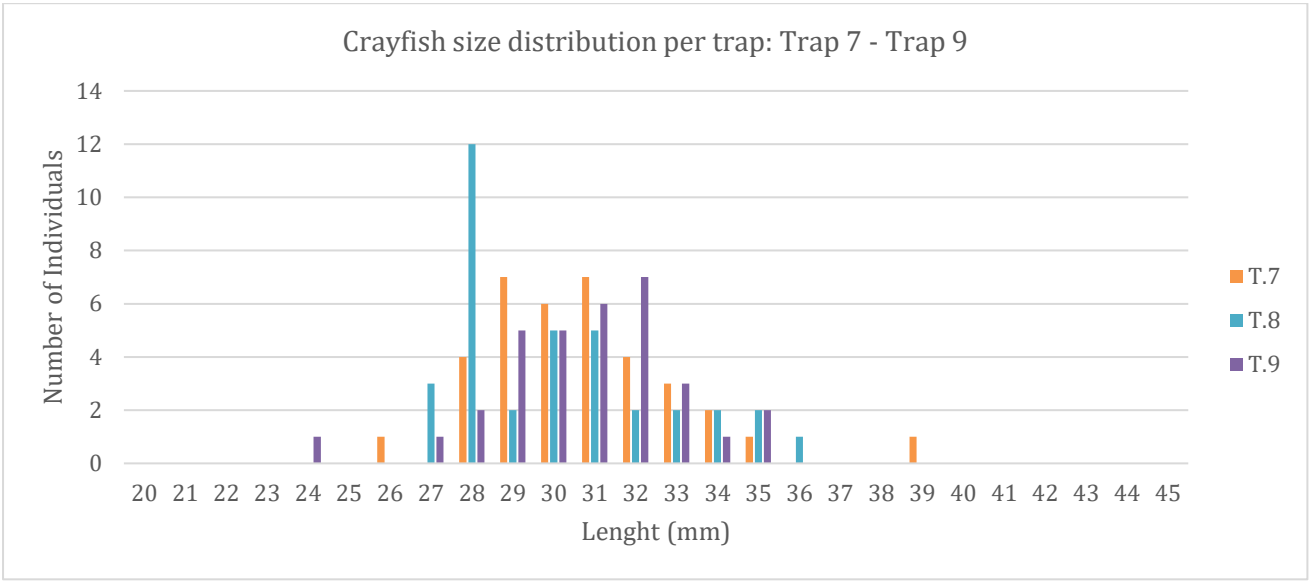




Fig. 5 a) Crayfish length distribution per trap: Trap 1 – 6.



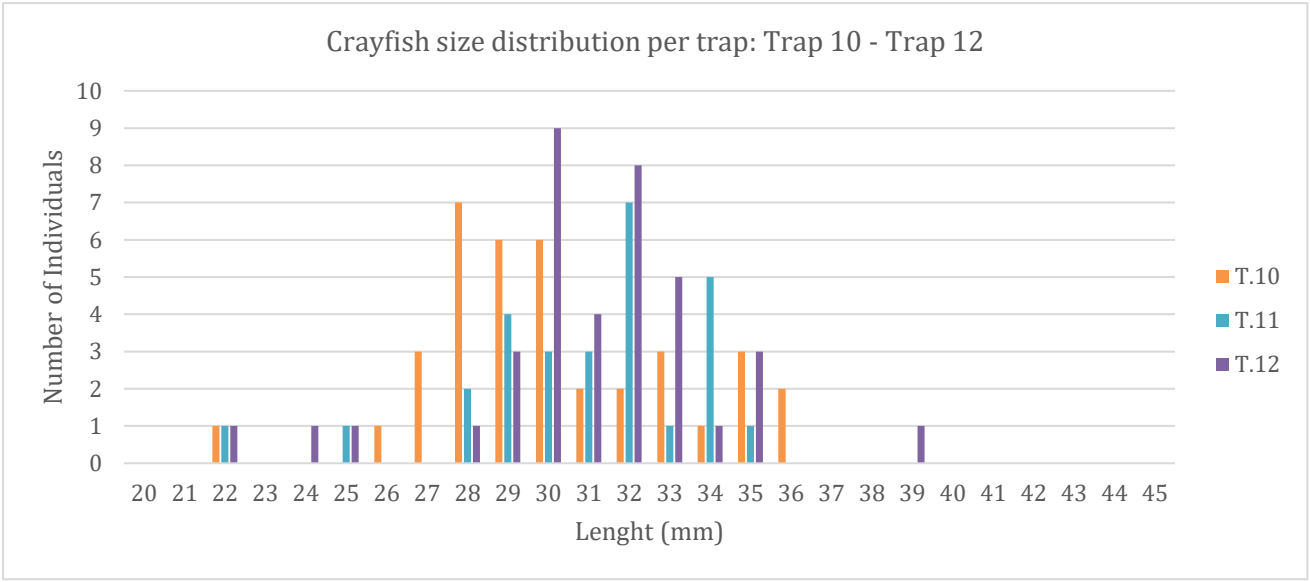




Fig. 5 b) Crayfish length distribution per trap: Trap 7 – 12.

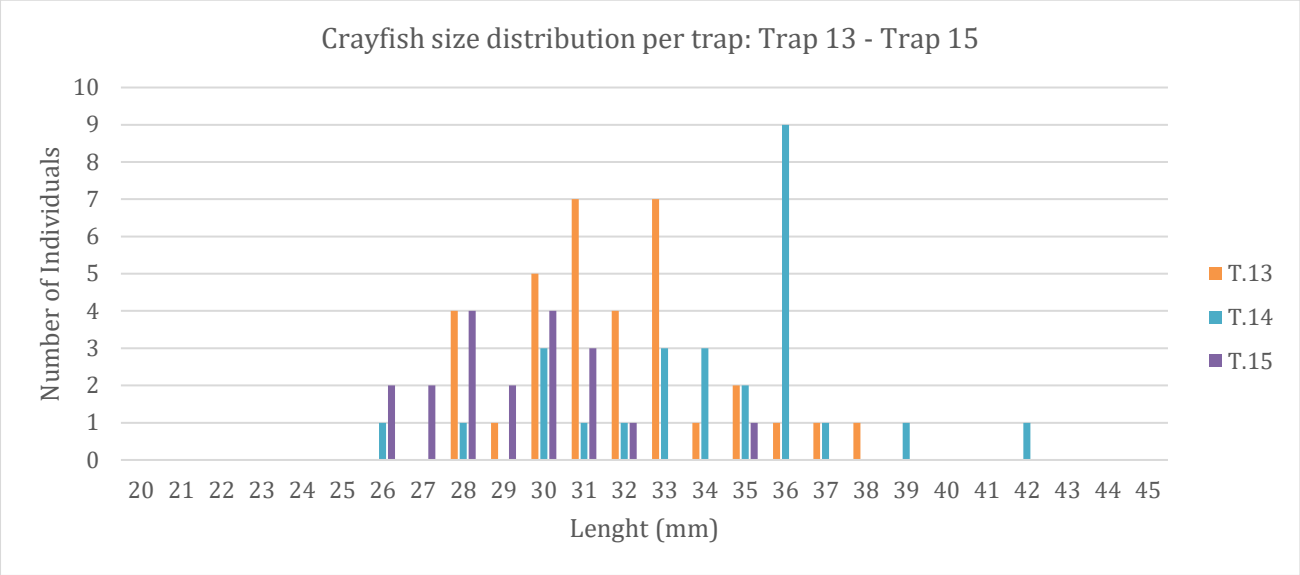



Fig. 5 c) Crayfish length distribution per trap: Trap 13 – 15.

#### 5.1.1.4 Bycatch characterization

No bycatch was observed in either the sample traps or reported by the fisher in Orellana lake.

#### 5.1.1.5 Bait characterization

In the 2022 season, the bait consisted mainly of raw chicken and fruits in Orellana lakes. However, during the 2023 season, fishers used sardines (*Sardina pilchardus*) as bait, as previously noted in the 4th report. This development has prompted the re-opening of Action 4 under Principle 2. It was not possible to assess the amount of sardines used amongst fishers in Orellana lake. The fisher from the site visit in May reported using around 40 kg of frozen sardines daily in roughly 200 traps. These sardines are sourced from Vigo and harvested from Iberian Atlantic waters as already stated in the 4th FIP report.

## 5.2 Achievements and limitations

### *5.2.1 Principle 1 – Stock Status*

Accompanying two fishers in 2022 and 2023 seasons for sampling purposes poses challenges for accurately assessing key fisheries issues, such as the extent of fishing areas covered and the number of fishers and fishing gears used, which are critical for conducting Actions 1, 2 and 4 of Principle 1.

Table 1. Principle 1 Actions

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### *5.2.2 Principle 2 – Ecosystem Impacts*

Bycatch from fyke nets is notably minimal, particularly considering that when present the species is pumpkinseed, an abundant invasive species in the region. The estimated proportion of this species caught in relation to total crayfish catches is approximately 1%. Also, no interactions with ETP species were observed, or reported by the two fishers, for Orellana lake. These observations positively address Actions 1, 3 and 4.

As crayfish is an invasive species, Annex SD from MSC Fishery Standard could be applied, where if primary or secondary species (Action 1 and 2) are also non-native, the impact of the fishery does not need to be scored against the respective PIs. However, two fishers' activity is not enough to characterise the fishing impacts on bycatch species, but also on the wider habitat and ecosystem impacts (Actions 5, 6 and 7).

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### *5.2.3 Principle 3 – Management of the fishery*

Stakeholder mapping and engagement activities were planned to focus on contacting central and regional government representatives to initiate a round of meeting in 2023 to introduce the FIP, as described in the 3rd FIP report. However, little progress was made to engage fishers and government agencies. Nevertheless, a Compromise of Good Practices between fishers and Alfocan was drafted, which is expected to be implemented soon, positively addressing Action 2.

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# 6 Production characterization

In 2023, Alfocan made two sets of data from the Guadiana basin available: a) total catch data (total weight per week) between April and June 2023 (which were analysed in the 4th FIP report), and b) crayfish length measurements based on a 2 kg sample collected twice or three times per week between July 11 and October 25. The length measurement data made available for the 2023 season could be compared and analysed with similar data from the 2022 season. However, due to the fact that the data was only made available very close to this report due date, it was not possible to treat and analyse it to be included in this report. Data for the entire season from South Ocean was not provided. It is critical to the successful completion of the work planned that data from the producers are provided on a timely manner.

# 7 2023 Results Discussion

FIP activities for the year 2023 started in May, involving three site visits to the Guadiana basin (one in a fishing pond, and two in Orellana lake). Fieldwork and data collection were exclusively conducted at Extremadura's lake fisheries, utilizing traps within the Guadiana basin, as there were no fishing activities in Andalucía in 2023 due to the aforementioned drought. The data collected provided the basis for an analysis of the catch composition and characterization the bycatch of the fishery in Extremadura, allowing for a comparison with the results from the previous year, 2022, in the same region.

On May 31st, the first visit to one of the fishing ponds was conducted. Data collected from this site showed significantly lower numbers of crayfish caught compared to the fishery in Orellana lake. The limited area of the sampled pond dictated the number of traps deployed, totalling 20. The CPUE (catch per unit of effort) was estimated at 5.27, indicating an average of 5 individuals caught during the 48-hour fishing period, as described in the 4th FIP report.

CPUE calculated for the 3r site visit in Orellana lake (July 18th 2023) were lower than the previous site visit in June in Orellana, approximately 3 weeks before, with a CPUE calculated in 63.9, as described in the 4th FIP report. CPUE from the site visit on the 1st of June 2022, was assessed to be 40.2. The results from the three sampling visits in Orellana (2022 and 2023) are difficult to compare since crustaceans populations are known to quickly change their abundance

in response to environment variations, as already described for Andalusia region in the 3rd FIP report. Additionally, the second visit in 2023 in Orellana was conducted with a (new) different fisher than the previous site visits in 2023 and 2022, as described in 2nd and 4th FIP reports.

Two main differences between years were also observed, namely in the fishing location within the lake (refer to Fig. 2) and the bait used, compared to the same period the previous year. In 2022, the bait primarily consisted of raw chicken and fruits, whereas this year, sardines replaced chicken as the bait of choice. The sardines purchased in Vigo appear to originate from the Iberian southern sardine stock caught by the local Galiza purse seine fishery. However, both the fishery and the stock require further confirmation. Additionally, the total quantity of sardines used in the Orellana fishery remains unclear, as also reported in the 4th FIP report.

Regarding the sex ratio of the crayfish sampled, the proportion of females were slightly higher than males for all three visits in Orellana lake, but the size distribution were similar, showing that the population were mainly composed by adult individuals approximately 250 days of age, with slightly decrease of size at the July 18th 2023 visit, where bigger individuals where not found (max. found was 43mm).

Bycatch was present in 59 traps sampled during the three visits at Orellana, between 2022 and 2023, and was therefore assessed to be very low. In addition, only one pumpkinseed individual, a prolific invasive species in the region, was found caught in one trap at the pond sampled.

Finally, the data provided by Alfocan in 2023 included total catch weights between April and June, which were analysed in the 4th FIP report, and the length measurements for July to October. However, the second set of production data was not provided on time to be included in this report. Data from South Ocean was not available for 2023 season.

## 8 Conclusions and Recommendations

The crayfish fishery in Extremadura and Andalusia seems to have similar crayfish catch composition in terms of sex ratio and length profiles within areas, and overall low bycatch of non-native species. However, stakeholder engagement and the involvement of government agencies in the fishery management process, as well as fishers' organization, are compromising the successful achievement of crucial actions in Principle 1 and 3, and impacting also Principle

2. As stated in the previous reports, stakeholders' engagement are crucial to understand the extent of the fishery and its impact. Hence, the subsequent recommendations are made:

a) Collect additional data concerning fishers and fishing areas, with a specific focus on fishing activities in the ponds within the Extremadura region.

b) Encourage increased involvement of fishers in the FIP activities.

c) Assess the origin and quantity of the sardines used as bait.

d) Request historical data from government administrations.

e) Obtain crayfish catch data for the whole fishing season from both companies to enable a comparative analysis.