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The use of fishers' Local Ecological Knowledge to reconstruct fish behavioural traits and fishers' perception of conservation relevance of elasmobranchs in the Mediterranean Sea

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The use of fishers' Local Ecological Knowledge to reconstruct fish behavioural traits and fishers' perception of the conservation relevance of elasmobranchs in the Mediterranean Sea

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| Fig. S1: Questionnai | ire template. | | |
|--------------------------------|-------------------------|--------------------|----------|
| PERSONAL DAT | `A | | |
| Name and surnam | e (voluntary) | | |
| Residence: Age and years of | fishing experience | City | Province |
| Fisheries | □ Gill nets | □ Bottom trawl | □ Others |
| | □ Longline | □ Otter beam trawl | |
| Targeted species: | : | | |
| Fishing frequenc | y: Number of times/year | | |

Questions

1. Have you ever fished, in the past or the present, sharks, skates or rays?

| | РА | ST | | PRESENT | | | |
|-----------------|-----|----|----|---------|-----|--|----|
| Sharks | YES | | NO | | YES | | NO |
| Skates and Rays | YES | | NO | | YES | | NO |

2. In which areas have you fished in the past? (point in the map)

3. In which areas do you fish nowadays? If it has changed regarding the past, why?

4. Have the shark_fisheries varied over time? In which way?

| | | 1940-1960 | 1960-1980 | | | 1980-2000 | | 2000-present | | | | | |
|---|----------|---|-----------|---|----------|---|----------|---|--|---|--|---|--|
| Total catches in the past regarding the present Personal assess- ment | | Very abundant (more than 3 times in comparison to the present) | | Very abundant (more than 3 times in comparison to the present) | | Very abundant (more than 3 times in comparison to the present) | | Very abundant (more than 3 times in comparison to the present) | | Very abundant (more than 3 times in comparison to the present) | | Very abundant (more than 3 times in comparison to the present) | |
| | | Abundant (twice more than in the present) | | Abundant (twice more than in the present) | | Abundant (twice more than in the present) | | Abundant (twice more than in the present) | | | | | |
| | | They remain the same | | They remain the same | | They remain the same | | They remain the same | | | | | |
| | | Less abundant | | Less abundant | | Less abundant | | Less abundant | | | | | |
| | | No assessment | | No assessment | | No assessment | | No assessment | | | | | |
| Which ones used to be the most | 1) 2) | | 1) 2) | | 1) 2) | | 1) 2) | | | | | | |
| abundant species? | 3) | | 3) | | 3) | | 3) | | | | | | |
| | 4) 5) | | 4) 5) | | 4) 5) | | 4) 5) | | | | | | |

CATCHES

5. Which shark species are not caught anymore, or have dramatically declined?

6. Are there any new shark species that have been caught nowadays, but not in the past? Which ones?

7. Have you noticed any change (increase or decrease) in the size of any shark species over time?

| Specie | Increase | Decrease | | | | |
|--------|----------|----------|--|--|--|--|
| | | | | | | |

8. Have the rays and skates' fisheries varied over time? In which way?

CATCHES

| | 1940-1960 | | | 1960-1980 | 1980-2000 | | | 2000-present | | |
|---|---|---|---|---|-----------|---|----|---|--|--|
| Total catches in the past regarding the present Personal assess- ment | Very abundant (more than 3 times in comparison to the present) | | Very abundant (more than 3 times in comparison to the present) | | | Very abundant (more than 3 times in comparison to the present) | | Very abundant (more than 3 times in comparison to the present) | | |
| | | Abundant (twice more than in the present) | | Abundant (twice more than in the present) | | Abundant (twice more than in the present) | | Abundant (twice more than in the present) | | |
| | | They remain the same | | They remain the same | | They remain the same | | They remain the same | | |
| | | Less abundant | | Less abundant | | Less abundant | | Less abundant | | |
| | | No assessment | | No assessment | | No assessment | | No assessment | | |
| Which ones used | 1) | | 1) | | 1) | | 1) | | | |
| to be the most | 2) | | 2) | | 2) | | 2) | | | |
| abundant species: | 3) | | 3) | | 3) | | 3) | | | |
| | 4) | | 4) | | 4) | | 4) | | | |
| | 5) | | 5) | | 5) | | 5) | | | |

9. Which ray/skate species are not caught anymore, or have dramatically declined?

10. Are there any new ray/skate species that have been caught nowadays, but not in the past? Which ones?

11. Have you noticed any change (increase or decrease) in the size of any ray/skate species over time?

| Specie | Increase | Decrease |
|--------|----------|----------|
| | | |

12. In your opinion, has the way of fishing sharks, skates and rays changed over time? (Type of fishery, seasons...)

13. Are there seasons in which you caught more or fewer sharks and/or skates and rays? (Please indicate the season(s))

| Species | Spring | Summer | Autumn | Winter |
|---------|--------|--------|--------|--------|
| | | | | |

14. In your opinion, is this seasonality related to migratory movements? For which species do you think this is true?

15. According to your knowledge, how do the sharks, skates and rays move in your fishing area?

16. Have you ever seen or fished any time aggregation of sharks and/or skates/rays? Of which species?

17. Has the occurrence of such aggregations changed over time? For which species?

AGGREGATIONS

| | 1940-1960 | 1960-1980 | | 1980-2000 | 2000-present | | |
|---------|----------------|-----------|----------------|----------------|--------------|----------------|--|
| Species | Never observed | | Never observed | Never observed | | Never observed | |
| | Rarely | | Rarely | Rarely | | Rarely | |
| | Frequently | | Frequently | Frequently | | Frequently | |

18. Description of the aggregations: dimension, sex and abundance, in the past and present.

AGGREGATIONS

| | 1940-1960 | 1960-1980 | 1980-2000 | 2000-present |
|---------|--|--|--|--|
| Species | Few | Few | Few | Few |
| | Many (more than 10 specimens) |
| | A lot of them (more than 50 specimens) |
| | Big | Big | Big | Big |
| | Medium | Medium | Medium | Medium |
| | Small | Small | Small | Small |
| | Males | Males | Males | Males |
| | No pregnant females | No pregnant females | No pregnant females | No pregnant females |
| | Pregnant females | Pregnant females | Pregnant females | Pregnant females |
| | Mixed | Mixed | Mixed | Mixed |

19. Could you indicate in which areas these aggregations occurred (map)? Inshore or offshore? Any location in particular?

20. In which period of the year?

21. Do you believe that sharks, rays and skates are important for the marine environment?

22. Do you believe that sharks, skates and rays are important for fisheries?

23. Do you think that is important to conserve sharks, skates and rays? If so, how would you do it?

Table S1. Percentage of interviewed fishers answering about the seasonality of each species for the different sampling points (Ancona (ANC), Chioggia (CHIO), Marano Lagunare (ML), Northern Istria (NI), Southern Istria (SI), Eastern Adriatic coast (EAC) and Montenegro (MON) in the Adriatic Sea, above the 25% threshold.

| | ANC | CHIO | ML | NI | SI | EAC | MON |
|------------------|-----|------|-----|-----|----|-----|-----|
| Total of fishers | 15 | 12 | 13 | 23 | 21 | 8 | 10 |
| Mustelus spp. | - | 83 | 92 | 100 | 52 | 100 | 40 |
| M. aquila | - | - | 92 | 100 | - | 75 | - |
| <i>Raja</i> spp. | 53 | 33 | 85 | 75 | 62 | 100 | 50 |
| S. acanthias | 27 | 42 | 100 | 100 | 57 | 25 | 30 |
| S. stellaris | - | - | 62 | 60 | - | - | - |

Table S2. Percentage of interviewed fishers answering about the seasonality question of each species for the different sampling areas in other GSAs [Italy (ITA), Turkey (TUR), Spain (SPA)], above the 25% threshold.

| GSA | 9 | 9 | 22/28 | 11.2 | 16 | 6 | 19 | 10 |
|---------------|-----|-----|-------|-----------|-----------|-----|----------|----------|
| Country | ITA | ITA | TUR | ITA (SAR) | ITA (SIC) | SPA | ITA(CAL) | ITA(CAL) |
| Tot. fishers | 12 | 9 | 10 | 14 | 15 | 15 | 6 | 6 |
| Raja spp. | 40 | 33 | 44 | 57 | - | - | - | - |
| P. glauca | - | 33 | - | - | - | 28 | 50 | - |
| S. canicula | - | - | - | 42 | - | - | - | - |
| Torpedo spp. | - | - | - | 28 | - | - | 33 | - |
| Mustelus spp. | - | - | - | - | 40 | - | - | - |
| P. violacea | - | - | - | - | - | 42 | - | - |
| I. oxyrhincus | - | - | - | - | - | - | - | 33 |

Table S3. Percentage of interviewed fishers answering to each question (QN: question number) for each species indicating aggregation features in the Adriatic Sea during different time periods: B) 1960-1980; C) 1980-2000; D) 2000-Present.

| | QN 17 | | | QN 18A | | | QN 18B | | | QN 18C | | |
|------------------|---------------|---------------|------------------|---------------|---------------|------------------|---------------|---------------|------------------|---------------|---------------|------------------|
| | 1960- 1980 | 1980- 2000 | 2000 -Present |
| Mustelus spp. | 9 | 45 | 48 | 7 | 49 | 49 | 7 | 38 | 42 | 5 | 43 | 44 |
| S. acanthias | 5 | 30 | 35 | 4 | 22 | 26 | 4 | 17 | 20 | 5 | 17 | 19 |
| M. aquila | 4 | 22 | 23 | 2 | 19 | 16 | 2 | 15 | 13 | 2 | 10 | 9 |
| <i>Raja</i> spp. | 7 | 19 | 25 | 4 | 16 | 24 | 4 | 13 | 20 | 3 | 11 | 14 |

Table S4. Percentage of interviewed fishers answering to each question (QN: question number) for each species indicating agregation features in other Mediterranean GSAs during different time periods: B) 1960-1980; C) 1980-2000; D) 2000-Present.

| | QN 17 | | | QN 18A | | | QN 18B | | | QN 18C | | |
|------------------|---------------|---------------|------------------|---------------|---------------|------------------|---------------|---------------|-------------------|---------------|---------------|------------------|
| | 1960- 1980 | 1980- 2000 | 2000 -Present | 1960- 1980 | 1980- 2000 | 2000 -Present | 1960- 1980 | 1980- 2000 | 2000-Pres- ent | 1960- 1980 | 1980- 2000 | 2000 -Present |
| Mustelus spp. | 9 | 9 | 7 | 8 | 9 | 4 | 7 | 8 | 3 | 6 | 6 | 4 |
| <i>Raja</i> spp. | 9 | 11 | 9 | 9 | 13 | 10 | 8 | 13 | 9 | 8 | 10 | 9 |
| S. canicula | 9 | 14 | 11 | 7 | 12 | 12 | 5 | 12 | 11 | 5 | 9 | 8 |

| Table S5. Percentage of interviewed fishers answering to the questions related to aggregations (QN 17 and QN 18) in each | GSA. |
|--|------|
|--|------|

| GSA | GSA 6 | GSA 9 | GSA 10 | GSA 11 | GSA 16 | GSA 19 | GSA 22/28 |
|------------------|-------|-------|--------|--------|--------|--------|-----------|
| Mustelus spp. | - | 8 | - | - | 84 | 8 | |
| <i>Raja</i> spp. | - | 25 | 13 | 13 | 36 | - | 13 |
| S. canicula | 23 | 27 | - | 23 | 27 | - | - |

Table S6. Percentage of fishing gears used by interviewed fishers in the different sampling areas.

| | GSA 6 | GSA 9 | GSA 10 | GSA 11 | GSA13 | GSA 16 | GSA 17 | GSA 18 | GSA 19 | GSA 20 | GSA 22 | GSA 28 |
|--------------------------|-------|-------|--------|--------|-------|--------|--------|--------|--------|--------|--------|--------|
| Gillnets (GNS) | 0 | 40 | 30 | 34 | 41 | 17 | 29 | 17 | 31 | 8 | 45 | 0 |
| Long Line (LLS) | 11 | 21 | 25 | 35 | 5 | 20 | 8 | 25 | 31 | 33 | 45 | 50 |
| Bottom trawl (OTB) | 55 | 29 | 40 | 24 | 33 | 63 | 35 | 25 | 8 | 58 | 10 | 6 |
| Mid-water Trawl (PTM) | 7 | 0 | 0 | 0 | 0 | 0 | 10 | 17 | 0 | 0 | 0 | 6 |
| Other beam trawl (TTB) | 0 | 0 | 0 | 0 | 22 | 0 | 9 | 0 | 0 | 0 | 0 | 19 |
| Other | 27 | 9 | 5 | 7 | 0 | 0 | 10 | 17 | 31 | 0 | 0 | 19 |