

[10.1071/MF23094](https://doi.org/10.1071/MF23094)

*Marine and Freshwater Research*

### **Supplementary Material**

#### **The social and economic dimensions of one of the world's longest-operating shark fisheries**

*Matias Braccini<sup>A\*</sup>, Maddison Watt<sup>B</sup>, Clinton Syers<sup>B</sup>, Nick Blay<sup>B</sup>, Matthew Navarro<sup>C</sup>, and Michael Burton<sup>C</sup>*

<sup>A</sup>Western Australian Fisheries and Marine Research Laboratories, Department of Primary Industries and Regional Development of Western Australia, 39 Northside Drive, Hillarys, WA 6920, Australia.

<sup>B</sup>Fisheries and Agriculture Resource Management, Department of Primary Industries and Regional Development of Western Australia, 1 Nash Street, Perth, WA 6000, Australia.

<sup>C</sup>UWA School of Biological Sciences and UWA Oceans Institute, The University of Western Australia, 35 Stirling Highway, Crawley WA 6009, Australia.

\*Correspondence to: Matias Braccini Western Australian Fisheries and Marine Research Laboratories, Department of Primary Industries and Regional Development of Western Australia, 39 Northside Drive, Hillarys, WA 6920, Australia Email: [matias.braccini@dpird.wa.gov.au](mailto:matias.braccini@dpird.wa.gov.au)

# Questionnaires used during the interview of (a) fishers and (b) fish processors

## (a) Fisher questionnaire

*This survey takes no more than 30 minutes to complete and consists of 7 sections*

1. Date. / /
2. Full name.

### Section 1: Ownership and employment

*In this part of the survey, we will ask you some basic questions about your vessel and employees to determine the social benefits of your business to regional communities*

3. Source of information. *Are you an*  Owner  Skipper *(tick as appropriate)*
4. *What is the name of your vessel?*
5. *What is your vessel registration number?*
6. *What fishing method do you use?*  Gillnet  Longline  Gillnet & Longline
  - a. *If both, what percentage of your annual fishing trips are done with gillnets?* %
7. ***On an average fishing day***, how many FTEs work on your boat, including the skipper?
8. ***In a whole year***, how many people do you employ to work on your boat? *(this is about the total number of jobs provided in a year)*

### Section 2: Catch

*In this part of the survey, we will ask you some basic questions about who you sell your catch to. The aim of this question is to determine roughly how much of your catch is sold **locally (within 50 km)** and how much is sold elsewhere.*

9. *What percentage of your **annual** catch do you sell to the following buyers?*
  - a. *Direct to public* %
  - b. *Direct to local restaurants or other retailers* %
    - i. *Could you provide the name of those businesses?*
  - c. *Self-consumed* %
  - d. *Local fish processor* %
    - i. *Could you provide the name of those businesses?*
  - e. *Export interstate* %
  - f. *Export overseas* %
  - g. *Other* %
    - i. *Specify 'other'*
10. *If selling to overseas exporter, what body parts do you sell?*  Fins  Meat  Cartilage  Liver  Other

### Section 3: Revenue

*In this part of the survey, we will ask you some basic questions about your revenue. This information is important to know in order to understand how much total income was generated within your region from fishing and related businesses.*

*If you are also a processor, please provide revenue from **catching fish** only. Revenue from fish processing is provided in the 'processor questionnaire'.*

11. *What is your approximate **total annual fishing revenue**? (for an average financial year)*

- |   |   |   |
|---|---|---|
| <input type="checkbox"/> Less than \$50,000     | <input type="checkbox"/> \$50,000 to \$99,999   | <input type="checkbox"/> \$100,000 to \$149,999 |
| <input type="checkbox"/> \$150,000 to \$199,999 | <input type="checkbox"/> \$200,000 to \$249,999 | <input type="checkbox"/> \$250,000 to \$299,999 |
| <input type="checkbox"/> \$300,000 to \$349,999 | <input type="checkbox"/> \$350,000 to \$399,999 | <input type="checkbox"/> \$400,000 to \$449,999 |
| <input type="checkbox"/> \$450,000 to \$499,999 | <input type="checkbox"/> \$500,000 or more      | <input type="checkbox"/> Prefer not to answer   |

12. *If you are willing to provide the actual value (to the nearest \$10,000) that would be most appreciated \$*

13. *What is the average price you receive per kg of:*

a. Gummy shark	\$
b. Dusky shark	\$
c. Whiskery shark	\$
d. Sandbar (thick skin) shark	\$
e. Shark fins	\$
f. Other sharks and rays	\$
g. Snapper	\$
h. Dhufish	\$
i. Queen snapper	\$
j. Blue groper	\$
k. Other scalefish	\$

14. *Do you sell other shark products?*  Cartilage  Liver  Skin  Jaws/teeth  Other

15. *Roughly, what proportion of your **total fishing revenue** do you keep as your **own personal income**?*

less than 10%	10%	15%	20%	25%	30%	35%	40%	45%	more than 45%
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

## Section 4: Costs

In this part of the survey, we will ask you some basic questions about your **annual** fishing costs. This information is important to determine the flow on effects and value of the fishery to local communities.

If you are also a processor, please provide costs from **catching fish** only. Costs from fish processing are provided in the 'processor questionnaire'.

16. What are your approximate **total annual fishing costs**? (see Question 19. for a list of different costs)

- |   |   |   |
|---|---|---|
| <input type="checkbox"/> Less than \$50,000     | <input type="checkbox"/> \$50,000 to \$99,999   | <input type="checkbox"/> \$100,000 to \$149,999 |
| <input type="checkbox"/> \$150,000 to \$199,999 | <input type="checkbox"/> \$200,000 to \$249,999 | <input type="checkbox"/> \$250,000 to \$299,999 |
| <input type="checkbox"/> \$300,000 to \$349,999 | <input type="checkbox"/> \$350,000 to \$399,999 | <input type="checkbox"/> \$400,000 to \$449,999 |
| <input type="checkbox"/> \$450,000 to \$499,999 | <input type="checkbox"/> \$500,000 or more      | <input type="checkbox"/> Prefer not to answer   |

17. If you are willing to provide the actual value (to the nearest \$10,000) that would be most appreciated \$

18. Roughly, how much do you pay per year for your fishing business related taxes (i.e. excluding income tax):

- a. State Government tax (e.g. payroll tax)? \$
- b. Federal Government tax (e.g. GST)? \$

19. If you are willing to break down the fishing costs, **what percentage** of your annual fishing costs was due to:

a. Vessel repairs and maintenance	%
b. Vessel lease/mortgage	%
c. Gear repairs, maintenance and replacement	%
d. Fuel and lubricants	%
e. Crew (including skipper; salaries, superannuation, etc.)	%
f. Food	%
g. Packaging	%
h. Ice	%
i. Bait	%
j. Administration (accountancy, electricity, gas, business vehicle repair and maintenance, wharfage, fishing licence fees & levies, unit/licence leasing, telephone & postage, insurance)	%
k. Other costs (e.g. protective equipment, general consumables)	%

## Section 5: Business expenditure location

*In this part of the survey, we will ask you some basic questions about what part of your business expenditure is done locally.*

(note: if not using a particular input at all, e.g. bait, do not write '0', just tick the "Did not use" box)

20. *What percentage of your annual costs is spent within your **local government area** (i.e. shire, city or town)?*

a. Vessel repairs and maintenance	%	<input type="checkbox"/> Did not use
b. Vessel lease/mortgage	%	<input type="checkbox"/> Did not use
c. Gear repairs, maintenance and replacement	%	<input type="checkbox"/> Did not use
d. Fuel and lubricants	%	<input type="checkbox"/> Did not use
e. Crew	%	<input type="checkbox"/> Did not use
f. Food	%	<input type="checkbox"/> Did not use
g. Packaging	%	<input type="checkbox"/> Did not use
h. Ice	%	<input type="checkbox"/> Did not use
i. Bait	%	<input type="checkbox"/> Did not use
j. Administration	%	<input type="checkbox"/> Did not use
k. Other costs	%	<input type="checkbox"/> Did not use

20.I *What is your home port?*

## Section 6: Demographics

*This part is about you.*

21. *How many years have you been commercially fishing?*

22. *Gender*  Male  Female  Other, please specify

23. *Are you of Aboriginal and/or Torres Strait Islander origin?*  Yes  No

24. *What is your household size (number of persons)?*

25. *How many family members are engaged in commercial fishing?*

26. *What percentage of your family income comes from commercial fishing?* %

## Section 7: Other

27. *Do you receive a fuel rebate?*  Yes  No

a. *If Yes, how many cents per litre?*

b. *If Yes, how many litres of fuel do you use per year?*

28. *Do you receive other types of business rebates, exemptions or government assistance?*  Yes  No

a. *If Yes, please specify*

b. *If Yes, how much per year (to the nearest \$100)? \$*

29. *Do you own the vessel?*  Yes  No

a. *If Yes, when did you purchase your vessel?*

b. *If Yes, how much did you pay (to the nearest \$10,000)? \$*

c. *If Yes, what is the market value of your vessel now (to the nearest \$10,000)? \$*

d. *If you own & operate the vessel, how much you would need to pay someone else to skip it per year? \$*

30. *Please add any comments you would like to make and/or your email address if you would like further information*

## (b) Fish processor questionnaire

*This survey takes no more than 30 minutes to complete and consists of 7 sections*

31. Date. / /

### Section 1: Ownership and employment

*In this part of the survey, we will ask you some basic questions about your employees to determine the social benefits of your business to regional communities*

32. Full name

a. Are you a?  Processor  Processor and vessel owner *(tick as appropriate)*

33. **On an average day**, how many FTEs work in your processing plant (filleting, packaging, admins, transport, etc.)?

34. **In a whole year**, how many people do you employ to work in your processing plant? (this is about the total number of jobs provided in a year)

### Section 2: Catch

*In this part of the survey, we will ask you some basic questions about how much catch you process and who you sell this catch to.*

35. How many **tonnes** of fish do you **process per year** (this includes all species and fisheries)?

a. What **percentage** of the **total processed** catch comes from the TDGDLF? %

b. How many tonnes of processed fish do you buy **from other processors**?

36. What **percentage** of your total processed catch do you sell to the following buyers?

a. Direct to public %

b. Direct to **local (within 50 km)** restaurants or other retailers %

i. Could you provide the name of those businesses?

c. Self-consumed %

d. Other processor %

e. Export interstate %

f. Export overseas %

g. Other %

i. Specify 'other'

37. **Overseas and interstate import/export.**

a. **If selling to overseas exporter, what body parts do you sell?**  Fins  Meat  Cartilage  Liver  
 Other

b. **Do you import fish from interstate?**  Yes  No

i. **If Yes, how many tonnes per year?**

c. **Do you import fish from overseas?**  Yes  No

i. **If Yes, how many tonnes per year?**

### Section 3: Revenue

*In this part of the survey, we will ask you some basic questions about your revenue. This information is important to know in order to understand how much total income was generated within your region from your businesses.*

*If you are also a vessel owner, please provide revenue from **fish processing** only. Revenue from catching fish is provided in the 'fisher questionnaire'.*

**38. What is your approximate total annual revenue? (for an average financial year)**

- |   |   |   |
|---|---|---|
| <input type="checkbox"/> Less than \$50,000     | <input type="checkbox"/> \$50,000 to \$99,999   | <input type="checkbox"/> \$100,000 to \$149,999 |
| <input type="checkbox"/> \$150,000 to \$199,999 | <input type="checkbox"/> \$200,000 to \$249,999 | <input type="checkbox"/> \$250,000 to \$299,999 |
| <input type="checkbox"/> \$300,000 to \$349,999 | <input type="checkbox"/> \$350,000 to \$399,999 | <input type="checkbox"/> \$400,000 to \$449,999 |
| <input type="checkbox"/> \$450,000 to \$499,999 | <input type="checkbox"/> \$500,000 or more      | <input type="checkbox"/> Prefer not to answer   |

**39. If you are willing to provide the actual value (to the nearest \$10,000) that would be most appreciated \$**

**40. What is the average price you receive per kg of:**

	Retail	Wholesale
a. Gummy shark	\$	\$
b. Dusky shark	\$	\$
c. Whiskery shark	\$	\$
d. Sandbar (thick skin) shark	\$	\$
e. Shark fins	\$	\$
f. Other sharks and rays	\$	\$
g. Snapper	\$	\$
h. Dhufish	\$	\$
i. Queen snapper	\$	\$
j. Blue groper	\$	\$
k. Other scalefish	\$	\$

**l. What proportion of the processed catch is sold wholesale?**

**41. Do you sell other shark products?**  Cartilage  Liver  Skin  Jaws/teeth  Other

**42. Roughly, what proportion of your total revenue do you keep as your own personal income?**

less than 10%	10%	15%	20%	25%	30%	35%	40%	45%	more than 45%
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

## Section 4: Costs

*In this part of the survey, we will ask you some basic questions about your **annual** fishing costs. This information is important to determine the flow on effects and value of the fishery to local communities.*

*If you are also a vessel owner, please provide costs from **fish processing** only. Costs from catching fish are provided in the 'fisher questionnaire'.*

43. *What are your approximate **total annual processing costs**? (see question 16. for a list of different costs)*

- |   |   |   |
|---|---|---|
| <input type="checkbox"/> Less than \$50,000     | <input type="checkbox"/> \$50,000 to \$99,999   | <input type="checkbox"/> \$100,000 to \$149,999 |
| <input type="checkbox"/> \$150,000 to \$199,999 | <input type="checkbox"/> \$200,000 to \$249,999 | <input type="checkbox"/> \$250,000 to \$299,999 |
| <input type="checkbox"/> \$300,000 to \$349,999 | <input type="checkbox"/> \$350,000 to \$399,999 | <input type="checkbox"/> \$400,000 to \$449,999 |
| <input type="checkbox"/> \$450,000 to \$499,999 | <input type="checkbox"/> \$500,000 or more      | <input type="checkbox"/> Prefer not to answer   |

44. *If you are willing to provide the actual value (to the nearest \$10,000) that would be most appreciated \$*

45. *Roughly, how much do you pay per year for your processing business related taxes (i.e. excluding income tax):*

a. *State Government tax (e.g. payroll tax)? \$*

b. *Federal Government tax (e.g. GST)? \$*

46. *If you are willing to break down these costs, **what percentage** of your annual processing costs was due to:*

a. Sourcing fish (purchasing from fisher or other processor)	%
b. Equipment repairs, maintenance and replacement	%
c. Packaging	%
d. Persons working in processing plant (salaries, superannuation, etc. for filleting, packaging, admin, transport, etc.)	%
e. Ice	%
f. Processing plant lease/mortgage	%
g. Administration (accountancy, electricity, gas, business vehicle repair and maintenance, telephone & postage, bank fees & interests, insurance)	%
h. Other costs (e.g. protective equipment, general consumables)	%



## Section 5: Business expenditure location

*In this part of the survey, we will ask you some basic questions about what part of your business expenditure is done locally.*

(note: if not using a particular input at all, e.g. bait, do not write '0', just tick the "Did not use" box)

47. *What percentage of your annual processing costs is spent within your local government area (i.e. shire, city or town)?*

a. Sourcing fish	%	<input type="checkbox"/> Did not use
b. Gear repairs, maintenance and replacement	%	<input type="checkbox"/> Did not use
c. Packaging	%	<input type="checkbox"/> Did not use
d. Persons working in processing plant	%	<input type="checkbox"/> Did not use
e. Ice	%	<input type="checkbox"/> Did not use
f. Processing plant lease/mortgage	%	<input type="checkbox"/> Did not use
g. Administration	%	<input type="checkbox"/> Did not use
h. Other costs	%	<input type="checkbox"/> Did not use

17.i *Where are you based?*

## Section 6: Demographics

*This part is about you.*

48. *How many years have you been a processor?*

49. *Gender*  Male  Female  Other, please specify

50. *Are you of Aboriginal and/or Torres Strait Islander origin?*  Yes  No

51. *What is your household size (number of persons)?*

52. *How many family members are engaged in fish processing?*

53. *What percentage of your family income comes from fish processing?* %

## Section 7: Other

54. *Do you receive any type of business rebates, exemptions or government assistance for processing fish?*

Yes  No

a. *If Yes, please specify*

b. *If Yes, how much per year (to the nearest \$100)? \$*

55. *Do you own the processing plant?*  Yes  No

a. *If Yes, when did you purchase it?*

b. *If Yes, how much did you pay (to the nearest \$10,000)? \$*

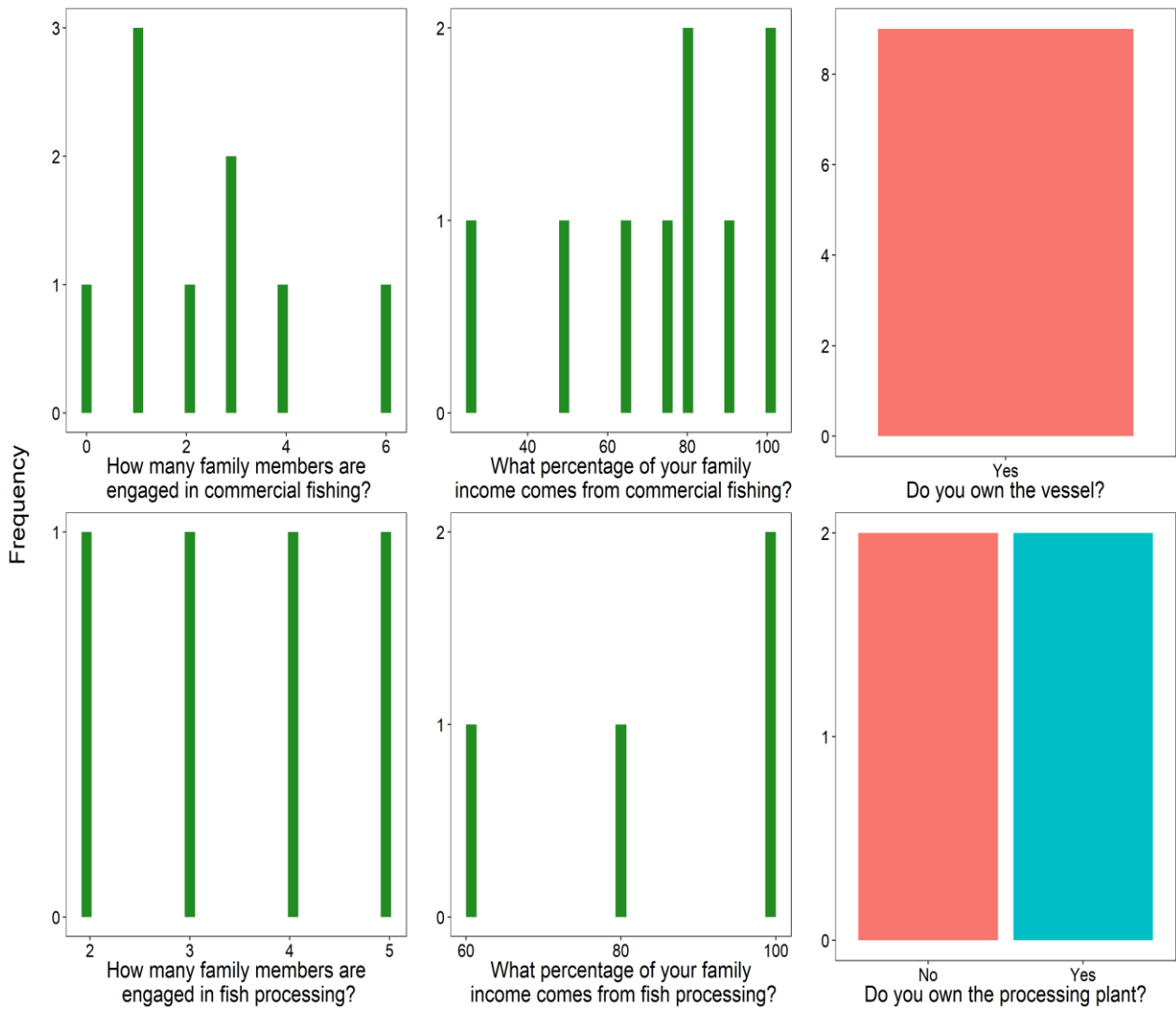
c. *If Yes, what is the market value of your processing plant now (to the nearest \$10,000)? \$*

56. *Please add any comments you would like to make and/or your email address if you would like further information*

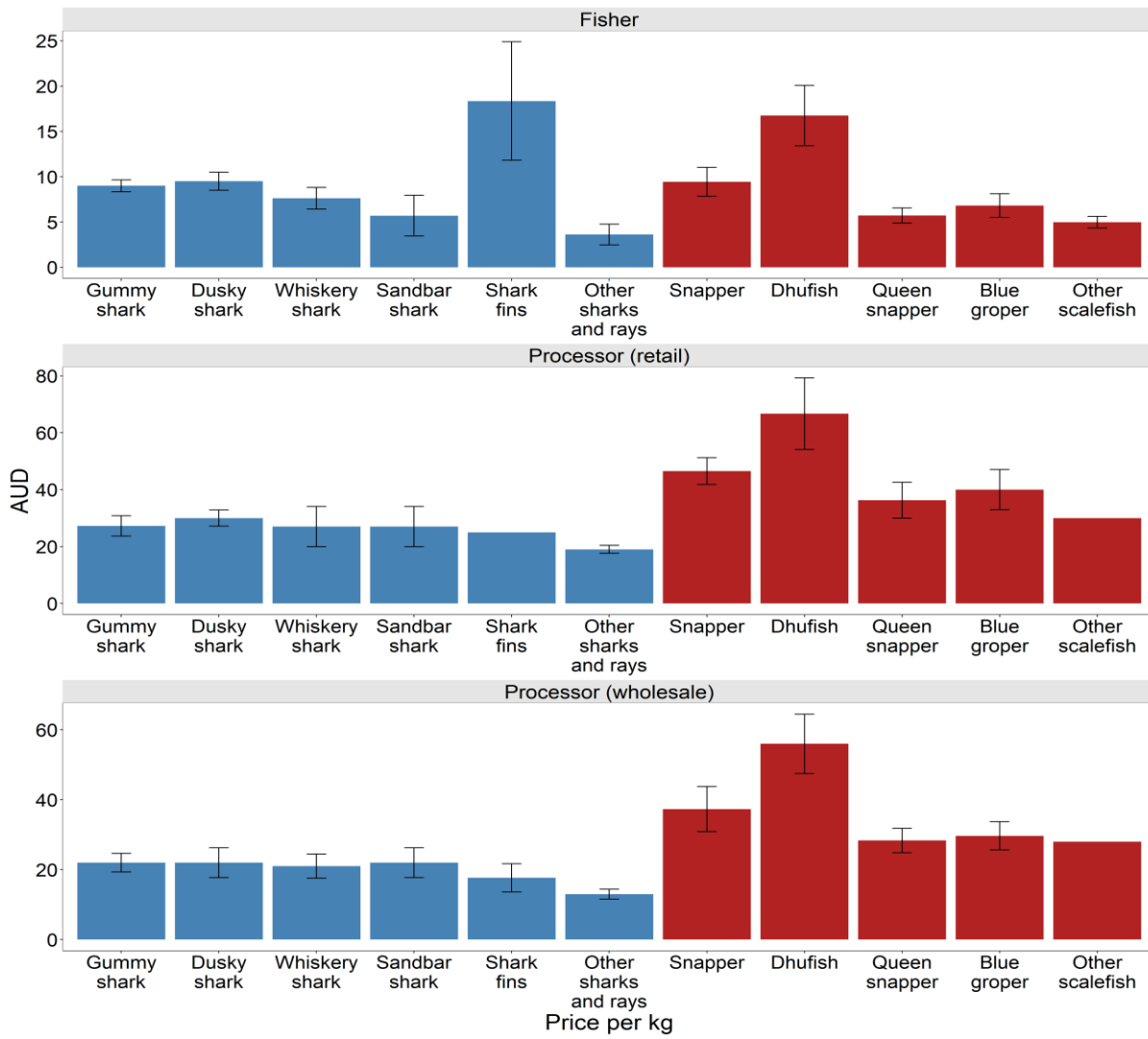
**Table S1.** Summary of parameters and variables used in the calculation of fishery value through the supply chain.

Parameter/variable	Description	Parameter value	Source
$p_{sold\ retail}$	Proportion of the processed catch from the TDGDLF sold by processors as retail	0.35	This study
$p_{ri}$	Processors' retail price per kg (fillets) for species $i$		This study
$\bar{l}_i$	Annual landed catch of species $i$ by the TDGDLF (average for 2014-2019)		DPIRD's catch and effort systems
$r_i$	Flesh recovery rate of species $i$	0.7: shark trunks 0.06: shark belly flaps 0.35: scalefish	Rogers (2017)
$p_{sold\ other\ retailer}$	Proportion of the processed catch from the TDGDLF sold by processors to retailers other than fish & chip shops	0.275	This study
$p_{wi}$	Processors' wholesale price per kg (fillets) for species		This study
$\alpha$	Multiplier used for determining menu price for retailers other than fish & chip shops	3.3	Trenton Brennan, owner of the Ocean & Paddock restaurant
$p_{sold\ FC}$	Proportion of the processed catch from the TDGDLF sold by processors to fish & chip shops	0.375	This study
$p_{fci}$	Fish & chips price per kg (fillets) for species $i$		This study

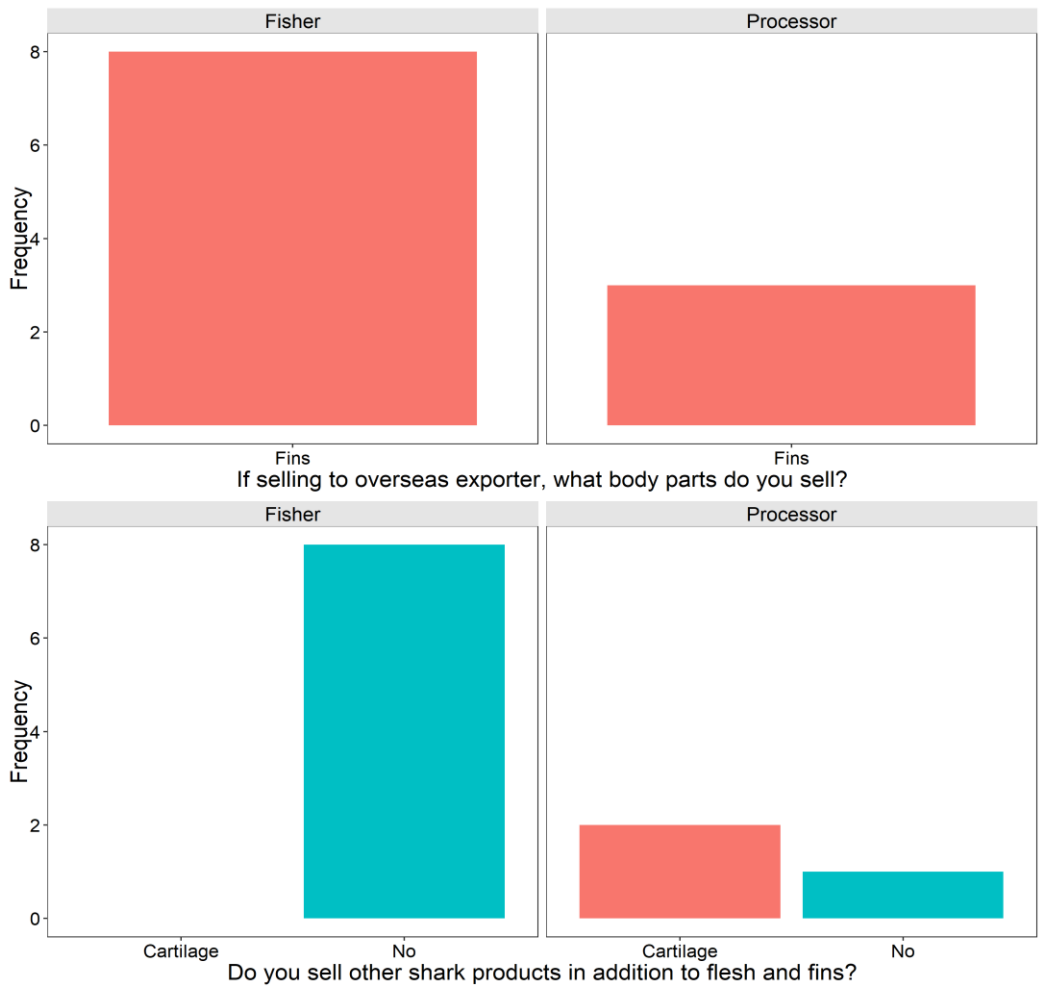
Only parameter values are provided in this table. Variable values are presented in the figures.



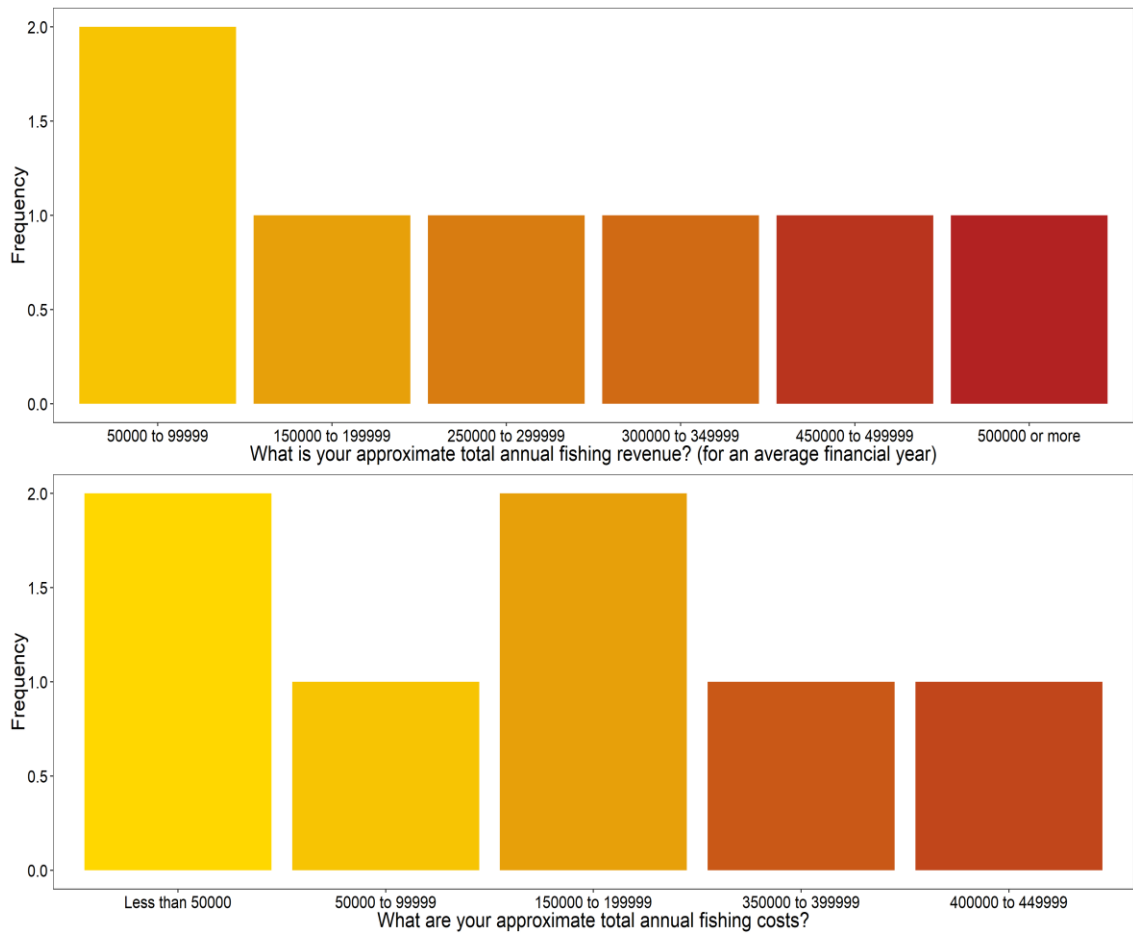
**Figure S1.** Socio-economic survey. Family engagement, income and ownership for fishers (top panels) and processors (bottom panels).



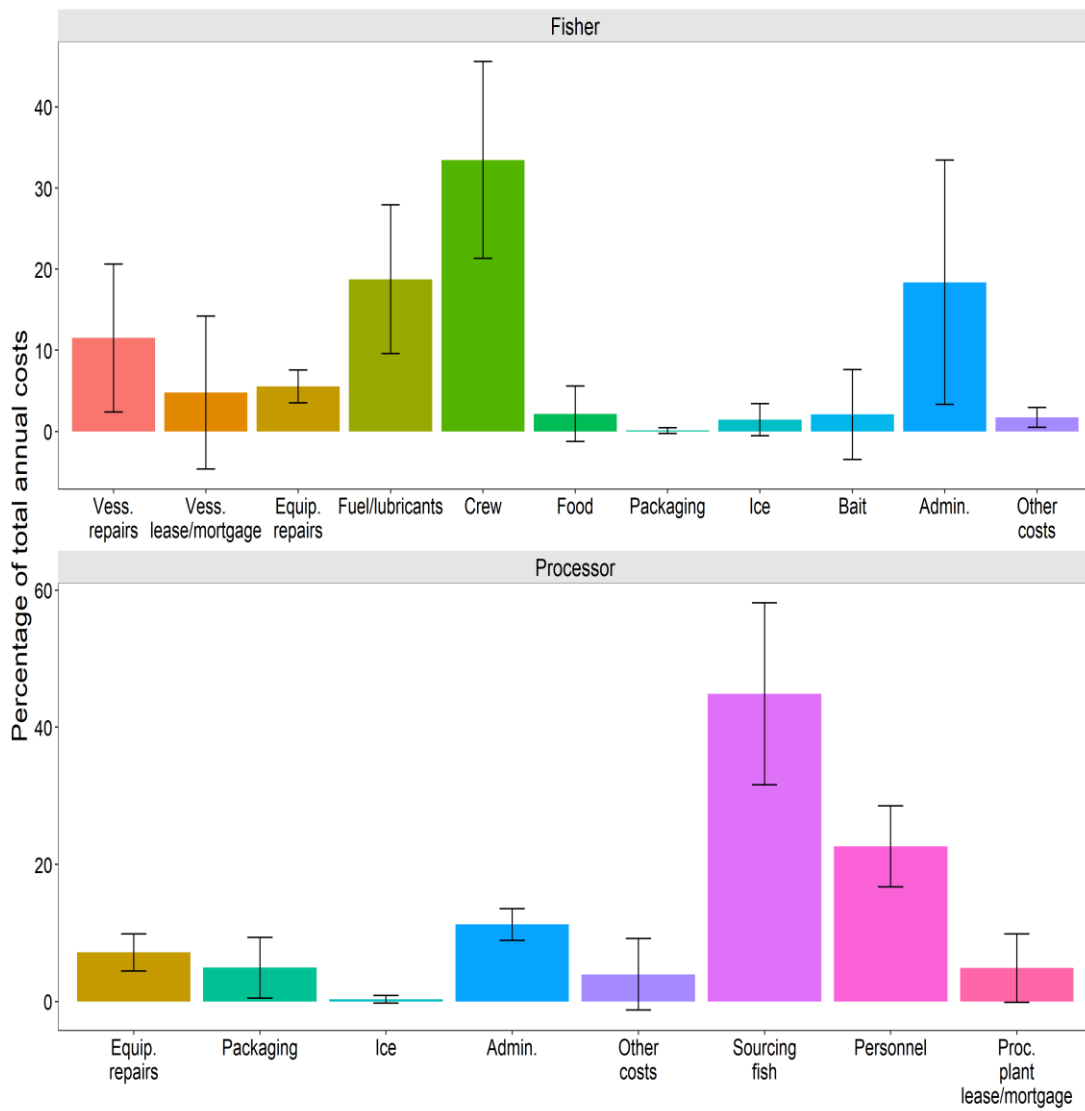
**Figure S2.** Socio-economic survey. Average price ( $\pm$ s.d.) per kilogram for trunks (sharks) or whole body (scalefish) for fishers or per kilogram for fillets for processors.



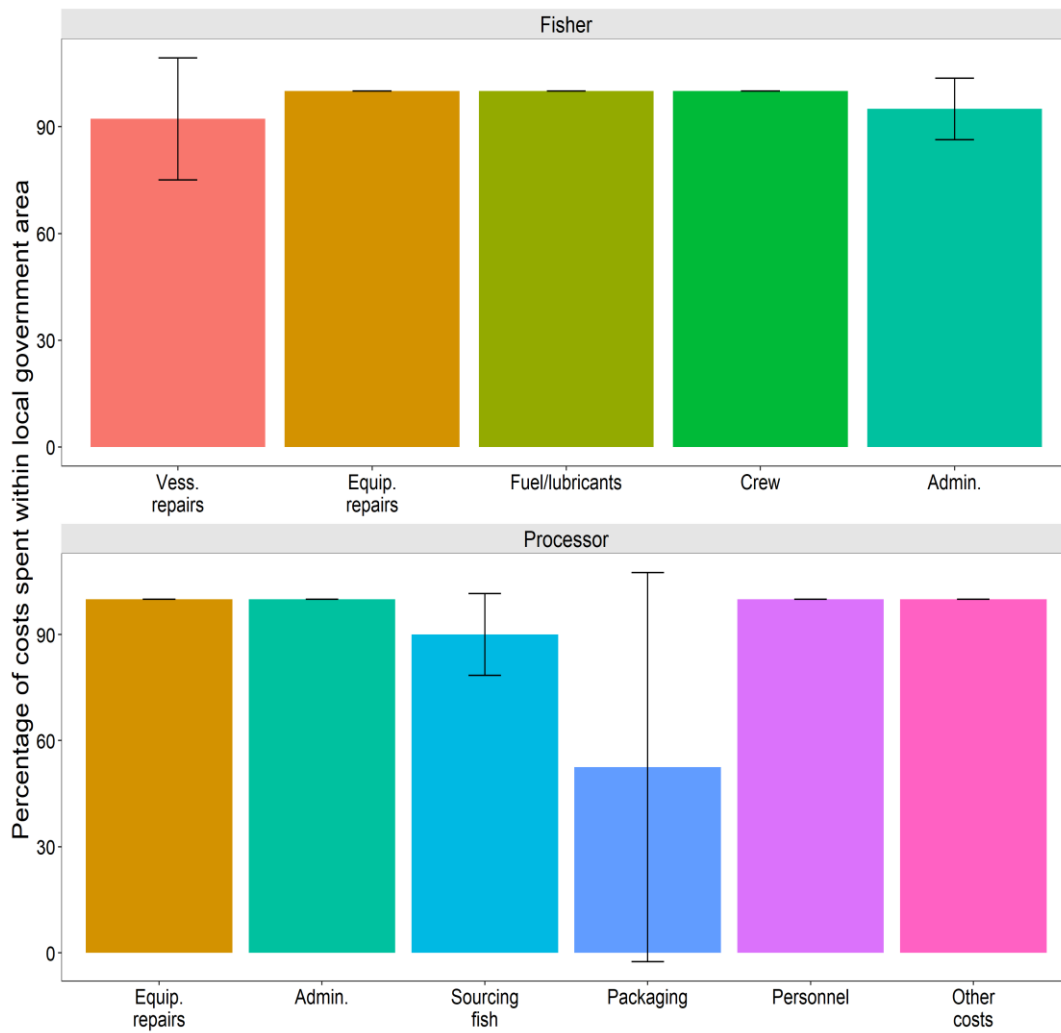
**Figure S3.** Socio-economic survey. Exported shark parts and other shark parts sold by fishers and processors.



**Figure S4.** Socio-economic survey. Total annual revenue and costs by fisher.

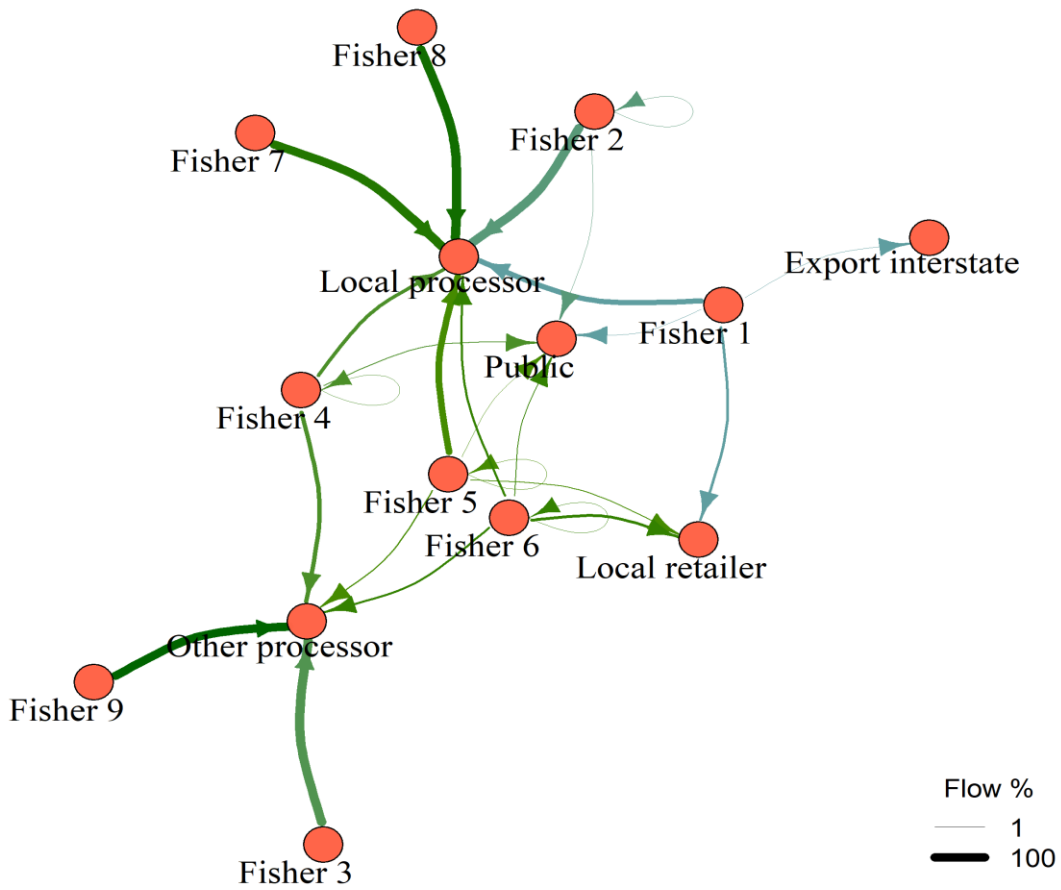


**Figure S5.** Socio-economic survey. Breakdown of the total annual costs (averaged across all respondents with s.d.).



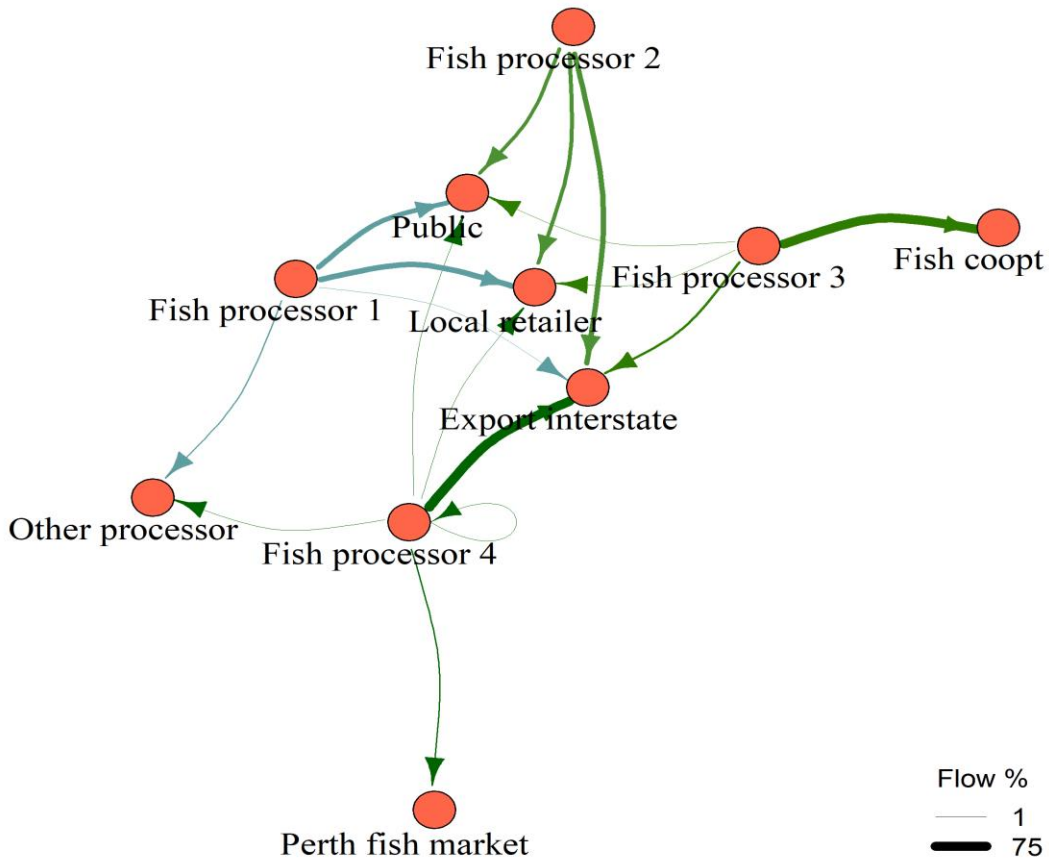
**Figure S6.** Socio-economic survey. Breakdown of the total annual costs (averaged across all respondents with s.d.) spent within local government areas.





**Figure S7.** Social network displaying the destination of landed catch and supply chain for each interviewed fisher.

Link width is proportional to catch flow.



**Figure S8.** Social network displaying the destination of landed catch and supply chain for each interviewed processor. Link width is proportional to catch flow.