



Knowledge on the use of catch material for craftwork/handicrafts by an urban fishing community

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The present study aimed to investigate knowledge on the use of catch material for craftwork by the members of the fishing community of Brasília Teimosa. Among the 98 artisanal fishermen interviewed, 64.6% demonstrated knowledge on the use of catch material for craftwork, but reported not participating in the creation of such craftwork. The fishermen cited 36 common names, mainly Actinopterygii (53.8%) and Crustacea (29.2%). The most caught species were the queen triggerfish *Balistes vetula* (13.1%) and the Atlantic tarpon *Megalops atlanticus* (12.3%). The most cited material was the entire body or taxidermied parts of the body (48.8%), followed by the skin (20.1%) for the fabrication of jewelry and souvenirs. Some catches had more than one raw material cited, such as sharks and the queen triggerfish. The main market pressure on fishing activity in the community of Brasília Teimosa is for food consumption. Catches destined for the production of craftwork are appreciated as a food source or captured incidentally. However, many of the species cited are on national and international conservation priority lists. Thus, regardless of the end use, the exploitation of these fishing resources should be performed with caution to avoid further harm to these populations and not compromise the sustainability of the activity, considering the cultural particularities of the populations that use these resources for subsistence and/or the generation of income.

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Natural aquatic resources used by humans are perceived and exploited in accordance with the culture of each society¹⁻³. Although the end use of most fishing production worldwide is food, a small portion of these resources is used for other purposes⁴, such as craftwork. This activity regards any craft that uses animals or parts of animals as cultural, artistic expression and is very often passed down from generation to generation⁵.

The global trade of marine craftwork involves numerous species of Sponges, corals, mollusks, arthropods, echinoderms and fishes⁶⁻⁹. In Brazil, this type of product is common merchandise in shops and craft fairs in both coastal and inland communities⁷. In

the State of Pernambuco (northeastern Brazil), this activity has been strengthened as a source of employment and income and such products are easily found in traditional craftwork markets in the city of Recife, which is the capital of the state, as a manner to meet the demands of the intensive tourist trade. Twenty-eight species of marine vertebrates, including cnidarians, mollusks, arthropods and echinoderms, are used for craftwork in the city⁵.

The growth of tourism, especially in the northeastern region of Brazil¹⁰, has exerted an influence on market pressure for local craft products and will likely lead to greater exploitation of the organisms used in this practice. Such information is of extreme importance to the evaluation of anthropogenic pressure on these resources in both the

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short and long term and is fundamental to management plans.

Artisanal fishermen are an essential element in the commercial chain of this type of craftwork, as they either directly or indirectly provide the raw materials for the practice⁵. More than half of the estuarine and marine fishing resources landed in Brazil are caught by artisanal fishermen, especially in the northeastern region, which has the second largest artisanal fishing production in the country¹¹.

The analysis of the relationship between humans and biodiversity to gain an understanding of how resources are known, used and managed is of fundamental importance, since this relationship is based on connections that stem from the longstanding contact between the two sides¹²⁻¹⁵. As the destination of catch material for use in craftwork influenced by the market leads to greater exploitation of fishing resources, the aim of the present study was to investigate knowledge on the part of artisanal fishermen in the community of Brasília Teimosa in the city of Recife (state of Pernambuco, Northeastern Brazil) regarding the use of catch material for the creation of craftwork in an attempt to understand the different forms of use and the influence of this activity on the capture of natural resources.

Methodology

Study area

The artisanal fishing community studied is located in the neighborhood of Brasília Teimosa in the city of Recife (Fig. 1). The neighborhood corresponds to a triangular peninsula with an area of approximately 50

ha¹⁶ between the estuary of the Pina Basin and the Atlantic Ocean. Brasília Teimosa is one of the oldest urban invasions (informal land occupation) in the city. The neighborhood, which was made official in 1956, currently has a population of approximately 18,000 inhabitants¹⁷. Due to its fishing origin and its proximity to bodies of water, a large portion of the population survives on fishing activities in the estuary and ocean. Indeed, Brasília Teimosa is among the five most productive of the 34 artisanal fishing communities along the coast of the State of Pernambuco¹¹. The marine artisanal fishermen of Brasília Teimosa and surrounding areas conduct fishing activities on the continental shelf, operating in the entire coastal zone of the state of Pernambuco as well as the neighboring States of Paraíba and Alagoas^{18,19}.

Ethno-Zoological data

Monthly visits were made to the community of Brasília Teimosa between January 2010 and February 2011, during which semi-structured questionnaires were administered in interview form to record the knowledge of the marine artisanal fishermen on the use of catch material for the creation of craftwork²⁰. The interviews were held during fishing-related activities (cleaning and repair of nets and gear) or in the homes of the fishermen, when permitted and previously arranged. When authorized, the interviews were recorded and subsequently transcribed.

For the localization of the target fishermen of the study, the “Snowball” sampling method was employed²¹, which consists of asking the first interviewees to indicate other informants. To increase

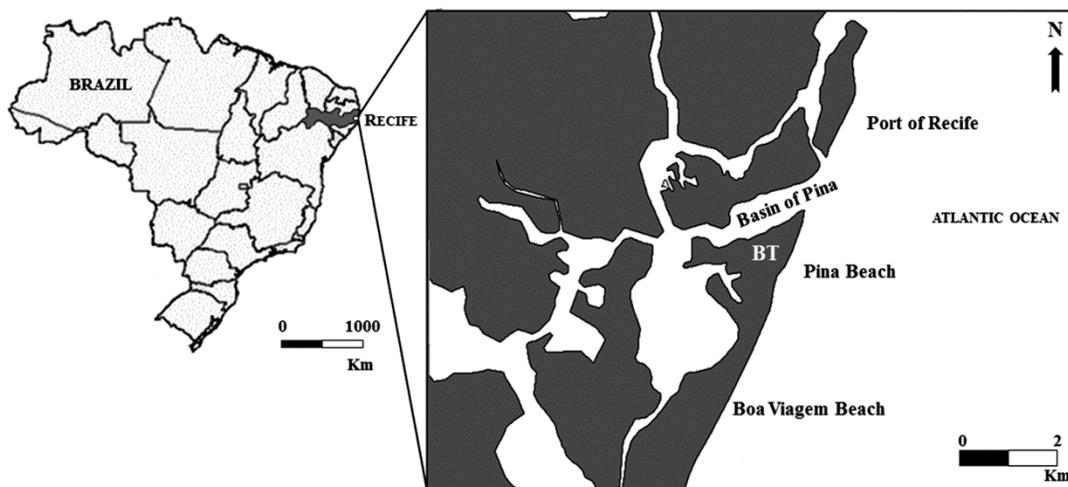


Fig. 1 — Fishing community of Brasília Teimosa (BT), city of Recife, state of Pernambuco, Brazil

the sample size, fishermen were also contacted randomly at landing sites, where they commonly unite.

The answers to the questionnaires and the discourses of the interviewees were interpreted and categorized. The relative frequency was calculated and descriptive statistics (mean and standard deviation) of the data were performed. Based on the answers regarding knowledge on the use of catch material for craftwork, the Rapid Informant Ranking (RIR) was calculated, which demonstrates the importance and prominence of the information in the community. With this method, the order of the species listed is converted into a score and each organism caught receives a differentiated value based on the position on the list. Species cited in first place in the ranking received a score of 10, those in second place received a score of nine, third place received a score of eight, and so on. The formula²², $RIR = \sum T/n$ was applied, in which 'T' is the total value of the scores of a given species and 'n' is the number of interviewees.

This study received approval from the Human Research Ethics Committee of the Lauro Wanderley Hospital in the city of João Pessoa, the State of Paraíba, Brazil (ethical certificate number: 0076.0.126.000-10).

Biological data

Catch specimens derived donations from the fishermen to the community were acquired and taken to the Tropical Fish Ethnoecology and Ecology Laboratory of the University of Pernambuco for identification. As some common names cited made reference to more than one species, the highest Taxon (Genus, Family, Order or Subdivision) was considered to represent the local identification.

For the confirmation of the scientific and local nomenclature, images were presented to local specialists selected from the sample (those with more than 35 years of experience in the activity). The cross ethno-identification method was used for the confirmation of the identification²³, in which images of the catches were identified by specialists and subsequently submitted to other specialists for identification, with the confirmation only considered in the occurrence of consensus.

Results

Ninety-eight fishermen (all males) with more than two years experience in the fishing activity (mean duration of experience: 29.1 ± 16.1 years) were

interviewed in the community of Brasília Teimosa. While 64.6% had knowledge on the use of catch material for craftwork, all reported not participating in the creation of such products.

Individuals from the community itself or other places were seen interested in acquiring catch material for craftwork to buy the products from the fishermen at the market prices for food consumption.

Therefore, there is no targeting or trade of species exclusively for the purposes of craftwork in the community. However, raw materials considered discards of the food trade, such as scales, teeth, skin and bone structures, are often donated by the fishermen to acquaintances for the production of craftwork.

The fishermen indicated up to six different types (mean: 2.29 ± 1.45 types cited per interviewee) of craftwork made from catch material and referenced a total of 36 common names of natural resources for this purpose. The most representative zoological group was Actinopterygii (53.8%), followed by Crustacea (29.2%), Chondrichthyes (12.3%), Echinodermata (2.3%), Mammalia, Mollusca and Sauropsida (0.8% each). Twenty four species belonging to 19 families were identified. The other common names referred to categories involving various species, which were identified on the Genus (3), Family (8), Class (3), Subdivision (2) and Infraorder (1) level.

The most frequently cited organisms were the queen triggerfish, *Balistes vetula* (13.1%), Atlantic Tarpon *Megalops atlanticus* (12.3%), Lobster *Panulirus* spp. (11.5%), Sharks (Selachii) (11.5%) and the batwing coral crab, *Carpilius corallinus* (10.0%). These species also corresponded to the highest RIR values (1.23, 1.21, 1.06, 1.02 and 0.88, respectively) (Table 1). The raw material used for the creation of craftwork was varied, depending on the characteristics of the organism and the type of product to be crafted (Table 2).

The main form of craftwork cited by the fishermen consists of the technique known locally as "Stuffing", which corresponds to the method of Taxidermy (48.8%), in which part or all of the body of the organism is used in the creation of the product (Table 2). The organisms that undergo this process are used as decorative items in homes and restaurants or as objects of study by students at Schools or Universities. Lobster *Panulirus* spp., the batwing coral crab *Carpilius corallinus* and the Brazilian

Table 1 — Absolute frequency, relative frequency, RIR and raw material of catch material cited by marine artisanal fishermen from Brasília Teimosa (Recife, Pernambuco, Brazil) for creation of craftwork. Raw material used:Sk = skin, Sc = scales, B = Body or part of body for taxidermy, T = teeth, S = support structure (bone and cartilage)

Scientific identification	Common name	N° of times cited (%)	RIR	Raw material
Mollusca				
Buccinidae e Ranellidae	Clams	1 (0,7)	0,04	B
Crustacea				
Palinuridae				
<i>Panulirus</i> spp	Lobster	15 (11,5)	1,06	B
Carpiliidae				
<i>Carpilius corallinus</i>	Batwing coral crab	13 (10,0)	0,88	B
Ocyrodidae				
<i>Ucides cordatus</i>	Mangrove crab	3 (2,3)	0,18	B
Portunidae				
<i>Callinectes</i> spp	Crabs	4 (3,1)	0,27	B
Grapsidae	Crabs	2 (1,5)	0,09	B
Gecarcinidae				
<i>Cardisoma guanhumi</i>	Crabs	1 (0,7)	0,5	B
Echinodermata				
Echinasteridae				
<i>Echinaster</i> spp	Starfish	3 (2,3)	0,32	B
Chordata				
Chondrichthyes				
Selachii	Sharks	15 (11,5)	1,02	T, Sk, S, B
Batoidea	Rays	1 (0,7)	0,07	B
Actinopterygii				
Balistidae				
<i>Balistes vetula</i>	Queen triggerfish	17 (13,1)	1,23	Sk, Sc, B
Megalopidae				
<i>Megalops atlanticus</i>	Atlantic tarpon	16 (12,3)	1,21	Sc
Ogocephalidae				
<i>Ogocephalus vespertilio</i>	Brazilian batfish	6 (4,6)	0,45	B
Lutjanidae				
<i>Lutjanus cyanopterus</i> and <i>L. alexandrei</i>	Snappers	3 (2,3)	0,21	T, Sc
Diodontidae and Tetraodontidae	Ray-finned fish	3 (2,3)	0,23	B
Ostraciidae	Boxfishes	1 (0,7)	0,07	B
Batrachoididae				
<i>Amphichthys cryptocentrus</i>	Bocon toadfish	3 (2,3)	0,18	S
Ariidae	Sea catfishes	2 (1,5)	0,16	Sk, S
Syngnathidae				
<i>Hippocampus reidi</i> and <i>Cosmocampus elucens</i>	Seahorse and pipefish	2 (1,5)	0,15	B
Coryphaenidae				
<i>Coryphaena hippurus</i>	Common dolphinfish	2 (1,5)	0,15	Sk
Sciaenidae	Drums or croakers	2 (1,5)	0,12	Sk
Cichlidae				
<i>Oreochromis niloticus</i>	Nile tilapia	2 (1,5)	0,15	Sk
Serranidae				
<i>Epinephelus morio</i>	Red grouper	1 (0,7)	0,07	Sk
<i>Mycteroperca bonaci</i>	Black grouper	1 (0,7)	0,06	Sk
Centropomidae				
<i>Centropomus</i> spp	Snooks	1 (0,7)	0,08	Sc
Scaridae				
<i>Sparisoma viride</i>	Stoplight parrotfish	1 (0,7)	0,08	Sc
Clupeidae				
<i>Opisthonema oglinum</i>	Atlantic thread herring	1 (0,7)	0,07	Sc
Triglidae				
<i>Prionotus punctatus</i>	Bluewingsearobin	1 (0,7)	0,08	B
Belonidae				
<i>Ablennes hians</i> , <i>Tylosurus acus acus</i> and <i>Strongylura marina</i>	Needlefishes	1 (0,7)	0,07	B
Chaetodontidae				
<i>Chaetodon</i> spp	Butterflyfish	1 (0,7)	0,08	B

Contd.

Table 1 — Absolute frequency, relative frequency, RIR and raw material of catch material cited by marine artisanal fishermen from Brasília Teimosa (Recife, Pernambuco, Brazil) for creation of craftwork. Raw material used: Sk = skin, Sc = scales, B = Body or part of body for taxidermy, T = teeth, S = support structure (bone and cartilage) (Contd.)

Scientific identification	Common name	N° of times cited (%)	RIR	Raw material
Actinopterygii	Clownfish	1 (0,7)	0,07	B
Actinopterygii	“Piranha”	1 (0,7)	0,08	B
Actinopterygii	“Beijamoça”	1 (0,7)	0,04	B
Sauropsida				
Cheloniidae				
<i>Eretmochelys imbricata</i>	Hawksbill sea turtle	1 (0,7)	0,05	S
Mammalia				
Cetacea	Whales	1 (0,7)	0,04	T

Table 2 — Absolute and relative frequency of raw materials, preparation procedures and end products of main organisms cited at least twice by marine artisanal fishermen from Brasília Teimosa (Recife, Pernambuco, Brazil) for creation of craftwork. “Others” represents set of organisms only cited once

Raw material	N° of times cited (%)	Procedures	Craft products	Common name	Scientific identification	N° of times cited (%)
All or parts of body	63 (48.8)	Taxidermy	Used for decoration or study material	Lobster	<i>Panulirus spp</i>	15 (23.8)
				Batwing coral crab	<i>Carpilius corallinus</i>	13 (20.6)
				Brazilian batfish	<i>Ogcocephalus vespertilio</i>	6 (9.5)
				Crabs	<i>Callinectes spp</i>	4 (6.3)
				Ray-finned fish	Tetraodontoidei	3 (4.8)
				Mangrove crab	<i>Ucides cordatus</i>	3 (4.8)
				Starfish	<i>Echinaster spp</i>	3 (4.8)
				Crabs	Grapsidae	2 (3.2)
				Seahorse	<i>Hippocampus reidi</i>	2 (3.2)
				Others		12 (18.0)
Skin	26 (20.1)	Drying and/or chemical treatment	Production of bags, belts, wallets, shoes and clothes	Queen triggerfish	<i>Balistes vetula</i>	15 (57.7)
				Common dolphinfish	<i>Coryphaena hippurus</i>	2 (7.7)
				Drums or croakers	Sciaenidae	2 (7.7)
				Nile tilapia	<i>Oreochromis niloticus</i>	2 (7.7)
				Sharks	Selachii	2 (7.7)
				Others		3 (11.5)
Scales	21 (16.3)	Cleaning and natural drying	Production of bags, jewelry, curtains, clothes, lamps and other decorative items	Atlantic tarpon	<i>Megalops atlanticus</i>	16 (76.2)
				Others		5 (23.8)
Teeth	13 (10.1)	Cleaning and natural drying	Jewelry	Sharks	Selachii	10 (76.9)
				Snappers	<i>Lutjanus cyanopterus</i> and <i>L. alexandrei</i>	2 (15.4)
				Others		1 (7.8)
Support structures (bones and cartilage)	6 (4.6)	Cleaning and natural drying	Jewelry, hair clips and guitar picks	Bocon toadfish	<i>Amphichthys cryptocentrus</i>	3 (50.0)
				Others		3 (50.0)

batfish *Ogcocephalus vespertilio* were the most cited organisms for this type of craftwork (23.8%, 20.6% and 9.5% of the citations, respectively). According to 14 fishermen, any type of catch can be used in this process.

Among the raw materials cited, whale teeth (Cetacea) and the shell of the Hawksbill sea turtle *Eretmochelys imbricata* are two cases the merit attention. These mentions were made based on historical reports in the community and past knowledge of the fishermen; as such organisms are not currently targeted in fishing activities.

The craftwork made from fishing catches includes a variety of decorative and/or utilitarian items, such as taxidermied organisms, bags, belts, shoes, clothes, curtains, lamps and jewelry, using all of these organisms or only their parts, such as scales, teeth, skin, bones and cartilages (Table 2). Some organisms were cited as being more than one raw material for craftwork (mean: 1.19 ± 0.62 raw materials per catch item), with sharks (Selachii) and queen triggerfish *Balistes vetula* having the greatest diversity of uses (four and three, respectively) (Table 1).

Discussion

Authors recorded the craftwork trade of various marine and estuarine Macrofauna (Phyla: Cnidaria, Mollusca, Arthropoda and Echinodermata) in local marketplaces of Northeastern Brazil, with the Seahorse *Hippocampus reidi* the only representative of Vertebrata^{5,7}. This species is highly prized and used as craftwork and souvenirs in different states of Brazil²⁴. Unlike what is reported in the literature, the majority of species cited by the fishermen of Brasília Teimosa were marine vertebrates, which demonstrates a lack of information and the need for further studies to fill this gap in knowledge on the use of natural resources.

Many of the species cited by the fishermen of Brasília Teimosa for the production of craftwork are on international²⁵ and national²⁶⁻²⁸ priority conservation lists, which has also been observed in the trade that occurs in the states of Pernambuco⁵ and Paraíba^{7,29}. The Hawksbill Sea Turtle *Eretmochelys imbricata*, Red Grouper *Epinephelus morio*, Black Grouper *Mycteroperca bonaci*, Humpback Whale *Megaptera novaeangliae* and Sperm Whale *Physeter macrocephalus* are on National and International conservation lists. The queen of Triggerfish *Balistes vetula*, Atlantic Tarpon *Megalops atlanticus*, the Shark as *Galeocerdo cuvier*, Snapper *Lutjanus cyanopterus* and Southern Guitarfish *Rhinobatos percellens* are only on International lists, whereas the Starfish *Astropecten brasiliensis*, *A. cingulatus* and *A. marginatus*, crabs, *Ucides cordatus*, *Cardisoma guanhumi* and *Callinectes sapidus*, the lobsters *Palinurus argus* and *P. laevicauda* and the Seahorse *Hippocampus reidi* are only on National lists. This demonstrates that, craftwork activity involves currently endangered species that need special attention for conservation purposes.

The Hawksbill sea turtle, Humpback Whale and Sperm Whale are some of the main endangered species cited in Brasília Teimosa. However, the fishermen state that knowledge on the use of these species for craftwork stems from the time when targeting these animals was permitted and the shells (sea turtle) and teeth (whales) were often used in the crafting of jewelry. Sea turtles and whales are currently protected nationally, with the prohibition of any fishing activity targeting these organisms in Brazil (Environmental Crimes Law n° 9.605/98^(ref. 30) and n° 7.643/87^(ref. 31), respectively), which directly contributes to the conservation and recovery of the populations of these species.

The most cited species in Brasília Teimosa are *Balistes vetula*, *Megalops atlanticus* and sharks, which together accounted for more than one fourth of the citations, are only on International lists, with no National actions taken for the conservation of these species. In the Caribbean off Colombia, the Mollusk, *Cittarium pica* is used as a food source and its shells are used in craftwork produced by the local population. However, the population structure and density of this mollusk in the region indicates that, it is being submitted to overexploitation and runs the risk of becoming extinct³². Thus, exposing some species to yet another pressure, such as use in craftwork, could aggravate their conservation status.

The practice of taxidermy in the animal trade is common in Northeastern Brazil^{5,7} and was reported in Brasília Teimosa. Products sold as craftwork have a decorative and/or utilitarian function, but the sale of pieces without adornments, represented by the entire animal or parts of it, is also quite common^{7,33}. The variety of raw material used per each species is an important piece of information that portrays how these resources are appreciated for use in craftwork. The set of morpho-anatomic characteristics of the species preferred in craftwork activities may represent greater pressure and further threaten these organisms. However, although this form of craftwork has the potential to cause a negative impact on the fauna, this premise does not always hold true in particular situations due mainly to the market supply structure. On the coast of the state of Paraíba⁷ and in Brasília Teimosa, the market force that truly exerts pressure on fishing resources is food consumption. Thus, the supply to the craftwork market in these locations is satisfied by species that are targeted for food purposes or are caught incidentally and there is no additional market force pressuring these resources.

The artisanal fishermen are the main suppliers of raw materials for craftwork and this is an important economic activity for those who depend directly on natural resources for their subsistence, representing the main or only source of income for the families that survive on this type of trade^{5,12}. Since the fishermen in Brasília Teimosa are not involved in the production of craftwork and do not direct their fishing activities toward this trade (often donating the material or receiving indirect gains), they do not cause increased exploitation pressure on natural resources with this activity.

Conclusion

As the main suppliers of raw materials for the craftwork market, Artisanal fishermen exhibit vast knowledge on the diverse applications of aquatic species in this type of activity.

The production of craftwork does not exert pressure on fishing activities in the community of Brasília Teimosa, since the material used is derived from species that are sold for food. However, many of these species are endangered and their exploitation, regardless of the end use, should be performed with caution to avoid further harm to populations that are in a state of alert in terms of conservation, which could compromise the sustainability of the activity.

Information on the use of natural resources is important and can assist in the development of strategic management and conservation plan that consider the cultural peculiarities of the human groups that use these resources, enabling the development of more efficient conservation actions that are adjusted to the reality of each location.

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Conflict of Interest

All the authors declare that they have no conflict of interest financial or otherwise

Author Contribution Statement

D Mariz - designed the experiments, performed the interviews, analyzed the ethnozoological data, identification of fish species, prepared figures and/or tables, authored and reviewed drafts of the paper; A C F F de Souza- performed the interviews, identification of fish species, authored and reviewed drafts of the paper; S F Teixeira- designed the experiments, identification of fish species, prepared figures and/or tables, authored and reviewed drafts of the paper; S S Campos- authored and reviewed drafts of the paper; R F P de Lucena- designed the experiments, authored and reviewed drafts of the paper; R R da Nóbrega Alves- designed the experiments, authored and reviewed drafts of the paper. All authors read and approved the final manuscript.

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