African Journal of Biotechnology Vol. 8 (18), pp. 4680-4684, 15 September, 2009
Available online at http://www.academicjournals.org/AJB
ISSN 1684–5315 © 2009 Academic Journals

Full Length Research Paper

Assessment of crab trap selectivity and efficiency in a tropical riparian swamp

Babatunde Eniola Emmanuel

Department of Marine Sciences, Faculty of Science, University of Lagos, Akoka, Nigeria.
E-mail: monetemi@yahoo.com. Tel: 234 – 802-853-9459

Accepted 23 July, 2009

The efficiency of the can trap for the collection of *Cardiosoma armatum* was examined for 2 year (2003 - 2005). The trap was designed with popular Nigeria beverages. The circumferences of the traps determined the size of individual crabs to be caught. The cans circumference ranged between 30.45 and 40.23 cm. The trap operated on trigger mechanism. It was baited with orange peels, onion bulb and fish trash. The trap reduces stress of land crabbing, made the operation easy and less strenuous. The highest catch (500 crabs at 58.14%) of crabs was recorded for can trap followed by the hand picking (300 crabs at 34.8%) and the least was recorded for barricading of crab holes with nets method (60 crabs at 6.98%). The bigger the crabs, the higher the market values. Can trap is effective for the operation and a means of livelihood for the youth around the study area.

Key words: Can trap, *Cardiosoma armatum*, crabbing, hand - picking.

INTRODUCTION

Collecting organisms from their natural habitats is critical to a variety of studies ranging from systematic and genetics to physiology and ecology. For land crab, advances in such studies have been hindered by the difficulty in efficiently collecting undamaged specimens from structurally complex environments (Anderson and Carr, 1998). For example, the increasing interest in recruitment of early life stages for crab populations has prompted the need to collect small, elusive and sometimes cryptic individuals. Various collecting methods have been developed, most of which are time-consuming and labor-intensive. These include hand picking, netting the hole and pouring of hot water to stupefy the crabs.

There are 9 species of crabs found in the brackish water ecological zone of the Niger Delta in Nigeria (Abbykalio, 1982; Hart and Chindah, 1998; Emmanuel, 2008). 3 are edible namely, the land crab, *C. armatum*, the big fisted swimming crab, *Callinectes amnicola* and *Callinectes latimanus* (Abby-Kalio, 1982; Emmanuel, 2008). The giant land crab is the largest of semi-terrestrial crabs (Hostetler et al., 1991). It was reported further that the animal can measure up to 6 inches (15 cm) across its carapace. Hostetler et al. (1991) reported that in its juvenile form, the crab is a dark brown, purple or orange in colour. They reported further that as an adult, it has bluish-gray colour; females sometimes appear light gray or white. One claw is larger than the other and the walking legs are sparsely hairy.

Land crabs are terrestrial and are found as far as 5 miles from the shoreline, returning to the sea only to drink or breed (Hostetler et al., 1991). They live in burrows several feet deep at least to a level that will allow water to seep in for moisture (Evoy and Fourtner, 1973; Hostetler et al., 1991). Hostetler et al. (1991) reported that *C. armatum* and *C. guanhumi* are primarily vegetarians preferring tender leaves, fruits, berries, flowers and some vegetables. Occasionally, they will eat beetles or other large insects and reach sexual maturity in approximately 4 years and peak reproductive activity occurs during full moon in summer (Hostetler et al., 1991).

The use of traps in Nigeria has been documented by Udolisa et al. (1994) where various fishing traps operated and the techniques used were explained. Solarin (1998) documented the use of liftnet (Garawa) to harvest lagoon crabs, *Callinectes amnicola* and Moses (1983) reported the use of rectangular liftnet in capture fishes. The use of traps has been found to be an easy method of catching crabs and has been employed by several researchers like Guillory and Prejean (1997) on blue crab trap selectivity studies; Smith and Sumpton (1989) on behavior of the commercial sand crab *Portunus pelagicus* at traps entrances; Anonymous (1986) on pot fishing; Kusemiju

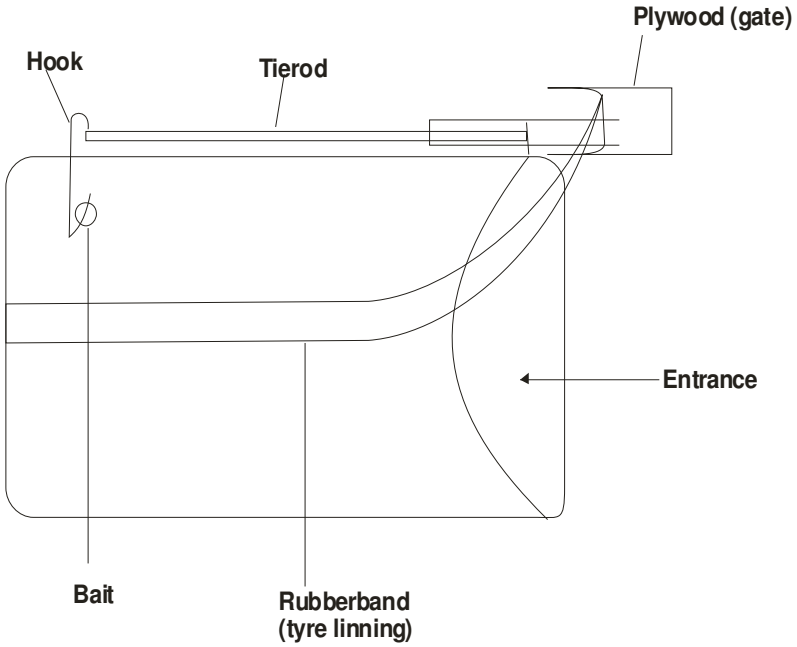

Figure 1. Can trap before trigger mechanism was released.

(1973) and Fagade (1969) reported on the uses of various fishing traps in both Lagos and Lekki lagoons and Emmanuel (2008) reported on the use of crab pot (garawa) and wire guaze trap in catching *C. amnicola* from Lagos lagoon and its adjacent creek. The king crab pot was constructed from galvanized steel with frames of 213 by 213.3 by 91.4 cm and the frames for the funnels are also made from the same source (Okawra and Masthawee, 1980, 1981). They also described swimmer crab pots and they stated that crab pots can be shaped from wire netting or constructed from welded mesh and that in some places a metal hoop with a strong synthetic mesh laced on it for easier uses. They reported further that, in northern Australia, mud crab (*Scylla serrata*) is harvested with a specially made trap. They described the pot design characteristics as a rectangular piece of mesh 1800 mm long by 600 mm wide is cut for the top, bottom and sides of the traps. 2 addition pieces of 700 by 200 mm are then cut to make the end of the trap. Okawra and Masthewee (1981) described the operation of crab pot as depending on the tidal range where they are set and are rigged with approximately 7 m of rope and 10 cm bouys to mark their location. Despite the long history of trap fisheries world wide and the common use of various traps in research, relatively little is known about the effectiveness of can trap on the *C. armatum.* This is a first attempt on reporting the use of empty can as trap for crab harvesting in the region. This method is particularly effective for collecting crab on both muddy and sandy land near riparian areas. In this study 3 methods of effectively collecting large number of crabs were investigated. They were handpicking, the barricading of the crab holes using nets and the use of empty can traps. Further more, emphasis is laid on their design efficiency and longevity. The latter has been in use by local crabbers which usually comprise young boys and old people.

MATERIALS AND METHODS

Description of study site

The brackish water swamp under study is situated within the university of Lagos, Akoka campus, Nigeria (Between Latitude 6^{o} .30' 53.5''N, Longitude 3^{o}. 23' 57.4''E and Latitude 6^{o}. 30' 55.6''N, Longitude 3^{o}. 24' 01.4''E). Notable riparian flora around the study area includes *Paspalum orbiquilare, Acrotiscum aureum, Phoenix reclinata, Rhizopohora racemosa, Avicenia nitida, Drepanocarpus lunatus* and *Cyperus articulatus*. Notable fauna include *Periopthalmus, Balanus pallidus, Chthamalus* sp, *Uca tangeri, Seserma huzardi, Gryphea gasar, Tympanotonus fuscatus* var *radula* and herons that feed on exposed invertebrates at low tide.

Trap design and construction can - trap

The can traps were designed using used cans (Figures 1 and 2). The cans were sourced from refused dumping site at Iwaya and were transported to the marine sciences postgraduate laboratory. The tie-rods and the ply woods were purchased from Oko - baba sawmill. The nail and the wire were purchased from Idumagbo, Lagos Island while the tyre tubes were purchased from a mechanic workshop at Iwaya, Lagos. The plywood and wire (hook) were measured and cut to the specified sizes.

The gate plywood (Length = 11 cm x breadth = 11 cm) and tie rod (25 cm x 2 inches) nailed together using 1 inch nail (4) for the covering of the can. The trigger mechanism was constructed from used tyre tube and a wire. The tube was used to bind the plywood to the perforated can bottom. The circumference of the can was determined by mathematical formula, $2\ \pi r^2$ (Stroud, 1995).

The can was perforated in the bottom to allow the bait odour

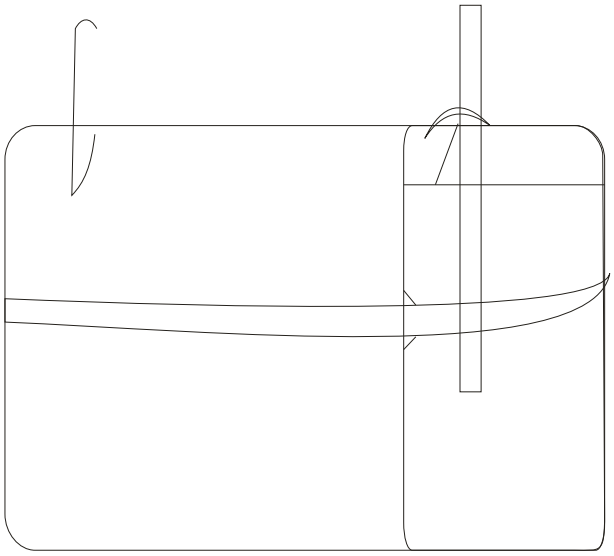

Figure 2. Can trap in the crab hole before trigger mechanism was released.

Table 1. Appropriate can circumference for size range of *C. armatum.*

Carapace size group (cm)	Can circumference (cm)
3.0 - 3.9	30.0
4.0 - 4.9	31.2
5.0 - 5.9	40.0
6.0 - 6.9	40.0

diffuse properly and attract the crab. The hook was made of copper wire (0.24 mm diameter and 10 - 15 cm long depending on the size of the can). The plywood was nailed to the tie - rod forming a T-shape. The piece of rubber band from the used tyre tube was used to hold the gate in position to allow the 2 way movement of the gate (outward and inward). The hook was curved at both ends. The aluminium foil in the can was totally removed from the mouth of the can to free the can entrance.

Operation and application of the can - trap

The trap was examined for 2 years (January, 2003- December, 2005) day and night bi-weekly. For the collection of large crab, larger cans were used (circumference ≥ 40.23 cm). The traps were baited using orange peels, onion bulbs and sometimes fish trash. Baits were fixed to the hook at the back of the trap. The other end of the hook was used to keep the gate open and gently place at the crab burrow entrance. Other method tested were hand picking with the aid of hand glove; the holes were also dug to expose the crab for easier collection and crabs burrow barricading with net (45 mm mesh size multifilament polyamide). The traps are set at about 5 pm and left overnight.

RESULTS

The size of the trap determined the size (diameter and weight) of the crab to be caught. The mouth diameter of the can also determine the gauge of the trap, capture volume and this determine the size of the individual crab to be caught. Smaller cans are required for collecting small size crabs while larger can were used for large crabs. The circumference of the can used ranged from 30.00 to 40.23 cm (Table 1).

Greater success was achieved by setting the trap at the entrance of the crab hole in a way that the triggered will be able to close the gate firmly.

The a, b, d and e above can be used for more than 50 traps while c can be used for more than 20 traps depending on the sizes (Table 2).

Table 2. Cost of production of can-trap used for catching *C. armatum.*

Materials	Description	Cost of materials	
		N	$
Cans	Empty	Free	
Wire [a]	A roll	300	2.5
Tyre tube [b]	Tyre tube	300	2.5
Plywood board [c]	1 by 1.5 m	1500	12.5
Tie-rod [d]	Bundle	500	4.17
Nails [e]	1 inch 100 g	500	4.17

Field observations and the trap efficiency

It was noted during the operation that the crabs normally come out between 8 and 10 pm. At this time they were very active and easily locate their burrows. On a cold day, they stayed at the interface of the burrow to enjoy the warm temperature emitted from the burrows. Any perceived vibration will triggered their withdrawal into their burrows. This trap reduces stress of crabbing, made the operation easier and less strenuous. However, it takes between 12 to 14 h before it can usually yield result.

As the crab enters the trap and takes the bait, the gate is triggered and it blocked the trap entrance to prevent the crab from escaping. It was noted during the study that the bigger crab find it difficult to enter smaller trap but instead created another outlet for escape. A closed trap is easily lifted and the catch is removed into a sack and transported to the laboratory. The specific application of this trap includes the collection of the following size groups (Table 3).

The comparative study of the crabbing methods at Abule-Agege swamp in University of Lagos is presented in Table 4.

The highest catch (500 crabs at 58.14%) of crabs was recorded for empty-can trap followed by the hand picking (300 crabs at 34.8%) and the least was recorded for barricading of crab holes with nets method (60 crabs at 6.98%).

The crabs were more around the creek than further away upland from the creek.

Table 3. The size composition of *C. armatum* caught with can traps around Abule–Agege swamp, University of Lagos.

Carapace length Group (cm)	Frequency of occurrence	Percentage of frequency
3.0 - 3.9	80	16.0
4.0 - 4.9	300	60.0
5.0 - 5.9	100	20.0
6.0 - 6.9	20	4.00

Table 4. Comparative catches of crabbing methods at Abule-Agege swamp, university of Lagos.

Crabbing method	Number of catch	% of catch
Empty - can trap	500	58.14
Hand picking	300	34.88
Barricading of crab holes with nets	60	6.98
Total	860	100

Table 5. Market value of *C. armatum* around university of Lagos.

Carapace size (cm)	Quantity	Price	
		N	$
3.0 – 3.9	5	70 - 80	0.58 - 0.67
4.0 – 4.9	5	100 - 110	0.83 - 0.92
5.0 – 5.9	5	120 -130	1.00 - 1.08
6.0 - 6.9	5	150 - 180	1.25 - 1.50

Market value of *C. armatum* around University of Lagos

The crabs are sold in bundles of 5. Table 5 shows the market value of the crab in relation to size. The bigger the crab, the higher the market value. The price above varies depending on the bargain and the availability of the crab.

DISCUSSION

The can - trap was very efficient for land crab collection with minor technical know-how ability. On the other hand, handpicking yields immediate result but it is strenuous and brings injury despite the gloves used to prevent one's hand. The number of traps determines the crab's numbers. The holes at the bottom of the trap lead the crab to the smell of the bait via the entrance to trigger the hook; this was also reported by Miller (1979) to trap *Cancer productus*. Crabs typically approach the bait in attempt to come out of the burrow. The pertinent question is how do we know that the burrow is still occupied by a crab? From this study, the best way to know this is by observing the freshness of the mark on the burrow aperture. An individual can operate over 100 traps in a day.

The trap is less costly since the cans can be collected from the refuse dumping sites. The trap lifespan depends on the season and its contact with water due to oxidation which eventually results in rusting but the rubber band (from used-tyre) could be used over and over again. The trap can only harvest one crab at a time. The traps simple design and ability to catch land crabs alive and unharmed makes it a viable research tool in population and ecological studies of land crabs. Bigger traps were noted to catch all sizes of crabs but smaller traps had preference for smaller crabs that can enter them.

The distribution of the crab was associated with water source; this may be related to their egg fertilization mechanism. Hostetler et al. (1991) reported that after mating, the female lays her eggs but carries the eggs mass beneath her body for approximately 2 weeks prior to migrating to the riparian water and releasing the eggs. During rainy season more crabs were caught than dry season because the crabs were finding it difficult to locate their burrows once they moved away as result of the flood. The land crab poses no threat to human unless caught and handled. If handled carelessly, they are capable of inflicting a memorable pinch. This agreed with the report of Hostetler et al. (1991) on *C. guanhum*i. The crab constitutes a nuisance to the environment by digging burrow that can be as deep as 1.5 m and 8 to 13m wide (Hostetler et al., 1991).

It is important to note that the size of the hole will determine the size of the trap to be used and the size of the crab. Although, it is not the first operated trap for collecting *C. armatum,* it is easy to operate, versatile and its significant improvement over the previously used traps is enormous. Due to its wide success in collecting crabs on both muddy and sandy soil, it is effective for the operation and a means of livelihood for the youth in the area studied.

REFERENCES

Anderson TW, Carr MH (1998). Binkle: a highly efficient net for collecting reef fishes. Environ. Biol. Fishes, 51: 111-115

Anonymous (1986). Pot fishing: simple and more effective modernized methods. Fishery J. 27:8

Emmanuel BE (2008). The fishery and the bionomics of the swimming crab, *Callinectes amnicola* (De Rocheburne, 1883) from a tropical lagoon and its adjacent creek, Southwest, Nigeria. J. Fisheries Aquat. Sci. 3(2): 114-125.

Evoy WH, Fourtner CR (1973). Nervous control of walking in the crab *Cardisoma guanhumi*. III. Proprioceptive influences on intra- and intersegmental coordination. J. comp. Physiol. 83: 303-318.

Fagade SO (1969). Studies on the biology of some fishes and the fisheries of the Lagos lagoon. Ph.D. Thesis. University of Lagos. p. 385.

Guillory V, Prejean P (1997). Blue crab trap selectivity studies: mesh size. Mar. Fish. Rev. 59(1): 29-31.

Hostetler ME, Mazzotti FJ, Taylor AK (1991). Blue land crab (*Cardiosoma guanhumi*). University of Florida Extension Paper WEC 30: p. 2.

Kusemiju K (1973). A study of the catfishes of Lekki lagoon with parti-

cular reference to the species *Chrysichthys walkeri* Bagridae. Ph.D Thesis. University of Lagos. p. 188.
Miller RJ (1979). Entry of *Cancer productus* to baited traps. Journal du Conseil International pour l' Exploration de la Mer. 38: 220-223.
Smith GS, Sumpton WD (1989). Behavior of the commercial sand crab *Portunus pelagicus* (L) at traps entrances. Asian Fish. Sci. 3(1): 101-113.
Solarin BB (1998). The hydrobiology, fishes and fisheries of the Lagos lagoon, Nigeria. Ph.D Thesis. University of Lagos. p. 235.
Stroud KA (1995). Engineering mathematics, 4th Edition. Macmillan Press Ltd.
Udolisa REK, Solarin BB, Lebo P, Ambrose EE (1994). A catalogue of small scale fishing gear in Nigeria. RAFR Publication RAFR/041/F1/94/02: p. 142.