Turkish Journal of Veterinary & Animal Sciences

Volume 26 | Number 5 Article 26

1-1-2002

Comparison of Three Different Traps for Catching Blue Crab (Callinectes sapidus Rathbun 1896) in Beymelek Lagoon

HASAN HÜSEYİN ATAR

MURTAZA ÖLMEZ

SÜLEYMAN BEKCAN

SELÇUK SEÇER

Turk J Vet Anim Sci
26 (2002) 1145-1150

Research Article

Comparison of Three Different Traps for Catching Blue Crab (*Callinectes sapidus* Rathbun 1896) in Beymelek Lagoon

Hasan Hüseyin ATAR
Ankara University, Faculty of Agriculture, Fisheries and Aquaculture Department, 06110, Dışkapı, Ankara - TURKEY
Murtaza ÖLMEZ
Süleyman Demirel University, Eğirdir Fisheries Faculty, Eğirdir, Isparta - TURKEY
Süleyman BEKCAN, Selçuk SEÇER
Ankara University, Faculty of Agriculture, Fisheries and Aquaculture Department, 06110, Dışkapı, Ankara - TURKEY

Received: 05.10.2001

Abstract: In this study, the capture efficiencies and catch rates of three different traps were compared for the blue crab *Callinectes sapidus* in Beymelek Lagoon, Antalya, Turkey. All gear was used simultaneously and in the same habitats. The mean catch per unit effort (CPUE) was determined to be significantly higher for hoop nets than for traps. Gear effectiveness was examined by comparing CPUE (CPUE as number of crab per trap per haul, and g per trap haul), mean weight of individual crabs, catch composition and width frequency distributions of the blue crab for each gear.

Key Words: Trap, hoop nets, blue crab *Callinectes sapidus*

Beymelek Lagün Gölü'nde Mavi Yengeç (*Callinectes sapidus* Rathbun 1896) Avcılığında Üç Farklı Tuzağın Karşılaştırılması

Özet: Bu çalışmada, Beymelek Lagün'ünde (Antalya, Türkiye) üç farklı tuzağın mavi yengeci yakalama etkinliği ve av oranları karşılaştırıldı. Tüm av araçları, aynı ortamda ve eş zamanlı kullanıldı. Ortalama birim güç başına avın (CPUE), pinterde tuzaklardan önemli miktarda fazla olduğu saptandı. Her av aracının mavi yengeç için verimliliği, CPUE (her çekişte birim tuzağın yakaladığı yengeç sayısı ve her çekişte ağırlık ve yakalanan yengeç olarak CPUE), bireysel yengeç ağırlığı, av kompozisyonu, en frekans dağılımı karşılaştırılarak incelendi.

Anahtar Sözcükler: Tuzak, pinter, mavi yengeç *Callinectes sapidus*

Introduction

In Turkey, from the eastern side of the Mediterranean Sea to the Black Sea, blue crab *Callinectes sapidus* (Rathbun 1896) of economic value occur primarily in coastal seas and lagoons. The blue crab is mainly caught by traps, beach seines and by other fishing gear such as gill-nets, or as bycatch or discards from trawls (1).

Artüz (2) reported that the blue crab was introduced artificially between 1935 and 1945 to the northern Aegean Sea, and gradually came to occupy the Turkish coasts in the northeastern Mediterranean. Enzenrob et al. (3) reported the occurrence of the blue crab in 15 lagoons of the Mediterranean coastline of Turkey and a large well-developed blue crab population exists in Beymelek Lagoon.

The use of traps has been found to be an easy method of catching crabs and has been employed by several researchers (4-7). Despite the long history of trap fisheries worldwide, and the common use of various traps in research, relatively little is known about the effectiveness of traps on the blue crab. Widely observed in the seas, lagoons and brackish waters of Turkey, the blue crab *Callinectes sapidus* is mainly caught in traditional traps and by other fishing gear such as gill-nets, or as bycatch or even discard from trawls.

This study aims to determine which gear is more effective for catching blue crabs in Beymelek Lagoon.

Materials and Methods

Beymelek Lagoon is located on the Mediterranean Sea, Demre, Antalya (Figure 1).

Trap material

One hoop net and two collapsible traps were used and all operate, by guiding a crab through an entrance and/or funnels that facilitate ingress but not escape. All are passive gear and are widely used for catching blue crabs. The primary differences between these gears are as follows: hoop nets have a leader net, and one of the traps has funnels different from the other, which has an opening only. All equipment was fabricated with 13 mm knot-to-knot mesh nylon multifilament net by fishermen.

1- Collapsible traps

Two traps, a collapsible ellipsoid trap (CET) and a collapsible box type trap (CBT), were constructed from net and plastic reinforced with metal of a similar size to those employed by commercial crab fisheries in Japan (Figure 2) (8). The CET has two opposite funnel-shaped 24 cm entrances and is 68 cm in length. Crabs enter the trap through the funnels. The CBT is 62 cm in length and has two side entrances with 44 cm openings, with spaced 1-2 cm gaps so that the crabs enter.

2-Hoop nets-traditional traps

Traditional traps are operated in rivers, lakes and lagoons around Turkey. A previously used small fish and crustacean trap was modified in order to better catch blue crabs (Figure 2).

The trap is cylindrical and hooped and is covered by a nylon net. The trap is 180 cm in length and 50 cm in diameter. Six plastic reinforced metal hoops were used in this trap. The first hoop was a horseshoe-shaped frame and the entrance, which is 50 cm in diameter and narrows to 20 cm, is shaped like a funnel. It has one other funnel shaped non-return device between the 4th and 6th hoops. A unit trap was attached to the other by a leader net as shown in Figure 2. The end of both units were fastened before deployment. Crabs captured in the traps were removed by detaching (unfastening) and pouring the contents through the opening created.

Methods

The investigation was carried out from May to September 2000. In the initial comparison of the effectiveness of the two types of traps and hoop nets, 12 in one set were attached to each other 1 m apart, and the order of the traps set was varied randomly. Each set of traps was deployed at depths of about 1.5-2 m in each site, which were also randomly selected in Beymelek Lagoon.

All traps were used simultaneously to sample blue crabs in this study. None of the traps contained bait. The traps and hoop nets were left overnight and the sampling effort consisted of 36 gear-nights, and 108 gear-nights per month. Sampling was continuous over a month, weather permitting.

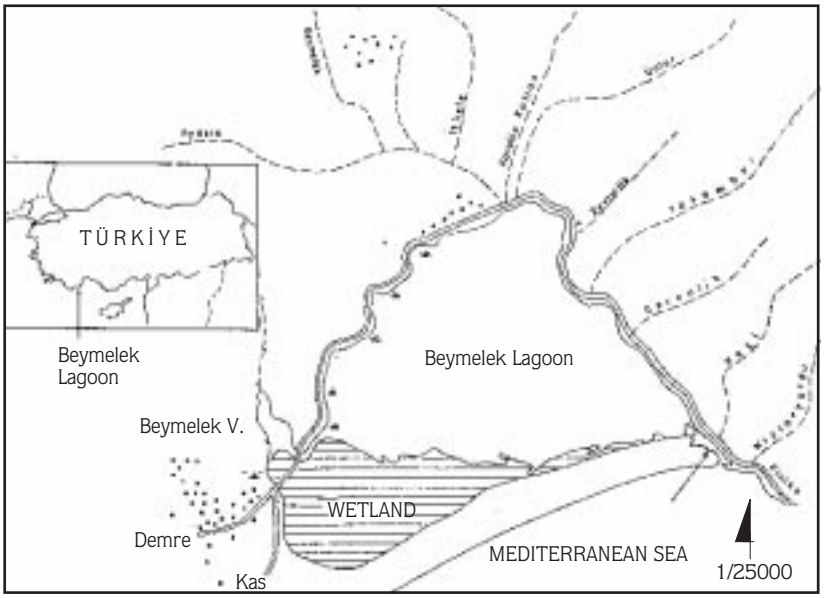

Figure 1. Sampling area for blue crab collected with a hoop nets and two traps in Beymelek Lagoon, Antalya, May to September 2000.

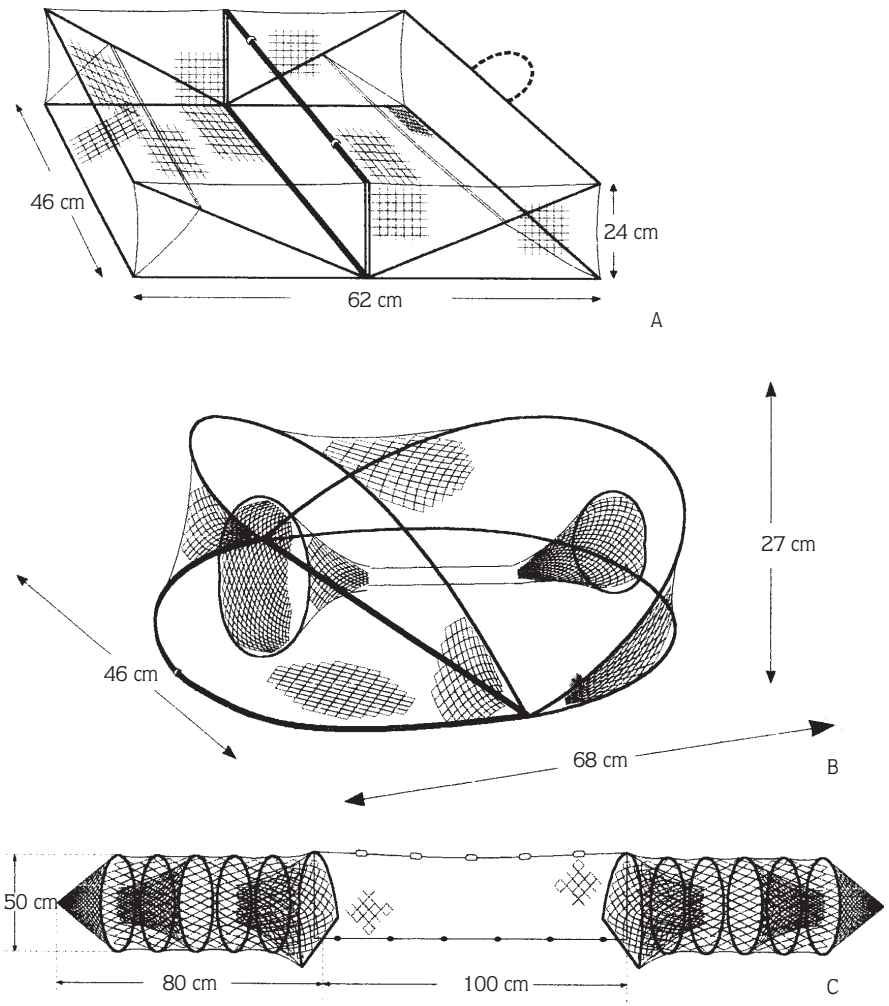

Figure 2. Diagram of a collapsible ellipsoid trap (CET) (A), a collapsible box type trap (CBT) (B) and a hoop net used to sample blue crab in Beymelek Lagoon, Antalya.

All captured crab samples were enumerated, grouped by site according to gear type and measured by carapace width (CW) and total weight within 0.5 mm and 0.1 g precision, respectively.

Catch rates and the sizes of blue crabs were compared between the three gears. Catch per gear of legal and non-legal size blue crabs was also determined.

Differences in catch rates among gear types were determined using analysis of variance (ANOVA), and CPUE differences for each gear type were evaluated using Duncan's multiple range test (9).

Results

During the six-month study period, 648 traps and hoop nets (216 traditional hoop nets, 216 CBTs and 216 CETs) were set and 560 blue crabs were caught. The crabs in the hoop nets were larger (mean CW 13.94 cm, range 7.2-18 cm, N = 363) than those in the two traps (for CBT mean CW 12.11 cm, range, 5.1-18.1 cm, N = 113; for CET mean CW 13.33 cm, range 8.4-16.4 cm, N = 84). The catch of hoop nets was 3.2 times greater than for CBT, 4.3 times greater than for CET and the catch of CBT was 1.3 times greater than for CET.

Five hundred and four of 648 (77.7%) gears caught at least one crab. The mean CPUE for blue crabs was significantly higher (1.26 crabs per trap-night^{-1}) for traditional hoop nets than for the two traps. Catch rates were highly variable, as indicated by the coefficients of variation (Table 1), and significantly higher for the hoop nets (64.8%) than for CBT (20.2%) and CET (15%). Mean weight per gear was greater for hoop nets than for

Table 1. Means and coefficients of variation (CV) of catch per unit effort (CPUE) for blue crab caught with hoop nets and two traps in Beymelek Lagoon, Antalya.

	Number of gear set	CPUE	CV
CET	216	0.29	12.3
CBT	216	0.39	7.8
Hoop nets	216	1.26	109.9

CET and CBT (Table 2). Although the blue crabs caught in all gear types encompassed similar size ranges, crabs of various size categories were caught at different frequencies in each type of gear (Figure 3).

Table 2. Total numbers and mean weights (g) of blue crab caught with hoop nets and two traps in Beymelek Lagoon, Antalya.

	Number of gear set	N	Mean weight	SD
CET	216	84	138.5	72.18
CBT	216	113	115.8	66.46
Hoop nets	216	363	162.3	49.63

According to the legal blue crab carapace width (7 cm) determined by the Fisheries Circular No. 34 of the Ministry of Agriculture and Rural Affairs, sublegal CPUE by number was significantly higher in CBT (10%) and CET (7.1%). Legal blue crab CPUE was highest (99.1%) in hoop nets.

Discussion

Trap fishing is a relatively simple fishing method that has been used traditionally by fishermen all over the world to lure and catch aquatic animals. Traps have several advantages compared to other fishing gears: they do not need to be hauled within short time limits, but can be left for several days, e.g. when the weather is bad, and the catch will still be in good condition. Operating expenses are fairly low. With increased demands for responsible fishing, traps may gain importance in the future owing to their selective characteristics and their advantages of mode of operation (10). Moreover, an advantage of gear like hoops or trap was that young or ovigerous female crabs can be set free in their habitat immediately after capture.

The trap methods used in this study were operated to minimize the masking by other variables of catch differences due to the gear themselves. All gear types were spaced as far as possible apart to minimize interaction. A comparatively higher CPUE with hoop nets suggests that for catching blue crabs hoop nets could be used more efficiently than the two traps. As reported by Muoneke et al. (11), the capture efficiency of passive gear depends on a variety of factors including species, habitat, size and behavior and gear attributes. Thus, because the deployment methods of the two traps and hoop nets were similar and were used in the same habitats, they caught blue crabs of similar size, they did so at different proportions. The variation in catch rates may be associated with differences in the gear. As we used similar net materials and placed both types of gear in similar areas, it is likely that most of the variation in CPUE stemmed from differences in design (shape, funnel type), gear volume, and area of the substrate covered by the gear. Munro (12) observed that larger pots had a higher catch rate, owing to the fact that escape from pots is inversely proportional to the area within which the fish are contained. Munro et al. (13) and Luckhurst and Ward (14) reported that there is often great variation in

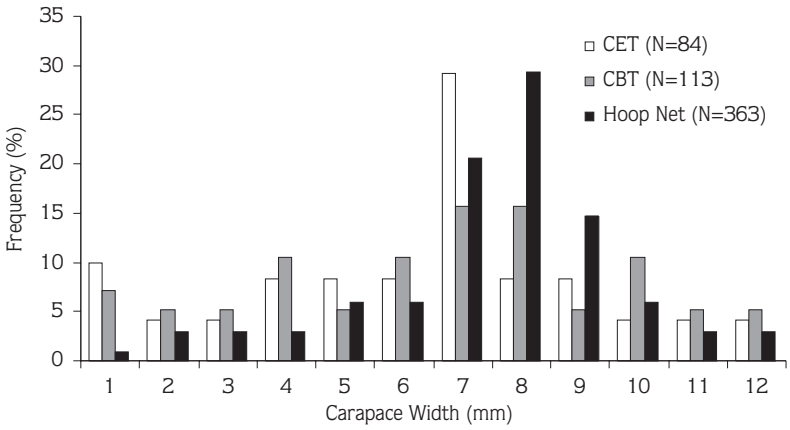

Figure 3. Carapace width (mm) frequency (percent) distributions of blue crab collected with hoop nets and two traps (CET and CBT) in Beymelek Lagoon, Antalya.

catches between pots, and fish already at or inside the pot may attract other fish in the area. Munro et al. (13) suggested that the high between-pot variability in catches may be largely due to conspecific attraction. Crossland (15) found that the efficiency of pots was a function of pot size. Collins (16) compared three fish pot designs and found that the largest was the most effective. Wolf and Chislett (17) found that larger pots resulted in higher catch rates. Wheaton and Lawson (6) pointed out that larger pots might not only have a lower escape rate but the greater visual outline of larger pots might also attract more fish than smaller pots. On the other hand pot gear does not damage the catch unless the animals injure themselves trying to escape or because of cannibalism (6).

The reason for the lower CPUE of the CBT is possibly that the large entrance may be used to escape from the trap. The CET had the smallest entrance in our study. Whitelaw et al. (18) reported that in pots with large entrances, the catch declined after 3 h soak time, indicating a significant escape rate. Therefore, the design of the entrance may be the critical factor for escape rates. However, escape rates from some pots may be negligible according to the design of the entrance (19).

In conclusion, the results of this study show that traditional hoop nets are more effective than the other two trapsts tested in capturing blue crabs. Even though hoop nets were more labor intensive than the others, because they catch the crabs undamaged allowing them to be sold live, it may be suggested that hoop nets be considered for use by blue crab fishermen. Future subjects to study include the use of different netting materials, such as reinforced or thicker net fiber or mesh sizes, and entrance size. A structural advantage of hoop nets is the leader net that allows crabs to easily enter through the funnel. On the other hand, the advantages of the two traps tested are that they require less labor to free enmeshed crabs from a net or entrapped crabs from a trap. With regards regulating stocks of blue crab by legal catch size, the most appropriate gear was the hoop net. Although all traps and hoop nets target the blue crab, the simple design, operation and efficiency of hoop nets make them more effective. Hoop nets, therefore, seem to be more appropriate for collecting blue crabs.

Acknowledgments

We thank Ersin ÖZTÜRK for preparing the gear illustrations. This study was sponsored by the Ankara University Research Fund, project number 98-11-05-03.

References

1. Anonymous.: FAO Species identification sheets for fishery purposes. Mediterranean and Black Sea (Fishing area 37). 1973. Volume I. Rome.
2. Artüz, İ.: Mavi yengecin serüvenleri. Cumhuriyet Bilim ve Teknik, 1990; 148: 6.
3. Enzenrob, R., Enzenrob L., Bingel, F.: Occurrence of Blue Crab, *Callinectes sapidus* (Rathbun 1896) (Crustacea, Brachyura) on the Turkish Mediterranean and the Adjacent Coast and Its Size Distribution in the Bay of İskenderun. Tr. J. of Zoology, 1997; 21: 113-122.
4. Guillory, V., Prejean P.: Blue crab trap selectivity studies: mesh size. Mar. Fish. Rev. 1997; 59 (1): 29-31.
5. Smith, G.S., Sumpton W.D.: Behavior of the commercial sand crab Portunus pelagicus (L) at trap entrances. Asian Fish. Sci. 1989; 3 (1): 101-113.
6. Wheaton, F.W., Lawson, T.B.: Processing Aquatic Food Products., John Wiley & Sons. 1985.
7. Munprasit, A., Soodhom, S., Theparoonrat Y., Sae-Ung, S., Matsunaga Y., Chokesanguan, B., Siriraksophon S.: Fishing gear and methods in southeast Asia: 11. 338 p. Malaysia. 1989.
8. Anonymous.: Pot fishing. Simpler and more effective modernized methods. Fishery J. 1986; 27: 8.
9. Düzgüneş, O., Kesici, T., Gürbüz, F.: İstatistik metodları I. A.Ü.Z.F. Yayın no: 861, 218p. 1993.
10. Furevik, D.M.: Report from the Department of Marine Resources No: 20-1993, Institute of Marine Research, Bergen, Norway. Fishing trials with traps and pots on the western and northern coast of Norway, (In Norwegian). 1993.
11. Muoneke, M.I., Maughan, O.E., Henry, C.C.: Comparative capture efficiencies of frame and hoop nets for white crappie (*Pomoxis annularis* Rafinesque). Fish. Res., 1993; 18: 231-240.
12. Munro, J.L.: The mode of operation of Antillean fish traps and relationships between ingress, escapement, catch and soak. J. Cons. Int. Explor. Mer, 1974; 35 (3): 337-350.
13. Munro, J.L., Reeson P.H., Gant, V.C.: Dynamic factors affecting the performance of the Antillean fish trap. Proc. Gulf Caribb. Fish. Inst. 1971; 23: 184-194.
14. Luckhurst, B., Ward, J.: Behavioural dynamics of coral reef fishes in Antillian fish traps at Bermuda. Proc. Gulf. Caribb. Fish. Inst. 1985; 38: 528-546.

15. Crossland, J.: Fish trapping experiments in the northern New Zealand waters. N. Z. J. Mar. Freshw. Res., 1976; 10 (3): 511-516.

16. Collins, M.R.: A comparison of three fish trap designs. Fish. Res., 1990: 9; 325-332.

17. Wolf, S., Chislett, G.: Trap fishing. Explorations for snapper and related species in the Caribbean and adjacent waters. Mar. Fish. Rev. 1974; 37 (9): 49-61.

18. Whitelaw, A.W., Sainsbury, K.J., Dews, G.J., Campbell, R.A.: Catching characteristics of four fish trap types on the North West Shelf of Australia. Aust. J. Mar. Freshwater Res. 1991; 42: 369-382.

19. Fernö, A., Olsen, S.: Marine fish behaviour in capture and abundance estimation. Fishing News Books. London. 222 p. 1994.