Effect of a Terrapin Excluder Device on Blue Crab, *Callinectes sapidus,* Trap Catches

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Introduction

Bycatch considerations (perceived waste, mortality of rare or protected species, and inefficient use of available resources) have captured the atttention and scrutiny of interest groups and the public in recent years (Murawski, 1996). The incidental catch of diamondback terrapins, *Malaclemys terrapin*, in blue crab, *Callinectes sapidus*, traps has become an issue along both the Atlantic coast and Gulf of Mexico. The diamondback terrapin ranges from Cape Cod, Mass., to Texas and exclusively inhabits brackish habitats (Ernest and Barbour, 1972). Two of the seven subspecies of the diamondback terrapin are currently Category 2 candidates for listing under the Endangered Species Act (Seigel and Gibbons, 1995). Wood[1,2] and Seigel and Gibbons (1995) concluded that a major threat to diamondback terrapins appears to be incidental drowning in blue crab traps. Mann (1995) suggested that diamondback terrapins in Mississippi were most common in areas with relatively few blue crab traps.

A turtle excluder device (TED) was developed by Wood[1,2] to reduce incidental capture of diamondback terrapins in blue crab traps. Subsequently, Seigel and Gibbons (1995) and Mann (1995) recommended the use of TED's in blue crab traps because of diamondback terrapin mortality. Research was undertaken to evaluate the effects of TED's on blue crab catches. The objective of this report is to compare blue crab catch rates in traps with standard funnels and funnels equipped with a TED.

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ABSTRACT—Mortality of diamondback terrapins, Malaclemys terrapin*, in blue crab,* Callinectes sapidus*, traps has become a controversial bycatch issue in some areas. Traps with turtle excluder devices (TED's) had increased sublegal (14.5%), legal (32.9%), and total (25.7%) blue crab catch per trap day (CPUE). There were statistically significant differences between total (P=0.0202) and legal (0.0174) CPUE for standard traps and traps with TED's. The increased catch rates of blue crabs in traps with TED's may be due to decreased escapement through the entrance funnel.*

Methods

The study was conducted in three locations in the Terrebonne/Timbalier Bay estuary, Lafourche and Terrebonne Parishes in south-central Louisiana: Bay Blanc (high salinity, lower estuary bay); Bayou Blue (low salinity, upper estuary bayou); and Pointe au Chien Wildlife Management Area (low salinity, upper estuary canal).

Traps were 60.9 cm (24 in) in width and depth and 36.8 cm (14.5 in) in height and were constructed of black vinyl-coated 3.8 cm (1.5 in) square mesh wire. Each trap had three entrance funnels with the inner or bait chamber occupying approximately half of the trap floor. The 5 × 10 cm rectangular TED was constructed of stainless steel wire and attached with crab trap rings (short side on the vertical) to the inner opening of each entrance funnel. The 5 × 10 cm TED physically excludes most diamondback terrapins (Wood[1,2]).

Five replicates of each funnel type were baited with equal portions of fish and alternated by trap type when placed in the water. Traps were hauled approximately 24 hours after baiting. All blue crabs were measured in 10 mm CW size groups with reference to the minimum legal commercial size of 127 mm CW. The number of sampling runs (i.e. all traps fished for 24 hours) and inclusive dates by area were: six runs in Bayou Blue, 1–15 Sept. 1995; eight runs in Bay Blanc, 12 Oct.– 6 Nov. 1995; 15 runs in the Pointe au Chien Wildlife Management Area 9 May–28 June 1996. A total of 4,145 blue crabs were collected.

The General Linear Models Procedure (SAS, 1988) was used to determine if there were significant differences between trap types for mean catch per trap day for number of sublegal, legal, and total crabs.

Results and Discussion

Catch (number) per trap day (CPUE) of blue crabs by area by trap type are

[1] Wood, R. C. 1992. Diamondback terrapin (*Malaclemys terrapin*) field investigations on the Cape May peninsula (summer, 1992). Unpubl. manuscr. on file at The Wetlands Institute, 1075 Stone Harbor Boulevard, Stone Harbor, NJ 08247.

[2] Wood, R. C. 1994. Diamondback terrapin (*Malaclemys terrapin*) field investigations on the Cape May peninsula (summer, 1993). Unpubl. manuscr. on file at The Wetlands Institute, 1075 Stone Harbor Boulevard, Stone Harbor, NJ 08247.

tabulated in Table 1. Overall sublegal, legal, and total CPUE in traps with TED's was 14.5%, 37.9%, and 25.7% greater, respectively, than in standard traps. There were significant differences in total CPUE (P=0.0202) and legal CPUE (P=0.0174) between trap types. Wood[1,2] found a 5–10% increase in blue crab catches in traps with TED's while Mazzarella[3] and Cuevas et. al.[4] found no overall significant increase in legal catch.

The Pointe au Chien location was the only site with a significantly greater total CPUE (P=0.0031) and legal CPUE (P=0.0015) in traps with TED's than in standard traps. Total CPUE also was significantly greater (P=0.0001) at the Pointe au Chien location than at the other two sites.

The increased CPUE of both sublegal and legal crabs in traps with TED's was apparently due to increased ingress and/or reduced egress of crabs through the entrance funnels. Research has documented that the inside dimensions (Koike and Ogura, 1977; Koike and Ishidoya, 1978; Boutillier, 1985), height above the floor (Isaacson, 1962; Yamane and Itaka, 1987; Yamane et al., 1987), and design (Thomas, 1959) of the entrance funnel influences ingress or egress of various decapods. Egress of blue crabs through the entrance funnels has been alluded to on several occasions. Guillory (1998) showed that 38.1 mm square mesh physically retains an extremely high percentage of sublegal blue crabs from 92 to 127 mm and suggested that blue crab escapment occurs through the entrance funnels. Approximately half of blue crabs captured in ghost traps escaped through the entrance funnels (Guillory, 1993).

No diamondback terrapins were caught during this study or other recent trap studies (Guillory, 1989, 1993; Arcement and Guillory, 1993; Guillory and Merrell, 1993; Guillory and Prejean, 1997; Guillory and Hein, 1998a; Prejean and Guillory, 1998) in the Terrebonne/Timbalier estuary. However, we assume that TED's will reduce diamondback terrapin catches in crab traps in Louisiana estuaries as documented in other studies; Mazzarella[3] found a 92.5% reduction in diamondback catch rates in crab traps with TED's while Wood[2] collected 25 diamondback terrapins in standard traps and none in traps with TED's. The mortality rate of diamondback terrapins in crab traps was estimated as quite high (Seigel and Gibbons, 1995), 10% by Bishop (1983), and 10–50% by Wood.[1] TED's would also reduce diamondback terrapin mortality in ghost traps (i.e. traps lost accidentally or abandoned by fishermen), which may be more detrimental than mortalities in actively fished traps (Bishop, 1983). High numbers of dead diamondback terrapins have been documented in individual ghost traps: 28 (Bishop, 1983) and 12 (personal observ. of a trap from the Terrebonne Bay estuary, spring 1994).

An important ancillary benefit of TED's would be a probable reduction in rate of ingress of other vertebrate bycatch in both the active and ghost fishing modes. Miller (1996) indicated that a rectangular entrance funnel would allow ingress of crabs but exclude fish and other species. Guillory (1993) observed 11 different fish species in blue crab ghost traps. Mammals such as the river otter, *Lutra canadensis*, have also been found in blue crab traps.

In conclusion, TED's in blue crab traps do not reduce and may increase catch of legal blue crabs, they have been documented to reduce the catch of diamondback terrapins, and they probably reduce fish and aquatic mammal catch in both the active and ghost fishing modes. The increased CPUE of sublegal blue crabs in traps with TED's could easily be rectified with the addition of escape vents (Guillory 1989; Guillory and Merrell, 1993; Guillory and Hein, 1998a, b)

[3] Mazzarella, A. D. Undated. Test of a turtle excluder device in commercial crab pots. Unpubl. manuscr. on file at N.J. Dep. Environ. Prot. Agency, P.O. Box 418, Port Republic, NJ 08241.

[4] Cuevas, K. J., M. V. Buchanan, W. S. Perret, and J. Warren. 1998. A preliminary study of blue crab catch in crab traps fitted with a diamondback terrapin excluder device. Unpubl. manuscr. on file at Miss. Dep. Nat. Resour., 1411 Bayview Ave., Suite 101, Biloxi, MS 39530.

Table 1.—Catch (number) per trap day and standard deviation (in parenthesis) by location and overall for standard traps and traps with turtle excluder devices (TED's).

	Catch and (S.D.)		
Location	Sublegal	Legal	Total
Bay Blanc			
Standard	3.48 (2.75)	2.26 (1.48)	5.74 (2.85)
TED's	3.75 (2.10)	2.61 (1.79)	6.35 (2.61)
Pointe au Chien			
Standard	8.50 (5.40)	7.89 (5.79)	16.39 (10.09)
TED's	9.80 (4.60)	11.07 (7.36)	20.86 (10.38)
Bayou Blue			
Standard	1.05 (0.82)	2.35 (2.57)	3.41 (2.96)
TED's	2.05 (1.75)	4.16 (3.17)	6.21 (3.87)
Overall			
Standard	5.52 (5.15)	5.09 (5.13)	10.61 (9.42)
TED's	6.32 (4.88)	7.02 (6.68)	13.34 (10.49)

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