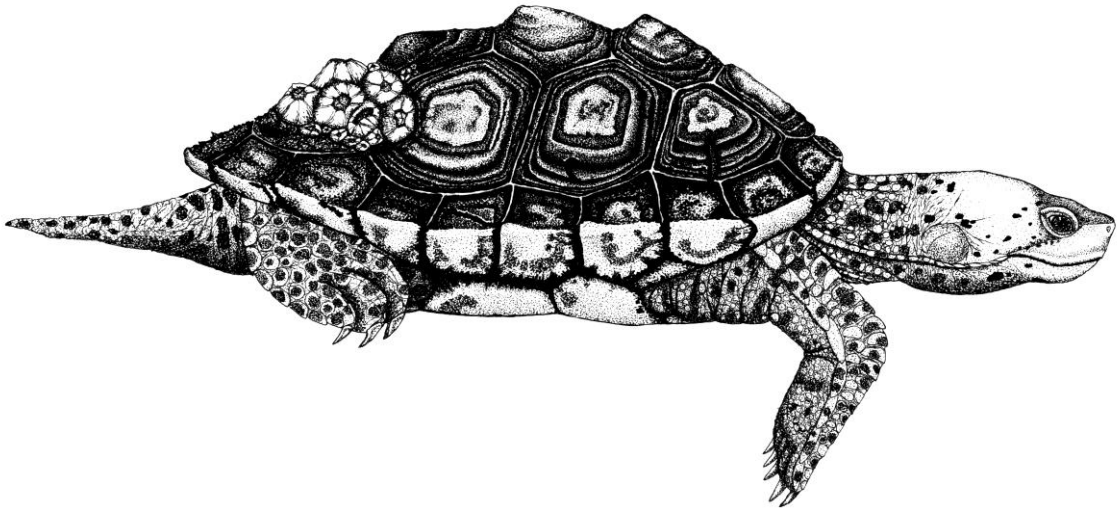
Diamondback Terrapins of Tampa Bay: an Educator's Guide



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Exploring the Nature of Florida

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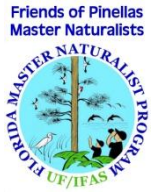

Acknowledgements

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Note to Educators

Florida is geographically located in the second richest center of global diversity for turtles and its wide variety of habitats support over 8% of the world's known species. Twenty-five (45.5%) of the 55 species found in the United States also occur in Florida, with 18 (72%) of those considered by turtle biologists to be in need of conservation attention. Florida's significant habitat diversity and species richness not only make the state a chelonian hotspot, but critical to the conservation of many species as well.

Turtles are ancient creatures that walked the earth with the dinosaurs and today are important and visible elements in many ecosystems. Some species serve as barometers of the environment (providing information on the health of their habitat), while others serve as keystone, umbrella or flagship species. Conservation efforts on their behalf are also beneficial to the ecosystems in which they are found. Certainly, the threats to Florida turtles and their associated ecosystems present broad conservation challenges. However, despite the apparent urgency of the situation, the opportunities for conservation remain great. Consequently, turtles are an excellent group to use for teaching both ecology and conservation.

The authors of this educator's guide believe that education is the foundation of conservation and that educators can play a key role in conserving these ecologically important vertebrates. This guide was developed for both formal educators (elementary-secondary) and non-formal educators (e.g., zoos, aquaria, museums, and nature centers) and uses the diamondback terrapin as a model, integrating lessons in biology, geography, language arts, and mathematics. It includes background instructional material, worksheets, an associated board game, and additional teaching resources. We hope that you find it useful and encourage you to complete and return the evaluation form located at the end of the guide. Your input will help improve future editions and would be greatly appreciated.

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Introduction

The diamondback terrapin (*Malaclemys terrapin*) is the only entirely estuarine turtle and is a member of the family Emydidae. Despite the importance of Florida to diamondback terrapin biology, little is known concerning this species over long stretches of Florida coastline. Graduate students and researchers are strongly encouraged to consider initiating field studies that will ultimately benefit this imperiled species. Likewise, diamondback terrapins are unknown to many Floridians. Education is also an important component of successful wildlife conservation programs. The education of diverse audiences is required if we are to improve the future outlook for this umbrella species. Educators are urged to teach about the ecology and plight of this ecologically significant vertebrate. Without your participation, there is little hope for this flagship species for coastal conservation.

Ecology

Size: Diamondback terrapins exhibit sexual dimorphism with males being significantly smaller than females. Male terrapins in Tampa Bay reach a maximum carapace length of 143 mm and weight of 425 grams. Female terrapins reach a maximum carapace length of 215 mm and weight of 1,600 grams.

Geographic distribution: The diamondback terrapin is found from Cape Cod (Massachusetts) to southern Texas. Although terrapins occur in 16 states along the Atlantic and Gulf coasts, the coastline of Florida represents approximately 20% of their entire range. Five of the seven recognized subspecies occur in the state's extensive salt marsh and mangrove habitats, including three endemics (see distribution map). Therefore, Florida terrapin populations and habitats are critical to the conservation of the entire species.

Diamondback terrapins occur in a number of locations throughout Tampa Bay. Terrapins can occasionally be observed in protected areas such as Tarpon Key (Pinellas County), Alafia Bank (Hillsborough County) and Terra Ceia Bay (Manatee County).

Since diamondback terrapins are restricted to brackish water, they have a narrow linear range. Maps found in field guides lead one to believe that their distribution is contiguous, when in actuality they should show a series of dots and dashes, and not a solid line. In other words, large gaps exist where the species is not present.

In 2008, Parham and co-workers published a paper documenting diamondback terrapins are native to Bermuda (supported by fossil and genetic data). A tiny population currently occurs at the Mid Ocean Club golf course. This publication would be of value in initiating a student discussion about species dispersal.

Habitat: The diamondback terrapin is the only turtle in the world that is entirely restricted to brackish water and can be found in Florida's extensive estuaries, mangrove and salt marsh habitats. Tampa Bay is the largest open water estuary in Florida. These habitats are often described as areas "where rivers meet the sea" (mixture of fresh and salt water).

Longevity: Field studies have suggested that diamondback terrapins can live over 20 years. Captive terrapins are known to live up to 22 years.

Reproduction: Diamondback terrapins in Florida nest from late April through the end of July. They nest on dunes, beaches, sandy edges of marshes, islands, and dike roads. Terrapins may travel relatively long distances (up to 10.4 km) to nest. They can lay multiple nests per season and typically are diurnal nesters, although nocturnal nesting has been documented. Terrapins in the northern part of their range lay as many as 22 eggs, while a study in northeastern Florida showed an average clutch size of 6.7 eggs. The oblong pinkish eggs turn white within 24-48 hours. Eggs range from 31.1-39.0 mm in length and 19.7-23.9 mm in width. Northern subspecies have smaller egg sizes than those in the southern part of the species range. In northeastern Florida, hatchlings emerged from 55-97 days after egg deposition. Diamondback terrapins have temperature dependent sex determination (TDSD) and sex is determined by the temperature of the nest at a critical point in incubation. Some terrapin hatchlings overwinter in the nest.

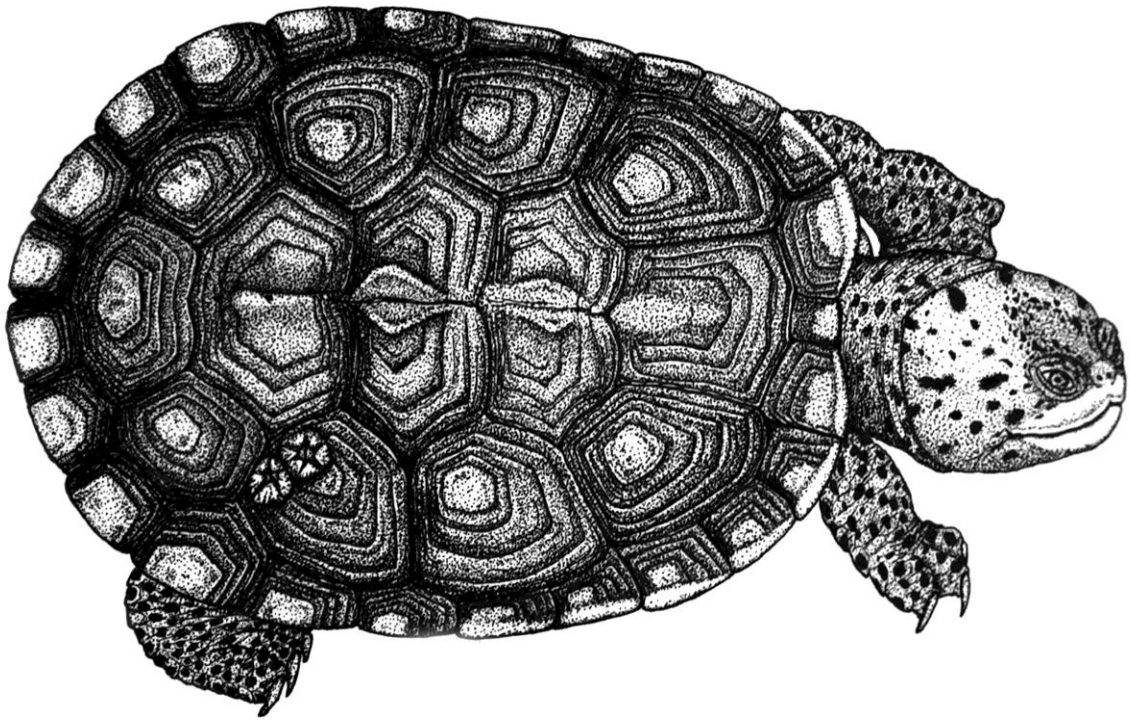
Hatchlings: Diamondback terrapin hatchlings in northeastern Florida have a mean carapace length of 33.9 mm and mean weight of 9.5 grams. Terrapin hatchlings and juveniles avoid open water and seek refuge in vegetation and/or marshes.

Diet: Diamondback terrapins are molluscivores and the single Florida study on diet found that they primarily eat dwarf surf clams (*Mulinia lateralis*), marsh periwinkles (*Littorina irrorata*) and small species of crabs. Terrapins have a broad tomium (mouth plate composed of keratin) that allows them to crush the shell of their prey.

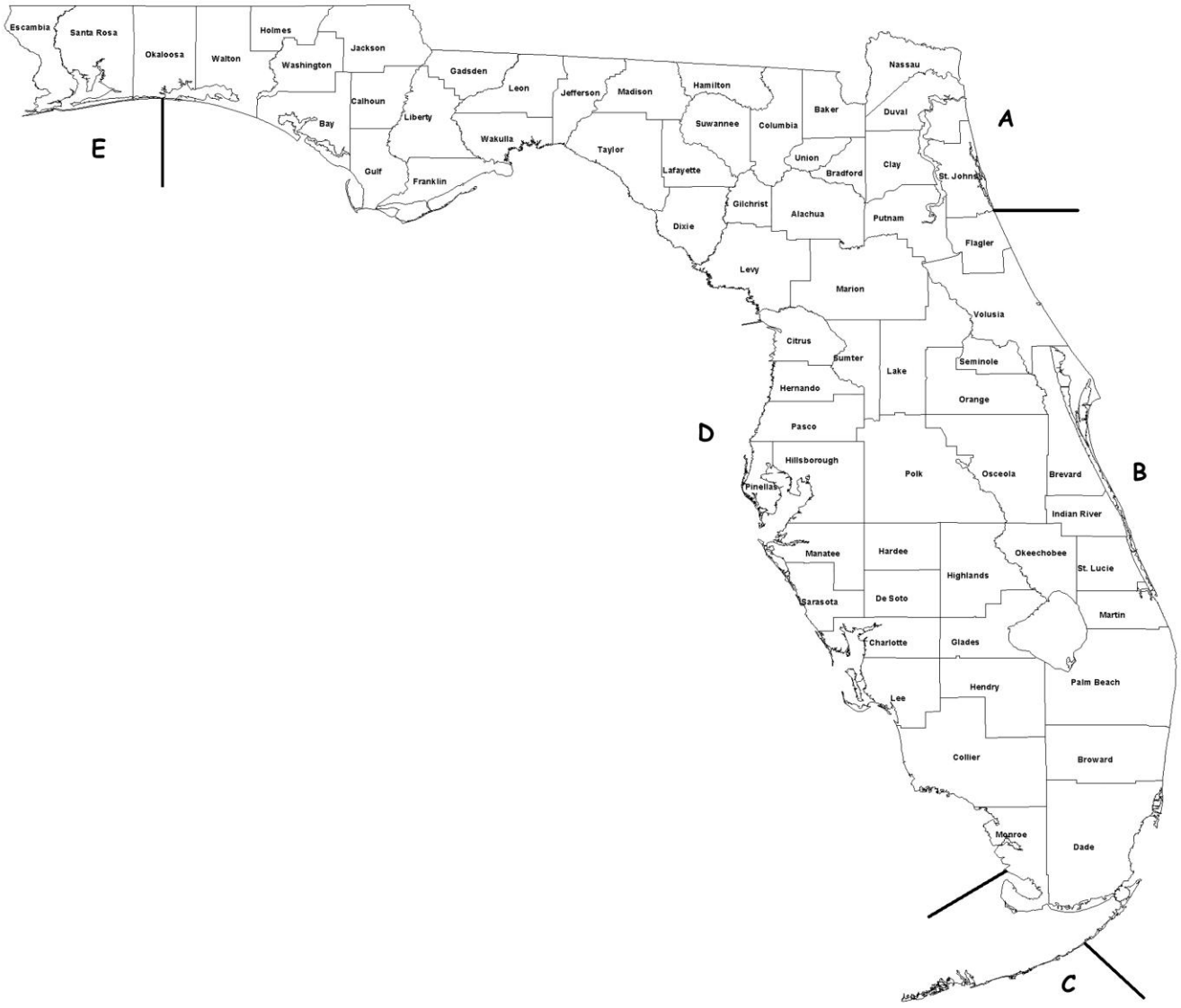
Predation: Diamondback terrapins and their eggs are known to be taken by many predators including raccoons, foxes, otters, skunks, Norway rats, crows, laughing gulls, ghost crabs, and fire ants.

Importance to brackish water ecosystems: Terrapins play a significant role in the food chain as both predators and prey. As predators, they help to control populations of prey items (see list of species above). In addition, they are an important food item for many species (see list of species above).

Butler, Seigel and Mealey (2006) published a thorough species account, including excellent photographs of different subspecies and size classes. We highly recommend this paper as a source of additional background information.



Florida Distribution of Diamondback Terrapins



A: Carolina diamondback terrapin (*Malaclemys terrapin centrata*)

B: Florida east coast diamondback terrapin (*M. t. tequesta*)

C: Mangrove diamondback terrapin (*M. t. rhizophorarum*)

D: Ornate diamondback terrapin (*M. t. macrospilota*)

E: Mississippi diamondback terrapin (*M. t. pileata*)

Threats and Conservation Actions

Diamondback terrapins were once common in brackish ecosystems along the Atlantic and Gulf coasts, but have suffered from a long history of human exploitation. Some threats are specific to particular regions, while others occur nearly rangewide. Current major threats to this species in Florida include loss of nesting habitat, predation of nests and adults, and incidental drowning in crab pots. Several other anthropogenic threats are known to affect terrapins. While each threat alone is of concern, there is an even greater concern regarding their ability to work in negative synergy. It should be known, however, that each of these conservation challenges comes along with a conservation opportunity. It's what we do with that opportunity that can make a difference.

Loss of nesting habitat: Coastal development decreases available nesting habitat and further fragments populations. Acquisition and protection of nesting sites by governmental agencies and private conservation groups would greatly benefit terrapin conservation efforts.

Coastal armoring: Hardening of shoreline to prevent real estate property damage can decrease available terrapin nesting habitat. This has also been well-documented as a threat to marine turtles. In cases where coastal armoring cannot be avoided, then identifying ways to provide access to terrapin nesting sites is recommended.

Incidental drowning in crab pots: Mortality due to bycatch in crab pots is the greatest threat to terrapins throughout their range. This threat first appeared in the literature in 1942. Research in Florida waters has shown that the use of 45 mm x 120 mm bycatch reductions devices (BRDs) on crab pots can reduce terrapin mortality by 73.2%. Further, there was no impact on sex, size or number of legal-sized blue crabs captured. Regulatory change requiring BRDs on commercial and recreational crab pots used in Florida waters would be the greatest immediate conservation action that could be implemented by the Florida Fish and Wildlife Conservation Commission.

Ghost pots: Ghost pots continue to trap wildlife long after they are abandoned or lost. Support of old crab pot removal programs and participation in such efforts will save wildlife from a certain death.

Harvest: It is believed that collection for the food and pet trade had a negative impact on Florida terrapin populations in the past. It is now illegal to collect terrapins for commercial purposes. The removal of even small numbers of turtles from the wild can cause populations to crash and in some cases not recover. Educational efforts

highlighting the negative impacts of removing terrapins from the wild is of importance. Increased law enforcement efforts would also be beneficial.

Predation: Diamondback terrapin nests and adults are an important food source for many species of wildlife (see list of species above). Some subsidized predators, such as raccoons, cause considerable damage to terrapin populations at nesting sites. In some cases, control efforts may be warranted.

Encounters with automobiles (road mortality): Although considered to be a very minor threat to diamondback terrapins in Florida, it has been documented in a number of counties. Road mortality is a major threat in other states, such as New Jersey, Delaware, South Carolina, and Georgia. Terrapins should be taken into consideration in road planning and realignment projects.

Boat strikes: Encounters with boats have been documented as a significant threat to diamondback terrapins. Mortality can occur as a result of blunt-force trauma from boat impact or from injuries caused by propellers. Survivors may experience scars, loss of limbs, compromised fitness, and decreased survivorship. Efforts that may address this threat include increasing the number and size of protected areas in known terrapin habitat (closed to motorized watercraft), establishing reduced speed zones, encouraging the use of propeller guards, developing effective education programs, and increasing law enforcement efforts.

Non-native species: These species can have a negative impact on diamondback terrapins. Feral hogs disturb nesting sites and can eat eggs and young. Fire ants are known to attack hatching eggs and young. Since terrapins have temperature dependent sex determination (TDSD), shading of nest sites by invasive non-native plants can result in more males being produced and potentially skewing sex ratios. All of these threats were documented in a study of terrapins by Butler and Heinrich in the Big Bend region. Coordinated efforts to control harmful, invasive non-native species are needed in order to conserve terrapin populations.

Pollution: Coastal aquatic and terrestrial habitats are littered with trash. Participation in coastal cleanup programs is an excellent way for people to contribute to protecting diamondback terrapin habitat.

Oil spills: This threat can degrade critical wetlands and nesting habitat. It can also affect the food chain. Contaminants can bioaccumulate in terrapin prey items. The Tampa Bay oil spill (1993) and the Deepwater Horizon blowout (2010) are both known to

have directly affected terrapins. Avoidance of drilling for oil in the Gulf of Mexico would be a positive conservation action for this species and the wildlife community in general.

Global warming: The greatest concern regarding this threat is the potential loss of nesting habitat due to sea level rise. Since terrapins have temperature dependent sex determination (TDSD), increased nest temperatures can result in more females being produced and potentially skewing sex ratios. Support governmental policies and initiatives that can positively address this threat.

Laws and Regulations Pertaining to Diamondback Terrapins in Florida

Take is limited to one diamondback terrapin per person per day (midnight to midnight) from the wild for noncommercial use. The transport of more than one terrapin per day is prohibited, unless the transporter has a license for sale or exhibition of wildlife, aquaculture certification from the Department of Agriculture and Consumer Services, or documentation that their terrapins were legally obtained. Selling terrapins is prohibited. Possession of terrapins is limited to two. The take of terrapin eggs is also prohibited.

Worksheet #1: Estuarine Food Chains

Try your hand at creating your own estuarine food chains. The examples provided below include a diamondback terrapin. However, you do not need to include terrapins in your food chains unless you wish to do so.

example #1: *Spartina* grass → marsh periwinkle → diamondback terrapin

example #2: diamondback terrapin egg → ghost crab → raccoon

_____ → _____ → _____

_____ → _____ → _____

_____ → _____ → _____

_____ → _____ → _____

_____ → _____ → _____

_____ → _____ → _____

_____ → _____ → _____

_____ → _____ → _____

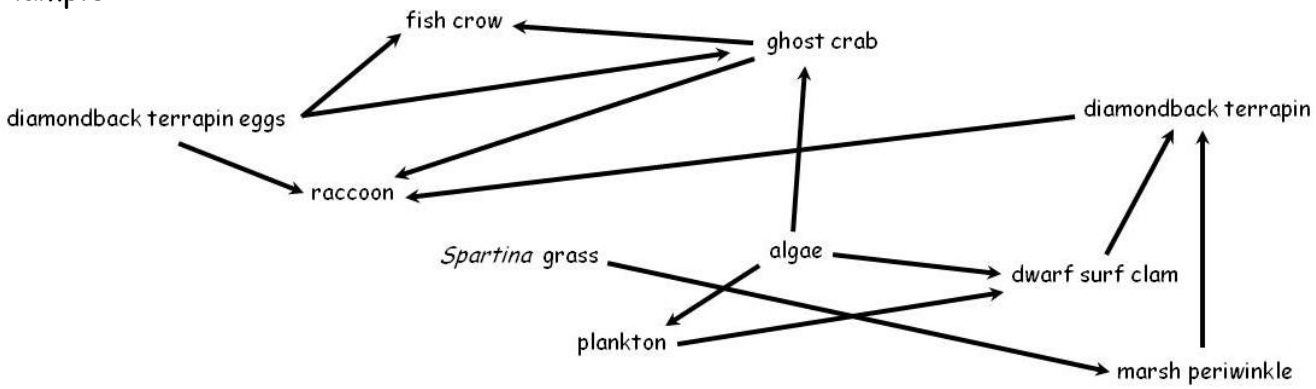
_____ → _____ → _____

_____ → _____ → _____

Worksheet #2: Estuarine Food Webs

A food web is a group of organisms related by predator-prey and consumer-resource interactions. It is comprised from all interrelated food chains in an ecological community. Use four of your food chains to draw your own estuarine food web.

example:



Worksheet #3: Sexual Dimorphism

Diamondback terrapins are a sexually dimorphic species (males are significantly smaller than females). In order for scientists to compare adult male to female terrapins, they must measure and weigh a representative sample of each sex. Add the lengths and weights for the 10 males (data provided) and then determine the range (lowest and highest numbers) and mean (average). Do the same thing with the data provided for the females. Present your findings as a range and mean for both sexes (see example below). The "n" represents the number in the sample size. In science, larger sample sizes (n) make the data more statistically significant. A portion of this data came from a field study site located in Tampa Bay.

example:

adult males: maximum carapace length = 120-140 mm, mean = 130.5 mm (n = 50), weight = 300-425 grams, mean = 375 grams (n = 50)

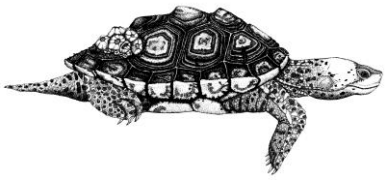
adult females: maximum carapace length = 155-210 mm, mean = 180 mm (n = 70), weight = 1,000-1,600 grams, mean = 1,250 grams (n = 70)

your results:

adult males: maximum carapace length = _____-_____ mm, mean = _____mm (n = _____), weight = _____-_____ grams, mean = _____ grams (n = _____)

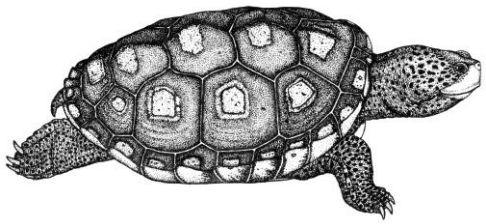
adult females: maximum carapace length = _____-_____ mm, mean = _____mm (n = _____), weight = _____-_____ grams, mean = _____ grams (n = _____)

Males



Terrapin #	Maximum carapace length (mm)	Weight (grams)
1	138	390
2	140	400
3	127	385
4	125	380
5	124	375
6	131	383
7	122	362
8	120	356
9	135	384
10	143	425
total:		

Females



Terrapin #	Maximum carapace length (mm)	Weight (grams)
1	190	1,375
2	155	1,204
3	215	1,600
4	168	1,300
5	185	1,370
6	180	1,340
7	172	1,335
8	150	1,116
9	200	1,400
10	160	1,250
total:		

Worksheet #4: Sex Ratio

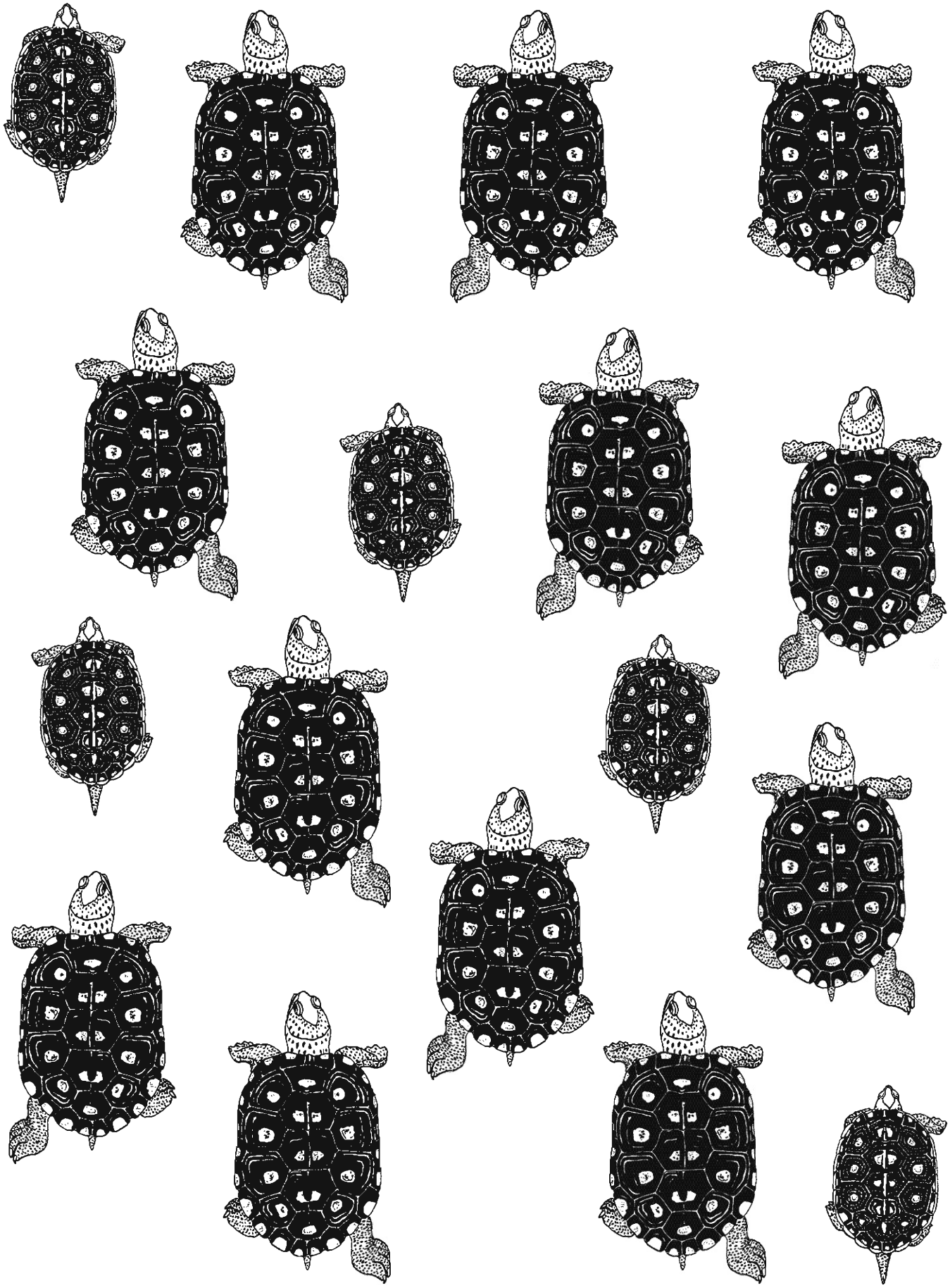
Field biologists often need to determine sex ratios for the species they study. Let's consider how you would go about determining the sex ratio of a population of diamondback terrapins. Male terrapins are significantly smaller than females, have narrower heads and longer tails. Count the number of each sex and then turn it into a simple ratio (see examples below). You need to present your sex ratio with one male, so it will require you to use some basic math (try dividing both numbers by the number of males).

example #1: 10 males and 20 females would be 10:20 or a 1:2 sex ratio

example #2: 10 males and 25 females would be 10:25 or a 1:2.5 sex ratio

your results:

____ males and ____ females would be ____:____ or a ____:____ sex ratio



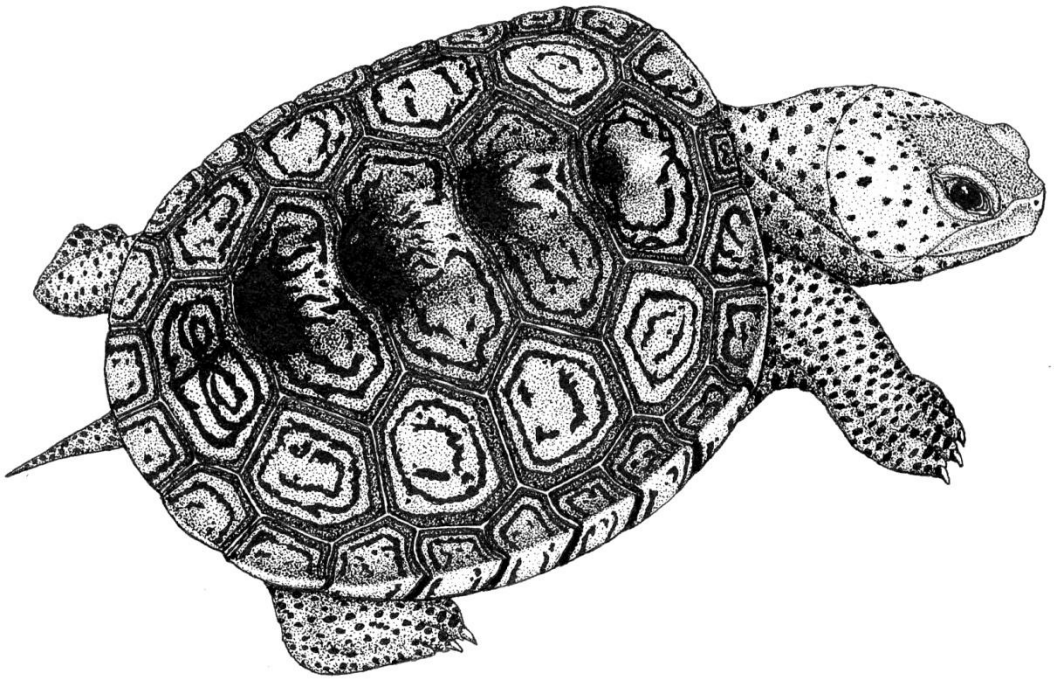
Worksheet #5: Clutch Size

Determining the clutch size (number of eggs) of diamondback terrapins is done by radiographing a female and then counting the number of eggs, or by counting the eggs found in a nest. Add all of the clutch sizes presented below and divide by the number of clutches sampled. Present your findings as a range and mean (see example below). The "n" represents the number in the sample size. In science, larger sample sizes (n) make the data more statistically significant. This data came from a field study in northeastern Florida.

example: clutch size = 5-10 eggs, mean = 7.5 eggs (n = 10)

your results: clutch size = _____-_____ eggs, mean = _____ eggs (n = _____)

Clutch #	# eggs
1	4
2	8
3	5
4	6
5	7
6	10
7	6
8	9
9	7
10	8
total:	



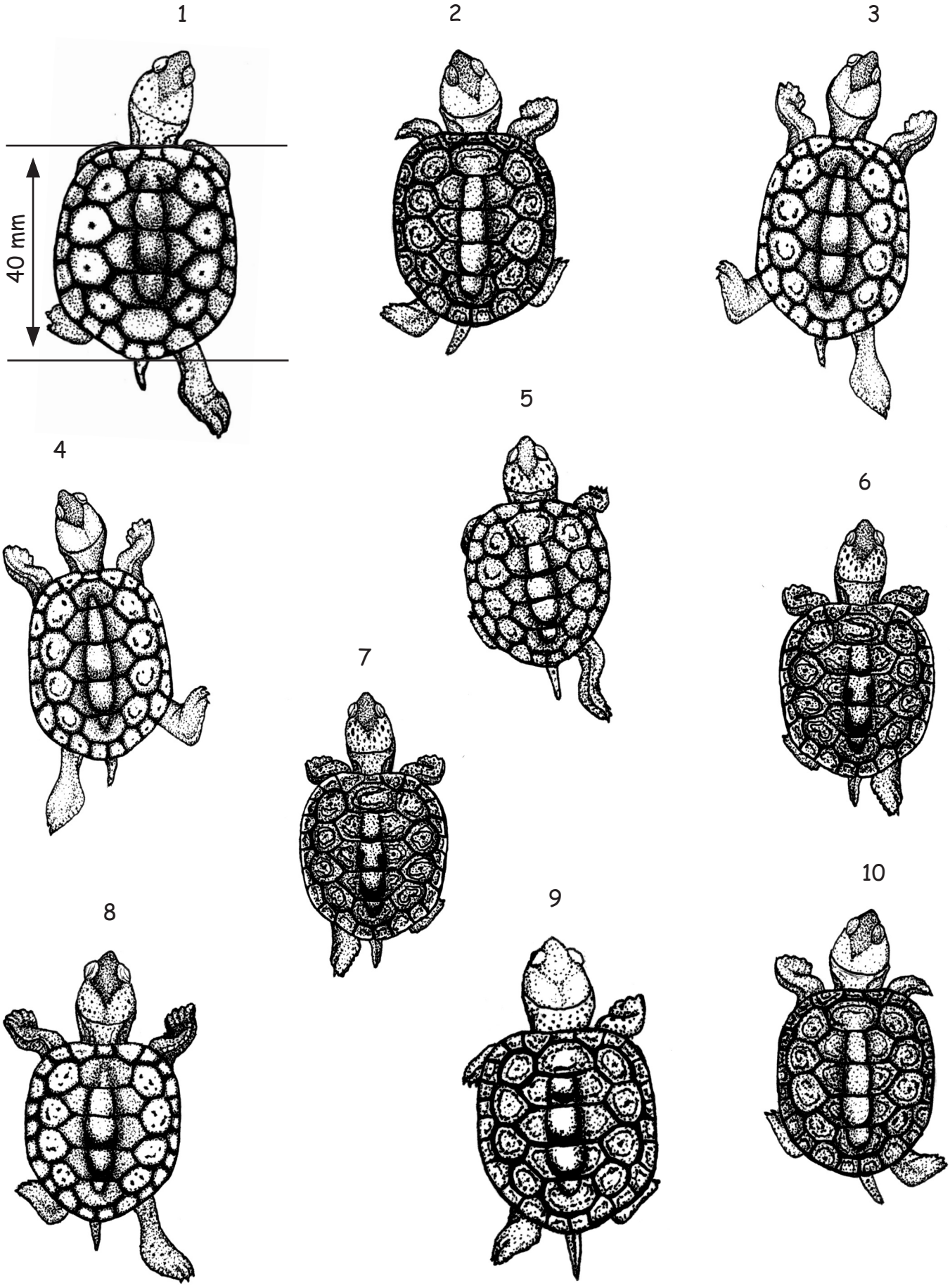
Worksheet #6: Hatchling Measurements

Diamondback terrapin researchers can determine the range (lowest and highest numbers) and mean (average) of hatchlings by measuring a number of individuals. Measure the maximum carapace (top of shell) length of each terrapin hatchling in mm (see hatchling #1 for example). Then add all of the measurements and divide by the number of hatchlings. Present your findings as a range and mean (see example below). The "n" represents the number in the sample size. In science, larger sample sizes (n) make the data more statistically significant. This data came from a study in northeastern Florida.

example: maximum carapace length = 25.0-50.0 mm, mean = 37.5 mm (n = 10)

your results: maximum carapace length = _____-_____ mm, mean = _____ mm (n = _____)

Terrapin #	Maximum carapace length (mm)
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
total:	


1
40 mm
2
3
4
5
6
7
8
9
10

Diamondback Terrapin Word Find

U N W N O I T A V R E S N O C H N R V S U S R O Q

R I H U P N I H Y C R W N E O N U F O E W J B W N

H P A D D A U H I R L A F W A R G D G I T F U S E

P A T H E S A L T M A R S H G N U I P C H S O X M

W R C S E J X P Q W O P R H S H N M J E O E S P A

Z R H I E B P R E D A T I O N N W O S P I I Q F N

G E L K M D O R W E I Y Q D I B U R Y S T C I F G

X T I C F G T A C N R C B C E L R P G E A E L A R

A B N A E Q N Z T A I B I A B L V H I V R P Z S O

U Z G R Y F P C U S I A C M K Q Q I X I X S E H V

T H J B H J R T O S T H H K E K Q S K S E P S V E

C E X A S E S Z I L W R G C E D M M I A S I T S X

R Q H D W E K K X R N O I U D T N V C V H H S M T

A I W K E L A Z A E Z V M K J O F E K N G S E X T

B M O L L U S C I V O R E K E N O E N I V G V A V

P N H C M R K H P Y X Z J U R E J F O Z R A R F C

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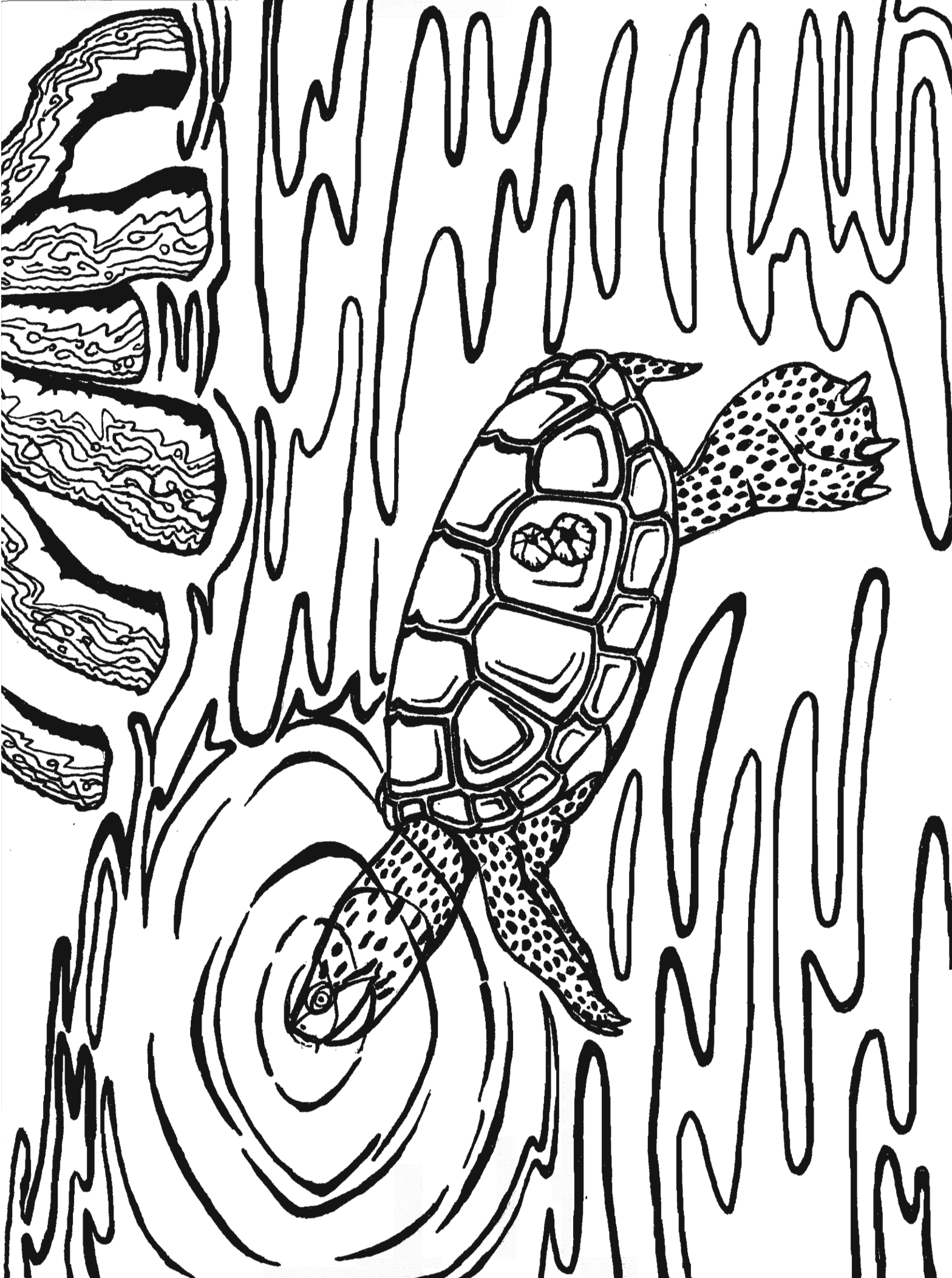
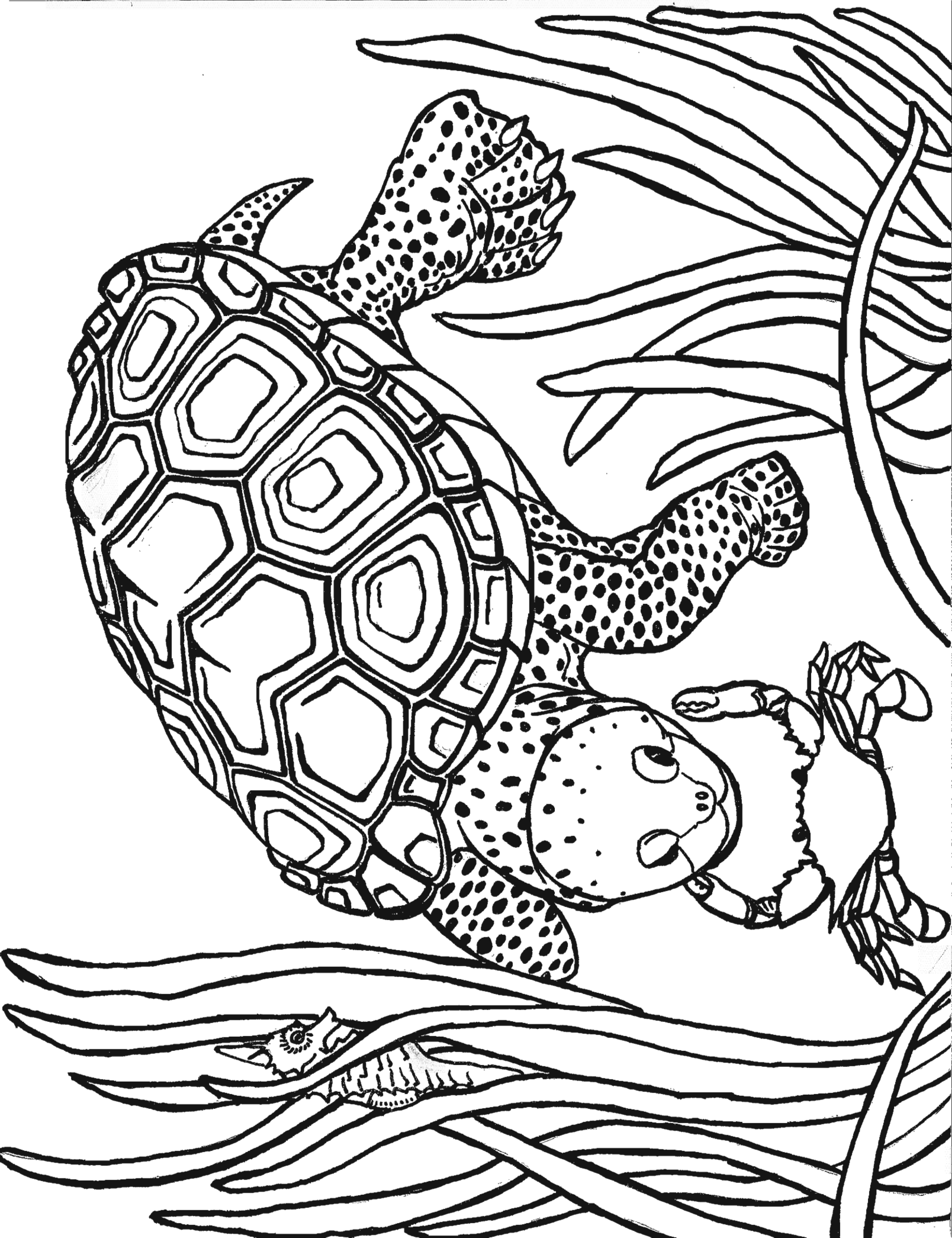
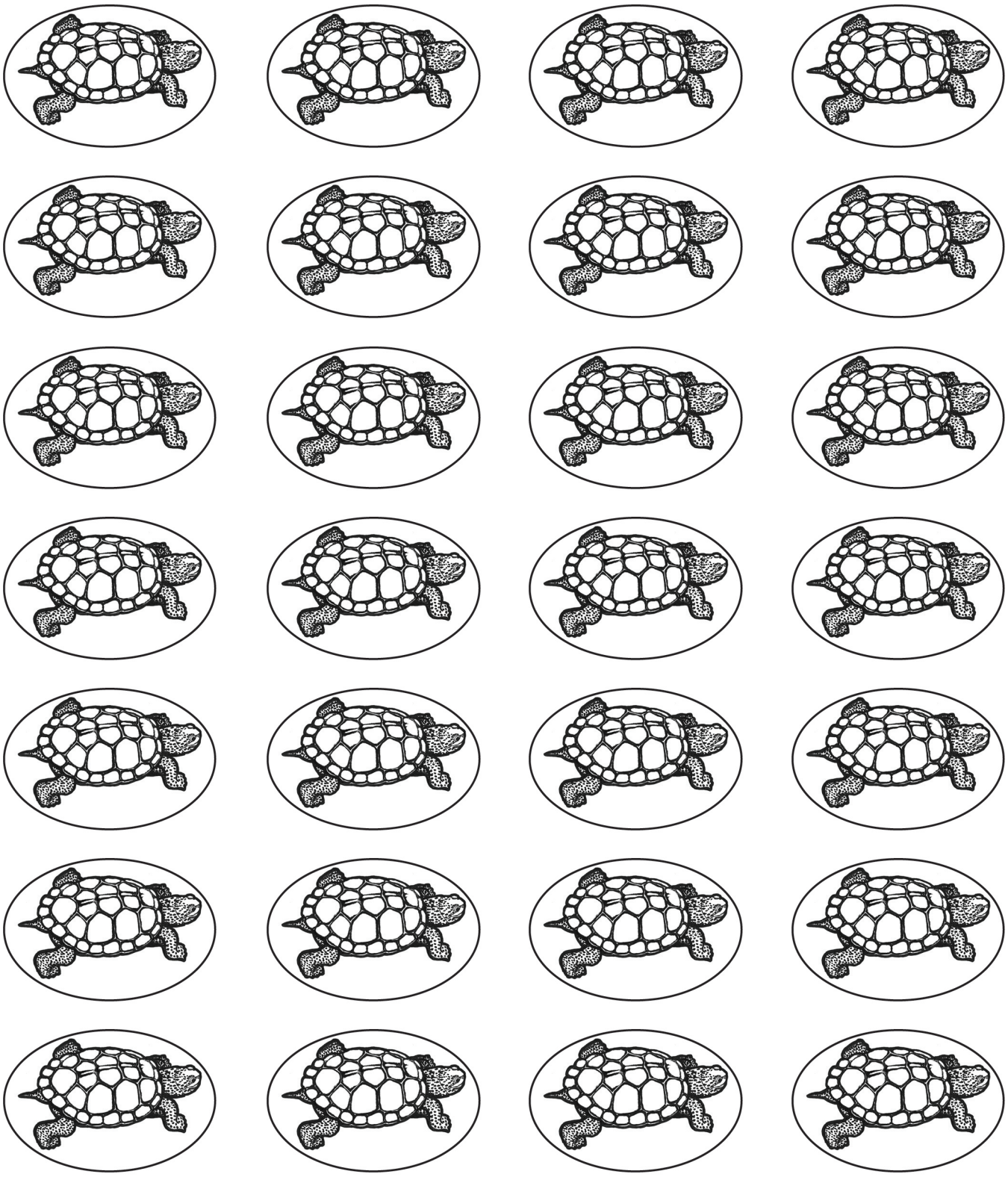
T C Y D E K S O X R M E C A P A R A C N T F H G J

BEACH WRACK
BOAT STRIKE
BRACKISH
CARAPACE
CLUTCH
CONSERVATION
CRAB POT
DIMORPHISM
ENDEMIC
ESTUARY
FLAGSHIP SPECIES
FOOD CHAIN
HARVEST
HATCHLING
INVASIVE SPECIES
MANGROVE
MOLLUSCIVORE
PREDATION
SALT MARSH
SEX RATIO
TERRAPIN





Diamondback Terrapins: Living on the Edge (Game Pieces)



Glossary of Terms

anthropogenic – something caused by humans

beach wrack - clumps of stranded seaweed

boat strike - direct injuries of wildlife by motorized watercraft

brackish - a mixture of fresh and salt water; "where rivers meet the sea"

bycatch reduction device (BRD) - a rectangular device designed to prevent diamondback terrapins from entering blue crab pots

carapace - top of a turtle's shell

chelonian – turtle

clutch - group of reptile eggs

coastal armoring - hardening of shoreline to prevent real estate property damage

conservation - the act of conserving or protecting wildlife and wild lands

crab pot - a trap designed to capture blue crabs

data - individual facts, statistics or items of information

dike - a long embankment or causeway to prevent flooding

endemic - species restricted or limited to specific states, regions or countries

estuarine - species that occur in brackish water habitats

estuary - an area where a river meets a sea, gulf or ocean and the mixing of fresh and salt water occurs

exclude - to keep out

exploitation - to take advantage of unethically or unjustly for one's own ends

extirpation - localized extinction

flagship species - a species chosen to represent an environmental cause

food chain - a succession of organisms in an ecological community that constitutes a continuation of food energy from one organism to another as each consumes a lower member and in turn is preyed upon by a higher member

harvest - catch, take or removal of wild species for human use

imperiled species - species at risk of increased endangerment or possible extinction

invasive species - species, both native and non-native, that reproduce and spread aggressively

keystone species – a species that plays a pivotal role in the ecology of an ecosystem

mangrove - a type of tree that grows in coastal habitat waters

mean - an average for a range of numbers

molluscivore - a species that eats molluscs

predation - act of wildlife killing and eating another animal, including nests of eggs

radiograph - x-ray

range - a range of numbers from lowest to highest

salinity - amount of salt in water, often presented as parts per thousand (PPT)

salt marsh - a marshy tract of coastal land that occurs in brackish waters

sex ratio - ratio of males to females in a wildlife population

sexual dimorphism - difference in appearance between the male and female of a species

subsidized predators – animals, such as raccoons, that have higher than naturally occurring population levels due to humans altering resource levels

synergy – interaction or cooperation of two or more agents that produce a combined effect greater than the sum of their separate effects

temperature dependent sex determination (TDSD) - sex determined by the temperature of a nest at a critical point in incubation of reptile eggs

tomium - the mouth plate of a turtle (composed of keratin)

umbrella species - a species with large area requirements; protection of umbrella species offers protection to other species

Ten Things You Can Do to Help Protect Diamondback Terrapins

1. Support conservation organizations that work to protect diamondback terrapins, such as the Florida Turtle Conservation Trust.

2. Help protect coastal wildlife habitat by supporting land conservation organizations, such as The Nature Conservancy or land trust groups.

3. Help diamondback terrapins across the road. Always take them in the direction that they are moving. Only adults (never children) should do this as some terrapins may bite and vehicle traffic is extremely dangerous.

4. Leave wild diamondback terrapins where they belong. The removal of even small numbers of turtles from the wild can cause populations to crash and in some cases not recover.

5. Encourage recreational and commercial crabbers to use bycatch reduction devices on all crab pots. Research in Florida waters has shown that this can significantly reduce diamondback terrapin mortality, with no impact on the number or size of crabs captured.

6. Participate in organized ghost pot removal efforts.

7. Support regulations that will increase protection of diamondback terrapins and their habitats. A current example is the need for regulatory change that would require bycatch reduction devices on all crab pots used in Florida waters.

8. Participate in habitat clean-up efforts, such as the annual International Coastal Cleanup. Check with your local conservation organizations on how you can get involved.

9. Support habitat restoration efforts. Restoring degraded natural areas can provide improved habitat for wildlife, including turtles.

10. Learn about the natural history and conservation needs of this fascinating and imperiled estuarine species. Teach others how they can assist in protecting these ecologically significant vertebrates. Consider organizing a turtle educational awareness event at your school, church, club, or local nature center.

Additional Teaching Resources

Publications:

Butler, J.A. and G.L. Heinrich. 2007. The effectiveness of bycatch reduction devices on crab pots at reducing capture and mortality of diamondback terrapins (*Malaclemys terrapin*) in Florida. Estuaries and Coasts 30:179-185. (available as a PDF at the Diamondback Terrapin Working Group website: www.dtwg.org)

Butler, J.A., G.L. Heinrich, and R.A. Seigel. 2006. Third workshop on the ecology, status and conservation of diamondback terrapins (*Malaclemys terrapin*): Results and recommendations. Chelonian Conservation and Biology 5:331-334. (available as a PDF at the Diamondback Terrapin Working Group website: www.dtwg.org)

Butler, J.A., R.A. Seigel, and B. Mealey. 2006. *Malaclemys terrapin* – diamondback terrapin. Pages 279-295 *in* P.A. Meylan, editor. Biology and conservation of Florida turtles. Chelonian Research Monographs 3:279-295. (available as a PDF at the Diamondback Terrapin Working Group website: www.dtwg.org)

Brennessel, B. 2006. Diamonds in the marsh. University Press of New England. Lebanon, NH. 219 pp. (ISBN: 978-1-58465-536-7)

Curtis, J.K. 2006. Turtles in my sandbox. Sylvan Dell Publishing, Mt. Pleasant, SC. (ISBN: 978-0-9768823-74 for hardcover and 978-1-6071811-94 for paperback; children's book with additional resources available at www.sylvandellpublishing.com)

Parham, J.F., M.E. Outerbridge, B.L. Stuart, D.B. Wingate, H. Erlenkeuser, and T.J. Papenfuss. 2008. Introduced delicacy or native species? A natural origin of Bermudian terrapins supported by fossil and genetic data. Biology Letters 4:216-219. (available as a PDF at the Diamondback Terrapin Working Group website: www.dtwg.org)

DVDs:

Tampa Bay: Living Legacy. 2006. Tampa Bay Estuary Program. A production of Public Media Productions. (available from the Tampa Bay Estuary Program: www.tbep.org)

Terrapin. 1992. NJN. Produced by New Jersey Outdoors. (available from NJN: www.njnstore.org)

Zoos, aquaria and nature centers in Tampa Bay that currently display diamondback terrapins:

Florida Aquarium
(www.flaquarium.org)

Tampa's Lowry Park Zoo
(www.lowryparkzoo.com)

Upper Tampa Bay Park
(www.hillsboroughcounty.org/parks/resources/forms/parkservices/trails96.pdf)

In addition, Tampa Bay Watch (www.tampabaywatch.org) has a diamondback terrapin education program and exhibit in development. Public facilities such as these are encouraged to address the lack of educational exhibits regarding terrapins.

Ghost pot removal program:

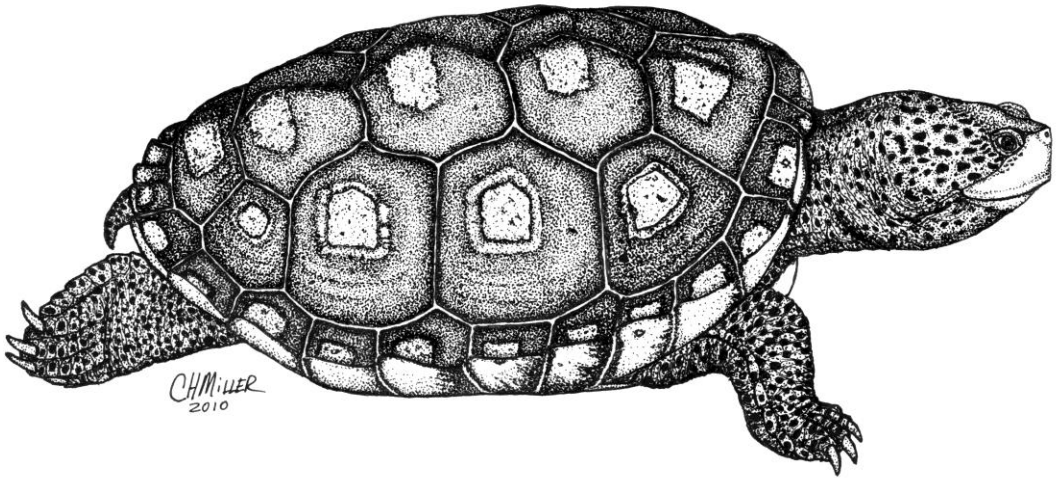
Tampa Bay Watch conducts a ghost pot removal program. Please contact them at www.tampabaywatch.org for information on how to get involved.

Website:

Diamondback Terrapin Working Group: This working group was formed in 2004 with the goals of uniting all individuals and organizations concerned with the decline of the species and begin to lay the foundation for a rangewide conservation plan. The working group is committed to and supports research, management, conservation, and education efforts that benefit diamondback terrapin populations and their associated ecosystems within the sixteen state range. This organization offers an excellent listserv and website, which includes an extensive bibliography with PDFs. For more information on the working group, please visit www.dtwg.org.

WANTED

Information on Diamondback Terrapin Sightings



We need your assistance with a distributional survey of this imperiled brackish-water species in Tampa Bay. Exact locations (GPS coordinates preferred) and photos would be of great value.

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FLORIDA TURTLE CONSERVATION TRUST

FLORIDA T-BAY Tampa Bay Estuary

UNF UNIVERSITY of NORTH FLORIDA

Heinrich Ecological Services
Exploring the Nature of Florida

Educator's Guide Evaluation Form

Did you copy any of the educator's guide to distribute to students or other groups?

Yes No

On a scale of 1-10, how useful was the educator's guide in helping you teach students or other groups about diamondback terrapins (with 10 being the most useful)?

1 2 3 4 5 6 7 8 9 10

What was your impression and that of your students or other groups toward the worksheets?

What was your general impression of the educator's guide?

Do you have any suggestions for improving the educator's guide?

Do you think that your students or other groups gained a better appreciation for the importance and conservation of diamondback terrapins due to this educator's guide?

Do you think that your students or other groups gained a better appreciation for the importance and conservation of brackish coastal habitats due to this educator's guide?

Do you have any suggestions for classroom activities that we can include in future editions of this educator's guide?

Thank you for helping us to continue to improve this guide!

Please return your completed form to: Florida Turtle Conservation Trust, 1213 Alhambra Way S., St. Petersburg, FL 33705-4620.

George L. Heinrich is a field biologist and environmental educator specializing in Florida turtles. His company, Heinrich Ecological Services, is based in St. Petersburg, Florida and conducts wildlife surveys and research, natural history programming, and nature-based tours. A graduate of Memphis State University, his research interests focus on anthropogenic threats to Florida's non-marine turtles. Current collaborative projects include two imperiled emydids, the diamondback terrapin and Suwannee cooter. His conservation education efforts include an annual four-day Florida turtle workshop for educators offered since 1993. George is an invited member of the IUCN Tortoise and Freshwater Turtle Specialist Group, served twice as co-chair of the Gopher Tortoise Council, was the founding president of the Florida Turtle Conservation Trust, and served as the Florida regional representative of the Diamondback Terrapin Working Group. (george@heinrichecologicalservices.com)

Timothy J. Walsh became actively involved in herpetology at the age of ten and has maintained an obsession ever since. At age twelve, he was mentored by Dr. Jim Layne of Archbold Biological Station. Tim went on to receive a degree in Zoo Animal Technology and has worked in the zoo, aquarium and museum field since 1992. He held the position of Collection Manager with the Chelonian Research Institute (Oviedo, Florida) and has been involved in a variety of research projects with such species as Carolina diamondback terrapins, spotted turtles and Suwannee cooters. A member of the IUCN Tortoise and Freshwater Turtle Specialist Group, he is also an avid outdoorsman, accomplished photographer, and book collector. Tim is currently the Manager of NatureWorks for the Orlando Science Center where he is able to share his passion for turtles and the natural world with children and adults alike. (turtleconservationist@gmail.com)

Dr. Joseph A. Butler did his undergraduate studies at Miami University (Ohio) and earned his Ph.D. from Ohio University. He has been a member of the biology department at the University of North Florida since 1989. Joe has studied snake physiology and ecology in Nigeria, West Africa and marine turtles on the Caribbean island of St. Kitts. He has also studied diamondback terrapins throughout Florida since 1995. Joe has served as co-chair of the Gopher Tortoise Council and as a founding co-chair of the Diamondback Terrapin Working Group. (jbutler@unf.edu)

Charles H. Miller earned a Bachelor of Science degree in Biology Education from St. Petersburg College. He is certified to teach middle grades science and is currently assigned to Tampa Charter School. Charlie spends his summers as an instructor with Boyd Hill Nature Preserve's summer nature camp program and has extensive field experience. He is a talented wildlife artist and has long supported the educational efforts of the Florida Turtle Conservation Trust. (chmturtleman74@aol.com)

Florida Turtle Conservation Trust

The Florida Turtle Conservation Trust (FTCT) was formed in 1999 by a group of biologists and conservationists concerned with the conservation outlook for Florida turtles. This membership-based NGO focuses its efforts on the conservation of non-marine turtles, with current projects targeting diamondback terrapins and riverine species. This work is done through the education and engagement of diverse target audiences. Areas of focus include the development of educational programs and materials, coordination of community-supported habitat cleanups, identification of existing threats, and development of recommendations resulting in positive change. Certainly, the threats to Florida turtles and their associated ecosystems present broad conservation challenges. However, despite the apparent urgency of the situation, the opportunities for conservation remain great. The FTCT welcomes individuals that want to join us in working to conserve Florida's rich turtle diversity. To learn more, please visit www.ftct.org.

Heinrich Ecological Services

Heinrich Ecological Services (HES) is based in St. Petersburg, Florida and conducts wildlife surveys and research, natural history programming, and nature-based tours. Environmental education is a major focus of HES efforts and special emphasis is placed on training naturalists, land managers and educators. Related programs include an annual four-day Florida turtle workshop for formal and non-formal educators, and Florida turtle natural history tours. Cooperative efforts with site-based educators allow HES to offer classroom and field programs for students throughout central Florida. For more information, please visit www.heinrichecologicalservices.com.

Tampa Bay Estuary Program

The Tampa Bay Estuary Program (TBEP) is a partnership of local governments and state and federal environmental agencies that was formed in 1990 to develop a conservation and management plan for Tampa Bay. In addition to conducting research and implementing strategies for bay restoration, TBEP also develops programs to educate citizens about ways to prevent water pollution and protect Tampa Bay. The Tampa Bay Estuary Program invites you to explore the bay through their website (www.tbep.org), learn more about what they do and join them in working to keep Tampa Bay on the road to recovery!