

### SCRATCH: Sea Turtle Survival

The 'Sea Turtle Survival' computational model, through the Scratch program (scratch.mit.edu), is intended to represent the heavy predation and low survival rate of hatchling sea turtles.

The model allows the viewer to horizontally move four different common sea turtle predators (shark, vulture, Ghost Crab, and raccoon) individually to hunt the hatchling (just hatched) sea turtles moving from their clutch (nest) location on the coast to the sea. Designated keys allow for the independent movement of the predators from the left to the right: *shark = q (left) | e (right)*, *vulture = a (left) | d (right)*, *Ghost Crab = z (left) | c (right)*, and *raccoon = 1 (left) | 3 (right)*.

When a predator comes in contact with a hatchling sea turtle, the turtle is considered deceased and is removed from the model. When a hatchling sea turtle reaches the upper most edge of the window (the sea), the turtle is considered a survivor. The model displays the number of sea turtles hatched, the number predated by each of the four predators, the number and percent survived. Admittedly, this model is a gross simplification of the harsh conditions faced by hatchling sea turtles.

Such heavy natural predation is the reason average clutch sizes and lifespan are and need to be high if any sea turtle is to reach reproductive age (3-50 years old, depending on the species and individual size/health) to continue the species. Depending on the species, females deposit roughly 50-200 eggs per clutch, 1-9 clutches per season, and nest every 2-3 years. The average life span of sea turtles is currently estimated to be about 80 years.

However, these natural compensations for heavy early predation are not enough to overcome the consequences of human activity on sea turtle populations. Hatchling sea turtles have a roughly 0.1% chance (or 1/1,000) of surviving to adulthood. Causes of sea turtle mortality in addition to predators are weather (hurricanes), illness (Fibropapillomatosis), and human activity (pollution, land development, bullying, hunting, etc.). Conservation efforts must continue and further develop if sea turtle species' are to survive long into the future.

Furthermore, the temperature of the clutch during development (the thermosensitive period) determines the expression or repression of the sea turtle *Sox9* gene. In other words, the temperature of the nest roughly 28-52 days post egg laying determines if the sea turtle becomes male or female for the rest of its life. With human activity influencing climate, it is argued that unnatural imbalances are occurring in hatchling gender. This further impacts the future prognosis of sea turtle populations.

#### MULTI-DISCIPLINARY MODEL & CONCEPT:

Earth Science	Climate Influence on Species Population
Biology / Living Environment	Population Dynamics
Chemistry	Clutch Temperature Influence on Gender
Physics	Conservation Effort Design
Mathematics	Percent Survival
Technology	Scratch Model
Social Studies	Human Impact on Species & Conservation