



# Smithsonian Marine Station at Fort Pierce

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**Species Name:** *Cardisoma guanhumi*

**Common Name:** (Blue Land Crab)

## I. TAXONOMY

Kingdom:	Phylum/Division:	Class:	Order:	Family:	Genus:
Animalia	Arthropoda	Malacostraca	Decapoda	Gecarcinidae	Cardisoma



*Cardisoma guanhumi* male.

**Species Name:**

*Cardisoma guanhumi* Latreille, 1825

**Common Name:**

Blue land crab, white land crab, great land crab

### Species Description:

*Cardisoma guanhumi*, the blue land crab, is a large burrowing crab whose distribution on land is generally limited to within 5 km of the ocean. Large individuals may grow to over 11 cm and weigh over 500 grams.

This species is similar in shape to *Uca* species; its eyes are stalked and fairly widespread, and males have one enlarged cheliped. Adults of both sexes have carapaces which range in color from dark blue to various shades of brown to gray/white. The adult color pattern is well developed in most crabs by the time they reach 80-90 grams; however, some may attain 180 grams before they show an adult pattern. Juveniles generally have brown carapaces and orange colored legs. Ovigerous females frequently appear light gray or white.

## II. HABITAT AND DISTRIBUTION

### Regional Occurrence:

*Cardisoma guanhumi* is a circumequatorial species found throughout

estuarine regions of the Caribbean, Central and South America including Columbia, Venezuela, the Bahamas, and Puerto Rico. Within the U.S. it is limited to the Gulf of Mexico and coastal Florida and is rarely found more than 8 km from the ocean. It is found in greatest concentration on low lying ground, and burrow concentrations in these optimum habitat areas may exceed 7500 per acre. In Central and South America, as well as in the Bahamas, *C. guanhumi* is exploited for food; however, in the U.S. and in much of Puerto Rico it is considered a pest.

The population distribution of this species is heavily influenced by water temperature. In areas where water temperatures fall below 20 C in winter, larval survival is affected. Within the U.S., *Cardisoma guanhumi* has been observed as far north as Vero Beach, Florida; however, north of this area, water temperatures in the winter limit the growth of large populations.

#### **IRL Distribution:**

*C. guanhumi* is found throughout the Indian River Lagoon.

### **III. LIFE HISTORY AND POPULATION BIOLOGY**

#### **Age, Size, Lifespan:**

*Cardisoma guanhumi* reaches sexual maturity in approximately 4 years, when it attains a mass of 40 g; however, it is not uncommon for adult crabs to measure 10-11 cm and weigh up to 500 g.

*Cardisoma guanhumi* is a slow growing species compared to most other crabs. While most crabs may require approximately 20 molts to reach maximum size, *Cardisoma* requires more than 60 molts. Premolt crabs seal the entrances to their burrows with mud and will remain sealed inside the burrow until molting takes place, generally within 6-10 days. Molt frequency decreases with age.

#### **Abundance:**

This species is abundant throughout much of the Indian River Lagoon and its adjacent areas.

#### **Locomotion:**

*Cardisoma* are typically able to walk at a rate of 100 m/hr. and may move over 500 m or more per evening. However, if actively foraging, this distance is decreased to an average of less than 100 m.

Land crabs orient themselves by using polarized light during the day, and by identifying the brightest sector of the horizon at night. However, other cues such as [geotaxis](#), substrate vibration, landmarks and prevailing winds may also aid in orientation, especially during migratory periods.

#### **Reproduction:**

The reproductive cycle is closely linked to seasonal weather patterns and lunar phase. Heavy rains in the spring initiate migrations. At this time, *Cardisoma* gains weight rapidly as foraging intensity is increased for the first few weeks of the migratory period. Males actively court ripe females during this period. Fertilization is internal, and throughout July and August most females carry external egg masses. Eggs are carried for approximately 2 weeks prior to hatching, and must be released into salt water for larvae to

survive. Females typically complete spawning migrations within 1-2 days and generally spawn within 1-2 days of a full moon. Thus, though *Cardisoma* and other terrestrial crabs have been successful invaders of the land, they are still heavily dependent on the ocean for at least part of the life cycle.

Several spawns per year may occur, with spawning season varying with location within the range. In Florida, spawning season lasts from June to December, peaking in October and November. In the Bahamas the season extends from July - September, while in Venezuela spawning lasts from July - November.

Eggs hatch into free swimming larvae with 5 zoeal stages and 1 postlarval, or megalopal stage. Typical development time from hatching to the first crabs stage is 42 days under laboratory conditions; however, this time may be much shorter in nature.

Fecundity in *Cardisoma* is related to body mass. A 300 g female may produce 300,000 - 700,000 eggs per spawn.

#### IV. PHYSICAL TOLERANCES

##### Temperature:

As a tropical/subtropical species, *Cardisoma* adults are generally not heavily impacted by low winter temperatures. However, *Cardisoma* larvae are highly affected by water temperatures below 20 C. Under laboratory conditions, zoea larvae held at 20 C required twice as long to complete development as those held at higher temperatures. Further, less than 10% of the zoea held at 20 C molted to the megalopal stage. Optimum larval development in the laboratory occurred when water temperature was 25-30 C.

##### Salinity:

Adult *Cardisoma* utilize a range of habitats and tolerate salinities from zero to hypersaline. Because these crabs are usually surrounded by air rather than water, they are essentially closed systems and not subject to salt gain on or through the body surface. Further, they are able to osmoregulate down to fresh water levels.

Larval development was shown to be optimal at salinities of 20 - 40 ppt, though a wide range of salinity was tolerated. Larval survival fell off dramatically at salinities below 15 ppt and above 45 ppt. At 10 ppt, zoea developed only to the second stage; and at 45 ppt less than 1% of larvae completed development to the megalopa.

##### Other Physical Tolerances:

Terrestrialization in crabs is accompanied by a decrease in the number, volumes and area occupied by the gills. This adaptation perhaps serves to decrease the amount of evaporative surface area, thus minimizing the effects of desiccation. The gill structure in land crabs also shows increased sclerotization to support platelets which may result in decreased permeability of gases. One result of this structural change is that oxygen availability is lowered in terrestrial crabs. A possible compensation for this potential problem is to increase the folds of the vascular epithelium and

vascular tufts associated with the gills.

The gills of *Cardisoma* are relatively small, less than 10% of the volume of the branchial cavity. However, gill surface area is increased due to extensive folding and high vascularization of the epithelial sheet lining the branchial cavity.

*Cardisoma*, when tested against other crabs, both terrestrial and aquatic, maintained a nearly constant rate of oxygen consumption in both air and water. This was accomplished by its manipulating the rates of oxygen extraction and ventilation over the gills. In water, where oxygen concentrations are lower, and extraction rates tend to fall off, *Cardisoma* increases its ventilation rate. In air, where both oxygen concentration and extraction rate are higher, *Cardisoma* decreases its ventilation rate.

Invasion of land by *Cardisoma guanhumi* and other terrestrial crabs is also limited by mechanisms of water conservation. Land crabs are unable to conserve water; thus, though they are able to function extremely well in moist air, they die when faced with desiccating conditions for over 2 days.

## V. COMMUNITY ECOLOGY

### **Trophic Mode:**

For the most part, *Cardisoma guanhumi* is a vegetarian crab which collects and eats leaves fruits and grasses collected near the vicinity of its burrow. However, these crabs will also eat insects, carrion, feces and is sometimes cannibalistic; thus, it is functionally an omnivore. The preferential foods of *C. guanhumi* are the leaves of red and white mangroves, and the buttonwood tree. They feed throughout the day in shaded areas; however, if exposed to direct sunlight for prolonged periods, they prefer to feed at night.

*Cardisoma guanhumi* uses light and sound detectors to locate food items. Field experiments using falling fruit and leaves showed that crabs can be drawn from their burrows to investigate the sound and initiate a search for food. Predatory behavior is released in these crabs by detection of small moving objects. *Cardisoma* is able to detect small substrate vibrations in the range of 10-1500 Hz and 70 dB. Visual acuity increases with body size due to an increase in both the number and diameter of ommatidia.

### **Habitat:**

*Cardisoma guanhumi* colonizes habitats of various ecological conditions. Thus, in areas where it occurs, its distribution tends to be patchy and uneven owing to differences in the type and availability of food resources, ground water levels and the aggressiveness or gregariousness of conspecifics.

Terrestrial crabs are limited to areas where they can burrow to intersect the water table and maintain a 1-2 liter pool in the bottom of the burrow. Thus they are functionally limited to areas where the water table is within approximately 2 m of the surface. In south Florida, burrow densities have been found to be highest in firm, muddy substrates, with as many as 7500 burrows per acre.

Burrow openings lie flush with ground level and may be 1-18 cm in width. Burrows descend, first gradually, then more steeply, to the water table where a small pool of 1-2 liters of water is maintained. This water may be either

fresh or salt water, depending upon location.

Generally only a single individual occupies a burrow. However, small juveniles (less than 10 mm CW) do not dig their own burrows, and will often share a burrow with an adult crab. Males tend to be more territorial than females and will defend burrows and small surrounding territories. Agonistic behavior accounts for the spacing of burrows in populations. Burrow disputes, along with intense competition for optimum shoreline burrows, may be the force which drives terrestrial crabs to migrate further inland.

#### **Activity Time:**

Peak activity time is at dawn and dusk, though activity in *C. guanhum* tends to increase under low light levels and with reduced food availability. Activity in this species is decreased by high daytime temperatures.

#### **Associated Species:**

In swampy habitats, *Cardisoma guanhum* commonly occurs with 2 Grapsoid crabs: *Ucides cordatus* and *Goniosis cruentata*. In shoreline habitats, it most commonly is observed with fiddler crab species.

## **VI. SPECIAL STATUS**

#### **Special Status:**

Economic

#### **Notes on Special Status:**

Throughout the Bahamas and the Caribbean, *Cardisoma guanhum* is intensively exploited as a food resource. Harvesters of wild populations in Venezuela have reported that as many as 400 crabs per harvester per night can be collected even during the months of lowest catch. This figure increases as migration periods approach.

#### **Economic Importance:**

*Cardisoma gunahumi* is economically important in the Caribbean and Bahamas. In the U.S., it is not generally exploited for food. Some people consider it a common garden pest in Florida, because it regularly chooses to dig its burrows in lawns.

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