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## CHINESE MANTID

(Praying mantis; *Tenodera sinensis*)



**Over a century ago a Philadelphia nursery accidentally introduced the Chinese mantid into North America, and it spread through most of the eastern United States. In Center City, the smaller Carolina mantid (*Stagmomantis carolina*) is replacing it.**

*Figure 15.1* Chinese mantids (*Tenodera sinensis*) from Mt. Airy, Philadelphia, where the first Chinese mantid in North America was discovered. From Philip Laurent's collection, deposited in the Academy of Natural Sciences of Drexel University. (Courtesy of the Academy of Natural Sciences of Drexel University)

On October 16, 1897, Joseph Hindermyer encountered a Chinese mantid (*Tenodera sinensis*) on a tomato vine in his garden in Mt. Airy, Philadelphia.<sup>1</sup> Never before seen on this continent, it was the largest carnivorous insect in North America. His neighbor, Philip Laurent, an entomologist, reported what happened next:

Mr. H., not being familiar with the insect's harmless nature, was afraid to touch it, but at last managed to secure it in a paste-board box, in which condition it was brought to me... Although a careful search was made in the vicinity in which the specimen was found, no others were discovered. Learning later that the native habitat of the insect was China and Japan, I made inquiry among those having nurseries and conservatories in the neighborhood where the specimen was captured, regarding the importation of plants from the above named countries. At the nursery of Thomas Meehan & Sons—the largest nursery in the vicinity of where the insect was captured—I was informed that they were constantly receiving plants from all parts of the world, so that it is more than likely that the insect was introduced through this channel.<sup>2</sup>

In March 1898, Ella Jacobs, visiting Meehan's Nursery in Germantown, found six specimens of what she thought were galls. Unable to identify them, she took them to her office and kept them around to see what might develop:

About the end of May, as I went to my office, the janitor greeted me with the pleasant news that my room was full of "bugs." Rather startled, I proceeded to investigate, and discovered several hundred insects on the wall, over pictures and desk. I examined closely and decided it was the fault of my unnamed specimen. I noticed that it was broken open in ridges; I placed it in a box and in an hour I saw several of the insects emerge. The curious part is, that these insects appeared to be the Praying Mantis. A visit to Dr. Skinner, at the Academy, confirmed this fact.

It seems rather a coincidence to have found these in this locality so soon after the report of Mr. Laurent's find of a somewhat similar character.

I greatly regret that we took all of the cases we saw, six of them, as I know now that their contents would have been a valuable acquisition to the nurseries as these carnivorous insects would have eaten other insects injurious to the plants.<sup>3</sup>

## Importation into North America

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In the archives of the McLean Library of the Pennsylvania Horticultural Society is a Meehan nursery catalog dated 1858—39 years before Hindermyer found his Chinese mantid. It offers for sale Chinese magnolias and Japanese paulownias.<sup>4</sup> Imported nursery stock could have introduced the Chinese mantid into Meehan's nursery decades before it surfaced on Hindermyer's tomato plants. Discoveries of accidentally introduced species of insects typically occur after a lag during which their populations grow to the point that they come to people's attention. The lag may have been shorter than usual in the case of the Chinese mantid because its 10-centimeter body and 2.5-centimeter egg case are so conspicuous.

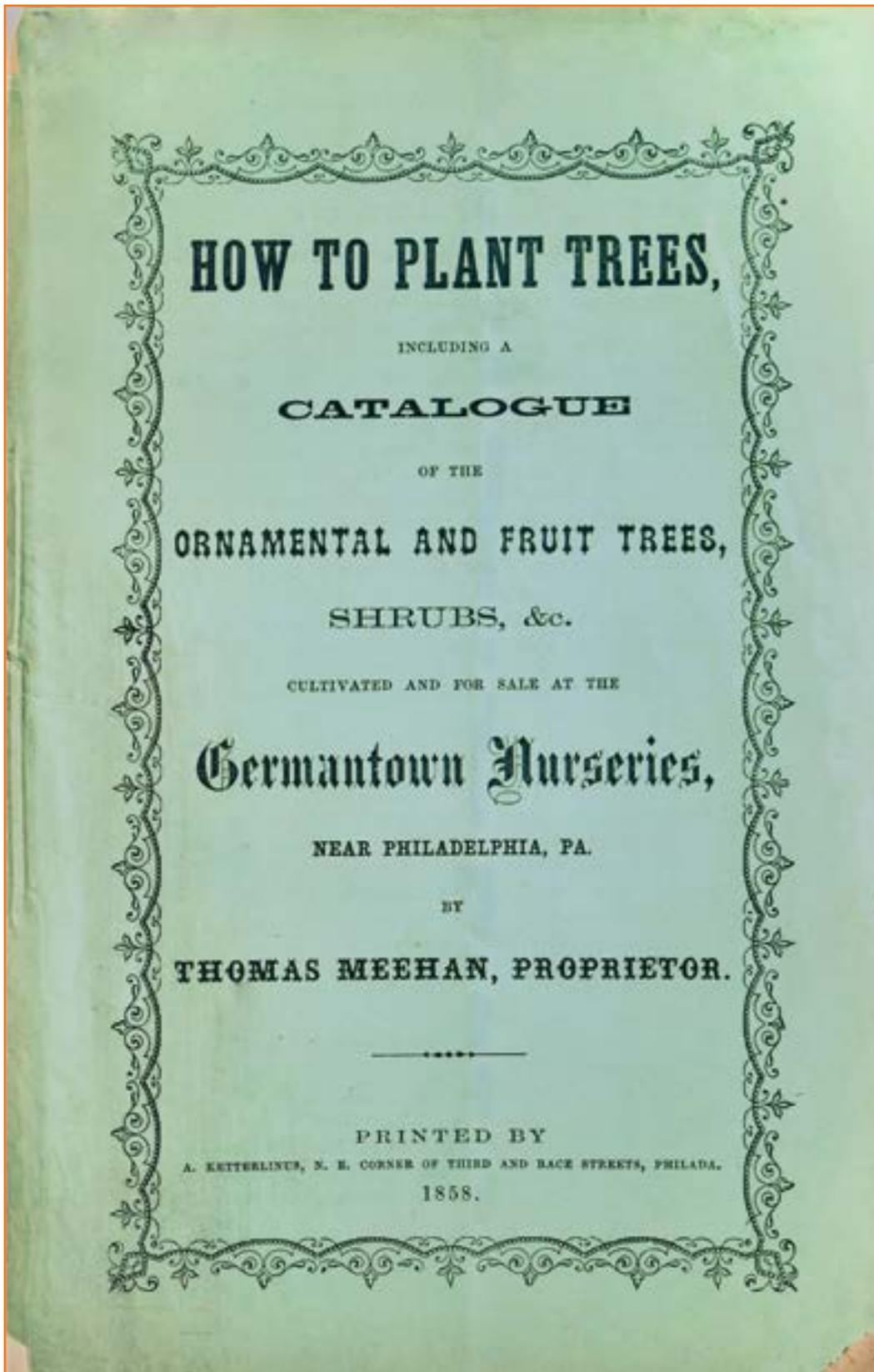


Figure 15.2 Cover of the catalog of the Germantown Nurseries of Thomas Meehan, 1858. Offerings include species from China and Japan, likely sources for the accidental importation of the Chinese mantid, *Tenodera sinensis*, into North America. (Courtesy of the McLean Library of the Pennsylvania Horticultural Society)



Figure 15.3 Chinese mantid egg case (ootheca) found in Bartram's Garden, Philadelphia, in 2012.

### Beneficial or harmful?

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In 1926, Walter R. Thierolf attempted to determine whether this predator was economically beneficial. His investigation was the basis of his thesis at the University of Pennsylvania, and is reminiscent of studies that attempted to determine whether the house sparrow was helpful or harmful. He collected fifty egg cases in Glenside, Pennsylvania, and released an estimated 10,000 individuals into the neighborhood around his home. He identified their prey by observing mature mantids eating and by dissecting their alimentary tracts.

Thierolf's verdict on the economic value of the species was cautious, in part because he found that the mantids avidly ate honeybees. He diplomatically concluded, "The fact that the insect victims of mantids are so extremely varied would appear to make them worthy agents in nature's plan to retain a normal balance in insect life."<sup>5</sup> In the course of releasing 10,000 mantids into new territory, Thierolf likely expedited the mantid's dispersal, beneficial or not.

### Means of dispersal

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By 1950, according to an annual report of the Smithsonian Institution, the Chinese mantid had been found along the Atlantic Coast from Connecticut to Virginia and in scattered locations elsewhere, including California.<sup>6</sup> Today, it is found in almost every state east of the Mississippi and in several western states, plus Ontario and Quebec, as documented by a website that posts photographs of insects that people submit for identification.<sup>7</sup>

This dispersal is greater than expected based on the female mantid's low mobility. The female does not fly and is stopped by common barriers such as streams or highways.<sup>8</sup> Vendors of garden supplies market egg cases of the Chinese mantid for control of insect pests and, along with nurseries, have undoubtedly accelerated the mantid's dissemination.<sup>9</sup> (In advertisements, garden supply businesses offer the egg cases for sale under the name *Tenodera aridifolia sinensis*, but the nomenclature recently has reverted back to *Tenodera sinensis*, its name at the time of its discovery in Philadelphia.<sup>10</sup>)

## Collecting egg cases

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In Center City the Chinese mantid is a casualty of its celebrity status as a “beneficial” insect. I have not found one for several years downtown. Gardeners collect their egg cases and place them in their gardens, where squirrels, birds and mice prey on them, or they bring them indoors, where they hatch prematurely in the spring. The last egg case I found in Center City was on a sapling transplanted from nursery stock; the egg case disappeared a few days after I discovered it. Egg cases in Fairmount Park just outside of Center City are still common in brambles in old fields.

## A “native” praying mantid introduced into Center City

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The Chinese mantid is one of four species of mantids in this region. Two were introduced from Asia, one from Europe, and one, the Carolina mantid (*Stagmomantis carolina*), from just south of Pennsylvania.<sup>11</sup> The Carolina mantid ranges from northern Brazil and Ecuador into Venezuela, Colombia, Central America, Mexico, and the southern United States.<sup>12</sup> Along the east coast of the United States, its northern limit was Chestertown, Maryland, according to an analysis of specimens in the Academy of Natural Sciences of Philadelphia in 1937.<sup>13</sup> I have found both sexes of the Carolina mantid attracted to door lamps on our row house on Pine Street in Center City. Like bridge spiders, Carolina mantids capture prey attracted to electric light.

The Carolina mantid is smaller than the Chinese mantid, but still among the biggest insects one is likely to find in Center City. Body lengths of adults reach 5–6 centimeters (2–2.4 inches), compared to 8–10 centimeters (3–4 inches) for the Chinese mantid. The female Carolina mantid has short stubby wings and is usually green. The male has fully developed wings, and its body is usually brown, but color in either sex can be predominantly brown or green.

Egg cases of Carolina mantids are better camouflaged than those of Chinese mantids. Unlike the bulky, conspicuous globular egg cases of Chinese mantids, egg cases of Carolina mantids are smaller, elongated, and oriented so they blend in with the twigs to which they are attached. Crowds of people in Schuylkill Park ignore them.



Figure 15.4 Egg case (ootheca) of Carolina mantid (*Stagmomantis carolina*). Its linear profile is smaller and less conspicuous than the bigger and more globular egg case of the Chinese mantid. (Photographed at Bartram's garden)

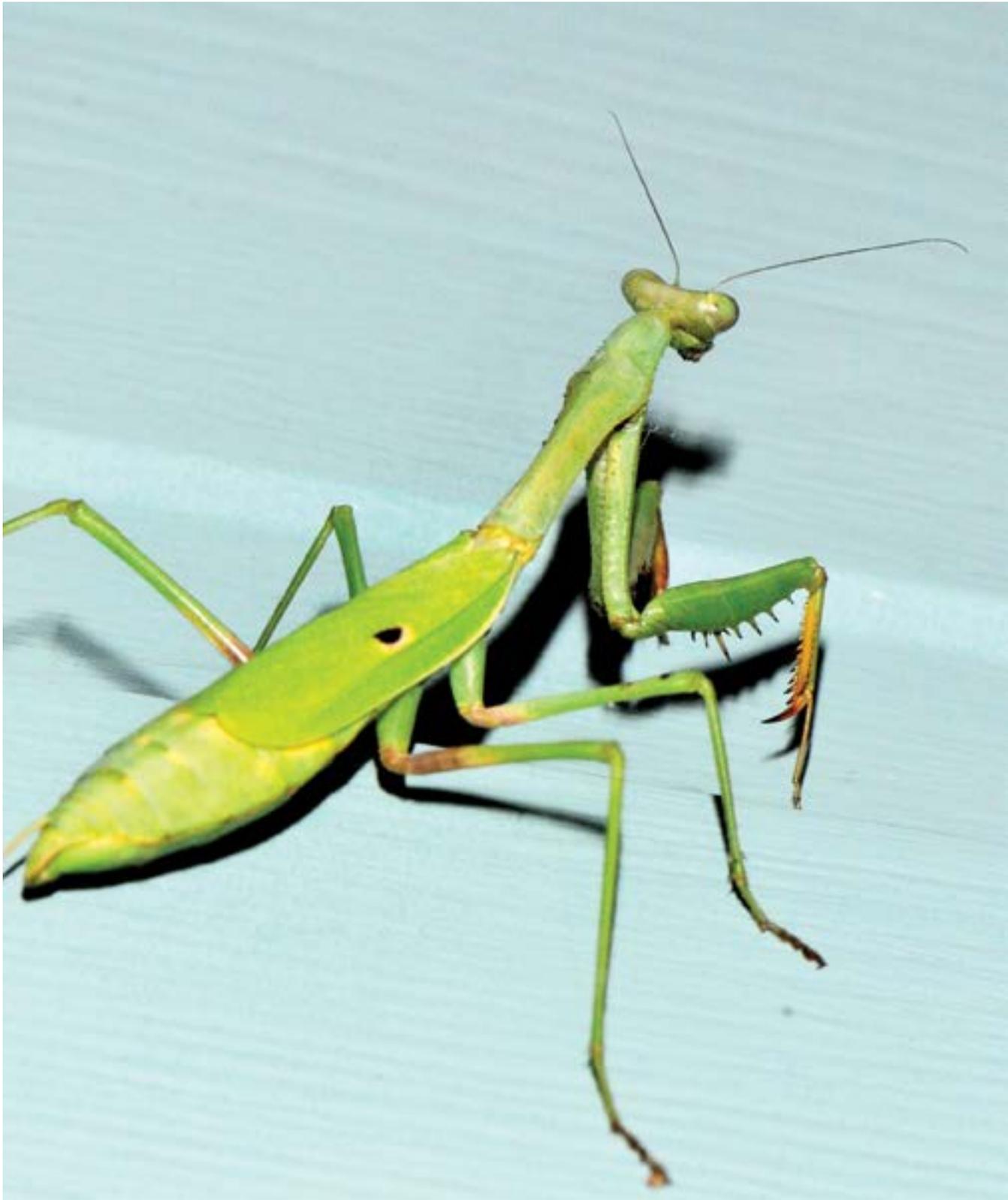


Figure 15.5 Female Carolina mantid (*Stagmomantis carolina*) attracted to the porch light of our house at night in Center City. The black spot on its wing distinguishes it from other species.



*Figure 15.6* Male Carolina mantid on our house.



*Figure 15.7* Carolina mantid eating a moth fly (Family: Psychodidae) beside our front door.

## Mystery of the dispersal of the Carolina mantid into Philadelphia

How the Carolina mantid colonized Center City is unknown. Mantids have low “vagility,” meaning the distances they crawl or fly in the course of their lives are short. In Northern Delaware the lifetime distance traveled by adult Chinese mantids that were marked and recaptured was 70 meters maximum, and usually less than 20 meters.<sup>14</sup> The Carolina mantid, which is about half the size of the Chinese mantid, has no obvious means of dispersal other than its legs; the female’s wings are too short for powered flight. Despite limited mobility, this species has managed to populate a vast geographic expanse from Brazil to Maryland. Fossil mantids dating back 90 million years have been found in New Jersey amber,<sup>15</sup> so mantids have had a long time to disperse. Still, in the absence of human assistance, how might this species have traversed barriers like rivers?

The answer to this question is not known. Mantids have been found on top of the Empire State Building in Manhattan;<sup>16</sup> conceivably females crawled up trees or cliffs and used their stubby wings to glide. Six species of birds have been reported to feed on mantid egg cases;<sup>17</sup> in principle birds might excrete and disperse viable mantid eggs embedded in the tough matrix of their cases, but this hypothesis has yet to be investigated. Floods might have carried egg cases or adults on debris across rivers; but this too is conjecture.

## Freight trains and boats as possible agents of dispersal

The first record of a Carolina mantid in Pennsylvania was in 1862, after ootheca (egg cases) imported from Maryland produced populations that reproduced for two or three generations in Lancaster City.<sup>18</sup> In 1899 Philip Laurent reported identifying a Carolina mantid collected on a wharf in Philadelphia.<sup>19</sup> Nursery stock could disperse the Carolina mantid like the Chinese mantid; egg cases of both are offered for sale online.

Lawrence Hurd of the University of Delaware reported finding ootheca (egg cases) of the European mantid (*Mantis religiosa*) attached to the undercarriage of railroad freight cars, which he concluded transported this mantid to fields along train tracks in Northern Delaware.<sup>20</sup> In Center City freight trains frequently park along tracks bordered by wild vegetation. I found an egg case of a Carolina mantid attached to a pine tree in Schuylkill Park less than 50 meters from these tracks.



*Figure 15.8* Vegetation along the CSX railroad tracks in Center City. The view faces south near the Schuylkill River and Interstate 676. In Delaware, egg cases of mantids have been found attached to the undercarriages of freight trains, which may disperse them.

## Center City's heat island

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In the northeastern United States, the distribution of many species of southern insects, particularly butterflies, has been moving northward due to temperatures rising from climate change.<sup>21</sup> The northward advance of the distribution of the Carolina mantid is part of this trend, even though people have introduced it. Center City's urban heat island may have encouraged establishment of Carolina mantids.

## Pressure for smallness downtown

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Carolina and Chinese mantids coexist in Bartram's garden, Philadelphia, just outside of Center City. Here open fields provide abundant prey, and the remote location protects them and their egg cases from destruction by people. In contrast, in Center City, the larger (Chinese) mantid and its egg case have become rare. Persecution of these big attractive targets may explain their rarity downtown, but another hypothesis is worth considering. In *Why Big Fierce Animals Are Rare*, Paul Colinvaux argues that scarcity of prey limits the abundance of big predators such as lions and tigers.<sup>22</sup> Perhaps scarcity of insect prey downtown contributes to the scarcity of Center City's biggest carnivorous insect.