

First records of *Hakka* (Araneae: Salticidae) in North America¹

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Abstract. *Hakka* Berry & Prószyński 2001 is a genus of jumping spiders comprising a single species, *Hakka himeshimensis* (Doenitz & Strand 1906), endemic to East Asia, and belonging to the subfamily Heliophaninae. We document the first records of this genus and species from North America, as well as evidence of established populations at Marblehead, Massachusetts and Cape May Point, New Jersey. It is hypothesized that this coastal species is a recent anthropogenic introduction, most likely introduced via cargo imported through a New England or Mid-Atlantic seaport. A brief review of the genus *Hakka* is also presented.

New Records

On October 26, 2010, Peter Cristofono was searching for interesting minerals to photograph along Granite Pier in Rockport, Massachusetts (42°40'4.4"N 70°37'20.4"W). Granite Pier is an artificial wharf created from locally mined blocks of alkaline granite (Cristofono, pers. comm.). While surveying the pier, Cristofono encountered an interesting spider on a block of granite. He photographed the spider and submitted it to *BugGuide* for identification (Figure 1, A). One of us (Kaldari) identified it as a salticid, but commented that it was not one he had seen before. The spider was then largely forgotten.

The next summer (2011), numerous photos of similar spiders were posted to *BugGuide* by Tom Adams. These photos were dated from late July and were taken in Marblehead, Massachusetts. The spiders were found on granite outcroppings on the south side of an area known as Marblehead Neck (42°29'27.7"N 70°50'49.7"W). The 'Neck', a peninsula extending into Massachusetts Bay, is connected to Marblehead proper by a causeway on the southeastern side of the town. Marblehead Neck is primarily a residential area, although several parks, including the 18 acre Massachusetts Audubon Marblehead Neck Wildlife Sanctuary, preserve some of the natural habitats.

In early August, one of us (Walton) came across Adams' photographs on *BugGuide*. From his initial search of online references, Walton was unable to determine any satisfactory identification for what was a large (7–10 mm) and distinctive species. The only match Walton was able to find was Cristofono's photo from the year before, which was still unidentified. After contacting G. B. Edwards, who was also unfamiliar with the species in the photographs, Walton decided to travel to Marblehead to see if he could track down these jumping spiders. In a series of visits to Marblehead (12, 13, 17, and 19 August), Walton, assisted by Adams, located and videotaped both male and female spiders from the same location as Adams' earlier images (Walton 2011). The six adults and 20–30 juveniles seen by Walton during this period, as well as the adults found and photographed previously by Adams, were all located on granite outcroppings within or near the intertidal zone. Walton observed both adult males and females moving across the rock surfaces, as well as in the crevices and cracks of the granite (Figure 1, B–F). The spiders invariably retreated to these natural refuges when approached by humans.

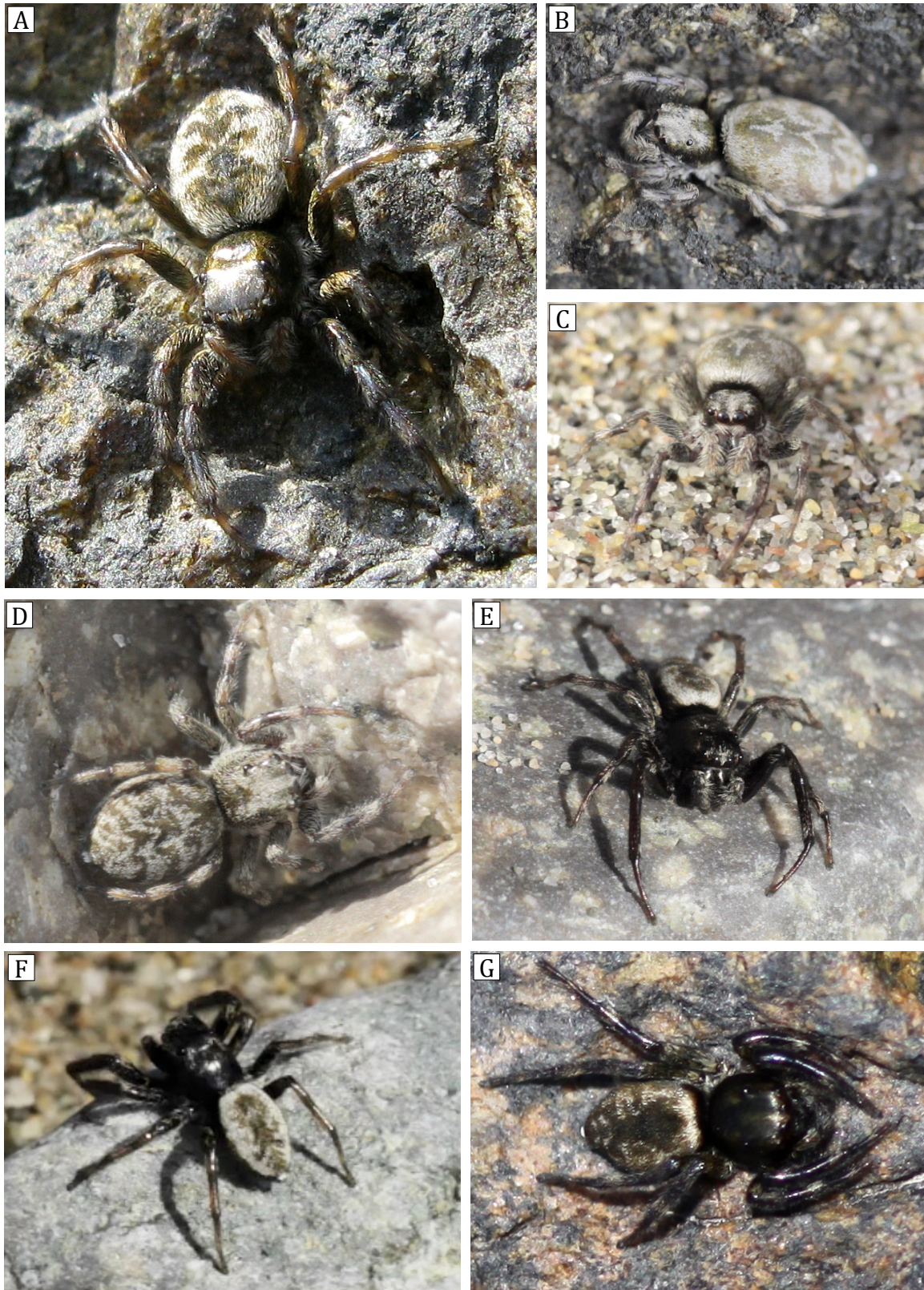


Figure 1. *Hakka himeshimensis*. A, Female or immature male (Rockport, Massachusetts). B–D, Females (Marblehead, Massachusetts). E–F, Males (Marblehead, Massachusetts). G, Male (Cape May Port, New Jersey).

In addition to videotaping the spiders, Walton also collected two adult males (17 August) and sent a single specimen each to Edwards and Kaldari. Subsequently, an adult female and adult male (collected 19 August) went to Edwards as additional vouchers for deposit in the Florida State Collection of Arthropods (FSCA). On 21 August, Kaldari identified the species as *Hakka himeshimensis* based on examination of the

male pedipalp (Figure 2, A). This identification was confirmed by Edwards and J. Prószyński (pers. comm.). The pedipalp of the male *Hakka himeshimensis* has several distinctive characters, including a large groove separating the embolar base from the rest of the bulb, the bulb overlapping the tibia proximally, a large sinuous embolus, and small ridges on the inner surface of the retrolateral tibial apophysis, all of which were present in the specimen from Marblehead. Several somatic characters also matched the specimens, such as the dorsal color pattern of both sexes, reddish setae surrounding the eyes, a very narrow clypeus, and robust brown chelicerae.

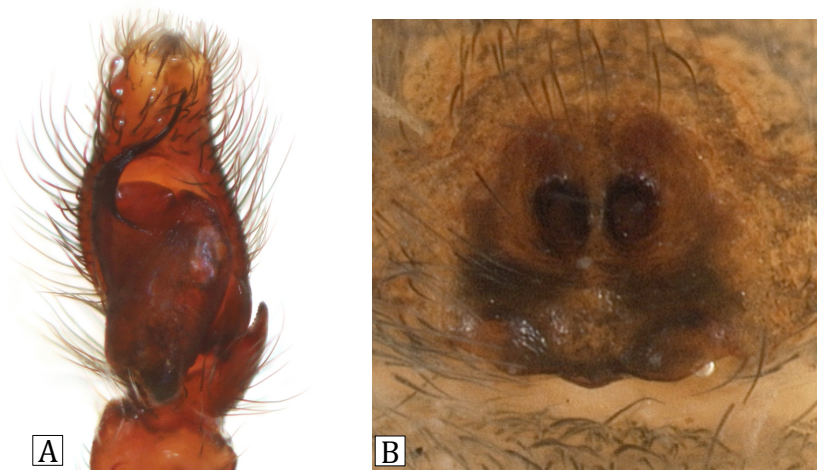


Figure 2. *Hakka himeshimensis*. A, Ventral view of male pedipalp. B, Ventral view of female epigynum.

A month later, Walton was in Cape May Point, New Jersey (Cape May County) doing a research project with the Cape May Bird Observatory. On 29 September, he and some friends were observing wildlife in the area and the group took a dirt road north from the Higbee Beach Wildlife Management Area to the south side of the Cape May Canal opposite the terminal of the Cape May–Lewes Ferry (38°57'57.1"N 74°57'43.7"W). At approximately 3:30 pm, Jeff Kingery called Walton's attention to a spider on rocks forming the retaining structure and fill of the canal bank (Figure 3). Walton recognized the spider as a male *Hakka himeshimensis*. Walton subsequently observed 15 to 20 other similar spiders along a 50 foot stretch of the embankment. All of the adults appeared to be males; the gender of the dozen or so immatures was not determined. During the next hour, Jeff and Becky Kingery took pictures of several of these spiders (Figure 1, G). Walton was able to collect a single adult male which will be deposited in the FSCA as an additional voucher.



Figure 3. Rocks on the bank of the Cape May Canal.

Pathways for introduction

At all three North American locations (Figure 4), *H. himeshimensis* was found on rocky coastal embankments. This habitat is similar to areas where *H. himeshimensis* has been collected in Japan (Chikuni 2008). This species appears to be primarily, or even exclusively, a spider of coastal habitats. Its proximity to maritime transport and coastal freight yards likely affords it frequent opportunities to travel outside of its native range as a stow-away. In addition, its adaptation to coastal landforms and climates increases the likelihood that it will become successfully established near any ports it is transported to.

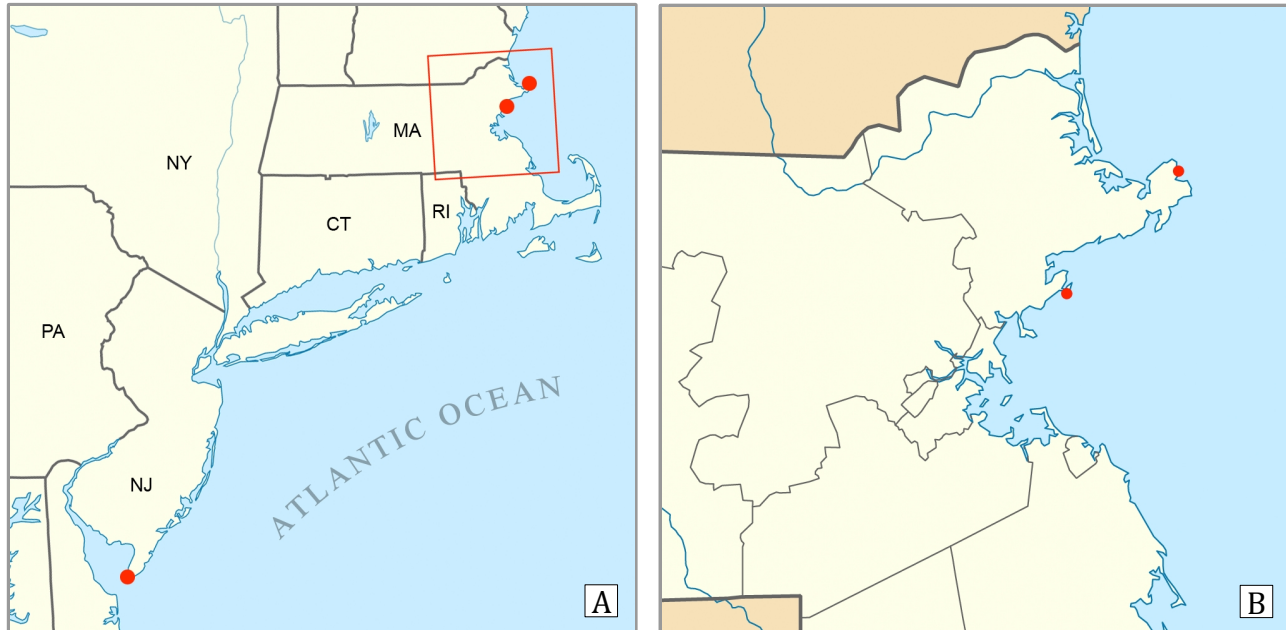


Figure 4. A, Localities where *Hakka himeshimensis* has been found in the northeastern United States. B, Detail of inset from (A).

Accidental importation through maritime trade is a common pathway by which non-indigenous species reach the United States (Work *et al.* 2005). Between the New Jersey and Massachusetts populations of *H. himeshimensis* lie three of the busiest international trading hubs in the U.S.: Boston, New York City, and Philadelphia.

The Port of Boston, which lies a mere 21 km (13 miles) from Marblehead, touts itself as “the oldest continually active port in the Western Hemisphere, and New England’s maritime hub” (Massport 2011a). In 2009, the port handled over 18 million metric tons of cargo, nearly 11 million of which consisted of imports from other countries (AAPA 2011). The freighters of two international firms, China Ocean Shipping Company and Hanlin, call at Boston weekly and provide direct service to four ports in China as well as to others in East Asia (Massport 2011b).

The Port of Philadelphia lies approximately 110km (68 miles) from Cape May Point, New Jersey, and handles over 18 million metric tons of imports annually (AAPA 2011). The port was recently identified as a likely point of entry for another Asian introduction, the Brown Marmorated Stink Bug, *Halyomorpha halys* (Stål) (Hamilton 2009).

Midway between the Massachusetts and New Jersey locations lies the The Port of New York and New Jersey, the third busiest seaport in the United States by tonnage. In 2009, the port handled over 58 million metric tons of foreign imports (AAPA 2011). A resurgence of traffic to the port in the past decade has been credited specifically to increases in direct maritime shipping from Asia (Lipton 2004).

Although *H. himeshimensis* is most likely to be a recent introduction, the possibility of spiders being accidentally transported from East Asia to the Northeastern coast of the United States has existed for over 200 years. After the Treaty of Paris was signed in 1783, ending the American Revolutionary War, trade with China and other Asian territories opened up to American merchants. Early commerce between Qing dynasty China and the United States, now referred to as the Old China Trade, proved to be extremely lucrative and contributed to a thriving mercantile industry along the Eastern Seaboard (Dulles 1930). Major hubs for the Old China Trade included New York City, Philadelphia, Boston, and Salem, all cities near the recently discovered populations of *H. himeshimensis*.

As is evident from the examples above, opportunities for *H. himeshimensis* to travel from Asia to the United States have been numerous. It is even possible the species has been introduced more than once. Surveys of additional locations along the Atlantic coast may give us a better idea of the species' current extent, and its likely source (or sources) of introduction.

Brief review of *Hakka*

As noted above, *Hakka* belongs to the subfamily Heliophaninae, which is true of all the genera in the following discussion. *Hakka* currently includes a single species, *H. himeshimensis*, which is known from a small number of specimens from China, Korea, Japan, and Hawaii (Logunov & Marusik 2000, Berry and Prószyński 2001). Prószyński (2006) proposed placing two similar species within *Hakka*: *Icius yadongensis* Hu 2001 and *Pseudicius marshi* (Peckham & Peckham 1903), based on similarities in palpal structure. *Icius yadongensis* is an Asian species, which not only shares palpal similarities with *H. himeshimensis*, but also two characteristics of the female epigyne: anterior-directed copulatory ducts which curve back posteriorly to the spermathecae, and a heavily sclerotized posterior edge (Figure 2, B). *Pseudicius marshi* is from South Africa; its female is unknown. From a geographic standpoint, the latter species seems less likely to belong to *Hakka*. Morphologically, it has a color pattern more consistent with *Heliophanus* (where it was originally described), a speciose and diverse genus in Africa, and the related genus *Heliophanillus*. The palp is not inconsistent with *Pseudicius* where it was most recently placed. The illustrations of the male show very enlarged forelegs and only 3 ventral tibial spines, typical of *Pseudicius*; lack of enlarged forelegs and 5–6 ventral tibial spines are some of the characters used to distinguish *Hakka* from *Pseudicius* (Berry & Prószyński 2001). At the present time, we would support the transfer of *I. yadongensis* to *Hakka*, however, *P. marshi* seems best placed where it is.

Image credits

Figure 1, A	Peter Cristofono
Figure 1, B-F	Richard K. Walton
Figure 1, G	Jeff Kingery
Figure 2, A	Ryan Kaldari
Figure 2, B	G. B. Edwards
Figure 3	Richard K. Walton
Figure 4, A	Ryan Kaldari, based on map data from Natural Earth
Figure 4, B	Ryan Kaldari, based on map by Alexander Karnstedt

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