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The semi-aquatic spider genus *Dolomedes* (Araneae: Pisauridae) in the Canadian Maritime Provinces

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ABSTRACT

The fishing (dock or wharf) spiders (*Dolomedes spp.* Latreille, 1804) of the Maritime Provinces of Canada were surveyed through a combination of new collecting and examination of specimens from the Nova Scotia Museum and the New Brunswick Museum. Four species (*Dolomedes tenebrosus* Hentz, 1844, *Dolomedes triton* (Walckenaer, 1837), *Dolomedes scriptus* Hentz, 1845, and *Dolomedes striatus* Giebel, 1869) were represented in collections made between 1961 and 2011 from New Brunswick and Nova Scotia, and *Dolomedes triton* was collected on Prince Edward Island in 2010 and 2011. *Dolomedes* is recorded for the first time in Prince Edward Island, and *Dolomedes triton* is recorded for the first time in the Maritime Provinces, extending its reported known eastern range from Maine and southern Québec.

RÉSUMÉ

Les araignées dolomèdes (*Dolomedes* sp. Latreille, 1804) des provinces maritimes du Canada ont été recensées par le biais d'un nouvel échantillonnage et par l'examen de spécimens du Musée de la Nouvelle-Écosse et du Musée du Nouveau-Brunswick. Quatre espèces (*Dolomedes tenebrosus* Hentz, 1844, *Dolomedes triton* (Walckenaer, 1837), *Dolomedes scriptus* Hentz, 1845, et *Dolomedes striatus* Giebel, 1869) étaient présentes dans les collections recueillies entre 1961 et 2011 au Nouveau-Brunswick et en Nouvelle-Écosse et *Dolomedes triton* fut collectée sur l'Île-du-Prince-Édouard en 2010 et 2011. *Dolomedes* est documentée pour la première fois à l'Île-du-Prince-Édouard et *Dolomedes triton* est documentée pour la première fois dans les provinces maritimes, agrandissant de son aire connue de répartition de l'est du Maine et du sud du Québec.

INTRODUCTION

Semi-aquatic spiders in North America of the families Lycosidae Sundevall, 1833 and Pisauridae Simon, 1890 have strong associations with aquatic habitats (Graham et al. 2003), usually living on or near the surface film of ponds and rivers (Carico 1973; Perevozkin et al. 2004). The genus *Dolomedes* Latreille 1804 (Araneae: Pisauridae), fishing or dock spiders, has the strongest association with aquatic habitats, actively hunting on the water's surface (Carico 1973) or just below the surface (Bleckmann and Lotz 1987). Their prey consists mainly of surface-dwelling insects (Zimmermann and Spence 1989), but can also include vertebrates such as small fish (Meehean 1934; Carico 1973; Bleckmann and Lotz 1987). *Dolomedes* spp. use emergent and floating vegetation as cover or hide underwater (Bishop 1924; Carico 1973; Bleckmann and Rovner 1984). Habitat preferences of fishing spiders in North America depend on species. For example, *Dolomedes triton* (Walckenaer 1837) and *Dolomedes striatus* Giebel 1869 prefer still waters such as lakes and marshes (Dondale and Redner 1990), whereas *Dolomedes scriptus* Hentz 1845 and *Dolomedes vittatus* (Walckenaer 1837) prefer stream or river habitats (Dondale and Redner 1990). *Dolomedes tenebrosus* Hentz 1844 can be found in swamps, ponds and lakes, but has also been collected in terrestrial habitats such as the bases of trees and even within houses (Carico 1973; Dondale and Redner 1990).

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Nine species of *Dolomedes* occur in North America, five of these being found in Canada (Carico 1973; Paquin et al. 2010). *Dolomedes tenebrosus*, *Dolomedes triton*, *Dolomedes scriptus*, and *Dolomedes striatus* have been reported in Québec, but only *Dolomedes tenebrosus*, *Dolomedes scriptus*, and *Dolomedes striatus* have been reported from New Brunswick and Nova Scotia (Paquin et al. 2010). *Dolomedes striatus, Dolomedes triton,* and *Dolomedes tenebrosus* have been reported for insular Newfoundland (Bishop 1924; Carico 1973). However, Paquin et al. (2010) listed only *Dolomedes striatus* for Newfoundland, and Pickavance and Dondale (2005) indicated that they found no specimen records for *Dolomedes triton* or *Dolomedes tenebrosus* for Newfoundland. No *Dolomedes* have been previously reported from Prince Edward Island (Dondale and Redner 1990; Paquin et al. 2010). The collection of a specimen of *Dolomedes triton* from the surface of a pond in PEI in the summer of 2010, therefore, prompted an investigation aimed at determining the species composition and distribution of the fishing spiders of the Maritime Provinces.

METHODS

*Dolomede*s spp. records for this study were obtained from a combination of new collecting and examination of museum specimens from the New Brunswick Museum Collection (NBM) and the Nova Scotia Museum (NSMC). The museum specimens were deposited between 1961 and 2005 and additional New Brunswick specimens were obtained from the collections of D. Giberson and R. Steeves. To obtain Prince Edward Island specimens, hand searches were conducted along pond, marsh, and stream edges during 2010 and 2011, and deposited in the University of Prince Edward Island Collection (UPEI). A total of 17 *Dolomedes* specimens from New Brunswick, 59 from Nova Scotia and two from Prince Edward Island were examined for this study, and the specimens were identified or verified as necessary. Genitalia characters for all fluid-preserved material from the Nova Scotia and New Brunswick Museums were examined. *Dolomedes* spp. were identified using the characters provided in Carico (1973) and Dondale and Redner (1990). Useful identification references (in French) for *Dolomedes*, can be found in Hutchinson et al. (1993) and Paquin and Dupérré (2003). Dondale and Redner (1990) includes a bilingual key to the Canadian species and Carico (1973) includes a key to immature North American species based on color patterns, which can also be useful in the identification of *Dolomedes spp.* in photographs.

Label data and recent collection information was used to assess distribution, habitat preferences, and phenology of the *Dolomedes* in the Maritimes. A "record" is defined here as all the specimens collected at a specific location on a specific day, regardless of number of specimens. Locality information was geo-referenced for most sites from information on the Geographical Names of Canada database (http://geonames.nrcan.gc.ca/search/search_e.php). Collection localities for each record were plotted, along with known specimen-based records from Dondale and Redner (1990), onto a map of the Maritime Provinces using MapInfo v.7. Habitat preference (lentic or still water, lotic or running water, or terrestrial) was inferred from the label site information, and the timing of the adult and juvenile stages were determined by plotting the dates when each stage was found over the full period of the collection records. For this analysis, penultimate spiders were considered to be juvenile.

RESULTS

We report a first genus record for *Dolomedes* for Prince Edward Island and new provincial records for *Dolomedes triton* in Prince Edward Island, New Brunswick, and Nova Scotia.

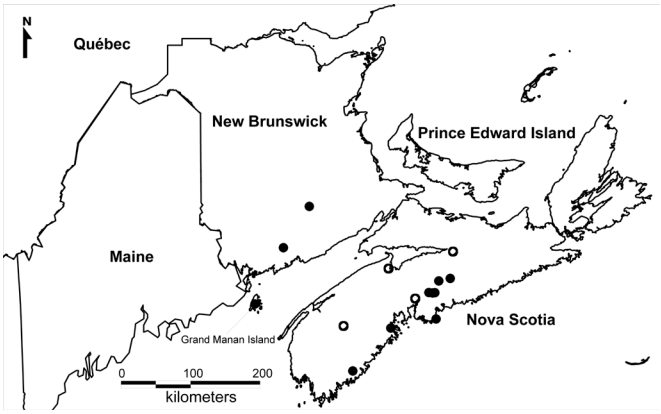
Dolomedes tenebrosus Hentz, 1844

NEW BRUNSWICK: **Kings County**: Cunningham Creek, 19 June 1992, D.F. McAlpine (1♀, NBM); **Charlotte County**: Greenlaw's Field, Grand Manan, 24 June 1994, T.J. Fletcher and D.F. McAlpine, with egg case (1♀, NBM); **Queens County**: Washademoak Lake, 30 June 1985, J. Smith, Eggs collected at site and reared at NBM (1♀, NBM). **NOVA SCOTIA**: **Halifax County**: Lake Egmont, 16 May 2002, R. Benson, found in washroom (1♀, NSMC); Halifax, 10 June 2002, D. Migel (1♀, NSMC); Fall River, 16 May 1996, C. Mirabelli, on rose bush in nursery (1♀, NSMC); Ketch Harbour, 4 December 1997, B. Jones, found in vehicle in autobody shop (1 Juv., NSMC); Beaverbank, 3 July 2000, S. Hrynewich (1♀, NSMC); **Hants County**: Elmsdale, 21 July 1997, P. Senz, in basement (1♀, NSMC); **Lunenburg County**: No specific locality given, 27 May 1998, C. Bell, in cabin (1♂, NSMC). Kings County: Mack Lake, East Dalhousie, 29 August 2004, J. Gilhen, on wall of old barn, mid molt (1♀, NSMC).

Dolomedes tenebrosus had previously been reported in the Maritimes on Grand Manan Island in New Brunswick and from the mainland of Nova Scotia (Figure 1; Carico 1973; Dondale and Redner 1990). Here we confirm collection localities on mainland Nova Scotia and on Grand Manan Island, New Brunswick and add two records on the

mainland in southern NB (Figure 1). *Dolomedes tenebrosus* has also been reported from the Gaspé peninsula in Québec (Dondale and Redner 1990; Hutchinson et al. 1993).

Figure 1. Collection localities of *Dolomedes tenebrosus* in the Maritimes. Records examined in this study (●); localities from Dondale and Redner (1990) (○).

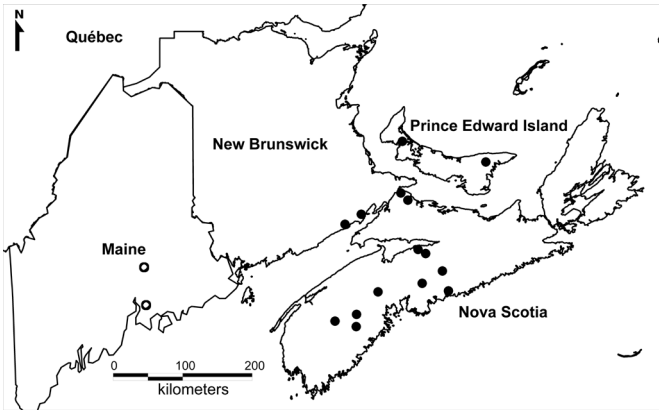


Dolomedes triton (Walckenaer, 1837)

NEW BRUNSWICK: **Albert County**: Fundy National Park, 2 June 1994, J. Edsall (1 Juv., NBM; mislabeled as *Dolomedes striatus*); Germantown, 1 November 2011, R.Steeves, on water after being dug out from a muskrat house, with several *Pirata sp.* (1 Juv., UPEI). **NOVA SCOTIA**: **Halifax County**: Lake Egmont, 15 June 1985, J. Gilhen (2♀, 2 Juv., NSMC), 25 April 1991, No collector listed, on floating leaf litter (3 Juv., NSMC), 18 September 1991, B. Wright, grassy shallows (1 Juv., NSMC); Petpeswick Lake, 31 May 1970, J. Gilhen (1 Juv., NSMC); **Hants County**: Noel Lake, 26 May 1979, J. Gilhen, (1♀, NSMC); **Cumberland County**: Tidnish Bridge, 6 June 1978, J. Gilhen, under boards in grass near pond in gravel pit (1♀, 1♂, 1 Juv., NSMC); Trumanville, 6 August 1979, J. Gilhen, roadside pond (1 Juv., NSMC); **Lunenburg County**: New Ross, 4 June 1971, B. Shaw, on water in marshy area at edge of lake (1 Juv., NSMC); Colpton, 22 March 1972, J. Gilhen, sluggish stream (5 Juv., NSMC); **Queens County**: Lake Kejimkujik, 30 July 1968, B. Wright and J. Gilhen (1♀, NSMC). Little Ponhook Lake, 29 August 1989, G. King, with egg sac (1♀, NSMC). **PRINCE EDWARD ISLAND**: **Kings County**: Doc's Marsh, 2 June 2010, K.M. Knysh, Hand collected from canoe on water's surface (1♂, UPEI); **Prince County**: McNeal's Mill Road, 10 October 2011, K.M. Knysh, Sweep net on water surface of pond (1 Juv., UPEI).

Dolomedes triton is now known from all three Maritime Provinces (Figure 2). Previously the eastern extent of this species was reported to be Maine (Dondale and Redner 1990; Guarisco 2010). Confusion over distribution was likely related to mislabeling or outdated labeling, as the NBM specimen was mislabeled as *Dolomedes striatus* and many of the older Nova Scotia specimens were labeled under a junior synonym *Dolomedes sexpunctatus* Hentz 1845.

Figure 2. Collection localities of *Dolomedes triton* in the Maritimes. Records examined in this study: ●; localities from Dondale and Redner (1990): ○.



Dolomedes scriptus Hentz, 1845

NEW BRUNSWICK (all specimens from NBM previously mislabeled as *Dolomedes tenebrosus)*: **Northumberland County**: Catamaran Brook, 1 July 1992, D.J. Giberson, from a dried specimen; collected from a fish counting fence feeding on salmon fry (1♀, UPEI); **Saint John County**: West Bracnch Musquash River, October 1988, G. Thompson (1♀, NBM); **Charlotte County**: Canoose Stream, Canoose, 16 July 1996, T.J. Fletcher and L. Hughes (2♂,NBM); Canoose Stream, Canoose, 16 July 1996, T.J. Fletcher and J. Abrahamsen(1♀, NBM); Grand Harbour, Grand Manan, 6 July 2000, T.J. Fletcher and D.F. McAlpine (1♂, 1♀, NBM); **Kings County**: Cunningham Creek, 19 July 1992, T.J. Fletcher (1♀, NBM); York: Magaguadavic Lake, 4 July 1992, C. Wallace (1♀, NBM); **Westmorland County**: Stoney Creek, 13 July 2000, T.J. Fletcher, with egg case (1♂, 2♀, NBM). **NOVA SCOTIA**: **Halifax County**: Williams Lake, 10 September 1961, D.C.F, with egg sac (1♀, NSMC); Lake Kinterwater, Date not given (before 1985), Acadia University Student, on rocks at edge of water (1♀, NSMC); Sackville River, Halifax, 27 June 1971, J. Gilhen, (1♀, NSMC); **Hants County**: Meander River, 21 June 1997, J. Gilhen, on rocks at bank (1♂, NSMC); Kennetcook River at Kennetcook, 26 May 1979, J. Gilhen,

under boards 2m from river (1 Juv., NSMC); Clark lake, Uniacke Estate, 23 July 1996, J. Gilhen, on rocks on shore (1♀, NSMC); **Colchester County**: East Branch of Economy River, 21 September 1968, J. Gilhen (1 Juv., NSMC); Upper Bass River, 23 August 1997, J. Gilhen, on cobble bar at river (1 Juv., NSMC); **Cumberland County**: Wallace River, Wentworth Provincial Park, 23 August 2005, J. Gilhen, on goldenrod (5♀, NSMC); **Kings County**: Mack Lake, East Dalhousie, 29 August 2004, J. Gilhen, on wall of old barn (1 Juv., NSMC); 26 September 2004, J. Gilhen, on cement warf (5 Juv., NSMC); **Shelburne County**: Sable River, 8 May 2001, J. Taylor (1 Juv., NSMC); **Guysborough County**: East River, St. Marys, 12 August 1997, J. Gilhen, on weeds at edge of river (1♀, NSMC).

Dolomedes scriptus was reported from one locality in northern NB and mainland NS (Dondale and Redner 1990), as well as south-west Québec and Maine (Dondale and Redner 1990, Hutchinson et al. 1993). Here we confirm presence in northern NB and report additional records in southern NB and throughout NS (Figure 3).

Dolomedes striatus Giebel, 1869

NOVA SCOTIA: **Victoria County**: St. Paul Island, Atlantic cove, 1-3 July 1991, A. Bent and R. Crowe, wet grassy area (1♂, 3♀).

No specimens of *Dolomedes striatus* from New Brunswick were found in the New Brunswick Museum to be examined for this study, but the species has been previously reported from the north coast of New Brunswick (Dondale and Redner 1990) (Figure 4). This species has also been reported in southern Nova Scotia and Sable Island (Dondale and Redner 1990) in addition to the specimens from St. Paul Island that were examined for this study. The species has also been reported from Maine, Newfoundland and Labrador, and les Îles de la Madeleine in the Gulf of St. Lawrence (Québec) (Dondale and Redner 1990; Hutchinson et al. 1993; Pickavance and Dondale 2005).

DISCUSSION

Specimen identification and verification

Natural history museums are critical repositories of specimen data for assessing distribution and phenological pattern for species, but an important step before using the data is to examine specimens to identify, or verify previously identified, material (Lovejoy et al. 2010). Accuracy of identifications is strongly related to the area of interest of museum workers, so can vary depending on the taxonomic group. In the case of fishing spiders, many species need to be identified using genitalia characters (Carico 1973), though some species can be separated by comparing abdominal patterns (e.g., illustrations in Carico (1973) and Hutchinson et al. (1993) and the shape of the male tibial apotheosis of the palp (Carico 1973; Dondale and Redner 1990)). Four species were identified from the region. The NSMC collection housed *Dolomedes tenebrosus* Hentz, 1844, *Dolomedes triton* (Walckenaer, 1837), *Dolomedes scriptus* Hentz, 1845, and *Dolomedes striatus* Giebel, 1869. The NBM did not have a *Dolomedes striatus* specimen from New Brunswick, but had examples of the remaining three species.

The two museums that contributed specimens to this study differ in the taxonomic expertise available,

Figure 3. Collection localities of *Dolomedes scriptus* in the Maritimes. Records examined in this study: ●; localities from Dondale and Redner (1990): ○.

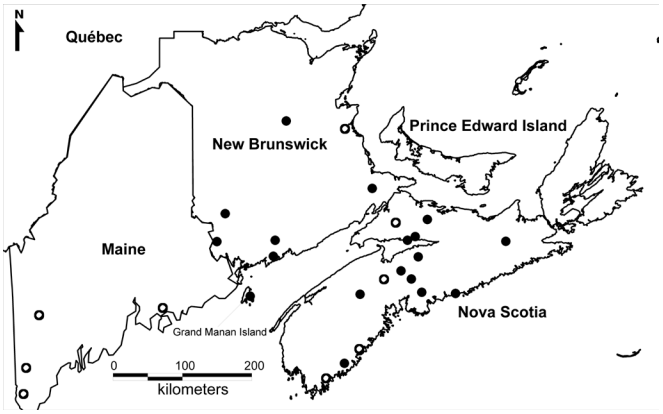
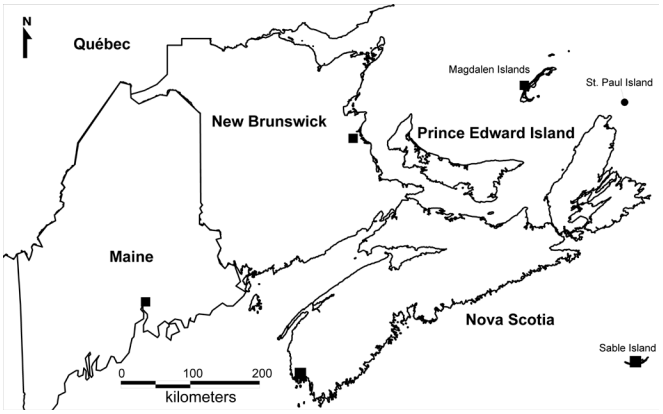


Figure 4. Collection localities *Dolomedes striatus* in the Maritimes. Records examined in this study: ●; localities from Dondale and Redner (1990): ■.



leading to differences both in the accuracy of the fishing spider identifications and the extent of the collection. Identifications in the Nova Scotia Museum reflect the Arachnida expertise of C. Ewing, who identified most of the material. Some older specimens possessed determination labels by other workers and in the case of *Dolomedes triton,* were labeled under a junior synonym for the species and thus have been included with *Dolomedes triton* in this study. In contrast, all of the *Dolomedes scriptus* specimens from New Brunswick were previously misidentified and labeled as *Dolomedes tenebrosus*. *Dolomedes scriptus* and *Dolomedes tenebrosus* are similar in size and colour patterns, so can be confused if not identified using genetalia or palpal characters (Dondale and Redner 1990).

Biology and habitats

In the Maritimes, fishing spiders are commonly known as dock or wharf spiders due to their common presence near docks on ponds and lakes. As expected, most specimens were collected near ponds or lakes (Table 1), including the recently collected Prince Edward Island and New Brunswick *Dolomedes triton* specimens. Fishing spiders were found throughout the open water season in the Maritimes with records for *Dolomedes triton* extending from March to November, and *Dolomedes scriptus* from May to October (Figure 5).

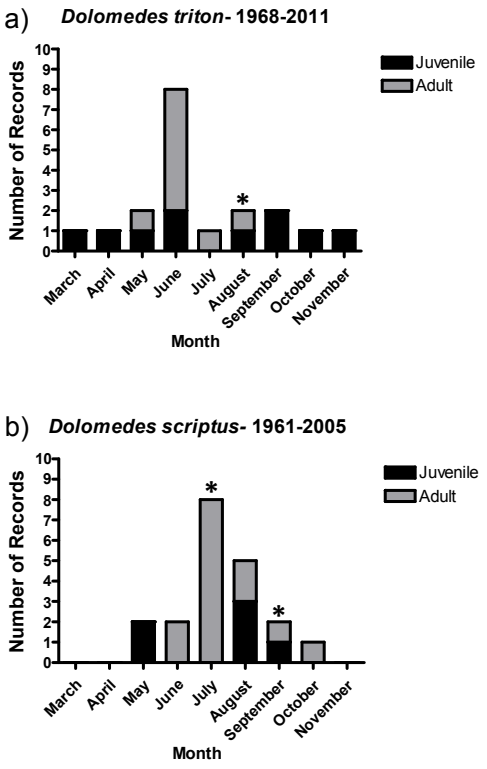
Dolomedes triton is one of the most common fishing spider species in the Maritimes collections (Table 1), so it is interesting that it had not been previously recorded for the Maritimes. Although it is now also known from PEI, it may be relatively rare there, as extensive searching along pond, marshes, and stream edges in Prince Edward Island during 2010 and 2011 yielded only two specimens. *Dolomedes triton* has been noted as the most aquatic of the *Dolomedes spp*. by many authors (Bishop 1924; Carico 1973; Zimmermann and Spence 1992). *Dolomedes triton* records from the Maritime Provinces indicate a clear preference for lentic (still water) habitats, with 15 of 18 records from marshes and ponds (Table 1) with one of the lotic records being labeled as a "sluggish stream". Association with still waters is well known for *Dolomedes triton* (Bishop 1924; Carico 1973; Dondale and Redner 1990) and Graham et al. (2003) most frequently collected *Dolomedes triton* in open water traps. However, *Dolomedes triton* has been observed in both streams and still waters in Alberta (K. Knysh, University of Prince Edward Island (UPEI), personal observation) and Carico (1973) reported examining specimens from streams as well as lentic sites. Another species primarily recorded from lentic sites is *Dolomedes striatus* (Carico 1973; Dondale and Redner 1990). In this study, the only series of *Dolomedes striatus* examined were collected in a "wet grassy area" from St. Paul Island, Nova Scotia. Hutchinson et al. (1993) reports this species has also been found in peatmoss and in litter on a coastal beach.

In contrast to the mostly lentic *Dolomedes triton* and *Dolomedes striatus, Dolomedes scriptus*, known for its

Table 1. Habitat data for *Dolomedes tenebrosus Dolomedes triton, Dolomedes scriptus* and *Dolomedes striatus* records, based on the locality labels associated with the specimens. Total number of specimens collected from the different habitats are shown in parentheses.

	Dolomedes tenebrosus	*Dolomedes triton*	*Dolomedes scriptus*	*Dolomedes striatus*
Lotic	1(1)	2(6)	15(22)	0
Lentic	1(1)	15(22)	5(9)	0
Terrestrial	7(7)	0	1(1)	1(4)
No habitat given	2(2)	1(1)	1(2)	0
Total	11(11)	18(29)	22(34)	1(4)

Figure 5. Phenology of (a) *Dolomedes triton* (19 records) and (b) *Dolomedes scriptus* (20 records); * represent months where egg sacs were collected alongside female adults.



feeding strategy of ambushing prey in fast flowing water, is most often reported in lotic habitats (Carico 1973; Dondale and Redner 1990). As expected, therefore, NB and NS specimens of *Dolomedes scriptus* were most frequently collected in lotic habitats (Table 1). However, five of the records examined for this study were recorded from lentic habitats and one from a building. Carico (1973) also examined specimens of *Dolomedes scriptus* from lentic sites.

Dolomedes tenebrosus is the least dependent on aquatic habitats of the *Dolomedes spp.* (Carico 1973) and has been often collected far from bodies of water. This is a large spider, and many of the records in our collections come from specimens turned in for identification by homeowners, who reported finding them in their homes (Table 1; "terrestrial"). Few specimens of *Dolomedes tenebrosus* in the Maritimes collections were from natural habitats, only one of these were from running water and one from still water (Table 1).

Records for the two species with sufficient numbers to assess phenology patterns, *Dolomedes triton* and *Dolomedes scriptus*; showed different patterns in life history (Figure 5). Adults of *Dolomedes triton* were found from May to August with a peak in June, with juveniles found through most of the year. Zimmermann and Spence (1992) found a similar pattern in a pond in northern Alberta with peaks in June 1986 and May 1987 and no adults after August. Zimmermann and Spence (1998) reported that *Dolomedes triton* overwinter twice as juveniles during their life cycle in Alberta before reaching maturity, likely in littoral areas of ponds. In the Maritimes, a single specimen of *Dolomedes triton* was collected in November among the fluff of a muskrat house alongside many *Pirata sp.* spiders (Aranaea: Lycosidae) (R. Steeves, University of Guelph (UG), personal communication). Egg sacs have been reported on *Dolomedes triton* from late June to September (Carico 1973; Zimmermann and Spence 1992). Our only *Dolomedes triton* with an egg sac was collected on 29 August 1989 (Figure 5a). *Dolomedes scriptus* appeared to have a more defined separation between periods where juveniles and adults were present. Adults were found from June to October, but were the only stage collected in June and July, with egg sacs present in July and September. Juveniles were collected in May, August, and September (Figure 5b). Adults of *Dolomedes scriptus* have been collected previously from May until October (Dondale and Redner 1990) with egg sacs being reported from late June to October (Bishop 1924; Carico 1973; Dondale and Redner 1990).

Dolomedes tenebrosus and *Dolomedes striatus* were too rare in Maritimes collections to assess life history, but the Maritimes records are consistent with literature reports. *Dolomedes tenebrosus* adults have been collected from May to September with egg sacs being present from June until August (Dondale and Redner 1990). Adults examined in this study were collected from May to July, with egg sacs present only in June. Despite Guarisco (2010) reporting this species overwintering as juveniles, only one juvenile was collected in December. Adults of *Dolomedes striatus* are generally present from May to September with egg sacs from June to August (Dondale and Redner 1990) although Carico (1973) noted a mature male in Ontario in January. The single record for *Dolomedes striatus* examined in this study consisted of 4 adults (1 ♂, 3 ♀) collected in early July.

It is interesting to note that several of the records included in this study are from islands, despite reports by Carico (1973) that *Dolomedes* is absent from many islands off the southeastern coast of the USA. All four species in the Maritimes have been found on islands, indicating that they are capable of dispersal over salt water for at least 24 km (the distance from Cape Breton Island to St. Paul's Island). *Dolomedes striatus* has also been reported on les Îles de la Madeleine in the Gulf of St. Lawrence, 90 km from the nearest larger land mass (Dondale and Redner 1990). Dispersal was likely through "ballooning" of juveniles, where spiders spin a strand of silk and are carried on the wind (Carico 1973; Zimmermann and Spence 1992). *Dolomedes striatus* should also be present on Cape Breton Island if it is present on St. Paul's Island, and other species are likely present in PEI.

This study allowed us to fill in some gaps in the distribution for the recorded species of *Dolomedes* in the Maritimes. In particular, the lack of *Dolomedes triton* in the Maritimes had been surprising as it is the most widely distributed fishing spider across North America, ranging from the Pacific coast to Maine, and from Yukon to southern Mexico (Carico 1973; Dondale and Redner 1990; Guarisco 2010; and Paquin et al. 2010). This study confirmed that the species is also widely distributed in our region. As records indicate that collection effort has been sparse throughout the Maritimes, more collecting should result in additional records of the four eastern species.

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the specimen collected from the New Brunswick muskrat house in November 2011. Funding for the study was from an NSERC Discovery Grant to DG. We especially thank Dr. Chris Buddle and an anonymous reviewer for their many helpful comments in improving this manuscript.

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