

**MONITORING INVERTEBRATE FEATURES
ON SSSI'S: FEN RAFT SPIDER ON CRYMLYN
BOG & PANT-Y-SAIS, WEST GLAMORGAN**

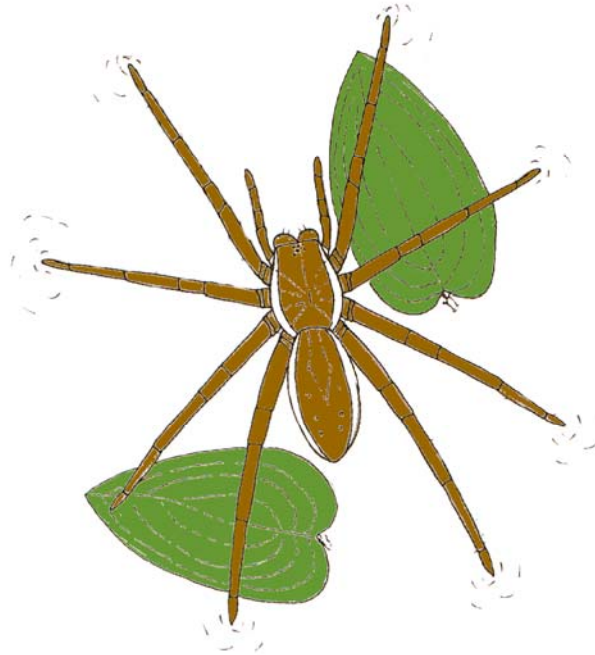
**R. Gallon
2007**

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MONITORING INVERTEBRATE FEATURES ON SSSI'S

THE FEN RAFT SPIDER *Dolomedes plantarius* ON CRYMLYN BOG & PANT-Y-SAIS
SSSIs, WEST GLAMORGAN



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Executive summary / Crynodeb gweithredol

English

Survey work was undertaken at both the Tennant Canal / Pant-y-Sais SSSI and Crymlyn Bog SSSI (Glamorganshire), in order to develop a Common Standards Monitoring (CSM) objective for the Fen raft spider *Dolomedes plantarius* at its known Welsh locations.

The Tennant Canal population was surveyed on the 1st October 2006 and a total of 17 live *Dolomedes plantarius* specimens were recorded, comprising 3 adult females (one with an egg-sac, another with an old nursery web), 1 sub-adult and 13 juveniles. The habitat occupied by the Tennant Canal population was assessed both qualitatively and quantitatively. These data, together with published records, particulars of the site and the species' known ecology were used to propose a site-specific CSM strategy.

Crymlyn Bog SSSI was surveyed on the 2nd–3rd October 2006 where a total of three *D. plantarius* specimens were found; two large juveniles and a single adult female guarding spiderlings. Subsite information gathered during the survey were used to suggest a CSM strategy. Survey difficulties were also highlighted which may be useful for future investigations.

The *Dolomedes plantarius* population feature and its habitat at the Tennant Canal/Pant-y-Sais SSSI is currently considered in a favourable condition. However, a number of detrimental aspects have been identified which could alter this current assessment in the future.

The Crymlyn Bog SSSI *Dolomedes plantarius* population is currently in an unfavourable condition due to excessive growth of *Phragmites* at some of its known subsites. Ongoing pony grazing is remedying this situation in the core southern area, but the situation requires careful monitoring to assess its future success.

Welsh – Cymraeg

Gwnaethpwyd arolygon yn SoDdGA Camlas Tennant / Pant-y-Sais a SoDdGA Cors Crymlyn (Sir Forgannwg), er mwyn datblygu amcan Monitro Safonau Cyffredin (CSM) ar gyfer corryn/copyn rafftio'r gors galchog, *Dolomedes plantarius*, yn ei leoliadau hysbys yng Nghymru.

Arolygwyd poblogaeth Camlas Tennant ar 1af Hydref 2006 a chofnodwyd cyfanswm o 17 sbesimen byw o *Dolomedes plantarius*, gan gynnwys tair benyw aeddfed (un gyda choden wyau, un arall gyda hen we feithrin), 1 copyn/corryn lled-aeddfed a 13 sbesimen ifanc. Aseswyd cynefin poblogaeth Camlas Tennant o ran ei ansawdd ac o ran ei faint. Defnyddiwyd y data hyn, ynghyd â chofnodion cyhoeddedig, manylion y safle ac ecoleg hysbys y rhywogaeth, i gynnig strategaeth CSM safle-benodol.

Arolygwyd SoDdGA Cors Crymlyn ar 2il–3ydd Hydref 2006 ac yno cafwyd tri sbesimen o *D. plantarius*; rhai ifainc mawr oedd dau ohonynt ac un fenyw aeddfed a oedd yn gwarchod corynnod bychain. Defnyddiwyd gwybodaeth a gasglwyd ynghylch is-safleoedd yn ystod yr arolwg i awgrymu strategaeth CSM. Yn ogystal, amlygwyd anawsterau yn yr arolwg – gwybodaeth a all fod yn ddefnyddiol ar gyfer archwiliadau yn y dyfodol.

Ar hyn o bryd ystyrir bod poblogaeth *Dolomedes plantarius* a'i chynefin yn SoDdGA Camlas Tennant / Pant-y-Sais SSSI mewn cyflwr ffafriol. Er hynny, nodwyd nifer o agweddau niweidiol a all newid yr asesiad presennol yn y dyfodol.

Ar hyn o bryd mae poblogaeth *Dolomedes plantarius* SoDdGA Cors Crymlyn mewn cyflwr anffafriol oherwydd twf gormodol *Phragmites* yn rhai o'i is-safleoedd hysbys. Mae pori merlod yn parhau i wella'r sefyllfa yn ardal graidd y de, ond mae gofyn monitro'r sefyllfa'n ofalus er mwyn asesu llwyddiant hyn o hyn ymlaen.

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Introduction

The spider genus *Dolomedes* is represented in Britain by two species: *Dolomedes fimbriatus* (Clerck, 1757) and *Dolomedes plantarius* (Clerck, 1757). Both species are large (c.6 cm leg-span), generally chocolate brown spiders with lateral cream stripes running down the length of their carapace and abdomen (although uniformly brown examples are present amongst *D. plantarius* populations).

Dolomedes fimbriatus is the more widespread British species, occurring in a number acidic wetland sites throughout Wales, England and Southern Scotland. By contrast, *Dolomedes plantarius* is recorded from just two sites in England (Redgrave and Lopham Fen NNR in East Anglia & Pevensey Levels on the Sussex coast), and one in South Wales (Crymlyn Bog SSSI / Tennant Canal/Pant-y-Sais SSSI). *Dolomedes plantarius* is one of only two British spider species protected under Schedule 5 of the Wildlife and Countryside Act, and is also categorised as an RDB1 species.

Both *Dolomedes* species are wetland spiders: *D. fimbriatus* associated with acidic oligotrophic habitats such as bogs, often away from open water; *D. plantarius* associated with eutrophic water systems such as canals, fens and grazing levels. *Dolomedes plantarius* is more restricted to open water habitats than *D. fimbriatus*.

The two English populations of *D. plantarius* were discovered in 1956 (Redgrave and Lopham Fen) and 1988 (Pevensey Levels) (Duffey, 1958; Kirby, 1990). The presence of the species was suspected in Wales based on habitat, although a survey of the Gwent Levels in September 2001 did not confirm its presence at this likely site (Gallon, 2001).

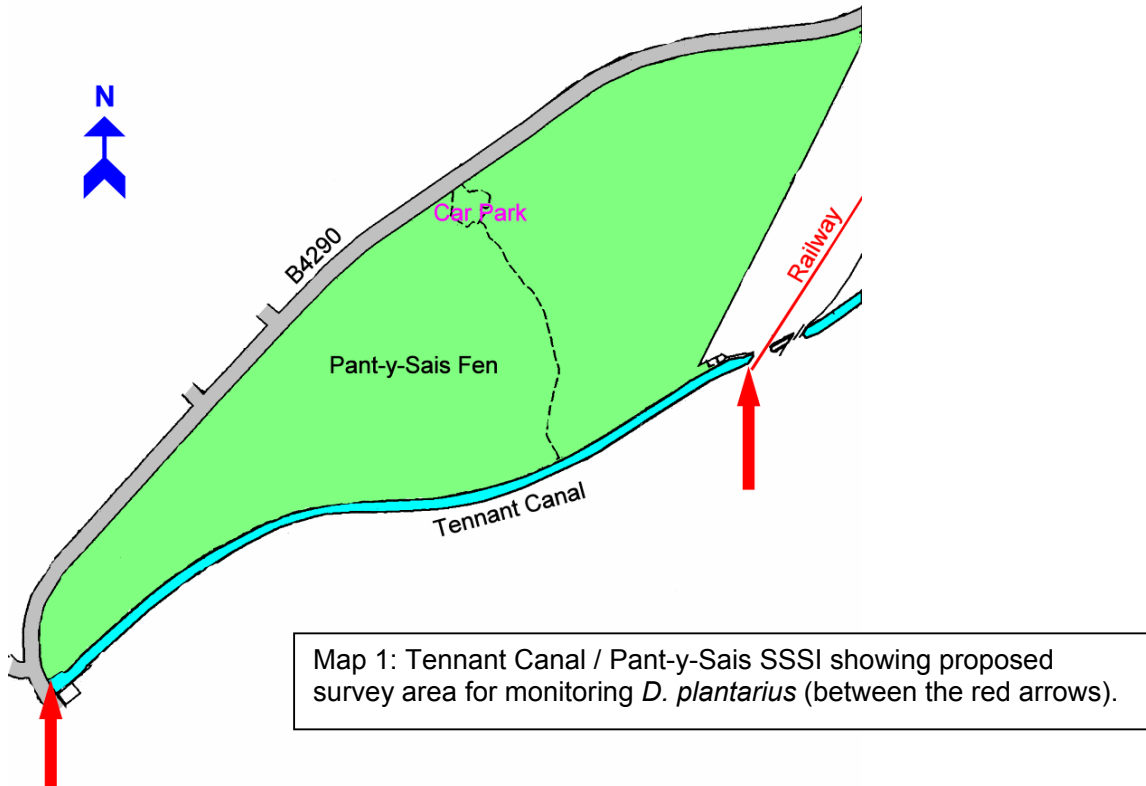
Dolomedes plantarius was first identified from Wales on 18th May 2003 from the Tennant Canal by Michael Clark. Its presence on Crymlyn Bog SSSI (a site arguably contiguous with the Tennant Canal/Pant-y-Sais SSSI given that the Tennant Canal extends along its southern boundary) was confirmed when a juvenile female, collected by Clark, was reared to maturity by myself (specimen collected 9th September 2003). *Dolomedes* populations were known from both sites previously, but had been assumed incorrectly to represent *D. fimbriatus*; an assumption which perhaps masks additional unrecorded populations of *D. plantarius* in Britain.

Michael Clark has studied the Welsh *Dolomedes plantarius* population at its various subsites (Tennant Canal/Pant-y-Sais SSSI, Crymlyn Bog SSSI), providing useful baseline data for future reference (Clark & Clark, 2003; Clark, 2004). Clark's data, along with information gathered during this current survey (undertaken under licence OTH:SA:276:2006), have been used to formulate a Common Standards Monitoring methodology for the species in Wales.

Tennant Canal / Pant-y-Sais SSSI

Site visit: 1 October 2006

Weather conditions: overcast with sunny breaks in the morning, brightening up and becoming increasingly windy through the day. The previous evening experienced a thunder storm and the effects of this were evident during the survey; saturated, flattened *Carex* at the canal margins.



Search methods – Tennant Canal / Pant-y-Sais SSSI

The entire stretch of the canal between the north-eastern rail bridge (Plates 1–2) and south-western road bridge (Plate 4) was initially searched for *Dolomedes*. This initial phase involved scanning the northern bank of the canal, from the towpath, for nursery webs and specimens, either on the marginal vegetation or water's edge. This proved difficult due to the height/density of the *Carex paniculata* and its flattened condition, caused by the previous night's thunderstorm. However there were several small (50–100 cm wide) clearings (presumably fishing spots) along the towpath where safe access to the water's edge was possible and these were exhaustively studied. During this initial search phase specimen numbers, ages and locations were recorded (using a G.P.S.).

This initial search was extended past the south-western road bridge for 50 m and also past the north-eastern rail bridge up to SS7213494363.

A limited amount of hand-searching within the *Carex paniculata* tussocks was undertaken at SS7186894215 to see whether specimens were utilising this habitat for cover (a small number of other spider species were also collected from this microhabitat – see appendix 1).

The marginal vegetation along the north bank of the canal (between the two bridges) was then mapped and assessed using a G.P.S. Marginal vegetation was categorised as either “bad” or “good”, with regards to the ecological requirements of *Dolomedes plantarius*. These

distinctions were based on the relative presence of shading *Phragmites* within each identifiable stretch of similar vegetation.

Marginal vegetation quality was considered “bad” where: *Phragmites* formed dense stands to the exclusion of *Carex paniculata* and/or *Glyceria maxima*; where *Phragmites* dominated other plant species (i.e. stems less than 30 cm apart and over 1 m high forming a continuous shading layer above other plants).

Marginal vegetation quality was considered “good” where: *Carex paniculata* and *Glyceria maxima* dominated the vegetation structure. Weak, sparse *Phragmites* growth (i.e. isolated stems over 30 cm apart and less than 1 m high) within “good” vegetation such as *Carex paniculata* and/or *Glyceria maxima* was also considered acceptable within the definition of “good” habitat quality.

The entire length of the boardwalk across the fen was also investigated, with particular attention given to pools of open water (e.g. at SS7159694203).

Results – Tennant Canal / Pant-y-Sais SSSI

In total 17 live specimens of *Dolomedes plantarius* were recorded from the Tennant Canal, comprising 3 adult females, 1 sub-adult and 13 juveniles; 2 exuviae were also encountered (Table 1). One of the adult females was carrying an egg-sac whilst basking from emergent *Glyceria maxima* (Plate 3), and another was initially discovered sitting on an old, tattered nursery web built in *Carex paniculata* 50 cm above the canal’s water surface (Plate 5).

Despite much searching, no additional nursery webs (or their remains) could be located, perhaps due to the destructive heavy rain associated with the previous night’s thunder storm.

An assessment of the marginal vegetation (Table 2) along the northern bank of the canal (between the rail and road bridges) rated 76% of the habitat as favourable, comprising *Carex paniculata*, *Glyceria maxima* and grass. The remaining 24% was graded as unfavourable given the dominance of shading *Phragmites*. The habitat past the south-western road bridge was considered unfavourable (shaded by woodland and with poor marginal vegetation structure) and no spiders were discovered here. Similarly no spiders were discovered on the main Pant-y-Sais fen. Five juveniles were discovered past the north-east rail bridge hunting off water lily pads (the marginal vegetation here was dominated by *Glyceria maxima* with *Carex paniculata* being a less dominant component than on the main section of canal).

Table 1: *Dolomedes plantarius* specimens recorded at the Tennant Canal; 1st October 2006.

Number & Stages	Grid reference	Notes
2 adult ♀ 3 juveniles	SS7186894215	One of the adult females was holding an egg-sac. Body lengths c.10 mm. Both adult females and one juvenile sitting on <i>Glyceria maxima</i> leaves, 2 juveniles on <i>Rumex</i> leaves.
1 juvenile	SS7186894215	Discovered deep within base of <i>Carex</i> clump on bank.
3 juveniles	SS71975 94250	Hunting off lily pads.
1 adult ♀ 1 juvenile exuviae	SS7124593935	Adult female was sitting on old nursery web in <i>Carex</i> overhanging canal.
1 sub-adult	SS7122293916	Body length 15 mm. Hunting off emergent <i>Glyceria maxima</i> leaf.
1 juvenile	SS7149094073	Body length 10 mm.
3 juveniles 1 sub-adult exuviae	SS7121293907	Body lengths 10 mm, 10 mm, 15 mm. All hunting off emergent <i>Glyceria maxima</i> leaves.
1 juvenile	SS7198294273	Body length 10 mm. Sitting on <i>Nymphoides peltata</i> pad.
1 juvenile	SS7199094280	Body length 12 mm. Sitting on <i>Nymphoides peltata</i> pad.
Total: 3 adult ♀, 1 sub-adult, 13 juveniles, 2 exuviae.		

Table 2: Tennant Canal (northern bank between road and rail bridges) marginal vegetation analysis with *Dolomedes plantarius* habitat quality; 1st October 2006.

From	To	Extent (m)	Vegetation composition	Habitat quality
Road-bridge	SS71258 93952	78 m	Grass/ <i>Glyceria</i>	Good
SS71258 93952	SS71262 93954	4 m	<i>Phragmites</i>	Bad
SS71262 93954	SS71299 93987	50 m	<i>Carex/Glyceria</i>	Good
SS71299 93987	SS71350 94025	64 m	<i>Phragmites</i>	Bad
SS71350 94025	SS71511 94077	169 m	<i>Carex/Glyceria</i>	Good
SS71511 94077	SS71577 94080	66 m	<i>Carex</i>	Good
SS71577 94080	SS71618 94087	42 m	<i>Carex/Glyceria</i>	Good
SS71618 94087	SS71641 94094	24 m	<i>Carex/Glyceria/Phragmites</i>	Bad
SS71641 94094	SS71665 94102	25 m	<i>Carex/Glyceria</i>	Good
SS71665 94102	SS71700 94118	38 m	<i>Phragmites/Carex</i>	Bad
SS71700 94118	SS71789 94171	104 m	<i>Carex/Glyceria</i>	Good
SS71789 94171	SS71794 94173	5 m	<i>Carex/Phragmites</i>	Bad
SS71794 94173	SS71807 94183	16 m	<i>Carex/Glyceria</i>	Good
SS71807 94183	SS71849 94206	48 m	<i>Glyceria/Phragmites</i>	Bad
SS71849 94206	SS71877 94225	34 m	<i>Carex/Glyceria</i>	Good
SS71877 94225	Rail-bridge	10 m	Grass/ <i>Carex/Glyceria</i>	Good
Total length of transect		777 m		
Habitat graded good		594 m	76%	
Habitat graded bad		183 m	24%	

Previous published survey work – Tennant Canal / Pant-y-Sais SSSI

A survey of the same section of the canal (between the rail and road bridges) in August 2003 (Clark & Clark, 2003) yielded 5 adult females and 4 nursery webs (from a boat) and 1 adult female and 3 nursery webs (from the towpath).

Clark & Clark (2003) combined these data above with additional information collected after the survey (for the year 2003). They were able to identify 21 separate adults based on unique individual coloration, and estimated that an additional 7 were present. They also counted 14 nursery webs (which contained egg-sacs) during that period and noted that the maximum number of juveniles seen in any one day in September 2003 was 9.

Further counts were provided by Clark (2004):

- 16 March 2004: 8 juveniles.
- 22 March 2004: 1 juveniles.
- 30 March 2004: 15 juveniles.
- 31 March 2004: 21 (stages unspecified).
- 12 April 2004: 10 (stages unspecified).
- 19 April 2004: 23 (stages unspecified).
- 22 April 2004: 25 (stages unspecified).
- 2 May 2004: 30 (stages unspecified).
- 12 May 2004: 13 (stages unspecified).
- 7 June 2004: 14 (stages unspecified).
- 5 July 2004: 8 (stage unspecified), 3 juveniles.
- 28 July 2004: 21 nursery webs; 9 adult female with sacs.
- 30 July 2004: 23 nursery webs; 1 adult female with sac; 1 juvenile.
- 4 August 2004: 36 nursery webs; 7 adult females (4 of which carrying sacs); 1 adult male; 2 juveniles.

Common Standards Monitoring – Tennant Canal / Pant-y-Sais SSSI

This current survey, along with past research at the site (Clark & Clark, 2003; Clark, 2004), has demonstrated that *Dolomedes plantarius* is restricted to the marginal vegetation (*Carex paniculata*/*Glyceria maxima*) of the northern bank of the Tennant canal (largely between the rail and road bridges). To date there is no evidence that the species utilises the main fenland habitat associated with the reserve. For this reason it is felt that a monitoring protocol should focus on the marginal habitat along the northern bank of the canal between the road and rail bridges.

It is suggested that monitoring *D. plantarius* at the Tennant Canal should include factors which confirm breeding success and continued habitat quality. Survey work should be undertaken between late July–early September on a warm, sunny, calm day. The well defined, linear nature of the occupied habitat lends itself to transect work.

Conservation Objective for the fen raft spider at Pant-y-sais SSSI

Conservation Objective (for when the feature is in favourable condition)	To maintain the fen raft spider at Pant-y-sais SSSI in favourable condition where
Lower limit	in one year in 3, a 3-hour site survey from the towpath should record: 3 nursery webs (with or without females) and 5 spiders (adult &/or independent juveniles), at least one of which must be an independent juvenile
	and
Habitat quality Lower limit	Within the area shown on map 1 at least 550 m of the bankside vegetation is suitable breeding habitat, and at least 500 m of this consists of <i>Carex paniculata</i> dominated stands.
Definition of suitable fen raft spider habitat	Large clumps of (water overhanging) <i>Carex paniculata</i> , occupying a band of at least 1 m wide along the northern bank of the canal, giving way in part to emergent growth of <i>Glyceria maxima</i> . Or, emergent stands of <i>Glyceria maxima</i> , even when not associated with <i>Carex paniculata</i> , but this habitat type should be sub-dominant to the above (not more than 10% of favourable habitat).

Justification for limits and survey protocol – Tennant Canal / Pant-y-Sais SSSI

Given the rapid growth/spread capability of *Phragmites* (by means of stolons) and this species' potential to alter *Dolomedes* habitat detrimentally, it is suggested that a survey be undertaken once every three years to identify (and remedy) such issues quickly.

Dolomedes plantarius is more easily observed/encountered while it is basking in direct sunlight. Windy conditions cause *Carex* leaves to sway and this would make spotting individuals more difficult. Therefore it is recommended that survey work be restricted to days with suitable weather conditions (wind strength at Beaufort 3 or less).

A late summer/early autumn survey period has been recommended since this provides the best opportunity to encounter nursery webs (Smith, 2001), adults and in particular large juveniles. It is also the period where one is more likely to have favourable weather conditions.

Given that *Carex* growth at this time of year can impede safe access to the canal margin for counts, it is felt that a lower threshold of 3 nursery webs and 5 spiders is appropriate. By specifying that nursery webs and independent juveniles must be encountered during the monitoring survey this gives a useful indication of successful breeding and recruitment for that year (something which a count restricted to adults only may not).

Given that Clark encountered 4 nursery webs during a survey from a boat and 3 from the towpath (Clark & Clark, 2003), it was felt that the benefits of surveying from the water were not sufficiently great, compared to the practical convenience of surveying from the towpath.

The small size and restricted habitat occupied by the population at the Tennant Canal makes it all the more important to preserve the entire occupied section of canal, ensuring no change in land use (e.g. conversion to short amenity grass for recreational use, boat moorings, etc.) which might result in alterations to bankside vegetation structure.

The current survey of the canal between the road and rail bridges assessed 594 m of the habitat as favourable and it is felt that, due to the small size of occupied habitat, a lower threshold of 550 m is justified to reduce the risk of stochastic local extinction.

Clark (2004) noted that out of 38 nursery webs on the canal, 24 were constructed on *Glyceria maxima*. For this reason *Glyceria* has been specified as an important factor in grading the habitat quality on the canal. However, *Carex paniculata* is the dominant component of the habitat and, although not a preferred attachment substrate for nursery webs, it provides year-round cover and this is highly likely to be where spiders over-winter (note that a juvenile was discovered on this survey hiding within the base of such a clump). These two plant species were observed growing side-by-side, with *Carex* occupying the bank and *Glyceria* the water's margin. Such a vegetation structure is considered ideal, offering both shelter, nursery web substrate, basking and hunting opportunities.

Dolomedes plantarius favours open habitats where basking in direct sunlight is possible. Areas with dense *Phragmites* growth, shrubs and trees are avoided and, as such, are considered unfavourable habitat. Likewise the growth of tall exotic invasive plants like Himalayan Balsam and Japanese Knotweed (etc.) are considered detrimental to habitat quality. Short mown amenity grass extending down to the water's edge without emergent *Glyceria*, bare trampled ground and gravel hardstands are also considered detrimental to habitat quality.

Periodic dredging of submerged aquatic plants/debris is vital for the long-term maintenance of a open canal system. However, such activity would be detrimental if conducted during the *D. plantarius* breeding season (mid June to early October), since this would destroy some nursery webs. Dredging should be restricted to dates outside of this core breeding period, and should minimise disturbance to the northern bank (i.e. dredged material should not be dumped/dragged onto the northern bank, as this would smother spiders sheltering/over-wintering within marginal vegetation clumps).

Although *D. plantarius* will utilise floating aquatic plants as hunting platforms, it appears to favour hunting from partially submerged marginal vegetation in close proximity to the bank (presumably taking advantage of the protective cover afforded by such vegetation). For this reason the presence of floating aquatic plants across the entire width of the canal is not considered an important attribute per se.

Crymlyn Bog SSSI

Site visit: 2–3 October 2006

Weather conditions: overcast with sunny breaks, somewhat windy.

Search methods – Crymlyn Bog SSSI

On the 2nd October 2006 the south-east section of Crymlyn Bog was surveyed for *Dolomedes plantarius* with the assistance of Jamie Bevan, the reserve warden.

The first area investigated equated with subsite-3 at SS68869423 (Clark, 2004), a pool of open water (c.90 cm deep) fringed with *Iris pseudacorus*, sparse *Phragmites*, *Typha latifolia* and isolated clumps of *Carex* sp., these marginal plants also forming emergents over much of the pool's surface (Plate 6). The entire circumference of this pool was examined by walking carefully through the water with waders, scrutinising the vegetation and water for specimens and nursery webs. It was noted that some of the margins were heavily pony trodden.

We then went on to examine subsite-1 (Borehole-7, SS689942) and subsite-4 (SS690943) (Clark, 2004), sites which we felt are becoming contiguous now due to the activity of grazing ponies which are actively opening-up the dense *Phragmites* growth around subsite-1.

Subsite-1 was covered with tall (c.2 m) dense *Phragmites* with little open water except where ponies had ingressed (Plate 7). As we walked onwards towards subsite-4 *Phragmites* growth became increasingly sparse and water depth increased (to c.50 cm). On reaching subsite-4 the *Phragmites* had largely given way to short (c.30 cm) emergent *Equisetum* and *Ranunculus lingua* with isolated emergent clumps of *Carex* spp. (Plate 8). Throughout this transect the vegetation and water were scanned for evidence of *Dolomedes* (and G.P.S. recordings taken where necessary).

A very deep pool of open water (c.10 m in diameter) was encountered at SS6909594350 and was fringed in part by *Carex* tussocks, although this habitat looked promising it proved too dangerous under-foot to investigate in detail (Plate 9).

On the 3rd October 2006 we investigated the northern section of Crymlyn Bog. Following a sketch map (Clark, 2004) we attempted to visit subsite-2 (SS699959), approaching from both Glan-y-wern Farm and Upper Glan-y-wern. Despite numerous attempts we were unable to safely access the bog from either of these points. We have since learnt that the position of subsite-2 is not correctly marked on this map.

We abandoned our attempts to reach subsite-2 and instead decided to investigate the pools of open water (seen on aerial photographs) associated with the disused Glan-y-wern canal (the Glan-y-wern canal being a side-branch of the Tennant Canal which bisects the NNR). This was accessed from the boardwalk which starts near Upper Glan-y-wern. Although there is still some water flow through the canal, it is now choked with tall dense stands of *Phragmites*. We located a 6 x 4 m pool of deep open water at SS6933695114 (Plate 11) and the presence of an abandoned swan's nest, complete with eggs, suggests that this area of open water was more extensive within the last couple of years. It is now too shaded with *Phragmites* to be suitable *Dolomedes* habitat.

Results – Crymlyn Bog SSSI

A total of three *Dolomedes plantarius* specimens were located at Crymlyn Bog during the two days of survey work (Table 3). Two large juveniles were observed climbing amongst isolated emergent clumps of *Carex* spp. at SS6905894346 and a single adult female, guarding spiderlings, was seen nearby at SS6906494348 in the same microhabitat (Plates 8 & 10), both recorded on 2nd October 2006. This site corresponds with Clark's subsite-4 and was the only area where we managed to locate *Dolomedes plantarius*.

A search of Clark's subsite-3 (Plate 6) failed to confirm the continued presence of *D. plantarius* here, however this area had become more heavily vegetated since Clark's records. On the day of our visit the area had been trampled heavily by ponies and their recent activity has now begun to open-up the vegetation structure.

The vegetation structure at Clark's subsite-1/borehole-7 (Plate 7) had also changed dramatically and was now dense *Phragmites*, in the process of being improved by grazing ponies.

Table 3: *Dolomedes plantarius* specimens recorded at Crymlyn Bog SSSI; 2nd October 2006.

Number & Stages	Grid reference	Notes
2 juveniles	SS6905894346	Both found sitting on isolated emergent clumps of <i>Carex</i> sp. and <i>C. acutiformis</i> surrounded by 40 cm deep water.
1 adult ♀ + spiderlings	SS6906494348	Female in nursery web with spiderlings. Nursery web built in isolated emergent clump of <i>Carex</i> sp., 50 cm above water surface; water depth 30 cm.
Total: 1 adult ♀, brood of spiderlings, 2 juveniles.		

Previous published survey work – Crymlyn Bog SSSI

Clark's survey of the site (at subsite-1/borehole-7; SS689942) on the 9th September 2003 produced a count of 2 nursery webs (one of which was occupied by a female guarding spiderlings), and a single juvenile. He also noted that a maximum number of juveniles seen in any one day in September 2003 was 6 (Clark & Clark, 2003).

Further counts were provided by Clark (2004):

Subsite-1/Borehole-7:

12 April 2004: 5 (stage unspecified, believed to be juveniles).
 23 April 2004: 9 (stage unspecified, believed to be juveniles) & 2 exuviae.
 25 April 2004: 15 (stage unspecified, believed to be juveniles).
 12 May 2004: 12 (stage unspecified, believed to be juveniles).

Subsite-2:

2 April 2004: 2 juveniles.
 23 April 2004: 8 juveniles & 2 exuviae.
 25 April 2004: 15 juveniles.
 4 May 2004: 5 juveniles.
 12 May 2004: 13 (stage unspecified).
 7 June 2004: 14 (stage unspecified).
 7 July 2004: 2 nursery webs, one of which with an adult female with egg-sac.

Common Standards Monitoring – Crymlyn Bog SSSI

The *Dolomedes plantarius* population distribution on Crymlyn Bog SSSI is dissimilar to that of the Tennant Canal, in that it appears to be restricted to isolated pockets of suitable habitat within an extensive site (much of which is extremely difficult to investigate due to the vegetation density and dangerous boggy ground). To date *D. plantarius* has been recorded from three subsites in the south (subsites-1, 3, 4) and one in the north (subsite-2) of the reserve (Clark & Clark, 2003; Clark, 2004). These factors make it impractical to survey all the subsites in a single day. Note that some subsites can only be reached by wading long distances through deep (30–50 cm) water, vegetation and mud which can be tiring and time consuming, with obvious safety implications which need to be borne in mind for further monitoring work.

As with the Tennant Canal, a monitoring protocol has been suggested which confirms breeding success. Given the ill-defined nature of the subsites, due to changes in surrounding vegetation structure and grazing, an area search at the specific subsites is deemed more appropriate.

Conservation Objective for the fen raft spider on Crymlyn Bog SSSI

Conservation Objective (for when the feature is in favourable condition)	To maintain the fen raft spider on Crymlyn Bog SSSI in favourable condition where
Lower limit	In one year in 3, a 2-hour survey at each subsite (1, 2, 3, 4), should record: 3 nursery webs (with or without females) and 3 spiders (adult, independent juvenile or exuviae) in at least 3 of the 4 subsites
	and
Habitat extent	Each subsite should comprise a minimum diameter of 50 m of suitable open habitat
Lower limit	and
Habitat quality	Each subsite must contain at least one isolated clump of tussock-forming <i>Carex</i> spp., either emergent from or adjacent to permanent deep (30 cm) open water
Lower limit	A permanent water depth of at least 30 cm with either emergent <i>Equisetum</i> and <i>Ranunculus lingua</i> with isolated 'island' clumps of <i>Carex</i> spp., or open water fringed with isolated clumps of <i>Carex</i> spp. and/or <i>Juncus</i> spp.

Justification for limits and survey protocol – Crymlyn Bog SSSI

Monitoring period and survey weather conditions remarks follow those detailed from the Tennant Canal. However, due to the dispersed nature of the population at each subsite (rather than the linearly confined, concentrated, population at the Tennant Canal) a lower limit of 3 has been set for numbers of spiders, with exuviae also included within this count. The reasons for including exuviae within the counts at Crymlyn are twofold: searching here involves wading through water, an activity which causes the spiders to dive beneath water; discarded

exuviae are often seen attached to emergent vegetation or floating on the water surface and, as such, are more likely to be encountered during the search. Obviously, where a specimen is found in close association with an exuvia it would not be counted as two 'spiders' for the purpose of this monitoring. Where a female is found guarding a nursery web, both the spider and the web will be counted separately (for the purpose of defining a lower limit count).

A lower limit of a 50 m diameter of suitable habitat has been suggested for each subsite, since it would appear that *Phragmites* growth at Crymlyn can rapidly alter the quality of a particular subsite (Clark's open subsite-1 of 2004 is now a dense, unsuitable stand of tall *Phragmites* only 2.5 years later; Plate 7). Shading growth of *Phragmites* and shrubs are considered detrimental to the habitat quality of *D. plantarius* (Smith, 1997, 2001).

The current survey discovered *Dolomedes plantarius* was utilising isolated islands of *Carex* spp. within areas of deep water, both for nursery web construction and juvenile refuge. Clark (2004) also reported juveniles utilising dry *Juncus* leaves in April/May as basking spots. As at Tennant, these clumps of *Carex* (and possibly *Juncus*) may represent important winter refugia. The islands of *Carex* would certainly offer the only available dense cover (above the water surface) at the site where we observed specimens.

The nursery web discovered at Crymlyn on this survey (Plate 10), was constructed against the south-facing side of an island clump of *Carex* (and the two juveniles were also discovered in a similar southerly facing aspect). Given that the inhabited section of the Tennant Canal is also southerly facing, one could argue that such an aspect is important for breeding success. With this in mind survey effort may be more productive at Crymlyn if such areas are concentrated on.

At Crymlyn, water depth could alter due to drought or vegetation growth. Given that *D. plantarius* is tied to habitats with permanent deep water, efforts should be made to monitor this with a view to remedial action. The maintenance of a high water level throughout the seasons has been beneficial for the *D. plantarius* population at Redgrave & Lopham Fen (Smith, 2001). However during winter, water levels should not be permitted to inundate the island *Carex* clumps. Smith (2001) has implicated such winter flooding as detrimental to over-wintering spiders.

Conclusions

Based on this survey, the *Dolomedes plantarius* population and its habitat along the Tennant Canal in Pant-y-Sais SSSI is currently in Favourable Condition. However, a number of factors have been identified which have the potential to alter this detrimentally. Of primary importance is the bankside vegetation composition and structure. Invasive species such as Japanese Knotweed, which is already established on site, need to be controlled to prevent further spread. *Phragmites* growth also needs to be managed to prevent it forming dense mono-species stands to the detriment of the valuable *Carex paniculata*/*Glyceria maxima* habitat. Canal water levels also need to be maintained long-term. Dredging maintenance should be restricted to the period outside the breeding season of *D. plantarius*, and dredged material should not be deposited on the northern bank of the canal.

The *Dolomedes plantarius* population and its habitat on Crymlyn Bog SSSI is currently in Unfavourable Condition, due to the growth of dense *Phragmites* over subsites where populations were recorded previously (i.e. subsite-1). Pony grazing, which had already begun at the time of this survey, is having a positive impact on opening-up the vegetation structure and this management strategy should be maintained.

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Appendix 1

Other spiders recorded from the Tennant Canal

1st October 2006; SS7185994215. Grubbed from *Carex paniculata* tussock at canal margin.

<i>Bathyphantes approximatus</i>	4♀
<i>Tallusia experta</i>	2♀
<i>Nerienne clathrata</i>	1♂ 1♀
<i>Lepthyphantes tenuis</i>	1♂
<i>Kaestneria pullata</i>	1♂



Plate 1: Tennant Canal near railway bridge where several *D. plantarius* were observed easily.



Plate 2: Tennant Canal near railway bridge showing marginal *Carex paniculata/Glyceria maxima* on the northern bank; *Dolomedes plantarius* habitat. This image clearly illustrates the effect of aspect and basking potential between the two banks.



Plate 3: Adult female *Dolomedes plantarius* carrying egg-sac whilst basking on emergent *Glyceria maxima*; near railway bridge, Tennant Canal.



Plate 4: Tennant Canal from road bridge showing *Glyceria maxima* in foreground – an open area where *Dolomedes plantarius* may be observed easily.



Plate 5: Abandoned *Dolomedes plantarius* nursery web constructed on *Carex paniculata*, remains of egg-sac visible on right. Tennant Canal.



Plate 6: Crymlyn Bog SSSI, subsite-3 (Clark, 2004), a pool of open water fringed with *Iris pseudacorus*, sparse *Phragmites*, *Typha latifolia* and isolated clumps of *Carex* sp.



Plate 7: Crymlyn Bog SSSI, subsite-1 (Clark, 2004) with tall (c.2 m) dense *Phragmites* and little open water.



Plate 8: Crymlyn Bog SSSI, subsite-4 (Clark, 2004) emergent *Equisetum* and *Ranunculus lingua* with isolated island clumps of *Carex* spp. which were occupied by *Dolomedes plantarius*. Water depth here between 30–50 cm.



Plate 9: Deep pool of open water (c.10 m in diameter) at SS69095 94350, fringed in part by *Carex* tussocks. Crymlyn Bog SSSI.



Plate 10: Adult female *Dolomedes plantarius* on nursery web with cluster of emerged spiderlings above, on island clump of *Carex*, facing south. Crymlyn Bog SSSI.



Plate 11: Remnant pool of open water on the Glan-y-wern canal, SS6933695114, Crymlyn Bog SSSI. Heavily choked with shading *Phragmites*.