

Research Report No. 153

***Crassula* invasion levels and success of recent eradication attempts at the
Thompson Common pingo ponds**

Final Report to the Norfolk Non-native Species Initiative

Carl Sayer & Pete Robinson

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List of contributors

Carl Sayer

Environmental Change Research Centre / ENSIS Ltd.
Department of Geography
University College London
Pearson Building
Gower Street
London
WC1E 6BT

Pete Robinson

Flat 5
58 Tressillian Road
Brockley
London
SE4 1YB

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Cover photograph: Pingo pond 37 (photo: Jo Atherton 14th August, 2012)

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Background and Aims

Crassula helmsii (New Zealand Pigmyweed) is an invasive aquatic plant in the UK which has caused considerable damage to native aquatic plant communities in ponds and lakes (Leach & Dawson, 1999). It is notoriously difficult to eradicate this species and much evidence suggests that success (which is rare) requires very early detection at the point of colonisation (Dawson, 1996; Willby, 2007).

Recently (2011) *C. helmsii* was found in two neighbouring pingos at Thompson Common SSSI in the Brecklands of Norfolk (ponds at TL 93373 96310 and TL 93370 96368). Site manager Darrell Stevens located the plants and applied herbicide in an attempt to eradicate *C. helmsii*. Due to the important and distinctive macrophyte flora of the Thompson Common pingos there are rightly-held concerns regarding possible future impacts of *C. helmsii* invasion.

The current study sought to determine the success of attempted *C. helmsii* eradication from the two aforementioned pingos at Thompson Common, whilst ascertaining whether the species had colonised other ponds at the reserve. An opportunity was also taken to record aquatic macrophyte communities in the surveyed pingos.

In summary the aims of the current study were:

1. **To identify whether *C. helmsii* eradication was successful**
2. **To identify the presence/absence of *C. helmsii* in Thompson Common pingos that surround the invasion sites**
3. **To determine possible conduits of *C. helmsii* to the site (in the future) to help guard against future invasion.**
4. **To gain more data on aquatic macrophyte occurrence in the ponds.**

Sites and Methods

The pingos were visited over the 13th and 14th August, 2012. The survey area was centred around the north-west section of the Thompson Common site (encompassing compartments 1, 2, 3 and 4) close to the two pingos where *C. helmsii* was found in 2011. Additionally an attempt was made to determine the source of *C. helmsii* invasion by searching ponds associated with houses and gardens close to the two affected pingos.

The perimeter of each pond was subjected to a visual survey. In addition Carl Sayer searched the interior of the pingos and any open water areas as far as was safely possible by wading. A double-headed rake was used to assist plant searches in open water regions. All submerged and floating-leaved aquatic plants were recorded as present or absent. It should be recognised that some aquatic plant species may have been missed using this approach as the priority was (i) finding *C. helmsii* and (ii) covering as many ponds as possible over the two day period.

A map of the surveyed ponds showing the location of *C. helmsii* was produced using ArcGIS version 10.0.

Results

Surveyed ponds

A total of 42 ponds were surveyed including seven ponds associated with private properties and gardens close to the Thompson Common reserve (Fig. 1). The latter included six pingos (pingos 25-30 in Table 1) and one medieval fish pond (pond 24 in Table 1).

Invasive species

C. helmsii was found in one of the original invaded pingo ponds in compartment 3c (pond 22 at TL 93373 96310), but not in the other (pond 23 at TL 93370 96368). This suggests that eradication was likely successful in the latter. In pond 22 *C. helmsii* covered around one third to half of the pond.

C. helmsii was not found in any of the 33 other surveyed Thompson Common pingos suggesting that it may not, as yet, have invaded the wider nature reserve. Nonetheless caution should be applied to this statement given that it was not possible to visit all of the pingos.

The source of *C. helmsii* invasion was likely found this being a pingo pond (pond 30 TL 93304 96228, Fig. 1) incorporated into the garden of a private house (Butters Lodge) close to the invaded site. This pond had been subjected to management in 2011, but given its dominance in the pond (it was even growing in the lawn around the pond), it seems likely that *C. helmsii* was present prior to this time, with the probably origin being a garden centre.

During the survey two small stands of Himalayan balsam (*Impatiens glandulifera*) was also found in the College Farm area close to a stream that drains into Thompson Common (TL 93258 96784 and TL 93196, 96712). Clearance was not possible at the time of the survey, however, as it was already setting seed.

Plant communities in the pingos

Some 29 aquatic plants were recorded in the survey (Table 2). The most common plants were Common duckweed (*Lemna minor* in 22 ponds), Ivy-leaved duckweed (*Lemna trisulca* in 17 ponds), Amphibious bistort (*Persicaria amphibia* in 12 ponds), Water violet (*Hottonia palustris* in 12 ponds), Broad-leaved pondweed (*Potamogeton natans* in 11 ponds), American duckweed (*Lemna minuta* in 8 ponds) Greater bladderwort (*Utricularia vulgaris* in 9 ponds) and the floating liverwort Crystalwort (*Riccia fluitans* in 7 ponds). Gibbons (2004) stated that *U. vulgaris* "may be extinct" in the Thompson Common ponds so we can clearly show this not to be the case.

Notable species found during the survey were Least bur-reed (*Sparganium natans*), Frogbit (*Hydrocharis morsus-ranae*), Tubular water-dropwort (*Oenanthe fistulosa*), Fen pondweed (*Potamogeton coloratus*), Water-violet (*Hottonia palustris*) and the floating liverwort *Ricciocarpus natans*. Both *S. natans* and *H. palustris* are classified as local in the British Isles, with *P. coloratus* classified as Nationally Scarce and *H. morsus-ranae* and *O. fistulosa* listed as Vulnerable (Cheffings & Farrell, 2005; Palmer *et al.*, 2010). In addition, Dark stonewort (*Nitella opaca*), although relatively common in Northern Britain is rare in Norfolk (C. Sayer pers. obs.).

Discussion and Recommendations

The Thompson Common pingos are of exceptional ecological importance. Currently, as demonstrated by this brief study, they hold populations of several nationally scarce and notable aquatic plants (see above).

The important plant communities at Thompson Common are potentially threatened by *C. helmsii* invasion, so all possible efforts should be made to prevent this from occurring. We recommend the following courses of action:

Eradication work:

- 1. Eradication of *C. helmsii* should be repeatedly attempted at the two invaded pingos. Note that Darrel Stevens of Norfolk Wildlife Trust is already working on this and should be given the full support of the Norfolk Non-native Species Initiative (NNSI).**
- 2. Clearance of *I. glandulifera* from the invaded area close to College Farm (Fig. 1) should be undertaken over the next three summers (at least) until it is hopefully eradicated. The NNSI should liaise with Darrel Stevens regarding this work.**

Future invasive species surveys:

- 3. A second *C. helmsii* survey (of a similar nature) is undertaken in summer 2013 which again focuses on the two invaded pingos and the area surrounding them. This survey should include ponds missed during 2012 (there are so many it was impossible to cover them all in the two survey days) and further garden ponds/pingos around the reserve to further assess potential invasive species threats in the future.**

Minimising *C. helmsii* spread:

- 4. Compartment 3c (which contains the *C. helmsii* pingo 22) should not be grazed by animals that are then transferred to another compartment on the reserve so that the potential for spreading *C. helmsii* is minimized. Indeed mowing may be the most appropriate grassland management method for the time being in 3c. Further, all surveys of the pingos should be planned so that pingo 22 is the last study site.**

Aquatic plant surveys:

- 5. A Thompson Common-wide survey of aquatic plants should be undertaken to record the rare species present and to assess the value of pond management. We suspect that pond management has been tremendously beneficial to macrophyte communities at Thompson Common and it would be good to further quantify and understand the management effect.**

References

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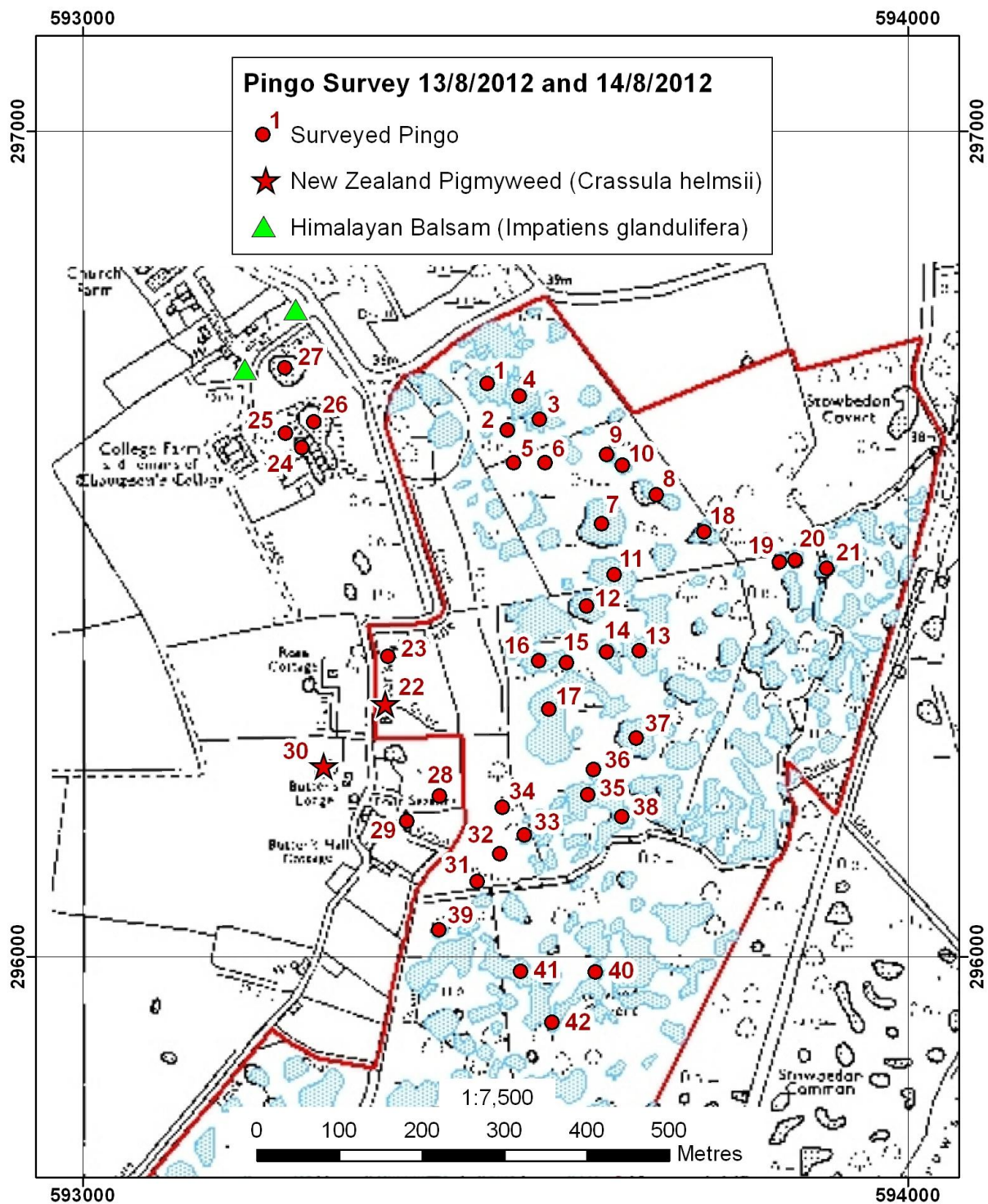
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Based upon Norfolk Wildlife Trust map "NWT Thompson Common Map 6: Pingos".
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Figure 1. Map of the Thompson Common pingo ponds showing ponds searched for *Crassula helmsii* (red dots) and current location of *C. helmsii* (red stars). Note that during the *C. helmsii* search Himalayan balsam (*Impatiens glandulifera*) was also found (green triangles).

No.	NGR (TL..... ..)		<i>C. helmsii</i> present	Notes
1	93490	96695		
2	93514	96639		
3	93553	96652		
4	93529	96680		Connected to pingo 1?
5	93522	96599		
6	93560	96599		
7	93628	96525		Large round pingo
8	93695	96560		
9	93634	96609		Small dry pingo
10	93653	96596		Small dry pingo
11	93643	96463		
12	93610	96425		Could be fish, looks to be permanent
13	93674	96371		
14	93635	96370		
15	93586	96356		Crescent shaped pingo
16	93552	96359		
17	93564	96300		Could be fish, looks to be permanent
18	93752	96515		
19	93844	96478		<i>Lemna</i> -covered nearly 100%
20	93863	96481		<i>Lemna</i> -covered nearly 100%
21	93901	96471		
22	93367	96307	YES	<i>Crassula</i> covers 1/3 to 1/2 pingo area
23	93370	96365		No <i>Crassula</i> but may have been present before. Eradication successful
24	93265	96617		College Farm medieval fish pond. <i>Lemna</i> -covered 100%
25	93245	96635		College Farm pingo 1
26	93280	96648		College Farm pingo 2. <i>Lemna</i> -covered 100%
27	93244	96714		College Farm pingo 3. Fish fry abundant
28	93432	96195		Sylvia's pingo 1. Dry/damp bed
29	93392	96165		Sylvia's pingo 2. <i>Lemna</i> -covered 100%
30	93291	96231	YES	Butters Lodge pingo, cleared out autumn 2011. No survey undertaken, quick look
31	93478	96091		
32	93505	96125		
33	93535	96148		
34	93508	96181		
35	93611	96197		
36	93618	96227		
37	93670	96265		Fish seen topping
38	93653	96170		
39	93431	96032		
40	93621	95981		
41	93530	95982		
42	93568	95921		

Table 1. Pond locations and *Crassula helmsii* data for the pingo survey 13-14th August, 2012. Ponds with *C. helmsii* are highlighted (red fill).

Pingo number	<i>Alisma plantago-aquatica</i>	<i>Apium inundatum</i>	<i>Berula erecta</i>	<i>Callitriche</i> sp.	<i>Chara globularis</i>	<i>Chara hispida</i>	<i>Chara virgata</i>	<i>Crassula helmsii</i>	<i>Hippurus vulgaris</i>	<i>Hottonia palustris</i>	<i>Hydrocharis morsus-ranae</i>	<i>Lemna minor</i>	<i>Lemna minuta</i>	<i>Lemna trisulca</i>	<i>Nitella opaca</i>	<i>Nymphaea alba</i>	<i>Oenanthe fistulosa</i>	<i>Persicaria amphibia</i>	<i>Potamogeton coloratus</i>	<i>Potamogeton natans</i>	<i>Potamogeton obtusifolius</i>	<i>Potamogeton polygonifolius</i>	<i>Ranunculus aquatilis</i>	<i>Riccia fluitans</i>	<i>Ricciocarpus natans</i>	<i>Rorripa nasturtium-aquaticum</i>	<i>Sparganium natans</i>	<i>Spirodella polyrhiza</i>	<i>Utricularia vulgaris</i>			
1									1			1																		1		
2										1								1														
3										1		1						1													1	
4										1										1											1	
5												1																				
6										1		1																			1	
7	1		1											1			1	1		1						1						
8												1		1			1	1														
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14										1		1		1				1		1											1	
15					1	1					1																1				1	
16					1							1		1								1										
17										1	1	1								1	1			1							1	
18		1										1		1				1														
19													1	1										1						1		
20				1									1											1								

