Tansy Beetle Action Group

Tansy Beetle
Chrysolina graminis
Conservation Action Plan

2017-2021

Edited by:

Vicky Wilkins-Kindemba (Buglife)

Geoff Oxford (University of York)

Jessica Hughes (Buglife Volunteer)

In Collaboration with:

Dan Calvert (City of York Council)

Louis Douglas (Leeds City Council)

Caroline Howard (Askham Bryan College)

Helen Kirk (The Carstairs Countryside Trust)

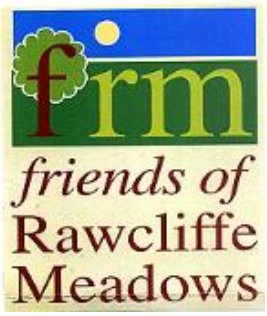
Jeff Lambert (Coleg Cambria)

Roma Oxford (Independent consultant)

Mick Phythian (Friends of Rawcliffe Meadow)

Sue Penn (Environment Agency)

Julia Smith (Buglife)



West Leeds Country Park Visitor Centre **Pudsey Park**

Contents

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Introduction

This plan was initiated by the Tansy Beetle Action Group (TBAG), which was established to develop and oversee conservation efforts aimed at saving the Tansy beetle *Chrysolina graminis* from extinction in Britain. TBAG consists of a range of local and national organisations working in partnership towards the beetle's conservation. This plan will provide a focus and facilitate collaborative working between 2017 and 2021.

Status Review

1. Species Description

Chrysolina graminis, more commonly known as the Tansy beetle, is a chrysomelid leaf-beetle that predominantly feeds on the plant Tansy *Tanacetum vulgare*, but it can also use other wetland plants. The species' world distribution ranges from south-eastern Europe through to central Asia and China. The beetle is an iridescent green and around 10 mm long. Its elytra are pitted and have a coppery tinge. Currently the only known British populations are (a) along a 45 km stretch of the River Ouse in central Yorkshire, and (b), at Woodwalton Fen, Cambridgeshire, where it was rediscovered in 2014 after a 40 year absence of records.

The Ouse population is by far the larger of the two. The beetle is part of the landscape of traditionally managed floodplain grasslands (Ings) in York. Although the Tansy beetle is characteristic of the riparian margins of meadows rather than the grasslands themselves, it is still a quintessentially 'Ings' species. It is likely that the practice of hay making followed by aftermath grazing favoured the survival of Tansy beetles by removing livestock during the spring/summer breeding and larval development period, while autumn grazing helped suppress more competitive vegetation on the riparian fringe. This system of land use probably dates back to Roman times around York, was established extensively during the Saxon period and covered a large proportion of the Ouse floodplain until relatively recently. This historical land-use legacy is probably one of the reasons that the Ouse corridor is the Tansy beetle's remaining stronghold.

Along the River Ouse the beetle is mainly found living in clumps of Tansy, which provide their staple food source. In contrast, in the East Anglian Fens it has been recorded feeding on Water Mint *Mentha aquatica* and Gypsywort *Lycopus europaeus* (Oxford et al., 2003). As a result of the rediscovery of the Woodwalton population' recent and its very small size, almost all information on the biology of the species has been gleaned from the York population.

1.1 Life cycle

The Tansy beetle has an annual life cycle with a peak mating period during the spring and continuing into early summer. Females lay numerous batches of from three to fifteen eggs on the under surface of Tansy leaves. Each yellow, rice-grain-shaped egg is 2 mm long and stands upright from the leaf's surface. In captivity, a female was reported to have laid 561 eggs over the course of 136 days, suggesting a capacity for rapid population growth. However, this figure is likely to be greatly reduced in the field, where conditions will be far from ideal (Oxford *et al*., 2003). High beetle density on Tansy plants induces some females to seek out other, non-food plants on which to lay their eggs. This strategy acts to decrease the chance of their eggs being cannibalised by other adults but it may,

however, lead to an increase in larval mortality, while they locate Tansy to commence feeding (Chapman *et al*., 2006).

After hatching, the newly emerged, grey larvae pass through four instars before burrowing into the soil at the base of the Tansy clump during July. Once underground the larvae metamorphose into pale yellow pupae. The new generation of adults emerges from the soil around a month later and begins feeding. Most of the previous generation's adults die before the new generation emerges (Oxford *et al*., 2003). By late September and into early October the new adult beetles return to the soil to overwinter. They do not emerge again until spring when, the cycle completed, they begin mating and egg-laying again (Oxford *et al*., 2003).

Knowledge gap(s) identified:

- More research into Tansy beetle ecology, specifically defining habitat requirements. Key areas for research include:
    - soil water content during pupation and overwintering
    - impacts of predators on eggs and larvae (ants, spiders etc.)
- Differences in ecological requirements of York and Fen populations, particularly food plants, egg laying, depth of pupation/overwintering and soil attributes of overwintering sites.

1.2 Populations

The stronghold population of Tansy beetles along the Ouse is split into smaller sub-populations as a result of the localised distribution of their major food plant, Tansy. These sub-populations are more-or-less isolated from one another as the beetle very rarely flies. Flight has only been witnessed on one or two occasions, most recently at Wicken Fen in 2014 (during an attempted reintroduction, see section 8) where it was recorded on film. Patches of Tansy along the Ouse are made more sporadic by shade from large willow trees and competition from the invasive non-native plant Himalayan balsam *Impatiens glandulifera* (Oxford and Millington, 2014). Tansy patches are further compromised by their physical removal by humans in mistake for ragwort, and by overgrazing from livestock (Oxford *et al*., 2003). Therefore, as beetles hardly ever fly and have been shown to walk only 150-200m between food-plant clumps, sub-populations can easily become isolated and vulnerable to local extinctions (Oxford and Millington, 2014). Large gaps in food-plant distributions threaten the long-term future of the beetle 'smeta-populations.

At Woodwalton Fen, unlike on the Ouse, the food plants tend not to grow in clumps but, spatially, do vary in density. The extent and structure of the beetle population here are still to be determined.

It seems likely that the Tansy beetle populations in the Fens and on the Ouse have been separated for a very long time (Oxford, 2015) and may have evolved adaptive differences in behaviour and the ability to metabolise different food plants. For example, beetles at Woodwalton may overwinter in soil at a shallower depth compared with those along the Ouse as they are not exposed to potential soil erosion during winter flooding.

Tansy beetle habitat Woodwalton Fen © Vicky Kindemba

Likewise, feeding beetles from the Ouse population over a number of generations solely on Water Mint has been shown to severely reduce their reproductive output; similar but less extreme effects are seen when they are fed a diet of Gypsywort. Increased research into potential evolved behavioural and physiological differences between these beetle populations is important if we are to understand the conservation needs of the two populations.

Knowledge gap(s) identified:

- Genetic work using neutral DNA markers is required to assess how differentiated the population in York is compared with those at Woodwalton Fen.
- Behaviour and ecological research to understand differences between York and Fen populations, especially with respect to survival and reproduction on different food plants and the overwintering behaviour of adults.

2. Functions and Values

The functional value of the Tansy beetle within UK ecosystems is largely unknown, especially since their single core population is geographically restricted. It is a herbivore but occurs in such small numbers that it is unlikely to make a significant impact on the ecosystem as a whole, but may affect single food-plant patches when in large numbers. However, in York it can be used as an indicator of healthy riverbank habitat as it demonstrate a higher quality, diverse ecosystem without negative impacts caused by invasive plant species and overgrazing. Because of its association with the historical management of York's Ings it is also an indirect local indicator species of the Lowland Meadows Habitat of Principal Importance (as listed in NERC Act Section 41) and the Lowland Hay Meadows Habitat of European Importance (as listed in Annex 1 of the EU Habitats Directive).

The social value of the Tansy beetle is more obvious. It is commonly known as the ''Jewel of York'', recognizing its intrinsic beauty and the fact that its stronghold occurs in York. The Tansy Beetle Action Group (TBAG) was set up in 2008 by a number of organisations to coordinate conservation efforts for the beetle and raise its public profile. Public information boards have been erected at two sites along the River Ouse where the beetle is usually found in numbers. Stalls at events such as the Insect Festival held in York, as well as regular walks and talks on the beetle, have all further engaged and educated the public. Handmade brooches featuring the beetle have been made, as well as pin badges and postcards, in order to increase its public appeal. There is growing interest in captive breeding of the beetle by zoos and colleges; to use educationally as an example of invertebrate conservation in Britain, as well as potentially providing individuals for future reintroductions. Therefore, the Tansy beetle is a local icon in York but in addition raises awareness of invertebrate conservation across Britain.

Giant Tansy beetle and friend at 2015 Insect Festival © Sophie Badrick

Knowledge gap(s) identified:

- Research public awareness of the Tansy beetles and the education and well-being benefits the beetle

provides to local residents.

- Quantify Tansy beetle's function in the river bank ecosystem, as a food source and a herbivore, as well as defining the wider benefits to other wildlife through its conservation.
- Research the wider implications of management of the beetle, for example the ecosystem importance of Tansy as a food plant for other riparian insects such as Aculeate Hymenoptera.

3. Historical account

It is difficult to determine accurately the past distribution and abundance of the Tansy beetle (see below). However, in the last 50 years the distribution of Tansy beetle populations has been undoubtedly significantly reduced, with only 11 '10 km squares' verified as positive since 1970 (Oxford *et al*., 2003). With only two UK populations remaining the Tansy beetle was categorised as Endangered using the IUCN Red List criteria in the recent UK species status review (Hubble, 2014).

3.1 Distribution

Some historical records should be treated with caution as a number have been shown to refer to misidentified Mint beetles *Chrysolina herbacea*, which are very similar in overall appearance (Oxford *et al*. 2003). There are other documented cases of mislabelling and assignment to totally unrealistic locations. The past distribution of the Tansy beetle is impossible to determine accurately unless museum specimens are checked for correct identification, although errors in recorded source locations remain.

It is believed that the Tansy beetle was once relatively common and widespread in the East Anglian Fens. Up until the second half of the 1980s the beetle was regularly recorded at Wicken Fen, Cambridgeshire (Oxford and Millington, 2013) and was thought to be the last extant population in the Fens. Specimens in the Cambridge University Zoological Museum throw light on past distributions in the region. As well as Wicken Fen, Tansy beetles in the collection came from Woodwalton Fen (between 1956 and 1975), Whittlesey Mere, near Peterborough (undated) and Chatteris and Sutton Gault (both 1898) (Oxford and Millington, 2013). Therefore, until the recent 2014 record at Woodwalton Fen, the beetle had not been sighted in this region for some 30 years (see Current Distribution and Demography).

Surveying efforts have therefore focused on the known stronghold of the Tansy beetle along the River Ouse, in Yorkshire. The first concerted attempt to assess the distribution of the beetle was by Calvert (1998), who surveyed the river from Linton Lock to Fulford Ings on the east bank, and from Nun Monkton to north of Acaster Selby on the west bank. He discovered beetles and Tansy to be distributed from about 8 km north of York city centre to 26 km south (Oxford *et al*., 2003; Oxford and Millington, 2013). Two postgraduate students at the University of York, Duncan Sivell (2000-2003) and Dan Chapman (2003-2006) continued this surveying work along the Ouse. Although recording valuable data at certain locations, they did not cover the entire Tansy beetle range and not all of their sites were surveyed every year.

The first comprehensive survey completed along the Ouse to assess both the distribution and abundance of Tansy beetles and Tansy plants began in 2009, and has continued annually since then.

Trained volunteers survey an approximately 45 km stretch of the river (90 km of bank), which encompasses the beetle's entire distribution on the Ouse (Oxford and Millington, 2013). Surveys of the new generation of beetles each year are carried out on warm, sunny days over a four to five-week window, usually from the end of the first week in August to the end of the first week in September.

Overall, the beetles and Tansy plant range along the Ouse has remained relatively stable, although there has been some annual variation in the range of the beetle along the river, often as a result of finding, or not finding, a single individual (Oxford and Millington, 2013). However, the proportion of Tansy plants clumps occupied by beetles has varied; for example, falling from 19% to 13.2% between 2011 and 2012 (Oxford and Millington, 2013). In particular, range contraction has occurred on the east bank south of York and west bank north of York. Reasons for these contractions have been put down to overgrazing by cattle over the last 10 years and flooding events (see below) (Oxford and Millington, 2014).

3.2 Abundance

As well as noting the presence/absence of beetles during the annual surveys, when present beetles are counted or, in some cases, numbers are estimated. Quantifying the actual beetle population size within Tansy clumps suggest that approximately half of the beetles present are visible at any one time (Oxford *et al*., 2003). A crude estimate of total population size is therefore made by doubling the number of beetles counted during the survey.

The vagaries of beetle population changes over time are illustrated by the survey in 2011. The number of beetles north of York approximately doubled when compared to 2010 numbers whereas to the south of York they dropped to a tenth of that in the previous year. The reasons for this remain unclear, but were not thought to be a result of summer flooding. In general, the factors governing population sizes and distributions of the Tansy beetle are still obscure (Oxford and Millington, 2013).

In 2012 most sites demonstrated a decrease in beetle numbers, irrespective of geography. The number of Tansy clumps also showed a marked decline of 21% (1727 clumps to 1361). The number of beetles suffered an overall decrease of 52.5% (individuals counted: 2097 down to 1101), but these figures hide marked and enigmatic variation along different parts of the Ouse (Oxford and Millington, 2013 – see below).

Flooding in the summer of 2012 was almost certainly the main reason for the marked decline observed in Tansy clumps and beetles that year, which had the wettest summer for 100 years, as cited by Oxford and Millington, 2013. Winter flooding doesn't seem to be deleterious for the Tansy beetle, but floods during their active season in the summer appear to have a significant impact. Through the summer of 2012 there were at least eight major floods along the Ouse, some of which coincided with the period when the vulnerable larvae were feeding on plants (Oxford and Millington, 2013). However, flooding is probably not the sole factor affecting local population sizes. For example, in 2012 a site north of Selby experienced flooding as well as the exacerbating effects of tidal flow, but showed a dramatic increase in numbers of beetles between 2011 and 2012, bucking the general trend. Other than flooding there must be other, possibly very local, factors which influence annual variation in abundance.

The number of Tansy beetles counted along the Ouse in 2015 was 15% higher than that counted in 2014 (12,139 compared with 10,557), with the largest increase in abundance (69 fold) observed between Linton Lock and Nun Monkton (Oxford, 2015). If the doubling rule, as described by Oxford *et al*. (2003), is applied there were roughly 24,000 individual beetles in 2015, supporting an encouraging gradual upward trend in numbers. The number of Tansy clumps increased from 2014 to 2015 (2271 to 2713) but the proportion of clumps containing beetles only marginally increased (from 20.3% occupied in 2014 to 20.9% occupied in 2015) (Oxford, 2015). In 2016, the total beetle population was estimated to be some 40,000 individuals, an increase on the 2015 figure of 63%. Specific sites along the River Ouse in Yorkshire need to be examined to reveal finer-scale demographic trends over time and their possible causes.

4. Current distribution and demography

Annual surveys along the Ouse, begun in 2009 and continuing to the present day, have provided insights into the current distribution and demography of both the Tansy beetle and its food plant. Surveys completed from 2014 onwards covered a 46.8 km stretch of the river, from Linton Lock in the north to Selby in the south (Oxford, 2015). In 2014 the Linton Lock to Nun Monkton west bank site, which had lost beetles in previous summer flooding, received wild-collected and captive-bred beetles which were successfully re-established.

Overall there has been a continuing increase in the numbers of beetles, numbers of Tansy plants, and the numbers of Tansy plants occupied by beetles from 2014 to 2016. The geographical range of the beetle doesn't seem to have changed significantly in this time.

In the Fens a monitoring protocol has been established and during 2016 this has been implemented by Tom Bowers (Natural England) approximately weekly within the known beetle 'hot-spot'. A maximum of three individuals was recorded on any one occasion. A previous *ad hoc* survey at Woodwalton Fen recorded a maximum of nine beetles in 2014. A notice to the general public on the Fen has resulted in a small number of additional localised records. Indeed, one person reported seeing eight in the 'hot spot' during September 2016. It is not known how the numbers of beetle sighted relates to the true population size on the Fen.

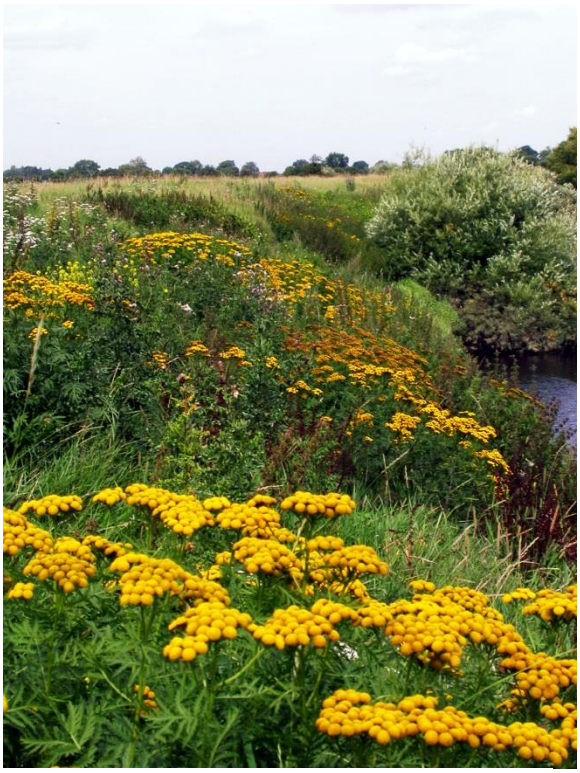
Knowledge gap(s) identified:

- Understanding seasonal and annual changes in abundance and distribution, with more intensive recording complementing the wider monitoring.
- Mapping of flood occurrence and levels (using LIDAR) relative to patches of Tansy and beetle numbers to better understand impacts and to facilitate effective management of sub-populations with reduced vulnerability
- Gather more consistent recording information for Woodwalton Fen on (a) the true distribution of the population and (b) calibrate the multiplier to convert beetle counts to a true population size estimate.

5. Habitat and Resource Assessment

Tansy is an ephemeral plant which grows on disturbed ground, so a particular tansy patch may not be present in a habitat for very long (Oxford *et al.,* 2003). The stronghold population of Tansy beetles along the Ouse is split into smaller sub-populations; a result of the clumped nature of their food plant. As mentioned earlier, these patches of Tansy are made more sporadic by shading from large willow trees and competition from the invasive non-native plant Himalayan balsam *Impatiens glandulifera*. More generally, Tansy occurs in damp environments such as marshland and at the margins of rivers and ponds, but also on roadside verges. It is a widespread plant in the British Isles (BSBI, 2016) but often occurs in small, isolated patches, which are unsuitable for sustaining beetle populations in the long term. The presence of the beetle on the Ouse is likely to be a result of abundant tansy, distributed along many stretches in large and adjacent clumps. It is likely that grazing is an important tool in maintaining the heterogeneous vegetation mosaics favourable to Tansy, and may be a means of controlling Himalayan balsam on some sites. Fine-scale habitat preferences of the Tansy beetle are not currently fully understood (Oxford *et al*. 2003).

In the Fens the beetles occur on a very different vegetation type compared to the York population and at its only currently known site at, Woodwalton Fen it is found along ditch edges. These are dominated by Common reed *Phragmites australis* but include a mix of, often scattered, food plants – Gypsywort and Water Mint. With rotational management practiced on site, there is a need to maintain appropriate habitat structure and connectivity.



Tansy beetle habitat York © Geoff Oxford

One obvious difference, other than food plants, between the York and Woodwalton habitats is that the River Ouse floods every winter (Oxford *et al*., 2003). Tansy beetles demonstrate a high winter survival rate (Oxford *et al*., 2003; Oxford and Millington, 2013). It has been suggested that winter flooding may reduce the impact of predation on the beetle. For example, adults in the soil might suffer reduced mortality from moles, and in the summer larvae and eggs on plants could be exposed to reduced mortality from ants, which are less successful in damp environments (Oxford *et al*., 2003); however all these hypotheses need further research.

Knowledge gap(s) identified:

- Establish in more detail the ecological requirements in relation to food availability and environmental attributes of sites both in York and the Fens.
- Map and quantify the habitat being used by the beetles in Woodwalton Fen.

6. Threat Analysis

Historically the Tansy beetle may have been more widespread in Britain and it is not clear what factors have led to its decline, especially in the East Anglian Fens. The beetle's food plants – Tansy, Water mint and Gypsywort – are widespread across the British Isles (Oxford *et al*., 2003) although,

as intimated above, local quantity and distribution are both critical for the long-term survival of beetle populations. Flooding can eliminate large sub-populations; evidence suggests that summer flooding has the greatest impact. With only one known stronghold population in Britain, it would take just one year of extreme summer flooding to jeopardise the whole population along the River Ouse. During summer floods, larvae sink and drown when knocked off plants (Oxford *et al*., 2003; Oxford and Millington, 2013) and eggs also die after a few days inundation. Adults do not seem to suffer as much mortality, as they either float away (buoyed by air trapped under their elytra), climb to higher ground or even enter the soil by climbing down submerged stems (Chapman 2006, as cited in Oxford and Millington, 2013).

On the River Ouse a number of other threats directly impact Tansy and lead to the removal of the food plant on which the beetles rely. These include overgrazing by livestock, particularly cattle, which results in the further isolation of Tansy patches. In addition, the invasive plant species Himalayan balsam outcompetes Tansy and willows shade out clumps. It is also the case that some landowners actively remove Tansy plants, mistaking them for Ragwort.

Eutrophication is likely to be significant as it leads to the decline of Tansy and the replacement of heterogeneous vegetation mosaics with highly competitive nitrophilous plant communities. There is a general increase in nutrient loading in the Ouse floodplain as historic botanical data indicates the loss of many smaller, poorly-competitive plants during the past 100 years. There are localised nutrient issues for example on the Ings Dyke and Blue Beck at Clifton, deposition of ditch slubbings along the banks has resulted in the loss of a significant Tansy beetle populations as nettle-bed vegetation has encroached. This also reflects the high nutrient inputs into these watercourses from urban surface water run-off.

Another threat is development and some land management by public authorities (Environment Agency, City of York Council, North Yorkshire County Council, district councils, Internal Drainage Boards) when exercising their duties, as well as private development (which is regulated by City of York Council). Some recent works such as regrading of the river bank along the Esplanade in York have had a significant impact on Tansy beetle habitat and the upgrading of the Clifton Washland defences has the potential to affect the Rawcliffe Meadows population. Tansy beetle populations need to be protected during operations and any unavoidable impacts fully mitigated.

Small Tansy patches cannot sustain beetle populations in the long term unless they form part of a landscape-scale mosaic of adjacent clumps. Beetles mainly disperse by walking but clumps more than about 150 to 200 m away are not accessible. Therefore if clumps are reduced in size or further isolated as a result of overgrazing or flooding the metapopulation structure of the beetle breaks down. Longer distance dispersal by flight is a possibility but is thought to be relatively rare. These threats, specifically flooding and overgrazing, put the remaining patches of Tansy and beetle populations at risk. To make long term populations sustainable, there is a need to increase the connectivity between Tansy patches along certain stretches of the Ouse.

Specific site impacts and threats at Woodwalton Fen are still unclear.

Knowledge gap(s) identified:

- Threat analysis mapping and integration into habitat management plans
- Ascertain the timing, frequency and duration of flight and long distance migrations (York & Woodwalton) to understand population distributions

7. Conservation and Management

7.1 Status and Research

In 2008, the Tansy beetle was recognized as a BAP species and, as a consequence, the Tansy Beetle Action Group (TBAG) was formed to coordinate conservation efforts in the York area. The Tansy beetle is listed on Section 41 of the Natural Environment and Rural Communities Act 2006 and in 2014 it was classified as Endangered in the UK Red List review (Hubble 2014), establishing the beetle as a species of national conservation concern. It is worth noting that if the tiny Woodwalton population hadn't been rediscovered just prior to the publishing of the revised Red List, the designation would have been Critically Endangered since the Ouse sub-populations are effectively one population with respect to the threat of a major summer flood.

Although there are still major gaps in our knowledge of what habitat factors Tansy beetles need to thrive, enough is known to inform conservation initiatives.

7.2 Conservation projects including habitat restoration

In 2009 TBAG secured SITA Trust funds for restoring 11 sites across the beetle's range on the Ouse. This project included the construction of Tansy enclosures in some areas to reduce overgrazing, and the removal of Himalayan balsam and coppicing of willow trees to encourage Tansy growth. Tansy was planted at key sites.

This type of habitat restoration work has been continued on selective sites by the City of York Council, North Yorkshire County Council, the Carstairs Trust, Beningborough Hall (National Trust) and the Yorkshire Wildlife Trust.

A small number of ark sites for beetles have been established to provide secure populations close to the Ouse but unaffected by summer flooding. In addition, sites have been set up specifically for educational purposes. As a result there are small sub-populations of beetles at Askham Bryan College, York (x2), on the Selby Canal (Canal and Rivers Trust) and in the York Museum Gardens (York Museums Trust). A further ark/education population is planned for Stockbridge Technology Centre, Cawood, in 2017.

Tansy beetle champions working on habitat restoration © Sophie Badrick

Recently the Tansy Beetle Champions Project was set up by Buglife in conjunction with TBAG and with HLF support.

This project seeks to encourage members of the public to engage with conservation efforts, support monitoring and restoration work and learn more about the beetle and how they can help in the long term.

8. Captive Breeding and reintroductions

The beetle has been bred by Roma Oxford for a number of years and has been found to be easy to culture. As a result of this captive-breeding work beetles have successfully been reintroduced to a number of sites along the Ouse. For example, in 2005 individuals were reintroduced on the east bank near Newton-on-Ouse, successfully re-establishing populations that had been lost around the 1960s. On the opposite bank, four sub-populations were re-established in 2014 after beetles had disappeared as a result of the 2012 summer floods. Reintroductions of populations on the Ouse lost during flooding have, with only a very few exceptions, been highly successful.

A reintroduction strategy was formulated for Wicken Fen and beetles from the captive bred population, together with some removed from large natural populations on the Ouse, were introduced into the Fen in September 2014. However in spring and summer 2015 no beetles were found at the reintroduction site. The reason(s) for the failure of the reintroduction are not obvious but may be a result of biological differences in over-wintering behaviour between York and Fen populations since adequate food plants were available and losses occurred outside the breeding season.

British and Irish Association of Zoos and Aquariums(BIAZA) has more recently become involved with TBAG with Dudley Zoo, Pudsey Park, the Deep and Coleg Cambria all interested in captive-breeding beetles to help raise awareness of invertebrate conservation in the UK, and learn more about their autecology.

Research /knowledge gap(s) identified:

- Understanding vegetation dynamics through mapping of active management and correlating with Tansy clumps and beetle numbers in order to assess impacts along the Ouse
- How do we maintain Tansy at the inland edge of the floodplain where there are fewer opportunities for Tansy to colonise gaps?
- Need to consider ways of captive-breeding Woodwalton material but without compromising the existing population. This could then be used to (a) expand the distribution of the beetle at Woodwalton, reducing its vulnerability, and (b) possibly acting as a more appropriate source of re-introduction material at Wicken Fen.

Workshop

A workshop was organised on 17th May 2016 to bring together all those working on Tansy beetle conservation. The aim was to develop a five year plan for the species: ‘Tansy Beetle Chrysolina graminis Conservation Action Plan 2017-2021’.

VISION

Secure and expand the two existing viable populations by maintaining and extending well-connected food plant habitats at York and Woodwalton Fen. Secure additional populations through ark sites and establish the beetle as a flagship for invertebrate conservation.

Research

Improve understanding of the beetle's ecology, population dynamics and genetics, thereby defining a viable population and optimal habitats to inform future conservation work.

Objectives

1. Understand the biology and ecology of the Fen and Ouse populations especially feeding, behaviour, predators/competitors, hydrology, impact of invasive species, vegetation dynamics and conservation management.
2. Investigate the genetic differentiation of Fen and Ouse populations against the background of European populations.
3. Establish effective monitoring of existing populations (Ouse and Fen).

Habitat management

Strategic long-term adaptive management aiming to improve connectivity, quality/resilience and area of habitat. Habitat management plans in place and actively co-ordinated in collaboration with river catchment/wetland margin managers.

Objectives

1. Habitat assessment to better understand current habitat use by the beetle
2. Habitat management plans, informed by habitat assessment
3. Establish actions to control habitat loss in York and the Fens

Public awareness goal

To increase public appreciation of the Tansy beetle and their importance in ecosystem functioning; increasing action to protect Tansy beetles and UK invertebrates in general, with a particular focus on priority audiences.

Objectives:

1. Increase the number of land managers wanting to be involved in Tansy beetle conservation and taking appropriate land management actions
2. Increase the number of school children learning about Tansy beetle and directly involved in its conservation
3. Increase awareness in the local area and directly engage people with its conservation to secure and create more habitat
4. Raise awareness among public bodies of their responsibilities towards Tansy beetles under Sections 40 & 41 of the Natural Environment & Rural Communities Act 2006 and the National Planning Policy Framework.

Resourcing and evaluation

To ensure the long term resourcing and sustainability of Tansy beetle conservation in York and the Fens

Objectives:

1. Secure long term partner commitments to deliver the plan
2. Maintain TBAG and deliver high quality conservation work

Action Table

Action No	Actions	Who	When	How	What resources needed	Indicator of success
Research Goal 1 - Improve understanding of the beetle's ecology, population dynamics and genetics, thereby defining a viable population and optimal habitats to inform future conservation work.						
Objective 1.1: Understand the biology and ecology of the Fen and Ouse populations feeding, behaviour, predators/competitors, hydrology, impact of invasive species.						
1.1.1	Test Fen and Ouse populations on single species and suites of food plants. Monitor reproductive performance and survival over >1 generation.	BIAZA contacts – coordinated by BIAZA rep	2017-19	Research projects	Staff time and captive populations	Research reports and published papers
1.1.2	Assess fen and riverbank vegetation dynamics in relation to Tansy beetle food plants to inform long term management	BIAZA contacts – coordinated by BIAZA rep	2017-19	Research projects	Staff time and captive populations	Research reports and published papers
1.1.3	Determine overwintering and pupation depths and soil conditions of Fen and Ouse populations in captivity and in the field.	BIAZA contacts – coordinated by BIAZA rep	2017-19	Research projects	Staff time and captive populations	Research reports and published papers
1.1.4	Field experiments on eggs and larvae to investigate predation sources and pressures.	BIAZA contacts – coordinated by BIAZA rep	2017-19	Research projects	Staff time and captive populations	Research reports and published papers
1.1.5	Assess beetle long distance dispersal, their frequency and nature (walking and flight) and impact on distribution	EA, NE, Askham Bryan project (through BIAZA rep)	Year 2017-21	Research projects	Staff/student time and field equipment	Research reports and published papers
1.1.6	Evaluate impact of invasive species/ willow and assess techniques for	EA, NE, Askham Bryan project	Year 2017-21	Research projects	Staff/student time and field	Research reports and published

	control and monitor their effect on beetles	(through BIAZA rep)			equipment	papers
1.1.7	Evaluate techniques for creating and managing food plant habitat (Fens and York) and impacts on beetle distribution and abundance	EA, NE, Askham Bryan project (through BIAZA rep)	Year 2017-21	Research projects	Staff/student time and field equipment	Research reports and published papers
1.1.8	Investigate the contribution management for the Tansy beetle has on other insects, wider biodiversity and any additional contributions to ecosystem function.	BIAZA contacts – coordinated by BIAZA rep	Year 2017-21	Research projects	Staff/student time and field equipment	Research reports and published papers
Objective 1.2 Investigate the differentiation of Fen and Ouse populations against the background of European populations.						
1.2.1	Establish a captive-breeding population of the Fen beetles, using short-term female capture to harvest eggs	BIAZA contact – coordinated by BIAZA rep	2017	Coordinated project with NE Woodwalton team	Captive breeding facilities and beetle expertise, working with Roma Oxford	Project progress report and captive population established
1.2.2	Investigate differences between the York and Fen populations in terms of behaviour and ecology	BIAZA contact – coordinated by BIAZA rep	2019	Coordinated project with NE Woodwalton team	Captive breeding facilities and beetle expertise, working with Roma Oxford	Progress reports and research papers
1.2.3	DNA variation in Fen, Ouse and European populations (linked to 1.2.1)	Max Blake, BIAZA contact – via BIAZA rep	2018-2020	Genetic profiling	Genetic processing equipment	Progress report and genetic results published
Objective 1.3 Establish effective monitoring of existing populations (Ouse and Fen)						
1.3.1	Continue current monitoring program and build on it to include spring sampling of selected Ouse populations.	Tansy beetle survey coordinator	2017-2021	Continue Aug/Sept surveys plus implement spring monitoring	Time of coordinator and survey volunteers	Annual survey report including spring monitoring
1.3.2	Develop and implement appropriate monitoring protocols for the fens.	Coordinated by NE staff with Tansy beetle	2017-2021	Develop protocols and training	Time of Tansy beetle survey coordinator as well	Results of Fen monitoring feeding into annual survey

		survey coordinator, and Natural England volunteers			staff (NE) and volunteer	Tansy beetle results
Habitat Management Goal 2 - Strategic long-term adaptive management aiming to improve connectivity, quality/resilience and area of habitat. Habitat management plans in place and actively co-ordinated in collaboration with river catchment/wetland margin managers.						
Objective 2.1 Habitat assessment to better understand current habitat use by the beetle's population						
2.1.1	Monitor and assess distribution of Tansy beetle food plants and assess vegetation dynamics in locations of existing and historic populations	Tansy beetle survey coordinator	Annually (August) and interim	Through Tansy beetle survey TBAG	Survey volunteer availability	Incorporated into annual survey report
2.1.2	Map and assess potential connectivity in locations of existing and future tansy beetle populations i.e. creation opportunities	BIAZA (rep) or Buglife	2017	Use tansy beetle survey data to GIS map	GIS volunteer need or student project	Tansy beetle habitat report
2.1.3	Prioritisation of tansy beetle habitat, through identification of strongholds, and integration of information into habitat management plans.	BIAZA (rep) or Buglife	2017	Use tansy beetle survey data to GIS map	GIS volunteer need or student project	Tansy beetle habitat report
2.1.4	Habitat Management Plans produced for priority tansy beetle locations. Plans incorporated into or reflected in local, regional and national policies. E.g. Water Framework Directive, York local plan, Great Fen project.	NE (Woodwalton), EA & CYC, Tansy beetle volunteer coordinator	2017	Habitat management plans written	Staff time, Volunteer time	Habitat management plans produced and being implemented
2.1.5	Log existing and potential Ark sites and produce a strategy for Ark sites	Buglife	ongoing by end of 2016	List current and define Ark site	Staff time	Ark document produced and

				criteria and update		circulated. List in use and being updated
2.1.6	Survey potential sites for creating new beetle populations and write feasibility/introduction plans – expanding range.	Tansy beetle volunteer coordinator	2018	Assess habitat creation opportunities	Volunteer time	Integrated into Tansy beetle habitat report
2.1.7	Adapt and document management approaches and habitat provision/creation (restoration) techniques, incorporating knowledge gained through habitat assessments.	Tansy beetle volunteer coordinator working with TBAG partners	2021	Collate case studies and working with research projects see 1.4.1	Volunteer and staff time	Updated habitat guidance available on the hub and disseminated
2.1.8	Encourage and inform landowners on appropriate habitat management	Tansy beetle volunteer coordinator and TBAG partners	By end of 2017	Disseminate guidance	Volunteer and staff time	Evidence of habitat management through surveys
2.1.9	Raise profile within agri-environmental schemes in Ouse corridor through Natural England advisor.	Natural England working with Buglife	By end of 2017	Set up and run a seminar	Staff time	Evidence of increased use of agri-env for the beetle
Objective 2.2 Establish actions to control habitat loss in York and the Fens						
2.2.1	Threat analysis and mapping (for example flood mapping); integrate results into habitat management plans	GIS volunteer	2017	Assess areas where habitat loss issues need to be addressed	GIS volunteer	Report on threat analysis and mapping
2.2.2	Encourage land owners/ managers to control invasive species	EA, NE and YWT; and Tansy beetle volunteer coordinator	by the end of 2017	Identify areas for work and communicate with landowners	Volunteer coordinator	Evidence of invasive control through habitat assessments
Outreach Goal 3 - To increase appreciation of Tansy beetles' and wider invertebrates' public role and importance in ecosystem function; to increase						

action to protect tansy beetles and UK invertebrates in general, with a particular focus on priority audiences.						
Objective 3.1 Increase the number of land managers wanting to be involved in tansy beetle conservation and taking appropriate land management actions						
3.1.1	Identify sites & managers: define priorities for communication utilising habitat management plan	Tansy beetle volunteer coordinator	2017	Communication plan and undertake visits etc	Volunteer coordinator	Evidence of improved habitat management through surveys
Objective 3.2 Increase the number of school children learning about Tansy beetle and directly involved in its conservation						
3.2.1	Finish and publish the education resources and signpost schools to resources e.g. outdoor education networks, links with YWT, other orgs.	Buglife	End of 2016	Finalise currently developed materials	Tansy beetle officer	Make education materials available on hub plus publicity
3.2.2	Education project with a coordinator to manage 'beetles in the classroom'; needs sponsorship and could be possible through a zoo connection to run a pilot; and include teaching those who are teaching the teachers.	YWT/BIAZA?	End of 2018	Create materials and pilot with a school	Staff time to develop materials	Materials and feedback from kids and teachers
Objective 3.3 Increase awareness in the local area and directly engage people in the with conservation to secure and deliver more habitat						
3.3.1	Research public awareness of the beetle and wellbeing benefits, to inform awareness work	Askham Bryan, BIAZA rep	End of 207	Research projects	Staff/ student time	Progress reports and research papers
3.3.2	Partners: Build a model education site e.g. museum gardens or Askham Bryan College etc. All partners to provide basic beetle interpretation - lifecycle, threats (e.g. through open days) and include a call to action.	Askham Bryan College, National Trust and York Museums Trust	End of 2017/18	Education sites developed maintained and interpretation included	Commitment from partners	Education sites reports
3.3.3	Using zoos as beetle ambassadors and raising awareness of invertebrates and	BIAZA rep	End of 2018	Captive bred populations with	BIAZA partners commit resources	Progress reports from these

	their importance. e.g. interpretation			interpretation	and staff time	partners
3.3.4	Long term citizen science project including surveying (app) and volunteering e.g. growing tansy etc.	Buglife	End of 2020	Project developed and funding secured	Buglife staff time for project development	Project implemented
Resourcing Goal 4 - To ensure the long term resourcing and sustainability of Tansy beetle conservation in York and the Fens						
Objective 4.1 Secure long term partner commitments to deliver the plan						
4.1.1	TBAG members signing up to strategy and its long term delivery; as well as committing to a number of individual actions to lead on.	All TBAG partners	End of 2016	Strategy commented on and finalised	Staff time	Finalised strategy with sign on available on Tansy beetle hub
Objective 4.2 Maintain TBAG and deliver high quality conservation work						
4.2.1	TBAG is continued with quarterly meeting of partners coordinating the work of the strategy	TBAG Action plan lead	Ongoing	Lead and coordinate work in action plan	Time	Minutes of meetings and action plan
4.2.2	TBAG annual review of outcomes of implementation of action plan	Action plan lead and partners	Annual	Assess delivery of action plan	Staff time	Annual progress report at end of year

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