NatureScot

SCIENTIFIC ADVISORY COMMITTEE

Infiormation Paper Slender Naiad – recovery plan

Purpose

1. This paper updates the Committee on actions being taken by NatureScot for the conservation of Slender naiad (*Najas flexilis*). We invite the Committee to review the actions taken to date and proposed next steps.

Action

2. **The Committee is asked to:**

   a. **Note the status of Slender naiad, the work carried out to date and;**

   b. **endorse the proposed actions**

Preparation

3. The paper has been prepared by Ewan Lawrie, with input from Iain Sime. It is sponsored by Graham Neville.

Background

4. *Najas flexilis* (Willd.) Rostk. & Schmidt is a submerged rooted macrophyte occurring in lakes, usually in deep water. It is a Red Data Book species and is listed in Annexes II and IV of the EC Habitats Directive 92/43/EEC. There are five Special Areas of Conservation (SAC) where it is a qualifying interest. It is listed on Appendix 1 of the Bern Convention. It is also protected under domestic legislation, being listed in Schedule 8 of The Wildlife and Countryside Act, 1981, and Schedule 4 of The Conservation (Natural Habitats & c.) Regulations. It is a UK BAP species and is on the Scottish Biodiversity List.

5. All of the UK sites are in Scotland. It is considered extinct in Esthwaite Water, it's only recent English locality. Within the British Isles, outside Scotland, it is only found in the Republic in Ireland. Scotland therefore has a particular responsibility for its conservation. Reporting under Article 17 of the Habitats and Species Regulations found that in Scotland, and the UK, the overall assessment of the conservation status of the species was unfavourable 'inadequate' with a deteriorating trend in conservation status. This is also the overall assessment for the wider Atlantic and Boreal biogeographical region. In the Continental biogeographical region this species was assessed as unfavourable 'bad'.

6. The species has been recorded from a total of 54 lochs in Scotland. These are mainly in the Hebrides, with 14 mainland lochs. While the overall number of lochs supporting the species has remained roughly stable (due to new locations being recorded in the Hebrides), there has been a large reduction in the number of mainland sites where it is considered present (Table 1). The loss of the species from so many mainland lochs is particularly concerning and poses a significant risk to maintaining the species' current range in Scotland.

7. The main threats are considered to be nutrient enrichment and competition from invasive non-native species particularly *Elodea canadensis* and *E. nutallii*. Acidification may have also played a role, Climate change poses a threat, from increased drought, storm events releasing nutrients and, in the longer term, potentially sea-level change impacts on low lying coastal sites.

Table 1. Current status of *Najas flexilis* in Scottish mainland loch sites.

Mainland loch sites where *N. flexilis* is considered extant	**Mainland loch sites where *N. flexilis* is considered to have become absent**
Lake of Menteith (Stirlingshire)	Loch of Butterstone (Perthshire)
Loch a' Bhada Dharaich (Lochaber)	Loch of Clunie (Perthshire)
Loch Kindar (Dumfries and Galloway)*	Loch of Craiglush (Perthshire)
Loch Monzievaird (Perthshire)	Loch Flemington (near Inverness)
Loch nan Gad (Kintyre)*	Loch of Lowes (Perthshire)
Loch Tangy (Kintyre)*	Marlee Loch (or Loch of Drumellie) (Perthshire)
	White Loch (Perthshire)
	Fingask Loch (Perthshire)

*sites where *N. flexilis* has been recorded since 2008

Work to date

8. Since *N. flexilis* became a particular conservation priority under the Habitats Directive, we have been working on a series of actions first articulated in the UK Biodiversity Action Plan. These include:

- Surveying former and potential sites to ascertain the precise distribution of this species in Britain, including the use of underwater survey techniques where necessary;

- Where necessary within SSSIs, negotiate management agreements to maintain sympathetic low intensity agricultural and forestry works in the catchment of lakes containing this species;

- Promote ecological studies on population dynamics and the habitat requirements of this species to underpin management advice ; and

- Collect seed from a range of Scottish sites and (if the plant is still present) also from Esthwaite Water, for preservation at RBG Kew's seed bank.

9. NatureScot have supported two PhDs on *N. flexilis*. These have laid many of the foundations of our ecological knowledge and helped inform conservation actions. The first was 'The Ecology of *Najas flexilis*' by Wingfield *et al* (2004) and, more recently, 'Understanding the habitat and decline of Najas flexilis in the UK Using Ecology and Paleoecology' by Bishop *et al* (2018).

10. *N. flexilis* is relatively short, rarely reaching above 30cm tall. It does not grow to the water surface and lives its entire life cycle completely submerged. It is an annual and abundance may fluctuate from year to year. As a relatively rare plant and as a submerged macrophyte, which is under-represented on rake samples, casual records are unusual. Snorkling is currently the most reliable method of survey.

11. As part of NatureScot's most recent Site Condition Monitoring programme, and to inform our Article 17 assessment, 42 lakes from which *N. flexilis* had been recorded were investigated in *c* 2016, giving rise to much of the present knowledge of distribution. At each site *N. flexilis* presence or absence was recorded. Three basic survey methods were used to locate *N. flexilis* within the lake; boat, shoreline and snorkel surveys. Snorkel surveys were considered the most effective for finding *N. flexilis*, and were adopted as the standard approach wherever feasible. Boats were used when the lakes were particularly large and there was no knowledge of exactly where the plant could be found; this enabled a larger area to be surveyed.

12. Since then exploratory work to identify an effective eDNA probe was undertaken in 2018 by a Masters student at the University of the Highlands and Islands. Despite a successful genetic marker being identified, further research is required to produce a reliable eDNA survey method that can be deployed in the field.

13. Over more than a decade, work has been carried out to conserve the species and address unfavourable condition on SSSIs, mainly through agri-environment schemes. A particular priority has been the Lunan Lochs (Loch of Butterstone, Loch of Clunie, Loch of Craiglush, Loch of Lowes and Marlee Loch) in Perthshire, which form the Dunkeld Blairgowrie Lochs SAC. These lochs have been the subject of a natural care scheme, and subsequent agreements, with the aim of reducing diffuse nutrient inputs from agriculture. Through this scheme, land managers reduced the application of inorganic phosphate fertiliser, adhered to phosphate budgets and waste management plans and ploughed cereal crops later than usual. They also created grass buffers, reverted to grass in flood risk fields, made steading improvements and fenced watercourses from cattle. These actions produced measurable reductions in the phosphorus inputs to the Lunan lochs. However the actions, despite considerable investment, were not sufficient to prevent the apparent loss of *N. flexilis* from those lochs (Table 1). This is likely to be because of the additional pressure of *E. canadensis* colonising the loch during the same period, and the long recovery period needed for freshwater lochs suffering from eutrophication due to internal nutrient loading liberating past phosphorus inputs that have been sequestered into loch sediments. Such results emphasise the importance of preventing eutrophication, and also the long-term nature of recovery plans.

14. Over the last two years, we have worked in partnership with Scottish Government's Centre for Expertise in Waters (CREW) on a project to help inform our future conservation strategy for the species. The first phase of our work with CREW was

to review the existing knowledge and available information on the habitat requirements of *N. flexilis* from Scotland and other countries where the species is native. This project identified available habitat data, where it is held, and how to access it. This results were published in the Slender Naiad (*Najas flexilis*) Habitat Quality Assessment (2019). A second phase to this project is underway. The report is due to be published shortly using environmental and phyto-sociological information to identify Scottish lochs, where *N. flexilis* is currently unrecorded, and are judged to provide suitable habitat for the species. In turn, these sites will be subjected to further field investigations to identify any undiscovered populations, or their potential as future translocation sites for *N. flexilis*. Suitable sites on the mainland, where populations are most threatened, have been prioritised. We consider these actions important while efforts are maintained to restore other mainland lochs where *N. flexilis* is under threat or has become extinct.

15. Seed has been collected and stored at the RBG Kew seedbank. Until recently, it had not been possible to propagate the plant. However as part of a CASE studentship the UK Centre for Ecology and Hydrology (UKCEH) collected material which they were able to propagate on a small scale. We have been working with UKCEH during 2020 to increase the scale of propagation, in order to provide material for subsequent conservation translocations. Unfortunately much of this further work with this has been limited by Covid-19 restrictions.

Proposed further work

16. Building on the final output from our collaboration with CREW, we propose bring forward conservation actions linked to the Scottish Biodiversity Strategy. Our work with CREW has brought together a partnership of organisations and specialists keen to help us conserve this species (e.g. SEPA, UKCEH, consultants, University of Stirling and representatives from England and Ireland). We will seek to engage with them in the drafting and delivery of the work. Actions we envisage being considered or adopted include:

- A survey and monitoring programme using existing information, augmented by the prioritised list that will shortly be produced by CREW. As Slender Naiad is under represented using most traditional survey methods, work to support the refinement and introduction of eDNA methods could significantly enhance this work and reduce costs. We also envisage developing other potential novel survey techniques, and sediment surveys.

- Further landscape scale actions to maintain or improve the habitat conditions in priority lochs, including discussions with landowners regarding actions arising from the pressures and measures identified in the Conservation Advice Packages for SACs and other work to achieve favourable condition on designated sites.

- Using the Scottish Code for Conservation Translocations, consider the reinforcement or introduction of the species to suitable sites on mainland Scotland, where the species and its range is under particular pressure.

- Freshwater species have an important role in tackling the Biodiversity Emergency. Slender Naiad is not only a conservation priority in its own right, it is also a “canary in the coalmine” for the condition of the wider loch habitat in which it resides. The threats to this species are common to the majority of standing waters. There are therefore significant and valuable opportunities to raise awareness of the

importance of the species, and its surrounding habitat and ecosystems, with the public.

17. **The Committee is asked to note the status of the species and the proposals for managing future conservation action.**

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