# European Community Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora (92/43/EEC)

## Fourth Report by the United Kingdom under Article 17

on the implementation of the Directive
from January 2013 to December 2018

Conservation status assessment for the species:

## S4056 - Little ramshorn whirlpool snail (*Anisus vorticulus*)

UNITED KINGDOM

## IMPORTANT NOTE - PLEASE READ

- The information in this document represents the UK Report on the conservation status of this species, submitted to the European Commission as part of the 2019 UK Reporting under Article 17 of the EU Habitats Directive.
- It is based on supporting information provided by the geographically-relevant Statutory Nature Conservation Bodies, which is documented separately.
- The 2019 Article 17 UK Approach document provides details on how this supporting information contributed to the UK Report and the fields that were completed for each parameter.
- The reporting fields and options used are aligned to those set out in the European Commission guidance.
- Maps showing the distribution and range of the species are included (where available).
- Explanatory notes (where provided) are included at the end. These provide additional audit trail information to that included within the UK assessments. Further underpinning explanatory notes are available in the related country-level reports.
- Some of the reporting fields have been left blank because either: (i) there was insufficient information to complete the field; (ii) completion of the field was not obligatory; and/or (iii) the field was not relevant to this species (section 12 Natura 2000 coverage for Annex II species).
- The UK-level reporting information for all habitats and species is also available in spreadsheet format.

Visit the JNCC website, https://jncc.gov.uk/article17, for further information on UK Article 17 reporting.

# Report on the main results of the surveillance under Article 11 for Annex II, IV and V species (Annex B)

## NATIONAL LEVEL

## 1. General information

| | |
|---|---|
| 1.1 Member State | **UK** |
| 1.2 Species code | **4056** |
| 1.3 Species scientific name | **Anisus vorticulus** |
| 1.4 Alternative species scientific name | |
| 1.5 Common name (in national language) | Little ramshorn whirlpool snail |

## 2. Maps

| | |
|---|---|
| 2.1 Sensitive species | No |
| 2.2 Year or period | 2013-2018 |
| 2.3 Distribution map | Yes |
| 2.4 Distribution map Method used | Complete survey or a statistically robust estimate |
| 2.5 Additional maps | No |

## 3. Information related to Annex V Species (Art. 14)

| | | |
|---|---|---|
| 3.1 Is the species taken in the wild/exploited? | | No |
| 3.2 Which of the measures in Art. 14 have been taken? | a) regulations regarding access to property | No |
| | b) temporary or local prohibition of the taking of specimens in the wild and exploitation | No |
| | c) regulation of the periods and/or methods of taking specimens | No |
| | d) application of hunting and fishing rules which take account of the conservation of such populations | No |
| | e) establishment of a system of licences for taking specimens or of quotas | No |
| | f) regulation of the purchase, sale, offering for sale, keeping for sale or transport for sale of specimens | No |
| | g) breeding in captivity of animal species as well as artificial propagation of plant species | No |
| | h) other measures | No |

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3.3 Hunting bag or quantity taken in the wild for Mammals and Acipenseridae (Fish)

a) Unit

| b) Statistics/ quantity taken | Provide statistics/quantity per hunting season or per year (where season is not used) over the reporting period | | | | | |
|---|---|---|---|---|---|---|
| | Season/ year 1 | Season/ year 2 | Season/ year 3 | Season/ year 4 | Season/ year 5 | Season/ year 6 |
| Min. (raw, ie. not rounded) | | | | | | |
| Max. (raw, ie. not rounded) | | | | | | |
| Unknown | No | No | No | No | No | No |

3.4. Hunting bag or quantity taken in the wild Method used

3.5. Additional information

## BIOGEOGRAPHICAL LEVEL

## 4. Biogeographical and marine regions

4.1 Biogeographical or marine region where the species occurs

**Atlantic (ATL)**

4.2 Sources of information

AECOM/Abrehart Ecology. Translocation of the little whirlpool ramshorn snail - Detailed surveys. AECOM. Highways England, November 2015.
AECOM/Abrehart Ecology, 2017b. Translocation of the little whirlpool ramshorn snail - detailed surveys 2016-2017. Report to Highways England
AECOM/Abrehart Ecology. Translocation Methods for Anisus vorticulus Amended May 2016. Damgate Marshes SSSI 2016 AECOM. Highways England.
Willing MJ. 2014.A full survey of ditches on RSPB Pulborough Brooks for the Little Whirlpool Ram's-horn Snail Anisus vorticulus: (November 2013 / July 2014). Joint Project: Natural England & RSPB.
Willing MJ. 2013. Project to locate populations of the Little Whirlpool Ram's-horn Snail Anisus vorticulus living with Floating Pennywort Hydrocotyle ranunculoides on a selected area of Pevensey Levels. Report to Natural England and the Environment Agency.
Kerney, M. P., ed. 1976 Atlas of the non-marine mollusca of the British Isles. Cambridge, Institute of Terrestrial Ecology, 216pp.
Jurkiewicz-Karnkowska,E. 2015. Diversity of Aquatic Molluscs in a Heterogenous Section of a Medium-Sized Lowland River-Floodplain System: An Example of Intermediate Disturbance Hypothesis. Polish Journal of Ecology 63(4):559-572.
Jurkiewicz-Karnkowska,E. 2009. Diversity of aquatic malacofauna within a floodplain of a large lowland river (lower Bug River, Eastern Poland). J Molluscan Stud (2009) 75 (3): 223-234
Jurkiewicz-Karnkowska,E. 2006 Communities of aquatic molluscs in floodplain water bodies of lowland river (Bug river, east Poland). Pol. J. Ecol. 54 (2) 253-266.
Willing (2018) draft report on the survey of Anisus vorticulus on Pevensey levels. Report to Natural England.

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M.B. Seddon, I.J. Killeen & A.P. Fowles. 2014. A Review of the Non-Marine Mollusca of Great Britain: Species Status No. 17. NRW Evidence Report No: 14, 84pp, Natural Resources Wales, Bangor.

## 5. Range

| | | |
|---|---|---|
| 5.1 Surface area (km²) | 1619 | |
| 5.2 Short-term trend Period | 2013-2018 | |
| 5.3 Short-term trend Direction | Stable (0) | |
| 5.4 Short-term trend Magnitude | a) Minimum | b) Maximum |
| 5.5 Short-term trend Method used | Complete survey or a statistically robust estimate | |
| 5.6 Long-term trend Period | | |
| 5.7 Long-term trend Direction | | |
| 5.8 Long-term trend Magnitude | a) Minimum | b) Maximum |
| 5.9 Long-term trend Method used | | |
| 5.10 Favourable reference range | a) Area (km²) | 1619 |
| | b) Operator | |
| | c) Unknown | |
| | d) Method | The FRR has changed since 2013. The new value is considered to be large enough to support a viable population and no lower than the range estimate when the Habitats Directive came into force in the UK. The FRR has been recalculated since 2013 to remove incorrect information on this species distribution. For further information see the 2019 Article 17 UK Approach document. |
| 5.11 Change and reason for change in surface area of range | Improved knowledge/more accurate data | |
| | The change is mainly due to: | Improved knowledge/more accurate data |
| 5.12 Additional information | | |

## 6. Population

| | | |
|---|---|---|
| 6.1 Year or period | 2013-2018 | |
| 6.2 Population size (in reporting unit) | a) Unit | number of map 1x1 km grid cells (grids1x1) |
| | b) Minimum | |
| | c) Maximum | |
| | d) Best single value | 22 |
| 6.3 Type of estimate | Best estimate | |
| 6.4 Additional population size (using population unit other than reporting unit) | a) Unit | number of map 10x10 km grid cells (grids10x10) |
| | b) Minimum | |
| | c) Maximum | |
| | d) Best single value | 8 |

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| | | |
|---|---|---|
| 6.5 Type of estimate | Best estimate | |
| 6.6 Population size Method used | Based mainly on extrapolation from a limited amount of data | |
| 6.7 Short-term trend Period | 2007-2018 | |
| 6.8 Short-term trend Direction | Decreasing (-) | |
| 6.9 Short-term trend Magnitude | a) Minimum<br>b) Maximum<br>c) Confidence interval | |
| 6.10 Short-term trend Method used | Based mainly on extrapolation from a limited amount of data | |
| 6.11 Long-term trend Period | | |
| 6.12 Long-term trend Direction | | |
| 6.13 Long-term trend Magnitude | a) Minimum<br>b) Maximum<br>c) Confidence interval | |
| 6.14 Long-term trend Method used | | |
| 6.15 Favourable reference population (using the unit in 6.2 or 6.4) | a) Population size<br>b) Operator<br>c) Unknown<br>d) Method | 26 with unit number of map 1x1 km grid cells (grids1x1)<br>The FRP has changed since 2013. The new value is considered to be large enough to support a viable population and no lower than the estimate when the Habitats Directive came into force in the UK. The FRP has been revised to 26 1x1 km grids based on recent survey data and past records, site gains and losses. It captures the finer detail of the sites. For further information see the 2019 Article 17 UK Approach document. |
| 6.16 Change and reason for change in population size | Genuine change<br>Improved knowledge/more accurate data<br>The change is mainly due to: | Improved knowledge/more accurate data |
| 6.17 Additional information | The current population is decreasing but is less than 25% below the FRP. | |

## 7. Habitat for the species

| | | |
|---|---|---|
| 7.1 Sufficiency of area and quality of occupied habitat | a) Are area and quality of occupied habitat sufficient (for long-term survival)?<br>b) Is there a sufficiently large area of unoccupied habitat of suitable quality (for long-term survival)? | Yes |
| 7.2 Sufficiency of area and quality of occupied habitat Method used | Based mainly on expert opinion with very limited data | |
| 7.3 Short-term trend Period | 2007-2018 | |
| 7.4 Short-term trend Direction | Stable (0) | |
| 7.5 Short-term trend Method used | Based mainly on extrapolation from a limited amount of data | |

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| | |
|---|---|
| 7.6 Long-term trend Period | 1995-2018 |
| 7.7 Long-term trend Direction | Increasing (+) |
| 7.8 Long-term trend Method used | Based mainly on expert opinion with very limited data |
| 7.9 Additional information | |

## 8. Main pressures and threats

### 8.1 Characterisation of pressures/threats

| Pressure | Ranking |
|---|---|
| Extensive grazing or undergrazing by livestock (A10) | M |
| Modification of hydrological flow or physical alteration of water bodies for agriculture (excluding development and operation of dams) (A33) | H |
| Invasive alien species of Union concern (I01) | M |
| Other invasive alien species (other then species of Union concern) (I02) | M |
| Natural succession resulting in species composition change (other than by direct changes of agricultural or forestry practices) (L02) | H |

| Threat | Ranking |
|---|---|
| Extensive grazing or undergrazing by livestock (A10) | M |
| Modification of hydrological flow or physical alteration of water bodies for agriculture (excluding development and operation of dams) (A33) | H |
| Invasive alien species of Union concern (I01) | M |
| Other invasive alien species (other then species of Union concern) (I02) | M |
| Natural succession resulting in species composition change (other than by direct changes of agricultural or forestry practices) (L02) | M |

### 8.2 Sources of information

### 8.3 Additional information

In relation to pressure/threat A33, this is specifically ditch maintenance works where the licensed maintenance regime is not followed.

In relation to pressure/threat I01, the invasive species concerned is floating pennywort (Hydrocotyle ranunculoides).

In relation to pressure/threat I02, the invasive species concered is Crassula helmsii.

## 9. Conservation measures

### 9.1 Status of measures

| | |
|---|---|
| a) Are measures needed? | Yes |
| b) Indicate the status of measures | Measures identified and taken |

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| | |
|---|---|
| 9.2 Main purpose of the measures taken | Restore the habitat of the species (related to 'Habitat for the species') |
| 9.3 Location of the measures taken | Both inside and outside Natura 2000 |
| 9.4 Response to the measures | Medium-term results (within the next two reporting periods, 2019-2030) |
| 9.5 List of main conservation measures | |

Manage drainage and irrigation operations and infrastructures in agriculture (CA15)

Reduce diffuse pollution to surface or ground waters from agricultural activities (CA11)

Reduce impact of transport operation and infrastructure (CE01)

| | |
|---|---|
| 9.6 Additional information | Aside from water quality issues, the principal threat to UK Anisus vorticulus populations is their very slow colonisation ability in the face of standard ditch cleaning techniques. See country level assessment for more detail. |

## 10. Future prospects

| | | |
|---|---|---|
| 10.1 Future prospects of parameters | a) Range | Good |
| | b) Population | Poor |
| | c) Habitat of the species | Good |
| 10.2 Additional information | Future trend of Range is Stable, future trend of Population is Negative - decreasing <=1% (one percent or less) per year on average, and future trend of Habitat for the species is Stable.<br>For further information on how future trends inform the Future Prospects conclusion see the 2019 Article 17 UK Approach document. | |

## 11. Conclusions

| | |
|---|---|
| 11.1. Range | Favourable (FV) |
| 11.2. Population | Unfavourable - Inadequate (U1) |
| 11.3. Habitat for the species | Favourable (FV) |
| 11.4. Future prospects | Unfavourable - Inadequate (U1) |
| 11.5 Overall assessment of Conservation Status | Unfavourable - Inadequate (U1) |
| 11.6 Overall trend in Conservation Status | Deteriorating (-) |
| 11.7 Change and reasons for change in conservation status and conservation status trend | a) Overall assessment of conservation status<br>No change<br>The change is mainly due to:<br>b) Overall trend in conservation status<br>Use of different method<br>The change is mainly due to: Use of different method |
| 11.8 Additional information | Conclusion on Range reached because: (i) the short-term trend direction in Range surface area is stable; and (ii) the current Range surface area is approximately equal to the Favourable Reference Range. |

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Conclusion on Population reached because: (i) the short-term trend direction in Population size is decreasing; and (ii) the current Population size is is not more than 25% below the Favourable Reference Population.

Conclusion on Habitat for the species reached because: (i) the area of occupied habitat is sufficiently large and (ii) the habitat quality is suitable for the long-term survival of the species; and (iii) the short-term trend in area of habitat is stable and the quality of habitat is stable.

Conclusion on Future prospects reached because: (i) the Future prospects for Range are good; (ii) the Future prospects for Population are poor; and (iii) the Future prospects for Habitat for the species are good.

Overall assessment of Conservation Status is Favourable because two of the conclusions are Unfavourable-inadequate.

Overall trend in Conservation Status is based on the combination of the short-term trends for Range – stable, Population – decreasing, and Habitat for the species – stable.

Overal assessment of Conservation Status has not changed since 2013.

Overall trend in Conservation Status has changed between 2013 and 2019 because of the removal of the Future prospects trend from the 2019 method used to assess Overall trend. Therefore this is not a genuine change in Overall trend.

## 12. Natura 2000 (pSCIs, SCIs and SACs) coverage for Annex II species

| | | |
|---|---|---|
| 12.1 Population size inside the pSCIs, SCIs and SACs network (on the biogeographical/marine level including all sites where the species is present) | a) Unit | number of map 1x1 km grid cells (grids1x1) |
| | b) Minimum | |
| | c) Maximum | |
| | d) Best single value | 7 |
| 12.2 Type of estimate | | Best estimate |
| 12.3 Population size inside the network Method used | | Based mainly on extrapolation from a limited amount of data |
| 12.4 Short-term trend of population size within the network Direction | | Decreasing (-) |
| 12.5 Short-term trend of population size within the network Method used | | Based mainly on extrapolation from a limited amount of data |
| 12.6 Additional information | | |

## 13. Complementary information

| | |
|---|---|
| 13.1 Justification of % thresholds for trends | |

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13.2 Trans-boundary assessment

13.3 Other relevant Information

# Distribution Map

Figure 1: UK distribution map for S4056 - Little ramshorn whirlpool snail (*Anisus vorticulus*). Coastline boundary derived from the Oil and Gas Authority's OGA and Lloyd's Register SNS Regional Geological Maps (Open Source). Open Government Licence v3 (OGL). Contains data © 2017 Oil and Gas Authority.

The 10km grid square distribution map is based on available species records within the current reporting period. For further details see the 2019 Article 17 UK Approach document.

# Range Map

Figure 2: UK range map for S4056 - Little ramshorn whirlpool snail (*Anisus vorticulus*). Coastline boundary derived from the Oil and Gas Authority's OGA and Lloyd's Register SNS Regional Geological Maps (Open Source). Open Government Licence v3 (OGL). Contains data © 2017 Oil and Gas Authority.

The range map has been produced by applying a bespoke range mapping tool for Article 17 reporting (produced by JNCC) to the 10km grid square distribution map presented in Figure 1. The alpha value for this species was 20km. For further details see the 2019 Article 17 UK Approach document.

# Explanatory Notes

**Species name: Anisus vorticulus (4056) Region code: ATL**

| Field label | Note |
|---|---|
| 5.11 Change and reason for change in surface area of range | The 3rd report mapped supposed populations in the Bristol area in the west of England. Closer inspection of the sources of those records brings most of them into question, leaving only one of them with a possibility of being correct. Two of the records were from a suburban stream edge, another when checked was an input error for the common Anisus vortex, and one was an ascription to A. vorticulus from a record that stated only Anisus has been found. The outstanding record is from a good source in a Somerset levels wetland, and is the sort of habitat one might expect A.vorticulus to occur in. This area does need surveying to discover if there are any western populations. That aside this group of 2 ten km sqs should not be regarded as sound, reducing the species range calculation. |
| 6.2 Population size | The reduction in monad count for the 4th period is partly driven by the declines at Pevensey Levels. Although our understanding of the distribution of this very large area of grazing marsh ditches is incomplete, the historically strong areas have showed some spatial declines. The habitat is, of course, very artificial, and quite unlike the sort of functional wetland ecosystem it should be in. This makes the maintenance of the conditions we think it understands hard to replicate and sustain. The comparison between the 2007 survey and that of 2018 shows a loss of two monads of occupation at Pevensey (Willing, 2018). The drop to 8 mapped hectads is a mix of survey level effort in the 4th period and some seemingly real declines at Pevensey, as well as rejection of the incorrect west of England records. The latter will have reduced the 3rd account down to 11, with the further drop down to a mixture of less survey coverage and loss. New populations have been recently found (2017-2018) within the 4th period, but those were extant before, just not known about, and are clustered at the hectad level. The drop in monad count is part loss, part under-survey of some sites that were able to be surveyed for the 3rd report but not the 4th; utilisation of much of the funding on complete survey of the Amberley Wildbrooks SAC ditches accounts for some of this lack of coverage. |
| 6.12 Long term trend; Direction | Looking at Kerney (1976) mapping of Anisus in the UK, there is a remarkable co-incidence of the 10km square distribution between now and then, incorporating records post 1950. As noted in the 3rd report, there have been real losses within that distribution, though more survey work has uncovered both new sites and additional sites within that historic range. Overall the long term trend might now be seen as stable, or with at most a quite shallow level of decline. |
| 7.1 Sufficiency of area and quality of occupied habitat | A.vorticulus has only been found in the UK within grazing marshes which are drained by ditches, rhymes, dykes etc. It occurs in the unpolluted, calcareous waters of well-vegetated marsh drains and is occasionally found with other uncommon or vulnerable molluscs such as Valvata macrostoma, Pisidium pseudosphaerium and Segmentina nitida and often found floating on the surface amongst duckweed (Lemna spp.). It also shows preference for ditches or channels of >3m in width and >1m in depth with a diverse flora but with a moderate emergent vegetative cover, and often occurs in ditches in wet fields that flood in winter, as this may be important in enabling young snails to colonise new ditches. However, it is really a wetland species, and the problems that arise with it being in the wrong habitat do nothing for its conservation. Clearly the UK needs to establish this species back within functional wetlands within which it formerly existed; much of The Broads grazing marsh drainage had been effected in the 18th century and the species was almost certainly pushed into the ditch systems it still occupies. |

| | |
|---|---|
| 7.4 Short term trend; Direction | The habitat for the species becomes ever more difficult to place, as we gradually understand more about this species. Work (various papers by Jurkiewicz-Karnkowska) suggests that bound phosphate and large levels of coarse organic particulate matter might be key drivers for this species, but these parameters are nor routinelt measured within the ditch systems and, as the 3rd report noted, the issue is compounded by Anisus often not being present when the other rare mollusc species are. Finding a proxy for habitat quality and its trend is therefore hard. 2294.93 remains the hectarage of grazing marsh in England, though much of the western England resource is not used by the species. |
| 7.7 Long term trend; Direction | An argument founded on water quality improvements which have generally improved. Working counter to this will have been unsympathetic agricultural ditch clearance programmes over the long-term, in the absence of understanding how this will have impacted this species. |
| 7.9 Additional information | As noted in the 3rd report, this species seems to be naturally rare within the ditch systems in which it occurs, even when the ditches support a number of other rare aquatic snail species (such as Valvata macrostoma) and so have both good water quality and ditch management regimes. That said, it probably ought to be more widespread than it is within the areas it occupies. Confirmation of its poor distributional status at Amberley does lead to the conclusion that much more habitat is available if only its quality was improved. There are issues around how the species would colonise, of course, and some experimental tranlsocations are being undertaken within the Broads SAC; if these prove successful this may enable the species to consolidate its position better. |
| 8.3 Additional information | Both the non native species are impacting at Pevensey levels, and then only over part of that area. Crassula may have the edge on causing the most damage, since it is capable of infilling ditches. The additional pressure of successional change is particularly relevent to the ditch systems the species uses, and our understanding of the niche it occupies which suggests a transitional meta-population is in existence which makes relatively static ditches hard to manage for it. On those natural functioning wetland ecosystems it utilises it ought to do much better, though at possibly lower population densities. This latter pressure is constant. |

| | |
|---|---|
| 9.6 Additional information | This species in included in the UK Back from the Brink project, where experimental ditch management techniques are to be trialed to assess the impact this has on this species. The draft England Favourable Conservation Status statement for this species sets a number of parameters to be addressed, which are related to the ditch and wider wetland management, to ensure this processes are present and in operation: As favourable for this species is unknown, the following can be considered as factors: For ditches - Connected to other favourable ditches, or at least not too isolated - Mid to late successional stage, probably defined by a high plant-animal diversity measure - Obvious open water present but<50% - up to 50% floating/submerged vegetation and up to 50% emergent. - Maintenance periodicity long (> 10 years between cleans) - Grazed edges, so limited over-shading. - Ditches should have a berm/margin (with gentle gradient) on one side or both - Water-quality good - Good coarse organic particulate matter in the ditch bottoms. Since Anisus vorticulus has been lost as a functional wetland species in the UK, European data is used here to construct the elements composing the favourable habitat parameters. For wetlands: -adjacent waters always clear and oligotrophic to mesotrophic - 0 to 0.5 m water depth Riparian zones with sheltered shores or swampy calcareous fens which are sun exposed, with - sediments varying between peaty and compact vegetation-fixed muddy sand. - prefers higher temperatures and thus occurs predominantly in well insolated, shallow water bodies. - most frequent in lakes (64% in Polish samples). It was occasionally found in streams and rivers systems (2 localities each), but only in dsecondary channels and former channels - slow to no discernible flow - In a large PCA ordination of river wetland species, those taxa often associated with A.vorticulus were associated with a muddy ditch substrate with coarse organic particulate matter. It is considered that this reflects expression of the Intermediate Disturbance Hypothesis operating between main river channel and former river channel, though the latter shows little differentiation from the mollusc-rich secondary water channel. A.vorticulus seems to require this transitional state. - Late successional samples in which A.vorticulus was found were statistically different from younger communities where it was absent. Late successional sites described as 'shallow water bodies were characterized by thick layer of dark muddy sediments with coarse detritus admixture and represented strongly advanced successional stages.' |
| 10.1 Future prospects of parameters | This species will really only consistently do well when we establish more populations within large wetland ecosystems. Having populations trapped within ditch networks makes sustaining them very hard. Work is currently underway to guage the success of translocation, and it is quite possible that within the future parameters time frame we will have moved populations into more sustainable habitats. |
| 12.6 Additional information | A complete survey of Amberley Wildbrooks section of the Arun Valley SAC showed an almost complete absence, meaning that the species resource is centred on the Pulborough brooks section. However, there is only patchy historical data for Amberley, its inclusion into the SAC being founded on hydrological unit grounds and on the expectation that the species ought to be present within the southern sector of this site. Generally much of the SSSI was considered unfavourable recovering under the last assessment. Pulborough is subject to conservation effort there to assess ditching impacts upon. The vast Pevensey Levels SAC remains poorly known, but is considered still reasonably strong for the areas known although the 2018 survey showed losses in the core ditches. Good and increasing survey work within the Broads SAC is uncovering new sites, as well as returning to known locations. The drop in records between the 3rd and 4th SAC representation counts is partly through real decline but partly through under-sampling in the 4th report, since much of the survey effort was directed to a complete assessment of Amberly Wldbrooks SAC. So there has been some loss within the SAC network, it seems, but probably not as large as the data suggest. |