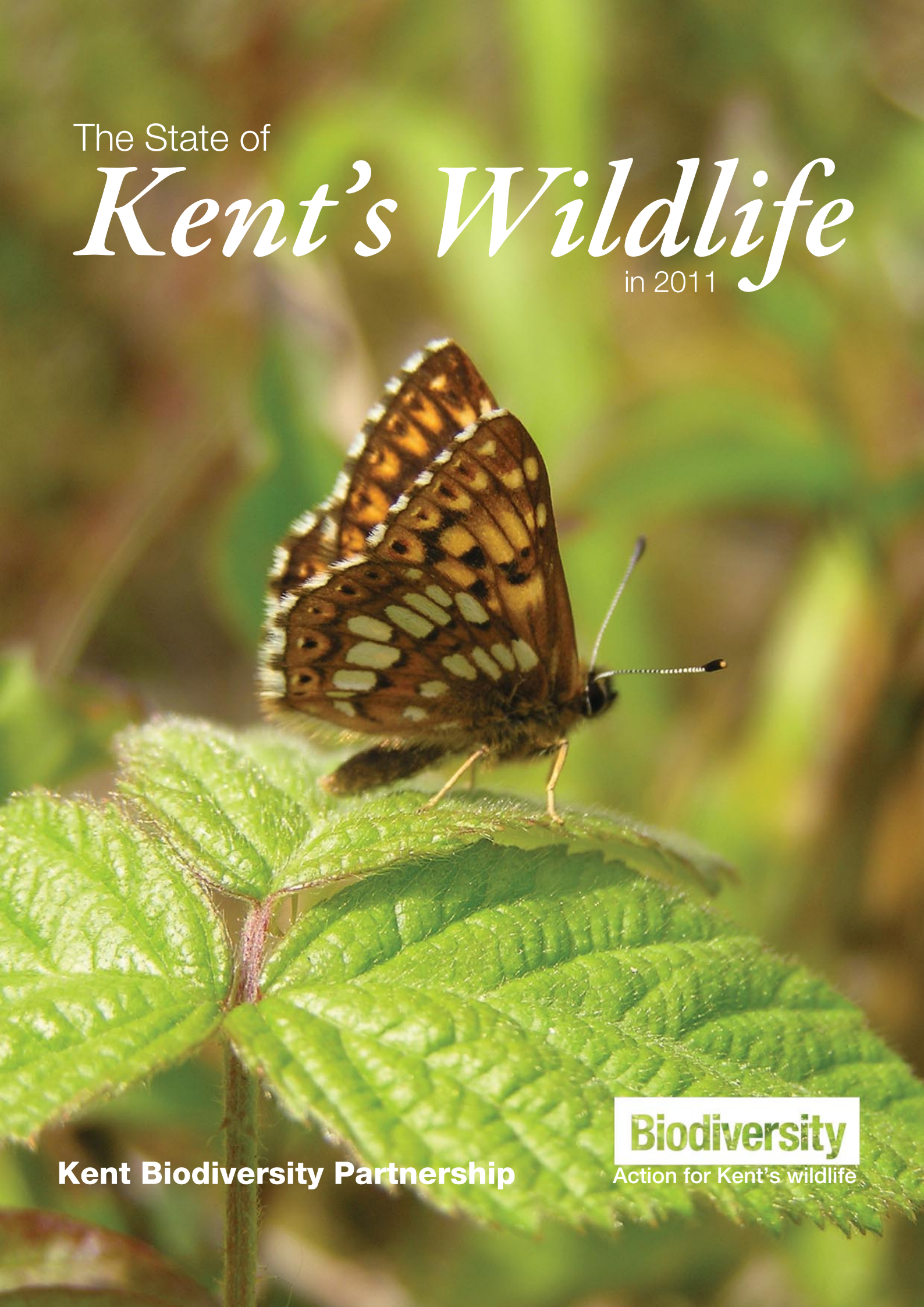


The State of *Kent's Wildlife* in 2011

Kent Biodiversity Partnership

Biodiversity
Action for Kent's wildlife

Contents

Introduction

The State of Kent's Wildlife in 2011

Kent is one the UK's most wildlife-rich counties, a result of its varied geology, long coastline, landscape history, southerly location and proximity to mainland Europe. Its important wildlife habitats include estuaries, chalk cliffs, woodlands, and chalk downland, and encompass some of the South East's most iconic landscapes, such as the shingle headland of Dungeness and the White Cliffs of Dover.

This publication has been prepared by Kent natural historians to give an outline of the changing fortunes of Kent's wild plants and animals over the last century. It is intended to provide a context for, and to inform, on-going action to protect and restore the county's wildlife and wild places.

The picture painted here is far from entirely rosy but is not all doom-and-gloom. It is recognised, for example, that protection of the best wild places, such as nature reserves or Sites of Special Scientific Interest, has been successful in protecting some otherwise very threatened habitats.

It is also the case that a number of previously rare and threatened species are recovering. The recent return to Kent of birds, such as the Hobby, Buzzard and Raven, show how conservation measures (in these cases, protective legislation and the banning of dangerous pesticides) can be very effective.

Nonetheless, it is clearly the case that the last century has seen major losses in Kent's wildlife. During this period, 30 species of wild plant, eight species of butterfly, one amphibian, one reptile, 10 bird species, and two species of bat all became extinct in the county. This excludes consideration of groups not covered in the following chapters; for example, the Red Squirrel and 3 species of bumblebee were also lost during the 20th century. In addition to this, many of the species that remain have seen big population declines, including many species of butterflies and moths, birds and wildflowers of farmland, wetland plants, Adders and Common Toads.

As seen in the following chapters, the causes of these losses and declines are various. However, amongst the most important are:

- direct loss of land of value to wildlife to built development or intensive farming, which has reduced and fragmented populations of wild plants and animals
- intensification of the way land is farmed, particularly the use of pesticides and artificial fertilisers, which has resulted in losses of wildlife across the wider landscape, and has increased nutrient levels on land and in water
- changes in the management of woodland, resulting in loss of open space in woods and forests
- climate change, which increasingly shapes which species are, and are not, able to live successfully in Kent

It has been acknowledged that the UK and the other signatories to the 1994 Convention on Biodiversity failed to meet their self-imposed target of halting the loss of biodiversity by 2010. If we still want to achieve this laudable and important aim, there is much to do. The information in the following chapters will prove invaluable in guiding future efforts.


Kent's
Butterflies

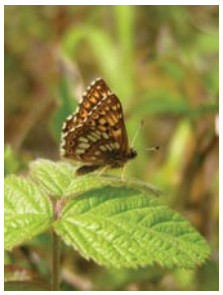


Photo: R I Moyse

The Duke of Burgundy is now only found around the Denge Wood area

Kent's Butterflies

Mike Easterbrook, Butterfly Conservation - Kent

Kent lost eight species of butterfly during the last 100 years, and at least three further species now only survive as very localised populations. Habitat change and loss, particularly loss of downland and wetland, and changes in woodland management, are likely to be the most important causes of butterfly population decline.

However, some butterflies species are showing population increases, or recovery from previous declines. Targeted conservation work is also proving effective.

The restoration and reconnection of existing areas of butterfly habitat is likely to be necessary to maintain and restore populations in the future.

Kent's butterfly fauna

Some seventy species of butterfly have been recorded in Kent, though a number of these are scarce migrants or specimens of doubtful origin (i.e. either escapes or deliberate releases from captivity). There are now forty species which are resident in the county, as well as one regular migrant which may occasionally breed here (the Clouded Yellow) and a number of irregular migrants, such as the Swallowtail.

Species known to have been resident in Kent and now extinct, with dates when last seen

Glanville Fritillary	Pre-1900
Wood White	1915
Black-veined White	1920s
Marsh Fritillary	1945
Brown Hairstreak	Early 1970s
High Brown Fritillary	Early 1970s
Silver-studded Blue	1970s
Small Pearl-bordered Fritillary	1991
Pearl-bordered Fritillary	2002

Several species are just about hanging on in Kent at the moment. The Grayling is in a particularly precarious position, as it is now reduced to one main colony near Folkestone, with occasional sightings from two other sites. The Duke of Burgundy is now confined to a few small colonies in one small area of Kent. The Small Blue is another butterfly that lives in small colonies, with little mobility. Over the last century many of these colonies have been lost to changes in land use and building development, so its distribution is now very restricted. Its stronghold is on the cliff tops in the Dover and Deal area, with a colony in Thanet, two small colonies in mid-Kent and one in north¬west Kent. It is unlikely to colonise any other areas without human intervention and is dependent on the presence of its food plant, kidney vetch, in suitable condition. These factors mean that its future is uncertain. The Heath Fritillary is also restricted to a small number of sites, but in this case the prospects are more optimistic. This is partly because intensive scientific research has revealed the management requirements that allow it to flourish and, very importantly, the woods where it survives are now owned and managed by conservation organisations.

Apart from the species mentioned above, there are other butterflies that have suffered declines in range, but less catastrophically. These include three species of Skipper butterfly, the Dingy, Grizzled and Silver-spotted, and the Dark Green Fritillary. In many cases colonies of these butterflies have been lost because of changes in habitat, particularly the loss of huge areas of chalk downland to arable farming or to scrub.

Nationally, more than two-thirds of our resident butterfly species have become less widespread since the 1970s, and 54% of the species assessed by Butterfly Conservation have declined in overall population size in this time. In some cases, these declines have been substantial: populations of the Duke of Burgundy and Heath Fritillary (both of which have important colonies in Kent) declined by 58% and 46% respectively in the period 1995-2004.

Photo: R I Moyse

The Dingy Skipper has undergone declines and is now on the UK Biodiversity Action Plan priority list

Photo: Bryony Chapman

The Silver-washed Fritillary was previously veryrare in Kent, but has recently expanded its range

Kent's Butterflies

Mike Easterbrook, Butterfly Conservation - Kent

Positive change in butterfly populations

It is not all bad news, however. Some butterflies are more numerous now than at various stages in the last 100 years. Some of them have experienced major changes in numbers and distribution over that period. The Comma, now a fairly common butterfly in gardens, woods, and the wider countryside, was extremely rare in Kent for a century or more prior to 1930. Another butterfly that is common now, the Speckled Wood, was absent from Kent from 1913 to 1942, before returning to west Kent in the 1940s and spreading to much of the county by 1960. The Gatekeeper and Essex Skipper are two more butterflies that increased their range in the 20th century and are common today.

Two woodland butterflies, White Admiral and Silver-washed Fritillary, both became very scarce in Kent between 1960 and 1980. The White Admiral was the first to recover, re-colonising from the west during the 1990s. The rate of spread has probably increased over the last few years, and it is now recorded again in east Kent. 2006 saw the most records for Silver-washed Fritillary in Kent for many years and this upward trend has continued, with reports from more new sites in 2010.

A number of butterflies are also benefiting from targeted conservation action:

- the reintroduction of woodland management to the Blean Woods complex led to major increases in what is now the UK's most important population of Heath Fritillary
- projects to reintroduce the Adonis Blue and Silver-spotted Skipper to Kent Wildlife Trust reserves at Queendown Warren and Burham Down have been highly successful, with the Adonis Blue subsequently colonising other sites nearby.
- a project by Butterfly Conservation is re-establishing woodland management for the Duke of Burgundy at a number of sites in and around Denge Woods near Canterbury

Conclusions

There have been many changes in the populations of butterfly species in Kent over the last hundred years and many of these changes cannot be attributed to habitat loss. However, for the less mobile species that live in discrete colonies, loss of habitat is a major factor in their decline. Changes of land use also have major implications for recovery of butterfly populations – when suitable habitat is greatly reduced and fragmented it is difficult for butterflies to find and re-colonise. Isolated nature reserves are often unlikely to be re-colonised without difficult and costly artificial releases and will be vulnerable to subtle changes in habitat caused by changes in management and climate.

As increasing amounts of land are lost to building development and large areas of farmland are unsuitable for supporting butterfly populations, it is vital that other land is protected or restored. It is also essential that suitable areas are linked together, so that butterflies and other wildlife can spread between them.

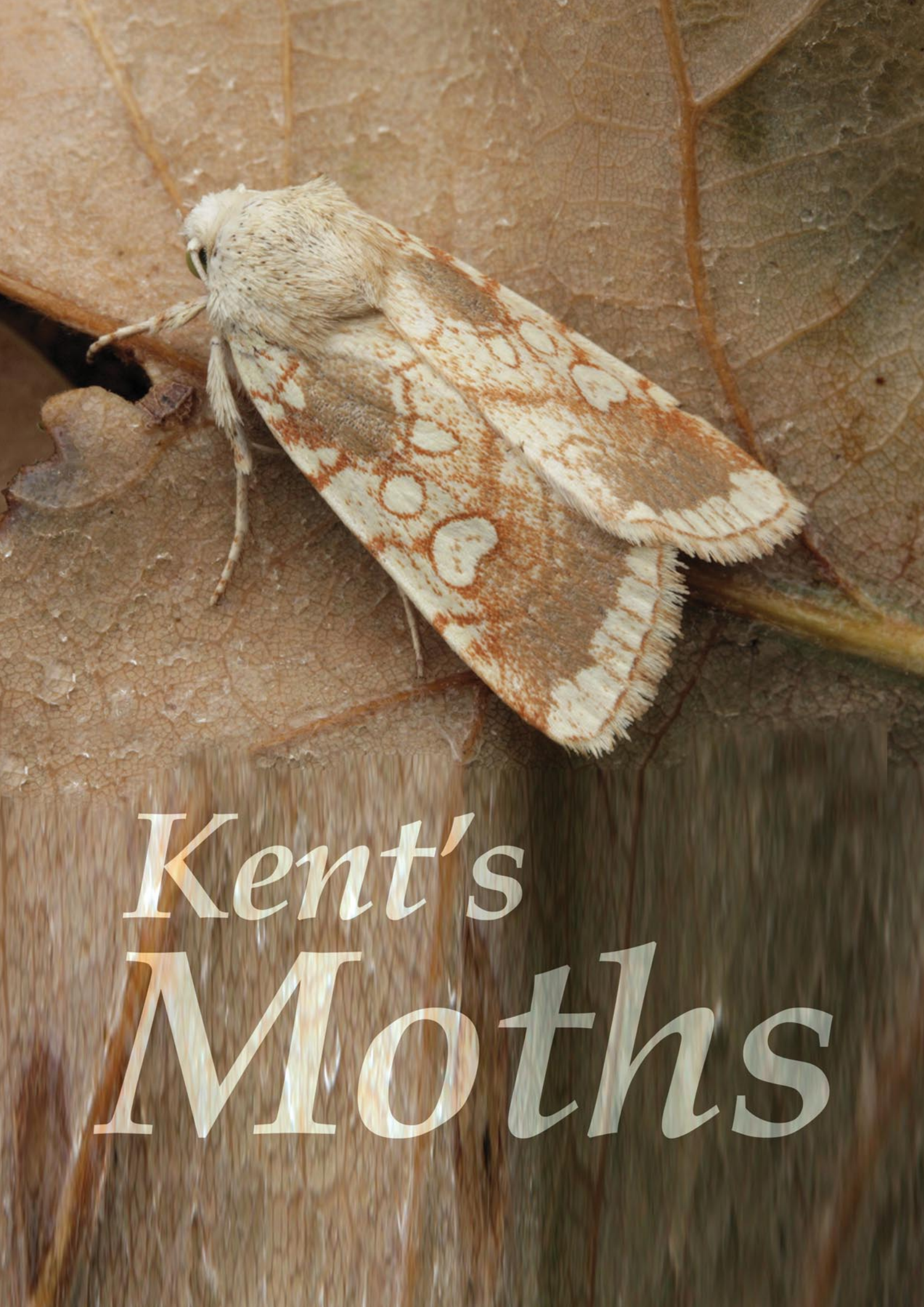
References

Butterfly Conservation, Kent Branch. Annual Reports, 1994-2006. Chalmers-Hunt, JM. (1961). *The butterflies and moths of Kent.*

Chalmers-Hunt, M. (1979). Supplement to the butterflies and moths of Kent. Embry, B & Youden, GH. (1949). *The butterflies and moths found in the Dover and Deal district of Kent.*

Folkestone Natural History Society (1968). Some aspects of the natural history of the Folkestone District. Fox, R et al. (2006). *The state of butterflies in Britain and Ireland.*

Philp, EG. (1993). The butterflies of Kent. Kent Field Club Scott, E. (1936). A list of the butterflies and moths occurring in the neighbourhood of Ashford, Kent.



Kent's Moths

Kent's Moths

Ian Ferguson and David Gardner, Butterfly Conservation - Kent

Kent's moth fauna has undergone substantial change over the last 100 years, with species being lost and gained, often naturally, but also due to human activity.

However, the number of species lost far outweighs the number gained, and must also be seen against national declines in moth populations. Habitat loss and the massive increase in pesticide use during the 20th Century are likely to have had major impacts on moth populations.

Introduction

Some 2000 species of moth (out of a national total of around 2,500 species) have been recorded in Kent, though some of these are one-offs, some very hard to find, and others no longer believed to be here. Species range in size from tiny leaf-mining moths to the Death's-Head Hawk-moth: nearly 750 species of larger moth have been found in the county, representing over 80% of the UK fauna. Kent has important populations of a number of rare moth species, including Straw Belle on the Kent Downs, and the coastal species Bright Wave and Fiery Clearwing, the latter being now entirely restricted to Kent.

Kent is an important county for moths as it is very close to the continent, so migrant species can reach this country and attempt to breed. Kent receives regular influxes of common species, and in years with poor migrant numbers the count of moths in garden moth-traps is seen to be lower. The regular movements of migrants keep the UK populations in touch genetically with the main centres of the species in mainland Europe.

Change in moth populations

There is constant change in the number of moth species living in Britain, as resident species are lost and new species colonise.

This pattern is reflected in Kent; an informed assessment shows that, over the 20th century, the county lost thirty-seven species and gained nineteen species.

Some new arrivals probably simply reflect this continual flux, although other changes may reflect a range of factors. For example:

- pine Hawk-moth was previously recorded as a migrant, but has moved into Kent from the west, perhaps as a result of climate change
- clay Triple-lines, which used to be found by searching under beech hangers now seems to use beech hedges, so can be found almost anywhere in Kent. Other species whose expansion reflects changes in parks and gardens include Blair's Shoulder-knot, which mainly feeds on non-native cypress trees.

Change in the number of moth species recorded in Kent

Period	Gain	Losses
19th c	Unknown	10
20th c	19	37
21st c	6	4

- species such as Orange Footman, which feed on lichens, have increased following reductions in air pollution in the second half of the 20th Century, and the associated increase in pollution-sensitive lichens.

In the UK as a whole, 62 moth species became extinct during the 20th century. However, species extinctions are only part of the picture, and the key concern is the recent massive decline in the numbers of many moth species. Of the 337 larger moths species for which a UK population-trend has been generated, two-thirds show declining populations, and seventy-one species – a fifth of the total – have declined in numbers by more than 70% over the last 35 years. Population declines have been particularly severe in the South East.

Kent's Moths

Ian Ferguson and David Gardner, Butterfly Conservation - Kent

Kent has not been immune from these changes. For example:

- the V-Moth, which has shown a 97% national decline since 1968, was last seen in Kent in 2003.
- the Garden Tiger- so named because it was once seen commonly in gardens– has declined by 89% nationally, and in Kent is now almost entirely restricted to the coast.
- the Barred Umber has declined to a point where we have no record since 2005
- the Lace Border has declined and disappeared from many locations, now restricted to a few downs in Surrey and Kent.
- black-veined Moth has declined and is now restricted to the eastern downs of Kent.

Causes of change in moth populations

There are likely to be a number of reasons why moth populations have declined so massively over recent decades. Among the most important in Kent are likely to be habitat loss and fragmentation, changes in habitat management, increased use of pesticides and climate change. Light pollution may also be an important issue for moths, though its impact is hard to separate from other effects of urbanisation.

Habitat change and loss

Habitat loss accelerated in the second half of the 20th Century with increased built development and intensification of agriculture and forestry. Nationally, it is estimated that 80% of chalk grassland, 97% of lowland hay meadows, 40% of lowland heathland, and 67% of hedgerows were lost over this period (though substantial lengths of new hedgerow have been replanted since 1990). Figures for Kent are harder to determine, though heathland in the county has probably declined by two-thirds since the mid-1940s.

Agricultural and forestry intensification did not just lead to direct habitat loss (for example, by ploughing and reseeding of grasslands, draining of wetland and grubbing of woodland), but resulted in the abandonment of marginally productive agricultural land, such as chalk grassland and heath, and to a sharp decline in traditional, commercial management of broad-leaved woodland. The resulting changes to habitats resulted in loss of populations as shading by trees and scrub led to lower ground temperatures and loss of foodplants. As an example, the loss of chalk grassland to scrub following the introduction of myxomatosis in the 1950s was the likely cause of the extinction of the Feather Ear in Kent (last recorded in 1963).

Photo: David Green, Butterfly Conservation

Heart moth. This species ceased to breed in Kent during the 1990s

Kent's Moths

Ian Ferguson and David Gardner, Butterfly Conservation - Kent

LOSSES

Year	Species
1831	Bordered Grey
1865	Grey Scalloped Bar
1868	Kentish Glory
1873	Frosted Yellow
1876	Scarce Dagger (1)
1881	Brighton Wainscott
1891	Purple-bordered Gold
1891	Dusky Clearwing
1895	Scarce Black Arches (1)
1899	Gypsy Moth (1)
1902	Scarce Burnished Brass
1903	Spotted Sulphur
1909	Dingy Mocha
1909	Small Ranunculus (2)
1916	Marbled Pug
1916	White-marked (1)
1948	Dark Crimson Underwing
1951	Small Eggar
1955	Cistus Forester
1955	Beech-green Carpet
1955	Butterbur
1956	Dark Brocade
1956	Bond's Wainscott
1958	Narrow-bordered Bee Hawk-moth
1958	Lunar Double-stripe
1959	Orange Upperwing
1960	Dentated Pug
1961	Double Line
1963	Feathered Ear
1963	White-barred Clearwing (2)
1965	Grass Wave
1967	Four-spotted (3)
1968	Argent & Sable
1968	Cudweed
1968	Light Crimson Underwing
1973	Horse Chestnut
1974	Autumn Green Carpet
1975	Sloe Carpet
1976	False Mocha (1)
1976	Wood Tiger
1976	Small Black Arches
1977	Lesser Belle
1984	White-spotted Pinion
1987	Five-spot Burnet
1988	Essex Emerald
1992	Pale Shining Brown (1)
1994	Heart Moth
1999	Scarce Forester
2000	Scarlet Tiger
2001	Bordered Gothic
2003	V-moth

GAINS

Year	Species
1903	White-barred Clearwing
1924	White-banded Carpet
1927	Sallow Clearwing
1935	Vine's Rustic
1948	Reed Dagger
1953	Marsh Mallow Moth
1965	Cypress Pug
1965	Silver Barred
1968	Blair's Shoulder-knot
1975	Sloe Pug
1981	Feathered Beauty
1984	Dusky Peacock
1990	Sandhill Rustic
1992	Large Ear
1993	Radford's Flame Shoulder
1995	Balsam Carpet (4)
1995	Tree-lichen Beauty
1997	Small Ranunculus (2)
1997	Dotted Chestnut
1999	Cypress Carpet
2000	Fisher's Estuarine Moth (5)
2001	Jersey Tiger
2002	Clancy's Rustic
2003	Langmaid's Yellow Underwing
2003	Splendid Brocade
2004	Porter's Rustic
2010	Raspberry Clearwing

NOTES

(1) Still occurs as a migrant
(2) Recolonisation following earlier loss
(3) May have recolonised subsequently
(4) Presumed date; first confirmed 2005
(5) Introduced

Kent's Moths

Ian Ferguson and David Gardner, Butterfly Conservation - Kent

Pesticide use

The use of garden and agricultural pesticides increased substantially during the second half of the 20th century, although the use of agricultural insecticides has declined over the last 20 years (in the South East, the total weight of insecticides are applied declined by nearly 70% between 1990 and 2006). Agricultural herbicide use in the South Easthas also declined over the last 20 years (though in this case by only about 25%), though the area treated (the area over which insecticides applied multiplied by the number of treatments), has increased. Butterfly Conservation has suggested that the effectiveness of herbicides in reducing weed populations may be impacting on moths by reducing the availability of food plants.

Climate change

The effects of climate change on moths are likely to be mixed. Some species with southern distribution are showing expansions in range in the UK. How climate change is involved in moth decline is less clear, though studies on the Garden Tiger moth have shown that it declines after wet winters and warm springs.

References

Butterfly Conservation, Kent Branch. (2003). *An Initial Checklist of Kent Lepidoptera.*

Butterfly Conservation. (2006).*The State of Britain's Larger Moths.*

Food and Environment Research Agency website (http://pusstats.csl.gov.uk).

Kent Biodiversity Action Plan website (www.kentbap.org.uk).

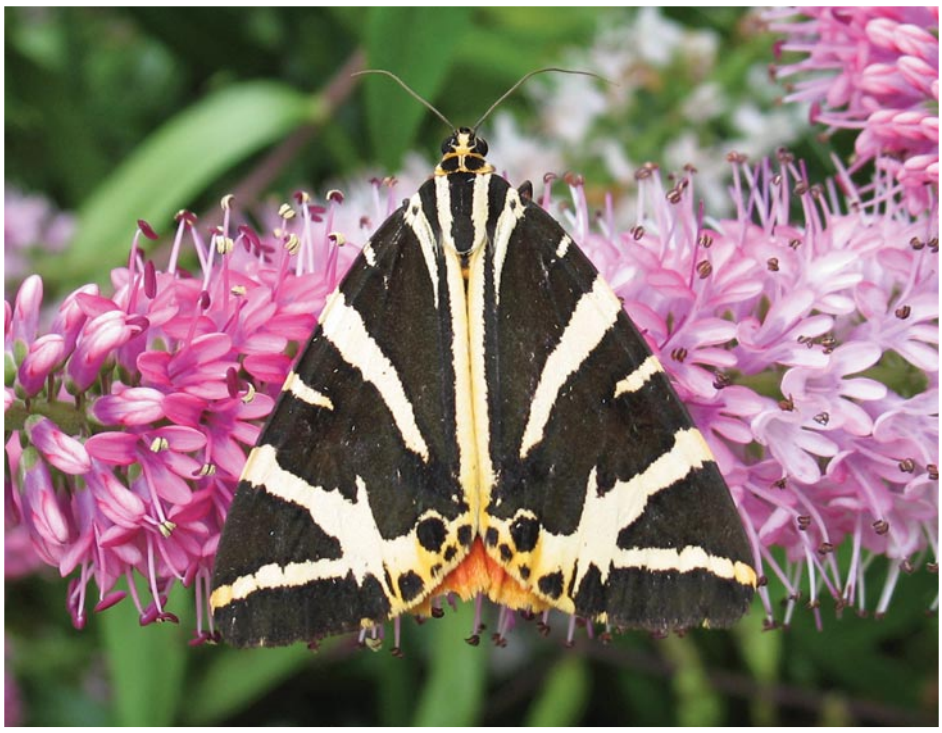
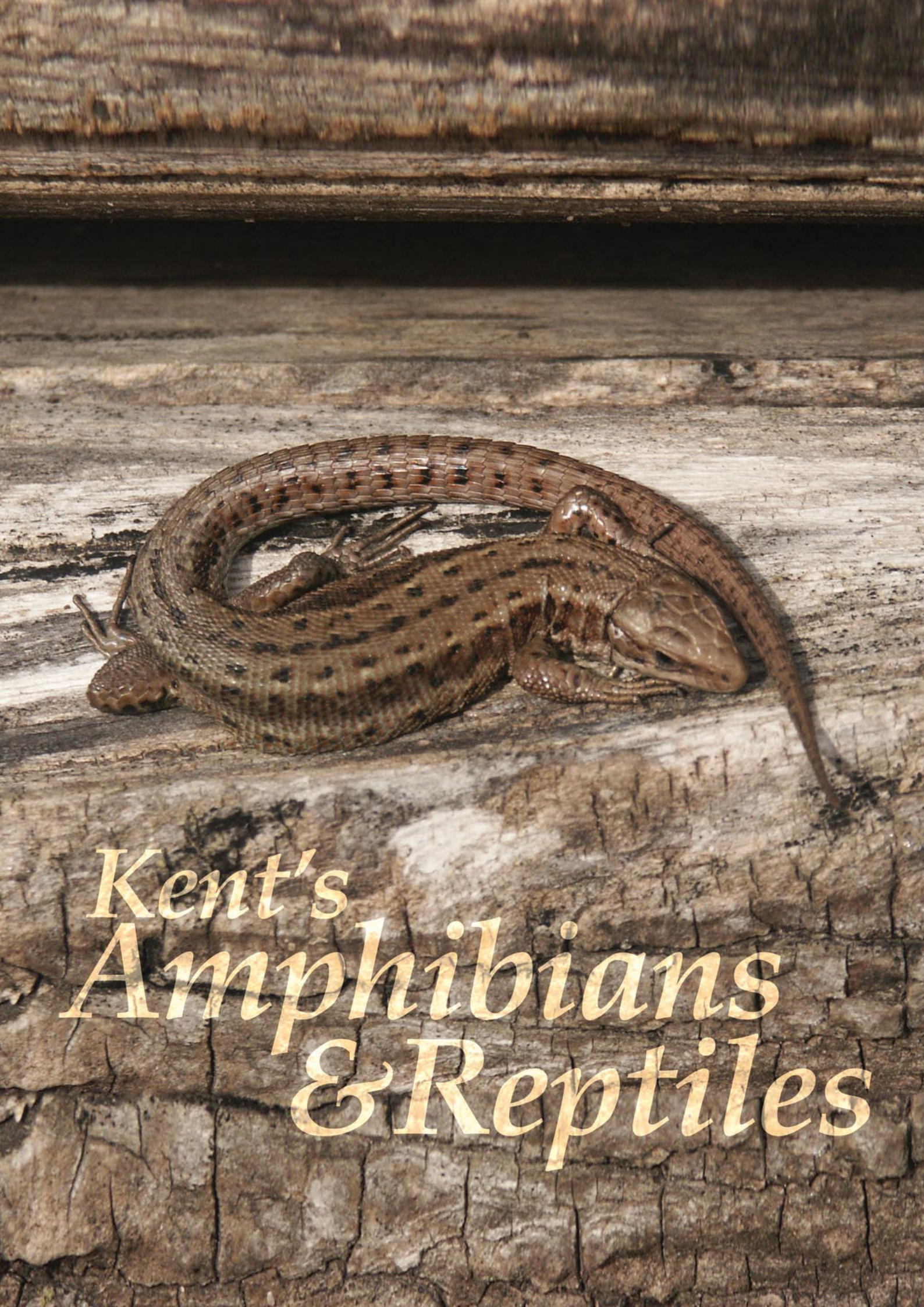


Photo: Mark Parsons, Butterfly Conservation

Jersey Tiger. A new species to Kent in 2001


Kent's
Amphibians
& Reptiles

Kent's Amphibians and Reptiles

Dr Lee Brady, Kent Reptile and Amphibian Group

During the 20th century, Kent lost one of its five reptile species, and one of its six amphibians. National declines in populations have been so severe that all Kent's reptiles, and three of its seven amphibians are listed as Priority species in the UK Biodiversity Action Plan.

Habitat loss and fragmentation are the most important factors causing declines in amphibian and reptile populations. Built development is very significant as 'brownfield' sites can hold large reptile populations, and all species have trouble crossing artificial barriers such as large roads.

Europe has around 60 amphibian species and around 120 reptile species. However, just seven amphibian species (including the reintroduced Pool Frog) and six native terrestrial reptiles were able to colonise the British Isles before they became isolated from the rest of Europe. Kent has even fewer species with native populations of Pool Frog and Smooth Snake never recorded. Although Kent populations of Natterjack Toad and Sand Lizard became extinct in the 1960s, both species are now subject to reintroduction projects. In addition, several new species have been introduced and now form viable breeding populations.

Current Status of Herpetofauna

The secretive and cryptic nature of Kent's herpetofauna means that they are not always easily visible. This can create difficulties in establishing species presence and determining population status.

Native Amphibians

The most important factor limiting amphibian populations is the number of available breeding ponds. Outside of the breeding season, amphibians can disperse in terrestrial habitat (for some species dispersal can even occur over several kilometres when habitat connectivity is high). Detectability of animals in terrestrial habitat, and sometimes even in ponds, can be very low, but long-term population assessments that control for detectability have revealed that amphibian populations can experience cycles, with numbers increasing over several years followed by declines before the cycle repeats itself.

Common Frogs are distributed across the county and frequently recorded in urban and suburban areas, particularly where there are large numbers of small garden ponds. In the wider countryside, Common Frog pond occupancy appears to be negatively influenced by high pond density, because high pond density is associated with high populations of Great Crested Newts, which feed on frog tadpoles. In such areas, Common Frogs often breed in relatively small ponds that desiccate too early in the season to support large numbers of aquatic predators.

Common Toads tend to breed in larger, more permanent waterbodies that frequently support populations of fish, as toxins present in the skin of toad tadpoles

Smooth and Palmate Newts display very similar life histories and frequently occupy the same breeding ponds. However, Palmate Newts have never been recorded from some areas of Kent (e.g. Sheppey, Thanet and Dungeness), even though these areas do support populations of Smooth Newt. Analysis of habitat data reveals that areas not occupied by Palmate Newt typically display relatively low tree cover and historically were probably never heavily wooded. This is probably related to Palmate Newts' greater tolerance of acidic conditions, which may give them a competitive advantage in Kent's woodland ponds.

This makes them relatively unpalatable to predatory fish. The number of larger more permanent ponds and lakes in Kent is lower than that of smaller more ephemeral waterbodies, and this limits the potential distribution of Common Toad. Survey work in Kent also suggests that the largest toad populations are more frequently found where there are no significant dispersal barriers between breeding sites and good quality terrestrial habitat (e.g. woodland).

Kent's Amphibians and Reptiles

Dr Lee Brady, Kent Reptile and Amphibian Group

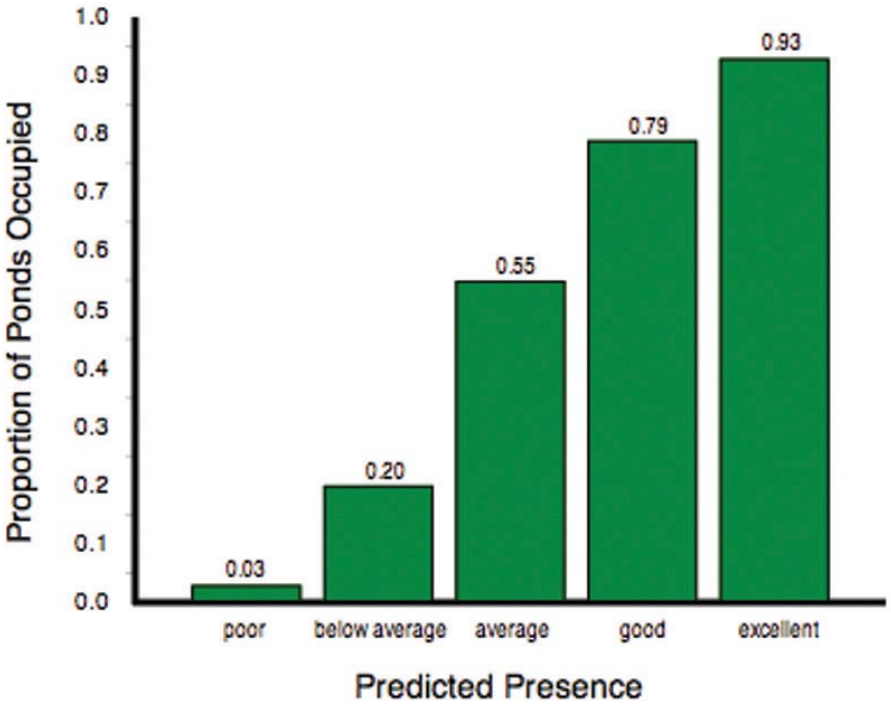
National declines in Common Toad have resulted in the species' designation as a Biodiversity Action Plan Priority Species.

The most important factor influencing the Kent distribution of Great Crested Newt is rural pond density. Kent has exceptionally high pond density, with some areas of the Low Weald displaying more than 50 ponds per km2. Pond densities lower than 4 ponds per km2 are limiting for Great Crested Newt, but as pond density increases above this value, occupancy by Great Crested Newt also increases. In areas of high pond density, Great Crested Newt may even be found in relatively poor quality ponds. Such ponds may not necessarily be used for breeding and any breeding that does take place may not be successful. Of the 17,000+ ponds believed to occur in Kent, 44% have been estimated as occupied by Great Crested Newt whilst 32% may be used for breeding.

Non-Native Amphibians

Twelve Hungarian Marsh Frogs were introduced to a garden at Stone-in-Oxney in 1936. From this, and other introductions (including on the Isle of Sheppey and the Hoo Peninsula), the species has significantly expanded its range. Populations have established across Romney and Walland Marshes as well as along the Medway and Stour river valleys, with large numbers of Marsh Frogs now regularly seen at Sandwich and across the North Kent Marshes. In the Kent Weald, Marsh Frogs have spread as far west as Horsmonden. Marsh Frog is very similar to the Pool and Edible Frogs (the latter a hybrid of the other two species). All three species have been introduced to Kent, and reports of very loud calling frogs could be attributed to any of the three species.

At least three areas in Kent are believed to support breeding Alpine Newt. In the 1990s,



The relationship between Great Crested Newt pond quality and pond occupancy. The horizontal axis shows predicted pond quality derived from habitat suitability indices. Note that Great Crested Newts can sometimes occur in poor quality ponds and do not always occupy excellent quality ponds

Kent's Amphibians and Reptiles

Dr Lee Brady, Kent Reptile and Amphibian Group

Alpine Newts were introduced to two waterbodies located at different Canterbury sites. Successful breeding at both sites has resulted in colonisation of other nearby ponds and the population expansion is considered likely to continue.

American Bullfrog is a large amphibian species that used to be sold in some pet shops and garden centres (as large tadpoles). Following several years of infrequent reports of bullfrogs from multiple localities, a breeding population became established in West Kent. This population was subject to an eradication programme organised by Natural England. Follow-up survey work is being undertaken to determine whether satellite populations have established in nearby waterbodies.

Native Reptiles

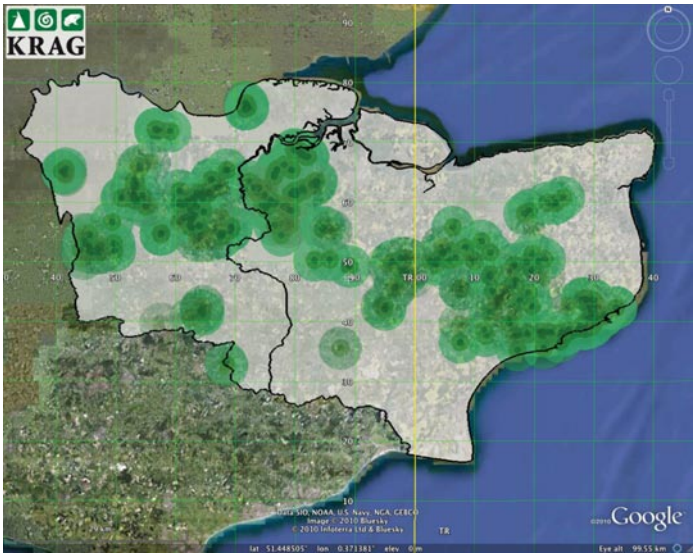
Reptiles are secretive and cryptic, and can therefore be difficult to survey. However, all of the widespread species are considered to be experiencing national declines and have recently been elevated to BAP Priority Species status.

Viviparous Lizard and Slow-worm display broadly similar habitat requirements and are often recorded from the same sites. However, unlike Viviparous Lizard, Slow-worm is frequently recorded from urban and suburban gardens where they are considered to be more tolerant of disturbance and increased predation risk from cats. Spending much of their time underground, Slow-worms prefer habitats that display previously disturbed ground (e.g. gardens and old allotments) and appear to be less frequently encountered in areas that are subject to regular flooding (e.g. Romney Marsh). Viviparous Lizard and Slow-worm are positively associated with areas of woodland. 'Brownfield sites', which often have structurally complex vegetation and lots of opportunities for shelter and basking (e.g. brick and concrete rubble, wooden posts, areas of open ground, etc.) are often occupied by these species, and population estimates at such sites have revealed densities of over 500 Viviparous Lizards per hectare and over 2,000 Slow-worms per hectare.

Population levels within the wider countryside are generally considered to be lower, though populations can become very high if an appropriately complex vegetation structure is provided. Where grazing results in short and even grassland, populations may decline rapidly. In such situations, Viviparous Lizards may appear to become 'edge species', occupying areas of rough vegetation along field boundaries or interface habitat between grassland and scrub or woodland.

Photo: Lee Brady

Viviparous lizard



Google Earth map illustrating projected range of adder derived from statistical analysis (nearest neighbour) of individual records. Darker areas represent locations where there is a higher probability of encountering the species.

Kent's Amphibians and Reptiles

Dr Lee Brady, Kent Reptile and Amphibian Group

There are concerns over national declines in Adder populations, and declines have been reported from several well-studied Kent sites. In Kent, Adder is highly localised with populations centred on areas of high quality habitat. Typically such areas are located in or close to woodland and/or scrub, with many of Kent's Adder populations found in areas of more structurally complex chalk grassland and scrub along the North Downs. Adder populations are composed of fewer individuals than lizards, with counts of just 30 to 50 animals per hectare considered normal. Low population densities, and the fact that female Adders do not reproduce every year, mean that populations are slow to respond to improving habitat conditions. Adders are also slow to colonise surrounding sites. Juvenile Adders feed on Viviparous Lizards, and declines in lizard population can result in several years of low Adder recruitment.

Fortunately, Adders are relatively long lived; wild individuals have been recorded surviving to 30 or more years. However, this does mean that non-breeding adult animals may still be recorded from a site for several years after the population has ceased to be viable; survey work must therefore establish the population structure to determine long-term viability. Analysis of available habitat data has revealed that of the 4,456 kilometre squares in Vice Counties East and West Kent, 25% are probably of above average suitability for Adders. However, Adders have been recorded from only 10% (109) of these squares. Low dispersal rates and unsympathetic site management are believed to be important reasons for this low figure.

Grass Snake is probably the most widely distributed reptile species in Kent. Although they are more likely to be encountered close to freshwater, Grass Snakes have also been recorded away from water in woodland areas on the North Downs, and adult females my well use rotting timber within the woodland for egg laying. Egg-laying sites, such as manure heaps and compost bins, are often used in successive years, with incubation rates dependent upon climatic conditions. Grass Snakes are highly mobile and individuals can range over several hectares or even kilometres to find suitable nesting sites, and the need to lay eggs may act as a constraint on their distribution. Radio-tracking studies have shown Grass Snakes to disperse over several kilometres whilst occupying a wide range of different habitats, with some individuals even spending significant amounts of time within arable crops. Increased populations of amphibian species such as Marsh Frog, are likely to have resulted in local population increases; studies at Fordwich have revealed that Marsh Frog now forms an important dietary component for snakes at this location.

Sand Lizard is another egg-laying reptile species and appears to require a sandy substratum for egg deposition. In Britain, the species is at the edge of its European range and is restricted to sand dune and lowland heathland habitats. In Kent, just six historical records exist for Sand Lizard, and the species is believed to have become extinct in the 1960s. Recently, a project has been undertaken to introduce Sand Lizard to a dune system in East Kent. Although there have been some early successes and neonate lizards have successfully survived their first winter, the long-term viability of the population has yet to be determined.

Non-Native Reptiles

Reports of unusual lizards have been received for several years at sites close to Folkestone. The first such report was submitted by Dr. Phil Shore in 1996, he reported that Wall Lizards were believed to have been deliberately released by a local pet shop that was unable to sell them. In 2007, Julian Russell submitted the first confirmed record for the species. Recent observations of Wall Lizard at two nearby locations suggest that the population may be expanding its range.

Kent's Amphibians and Reptiles

Dr Lee Brady, Kent Reptile and Amphibian Group

Photo: Lee Brady

Female adder

A small number of Green Lizards were introduced to a site near Sittingbourne in 1962. The population is not believed to have bred successfully and soon died out. There is also an account of Green Lizards being recorded at Herne Bay in M.C. Cooke's Our Reptiles and Batracians (1893). No further records have been received from this site.

Records of the North American Red-eared Terrapin are sometimes received from ponds in urban parks and other sites frequented by the public. Individual terrapins are long-lived and animals can be encountered at the same site over several years. There are no confirmed records of terrapins breeding in Kent.

Future Trends

Habitat Loss

Direct loss of habitat through changes in land-use is the most important factor influencing the current status of Kent's reptiles and amphibians. Although Kent still includes a very large number of ponds, many waterbodies have been lost over the past 100 years. Ponds have been filled, lost to succession or subject to reduced water quality through agricultural run-off. In towns and rural gardens, ponds are frequently managed as amenity features. Such ponds may be deepened and fish introduced. All of these factors can limit amphibian breeding success.

Kent is a county that is subject to increasing pressure from development. Current government policy is to target previously developed sites. Brownfield sites, which are a primary target for development, often support good populations of Viviparous Lizard and Slow-worm. Pre-development work frequently includes the capture and translocation of many hundreds of individual animals to receptor sites. Work undertaken by ecological consultants has revealed that such projects can succeed in establishing new populations, at least in the short term. However, translocation projects are often poorly monitored and insufficient data is available to determine long-term population trends at receptor sites. Increasing development pressure will continue to impact on available habitat and also lead to increased habitat fragmentation.

Habitat Fragmentation

Amphibians and reptiles display poor dispersal capabilities. Colonisation of new habitat occurs relatively slowly and sites that are isolated by significant dispersal barriers (e.g. major roads, large arable fields or other expanses of unfavourable habitat) may never be colonised by some species. Despite the large number of small garden ponds that occur in urban areas, an analysis of available data reveals that the habitat that most negatively influences Great Crested Newt pond occupancy is 'built up'; the species is largely absent from urban areas where dispersal between ponds is significantly constrained.

Survey work in Kent and other counties has revealed Adder to be a species that is also highly sensitive to habitat fragmentation. Such fragmentation can lead to inbreeding depression (reduced fitness caused by breeding of related individuals). If future herpetofauna conservation in Kent cannot be achieved at the landscape level through significant reduction in fragmentation, the status of small isolated populations of species such as Adder are likely to decline.

Unsympathetic Management

Herpetofauna populations can be lost simply because their presence was not known or taken into consideration when land management decisions were being planned. This situation is exacerbated because dispersal barriers increasingly isolate populations. For example, one well-studied site close to Maidstone was found to be devoid of Viviparous Lizard despite historical records in known populations within nearby areas. Despite of its relatively large size, the Maidstone site is isolated by major roads. Lizard populations are believed to have disappeared due to previous

unsympathetic management: recent changes in the management regime resulted in a significant improvement to reptile habitat, but colonisation was constrained by surrounding dispersal barriers. Artificial introduction of lizards was followed by four years of monitoring that have confirmed continued breeding success. This suggests that reversing unsympathetic management; practices may not result in the immediate natural recolonisation of sites.

Targeted management of readily identifiable habitat features such as amphibian breeding ponds is regularly undertaken by land managers. However, other important habitat features may be less obvious. For example, several individual Adders may use the same subterranean shelter during the winter. Such hibernacula are critically important for populations, yet their specific locations may not be known to land managers. Unsympathetic management of habitat around hibernacula can result in increased shading (e.g. tree planting in forestry plantations), while excessive vegetation clearance can increase the detectability of Adders to predators during the spring 'lying out' period.

Lizard and Adder populations are dependent upon prey species that favour structurally complex vegetation swards (i.e. invertebrates and small mammals). Striking a management balance for species that frequently occupy such habitats is certainly challenging, but better assessments of the needs of herpetofauna and their likely presence must be achieved if populations are not to decline, including land managed for nature conservation.

Public Pressure and Persecution

Significant attempts have been made in recent years to increase herpetofauna awareness amongst conservation practitioners and the general public. This has resulted in a great deal of success, and the needs of different species are now much better understood. Yet Kent is a county that is experiencing significant development pressure, leading to an increasing human population. Pressure on herpetofauna habitats will continue to increase in future years, with direct persecution of animals at sites regularly visited by the public already evident. Fortunately, some human activities can actually benefit herpetofauna. For example, sympathetic management of ponds and lakes for fishing benefits Common Toad, whilst increasing interest in composting provides opportunities for Slow-worm and Grass Snake.

Non-native Species and Disease

The potential future impact of introduced amphibians on native species is not currently known. However, Marsh Frog, Alpine Newt and American Bullfrog are known carriers of chytridiomycosis, an infectious disease of amphibians that is believed to be responsible for amphibian population declines in several other countries. Field samples have confirmed that some Kent populations are also infected, although negative impacts on local status have not yet been observed.

Marsh Frog and American Bullfrog can eat native amphibian species and have the potential to reduce local populations. In the Low Weald, large fishponds which might offer a refuge for Common Frogs (because they are unlikely to support breeding populations of Great Crested Newt) are rapidly being colonised by Marsh Frog. Much more survey work is required to determine the interaction between fish, newts and frogs, and the implications for the future distribution of Common Frog.

The impact of fish on amphibian populations is widely recognised. However, recent survey work has indicated that populations of the introduced North American Signal Crayfish may also negatively impact populations. At some locations incidents of red leg frog mortality have been reported. Analysis of specimens from several sites has implicated ranavirus and the disease is thought to be more prevalent in stressed populations.

Kent's Amphibians and Reptiles

Dr Lee Brady, Kent Reptile and Amphibian Group

Climate Change

Although the fact that climate change will affect Kent species is widely accepted, specific impacts are poorly understood. One study has suggested that climate change will result in changes to Kent's hydrology, resulting in earlier pond desiccation. Loss of breeding ponds will negatively impact on species such as Great Crested Newt, with populations increasingly confined to areas of highest pond density. Other species may potentially benefit from this change, such as Common Frog, which is believed to be constrained by Great Crested Newt predation. Future impacts of climate change on reptiles are even less certain. Hot dry periods result in reduced encounter rates for many reptile species as animals become less active. Slow-worm reproduction appears to occur much later in years with low precipitation, possibly due to summer shortages of mollusc prey. If climate change increases the likelihood of hot dry summers, it could result in population declines.

Conclusions

The current status of Kent's herpetofauna is directly related to past human activity. Intensive agriculture and development have led to habitat loss and fragmentation, resulting in the extinction of two Kent species. Some species have also been directly targeted through persecution. Yet there have also been positive benefits. Widespread historical pond creation in the Low Weald has benefited amphibians such as the Great Crested Newt, whilst the introduction of non-native Marsh Frogs has increased the available prey for Grass Snake. Today's increased awareness of herpetofauna in terms of both distribution and habitat requirements provides a solid foundation for future conservation efforts.

References

Beebee, T & Griffiths, R. (2000). *Amphibians and Reptiles.* Collins.

Davis, GAN & Frazer, JFD. (1990). The distributions of newts in Kent. *Transactions of the Kent Field Club, 11 (2), 661-68.*

Edgar, P, Foster, J & Baker, J. (2010). *Reptile Habitat Management Handbook.*

Gent, AH & Gibson, SD. (1998). *Herpetofauna Workers' Manual.* Joint Nature Conservation Committee, Peterborough,

Inns, H. (2009). *Britain's Reptiles and Amphibians*. WildGuides.

Jehle, R, Thiesmeier, B & Foster, J. (2011). *The Crested Newt*. Laurenti Verlag and British Herpetological Society.

Lagton, T, Beckett, C & Foster, J. (2001). *Great Crested Newt Conservation Handbook.* Froglife.

Philp, EG. (1998). Provisional atlas of the amphibians and reptiles of Kent. *Transactions of the Kent Field Club*, 15 (2), 61-82.

Kent's Birds

Kent's Birds

Andrew Henderson, Kent Ornithological Society

The fortunes of Kent's birds have fluctuated over the 100 years for which good records are available. Some species have increased in population, while others have decreased.

Twenty-five species started breeding regularly in Kent only in the last 100 years. Some escaped from captivity, others took advantage of new, man-made habitats, while a number were responding to climate change.

Ten species no longer breed in the county, with habitat change – especially changes in farming practices – being the major cause.

Conservation work has been effective for a number of species, particularly protective legislation which prevents persecution of birds of prey, and habitat creation for wetland birds. However, more and more species are showing declining populations

Around 420 or so species have been recorded in the county, although many of these are scarce or rare migrants occurring in small numbers. We have used a range of sources to examine the trends of all breeding, passage and wintering birds, and especially the 215 regularly occurring species.

Since 1900, there have been three major publications describing the status of birds in Kent, in 1909, 1953 and 1981. These have been our key sources for the majority of the period under review. The Kent Ornithological Society was formed, and started publishing annual reports, in 1952; these together with the wealth of other information – from individual species' studies, the Breeding Bird Survey, The Wetland Bird Survey, and many others – have been used as the basis for assessments of trends in the more recent period. The four time points at which we have described the status of each species are as follows:

- 1909 -N. F. Ticehurst's *History of the Birds of Kent*
- 1953 -J. M. Harrison's *The Birds of Kent*
- 1976 -The final year covered by D. W. Taylor, D. L. Davenport & J. J. M. Flegg's 1981 The Birds of Kent
- 2010 -Current assessments and draft texts for the prospective new Birds of Kent

In addition, we have taken into account current trends, where they differ from those pertaining over the previous 30 years.

Birds are perhaps better recorded than any other group of animals or plants. This is not only helpful to any account of the changes of birds' status but also something of a problem, since there is a large amount of information and we have, for example, to disentangle differing trends between resident and migratory populations of the same species. We have tried to make allowances for the changing numbers, skills and focus of observers but it is often difficult to be sure exactly what the earlier accounts really mean. Deciding on what the trend has been for any one species is often a matter of judgement.

Bird trends through the past century

The table below shows the numbers of species judged to be increasing, decreasing, or showing little change during the periods between each of our time points, and currently. Totals are shown separately for all species on the Kent list, for those of regular occurrence, and those breeding here regularly at some point during 1900 - 2010. We have also attempted to decide whether species have increased or decreased significantly over the whole period 1900-2010, ignoring such ups and downs.

However, it should be noted that it is not always the same species which show a decline (or increase) in each time period. For many species, trends have changed over the years, an example being the

Photo: Andy Vidler

Juvenile Red-backed Shrike. This species ceased to breed in Kent during the 20th century

decline of many birds of prey as a result of the use of persistent organochlorine pesticides and their subsequent recovery following the chemicals' withdrawal. Thus, Sparrowhawk was fairly common early in the 20th century as it is now, but did not nest in Kent for much of the 1960s.

Regularly occurring species

Of the 215 regularly occurring species, 119 (55%) are thought to be present in broadly similar numbers in 2010 as in 1900, though some, such as Pochard, Guillemot and Whitethroat have shown major increases and decreases over that time.

Fifty-nine species have increased markedly over the period, 10 of these being new arrivals. Four of these new arrivals (Canada Goose, Mandarin Duck, Ruddy Duck and Ring-necked Parakeet) are introduced species, reflecting the fairly recent development of the practice of keeping a wide range of exotic birds in captivity. The appearance of four other gained species is mainly climate-related, though with significant habitat influences in some cases: Little Egret, Mediterranean Gull, Cetti's Warbler and Savi's Warbler (the last only just classable as regular). Little Ringed Plover colonised Britain in the wake of gravel pit excavation, which created suitable breeding habitat. Collared Dove's colonisation of the whole of mainland Europe and Britain through the 20th Century was driven by unknown factors. Thirty-seven regularly occurring species have decreased or been lost entirely to Kent. The losses include three for which the trends seem to be habitat-related, though with climatic influences: Wryneck and Red-backed Shrike, and Cirl Bunting. Kentish Plover has been lost because of disturbance in its coastal breeding areas, while for Willow Tit the cause is unknown though possibly habitat-related. Thus, there appears to be a number of common patterns in the trends and their causes:

	1909-1953	1953-1976	1976-2010	Current trend
Regularly breeding species				
Little change	97 (68%)	103 (73%)	53 (37%)	86 (61%)
Increase	35 (25%)	24 (17%)	48 (34%)	16 (11%)
Decrease	10 (7%)	15 (11%)	41 (29%)	40 (28%)
Total	142 (100%)	142 (100%)	142 (100%)	142 (100%)
Regularly species				
Little change	150 (70%)	157 (73%)	98 (46%)	145 (67%)
Increase	53 (25%)	40 (19%)	69 (32%)	18 (8%)
Decrease	12 (6%)	18 (8%)	48 (22%)	52 (24%)
Total	215 (100%)	215 (100%)	215 (100%)	215 (100%)
All species				
Little change	339 (81%)	352 (84%)	294 (70%)	345 (82%)
Increase	62 (15%)	48 (11%)	72 (17%)	21 (5%)
Decrease	18 (4%)	19 (5%)	53 (13%)	53 (13%)
Total	419 (100%)	419 (100%)	419 (100%)	419 (100%)

The numbers of species showing positive and negative population changes over the last century

Kent's Birds

Andrew Henderson, Kent Ornithological Society

Thirty-seven regularly occurring species have decreased or been lost entirely to Kent. The losses include three for which the trends seem to be habitat-related though with climatic influences: Wryneck and Redbacked Shrike, and Cirl Bunting. Kentish Plover has been lost because of disturbance in its coastal breeding areas, while for Willow Tit the cause is unknown though possibly habitat-related.

Thus, there appears to be a number of common patterns in the trends and their causes:

- Climate change appears to be causing decreases in a group of species, such as Turtle Dove and Spotted Flycatcher, because of impacts on their African wintering grounds. At the same time, climatic amelioration in Britain and Europe has assisted increases in a separate group, including Avocet and Green Woodpecker.
- Declines in persecution have contributed to the increases of several birds of prey, Carrion Crow and other species.
- Changes in farming practice have deleteriously affected a large group of species including Grey Partridge, Starling and Yellowhammer, which have lost suitable nesting and feeding habitat.

The development of gravel extraction has led to a major increase in freshwater bodies, and has benefited a large group including Great Crested Grebe, Tufted Duck and Coot.

The table on the previous page summarises the number of regularly occurring species positively and negatively affected by the changes described above.

Breeding species

Of the 142 regularly breeding species, 55 are thought to be present in broadly similar numbers in 2010 as in 1900, though some such as Sparrowhawk or Lesser Redpoll have shown major increases and decreases over that time. Fifty species are thought to have increased markedly over the period, including 25 which were completely new

Factor	Number of increasing species	Number of decreasing species
Climate change & African habitat change	7	8
Disturbance, persecution	7	5
Habitat & land use change	13	13
Mixtures of the above	9	0
Introductions	17	3
Uncertain	6	8

Causes of positive and negative population changes in regularly occurring species

as breeding species in Kent. Six of the species gained as breeding birds were, at least to begin with, escapes from captivity or deliberate introductions, and most are geese or ducks which have also benefited from the growth of wetland habitats, from gravel-working and similar activities. The creation of new wetlands by gravel extraction or deliberately for nature conservation purposes has also been a major factor behind many of the other gains to the county breeding bird community, including Tufted Duck, Cormorant, Bittern, Little Egret, Great Crested Grebe, Marsh Harrier, Avocet, Little Ringed Plover, Mediterranean Gull, Bearded Tit, Cetti's Warbler and Savi's Warbler.

Other gained species are Buzzard (responding to lower levels of persecution), Fulmar and Kittiwake (responding to changes in marine food availability – Fulmar in particular is believed to have benefited from the increase in fish offal dumped from fishing boats), Firecrest (dependent on 20th century conifer plantations), Black Redstart (which colonised bomb-damaged and industrial areas after World War Two), and Common Gull and Collared Dove (for which the causes of colonisation are unclear).

Increases associated with climate change are found among shorter-distance migrants or sedentary species, which have benefited from milder winters (and often from other factors such as greater availability of suitable habitat). Examples are Little Egret, Mediterranean Gull and Green Woodpecker, and Blackcap and Chiffchaff are assumed also to be in this category.

Quite a number of species have increased through reductions in direct persecution. These include around five birds of prey such as Marsh Harrier, Buzzard and Peregrine, as well as Magpie and Carrion Crow. Several gull species, and perhaps also Sandwich Tern, have increased because their breeding colonies are protected or are no longer raided for eggs.

Thirty-seven regularly breeding species have decreased, and 10 species no longer breed in the county. Habitat change, particularly as a result of changes in farming practice, is responsible for most losses and population declines. Species affected include Lapwing and Snipe, affected by loss of wet grassland, and especially those affected by reductions in either winter or nestling food abundance (or both), such as Grey Partridge, Song Thrush and House Sparrow. In some cases, habitat change impacts have been exacerbated by climatic factors; the disappearance of Cirl Bunting was probably due to cold winters exacerbated by habitat change, while Wood Warbler may be more affected by habitat change in its African wintering grounds than local factors. Stone-curlew and Kentish Plover have been lost because of disturbance in their breeding areas, compounded by farmland changes in the case of Stone-curlew. Most of the losses from the list of regular breeding species seem to be habitat-related though with climatic influences: Corncrake, Guillemot, Wryneck, Red-backed Shrike, Whinchat, and possibly Willow Tit.

Decreases believed to be caused in large part by climatic changes or problems in Africa are found primarily among trans-Saharan migrants, including Cuckoo, Tree Pipit, Willow Warbler and Spotted Flycatcher. In some cases, subtle changes in climate on the breeding grounds, as well as habitat changes, may have been partly responsible, along with changes in Africa; Wryneck and Whinchat, for example, are in this group.

As for the regularly occurring species, the table below summarises the number of regularly breeding species positively and negatively affected by the changes described above.

Photo: Andy Vidler

Great Crested Grebes have benefitted from the creation of gravel pits

Conclusions

Overall, for both breeding and other species, the two major factors believed to be linked with declines in bird species are (a) changes in farming practice in Britain, affecting nestling and adult survival, and (b) changes in conditions in African wintering grounds of long-distance summer migrants, often accentuated by climate change. These jointly affect about two-thirds of the species identified as decreasing or lost from the Kent breeding bird community.

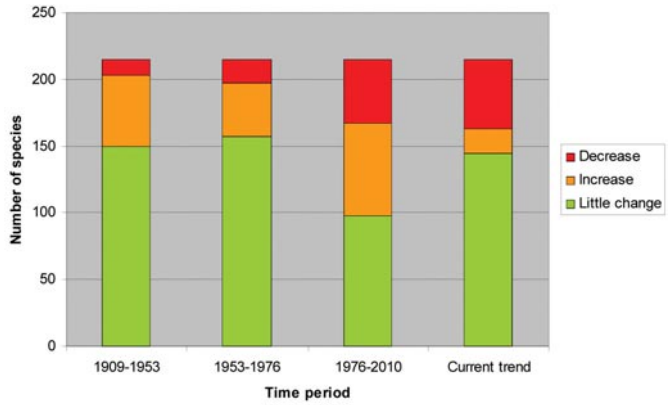
Similarly, the two main factors believed to be linked with increases in breeding species are (a) the increased availability of wetland habitats (in the form of gravel pits, managed wetland nature reserves, reservoirs and similar) and (b) reduced persecution of birds of prey and gulls. These affect over half of the species identified as increasing or gained by the Kent breeding bird community. The next most important factor is judged to be climate change, especially the occurrence of milder winters.

Factor	Number of increasing species	Number of decreasing species
Climate change & African habitat change	7	10
Disturbance, persecution	11	4
Habitat & land use change	14	15
Mixtures of the above	3	3
Introductions	9	0
Uncertain	6	5

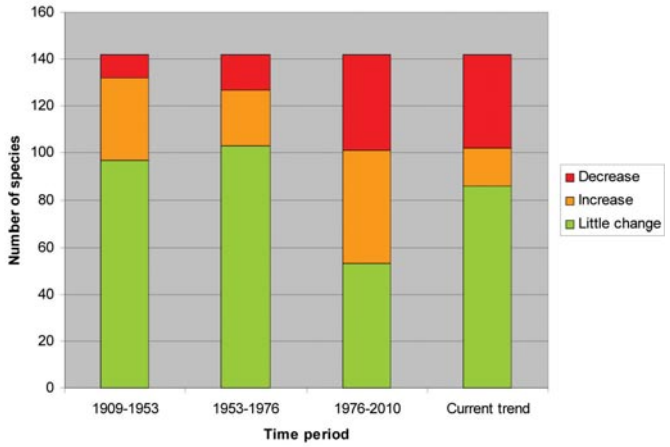
Causes of positive and negative population changes in regularly breeding species

Kent's Birds

Andrew Henderson, Kent Ornithological Society



The changing fortunes of regularly occurring species over the last 100 years



The changing fortunes of regularly breeding species over the last 100 years

Over the century or so since 1900, species' fortunes seem to have been fairly evenly matched, with gains and increases slightly more numerous than losses and decreases. This conclusion does, though, need to be qualified in two important respects.

First, there is a strong possibility that the qualitative descriptions of species' abundance on which we have relied until around 1970 are insufficiently precise to infer actual changes. Thus, a bird may be described as very common in both 1909 and 1953, despite having increased or decreased significantly. As an example, Nightingales were described in 1909 as being almost universally distributed and locally numerous, while in 1953 it was well distributed and abundant, having shown an insignificant decrease, and in 1976 it was locally common, found in 367 tetrads and with a county population of up to about 1,000 singing males. We have suspicions that there was a major decrease during the mid part of the century, but have no hard evidence for this and so have classed this species as 'no change'. Thus, the imprecision of status descriptions may well have obscured many real changes.

The second point is that at present, a number of species have different trends from those typical of the past 30 years. Our estimates of changes between 1976 and the present cover the whole of that period, but we have also been able to assess current trends – for the last ten years or so – thanks to the large amounts

of survey data now available. Current trends have reversed the balance, as shown in the first table in this chapter. Amongst 'regular' species, for example, 52 species are now judged to be decreasing and 18 increasing contrasted with 47 and 69 respectively over the whole of 1976-2010.

This change is due primarily to the reversed fortunes of wintering wildfowl and waders, most of which had been increasing steadily from the 1960s or 1970s but went into decline during the 1990s. At the same time, the declines in farmland birds and trans-Saharan migrants and a few other groups show no sign of ending. These are not offset by increases in a few birds of prey, wetland and introduced species. The upper graph on the preceding page shows how the fortunes of the 215 regularly occurring species have changed over time, while the lower graph does the same for regularly breeding species. It is clear that, while the number of species showing a population increase varies over time, there has been a steady increase in the number of species showing a decline, and this is particularly acute in species that breed regularly in the county.

It is a common attitude of conservationists - and perhaps of people in general – to believe that things are getting worse, but for birds in Kent a great deal of evidence shows that this is the case.

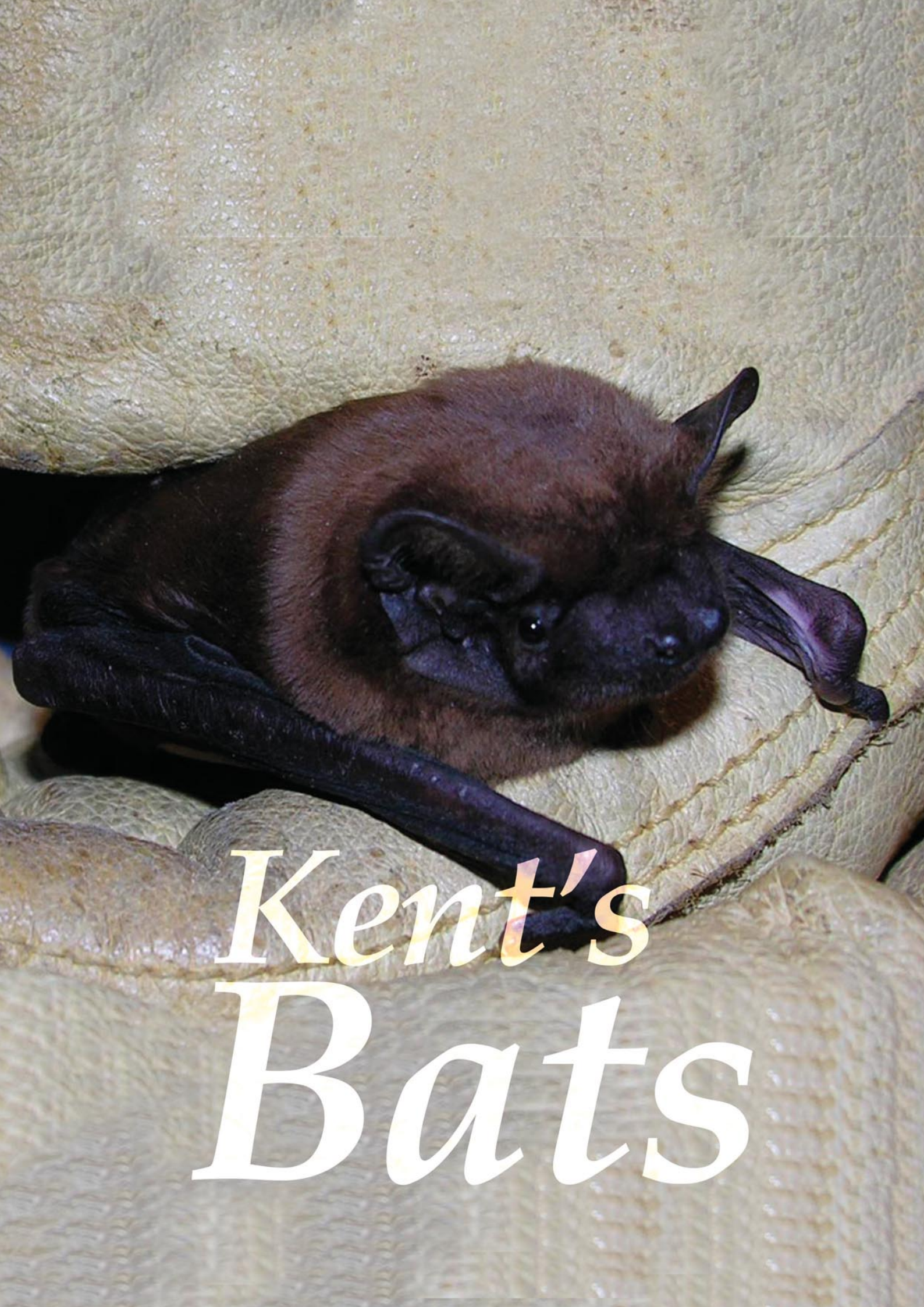

Kent's
Bats

Photo: Kent Bat Group

The Alcathoë Bat was only recognised as separate species in 2010

Kent's Bats

Shirley Thompson, Kent Bat Group

Bat populations are believed to have undergone major, long-term declines. This is certainly the case for some species such as the Greater and Lesser Horseshoe bats, which both became extinct in Kent during the 20th Century.

For a number of species, national trends show declines are levelling off, or even reversing. As a result, populations of some species are starting to recover. However, the picture in Kent is bleaker, with on-going declines in species whose populations are more stable elsewhere

The way in which bats use the landscape makes them vulnerable to habitat loss and fragmentation, and particularly to agricultural intensification. It also means that localised change can have wide impacts. Even where populations now appear stable, this is against a background of long-term decline, and even the most common species may be vulnerable to future population loss.

The small size of bats, their power of flight, their nocturnal and secretive way of life and their vulnerability to disturbance all combine to make bats particularly difficult to study. In addition, some species show close physical similarities so that what was previously considered a single species has sometimes been found to be two or even three separate species, each with slightly different ecological requirements. The Pipistrelle was recognised as actually comprising two species, the Common Pipistrelle and the Soprano Pipistrelle, in 1997. Whiskered and Brandt's Bats were first identified as separate species in 1970, while the Alcathoë Bat was only separated from the Whiskered Bat in 2010.

Nonetheless, there are records from Kent for all eighteen species of bat (see the box on the following page) considered to occur regularly in the UK.

Change in bat populations

Probably three, and certainly two, species of bat were lost to Kent during the 20th Century. These were:

Greater Horseshoe Bat
In the 19th Century, Greater Horseshoe Bats were reported as abundant in Rochester and Canterbury Cathedrals, and there were at least five other records at sites in Kent. The last definite sighting was a single bat seen closely in 1909 in Sevenoaks.

Lesser Horseshoe Bat
The last and the only positive record of the species in Kent is of a male taken from hibernation in old stone mines in Maidstone in 1954. They are now mainly confined to Wales, western England and western Ireland.

Barbastelle
The first Barbastelle in the UK was discovered at Dartford in 1802, but nearly 100 years passed before the second was found at Allington, Maidstone. The most recent confirmed record for Kent was of a male found dead in High Halstow Church in 1950. However, analysis of bats' echolocation calls at Haysden Lake in September 2009 suggests that the species may still be present in the county, though this has not been confirmed.

Many – probably most – of Kent's remaining bat species are likely to have undergone substantial reductions in population during the 20th Century. However, providing an overview of changes over the last 100 years is problematic. Before the early 80s, when protection of all species became law, there were few studies of bats and no baseline by which to judge them, as so much of the information prior to that period is anecdotal. A lack of systematic data, except in the latter few decades of the century, makes it difficult to establish definite, long-term population trends.

Kent's Bats Shirley Thompson, Kent Bat Group

Photo: Kent Bat Group

Noctule Bat

Bat species recorded in Kent

Asterisked species are those species currently occurring in Kent and used as biodiversity indicators by Defra.

Greater Horseshoe Bat *Rhinolophus ferrumequinum* – extinct

Lesser Horseshoe Bat *Rhinolophus hipposideros* – extinct

Daubenton's Bat *Myotis daubentonii**

Brandt's Bat *Myotis brandtii*

Whiskered Bat *Myotis mystacinus*

Alcathoë Bat *Myotis alcathoe*

Natterer's Bat *Myotis nattereri*

Bechstein's Bat *Myotis bechsteinii*

Greater Mouse-eared Bat *Myotis myotis* – status as a resident UK species uncertain

Noctule Bat *Nyctalus noctula**

Leisler's Bat *Nyctalus leisleri*

Serotine Bat *Eptesicus serotinus**

Common Pipistrelle *Pipistrellus pipistrellus**

Soprano Pipistrelle *Pipistrellus pygmaeus**

Nathusius' Pipistrelle *Pipistrellus nathusii*

Brown Long-eared Bat *Plecotus auritus*

Grey Long-eared Bat *Plecotus austriacus* – probably not resident in Kent

Barbastelle Barbastellus *barbastellus* – extinct (Possibly still present)

Common Pipistrelle

Nationally, Pipistrelle numbers declined dramatically in the last few decades, with reports indicating a decline of some 60% in the size of the UK population. However, Common Pipistrelle populations have started showing signs of recovery in recent years, with annual increases of around 6% a year indicated by field counts.

Soprano Pipistrelle

This species was only recognised as distinct from Common Pipistrelle in the 1990s. It is assumed, from current knowledge, that the very large summer roosts of Pipistrelles which were not unusual 50 years ago were of Soprano Pipistrelles. Several such roosts of about a thousand bats were recorded by Kent Bat Group in the early 1980s. Though the largest known maternity roost in the South East, of over 1,000 adult females, appears to be stable, the average size of maternity roosts is now much lower. This appears to reflect what is apparently a national decline in this species' numbers, and therefore this is a species of possible concern.

Noctule Bat

Brian Vesey-Fitzgerald, in the first book to be published devoted to British Bats (in 1949, when only twelve species were described) wrote of Noctules Common and widespread in wooded districts of Southern England'. Today this is a species considered nationally of possible concern. A decline in Noctules was noted and commented on in Kent in the early 90s, before it was recognised in other parts of the country. These bats are now considered scarce in the county, with only single bats or small numbers seen occasionally. No stable maternity roosts are recorded at present. This does not reflect the national trend, which shows a slight population increase over the last five years.

Serotine Bat

The National Bat Monitoring Programme (NBMP) suggests populations are stable (at least until more conclusive evidence

Photo: Kent Bat Group

Nathusius Bat

Kent's Bats

Shirley Thompson, Kent Bat Group

emerges from the trends). However, in Kent the decline is still giving cause for concern. A number of roosts where bats have been recorded in the last 20 years appear not to have been used recently. Numbers at several of those monitored each summer have declined, some to single figures. One roost in East Kent has been monitored since 1986, when 62 adults were counted out, our maximum count. In 2010 there were 29 adults.

Daubenton's Bat

Daubenton's Bats are very dependent on lakes and waterways, feeding on insects close to the water's surface, although they will also feed in woodland. The NBMP waterways survey indicates significant increases. In Kent, these bats can be seen over most waterways in summer, and are also the most commonly recorded species found hibernating in underground sites such as tunnels and deneholes. However, at present only one summer maternity roost is known in the county.

Brown Long-eared Bat

After the Pipistrelles, this is the most abundant bat in the UK, but it appears to have undergone a major decline during the 20th Century. NBMP data suggests that this decline has levelled and stabilised. However, in Kent, evidence of the species' past presence, in the form of old droppings, has been found in many houses and other buildings where bats no longer appear to be present, or are only present in very small numbers, so there is still cause for concern in Kent.

Leisler's Bat

Leisler's Bat has been considered rare in most of the UK. However, there is a suggestion that their numbers may be increasing as Noctules decline, their use of buildings giving them an advantage. In Kent, known maternity roosts appear to have been lost or relocated as a result of building the Channel Tunnel Rail Link and possibly the recent M2 widening. Nonetheless, there have been more validated records of Leisler's in the last five years, with the majority in the north-west of the county.

Nathusius' Pipistrelle

Initially this species was regarded as a vagrant, then as a winter-visiting migrant which came to the UK to hibernate. However, since the 1990s a small number of maternity colonies have been recorded, and there appears to be a migratory population during autumn and winter, and a small summer breeding population. The increase in records in the British Isles may reflect sampling effort, but there is a possibility that the species range is expanding. The species may also have been previously under-recorded until the more widespread use of bat detectors and sound analysis software. Although no breeding colonies have been found in the county, Kent appears to be a significant county for this species, with a comparatively high number of records. In 2009, the NBMP set up a new monitoring system for the species, but it will be several years before a trend will emerge from the results.

Natterer's Bat

Natterer's Bats are found throughout most of the British Isles; it is generally a scarce and poorly known species, but the British population is internationally important. Population trends are unclear and numbers are assumed to be stable until more conclusive evidence emerges from the NBMP data. In Kent, most records of this bat are in hibernation at underground sites. Almost all summer records are of bats found during demolition or conversion of barns, or surveys prior to conversion, when the roost is about to be lost.

Whiskered and Brandt's Bats

In Kent, most records are from hibernation sites, mainly tunnels and deneholes, where they have been recorded as Whiskered/Brandt's as they are never handled for close inspection while hibernating. Both species have been considered rare in the county, and they appear to have undergone a long-term decline during the 20th Century.

However, during a survey of woodland bats (2009-2010) Whiskered bats were

the second most frequently trapped after Brown Long-eared bats, suggesting they are more abundant than previously thought. Nationally, populations now appear to be stable.

Bechstein's Bat

Bechstein's is one of Britain's rarest mammals, with only six breeding populations (in the whole UK) known in 2005. Bechstein's was first recorded in Kent in 1999, hibernating in a denehole, with up to four individuals hibernating there in subsequent years, probably males. In July 2009, a lactating female was trapped in West Kent during a targeted survey. Most recently two male and one female Bechstein's were among bats trapped during swarming outside Westerham Mines in September 2010. The rarity of this species makes population trends impossible to assess, but the species' apparent reliance on closed-canopy, undisturbed woodland probably makes it one of the UK's most threatened animals.

Alcathoë Bat

This species is very similar in appearance to the Whiskered bat, and only recognised as a UK resident in 2010, using DNA analysis. One was trapped in Kent in July 2010 during survey work for other species, and was verified from photographs by Prof. John Altringham. Its status in the UK and Kent is unknown.

Causes of change in population status

Bats have three major needs:

Suitable roosting sites. Roosts include maternity sites used by females to give birth and raise young, spring gathering roosts, mating roosts, night roosts, and hibernation roosts. Some hibernation sites are also used for autumn 'swarming' by some species, an important social activity which is little understood.

- Good foraging areas within commuting distance of their roosts. All UK bats feed on insects, eating large numbers to provide the energy needed for flight.
- Safe links between roosting and foraging sites. Bats navigate between feeding and roosting sites by following physical features such as hedges and tree-lines.

Bats are long-lived, produce small numbers of young, and are faithful to traditional feeding and roosting sites. They are therefore very vulnerable to change, as if even one of the places on which they have depended is lost or degraded – even just a particular hedgerow lost – their breeding success may be reduced or their very survival threatened.

The following are likely to have, or have had, the most impact on bat populations:

Changes in land use practices

Agricultural intensification has probably had the greatest impact on bat populations, by reducing the diversity and abundance of insect prey through agricultural improvement of grassland and its conversion to arable, and through loss of important habitats such as ponds and hedgerows. Because prey items vary with different bat species, so certain agricultural practices affect some species more than others: for example, the decline in larger bats such as Serotine and Noctule is likely to be related to reduction in cattle grazing and increased use of avermectin-based wormers (which persist in dung), and the subsequent reduction in dung and grassland beetles on which the bats feed.

Use of insecticides

Bats have very high energy requirements, so need to eat huge numbers of insects. Insecticides reduce the availability of food. In addition, the accumulative effect of pesticides in their fatty tissues, on reduced fitness and breeding success, is not fully known. Research in 1972 at an intensively farmed area of England found bats were more heavily contaminated with residues of DDT than insectivorous or carnivorous birds.

Loss of roosts in buildings

It was only with the Wildlife and Countryside Act 1981 that bats and their roosts received protection. Prior to that

time, deliberate exclusion or destruction of bats in houses and other buildings undoubtedly had an impact on local populations. Further impacts came from the use of timber treatments (such as Lindane) which were highly toxic to mammals. While more closely regulated, loss of roost sites still occurs as a result of built development from road schemes to barn conversions. Natterer's and Long-eared Bats are particularly vulnerable to the latter as they are faithful to traditional roosts over periods of many years. Unpopularity of bats based on fear and misunderstanding can still be a threat to bats roosting in houses, when direct action may be taken to exclude them. Legal exclusion is carried out in certain circumstances under licence.

Habitat fragmentation

Roosting sites and foraging sites must be close enough to enable bats to travel economically (in energy terms) between one and the other with safe commuting routes linking them. In particular, foraging sites close to the maternity roost are essential for young just learning to fly and echolocate. Fragmentation of remaining habitats has undoubtedly contributed to the long-term decline of many species.

Inappropriate management and loss of woodland

Whilst management such as coppicing may help some species of bat and other wildlife, others, such as Bechstein's and Natterer's, require more structured, less disturbed and dense woodland with many mature trees. The preponderance of coppice management in much of the UK may well be a key reason why Bechstein's bat is so rare here. Even for species which do better in more intensively managed woodland, removal of older trees with cracks and holes may result in loss of important roost sites.

Changes in water quality

Deterioration in water quality and loss of marginal vegetation can lead to reductions in the abundance and diversity of insect prey. This is especially important to bats whose preferred prey are insects with aquatic larvae (Soprano Pipistrelle, Nathusius' Pipistrelle, Daubenton's and Natterer's).

Although many bat species have undergone long-term population declines, these appear to be levelling off (at least nationally) and population gains are actually being made. The role of agri¬environment schemes, such as Countryside Stewardship and Environmental Stewardship in this partial recovery is unclear, though they are likely to have had a positive impact; the same is probably true of the recent and very significant reversal of the historic decline in hedgerows and recent increases in water quality.

Factors which have clearly been of value are:

Legislation to protect roosts

Wildlife legislation has made bats among the best-protected mammals in Britain. This has reduced substantially the casual destruction of roosts. Important indirect benefits are (a) direct contact with the general public through the roost visitor license system, and (b) contact with professional sectors such as timber-treatment companies, builders and forestry.

Education

Public awareness has been raised nationally and locally. The Bat Conservation Trust runs a series of courses - targeting professionals and others - on bats, their legal protections and their conservation needs. In the county, Kent Bat Group is raising awareness through bat walks for the general public and talks to a wide range of audiences including schools, gardening societies, natural history societies and others. There is always a very positive reaction from the varied audiences.

Research

Many studies are now being undertaken which are helping to inform conservation

actions. These include a recent national survey of Bechstein's Bat.

Monitoring Programme
This is providing a baseline for population studies, and acting as an early warning system for problems. Kent Bat Group inputs data each summer on Common, Soprano and Nathusius' Pipistrelles, Serotine, Noctule, Brown Long-eared and Daubenton's Bats, and on hibernating bats each winter.

Much more work will be required to maintain and improve diversity of this highly vulnerable group, which is itself an important indicator of the wider health of the environment. This should include further research and data collection to assess trends and highlight particular problems; continued monitoring of known sites; ensuring the needs of bats are taken into account in habitat management, especially in the case of woodland where this is increasingly well understood; and planning and delivery of habitat restoration at a landscape-scale.

References

Altringham, JD. (2003). *British Bats.* Harper Collins.

Bat Conservation Trust. Species descriptions, downloadable at www.bats.org.uk

Bat Conservation Trust. *The State of the UK's Bats. National Bat Monitoring Programme Population Trends.*

Vesey-Fitzgerald, B. (1948). *British Bats.* Methuen & Co Ltd.

Harris, S. et al (1995). *A review of British mammals: population estimates and conservation status of British mammals other than cetaceans.* JNCC.

Haysom, KA, Jones, G, Merrett, D & Racey, PA. (2010). *Silent Summer – The State of Wildlife in Britain and Ireland, Cambridge University Press*. 259-280.

Heathcote, PC & Heathcote, P. (1994). *The Bats of Kent.* Kent Field Club.

Jeffries, DJ. (1972). Organochlorine insecticide residues in British bats and their significance. Journal of *Zoology Society of London.*

Kent Bat Group records database 1980 - 2010.

Waite, AR (ed). (2000) Kent Red Data Book. Kent Wildlife Trust & Kent County Council

Kent's Wild Plants

Kent's Wild Plants

Richard Moyse, Kent Wildlife Trust

Photo: R I Moyse

Annual Knawel, a plant of open, dry habitats

Between 1900 and 2010, more than 30 wild plants were lost from Kent. The rate of plant extinction accelerated over the course of the 20th Century.

Habitat loss has been a major contributor to plant population declines. Particularly hard-hit during the 20th century have been plants of wetlands, heathlands, and meadows.

Changes in habitat quality have also had an impact. Wildflowers of arable farmland have suffered massive declines due to changes in farming practices. Data suggests that other changes associated with farming and development, such as increased nutrient availability and the drying-out of wetlands, continue to contribute to declines in wildflowers.

Over 2,000 species of plant have been recorded in the wild in Kent. These include some 950 native plant species, around 130 'archaeophytes' (ancient introductions which have been long-established in the UK, such as field poppy and cornflower) and over 1000 recently introduced species. It is the native plants and archaeophytes which we generally think of as 'wildflowers', and it is these which are considered in this paper. The information presented in this paper is primarily derived from the Atlas of the Kent Flora, published in 1982, and 2010's A New Atlas of the Kent Flora; both books are by Eric Philp and published by Kent Field Club. Considerable use has also been made of the Flora of Kent of 1899, by Frederick Hanbury and Edward Marshall.

Extinctions

Kent's wild flora has become increasing impoverished over time. One hundred native or archaeophyte species which once occurred in Kent – 10% of all such species recorded – are no longer found here. Some of these disappeared many years ago: for example Water Avens Geum rivale was last recorded in Kent in the 1,770s, and 32 previously recorded plant species had appeared before 1900. In the eight decades between 1900 and 1980, 21 species became extinct in the county, an average of 2.6 species a decade. Since 1980, the rate of extinction appears to have accelerated, with 12 species vanishing from Kent, an average of 4 species per decade.

The causes of these extinctions may never be entirely clear. Many of the species now extinct were always rare in the county, and may simply have succumbed to chance events. However, the loss of species such as Field Fleawort *Tephroseris integrifolia*, Moonwort *Botrychium lunaria*, and Small Fleabane *Pulicaria vulgaris* suggest one possible cause is change in the management of grassland. Perhaps more significant have been changes to wetland habitats and systems. The loss of Marsh Gentian *Gentiana pneumonanthe*, Broad-leaved *Cottongrass Eriophorum latifolium*, Fen Orchid *Liparis loeselii*, and *Shoreweed, Littorella uniflora*, all suggest that loss of wetlands (either by drainage or abandonment) has been very significant, and may have been a factor as far back as the early 19th Century, if not earlier.

Habitat loss

Extinction of individual species is only the very coarsest measure of change in plant populations. Absolute change in the abundance and distribution of wild plants is difficult to assess. Because distribution maps (or descriptions) indicate only the presence or absence of a plant within a given area (in the case of the most recent plant atlases of Kent's flora, a 2km by 2km square) substantial changes in abundance can occur without being clearly apparent; a species may be marked simply as being present in an area whether there are 10,000 individuals or just one.

So, although past habitat loss will undoubtedly have resulted in reductions in populations of many species, this may not be apparent from distribution maps if the remaining habitat fragments are widely

spread. For example, plants associated with ancient woodland have largely maintained their overall distribution in the county even while there has been a substantial drop in habitat extent.

For some wild plants though, the extent of habitat loss has been so extreme that they have disappeared from wide areas of countryside. 90% of the heathland present in 1798 was lost in the following 200 years. Alongside this have been clear declines in heathland plants such as Petty Whin *Genista anglica*, and plants of open, acidic habitats, such as Annual Knawel *Scleranthus annuus*. At the end of the 19th century, Annual Knawel was noted as locally plentiful on sites across Kent, but is now known only from 5 tetrads in the county; nationally, it is formally listed as Endangered.

Likewise, the historic, and undoubtedly severe, loss of traditional hay meadows and unintensively managed grassland shows in the distribution of plants associated with these habitats. Green-winged Orchid *Orchis morio* is reported in the 1899 Flora of Kent as 'common, particularly on chalk and wealden clay', and Dyer's Greenweed *Genista tinctoria* is 'frequent in several districts'; both are plants of very restricted distribution today. Likewise, Meadow Saxifrage *Saxifraga granulata* was 'locally plentiful' in the 19th Century, but is now very scarce, with just a few sites in the west of the county.

The suite of annual plants associated with arable fields has shown even greater loss. Of the 50 plant species which have shown the greatest relative decline in the county over recent decades, 12 are arable 'weeds'. These include Corn Buttercup *Ranunculus arvensis* (common and found across Kent during the 19th Century, but perhaps now limited to one site), Pheasant's Eye *Adonis annua* (well established in some places on the chalk, according to the 1899 Flora of Kent), Red Hemp-nettle Galeopsis angustifolia (frequent in cornfields and on shingly beaches in the 19th century, now only found at Dungeness), Field Woundwort *Stachys arvensis* (common throughout the county in the 19th Century, and showing a 75% decline in distribution since 1980), and Shepherd's Needle *Scandix pecten-veneris* (common throughout the county in the 19th Century, now only recorded from three tetrads).

Factors implicated in plant declines

Information on the relative decline of particular plant species can be obtained by comparing the number of 2km by 2km squares (tetrads) occupied by a species in the Atlas of the Kent Flora of 1982 and A New Atlas of the Kent Flora of 2010. By subjecting the data to the same analysis used in the New Atlas of the British and Irish Flora, it is possible to calculate a 'change index'; this does not give absolute change, but allows some conclusions to be drawn about relative 'winners' and 'losers'. In addition, by comparing change indices for large numbers of species against other environmental information, it is possible to draw some broad conclusions about the nature of environmental change in the county.

Extinctions of wetland plant species are discussed above. It is also the case that, of the 50 species showing the greatest relative decline between the 1982 and 2010 atlases, 16 are wetland plants. These range from fully submerged species, such as Opposite-leaved Pondweed *Groenlandia densa*, through emergent species such as Water-cress *Rorippa naturtium-aquaticum*, to plants of wet grassland, such as Marsh Arrow-grass *Triglochin palustre*.

The relative decline of plants of wet habitats is well illustrated using Ellenberg values. Ellenberg values are assigned to individual plant species and indicate the tolerance of that species to certain environmental conditions. For example, Ellenberg values for moisture range from 1 (plants of extremely dry sites) to 12 (submerged plants found permanently or almost permanently under water). Plotting Ellenberg values for moisture against the mean change index for all native or

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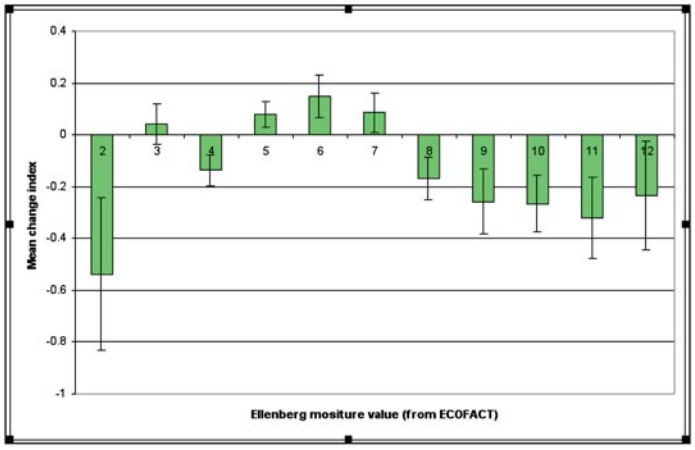
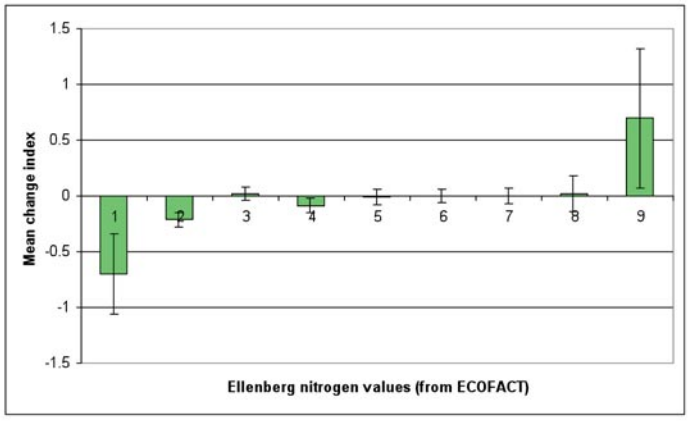
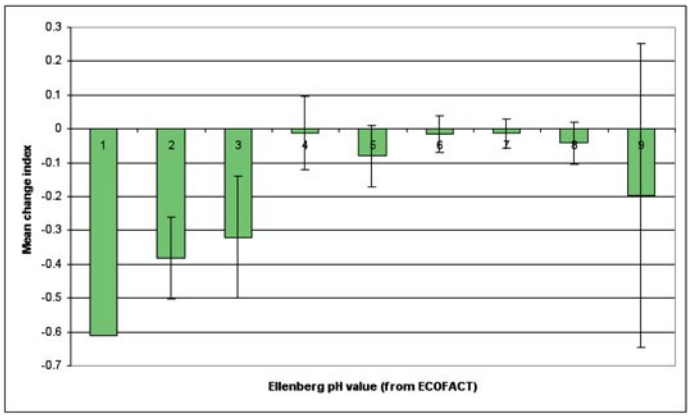


Positive and negative change in Kent's wild plants in relation to soil moisture conditions, from very dry (2) to submerged (12)



Positive and negative change in Kent's wild plants in relation to soil fertility, from very low nitrogen content (1) to very high nitrogen content (9)



Positive and negative change in Kent's wild plants in relation to soil pH conditions, from very acidic (1) to highly alkaline (9)

Photo: R I Moyse

Lizard Orchid, a plant showing a recent increase

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Richard Moyse, Kent Wildlife Trust

archaeophyte plants with that value, we get the top chart on the previous page. This shows that plants of averagely moist to damp soils (Ellenberg values of 5 to 7) have generally increased in distribution, while plants of wetter situations have declined. Note that this graph excludes Least Duckweed *Lemna minuta*, an invasive, non-native wetland plant which has spread rapidly in recent years; if this is included, a slight increase is shown against the value of 11.

Plotting change indices against Ellenberg values for nitrogen (effectively an indicator of the soil fertility with which individual species are associated) also gives an indication of how Kent's environment may be changing. The centre chart on the previous page shows the apparent decline of plants of very infertile sites (value 1) and the apparent increase in plants of very rich sites (value 9) – though the number of species in each of these categories (12 and 5 respectively) is small.

Likewise, in the bottom chart on the previous page, only one species in Kent (Dwarf Gorse *Ulex minor*) has an Ellenberg pH value of 1 (plants of extremely acidic soils), and relatively small numbers (14 and 25 respectively) have values of 2 and 3. Seven species have a Ellenberg pH value of 9, being associated with very calcareous soils: these include Lizard Orchid *Himantoglossum hircinum*, a species which has increased substantially in recent years, probably in response to climate change. Nonetheless, there does appear to be a decline in species associated with more acidic conditions.

Graphs like these need to be interpreted with a certain amount of care. However, what they seem to suggest is that the plants which have declined most, at least since 1980, are those associated with the ends of the spectrum of environmental conditions in the county. So species of wet, very dry, acid, calcareous, or low nutrient situations have declined relative to the rest of the county's flora. It also seems likely to be the case that, for some species at least, this decline is related more to decline in habitat quality than to loss of habitat extent. This may include declining plants such as Meadow Oat-grass *Helictotrichon pratense*, Silver Hair-grass *Aira caryophyllea*, Musk Orchid *Herminium monorchis*, and Dodder *Cuscuta epithymum*.

Plant population increases

What of the winners? Which plant species might be increasing? This paper does not, in general, deal with recently introduced species to the UK, although half of the plant species occurring in the wild in Kent were introduced to the county in historical times, and some very recently indeed. Recent arrivals often tend to spread rapidly, and this has been the case in a number of species in the county. Narrow-leaved Ragwort *Senecio inaequidens*, a South American species, was unknown to the UK in Victorian times, and was only recorded from a single site in the 1982 Atlas of the Kent Flora. Now it is recorded from at least 15 tetrads. Least Duckweed *Lemna minuta*, a tiny, floating wetland plant, was first recorded in the Kent in 1981. The 2010 New Atlas of the Kent Flora shows it as present in 330 tetrads – one-third of the total

Of the 50 native and archaeophyte 'winners' – those plants showing the greatest positive change between the 1982 and 2010 atlases – a number appear to be plants which have become increasingly rare but which may now be staging a slight comeback, such as Stinking Goosefoot *Chenopodium vulvaria*, Rye Brome *Bromus secalinus*, Field Garlic *Allium oleraceum* and Wild Candytuft *Iberis amara*. However, there do appear to be some significant gains by plants which were historically rare in Kent, including Oak-leaved Goosefoot *Chenopodium glaucum*, Lesser Centaury *Centaurium pulchellum* and Lizard Orchid *Himantoglossum hircinum*. Lizard Orchid is discussed above, and Lesser Centaury's increase may be related to an ability to colonise disused quarries and other post¬industrial sites. Some formerly

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rare species are now widespread, particularly Prickly Lettuce *Lactuca serriola* and Great Lettuce *Lactuca virosa*.

In addition, some (though very few) species previously considered extinct have reappeared, and there have been some genuine colonisations by species never previously recorded here. For example, Pennyroyal *Mentha pulegium* has been found at Sevenoaks Wildlife Reserve, where it may be an accidental introduction, Smooth Cats-ear *Hypochaeris glabra* was discovered near New Romney in the 1980s, and Shrubby Seablite *Suaeda vera* (almost certainly a genuine, natural colonist) was first recorded in 1964. One of the few species to have apparently returned from extinction in the county is Bog Myrtle *Myrica* gale, rediscovered at Hothfield Common in 2010, 50 years since it was last seen.

The reasons why some plant species appear to be increasing are unclear, and are not obvious from the Ellenberg values for moisture, nitrogen, pH or light. However, a suite of native plants associated with coastal habitats, and especially with saltmarsh, have shown substantial expansion of range. These plants have exploited the margins of roads, where winter gritting creates saline conditions which most other species are unable to tolerate. These species include Danish Scurvy-grass *Cochlearia danica*, Lesser Sea-spurrey *Spegularia marina*, and Reflexed Saltmarsh grass *Puccinellia distans*.

Conclusions

There is undoubtedly good news to be reported. Some declining species are showing signs of recovery, and some species previously considered extinct have been refound. The rate of loss of plant species is lower for Kent than for many other counties, where geology and land-use history has encouraged much more intensive agricultural exploitation.

However, past loss of habitat has undoubtedly reduced Kent's plant populations, even if many species remain widespread. Population declines are continuing and are severe for some groups of plants, especially wetland plants and arable wildflowers. Perhaps most worryingly, there has been an acceleration in the rate at which plants are disappearing from the county altogether.

Historic habitat loss has undoubtedly played its part in the decline in Kent's wild plants. But the data show that decline in the availability of wet habitats, low pH habitats and low fertility sites have all been major factors in on-going decline. Our flora is far less rich than it was in the 19th century, and continues to become more impoverished and homogenous.

References

Hanbury, F & Marshall, E. (1899). *Flora of Kent.*

Hill, MO, Mountford, JO, Roy, DB & Bunce, RGH. (1999). *ECOFACT 2a Technical Annex -Ellenberg's indicator values for British plants. DETR*

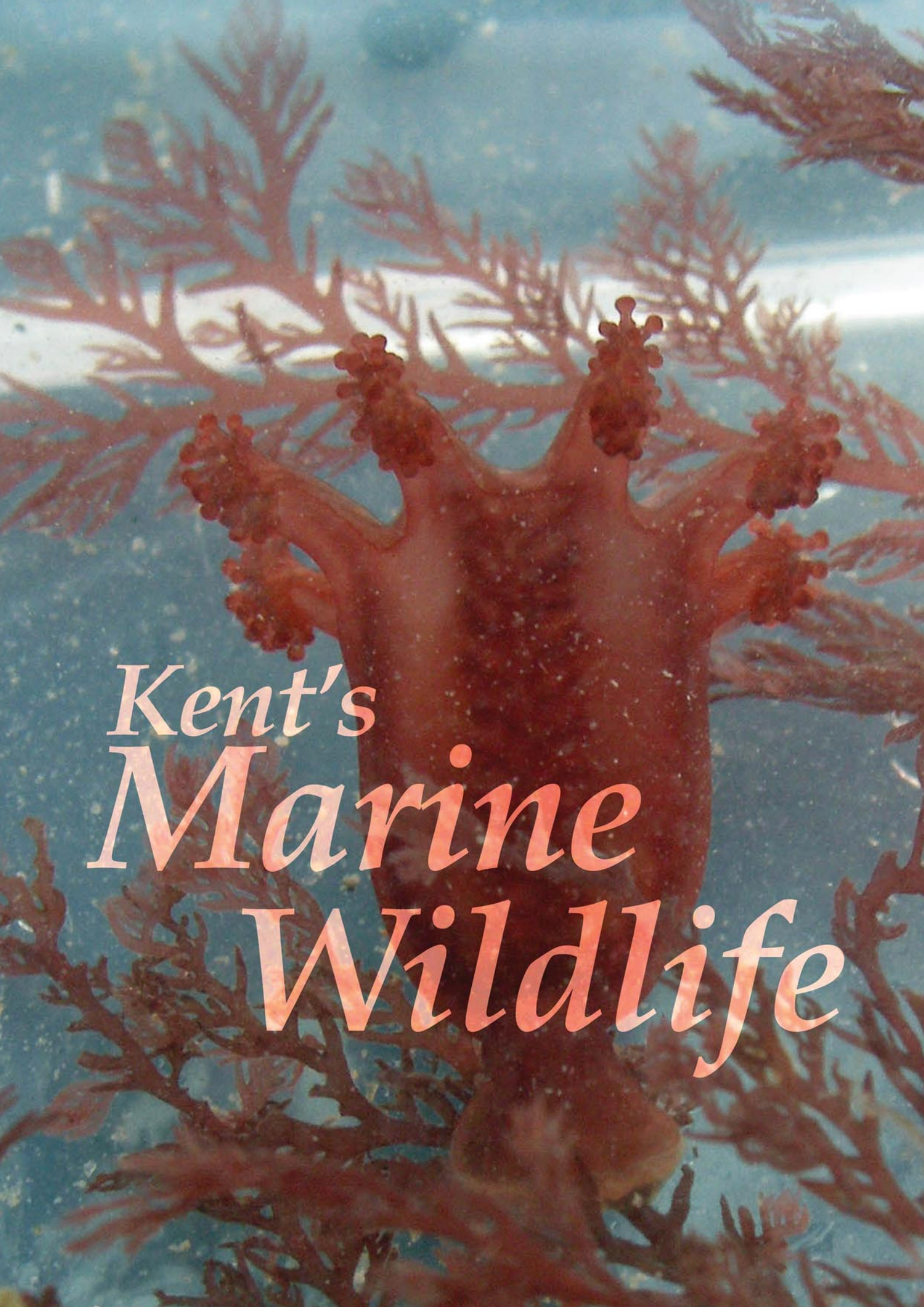
Philp, EG. (1982). *Atlas of the Kent Flora. Kent Field Club.*

Philp, EG. (2010). *A New Atlas of the Kent Flora. Kent Field Club.*

Preston, CD, Pearman, DA & Dines, TD. (2002) *New Atlas of the British and Irish Flora. Oxford University Press.*

Photo: R I Moyse

Shepherd's Needle, a declining wildflower of arable fields


Kent's
Marine
Wildlife

Kent's Marine Wildlife Bryony Chapman, Kent Wildlife Trust

Survey data is not yet sufficiently detailed or extensive to be able to catalogue losses or increases of specific numbers of marine species from the seas around Kent.

What is clear is that the seas all around the UK have suffered serious decline, with fish stocks falling and habitats being lost or damaged through an ever increasing range and intensity of commercial and recreational pressures. Several marine species which occur around Kent are listed as endangered or vulnerable. Other pressures on marine wildlife come in the form of pollution and from climate change and rising sea temperatures, ocean acidification, and rising sea levels causing coastal squeeze against hard sea defences. A more recent, yet significant, threat is competition from rising numbers of invasive non-native species.

The Marine and Coastal Access Act 2009 requires the establishment of an ecologically coherent network of Marine Protected Areas, and the formulation of regional marine plans, which could help to reverse the decline, if delivered and managed robustly.

Marine Species of Kent

Around 250 species of marine algae have been recorded in Kent (compared with about 600 species around the entire UK). Occurring in roughly similar proportions nationally, this comprises Approximatelyimately 110 red algae, 80 brown algae and 50 green algae. The county's marine algae are mapped in An Atlas of the Seaweeds of Kent, (Tittley & Price, 1977), and in a significantly augmented atlas, incorporating a thorough review of past museum and field records and comprehensive new survey data, in preparation by Ian Tittley for publication in 2012. This includes several additional species newly recorded from Kent.

Unfortunately, a similarly comprehensive survey of each of the disparate groups of marine fauna found around Kent is not available. However, national marine databases include records of around 700 different species of marine animals around Kent.

These fall into 17 different phyla:

- Porifera (sponges). Approximatelyimately 40 species
- Cnidaria (anemones, corals, hydroids, jellyfish). Approximately 65 species
- Ctenophora (comb jellies). Minimum 2 species
- Platyhelminthes (flatworms). Minimum 1 species
- Nemertea (ribbon worms). Minimum 5 species
- Entoprocta (small stalked animals with a ring of tentacles). Minimum 2 species
- Sipuncula (peanut worms). Minimum 4 species
- Echiura (spoonworms). Minimum 1 species
- Annelida (segmented worms). Approximately 170 species
- Chelicerata (including sea spiders). Approximately 10 species
- Crustacea (including crabs and barnacles). Approximately 165 species
- Mollusca (including snails, clams, slugs and octopus). Approximately 130 species
- Brachiopoda (lamp shells). Minimum 2 species
- Bryozoa (sea mats). Approximately 50 species
- Phoronida (horseshoe worms). Minimum 1 species
- Echinodermata (including starfish, sea urchins). Approximately 20 species
- Chordata – Tunicata (seasquirts). Approximately 20 species
- Chordata – Pisces (fish). Approximately 75 species

It is undoubtedly the case that most of these groups are under-recorded, and that many more species occur around Kent, but have yet to be recorded. Recent intertidal chalk surveys around Dover for example produced new records of eight sponges, four hydroids and eight bryozoans (as well as several new algae) (Spurrier et al, 2011).

Kent's Marine Wildlife

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Photo: Chris Wood

Anemones and sponges

Other, more conspicuous marine species and features have also been recorded only within the last decade. In the early 2000s, *Sabellaria spinulosa* (rossworm) had not been recorded in reef form around Kent, but several reef formations have since been recorded in Seasearch diving and Shoresearch surveys and in offshore windfarm impact assessment surveys. Seasearch surveys have also recorded several occurrences of species not previously known to be present in Kent, such as ross coral/potato crisp bryozoan, *Pentapora foliacea*, the candy striped flatworm, *Prosthececeraeus vittatus*, the solitary hydroid, *Corymorpha nutans*, and seaslug species *Polycera faeroensis*, *Polycera quadrilineata* and *Crimora papillata*. It is likely that these widespread species were present previously but simply had not been seen or recorded.

Rare marine species around Kent

Recent surveys have identified a number of rare species new to Kent, including:

- *Craterolophus convolvulus* a rare stalked jellyfish recorded in Fan Bay in 2010, the nearest other records being in Scotland and Cornwall.
- *Lucernariopsis cruxmelitensis*, a stalked jellyfish recorded at Margate in 2001, previously recorded only in Southwest England.
- *Halcampa chrysanthellum*, an unusual anemone recorded off The Street, Whitstable in 2008, for which there are only scattered other records around the UK.
- *Caecum armoricum*, Defolin's Lagoon snail, recorded in Lydd in 2007, whose known distribution is limited to this location, Pagham Harbour and The Fleet in Dorset.
- *Hermaea bifida*, a seaslug recorded at St Margaret's in 2011 (unusually on the intertidal), for which the scattered records did not previously extend east of Hampshire.
- *Clathria (Microciona) strepsitoxa*, a sponge recorded on the chalk near Dover in 2010, and at few other locations previously, all west from Hampshire.
- *Dasya cf ocellata*, a small red filamentous alga, detected on the floating pontoons of Dover Harbour in 2005. It has not been recorded on Kent's shores, and the record represents the first record for the southeast of England of a species common in the warmer parts of the Atlantic Ocean.
- *Einhornia (Electra) crustulenta*, an encrusting bryozoan of estuarine habitats, found on the pontoons in the Medway near Chatham in 2011, not previously recorded in Kent, and with limited records elsewhere around the UK. It was found with *Cordylophora caspia*, a non-native hydroid, and together these species characterize a rare brackish water community type which has only one other recorded occurrence in the UK (in a turbid water estuary in southwest England).

These species have been found rarely even during detailed surveys, and were not found where comparable surveys were conducted in previous decades. Conversely, some rare species recorded in previous decades have not been recorded in more recent surveys. However, in most cases, this is more likely to represent serendipitous finds of rare species than the arrival or disappearance of the species in the area. This reinforces the need for further survey.

The ongoing presence of some rare species has recently been confirmed through specific surveys, including, a rich and unusual community of burrowing fauna characterised by the spoonworm, *Maxmuelleria lankesteri*, with the lobe shell *Philine aperta*, which was found in 2010 to persist in the muddy sediment in Hythe Bay.

Some generally widespread species are found only rarely around Kent.

The greensand at Copt Point, Folkestone, is particularly notable in supporting species of algae which do not occur anywhere else around the county. For example, the brown channel wrack, *Pelvetia canaliculata*, occurs only at this location, where it forms a discontinuous zone near the high tide level. Below this,

Photo: B Chapman

Didemnum vexillum
Carpet Seasquirt
invasive non-native
Seasalter

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another brown alga, knotted wrack, *Ascophyllum nodosum*, forms a distinct zone on the intertidal, and is found only here or on man-made hard structures in the Thames, Medway and Swale on the north Kent coast. Copt Point is also the only recorded location around Kent for *Polysiphonia lanosa*, which is only found growing on *Ascophyllum nodosum*, while the red algal parasite, *Choreocolax polysiphoniae*, is found growing on this *Polysiphonia* species only.

Other species known only from Copt Point are the red alga *Lomentaria clavellosa*, the brown algal epiphyte, *Stictyosiphon griffithsianus*, and the brown alga, mermaid's tresses, *Chorda filum*. The small red alga, *Erythrodermis traillii* is only known to occur on the greensand boulders of Folkestone Harbour wall. It is unlikely that the loss of these species at this location could be reversed through natural recolonisation, and the area is highlighted as an Important Plant Area (Plantlife, 2007).

A number of algal species are restricted in distribution in Kent to the chalk reefs at Langdon Bay and Shakespeare Cliff, either side of Dover, including *Apoglossum ruscifolium, Callophyllis laciniata, Dilsea carnosa, Plumaria plumosa, Pterosiphonia pennata, Rhodophysema elegans, Schmitziella endophloea, Scinaia furcellata*, and *Spermothamnion* spp.

The brown thong weed, *Himanthalia elongata*, is frequently found washed ashore around Kent, but has only been recorded once in the county in recent years (in 2006), growing on the chalk shore at Langdon Bay. A search in 2007 in the same location failed to find any specimens, suggesting this may have derived from viable drift material. There is a gap in the species' distribution in the South East(from Yorkshire to West Sussex), which may be attributable to the soft and friable nature of most of the county's shores (Tittley, 2008). The large brown kelp, *Laminaria hyperborea*, is also restricted to the chalk around Dover where it occurs sporadically (in contrast to other locations in Britain where it forms forests).

Several species are currently known in Kent only from Thanet, including the algae *Acrochaetium virgatulum, Chondria dasyphylla*, and *Griffithsia devoniensis*. The first studies of the taxonomy and ecology of chalk cliff algae were undertaken at Westgate and Ramsgate and these are the 'type' localities of several genera and species of algae, (where they were first found and described).

The stringy red alga *Gracilariopsis longissima* was first found and described from material collected at Sheerness, and it features two small red algal epiphytes *Acrochaetium corymbiferum* and *Aglaothamnion pseudobyssoides* that in Kent are largely restricted to this area.

The red alga *Bostrychia scorpioides* in Kent is restricted to saltmarshes and occurs only in the Medway and Swale estuaries where it grows on and among the sea purslane, *Atriplex portulacoides*. Commonly associated with *Bostrychia* is another red alga, *Catenella caespitosa*, but this occurs more widely in the county.

A red algal species, *Callophyllis laciniata* was recorded in Dover Harbour in 2008, confirming some historic records, and falling in a gap in the species' recorded distribution between Yorkshire and the Isle of Wight. A brown alga, *Desmarestia ligulata*, was recorded for the first time on natural shores around Kent in 2010, on the chalk at Folkestone Warren, where it falls in a gap in the species' recorded distribution between Norfolk and Sussex.

Several species are known only from the man-made structures that occur around the Kent coast. These include the green alga, *Gayralia oxysperma*, on seawalls in the Thames and Medway estuaries; the brown alga *Desmarestia viridis* and the red *Griffithsia corallinoides* in Ramsgate Harbour, the red *Dasya cf. ocellata* in Dover Harbour, and the red alga, *Calliblepharis jubata*, in the Walpole Bay

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swimming pool. The conspicuous blackish-red tufted alga, *Spyridia filamentosa*, has also been recorded in the Walpole Bay swimming pool near Margate, but not on natural shores around Kent. The record represents the eastern limit of distributional range in Britain, and is the first record for Kent and the southeast of England of a species that occurs widely in the North Atlantic.

Other algal species currently known from a single location around Kent comprise *Acrochaetium sparsum*, an epiphyte recorded at Reculver only; *Antithamnion cruciatum*, recorded in Dover Harbour only; *Halopteris filicina*, and *Punctaria latifolia*, recorded at Abbot's Cliff only; and Hincksia ovata, recorded in Chatham harbour only.

Seagrass beds in the Swale area feature the finer-leaved *Nannozostera noltii* and the more robust *Zostera angustifolia*, both of which are nationally scarce species.

Marine species highlighted for protection

Kent's marine fauna and flora includes a number of rare or threatened species which have been highlighted for protection. Twenty eight of the UK's 275 marine fish are listed as Biodiversity Action Plan priority species, and 15 of these occur around Kent.

UK Biodiversity Action Plan priority species found around Kent:

- Stalked jellyfish, *Haliclystus auricula*
- Stalked jellyfish, *Lucernariopsis cruxmelitensis*
- Native oyster, *Ostrea edulis*
- Herring, *Clupea harengus*
- Cod, *Gadus morhua*
- Whiting, *Merlangius merlangus*
- Mackerel, *Scomber scombrus*
- Horse mackerel, *Trachurus trachurus*
- Sea monkfish, *Lophius piscatorius*
- Lesser sandeel, *Ammodytes marinus*
- Short-snouted seahorse, *Hippocampus hippocampus*
- Plaice, *Pleuronectes platessa*
- Sole, *Solea solea*
- Common skate, *Dipturus batis*
- Undulate ray, *Raja undulata*
- Basking shark, *Cetorhinus maximus*
- Tope shark, *Galeorhinus galeus*
- Blue shark, *Prionace glauca*

Six of the 29 Marine Conservation Zone Species Features of Conservation Importance (FOCI) are present around Kent:

- Stalked jellyfish, *Haliclystus auricula* - a single known site at Westgate, Thanet
- Stalked jellyfish, *Lucernariopsis cruxmelitensis* – a few records around Thanet
- Tentacled Lagoon worm, *Alkmaria romijni* - in the Thames and Medway
- Native oyster, *Ostrea edulis* – records scattered all around the county
- Defolin's Lagoon snail, *Caecum armoricum* – a single known site, in Lydd's lagoons
- Short-snouted seahorse, *Hippocampus hippocampus* – a few scattered records around the county

Key marine habitats and communities found in Kent

Kent's seabed features some exposed rock reefs, such as those extending out from the chalk cliffs around Thanet and Dover, and the greensand around Folkestone. On the north Kent coast, London clay is intermittently exposed, and, at Reculver, blocks of tabular sandstone overlay clay. These relatively stable rock areas support algae on the intertidal and shallow subtidal (as far as light penetration is sufficient through the typically turbid water). Around and below low tide the rocks support rich communities of attached animal life.

Coastal and marine chalk is globally scarce, forming less than 1% of the whole UK coastline, and Kent has 35% of this UK resource. The chalk and clay allow unusual assemblages of plants and animals, adapted to living on and within the soft rock. In some areas of chalk reef, deep gullies are formed, with shaded overhangs created by scouring of the soft chalk. Further habitat complexity is provided by the periodic falls from the chalk cliffs, depositing large boulders out

Photo: B Chapman

Lower greensand Laminaria zone

onto the intertidal. These can support unusual and rich communities of attached animal life on the damp and shaded undersides, featuring sponges, seasquirts and bryozoans in particular.

Analysis of Kent's algal distribution data reveals the chalk reefs in Langdon Bay and below Shakespeare Cliff, located either side of Dover, to be the richest in algal species in Kent, with 90-100 species recorded here (Tittley, in prep.). The coast of Thanet is recognized to be of international importance for the rare algal communities on its chalk cliffs, in caves and on the intertidal chalk reefs. While floristically not as rich overall as the Dover area, analysis of Kent's algal distribution data reveals the north coast of Thanet to be moderately species rich.

The soft London clay of north Kent is ecologically distinct form the county's chalk in lacking the dense canopies of fucoid and kelp algae. Nonetheless the clay (particularly that at Studd Hill, between Hampton and Tankerton) is of moderate algal species richness.

The small outcrop of lower greensand at Copt Point at Folkestone represents a single area of harder natural intertidal rock around Kent, and is important in supporting algal communities and species not found on natural surfaces elsewhere around Kent.

Kent seas also hold offshore sand banks, such as those of the Goodwin Sands and Margate Sands complexes, as well as the impressively long and tall sediment formation of the Varne Bank in the Dover Strait. While sandbank sediments are often mobile, they can also harbour many invertebrates and fish, and can be consolidated by beds of mussels and reefs of rossworm tubes. Those sandbanks which are exposed at low tide provide remote haul out sites for seals.

Mud and fine sand seabeds occur in the estuary areas of the Thames, Medway, Swale and Pegwell, supporting high numbers of animals living within the sediment. Seagrass beds and extensive saltmarsh formations in the Medway estuary and the Swale create habitats which supports different plant and animal diversity, as well as protected nursery grounds for fish and other species. The saltmarshes of the Medway estuary and the Swale represent an important component of the algal species and communities of the county, often characterised by green algae and the yellow green algal genus *Vaucheria*, and supporting the red alga *Bostrychia scorpioides*.

In Hythe Bay stable and unusual communities occur in the subtidal mud, featuring large burrowing animals including spoonworms (*Maxmuelleria lankesteri*) and mats of tiny *Ampelisca* crustaceans.

Large areas of Kent's seabed comprise varying coarsenesses of sediment overlying rock in varying thicknesses from thin veneers to deep deposits. In many places, the bedrock and boulders are intermittently exposed, providing a rich habitat mosaic of stable rock supporting sessile animals, with mobile and burrowing animals living on and within the sediment between.

The county's seabed sediment habitats are frequently stabilised with formations of sand tubes constructed by rossworms, *Sabellaria spinulosa*. These tubes can form a stabilising crust over the sediment seabed, or in certain conditions they can form into reef structures standing several centimetres proud of the seabed and covering large areas. *Sabellaria spinulosa* reefs are usually found in the subtidal, but significant formations are present on intertidal chalk around Kent, at Kingsdown, Deal and Dumpton Gap and Birchington on Thanet, representing a habitat and community type not included in the national classification system. The honeycomb worm, *Sabellaria alveolata*, more typically occurs on shore in areas of rock and sand, but off Folkestone it forms reefs on subtidal muddy sediments, representing another habitat and

Photo: Jason Armstrong

Mussel bed
Mytilus edulis

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community type not included in the national classification system. These *Sabellaria* formations are delicate, and broken sections and collections of broken tubes are frequently encountered on the seabed.

Blue mussels are also present around the whole Kent coast, forming often long-lived, stable beds on both rock and sediment on the intertidal, and sometimes more ephemeral features in the subtidal.

All these types of natural 'biogenic' reef formations provide important habitat and shelter for a range of small species, which in turn provide a food source for larger animals.

The many man-made structures that have been constructed and the numerous wrecks that lie around Kent create additional hard habitat features, and can increase biodiversity locally, although in some cases (notably coastal protection on chalk coasts) they can cause the loss of natural habitat and communities.

Marine habitats highlighted for protection

Biogenic reef habitats are among several of Kent's marine habitats which have been recognised as priority habitats in the UK Biodiversity Action Plan and more recently for protection as Habitat Features of Conservation Importance (FOCI) in the designation of Marine Conservation Zones under the Marine and Coastal Access Act 2009.

Marine Conservation Zone Habitat FOCI present around Kent:

- intertidal chalk – Thanet, and Kingsdown to Folkestone
- subtidal chalk – Thanet, and Kingsdown to Folkestone
- subtidal sands and gravels – widespread around the county
- mud in deep water, and mud with burrowing megafauna – Hythe Bay
- sheltered muddy gravels – scattered records, including Thames estuary
- peat and clay exposures – Folkestone Warren, and north Kent, west of Thanet
- fragile sponge and anthozoan communities – on subtidal greensand off Folkestone
- intertidal under-boulder communities – Kingsdown to Folkestone
- seagrass beds – Medway and Swale (intertidal beds only)
- rossworm reefs – records scattered around the county, both intertidal and subtidal
- honeycomb worm reefs – subtidal off Folkestone
- native oyster beds – north Kent
- mussel beds – records scattered around the county

The chalk reefs of Thanet, sand dunes of Sandwich Bay, shingle of Dungeness and sandbanks in the outer Thames each fall within Special Areas of Conservation under the European Habitats Directive. The Swale, Medway Estuary and Marshes, Outer Thames Estuary, Thanet Coast and Sandwich Bay, and Dungeness to Pett Level each fall within Special Protection Areas under the European Birds Directive. Sites around Thanet, at Folkestone and in the Thames have been identified as Important Plant Areas (Plantlife, 2007).

The current status of species

There is insufficient data available for a detailed analysis of the state of individual marine species in Kent. Even baseline data is far from comprehensive, although the forthcoming comprehensive seaweed atlas (Tittley, in prep) will greatly facilitate future analysis of the county's marine algal communities.

Certain specific areas of the county have been subject to repeated studies, including Sandwich Bay, Thanet's intertidal and subtidal chalk and Dover's intertidal chalk. These studies indicate that most key biotopes and their characterising species (i.e. broadly similar species assemblages) have persisted on the intertidal chalk around Thanet and Dover. Changes in abundance of several of the species, and large differences in the species lists on the subtidal chalk around Thanet were noted in 2004, compared

Photo: B Chapman

Pacific Oyster
Crassostrea gigas
Epple

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Photo: B Chapman

Sabellaria spinulosa intertidal rossworm Kingsdown

with 1997. However, it was concluded that there was a constant core community over the seven year period, and that changes of the scale observed were likely to occur on a regular basis.

It is not possible to determine whether a general decline in intertidal species diversity in recent years perceived by a number of regular long term marine survey volunteers is significant, transitory or permanent.

Species losses

Species losses experienced in Kent are not easily determined from the data available, though some declines are notable.

The county's once abundant native oyster beds have been reduced to small pockets and farmed stocks. Even by 1903, the Sea Fisheries Committee noted that the indigenous oyster banks which were previously found here and there all over the area of the Thames Estuary were now only to be found in the Blackwater and Kentish Flats. Subtidal mussel beds in areas such as the Swale are also noted to have declined in recent years.

Populations of commercially exploited fish have declined around the UK, to the extent that around half the North Sea's commercial fish stocks are now 'outside safe biological limits', and the sizes at which some species breed have reduced. Around ten fish species found in English waters are either critically endangered or endangered, while fifteen more are vulnerable to global extinction (Natural England 2010). This includes the critically endangered European eel, *Anguilla anguilla*, the endangered undulate ray, *Raja undulata*, and the vulnerable Atlantic cod, *Gadus morhua*, haddock, *Melanogrammus aeglefinus*, basking shark, *Cetorhinus maximus*, tope shark *Galeorhinus galeus*, and smooth hound, *Mustelus mustelus*, all of which have been recorded around Kent.

A young fish survey carried out by Cefas over the past 30 years around the east and south coasts of England recorded a significant decline in the overall catch per unit effort over the time of the survey, especially in the young of fished species, and concluded that fisheries have negatively impacted on the recruitment of young commercial fish.

Certain marine species found around Kent are vulnerable to disturbance and less able to recover (Marine Ecological Surveys Limited, 2008). Records of species such as the delicate fan worms, *Bispira volutacornis*, (identified as vulnerable) around the Kent coast appear to be generally restricted to larger rock or wreck features which are unsuitable for towed fishing gear and therefore provide them with protection from physical damage.

A decline or change has been noted in certain species, such as the widely occurring *bryozoan, Membranipora membranacea* which could not be found around Dover on intertidal surveys in 2009/10, where previously it had been recorded commonly on the intertidal (Spurrier et al 2011). Similarly, monitoring surveys of the subtidal chalk around Thanet in 2004 failed to find the large aggregations of the seasquirt *Molgula manhattensis* present in 1995 and 1997.

The Defolin's lagoon snail, *Caecum armoricum*, was recorded in Lydd in 2007 (Pain et al, 2008). A subsequent SAC monitoring survey failed to find the species, and concluded that recent changes to the lagoon habitat conditions may mean the site is no longer suitable.

The peacock tail alga, *Padina pavonica* has not been recorded in the past century around Kent, while several, sporadic records exist previous to 1900. Historical evidence also indicates that the red alga *Bostrychia scorpioides* has now become extinct on the Kent side of the Thames.

Climate change

Recent surveys have recorded several new arrivals to Kent which represent range extensions of native species, probably as a result of climate change and

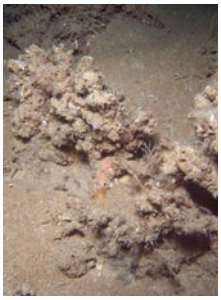

Photo: Dave Wood

Sabellaria spinulosa
Ross worm

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rising sea temperatures. These include the purple topshell, *Gibbula umbilicalis*, which was recorded for the first time in Kent in 2005, at St Margaret's Bay. This had not been found previously, despite dedicated surveys for this and other climate change indicator species in Kent, but it is now recorded in some abundance on the chalk shores around Dover and Thanet. Similarly, the small periwinkle, *Melarhaphe neritoides* was found for the first time at Ramsgate in 2006, and again in Folkestone in 2007, although this does not appear to have become widespread. The range of the grey triggerfish, Balistes capriscus, a Mediterranean species, has been expanding along the south coast, and records have now extended its known range to the Dover area.

The Cefas young fish survey revealed a change in the make-up of young fish communities over the past 30 years, attributed to the corresponding increases in sea temperatures. The seas around Kent feature a high proportion of the total number of different species caught in this survey, being positioned on the edge of the warm Lusitanian waters from the south west, and the cold waters from the North Sea. However, in the 1980s more cod were recorded, and in later years, more solonettes and rays were recorded. Also now found in lower numbers are species such as eel pout, pogge and butterfish, while species such as weaver fish, black sea bream and tub gurnard appear to be on the increase in the area.

Non-native species

There are several marine non-native species present around Kent, some of which are well established, while some are relatively new arrivals and include invasive species which give cause for concern. Movement of vessels, ships' ballast water and the introduction of farmed oysters appear to have been the main vectors for the introduction of the county's non-native species.

Some species, such as wireweed, *Sargassum muticum*, slipper limpets, *Crepidula fornicata*, leathery seasquirt, *Styela clava*, the Australasian barnacle, *Elminius modestus*, the American razor, *Ensis americanus*, the American sand gaper, *Mya arenaria*, the American piddock, *Petricola pholadiformis*, and the American sting winkle, *Urosalpinx cinerea*, have occurred in Kent for many years and have possibly reached an equilibrium position. However, they can frequently represent a significant component of shore communities, sometimes dominating in the place of similar native species, such as the sword razor, *Ensis ensis*, the European sting winkle, Ocenebra erinacea, and the native acorn barnacle, *Semibalanus balanoides*. *Sargassum muticum* was first recorded growing in Kent in 1988, and is now recorded forming blanketing growths in the tidal swimming pools and many rockpools around the Thanet coast.

The Pacific oyster, *Crassostrea gigas*, was introduced for commercial cultivation, believing the UK waters to be too cold to allow it to breed. It has been present wild on the shores around Kent for several years, but has recently increased significantly in dominance and extent, following warm summer water temperatures, when breeding is triggered. A detailed study of their coverage documents its increase around the Thanet shores where it may impact on intertidal Sabellaria reefs and mussel beds (McKnight, 2009). There appear to be some natural limiting factors to the species' spread, such as storms which dislodge clusters from the chalk, and smothering with fine sediment movement, as well as disease which has killed farmed stock.

Another bivalve introduced to create a fishery is the Manila carpet shell clam, *Tapes philippinarum*, which is now spreading along Kent's shores.

The Chinese mitten crab, *Eriocheir sinensis*, occurs in several of the county's freshwater bodies, where the animals spend most of their lives before moving to marine waters to breed. The species has also been recorded in several estuarine

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Photo: Rachel Coppock

Square Crab
Goneplax Hythe
Spoon Worm Site

locations around the county, as well as incidental capture by a fishing vessel off Folkestone. The animals' borrowing behaviour can cause considerable damage to soft sediment banks, increasing erosion.

The ongoing presence of a rare non-native bamboo worm, *Clymenella torquata*, at Whitstable was confirmed in 2011. Its recorded distribution is restricted to Whitstable and very few other sites on the UK's east coast.

Other non-native algal species have been recorded recently on the shores, but the occurrences of each have to date been extremely limited. These include the green sea fingers alga, *Codium fragile* subsp. *fragile*, and the red alga, *Bonnemaisonia hamifera*, both found in the man-made Walpole Bay swimming pool near Margate. Another new non-native red alga, *Asparagopsis armata* was found on the natural shore at Abbot's Cliff near Dover. A single location of a non-native hydroid, *Cordylophora caspia*, has been recorded in Kent, in the Medway in 2011; this species has not been reported to compete with native species in the UK.

A solitary seasquirt, *Corella eumyota*, was first recorded in 2010 at Shakespeare Cliff. While only a few individuals have so far been detected, this is highlighted as an invasive non-native species which can form into large aggregations and smother native species.

The very recent arrival of other highly invasive species could have severe implications for native species assemblages.

The Pacific strain of a small red alga, *Caulacanthus ustulatus* was first recorded in Kent in 2009 around Dover. It has rapidly spread around Dover and up to Thanet where it dominates areas on the shore previously covered by native algal turf characterised by *Gelidium pusillum*.

A highly invasive colonial seasquirt, *Didemnum vexillum*, was first recorded in Kent in 2011. This was found on the shore at Seasalter, whereas all previous UK records were restricted to harbours, marinas and other man-made structures. The species can quickly form gelatinous sheets which smother native species, with resultant impact on biodiversity. Experimental eradication attempts in the confines of a Welsh harbour proved unsuccessful. Its rapid colonisation of intertidal boulders at Reculver within a matter of weeks over the 2011 summer period is cause for great concern.

Still further invasive non-native species, such as the Japanese wakame kelp, *Undaria pinnatifida*, and the red alga, *Grateloupia turuturu*, are currently believed to be restricted to harbours around Kent, where the floating pontoons provide both permanent sea water immersion and good light levels. Their further spread outwards to the shores has been recorded elsewhere, and is possible around Kent.

The non-native red alga, *Antithamnionella spirographidis*, has also been recorded in both Dover and Ramsgate Harbours. The non-native fan worm, *Ficopomatus enigmaticus*, occurs in Wellington Dock of Dover Harbour. Its spawning requires variable salinity water, so that its distribution is largely restricted to harbours and brackish waters. While it can compete with native fauna for suspended food, it is noted to improve oxygen and nutrient status in enclosed water bodies, to the benefit of other species.

Further survey to evaluate the spread of all the invasive non-native species and their impact on native biodiversity is required, although effective mechanisms for control have yet to be determined.

Pressures on marine habitats and species

In addition to competition from non-native species, Kent's seabed habitats and native marine biodiversity face a host of pressures from human activities in the county's extremely busy sea areas. Almost all the seabed around Kent is used

Photo: B Chapman

Undaria pin Wakame
Ramsgate

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for commercial fishing of one type or another, for fin fish, crustaceans and molluscs, including dredging, trawling, potting, set netting, and shellfish farming. Fisheries impact on the populations of target species, as well as unwanted bycatch species such as catsharks and invertebrates. The habitat-forming mussel beds are commercially harvested, and seed mussel is collected for growing on in other, more productive locations. Certain fishing gear types cause damage to rock and sediment habitats and their associated assemblages of species, and to Sabellaria reef formations. Angling removes certain targeted fish species, and bait collection can disturb intertidal habitats while removing bait species. Significant levels of inter-tidal shellfish harvesting occur on the more accessible chalk shores around Thanet by the public and organised groups.

Further habitat damage arises from the laying of cables and pipelines, from commercial and recreational anchoring, and from the dredging and disposal of sediment to open or maintain navigational channels, or for extraction for construction. Coastal developments and offshore developments, including the new offshore windfarms, can further change or reduce natural habitat available for biodiversity.

Considerable areas of saline wetland in Britain have been lost over the past two centuries, mostly due to drainage and land claim, with concomitant loss of higher plants and algal species. Following significant land claim from the sea particularly in the Wantsum Channel and Romney Marsh areas, the saltmarshes of the Medway and Swale represent an important remaining resource in the county.

The seas also suffer from direct and diffuse sources of pollution, from oil spills and sewage disposal to nutrient run off, while climate change has severe implications through rising sea temperatures, ocean acidification, and rising sea levels causing coastal squeeze against hard sea defences.

Artificial structures have significantly changed the nature and dynamics of the shoreline and some offshore areas, with the natural longshore drift of sediment being interrupted, and additional hard attachment surfaces being available for algae and sessile animals.

Positive change

The Marine and Coastal Access Act 2009 presented a long-awaited opportunity to establish an ecologically coherent network of Marine Protected Areas (including new national-level designations, Marine Conservation Zones), to formulate regional marine plans, and to create a Marine Management Organisation and ten Inshore Fisheries and Conservation Authorities, responsible for planning and managing our seas sustainably. If delivered robustly, these opportunities could help to reverse the degradation of marine biodiversity.
Ten Marine Conservation Zones (MCZs) around Kent have been recommended by the Balanced Seas' Regional Stakeholder Group, for review by the statutory nature conservation bodies and the national MCZ Science Advisory Panel, before submission on to Government late in 2011. MCZ designations begin following public consultation in 2012.

References

Howson, C., Bunker, F., and Mercer, T., Aquatic Survey & Monitoring Ltd. 2005. Isle of Thanet European Marine Site sublittoral monitoring 2004. English Nature Contract FST20-46-16.

JNCC Marine Recorder Database.

Marine Ecological Surveys Limited. 2008. Marine Macrofauna Genus Trait Handbook. Marine Ecological Surveys Limited, 24a Monmouth Place, Bath, BA1 2AY. 184pp. ISBN 978-0-9506920-2-9

McKnight, W., 2009. Pacific Oyster

survey of the North East Kent European marine sites. Natural England Commissioned Report NECR016

Natural England, 2010. Lost life: England's lost and threatened species

Natural England and JNCC 2010. Marine Conservation Zone Project. Ecological Network Guidance.

National Biodiversity Network Gateway. www.nbn.org.uk/

Pain, C., Wilkinson, S. and Light, J. 2008. Two further UK sites for Caecum armoricum, de Folin, 2869, formerly known only in the Fleet, Dorset, as a member of the interstitial 'springs' community. Journal of Conchology, 2008, VOL.39, NO.6

Plantlife, 2007. Important Plant Areas for Algae. A Provisional Review of Sites and Areas of Importance for Algae in the UK.

Spurrier, C., Tittley, I, and Chapman, B. 2011. Biological survey of the intertidal chalk reefs between Folkestone Warren and Kingsdown, Kent. Kent Wildlife Trust report.

Tittley, I. and Price, J.H., 1977. An Atlas of the Seaweeds of Kent. Transactions of the Kent Field Club Volume 7.

Tittley, I., Spurrier, C.J.H., Chimonides, P.J., Chapman, B. 2006 Thanet Coast Special Area of Conservation: 2005 intertidal monitoring. English Nature Contract IIT25/05-06
Tittley, I. 2008. Marine algae new to Kent. Bulletin of the Kent Field Club.

Tittley, I. In prep. Atlas of the Seaweeds of Kent.

UK Biodiversity Action Plan Priority Species. http://tna.europarchive.org/20110303145

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