

Hippuris vulgaris, fennel pondweed *Potamogeton pectinatus* and the nationally rare holly-leaved naiad *Najas marina* are all present in quantity, and the stonewort *Nitellopsis obtusa*, which is scarce throughout Europe, has been recorded. The latter three species are indicative of the brackish nature of the broad. In contrast Hickling Broad, one of the largest and oldest expanses of open water in East Anglia, and the adjacent Horsey Mere have suffered deterioration in water quality over recent years due to increased nutrient input from several sources, including a roost of overwintering black-headed gulls. Nevertheless they retain a limited aquatic flora including mare's-tail and spiked water-milfoil *Myriophyllum spicatum*, and together the two broads attract outstanding numbers of wintering wildfowl, with particularly notable populations of teal, shoveler and gadwall. Shallow scrapes have been created in places near the Broad, and these provide both feeding areas for migrant birds and nesting areas for several uncommon species such as avocet, ringed plover and little tern.

A fringing zone of reedswamp dominated by common reed *Phragmites australis* and lesser bulrush *Typha angustifolia* surrounds the broads, and the presence of marsh-mallow *Althaea officinalis*, Danish scurvygrass *Cochlearia danica* and sea-milkwort *Glaux maritima* in places attests to the influence of brackish water here. Birds nesting around the margins of the broads include water rail, mallard, gadwall, garganey and particularly significant numbers of pochard. The wildfowl also nest along drainage dykes in the grazing marshes.

Fen

Fen communities occur on the more consolidated ground behind the reedswamp, and these take the form of extensive reedbed dominated by common reed, commercial sedge beds dominated by great fen-sedge *Cladium mariscus* and species-rich mixed fen of both reed and sedge. The reedbeds in particular, most of which are regularly cut, are of outstanding importance for their characteristic Broadland birds including nationally important breeding populations of rare species such as marsh harrier, bittern, bearded tit and savis warbler. The complementary mixed fen areas are of a vegetation type now almost entirely confined to Broadland, and this highly characteristic community comprised common reed and great fen-sedge with a wide variety of tall associates such as yellow loosestrife *Lysimachia vulgaris*, hemp agrimony *Agrimonia eupatoria*, purple loosestrife *Lythrum salicaria*, greater spearwort *Ranunculus lingua* and a number of localised species such as milk-parsley *Peucedanum palustre*, cowbane *Cicuta virosa*, marsh sow-thistle *Sonchus palustris* and greater water-parsnip *Sium latifolium*. Beneath these components is a lower layer generally dominated by blunt-flowered rush *Juncus subnodulosus*, tufted sedge *Carex elata* and black bog-rush *Schoenus nigricans*, and probably developed in response to traditional mowing of the fens as in parts of the Ant Valley. A further particularly distinctive feature of this community in the Thurne Valley is the presence of salt-tolerant plants such as parsley water-dropwort *Oenanthe lachenalii* and brookweed *Samolus valerandi*. In places within the fen protected from the rise and fall in water levels acidic conditions have developed. Here the vegetation is characterised by carpets of bog mosses (principally *Sphagnum fimbriatum* and *S. palustre*) under a canopy of downy birch *Betula pubescens*. Round-leaved wintergreen *Pyrola rotundifolia* occurs sporadically and large populations of the rare crested buckler-fern *Dryopteris cristata* are present.

In contrast to the fen communities which have developed in the river's flood-plain under the influence of calcareous groundwater, a second type of acidic community has arisen locally on the margins of the site where fed by base-poor seepage water. This community, found rarely in the other Broadland river valleys, supports locally uncommon species such as white sedge *Carex curta*, marsh cinquefoil *Potentilla palustris*, bogbean *Menyanthes trifoliata*, cross-leaved heath *Erica tetralix* and petty whin *Genista anglica*, together with the bog mosses *Sphagnum plumulosum* and *S. subsecundum* var *inundatum*.

The large size, floristic diversity, restricted distribution and historical continuity of these fen communities has resulted in a highly specialised habitat which supports a remarkable number of rare and notable insect species. It is one of the principal remaining strongholds of the swallowtail butterfly *Papilio machaon britannica*, whose larvae feed on milk-parsley, and the moth fauna includes an exceptional total of 48 species considered uncommon such as the fenn's wainscot *Photedes brevilinea*, reed leopard *Phragmataecia castaneae* and small dotted footman *Pelosia obtusa*, the latter known from only one other British site. These areas support an unusual coleopteran (beetle) fauna dependant on managed fen areas with relatively low levels of litter, including the rare ground beetle *Dromius longiceps*. Wetter areas and dykes within the fen are also of considerable importance for their aquatic coleoptera, with several relict fen species including the rare *Agabus striolatus* and *Hydroporus scalesianus*.

Grazing Marsh

Extensive areas of grazing marsh provide breeding grounds for birds such as snipe, lapwing and redshank and are important feeding areas for the large numbers of wintering wildfowl, including a nationally important flock of bewick's swans, attracted to the site. The associated dykes have a diverse aquatic flora and show a range of salinities, with sea club-rush *Scirpus maritimus*, grey club-rush *Schoenoplectus tabernae-montani*, whorled water-milfoil *Myriophyllum verticillatum* and fen pondweed *Potamogeton coloratus* present in the brackish dykes nearest the coast. Further inland they support a more typical freshwater Broadland flora that includes frogbit *Hydrocharis morsus-ranae*, water-violet *Hottonia palustris*, greater bladderwort and the scarce water-soldier *Stratiotes aloides*. A wide variety of dragonflies is associated with the dykes, amongst which are the uncommon *Coenagrioni pulchellum*, *Brachytron pratense* and Norfolk aeshna *Aeshna isosceles*, the latter known from only a few Broadland localities in Britain. Floristically rich mowing marsh is present locally and is notable for the large populations of common spotted-orchid and southern marsh-orchid *Dactylorhiza fuchsii* and *D. praetermissa*.

Woodland

Areas of old oak plantation and alder *Alnus glutinosa* and grey willow *Salix cinerea* carr within the site are not extensive, and support a flora of shade-tolerant fen plants such as bittersweet *Solanum dulcamara* and yellow iris *Iris pseudacorus*. A number of specialised beetles and moths generally associated with old woodland have been recorded from these areas, which contribute to the overall diversity of the site. Scattered trees and scrub provide winter roost sites for raptors.

Hickling Broad is an important site for research into the origin of the Norfolk Broads and problems currently affecting them.