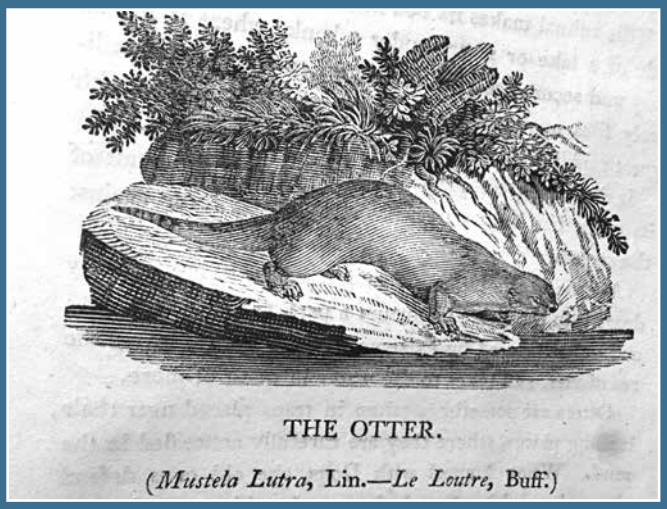
Richard Carew (1555–1620), aged 32, as High Sherrif and Deputy-Lieutenant of Cornwall, National Trust



The Otter by Thomas Bewick 1807.

Otter in river. Photograph by Adrian Langdon

The Cornwall Coastal Otter Project – Cornwall Mammal Group's study of otter diet around the coastal fringe

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Some of the earliest wildlife records in Britain appear in county histories – surveys of industry, stately homes, significant families, geology and natural history. In 1602 Richard Carew, one-time High Sheriff of Cornwall and MP for Saltash, noted in his Survey of Cornwall that otters, although of one kind, occupied two habitats: a less productive one of freshwater rivers and the coastal cliffs where they fed well on sea fish. Despite the fishing, mining, shipping and hunting around the Cornish coast, records of coastal otters continued through the 18th, 19th and early 20th centuries with Marie Stephen's 1957 report for the Otter Committee reporting that coastal otters move inland in bad weather.

After the 1970s and 80s and the well-documented decline in otter populations across England, otters in Cornwall appeared to retreat to freshwater habitats with only occasional records from the coast, although this habitat clearly offered abundant prey compared to the small acidic streams of the high moor.

Carew's comments that there was a single otter species was at odds with the thinking of some later naturalists. Observing the darker coat, larger size and behavioural differences Ogilby in 1836 proposed the coastal otter of Ireland and Scotland to be a separate species from the animals found in freshwater. Although we now know that only a single species of *Lutra lutra* occurs in the UK, otters do exhibit characteristic behaviour dependent on their habitat. Coastal otters in Scotland tend to occupy smaller, less linear ranges, exhibit more diurnal activity and appear less likely to be solitary than inland animals. Over the last 20 years reports of otters sighted around the coastline and estuaries of Cornwall have increased and the Cornwall Mammal Group (CMG) were keen to learn if this was just animals moving between river catchments or if there was evidence of a return by otters to coastal habitats. Spraints had been recorded around the coastal fringe in several surveys but the only direct evidence of the consumption of marine prey was a report of 2 examples found in the analysis of 171 stomachs of road casualties, both prey species possibly originating from brackish water. More recently research around the coasts of South-West Wales and Suffolk demonstrated otters using marine resources, although with little evidence of the level of coastal dependence exhibited by otters around the Scottish highlands and islands.

After discussion with other local mammal and otter groups in the Southwest and Wales, CMG recruited 30 volunteers to search for spraint around the coastline and estuaries of Cornwall in 2018/19. Although finding spraint at coastal sites is more difficult than looking on rivers, we collected 50 coastal samples; 61 from estuaries and a further 104 at varying distances inland.

Our primary interest was to determine if any marine prey could be identified in the spraints. Spraint samples were processed and

analysed using the techniques outlined in the Mammal Society's excellent book by Conroy *et al*. Some reference samples were prepared and a range of invaluable contacts, from fishery biologists to archaeologists, were called on for help. We used this to prepare a photographic reference manual.

Where possible prey remains were categorised to individual species, for instance European eel, 3-spined stickleback and bullhead. Some species were pooled into categories because of the difficulties of finding characteristic remains in a suitable state of preservation (e.g. rocklings and flatfish), and some categories consisted of groups of species which could not be separated reliably using spraint remains (e.g. salmonids and gobies).

No attempt was made to quantify individual prey items or assess their relative importance. The unknowns in terms of how much, and which parts, of a prey item have been consumed, the degree of mastication and digestion, and the number of spraints over which it was evacuated make meaningful quantification from field samples almost impossible. What we could confirm was that otter diet in Cornwall is diverse (24 different prey categories were identified and 11 of these appeared in at least 10% of samples) and that an extraordinary amount of small prey is taken. Sticklebacks, minnows, gobies and newts all featured, with the remains of multiple individuals, identified by otoliths, in many spraints (one sample containing at least 65 gobies).

Having categorised prey remains it was key to know where these prey had been caught. Many of the prey categories occur in both marine and freshwater habitats. Salmonids (primarily brown trout) are likely to have been caught in fresh water streams, based on the generally small size of the remains. It is not possible to discriminate brown trout from sea trout or salmon, which might be caught in the ocean, however unlikely. Likewise, 3-spined sticklebacks are a freshwater species which can also occur in brackish water. Eels, again likely to have been caught in freshwater, migrate to the ocean to breed and younger eels may be found in estuaries and brackish water. Gobies, mullet and flatfish are primarily marine but move into brackish and even freshwater and are certainly found beyond the tidal limit. Fortunately some prey categories can evidence hunting in marine habitats: rockling, wrasse, blennies and 15-spined stickleback do not occur in fresh water. Likewise bullhead, cyprinids, insects and amphibians occur only in fresh water or terrestrial habitats.

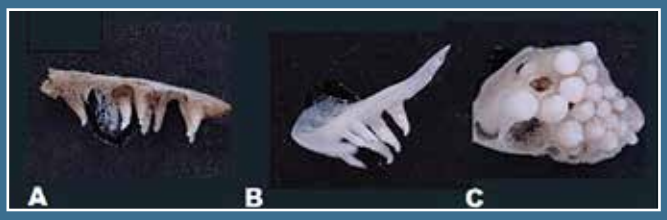
Notwithstanding the reluctance of some prey to remain in their 'primary' habitats, prey categories were assigned to marine or freshwater origins.

> Fish remains were identified in 90% of spraints, with birds, amphibians, insects, crustaceans and mammals also appearing. Marine prey remains were identified in 82% of spraints collected from estuarine sites, in 44% of coastal spraints and in 30% of spraints collected inland.

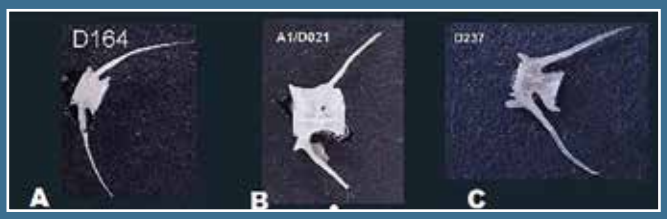
The proportion of spraints containing marine prey declined with increasing distance from the coast, only goby and flatfish remains were identified more than 1 km from the coast and beyond 1.6 km from the coast. Only a single item of marine prey was identified in 28 spraints. In contrast, studies of otters around the Scottish and Irish coasts showed little freshwater prey was taken. Spraint studies from South West Wales, Suffolk and Portugal all found evidence of both marine and freshwater prey in spraints. In the current study freshwater prey were found in spraints collected from all environments, 79% of coastal spraints containing freshwater or terrestrial prey. Prey remains are typically excreted with 24 hours of ingestion and a single prey item may be spread between 10 or more spraints, but most marine prey identified was in spraints within 1 km of the coast. Otters are highly mobile animals with linear ranges extending to 80 km and they readily travel 5-10 km in a night, but this spraint analysis indicates the animals are remaining close to the coast.

Spraint prey remains

Otoliths of **A** bullhead, **B** salmonid and **C** wrasse (size approx. 1-2 mm).



Teeth of **A** salmonid, **B** minnow and **C** wrasse.



Caudal vertibrae of **A** salmonid, **B** eel and **C** rockling.

Spraint. Photograph by Alex Howie

Sorted spraint remains. Photograph by Dave Groves

Otter with lumpsucker Shetland. Photograph by Dave Groves

Otter in lobster pot, Mousehole 2021. Photograph by Tom Holland

Mousehole otter. Photograph by C Beazley 2020

Otter on River Camel Estuary. Photograph by Adrian Langdon

Captive otter. Photograph by Adrian Langdon

CMG surveyors collected 215 spraints and identified 537 occurrences of 24 prey categories. Otters are feeding on marine prey around the coast of Cornwall and individuals are remaining close to the coast for extended periods. However, these individuals are also feeding in freshwater and terrestrial habitats. This may be a transitional stage from a primarily riparian behaviour to the coastal behaviour seen before the national decline of the 1960s. Although the pressures of 70 years ago, the disturbance and pollution of mining and the general persecution of wildlife, may have changed, otters around the coast face new challenges including road traffic, development and diffuse pollution. Some of the historic obstacles remain. Victorian and Edwardian naturalists mentioned the issue of coastal otters drowning in Cornish crab pots. In 2021, following several sightings of an otter in the sea at Mousehole, near Penzance, a dead otter was found in a lobster pot close to the shore. CMG hope that our work will help inform regulation of coastal resources and support the return of otters to the Cornish coast.

Further reading:

Groves, D. and Smith, R.J. (2021) *The diet of Eurasian otters (*Lutra lutra*) around the coastal fringe of Cornwall*. Mammal Communications, 7, 11-16.

Conroy, J.W.H., Watt, J., Webb, J.B and Jones, A. (2005) *A guide to the identification of prey remains in otter spraint*. The Mammal Society, London

Chanin, P. (2013) *Otters*. Whittet Books, Stansted

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