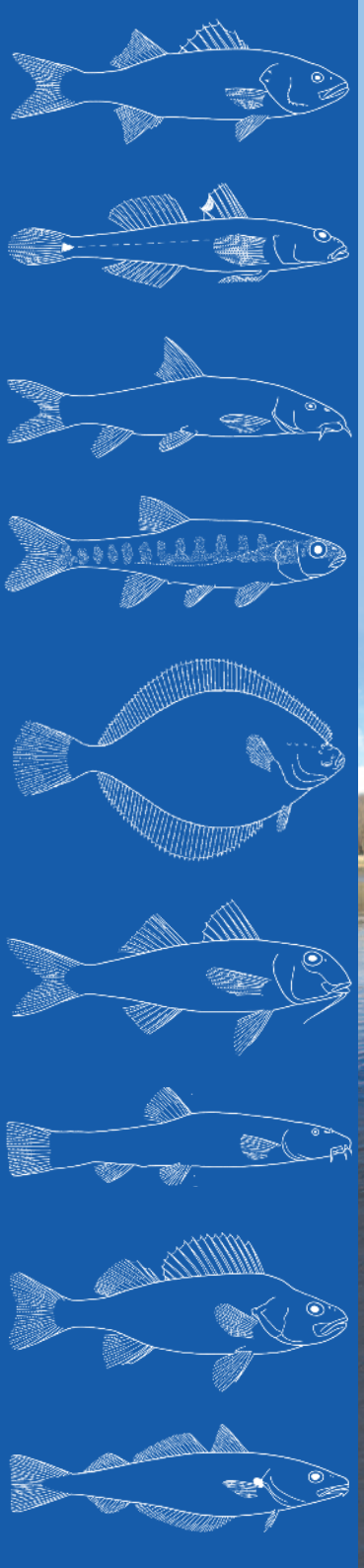
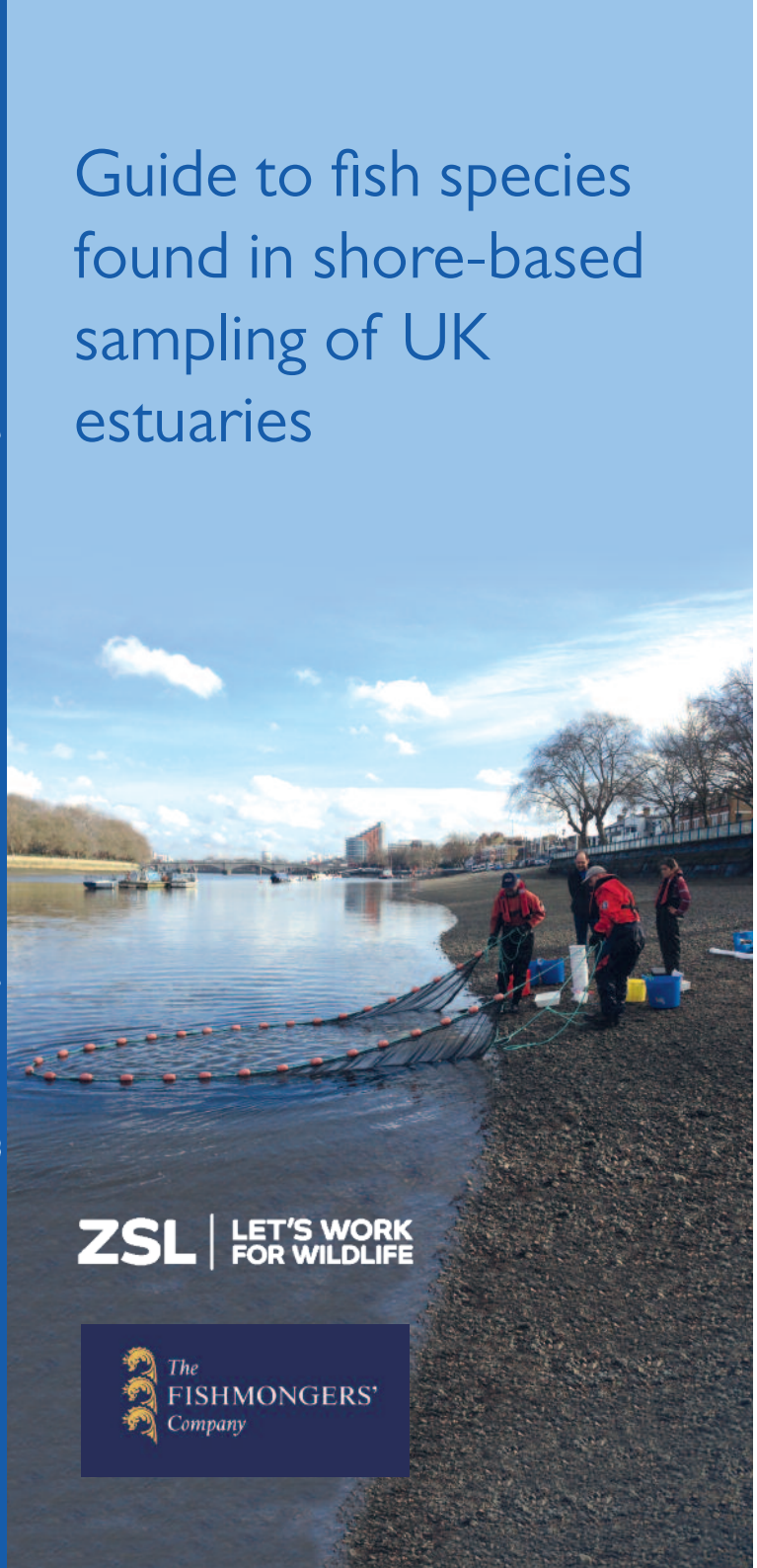


Guide to fish species found in shore-based sampling of UK estuaries



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The FISHMONGERS' Company

Acknowledgments

We are grateful to The Fishmongers Company for funding the development of this guide. We are also very grateful for the help of Steve Colclough from the Institute of Fisheries Management (IFM), Tom Cousins and Darryl Clifton-Dey from the Environment Agency (EA) and Dr Jen Lewis and Angharad Purcell from the Sussex Inshore Fisheries and Conservation Authority (IFCA). The development of this guide was overseen by Phoebe Shaw Stewart (ZSL).

Additional thanks go to Peter Gray, Jamie Craggs, Andy D. Nunn, Neil Garrick-Maidment, Gareth Jones, Pete Liptrot, John Newman, Paul Peters, Adrian Pinder, David Powell, Katherine Tye and Dave Herdson who provided invaluable photos and expertise to use in this Guide.

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If you have any comments or suggestions on ways we can improve this guide, please get in contact with us at **marineandfreshwater@zsl.org**.

The guide is supported by:

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ISBN 978-0-900881-86-2

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Introduction: why sample fish in estuaries

Estuaries are unique and important natural environments consisting of transitional waters that are subject to both marine influences and the tidal influx of saline water, and freshwater riverine influences. Estuaries contain a wide range of habitats including open water, rocky reefs, unconsolidated bed sediments, intertidal sand and mud flats, and saltmarshes. The mixing of seawater, freshwater and sediments associated with each, make estuaries among the most productive ecosystems in the world. Estuaries support an array of vital functions, such as spawning and nursery sites, that determine the recruitment potential of a broad range of freshwater and marine fishes. They also facilitate the migration of species both to and from saltwater and freshwater environments. However, due to tidal dynamics and logistical challenges associated with data collection, they remain one of the most poorly studied ecosystems on earth.

Systematic sampling of fishes in estuaries, as part of a broad environmental monitoring programme, is essential in providing trends in the ecological status of key species and the health of the wider estuary. The Water Environment Regulations are part of UK Law, and require that 'good ecological and chemical status' is achieved in all waterbodies including estuaries. The ecological status is assessed by using different quality elements, and "fish fauna" is identified as a biological quality element to be monitored and assessed in transitional waters (as listed in Table 1.2.3 of Annex V to the Water Framework Directive). One such indicator species is smelt, *Osmerus eperlanus*. As smelt exhibit specific sensitivities to disturbance and/or anthropogenic exploitation, its presence is used as an indicator of "good ecological status".

Understanding the spatial and temporal distribution of fish species in estuaries is essential for informing environmental management and policy, from protecting spawning sites to timing works such as piling to avoid key migration or spawning events. It can also help bridge the data gap on how key fish species use coastal estuarine habitats and help protect Essential Fish Habitats (EFH) that are defined as "those waters and substrates necessary to fish for spawning, breeding, feeding or growth to maturity". Identifying and improving the protection of the breeding, spawning and nursery ground habitats for priority species, aids in recovery or maintenance of populations and ecosystems, and creates a link between recognising the important role of estuarine habitat and successful fishery management.

This guide is intended for advanced amateurs and professionals engaged in monitoring fish populations in estuaries. The aim is to help the bankside identification of estuarine fish. The shore-based sampling methods described in this guide will naturally select for smaller and juvenile fish that frequent marginal habitats.

Best practice strategies for monitoring fish populations in estuaries

The following is a list of recommendations to be incorporated into the design of an estuarine fish monitoring programme:

- To make it resilient enough to withstand changing priorities and funding streams it is best to involve a broad partnership of organisations and stakeholders in the design and delivery of your monitoring programme.
- Each sampling method outlined in this document is selective and therefore a multi-method approach is essential in providing the most representative picture of the fish present at the time of sampling.
- Standardisation of methods is essential for comparability across surveys. Each method should be deployed for a consistent recorded time/distance/area.
- Sampling should be carried out in "Spring" (May-June) and again in "Autumn" (September) to bookend the appearance of juvenile fish, with autumn sampling prioritised over spring if time and resources are limited as group 0+ juveniles are more likely to be present at this time of year.
- When planning to monitor populations of single species, the timing of sampling should be planned to match the ecology of the target species. For example, ZSL's smelt monitoring in the Thames starts in February to coincide with their spawning season.
- Sampling methods should be location/habitat specific and conducted according to a consistent method (same state of tide, same number of replicates etc), at the same sites, to allow for comparability over time.
- Most fish species that are not primarily demersal in their habitat move with the tide to minimise energy expenditure, which is the most energetically favourable behaviour in these environments. This means that a consistent approach dictates sampling the same period in the tidal cycle. In most estuaries this usually means either low-water slack tide or high-water slack tide.
- Unless specific to the aims of the survey, sites close to anthropogenic influences should be avoided (sewage outfalls, moorings etc) to ensure both representative results and the safety of survey personnel and equipment.
- Sampling strategies should be adapted to each estuarine habitat, for example sampling a saltmarsh will be different from a tidal river.
- Research what species you are likely to encounter and be familiar with their key identification features.
- The catch should be processed as quickly as possible, recording all relevant data (species/length/environmental variables).

Identifying fish can be difficult so although this guide will help, we suggest you always test your identification skills with an expert and take good photos for later cross checking.

Figure 1. Measuring a flounder in a fish viewer.

- Try to get profile photos of fish in water (this is easiest to do when using fish viewers).
- Close-ups of the head and fins are most helpful.
- The more photos the better, as a general rule.

Citizen science and monitoring juvenile fish populations in estuaries

To support the inclusion and spread of citizen science in estuarine fish monitoring, sampling methods suitable for citizen science have been highlighted in this guide. Well-designed citizen science projects can be a cost-effective and scalable way of gathering long term datasets, especially over large geographical areas. The challenging nature of sampling aquatic environments means that fish are underrepresented in UK citizen science projects. Given the health and safety issues of working in estuaries and the difficulties of identifying fish species, particularly as juveniles, professional led sampling with citizen science support is recommended.

Sharing species records

The best place to record species data is the National Biodiversity Network (NBN). It is a free online tool widely used for managing and sharing species data. More information can be found here: **https://docs.nbnatlas.org/**

Data should also be shared with your local catchment partnership, Rivers Trust and IFCA. It is particularly important to share records of rare species.

Sampling methods

Intertidal net

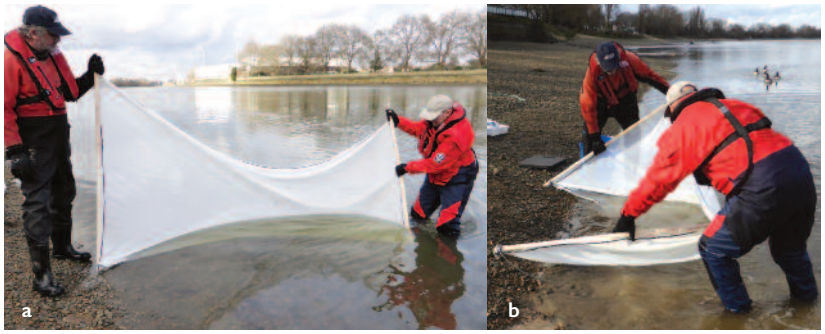


Figure 2. Deployment of intertidal nets.

Description: intertidal nets are rectangular, 3 m long and 1.5 m wide with poles at either end and a 1.5 mm mesh size. The weighted lead line runs against the bed of the estuary.

Catch: intertidal nets are selective for juvenile fish using the estuary edges for migration or refuge.

Habitat type: nets are used on firm, uniform substrate, but are not suitable for use over soft mud or rocky habitats.

Deployment: intertidal nets are most safely deployed as the tide ebbs to low water, with best catches typically at, or near low water. Both surveyors hold the net parallel to the river. Person A holds one side of the net stationary at the edge of the water, while person B walks the net in a 180° semi-circle against the flow and back to the shore (Fig. 3). The net should be closely inspected for fish, and the catch quickly transferred to prefilled storage tanks for processing and release. If the weather is windy then take particular care when moving with the net containing fish as it may tip over.

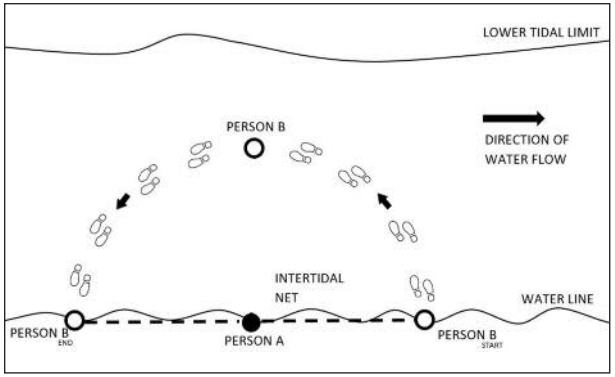


Figure 3.
An aerial schematic of the intertidal netting.

Riley push-net

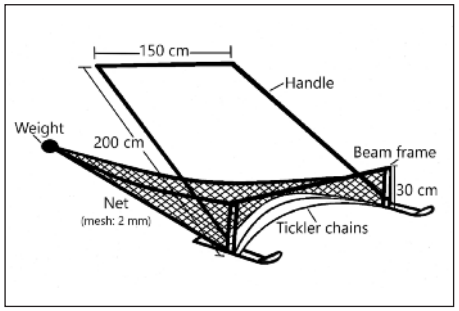


Figure 4. Diagram of a Riley push-net (based on a drawing by Amarullah & Senta, 1989).

© NWIFCA

Figure 5. Deployment of a Riley push net.

Description: a Riley push-net consists of a net with the open end attached to a frame 150 cm wide x 30 cm high with 1.4 mm mesh size. Riley nets are available in various configurations, including tickler chains between the runners on the base of the frame and can have either a single or double cod-end (Fig. 4).

Catch: Riley push-nets are selective for small bottom dwelling (demersal) fish from shallow inshore waters to a depth of 60 cm.

Habitat type: Riley push-nets are for use on intertidal soft substrates, not for use over soft mud or rocky habitats.

Deployment: the net is pushed from a handle or towed by a person wearing a harness (Fig. 5). Standardise the time and distance to be surveyed to suit different locations.

Hand net

Description: a hand-net has a standard 25 cm x 30 cm aperture with 1 mm mesh.

Catch: hand-nets are selective for very small fish.

Habitat type: hand-nets are best used in combination with other methods, or in places where alternative methods are not suitable such as very small channels or intertidal pools.

Figure 6. Kick sampling using a hand net.

Deployment: the net is used either by sweeping through shallow water, or by kicking substrate with the net held downstream, collecting the species that are stirred up (Fig. 6).

Seine net

Figure 7. Deployment of seine nets.

Description: Seine nets are long rectangular nets consisting of a float line (line with a series of floats attached) and a lead line (line that will sit on the estuary bed).

The Environment Agency recommend 43 m by 4 m seine nets with 20 mm knotless wings for transitional and coastal (TRAC) waters as WFD standard protocols. This net is very effective when deployed from a vessel at slack water low tide, however it can be too large for small systems and shore-based surveys.

Smaller net sizes of 25 m by 1.5 mm micromesh are more manageable and recommended for shore-based surveys. A review of the site and personnel should be undertaken to determine which net is suitable for each situation.

Catch: Seine nets are selective for juvenile fish communities found in marginal habitats (intertidal and shallow subtidal) of estuaries, however fish at other life stages may also be caught and should be recorded.

Deployment: Seine nets are best used during slack water periods at low tide. The net is walked out to hip height, or a set distance perpendicular to shore (whichever comes first), and then deployed parallel to the foreshore. The net is then slowly walked back to the foreshore while drawing the ends together to create a U-shaped curtain of net to catch the fish (Figs 7 and 8).

When both ends of the float line are back on the foreshore, the net should be hauled by pulling steadily on the float line. When approximately two thirds of the net is out of the water, the lead line can start to be hauled steadily and slowly, being kept as close as possible to the bed so no fish escape underneath. The float line should be held up to reduce the chance of fish jumping over. The net should be kept as taut as possible between the lead line and the float line to reduce the risk of anything being trapped in the folds of the net. The aim is to shake everything down to the centre of the net. The net should be inspected for fish, and the catch held in storage for later identification.

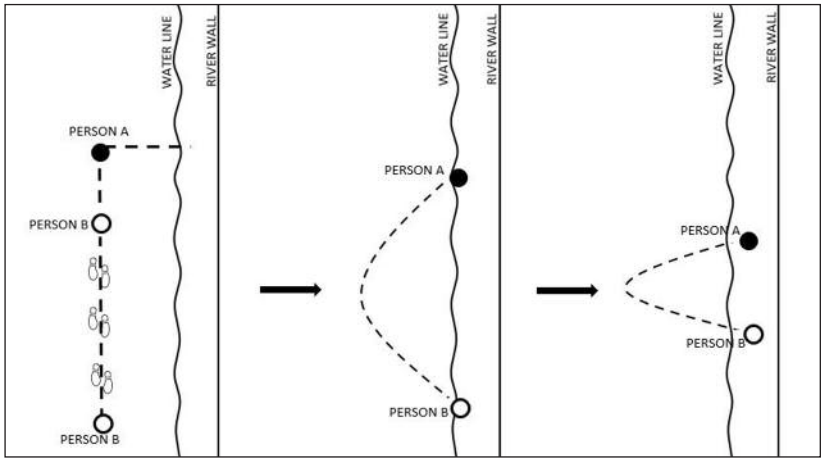


Figure 8. An aerial schematic of seine netting.

Health and safety

Estuaries are dynamic environments and present potential hazards such as strong tidal flows, adverse weather, uneven substrates with trip hazards, deep mud and waterborne pathogens. A site-specific risk assessment must be conducted for each sampling site in combination with the following:

- A dynamic risk assessment should be undertaken on arrival at the sampling site.
- Ensure access and egress points are clear and accessible at all states of tide.
- An up-to-date contact list of all relevant emergency services should be taken to site and a pre-arranged. An offsite based contact should be made aware when sampling starts and ends.
- If necessary, the relevant harbour master/port authority should be notified on arrival and departure of site.
- Never sample estuaries on your own.

Invasive non-native species (INNS)

It is very important that those engaged in monitoring estuaries do not facilitate the spread of invasive non-native species. "Check, Clean & Dry" protocols should be followed post survey for all equipment. http://www.nonnativespecies.org/checkcleandry/

All invasive non-native species should be reported to the Environment Agency and Natural England. http://www.nonnativespecies.org/home/index.cfm

Licences and permits

If a survey is to be conducted on private land, permission should be sought from the relevant owner and/or local harbour authority. Depending on your proposed sites, a licence or permit may be necessary to conduct scientific fish surveys. Contact the relevant authorities to check if one is needed.

- **England** – Natural England & Environment Agency:
  www.gov.uk/government/collections/freshwater-and-migratory-fish-licences
  www.gov.uk/guidance/freshwater-and-migratory-fish-protection-surveys-and-licences
- **Wales** – Natural Resources Wales: www.naturalresourceswales.gov.uk
- **Scotland** – Scottish Natural Heritage: www.nature.scot
- **Northern Ireland** – The Department of Agriculture, Environment and Rural Affairs (DAERA): www.daera-ni.gov.uk

Fish welfare

All fish should be returned alive, and in good condition, post sampling. The following list of recommendations should be incorporated into your sampling and catch processing to minimise impact on the fish caught:

- Brief everyone involved at the outset, assign roles (such as scribe) and process your catch as quickly and efficiently as possible.
- To ensure minimum exposure to air your catch should be immediately transferred from catch nets to vessels which have been prefilled with water from the survey site using small hand nets.
- Any vessels that your catch is temporarily stored in before processing should be kept out of direct sunlight.
- Only nets with knotless soft mesh should be used to catch and move fish. If handling is necessary, hands should be wet to reduce risk of injury.

- The temperature of storage vessel must be monitored to ensure it remains close to the site ambient water temperature.
- Dissolved oxygen saturation in containers should be monitored to ensure they remain within +/- 10 % of the water that the fish were sampled from. If fish need to be held for a prolonged period, then aeration/oxygenation of storage containers will be necessary.
- If aeration equipment is not available, then water must be replenished or changed at regular intervals to avoid low dissolved oxygen and the accumulation of ammonia.
- If surveys are carried out on a falling tide it is vital to make sure that enough water is stored in advance for processing the catch.
- If a fish appears to be listless at any point, then they should be returned to the water immediately, even if they haven't yet been processed.

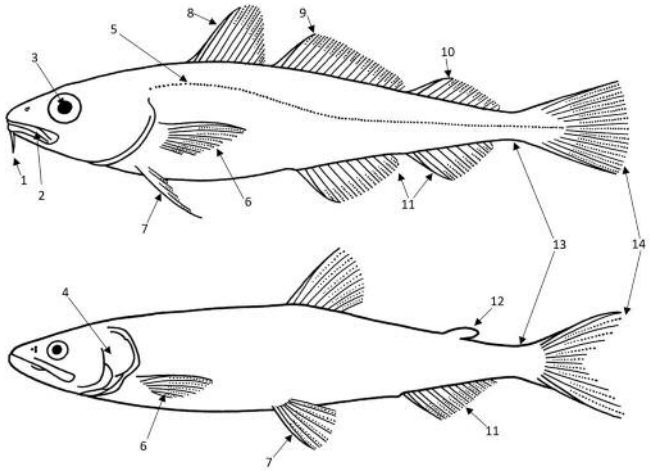
Protection classifications

Initials used in the text stand for the following classifications:

- Wildlife and Countryside Act (WCA)
- NERC Species of Principle importance (NERC)
- UK BAP Priority Species (UK-BAP)
- Habitats Directive (HD)
- MCZ Species Features of Conservation Importance (MCZ)
- Convention on International Trade in Endangered Species (CITES)

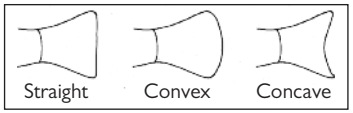
Fish anatomy

Throughout this guide specific vocabulary will be used to refer to the fish anatomy. Important features for identification are listed below.



1. Barbel
2. Mouth
3. Eye
4. Gill cover
5. Lateral line
6. Pectoral fins
7. Pelvic fins
8. First dorsal fin
9. Second dorsal fin
10. Third dorsal fin
11. Anal fin
12. Adipose fin
13. Tail wrist
14. Tail or caudal fin

It is also important to know how to differentiate tail fin shapes to correctly ID an individual. In this guide we describe three main tail shapes.



Sussex IFCA use a helpful mnemonic (**FLEMMS**) to systematically look for identification features:

Fins – number, shape, colour and relative size of the dorsal, tail, anal, pelvic and pectoral fins.

Lateral line – shape, colour and prominence.

Eyes – position on head, relative size.

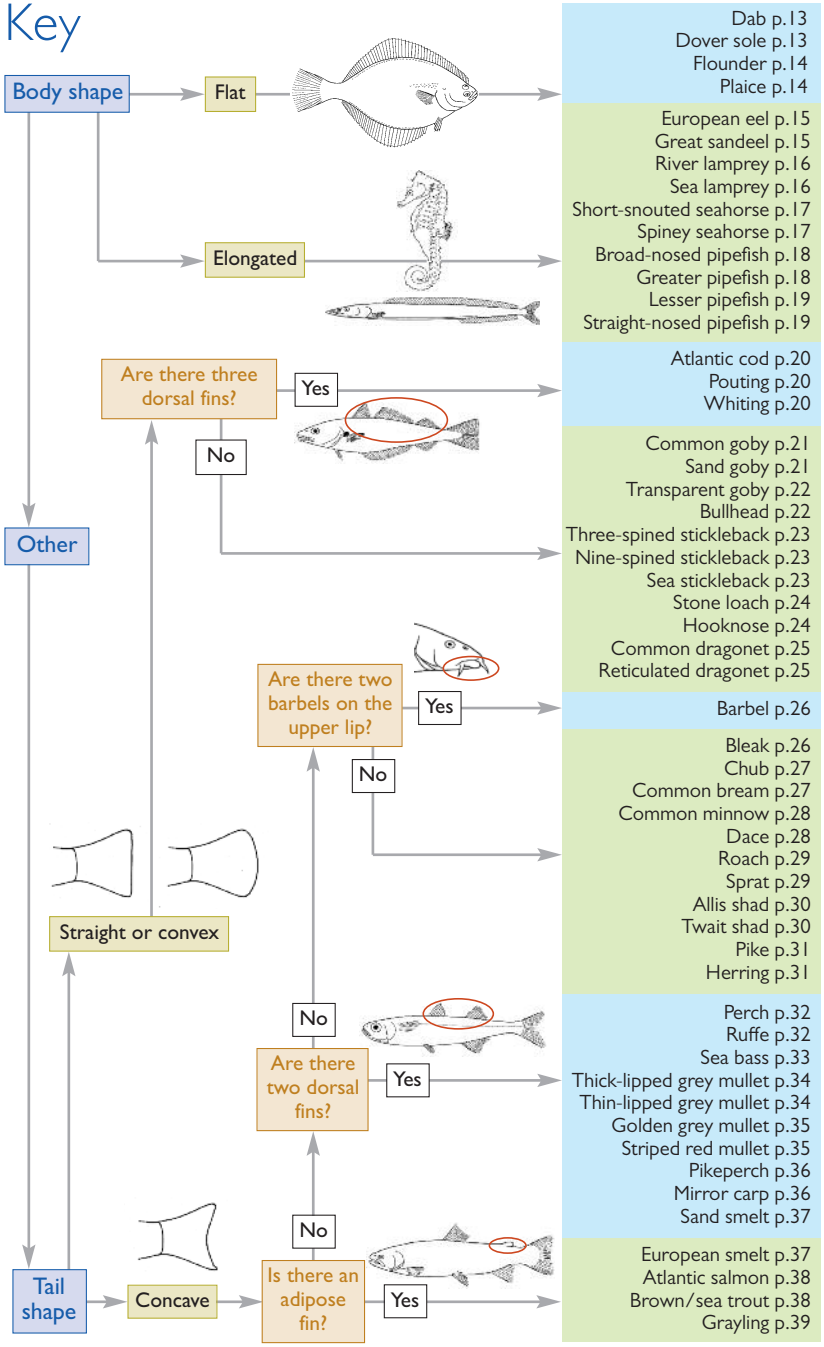
Mouth – position and angle on the head, relative size, shape, relative length of jaws, lips, barbels, spines.

Markings – spots, lines, patters, stripes, blotches, colour (although this can be very variable).

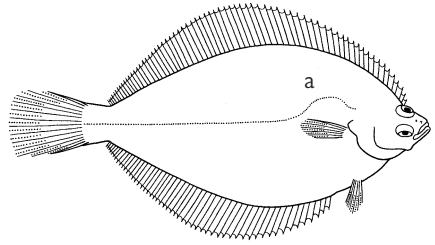
Shape – the general body shape or outline of the fish, size.

Most fish species described in this guide are bilaterally symmetrical with body shapes that are mirror images along a midline. The exceptions to this are the four species of flatfish that start their life cycle with symmetrical bodies before metamorphosing to an asymmetrical shape with both eyes usually on the right-hand side.

Key



Dab (*Limanda limanda*)



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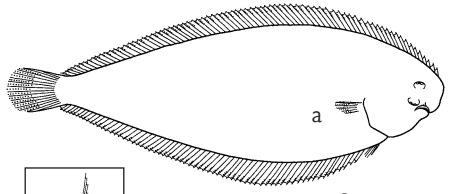
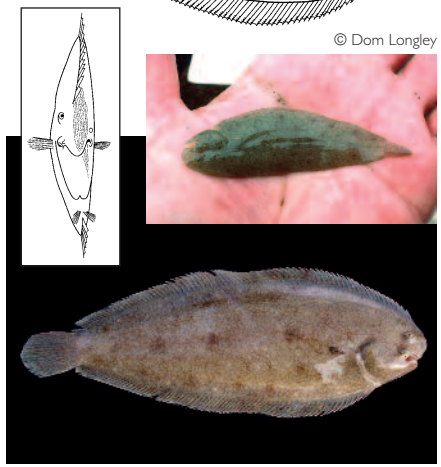
Marine species found in shallower waters during the summer months. Hatch as symmetrical fish before metamorphosing to flat fish with both eyes usually on the right side. Average length of adult around 20 cm (maximum 42 cm).

- Convex tail fin.
- Toothed scales that are rough to touch.
- Deeply curved lateral line over pectoral fin (a).
- Mottled, sandy brown in colour, sometimes with faint orange spots.

Dover sole (*Solea solea*)

Protected (NERC & UK-BAP)





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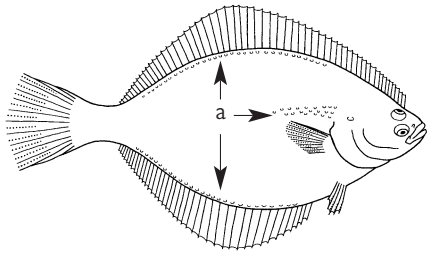
Marine/brackish species. Juveniles form nurseries in coastal and estuarine habitats for first three years of life. Adults swim to deeper waters during winter months. Hatch as symmetrical fish before metamorphosing to flat fish with both eyes usually on the right-hand side at about 10 mm length. Maximum larval length 40 mm. Sexually mature from 25 cm length. Average length of adult around 30-40 cm (maximum 70 cm).

- Very small pectoral fin (a).
- Elongated oval shape.
- Brownish colour.
- Long dorsal and anal fins, connected to the tail fin by a membrane.

Flounder (*Platichthys flesus*)



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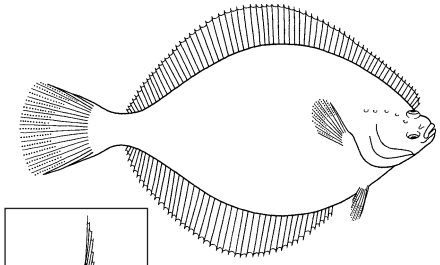
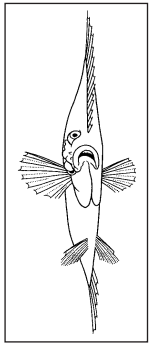
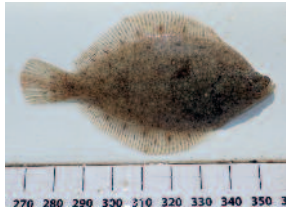
Marine/freshwater/brackish species. Adults spawn in the sea March to May with young traveling up into estuaries on the tide. Hatch as symmetrical fish before metamorphosing to flat fish with both eyes on the right side around 70% of the time. Juveniles are found most of the year up into freshwater zones of estuaries, adults live in marine coastal habitats. The only species of flatfish that can live in freshwater. Maximum larval length 40 mm. Sexually mature from 14 cm length. Average length of adult 50 cm.

- Flat and asymmetric.
- Diamond shaped including dorsal and anal fin.
- Length of body is around double the width.
- Rough tubercles (skin) along the edges of the body and the lateral line (a).
- Usually olive-green coloured with mottled spots.

Plaice (*Pleuronectes platessa*)







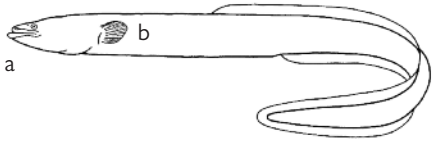
© Dom Longley

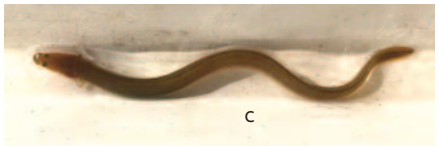
Protected (NERC & UK-BAP)

Marine/brackish species. Juveniles found in estuaries, older fish are found in marine waters. Hatch as symmetrical fish before metamorphosing to flat fish with both eyes usually on the right side. Average length of adult 50 cm.

- Rounder body-shape than the flounder and Dover sole.
- Convex tail fin.
- Smooth olive-green body.
- Large orange spots on the top side of the body and along the dorsal and anal fins on adult fish only.

European eel (*Anguilla anguilla*)



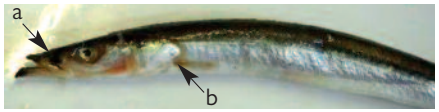


Protected (NERC, UK-BAP, CITES)

Marine/freshwater/brackish species. Listed as Critically Endangered by the International Union for the Conservation of Nature (IUCN). Catadromous species, they can spend most of their lifecycle in fresh water but migrate in from the sea as glass eel and elver before returning back to the sea to spawn. Elver are most commonly found from April to October throughout the length of estuaries. Average length adult 35 cm (male) to 60 cm (female).

- Glass eels are transparent (smaller, younger animals than elvers).
- Protruding lower jaw (a).
- Small pectoral fins just behind gill slits (b).
- Elvers are pigmented throughout the length of their body and less than 12 cm long (c).

Great sandeel (*Hyperoplus lanceolatus*)



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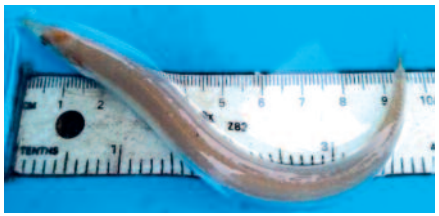
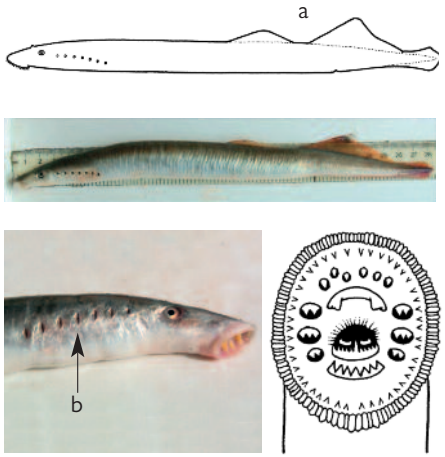


© Sussex IFCA

Marine/brackish species often found in estuaries. Breeding takes place during the spring and summer months. Average adult length 20 cm.

- Distinctive black spot on each side of snout (a).
- Long, pointed head with protruding lower jaw.
- Small pectoral fins (b).
- Yellowish-blue colour on back with silver belly.

River lamprey
(Lampetra fluviatilis)



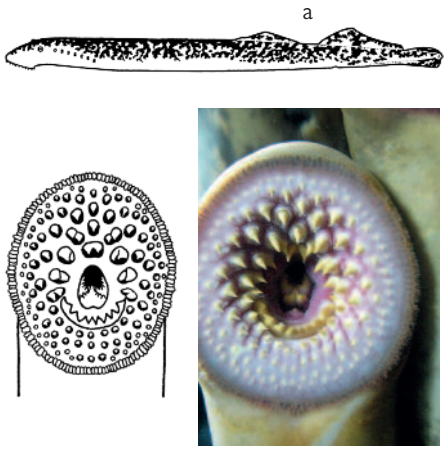
© M. Buschmann

Protected (NERC, HD, UK-BAP)

Freshwater/marine/brackish species that travel from either the sea or freshwater lakes, upstream to make 'nests' (hollowed out area of silt free stones) and spawn in April to May. Larval ammocoetes live in the river substrate until they undergo metamorphosis at around 13 cm length and migrate downstream to the sea or lake. Maximum larval length 13 cm. Average length of adult around 30 cm.

- Round sucker mouth with an outer circle of small teeth and an inner circle of large teeth.
- Two dorsal fins and no pectoral fins (a).
- Seven gill openings behind the eye (b).
- Adults are bright silver in colour.

Sea lamprey
(Petromyzon marinus)



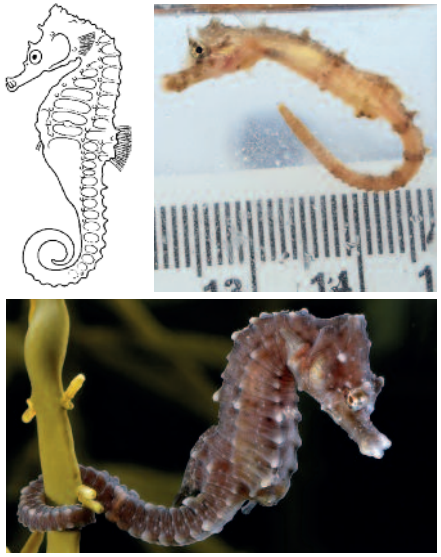
© Drow Male

Protected (NERC, HD, UK-BAP)

Rare in the UK. Marine/freshwater/brackish species that swim in from the sea to make 'nests' (hollowed out area of silt free stones) and spawn in June to July. Larval ammocaetes live in the estuary substrate for two to five years before heading back out to sea. Maximum larval length 15 cm. Average adult length 60 cm.

- Round sucker mouth with distinctive radiating pattern of teeth.
- Two dorsal fins and no pectoral fins (a).
- Seven gill openings behind the eye.
- Olive yellow – brown colour on back and sides with black mottling (which distinguishes it from the River lamprey).
- Lighter, silver colouration on belly.
- Adults can grow to 90 cm long.

Short-snouted seahorse
(Hippocampus hippocampus)



© Hans Hillewaert

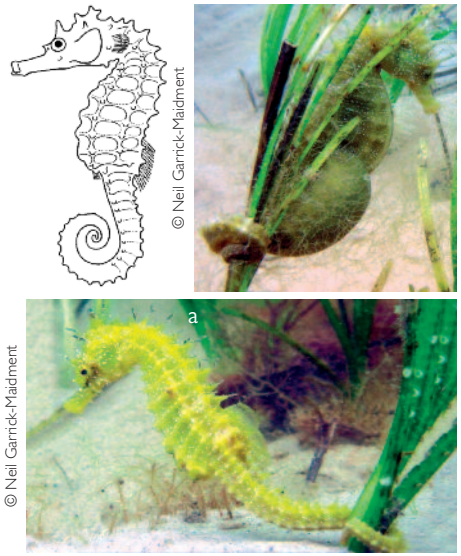
Protected (WCA, NERC, MCZ, UK-BAP, CITES)

Marine species. Found in shallow coastal or estuarine habitats with muddy bottoms, under rocks and around seagrass beds. They move to deeper waters during winter months. Sexually mature from 7 cm length. Maximum adult length 15 cm.

- Usually mottled brown in colour sometimes with tiny white dots.
- Snout under 1/3 of the head length.

Spiny seahorse
(Hippocampus guttulatus)

Also known as the long-snouted seahorse



© Neil Garrick-Maidment

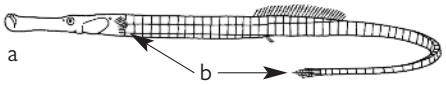
© Neil Garrick-Maidment

Protected (WCA, NERC, MCZ, UK-BAP, CITES)

Marine/brackish species. Found in shallow coastal or estuarine habitats around algal covered rocks and seagrass beds. They move to deeper waters during the winter months. Sexually mature from 8.5 cm length. Average length adult around 12.5 cm (maximum 23 cm).

- Colour can vary but usually has prominent small white spots over the body.
- Body rings with spines on the angles, often with longer spines around the neck and head (a).
- Snout more than 1/3 of the head length.

Broad nosed pipefish
(*Syngnathus typhle*)



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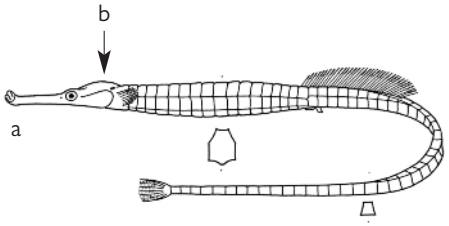
Also known as the deep snouted pipefish

Marine/brackish species commonly found in seagrass beds. Sexually mature at around 12 cm. Maximum size 35 cm.

- Long, flattened snout (a).
- Well developed pectoral and tail fins (b).
- Brown-green colour on back (c).
- Pale brown-yellow underside.
- Pronounced body rings and tail rings.

Greater pipefish
(*Syngnathus acus*)



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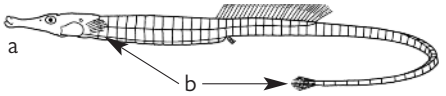
Marine/brackish species found in a range of habitats, sometimes in outer estuaries. Sexually mature at around 30 cm. Maximum size 50 cm.

- Brown-green in colour with dark saddles across back.
- Pale cream underside.
- Pronounced body rings and four-sided tail rings.
- Long, cylindrical snout (a).
- Distinctive hump on top of head behind eyes (b).
- No pectoral or anal fins.

Lesser pipefish
(*Syngnathus rostellatus*)



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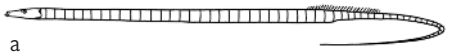
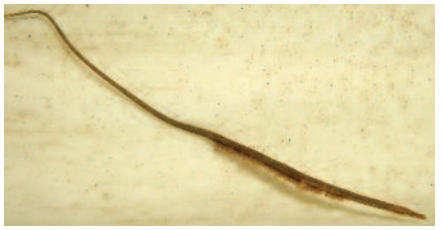
Marine/brackish species mostly found in sandy areas amongst seaweeds. Commonly found in estuaries. Sexually mature at around 10 cm. Maximum size 17 cm.

- Mottled brown in colour with saddles across back.
- Pale cream underside.
- Distinct body and tail rings.
- Short, cylindrical snout (a).
- Well developed pectoral and tail fins (b).

Straight-nosed pipefish
(*Nerophis ophidion*)



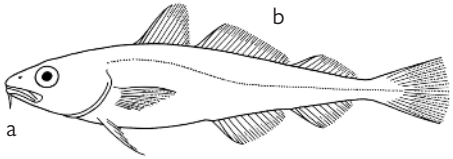


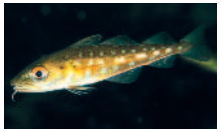
© Yuriy Kvach

Marine/freshwater/brackish species found in sandy habitats, commonly with seagrass. Maximum size 30 cm (females) 25 cm (males).

- Green colour on back with yellow underside.
- Female has pale blue markings on head and body.
- Breeding male's snout turns yellow.
- Small head (a).
- No pectoral, anal or tail fins.

Atlantic cod (*Gadus morhua*)





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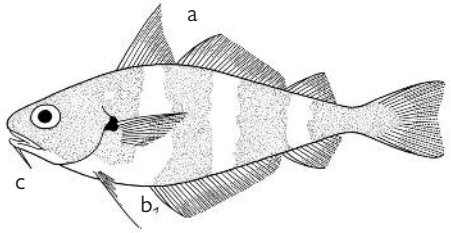
Protected (NERC, UK-BAP)

Marine/brackish species, with juveniles found in shallower coastal and estuarine habitats and adults more commonly found in deeper waters. Maximum larval length 40 mm. Average adult length 120 cm.

- Very pronounced chin barbel (a).
- Three separated dorsal fins (b).
- Sandy brown-green colour.
- Pale dots over the body in juveniles.

Pouting (*Trisopterus luscus*)



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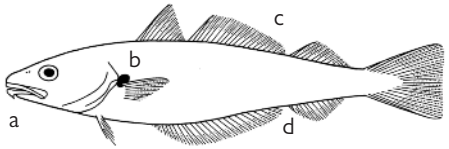
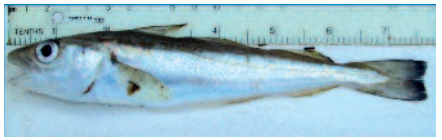
Also known as Bib

Marine/brackish species, with juveniles found in shallower coastal and estuarine habitats and adults more commonly found in deeper waters. Maximum larval length 48-50 mm. Sexually mature from 21 cm length. Average adult length 30 cm.

- Three dorsal fins, the first of which is high and triangular (a).
- Long pelvic fin and two anal fins (b).
- Single chin barbel (c).
- Back is usually brownish to orangey/copper in colour and underbelly is pale.
- Thick, pale stripes can sometimes be found running down the flanks of this species.

Whiting (*Merlangius merlangus*)



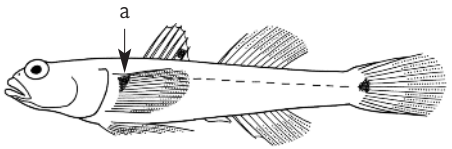


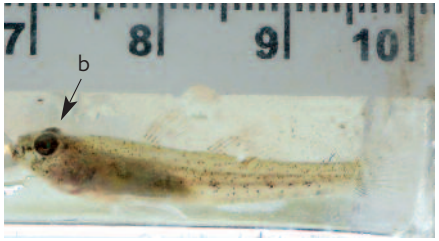
Protected (NERC & UK-BAP)

Marine/brackish species, with juveniles found in shallower coastal and estuarine habitats and are often found with jellyfish. Maximum larval length 40 mm. Average adult length 30-40 cm.

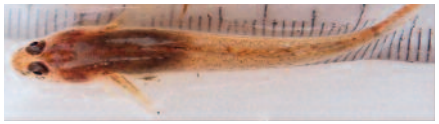
- Small chin barbel (not always present) (a).
- Dark spot over pectoral fin (b).
- Three dorsal fins (c).
- Pale body often with a pinkish sheen (d).
- Two anal fins very close together.
- Shallow concave tail fin.

Common goby (*Pomatoschistus microps*)





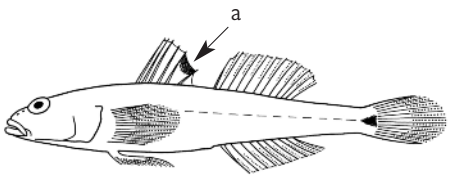
© Tom Bosley

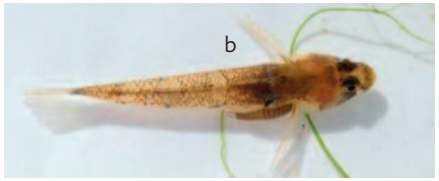


Marine/freshwater/brackish species, usually found on sandy or muddy substrate into which they can bury. Spawning occurs between February and September at sea or in brackish water. Maximum larval length 11-12 mm. Sexually mature from 3 cm length. Maximum adult length 9 cm.

- Black mark on root of pectoral fin (a).
- Prominent eyes that protrude from the head (b).
- Darker in colour than the sand goby.

Sand goby (*Pomatoschistus minutus*)





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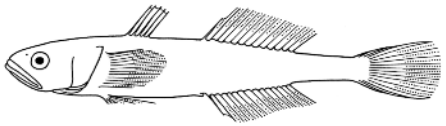
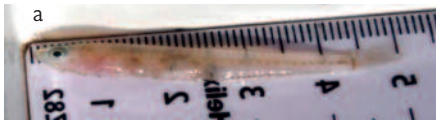
Marine/brackish species found in coastal habitats with a sandy or muddy bottom into which they can bury. Juveniles found in lower estuarine habitats. Larvae are pelagic until 17 mm length, when they start living on the bottom. Maximum larval length 12 mm. Sexually mature from 3 cm length. Maximum adult length 11 cm.

- Dark spot on the hind end of the first dorsal fin (a).
- Pectoral fins can appear separated from the body, like two small arms (b).
- Eyes do not protrude from the head as much as the common goby.
- Light pinkish, mottled colour, generally lighter than the common goby.

Transparent goby
(Aphia minuta)





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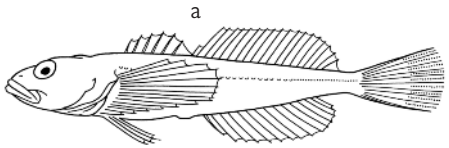
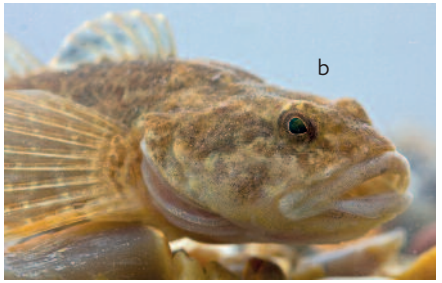
Marine/brackish species commonly found in inshore and estuarine waters usually with sandy or muddy bottoms or seagrass habitats. Spawn in summer in empty shells. Sexually mature at 5 cm. Maximum adult length 8 cm.

- Slender-bodied.
- Almost transparent with a pink tinge and pigmented eyes (a).
- Lines of pigmented spots at base of dorsal and anal fins and along lateral line.

Bullhead *(Cottus gobio)*





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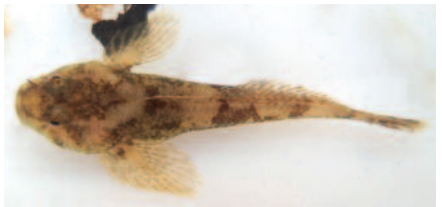
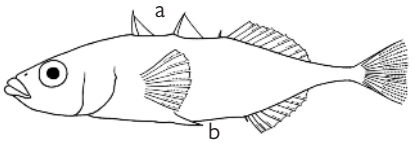


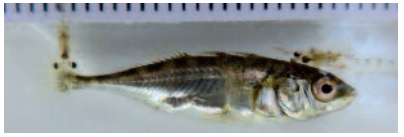
Protected (HD)

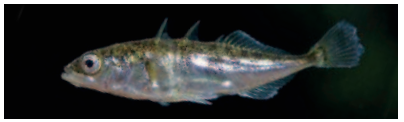
Freshwater/brackish species that can be found in the upper stretches of estuaries. Usually seen in clear, fast flowing water on rocky or gravel bottom. Males and females guard nests May to July. Maximum larval length 40 mm. Average adult length 10 cm.

- Large, broad head.
- Two dorsal fins linked together with no gap in between (a).
- Eyes located on top of the head (b).
- Small fish (adults up to 10 cm maximum length).

Three-spined stickleback
(Gasterosteus aculeatus)







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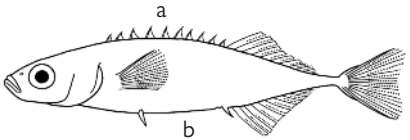
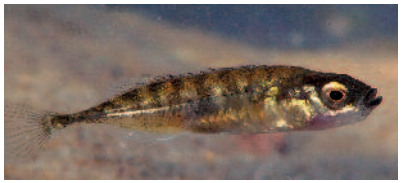
Marine/brackish/freshwater species. Some populations travel upriver to spawn, others are purely marine, brackish or freshwater throughout their lifecycle. Nest building males guard eggs March to June. Juveniles move to deeper waters during summer months. Maximum larval length 14-15 mm. Sexually mature from around 5 cm length, marine populations are larger in size. Average adult length 5cm (maximum 11 cm).

- Spines on the back in front of the dorsal fin, two very obvious and one tiny (a).
- Spine in place of the pelvic fin (b).
- Males turn blue and red during breeding season.

Ninespine stickleback
(Pungitius pungitius)

Also known as the ten-spined stickleback





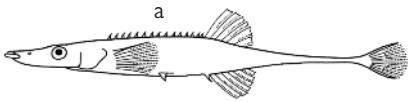
© Piet Spaans

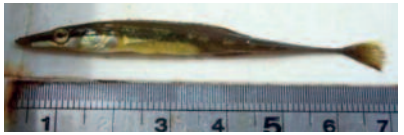
Marine/brackish/freshwater species. Breeding season is April to July. Marine populations migrate to freshwater to spawn. Sexually mature from around 4 cm length. Average adult length 6.5 cm (maximum 9 cm).

- Six to twelve dorsal spines in front of dorsal fin (most commonly nine spines) (a).
- Pectoral and anal spine (in front of anal fin) (b).
- Male's throat turns black during breeding season.

Sea stickleback
(Spinachia spinachia)

Also known as the fifteen spined stickleback





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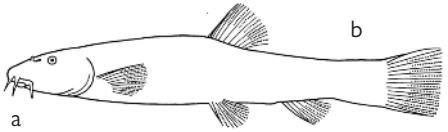
Marine/brackish species predominantly found in rocky coastal habitats, but also found in estuaries around the UK. Average length of adult around 15 cm (maximum 20 cm).

- Elongated body with a long snout and tail.
- Fourteen to seventeen dorsal spines in front of the dorsal fin (a).
- Brownish-yellow in colour with a silver underside.

Stone loach
(*Barbatula barbatula*)



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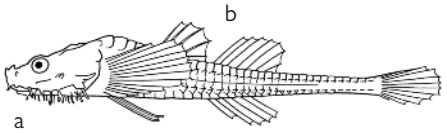
Freshwater species that can be found in the upper reaches of estuaries across a range of habitats, but usually in flowing water with a gravel or stone bottom. Lays yellow eggs amongst clean gravels, April to July. Larvae and juvenile fish prefer lower flows and sandy bottom. Maximum larval length 40 mm. Average adult length 10-12 cm (maximum 15 cm).

- Six long barbels (arranged in three pairs on the lower jaw) (a).
- Slender body with relatively thick tail wrist (b).
- Green-brown and mottled on top with a hint of yellow on the sides (c).

Hooknose
(*Agonus cataphractus*)



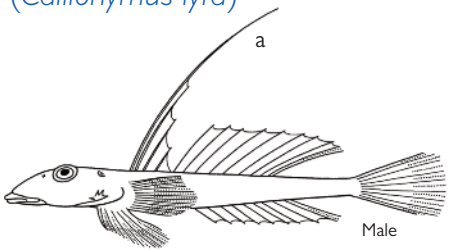
© Sussex IFCA

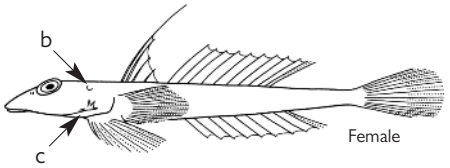
Also known as Pogge

Marine species found in coastal and inshore waters over sandy bottoms. Breeds from February to May. Average adult length 10-15 cm (maximum 21 cm).

- Dark, mottled brow in colour, paler underneath.
- Broad head with multiple (more than three) short barbels (a).
- Hard bony plates over the body.
- Two short dorsal fins and a spine on each gill cover (b).

Common dragonet
(*Callionymus lyra*)



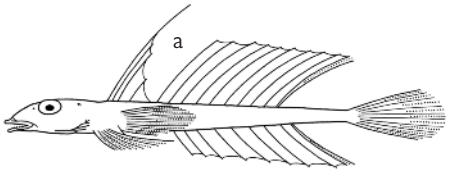


© Tino Strauss

Marine species usually found in coastal, sandy bottom habitats. Sexually mature at 17.5 cm. Maximum adult length 20 cm (females) 30 cm (males).

- Light brown in colour with darker speckles.
- Two dorsal fins, the first with elongated rays exaggerated in males (a).
- Adult males have bright blue marks on body and second dorsal fin.
- Hooked gill cover on top of body (b).
- Gill cover with four spines, three facing back and one facing forward (c).
- Broad, flattened head (d).

Reticulated dragonet
(*Callionymus reticulatus*)

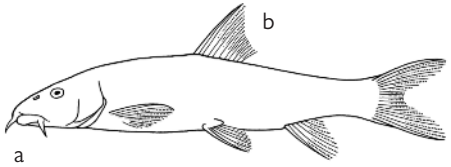


© Fernando Trindade

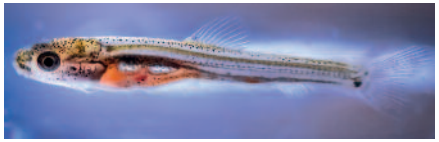
Marine/brackish species found over soft substrates in estuaries. Spawning is believed to take place between April and September. Maximum length 8 cm (females) 10 cm (males).

- Two dorsal fins, the first triangular and dark (a).
- Triangular, flattened head (b).
- Speckled light brown in colour with dark saddles across back and blue spots along the body.
- Three spines on gill cover, all facing backwards.

Barbel (*Barbus barbus*)



© Alan Henshaw



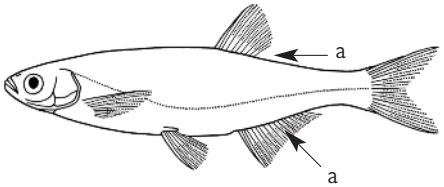
© Alan Henshaw

Protected (HD)

Freshwater species that can be found in the upper reaches of estuaries. Lives in the deeper, faster flowing sections of river with stony or gravel bottom. Spawns May to July. Larvae and juveniles stay on the bottom in shallow, low flow areas along river margins. Maximum larval length 40 mm. Average adult length 50 cm.

- Two pairs of barbels on the upper lip (a).
- High dorsal fin with a short base (b).
- Rich brown-olive colour with an orange tint to the fins (c).

Bleak (*Alburnus alburnus*)



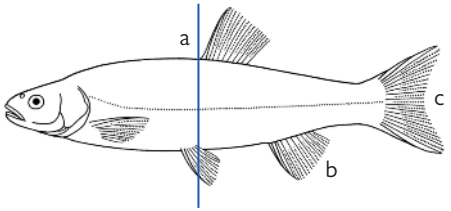
© Piet Spaans

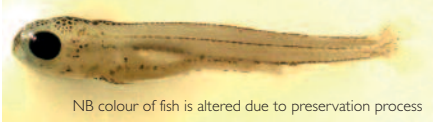
© Piet Spaans

Freshwater/brackish species found in slow flowing lowland rivers. Spawns May to July along the river margins. Sexually mature from 9 cm length. Average adult length 15 cm.

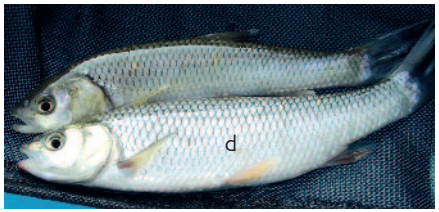
- Base of anal fin longer than base of dorsal fin (a).
- Forked tail fin (b).
- Relatively small upward-facing mouth (c).
- Anal fin with fewer than 13 rays.
- Silver body with colourless fins.

Chub (*Squalius cephalus*)





© Andy D. Nunn

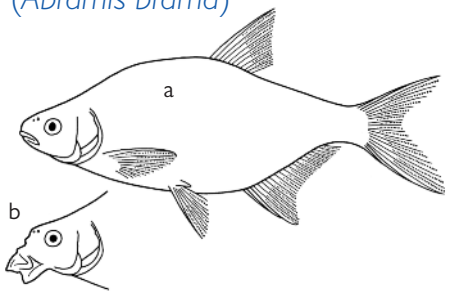


© Shaun Leonard

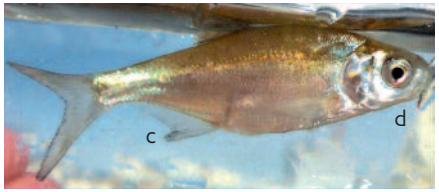
Freshwater/brackish species. Spawn April to June. Larvae and juveniles often found in groups in shallow waters. Maximum larval length 40 mm. Sexually mature from 7 cm length. Average adult length 30 cm.

- Dorsal fin starts further back than the pelvic fin (a).
- Convex anal fin (b).
- Concave tail fin (c).
- Smaller mouth than dace and roach.
- Pelvic, pectoral and anal fin orange, darker in colour than dace (d).

Common bream (*Abramis brama*)



© Andy D. Nunn

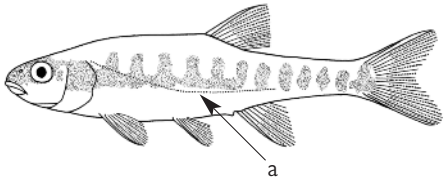


Freshwater/brackish species. Spawn May to July. Juveniles can be found foraging in estuaries and often overwinter in the lower stretches of rivers. Maximum larval length 40 mm. Average adult length 41-51 cm.

- Deep, hump-shaped in the body but this can be difficult to see in very young animals (a).
- Mouth opens downwards (b).
- Long anal fin (c).
- Green-silvery body.
- Clear and large eye (d).

Note: Roach and Bream can form hybrids which are difficult to identify.

Common minnow (Phoxinus phoxinus)

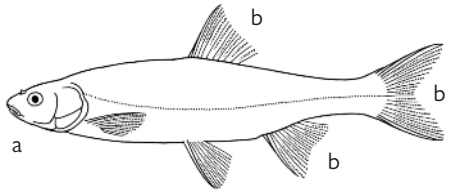


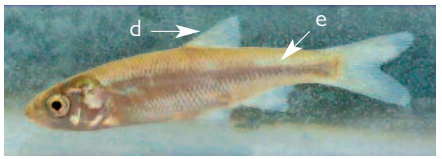
© Adrien Pinot

Freshwater/brackish species. Spawn June to July. Overwinters in deep waters with low flow. Sexually mature from 5 cm length. Average adult length 7 cm.

- Dark colouration present on lateral line and dorsal surface in larvae.
- Dark lateral line extending past the base of the anal fin (a).
- Dark spot at the base of the tail fin.
- Dark, vertical blotches develop along flanks in older animals.

Dace (*Leuciscus leuciscus*)

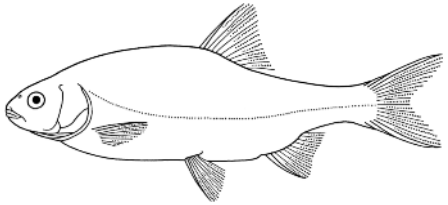




Freshwater/brackish species. Spawn March to May. Larvae and juveniles commonly found along shallow shoreline areas, adults are found in faster flowing waters. Maximum larval length 40 mm. Average adult length 15 cm.

- Upper jaw slightly longer than lower jaw (a).
- Concave anal, dorsal and pectoral fins (b).
- Thick lateral line in younger animals (c).
- Pectoral and pelvic fins translucent (d).
- Silvery, slightly green colouration on top of body (e).

Roach (*Rutilus rutilus*)

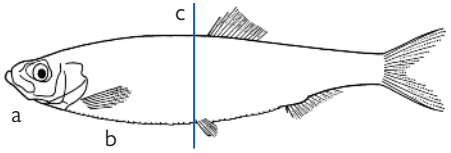


© Lauren Vickers

Freshwater/brackish species. Found across a variety of habitats but generally overwinters in deep waters. Spawns May to June. Larvae and juveniles found in shallower, shoreline areas. Maximum larval length 40 mm. Average adult length 25 cm.

- Yellow eyes in young juveniles, deepening to orange/red as the fish develop (a).
- Slender fish as larvae and small juveniles, broadening out as they become older.
- Pelvic and anal fins are orange-red but this is not always obvious.
- Broader than bream but not as deep in the body.
- Hint of blue on the back/lateral line.

Sprat (*Sprattus sprattus*)



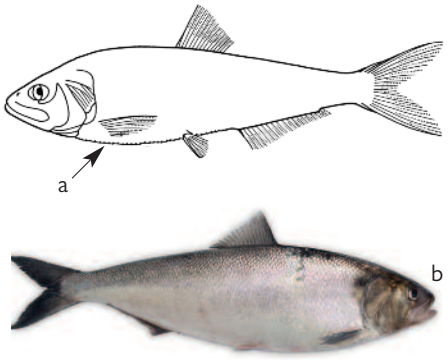
© Dom Longley

© Hans Hillewaert

Marine/brackish species. Commercially important, sprat is commonly found in estuaries. Spawning takes place in spring and early summer out to sea and the eggs and larvae drift inshore over the summer months. Sprat are commonly found in mixed shoals with juvenile herring. To distinguish between the species look for the position of the dorsal and pelvic fins. In sprat, the front of the dorsal fin is behind the base of the pelvic fin, but in herring the front of the dorsal fin is in front of the pelvic fin. Maximum larval length 40 mm. Sexually mature at 13-15 cm. Average adult length 12 cm.

- Upturned mouth with slightly protruding lower jaw (a).
- Rough, bony scales on the lower part of the body (b).
- Front end of pelvic fin in front of dorsal fin (c).
- Small fish (adults less than 16 cm).
- Silver colour, greenish on the back.

Allis shad (*Alosa alosa*)



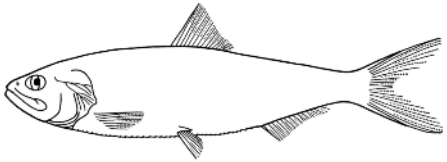
© Fernando Coello Vicente

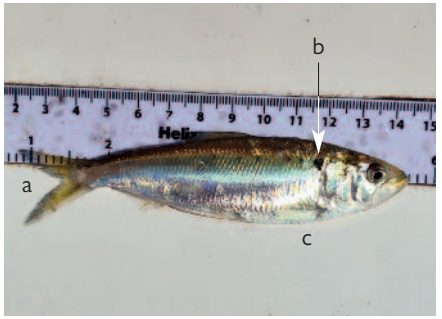
Protected (NERC, UK-BAP, HD)

Marine/freshwater/brackish species. Once common, it is now rare in the UK. Spawns in freshwater in May and June before returning to the sea. Sexually mature between 45-50 cm. Maximum adult length 83 cm.

- Deep in the body, very similar to herring.
- Line of bony scales along the belly (a).
- Distinctive notch in upper lip (b).
- A dark spot might be present behind gill opening, sometimes followed by up to six more.

Twait shad (*Alosa fallax*)





© Liam K. Byrne

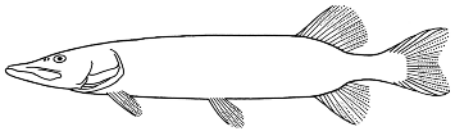
Protected (NERC, UK-BAP, HD)

Marine/freshwater/brackish species that lives in the sea but migrates to freshwater to breed from April to June. Maximum adult length of 60 cm.

- Deeper in the body than herring.
- Very difficult to distinguish from herring when smaller than 5 cm in length.
- Deeply forked tail fin (a).
- Dark spot just behind the gills, usually followed by seven or eight more spots along the flank in older animals (b).
- Pectoral fin low on the body (c).

Note: both sprat and twait shad are known to form schools with herring and can be misidentified as a result.

Pike (*Esox lucius*)

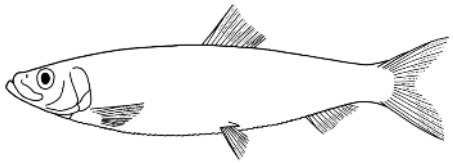


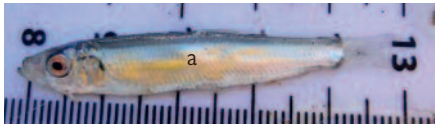
© Andy D. Nunn

Freshwater/brackish species. Spawn February to May amongst aquatic plants. Maximum larval length 40 mm. Sexually mature from 25 cm. Average adult length 40 cm (male) to 55 cm (female).

- Elongated body shape.
- Black stripe of pigment below the eye in larvae.
- Predator-like mouth starts to develop in the larval stage.
- Green and silvery on top.
- Dorsal and anal fins are very far back along the body (a).
- Pectoral fins are low on the body (b).
- Large, flat mouth with multiple teeth.

Herring (*Clupea harengus*)





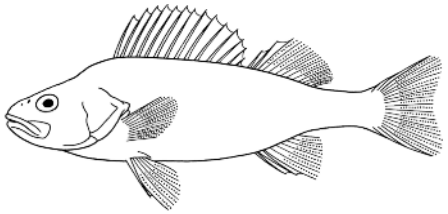
© Sussex IFCA

Protected (NERC, UK-BAP)

Marine/brackish species. Usually found in large schools in coastal waters, they can be found in estuaries with low pollution levels where they spawn. Sexually mature at 23 cm. Maximum length 45 cm.

- Blue-green colour on back with silver sides (a).
- Large eye.
- Large, delicate scales.
- Slender body shape with rounded belly.

Perch (*Perca fluviatilis*)



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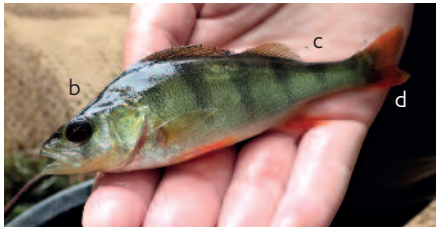
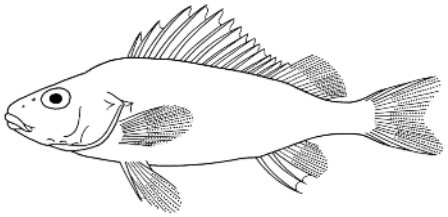


© Andy D. Nunn

Freshwater/brackish species that is commonly found in estuaries. Juveniles feed near the shore during the summer months. Maximum larval length 40 mm. Sexually mature from 11 cm.
Average length of adult around 35 cm (maximum 51 cm).

- Black-bars banding across the body start to develop in juveniles (not always obvious) (a).
- Large predator eyes already present at larval stage (b).
- Juveniles have a greenish tinge on the top of the head.
- Greenish-yellow coloured body, darker on top (c).
- Double dorsal fin, with narrow but clear separation.
- Pelvic, anal and tail fins coloured entirely or partially red (d).

Ruffe (*Gymnocephalus cernuus*)

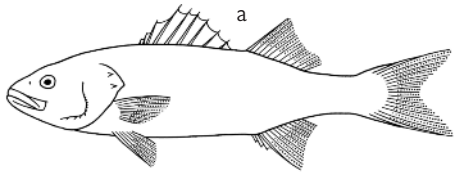


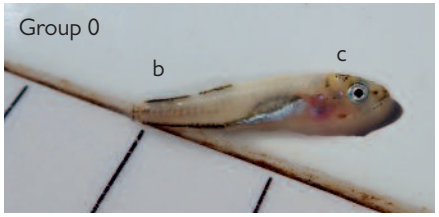
© Tiit Hunt

Freshwater/brackish species found in slow flowing lowland rivers. Spawns April to May. Average length of adult 15-18 cm (maximum 30 cm).

- Double dorsal fin partially joined to each other (a).
- Anterior section of the dorsal with 11 to 16 spines.
- Deep in the body but with a thin tail-wrist.
- Yellowish in colour with dark blotches over the body and fins.

Sea bass (*Dicentrarchus labrax*)





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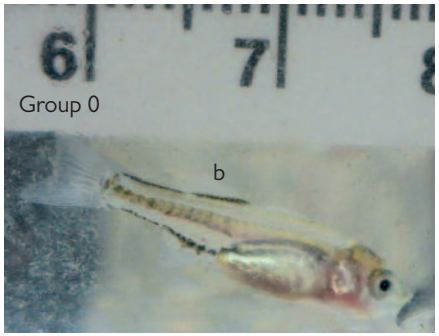

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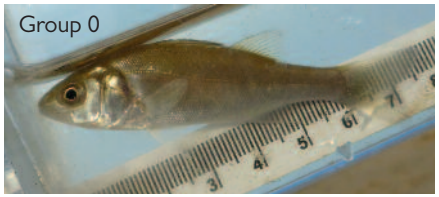
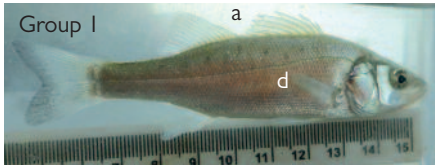




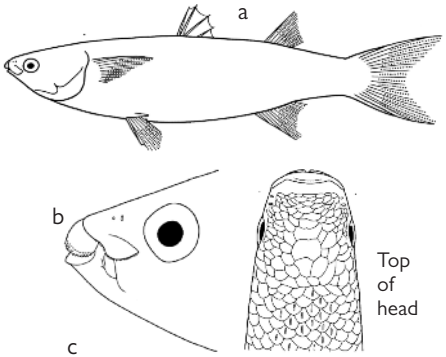
Marine/freshwater/brackish species that is commercially important and popular with recreational fishers. Spawning takes place from March to June in shallow coastal waters and estuaries. Juveniles usually stay in brackish nursery waters until their second summer (>210 mm in length). Adult fish migrate to deep waters during the colder months. They are a long-lived species that can live up to 20 years in age. In UK waters they do not become sexually mature until around six to eight years and are therefore vulnerable to exploitation without strict implementation of minimum catch sizes and protected nursery areas. Maximum larval length 40 mm. Sexually mature from 23 cm length. Average length of adult 60 cm (maximum 100 cm).

- Two separate dorsal fins, the first with eight to nine spines and the second with 12-13 soft rays (a).
- Distinctive dark spotting along edging and ventral line is commonly seen in larval fish up to around 40 mm in length, but it can be present in juvenile fish up to 10 cm in length (b).
- Larval fish have some purple-pink colouration around the lower part of the head and can show some faint orange colouration on top of the head (c).
- Larvae have thick heads relative to their body.
- Juvenile and adult fish are silver in colour, lighter than perch (d).

Age class	Size mm
Group 0	1-69
	70-89
Group 1	90-139
	140-169
Group 2	170-209
	>210

Data on age and size classes sourced from Sussex IFCA

Thick-lipped grey mullet
(Chelon labrosus)

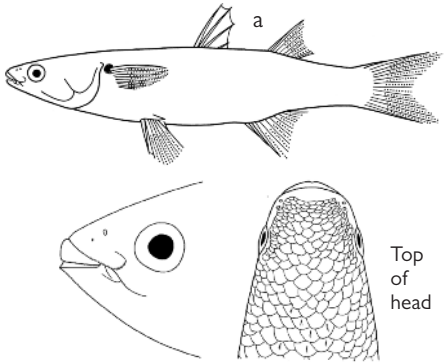


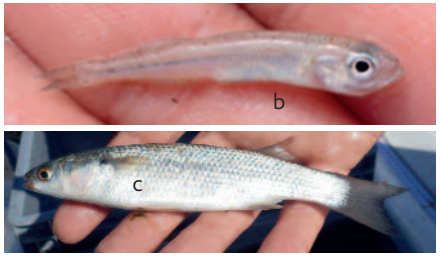
© Sussex IFCA

Marine/freshwater/brackish species that migrate from rivers to the sea to spawn. Juveniles are commonly found in estuaries from April to June. Sexually mature at 25 cm. Maximum length 75 cm.

- Long, torpedo shaped body with large scales.
- Two dorsal fins, the first with four spines (a).
- Upper lip thicker than half diameter of the eye (b).
- Long pectoral fin with no dark spot at base (c).

Thin-lipped grey mullet
(Chelon ramada)



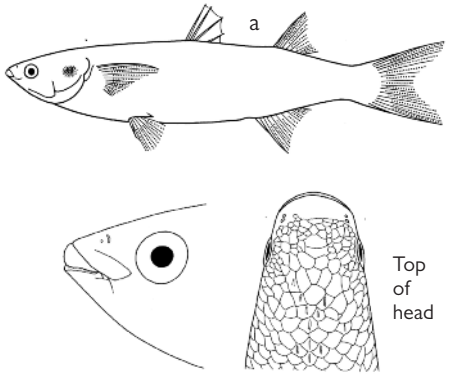


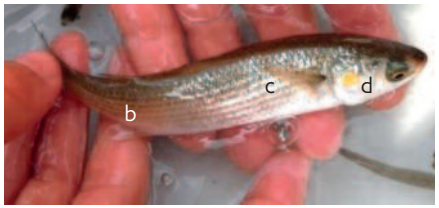
© Dom Longley

Marine/freshwater/brackish species. Adults are found in the lower reaches of rivers but return to the sea during July to September to spawn. The eggs develop at sea, juveniles are found around coastal areas and estuaries. Maximum larval length 40 mm. Sexually mature from 25 cm length. Average length of adult 35 cm (maximum 60 cm).

- Two dorsal fins, the first with four spines (a).
- Larvae smaller than 15 mm have no scales and develop an iridescence (b).
- Smaller animals have a large eye compared to the size of the body.
- Presence of a characteristic spot behind the pectoral fin (c).
- Long pectoral fin placed high on the body.
- Long, flattened head with a small. broad mouth.
- Blue-grey on the back and sides.

Golden grey mullet
(Chelon auratus)





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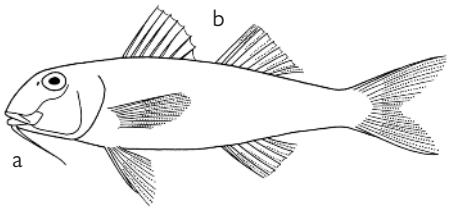
Marine/freshwater/brackish species. Juveniles spend winter and spring months in estuaries. Sexually mature at 34 cm. Maximum length 50 cm.

- Long, torpedo shaped body.
- Large scales.
- Two separate dorsal fins, the first with four spines (a).
- Silver-grey in colour with longitudinal stripes (b).
- Long, pointed pectoral fin (c).
- Golden yellow spot on gill cover (d).

Striped red mullet
(Mullus surmuletus)



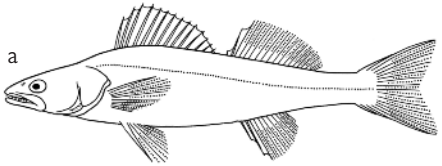
© Sussex IFCA

Marine species often found in estuaries in sandy bottomed and rocky habitats. Sexually mature at 16 cm. Maximum length 40 cm.

- Longitudinal stripes in yellow, red or brown.
- Two long barbels on lower jaw (a).
- Two separated dorsal fins, the first with dark markings (b).
- Red-pink in colour (c).

Pikeperch (*Sander lucioperca*)

Also known as Zander



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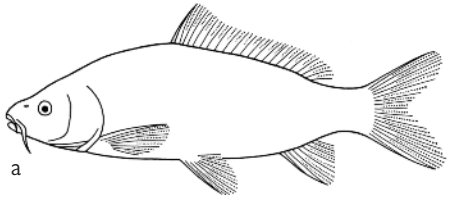
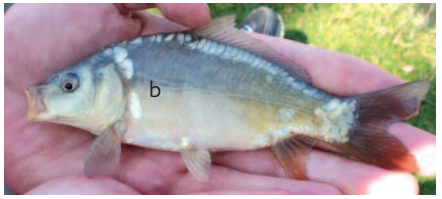
Freshwater/brackish, non-native species. Spawning occurs in freshwater habitats. Maximum larval length 40 mm. Sexually mature from 28 cm length. Average length of adult around 60 cm (maximum 130 cm).

- Long, thin body shape with a pointed head (a).
- Elongated head shape with large, bulbous eyes (b).
- Two dorsal fins separated by a narrow gap (c).
- Between eight to ten dark bars on flank that fade in adults (d).
- Tail fin is transparent in younger animals (e).

Mirror carp (*Cyprinus carpio caprio*)



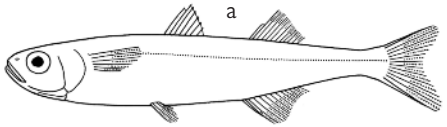


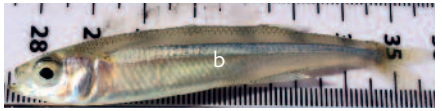
© Raffskii

Freshwater/brackish species. Mirror carp are a subspecies of the wild common carp. They are almost biologically identical, but mirror carp have fewer scales that are larger and resemble mirrors. They are freshwater fish but are tolerant of many conditions and are often found in brackish waters. Size of common carp 51-61 cm. Maximum length mirror carp around 114 cm.

- Round, high backed body shape.
- Four barbels, two long at the corner of the mouth and two shorter ones on the upper lip (a).
- Irregular large scales scattered over the body (b).
- Yellow-brown colour on top, paler underneath.

Sand smelt (*Atherina presbyter*)





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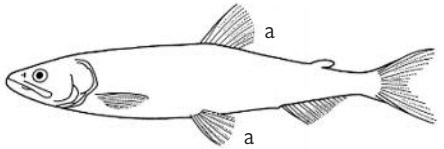
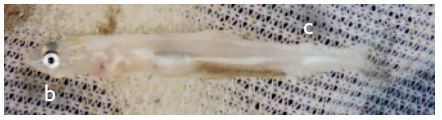
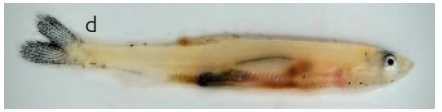
Marine/brackish species. Spawning takes place in spring and summer in shallower waters. They overwinter in deeper waters. Maximum larval length 40 mm. Average length of adult around 15 cm (maximum 21 cm).

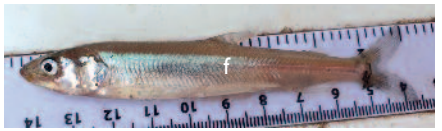
- Two dorsal fins (a).
- Slender bodies with a small head.
- Similar to herring with a clear silver and black line along the body (b).
- Deeply forked tail fin (c).

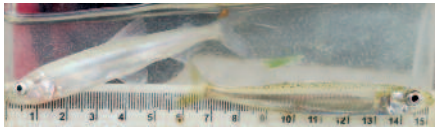
European smelt (*Osmerus eperlanus*)











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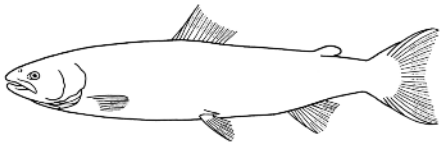
European smelt Sand smelt

Protected (NERC, MCZ, UK-BAP)

Marine/freshwater/brackish species found in western Europe. They migrate to freshwater to spawn from March to April. Entirely freshwater populations are known to occur. Found in estuaries and coastal areas. A valuable indicator species due to sensitivity to pollution, UK populations suffered severe declines since the 19th century. Signs of recovery have been observed but they are still threatened by poor water quality and barriers to migration such as weirs and dams. Maximum larval length 40 mm. Sexually mature from 8 cm length. Average length of adult 16.5 cm.

- Dorsal and pelvic fins quite far back along body (a).
- Large eye in relation to body at larval stage (b).
- Adipose fin (c).
- Smells like cucumber.
- Larvae are entirely transparent to begin with, developing black colouration in tail fin with age (d).
- Pointed head with large mouth that reaches behind the eye (e).
- Juveniles have pink-ish colouration with silverly stripe along flanks (f).

Atlantic salmon (*Salmo salar*)



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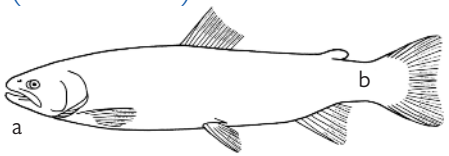
© Dr Chris Gardener (SERT)

Protected (NERC, HD, UK-BAP)

Rare in UK estuaries. Marine/freshwater/brackish species that spends most of its lifecycle in freshwater, migrating to coastal and marine habitats for a few years before returning to freshwater to spawn. Females make redds in clean gravels. Spawning is October to January and eggs are orange and around 6 mm in diameter. Smolts move downstream to the lower estuary as they begin their migration to marine habitats. Maximum larval length 40 mm. Average length of adult 75-100 cm (up to 150 cm).

- Adipose fin (a).
- Mouth almost faces upwards.
- Tail fin has a pronounced edge.
- Jaw is shorter than trout.
- Between 8-12 large bluish spots along the flanks of young fish (b).
- Long pectoral fin placed low on the body just underneath gill cover (c).

Brown/Sea trout (*Salmo trutta*)



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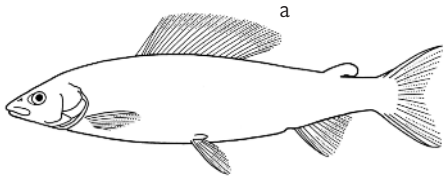
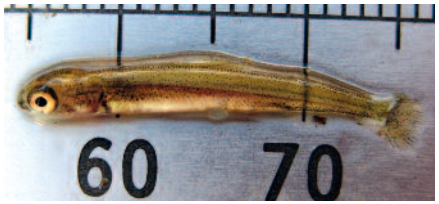
Protected (NERC & UK-BAP)

Rare in UK estuaries. Marine/freshwater/brackish species that spends most of its lifecycle in freshwater, migrating to salt water for a few years before returning to freshwater to spawn in October to December. Not all individuals go to sea and they generally remain in coastal habitats when they do. Maximum larval length 40 mm. Average length of adult 72 cm (highly variable).

- Larvae have a rounded head shape.
- Tail fin has a less pronounced edge than salmon.
- Silvery colour.
- Jaw extends to back of the eye (a).
- Thick tail wrist (b).
- Adipose fin (c).
- Dark, pale spots along the flank with smaller red spots in between (not present on adult fish) (d).
- Pectoral fin is low on the body (e).

Grayling (*Thymallus thymallus*)





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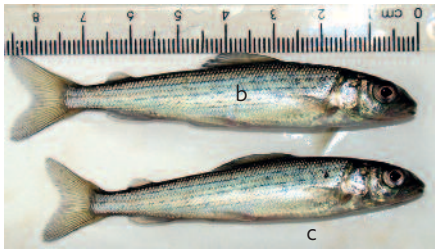

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Protected (BCPF, HD)

Freshwater/brackish species. Spawning takes place, March to May, in shallow waters with gravel bottom. Maximum larval length 40 mm. Average length of adult 30 cm.

- Adipose fin.
- Large dorsal fin developed by juvenile stage (a).
- Small eye compared to the body size in adult fish.
- Smells faintly of thyme.
- Pale body with lines of dusky, dark spots on younger animals (b).
- Flattened bottom – lives in fast water (c).

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Founded in 1826, ZSL is an international conservation charity with a vision of a world where wildlife thrives. We are working to achieve this through our science, our field conservation around the world and engaging millions of people throughout two Zoos.

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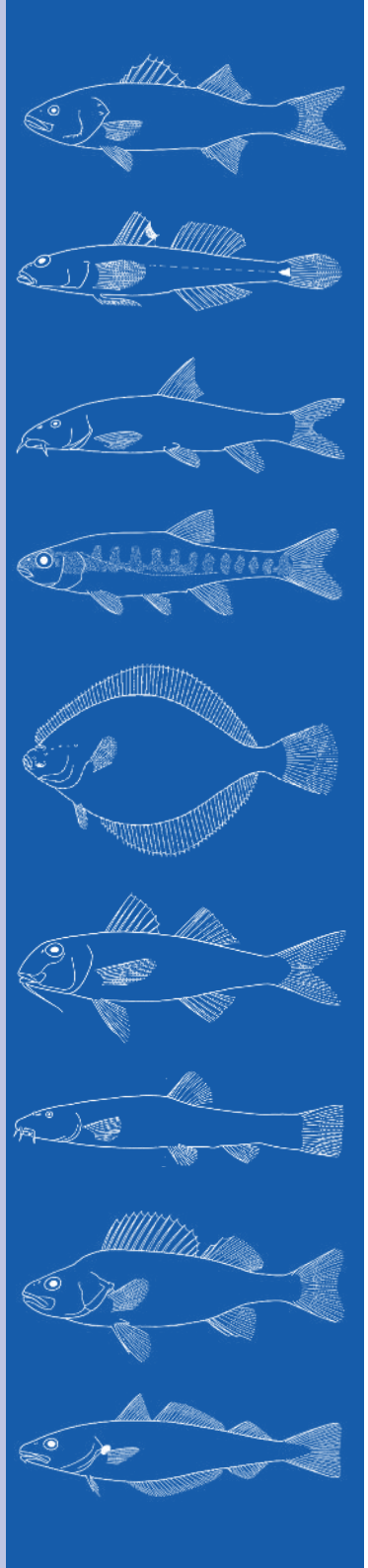
The Sussex IFCA Fish ID Guide can be accessed via their website, alongside their other publications: www.sussex-ifca.gov.uk/publications



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