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Fish Ring Test Bulletin

F_RT11

2017/2018

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PISCES CONSERVATION LTD

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Date of Issue: 14 th February 2018

Contents

RING TEST DETAILS

Fish Ring Test #11
Type/Contents –General
Circulated –05/12/2017
Completion Date –19/01/2018
Number of Participating Laboratories –13
Number of Results Received –13

Table 1. Summary of taxonomic differences in F_RT11 (for further details see Table 2).

Specimen	Genus	Species	Taxon. differences for 13 returns	
			Genus	Species
F_RT1101	*Clupea*	*harengus*	0	0
F_RT1102	*Atherina*	*presbyter / boyeri*	0	0
F_RT1103	*Mullus*	*surmuletus*	0	0
F_RT1104	*Spondyliosoma*	*cantharus*	0	0
F_RT1105	*Sardina*	*pilchardus*	0	0
F_RT1106	*Scomber*	*scombrus*	0	1
F_RT1107	*Eutrigla*	*gurnardus*	1	1
F_RT1108	*Pomatoschistus*	*microps*	2	4
F_RT1109	*Liparis*	*liparis*	0	0
F_RT1110	*Dicentrarchus*	*labrax*	0	0
F_RT1111	*Ciliata*	*mustela*	0	1
F_RT1112	*Merlangius*	*merlangus*	0	0
F_RT1113	*Sprattus*	*sprattus*	0	0
F_RT1114	*Pomatoschistus*	*minutus / lozanoi / norvegicus*	0	1
F_RT1115	*Syngnathus*	*rostellatus*	0	3
		Total differences	**3**	**11**
		Average differences /lab.	**0.23**	**0.85**

Synonyms or spelling errors are not included.

Table 2. Differences of identification in F_RT11, sorted by specimens.

	F_RT1101	**F_RT1102**	**F_RT1103**	**F_RT1104**	**F_RT1105**	**F_RT1106**
Taxon	*Clupea harengus*	*Atherina presbyter / A. boyeri*	*Mullus surmuletus*	*Spondyliosoma cantharus*	*Sardina pilchardus*	*Scomber scombrus*
LB2401	- -	- -	- -	- -	- -	- -
LB2406	- -	- -	- -	- -	- -	- -
LB2412	- -	- -	- -	- -	- -	- -
LB2413	- -	- -	*- [sumuletus]*	*- [cantharas]*	- -	- -
LB2414	*- [herrangus]*	- -	- -	- -	- -	- -
LB2415	- -	- -	- -	- -	- -	*[Scamber scambrus]*
LB2416	- -	- -	- -	- -	- -	- -
LB2417	- -	- -	- -	- -	- -	***- colias***
LB2418	- -	- -	- -	- -	- -	- -
LB2419	- -	- -	- -	- -	- -	- -
LB2422	- -	- -	- -	- -	- -	- -
LB2424	- -	- -	- -	- -	- -	- -
LB2425	- -	- -	- -	- -	- -	- -

Table 2. Differences of identification in F_RT11, sorted by specimens.

	F_RT1107	**F_RT1108**	**F_RT1109**	**F_RT1110**	**F_RT1111**	**F_RT1112**
Taxon	*Eutrigla gurnardus*	*Pomatoschistus microps*	*Liparis liparis*	*Dicentrarchus labrax*	*Ciliata mustela*	*Merlangius merlangus*
LB2401	***Aspitrigla cuculus***	- ***pictus***	- -	- -	- -	- -
LB2406	- -	- -	- -	- -	- -	- -
LB2412	- -	- -	- -	- -	- -	- -
LB2413	- -	- -	- -	- -	- -	- -
LB2414	- -	- -	- -	- -	- *[mustella]*	- -
LB2415	- -	***Gobiusculus flavescens***	- -	- -	- -	- -
LB2416	- -	- ***pictus***	- -	- -	- -	- -
LB2417	- -	- -	- -	- -	- -	- -
LB2418	- -	- -	- -	- -	- -	- -
LB2419	- -	- -	- -	- -	- -	- -
LB2422	- -	- -	- -	- -	- -	- -
LB2424	- -	- -	- -	- -	- -	- -
LB2425	- -	***Gobiusculus flavescens***	- -	- -	- ***septentrionalis***	- -

Table 2. Differences of identification in F_RT11, sorted by specimens.

	F_RT1113	**F_RT1114**	**F_RT1115**
Taxon	*Sprattus sprattus*	*Pomatoschistus minutus / P. lozanoi / P. norvegicus*	*Syngnathus rostellatus*
LB2401	- -	- -	- ***acus***
LB2406	- -	- -	- -
LB2412	- -	- -	- -
LB2413	- -	- -	- -
LB2414	- -	- -	- -
LB2415	- -	- -	- -
LB2416	- -	- -	- ***acus***
LB2417	- -	- -	- -
LB2418	- -	- -	- -
LB2419	- -	- -	- -
LB2422	- -	- -	- -
LB2424	- -	- ***microps***	- -
LB2425	- -	- -	- ***acus***

Graph 1. Number of taxonomic differences in F_RT11 per laboratory (for further details see Table 3).

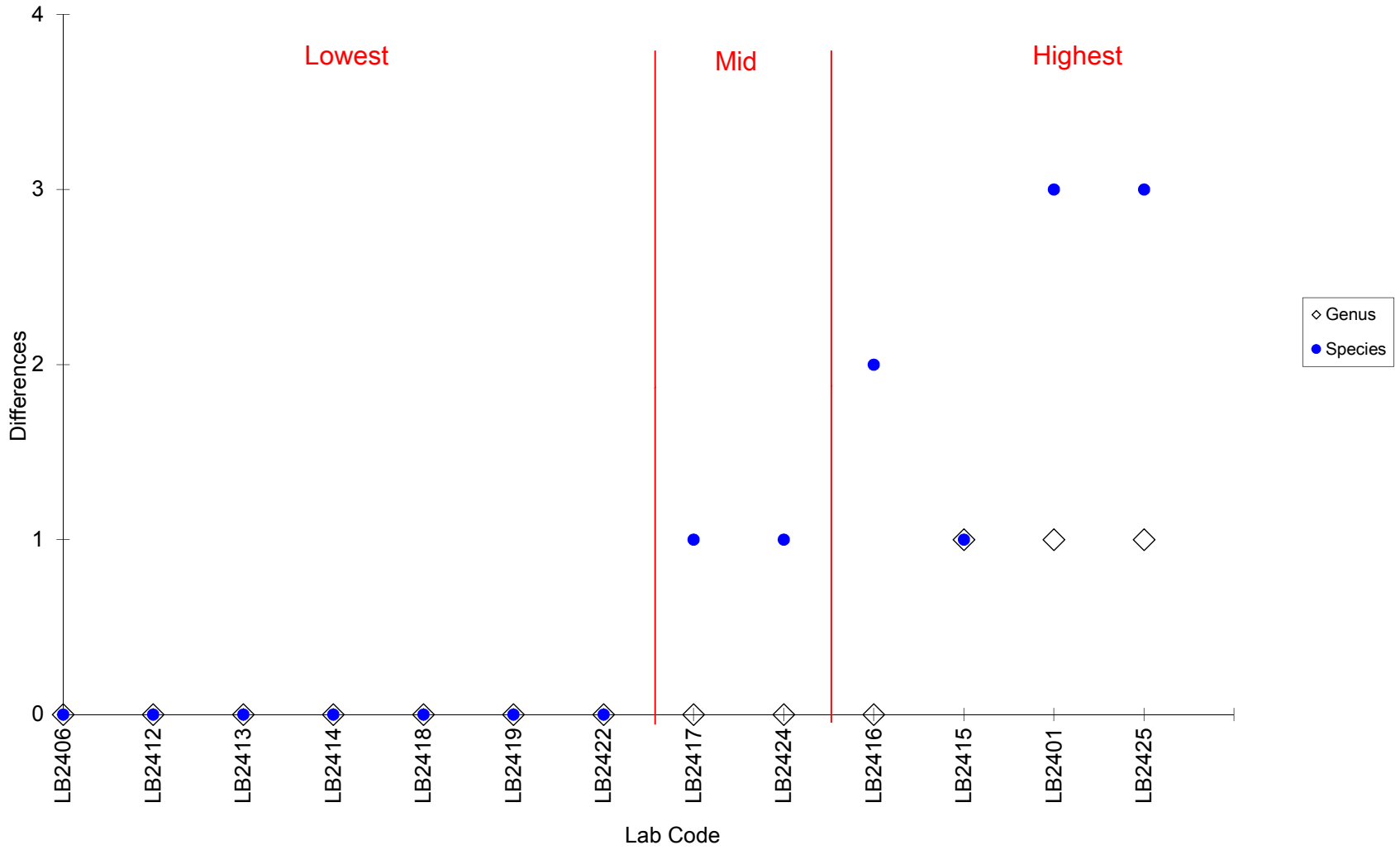

Table 3. Differences of identification in F_RT11, sorted by participating laboratories.

	Taxon	LB2401	LB2406	LB2412	LB2413	LB2414
F_RT1101	*Clupea harengus*	- -	- -	- -	- -	*- [herrangus]*
F_RT1102	*Atherina presbyter / A. boyeri*	- -	- -	- -	- -	- -
F_RT1103	*Mullus surmuletus*	- -	- -	- -	*- [sumuletus]*	- -
F_RT1104	*Spondyliosoma cantharus*	- -	- -	- -	*- [cantharas]*	- -
F_RT1105	*Sardina pilchardus*	- -	- -	- -	- -	- -
F_RT1106	*Scomber scombrus*	- -	- -	- -	- -	- -
F_RT1107	*Eutrigla gurnardus*	***Aspitrigla cuculus***	- -	- -	- -	- -
F_RT1108	*Pomatoschistus microps*	*-* ***pictus***	- -	- -	- -	- -
F_RT1109	*Liparis liparis*	- -	- -	- -	- -	- -
F_RT1110	*Dicentrarchus labrax*	- -	- -	- -	- -	- -
F_RT1111	*Ciliata mustela*	- -	- -	- -	- -	*- [mustella]*
F_RT1112	*Merlangius merlangus*	- -	- -	- -	- -	- -
F_RT1113	*Sprattus sprattus*	- -	- -	- -	- -	- -
F_RT1114	*Pomatoschistus minutus / P. lozanoi / P. norvegicus*	- -	- -	- -	- -	- -
F_RT1115	*Syngnathus rostellatus*	*-* ***acus***	- -	- -	- -	- -

	Taxon	LB2415	LB2416	LB2417	LB2418	LB2419
F_RT1101	*Clupea harengus*	- -	- -	- -	- -	- -
F_RT1102	*Atherina presbyter / A. boyeri*	- -	- -	- -	- -	- -
F_RT1103	*Mullus surmuletus*	- -	- -	- -	- -	- -
F_RT1104	*Spondyliosoma cantharus*	- -	- -	- -	- -	- -
F_RT1105	*Sardina pilchardus*	- -	- -	- -	- -	- -
F_RT1106	*Scomber scombrus*	*[Scamber scambrus]*	- -	*-* ***colias***	- -	- -
F_RT1107	*Eutrigla gurnardus*	- -	- -	- -	- -	- -
F_RT1108	*Pomatoschistus microps*	***Gobiusculus flavescens***	*-* ***pictus***	- -	- -	- -
F_RT1109	*Liparis liparis*	- -	- -	- -	- -	- -
F_RT1110	*Dicentrarchus labrax*	- -	- -	- -	- -	- -
F_RT1111	*Ciliata mustela*	- -	- -	- -	- -	- -
F_RT1112	*Merlangius merlangus*	- -	- -	- -	- -	- -
F_RT1113	*Sprattus sprattus*	- -	- -	- -	- -	- -
F_RT1114	*Pomatoschistus minutus / P. lozanoi / P. norvegicus*	- -	- -	- -	- -	- -
F_RT1115	*Syngnathus rostellatus*	- -	*-* ***acus***	- -	- -	- -

Table 3. Differences of identification in F_RT11, sorted by participating laboratories.

	Taxon	LB2422	LB2424	LB2425
F_RT1101	*Clupea harengus*	- -	- -	- -
F_RT1102	*Atherina presbyter / A. boyeri*	- -	- -	- -
F_RT1103	*Mullus surmuletus*	- -	- -	- -
F_RT1104	*Spondyliosoma cantharus*	- -	- -	- -
F_RT1105	*Sardina pilchardus*	- -	- -	- -
F_RT1106	*Scomber scombrus*	- -	- -	- -
F_RT1107	*Eutrigla gurnardus*	- -	- -	- -
F_RT1108	*Pomatoschistus microps*	- -	- -	***Gobiusculus flavescens***
F_RT1109	*Liparis liparis*	- -	- -	- -
F_RT1110	*Dicentrarchus labrax*	- -	- -	- -
F_RT1111	*Ciliata mustela*	- -	- -	- ***septentrionalis***
F_RT1112	*Merlangius merlangus*	- -	- -	- -
F_RT1113	*Sprattus sprattus*	- -	- -	- -
F_RT1114	*Pomatoschistus minutus / P. lozanoi / P. norvegicus*	- -	- ***microps***	- -
F_RT1115	*Syngnathus rostellatus*	- -	- -	- ***acus***

Summary of literature used for specimens in F_RT11

Participants

Henderson 2015
Kay & Dipper 2009
Maitland & Herdson 2009
Wheeler 1969
Wheeler 1978
Whitehead et al. 1984-1986

Fishbase http://www.fishbase.org/
WORMS http://www.marinespecies.org/

Additional literature used for:

F_RT1102 *Atherina* spp:	Pombo et al. 2005
F_RT1107 *Eutrigla gurnardus*:	Hayward & Ryland 1995
F_RT1108 and F_RT1114 *Pomatoschistus* spp:	Kovačić 2008; Miller 2011 a & b
F_RT1115 *Syngnathus rostellatus*:	Ben Amor et al. 2008

PISCES Conservation Ltd.

Henderson 2015
Wheeler 1969

Additional literature used for F_RT1106 *Scomber scombrus / S. colias*

Collette et al. 1983
Fishbase http://www.fishbase.org/

Fish ring test F RT11: General information

Participants were asked to provide common names, as they are required for general reports, however differences in common names are not used for scoring. For details of your LabCode please contact your Scheme representative or Thomson Unicomarine Ltd.

All photographs in the following paragraph are in lateral view (L).

Habitats
Pelagic: Occurs primarily in the water column
Demersal: Occurs on or near to the sea floor
Bentho-pelagic: Occurs both near the sea floor and in the water column

Substrata
Mixed: Occurs on a variety of sediment types
Sand: Occurs primarily on sandy sediments
Rock: Occurs primarily on rocky grounds
Mud: Occurs primarily on muddy sediments
NA: No substratum is defined for pelagic species

Salinity
High: Occurs in fully marine habitats
Mixed: Occurs in fully marine and transitional waters
Reduced: Occurs primarily in estuarine and transitional waters

Depth
Shallow sublittoral: Occurs primarily in coastal waters <20 m deep, including intertidal habitats
Circalittoral: Occurs primarily in shelf seas to depths of 200 m
Deep-water: Occurs primarily in waters depths >200 m

Geographic origin
Refers to the region where the actual specimens were sourced from.

Specimens
Laboratories are permitted to keep their specimens for inclusion to their in-house reference collections.

Fish ring test F_RT11: Specimens

F_RT1101 – *Clupea harengus* (Herring)

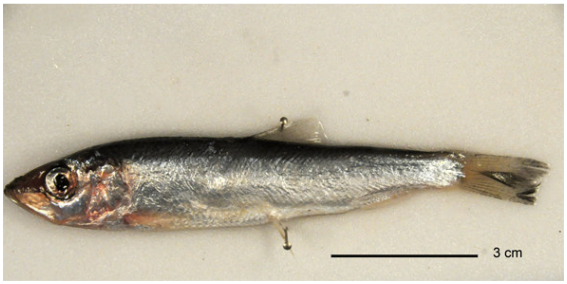

Figure 1 (F_RT1101) – L

Habitat: Pelagic.
Substrate: NA
Salinity: High.
Depth: Shallow sublittoral to deep-water.
Geographic source: South West England.

No differences recorded.

F_RT1102 – *Atherina presbyter / A. boyeri* (Sand smelt)

Figure 2 (F_RT1102) – L

Habitat: Pelagic.
Substrate: NA
Salinity: Reduced.
Depth: Shallow sublittoral.
Geographic source: Southern England.

No differences recorded.

F_RT1103 – *Mullus surmuletus* (Red mullet)

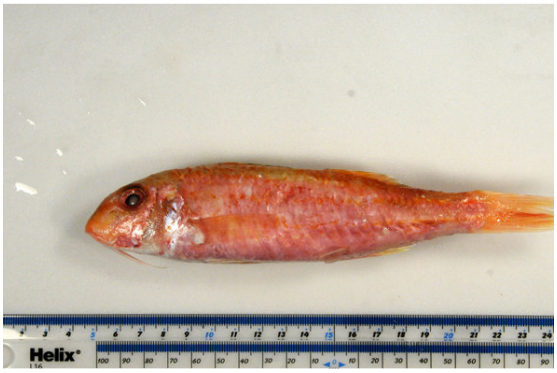

Figure 3 (F_RT1103) – L

Habitat: Demersal.
Substrate: Sand.
Salinity: High.
Depth: Shallow sublittoral to deep-water.
Geographic source: South East England.

No differences recorded.

F_RT1104 – *Spondyliosoma cantharus* (Black sea bream)

Figure 4 (F_RT1104) – L

Habitat: Bentho-pelagic.
Substrate: Sand/rock/seagrass.
Salinity: High.
Depth: Shallow sublittoral to deep-water.
Geographic source: South West England.

No differences recorded.

F_RT1105 – *Sardina pilchardus* (Sardine)

Figure 5 (F_RT1105) – L

Habitat: Pelagic.
Substrate: NA
Salinity: High.
Depth: Shallow sublittoral to circalittoral.
Geographic source: South East England.

No differences recorded.

F_RT1106 – *Scomber scombrus* (Mackerel)

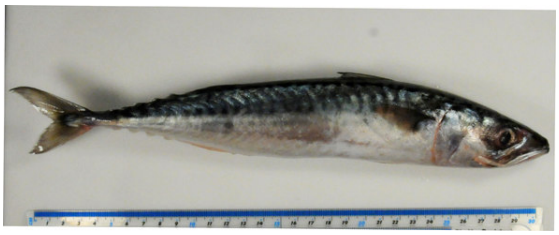

Figure 6 (F_RT1106) – L

Habitat: Pelagic.
Substrate: NA
Salinity: High.
Depth: Shallow sublittoral to deep-water.
Geographic source: South East England.

One specific difference recorded.

Lab 2417 identified as *Scomber colias.*
For a discussion of the respective differentiating characters, see **Appendix 1**.

F_RT1107 – *Eutrigla gurnardus* (Grey gurnard)

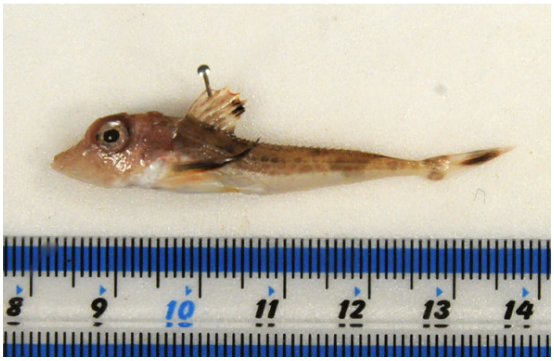

Figure 7 (F_RT1107) – L

Habitat: Demersal.
Substrate: Sand / rock.
Salinity: Mixed.
Depth: Shallow sublittoral to circalittoral.
Geographic source: Bristol Channel.

One generic and one specific difference recorded.

Lab 2401 identified as *Aspitrigla cuculus.*
For a discussion of the respective differentiating characters, see **Appendix 2**.

F_RT1108 – *Pomatoschistus microps* (Common goby)

Figure 8 (F_RT1108) – L

Habitat: Demersal.
Substrate: Mixed.
Salinity: Reduced.
Depth: Shallow sublittoral.
Geographic source: Southern England.

Two generic and four specific differences recorded.

Labs 2401 and 2416 identified as *P. pictus* and Labs 2415 and 2425 identified as *Gobiusculus flavescens*.
For a discussion of the respective differentiating characters, see **Appendices 3, 4 and 5**.

F_RT1109 – *Liparis liparis* (Common sea snail)

Figure 9 (F_RT1109) – L

Habitat: Demersal.
Substrate: Mixed.
Salinity: High.
Depth: Shallow sublittoral to deep-water.
Geographic source: Bristol Channel.

No differences recorded.

F_RT1110 – *Dicentrarchus labrax* (Bass)

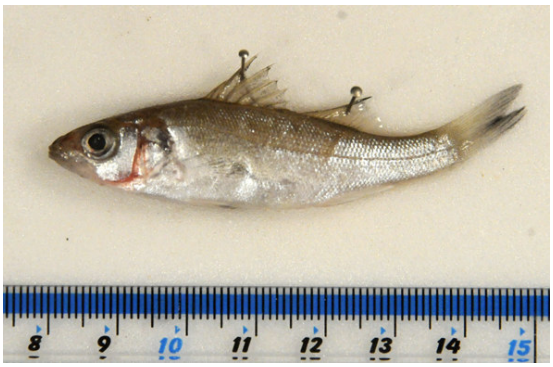

Figure 10 (F_RT1110) – L

Habitat: Pelagic.
Substrate: NA
Salinity: High.
Depth: Shallow sublittoral to circalittoral.
Geographic source: South East England.

No differences recorded.

F_RT1111 – *Ciliata mustela* (5-bearded rockling)

Figure 11 (F_RT1111) – L

Habitat: Demersal.
Substrate: Mixed.
Salinity: High.
Depth: Shallow sublittoral.
Geographic source: Bristol Channel.

One specific difference recorded.

Lab 2425 identified as *C. septentrionalis*.
For a discussion of the respective differentiating characters, see **Appendix 6**.

F_RT1112 – *Merlangius merlangus* (Whiting)

Figure 12a (F_RT1112) - L

Habitat: Bentho-pelagic.
Substrate: Sand.
Salinity: Mixed.
Depth: Shallow sublittoral to circalittoral.
Geographic source: Southern England.

No differences recorded.

F_RT1113 – *Sprattus sprattus* (Sprat)

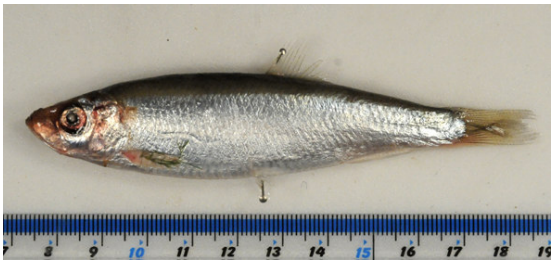

Figure 13 (F_RT1113) – L

Habitat: Pelagic.
Substrate: NA
Salinity: Mixed.
Depth: Shallow sublittoral to circalittoral.
Geographic source: South West England.

No differences recorded.

F_RT1114 – *Pomatoschistus minutus / P. lozanoi / P. norvegicus* (Sand goby complex)

Figure 14 (F_RT1114) – L

Habitat: Demersal.
Substrate: Sand.
Salinity: Mixed.
Depth: Shallow sublittoral to circalittoral.
Geographic source: South East England.

One specific difference recorded.

Lab 2424 identified as *P. microps*.
For a discussion of the respective differentiating characters, see **Appendices 3, 4 and 5**.

F_RT1115 – *Syngnathus rostellatus* (Nilsson's pipefish)

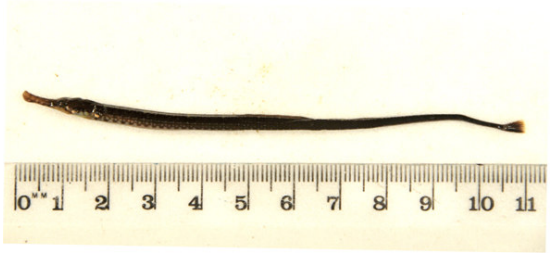

Figure 15 (F_RT0915) – L

Habitat: Demersal.
Substrate: Sand.
Salinity: Reduced.
Depth: Shallow sublittoral.
Geographic source: Southern England.

Three specific differences recorded.

Labs 2401, 2416 and 2425 identified as *S. acus*. For a discussion of the respective differentiating characters, see **Appendix 7**.

References

Ben Amor M.M., Ben Salem M., Ben Souissi J. & Capapé C. 2008. Occurrence of Nilsson's Pipefish *Syngnathus rostellatus* (Osteichthyes: Syngnathidae) in the Gulf of Tunis (Central Mediterranean). Vie et Milieu - Life and Environment 58 (3/4): 189-192.

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Kay P. & Dipper F. 2009. A Field Guide to the Marine Fishes of Wales and adjacent waters. Marine Wildlife, Llanfairfechan.

Kovačić M. 2008. The key for identification of Gobiidae (Pisces: Perciformes) in the Adriatic Sea. Acta Adriatica 49(3): 245-254.

Maitland P.S. & Herdson D. 2009. Key to the Marine and Freshwater Fishes of Britain and Ireland. Environment Agency.

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Miller P.J. 2011b. Key to Gobies of the British Isles. pp 1-5. NMBAQC April 2011 Fish ID Workshop.

Pombo L., Elliott M. & Rebelo E. 2005. Ecology, age and growth of *Atherina boyeri* and *Atherina presbyter* in the Ria de Aveiro, Portugal. Cybium 29(1): 47-55.

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Wheeler A. 1978. Key to the fishes of Northern Europe. Warne, London.

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Databases

Fishbase http://www.fishbase.org/

World Register of Marine Species (WoRMS) http://www.marinespecies.org/

Key features separating difficult fish species

1 Mackerel (*Scomber scombrus*) and Atlantic chub mackerel (*S. colias*)

A query has been raised as to the identification of one of the mackerel specimens. The lab looked at the fin ray count and identified the species as *Scomber colias* rather than *S. scombrus*. From the supplied image there do appear to be 10 spines showing. However, the other characteristics all point to it being a *S. scombrus*. There appears to be some issue with the exact fin ray number of *S. scombrus*, with FishBase giving a range of 8 - 14, whereas Wheeler (1969) indicates 11 - 13. It is worth noting that the final fin ray can be very short and difficult to raise if the fin is not fully extended, and so it is possible that this last ray has been overlooked.

Other reasons we believe that the specimen is *S. scombrus* include:

- the colouration – *S. colias* has a pattern of oblique lines which zigzag and undulate on the back, with the belly marked by spotting or wavy broken lines (Collette & Nauen, 1983). Wheeler (1969) describes it as "*sides and belly silvery yellow with numerous dusky rounded marks*". In *S. scombrus* the markings on the back are oblique to near vertical, with relatively little undulating and the belly unmarked (Collette & Nauen, 1983),
- The lateral line - *S colias* has a lateral line in a long curve from above the pectoral fin almost to the anal fin whereas *S. scombrus* has a lateral line almost straight (Wheeler, 1969).
- Scales – *S. colias* has scales behind the head and around the pectoral base which are large, conspicuous and remain attached when the remainder of the scales are lost (Wheeler, 1969). *S, scombrus* scales are similar along the entire body.
- Fin position – *S. colias* has a gap between the first and second dorsal fins which is less than the first dorsal fin base. In *S. scombrus* the gap between the first dorsal fin groove and second dorsal fin is clearly greater (approximately 1.5 times) than the length of groove (Collette & Nauen, 1983),

If identification were based on dorsal fin ray count alone, the specimen is feasibly *S. colias*. However, the uncertainty over the definitive fin ray count between different authorities, the possibility that an 11th, very small, fin ray has been overlooked, and the other features which point to *S. scombrus*, reinforce our view that the specimen is *S. scombrus*.

Figure 1: The mackerel image from the lab – showing typical *S. scombrus* colouration and fin position.

Figure 2: The fin of the mackerel from the lab – showing 10 rays.

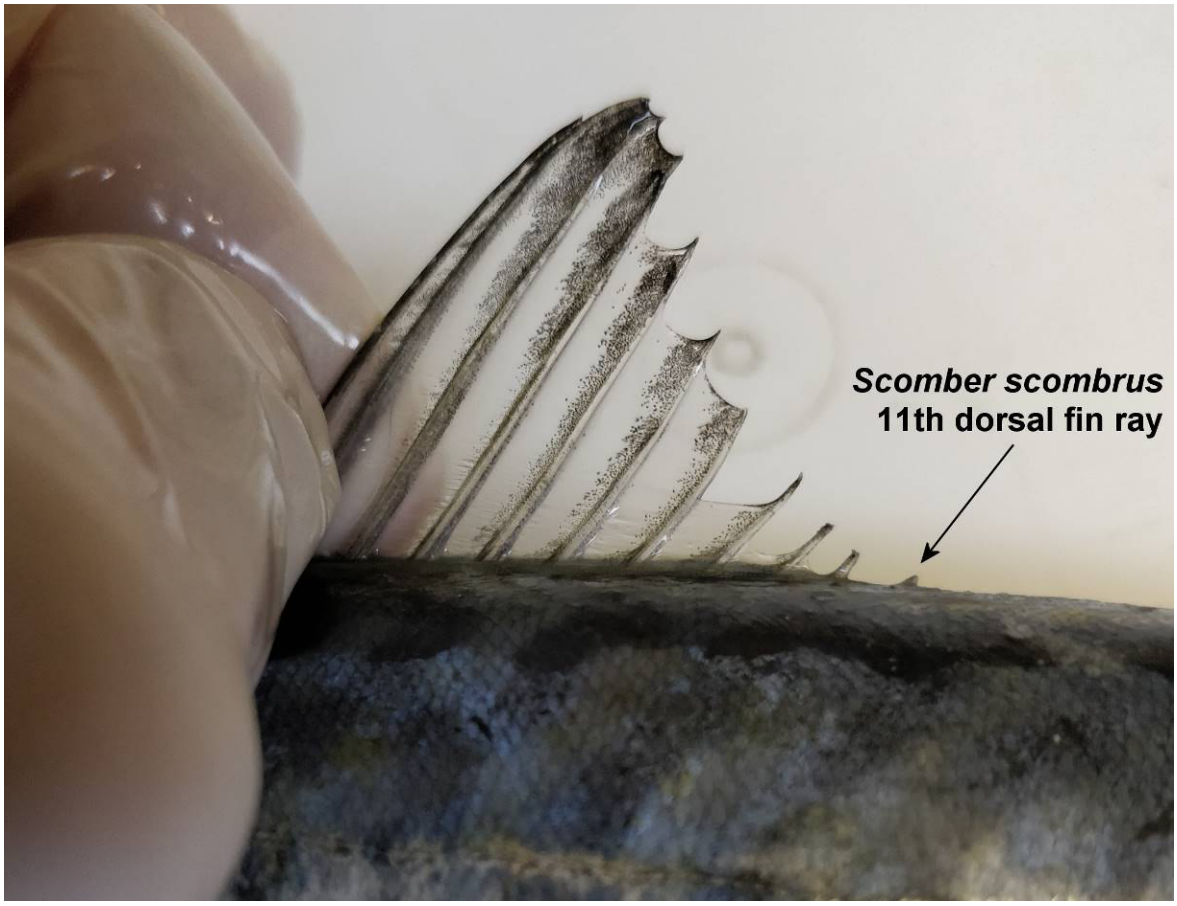

Figure 3: 1st dorsal fin of Pisces specimen of *S. scombrus*, showing the very small 11th fin ray. Note also the similarity in the patterning on the back, and the dusky spotting on the fin membrane, with the specimen in the previous image submitted by the lab.

Figure 4. *S. colias* taken from FishBase; note the patterning, spots on the belly and fin positions. (http://www.fishbase.org/photos/PicturesSummary.php?StartRow=1&ID=54736&what=species&TotRec=3)

The range of differences between the two species is outlined below:

1.1 Fins

S. scombrus

- Dorsal fin spines 8 – 14 (FishBase),
- First dorsal 11 – 13 spines (Henderson, 2015)
- First dorsal 11 – 13 spines (Wheeler, 1969)
- Space between first dorsal fin groove and second dorsal fin clearly greater (approximately 1.5 times) than length of groove (Collette & Nauen, 1983),
- Dorsal fins widely separated and there is no deep groove along the back (Wheeler 1969),
- Anal fin origin opposite that of second dorsal fin or nearly so (Collette & Nauen, 1983).

S. colias

- First dorsal with 9 or 10 spines (Collette & Nauen, 1983),
- Space between first and second dorsal fin less than first dorsal fin base (Collette & Nauen, 1983),
- Anal fin origin opposite that of second dorsal fin or somewhat more posterior (Collette & Nauen, 1983).

1.2 Head / operculum

S. scombrus

- Eye smallish, set well forward in the head (Wheeler, 1969),
- Posterior edge of operculum notched around origin of pectoral fin (Wheeler, 1969),
- Anterior dorsal end of preoperculum curved in towards the dorsal edge of the eye socket; ventral end of preoperculum curves in towards the mouth (Wheeler, 1969).

S. colias

- Eye large and positioned almost mid-way on the head (Wheeler, 1969),
- Posterior edge of operculum pointed below pectoral fin base (Wheeler, 1969),
- Anterior dorsal end of preoperculum ends half way up the eye socket; ventral end of preoperculum curves down below the jaw (Wheeler, 1969).

1.3 Scales

S. colias

- Scales behind the head and around the pectoral base are large, conspicuous and remain attached when the remainder of the scales are lost (Wheeler, 1969).

1.4 Markings

S. scombrus

- Markings on back oblique to near vertical, with relatively little undulating (C&N, 1983),
- Belly unmarked (Collette & Nauen, 1983),
- Sides metallic, belly white, with purplish and silvery reflections (Wheeler, 1969),
- Lateral line almost straight (Wheeler, 1969).

S. colias

- Back with oblique lines which zigzag and undulate (Collette & Nauen, 1983),
- Belly marked by spotting or wavy broken lines (Collette & Nauen, 1983)
- Sides and belly silvery yellow with numerous dusky rounded spots (Wheeler, 1969),
- Lateral line in a long curve from above pectoral fin almost to anal fin (Wheeler, 1969).

1.5 Dentition

S. scombrus

- Palatine wide, teeth in two widely spaced rows (Collette & Nauen, 1983).

S. colias

- Palatine bone (on roof of mouth) narrow, palatine teeth in single or double rows, when double, rows close and running into each other (Collette & Nauen, 1983).

1.6 Internal

S. scombrus

- Swimbladder absent (Collette & Nauen, 1983).

S. colias

- Swimbladder present (Collette & Nauen, 1983).

2 Grey gurnard, (*Eutrigla gurnardus*), and red gurnard, (*Aspitrigla cuculus*)

Details taken from Henderson, 2015.

E. gurnardus

- Pectoral fins do not reach the vent,
- Dark blotch on first dorsal fin,
- Sharp scutes on lateral line,
- Eye diameter as great as the depth of the cheek,
- Head profile almost straight.

A. cuculus

- Pectoral fins only just reach the vent,
- No mark on first dorsal fin,
- Scales but no spines on lateral line,
- Eye diameter much less than depth of cheek,
- Head profile rather concave.

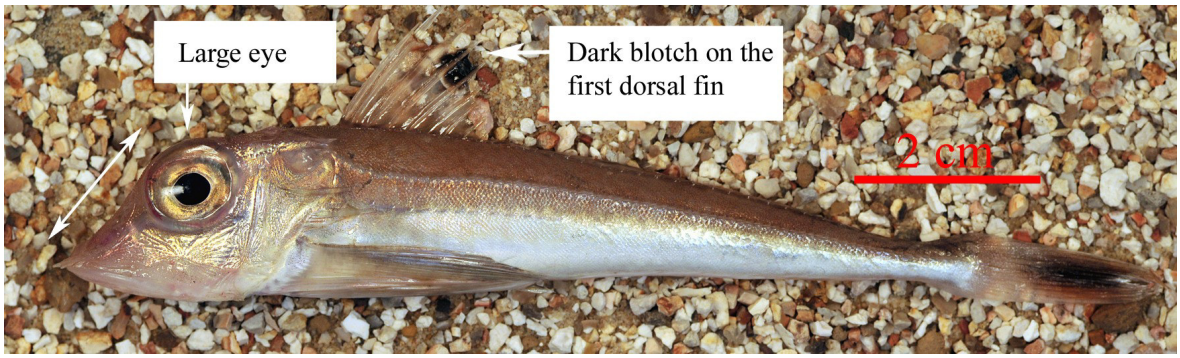

Figure 5: Grey gurnard, *Eutrigla gurnardus*.

Figure 6: Red gurnard, *Aspitrigla cuculus*.

3 Common goby (*Pomatoschistus microps*) and two-spot goby (*Gobiusculus flavescens*)

A lab has queried the common goby (*Pomatoschistus microps*) and has identified it as a two spot goby (*Gobiusculus flavescens)*. We believe that it is a *P. microps* because:

- Colouration - in *P. microps* there is a T-shaped blackish spot at base of tail, and no second black spot adjacent to pectoral fin, but a series of vertical bars and spotting along the sides (Henderson, 2015), and a dark patch on the base of the pectoral fin (Wheeler, 1969). In *G. flavescens* there is a round black spot at the base of the tail, surrounded by yellow, and a 2nd black spot adjacent to the pectoral fin (in males only) (Henderson, 2015), and no dark patch on base of pectoral fin. (Wheeler, 1969).
- Eyes - in *P. microps*, the eyes are close together and set on top of the head, whereas in *G. flavescens* the eyes are large, separated, and set on side of head - Figure 10, below - (Henderson, 2015).

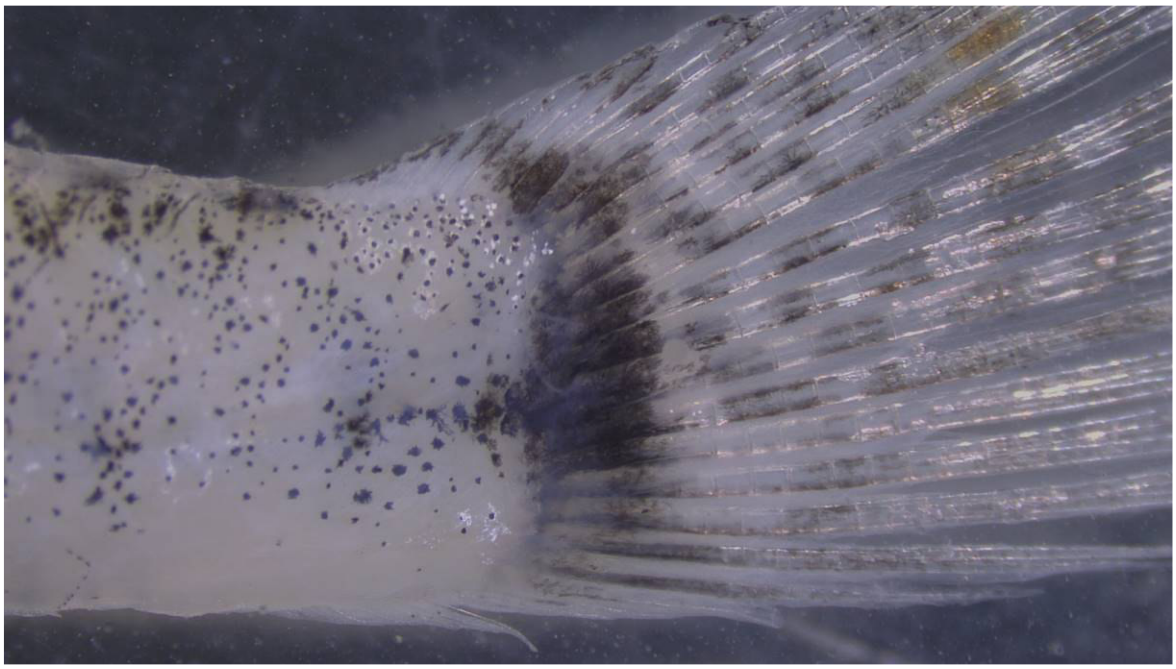

Figure 7: Image of the tail of the goby in question – showing a T-shaped mark

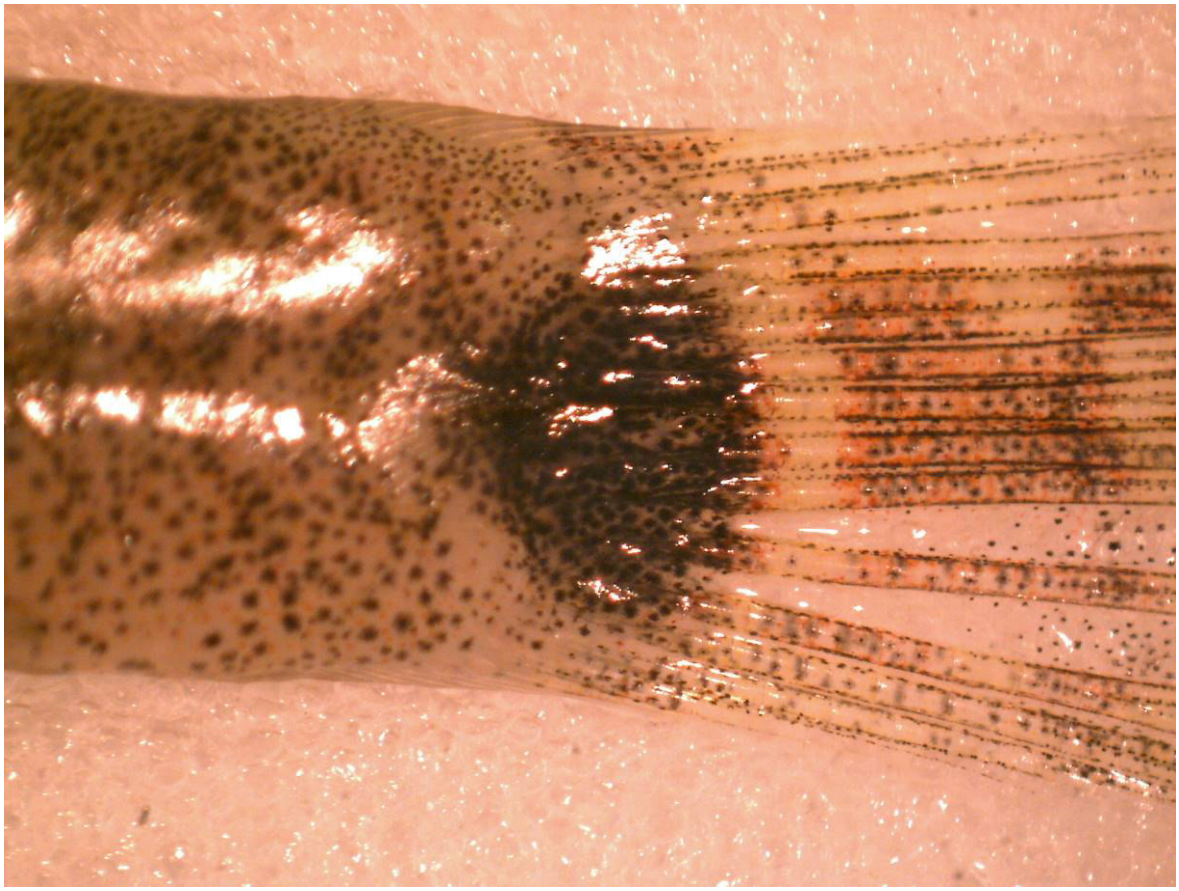

Figure 8: A image of a 2 spot goby tail spot - note the round shape and the lighter border around the spot.

Figure 9: a live two spot goby.

A summary of the key differences between the species is given below:

3.1 Eyes

P. microps

- Eyes close together and set on top of the head (Henderson, 2015)

G. flavescens

- Eyes large, separated, set on side of head (Henderson, 2015).

Figure 10: Eye positions of *P. microps* (top) and *G. flavescens* (bottom).

3.2 Markings

P. microps

- T-shaped blackish spot at base of tail (Henderson, 2015),
- No second black spot adjacent to pectoral fin, but series of vertical bars and spotting along sides (Henderson, 2015),
- Dark patch on base of pectoral fin (Wheeler, 1969).

G. flavescens

- Round black spot at base of tail, surrounded by yellow (Henderson, 2015),
- 2nd black spot adjacent to pectoral fin (in males only) (Henderson, 2015),
- No dark patch on base of pectoral fin.

4 Common goby (*Pomatoschistus microps*) and painted goby (*P. pictus*)

Details taken from Henderson, 2015.

P. microps

- More likely to occur in lowered-salinity environment,
- Black/blueish spot low down between rays 5 and 6 of first dorsal fin (see Figure 14 below),
- (Males in breeding condition) lower gill covers and throat orange-red and blackish; pelvic and anal fins distinctly black,
- (Males) >4 dusky black bars along the sides

P. pictus

- At least 1 row, often 2, of dark spots low down on 1st and 2nd dorsal fins,
- Occasionally yellow patches around the body, and generally more colourful in the body than *P. microps*,
- 4 pairs of dark spots along the lateral midline.

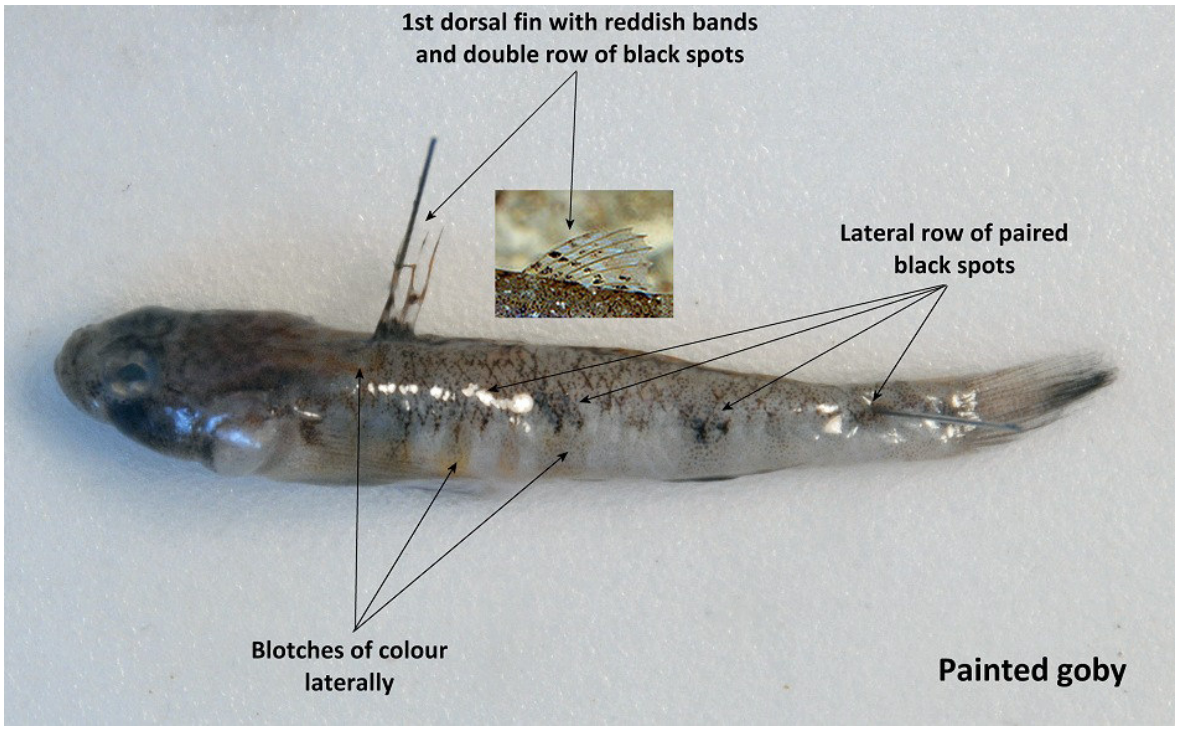

Figure 11: Features of *Pomatoschistus pictus*.

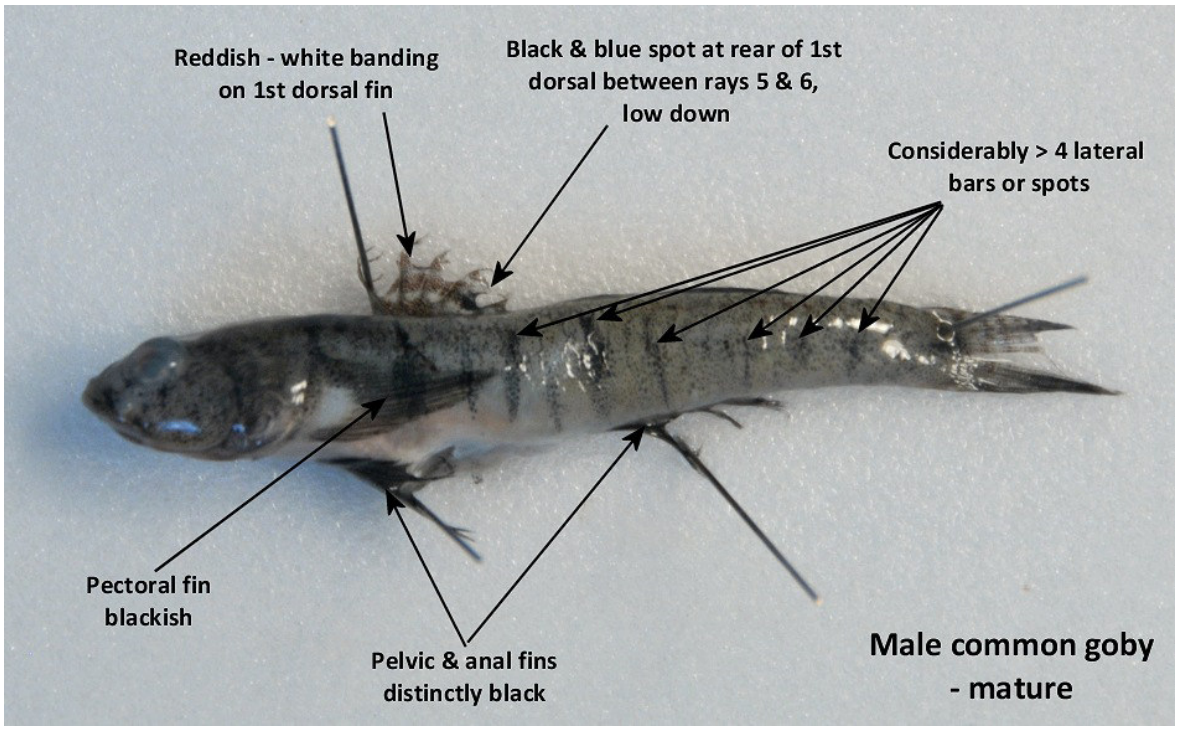

Figure 12: *P. microps*.

5 Sand goby complex (*Pomatoschistus minutus / lozanoi / norvegicus*) and common goby (*P. microps*)

Details taken from Henderson, 2015.

P. minutus (Complex)

- More likely in fully saline conditions,
- (Males) Black/bluish spot high up between rays 5 and 6 of first dorsal fin,
- (Under microscope) Villi present on anterior edge of pelvic fin membrane,
- Maximum of 4 dusky black bars along the sides,
- *P. lozanoi* restricted to Atlantic coast of Britain,
- *P. norvegicus* absent from southern North Sea.

P. microps

- More likely to occur in lowered-salinity environment; moves in to shallow intertidal zone during breeding season in spring and early summer,
- Anterior body shape generally more rounded than *P. minutus*,
- (Males) Black/blueish spot low down between rays 5 and 6 of first dorsal fin,
- (Under microscope) Villi absent from anterior edge of pelvic fin membrane,
- (Males in breeding condition) lower gill covers and throat orange-red and blackish; pelvic and anal fins distinctly black,
- (Males) >4 dusky black bars along the sides.

Figure 13: The blue spot high up on the 1st dorsal fin of *P. minutus*.

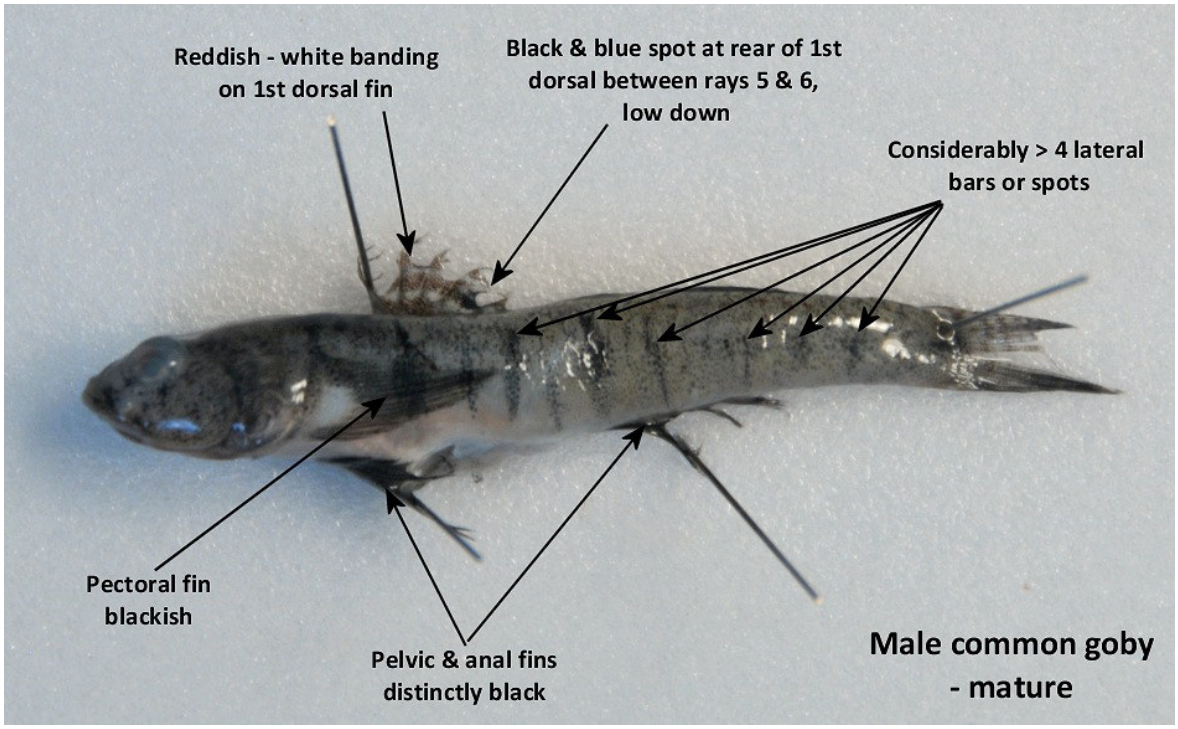

Figure 14: Features of mature male *P. microps*, including the spot low down on the 1st dorsal fin.

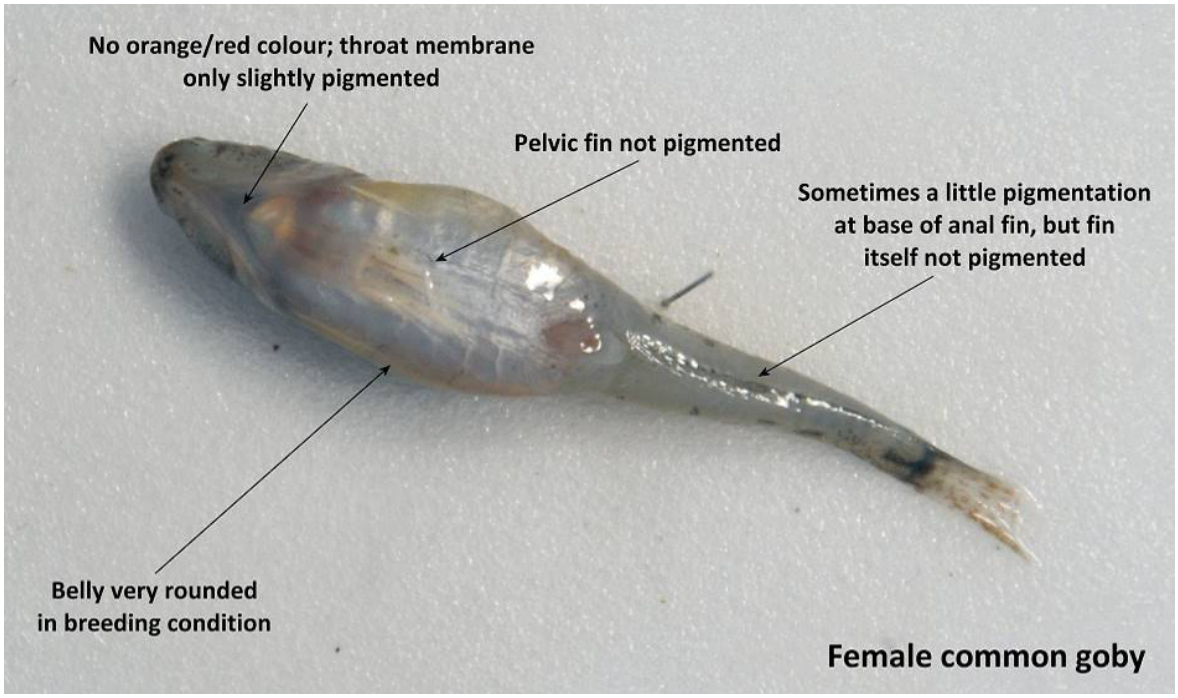

Figure 15: Features of female common goby (*P. microps*).

Figure 16: Villi on the pelvic fin membrane of *P. minutus*.

6 Five-bearded rockling (*Ciliata mustela*) and northern rockling (*C. septentrionalis*)

Details taken from Henderson, 2015.

C. mustela

- Maximum adult size 25 cm,
- Colouration chestnut or sepia brown, golden on the sides,
- Upper lip has no papillae.

C. septentrionalis

- Maximum adult size 18 cm,
- Colouration coppery pink,
- Upper lip fringed with papillae (hand lens may be needed to see this).

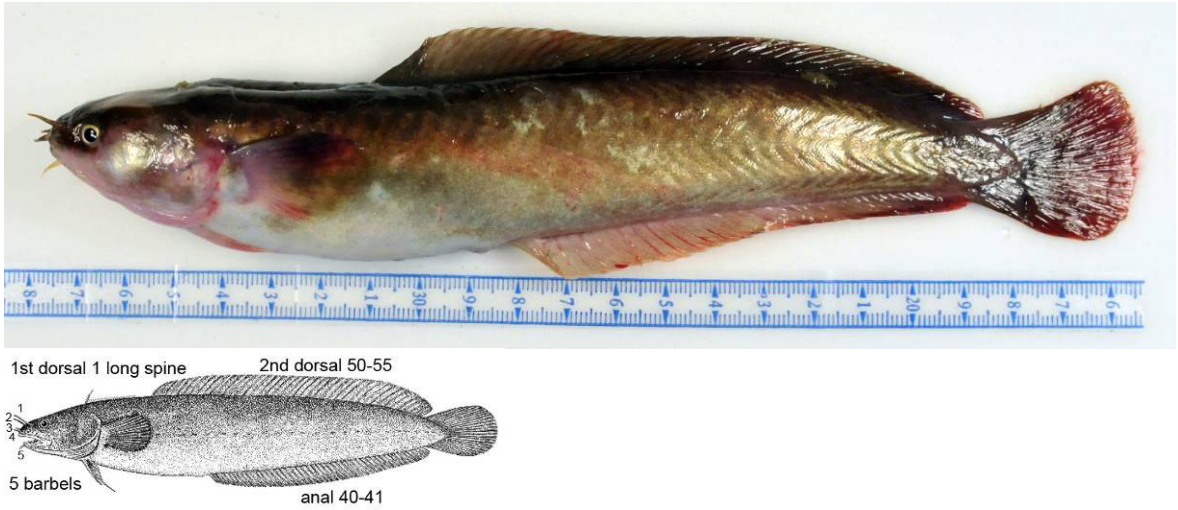

Figure 17: 5-bearded rockling, *Ciliata mustela*.

Figure 18: Northern rockling, *C. septentrionalis*.

7 Nilsson's pipefish (*Syngnathus rostellatus*) and greater pipefish (*S. acus*)

Details taken from Henderson, 2015.

S. rostellatus

- Adult maximum size approx. 17 cm; anything much above this will be *S. acus*,
- Snout short; less than half total head length,
- The head is slightly humped behind the eye, but not markedly so,
- 13 – 17 rings on body between pectoral fin base and vent.

S. acus

- Adult maximum size 45 cm,
- Snout long, more than half total head length,
- Distinct raised hump behind eye,
- 17 - 21 rings on body between pectoral fin base and vent.

Figure 19: Nilsson's pipefish, *Syngnathus rostellatus*.

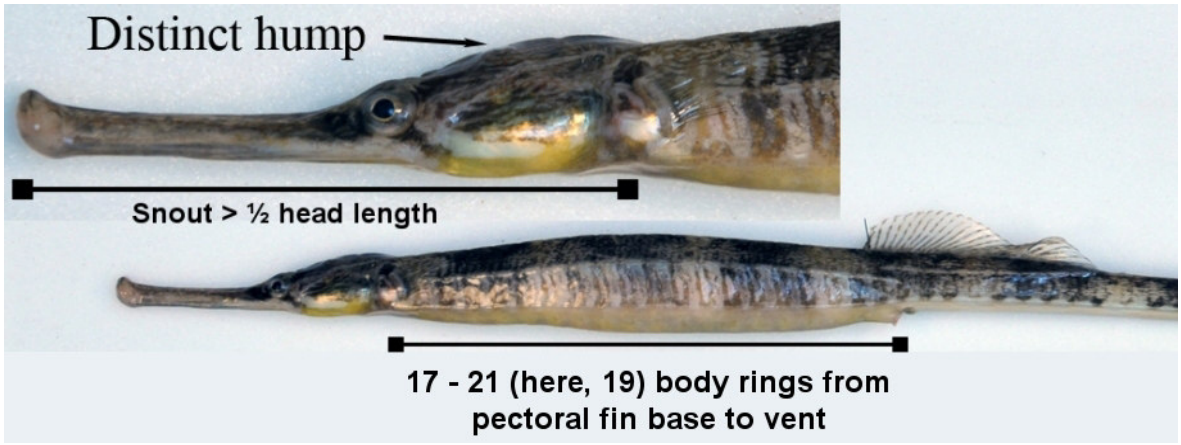

Figure 20: Greater pipefish, *S. acus*.

8 References

Collette, B. B. and Nauen, C. E. (1983). *FAO Species Catalogue, Vol. 2, Scombrids of the world - An Annotated and Illustrated Catalogue of Tunas, Mackerels, Bonitos and Related Species Known to Date.* FAO Fisheries Synopsis No. 125, Volume 2 FIR/S125.

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S. scombrus: http://www.fishbase.org/summary/118

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Wheeler, A. (1969). *The Fishes of the British Isles and North West Europe*. Macmillan.