Table of proportionate measurements.

Species	Parophrys ischyrus.				Hippoglossoides elassodon.			
Locality	Seattle.		Seattle.		Seattle.		Tacoma.	
	Inches and 100ths.	100ths of length.	Inches and 100ths.	100ths of length.	Inches and 100ths.	100ths of length.	Inches and 100ths.	100ths of length.
Extreme length	17.05		14.20		9.75		12.90	
Length to end of middle caudal rays	14.30		11.50		7.80		10.50	
Body:								
Greatest height		$43\frac{1}{2}$		$45\frac{1}{2}$		41		46
Least height of tail		$9\frac{1}{2}$		$9\frac{1}{2}$		$9\frac{1}{2}$		11
Length of caudal peduncle		$10\frac{1}{2}$		$9\frac{1}{2}$		$10\frac{1}{2}$		9
Head:								
Greatest length		$26\frac{1}{2}$		31		30		29
Width of interorbital area		$1\frac{1}{2}$		$1\frac{3}{4}$		1		1
Length of longest gill-raker						$3\frac{1}{2}$		3
Length of maxillary (from tip of snout)						13		12
Length of maxillary (from tip of snout, blind side)								14
Length of mandible						$16\frac{1}{2}$		15
Distance from snout to orbit		$4\frac{1}{2}$		6		5		$6\frac{1}{4}$
Diameter of orbit		5		$5\frac{1}{2}$		8		7
Dorsal:								
Distance from snout						8		$6\frac{1}{2}$
Height at longest ray		13		$14\frac{1}{2}$		14		14
Anal:								
Distance from snout						40		$36\frac{1}{4}$
Height at longest ray		$13\frac{1}{2}$		$14\frac{1}{2}$		15		$13\frac{1}{2}$
Caudal:								
Length of middle rays		19		$22\frac{1}{2}$		$23\frac{1}{2}$		22
Length of external rays						22		19
Pectoral, length		15		16		17		14
Ventral, length		7		9		11		11
Dorsal rays	76		70			77		84
Anal rays	57		52			59		61
Ventral rays	6		6			6		6
Number of tubes in lateral line	88		88			926		90
Number of transverse rows						120		110
Number of cæcal appendages						4		

ASTORIA, OREG., *June* 16, 1880.

ON THE GENITALIA OF MALE EELS AND THEIR SEXUAL CHARACTERS.*

By S. TH. CATTIE, Arnheim, Holland.

As is well known, Darwin† has called attention to the experience of Günther that the females of fishes are in almost all cases larger than the males. This was perhaps the reason that Syrski, in 1874,‡ in investigating the reproductive organs of eels, directed his attention more especially to the smaller individuals, where he was fortunate in finding what is called by many the organs of Syrski, and also considered to be the male genital apparatus. Afterwards, in a variety which is known

* Ueber die Genitalien der männlichen Aale und ihre Sexualunterschiede, von S. Th. Cattie, Phil. nat. Cand., Docent an der Realschule zu Arnheim (Holland). Extracted from the Zoologischer Anzeiger, 7th June, 1880, pp. 275–279. Translated by J. A. Ryder.

† Ch. Darwin, Descent of Man, translated into German by Carus, part ii, p. 5 et seq.

‡ Abhandl. d. kais. Akad. d. Wissensch., Wien, April Heft, 1874.

in France under the name of *Anguille pimperneau*, Dareste* found the same organ. It appears that only in one case (*Anguilla bostoniensis*) have living spermatozoa been found in a male eel, as we learn from a communication to the Zoologischer Anzeiger, vol. ii, No. 18, p. 15, by A. S. Packard. The male in this case was about 430^{mm} long (17 inches). That the finding of such specimens is so very rare should not astonish us, since the young eels migrate to the deep sea, where the reproductive organs complete their development very rapidly (6 to 8 weeks), when spawning takes place; the old eels, the females as well as the males, dying after the reproductive act is consummated. Though on this account the spermatozoa, and in most cases their testicular mother cells, are wanting, the investigation of the histological structure of the organ of Syrski may still bring us somewhat nearer to the truth.

If one examines partially grown eels measuring 200–500^{mm} in length one will find a moderate broad band in the abdominal cavity of some of them, attached at its inner margin by a narrow duplicature of the peritoneum to the air-bladder, the other margin, however, hanging free in the cavity of the abdomen. This band extends from the liver to behind the anal opening, and is covered by thousands of fat cells. A lobular organ, consisting also of fat cells, overlies the hinder portion of the alimentary canal and ovarium. I found the eggs to average 0.75^{mm} in diameter from specimens 20–50^{cm} in length. Treated with acetic acid and ammoniacal carmine solution, a large nucleus and nucleolus became visible. In other examples, although the fat lobules were present, the broad band was absent. But in exactly the same position and along the dorsal aspect of the abdominal cavity a quite thin band or strip of tissue of glass-like transparency is attached, and likewise by a fold of connective tissue (peritoneum), to the air-bladder, and extends from the liver to behind the anal opening. This band or strip of tissue is crenated along its free margin, the lobes of which measure 0.75^{mm} in length and 0.5^{mm} in depth, their convex portion depending into the abdominal cavity. In this Syrskian or lobed organ one finds, along the margin where it is attached, a fine canal, the efferent seminal duct, which, upon being tinged with carmine, becomes quite distinct, and which may also be demonstrated by means of injections. The histological structure of the foregoing lobulated organ was investigated by Freud.† He found an areolar structure with connective tissue corpuscles, similar to the histological structure of the immature testes of fishes. My preparations had a similar appearance as long as the smaller examples were the subjects of investigation. In the largest specimens of eels with lobulated organs investigated by me (445^{mm} long) I found cylindriform strings, which passed from the bases to the tips of the lobes, and were filled with cells. After repeated trials with the most different reagents, I did not succeed in clearly distinguishing a nucleus in these cells. My observations

* Compt. Rendus, 1875. t. lxxxi p. 159.

† Sitzungsber. d. kais. Akad. d. Wissensch., Wien, 1877, März Heft,

were made with a Zeiss immersion, objective K, oculars 2 and 3. According to Jacoby,* Von Seibold saw similar strings of cells in an eel, in which the lobes were very strongly developed. These strings of cells presented to the eye the most undoubted similarity to the testicular mother cells of spermatozoa. I also believe that the strings of cells observed by me must be regarded as such. In no case did I observe any spermatozoa.

Previous to my investigations into the histology of the testicular lobes of the eel, I occupied myself with the question whether there were not some other external characters distinguishing the sexes besides the already mentioned difference in size and length. Jacoby remarks as follows upon this point:

"1. A distinctly broader snout in the female as compared with the slender, either elongated or short, and pointed snout of specimens with the lobulated organs.

"2. A lighter coloration of the female, usually quite green on the back and yellowish or yellow on the belly, whilst the other sex is much darker green in color, often an intense black on the back, with always a more marked metallic luster on the sides, and usually whitish on the belly.

"3. A further and important external character is an appreciable difference in the height of the dorsal fin (a point confirmed by me). All the females have a distinctly higher and wider dorsal than males of the same size.

"4. And, finally, we may note, although not a constantly appreciable character, the greater diameter of the eye of the male. Eels with strikingly small eyes seem almost always to be females. Eels which have a Syrskian organ usually have relatively large eyes, though large-eyed females are equally common."

Jacoby then gives some measurements, the averages of a great number of eels measured by him, from which the actual value of his characters becomes apparent. I believe, nevertheless, that he attaches too much importance to some of his characters, and some others, not less important, he has not noticed at all.

Out of a great number of eels measured by me I select the following, in which the measurements given in the parallel rows are taken from pairs the lengths of which are, as nearly as possible, the same:

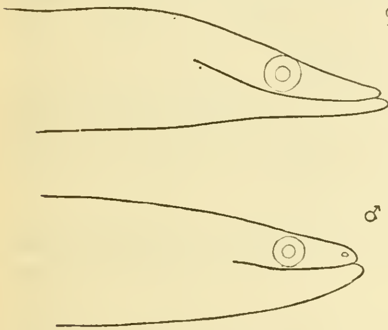
---

* Dr. L. Jacoby, Der Fischfang in der Lagune von Commachio.

	Length of the body.	Width of the snout between the nasal tubes.	Width of the snout between the centers of the eyes.	Length of the mouth from the middle of the eye to the tip of the snout.	Diameter of the eyes.	Length of the head to the gill-opening, measured along the lower jaw.	Height of the dorsal fin.
	mm.	*mm.*	*mm.*	*mm.*	*mm.*	*mm.*	*mm.*
I ♂	270	— 4	8	8	4	35	6
I ♀	305	4.5	8.5	9	3.5	35	— 7
II ♂	325	— 4	8	9	4.5	37	7
II ♀	324	— 5	9	10	5	39	8
III ♂	327.5	— 4	9	9	4	40	6.5
III ♀	327.5	5	10	—10	5	40	7.5
IV ♂	345	— 4	8	10	5	41	6
IV ♀	344	4.5	9	+10	4	43	7
V ♂	355	4	+ 9	9	5	41	— 7
V ♀	352	5	10	10	+ 5	42	7.5
VI ♂	359	— 4.5	+ 9	— 9.5	5	+ 41	— 7
VI ♀	358	5	10	10	5	42	+ 8
VII ♂	378	4.5	9.5	10	5	43	7
VII ♀	375	6	11	12	5	45	+ 8
VIII ♂	389	4.5	9.5	10	5	44	7
VIII ♀	380	— 5.5	10	11.5	4.5	47.5	+ 8

— 4 indicates somewhat less than 4; + 4 somewhat more than 4.

From this table the conclusion is reached that all the females have the dorsal fin higher than those specimens of the same length presumed to be males, and that with age this difference becomes still more marked.



♀

♂

The larged-eyed character of eels with the lobulated organs has appeared to me to be too uncertain a feature, so much so that, according to the foregoing table of measurements, the same feature might be assumed as characteristic of the females. On the other hand, I attach great importance to the broader snout of the female in contrast to the slender and pointed snout of the male. But the snout of the female is not only broader, but also more depressed, and has the eyes more prominent, a feature to which I would call special attention, and one which I do not find in the male. In contrast, the snout of the male eel is more convex, as will be seen by comparing the accompanying outline sketches.

If one will only notice the width or slenderness of the dorsal, and more especially the broad, depressed snout of the female, with the prominent eyes, as compared with the slender, convex snout of the male, it will require little trouble to pick out the specimens from these data conjectured to be males.

On an average amongst twenty eels, measuring 300–500^{mm} in length, furnished me by different fishermen, I found 5 eels with lobulated organs or 25 per cent. If, however, I paid attention to the two most important characters, namely, the relative proportions of the dorsal and snout, by their help picking out those specimens which appeared to be males, I actually found 80 to 90 per cent. of the individuals so selected to be males with the Syrskian organ.

I found it impossible to discover distinctive sexual differences of coloration; all the males and females investigated by me were of a white color ventrally, green above, with a metalic luster on the sides.

DESCRIPTION OF A NEW SPAROID FISH (SPARUS BRACHYSOMUS), FROM LOWER CALIFORNIA.

By W. N. LOCKINGTON.

Sparus brachysomus n. sp.

D. $\frac{12}{12}$; A. $\frac{3}{11}$; P. 15; V. $\frac{1}{5}$; C. 3–9–8–3; L. lat. cir. 50.

Body compressed, high; snout and forehead rising in nearly a straight line, at an angle of about fifty degrees with the axis of the body, to the occiput. From this point the dorsal outline arches upwards to the third dorsal spine, then downwards in a continuous arch to the end of the dorsal fin. Abdominal outline much less curved than the dorsal, the anal portion more curved than the anterior portion, lower jaw curved, outline between lower jaw and ventrals nearly straight.

Greatest depth $2\frac{2}{3}$; length of head about $3\frac{1}{11}$; dorsal base about $2\frac{3}{10}$; pectoral about $3\frac{2}{3}$ times in the greatest length; snout (along axis of body) $\frac{8}{7}$; orbit $4\frac{1}{2}$; interocular width $3\frac{33}{46}$ in the length of the head; least depth of caudal peduncle $5\frac{1}{4}$ times in the greatest depth.

Posterior extremity of maxillary falling somewhat short of the anterior margin of the orbit, its upper margin concealed beneath the preorbital throughout; no prominent knob at upper extremity. Lower jaw shorter than the upper.

Nostrils simple; the posterior a large elongated slit close in front of the orbit and on a level with the lower half of the eye; the anterior a small circular foramen situated at a lower level than the posterior and about one-fourth of the diameter of the eye in advance of it.

Interocular space considerably convex transversely, but only slightly so longitudinally.

Posterior margin of preoperculum straight and vertical, lower line convex, the angle of junction strongly rounded. Operculum ending in a flat point; suboperculum membranous at tip.

Numerous conical teeth in front of the jaws, the anterior row considerably larger than those behind. Three rows of molars in the upper jaw, two in the lower. In the specimens examined there are 9 large incisors in the mandible, forming a bold arc, the interior of which contains about five irregular rows of crowded cardiform teeth, reaching back to the anterior small molars. Upper jaw similar, with 7–10 large incisor teeth.