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# **The Freshwater Fishes of Europe**

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Clupeidae  
Anguillidae

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## List of symbols and abbreviations

<i>als</i>	alisphenoïd
<i>A</i>	anal fin
<i>A—C</i>	distance between base of anal fin and base of caudal fin
<i>Ab</i>	branched [soft] rays of anal fin
<i>Au</i>	unbranched rays [spinous rays, spines] of anal fin
<i>boc</i>	basioccipital
<i>bs</i>	basisphenoïd
<i>BR</i>	branchiostegal rays
<i>C</i>	caudal fin
<i>C<sub>1</sub>, C<sub>2</sub>, C<sub>3</sub></i>	upper lobe, median part and lower lobe of caudal fin, respectively
<i>Cb</i>	branched rays of caudal fin
<i>CI</i>	cephalization index
<i>Cu</i>	unbranched rays of caudal fin
<i>D (D<sub>1</sub>, D<sub>2</sub>)</i>	dorsal fin [first D, second D];
<i>D ad</i>	distance between end of D base and beginning of adipose fin base
<i>Db</i>	branched rays of dorsal fin
<i>DI</i>	predorsal distance index
<i>D.ph.</i>	pharyngeal teeth
<i>Du</i>	unbranched rays [spinous rays, spines] of dorsal fin
<i>epo</i>	epiotic
<i>ex</i>	exoccipital
<i>eth.l.</i>	lateral ethmoid
<i>f</i>	frontal
<i>Fl</i>	fork length [Smitt's length];
<i>Fu</i>	fulcræ
<i>h</i>	minimum body depth [least depth of caudal peduncle];
<i>hA</i>	depth of anal fin
<i>hD (hD<sub>1</sub>, hD<sub>2</sub>)</i>	depth of dorsal fin [depth of D <sub>1</sub> , depth of D <sub>2</sub> ];
<i>hDf</i>	depth of posterior part of dorsal fin
<i>hc</i>	head depth [at nape];
<i>hco</i>	head depth [at centre of eye];
<i>hmx</i>	depth of upper jaw
<i>hpc</i>	depth of caudal peduncle [maximum depth of caudal peduncle];
<i>H</i>	body depth [maximum body depth];
<i>io</i>	interorbital distance [skull width];
<i>juv</i>	juvenil
<i>K</i>	Fulton's coefficient of condition
<i>lab</i>	width of snout at base of barbels

## *Alosa caspia vistonica* Economidis and Sinis, 1986

E = Thracian shad, F = Alose de Thrace, G = —, R = —, Gr = Thrítsa

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### Synonyms

*Alosa (Caspialosa) macedonica* Economidis, 1973 (partim):552 (Collection: Vistonis): Economidis, 1974 (partim):12 (Characters, distribution: Vistonis), Economidis & Sinis, 1982 (partim):295 (in lit.)

*Alosa caspia vistonica* Economidis & Sinis, 1986 (description as new subspecies, comparisons with other forms, distribution: Vistonis).

### Holotype

The description of this subspecies by Economidis & Sinis (1986) is based on the holotype (ZMUT\* No.D-351) and 45 paratypes (39 of ZMUT Nos. Z-30, D-20, E-15, C-346, VA-75 and VA-76; 3 of BMNH\* No 1987.3.30.1-3; 3 of MNHN\* No. 1987-708). Additional specimens were also examined. The measurements and the meristic characters of these specimens are shown in Table 23.

### Etymology

The name *vistonica* is derived from the name of the Vistonis Lake in Western Thrace, Greece, where this form originates.

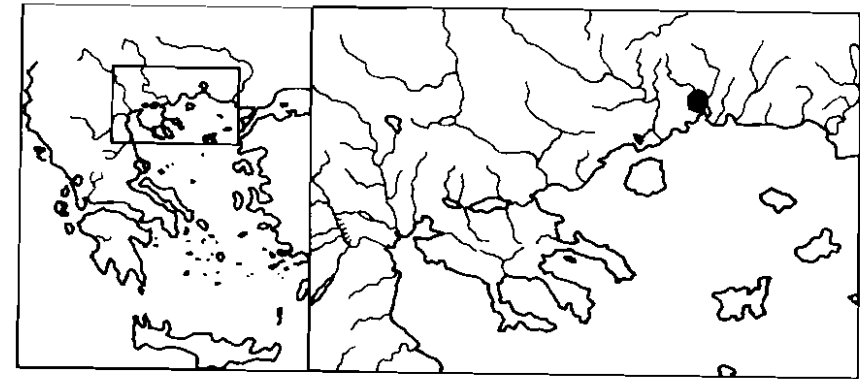
### Description

D:III-IV 13-16, A:II-IV 15-20, P:14-16, V:I 8, C:19, Squ. 47-50, Sp.br. 78-97, Vert. 47-50, keeled scales 29-34, pyloric caeca 36-58, teeth in palatine and vomer present. The maximum length observed was 253 mm.

\* ZMUT: Zoological Museum of the University of Thessaloniki.  
 BMNH: British Museum of Natural History.  
 MNHN: Museum National d' Histoire Naturelle, Paris.

Table 23: Morphometric and meristic features of *Alosa caspia vistonica* from Lake Vistonis. Abbreviations see p. 10.

	<i>n</i>	$\bar{x}$	$S\bar{x}$	<i>s</i>	<i>V</i>	Ranges	Holotypes No. D-351	Paratypes No. Z-30
<i>TL</i> (mm)	41	172.52	4.10	26.25	15.22	120.8 - 253.5	220.3	170.2
<i>FL</i> (mm)	41	154.52	3.69	23.66	15.31	106.9 - 226.8	200.4	153.8
In % of <i>FL</i>								
<i>lc</i> (length of head)	40	23.79	0.12	0.75	3.14	22.79 - 26.29	23.00	23.02
<i>pD</i> (predorsal)	39	44.58	0.11	0.68	1.53	43.01 - 46.01	44.86	44.03
<i>pV</i> (preventral)	41	46.60	0.14	0.89	1.91	44.48 - 48.27	47.21	46.52
<i>pA</i> (pre-anal)	41	67.74	0.14	0.88	1.31	65.18 - 69.12	68.01	68.26
<i>H</i> (body depth max.)	40	27.13	0.20	1.31	4.82	24.59 - 30.50	27.99	26.83
<i>h</i> (body depth min.)	38	8.81	0.06	0.36	4.13	8.19 - 9.75	8.28	8.54
<i>p - V</i>	41	24.22	0.16	1.04	4.29	21.80 - 26.07	25.70	24.65
<i>lD</i> (length of D)	41	13.75	0.10	0.62	4.50	12.25 - 15.08	14.87	13.33
<i>lA</i> (length of A)	40	16.30	0.10	0.65	3.99	15.28 - 17.95	16.52	15.99
<i>lP</i> (length of P)	41	15.90	0.10	0.63	3.97	14.45 - 17.26	15.22	15.45
<i>lV</i> (length of V)	41	9.72	0.07	0.47	4.79	8.72 - 10.61	9.73	9.99
In % of <i>lc</i>								
<i>prO</i> (preorbital)	40	28.82	0.14	0.91	3.16	26.84 - 31.04	29.72	28.16
<i>Oh</i> (diameter of eye)	39	24.01	0.13	0.85	3.55	22.09 - 25.75	22.99	23.68
<i>poO</i> (postorbital)	40	52.77	0.22	1.41	2.66	49.47 - 55.12	52.49	49.74
<i>lc</i> (head depth)	39	75.59	0.59	3.77	4.98	69.85 - 86.45	74.62	73.68
<i>iO</i> (interorbital)	40	18.70	0.15	0.94	5.03	16.25 - 20.36	19.52	18.68
Meristic characters								
<i>Db</i> (branched D)	41	14.02	0.11	0.68	4.85	13 - 16	15	15
<i>Ab</i> (branched A)	39	18.18	0.19	1.17	6.46	15 - 20	19	19
<i>Squ</i>	27	48.07	0.17	0.87	1.82	47 - 50	48	48
<i>Sp. br.</i>	45	87.44	0.68	4.55	5.20	78 - 97	97	85
<i>Vert</i>	35	48.89	0.12	0.71	1.45	47 - 50	—	—
<i>SA</i> (abdom scutes)	41	32.02	0.15	0.95	2.97	29 - 34	32	31
<i>PC</i> (pyloric caeca)	20	42.25	1.37	5.99	14.18	36 - 58	—	—
Stots on body side	87	3.63	0.30	2.75	75.84	1 - 9	5	8

Fig. 53: Geographical distribution of *Alosa caspia vistonica*.

The body is shad-like, or "aloid" (Fig. 52). Its height varies from 24.59 to 30.50 % of *FL* (Table 23). Head flattened, its height is 15.92 to 22.73 % of *FL*. Dorsal fin margin more or less straight, its length is 12.25 to 15.08 % of *FL*. The anal fin margin is concave, and its length is 15.28 to 17.95 % of *FL*. The pectoral fin is 14.45 to 17.26 % of *FL*. The pelvic fin is inserted nearly directly below the first branched ray of the dorsal fin; its length is 8.72 to 10.61 % of *FL*. The coloration is typical of a shad: silvery on the sides and belly, and bluish-green on the dorsum. The line which separates these two colours runs from the upper angle of the operculum to the base of the upper lobe of the caudal fin. Ordinarily, there is a small black spot of the body, laterally just behind the operculum, which very often is followed by a row of 2 to 8 similar spots.

### Distribution

This is a subspecies endemic to the Vistonis Lake in Greek Thrace (Fig. 53). This lake is a normal one with fresh water in its inland part. But in its lower part, it is a true lagoon with brackish water. The fish prefers fresh water to the brackish habitat. In the seaward part of the lagoon near the outlet, there are frequently many *Alosa fallax nilotica* that entered from the sea. However, no common schools of these two subspecies have been observed in this water body. If the Thracian shad had migratory habits, it might also be encountered in the nearby Nestos and Evros (Mariza) Rivers, but this has not been observed.

This subspecies originated from ancestors that came from the Ponto-Caspian Basin and became adapted to the Vistonis Lake system during a period of the Quaternary characterized by low salinity. The Thracian shad was isolated then in the lacustrine part of Vistonis, being incapable of passing through the barrier

of high salinity of the North Aegean Sea for migratory purposes. It is well known that Ponto-Caspian species are adapted to migrate in waters of low salinity (less than 19‰). This is the first subspecies of *Alosa caspia* found in the drainage area of the Mediterranean Sea. The relationship between the ichthyofauna of the fresh and brackish water in the northern Aegean Sea and that of the Ponto-Caspian Basin is also demonstrated by the presence of other species, including *Proterorhinus marmoratus*, *Knipowitschia caucasica*, *Stizostedion lucioperca*, *Leuciscus borysthenicus*, and *Chalcalburnus chalcoides*.

### Ecology

The ecology and biology of the Thracian shad are not yet well known.

Recent attempts (autumn 1989) to investigate the biology and ecology of the species showed that it has become very rare. The decrease in the population should be attributed in various factors such as the increase of salinity in the lake, the pollution and the changes in its habitat.

As far as the increase of the salinity is concerned, it is known that since 1986, some public works for the extension of the canal connecting the lagoon and the lake, resulted in the transportation of sea water into the area of the lake.

On the other hand, it is well known that the lake is the main receiver of sewage and industrial effluents from the surrounding and from the town of Xanthi (located at a distance of about 15 km).

Finally, another important factor which influenced the population of this species seems to be the changes in the habitat, especially in the places of spawning. These changes are mainly due to agricultural development.

Probably, the combined influence of the above mentioned and perhaps other factors has affected the population density of the species.

It is obvious that this taxon should be characterized as endangered and included in the List of Threatened Fishes of Europe.

### Economic importance

The population in Vistonis Lake does not seem to be very important according to the fishing records.

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List of symbols and abbreviations

<i>lac</i>	head width
<i>laco</i>	body width
<i>lad</i>	length of adipose fin base
<i>lum</i>	width of mouth
<i>lapc</i>	width of caudal peduncle
<i>las</i>	width of snout
<i>lh</i>	length of barbel
<i>lhr</i>	length of gill arch
<i>lc</i>	length of head
<i>liu</i>	length of throat
<i>lmd</i>	lower jaw length
<i>lmx</i>	upper jaw length
<i>lpc</i>	length of caudal peduncle
<i>lA</i>	length of anal fin base
<i>lC</i> ( <i>lC</i> <sub>1</sub> , <i>lC</i> <sub>2</sub> , <i>lC</i> <sub>3</sub> )	length of caudal fin [length of upper lobe, middle part and lower lobe of C, respectively];
<i>lD</i> ( <i>lD</i> <sub>1</sub> , <i>lD</i> <sub>2</sub> )	length of dorsal fin [length of D <sub>1</sub> , length of D <sub>2</sub> ];
<i>lP</i>	length of pectoral fin
<i>lV</i>	length of ventral [pelvic] fin
<i>lVbs</i>	length of ventral fin base
<i>meth</i>	mesethmoid
<i>n</i>	sample number
<i>Oh</i>	horizontal diameter of eye
<i>Ov</i>	vertical diameter of eye
<i>Opo</i>	opisthotic
<i>orb</i>	orbitosphenoid
<i>p</i>	parietal
<i>poD</i>	postdorsal distance
<i>poO</i>	postorbital distance
<i>prO</i>	preorbital distance [snout length]
<i>pro</i>	prootic
<i>ps</i>	parasphenoid
<i>pto</i>	pteroic
<i>pA</i>	preanal distance
<i>pD</i>	predorsal distance
<i>pP</i>	prepectoral distance
<i>pV</i>	preventral distance
<i>P</i>	pectoral fin
<i>Pb</i>	branched [soft] rays of pectoral fin
<i>Pu</i>	unbranched rays [spinous rays, spines] of pectoral fin
<i>PC</i>	pyloric caeca
<i>PreSV</i>	number of prepelvic scutes
<i>PostSV</i>	number of postpelvic scutes
<i>P A</i>	distance between pectoral fin base and anal fin base
<i>P V</i>	distance between pectoral fin base and ventral fin base
<i>s</i>	standard deviation



## List of symbols and abbreviations

<i>s—b</i>	distance between tip of snout and barbels
<i>s—m</i>	distance between tip of snout and mouth
<i>s—mc</i>	distance between tip of snout and cartilaginous arch of mouth
<i>soc</i>	supraoccipital
<i>spho</i>	sphenotic
<i>Sl</i>	standard length
<i>Sp.br.</i>	branchial spines [gill rakers];
<i>Squ.</i>	transverse rows of scales
<i>Squ.sup.</i>	scale rows above lateral line
<i>Squ.inf.</i>	scale rows below lateral line
<i>SA</i>	abdominal scutes
<i>SD</i>	dorsal scutes
<i>SL</i>	lateral scutes
<i>SV</i>	ventral scutes
<i>Tl</i>	total length
<i>v</i>	vomer
<i>V</i>	ventral [pelvic] fin
<i>Vb</i>	branched [soft] rays of ventral fin
<i>Vert.</i>	vertebrae
<i>Vert.s.</i>	
<i>Vu</i>	unbranched rays [spinous rays, spines] of ventral fin
<i>V—A</i>	distance between ventral fin base and anal fin base
<i>w, W</i>	individual weight
<i>wg</i>	weight of gonads
<i>ws</i>	somatic weight
$\bar{x}$	mean value

## Abbreviations of languages of vernacular names

Alb	Albanian
Da	Danish
E	English
Es	Spanish
F	French
Fin	Finnish
G	German
I	Italian
NL	Dutch
No	Norwegian
Po	Polish
R	Russian
Serb	Serbocroatian
Swe	Swedish