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A Catalog of Information, Primarily Illustrative, on Larval Development of *Sebastes*

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NOTICE

A CATALOG OF INFORMATION, PRIMARILY ILLUSTRATIVE, ON LARVAL DEVELOPMENT OF *SEBASTES*

By

Arthur W. Kendall, Jr.

Resource Assessment and Conservation Engineering Division
Northwest and Alaska Fisheries Center
National Marine Fisheries Service
National Oceanic and Atmospheric Administration
2725 Montlake Boulevard East
Seattle, Washington 98112

INTRODUCTION

Pelagic larvae and juveniles of the speciose genus Sebastes are abundant constituents of ichthyoplankton samples from the northeast Pacific Ocean. Members of this genus are also ecologically and economically important members of the adult fish community of the area. In spite of their importance, the specific identity of their larvae cannot generally be determined. This paper presents the currently available information on descriptions of larvae, and intra-generic systematics of Sebastes. This is done to show what is known, and what is not known about the subject and is preparatory to a study of the taxonomy of the larvae.

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Table 1.--Summary of available illustrations of Sebastes larvae from the northeast Pacific Ocean. Numbers in table key to references in literature cited.

Species	Stage: Preextrusion - newborn	Yolk depleted	Flexion	Post flexion	Pelagic juvenile
S. aleutianus	3,18				
S. alutus	2,3,18				
S. atrovirens					
S. auriculatus	2,4	11			
S. babcocki	2,3,18				
S. borealis					
S. brevispinis	2,3				
S. carnatus		9,11			
S. caurinus	2	11			
S. chlorostictus		9,11			
S. chrysomelas					
S. ciliatus	5				
S. constellatus		11			
S. cortezi		11	11	11	11
S. crameri	18			14	14
S. dalli	13	9,11	13	13	13
S. diploproa	2,19				
S. elongatus	19	9,11			
S. emphaeus					
S. ensifer		9,11			
S. entomelas	5			7	7
S. eos		9,11			
S. exsul					
S. flavidus	2			6	6
S. gilli		11			
S. glaucus					
S. goodei		8,11			
S. helvomaculatus	19			14	14
S. hopkinsi		9,11			
S. jordani		8,11	11	11	11
S. lentiginosus					
S. levis		9,11	11	11	11
S. macdonaldi		9,10,11	11	11	11
S. maliger	2,19				
S. melanops				6	6
S. melanostictus					
S. melanostomus		11,12	12	12	12
S. miniatus		11			
S. mystinus	3, 16				
S. nebulosus					
S. nigrocinctus					
S. notius					
S. ovalis		9,11			
S. paucispinis		8,9,11	1,11	1,11	11
S. peduncularis					
S. phillipsi					
S. pinniger	15	11,15		14	14
S. polyspinis					
S. proriger	19				
S. rastrelliger					
S. reedi	18				
S. rosaceus		9,11			
S. rosenblatti		11			
S. ruberrimus	2,5,19				
S. rubrivinctus					
S. rufinanus					
S. rufus		11			
S. saxicola	18	8,11			
S. semicinctus		11			
S. serranoides					
S. serriceps		11			
S. simulator					
S. sinensis					
S. spinorbis					
S. umbrosus		9,11			
S. variegatus	5				
S. varispinis					
S. wilsoni					
S. zacentrus	3,5,19			7	7

Pigment patterns of preextrusion larvae from 24 *Sebastes* species (Numerals are %; + = 100%, − = 0%).

	aleutianus	alutus		auriculatus	babcocki		brevispinis	caurinus	ciliatus	crameri	diploproa		elongatus	entomelas	flavidus	goodei	helvomaculatus	jordani	maliger		paucispinis	piniger	proriger	reedi	ruberrimus		saxicola		variegatus	zacentrus
Source[a]	1	1	2	2	1	2	2	2	1	1	1	2	1	1	2	3	1	3	1	2	3	4	1	1	1	2	1	3	1	1
Character																														
Ventral pigment row																														
present	98	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
stops short of anus	98	+	+	—	+	+	+	—	+	+	+	+	+	+	+	+	+	+	—	—	+	+	+	+	+	+	90	—	+	+
multiple or irregular	21	—	+	+	90	+	—	+	—	—	—	—	—	—	—	?	—	?	76	+	?	+	—	—	—	+	25	?	—	—
stops short of anus by as much as 4 myotomes	89	94	—	—	99+	—	—	—	+	74	98	+	+	+	+	+	82	+	—	—	+	+	94	5	33	—	65	—	+	99
usually < 16 melanophores	95	28	—	—	2	—	—	—	—	45	87	—	80	80	+	—	83	—	—	—	+	+	31	+	+	—	—	—	16	21
Dorsal pigment row																														
present	—	9	—	+	+	+	—	+	40	—	—	—	—	—	—	—	—	+	+	+	—	—	—	—	—	—	+	+	—	—
stops short of anus	—	9	—	+	+	+	—	—	40	—	—	—	—	—	—	—	—	+	69	+	—	—	—	—	—	—	+	+	—	—
multiple or irregular	—	—	—	+	+	+	—	+	—	—	—	—	—	—	—	—	—	?	21	—	—	—	—	—	—	—	—	?	—	—
Head																														
or nape with some pigment	—	1	—	+	—	+	—	+	—	—	—	+	10	—	—	+	—	—	59	+	—	—	13	—	—	—	3	—	—	—
with 2–5 melanophores	—	1	—	—	—	—	—	+	—	—	—	—	—	—	—	—	—	—	21	—	—	—	—	—	—	—	—	—	—	—
with > 5 melanophores	—	—	—	+	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	—	—	—	—	—	—	—	—	—	—	—
lower jaw with some pigment	—	T	—	+	—	—	—	—	—	—	—	—	—	—	—	—	—	—	14	—	—	—	—	—	—	—	—	—	—	—
Hypural region																														
with pigment spot(s)	93	—	—	—	96	+	+	—	90	89	83	+	—	—	+	—	1	—	—	—	—	—	64	27	—	+	—	—	83	71
Mean total length (mm)	4.9	6.3	5.3	5.8	5.4	5.0	4.0	5.5	5.8	5.7	4.4	5.0	4.8	5.0	4.5	5.7	4.1	6.8	5.5	5.0	6.0	—	4.9	5.8	4.3	5.0	5.0	4.3	4.7	4.3
No. of larvae	57	355	4	?	100	4	?	?	10	60	60	4	20	5	?	?	120	?	29	4	?	—	85	63	15	4	40	?	35	70
No. of females	7	52	1	?	9	1	?	?	2	7	6	1	3	1	?	?	17	?	4	1	?	—	12	7	2	1	4	?	7	8

[a]1, This study; 2, DeLacy et al. (1964); 3, Morris (1956); 4, Waldron (1972).

Table 2.--Pigment characters of early larvae of several northeast Pacific species of Sebastes (from Westrheim 1975).

Figure 1.--Scheme of the phylogeny of the subfamily Sebastinae from Barsukov (1981). Translated from the figure caption by Douglas W. Nelson, School of Fisheries, University of Washington*:

The branches of the wheel are indicated [marked; noted] which [species] had, in a given cycle, possibly, a living space [habitat] not only on the Asiatic coast, but also along the Pacific coast of North America, or, vice versa, not only on the latter [coast], but also along the Asiatic coast. The letters beside the branches of the phylogentic tree indicate the depth distribution of the given ancestral species (S -- shallow-water species, M -- intermediate depth, D -- deep water), and they are utilized as the names of the branches. A branch contains in itself all descendants of a given species, for example: branch M -- all ancestral species of the 17 present day [extant] and of these latter, from S. serranoides to S. itinus; branch MS -- the same for its 12 species, from S. serranoides to S. ovalis; branch MSS -- for 5 [species], from S. serranoides to S. entomelas; branch MSSS -- for 2 species, S. serranoides and S. flavidus. The branches originating as a result of complete geographic isolation in addition to the three originating only from partial isolation are indicated by the symbol "+"; for example, the branch MDD^{+} originated due to complete isolation on the Asiatic coast of the ancestor shared with branch MDD and [the ancestor] dispersed to there from the American coast. The legend of the branch is supplied in brackets if the set of branches is represented by extant species [only] partially, and therefore the bathymetric distribution of the branch is highly conjectural. In the text (but not in the figure) the branches of the subgenus Sebastodes are not emphasized, [those] of the subgenus Sebastes are emphasized. On the figure the genera and all other smaller subdivisions are arranged within the larger subdivisions in a clockwise fashion -- from shallow-water in origin to more deep-water. The cycles, during the course of which each ancestral species sympatrically split into not more than 3 descendant species, are designated by Roman numerals; the approximations of these cycles to geologic time are indicated.

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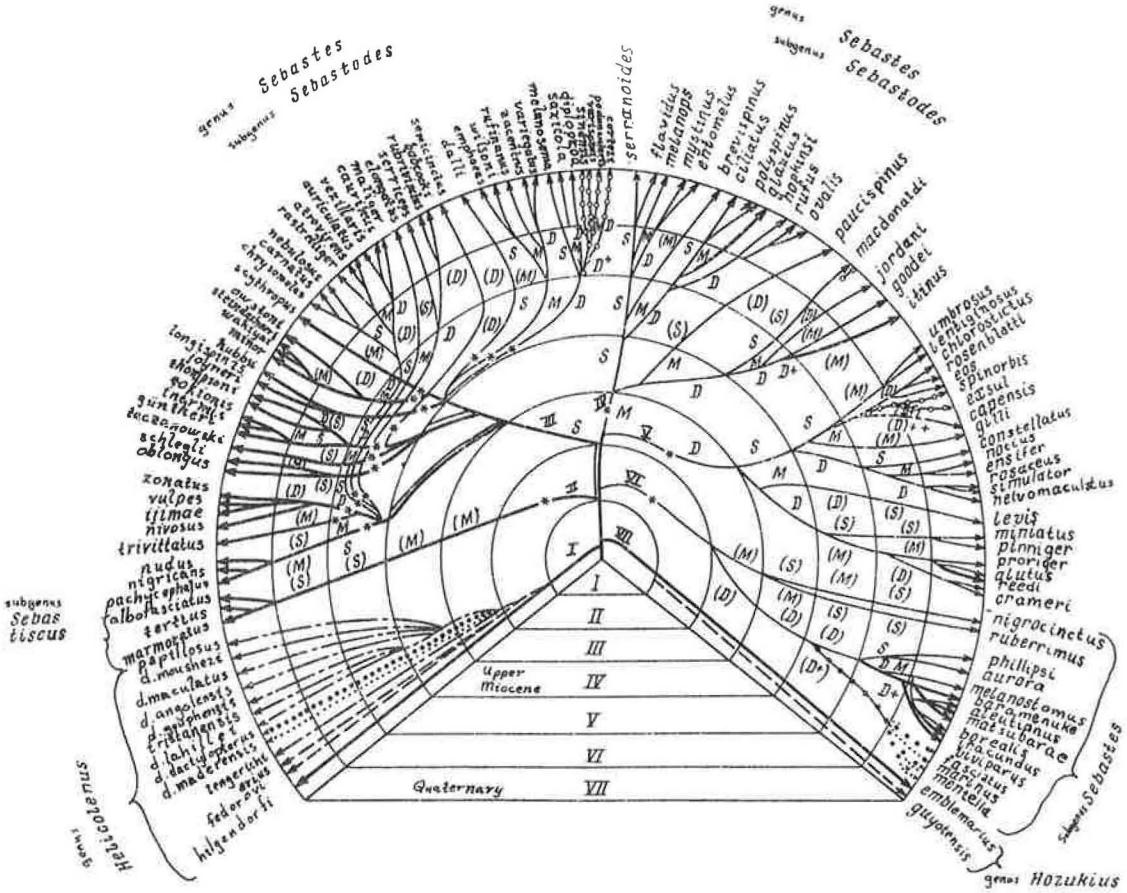
* within brackets [ ] are translator's notes, parenthetical statements ( ) are the author's.



littoral zone of Asia
Pacific littoral zone of North America
guyots of Hawaiian submarine ridge
northern part of the Gulf of California
southern hemisphere
Arctic basin
northeastern part of Atlantic Ocean
northwestern part of Atlantic Ocean

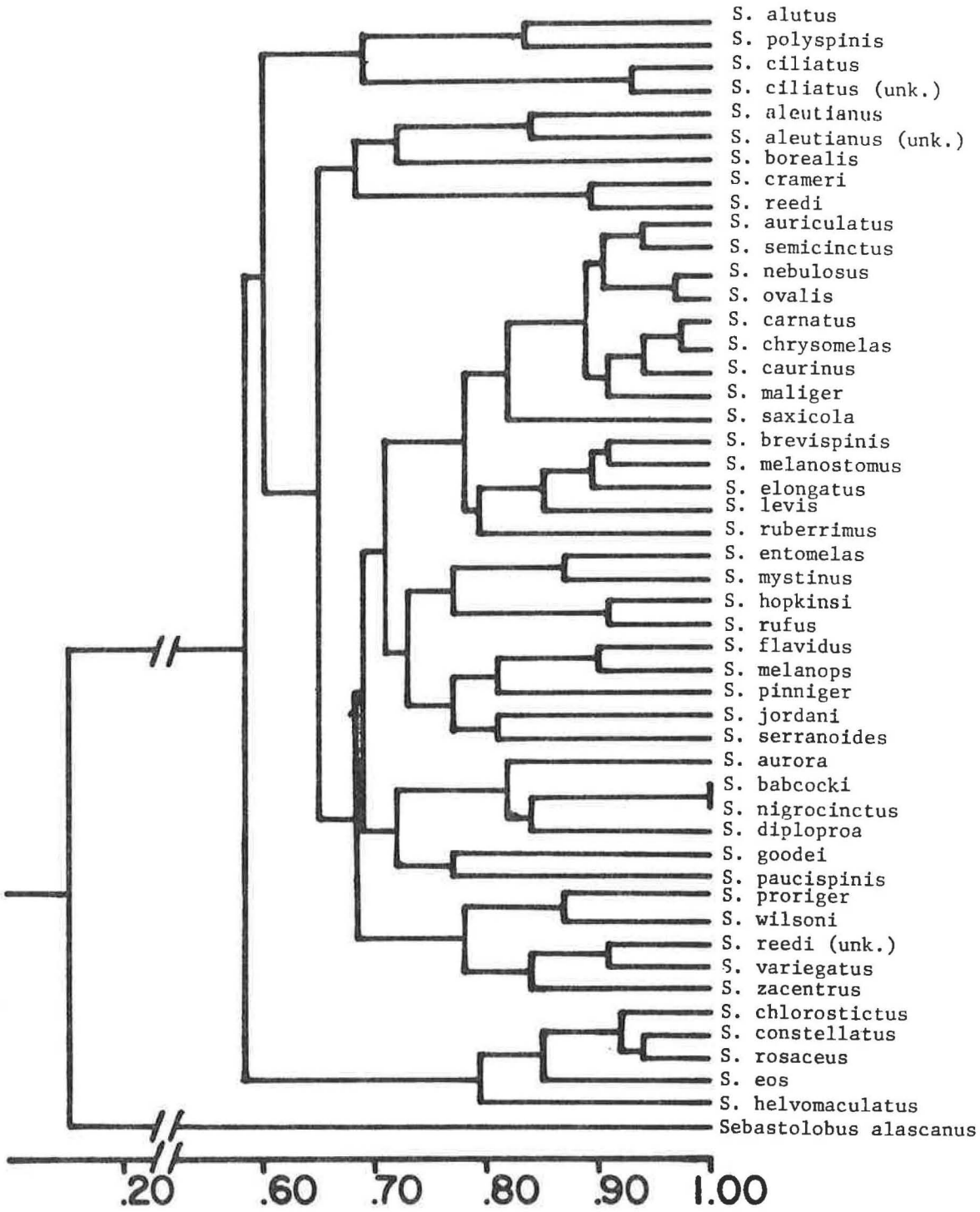


Figure 2.--Relationships among some northeast Pacific members of Sebastes based on electrophoretic analysis by Wishard and Gunderson (MS 1981).

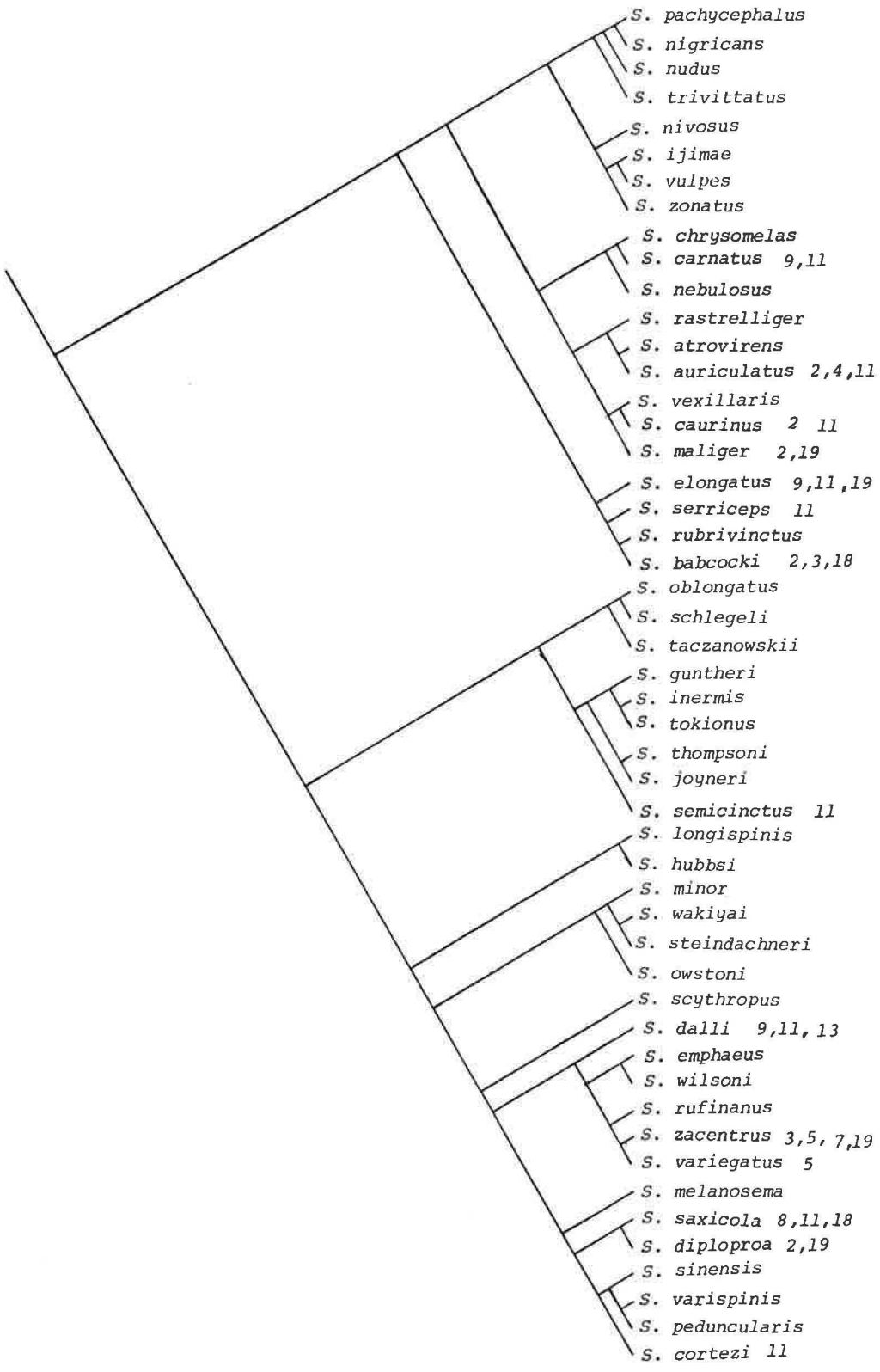


Figure 3.--Branch III (i.e. S) of the figure in Barsukov (1981) redrawn as a dendrogram. Numbers following species' names refer to references containing illustrations of larvae for northeast species.

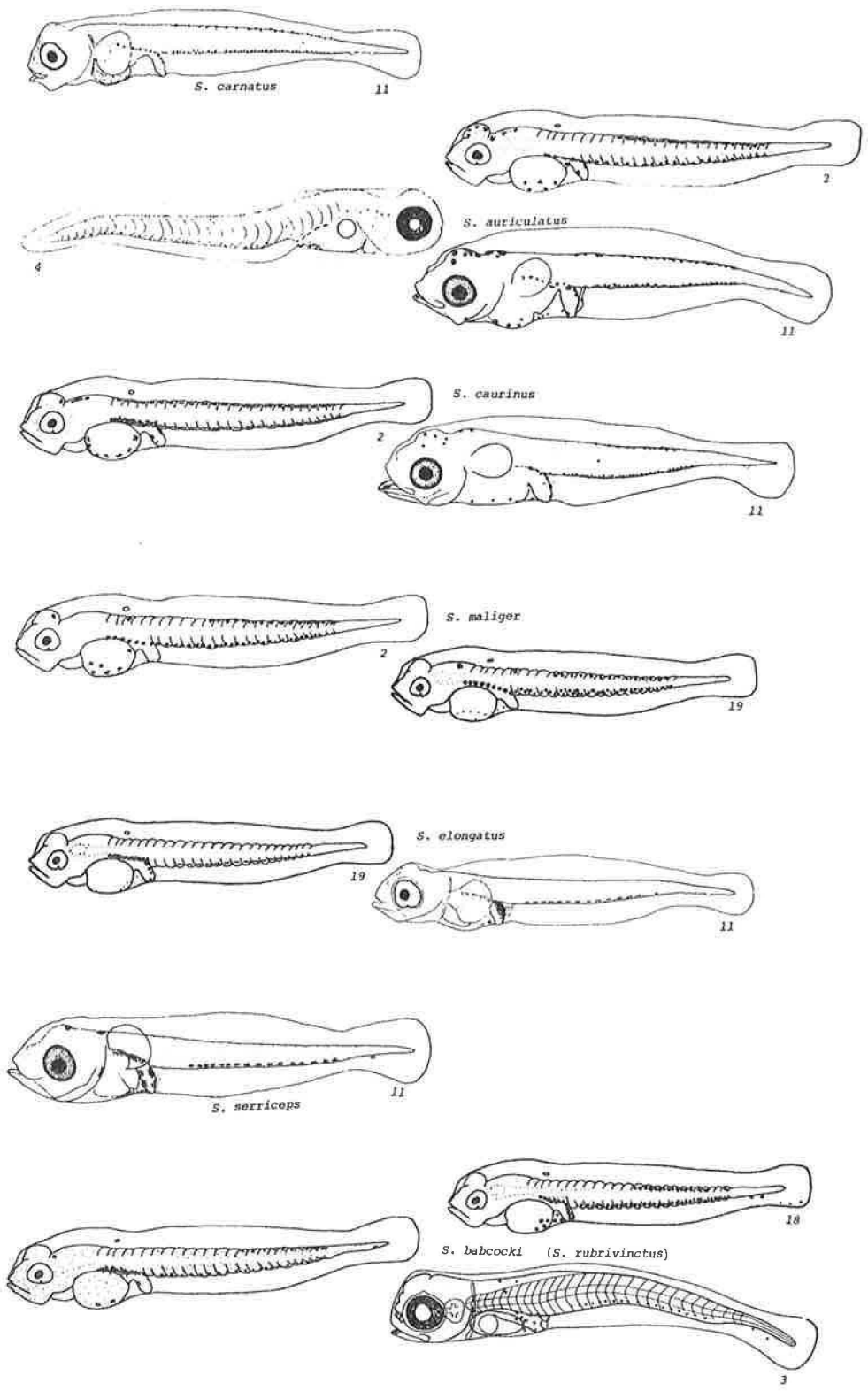


Figure 4a.-Extrusion or yolk-exhaustion larvae of species of Sebastes contained in Branch III (i.e. S) of the figure in Barsukov (1981). Numbers below the tail of the larvae refer to reference which contained the illustration.

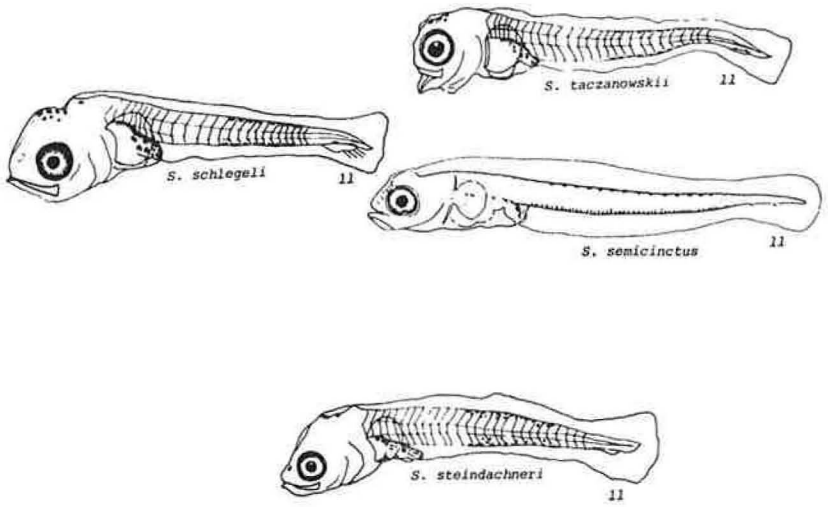


Figure 4b.-Extrusion of yolk-exhaustion larvae of species of Sebastes contained in Branch III (i.e. S) of the figure in Barsukov (1981). Numbers below the tail of the larvae refer to reference which contained the illustration.

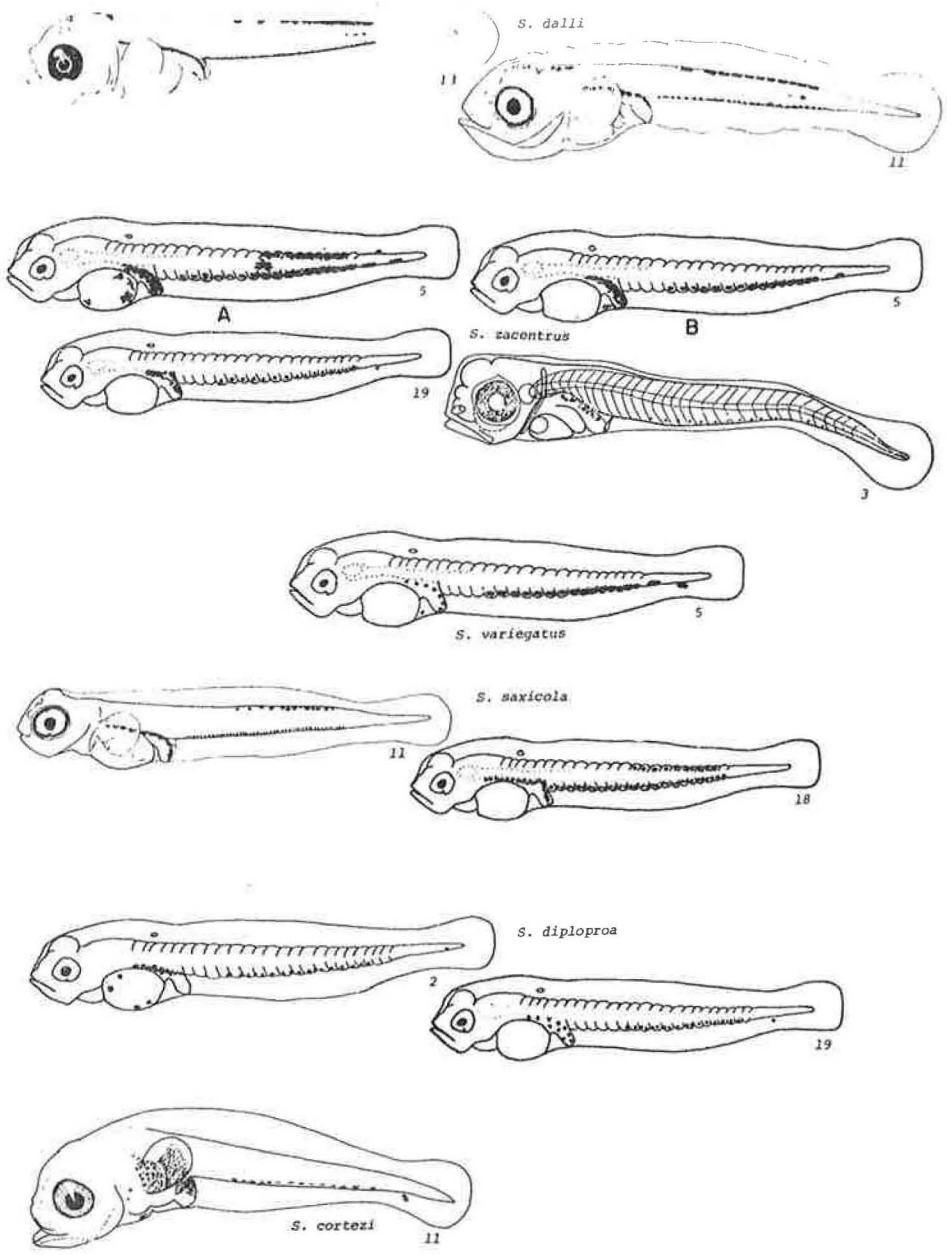


Figure 4c.-Extrusion of yolk-exhaustion larvae of species of Sebastes contained in Branch III (i.e. S) of the figure in Barsukov (1981). Numbers below the tail of the larvae refer to reference which contained the illustration.

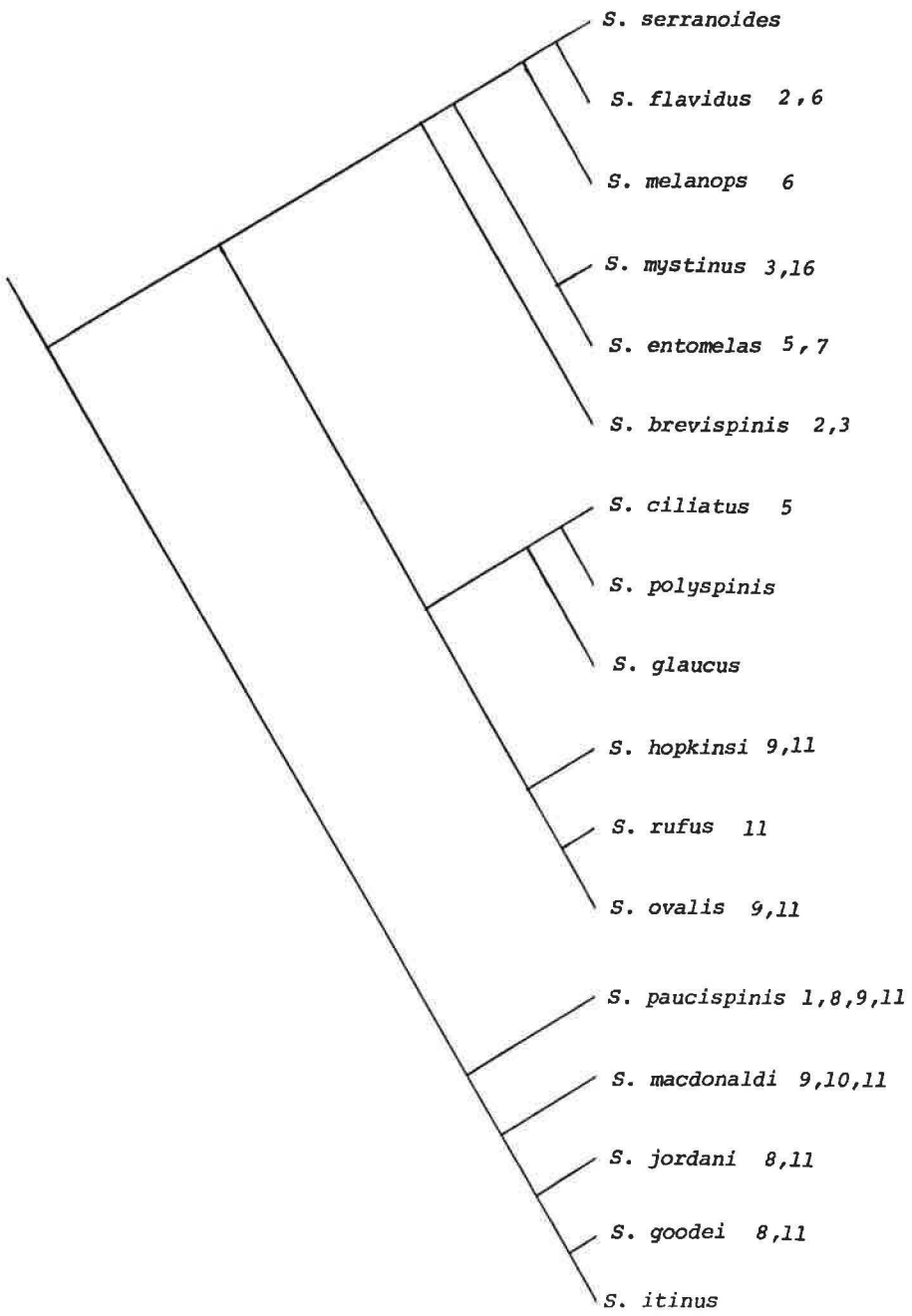


Figure 5.--Branch IV (i.e. M) of the figure in Barsukov (1981) redrawn as a dendrogram. Numbers following species' names refer to references containing illustrations of larvae for northeast Pacific species.

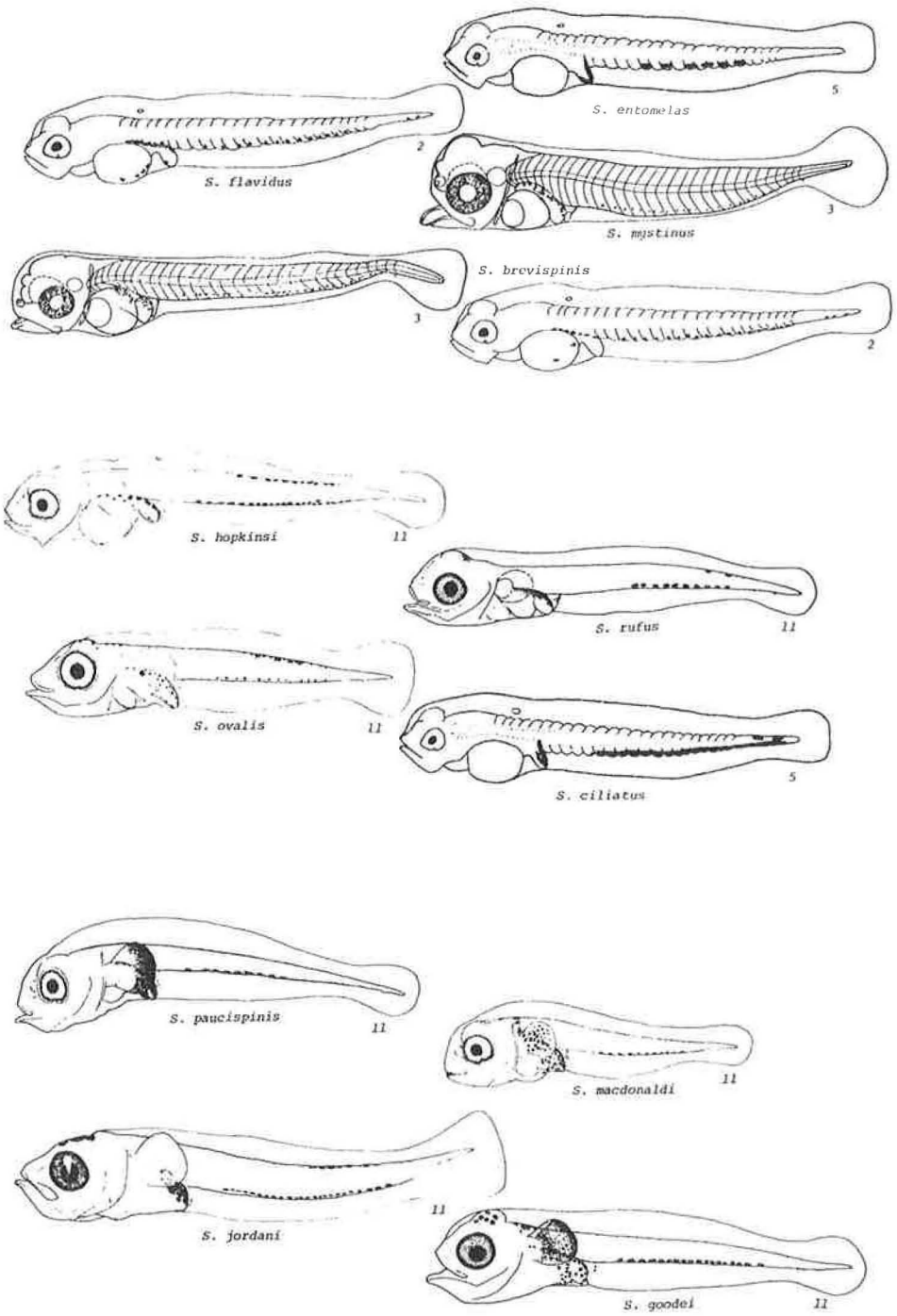


Figure 6.--Extrusion or yolk-exhustion larvae of species of Sebastes contained in Brach IV (i.e, M) of the figure in Barsukov (1981). Numbers below the tail of the larvae refer to reference which contained the illustration.

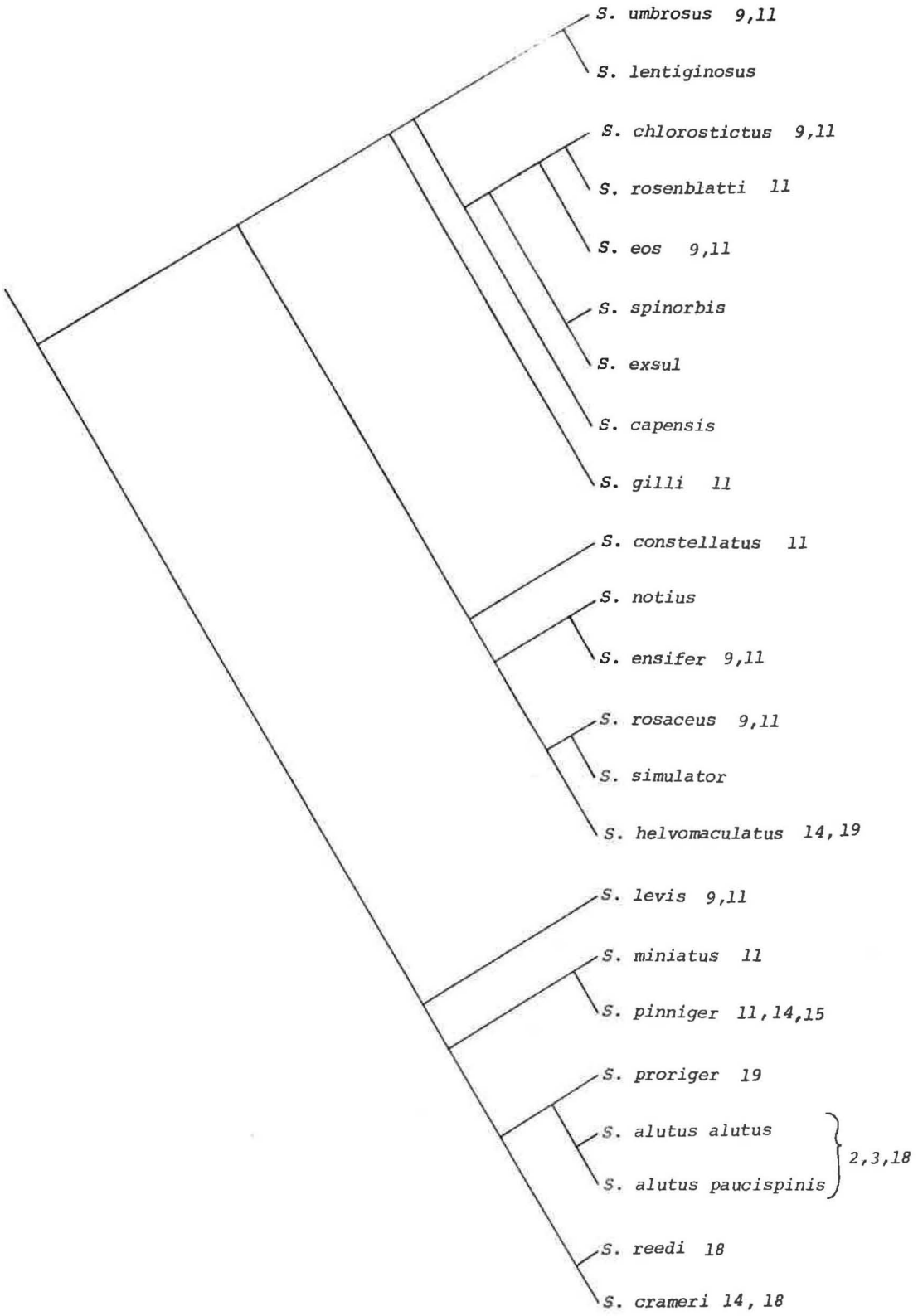


Figure 7.--Branch V (i.e. D) of the figure in Barsukov (1981) redrawn as a dendrogram. Numbers following species' names refer to references containing illustrations of northeast Pacific species.

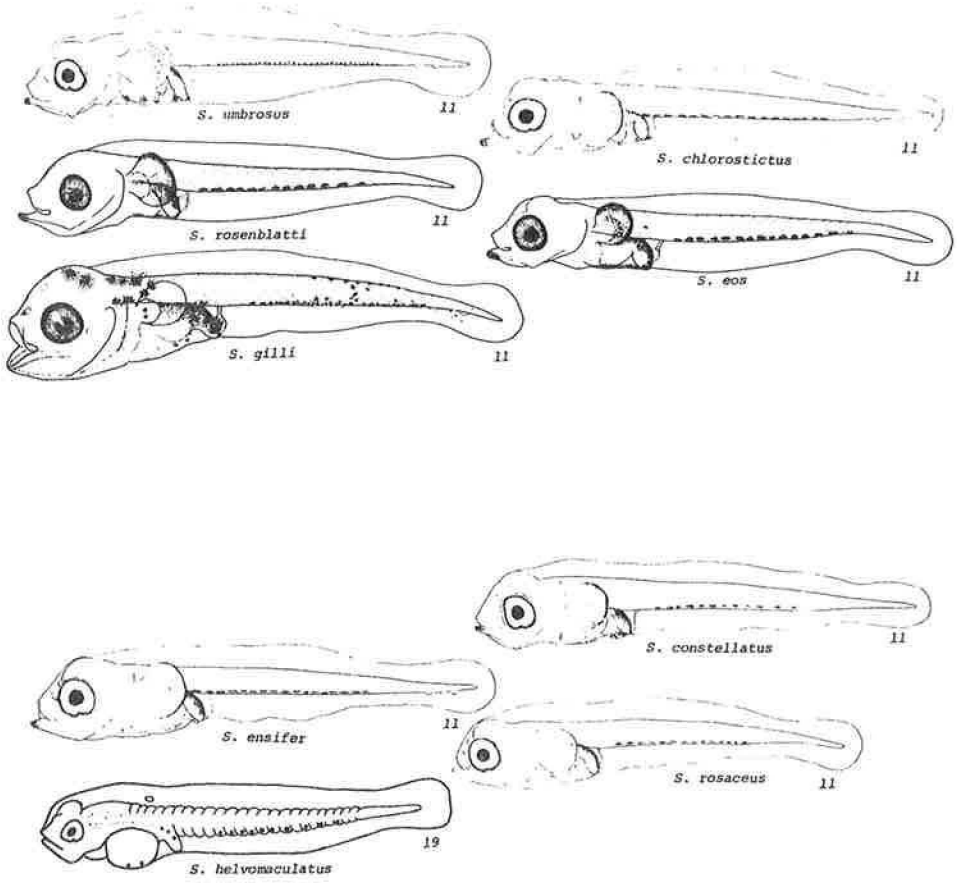


Figure 8a.-Extrusion or yolk-exhaustion larvae of species of Sebastes contained in Branch V (i.e. D) of the figure in Barsukov (1981). Numbers below the tail of the larvae refer to references which contained the illustration.

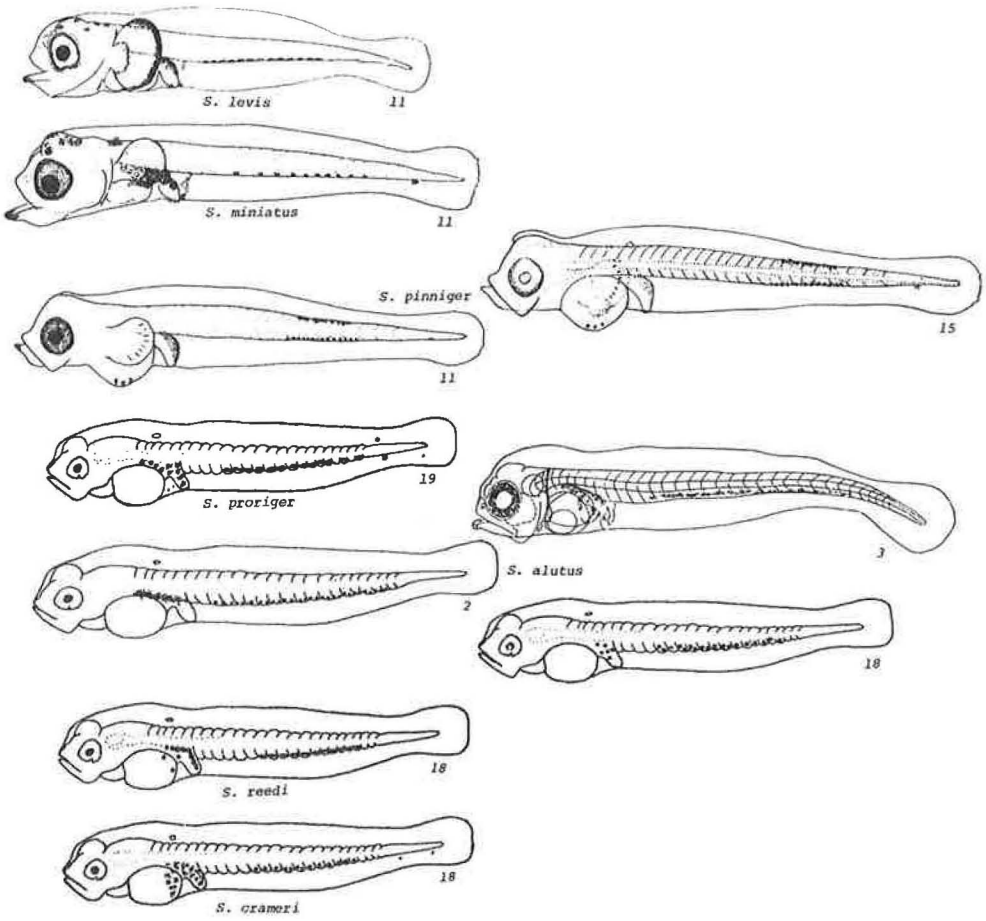


Figure 8b.-Extrusion or yolk-exhaustion larvae of species of Sebastes contained in Branch V (i.e. D) of the figure in Barsukov (1981). Numbers below the tail of the larvae refer to references which contained the illustration.

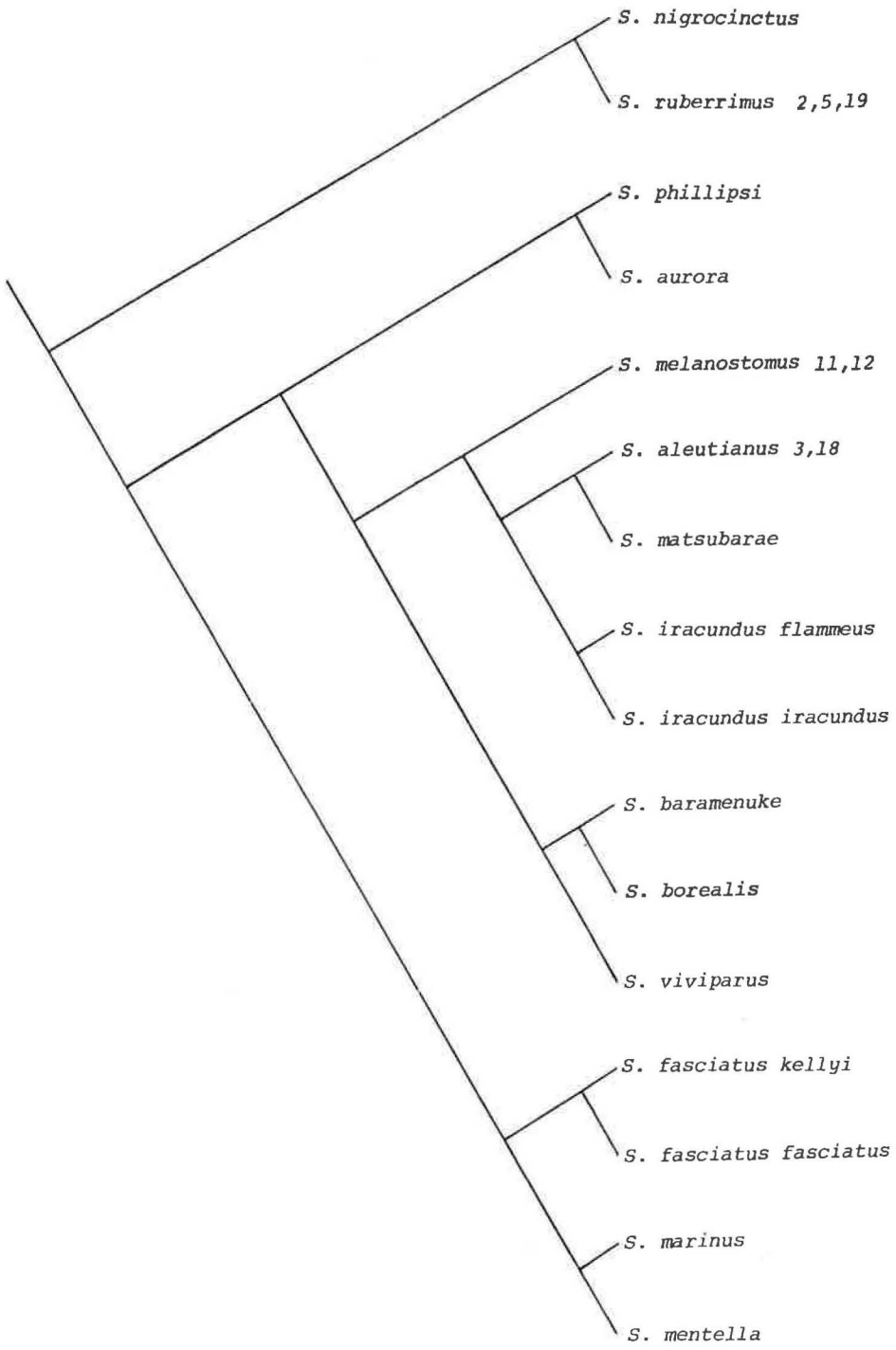


Figure 9.--Branch VI of the figure in Barsukov (1981) redrawn as a dendrogram. Numbers following the species' names refer to references containing illustrations of northeast Pacific species.

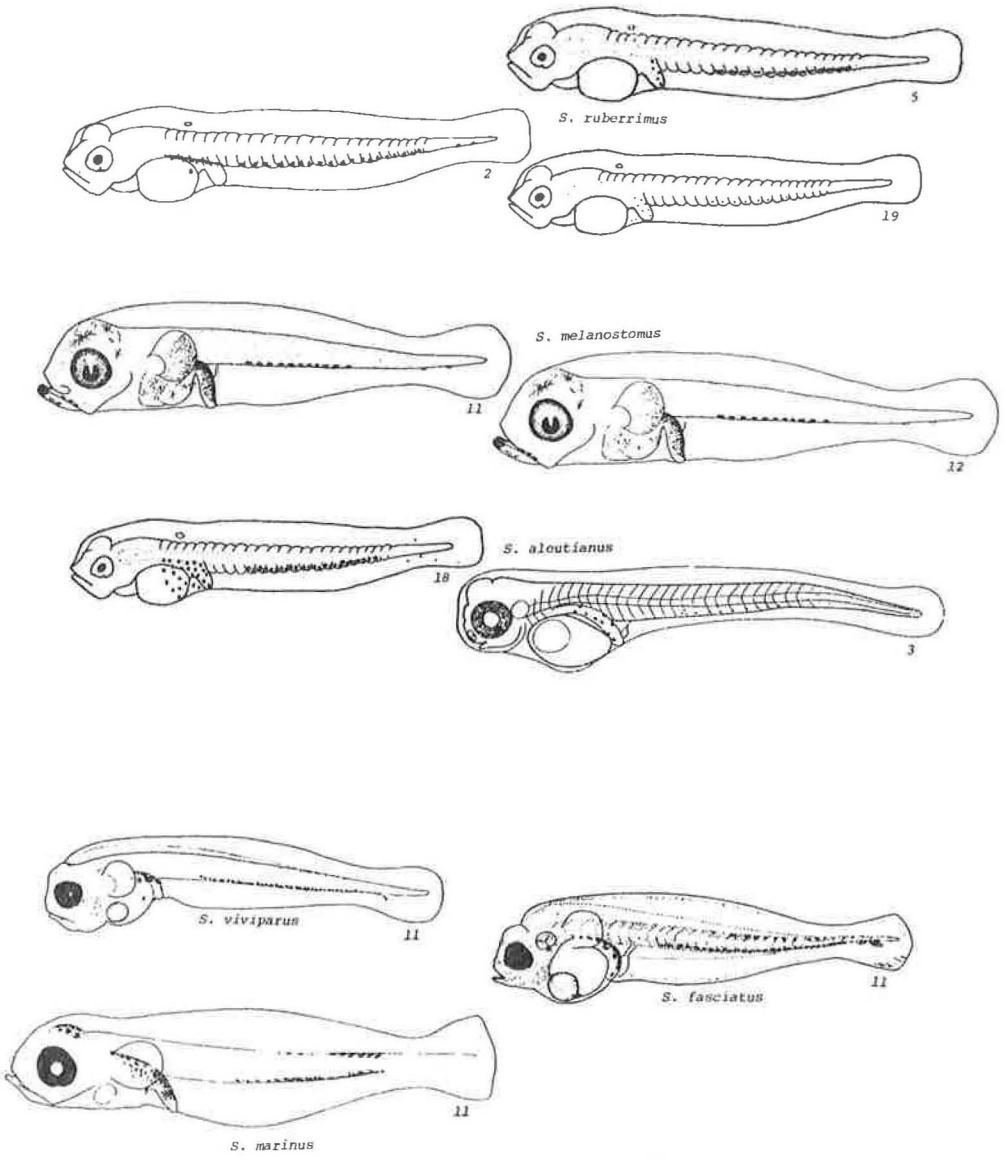


Figure 10.-Extrusion or yolk-exhaustion larvae of species of Sebastes contained in Brach VI of the figure in Barsukov (1981). Numbers below the tail of the larvae refer to references which contained the illustration.

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