

**REPORT OF THE INTERNATIONAL FISHERIES  
COMMISSION**

**APPOINTED UNDER THE TREATY BETWEEN THE UNITED STATES  
AND CANADA FOR THE PRESERVATION OF THE  
NORTHERN PACIFIC HALIBUT FISHERY**

**NUMBER 11**

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**VARIATIONS IN THE MERISTIC  
CHARACTERS OF FLOUNDERS FROM  
THE NORTHEASTERN PACIFIC**

**BY**

**LAWRENCE D. TOWNSEND**

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## FOREWORD

The present is an eleventh report by the International Fisheries Commission upon scientific results obtained under the terms of the Conventions of 1924 and 1930 between Canada and the United States for the preservation of the halibut fishery of the Northern Pacific Ocean, including Bering Sea.

It gives certain necessary information as to the characteristics of fishes whose young must be distinguished from those of the halibut in order that the early life history of the latter species may be followed. It is a technical report which will not be of direct use in halibut regulation, but which is of great value in the scientific work upon which such regulation is based. It should also be of value to fisheries science in general.

The International Fisheries Commission has had the help of an advisory board of four members: Dr. C. McLean Fraser, Dr. W. A. Clemens, N. B. Scofield, and Dr. Willis H. Rich.

This report is one of a series of investigations under the direction of Dr. William F. Thompson and carried on by a staff with laboratories and headquarters at the University of Washington, Seattle, U. S. A.

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**REPORTS BY THE INTERNATIONAL FISHERIES COMMISSION**

1. Report of the International Fisheries Commission appointed under the Northern Pacific Halibut Treaty, by John Pease Babcock, Chairman, and William A. Found, Miller Freeman, and Henry O'Malley, Commissioners. Dominion of Canada, Ottawa, 1928.  
Same. Report of the British Columbia Commissioner of Fisheries for 1928, pp. 58-76. Victoria, 1929.  
Same. Report of the United States Commissioner of Fisheries for 1930, Appendix 1. U. S. Bureau of Fisheries Document No. 1073. Washington, 1930.
2. Life History of the Pacific Halibut (1) Marking Experiments, by William F. Thompson and William C. Herrington. Victoria, B. C., 1930.
3. Determination of the Chlorinity of Ocean Waters, by Thomas G. Thompson and Richard Van Cleve. Vancouver, B. C., 1930.
4. Hydrographic Sections and Calculated Currents in the Gulf of Alaska, 1927 and 1928, by George F. McEwen, Thomas G. Thompson, and Richard Van Cleve. Vancouver, B. C., 1930.
5. The History of the Pacific Halibut Fishery, by William F. Thompson and Norman L. Freeman. Vancouver, B. C., 1930.
6. Biological Statistics of the Pacific Halibut Fishery (1) Changes in Yield of a Standardized Unit of Gear, by William F. Thompson, Harry A. Dunlop, and F. Heward Bell. Vancouver, B. C., 1931.
7. Investigations of the International Fisheries Commission to December 1930, and their Bearing on Regulation of the Pacific Halibut Fishery, by John Pease Babcock, Chairman, William A. Found, Miller Freeman, and Henry O'Malley, Commissioners. Seattle, Washington, 1930.
8. Biological Statistics of the Pacific Halibut Fishery (2) Effect of Changes in Intensity upon Total Yield and Yield per Unit of Gear, by William F. Thompson and F. Heward Bell. Seattle, Washington, 1934.
9. Life History of the Pacific Halibut (2) Distribution and Early Life History, by William F. Thompson and Richard Van Cleve. Seattle, Washington, 1936.
10. Hydrographic Sections and Calculated Currents in the Gulf of Alaska, 1929, by Thomas G. Thompson, George F. McEwen, and Richard Van Cleve. Seattle, Washington, 1936.
11. Variations in the Meristic Characters of Flounders from the Northeastern Pacific, by Lawrence D. Townsend. Seattle, Washington, 1936.

Further reports will bear serial numbers and will be issued separately by the Commission.

**VARIATIONS IN THE MERISTIC CHARACTERS OF  
FLOUNDERS FROM THE NORTHEASTERN PACIFIC**

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By LAWRENCE D. TOWNSEND

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This paper presents data on the variation and range in number of meristic characters of Pacific flatfishes. The need for this study arose during the investigation of the early life history of the halibut, in order that its early stages might be distinguished from those of the species here described. It reports counts of fin-rays and vertebræ based upon the examination of 2850 specimens of flounders from the North Pacific. The species included are those occurring along the west coast of North America from Puget Sound, Washington, to Pavlof Bay, Alaska. Of these species sufficient specimens are available to indicate closely the probable variation in the characters studied. Reliable averages and ranges of variation are given for most species for each geographical locality from which the sample was taken.

Nineteen species of flounders are known to occur within the area from which the samples were obtained. The published counts of numerical characters of these species are nearly all confined to preliminary taxonomic reports dealing with but a very few individuals. The paucity of published material of this nature about so many species, many of which are common, of wide occurrence, and valuable as sources of food, has left a very prominent blank in our knowledge of the fishes of this region. The present contribution will serve to reduce this at least in respect to the variability of numerical characters.

The species of flatfishes recorded from the region under investigation are listed below. The citations following each are of papers examined by the writer that contain original accounts of fin-rays or vertebræ for that species. Jordan and Evermann (1898) give counts for each species, but these are usually repetitions from earlier works.

*Citharichthys sordidus* (Girard, 1856b); Lockington, 1880; Bean, 1884.

*Citharichthys stigmæus* Jordan and Gilbert, 1883; Townsend, 1935.

*Atheresthes stomias* (Jordan and Gilbert, 1881b); Evermann and Goldsborough, 1907; Hubbs, 1915.

*Hippoglossus stenolepis* Schmidt; Bean, 1880, 1882.

*Hippoglossoides elassodon* Jordan and Gilbert, 1881c; Gilbert, 1895; Hubbs, 1918.

*Lyopsetta exilis* (Jordan and Gilbert, 1881a); Gilbert, 1915.

*Eopsetta jordani* (Lockington, 1880); Jordan and Gilbert, 1881a; Bean, 1882.

*Psettichthys melanostictus* Girard, 1856a; Lockington, 1880; Bean, 1882.

- Pleuronectes pallasii* Steindachner.  
*Platichthys stellatus* (Pallas); Girard, 1856a; Lockington, 1880; Hubbs, 1915.  
*Isopsetta isolepis* (Lockington, 1880).  
*Parophrys vetulus* Girard, 1856a; Lockington, 1880.  
*Limanda aspera* (Pallas); Hubbs, 1915.  
*Lepidopsetta bilineata* (Ayres, Ed. 2, 1873); Lockington, 1880; Bean, 1884; Snyder, 1911; Hubbs, 1915; Villadolid, 1927.  
*Inopsetta ischyra* (Jordan and Gilbert, 1881c); Villadolid, 1927.  
*Pleuronichthys caenosus* Girard, 1856a; Lockington, 1880; Starks and Thompson, 1910.  
*Pleuronichthys decurrens* Jordan and Gilbert; Starks and Thompson, 1910; Schultz, Hart, and Gunderson, 1932.  
*Microstomus pacificus* (Lockington, 1880); Evermann and Goldsborough, 1907.  
*Glyptocephalus zachirus* Lockington, 1880.

Careful comparison of the specimens of *Glyptocephalus zachirus* Lockington with the descriptions of Atlantic and Asiatic species of the genus confirms the opinion of Norman (1933) that the species from the eastern Pacific may be referred to the genus *Glyptocephalus* Gottsche (1835) instead of the genus *Errex* Jordan. The distinction by Jordan (1919) of *Errex* on the basis of the elongated eyed pectoral is here considered to be insufficient for generic separation.

Eighteen of the nineteen species known from this region have been recorded from wide geographical ranges. *Inopsetta ischyra*, a species rarely taken, has been found only in Puget Sound. *Pleuronichthys decurrens* has a gap of nearly 800 miles in its range. Two Alaskan records are isolated from the principal range, the northern boundary of which is along the northern California coast.

*Citharichthys stigmæus*, previously known only as far north as Puget Sound (Evermann and Goldsborough, 1907), has been found at Hanning Bay, Montague Island, Alaska, establishing a substantial northwestward extension of the known range.

The study was undertaken to provide means of identifying larval and post-larval stages of Pacific flounders by the use of fin-ray and vertebral counts. These are the most readily available characters which persist into the known adult form, but they nevertheless are undeveloped in the earliest stages and to that extent are not usable. This is more noticeable in the case of median fin-rays than of vertebræ. Moreover, counts of these overlap in different species, as will be noted below. It will therefore be necessary that other characters, such as body proportions and pigment patterns be used with them in order that identification be carried through the successive stages from egg to known adult.

The data are also useful in identification of the adults. If a sufficient number of specimens is available to give a reliable average and range of variation, the species can be determined readily. When a single specimen only is at hand, it may, if but one character is considered, be found to fall within the limits of varia-

tion of a group of species. But by using several such characters, the choice of identity may be narrowed to one or two species, usually to one. Whereas previously reliance has been placed upon fin-ray formulas, or other characters based upon one or but few specimens, a more precise method is now available.

This more precise treatment has brought to light instances of geographic races or variant stocks, characterized by significantly different means of counts. Careful treatment of these must await a later publication. The present records will suffice to show whether specimens from one locality fall within the normal range of variation. The most extreme variations are perhaps lacking, both as regards individuals and geographic races, but the present paper will provide a basis for their study.

Most of the Alaskan fishes were collected under the personal supervision of the writer during operations at sea and in Alaska by the International Fisheries Commission. Counts were made at the time for many of the larger specimens, while the remainder were preserved in formalin for later study. Material from Puget Sound and vicinity has been obtained from the collection of fishes of the School of Fisheries, University of Washington; from beach seinings in the Sound; from shrimp trawlers; from the collections of Richard T. Smith; and from the local markets. W. F. Thompson has permitted the inclusion of 140 counts he made on 14 species; F. Heward Bell contributed counts for the common halibut; and R. Van Cleve counted some specimens in two species and checked the author's counts on about 250 specimens from Alaska.

The sources of the materials used in this study are listed for the various species in Tables 1 and 2. The numbers opposite the localities given in Table 3 are those used in the tables following to indicate the source of material under each column. Letters are given in Table 3 to designate the species in the succeeding tables.

As in the case of localities, numbers have been assigned to columns containing the published data of authorities that have been used in Tables 4 and 5. The following numbers indicate the source in each case:

20. Lockington (1880)
22. Hubbs (1915)
23. Starks and Thompson (1910), Puget Sound
24. Starks and Thompson (1910), San Francisco.

The following characters were studied: (1) number of vertebræ; (2) number of dorsal fin-rays; (3) number of anal fin-rays; and (4) number of caudal fin-rays. A distinction was always made between abdominal and caudal vertebræ. Fin-rays were counted by holding the specimen up to the light, or in those species having prominent rays, by spreading out the fin against a board and counting with the aid of a needle. Small specimens were examined by reflected light under a binocular microscope. Counting the caudal rays usually necessitated the dissection of skin and muscle from one side of the base of the fin. The fish were filleted and the vertebræ scraped free of flesh on one side before the vertebral counts were made.

All counts were made and checked by counting a second time, or until an identical repeated count was obtained. The vertebral counts did not include the hypural plate; and the most anterior vertebra bearing a hæmal arch was considered to be the first caudal. All rays in the dorsal and anal fins were counted and recorded without any constant attempt to determine whether the structures were divided at the base or not.

In order to test the amount of error introduced by possible double counting of the last fin-ray which might have been divided, 93 small specimens of *Glyptocephalus zachirus* were heavily stained in an alcoholic solution of alizarin, which colors the bones selectively, and the rays counted with particular attention to the condition of the last rays. In this series no case was found in which the final ray was divided in such a way that it might have been misinterpreted in an unstained specimen by the usual method of counting. The evidence from this species corroborated the general impression gained from a less precise examination of other species that the final median fin-rays of Pacific flounders are very seldom divided. *Lyopsetta exilis* has probably furnished the most frequent exceptions to this rule.

Positive identification on the basis of adult characters as given in Jordan and Evermann (1898) and in later keys (Starks, 1918; Schultz, 1931) was established for all specimens included in the tabular data.

The data for the various samples are kept separate in Tables 4 and 5, which consist of the counted frequencies of dorsal and anal fin-rays respectively. In Tables 6, 7, 8, and 9, all specimens of a species are placed together without regard to source. These tables contain the frequencies of vertebræ and dorsal, anal, and caudal fin-rays, respectively. Slight discrepancies in the totals of Tables 4 and 7 and Tables 5 and 8 are due to the omission from the combined data of the counts by Thompson, and those obtained from published reports (except those of Starks and Thompson, 1910, for *Pleuronichthys decurrens*).

All frequency distributions of the counts for the samples having an adequate number of specimens approximate normal curves, and it may be assumed, in the absence of positive evidence to the contrary, that this would be true of all species if sufficiently large samples had been obtained. The mean number of fin-rays and vertebræ has been calculated for each species; and likewise the probable error of the mean for individual samples, where the number of individuals in the sample has warranted this. In Tables 6, 7, 8, and 9 the probable errors of the means are omitted due to the heterogeneity of the materials in the tables.

The least variable character studied was the number of abdominal vertebræ which is almost constant for each species. The total number of vertebræ and the number of caudal rays also vary but slightly; in most species the range is within two counts, and in no case does the range cover more than five. The anal rays are more variable, with a range of nineteen in one species. The dorsal rays show the greatest variability, with as many as twenty-three in the range of a single species.

Table 10 gives the limits of variability of the several characters for each



species as determined by the records obtained in this study, together with the means of these characters.

If it is possible to separate individuals according to the family designations given by Jordan (1923), the following key may be used for identification of certain species on the basis of the present counts:

*A Key to Pacific Flatfishes Based on Meristic Characters*<sup>1</sup>

Family *Bothidae*.

- A. Vertebrae 38 or more—*Citharichthys sordidus*.
- AA. Vertebrae 37 or less—*Citharichthys stigmæus*.

Family *Hippoglossidae*.

- A. Vertebrae 39 or less—*Psettichthys melanostictus*.
- AA. Vertebrae 41 or more.
  - B. Caudal rays 17—*Atheresthes stomias*.
  - BB. Caudal rays 18 to 20.
    - C. Vertebrae 49 or more—*Hippoglossus stenolepis*.
    - CC. Vertebrae 41 to 46.
      - D. Abdominal vertebrae 11.
        - E. Dorsal rays 87 or more—*Eopsetta jordani*.
        - EE. Dorsal rays 83 or less—*Lyopsetta exilis*.
      - DD. Abdominal vertebrae 12 or 13.
        - F. Caudal rays 18—*Hippoglossoides elassodon*.
        - FF. Caudal rays 19—*Lyopsetta exilis*; rarely also *Hippoglossoides elassodon*.

Family *Pleuronectidae*.

- A. Vertebrae 51 or more.
- B. Vertebrae 54 or less—*Microstomus pacificus*.
- BB. Vertebrae 62 or more—*Glyptocephalus zachirus*.
- AA. Vertebrae 44 or less.
  - C. Vertebrae 42 or more—*Parophrys vetulus*; rarely also *Isopsetta isolepis*.
  - CC. Vertebrae 41 or less.
    - D. Abdominal vertebrae 13 or 14—*Pleuronichthys decurrens* or *P. cænopus*.
    - DD. Abdominal vertebrae 12 or less.
      - E. Vertebrae 37 or less (also anal rays 47 or less)—*Platichthys stellatus*.
      - EE. Vertebrae 38 or more; anal rays 49 or more.
        - F. Dorsal rays 77 or less; anal rays 58 or less.
        - G. Abdominal vertebrae 12—*Pleuronectes pallasii*.
        - GG. Abdominal vertebrae 11 except in rare cases—*Limanda aspera* and *Lepidopsetta bilineata*. (See also FF.)
      - FF. Dorsal rays 78 or more; anal rays 61 or more—*Isopsetta isolepis* and *Lepidopsetta bilineata*.

<sup>1</sup>No consideration is given in this key to *Inopsetta ischyra* for which data are hopelessly inadequate. The species would fall under section CC of the *Pleuronectidae*.

The incomplete separations in the key are seen to be found mostly among the small-mouth flounders (*Pleuronectidæ*). Of the species not entirely separated in this key *Pleuronichthys decurrens* and *P. cænosus* are separated in about 85 per cent of cases by the number of abdominal vertebræ; *Pleuronichthys decurrens* usually has 38 or 39 vertebræ, *P. cænosus* 37. And *Pleuronectes pallasii* is separated by the number of abdominal vertebræ from all others in its group except 0.4 per cent of cases of *Lepidopsetta bilineata*. *Isopsetta isolepis* is separated from all but *Lepidopsetta bilineata* by having more than 78 dorsal rays and more than 60 anal; it also rarely conflicts with *Parophrys vetulus* by having 42 vertebræ. Because of the great range of the counts in *Lepidopsetta bilineata*, it cannot be separated from *Limanda aspera* or from *Isopsetta isolepis* by means of characters given in this paper. *Inopsetta ischyra* may hinder the separation of any species of this group. Its extreme rarity in collections has precluded adequate treatment.

In cases where species are incompletely separated in the key, if sufficient specimens are at hand to give reliable average counts, comparison may be made with the means given in Table 10.

TABLE 1.—Key to alphabetical and numerical references in the following tables.

Letter	Species	Number	Location
A	<i>Atheresthes stomias</i>	1	Washington
B	<i>Citharichthys sordidus</i>	2	British Columbia
C	<i>Citharichthys stigmæus</i>	3	Alaska, various localities grouped
D	<i>Eopsetta jordani</i>	4	Wrangell
E	<i>Glyptocephalus zachirus</i>	5	Yakutat Bay
F	<i>Hippoglossoides elassodon</i>	6	Zaikof Bay
G	<i>Hippoglossus stenolepis</i>	7	Hanning Bay
H	<i>Inopsetta ischyra</i>	8	Kodiak Harbor
I	<i>Isopsetta isolepis</i>	9	Alitak Bay
J	<i>Lepidopsetta bilineata</i>	10	Cold Bay
K	<i>Limanda aspera</i>	11	Wide Bay
L	<i>Lyopsetta exilis</i>	12	Hook Bay
M	<i>Microstomus pacificus</i>	13	Mitrofanía Bay
N	<i>Parophrys vetulus</i>	14	Boulder Bay
O	<i>Platichthys stellatus</i>	15	Fox Bay
P	<i>Pleuronectes pallasii</i>	16	Baralof Bay
Q	<i>Pleuronichthys cænosus</i>	17	Northeast Harbor
R	<i>Pleuronichthys decurrens</i>	18	Bering Sea
S	<i>Psettichthys melanostictus</i>	19	San Francisco
		20	Records from Lockington
		21	Records from Thompson
		22	Records from Hubbs
		23	Records from Starks and Thompson, Puget Sound.
		24	Records from Starks and Thompson, San Francisco.

TABLE 2.—Locations and numbers of each species examined.

Location	Species																		
	A	B	C	D	E	F	G	I	J	K	L	M	N	O	P	Q	R	S	
<b>CALIFORNIA</b>																			
San Francisco.....																	9		
<b>WASHINGTON</b>																			
Seattle Harbor.....	1	9	43		12	16			175		33	9	21			34		1	
Shilshole Bay.....									4				158	2					
Everett Harbor.....		2	7		94														
Saratoga Passage.....	10	16	4		3	7			55		51	19	4			1			
Holmes Harbor.....	4			1	4	5		2			46	8				9		8	
Utsalady.....		1				2													
Dungeness Spit.....														5					
Off Cape Flattery.....				9															
Semiamoo.....													195						
Bellingham Bay.....						31		87							4			10	
Point Roberts.....														9					
Blakely Island.....		1	1																
San Juan Island.....		1						3					5						
Orcas Island.....			1			15		9										3	
Lopez Island.....			1															4	
Harney Channel.....			1															9	
Seattle Markets.....			2	1		5			3				15			4			
<b>BRITISH COLUMBIA</b>																			
Goose Island Grounds.....	20			55															
Off Helen Point.....	20			1															
Prince Rupert Markets.....								6	1										
Masset Grounds.....							240												
<b>ALASKA</b>																			
Wrangell.....								1		3									
Yakutat Bay.....						105		2		3		6							
Zaikof Bay.....	2					22				2		4							
Off Ocean Cape.....	10																		
Off Icy Bay.....	5																		
Hanning Bay.....			1															1	
Kodiak Harbor.....									7					5	2				
Off Trinity Islands.....	5				1							1							
Alitak Bay.....						12			11	105		1		3	6			5	
Raspberry Strait.....									1	1				5					
Cold Bay.....						31			209	40		5		1	1			1	
Wide Bay.....										8									
Hook Bay.....						2			3						3			1	
Mitrofanina Bay.....						1			52					6					
Boulder Bay.....									16					41	3				
Fox Bay.....									4					13	1				
Baralof Bay.....									88					21	2				
Northeast Harbor.....									122					20					
Bering Sea.....										6					1				

TABLE 3.—Locations of capture of specimens of flatfishes referred to in the manuscript notes of W. F. Thompson.

Species	San Francisco, California	Vancouver, B. C.	Prince Rupert, B. C.	White Rock, B. C.	Hope Island, B. C.	Oval Bay, B. C.	Off Kodiak Island, Alaska	No Location
B	6	1	..	..	..	..	..	..
C	..	..	..	..	..	..	..	..
D	..	..	..	..	..	..	..	..
E	..	..	..	..	..	..	..	..
F	..	..	..	..	..	..	..	..
G	..	..	..	..	..	..	..	..
H	..	..	..	..	..	..	..	..
I	11	1	..	..	..	..	..	..
J	7	..	..	..	..	..	..	..
K	..	..	1	1	10	..	..	..
L	..	..	..	..	..	..	..	..
M	..	..	..	..	..	..	..	..
N	..	..	..	..	..	..	..	..
O	20	..	..	..	..	..	..	..
R	4	1	..	..	..	14	..	..
S	15	..	..	..	..	..	..	..
	6	..	..	..	..	..	..	..

TABLE 4a.—The counted frequencies of dorsal fin-rays in the flatfishes from different parts of the North Pacific (excepting *Inopsetta ischyra*). (Continued in Tables 4b and 4c).

Number of Rays	SPECIES																							
	O				K				P	Q				R	J									
	LOCALITY																							
	1	3	20	21	4	8-17	18	21	22	3	1	23	24	19	1	2	8, 9	10	11, 12, 15	13	14	16	17	21
52	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
53	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
54	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
55	9	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
56	18	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
57	28	5	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
58	43	11	1	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
59	42	14	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
60	28	24	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
61	14	21	1	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
62	10	16	...	1	...	1	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...
63	5	7	...	1	...	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
64	1	6	...	...	...	4	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...
65	1	5	...	...	...	5	...	...	...	1	...	...	...	...	1	...	...	...	...	...	...	...	...	...
66	...	1	...	...	...	18	...	...	...	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...
67	...	...	...	...	...	20	...	...	1	...	1	...	...	...	3	...	...	...	...	...	...	...	...	...
68	...	...	...	...	1	24	...	...	2	3	7	3	...	1	2	...	...	...	...	...	...	...	...	...
69	...	...	...	...	1	28	...	...	2	6	9	2	...	...	...	...	...	...	...	...	...	...	...	...
70	...	...	...	...	...	25	1	...	4	4	6	...	...	...	8	...	...	...	...	4	...	1	...	...
71	...	...	...	...	...	15	2	1	...	4	7	2	...	...	...	...	...	...	...	...	...	...	...	...
72	...	...	...	...	...	6	1	1	...	...	8	...	...	1	15	...	...	3	...	1	1	5	4	1
73	...	...	...	...	1	3	2	...	...	...	5	...	...	...	3	26	...	14	1	3	3	5	15	2
74	...	...	...	...	...	1	...	...	...	...	3	...	1	...	31	...	2	26	6	1	13	8	13	...
75	...	...	...	...	...	...	...	...	...	...	1	...	...	...	44	...	1	32	3	6	2	8	14	1
76	...	...	...	...	...	...	...	...	...	...	...	...	...	...	35	...	2	33	...	14	3	17	19	5
77	...	...	...	...	...	...	...	...	2	...	...	...	...	...	30	...	...	32	...	7	2	20	18	5
78	...	...	...	...	...	...	...	...	...	...	...	...	1	...	14	1	...	24	...	4	1	8	8	4
79	...	...	...	...	...	...	...	...	...	...	...	...	...	1	10	...	1	13	...	4	...	4	17	3
80	...	...	...	...	...	...	...	...	...	...	...	...	...	...	3	...	1	12	1	2	1	2	6	3
81	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	3	1	...	1	3	4	...
82	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	...	...	...	...	...	...	...	4	...
83	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...
84	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...
Total	203	113	5	5	3	153	6	2	12	22	47	12	3	20	233	1	7	203	8	52	16	88	122	24
Mean	58.5	60.6	...	...	...	68.4	...	...	...	68.4	70.6	...	...	74.2	74.9	...	...	76.2	...	75.5	...	75.8	76.4	...
P.E.±	.1	.1	...	...	...	.1	...	...	...	...	.2	...	...	...	.1	...	...	.1	...	...	...	...	.1	...

TABLE 4b.—(Continued from Table 4a).

Number of Rays	SPECIES																							
	N			L		F				S				C		I			B					
	LOCALITY																							
	1	20	21	1	21	1	5	6	8-17	21	1	3	20	21	1	7	1	2	3	20	21	1	20	
72	1	---	---	1	---	---	1	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
73	2	---	---	2	---	2	---	---	---	---	2	---	---	---	---	---	---	---	---	---	---	---	---	---
74	2	1	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
75	5	1	---	17	---	5	3	1	---	---	2	---	---	---	---	---	---	---	---	---	---	---	---	---
76	12	---	1	13	---	4	4	---	---	---	4	---	---	1	---	---	---	---	---	---	---	---	---	---
77	9	1	2	27	---	2	5	---	---	---	2	---	---	---	---	---	---	---	---	---	---	---	---	---
78	18	1	2	23	---	5	12	2	1	---	4	---	---	2	---	---	1	---	---	---	---	---	---	---
79	20	1	6	19	2	6	19	1	4	1	9	---	---	---	1	---	---	---	---	---	---	---	---	---
80	22	1	10	7	---	9	9	3	5	---	2	1	---	---	4	---	---	---	---	---	---	---	---	---
81	21	2	4	2	---	7	12	5	4	---	4	---	1	1	3	---	6	---	---	---	---	---	---	---
82	20	---	8	2	---	7	12	3	8	1	4	---	2	---	5	---	5	1	---	---	---	---	---	---
83	20	---	2	---	1	2	10	5	7	1	1	1	---	1	9	---	17	2	---	---	2	---	---	---
84	20	---	3	---	---	1	7	1	4	---	1	1	1	2	10	---	13	1	---	---	1	---	---	---
85	13	1	---	---	---	1	5	1	3	---	1	3	---	---	9	---	22	---	---	2	---	---	---	---
86	5	1	2	---	---	4	3	---	4	---	---	1	---	---	12	---	14	2	---	---	---	1	---	---
87	6	---	---	---	---	1	1	---	5	---	---	---	---	---	4	---	10	---	1	---	3	---	---	---
88	2	---	---	---	---	---	1	---	---	---	---	---	---	---	2	1	5	---	---	1	---	2	---	---
89	3	---	---	---	---	1	---	---	---	---	---	---	---	---	2	---	5	---	---	5	---	1	---	---
90	---	---	---	---	---	2	---	---	1	---	---	---	---	---	---	---	3	---	---	2	---	5	---	---
91	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
92	1	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	1	---	3	2
93	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	5	1
94	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	4	---
95	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	1
96	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
97	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	1	---
98	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	1
99	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	1
Total	202	10	40	120	3	59	104	22	46	3	36	8	5	7	61	1	101	6	3	5	12	29	6	
Mean	81.0	---	---	77.2	---	80.3	80.5	81.1	82.9	---	78.9	---	---	---	84.2	---	84.9	---	---	---	---	91.4	---	
P.E.±	.2	---	---	.1	---	.3	.2	---	---	---	---	---	---	---	.2	---	.01	---	---	---	---	---	---	

TABLE 4c.—(Continued from Table 4b).

Number of Rays	SPECIES															
	D				G		A			E			M			
	LOCALITY															
	1	2	20	21	2	1	2	3	1	2	20	21	1	3	20	21
87	...	1	...	...	...	...	...	...	...	...	1	...	...	...	...	
88	...	3	...	...	...	...	...	...	...	...	...	...	...	...	...	
89	...	4	...	...	...	...	...	...	...	...	...	...	...	...	...	
90	...	1	...	...	1	...	...	...	...	...	...	...	...	...	...	
91	...	3	...	...	1	...	...	...	...	...	...	...	...	...	...	
92	4	1	...	1	2	...	...	...	...	...	...	...	...	...	...	
93	2	3	1	2	4	...	...	1	...	...	...	...	...	...	...	
94	1	7	1	3	3	...	...	...	...	3	...	...	1	...	...	
95	1	6	...	...	9	2	1	...	...	...	1	1	...	...	...	
96	...	6	...	...	17	...	...	8	...	...	...	...	...	...	...	
97	2	10	...	1	12	...	...	1	8	1	1	...	...	...	...	
98	...	9	...	1	28	...	...	6	1	1	...	2	1	...	1	
99	...	3	...	...	35	...	...	1	9	...	...	1	1	1	...	
100	...	...	...	...	33	...	4	1	11	...	1	1	1	...	...	
101	1	...	...	...	29	...	2	1	10	...	...	1	...	1	...	
102	...	...	...	...	23	...	...	...	12	...	...	2	...	1	...	
103	...	...	...	...	19	1	4	1	8	...	...	3	...	...	2	
104	...	...	...	...	12	2	2	3	9	...	...	2	1	1	1	
105	...	...	...	...	7	1	1	3	9	...	...	9	2	2	...	
106	...	...	...	...	6	1	1	1	7	1	...	3	2	2	...	
107	...	...	...	...	1	...	5	3	1	...	...	1	1	...	...	
108	...	...	...	...	...	2	4	2	...	...	...	1	1	...	1	
109	...	...	...	...	...	1	2	1	1	...	...	2	1	...	...	
110	...	...	...	...	...	...	4	2	4	...	...	2	1	...	...	
111	...	...	...	...	...	2	1	...	...	...	...	1	1	...	...	
112	...	...	...	...	...	...	3	...	...	...	...	1	2	...	...	
113	...	...	...	...	...	...	...	...	...	...	...	1	2	...	...	
114	...	...	...	...	...	...	2	...	...	...	...	1	...	...	...	
115	...	...	...	...	...	...	2	...	...	...	...	1	...	...	...	
116	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	
Total	11	56	3	8	240	11	38	21	103	1	6	3	34	17	4	5
Mean	...	...	...	...	99.8	...	...	...	101.6	...	...	...	105.2	106.6	...	...
P.E.±	...	...	...	...	.1	...	...	...	.2	...	...	...	...	...	...	...

MERISTIC CHARACTERS OF FLOUNDERS

TABLE 5a.—The counted frequencies of anal fin-rays in the flatfishes from different parts of the North Pacific (excepting *Inopsetta ischyra*). (Continued in Tables 5a and 5b).

Number of Rays	SPECIES																							
	O				Q		R	K					P	J										
	LOCALITY																							
	1	3	20	21	1	23	24	19	4	8-17	18	21	22	3	1	2	8, 9	10	11, 12, 15	13	14	16	17	21
38	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
39	7	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
40	17	4	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
41	41	12	...	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
42	68	28	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
43	35	27	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
44	29	22	1	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
45	8	13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
46	2	4	...	1	2	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
47	...	2	...	...	5	3	...	3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
48	...	...	...	...	6	1	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
49	...	...	...	...	8	4	...	6	6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
50	...	...	...	...	7	2	1	4	11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
51	...	...	...	...	3	1	...	2	23	1	1	...	11	2	...	...	...	...	...	...	...	...	...	
52	...	...	...	...	9	...	...	3	41	1	...	...	2	...	...	...	...	...	...	...	...	...	...	
53	...	...	...	...	5	...	2	...	31	1	1	4	6	4	...	...	...	...	1	...	1	...	...	
54	...	...	...	...	2	...	...	1	24	2	...	3	2	...	...	...	...	...	...	...	...	...	...	
55	...	...	...	...	1	...	...	...	8	1	...	2	...	17	...	...	14	1	2	...	3	4	...	
56	...	...	...	...	...	1	...	...	6	...	...	...	1	27	...	1	28	...	6	...	7	10	1	
57	...	...	...	...	...	...	...	...	1	...	...	2	...	38	...	1	22	1	4	2	9	12	2	
58	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	2	43	2	12	6	17	21	4	
59	...	...	...	...	...	...	...	...	...	...	...	...	...	50	...	2	37	2	6	3	17	25	4	
60	...	...	...	...	...	...	...	...	...	...	...	...	...	34	1	2	27	1	11	3	17	16	6	
61	...	...	...	...	...	...	...	...	...	...	...	...	...	14	...	...	25	3	1	13	11	4	4	
62	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	1	6	1	3	...	2	7	2	
63	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	3	...	2	1	1	10	...	...	
64	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	1	3	...	
Total	208	114	5	5	48	12	3	20	3	152	6	2	12	22	232	1	7	206	8	50	16	88	120	23
Mean	42.1	42.9	...	...	50.1	...	...	...	...	52.6	...	...	...	52.1	57.4	...	...	58.4	...	58.6	...	58.8	59.2	...
P.E.±	.1	.1	...	...	.2	...	...	...	...	.1	...	...	...	.2	.2	...	...	.1	...	...	...	...	.1	...



TABLE 5b.—(Continued from Table 5a).

Number of Rays	SPECIES																				
	S			N			L		F				C		I						
	LOCALITY																				
	1	3	20	21	1	20	21	1	21	1	5	6	8-17	21	1	7	1	2	3	20	21
53	3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
54	1	...	...	...	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
55	2	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
56	7	...	...	1	5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
57	5	...	...	...	8	1	...	3	...	2	1	...	...	...	...	...	...	...	...	...	...
58	10	1	1	...	13	2	10	...	4	1	...	...	...	...	...	...	...	...	...	...	...
59	4	1	...	3	23	3	20	...	4	5	1	1	...	1	...	...	...	...	...	...	...
60	3	3	3	1	38	3	30	...	6	7	...	...	...	3	...	...	...	...	...	...	...
61	...	1	...	1	20	2	29	...	5	12	4	2	...	1	...	2	1	...	...	...	...
62	1	1	1	...	30	5	23	...	12	16	2	4	1	5	7	...	...	...	...	...	2
63	...	...	...	...	23	5	1	...	7	19	6	8	...	16	...	16	1	...	...	...	...
64	...	...	...	...	18	4	2	2	5	11	2	7	...	12	...	17	1	...	...	...	...
65	...	...	...	...	10	1	7	...	6	12	2	6	...	16	...	17	1	...	...	...	1
66	...	...	...	...	5	1	1	...	4	12	2	5	1	12	...	23	1	1	3	2	2
67	...	...	...	...	4	...	...	...	...	6	2	6	...	4	...	9	...	2	...	...	4
68	...	...	...	...	2	2	1	...	...	1	1	1	2	4	...	11	1	...	2	1	1
69	...	...	...	...	...	...	...	...	...	2	...	2	...	1	...	...	...	...	...	...	1
70	...	...	...	...	1	...	...	...	...	1	...	2	...	2	1	...	...	...	...	...	...
71	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...
Total	36	7	5	6	203	9	38	118	3	60	103	22	46	3	60	1	102	6	3	5	11
Mean	57.2	...	...	...	61.2	...	...	60.3	...	63.6	63.1	63.5	64.7	...	64.6	...	65.0	...	...	...	...
P.E.±	...	...	...	...	.1	...	...	.1	...	.3	.1	...	...	...	.2	...	.01	...	...	...	...

MERISTIC CHARACTERS OF FLOUNDERS

TABLE 5c.—(Continued from Table 5b).

Number of Rays	SPECIES																	
	D			G	B		E				M			A				
	LOCALITY																	
	1	2	20	21	2	1	20	1	2	20	21	1	3	20	21	1	2	3
67	....	1	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....
68	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
69	....	5	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....
70	....	1	....	....	6	....	....	....	....	....	....	....	....	....	....	....	....	....
71	....	6	....	....	19	2	....	....	....	....	....	....	....	....	....	....	....	....
72	1	7	1	2	28	8	1	....	....	....	....	....	....	....	....	....	....	....
73	4	9	....	3	37	4	....	....	....	....	....	....	....	....	....	....	....	....
74	2	10	....	1	37	6	....	....	....	....	....	....	....	....	....	....	....	....
75	....	7	1	1	43	3	1	....	....	....	....	....	....	....	....	....	....	....
76	1	2	....	....	25	4	2	....	....	....	....	....	....	....	....	....	....	....
77	....	3	....	....	27	1	....	....	....	....	....	....	....	....	....	....	....	....
78	1	2	....	1	10	1	....	....	....	2	....	....	....	....	....	....	....	....
79	....	1	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....
80	....	....	....	....	6	....	....	3	....	1	....	....	1	....	....	....	....	....
81	....	....	....	....	....	....	....	2	....	1	....	....	1	....	....	....	....	....
82	....	....	....	....	....	....	....	5	....	1	....	....	2	....	....	....	....	....
83	....	....	....	....	....	....	....	10	....	1	....	....	1	....	....	....	....	....
84	....	....	....	....	....	....	....	10	....	1	....	....	2	....	....	....	....	....
85	....	....	....	....	....	....	....	14	....	....	....	....	2	....	....	....	....	....
86	....	....	....	....	....	....	....	18	....	....	....	....	4	....	....	....	....	....
87	....	....	....	....	....	....	....	13	....	....	....	....	1	....	....	....	....	....
88	....	....	....	....	....	....	....	9	....	....	....	....	8	....	....	....	....	....
89	....	....	....	....	....	....	....	4	....	....	....	....	2	....	....	....	....	....
90	....	....	....	....	....	....	....	8	....	....	....	....	1	....	....	....	....	....
91	....	....	....	....	....	....	....	6	....	....	....	....	4	....	....	....	....	....
92	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....
93	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
94	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
95	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
96	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
97	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
98	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
99	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Total	11	55	3	8	240	30	4	104	1	6	3	34	17	4	5	10	37	21
Mean	....	....	....	....	74.3	73.5	....	85.1	....	....	....	86.9	89.0	....	....	....	....	....
P.E.±	....	....	....	....	.1	....	....	.2	....	....	....	....	....	....	....	....	....	....

TABLE 6.—The frequency distributions of the total number of vertebrae in Pacific flatfishes for all samples and species (excepting *Inopsetta ischyra*).

Number of Vertebrae	SPECIES																	
	O	C	Q	S	R	B	J	K	P	I	D	N	L	F	A	G	M	E
34	6	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	150	12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	81	17	8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	2	5	11	1	1	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	1	11	7	13	9	...	...	...	...	...	...	...	...	...	...	...
39	...	...	...	7	6	13	...	13	1	2	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	258	13	6	55	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	224	10	1	39	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	4	...	2	5	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	1	34	6	2	2	4	...	...	...	...
44	...	...	...	...	...	...	...	...	...	15	69	23	20	20	...	...	...	...
45	...	...	...	...	...	...	...	...	...	1	40	35	50	16	...	...	...	...
46	...	...	...	...	...	...	...	...	...	...	...	...	4	2	...	...	...	...
47	...	...	...	...	...	...	...	...	...	...	...	...	...	4	...	...	...	...
48	...	...	...	...	...	...	...	...	...	...	...	...	...	...	45	...	...	...
49	...	...	...	...	...	...	...	...	...	...	...	...	...	...	9	2	...	...
50	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	69	...	...
51	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	24	5	...
52	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	4	...
53	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...
54	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...
55	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
56	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
57	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
58	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
59	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
60	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
61	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1
62	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	8
63	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2
64	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2
65	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Total	239	35	20	19	14	26	495	23	9	97	55	115	64	92	58	95	11	12
Mean	35.3	35.7	36.6	38.3	38.4	38.5	39.4	39.4	40.1	40.4	42.2	43.3	43.6	43.9	48.1	50.2	51.8	63.2

TABLE 7.—The frequency distributions of the number of dorsal fin-rays in Pacific flatfishes for all samples and species (excepting *Inopsetta ischyra*).

Number of Rays	Species																	
	O	K	P	Q	R	J	N	L	F	S	C	I	B	D	G	A	E	M
52	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
53	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
54	2	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
55	10	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
56	20	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
57	33	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
58	54	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
59	56	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
60	52	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
61	35	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
62	26	2	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
63	12	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
64	7	4	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
65	6	5	1	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....
66	1	18	2	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
67	....	20	....	....	....	3	....	....	....	....	....	....	....	....	....	....	....	....
68	....	25	3	7	1	....	....	....	....	....	....	....	....	....	....	....	....	....
69	....	29	6	6	....	2	....	....	....	....	....	....	....	....	....	....	....	....
70	....	25	4	9	....	13	....	....	....	....	....	....	....	....	....	....	....	....
71	....	15	4	7	....	15	....	....	....	....	....	....	....	....	....	....	....	....
72	....	6	....	8	2	33	1	1	1	....	....	....	....	....	....	....	....	....
73	....	4	....	5	3	67	2	2	2	2	....	....	....	....	....	....	....	....
74	....	1	....	3	5	94	2	7	....	....	....	....	....	....	....	....	....	....
75	....	....	....	1	....	110	5	17	9	2	....	....	....	....	....	....	....	....
76	....	....	....	....	2	123	12	13	8	4	....	....	....	....	....	....	....	....
77	....	....	....	....	3	109	9	27	7	2	....	....	....	....	....	....	....	....
78	....	....	....	....	2	60	18	23	20	4	....	1	....	....	....	....	....	....
79	....	....	....	....	1	49	20	19	30	9	1	....	....	....	....	....	....	....
80	....	....	....	....	....	28	22	7	26	3	4	1	....	....	....	....	....	....
81	....	....	....	....	....	13	21	2	28	4	3	6	....	....	....	....	....	....
82	....	....	....	....	....	9	20	2	30	4	5	6	....	....	....	....	....	....
83	....	....	....	....	....	1	20	....	24	2	9	19	....	....	....	....	....	....
84	....	....	....	....	....	1	20	....	13	2	10	14	....	....	....	....	....	....
85	....	....	....	....	....	....	13	....	10	4	9	22	....	....	....	....	....	....
86	....	....	....	....	....	....	5	....	11	1	12	16	1	....	....	....	....	....
87	....	....	....	....	....	....	6	....	7	1	4	11	1	....	....	....	....	....
88	....	....	....	....	....	....	2	....	1	1	....	5	....	....	....	....	....	....
89	....	....	....	....	....	....	3	....	1	....	3	2	2	1	....	....	....	....
90	....	....	....	....	....	....	....	....	3	....	....	....	....	3	....	....	....	....
91	....	....	....	....	....	....	....	....	....	....	....	....	....	4	....	....	....	....
92	....	....	....	....	....	....	....	....	....	....	....	....	....	4	....	....	....	....
93	....	....	....	....	....	....	....	....	....	....	....	....	....	5	....	....	....	....
94	....	....	....	....	....	....	....	....	....	....	....	....	....	5	....	....	....	....
95	....	....	....	....	....	....	....	....	....	....	....	....	....	5	....	....	....	....
96	....	....	....	....	....	....	....	....	....	....	....	....	....	8	....	....	....	....
97	....	....	....	....	....	....	....	....	....	....	....	....	....	7	....	....	....	....
98	....	....	....	....	....	....	....	....	....	....	....	....	....	12	....	....	....	....
99	....	....	....	....	....	....	....	....	....	....	....	....	....	9	....	....	....	....
100	....	....	....	....	....	....	....	....	....	....	....	....	....	28	....	....	....	....
101	....	....	....	....	....	....	....	....	....	....	....	....	....	35	....	....	....	....
102	....	....	....	....	....	....	....	....	....	....	....	....	....	3	....	....	....	....
103	....	....	....	....	....	....	....	....	....	....	....	....	....	33	....	....	....	....
104	....	....	....	....	....	....	....	....	....	....	....	....	....	29	....	....	....	....
105	....	....	....	....	....	....	....	....	....	....	....	....	....	3	....	....	....	....
106	....	....	....	....	....	....	....	....	....	....	....	....	....	23	....	....	....	....
107	....	....	....	....	....	....	....	....	....	....	....	....	....	19	....	....	....	....
108	....	....	....	....	....	....	....	....	....	....	....	....	....	6	....	....	....	....
109	....	....	....	....	....	....	....	....	....	....	....	....	....	7	....	....	....	....
110	....	....	....	....	....	....	....	....	....	....	....	....	....	17	....	....	....	....
111	....	....	....	....	....	....	....	....	....	....	....	....	....	12	....	....	....	....
112	....	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....
113	....	....	....	....	....	....	....	....	....	....	....	....	....	28	....	....	....	....
114	....	....	....	....	....	....	....	....	....	....	....	....	....	9	....	....	....	....
115	....	....	....	....	....	....	....	....	....	....	....	....	....	35	....	....	....	....
116	....	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....
Total	316	156	22	47	20	730	202	120	231	44	62	110	29	67	240	70	104	51
Mean	59.2	68.4	68.4	70.6	74.2	75.7	81.0	77.2	81.0	79.9	84.2	84.8	91.4	94.8	99.8	105.8	101.5	105.7

TABLE 8.—The frequency distributions of the number of anal fin-rays in Pacific flatfishes for all samples and species (excepting *Inopsetta ischyra*).

Number of Rays	Species																	
	O	Q	R	K	P	J	S	N	L	F	C	I	D	G	B	E	M	A
38	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
39	9	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
40	21	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
41	53	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
42	96	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
43	62	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
44	51	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
45	21	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
46	6	2	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
47	2	5	3	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
48	.....	6	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
49	.....	8	6	6	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
50	.....	7	4	11	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
51	.....	3	2	23	11	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
52	.....	9	3	41	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
53	.....	5	.....	33	6	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
54	.....	2	.....	25	2	11	3	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
55	.....	1	.....	8	.....	41	2	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
56	.....	.....	.....	6	1	79	5	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
57	.....	.....	.....	.....	.....	89	5	8	3	.....	.....	.....	.....	.....	.....	.....	.....	.....
58	.....	.....	.....	1	.....	153	11	13	10	5	.....	.....	.....	.....	.....	.....	.....	.....
59	.....	.....	.....	.....	.....	126	5	23	20	11	1	.....	.....	.....	.....	.....	.....	.....
60	.....	.....	.....	.....	.....	112	6	38	30	14	.....	.....	.....	.....	.....	.....	.....	.....
61	.....	.....	.....	.....	.....	67	1	20	29	23	3	3	.....	.....	.....	.....	.....	.....
62	.....	.....	.....	.....	.....	21	2	30	23	34	5	7	.....	.....	.....	.....	.....	.....
63	.....	.....	.....	.....	.....	17	.....	23	1	40	9	17	.....	.....	.....	.....	.....	.....
64	.....	.....	.....	.....	.....	4	.....	18	2	25	12	18	.....	.....	.....	.....	.....	.....
65	.....	.....	.....	.....	.....	.....	.....	10	.....	26	6	18	.....	.....	.....	.....	.....	.....
66	.....	.....	.....	.....	.....	.....	.....	5	.....	23	12	25	.....	.....	.....	.....	.....	.....
67	.....	.....	.....	.....	.....	.....	.....	4	.....	14	4	11	.....	.....	1	.....	.....	.....
68	.....	.....	.....	.....	.....	.....	.....	2	.....	5	4	12	.....	.....	.....	.....	.....	.....
69	.....	.....	.....	.....	.....	.....	.....	.....	.....	4	1	.....	.....	.....	.....	.....	.....	.....
70	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	3	.....	.....	.....	.....	.....	.....	.....
71	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
72	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
73	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
74	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
75	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
76	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
77	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
78	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
79	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
80	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
81	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
82	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
83	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
84	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
85	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
86	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
87	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
88	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
89	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
90	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
91	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
92	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
93	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
94	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
95	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
96	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
97	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
98	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
99	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Total	322	48	20	155	22	728	43	203	118	231	61	111	66	240	30	105	51	68
Mean	42.4	50.1	49.4	52.5	52.1	58.4	57.6	61.2	60.3	63.3	64.7	65.0	73.2	74.3	73.5	85.0	87.6	86.9

TABLE 9.—The frequency distributions of the number of caudal rays in Pacific flatfishes for all samples and species (excepting *Inopsetta ischyra*).

Species	Number of Caudal Rays									Total
	16	17	18	19	20	21	22	23	24	
A	....	21	....	....	....	....	....	....	....	21
B	....	26	....	....	....	....	....	....	....	24
C	2	52	1	2	....	....	....	....	....	57
D	....	....	7	54	4	....	....	....	....	65
E	....	....	....	....	....	2	68	30	9	109
F	....	....	72	2	....	....	....	....	....	74
G	....	....	....	20	....	....	....	....	....	20
H	....	2	101	....	....	....	....	....	....	103
I	....	....	108	....	....	....	....	....	....	108
J	....	2	121	1	....	....	....	....	....	124
K	....	....	....	46	....	....	....	....	....	46
L	....	....	....	....	2	24	3	....	....	29
M	....	....	37	....	....	....	....	....	....	37
N	....	....	35	....	....	....	....	....	....	35
O	....	....	19	1	....	....	....	....	....	20
P	....	....	1	40	5	....	....	....	....	46
Q	....	....	....	5	....	....	....	....	....	5
R	....	....	32	....	....	....	....	....	....	32
S	....	....	....	....	....	....	....	....	....	....

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TABLE 10.—Summary of the meristic characters studied in the flatfishes of the North Pacific. The data for *Inopsetta ischyra* are taken from Villadolid (1927).

Species	Vertebral Range	Vertebral Mean	Abdominal Vertebral Range	Abdominal Vertebral Mode	Dorsal Range	Dorsal Mean	Anal Range	Anal Mean	Caudal Range	Caudal Mode
A	47-49	48.1	12	12	93-115	105.8	81-99	86.9	17	17
B	38-39	38.5	11	11	86-99	91.4	67-78	73.5	17	17
C	34-37	35.7	9-10	10	79-89	84.2	59-70	64.7	16-19	17
D	41-44	42.2	11	11	87-101	94.8	67-79	73.2	18-20	19
E	62-65	63.2	12-14	13	94-110	101.5	78-93	85.0	21-24	22
F	42-46	43.9	12-13	13	72-90	81.0	57-71	63.3	18-19	18
G	49-51	50.2	16	16	90-107	99.8	69-80	74.3	19	19
H	41	....	....	....	68-76	....	50-57	....	18-19	....
I	39-42	40.4	9-11	10	78-92	84.8	61-69	65.0	17-18	18
J	38-41	39.4	10-12	11	67-84	75.7	51-64	58.4	18	18
K	39-40	39.4	10-11	11	61-77	68.4	49-58	52.5	17-19	18
L	42-45	43.6	11-12	12	72-83	77.2	57-64	60.3	19	19
M	51-54	51.8	11-12	12	94-116	105.7	80-96	87.6	20-22	21
N	42-44	43.3	10-12	11	72-92	81.0	54-70	61.2	18	18
O	34-37	35.3	11-12	11	52-66	59.2	38-47	42.4	18	18
P	39-41	40.1	12	12	62-71	68.4	51-56	52.1	18-19	18
Q	36-38	36.6	13	13	65-78	70.6	46-56	50.1	18-20	19
R	37-39	38.4	13-14	14	68-79	74.2	46-52	49.4	19	19
S	37-39	38.3	11	11	73-88	79.9	53-62	57.6	18	18

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