Revision of the Blenniid Fish Genus *Omobranchus* with Descriptions of Three New Species and Notes on Other Species of the Tribe Omobranchini

VICTOR G. SPRINGER
and
MARTIN F. GOMON

SMITHSONIAN CONTRIBUTIONS TO ZOOLOGY • NUMBER 177

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ABSTRACT

Springer, Victor G., and Martin F. Gomon. Revision of the Blenniid Fish Genus *Omobranchus* with Descriptions of Three New Species and Notes on Other Species of the Tribe Omobranchini. *Smithsonian Contributions to Zoology,* number 177, 135 pages, 52 figures, 17 tables, 1975.—*Omobranchus* comprises 19 species, one of which includes two subspecies. Three species are described as new: *O. meniscus,* from Thailand, *O. steinitzi,* from the southern Red Sea, and *O. verticalis,* from Queensland. A key is given to all taxa of *Omobranchus,* and sexual dimorphism, geographic distribution and variation, habitat, and nomenclature are discussed. All taxa are illustrated and their distributions plotted on maps. Neotypes are designated for the following species: *Blennechis fasciolatus* Valenciennes (1836), *Petroscirtes lineolatus* Kner (1868a,b), *Petroscirtes ferox* Herre (1927).

Omobranchus is native to the Indo-west Pacific, and all taxa, except one subspecies, occur only in areas west of the Andesite Line. One species, *O. punctatus,* has been introduced into the Caribbean. Circumstantial evidence indicates that *O. punctatus* was probably introduced by ships transporting East Indian coolies from Madras and Calcutta around southern Africa to the Caribbean between 1845 and the opening of the Panama Canal (1914).

New information (range extensions, taxonomy, errata), since Springer's 1972 Synopsis of the Tribe Omobranchini, is given for the genera *Enchelyurus, Haptogenys, Omox,* and *Parenchelyurus. Haptogenys quadripora* Springer is synonymized with *H. bipunctata* (Day).

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Introduction

Springer (1972a) revised the genera of the blenniid tribe Omobranchini with the exception of *Omobranchus*. It is the purpose of our study to revise *Omobranchus* and to provide information on the other species of Omobranchini that has come to our attention since the 1972 study.

Omobranchus, with 19 species, is the largest of the six genera in the Omobranchini, which comprises only 29 species altogether. The species of *Omobranchus* are small, carnivorous, benthic inhabitants of the shallow, close-shore, marine and estuarine waters of the Indo-west Pacific (one species has been introduced into the Caribbean). At least one species is reported to occur in freshwater. The species most commonly inhabit rocky and oyster reefs, often near the edge of mangrove swamps; one species has been observed living in holes in mangrove roots. Unlike the species of some blenniid genera (e.g., *Alloblennius, Ecsenius, Cirripectes*), the species of *Omobranchus* are not definitely known to occur on living corals, although they may occur on hard substrate near corals. Only one specimen is definitely known to have been taken at a depth greater than four meters, while many specimens have come from depths of less than half a meter. The species are secretive and few are brightly colored in life.

The question arises as to how many species of *Omobranchus* are yet to be described. Inasmuch as *Omobranchus* occurs almost exclusively in shallow, close-shore habitats, which are generally well collected, one might surmise that few species remain undescribed. *Entomacrodus*, which also occurs predominantly in shallow, close-shore waters, was revised several years ago (Springer, 1967), and considerable collecting in *Entomacrodus*-type habitats since 1967 has failed to produce any new species of *Entomacrodus*. In *Ecsenius*, whose species may occur at greater depths and distances from shore than those of either *Omobranchus* or *Entomacrodus*, new species are continually appearing in collections (Springer, 1971, 1972b; more undescribed species are at hand). With the possible exception of the species we treat here as "*Omobran-*

Victor G. Springer, Department of Vertebrate Zoology, National Museum of Natural History, Smithsonian Institution, Washington, D.C. 20560. Martin F. Gomon, University of Miami, Rosenstiel School of Marine and Atmospheric Sciences, Miami, Florida 33149.

chus species," we expect that few new, primarily marine, species of *Omobranchus* will be found. *Omobranchus,* however, also occurs in estuarine and freshwater habitats (where *Entomacrodus* and *Ecsenius* do not occur). These habitats have not been well collected in the Indo-west Pacific, and it would not be surprising to encounter a few undescribed species of *Omobranchus* in them.

Methods

Counts.—Dorsal-, anal-, and caudal-fin, vertebral, and epipleural rib counts were taken from radiographs.

In the *dorsal* and *anal fins* each spine and segmented ray (external element) is typically supported by its own pterygiophore (internal element). Some specimens exhibited a pterygiophore, occasionally two or three, that supported no external element. The external element count was increased by one for each such pterygiophore. Usually it was the segmented-ray portion of the dorsal fin that lacked external elements, and these anomalies were most often associated with the posteriormost pterygiophore. Missing external elements anterior to the posteriormost pterygiophore in either the dorsal or anal fin can usually be discerned without a radiograph by the presence of an unusually large gap between two adjacent external elements.

Total dorsal-fin elements is the sum of the unsegmented (spines) and segmented rays.

With rare exceptions the anal fin has two spines. In males of some species and in all females, one or both spines are discernible only on skeletal preparations or from radiographs.

The *caudal-fin elements* include spinelike dorsal and ventral procurrent rays and segmented rays (see Springer, 1968, fig. 10). All rays are typically simple, but in rare specimens some segmented rays may be branched once. For most specimens the count of the segmented rays is identical with that of the principal caudal-fin rays (those rays that articulate with a hypural element); however, in many specimens one or more of the unsegmented, spinelike rays may articulate with a hypural element or one of the segmented rays may not articulate with a hypural element. The number of segmented rays is the most consistent and useful count for any species.

Vertebral counts distinguish precaudal and caudal vertebrae. The first caudal vertebra includes the first centrum with a recognizable hemal spine, and the last includes the hypural-bearing "centrum" (actually a complex element). Occasional specimens exhibit fusions among the caudal vertebrae; caudal vertebral counts for these specimens were not recorded, with the following exception: the penultimate centrum is often enlarged and may bear bifurcate neural and/or hemal spines, but except for size, the centrum appears normal on radiographs and was counted as one vertebra.

The *pelvic fins* invariably consist of a spine (not visible externally) and two simple, segmented rays. The *pectoral fins* consist of 12–14 simple, segmented rays with a strong mode of 13 in all species.

Teeth.—With one partial exception, all species of *Omobranchus* normally bear a large, recurved canine tooth (rarely two) posteriorly on each side of each jaw. The lower canines are larger than the upper canines. Mature females of *O. fasciolatoceps* lack canine teeth. The remaining teeth in each jaw, although often slightly pointed, are here considered to be incisors and are much smaller than the canine teeth. Tooth counts comprise only the total number of *upper jaw* (premaxillary) or *lower jaw* (dentary) *incisor teeth* in specimens 25.0 mm standard length or larger.

All but three of the species of *Omobranchus* are characterized by having more incisor teeth in the lower jaw than in the upper jaw (Table 1). Two species are characterized by having more than half their specimens with the same number of teeth in each jaw, and one species has equal numbers of specimens with either more teeth in the lower jaw or an equal number in each jaw. Ten species failed to exhibit the condition of having more teeth in the upper jaw than in the lower jaw. Populations within a taxon were not noticeably different with regard to the three conditions for numbers of teeth, except that the Guam population of *O. r. obliquus* approached significance (here set at $p=.01$) in its difference from the other populations of that subspecies (Chi-square = 6.2; $.05 > p > .02$; 2 df). When a difference existed between the number of teeth in the lower jaw and the number in the upper jaw, the difference was usually in the range of one to four teeth. It is not presently possible to explain the meaning of these differences.

Incisor teeth in either jaw increase in number

TABLE 1.—*Percentage of specimens of species or populations of* Omobranchus *exhibiting each of three conditions regarding number of teeth in upper and lower jaws*

Species or population	N	Conditions		
		Percentage of specimens with more lower jaw teeth than upper jaw teeth	Percentage of specimens with equal numbers of teeth in each jaw	Percentage of specimens with more upper jaw teeth than lower jaw teeth
anolius	34	47.1	41.1	11.8
aurosplendidus	9	44.4	44.4	11.1
banditus	42	85.7	14.3	0.0
elegans	154	88.3	11.7	0.0
elongatus	215	74.0	22.3	3.3
fasciolatoceps	17	94.1	0.0	5.9
fasciolatus	50	76.0	24.0	0.0
ferox	52	52.0	46.2	1.9
germaini	159	91.8	8.2	0.0
lineolatus	5	100	0.0	0.0
loxozonus	67	76.0	24.0	0.0
mekranensis	13	100	0.0	0.0
meniscus	2	100	0.0	0.0
punctatus	273	87.2	10.3	1.8
r. rotundiceps	99	89.9	10.1	0.0
r. obliquus				
Guam	45	55.6	44.4	0.0
other	87	78.1	21.8	0.0
steinitzi	4	25.0	75.0	0.0
verticalis	3	66.7	33.3	0.0
woodi	30	83.3	6.7	10.0
zebra	25	20.0	56.0	24.0

with increase in standard length. Linear regression equations and associated correlation coefficients (Snedecor and Cochran, 1971) were obtained for number of teeth in each jaw for each sex of selected populations of each species for which sufficient data were available (Table 2; where only a limited number of specimens was available for a species, all specimens were grouped together for the analysis). Regressions were all positive and almost all had significant correlation coefficients ($p. \leq .01$; Table 2). Covariance comparisons (Snedecor and Cochran, 1971) were made between males and females within each population and between males or females of different populations of the same species. Covariance comparisons were considered to indicate valid differences when the F values for either slopes or heights were at the $p. \leq .001$ level (Table 3). All statistical tests were two-sided and were computer performed (IBM 1130; based on a program constructed by P. Poole, Gulf Coast Research Laboratory). Any statistical differences between sexes or populations are discussed in the text. Selected XY plots (Figures 36–52), mostly of upper jaw teeth, are presented as examples of species, population, and sexual differences. These plots are printed on translucent paper on one side only and

TABLE 2.—*Regression equations and associated correlation coefficients for number of upper or lower jaw teeth (Y) versus standard length (X) in certain species of* Omobranchus (** = *significant at p = .01; NS = not significant*)

Species, population, sex	Regression equation lower jaw teeth	N	Correlation coefficient	Regression equation upper jaw teeth	N	Correlation coefficient
anolius						
males	Y = 13.6428 + 0.2110X	22	0.772 **	Y = 13.9621 + 0.1988X	24	0.791 **
females	Y = 14.4446 + 0.2396X	11	0.665 NS	Y = 11.9842 + 0.2857X	11	0.576 NS
banditus						
males	Y = 16.7374 + 0.1622X	28	0.703 **	Y = 15.8282 + 0.1431X	27	0.721 **
females	Y = 12.2709 + 0.2849X	14	0.860 **	Y = 12.5010 + 0.2312X	14	0.721 **
elegans						
males	Y = 12.6607 + 0.1827X	41	0.842 **	Y = 11.4375 + 0.1635X	40	0.866 **
females	Y = 13.2074 + 0.1727X	42	0.829 **	Y = 11.0033 + 0.1770X	42	0.902 **
elongatus						
Madagascar						
males	Y = 16.0950 + 0.1541X	14	0.788 **	Y = 13.9847 + 0.1741X	14	0.821 **
females	Y = 14.3674 + 0.1969X	8	0.680 NS	Y = 13.8062 + 0.1914X	8	0.696 NS
Chagos Islands						
males	Y = 13.7319 + 0.2595X	7	0.811 NS	Y = 13.2404 + 0.2224X	7	0.784 NS
females	Y = 7.5892 + 0.4742X	8	0.932 **	Y = 10.6959 + 0.3226X	8	0.708 NS
Mozambique						
males	Y = 14.0564 + 0.1710X	26	0.692 **	Y = 11.7330 + 0.2123X	25	0.733 **
females	Y = 11.3508 + 0.2701X	27	0.751 **	Y = 9.6017 + 0.2981X	27	0.775 **
Gulf of Thailand						
males	Y = 14.2449 + 0.2270X	29	0.771 **	Y = 13.0449 + 0.2236X	28	0.798 **
females	Y = 9.6895 + 0.4214X	27	0.776 **	Y = 11.2567 + 0.3313X	27	0.710 **
fasciolatus						
males	Y = 12.4387 + 0.2811X	27	0.792 **	Y = 14.2373 + 0.1850X	29	0.692 **
females	Y = 13.9678 + 0.2658X	23	0.826 **	Y = 15.7450 + 0.1638X	21	0.732 **
ferox						
males	Y = 12.8756 + 0.1473X	29	0.748 **	Y = 14.5143 + 0.0941X	30	0.488 **
females	Y = 11.0126 + 0.1960X	16	0.510 NS	Y = 12.2687 + 0.1540X	16	0.512 NS
germaini						
Hong Kong						
males	Y = 14.3719 + 0.1841X	10	0.803 **	Y = 12.1805 + 0.1838X	10	0.774 **
females	Y = 9.5122 + 0.3571X	6	0.910 NS[1]	Y = 12.6322 + 0.2212X	7	0.888 **
Queensland						
males	Y = 13.5619 + 0.1986X	35	0.804 **	Y = 12.0392 + 0.1810X	35	0.704 **
females	Y = 14.3954 + 0.2138X	22	0.858 **	Y = 13.4897 + 0.1777X	22	0.621 **
Western Australia						
Montebello to Maud						
males	Y = 12.7926 + 0.2098X	17	0.864 **	Y = 13.1400 + 0.1548X	18	0.672 **
females	Y = 9.0513 + 0.3325X	20	0.828 **	Y = 5.5424 + 0.3483X	20	0.865 **
Shark Bay to Perth						
males	Y = 8.9368 + 0.3118X	13	0.782 **	Y = 8.0765 + 0.2681X	13	0.740 **
females	Y = 10.1621 + 0.2837X	21	0.787 **	Y = 10.1635 + 0.2287X	20	0.722 **
loxozonus						
Japan						
males	Y = 13.5425 + 0.1921X	39	0.910 **	Y = 13.1271 + 0.1748X	40	0.886 **
females	Y = 10.5804 + 0.2758X	28	0.874 **	Y = 11.7180 + 0.2189X	28	0.830 **
Okinawa						
males	Y = 17.9076 + 0.0812X	8	0.380 NS	Y = 18.0726 + 0.0443X	8	0.173 NS
females	Y = 13.5538 + 0.2214X	7	0.796 NS	Y = 10.5157 + 0.2719X	7	0.893 **
punctatus						
Ceylon						
males	Y = 20.7766 + 0.1706X	23	0.834 **	Y = 22.9006 + 0.0526X	23	0.337 NS
females	Y = 16.7333 + 0.3355X	20	0.845 **	Y = 19.0626 + 0.1939X	20	0.629 **
Gulf of Thailand (east coast)						
males	Y = 19.2111 + 0.1754X	35	0.788 **	Y = 18.3961 + 0.1564X	34	0.758 **
females	Y = 15.7239 + 0.2907X	21	0.906 **	Y = 14.4955 + 0.2756X	21	0.921 **
China						
males	Y = 19.4997 + 0.1493X	20	0.878 **	Y = 19.1633 + 0.1140X	20	0.871 **
females	Y = 18.5295 + 0.1740X	15	0.553 NS	Y = 17.9137 + 0.1517X	14	0.521 NS
Western Australia						
males	Y = 21.9070 + 0.0823X	6	0.465 NS	Y = 19.7653 + 0.0927X	6	0.854 **
females	Y = 18.3451 + 0.1801X	10	0.645 NS	Y = 9.6733 + 0.4039X	10	0.854 **
Trinidad						
males	Y = 17.8032 + 0.2526X	18	0.874 **	Y = 16.9280 + 0.2362X	18	0.915 **
females	Y = 20.2373 + 0.1969X	8	0.850 **	Y = 18.7840 + 0.2026X	8	0.774 **
rotundiceps						
rotundiceps						
Northern Territory						
males	Y = 13.7942 + 0.2541X	45	0.901 **	Y = 13.5515 + 0.2186X	45	0.846 **
females	Y = 11.8393 + 0.3376X	38	0.923 **	Y = 10.1819 + 0.3317X	37	0.920 **
obliquus						
Palau Islands						
males	Y = 16.3638 + 0.2325X	18	0.830 **	Y = 16.1124 + 0.1926X	18	0.787 **
females	Y = 10.0620 + 0.4584X	16	0.661 **	Y = 9.6517 + 0.4182X	16	0.541 **
Guam						
males	Y = 11.6324 + 0.3471X	23	0.887 **	Y = 9.5000 + 0.3931X	24	0.968 **
females	Y = 10.2077 + 0.4183X	22	0.857 **	Y = 10.7593 + 0.3715X	22	0.793 **
Palmyra						
females	Y = 10.4757 + 0.4066X	16	0.807 **	Y = 9.2942 + 0.4236X	16	0.841 **
woodi						
males	Y = 21.0588 + 0.1094X	15	0.515 NS	Y = 20.4330 + 0.0967X	17	0.495 NS
females	Y = 16.8481 + 0.2144X	14	0.682 **	Y = 15.4604 + 0.2041X	14	0.671 **
zebra						
males	Y = 8.7708 + 0.2498X	7	0.958 **	Y = 6.8382 + 0.3063X	7	0.946 **
females	Y = 11.4259 + 0.1845X	13	0.852 **	Y = 10.0231 + 0.2241X	13	0.865 **

[1]To be significant, this value should be 0.917; the regression data, however, have been used in covariance analyses.

TABLE 3.—*F values for covariance comparisons of regression equations (Table 2) of lower and upper jaw teeth between males and females within certain species and populations of* Omobranchus (** = *significant at p = .001; NS = not significant*)

Comparisons	F values slopes	Degrees of freedom	F values heights	Degrees of freedom
banditus				
lower teeth	3.41 NS	1/38	0.05 NS	1/39
upper teeth	1.89 NS	1/37	0.22 NS	1/38
elegans				
lower teeth	0.14 NS	1/79	0.18 NS	1/80
upper teeth	0.43 NS	1/78	0.43 NS	1/79
elongatus				
Mozambique				
lower teeth	2.50 NS	1/49	9.47 NS	1/50
upper teeth	1.67 NS	1/48	10.17 NS	1/49
Gulf of Thailand				
lower teeth	5.48 NS	1/52	22.76 **	1/53
upper teeth	2.05 NS	1/51	29.18 **	1/52
fasciolatus				
lower teeth	0.06 NS	1/46	6.04 NS	1/47
upper teeth	0.16 NS	1/46	4.50 NS	1/47
germaini				
Hong Kong				
lower teeth	2.88 NS	1/12	1.42 NS	1/13
upper teeth	0.20 NS	1/13	10.14 NS	1/14
Queensland				
lower teeth	0.09 NS	1/53	22.07 **	1/54
upper teeth	0.00 NS	1/53	9.91 NS	1/54
Western Australia				
Montebello to Maud				
lower teeth	3.75 NS	1/33	9.94 NS	1/34
upper teeth	7.27 NS	1/34	0.04 NS	1/35
Shark Bay to Perth				
lower teeth	0.10 NS	1/30	0.21 NS	1/31
upper teeth	0.20 NS	1/29	2.48 NS	1/30
loxozonus				
Japan				
lower teeth	6.48 NS	1/63	7.16 NS	1/64
upper teeth	1.92 NS	1/64	3.83 NS	1/65
punctatus				
Ceylon				
lower teeth	7.09 NS	1/39	28.74 **	1/40
Gulf of Thailand				
lower teeth	6.71 NS	1/52	8.44 NS	1/53
upper teeth	7.66 NS	1/51	5.63 NS	1/52
Western Australia				
upper teeth	6.60 NS	1/12	2.44 NS	1/13
Trinidad				
lower teeth	0.52 NS	1/22	0.37 NS	1/23
upper teeth	0.26 NS	1/22	1.31 NS	1/23
rotundiceps				
rotundiceps				
Northern Territory				
lower teeth	6.75 NS	1/79	14.57 **	1/80
upper teeth	9.78 NS	1/78	4.56 NS	1/79
obliquus				
Palau Islands				
lower teeth	2.42 NS	1/30	1.93 NS	1/31
Guam				
lower teeth	0.92 NS	1/41	5.27 NS	1/42
upper teeth	0.12 NS	1/42	6.10 NS	1/43
zebra				
lower teeth	1.33 NS	1/16	0.03 NS	1/17
upper teeth	1.48 NS	1/16	0.00 NS	1/17

are all drawn to the same scale. The pages containing the plots can be removed and any page superimposed on another to enable comparison of the plots for different species.

The number of *circumorbital bones* (Springer, 1968) is reasonably consistent for any given blenniid species (often for a genus). In *Omobranchus* the species have either 4 or 5 circumorbital bones on each side. In those species normally with 5 bones, 4 may occur unilaterally. The dorsalmost circumorbital bone (dermosphenotic of Springer, 1968) is greatly reduced and often obscured from view by the next to dorsalmost bone. From two to seven specimens of each species or subspecies of *Omobranchus* were examined for number of circumorbital bones.

MEASUREMENTS.—All measurements were made with needlepoint dial calipers and recorded to the nearest 0.1 millimeter. *Standard length* (SL) was measured from the midtip of the snout (not necessarily the midtip of the upper lip) to the lateral midbase of the caudal fin. *Head length* was measured from the midtip of the snout to the posterodorsal junction of the membranous margin of the gill opening with the body (dorsal end of gill opening). *Dorsal-fin element lengths* were measured from the corner of the posterior angle formed by the element and the dorsal body contour to the tip of the element. *Caudal-fin ray lengths* were measured from the base to the tip of the ray. The *height* of the *bladelike, fleshy crest* on top of the head was measured as a perpendicular from the apparent head contour at the base of the crest to the highest point on the crest.

OTHER CHARACTERS.—The *gill opening* is restricted in *Omobranchus*. The ventral point where the membrane bordering the gill opening joins the body relative to the insertion of the pectoral-fin rays is an important specific character. The gill opening may loop farther ventrally than the point of junction between the membrane and the body, but it is the junction point that we record. When the gill opening is restricted to the area dorsal to the pectoral-fin insertion, this condition is recorded as 0. Otherwise the number of the fin ray (counting dorsally to ventrally) is recorded. Because the posi-

tion of the opening relative to a particular fin ray is often a matter of judgment, an allowance of plus or minus one ray should be assumed. In specimens smaller than 25 mm SL of any species, the size of the gill opening may vary considerably and may extend much farther ventrally than in larger specimens. For that reason we report data only on specimens larger than 24.9 mm SL.

The *epipleural rib count* is actually a count of the vertebrae bearing an epipleural rib on either one or both sides. Occasional caudal vertebrae that lack epipleural ribs but occur between vertebrae bearing epipleural ribs are included in the count. In all cleared and stained specimens, the first epipleural rib is on the first vertebra, and our counts commenced with the first vertebra even though the anteriormost epipleural ribs are not distinguishable on radiographs.

Cephalic sensory pore series and lateral-line tubes are illustrated in Figure 1. *Interorbital pores,* all opening into the frontal bones, are situated in the interorbital region and number modally 2 or 3 for a given species. Where the count is 3, there is typically a pair of anterior pores and a single posterior (apical) pore arranged in a triangular pattern. Where the count is 2, the apical pore is most often absent. In species possessing a fleshy, bladelike crest on top of the head the apical pore, if present, is well up on the crest, either on the midline of the crest or displaced to one side. The *circumorbital pores* ring the posterior half of the orbit, beginning dorsally at about the one o'clock position and extending clockwise to the eight o'clock position. The two anteriormost circumorbital pores are just posterior or lateral to the nostrils. There are two *prenasal pores* on each side, one just anterior or ventral to each of the nostrils. The only exception is *O. steinitzi,* which lacks prenasal pores. The mandibular, preopercular, and supratemporal pore series were not used as characters. The total number of these pores on one side is modally 14 (including the median supratemporal commissural pore) in all species. Springer (1972a) noted 13 pores in these series of *Omobranchus,* failing to include the posteriormost pore of the supratemporal series in his count.

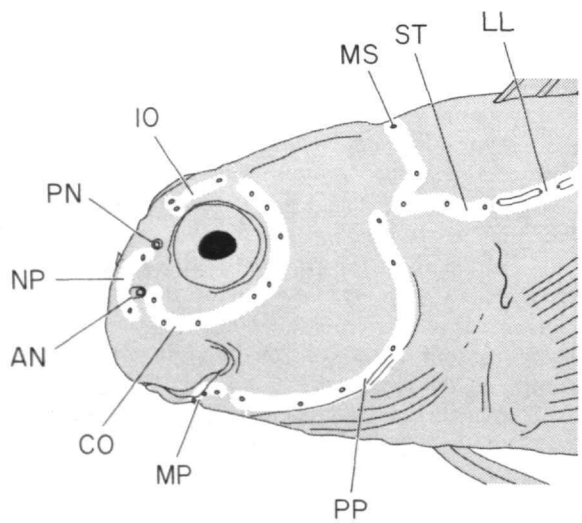

FIGURE 1.—Diagrammatic illustration of cephalic sensory pores in *Omobranchus.* (AN = anterior nostril; CO = circumorbital pores; IO = interorbital pores (both sides included in count); LL = lateral-line tubes (one complete tube and portion of second illustrated); MP = mandibular pores; MS = median supratemporal commissural pore; NP = prenasal pores; PN = posterior nostril; PP = preopercular pores; ST = supratemporal pores.)

The *lateral-line tubes,* when present, are raised, typically bipored tubes on the body in the area below the spinous dorsal fin. The tubes are usually not continuous with each other or with the posterior branch of the supratemporal pore series, although two or three tubes may be connected occasionally. The tubes are usually close together but may be widely separated from each other. Pitlike depressions are sometimes present along the route followed by the lateral-line tubes but were not included in the lateral-line tube counts. The anteriormost lateral-line tube rarely originates anterior to the level of the gill opening. In ascertaining the position of the posteriormost lateral-line tube relative to a dorsal-fin spine, those tubes that terminated at a level between two spines were recorded as reaching to below the level of the posteriormost of the two spines. Where lateral-line tubes were absent, they were recorded as reaching to below the level of dorsal-fin spine 0.

All species of *Omobranchus* except *O. banditus* possess a ventrally free fold of skin on the lower jaw near the corner of the mouth (Figure 2), which we term the *lower-lip flap.*

Color pattern descriptions are usually composites based on a number of specimens. For this reason no single specimen is likely to exhibit all features of

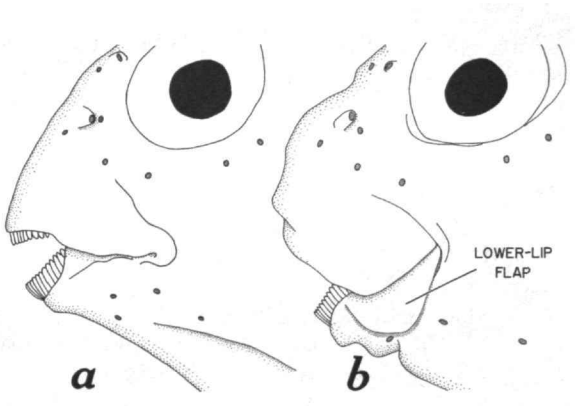

FIGURE 2.—Diagrammatic illustration of lower-lip flap in *Omobranchus*: *a*, lower-lip flap absent (only *O. banditus*); *b*, lower-lip flap present (all species except *O. banditus*).

the color pattern given for a species. We use "bars" and "bands" to refer to vertically oriented markings; "stripes" refer to longitudinally oriented markings.

Larvae are here defined as specimens in which there is a posteriorly directed projection at the angle of the preopercle (Figure 3). The projection apparently originates as a bony spine, which later becomes fleshy and flexible before being lost (absorbed?) entirely. Most larvae also possess a large area of dark melanophores on the pectoral fin and a relatively large gill opening. All collections, except one, that included larvae also included adults. The exception, which includes the smallest larvae, was a night collection made at the surface near a light, and may indicate that pelagic stages of *Omobranchus* are more common than the available evidence indicates.

The synonymies include only references to original species descriptions.

In the lists under "Material Examined" abbreviated locality data are given, followed by institutional abbreviations, catalog numbers (if cataloged), and, in parentheses, the number of specimens (if more than one) and size range in mm SL.

ABBREVIATIONS.—The following institutional abbreviations are used to denote the location of specimens studied.

AMNH	American Museum of Natural History, New York City
AMS	Australian Museum, Sydney (catalog numbers usually with the prefixes I, IA, and IB)
ANSP	Academy of Natural Sciences of Philadelphia
BMNH	British Museum (Natural History), London
BPBM	Bernice P. Bishop Museum, Honolulu

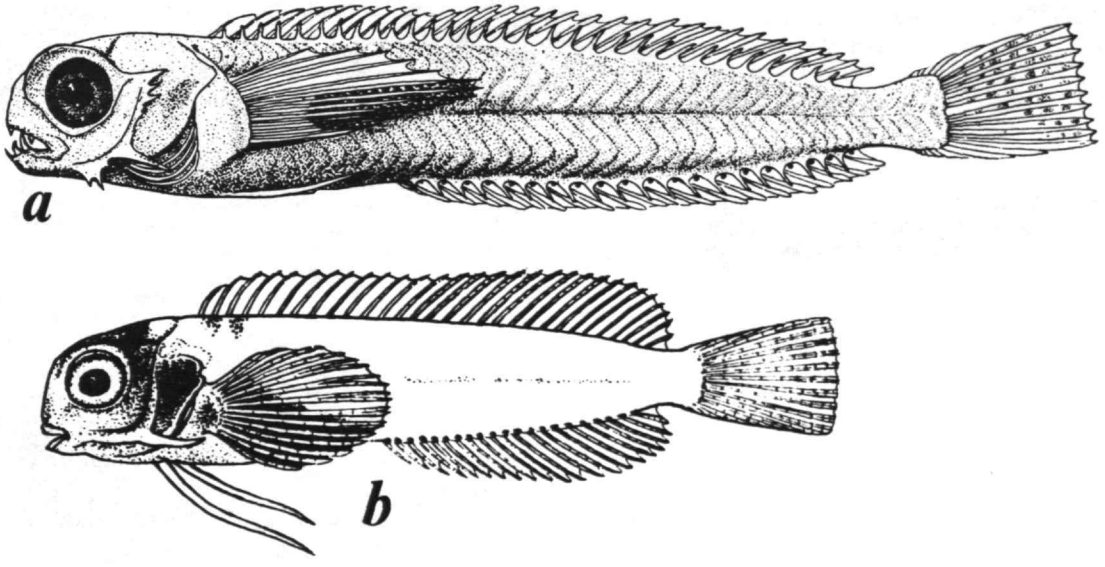

FIGURE 3.—Morphology of *Omobranchus* larvae: *a*, presumable larva of *O. lineolatus* (after Weber, 1913); *b*, presumable larva of *O. r. obliquus* (after Seale, 1935).

CAS	California Academy of Sciences, San Francisco (catalog or register numbers frequently with the prefixes SU or GVF)
DASF	Fisheries Research, Department of Agriculture, Stock and Fisheries, Kanedobu, Papua
FMNH	Field Museum of Natural History, Chicago
GCRL	Gulf Coast Research Laboratory, Ocean Springs, Mississippi
HUJ	Hebrew University, Department of Zoology, Jerusalem (catalog numbers frequently with the prefixes Fish, F, and E)
MCSN	Museo Civicio di Storia Naturale, Genova
MCZ	Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts
MNHN	Museum National d'Histoire Naturelle, Paris (catalog numbers frequently with a prefix A)
NFIS	Natur-Museum und Forschungs-Institut Senckenberg, Frankfurt
NMV	Naturhistorisches Museum, Vienna
QM	Queensland Museum, Brisbane (catalog numbers frequently with the prefix I)
RMNH	Rijksmuseum van Natuurlijke Historie, Leiden
RUSI	J.L.B. Smith Institute of Ichthyology, Rhodes University, Grahamstown, South Africa
SAM	South African Museum, Capetown
SIO	Scripps Institution of Oceanography, La Jolla, California (catalog numbers with the prefix JEM)
UG	University of Guam, Agana
UMML	School of Marine and Atmospheric Sciences, University of Miami, Florida
USNM	Division of Fishes, National Museum of Natural History, Smithsonian Institution, Washington, D.C. (catalog numbers of the former United States National Museum)
UZMK	Universitetets Zoologiske Museum, Copenhagen (catalog numbers with the prefixes CN and P)
WAM	Western Australian Museum, Perth (catalog numbers with the prefix P)
ZSIC	Zoological Survey of India, Calcutta (catalog numbers with the prefix F)
ZITU	Zoological Institute, University of Tokyo
ZMA	Zoologisch Museum, Universiteit van Amsterdam
ZMB	Institut für Spezielle Zoologie und Zoologisches Museum, Berlin (East)
ZSZM	Zoologisches Staatsinstitut und Zoologisches Museum, Hamburg

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Omobranchus Ehrenberg

Omobranchus Ehrenberg, in Valenciennes in Cuvier and Valenciennes, 1836:287 [first appearance in synonymy, subsequently made available by Swainson, 1839:274; type-species: *O. fasciolatus* Valenciennes, in Cuvier and Valenciennes, 1836, by monotypy].

Graviceps Fowler, 1903:170 [type-species: *Petroscirtes elegans* Steindachner, 1876, by original designation].

Cyneichthys Ogilby, 1910: 55 [type-species: *Blennechis anolius* Valenciennes, in Cuvier and Valenciennes, 1836, by original designation, in parentheses[1], and monotypy].

Poroalticus Fowler, 1931:403 [type-species: *Poroalticus sewalli* Fowler, 1931 (=*Blennechis punctatus* Valenciennes, in Cuvier and Valenciennes, 1836), by monotypy].

Pauloscirtes Whitley, 1935:351 [type-species: *Petroscirtes obliquus* Garman, 1903, by original designation].

Cruantus J. L. B. Smith, 1959: 234 [type-species: *Omobranchus dealmeida* J. L. B. Smith (=*Petroscirtes ferox* Herre, 1927), by original designation].

NOMENCLATURAL DISCUSSION.—The synonymy of *Omobranchus* was discussed by Springer (1972a) and will not be repeated here. However, some comment is required on the date and authorship of the name *Omobranchus*.

The genus *Omobranchus* and the species *Omobranchus fasciolatus* first appeared in Valenciennes (in Cuvier and Valenciennes, 1836) as follows:

> Le Blennechis fascié
> (*Blennechis fasciolatus*, nob.; *Omobranchus fasciolatus*, Ehremb.).

Valenciennes based his description on a plate that he erroneously assumed Ehrenberg had published; however, the actual appearance of the plate (and Ehrenberg's name, *Omobranchus fasciolatus*) did not appear until much later (Hemprich and Ehrenberg, 1899).

Thus, the first appearance of *Omobranchus* can be construed to have occurred in synonymy, and the same is true for *O. fasciolatus* Ehrenberg.

According to the *International Code of Zoological Nomenclature*, Article 11 (d), "A name first published as a synonym is not thereby made available unless prior to 1961 it has been treated as an available name with its original date and authorship, and either adopted as the name of a taxon or used as a senior homonym."

Swainson (1839:79) next mentioned *Omobranchus*, as follows:

"Lastly comes Dr. Rüppel's sub-genus *Petroscertes*, joined indeed to *Blennichus* by M. Valenciennes, but at once distinguished by a single series of small setaceous teeth, without the large canines of *Omobranchus* Ehr. (*Blennichus Val.*)." (Note misspelling of *Blennechis* and *Petroscirtes*).

On page 182, Swainson gives the genus *Blennius* under which he recognizes and characterizes several genus-group taxa. Among these is *Omobranchus*, but not *Blennechis*. On page 274, Swainson gives and characterizes "*Omobranchus* Ehrenberg" as a genus-group taxon under *Blennius*. He included several species in *Omobranchus*, among which are "*filamentosus*. Cuv. xi. 280." and "*fasciolatus*. Ehrenb. Ib. 287."

Although Swainson referred to "Cuv." for the last-mentioned names, it is obvious from the volume and page citations that he was referring to Valenciennes in Cuvier and Valenciennes (1836).

On the basis of Swainson's treatment of *Omobranchus* and *O. fasciolatus*, these names were made available with their original date and authorship. There is no need to consider *Omobranchus fasciolatus* Ehrenberg further as it is a junior objective homonym of *Blennechis fasciolatus* Valenciennes. However, the authorship of *Omobranchus* is a problem as the International Rules of Zoological Nomenclature furnish no guide as to how to assign authorship to names first appearing in synonymy. *Omobranchus* has been attributed to various authors: De Beaufort (in de Beaufort and Chapman, 1951) attributed it to Cuvier and Valenciennes; Springer (1963), to Swainson. We choose to recognize Ehrenberg as the author of *Omobranchus*, which action is in keeping with the senior author's recent treatments of the genus (Springer, 1968, 1972a).

DIAGNOSIS.—Dorsal-fin spines X–XIV (rarely X); segmented dorsal-fin rays 16–26; total dorsal-fin elements 28–37; anal fin II, 18–27; pectoral fin 12–14 (rarely 12 or 14 in any species); pelvic fin I,2; seg-

[1] For a discussion of type-species designations in parentheses, see Hubbs, et al., (1963).

mented caudal-fin rays 12–15 (modally 13 in all species); dorsal + ventral procurrent caudal-fin rays 8–18 (rarely 8, 17, or 18), about equally divided between dorsal and ventral portions; all fin elements unbranched except for an occasional caudal-fin ray; precaudal vertebrae 10–12; caudal vertebrae 26–33; total vertebrae 36–43; epipleural ribs 10–25 (rarely 10 or 25); ventral hypural plate (Springer, 1968) autogenous; circumorbital bones 4 or 5; postcleithra 2, not fragmented; nasal bones separate in juveniles and adults; dentaries connected by suturing joint (except in mature females of *O. fasciolatoceps,* where the dentaries merely abut); enlarged posterior canine posteriorly on each side of each jaw (except in mature females of *O. fasciolatoceps,* which lack canines); total premaxillary incisoriform teeth in specimens 25 mm SL and larger 14–38; total dentary incisoriform teeth in specimens 25 mm SL and larger 16–48; kinethmoid (Springer, 1968) absent; basisphenoid well developed; interopercle with posteriorly projecting spur (Springer, 1968, fig. 16); pterosphenoid reduced, excluded from external surface of skull; frontal bones not fused in adults; interorbital sensory pores 1–4 (modally 2 or 3 in all species); circumorbital sensory pores 6–10 (modally 7–9); prenasal sensory pores present (except absent in *O. steinitzi*); anterior and posterior nostrils present; bipored lateral-line tubes on body 0–9; gill opening in specimens 25 mm and larger varying from restricted entirely above level of dorsalmost pectoral-fin ray to extending ventrally to level of 8th pectoral-fin ray; raised, bladelike, fleshy crest on top of head present or absent; no cirri on head (the anterior nostrils of *Omobranchus* exit from short, fleshy tubes that might be confused with cirri; only *Laiphognathus* in the Omobranchini has head cirri, and these arise from the anterior and posterior rims of both the anterior and posterior nostrils).

COMPARISONS.—*Omobranchus* is most similar to *Omox* and *Parenchelyurus* within the Omobranchini. It differs from *Omox* in lacking a kinethmoid bone, in having strongly modally 2–3 interorbital pores (versus 4 in *Omox*), in having a median predorsal supratemporal commissural pore (usually absent in *Omox*), and in having the gill opening rarely extending ventrally below the 6th pectoral-fin ray (opposite 8th–11th ray in *Omox*). *Omobranchus* differs from *Parenchelyurus* in having 3, as opposed to 2, mandibular sensory pores (although, exceptional specimens of *Omobranchus* may have 2 on one side). Inasmuch as pores are often difficult to see in the Omobranchini, it is possible that specimens of the two species of *Parenchelyurus* may be erroneously assigned to *Omobranchus.* The color patterns of the two *Parenchelyurus* species, however, are quite unlike those of any *Omobranchus* species (see Springer, 1972a, figs. 15–16).

SEXUAL DIMORPHISM.—The species of *Omobranchus* exhibit a variety of different types of sexual dimorphism. In some species the sexes are so different that they might appear, on superficial examination, to belong to separate species.

PRIMARY SEXUAL DIMORPHISM.—The primary sexual dimorphism of *Omobranchus* is that typical of most blenniids. The first (and occasionally the second) anal-fin spine of females is greatly reduced, not visible externally, and completely included in a somewhat triangular, bilobed, fleshy swelling embodying a relatively large, pocketlike urogenital opening and a papilla, which Tomiyama (1952) found to indicate the tip of the first anal-fin spine. The papilla is greatly reduced and frequently not noticeable in some species (*O. punctatus, mekranensis, banditus*). In males (except *O. punctatus, mekranensis, banditus* and *steinitzi*) the anal-fin spines are usually distinct and the urogenital opening is a minute orifice at the tip of a short, usually truncate, tube. In the excepted species one or both anal-fin spines are reduced, closely applied, imbedded in thick skin, and not ordinarily visible externally. The primary sexual dimorphism of *O. elegans* has been figured by Tomiyama (1950), of *O. loxozonus* by Tomiyama (1951), of *O. fasciolatoceps* (as *O. uekii*) by Tomiyama and Abe (1953) and of *O. punctatus* by Tomiyama (1952).

SECONDARY SEXUAL DIMORPHISM.—Most of the secondary sexual modifications found in *Omobranchus* appear to confer a higher degree of visibility on males (larger size, larger structures, more striking color pattern). Higher visibility may function in sex recognition and/or in territory maintenance. Modifications in females (more teeth, and other structural changes in the jaws of one species) serve an unknown function. Following are the main secondary sexual modifications noted.

1. *Standard Length*: In 18 of the 20 taxa of *Omobranchus* the largest male is larger than the largest female (Table 4; a female *O. verticalis* arrived too late to be included in the table; see species account).

TABLE 4.—*Comparisons of sizes (standard length in mm) of species and subspecies of* Omobranchus

Species or subspecies	Largest male	Largest female	Largest larva	Smallest nonlarva
anolius	60.6	47.0	---	17.2
aurosplendidus	112.2	97.7	---	75.8
banditus	55.8	46.2	---	21.2
elegans	64.3	58.0	---	16.6
elongatus	53.8	45.4	13.0	13.2
fasciolatoceps	63.4	61.6	---	32.5
fasciolatus	49.5	48.4	---	23.6
ferox	59.9	ca. 48	---	30.4
germaini	65.4	ca. 49	16.2	17.0
lineolatus	36.3	66.8	13.0[1]	31.1
loxozonus	70.7	57.0	---	19.4
mekranensis	50.7	43.5	---	33.3
meniscus	60.1	54.8	---	54.8
punctatus	95.0	77.7	18.1	17.2
r. rotundiceps	74.2	51.9	13.9	16.9
r. obliquus	56.2	39.7	12.6[2]	12.7
steinitzi	32.0	25.3	---	25.3
verticalis	49.5	---	---	33.3
woodi	81.1	62.1	---	23.7
zebra	48.1	56.5	ca. 13.5[3]	25.2

[1]See O. lineolatus, discussion under geographical distribution.
[2]Based on types of Petroscirtes samoensis. See O. r. obliquus nomenclatural discussion.
[3]Based on information in Bhattacharya (1916).

Of the remaining two species, *O. lineolatus* is known from only four specimens; and *O. zebra* is represented in our material by 20 specimens. Of the other 18 species, 11 are known from over 50 specimens each. Generally, in any single, large collection of a species of *Omobranchus* the largest specimens are males. Larger size for males is, generally, a typical condition for blenniids, and probably indicates territoriality (Collette and Yerger, 1962).

2. *Crest*: A fleshy, bladelike crest on top of the head is found in at least some specimens of eight species of *Omobranchus* (Table 5). The standard length at which the crest first becomes apparent is variable in these species and may be attributable as much to state of sexual maturity as to size attained. Inadequate data are available for most of these species; for instance, no female smaller than 75 mm and no male smaller than 99 mm are known for *O. aurosplendidus*. All specimens of *O. aurosplendidus* have a crest; the vertical height of the crest ranges from 5.8–7.7% SL in males and from 2.6–4.8% in females, and the smallest member of each sex has the proportionally highest crest for its sex. In *O. fasciolatus* the crest is not, or scarcely, apparent in many males less than 33 mm (but always present, although irregularly variable in size, in larger males); it is absent, or at best poorly developed, in females. In *O. banditus* a crest is apparent in males over 30 mm but never present in females. All specimens of *O. woodi* (23.7–81.1 mm), of *O. fasciolatoceps* (32.5–63.4 mm), and of *O. mekranensis* (33.3–50.7 mm) have well-developed crests. The

TABLE 5.—*Frequency distributions and character states for certain characters in* Omobranchus *species* (*P* = *present*; *A* = *absent*)

Species	Dorsal-fin spines				Segmented dorsal-fin rays										Total dorsal-fin elements							
	10	11	12	13	16	17	18	19	20	21	22	23	24	25	26	28	29	30	31	32	33	34	35	36	37
anolius		5	47	1		10	39	4									12	39	2						
aurospleniduus	1	8	1											7	3									7	3
banditus		2	49	3				8	42	4									8	41	5				
elegans			160	6					3	71	92	9								3	57	95	10		
elongatus	(see Table 6)				(see Table 6)											(see Table 6)									
fasciolatocepe			21					1	6	12	2								1	6	12	2			
fasciolatus	(see Table 8)				(see Table 8)											(see Table 8)									
ferox	(see Table 9)				(see Table 9)											(see Table 9)									
germaini	(see Table 10)				(see Table 10)											(see Table 10)									
lineolatus		5						3	1	1									3	1	1				
loxosomus	(see Table 12)				(see Table 12)											(see Table 12)									
mekranensis		1	12						7	6										8	5				
meniscus			2					2											2						
punctatus	(see Table 13)				(see Table 13)											(see Table 13)									
rotundiceps	(see Table 15)				(see Table 15)											(see Table 15)									
steinitzi		1	3		3	1										4									
verticalis			3					2	1										2	1					
woodi		1	35	2				11	20	8									10	21	8				
zebra			21				2	12	7									2	12	7					

Species	Segmented anal-fin rays										Precaudal vertebrae			Caudal vertebrae							Total vertebrae						
	18	19	20	21	22	23	24	25	26	27	10	11	12	26	27	28	29	30	31	32	36	37	38	39	40	41	42
anolius		1	31	19	2						41	1		8	32	1			6	4	9	30	2				
aurospleniduus								1	7	1	9	1														5	5
banditus				7	33	14					37	16			1	19	28	4					9	36	8		
elegans				2	46	105	11				3	151	1			7	90	59	4					8	89	54	4
elongatus	(see Table 6)										(see Table 6)			(see Table 6)							(see Table 6)						
fasciolatocepe					5	13	3				20				1	7	9	2					1	7	9		
fasciolatus	(see Table 8)										(see Table 8)			(see Table 8)							(see Table 8)						
ferox	(see Table 9)										(see Table 9)			(see Table 9)							(see Table 9)						
germaini	(see Table 10)										(see Table 10)			(see Table 10)							(see Table 10)						
lineolatus			4	-	-	1					5			2	-	-	1				2	-	-	1			
loxosomus	(see Table 12)										(see Table 12)			(see Table 12)							(see Table 12)						
mekranensis					9	4					10					8	2							10	3		
meniscus				1	1						2			1	1						1	1					
punctatus	(see Table 13)										(see Table 13)			(see Table 13)							(see Table 13)						
rotundiceps	(see Table 15)										(see Table 15)			(see Table 15)							(see Table 15)						
steinitzi	4										4			3							3						
verticalis					2						3				2	1						2	1				
woodi			6	26	6							33	5		11	22	5						8	23	7		
zebra			1	14	6						20				14	6						14	6				

Species	Lateral-line tubes										Last lateral-line tube below dorsal-fin spine											
	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	10	11
anolius	41										41											
aurospleniduus	2	5	2								2	-	4	3								
banditus						3	8	37	2	1									3	11	34	3
elegans	5	107									5	1	51	26								
elongatus	(see Table 6)										(see Table 6)											
fasciolatocepe				2	3	5	8	1	1								1	1	4	2	7	5
fasciolatus	(see Table 8)										(see Table 8)											
ferox	(see Table 9)										(see Table 9)											
germaini	(see Table 10)										(see Table 10)											
lineolatus					1	-	2	1	1										1	-	-	1	3
loxosomus	12	100	65	16	3						12	18	91	52	15	1	2					
mekranensis							2	7													1	5	4
meniscus	2										2											
punctatus	(see Table 13)										(see Table 13)											
rotundiceps	(see Table 15)										(see Table 15)											
steinitzi					1	1	2										1	1	1	1		
verticalis				1	1	1											2	-	1			
woodi	1	-	1	2	6	21	2				1	-	1	-	-	4	4	9	8	4	2	
zebra		6	6	7	1								5	7	5	2	-	1				

Species	Dorsal + ventral procurrent caudal-fin rays										Lower end of gill opening opposite pectoral-fin ray							
	9	10	11	12	13	14	15	16	17	18	0	1	2	3	4	5	6	7
anolius			12	16	9	5					35	5						
aurospleniduus		3	1	6							9							
banditus				3	8	18	12	12			42							
elegans	1	1	29	50	37	12	1				1	6	37	52	18	3		
elongatus	(see Table 6)										(see Table 6)							
fasciolatocepe			2	12	4						20							
fasciolatus	(see Table 8)										51	2	1					
ferox		1	-	24	16	21	1							3	25	25	8	
germaini			2	9	34	99	62	32	1	3	(see Table 10)							
lineolatus			1	1	-	3					5							
loxosomus		3	13	31	43	15	7					7	40	36	6			
mekranensis				1	1	9					11							
meniscus	1	1												2				
punctatus	(see Table 13)										346	26						
rotundiceps	(see Table 15)										(see Table 15)							
steinitzi		2	-	2							3							
verticalis						2	1				1	2						
woodi				9	9	16	2				31	1						
zebra			3	8	4	5					19	1						

Species	Epipleural ribs														Interorbital pores				Circumorbital pores					Fleshy crest on head of	
	10	11	12	13	14	15	16	17	18	19	20	21	22	23	1	2	3	4	6	7	8	9	10	male	female
anolius		14	13	13												2	35	3		2	35	2	1	P	P or A
aurospleniduus		2	7	1													9			7	2			P	P
banditus						1	4	2	16	22	5	3				4	50			1	48	5		P or A	A
elegans		2	3	39	56	42	1	-	1							4	154	2	2	142	16			A	A
elongatus	(see Table 6)														1	2	243	4		4	241	5		A	A
fasciolatocepe		4	15	1												18	1			3	17			P	P
fasciolatus	(see Table 8)															55				1	49	4		P or A	P or A
ferox	1	17	38	1												2	59				57	2		A	A
germaini	(see Table 10)															2	242	8	(see Table 10)					A	A
lineolatus			2	3													5				5			A	A
loxosomus			2	24	45	34	6									2	186	7		1	186	8		A	A
mekranensis								1	4	2	3	-	-	1		10					10			P	P
meniscus		1	1														2				2			P	A
punctatus	(see Table 13)															7	504	16	2	24	609	19	2	A	A
rotundiceps	(see Table 15)														(see Table 15)				(see Table 15)					A	A
steinitzi					3	1											4				4			A	A
verticalis				3													2	1			2	1		A	?
woodi					1	2	10	11	9	4						1	33	1		1	33	1		P	P
zebra			2	14	4												20			3	16			A	A

crests of males of these three species are always relatively larger than those of comparably sized females; a few *O. fasciolatoceps* females have crests as high as those of males of comparable size, but the lateral area of the female crests was obviously smaller (extreme development of the crest in an *O. fasciolatoceps* male is illustrated in Tomiyama and Abe, 1953). In *O. anolius* all the males available (34–60 mm) have very well-developed crests, whereas females (28–46 mm) either have no crest or a very poorly developed one, usually represented by a ridge less than 0.5 mm high. The single available male, 60 mm, of *O. meniscus* has a crest, whereas the single available female, 54 mm, has none.

3. *Enlarged Head*: In *O. elegans, rotundiceps, loxozonus,* and possible other species, the heads of many of the larger, or presumably mature, males appear to be enlarged or inflated, particularly dorsally, giving the impression of a slight hump. After long preservation, the skin on top of the head becomes flaccid, and in the case of shrinkage is drawn into a low crestlike fold.

4. *Anal-fin Tabs*: These are small, lappetlike structures of apparently noncellular composition that form subdistally to the tips of the segmented rays of the anal fin of presumably mature males (see Figure 33*b* and Springer, 1972a, fig. 8*b*). The tabs are easily scraped off and are usually not found on old or poorly preserved specimens. Tabs develop in most species of *Omobranchus* and may possibly occur even in those species for which we have no records of tabs. The function of the tabs is not known.

5. *Flattened Tips of Dorsal- and Anal-fin Segmented Rays*: The tips of the more anterior anal-fin rays and/or more posterior dorsal-fin rays of presumably mature males of several species become expanded or spatulate. The function of these structures is not known.

6. *Color Pattern*: The males of *Omobranchus* are generally darker than females, and the bands on the body more completely developed than on females. In *O. elongatus, rotundiceps, loxozonus, germaini,* and *fasciolatus,* most males exhibit a large, dark spot or group of spots covering the midportions of the membranes of the central segmented dorsal-fin rays. Females of these species lack this marking, although a few females of *O. germaini* exhibited indications of the spot. Males of *O. ferox* usually have a noticeable dusky spot that females lack on the posteriormost segmented dorsal-fin rays. On the other hand, females of *O. aurosplendidus* have an intense dark spot, which males lack, at the anterior end of the dorsal fin. The three males available of *O. verticalis* have a dark spot at the anterior end of the dorsal fin. In the single available female of this species the spot is present but not quite as dark as in the males.

7. *Fin Spine and Ray Lengths*: In most species of *Omobranchus* the larger, presumably mature, males have proportionately longer segmented dorsal-fin rays (particularly the more posterior rays) than do females. In the males the tips of the rays tend to become free of the interradial membranes. This condition reaches an extreme in some large males of *O. anolius,* where the rays become long and filamentous, attaining a length equal to at least one-third the standard length. All males of *O. aurosplendidus* (smallest available, 99 mm) are distinguished from all females in having most of the dorsal-fin spines prolonged into filaments, the longest equaling more than 40 percent of the standard length. Males of *O. elongatus, rotundiceps, germaini,* and *loxozonus* typically have one or more caudal-fin rays prolonged and filamentous, a condition rarely present in females.

8. *Jaw Modifications*: Females of one species of *Omobranchus, O. fasciolatoceps,* with spent gonads exhibit modifications of the jaws that are not approximated in any other species of blenniid. These females have lost the posterior canines in both jaws. The hingelike, interdigitating dentary processes that connect the dentaries anteriorly are also lost and replaced by a smooth joint at the symphysis. Along with these modifications, the gape is enlarged, a large flap of skin from the posterior end of each side of each jaw is extended partway across the floor and roof of the mouth, both jaws become broadly rounded anteriorly, the incisoriform teeth become strongly recurved, and the number of teeth in the upper jaw is greatly increased. The function of these modifications is unknown, but they may indicate mouth brooding, a habit not yet reported for blennioids. Females of *O. fasciolatoceps* with ripe, or near ripe, ovaries exhibit no modifications of the jaws.

9. *Number of Teeth*: Four of the nine species of *Omobranchus* (*elongatus, germaini, punctatus, rotundiceps*) that were statistically tested for sexual

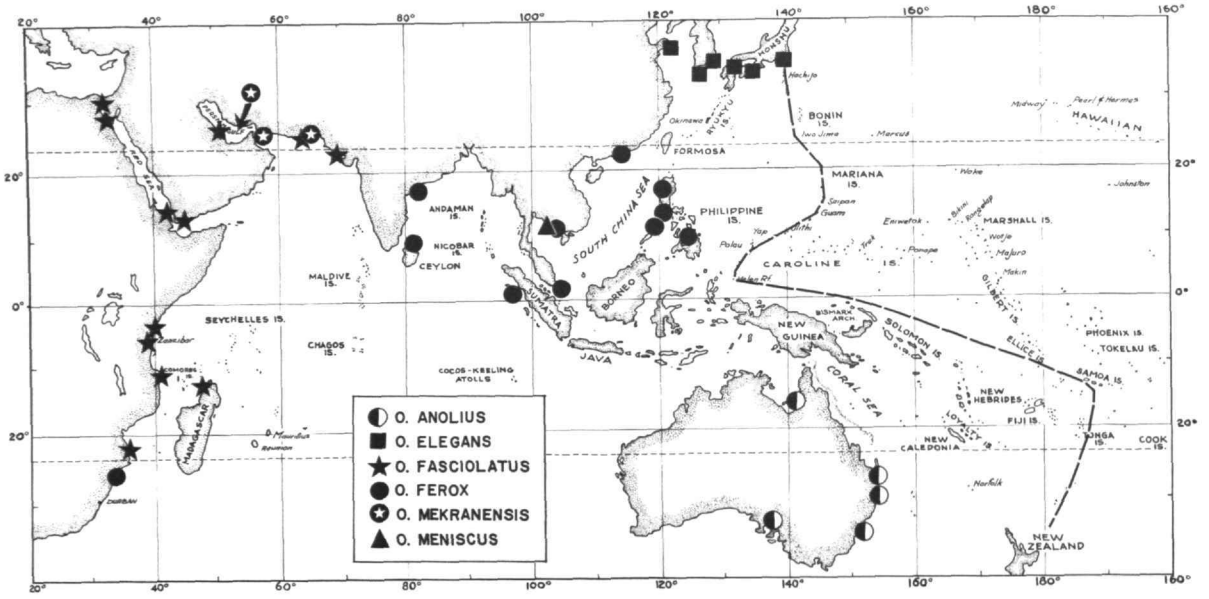

FIGURE 4.—Distribution of certain species of *Omobranchus*. Dashed line represents approximate position of Andesite Line.

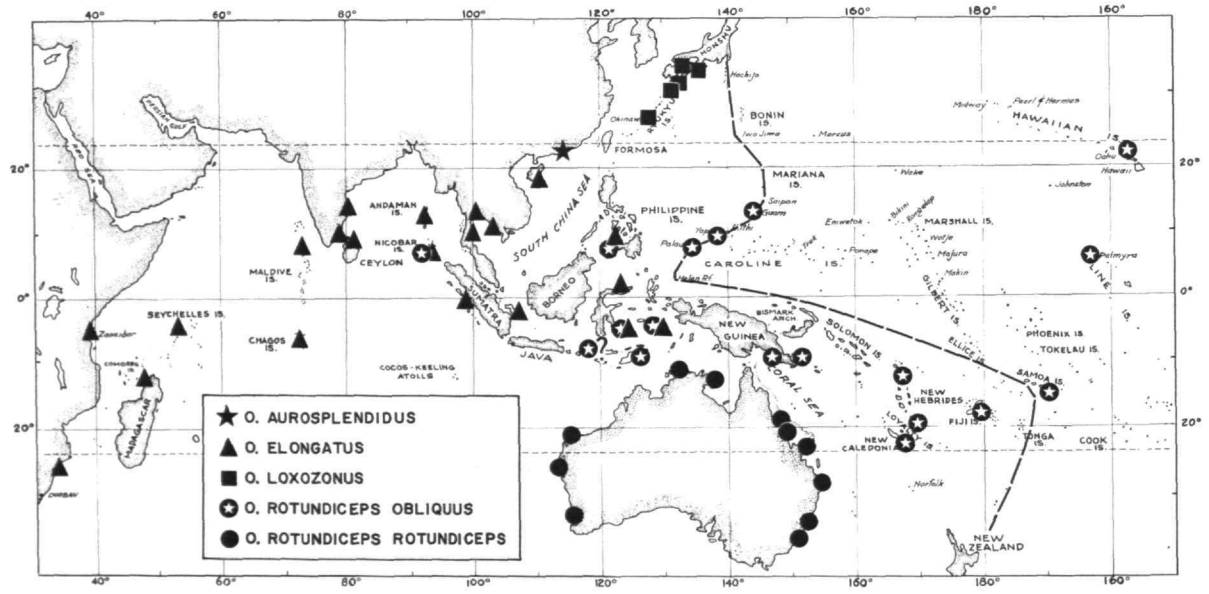

FIGURE 5.—Distribution of certain species and subspecies of *Omobranchus*. Dashed line represents approximate position of Andesite Line. Questionable locality record indicated (see "Geographic Distribution" under *O. r. obliquus*).

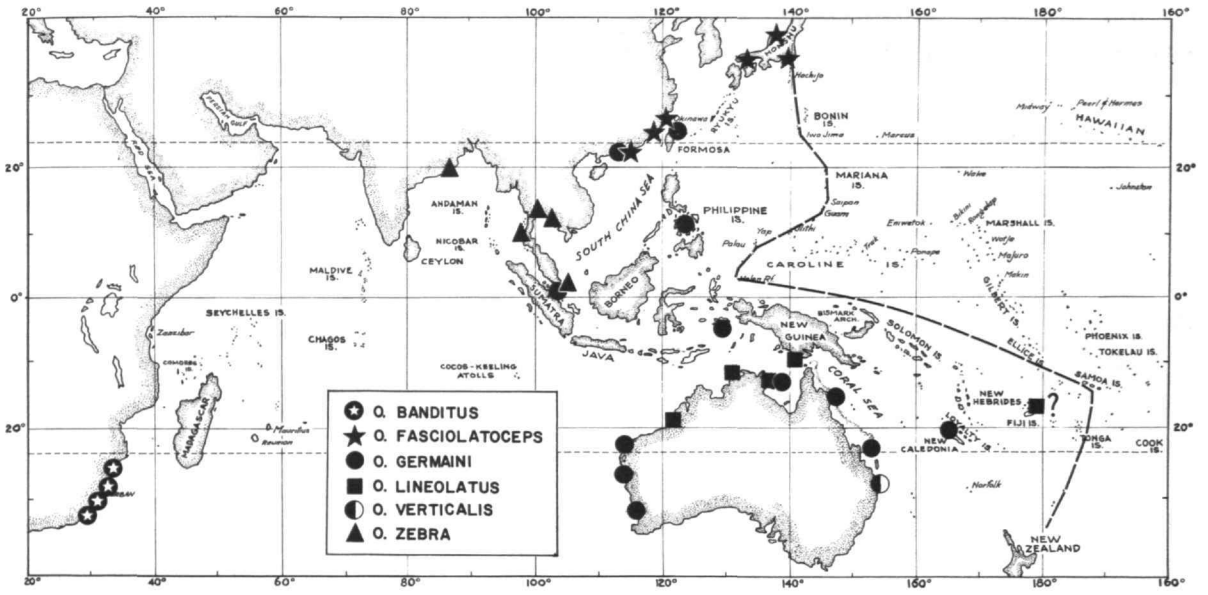

FIGURE 6.—Distribution of certain species of *Omobranchus*. Dashed line represents approximate position of Andesite Line. Questionable locality record indicated (see "Geographic Distribution" under *O. lineolatus*).

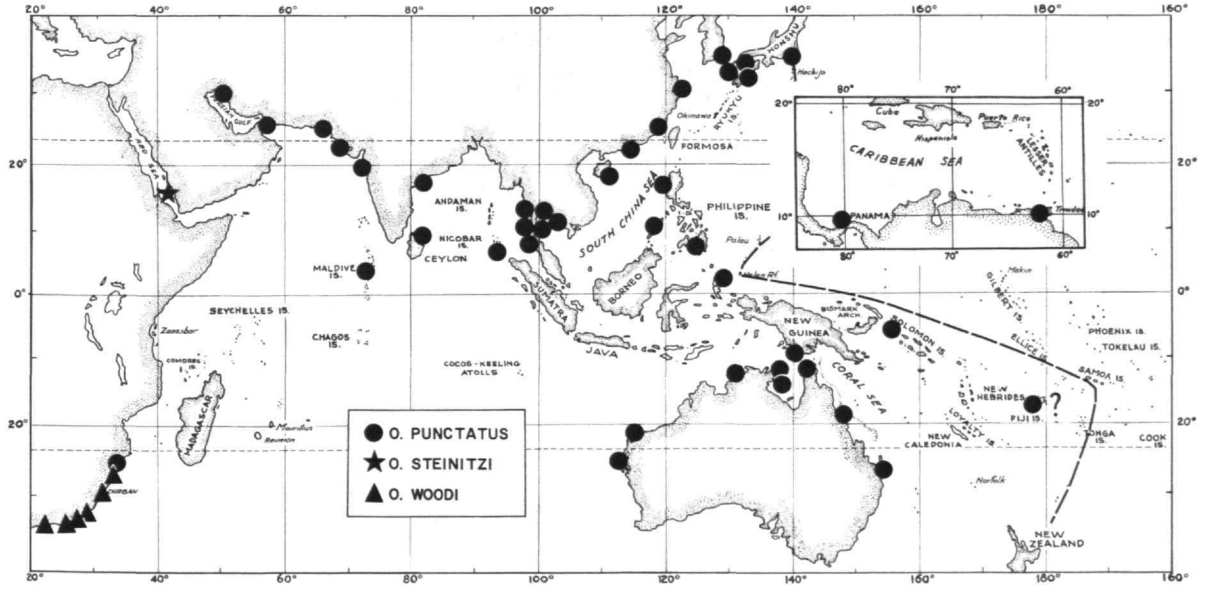

FIGURE 7.—Distribution of certain species of *Omobranchus*. Dashed line represents approximate position of Andesite Line. Questionable locality record and extralimital distribution indicated for *O. punctatus* (see "Geographic Distribution" under *O. punctatus*).

dimorphism in number of incisoriform teeth exhibited such dimorphism, although the dimorphism was not present in all populations of a species, nor did it necessarily involve the teeth in both jaws. The results of the tests are given in Table 3. A fifth species, *O. fasciolatoceps*, which was not tested, also showed differences between males and females in number of lower jaw teeth (Figure 41), but not in number of upper jaw teeth (Figure 40). In species where there was sexual dimorphism, females had more teeth than males. Springer (1971) found significant sexual differences in number of lower jaw teeth in three of 18 species of the blenniid genus *Ecsenius* (upper jaw teeth were not examined for dimorphism). In all three species females had more teeth than males (in contrast to *Omobranchus*, tooth numbers in *Ecsenius* are not related to SL). We are unable to explain why females should have more teeth, or why this type of sexual dimorphism is not exhibited consistently in all populations within a species.

ZOOGEOGRAPHY.—The distribution of *Omobranchus* (Figures 4–7) extends from the northern Red Sea and southern Africa in the western Indian Ocean, to the Samoan, Line, and Hawaiian islands in the central Pacific Ocean (the introduced populations in the Caribbean Sea are ignored here; see geographic distribution discussion under *O. punctatus*).

It is of interest to compare the distributions of *Omobranchus* species with those of another blenniid genus, *Ecsenius*, which has about the same number of species (Springer 1971, 1972*b*) as *Omobranchus* but appears to have different ecological requirements and behavior. (*Ecsenius* is not as secretive and often occurs in deeper offshore waters than does *Omobranchus*. The blenniid genus *Entomacrodus* is perhaps more similar to *Omobranchus* in ecological requirements and behavior than is *Ecsenius*, but there are few parallels in the distributions of *Omobranchus* and *Entomacrodus* species; see Springer, 1967, for *Entomacrodus*.) In general, *Omobranchus* occurs farther north and south than does *Ecsenius*.

Five species of *Omobranchus* occur only in the western Indian Ocean and Red Sea. Of these, two (*woodi, banditus*) occur only in southern Africa, where *Ecsenius* has not been reported, and one (*steinitzi*) is known only from the Red Sea, where there are three endemic species of *Ecsenius*. *Omobranchus mekranensis* occurs only in the Persian Gulf and Gulf of Oman, which distribution is similar to that of *Ecsenius pulcher*, and *O. fasciolatus*, which is widespread in the western Indian Ocean, closely parallels the distribution of *Ecsenius nalolo*. There are two endemic species and one endemic subspecies of *Omobranchus* (*verticalis, anolius, r. rotundiceps*) in Australia, as well as two or three more broadly distributed species (*punctatus, germaini, lineolatus?*). These compare well with *Ecsenius*, which has one endemic species, one endemic population of another species, and two more broadly distributed species in Australia; however, *Ecsenius* has not been reported from Western Australia where *Omobranchus* is common. With regard to the remaining species of *Omobranchus* and *Ecsenius*, there does not appear to be much similarity in individual species distributions.

With the exception of one subspecies, *O. r. obliquus*, *Omobranchus* is limited in distribution to the area west of the Andesite Line (MacDonald, 1949; modified by later authors). Of the other ten species in the tribe Omobranchini (Springer, 1972a), seven occur only west of the Andesite Line. Of the three species that occur east of the line, one, *Parenchelyurus hepburni*, barely transcends the Line eastward; one, *Enchelyurus ater*, barely transcends the Line westward, and one, *Enchelyurus brunneolus*, is found only well east (Hawaii) of the Line.

The Andesite Line marks the separation of the continental from the oceanic rocks. The oceanic rocks are of more recent age than the continental rocks, and apparently there has been insufficient time for *Omobranchus* to have spread fully into Oceania. Although the continental areas may offer a greater variety of niches that are suitable for *Omobranchus* (and other fish genera), and thus have enhanced speciation of the genus in these areas, it seems improbable that the oceanic areas provide niches enough for only one species of *Omobranchus*. The evidence, therefore, favors a continental area as the area of origin of *Omobranchus*, and also indicates that the oceanic fish fauna generally is probably derivative of the continental fauna. Ladd (1960), however, has presented evidence favoring the dispersal of marine faunas (primarily molluscan) westward from Oceania to the andesite areas.

Key to the Species and Subspecies of *Omobranchus*

1. Total dorsal-fin ray elements 28; segmented anal-fin rays 18; prenasal pores absent ..... ***steinitzi,*** new species (Red Sea)

   Total dorsal-fin ray elements more than 28 (more than 29 except in *anolius* from Australia); segmented anal-fin rays more than 18 (more than 19 except in *anolius,* which rarely has 19); prenasal pores present 2

2. Segmented dorsal-fin rays 25–26; total dorsal-fin elements 36–37; bladelike crest present on top of head; mature males with anterior dorsal-fin spines filamentous (Figure 9) ..... ***aurosplendidus*** (South China Sea)

   Segmented dorsal-fin rays 17–24 (rarely 24); total dorsal-fin elements 29–36, but if more than 34 no bladelike crest on top of head; mature males without filamentous anterior dorsal-fin spines 3

3. Body covered with dense, randomly distributed sprinkling of fine black spots (Figure 12); circumorbital pores 6–8 (strong mode of 7); lateral-line tubes 0–1 ..... ***elegans*** (Japan, China, Korea)

   Body not covered with fine sprinkling of numerous black spots (*anolius,* from Australia, with up to 5 more or less longitudinal rows of dark spots); circumorbital pores 7–10 (strong mode of 8 or 9 pores; 7 pores common only in Guam population of *rotundiceps*); lateral-line tubes 0–9 4

4. Lower-lip flap absent (Figure 2*a*); fleshy bladelike crest on top of head present on males over 30 mm SL (absent on females); gill opening restricted to area above level of dorsalmost pectoral-fin ray; lateral-line tubes 5–9; posteriormost tube reaching to below level of 8th–11th dorsal-fin spine ..... ***banditus*** (southeastern Africa)

   Lower-lip flap present (Figure 2*b*); fleshy bladelike crest on top of head present or absent on males over 30 mm (present or absent on females); gill opening varying from restricted to area above level of dorsalmost pectoral-fin ray to extending ventrally to opposite 6th ray; lateral-line tubes 0–9; posteriormost tube, when tubes present, reaching to below level of 1st–12th dorsal-fin spine 5

5. Conspicuous, slender, black, crescentic mark extending dorsally from dorsoposterior orbital margin (Figure 25); no lateral-line tubes; gill opening extending ventrally to opposite 3rd pectoral-fin ray; slender fleshy crest present on top of head of males only ..... ***meniscus,*** new species (Gulf of Thailand)

   No black, crescentic mark on head; lateral-line tubes present or absent; gill opening varying from restricted to area above level of dorsalmost pectoral-fin ray to extending ventrally to opposite 6th ray; slender fleshy crest present or absent on top of head of males and females 6

6. Two to five more or less longitudinal rows of small black spots on body, overlying other features of color pattern; well-developed bladelike fleshy crest on top of head of males, poorly developed or absent on females; no lateral-line tubes; posterior segmented dorsal-fin rays of mature males becoming long and filamentous; gill opening restricted to area dorsal to dorsalmost pectoral-fin ray ..... ***anolius*** (eastern Australia)

   No rows of black spots on body overlying color pattern; fleshy crest present or absent on top of head of males and females; lateral-line tubes present or absent; posterior segmented dorsal-fin rays never filamentous; gill opening varying from restricted to area dorsal to dorsalmost pectoral-fin ray to extending ventrally to opposite 6th ray 7

7. Fleshy bladelike* crest present on top of head (possibly absent in specimens under 33 mm SL); gill opening usually restricted to area dorsal to level of dorsalmost pectoral-fin ray (occasionally reaching opposite 1st ray) 8

   No fleshy bladelike* crest on top of head; gill opening varying from restricted to area dorsal to level of dorsalmost pectoral-fin ray to extending ventrally to opposite 6th ray 11

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* In large or mature males of *O. rotundiceps* and *O. loxozonus* the head may be fleshy and dorsally swollen. In preservative the head often shrinks, causing the skin in the dorsal region of the head to form a loose, fleshy fold that might be confused with a crest. Males with swollen heads usually also have the dorsal and/or ventral lobes of the caudal fin produced as filaments, a condition not present in any of the species that fall into key couplets 8–10.

8. Interorbital pores 3; precaudal vertebrae 11–12; epipleural ribs 14–19 (rarely 14) ..... ***woodi*** (southeastern Africa)

   Interorbital pores 2; precaudal vertebrae 10–11; epipleural ribs 10–23 9

9. Segmented dorsal-fin rays 18–19; segmented anal-fin rays 20–22; precaudal vertebrae 10; males frequently with noticeable dark or dusky spot at midlevel of central segmented dorsal-fin rays; epipleural ribs 10–13 ..... ***fasciolatus*** (western half of Indian Ocean, including Red Sea)

   Segmented dorsal-fin rays 19–22 (rarely 19); segmented anal-fin rays 22–24; precaudal vertebrae 10–11; males without noticeable dark or dusky spot on segmented ray portion of dorsal fin; epipleural ribs 11–23 10

10. Height of crest on top of head 3.1–8.2% SL; mature females without posterior canines in either jaw and with more than 30 incisoriform teeth in lower jaw; both anal-fin spines of males discernible externally; precaudal vertebrae 10; epipleural ribs 11–13 ..... ***fasciolatoceps*** (Japan, China, South China Sea)

    Height of crest on top of head 1.1–4.5% SL; mature females with posterior canines in both jaws and fewer than 30 incisoriform teeth in lower jaw; 1st, and frequently 2nd, anal-fin spines of males reduced, not discernible externally; precaudal vertebrae 11; epipleural ribs 17–23 ..... ***mekranensis*** (Persian Gulf; West Pakistan)

11. Interorbital pores 2 12

    Interorbital pores 2–4 (2 in fewer than 0.5% of specimens) 13

12. Gill opening restricted to area above level of dorsalmost pectoral-fin ray; lateral-line tubes 3–8 (rarely 3 or 4), extending posteriorly to below level of 7–10th dorsal-fin spine ..... ***fasciolatus*** (western half of Indian Ocean including Red Sea)

    Gill opening extending ventrally to level of 3rd–5th pectoral-fin ray; lateral-line tubes 0–4, extending posteriorly no farther than to below level of 6th dorsal-fin spine ..... ***rotundiceps obliquus*** (Pacific Islands)

13. Head more than 24.0% SL in specimens 25–48 mm SL, and more than 23.5% SL in specimens 53–56 mm SL; gill opening restricted to area dorsal to level of dorsalmost pectoral-fin ray (reaching to opposite first ray in only one 25 mm specimen); caudal-fin rays never filamentous 14

    Head less than 24.0% SL in specimens 25–48 mm SL, and less than 23.5% SL in specimens over 42 mm SL; gill opening varying from restricted to area dorsal to level of dorsalmost pectoral-fin ray to extending ventrally to opposite 6th ray; caudal-fin rays filamentous in males of some species (Figures 13, 15, 19, 23, 28) 15

14. Dorsal-fin spines 12; lateral-line tubes 1–4; pale interspaces separating broad, dusky bands on side of head without small, dark spots; dark spot on side of head posterior to eye an intensification of dark head band (Figures 33*a*, 34) ..... ***zebra*** (India, South China Sea)

    Dorsal-fin spines 11; lateral-line tubes 6–8; pale interspaces separating broad, dusky bands on head with small, dark spots; large, dark, oval spot with pale margin on side of head posterior to eye distinct from dark head bands ..... ***lineolatus*** (Australia, New Guinea, Candavu)

15. Broad, dusky to dark band, with pale margin, extending dorsally from one side of body to other in region just anterior to dorsal fin (band occasionally broken into 3 blotches: 1 on each side and 1 medial); several slender, dusky or dark stripes on side of body in region covered by appressed pectoral fin; gill opening restricted to area dorsal to level of dorsalmost pectoral-fin ray (occasionally extending ventrally to opposite dorsalmost ray); caudal-fin rays never filamentous; 1st, and frequently 2nd, anal-fin spine of males reduced, not discernible externally; epipleural ribs 15–25 (rarely 15–17) ..... ***punctatus*** (Indian Ocean, Pacific Ocean, Caribbean Sea)

    No dark band on body just anterior to dorsal fin; no stripes on body in region covered by appressed pectoral fin; gill opening varying from restricted to area above level of dorsalmost pectoral-fin ray to extending ventrally to opposite 6th ray; caudal-fin rays of males filamentous or not; both anal-fin spines of males discernible externally; epipleural ribs 10–16 (rarely 16) 16

16. Prominent black or dusky spot covering most of distal portion of membrane between first 2 dorsal-fin spines; prominent dark spot posterior to eye; up to 16 vertical, dusky bands on body, several partially outlined with slender dark lines; gill opening restricted to area dorsal to level of 2nd pectoral-fin ray; fewer than 20 incisor teeth in either jaw in

specimens 30–49 mm SL ..... ***verticalis***, new species (Queensland)

No prominent spot on distal portion of membrane between first 2 dorsal-fin spines; prominent dark spot on head posterior to eye present or absent; dark bands present or absent on body (bands, when present, usually strongly inclined anteriorly or posteriorly except occasionally in *germaini*); bands not outlined with darker lines; gill opening varying from restricted to area dorsal to level of dorsalmost pectoral-fin ray to extending ventrally to opposite 6th ray; most species with 20 or more teeth in each jaw in specimens over 30 mm SL (number increasing with increase in SL) 17

17. Dorsal-fin spines 11 and gill opening restricted to area dorsal to level of dorsalmost pectoral-fin ray 18

Dorsal-fin spines 11–14 (usually 12–13), but if 11, gill opening extends ventrally at least to opposite 2nd from dorsalmost pectoral-fin ray 19

18. Lateral-line tubes 6–8, extending posteriorly to below level of 6th–11th dorsal-fin spine; caudal-fin rays not filamentous ..... ***lineolatus*** (Australia, New Guinea, Candavu)

Lateral-line tubes 0–5 (rarely more than 3), extending posteriorly (when present) to below level of 1st–6th dorsal-fin spine (rarely posterior to level of 4th dorsal-fin spine); some caudal-fin rays of some males filamentous ..... ***rotundiceps rotundiceps*** (Australia)

19. 15th segmented dorsal-fin ray 14.7–22.4% SL in males (rarely less than 18.0%), 12.1–16.0% SL in females (rarely less than 13.5%); gill opening extending ventrally to opposite 3rd–6th pectoral-fin ray (rarely only to 3rd ray); dorsal-fin spines 11–13 (strong mode of 12); lateral-line tubes 1–4; males frequently with dusky spot over last 1–4 segmented dorsal-fin rays as most prominent mark in dorsal fin (Figure 18); slender, dusky to black band adjacent to postorbital margin (but separated from margin by slender, pale area); no dusky pinstripes in segmented ray portion of dorsal fin; circumorbital bones 4 ..... ***ferox*** (eastern Africa to Philippine Islands)

15th segmented dorsal-fin ray 9.1–16.0% SL in males (rarely more than 14.0%), 8.4–13.6% in females (rarely more than 12.9%); gill opening varying from restricted to area above level of dorsalmost pectoral-fin ray to extending ventrally to opposite 6th ray; dorsal-fin spines 12–14 (modally 12 or 13); lateral-line tubes 0–9; males frequently with dark spot, or short series of dark spots, commencing about midway along segmented ray portion of dorsal fin as most prominent mark in fin (Figures 13, 15, 19, 23, 28); slender, dusky to black band adjacent to postorbital margin present or absent; dusky pinstripes present or absent in segmented ray portion of dorsal fin; circumorbital bones 5 20

20. Darkest marking on side of head a prominent spot, which is noticeably closer to preopercular series of sensory pores than to circumorbital series of pores (spot occupies dorsoposterior corner of dusky domeshaped area; Figures 28, 29*a*); dorsal-fin spines 11–13 (rarely 13) ..... ***rotundiceps rotundiceps*** (Australia)

Darkest marking on head a faint to dark band, spot, or blotch, which is either noticeably closer to circumorbital series of sensory pores than to peropercular series of pores or only slightly closer to preopercular series (Figures 23*e*, 29*c* and *e*); dorsal-fine spines 11–14 (rarely 11) 21

21. Dorsal-fin spines 12–13 (rarely 13); underside of head varying from plain dusky to bearing conspicuous dark chevrons, never with scattered dusky spots or mosaic of chevrons and vermiculations; prominent dark spot on head posterior to eye approximately midway between circumorbital and preopercular series of pores or slightly closer to preopercular series (Figure 29*c*) ..... ***rotundiceps obliquus*** (Pacific Islands)

Dorsal-fin spines 12–14 (strongly modally 13); underside of head variable: plain dusky, with diffuse dusky chevrons, with scattered dusky to dark spots, or with a mosaic of dark chevrons and vermiculations; prominent dark spot on head posterior to eye present or absent, when present closer to circumorbital series of pores than to preopercular series 22

22. Segmented dorsal-fin rays 17–20 (modally 18–19); underside of head uniformly dusky or with scattered dusky to dark spots, which may extend onto prepelvic and prepectoral areas; side of head with or without prominent dark markings (markings, when present, variable in form but usually not present as distinct dark spot posterior to eye; occasionally present as dark band or smudge) ..... ***elongatus*** (eastern Africa to Philippine Islands, excluding Australia)

Segmented dorsal-fin rays 18–23 (modally 19–22); underside of head dusky, bearing dusky

chevrons or mosaic of dusky to dark chevrons and vermiculations; side of head with distinct dark spot posterior to eye as most prominent marking 23

23. Lateral-line tubes 0–8 (usually more than 3); circumorbital pores 7–10 (modally 8–9); usually 6–8 pairs of more or less vertical, narrow, dark bands or spots on body; underside of head frequently marked with dark mosaic of chevrons and vermiculations; precaudal vertebrae 10, rarely 11, in all populations except those from Western Australia, which may have modally 11 precaudal vertebrae ..... ***germaini*** (Australia north to Taiwan; New Caledonia)

Lateral-line tubes 0–4 (usually less than 3); circumorbital pores 7–9 (rarely 7 or 9); usually 11 or fewer broad, dusky, inclined bands on body; underside of head varying from uniformly dusky to bearing faint, dusky chevrons; precaudal vertebrae 10–12 (rarely 10) ..... ***loxozonus*** (Japan to Okinawa)

Omobranchus anolius (Valenciennes)

FIGURE 8

Blennechis anolius Valenciennes in Cuvier and Valenciennes, 1836:288 [Port Jackson].

Petroscirtes altivelis Steindachner, 1863:1191 [Bombay; locality probably erroneous].

Blennius unicornis Castelnau, 1879:384 [enters oysters about Sydney].

Petroscirtes guttatus Macleay, 1881:9 [Port Jackson].

Petroscirtes cristiceps Macleay, 1881:9 [Port Jackson].

Petroscirtes wilsoni Macleay, 1884:171 [Port Jackson].

Salarius galeatus DeVis, 1884a:147 [Moreton Bay]; 1886; 59 [St. Helena, Moreton Bay; twice described as new; impossible to determine if the same or different specimens formed basis of descriptions].

DESCRIPTION (see also Table 5).—Dorsal fin XI–XIII (XII in 79.2% of specimens), 17–19 = 29–31; anal fin II, 19–22 (20–21 in 94.3% of specimens); both anal-fin spines of males discernible externally; segmented caudal-fin rays 12–13 (13 in 94.3% of specimens); dorsal + ventral procurrent caudal-fin rays 11–14; vertebrae 10–11 (11 in only 1 of 42 specimens) + 26–28 (28 in only 1 of 41 specimens) = 36–38 (38 in only 2 of 41 specimens); epipleural ribs 11–13; prenasal pores present; interorbital pores 2–4 (3 in 87.5% of specimens); circumorbital pores 7–10 (8 in 87.5% of specimens); lateral-line tubes absent; gill opening varying from restricted to area dorsal to level of dorsalmost pectoral-fin ray (87.5% of specimens) to extending ventrally to opposite dorsalmost ray; lower-lip flap present; circumorbital bones 5; lower jaw teeth 20–27; upper jaw teeth 19–25 (Figure 36); males with fleshy bladelike crest on top of head (at least in specimens 34–60 mm SL), females with crest poorly developed or absent (at least in specimens 28–46 mm SL).

COLOR PATTERN.—*Males*: Head: Three dusky to dark dusky bands present. First band moderately wide, extending from anteroventral margin of orbit across mouth, just anterior to angle of jaws, to chin where it joins corresponding band of opposite side. Second band almost twice as broad as first, extending from ventral margin of orbit to ventral midline of head where it joins corresponding band of opposite side; band, interrupted by eye, continues from dorsoposterior margin of orbit across anterior nape to base of fleshy crest. Narrow, pale or pearly lines border anterior and posterior margins of both portions of second band. Third head band encircles head posterior to eye; band often obscured by dark background color of head. Narrow, pale or pearly line borders posterior margin of third band below level of ventral margin of orbit. Intensely dark, short line, blotch, or spot present on third band just above lateral midline of head. Narrow, pale or pearly line extends posteroventrally from preopercular head pores near dorsal end of operculum to anterior edge of fleshy pectoral-fin base. Another narrow, pale or pearly line occasionally extending from middle of nape and base of crest, along dorsoposterior edge of operculum and posteroventral edge of gill opening to upper end of fleshy pectoral-fin base; line broadens as it passes along edge of gill opening. Snout, interorbital, nape, and prepelvic areas dark dusky except where crossed by pale lines.

Trunk: Body crossed with about 17 to 19 evenly spaced, narrow, dusky, chevronlike bands flexed posteriorly; anterior and posterior bands indistinct; bands originating on dorsal body contour, becoming faint, then absent on ventral fifth of body; posterior 3 or 4 bands broken, forming 3 dusky stripes: 1 on lateral midline, 1 each midway between lateral midline and dorsal and ventral body contours; dorsal ends of bands occasionally expanded and

intensified. Horizontal series of small, intensely dark spots present on lateral midline of body, each spot lying on body band at angle of flexion (not all bands with spot). Second horizontal series of small, dark spots present midway between lateral midline of body and dorsal body contour, each spot located on body band. Third horizontal series of small, dark spots usually present midway between lateral midline and ventral body contour, at least posteriorly; each spot located on body band. Area covered by appressed pectoral fin with posteroventrally directed, diagonal row of intensely dark marks or spots, more or less connected by dark dusky line on body midlaterally; second parallel line of dark marks occasionally present just posteriorly on dorsal half of body.

Pectoral Fin: Pale to transparent with fine dark specks of pigment scattered over fin; pigment heavy proximally and distally. Fleshy pectoral-fin base with large, intensely dark spot, occasionally broken into several intensely dark marks anteroventrally. Vertical, narrow, pale line present between large dark spot and base of pectoral fin; line confluent dorsally with narrow, pale line on head.

Pelvic Fin: Distal half pale, proximal half dark dusky, line of demarcation between contrastingly pigmented areas angled so inner rays darkly pigmented more distally than outer rays.

Dorsal Fin: Pale dusky with dark markings. Membranes between first 5 dorsal-fin spines with 2 or 3 evenly spaced, narrow, horizontal, dark lines; lines becoming dorsoposteriorly angled on more posterior spines; parallel series of similar dorsoposteriorly oriented, narrow, dark lines along rest of fin; lines becoming faint to absent all but proximally on posterior half of fin (particularly in large specimens).

Anal Fin: Dark dusky proximally, tips of rays abruptly pale. Several, often interrupted, posteroventrally directed, narrow, pale lines on proximal two-thirds of fin; lines faint posteriorly.

Caudal Fin: Proximal end of fin with pale membranes; rays outlined with dark dusky pigment, occasionally extending posteriorly at midlevel of fin; some specimens with vertical, narrow, dark dusky margin on fin at posterior end of fleshy caudal base.

Females: Similar to males except: head background usually not as dark; dark bands and markings on head more apparent; pale spaces between dark bands slightly broader; body background paler; body bands less distinct; usually 4th and occasionally 5th horizontal series of intense, dark spots present on body; spots in somewhat less distinctly arranged rows; fins less distinctly pigmented; dorsal fin often only with dark dusky blotches along base above dorsal ends of body bands.

McCulloch (1917, pl. 10:fig. 2) presented a useful illustration of *O. anolius*, which is reproduced in Scott (1962:247).

GEOGRAPHIC DISTRIBUTION (Figure 4).—Spencer Gulf, South Australia, to the Queensland coast of the Gulf of Carpentaria. Scott (1962) reported that *O. anolius* occurs in Victoria, but we have seen no specimens from that state. See "Nomenclatural Discussion" for erroneous locality records.

HABITAT.—Shallow, usually estuarine waters in and around oyster and other mollusc beds on tidal mud flats (Thomson and Bennett, 1953).

COMPARISONS.—*Omobranchus anolius* is unique in *Omobranchus* in having the posterior segmented dorsal-fin rays of larger males long and filamentous. The 15th ray, for instance, may attain a length of up to 31.9% SL, more than in any other species of *Omobranchus*. In *O. ferox* and *aurosplendidus* the 15th ray may attain a length of 22–24% SL, but none of the rays become filamentous or much exserted beyond the margin of the interradial membrane (the dorsal-fin spines of male *aurosplendidus* do, however, become long and filamentous). In *O. anolius* there are several series of small, dark spots that appear to be superimposed on the color pattern of the body. *Omobranchus elegans, aurosplendidus* and, to a much lesser extent, *meniscus* also have a similar spotting, but the spots are smaller, more numerous, and more randomly distributed in these three species. Some specimens of *O. fasciolatus* appear to have a similar spotting, but the spots are not so intensely dark and do not appear to overlie other features of the color pattern.

Omobranchus anolius can be differentiated externally from the Australian populations of those species of *Omobranchus* with which it appears to be broadly sympatric (*O. lineolatus, germaini, punctatus, r. rotundiceps, verticalis*) most readily by its lack of lateral-line tubes. The majority of the specimens of *O. r. rotundiceps* from New South Wales also lack lateral-line tubes, but these specimens

have 33–35 total dorsal-fin elements (versus 29–31 for *anolius*). *O. anolius* is also the only Australian species that may have a fleshy crest on the head.

REMARKS.—Thomson and Bennett (1953) described the nests, development of eggs, and behavior at hatching of adults and larvae, and Ogilby (1910) reported on the nests, habitat, and reproductive behavior.

NOMENCLATURAL DISCUSSION.—None of the authors of the synonyms of *O. anolius* distinguished their new species from any other species.

The type-material of *P. altivelis* comprises three syntypes, all identifiable as male *anolius*. Steindachner (1863) gave the type-locality as Bombay, but otherwise the species has been recorded only from Australia, except for a specimen cataloged into the British Museum collections in 1864 and reported as coming from New Zealand (the only record of an omobranchine from that country). The fact that no specimens of this common, oyster-shell inhabiting species have been taken outside Australian waters in over 100 years seems to indicate that the species is probably limited to Australia and that the Bombay and New Zealand records are erroneous.

No type-material is known for *B. unicornis*. The description is brief, but the mention of the lack of head cirri, the presence of an "arched fleshy horn directed upwards" on the head, and a series of black spots on the body identifies *B. unicornis* with *anolius*, the only Australian blenniid with this combination of characters.

The syntypic material of *P. guttatus* comprises two female *anolius*, without obvious fleshy crests on the head. The only known type-material of *P. cristiceps*, described in the same paper with *P. guttatus*, comprises four male *anolius* (listed as cotypes) with fleshy, conspicuous crests on their heads. This sexual difference probably accounts for Macleay's (1881) description of the species twice in the same paper.

The holotype of *P. wilsoni* is a male *anolius*. Macleay (1884) noted the similarity of his *wilsoni* with his *cristiceps*, but mentioned no differences.

DeVis (1884a, 1886) twice described *Salarias galeatus*. The two descriptions could have been taken from the same specimen, but this is not certain. Both depict a male *anolius*, with the type-localities as Moreton Bay and St. Helena, Morton Bay. The only possible type-material known for either species is a male specimen registered as a "cotype" in the Australian Museum. Although this specimen is identifiable as *anolius*, its dorsal-fin count fits neither of DeVis' descriptions of *S. galeatus*.

MATERIAL EXAMINED.—AUSTRALIA: NEW SOUTH WALES: Sydney, USNM 197621 (26: 17.2–46.0, including 2 cleared and stained), MNHN A.2160 (ca. 48), BMNH 1862.8.1.16 (52.8); Port Jackson, MNHN A.1832 (ca. 46, holotype of *Blennechis anolius*), AMS I.16409–001 (2: ca. 44–45, syntypes of *Petroscirtes guttatus*), I 16410–001 (ca. 49, holotype of *Petroscirtes wilsoni*), I.16411–001 (4: 31.5–52.8, "cotypes" of *Petroscirtes cristiceps*); Shoalhaven River, BMNH 1929.12.3.31.2 (60.6); Clarence River, BMNH 1914.8.20.238 (53.4). SOUTH AUSTRALIA: Backy Point (Spencer Gulf), AMS IB.5142 (ca. 47). QUEENSLAND: Moreton Bay, AMS IA.4596 (41.8), I.470 (47.0, "cotype" of *Salarias galeatus*), I.383 (ca. 28, originally among syntypes of *Salarias furtivus* = *O. r. rotundiceps*); Manly, QM I.7828 (52.2); Caloundra, AMS I.6206 (2: 30.5–33.5); Norman River, QM I.2200 (ca. 47), I.2210 (45.2), I.2211 (47.6), I.2213 (40.7). INDIA: Bombay (probably erroneous), NMV 71774 (3: 43.9–50.3, syntypes of *Petroscirtes altivelis*). NEW ZEALAND (probably erroneous): BMNH 1864.1.17.4 (56.0).

Omobranchus aurosplendidus (Richardson)

FIGURES 9 and 10

Blennius? auro-splendidus Richardson, 1846:265 [Macao].
Petroscirtes lini Herre, 1934:292 [oyster beds, Heungchow, Kwangtung Province, China].

DESCRIPTION (see also Table 5).—Dorsal fin XI–XII (XI in 8 of 10 specimens), 25–26 = 36–37; anal fin II, 25–27; both anal-fin spines of males discernible externally; segmented caudal-fin rays 13–15 (14 in 3 and 15 in 1 of 10 specimens); vertebrae 10–11 (11 in 1 of 10 specimens) + 31–32 = 41–42; epipleural ribs 11–13; prenasal pores present; interorbital pores 3; circumorbital pores 7–8 (7 in 7 of 9 specimens); lateral-line tubes 0–2; lateral-line tubes, when present, extending posteriorly to below level of 2nd or 3rd dorsal-fin spine; gill opening restricted to area dorsal to level of dorsalmost pectoral-fin ray; lower-lip flap present; circumorbital bones 5; lower jaw teeth 22–28; upper jaw teeth 21–26 (Figure 47); fleshy bladelike crest on top of head of both sexes.

COLOR PATTERN.—*Males*: Head: Broad, dusky to dark dusky band extending from anteroventral margin of orbit across corner of mouth to chin, where it joins corresponding band of opposite side; band interrupted by eye, continuing on dorsoposterior margin or orbit as rounded dark blotch; background very pale along anterior and posterior margins of band; pale area broadest posterior to dorsal segment of band. Fleshy head crest pale with dark dusky vermiculations. Snout dusky; lower lip pale. One specimen with broad, pale area extending from just below 1st dorsal-fin spine to upper end of operculum, then posteroventrally to gill slit, and ventrally along anterior fleshy pectoral-fin base to pelvic-fin base. Single (occasionally as many as 4) small, intensely dark spot posterior to eye midway between circumorbital and preopercular sensory pores. Remainder of head indistinctly marked with dusky to dark dusky pigment.

Trunk: Background dusky, palest ventrally, darkest dorsoanteriorly, with fairly even spread of small, intensely dark spots and moderately small, pale spots and blotches.

Pectoral Fin: Pale.

Pelvic Fin: Pale with even spread of fine, dark specks of pigment.

Dorsal Fin: Dusky to dark dusky anteriorly and anteroventrally, becoming pale to transparent dorsoposteriorly. Anterior portion of fin with moderately narrow, pale stripe extending from 1st to about 9th spine midway up fin; several dorsoposteriorly angled, narrow, pale lines present distally; posteriorly, dark dusky background differentiates into numerous dorsoposteriorly directed, narrow lines with pale to transparent interspaces; interspaces broader than adjacent dark dusty lines. Several small, pale spots present on midbase of fin.

Anal Fin: Dusky with 5 or 6 narrow, pale stripes running length of fin; fin darker anteriorly.

Caudal Fin: Pale dusky, slightly paler proximally.

Females: Similar to males except: background color of head and body generally paler; dark band on head slightly narrower, more distinct; segment of band above eye extending unbroken, or as a series of irregular dark markings, nearly to dorsal edge of crest; other markings on crest larger, darker, often forming an almost complete dark border to free margin of crest; markings on dorsal and anal fins much fainter except for large, dark, oblong spot near outer edge of fin between 1st and 4th or 5th dorsal-fin spines (spot absent in males).

GEOGRAPHIC DISTRIBUTION (Figure 5).—Hong Kong, Macao, and vicinity.

HABITAT.—Shallow, brackish water in oyster beds.

COMPARISONS.—*Omobranchus aurosplendidus* is one of the most distinctive species of *Omobranchus*; however, only large adult specimens are available, and it is questionable whether all the characters that set *aurosplendidus* off from its congeners will be true of smaller specimens. The long filamentous dorsal-fin spines of male *aurosplendidus* are unique in *Omobranchus,* and the large, black spot on the anterior dorsal-fin spines of females may also be unique, although the single (30 mm SL) female *O. verticalis* available has a prominent spot between the first two dorsal-fin spines. *Omobranchus aurosplendidus* has more segmented dorsal-fin rays than any other *Omobranchus* species, but there is overlap with other species in total number of dorsal-fin elements. Although several other species approach or overlap *aurosplendidus* in having a large number of segmented anal-fin rays and vertebrae, such species lack the fleshy crest on top of the head that is present in both sexes of *aurosplendidus.* Only *aurosplendidus* and *lineolatus* have modally 11 dorsal-fin spines, and only *aurosplendidus* and *elegans* have modally 7 circumorbital pores. Of the ten specimens of *aurosplendidus* available, seven have 13, two have 14, and one 15, segmented caudal-fin rays. No other species of *Omobranchus* has such a large percentage of its specimens with more than 13 segmented caudal-fin rays (0.0–7.9% in the other taxa), but perhaps this is due to the small sample of *aurosplendidus.* The large numbers of segmented caudal-fin rays in *aurosplendidus* are associated with relatively small total numbers of procurrent caudal-fin rays, indicating the probability that some of the procurrent rays became segmented.

NOMENCLATURAL DISCUSSION.—Richardson (1846) described *B. aurosplendidus* from an illustration, now apparently lost (Whitehead, 1969). His mention that the species had a crest on top of the head, no cirri (this fact mentioned under the description of the next species, *B. fasciolatoceps,* he described in the same study), the first seven dorsal-fin rays (spines) elongated and numerous black dots on the body could only refer to a male of the species here recognized under his name. The type-locality,

Macao, is close to that (vicinity of Hong Kong) from which all other specimens of the species have come.

Herre (1934) did not compare *P. lini* with any other species, but his specimens include males that agree closely with Richardson's description. Herre did not segregate his holotype from his paratypes, but merely mentioned that the holotype was a male, 111 mm, with the dorsal-fin elements 37 and the anal-fin elements 27. The type-material comprises four males (99.5, 100.8, 110.1, 112.2 mm SL) and five females (75.8–97.7 mm SL). Herre's measurements must have been SL as the length of the caudal fin (20.3) of the smallest male added to its SL would make the total length over 119 mm. The two largest males are thus candidates for holotype. Of these, the 110-mm specimen has 37 dorsal-fin elements (anal fin II, 29), and the largest specimen has 36 dorsal-fin elements (anal fin II, 26). We therefore consider the 110-mm specimen to be the holotype.

MATERIAL EXAMINED.—CHINA: KWANGTUNG PROVINCE: Heungchow, CAS SU29088 (9: 75.8–112.2, including holotype of *Petroscirtes lini* and 1 cleared and stained). HONG KONG: USNM 201464 (93.6).

Omobranchus banditus J. L. B. Smith

FIGURES 2*a* and 11

Omobranchus banditus J. L. B. Smith, 1959:232 [Umgazi].

DESCRIPTION (see also Table 5).—Dorsal fin XI–XIII (XII in 90.7% of specimens), 19–21 = 31–33; anal fin II, 21–23; one or both anal-fin spines of males not discernible externally; segmented caudal-fin rays 13 or 15 (15 in only 1 of 55 specimens); dorsal + ventral procurrent caudal-fin rays 12–16; vertebrae 10–11 + 27–30 (rarely 27) = 38–40; epipleural ribs 15–21 (rarely 15); prenasal pores present; interorbital pores 2–3 (3 in 92.5% of specimens); circumorbital pores 7–9 (8 in 88.9% of specimens); lateral-line tubes 5–9 (rarely 9); lateral-line tubes extending posteriorly to below level of dorsal-fin spine 8–11; gill opening restricted to area dorsal to level of dorsalmost pectoral-fin ray; lower-lip flap absent (Figure 2*a*); circumorbital bones 5; lower jaw teeth 19–27; upper jaw teeth 17–24 (Figure 37); males over 30 mm SL with bladelike fleshy crest on top of head; crest absent in males under 30 mm SL and in all females.

COLOR PATTERN.—*Males*: Head: Three variable, dark bands radiating from eye on lower two-thirds of head; anterior band moderately broad at origin on anteroventral edge of orbit, flaring broadly as it crosses mouth just anterior to angle of jaws and continuing onto chin; 2nd band narrow to moderately broad, extending from midventral margin of orbit to ventral midline of head, sometimes deflected slightly posteriorly on ventral side of head; 3rd band broad, angled posteroventrally, then ventrally, from posterior margin of orbit to ventral midline of head; broad (4th) band arising approximately at midside of head in preopercular area, extending downward across branchiostegal membranes onto prepelvic area; each band meeting or confluent with corresponding band of opposite side at ventral midline of head; bands almost evenly spaced; posterior 3 bands often broken, wavy, or with branches of pigment occasionally forming irregular vermiculations on cheek. Parallel pair of narrow, irregular bands, usually angled posteroventrally from near upper end of 4th head band, extending across branchiostegal membranes to dark, vertical band on fleshy pectoral-fin base; lower band of pair may be quite short; both bands sometimes incorporated in vermiculations on cheek. Vertically oriented, moderately broad, wavy, dark line present just posterior to upper half of eye, continuing onto nape. Snout with pair of dark, often slivered, bands along anterodorsal contour of head; bands separated at dorsal midline by pale space; large specimens with snout entirely dusky. Interorbital area with 2 short, moderately broad, dark lines angled dorsoposteriorly from dorsal edge of orbit; anterior line continuing onto fleshy crest, posterior terminating on nape; posterior line appears as disconnected dorsal extension of anterior band on lower side of head. Fleshy crest with approximately 3 moderately broad, dark bands; posteriormost band usually continuous with wavy, dark line posterior to upper half of eye. Large, intensely dark spot approximately one-third to one-half size of eye on side of nape just anterior to level of 1st dorsal-fin spine; spots on both sides loosely joined across nape by narrow, dusky to dark line; anterodorsally inclined, short, narrow, dark line parallels anteroventral border of dark spot, separated from spot by slightly smaller, very pale line.

Trunk: Pale with approximately 13 evenly spaced, broad, dark bands, usually reaching from

dorsal to ventral body contours, sometimes fainter ventrally and not quite reaching ventral contour; posterior 2 or 3 bands often represented only as large midlateral spots or short, broad, midlateral stripe; spaces separating bands varying from slightly broader than bands to one and one-half times as broad as bands; dorsal ends of bands sometimes expanded slightly, often with pale spot near center of expansion; dorsal ends of anterior bands sometimes deflected slightly anteriorly, ends of posterior bands deflected posteriorly; dorsal ends of bands occasionally separate from rest of bands (more often true of posterior bands); dorsal ends of posterior bands occasionally angled and connected irregularly to one another; bands often taper slightly ventrally. Some specimens with a faint, vertical, thin to moderately broad, dusky line midway in each pale interspace between body bands, most noticeable dorsally.

Pectoral Fin: Pale with fairly even spread of fine, dark specks of pigment on rays; dusky band near fin base, sometimes confined to dorsal half of fin; distal portion of fin dusky ventrally. Fleshy pectoral-fin base with prominent, broad, dark band extending from near lower end of gill opening to abdomen just behind pelvic-fin base; bands of opposite sides with dusky connection across ventral body midline. Second, narrow, dusky band sometimes present posteriorly on fleshy base of fin.

Pelvic Fin: Pale; dusky proximally where fin overlies ventral extension of prominent, dark band on fleshy pectoral-fin base.

Dorsal Fin: Transparent with dusky and dark markings; base of fin with large, dark blotch at dorsal end of each body band; blotches extend dorsoposteriorly on fin as broad, dusky bands; longitudinal row of approximately five dark spots present one-half to two-thirds distance up from fin base; distal area of fin usually dusky.

Anal Fin: Largely dusky, or pale with dusky bands; dark spot in membrane posterior to basal end of every third ray, usually with narrow, dusky band directed posteroventrally from each spot; distal area of fin dusky; tips of rays abruptly pale.

Caudal Fin: Pale dusky; central portion of fin base pale with 2 vertically oriented, dark spots, each with streak of dusky pigment extending slightly posteriorly; dorsal and ventral portions of fin base dusky.

Females: Similar to males except: dark markings on head, body, and fins, other than dark spot on side of nape, usually fainter; body bands noticeably fainter, particularly posteriorly; pale spots in dorsal expansions of body bands more apparent.

GEOGRAPHIC DISTRIBUTION (Figure 6).—Port Maone, Mozambique, south to Port St. Johns, South Africa. Smith (1959) and Penrith and Penrith (1972) reported that *O. banditus* occurred as far north as Bazaruto Island, Mozambique, but we have seen no specimens from north of Port Maone.

HABITAT.—Smith (1959) stated that *O. banditus* occurred in weedy and muddy areas; Penrith and Penrith (1972) reported it from rocky intertidal pools; Millard and Broekhuysen (1970) reported it from dead oyster shells in the St. Lucia estuary basin where salinities ranged from 34.4–35.2 o/oo.

COMPARISON.—*Omobranchus banditus* is unique in *Omobranchus* in lacking a lower-lip flap (Figure 2*a*). Its bold pattern of body bands also readily distinguishes it. *Omobranchus banditus* together with *punctatus* and *mekranensis* appear to form a closely related group that share the following specializations: one or both anal-fin spines of males reduced and not discernible externally, a large number of epipleural ribs, a gill opening predominantly restricted to the area dorsal to the level of the dorsalmost pectoral-fin ray, a dark spot or band present dorsally on the side just ventroanterior to the dorsal-fin origin, and a strong trend toward increased number of precaudal vertebrae to more than 10. *Omobranchus woodi* is also close to this group but lacks the anal-fin spine modification; however, *woodi, banditus,* and *mekranensis* share in having a fleshy crest on the head of males; the crest is lacking in *punctatus*. The only other species of *Omobranchus* in which the anal-fin spines of males are not discernible externally is *steinitzi*. *Omobranchus steinitzi,* however, has the lowest number of dorsal- and anal-fin elements and vertebrae in the genus. It also has only 14–15 epipleural ribs and is unique in the genus in lacking prenasal pores.

Aside from the lack of a lower-lip flap, presence of modified anal-fin spines, and features of its color pattern, *O. banditus* can be distinguished from the South African populations of those species of *Omobranchus* with which it appears to be broadly sympatric as follows: *woodi* has 0–6 (modally 5) lateral-line tubes (versus 5–9, modally 7, for *banditus*) and a fleshy crest on the head of females

(females of *banditus* lack crests). *Omobranchus ferox* has 0–4 lateral-line tubes, which extend posteriorly no farther than to below dorsal-fin spine 7 (versus 5–9 tubes extending posteriorly to below dorsal-fin spines 8–11); *O. ferox* has the gill opening extending ventrally to opposite the 3rd to 6th pectoral-fin ray (versus restricted to area dorsal to dorsalmost ray); *O. ferox* also has 4 circumorbital bones, 10–13 epipleural ribs, and no fleshy crest on the head of either sex (versus 5 circumorbital bones, 15–21 epipleural ribs, and a fleshy crest on many males); *O. punctatus* lacks a fleshy crest in both sexes. *Omobranchus elongatus* has 0–2 lateral-line tubes, which extend posteriorly no farther than to below the level of secondary dorsal-fin spine, 11–14 epipleural ribs, gill-opening rarely restricted to area dorsal to level of dorsalmost pectoral-fin ray (usually extending ventral to first ray), and no fleshy crest on the head of either sex. *Omobranchus fasciolatus* has 2 interorbital pores (versus 3, rarely 2, for *banditus*) and usually has fewer vertebrae, dorsal-fin elements, and epipleural ribs than *banditus* (see Tables 5 and 8).

NOMENCLATURAL DISCUSSION.—The holotype (RUDI 232) of *O. banditus* was not seen by us; however, the illustration of the holotype (Smith, 1959, pl. 14*d*) and the description, which calls attention to the diagnostic lack of a flap on the lower lip, are sufficient for identification of the specimens here assigned to *O. banditus*. In the description Smith states that the type is 50 mm long; in the legend for the figure of the holotype, he states that the type is 51 mm long.

MATERIAL EXAMINED.—MOZAMBIQUE: Port Maone, USNM 197640 (31.5); Inhaca. RUSI 1099 (3: 31.2–42.7), SAM 26406 (ca. 31); Delagoa Bay, SAM 15547 (7: 22.1–39.3). SOUTH AFRICA: St. Lucia coast, ANSP 54998–99 (2: 32.5–36.8); Ballito Bay, RUSI 1095 (18: 24.1–42.2); Durban, ANSP 51282 (39.1), 55121–23 (3: 34.8–53.3), BMNH 1919.4.1.30 (49.3), 1920.7.23.65 (44.5), FMNH 47025 (7: 31.4–48.6), 47223 (6: 25.8–55.8); Port St. Johns, SAM 23330 (44.6), 23850 (2: 32.1–46.2).

Omobranchus elegans (Steindachner)

FIGURE 12

Petroscirtes elegans Steindachner, 1876:217 [Nangasaki, Japan].

Petroscirtes lineo-punctatus Sauvage, 1880:216 ["Japon"].

DESCRIPTION (see also Table 5).—Dorsal fin XII–XIII (XII in 96.4% of specimens), 20–23 (21–22 in 93.1% of specimens) = 32–35 (33–34 in 92.1% of specimens); anal fin II, 21–24 (22–23 in 92.0% of specimens); both anal-fin spines of males discernible externally; segmented caudal-fin rays 12–14 (13 in 95.5% of specimens); dorsal + ventral procurrent caudal-fin rays 9–15 (9, 10, and 15 in one specimen each of 131 specimens); vertebrae 10–12 (11 in 97.5% of specimens) + 28–31 (29–30 in 93.1% of specimens) = 39–42 (40–41 in 92.2% of specimens); epipleural ribs 11–18 (11–15 in 98.6% of specimens); prenasal pores present; interorbital pores 2–4 (3 in 96.2% of specimens); circumorbital pores 6–8 (7 in 88.8% of specimens); lateral-line tubes 0 or 1 (1 in 95.5% of specimens); lateral-line tubes, when present, extending posteriorly to below level of dorsal-fin spine 1–3; gill opening varying from restricted to area dorsal to level of dorsalmost pectoral-fin ray (1 of 117 specimens) to extending ventrally to opposite 5th ray (opposite rays 2–4 in 91.5% of specimens); lower-lip flap present; circumorbital bones 5; lower jaw teeth 16–27; upper jaw teeth 15–24 (Figure 36); fleshy bladelike crest on top of head absent in both sexes (head of some presumably mature males swollen in appearance).

COLOR PATTERN.—*Males*: Head: Two moderately narrow, dark dusky bands, separated by pale interspace, extending from ventral margin of eye; anteriormost band crosses mouth just anterior to angle of jaws, bends slightly posteriorly and continues to ventral midline of head, where it joins corresponding band of opposite side; second band extends vertically from ventral margin of orbit, bends slightly posteriorly on ventral side of head and continues to ventral midline where it joins corresponding band of opposite side. Third dark dusky band usually encircling head posterior to eye; band broad dorsally and dorsolaterally, tapering below level of eye of just below preopercular pores and continuing posteroventrally to ventral midline as broader, often fainter, segment; ventral portion of band usually broken into mottled pattern; some specimens with short, broad, dark dusky line connecting posterior margin of orbit to encircling band midlaterally. Dark dusky freckles or mottling present between and posterior to head bands on ventral side of head, branchiostegal membranes, and prepelvic area. Snout and interorbital dusky. Broad, dark dusky band extending from dorsal body con-

tour at bases of first 2 dorsal-fin spines (and posterior nape in some specimens) to just above dorsal end of gill opening; anteroventral corner of band connected across dorsal end of operculum by broad, irregular mark to short, broad, dark dusky bar or blotch on midanterior edge of operculum. As many as 12 small, intensely dark spots present on cheek and area posterior to eye; several spots also usually present along posteroventral edge of operculum.

Trunk: Up to about 10 broad bands on body, anterior 4 or 5 bands darkest and broadest; posterior bands very faint, sometimes barely noticeable; bands originate on dorsal body contour, become faint to absent on belly or on ventral half of body posterior to belly; 2nd and 3rd bands often bifurcate ventrally; sometimes narrow, dark bar present ventrolaterally between 1st and 2nd band. Body covered by small, intensely dark spots; spots largest anteriorly, becoming progressively smaller posteriorly and along dorsal and ventral body contours; occasionally spots tend to be aligned along anterior and posterior margins of darkest body bands.

Pectoral Fins: Pale with even spread of very fine, dark spots on rays, spots slightly larger proximally. Fleshy base with about 10 crowded, moderately large, intensely dark spots.

Pelvic Fin: Pale.

Dorsal Fin: Pale to transparent with dark to dusky markings. Base of fin with dark blotchlike continuations of body bands anteriorly. Dorsoposteriorly slanted dark line arising from blotch above band at posterior end of nape; 2nd parallel line arising from dorsal end of first body band present on anterior portion of fin; lines becoming fainter distally on fin; 1st and occasionally 2nd line with several intensely dark spots along its length; distal half of fin with series of very faint, narrow, dorsoposteriorly directed, dusky lines parallel to distal ends of first 2 dark lines. Some specimens with additional small, intensely dark spots mostly on anterior half of fin, but occasionally on posterior portion also.

Anal Fin: Pale to transparent with dark area anterodistally (tips of rays abruptly pale in this area). Irregular, longitudinal row of moderately small, dark spots just ventral to ventral body contour, each spot on membrane between bases of 2 adjacent fin rays; spots becoming smaller and fainter posteriorly.

Caudal Fin: Pale to transparent with several irregularly placed, horizontal, dusky blotches. Some specimens with pair of vertically oriented, faint, dusky blotches at basal edge of fin, each giving rise to very faint, posteriorly directed, dusky streak.

Females: Similar to males except: head generally paler; bands on head fainter ventrally, sometimes fading out before reaching ventral midline; freckles and mottling on underside of head almost totally absent; body slightly paler.

GEOGRAPHIC DISTRIBUTION (Figure 4).—Southern Japan, southern Korea, and Shantung Province, China. *Omobranchus elegans* (as *Dasson*) was reported by Chyung (1954) from Pusan, Masan, and Cheju-do, Korea. Chyung (1961) identifiably illustrated the species (as *Dasson*) but we were unable to ascertain localities from the Korean ideographs. We have included the Korean localities on Figure 4 on the basis of the 1954 report, together with the 1961 illustration. There is a specimen (USNM 143553) questionably labeled as having come from Mauritius. This locality is improbable as the species is otherwise known only from north of about 35° north latitude; Mauritius is at 20° south latitude.

HABITAT.—Chyung (1954, 1961) reports this species from shallow waters and dead clams.

COMPARISONS.—*Omobranchus elegans* is instantly recognizable by its unique color pattern: a heavy sprinkling of fine, dark spots covering the entire body, together with prominent dark bands anteriorly on the body. *Omobranchus elegans* and *aurosplendidus*, which is allopatric to *elegans*, are the only species in the genus with modally 7 circumorbital pores; the other species have modally 8 or 9 pores. *Omobranchus aurosplendidus* has a fleshy head crest, which is lacking in *elegans*. Aside from color pattern, *elegans* can be distinguished from the populations of the three other species of *Omobranchus* with which it appears to be broadly sympatric as follows: *punctatus* has 5–8 lateral-line tubes, which extend posteriorly at least to below the level of dorsal-fin spine 7 (versus 0–1 tube, which extends no farther than to below spine 3); *O. punctatus* also has more than 19 epipleural ribs (versus 11–18, rarely more than 15, in *elegans*); *loxozonus* has 0–4 lateral-line tubes, which may extend posteriorly to below the level of dorsal-fin spine 6, and 12–14 (modally 13) dorsal-fin spines (versus 12–13, rarely 13 in *elegans*); *fasciolatoceps* has 3–8 lateral-line tubes, which extend posteriorly at least to below the level of dorsal-fin spine 5, 2–3 (modally 2) in-

terorbital pores (versus 2–4, modally 3 pores in *elegans*), and a fleshy crest on the head (absent in both sexes of *elegans*).

NOMENCLATURAL DISCUSSION.—The holotype of *P. elegans* is apparently lost; however, the original description, especially in the details of the color pattern, clearly refers to the species here accorded Steindachner's name.

Sauvage (1880) did not compare *P. lineopunctatus* with any other species. The holotype is a typical example of *O. elegans*.

MATERIAL EXAMINED.—CHINA: SHANTUNG PROVINCE: Tsingtao, USNM 130378 (16.6), 130366 (9: ca. 16–42). JAPAN: MNHN 5120 (68.5, holotype of *Petroscirtes lineopunctatus*). KUMAMOTO PREFECTURE: Tomioka, USNM 208471 (44.4). YAMAGUCHI PREFECTURE: Shimonoseki, USNM 71503 (28: 23.2–58.9); Mitajiri, USNM 70774 (8: 17.6–48.2). KAGOSHIMA PREFCTURE: Akune, Satsuma, USNM 71492 (2: 51.5–53.2). KANAGAWA PREFECTURE: Misaki, Sagami, USNM 71530 (90: 21.2–64.3, including 3 cleared and stained), 208472 (4: 47.7–50.8), 208473 (4: ca. 54–58.0); Hayamamachi, USNM 199522 (4: 43.0–53.3); Yokohama, USNM 44442 (ca. 44). WAKAYAMA PREFECTURE: Wakanoura, USNM 50270 (15: 18.0–58.6). CHIBA PREFECTURE: Pacific coast of Boshyu, USNM 195811 (47.6).

Omobranchus elongatus (Peters)

FIGURES 13–15

Petroscirtes elongatus Peters, 1855*a*:249; 1855*b*:440 [Mossambique].

Petroskirtes kallosoma Bleeker, 1858:227 [Biliton occidentalis, in mari].

Petroscirtes dispar Fowler, 1937:258 [Bangkok, Siam; junior primary homonym of *Petroscirtes dispar* Günther, 1861, = *Omobranchus punctatus* (Valenciennes)].

DESCRIPTION (see also Tables 5 and 6).—Dorsal-fin XII–XIV (XIII in 88.9% of specimens), 17–20 (rarely 17) = 30–33 (rarely 30 or 33); anal fin II, 20–23 (rarely 20); both anal-fin spines of males discernible externally; segmented caudal-fin rays 12–14 (13 in 98.2% of specimens); dorsal + ventral procurrent caudal-fin rays 10–16 (rarely 10 or 16); vertebrae 10–11 (10 in 96.5% of specimens) + 27–30 (rarely 30) = 37–40 (rarely 40); epipleural ribs 11–15 (rarely 11 or 15); prenasal pores present; interorbital pores 1–4 (3 in 97.6% of specimens); circumorbital pores 7–9 (8 in 96.5% of specimens); lateral-line tubes 0–9 (rarely 8 or 9); lateral-line tubes, when present, extending posteriorly to below level of dorsal-fin spine 1–10 (rarely 10); gill opening varying from restricted to area dorsal to level of dorsalmost pectoral-fin ray to extending ventrally to opposite 6th ray (rarely restricted dorsal to dorsalmost ray or extending ventral to 5th ray); lower-lip flap present; circumorbital bones 5; lower jaw teeth 18–26 (Figure 39); upper jaw teeth 15–24 (Figure 38); no fleshy bladelike crest on top of head of either sex.

COLOR PATTERN.—*Males*: Head: Two diffusely dusky to dark bands on side of head below eye; anterior band extends from anteroventral margin of eye across corner of mouth to ventral surface of chin, where it joins corresponding band of opposite side; second band (frequently absent) extends from posteroventral margin of eye to ventral surface of head, where it may join corresponding band of opposite side. Ventral third of head posterior to bands, and prepelvic area, with numerous dark spots, smaller than pupil of eye. Large, dark smudge present between circumorbital and preopercular series of cephalic sensory pores at level of lower two-thirds of eye; smudge domeshaped in some specimens, occasionally with anterior margin slightly intensified as spot. Operculum occasionally with anterodorsally directed, pale dusky, oval spot, partially to completely encircled by distinct, narrow, pale margin; vertical, darkened area present between spot and posterior preopercular margin; opercular membrane dusky posterior to spot. Snout with middorsal dark patch extending posteriorly to top of head. Ill-defined, horizontal marks dorsolaterally on head posterior to eye in freshly preserved specimens.

Trunk: About 11 or 12 dark bands laterally; 2nd through 7th bands arranged somewhat in pairs; lower half of bands vertical or slanted slightly posteriorly, reaching nearly to ventral midline of body anteriorly; posteriorly lower half of bands shorter, often faint or absent, occasionally ventral portions of all bands poorly developed; upper half of anterior 5 bands inclined dorsoanteriorly; upper half of succeeding bands decreasingly inclined dorsoposteriorly; upper end of posterior bands often elongate; bands not reaching onto upper one-fifth of body; posteriormost 1 or 2 bands usually represented only as narrow, horizontal, dark spot or spots. Body

TABLE 6.—*Frequency distributions for certain characters in populations of* Omobranchus elongatus

Population	Dorsal-fin spines				Segmented dorsal-fin rays					Total dorsal-fin elements					Segmented anal-fin rays				
	12	13	14	x̄	17	18	19	20	x̄	30	31	32	33	x̄	20	21	22	23	x̄
Zanzibar	1	1	-	12.5			1	1	19.5			2	-	32.0			1	1	22.5
Mozambique	5	39	1	12.9		16	25	4	18.7		18	25	2	31.6		3	37	5	22.0
Madagascar	4	23	-	12.8	2	9	15	1	18.6	3	11	12	1	31.4		9	15	3	21.8
Seychelles Islands	1	6	-	12.8		3	3	1	18.7		3	4	-	31.6		1	5	-	21.8
Chagos Islands	1	18	-	12.9	1	1	15	1	18.9	1	2	14	1	31.8		1	15	3	22.1
Ceylon	1	15	-	12.9		3	11	2	18.9	1	2	11	2	31.9		2	9	4	22.1
Andaman Islands		1				1					1					1			
Nicobar Islands		4	-	13.0		3	1	-	18.2		3	1	-	31.2		2	2	-	21.5
Sumatra		1				1					1					1			
Biliton		1					1					1					1		
Gulf of Thailand	11	132	7	13.0	9	74	65	2	18.4	6	83	60	1	31.4	2	52	87	9	21.7
Philippine Islands	1	11	-	12.9	1	6	5	-	18.3	1	7	4	-	32.2		6	6	-	21.5
Celebes			1		1						1					1			
Ambon	3	10	-	12.8		9	4	-	18.3	1	11	1	-	31.0		10	3	-	21.2

Population	Precaudal vertebrae			Caudal vertebrae					Total vertebrae					Epipleural ribs					
	10	11	x̄	27	28	29	30	x̄	37	38	39	40	x̄	11	12	13	14	15	x̄
Zanzibar	2	-	10.0			2	-	29.0			2	-	39.0		1	1	-	-	12.5
Mozambique	42	1	10.0	1	11	28	3	28.8	1	11	27	4	38.8		16	18	5	-	12.7
Madagascar	26	-	10.0	1	12	13	1	28.5	1	11	13	1	38.5	1	2	21	2	-	12.9
Seychelles Islands	6	-	10.0		4	2	-	28.3		4	2	-	38.3				1		
Chagos Islands	19	-	10.0		8	10	1	28.6		8	10	1	38.6	1	9	4	-	-	12.2
Ceylon	14	2	10.1	2	6	8	-	28.4	1	6	9	-	38.5		1	8	2	-	13.1
Andaman Islands	1			1					1							1			
Nicobar Islands	3	-	10.0		3	-	-	28.0		3	-	-	38.0		1	3	-	-	12.8
Sumatra	1				1					1							1		
Biliton	1					1					1								
Gulf of Thailand	149	1	10.0	11	106	32	1	28.2	11	105	33	1	38.2	1	18	97	29	2	13.1
Philippine Islands	10	2	10.2	6	4	2	-	27.7	4	6	2	-	37.8		2	8	2	-	13.0
Celebes		1		1						1						1			
Ambon	13	-	10.0	1	10	2	-	28.1	1	10	2	-	38.1		2	9	1	-	12.9

Population	Lateral-line tubes											Last lateral-line tube below dorsal-fin spine										
	0	1	2	3	4	5	6	7	8	9	x̄	0	1	2	3	4	5	6	7	8	9	10	x̄
Zanzibar																							
Mozambique	12	65	3	-	-	-	-	-	-	-	0.9	12	11	57	-	-	-	-	-	-	-	-	1.6
Madagascar		18	1	2	2	3	1	-	-	-	2.0		1	15	1	2	1	4	-	1	-	-	3.2
Seychelles Islands																							
Chagos Islands		2	3	6	2	3	2	-	-	-	3.3			3	1	6	1	3	1	3	-	-	4.8
Ceylon			1	1	4	4	2	-	-	-	4.4				1	-	4	4	1	1	1	-	5.9
Andaman Islands				1											1								
Nicobar Islands						2	1	-	-	-	5.3						1	-	2	-	-	-	6.3
Sumatra							1												1				
Biliton					1														1				
Gulf of Thailand		3	-	7	19	32	39	10	3	1	5.2			3	1	6	17	19	33	25	7	3	6.8
Philippine Islands			1	1	5	4	1	-	-	-	4.2				1	-	3	2	3	3	-	-	6.2
Celebes				1													1						
Ambon				4	4	2	3	-	-	-	4.3					1	4	1	6	1	-	-	6.2

Population	Dorsal + ventral procurrent caudal-fin rays								Lower end of gill opening opposite pectoral-fin ray							
	10	11	12	13	14	15	16	x̄	0	1	2	3	4	5	6	x̄
Zanzibar			1													
Mozambique	3	3	28	8	-	-	-	12.0	2	9	32	28	5	-	-	2.3
Madagascar		1	9	7	9	-	-	12.9		6	5	10	2	1	3	2.8
Seychelles Islands																
Chagos Islands			3	7	6	3	-	14.2				5	9	5	-	4.0
Ceylon			1	3	9	1	-	13.7			1	1	4	3	-	4.0
Andaman Islands						1						1				
Nicobar Islands			1	-	2	1	-	13.8					2	1	-	4.3
Sumatra			1											1		
Biliton				1							1					
Gulf of Thailand		3	25	63	48	9	1	13.2		2	15	25	8	2	-	2.9
Philippine Islands				6	5	-	1	13.7			1	4	4	3	-	3.8
Celebes				1									1			
Ambon			3	4	5	1	-	13.3					5	2	2	4.7

bands narrow, broadest medially, tapering dorsally and ventrally, often surrounded by poorly defined dusky area; bands usually indistinctly separated from dusky areas. Pale background spaces between bands with dorsoanteriorly slanted, very narrow, paler band extending from just below dorsal fin to near ventral body midline; posterior paler bands with dorsal half inclined dorsoposteriorly; paler bands not evident in faded specimens. Two longitudinal series of paired, elongate, dark spots dorsally on body; dorsal series at junction of dorsal fin and body; ventral series just ventral to dorsal series, with each spot directly under corresponding spot of dorsal series; dorsal series united into narrow stripe in some specimens. Trunk portion of gill opening with dusky to dark bar at posterior border of opercular membrane.

Pectoral Fins: Transparent with uniform spread of dark specks of pigment. Fleshy base with 0 to 4 small, dark spots, 1 or 2 occasionally extending onto basal portion of fin membrane.

Pelvic Fins: Pale with uniform spread of fine, dark specks of pigment.

Dorsal Fin: Generally transparent with series of dark stripes; stripes on spinous portion moderately broad, curving ventroposteriorly; stripes on segmented-ray portion narrow, more numerous, curving dorsoposteriorly. Large, intensely dark spot (ocellus), encircled by transparent or pale margin, located slightly above center of fin between 7th and 14th segmented rays (usually extending from 9th to 11th rays). Series of dusky marks basally on fin associated with adjacent series of body spots. Some specimens with fin more or less uniformly dusky to dark, except for narrow, pale, distal margin.

Anal Fin: Dusky to dark, darkest distally, with narrow, pale, distal margin. Freshly preserved specimens with narrow, curved, oblique, pale lines directed ventroposteriorly from lower ends of paler bands on body; pale lines terminate proximal to distal third of fin, become faint to absent posteriorly on fin. Dark spot just posterior to proximal end of each oblique pale line (after approximately every 3rd ray base), obscured in specimens with dark fins.

Caudal Fin: Pale with uniform spread of dark specks of pigment; dorsal and ventral margins dark. Caudal peduncle with moderately large, dark spot just above and below lateral midline at caudal-fin base; pigment streak from each spot continued posteriorly onto fin.

Females: Color pattern as in males except: overall background paler; dark markings on trunk and posterior body better defined; dusky patches surrounding body bands poorly developed or absent; bands often undeveloped ventrally; narrow, paler bands in pale spaces between dark bands often inapparent; dorsal and anal fins largely transparent, unmarked; ocellus in dorsal fin absent; anal fin dusky only along proximal edge of pale, distal border.

Geographic Variation: Although the color pattern variations of specimens from any particular area appear to encompass the variations found in the species as a whole, there is a prevalence of specimens with reduced head and fin markings from southern Africa and Madagascar and specimens with the same markings intensified from the Gulf of Thailand and Philippine Islands.

Gulf of Thailand: Both dark bands on head well developed; spots on underside of head small, distinct, numerous; dusky smudge posterior to eye usually intensified anteriorly; narrow, paler body bands (in spaces between dark body bands) not apparent in many specimens; fleshy pectoral-fin base usually with 4 distinct spots; dorsal fin with distinct, dark stripes in males; dorsal-fin ocellus of males located between 7th and 10th segmented rays, occasionally reaching posteriorly to 11th.

Madagascar: Anterior dark band on head faint; 2nd band usually faint or absent; spots on underside of head large, indistinct, faint, few in number; dusky smudge posterior to eye usually without anteriorly intensified area; narrow, paler body bands usually distinct; fleshy pectoral-fin base often without spots, occasionally with narrow, pale bar at proximal edge of fin; dorsal fin of males with stripes obliterated by even, dusky pigmentation at anterior and posterior ends of fin; dorsal-fin ocellus of males located between 9th and 14th segmented rays, occasionally reaching anteriorly to 8th ray.

Geographic Variation (see also "Color Pattern").—Variation in meristic characters (Table 6) occurs in some populations of *O. elongatus*. The Gulf of Thailand population has a higher average number of lateral-line tubes and lower average numbers of total dorsal- and anal-fin elements and vertebrae than most of the other populations. The Mozambique population was notable for having the lowest numbers of total procurrent caudal-fin

TABLE 7.—*F values for covariance comparisons of regression equations (Table 2) for number of lower or upper jaw teeth between males or females from different populations of* Omobranchus elongatus (** = *significant at p = .001; NS = not significant*)

Comparisons	F values slopes	Degrees of freedom	F values heights	Degrees of freedom
Lower teeth				
males				
Madagascar X Mozambique	0.11 NS	1/36	24.59 **	1/37
Madagascar X Gulf of Thailand	1.76 NS	1/39	3.90 NS	1/40
Mozambique X Gulf of Thailand	1.07 NS	1/51	67.18 **	1/52
females				
Chagos Is. X Mozambique	1.24 NS	1/31	26.70 **	1/32
Chagos Is. X Gulf of Thailand	0.11 NS	1/31	1.84 NS	1/32
Mozambique X Gulf of Thailand	2.87 NS	1/50	80.46 **	1/51
Upper teeth				
males				
Madagascar X Mozambique	0.50 NS	1/35	7.34 NS	1/36
Madagascar X Gulf of Thailand	0.94 NS	1/38	6.10 NS	1/39
Mozambique X Gulf of Thailand	0.04 NS	1/49	40.58 **	1/50
females				
Mozambique X Gulf of Thailand	0.14 NS	1/50	64.36 **	1/51

rays and lateral-line tubes. It was the only population in which some specimens lacked lateral-line tubes altogether.

Although covariance comparisons of numbers of jaw teeth were not feasible for all populations of *O. elongatus,* significant differences do occur among those populations that were compared (Table 7).

GEOGRAPHIC DISTRIBUTION (Figure 5).—Tropical Indian Ocean, excluding the Red Sea and Persian Gulf, east to the Philippine Islands and Ambon in the Pacific Ocean.

A completely faded specimen from Sumbawa Island, Indonesia, questionably referred to *O. rotundiceps obliquus* could possibly be *O. elongatus* (see "Geographic Distribution" under *O. r. obliquus*).

Menon and Rama Rao (1963) recorded *O. kallosoma* from Madras and Mandapam, India, and the Andaman Islands (actually Nicobar Islands). Their specimens from India are *O. elongatus,* whereas their specimen from the Nicobar Islands is *O. rotundiceps obliquus.* Of the Indian specimens, we were able to examine only the Mandapam specimen (ZSIC F6916/2), which arrived too late to be included in Table 6. We have entered the Madras record for *O. elongatus* on Figure 5 based on the color pattern description given by Menon and Rama Rao. Meristics for the Mandapam specimen are as follows: dorsal fin XIII,20; anal fin II,23; total procurrent caudal-fin rays 12; vertebrae 11 + 29; epipleural ribs 13; lateral-line tubes 2, extending posteriorly to below fourth dorsal-fin spine; interorbital pores 3; circumorbital pores 8; gill opening extending ventrally to opposite second pectoral-fin ray.

Chu, et al. (1962) reported and illustrated *O. elongatus* (as *O. kallosoma*) from Hainan, and Jones and Kumaran (1965) described and illustrated *O. elongatus* from Minicoy, Laccadive Islands. We have also included these records on the distribution map.

Munro (1958) mistakenly included *O. elongatus* in his checklist of New Guinea fishes. His error was the result of his reporting the type-locality of *Petroscirtes germaini* Sauvage, which species he wrongly considered to be a synonym of *O. elongatus,* as New Guinea, instead of New Caledonia. Munro (1967) continued the error, twice illustrating *O. elongatus,* based on published illustrations of extralimital records.

HABITAT.—Shallow (0–4 m) coastal waters and tide pools with rocks and little coral. Occasionally recorded from brackish water and stream mouths and from rocks with oysters.

COMPARISONS.—*Omobranchus elongatus* belongs to a group of species also comprising *germaini, rotundiceps,* and *loxozonus.* This group of species is united by the following unique specializations: Males may have one or more caudal-fin rays strongly exserted and/or filamentous and a dark ocellus or group of dark spots usually present near the middle of the segmented-ray portion of the dorsal

fin. In addition, all the species have a distinctive pattern of bands on the body: the anterior bands are inclined anteriorly from their ventral origin and the posterior bands are inclined posteriorly. Some males of *O. fasciolatus* may have a similar dark blotch in the dorsal fin, but the pattern of bands on the body is different and the caudal-fin rays are never exserted or filamentous. Most male *O. fasciolatus* have a fleshy crest on the head, a structure not present in the *elongatus* species group. *Omobranchus ferox* males may also have a dark blotch in the dorsal fin but it is positioned at the posterior end of the fin. The pattern of bars on the body of *O. ferox* is usually very faint or absent, but when present it adumbrates that of the *elongatus* group; however, the narrow pale and dark bars adjacent to the posterior margin of the orbit (Figure 29 *f*) readily separate *O. ferox* from the *elongatus* group.

With the exception of *O. germaini,* which overlaps the distribution of *O. elongatus* and *O. rotundiceps,* the species of the *elongatus* group are predominantly allopatric; however, *O. elongatus, O. germaini,* and *O. rotundiceps* have all been collected at the small island of Ambon in Indonesia, where each occurred at the mouth of a different stream. Where two or more of these species occur together, all or most of the specimens of each species are readily separable. Overlaps in the overall ranges for characters of the species are the result of combining individual population variations within a species. Problems in identification occur with specimens that have poorly developed color patterns and counts in the overlap portions of the ranges for the characters of the population under consideration.

A pattern of small, dark spots on the underside of the head (Figures 13*b*, 14*b*) found in many male and some female specimens of *O. elongatus* will distinguish those specimens from specimens of the other species in the *elongatus* group. The spotted pattern is adumbrated by some specimens of *O. r. rotundiceps* from eastern Australia (Figure 29*b*), where *O. elongatus* does not occur. Within the *elongatus* group, *O. elongatus* is distinctive in lacking a well-defined dark spot posterior to the eye.

NOMENCLATURAL DISCUSSION.—Bleeker (1858) did not compare *P. kallosoma* with any nominal species, although he mentioned that the color patterns of the fins distinguished it from all other species of *Petroscirtes,* a conglomerate genus at that time. Bleeker was referring primarily to the stripes and ocellus found on the dorsal-fin rays (of males), characters which are also present in *O. rotundiceps, germaini,* and *loxozonus.* The holotype, now faded, is a typical male *O. elongatus.*

In the files of RMNH are a number of unpublished colored illustrations that Bleeker intended to use in his "Atlas." Among these is one labeled *Petroscirtes kallosoma,* which was probably drawn from the holotype. This illustration shows one more dorsal-fin spine and ray than is present in the holotype. The distinctive spotting under the head is not indicated, although Bleeker noted it in his description.

Fowler (1937) compared his *P. dispar* only with *P. masyae* (= *O. punctatus*). The holotype is a small female *O. elongatus.*

MATERIAL EXAMINED.—ZANZIBAR: USNM 12678 (2: 36.8–ca. 39). MOZAMBIQUE: ZMB 1940 (2: ca. 48–50 syntypes of *Petroscirtes elongatus*). INHACA ISLAND: RUSI 1101 (65: 27.8–47.6), 1098 (13: 16.2–53.8), SAM 25169 (4: 28.0–43.2), USNM 197642 (32.6). MADAGASCAR: Nossi Be, USNM 201876 (6: 37.3–48.6), 201877 (2: 25.2–27.1), 201878 (6: 28.5–35.4), 201879 (25.7), 201891 (4: 27.9–34.3), 201892 (3: ca. 25–31), 209235 (3: 29.8–39.3), 209231 (2: 24.2–27.3). SEYCHELLES ISLANDS: MAHE: ANSP uncataloged, Sta. F–1 (18.8), Sta. F–116 (13.8), Sta. F–117 (4: 13.0–14.6). ANONYME: ANSP uncataloged, Sta. F–21 (2: 24.9–25.7). CHAGOS ARCHIPELAGO: DIEGO GARCIA ATOLL: USNM 209232 (18: 22.5–43.8), 209230 (33.2). INDIA: Mandapam Camp, ZSIC F6916/2 (44.1). CEYLON: USNM 209228 (11: 16.0–38.0), 209233 (4: 16.4–40.4), NFIS 11621 (27.4). ANDAMAN ISLANDS: USNM 144418 (ca. 33). NICOBAR ISLANDS: NFIS 11859 (2: 21.8–27.6), 11860 (2: 30.8–34.1). INDONESIA: SUMATRA: 00° 41′ N, 97° 53′ 30′ E, USNM 201558 (26.9). BILITON: RMNH 4452 (48.2, holotype of *Petroskirtes kallosoma*). CELEBES: Kwandung Bay, ZMA 113014 (28.8). BUTON (also Butung): USNM 211872 (25.7). AMBON: USNM 211878 (13: 19.5–43.6). GULF OF THAILAND: southeast portion, USNM 119664 (2: 27.4–29.3). GOH KRAM ISLAND: USNM 209425 (123: 13.2–39.8). GOH SAK ISLAND: CAS GVF reg. no. 1459 (71: 20.3–46.4). GOH SAMED ISLAND: CAS GVF reg. no. 2198 (43: 23.1–47.0). KOH KUT ISLAND: USNM 119661 (4: 28.1–41.7). THAILAND: Bangkok, ANSP 68255 (24.0, holotype of *Petroscirtes dispar* Fowler). PHILIP-

PINE ISLANDS: NEGROS: CAS GVF reg. no. 1597 (35.9), GVF reg. no. 1598 (3: 31.1–41.6). MINDANAO: AMNH 15559 (6: 32.3–48.6), FMNH 40581–83 (3: 32.4–35.2). A large number of CAS specimens from the northern Gulf of Thailand were examined, in addition to those listed above, but only associated ecological data were recorded.

Omobranchus fasciolatoceps (Richardson)

FIGURE 16

Blennius ?fasciolatoceps Richardson, 1846:265 [Macao, based on a then-unpublished illustration].

Petroscirtes dispar Günther, 1861:232 [in part; Amoy, China; name restricted under *Omobranchus punctatus*].

Chasmodes herklotsi Herre, 1935:288 [southern coast of Hong Kong].

Petroscirtes uekii Katayama, 1941:591 [Higashiiwase of Toyama Bay].

DESCRIPTION (see also Table 5).—Dorsal fin XII, 19–22 = 31–34; anal fin II, 22–24; (Katayama and Ikeda, 1973, reported an anal-fin count of II, 21 for a specimen from Yamaguchi Prefecture, Japan); both anal-fin spines of males discernible externally; segmented caudal-fin rays 12–13 (12 in 1 of 21 specimens); dorsal + ventral procurrent caudal-fin rays 11–13; vertebrae 10 + 27–30 = 37–40; epipleural ribs 11–13 (13 in 1 of 20 specimens); prenasal pores present; interorbital pores 2–3 (2 in 18 of 19 specimens); circumorbital pores 7–8 (8 in 17 of 20 specimens); lateral-line tubes 3–8; lateral-line tubes extending posteriorly to below level of dorsal-fin spine 5–10; gill opening restricted to area dorsal to level of dorsalmost pectoral-fin ray; lower-lip flap present; circumorbital bones 5; lower jaw teeth 26–48 (Figure 41); upper jaw teeth 24–35 (Figure 40); fleshy bladelike crest present on top of head of both sexes.

COLOR PATTERN.—*Males*: Head: Four moderately narrow to broad, pale to dusky bands on head. Anterior band extending from anteroventral margin of orbit across mouth, just anterior to corner of jaws, onto chin. Second band extending ventrally from orbit, angled slightly posteriorly on ventral side of head. Broad, dark dusky continuation of 1st or 2nd band directed dorsally from dorsal margin of orbit to anterodorsal edge of fleshy crest, covering anterior half of crest. Third band encircling head posterior to eye; above level of mouth band broad, extending onto posterior end of fleshy crest; below level of mouth band narrow, slanted posteroventrally; large, dark dusky to dark oval spot present on band posterior to level of eye; spot well defined all but ventrally, with dark anterior and posterior margins continued dorsally and ventrally on band in some specimens. All 3 bands may be confluent ventrally with corresponding bands of opposite side. Fourth band encircling head just anterior to dorsal-fin origin; ventral end of band terminating just dorsal to pelvic-fin origin (illustration by Tomiyama and Abe, 1953, shows band splitting just below level of eye, and posterior arm of band directed onto fleshy pectoral-fin base; our specimens do not exhibit this pattern but they are faded).

Trunk: Pale to pale dusky with approximately 10 evenly spaced, faint, broad, dusky bands. Bands reaching from dorsal to ventral body contour; dorsal half of bands directed slightly dorsoposteriorly, ventral half slightly ventroposteriorly, bands becoming very faint to absent posteriorly; posterior one-fifth of body apparently without bands.

Pectoral Fin: Pale to transparent with dark specks of pigment scattered basally and concentrated in single threadlike lines along dorsal and ventral edges of each ray.

Pelvic Fin: Pale with dark specks of pigment scattered basally.

Dorsal Fin: Pale with narrow, dark dusky to dark stripes. Two moderately narrow stripes present anteriorly on fin; 3rd stripe appearing distally at about 6th dorsal-fin spine; stripes becoming slightly narrower and turning dorsoposteriorly near last dorsal-fin spine; posterior half of fin with series of narrow, dorsoposteriorly slanted stripes, becoming faint distally. Large, but not prominent, dusky spot present distally between about first 3 segmented dorsal-fin rays in some specimens.

Anal Fin: Dark dusky to dark, tips of rays abruptly pale.

Caudal Fin: Pale with evenly scattered dark specks of pigment; duskier basally.

Females (specimens examined greatly faded): Similar to males except: overall pigment pattern apparently paler, bands fainter; dorsal-fin markings less distinct; dusky spot on dorsal fin apparently absent.

Useful illustrations of *O. fasciolatoceps* are contained in Tomiyama and Abe (1953, pl. 193) and Whitehead (1969, pl. 25*c*).

GEOGRAPHIC DISTRIBUTION (Figure 6).—Coast of mainland China from Macao and Hong Kong north to Toyama Bay, Japan. The Macao record is based on the type-locality of *Blennius fasciolatoceps*. Tomiyama and Abe (1953) described and illustrated a specimen (as *O. uekii*) from Hamana Lake, Honshu, Japan, which is the northernmost record for the Pacific coast of Japan. Kamohara (1956) reported a specimen (as *O. uekii*) from the mouth of the Kogami River in Kochi City, Shikoku; we have not recorded this locality on the distribution map because we are unable to verify the identification. Katayama and Ikeda (1973) described and illustrated a specimen (as *O. uekii*) from the Atsu Higashigawa River in Yamaguchi Prefecture, Japan. We have entered this locality record on the distribution map.

HABITAT.—Tomiyama and Abe (1953) reported *O. fasciolatoceps* (as *O. uekii*) from brackish water, and Herre (1934) reported it (as *Petroscirtes dispar*) from oyster beds.

COMPARISONS.—*Omobranchus fasciolatoceps* is unique in the Blenniidae in the changes in jaw structure that occur in mature females (see "Sexual Dimorphism" under the generic account). It is otherwise separable from most of the other species of *Omobranchus* only by a combination of characters. The possession of 2 interorbital pores and a fleshy crest on the head separates *O. fasciolatoceps* from all the *Omobranchus* species with which it appears to be broadly sympatric; *O. aurosplendidus, elongatus, ferox, germaini, loxozonus, elegans, punctatus. Omobranchus aurosplendidus* also has a crest, but it has 3 interorbital pores, more dorsal- and anal-fin elements, more vertebrae, and fewer lateral-line tubes than *O. fasciolatoceps* (Table 5). The other species have 3, rarely 2 or 4, introrbital pores and no crest.

NOMENCLATURAL DISCUSSION.—Richardson (1846) based his description of *B. fasciolatoceps* on an unpublished colored illustration, later published by Whitehead (1969, pl. 25*c*) in black and white. The illustration depicts an *Omobranchus* with a crested head bearing five dark bands and no other distinctive color pattern on the body. The dorsal fin is without filamentous anterior dorsal-fin spines or a black spot covering the base of the anteriormost spines. Except for the 42 dorsal-fin elements depicted (five more than known for any species of *Omobranchus*), the illustration reasonably represents a male of the species here treated as *O. fasciolatoceps*. (Note: Our illustrations of *O. fasciolatoceps*, Figure 16, were based on faded specimens, which did not exhibit the dark bands on the head.)

Günther (1861) based his description of *P. dispar* on two specimens representing two species, *O. punctatus* and *O. fasciolatoceps*, which were not considered in his discussion. We have designated his specimen of *O. punctatus* as lectotype of *P. dispar* and in doing so have restricted the name.

Herre (1935) noted the similarity of his *C. herklotsi* to Günther's *P. dispar*, but distinguished it from that species by stating only that its anterior profile was markedly different. Herre's holotype and paratypes were all females that do have a unique snout physiognomy, while Günther's specimen of *O. fasciolatoceps* was a male, thus accounting for the difference noted by Herre.

Katayama (1941) also compared his *P. uekii* only with *P. dispar*, noting that his species had a higher crest and shorter snout. The height of the crest and length of the snout are highly variable characters. Although the crest of the larger Japanese male specimens may be more strongly developed than that of other specimens, we find no reason to recognize the Japanese specimens nomenclaturally.

MATERIAL EXAMINED.—HONG KONG: CAS SU62067 (2: 50.0–53.0), SU66811 (4: 42.8–63.4), SU62063 (3: 40.0–45.2), SU61121 (3: 51.0–61.7), SU30970 (3: 51.1–57.4, holotype and paratypes of *Chasmodes herklotsi*; holotype unsegregated, the largest specimen), USNM 209264 (61.6). CHINA: Futschau (Foochow), ZSZM 11386 (32.5), ZSZM uncataloged (46.7); Amoy, BMNH 1860.7.20.100 (ca 59, syntype of *Petroscirtes dispar* Günther = *O. punctatus*). JAPAN: Higashiiwase, near Toyama City, private collection of Masao Katayama, Yamaguchi University (59.5); Hamamatsu, ZITU 35257 (47.7).

Omobranchus fasciolatus (Valenciennes)

FIGURE 17

Blennechis fasciolatus Valenciennes in Cuvier and Valenciennes, 1836:287 [based on a then-unpublished figure; neotype designated below].

Petroscirtes striatus Jatzow and Lenz, 1898:512 [junior primary homonym of *Petroscirtes striatus* Day, 1888, tribe Nemophini, Bawi, Zanzibar].

Petroscirtes vinciguerrae Borsieri, 1904: 211 [Massaua].

Omobranchus cristatus Fraser-Brunner, 1951:214 [tide-pools at Sirah Island, Aden; junior homonym of *Petroscrites cristatus* Zugmayer, 1913 (= *Omobranchus mekranensis*)].

DESCRIPTION (see also Tables 5 and 8).—Dorsal fin XI–XII (XII in 95.0% of specimens), 18–19 = 30–31; anal fin II, 20–22; both anal-fin spines of males discernible externally; segmented caudal-fin rays 13; dorsal + ventral procurrent caudal-fin rays 12–15; vertebrae 10 + 26–28 (26 in only 1 of 51 specimens) = 36–38; epipleural ribs 12–16 (16 in only 1 of 53 specimens); prenasal pores present; interorbital pores 2; circumorbital pores 7–9 (8 in 88.9% of specimens); lateral-line tubes 3–8 (5–7 in 90.5% of specimens); lateral-line tubes extending posteriorly to below level of dorsal-fin spine 7–10; gill opening varying from resricted to area dorsal to level of dorsalmost pectoral-fin ray to extending ventrally to opposite 2nd ray (restricted to area dorsal to dorsalmost ray in 95.0% of specimens); lower-lip flap present; circumorbital bones 5; lower jaw teeth 18–26; upper jaw teeth 18–25 (Figure 42); fleshy bladelike crest present on top of head of males over 33 mm SL, present or absent on smaller males, poorly developed or absent on females.

COLOR PATTERN.—*Males*: Head: Two narrow, dark bands present between anterior margin of orbit and upper lip; row of intense, small, dark spots occasionally present along each band. Three broad, mottled, dark bands on lower half of head; anterior band extending from anteroventral margin of orbit across mouth just anterior to angle of jaws to chin, usually joining corresponding band of opposite side on chin; 2nd band extending ventrally from posteroventral margin of orbit, directed slightly posteriorly at level of anterior preopercular pores; 3rd band extending ventroposteriorly from posterior margin of orbit; cheek portion of 3rd band faint or absent in most specimens; posterior 2 bands

TABLE 8.—*Frequency distributions for certain characters in populations of* Omobranchus fasciolatus

Population	Dorsal-fin spines			Segmented dorsal-fin rays			Total dorsal-fin elements			Precaudal vertebrae	Caudal vertebrae				Total vertebrae			
	11	12	x̄	18	19	x̄	30	31	x̄	10	26	27	28	x̄	36	37	38	x̄
Northern Red Sea		5	12.0	3	2	18.4	3	2	30.4	5		2	3	27.6		2	3	37.6
Southern Red Sea	1	5	11.8	3	3	18.5	4	2	30.3	6		5	1	27.2		5	1	37.2
Gulf of Aden		6	12.0	2	4	18.7	2	4	30.7									
Persian Gulf	2	12	11.9	6	8	18.6	8	6	30.4	14		7	6	27.5		7	6	37.5
Arabian Sea		12	12.0	3	9	18.8	3	9	30.8	12		4	8	27.7		4	8	37.7
Mombasa		1			1			1		1			1				1	
Mozambique		1			1			1		1			1				1	
Madagascar		15	12.0	12	3	18.2	12	3	30.2	15	1	14		26.9	1	14		36.9

Population	Segmented anal-fin rays				Dorsal + ventral procurrent caudal-fin rays					Epipleural ribs						Lateral-line tubes							Last lateral-line tube below dorsal-fin spine				
	20	21	22	x̄	12	13	14	15	x̄	12	13	14	15	16	x̄	3	4	5	6	7	8	x̄	7	8	9	10	x̄
Northern Red Sea	1	4		20.8		1	4		13.8		1	2	2		14.2		2	2	1			5.8	2	1	2		8.0
Southern Red Sea	2	3	1	20.8		3	3		13.5		1	3	2		14.2			5	1			6.2	1	3	2		8.2
Gulf of Aden	1	5		20.8																						
Persian Gulf	4	9	1	20.8	1	-	11	2	14.0	2	4	7			13.4	1	1	2	8	2		5.6	2	8	3	1	8.2
Arabian Sea	1	5	6	21.4	6	4	2		12.7		2	7	3		14.1				3	7	2	6.9		2	6	4	9.2
Mombasa		1					1						1													
Mozambique		1											1					1							1	
Madagascar	3	12		20.8	1	2	9	1	13.8		3	6	5	1	14.3		1	2	8	4		6.0	2	8	5		8.2

usually terminating before reaching ventral midline of head. Underside of head with dusky spots or freckles in spaces between bands and in area posterior to 3rd band, particularly well developed posteriorly; narrow, vertical, dusky streaks or lines of small, dark spots located more dorsally between bands. Large, dusky, oval area directly behind eye, extending from level of upper end of orbit to ventral extent of preopercular pores; intensely dark semicircular spot approximately half size of eye covering dorsal end of oval area; oval area dusky anteriorly and medially, usually paler ventrally and ventroposteriorly; narrow, pale margin along curved dorsal edge of semicircular spot; some specimens with narrow, posteroventrally inclined, pale slash across center of oval area. Operculum generally indistinctly mottled except for narrow, pale slash originating just above pale, dorsal margin of semicircular spot and running diagonally downward across upper portion of operculum; posteroventral portion of operculum sometimes with several tiny, dark spots; posterior opercular membrane pale. Interorbital area occasionally with several broad, dark bands, spots, or blotches continuing dorsally onto fleshy crest.

Trunk: Approximately 17 vertical, broad, dusky to dark bands on body; tips of bands reaching to or near dorsal and ventral body contours, usually becoming fainter ventrally; occasionally 1 or 2 middle bands not reaching as high as adjacent bands: posterior bands often faint and blotchlike; dorsal ends of anterior bands directed slightly anteriorly, posterior bands slightly posteriorly; dorsal ends of bands wavy, giving dorsal one-fourth of body color pattern less regular appearance; some specimens with bands paired, bands in a band pair only slightly closer together than band pairs; pigment along vertical axes of bands slightly intensified; intensification greatest at 3 points, at lateral midline of body, halfway up dorsal half of body, and halfway down ventral half of body, giving appearance of 3 longitudinal rows of dark spots in faded specimens; rows usually not well developed in males; when evident, midlateral row usually best developed.

Pectoral Fin: Fin and fleshy base pale with even spread of dark specks of pigment. Some specimens with about 4 tiny, dark spots evenly spaced along basal edge of fin.

Pelvic Fin: Pale with even spread of dark specks of pigment.

Dorsal Fin: Mostly dusky proximally; membrane pale to transparent distally, usually with slightly dusky edge; spinous portion occasionally with dusky mottling or several dorsoanteriorly slanted, broad, dusky bands proximally, otherwise evenly dusky, except more transparent proximally. Large, intensely dark, oval spot usually present somewhat distally between 9th and 14th segmented rays.

Anal Fin: Pale dusky proximally, dusky to dark distally, tips of rays abruptly pale.

Caudal Fin: Pale with even spread of dark specks of pigment. Vertically oriented pair of diffuse, dusky blotches at base of fin giving rise to 2 diffuse, dusky stripes; stripes may converge into 1 posteriorly.

Females: Similar to males except: body bands largely reduced or fainter; intensifications of pigment in bands usually forming 3 rather distinct rows of dark spots and often a 4th row above anterior portion of dorsal row; other spots often present along vertical axes of bands and dorsally; dorsal and anal fins weakly pigmented, dorsal fin uniformly very pale dusky proximally, transparent distally, dark oval spot in dorsal fin absent.

Geographic Variation.—There are slight shifts in the averages for meristic characters in the various populations of *O. fasciolatus* that may prove to be descriptive of the populations when more specimens are available (Table 8).

Geographic Distribution (Figure 4).—Bitter Lakes of the Suez Canal south to Bazaruto Island, Mozambique, and east from Persian Gulf to northwest India; Madagascar. Smith (1959) reported *O. fasciolatus* (as *O. mekranensis*) from Malindi and Shimoni, Kenya, Zanzibar (based on Jatzow and Lenz, 1898), and Ibo and Bazaruto Island, Mozambique. We have not seen Smith's specimens, but based on his description and illustration of a specimen from Ibo, we accept his records and have recorded them on the distribution map.

Habitat.—Shallow coastal waters and tidepools in rocky areas and under nonestuarine conditions. In the "Material Examined" section, the specimen recorded as having come from Kabret, which is in the Bitter Lakes, is of interest. The specimen was collected by the Cambridge Suez Canal Expedition of 1924, at which time the salinity of the Bitter

Lakes was 48.5–53.5 o/oo (Fox, 1926, tables 5 and 11). In view of the ability of *O. fasciolatus* to exist in this high salinity barrier, it is conceivable that it might penetrate to, and become established in, the Mediterranean Sea.

COMPARISONS.—*Omobranchus fasciolatus* is separable from most of the other species of *Omobranchus* only by a combination of characters. It is most easily confused with *O. mekranensis,* with which it is sympatric (both species have been taken in the same collection). It differs from *O. mekranensis* most obviously in having 30–31 total dorsal-fin elements (versus 32–33), 10 + 26–28 = 36–38 vertebrae (versus 11 + 28–29 = 39–40), and both anal-fin spines of males discernible externally (versus one or both spines not discernible). Male *O. fasciolatus* may have a dark spot, which *O. mekranensis* lacks, near the center of the segmented dorsal-fin rays.

Omobranchus fasciolatus may be most easily separated from the other *Omobranchus* species (*banditus, elongatus, ferox, punctatus,* and *woodi*) with which it appears to be broadly sympatric as follows: from all in having typically 2 interorbital pores (rarely fewer than 3 pores in the other species); from *O. banditus* in having a lower-lip flap and in lacking prominent, discrete dark bands on the body; from *O. elongatus* in frequently having a fleshy crest, 12 dorsal-fin spines (usually more than 12 in *O. elongatus*), the gill opening usually restricted to the area dorsal to the level of the dorsalmost pectoral-fin ray (versus usually extending ventrally to or below 2nd from dorsalmost ray in *O. elongatus*), and in never having filamentous caudal-fin rays in males; from *O. ferox* in having 30–31 total dorsal-fin elements (versus 32–35) and in having the gill opening restricted dorsal to the level of the 3rd pectoral-fin ray (versus extending ventral to the second ray in *O. ferox*), and in frequently having a fleshy crest; from *O. punctatus* in frequently having a fleshy crest, both anal-fin spines of males discernible externally, 12–16 epipleural ribs (versus 15–25, rarely less than 18 in *O. punctatus*), and 10 precaudal vertebrae (versus 10–12, rarely 10); from *O. woodi* in having 10 precaudal vertebrae (versus 11–12), and usually fewer total dorsal-fin elements and vertebrae (Tables 5 and 8).

NOMENCLATURAL DISCUSSION.— (For discussion of the date and authorship of *Blennechis fasciolatus* see "Nomenclatural Discussion" under generic account). Valenciennes' (1836) description of *B. fasciolatus* was based on an unpublished illustration, which Valenciennes erroneously believed to have been published, but that was first published by Hemprich and Ehrenberg (1889). Hemprich and Ehrenberg noted that the specimen on which the figure was based came from the Red Sea and was lost. The general appearance of the figure, presence of canine teeth posteriorly in both jaws, and the banded color pattern definitely portray a species of the generic taxon that we recognize as comprising all the species in the present study, but it is not possible to absolutely determine which, if any, of these species the figure represents. Only two species of *Omobranchus* are known from the Red Sea: *fasciolatus* and *steinitzi.* Of these two only the specimens we treat here as *fasciolatus* exhibit a color pattern similar to the type shown in the illustration. Inasmuch as *fasciolatus* is the type-species of *Omobranchus,* it is important to tie the generic and specific names to a specimen in order to stabilize the nomenclature. We, therefore, designate USNM 204487, male, 44.5 mm SL, from the Ethiopian Naval Base, Massawa Ethiopia (collected by V. G. Springer and P. Anastos, 10 August 1969) as neotype of *Blennechis fasciolatus.* A female specimen (USNM 209265) was collected with the neotype.

Jatzow and Lenz (1898) described *P. striatus* from two specimens from Bawi, Zanzibar. They did not compare their species with any other; their specimens are no longer extant. The species was illustrated, however, and based on the crested head, color pattern, total number of dorsal-fin elements, and locality of origin, it is obviously a synonym of *O. fasciolatus.*

Of the species of *Omobranchus,* Borsieri (1904) compared his *P. vinciguerrae* only with *O. lineolatus* (Kner). We have examined the holotype of *P. vinciguerrae* and find it to be a male specimen of *O. fasciolatus.* The crest on the head is represented only by a ridge less than 0.3 mm high, and is rather low for a specimen its size (39.1 mm SL); however, all other characters of the specimen are in good agreement with those of other specmens of *O. fasciolatus.*

Fraser-Brunner (1951) stated that his *O. cristatus* differed from all other *Omobranchus* species in having a crest on the head. He did mention, however, that male *O. striatus* has such a crest (it is not clear how he knew that Jatzow and Lenz's specimens included a male as they did not mention sex

and their illustration is inadequate for determining sex). He stated that *O. cristatus* differed from *O. striatus* in proportions, fin-ray counts, and color pattern. The fin-ray counts reported by Jatzow and Lentz for *O. striatus,* however, are within the range of those reported by Fraser-Brunner for *O. cristatus.* Jatzow and Lenz reported the two proportions they gave in terms of total length, and Fraser-Brunner reported his proportions for the same characters in terms of standard length. When this difference in method is considered, the two sets of proportions would be similar, if not identical. Finally, color pattern in *O. fasciolatus* is quite variable, and we have examined specimens that are similar in color pattern to that described and illustrated by both Jatzow and Lenz and Fraser-Brunner.

MATERIAL EXAMINED.—NORTHERN RED SEA: SUEZ CANAL: Kabret, BMNH 1925.9.19.139 (47.1). GULF OF SUEZ: Ras Misalla, HUJ Fish 303 (31.1); Abu Rodees, HUJ F-4379 (39.6); Et Tur, HUJ Fish 44 (33.9). SOUTHERN RED SEA: ETHIOPIA: USNM 130834 (33.8); Massawa, USNM 204487 (44.5, neotype of *Blennechis fasciolatus*), 209265 (35.8), MCSN 32051 (39.1, holotype of *Petroscirtes vinciguerrae*). DAHLAK ARCHIPELAGO: Cundabilu, HUJ E62/44 (34.1); Entedebir, HUJ E62/4037 (40.2). GULF OF ADEN: SIRAH ISLAND: BMNH 1954.4.26.68 (38.0, holotype of *Omobranchus cristatus* Fraser-Brunner), 1954.4.26.69–74 (6: 26.5–41.7). PERSIAN GULF: SAUDI ARABIA: Ras Tanura, USNM 147984 (9: 23.6–47.3). ZAAL ISLAND, USNM 147980 (5: 27.4–34.0). ARABIAN SEA: WEST PAKISTAN: Astola Island, USNM 201869 (11: 38.6–48.4). INDIA: Okha Point, USNM 201889 (38.1). KENYA: Mombasa, ANSP 53260 (40.0). MOZAMBIQUE: Cape Delgado, USNM 197641 (44.7). MADAGASCAR: Nossi Be, USNM 201880 (11: 23.7–49.5), 209267 (32.2), 201890 (38.3), 201894 (2: 29.6–32.1). NO LOCALITY: BMNH 1878.9.26.7 (36.0).

Omobranchus ferox (Herre)

FIGURES 18, 29*f*

Petroscirtes ferox Herre, 1927:277 [60 syntypes from vicinity of Ambulong, Talisay, and around Volcano Island, all in Lake Taal; neotype designated below].

Petroscirtes kranjiensis Herre, 1940:25 [mangrove swamp drained by Kranji River, Singapore Island].

Petroscirtes waterousi Herre, 1942:112 [swamp on Waterous Hacienda, Mangarin, Mindoro, Philippine Islands].

Petroscirtes feliciana Herre, 1942:112 [mangrove swamp beside Fishery Station at Cagayan, Oriental Misamis, Mindanao, Philippine Islands].

Omobranchus dealmeida J. L. B. Smith, 1949:104 [rock pool, Ponte Maone, Delagoa Bay].

DESCRIPTION (see also Tables 5 and 9).—Dorsal fin XI–XIII (XII in 85.2% of specimens), 20–23 = 32–35; anal fin II, 22–26; both anal-fin spines of males discernible externally; segmented caudal-fin rays 13–15 (13 in 95.4% of specimens); dorsal + ventral procurrent caudal-fin rays 10–15 (12–14 in 96.7% of specimens); vertebrae 10–11 (11 in only 1 of 75 specimens) + 28–30 = 38–40; epipleural ribs 10–13 (11–12 in 96.5% of specimens); prenasal pores present; interorbital pores 2–3 (3 in 96.8% of specimens); circumorbital pores 8–9 (8 in 96.8% of specimens); lateral-line tubes 0–4; lateral-line tubes, when present, extending posteriorly to below level of dorsal-fin spine 2–7; gill opening extending ventrally to level of pectoral-fin ray 3–6; lower-lip flap present; circumorbital bones 4; lower jaw teeth 16–22; upper jaw teeth 14–21 (Figure 37); no fleshy bladelike crest on top of head of either sex.

COLOR PATTERN (available specimens all greatly faded).—Males. Head: Two very faint, dusky bands present below eye; distinctive, almost vertical, narrow, pale line, approximately two-thirds eye diameter in length, bordered posteriorly by intense dark line of similar length, present along posteroventral margin of orbit; lower dorsoanterior edge of pale line also with very narrow, intensely dark, marginal line. Dark dusky blotch apparent posteriorly on operculum in some specimens.

Trunk: Up to 12 or 13 evenly spaced, moderately narrow, dark dusky bands reaching almost from dorsal to ventral body contour present in some specimens (most specimens with color pattern almost totally faded); bands nearly vertical, though apparently with slight anteriorly directed angle at lateral midline of body; bands only about half as broad as adjacent pale dusky interspaces; some bands incomplete dorsally or dorsal ends separate from rest of band. Row of paired dark blotches present on dorsal body contour, each pair at dorsal end of corresponding body band.

Pectoral Fin: Pale with even spread of dark specks of pigment; very fine, threadlike, dark line running length of each ray. Dusky blotch present on dorsal half of fleshy pectoral-fin base.

TABLE 9.—*Frequency distributions for certain characters in populations of* Omobranchus ferox

Population	Dorsal-fin spines				Segmented dorsal-fin rays					Total dorsal-fin elements					Segmented anal-fin rays					
	11	12	13	x̄	20	21	22	23	x̄	32	33	34	35	x̄	22	23	24	25	26	x̄
Mozambique	1						1				1					1				
Ceylon		5	-	12.0	1	4	-	-	20.8	1	4	-	-	32.8		4	1	-	-	23.2
India		4					3	1	22.2			3	1	34.2			2	1	1	24.8
Nias Island		3	-	12.0	2	1	-	-	20.3	2	1	-	-	32.3		3	-	-	-	23.0
Singapore		2	-	12.0			2	-	22.0			2	-	34.0			2	-	-	24.0
Gulf of Thailand	2	22	1	12.0	1	18	6	-	21.2	1	19	5	-	33.2	1	13	11	-	-	23.4
Hong Kong		1					1					1					1			
Philippine Islands	1	27	6	12.1	9	19	6	-	20.9	7	18	9	-	33.0	2	22	10	-	-	23.2

Population	Precaudal vertebrae			Caudal vertebrae				Total vertebrae				Lateral-line tubes						Last lateral-line tube below dorsal-fin spine							
	10	11	x̄	28	29	30	x̄	38	39	40	x̄	0	1	2	3	4	x̄	0	1	2	3	4	5	6	7	x̄
Mozambique	1					1				1																
Ceylon	5	-	10.0	1	3	1	29.0	1	3	1	39.0		4	1	-	-	1.2			4	-	-	-	1	-	2.8
India	4	-	10.0			4	30.0			4	40.0	1	3	-	-	-	0.8	1	-	3	-	-	-	-	-	1.5
Nias Island	3	-	10.0		3	-	29.0		3	-	39.0			1	1	-	2.5				1	1	-	-	-	3.5
Singapore	2	-	10.0			2	30.0			2	40.0		1	1	-	-	1.5			1	1	-	-	-	-	2.5
Gulf of Thailand	25	-	10.0		16	9	29.4		16	9	39.4		11	7	5	2	1.9			10	6	5	3	-	1	3.2
Hong Kong	1					1				1			1							1						
Philippine Islands	33	1	10.0	2	18	14	29.4	2	17	15	39.4		6	9	6	3	1.8			5	7	3	9	-	-	3.7

Pelvic Fin: Pale with even spread of dark specks of pigment proximally.

Dorsal Fin: Pale with scattered fine, dark spots. Indication of some color pattern in the dorsal fin, possibly 1 or 2 longitudinal stripes as described by Herre for *O. waterousi*; however, not apparent on best marked specimen available. Large, dark spot, diffuse in some specimens, present distally between last 3 or 4 segmented rays.

Anal Fin: Dark dusky, ray tips abruptly pale.

Caudal Fin: Pale, membranes transparent distally, dorsal and ventral edges dusky. Two broad, longitudinal, dark dusky streaks present on fin, 1 just above and 1 just below lateral midline of fin.

Female: Apparently similar to males except for absence of dark blotch on posterior distal portion of dorsal fin.

GEOGRAPHIC VARIATION.—There is some evidence (Table 9) that the Indian population of *O. ferox* has greater numbers of meristic elements than do the other populations. Rama Rao (1968) also reported a high number of segmented dorsal- and anal-fin rays for his specimens from India.

GEOGRAPHIC DISTRIBUTION (Figure 4).—Philippine Islands, South China Sea, west to Delagoa Bay, Mozambique. The two specimens known from Mozambique (Smith, 1959) may possibly be the result of artificial introductions similar to that we propose for *O. punctatus* (p. 63) from the same area. The wide gap in distribution between the Mozambique locality and the nearest locality of occurrence to the east (India), together with the estuarine habitat of the species, furnishes circumstantial evidence favoring a hypothesis of artificial introduction.

We have examined specimens of *O. ferox* from India only from Vizgapatnam (about 17° 30′ N) on the Bengal coast. Rama Rao (1968) has reliably reported and illustrated the species, as *Cruantus dealmeida*, from Nizampatnam (above 16°00′N) on the same coast.

HABITAT.—Shallow waters, most frequently collected in mangrove swamps and river estuaries; also from a freshwater lake. One collection was recorded as having come from oysters in a river.

COMPARISONS.—*Omobranchus ferox* differs from all other species of *Omobranchus* except *O. zebra*, with which it is broadly sympatric, in having 4 circumorbital bones (4 bones is a unilateral variant in the other species). It differs from *O. zebra* most obviously in having the gill opening extending ventrally to opposite the 3rd to 6th pectoral-fin ray

(versus never extending ventral to level of dorsalmost ray), in lacking well-defined bands on the head, and in having a shorter head (see key couplet 13).

Omobranchus ferox may be most readily separated from the other species of *Omobranchus* that occupy the same general geographic area as follows: from *O. aurosplendidus* and *fasciolatoceps* in lacking a fleshy crest on the head and in having the gill opening extending much farther ventrally (restricted to area dorsal to dorsalmost pectoral-fin ray in the other species); from *O. meniscus* in having lateral-line tubes (versus lacking tubes), 20–23 segmented dorsal-fin rays (versus 19 rays), males without a fleshy crest, and no dark, crescentic marking extending dorsally from the postorbital margin; from *O. punctatus* in having the gill opening extending farther ventrally (never below level of dorsalmost pectoral-fin ray in *punctatus*), and no more than 4 lateral-line tubes (versus rarely less than 4); from *O. elongatus* and *germaini* in not having any distinct, dark markings on the underside of the head and on the body, and in the nature of the dark spot behind the eye (compare Figure 29*f* with Figures 29*e* and 13–15).

Males of *O. ferox* are unique in *Omobranchus* in having a dark spot distally at the posterior end of the dorsal fin (Figure 18).

NOMENCLATURAL DISCUSSION.—Herre (1927) described *Petroscirtes ferox* based on 60 syntypes from Lake Taal (= Lake Bombon), Luzon, Philippine Islands. We have been unable to locate any of the specimens upon which his description was based. Herre did not compare his species with any other, and while the description and illustration best fit the species here called *O. ferox*, the determination is not unequivocal. For this reason, and in order to stabilize the name of the taxon in question, we here designate CAS SU67264, male, 38.1 mm SL, Lake Bombon, collected by Herre, May 1931, as neotype of *Petroscirtes ferox*. The neotype is one of 19 specimens (14.5–41.7 mm SL) originally cataloged as CAS SU28446 (the remaining 18 specimens retain this number) under the name *Petroscirtes ferox*, and were presumably identified as such by Herre. In the description of *P. ferox*, Herre stated that the total number of dorsal-fin elements ranged from 32–36, which is one element more than we have found for the species and two more than we found among the 34 specimens available from the Philippine Islands.

Herre (1940) did not compare his *Petroscirtes kranjiensis* with any other species. We have examined the holotype and paratype and find them to be specimens of *O. ferox*.

Herre (1942) described two more species, *P. waterousi* and *P. feliciana*, also synonymous with *P. ferox*. His comparison of these two species is contained in a key to the Philippine species of *Petroscirtes*, which included several species in the blenniid tribe Nemophini and the following nominal species of *Omobranchus*: *ferox*, *waterousi*, *kallosoma* (= *elongatus*), *feliciana* and *loxias* (= *rotundiceps obliquus*). His first major separation in the key was only ecologically based: freshwater species versus marine species. His *P. ferox* keyed out as the only freshwater species. All the remaining *Omobranchus* species and two nemophinine species, *P. bankanensis* and *P. eretes*, fall under couplets H and HH of his key. *Petroscirtes waterousi* is segregated in couplet H, which reads "no cross bands or stripes on body," but in couplet I leading to *waterousi*, he stated contradictorily: ". . . with faint indications of a dozen narrow crossbars. . . ." Later, in couplet LL leading to *P. feliciana*, he stated: ". . . 12 angulate or vertical dusky brown crossbars." He, therefore, did not differentiate his species, and we can find no reason to recognize them.

Smith (1949) did not compare his *O. dealmeida* with any other species. We have examined the holotype and find it to be a specimen of *O. ferox*.

MATERIAL EXAMINED.—MOZAMBIQUE: DELAGOA BAY: Ponte Maone, RUSI 233 (44.1, holotype of *Omobranchus dealmeida*). CEYLON: Trincomalee, USNM 209268 (5: 39.0–49.8). INDIA: Vizagapatnam, CAS SU67265 (4: 29.2–36.5). INDONESIA: NIAS ISLAND: USNM 201559 (3: 30.4–34.5, including one cleared and stained). SINGAPORE: CAS SU33007 (42.4, holotype of *Petroscirtes kranjiensis*), SU33008 (40.5). THAILAND: northeast coast Gulf of Thailand, USNM 119663 (ca. 45), CAS GVF reg. no. 1486 (23: 35.7–ca. 49), GVF reg. no. 2176 (38.8). HONG KONG: CAS SU62066 (42.6). PHILIPPINE ISLANDS: Manila fish market, USNM 99372 (4: 53.1–55.7), 122383 (54.6). PALAWAN: USNM 122382 (37.9). LUZON: Pangasinan Province, USNM 209345 (34.4), 209346 (8: 36.8–58.3); Batangas Province,

CAS SU28446 (18: 14.8–41.7), SU67264 (38.1, neotype of *Petroscirtes ferox*). MINDANAO: CAS SU36671 (54.7, holotype of *Petroscirtes feliciana*), SU36672 (46.1). MINDORO: CAS SU36673 (38.4, holotype of *Petroscirtes waterousi*).

Omobranchus germaini (Sauvage)

FIGURES 19, 20, 29*e*

Petroscirtes germaini Sauvage, 1883:158 [Nouvelle-Caledonie].
Graviceps alexanderi Whitley, 1945:33 [Fremantle, Western Australia, living in holes in wharf piles].

DESCRIPTION (see also Tables 5 and 10).—Dorsal fin XII–XIV (XIII in 84.6% of specimens), 18–23= 31–36; anal fin II, 21–26; both anal-fin spines of males discernible externally; segmented caudal-fin rays 13–14 (13 in 98.8% of specimens); dorsal + ventral procurrent caudal-fin rays 11–18 (12–16 in 97.5% of specimens); vertebrae 10–11 + 28–32 = 38–43; epipleural ribs 11–15 (12–14 in 97.4% of specimens); prenasal pores present; interorbital pores 2–5 (3 in 96.7% of specimens); circumorbital pores 7–10 (modally 8 or 9); lateral-line tubes 0–8 (0 in only 1 of 243 specimens); lateral-line tubes, when present, extending posteriorly to below level of dorsal-fin spine 1–10; gill opening varying from restricted to area dorsal to level of dorsalmost pectoral-fin ray to extending ventrally to opposite 6th ray (extending below level of 4th ray in only 3 of 230 specimens); lower-lip flap present; circumorbital bones 4–5 (of 7 specimens examined all had 5 except 1 specimen with 4 on one side and 5 on the other; the 4 bones resulted from a fusion of the posteriormost 2 circumorbials); lower jaw teeth 16–28 (Figure 48); upper jaw teeth 14–25; no fleshy bladelike crest on top of head of either sex.

COLOR PATTERN.—*Males*: Head: Ventral half to one-third with about 4 irregular, moderate to broad, evenly spaced bands; anteriormost band joining corresponding band from opposite side across ventral surface; remaining 3 bands variable, with none to all bands joining corresponding band of opposite side across ventral surface. Anteriormost band extends from chin to anterior edge of orbit; remaining 3 bands originate ventral and posterior to ventral extremity of orbit. Pale spaces between bands slightly broader than adjacent bands; spaces divided by vertical series of narrow to moderately broad dashes or broken lines. Ventral surface with irregular transverse series of uninterrupted and interrupted dark bands. One or more irregularly positioned, short, broad, dark lines posteriorly in branchiostegal region. Dorsoanteriorly darkened, dome-shaped area posterior to eye between circumorbital and preopercular series of cephalic sensory pores; vertically elongate, intense, black spot, about as broad as pupil diameter, at level of pupil just inside anterior margin of dome-shaped area. Operculum with large, dorsoanteriorly inclined, dusky area enclosed by pale border; border sometimes incomplete posteroventrally; dark blotch sometimes present above pale border. Short, dark band just anterior to gill opening. Trunk portion of gill opening darkly pigmented. Head and nape uniformly dusky dorsally.

Trunk: Unpaired dark band in area covered by appressed pectoral fin followed posteriorly by 7 or 8 pairs of dark, equally broad bands. Bands slant posteroventrally below lateral midline; unpaired band and first 2 band pairs slant anterodorsally above midline; remaining bands slant posterodorsally above midline. Bands usually well developed ventrally, occasionally faint to absent; bands broken into dark mottling or spotting on dorsal quarter of body. Posterior bands often poorly developed with posteriormost band usually represented as elongate midlateral spot. Each band with intensification of pigment midlaterally, sometimes continuing ventrally as medial sliver of dark pigment (intensifications appear as series of paired spots in faded specimens). Unpaired band and band pairs encircled by narrow, pale margins, paler than interspaces separating band pairs; interspaces between band pairs broader than individual bands. Narrow, dark stripe on body along dorsal-fin base, sometimes broken into series of spots in faded specimens.

Pectoral Fin: Pale with uniform spread of dark specks of pigment. Fleshy pectoral-fin base crossed by 1–3 dark or dusky bars; anteriormost bar darkest, occasionally extending onto head.

Pelvic Fin: Pale to slightly dusky.

Dorsal Fin: Pale with series of dark, irregular stripes; stripes broad, inclined anterodorsally on anteror portion of fin, less defined, narrower, inclined dorsoposteriorly on posterior portion. Posterior 3rd of dorsal fin uniformly dusky. Some specimens with a series of more-or-less joined, intensified, black blotches, usually extending from 8th to 11th segmented ray (variable in range between 7th and

TABLE 10.—*Frequency distributions for certain characters in populations of* Omobranchus germaini

Population	Dorsal-fin spines				Segmented Dorsal-fin rays							Total Dorsal-fin elements							Segmented Anal-fin rays						
	12	13	14	x̄	18	19	20	21	22	23	x̄	31	32	33	34	35	36	x̄	21	22	23	24	25	26	x̄
Taiwan	1	7	-	12.9		1	7	-	-	-	19.9		2	6	-	-	-	32.8		1	7	-	-	-	22.9
Hong Kong	2	15	1	12.9	4	14	-	-	-	-	18.8	6	11	1	-	-	-	31.7	2	12	4	-	-	-	22.1
Philippine Islands		3	-	13.0		3	-	-	-	-	19.0		3	-	-	-	-	32.0		3	-	-	-	-	22.0
Singapore	1						1						1							1					
Ambon		3	-	13.0		3	-	-	-	-	19.0		3	-	-	-	-	32.0		3	-	-	-	-	22.0
Australia																									
Queensland																									
Capricorn Islands	4	49	3	13.0		2	30	24	1	-	20.4		4	27	24	1	-	33.4		2	27	26	3	-	23.5
Swains Islands		2	-	13.0				2			21.0				2	-	-	34.0				2	-	-	24.0
Little Hope Island		12	1	13.1			5	8	-	-	20.6			4	9	-	-	33.7			4	9	-	-	23.7
Arnhemland		6	-	13.0	2	4	-	-	-	-	18.7	2	4	-	-	-	-	31.7		5	1	-	-	-	22.2
Western Australia																									
Montebello	1	1	-	12.5				2	-	-	21.0			1	1	-	-	33.5				2	-	-	24.0
Northwest Cape		2	-	13.0			1	-	1	-	21.0			1	-	1	-	34.0				1	1	-	24.5
Point Cloates	7	12	-	12.6			4	12	3	-	20.9			9	9	1	-	33.6			6	11	2	-	23.8
Maud Landing	7	18	-	12.7		2	5	15	3	-	20.8		2	9	14	-	-	33.5		1	7	14	3	-	23.8
Shark Bay	4	40	4	13.0		2	19	21	6	-	20.6		2	16	27	3	-	33.6			16	30	1	1	23.7
Port Denison	1	13	1	13.0				3	7	5	22.1				4	5	6	35.1				3	8	4	25.1
Rottnest Island		29	-	13.0				9	20	-	21.7				9	20	-	34.7				14	12	3	24.6
New Caledonia		2	1	13.3					3	-	22.0				2	1	-	34.3				2	1	-	24.3

Population	Precaudal vertebrae			Caudal vertebrae						Total vertebrae							Circumorbital pores					Epipleural ribs					
	10	11	x̄	28	29	30	31	32	x̄	38	39	40	41	42	43	x̄	7	8	9	10	x̄	11	12	13	14	15	x̄
Taiwan	8	-	10.0		7	-	-	-	29.0		7	-	-	-	-	39.0		6	2	-	8.2			8	-	-	13.0
Hong Kong	16	2	10.1	7	10	-	-	-	28.6	6	10	1	-	-	-	38.7		14	4	-	8.2	1	7	6	1	-	12.5
Philippine Islands	3	-	10.0	2	1	-	-	-	28.3	2	1	-	-	-	-	38.3		3	-	-	8.0		1	2	-	-	12.7
Singapore	1				1						1							1						1			
Ambon	3	-	10.0	2	1	-	-	-	28.3	2	1	-	-	-	-	38.3		3	-	-	8.0		1	2	-	-	12.7
Australia																											
Queensland																											
Capricorn Islands	55	1	10.0		8	41	6	-	30.0		9	40	8	-	-	40.0	1	53	2	-	8.0		13	36	7	1	12.9
Swains Islands	2	-	10.0				2	-	31.0				2	-	-	41.0		2	-	-	8.0			1	1	-	13.5
Little Hope Island	10	2	10.2		2	7	3	-	30.1		1	7	4	-	-	40.2		13	-	-	8.0		2	8	-	-	12.8
Arnhemland	5	1	10.2	4	2	-	-	-	28.3	3	3	-	-	-	-	38.5			5	1	9.2		3	3	-	-	12.5
Western Australia																											
Montebello	2	-	10.0			1	1	-	30.5			1	1	-	-	40.5			2	-	9.0	1	1	-	-	-	11.5
Northwest Cape	1	1	10.5			1	1	-	30.5			1	1	-	-	40.5		1	1	-	8.5			2	-	-	13.0
Point Cloates	12	7	10.4		4	8	6	1	30.2			10	8	-	1	40.6		5	14	-	8.7		1	13	2	-	13.1
Maud Landing	14	11	10.4		3	17	5	-	30.1		1	11	12	1	-	40.5		4	19	2	8.9	1	7	12	5	-	12.8
Shark Bay	9	39	10.8		10	25	10	2	30.1			15	23	8	1	40.9		8	39	1	8.8	1	8	33	6	-	12.9
Port Denison	6	9	10.6			1	7	7	31.4				4	7	4	42.0	2	3	9	1	8.6		3	5	4	-	13.1
Rottnest Island	12	17	10.6			4	20	5	31.0				13	14	2	41.6	1	13	14	1	8.5		3	11	14	-	13.4
New Caledonia	2	-	10.0				1	1	31.5				1	1	-	41.5		1	1	-	8.5			1	1	-	13.5

Population	Lateral-line tubes										Last lateral-line tube below dorsal-fin spine											Lower end of gill opening opposite pectoral-fin ray							
	0	1	2	3	4	5	6	7	8	x̄	0	1	2	3	4	5	6	7	8	9	10	x̄	0	1	2	3	4	5	6	x̄
Taiwan				2	1	4	1	-	-	4.5					1	1	4	1	1	-	-	6.0			5	3	-	1	-	2.7
Hong Kong			1	4	6	2	3	1	-	4.3				1	3	4	3	2	3	1	-	5.9		1	5	6	5	-	-	2.9
Philippine Islands			1	-	-	-	2	-	-	4.7				1	-	-	-	-	2	-	-	6.3				2	1	-	-	3.3
Singapore						1												1								1				
Ambon			2	-	-	1	-	-	-	3.0				1	1	-	-	1	-	-	-	4.7				1	2	-	-	3.7
Australia																														
Queensland																														
Capricorn Islands		6	15	8	14	9	2	-	-	3.2			4	12	7	5	6	13	6	1	-	5.2	5	11	24	1	-	-	1	1.6
Swains Islands			1	1	-	-	-	-	-	2.5				1	-	-	1	-	-	-	-	4.5		1						
Little Hope Island		1	4	1	3	3	1	-	-	3.5		1	-	4	-	1	1	2	4	-	-	5.4	5	5	1	-	-	-	-	0.6
Arnhemland				1	-	5	-	-	-	4.7					1	-	2	1	2	-	-	6.5	4	1	-	1	-	-	-	0.7
Western Australia																														
Montebello					2	-	-	-	-	4.0						1	1	-	-	-	-	5.5		1						
Northwest Cape					2	-	-	-	-	4.0									1	1	-	8.5		2	-	-	-	-	-	2.0
Point Cloates			1	4	7	7	-	-	-	4.1					2	3	3	4	6	1	-	6.6		2	9	7	1	-	-	2.4
Maud Landing			2	3	5	7	6	2	-	4.7				1	1	4	1	2	7	5	4	7.5	3	5	9	6	2	-	-	2.0
Shark Bay		1	-	-	15	14	12	3	1	5.0			1	-	1	4	3	10	21	6	-	7.3		9	18	11	5	1	-	2.3
Port Denison				2	4	4	3	-	-	4.6							3	2	7	-	-	7.3	2	3	2	2	2	-	-	1.9
Rottnest Island	1	2	4	7	6	5	3	-	-	3.5	1	-	2	-	5	6	3	4	7	-	-	5.6		9	7	7	1	-	-	2.0
New Caledonia		1	1	-	-	-	-	-	-	1.5			1	-	-	1	-	1	-	-	-	4.7		1	1	-	-	-	-	1.5

13th rays); others with single large, dusky to intense dark spot in same area. Distal margin of fin with narrow white edge.

Anal Fin: Dusky, slightly darker distally with narrow, white, distal margin. Small, poorly defined, dark spot on membrane at fin base posterior to every 2nd ray.

Caudal Fin: Uniformly pale. Caudal peduncle with 2 moderately sized spots at fin base, 1 just above and 1 just below lateral midline of body; pigment streak from each spot continued posteriorly onto fin.

Females: Color pattern as in males but considerably less intense; body bands very narrow, ventral portions faint to absent. Fin pigment usually faint; spot or spots between 7th and 13th segmented dorsal-fin rays faint or absent.

Geographic Variation: Taiwan: Dark pigment on dorsal portion of body generally better developed; lines and marks in pale interspaces above lateral midline of body intensified, producing mottled appearance on trunk and posterior body. Dark blotches present on top of head and nape. Females with better development of spots (normally characteristic of males) in region of 7th to 13th dorsal-fin rays. Ventral edge of caudal fin occasionally dusky.

Hong Kong and Northern and Western Australia: Trunk and posterior body mottled dorsally, similar to Taiwan specimens. Anterior end of dorsal fin with narrow, anterodorsally inclined, dark stripes.

GEOGRAPHIC VARIATION (see also color pattern).—Population variation was noted in most meristic characters of *O. germaini* (Table 10). In general, the Australian populations have the highest average numbers of elements for each character, but within Australia most of the Arhnemland population's averages are noticeably low and closer to those of the extra-Australian populations.

The Western Australian populations exhibit increases in numbers of precaudal, caudal, and total vertebrae. Similar increases are exhibited by the Western Australian populations of *O. rotundiceps*, whereas the Western Australian populations of *O. punctatus* exhibit an increase in the number of precaudal vertebrae, but not caudal or total vertebrae. Increase in number of precaudal vertebrae was not encountered in any other species of *Omobranchus*. It is noteworthy that three species of *Omobranchus* should each exhibit increases in number of precaudal vertebrae in about the same geographic area, even if presently inexplicable.

Although covariance comparisons of numbers of jaw teeth (Table 11) were not feasible for all populations of *O. germaini*, it was found that significant differences in numbers of lower teeth occurred between females of the Hong Kong and southwestern Australian (Shark Bay to Perth) populations and between the southwestern Australian and Queensland populations. For upper jaw teeth, significant differences occurred between females of the Hong Kong and northwestern Australian (Montebello to Maud), between Hong Kong and southwestern Australian, and between the southwestern Australian and Queensland populations; the comparisons between the northwestern Australian and Queensland populations were almost significant.

GEOGRAPHIC DISTRIBUTION (Figure 6).—Western Pacific Ocean from northern Taiwan south to the Tropic of Capricorn on the Australian east coast and Perth on the Australian west coast; New Caledonia.

HABITAT.—Found in shallow coastal waters and tide pools around rocks and coral, usually at normal seawater salinities. At least 1 collection from rocks at the mouth of a small stream. Usually in calm waters but common on the open-ocean (high-energy) side of One Tree Island in areas inundated at high tide and subjected to the action of breakers.

COMPARISONS.—*Omobranchus germaini* is a member of the *elongatus* species group (see "Comparisons" under *O. elongatus*). Males and sometimes females of *O. germaini* are distinguishable from all other *Omobranchus* species by the mosaiclike pattern of dark spots and bars that is often present on the underside of the head (Figure 29*e*). Within the *elongatus* group, *O. germaini* is most similar to *O. loxozonus*, which is allopatric. The color pattern on the head and body of *O. germaini* is usually more contrasty and the number of body bands is usually larger than in *O. loxozonus*. Where populations of the two species are geographically closest, there are marked differences in numbers of fin rays, vertebrae, and lateral-line tubes (see Tables 5, 10, 12), although overlaps in the ranges for these characters exist.

NOMENCLATURAL DISCUSSION.—Whitley (1945) did not compare his *G. alexanderi* with *O. germaini*. We have not seen his holotype (WAM P.671), but based on his report of the number of dorsal-fin spines (14), total number of dorsal-fin elements

TABLE 11.—*F values for covariance comparisons of regression equations (Table 2) for number of lower or upper jaw teeth between males or females from different populations of* Omobranchus germaini (** = *significant at p = .001; NS = not significant*)

Comparisons	F values slopes	Degrees of freedom	F values heights	Degrees of freedom
Lower teeth				
males				
Hong Kong X Queensland	0.06 NS	1/41	0.27 NS	1/42
Western Australia				
Montebello-Maud X Hong Kong	0.23 NS	1/23	2.22 NS	1/24
Shark Bay-Perth X Hong Kong	1.95 NS	1/19	1.23 NS	1/20
Montebello-Maud X Queensland	0.05 NS	1/48	0.69 NS	1/49
Shark Bay-Perth X Queensland	2.33 NS	1/44	0.10 NS	1/45
Montebello-Maud X Shark Bay-Perth	1.89 NS	1/26	0.15 NS	1/27
females				
Hong Kong X Queensland	4.18 NS	1/24	0.03 NS	1/25
Western Australia				
Montebello-Maud X Hong Kong	0.06 NS	1/22	4.62 NS	1/23
Shark Bay-Perth X Hong Kong	0.75 NS	1/23	14.89 **	1/24
Montebello-Maud X Queensland	3.90 NS	1/38	5.07 NS	1/39
Shark Bay-Perth X Queensland	1.51 NS	1/39	38.03 **	1/40
Montebello-Maud X Shark Bay-Perth	0.42 NS	1/37	5.10 NS	1/38
Upper teeth				
males				
Hong Kong X Queensland	0.00 NS	1/41	0.17 NS	1/42
Western Australia				
Montebello-Maud X Hong Kong	0.19 NS	1/24	0.11 NS	1/25
Shark Bay-Perth X Hong Kong	0.86 NS	1/19	2.77 NS	1/20
Montebello-Maud X Queensland	0.18 NS	1/49	0.00 NS	1/50
Shark Bay-Perth X Queensland	1.04 NS	1/44	0.91 NS	1/45
Montebello-Maud X Shark Bay-Perth	1.89 NS	1/27	1.47 NS	1/28
females				
Hong Kong X Queensland	0.23 NS	1/25	1.31 NS	1/26
Western Australia				
Montebello-Maud X Hong Kong	2.43 NS	1/23	30.58 **	1/24
Shark Bay-Perth X Hong Kong	0.01 NS	1/23	31.89 **	1/24
Montebello-Maud X Queensland	5.18 NS	1/38	10.97 NS	1/39
Shark Bay-Perth X Queensland	0.43 NS	1/38	15.54 **	1/39
Montebello-Maud X Shark Bay-Perth	2.65 NS	1/36	0.30 NS	1/37

(33), segmented anal-fin rays (25), the presence of a crescent-shaped blue spot close behind the eye, and the type-locality (Freemantle, Western Australia), we believe that the holotype could only be *O. germaini*. In addition, all specimens of *O. germaini* sent to us from the Western Australian Museum were identified as *O. alexanderi*, and were presumably so identified based on knowledge of Whitley's holotype. (These specimens were part of the material treated in an unpublished master's thesis by N. Milward, University of Western Australia, on the systematics and biology of Western Australian Blenniidae, Tripterygiidae, and Clinidae, 1962.)

MATERIAL EXAMINED.—TAIWAN: USNM 204027 (5: 44.7–50.4), 208479 (2: 40.1–42.8), 208480 (58.3). HONG KONG: CAS GVF reg. no. 1730 (2: 37.0–38.4), GVF reg. no. 1723 (5: 25.1–36.7), SU62062 (8: 23.8–47.5), USNM 197977 (2: ca. 25–33), 197983 (38.0). PHILIPPINE ISLANDS: CEBU: USNM 207270 (3: 25.7–35.3). SINGAPORE: CAS SU32887 (29.7). INDONESIA: AMBON: USNM 209531 (3: 30.3–37.1). AUSTRALIA: GULF OF CARPENTARIA (Arnhemland): USNM 174338 (34.2), 174342 (2: 41.7–44.0), 174343 (2: 29.3–32.9), 207959 (31.4). GREAT BARRIER REEF: Little Hope Island, ANSP 109700 (12: 16.1–51.3), 109701 (29.4); Swain Reefs, AMS IB.6220–1 (2: 42.6–ca. 45); One Tree Island, USNM 208475 (29: 32.2–54.0), 208476 (ca. 40), 208478 (2: ca. 34–37.4), CAS 13780 (20: 37.8–65.4); Heron Island, BPBM 15129 (4: 30.1–50.2), USNM 208477 (2: 29.4–36.1). WESTERN AUSTRALIA: Montebello Island, BMNH 1961.8.16.76 (31.7), 1961.8.16.78 (43.2); North West Cape, WAM P4837 (2: 41.0–ca. 45); Point Cloates, WAM P10720–36 (19: 28.5–59.4); Maud Landing, WAM P7735–59 (25: 32.4–47.5); Shark Bay, WAM P7257–7306 (48: 22.9–42.8) Port Denison, WAM P4836 (6: ca. 37–48), P10403–11 (9: 16.2–38.8); Rottnest Island, WAM P4779 (2: 42.4–49.7), P6296 (45.7), P10115–22 (8: 32.6–42.6), P10123–28 (6: ca. 36–40.5).

P10393–402 (11: 17.9–46.5); near Perth, NFIS 9635 (51.6). NEW CALEDONIA: MNHN A–4891 (45.5, holotype of *Petroscirtes germaini*); Noumea, CAS SU47017 (36.2), AMS IB.2239 (41.6).

Omobranchus lineolatus (Kner)

FIGURES 21, 22

Petroscirtes lineolatus Kner, 1868a:29; 1868b:331 [Candavu].
Graviceps darwini Whitley, 1958:47 [Port Darwin, Northern Territory of Australia].

Description (see also Table 5).—Dorsal fin XI, 19–21 = 30–32; anal fin II, 20–23; both anal-fin spines of males discernible externally; segmented caudal-fin rays 13–14; dorsal + ventral procurrent caudal-fin rays 11–14; vertebrae 10 + 26–29 = 36–39; epipleural ribs 11–13; prenasal pores present; interorbital pores 3; circumorbital pores 8; lateral-line tubes 4–8; lateral-line tubes extending posteriorly to below level of dorsal-fin spine 6–11; gill opening restricted to area dorsal to level of dorsalmost pectoral-fin ray; lower-lip flap present; circumorbital bones 5; lower jaw teeth 22–30; upper jaw teeth 20–27 (Figure 44); no fleshy bladelike crest on top of head of either sex.

COLOR PATTERN.—Head: Pale with 5 dark bands approximately half width of pale interspaces. Anteriormost band extends from anteroventral margin of orbit across mouth, just anterior to angle of jaws, onto chin; 2nd band extends ventrally from eye and is deflected posteriorly on underside of head; 3rd band extends ventrally from posteroventral edge of eye to ventral portion of head; anterior 3 bands meet corresponding bands of opposite side at ventral midline of head; 4th band originates laterally on nape, curves ventroanteriorly, then posteriorly, and extends to point just above anterior end of pelvic girdle; 5th band extends ventrally from near upper end of gill opening to uppermost branchiostegal membrane fold. Each pale interspace contains a medial, vertical series of about 3–5 small, dark spots. A large, dark, ovoid spot, slightly smaller than eye, present posterior to eye midway between dorsal origins of 3rd and 4th cephalic dark bands (illustrated specimen, Figure 21*a*, has spot on left side slightly darker along anterior edge, resembling a posteriorly opening crescent; spot on right side is uniformly dark); spot sandwiched between small, dark, longitudinal dorsal mark and ventral dark blotch that is confluent with upper end of 3rd band. Dark, tear-shaped mark directed posteriorly from dorsoposterior edge of eye. Series of irregularly shaped, well-defined, dark spots less than half pupil diameter along top of head posterior to anterior nostrils. Smaller, less defined, dark blotches and spots extend posteriorly along nape and sides of body below anterior end of dorsal fin.

Trunk: Pale with about 9 or 10 pairs of darker, irregularly vertical bands originating along dorsal-fin base and fading out on approximately ventral quarter of body; anteriorly, banding less defined and paired nature less apparent.

Pectoral Fin: Pale with broad, dark band along base (illustrated specimen, Figure 21*a*, had band broken into small dorsal spot and large ventral blotch on left side of body). Several small, dark freckles present on fleshy pectoral-fin base and basal part of rays.

Pelvic Fins: Uniformly pale.

Dorsal and Anal Fins: Uniformly dusky with several irregularly placed pale spots, each slightly smaller than pupil of eye; pale spots noticeable only in freshest specimen. Series of dark lines in dorsal fin; each line extending from base of a dorsal-fin ray, along posterior edge of ray to fin margin.

Caudal Fin: Dusky with numerous small, pale spots. Series of 4 short, dark stripes on basal portion of fin just posterior to caudal peduncle; series appears superficially as broad bar. Narrow, longitudinal lines of darker pigment present posteriorly.

The largest specimen available (female, Figure 22) differs from the above description in having the cephalic bands very faint laterally on the head and the spotting in the cheek region intensified into a densely speckled pattern. The dark lines in the dorsal fin are directed slightly more diagonally and cross several succeeding rays, a condition similar to that shown in Kner's (1868b) illustration of *Petroscirtes lineolatus* (Figure 21*b*). The dark lines in the anal fin illustrated by Kner are not present in any of our specimens.

There was no noticeable difference in color pattern between males and females.

GEOGRAPHICAL DISTRIBUTION (Figure 6).—Northern and Western Australia and southern New Guinea. The holotype of *O. lineolatus* was reported to have come from Candavu, Fiji Islands. As noted in the "Nomenclatural Discussion," we question the

validity of this locality record (also see p. 63 under *O. punctatus*).

Weber (1913, fig. 114; the same illustration appears in de Beaufort and Chapman, 1951, fig. 53, and we reproduce it in our Figure 3*a*) illustrated a planktonic larva that he listed as *Petroscirtes* spec. juv. from Laiwui, Obi, Indonesia (Siboga station 142). He mentioned only one specimen, but there are three, 12.1–13.0 mm SL, in ZMA 109.362 from the same station and locality. Weber's illustration is representative of these specimens, particularly in the preopercular spination. The bony projections anterior to each dorsal-fin ray element except the anteriormost, which lacks a projection, that Weber portrays are actually external projections of the dorsal-fin pterygiophores. The specimens definitely belong in the tribe Omobranchini (as evidenced by their having only two segmented pelvic-fin rays and hinged dentaries), but it is not possible to identify them with certainty. Based on the following meristics obtained from a radiograph, they could be *O. lineolatus* or *Laiphognathus multimaculatus*; dorsal fin XI, 20–21; anal fin II, 20–21 (or 21–22, uncertain), vertebrae 10 + 27–28.

HABITAT.—Little known; taken once from rocky ironstone reef in "salt" water at a depth up to 1 meter; once from rock holes on a reef.

COMPARISON.—*Omobranchus lineolatus* is separable from most of the other species of *Omobranchus* only by a combination of characters. It differs from all the other species of *Omobranchus* except *O. aurosplendidus* in having modally 11 dorsal-fin spines (all populations of the other species have modally 12 or 13 spines). It is prominently different from *O. aurosplendidus* in lacking a fleshy crest and in having fewer dorsal- and anal-fin elements and vertebrae. In small specimens of *O. lineolatus*, the color pattern of the head (Figure 21) renders the species instantly recognizable. It is most likely to be confused with members of the *elongatus* species group, but only *O. rotundiceps* of that group ever has as few as 11 dorsal-fin spines. In having the gill opening restricted to the area dorsal to the level of the dorsalmost pectoral-fin ray, *O. lineolatus* could only be confused with the nominal subspecies, *O. r. rotundiceps*, which infrequently has more than 3 lateral-line tubes, whereas *O. lineolatus* usually has more than 4.

NOMENCLATURAL DISCUSSION.—Kner (1868a) briefly described *P. lineolatus* from Candavu (in the Fiji Islands) without noting the number of specimens he was treating. He accorded the species a number (catalog?), 834, and stated that the species resembled *Salarias semilineatus* Kner in color pattern. Kner (1868b) again described *P. lineolatus* as a new species from Candavu based on a single specimen, which he accorded the number 834d (we have been unable to determine the allocation of 834a–c). Kner (1868b) was merely expanding on Kner (1868a), as all the new species in 1868a were redescribed in more detail and as new in 1868b. In the second description all the characters of the first description were repeated except for the color pattern, which was described entirely differently. At the end of the second description he noted that there was a second specimen from Candavu, number 834e, that differed from the first in several characters, including those repeated in the first and second descriptions of *P. lineolatus*, and particularly in color pattern, in which the second specimen was said to resemble *Salarias semilineatus*. Kner concluded his description of the second specimen stating, "Wenn dieses Exemplar als neue Art gelten kann, so dürste die Benennung *P. semilineatus* nicht unpassend erschienen."

As a result of the information thus far presented, we believe that Kner's first description of *P. lineolatus* was based on at least (and possibly only) two specimens (syntypes): one served as the basis for the counts and proportions and the other for the color pattern. In the second description Kner effectively restricted the name *P. lineolatus* to the specimen that provided the counts and proportions (this specimen is also the holotype of the second *P. lineolatus* description, and the second *P. lineolatus* is a junior objective primary homonym of the first *P. lineolatus*).

Dr. P. Kähsbauer and one of us (VGS) have searched the collection of the Vienna museum and have been unable to locate the holotype of the second *P. lineolatus*. However, the description and illustration provided in the second account clearly define a taxon applicable to certain specimens we have examined, and *P. lineolatus* is the oldest name for that taxon. The nomenclatural situation is complicated, however, by other circumstances. First, we believe that one of the syntypes of *P. lineolatus* (1868a) is extant. We have found a specimen labeled as *Petroscirtes semilineatus* in the Vienna museum, NMV 12561, from Candavu, that closely

agrees with Kner's description of *P. semilineatus* (but there is no indication of the number 834e with the specimen). Furthermore, this specimen is identifiable as *O. punctatus* and is the only specimen of that species known from Candavu. If we are correct, this specimen also represents the holotype of *P. semilineatus,* for Kner's description constituted a valid species description under Article 17 (8) of the *International Code of Zoological Nomenclature.* Even if our interpretation of the *Code* is erroneous, Günther's (1877) first usage of *P. semilineatus* as a senior synonym made the name available.

Secondly, if our interpretation of Kner's second description of *P. lineolatus* as constituting a restriction of that name is not nomenclaturally acceptable, the only remaining syntype (the holotype of *P. semilineatus*) might be designated as the lectotype of *P. lineolatus* (1868a). Such an action would result in *P. semilineatus*' becoming a junior objective synonym of *P. lineolatus,* and *P. lineolatus* would then be a junior synonym of *O. punctatus.* The net result would be the loss of a name, *P. lineolatus,* that on other grounds would be the senior synonym of another taxon. In itself this would not be bad (there is a junior synonym available, *Graviceps darwini,* for that taxon), but *P. lineolatus* has been used several times as a senior synonym of a recognizable species (Günther, 1877; Whitley, 1927, 1958; Fowler, 1928, 1959; Norman, 1943; Springer, 1972a). The designation of the extant syntype would also subvert Kner's obvious intensions with regard to *P. lineolatus.*

We therefore believe that the designation of a neotype for the first description of *P. lineolatus* is desirable. To do so requires us to arbitrarily assume that the description was based either on only one specimen that was lost, or on more than one specimen, all of which are lost, because the *Code* (Article 75) predicates neotype designation on the fact that no holotype, syntype, or lectotype exists. To circumvent future controversy, a neotype is also needed for the second description of *P. lineolatus,* to replace the missing holotype. To avoid confusion, the same specimen should be designated neotype for both these descriptions. Before taking these actions further comment is necessary.

Both *P. lineolatus* and *P. semilineatus* were based on specimens reportedly from Candavu. Neither of the taxa we allocate to these names has since (or previously) been recorded from or near Candavu, albeit there are very few specimens of the first taxon known altogether (the second taxon is a commonly collected species). Aside from the lack of additional specimens from Candavu, we suspect that the locality is in error because only one species of *Omobranchus, O. rotundiceps,* is definitely known to occur so far east in the western Pacific Ocean, although numerous collections of fishes from Fiji and areas to the east have been made, especially in recent years. Also, there is a possibility that the collector of the specimens (source not furnished with the descriptions) made an error. According to Kner (1868a, b), the specimens on which he reported were sent to the Museum Godeffroy by various people, including a large number of boat captains. Locality records for specimens obtained by nonprofessional biologists, especially those of over a century ago, have often been suspect.

The *Code,* Article 75 (c) (5), requires that a neotype come as nearly as practicable from the original type-locality. Of the specimens we treat as *O. lineolatus,* the one that comes nearest to being from Candavu is the one contained in USNM 174335, from Port Bradshaw, Northern Territory, Australia. This specimen has almost completely lost the distinctive color pattern of the species, and it does not, therefore, appear to be a good choice for a neotype. The holotype of *Graviceps darwini* Whitley, AMS IA.4298, from nearby Port Darwin, Northern Territory, Australia, is in excellent condition, and the color pattern is still clearly represented. We therefore designate the holotype of *G. darwini* as the neotype of *Petroscirtes lineolatus* Kner, 1868a, and *Petroscirtes lineolatus* Kner, 1868b. In so doing, *G. darwini* becomes a junior objective synonym of *P. lineolatus.*

Whitley (1958) compared his *G. darwini* with *P. lineolatus,* which he believed different based on slight differences in color pattern shown by the illustration of *P. lineolatus* as compared with his specimen of *G. darwini.* We are more impressed with the similarities than the differences. The number of dark spots on the head is variable (see Figures 21 and 22), and the other differences noted by Whitley are probably due to minor introductions of the illustrator, but in any event are within the range of intraspecific variation we have noted in other species.

MATERIAL EXAMINED.—AUSTRALIA: NORTHWEST AUSTRALIA: BMNH 1933.8.14.7 (34.5). NORTH-

ERN TERRITORY: Port Darwin, AMS IA.4298 (31.1, holotype of *Graviceps darwini* and neotype of *Petroscirtes lineolatus*); Port Bradshaw, USNM 174335 (37.4). WESTERN AUSTRALIA: Broome, WAM P10100 (36.3). NEW GUINEA: Merauke, RMNH 26918 (66.8).

Omobranchus loxozonus (Jordan and Starks)

FIGURE 23

Petroscirtes loxozonus Jordan and Starks, 1906:705 [Tanega-shima].

Description (see also Tables 5 and 12).—Dorsal-fin spines XII–XIV (modally XIII), 19–22 = 32–35; anal fin II, 21–25; both anal-fin spines of males discernible externally; segmented caudal-fin rays 13–15 (13 in 92.1% of specimens); dorsal + ventral procurrent caudal-fin rays 10–15; vertebrae 10–12 (11 in 93.8% of specimens) + 28–31 = 39–42; epipleural ribs 12–16 (13–15 in 97.3% of specimens); prenasal pores present; interorbital pores 2–4 (3 in 96.0% of specimens); circumorbital pores 7–9 (8 in 95.5% of specimens); lateral-line tubes 0–4 (0–3 in 98.5% of specimens); lateral-line tubes, when present, extending posteriorly to below level of dorsal-fin spine 1–6 (1–5 in 99.0% of specimens); gill opening varying from restricted to area dorsal to level of dorsalmost pectoral-fin ray to extending ventrally to opposite 4th ray; lower-lip flap present; circumorbital bones 5; lower jaw teeth 18–28; upper jaw teeth 16–27 (Figure 43); no fleshy bladelike crest on top of head of either sex (head of some presumably mature males swollen in appearance).

COLOR PATTERN.—*Males*: Head: Dusky band extending from anteroventral margin of orbit across angle of jaws to chin, where it joins corresponding band of opposite side; dorsal portion of band with narrow, pale anterior and posterior margins. Four evenly spaced, parallel, dusky bands more posteriorly on lower half to third of head (bands greatly faded or absent in most specimens examined); 1st band angled posteroventrally from posteroventral margin of orbit, directed anteriorly for short distance at level of anterior preopercular sensory pores, then redirected posteroventrally to ventral

TABLE 12.—*Frequency distributions for certain meristic characters in populations of* Omobranchus loxozonus

Population	Dorsal-fin spines				Segmented dorsal-fin rays					Total dorsal-fin elements					Segmented anal-fin rays					
	12	13	14	x̄	19	20	21	22	x̄	32	33	34	35	x̄	21	22	23	24	25	x̄
Japan																				
Wakayama Prefecture	1	5	2	13.1	1	5	2		20.1	1	4	3		33.2		4	3			22.4
Kagawa Prefecture		1					1				1						1			
Miyazaki Prefecture	3	4		12.6		6	1		20.1	2	5			32.7	1	2	4			22.4
Tanega-shima	11	66	1	12.9	2	30	39	7	20.6	3	35	36	4	33.5	2	21	48	8		22.8
Okinawa	1	20	1	13.0		3	13	6	21.1		3	13	6	34.1		1	15	5	1	23.3

Population	Precaudal vertebrae				Caudal vertebrae					Total vertebrae				
	10	11	12	x̄	28	29	30	31	x̄	39	40	41	42	x̄
Japan														
Wakayama Prefecture	1	7		10.9	1	5	2		29.1	3	4	1		39.8
Kagawa Prefecture		1					1					1		
Miyazaki Prefecture		7		11.0	1	5	1		29.0	1	5	1		40.0
Tanega-shima	3	68	3	11.0	5	38	30	3	29.4	4	42	29	3	40.4
Okinawa		22		11.0		2	16	4	30.1		2	16	4	41.1

midline of head; dorsal half of band with narrow, pale anterior marginal line continuing dorsally along posterior edge of orbit, and narrow, pale posterior marginal line continuing dorsally as anterior margin of dorsoposteriorly lying, dome-shaped, dusky smudge; succeeding 3 bands each originating slightly higher on head than preceding band; last 2 bands extending ventrally onto prepelvic and prepectoral areas respectively; bands confluent ventrally with corresponding bands of opposite side. Large dome-shaped, dusky smudge approximately size of eye posterior to eye between circumorbital and preopercular series of cephalic sensory pores; smudge bordered anteriorly and posteriorly by narrow, pale, marginal lines; intense, dark spot approximately size of pupil in dorsoanterior corner of smudge. Operculum with vertically elongate, less dark spot encircled by narrow, pale, marginal line; slightly narrower, pale line running anterodorsally from dorsal end of spot, passing above dusky smudge and curving to join anterior, pale, marginal line of smudge; faint, dusky bar present posterior to spot. Snout and interorbital area darker than background.

Trunk: Approximately 11 more or less vertical, broad, dusky to dark bands present on body; pigment along central vertical axis of each band more intense than along edges; intensification sometimes occupying almost all of some bands, sometimes restricted to portion of band at lateral midline of body; bands usually not reaching onto upper and lower one-fourth to one-fifth of body (bands very broad, diffuse, and reaching more dorsally in very large specimens than in small specimens); anterior 5 or 6 bands inclined dorsoanteriorly; succeeding 4 or 5 bands inclined dorsoposteriorly at least above lateral midline (dorsal portion of approximately 9th band drawn into longitudinal streak above ventral midline of body), posterior 1 or 2 bands represented as short, narrow, stripes on lateral midline of body; often 1 or 2 middle bands broken into side-by-side paired, narrower bands. Elongate, dark blotch or spot usually present at dorsal tip of each body band, at least anteriorly, forming longitudinal row of spots just above body bands; each blotch or spot lies just below corresponding spot in row of approximately 8 moderately large pairs of evenly spaced, dark spots on dorsal body contour at base of dorsal fin. Dusky to dark blotches sometimes present between and below ventral tips of posterior bands. Best preserved specimens with narrow, pale lines midway between and parallel with body bands; pale lines extending from above dorsal tips of body bands to ventral body contour where they continue onto anal fin.

Pectoral Fin: Fin and fleshy base pale with even spread of dark specks of pigment.

Pelvic Fin: Pale.

Dorsal Fin: Membranes transparent with dusky to dark markings. Spinous ray portion of fin with several broad, dorsoanteriorly slanted to longitudinal dusky stripes; very large specimens with spinous portion largely dusky, stripes indistinct. Segmented ray portion with narrow, dusky, often faint stripes; oval, dusky to dark spot in distal portion of fin between 10th and 14th segmented rays (usually reaching from 11th to 13th); spot absent in many specimens.

Anal Fin: Pale proximally, dusky distally, tips of rays abruptly pale. Best preserved specimens with several distinct, narrow, pale lines slanted ventroposteriorly from ventral ends of narrow, pale lines on body.

Caudal Fin: Largely pale, sprinkled with dark specks of pigment. Two vertically oriented, dusky blotches at base of fin; very dark specimens with diffuse, dusky stripe directed posteriorly from ventral blotch.

Females: Similar to males except: body bands narrower, intensified portions much darker, usually occupying most of band; other body markings darker; stripes on dorsal fin usually more distinct; dusky to dark oval spot on dorsal fin absent.

GEOGRAPHIC VARIATION.—Variation in meristic characters was noted only in the Okinawa population of *O. loxozonus*, which tended to have higher averages for most characters (Table 12).

GEOGRAPHICAL DISTRIBUTION (Figure 5).—Southern Japan and Okinawa. Kamohara (1957) reported *O. loxozonus* as occurring as far north as Kominato, Chiba Prefecture. We have not been able to verify this record and have not, therefore, entered it on the distribution map.

HABITAT.—Little information is available, but some collections have come from shallow, rocky tidepools.

COMPARISONS.—*Omobranchus loxozonus* is a member of the *elongatus* species groups (see "Comparisons" under *O. elongatus*). Within the *elongatus* species group, *O. loxozonus* is most similar to *O.*

germaini, which is allopatric. The color pattern on the head and body of *O. loxozonus* is less contrasty than that usually exhibited by *O. germaini*, and the number of body bands is less. Where populations of the two species are geographically closest there are marked differences in numbers of fin-rays, vertebrae, and lateral-line tubes (see Tables 5, 10, 12), although overlaps in the ranges for these characters exist.

Omobranchus loxozonus can be most readily distinguished from those species of *Omobranchus* with which it appears to be sympatric as follows: from *O. fasciolatoceps* in lacking a fleshy crest, in having the gill opening extending ventrally to opposite the 1st to 4th pectoral-fin rays (versus restricted to area dorsal to dorsalmost ray), and in rarely having as few as 2 interorbital pores (versus rarely having as many as 3 pores); from *O. elegans* in lacking the dense covering of small, dark spots on the body and in infrequently having as few as 7 circumorbital pores (versus strongly modally 7 pores); and from *O. punctatus* in having 0–4, rarely more than 3, lateral-line tubes (versus 2–8, rarely fewer than 4 tubes), and in having the gill opening usually extending ventral to the level of the dorsalmost pectoral-fin ray (versus usually restricted to area dorsal to dorsalmost ray and never extending ventrally below dorsalmost ray).

MATERIAL EXAMINED.—JAPAN: WAKAYAMA PREFECTURE: CAS uncataloged (ca. 41); Shirahama, CAS GVF reg. no. 747 (6: 49.5–64.8), GVF reg. no. 748 (ca. 49). KAGAWA PREFECTURE: Toyohama, CAS uncataloged (ca. 51). MIYAZAKI PREFECTURE: Nobeoka, USNM 199520 (7: ca. 34–59.5). TANEGASHIMA: BMNH 1923.2.26.341–50 (6: 37.4–47.8), CAS SU9364 (53.5, presumed holotype of *Petroscirtes loxozonus*, see Springer and Eschmeyer, 1974), SU9783 (25: 28.8–58.0), USNM 53275 (16: 32.7–54.6, including putative holotype of *Petroscirtes loxozonus*), 70761 (142: 19.4–70.7). OKINAWA: USNM 70763 (4: 34.2–ca. 51), 123770 (ca. 45), 132754 (37.9), 132812 (13: 22.2–42.1), 209269 (2: 27.9–42.5), 209715 (ca. 40).

Omobranchus mekranensis (Regan)

FIGURE 24

Petroscirtes mekranensis Regan, 1905:328 [Jask, Mekran Coast].

Petroscirtes cristatus Zugmayer, 1913:20 [Ormara].

DESCRIPTION (see also Table 5).—Dorsal fin XI-XII (XI in one of 13 specimens), 20–21 = 32–33; anal fin II, 22–23; one or both anal-fin spines of males not discernible externally; segmented caudal-fin rays 13–14 (14 in one of 13 specimens); dorsal + ventral procurrent caudal-fin rays 12–14; vertebrae 11 + 28–29 = 39–40; epipleural ribs 17–23; prenasal pores present; interorbital pores 2; circumorbital pores 8; lateral-line tubes 6–7; lateral-line tubes extending posteriorly to below level of dorsal-fin spine 9–11; gill opening restricted to area dorsal to level of dorsalmost pectoral-fin ray; lower-lip flap present; circumorbital bones 5; lower jaw teeth 22–27; upper jaw teeth 18–23 (Figure 44); fleshy bladelike crest present on top of head of both sexes.

COLOR PATTERN:—*Males*: Head: Three narrow, dark bands radiating from eye on ventral two-thirds of head; anterior band flared ventrally, extending from anteroventral edge of orbit across mouth, just anterior to angle of jaws, to ventral midline of head, where it joins corresponding band of opposite side; 2nd band extending ventrally and slightly posteriorly from ventral margin of orbit, flaring sharply midventrally on cheek and terminating just before reaching ventral midline of head; 3rd band extending posteroventrally from posterior or posteroventral margin of orbit, becoming faint or disjunct ventrally on cheek, recommencing as broader, darker continuation, which is displaced slightly posteriorly, and continuing across branchiostegal membranes onto prepelvic area, where it joins corresponding band of opposite side. Moderately narrow, dark line (4th band) arises from dark blotch on upper end of operculum and runs posteroventrally across branchiostegal membranes, where it joins broad, dark band on fleshy pectoral-fin base. Series of narrow, dark spots, dashes, or lines present in each pale space separating dark head bands; each series parallel to and midway between adjacent head bands; each series except last continuous on underside of head with corresponding series of opposite side. Distinct, vertically oriented, dark, oval spot approximately one-half to two-thirds size of eye present just posterior to dorsal two-thirds of eye. Patch of intensely dark melanophores present on free opercular membrane margin; anterior edge of margin sometimes darkened to form narrow line running into upper end of band on fleshy pectoral-fin base. Snout dusky.

Interorbital and nape areas with irregular, narrow, dark, vertical lines mostly originating at dorsal edge of orbit, extending to dorsal midline and onto fleshy bladelike crest as pattern of vermiculations. Broad saddlelike, dark band on nape just anterior to 1st dorsal-fin spine; ventral end of band almost confluent with dark blotch at upper end of operculum.

Trunk: Pale to pale dusky with 7 pairs of broad, dark bands; posterior 2 bands often faint to absent (paired nature of bands less apparent in very large specimens); pale spaces between band pairs, one and one-half to two times as broad as adjacent bands. Bands extending from dorsal body contour almost to ventral body contour or becoming faint on ventral 3rd of body. Dorsal ends of body bands often expanded, occasionally more intense than rest of band, often with pale spot in center or near dorsal end of expanded area (particularly in anterior bands). Expanded dorsal ends of anterior 2 or 3 band pairs often deflected slightly anteriorly, those of posterior 2 or 3 pairs deflected slightly posteriorly; expanded portions of anterior and posterior bands sometimes separated from rest of band. Very faint, narrow, vertical, dusky lines sometimes present midway between bands.

Pectoral Fin: Pale with even spread of dark specks of pigment. Narrow, faint, dusky bar extending along basal portion of upper half of fin; ventrodistal portion of fin dusky. Fleshy base with nearly vertical, broad, dark band extending from edge of branchiostegal membrane to chest, usually faint or terminating on prepelvic area.

Pelvic Fin: Pale with even spread of dark specks of pigment.

Dorsal Fin: Transparent with dusky to dark markings. Dark dusky blotch at fin base just above each body band; some specimens with each blotch consisting of 2 closely paired blotches. Spinous portion of fin with moderately broad, dusky to dark stripe; some specimens with basal dark blotches extending dorsoposteriorly as faint, moderately broad, dusky bands; proximal portion of fin often dusky.

Anal Fin: Largely dusky, especially distally; proximal portion often slightly transparent. Tips of rays abruptly pale, particularly anterior rays.

Caudal Fin: Pale with 2 or 3 dusky streaks directed posteriorly from 1 or 2 vertically oriented, large dusky areas on basal one-fifth of fin. Proximal edge with narrow, dark dusky bar centrally. One large specimen had very fine, intensely dark spots spread over dorsal, anal, and caudal fins.

Females: Similar to males except: dark markings on head, body, and fins (other than oval spot posterior to eye and saddle-like band on nape) fainter; body bands noticeably fainter; bands not distinct as in males, even in darkly pigmented females.

GEOGRAPHIC DISTRIBUTION (Figure 4).—Persian Gulf, Gulf of Oman, and northern Arabian Sea. The Persian Gulf record was not accompanied by a specific locality; the record on the distribution map for the Persian Gulf is to be considered as generalized. Reported as occurring at Minicoy Atoll, Laccadive Archipelago, by Nagabhushanam and Chandrasekhara Rao (1972), which, if true, would represent a significant range extension. We were unable to verify the identification.

HABITAT.—Known only for 1 collection; rocks, sand, and sparse coral, thus indicating normal ocean salinites.

COMPARISONS.—*Omobranchus mekranensis* is a member of the *banditus* species group (see "Comparisons" under *O. banditus*). Superficially it is most similar to *O. fasciolatus* (for comparison see *O. fasciolatus*). The only species of *Omobranchus*, other than *O. fasciolatus*, with which *O. mekranensis* appears to be sympatric is *O. punctatus*, which lacks a fleshy crest and rarely has as few as 2 interorbital pores (only 2 in *O. mekranensis*).

NOMENCLATURAL DISCUSSION.—Zugmayer (1913) compared his *P. cristatus* only with *P. dispar*, which he believed to be the only species of *Petroscirtes* (*Omobranchus*) with a crest on top of the head. The four syntypes of *P. cristatus* are no longer extant (Dr. F. Terofal, Munich, in litt.), and one must depend entirely on the original description to determine the identity of *P. cristatus*. The important identifying characters contained in the description are the following (translated from the German): dorsal fin 33, an oval, dark blue spot restricted to the preopercle (Vordeckel), 10–12 spots along the base of the dorsal fin, which, on the anterior half of the body, send down transverse band-like continuations toward the lateral line. (Presumably the dark blue color described by Zugmayer is based on fresh material. In blenniids, this color is lost in preservation and is represented by dusky gray.)

Among the crested forms of *Omobranchus* in the

Indian Ocean, we recognize four species: *O. banditus* and *O. woodi* (both restricted to southern Africa), *O. fasciolatus* (western half of the Indian Ocean), and *O. mekranensis* (Persian Gulf, Gulf of Oman, and northern Arabian Sea). The last two species have been taken together in a single collection at Astola Island, close to Ormara, the type-locality of *P. cristatus*. Of these four species, *O. fasciolatus* can be excluded from consideration on the basis of its lower total number of dorsal-fin ray elements (30–31). The preopercular spot of *O. fasciolatus* (Figure 17) is not so distinctly oval as is the spot of *O. mekranensis*. Similarly, the transverse body bands of *O. fasciolatus* are less distinct than those of *O. mekranensis*. Both *O. woodi* and *O. banditus* also lack the preopercular oval spot (although such a spot does occur dorsoanteriorly on the body in *O. banditus*). The number of dorsal-fin ray elements and color pattern, as well as the type-locality, agree well with what is known for *O. mekranensis*, and for these reasons we synonymize *P. cristatus* with *O. mekranensis*.

MATERIAL EXAMINED.—PERSIAN GULF: BMNH 1900.7.25.41 (43.5). IRAN (Gulf of Oman): Jask, BMNH 1904.5.25.94 (ca. 46, holotype of *Petroscirtes mekranensis*). WEST PAKISTAN: Astola Island: USNM 200604 (11: 33.3–50.7, including two cleared and stained).

Omobranchus meniscus, new species

FIGURE 25

DESCRIPTION (where variation is indicated, the holotype is flagged with an asterisk).—Dorsal fin XII, 19; anal fin II, 21–22*; both anal-fin spines of male discernible externally; segmented caudal-fin rays 13; dorsal + ventral procurrent caudal-fin rays 9–10*; vertebrae 10 + 26–27*; epipleural ribs 11–12*; prenasal pores present; interorbital pores 3; circumorbital pores 8; lateral-line tubes absent; gill opening extending ventrally to opposite 3rd pectoral-fin ray; lower-lip flap present; circumorbital bones 5; male with fleshy, bladelike crest on top of head (2.8 percent SL), female lacks crest.

Teeth (Figure 43): The 60.1 mm SL male holotype has 20 premaxillary and 22 dentary incisoriform teeth. The 54.8 mm SL female paratype has 21 premaxillary and 23 dentary incisoriform teeth. Both specimens have dorsal and ventral posterior caniniform teeth.

COLOR PATTERN (specimens faded).—*Male*: Head: Moderately narrow, dusky band extending from anteroventral margin of orbit at least to corner of mouth. Large, intensely dark, anteriorly opening, crescentic mark curving dorsally from dorsoposterior margin of orbit, almost reaching to base of fleshy head crest. Snout dark dusky with sensory pores and nostrils pale ringed. Dark dusky vermiculations present on crest. Dark, oval blotch present laterally on nape just anterior to dorsal-fin origin, narrowly joined to similar blotch on opposite side at dorsal midline; 3 to 5 small, intensely dark spots present on blotch in dorsoposteriorly directed line.

Trunk: Several faint, moderately broad, dusky bands apparently present on side, extending approximately from dorsal to ventral body contours. Indication of broad, dark dusky stripe just below dorsal body contour extending from just behind head to caudal peduncle (possibly artifact of preservation); longitudinal series of dusky blotches or dusky stripe apparently present at dorsal-fin base. Number of very small, intensely dark spots scattered along body, probably restricted somewhat to body bands. Connected horizontal line of very narrow, dark dashes present posteriorly on lateral midline of body.

Pectoral Fin: Pale, transparent.

Pelvic Fin: Pale.

Dorsal Fin: Dusky anteriorly, pale to transparent posteriorly. Anterior half of fin with several darkish streaks, apparently representing dorsoposteriorly angled dark lines. Posterior half of fin with streaks very faint, fin transparent distally.

Anal Fin: Pale with dark membranes between tips of rays.

Caudal Fin: Pale. Midportion of base dusky, becoming faint distally.

Female: Apparently similar to male, appears to have slightly less developed body bands and less distinct dorsal-fin markings (crest absent).

COMPARISONS.—*Omobranchus meniscus* is easily distinguishable from all other species of *Omobranchus* by the dark, crescentic marking extending dorsally from the posterior margin of the orbit. It is otherwise distinguishable only on the basis of a complex of characters. It appears probable that

when more specimens of *O. meniscus* are available, the species will exhibit a low number of meristic elements compared with those of the other species in the genus.

There are eight species of *Omobranchus* in which the males may have a fleshy, bladelike crest on top of the head. Of these, all but *O. meniscus* have the gill opening predominantly restricted to the area dorsal to the level of the dorsalmost pectoral-fin ray. Only one of these species with a restricted gill opening, *O. fasciolatus,* has the gill opening extending ventrally as far as the level of the second pectoral-fin ray (and this condition was found in only one of 54 specimens), whereas both specimens of *O. meniscus* have the gill opening extending ventrally to opposite the third pectoral-fin ray.

Of the eight crested species, only *O. anolius, O. aurosplendidus,* and *O. meniscus* commonly lack bipored lateral-line tubes.

The two specimens of *O. meniscus* have nine or ten total procurrent caudal-fin rays. Among the other crested species only *O. aurosplendidus* has as few as ten total procurrent caudal-fin rays.

Possibly the head of *O. meniscus* is proportionately larger than that of most of the other *Omobranchus* species. The head length of the two specimens of *O. meniscus,* 54.8 and 60.1 mm SL, are 24.2 and 23.6% SL, respectively. The head length of *O. zebra* is proportionately about the same as that of *O. meniscus* at similar sizes (the largest specimen of *O. zebra* available is only 56.5 mm SL). *Omobranchus aurosplendidus* may also have a head length proportionately the same as that of *O. meniscus,* but this is not certain as there are no specimens available less than 75 mm SL. Where specimens of comparable size to those of *O. meniscus* are available, the head length is about 17–22% SL in the other *Omobranchus* species.

ETYMOLOGY.—The specific epithet *meniscus* comes from Latin, meaning "crescent," and refers to the dark, crescent-shaped mark on the head that distinguishes the species. *Meniscus* is here used as a noun in apposition.

HOLOTYPE.—USNM 119685, male, 60.1 mm SL, mouth of river at Chantabun, Thailand. Collected by Mai Mah, 10 April 1933; habitat unknown.

PARATYPE.—USNM 211153, female, 54.8 mm SL, same data as holotype.

Omobranchus punctatus (Valenciennes)

FIGURES 26 and 27

Blennechis punctatus Valenciennes in Cuvier and Valenciennes, 1836:286 [le canal de Bombay].

Petroscirtes dispar Günther, 1861:232 [in part; Amoy, China; lectotype designated below].

Petroscirtes semilineatus Kner, 1868b:333 [Candavu].

?Petroskirtes japonicus Bleeker, 1869:246 [Jedo, Japonia].

Salarias decipiens DeVis, 1884b:694 [Cardwell, Queensland Coast].

Salarias helenae DeVis, 1884b:697 [St. Helena, Moreton Bay].

Salarias sindensis Day, 1888:263 [Kurrachee].

Aspidontus dasson Jordan and Snyder, 1902:456 [Wakanoura, Japan].

Petroscirtes kochi Weber, 1908:263 [Merauke-Fluss, Südküste, New Guinea, Brackwasser].

Poroalticus sewalli Fowler, 1931:403 [tide pools at Brighton Beach, Trinidad].

Petroscirtes masyae H. M. Smith, 1934:316 [tide pool on Koh Chula, a rocky islet in the Gulf of Siam off Lem Sing, Southeast Siam].

Omobranchus japonicus scalatus J. L. B. Smith, 1959:232 [Delagoa].

DESCRIPTION (see also Tables 5 and 13).—Dorsal fin XI–XIII (XII in 90.6% of specimens), 19–24 = 31–36; anal fin II, 20–26; one or both anal-fin spines of males not discernible externally; segmented caudal-fin rays 12–14 (13 in 97.9% of specimens); dorsal + ventral procurrent caudal-fin rays 8–16 (rarely 8–11); vertebrae 10–12 + 26–31 = 37–41; epipleural ribs 15–25 (rarely 15–17 or 25); prenasal pores present; interorbital pores 2–4 (3 in 95.6% of specimens); circumorbital pores 6–10 (8 in 92.8% of specimens; 6 or 10 in 0.6% of specimens); lateral-line tubes 2–8 (usually more than 4); lateral-line tubes extending posteriorly to below level of dorsal-fin spine 3–12 (usually 7–11); gill opening either restricted to area dorsal to level of dorsalmost pectoral-fin ray (93.0% of specimens) or extending ventrally to opposite dorsalmost ray; lower-lip flap present; circumorbital bones 4–5 (of 5 specimens examined all had 5 except one specimen with 5 on one side and 4 on the other; the 4 bones resulted from a fusion of the 2nd and 3rd circumorbitals from the anteriormost); lower jaw teeth 22–38 (Figures 49–52); upper jaw teeth 21–33; no fleshy bladelike crest on top of head of either sex.

COLOR PATTERN.—*Males*: Head: Broad, ventrally flared, dark dusky band running from anteroventral margin of orbit across mouth, just anterior to angle of jaws, onto chin where it joins corresponding

TABLE 13.—*Frequency distributions for certain characters in populations of* Omobranchus punctatus

Population	Dorsal-fin spines				Segmented dorsal-fin rays							Total dorsal-fin elements							Segmented anal-fin rays							
	11	12	13	x̄	19	20	21	22	23	24	x̄	31	32	33	34	35	36	x̄	20	21	22	23	24	25	26	x̄
Mozambique		6	-	12.0	1	2	3	-	-	-	20.3	1	2	3	-	-	-	32.3			3	3	-	-	-	22.5
Persian Gulf		2	-	12.0		1	-	1	-	-	21.0		1	-	1	-	-	33.0			1	1	-	-	-	22.5
Gulf of Oman	2	-	-	11.0				2	-	-	21.0			2	-	-	-	33.0				2	-	-	-	23.0
Arabian Sea		6	-	12.0			5	1	-	-	21.2			5	1	-	-	33.2			3	2	1	-	-	22.7
India																										
Gulf of Kutch		1						1							1						1					
Bombay		10	-	12.0			8	2	-	-	21.2			8	2	-	-	33.2			7	3	-	-	-	22.3
Vizagapatnam		5	-	12.0	1	3	1	-	-	-	20.0	1	3	1	-	-	-	32.0		1	4	-	-	-	-	21.8
Maldive Islands		1			1							1								1						
Ceylon		54	3	12.0		36	21	-	-	-	20.4		34	22	1	-	-	32.4			26	30	1	-	-	22.6
Nikobar Islands		1				1							1								1					
Burma		1				1							1								1					
Thailand																										
West Coast		25	1	12.0		22	4	-	-	-	20.2		21	5	-	-	-	32.2		1	20	5	-	-	-	22.2
Gulf of Thailand																										
West Coast	3	1	-	11.2			4	-	-	-	21.0		3	1	-	-	-	32.2			2	2	-	-	-	22.5
North Coast	5	29	1	11.9		17	16	2	-	-	20.6		20	14	1	-	-	32.4		1	24	9	1	-	-	22.3
East Coast	4	63	2	12.0		19	44	6	-	-	20.8		19	46	4	-	-	32.8			24	41	4	-	-	22.7
Hong Kong (vicinity)	2	13	-	11.9				4	9	1	22.8				5	9	1	34.7					4	8	3	24.9
China																										
Amoy		1							1							1								1		
Chusan Island	1	24	-	12.0				9	15	1	22.7				9	16	-	34.6					8	16	1	24.7
Japan	1	9	-	11.9			1	7	2	-	22.1			1	8	1	-	34.0			1	2	7	-	-	23.6
Philippine Islands		3	1	12.2		4	-	-	-	-	20.0		3	1	-	-	-	32.2			3	1	-	-	-	22.2
Halmahera		2	-	12.0	2	-	-	-	-	-	19.0	2	-	-	-	-	-	31.0	1	1	-	-	-	-	-	20.5
New Guinea		2	-	12.0	1	1	-	-	-	-	19.5	1	1	-	-	-	-	31.5		2	-	-	-	-	-	21.0
Bougainville		1			1							1								1						
Australia																										
West Coast																										
Shark Bay	2	15	3	12.0		2	10	7	1	-	21.4			12	8	-	-	33.4			7	12	1	-	-	22.7
Onslow		6	-	12.0	1	4	1	-	-	-	20.0	1	4	1	-	-	-	32.0		3	3	-	-	-	-	21.5
North Coast		7	-	12.0		5	2	-	-	-	20.3		5	2	-	-	-	32.3		2	5	-	-	-	-	21.7
East Coast	1	60	1	12.0			11	48	3	-	21.9			10	50	2	-	33.9			7	48	3	-	-	22.9
Candavu (?)		1						1							1							1				
Panama	1	21	-	12.0		4	17	1	-	-	20.9	1	3	17	1	-	-	32.8			9	12	1	-	-	22.6
Trinidad	2	33	6	12.1	1	13	22	4	-	-	20.7		11	25	4	-	-	32.8			12	25	5	-	-	22.8

Population	Precaudal vertebrae				Caudal vertebrae							Total vertebrae						Dorsal + ventral procurrent caudal-fin rays									
	10	11	12	x̄	26	27	28	29	30	31	x̄	37	38	39	40	41	x̄	8	9	10	11	12	13	14	15	16	x̄
Mozambique	1	4	-	10.8		1	3	1	-	-	28.0		1	4	-	-	38.8						1	3	-	-	13.8
Persian Gulf		2	-	11.0		1	1	-	-	-	27.5		1	1	-	-	38.5						1	-	-	1	14.5
Gulf of Oman		2	-	11.0			2	-	-	-	28.0			2	-	-	39.0						1	1	-	-	13.5
Arabian Sea		3	-	11.0			1	1	-	-	28.5			1	1	-	39.5							2	-	-	14.0
India																											
Gulf of Kutch			1				1								1											1	
Bombay		7	2	11.2		1	7	1	-	-	28.0			7	2	-	39.2					1	3	5	-	-	13.4
Vizagapatnam		5	-	11.0		4	1	-	-	-	27.2		4	1	-	-	38.2						2	1	-	1	14.0
Maldive Islands		1						1							1				1								
Ceylon	2	53	1	11.0		11	42	4	-	-	27.9	1	9	43	3	-	38.8				2	10	9	31	2	1	13.4
Nikobar Islands		1					1							1									1				
Burma		1				1							1													1	
Thailand																											
West Coast		25	1	11.0	2	13	11	-	-	-	27.3	2	12	12	-	-	38.4					2	3	18	1	1	13.8
Gulf of Thailand																											
West Coast	1	3	-	10.8		1	3	-	-	-	27.8		2	2	-	-	38.5					1	-	3	-	-	13.5
North Coast	6	29	-	10.8		13	17	4	-	-	27.7		16	15	3	-	38.6					2	2	18	9	3	14.3
East Coast	14	55	-	10.8		14	39	15	1	-	28.0		17	46	6	-	38.8				1	10	12	38	3	3	13.6
Hong Kong (vicinity)		15	-	11.0				7	7	-	29.5				7	7	40.5					1	3	8	3	-	13.9
China																											
Amoy		1							1							1											
Chusan Island	1	24	-	11.0				17	7	1	29.4				17	8	40.3	1	-	-	-	10	2	8	3	1	13.1
Japan		6	1	11.1			3	4	-	-	28.6			2	5	-	39.7					1	1	3	-	-	13.4
Philippine Islands		4	-	11.0		3	1	-	-	-	27.2		3	1	-	-	38.2							4	-	-	14.0
Halmahera	1	1	-	10.5	1	1	-	-	-	-	26.5	2	-	-	-	-	37.0						1	1	-	-	13.5
New Guinea		2	-	11.0	1	1	-	-	-	-	26.5	1	1	-	-	-	37.5						1	1	-	-	13.5
Bougainville		1				1							1									1					
Australia																											
West Coast																											
Shark Bay		8	12	11.6		2	12	6	-	-	28.2			5	14	1	39.8				1	-	4	12	3	-	13.8
Onslow		4	2	11.3	1	4	1	-	-	-	27.0		4	2	-	-	38.3						1	3	-	1	14.2
North Coast		7	-	11.0		5	2	-	-	-	27.3		5	2	-	-	38.3					2	2	2	-	1	13.4
East Coast	2	61	1	11.0		1	12	43	5	-	28.8			13	43	6	39.9					4	11	21	6	1	13.7
Candavu (?)		1						1							1									1			
Panama	2	20	-	10.9		3	10	8	-	-	28.2		3	12	6	-	39.1			1	2	6	4	3	-	-	12.4
Trinidad	3	32	-	10.9		4	23	6	1	-	28.1		4	25	5	-	39.0				1	15	3	14	-	-	12.9

Population	Lateral-line tubes								Last lateral-line tube below dorsal-fin spine											Epipleural ribs											
	2	3	4	5	6	7	8	x̄	3	4	5	6	7	8	9	10	11	12	x̄	15	16	17	18	19	20	21	22	23	24	25	x̄
Mozambique				2	2	-	-	5.5					1	3	-	-	-	-	7.8					2	1	1	1	-	-	-	20.2
Persian Gulf				1	1	-	-	5.5					1	-	1	-	-	-	8.0						1	1	-	-	-	-	20.5
Gulf of Oman					2	-	-	6.0						1	1	-	-	-	8.5								1	-	1	-	23.0
Arabian Sea				1	2	-	-	5.7					1	2	-	-	-	-	7.7								1	1	-	1	23.3
India																															
Gulf of Kutch						1											1												1		
Bombay		1	-	-	5	2	-	5.9							3	6	-	-	9.7								2	4	3	-	23.1
Vizagapatnam					4	1	-	6.2						3	2	-	-	-	8.4						3	-	-	1	-	-	20.8
Maldive Islands				1									1											1							
Ceylon			1	7	64	58	4	6.4					3	37	50	45	3	-	9.0					1	1	11	26	9	3	-	22.0
Nikobar Islands					1										1									1							
Burma						1										1										1					
Thailand																															
West Coast				7	20	18	2	6.3					2	17	18	11	1	-	8.8						2	3	15	6	-	-	22.0
Gulf of Thailand																															
West Coast					2	2	-	6.5					1	1	2	-	-	-	8.2					2	-	2	-	-	-	-	20.0
North Coast			5	22	34	25	3	6.0			1	1	7	25	28	30	5	-	8.9		1	-	4	7	12	9	1	-	-	-	19.8
East Coast		1	1	9	25	24	1	6.2					2	13	20	25	2	-	9.2	1	-	1	5	8	20	19	11	3	1	-	20.4
Hong Kong (vicinity)						12	3	7.2							4	7	3	1	10.1							2	7	1	-	-	21.9
China																															
Amoy																												1			
Chusan Island				1	23	51	12	6.8					1	13	27	38	8	-	9.4						2	5	11	5	-	1	22.0
Japan					2	5	-	6.7						2	-	1	3	1	10.1						1	1	3	-	-	-	21.4
Philippine Islands					3	1	-	6.2							3	1	-	-	9.2									4	-	-	23.0
Halmahera				1	-	1	-	6.0					1	-	1	-	-	-	8.0						1	1	-	-	-	-	20.5
New Guinea					2	-	-	6.0							2				8.0								1	-	1	-	23.0
Bougainville					1										1																
Australia																															
West Coast																															
Shark Bay					9	11	-	6.6						5	8	6	1	-	9.2					1	-	2	8	6	2	1	22.7
Onslow				2	3	1	-	5.8					1	3	-	2	-	-	8.5						1	1	3	1	-	-	21.7
North Coast				2	6	-	-	5.8						4	4	-	-	-	8.5						1	3	2	-	1	-	21.6
East Coast			1	2	21	25	-	6.4					2	5	19	22	-	1	9.3					1	4	12	13	12	6	-	22.0
Candavu (?)						1									1													1			
Panama			3	6	6	1	2	5.6				1	2	5	6	3	1	-	8.6				2	1	1	6	5	1	2	1	21.4
Trinidad	2	1	2	11	14	11	-	5.6	1	1	-	2	4	14	6	12	1	-	8.4				1	1	6	3	9	8	5	-	21.9

band of opposite side; band, interrupted by orbit, continues from dorsoposterior margin of orbit to dorsal midline of head, decreasing in definition. Second broad, dark dusky band present posterior to eye completely encircling head, often faint to absent midlaterally, being represented only by narrow, intensely dark, anterior marginal line, dusky to dark blotch, or curved, diagonal, moderately broad, dark dusky line posterior and ventroposterior to eye. Third broad, dark dusky band extending from dorsal end of operculum to ventral side of head, sometimes confluent with corresponding band of opposite side at ventral midline; band often faint midlaterally on operculum. Snout and interorbital dark dusky with large, irregular, pale blotches or spots anteromedially to eyes. Nape dark dusky with irregular pale spots and blotches anteriorly. Nape posterolaterally with prominent, dark, anteroventrally intensified blotch just anterior to dorsal-fin origin; corresponding blotches on opposite sides often continuous as band, sometimes with dusky blotch present between them middorsally; dark blotches, or band, usually set off by pale margin. Short, nearly horizontal, dark line present at dorsal end of 3rd dark head band.

Trunk: Four or five, more or less parallel, evenly spaced, slightly wavy, dark, horizontal lines present anteriorly on dorsal three-fourths of body; large specimens with lines extending posteriorly for half body length; lines much shorter in small specimens; midlateralmost line on body reaching forward to center of gill opening; dorsalmost line usually formed from series of 8 or 9 more or less joined horizontal dashes; midlateral 3 lines followed posteriorly by single midlateral series of dusky to dark rectangular blotches, becoming faint posteriorly; all blotches very faint in large specimens; blotches reach far forward in small specimens; some specimens with blotches continued ventrally as very faint, broad, dusky streaks. Dorsal body contour with series of about 11 joined pairs of intensely dark blotches; anteriorly each pair of blotches positioned above corresponding dash in dorsalmost horizontal dark body line.

Pectoral Fin: Pale with even spread of dark specks of pigment on rays; membranes mostly transparent. Lower half of fleshy pectoral-fin base with faint to prominent, broad, dark dusky bar immediately posterior to branchiostegal membrane; fleshy pectoral-fin base sometimes with dark line along base of fin, particularly dorsally.

Pelvic Fin: Pale with fairly even spread of dark specks of pigment, somewhat darker proximally.

Dorsal Fin: Transparent to slightly dusky with narrow, dark dusky stripe one-third distance up from base; stripe becoming faint to absent posteriorly. Dorsoposterior portion of fin often dusky. Some specimens with distal edge of fin narrowly dusky.

Anal Fin: Pale dusky to dark dusky, especially distally; ray tips abruptly pale, particularly anteriorly on fin.

Caudal Fin: Pale to dusky with vertically oriented pair of slightly darker blotches at base of fin; dusky streak directed posteriorly from each blotch in some specimens.

Females: Similar to males except: horizontal lines on body less distinct; midlateral, rectangular, dark blotches well developed, remaining distinct more posteriorly, often appearing associated with more dorsal row of dashes and row of blotches on dorsal body contour giving body banded appearance (banded appearance present in some males but not usually to extent of that in females).

Geographical Variation: This species is fairly consistent in color pattern throughout its range. A great deal of variation occurs in head pattern (particularly midlaterally) largely due to the indistinctness of the markings posterior to the eye and on the cheek. Specimens in the three lots examined from Ceylon, however, were somewhat distinct in the following particulars: head with dark markings behind eye usually joined to form reticulated pattern; dorsalmost horizontal line on body not usually clearly broken into dashes, posterior ends of next two lines confluent with second and first midlateral blotches respectively; blotches on lateral body midline less angular, extending slightly dorsally and ventrally, particularly in smaller specimens; series of paired blotches on dorsal body contour extending onto base of dorsal fin in many specimens.

Geographic Variation (see also "Color Pattern").—Population variation was noted in most meristic characters of *O. punctatus* (Table 13). There is no particular pattern shown by these variations. The Western Australian populations exhibit an increase in the number of precaudal vertebrae that is duplicated by no other population of *O.*

TABLE 14.—*F values for covariance comparisons of regression equations (Table 2) for number of lower or upper jaw teeth between males or females from different populations of* Omobranchus elongatus (** = *significant at p = .001; NS = not significant*)

Comparisons	F values slopes	Degrees of freedom	F values heights	Degrees of freedom
Lower teeth				
males				
Ceylon X Gulf of Thailand	0.01 NS	1/54	13.72 **	1/55
Ceylon X China	0.46 NS	1/39	38.75 **	1/40
Ceylon X Trinidad	3.50 NS	1/37	0.42 NS	1/38
Gulf of Thailand X China	0.69 NS	1/51	5.35 NS	1/52
Gulf of Thailand X Trinidad	3.44 NS	1/49	18.95 **	1/50
China X Trinidad	6.22 NS	1/34	27.73 **	1/35
females				
Ceylon X Gulf of Thailand	0.54 NS	1/37	59.23 **	1/38
Ceylon X Trinidad	3.49 NS	1/24	9.95 NS	1/25
Gulf of Thailand X Trinidad	2.23 NS	1/25	5.38 NS	1/26
Upper teeth				
males				
Gulf of Thailand X China	2.03 NS	1/50	9.75 NS	1/51
Gulf of Thailand X W. Australia	1.32 NS	1/36	7.13 NS	1/37
Gulf of Thailand X Trinidad	4.43 NS	1/48	24.13 **	1/49
China X W. Australia	0.34 NS	1/22	0.77 NS	1/23
China X Trinidad	12.04 NS	1/34	45.89 **	1/35
W. Australia X Trinidad	6.20 NS	1/20	32.65 **	1/21
females				
Ceylon X Gulf of Thailand	1.81 NS	1/37	22.12 **	1/38
Ceylon X W. Australia	2.99 NS	1/26	22.40 **	1/27
Ceylon X Trinidad	0.01 NS	1/24	0.00 NS	1/25
Gulf of Thailand X W. Australia	1.74 NS	1/27	0.74 NS	1/28
Gulf of Thailand X Trinidad	1.42 NS	1/25	12.46 NS	1/26
W. Australia X Trinidad	2.37 NS	1/14	13.07 NS	1/15

punctatus. Similar increases in number of precaudal vertebrae are also exhibited by the Western Australian populations of *O. germaini* and *O. r. rotundiceps*, but no others. The factors causing this peculiar type of variation are unknown.

Although covariance comparisons of numbers of jaw teeth (Table 14) were not feasible for all populations of *O. punctatus*, several of the populations exhibited significant differences in numbers of teeth. In general, if one sex of one population exhibited a significant difference in the number of teeth in one jaw from that exhibited by the same sex of another population, then both sexes of each population differed significantly in numbers of teeth in both jaws; where the differences in the other jaw or other sex were not significant they were nearly so.

GEOGRAPHIC DISTRIBUTION (Figure 7).—Recorded from one restricted locality (Delagoa Bay) in the western Indian Ocean, otherwise common from the Persian Gulf to Japan and eastern Australia. One questionable record from the Fiji Islands (discussion below). Common in Trinidad and in Panama around the Atlantic entrance to the Panama Canal and in lower Gatun Locks. (For discussion of Atlantic distribution see p. 59.)

Yazdani (1963) reported *Petroscirtes kochi* (= *O. punctatus*) from Phoenix Bay, Port Blair, Andaman Islands. We are unable to verify this identification and have not entered the record on the distribution map for *O. punctatus*. Chyung (1954) reported *O. punctatus* (as *Dasson*) from Masan, Korea, and (1961) identifiably illustrated it. We are unable to translate the Korean localities in the 1961 publication but based on the 1954 locality, together with the 1961 illustration, we have included the 1954 Korean locality on Figure 7.

HABITAT.—Shallow, often murky, marine and occasionally brackish waters at or close to the shoreline or near river mouths or mangroves. In tidepools and areas with rocks (often encrusted with barnacles or oysters), sparse corals, and sargassum. Once taken at a salinity of 28 o/oo in Gatun Locks, Panama. Reported (Lachner, Robins, Courtenay, 1970) common around docks in Trinidad.

COMPARISONS.—*Omobranchus punctatus* is a member of the *banditus* species group (see "Comparisons" under *O. banditus*). It differs from the

other members of its group as follows: from all in overall color pattern and in never having a fleshy crest on the head, and from *O. banditus* in having a lower-lip flap. It is otherwise distinguishable from the other species of *Omobranchus* only by a combination of characters, although when its color pattern is strongly manifested the species is recognizable at sight. The narrow, dark longitudinal lines on the anterior quarter of the body occur in no other species of *Omobranchus*.

NOMENCLATURAL DISCUSSION.—Günther (1861) described *P. dispar* on the basis of two specimens representing different species, both with available older names (*O. punctatus* and *O. fasciolatoceps*). No comparison was made with any other species as he erroneously thought the fleshy head crest, exhibited by one of his specimens, to be a unique character among the species of *Petroscirtes* (which in Günther's day included *Omobranchus*). In order to stabilize the name, we here designate the larger of Günther's two syntypes (BMNH 1860.7.20.99), identifiable as *O. punctatus*, as the lectotype of *P. dispar*. The other (crested) syntype bears the catalog number BMNH 1860.7.20.100.

Kner (1868b) did not compare his *P. semilineatus* with *O. punctatus* or *O. dispar*. We have examined the presumable holotype of *P. semilineatus* and find it to be identifiable with *O. punctatus*. (For a discussion of the complexities surrounding the description of *P. semilineatus* see "Nomenclatural Discussion" under *O. lineolatus*).

The most commonly applied name to the species we treat as *O. punctatus* is *O. japonicus* (Bleeker). Bleeker (1869) described *P. japonicus* from Tokyo on the basis of a single specimen, now lost. He compared his species only with (the lectotype of) *P. dispar* and noted that it differed from *P. dispar* in having its head contained six and one-third times in the total length (as opposed to seven times) and in having three fewer dorsal-fin elements. Bleeker noted that his specimen was remarkable for its numerous jaw teeth, 36–40 in each jaw.

Bleeker's description and illustration of *P. japonicus* clearly apply to a species of the genus *Omobranchus*, but it is impossible for us to assign it with certainty to any species we know in that genus. The only species of *Omobranchus* that has the jaw teeth so numerous is *O. fasciolatoceps* (known from China and Japan), and in that species only mature females may have as many teeth as Bleeker reported. However, mature females of *O. fasciolatoceps* lack canine teeth, whereas *P. japonicus* was described as having canine teeth. Furthermore, *O. fasciolatoceps* has an obvious, high, fleshy crest on top of the head in both sexes. Bleeker reported that his specimen lacked a crest and no indication of a crest is present in his figure.

There are three other species of *Omobranchus* known from Japan. Of these, *O. elegans* can probably be excluded from consideration as identifiable with *O. japonicus* because the black-spotted color pattern of *O. elegans* is so distinctive and persistent that Bleeker would hardly have overlooked it. In the unlikely event that *P. japonicus* should prove to be synonymous with *O. elegans*, *O. japonicus* would have priority as it is the older name.

Of the remaining two Japanese species of *Omobranchus*—*O. loxozonus* and *O. punctatus*—neither is a more likely candidate solely on the basis of Bleeker's description. However, *P. japonicus* was described from Tokyo, and of the two species, only *O. punctatus* has been recorded from this far north on the Japanese coast. We have therefore questionably synonymized *P. japonicus* with *O. punctatus*.

DeVis (1884b), who worked at the Queensland Museum, briefly described *S. decipiens* without comparing it with any other species. We have examined the holotype (only one specimen mentioned in the description) and find it to be a female *O. punctatus*. A few pages later, in the same publication, DeVis described *S. helenae* (number of specimens not indicated), also without comparison. The description of *S. helenae* is slightly less brief than that of *S. decipiens*, but almost identical with that of *S. decipiens*, where the same characters were described. In the Queensland Museum there are three specimens (QM I.1361) that are cataloged as "types" of *S. helenae*. In addition to these, the Australian Museum has two lots of specimens received from the Queensland Museum (AMS I.12694, two specimens, and I.445, five specimens) that are cataloged as "cotypes" of *S. helenae*. There is some question concerning the validity of the type-status accorded to the specimens in AMS I.445, but for the sake of argument we assume that they are types. All the QM and AMS specimens mentioned, except one contained in AMS I.445 that is identifiable as *O. r. rotundiceps*, are conspecific with *O. punctatus*. To stabilize the name of *S. helenae* we here designate

one specimen from QM I.1361 as the lectotype of *S. helenae*. The lectotype can be distingushed from the other syntypes by the followng combination of characters: 65.8 mm SL; 6 lateral-line tubes on the left side; last epipleural rib on vertebra 21; dorsal fin XII, 22; anal fin II, 23; 7 upper and 8 lower procurrent caudal-fin rays, 29 upper and 30 lower incisoriform teeth. The two syntypes formerly with the lectotype are now cataloged as QM I.10330.

Day (1888) described *S. sindensis* without comparison with any other species. The syntypic material comprises three specimens, all of which are identifiable as *O. punctatus*.

Jordan and Snyder (1902) described *A. dasson*, which they compared only with *P. japonicus*, noting that *P. japonicus* had more teeth than their specimens. They reported that they had two specimens, which they called the type (sic), from Wakanoura. These two specimens, which must be accorded syntypic status, are both identifiable as *O. punctatus*.

Jordan and Snyder (1902) reported that the paratype (cotype) of *Aspidontus dasson* came from "Agu in Shima." We are unable to locate this supposed Japanese locality and suspect that it was originally intended to be Aguni Shima, an island off Okinawa. However, as Jordan and Starks (1907) gave no records of fishes from Aguni Shima in their list of fishes from the Ryukyus, we have not included their record on the distribution map for *O. punctatus*.

Weber (1908) compared his *P. kochi* only with *O. lineolatus*, and then only to state that it was different without specifying how. We have examined the two syntypes of *P. kochi* and find them to be identifiable as male *O. punctatus*.

Fowler (1931) did not compare his *P. sewalli* with any other species. Inasmuch as his specimens came from Trinidad, it is understandable that he would not have looked for an applicable Indo-Pacific species name for his specimens. Although he designated a catalog number for the holotype (ANSP 53318) and a series of numbers for the paratypes (ANSP 53319–21, indicating 3 specimens), all four types are presently included in a single jar labeled with all the catalog numbers. Fowler did note that the holotype was 57 mm TL and that the paratypes were 50–55 mm TL; thus, the largest specimen (which we find to be 47.6 mm SL, 55.5 mm TL) is probably the holotype. The next largest specimen is 45.0 mm SL, but the caudal fin is damaged and the TL cannot be measured. It is not important to decide which specimen is the holotype as all are identifiable with *O. punctatus*.

H. M. Smith (1934) did not compare *P. masyae* with any other species. We have not seen the holotype (reported by Monkolprasit, 1969, to be in the collections of Kasetsart University, Bangkok). The description of the color pattern clearly applies only to *O. punctatus*. Furthermore, there is a photograph of a drawing by L. Masya (for whom the species was named), published as a postcard, in the illustration files of the Division of Fishes, USNM, that carries the legend, "*Petroscirtes masyae*." The drawing was apparently based on the holotype, which was reported to be 5.9 cm TL. The reproduced drawing, which is 9.4 cm TL, is stated on the postcard to be × 1.6 natural size, or 9.4 cm. This illustration clearly indicates the unique color pattern of *O. punctatus*.

J. L. B. Smith (1959) described his subspecies, *O. japonicus scalatus*, claiming that the stripes on the head and pectoral-fin base differentiated his form from the "typical form." The color pattern described and illustrated by Smith is found in specimens from throughout the range of *O. punctatus*. Although some populations tend to diverge from others in color pattern, the differences are minor and unworthy of nomenclatural recognition.

MATERIAL EXAMINED.—MOZAMBIQUE: Delagoa Bay, RUSI 1096 (2: 11.9–39.9), 1102 (56.2), SAM 25385 (38.3), USNM 197417 (2: ca. 43–55). IRAN: Bushire, (Persian Gulf), UZMK CN6–7 (38.8), CN6 (ca. 54); Jask (Gulf of Oman), BMNH 1904. 5.25.92–3 (2: ca. 44–46). PAKISTAN (Arabian Sea): Karachi (= Kurrachee), BMNH 1889.2.1. 3616–18 (3: 43.6–53.5, syntypes of *Salarias sindensis*), 1898.6. 29.148–9 (2: 30.5–45.1), UZMK P.75390 (34.9). INDIA: Okha Point (Gulf of Kutch), USNM 201882 (58.6); Bombay, ANSP 100170 (54.6), 122231 (68.8), BMNH 1887.9.22.67–73 (7: 30.9–57.7), MNHN 716 (40.2, holotype of *Blennechis punctatus*); Vizagapatnam, CAS SU41332 (5: 27.2–54.4). MALDIVE ISLANDS: Seenicappa, FMNH 71357 (44.3). CEYLON: Trincomalee, USNM 205449 (31: 21.2–37.7), 206389 (109: 16.3–55.5), 208275 (23.3). NICOBAR ISLANDS: GREAT NICOBAR ISLAND: NFIS 11861 (39.0). BURMA: TAVOY COAST: USNM 89499 (23.6). THAILAND: WEST COAST: Phuket, USNM 201871 (ca. 42); mouth of Pakchan River, CAS GVF reg. no. 2208 (48: 21.5–54.3). GULF OF

THAILAND: west coast (Chumphon Province), Matapora, CAS GVF reg. no. 2184 (3: 57.6–66.4), GVF reg. no. 2191 (40.7); north coast, Bangkok, CAS GVF reg. no. 2067 (45.0); vicinity of Chol Buri (= Chon Buri), CAS GVF reg. no. 1542 (200: 23.0–71.6), GVF reg. no. 1543 (9: 44.9–64.2); east coast, vicinity of Chantaburi (= Chantabun), CAS GVF reg. no. 1586 (3: 22.3–60.2), USNM 119660 (26.0); Goh Proet (= Kaw Praed?), CAS SU62090 (110: 27.4–63.7); vicinity of Trat Bay, CAS GVF reg. no. 1487 (5: 38.5–50.1). HONG KONG and vicinity (including Kwangtung Province, China); CAS SU29465 (14: 70.2–95.0), SU62061 (67.4). CHINA (other than Kwangtung Province); Amoy, BMNH 1860.7.20.99 (ca. 90, lectotype of *Petroscirtes dispar* Günther). CHUSAN ISLAND: Pu-tau, CAS SU32420 (88: 21.8–70.2). JAPAN: NAGASAKI PREFECTURE: Takegaki, USNM 199521 (3: 26.4–52.0). MIYAZAKI PREFECTURE: Nobeoka, USNM 199519 (ca. 76). WAKAYAMA PREFECTURE: Wakanoura, CAS SU7070 (2: 44.0–49.0, syntypes of *Aspidontus dasson*). HIROSHIMA PREFECTURE: Hiroshima, ZITU 24762 (74.8). TOKYO PREFECTURE: Tokyo, ZITU 31779 (34.8). INLAND SEA OF JAPAN: BMNH 1905.6.6.347 (52.0). PHILIPPINE ISLANDS: LUZON: Manat (Pangasinan Province), USNM 209347 (2: 47.7–54.5). PALAWAN: Nakoda Bay, USNM 99388 (36.0). MINDANAO: AMNH 40019 (32.8). INDONESIA: HALMAHERA: Teluk Kan, USNM 208278 (2: 24.6–39.5). NEW GUINEA: Merauke River, ZMA 109.102 (2: 32.8–42.3). SOLOMON ISLANDS: BOUGAINVILLE: Torokina, DASF FO1929 (39.6). AUSTRALIA: WESTERN AUSTRALIA: Onslow, WAM P4841 (5: 31.4–48.8), P11245 (25.9); Shark Bay, WAM P7257–7306, in part (2: 31.6–41.7), P7361–62 (2: 38.4–38.7), P7342 (16: 29.6–61.1). NORTHERN TERRITORY: Yirrkala, USNM 174331 (2: 20.9–33.1); Groote Eylandt, USNM 174332 (26.2); north of Port Darwin, USNM 174330 (5: 37.8–52.7, including one cleared and stained). QUEENSLAND: Weipa, AMS IB.5307 (39.7); Townsville, BPBM 14952 (26: 16.1–71.5); Bowen (including Port Denison), RMNH 11424 (43.6), AMS IA.1796 (3: 40.2–55.8); Brisbane and vicinity, AMS I.445 (4: ca. 47–78.4), IA.3670 (6: 37.5–65.2), IA.4597 (ca. 54), IA.4948 (5: 32.5–ca. 67), I.9871 (76.5), I.9872 (61.8), I.9873 (59.1), I.9874 (3: 34.0–39.8), I.9875 (52.1), I.11365 (2: 45.3–67.9), I.12616 (2: 64.3–66.9), I.12694 (2: 52.4–55.0), QM I.1352 (ca. 48, holotype of *Salarias decipiens*), I.1361 (65.8, lectotype of *Salarias helenae*), I.10330 (2: 49.9–64.6), USNM 209348 (2: 44.0–45.2). FIJI ISLANDS: CANDAVU: NMV 12561 (41.5, holotype of *Petroscirtes semilineatus*). PANAMA (Atlantic): Bahia Limon, SI0 JEM70–63 (3: 39.2–52.1), JEM71–60 (5: 17.7–27.5), USNM 201439 (44.4), 208276 (10: 37.4–69.4); Gatun Locks (lowest chamber), GCRL 8784 (2: 43.9–54.2), 9095 (40.3). TRINIDAD: Brighton Beach, ANSP 53318–21 (4. 42.8–47.6, including unsegregated holotype of *Poroalticus sewalli*); Mayaro Point, USNM 204059 (24: 22.0–58.2) Chaguarmus Bay, UMML 24718 (3: 23.0–55.4); Saline Bay, USNM 204060 (11: 24.9–36.9). GULF OF PARIA: BMNH 1933.11.20.12–13 (2: 35.7–63.8).

How *O. punctatus* Became Established in the Caribbean Sea

Omobranchus punctatus is the only Indo-Pacific marine fish species, other than circumtropical pelagic forms, known to be established in the western Atlantic. Its known occurrence in the western Atlantic dates from 30 April 1930, when four specimens were collected at Brighton Beach, Trinidad (Fowler, 1931, reported as *Poroalticus sewalli*). Since 1930, *O. punctatus* has been collected repeatedly and in large numbers in Trinidad, including points near the extreme corners of the island. *Omobranchus punctatus* (as *O. dasson*) was reported to be the most common fish around the docks north of Port of Spain, Trinidad (Lachner, Robins, and Courtenay, 1970).

Cervigon (1966) reported that one specimen of *O. punctatus* (as *O. dasson*) was collected 23 May 1961 on the shore at Guiria, Gulf of Paria, Venezuela, which is about 75 km west of Trinidad. The only other known occurrences of *O. punctatus* in the Atlantic are in Panama: at Limon Bay, which is at the entrance to the Panama Canal, and in the adjacent lower Gatun Locks of the Canal. The first Panamanian specimen was collected on 3 December 1966 in Limon Bay. Since that date several more specimens have been taken in Panama, all from Limon Bay, but the species does not appear to be nearly so common in Panama as in Trinidad.

The wide area between the Caribbean occurrences of *O. punctatus* appears to represent a real distributional void, as there has been continuous and extensive collecting of Caribbean shore fishes for many years, and no specimens of *O. punctatus*, other than from the Trinidad-Gulf of Paria area

and Panama, have been obtained. C. E. Dawson, who obtained the first Panamanian specimen, has since made numerous marine and estuarine fish collections in Panama from points approximately 5 km west of the entrance to Limon Bay eastward to Portobello and some of the San Blas Islands. He has obtained *O. punctatus* only from Limon Bay and the lower Gatun Locks. *Omobranchus punctatus* also has not been obtained in the eastern Pacific. Aside from extensive fish collecting throughout the tropical eastern Pacific by others, Dawson, since 1967, has been making fish collections within an arc of 8 km surrounding the Pacific entrance to the Panama Canal, into the Canal as far north as Miraflores locks, and along the Pacific coasts of Costa Rica and Colombia, and has not obtained *O. punctatus* from any of these areas.

The first question that arises concerning the distribution of *O. punctatus* is whether the Caribbean population (s) is a relic population of a once circumtropically distributed species or whether it is the result of an introduction. We believe that it is the result of an introduction. The circumstantial evidence supporting our belief follows.

Omobranchus punctatus is the only tropical Indo-west Pacific benthic shore fish that also occurs in the western Atlantic.[2] The blenniids are a relatively speciose group that includes many endemic populations and species of relatively restricted distribution, indicating a relatively rapid rate of speciation for the family as a whole. Such rapid speciation is indicated, for instance, by the fact that no blenniid species is native to both the western Atlantic and eastern Pacific oceans, which were connected most recently two or three million years ago (Woodring, 1966).[3] Nor is there a blenniid species common to the eastern and western Pacific Ocean. Furthermore, all species of the blenniid tribe *Omobranchini*, other than *O. punctatus*, are restricted to the Indo-west Pacific. If a species of Indo-west Pacific blenniid was successful in maintaining a naturally disjunct population in the western Atlantic, one should reasonably expect similar distributions for other Indo-west Pacific benthic species, yet there are no other similar distributions. Therefore, the presence of *O. punctatus* in the western Atlantic must be the result of an artificial introduction.

The presence of *O. punctatus* in Panama is probably the result of an artificial introduction from Trinidad, but first we must discuss the possible method by which *O. punctatus* was introduced into Trinidad.

Dawson (1973) presented a good case for the method of introduction of the Indo-west Pacific small, benthic, gobioid fish *Prionobutis koilomatodon* into the eastern Pacific (Panama Canal): in ship's ballast water, which was emptied into the Canal. Ballast water is preferable to bilge water as a means of hypothesized transport by motorized vessels because bilge water is mainly derived from avenues that would permit entry into the ship of few, if any, marine organisms, and bilge water is usually too foul and oily to support live fishes. Ballast water, in contrast, is drawn through a strainer, with perforations about one-half inch in diameter (although the diameter often greatly increases through corrosion) directly from the sea into a ship's relatively clean ballast tanks (Melvin Jackson, personal communications; however, Rubinoff, 1970, noted that modern nonstainless steel ballast tanks may be coated with highly toxic anticorrosion paints). Each ship usually has two ballast water intakes: one located on the side below the waterline and the other on the bottom of the hull. Both bilge and ballast water would offer possibilities for fish transport on sailing ships, the bilges of which are generally cleaner than those of motorized vessels. Sailing ships rarely used water for ballasting (Melvin Jackson, personal communication),

[2] Sauvage (1880) described *Salarias brasiliensis* from Santa Catarina, Brazil. Springer (1963) noted that Sauvage's species was a synonym of the common Indo-west Pacific species, *Salarias fasciatus*, and that there was good reason to question the locality data given by Sauvage. *S. fasciatus* has not otherwise been reported as occurring outside the Indo-west Pacific.

[3] Dawson (1970) reported the western Atlantic blenniid *Lupinoblennius dispar* from the unused Miraflores Third Lock on the Pacific side of the Panama Canal, and Hildebrand (1939) reported it, as *Blennius* sp., from Gatun Locks on the Atlantic side. Dawson believed, as do we, that its presence in these locks was the result of immigration through the Canal from the Caribbean. J. C. McCosker informs us that he has taken the Atlantic blenniid *Hypleurochilus aequipinnis* in the Miraflores Third Lock. We postulate a similar immigration for this species. Rubinoff and Rubinoff (1968) believed that the presence of the western Atlantic gobioid, *Lophogobius cyprinoides*, in the Miraflores Third Lock was the result of colonization from the Atlantic through the Canal.

but as early as 1901, at least, water ballast was used on some sailing vessels (Lubbock, 1935).

The ballast-bilge water method of introduction probably applies also to the Trinidad population of *O. punctatus* and to the two other New World (eastern Pacific) introductions of Indo-Pacific marine fishes (Brittan, Albrecht, and Hopkirk, 1963; Lachner, Robins, and Courtenay, 1970), which are both gobioids (*Acanthogobius flavimanus, Tridentiger trigonocephalus*) and relatively small benthic fishes. Small size is favored for introduction by ballast water (and probably bilge water also) because of the small size, at least initially, of the holes in the ballast strainer. *Omobranchus punctatus* would be a good candidate for being sucked into a ship's ballast tanks because of its small size, abundance around docks (at least in Trinidad; Lachner, Robins, and Courtenay, 1970), and because of the general inclination of blenniids, including *Omobranchus,* to inhabit tubelike holes. *Omobranchus* might well be expected to enter the holes in the ballast strainer of a ship that had been resting in port, and then be sucked into the ballast tanks when the pumps were started.

Inasmuch as *O. punctatus* has been taken in the Caribbean and not in the eastern Pacific it seems unlikely that its introduction into the Caribbean was effected through the Panama Canal via a trans-Pacific crossing. Ships intending to clear their bilges and ballast tanks must do so before entering the Canal (Rubinoff, 1970), and although some ships illegally discharge bilge and ballast after entering the locks (Dawson, 1973), it is most unlikely that they would wait until the end of the traverse to do so. More likely they would discharge at the beginning of the traverse. This being the case, one would expect to find *O. punctatus* at the Pacific side of the Canal had it arrived via a Pacific crossing. On the other hand, one would expect a ship entering the Canal from the Caribbean side to discharge its bilge or ballast in Limon Bay (just prior to making its traverse) or in Gatun Locks (just after entering the Canal). *Omobranchus punctatus* in Panama is most common in Limon Bay, where it has been collected repeatedly. It has been taken in only one collection in Gatun Locks and only three specimens were obtained (indicating that the lock environment is not particularly suitable, that periodic emptying of the lock for cleaning decimates the population, or that there has been insufficient time or introductions for the population to have developed large numbers). Another consideration that would argue against *O. punctatus'* having entered the Caribbean through the Panama Canal is the probability that it was introduced into the Caribbean prior to 16 August 1914, the date that the first ship passed through the Panama Canal; our reasons for this assumption will become apparent below.

Hildebrand (1939) reported on collections of fishes obtained from Gatun Locks (Atlantic side) in 1935 and Pedro Miguel and Miraflores locks (Pacific side) in 1937, when these locks had been dewatered for their periodic cleaning. *Omobranchus punctatus* was not present in his collections. The evidence thus favors the introduction of *O. punctatus* in Trinidad (first appearance in collections in 1930) before its presence in Panama (first appearance in collections in 1966) and to some extent supports our belief that the Panama population is a derivative of the Trinidad population. The very close averages for various meristic characters (Table 13) and the uniquely low averages in common for one of these characters, total number of procurrent caudal-fin rays, exhibited by the Trinidad and Panama populations of *O. punctatus* also point to a common origin for the two populations. (The relationship of these data to those of other populations of *O. punctatus* is by no means clear, but certainly seems to preclude derivation from some populations: China, Hong Kong, Australia. In general, the averages are close to those of specimens from western Thailand and, perhaps, Ceylon, which are relatively close geographically to the area we will propose below as the source of the Caribbean populations.)

If one accepts the proposition that *O. punctatus* did not arrive in the Caribbean via the Panama Canal, then it must have arrived by passage across the Atlantic Ocean. Such passage could have been made either around the southern tip of Africa or via the Red Sea, Suez Canal, and Straits of Gibraltar. In the latter case its arrival could not have been earlier than 1869, the year the Suez Canal was opened. In either case a locality in the Indian Ocean portion of the distribution of *O. punctatus* appears to be the most probable source of the parental population of the Trinidad introduction.

There are two main reasons for such an assumption. The first is proximity: survival during trans-

port is dependent on, among other things, the length of time spent in transport, and Indian Ocean localities are closer to Trinidad than are Pacific Ocean localities (considering the direction of transport proposed above). The second reason concerns the commerce in East Indian coolie labor that occurred between 1838 and 1917 (Erickson, 1934). It is for the second reason also that we believe the Trinidad population of *O. punctatus* originated at Madras or, more probably, Calcutta.

With the 1833 abolition of slavery in the British Empire, there developed a pressing demand by many of the British colonies for emigrant laborers. This demand was met by the importation of indentured east Indian coolies from Calcutta and, to a lesser extent, Madras on the east coast of India. The first Indian coolies sent to the New World arrived in British Guiana in 1838. Because of cruel practices the importation of coolies was suspended after 1838, but recommenced in 1844 after new safeguards for the coolies had been established. From 1845 until 1917, when immigration was suspended, there was a great flow of Indian coolies into British Guiana, Trinidad, Jamaica, and, to much lesser extent, other Caribbean Islands. Of these areas, British Guiana received the most coolies, approximately 240,000 (Gangulee, 1947); Trinidad received 143,900 (Klass, 1961); and Jamaica received 36,400 (Roberts, 1957). These numbers reflect the total number of arrivals only and not the greater number of coolies that initially embarked on the ships, because many died along the way (for instance, see Swinton and Swinton, 1859, for the account of one voyage from Calcutta to Trinidad during which 120 of 324 coolies died before reaching Trinidad; this may be an extreme case; for other, lesser, mortalities see Lubbock, 1935).

As far as we can determine, a sailing vessel (which was the type predominantly used) carried an average of about 380 coolies (range 269–515; Lubbock, 1935), but at the end of the period of immigration the steamers were carrying about 1000 coolies (Lubbock, 1935; although Klass, 1961, reported that the last steamship to carry coolies to Trinidad arrived in 1917 with only 394 coolies). Using the average figures and allowing for a most conservative 5 percent mortality, it would have required 400 shipments to bring the coolies to Trinidad. The means for transport of *O. punctatus* to Trinidad were, thus, abundantly available.

Coolie immigration into Trinidad (and elsewhere in the Caribbean) was essentially terminated in 1914 (because of World War I) and ended in April 1917 (Klass, 1961; Roberts, 1957), thus accounting for our belief that the introduction of *O. punctatus* into Trinidad occurred prior to the 1914 opening of the Panama Canal. In view of the probable introduction of *O. punctatus* into Trinidad prior to the opening of the Canal, the similarity in meristic characters shared by the Trinidad and Panama populations, the fact that *O. punctatus* is much more common at Trinidad than at Panama, the gap in distribution between Trinidad and Panama, and the probable means of ship transport of *O. punctatus,* we believe that the occurrence of *O. punctatus* in Panama is the result of a ship's acquiring the species in Trinidad, proceeding to the Canal, and discharging its acquisition at the entrance to the Canal just before making the Canal traverse. (We should interject here that although *O. punctatus* has not been reported from British Guiana we would not be surprised to find it there. Few, if any, shore fish collections have been made in British Guiana. Jamaica has, however, been well collected; see Caldwell, 1966.)

From the initiation of the Indian coolie emigration until about 1910, only sailing ships were used to transport the coolies (the 1910 date is inferred from data in Lubbock, 1935). Their trip to the New World was made only during the warm months and followed a route around the southern tip of Africa with one stop, St. Helena (Swinton and Swinton, 1859; Lubbock, 1935). The Suez Canal route was not used. When steamers replaced the sailing ships they followed the same route (Lubbock, 1935). As far as we can determine, the sailing ships required 69–101 days to make the journey from Calcutta to British Guiana or Trinidad (Lubbock, 1935; Swinton and Swinton, 1859). The steamers were probably able to halve the transit time. While speed and preferred method of ballasting would favor a steamer as the vessel for introducing *O. punctatus* to Trinidad, the much larger number of sailing vessels making the crossing might favor a sailer.

(It is perhaps relevant to note here that a specimen of a blennid, *Petroscirtes breviceps* [DASF F02130], was taken from the bilge of a ship that traveled from northwest Australia to Port Moresby

in September 1972. The data with the specimens indicates that there was a continuous flow of seawater in the ship's hold.)

In postulating that the origin of the Trinidad population of *O. punctatus* came from Madras or Calcutta, we are faced with the difficulty of a lack of records of *O. punctatus* from either of these two localities. This difficulty may be more apparent than real, as *O. punctatus* has been collected from Ceylon, which is south of Madras, from Vizagapatnam, which is between Madras and Calcutta, and from the Tavoy coast of Burma, which is east and south of Calcutta. The east and northeast coasts of India have not been well collected for fishes, and there is no reason to believe that *O. punctatus* does not occur at one or both, Calcutta or Madras.

Mauritus, Ceylon, southern Africa, and Fiji also received large numbers of Indian coolies from Madras and Calcutta (Gangulee, 1947) during the same period that coolies were arriving in the New World. For this reason alone, one must generally hold in suspect the naturalness of the apparent distributions of small, benthic shore fishes in the Indo-west Pacific. It is possible, for instance, that the isolated populations of *O. punctatus* and *O. ferox* at Delagoa Bay (southeast African coast) are the result of man-induced introductions. J. L. B. Smith (1959) reported that *O. japonicus* (= *punctatus)* was taken "nowhere else in the whole W. Ind. Ocean" despite careful search, and neither *O. punctatus* nor *O. ferox* have since been taken elsewhere in the western Indian Ocean.

The occurrence of *O. punctatus* at Candavu (Fiji Islands) must also be questioned. This record is based on Kner's (1868a) description of *Petroscirtes semilineatus,* from one specimen, which was given at the same time as his description of *P. lineolatus,* also based on one specimen from Candavu. Candavu is well removed from the verifiable distribution of both these species, and neither species has been retaken at Candavu or Fiji, in spite of considerable recent collecting. Furthermore, Kner received many of his specimens from boat captains, and it is quite possible that the localities were erroneously recorded. Perhaps the specimens came from the boats themselves, which had acquired them in another port only to be noticed after arrival in Candavu, but we shall never know (see also "Nomenclatural Discussion" under *O. lineolatus*).

Omobranchus rotundiceps (Macleay)

(For synonymy see subspecies)

COMPARISONS.—*Omobranchus rotundiceps* is a member of the *elongatus* species group (see "Comparisons" under *O. elongatus*). *Omobranchus rotundiceps* is the only species in the group with modally 12 dorsal-fin spines; the others have modally 13 spines. It further differs from the other species in the group in having the dark spot posterior to the eye either closer to the preopercular series of pores than to the circumorbital series or about midway between the two series. In the other species the dark spot is either absent or closer to the circumorbital series of pores. Aside from its species group characters, *O. rotundiceps* is separable from most of the other species of *Omobranchus* only by a combination of characters.

Omobranchus rotundiceps rotundiceps (Macleay)

FIGURES 28, 29*a,b*

Petroscirtes fasciolatus Macleay, 1881:8 [Port Jackson; secondary junior homonym of *Blennechis fasciolatus* Ehrenberg in Cuvier and Valenciennes, 1836, which also belongs in *Omobranchus*].

Petroscirtes rotundiceps Macleay, 1881:9 [Port Jackson; lectotype designated below].

Salarias furcatus DeVis, 1884b:696 [St. Helena, Moreton Bay].

Salarias furtivus DeVis, 1886:60 [Moreton Bay].

Petroscirtes macleayi Ogilby, 1887:38 [replacement name for *Petroscirtes fasciolatus* Macleay].

Graviceps angelus Whitley, 1959:320 [Heron Island, Capricorn Group, Queensland].

DESCRIPTION (see also Table 15).—Dorsal fin XI–XIII (XII in 85.2% of specimens), 18–24 = 30–36 (rarely 30); anal-fin II, 20–26 (rarely 20); both anal-fin spines of males discernible externally; segmented caudal-fin rays 11–14 (13 in 95.2% of specimens; 11 in only 1 of 230 specimens); dorsal + ventral procurrent caudal-fin rays 10–16; vertebrae 10–11 + 27–33 (rarely 27 or 33) = 37–43 (rarely 37); epipleural ribs 11–14 (rarely 11); prenasal pores present; interorbital pores 1–4 (3 in 96.8% of specimens); circumorbital pores 6–9 (8 in 94.7% of specimens; 6 in only 1 of 251 specimens); lateral-line tubes 0–5 (rarely 4 or 5); lateral-line tubes, when present, extending posteriorly to below level of dorsal-fin spine 1–6 (rarely 5 or 6); gill opening varying from restricted to area dorsal to level of dorsalmost

TABLE 15.—*Frequency distributions for certain characters in subspecies and populations of* Omobranchus rotundiceps

Subspecies and population	Dorsal-fin spines				Segmented dorsal-fin rays							Total dorsal-fin elements							Interorbital pores					Epipleural ribs					
	11	12	13	x̄	18	19	20	21	22	23	24	x̄	30	31	32	33	34	35	36	x̄	1	2	3	4	x̄	11	12	13	14	15	x̄
O. r. obliquus																															
Philippine Islands	2	15	-	11.9		16	1	-	-	-	-	19.0	1	16	-	-	-	-	-	30.9		11	3	3.2		1	2	11	1	-	12.8
Guam	3	47	3	12.0	4	44	5	-	-	-	-	19.0	6	40	7	-	-	-	-	31.0	1	19	57	3	2.8		16	32	2	-	12.7
Yap	1	16	-	11.9	8	8	1	-	-	-	-	18.6	8	9	-	-	-	-	-	30.5		3	14	-	2.8		3	14	-	-	12.8
Palau Islands	1	64	-	12.0	17	47	1	-	-	-	-	18.8	18	46	1	-	-	-	-	30.7			53	-	3.0		13	47	4	-	12.9
Ambon		2	-	12.0		2	-	-	-	-	-	19.0		2	-	-	-	-	-	31.0			2	-	3.0		1	1	-	-	12.5
Timor		1						1								1														1	
New Guinea		4	-	12.0	1	-	3	-	-	-	-	19.5	1	-	3	-	-	-	-	31.5			4	-	3.0		1	1	2	-	13.2
New Caledonia		1					1								1									1							
Vanikoro		4	-	12.0	1	3	-	-	-	-	-	18.8	1	3	-	-	-	-	-	30.8			2	-	3.0		1	3	-	-	12.8
Aneityum			-	12.0			2	-	-	-	-	20.0			2	-	-	-	-	32.0			2	-	3.0			2	-	-	13.0
Fiji Islands		20	-	12.0		4	14	2	-	-	-	19.9		4	14	2	-	-	-	31.9			18	-	3.0		4	9	-	-	12.7
Samoa Islands		4	-	12.0		1	1	-	-	-	-	19.5		1	1	-	-	-	-	31.5			1						2	-	14.0
Palmyra		26	1	12.0		21	6	-	-	-	-	19.2		20	7	-	-	-	-	31.2			25	1	3.0		2	19	5	-	13.1
Hawaiian Islands		5	-	12.0		4	1	-	-	-	-	19.2		4	1	-	-	-	-	31.2			5	-	3.0		1	2	-	-	12.7
O. r. rotundiceps																															
Northern Territory	23	145	2	11.9	4	12	63	75	16	-	-	20.5	4	12	72	77	5	-	-	32.4		188	5	3.0	2	31	110	24	-	12.9
Western Australia																															
Montebello		3	1	12.2				2	1	1	-	21.8				1	2	1	-	34.0		4	-	3.0			1	3	-	-	13.8
Exmouth Gulf		1							1								1					1									
Shark Bay		9	3	12.2					2	9	1	22.9					1	8	3	35.2		10	-	3.0			8	3	-	13.3
Cotteslоe		1								1								1				1									
Queensland																															
Townsville	4	12	-	11.8				2	9	5	-	22.2				3	11	2	-	33.9		10	-	3.0		2	12	3	-	13.0
Port Bowen		1							1								1														
Cumberland Islands		2	-	12.0					2	-	-	22.0					2	-	-	34.0	1	1	-	2.5			1	1	-	13.5
Heron Island		2	-	12.0					2	-	-	22.0					2	-	-	34.0		1						1		
Gladstone		1								1								1				1						1		
Moreton Bay		8	-	12.0				2	6	-	-	21.8					2	6	-	33.8		8	-	3.0		1	7	-	-	12.9
New South Wales	1	16	1	12.0				6	8	4	-	21.9					6	8	4	33.9	1	1	16	-	2.8		3	12	3	-	13.0

Subspecies and population	Precaudal vertebrae			Caudal vertebrae							Total vertebrae								Lower end of gill opening opposite pectoral-fin ray									Circumorbital pores				
	10	11	x̄	27	28	29	30	31	32	33	x̄	37	38	39	40	41	42	43	x̄	0	1	2	3	4	5	6	7	8	x̄	6	7	8	9	x̄
O. r. obliquus																																		
Philippine Islands	16	-	10.0		15	1	-	-	-	-	28.1		15	1	-	-	-	-	38.1			2	6	3	-	-	-	-	3.1		1	13	-	7.9
Guam	52	-	10.0	18	33	1	-	-	-	-	27.7	18	33	1	-	-	-	-	37.7				9	17	19	-	-	-	4.2		13	67	-	7.8
Yap	17	-	10.0	12	5	-	-	-	-	-	27.3	12	5	-	-	-	-	-	37.3			3	8	3	2	-	-	1	3.5		1	15	1	8.0
Palau Islands	65	-	10.0	21	42	2	-	-	-	-	27.7	21	42	2	-	-	-	-	37.7			4	10	24	12	2	-	1	4.0			52	1	8.0
Ambon	2	-	10.0	2	-	-	-	-	-	-	27.0	2	-	-	-	-	-	-	37.0				1									2	-	8.0
Timor		1		1									1								1											1		
New Guinea	4	-	10.0		2	2	-	-	-	-	28.5		2	2	-	-	-	-	38.5				2	1	-	-	-	-	3.3			4	-	8.0
New Caledonia	1					1								1										1								1		
Vanikoro	4	-	10.0	1	3	-	-	-	-	-	27.8	1	3	-	-	-	-	-	37.8						1							2	-	8.0
Aneityum	2	-	10.0		1	1	-	-	-	-	28.5		1	1	-	-	-	-	38.5						1	-						2	-	8.0
Fiji Islands	29	1	10.0		6	23	1	-	-	-	28.8		5	24	1	-	-	-	38.9			2	5	2	1	-	-	-	3.2			18	-	8.0
Samoa Islands	2	-	10.0		1	1	-	-	-	-	28.5		1	1	-	-	-	-	38.5					1								1		
Palmyra	26	1	10.0	1	18	6	1	-	-	-	28.3		19	6	1	-	-	-	38.3			2	9	12	2	-	-	-	3.6		1	25	-	8.0
Hawaiian Islands	4	-	10.0		4	1	-	-	-	-	28.2		3	1	-	-	-	-	38.2			2	2	1	-	-	-	-	2.8			5	-	8.0
O. r. rotundiceps																																		
Northern Territory	164	4	10.0	5	9	77	68	8	-	-	29.4	4	8	77	69	10	-	-	39.4	46	37	32	7	-	1	-	-	-	1.0		2	187	4	8.0
Western Australia																																		
Montebello	1	3	10.8					3	-	-	31.0					1	2	-	41.7		3	-	-	-	-	-	-	-	1.0			4	-	8.0
Exmouth Gulf		1						1									1						1									1		
Shark Bay	1	11	10.9					6	6	-	31.5						7	5	42.4		7	4	1	-	-	-	-	-	1.5			11	1	8.1
Cotteslоe		1							1									1				1										1		
Queensland																																		
Townsville	20	-	10.0				5	12	3	-	30.9				5	12	3	-	40.9	6	3	-	-	-	-	-	-	-	0.3		1	9	-	7.9
Port Bowen	1							1								1																		
Cumberland Islands	2	-	10.0					2	-	-	31.0					2	-	-	41.0	1	1	-	-	-	-	-	-	-	0.5			2	-	8.0
Heron Island	1							1								1				1												1		
Gladstone	1							1								1					1									1				
Moreton Bay	8	-	10.0				3	5	-	-	30.6				3	5	-	-	40.6	6	-	-	1	-	-	-	-	-	0.4			8	-	8.0
New South Wales	16	2	10.1			2	4	6	5	1	30.9			1	4	7	5	1	41.0	14	4	-	-	-	-	-	-	-	0.2	1	-	14	3	8.0

Subspecies and population	Segmented anal-fin rays								Dorsal + ventral procurrent caudal-fin rays								Lateral-line tubes								Last lateral-line tube below dorsal-fin spine							
	20	21	22	23	24	25	26	x̄	10	11	12	13	14	15	16	x̄	0	1	2	3	4	5	6	Av	0	1	2	3	4	5	6	7	x̄
O. r. obliquus																																		
Philippine Islands		14	3	-	-	-	-	21.2			5	5	5	2	-	13.2		3	7	4	-	-	-	2.2		1	4	6	2	-	1	-	2.9
Guam		38	15	-	-	-	-	21.3	13	17	16	4	1	-	-	11.3	4	30	25	16	5	-	-	1.8	4	-	33	21	14	7	1	-	2.6
Yap	5	10	2	-	-	-	-	20.8		4	7	4	1	-	-	12.1		4	5	3	4	-	-	2.4			3	5	1	2	5	-	4.0
Palau Islands	3	49	13	-	-	-	-	21.2	2	12	24	22	3	-	-	12.2	2	14	13	20	3	1	-	2.2	2	-	16	12	18	1	4	-	3.0
Ambon		2	-	-	-	-	-	21.0	1	1	-	-	-	-	-	10.5		1	1	-	-	-	-	1.5			1	1	-	-	-	-	2.5
Timor				1								1							1									1					
New Guinea		1	3	-	-	-	-	21.8			1	3	-	-	-	12.8	1	2	-	1	-	-	-	1.2	1	-	2	-	1	-	-	-	2.0
New Caledonia				1							1							1									1						
Vanikoro		4	-	-	-	-	-	21.0			2	1	1	-	-	12.8		1	-	-	-	1	-	3.0			1	-	-	-	1	-	4.0
Aneityum			2	-	-	-	-	22.0		1	1	-	-	-	-	11.5		2	-	-	-	-	-	1.0			2	-	-	-	-	-	2.0
Fiji Islands			14	4	-	-	-	22.2		7	4	1	-	-	-	11.5		1	3	8	3	2	2	3.4			2	3	7	2	3	2	4.4
Samoa Islands		1	1	-	-	-	-	21.5			2	-	-	-	-	13.0			1									1					
Palmyra	1	11	15	-	-	-	-	21.5	6	18	3	-	-	-	-	10.9	2	12	11	-	-	-	-	1.4	2	-	12	11	-	-	-	-	2.3
Hawaiian Islands		4	1	-	-	-	-	21.2	2	2	-	1	-	-	-	11.0	1	1	3	-	-	-	-	1.4	1	-	1	3	-	-	-	-	2.2
O. r. rotundiceps																																		
Northern Territory	3	10	60	91	6	-	-	22.5		1	33	44	59	12	7	13.4	10	117	53	12	3	1	-	1.4	10	1	121	49	13	1	1	-	2.3
Western Australia																																		
Montebello				1	3	-	-	23.8			2	2	-	-	13.5		3	-	1	-	-	-	1.5				3	1	-	-	-	-	2.2
Exmouth Gulf					1					1											1									1			
Shark Bay					8	4	-	24.3			1	10	-	-	13.9		8	3	1	-	-	-	1.4				7	4	1	-	-	-	2.5
Cotteslоe						1						1					1											1					
Queensland																																		
Townsville				2	12	2	-	24.0			3	4	5	1	-	13.3		7	3	-	-	-	-	1.3			7	3	-	-	-	-	2.3
Port Bowen					1					1																								
Cumberland Islands					2	-	-	24.0				2	-	-	14.0		2	-	-	-	-	-	-	1.0			2	-	-	-	-	-	2.0
Heron Island					2	-	-	24.0				1						1											1				
Gladstone						1						1					1										1						
Moreton Bay				3	5	-	-	23.6			1	2	3	-	1	13.7		7	-	1	-	-	-	1.2			7	-	1	-	-	-	2.2
New South Wales				3	9	5	1	24.2	4	-	6	7	1	-	-	12.1	10	8	-	-	-	-	-	0.4	10	-	7	1	-	-	-	-	0.9

pectoral-fin ray to extending ventrally to opposite 5th ray (rarely extending below level of 3rd ray); lower-lip flap present; circumorbital bones 5; lower jaw teeth 18–31; upper jaw teeth 16–29 (Figure 45); no fleshy bladelike crest on top of head of either sex (head of some presumably mature males swollen in appearance).

Color Pattern (described first from northern and western Australian specimens exhibiting most developed pattern, followed by comparison with eastern Australian specimens).—*Males*: Head: Narrow, dark band extending anteroventrally from anteroventral margin of orbit across mouth, just anterior to corner of jaws, to chin, confluent across chin with corresponding band of opposite side. Four slightly to considerably diffuse, posteroventrally slanted, narrow, dusky bands posteriorly on lower half to third of head and prepelvic area; anteriormost band extending from below posteroventral edge of orbit to ventral surface of head, usually with interruption and slight anterior shift of ventral part of band at preopercular series of pores; succeeding bands evenly spaced, paralleling 1st band; each band originating slightly higher on side of head than preceding band; 3rd and/or 4th band arising dorsally from diffuse, dusky area on operculum and continuing onto perpelvic area; additional (5th) small band originating on operculum and continuing onto prepectoral area; anterior bands usually confluent with corresponding bands of opposite side at ventral midline of head; posterior bands frequently interrupted on ventral surface of head. Large, oval to dome-shaped, dark area, approximately size of eye, present posterior to eye between circumorbital and preopercular series of sensory pores; dome-shaped area encircled by narrow, pale margin, which is less distinct ventrally; intense dark spot, equal to or smaller than pupil of eye, at dorsoposterior corner of dome-shaped area. Free opercular membrane pale. Predorsal area dark dusky with scattered dark spots in some specimens.

Trunk: Ten to 12 broad, ventrally tapering, dark dusky bands present on side of body; anterior 2 or 3 bands merging together to form dark dusky area; posterior 4 or 5 bands each represented as midlateral spot, or bands (spots) joined together to form narrow, midlateral stripe (especially in large specimens); anterior 5 or 6 bands slanted posteroventrally, usually not extending onto upper quarter of body; all bands terminating dorsal to ventral body contour; pigment of each band often narrowly intensified along central, vertical axis of band; some specimens with bands represented only as dark, midlateral blotches (in freshly preserved specimens, midlateral portion of bands more intense, forming interrupted midlateral stripe extending onto head); posterior bands and midlateral spots with slender dorsoposterior extensions; approximately 9th band (spot) prolonged dorsally into narrow, posteriorly extending stripe dorsal to midlateral stripe; both stripes directed ventrally at caudal-fin base and continuing onto fin. Adjacent body bands, posterior to 2nd or 3rd band, each separated by vertical, well-defined, slender, pale line; pale lines nearly reaching ventral body contour, terminating dorsally at level of dorsal ends of body bands, or directed sharply anteriorly anterior to about 6th body band, or angled posteriorly posterior to about 7th body band; free longitudinal pale lines sometimes present above dorsal ends of vertical, pale lines. Series of approximately 8 pairs of dark, dorsally open half-rings along base of dorsal fin; rings of each anterior pair joined. Dark peritoneum visible through abdominal wall.

Pectoral Fins: Slightly dusky. Fleshy base with dark band midway between opercular edge and bases of rays; vertically oriented pair of dark spots or faint bar at base of fin rays.

Pelvic Fins: Pale.

Dorsal Fin: Transparent with dark markings. Spinous portion with 3 pairs of broad, dorsoanteriorly directed or vertical bands; each pair above corresponding pair of dark, dorsally open half-rings. Segmented ray portion with approximately 8 narrow, dark stripes; tips of rays abruptly pale; large, diffusely dusky to black, oval spot on distal portion of fin in area of 10th to 16th (usually centering on 14th or 15th) segmented rays. Large specimens with spinous portion dusky except for 2 large, pale spots near distal edge: 1 near central spines, 1 near posteriormost spines; segmented ray portion of fin dusky near distal edge, transparent proximally; black, oval spot apparent.

Anal Fin: Dusky to dark distally, transparent proximally. Tips of rays abruptly pale.

Caudal Fin: Pale with 2 narrow, dark stripes directed posteriorly and slightly ventrally from posterior ends of midlateral and more dorsal pos-

terior body stripes (each stripe sometimes intensified as dark spot at caudal-fin base).

Females: Similar to males except: midlateral intensifications of body bands darker, generally broader, better defined, reaching farther ventrally; dusky portion of bands surrounding intensifications reduced, fainter; areas between posterior bands on lower half of body with additional intense, dark bands or spots; dorsal extensions of posterior bands (spots) broken into spots; posterior midlateral stripe and more dorsal stripe indicated only by 2 longitudinal series of spots; body more mottled or spotted dorsally; dorsal fin less pigmented, especially distally; dark bands of spinous dorsal fin, if present, much narrower; black, oval spot and all but basal dark stripes of segmented ray position of dorsal fin absent; stripes on caudal fin better defined or present as intense, dark streaks.

Eastern Australian Specimens: Head bands narrow, broken into dashes or irregular series of spots, often completely replaced by large number of fine spots and speckles (Figure 29*a,b*); complete head bands, when present, usually occur only posteriorly.

GEOGRAPHIC VARIATION (see also "Color Pattern").—Population variation was noted in most meristic characters of *O. rotundiceps*, both within a subspecies and between subspecies (Tables 15 and 16). The meristics of *O. r. rotundiceps* generally ranged and averaged higher in number than they did in *O. r. obliquus*. The northern Australian population of *O. r. rotundiceps*, which are geographically closest to the population of *O. r. obliquus*, are intermediate in meristics between the two subspecies (see also "Color Pattern" under *O. r. rotundiceps*).

The Western Australian populations of *O. r. rotundiceps* exhibit increases in numbers of precaudal, caudal, and total vertebrae. Similar increases are exhibited by the Western Australian populations of *O. germaini*, whereas the Western Australian populations of *O. punctatus* exhibit an increase in the number of precaudal, but not caudal and total, vertebrae. Increase in number of precaudal vertebrae is not encountered in any other species of *Omobranchus*. It is noteworthy, even if presently inexplicable, that three species of *Omobranchus* exhibit increases in number of precaudal vertebrae in about the same geographic area.

Although covariance comparisons of numbers of jaw teeth (Table 16) were not feasible for all populations of *O. rotundiceps*, almost all the tests that were performed between pairs of populations were either significant or almost significant.

GEOGRAPHIC DISTRIBUTION (Figure 5).—From Cottesloe (near Perth), Western Australia, northward around Australia to Sydney, New South Wales.

HABITAT.—Shallow marine and brackish water; in tide pools, around ironstone reefs, rocks, and coral. Most often taken in marine habitats.

COMPARISONS.—*Omobranchus r. rotundiceps* is completely separable from *O. r. obliquus* only on the nature of the dark spot posterior to the orbit. In *O. r. rotundiceps* this spot is much closer to the preopercular series of pores than to the circumorbital series (Figures 28*a* and 29*a*) and consists of a concentration of pigment along the posterodorsal portion of a dark dusky, dome-shoped area. In *O. r. obliquus* the spot is about midway between the circumorbital and preopercular series of pores and consists of a concentration of pigment over the dorsal portion of a dark dusky, dome-shaped area (Figure 29*c*). *Omobranchus r. rotundiceps* may have the color pattern on the underside of the head consisting of about 3 or 4 narrow, dark bands (Figure 28*b*; northern and Western Australian populations) or of a group of dark spots and slender bands (Figure 29*b*; eastern Australian populations). In *O. r. obliquus* the pattern under the head consists of dark, slender bands (Figure 29*d*). Where populations of the two subspecies are geographically closest, there is broad overlap in all meristic characters (Table 15).

NOMENCLATURAL DISCUSSION.—Macleay (1881) did not indicate the number of specimens on which he based his description of *P. rotundiceps*, and there is no indication that he had more than one specimen as he mentioned no variation in characters. The size was given as 2.5 inches, which might indicate a single type-specimen. The putative types, formerly in the Macleay Museum, are now cataloged into the Australian Museum collections. There are two conspecific specimens, 50.7 and 36.6 mm SL. Only the larger of these two is near enough in size to be considered as a type. This specimen, which we here designate the lectotype of *P. rotundiceps*, is now cataloged as AMS I.16413–001. The smaller specimen is now cataloged as AMS I.16413–002.

DeVis (1884b) did not compare his *Salarias furcatus* with any other species. The putative holotype

TABLE 16.—*F values for covariance comparisons of regression equations (Table 2) for number of lower or upper jaw teeth between males or females from different populations of* Omobranchus rotundiceps (** = *significant at p = .001; NS = not significant*)

Comparisons	F values slopes	Degrees of freedom	F values heights	Degrees of freedom
Lower teeth				
males				
Northern Territory X Palau Is.	0.23 NS	1/59	28.69 **	1/60
Northern Territory X Guam	3.92 NS	1/64	6.65 NS	1/65
Palau Is. X Guam	3.92 NS	1/37	7.02 NS	1/38
females				
Northern Territory X Palau Is.	0.85 NS	1/50	31.22 **	1/51
Northern Territory X Guam	1.38 NS	1/56	7.31 NS	1/57
Northern Territory X Palmyra	0.78 NS	1/50	7.84 NS	1/51
Palau Is. X Guam	0.08 NS	1/34	10.19 NS	1/35
Palau Is. X Palmyra	0.10 NS	1/28	7.12 NS	1/29
Guam X Palmyra	0.01 NS	1/34	0.06 NS	1/35
Upper teeth				
males				
Northern Territory X Palau Is.	0.28 NS	1/59	20.03 **	1/60
Northern Territory X Guam	13.63 **	1/65	(23.94)	1/66
Palau Is. X Guam	14.86 **	1/38	(0.00)	1/39
females				
Northern Territory X Guam	0.32 NS	1/55	36.79 **	1/56
Northern Territory X Palmyra	1.46 NS	1/49	45.74 **	1/50
Guam X Palmyra	0.30 NS	1/34	0.17 NS	1/35

(QM I.11/114) is a female *O. r. rotundiceps,* and although its characteristics do not all agree with those given in DeVis' description, the color pattern of the head given in the description is particularly distinctive of *O. r. rotundiceps.* On the basis of the description and the identity of the putative holotype, we synonymize *S. furcatus* with *O. rotundiceps.*

DeVis (1886) also failed to compare his *Salarias furtivus* with any other species. The description alludes to at least three specimens (from Moreton Bay), which must be considered as syntypes, and could pertain to either *O. r. rotundiceps* or *O. germaini.* There is no type-material of *S. furtivus* at the QM, where DeVis deposited his specimens. However, DeVis (1887) mentioned that five species of fishes (comprising 75 specimens) were exchanged with the Australian Museum in 1886. There is no correspondence at the AMS concerning the exchange, but AMS I.383–4 (five specimens) was cataloged in 1886 and listed as "cotypes" of *S. furtivus* (see also McCulloch, 1929:341). Considering the year the specimens were cataloged, the identification given them, and the mention in the report by DeVis (1887), we consider the specimens to be syntypes of *S. furtivus.* The five specimens comprise four identifiable as *O. r. rotundiceps* and one as *O. anolius.* We here designate one of the *O. r. rotundiceps* specimens as lectotype of *Salarias furtivus,* which is now cataloged as AMS I.16728–001. The other three specimens of *O. r. rotundiceps* are now cataloged as AMS I.384, and the specimen of *O. anolius* as AMS. I.383. The lectotype is a male, distinguishable from all the other syntypes in having three lateral-line tubes on the left side, as opposed to none or one tube, and in having the posteriormost dorsal-fin ray represented only by a fragment of its base (distinguishable only on a radiograph), as opposed to the posteriormost ray being present in its entirety in the other specimens.

Petroscirtes macleayi Ogilby is a replacement name for *Petroscirtes fasciolatus* Macleay, which is preoccupied. Neither Macleay nor Ogilby compared the species with any other. The type-material, which was originally at the Macleay Museum but is now deposited at AMS, comprises 12 syntypes, all identifiable as *O. r. rotundiceps.* We here designate one specimen, a male, as lectotype. The lectotype is now cataloged as AMS I.16412–002. It is distinguished from all the other syntypes, catalogued as AMS I.16412–001, in having the anal-fin rays II, 26, as opposed to II, 24–25, and from the other four males in having the dorsal-fin rays XII, 23, as opposed to XII, 21–22.

Whitley (1959) differentiated his *Graviceps angelus* from "*Petroscirtes elegans* and congeners" on the basis of unspecified "fin counts and color pat-

tern" and from its supposed nearest relative, *Petroscirtes kranjiensis*, on proportions and mouth position. The holotype of *G. angelus* is a male *O. r. rotundiceps*. Whitley reported the dorsal-fin formula as 13, 21, whereas we find it to be XII, 22, and the pectoral-fin rays as 14, whereas we find 13 in each fin.

MATERIAL EXAMINED.—AUSTRALIA: WESTERN AUSTRALIA: Montebello, BMNH 1961.8.16.71–73 (37.2), 1961.8.16.74–75 (2: 35.0–39.0), 1961.8.16.74–77 (36.9); Exmouth Gulf, WAM P11141 (34.4); Shark Bay, WAM 8148–56 (9: 26.2–49.4), P7649 (51.4), WAM uncataloged (2: 33.4–34.6); Cottesloe, WAM P6300 (31.3). NORTHERN TERRITORY: 7 miles north of Darwin, USNM 174263 (42: 18.9–48.6); East Alligator River at Cahill's Landing (Van Diemen Gulf), USNM 174336 (22.7); vicinity of Cape Arnhem, USNM 174337 (18: 28.1–48.2), 174339 (139: 18.9–48.5), 174344 (5: 28.9–37.5); Groote Eylandt, USNM 174334 (8: 24.2–37.7), 174340 (29: 20.6–43.7), 174341 (107: 21.4–65.6, including three cleared and stained). QUEENSLAND: Townsville, BPBM 15020 (20: 13.9–60.5); Pt. Bowen, BMNH 1871.9.13.192 (74.2); Cumberland Islands, AMS IB.5826 (48.1), IB.6004 (36.3); Heron Island, AMS IB.3995 (47.5, holotype of *Graviceps angelus*), IB.4057 (38.8); Gladstone, AMS IA.6093 (29.3); Moreton Bay, AMS I.445 (ca. 50), I.16728–001 (ca. 42, lectotype of *Salaris furtivus*), 1.384 (3: ca. 39–45), ANSP 98718 (68.7), MCZ 38548 (51.9), QM I.11/114 (35.5, holotype of *Salarias furcatus* DeVis). NEW SOUTH WALES: Newcastle, USNM 148633 (55.8); Port Jackson, AMS I.16412–002 (51.9, lectotype of *Petroscirtes fasciolatus* Macleay and *Petroscirtes macleayi*), I.16412–001 (11: 35.6–51.8), I.16413–001 (50.7, lectotype of *Petroscirtes rotundiceps*), I.16413–002 (36.6); Sydney Harbor, USNM 205712 (3: 40.1–56.9).

Omobranchus rotundiceps obliquus (Garman)

FIGURES 29*c,d*

Petroscirtes obliquus Garman, 1903:237 [Suva, Fiji Islands].
Hypleurochilus loxias Jordan and Seale, 1905:802 [Negros, Philippine Islands].
?Hypleurochilus samoensis Seale, 1935:374 [Pago Pago, Tutuila Island, Samoa].

DESCRIPTION (see also Table 15).—Dorsal-fin spines XI–XIII (XII in 95.0% of specimens); segmented dorsal-fin rays 18–21 (rarely 21); total dorsal-fin elements 30–33 (rarely 33); anal fin II, 20–23; both anal-fin spines of males discernible externally; segmented caudal-fin rays 11–13 (1 specimen each, of 210, with 11 and 12 rays); dorsal + ventral procurrent caudal-fin rays 10–15; vertebrae 10–11 (rarely 11) + 27–30 (rarely 30) = 37–40 (rarely 40); epipleural ribs 11–15 (rarely 11 or 15); prenasal pores present; interorbital pores 1–4 (rarely 1); circumorbital pores 7–9 (modally 8, rarely 9); lateral-line tubes 0–6 (rarely 5 or 6); lateral-line tubes, when present, extending posteriorly to below level of dorsal-fin spine 1–7 (rarely 1 or 7); gill opening extending ventrally to opposite 2nd to 8th pectoral-fin ray (to 7th in 0 and 8th in 2 of 170 specimens; of the 2, 1 each had the opening of the opposite side at the level of the 4th and 5th rays); lower-lip flap present; circumorbital bones 5; lower jaw teeth 19–29; upper jaw teeth 18–28 (Figure 45); no fleshy bladelike crest on top of head of either sex (head of some presumably mature males swollen in appearance).

COLOR PATTERN.—Closely resembles *O. r. rotundiceps* (q. v.) with the following notable exceptions:

Males: Bands on head better defined; band at posteroventral margin of eye not interrupted at preopercular series of sensory pores; it and following band confluent on underside of head with corresponding bands of opposite side; last 2 bands often separated from corresponding bands of opposite side by narrow, pale space; last band continuous dorsally with broad, dusky area. Dome-shaped, dark dusky area posterior to eye, reaching farther ventrally; intense dark spot, larger than pupil of eye, occupying entire dorsal portion of dome-shaped area. Vertically elongate, less dark, oval area outlined, except occasionally ventrally, by narrow, pale margin, present on operculum just posterior to broad, dusky area continuous with 4th head band; vertically elongate, dark smudge just posterior to pale, margined, oval area, confluent with dark area on top of head. No spots on top of head. Bands on trunk better defined; dark intensifications of body bands broad, not extending below midlateral line of body. Posterior midlateral stripe and more dorsal stripe not developed; midlateral stripe represented by series of dark spots; tips of anterodorsal and posterodorsal extensions of body bands disjunct from bands, forming longitudinal series of dark spots or dashes. Dark bar on fleshy pectoral-fin base

well defined, continued anteroventrally onto prepelvic area. Dorsal fin largely transparent with several narrow, dark stripes extending length of fin; diffuse concentration of pigment on segmented rays and dorsoposteriorly on interradial membranes; diffuse, dusky to black, oval spot placed more anteriorly, betweeen 8th and 12th (usually between 9th and 11th) segmented rays. Anal fin with slender, evenly spaced, posteroventrally inclined dusky bands; distal edge of fin dusky with abruptly pale ray tips. Caudal fin with vertically oriented pair of large, dark spots at base; stripes faint to absent, often only ventral stripe apparent.

Females: Sexual dimorphism as in *O. r. rotundiceps* except dark intensifications of body bands not extending much farther ventrally; additional bands or spots not developed ventrally between main body bands; dorsal spotting and vermiculations intensified and more numerous.

GEOGRAPHIC VARIATION.—See *O. r. rotundiceps.*

GEOGRAPHIC DISTRIBUTION (Figure 5).—Car Nicobar Island, Indian Ocean, west to Hawaii, but apparently absent from the eastern Caroline, Marshall, and Gilbert islands.

A completely faded specimen ZMA 113.013 (Female, 27.2 mm), from Sumbawa Island, Indonesia, is identifiable as *O. r. obliquus* or *O. elongatus.* We questionably allocate it to *O. r. obliquus* based on its having 12 dorsal-fin spines, a number uncommon in *O. elongatus.* Characters for the specimen are: dorsal fin XII, 19; anal fin II, 21; total procurrent caudal-fin rays 13; vertebrae 10 + 27; epipleural ribs 14; 1 lateral-line tube, positioned below 5th dorsal-fin spine; interorbital pores 3; circumorbital pores 8.

Menon and Rama Rao (1963) recorded *O. kallosoma* from Madras and Mandapam, India, and the Andaman Islands. Their specimens from India are *O. elongatus,* whereas their specimen from the Andaman Islands (actually Car Nicobar Island, Nicobar Islands), is *O. r. obliquus.* The Car Nicobar specimen, which represents the only Indian Ocean record for the subspecies, arrived too late to be included in Table 15. Meristics for the Car Nicobar specimen are as follows: dorsal fin XII, 19; anal fin, II, 21, vertebrae 10 + 28; epipleural ribs 13; lateral-line tubes 1, reaching to below 2nd dorsal-fin spine; gill opening extending ventrally to opposite pectoral-fin ray 4.

HABITAT.—Shallow, usually close to shore, marine waters. Frequently in tidepools, on muddy to sandy bottoms with eel grass and algae, and near the edge of mangrove swamps; once taken at the junction of a small freshwater stream and marine bay. Live and dead coral often recorded as present. Also taken from a concrete tank in Hawaii (Strasburg, 1956), and from around a rusting barge in the western Caroline Islands.

COMPARISONS.—See *O. r. rotundiceps.*

NOMENCLATURAL DISCUSSION.—Jordan and Seale (1905) did not compare their *Hypleurochilus loxias* with any other species. It seems strange that they failed to note the close resemblance of their illustration of the holotype (fig. 20) with Garman's (1903, pl. 4: fig. 3) illustration of the holotype of *Petroscirtes obliquus.* Jordan and Seale reported that the holotype of *H. loxias* had D. XII, 20 and A. 20. Their illustration indicates D. XII, 19 and A I, 21, whereas we find the counts to be D. XI, 19 and A. II, 21 (the specimen is a female and the first anal-fin spine can be seen only on a radiograph).

Springer (1972a) believed that the types of *Hypleurochilus samoensis* most probably represented the postlarvae of *Parenchelyurus hepburni,* noting, however, that the dorsal-fin formula of the types was more representative of an *Omobranchus* species than of *P. hepburni.* He excluded *Omobranchus* from consideration because he erroneously believed that *Omobranchus* was not known from Samoa. Both of the types of *H. samoensis* have 12 dorsal-fin spines, an unusual number for *Parenchelyurus,* but a common number for *Omobranchus.* It therefore appears that the types of *H. samoensis* are probably identifiable as *O. rotundiceps obliquus,* the only taxon of *Omobranchus* occurring in Oceania. Seale's (1935) illustration of the "type" of *H. samoensis* is reproduced as our Figure 3*b*.

MATERIAL EXAMINED.—NICOBAR ISLANDS: CAR NICOBAR: ZSIC F2764/2 (35.4). PHILIPPINE ISLANDS: NEGROS: USNM 51952 (28.82, holotype of *Hypleurochils loxias*), 137828 (4: 24.6–43.1), 209426 (4: 32.8–37.3), CAS GVF reg. no. 1597 (31.9), GVF reg. no. 1618 (3: 25.2–37.6), GVF reg. no. 2671 (12.7–39.9). GUAM: CAS GVF reg. no. 1858 (122: 14.8–46.2), UG 4125 (3: 14.6–33.7). CAROLINE ISLANDS: YAP: CAS GVF reg. no. 1910 (ca. 40), GVF reg. no. 1927 (3: 35.9–41.6) GVF reg. no. 1928 (12: 26.9–44.0), GVF reg. no. 1929 (39.0). PALAU ISLANDS: Koror, CAS SU62058 (3: 30.3–43.9), GVF reg. no. 814 (21.1), GVF reg. no. 1380 (5: 13.9–

29.3), GVF reg. no. 1894 (2: 27.1–52.0); Babalthuap, CAS GVF reg. no. 1397 (20.6), GVF reg. no. 1992 (32.3); Arakabesan, GVF reg. no. 1995 (31.5); Urukthapel, CAS SU62064 (5: 29.6–37.8); Aluptagel, CAS SU62068 (42: 22.8–45.5), GVF reg. no. 1414 (4: 24.1–28.1). INDONESIA: AMBON: RMNH 20201 (2: ca. 38–41), USNM 211874 (23.8, arrived too late to be included in Table 15). BUTON: USNM 211873 (4: 20.5–28.3, arrived too late to be included in Table 15). TIMOR: RMNH 20340 (ca. 40). NEW GUINEA: Port Moresby, DASF 1929 (38.0). TROBRIAND ISLANDS: USNM 205697 (3: 25.6–41.0). NEW CALEDONIA: USNM 210689 (25.7). SANTA CRUZ ISLANDS: Vanikoro: USNM 201893 (4: 19.5–26.8). NEW HEBRIDES: ANEITYUM: ANSP 91584 (2: ca. 28–37). FIJI ISLANDS: VITI LEVU: ANSP 93928 (2: 29.0–31.2), MCZ 28297 (25.6, holotype of *Petroscirtes obliquus*). OVALAU: CAS SU24926 (18: 22.9–ca. 39), FMNH 24928–37 (10: ca. 25–48.1). SAMOA: TUTUILA: CAS 5515–5516 (12.3–12.6, holotype and paratype of *Hypleurochilus samoensis*), USNM 209427 (ca. 20). UPOLU: USNM 52240 (ca. 30). LINE ISLANDS: PALMYRA: BPBM 15060 (2: 33.3–39.8), 15061 (3: 32.9–33.7), CAS SU62059 (20: 24.4–42.4), GVF reg. no. 45 (2: 28.5–32.7). HAWAIIAN ISLANDS: OAHU: BPBM 6205 (32.4), 15062 (50.9), 15063 (2: 35.1–56.2), USNM 198223 (54.8).

Omobranchus steinitzi, new species

FIGURE 30

DESCRIPTION (where variation is indicated, the holotype is flagged with an asterisk; see also Table 5).—Dorsal fin XI–XII*, 16*–17 = 28; anal fin II, 18; one or both anal-fin spines of males not discernible externally; segmented caudal-fin rays 13; dorsal + ventral procurrent caudal-fin rays 10–12*; vertebrae 10 + 26 = 36; epipleural ribs 14*–15; prenasal pores absent; interorbital pores 3; circumorbital pores 8; lateral-line tubes 4–6*; lateral-line tubes extending posteriorly to below level of dorsal-fin spine 6–9 (to 8 on one side and 9 on the other in the holotype); gill opening restricted to area dorsal to level of dorsalmost pectoral-fin ray; lower-lip flap present; circumorbital bones 5; lower jaw teeth 22–26 (24*); upper jaw teeth 22–24* (Figure 43); no fleshy bladelike crest on top of head of either sex.

COLOR PATTERN.—*Males*: Head. Up to 8 evenly spaced, dusky bands present on ventral half of head; 1st, 3rd, 5th, and 7th bands narrow; 2nd, 4th, 6th, and 8th bands slightly broader; 1st band connecting anterior margin of orbit and ventral edge of upper lip just posterior to tip of snout; 2nd band extending anteroventrally from nape to dorsoposterior margin of orbit, interrupted by eye and continuing from anteroventral margin of orbit across mouth, just anterior to corner of jaws, to chin; 3rd band extending from ventral margin of orbit to underside of head; 4th band paralleling 3rd from posteroventral margin of orbit to underside of head: 5th band originating at about level of ventral margin of orbit and extending to ventral side of head; 6th band extending from level just ventral to origin of 5th band and splitting near preopercular sensory pores, with 1 branch continuing to ventral side of head and other continuing posteroventrally to prepelvic area; 7th band short, extending posteroventrally from about level of ventral margin of orbit to near center of branchiostegal membrane; 8th band extending from level of center of eye to point just dorsoanterior to origin of pelvis fins; bands may join corresponding bands of opposite side on ventral side of head (largest specimens mostly dusky or duskily mottled on head with only 4 anterior bands apparent). Large, dusky, oval spot slightly smaller than eye present just posterior to eye; dorsal half of spot dark (sometimes only portion of spot apparent) with narrow, pale margin. Faint, broad, dusky band extending from dorsal side of spot to nape. Snout and interorbital dusky; nape with pale spots and blotches posteriorly.

Trunk: Approximately 7 pairs of narrow, dark bands present on trunk; posterior 2 pairs each coalesced into short, broad, irregular dash at lateral midline, 5 anterior band pairs distinct on midlateral half of body, bands in each pair broadly separated, but faintly joined at lateral midline in some specimens, giving each band pair an H configuration (banding obscured by mottled dusky pigment in some specimens). Five or 6 pairs of large, broad, dark circles with pale centers present in longitudinal series on dorsal quarter of trunk; circles more or less associated with dorsal ends of lateral bands or band pairs. Ventral quarter of trunk with series of irregular, dark marks usually present ventrally between tips of lateral bands along base of anal fin, especially posteriorly.

Pectoral Fin: Transparent with fine, dark specks of pigment scattered on rays; ventral rays dusky distally. Narrow to broad, dusky band present midway along fleshy pectoral-fin base. Large, faint, dusky blotch present dorsally on fleshy base at base of fin rays, 2nd spot sometimes present at middle of fin base.

Pelvic Fin: Pale with fin dark specks of pigment basally.

Dorsal Fin: Transparent with broad, dusky to dark, marginal stripe on distal third to half of fin; anterior half of fin with 2 darker, narrow stripes, 1 on proximal edge and 1 on distal edge of broad stripe. Tips of some segmented rays pale, others dark.

Anal Fin: Dark; rays transparent to pale proximally; tips of rays and membranes posterior to ray tips abruptly pale.

Caudal Fin: Pale, with some dusky pigment. Two large dusky spots present at base of fin, 1 just above and 1 just below lateral midline, each spot drawn into dusky streak posteriorly. Dorsal and ventral edges of fin dusky.

Female: Similar to males except: markings on head and trunk more distinct, less obscured by overall dusky pigment; background paler; bands on head and trunk well defined; dorsal fin with only 2 narrow, dark stripes (stripes not as dark) apparent anteriorly; posteriorly, dorsal fin transparent with irregular dark blotches present just above dark circles on trunk; anal fin with dark pigment confined to narrow stripe near distal edge of fin, pigment reaching slightly more basally on rays.

COMPARISONS.—*Omobranchus steinitzi* is unique among the species of *Omobranchus* in lacking prenasal sensory pores; it also has fewer dorsal- and anal-fin elements than any of the other species. In having one or both of the anal-fin spines of males not discernible externally it resembles the *banditus* species group, but it does not have the large number of epipleural ribs or color pattern features that characterize that group.

ETYMOLOGY.—Named in honor of the late Dr. H. Steinitz in recognition of his contributions to the field of marine biology.

HOLOTYPE.—USNM 209433, male, 32.0 mm SL, Cundabilu, Dahlak Archipelago, Red Sea, collected 20 March 1962, H. Steinitz, E. Clark, A. Ben-Tuvia.

PARATYPES.—USNM 209434, 2 males, 25.6–29.1 mm SL; HUJ E62/399a, female, 25.3 mm SL, all with same data as holotype.

Omobranchus verticalis, new species

FIGURE 31

DESCRIPTION (see also Table 5; where variation is indicated the holotype is flagged with an asterisk).—Dorsal fin XII, 19*–20 = 31*–32; anal fin II, 22; both anal-fin spines of males discernible externally; segmented caudal-fin rays 13; dorsal + ventral procurrent caudal-fin rays 14–15*; vertebrae 10 + 27*–28 = 37*–38; epipleural ribs 13; prenasal pores present; interorbital pores 3*–4; circumorbital pores 8; lateral-line tubes 3–5 (4 on both sides of holotype); lateral-line tubes extending posteriorly to below level of dorsal-fin spine 3–9 (to 6 on one side and 9 on the other in the holotype); gill opening either restricted to area dorsal to level of dorsalmost pectoral-fin ray* or extending ventrally to opposite dorsalmost ray; lower-lip flap present; circumorbital bones 5; lower jaw teeth 16*–18; upper jaw teeth 15–17 (16*; Figure 42); no fleshy bladelike crest on top of head of males.

The above description is based only on the three available males. The following description is based on a female that arrived too late to be included above or in Tables 1, 4, and 5 or Figure 42. Dorsal fin XIII, 19 = 32; anal fin II, 22; segmented caudal-fin rays 13; dorsal + ventral procurrent caudal-fin rays 14; vertebrae 10 + 28 = 38; epipleural ribs 12; prenasal pores present; interorbital pores 3; circumorbital pores 8; lateral-line tubes 2; lateral-line tubes extending posteriorly to below level of dorsal-fin spine 3; gill opening restricted to area dorsal to level of dorsalmost pectoral-fin ray; lower-lip flap present; lower jaw teeth 16; upper jaw teeth 15; no fleshy bladelike crest on top of head.

COLOR PATTERN.—*Males*: Head: Four moderately narrow, dark bands present on head; all bands confluent across ventral surface of head with corresponding band of opposite side; anterior band extends from anteroventral margin of orbit across mouth, just anterior to corner, to chin; 2nd band extends ventrally from posteroventral margin of orbit; 3rd band originates broadly on nape midway between eye and dorsal-fin origin, extends first anteroventrally, then slightly posteriorly just below posterior margin of orbit, where it narrows slightly

and continues to ventral surface of head; 3rd band bears dark intensification (spot) on anterior margin in area posterior to eye; 4th band extends ventrally, slightly posteriorly, from upper end of operculum. Several very fine, intensely dark spots present on opercular membrane just anterior to gill slit. Snout and interorbital dusky. Several pale blotches present on nape; dusky blotch present on nape just anterior to dorsal-fin origin.

Trunk: Approximately 10 to 12 dusky bands on body; bands on midlateral half of body, bordered by anterior and posterior narrow, dark margins; margins may converge slightly dorsally and ventrally, giving bands double convex appearance; bands generally broader anteriorly (although first 2 or 3 narrow) and progressively narrower posteriorly, the last 5 or 6 may be reduced to single dark, dusky, vertical lines, becoming faint to absent at posterior end of body; bands evenly spaced, spaces between bands slightly narrower than broadest band; ends of bands indistinct, dorsal end of each band connected by diffuse, irregular, dusky extension of band to corresponding blotch in series of dark, evenly spaced blotches lying along dorsal-fin base.

Pectoral Fin: Pale, slightly dusky area present midlaterally on base of fin; narrow dark band directed posteroventrally across fleshy fin base from ventral end of gill slit to ventral surface of trunk posterior to pelvic-fin base.

Pelvic Fin: Pale.

Dorsal Fin: Pale, with fairly even spread of fine dusky specks of pigment, pigment more dense anteriorly. Row of dusky blotches on body at base of dorsal fin continued slightly onto fin. Large, oval, dark spot present on distal three-fourths of membrane between first 2 spines.

Anal Fin: Pale dusky, darker anteriorly, ray tips abruptly pale. Dark dusky blotch present on membrane posterior to every 2nd ray base.

Caudal Fin: Pale with vertically oriented pair of dusky blotches at fin base, each blotch continued posteriorly as dusky streak.

Female: Similar to males except: narrow, pale, median stripe extending from between anterior nostril to interorbital area; pale spot enclosing posterior nostril; dark area on nape forming chain-like configuration enclosing pale spots; dark body bbands not converging dorsally or ventrally, less bbroad anteriorly, more uniformly pigmented; spinous portion of dorsal fin with distal half dusky, proximal half pale except for dusky blotches associated with body bands; dark spot at anterior end of dorsal fin slightly smaller and less intense.

COMPARISONS.—*Omobranchus verticalis* is separable from all other species of *Omobranchus* on features of its color pattern. Males have a dark spot between the anterior two dorsal-fin spines, a mark not found in males of the other species. The nature of the body bands of *O. verticalis* is also distinctive. *Omobranchus verticalis* is otherwise separable from most of the species of *Omobranchus* only by a combination of characters. Besides color pattern, it may be separated most readily from those populations (eastern Australian) of *Omobranchus* species with which it appears to be broadly sympatric as follows: from *O. anolius* in lacking a fleshy crest on the head and in having lateral-line tubes; from *O. germaini, O. rotundiceps,* and *O. punctatus* in having 31–32 total dorsal-fin elements (versus 32–36 in the other species; only a few specimens of *O. germaini* with 32) and 37–38 total vertebrae (39–43 in the other species); from *O. punctatus* in having 13 epipleural ribs (versus 19–24) and both anal-fin spines of males discernible externally; from *O. rotundiceps* in having 3–5 lateral-line tubes, which extend posteriorly to a level below dorsal fin spines 6–8 (versus 0–3, rarely 3, tubes extending, when present, to below dorsal-fin spines 1–4), and in having 22 segmented anal-fin rays (versus 23–26); from *O. lineolatus* in having 12 dorsal-fin spines (versus 11) and 22 segmented anal-fin rays (versus 20).

HOLOTYPE.—AMS IA.4938, male, 38.8 mm SL, Boat Passage, Brisbane River, Queensland, in hole in mangrove roots high up in root and almost at high-water mark, coll. T. Iredale, May 1931.

PARATYPES.—AMS I.17150–001, male, 49.5 mm SL, and USNM 210616, 33.3 mm SL, male, collected with the holotype. ANSP 128000, female, 30.4 mm SL, vicinity of Brisbane, probably Serpentine Creek mangrove area, 1970.

Omobranchus woodi (Gilchrist and Thompson)

FIGURE 32

Aspidontus woodi Gilchrist and Thompson, 1908:105 [Nahoon River].

DESCRIPTION (see also Table 5).—Dorsal fin XI–XIII (XII in 94.6% of specimens), 19–21 = 31–33;

anal fin II, 20–22 (up to 23 according to J. L. B. Smith, 1965 and Penrith and Penrith, 1972); both anal-fin spines of males discernible externally; segmented caudal-fin rays 13; dorsal + ventral procurrent caudal-fin rays 12–15 (rarely 15); vertebrae 11–12 (11 in 92.0% of specimens) + 27–29 = 38–40; epipleural ribs 14–19 (rarely 14); prenasal pores present; interorbital pores 2–4 (3 in 97.2% of specimens); circumorbital pores 7–9 (8 in 94.3% of specimens); lateral-line tubes 0–6 (0 in one, 1 in none, and 2 in one of 33 specimens); lateral-line tubes, when present, extending posteriorly to below level of dorsal-fin spine 2–10 (to 2 in one specimen, to 5–10 in all other specimens); gill opening either restricted to area dorsal to level of dorsalmost pectoral-fin ray (31 of 32 specimens) or extending ventrally to opposite dorsalmost ray (1 specimen); lower-lip flap present; circumorbital bones 5; lower jaw teeth 25–31; upper jaw teeth 23–30 (Figure 46); fleshy bladelike crest on top of head of both sexes.

COLOR PATTERN.—*Males* (pattern of most large individuals obscured by dusky to dark dusky shading): Head: Faint, diffuse, dusky band extending from anteroventral margin of orbit across mouth, just anterior to corner of jaws, to chin, where it joins corresponding band of opposite side; band interrupted by eye dorsally and continued from dorsoposterior margin of orbit onto fleshy crest. Two (occasionally 3) vertical, intensely dark marks separated by narrow, pale interspace on side of head posterior to eye. Circumorbital sensory pores along posterior half of eye ringed by intensely dark pigment. Several narrow, faint, dusky lines radiating from dorsal and ventral margins of orbit. Snout and anterior inteorbital dusky with several pale spots or small blotches anterior to eye. Crest and nape usually paler than rest of head with dorsoposteriorly slanted, dusky band extending onto crest from orbital margin. Dark ventroanteriorly slanted saddle extending across nape just anterior to dorsal-fin origin; ventral end of saddle (separate spot in some specimens) broad, somewhat darker, positioned posterior to 2 dark marks on side of head. Narrow, dark bar present on operculum just ventral to saddle, occasionally continuing across ventral surface on head to other side. Several scattered, small, intensely dark spots sometimes present on operculum.

Trunk: Up to 11 or 12 evenly spaced, faint, broad, dark dusky bands present on trunk, ventral half of anterior 5 bands slanted posteroventrally, posterior bands nearly vertical, dorsal ends of bands irregular, sometimes separate; bands becoming faint to absent posteriorly. Row of approximately 15 evenly spaced, faint, dusky blotches on dorsal body contour at dorsal-fin base. Many small, intensely dark spots occasionally present dorsoposteriorly to pectoral-fin base; approximately half of spots hidden by appressed pectoral fin. Freshly preserved specimens with trunk evenly covered by small, pale spots.

Pectoral Fin: Pale dusky with even spread of fine dark specks of pigment. Fleshy base pale dusky with dusky blotch ventrally.

Pelvic Fin: Pale dusky with even spread of fine dark specks of pigment.

Dorsal Fin: Pale dusky to transparent with even spread of fine dark specks of pigment, slightly duskier near base.

Anal Fin: Dark dusky to dark, occasionally with many indistinct, small, pale spots; tips of rays abruptly pale.

Caudal Fin: Pale dusky, duskier on ventral half of fin. Ventral edge of fin dark near base.

Females: Similar to males except: overall pigment paler; 1 freshly preserved specimen with 2 additional, very faint, broad, dusky bands slanted posteroventrally on ventral side of head; anteriormost band ventral to eye, joins corresponding band of opposite side; 2nd band broadly connected to dark saddle dorsally, reaching ventrally to prepelvic area but not to ventral midline; bands on trunk much fainter dorsally and ventrally, restricted much more to lateral midline, especially posteriorly; occasionally more small intensely dark spots near fleshy pectoral-fin base.

Omobranchus woodi has been illustrated in color in Smith and Smith (1967:112).

GEOGRAPHIC DISTRIBUTION (Figure 7).—Western coast of South Africa.

HABITAT.—Quiet backwaters in estuaries and tidal rivers; in burrows under stones in muddy areas (Smith and Smith, 1967).

COMPARISONS.—*Omobranchus woodi* is distinguishable from most of the other species of *Omobranchus* only on the basis of a combination of characters. It is closely related to the *banditus* species group (see "Comparisons" under *O. banditus*), but differs from that group in particulars of color

pattern and in having both anal-fin spines of males discernible externally. A fleshy crest on top of the head is present in all specimens of both sexes, and this character alone will distinguish *O. woodi* from those species with which it appears to be broadly sympatric, except *O. banditus* and *O. fasciolatus*. It is readily separable from *O. banditus* in having a lower-lip flap and in lacking the prominent dark body bands found in that species. It can be distinguished from *O. fasciolatus* in having 3 (versus 2) interorbital pores and 11–12 precaudal vertebrae (versus 10).

While it is not readily apparent to the uninitiated, *O. woodi* exhibits certain features of color pattern on the head that distinguish it from all other species of *Omobranchus*. The distinguishing pattern consists of 2 or 3, more or less parallel short, dark, vertical marks posterodorsal to the orbit, and the dark ringing of the posterior circumorbital pores (Figure 32).

MATERIAL EXAMINED.—SOUTH AFRICA: Durban Bay, SAM 17400 (ca. 29); Port Elizabeth, SAM 12024 (2: 62.1–ca. 74), BMNH uncataloged (3: ca. 51–81.1), 1900.4.20.9 (ca. 56); Nahoon River, SAM 9898 (77.9, holotype of *Aspindontus woodi*); Kowie River, RUSI 2364 (58.3); Kariega River, RUSI 2361 (48.0); Knysna and vicinity, RUSI 2365 (12: 23.7–68.7), 2357 (12: 45.0–75.7), 2359 (2: 60.8–70.2), SAM 25384 (ca. 40); Lake Sifungwe, RUSI uncataloged (43.6). NO LOCALITY: SAM 23984 (ca. 37).

Omobranchus zebra (Bleeker)

FIGURES 33, 34

Petroscirtes zebra Bleeker, 1868:279 [Singapore in mari].
Petroscirtes bhattacharyae Chaudhuri, 1916:107 [Barkul Point, Chilka Lake].

DESCRIPTION (see also Table 5).—Dorsal fin XII, 18–20 = 30–32; anal fin II, 20–22; both anal-fin spines of males discernible externally; segmented caudal-fin rays 13; dorsal + ventral procurrent caudal-fin rays 11–14; vertebrae 10 + 27–28 = 37–38; epipleural ribs 12–15; prenasal pores present; interorbital pores 3; circumorbital pores 7–8 (8 in 16 of 19 specimens); lateral-line tubes 1–4; lateral-line tubes extending posteriorly to below level of dorsal-fin spines 2–7 (2–5 in all but 1 specimen); gill opening either restricted to area dorsal to level of dorsalmost pectoral-fin ray (19 of 20 specimens) or extending ventrally to opposite dorsalmost ray (1 specimen); lower-lip flap present; circumorbital bones 4; lower jaw teeth 16–22; upper jaw teeth 15–24 (Figure 46); no fleshy bladelike crest on top of head of either sex.

COLOR PATTERN.—*Males*: Head: Four broad, dark bands present on head; anterior band running from anteroventral margin of orbit across mouth, midway between corner of jaws and anterior contour of head, to chin; band interrupted dorsally by eye, continuing dorsally for short distance from dorsoposterior margin of orbit; 2nd band angled slightly posteroventrally from posteroventral margin of orbit to ventral midline of head; 3rd band encircling head with dorsal one-third directed anteroventrally from center of nape to point just posterior to eye, then slightly posteroventrally to ventral midline; 3rd band bears dark intensification on anterior margin just posterior to eye; 4th band encircling head just anterior to dorsal-fin origin; dorsal half of 4th band angled slightly anteroventrally, ventral half slightly posteroventrally; 3rd and 4th bands usually fainter ventrally, especially on cheek and branchiostegal region; all 4 bands join corresponding bands of opposite side on underside of head, but are slightly fainter at ventral midline, particularly 1st band. Short, posteroventrally slanted, diffuse, dusky line usually present anteriorly on free opercular membrane. Snout and interorbital area dusky, blending with dorsal end of 1st band, forming confluent dark dusky area with well-defined posterior margin across top of head.

Trunk: Background pale to pale dusky, slightly darker dorsally, with dark markings. Bleeker's (1868) description and unpublished illustration of the holotype (our Figure 34) indicate 8 evenly spaced, broad, dark bands present on the body, each almost reaching from the dorsal to the ventral body contour (holotype now completely faded). Our material, however, exhibits only the anterior 2–4 bands, and even these may be faint. Where the bands are not prominent our specimens may exhibit a series of large, circular, dark spots, each appearing where a band would cross the lateral body midline; the last two bands are usually not represented in our specimens; the first two bands are usually developed, at least dorsally, and slant slightly posteroventrally.

Pectoral Fin: Rays pale with even spread of fine, dark specks of pigment, membranes transparent. Posteroventrally slanted, broad, dark band travers-

ing fleshy pectoral-fin base, anteriorly connected to faint dusky line on free opercular membrane dorsally and continued slightly onto abdomen ventrally.

Pelvic Fin: Pale with even spread of fine, dark specks of pigment.

Dorsal Fin: Pale with even spread of fine, dark specks of pigment and dark dusky to dark markings. Series of paired dark blotches (diffusely dusky and unpaired in some specimens) present along fin base anteriorly above dorsal ends of body bands; blotches becoming faint, then absent, midway along fin; each blotch covering membrane between bases of 2 adjacent rays; pairs of blotches separated by single, unpigmented membrane space. Broad, dark, marginal stripe present on spinous portion of fin; pigment on anterior distal edge of 1st spine and membrane between distal tips of first 2 spines intensified, often the only prominent dark markings in dorsal fin of small specimens.

Anal Fin: Dusky, ray tips abruptly pale.

Caudal Fin: Pale with even spread of fine, dusky specks of pigment on rays and membranes bordering rays. Basal margin of fin dusky; 2 longitudinal, diffuse, dusky streaks on fin, 1 just above and 1 just below lateral midline of fin.

Females: Similar to males except: series of spots on lateral midline of body very faint to absent; dark markings on dorsal fin slightly fainter, anal fin slightly paler.

GEOGRAPHIC DISTRIBUTION (Figure 6).—Bay of Bengal coast of India to Singapore.

Menon and Talwar (1972) reported *O. zebra* from Galathea Bay, Great Nicobar Island. Their description appears to apply to *O. zebra* but we have not seen their specimen and have not, therefore, included the record on Figure 6.

Dutt and Visveswara Rao (1961) reported *O. zebra* (as *Petroscirtes bipunctata*) nesting in holes in mangrove stems in the Godavari River estuary (16°28′N, 82°03′E) in India. We became aware of this reference too late to include the record on Figure 6.

HABITAT.—Mangrove areas, sand and mud bottom, brown stained water, low salinity areas. Bhattacharya (1916) reported larval stages, as *P. bhattacharyae*, 3.2–15.9 mm total length, from Chilka Lake waters of densities 1.006–1.007, corrected to 15° C. Converted to salinity, these densities equal a range of about 8.2–10.8 o/oo.

COMPARISONS.—*Omobranchus zebra* differs from all other species of *Omobranchus* except *O. ferox*, with which it is broadly sympatric, in having 4 circumorbital bones (4 bones is an uncommon variant in the other species). It differs from *O. ferox* most obviously in having the gill opening almost always restricted to the area dorsal to the level of the dorsalmost pectoral-fin ray, rarely extending ventrally to opposite the dorsalmost ray (versus opposite the 3rd to 6th ray in *O. ferox*), in having well-defined bands on the head, and in having a longer head (see key couplet 13).

Aside from the number of circumorbital bones, *O. zebra* may be most readily separated from the other species with which it appears to be broadly sympatric as follows: from all in having a longer head (key couplet 13); from *O. elongatus* and *O. germaini* in lacking those characters of the *elongatus* species group (see "Comparisons" under *O. elongatus*) and in having 12 dorsal-fin spines (versus 12–14, modally 13 spines); from *O. meniscus* in lacking a fleshy crest in males, in having lateral-line tubes, and in having the gill opening restricted to the area dorsal to the level of the 2nd pectoral-fin ray (versus tubes absent and gill-opening extending ventrally to opposite 3rd ray); and from *O. punctatus* in having 1–4 (rarely 4) lateral-line tubes, which extend posteriorly to below the level of dorsal-fin spines 2–6 (rarely 5–6; versus 3–8 tubes, rarely 3–4, which extend posteriorly to below dorsal-fin spines 6–11, rarely 6–7).

NOMENCLATURAL DISCUSSION.—Bleeker (1868) did not illustrate his holotype of *P. zebra*, but he did have a colored illustration prepared, which he intended to use in his "Atlas." This illustration is in the files of the RMNH. As the holotype is now faded and the illustration indicates a more complete banding on the body than any specimen we have examined, we have included a copy of the illustration, much enlarged, as Figure 34.

Chadhuri (1916) did not compare his *Petroscirtes bhattacharyae* with any other species. We have not seen the holotype, but from information contained in the original description, data on the holotype, which was examined for us, and our examination of 2 of the 11 paratypes, we are convinced that *P. bhattacharyae* is a synonym of *O. zebra*.

MATERIAL EXAMINED.—INDIA: Lake Chilka, ZISC F8764/1 (41.8, holotype of *Petroscirtes bhattacharyae*, information furnished by W. F. Smith-Vaniz), 8774 (25.2), 8775 (39.6). THAILAND: Pakchan River mouth (Indian Ocean), CAS SU62065

(2: 39.9–56.5). GULF OF THAILAND: between Chol Buri and Bangsaen, CAS GVF reg. no. 1542 (9: 25.2–53.8); Lem Nam Point, Trat Bay, CAS GVF reg. no. 1486 (35.9), GVF reg. no. 1487 (5: 36.2–48.1). SINGAPORE: RMNH 4454 (44.4, holotype of *Petroscirtes zebra*).

Omobranchus species

FIGURE 35

Among all the specimens of *Omobranchus* that we examined, there was only one (USNM 211092) that we could not identify with reasonable certainty. The specimen is a small (22.7 mm SL) male from a predominantly "worm rock" habitat about one-half mile (0.6 km) offshore of Hikkaduwa, Ceylon. The specimen is noteworthy for several reasons, among which are the following: it is the only transformed specimen of *Omobranchus* that we know of that has not come from a close-to-shore or freshwater habitat and it was taken at depth of 35–45 ft (10.7–13.7 m), much greater than that verifiable for any other collection of *Omobranchus*, which genus has rarely been reported from a depth as great as 4 meters. Furthermore, the color pattern on the head is unusually well developed for so small a specimen. Because of its small size and the possibility that important characteristic structures may not have had time to develop (for instance, a fleshy crest, filamentous caudal-fin rays) or because it might represent an aberrant specimen of a known species, we are unwilling to describe it as a new species.

The specimen has the following characteristics: dorsal fin XII, 19; anal fin II, 21; segmented caudal-fin rays 13; dorsal + ventral procurrent caudal-fin rays 12; vertebrae 10 + 28 = 38; epipleural ribs 14; prenasal pores present; interorbital pores 3; circumorbital pores 8; lateral-line tubes 7, extending posteriorly to below level of dorsal-fin spine 10; lower-lip flap present, gill opening extending ventrally to opposite 2nd pectoral-fin ray; 5 circumorbital bones; upper jaw incisor teeth 20; lower jaw incisor teeth 23.

The specimen appears to be most similar to *O. fasciolatus*, but aside from being somewhat outside the geographic range of that species, it has 3 interorbital pores, rather than 2, and a well-developed dark banding under its head and on the fleshy pectoral-fin base that are not found in *O. fasciolatus*. Nor does *O. fasciolatus* have a dark spot immediately posterior to the orbital margin as does the specimen. The number of jaw teeth is slightly higher than what we would expect for so small a specimen of *O. fasciolatus*.

In color pattern and other respects the specimen appears similar to *O. zebra*, which possibly occurs in Ceylon. The specimen differs from *O. zebra* in general physiognomy, in having more lateral-line tubes (which extend farther posteriorly than in *O. zebra*), more caudal and total vertebrae, more circumorbital bones, and far more jaw teeth than would be expected in so small a specimen of *O. zebra*.

It is markedly different from *O. punctatus* and *O. elongatus*, the other two species that occur in the same general geographic area with it.

Questionable Species

Blennius pardalis Castlenau (1875) was questionably allocated to the genus *Istiblennius* (tribe Salariini) by Smith-Vaniz and Springer (1971). Springer (1972a) overlooked his previous generic allocation and questionably assigned *B. pardalis* to *Omobranchus*, noting that it might even belong in the tribe Blenniini. We now believe that *B. pardalis* should be referred back to the Salariini and particularly to *Salarias fasciatus* (Bloch).

Castlenau described *B. pardalis* (from Cape York, Torres Strait) as lacking orbital cirri, having the head rounded and cut vertically in front, and having the dorsal fin of about uniform height for its entire length. The color pattern description includes the following information: anterior half of back with narrow, longitudinal, black lines; body entirely covered with oblong whitish blotches; dorsal fin brown with transverse whitish lines formed of oval or rounded blotches and with series of minute black blotches near edge of fin; caudal fin rounded, with three transverse series of black dots; anal fin brown, marked with whitish round blotches.

The color pattern is not found in any species of the tribes Omobranchini, Nemophini, Phenablenniini, or Blenniini (the last-named tribe is either rare in, or absent from, the tropical Indo-Australian archipelago). The color pattern seems most applicable to a member of the tribe Salariini, but not to

Ecsenius, the only genus of that tribe in the Indo-Australian archipelago normally lacking orbital cirri, nor to *Istiblennius,* which has a deeply notched dorsal fin. If, however, Castlenau was in error in reporting the absence of orbital cirri, the color pattern description best applies to *Salarias fasciatus,* a common, nearshort inhabitant of the Indo-Australian region.

List of Nominal Taxa of *Omobranchus* and Their Current Identification

Nominal Taxa	Current Identification
Graviceps alexanderi Whitley, 1945	*Omobranchus germaini*
Petroscirtes altivelis Steindachner, 1863	*Omobranchus anolius*
Graviceps angelus Whitley, 1959	*Omobranchus r. rotundiceps*
Blennechis anolius Valenciennes in Cuvier and Valenciennes, 1836	*Omobranchus anolius*
Blennius auro-splendidus Richardson, 1846	*Omobranchus aurosplendidus*
Omobranchus banditus J.L.B. Smith, 1959	*Omobranchus banditus*
Petroscirtes bhattacharyae Chaudhuri, 1916	*Omobranchus zebra*
Petroscirtes cristatus Zugmayer, 1913	*Omobranchus mekranensis*
Omobranchus cristatus Fraser-Brunner, 1951	*Omobranchus fasciolatus*
Petroscirtes cristiceps Macleay, 1881	*Omobranchus anolius*
Graviceps darwini Whitley, 1958	*Omobranchus lineolatus*
Aspidontus dasson Jordan and Snyder, 1902	*Omobranchus punctatus*
Omobranchus dealmeida J.L.B. Smith, 1949	*Omobranchus ferox*
Salarias decipiens DeVis, 1884b	*Omobranchus punctatus*
Petroscirtes dispar Günther, 1861	*Omobranchus punctatus*
Petroscirtes dispar Fowler, 1937	*Omobranchus elongatus*
Petroscirtes elegans Steindachner, 1876	*Omobranchus elegans*
Petroscirtes elongatus Peters, 1855a, 1855b	*Omobranchus elongatus*
Blennius fasciolatoceps Richardson, 1846	*Omobranchus fasciolatoceps*
Blennechis fasciolatus Valenciennes in Cuvier and Valenciennes, 1836	*Omobranchus fasciolatus*
Petroscirtes fasciolatus Macleay, 1881	*Omobranchus r. rotundiceps*
Petroscirtes feliciana Herre, 1942	*Omobranchus ferox*
Petroscirtes ferox Herre, 1927	*Omobranchus ferox*
Salarias furcatus DeVis, 1884b	*Omobranchus r. rotundiceps*
Salarias furtivus DeVis, 1886	*Omobranchus r. rotundiceps*
Salarias galeatus DeVis, 1884a	*Omobranchus anolius*
Petroscirtes germaini Sauvage, 1883	*Omobranchus germaini*
Petroscirtes guttatus Macleay, 1881	*Omobranchus anolius*
Salarias helenae DeVis, 1884b	*Omobranchus punctatus*
Chasmodes Herklotsi Herre, 1935	*Omobranchus fasciolatoceps*
Petroskirtes japonicus Bleeker, 1869	*Omobranchus punctatus*
Omobranchus japonicus scalatus J.L.B. Smith, 1959	*Omobranchus punctatus*
Petroskirtes kallosoma Bleeker, 1858	*Omobranchus elongatus*
Petroscirtes kochi Weber, 1908	*Omobranchus punctatus*
Petroscirtes kranjiensis Herre, 1940	*Omobranchus ferox*
Petroscirtes lineolatus Kner, 1868a, 1868b	*Omobranchus lineolatus*
Petroscirtes lineo-punctatus Sauvage, 1800	*Omobranchus elegans*
Petroscirtes lini Herre, 1934	*Omobranchus aurosplendidus*
Hypleurochilus loxias Jordan and Seale, 1905	*Omobranchus rotundiceps obliquus*
Petroscirtes loxozonus Jordan and Starks, 1906	*Ombranchus loxozonus*
Petroscirtes macleayi Ogilby, 1887	*Omobranchus r. rotundiceps*
Petroscirtes masyae H.M. Smith, 1934	*Omobranchus punctatus*
Petroscirtes mekranensis Regan, 1905	*Omobranchus mekranensis*
Omobranchus meniscus Springer and Gomon	*Omobranchus meniscus*
Petroscirtes obliquus Garman, 1903	*Omobranchus rotundiceps obliquus*

Nominal Taxa	Current Identification
Blennechis punctatus Valenciennes in Cuvier and Valenciennes, 1836	*Omobranchus punctatus*
Petroscirtes rotundiceps Macleay, 1881	*Omobranchus r. rotundiceps*
Hypleurochilus samoensis Seale, 1935	?*Omobranchus rotundiceps obliquus*
Petroscirtes semilineatus Kner, 1868b	*Omobranchus punctatus*
Poroalticus sewalli Fowler, 1931	*Omobranchus punctatus*
Salarias sindensis Day, 1888	*Omobranchus punctatus*
Omobranchus steinitzi Springer and Gomon	*Omobranchus steinitzi*
Petroscirtes striatus Jatzow and Lenz, 1898	*Omobranchus fasciolatus*
Petroscirtes uekii Katayama, 1941	*Omobranchus fasciolatoceps*
Blennius unicornis Castelnau, 1879	*Omobranchus anolius*
Omobranchus verticalis Springer and Gomon	*Omobranchus verticalis*
Petroscirtes vinciguerrae Borsieri, 1904	*Omobranchus fasciolatus*
Petroscirtes waterousi Herre, 1942	*Omobranchus ferox*
Petroscirtes wilsoni Macleay, 1884	*Omobranchus anolius*
Aspidontus woodi Gilchrist and Thompson, 1908	*Omobranchus woodi*
Petroscirtes zebra Bleeker, 1868	*Omobranchus zebra*

Notes on Other Species of the Tribe Omobranchini

Enchelyurus ater (Günther)

The following specimens extend the geographic range of this species beyond that reported by Springer (1972a): NEW HEBRIDES: AMS I.14313 (6: 23.5–28.6); Vila, Sandwich Island (= Efate Island?), AMS I.6323–4 (2: 20.7–32.7), IB.3609 (18.9); Santo (= Espiritu Santo?), AMS I.6513 (26.3). LORD HOWE ISLAND: AMS IA.969 (6: 19.0–ca. 47); IB.5995 (32.4).

Important meristic characters for these specimens are given in Table 17. The high counts of the Lord Howe Island specimens are similar to those of specimens from New Caledonia and Rapa, whereas the low counts of the New Hebrides specimens are similar to those of the other populations (Springer, 1972a, Tables 1–2).

Enchelyurus flavipes Peters

Springer (1972a) incorrectly cited RMNH 20813, from Gonto Soea, near Makassar, and ZMB 5193, from Singapore, as the types of *Enchelyurus flavipes* var. *nigerrima* Weber. The correct catalog number for the two syntypes is ZMA 112.678, from Barang Island near Makassar. We have examined both syntypes and find no reason to recognize the validity of Weber's infraspecific name.

Menon and Talwar (1972) reported on a specimen of *E. flavipes* (as *E. flaviceps*) from Galathea Bay, Great Nicobar Island. If their identification of the specimen is correct, the locality would represent the first record of *E. flavipes* in the Indian Ocean.

Haptogenys bipunctata (Day)

On the basis of information in Day (1876) Springer (1972a) assigned *Petroscirtes bipunctatus* from Calicut, India, to the genus *Omobranchus,* and noted that the holotype was lost. Menon and Yazdani (1968) did not mention the existence of the holotype in their purportedly complete catalog of the types in the collections of the Zoological Survey of India. W. F. Smith-Vaniz, who visited ZSIC in 1969 with the intention of examining all the blenniid types, was not apprised that it was present. Recently, Dr. P. Talwar (ZSIC) notified us that the type was available (ZSIC No. 2082). Information on the holotype, kindly furnished us by Dr. A. G. K. Menon, convinces us that *P. bipunctatus* is a species of *Haptogenys* and is undoubtedly the same as *H. quadripora* Springer, which we here place in synonymy with *H. bipunctata* (name emended here to agree with gender of the genus). Springer had but a single specimen (USNM) of *H. bipunctata* (as *H. quadripora*), from Koh Tao, Gulf of Thailand. Another specimen (MCZ 47202, female, 32.0 mm SL) of *H. bipunctata,* from Lam Goh Peninsula, south Thailand (6°57′N, 99°43′E), has also come to our attention. Both this specimen and the holotype of *P. bipunctatus* have three mandibular sens-

TABLE 17.—*Frequency distributions for certain meristic characters in two populations of* Enchelyurus ater

Population	Dorsal-fin spines			Segmented dorsal-fin rays					Total dorsal-fin elements					Total anal-fin elements				Caudal vertebrae					Total vertebrae				
	8	9	10	20	21	22	23	24	29	30	31	32	33	20	21	22	23	23	24	25	26	27	33	34	35	36	37
New Hebrides	3	7		1	7	2			3	6	1			3	7			2	7	1			2	7	1		
Lord Howe		6	1			2	3	2			1	4	2			4	3			3	3	1			3	3	1

ory pores, whereas the USNM specimen has two pores, indicating the probability that the USNM specimen is aberrant. The USNM specimen also may have been unsual in having the shortest pelvic-fin ray less than half the length (42.5%) of the longest. The MCZ specimen has the shortest ray 54.5% the length of the longest.

The following meristic data from the ZSIC and MCZ specimens expand the description of the species over that given by Springer; dorsal fin XII, 19 (2) anal fin II, 21 (2); pectoral fin 13 (MCZ); interorbital pores 4 (2); circumorbital pores 8 (MCZ); gill opening extending ventrally to pectoral-fin ray 13 (2); upper teeth 18 (MCZ); lower teeth 20 (MCZ). Ventral hypural plate autogenous.

Omox biporos Springer

Springer (1972a) described *O. biporos* from seven specimens, two of which were from New Guinea (Madang Harbor, north coast). Nineteen more specimens from New Guinea (south coast) are now available: AMS I.17541-001 (6: 25.2–36.9) and BPBM 15914 (10: 26.1–40.7), Port Moresby, and DASF FO1655 (3: 24.7–39.2) Lelea. All the collections were taken in mangrove areas.

The additional specimens modify the characterization of the genus (and its monotypic species) as given by Springer. All of the specimens have the characteristic four interorbital pores, except one, which has two pores. Fourteen specimens agree with Springer's description in lacking a median supratemporal commissural pore, whereas five of the specimens have this pore. On the basis of pore distribution, therefore, some specimens of *Omox* could be misidentified as *Omobranchus*. The much less restricted gill opening of *Omox* (extending to opposite pectoral-fin ray 8–11) will distinguish *Omox* from *Omobranchus*. Male *Omox* over 37 mm SL possess a kinethmoid, which is not present in any specimen of *Omobranchus* that we examined for this bone.

The frequencies for total dorsal-fin elements of *Omox biporos* from Thailand and New Guinea given by Springer (1972a, table 1) should each be shifted one column to the left.

Parenchelyurus hepburni (Snyder)

The following specimens represent new locality records for the species, which is now known to extend from the Amirante Islands, in the western Indian Ocean, to Samoa, in the central Pacific Ocean: DASF FO3200 (26.8), Port Moresby, New Guinea; USNM 211875 (2: 22.7–32.4), Ambon Island, Indonesia; USNM 211876 (23.0), Buton (also Butung), Indonesia; NFIS 11862 (2: 13.0–ca. 22), Great Nicobar Island, Nicobar Islands; ANSP station no. F-102 (8: 17.1–24.9), St. Joseph Island, Amirante Islands. The species appears to vary little throughout its geographic range.

Yamakawa (1971) reported and illustrated *P. hepburni* (as *Omobranchus hepburni*) from Yoronto and Kikaijima. These localities represent the northernmost records for the species.

Springer (1972a) believed that the types of *Hypleurochilus samoensis* Seale might represent the postlarvae of *P. hepburni*. It now appears more likely that these types are larval stages of *Omobranchus r. obliquus*, based on their dorsal-fin formulae.

Both species of *Parenchelyurus* have two mandibular sensory pores, as indicated in Springer's (1972a) key to the species. Due to a typographical error, the number of mandibular pores was given as three in Springer's generic diagnosis.

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Figures 8–35
The Species of *Omobranchus*

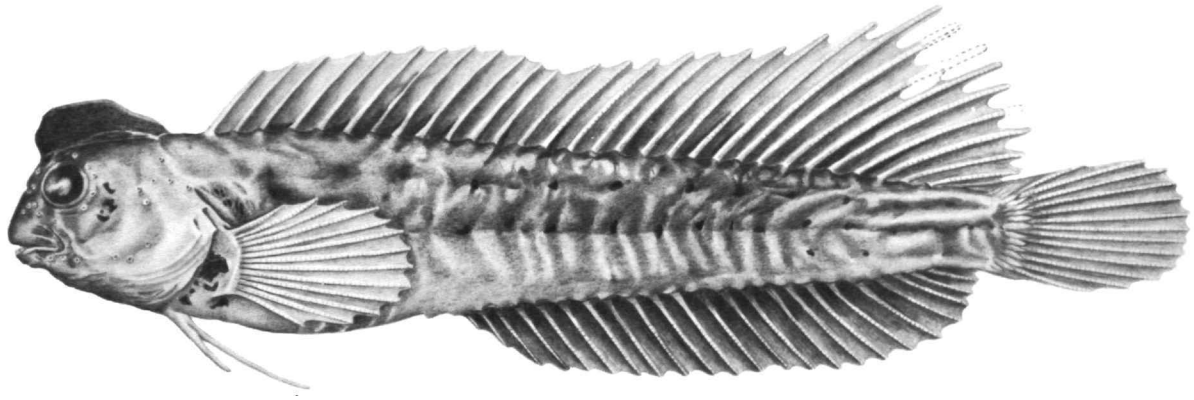

FIGURE 8.—*Omobranchus anolius*, USNM 197621, male, 46.9 mm SL Sydney, Australia. (Drawn by J. R. Schroeder.)

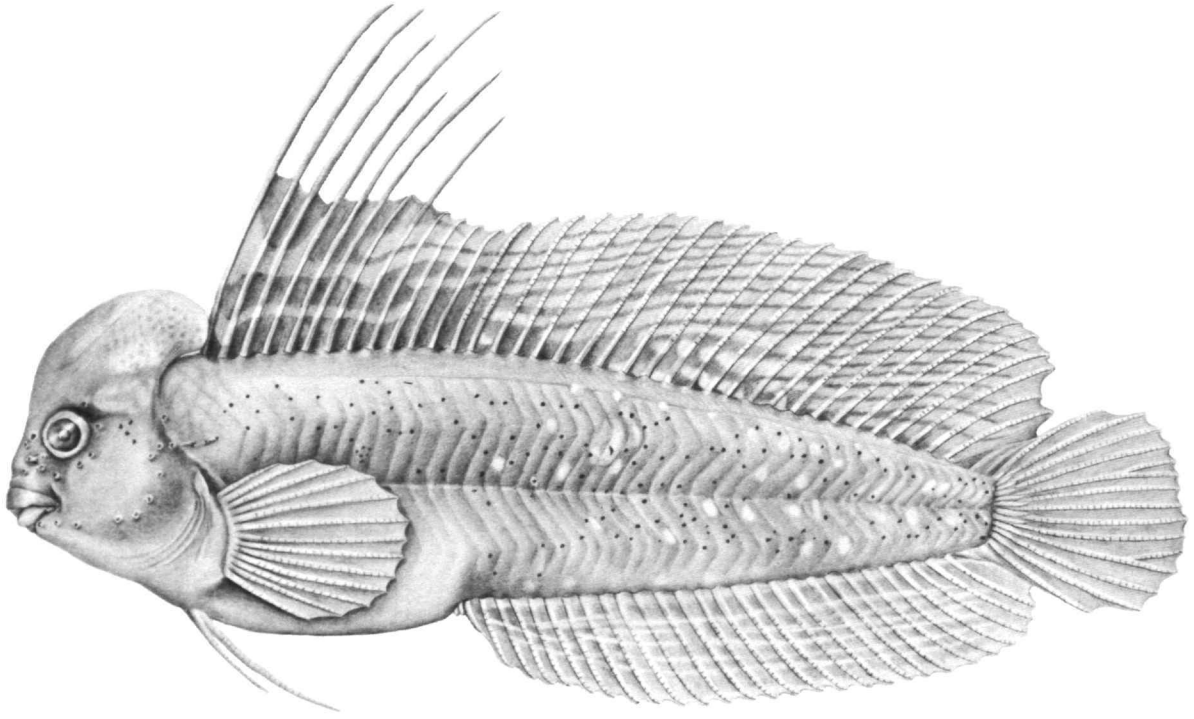

FIGURE 9.—*Omobranchus aurosplendidus*, CAS SU 29088, male, 99.5 mm SL, Heungchow, Kwangtung Province, China. (Drawn by J. R. Schroeder.)

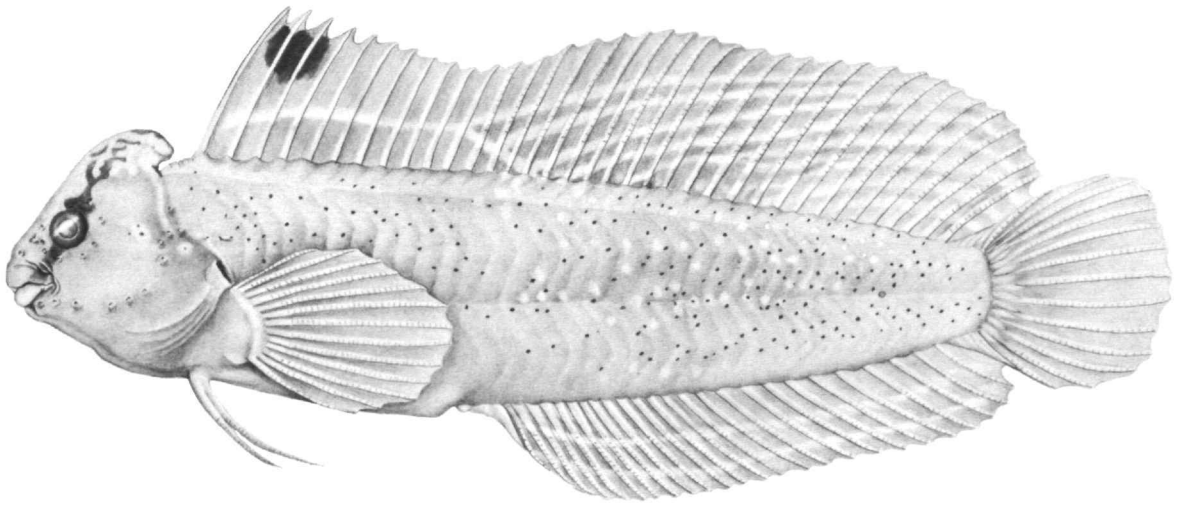

FIGURE 10.—*Omobranchus aurospendidus*, USNM 201464, female, 93.6 mm SL, Hong Kong. (Drawn by J. R. Schroeder.)

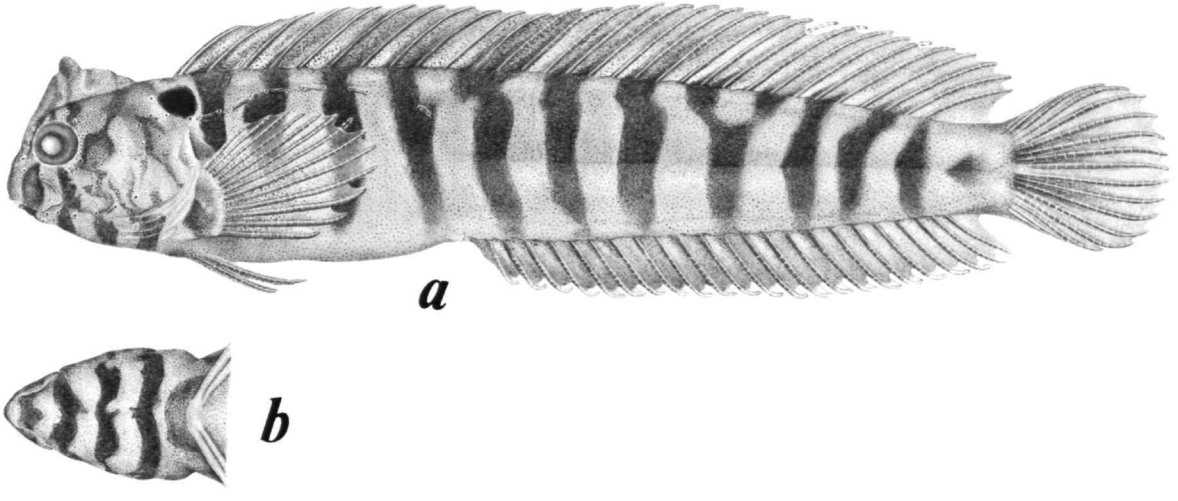

FIGURE 11.—*Omobranchus banditus*, BMNH 1919.4.1.30, male, 49.5 mm SL, Durban, South Africa: *a*, lateral view; *b*, ventral side of head. (Drawn by S. L. Chambers.)

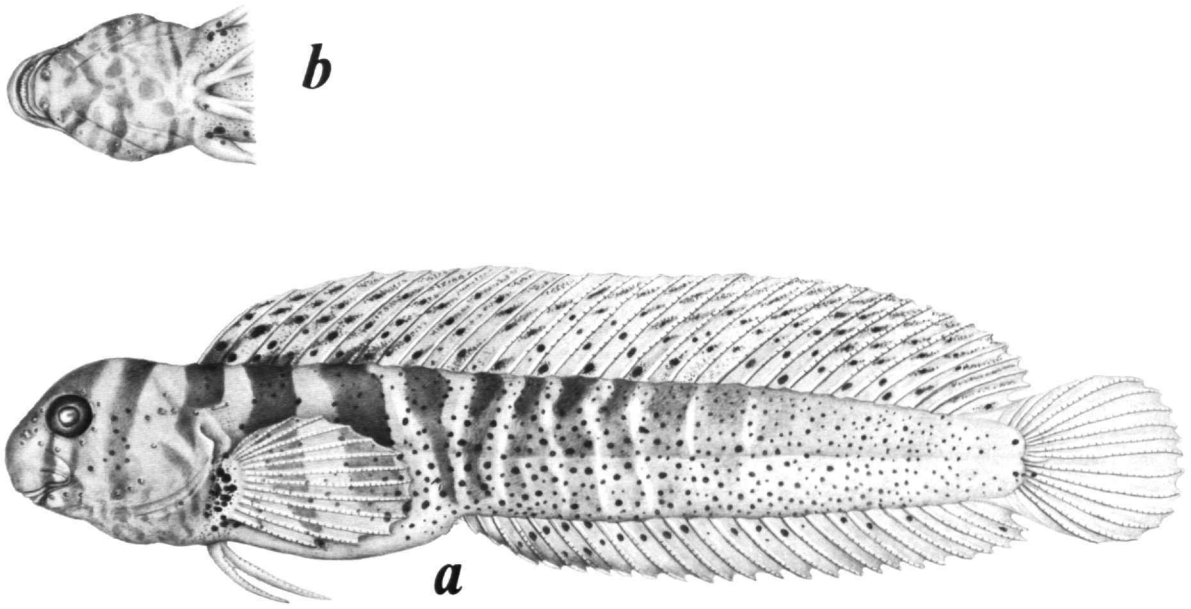

FIGURE 12.—*Omobranchus elegans*, USNM 71530, male, 53.8 mm SL, Misaki, Sagami Bay, Japan: *a*, lateral view; *b*, ventral side of head. (Drawn by J. R. Schroeder.)

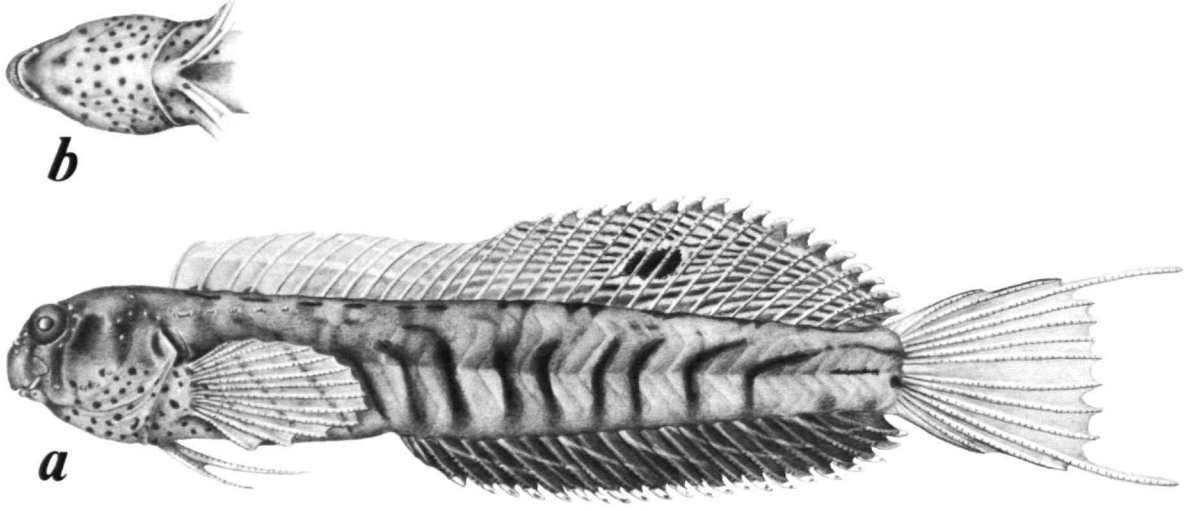

FIGURE 13.—*Omobranchus elongatus*, USNM 209425, male, 38.9 mm SL, Goh Kram, Gulf of Thailand: *a*, lateral view; *b*, ventral side of head. (Drawn by J. R. Schroeder.)

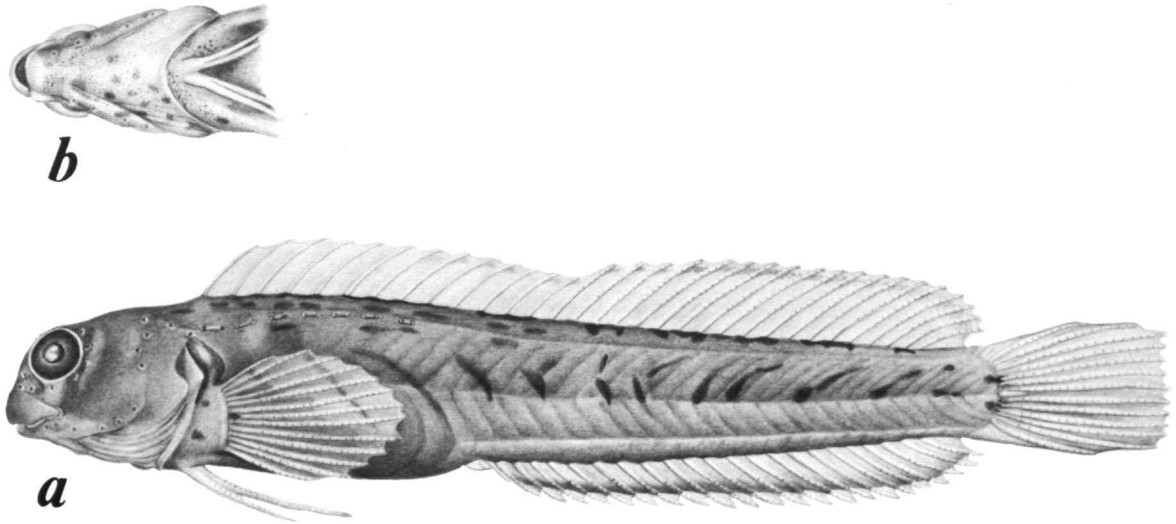

FIGURE 14.—*Omobranchus elongatus*, USNM 209425, female, 34.3 mm SL, Goh Kram, Gulf of Thailand: *a*, lateral view; *b*, ventral side of head. (Drawn by J .R. Schroeder.)

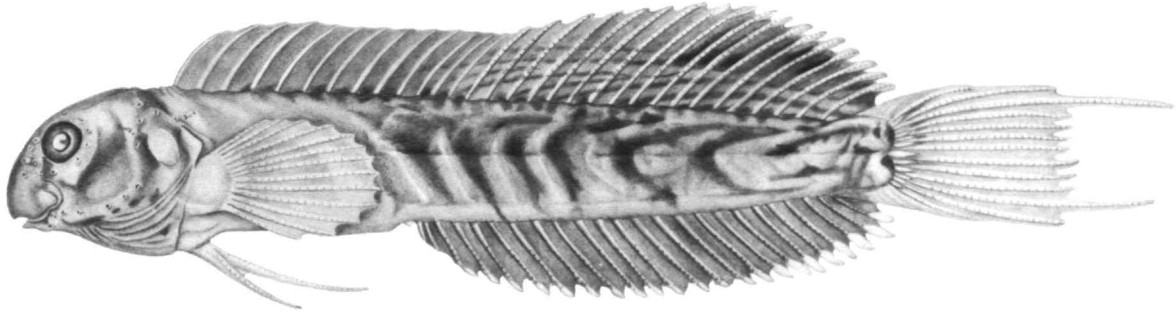

FIGURE 15.—*Omobranchus elongatus*, USNM 201876, male, 45.7 mm SL, near Marokibani, Madagascar. (Drawn by J. R. Schroeder.)

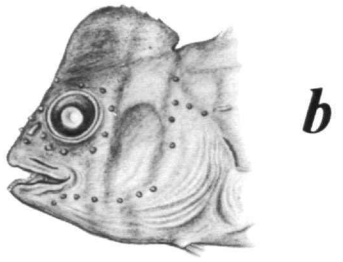

FIGURE 16.—*Omobranchus fasciolatoceps*, CAS SU61121, Hong Kong: *a*, female, 51.0 mm SL; *b*, male, 61.7 mm SL. (Drawn by K. H. Moore.)

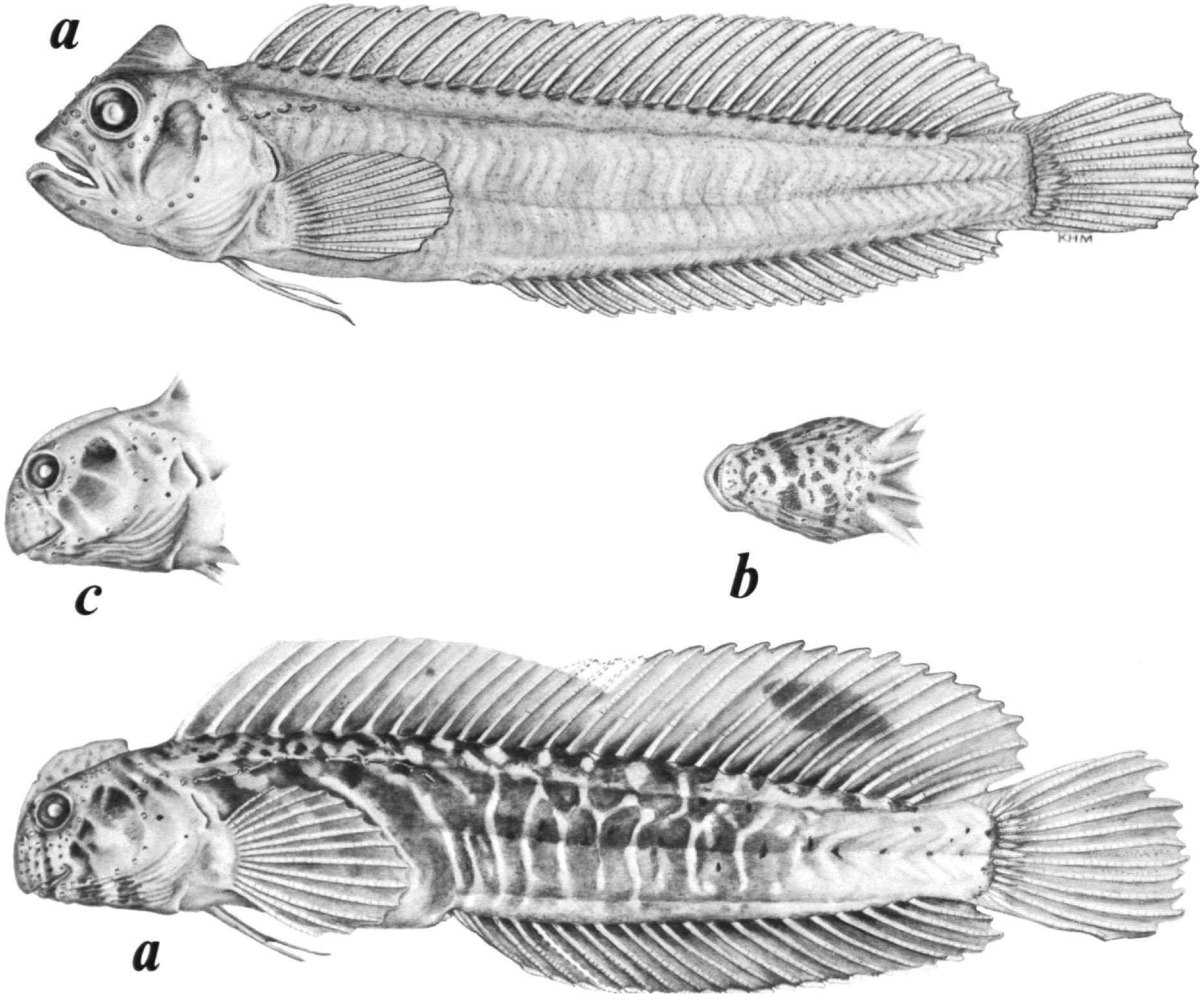

FIGURE 17.—*Omobranchus fasciolatus*, USNM 201869, Astola Island, West Pakistan. *a-b*, male, 44.2 mm SL: *a*, lateral view; *b*, ventral side of head; *c*, female, 48.4 mm SL. (Drawn by J. R. Schroeder.)

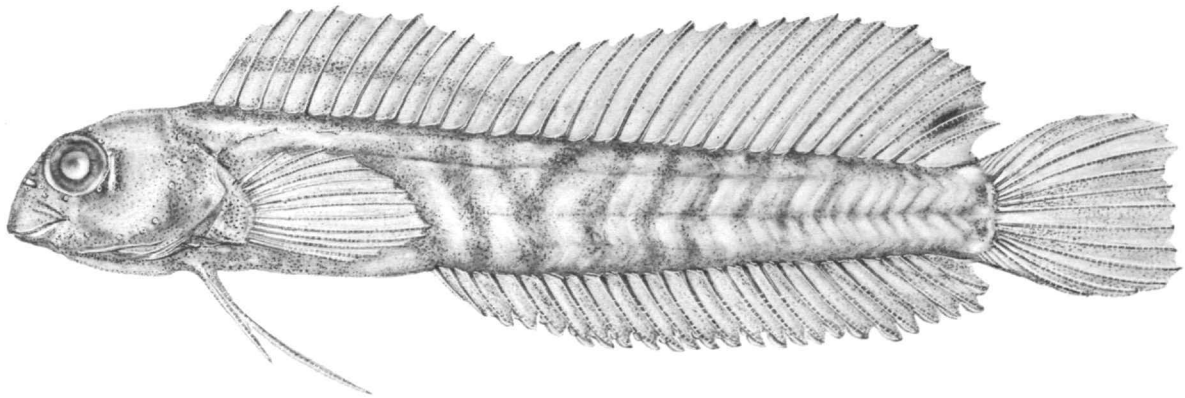

FIGURE 18.—*Omobranchus ferox*, USNM 201559, male, 34.5 mm SL, Nias Island, Indonesia. (Drawn by B. L. Holden.)

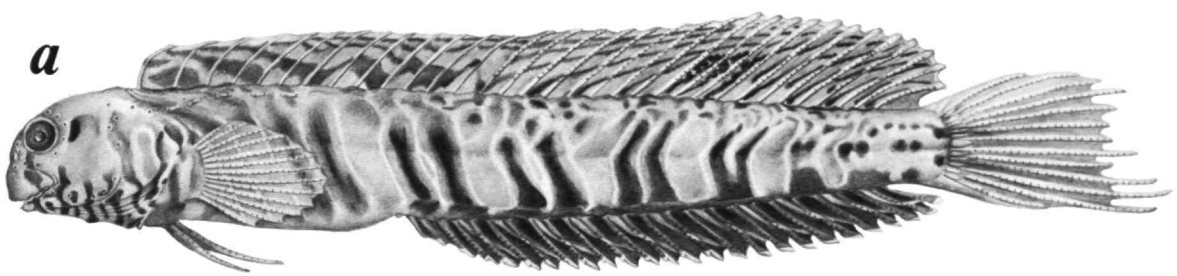

FIGURE 19.—*Omobranchus germaini*, CAS 13780, male, 63.7 mm SL, One Tree Island, Great Barrier Reef: *a*, lateral view; *b*, ventral side of head. (Drawn by J. R. Schroeder.)

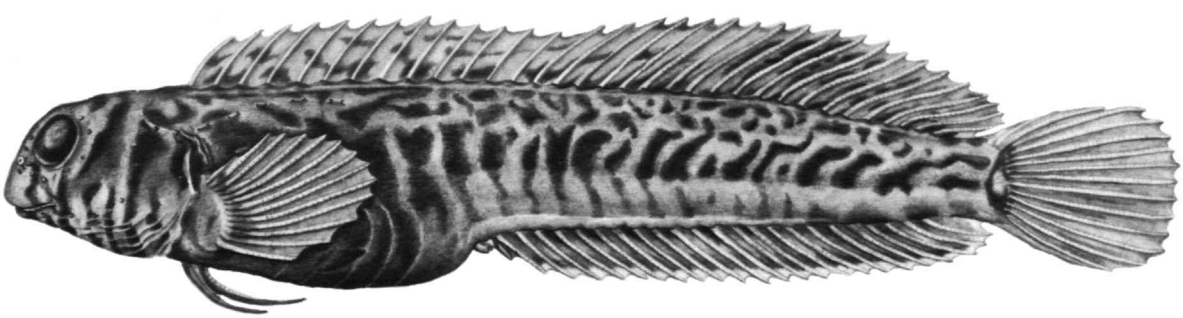

FIGURE 20.—*Omobranchus germaini*, USNM 204027, female, 45.1 mm SL, northwest of Yeh-Liu, Taiwan. (Drawn by J. R. Schroeder.)

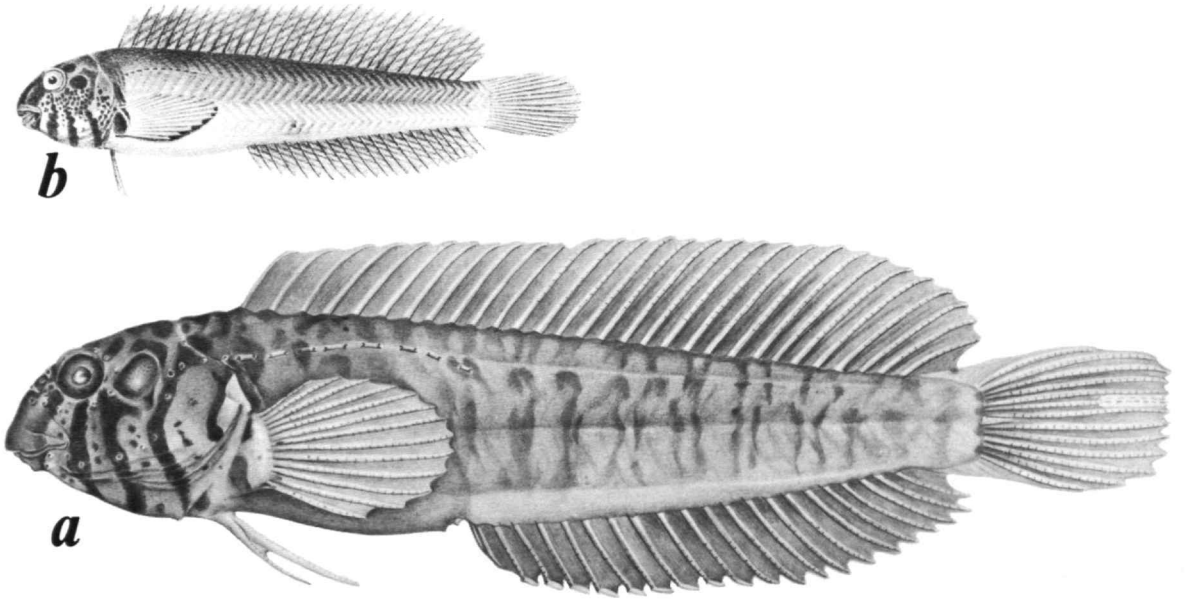

FIGURE 21.—*Omobranchus lineolatus*: *a*, WAM P.10100, male, 36.3 mm SL, Riddell Beach, Broome, Western Australia (Drawn by J. R. Schroeder.); *b*, holotype of *Petroscirtes lineolatus*, after Kner (1868b).

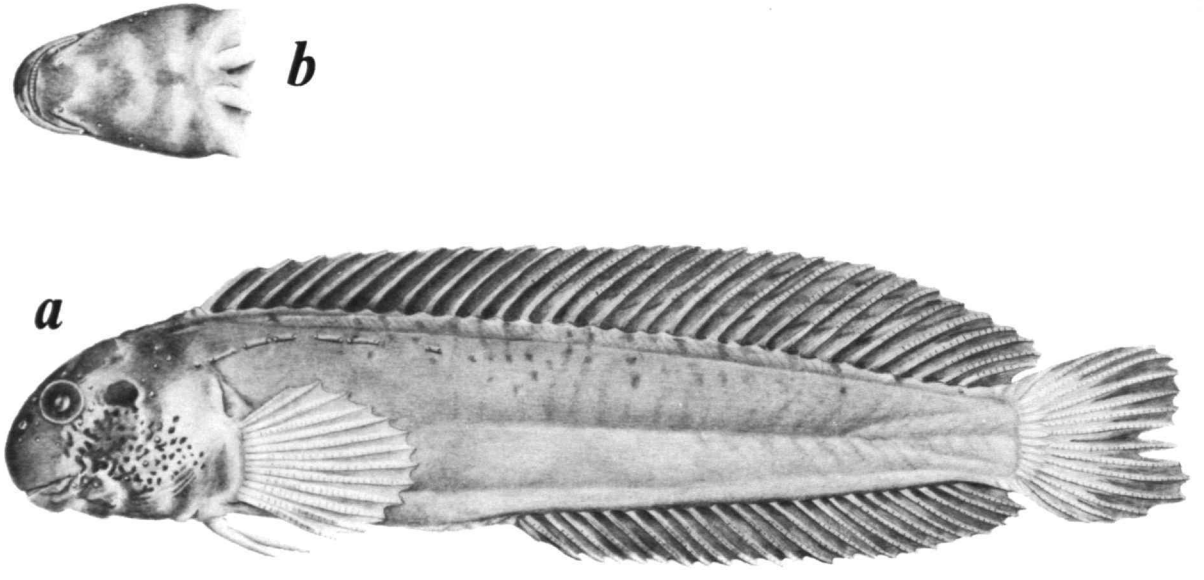

FIGURE 22.—*Omobranchus lineolatus*, RMNH 26918, female, 66.8 mm SL, Merauke, New Guinea: *a*, lateral view; *b*, ventral side of head. (Drawn by J. R. Schroeder.)

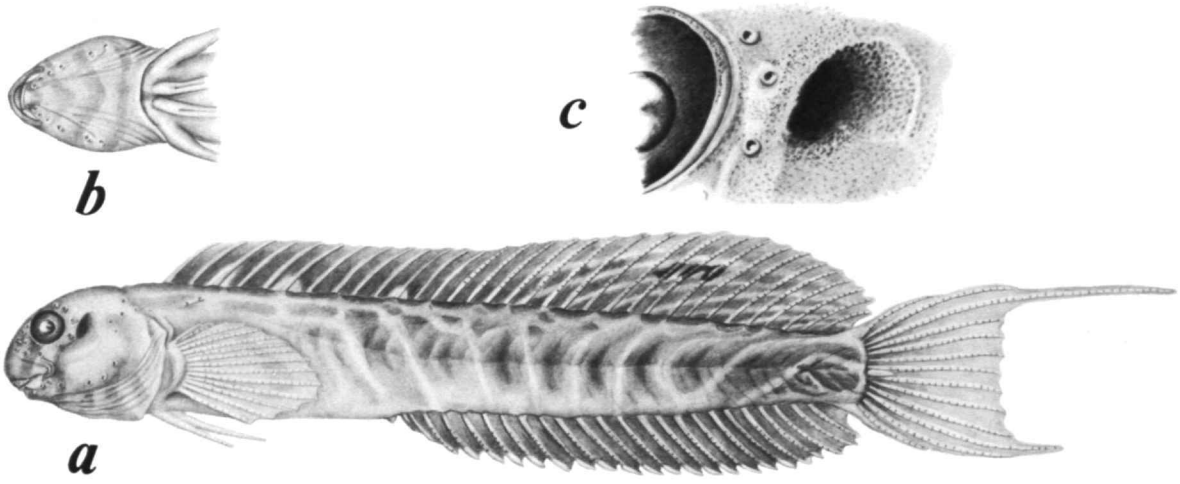

FIGURE 23.—*Omobranchus loxozonus*, USNM 70761, male, 49.1 mm SL, Tanegashima, Japan: *a*, lateral view; *b*, ventral side of head; *c*, area of head just posterior to eye. (Drawn by J. R. Schroeder.)

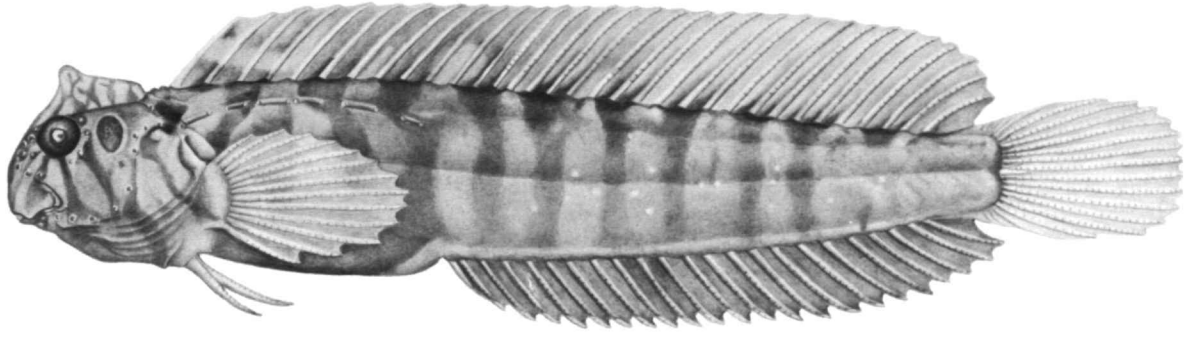

FIGURE 24.—*Omobranchus mekranensis*, USNM 200604, male, 46.4 mm SL, Astola Island, West Pakistan. (Drawn by J. R. Schroeder.)

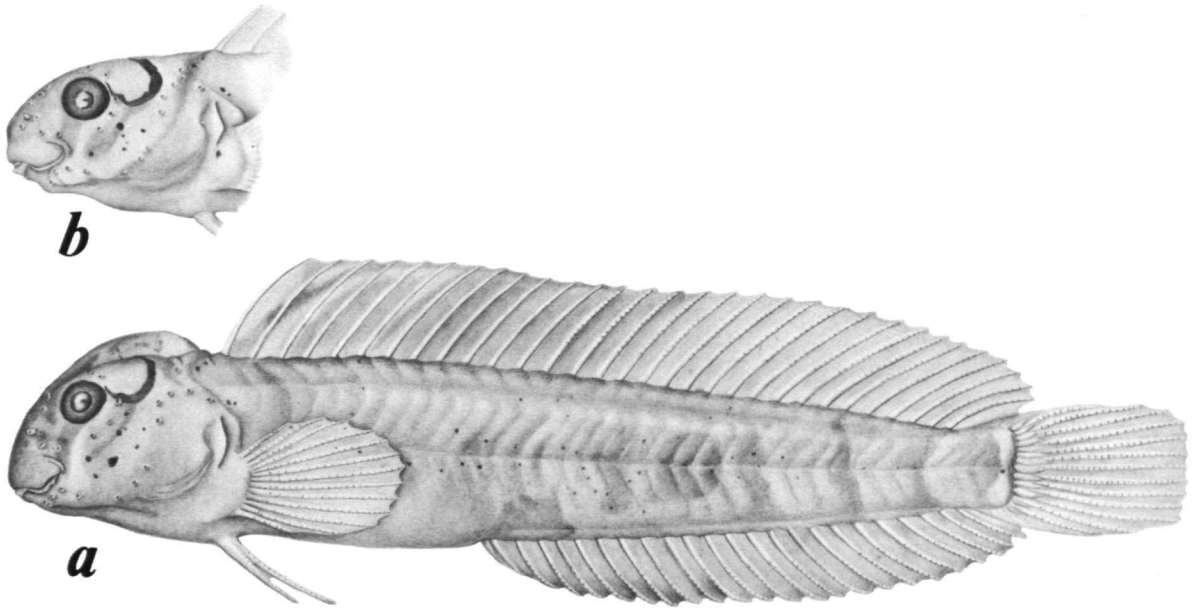

FIGURE 25.—*Omobranchus meniscus*, Chantabun, Thailand: *a*, USNM 119685, holotype, male, 60.1 mm SL; *b*, USNM 211153, female, 54.8 mm SL. (Drawn by J. R. Schroeder.)

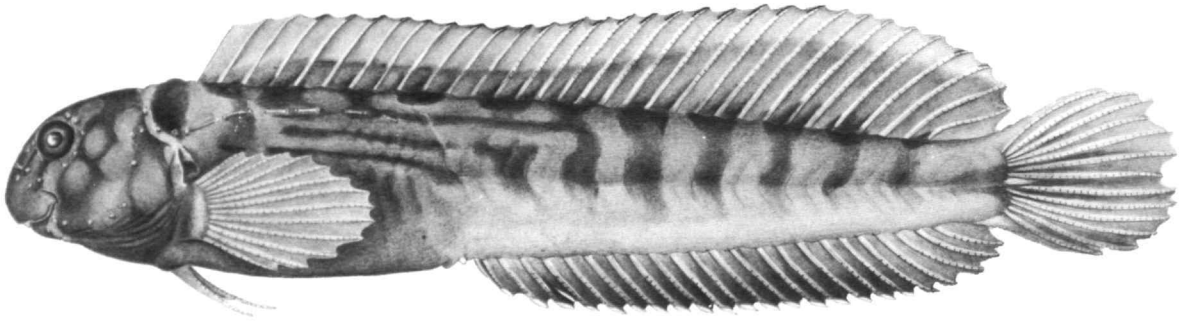

FIGURE 26.—*Omobranchus punctatus*, USNM 206389, male, 49.4 mm SL, Trincomalee, Ceylon. (Drawn by J. R. Schroeder.)

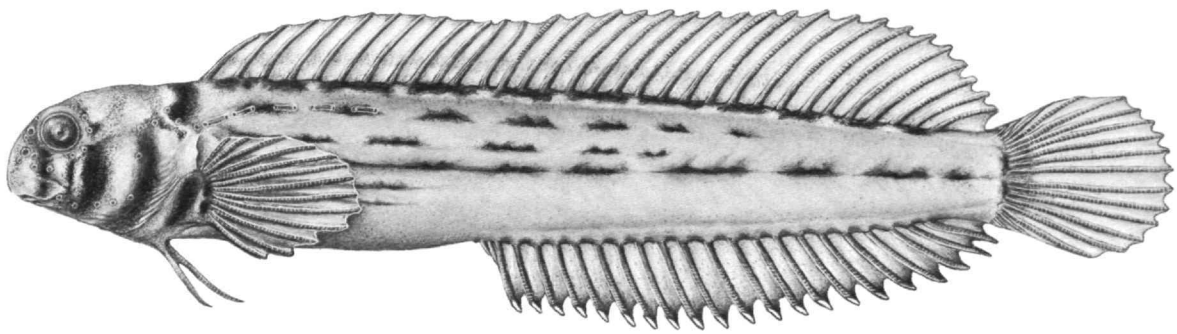

FIGURE 27.—*Omobranchus punctatus*, USNM 174330, male, 52.7 mm SL, Northern Territory, Australia. (Drawn by M. H. Lester.)

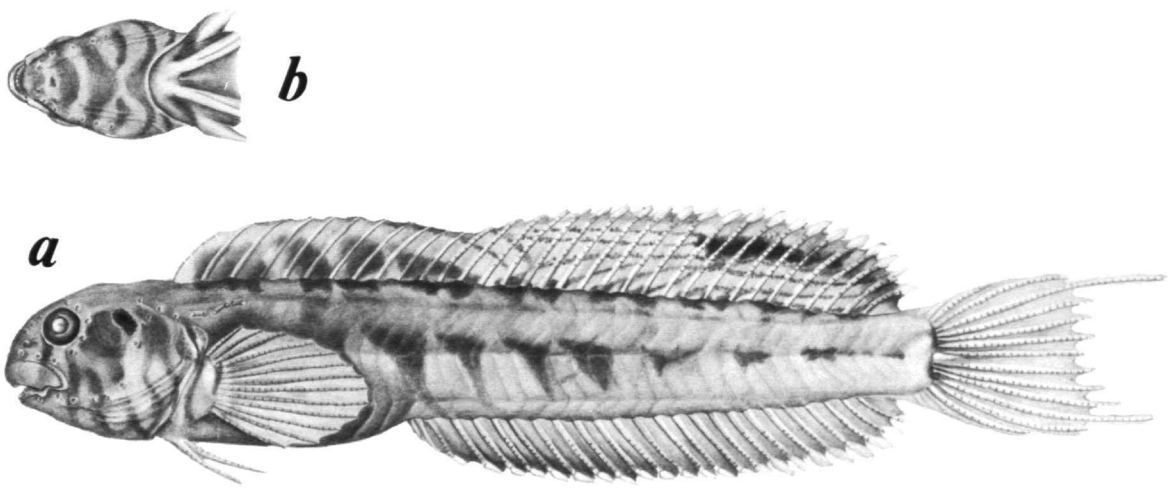

FIGURE 28.—*Omobranchus r. rotundiceps*, USNM 174337, male, 48.2 mm SL. Northern Territory, Australia: *a*, lateral view; *b*, ventral side of head. (Drawn by J. R. Schroeder.)

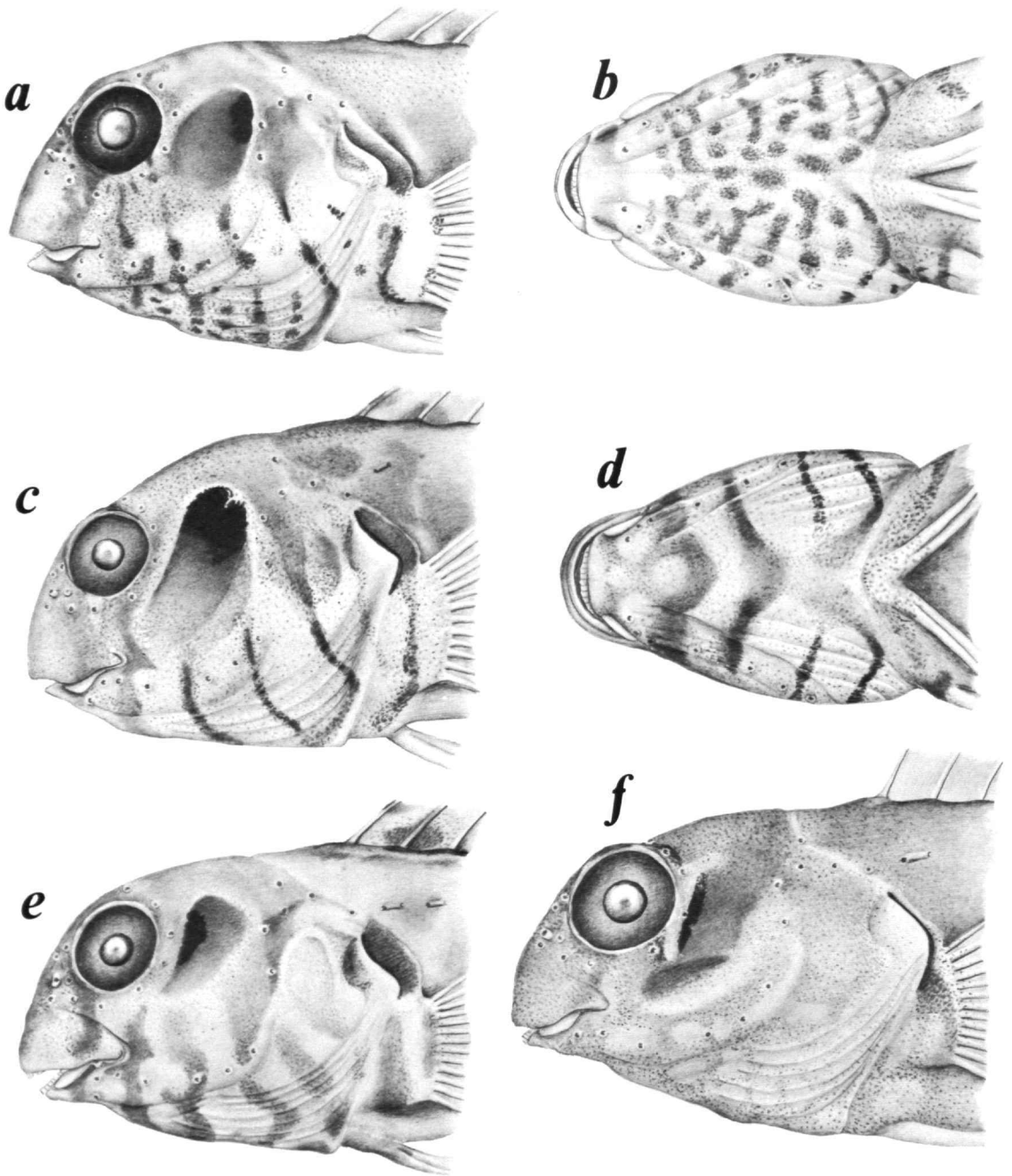

FIGURE 29.—Head color pattern exhibited by certain species of *Omobranchus*. *a-b*, *O. r. rotundiceps*, USNM 205712, male, 40.1 mm SL, Sydney, Australia: *a*, lateral view; *b*, ventral view. *c-d*, *O. r. obliquus*, CAS GVF reg. no. 1858, male, 34.9 mm SL, Guam: *c*, lateral view;*d*, ventral view. *e*, *O. germaini*, ANSP 109700, male, 49.6 mm SL, Little Hope Island, Great Barrier Reef. *f*, *O. ferox*, CAS GVF reg. no. 1486, female, 38.9 mm SL, Trat Bay, Gulf of Thailand. (Drawn by J. R. Schroeder.)

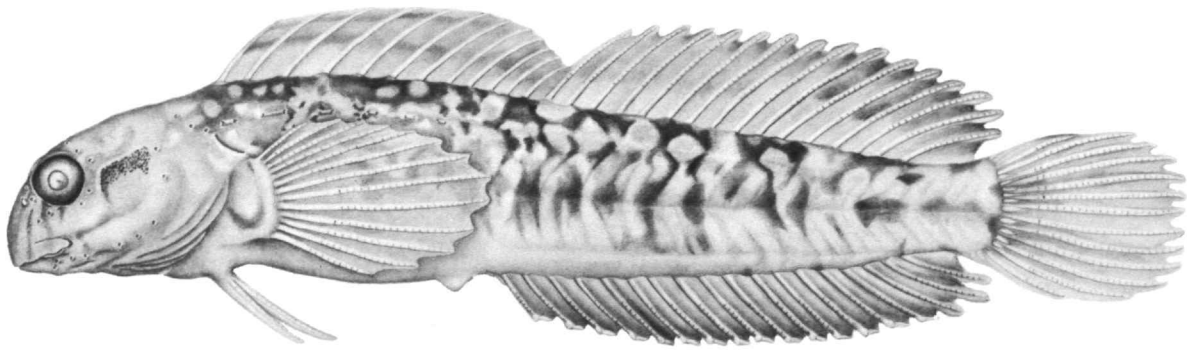

FIGURE 30.—*Omobranchus steinitzi*, USNM 209433, holotype, male, 32.0 mm SL, Cundabilu, Dahlak Archipelago, Red Sea. (Drawn by J. R. Schroeder.)

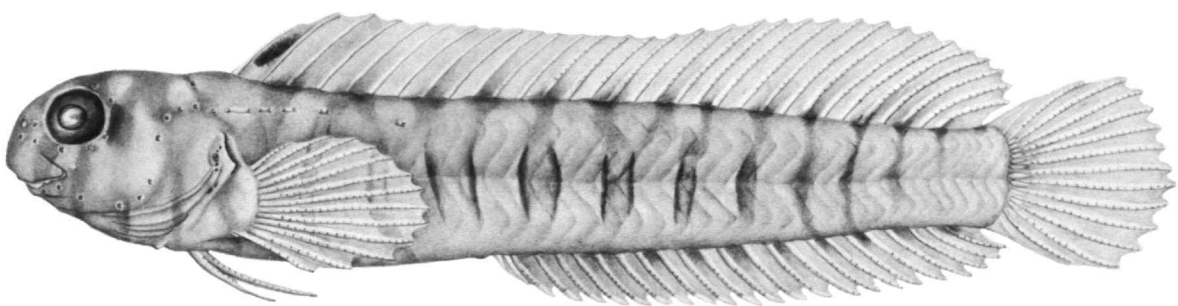

FIGURE 31.—*Omobranchus verticalis*, USNM 210616, male, 33.3 mm SL, Boat Passage, Brisbane River, Queensland, Australia. (Drawn by J. R. Schroeder.)

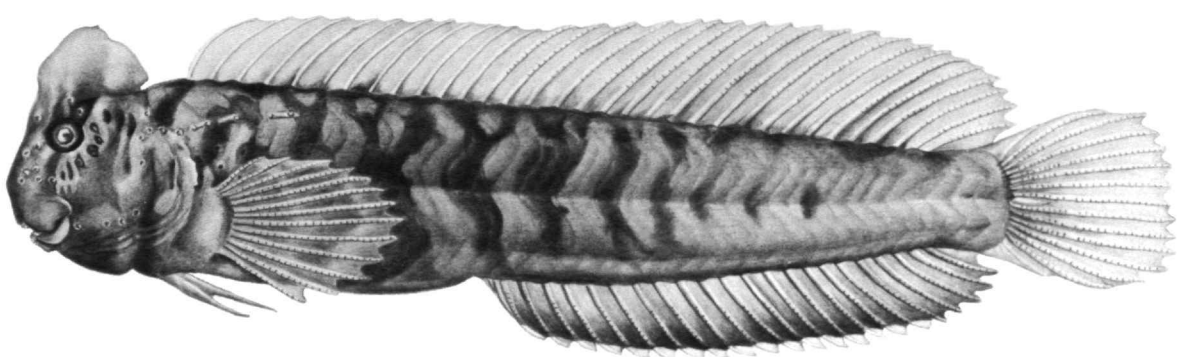

FIGURE 32.—*Omobranchus woodi*, RUSI 2357, male, 69.6 mm SL, Knysna Lagoon, South Africa. (Drawn by J. R. Schroeder.)

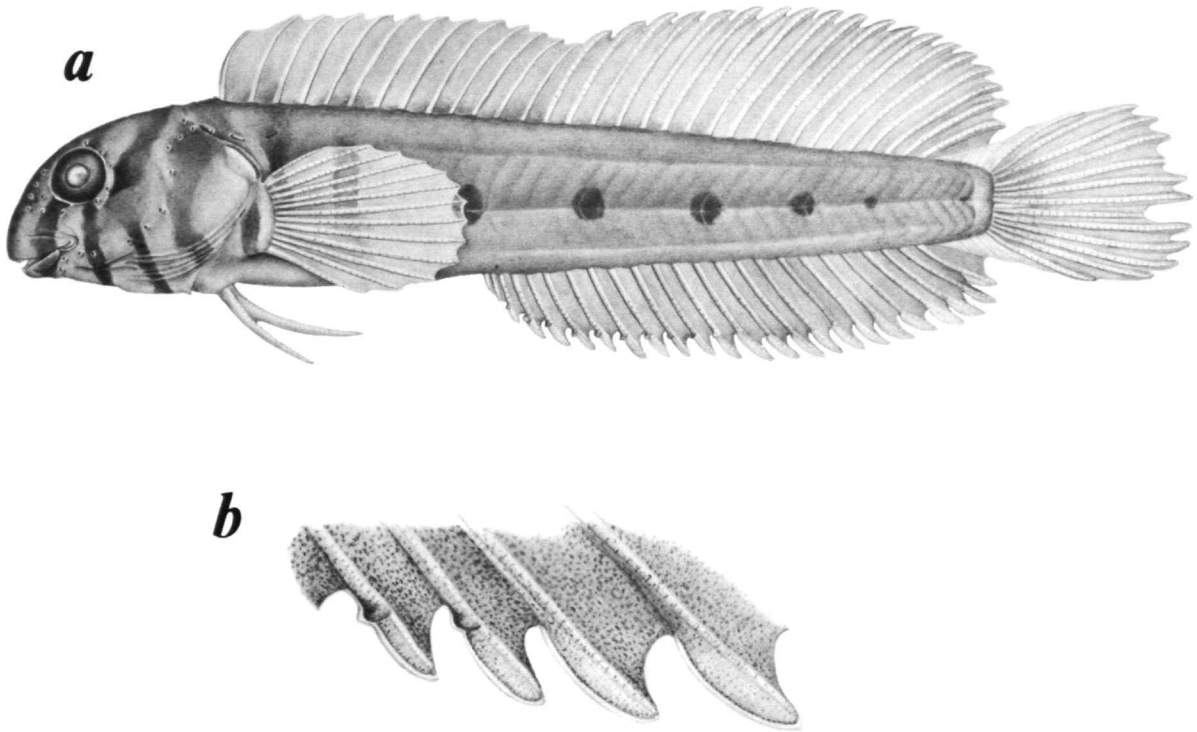

FIGURE 33.—*Omobranchus zebra*, USNM 209380, male, 43.0 mm SL, Trat Bay Gulf of Thailand: *a*, lateral view; *b*, tips of some anal-fin rays: two anterior rays with subdistal tabs; two posterior rays without tabs; all four rays with flattened tips (see "Sexual Dimorphism" under *Omobranchus*). (Drawn by J. R. Schroeder.)

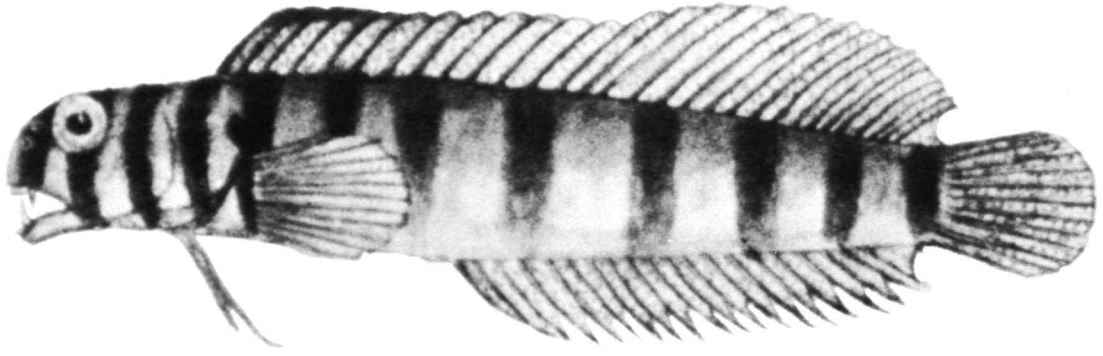

FIGURE 34.—*Omobranchus zebra*, photocopy of unpublished Bleeker color plate representing holotype of *Petroscirtes zebra* Bleeker. (Courtesy of RMNH.)

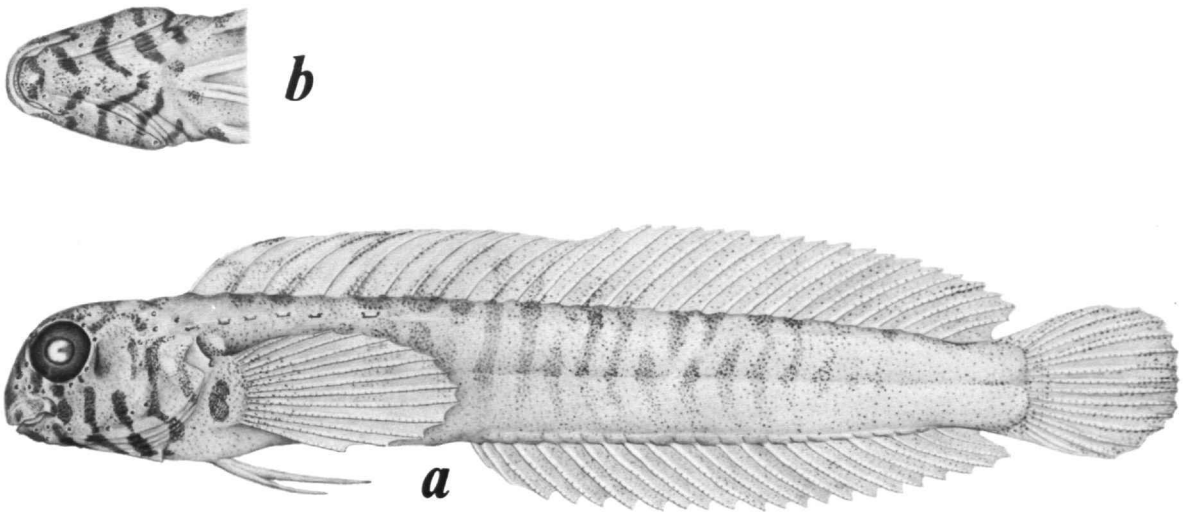

FIGURE 35.—*Omobranchus* species, USNM 211092, male, 22.7 mm SL, Hikkaduwa, Ceylon. (Drawn by J. R. Schroeder.)

Figures 36–52
Graphs

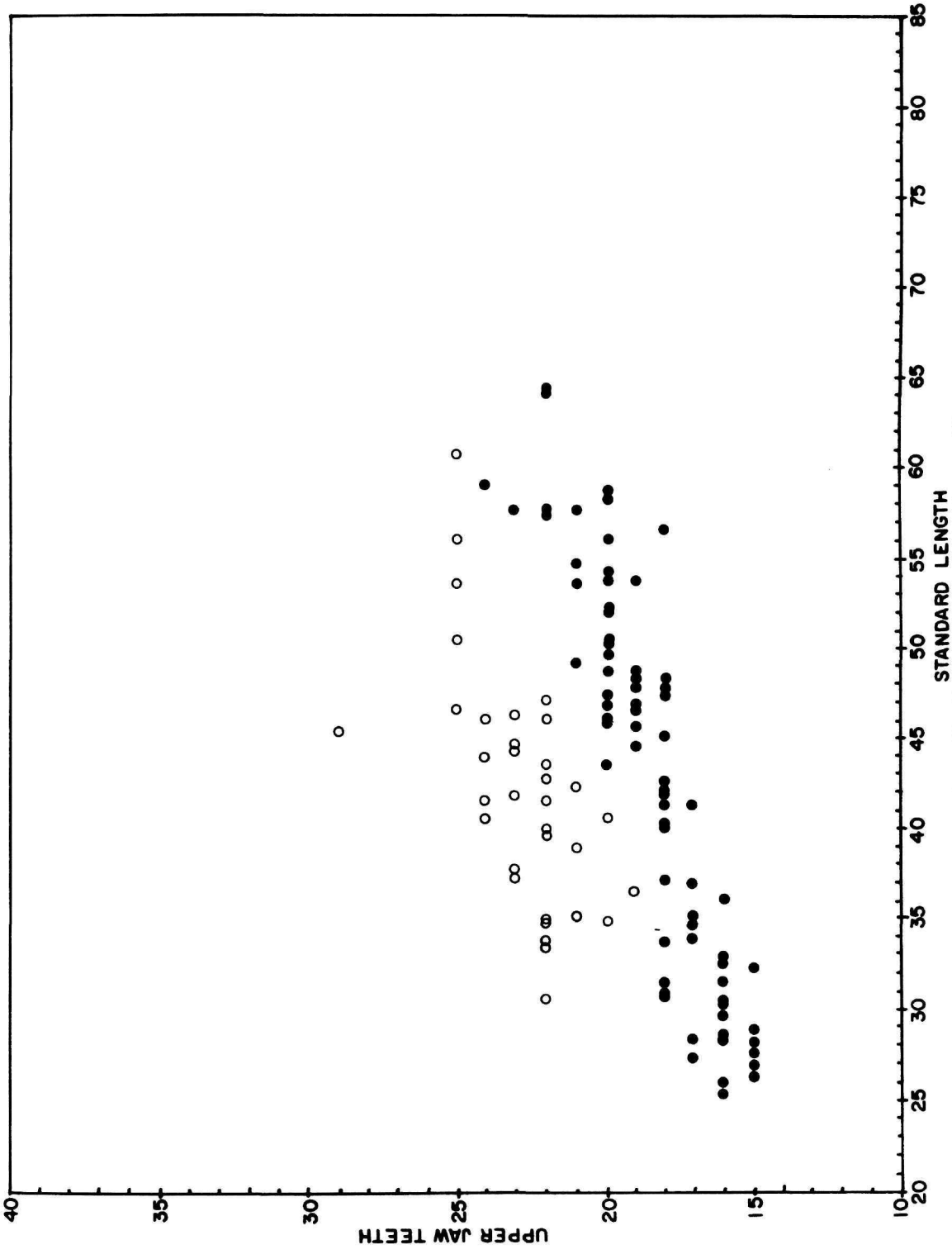

FIGURE 36.—Number of upper jaw teeth versus SL.
○ *Omobranchus anolius* ● *O. elegans*

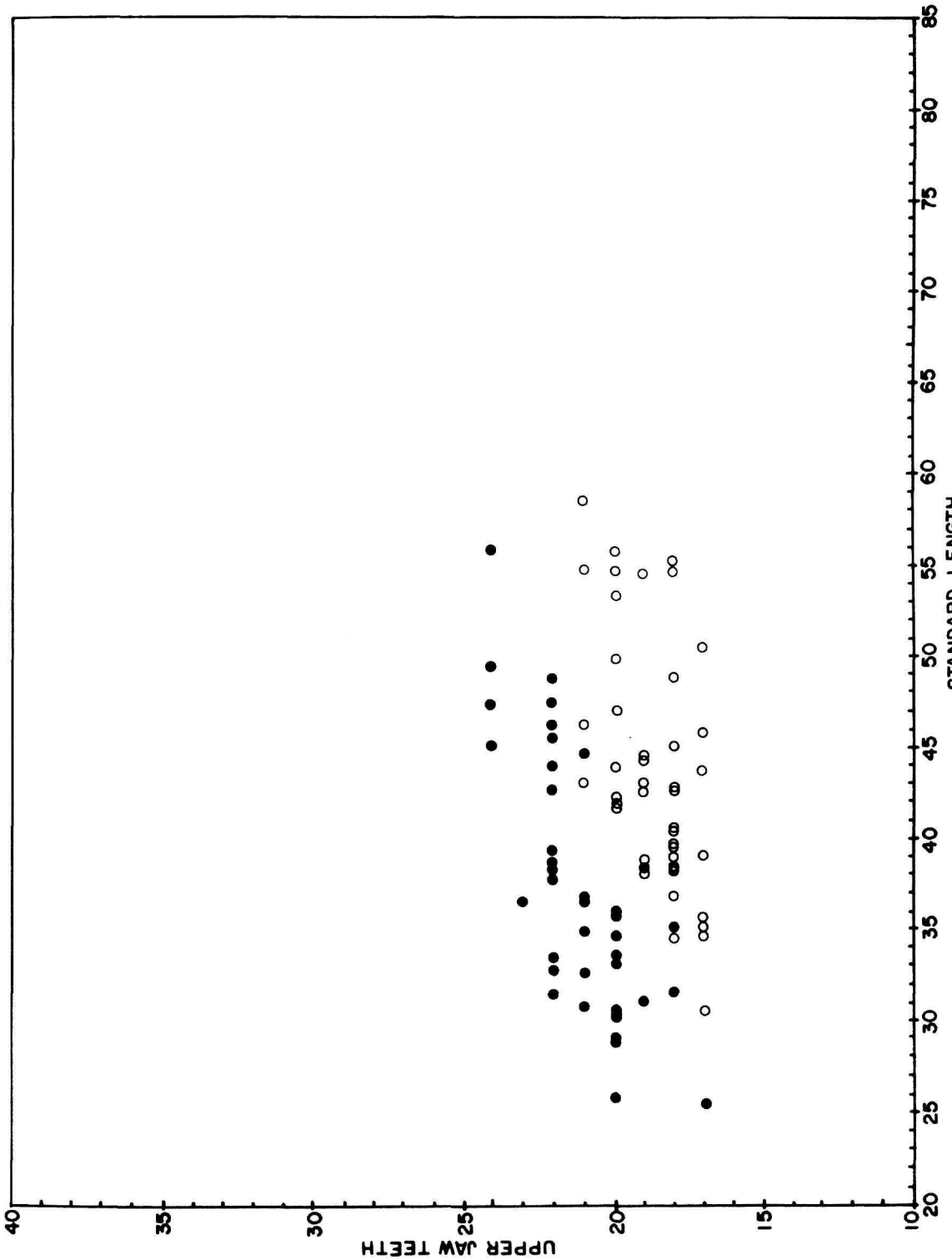

FIGURE 37.—Number of upper jaw teeth versus SL.
● *Omobranchus banditus* ○ *O. ferox*

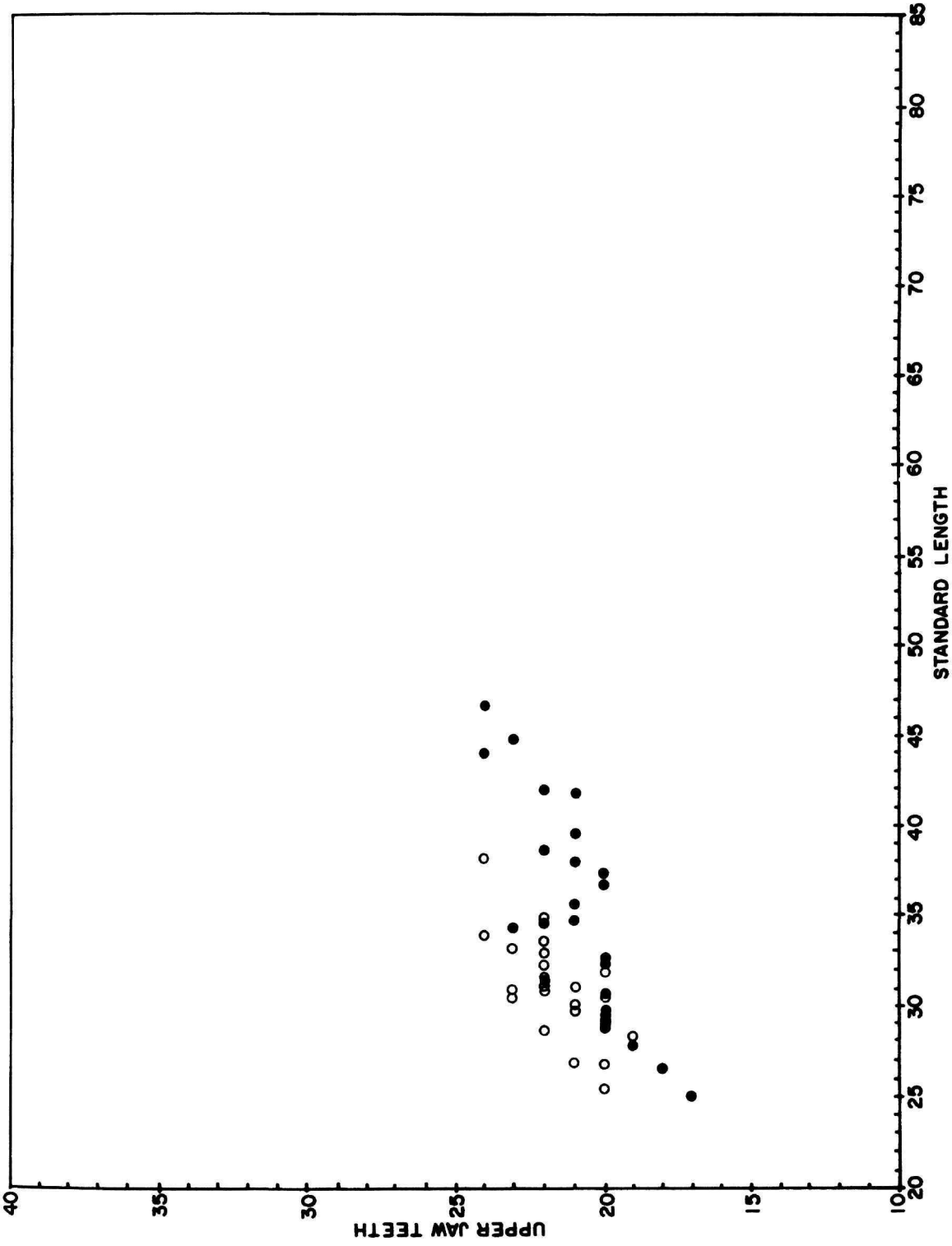

FIGURE 38.—Number of upper jaw teeth versus SL in *Omobranchus elongatus* from the Gulf of Thailand.

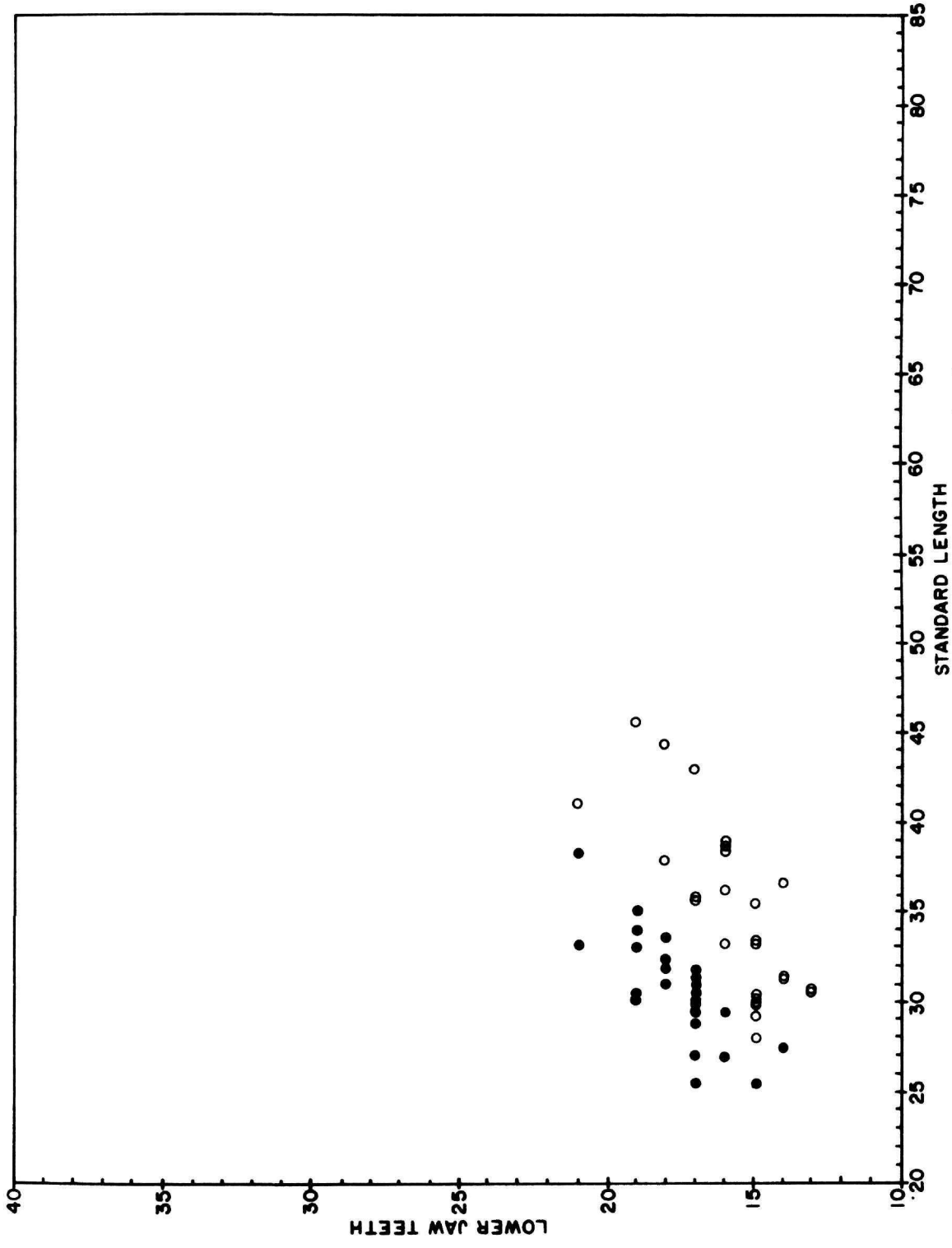

FIGURE 39.—Number of lower jaw teeth versus SL in female *Omobranchus elongatus*.
● Gulf of Thailand ○ Mozambique

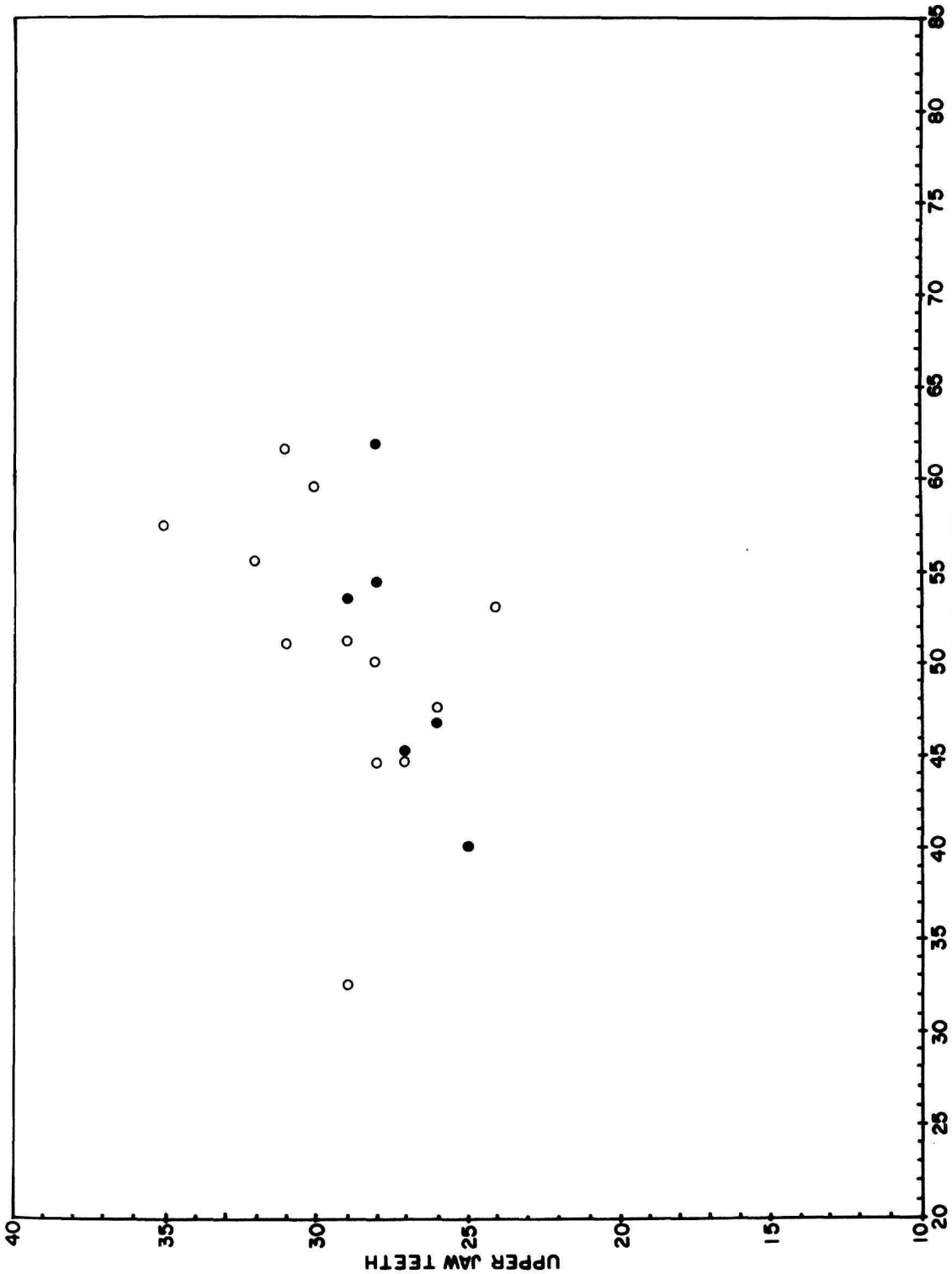

FIGURE 40.—Number of upper jaw teeth versus SL in *Omobranchus fasciolatoceps*.

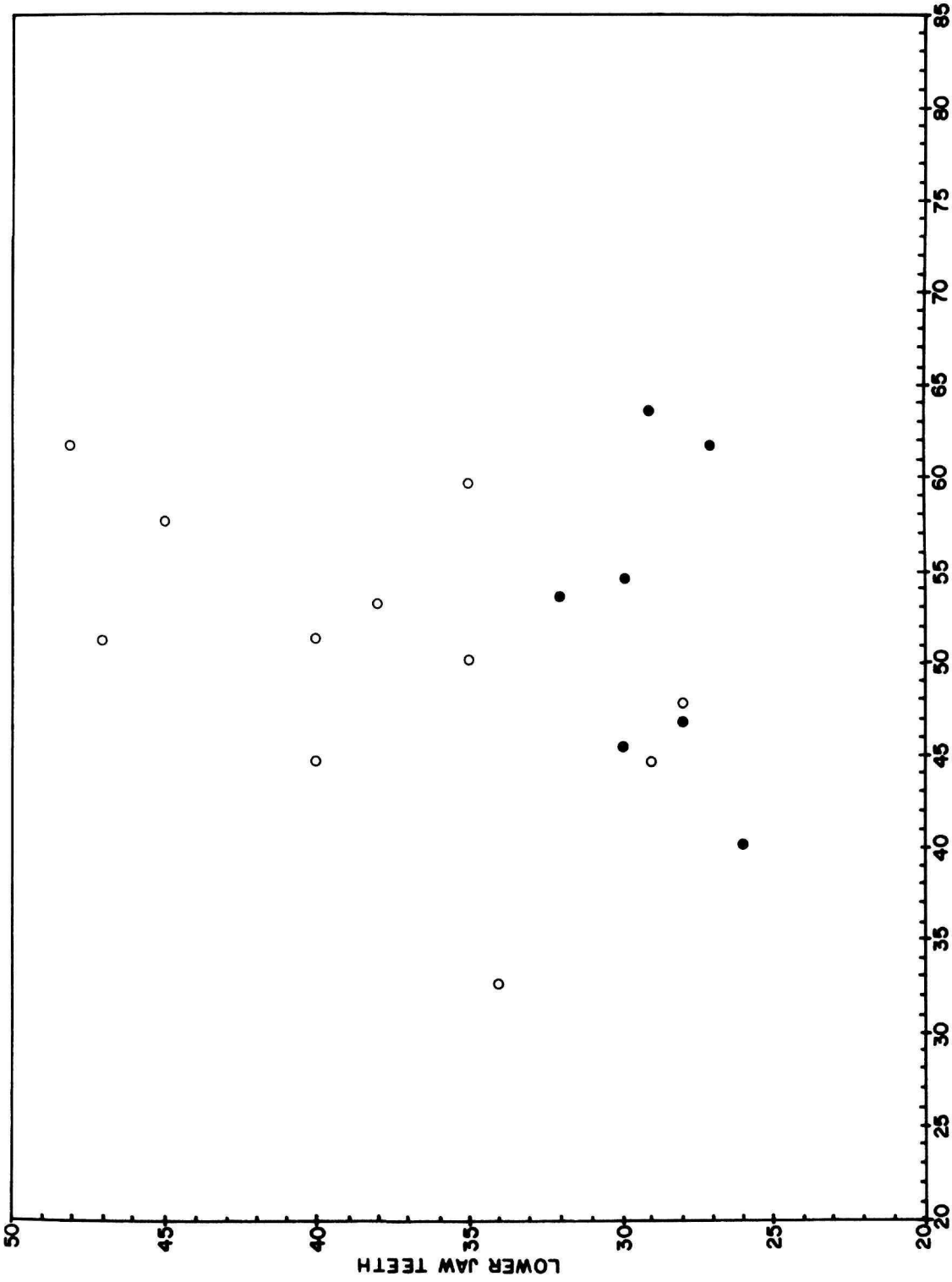

FIGURE 41.—Number of lower jaw teeth versus SL in *Omobranchus fasciolatoceps*.

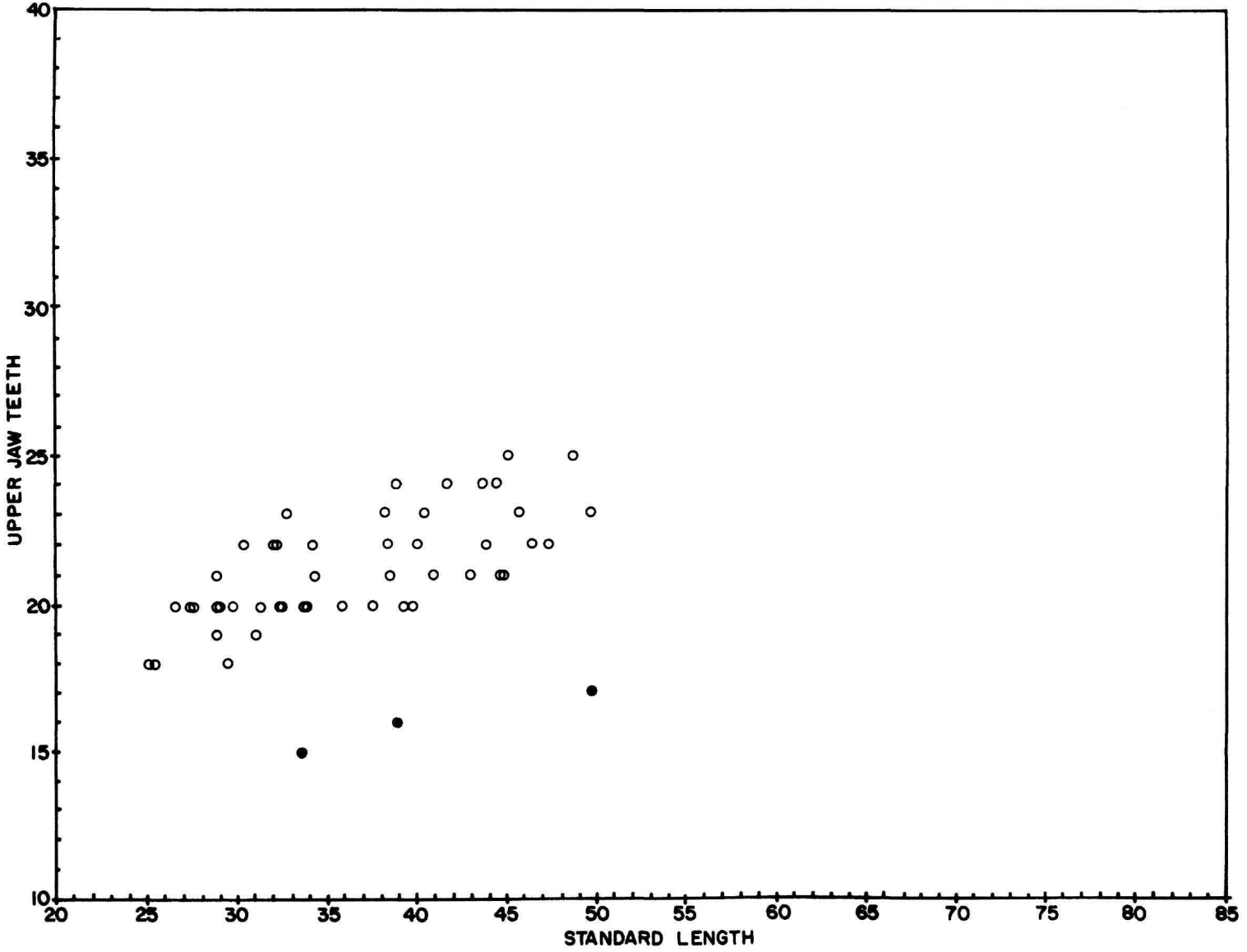

FIGURE 42.—Number of upper jaw teeth versus SL.
○ *Omobranchus fasciolatus* ● *O. verticalis*

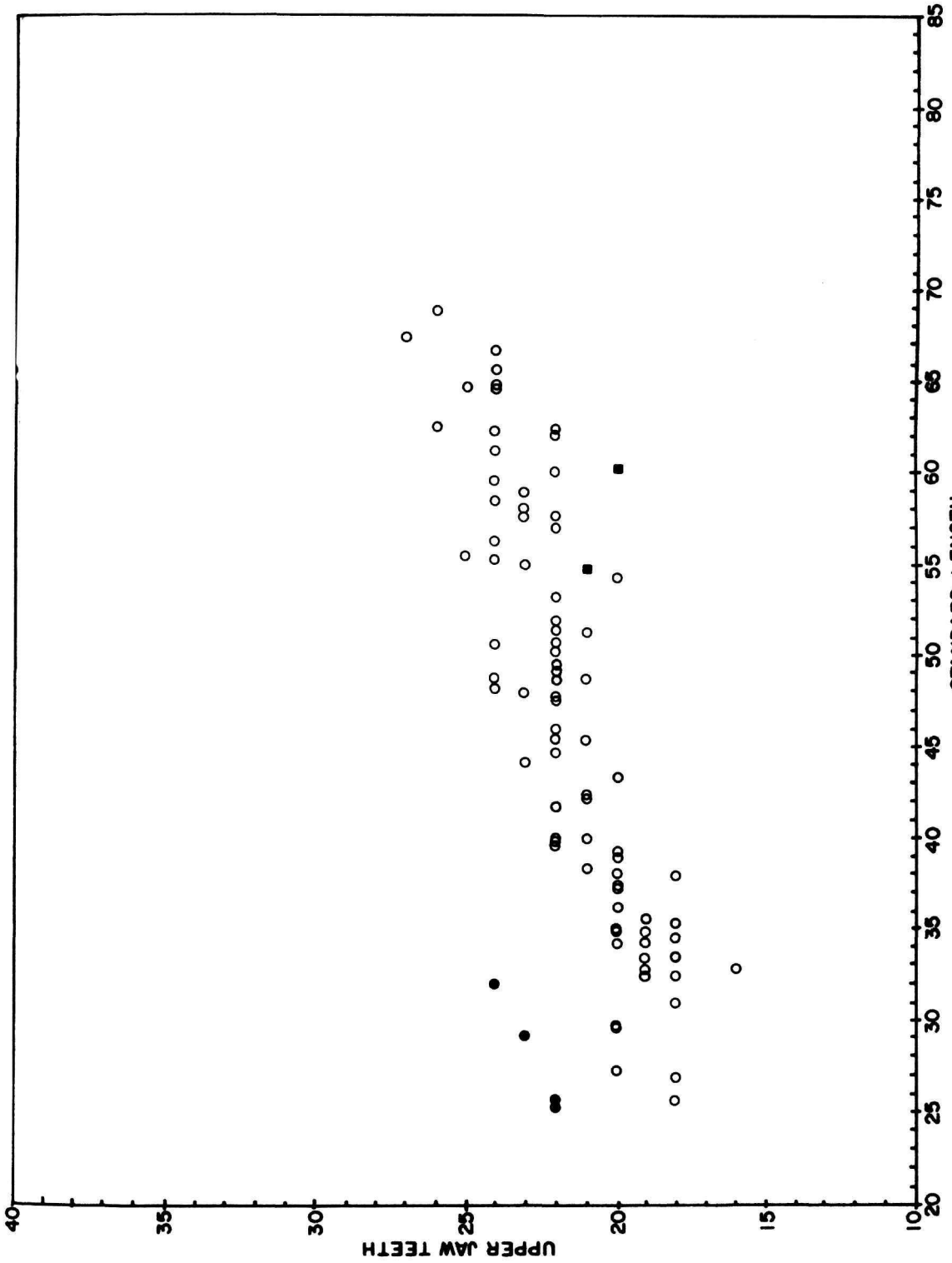

FIGURE 43.—Number of upper jaw teeth versus SL.
○ *Omobranchus loxozonus* ■ *O. meniscus* ● *O. steinitzi*

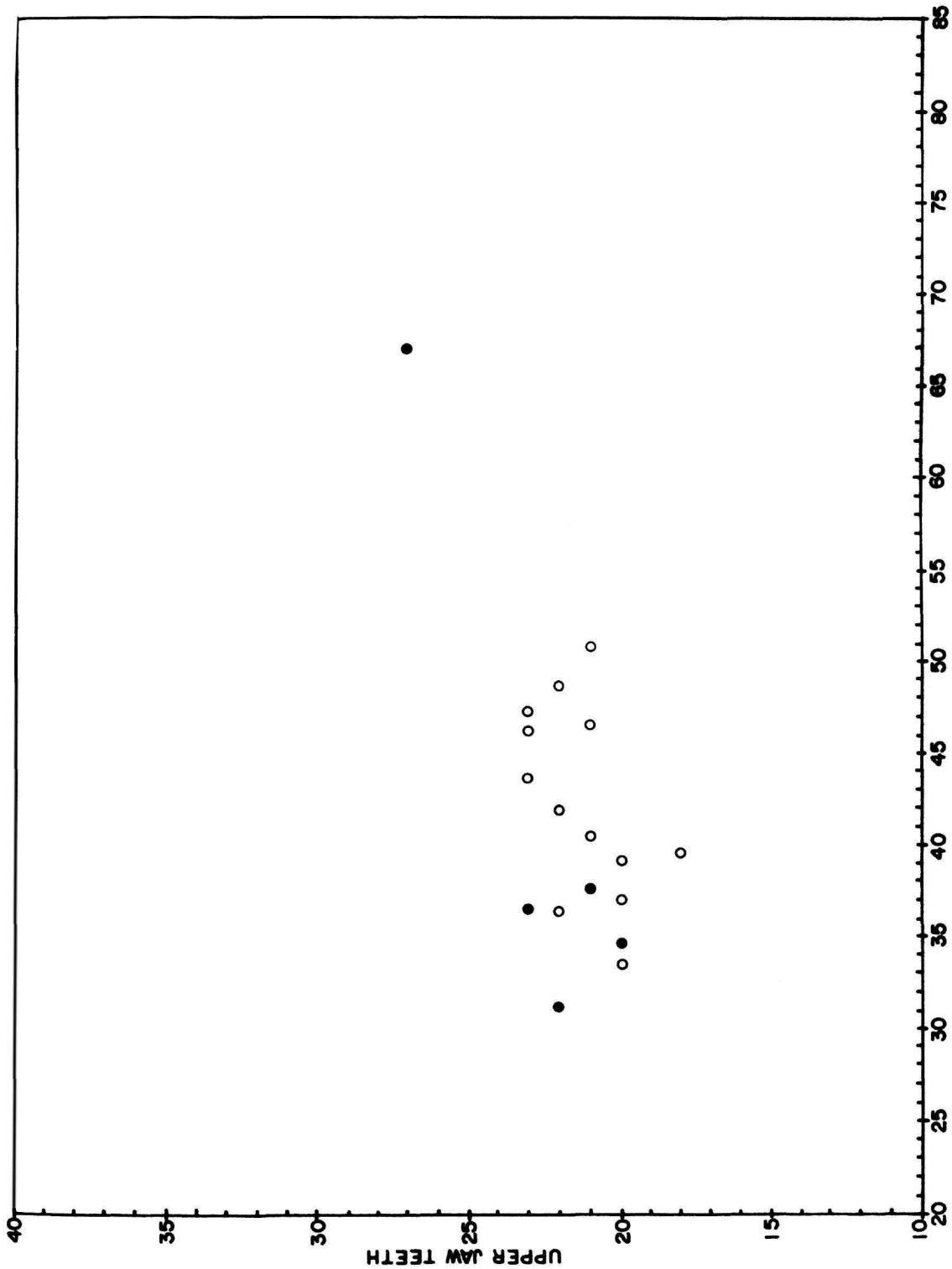

FIGURE 44.—Number of upper jaw teeth versus SL. ● *Omobranchus lineolatus* ○ *O. mekranensis*

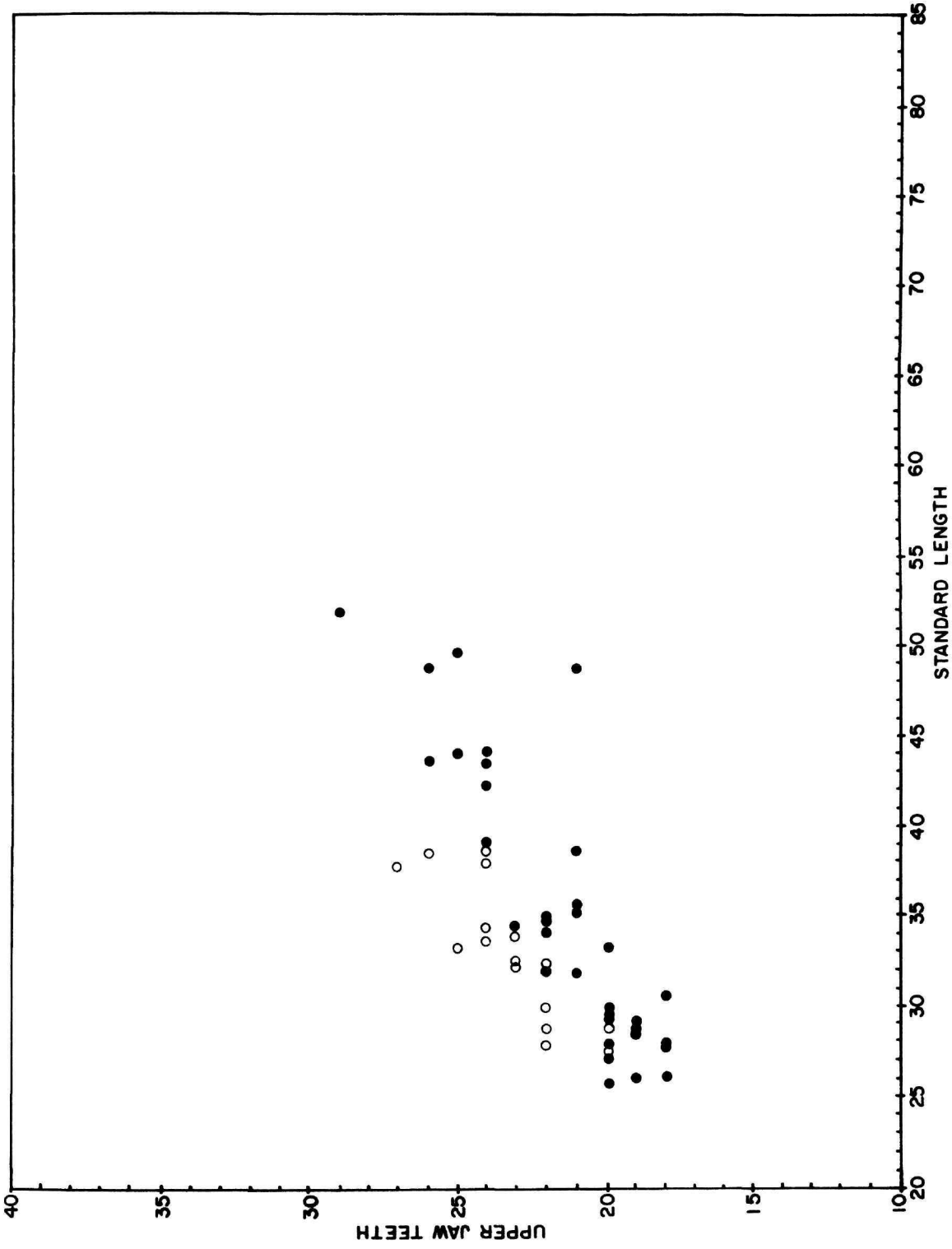

FIGURE 45.—Number of upper jaw teeth versus SL in female *Omobranchus rotundiceps*. ● Northern Territory, Australia ○ Palmyra

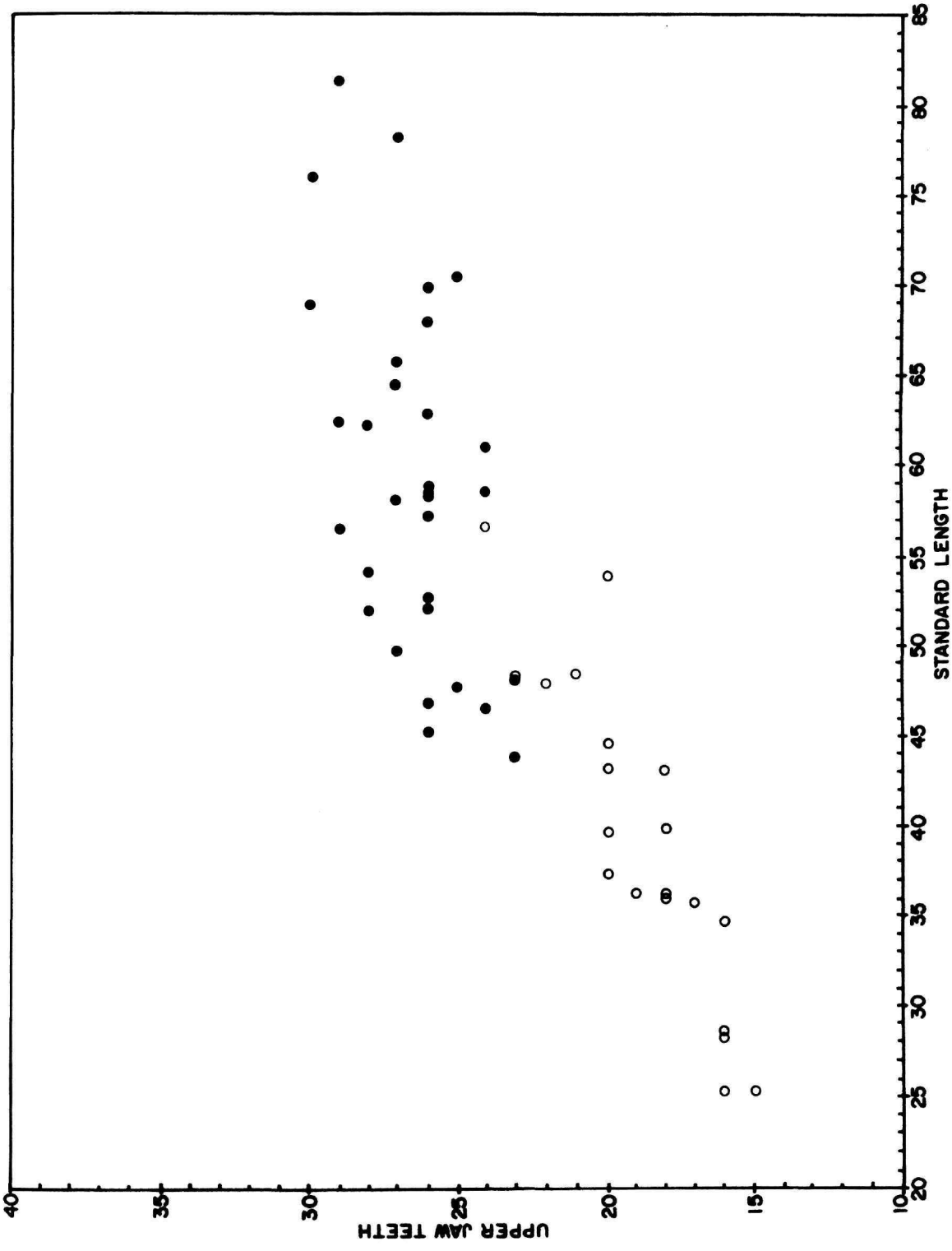

FIGURE 46.—Number of upper jaw teeth versus SL.
● *Omobranchus woodi* ○ *O. zebra*

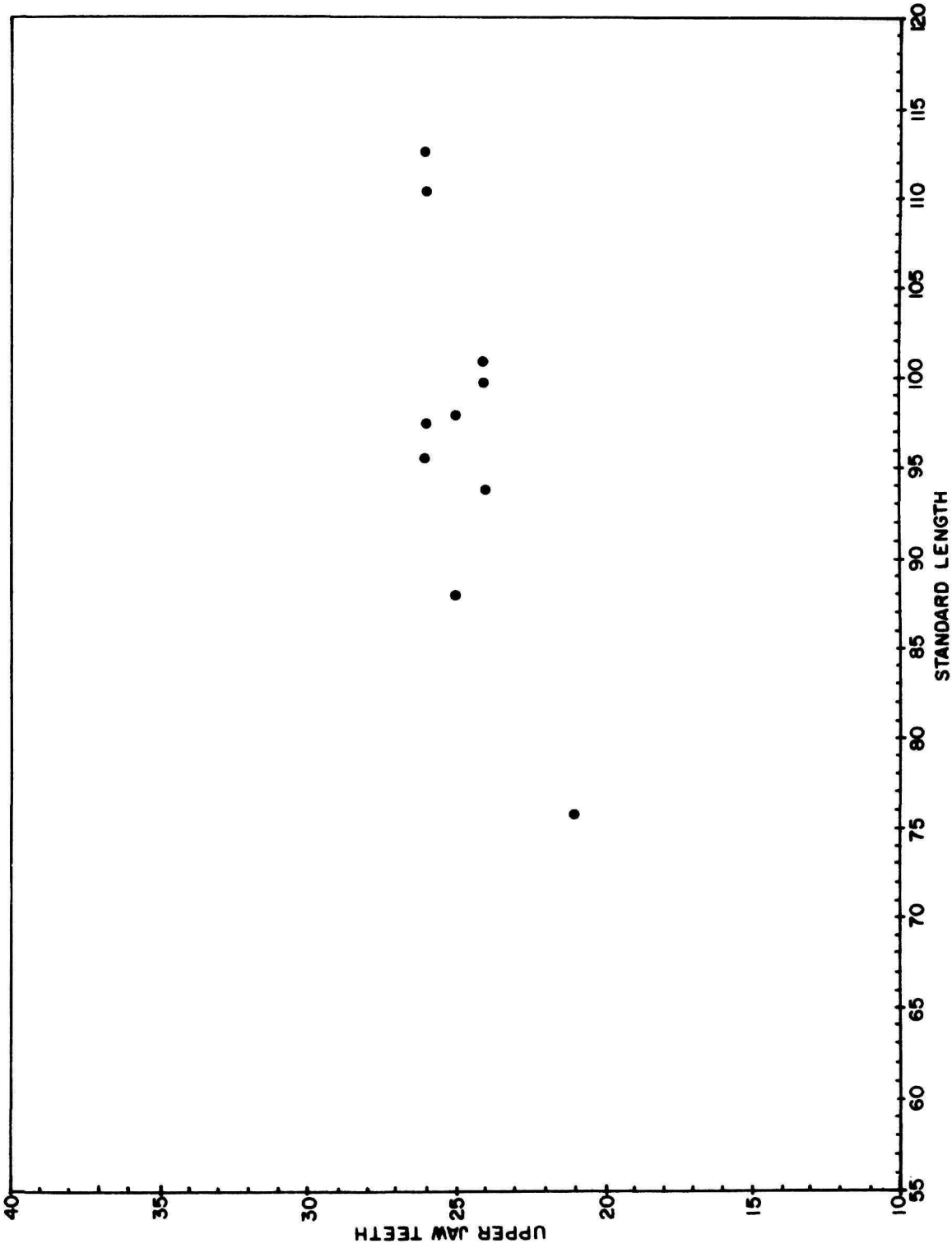

FIGURE 47.—Number of upper jaw teeth versus SL in *Omobranchus aurosplendidus*.

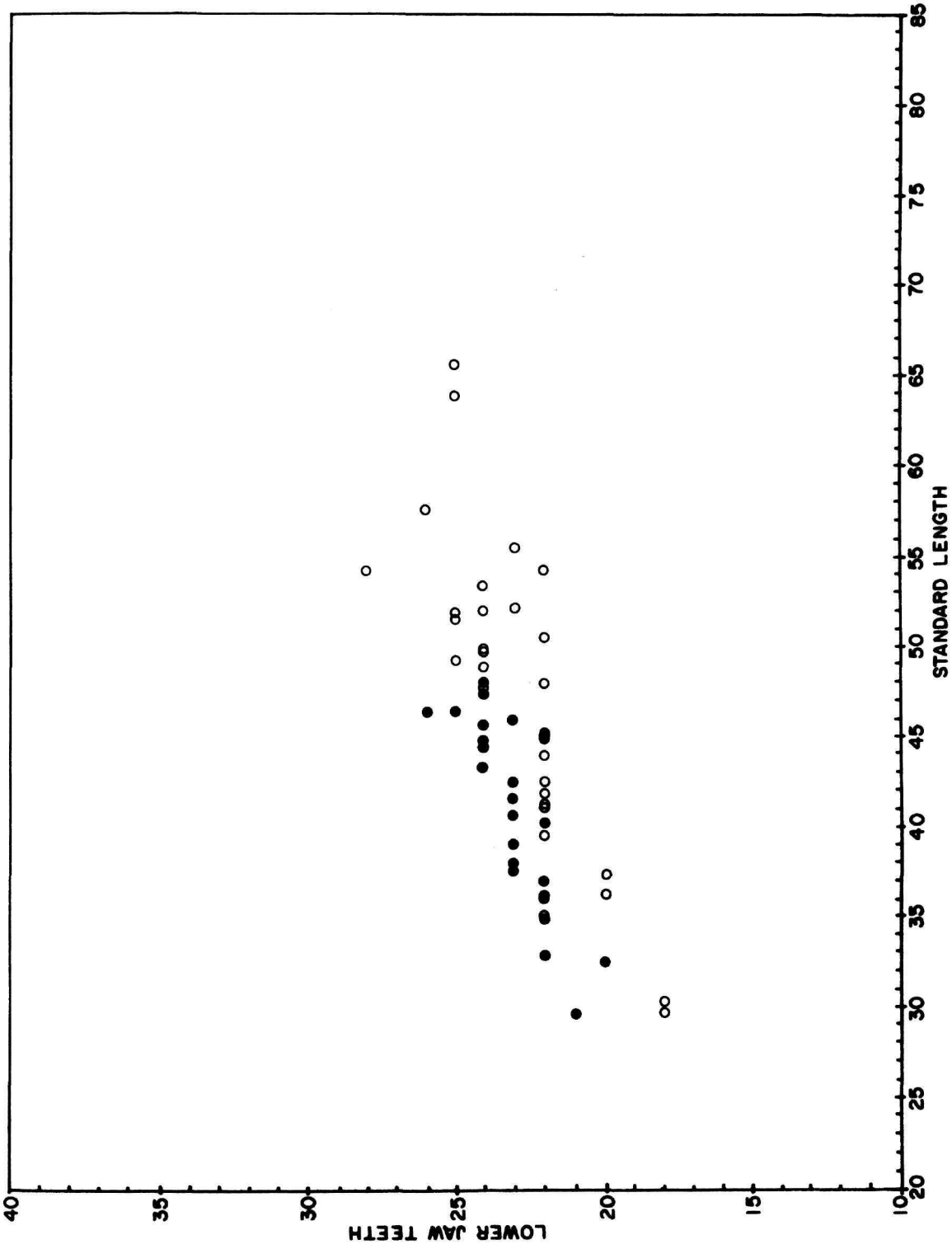

FIGURE 48.—Number of lower jaw teeth versus SL in *Omobranchus germaini* from Queensland.

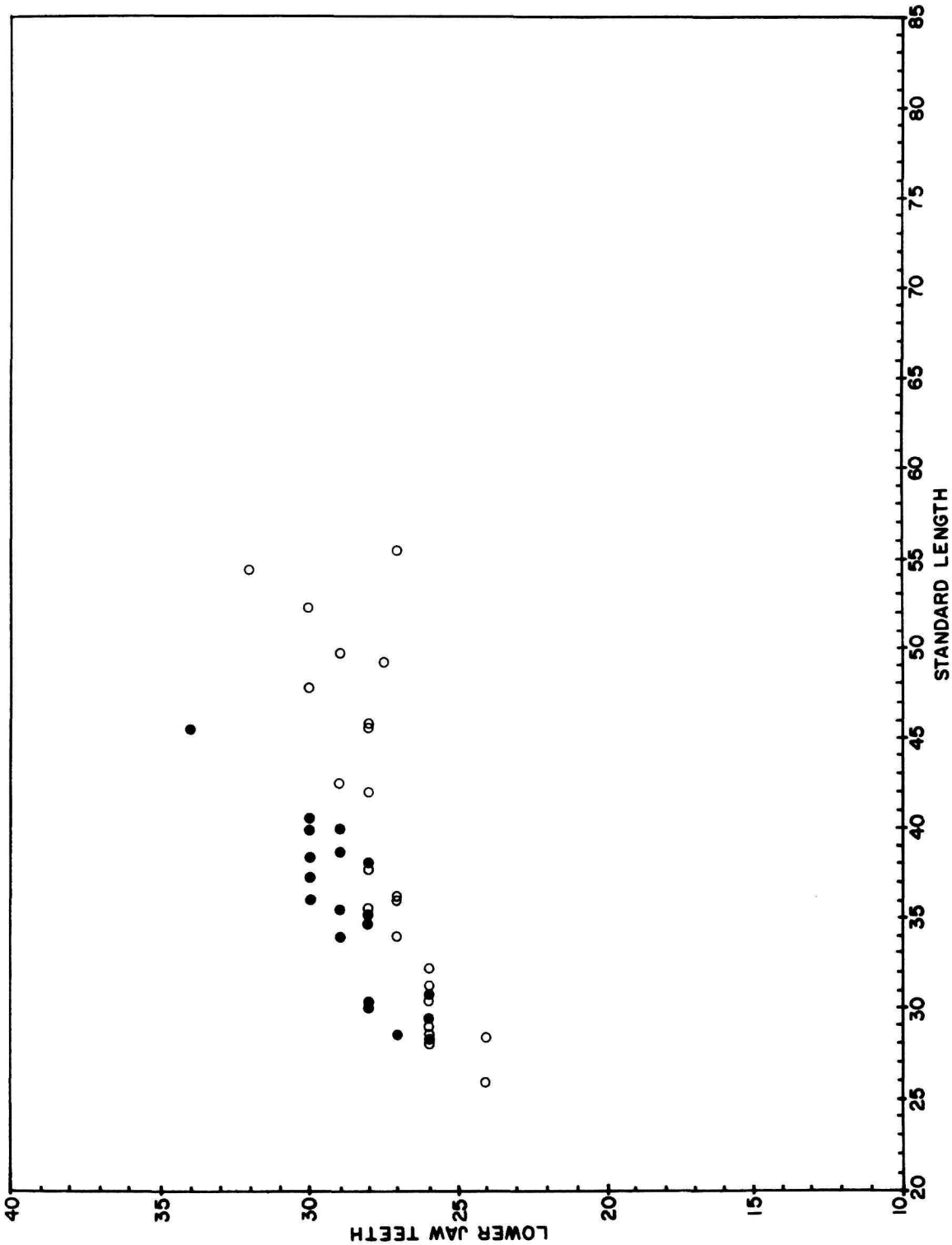

FIGURE 49.—Number of lower jaw teeth versus SL in *Omobranchus punctatus* from Ceylon.
○ male ● female

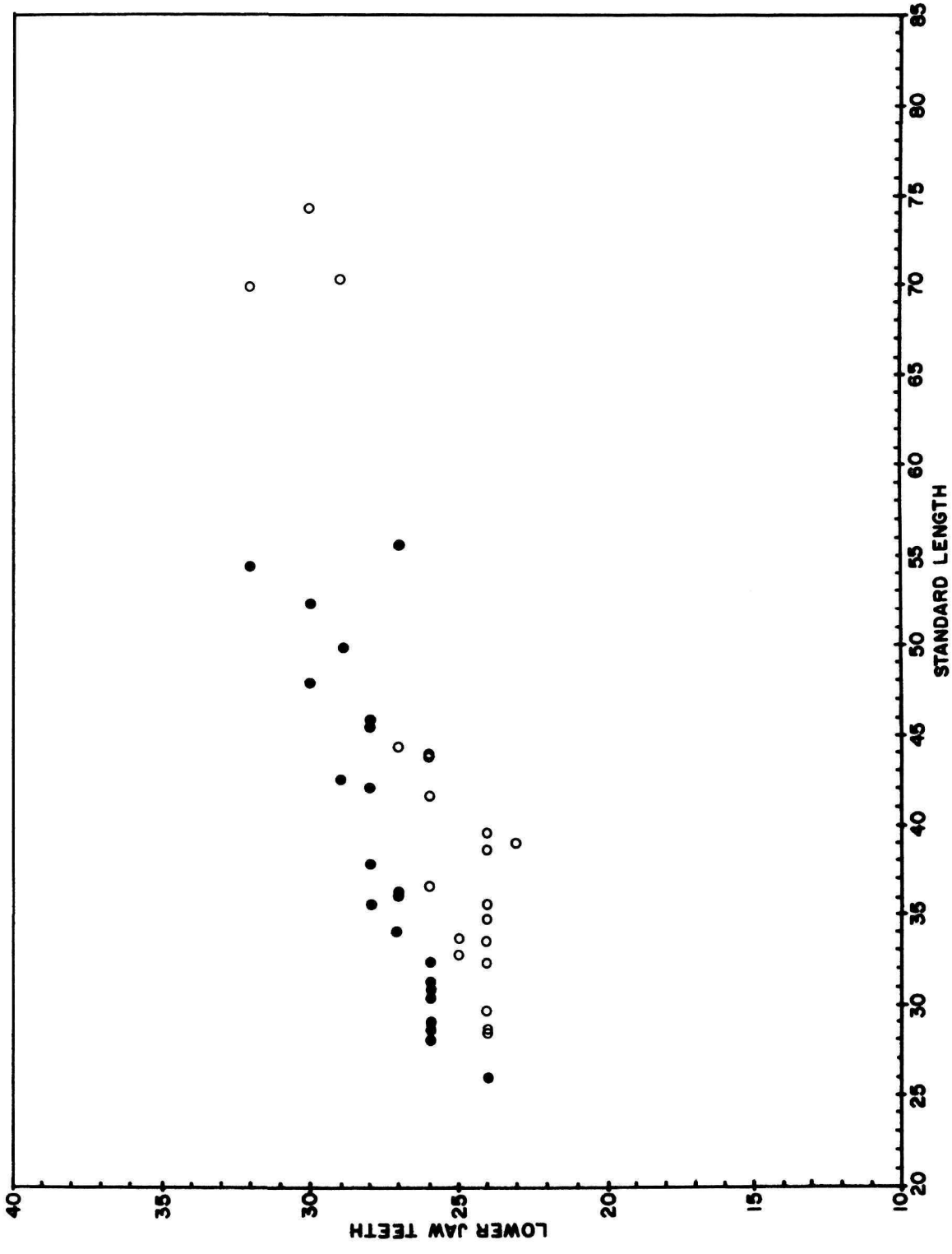

FIGURE 50.—Number of lower jaw teeth versus SL in male *Omobranchus punctatus*.

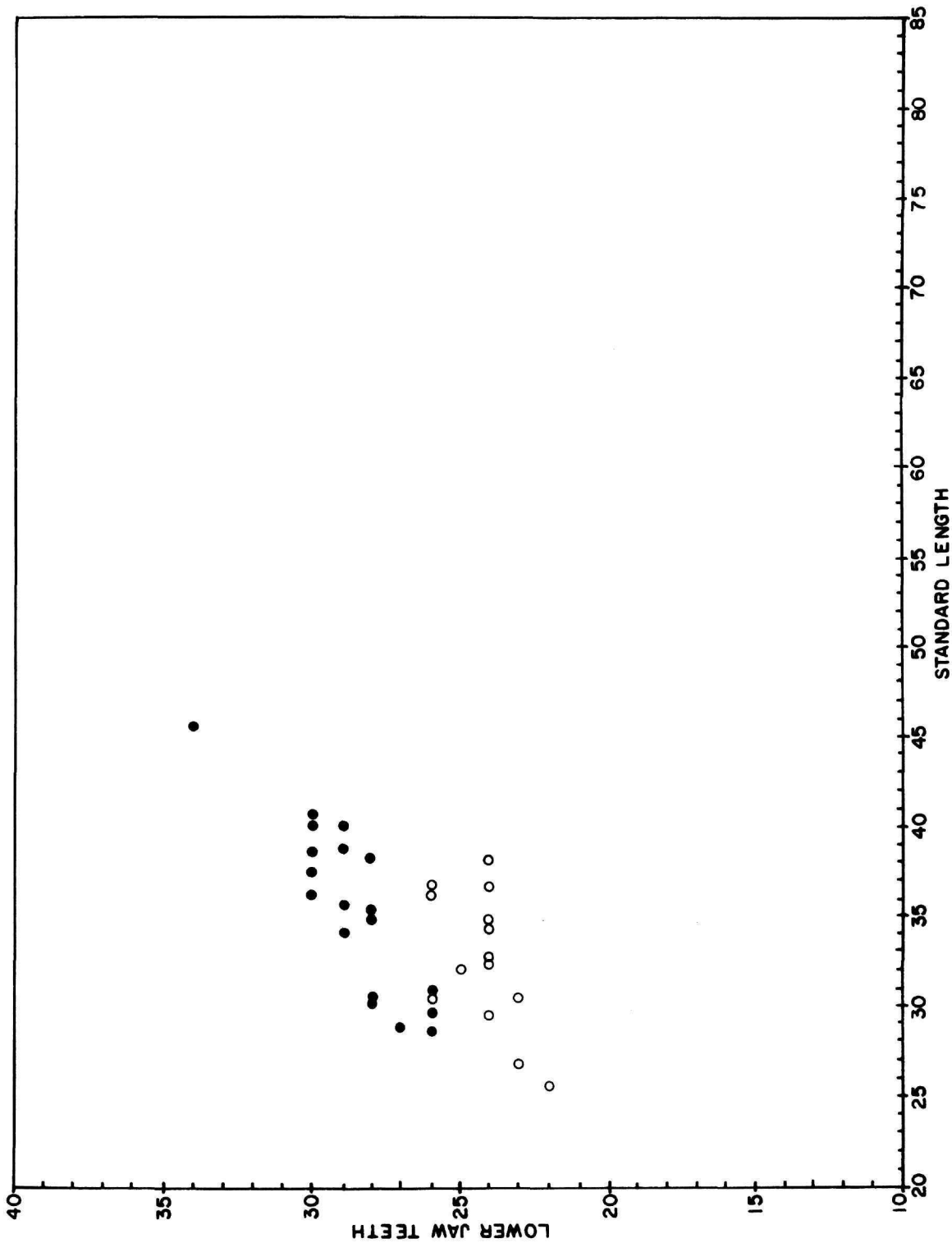

FIGURE 51.—Number of lower jaw teeth versus SL in female *Omobranchus punctatus*.
● Ceylon ○ China

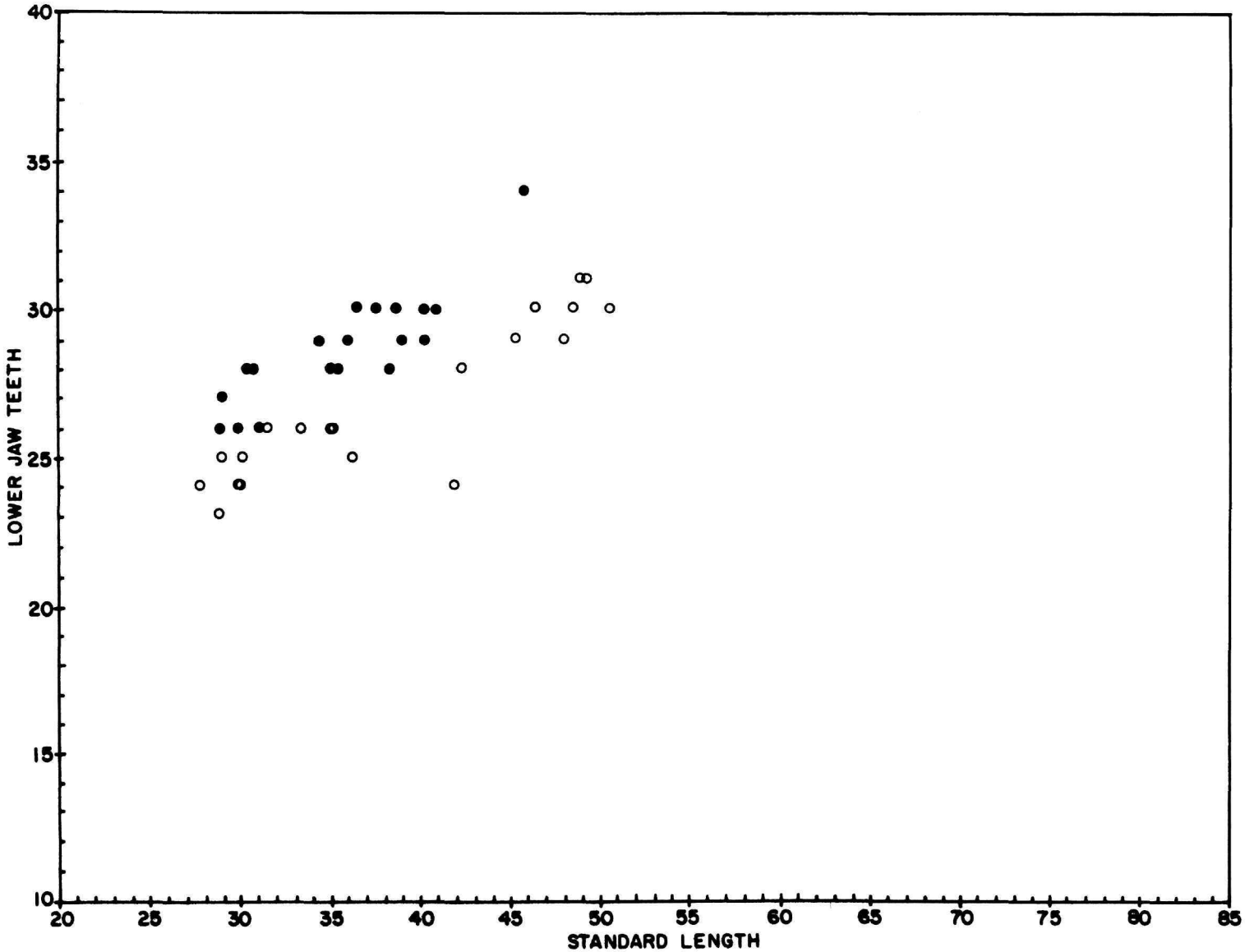

FIGURE 52.—Number of lower jaw teeth versus SL in female *Omobranchus punctatus*.
● Ceylon ○ Gulf of Thailand

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