OSTEEOLOGY AND RELATIONSHIPS OF CERATIOID ANGLERFISHES OF THE FAMILY ONEIRODIDAE, WITH A REVIEW OF THE GENUS ONEIRODES LÜTKEN
Oreodraco echrichtii, type species of the genus Oreodraco, Lütken, 1871.
OSTEOMETRY AND RELATIONSHIPS OF CERATIOID ANGLERFISHES OF THE FAMILY ONEIRODIDAE, WITH A REVIEW OF THE GENUS ONEIRODES LÜTKEN

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OSTEOLOGY AND RELATIONSHIPS OF CERATIOD ANGLERFISHES
OF THE FAMILY ONEIRODIDAE, WITH A REVIEW OF THE
GENUS ONEIRODES LÜTKEN

By Theodore W. Pietsch

ABSTRACT: A detailed osteological description of Oneirodes acanthias is presented as a basis for a comparative osteological study of nine of the 13 genera of the ceratioid family Oneirodidae. The family and the genus Oneirodes are diagnosed and described, and keys to the genera and species of Oneirodes are provided. The genus Oneirodes is reviewed on the basis of personal examination of all known material. Twenty-three species are recognized, seven of which are described as new. Eighteen nominal forms previously placed in the O. eschrichtii-group are considered synonyms of O. eschrichtii. The remaining species of the O. eschrichtii-group, O. bulbosus, O. antacanthus, O. heteronema, and O. theodoritissier are considered valid species of Oneirodes. Oneirodes inimicus is a synonym of O. carlsbergi, and O. thyamophorus is a synonym of O. flagellifer. The O. eschrichtii-group and O. flagellifer-group are not recognized. The O. schmidtii-group, however, is retained to include a number of morphologically similar forms which are clearly differentiated from other species of Oneirodes: O. mirus, O. schmidtii, O. basili, O. theodoritissier, and additional unidentifiable material designated as Oneirodes sp. of O. schmidtii-group. Larvae, metamorphosing and unidentifiable females, and males of all stages of development are listed as Oneirodes sp. Complete annotated synonymies are provided for each species followed by a diagnosis, description, and if known, comments on size at maturity, geographic variation and ontogenetic change.

Patterns of phenetic similarity and phyletic relationship among the nine onirodoid genera examined are deduced on the basis of 30 characters chosen for their intrageneric stability and intergeneric variability. Morphological trends found within and between these genera, and which characterize the evolution of the Oneirodidae, include an elongation and depression of the bones of the jaws, palatine arch, and cranium, accompanied by a shortening of the hyoid arch, a widening and deepening of the illicial trough, and an anterior displacement and flattening of the frontal bones. Lying near the base of these evolutionary trends, Oneirodes is considered to be the least derived member of the group, being most like the ancestral form which gave rise to the Oneirodidae. Danaphryne and Microlophichthys are phylogenetically closely related to Oneirodes. Leptacanthichthys appears to be intermediate between Microlophichthys and Dolophichthys. Bertella and especially Dolophichthys represent the extreme condition in the trends toward elongation and depression of the cranium, facial bones and jaws, and toward the anterior displacement and flattening of the frontal bones. Chaenophryne, Penherichthys, and Laphodolos are each unique in their own way and show little phylogenetic relationship to each other or to any other onirodoid.

Within the genus Oneirodes, O. luetkeni, O. carlsbergi, and O. rosenblatti are considered the least derived members of the group. Species included in the O. schmidtii-group are considered the most derived. The remaining 16 species appear intermediate in specialization and constitute an assemblage of morphologically very similar forms, the inter-relationships of which are difficult to assess.

Oneirodes is distributed in the more productive waters of all three major oceans of the world, between approximately 60° N and 65° S. The members of the genus occupy a wide vertical range between 300 and 3000 meters, but are commonly found between 800 and 1500 meters. Contrary to previous thought, the species are not cosmopolitan, but for the most part restricted

1Editorial Committee for this Bulletin
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2Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts 02138; and Research Associate in Ichthyology, Natural History Museum of Los Angeles County, Los Angeles, California 90007.
INTRODUCTION

Of the 11 families of the lophiiform suborder Ceratioidei (Pietsch, 1972a:18), the family Oneirodidae is the largest and most diverse, consisting of 13 genera and nearly 50 species, more than half of all described ceratioids. The systematic history of the Oneirodidae begins with Lütken’s (1871, 1872) description of a deep-sea anglerfish, collected from the west coast of Greenland, which he called Oneirodes eschrichtii. Since that time, and despite Lütken’s detailed and accurate original description, the systematics of the genus has been confusing. Part of this confusion can be traced to an early failure to distinguish between Oneirodes and Dolopichthys Garman, 1899. While maintaining Oneirodes as a monotypic genus, Regan and Trewavas (1932) provisionally recognized 43 species of Dolopichthys, 28 of which were described as new. These were distributed among five subgenera: Dermatias, Microlophichthys, Dolopichthys, Leptacanthichthys and Penherichthys. Within their subgenus Dermatias, Regan and Trewavas (1932) included 29 species, 18 of which were represented by only one or two adolescent female specimens less than 30 mm in standard length. Bertelsen (1951) amended this situation by placing the subgenus Dermatias in synonymy with Oneirodes and elevating the remaining four subgenera to generic status. Within the newly defined genus Oneirodes, Bertelsen (1951) listed 33 species, 28 of which were divided among three species groups. Within each of these groups “the separation of species is based on small details in the number, form and relative size of the esca appendages. These differences are almost of the same dimensions as the individual and ontogenetic variation we find within well-defined species. Only 4 of the 28 species I place in these 3 groups are based on more than 1 specimen and none on more than 4. The esca of the few specimens referred to the same species show differences, which do not seem essentially smaller than those used in the separation of the remaining species within the same group. As it is possible that each of the 3 groups embraces some few species, they may be designated, until closer examination of a larger material has been made, as respectively: the Oneirodes eschrichtii-, flagellifer- and schmidtii-groups.” (Bertelsen, 1951:77.)

Since the publication of Bertelsen’s (1951) monograph on the Ceratioidei the number of known female specimens of the genus Oneirodes has increased more than six-fold. This increase in material has made possible the following detailed revision of the group based on personal examination of the approximately 450 known metamorphosed male and female specimens of Oneirodes, including all type material. The work attempts to attain the following objectives: 1) to describe and compare osteological variation within the genus Oneirodes and the family Oneirodidae, and to thus broaden and establish definitions for the taxa; 2) to determine how many forms comprise the genus Onei-
rodes; 3) to determine how the many morphologically similar species of the genus may be best differentiated; 4) to describe geographical variation and ontogenetic change within the species; 5) to determine phenoetic similarities and phylogenetic relationships among oneirodoid genera and Oneirodes species; 6) to examine the geographic distribution of Oneirodes species relative to physico-chemically defined oceanic water masses; and 7) to consider the structure and function of the ceratoïd esca.

In spite of the increase in material, the systematics of Oneirodes is by no means complete. The separation of species is based on few characters, the most important being the morphology of the esca. Specimens with damaged or lost esca are particularly difficult and sometimes impossible to identify. Characters that allow specific identification of males have not been found, thus species definitions are based solely on females. Even as here restricted, Oneirodes is by far the largest of the 33 ceratoïd genera, including a quarter of all known ceratoïd species; yet, new forms remain to be described when adequate material becomes available and the discovery of numerous additional species is predicted.

**METHODS AND MATERIALS**

Standard lengths (SL) were used throughout, unless otherwise indicated. Measurements were taken from the left side whenever possible and rounded to the nearest 0.5 mm in specimens greater than 20 mm, and to the nearest 0.1 mm in specimens less than 20 mm. The range of variation for measurements was expressed in percent of SL within parentheses preceded by the mean. To insure accurate fin-ray counts, skin was removed from the pectoral fins and incisions were made in the skin to reveal the rays of the dorsal and anal fins. Sockets, indicating missing teeth in the jaws and on the vomer, were included in total tooth counts. Jaw-tooth counts are the sum of both left and right sides. Head length is the distance from the anterior tip of the upper jaw to the posterior-most margin of the preoperculum. Head width is the distance between the tips of the sphenotic spines. Head depth is the distance from the tip of the sphenotic spine to the base of the quadrate spine. Lower-jaw length is the distance from the symphysial spine to the posterior-most margin of the articular. Ilicium length is the distance from the articulation of the pterygiophore of the illicium and the illicial bone to the dorsal surface of the esca bulb, not including escal appendages. The ratio of the lengths of the upper and lower forks of the operculum is obtained by dividing the length of the lower fork of the bone by the length of the upper fork. Terminology used in describing the various appendages and filaments of the esca are given in the generic description, p. 35. Terminology used in describing the various parts of the angling apparatus follows Bradbury (1967). Definitions of terms used for the different stages of development follow Bertelsen (1951). Computation of statistics describing regressions was performed at the Natural History Museum of Los Angeles County on a General Electric time-share terminal on General Electric Mark II computer services. Drawings are by the author unless otherwise indicated, and were made with the aid of a Wild M-5 Camera Lucida except where noted.

Under the description of new species and in Appendix A, locality data are presented for all specimens examined. Complete data for DANA stations are given for type material only. For nontype material the reader is referred to Schmidt (1929) and Carlsberg Foundation (1934). Coordinates for the starting position only of each trawl are included. Most collections were made with a 10-foot Isaacs-Kidd midwater trawl (IKMT). Material deposited at the Institut für Seefischerei, Hamburg, was collected with a Combined Midwater Bottom Trawl, having a rectangular mouth and a 1600 mesh circumference (CMBT-1600). This and similar gear are described more fully by Schärfe (1966, 1969). Material from the National Institute of Oceanography, Surrey, England, was collected with a Rectangular Midwater Trawl, mouth area eight square meters, mesh size five millimeters (RMT 8/5), equipped with an opening and closing device (Clarke, 1969).

Since nearly all the available collections of Oneirodes were made with nonclosing nets the actual depth of capture is unknown. For those species represented by sufficient material, vertical distributions were analyzed by a procedure similar to that used by William H. Krueger (unpublished manuscript) for determining depths of capture of Idiacanthus, and outlined by Gibbs (1969). Data were used from expeditions from which all specimens of any species were examined, and only those stations within the known geographical range of a species were used. No separation of daytime and night tows was made. Station data were taken from Schmidt (1929), Carlsberg Foundation (1934), and unpublished data for VELERO IV cruises of the University of Southern California. For each trawl, the number of hours at depth was multiplied by the area of the mouth of the net. The number
of meter-hours for each depth interval, and the number of specimens caught at each depth interval were tabulated and expressed as a percentage of total for comparison. When the percentage of specimens caught at any depth is considerably greater than the percentage of meter-hours at that depth, it may be assumed that this represents a region of concentration. The reverse indicates that specimens recorded for that depth probably were caught while the net was being lowered or raised.

Vertical distributions of poorly represented species, for which an analytic treatment of the non-closing-net data was impossible, are based on the maximum depths reached by fishing gear for each capture.

Material used for the comparative osteological investigation was cleared and stained with alizarin red S following the trypsin digestion technique (Taylor, W., 1967). In many cases dissections were made of uncleared specimens to confirm observations made on cleared and stained specimens and to determine ontogenetic changes. All osteological material examined is listed by family in Appendix B with the exception of lophiform material previously listed by Pietsch (1972a). The formal classification follows that of Greenwood et al. (1966). Bone terminology follows Pietsch (1972a) and Nybelin (1963). In osteological drawings cartilage is stippled, and where necessary for clarity, open spaces are rendered in solid black.

The generic diagnosis and description of Oneirodes were based on 419 metamorphosed female specimens, ranging in size from 10.0 to 213.0 mm, and 35 metamorphosed males, 7.5 to 16.5 mm. Material examined is deposited in the following museums and institutions:

BOC: Bingham Oceanographic Collections, Peabody Museum of Natural History, Yale University.
BMNH: British Museum (Natural History), London.
CAS: California Academy of Sciences, San Francisco.
IFAN: Institut Français d’Afrique Noire, Senegal.
IOM: Institute of Oceanography, Academy of Sciences of the USSR, Moscow.
ISH: Institut für Seefischerei, Hamburg.
LACM: Natural History Museum of Los Angeles County.
MCZ: Museum of Comparative Zoology, Harvard University.
MHLR: Musée d’Histoire Naturelle de La Rochelle.
MMF: Museu Municipal do Funchal, Madeira.
NMFS: National Marine Fisheries Service, Fishery-Oceanography Center, La Jolla.
NMI: National Museum of Ireland, Dublin.
OSUO: Oregon State University, Department of Oceanography.
ROM: Royal Ontario Museum, Toronto.
SIO: Scripps Institution of Oceanography, La Jolla.
UBC: University of British Columbia, Institute of Fisheries, Vancouver.
UMML: University of Miami Marine Laboratory.
ZIL: Zoological Institute, Academy of Sciences of the USSR, Leningrad.
ZMUC: Zoological Museum, University of Copenhagen.

**OSTEOLOGY**

Osteology of Oneirodes acanthias

Craniun

Figs. 1-7

Ethmoid cartilage: (Figs. 1-4): The ethmoid cartilage of O. acanthias consists of a thick plate which broadly covers the dorsal surface of the vomer and the anterior tip of the parasphenoid. Anteromedially, the concave, dorsal surface of the cartilage forms a shelf upon which rides the symphysial cartilage (rostral cartilage of Gregory, 1933) of the upper jaw. The lateral faces of the posterior half of the ethmoid cartilage are concave and form the articular facets for the palatines. Immediately posterior to these articular facets the cartilage is covered by the anterolateral tips of the frontals. Posteriorly, the ethmoid cartilage trifurcates, remaining continuous laterally with the anterior ends of the lateral ethmoids and medially with the supraethmoid to form the nasal septum. Posteromedially, the space formed by the supraethmoid, the ventromedial margins of the frontals, the prootics, and the dorsal surface of the parasphenoid is free of cartilage, except for a narrow, dorsally-directed, posteromedial extension of the ethmoid cartilage which meets with ventromedial extensions of the frontals, and the posterior margin of the supraethmoid.

Supraethmoid and lateral ethmoids (Figs. 1-4, 6): Anteriorly, the ventromedial process of the T-shaped supraethmoid, together with the lateral ethmoids and concave, dorsal surface of the ethmoid cartilage, form large, nearly circular nasal foramina. The semicircular, posterior margin of the supraethmoid is bordered on each side by the anterior ventromedial extensions of the frontals (see below, p. 6).

A strong ethnomaxillary ligament originates on each anterolateral corner of the supraethmoid and inserts on the dorsal process of the respective maxillary bone.
Vomer (Figs. 2-4): The vomer consists of a broad, anterior head which lies ventral to the ethmoid cartilage and a posteromedial shaft which lies ventral to the anterior tip of the parascaphoid. Anteriorly, the vomer becomes thickened and forms an ascending process which cups the ethmoid cartilage. The ventral surface of the vomer of osteological preparations of *O. acanthias* examined bear as many as four, recurved and depressible teeth arranged in a transverse row on each side.

Frontals (Figs. 1-4, 6): The frontals are sep-
Figure 3. Ventral view of cranium of *Oneirodes acanthias* with anterior portions of premaxillary and maxillary bones of left side in place.

rated, approaching each other only at their ventromedial extensions. Each frontal has an anterior, ventromedial extension which meets the postero-dorsal process of the ethmoid cartilage, and a posterior ventromedial extension which is in contact with the parasphenoid anteriorly, and separated by cartilage from an anterior projection of the supraoccipital bone posteriorly.

Each frontal is deeply notched anteriorly forming a lateral fork which overlaps the lateral ethmoid and ethmoid cartilage, and a much narrower medial fork which extends nearly to the anterior limits of the ethmoid cartilage.

Parietales (Figs. 1-2): The thin, weakly ossified parietals make up a considerable portion of the dorsal surface of the cranium. Their medial margins dip slightly, overlap the supraoccipital and epiotic, and contribute to the relatively shallow posterior half of the trough in which lies the pterygophore of the illicium. The posterolateral corner of each parietal is sharply bent downward where it overlaps the pterotic laterally and borders on the posttemporal posteriorly. A narrow anterior process of each parietal overlaps the posterior one-third of the frontal, and a shorter, lateral extension overlaps the sphenotic.

Pterosphenoids (Figs. 1-3, 6): The pterosphenoids of *O. acanthias* are semicircular in shape and lie ventral to the posterior ends of the frontals. The curved, lateral margin of each pterosphenoid is separated by cartilage posteriorly from the respective sphenotic and prootic.

Orbitosphenoid and basi-phenoid: The orbitosphenoid and basisphenoid are absent in all Lophiiformes.

Parasphenoid (Figs. 2-3): The parasphenoid underlies the vomer and ethmoid cartilage anteriorly and the anterior one-half of the basioccipital posteriorly. Medially, each stout, posteriorly directed, dorsolateral wing of the parasphenoid is in contact laterally with the posterior, ventromedial
extension of the respective frontal, an anterior process of the supraoccipital, and the respective prootic.

Sphenotics (Figs. 1-3, 6): Each sphenotic is a posterodorsally directed, cone-shaped element, the apex of which forms a well-developed spine. Posterolaterally, the sphenotic is overlapped by a large, anterodorsal process of the respective pterotic, dorsally, by a lateral extension of the respective parietal, and anterolaterally by the posterior end of the respective frontal.

Pterotics (Figs. 1-3, 6): A large, anterodorsally directed extension of the pterotic overlaps the posterolateral surface of the sphenotic, reaching nearly to the base of the sphenotic spine. Posteri- orly, the pterotic is overlapped to a considerable extent by the respective posttemporal. A facet for the articulation of the posterior head of the double-headed hyomandibular bone is located on the ventrolateral surface of each pterotic.

Epiotics (Figs. 1-2, 5): The epiotics lie completely within the broad, shallow, posterior end of the illicial trough, and are not visible in lateral view. Each epiotic is overlapped anterolaterally by the parietal and posterolaterally by the post-temporal.

Intercalar: An intercalar (opisthotic) is absent in all Lophiliformes.

Prootics (Figs. 2-3): The prootics of O. acanthias are separated anteriorly by the anteroventral...
process of the supraoccipital. The ventral margins of the prootic pass dorsal to the paraphenoid where they are narrowly separated by cartilage. Each prootic meets the respective dorsolateral wing of the paraphenoid anteriorly, the pterosphenoid and sphenotic dorsally, and the pterotic and basioccipital posteriorly. The posteriormost margin of each prootic is widely separated from the exoccipital by cartilage.

Supraoccipital (Figs. 1-2): The supraoccipital of _O. acanthias_ is large, roughly hexagonal and makes up a considerable portion of the root of the cranium and the floor of the iliac trough. Its anterior margin dips ventrally, separating the prootics from each other, and meets the posteriorly-directed, dorsolateral wings of the paraphenoid. An anteriorly-directed extension of the supraoccipital is narrowly separated by cartilage from the ends of the posterior, ventromedial extensions of the frontals. Laterally, the supraoccipital is slightly overlapped by each parietal.

Exoccipital (Figs. 2-3, 5): The modified neural arch and spine of the last pre-ural centrum of _O. acanthias_ is suturally united to both exoccipitals along the posterior midline. With the basioccipital, a ventromedial extension of each exoccipital shares in the articulation with the centrum of the anteriormost vertebra. The postero medial margins of the exoccipitals form a large, nearly circular foramen magnum.

Basioccipital (Figs. 2-3, 5): The anterior one-half of the ventral surface of the basioccipital is covered by the posterior end of the paraphenoid. A dorsolateral flange projecting from each side of the basioccipital meets the prootic anteriorly and the exoccipital posteriorly. A short, posterolaterally-directed strut of bone, originating on the internal surface of each dorsolateral flange of the basioccipital, is suturally united to the internal surface of the medial margin of the respective exoccipital.

**Mandibular Arch**

**Upper Jaw**

Premaxillaries and symphysial cartilage (Figs. 1, 3, 6-7): Each premaxillary consists of a curved, elongate portion, the posterodorsal margin of which is slightly expanded at midlength, and an anterior portion which bears a short ascending process and a slightly longer articular process. The anterior tips of the premaxillaries are securely attached to each other by fibrous connective tissue and by a broad ligament which passes ventral to the anterior end of a large, triangular, posteriorly notched symphysial cartilage (Fig. 7). This car-

![Figure 7. Ventral view of symphysis of upper jaw of Oneirodes acanthias showing symphysial cartilage and associated ligaments. Teeth not shown.](image-url)
lary and maxillary bones are united by a strong ligament that passes anteriorly to attach to the labial cartilage of the dentary (Pietsch, 1972a:31). The elongate portion of each premaxillary bone may bear up to 28 recurved, depressible teeth of mixed sizes with no recognizable pattern in their placement.

Maxillaries (Figs. 1, 3, 6-7): The expanded anterior end of each maxillary bone consists of two parts: a dorsal process which overlaps the respective premaxillary and on which two ligaments insert (an ethmomaxillary ligament originating on the anterolateral corner of the supraethmoid, and a palatomaxillary ligament originating on the head of the palatine bone), and a ventromedial process which is loosely attached by a short ligament to the articular process of the respective premaxillary.

**Lower: Jaw**

Dentaries, articulars, and angulars (Figs. 6, 8): The dentaries are thick, toothed bones, each consisting of a dorsal and ventral fork between which fits the anterior process of the articular. Anteriorly, the dentaries curve to meet on the midline where they form a strong symphysial spine. The labial cartilage of the dentary (Pietsch, 1972a:31) is well developed. The anterior two-thirds of each dentary bears 14 to 17 depressible, recurved teeth of mixed sizes with no obvious pattern in their placement. At its articulation with the quadrate, the articular forms a small, posteriorly and ventrolaterally directed spine which is connected by a ligament to the ventral tip of the preoperculum. The angular articulates within a shallow recess on the medial surface of the articular just below the articular-quadrate joint. A strong ligament extends from the posteriormost tip of each angular to the ventral tip of the respective interoperculum.

**Palatine Arch**

Metapterygoids (Figs. 6, 8): Anteriorly, the upper half of each metapterygoid forms a thin, weakly ossified flange, the concave dorsal margin of which is attached to the anterodorsal margin of
the hyomandibular by a sheet of connective tissue. The posterior margin of the metapterygoid is ankylosed to the ventral half of the hyomandibular dorsally, and the dorsal two-thirds of the symplectic ventrally. Although Rosen and Patterson (1969: 439) state that the metapterygoid is fused with the hyomandibular in Lophiiformes, I have not found this to be the case in any lophiiform examined (see Appendix B).

Mesopterygoids (Figs. 6, 8): Each crescent-shaped mesopterygoid is grooved on its convex margin to receive the anteroventral corner of the metapterygoid, the dorsal half of the ectopterygoid, and the posteroventral tip of the palatine.

Ectopterygoids (Figs. 6, 8): The narrow, ventral half of each ectopterygoid is firmly attached to the upper two-thirds of the anterior margin of the quadrate. The anteriorly directed, dorsal half of the ectopterygoid lies lateral to, and within a groove on the ventrolateral side of the mesopterygoid. A posteriorly directed extension of the palatine overlaps the lateral surface of the anterior one-fourth of the ectopterygoid.

Palatines (Figs. 6, 8): The anterior head of each palatine is loosely held within a shallow concavity of the respective maxillary bone by connective tissue and by the palatomaxillary ligament. A second ligament originating on the head of the palatine inserts on the short ascending process of the premaxillary bone of the opposite side. Immediately posterior to the palatine-maxillary articulation, the medial surface of the palatine is firmly attached to the ethmoid cartilage. This cartilage thus acts as a keystone between the lateral ethmoids, the anterior tips of the frontals and the anterior heads of the palatines. Posteriorly, each palatine overlaps the ectopterygoid dorsolaterally, and lies within the grooved, anterior tip of the mesopterygoid, ventrally.

**Hyoid Arch**

**Figs. 6, 8-10**

**Hyomandibular (Figs. 6, 8):** Dorsally, each hyomandibular bone is forked forming two heads: a slightly longer and wider anterior head which articulates within an oval-shaped cartilaginous area between the sphenotic, prootic, and anterior corner of the pterotic; and a shorter posterior head which articulates on the ventrolateral face of the pterotic. An articular head for the proximal end of the operculum is found on the upper half of the posterior margin of the hyomandibular. The ventral half of the hyomandibular is bordered by the metapterygoid anteriorly, and widely separated by cartilage from the symplectic ventrally. A postero-

ventrally directed extention of each hyomandibular overlaps the dorsal end of the respective preoperculum.

**Symplectics (Figs. 6, 8):** Each symplectic consists of two parts: a tapering dorsal portion which is in contact with the metapterygoid anteriorly, the preoperculum posteriorly, and separated from the hyomandibular by cartilage; and a broad, spatulate ventral portion, the ventral one-half of which lies in a groove on the medial surface of the upper two-thirds of the quadrate. The upper one-half of the ventral portion of the symplectic is overlapped by the preoperculum.

**Quadrates (Figs. 6, 8):** Ventrally, each triangular-shaped quadrate forms an articulating head which fits into a socket on the posterior margin of the respective articular. A posteriorly and ventrally directed quadrate spine is attached by connective tissue to the slightly smaller mandibular spine.

**Interhyals (Figs. 6, 8):** Each interhyal is a slender, rodlike bone the dorsal end of which is loosely attached by connective tissue to the medial side of the cartilage that lies between the hyomandibular bone and symplectic. Ventrally, the interhyal makes a cartilaginous connection with the posterior end of the epiphyal.

The remaining elements of the hyoid arch, including the epiphyals, ceratohyals, dorsal and ventral hypohyals, and branchiostegal rays do not differ substantially from those described for other ceratioids (Pietsch, 1972a).

**Opercular Apparatus**

**Figs. 6, 8**

**Operculum (Figs. 6, 8):** The posterior margin of each operculum is deeply notched, the two forks of which are at an angle of approximately 45°. The lower fork is about twice the length of
the upper, and bears the respective suboperculum on its distal end.

Two ligaments insert on the articular head of the operculum. One of these originates on the posterior head of the double-headed hyomandibular bone; the other originates on the posterior margin of the preoperculum.

Suboperculum (Figs. 6, 8): Each suboperculum is firmly attached by its lateral surface to the distal tip of the lower fork of the respective operculum. The lower part of the suboperculum is semicircular and bears no spine on its anterior margin: the upper part is short, and rounded in smaller specimens, but becomes longer, narrower, and pointed in larger specimens. The dorsal tip of the upper part of the suboperculum is notched in some large individuals.

Interoperculum (Fig. 6): The interoperculum is narrow, and flattened, the upper one-fifth extending beyond its articulation with the posterior end of the epyhal. The tapering ventral end of each interoperculum is attached by a strong ligament to the posterior tip of the respective angular bone.

Preoperculum (Figs. 6, 8): The large, posteriorly curved preoperculum strengthens the entire length of the long hyoid arch. The anterior margin of the upper one-fifth of this element is overlapped by a posteroverentral extension of the hyomandibular bone. Ventrally, the preoperculum covers the lateral surface of the ventral portion of the symplectic, and is ankylosed to the posterior margin of the quadrate. A short ligament originates on the ventral tip of each preoperculum and inserts on the mandibular spine of the respective articular bone. A second ligament passes from the posterior margin of each preoperculum to the articulating head of the respective operculum.

Branchial Arches

Pharyngobranchials (Fig. 11): There are three pharyngobranchials. That of the first arch, the suspensor pharyngobranchial, is reduced, its dorsal end lying free in the connective tissue matrix with no ossified or ligamentous connection to the medial side of the hyoid arch.

The pharyngobranchials of the second and third arches are attached to each other and to the dorsal ends of the epibranchials of the second, third and fourth arches. Pharyngobranchial II, which is slightly more than half as long, and approximately half as wide as pharyngobranchial III, bears on its expanded ventral end as many as 10 large, depressed and recurved teeth of mixed sizes. As many as 12 similar teeth, some of which are considerably larger than those of pharyngobranchial II, are borne on the expanded ventral end of pharyngobranchial III. As in all ceratoid pharyngobranchial of the fourth arch is absent.

Epibranchials (Fig. 11): The epibranchial of the first arch is a long, narrow, dorsally curved bone that supports the reduced suspensor pharyngobranchial on its distal tip. Although teeth are absent on epibranchial I, all specimens of *O. acanthias* examined have a minute, rounded ossification lying free in the connective tissue matrix on the anterior margin of the first epibranchial. This element may be a remnant of a tooth-plate. Well-developed teeth are present on the epibranchial of the first arch of other species of *Oneirodes* (see below, p. 25, Fig. 50).

The epibranchials of the second, third and fourth arches are approximately twice as long as that of the first arch and support the toothed pharyngobranchials II and III distally. At mid-length,
epibranchials II and III each bear a short, blunt process on their anterior margins. These spines are interconnected by a short ligament which securely binds these bones to each other. The cartilaginous articulations of all four epibranchials with their respective ceratobranchials are loosely interconnected by short ligaments.

Ceratobranchials (Fig. 11): The ceratobranchials are the longest elements of the branchial arches. The ventral one-fourth of the first three of these is bent at an angle of approximately 140°; the cartilaginous ventral tip of each articulates with its respective hypobranchial. The ventral one-third of the ceratobranchial of the fourth arch is bent at a similar angle; its cartilaginous ventral tip articulates directly with the cartilaginous third basibranchial. The fifth ceratobranchial, like the first four, lacks teeth but is only slightly bent and approximately one-half as long. The cartilaginous ventral tip of ceratobranchial V articulates with the cartilaginous ventral tip of ceratobranchial IV and is not in contact with the third basibranchial. Dorsally, ceratobranchial V lies free in the connective tissue matrix.

The remaining elements of the branchial arches, the hypobranchials of the first three arches and basibranchials I, II, and III, are similar to those described for other ceratoids (Pietsch, 1972a).

Figure 12. Lateral view of 5th-19th pre-ural centra of Oneirodes acanthias, anterior to the left.

Vertebræ
Figs. 2-3, 6, 12-13

Of 24 specimens examined (either alizarin-stained or X-rayed), the number of vertebral centra (including the half-centrum to which is fused the hypural plate) varied from 19 to 21. Of these, two had 19, 20 had 20 and two had 21 centra. Of seven cleared and stained specimens examined, the number of precaudal vertebrae was four or five, and caudal vertebrae varied from 14 to 16 (the separation between precaudal and caudal vertebrae is taken at the point of the first complete haemal arch, after Weitzman, 1967, and Pietsch, 1972a).

The vertebrae are similar to those of Centrophyrne spinulosa (see Pietsch, 1972a: 36-37) differing, however, in the considerably greater development of the neural and haemal spines and in

Figure 13. Caudal skeletons of Oneirodes acanthias, lateral views, showing what appears to be fusion of 2nd and 3rd pre-ural centra (A and C): A. LACM 6839-14, 34.0 mm SL; B. LACM 9960-4, 71.0 mm SL; C. LACM 9773-21, 132.0 mm SL.
the unusually small size of the second anteriormost centrum.

Two individuals (34.0 and 132.0 mm) appear to have undergone an ontogenetic reduction in the number of vertebral centra through fusion of the second and third pre-ural centra (Fig. 13 A, C). This complex, double centrum bears two neural spines and two haemal spines in the larger specimen but only a single, large haemal spine in the 34.0 mm individual. The problem of two neural or haemal spines borne on a single centrum is discussed in detail by Totton (1914; see also Schultz, 1963).

Caudal Skeleton

Fig. 13

The caudal skeleton is like that of other ceratioids in having the ural centra fused with the first pre-ural centrum (postterminal centra and terminal centrum, respectively, of Gosline, 1960; Pietsch, 1972a) to form a single, complex half-centrum which is fused to a single hypural plate (Rosen and Patterson, 1969:441).

The hypural plate, unnotched posteriorly, and consisting of an unknown number of fused hypurals plus the parhypural (haemal spine of the terminal vertebra of Gosline, 1960; Pietsch, 1972a), bears the overlapping bases of nine principal caudal rays. These rays are all biserial and segmented. The third ray (from the top) through the sixth are bifurcated distally.

Dorsal Fin and Illicial Apparatus

Figs. 14-15

The dorsal fin consists of six biserial, segmented and unbranched rays. Each ray is supported by a pterygiophore which consists of a cartilaginous distal radial and a proximal radial. There are no medial radials. All six proximal radials are similar in appearance, each having their proximal and expanded distal ends unossified.

In all cleared and stained specimens of *O. acanthias* examined the proximal end of the first pterygiophore lies above the neural spine of the 12th pre-ural centrum, while the proximal end of the last pterygiophore lies just anterior to the neural spine of the seventh pre-ural centrum.

The long, rodlike pterygiophore of the illicial apparatus, including its long, tapering, unossified posterior portion, is approximately half of standard length.

The remnant of the second cephalic ray (Fig. 15) is a minute, toothlike ossification.

Anal Fin

Fig. 16

The anal fin consists of four biserial, segmented, and unbranched rays. Each ray is supported by a cartilaginous distal radial. The first two distal radials are, in turn, supported by a proximal radial. The last two distal radials, however, share the support of a single proximal radial. There are no medial radials. The three proximal radials are similar.
in appearance, each having their proximal and expanded distal ends unossified.

In all cleared and stained specimens of *O. acanthias* examined the proximal end of the first pterygiophore lies between the haemal spines of the eighth and ninth pre-ural centra, while the proximal end of the last pterygiophore lies between the haemal spines of the sixth and seventh pre-ural centra.

**Pectoral Girdle and Pectoral Fin**

Figs. 5-6, 17

Posttemporals (Figs. 5-6): The posttemporals are securely fixed to the posterolateral corners of the cranium. A deep notch is present on the anterolateral margin of each posttemporal. The flared-out, posterocaudally directed projections of each posttemporal bear a facet on the ventral surface for the articulation of the respective supraclithrum.

Supraclithrum (Fig. 6, 17): The pectoral girdle is suspended from the skull by an elongate supraclithrum. The dorsal end of this bone articulates on the ventral surface of the lateral tip of the respective posttemporal. Its tapering, posterior end lies in a shallow groove on the lateral surface of the cleithrum.

Cleithrum (Figs. 6, 17-18): The upper part of the flat, crescent-shaped cleithrum is shallowly grooved on its lateral surface to receive the supraclithrum. Similarly, the posteriormost margin of the cleithrum is recessed on its medial side to receive the cartilage of the respective scapula. The ventral end of each cleithrum bears the respective pelvic bone on its medial surface. Ligaments originating on the tips of the haemal spines of the 16th and 15th pre-ural centra insert on the dorsal tip of each cleithrum.

Postcleithrum (Fig. 6, 17-18): There is a single, long rod-like postcleithrum. Its proximal end articulates within a shallow socket on the medial side of the cleithrum, just anterior to the cartilage of the scapula.

Scapula (Fig. 6, 17-18): The scapula is largely unossified. It consists of a rounded ossification bounded on three sides by cartilage. The anterior half of this cartilage is securely fixed within a recess on the medial side of the cleithrum just.
posterior to the cleithrum-postcleithrum articulation. The scapular cartilage meets the coracoid ventrally and bears the radials of the pectoral fin posteriorly. On the ventral margin of the ossified part of the scapula, there is a small scapular foramen.

Coracoid (Figs. 6, 17-18): The coracoid consists of an expanded posterior portion, the dorsal margin of which meets the cartilage of the scapula, and an anteroventral prong which lies medial to the cleithrum. The unossified tip of a stout, posteroventral process of the coracoid is connected to the posterior margin of the postcleithrum by a ligament.

Radials (Figs. 6, 17): There are three separate, well-ossified pectoral radials, the first (uppermost) of which is approximately 75 percent of the length of the third. The cartilaginous proximal end of the first radial and the fused cartilaginous proximal tips of the second and third radials articulate with the cartilage of the scapula. The broad, fused, cartilaginous distal ends of the second and third radials support 15 to 18 moveable fin rays. In all osteological preparations examined a small foramen is present near the mid-dorsal margin of the third radial.

Bertelsen (1951:71; see also Regan and Trewavas, 1932: 35, 37, Figs. 41, 47) described a "small, oblong bone" which lies in contact with, "but is never fused" to the posterodorsal margin of the first pectoral radial. Although present in only the largest (132.0 mm) of the seven osteological preparations of Oneirodes acanthias examined, this element is found in most oneirodids;

but, contrary to Bertelsen (1951), it is fused to the first radial in all cases (see below, p. 29).

Pelvic Bones
Figs. 6, 17

The expanded, oval-shaped and unossified distal ends of the elongate pelvic bones are loosely attached to each other on the midline. Proximally, each pelvic bone is connected to the ventromedial margin of its respective cleithrum.

Skin Spines

Microscopic examination of all osteological preparations of O. acanthias revealed the presence of extremely small, widely separated dermal spines on the sides of the trunk and caudal peduncle. In an area of approximately 5 mm², just anterior to the base of the pectoral lobe of a 40.0 mm specimen, there are 18 spines.

Comparative Osteology of Oneirodidae Genera
Cranium

Ethmoid region: With few exceptions the ethmoid regions of all Oneirodes species examined are similar to that of O. acanthias. The supraethmoid of O. luetkeni, however, is Y-shaped rather than T-shaped, the ventro-medial process of the supraethmoid is short relative to its lateral processes, and the medial portion of the ethmoid cartilage is relatively thin (Fig. 19). Consequently, the illicial trough of O. luetkeni is deeper and narrower than that of other members of the genus. The supraethmoid of O. basili is T-shaped, and its ventromedial and lateral processes are approximately equal in length, but in this species the supraethmoid is displaced dorsally by the relatively thick medial portion of the ethmoid cartilage (Fig. 20). Thus, the posterior ends of the lateral ethmoids,
and the frontal bones are relatively far apart, resulting in a wider, shallower illicial trough than that of other members of the genus.

The ethmoid regions of *Microlophichthys* and *Danaphryne* closely resemble that of *Oneirodes*. In these three genera the relatively long ventromedial process of the supraethmoid, together with the large lateral ethmoids and relatively thin, dorsally concave ethmoid cartilage, form large, nearly circular nasal foramina. Correspondingly, the relatively large symphysial cartilages of these genera have prominent posterior lobes (see below, p. 19). Both *Microlophichthys* and *Danaphryne* have relatively deep and narrow illicial troughs, comparable to that of *O. luetkeni*, but whereas this condition results from a medial, dorsoventral depression of the ethmoid region in *O. luetkeni* and *Microlophichthys*, *Danaphryne* has undergone a lateral compression of the entire anterior portion of the cranium (Fig. 21). Unlike all other oneirodid genera examined, the width of the ethmoid cartilage and vomer of *Danaphryne* is considerably less than the distance between the anterior tips of the lateral ethmoids and frontals.

In *Leptacanthichthys*, *Dolopichthys*, *Bertella*, *Pentherichthys*, and *Chaenophryne*, relatively small lateral ethmoids, a ventromedial process of the supraethmoid which is less than half as long as the lateral processes of this bone, and a relatively thick anteromedial portion of the ethmoid cartilage (except in *Leptacanthichthys*), contribute to the formation of narrow, oval-shaped nasal foramina (Figs. 22-26). As in *O. luetkeni* and *Microlophichthys*, the ethmoid region of these genera is dorsoventrally depressed, but unlike the former, this depression is accompanied by a greater lateral separation of the frontal bones, thus forming a much wider, as well as a deeper, illicial trough. The extreme of this dorsoventral flattening of the ethmoid region and enlargement of the illicial trough is found in *Pentherichthys* (Fig. 25).

The anterodorsal surface of the ethmoid cartilage of *Leptacanthichthys* (Fig. 22) is deeply excavated medially to receive the relatively narrow symphysial cartilage of the upper jaw (Fig. 39C).
This part of the ethmoid cartilage is only slightly depressed in Chaenophrysne and not depressed in Dolopichthys, Bertiella, and Penterichthys.

The ethmoid region of Lophodolos is similar to that of Oneirodes, Microlophichthys, and Danaphyryne (Fig. 27), but the lateral ethmoids are much larger, apparently to compensate for the greatly reduced frontal bones of this genus (see below, p. 18). Unlike all other genera examined, the ethmoid cartilage of Lophodolos has no postero-lateral connection with the frontal bones.

Vomer: Vomerine teeth, present in most genera, vary in number and size among oneirodids. Of osteological preparations of oneiroid species and genera examined, teeth in moderate numbers and size are present on the vomer of O. acanthias (as many as four), and other Oneirodes species with the exception of O. luetkeni. High numbers of small vomerine teeth (10 or more) are found in O. luetkeni, Microlophichthys, Danaphyryne, Lep-tacanthichthys, and Dolopichthys. As many as six extremely large teeth are present on the vomer of Chaenophrysne (Fig. 26). In Bertiella and in some species of Dolopichthys (Pietesch, 1972c, 1973) vomerine teeth are lost with growth. Vomerine teeth are absent in Lophodolos and Penterichthys.

Frontal and parietal region: In O. luetkeni (Fig. 26) the frontals occupy a more posterior position than those of other Oneirodes species examined (compare with Figs. 2, 29). Their posterior, ventromedial extensions form an angle of approximately 70° with the parapophyseal (compared to an angle of about 55° in O. acanthias), their dorsal profile is less curved, their antero-medial forks are much weaker, and together with the pterophyseal, preotic, and parapophyseal, they form roughly circular orbital foramina. In contrast, the frontals of O. basilii (Fig. 29), lie in a more anterior position. Their well developed antero-medial forks extend considerably beyond the anterior limits of the ethmoid cartilage, their posterior, ventromedial extensions form an angle of roughly 45° with the parapophyseal, their dorsal margins are more sharply curved at mid-length, and they contribute to the formation of oval-shaped orbital foramina.

Further differences in the shape of the frontals occur among species of Oneirodes. The dorso-
lateral edge of the posterior half of these bones in *O. notius* is convex, compared to a linear shape of this part of the frontal in *O. acanthias* and other *Oneirodes* species examined (Fig. 30).

Among oneirodid genera, the shape and position of the frontals of *Microlophichthys* and *Danaephyne* (Figs. 31, 32) are similar to those of *Oneirodes*. Those of *Lophodolos* (Fig. 33), however, are considerably reduced in size and thickness, differing from those of all other genera in a number of ways: their dorsal margins are slightly concave, ventromedial extensions are absent (the frontals thus make no contact with the parasphenoid and meet with the ethmoid cartilage only at their extreme anterior tips), and the anterior two-thirds of each is deeply incised, forming a short medial fork which slightly overlaps the posterior tip of the enlarged lateral ethmoid, and a considerably longer lateral fork which extends beyond the anterior limits of the lateral ethmoid. In addition, the posterior ends of the frontals of *Lophodolos* extend ventrally, providing a brace against the sphenotic and prootic, perhaps helping to compensate for the lack of a pterosphenoid in this genus.

In contrast to the frontals of *Oneirodes*, *Microlophichthys*, *Danaephyne*, and *Lophodolos*, those of *Leptacanthichthys*, *Dolopichthys*, *Bertella*,

**Figure 28.** Lateral view of cranium of *Oneirodes laetkeni*, LACM 31801-1, 61.0 mm SL.

**Figure 30.** Dorsal-medial views of right frontal bone, anterior to the left: A. *Oneirodes acanthias*, LACM 9960-4, 71.0 mm SL; B. *Oneirodes notius*, paratype, LACM 11184-6, 54.0 mm SL.

*Chaenophryne*, and *Penherichthys* (Figs. 34-38) are longer and occupy a more anterior position, overhanging and extending past the anterior limits of the ethmoid cartilage and vomer. The posterior, ventromedial extensions of these bones are longer and more posteriorly directed, forming smaller angles with the parasphenoid (as small as 25° in *Dolopichthys*). The dorsal margin of the frontals of *Leptacanthichthys*, *Bertella*, and *Dolopichthys* is nearly linear; that of *Penherichthys* and *Chaenophryne* is convex.

Besides contributing to the formation of a longer cranium, the greater length and anterior extension of the frontals in these genera are accompanied by considerably larger, narrower, orbital

**Figure 29.** Lateral view of cranium of *Oneirodes baillii*, LACM 30028-30, 115 mm SL.

**Figure 31.** Lateral view of cranium of *Danaephyne nigrifilis*, ISH 2658/71, 82.0 mm SL.
foramina, and by a decrease in the depth of the cranium. The extreme of this elongation and depression of the cranium is represented by *Dolophichthys* (Fig. 35).

The dorsomedial margins of the frontals and parietals of *Oneiroides* and *Pentherichthys* diverge posteriorly, the posterior end of the illicial trough being considerably wider and shallower than its anterior end. In contrast, the dorsomedial margins of these bones in all other genera are parallel, contributing to the formation of an illicial trough that is approximately equal in width and depth along its entire length.

Ptérosphénoïds, sphénotics, ptérotics: A ptérosphénoïd, similar to that of *O. acanthias* (Figs. 2-3), is present in all oneiroidids examined except for *Lophodolos* (erroneously said to be present in *Lophodolos* by Pietsch, 1972a:29).

The sphénotic bone forms a spine of varying size in all oneiroidids except for *Chaenophryne* (Fig. 37). In this genus the sphénotic is only slightly raised on its dorsolateral surface; the dorsal surface of the sphénotic region is concave, the parietal being the most dorsally protruding bone of the skull. *Lophodolos* is unique among oneiroidids in bearing extraordinarily developed, posteriorly curved, sphénotic spines (Fig. 33).

The ptérotics of all oneiroidids examined are like those described for *O. acanthias*. All possess an anterodorsally directed process that overlaps the posterolateral surface of the respective sphénotic bone.

**Mandibular Arch**

**Upper Jaw**

Premaxillaries and symphysial cartilage: The premaxillaries of the various oneiroidids examined differ considerably in the number and size of the teeth which they bear. These differences are the same as those found in the teeth of the dentary described below.

As described above for *O. acanthias* (Fig. 1, 7), the symphysial cartilage of *Danaphryne, Microphichthys, Leptacanthichthys, Chaenophryne*, and *Lophodolos* (Fig. 39, A-E) is considerably longer than wide and deeply notched on its posterior margin. The well-developed posterior lobes of the symphysial cartilage correspond to the concave, dorsal surface of the ethmoid cartilage and wide nasal foramina of these genera. In contrast, the symphysial cartilage of *Dolophichthys, Bertella*, and *Pentherichthys* (Fig. 39, F-H) is much wider.
than long, its posterior margin is only slightly concave in *Bertella* and *Doloplchthys* and slightly convex in *Pentherichthys*.

Maxillaries: The maxillaries of all oneirodids examined, except *Chaenophryne*, are similar to those described above for *O. acanthis* (Figs. 1, 3, 6). Those of *Chaenophryne* differ from the maxillaries of the other genera in the greater expansion of their anterior portions (overlapping the pre-maxillaries to a considerably greater extent), and their much longer ventromedial processes.

*Chaenophryne* is not “peculiar in that the maxillary gradually tapers backwards” as stated by Regan and Trewavas (1932:35).

Lower Jaw

Differences in the size of the bones of the lower jaw are correlated with differences in the length and depth of the cranium; oneirodids with relatively short, deep dentary and articular bones such as *Oneirodes, Danaphryne*, and *Microlophichthys* (Figs. 8, 40, 41) have short, deep crania as compared to longer-jawed genera such as *Leptacan-
A distinct pattern in tooth placement is present in both upper and lower jaws of those forms having high tooth counts (for example, *O. lukeni*, *Microlophichthys*, *Lophodolos*, and especially *Penherichthys*). This pattern is like that described for *Dolichichthys* (see Pietsch, 1972c).

**Palatine Arch**

The bones of the palatine arch are much alike in all oneiroids examined. The anterior margin of the upper half of the metapterygoid of *Oneirodes*, however, forms a thin, weakly ossified flange which is absent in all other genera (Fig. 8). Variation among oneiroid genera in the length and width of the palatine arch is associated with the length and depth of the jaws and cranium. Those forms with longer, shallower jaw bones and crania (*Leptacanthichthys*, *Bertella*, and *Dolichichthys*) have longer, narrower mesopterygoid, ectopterygoid, and palatine bones (Figs. 42-44).

**Hyoid Arch**

The various elements of the hyoid arch are very similar in all oneiroids except that, unlike all other oneiroid genera, the hyomandibular of *Bertella* (Fig. 43) is undivided dorsally, forming a single broad articulation with the cranium.

**Opercular Apparatus**

The size and shape of the opercular and subopercular bones vary considerably among the species and genera of oneiroids. The form of these bones is a diagnostic feature of many genera (Bertelsen, 1951:73, Fig. 31), in spite of some intra-generic variation. Within *Oneirodes* the suboperculum is relatively short and broad in *O. notius* and *O. myronemus*, long and narrow in *O. rosenblatt*, *O. macrostegus*, and members of the *O.*
Figure 41. Lateral view of left side of lower jaw and suspensorium of Microlophichthys microlophus, ROM 27286, 99.0 mm SL, with part of opercular apparatus in place.

Figure 42. Lateral view of left side of lower jaw and suspensorium of Leptacanthichthys gracilispinis, ROM 27284, 54.0 mm SL, with part of opercular apparatus in place.
Figure 43. Lateral view of left side of lower jaw and suspensorium of *Bertella idiomorpha*, LACM 30561-1, 78.0 mm SL, with part of opercular apparatus in place.

Figure 44. Lateral view of the left side of lower jaw and suspensorium of *Dolopichthys pulex*, LACM 6723-33, 76.0 mm SL, with part of opercular apparatus in place.
Figure 45. Lateral view of left side of lower jaw and suspensorium of *Lophodolos acanthognathus*, ROM 27285, 57.0 mm SL, with part of opercular apparatus in place.

*schmidtii*-group, and intermediate in length and width in all other species. The posterior margin of the upper part of this bone is indented to deeply notched in *O. thompsoni* and in most specimens of *O. bulbosus* (see Species Accounts).

Like *Oneirodes*, *Microlophichthys* and *Leptacanthichthys* (as well as *Phyllorhinichthys*, *Tyrannophryne*, and *Chirophryne*; Pietsch, 1969; Bertelsen, 1951:93, 94, Figs. 48, 50) have a short, relatively broad suboperculum (Figs. 41-42). Nevertheless, distinct differences in the shape of this bone occur in these genera. The upper part of the suboperculum of *Danaphryne* (Fig. 40; see also Bertelsen, 1951:102, Fig. 58) is considerably longer and slenderer than that of the above forms. The suboperculum of *Ctenochirichthys* is short, and narrow (Bertelsen, 1951:95, Fig. 51). *Lophodolos*, *Bertella*, *Dolopichthys* and *Pentherichthys* have long, relatively narrow subopercula (Figs. 43-45, 47). Although its considerably smaller size is distinct in *Lophodolos*, the form of the suboperculum cannot be used to distinguish between *Pentherichthys*, *Bertella*, and *Dolopichthys*, being especially similar in the latter two genera.

Although similar to that of *Oneirodes* in shape, the suboperculum of most specimens of *Chaenophryne* (Figs. 46, 49) bears a small, blunt spine on its anterior margin. A small projection is also present on the anterior margin of the suboperculum of some adolescent females (25.0 mm or less) of *Lophodolos* and some larvae and males of *Dolopichthys* and *Pentherichthys* (Bertelsen, 1951:98, 102, 107, Figs. 54A-B, 60B-C, 64C-d). The absence of this spine was heretofore considered a diagnostic character of the *Oneirodidae* (Bertelsen, 1951:71).

The preoperculum of *Chaenophryne* (Figs. 46, 49) is sigmoidal in shape and extends considerably
beyond the articulation of the hyomandibular bone and operculum, whereas this bone in other oneirodids is crescent-shaped and terminates ventral to, or at the level of, this articulation. The posterior margin of the operculum of Chaenophryne is only moderately concave compared to the deeply notched opercula of all other genera. One osteological preparation of Chaenophryne examined (LACM 30427-17, Fig. 49) has a ventrally directed, hooked projection on the upper anterior margin of the operculum, and a similar, but dorsally directed projection on the upper posterior margin of the preoperculum from which extends a short ligament to the dorsal head of the operculum.

Branchial Arches

There is considerable variation in the branchial arches among oneirodids. Those of all Oneirodes species examined are similar to those of O. acanthias with a few exceptions. Pharyngobranchial II is reduced and lacks teeth in O. luetkeni (Fig. 50). Oneirodes luetkeni and O. carlsbergi bear up to 17 and 5 recurved, depressible teeth, respectively, on the anterior margin of each epibranchial (Fig. 50).

Epibranchial teeth are not found in any other oneiroid.

Among oneiroid genera, Oneirodes is unique in having a pharyngobranchial of the first arch. Pharyngobranchials II and III are present and bear teeth in Danaphryne, Leptacanthichthys, and Chaenophryne (Figs. 51A, C, F). Pharyngobranchial II, reduced, yet bearing up to six teeth in Dolopichthys (Fig. 51D), is further reduced and lacks teeth in Bertella (Fig. 51E). This bone is represented by a tiny ossified remnant in Microlophichthys (Fig. 51B), and is absent in Pantherichthys and Lophodolos (Fig. 51G-H).

The epibranchials, ceratobranchials, and basibranchials of all genera are similar to those of O. acanthias. Hypobranchial II is absent in Microlophichthys, Bertella, and Dolopichthys. Unlike all other genera, the median ends of the second, as well as the third, hypobranchials of Lophodolos pass ventral to the second basibranchial and approach, but do not meet each other on the midline.

Vertebrae

Except for minor differences in the length of neural and haemal spines, the vertebrae are similar
in the various oneirodids. Most specimens of *Oneirodes* species and the single osteological preparation of *Danaphryne* have 20 vertebrae (4 precaudal + 16 caudal). Osteological preparations of *Microlophichthys* have 21 vertebrae (4 + 17), *Lophodolos* and *Pentherichthys* 23 (4 + 19), *Beriella* 20 (5 + 15), *Dolopichthys* and *Chaenophryne* 21 (5 + 16), and *Leptacanthichthys* 22 (5 + 17).

An extra neural and haemal spine on the second pre-ural centrum of the single specimen of *Danaphryne* examined (Fig. 52A) may be the result of fusion of the second and third pre-ural centra as described above for *O. acanthias* (p. 13; see also Totten, 1914).

Caudal Skeleton

The caudal skeleton of all oneirodids is like that of *O. acanthias* described above, with one exception. The larger of the two osteological preparations of *Chaenophryne* (88.0 mm, Fig. 52B) has an anteriorly-directed, dorsal and ventral process located near the point of fusion of the first pre-ural and ural centra. The smaller specimen of *Chaenophryne* examined (56.0 mm) has a similar, but less prominent process, only on the ventral margin of this part of the caudal skeleton.
Dorsal Fin, Illicial Apparatus, and Anal Fin

Except for the number of pterygiophores and fin rays, the dorsal and anal fins are similar in all oneiroidids. Frequently in the dorsal fin, and always in the anal fin, there is one less pterygiophore than the number of rays. Unlike that of other genera, the first dorsal ray of *Lophodolos* is reduced to a small stub.

The number of dorsal rays varies considerably even within genera (5 to 8 in *Dolopichthys* and *Lophodolos*) and counts overlap among all genera. The number of anal rays, however, is less variable. *Oneirodes* has four anal rays, very rarely three or
five. All other oneirodids have five or more, very rarely four.

The illicial apparatus of all *Oneirodes* species examined is similar except for considerable differences in the length of the illicial bone: less than 20 percent of SL in *O. lukeni*, 50 percent of SL in *O. basili*, and more than 70 percent of SL in *O. bradburyae*.

The illicial bone of *Microlophichthys* (as well as that of *Phyllophanichthys* and *Tyrannophrynus*; Pietsch, 1969, 1972b; Bertelsen, 1951:93), is considerably shorter than that of other genera, approximately 9 percent of SL (Fig. 53A). In addition, the remnant of the second cephalic ray on the dorsal surface of the pterygiophore is much further anterior than in the other genera examined.

Except for small differences in the length of the illicial bone, the illicial apparatus of *Danaphryne, Leptacanthichthys, Bertella* and *Dolopichthys* is much like that described above for *O. acanthias*. The pterygiophore of *Chaenophrynge* is much longer than that of any other genus (70 to 82 percent of SL, compared to less than 50 percent of SL in other oneirodids). *Lophodolos* has a relatively short, stout pterygiophore (about 25 percent of SL) with a peculiar upturned, cartilaginous posterior end (Fig. 53B). The pterygiophore of *Pentherichthys* (Fig. 53C) is nearly as short as that of *Lophodolos* (about 30 percent of SL) but differs from that of all other oneirodids in its much wider, dorsosventrally flattened posterior end.

**Pectoral Girdle and Pectoral Fin**

Except for some differences in the number of pectoral fin rays, the pectoral girdle and pectoral fin are much the same in all *Oneirodes* species examined. Among oneirodid genera the shape of the coracoid and pectoral radials vary somewhat. The coracoid of *Oneirodes* is unique in having a large, posteroventral process (Fig. 17, 18). The coracoid of all other genera examined is like that of *Microlophichthys* (Fig. 54).

In all oneirodids there are three pectoral radials. Without exception the cartilaginous proximal and distal ends of the second radial are ankylosed to the cartilaginous ends of the third (or most ventral) radial. Although the third radial is always longer than the first, the length of these two elements relative to each other varies considerably among oneirodid genera. In *Chaenophrynge* the length of the first radial is approximately 85 percent of the length of the third, 70 to 75 percent in *Oneirodes* and *Danaphryne*, 60 to 65 percent in *Microlophichthys*, *Lophodolos, Bertella, Dolopichthys* and...
Pentherichthys, and 30 percent in Leptacanthichthys.

The pectoral lobe (pectoral fin not including fin rays) of Leptacanthichthys (as well as Ctenochirichthys and, to a lesser degree, Chiropryne; Regan and Trewavas, 1932:36, 81-82, Figs. 42C, D, 131) is unusually long and narrow (Fig. 55). Unlike that of other genera, the first radial is considerably shorter than the second; the cartilaginous distal end of the third radial is expanded in an anteroposterior direction to meet the distal end of the considerably shorter second radial. The fin rays, thus, articulate along the upper margin of the pectoral fin lobe (Regan and Trewavas, 1932, Pl. III, Fig. 3).

In all genera examined the third radial has a small foramen as described above for O. acanthias (see also Regan and Trewavas, 1932:37, Fig. 47; Bertelsen, 1951:72, 82, Figs. 30, 35). A small process on the dorsal margin of the first radial is present in O. acanthias and in all genera examined osteologically except for Microlophichthys, Leptacanthichthys, and Pentherichthys. Frequencies of pectoral fin ray counts are given by Bertelsen (1951) and Pietsch (1972b,c), and summarized in Table 23.

The pectoral lobe of Phyllorhinichthys is considerably shorter and broader than that of other oneirodoid genera (Pietsch, 1972b:337, Fig. 4).

**Pelvic Bones**

The shape of the distal end of the pelvic bone of oneirodids is quite variable, even within a single species. Although a distally expanded pelvic bone was previously thought to be diagnostic of the Oneirodidae (Bertelsen, 1951:71), this is not the case in some specimens of Microlophichthys, Berlina, and Dolopichthys (Fig. 56A-C). In contrast to all other genera, the pelvic bones of Chiropryne are triradiate (Fig. 56D). Among ceratoids, triradiate pelvic bones were previously known only in the family Himantolophidae.

**Skin Spines**

In all osteological preparations of Oneirodes species examined, extremely small, widely separated dermal spines are present in the skin. Skin spines could not be detected microscopically in cleared and stained specimens of any other oneirodoid genus.

**SYSTEMATICS**

**Family Oneirodidae Regan**

Type genus Oneirodes Lütken, 1871.

Oneirodidae Regan, 1925:562 (diagnosis; includes Lasiognathus). Regan, 1926:25 (diagnosis; key to genera; includes Lasiognathus and Thaumatichthys). Regan and Trewavas, 1932:62 (diagnosis; key to genera; includes Chiropryne, Lasiognathus, Thaumatichthys, Amacrodon and Trematorhynchus). Fowler, 1936:1336, 1365 (diagnosis after Regan, 1926, Regan and Trewavas, 1932; key...

Diagnosis for females.—The females of the family Oneirodidae are distinguished from those of all other ceratioid families by the following combination of characters: jaws equal anteriorly; supraethmoid present; parietals present; 2 hypophysals; 6 branchiostegal rays; ceratobranchial teeth absent; operculum bifurcate, upper fork supported by a single rib; sphenotic overlapped by anterolateral projection of pterotic; posterior margin of hypural plate entire; 3 pectoral radials; esca without denticles; only an ossified remnant of second cephalic ray present; labial cartilage well developed (Pietsch, 1972a:31).

Although not characteristic of all members of the family, the following additional features are important in differentiating the Oneirodidae: pterosphenoid usually present (absent in Lophodolos); hyomandibular usually with a double head (single head in Bertella); pharyngobranchial I usually absent (present in Oneirodes); epibranchial teeth usually absent (present on epibranchial I of some species of Oneirodes); anterior subopercular spine usually absent (blunt projection present in most specimens of Chaenophryne, adolescent females of Lophodolos and some larvae and males of Dolopichthys and Pentherichthys); pelvic bone usually rodlike, not expanded to slightly expanded distally (triradiate in Chaenophryne); skin spines usually absent (present in Oneirodes).

Diagnosis for males.—See Bertelsen (1951:71).

Key to the Genera of the Oneirodidae

The following key (modified from Bertelsen, 1951) will differentiate adolescent and adult female specimens only. For larvae and males see Bertelsen (1951:75). Since several genera are known only from one or two adolescent specimens, the key is tentative and may not include the best diagnostic characters. The genus Spiniophryne Bertelsen, 1951, included in the Oneirodidae by Bertelsen (1951), most likely belongs to the family Centrophrynidae and thus does not appear below.

1A. Sphenotic spines present; operculum deeply notched posteriorly (Fig. 40); pelvic bones rod-shaped, not expanded or slightly expanded distally ........................................ 2

1B. Sphenotic spines absent; operculum not deeply notched posteriorly (Fig. 46); pelvic bones triradiate ................................................................. Chaenophryne Regan, 1925

2A (1A). Pectoral fin-lobe short and broad, shorter than longest pectoral fin rays ........................................ 3

2B. Pectoral fin-lobe long and narrow, longer than longest pectoral fin rays ........................................ 10

3A (2A). Lower jaw with a symphysial spine, ventral margin of dentaries at symphysis convex; caudal rays not internally pigmented ............................................................. Pentherichthys Regan and Trewavas, 1932

3B. Lower jaw without a symphysial spine, ventral margin of dentaries at symphysis concave; caudal rays internally pigmented ..................
4A (3A). Illicial apparatus emerging from between frontal bones ........................................ 5

4B. Illicial apparatus not emerging from between frontal bones but between sphenotic spines or further posterior ........................................... Lophodolus Lloyd, 1909

5A (4A). Dorsal margin of frontal bones strongly curved; suboperculum short and broad, lower part nearly circular (Figs. 8, 40-41) .................................................. 6

5B. Dorsal margin of frontal bones nearly straight; suboperculum long and narrow, lower part strongly oval (Figs. 43-44) ........................................... 12

6A (5A). Caudal fin covered with black skin to some distance beyond fin base; anal fin rays 5, rarely 4 .............................................................. Oneirodes Lütken, 1871

6B. Caudal fin not covered by black skin except at base; anal fin rays 4, rarely 5 .......................... Tyrannophryne Regan and Trewavas, 1932

7A (6A). Cleft of mouth extending beyond base of pectoral fin ........................................... (a single known specimen, 12.0 mm)

7B. Cleft of mouth not extending beyond base of pectoral fin ........................................... 8

8A (7B). A pair of leaflike, unpigmented appendages on snout; fewer than 25 teeth in lower jaw; esca with three, stout, nontapering, internally pigmented appendages arising from dorsal surface (Fig. 57) ........................................... Phyllorhinichthys Pietsch, 1969

8B. No leaflike appendages on snout; more than 25 teeth in lower jaw; esca without stout appendages arising from dorsal surface ........................................... 9

9A (8B). Cleft of mouth extending past eye; length of esca bulb more than half length of illicial bone; upper part of suboperculum broad and rounded (Fig. 41) ........................................... Mirolophichthys Regan and Trewavas, 1932

9B. Cleft of mouth not extending past eye; esca bulb considerably shorter than half length of illicial bone; upper part of suboperculum slender and tapering to a point (Fig. 40) ........................................... Danophryne Bertelsen, 1951

10A (2B). Sphenotic and articular spines short, not piercing skin; pectoral fin rays 27-30 ........... Ctenochirichthys Regan and Trewavas, 1932

10B. Sphenotic and articular spines well-developed; pectoral fin rays 17-21 ................................ 11

11A (10B). Length of quadrate spine greater than length of mandibular spine; esca with five separate appendages arising from dorsal surface (Fig. 58) Chiropryne Regan and Trewavas, 1932

11B. Length of quadrate spine less than length of mandibular spine; esca with a single appendage arising from dorsal surface (Fig. 59) .................................. Lepiacanthichthys Regan and Trewavas, 1932

12A (5B). Hyomandibular bone with a single head (Fig. 43) ........................................... Bertella Pietsch, 1973

12B. Hyomandibular bone with a double head (Fig. 44) ........................................... Dolopichthys Garman, 1899

Generic Synonymies and List of Nominal Species in Each Genus

Oneirodes Lütken

Synonymy given below under account of genus.

Oneirodes luetkeni (Regan, 1925).
Oneirodes carlsbergi (Regan and Trewavas, 1932).
Oneirodes rosenblatti, new species.
Oneirodes eschrichtii Lütken, 1871.
Oneirodes bulbosus Chapman, 1939.
Oneirodes antisacanthus (Regan, 1925).

Oneirodes krefftii, new species.
Oneirodes myronemus, new species.
Oneirodes heteronema (Regan and Trewavas, 1932).
Oneirodes macrosteus, new species.
Oneirodes cristatus (Regan and Trewavas, 1932).
Oneirodes acanthias (Gilbert, 1915).
Oneirodes thompsoni (Schultz, 1934).
Oneirodes notius, new species.
Oneirodes flagellifer (Regan and Trewavas, 1932).
Oneirodes dicromischus, new species.
FIGURE 58. Esca of *Chirophyne xenolophus*, SIO 70-306, 22.0 mm SL, left side.

*Oneirodes bradburyae* Grey, 1956b.
*Oneirodes macronema* (Regan and Trewavas, 1932).
*Oneirodes melanocauda* Bertelsen, 1951.
*Oneirodes schmidtii* (Regan and Trewavas, 1932).
*Oneirodes mirus* (Regan and Trewavas, 1932).
*Oneirodes basili*, new species.
*Oneirodes theodoritissieri* Belloc, 1938.

*Danaphryne* Bertelsen

*Danaphryne* Bertelsen, 1951:101, Figs. 58-59 (type species *Dolopichthys* [subgenus *Dermaitas*] *nigrifilis* Regan and Trewavas, 1932, by monotypy).

*Danaphryne nigrifilis* (Regan and Trewavas, 1932).

*Microlophichthys* Regan and Trewavas


*Microlophichthys microlophus* (Regan, 1925).

*Microlophichthys andracanthus* Bertelsen, 1951.

*Phyllorhinichthys* Pietsch


*Phyllorhinichthys micractis* Pietsch, 1969.

FIGURE 59. Esca of *Leptacanthichthys gracilispinis*, LACM 32776-1, 22.0 mm SL; left side.

*Tyrannophryne* Regan and Trewavas

*Tyrannophryne* Regan and Trewavas, 1932:83, pl. 4, Fig. 1 (type species *Tyrannophryne pugnax* Regan and Trewavas, 1932, by monotypy).

*Tyrannophryne pugnax* Regan and Trewavas, 1932.

*Chirophyne* Regan and Trewavas

*Chirophyne* Regan and Trewavas, 1932:81, Figs. 131-132 (type species *Chirophyne xenolophus* Regan and Trewavas, 1932, by monotypy).

*Chirophyne xenolophus* Regan and Trewavas, 1932.

*Leptacanthichthys* Regan and Trewavas

*Leptacanthichthys* Regan and Trewavas, 1932:80, Fig. 128 (type species *Dolopichthys gracilispinis* Regan, 1925, by monotypy).

*Leptacanthichthys gracilispinis* (Regan, 1925).

*Ctenochirichthys* Regan and Trewavas

*Ctenochirichthys* Regan and Trewavas, 1932:82, pl. III, Fig. 3 (type species *Ctenochirichthys*
longimanus Regan and Trewavas, 1932, by monotypy).
*Ctenochirichthys longimanus* Regan and Trewavas, 1932.

_Dolopichthys_ Garman

_Dolopichthys_ Garman, 1899:81, pls. 13-15, Figs. 5-7 (type species _Dolopichthys allector_ Garman, 1899, by original designation and monotypy).

_Dolopichthys pullatus_ Regan and Trewavas, 1932.

_Dolopichthys longicornis_ Parr, 1927.

_Dolopichthys danae_ Regan, 1926.

_Dolopichthys jubatus_ Regan and Trewavas, 1932.

_Dolopichthys allector_ Garman, 1899.

_Dolopichthys dinema_ Pietsch, 1972c.

_Bertella_ Pietsch


_Chaenophryne_ Regan

_Chaenophryne_ Regan 1925:564 (type species _C. longiceps_ Regan, 1925, by original designation and monotypy).

_Chaenophryne longiceps-group_ Bertelsen, 1951.

_Chaenophryne longiceps_ Regan, 1925.

_Chaenophryne bicornis_ Regan and Trewavas, 1932.

_Chaenophryne quadrifilis_ Regan and Trewavas, 1932.

_Chaenophryne crenata_ Regan and Trewavas, 1932.

_Chaenophryne crosata_ Beebe, 1932.

_Chaenophryne draco-group_ Bertelsen, 1951.

_Chaenophryne draco_ Beebe, 1932.

_Chaenophryne parviconus_ Regan and Trewavas, 1932.

_Chaenophryne ramifera_ Regan and Trewavas, 1932.

_Pentherichthys_ Regan and Trewavas

_Pentherichthys_ Regan and Trewavas, 1932:81, Figs. 129-130 (type species _Dolopichthys atratus_ Regan and Trewavas, 1932, by subsequent designation of Burton, 1932).

_Pentherichthys atratus_ Regan and Trewavas, 1932.

_Pentherichthys venustus_ Regan and Trewavas, 1932.

_Lophodolos_ Lloyd


_Lophodolos indicus_ Lloyd, 1909.

_Lophodolos acanthognathus_ Regan, 1925.

_Lophodolos dinema_ Regan and Trewavas, 1932.

Genus _Oneirodes_ Lütken

Frontispiece, and figure 60

Females: _Oneirodes_ Lütken, 1871:72, Figs. 1-2, pl. 2 (type species _Oneirodes eschrichii_ Lütken, 1871, by original designation and monotypy).

_Onirodes_ Jordan and Gilbert, 1883:848 (erroneous spelling of _Oneirodes_, therefore taking the same type species _Oneirodes eschrichii_; generic description after Gill, 1878a). Alcock, 1899:-52, 57 (erroneous spelling; in key, includes _Paroneirodes_).

_Dermatias_ Smith and Radcliffe, 1912, In Radcliffe, 1912: 206, pl. 17, Fig. 3 (type species _Dermatias platynogaster_ Smith and Radcliffe, 1912, by original designation and monotypy).

_Monoceratias_ Gilbert, 1915:379, pl. 22, Fig. 24 (type species _Monoceratias acanthias_ Gilbert, 1915, by original designation and monotypy).

_Dolopichthys_ (in part; all erroneous designations subsequently corrected by Bertelsen, 1951; type species _Dolopichthys allector_ Garman, 1899, by original designation and monotypy): Regan, 1925:562; Regan, 1926:27-29, pl. 4, Fig. 2, pl. 5, Fig. 1; Parr, 1927:14-16, Fig. 5; Norman, 1930:-353; Beebe, 1932:88, Fig. 23; Schultz, 1934:66, Figs. 1-4; Fraser-Brunner, 1935:324, 325, Figs. 3-4; Fowler, 1936:1337-1339, 1365, 1366; Beebe, 1937:207; Norman, 1939:115, Figs. 40-41; Koefoed, 1944: 6, pl. 1, Figs. 4a-b, pl. 1, Fig. 5, pl. 3, Fig. 6; Beebe and Crane, 1947:159; Maul, 1949:39-40; Bolin and Myers, 1950:206, 207; Maul, 1961:129, 130; Beaufort and Briggs, 1962:248-251; Bussing, 1965:223; Wheeler, 1969:585.

_Dolopichthys_ (subgenus _Dermatias_ Regan and Trewavas, 1932:66-77, Figs. 91, 93-117 (in part; erroneous designations; genus _Dolopichthys_ broadened to incorporate five subgenera, amended by Bertelsen, 1951).

_Oneirodes_ Fowler, 1936:1139, 1140, Fig. 479 (erroneous spelling of _Oneirodes_, therefore taking the same type species _Oneirodes eschrichii_; generic description after Günther, 1887).

Males: _Lipactis_ Regan, 1926:43 (in part; erroneous designations; six specimens, one, DANA 1152, referred to _Oneirodes_ by Bertelsen, 1951; type species _Lipactis tumidus_ Regan, 1925, by original designation and monotypy). Norman,
subsequently referred to *Oneirodes* by Bertelsen, 1951; type species *Rhyncho ceratias brevirostris* Regan, 1925, by subsequent designation of Fowler, 1936).

*Trematorhynchus* Regan and Trewavas, 1932: 89-91 (in part; erroneous designations; four males referred to *Oneirodes* by Bertelsen, 1951; type species *Rhyncho ceratias leucorhinus* Regan, 1925, by subsequent designation of Burton, 1932).

*Caranactis* Regan and Trewavas, 1932: 58, 59, Fig. 86 (type species *Caranactis pumilus* Regan and Trewavas, 1932, by monotypy).

**Diagnosis**

Females: The genus *Oneirodes* is distinguished from all other genera of the family *Oenodidae* by having a pharyngobranchial of the first arch, coracoid with a posteroventral process, skin with minute, scattered dermal spines (detected microscopically in cleared and stained specimens), and skin not extending past base of caudal fin. In addition, *Oneirodes* is unique in having the following combination of characters: mouth large, cleft extending past eye; frontal bones convex along entire dorsolateral margin; vomerine teeth present; pterygiophore of illicium emerging on snout between frontal bones, its anterior end exposed, its posterior end protruding on back behind head; illicium length greater than 13 percent of SL; lower jaw with a well-developed symphysial spine; sphenotic spines well-developed; articular spines present, quadrate spine larger than mandibular spine; angular spines absent; pharyngobranchial II present and bearing teeth (teeth absent in *Oneirodes luetkeni*); hypobranchial II present; pectoral lobe short and broad, shorter than longest rays of pectoral fin; posterior margin of operculum deeply notched; suboperculum short and broad, its upper part rounded to bluntly pointed, its lower part semicircular, without anterior spine; anal fin with 4 rays, very rarely 5.

Males: Nonparasitic; septa between anterior nostrils and between posterior nostril and eye pigmented; septa between anterior and posterior nostril unpigmented; medial side of suboperculum unpigmented; caudal peduncle without subdermal pigment (except *Oneirodes melanocauda*; Bertelsen, 1951: 12); 6-12 olfactory lamellae; 6-17 upper, 7-28 lower denticular teeth (Bertelsen, 1951: 21); shape of pectoral fin lobe, opercular bones, and anal fin-ray counts as for females.

**Description**

Adolescent and adult females: Body relatively short, globular to moderately fusiform (Frontis-
longimanus Regan and Trewavas, 1932, by monotypy).
Ctenochirichthys longimanus Regan and Trewavas, 1932.

Dolopichthys Garman
Dolopichthys Garman, 1899:81, pls. 13-15, Figs. 5-7 (type species Dolopichthys alector Garman, 1899, by original designation and monotypy).
Dolopichthys pullatus Regan and Trewavas, 1932.
Dolopichthys longicornis Parr, 1927.
Dolopichthys danae Regan, 1926.
Dolopichthys jubatus Regan and Trewavas, 1932.
Dolopichthys alector Garman, 1899.
Dolopichthys dinema Pietsch, 1972c.

Bertella Pietsch

Chaenophryne Garman
Chaenophryne Garman 1925:564 (type species Chaenophryne longiceps Regan, 1925, by original designation and monotypy).
Chaenophryne longiceps-group Bertelsen, 1951.
Chaenophryne longiceps Regan, 1925.
Chaenophryne bicornis Regan and Trewavas, 1932.
Chaenophryne quadrifilis Regan and Trewavas, 1932.
Chaenophryne crenata Regan and Trewavas, 1932.
Chaenophryne crenalis Beebe, 1932.
Chaenophryne draco-group Bertelsen, 1951.
Chaenophryne draco Beebe, 1932.
Chaenophryne parvicornus Regan and Trewavas, 1932.
Chaenophryne ramifera Regan and Trewavas, 1932.

Pentherichthys Garman and Trewavas
Pentherichthys atratus Regan and Trewavas, 1932.
Pentherichthys venustus Regan and Trewavas, 1932.

Lophodolos Lloyd
Lophodolos indicus Lloyd, 1909.
Lophodolos acanthognathus Regan, 1925.
Lophodolos dinema Regan and Trewavas, 1932.

Genus Oneirodes Lütken
Frontispiece, and figure 60
Females: Oneirodes Lütken, 1871:72, Figs. 1-2, pl. 2 (type species Oneirodes eschrichtii Lütken, 1871, by original designation and monotypy).
Onirodes Jordan and Gilbert, 1883:848 (erroneous spelling of Oneirodes, therefore taking the same type species Oneirodes eschrichtii; generic description after Gill, 1878a). Alcock, 1899:52, 57 (erroneous spelling; in key; includes Puronuoneirodes).
Dermatias Smith and Radcliffe, 1912, In Radcliffe, 1912:206, pl. 17, Fig. 3 (type species Dermatias platynogaster Smith and Radcliffe, 1912, by original designation and monotypy).
Monoceratias Gilbert, 1915:379, pl. 22, Fig. 24 (type species Monoceratias acanthias Gilbert, 1915, by original designation and monotypy).
Dolopichthys (in part; all erroneous designations subsequently corrected by Bertelsen, 1951; type species Dolopichthys alector Garman, 1899, by original designation and monotypy): Regan, 1925:562; Regan, 1926:27-29, pl. 4, Fig. 2, pl. 5, Fig. 1; Parr, 1927:14-16, Fig. 5; Norman, 1930:353; Beebe, 1932:88, Fig. 23; Schultz, 1934:66, Figs. 1-4; Fraser-Brunner, 1935:324, 325, Figs. 3-4; Fowler, 1936:1337-1339, 1365, 1366; Beebe, 1937:207; Norman, 1939:115, Figs. 40-41; Koebe, 1944:6, pl. 1, Figs. 4a-b, pl. 1, Figs. 5, pl. 3, Fig. 6; Beebe and Crane, 1947:159; Moll, 1949:39-40; Bolin and Myers, 1950:206, 207; Moll, 1951:129, 130; Beaufort and Briggs, 1962:248-251; Bussing, 1965:223; Wheeler, 1969:585.
Dolopichthys (subgenus Dermatias) Regan and Trewavas, 1932:66-77, Figs. 91, 93-117 (in part; erroneous designations; genus Dolopichthys broadened to incorporate five subgenera, amended by Bertelsen, 1951).
Oneirodes Fowler, 1936:1139, 1140, Fig. 479 (erroneous spelling of Oneirodes, therefore taking the same type species Oneirodes eschrichtii; generic description after Günther, 1887).
Males: Lipactis Regan, 1926:43 (in part; erroneous designations; six specimens, one, DANA 1152, referred to Oneirodes by Bertelsen, 1951; type species Lipactis tumidus Regan, 1925, by original designation and monotypy). Norman,
piece); depth of head 32.2 to 64.3 percent of SL; oral valve well developed, lining inside of both upper and lower jaws; two nostrils on each side, at end of a single short tube; eye small and subcutaneous, appearing through a circular translucent area of integument; gill opening oval in shape, situated just posteroventrad to pectoral lobe; lateral line papillae as described for other oneirodids (Pietsch, 1969, 1972c); ovaries paired; two short pyloric caeca.

Lumen of esca bulb containing rod-shaped luminous bacteria (Fig. 114) and connected to outside by a pore located between terminal papilla and base of posterior esca appendage; esca bulb with an internal, arrow-shaped patch of pigment on dorsal surface; pigment usually covering basal half of bulb. The escape of all species of the genus as presently understood fall into one of three basic esca appendage patterns described below:

Pattern A: Anterior appendage without internal pigment; terminal papilla with a single distal spot of pigment; posterior appendage cylindrical; lateral appendage present or absent; a single pair of anterolateral appendages each represented by a broad, membranous flap (Fig. 60A). *Oneirodes luettkeni* and *O. rosenblatti* show Pattern A.

Pattern B: Anterior appendage internally pigmented; terminal papilla usually with a single distal spot of pigment (two distal pigment spots in *O. macrosteus*); posterior appendage cylindrical or laterally compressed; lateral appendages present or absent; anterolateral appendages, if present, usually a single filamentous pair (four filamentous pairs in *O. myriomenus*) (Fig. 60B). All species of the genus with esca not assigned to Pattern A above and C below show Pattern B.

Pattern C: Anterior appendage without internal pigment; terminal papilla usually with two distal spots of pigment (single distal pigment spot in *O. schmidtii* and *O. mirus*); posterior appendage usually anteroposteriorly compressed (cylindrical in *O. schmidtii*); lateral appendages absent; usually two pairs of filamentous anterolateral appendages (a single bifurcated pair in *O. theodoritissieri*) (Fig. 60C). Members of the *O. schmidtii*-group show Pattern C.

Teeth slender, recurved and depressible, those in lower jaw in overlapping sets as described for other oneirodids (Pietsch, 1972c:5, Fig. 2); pattern of tooth placement especially obvious in species having high tooth-counts; pattern in upper jaw apparently same as lower jaw but not nearly as obvious; teeth in lower jaw larger and more numerous than those in upper jaw; number of teeth in upper jaw 18-65, in lower jaw 18-160; total number of teeth on vomer 4-14, the largest outermost; pharyngobranchial I present but reduced, its dorsal end lying free in connective tissue matrix with no ossified or ligamentous connection to the medial side of hyoid arch; pharyngobranchial II slightly more than half as long as and approximately half as wide as pharyngobranchial III, and bearing none to numerous teeth; pharyngobranchial III with numerous teeth.

Color in preservation brown black to black over entire external surface of body except for bulbul appendages of esca; oral cavity and viscera, except for outer surface of stomach wall unpigmented.

D. 5-7; A. 4 (of 306 specimens, one had A. 3, three had A. 5); p. 13-19 (Table 1); pelvics absent; C. 9 (2 unbranched–4 branched–3 unbranched).

### Table 1

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The following measurements, expressed in percent of SL, are summarized for the females (20.0-213.0 mm) of all species: head length 32.1-64.3; head width 23.0-47.6; head depth 32.2-64.3; lower jaw 34.3-57.4; premaxillary 22.4-39.3; least outside width of frontals 7.5-19.0; illicium length 13.0-72.3.

Males: See Bertelsen (1951:83).

Etymology: The name *Oneirodes* is derived from the Greek "Oneiro'des" meaning dreamlike.
Keys to the Species of the Genus Oneirodes

Larvae

1A. Tips of caudal fin rays darkly pigmented; caudal peduncle subdermally pigmented ........................................... *O. melanocauda* Bertelsen, 1951, p. 76

1B. Caudal fin rays unpigmented; caudal peduncle without subdermal pigment. *Oneirodes* species

Adolescent and Adult Females

*Oneirodes macronema*, known from a single, damaged specimen (27.0 mm), is omitted from the key.

1A. Epibranchial of first arch toothed ................................................................. 2

1B. Epibranchial teeth absent ............................................................................. 3

2A (1A). Epibranchial of first arch with 6-17 teeth; a single pair of tooth-bearing pharyngobranchials; escal appendage pattern A: anterior appendage without internal pigment, anterolateral appendage represented by a broad, membranous flap (Figs. 60A, 61); ratio of length of upper and lower forks of operculum .60-.71 ......................... *O. luethkeni* (Regan, 1925), p. 38

2B. Epibranchial of first arch with 1-5 teeth; two pairs of tooth-bearing pharyngobranchials; escal appendage pattern B: anterior appendage internally pigmented, anterolateral appendage, if present, filamentous (Figs. 60B, 62); ratio of lengths of upper and lower forks of operculum .51-.61 .................................................. *O. carlsbergi* (Regan and Trewavas, 1932), p. 39

Eastern Tropical Pacific

Tropical Atlantic and Pacific

3A (1B). Escal appendage pattern C: anterior appendage without internal pigment, usually two pairs of filamentous anterolateral appendages (Fig. 60C) ............. (*O. schmidtii*-group, p. 77) 4

3B. Escal appendage pattern A: anterior appendage without internal pigment, a single pair of anterolateral appendages each represented by a broad, membranous flap; or escal appendage pattern B: anterior appendage internally pigmented, anterolateral appendages, if present, one or four filamentous pairs (Fig. 60A, B) ............................................... 7

4A (3A). Ratio of lengths of upper and lower forks of operculum .54-.62; distal end of posterior escal appendage anteroposteriorly compressed, the posterior face slightly concave and darkly pigmented (Fig. 101) ............................................. *O. basili*, new species, p. 79

Eastern Pacific off southern California and Baja California

4B. Ratio of lengths of upper and lower forks of operculum .44-.50; distal end of posterior escal appendage without concave, pigmented, posterior surface ............................................. 5

5A (4B). Anterolateral escal appendage more than three times length of escal bulb .......................... 6

5B. Anterolateral escal appendage approximately as long as escal bulb ...................... *O. theodoritisseri* Bello, 1938, p. 80

Eastern Atlantic off French West Africa

6A (5A). Lower jaw with 49 teeth in 42 mm specimen; anterolateral appendage less than five times length of escal bulb ......................... *O. schmidtii* (Regan and Trewavas, 1932), p. 78

(A single known specimen, 42.0 mm; Banda Sea)

6B. Lower jaw with 76 teeth in 32 mm specimen; anterolateral appendage greater than standard length .................................................. *O. mirus* (Regan and Trewavas, 1932), p. 79

(A single known specimen, 32.0 mm; Indian Ocean)

7A (3B). Lower jaw with more than 90 teeth in specimens larger than 45 mm, more than 60 teeth in specimens larger than 25 mm; number of teeth on vomer of specimens larger than 25 mm 8-14, usually more than 9 ........................................ 8

7B. Lower jaw with fewer than 90 teeth in specimens larger than 45 mm, fewer than 60 teeth in specimens larger than 25 mm; number of teeth on vomer of specimens larger than 25 mm 4-9, usually less than 8 ........................................ 9

8A (7A). Escal appendage pattern A: anterior appendage without internal pigment, anterolateral appendage represented by a broad, membranous flap (Figs. 60A, 63); length of illicium less than 35 percent of SL .......................... *O. rosenblatti*, new species, p. 41

Eastern Tropical Pacific
8B. Escal appendage pattern B: anterior appendage internally pigmented, anterolateral appendage filamentous (Figs. 60B, 92); length of illicium 60 percent of SL in 35 mm specimen ................................................. O. dicromiscus, new species, p. 73

(A single known specimen, 35.0 mm; Central Pacific)

9A (7B). Length of illicium less than 50 percent of SL ................................................. 10

9B. Length of illicium greater than 70 percent of SL in 23.5 mm specimen ................................................. O. bradburyae Grey, 1956b, p. 74

(A single known specimen, 23.5 mm; Gulf of Mexico)

10A (9A). Escs with a well-developed lateral appendage ................................................. 11

10B. Escas with lateral appendage minute or absent ................................................. 12

11A (10A). Escas with two or three medial filaments more than six times length of escal bulb (Fig. 75); head depth 43.9-47.6 percent of SL; head length 42.0-64.3 percent of SL; lower jaw 49.0-52.3 percent of SL ................................................. O. kreffti, new species, p. 57

Eastern South Pacific and Indian Oceans

11B. Escas without elongate medial filaments (Fig. 73); head depth 38.5-42.9 percent of SL; head length 38.2-43.6 percent of SL; lower jaw 43.2-50.6 percent of SL ................................................. O. anisacanthus (Regan, 1925), p. 54

North Atlantic

12A (10B). Escas with well-developed medial appendages ................................................. 13

12B. Escas with medial appendages minute or absent ................................................. 17

13A (12A). Escas with anterior and posterior appendages laterally compressed (Fig. 83); pectoral fin rays 13-14 ................................................. O. cristatus (Regan and Trewavas, 1932), p. 62

East Indies

13B. Escas with anterior and posterior appendages cylindrical; pectoral fin rays 15-19 ...... 14

14A (13B). Escas with posterior appendage highly branched (Fig. 79) ................................................. O. heteronema (Regan and Trewavas, 1932), p. 60

Eastern North Atlantic

14B. Escas with posterior appendage unbranched or bearing only minute filaments .......... 15

15A (14B). Escas with four pairs of filamentous anterolateral appendages; internally pigmented portion of anterior appendage nearly twice length of escal bulb (Fig. 77) ................................................. O. myriornemus, new species, p. 58

Eastern North Atlantic

15B. Escas with only a single pair of anterolateral appendages present or absent; internally pigmented portion of anterior appendage less than length of escal bulb (Figs. 65-66, 71) .. 16

16A (15B). Escas with anterior appendage distally divided into numerous long filaments; posterior appendage usually with one or two short branches (Fig. 71); posterior margin of upper part of suboperculum usually indented to deeply notched (Fig. 72) ................................................. O. bulbosus Chapman, 1939, p. 52

North Pacific

16B. Escas with anterior appendage bearing papillae and a few short filaments at distal tip; posterior appendage never branched (Figs. 65-66); posterior margin of upper part of suboperculum not indented ................................................. O. eschrichii Lütken, 1871, p. 44

Nearly cosmopolitan

17A (12B). Length of illicium greater than 33 percent of SL; suboperculum long and slender (Fig. 82); esca with an anterolateral appendage (Fig. 81) ................................................. O. macrosteus, new species, p. 61

Western North Atlantic

17B. Length of illicium less than 33 percent of SL; suboperculum short and broad (Figs. 88, 90); esca without anterolateral appendage ................................................. 18

18A (17B). Esca with anterior appendage bearing one to five stout papillae along posterior margin, posterior escal appendage branched (Fig. 84); ratio of lengths of upper and lower forks of operculum 0.53-0.71 ................................................. O. acanthias (Gilbert, 1915), p. 63

Eastern Pacific off southern California and Baja California
18B. Esca with anterior appendage without stout papillae along posterior margin, posterior esca! appendage unbranched; ratio of lengths of upper and lower forks of operculum .42-.59. 19

19A (18B). Esca with posterior appendage three to four times length of esca! bulb in 22 mm specimen, two times length of esca! bulb in 12.5 mm specimen (Fig. 9). 19

O. flagellifer (Regan and Trewavas, 1932), p. 72
(Three known specimens, 12.5-22.0 mm; Indian Ocean, Sulu and South China Seas)

19B. Esca with posterior appendage less than three times length of esca! bulb in specimens larger than 70 mm, as long as or less than length of esca! bulb in specimens smaller than 70 mm 20

20A (19B). Esca with anterior appendage bearing a compressed papilla and several smaller papillae on distal end, papillae darkly pigmented in specimens larger than 40 mm (Fig. 87); posterior margin of upper part of suboperculum indented to deeply notched (Fig. 88); ratio of lengths of upper and lower forks of operculum .42-.54; pectoral fin rays 15-17 20

O. thompsoni (Schultz, 1934), p. 68
North Pacific

20B. Esca with anterior appendage usually bearing a compressed papilla and two tapering filaments on distal end, papilla and filaments unpigmented (Fig. 89); posterior margin of upper part of suboperculum not indented (Fig. 90); ratio of lengths of upper and lower forks of operculum .52-.59; pectoral fin rays 17-19 20

O. notius, new species, p. 70
Atlantic and Pacific sectors of the Southern Ocean

Species Accounts
Oneirodes luetkeni (Regan)
Figures 19, 28, 50, 60A, 61, 106
Tables 1-3

Dolopichthys luetkeni Regan, 1925:562 (original description; single specimen; Gulf of Panama; holotype, ZMUC P9287). Regan, 1926:27-28, pl. 4, Fig. 2 (description; comparison with Oneirodes eschrichtii; in key). Parr, 1927:15 (in key; Dolopichthys heteracanthus, a synonym of D. luetkeni). Fowler, 1936; 1337 (description after Regan, 1926; in key). Beebe and Crane, 1947:159-160 (six additional specimens; synonymy; range; color; D. heteracanthus immature form of D. luetkeni).

Dolopichthys (subgenus Dermatias) luetkeni, Regan and Trewavas, 1932:76-77, Fig. 116 (description; in key).

Dolopichthys heteracanthus Regan, 1925:562 (in part; original description; ten specimens, no type designated; Gulf of Panama). Regan, 1926-28, pl. 5, Fig. 1 (in part; misidentifications; description; 21 specimens, 15 of which referred to Oneirodes luetkeni by Bertelsen, 1951; in key). Fowler, 1936:1338, 1339 [description after Regan, 1926; comparison with D. megacephus (=O. eschrichtii); in key].

Dolopichthys (subgenus Dermatias) heteracanthus, Regan and Trewavas, 1932:77, Fig. 117 (misidentifications; description; four additional specimens all referred to O. luetkeni by Bertelsen, 1951; in key).

Oneirodes luetkeni, Bertelsen, 1951:86-87, Figs. 31P-S, 40 (new combination; diagnostic character; available material listed; opercular bones described, figured; in key). Grey, 1956a:248 (synonymy; vertical distribution).

Material—43 females, 11.5-123.0 mm (see Appendix A).

Diagnosis—Oneirodes luetkeni is most similar to O. carlsbergi. Unlike all other oneirodids, these two species have well-developed teeth on the anterior margin of the epibranchial of the first arch. These teeth are present and easily discernible in the smallest known specimens (11.5 mm). In addition, O. luetkeni and O. carlsbergi, as well as O. rosenblatti and O. dicromisculus share a relatively high number of teeth in the jaws. Oneirodes luetkeni, however, is clearly differentiated from all its congeners by its esca! morphology (Fig. 61), absence of teeth on pharyngobranchial II, and short illicium (13.0-20.4 percent of SL).

FIGURE 61. Esca of Oneirodes luetkeni, LACM 31110-1, 60.0 mm SL: A. left side; B. dorsal view.
pigmented, tapering, posterior appendage less than length of esca bulb, becoming proportionately longer with growth; usually a pair of lateral appendages, each consisting of three or four short, unpigmented filaments; and a broad, fringed, membranous anterolateral flap (Fig. 61).

Suboperculum with posterior margin of upper part not indented (Bertelsen, 1951:87, Fig. 31P-S); length of lower fork of operculum 29.1 (22.8-35.7) percent of SL; ratio of lengths of upper and lower forks of operculum .64 (.60-.71) (measurements based on 11 specimens, 25.0-123.0 mm).

Epibranchial of first gill arch with 6-17 teeth on anterior margin (Fig. 50); teeth absent on pharyngobranchial II; total number of teeth on vomer 6-10; number of teeth in upper jaw 57-134, in lower jaw 51-93; D. 5-6; A. 4; P. 15-17 (Table 1).

Measurements in percent of SL, based on 21 specimens, 20.0-123.0 mm: head length 39.3 (32.5-46.4); head depth 46.5 (32.5-52.6); lower jaw 50.5 (42.9-57.4); premaxillary 34.1 (30.0-39.3); illicium length 17.9 (13.0-20.4). Complete counts and measurements of representative specimens are given in Table 2.

Rest of characters as for genus.

Distribution.—*Oneirodes luetkeni* was formerly known from the Gulf of Panama and adjacent waters of the eastern Pacific Ocean. The collections reported here extend the range along the west coast of the Americas to 20°21′N (VELEKO IV Station 13759) and to 12°20′S (AKADEMIK KURCHATOV Cruise 4, Station 229) (Fig. 106).

The vertical distribution of *O. luetkeni* was analyzed by a procedure outlined by Gibbs (1969; see Methods and Materials, p. 3). Results indicate a concentration between 700 and 1250 m (Table 3).

Etymology.—*Oneirodes luetkeni* is named for the Danish zoologist Christian Frederik Lütken.

**Oneirodes carlsbergi** (Regan and Trewavas)  
Figure 60B, 62, 107  
Tables 1 and 4

*Dolophichthys* (subgenus *Dermatias*) *carlsbergi*  
Regan and Trewavas, 1932:76, Fig. 115 (original description; six specimens; Atlantic and Pacific; lectotype, ZMUC P9285; in key).

*Oneirodes eschrichtii*, Regan, 1926:26 (in part; misidentifications; two specimens, the holotype of *O. eschrichtii* and another referred to *O. carlsbergi* by Bertelsen 1951). Regan and Trewavas, 1932:63 (in part; after Regan, 1926).

*Dolophichthys heterocanthus*, Regan, 1926:28 (in part; misidentifications; 21 specimens, two of
Table 3
Vertical distribution of *Oneirodes lutkeni* based on specimens collected by the DANA. Meter-hours and specimens expressed as percent of total. See text for methods of calculation.

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Number of specimens: 19
Number of meter-hours: 596.6
Number of hauls: 83

which referred to *D.* (subgenus *Dermatias*) *carlsbergi* by Regan and Trewavas, 1932]. Norman, 1930:353 [in part; misidentifications; two specimens, the larger referred to *D.* (subgenus *Dermatias*) *carlsbergi*, the smaller to *D.* (subgenus *Dermatias*) *anisacanthus* (= *O. anisacanthus*) by Regan and Trewavas, 1932].

*Dolopichthys megacerus,* Regan, 1926:29 [in part; misidentifications; nine specimens, one of which referred to *D.* (subgenus *Dermatias*) *carlsbergi* by Regan and Trewavas, 1932].

*Dolopichthys inimicus* Fraser-Brunner, 1935:-324-325, Fig. 3 (original description; single specimen; off Irish Atlantic Slope; 320 m; holotype, BMNH 1934.88.90). Wheeler, 1969:585 (reference to original description).


*Oneirodes carlsbergi,* Bertelsen, 1951:86, Figs. 31M-O, 39 (new combination; diagnostic characters; DANA material listed; lectotype designated; opercular bones described, figured; in key). Grey, 1956a:247-248 (synonymy; vertical distribution).

*Oneirodes eschrichti-group,* Bussing, 1963:223 misidentification; description of an additional spec-

Figure 62. Esca of *Oneirodes carlsbergi,* SIO 55-246, 62.0 mm SL: A. left side, medial appendage not shown; B. dorsal view.
imen; comparison with *Dolopichthys brevifilis* (= *O. eschrichtii*).

Material.—25 known females, 18.0-159.0 mm (see Appendix A).

Diagnosis.—*Oneirodes carlsbergi* is most similar to *O. luetkeni* (see diagnosis for the latter, p. 38). *Oneirodes carlsbergi* is easily distinguished from all of its congeners by its escal morphology (Fig. 62), presence of teeth on epibranchial I and pharyngobranchial II, and a high number of jaw teeth.

Description.—Escal appendage pattern B (Fig. 60B); esca with a tapering, internally pigmented, anterior appendage, two to more than three times as long as escal bulb becoming proportionately longer with growth, and usually bearing two short, unpigmented filaments on anterior margin near distal tip; a medial, unpaired, unpigmented appendage usually consisting of numerous branched filaments, flanked on each side by a similar filamentous medial appendage; a truncated terminal papilla, with a distal spot of pigment in some specimens; a laterally compressed, crescent-shaped posterior appendage, pigmented on distal margin in some specimens; an unpigmented, filamentous lateral appendage on each side; anterolateral appendages absent (Fig. 62).

Suboperculum with posterior margin of upper part not indented (Bettselsen, 1951:86, Fig. 31M-O); length of lower fork of operculum 26.9 (23.3-30.0) percent of SL; ratio of lengths of upper and lower forks of operculum .55 (.51-.61) (measurements based on 7 specimens, 37.0-159.0 mm).

Epibranchial I with 1-5 teeth on anterior margin; teeth present on pharyngobranchial II; total number of teeth on vomer 4-10; number of teeth in upper jaw 29-180, in lower jaw 53-160; D, 5-7; A, 4-5 (one specimen had A. 5); P, 16-18 (Table 1).

Measurements in percent of SL, based on 17 specimens, 21.0-159.0 mm: head length 41.1 (34.8-47.6); head depth 48.3 (41.9-64.3); lower jaw 46.4 (40.9-54.8); premaxillary 31.8 (26.1-38.1); illicium length 24.1 (15.2-35.3). Complete counts and measurements of representative specimens are given in Table 4.

Rest of characters as for genus.

Distribution.—*Oneirodes carlsbergi* has been taken in tropical waters of the eastern Atlantic Ocean west to 35°49'W between 17°49'N and 5°34'S, in the eastern Pacific Ocean west to 148°35'W between 12°07'N and 7°45'S, and a single specimen from the western Pacific at 16°55'N, 120°02'E (DANA Station 3730-1). One additional specimen, considerably outside the presumed circumtropical range of *O. carlsbergi*, was taken off the Irish Atlantic Slope. The lectotype is from the Gulf of Panama (Fig. 107).

The available data (maximum depths reached by fishing gear) suggest that *O. carlsbergi* has an extremely wide vertical range compared to that of other species of *Oneirodes*, and that it may be taken at relatively shallow depths. Thirty-six percent of the total material, including the largest specimens, was collected by gear that fished at maximum depths not exceeding 360 m; 72 percent was taken by nets fished above 1000 m. Two specimens (22.5 and 38.0 mm) were captured by a closing net between 690 and 900 m. Although data for the Atlantic and Pacific populations were analyzed separately, no significant differences in vertical distribution were found.

Geographic variation.—No geographic variation could be detected between the Atlantic and Pacific populations of *O. carlsbergi*.

Etymology.—This species is named in honor of the Danish Carlsberg Foundation.

Comments.—*Oneirodes inimicus* (Fraser-Brunner, 1935) was described from a single specimen reportedly collected from 320 m on the continental slope southwest of Ireland with a "small-meshed" net towed from the stern of a drifting commercial trawler. In describing *O. inimicus*, Fraser-Brunner (1935) failed to notice a posterior escal appendage characteristic of the esca of *O. carlsbergi*. The presence of epibranchial teeth, a toothed pharyngobranchial II, and high jaw-tooth counts confirm the identity of this specimen as *O. carlsbergi*.

*Oneirodes rosenblatti*, new species

Figures 60B, 63, 64, 108

Tables 1 and 5

Material.—12 females, 12.5-94.0 mm.

Holotype.—SIO 69-351, 94.0 mm; PIQUERO Cruise 8; Gulf of Panama, 3°10'N, 84°10'W; 10-ft IKMT; 0950-1453 hr; 3 July 1969.

Paratypes.—SIO 55-246, 2 (67.0-91.0 mm); HORIZON; 5°00'N, 78°09'W; 10-ft IKMT, 0-1436 m; 2050-0100 hr; 14-15 November 1965, SIO 52-384, 84.0 mm; HORIZON, Shellback Expedition; 2°09'N, 84°53.5'W; 10-ft IKMT, 0-1286 m; 29 July 1952. SIO 70-384, 56.0 mm; ANTTON BRUNN Cruise 11, Station 183, 8°59'S, 80°37'W; Menzies trawl, 0-4501 m; bottom depth 4486-4501 m; 4 November 1965. SIO 55-244, 26.0 m; HORIZON, Eastropac Expedition, trawl 12; 10-ft IKMT, 0-1335 m; 14 November 1955.

IOM uncatalogued, 66.0 mm; AKADEMIEK KURCHATOV Cruise 4, Station 282, Sample 208;
### Table 4
Counts and measurements of representative specimens of *Oneirodes carlsbergi*.
Measurements expressed in percent of SL

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### Table 5
Counts and measurements of *Oneirodes rosenblatti*.
Measurements expressed in percent of SL

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8°01.5'S, 81°01.2'W; 10-ft IKMT, 0-1500 m; bottom depth 3870-4800 m; 1450-1900 hr; 28 October 1968. IOM uncatalogued, 48.0 mm; AKADEMIIK KURCHATOV Cruise 4, Station 295, Sample 227; 8°25'S, 81°18'W; 10-ft IKMT, 0-910 m; 1940-0140 hr; 1-2 November 1968.

ZMUC P92188, 32.0 mm; GALATHEA Expedition Station 739; 7°22'N, 79°32'W; Herring Otter Trawl, 0-745 m; bottom depth 915-975 m; 15 May 1952.

USNM 201099, 13.0 mm; ANTON BRUNN Cruise 14, Station 570B; 8°33'S, 81°27'W; 10-ft IKMT, 0-2850 m; 0005-0505 hr; 14 March 1966.

LACM 32613-4, 12.5 mm; TE VEGA Cruise 20, Station B-16; 3°46'S, 85°37'W; 6-ft modified Tucker trawl with opening-closing device, 1000-1230 m.

Additional non-type material.—IOM uncatalogued, 22.0 mm; AKADEMIIK KURCHATOV Cruise 4, Station 229, Sample 80; 12°14'S, 81°23'W; 10-ft IKMT, 0-1500 m; bottom depth 4550-4650 m; 2315-0335 hr; 7-8 September 1968.

Description.—*Oneirodes rosenblatti* can only be confused with *O. luetkeni* both of which are characterized by a relatively high number of teeth in the jaws and on the vomer, and a similar esca morphology (Figs. 61, 63). The former, however, is clearly differentiated from *O. luetkeni* by the absence of epibranchial teeth, the presence of teeth on pharyngobranchial II, and a considerably longer illicium (see also diagnosis for *O. luetkeni*, p. 38).

Subopercular bone relatively long and slender, with posterior margin of upper part not indented (Fig. 64); length of lower fork of operculum 23.6 (20.7-26.5) percent of SL; ratio of lengths of upper and lower forks of operculum .49 (.45-54) (measurements based on seven specimens, 32.0-94.0 mm).

Epibranchial teeth absent; teeth present on pharyngobranchial II; total number of teeth on vomer 6-14; number of teeth in upper jaw 50-145, in lower jaw 59-137; D. 5-6; A. 4; P. 14-16 (Table 1). Counts and measurements are given in Table 5.

Rest of characters as for genus.

Distribution.—*Oneirodes rosenblatti* is known only from the eastern tropical Pacific Ocean as far west as 85°37'W between 7°22'N and 12°24'S (Fig. 108).

Based on the maximum depths reached by fishing gear, *O. rosenblatti* appears to be a relatively deep dwelling form with a rather wide vertical range. Seventy-five percent of the known material, including the largest specimens, was captured by gear that fished at depths below 1280 m, in spite

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**Figure 63.** Esca of *Oneirodes rosenblatti*, holotype; SIO 69-351, 94.0 mm SL, left side.

**Figure 64.** Subopercula of *Oneirodes rosenblatti*, lateral views, right side: A. paratype, IOM uncatalogued, 48.0 mm SL; B. paratype, SIO 55-246, 67.0 mm SL; C. paratype, SIO 52-384, 84.0 mm SL.
of the considerably greater fishing effort made above this depth during most oceanographic cruises to the eastern tropical Pacific (Gibbs, 1969:12-13). A single capture (12.5 mm) was made between 1000-1250 m with an opening-closing net. Although O. rosenblatti occurs between 750 m and perhaps as deep as 3000 m it seems to be concentrated between 1250 and 2000 m.

Etymology.—Oneirodes rosenblatti is named for Richard H. Rosenblatt, of the Scripps Institution of Oceanography, for his many contributions to ichthyology and for his help in making the present revision of Oneirodes possible.

Oneirodes eschrichtii Lütken
Frontispiece
Figures 60B, 65-70, 109
Tables 1, 6-9


Oneirodes eschrichtii, Jordan and Gilbert, 1883:848 (brief description after Gill, 1878a).

Oneirodes megaceros Holt and Byrne, 1908a:93-95 (original description; single specimen, Irish Atlantic Slope, 51°21’N, 11°36’W; 0-1454 m; holotype, NMI SR497; comparison with O. eschrichtii). Holt and Byrne, 1908b:60 (listed; reference to original description). Murray and Hjort, 1912:94, 614, Fig. 81 (specimen thought to resemble O. megaceros).

Dermatias platynogaster Smith and Radcliffe, 1912, In Radcliffe, 1912:206-207, pl. 17, Fig. 3 (original description; single specimen; off coast of Luzon, western Pacific, 13°40’N, 123°57’E; 549 m; holotype, USNM 70269).

Dolopichthys megaceros, Regan, 1926:29 [brief description; D. aniscacanthus (=O. aniscacanthus), a synonym of D. megaceros; additional specimens; comparison with holotype; in key]. Parr, 1927:15, 18 [comparison with D. obtusus (=O. eschrichtii); in key]. Fowler, 1936:139 (synonymy; description after Regan, 1926; in key). Koefoed, 1944:6, pl. 1, Figs. 4a-b, 5, pl. 3, Fig. 6 (description of two additional specimens; comparison with holotype). Maul, 1949:40 (a possible synonym of O. eschrichtii). Maul, 1961:130 (validity; synonymy; three specimens questionably referred to D. megaceros). Wheeler, 1969:585 (reference to original description).

Dolopichthys platynogaster, Regan, 1926:29-30 (brief description after Smith and Radcliffe, 1912; in key).

Dolopichthys sp. Regan, 1926:14 (listed). Norman, 1939:115, Fig. 41 (in part; two specimens, the smaller, DISCOVERY Station 186, is here referred to O. eschrichtii; the larger, DISCOVERY 193, is here referred to O. schmidtii-group; esca figured).

Dolopichthys (subgenus Dermatias) platynogaster, Parr, 1927:14 (in key).

Dolopichthys obtusus Parr, 1927:16-18, Fig. 5 [original description; single specimen; off Bermuda, 32°19’N, 64°32’W; 8000 ft. wire; holotype, BOC 2028; comparison with D. aniscacanthias (=O. aniscacanthias) and O. megaceros (=O. eschrichtii); in key]. Maul, 1961:130 [comparison with other species of Oneirodes; a possible synonym of D. megaceros (=O. eschrichtii)].

Dolopichthys tentaculatus Beebe, 1932:88-90, Fig. 23 [original description; single specimen; off Bermuda, 1097 m; holotype, USNM 170945 (formerly NYZS 23170); comparison with D. obtusus (=O. eschrichtii)]. Beebe, 1934:192 (figured). Beebe, 1937:207 (listed). Maul, 1961:130 [comparison with other species of Oneirodes; a possible synonym of D. megaceros (=O. eschrichtii)].

Dolopichthys (subgenus Dermatias) digitatus Regan and Trewavas, 1932:68, Fig. 94 (original description; single specimen; north of New Guinea, 1°20’S, 138°42’E; 4000 m wire; holotype ZMUC P9272).
**Dolopichthys** (subgenus Dermatias) platynogaster, Regan and Trewavas, 1932:68, Fig. 95 (brief description after Smith and Radcliffe, 1912; in key).

**Dolopichthys** (subgenus Dermatias) simplex Regan and Trewavas, 1932:68, Fig. 96 (original description; single specimen; eastern Atlantic, 13°31'N, 18°03'W; 3500 m wire; holotype, ZMUC P9279).

**Dolopichthys** (subgenus Dermatias) pollicifer Regan and Trewavas, 1932:69, Fig. 97 (original description; single specimen; Gulf of Panama; 3500 m wire; holotype, ZMUC P9277).

**Dolopichthys** (subgenus Dermatias) diadematus Regan and Trewavas, 1932:69, Fig. 98 (original description; single specimen; South Atlantic, 15°41'S, 5°50'W; 3000 m wire; holotype, ZMUC P9271).

**Dolopichthys** (subgenus Dermatias) brevifilis Regan and Trewavas, 1932:69, Fig. 99 (original description; single specimen; Gulf of Panama; 3000 m wire; holotype, ZMUC P9268).

**Dolopichthys** (subgenus Dermatias) pennatus Regan and Trewavas, 1932:69-70, Fig. 100 (original description; single specimen; Atlantic, 12°11'N, 35°49'W; 3000 m wire; holotype, ZMUC P9275).

**Dolopichthys** (subgenus Dermatias) frondosus Regan and Trewavas, 1932:70, Fig. 101 (original description; single specimen; eastern Atlantic, 15°31'N, 18°05'W; 1000 m wire; holotype, ZMUC P9273).

**Dolopichthys** (subgenus Dermatias) cirrifer Regan and Trewavas, 1932:70, Fig 102 (original description; single specimen; western North Atlantic, 32°56'N, 23°47'W; 3500 m wire; holotype, ZMUC P9269).

**Dolopichthys** (subgenus Dermatias) tentaculatus, Regan and Trewavas, 1932:70 (brief description after Beebe, 1932; in key).
**FIGURE 66. Escue of Oneirodes eschrichtii from southern California population, left sides:** A. LACM 6838-10, 22.0 mm SL; B. LACM 31100-1, 71.0 mm SL.

*Dolopichthys* (subgenus *Dermatias*) megaceros, Regan and Trewavas, 1932:71, Fig. 103 (description; reference to holotype; in key).

*Dolopichthys* (subgenus *Dermatias*) obtusus, Regan and Trewavas, 1932:71 (brief description after Parr, 1927; in key).

*Dolopichthys* (subgenus *Dermatias*) plumat us Regan and Trewavas, 1932:71-72, Fig. 104 (original description; single specimen; Gulf of Panama; 2500 m wire; holotype, ZMUC P9276).

*Dolopichthys* (subgenus *Dermatias*) pilotus Regan and Trewavas, 1932:73, Fig. 107 (original description; single specimen; Atlantic, 24°36.5'N, 17°27'W; 3000 m wire; holotype, ZMUC P9278).

*Dolopichthys* (subgenus *Dermatias*) multifilis Regan and Trewavas, 1932:73, Fig. 108 (original description; single specimen; Sulu Sea, 8°34'N, 119°55'E; 1000 m wire; holotype, ZMUC P9274).

*Dolopichthys* (subgenus *Dermatias*) claviger Regan and Trewavas, 1932:73-74, Fig. 109 (original description; two specimens; eastern Pacific near Galapagos; lectotype designated by Bertelsen, 1951, ZMUC P9270).

*Dolopichthys* (subgenus *Dermatias*) thysanophorus Regan and Trewavas, 1932:74, Fig. 110 (in part; original description; two specimens, the smaller, BMNH 1932.5.3.14, lectotype of *O. thysanophorus*, the larger, ZMUC P9281, here referred to *O. eschrichtii*).

*Dolopichthys* hibernicus Fraser-Brunner, 1935:325-326, Fig. 4 (original description; single specimen; Irish Atlantic Slope, 53°15'N, 12°28'W; holotype, BMNH 1934.8.8.91). Wheeler, 1969:585 (reference to original description).

Oneirodes eschrichtii, Fowler, 1936:1139, 1140, 1337, Fig. 479 (description after Günther, 1887; *O. megaceros* a synonym of *O. eschrichtii*; in key).

*Dolopichthys* simplex, Fowler, 1936:1365 (listed; in key).

*Dolopichthys* diadematus, Fowler, 1936:1366 (listed; in key).

*Dolopichthys* frondosus, Fowler, 1936:1366 (listed; in key).

*Dolopichthys* cirrifer, Fowler, 1936:1366 (listed; in key).

*Dolopichthys* pilotus, Fowler, 1936:1366 (list-
ed; in key). Maul, 1961:130 [a possible synonym of D. megaceros (=O. eschrichtii)].

Oneirodes eschrichti-group Bertelsen, 1951:70-84, Figs. 31E-G, 32-37 (in part; 22 nominal species grouped; common characters; all available material listed; description of larvae, males, females; in key). Grey, 1956a:244-246 (synonymy; vertical distribution). Maul, 1961:122-130, Figs. 18, 22, Table 1 (in part; four additional specimens; description; comparison; discussion of possible valid species within O. eschrichti-group). Maul, 1962:17-22, Figs. 7-9 (two additional specimens; description; discussion of proper identity). Bussing, 1965:223 [misidentification; single specimen here referred to O. carlsbergi; description; comparison with D. brevifilis (=O. eschrichtii)]. Taylor, F., 1967:2111-2113 (misidentification; single specimen here referred to O. bulbosus; description; opercular bones described, figured; esca figured).


Dolophichthys plumatus, Maul, 1961:130 [a possible synonym of D. megaceros (=O. eschrichtii)].

Dolophichthys digitatus, Beaufort and Briggs, 1962:249 (description after Regan and Trewavas, 1932; in key).


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**Figure 67.** Regression (y = a + bx) of head length on standard length for two populations of Oneirodes eschrichtii. Statistics as in Table 8.

Material.–52 females, 10.0–213.0 mm (see Appendix A).

Diagnosis.–The escal morphology of O. eschrichtii is most similar to that of O. bulbosus and O. aniscanthus (Figs. 65-66, 71, 73). The esca of O. eschrichtii, however, does not have the numerous, tapering distal filaments of the anterior appendage of O. bulbosus, nor the lateral escal appendage of O. aniscanthus. Although, the differences in the shape of the subopercular bone between O. eschrichtii and O. bulbosus (Fig. 72; Bertelsen, 1951:83, Fig. 31E-G), and the slightly higher jaw-tooth counts of the former, are helpful in distinguishing these two forms, the characters of the esca are the only satisfactory means of separating O. eschrichtii from this and from most of the other species of the genus.

Description.–Escal appendage pattern B (Fig. 60B); esca with a stout, internally pigmented, anterior appendage, not longer than escal bulb, bearing distally a large, compressed papilla, at the anterior base of which usually arise a pair of filaments shorter than length of anterior appendage; one or two additional, shorter filaments along anterior margin and several to many along posterior margin of anterior appendage; papilla and distal ends of some filaments of anterior appendage darkly pigmented in most specimens approximately 100 mm and larger (and the 61.0 mm holotype of O. megaceros); a pair of filamentous, medial appendages half as long as escal bulb in smaller specimens (about 15 mm) to more than twice the length of escal bulb in specimens of intermediate size.
(70 mm), less than half as long as escal bulb in largest specimens (150 mm); tips of tapering filaments of medial appendages darkly pigmented in a few large specimens (134 mm, 188 mm); a terminal papilla, truncated with a distal streak of pigment, or conical with a distal spot of pigment (see Geographic variation below, p. 51); an unpigmented, unbranched, tapering posterior appendage, one and a half to three times length of escal bulb in specimens less than approximately 100 mm, becoming proportionately shorter with further growth, less than length of escal bulb in 213.0 mm specimen; and in some specimens, on each side, a dorsolaterally to anterolaterally placed, unpigmented, filamentous appendage shorter than length of medial appendages (Figs. 65-66).

Subopercle with posterior margin of upper part not indented (Bertelsen, 1951:83, Fig. 31E-G); length of lower fork of operculum 27.1 (20.7-31.9) percent of SL; ratio of lengths of upper and lower forks of operculum 56 (44-69) (measurements based on 8 specimens, 22.5-213.0 mm).

Epibranchial teeth absent; teeth present on pharyngobranchial II; total number of teeth on vomer 4-8; number of teeth in upper jaw 24-50, in lower jaw 29-56; D. 5-7; A. 4; P. 15-9 (Table 1).

Measurements in percent of SL, based on 30 specimens, 21.0-213.0 mm: head length 40.2 (33.3-46.2); head depth 44.1 (34.7-55.4); lower jaw 45.1 (34.3-55.7); premaxillary 31.6 (22.4-38.9); illicium length 26.2 (17.8-38.6). Complete counts and measurements of representative specimens are given in Tables 6-7.

Rest of characters as for genus.

Size at maturity.—The ovaries of several large specimens (121.0-213.0 mm) of O. eschrichtii were large and tightly packed with eggs. The left ovary of the largest known specimen (213.0 mm, ROM 27277) was approximately 85 mm long or 40 percent of SL. Some of these ripe females were captured considerably outside the larval distribution of ceratioids found by Bertelsen (1951:224) to be limited to the warmer parts of the oceans between approximately 40°N and 35°S (see Ontogenetic Distribution, p. 95).

Distribution.—Oneirodes eschrichtii is the only member of the genus with a nearly cosmopolitan distribution. It is known from both sides of the North Atlantic, in the west from off Greenland (the type locality) south to Bermuda, and in the east from the Irish Atlantic Slope as far south as 10°52'N. In the South Atlantic the range extends as far south as 40°S, between 43°W and 7°W. In the Pacific Ocean, O. eschrichtii is found off the slope of the Americas from 33°N to 34°S.
Table 7
Counts and measurements of specimens of southern California population of *Oneirodes eschrichtii*. Measurements expressed in percent of SL.

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Figure 69. Regression ($y = a + bx$) of lower jaw length on standard length for two populations of *Oneirodes eschrichtii*. Statistics as in Table 8.
Two records are from the central Pacific, a single record from the Kurile-Kamchatka Trench at 49°29'N, 158°41'E, a single record just south of Tasmania, and several records from the East Indies. Three specimens are known from the Gulf of Aden and Arabian Sea (Fig. 109).

Data are not sufficient from any one geographic area to make meaningful suggestions about the vertical distribution of *O. eschrichtii*.

Geographic variation and ontogenetic change.—There appears to be a disjunct and morphologically distinct population of *O. eschrichtii* present in the waters off southern California. Morphological differences in the esca are apparent: the medial escal appendages of the southern California population are generally longer and more highly branched than those of specimens collected from other areas; the terminal escal papilla is considerably larger in southern California specimens and has a distal spot of pigment rather than a distal streak of pigment (Figs. 65-66). Several morphometrics average higher in the southern California population (Figs. 67-70, Table 8). Counts and measurements of specimens of the southern California population of *O. eschrichtii* are given in Table 7.

Ontogenetic changes and intraspecific variation in the morphology of the esca are outlined in the description of the esca above and shown in Figures 65-66.

Etymology.—*Oneirodes eschrichtii* is named for the Danish naturalist D. F. Eschricht.

Comments.—Bertelsen (1951) erected the *Oneirodes eschrichtii*-group to include 22 nominal species most of which were described by Regan and

**Figure 70.** Regression ($y = a + bx$) of illicium length on standard length for two populations of *Oneirodes eschrichtii*. Statistics as in Table 8.
Table 8

Statistics describing regressions (y = a + bx) of several morphometrics on standard length (Figs. 67-70) of two populations of Oneirodes eschrichtii. x = mean SL; y = mean of particular morphometric character; N = number of specimens; a = y intercept; b = slope; CL-b = 95 percent confidence limits for b; r = correlation coefficient

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Trewavas (1932) on the basis of one or two adolescent female specimens less than 25 mm SL, and on relatively minute differences in the morphology of the esca. With a better understanding of individual and ontogenetic variation since Bertelsen's (1951) monograph, these differences in the esca morphology are, in most cases, regarded as variations shown by widely distributed conspecific populations. In the absence of significant differences, the maintenance of specific distinction for 18 forms previously included in the O. eschrichti-group is considered unjustified. These are here synonymized with O. eschrichtii. The reallocation of the nominal forms included in Bertelsen's (1951) O. eschrichti-group is outlined in Table 9.

Oneirodes thyssanophorus (Regan and Trewavas, 1932) was described on the basis of two specimens (12.5 and 18.5 mm) both collected at the same station (DANA 3686-7) in the Sulu Sea. The smaller of these (BMNH 1932.5.3.14), the lectotype of O. thyssanophorus, is here referred to O. flagellifer (see comments under the latter species, p. 73). The 18.5 mm specimen (ZMUC P9281) has an esca that compares well with the known material of O. eschrichtii and is here referred to the latter (Fig. 65B).

Oneirodes bulbosus Chapman
Figures 60B, 71-72, 109
Tables 1 and 10

Oneirodes bulbosus Chapman, 1939:538-540, Fig. 70 (original description; single specimen; Gulf of Alaska, 53°50'N, 133°54'W; 693-891 m; holotype, USNM 108149; comparison with O. esch-
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Material.—31 females, 47.0-110.0 mm (see Appendix A).

Diagnosis.—Oneirodes bulbus is most similar to O. eschrichtii and O. anisacanthus (see diagnosis for O. eschrichtii, p. 48). In addition to differences in escal morphology, the shape of the suboperculum of most specimens of O. bulbus differs from that of these forms and all other species of the genus with the exception of O. thompsoni. The posterior margin of the upper part of this bone is indented to deeply notched in all specimens of O. bulbus examined except for the holotype (Fig. 72). O. bulbus further differs from O. anisacanthus in having slightly fewer teeth in the jaws (Tables 10, 11).

Description.—Escal appendage pattern B (Fig. 60B); esca with a stout, internally pigmented anterior appendage bearing distally numerous tapering filaments some of which may be twice length of escal bulb and darkly pigmented distally; a pair of highly branched, unpigmented, tapering medial filaments, two to nearly five times length of escal bulb in large specimens (81.0 mm); a short, rounded terminal papilla with a distal spot of pigment in specimens 57.0 mm and larger; and an unpigmented, tapering posterior appendage, nearly twice length of escal bulb, and usually bearing one
or two small, unpigmented filaments at one half to one third the distance from distal tip; lateral and anterolateral appendages absent (Fig. 71).

Suboperculum with posterior margin of upper part usually indented to deeply notched (Fig. 72); length of lower fork of operculum 31.0 (28.6-35.0) percent of SL; ratio of lengths of upper and lower forks of operculum .57 (.55-60) (measurements based on six specimens, 47.5-109.0 mm).

Epibranchial teeth absent; teeth present on pharyngobranchial II; total number of teeth on vomer 4-8: number of teeth in upper jaw 23-39, in lower jaw 24-40; D. 6-7; A. 4; P. 15-18 (Table 1).

Measurements in percent of SL, based on 23 specimens, 47.0-110.0 mm; head length 42.2 (37.6-49.1); head depth 43.7 (39.1-50.8); lower jaw 48.5 (44.1-56.1); premaxillary 32.4 (29.1-38.6); illicial length 26.9 (23.1-38.6). Complete counts and measurements of representative specimens are given in Table 10.

Rest of characters as for genus.

Distribution.—*Oneirodes bulbosus* is known only from the north Pacific Ocean and Bering Sea. The range extends south to 44°N in the east and to 49°N in the west. The holotype was taken at 53°50′N, 133°54′W (Fig. 109).

Although little is known about the relative fishing effort at various depths in the North Pacific, *O. bulbosus*, based on maximum depths reached by gear, appears to inhabit relatively shallow depths, the bulk of the population concentrated between 600 and 850 m with, perhaps, a second peak below approximately 950 m.

Etymology.—The specific name is from the Latin *bulbosus*, referring to the bulbous body shape.

*Oneirodes anisacanthus* (Regan)

Figures 60B, 73-74, 106

Tables 1 and 11

*Dolopichthys anisacanthus* Regan, 1925:562-563 (original description; four specimens; north Atlantic; lectotype, ZMUC P2967). Regan, 1926: 29 [synonymized with *D. megaceros* (=*Oneirodes eschrichtii*) without comment], Fowler, 1936:1364-1366 (listed; in key). Maul, 1949:39-40, Figs. 13-17 [*Oneirodes eschrichtii* (sensu lato) of Maul, 1949, a possible synonym of *D. anisacanthus*; description; osteology]. Maul, 1961:129-130, Figs. 19-21, Table 1 [*Oneirodes* sp. of *O. eschrichtii*-group of Maul, 1961, includes *O. eschrichtii* (sensu lato) of Maul, 1949; five specimens, the largest here referred to *O. anisacanthus*, remaining specimens here referred to *O. eschrichtii*]. Bertelsen, 1951:267 (lectotype designated).

*Dolopichthys megaceros*, Regan, 1926:29 (in part; *D. anisacanthus*, a synonym of *D. megaceros*).

*Dolopichthys heterocanthus*, Norman, 1930:353 [in part; misidentifications; two specimens, the larger referred to *D. carlsbergi* (=*O. carlsbergi*), the smaller to *D. anisacanthus* (=*O. anisacanthus*), by Regan and Trewavas, 1932].

*Dolopichthys* (subgenus *Dermatias*) *anisacanthus*, Regan and Trewavas, 1932:72, pl. 2, Fig. 2, text Fig. 105 (description; three additional specimens; in key).

*Oneirodes eschrichtii* (sensu lato) Maul, 1949:

---

**Table 10**

Counts and measurements of representative specimens of *Oneirodes bulbosus*.

Measurements expressed in percent of SL

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<td>4</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>Upper jaw</td>
<td>28</td>
<td>26</td>
<td>29</td>
<td>34</td>
<td>25</td>
<td>23</td>
<td>31</td>
</tr>
<tr>
<td></td>
<td>Lower jaw</td>
<td>24</td>
<td>30</td>
<td>26</td>
<td>34</td>
<td>25</td>
<td>25</td>
<td>31</td>
</tr>
</tbody>
</table>
34-42, Figs. 13-17 (description; osteology; a possible synonym of *D. anisacanthus*).

*Oneirodes eschrichtii*-group Bertelsen, 1951:79 (in part).

*Oneirodes* sp. of *Oneirodes eschrichtii*-group Maul, 1961:122-130, Figs. 19-21, Table 1 (in part, *O. eschrichtii* (*sensu lato*) of Maul, 1949; five specimens, the largest here referred to *O. anisacanthus*, remaining specimens here referred to *O. eschrichtii*; description in part after Maul, 1949).

Material.—9 females, 10.5-173.0 mm (see Appendix A).

Diagnosis.—The esca of this species is most similar to that of *O. eschrichtii* and *O. bulbosus* (see diagnosis for *O. eschrichtii*, p. 48), but differs in having a well-developed lateral esca appendage (Figs. 65, 71, 73). The esca characters are the only satisfactory means of separating *O. anisacanthus* from most of the other species of the genus.

Description.—Esca appendage pattern B (Fig. 60B); esca with a stout anterior appendage as long as, or slightly longer than esca bulb, bearing two, unpigmented, tapering filaments on anterior margin near distal tip, and numerous shorter filaments along anterior, posterior, and lateral margins, with distal tips of some darkly pigmented in specimens 78.0 mm and larger; proximal half of anterior appendage internally pigmented; a series of short,
### Table 11
Counts and measurements of *Oneirodes anisacanthus*.
Measurements expressed in percent of SL

<table>
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<tr>
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<th>MMF 3101</th>
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<th>ZMUC P92183</th>
<th>Lectotype ZMUC P9267</th>
<th>BMNH 1930.1.12.1018</th>
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<td><strong>Length</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Head</td>
<td>38.2</td>
<td>42.3</td>
<td>40.4</td>
<td>43.6</td>
<td>42.6</td>
<td>–</td>
<td>38.5</td>
</tr>
<tr>
<td>Lower jaw</td>
<td>43.4</td>
<td>50.6</td>
<td>45.7</td>
<td>46.2</td>
<td>48.1</td>
<td>43.2</td>
<td>38.5</td>
</tr>
<tr>
<td>Premaxillary</td>
<td>29.5</td>
<td>33.3</td>
<td>34.0</td>
<td>33.3</td>
<td>29.6</td>
<td>27.3</td>
<td>26.9</td>
</tr>
<tr>
<td>Illicium</td>
<td>20.8</td>
<td>28.2</td>
<td>27.6</td>
<td>30.8</td>
<td>24.1</td>
<td>22.7</td>
<td>21.5</td>
</tr>
<tr>
<td><strong>Head depth</strong></td>
<td>39.3</td>
<td>42.9</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>38.5</td>
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<tr>
<td><strong>Teeth</strong></td>
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<td>6</td>
<td>8</td>
<td>5</td>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td>Upper jaw</td>
<td>35</td>
<td>53</td>
<td>42</td>
<td>40</td>
<td>30</td>
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<td>20</td>
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<tr>
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<td>45</td>
<td>50</td>
<td>36</td>
<td>26</td>
<td>23</td>
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</tbody>
</table>

unpigmented filaments arranged along distal midline of esca bulb, usually three distinct groups, the posteriormost group paired; a truncated terminal papilla with a distal streak of pigment in specimens 47.0 mm and larger; an unpigmented posterior appendage, approximately half length of esca bulb, and bearing two to five short, unpigmented filaments near distal tip in most specimens; an unpigmented, tapering, unbranched lateral appendage less than one-third length of esca bulb in specimens 47.0 mm and smaller, unbranched and nearly six times length of esca bulb in 78.0 mm specimen, and branched and nearly seven times length of esca bulb in 173.0 mm specimen (Maul, 1949:37, Fig. 17); anterolateral appendage absent (Fig. 73).

Suboperculum with posterior margin of upper part not indented (Fig. 74); length of lower fork of operculum 27.0 (24.9-29.6) percent of SL; ratio of lengths of upper and lower forks of operculum .51 (.44-.60) (measurements based on six specimens, 22.0-173.0 mm).

Epibranchial teeth absent; teeth present on pharyngobranchial II; total number of teeth on vomer 5-8; number of teeth in upper jaw 21-53, in lower jaw 26-54; D. 6-7; A. 4; P. 15-19 (Table 1). Counts and measurements are given in Table 11.

Rest of characters as for genus.

Size at maturity.—Only the largest known individual of *O. anisacanthus* (173.0 mm) appears to be mature. The right ovary is about 40 mm long or 23.1 percent of SL and contains numerous eggs measuring approximately .08-.10 mm in diameter.

**Distribution.**—*Oneirodes anisacanthus* is known from the eastern tropical Atlantic, off Madeira (type locality) south to 10°46'N, the Gulf of Guinea and from the Caribbean Sea (Fig. 106).

The 47.0 mm specimen was captured with a closing net between 900 and 1040 m. The remaining vertical distributional data are too few to allow reasonable conclusions.

**Etymology.**—The name *anisacanthus* is derived from the Greek *anisos*, meaning unequal, and *akanthos*, a thorn or prickle, apparently in allusion to the unequal lengths of the articular spines.

**Comments.**—*Oneirodes anisacanthus* (Regan, 1925) was described from four individuals, only one of which actually represents this species. Two specimens (DANA Stations 1165 and 1183) are here referred to *O. eschrichtii*; the specimen from

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![Figure 74. Subopercula of *Oneirodes anisacanthus*, lateral views, right side: A. ISH 2730/71, 78.0 mm SL; B. MMF 3101, 173.0 mm SL.](image-url)
DANA Station 1256 was described as new by Regan and Trewavas (1932) and remains as the holotype of *O. macronema*.

### Oneirodes kreffti, new species

**Figure 60B, 75, 76, 107**

Tables 1 and 12

Material.—3 females. 21.0-53.5 mm.

Holotype.—ISH 1536/71, 50.0 mm; WALTHER HERWIG Station 431 III/71; 30°04'S, 5°22'E; CMBT-1600, 0-500 m; 2130-2252 hr; 31 March 1971.

Paratypes.—ISH 1463/71, 53.5 mm; WALTHER HERWIG Station 427/71; 33°00'S, 7°50'E; CMBT-1600, 0-2000 m; 1925-2343 hr; 30 March 1971.

### Table 12

Counts and measurements of *Oneirodes kreffti*.

Measurements expressed in percent of SL.

<table>
<thead>
<tr>
<th></th>
<th>Paratype</th>
<th>Holotype</th>
<th>Paratype</th>
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</thead>
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<td>ISH</td>
<td>MCZ</td>
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<tr>
<td>1463/71</td>
<td>1536/71</td>
<td>47554</td>
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<th>21.0</th>
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<tbody>
<tr>
<td>Length</td>
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<tr>
<td>Head</td>
<td>43.0</td>
<td>42.0</td>
<td>64.3</td>
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<tr>
<td>Lower jaw</td>
<td>52.3</td>
<td>49.0</td>
<td>50.0</td>
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<tr>
<td>Premaxillary</td>
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<td>35.0</td>
<td>31.0</td>
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<tr>
<td>Illicium</td>
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<td>24.0</td>
<td>23.8</td>
</tr>
<tr>
<td>Head depth</td>
<td>43.9</td>
<td>44.0</td>
<td>47.6</td>
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<tr>
<td>Teeth</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vomer</td>
<td>8</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Upper jaw</td>
<td>46</td>
<td>41</td>
<td>31</td>
</tr>
<tr>
<td>Lower jaw</td>
<td>50</td>
<td>39</td>
<td>40</td>
</tr>
</tbody>
</table>

MCZ 47554, 21.0 mm; ANTON BRUNN Cruise 3, Station 160, Trawl 27, APB 7133; 41°07'S, 59°52'E; 10-ft IKMT with Foxton closing device, deep fraction, 150-635 m; 1725-2105 hr; 12 September 1963.

Diagnosis.—*Oneirodes kreffti* is most similar to *O. anisacanthus*. These two species are the only members of the genus that possess a well-developed lateral escal appendage. The esca of *O. kreffti*, however, bears a pair of stout, medial appendages that are absent in *O. anisacanthus*. In addition, *O. kreffti* appears to be a more globose form, having a deeper and longer head, and a longer lower jaw than *O. anisacanthus* (Tables 11-12).

Description.—Escal appendage pattern B (Fig. 60B); esca with a stout, internally pigmented anterior appendage, not longer than escal bulb, that of the holotype bearing two tapering filaments near distal tip and one or two similar filaments along posterior margin; filaments of anterior appendage lightly pigmented in 53.5 mm paratype; a pair of branched, tapering, unpigmented medial filaments, more than six times length of escal bulb; in 53.5 mm paratype, a similar, branched, tapering filament arises between medial pair of filaments; a truncated terminal papilla with a distal streak of pigment; an unbranched, tapering posterior appendage, more than two times length of escal bulb; on each side, an unpigmented, tapering lateral appendage, unbranched, bifurcated or trifurcated, and considerably longer than medial filaments; anterolateral appendage absent (Fig. 75).

Suboperculum with posterior margin of upper part not indented (Fig. 76); length of lower fork of operculum 29.2 (28.6-29.9) percent of SL; ratio of lengths of upper and lower forks of operculum .52 (.50-.53).
Fig. 76. Subopercula of *Oneirodes krefti*, lateral views, right side: A. holotype, ISH 1536/71, 50.0 mm SL; B. paratype, ISH 1465/71, 53.5 mm SL.

Epibranchial teeth absent; teeth present on pharyngobranchial II; total number of teeth on vomer 6-7; number of teeth in upper jaw 31-46, in lower jaw 39-50; D. 5-6; A. 4; P. 17-18 (Table 1). Counts and measurements are given in Table 12.

Rest of characters as for genus.

Distribution.—*Oneirodes krefti* is known from two stations in the eastern South Atlantic and from the Indian Ocean west of the Kerguelen Islands (Fig. 107).

The 53.5 mm specimen was captured between 2000 m and the surface, the 50.0 mm specimen between 500 m and the surface, and the 21.0 mm specimen was taken with a 10-ft IKMT equipped with a Foxton closing device between 150 and 635 m.

Etymology.—*Oneirodes krefti* is named in honor of Gerhard Kreft, of the Institut für Seefischerei, Hamburg, for his many valuable contributions to ichthyology.

*Oneirodes myronenus*, new species

Figures 60B, 77, 78, 110

Tables 1 and 13

Material.—2 females, 43.0-121.0 mm.

Holotype.—ISH 3100a/71, 43.0 mm; WALTHER HERWIG Station 512/71; 32°47'N, 16°-24°W; CMBT-1600, 0-1800 m; 1945-2348 hr; 22 April 1971.

Paratype.—ISH 3100b/71; 121.0 mm; WALTHER HERWIG Station 512/71; data as for holotype.

One additional specimen, not included in the description below, is unquestionably identified as *O. myronenus* (see Comments below, p. 59): ISH 2325/71, 137.0 mm; WALTHER HERWIG Station 478/71; 1°04'N, 18°22'W; CMBT-1600, 0-2100 m; 1842-2245 hr; 12 April 1971.

Diagnosis.—In addition to differences in escal

![Figure 77. Escal of *Oneirodes myronenus*, holotype, ISH 3049/71, 43.0 mm SL, left side.](image)

**Table 13**

Measurements of *Oneirodes myronenus*, expressed in percent of SL

<table>
<thead>
<tr>
<th></th>
<th>Paratype ISH 3100b/71</th>
<th>Holotype ISH 3100a/71</th>
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</thead>
<tbody>
<tr>
<td><strong>Standard length</strong></td>
<td>121.0</td>
<td>43.0</td>
</tr>
<tr>
<td><strong>Length</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Head</td>
<td>33.1</td>
<td>39.5</td>
</tr>
<tr>
<td>Lower jaw</td>
<td>38.0</td>
<td>50.0</td>
</tr>
<tr>
<td>Premaxillary</td>
<td>27.3</td>
<td>32.6</td>
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<tr>
<td>Illicium</td>
<td>16.1</td>
<td>22.1</td>
</tr>
<tr>
<td><strong>Head depth</strong></td>
<td>40.0</td>
<td>51.2</td>
</tr>
</tbody>
</table>
morphology, *O. myrionemus* is distinguished from all species of *Oneirodes* by a combination of features including a relatively short head (less than that of all other species of the genus with the exception of *O. rosenblatti*) and illicium (less than that of all other species with the exception of *O. luetkeni*), and a short and broad subopercular bone (Fig. 78).

Description.—Escal appendage pattern B (Fig. 60B); esca with a stout, internally pigmented anterior appendage, approximately twice length of escal bulb, and bearing distally two or three, unpigmented, tapering filaments (shorter than to more than twice length of anterior appendage), and one or two branches or papillae which are darkly pigmented in 121.0 mm paratype; numerous, highly filamentous, medial appendages in the 43.0 mm holotype; a single unpaired, highly filamentous medial appendage in 121.0 mm paratype; a large truncated terminal papilla with a distal spot of pigment; an unpigmented, tapering posterior appendage approximately as long as escal bulb and bearing two small filaments in 43.0 holotype; lateral appendages absent; and four highly branched, unpigmented, anterolateral appendages on each side (Fig. 77).

Suboperculum relatively short and broad, posterior margin of upper part not indented (Fig. 78); length of lower fork of operculum 25.5 (23.1-27.9) percent of SL; ratio of lengths of upper and lower forks of operculum .47 (.42-.52).

Epibranchial teeth absent; teeth present on pharyngobranchial II; total number of teeth on vomer 4-6; number of teeth in upper jaw 31-33, in lower jaw 38-40; D. 5-6; A. 4; P. 18 (Table 1). Measurements are given in Table 13.

Rest of character as for genus.

Distribution.—Both known specimens of *O. myrionemus* were captured in the same haul in the eastern North Atlantic at 32°47′N, 16°24′W between 1800 m and the surface (Fig. 110).

Etymology.—The name *myrionemus* is derived from the Greek *myrios*, meaning numberless, and *nema*, meaning thread, alluding to the highly filamentous esca of this species.

Comments.—A 137.0 mm specimen (ISH 2325/71) is questionably identified as *O. myrionemus*. Although the illicium and esca are lost, all counts, morphometrics, and the shape of the suboperculum compare well with the two known individuals of this species. This additional specimen would extend the known geographical range of *O. myrionemus* south to 1°04′N, 18°22′W (Fig. 110).

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**Figure 78.** Subopercula of *Oneirodes myrionemus*, lateral views, right side: A. holotype, ISH 3049/71, 43.0 mm SL; B. paratype, ISH 3047/71, 121.0 mm SL.

**Figure 79.** Esca of *Oneirodes heteronema*, SIO 70-385, 91.0 mm SL, left side.
**Table 14**

Counts and measurements of *Oneirodes heteronema*.
Measurements expressed in percent of SL

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<th>IOM uncatalogued</th>
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<th>IOM uncatalogued</th>
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<td>Length</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Head</td>
<td>36.3</td>
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<td>51.1</td>
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<td>Lower jaw</td>
<td>56</td>
<td>37</td>
<td>30</td>
<td>49</td>
<td>29</td>
<td>33</td>
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</table>

*Oneirodes heteronema* (Regan and Trewavas)  
Figures 60B, 79, 80, 110  
Tables 1 and 14

*Dolophichthys heteracanthus*, Regan, 1926:28  
[ia part; misidentifications; 21 specimens, one of which described as *D. (subgenus Dermatias) heteronema*, new species by Regan and Trewavas, 1932].

*Dolophichthys* (subgenus *Dermatias*) *heteronema*  
Regan and Trewavas, 1932:72, Fig. 106 (original description; single specimen; Gulf of Panama; 3000 m wire; holotype, ZMUC P92150).

*Oneirodes eschrichtii*-group Bertelsen, 1951:80  
[ia part].

Material.—6 females, 13.5-95.0 mm (see Appendix A).

Diagnosis.—Except for the relatively short illicium and high ratio between the lengths of the upper and lower forks of the operculum, the escal characters of *O. heteronema* are the only satisfactory means of separating this species from most of the other members of the genus.

Description.—Escal appendage pattern B (Fig. 60B); esca with an anterior appendage bearing several filaments, two or three of which are stouter than others and darkly pigmented on distal one-third of length in specimens approximately 65 mm and larger; anterior appendage internally pigmented in 91.0 mm specimen; a pair of medial appendages each consisting of three main branches which give rise to numerous, unpigmented, tapering filaments some of which may be six times length of escal bulb; a truncated terminal papilla with a distal streak of pigment in specimens 44.0 mm and larger; a stout posterior appendage bearing from four to nine tapering filaments, the distal tips of which are lightly pigmented in some specimens; lateral appendages absent; and on each side, a filamentous anterolateral appendage usually consisting of two bifurcated, unpigmented filaments (Fig. 79).

Suboperculum with posterior margin of upper part not indented (Fig. 80); length of lower fork of operculum 30.4 (27.9-33.0) percent of SL; ratio of lengths of upper and lower forks of operculum .60 (.57-.62) (measurements based on 4 specimens, 44.0-95.0 mm).

Epibranchial teeth absent; teeth present on pharyngobranchial II, total number of teeth on vomer 4-7; number of teeth in upper jaw 30-48, in lower jaw 30-56; D. 5-6; A. 4 (the posteriormost anal ray of the 91.0 mm specimen is divided at its base); P. 15-16 (Table 1). Counts and measurements are given in Table 14. Rest of characters as for genus.

![Figure 80](image_url)  
Subopercula of *Oneirodes heteronema*, lateral views, right side: A. SIO 70-386, 44.0 mm SL; B. IOM uncatalogued, 65.0 mm SL.
Size at maturity.—The right ovary of the 91.0 mm specimen of *O. heteronema* is 22.0 mm long (or 24.2 percent of SL) and filled with numerous eggs approximately 0.15 to 0.20 mm in diameter. The 65.0 mm specimen has small, undeveloped ovaries, as do all other individuals examined.

Distribution.—*Oneirodes heteronema* is known only from the Gulf of Panama and Peru-Chile Trench as far south as 20°S. The holotype is from 7°15’N, 78°54’W (Fig. 110).

Little information concerning vertical distribution is available. The 65.0 mm specimen was taken between 500 m and the surface; the 14.0 mm specimen was captured in a closing net between 1000 and 1250 m.

Etymology.—The specific name is derived from the Greek *heteros*, meaning different, and *nema*, meaning thread, in allusion to the appendages of the esca.

Comments.—The 13.5 mm holotype of *O. heteronema*, from DANA Station 1209 (4), was originally described and listed as *Dolopichthys hetero-canthus* by Regan (1926), described as new by Regan and Trewavas (1932), and mislabeled and listed as *O. lucetkeni* by Bertelsen (1951).

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**Oneirodes macrosteus**, new species

Figures 60B, 81, 82, 110

Tables 1 and 15

Material.—5 females, 11.5-185.0 mm.

Holotype.—ROM 27262, 124.0 mm; BRAN-DAL Tow 10; 49°00’N, 45°00’W; Engel trawl, 0-990 m; 1511-1830 hr; 16 July 1968.

Paratypes.—ROM 27265, 185.0 mm; BRAN-DAL Tow 12; 47°30’N, 43°00’W; Engel trawl, 0-1000 m; 1810-2228 hr; 17 July 1968. ROM 27259, 87.0 mm; BRANDAL Tow 9; 49°00’N, 45°00’W; Engel trawl, 0-990 m 0901-1324 hr; 16 July 1968.

USNM 207855, 20.0 m; OCEAN ACRE 2-6N; 31°51’N, 63°40’W; 6-ft IKMT, 0-1025 m; 1110-1820 hr; 7 March 1968. USNM 207856, 11.5 mm; OCEAN ACRE 9-13N; 31°57’N, 63°56’W; 10-ft IKMT, 0-1550 m; 0715-2220 hr; 19 March 1969.

Two additional specimens, not included in the description below, are questionably identified as *O. macrosteus* (see Comments below, p. 62): ISH 2657/71, 110.0 mm; WALTHER HERWIG Station 490 II/71; 10°52’N, 22°09’W; CMBT-1600, 0-608 m; 2027-2152 hr; 15 April 1971. ISH 1956/71, 59.0 mm; WALTHER HERWIG Station 459/71; 10°57’S, 11°20’W; CMBT-1600, 0-1900 m; 1818-2218 hr; 7 April 1971.

Diagnosis.—In addition to the diagnostic escal

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**Table 15**

Counts and measurements of *Oneirodes macrosteus*. Measurements expressed in percent of SL.

<table>
<thead>
<tr>
<th></th>
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<th>Paratype ROM 27259</th>
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morphology and the relatively long illicium (comparable only to members of the *O. schmidtii*-group, see below, p. 77), the elongate shape of the suboperculum of *O. macrosteus* (Fig. 82) can be used to distinguish this species from all of its congeners with the exception of members of the *O. schmidtii*-group, *O. rosenblatti* and perhaps *O. cristatus*. *Oneirodes macrosteus* is easily separated from *O. rosenblatti* by its fewer teeth in the jaws (Tables 5, 15), and from *O. cristatus* by its greater number of pectoral fin rays (Table 1) and more vomerine teeth. *Oneirodes macrosteus* and forms included in the *O. schmidtii*-group can be separated with certainty only by means of the escal characters.

Description.—Escal appendage pattern B (Fig. 60B); esca with a stout, internally pigmented anterior appendage less than half length of esca bulb to nearly twice length of bulb in largest specimens, and bearing numerous tapering filaments at distal tip and two or three filaments along anterior margin; medial appendages absent; a truncated terminal papilla with two bilaterally placed, distal, pigmented spots in specimens 20.0 mm and larger; a posterior appendage, approximately one-half as long as to longer than esca bulb in largest specimens; distal one-third to one-half of posterior appendage split into numerous filaments; lateral appendages absent; a filamentous, anterolateral appendage, less than the length of anterior appendage (extremely small in 185.0 mm specimen); distal tips of filaments of anterior and posterior appendages and entire length of filaments of anterolateral appendage with dark melanophores in specimens 124.0 mm and larger (Fig. 81).

Suboperculum relatively long and narrow, posterior margin of upper part not indented (Fig. 82); length of lower fork of operculum 25.3 (24.4–26.0) percent of SL; ratio of lengths of upper and lower forks of operculum .51 (46.53) (measurements based on four specimens, 20.0–185.0 mm).

Epibranchial teeth absent; teeth present on pharyngobranchial II; total number of teeth on vomer 6–8; number of teeth in upper jaw 38–62, in lower jaw 38–58; D. 6; A. 4; P. 15–17 (Table 1). Counts and measurements are given in Table 15.

Rest of characters as for genus.

Size at maturity.—*Oneirodes macrosteus* appears to attain sexual maturity at a length somewhere between 87.0 and 124.0 mm. The right ovary of the 185.0 mm specimen, about 68 mm long (36.8 percent of SL) and 47 mm wide, contains numerous eggs that are approximately 0.5–0.6 mm in diameter. The 124.0 mm specimen has ovaries (right ovary 29 mm long or 23.4 percent of SL) that appears to be spent. These sexually mature female were captured considerably outside the larval distribution of ceratioicids, found by Bertelsen (1951:224-225, Fig. 139) to be limited to the warmer parts of the oceans between approximately 40°N and 35°S (see Ontogenetic Distribution below, p. 95). All other individuals of *O. macrosteus* examined have small, undeveloped gonads.

Distribution.—*Oneirodes macrosteus* is known only from the western north Atlantic off the Grand Bank, Newfoundland, and off Bermuda. The type locality is at 49°00′N, 45°00′W (Fig. 110).

Four individuals, including the largest specimen (87.0–185.0 mm), were caught between 1000 m and the surface. The remaining vertical distributional data are too few to allow reasonable conclusions.

Etymology.—The specific name is derived from the Greek *makros*, meaning long, and *osteon*, bone, alluding to the elongate subopercular bone which, among other features, distinguishes *O. macrosteus* from most of the other members of the genus.

Comments.—Two specimens (59.0 mm, ISH 1956/71; 110.0 mm, ISH 2657/71) are unquestionably identified as *O. macrosteus*. Although the illicia and esca of these specimens are lost, all counts, morphometrics, and the shape of the suboperculum compare well with the type material. These additional records would extend the known geographic range of *O. macrosteus* to the eastern North Atlantic from 10°52′N to 10°57′S between 11°20′W and 22°09′W (Fig. 110).

*Oneirodes cristatus* (Regan and Trewavas) 1932:67-68, Fig. 93 (original description; three specimens; Bandia and Cele-
bes seas, western pacific; lectotype, ZMUC P9286.


_Oneoires crisatus_, Bertelsen, 1951:79, Fig. 31C-D (new combination; diagnostic characters; lectotype designated; opercular bones described, figured; in key). Grey, 1956a:244 (synonymy; horizontal, vertical distribution).

Material.–3 females, 20.0-165.0 mm (see Appendix A).

Diagnosis.—In addition to the diagnostic escal morphology, _O. crisatus_ can be separated from all other species of the genus by the following combination of characters: illicium length less than 35 percent of SL, lower-jaw teeth 34-53, and pectoral fin rays 13-14.

Description.—Escal appendage pattern B (Fig. 60B); esca with a large, laterally compressed, internally pigmented anterior appendage with a membranous, scalloped distal margin; a pair of filamentous medial appendages, the distal tips of which are lightly pigmented in 52.5 mm specimen; a conical terminal papilla; a short, compressed posterior appendage with a single, small branch on posterior margin, and a similar branch on each side; lateral and anterolateral appendages absent (Fig. 83).

Suboperculum with posterior margin of upper part not indented (Bertelsen, 1951:79, Fig. 31C-D); length of lower fork of operculum 26.0 (23.0-30.1) percent of SL; ratio of lengths of upper and lower forks of operculum .47 (.42-50).

Epibranchial teeth absent; teeth present on pharyngo-branchial II; total number of teeth on vomer 4; number of teeth in upper jaw 28-53, in lower jaw 34-53; D. 6; A. 4-5 (only the lectotype has A. 5); P. 13-14 (Table 1). Counts and measurements are given in Table 16.

Rest of characters as for genus.

Distribution.—_Oneoires crisatus_ is known only from the Banda and Celebes seas. No conclusions can be made concerning vertical distribution (Fig. 108).

Etymology.—The specific name is from the Latin _crisatus_, meaning crested, apparently in allusion to the large, laterally compressed and scalloped anterior esca appendage of this species.

_Oneoires acanthias_ (Gilbert)
Figures 1-18, 30A, 60B, 84-86, 107
Tables 1, 17, 18

_Monoceratias acanthias_ Gilbert, 1915:370-380, pl. 22, Fig. 24 (original description; single specimen; off Santa Cruz Island, southern California; 1397-1629 m; holotype, USNM 75825).


_Dolopichthys_ (Monoceratias) _acanthias_, Parr, 1927:15 (in key).
Dooplichthys (subgenus Dermatias) acanthias, Regan and Trewavas, 1932:76, Fig. 114 (description after Gilbert, 1915, and Regan, 1926; in key).

Oneirodes acanthias, Bertelsen, 1951:85, Fig. 38A-B (in part; new combination; diagnostic characters; comparison with an additional specimen; in key). Rass, 1955:334, Table 2 (misidentifications; specimens here referred to O. thompsoni; distribution). Grey, 1956a:247 (synonymy; vertical distribution). Fast, 1957:237 (one of three ceratioid species known from California). Berry and Peckins, 1966:677, Fig. 30 (one additional specimen). Lavenberg and Ebeling, 1967:195, Fig. 5 (vertical distribution). Rass, 1967:233, Table 22 (misidentification; after Rass, 1955). Taylor, F., 1967:2:13-2114, Figs. 3-4 (misidentification; description of a specimen here referred to O. thompsoni; opercular bones described, figured). Fitch and Lavenberg, 1968:132-135, Fig. 73 (distinguishing characters; natural history notes; fishery information; comparison with other family members). Pietsch, 1969: 367, Fig. 3 (opercular bones figured). Ebeling et al., 1970:19, Figs. 3-4 (ecological groups of deep-sea animals off southern California). Ueno, 1971:102 (misidentifications; after Rass, 1955). Pietsch, 1972a: Fig. 24(4) (osteological comments, branchial arches; otolith described, figured).

Material—147 females, 11.5-167.0 mm (see Appendix A).

Diagnosis.—The esca morphology of O. acanthias is most similar to that of O. thompsoni and O. notius (Figs. 84, 87, 89). The posterior esca appendage, however, always branched in O. acanthias, is never branched in O. thompsoni and O. notius. Although, the slightly higher number of teeth in the jaws (Tables 17, 19) of O. acanthias and greater ratio between the lengths of the upper and lower forks of the operculum (.53-.71 and .42-.54 for O. acanthias and O. thompsoni, respectively) further distinguish this species from O. thompsoni, the characters of the esca are the only satisfactory means of separating O. acanthias from this and from most of the other species of Oneirodes.

Description.—Esca appendage pattern B (Fig. 60B); esca with a stout, internally pigmented, anterior appendage not longer than esca bulb, bearing distally a large, compressed papilla, at the anterior base of which usually arise two or three short filaments; posterior margin of anterior appendage bearing one to five (usually three) stout papillae; filaments and papillae of anterior appendage darkly pigmented in most specimens larger than approximately 50 mm; a minute pair of filamentous medial appendages in most specimens smaller than approximately 110 mm, unpigmented in most specimens smaller than approximately 80 mm, darkly pigmented in most specimens 80 mm to 110 mm; each medial appendage rep-
represented by a pair of minute, dark spots of pigment in most specimens larger than approximately 110 mm; a truncated terminal papilla with a distal streak of pigment; a posterior appendage, shorter than length of anterior appendage, bearing three to six short filaments or papillae which are darkly pigmented in some specimens 115 mm and larger; lateral appendages absent; a minute, unpigmented, filamentous anterolateral appendage in most specimens approximately 60 mm and smaller (Fig. 84).

Suboperculum with posterior margin of upper part not indented (Pietsch, 1969:367, Fig. 3); length of lower fork of opercleum 29.3 (24.8-32.7) percent of SL; ratio of lengths of upper and lower forks of opercleum .60 (.53-.71) (measurements based on 29 specimens, 27.0-167.0 mm).

Epibranchial teeth absent; teeth present on pharyngobranchial II; total number of teeth on vomer 4-8; number of teeth in upper jaw 20-55, in lower jaw 24-51; D. 5-7; A. 4; P. 15-18 (Table 1).

Measurements in percent of SL, based on 103 specimens, 20.5-167.0 mm: head length 40.7 (34.2-44.5); head depth 43.1 (35.2-53.6); lower jaw 45.4 (38.6-51.8); illicium length 23.2 (18.6-28.6). Complete counts and measurements of representative specimens are given in Table 17.

Rest of characters as for genus.

Size at maturity.—Oneirodes acanthias approaches sexual maturity at a length of approximately 100 mm. The ovaries of a 125.0 mm specimen (LACM 9664-18) were about 41.0 mm long (30.5 percent of SL) and contained approximately 100,000 eggs of a single size class, measuring 0.5-0.7 mm in diameter.

Variation.—The relatively large amount of material of O. acanthias, including a wide size range of individuals (147 specimens, 11.5-167.0 mm), provides for the first time a good understanding of the intraspecific variation and ontogenetic change which occur within a member of the genus Oneirodes. As shown in the scatter diagrams (Figs. 85-86), head length and depth, illicium and lower-jaw length, and the number of lower-jaw teeth decrease slightly with growth.

This large series has had its greatest value in elucidating ontogenetic changes which occur in the morphology of the esca, the most important taxonomic character complex of the genus. These changes are outlined in the description of the esca of O. acanthias above (p. 64) and shown in Figure 84.

Distribution.—Oneirodes acanthias is known only from the eastern north Pacific Ocean as far west as 126°37.5'W, between 37°48'N and 26°51'N (Fig. 107).
Figure 85. Ratio-on-size scatter diagrams for three morphometric characters of *Oneirodes acanthias*. 
Figure 86. Ratio-on-size scatter diagram for illicium length, and number of teeth in lower jaw versus standard length of *Oneirodes acanthias*. 
Table 18

Vertical distribution of *Oeniroides acanthias* based on specimens collected by the VELERO IV. Meter-hours and specimens expressed as percent of total. See text for methods of calculation.

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<th>Specimens</th>
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<td>101-200</td>
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</tr>
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</table>

Numbers of specimens: 113

Number of meter-hours: 10143.7

Number of hauls: 547

The vertical distribution of *O. acanthias* was analyzed by a procedure outlined by Gibbs (1969; see Methods and Materials, p. 3). Results based on the total horizontal range of the species indicate a concentration between 500 and 1250 m (Table 18).

Etymology.—The specific name is derived from the Greek, *akanthos*, meaning thorn or prickle, apparently in allusion to the sphenotic and articular spines present in various degrees of development in all *Oeniroides* species.

*Oeniroides thompsoni* (Schultz)

Figures 60B, 87, 88, 106

Tables 1 and 19

*Dolopichthys thompsoni* Schultz, 1934:66-68, Figs. 1-4 [original description; single specimen; Gulf of Alaska; 100-900 m; holotype, USNM 104495 (formally Department of Fisheries, University of Washington Cat. No. 2890); comparison with *D. acanthias* (=*O. acanthias*]. Bertelsen, 1951:85, Fig. 38C (*D. thompsoni* a synonym of *O. acanthias*). Rass, 1955:334 (a synonym of *O. acanthias*; distribution).

*Oeniroides acanthias*, Bertelsen, 1951:85, Fig. 38C (in part; *D. thompsoni* a synonym of *O. acanthias*).

Material.—20 females, 33.0-128.0 mm (see Appendix A).

Figure 87. Escal of *Oeniroides thompsoni*, OSUO 532, 69.0 mm SL, left side.

Diagnosis.—*Oeniroides thompsoni* is most similar to *O. acanthias* and *O. notius* (see diagnosis for *O. acanthias*, p. 64). In addition to differences in escal morphology, the shape of the suboperculum of *O. thompsoni* differs from that of these forms and all other species of the genus with the exception of *O. bulbosus*. The posterior margin of the upper part of this bone is indented to deeply notched in all specimens of *O. thompsoni* examined (Fig. 88). *Oeniroides thompsoni* further differs from *O. notius* in having a lower pectoral fin-ray count (Table 1) and a smaller ratio between the lengths of the upper and lower forks of the operculum (.42-.54 and .52-.59 for *O. thompsoni* and *O. notius*, respectively).

Description.—Escal appendage pattern B (Fig. 60B); escal with a stout, internally pigmented anterior appendage, shorter than escal bulb in smaller

Figure 88. Subopercula of *Oeniroides thompsoni*, lateral views, right side: A. holotype, USNM 104495, 33.0 mm SL; B. SIO 51-362, 37.0 mm SL; C. UBC 65-623, 58.0 mm SL; D. OSUO 532, 69.0 mm SL.
specimens (33.0 mm) to more than three times length of esca bulb in the largest specimen (128.0 mm), and bearing a large, compressed distal papilla, closely associated with one to several smaller papillae on posterior margin and usually two on anterior margin; papillae of anterior appendage darkly pigmented in most specimens approximately 40 mm and larger; medial appendages absent; a truncated or conical terminal papilla with a distal streak of pigment; and an unpigmented, tapering, unbranched posterior appendage, less than length of esca bulb in smaller specimens (69.0 mm) to more than twice length of esca bulb in the largest specimen (128.0 mm); lateral and anterolateral appendages absent (Fig. 87).

Suboperculum with posterior margin of upper part indented to deeply notched (Fig. 88); length of lower fork of operculum 33.2 (30.5-37.3) percent of SL; ratio of lengths of upper and lower forks of operculum .49 (.42-.54) (measurements based on six specimens, 33.0-69.0 mm).

Epibranchial teeth absent; teeth present on pharyngobranchial II, total number of teeth on vomer 4-9; number of teeth in upper jaw 19-42, in lower jaw 18-36; D. 5-6; A. 4; P. 14-17 (Table 1).

Measurements in percent of SL, based on 16 specimens, 33.0-128.0 mm: head length 42.8 (37.7-48.6); head depth 44.3 (39.1-54.1); lower jaw 48.1 (41.3-54.1); premaxillary 31.4 (28.4-34.1); illicium length 23.9 (26.4-39.0). Complete counts and measurements of representative specimens are given in Table 19.

Rest of characters as for genus.

Distribution.—*Oneirodes thompsoni* is known only from the north Pacific Ocean and Bering Sea. The range extends south to approximately 40°N in the east and 47°N in the west. The holotype was taken at 54°13'N, 159°06'W (Fig. 106).

Although little is known about the relative fishing effort at various depths in the north Pacific, *O. thompsoni*, based on maximum depths reached by gear, appears to inhabit relatively shallow depths, the bulk of the population concentrated between 600 and 800 m, with a second peak between 950 and 1250 m.

Etymology.—*Oneirodes thompsoni* is named for the late William Francis Thompson, at one time Director of the International Fisheries Commission, and Chairman of the Department of Fisheries, University of Washington, Seattle.

Comments.—*Oneirodes thompsoni*, described by Schultz (1934), was synonymized with *O. acanthias* by Bertelsen (1951:85, Fig. 38) on the basis of similarity in esca morphology and morphometrics. Additional material of both species, how-
ever, has shown distinct differences in the esca and in the shape of the subopercular bone (see Diagnosis, p. 68). *Oneirodes thompsoni* is here resurrected from the synonymy of *O. acanthias* and given specific status.

**Oneirodes notius**, new species

Figures 30B, 60B, 89, 90, 106

Tables 1 and 20

Material.—10 females, 30.0–150.0 mm.

Holotype.—LACM 11165-9, 132.0 mm; USNS ELTANIN Cruise 23, Station 1615; 62°13’S, 95°39’W; 10-ft IKMT, 0-1025 m; bottom depth 4914-4912 m; 0610-0919 hr; 9 April 1966.

Paratypes.—LACM 10716-6, 106.0 mm; USNS ELTANIN Cruise 11, Station 949; 65°47’S, 88°48’W; 10-ft IKMT, 0-1028 m; bottom depth 4502-4526 m; 1845-2200 hr; 28 January 1964. LACM 10841-4, 60.0 mm; USNS ELTANIN Cruise 13, Station 1120; 62°05’S, 89°56’W; 10-ft IKMT, 0-850 m; bottom depth 4721 m; 1825-2055 hr; 29 May 1964. LACM 11184-6, 54.0 mm; USNS ELTANIN Cruise 23, Station 1648; 58°14’S, 101°02’W; 10-ft IKMT, 0-825 m; bottom depth 4685-4575 m; 1500-1758 hr; 19 April 1966. LACM 10875-8, 45.0 mm; USNS ELTANIN Cruise 14, Station 1204; 55°57’S, 159°23’W; 10-ft IKMT, 0-1080 m; bottom depth 4145-3962 m; 0650-1035 hr; 10 August 1964.

ISH 590/71, 150.0 mm; WALTHER HERWIG Station 354-II/71; 39°19’S, 48°02’W; CMBT-1600, 0-2000 m; 2053-0021 hr; 6 March 1971. ISH 648/71, 115.0 mm; WALTHER HERWIG Station 358-III/71; 39°47’S, 43°30’W; CMBT-1600, 0-1015 m; 2035-2305 hr; 7 March 1971. SIO 61-45, 30.0 mm; MONSOON EXPEDITION midwater trawl no. 17; 46°53’S, 179°48’W; 10-ft IKMT, 0-2000 m; 28 February 1961.

Additional non-type material.—ISH 822/71, 42.0 mm; WALTHER HERWIG Station 371-III/71; 40°00’S, 30°30’W; CMBT-1600, 0-700 m; 2104-2304 hr; 10 March 1971. ZMUC P92189, 40.0 mm; GALATHEA EXPEDITION Station 664; 36°34’S, 178°57’W; Herring Otter trawl, 8900 m wire; bottom depth 4540 m; 1130 hr; 24 February 1952.

Diagnosis.—*Oneirodes notius* is most similar to *O. acanthias* and *O. thompsoni* (see diagnosis for *O. acanthias*, p. 64). Although, the high pectoral fin-ray count of *O. notius* (17-19) is helpful in dis-

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**Figure 89.** Escue of *Oneirodes notius*, left sides: A. paratype, LACM 11184-6, 54.0 mm SL; B. paratype, LACM 10841-4, 60.0 mm SL; C. paratype, LACM 10716-6, 106.0 mm SL.

**Figure 90.** Subopercula of *Oneirodes notius*, lateral views, right side: A. paratype, SIO 61-45, 30.0 mm SL; B. ZMUC P92189, 40.0 mm SL; C. paratype, LACM 11184-6, 54.0 mm SL; D. paratype, ISH 648/71, 115.0 mm SL.
tistinguishing this species from its congener the characters of the esca are the only satisfactory means of identification.

The shape of the frontal bones of *O. notius* differs from those of all other species of *Oneirodes* examined osteologically (p. 17, Fig. 30).

Description.—Escal appendage pattern B (Fig. 60B); esca with a stout, internally pigmented anterior appendage, shorter than esca bulb in smaller specimens (60 mm) to slightly longer than length of bulb in largest specimen (150.0 mm), usually bearing a compressed papilla and two tapering filaments on distal tip; several small, tapering filaments along posterior appendage of anterior appendage of 60.0 mm specimen; papilla and filaments of anterior appendage unpigmented; a pair of minute, unpigmented, filamentous medial appendages present in all but 115.0 mm specimen; a rounded or truncated terminal papilla with a distal streak of pigment; an unpigmented, unbranched, tapering posterior appendage as long as, or shorter than esca bulb; lateral and anterolateral appendages absent (Fig. 89).

Suboperculum relatively short and broad, posterior margin of upper part not indented (Fig. 90); length of lower fork 28.4 (25.2-32.2) percent of SL; ratio of lengths of upper and lower forks of operculum .55 (.52-.59) (measurements based on 10 specimens, 30.0-150.0 mm).

Epibranchial teeth absent; teeth present on pharyngobranchial II; total number of teeth on vomer 4-7; number of teeth in upper jaw 20-37, in lower jaw 24-48; D. 5-7; A. 4; P. 17-15 (Table 1). Counts and measurements are given in Table 20.

Rest of characters as for genus.

Distribution.—*Oneirodes notius* is known only from subantarctic waters: three stations from the Atlantic sector of the Southern Ocean along the 40th parallel between 30°30'S and 48°02'W, and seven from the Pacific sector extending from off New Zealand at 46°53'S, 179°48'W southeast to 65°47'S, 88°48'W. The holotype was collected at 62°13'W, 95°39'W (Fig. 106).

Based on maximum depth reached by fishing gear, *O. notius* appears to have a relatively wide vertical distribution, from about 700 to 2000 m, with the greatest concentration between 800 and 1100 m.

Geographic variation.—No geographic variation was noted between the Atlantic and Pacific populations of *O. notius*.

Etymology.—The name *notius* is from the Greek *notios* meaning southern in allusion to the distribution of this species, apparently restricted to the Southern Ocean.
Oneirodes flagellifer (Regan and Trewavas)
Figures 60B, 91, 110
Tables 1 and 21

Dolopichthys (subgenus Dermatias) flagellifer
Regan and Trewavas, 1932:74, Fig. 111 (original description; single specimen; Indian Ocean, off Ceylon; 3500 m wire; holotype, ZMUC P9280).

Dolopichthys (subgenus Dermatias) thysoanophorus
Regan and Trewavas, 1932:74, Fig. 110 (in part; original description; two specimens, the larger here referred to O. eschrichtii; Sulu Sea; 3500 m wire; lectotype, BMNH 1932.5.3.14).

Oneirodes flagellifer-group Bertelsen, 1951:84, Fig. 31J-K (in part; new combination; characters; comparison with O. eschrichti-group; opercular bones described, figured; in key). Grey, 1956a:246 (in part; synonymy; vertical distribution).


Material.—3 females, 12.5-22.0 mm (see Appendix A).

Diagnosis.—The characters of the esca of O. flag-

![Figure 91. Escue of Oneirodes flagellifer, left sides: A. holotype, ZMUC P9280, 22.0 mm SL; B. lectotype of Dolopichthys (subgenus Dermatias) thysoanophorus, BMNH 1932.5.3.14, 12.5 mm SL.](image)

| Measurements of Oneirodes flagellifer, expressed in percent of SL |
|-----------------|-----------------|-----------------|
|                | Holotype        | ZMUC P9280      | ZMUC P92190      | BMNH 1932.5.3.14 |
| Standard length| 22.0            | 22.0            | 12.5             |
| Width head     | 40.9            | 45.4            | —                |
| Lower jaw      | 50.0            | 50.0            | —                |
| Premaxillary   | 36.4            | 34.1            | —                |
| Illicium        | 22.7            | 25.0            | 20.0             |
| Head depth     | 45.4            | 37.7            | —                |

1Lectotype of O. thysoanophorus Regan and Trewavas, 1932

ellifer are the only means of separating this species from its congeners.

Description.—Escal appendage pattern B (Fig. 60B); esca with an anterior group of short, unpigmented filaments arising from a common base in 12.5 mm specimen, larger specimens with a stout, internally pigmented anterior appendage, slightly more than half length of esca bulb, and bearing numerous unpigmented filaments on distal end, some of which are as long as anterior appendage; medial appendages absent; a truncated or rounded terminal papilla with a distal streak of pigment in 22.0 mm specimens; an unpigmented, tapering posterior appendage nearly twice as long as esca bulb in 12.5 mm specimen, three to four times length of bulb in 22.0 mm specimens; lateral and antero-lateral appendages absent (Fig. 91).

Suboperculum with posterior margin of upper part not indented (Bertelsen, 1951:84, Fig. 31J-K); length of lower fork of operculum 28.2-28.6 percent of SL; ratio of lengths of upper and lower forks of operculum .48-.56 (measurements based on two specimens, both 22.0 mm).

Epibranchial teeth absent; teeth present on pharyngobranchial II; total number of teeth on vomer 4-6; number of teeth in upper jaw 18-22, in lower jaw 25-30; D, 6; A, 4; P, 14-15 (Table 1). Measurements are given in Table 21.

Rest of characters as for genus.

Distribution.—Oneirodes flagellifer is known from three specimens collected in the Indo-Pacific region: the holotype from approximately 1750 m in the Indian Ocean off Ceylon (5°21'N, 80°38'E), the lectotype of O. thysoanophorus from 1750 m in the Sulu Sea (8°34'N, 119°55'E), and the GALA-THEA specimen from 3800 m in the South China Sea (12°10'N, 114°56'E) (Fig. 110).
Etymology.—The specific name is from the Latin flagellum, a whip, apparently in allusion to the long, tapering posterior escal appendage of this species.

Comments.—Oneirodes flagellifer and O. thyسانoporphorus were described by Regan and Trewavas (1932) from one and two specimens, respectively. On the basis of similarity in the shape of the opercular bones and escal morphology, Bertelsen (1951: 84, fig. 31J-K) placed all three of these specimens into what he called the Oneirodes flagellifer-group. The larger of the two syntypes of O. thyسانoporphorus (ZMUC P9281) is here referred to O. eschrichtii (see Comments under the latter, p. 52). The 12.5 mm syntype, hereby designated as the lectotype of O. thyسانoporphorus, compares well with the known material of O. flagellifer, except for differences in the escal morphology. The anterior escal appendage of the former consists of a short tuft of filaments arising from a common base, whereas that of the holotype of O. flagellifer is stout, internally pigmented, and bears a tuft of filaments distally (Fig. 91). These differences, however, are most likely ontogenetic (Bertelsen, 1951:84); the escal appendages of O. heteronema and O. myronemus appear to undergo similar changes with growth, the anterior appendage in the case of the former, the medial appendage in the latter. As no significant differences can be found in the material, O. thy-sanoporphorus is hereby placed in the synonymy of O. flagellifer.

Oneirodes dicromischus, new species

Figures 60B, 92, 93, 108

Table 1

Material.—A single female, the holotype: LACM 31463-1, 35.0 mm; CARIDE Cruise III, Station 59; 00°01’N, 139°06’W; 10-ft IKMT, 0-840 m; 0816 hr; 18 February 1969.

Diagnosis.—Although represented by a single specimen, O. dicromischus is described as new on the basis of a relatively long illicium (comparably only to that of O. bradburyae and some members of the O. Schmidtii-group), high tooth counts, and a distinct escal morphology. The illicium length and tooth counts alone, easily separate this form from all other described species of Oneirodes. In addition, O. dicromischus appears to be a relatively elongate member of the genus. Proportional measurements of head length and depth, and premaxillary and lower-jaw length lie near the bottom of the range of variation for females of all species combined (see Generic Description, p. 35).

Description.—Escala appendage pattern B (Fig. 60B); escala with a stout, internally pigmented anterior appendage, the bifurcated distal end of which bears numerous, unpigmented, tapering filaments; three pairs of filamentous medial appendages, most anterior pair the longest, nearly as long as escala bulb; a rounded terminal papilla with a distal streak of pigment; an unpigmented tapering posterior appendage, slightly expanded and trifurcated at distal tip; lateral appendages absent; a stout, unpigmented, anterolateral appendage bearing a few small filaments (Fig. 92).

Suboperculum with posterior margin of upper part not indented (Fig. 93); length of lower fork of operculum 21.4 percent of SL; ratio of lengths of upper and lower forks of operculum .47.

Epibranchial teeth absent; teeth present on pharyngobranchial II: total number of teeth on vomer 8; number of teeth in upper jaw 65, in lower jaw 70; D. 6; A. 4; P. 17 (Table 1).

Measurements in percent of SL: head length 35.7; head depth 38.6; lower jaw 38.6; premaxillary 25.7; illicium length 60.0.

Rest of characters as for genus.

Distribution.—Oneirodes dicromischus is known from a single specimen captured between 840 m
and the surface in the central Pacific at 0°01'N, 139°06'W (Fig. 108).

Etymology.—The name *dicromischus* refers to the forked anterior esca appendage of this species. It is derived from the Greek *dikros*, meaning forked or cloven, and *mischos*, meaning stalk or pedicle.

*Oneirodes bradburyae* Grey

Figures 94, 95, 107

Table 1

*Oneirodes bradburyae* Grey, 1956b:245, Fig. 2 (original description; single specimen).

Material.—A single female, the holotype: USNM 164359, 23.5 mm; OREGON Station 1028; Gulf of Mexico, 28°28'N, 87°18'W; 0-1426 m; 21 April 1954.

Diagnosis.—*Oneirodes bradburyae* is distinguished by having a long illicium (72.3 percent of SL), comparable to no other species of the genus.

Description.—The esca of the holotype and only known specimen of *O. bradburyae* is badly damaged. The following is taken from the original description (Grey, 1956b:245): "A rather long, fine filament arising from left side of distal end of esca; a shorter, club-tipped prolongation on right side; and a short, delicate cluster of filaments centrally; all filaments colorless. . . longest filament 15.7. . ." percent of SL (Fig. 94).

Ocular bones shown in Figure 95; length of lower fork of operculum 24.7 percent of SL; ratio of lengths of upper and lower forks of operculum .45.

Epibranchial teeth absent; teeth present on pharyngobranchial II; total number of teeth on vomer 8; number of teeth in upper jaw 42, in lower jaw 54 (jaw-tooth counts are low due to damage); D. 5; A. 4; P. 14 (Table 1).

Measurements in percent of SL: head length 43.8; head depth 42.6; lower jaw 48.9; premaxillary 34.0; illicium length 72.3.

Distribution.—*Oneirodes bradburyae* is known from a single specimen collected between 1426 m
and the surface in the Gulf of Mexico at 28°28'N, 87°18'W (Fig. 107).

Etymology.—This species is named for Margaret G. Bradbury.

Comments.—Although the esca of the only known specimen of _O. bradburyae_ is badly damaged, it appears to be like those of forms here included in the _O. schmidtii_-group. The illicium, however, is considerably longer than that of members of this group and of any other known species of _Oeniodes._

_Oeniodes macronema_ (Regan and Trewavas)  
Figures 96, 97, 110  
Table 1

_Dolopichthys_ (subgenus _Dermatias_) _macronema_  
Regan and Trewavas, 1932:66-67, Fig. 91 (original description; single specimen).

_Oeniodes schmidtii_-group Bertelsen, 1951:84  
(in part).

Material.—A single female, the holotype: ZMUC P9282, 27.0 mm; Dana 1256 (1); 17°43'N, 64°56'W; 1000 m wire; 1920 hr; 4 March 1922.

Diagnosis.—The characters of the esca are the only means of separating this species from its congeners (see Comments below, p. 76).

Description.—The esca of the holotype and only known specimen of _O. macronema_ is badly damaged. The following is modified from the original description (Regan and Trewavas, 1932:66-67): a short anterior appendage of uncertain morphology; a pair of medial appendages, nearly as long as illicium, each bearing minute hair-like filaments along entire length, and one of which bears a single short branch; a truncated terminal papilla; an unpigmented posterior appendage less than one-fourth length of esca bulb; lateral and anterolateral appendages absent (Fig. 96).

Opercular bones shown in Figure 97; length of lower fork of operculum 27.8 percent of SL; ratio of lengths of upper and lower forks of operculum .47.

Epibranial teeth absent; teeth present on pha-
ryngobranchial II; total number of teeth on vomer 7; number of teeth in upper jaw 38, in lower jaw 44; D. 5; A. 4; P. 15 (Table 1).

Measurements in percent of SL: head length 40.8; head depth 42.2; lower jaw 46.3; premaxillary 29.6; illicium length 22.2.

Rest of characters as for genus.

Distribution.—*Oneirodes macronema* is known from a single specimen collected in the Caribbean Sea at 17°43'N, 64°56'W with 1000 m of wire out (Fig. 110).

Etymology.—The specific name is derived from the Greek *makros*, meaning long, and *nema*, thread, alluding to the two long medial filaments of the esca.

Comments.—Bertelsen (1951:84) included *O. macronema* in the *O. schmidti*-group, together with *O. mirus* and *O. schmidtii*, because of the long medial escal filaments shared by all three species. The short illicium of the single known specimen of *O. macronema*, however, is considerably outside the range of that of the *O. schmidti*-group as here restricted. In addition, the shape of the subopercular bone of *O. macronema* does not agree with the relatively elongate suboperculum characteristic of this group. Until comparative material becomes available, *O. macronema* is retained as a distinct species.

*Oneirodes melanocauda* Bertelsen

**Figure 108**

**Table 1**

*Oneirodes melanocauda* Bertelsen, 1951:76, 87-88, Figs. 31L, 41, Tables 11, 14 (original description; four larval specimens; Caribbean Sea, Indian Ocean, and South China Sea; 2500-4000 m wire out; holotype, ZMUC P9288; in key). Grey, 1956a: 248-249 (synonymy; vertical distribution).

Material.—5 larval specimens, four females (6.5-15.5 mm) and a male (5.0 mm) (see Appendix A).

Diagnosis.—*Oneirodes melanocauda* is easily separated from other larvae of the genus by the presence of pigment on the tips of the caudal fin rays and subdermal pigment on the caudal peduncle.

Description.—See Bertelsen (1951:87-88).

Etymology.—The specific name is derived from the Greek *melas*, meaning black and the Latin *cauda*, meaning tail, alluding to the darkly pigmented posterior ends of the caudal-fin rays of this form.

Distribution.—*Oneirodes melanocauda* is represented only by larvae; two specimens are from the Caribbean Sea and three from the East Indies (Fig. 109).

Comments.—Bertelsen (1951) described *O. melanocauda* on the basis of four larval specimens (5.0-15.5 mm) possessing several features not found in any other *Oneirodes* larvae. These features include the presence of pigment on the tips of the caudal fin rays, presence of subdermal pigment on the caudal peduncle, apparent absence of sphenotic, articular, and symphysial spines, a short illicium (in the 15.5 mm specimen), a large suboperculum and a short opercular bone (Bertelsen, 1951:87-88, Fig. 41). In addition, the esca of the 15.5 mm specimen is poorly developed in contrast to all other known forms of *Oneirodes* in which the characteristic escal morphology of the species is fully formed at a standard length of 10 or 11 mm. There is a good possibility that *O. melanocauda* represents the larvae of an undescribed ceratoid genus.

Careful comparison of the 6.5 mm PILLSBURY specimen (UMML 30270) with the 7.0 mm DANA
specimen (ZMUC P92186), both collected in the Caribbean Sea, showed essentially no differences.

Oneirodes schmidtii-group Bertelsen

Figures 20, 29, 60C, 98-102, 111

Tables 1 and 22

Oneirodes schmidtii-group Bertelsen, 1951:84, Fig. 31H-I (in part; three nominal species grouped; common characters; material listed; in key).

Dolophilthys sp., Norman, 1939:115, Fig. 40 (in part; two specimens, the larger here referred to O. sp. of O. schmidtii-group). Bertelsen, 1951:80 (in part; specimen of Norman, 1939, listed under O. eschrichtii-group).

Oneirodes eschrichtii-group Bertelsen, 1951:79-80 (in part; Dolophilthys sp. of Norman, 1939, O. theodoritissieri, Belloc, 1938, here referred to O. schmidtii-group).

Material.—16 females 12.0-183.0 mm (see below).

Diagnosis.—Members of the O. schmidtii-group are distinguished from all other species of the genus by having escue fall into escl appendage pattern C (see Description, p. 35, Fig. 60C), a relatively long and narrow suboperculum (Fig. 94), comparable only to O. macrosteus and O. rosenblatti, and a long illicium (33.3-57.8 percent of SL), comparable only to O. macrosteus.

Description.—The following species and previously unrecorded material are described as follows: suboperculum relatively long and narrow, posterior margin of upper part not indented (Fig. 98); length of lower fork of operculum 26.2 (23.4-28.6) percent of SL; ratio of lengths of upper and lower forks of operculum .50 (.44-.62) (measurements based on 12 specimens, 23.5-183.0 mm).

Epibranchial teeth absent; teeth present on pharyngobranchial II; total number of teeth on vomer 4-8; number of teeth in upper jaw 33-71, in lower

![Figure 98. Subopercula of members of Oneirodes schmidtii-group, lateral views, right side: A. Oneirodes schmidtii, holotype, ZMUC P9284, 32.0 mm SL; B. Oneirodes mirus, holotype, ZMUC P9283, 42.0 mm SL; C. Oneirodes basilii, holotype, LACM 30020-34, 95.0 mm SL; D. Oneirodes theodoritissieri, holotype, MHLR P448, 64.0 mm SL, freehand sketch.](image-url)
jaw 44-76; D. 5-7; A. 4; P. 15-16 (Table 1). Counts and measurements are given in Table 22.

Rest of characters as for genus.

Distribution.—Representatives of the *O. schmidtii*-group are known from all three major oceans: five records from the Atlantic, off Newfoundland, Bermuda, and French West Africa; five from the Indo-Pacific north of the equator, from the Gulf of Aden in the Indian Ocean to the Caroline Islands, Micronesia; and six from the eastern Pacific to 140°W between 33°N and 2°N (Fig. 111).

*Oneirodes schmidtii* (Regan and Trewavas)

Figures 60C, 98A, 99, 111

Tables 1 and 22

*Dolopichthys* (subgenus *Dermatias*) *schmidtii*

Regan and Trewavas, 1932:75, Fig. 113 (original description; single specimen).

*Oneirodes schmidtii*-group Bertelsen, 1951:84, Fig. 31I (in part). Grey 1956a:246 (in part; after Bertelsen, 1951; vertical distribution).

Material.—A single female, the holotype: ZMUC P9284, 32.0 mm; DANA Station 3678(1), 4°05'S; 128°16'E; 5000 m wire; bottom depth 4700 m; 1840 hr; 24 March 1929.

Diagnosis.—*Oneirodes schmidtii* is a member of the *O. schmidtii*-group as diagnosed above (p. 77). In addition to differences in esca morphology (Figs. 99-102), *O. schmidtii* differs from other members of the *O. schmidtii*-group by having a greater number of teeth in the jaws (Table 22).

Description.—Esca with a filamentous anterior appendage, shorter than length of esca bulb, without internal pigment; a pair of unpigmented, filamentous, medial appendages, shorter than length of anterior appendage; a rounded terminal papilla with a distal streak of pigment; a short, unpigmented, unbranched posterior appendage; lateral appendages absent; two pairs of filamentous anterolateral appendages: an inner pair of stout, tapering appendages flanking anterior appendage each more than four times length of esca bulb, with upper two-thirds branched; and an outer pair of branched appendages less than half length of esca bulb (Fig. 99).

Suboperculum shown in Figure 98A; length of lower fork of operculum 25.0 percent of SL; ratio of lengths of upper and lower forks of operculum .44. Counts and measurements are given in Table 22.

Rest of characters as for *O. schmidtii*-group.

Distribution.—*Oneirodes schmidtii* is known from a single specimen collected in the Banda Sea with 3500 m of wire out (Fig. 111).
Etymology.—*Oneirodes schmidtii* is named for Johannes Schmidt, leader of DANA Expeditions.

*Oneirodes mirus* (Regan and Trewavas)
Figures 60C, 98B, 100, 111
Tables 1 and 22

*Dolopichthys* (subgenus *Dermatis*) *mirus* Regan and Trewavas, 1932:74-75, Fig. 112 (original description; single specimen).

*Oneirodes schmidtii*-group Bertelsen, 1951:84, Fig. 31H (in part). Gray, 1965a:246 (after Bertelsen, 1951; vertical distribution).

Material.—A single female, the holotype: ZMUC P9283, 42.0 mm; DANA Station 3828 (10), 1°22′N, 96°06.5′E; 3000 m wire; bottom depth 4980 m; 1600 hr; 18 September 1929.

Diagnosis.—*Oneirodes mirus* is a member of the *O. schmidtii*-group as diagnosed above (p. 77). It differs from other members of the *O. schmidtii*-group in its escal morphology (Figs. 99-102) and is further differentiated from *O. schmidtii* by having fewer teeth in the jaws (Table 22).

Description.—Escal with a stout anterior appendage, shorter than escal bulb, without internal pigment, bearing a single short branch; a pair of unpigmented, filamentous medial appendages, slightly longer than anterior appendage; a rounded terminal papilla with a distal spot of pigment; an anteroposteriorly compressed, unpigmented posterior appendage, as long as escal bulb, bearing two short branches at mid-length; lateral appendages absent; two pairs of filamentous anterolateral appendages: an inner pair of stout, tapering appendages flanking anterior appendage each longer than SL, lightly pigmented internally except for slightly expanded distal tip, and bearing numerous, short filaments; and an outer pair of unpigmented, bifurcated appendages, each tapering branch of which is more than three times length of escal bulb and bears two short filaments (Fig. 100).

Suboperculum shown in Figure 98B; length of lower fork of operculum 23.8 percent of SL; ratio of lengths of upper and lower forks of operculum .50.

Counts and measurements are given in Table 22.

Rest of characters as for *O. schmidtii*-group.

Distribution.—*O. mirus* is known from a single specimen collected in the Indian Ocean, off Sumatra, with 3000 m of wire out (Fig. 111).

Etymology.—The specific name is from the Latin *mirus*, meaning wonderful.

*Oneirodes basilii*, new species
Figures 20, 29, 60C, 98C, 101, 111
Tables 1 and 22

*Oneirodes*, new species Pietsch, 1972a:42-43, 45, Fig. 24(5) (otolith described, figured).

Material.—3 females, 95.0-159.0 mm.

Holotype.—LACM 30020-34, 95.0 mm; VELERO IV Station 11635; 28°08′N, 117°31′W; 10-ft IKMT, 0-700 m; bottom depth 3520-3493 m; 2340-0430 hr; 20 August 1967.

Paratypes.—LACM 31100-2, 159.0 mm; VELERO IV Station 13721; 33°06′N, 118°22′W; 10ft. IKMT, 0-990 m; bottom depth 1152-1353 m; 2320-0530 hr; 18 December 1969. LACM 30028-30, 115.0 mm; VELERO IV Station 11644; 29°40′N, 118°15′W; 10-ft IKMT, 0-1400 m; bottom depth 3383-3292 m; 1300-2117 hr; 22 August 1967.

Diagnosis.—*Oneirodes basilii* is a member of the *O. schmidtii*-group as diagnosed above (p. 77). It differs from other members of the *O. schmidtii*-group in its escal morphology (Figs. 99-102). It is further differentiated from *O. schmidtii* by having fewer jaw teeth (Table 22), and from *O. theodoritissleri* by having a greater ratio between the lengths of the upper and lower forks of the operculum (.44-.50 and .54-.62 for the *O. theodoritissleri* and *O. basilii*, respectively).

Description.—Escal with a branched, filamentous anterior appendage, two times length of escal bulb, without internal pigment; spots of dark pigment present on most branches of anterior appendage; medial appendage absent; a rounded or conical terminal papilla with two, bilaterally placed distal spots of pigment; a posterior appendage, as long as escal bulb, with an anteroposteriorly compressed distal end, the posterior surface of which is slightly concave and darkly pigmented; lateral appendages...
Etymology.—Oneirodes basili is named for Basil G. Naftakiitis of the University of Southern California, for his encouragement and guidance as major professor and friend.

Oneirodes theodoritissieri Belloc
Figures 60C, 98D, 102, 111
Tables 1 and 22

Oneirodes theodoritissieri Belloc, 1938:303, Figs. 23-25 (original description; single specimen; 11°13'N, 17°26'W; 1000 m wire; holotype, MHLR P448).

Oneirodes theodoritissieri, Aloncle, 1968:691 (listed).


Material.—3 females, 58.0-183.0 mm (see Appendix A).

Diagnosis.—Oneirodes theodoritissieri is a member of the O. schmidtii-group as diagnosed above (p. 77). It differs from other members of the O. schmidtii-group in its escal morphology (Figs. 99-

Figure 101. Esc of Oneirodes basili, paratype, LACM 30028-30, 115.0 mm SL, left side.

absent; two pairs of flamelaceous anterolateral appendages: an inner pair of tapering, branched appendages flanking anterior appendage, each less than one-half length of esca bulb; and a similar, outer pair of appendages equal to or less than length of inner pair (Fig. 101).

Opercular bones shown in Figure 98C; length of lower fork of operculum 27.1 (25.3-28.6) percent of SL; ratio of lengths of upper and lower forks of operculum .58 (.54-.62).

Total number of teeth on vomer 4-8; number of teeth in upper jaw 49-69, in lower jaw 46-60; D. 5-6; A. 4; P. 15-16 (Table 1). Counts and measurements are given in Table 22.

Rest of characters as for O. schmidtii-group.

Size at maturity.—The length of the right ovary of the 159.0 mm specimen of O. basili 33.0 mm or 20.8 percent of SL. The ovaries of the 115.0 mm specimen are small and undeveloped.

Distribution.—Oneirodes basili is known only from the southern California borderland region and off Guadalupe Island, Mexico. Vertical distribution data are too few to make any reasonable statement (Fig. 111).

Figure 102. Esc of Oneirodes theodoritissieri, NIO uncatalogued, 58.0 mm SL, left side, freehand sketch.
It is further differentiated from *O. schmidtii* by having fewer jaw teeth (Table 22), and from *O. basili* by having a smaller ratio between the lengths of the upper and lower forks of the operculum (.44-.50 and .54-.62 for *O. theodoritissieri* and *O. basili*, respectively).

Description.—Esca with a branched, filamentous anterior appendage, as long as esca bulb, without internal pigment; a pair of filamentous medial appendages as long as esca bulb; a conical terminal papilla with two, bilaterally placed, distal spots of pigment; an unpigmented, anteroposteriorly compressed posterior appendage, as long as esca bulb, the distal half of which bears six short branches in 58.0 mm specimen; lateral appendages absent; a single pair of unpigmented, bifurcated, anterolateral appendages each fork of which is highly branched and longer than esca bulb (Fig. 102).

Subopercular bone shown in figure 98D; length of lower fork of operculum 26.2 (25.9-26.6) percent of SL; ratio of lengths of upper and lower forks of operculum .48 (.44-50).

Total number of teeth on vomer 5-7; number of teeth in upper jaw 40-55, in lower jaw 44-58; D. 5-6; A. 4; P. 15-16 (Table 1). Counts and measurements are given in Table 22.

Rest of characters as for *O. schmidtii*-group.

Distribution.—*Oneirodes theodoritissieri* is known only from the eastern north Atlantic Ocean off Portuguese Guinea, and the Cape Verde Islands. The 58.0 mm specimen was captured with a closing net between 810 and 900 m (Fig. 111).

Etymology.—This species is named for Théodore Tissier, at one time Président du Conseil d’administration de l’Office scientifique et technique des Pêches Maritimes.

*Oneirodes* species of *Oneirodes schmidtii*-group

* Dolopichthys sp. Norman, 1939:115, Fig. 40 (in part). Bertelsen, 1951:80 (in part; specimen of Norman, 1939, listed under *O. eschrichtii*-group).

* Oneirodes eschrichtii-group Bertelsen, 1951:80 (in part; *Dolopichthys* sp. of Norman, 1939).

Eight additional specimens (12.0-42.0 mm) here assigned to the *O. schmidtii*-group cannot be referred to any described species. Although some of these appear to represent new forms, description is deferred until adequate material is available. Collection data for these specimens are given in Appendix A.

*Oneirodes* species

Adolescent and adult males and females, metamorphosis stages, and larvae not identifiable to species.

A considerable number of metamorphosed female specimens cannot be identified to species, including a number which may represent new species, but remain undescribed due to a lack of adequate material. These are listed in Appendix A.

Syonymy of Males.—*Liparisium tumidus*, Regan, 1926:43 (in part; erroneous designations; six specimens, one, DANA Station 1152, referred to *O. eschrichtii*-group by Bertelsen, 1951). Norman, 1930:357 (erroneous designation, specimen subsequently described as *Trematorrhynchus exiguus*, new species by Regan and Trewavas, 1932). Fowler, 1936:1349, Fig. 567 (in part; after Regan, 1926).

*Rhinnocheraeia leuconius*, Regan, 1926:44 (in part; erroneous designations; 17 specimens, two referred to *Trematorrhynchus leuconius* by Regan and Trewavas, 1932, subsequently referred to *O. eschrichtii*-group by Bertelsen, 1951).

*Trematorrhynchus leuconius*, Regan, Trewavas, 1932:91 (in part; new combination; erroneous designations; four specimens referred to *O. eschrichtii*-group by Bertelsen, 1951).

*Trematorrhynchus exiguus* Regan and Trewavas, 1932:91, Fig. 147 (original description, single specimen, holotype BMNH 1930.1.12.1102: *Liparisium tumidus* of Norman, 1930). Bertelsen, 1951:73-74 (referred to the Oneirodidae).

*Caranactis pumilus* Regan and Trewavas, 1932:59, Fig. 86 (original description, single specimen, holotype ZMUC P9266; referred to *O. eschrichtii*-group by Bertelsen, 1951).


*Oneirodes* sp.? Bertelsen, 1951:88.

Of six adolescent and adult *Oneirodes* males examined by Bertelsen (1951), five appeared to be nearly identical. These were placed in what was the commonest group of species, the *O. eschrichtii*-group. The somewhat divergent sixth specimen was designated by Bertelsen (1951) as *Oneirodes* sp.? At present 35 adolescent and adult males of *Oneirodes* are known. In spite of this increase in material no characters have been found which would allow males to be included in any species based on females. Furthermore, no significant differences within the material could be found in spite of its world-wide distribution. All of this material, including Bertelsen’s (1951) *Oneirodes* sp.? is therefore designated as *O. sp.*, until means of identifying these specimens are found. Adolescent and adult males of the DANA collections are listed by Bertelsen (1951:88, 267, Appendix, Table 6). Additional material is listed in Appendix A.