DISTRIBUTION AND EVOLUTION OF HETERODONTY IN THE RAY-FINNED FISHES (ACTINOPTERYGII)

A Thesis

by

NICHOLAS GILBERT BERTRAND

Submitted to the Office of Graduate and Professional Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE

Chair of Committee,	Kevin Conway
Co-Chair of Committee,	William Neill
Committee Member,	Delbert Gatlin
Head of Department,	Michael Masser

December 2014

Major Subject: Wildlife and Fisheries Sciences

ABSTRACT

Heterodonty, having multiple different types of teeth in the jaws, is well documented in chondrichthyan and sarcopterygian lineages, but is poorly documented within the Actinopterygii (ray-finned fishes). To further our understanding of actinopterygian dentition, a broad-scale literature review of tooth types across all families of actinopterygian fishes was conducted to (1) summarize the diversity of oral jaw teeth that exists within the group and (2) assess the distribution of heterodonty. Based on a thorough survey of the published literature on actinopterygian fishes, 15 distinct types of oral jaw teeth are recognized and named based on attributes of tooth shape. Heterodonty is widespread within the Actinopterygii and is documented in 20 of the 45 orders ray-finned fishes. The oral jaws of actinopterygiian fishes have 39 distinct forms of heterodonty, which comprise two, three or four different tooth types. The results of ancestral character state reconstruction analyses, conducted in conjunction with a recently published molecular phylogenetic hypothesis for actinopterygian fishes, confirm that heterodonty has evolved multiple times throughout the evolutionary history of the group and suggest that a homodont dentition comprised only of coniform teeth is a plesiomorphic condition for the Actinopterygii. Summaries of oral jaw teeth are provided for 3,000 species of ray-finned fishes, representing 442 families and 45 orders.

AKNOWLEDGEMENTS

I thank my committee chair, Dr. Kevin W. Conway for taking me on as a student. Many of my plans had to change unexpectedly during my time at the university and he has been infinitely supportive through them all. Furthermore, I cannot measure how much I learned under his guidance. I would have never become a fish dentist without him. I also thank my committee members, Dr. William Neill and Dr. Delbert Gatlin for their helpful advice and comments on this document and for their continued support during my time at Texas A&M University. Thanks also go to Heather Prestridge at the Biodiversity Research and Teaching Collections for all her help with specimen loans. Special thanks go to a number of researchers who helped with this project in a number of different ways. I thank Dr. Richard Vari for granting me access to the immense resources of the Smithsonian Museum of Natural History's cleared and stained collections, without which I would not have been able to examine nearly as many skeletal preparations. Dr. Ralf Britz provided a great deal of advice and enthusiasm and allowed the use of his photographs. I would especially like to thank Dr. Tiiu Märss and Dr. Katsutoshi Watanabe for allowing me to reproduce images from their research to provide examples of tooth types. Dr. David G. Johnson also provided access to additional specimens. Additionally, I want to recognize the various researchers who corresponded with me about the dentition of various groups of fishes, including Drs. Bruce Mundy, Heok Hee Ng, Tyson Roberts, David G. Smith, Gloria Arratia, Ralf Britz, Leo Smith, and Douglas F. Markle. Funding for this research was provided by Texas A&M University, The Sloan Fellowship, The Diversity Fellowship, and the Smithsonian Institution. Finally, thanks to my family and friends for all of their support and patience.

TABLE OF CONTENTS

LIST OF FIGURES

INTRODUCTION

Teeth in the oral jaws of gnathostomous (jawed) vertebrates exhibit tremendous morphological diversity, ranging from small and simple peg-like structures in certain groups of bony fishes and amphibians, to the large and complex multicuspids in groups as unrelated as chondrichthyans and mammals. Like other components of the vertebrate exoskeleton, teeth are well represented in the fossil record, so much so that the teeth of certain taxa are considered important biostratigraphic markers (Repenning 1987; Sibert et al. 2014). The genetic basis of vertebrate tooth development is also relatively well known for a number of taxa (Chinsembu 2012; Tucker & Fraser 2014), and teeth have become popular subjects of recent evolutionary-developmental (evo-devo) studies (Streelman et al. 2003; Stock 2007; Ohazama et al. 2010; Jackman et al. 2013).

Vertebrate oral dentitions are labeled as either homodont or heterodont based on the number of different tooth types present. Homodonts possess only a single type of tooth (e.g., weakly bicuspid teeth in the upper jaw of anurans; Peyer 1968; Tucker & Fraser 2014) while heterodonts simultaneously possess multiple types of teeth (e.g., humans possess canines, incisors, premolars and molars; (Ungar 2010). Homodonty and heterodonty are generally considered to represent plesiomorphic and apomorphic conditions, respectively (Ungar 2010), and the derived condition has certainly evolved multiple times independently throughout the evolutionary history of the Vertebrata (Kieser et al. 1993; Smith 2005; Ungar 2010). Despite the widespread distribution of heterodonty across vertebrates, the majority of research on heterodonty has focused on either sarcopterygian (Butler 1978; Evans & Sanson 2003; Brook et al. 2014) or chondrichthyan taxa (Applegate 1965; Maisey et al. 2014; Rangel et al. 2014), and has yet to be investigated in detail for the Actinopterygii, a morphologically diverse and highly speciose lineage of the Vertebrata.

HETERODONTY IN THE ACTINOPTERYGII

With approximately 33,000 species and a distribution that is worldwide, members of the Actinopterygii (ray-finned fishes) dominate aquatic habitats on a global scale (Nelson 2006). The oral jaw teeth of actinopterygians range from tiny conical teeth that are barely visible to the naked eye in several groups of catfishes (e.g. Amphilidae and *Silurandon*; (Golubtsov et al. 2004) to the exaggerated conical teeth present in members of the Trichiuridae (Nakamura & Parin 1993) or the large tightly interlocking conical teeth of *Hydrocynus vittatus* (Gagiano et al. 1996). In addition to size, the diversity in oral tooth shape that exists across the Actinopterygii is astounding, and ranges from simple conical teeth to the complex multicuspid teeth present in certain members of the Characiformes (Roberts 1967) or Acanthuridae (Wakita et al. 1977). In other groups, the oral jaw teeth are modified to form complex structures, such as the beak in the pufferfishes (Fraser et al. 2012) and parrotfishes (Bellwood 1994), and in still other groups, the oral jaw teeth may be absent, either throughout the entire lifecycle (e.g., seahorses and pipefishes; Dawson & Fritzsche 1975) or during particular life history stages (e.g., adult stages of the Acipenseriformes; Hilton et al. 2011). The vast majority of actinopterygians are homodonts and though a few striking examples of actinopterygian heterodonty have been known for a long time and are well documented (e.g., in the oral jaws of the wolf fishes, Anarhichadidae; Andre et al. 1784), the distribution of heterodonty across ray-finned fishes is unclear and has yet to be summarized within a phylogenetic framework. One of the major obstacles to accurately documenting the distribution of heterodonty across the

Actinopterygii is that information on dentition is scattered across a large body of published literature (particularly species descriptions, which may be published in obscure and difficult to obtain journals). Additionally, the terminology utilized to refer to different types of actinopterygian teeth is not consistently applied by different researchers and is in need of revision.

Many of the terms used for the different tooth types found in the oral jaws of actinopterygian fishes were introduced by Owen (1845). Owen (1845) equates his terms to the French terms used earlier by Georges Cuvier in the *Histoire naturelle des poisons*, first published in 1828. Owen's work appears to represent the oldest detailed assessment of actinopterygian tooth types, and while there is no rule of priority in anatomical nomenclature (equivalent to the rule of priority in Zoological Nomenclature), many of Owen's terms have continued to be utilized up until the present (Ho et al. 2014). Owen (1845) considered actinopterygian teeth within a framework of four basic shapes (cone, plate, prism, and cylinder), which were, in some cases, utilized in combination with the Latin suffix "*iform,*" to create names for different tooth types (e.g., coniform or lamelliform). Owen (1845) likened the diversity of tooth shape within actinopterygian fishes to a continuum and considered different tooth shapes along the continuum to be easily achieved via minor modification. For example, Owen described the change from a cone tooth shape to a cylinder tooth shape (his molariform teeth) by the "progressive, blunting, flattening, and expansion of the apex" as equivalent to shape variation existing between a conical tooth and a molariform tooth. Subsequently, by further flattening the cylindrical tooth shape, a plate tooth shape (his lamelliform teeth) could be achieved. Finally, Owen (1845) described that by altering the shape of the plate and combining it with a “grinding surface variously sculptured” a prism shape or multicuspid tooth shape could be achieved.

Though textbooks on vertebrate dentition devote relatively little time to the teeth of actinopterygian fishes (e.g., Peyer 1968; Komada 1986; Ungar 2010), the topic has received continuous attention from Ichthyologists since Owen (1985). Characteristics of oral jaw teeth often are used to distinguish between closely related species and illustrations of teeth are commonplace in species descriptions for many groups, for example the Characiformes (Vera Alcaraz et al. 2009; Bertaco & Carvalho 2010; Malabarba & Jerep 2012) or Pleuronectiformes (Amaoka 1969; Hensley & Buth 2005; Lee et al. 2009).

A large-scale survey of tooth attachment in actinopterygian fishes by Fink (1981) illustrated that teeth attach to the underlying jaw bones in one of four different ways (Types 1-4), with different modes of attachment either preventing (Type 1) or enabling (2-4) tooth mobility to various degrees. A similar large-scale survey of tooth replacement in actinopterygian fishes by Trapani (2001) documented two distinct modes of tooth replacement, including an extraosseous mode (in which replacement teeth develop in soft tissue surrounding the jaw bones) and an intraosseous mode (in which replacement teeth develop in crypts inside of the jaw bones). Subsequent studies on tooth replacement have revealed additional diversity in the way in which replacement teeth develop, especially within the speciose Percomorpha (Bemis et al. 2005; Hilton et al. 2005a). Actinopterygian taxa with unique dentitions continue to receive attention from ichthyologists, comparative odontologists, and developmental biologists alike. For example, studies on the strange upper jaw teeth of sicydium gobies that develop in a serial replacement series comprised of 20-30 replacement teeth in various stages of development (Mochizuki & Fukui 1983;

Sahara et al. 2013), the flexible teeth of loricarid catfishes that can bend up to 180^{o} (Geerinckx et al. 2012), or the beak of the pufferfishes that is formed via vertical stacking of elongate replacement teeth (Fraser et al. 2012) not only further our understanding of specific actinopterygian dentitions, but also our understanding of morphological novelties in vertebrates.

Unfortunately, the terminology used to describe oral jaw teeth in actinopterygian fishes is often inconsistently applied in recent literature. For example, the dentition of *Elops saurus* has been described as both small and granular (Smith 2002a), and as villiform (Sekavec 1971). In another example, the teeth of *Mugil incilis* were described as ciliiform by (Fowler 1903b) but were described as "recurved unicuspid" teeth by Harrison (2002). Occasionally, the same term may be used in different ways by different authors. For example, Nakamura and Parin (1993) defined a "fang" as "a long sharp tooth situated in the frontal part of the upper jaw, by which prey is seized." Yet, Grande (2010) used the term fang for the larger conical teeth that are present in the lingual tooth rows along both the upper and lower jaws in members of the Lepisosteidae, and Melo (2009) reserved this term for teeth attached to the underlying jaw bones via type 4 attachment in members of the Chiasmodontidae. Such variation in the application of terms is commonplace in descriptions of actinopterygian teeth and is problematic.

AIMS OF THIS STUDY

This review documents the distribution of heterodonty in the oral jaws of actinopterygian fishes, and is limited to teeth on the premaxilla and maxilla in the upper jaw, and the dentary in the lower jaw. Information on actinopterygian dentition was collected from two sources: (1) the vast body of published literature (both morphological and alpha taxonomic) on actinopterygian taxa, and (2) from direct observations on skeletal preparations of actinopterygian taxa.

The review will address the following questions concerning the evolution of heterodonty in the Actinopterygii:

1. *How many different types of teeth are present within the Actinopterygii?*
2. *How many times has heterodonty evolved independently across the Actinopterygii?*
3. *Have particular combinations of tooth types (e.g. incisiform plus caniniform teeth) evolved independently more often than other combinations within the Actinopterygii?*

By answering these questions I hope to further our understanding of the evolution of actinopterygian dentitions and facilitate future morphological and evo-devo research by providing a precise roadmap to the distribution of different tooth types across this large and successful group of vertebrates. Additionally, I hope to facilitate future research on actinopterygian fishes by introducing a concise terminology for actinopterygian tooth types, comparable to that which is already available for chondrichthyan fishes (Applegate (1965) or mammals (Ungar 2010).

MATERIALS AND METHODS

REVIEW OF THE LITERATURE

I surveyed the literature on actinopterygian fishes for information on teeth associated with the oral jaws (premaxilla, maxilla and dentary). In some cases, I also obtained information on teeth associated with additional tooth-bearing elements of the dermatocranium that are in close association with the jaw bones (e.g., hypomaxilla in clupeiform fishes) or functionally replace one or more of the jaw bones (e.g., the ethmovomer in anguilliform fishes). My survey was focused predominantly on the taxonomic and morphological literature available on actinopterygian fishes and utilized Nelson (2006) as both a means to navigate the taxonomic diversity of the group and a checklist to "steer the course" of the survey. Nelson (2006) provides a summary of the genera contained within each family of actinopterygian fishes that he recognizes, and though incomplete for many families, I attempted to obtain information on the dentition in at least one member of all the genera listed in Nelson (2006). I also collected information on dentition in taxa belonging to genera in addition to those included in Nelson (2006) either fortuitously, as I came across it during my survey, or purposely when information could not be obtained for those genera listed for a particular family in Nelson (2006). In most cases, I considered a search for information on a particular genus complete when I obtained information on oral jaw teeth for a single representative of that genus. However, in cases where information on oral jaw teeth was available for more then one species per genus in a single publication I also collected this information. For each genus surveyed, I characterized the dentition of at least one member species as either edentulous, homodont, or heterodont. For taxa categorized as homodonts or heterodonts, the type(s) of teeth present in the oral jaws was documented, as was information on tooth attachment (Types 1-4 sensu Fink 1981) or replacement (extraosseous or intraosseous sensu Trapani 2001), if available. Information on tooth type obtained from the literature was strictly interpreted as written by the original author; unless an accompanying figure contradicted the written description provided (e.g., if the term canine is used in text, but minute conical teeth are clearly illustrated on the jaw bones in an accompanying figure). All such changes have been noted in the summary provided for each family (see Results section). Teeth are referred to herein using one of 15 terms, which are defined based on characters of shape only (see results section for definitions associated with each term). All of the “iform” terms used by Owen (1845) to describe conical teeth arranged in multiple rows (e.g., villiform or ciliiform) are referred to simply as coniform teeth. Teeth described simply as bicuspid or tricuspid in the literature without accompanying information on shape or any accompanying illustration are referred to herein as bifidiform and tridentiform, respectively. In cases where a description of cusp number is accompanied by an “iform” tooth term, the “iform” type is given precedence. For example, a tricuspid incisiform tooth is listed as an incisiform tooth, but information about cusp number is included in the generic description.

Using this process, 3,510 papers were examined during the course of this study and the dentition of 3,802 species of actinopterygian fishes was recorded. Information on dentition could not be located for all of the genera listed in Nelson (2006) and for a small number of families I failed to obtain any information on oral dentition from the literature.

SKELETAL SPECIMEN PREPARATION AND EXAMINATION

Selected specimens from the Collection of Fishes at the Biodiversity Research and Teaching Collections were cleared and double stained (C&S) using the protocol of Taylor & Van Dyke (1985) and dissected following the protocol of Weitzman (1974). All C&S specimens were examined using a Zeiss SteREO Discovery V20 and photographs were obtained using a Zeiss AxioCam MRc5 attached to the aforementioned scope.

ANCESTRAL CHARACTER STATE RECONSTRUCTIONS

The evolution of oral dentition across the Actinopterygii was investigated using Ancestral Character State Reconstruction (ACSR) analyses within the framework of the recent molecular phylogenetic hypothesis of actinopterygian relationships (Near et al. 2012). All ACSR analyses were conducted in Mesquite version 3.0 (Maddison & Maddison 2011) under the criterion of Maximum Parsimony. It was not possible to obtain information on all of the taxa included in the "molecular hypothesis" and in such cases I used close relatives (members of same genus) as substitute taxa (denoted with an asterisk [*] in figures). The first ACSR analysis investigated the evolution of heterodonty, with terminal taxa designated as either homodonts (including edentulous taxa) or heterodonts using a simple binary state character (homodonty (0); heterodonty (1)). A second ACSR analysis investigated the evolution of specific tooth types (e.g., caniniform) and types of heterodonty (e.g., caniniform/coniform heterodonts or incisiform/coniform heterodonts). For the purposes of this analysis, tooth types and type of heterodonty were coded as different states of a single multistate character, including: edentulous (state 0); coniform (1); caniniform (2); depressiform (3); bifidiform (4); tridentiform (5); incisiform (6); lamelliform (7); molariform (8); palmiform (9); raduliform (10); combiform (11);

coniform/caniniform (12); coniform/caniniform/depressiform (13); coniform/tridentiform (14); coniform/depressiform (15); caniniform/incisiform (16); caniniform/suspensiform (17); (18) coniform/bifidiform (18); bifidiform/tridentform (19); lamelliform/trituation (20); coniform/incisiform (21).

RESULTS

BASIC STRUCTURE OF THE ACTINOPTERYGIAN TOOTH

A typical actinopterygian tooth exhibits a cylindrical shaft that is circular in cross section and tapers to a unicuspid crown. Multiple distinct well-mineralized tissues encircle the tooth, including (from distal to proximal): crown enameloid (acrodine), collar enameloid, and occasionally collar enamel (Sasagawa et al. 2009). These highly mineralized tissues surround several different inner tissues, including: a radial fibril layer, mantle dentine, cricumpulpal orthodentine, and the central pulp cavity (innermost) (Hughes et al. 1994). The crown enameloid (commonly referred to as the acrodin cap) covers the tooth crown (including cusp(s)) and collar enameloid forms a thin outermost layer around the tooth shaft and base of the tooth. At the base of the collar enameloid is the annular ligament, which attaches the tooth to its pedicel. The pedicel has long been referred to as "the bone of attachment," a term introduced by Tomes (1874), but Hughes et al. (1994) determined this term to be erroneous because the pedicel is composed of dentine and not bone tissue (at least in the taxa examined by Hughes et al. (1994). Hughes et al. (1994) suggest that the term used by Tomes (1874) is more appropriately applied to the spongy bone that forms around the pedicel and on the adjacent compact bone of the dentary and premaxilla. For the purposes of this study I will use the term pedicel to describe the base to which the annular ligament attaches.

TOOTH TYPES IN ACTINOPTERYGIAN FISHES

The following terms are utilized in this study.

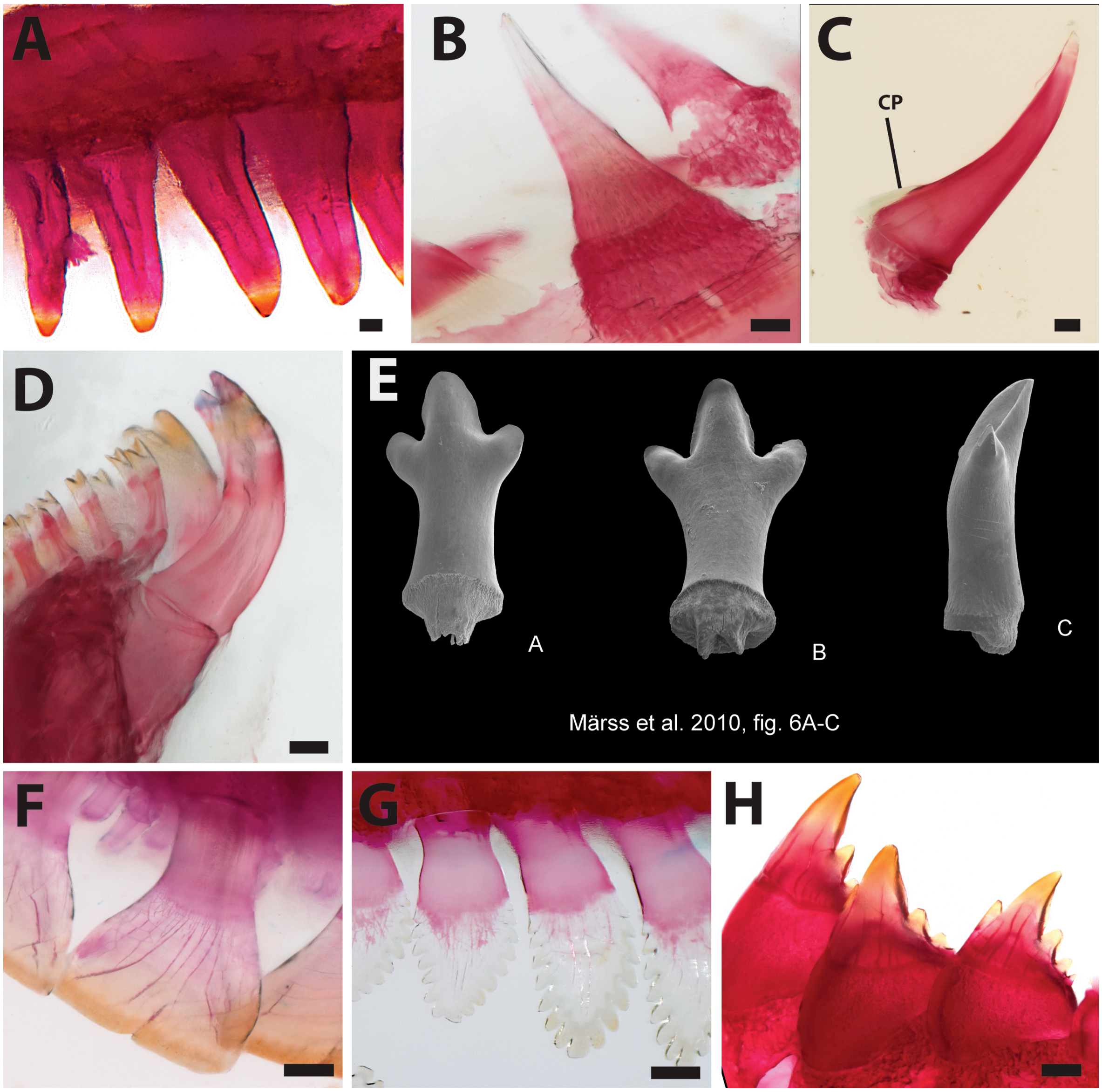

Figure 1. Representative Samples of the Tooth Types. (scale bar 0.05mm) A) Coniform teeth present on the premaxilla in *Gymnotus carapao*, TCWC 7502.51. B) Caniniform tooth present on the dentary in *Esox americanus*, TCWC uncataloged. C) Dissected depressiform tooth from the dentary of *Mercluccias bilinearis,* TCWC 3289.13; collagen plug (CP) is located on the lingual tooth face. D) Bifidiform teeth present on the dentary of *Ameca splendens*, TCWC uncataloged. E) Tridentiform teeth from the premaxilla of *Liparis liparis* reproduced from (Märss et al. 2010). F) Incisiform teeth on the premaxilla of *Lagodon rhomboides*, TCWC 12302.16. G) Raduliform teeth from the premaxilla of *Acanthurus* sp., TCWC uncataloged. H) Palmiform teeth present on the dentary of *Astyannax mexicanus*, TCWC uncataloged. I) Molariform teeth present on the dentary of *L. rhomboides* (specimen as in F). J) Suspensiform teeth on the premaxilla of *Mugil curema*, TCWC uncataloged. K) Dissected sigmoidiform tooth from the premaxilla of *Chaetostoma* sp., TCWC uncataloged. L) Dissected spiraliform teeth from the premaxilla of *Plecoglossus altevilis*, TCWC 3603.02. M) Lepidophagiform tooth from the oral jaws of *Perrisodus paradoxus* reproduced from Takahashi et al. 2007 (scale bar 0.1mm). N) Trituatiform teeth (T) on the dentary of *Ranzania* sp. (photo by Ralf Britz). O) Lamelliform teeth on the premaxilla and dentary of *Tetractenos* sp. (photo by Ralf Britz).

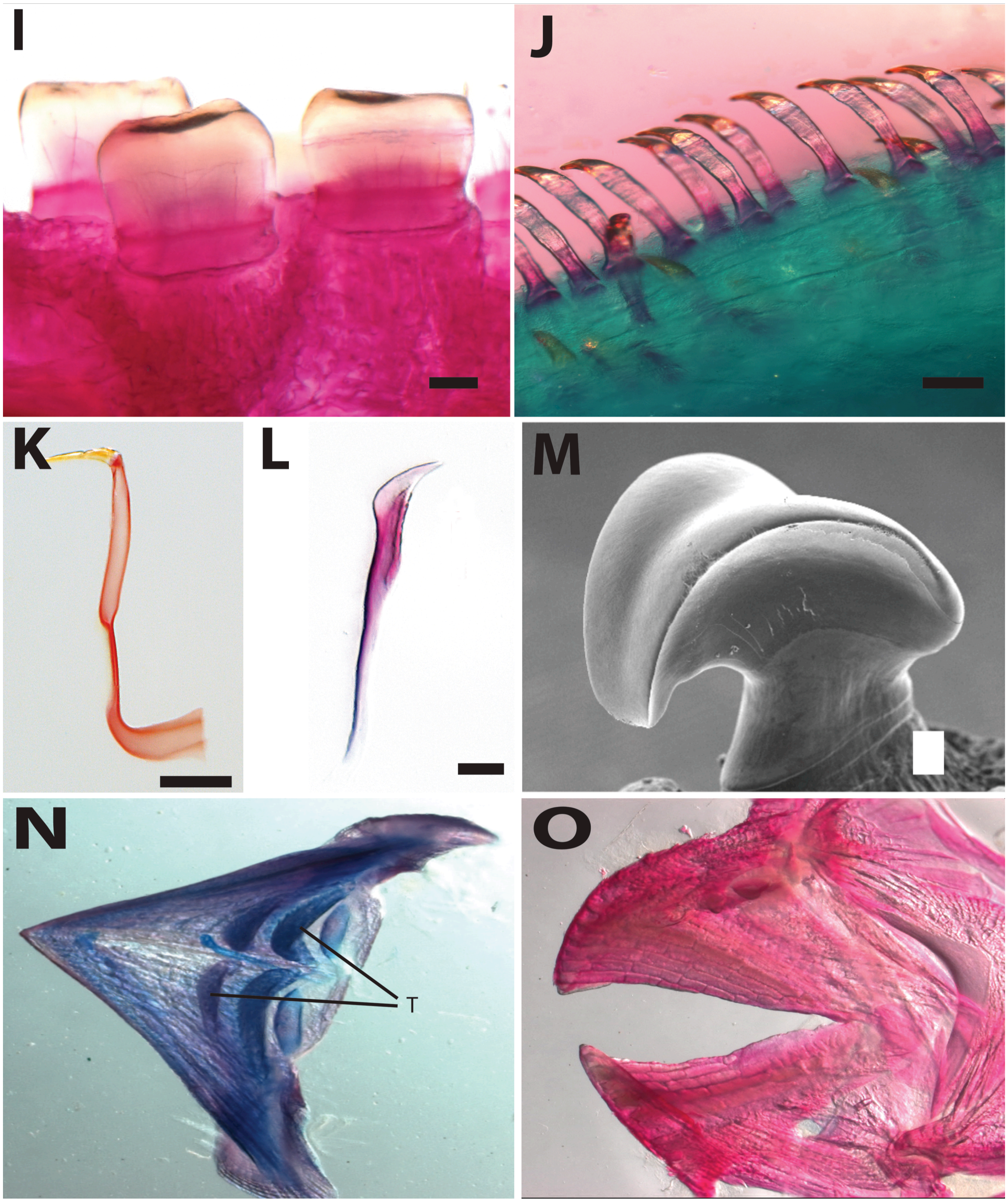

Figure 1. Continued

Coniform (Fig.1A): Coniform teeth are typically shaped like a cone. The crown is unicuspid and the shaft is stout or elongate. Coniform teeth are circular to ovoid in cross section and the cross section at the base is similar to that of the pedicel. Tooth attachment is Type 1 or Type 2. Widespread across Actinopterygii.

Caniniform (Fig.1B): Caniniform teeth are typically shaped like a cone. The crown is unicuspid and the shaft is stout or elongate. Caniniform teeth are disproportionately large compared to surrounding teeth. They are circular to ovoid in cross section and the cross section at the base is similar to that of the pedicel. Tooth attachment is Type 1 or Type 2. Widespread across Actinopterygii.

Depressiform (Fig.1C): Depressiform teeth are shaped like a cone distally and exhibit a concave depression along the lingual face proximally. The crown is unicuspid and the shaft is stout or elongate. Depressiform teeth are cylindrical in cross section above the base. At the base, depressiform teeth are horse-shoe shaped in cross section due to the presence of a cavity on the lingual face of the tooth to accommodate an expanded collagen plug, associated with Type 3 or Type 4 attachment, which enables each tooth to be depressed lingually when pressure is applied. Widespread across Actinopterygii.

Bifidiform (Fig.1D): Bifidiform teeth are shaped like a "Y." The tooth crown is bicuspid (cusps may or may not be asymmetrical) and the tooth shaft is stout or elongate. Bifidiform teeth are typically cylindrical in cross section, rarely labiolingually flattened, and the cross section at the base is similar to that of the pedicel. Tooth attachment is Type 1 or Type 2. Widespread across Actinopterygii.

Tridentiform (Fig.1E): Tridentiform teeth are shaped like a three-pronged fork. The tooth crown is tricuspid and the tooth shaft is stout or elongate. Tridentiform teeth are typically cylindrical in cross section, rarely labiolingually flattened, and the cross section at the base is similar to that of the pedicel. Tooth attachment is Type 1 or Type 2. Widespread across Actinopterygii.

Incisiform (Fig.1F): Incisiform teeth are shaped like a spatula with distinct labio-lingual flattening. The crown may vary from unicuspid to multicuspid, with all cusps located on the distal tip (versus lateral margins) of the crown. The cusps may be variable in length. The shaft is either stout or elongate and may be significantly tapered or waisted in some groups. The cross section at the base is similar to that of the pedicel. Tooth attachment is Type 1 or Type 2. Widespread across Actinopterygii.

Raduliform (Fig.1G): Raduliform teeth are shaped like a lobate plant leaf (Hickey 1973). The crown exhibits multiple cusps arranged around a central stout labio-lingally flattened shaft and the cross section at the base is similar to that of the pedicel. Tooth attachment is Type 2, but depressible raduliform teeth were reported in *Ctenochaetus* (Krone et al. 2006). Found only in members of the Acanthuridae and Nomeidae.

Palmiform (Fig.1H): Palmiform teeth have a crown with multiple cusps arranged like the digits of a human hand with the central cusp being the most prominent and lateral cusps becoming progressively smaller the more distant they are from the central cusp. The tooth shaft is very stout. Palmiform teeth are circular to ovoid in cross section and the cross section at the base is similar to that of the pedicel. Tooth attachment is Type 2. Found only in members of the Characiformes.

Molariform (Fig.1I): Molariform teeth have a spherical crown on a short stout shaft. Molariform teeth are circular to ovoid in cross section and the cross section at the base is similar to that of the pedicel. Tooth attachment is Type 2. Widespread across Actinopterygii.

Suspensiform (Fig.1J): Suspensiform teeth have a crown shaped like a spatula with distinct labio-lingual flattening. The crown may vary from unicuspid to multicuspid, with all cusps located on the distal tip (versus lateral margins) of the crown. The cusps may be variable in length. The shaft is typically elongate and may be significantly tapered or waisted in some groups. The base is never attached to a pedicel and instead each tooth is suspended in connective tissue surrounding the underlying jaw bones. The labial face of the base may be elongated (Ebeling 1957). Widespread across Actinopterygii.

Sigmoidiform (Fig.1K): Sigmoidiform teeth have a unicuspid or bicuspid tooth crown that is labiolingually flattened. When bicuspid, cusps may be symmetrical or asymmetrical. When unicuspid, the crown may be conical or spoon-like in shape. The shaft is shaped like a sigmoid curve and may be stout or elongate. The shaft is circular to ovoid in cross section and the cross section at the base is similar to that of the pedicel. Geerinckx et al. (2012) observed that some sigmoidiform teeth have "flexible" dentine in the tooth shaft that allows the shaft to bend. Mode of attachment is unknown. Found only in members of the Loricariidae.

Spiraliform (Fig.1L): Spiraliform teeth have a flattened crown that spirals distal-lingually from the shaft forming a "C" shape. The shaft is elongate and compressed with the widest point located approximately midlength along the shaft. Mode of attachment is unknown. Referred to as "comb-teeth" by Howes and Sanford (1987). Found only in *Plecoglossus altivelis* (Howes & Sanford 1987).

Lepidophagiform (Fig.1M): Lepidophagiform teeth have a crown shaped like a cordate leaf (Hickey 1973) that is orientated perpendicular to a stout (rarely elongate) shaft. The crown is typically reduced to three weak cusps with two posteriorly and one anteriorly in some species. The shaft is circular to ovoid in cross section and the cross section at the base is similar to that of the pedicel. Mode of attachment is unknown. Widespread within the genus *Perissodus* (Takahashi et al. 2007), but uncommon, across Actinopterygii.

Trituatiform (Fig.1N): Trituatiform teeth have a crown shaped like a horizatonally elongate dome with a short and stout shaft, which is much wider than it is tall. The shaft and base have an elongate ovoid shape in cross section. Mode of attachment is unknown. Restricted distribution within Tetraodontiformes.

Lamelliform (Fig.1O): Lamelliform teeth contribute to the formation of a beak-like structure on the premaxilla and dentary. Teeth may be variable in size and are bound or stacked together in a variety of different way. Restricted distribution within Percomorpha.

DESCRIPTION AND PHYLOGENETIC DISTRIBUTION OF TOOTH TYPES ACROSS ACTINOPTERYGII

The dentition of Actinopterygii is summarized for each family provided by Nelson (2006). Each account begins with a list of genera and the citation(s) from which information for that particular genus was obtained. This is followed by a short summary of dentition in each genus. In cases where different genera have similar dentition within a single family or subfamily they have been consolidated into a single sentence. All figure references in this section of the paper refer to the source literature and do not refer to figures present herein. The dentition of each genus is described by tooth type and arrangement if this information is available. If information on arrangement is not provided in the account this indicates that no information could be obtained from the literature. Arrangement is described using a modified version of the terminology given by Ungar (2010) in Fig.1.1. Labial and lingual describe interior and exterior surfaces of the mouth while anterior and posterior describe position based on the forward and rearward most points on the oral jaws. Finally, each family or subfamily concludes with any available information on attachment, replacement, and any other pertinent information about the dentition of that family.

POLYPTERIFORMES

Polypteridae: *Polypterus* (Traquair 1870; Clemen et al. 1998; Wacker et al. 2001) and *Erpetoichthys* (Claeson et al. 2007)**.**

Polypterus possesses coniform teeth arranged in a single row on the premaxilla, maxilla, and dentary (Clemen et al. 1998). *Erpetoichthys* possesses coniform teeth on the premaxilla in one to two rows with the lingual row containing the smallest teeth; the maxilla and dentary have coniform teeth arranged in a single row (Claeson et al. 2007). Tooth attachment is Type 1 in *P. senegalus* (Cuvier) (Fink 1981). Tooth replacement is extraosseus in *P. senegalus* (Trapani 2001).

ACIPENSERIFORMES

Acipenseridae: *Acipenser* (Hilton et al. 2011), *Scaphirhynchus* and *Huso* (Bemis et al. 1997).

Adult acipenserids are edentulous with the coniform teeth present in juveniles being shed early in development (Bemis et al. 1997; Hilton et al. 2011). Hilton et al. (2011) report that the coniform teeth arranged in a single row on the dentary of *Acipenser brevirostrum* (Lesueur) are shed before reaching 26.7mm TL (Hilton et al. 2011). Tooth attachment and tooth replacement have not been investigated.

Polyodontidae: *Polyodon* (Bemis et al. 1997; Georgi & Brady 1999), *Psephurus* (Mims et al. 1993; Georgi & Brady 1999).

Juveniles of *Polyodon* possess two rows of coniform teeth on the maxilla and dentary which are lost by 180 days post hatch (Georgi & Brady 1999). *Psephurus* possess multiple rows of coniform teeth, but unlike *Polyodon*, teeth are retained by adults (Mims et al. 1993; Georgi & Brady 1999). Tooth attachment is Type 1 in *P. spathula* (Walbaum) (Fink 1981; Georgi & Brady 1999). Tooth replacement has not been investigated. Georgi and Brady (1999) reported that the teeth of *Polyodon* have a unique homogenous structure, lacking separate regions such as the enameloid cap or dentine. Histological examination of the jaws of *Polyodon* indicates that teeth are absorbed into the bone rather then shed as in members of the Acipenseridae (Bemis et al. 1997).

LEPISOSTEIFORMES

The maxilla and premaxilla are greatly reduced in extant Lepisosteiformes and the elements of the lacromaxillary series are the major tooth bearing elements of the upper jaw (Grande 2010).

Lepisosteidae: *Lepisosteus** and *Atractosteus**(Grande 2010).

Lepisosteus and *Atractosteus* possess coniform teeth in the labial row and caniniform teeth in the lingual row along the premaxilla, lacromaxilllary series and dentary (Grande, 2010). Grande (2010) referred to the caniniform teeth in the lingual row as "fangs." *Lepisosteus oculatus* (Winchell) and *L. platrhincus* (DeKay) are notable in that the outer row of the upper jaw is reduced to a single median tooth on the premaxilla (Grande 2010). Tooth attachment is Type 1 in *L. oculatus* (Fink 1981). Tooth replacement is extraosseus in *A. tropicus* Gill (Trapani 2001). At sizes greater than 100mm SL, the oral teeth of lepisosteids posses a unique folded dentine known as plicidentine, which is considered unique to Lepisosteiformes among actinopterygians (Grande 2010). A similar plicidentine has been reported in mammals (Peyer 1968). This folding results in multiple vertical striations, extending from the base of the tooth toward the tooth crown.

AMIIFORMES

Amiidiae: *Amia**(Miller & Radnor 1973; Grande & Bemis 1998).

Amia possesses caniniform teeth arranged in a single row on the premaxilla and dentary; the maxilla has coniform teeth arranged in a single row (Grande & Bemis 1998). Tooth attachment is Type 1 (Fink 1981) and tooth replacement is extraossessus (Miller & Radnor 1973; Trapani 2001)

HIODONTIFORMES

Hiodontidae: *Hiodon* (Guo-Qing et al. 1997; Hilton 2002).

Hiodon possess coniform teeth in two rows on the premaxilla and a single row on the maxilla; the dentary has two rows of coniform teeth (Guo-Qing et al. 1997; Hilton 2002). Tooth attachment is Type 1 in *H. alosoides* (Rafinesque) (Fink 1981). Tooth replacement is extraosseus in *H. alosoides* (Trapani 2001).

OSTEOGLOSSIFORMES

Osteoglossidae:

Heterotidinae: *Arapaima* and *Heterotis* (Ridewood 1905; Stewart 2013).

Arapaima and *Heterotis* have a single row of coniform teeth on the premaxilla, maxilla and dentary (Ridewood 1905). The dentary may have as many as three rows in *A. gigas* (Schinz) (Stewart 2013). Tooth replacement is extrasosseus in *H. niloticus* (Trapani 2001). Tooth attachment has not been investigated.

Osteoglossinae: *Osteoglossum, Scleropages* and *Pantodon* (Ridewood 1905).

Osteoglossum and *Scleropages* have a a single row of coniform teeth on the premaxilla, maxilla and dentary (Ridewood 1905). *Pantodon* possesses a single row of coniform teeth on the premaxilla; the maxilla and dentary have coniform teeth arranged in two rows. The largest teeth on the maxilla of *Pantodon* are in the lingual row, but on the dentary the largest teeth are in the labial row (Ridewood 1905; Hilton 2003) Tooth attachment is Type 1 in *S. formosus* (Müller & Schlegel) and *O. bicirrhosum* (Cuvier) (Fink 1981). Tooth replacement is extraosseus in *O. bicirrhosum* (Trapani 2001).

Notopteridae: *Notopterus* (Ridewood 1904b; Carpenter 2002a), *Chitala* (Sanford & Lauder 1989), or *Xenomystus* (Günther 1868).

Notopterus possesses coniform teeth arranged in two rows on the premaxilla, maxilla and dentary with smaller teeth present in the lingual row (Ridewood 1904b). *Chitala* possesses coniform teeth on the premaxilla, maxilla, and dentary (Sanford & Lauder 1989). *Xenomystus* possesses coniform teeth arranged in multiple rows on the premaxilla, maxilla and dentary (Günther 1868). Tooth attachment is Type 1 in *Papyrocranus* sp. (Fink 1981). The mode of replacement has not been investigated.

Mormyridae: *Brienomyrus* (King 1989), *Gnathonemus* (Pellegrin 1924; Mikuriya 1972), *Hippopotamyrus* (Myers 1960; Kramer & Swartz 2010), *Isichthys* (Gill 1862a), *Marcusenius* (Boulenger 1890; Norman 1928; Boden et al. 1997), *Mormyrops* (Ridewood 1904b; Norman 1935b), *Petrocephalus* (Ridewood 1904b), *Stomatorhinus* (Sullivan & Hopkins 2004).

Brienomyrus, Cyphomyrus, Gnathonemus, Hippopotamyrus, Marcusenius, *Mormyrops, Petrocephalus*, and *Stomatorhinus* possess bifidiform teeth in a single row on the premaxilla and dentary; the maxilla is edentulous. Boden et al. (1997) notes that conical or bifidiform teeth are listed for *Marcusenius* in the description provided by Taverne (1971) but observed only bifidiform teeth in *M. sanagaensis* Boden, Teugels & Hopkins. Norman (1928) briefly described the wearing of teeth from bifidiform to truncate in *H. graham* (Norman). Tooth attachment and tooth replacement have not been investigated.

Gymnarchidae: *Gymnarchus* (Ridewood 1904b; Sagua 1986).

Gymnarchus possesses incisiform teeth arranged in a single row on the premaxilla and dentary (Sagua 1986). The maxilla is edentulous. Tooth attachment has not been investigated. Ridewood (1904b) illustrates a distinct crypt below the tooth on the dentary (Fig. 11) in which the teeth are seated implying intraosseus tooth replacement, but this should be confirmed through the examination of specimens.

ELOPIFORMES

Elopidae: *Elops* (Regan 1909; Nybelin 1968; Smith 2002a).

Elops possesses coniform teeth arranged in multiple rows on the premaxilla, maxilla and dentary (Regan 1909). Tooth attachment is Type 2 (Fink 1981). Tooth replacement is extraosseus (Trapani 2001)

Megalopidae: *Megalops* (Cuvier & Valenciennes 1847; Ridewood 1904a; Smith 2002a).

Megalops possesses coniform teeth arranged in multiple rows on the premaxilla, maxilla and dentary (Ridewood 1904a). Tooth attachment is Type 2 in *Megalops atlanticus* Valenciennes (Fink 1981) and tooth replacement is extraosseus (Trapani 2001).

ABULIFORMES

Albulidae: *Albula* (Ridewood 1904a; Nybelin 1976; Smith 2002a; Smith & Randall 2002).

Albula possesses coniform teeth arranged in three rows on the premaxilla and dentary; the maxilla is edentulous (Ridewood 1904a; Nybelin 1976). Tooth attachment has not been investigated. Tooth replacement is extraosseus in *A. vulpes* (Linnaeus)(Trapani 2001).

Halosauridae: *Halosaurus*, *Halosauropsis*, and *Aldrovandia* (Smith 2002a; Smith 2002c; Shelyagin 2010).

Halosaurus, *Halosauropsis*, and *Aldrovandia* possess coniform teeth in multiple rows on the premaxilla, maxilla and dentary (Shelyagin 2010). Tooth attachment and tooth replacement have not been investigated. McDowell (1973) reports that the teeth of halosaurs are depressible, but gives no further information on tooth attachment.

Notacanthidae: *Lipogenys*, *Polyacathonotus*, and *Notacanthus* (McDowell 1973; Mundy et al. 2011).

Lipogenys is edentulous (Mundy et al. 2011). *Polyacanthonotus* possesses coniform teeth arranged in a single row on the premaxilla and dentary; the maxilla is edentulous(Mundy et al. 2011). The dentition of *Notacanthus* is variable among species and within species. Recent examination of *N. abotti* and *N. chemnitzii* has revealed tooth shape may not be a reliable character to distinguish between species of *Notacanthus* and reexamination was recommended (Mundy et al. 2011). McDowell (1973) also reported depressibility in those populations without the flattened crowns, but no specific information on attachment Type was given. Tooth replacement has not been investigated.

ANGUILLIFORMES

The premaxilla is greatly reduced (Protoanguillidae) or absent in modern anguilliforms (Johnson et al., 2012). I have chosen to include the intermaxillary teeth associated with the anterior portion of the ethmovomer (which appear to functionally replace premaxillary teeth) in addition to teeth present on the maxilla and dentary. Böhlke and Smith (2002) recently introduced a useful terminology to describe the intermaxillary tooth rows of muraenids. This system describes the arrangement of intermaxillary teeth based on position, including: peripheral intermaxillary (PIM), intermediate intermaxillary (IIM), and median intermaxillary (MIM) teeth. I have attempted to apply this terminology to all groups of anguilliforms where sufficient information on arrangement is available in the literature. When this information is not available, the arrangement of intermaxillary teeth will be treated as teeth on the ethmovomer. The vomerine tooth position defined by Böhlke and Smith (2002) has been excluded.

Protanguillidae: *Protanguilla* (Johnson et al. 2012).

Protanguilla possesses coniform teeth arranged in multiple rows on the premaxilla (three to four rows) and ethmovomer and dentary Tooth attachment and replacement have not been investigated.

Anguillidae: *Anguilla* (Watanabe et al. 2004; Watanabe et al. 2009; Johnson et al. 2012).

Anguilla possesses coniform teeth arranged in two to nine rows on the ethmovomer, maxilla, and dentary (Johnson et al. 2012). Watanabe et al. (2004) considered the width of tooth patch on the maxilla a useful character for distinguishing between different species of *Anguilla*. Tooth attachment is Type 2 in *A. rostrata* (Lesueur) (Fink, 1981). Tooth replacement is extraosseus in *A. rostrata* and *A. anguilla* (Linneaus) (Trapani 2001).

Heterenchelyidae: *Panturichthys** (Ben-Tuvia 1956; Smith et al. 2012), *Pythonichthys** (Rosenblatt & Rubinoff 1972).

Panturichthys and *Pythonichthys* possess coniform teeth on the ethmovomer; the maxilla has coniform teeth arranged in two to four rows; the dentary has anterior coniform teeth and posterior molariform teeth arranged in two to four rows (Ben-Tuvia 1956;

Rosenblatt & Rubinoff 1972; Smith et al. 2012). Smaller individuals have two rows of teeth on the maxilla and dentary, but this increases to as many as four rows in large individuals (Ben-Tuvia 1956; Rosenblatt & Rubinoff 1972; Smith et al. 2012). Tooth attachment and tooth replacement have not been investigated.

Moringuidae: *Moringua* (De Schepper et al. 2005), *Neoconger* (Smith & Castle 1972)**.**

Moringuids possess a single row of caniniform teeth on the ethmovomer, maxilla, and dentary (Smith & Castle 1972; De Schepper et al. 2005). Tooth attachment and tooth replacement have not been investigated.

Chlopsidae: *Boehlkenchelys* (Tighe 1992), *Catesbya* (Böhlke & Smith 1968), *Chilorhinus* (Gosline 1951a), *Chlopsis** (Böhlke 1956), *Kaupichthys* (Böhlke 1956)*, *Powellichthys (Smith 1965b),* and *Robinsia* (Böhlke & Smith 1967).

Boehlkenchelys possesses depressiform teeth arranged in multiple rows on the ethmovomer, maxilla (six-seven rows) and dentary (five to six rows) (Tighe 1992). Teeth on the ethmovomer are continuous with the six to seven rows of maxillary teeth (Tighe 1992). *Catesbya* possesses coniform teeth arranged in two rows on the ethmovomer, four rows on the maxilla, and eight rows on the dentary with the lingualmost rows containing the largest teeth (Böhlke & Smith 1968). *Chilorhinus* possesses coniform teeth on the ethmovomer; the maxilla and dentary have coniform teeth arranged in two rows and a single row respectively (Gosline 1951a). *Chlopsis* possesses an exterior row of caniniform teeth and a single depressiform tooth at the rear of the ethmovomer; the maxilla and dentary have coniform teeth arranged in two rows with the largest teeth located anteriorly (Böhlke 1956). *Kaupichthys* contains gynandic heterodonts. Males of *K. hyoproroides* (Strömman) possess coniform teeth arranged in multiple rows on the ethmovomer and three rows on the maxilla with the lingualmost row containing the largest teeth; the dentary has coniform teeth arranged in one to two labial rows with an additional one or two lingual rows consisting of recurved caniniform teeth with labio-lingually flattened crowns. Females of *K. hyoproroides* possess ethmovomerine and maxillary teeth similar to males; the has only coniform teeth arranged in three to four rows. Some rounding of the crowns of the coniform teeth of large females was noted by Böhlke (1956). *Powellichthys* possesses coniform teeth in the PIM, IIM and MIM rows of the ethmovomerine tooth patch; the maxilla and dentary have coniform teeth arranged in two to three rows and three to four rows respectively with the lingualmost rows containing the largest teeth (Smith 1965b). *Robinsia* possesses coniform teeth on the ethmovomer; the maxilla has coniform teeth continuous with the teeth of the ethmovomer that are arranged in two rows with the lingualmost row containing the largest teeth; the dentary has large labio-lingually compressed caniniform teeth in a single row (except anteriorly where two teeth create a second row at the symphysis) (Böhlke & Smith 1967). Böhlke and Smith (1967) also noted a change in tooth shape between the sexes of *Robinsia catherinae*, but stated that this dimorphism is not as well defined as in *Kaupichthys.* Tooth attachment and tooth replacement have not been investigated.

Myrocongridae: *Myroconger** (Smith 1984; Castle & Bearez 1995; Karmovskaya 2006).

Myroconger possesses coniform teeth arranged in three to four rows on the ethmovomer, maxilla and dentary with the lingualmost rows containing the largest teeth (Karmovskaya 2006). Castle and Bearez (1995) reported 20 depressiform teeth on the ethmovomerine tooth patch of *M. prolixus* (Castle & Béarez). Tooth attachment and tooth replacement have not been investigated.

Muraenidae:

Uropterygiinae: *Anarchias** (Reece et al. 2010b), *Channomuraena* (Chen & Shao 1995), *Scuticaria** (Böhlke & McCosker 1997), and *Uropterygius* (Böhlke & Smith 2002)

Anarchias possesses coniform teeth in the PIM row, depressiform teeth in the IIM row and both depressiform and coniform in the MIM row; the coniform PIM and depressiform IIM tooth rows are continous with tooth rows on the maxilla; the maxilla and dentary have coniform teeth in the labial row and caniniform teeth in the lingual row (Reece et al. 2010b). *Channomuraena* possesses coniform teeth in the PIM, IIM, and the MIM tooth rows; the maxilla has coniform teeth arranged in two rows, which are continuous with the PIM and IIM tooth rows; the dentary has two rows of coniform teeth with the lingualmost row containing the largest teeth (Chen & Shao 1995). *Scuticaria* possesses coniform teeth in the PIM, IIM, and MIM tooth rows; the maxilla has coniform teeth in the labial row and depressiform teeth in the lingual row; the dentary has coniform teeth arranged in two rows (Böhlke & McCosker 1997). The depressiform teeth on the maxilla were described as only "slightly depressible" by Böhlke and McCosker (1997). *Uropterygius* possesses coniform teeth in the PIM row, two IIM rows and MIM tooth row; the maxilla has coniform teeth arranged in two to six rows that are continuous with IIM rows; the dentary has coniform teeth arranged in two to six rows with the lingualmost row containing the largest teeth (Böhlke & Smith 2002). Two general trends seem to exist within *Uropterygius:* (1) dentition is made up of numerous rows and small coniform teeth; and (2) dentition is made up of fewer rows and much larger coniform teeth. Böhlke and Smith (2002) described some "conical to triangular" shape variation in the dentary teeth among species of *Uropterygius*. Tooth attachment and replacement have not been investigated.

Muraeninae: *Echidna** (Hatooka 1986), *Enchelycore** (Böhlke & Böhlke 1975; Böhlke & Böhlke 1980; Böhlke & Randall 2000; Smith 2002b), *Enchelynassa** (Böhlke & Randall 2000), *Gymnomuraena* (Böhlke & Randall 2000), *Gymnothorax** (Hatooka 1986; Böhlke & McCosker 1997; Smith & Böhlke 1997; Smith et al. 2008), *Monopenchelys** (Böhlke & McCosker 1982; Böhlke & Randall 2000), *Muraena* (Böhlke & Smith 2002), *Rhinomuraena* (Böhlke & Smith 2002), *Strophidon** (Böhlke 1997).

Echidna contains at least two species of gynandric heterodont (Hatooka 1986). The primary difference between the sexes in both species is the tooth type found in the PIM row. Males possess a PIM row of labio-lingually flatten caniniform teeth with serrated posterior edges (in males of *E. nebulosa* (Ahl)*,* these caniniform teeth are present on the lingual row of the dentary as well). In females, this row is composed entirely of blunt coniform teeth. Additionally, females of *E. nebulosa* have coniform teeth in the MIM tooth row. The maxilla of both sexes exhibit coniform teeth arranged in one to two rows. The dentary has coniform teeth arranged in two to three rows, except in male *E. nebulosa* where caniniform teeth are present (Hatooka 1986). *Enchelycore* possesses coniform teeth in the PIM tooth row and depressiform teeth in the IIM and MIM tooth rows; the maxilla has coniform teeth arranged in two to three rows with the lingualmost row containing the largest teeth; the dentary has coniform teeth arranged in two rows with the lingual row containing the largest teeth (Smith 2002b). In *E. carychroa* Böhlke & Böhlke*,* teeth in the lingualmost row are large and were referred to as caniniform by (Böhlke & Böhlke 1975). *Enchelynassa* possesses coniform teeth in the PIM tooth row, and caniniform teeth in the

IIM and MIM tooth rows; the maxilla and dentary have two rows of coniform teeth with the lingual row containing the largest teeth (Böhlke & Randall 2000). Böhlke and Randall (2000) noted an ontogenetic reduction in the number of teeth present in *Enchelynassa*. *Gymnomuraena* possesses molariform teeth in the PIM, IIM, and MIM tooth rows; the maxilla has two rows of small molariform teeth; the dentary has two to three rows of molariform teeth with the lingualmost row containing the largest teeth (Böhlke & Randall 2000). Böhlke and Randall (2000) speculated that *Gymnomuraena* may also be a gynandric heterodont, but acknowledged that more investigation was needed. *Gymnothorax* contains at least one gynandric heterodont, *G. richardsoni* (Bleeker) (Hatooka 1986). Females of *G. richardsoni* have both greater numbers of teeth and rows of teeth compared to males. In general, *Gymnothorax* possesses coniform teeth in the PIM tooth row, either caniniform or coniform teeth in the IIM tooth row, and a combination of coniform, caniniform, and/or depressiform teeth in the MIM tooth row. The maxilla has one to two rows of coniform or caniniform teeth with the lingual row containing the largest teeth. Some species may have depressiform teeth on the lingual row of the maxilla (Böhlke & Smith 2002). The dentary has coniform, caniniform or depressiform teeth arranged in one to two rows. When multiple tooth types are present on the dentary, the caniniform or depressiform teeth usually occur in the lingual row. Serrations may or may not be present on caniniform teeth (Smith & Böhlke 1997). *Monopenchelys* possesses coniform teeth in the PIM tooth row while the IIM and MIM tooth rows contain caniniform teeth; the maxilla has coniform teeth in the labial row and depressiform teeth in the lingual row; the dentary has coniform teeth arranged in two rows with the lingual row containing the largest teeth (Böhlke & Randall 2000). *Muraena* possesses coniform teeth in the PIM tooth row and depressiform teeth in the MIM tooth row; the maxilla and dentary have coniform teeth arranged in a single row (Böhlke & Smith 2002). *Rhinomuraena* possesses coniform teeth in the PIM and the MIM tooth rows; the maxilla and dentary have a single row of coniform teeth (Böhlke & Smith 2002). *Strophidon* possesses coniform teeth in the PIM and MIM tooth rows; the maxilla has coniform teeth in the labial row and depressiform teeth in the lingual row. The dentary has coniform teeth arranged in two rows (Böhlke 1997).

Tooth attachment has not been investigated. The consistent mention of depressible teeth in species descriptions for members of this family implies Type 3 or Type 4 tooth attachment may also be present. Tooth replacement is extraosseus in *Gymnomuraena zebra* (Shaw& Nodder), *E. catenata* (Bloch), *Enchelycore nigricans* (Bonnaterre)*, and Gymnothorax funebris* (Ranzani)(Trapani 2001).

Synaphobranchidae:

Ilyophinae: *Atractodenchelys* (Robins & Robins 1970), *Dysomma** (Robins & Robins 1970; Robins & Robins 1975; Chen & Mok 2001), *Dysommina* (Böhlke & Hubbs 1951), *Ilyophis* (Saldanha & Merrett 1982; Saldanha & Merrett 1987), and *Meadia** (Robins & Robins 1975; Mok et al. 1991).

Atractodenchelys possesses coniform teeth arranged in multiple rows on the ethmovomer; the maxilla and dentary have coniform teeth arranged in two to three rows and three to four rows respectively, with the lingualmost row containing the largest teeth (Robins & Robins 1970). *Dysomma* either lack teeth on the ethmovomer or possess a pair of coniform teeth on the ethmovomer depending on the species (Chen & Mok 2001). The maxilla has coniform teeth in one to three rows. The dentary of *Dysomma* has one to two rows of coniform teeth or three to four rows of coniform teeth with the lingualmost row composed of caniniform teeth (Robins & Robins 1975). In *D. melanurum* (Chen & Weng), caniniform teeth are present in the lingualmost row of the maxilla. *Dysommina* is edentulous on the ethmovomer; the maxilla and dentary have coniform teeth arranged in four to five rows (Böhlke & Hubbs 1951). *Ilyophis* possesses coniform teeth arranged in six rows on the ethmovomer; the maxilla and dentary have three to four rows of coniform teeth with the lingualmost row containing the largest teeth (Saldanha & Merrett 1987). Saldanha and Merrett (1982) describe the teeth of *I. blachei* Saldanha & Merrett as caniniform, however their detailed illustrations (Fig. 1) show many rows of small conical teeth that would be more appropriately described as coniform. *Meadia* possesses caniniform teeth on the ethmovomer; the maxilla has coniform teeth arranged in three rows; the dentary has coniform teeth in the labial row and caninform teeth in the lingual row (Robins & Robins 1975). Tooth attachment and replacement have not been investigated.

Synaphobranchinae: *Haptenchelys* (Robins & Robins 1975; Merrett & Saldanha 1985), *Histiobranchus* (Karmovskaya & Merrett 1998), and *Synaphobranchus* (Melo 2007a).

Haptenchelys possesses coniform teeth arranged in three rows on the ethmovomer; the maxilla and dentary have coniform teeth in two to five rows with the lingualmost rows containing the largest teeth (Merrett & Saldanha 1985). *Histiobranchus* possesses coniform teeth in the ethmovomer; the maxilla and dentary have coniform teeth in two to fifteen rows (Karmovskaya & Merrett 1998). *Synaphobranchus* possesses coniform teeth on the ethmovomer; the maxilla and dentary have coniform teeth arranged in two rows (Melo 2007a). Tooth attachment is Type 2 in *Synaphobranchus kaupi* (Johnson)(Fink 1981). Tooth replacement has not been investigated.

Ophichthidae:

Myrophinae: *Ahlia* (Jordan 1884), *Asarcenchelys* (McCosker 1985), *Benthenchelys* (Castle 1972), *Glenoglossa* (McCosker 1982), *Mixomyrophis* (McCosker 1985), *Muraenichthys* (McCosker & Parin 1995), *Myrophis* (Richardson 1848; Leiby 1979), *Neenchelys* (Nelson 1966), and *Pseudomyrophis* (Böhlke 1960).

Ahlia possesses coniform teeth arranged in a single row on the ethmovomer; the maxilla and dentary have coniform teeth, but Jordan (1884) did not provide information on attachment. *Asarcenchelys* possesses coniform teeth on the ethmovomer; the maxilla and dentary have coniform teeth arranged in one to two rows (McCosker 1985). *Benthenchelys* possesses coniform teeth arranged in a single row on the ethmovomer, maxilla and dentary (Castle 1972). *Glenoglossa* possesses coniform teeth on the ethomovomer; the maxilla and dentary have coniform teeth in a single row (McCosker 1982). *Mixomyrophis* possesses coniform teeth on the ethmovomer; the maxilla and dentary have coniform teeth arranged in a single row (McCosker 1985). *Muraenichthys* possesses coniform teeth arranged in two rows on the ethmovomer that are continuous with the teeth of the maxilla; the maxilla and dentary have coniform teeth arranged in a single row (McCosker & Parin 1995). *Myrophis* possesses coniform teeth arranged in a single row on the ethmovomer and maxilla; the dentary has coniform teeth arranged in two rows (Richardson 1848). *Neenchelys* possesses coniform teeth on the ethmovomer; the maxilla and dentary have coniform teeth arranged in a single row (Smith & Böhlke 1983). Nelson (1966) reported depressible teeth throughout the mouth of *N. buitendijki* Weber & de Beaufort. *Pseudomyrophis* possesses coniform teeth arranged in two rows in the ethmovomer; the maxilla and dentary have coniform teeth arranged in one and two rows, respectively (Böhlke 1960). Tooth attachment has not been investigated. Tooth replacement in the early development of *Myrophis punctatus* Lütken as described by Leiby (1979) would appear to be extraosseous. Ophichthinae: *Apterichtus* (Machida & Ohta 1994; Machida et al. 1997a), *Bascanichthys* (Leiby & Yerger 1980), *Caecula* (Böhlke & McCosker 1975), *Callechelys* (Kanazawa 1952; McCosker 1977; McCosker et al. 2011), *Cirrhimuraena* (Smith 1962; McCosker 1977), *Dalophis* (McCosker 1977), *Echiophis* (McCosker 1977), *Ethadophis* (McCosker & Böhlke 1984), *Lamnostoma* (Hatooka & Yoshino 1998), *Letharchus* (McCosker 1974), *Myrichthys* (McCosker 1977; McCosker & Rosenblatt 1993), *Mystriophis* (Richardson 1848) (McCosker 1977), *Ophichthus* (McCosker & Ross 2007), *Phaenomonas* (Palmer 1970), *Pisodonophis* (McCosker 1977), and *Yirrkala* (McCosker 2011).

Apterichtus possesses coniform teeth arranged in two rows on the ethmovomer that are continuous with those of the maxilla, but are larger in size; the maxilla and dentary have coniform teeth arranged in a single row (Machida & Ohta 1994; Machida et al. 1997a). *Bascanichthys* possesses coniform teeth arranged in one to two rows on the ethmovomer, maxilla and dentary (Leiby & Yerger 1980). The teeth of the holotype of *B. scuticaris* (Goode & Bean) were considered anomalous by Leiby and Yerger (1980) for having up to three rows of teeth on the maxilla and dentary. *Caecula* possesses coniform teeth, but a detailed description was not provided by Böhlke and McCosker (1975). *Callechelys* possesses caniniform teeth on the ethmovomer; the maxilla and dentary have coniform teeth arranged in a single row (McCosker et al. 2011). *Cirrhimuraena* possesses coniform teeth on the ethmovomer; the maxilla and dentary have coniform teeth in one to several rows (McCosker 1977). *Dalophis* possesses coniform teeth on the ethmovomer; the maxilla and dentary have coniform teeth arranged in a single row (McCosker 1977).

Echiophis possesses coniform teeth on the ethmovomer; the maxilla and dentary have coniform teeth arranged in two rows (McCosker 1977). *Ethadophis* possesses coniform teeth arranged in a single row on the ethomovomer, maxilla, and dentary (McCosker & Böhlke 1984). *Lamnostoma* possesses coniform teeth arranged in a single row on the ethmovomer, maxilla and dentary (Hatooka & Yoshino 1998). *Letharcus* possesses coniform teeth arranged in two rows on the ethmovomer; the maxilla and dentary have coniform teeth arranged in a single row (McCosker 1974). *Myrichthys* possesses molariform teeth arranged in a single row on the ethmovomer; the maxilla and dentary have molariform teeth arranged in two to three rows and two rows, respectively (McCosker & Rosenblatt 1993). The teeth of *Myrichthys* have been described as either granular or molariform which implies variation in tooth shape (McCosker 1977). *Mystriophis* possesses coniform teeth on the ethmovomer; the maxilla and dentary have coniform teeth arranged in two rows (McCosker 1977). *Ophichthus* possesses coniform teeth arranged in a single row on the ethmovomer; the maxilla and dentary have coniform teeth arranged in two and one rows respectively (McCosker & Ross 2007). *Phaenomonas* possesses coniform teeth on the ethmovomer; the maxilla and dentary have coniform teeth arranged in a single row (Palmer 1970). *Pisodonophis* possesses molariform teeth arranged in multiple rows on the ethmovomer, maxilla and dentary (McCosker 1977). *Yirrkala* possesses coniform teeth arranged in a single row on the ethmovomer, maxilla, and dentary. Tooth attachment and tooth replacement have not been investigated.

Colocongridae: *Coloconger* (Kanazawa 1957; Chan 1967)

Coloconger possesses labial-lingually flattened coniform teeth in two rows on the ethmovomer; the maxilla and dentary have labial-lingually flattened coniform teeth arranged in a single row (Kanazawa 1957). Tooth attachment and tooth replacement have not been investigated.

Derichthyidae: *Derichthys* (Trewavas 1932) and *Nessorhamphus* (Beebe & Crane 1937; Merrett & Saldanha 1985).

Derichthys possesses coniform teeth on the ethmovomer; the maxilla and dentary have coniform teeth arranged in three to four rows (Trewavas 1932). *Nessorhamphus* possesses coniform teeth arranged in one to six rows on the ethmovomer; the maxilla has coniform teeth in three to four rows; the dentary has coniform teeth in two to three rows (Beebe & Crane 1937; Merrett & Saldanha 1985). Tooth attachment and replacement have not been investigated.

Muraenosocidae: *Cynoponticus** (Jordan & Gilbert 1882c), *Muraenesox** (Katayama & Takai 1954; Chyi-Yeong 1957), and *Sauromuraenesox** (Talwar 1977).

Cynoponticus possesses caniniform teeth on the ethmovomer; the maxilla and dentary have coniform teeth arranged in three rows with the lingualmost row containing the largest teeth (Jordan & Gilbert 1882c). *Muranesox* possesses caniniform teeth in the PIM tooth row and coniform teeth in the MIM tooth row (Chyi-Yeong 1957); the maxilla and dentary have coniform teeth arranged in three to four rows and three rows respectively (Katayama & Takai 1954). *Sauromuraenesox* possesses caniniform teeth on the ethmovomer; the maxilla has coniform teeth arranged in a single row; the dentary has three caniniform teeth at the symphysis followed posteriorly by coniform teeth arranged in a single row (Talwar 1977). Tooth attachment and replacement have not been investigated.

Nemichthyidae: *Avocetttina, Labichthys,* and *Nemichthys* (Mead & Earle 1970; Nielsen & Smith 1978; Smith & Nielsen 1989).

Avocetttina and *Labichthys* possess coniform teeth arranged in multiple rows on the ethmovomer and dentary; the maxilla is edentulous (Mead & Earle 1970). *Nemichthys* possesses coniform teeth in approximately eight rows on the ethmovomer and dentary; the maxilla is edentulous (Mead & Earle 1970). Tooth attachment and replacement have not been investigated.

Congridae:

Heterocongrinae: *Gorgasia* (Robison & Lancraft 1984; Castle & Randall 1999) and *Heteroconger* (Castle & Randall 1999; De Schepper et al. 2007).

Gorgasia possesses coniform teeth arranged in three to four rows on the ethmovomer, maxilla and dentary (Robison & Lancraft 1984). *Heteroconger* possesses coniform teeth in multiple rows on the ethmovomer, maxilla, and dentary. The number of rows is highly variable among species of *Heteroconger* (Castle & Randall 1999). The tooth rows usually rapidly taper to a single row anteriorly on the maxilla and dentary. In species that exhibit this arrangement, the posteriormost teeth on the maxilla are may be enlarged (Castle & Randall 1999). In *H. longissimus* Günther these teeth are notably recurved anteriorly (De Schepper et al. 2007). Tooth attachment and replacement have not been investigated.

Bathymyrinae: *Ariosoma* (Shen 1998), *Chiloconger* (Smith & Karmovskaya 2003), *Kenyaconger* (Smith & Karmovskaya 2003), *Poeciloconger** (Castle 1988), *Parabathymyrus*, and *Paraconger* (Kanazawa 1961).

Ariosoma and *Chiloconger* possess coniform teeth arranged in two to four rows on the ethmovomer, maxilla and dentary (Shen 1998; Smith & Karmovskaya 2003). *Kenyaconger* possesses coniform teeth arranged in four rows on the ethmovomer; the maxilla and dentary have coniform teeth arranged in a single row and three rows, respectively (Smith & Karmovskaya 2003). *Poeciloconger* possesses coniform teeth arranged in four to five rows on the ethmovomer; the maxilla and dentary have coniform teeth in the labial tooth rows and molariform teeth in the lingualmost one to two rows (Castle 1988). *Parabathymyrus* possesses coniform teeth arranged in four rows on the ethmovomer; the maxilla and dentary have coniform teeth arranged in one to two rows (Karmovskaya 2004). *Paraconger* possesses coniform teeth arranged in one to two rows on the ethmovomer, maxilla and dentary (Kanazawa 1961). The labial most teeth are labio-lingually compressed and create a sharp cutting edge along maxilla and dentary (Kanazawa 1961). Tooth attachment and replacement have not been investigated.

Congrinae: *Acromycter* (Karmovskaya 2004), *Bathycongrus* (Castle & Smith 1999), *Conger* (Mitchill 1818; Kanazawa 1958), *Gavialiceps* (Karmovskaya 1994b), *Gnathophis* (Karmovskaya 2004), *Lumiconger* (Castle & Paxton 1984), *Macrocephenchelys* (Robins & Robins 1971), *Rhynchoconger* (Smith & Kanazawa 1977; Ben-Tuvia 1993), *Uroconger* (Karmovskaya 2004), and *Xenomystax* (Peden 1972).

Acromycter posseses coniform teeth arranged in multiple rows on the ethmovomer, maxilla, and dentary (Karmovskaya 2004). *Bathycongrus* possesses coniform teeth arranged in one to two rows on the ethmovomer; the maxilla and dentary have coniform teeth arranged in three to four rows (Castle & Smith 1999). Castle and Smith (1999) reported the central teeth on the ethmovomer of *B. wallacei* (Castle) to be larger than surrounding teeth, but admit the size gradient is only slight. *Conger* possesses coniform teeth in one to two rows on the ethmovomer, maxilla and dentary (Kanazawa 1958). Kanazawa (1958) observed labio-lingual flattening of the coniform teeth in the labial row of species with two rows of teeth on the maxilla and dentary. *Gavialiceps* possesses coniform teeth on the ethmovomer, maxilla and dentary (Karmovskaya 1994b). *Gnathophis* possesses coniform teeth in four to seven rows on the ethmovomer; the maxilla and dentary have coniform teeth in four to six rows (Karmovskaya 2004). *Lumiconger* possesses recurved coniform teeth in eight rows on the ethmovomer; the maxilla and dentary have recurved coniform teeth arranged in five to six rows (Castle & Paxton 1984). *Macrocephenchelys* possesses coniform teeth in a single row on the ethmovomer; the maxilla and dentary have coniform teeth arranged in three to four rows (Robins & Robins 1971). Robins and Robins (1971) noted that the specimens used in their study have damaged dentaries and recommended reassessment of dentition when more specimens become available. *Rhynchoconger* possesses coniform teeth arranged in five rows on the ethmovomer; the maxilla and dentary have coniform teeth arranged in five to seven rows (Ben-Tuvia 1993). *Uroconger* possesses a single caniniform tooth in anteriormost tooth position of the IIM tooth row which is followed posteriorly by two rows of coniform teeth on the ethomovomer; the maxilla and dentary have caniniform teeth anteriorly in the labialmost tooth row and coniform teeth posteriorly, arranged in two to three rows (Ginsburg 1954). *Xenomystax* possesses both coniform and depressiform teeth arranged in two to three rows on the ethmovomer; the maxilla and dentary have coniform teeth arranged in four rows (Peden 1972). Tooth attachment and replacement have not been investigated.

Nettastomatidae: *Facciolella* (Klausewitz 1994; Klausewitz 1995), *Hoplunnis** (Eagderi & Adriaens 2010), *Nettastoma* (Smith et al. 1981), *Nettenchelys* (Brito 1989; Karmovskaya 1994a), *Saurenchelys* (Karmovskaya 2004), and *Venefica* (Hanke & Roias 2013).

Facciolella possesses coniform teeth arranged in multiple rows on the ethmovomerine, maxilla, and dentary with the lingualmost tooth rows containing the largest teeth (Klausewitz 1994; Klausewitz 1995). *Hoplunnis* possesses a single row of caniniform teeth along the center of the ethmovomer; the maxilla and dentary have coniform teeth arranged in one to two rows with the lingualmost tooth row containing the largest teeth (Eagderi & Adriaens 2010). *Nettastoma* possesses coniform teeth in four to five rows on the ethmovomer, maxilla, and dentary with the lingualmost tooth row containing the largest teeth (Smith et al. 1981). *Nettenchelys* possesses recurved coniform teeth arranged in four rows on the ethmovomer; the maxilla and dentary have recurved coniform teeth in four to eight and four to eleven rows, respectively, with the lingualmost tooth row containing the largest teeth (Karmovskaya 1994a). Brito (1989) identified the teeth of *N. dionisi* Brito as caniniform, however, based on the illustrations accompanying the description (Fig. 4A&B) the teeth are reinterpreted as coniform. *Saurenchelys* possesses coniform teeth in four rows on the ethmovomerine tooth patch; the maxilla and dentary have coniform teeth in four rows with the lingualmost tooth row containing the largest teeth (Karmovskaya 2004). *Venefica* possesses coniform teeth (Hanke & Roias 2013), but information on arrangement is not available. Tooth attachment and replacement have not been investigated

Serrivomeridae: *Serrivomer* (Beebe & Crane 1936) and *Stemonidium* (Gilbert 1905).

Serrivomer possesses coniform teeth arranged in two rows on the ethmovomer; the maxilla has coniform teeth arranged in three to four rows with the lingualmost tooth row containing the largest teeth; the dentary has coniform teeth in three to five rows with the central row containing the largest teeth (Beebe & Crane 1936). *Stemonidium* possesses coniform teeth arranged in multiple rows on the ethmovomerine tooth patch, maxilla and dentary (Gilbert 1905). Tooth attachment and replacement have not been investigated.

Cymatidae: *Cyema* (Smith 1989; Aizawa & Sakamoto 1993) and *Neocyema* (Smith 1989).

Cyema and *Neocyema* possess coniform teeth arranged in multiple rows on the ethomoverine tooth patch, maxilla, and dentary (Smith 1989). The teeth are arranged in a circular patch on the posterior end of the maxilla in *C. atrum* Günther (Aizawa & Sakamoto 1993). Tooth attachment and replacement have not been investigated.

SACCOPHARYNGIFORMES

Saccophayngidae: *Saccopharynx* (Nielsen & Bertelsen 1985; Tighe & Nielsen 2000).

Upon sexual maturity (often referred to as “ripe”), the oral jaws of *Saccopharynx* are reabsorped and the oral jaw teeth are hypothesized to be either lost or reabsorbed in both sexes (Nielsen & Bertelsen 1985). *Saccopharynx* is edentulous on the ethmovomer; the maxilla and dentary may or may not possess depressiform teeth depending upon the degree of sexual maturity (Nielsen & Bertelsen 1985). In immature specimens, depressiform teeth are arranged in three to four rows. Differences in the degree of jaw reabsorption vary among species of *Saccopharynx*, with *S. ampullaceus* (Harwood) exhibiting the most reduced state (Nielsen & Bertelsen 1985). Teeth were reported as depressible byNielsen and Bertelsen (1985) Tooth replacement have not been investigated.

Euryphayngidae: *Eurypharynx* (Gill & Ryder 1883; Nielsen et al. 1989).

Eurypharynx pelecanoides Vaillant is a gynandric heterodont(Nielsen et al. 1989). Sexually mature males of *E. pelecanoides* are edentulous or bear very coniform few teeth on the dentary Females maintain thier coniform teeth or have only a slight reduction in dention Nielsen et al. (1989). Immature specimens of *Eurypharynx* possess coniform teeth arranged in multiple rows on the maxilla and dentary. (Nielsen et al. 1989). Tooth attachment and replacement have not been investigated.

Monognathidae: *Monognathus* (Bertelsen & Nielsen 1987; Nielsen & Hartel 1996)

Monognathus possesses coniform teeth on the dentary, but exhibit reabsorption of the dentary and tooth loss/reabsorption of dentary teeth upon sexually maturation. *Monognathus* does not possess a maxilla or a distinct ethomovomer. The dentary of immature specimens has coniform teeth arranged in one to two rows. The "short skulled" species (length of skull is 3.0-5.5%TL) possess more teeth than the "long skulled" species (length of skull is 5.3-7.9%TL) (Bertelsen & Nielsen 1987). The hollow structure on the anterior portion of the skull was deemed the "rostral fang" by Bertelsen and Nielsen (1987), but acknowledged uncertainty about the identity of the structure and recommended further study. In light of this further study is needed to assess if heterodonty is present in *Monognathus.*

CLUPEIFORMES

Several members of the Clupeiformes possess a hypomaxilla, a small bone present between the posterior tip of the premaxilla and the anteroventral margin of the maxilla (Whitehead 1985). The hypomaxilla may or may not support teeth (Whitehead 1985).

Denticipitidae: *Denticeps* (Sire et al. 1998)

Denticeps possesses coniform teeth arranged in three to four rows on the premaxilla, maxilla and dentary (Sire et al. 1998). Tooth attachment is Type 2 in *D. clupeoides* Clausen (Fink 1981). Tooth replacement is extraosseus in *D. clupeoides* (Trapani 2001).

Pristigasteridae:

Pellioninae: *Chirocentrodon** (Whitehead 1985; Sazima et al. 2004), *Ilisha* (Rao 1973; Rao 1976), *Neoopisthopterus* (Hildebrand 1948a), *Pellona* (Wongratana 1983; Whitehead 1985), and *Pliosteostoma* (Jordan & Gilbert 1882c; Whitehead 1985).

Chirocentrodon possesses caniniform teeth arranged in a single row on the premaxilla; the maxilla has coniform teeth arranged in a single row; the dentary has caniniform teeth anteriorly and coniform teeth posteriorly arranged in a single row (Whitehead 1985). *Ilisha* possesses coniform teeth arranged in a single row on the premaxilla, maxilla and dentary; the midlength the maxilla is edentulous (Rao 1976). *Neoopisthopterus* possesses coniform teeth arranged in a single row on the premaxilla, maxilla, and dentary (Hildebrand 1948a). *Pellona* possesses coniform teeth on the premaxilla, hypomaxilla, maxilla and dentary (Whitehead 1985). *Pliosteostoma* possesses coniform teeth arranged in a single row on the premaxilla, hypomaxilla, maxilla, and dentary (Jordan & Gilbert 1882c). Tooth attachment and replacement have not been investigated.

Pistigasterinae: *Odontognathus* (Meek & Hildebrand 1923; Whitehead 1985), *Ophisthopterus* (Hildebrand 1946; Whitehead 1985), and *Pristigaster* (Myers 1956; Menezes & de Pinna 2000).

Odontognathus possesses coniform teeth arranged in a single row on the premaxilla, maxilla and dentary; the median portion of the maxilla is edentulous (Whitehead 1985). *Ophisthopterus* possesses coniform teeth arranged in single row on the premaxilla, maxilla and dentary (Hildebrand 1946). The median portion of the maxilla is edentulous (Whitehead 1985). *Pristigaster* possesses coniform teeth arranged in a single row on the premaxilla, maxilla, and dentary (Myers 1956). Menezes and de Pinna (2000) reported a positive correlation between the number of teeth present in the jaws and body length in *P. whitheadi* Menezes & de Pinna. Tooth attachment and replacement have not been investigated.

Engraulidae:

Coilinae: *Coilia* (Ridewood 1904a; Kwun et al. 2010), *Lycothrissa** (Whithead et al. 1988), *Papuengraulis* (Munro 1964), *Setipinna* (Whithead et al. 1988), and *Thryssa* (Rao 1971; Whithead et al. 1988).

Coilia possesses coniform teeth arranged in a single row on the premaxilla, maxilla, and dentary. Kwun et al. (2010) described the teeth of *Coilia* as "small canine-like," which contrasts with the description of "conical and small" by Whithead et al. (1988). The elongate maxilla present in some species of *Coilia* typically bares coniform teeth (Ridewood 1904a). *Lycothrissa* possesses caniniform and coniform teeth on the premaxilla, maxilla, and dentary (Whithead et al. 1988). *Papuengraulis* possess coniform teeth arranged in a single row on the premaxilla, maxilla and dentary (Munro 1964). *Setipinna* possesses coniform teeth on the premaxilla, maxilla, and dentary (Whithead et al. 1988). *Thryssa* possesses coniform teeth arranged in one row of on the premaxilla, maxilla, and dentary (Rao 1971). The long extensions of the maxilla bare teeth in *Thryssa* (Rao 1971). Enlarged teeth are reported in *T. dayi* (Wongratana), *T. gautamiensis* (Babu Rao), *T. spinidens* (Jordan & Seale), *T. whiteheadi* (Wongratana) (Whithead et al. 1988). Tooth attachment and replacement have not been investigated.

Engraulinae: *Anchoa* (Chapman 1944), *Anchovia* (Meek & Hildebrand 1923; Whithead et al. 1988), *Anchoviella* (Loeb 2012), *Cetengraulis* (Whithead et al. 1988), *Encrasicholina*

(Wongratana 1987), *Engraulis* (Whithead et al. 1988), *Jurengraulis* (Boulenger 1898a), *Lycengraulis* (Schultz 1949; Bornbusch 1988; Loeb & Alcantara 2013), *Pterengraulis* (Whithead et al. 1988; Krumme et al. 2005), and *Stolephorus* (Wongratana 1987).

Anchoa, Anchovia, Anchoviella, and *Engraulis* possess coniform teeth in a single row on the premaxilla, maxilla and dentary (Whithead et al. 1988). *Cetengraulis* possesses coniform teeth on the premaxilla and maxilla; the dentary is edentulous in *Cetengraulis* (Whithead et al. 1988). *Encrasicholina* possesses coniform teeth, but further information is not available (Wongratana 1987). *Jurengraulis* is edentulous according to Boulenger (1898a), but Whithead et al. (1988) describes the teeth as "minute or absent." *Lycengraulis* possesses coniform teeth in a single row on the premaxilla, and maxilla; the dentary has both coniform and caniniform teeth interspersed in a single row (Loeb & Alcantara 2013). *Pterengraulis* possesses coniform teeth on the premaxilla, maxilla, and dentary that were likened to the dentition of *Lycengraulis* by Krumme et al. (2005). However, Whithead et al. (1988) did not include *Pterengraulis* among the genera of engraulids with caniniform teeth. *Stolephorus* possesses coniform teeth, but further information is not available (Wongratana 1987). Tooth attachment and replacement have not been investigated.

Chirocentridae: *Chirocentrus** (Ridewood 1904a; Di Dario 2009)

Chirocentrus possesses caniniform teeth arranged in a single row on the premaxilla and dentary; the maxilla has coniform teeth arranged in a single row (Di Dario 2009). The caniniform teeth on the dentary are larger than those on the premaxilla. Tooth attachment is Type 1 on the dentary in *C. dorab* (Forsskål) (Ridewood 1904a). Tooth replacement has not been investigated.

Clupeidae:

Dussumieriinae: *Dussumieria* (Whitehead 1963; Nair 1999), *Etrumeus* (Whitehead 1963), *Jenkinsia* (Whitehead 1963; Powles 1977), and *Spratelloides* (Whitehead 1963).

Dussumieria and *Etrumeus* possess coniform teeth arranged in a single row on the premaxilla, maxilla, and dentary. *Jenkinsia* possesses coniform teeth arranged in a single row on the maxilla and dentary; the premaxilla is edentulous in all species of *Jenkinsia* except for *J. lamprotaenia* (Gosse), which exhibits a single row of coniform teeth on the premaxilla (Whitehead 1963). *Spratelloides* possesses coniform teeth arranged in a single row on the maxilla and dentary; the premaxilla is edentulous (Whitehead 1963). Tooth attachment is Type 1 in *Etrumeus sadina* (Mitchill) (Fink 1981). Tooth replacement has not been investigated.

Pellonulinae: *Clupeichthys* (Whitehead 1985), *Congothrissa* (Whitehead 1985), *Ehirava* (Deraniyagala 1929; Whitehead 1985), *Hyperlophus* (McCulloch 1917), *Limnothrissa* (Gourène & Teugels 1993), *Microthrissa* (Gourène & Teugels 1988), *Odaxothrissa** (Regan 1917), *Pellonula* (Regan 1917), *Potamalosa* (Regan 1922), *Potamothrissa* (Boulenger 1909a), *Sauvagella* (Stiassny 2002), and *Stolothrissa* (Regan 1917).

Clupeichthys possesses coniform teeth in the labial row and caniniform teeth in the lingual row on the premaxilla; the maxilla has coniform teeth arranged in a single row; the dentary has caniniform teeth arranged in a single row (Whitehead 1985). *Congothrissa* possesses coniform teeth on the premaxilla, maxilla, and dentary (Whitehead 1985). *Ehirava* possesses very small coniform teeth on the premaxilla, maxilla, and dentary (Deraniyagala 1929; Whitehead 1985). *Hyperlophus* is edentulous on the premaxilla, maxilla, and dentary (McCulloch 1917). *Limnothrissa* possesses a single row of coniform

teeth on the premaxilla, maxilla, and dentary (Gourène & Teugels 1993). *Microthrissa* possesses coniform teeth on the premaxilla and dentary; the maxilla is edentulous (Gourène & Teugels 1988). *Odaxothrissa* possesses a single row of coniform teeth, lead anteriorly by a large caniniform tooth, on the premaxilla and dentary; the maxilla has coniform teeth (Regan 1917). *Pellonula* possesses coniform teeth in a single row on the premaxilla, maxilla, and dentary (Regan 1917). *Potamalosa* possesses coniform teeth in a single row on the premaxilla, maxilla, and dentary (Regan 1922). *Potamothrissa* possesses coniform teeth on the premaxilla, maxilla and dentary (Boulenger 1909a). *Sauvagella* possesses coniform teeth in a single row on the premaxilla and dentary; the maxilla is edentulous (Stiassny 2002). *Stolothrissa* possesses coniform teeth in a single row on the premaxilla, maxilla, and dentary (Regan 1917). Tooth attachment is Type 2 in *Microthrissa royauxi* Boulenger (Fink 1981) Tooth attachment and tooth replacement have not been investigated.
Clupeinae: *Clupea*, *Clupeonella, Escualosa, Harengula, Herklotsichthys* (Whitehead 1985), *Lile* (Castro-Aguirre et al. 2002), and *Opisthonema* (Berry & Barrett 1963).

Clupea, Clupeonella, Escualosa, Harengula, and *Herklotsichthys* possess coniform teeth on the premaxilla, maxilla, and dentary (Whitehead (1985). *Lile* possess coniform teeth on the premaxilla, maxilla, and dentary. In *L. nigrofasciata* Castro-Aguirre, Ruiz-Campos & Balart several rows of coniform teeth are reported to be present at the symphysis (Castro-Aguirre et al. 2002). *Opisthonema* possess an edentulous premaxilla, but the maxilla and dentary possess a single row of coniform teeth, but are edentulous as juveniles (Berry & Barrett 1963). Tooth attachment is Type 1 in *Harengula jaguana* (Poey) (Fink 1981). Tooth replacement has not been investigated.

Alosinae: *Alosa* (Svetovidov 1964), *Brevoortia* (Hildebrand 1948b), *Ethmalosa* (Whitehead 1967), *Ethmidium* (Hildebrand 1946), *Gudusia* (Srivastava 1968), Hilsa, and Tenualosa.

Alosa possesses coniform teeth in a single row on the premaxilla and maxilla; the dentary is edentulous (Svetovidov 1964). Species of *Brevoortia* are edentulous as adults, but juveniles (under 70mm) possess coniform teeth arranged in a single row on the maxilla (Hildebrand 1948b). *Ethmalosa, Ethmidium,* and *Gudusia* are edentulous (Hildebrand 1946; Whitehead 1967; Srivastava 1968). Tooth attachment and replacement have not been investigated.

Dorosomatinae: *Anodontostoma, Clupanodon, Dorosoma, Gonialosa, Konosirus, and Nematalosa* (Whitehead 1985).

Anodontostoma, Clupanodon, Dorosoma, Gonialosa, Konosirus, and *Nematalosa* are edentulous.

Sundasalangidae: *Sundasalanx* (Siebert 1997; Britz & Kottelat 1999)

Sundasalanx possess coniform teeth in a single row on the premaxilla, maxilla, and dentary (Britz & Kottelat 1999). Tooth attachment and replacement have not been investigated.

GONORYNCHIFORMES

All gonorynchiforms are edentulous (Britz & Moritz 2007),

CYPRINIFORMES

All cypriniforms are edentulous in the oral jaws and the absence of oral jaw teeth is considered a synapomorphy for the order (Fink & Fink 1981; Britz et al. 2009). The tooth-like structures present along the dentary and upper jawbone in *Danionella dracula* lack a pulp cavity and enameloid cap and are not true teeth (Britz et al. 2009).

CHARACIFORMES

Distichodontidae: *Belonophago* (Giltay 1929; Vari 1979), *Distichodus* (Roberts 1967; Mamonekene & Vreven 2008), *Eugnathichthys** (Stiassny et al. 2013), *Hemigrammocharax* (Jerep & Vari 2013), *Hemistichodus* (Poll & Daget 1968), *Ichthyborus* (Vari 1979), *Mesoborus* (Boulenger 1909b; Vari 1979), *Microstomatichthyoborus* (Nichols & Griscom 1917), *Nannaethiops* (Günther 1872b; Fowler 1949), *Nannocharax* (Vari & Géry 1981; Van den Bergh et al. 1995), *Neolebias* (Winemiller & Kelso-Winemiller 1993), *Paradistichodus* (Pellegrin 1922), *Paraphago* (Vari 1979), *Phago* (Günther 1865; Vari 1979), and *Xenocharax* (Günther 1867).

Distichodontids with bifidiform teeth exhibit ontogenetic change in the general bifidiform tooth shape as replacement occurs. Initially, the two cusps are near equal in size, but are replaced by teeth with either a larger posterior or anterior cusp depending upon the genus. Cusp reduction may also increase anteriorly in the jaws, resulting in caniniform teeth anteriorly in the jaws of some species (Vari 1979).

Belonophago possesses bifidiform teeth with an enlarged posterior cusp arranged in one to two rows on the premaxilla and dentary; the maxilla is edentulous (Giltay 1929). *Distichodus* possesses bicuspid incisiform teeth on the premaxilla arranged in two rows; the maxilla is edentulous; the dentary has bicuspid incisiform teeth arrange in one to two rows (Mamonekene & Vreven 2008). Juveniles of *Distichodus* between 14-18 mm have an internal row of coniform teeth on the dentary (Roberts 1967). *Eugnathichthys* possesses bifidiform teeth (posterior cusp enlarged) with a lingual row of moveable elongate bicuspid suspensiform teeth suspended in connective tissue on the premaxilla and dentary (Stiassny et al. 2013). *Hemigrammocharax* possesses bifidiform teeth in a single row on the premaxilla; the maxilla is edentulous; the dentary has bifidiform teeth arranged in single row (Jerep & Vari 2013). *Hemistichodus* possesses bifidiform teeth in a single row on the premaxilla that does not reach the symphysis; the maxilla is edentulous; the dentary has a single row of bifidiform teeth (Poll & Daget 1968). *Ichthyborus* possesses symphyseal caniniform teeth followed posteriorly by bifidiform teeth with an enlarged anterior cusp arranged in a single row on the premaxilla; the maxilla is edentulous; the dentary has bifidiform teeth with an enlarged anterior cusp arranged in a single row combined with a single caniniform tooth at the symphysis (Vari 1979). In *I. besse* (Joannis) a second row of teeth is present on the dentary (Vari 1979). *Mesoborus* possesses caniniform teeth anteriorly in the second to fourth tooth positions from the symphysis followed posteriorly by bifidiform teeth with an enlarged posterior cusp in a single row on premaxilla and dentary; the maxilla is edentulous (Vari 1979). *Microstomatichthyoborus* possesses bifidiform teeth with an enlarged posterior cusp in a single row on the premaxilla and dentary; the maxilla is edentulous (Nichols & Griscom 1917). *Nannaethiops* possesses bifidiform teeth in a single row on the premaxilla and maxilla; the maxilla is edentulous; the dentary has bifidiform teeth arranged in two rows (Günther 1872b; Fowler 1949). *Nannocharax* possesses bifidiform teeth in a single row on the premaxilla and dentary; the maxilla is edentulous (Vari & Géry 1981). *Neolebias* possesses bifidiform teeth on the premaxilla and maxilla arranged in a single row; the dentary has a labial row of bifidiform teeth and a lingual row of coniform teeth (Winemiller & Kelso-Winemiller 1993). *Paradistichodus* possesses bifidiform teeth in two rows on the premaxilla and dentary; the maxilla is edentulous (Pellegrin 1922). *Paraphago* possesses bifidiform teeth with an enlarged posterior cusp arranged in a single row on the premaxilla and dentary; the maxilla is edentulous (Vari 1979). *Phago* possesses bifidiform teeth with an enlarged posterior cusp in the labial row and coniform teeth in the lingual row of the premaxilla and dentary; the maxilla is edentulous (Günther 1865; Vari 1979). *Xenocharax* possesses bifidiform teeth arranged in three rows on the premaxilla, maxilla and dentary (Günther 1867). Tooth attachment has not been investigated. Tooth replacement is intraosseous and occurs in an open crypt and individual teeth are replaced by a progenic serial replacement series of 10-12 replacement teeth (Roberts 1967).

Citharinidae: *Citharinus* (Boulenger 1897; Vari 1979), *Citharinops* (Pellegrin 1919), and *Citharidium* (Boulenger 1902a; Vari 1979).

Citharinus, *Citharinops* and *Citharidium* possess bifidiform teeth arranged in a single row on the premaxilla and dentary; the maxilla is edentulous (Vari 1979). Tooth attachment has not been investigated. Roberts (1967) described tooth replacement as "numerous sets of more or less completely preformed replacement teeth present at any one time."

Parodontidae: *Apareiodon* (Pavanelli et al. 2003; Pavanelli 2006), *Parodon* (Roberts 1974b; Ingenito et al. 2005), and *Saccodon* (Roberts 1974a).

Apareiodon possesses multicuspid incisiform teeth arranged in a single row on the premaxilla; the maxilla has one to two similar, but smaller teeth in a single row; the dentary is edentulous (Pavanelli et al. 2003). Tooth shape and cusp number appear to be variable in *Apareiodon*. In general, a wide the tooth crown will have more, but smaller cusps, while those teeth with a less expanded tooth crown exhibit fewer, but larger cusps (Pavanelli

2006). *Parodon* possesses multicuspid incisiform teeth arranged in a single row on the premaxilla and maxilla The curvature of the cutting edge of each tooth is rounded with between nine and twelve cusps; cuspa may become worn (Ingenito et al. 2005). The dentary is edentulous in young *Parodon*, but a single row of three small multicuspid incisiform teeth may be present in adults (Roberts 1974b). These latter teeth are deeply embedded in the gums of *P. moreirai* (Ingenito & Buckup) (Ingenito et al. 2005). *Saccodon* possesses multicuspid incisiform teeth arranged in a single row on the premaxilla; the maxilla may or may not bear one to two multicuspid incisiform teeth in a single row; the dentary is edentulous. Roberts (1974a) identified five different dental morphs in *Saccodon* based upon tooth shape and arrangement. Cusp size and number is variable between morphs, ranging from seven large cusps to 21 minute cusps in some dental morphs. Teeth on premaxilla arranged in one row, but the number of teeth ranges from three to eight between morphs. Tooth attachment has not been investigated. Tooth replacement is extraosseus in *Saccodon* (Trapani 2001). Parodontids exhibit progenic serial replacement of each individual tooth on the premaxilla (Roberts 1974b). *Apareiodon* has the fewest replacement teeth with approximately four behind each functional tooth, *Saccodon* may have as many as 30 replacement teeth associated with each functional tooth, and *Parodon* exhibits an intermediate number of replacement teeth (Roberts 1974b).

Curimatidae: *Curimata, Curimatella, Curimatopsis, Cyphocharax, Potamorhina, Psectrogaster, Pseudocurimata,* and *Steindachneria* (Vari 1989).

All curimatids are edentulous adults, but a single row of coniform teeth may be present on the premaxilla and dentary in juveniles under 30 mm (Vari 1989). Tooth attachment and replacement have not been investigated.

Prochilodontidae: *Ichthyoelephas*, *Prochilodus*, and *Semaprochilodus* (Roberts 1973; Vari 1983; Rossi; Castro & Vari 2004).

Castro and Vari (2004) identified two tooth morphs in Prochilodontidae both are suspensiform, but in the "falcate morph", the crown is sharply angled posteriorly from the base while the "spatulate form" exhibits the normal vertical orientation.

Ichthyoelephas possesses suspensiform (falcate morph) teeth arranged in two rows (lingual row "v" shaped) on the premaxilla and dentary; the maxilla is edentulous (Castro & Vari 2004). *Prochilodus* possesses suspensiform (spatulate morph) teeth arranged in two rows (lingual row "v" shaped) on the premaxilla and dentary; the maxilla is edentulous (Castro & Vari 2004). *Semaprochilodus* possesses suspensiform (spatulate morph) teeth arranged in two rows (lingual row "v" shaped) on the premaxilla and dentary; the maxilla is edentulous (Castro & Vari 2004). There is an ontogenetic transition in the type of teeth present in members of this family. In small juveniles (<13 mm SL), small coniform teeth are present on the premaxilla and dentary. Above 13 mm SL, suspensiform teeth are associated with premaxilla and dentary Tooth attachment has not been investigated. Tooth replacement is extraosseus (Roberts 1973). Individual teeth are replaced by a progenic serial replacement series with multiple replacement teeth present for each functional tooth (Roberts 1973). *Semaprochilodus* has only three to five rows of replacement teeth, while *Prochilodus* has six to eight and *Ichthyoelephas* has the greatest number, with ten to twelve rows (Roberts 1973). The number of functional and replacement teeth appears to be correlated positively with body size (Roberts 1973; Castro & Vari 2004).

Anostomidae: *Abramites, Anostomoides, Anostomus, Gnathodolus, Laemolyta, Leporellus, Leporinus, Pseudanos, Rhytoidus, Sartor, Schizodon,* and *Synaptolaemus* (Steindachner 1875; Sidlauskas & Vari 2008).

Anostomid tooth crowns are highly variable, but exhibit a general pattern of reduction in size and cups number posteriorly. The dentary teeth of anostomids exhibit fewer cusps then are present on the premaxillary teeth. See Sidlauskas and Vari (2008) for an overview of shape variation in relation to tooth position in members of the Anostomidae.

Abramites possesses incisiform teeth with one to two cusps arranged in a single row on the premaxilla and dentary; the maxilla is edentulous (Sidlauskas & Vari 2008). *Anostomoides, Anostomus, Gnathodolus Leporellus* possesses bicuspid or tricuspid incisiform teeth arranged in a single row on the premaxilla and dentary; the maxilla is edentulous (Sidlauskas & Vari 2008). *Laemolyta, Rhytoidus,* and *Schizodon* possesses tricuspid to quadracuspid incisiform teeth (depending on species) arranged in a single row on the premaxilla and dentary; the maxilla is edentulous (Sidlauskas & Vari 2008). *Leporinus* possesses unicuspid to quadracuspid incisiform teeth (depending on species) arranged in a single row on the premaxilla and dentary; the maxilla is edentulous (Sidlauskas & Vari 2008). *Pseudanos*, *Sartor* and *Synaptolaemus* possesses tricuspid incisiform teeth arranged in a single row on the premaxilla and dentary; the maxilla is edentulous (Sidlauskas & Vari 2008). *Petulanos* possesses incisiform teeth with two to three cusps arranged in a single row on the premaxilla; the maxilla is edentulous; the dentary has bicuspid inscisiform teeth in juveniles, but are replaced by unicuspid incisiform teeth in adults (Sidlauskas & Vari 2008). Tooth attachment has not been investigated.

Tooth replacement is extraosseus in *Schizodon fasciatus* Spix & Agassiz (Trapani 2001). Sidlauskas and Vari (2008) surmised that simultaneous (wholesale) replacement of all or nearly all teeth on either the right or left side of the jaw occurs in *Petulanos intermedius* (Winterbottom).

Chilodontidae: *Caenotropus* (Scharcansky & Lucena 2007), and *Chilodus* (Isbrücker & Nijssen 1988; Vari et al. 1995).

Caenotropus and *Chilodus* possess suspensiform teeth in a single row in the tissue around the premaxilla and dentary; the maxilla is edentulous (Isbrücker & Nijssen 1988). *Caenotropus schizodon* Scharcansky & Lucena is exceptional in having a single row of bifidiform teeth on the premaxilla (Scharcansky & Lucena 2007). Tooth attachment has not been investigated. Tooth replacement is extraosseus in *C. schizodon* (Scharcansky & Lucena 2007).

Crenuchidae:

Crenuchinae: *Crenuchus* (Günther 1863) and *Poecilocharax* (Eigenmann 1909).

Crenuchus and *Poecilocharax* possess tridentiform teeth arranged in a single row on the premaxilla, maxilla, and dentary (Eigenmann 1909). Tooth attachment and replacement have not been investigated.

Characidinae: *Ammocryptocharax** (Weitzman & Kanazawa 1976), *Characidium* (da Graça et al. 2008), *Elachocharax** (Weitzman & Kanazawa 1978), *Geryichthys* (Zarske 1997), *Klausewitzia** (Géry 1965), *Leptocharacidium*, *Melanocharacidium**, *Microcharacidium*, *Odontocharacidium* (Weitzman & Kanazawa 1977; Buckup 1993), and *Skiotocharax* (Presswell et al. 2000).

Ammocryptocharax possesses tridentiform and coniform teeth arranged in a single row on the premaxilla and maxilla; the dentary has tridentiform and coniform teeth in the labial most row and as many as two irregular rows of coniform teeth lingually (Weitzman & Kanazawa 1976). *Characidium* possesses coniform teeth arranged in single row on the premaxilla and dentary; the maxilla is edentulous (da Graça et al. 2008). *Elachocharax* possesses tridentiform, bifidiform, and coniform teeth arranged in a single row on the premaxilla and two rows on the dentary. The maxilla is edentulous (Weitzman & Kanazawa 1978). Only coniform teeth were observed on the premaxilla and dentary in *E. geryi* Weitzman & Kanazawa by Weitzman and Kanazawa (1978). *Geryichthys* possesses coniform teeth arranged in a single row on the premaxilla; the maxilla is edentulous; the dentary has coniform teeth arranged in two rows (Zarske 1997). *Klausewitzia* possesses a single row of tridentiform teeth on the premaxilla; the maxilla has several tridentiform teeth anteriorly followed by coniform teeth posteriorly; the dentary has tridentiform teeth arranged in two rows (Géry 1965). *Leptocharacidium* possesses coniform teeth arrange in a single row on the premaxilla; the maxilla is edentulous; the dentary has coniform teeth arranged in two rows; the crowns of the labial row of dentary teeth were described as "triangular in anterior view, with small lateral bulges in lieu of lateral cusps" by Buckup (1993). *Melanocharacidium* possesses tridentiform, bifidiform or coniform teeth arranged in a single row on the premaxilla; the maxilla is edentulous; the dentary has tridentiform or bifidiform teeth in the labial row and coniform teeth in the lingual row (lingual row not present in *M. depressum* Buckup (Buckup 1993). *Microcharacidium* possesses coniform teeth in a single row on the premaxilla; the maxilla is edentulous; the dentary has coniform teeth arranged in two rows (Buckup 1993). *Microcharacidium eleotrioides* (Géry) exceptional in having tridentiform teeth rather then coniform (Buckup 1993). *Odontocharacidium* possesses coniform teeth arranged in a single row on the premaxilla and the maxilla; the dentary has conform teeth arranged in a single row (Buckup 1993). *Skiotocharax* possesses coniform teeth arranged in two rows on the premaxilla and dentary; the maxilla is edentulous (Presswell et al. 2000). Tooth attachment and tooth replacement have not been investigated.

Hemiodontidae:

Anodontinae: *Anodus* (Roberts 1974b) and *Micromischodus* (Roberts 1971).

Members of *Anodus* are edentulous (Roberts 1974b). *Micromischodus* possesses depressiform teeth arranged in one row on the premaxilla and two rows on the premaxilla; the maxilla is edentulous (Roberts 1971). Roberts (1971) reported the teeth of *M. sugillatus* Roberts to be movable, but no other information on attachment was provided. Tooth replacement is extraosseous in *M. sugillatus* (Roberts (1971).

Hemiodontinae: *Argonectes*, *Bivibranchia*, and *Hemiodus* (Roberts 1974b).

Argonectes and *Bivibranchia* possess tridentiform teeth arranged in a single row on the premaxilla and maxilla; the dentary is edentulous. *Hemiodus* possesses multicuspid incisiform teeth with a semicircular crown arranged in a single row on the premaxilla and maxilla; the dentary is edentulous. Roberts (1974b) described the teeth of *Hemiodus* as "loosely attached" to the premaxilla and maxilla. Tooth replacement is extraosseus in *A. longiceps* (Kner) and *B. protractila* (Steindachner) with three to four and one to two replacement teeth present respectively (Roberts 1974b). Tooth replacement is extrosseus in *H. semitaeniatus* (Kner) and *H. quadrimaculatus* (Pellegrin) with as many as two and four replacement teeth present respectively (Roberts 1974b).

Alestiidae: *Alestes* (Murray 2004; Stiassny et al. 2009), *Alestopetersius* (Munene & Stiassny 2012), *Brycinus* (Géry 1995), *Bryconaethiops* (Zamba et al. 2007), *Clupeochrarax* (Pellegrin 1926), *Hemigrammopetersius* (Herre 1936a), *Hydrocynus* (Gagiano et al. 1996; Zanata & Vari 2005), *Ladigesia* (Géry 1968), *Micralestes* (Stiassny & Mamonekene 2007), *Nannopetersius* (Wamuini Lunkayilaki & Vreven 2008), and *Rhabdalestes* (Stiassny & Schaefer 2005; Zamba & Vreven 2008).

Alestes possesses palmiform teeth arranged in two rows on the premaxilla, and a single row on the dentary; the maxilla is edentulous (Stiassny et al. 2009). A pair of conical teeth may be present in a second row on the dentary in some species of *Alestes* (e.g., *A. inferus* Stiassny, Schelly & Mamonekene; Stiassny et al. 2009). *Alestopetersius* possesses palmiform teeth arranged in two rows on the premaxilla; the maxilla is edentulous; the dentary has palmiform teeth arranged in a single row (Munene & Stiassny 2012). *Brycinus* possesses palmiform teeth arranged in two rows on the premaxilla; the maxilla is edentulous; the dentary has palmiform teeth arranged in a single row (Géry 1995). *Bryconaethiops* possesses coniform and palmiform teeth arranged in three rows on the premaxilla; the maxilla is edentulous; the dentary has palmiform teeth in the labial row and a pair of coniform teeth in the lingual row near the symphysis (Zamba et al. 2007). *Clupeocharax* possesses a single row of coniform teeth on the premaxilla and dentary; the maxilla is edentulous (Pellegrin 1926). *Hemigrammopetersius* possesses palmiform teeth in two rows on the premaxilla and a single row on the dentary; the maxilla is edentulous (Herre 1936a). *Hydrocynus* possesses caniniform teeth arranged in a single row on the premaxilla and dentary. The first teeth to develop in juveniles are coniform and arranged in a single row, but those teeth are replaced by tridentiform teeth, and the tridentiform teeth are later replaced by caniniform teeth (Gagiano et al. 1996). *Ladigesia* possesses palmiform teeth arranged in single row on the premaxilla and dentary; the maxilla is edentulous (Géry 1968). *Micralestes* possesses plamiform teeth arranged in two rows on the premaxilla; the maxilla is edentulous; the dentary has a labial row of plamiform teeth and a lingual pair of coniform teeth (Stiassny & Mamonekene 2007). *Nannopetersius* possesses plamiform teeth arranged in two rows on the premaxilla; the maxilla is edentulous; the dentary has a labial row of palmiform teeth and a lingual pair of coniform teeth (Wamuini Lunkayilaki & Vreven 2008). *Rhabdalestes* possesses palmiform teeth in two rows on the premaxilla; the maxilla is edentulous; the dentary has palmiform teeth arranged in a single row (Stiassny & Schaefer 2005). Tooth attachment has not been investigated. Tooth replacement is intraosseus in *Brycinus lateralis* (Boulenger) (Trapani 2001).

Gasteropelecidae: *Carnegiella, Gasteropelecus,* and *Thoracocharax* (Weitzman 1954; Weitzman 1960).

Carnegiella possesses both tridentiform (anteriorly) and coniform teeth (posteriorly) arranged in a single row on the premaxilla and dentary; the maxilla has coniform tooth arranged in a single row (Weitzman 1960). *Gasteropelecus* possesses tridentiform teeth arranged in two rows on the premaxilla; the maxilla has coniform tooth arranged in a single row; the dentary has tridentiform teeth arranged in a single row (Weitzman 1960). *Thoracocharax* possesses tridentiform teeth arranged in two rows on the premaxilla and single row on the dentary; the maxilla has coniform teeth arranged in a single row (Weitzman 1960). Tooth attachment and tooth replacement have not been investigated.

Characidae:

Agoniatinae: *Agoniates* (Zarske & Gery 1997).

Agoniates possesses coniform and tridentiform teeth in two rows with tridentiform teeth occurring more commonly in the lingual row; the maxilla has coniform teeth arranged in a single row; the dentary has tridentiform teeth nearest to the symphysis followed by caniniform teeth and then coniform teeth posteriorly in a single row (Zarske & Gery 1997).

Clupeacharacinae: *Clupeacharax* (Miquelarena & Casciotta 1982).

Clupeacharax possesses palmiform teeth arranged in two rows on the premaxilla with those of the labial row bearing the fewest cusp; the maxilla is edentelous; the dentary has palmiform teeth arranged in a single row (Miquelarena & Casciotta 1982).

Iguanodectinae: *Iguanodectes* (Géry 1970; Mirande 2010) and *Piabucus* (Vari 1977).

Iguanodectes possesses palmiform teeth with numerous cusps (as many as 14 may be present) arranged in two rows on the premaxilla with teeth in the labial row having fewer cusps than those in the lingual row; the maxilla has a few palmiform teeth in *I. spilurus* (Günther), but is edentulous in *I. geisieri* (Géry); the dentary has palmiform teeth arranged in a single row (Géry 1970; Mirande 2010). *Piabucus* possesses palmiform teeth (with 10-12 cusps) arranged in a single row on the premaxilla; the maxilla has a single palmiform tooth (with a similar number of cusps to those on the premaxilla); the dentary has palmiform teeth (with 11-13 cusps) arranged in a single row (Vari 1977). Tooth attachment and replacement have not been investigated.

Bryconinae: *Brycon* (Weitzman 1962; Howes 1982), *Chilobrycon* (Géry & Rham 1981), and *Henochilus* (Castro et al. 2004).

Brycon possesses coniform or palmiform teeth in the labialmost row with palmiform teeth in the middle row and a pair of coniform teeth near the symphysis in the lingualmost row on the premaxilla; the maxilla has a single row of coniform teeth; the dentary has palmiform teeth arranged in two to three rows with a pair of coniform teeth present in the second or third row near the symphysis (Weitzman 1962; Howes 1982). *Brycon* dentition varies among species and was examined in detail by Howes (1982). *Chilobrycon* possesses tridentiform teeth arranged in two rows on the premaxilla and a single row on the maxilla and dentary (Géry & Rham 1981). *Henochilus* possesses palmiform teeth arranged in two rows on the premaxilla; the maxilla has palmiform teeth anteriorly and coniform teeth posteriorly arranged in a single row; the dentary has palmiform teeth in the labial row followed by a single caniniform tooth and a lingual row of coniform teeth (Castro et al. 2004). *Henochilus* dentition varies ontogenetically with both the robustness and cusp number of the palmiform teeth increasing with the size of individuals. Unlike the palmiform teeth the coniform teeth are reduced in number as individual size increases (Castro et al. 2004). Tooth attachment and replacement have not been investigated.

Serrasalminae: *Acnodon* (Gosline 1951b), *Metynnis* (Pavanelli et al. 2009), Myleus (Jégu & dos Santos 2002), *Pristobrycon* (Fink & Machado-Allison 1992), *Pygocentrus* (Fink 1993), *Serrasalmus* (Fink & Machado-Allison 2001), and *Tometes* (Jégu et al. 2002).

Acnodon possesses coniform teeth and molariform teeth arranged in two rows on the premaxilla; coniform teeth are restricted to the anteriormost tip of the premaxilla near the symphysis in the labial row only; the maxilla is edentulous; the dentary has cusped molariform teeth (Gosline 1951b). *Metynnis* possesses molariform teeth arranged in two rows on the premaxilla; the maxilla is edentulous; the dentary has molariform teeth arranged in a single row (Pavanelli et al. 2009). *Myleus* possesses incisiform teeth in the labial row and molariform teeth with cusps in the lingual row of the premaxilla; the maxilla is edentulous; the dentary has bifidiform teeth in the labial row which become increasingly more asymmetrical asymmetrical posteriorly and a coniform tooth in the lingual row (Jégu & dos Santos 2002). *Pristobrycon* possesses tridentiform teeth with an enlarged central cusp in a single row on the premaxilla and dentary; the maxilla is edentulous (Fink & Machado-Allison 1992). *Pygocentrus* possesses tricuspid teeth with an enlarged central cusp in a single row on the premaxilla and dentary (gradual reduction in size of central cusp towards posterior); the maxilla is edentulous (Fink 1993). *Serrasalmus* possesses tridentiform teeth with an enlarged central cusp in a single row on the premaxilla and dentary (gradual reduction in size of central cusp towards posterior); the maxilla is edentulous (Fink & Machado-Allison 2001) *Tometes* possesses tridentiform teeth in the two rows on the premaxilla; the maxilla is edentulous; the dentary has tridentiform teeth with an enlarged central cusp arranged in a single row. Ontogenetically the number of cusps increases from two to three in *T. lebaili* Jégu, Keith & Belmont-Jégu (Jégu et al. 2002). Tooth attachment has not been investigated. Tooth replacement is intraosseus in *Serrsalmus* and *Pygocentrus* (Trapani 2001).

Aphyocharacinae: *Aphyocharax* (Willink et al. 2003).

Aphyocharax possesses coniform and tridentiform teeth arranged in a single row on the premaxilla, maxilla, and dentary. Tooth attachment and replacement have not been investigated.

Characinae: *Acestrocephalus* *(Menezes 2006), *Cynopotamus* (Menezes 2007), *Phenacogaster* (Lucena & Gama 2007), *Priocharax* (Weitzman & Vari 1987), and *Roeboides** (Lucena 1998; Matamoros et al. 2013).

Astrocephalus possesses several anterior caniniform teeth and coniform teeth arranged in two rows on the premaxilla and dentary with teeth in the labialmost row enlarged. (Menezes 2006). *Cynopotamus* possesses an anterior caniniform tooth followed by a series of coniform teeth followed by an additional posterior caniniform tooth in the labial row on the premaxilla. The lingual row of the premaxilla contains only coniform teeth; the maxilla has a single row of coniform teeth highly variable in number; the dentary has several caniniform teeth near the symphysis followed posteriorly by coniform teeth arranged in a single row (Menezes 2007). *Phenacogaster* possesses tridentiform teeth arranged in a single row on the premaxilla; the maxilla has coniform teeth arranged in a single row; the dentary has tridentiform teeth anteriorly followed by bifidiform teeth with coniform teeth in the posteriormost positions (Lucena & Gama 2007). *Priocharax* possesses coniform teeth arranged in a single row on the premaxilla, maxilla, and dentary (Weitzman & Vari 1987). *Roeboides* possesses coniform teeth arranged in a single row on the premaxilla and dentary (Matamoros et al. 2013). Tooth attachment and replacement have not been investigated.

Stethaprioninae: *Stethaprion* (Cope 1870).

Stethaprion possesses two rows of palmiform teeth on the premaxilla; the maxilla and dentary have palmiform teeth arranged in a single row. Tooth attachment and replacement have not been investigated.

Tetragonopterinae: *Tetragonopterus* (Silva et al. 2013).

Tetragonopterus possesses palmiform teeth arranged in two rows on the premaxilla; the maxilla has tridentiform teeth arranged in a single row; the dentary has anterior palmiform teeth with posterior coniform teeth arranged in a single row. Tooth attachment and replacement have not been investigated.

Rhoadsiinae: *Carlana* (Fink & Weitzman 1974; Mirande 2010), *Parastremma* (Dahl 1960), and *Rhoadsia* (Fowler 1911).

Carlana possesses multicuspid incisiform teeth arranged in a single row on the premaxilla and maxilla as juveniles; in adults coniform teeth are added to the posteror end of the row along the maxilla; the dentary has multicuspid incisiform teeth anteriorly followed by coniform teeth in a single row (Fink & Weitzman 1974). *Parastremma* possesses multicupid incisiform teeth arranged in a lingual row with a symphyseal coniform tooth; the maxilla has two tridentiform teeth followed by a long series of coniform teeth posteriorly; the dentary has a single row comprised of multicuspid incisiform teeth anteriorly followed by tricuspid teeth and coniform teeth posteriorly (Dahl 1960). *Rhoadsia* possesses multicupid incisiform teeth arranged in a single row on the premaxilla and dentary; the maxilla has coniform teeth arranged in a single row (Fowler 1911). Fowler (1911) reported the presence of a few conical teeth on the premaxilla is some adults of *R. altipinna* Fowler. Tooth attachment is Type 2 in *R. altipinna* (Fink 1981). Tooth replacement has not been investigated.

Cheirodontinae: *Compsura* (Fink & Weitzman 1974), *Ctenocheirodon* (Malabarba & Jerep 2012), *Kolpotocheirodon* (Malabarba & Weitzman 2000), *Odontostible*, *Pseudocheirodon* (Fink & Weitzman 1974), and *Spintherobolus* (Weitzman & Malabarba 1999).

Compsura possesses multicuspid incisiform teeth arranged in a single row on the premaxilla, maxilla and dentary (Fink & Weitzman 1974). *Ctenocheirodon* possesses multicuspid incisiform teeth arranged in a single row on the premaxilla, maxilla and dentary; a single coniform tooth may be present as the posteriormost tooth on the dentary (Malabarba & Jerep 2012). *Kolpotocheirodon* possesses multicuspid incisiform teeth arranged in a single row on the premaxilla, maxilla and dentary (Malabarba & Weitzman 2000). *Odontostible* possesses multicuspid incisiform teeth arranged in a single row on the premaxilla, maxilla and dentary; a single coniform tooth may be present as the posteriormost tooth on the dentary (Fink & Weitzman 1974) *Pseudocheirodon* possesses multicuspid incisiform teeth arranged in a single row on the premaxilla, maxilla and dentary; a single coniform tooth may be present as the posterior most tooth on the dentary (Fink & Weitzman 1974),. The crown shape of the multicuspid incisiform teeth of *Pseudocheirodon* varies between species (Fink & Weitzman 1974). *Spintherobolus* possesses coniform teeth arranged in a single row on the premaxilla and maxilla; the dentary has tridentiform teeth anteriorly followed by posterior coniform teeth (Weitzman & Malabarba 1999). In *S. ankoseion* Weitzman & Malabarba only tridentiform teeth are present on the dentary (Weitzman & Malabarba 1999). Tooth attachment and replacement have not been investigated.

Glandulocaudinae: *Corynopoma* (Gill 1858), *Diapoma* (Menezes & Weitzman 2011), *Gephyrocharax* (Menezes & Weitzman 2011), *Mimagoniates* (Regan 1907), *Tyttocharax* (Román-Valencia et al. 2012), and *Xenurobrycon* (Weitzman & Fink 1985; Moreira 2005).

Corynopoma possesses palmiform teeth on the premaxilla, maxilla and dentary. Gill (1858) originally described these teeth as only “multicuspid”.

Diapoma possesses palmiform teeth in two rows on the premaxilla; the maxilla has only a few palmiform teeth usually with fewer cusps then those on the premaxilla; the dentary has a single row of palmiform teeth (Menezes & Weitzman 2011). *Gephyrocharax* possesses palmiform teeth in two rows on the premaxilla and a single row on the maxilla; the dentary has palmiform teeth arranged in a single row with the posterior most teeth being coniform (Menezes & Weitzman 2011). *Mimagoniates* possesses tridentiform teeth in a single row on the premaxilla and dentary; the maxilla is edentulous (Regan 1907). *Tyttocharax* contains gynandric heterodonts. The males of *T. metae* Román-Valencia, García-Alzate, Ruiz-C. & Taphorn possess coniform teeth arranged in five rows on the premaxilla and dentary and three rows on the maxilla. Females of *T. metae* have less rows than are present in males, with fewer teeth in each row (Román-Valencia et al. 2012). *Xenurobrycon* possesses coniform teeth arranged in a single row on the premaxilla, maxilla and dentary. Weitzman and Fink (1985)observed, *X. heterodon* (Weitzman & Fink) possesses several tridentiform or bifidiform teeth in the anterior most tooth positions of the dentary in *X. heterodon* (Weitzman & Fink). Additionally coniform teeth "tusk teeth" may be present on the premaxilla (Weitzman & Fink 1985). Tooth attachment has not been reported for much of Characidae. Tooth replacement in Characidae needs further examination. Unlike previously accepted hypotheses on tooth development in characiformes Trapani et al. (2005) found that teeth of *Astyanax mexicanus* (De Filippi) form from a single tooth germ rather then the unification of separate conical tooth elements (Roberts 1967). Additionally, they showed that the initial first set of coniform teeth form extraosseously while the second and all additional sets of palmiform teeth develop intraosseously.

Acestorhynchidae: *Acestorhynchus* (Toledo-Piza 2007).

Acestorhynchus possesses an anterior caniniform tooth followed by several coniform teeth and a posterior caniniform tooth arranged in a single row on the premaxilla; the maxilla has caniniform teeth anteriorly followed by a posterior row of coniform teeth that extends along the entire length of the maxilla; the dentary has a similar pattern of anteriorly positioned caniniform teeth with coniform teeth interspersed between them in a single row. Among species of *Acestorhynchus* variation exists in the number of caniniform teeth and the arrangement of coniform teeth (Toledo-Piza 2007). Tooth attachment and replacment have not been investigated.

Cynodontidae: *Cynodon* (Toledo-Piza 2000), *Gilbertolus* (Menezes & Lucena 1998), *Hydrolycus*, *Rhaphiodon* (Toledo-Piza 2000), and *Roestes* (Menezes & Lucena 1998).

Cynodon possesses coniform teeth and caniniform teeth arranged in a single row on the premaxilla; the maxilla has coniform teeth arranged in single row. The dentary has caniniform teeth and coniform teeth arranged in a single row. *Gilbertolus* possesses coniform teeth arranged in a single row on the premaxilla and maxilla; the dentary has a single row of teeth comprised of ~three caniniform teeth anteriorly followed posteriorly by coniform teeth (Menezes & Lucena 1998). *Hydrolycus* possesses coniform and caniniform teeth on the premaxilla and maxilla arranged in a single row; the dentary has an extremely large symphyseal caninform tooth followed posteriorly by smaller caniniform and coniform teeth arranged in a single row (Toledo-Piza 2000). *Rhaphiodon* possesses coniform teeth and caniniform teeth arranged in a single row on the premaxilla; the maxilla has coniform teeth arranged in single row; the dentary has caniniform teeth interspersed anteriorly among coniform teeth arranged in a single row with the anteriormost caniniform tooth the largest (Toledo-Piza 2000). *Roestes* possesses coniform teeth and interspersed caniniform teeth arranged in a single row on the premaxilla. The maxilla has coniform teeth arranged in single row. The dentary has caniniform teeth interspersed anteriorly among coniform teeth arranged in a single row (Menezes & Lucena 1998). Tooth attachment has not been investigated. Tooth replacement is extraossesseus in *H. scomberoides* (Cuvier) and replacement teeth develop in relatively shallow trenches (Toledo-Piza 2000; Trapani 2001).

Erythrinidae: *Hoplerythrinus* (Gill 1858), and *Hoplias* (Oyakawa & Mattox 2009).

Hoplerythrinus possesses coniform teeth in a single row on the premaxilla, maxilla, and dentary (Gill 1858). H*oplias* possesses several caniniform teeth interspersed among coniform teeth in a single row on the premaxilla; the maxilla has a single row of coniform teeth; the dentary has caniniform teeth interspersed among coniform teeth in the labial row and a lingual row of coniform teeth (Oyakawa & Mattox 2009). The arrangements of caniniform teeth and coniform teeth were described in detail by Oyakawa and Mattox (2009). Tooth attachment has not been investigated. Tooth replacement is extraosseus is *H. malabaricus* (Bloch) (Trapani 2001).

Lebiasinidae:

Lebiasininae: *Lebiasina* (Netto-Ferreira 2012) and *Piabucina* (Taphorn & Lilyestrom 1980).

Lebiasina possesses tridentiform teeth arranged in a single row on the premaxilla; the maxilla has either exclusively tridentiform teeth or tridentiform and coniform arranged in a single row; the dentary has a labial row of tridentiform teeth and a lingual row of coniform teeth (Netto-Ferreira 2012). *Piabucina* possesses tridentiform teeth arranged in a single row on the premaxilla; the maxilla has tridentiform and coniform arranged in a single row; the dentary has a labial row of tridentiform teeth and a lingual row of coniform teeth (Taphorn & Lilyestrom 1980). Tooth attachment and tooth replacement have not been investigated.

Pyrrhulininae: *Copeina, Copella* (Regan 1912), *Nannostomus* (Weitzman 1978), and *Pyrrhulina* (Netto-Ferreira & Marinho 2013).

Copeina possesses coniform teeth arranged in a single row on the premaxilla and two rows on the dentary. Maxilla was not described by Regan (1912). *Copella* possesses coniform teeth arranged in a single row on the premaxilla and two rows on the dentary Maxilla was not described by Regan (1912)*annostomus* possesses multicuspid incisiform teeth in a single row on the premaxilla; the maxilla may be either edentulous or exhibit a single tricuspid or coniform tooth; the dentary has a single row of multicuspid incisiform teeth (Weitzman 1978). *Pyrrhulina* contains gynandric heterdonts. Males and females of *P. marilynae* Netto-Ferreira & Marinho possesses two rows of coniform teeth on the premaxilla and dentary (with higher numbers of teeth in males than females); the maxilla is edentulous (Netto-Ferreira & Marinho 2013). Tooth attachment and tooth replacement have not been investigated.

Ctenoluciidae: *Boulengerella* and *Ctenolucius* (Vari 1995).

Boulengerella possesses coniform teeth arranged in a single row on the premaxilla, maxilla and dentary (Vari 1995). Occasionally a second row comprised of a small number of coniform teeth may be present on the premaxilla. Tooth number increases with ontogeny in *Boulengerella* (Vari 1995). *Ctenolucius* possesses coniform teeth arranged in one or two rows on the premaxilla, a single row on maxilla and two rows on the dentary (Vari, 1995).

Tooth number increases with ontogeny (Vari 1995). Tooth attachment has not been investigated. Tooth replacement is extraosseus in *Ctenolucius* sp. (Trapani 2001).

Hepsetidae: *Hepsetus* (Decru et al. 2012).

Hepsetus possesses coniform teeth, but little other information is available (Decru et al. 2012). Tooth attachment and tooth replacement have not been investigated.

SILURIFORMES

The maxilla is edentulous in all extant members of the Siluriformes excluding members of Diplomystidae.

Diplomystidae: *Diplomystes* and *Olivaichthys* (Arratia F. 1987).

Diplomystes and Olivaichthys possess coniform teeth arranged in multiple rows on the premaxilla, maxilla and dentary (Arratia F. 1987). Tooth attachment is Type 2 in *D. papillosus* (Fink 1981). Tooth replacement has not been investigated.

Cetopsidae:

Cetopsinae: *Bathycetopsis* (Lundberg & Py-Daniel 1994), *Cetopsidium*, *Cetopsis** (de Pinna et al. 2007), *Denticetopsis* (Vari et al. 2005), and *Paracetopsis* (Vari et al. 2005).

Bathycetopsis possesses coniform teeth arranged in two rows on the premaxilla and a single row on the dentary (Lundberg & Py-Daniel 1994). *Cetopsidium* possesses coniform teeth arranged in two to three rows on the premaxilla and dentary (Vari et al. 2005). *Cetopsis* possesses coniform teeth arranged in two to six rows on the premaxilla with the teeth in lingual row enlarged; the dentary has coniform teeth arranged in a one to four rows (Vari et al. 2005). *Cetopsis candiru* Spix & Agassiz possesses tricuspid incisiform teeth with a labio-lingually flattened central cusp and much smaller lateral cusps arranged in a single row on the premaxilla and dentary (de Pinna et al. 2007). *Cetopsis* *coecutiens* (Lichtenstein) possesses coniform teeth as juveniles but develops weakly tricuspid incisiform teeth in all, but the anteriormost row of the dentary (de Pinna et al. 2007). *Denticetopsis* possesses coniform teeth arranged in one to four rows on the premaxilla and dentary (Vari et al. 2005). *Paracetopsis* possesses coniform teeth arranged in four rows on the premaxilla and dentary (Vari et al. 2005). Tooth attachment and tooth replacement have not been investigated.

Helogeneinae: *Helogenes* (Vari & Ortega 1986).

Helogenes possesses coniform teeth arranged in two rows on the premaxilla and dentary with the labialmost row enlarged (Vari & Ortega 1986). Tooth attachment and tooth replacement have not been investigated.

Ampiliidae:

Amphiliinae: *Amphilius* (Thomson 2007) and *Paramphilius* (Skelton 2007).

Amphilius and *Paraamphilius* possess coniform teeth arranged in multiple rows on the premaxilla and dentary. Skelton (2007) described the teeth of amphiliids as "villiform," in his description of the genus. Tooth attachment and tooth replacement have not been investigated.

Leptoglaninae: *Dolichamphilius, Leptoglanis Psammphiletria, Tetracamphilius,* and *Zaireichthys* (Roberts 2003).

Dolichamphilius possesses coniform teeth arranged in a single row on the premaxilla and dentary. *Leptoglanis* possesses coniform teeth posteriorly on the premaxilla; the dentary is edentulous. *Psammphiletria* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary. *Tetracamphilius* possesses multicuspid incisiform teeth with as many as six cusps arranged in multiple rows on the premaxilla and dentary.

Roberts (2003) hypothesized that the multicuspid incisiform teeth of *Tetracamphilius* may be unique within the Ostariophysi. *Zaireichthys* possesses multiple rows of coniform teeth on the premaxilla and dentary. Tooth attachment and tooth replacement have not been investigated.

Doumeinae: *Andersonia* (Golubtsov et al. 2004), *Belonoglanis* (He et al. 1999), *Doumea*, and *Phractura* (Skelton 2007).

Andersonia possesses very minute coniform teeth arranged in three to four rows on the premaxilla and two rows on the dentary (Golubtsov et al. 2004). *Belonoglanis, Doumea* and *Phractura* possess very minute coniform teeth on the premaxilla and dentary. The teeth of *Belonoglanis, Doumea* and *Phractura* are so small that they have previously been described as edentulous, but recent findings have identified coniform teeth (He et al. 1999; Golubtsov et al. 2004; Skelton 2007). Tooth attachment and tooth replacement have not been investigated.

Trichomycteridae:

Copionodontinae: *Copionodon** (Zanata & Primitivo 2013) and *Glaphyropoma** (Bichuette et al. 2008).

Copionodon and *Glaphyropoma* possess anterior incisiform teeth and posterior coniform teeth arranged in two to three rows on the premaxilla and only two rows on the dentary. The incisiform tooth crowns exhibit the most labio-lingual flattening in teeth nearest the symphysis (Bichuette et al. 2008; Zanata & Primitivo 2013). Tooth attachment and tooth replacement have not been investigated.

Trichomycterinae: *Bullockia* (Arratia F. et al. 1978), *Ituglanis* (Bichuette & Trajano 2004), *Rhizosomichthys* (Schaefer & Fernández 2009), *Silvinichthys* (Fernández et al. 2005), and *Trichmycterus** (Arratia & Marque 1984).

Bullockia possesses coniform teeth arranged in two to three rows on the premaxilla and dentary (Arratia F. et al. 1978). *Ituglanis* and *Rhizosomichthys* possess coniform teeth in three and four rows respectively on the premaxilla; no information is available on teeth in the lower jaw (Bichuette & Trajano 2004; Schaefer & Fernández 2009). *Silvinichthys* possesses coniform teeth but further information is not available (Fernández et al. 2005). *Trichmycterus* possesses incisiform teeth (occasionally bicuspid) and coniform teeth arranged in 3 to 7 rows on the premaxilla with the labialmost tooth rows containing predominantly incisiform teeth; the dentary has incisiform and coniform teeth. Juveniles have fewer rows of teeth and more or exclusively coniform teeth (Arratia & Marque 1984). Tooth attachment and tooth replacement have not been investigated.

Vandelliinae: *Vandellia* (Schmidt 1987).

Vandellia possesses coniform teeth on the premaxilla; the dentary is edentulous (Schmidt 1987). Tooth attachment and tooth replacement have not been investigated.

Stegophilinae: *Henonemus** (DoNascimiento & Provenzano 2006), and *Homodiaetus** (Koch 2002)

Henonemus possesses suspensiform teeth arranged in three rows in the tissue associated with the anterior edge of the premaxilla followed posteriorly by four rows of sigmoidiform teeth on the premaxilla; the dentary has sigmoidiform teeth arranged in seven rows (DoNascimiento & Provenzano 2006). *Homodiaetus* possesses suspensiform teeth arranged in four rows in the tissue associated with the anterior edge of the premaxilla followed posteriorly by five to seven rows of coniform teeth on the premaxilla; the dentary has coniform teeth arranged in five to seven rows (Koch 2002). Tooth attachment and tooth replacement have not been investigated.

Glanapteryginae: *Glanapteryx* (de Pinna 1989b), *Listrura* (Landim et al. 2002), *Pygidianops* (de Pinna & Kirovsky 2011), and *Typhlobelus* (de Pinna & Zuanon 2013).

Glanapteryx possesses coniform teeth in two to three rows on the premaxilla and dentary (de Pinna 1989b). *Listura* possesses coniform teeth in two rows on the premaxilla and dentary (Landim et al. 2002). *Pygidianops* possesses very minute coniform teeth in a single row on the premaxilla and dentary (de Pinna & Kirovsky 2011). *Typhlobelus* is edentulous or with only a few coniform teeth arranged in a single row on the premaxilla and dentary depending upon the species (de Pinna & Zuanon 2013). Tooth attachment and tooth replacement have not been investigated.

Sarcoglanidinae: *Ammoglanis* (de Pinna & Winemiller 2000; Mattos & Lima 2010), *Microcambeva* (Costa & Bockmann 1994; Mattos & Lima 2010), *Sarcoglanis* (Costa & Bockmann 1994; Claeson et al. 2008), and *Stauroglanis* (de Pinna 1989a; Zuanon & Sazima 2004).

Ammoglanis possesses coniform teeth arranged in two rows on the premaxilla and dentary (Mattos & Lima 2010). *Ammoglanis pulex* de Pinna & Winemiller is edentulous (Mattos & Lima 2010). *Microcambeva* possesses coniform teeth arranged in two rows on the premaxilla and dentary (Costa & Bockmann 1994). *Sarcoglanis* is edentulous on the premaxilla; the dentary has a few coniform teeth (Claeson et al. 2008). *Stauroglanis* contains gynandric heterodonts. Males of *S. gouldingi* have larger teeth then females (Zuanon & Sazima 2004). The premaxilla has coniform teeth arranged in two rows and the dentary has only a single row (de Pinna 1989a).Tooth attachment and tooth replacement have not been investigated.

Nematogenyidae: *Nematogenys* (Datovo & Bockmann 2010).

Nematogenys possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Datovo & Bockmann 2010). Tooth attachment and tooth replacement have not been investigated.

Callichthyidae:

Callichthyinae: *Hoplosternum* (Huysseune & Sire 1997).

Adults of *Hoplosternum* are edentulous. In juveniles, coniform teeth develop on the premaxilla, but are lost by 75mm in *H. littorale* (Huysseune & Sire 1997). Tooth attachment in *H. littorale* was examined in detail by Huysseune and Sire (1997) who reported highly variable forms of attachment. Tooth replacement is extraosseus in *H. littorale* (Huysseune & Sire 1997).

Corydoradinae: *Corydoras* (Huysseune & Sire 1997).

Adults of *Corydoras* are edentulous. In juveniles, coniform teeth develop on the premaxilla, but are lost by 14mm in *C. aeneus* (Huysseune & Sire 1997).Tooth replacement is extraosseus in *C. aeneus, and C. arcuatus* (Huysseune & Sire 1997). Tooth attachment has not been investigated.

Scoloplacidae: *Scoloplax* (Bailey & Baskin 1976)

Scoloplax possesses bifidiform teeth arranged in a single row on the premaxilla and dentary. Tooth attachment and tooth replacement have not been investigated.

Astroblepidae: *Astroblepus** (Collette 1962)

Astroblepus possesses anterior coniform teeth and posterior bifidiform teeth on the premaxilla and dentary (Collette 1962). Tooth attachment and replacement have not been investigated.

Loricariidae:

Lithogeneinae: *Lithogenes** (Schaefer 2003).

Lithogenes possesses sigmoidiform teeth in a single row on the premaxilla with a patch of coniform posterior to the crypt containing the sigmoidiform teeth; the dentary has a single row of sigmoidiform teeth. Schaefer (2003) described the coniform tooth patch as "accessory teeth." Tooth attachment and replacement have not been investigated.

Neoplecostominae: *Neoplecostomus* (Zawadzki et al. 2008).

Neoplecostomus possesses bicuspid sigmoidiform teeth with an enlarged anterior cusp on the premaxilla and dentary (Zawadzki et al. 2008). Tooth attachment and replacement have not been investigated.

Hypoptopomatinae: *Acestridium* (Reis & Lehmann A 2009), *Hisonotus* (Aquino et al. 2001), *Hypoptopoma*(Aquino & Miquelarena 2001), *Microlepidogaster* (de Oliveira Martins & Langeani 2011), *Otocinclus* (Schaefer 1997), *Otothyris* (Garavello et al. 1998).

Acestridium possesses bicuspid sigmoidiform teeth with "uneven cusps" arranged in a single row on the premaxilla and dentary (Reis & Lehmann A 2009). *Hisonotus* possesses bicuspid sigmoidiform teeth with a rounded anterior cusp and pointed posterior cusp arranged in a single row on the premaxilla and dentary (Aquino et al. 2001). *Hypoptopoma* possesses bicuspid sigmoidiform teeth arranged in a single row on the premaxilla and dentary. The enlarged cusp is rounded and the smaller cusp is pointed (Aquino &

Miquelarena 2001). *Microlepidogaster* possesses bicuspid sigmoidiform teeth arranged in a single row on the premaxilla and dentary. The enlarged cusp is rounded and the smaller cusp is pointed (de Oliveira Martins & Langeani 2011). *Otocinclus* possesses bicuspid sigmoidiform teeth arranged in a single row on the premaxilla and dentary. The anterior enlarged cusp is rounded and the smaller cusp is pointed. Schaefer (1997) examined the minor interspecific differences of the dentition in *Otocinclus*. Tooth attachment and replacement have not been investigated.

Loricariinae: *Harttia* (Langeani et al. 2001; Provenzano R et al. 2005), *Loricaria* (Thomas & Pérez 2010), *Loricariichthys* (Reis et al. 2000), *Pseudohemiodon* (Isbrücker 1971), *Rineloricaria* (Rodriguez & Miquelarena 2005), and *Sturisoma* (Ghazzi 2005).

Harttia possesses bicuspid sigmoidiform teeth on the premaxilla and dentary (Langeani et al. 2001). The anterior enlarged cusp is rounded in *H. merevari* Provenzano, Machado-Allison, Chernoff, Willink & Petry (Langeani et al. 2001). *Loricaria* possesses bicuspid sigmoidiform teeth with an enlarged rounded cusp anteriorly and a smaller pointed cusp posteriorly arranged in a single row on the premaxilla and dentary. Teeth on the dentary are described as smaller and more rounded then those on the premaxilla by (Thomas & Pérez 2010). *Loricariichthys* contains gynandric heterodonts. Males of *L. anus* (Valenciennes 1835), *L. castaneus* (Castelnau 1855), *L. labialis* (Boulenger 1895), *L. platymetopon* Isbrücker & Nijssen 1979, *L. edentates* Reis & Pereira 2000, and *L. rostratus* Reis & Pereira 2000 have rounded cusps and females have pointed cusps. The premaxilla and dentary have sigmoidiform teeth arranged in a single row (Reis et al. 2000). *Pseudohemiodon* possesses “spoon shaped” sigmoidiform teeth arranged in a single row on the premaxilla and dentary (Isbrücker 1971). The tooth crown is unicuspid, but does not form a conical point (Isbrücker 1971). *Rineloricaria* possesses bicuspid sigmoidiform teeth with a rounded cusp anteriorly and a smaller pointed cusp posteriorly arranged in a single row on the premaxilla and dentary (Rodriguez & Miquelarena 2005). *Sturisoma* possesses bicuspid sigmoidiform teeth with slightly curved cusps arranged in a single row on the premaxilla and dentary (Ghazzi 2005). Tooth attachment and replacement have not been investigated.

Ancistrinae: *Ancistrus* (Fisch-Muller et al. 2005), *Chaetostoma* (Salcedo & Armbruster 2006), *Hemiancistrus* (Cardoso & Pezzi da Silva 2004), *Hypancistrus* (Armbruster 2002), *Lasiancistrus* (Armbruster 2005), *Lithoxus* (Lujan 2008), *Megalancistrus* (Delariva & Agostinho 2001), *Panaque* (Lujan et al. 2010), *Peckoltia* (Armbruster & Werneke 2005), and *Pseudoancistrus* (Armbruster 2004).

Ancistrus possesses bicuspid sigmoidiform teeth with an enlarged anterior cusp arranged in a single row on the premaxilla and dentary. The size of the anterior cusp has been used to distinguish between different species (Fisch-Muller et al. 2005). *Chaetostoma* possesses bicuspid sigmoidiform teeth with an enlarged anterior cusp arranged in a single row on the premaxilla and dentary (Salcedo & Armbruster 2006). *Hemiancistrus* possesses bicuspid sigmoidiform teeth with a rounded anterior cusp and a smaller pointed cusp posteriorly arranged in a single row on the premaxilla and dentary (Cardoso & Pezzi da Silva 2004). *Hypancistrus* possesses bicuspid sigmoidiform teeth arranged in a single row on the premaxilla and dentary (Armbruster 2002). The cusps of premaxillary teeth are of equal size but those on the dentary exhibit a smaller posterior cusp (Armbruster 2002). *Lasiancistrus* possesses bicuspid sigmoidiform teeth with an enlarged anterior cusp arranged in a single row on the premaxilla and dentary (Armbruster 2005). *Lithoxus* possesses bicuspid sigmoidiform teeth with an enlarged anterior cusp arranged in a single row on the premaxilla and dentary (Lujan 2008). The anterior cusp is more enlarged near the symphysis (Lujan 2008). *Megalancistrus* possesses bicuspid sigmoidiform teeth with an enlarged anterior cusp arranged in a single row on the premaxilla and dentary (Delariva & Agostinho 2001) *Panaque* possesses stout unicuspid sigmoidiform teeth arranged in a single row on the premaxilla and dentary (Lujan et al. 2010). The sigmoidiform teeth of *Panaque* are more robust then those of other loricariids (Lujan et al. 2010). *Peckoltia* possesses bicuspid sigmoidiform teeth with an enlarged anterior cusp arranged in a single row on the premaxilla and dentary (Armbruster & Werneke 2005) *Pseudoancistrus* possesses bicuspid sigmoidiform teeth with an enlarged anterior cusp arranged in a single row on the premaxilla and dentary (Armbruster 2004). The tips of both anterior and posterior cusp are pointed in *Pseudoancistrus* (Armbruster, 2004). Tooth attachment and replacement have not been investigated.

Hypostominae: *Delturus* (Reis et al. 2006), *Hemipisilchthys* (Reis et al. 2006), *Hypostomus* (Armbruster et al. 2007), *Pogonopoma* (Quevedo et al. 2002), *Pterygoplichthys* (Geerinckx et al. 2012), and *Rhinelepis* (Armbruster 1998; Delariva & Agostinho 2001).

Delturus and *Hemipisilchthys* possess bicuspid sigmoidiform teeth with cusps of approximately equal size arranged in a single row on the premaxilla and dentary (Reis et al. 2006). *Hypostomus* possesses bicuspid sigmoidiform teeth with an enlarged anterior cusp arranged in a single row on the premaxilla and dentary (Armbruster et al. 2007). *Pogonopoma* posses bicuspid sigmoidiform teeth with an enlarged anterior cusp arranged in a single row on the premaxilla and dentary (Quevedo et al. 2002). *Pterygoplichthys* possesses bicuspid sigmoidiform teeth arranged in a single row on the premaxilla and dentary (Geerinckx et al. 2012). *Rhinelepis* possesses unicuspid sigmoidiform teeth arranged in a single row on the premaxilla and dentary (Armbruster 1998). Tooth attachment was reported as " a movable joint just under the overhanging rim of the trough [crypt]," by Eaton (1935). Tooth replacement is extraosseous and takes place in an open crypt in *Hypostomus paranensis* Weyenbergh 1877. Eaton (1935) also observed a progenic serial replacement series of 20 to 25 teeth for each functional tooth in *H. paranensis.*

Amblyciptitidae: *Amblyceps* (Ng 2005a), and *Xiurenbagrus* (Zhao et al. 2004).

Amblyceps and *Xiurenbagrus* possess coniform teeth arranged in multiple rows on the premaxilla and dentary. Tooth attachment and replacement have not been investigated.

Akysidae: *Akysis* (Ng 2006a)

Akysis possesses coniform teeth arranged in multiple rows on the premaxilla and dentary. Tooth attachment and replacement have not been investigated.

Sisoridae:

Sirorinae: *Bagarius** (Roberts 1983), *Gagata* (Tilak 1970), *Glyptothorax* (Ng 2005b), *Gogangra* (Ng 2005c), and *Nangra* (Roberts 1983).

Bagarius possesses coniform teeth in two to three rows on the premaxilla; the dentary has coniform teeth in two to three labial rows and caniniform teeth in one to two lingual rows that are separated from the labial rows by a short gap (Roberts 1983). *Gagata*, *Glyptothorax* and *Gogangra* possess coniform teeth arranged in multiple rows on the premaxilla and dentary. *Nangra* possesses coniform teeth arranged in approximately three rows on the premaxilla and dentary (Roberts 1983). Tooth attachment and replacement have not been investigated.

Glyptosterninae: *Coraglanis*, *Euchiloglanis* (Hora & Silas 1952), *Exostoma* (Norman 1925), *Glaridoglanis* (Hora & Silas 1952), *Glyptosternon* (Hora & Silas 1952), *Myersglanis* (Hora & Silas 1952), *Oreoglanis** (Ng 2004c; Lithoingambi & Vishwanath 2011), *Pareuchiloglanis* (Xu et al. 2007), *Pseudecheneis* (Ng & Edds 2005), and *Pseudexostoma* (Zhou 2007).

Coraglanis, Euchiloglanis, Glyptotsternon, Myersglanis, Oreoglanis, Pareuchiloglanis and *Pseudecheneis* possess coniform teeth arranged in multiple rows on the premaxilla and dentary. *Exostoma* possesses suspensiform teeth with labio-lingually flattened cusps arranged in multiple rows on the premaxilla and dentary (Norman 1925). *Glaridoglanis* possesses incisiform teeth with "notched apices" (Hora & Silas 1952). *Pseudexostoma* possesses incisiform teeth arranged in multiple rows on the premaxilla and dentary (Zhou 2007). Tooth attachment and replacement have not been investigated.

Erethistidae: *Caelatoglanis* (Ng & Kottelat 2005), *Erethistes* (Kottelat 1983), *Erethistoides* (Ng 2006b), *Hara* (Anganthoibi & Vishwanath 2009), and Pseudolaguvia(Ng 2005d).

Caelatoglanis, Erethistoides, Hara, and *Pseudolaguvia* possess coniform teeth arranged in multiple rows on the premaxilla and dentary. *Erethistes* possesses coniform teeth arranged in three to four rows on the premaxilla and dentary (Kottelat 1983). Tooth attachment and replacement have not been investigated.

Aspredinidae:

Bunocephalinae: *Acanthobunocephalus* (Friel 1995), and *Bunocephalus* (Diogo et al. 2001).

Acanthobunocephalus possesses coniform teeth arranged in three to four rows on the premaxilla and dentary (Friel 1995). *Bunocephalus* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Diogo et al. 2001). Tooth attachment and replacement have not been investigated.

Aspredininae: *Pterobunocephalus* (Ciotek et al. 2008).

Pterobunocephalus possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Ciotek et al. 2008). Tooth attachment and replacement have not been investigated.

Hoplomyzontinae:, *Micromyzon* (Friel & Lundberg 1996).

Micromyzon is edentulous on the oral jaws (Friel & Lundberg 1996).

Pseudopimelodidae: *Batrochoglanis* (Diogo et al. 2004), *Lophiosilurus* (Guimarães-Cruz et al. 2009), and *Microglanis* (Bertaco & Cardoso 2005; Shibatta & Benine 2005; Mori & Shibatta 2006; Sarmento-Soares et al. 2006).

Batrochoglanis and *Lophiosilurus* possess coniform teeth arranged in multiple rows on the premaxilla and dentary. *Microglanis* possesses coniform teeth arranged in four to five rows (Sarmento-Soares et al. 2006). Tooth attachment and replacement have not been investigated.

Heptapteridae: *Gladioglanis* (Rocha et al. 2008), *Heptapterus* (Buckup 1988), *Imparfinis* (Ortega-Lara et al. 2011), *Phenacorhamdia* (DoNascimiento & Milani 2008), *Pimelodella* (Van der Stigchel 1964), *Rhamdella* (Bockmann & Miquelarena 2008), and *Rhamdia* (Bichuette & Trajano 2005).

Gladioglanis, Heptapterus, Pimelodella, and *Rhamdella* possess coniform teeth arranged in multiple rows on the premaxilla and dentary. *Imparfinis* possesses coniform teeth arranged in four to five rows on the premaxilla and four rows on the dentary (Ortega-Lara et al. 2011). *Phenacorhamdia* possesses coniform teeth arranged in four to five rows on the premaxilla and dentary (DoNascimiento & Milani 2008). *Phenacorhamdia taphorni* DoNascimiento & Milani is exceptional in possessing multicupid incisiform teeth arranged in five to six rows on the premaxilla and dentary (DoNascimiento & Milani 2008). *Rhamdia* possesses coniform teeth arranged in ten rows on the premaxilla and six rows on the dentary (Bichuette & Trajano 2005). Tooth attachment has not been investigated. Tooth replacement was extraosseous in *Rhamdia guatemalensis* (Trapani 2001).

Cranoglandidae: *Cranoglanis* (Ng & Kottelat 2000)

Cranoglanis possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Ng & Kottelat 2000). Tooth attachment and replacement have not been investigated.

Ictaluridae: *Ameiurus*, *Ictalurus* (Lundberg 1982), *Noturus* (Egge & Simons 2006), *Prietella* (Walsh & Gilbert 1995), *Pylodictis* (Lundberg 1982), and *Trogloglanis* (Lundberg 1982).

Ameiurus, Ictalurus Noturus and *Pylodictis* possess coniform teeth arranged in multiple rows on the premaxilla and dentary. *Prietella* possesses coniform teeth arranged in two rows on the premaxilla and dentary (Walsh & Gilbert 1995). *Trogloglanis* is edentulous (Lundberg 1982). Tooth attachment and replacement have not been investigated.

Mochokidae: *Chiloglanis* (Ng & Bailey 2006), *Microsynodontis* (Ng 2004b), and *Synodontis* (Bruwer & van der Bank 2003; Wright & Page 2008).

Chiloglanis possesses coniform teeth arranged in multiple rows on the premaxilla and a single row on the dentary (Ng & Bailey 2006). *Microsynodontis* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary Ng (2004b). *Synodontis* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Wright & Page 2008). Bruwer and van der Bank (2003) proposed a terminology to describe tooth arrangement on the premaxilla in *Synodontis.* They categorized the anterior most (and largest) tooth rows as the primary premaxillary teeth. Tooth rows posterior to primary premaxillary teeth were designated as secondary premaxillary teeth. The degree of separation between these two tooth rows is variable. In cases where a third patch of the smallest teeth is present it would designated tertiary premaxillary teeth (Bruwer & van der Bank 2003). Tooth attachment and replacement have not been investigated.

Doradidiae: *Doras* (Sabaj Pérez & Birindelli 2008), *Hassar* (Birindelli et al. 2011), *Leptodoras* (Sabaj 2005), *Liosomadoras* (Birindelli & Zuanon 2012), *Platydoras* (Piorski et al. 2008), and *Scorpiodoras* (Sousa & Birindelli 2011).

Doras possesses coniform teeth in one to two rows on the premaxilla and dentary (Sabaj Pérez & Birindelli 2008). In some species of *Doras* teeth may be absent Sabaj Pérez and Birindelli (2008). *Hassar* possesses coniform teeth in a single row on the premaxilla and dentary (Birindelli et al. 2011).

Members of *Leptodoras* are edentulous as adults but juveniles possesses a few coniform teeth on the dentary (Sabaj 2005). *Liosomadoras and Scorpiodoras* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary. *Platydoras* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary; the labialmost tooth row on the premaxilla contains the largest teeth (Piorski et al. 2008). Tooth attachment and replacement have not been investigated.

Auchenipteridae:

Centromochlinae: *Centromochlus* (Diogo et al. 2003b), and *Glenoglanis* (Böhlke 1980).

Centromochlus and *Glenoglanis* possess coniform teeth arranged in three to four rows on the premaxilla and dentary. Tooth attachment and replacement have not been investigated

Auchenipterinae: *Auchenipterus* (Ferraris & Vari 1999), *Epapterus* (Vari & C. J. 1998), *Tertranematichthys* (Vari & Ferraris 2006), *Trachelyopterus* (Moresco & Bemvenuti 2005), and *Trachycorystes* (Britski & Akama 2011).

Auchenipterus possesses coniform teeth arranged in six to eight rows on the premaxilla and dentary (Ferraris & Vari 1999). *Epapterus* is edentulous (Vari & C. J. 1998). *Tertranematichthys* possesses coniform teeth arranged in approximately ten rows on the premaxilla and dentary (Vari & Ferraris 2006). *Trachelyopterus* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Moresco & Bemvenuti 2005). *Trachycorystes* possesses coniform teeth arranged in approximately eight rows on the premaxilla and dentary (Britski & Akama 2011). Tooth attachment and replacement have not been investigated.

Siluridae: *Belodontichthys** (Kottelat & Ng 1999), *Ceratoglanis* (Ng 1999), *Hemisilurus* (Bornbusch & Lundberg 1989), *Krytopterus* (Ng 2003; Ng 2004a), *Ompok* (Ng & Tan 2004), *Pterocryptis* (Ng & Freyhof 2001), *Silurichthys* (Ng & Tan 2011), and *Wallago* (Ng & Buth 2004).

Belodontichthys possesses caniniform on the premaxilla and coniform teeth on the dentary (Kottelat & Ng 1999). *Ceratoglanis* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Ng 1999). *Hemisilurus* possesses depressiform teeth arranged in multiple rows on the premaxilla and dentary (Bornbusch & Lundberg 1989). *Krytopterus, Ompok* and *Wallago* possess depressiform teeth arranged in four to five rows on the premaxilla and dentary. *Pterocryptis* and *Silurichthys* possess coniform teeth arranged in multiple rows on the premaxilla and dentary. Tooth attachment and replacement have not been investigated.

Malapteruridae: *Malapterurus* (Roberts 2000) .

Malapterurus possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Roberts 2000). Tooth attachment and replacement have not been investigated.

Auchenoglanididae: *Auchenoglanis* (Retzer 2010), and *Notoglanidium* (Geerinckx et al. 2013).

Auchenoglanis and *Notoglanidium* possess coniform teeth arranged in multiple rows on the premaxilla and dentary. Tooth attachment and replacement have not been investigated.

Chacidae: *Chaca* (Roberts 1982)

Chaca possesses coniform teeth arranged in multiple rows on the premaxilla and dentary. Tooth attachment and replacement have not been investigated.

Plotosidae: *Euristhmus* (Murdy & Ferraris Jr. 2006), *Oloplotosus* (Allen 1985), *Paraplotosus* (Allen 1998b), *Plotosus** (Gomon & Taylor 1969; Ng & Sparks 2002), and *Tandanus* (Allen 1985).

Euristhmus possesses coniform teeth arranged in two to three rows on the premaxilla and dentary (Murdy & Ferraris Jr. 2006). *Oloplotosusis* is edentulous on the premaxilla (Allen (1985) erroneously named maxilla in description) and possesses coniform or incisiform teeth arranged in two to three rows on the dentary (Allen 1985). *Paraplotosus* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Allen 1998b). *Plotosus* possesses coniform teeth arranged in multiple rows on the premaxilla; the dentary has coniform teeth in the labial most row and molariform teeth in all lingual rows (Gomon & Taylor 1969). *Tandanus* possesses coniform teeth arranged in three to four rows on the premaxilla and dentary (Allen 1985). Tooth attachment and replacement have not been investigated.

Clariidae: *Bathyclarias* (Kaunda 2001), *Channallabes* (Devaere et al. 2001), *Clariallabes* (Cabuy et al. 1999), *Clarias* (Teugels et al. 1999; Ng & Hadiaty 2011; Ng et al. 2011), *Dinopterus* (Greenwood 1961), *Dolichallabes* (Devaere et al. 2004), *Encheloclarias* (Ng & Lim 1993), *Heterobranchus* (Teugels et al. 1990), *Horaglanis* (Mercy & Pillai 1985), *Platyallabes* (Devaere et al. 2005), *Platyclarias* (Devaere et al. 2006), and *Tanganikallabes* (Wright & Bailey 2012).

Bathyclarias, Channallabes, Clarias, Dinopterus, Dolichallabes, Encheloclarias, Heterobranchus, Horaglanis, Platyallabes, Platyclarias, and *Tanganikallabes* possess coniform teeth arranged in multiple rows on the premaxilla and dentary. *Clariallabes* possesses coniform teeth arranged in four to five rows on the premaxilla and approximately eight rows on the dentary (Cabuy et al. 1999). Tooth attachment and replacement have not been investigated.

Heteropneustidae: *Heteropneustes* (Diogo et al. 2003a).

Heteropneustes possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Diogo et al. 2003a). Tooth attachment and replacement have not been investigated.

Austroglanididae: *Austroglanis* (Diogo & Bills 2006).

Austroglanis possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Diogo & Bills 2006). Tooth attachment and replacement have not been investigated.

Claroteidae: *Chrysichthys* (Hardman 2008), and *Gephyroglanis* (Skelton 1981).

Chrysichthys and *Gephyroglanis* possess coniform teeth arranged in multiple rows on the premaxilla and dentary. Tooth attachment and replacement have not been investigated.

Ariidae: *Arius* (Ng & Sparks 2003), *Cathorops** (Marceniuk & Betancur-R 2008), *Cinetodus, Cochlefelis, Doiichthys* (Roberts 1978b), *Ketengus* (Marceniuk & Menezes 2007), *Netuma* (Borodin 1934), *Notarius* (Betancur-R & Acero 2006), and *Potamarius* (Hubbs & Miller 1960).

Arius possesses depressiform teeth arranged in five to six rows on the premaxilla and four to five rows on the dentary (Ng & Sparks 2003). *Cathorops* contains gynandric heterodonts. *Cathorops* possesses coniform teeth arranged in multiple on the premaxilla. The dentary has coniform teeth in the labialmost tooth rows and molariform teeth in the lingualmost rows near the symphysis. In females, the molariform teeth on the dentary are much larger and more numerous than those present in males (Marceniuk & Betancur-R 2008). *Cinetodus, Doiichthys, Ketengus, Netuma, Notarius* and *Potamarius* possess coniform teeth arranged in multiple rows on the premaxilla and dentary. *Cochlefelis* possesses incisiform teeth arranged in multiple rows on the premaxilla and dentary (Roberts 1978). Roberts (1978) reported "flattened crowns (producing sharp lateral margins)" on the teeth of *C. spathula* (Ramsay & Ogilby 1886). Tooth attachment and replacement have not been investigated.

Schilbeidae: *Clupisoma* (Chen et al. 2005), *Eutropiichthys** (Ferraris & Vari 2007), *Pseudeutropius* (Ng & Vidthayanon 2011), and *Siluranodon* (Golubtsov et al. 2004).

Clupisoma possesses coniform teeth arranged in two to three rows on the premaxilla and several rows on the dentary (Chen et al. 2005). *Eutropiichthys* possesses depressiform teeth arranged in about seven to eight rows on the premaxilla; the dentary has coniform teeth arranged in approximately seven to eight rows (Ferraris & Vari 2007). *Pseudeutropius* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Ng & Vidthayanon 2011). *Siluranodon* possesses coniform teeth arranged in a single row on the premaxilla and dentary as juveniles; edentulous as adults (Golubtsov et al. 2004). Golubtsov et al. (2004) reported that the loss of teeth on the premaxilla of *Siluranodon auritus* (Geoffroy St. Hilaire) may be due to mechanical damage to functional teeth without subsequent replacement. To the contrary, teeth on the dentary are not lost but instead become encased in the bone of the dentary as it grows around the static teeth (Golubtsov et al. 2004). Based on the description of *S. auritus* by Golubtsov et al. (2004), tooth attachment is likely Type 2. Tooth replacement has not been investigated.

Pangasiidae: *Helicophagus* (Roberts & Vidthayanon 1991), *Pangasianodon* (Kakizawa & Meenakarn 2003), *Pangasius* (Roberts & Vidthayanon 1991).

Helicophagus and *Pangasius* possess coniform teeth arranged in multiple rows on the premaxilla and dentary. *Pangasianodon* possesses coniform teeth arranged in a single row on the premaxilla and dentary as juveniles, but are edentulous as adults (Kakizawa & Meenakarn 2003). Teeth are lost by 24cm in *P. gigas* Chevey 1931 (Kakizawa & Meenakarn 2003). Tooth attachment has not been investigated. Tooth replacement is extraosseus in *P. gigas* (Kakizawa & Meenakarn 2003).

Bagridae: *Bagrichthys** (Roberts 1989b; Ng 2002), *Bagrus* (Diogo et al. 1999), *Batasio* (Vishwanath & Darshan 2006), *Hemileiocassis* (Ng & Lim 2000), *Leiocassis* (Ng & Lim 2006), *Mystus* (Khan et al. 2011), *Nanobagrus* (Ng 2008), *Pseudobagrus* (Cheng et al. 2008), *Pseudomystus* (Ng & Freyhof 2005), and *Rita** (Ng 2004d).

Bagrus, Batasio Hemileiocassis, Leiocassis, Mystus, Nanobagrus, Pseudobagrus, and Pseudomystus possess coniform teeth arranged in multiple row on the premaxilla and dentary. *Bagrichthys* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Roberts 1989b; Ng 2002). *Bagrichthys macropterus* (Bleeker) and *B. micranodus* Roberts have very reduced coniform teeth that may be imbedded in the soft tissue of the jaws. *Rita* possesses coniform teeth arranged in multiple rows on the premaxilla; the dentary has coniform teeth in multiple rows in the "anterior quarter" followed lingually by "bluntly rounded, peg like" molariform teeth (Ng 2004d). Tooth attachment and replacement have not been investigated

Pimelodidae: *Brachyplatystoma** (Lundberg et al. 2005), *Parapimelodus* (Lucena et al. 1992), *Pimelodus* (Rocha & Ribeiro 2010), and *Sorubimichthys* (Lundberg et al. 1989).

Brachyplatystoma possesses coniform teeth arranged in multiple rows labially followed lingually by three to six rows of depressiform teeth on the premaxilla and dentary

(Lundberg et al. 2005). Labial coniform teeth are generally larger then the depressiform teeth (Lundberg et al. 2005). *Parapimelodus* and *Sorubimichthys* possess coniform teeth arranged in multiple rows on the premaxilla and dentary. *Pimelodus* possesses coniform teeth arranged in ten to twelve rows on the premaxilla and eight rows on the dentary (Rocha & Ribeiro 2010). Tooth attachment and replacement have not been investigated.

GYMNOTIFORMES

All extant Gymnotiforms are edentulous on the maxilla.

Gymnotidae: *Electrophorus* and *Gymnotus* (Albert & Crampton 2003).

Electrophorus possesses coniform teeth arranged in a single row on the premaxilla and dentary (Albert et al. 2005). *Gymnotus* possesses coniform teeth arranged in one to two rows depending upon the species. Albert and Crampton (2003) reported "arrow-head" shaped teeth in some species, but no illustration was provided. Tooth attachment has not been investigated. Tooth replacement is extraosseus in *E. electricus* (Linnaeus) (Trapani 2001).

Rhamphichthyidae: *Gymnorhamphicthys* (Schwassmann 1989), *Iracema* (Carvalho & Albert 2011), and *Rhamphichthys* (Correa da Silva et al. 2013).

Gymnorhamphicthys, Iracema, and *Rhamphichthys* are edentulous.

Hypopomidae: *Brachyhypopomus* (Claudino et al. 2010; Sullivan et al. 2013), *Hypopomus* (Hopkins 1991), *Hypopygus* (Nijssen & Isbrücker 1972), *Steatogenys* (Crampton et al. 2004), *Stegostenops* (Triques 1997).

Most species of *Brachyhypopomus* are edentulous, excluding *B. walteri* Sullivan, Zuanon & Cox Fernandes and *B. bennetti* Sullivan, Zuanon & Cox Fernandes, which possess a single row of coniform teeth on the premaxilla. All other hypopomids are edentulous (Sullivan et al. 2013).

Sternopygidae: *Archolaemus** (Vari et al. 2012), *Rhabdolichops* (Lundberg & Mago-Leccia 1986), and *Sternopygus* (Albert & Fink 1996).

Archolaemus contains gynandric heterodonts. In males of *A. ferreirai,* the tooth rows on the premaxilla extend labially onto anterior face of the premaxilla, and females do not develop these additional rows. The premaxilla has depressiform teeth in the labial most row of the on the face of the premaxilla and coniform teeth are present in all lingual tooth rows. The dentary has coniform teeth arranged in multiple rows (Vari et al. 2012). *Rhabdolichops* possesses coniform teeth arranged in two to three rows on the premaxilla and dentary (Lundberg & Mago-Leccia 1986). *Sternopygus* possesses coniform teeth in multiple rows on the premaxilla and dentary (Albert & Fink 1996). Tooth attachment is Type 2 in *Sternopygus macrurus* (Bloch & Schneider) (Fink 1981). Tooth replacement has not been investigated.

Apteronotidae: *Adontosternarchus* (Lundberg & Fernandes 2007), *Apteronotus* (de Santana 2003; de Santana & Maldonado-Ocampo 2004), *Compsaraia* (Albert & Crampton 2009), *Magosternarchus* (Lundberg et al. 1996), *Megadontognathus* (Campos-da-Paz 1999), *Orthosternarchus* (Hilton et al. 2007), *Platyurosternarchus* (de Santana & Vari 2009), *Porotergus* (de Santana & Crampton 2010), *Sternarchella* (Lundberg et al. 2013), *Sternarchogiton* (de Santana & Crampton 2007), *Sternarchorhampus* (Campos-da-Paz 1995), *Sternarchorhynchus* (de Santana & Crampton 2006) and *Tembeassu* (Campos-da-Paz 2005).

Adontosternarchus is edentulous (Lundberg & Fernandes 2007). *Apteronotus* possesses coniform teeth arranged in two to four rows on the premaxilla and dentary (de Santana & Maldonado-Ocampo 2004). *Compsaraia* possesses coniform teeth in a single row on the premaxilla; the dentary has coniform teeth arranged in one to two rows (Albert & Crampton 2009). *Magosternarchus* possesses coniform teeth arranged in two to three rows on the premaxilla and two rows on the dentary; the labialmost row on both jaws contains the largest teeth (Lundberg et al. 1996).. In *M. raptor* these teeth are 1.5 times larger then the teeth in the lingual rows (Lundberg et al. 1996). *Megadontognathus* possesses coniform teeth arranged in a single row on the premaxilla; the dentary has a few coniform teeth posteriorly (Campos-da-Paz 1999). *Orthosternarchus* possesses coniform teeth in two to three rows on the premaxilla and dentary (Hilton et al. 2007). *Platyurosternarchus* possesses an edentulous premaxilla; the dentary has coniform teeth arranged in a single row (de Santana & Vari 2009). *Porotergus* possesses a single row of coniform teeth on the premaxilla or is edentulous on this bone; the dentary has coniform teeth arranged in single row (de Santana & Crampton 2010). *Sternarchella* possesses coniform teeth arranged in three to four rows on the premaxilla and dentary (Lundberg et al. 2013). *Sternarchogiton* contains gynandric heterodonts. Some, but not all mature *S. nattereri* (Steindachner 1868) males possess coniform tooth rows extending labially beyond the margins of the mouth. This extension of the tooth rows on the premaxilla is not present in females. The premaxilla has either a single row of coniform teeth or is edentulous depending upon the species. The dentary has coniform teeth arranged in a one or two rows depending upon the species (de Santana & Crampton 2007). *Sternarchorhampus* possesses coniform teeth in four to five rows on the premaxilla and dentary (Campos-da-Paz 1995). *Sternarchorhynchus* contains gynandric heterodonts. Males of *S. roseni* Mago-Leccia 1994 possesses coniform tooth rows extending labially beyond the margins of the mouth, but no other described species exhibits this dimorphism. Other *Sternarchorhynchus* species possesses coniform teeth arranged in a single row on the premaxilla and dentary (de Santana & Crampton 2006). *Tembeassu* possesses suspensiform teeth embedded within a fleshy extension of the upper jaw; the premaxilla has coniform teeth arranged in a single row; the dentary has coniform teeth arranged in two rows. Tooth attachment has not been investigated. Tooth replacement is extraosseous in *Platyurosternarchus crypticus* de Santana & Vari and *P. macrostoma* (Günther) (de Santana & Vari 2009).

ARGENTINTINIFORMES

Argentinidae: *Argentina* (Chapman 1942a) and *Glossandon* (Parin & Shcherbachev 1982).

Argentina is edentulous on the oral jaws (Chapman 1942a). *Glossandon* is edentulous on the premaxilla; the dentary has a single row of coniform teeth (Parin & Shcherbachev 1982). Tooth attachment and replacement have not been investigated.

Opisthoproctidae:

The maxilla lacks teeth in all opisthoproctids (Begle 1992).

Bathylychnops (Cohen 1958; Stein & Bond 1985), *Dolichopteryx* (Fukui & Kitagawa 2006a; Fukui & Kitagawa 2006b), *Macropinna* (Chapman 1942b), and *Rhynchohyalus* (Hubbs 1953a).

The premaxilla is absent in *Bathylychnops*; the dentary has coniform teeth arranged in multiple rows (Stein & Bond 1985). The premaxilla is absent in *Dolichopteryx*; the dentary has coniform teeth arranged in a single row (Fukui & Kitagawa 2006b). The premaxilla is absent in *Macropinna*; the dentary bears a single row of coniform teeth (Chapman 1942b). *Rhynchohyalus* is edentulous (Hubbs 1953a). Tooth attachment and replacement have not been investigated.

Microstomatidae:

The maxilla lacks teeth in all microstomatids (Begle 1992).

Microstomatinae: *Nansenia* (Chapman 1948), and *Xenophthalmichthys* (Bertelsen 1958).

Xenophthalmichthys and *Nansenia* are edentulous on the premaxilla; tthe dentary has coniform teeth arranged in a single row. Tooth attachment and replacement have not been investigated.

Bathylaginae: *Bathylagus* (Günther 1878) and *Leuroglossus* (Cailliet & Ebeling 1990).

Bathylagus possesses coniform teeth on the premaxilla and dentary (Günther 1878). The premaxilla lacks teeth in *Leuroglossus*; the dentary has coniform teeth arranged in a single row (Cailliet & Ebeling 1990). Tooth attachment and replacement have not been investigated.

Platytroctidae:

Most platytroctids have one to four large coniform teeth at the symphysis of the premaxilla. These teeth are positioned antero-labially and separated from smaller, more lingually positioned teeth with crowns pointed approximately perpendicular to the crowns of the lingual teeth. Matsui and Rosenblatt (1987) describe these larger coniform teeth as “tusks.” They also used the term “mid-dentary teeth” in reference to coniform teeth present on the anterolateral surface of the dentary. These latter teeth may be absent in adults of some species (Matsui and Rosenblatt (1987).

Barbantus, Holtbyrnia, Maulisia, Mirorictus, Normichthys, Paraholtbyrnia, Pellisolus, Perparsia, Platytroctes, Sagamichthys, Searsia, Searsoides, and *Tragularius* (Matsui & Rosenblatt 1987).

Barbantus and *Platytroctes* possess coniform teeth arranged in a single row on the premaxilla, maxilla, and dentary; tusks and mid-dentary teeth are absent. *Holtbyrnia, Maulisia, Normichthys,* and *Searsia* possess coniform teeth arranged in a single row on the premaxilla, maxilla, and dentary; one to two tusks may be present and mid-dentary teeth are present in adults. *Mirorictus* possesses coniform teeth on the premaxilla, maxilla, and dentary; tusks are absent; teeth described as "very weak", with specimens noticeably having lost many teeth (Matsui & Rosenblatt 1987). *Paraholtbyrnia* possesses coniform teeth arranged in a single row on the premaxilla, maxilla and dentary; one to three tusks may be present and mid-dentary teeth absent in adults (Matsui & Rosenblatt 1987). *Pellisolus* possesses coniform teeth arranged in a single row on the premaxilla, maxilla, and dentary; one to four tusks may be present and mid dentary teeth are absent in adults (Matsui & Rosenblatt 1987). *Perparsia* possesses coniform teeth arranged in a single row on the premaxilla, maxilla and dentary; one to three tusks may be present and mid-dentary teeth absent in adults (Matsui & Rosenblatt 1987). *Sagamichthys* possesses coniform teeth in multiple rows on the premaxilla, maxilla, and dentary; tusks are absent and mid-dentary teeth are present in adults (Matsui & Rosenblatt 1987).. *Searsoides* possesses coniform teeth arranged in a single row on the premaxilla, maxilla, and dentary; one to two tusks may be present and a low number of mid-dentary teeth are present in adults (Matsui & Rosenblatt 1987). *Tragularius* possesses coniform teeth arranged in a single row on the premaxilla, maxilla and dentary; one to four tusks may be present and mid-dentary teeth are present in adults (Matsui & Rosenblatt 1987).Tooth attachment and replacement have not been investigated.

Bathylaconidae: *Bathylaco* (Nielsen & Larsen 1968) and *Herwigia* (Iwamoto et al. 1976).

Bathylaco possesses coniform teeth arranged in one to three rows on the premaxilla and maxilla; the dentary has as many as four rows of coniform teeth (Nielsen & Larsen 1968). Nielsen and Larsen (1968) described teeth as "flexible." Iwamoto et al. (1976) reported multiple rows of coniform teeth along the dentary in specimens of *H. kreffti* (Nielsen & Larsen) from Hawaii. Specimens collected from the Atlantic lack dentary teeth. Tooth attachment and replacement have not been investigated.

Alepocephalidae: *Asquamiceps* (Parr 1954; Markle 1980), *Aulastomatomorpha* (Markle & Sazonov 1996), *Bajacalifornia* (Markle & Krefft 1985), *Bathyprion* (Marshall 1966), *Bathytroctes* (Sazonov 1999), *Conocara* (Sazonov et al. 2009), *Leptochilichthys* (Machida & Shiogaki 1988), *Leptoderma* (Byrkjedal et al. 2011), *Narcetes* (Sazonov 1998), *Photostylus* (Tsukamoto et al. 1992), *Rinoctes* (Markle & Merrett 1980), *Rouleina* (Uyeno 1977), and *Talismania* (Parr 1952).

Asquamiceps is edentulous on the premaxilla and maxilla; the dentary has coniform teeth arranged in a single row (Markle 1980). *Aulastomatomorpha* possesses coniform teeth arranged in a single row on the premaxilla and dentary; the maxilla is edentulous (Markle & Sazonov 1996). *Bajacalifornia* and *Bathyprion* possess coniform teeth arranged in a single row on the premaxilla, maxilla and dentary. *Bathytroctes* possesses coniform teeth arranged in multiple rows on the premaxilla, maxilla, and dentary; the labialmost row of coniform teeth on the premaxilla have crowns pointed anteriorly and were described as "modified teeth" by Sazonov (1999). *Conocara* possesses coniform teeth in a single row on the premaxilla, maxilla and dentary; modified teeth may or may not be present on the premaxilla depending upon the species (Sazonov et al. 2009). *Leptochilichthys* are edentulous on the premaxilla and maxilla; the dentary has a single row of coniform teeth (Machida & Shiogaki 1988). *Leptoderma* possesses coniform teeth arranged in a single row on the premaxilla and dentary; no information is available on the teeth associated with the maxilla (Byrkjedal et al. 2011). *Narcetes* possesses coniform teeth arranged in four rows on the premaxilla and dentary with the labialmost teeth oriented anteriorly and those located more lingually oriented vertically; the maxilla has coniform teeth arranged in a single row (Sazonov 1998). *Photostylus* possesses coniform teeth on the premaxilla, maxilla, and dentary (Tsukamoto et al. 1992). *Rinoctes* possesses coniform teeth arranged in one row on the premaxilla, maxilla, and dentary; additional tooth rows may be present at the symphysis, but rows taper posteriorly to form a single row (Markle & Merrett 1980). *Rouleina* possesses coniform teeth on the premaxilla and dentary; the maxilla is edentulous (Uyeno 1977). *Talismania* possesses coniform teeth arranged in two rows on the premaxilla; the maxilla and dentary have coniform teeth arranged in a single row (Parr 1952). Tooth attachment and replacement have not been investigated.

OSMERIFORMES

Osmeridae:

Hypomesinae: *Hypomesus* (Chereshnev et al. 2001; Komada et al. 2002).

Hypomesus possesses coniform teeth arranged in a single row on the premaxilla, maxilla, and dentary (Chereshnev et al. 2001). Komada et al. (2002) noted similarities between tooth loss on the maxilla of *H. transpacificus* and that in species of *Plecoglossus.* Tooth attachment and replacement have not been investigated.

Plecoglossinae: *Plecoglossus* (Howes & Sanford 1987; Uehara & Miyoshi 1993).

Plecoglossus possesses spiraliform teeth arranged in a single row on the premaxilla, maxilla and dentary as adults. Juveniles possess coniform teeth arranged in a single row on the oral jaws (Uehara & Miyoshi 1993). Tooth attachment and replacement have not been investigated.

Osmerinae: *Allosmerus* (Lockington 1880a), *Neosalanx* (Shuozeng & Dagang 1994), *Salanx* (Shuozeng & Dagang 1994), and *Thaleichthys* (Hubbs 1925).

Allosmerus possesses coniform teeth arranged in single row on the premaxilla and maxilla; the dentary has coniform teeth arranged in two rows with the largest teeth in the labial row (Lockington 1880a). *Neosalanx* and *Salanx* possesses coniform teeth arranged in a single row on the premaxilla, maxilla, and dentary (Shuozeng & Dagang 1994). *Thaleichthys* possesses minute coniform teeth or are edentulous in "breeding fish" on the premaxilla, maxilla, and dentary (Hubbs 1925). Tooth attachment and replacement have not been investigated.

Retropinnidae:

Prototroctinae: *Protoroctes* (McDowall 1974).

Protoroctes possesses elongate, tightly packed coniform teeth arranged in a single row on the premaxilla; the maxilla is edentulous; the dentary has a few small coniform teeth arranged in a single row (McDowall 1974). McDowall (1974) observed that the teeth of *Protoroctes* are easily over looked and specimens may appear edentulous. Tooth attachment and replacement have not been investigated.

Retropinninae: *Retropinna* and *Stokellia* (Woods 1968)

Retropinna possesses coniform teeth on the premaxilla; the maxilla may or may not bear coniform teeth arranged in a single row; the dentary has coniform teeth arranged in one or two rows (Woods 1968). A positive correlation between the number of teeth and tooth rows and body size has been reported (Woods 1968). *Stokellia* possesses coniform teeth on the premaxilla and dentary; the maxilla is edentulous (Woods 1968). Tooth attachment and replacement have not been investigated.

Galaxiidae:

Galaxiids are edentulous on the maxilla.

Lepidogalaxiinae: *Lepidogalaxias* (McDowall & Pusey 1983).

Lepidogalaxias possesses coniform teeth arranged in a single row on the premaxilla and dentary (McDowall & Pusey 1983). Tooth attachment and replacement have not been investigated.

Galaxiinae: *Aplochiton, Brachygalaxias, Galaxias, Galaxiella, Lovettia, Neochanna,* and *Paragalaxias* (McDowall & Burridge 2011).

Aplochiton, Brachygalaxias Galaxias, Galaxiella, Paragalaxias, Lovettia, and *Neochanna* possess coniform teeth arranged in a single row on the premaxilla and dentary. *Neochanna* possesses coniform teeth with arranged in a single row on the premaxilla and dentary (McDowall & Burridge 2011). Tooth attachment and replacement have not been investigated.

SALMONIFORMES

Salmonidae:

Coregoninae: *Coregonus* (Norden 1961), *Stenodus* (Alt 1977), and *Prosopium* (Booke 1974).

Coregonus possesses coniform teeth on the premaxilla and dentary in the juvenile stage; adults are edentulous (Norden 1961). *Stenodus* possesses coniform teeth in multiple rows on the premaxilla and dentary; the maxilla is edentulous (Alt 1977). *Prosopium* possesses coniform teeth on the premaxilla and dentary in the juvenile stage; teeth may or may not be present in the premaxilla in the adult stage; the maxilla is edentulous (Booke 1974). Interspecific variation exists in the presence or absence of teeth on the premaxilla (Booke 1974). Tooth attachment and replacement have not been investigated.

Thymallinae: *Thymallus* (Norden 1961; Knizhin & S. J. 2009).

Thymallus possesses coniform teeth arranged in a single row on the premaxilla, maxilla, and dentary (Norden 1961). Tooth replacement is extraosseous (Norden 1961). Tooth attachment has not been investigated.

Salmoninae: *Hucho* (Holčík 1995), *Oncorhynchus* (Berkovitz & Moore 1974; Berkovitz 1977; Berkovitz 1978; Fraser et al. 2006), *Salmo* (Huysseune et al. 2007; Huysseune & Witten 2008), and *Salvethymus* (Chereshnev & Skopets 1990).

Hucho possesses coniform teeth on the premaxilla, maxilla, and dentary (Holčík 1995). *Oncorhynchus* and *Salmo* possess coniform teeth arranged in a single row on the premaxilla, maxilla and dentary. *Salvethymus* possess caniniform teeth arranged in a single row on the premaxilla, maxilla, and dentary. The teeth of *Salvethymus* are categorized as caniniform based on Chereshnev and Skopets (1990) description of the teeth of *S. svetovidovi* Chereshnev & Skopets as "large fanglike teeth" and accompanying illustrations (Fig. 5). Tooth attachment is Type 1 in *Oncorhynchus mykiss* (Walbaum) *and Salmo salar* (Fink 1981; Huysseune et al. 2007; Huysseune & Witten 2008). Tooth replacement is extraosseus in *O. mykiss*, *O. masou* (Brevoort), *O. tshawytscha* (Walbaum), and *Salmo* *trutta* Linnaeus (Trapani 2001). Multiple detailed examinations of tooth replacement in *O. mykiss* suggest that the order of tooth replacement is not clearly alternating between odd and even tooth positions on the premaxilla as on the maxilla and dentary (Berkovitz & Moore 1974; Berkovitz 1977; Berkovitz 1978). Gene deployment during tooth replacement was examined by Fraser et al. (2006) in *O. mykiss.* Tooth structure and histology was examined in *S. trutta* by (Bergot 1975). Tooth replacement is extraossous in *Salmo salar* Linnaeus (Huysseune et al. 2007). Huysseune et al. (2007) found no evidence of an edentulous transition stage associated with the breeding migration from salt water to fresh water.

ESOCIFORMES

Esocidae: *Esox* (Bucke 1971; Tereshenkov 1972; Grande et al. 2004).

Esox possesses coniform teeth arranged in a single row on the premaxilla and maxilla; the dentary has depressiform teeth anteriorly with caniniform teeth beginning at about the mid-length of the jaw, arranged in a single row. Tooth attachment is Type 1 in coniform and caniniform teeth and Type 4 in depressiform teeth in *E. lucius* Linnaeus*, E. masquinongy* Mitchill*,* and *E.niger* Lesueur (Bucke 1971; Fink 1981; Grande et al. 2004). Tooth replacement is extraosseus and continuous through out the life of *E. lucius* with no association to season, age or sex (Tereshenkov 1972). Tooth structure and odontogenisis of *Esox* has been examined in detail by (Herold 1971; Herold 1974; Herold 1975). Grande et al. (2004) commented on available hypotheses regarding the evolution of the depressiform teeth within Esocidae.

Umbridae: *Dallia*, *Novumbra*, and *Umbra* (Wilson & Veilleux 1982).

The maxilla is edentulous in all umbrids. *Dallia and Novumbra* possesses coniform teeth arranged in a single row on the premaxilla and dentary. *Umbra* possesses coniform teeth arranged in three rows on the premaxilla and two rows on the dentary. Tooth attachment is Type 2 in *D. pectoralis* and Type 1 in *U. limi* (Fink 1981). Tooth replacement is likely extraosseus in all umbrids based on the description of visible replacement teeth by Wilson and Veilleux (1982).

STOMIIFORMES

Diplophidae: *Diplophos** (Ozawa et al. 1990; Harold 1998), and *Manducus** (Johnson 1970).

Diplophos possesses coniform teeth, interspersed with caniniform teeth, arranged in a single row on the premaxilla and maxilla; the dentary has coniform teeth, with interspersed caniniform teeth, arranged in two rows Ozawa et al. (1990). *Manducus* possesses coniform teeth, interspersed with caniniform teeth, arranged in a single row on the premaxilla and maxilla; the dentary has coniform teeth, interspersed with caniniform teeth, arranged in two rows (Johnson 1970). Tooth attachment is Type 1 in adult *Diplophos taenia* and Type 4 in juveniles (Fink 1981). Tooth attachment is Type 1 in *Triplophos hemingi* (Fink 1981). Tooth replacement has not been investigated.

Gonostomatidae: *Bonapartia** (Harold 1998), *Cyclothone* (Badcock 1982; Harold 1998), *Gonostoma** (Bordulina 1984; Harold 1998), and *Margrethia** (Bordulina 1984).

Bonapartia possesses coniform teeth, interspersed with caniniform teeth, arranged in a single row on the premaxilla, maxilla and dentary (Harold 1998). *Cyclothone* possesses coniform teeth arranged in a single row on the premaxilla, maxilla and dentary (Badcock 1982). Some enlarged teeth may be present near the symphysis and posteriorly along the maxilla and dentary in some species (Badcock 1982). *Gonostoma* possesses coniform teeth, interspersed with caniniform teeth, arranged in a single tooth row on the premaxilla and maxilla; the dentary has coniform teeth, interspersed with caniniform teeth, arranged in two rows (Bordulina 1984; Harold 1998). *Margrethia* possesses coniform teeth, interspersed with caniniform teeth, arranged in a single row on the premaxilla and maxilla; the dentary has coniform teeth, interspersed with caniniform teeth, in a lingual row and coniform teeth in a labial row (Bordulina 1984).Tooth attachment is Type 1 in *C. pseudopallida* Mukhacheva and *Sigmops elongates* (Günther) (Fink 1981). Tooth replacement has not been investigated.

Sternoptychidae:

Maurolicinae: *Araiophos* (Ahlstrom & Moser 1969), *Argyripnus* (Parin 1992), *Danaphos* (Weitzman 1974), *Maurolicus* (Weitzman 1974), *Sonoda* (Weitzman 1974), *Thorophos* (Weitzman 1974), and *Valenciennellus* (Weitzman 1974).

Araiophos possesses coniform teeth arranged in a single row on the premaxilla and maxilla and in two rows on the dentary (Ahlstrom & Moser 1969). *Argyripnus* possesses coniform teeth arranged in two rows on the premaxilla, a single row on the maxilla, and two to three rows on the dentary (Parin 1992). *Danaphos* possesses coniform teeth arranged in a lingual row and caniniform teeth in a labial row on the premaxilla; the maxilla has a lingual row of coniform teeth and a labial row of caniniform teeth; the dentary has coniform teeth arranged in three rows (Weitzman 1974). *Maurolicus* possesses coniform teeth arranged in a single row on the premaxilla, maxilla and dentary (Weitzman 1974). *Sonoda* possesses coniform teeth arranged in a single row on the premaxilla, maxilla and dentary; the posteriormost teeth on the maxilla are the largest teeth in the jaws (Weitzman 1974). *Thorophos* possesses coniform teeth arranged in two rows on the premaxilla with teeth in the labial row larger than those in the lingual row; the maxilla has coniform teeth arranged in a single row with teeth located posteriorly larger than those located anteriorly; the dentary has coniform teeth arranged in three rows anteriorly, tapering to a single row posteriorly (Weitzman 1974). *Valenciennellus* possesses coniform teeth in a lingual row and caniniform teeth in a labial row on the premaxilla; the maxilla has a lingual row of coniform teeth and a labial row of caniniform teeth; the dentary has coniform teeth arranged in two rows with teeth in the labial row smaller than those in the lingual row (Weitzman 1974). Tooth attachment is Type 4 in *Valenciennellus tripunclatus* (Esmark) and *Maurolicus sp.*(Fink 1981) and Type 1 in *Thorophos euryops* Bruun 1931 and *T. nexilis* (Myers 1932) (Weitzman 1974). Tooth replacement has not been investigated.

Sternoptychinae: *Argyropelecus**, *Sternoptyx*, and *Polypinus* (Weitzman 1974).

Argyropelecus possesses mixed coniform and caniniform teeth arranged in a single row on the premaxilla and maxilla. The coniform teeth on the posterior section of maxilla are recurved anteriorly unlike all other teeth; the dentary has one or two large caniniform teeth at about the mid point of the dentary and coniform teeth arranged in two rows surrounding those teeth (Weitzman 1974). *Sternoptyx* possesses coniform teeth arranged in approximately three rows on the premaxilla and maxilla and up to four rows on the dentary (Weitzman 1974). *Polypinus* possesses coniform teeth arranged in three to five rows on the premaxilla and maxilla; the dentary has coniform teeth arranged in two rows (Weitzman 1974). Tooth attachment is Type 1 and Type 3 in *Argyropelecus aculeatus* Valenciennes and *A. olfersi* (Cuvier) (Weitzman 1974). Tooth replacement has not been investigated.

Phosichthyidae: *Ichthyococcus* (Mukhacheva 1980; Bordulina 1984), *Phosichthys*, Pollichthys, Polymetme*, Vinciguerria, Woodsia*,* and *Yarrella* (Bordulina 1984).

Ichthyococcus possesses coniform teeth arranged in single row on the premaxilla, maxilla, and dentary (Mukhacheva 1980). *Ichthyococcus elongatus* Imai was described as having only one or two "denticles," when present, on a reduced premaxilla (Bordulina 1984). *Phosichthys* possesses coniform teeth, interspersed with caniniform teeth, arranged in two rows on the premaxilla and one row on the maxilla; the dentary has caniniform, interspersed among coniform teeth, in a lingual row and a labial row of coniform teeth (Bordulina 1984). *Pollichthys* possesses coniform teeth arranged in two rows on the premaxilla and single row on the maxilla; the dentary has coniform teeth arranged in three rows with teeth in the labialmost tooth row larger than those in other rows (Bordulina 1984). *Polymetme* possesses caniniform teeth arranged in two rows on the premaxilla and one row on the maxilla; the dentary has a labial row of coniform teeth and a lingual row or caniniform teeth (Bordulina 1984). *Vinciguerria* possesses coniform teeth arranged in a single row on the premaxilla and maxilla; the coniform teeth located posteriorly on the maxilla are curved with the crowns orientated anteriorly; the dentary has coniform teeth arranged in two rows (Bordulina 1984). *Woodsia* possesses coniform teeth arranged in two rows on the premaxilla; the maxilla has a single row of caniniform teeth; the dentary has coniform teeth interspersed with caniniform teeth arranged in two rows. *Yarrella* possesses coniform teeth arranged in two rows on the premaxilla and one row on maxilla; the posterior most teeth on the maxilla are enlarged compared to those located more anteriorly; the dentary has coniform teeth arranged in two rows (Bordulina 1984). Tooth attachment is Type 1 in *Ichthyococcus irregularis* Rechnitzer & Böhlke (Fink 1981). Tooth attachment is Type 1 and Type 4 in *Pollichthys mauli* and *Vinciguerria poweriae* (Cocco)(Fink 1981) and Type 3 in *Woodsia nonsuchae* (Beebe). Tooth replacement has not been investigated.

Stomiidae:

Astronestinae: *Astronesthes** (Gibbs Jr et al. 1984; Parin & Borodulina 2003), *Eupogonesthes* (Parin & Borodulina 1993), and *Neonesthes* (Cohen 1956).

Astronesthes possesses caniniform teeth on the premaxilla and dentary in one to two rows; the maxilla has coniform teeth arranged in a single short row posteriorly (Gibbs Jr et al. 1984). *Eupogonesthes* possesses caniniform teeth arranged in a single row on the premaxilla, maxilla, and dentary (Parin & Borodulina 1993). *Neonesthes* possesses caniniform teeth on the premaxilla, maxilla, and dentary (Cohen 1956). Tooth attachment is Type 1 in *Astronesthes chrysophekadion* (Bleeker), Type 1 and Type 3 in *A. niger* Richardson and *Astronesthes sp. Borostomias elucens* (Brauer) and *N. capensis* (Gilchrist & von Bonde) both have Type 1 tooth attachment (Fink 1981). Tooth replacement has not been investigated.

Stomiinae: *Chauliodus** (Daylan & Eryilmaz 2008; Greven et al. 2009).

Chauliodus possesses caniniform teeth arranged in one to two rows on the premaxilla and dentary; the maxilla has coniform teeth arranged in a single short row posteriorly (Greven et al. 2009) Tooth attachment is Type 1 in *Chauliodus sloani* Bloch & Schneider (Fink 1981). Tooth attachment and structure was further examined in *C. sloani* and the expansion of the bone of attachment lingually was suggested to reinforce the tooth against caged prey items (Greven et al. 2009). Tooth replacement has not been investigated.

Melanostomiinae: *Eustomias** (Gibbs 1960b; Sutton et al. 2004), *Grammatostomias** (Holt & Byrne 1910), *Melanostomias* (Coad 1987), and *Tactostoma** (Bolin 1939).

Eustomias possesses caniniform teeth in a labial row and depressiform teeth in a lingual row along the premaxilla and dentary (occasionally both tooth types ocurr in a single row); the maxilla has coniform teeth arranged in a short single row posteriorly (Sutton et al. 2004). *Grammatostomias* possesses a caniniform teeth at the symphysis followed by depressiform teeth interspersed with a few smaller caniniform teeth arranged in a single row on the premaxilla and dentary; the maxilla has coniform teeth arranged in a short single row posteriorly (Holt & Byrne 1910). *Melanostomias* possesses depressiform teeth on the premaxilla, maxilla, and dentary (Coad 1987). *Tactostoma* possesses caniniform teeth, interspersed with depressiform teeth, arranged in a single tooth row on the premaxilla and dentary; the maxilla has coniform teeth arranged in a short single row posteriorly (Bolin 1939). Tooth attachment is Type 1 and Type 3 in *Bathophilus ater* (Brauer), *Leptostomias gladiator* (Zugmayer), and *Melanostomias sp.*, but *Tactostoma macropus* Bolin has Type 4 attachment (Fink 1981). Tooth replacement has not been investigated.

Malacosteinae: *Malacosteus** (Kenaley 2007), and *Photostomias** (Kenaley 2009).

Malacosteus possesses coniform teeth in one irregular row on the premaxilla and maxilla; the dentary has caniniform teeth anteriorly followed posteriorly by coniform teeth arranged in a single row (Kenaley 2007). *Photostomias* possesses caniniform teeth anteriorly followed posteriorly by coniform teeth arranged in one irregular row on the premaxilla and maxilla; the dentary has several caniniform teeth anteriorly followed posteriorly by coniform teeth arranged in a single row (Kenaley 2009). Tooth attachment is Type 1 in *Malacosteus niger* Ayres and *Photostomias guernei* Collett (Fink 1981). Teeth on the dentary of *Malacosteus* are not replaced (Kenaley 2007) and there is a negative correlation between number of dentary teeth and standard length (Kenaley 2009).

ATELEOPODIFORMES

Ateleopodidae: *Ateleopus* (Sasaki et al. 2006) and *Guentherus* (Senou et al. 2008).

Ateleopus possesses coniform teeth arranged in a single row on the premaxilla; the maxilla and dentary are edentulous (Sasaki et al. 2006). *Guentherus* is edentulous (Senou et al. 2008). Tooth attachment and replacement have not been investigated.

AULOPIFORMES

Paraulopidae: *Paraulopus* (Sato & Nakabo 2002; Sato & Nakabo 2003).

Paraulopus possesses coniform teeth arranged in multiple rows on the premaxilla and dentary; the maxilla is edentulous (Sato & Nakabo 2002). Tooth attachment is Type 4 in *P. nigripinnis* (Günther) (Sato & Nakabo 2002). Tooth replacement has not been investigated.

Aulopidae: *Aulopus** (Prokofiev 2008b; Carvalho-Filho et al. 2010) and *Hime** (Parin & Kotlyar 1989; Prokofiev 2008b).

Aulopus possesses a labial row of coniform teeth and multiple lingual rows of depressiform teeth on both the premaxilla and dentary, with teeth in the lingualmost row larger than those in remaining rows; the maxilla is edentulous (Carvalho-Filho et al. 2010). *Hime* possesses coniform and depressiform teeth arranged in multiple rows on the premaxilla and dentary; the maxilla is edentulous (Parin & Kotlyar 1989). The arrangement of teeth on the premaxilla and dentary in *Hime* was not described by Parin and Kotlyar (1989). Tooth attachment and replacement has not been investigated.

Pseudotrichonotidae: *Pseudotrichonotus* (Johnson et al. 1996).

Pseudotrichonotus possesses depressiform teeth in multiple rows on the premaxilla and dentary; the maxilla is edentulous. Tooth attachment is Type 4 in *P. altivelis* Yoshino & Araga (Johnson et al. 1996). Tooth replacement has not been investigated.

Synodontidae:

Synodontinae: *Synodus* (Chen et al. 2007; Frable et al. 2013) and *Trachinocephalus* (Norman 1935c).

Synodus possesses coniform teeth arranged in two rows on the premaxilla and three to four rows on the dentary, with the lingualmost row containing the largest teeth; the maxilla is edentulous (Chen et al. 2007). *Trachinocephalus* possesses coniform teeth on premaxilla and dentary; the maxilla is edentulous (Norman 1935c). Tooth attachment is Type 2 in *Synodus intermedius* (Spix & Agassiz) (Fink 1981). Tooth replacement is extraosseous in *S. intermedius* (Trapani 2001).

Harpadontinae: *Harpadon* and *Saurida** (Rao 1977).

Saurida possesses depressiform teeth in the lingualmost and coniform teeth arranged in multiple labial rows on the premaxilla and dentary; the maxilla is edentulous (Rao 1977). Tooth attachment is Type 4 in *H. machrochir* (Fink 1981). Tooth replacement has not been investigated.

Bathysauroididae: *Bathysauroides* (Kamohara 1952).

Bathysauroides possesses both coniform, arranged in multiple rows, and caniniform teeth anteriorly close to the symphysis, on the premaxilla and dentary; coniform teeth are arranged in multiple rows on the premaxilla and dentary; the maxilla is edentulous (Kamohara 1952). Tooth attachment and replacement have not been investigated.

Chlorophthalmidae: *Chlorophthalmus* (Kamohara 1953; Mead 1966a; Kim et al. 1997) and *Parasudis* (Mead 1966a)

Chlorophthalmus possesses depressiform teeth arranged in multiple rows on the premaxilla and dentary; the maxilla is edentulous (Mead 1966a). Depressible teeth were not mentioned in the descriptions of either *C. oblongus* (Kamohara) or *C. albatrossis* Jordan & Starks (Kamohara 1953; Kim et al. 1997). *Parasudis* possesses depressiform teeth arranged in two rows on the premaxilla and dentary; the maxilla is edentulous (Mead 1966a). Tooth attachment is Type 4 in *C. agassizi* Bonaparte (Fink 1981). Tooth replacement has not been investigated.

Bathysauropsidae: *Bathysauropsis*.

No information on the dentition of this family was found.

Notosudidae: *Ahliesaurus, Luciosudis,* and *Scopelosaurus* (Bertelsen et al. 1976).

Ahliesaurus possesses coniform teeth arranged in two to three rows on the premaxilla and up to six rows on the dentary in the juvenile stage; adults possess few coniform teeth near the symphysis of the premaxilla and dentary or are edentulous on these bones; the maxilla is edentulous in adults, but 12 mm larvae of *A. brevis* Bertelsen, Krefft & Marshall have a single row of coniform teeth on the maxilla (Bertelsen et al. 1976). *Luciosudis* possesses coniform teeth on the premaxilla and dentary in the juvenile stage; adults possess few coniform teeth near the symphysis of the premaxilla and dentary or are edentulous on these bones; the maxilla is edentulous in adults, but 10-12 mm larvae of *L. normani* Fraser-Brunner are reported to have coniform teeth on the maxilla (Bertelsen et al.

1976). *Scopelosaurus* possesses depressiform teeth arranged in two to three rows on the premaxilla; the dentary has coniform teeth arranged in approximately six rows, which are separated into a lingual and labial tooth bands, each consisting or approximately three rows of teeth; the maxilla is edentulous in adults, but 13 mm larvae of *S. mauli* Bertelsen, Krefft & Marshall have a single row of coniform teeth on the maxilla (Bertelsen et al. 1976). Tooth attachment and replacement have not been investigated.

Ipnopidae: *Bathymicrops* (Mead 1966b), *Bathypterois* (Sulak 1977), *Bathytyphlops* (Mead 1966b), *Discoverichthys* (Merrett & Nielsen 1987), and *Ipnops* (Mead 1966b).

Bathymicrops possesses depressiform teeth arranged in multiple rows on the premaxilla and dentary; the maxilla is edentulous (Mead 1966b). *Bathypterois, Bathytyphlops,* and *Ipnops* possess coniform teeth arranged in multiple rows on the premaxilla and dentary; the maxilla is edentulous. *Discoverichthys* possesses coniform teeth arranged in seven to eight rows on the premaxilla and two to four rows on the dentary; a single row of "arrowhead-shaped" teeth is present on the anterior half of the dentary that are orientated anteriorly (Merrett & Nielsen 1987). Tooth attachment and replacement has not been investigated.

Scopelarchidae: *Benthalbella* (Bussing & Bussing 1966), *Rosenblattichthys* (Okiyama & Johnson 1986), *Scopelarchoides* (Motomura et al. 2007), and *Scopelarchus* (Mead & Bohlke 1953).

Benthalbella possesses coniform teeth arranged in a single row on the premaxilla; the dentary has coniform teeth in the labial row and caniniform teeth with expanded tips in the lingual row; the maxilla is edentulous (Bussing & Bussing 1966). Bussing & Bussing (1966) described the caniniform teeth in the labial row of the dentary in *Benthalbella* described as “long, daggerlike and sagittate” (Bussing & Bussing 1966). *Rosenblattichthys* possesses coniform teeth in a single row on the premaxilla and two rows on the dentary with the lingual row containing the largest teeth; the maxilla is edentulous (Okiyama & Johnson 1986). *Scopelarchoides* possesses a single row of coniform teeth on the premaxilla; the dentary has a row of coniniform teeth labially and a row of caniniform teeth lingually; the maxilla is edentulous (Motomura et al. 2007). *Scopelarchus* possesses a row of coniform teeth labially and a row of depressiform teeth lingually on the premaxilla and dentary, with largest teeth in the lingual row; (Mead & Bohlke 1953). Tooth attachment and replacement have not been investigated.

Evermanellidae: *Coccorella* (Kimura & Suzuki 1990) and *Evermannella* (Johnson & Glodek 1975).

Coccorella possesses coniform teeth arranged in a single row on the premaxilla; the dentary has caniniform teeth arranged in single row; the maxilla is edentulous (Kimura & Suzuki 1990). *Evermannella* possesses coniform teeth in a single row on the premaxilla; the dentary has caniniform teeth in a lingual row and coniform teeth in a shorter labial row; the largest caniniform teeth are located in the middle of the dentary; the maxilla is edentulous (Johnson & Glodek 1975). Tooth attachment is Type 4 in *Evermannella balbo* (Risso) (Fink 1981). Tooth replacement has not been investigated.

Alepisauridae: *Alepisaurus* (Gibbs 1960a).

Alepisaurus possesses labio-lingually flattened coniform teeth arranged in single row on the premaxilla; the dentary has a single row of teeth comprised of multiple different types, including a single large caniniform tooth anteriorly, followed directly by a row of smaller caniniform teeth, which are followed by several large caniniform teeth, and terminating with several labio-lingually flattened coniform teeth; the maxilla is edentulous (Gibbs 1960a). Tooth attachment and replacement have not been investigated.

Paralepididae:

The teeth of paralepids (usually caniniform or depressiform) may be orientated posteriorly or anteriorly within the same row along the premaxilla or dentary. Harry (1953) used the terms antrorse and retrorse to refer to those teeth that are orientated anteriorly or posteriorly, respectively.

Paralepidinae: *Anotopterus*, *Lestidium**, *Macroparalepis**, *Magnisudis*, *Notolepis**, *Parlepis*, *Stemnosudis** (Harry 1953) and *Uncisudis* (Fukui & Ozawa 2004).

Anotopterus possesses coniform teeth arranged in a single row on the premaxilla; the dentary has caniniform teeth arranged in single row; the maxilla is edentulous (Harry 1953). *Lestidium* possesses several anteriorly directed depressiform teeth followed posteriorly by a single row of coniform teeth; the dentary has both caniniform teeth and depressiform teeth (usually the largest teeth); the maxilla is edentulous (Harry 1953). *Macroparalepis* possesses several depressiform teeth anteriorly followed posteriorly by a single row of coniform teeth; the dentary has both caniniform teeth and depressiform teeth (usually the largest teeth) arranged two rows; the maxilla is edentulous (Harry 1953). *Magnisudis* possesses coniform teeth arranged in a single row on the premaxilla; the dentary has very sparse coniform teeth and may be edentulous in some species; the maxilla is edentulous (Harry 1953). *Notolepis* possesses several depressiform teeth anteriorly followed by a single row of coniform teeth; the dentary has depressiform teeth arranged in two to three rows(Harry 1953) *Paralepis* possess coniform teeth arranged in a single row on the premaxilla and dentary, but dentary teeth may be absent in adults; maxilla is edentulous (Harry 1953) *Stemonosudis* possesses several depressiform teeth anteriorly followed posteriorly by a single row of caniniform teeth; the dentary has both caniniform teeth and depressiform teeth arranged in nearly alternating order in a single row; the maxilla is edentulous (Harry 1953). *Uncisudis* possesses caniniform teeth arranged in a single row on the premaxilla and dentary; maxilla is edentulous (Fukui & Ozawa 2004). Tooth attachment is Type 4 in *Paralepis coregonoides* Risso (Fink 1981). Tooth replacement has not been investigated.

Sudinae: *Sudis** (Harry 1953).

Sudis possesses coniform teeth arranged in a single row on the premaxilla; the dentary has large labio-lingually flattened caniniform teeth and a few depressiform teeth arranged in one to two rows; the maxilla is edentulous. Tooth attachment and replacement have not been investigated.

Bathysauridae: *Bathysaurus* (Sulak et al. 1985)

Bathysaurus possesses depressiform teeth arranged in multiple rows on the premaxilla and dentary; the maxilla is edentulous (Sulak et al. 1985). Tooth attachment and replacement have not been investigated.

Giganturidae: *Gigantura* (Walters 1961).

Gigantura possesses depressiform teeth arranged in two rows on the premaxilla and dentary with the largest teeth in the lingual row (Walters 1961). Tooth attachment is Type 4 in *Gigantura vorax* Brauer (Fink 1981). Tooth replacement has not been investigated.

MYCTOPHIFORMES

The maxilla is edentulous in all myctophiforms.

Neoscopelidae: *Scopelngys* (Butler & Ahlstrom 1976), and *Solivomer* (Miller 1947).

Scopelngys and *Solivomer* possess coniform teeth arranged in multiple rows on the premaxilla and dentary (Butler & Ahlstrom 1976). Tooth attachment and replacement have not been investigated.

Myctophidae:

Myctophinae: *Benthosema*, *Centrobranchus*, *Diogenichthys*, *Electrona*, Gonichthys, *Hygophum* (Wisner 1971; Fink 1981), *Myctophum*, *Loweina* (Wisner 1971), *Protomyctophum*, *Symbolophorus*, and *Tarletonbeania* (Paxton 1972).

Benthosema, Electrona, Protomyctophum, and *Tarletonbeania* possess depressiform teeth arranged in multiple rows on the premaxilla and dentary. *Centrobranchus* and *Gonichthys* possess depressiform teeth arranged in multiple rows on the premaxilla and dentary; the teeth on the premaxilla are moderately or strongly hooked (Wisner 1971; Fink 1981). *Diogenichthys* possesses depressiform teeth arranged in multiple rows on the premaxilla and dentary;; teeth in the labialmost row of the dentary are greatly widened while those located towards the posterior of the dentary are strongly hooked (Paxton 1972). *Hygophum* possesses depressiform teeth arranged in multiple rows on the premaxilla and dentary (Paxton 1972). M*yctophum* possesses depressiform teeth arranged in multiple rows on the premaxilla and dentary (Paxton 1972). *Loweina* possesses depressiform teeth arranged in multiple rows on the premaxilla and dentary (Wisner 1971). In *L. laurae* the teeth are arranged with alternating enlarged and small teeth in a single row on the premaxilla and two rows on the dentary (Wisner 1971). *Symbolophorus* possesses depressiform teeth on the premaxilla and dentary (Paxton 1972). Tooth attachment is Type 4 in *Hygophum hygomii* (Lütken) (Fink 1981). Tooth replacement has not been investigated.

Lampanyctinae: *Bolinichthys*, *Ceratoscopelus* (Paxton 1972), *Diaphus* (Nafpaktitis 1966; Wisner 1971), *Gymnoscopelus*, *Lampadena*, *Lampanyctus*, *Lepidophanes*, *Lobianchia* (Paxton 1972), *Nannobrachium* (Zahuranec 2000), *Notoscopolus*, *Scopelopsis*, *Stenobrachius*, *Taaningichthys,* and *Triphoturus* (Paxton 1972).

Bolinichthys, Ceratoscopelus, Hintonia, Lampadena, Lepidophanes, Neoscopolus, Scopelopsis, Stenobrachius, and *Triphoturus* possess depressiform teeth arranged in multiple rows on the premaxilla and dentary. Teeth located anteriorly on the dentary are small and conical while those located posteriorly are moderately hooked (Paxton 1972). *Diaphus* possesses depressiform teeth arranged in two rows on the premaxilla and dentary with the largest teeth located in the lingualmost row (Nafpaktitis 1966; Paxton 1972). Wisner (1971) did not mention depressibility in his description of *D. phillipsi* Fowler. *Gymnoscopelus, Lampichthys,* and *Lobianchia* possess depressiform teeth arranged in multiple rows on the premaxilla and dentary (Paxton 1972). *Lampanyctus* possesses depressiform teeth arranged in multiple rows on the premaxilla and dentary (Paxton 1972). Teeth located anteriorly on the dentary are small and conical while those located posteriorly are moderately hooked (Paxton 1972). Wisner (1971) did not mention depressibility of the teeth is descriptions of *L. fernae* (Wisner) or *L. simulator* Wisner. *Lampanyctodes* possesses depressiform teeth arranged in multiple rows on the premaxilla and dentary (Paxton 1972). *Nannobrachium* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Paxton 1972). Zahuranec (2000) provides relatively little information on the dentition of *Nannobranchium* and does not mention whether teeth are depressible or not. *Taaningichthys* possesses depressiform teeth arranged in multiple rows on the premaxilla and dentary (Paxton 1972).. Teeth located anteriorly on the dentary are small and conical or moderately hooked while those located posteriorly are strongly hooked (Paxton 1972). Tooth attachment is Type 4 in *Bolinichthys supralateralis* (Parr), *Ceratoscopelus warmingii* (Lütken), and *Lampanyctus ater* (Fink 1981). Tooth replacement has not been investigated.

LAMPRIFORMES

The maxilla is edentulous in all members of the Lampriformes (Nelson 2006).

Veliferidae: *Velifer* and *Metavelifer* (Olney et al. 1993).

Velifer and *Metavelifer* are edentulous.

Lampridae: *Lampris* (Olney et al. 1993).

Lampris is edentulous.

Stylephoridae: Stylephorus (Olney et al. 1993; Olney 2003)

Stylephorus is edentulous.

Lophotidae: *Lophotus* (Dulcic & Ahnelt 2007) and *Eumecichthys* (Olney 2003).

Lophotus possesses coniform teeth arranged in a single row on the premaxilla and dentary (Dulcic & Ahnelt 2007). *Eumecichthys* possesses coniform teeth on the premaxilla and dentary (Olney 2003). Tooth attachment and replacement have not been investigated.

Radiicephalidae: *Radiicephalus* (Olney et al. 1993; Olney 2003).

Radiicephalus is edentulous (Olney 2003). However, it was not listed among the edentulous species of Olney et al. (1993) and tooth attachment type observed. Tooth attachment is Type 2 in *Radiicephalus elongatus* (Osório) (Olney et al. 1993). Tooth replacement has not been investigated.

Trachipteridae: *Desmodema*, *Trachipterus*, and *Zu*.

Trachipterids possesses coniform teeth on the premaxilla and dentary (Olney 2003). Tooth attachment is Type 2 in *Zu cristatus* (Bonelli) (Olney et al. 1993). Tooth replacement has not been investigated.

Regalecidae: *Regalecus* (Olney 2003).

Regalecus possesses coniform teeth on the premaxilla and dentary (Olney 2003). Tooth attachment and replacement have not been investigated.

POLYMIXIIFORMES

Polymixiidae: *Polymixia* (Moore 2003d).

Polymixia possesses coniform teeth arranged in eight rows on the premaxilla and dentary (Moore 2003d). Tooth attachment and replacement have not been investigated

PERCOPSIFORMES

Percopsidae: *Percopsis*

Percopsis possesses coniform teeth arranged in multiple rows on the premaxilla and dentary; maxilla is edenulous. Tooth attachment is Type 2 in *P. omiscomaycus* (Walbaum) (Fink 1981). Tooth replacement is extraosseus in *P. omiscomaycus* (Trapani 2001).

Aphredoderidae: *Aphredoderus*

Aphredoderus possesses coniform teeth arranged in multiple rows on the premaxilla and dentary; maxilla is edentulous. Tooth attachment is Type 2 in *A. sayanus* (Fink 1981). Tooth replacement has not been investigated

Amblyopsidae: *Amblyopsis* (Cox 1905), and *Typhlichthys* (Romero & Conner 2007). *Amblyopsis* possess coniform teeth arranged in multiple rows on the premaxilla and dentary; the maxilla is edentulous (Cox 1905). *Typhlichthys* possesses coniform teeth in multiple rows on the premaxilla and dentary; the maxilla is edentulous (Romero & Conner

2007). Tooth attachment is Type 2 in *A. spelaeus* (DeKay) (Fink 1981). Tooth replacement has not been investigated.

GADIFORMES

The maxilla is edentulous in all members of the Gadiformes.

Muraenolepididae: *Muraenolepis* (Balushkin & Prirodina 2007; Balushkin & Prirodina 2010).

Muraenolepis possesses coniform teeth in three to seven rows (depending on species) on the premaxilla and dentary. When tooth size variation is present the labial row contains the largest teeth (Balushkin & Prirodina 2007). Tooth attachment and tooth replacement have not been investigated.

Bregmacerotidae: *Bregmaceros* (Świdnicki 1991; Torii et al. 2004).

Bregmaceros possesses coniform teeth in two rows on the premaxilla and dentary with the lingualmost row containing the largest teeth (Świdnicki 1991). Tooth attachment and tooth replacement have not been investigated.

Euclichthyidae: *Euclichthys*.

Information on the dentiton of this family was not available.

Macrouridae:

Bathygadinae: *Bathygadus* and *Gadomus* (Cohen et al. 1990).

Bathygadus possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Cohen et al. 1990). *Gadomus* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Cohen et al. 1990). Tooth attachment and tooth replacement have not been investigated.

Macrouroidinae: *Macrouroides* (Radcliffe 1912) and *Squalogadus* (Grey 1959).

Macrouroides and *Squalogadus* possess coniform teeth arranged in multiple rows on the premaxilla and dentary (Radcliffe 1912; Grey 1959). Tooth attachment and tooth replacement have not been investigated.

Trachyrincinae: *Idiolophorhynchus* and *Trachyrincus* (McMillan 1995).

Idiolophorhynchus and *Trachyrincus* possess coniform teeth arranged in multiple rows on the premaxilla and dentary. Tooth attachment and tooth replacement have not been investigated.

Macrourinae: *Albatrossia* (Cohen et al. 1990), *Cetenourus* (Gilbert & Hubbs 1916), *Coelorinchus, Coryphaenoides, Cynomacrurus, Hymenocephalus, Lepidorhynchus, Macrourus*, *Malacocephalus**, *Nezumia*, *Phagemacruorus*, *Trachonurus, and Ventrifossa* (Cohen et al. 1990).

Albatrossia possesses coniform teeth arranged in one to three rows on the premaxilla and dentary with the labialmost tooth row containing the largest teeth (Cohen et al. 1990). *Cetenourus, Coelorinchus* and *Cynomacrurus* possess coniform teeth arranged in one to three rows on the premaxilla and dentary. *Coryphaenoides* possesses coniform teeth arranged in multiple rows with symphyseal caniniform tooth on the premaxilla and dentary (Cohen et al. 1990). *Hymenocephalus* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Cohen et al. 1990). *Lepidorhynchus* and *Nezumia* possess coniform teeth arranged in multiple rows on the premaxilla and dentary with the labialmost row containing the largest teeth. *Macrourus, Phagemarcrurus,* and *Trachonurus* possess coniform teeth arranged in multiple rows on the premaxilla and dentary. *Malacocephalus* possesses caniniform teeth in the labialmost row followed lingually by coniform teeth arranged in two rows; the dentary has coniform teeth arranged in a single row (Cohen et al.

1990). *Nezumia* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary with the labialmost row containing the largest teeth (Cohen et al. 1990). *Ventrifossa* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Cohen et al. 1990). Tooth attachment is Type 2 in *Coryphaenoides acrolepis* (Bean) (Fink 1981).

Moridae: *Antimora* (Iwamoto 1975), *Auchenoceros* (Paulin 1983), *Gadella** (Long & McCosker 1998), *Halargyreus*, *Laemonema* (Paulin 1983), *Lepidion* (Nakaya et al. 1980), *Lotella** (Cohen 1979; Paulin 1983), *Mora* (Paulin 1983), *Paralaemonema* (Trunov 1990), *Physiculus*, *Pseudophycis* (Paulin 1983), *Salilota* (Paulin 1989b), and *Tripterophycis* (Paulin 1983).

Antimora, Auchenoceros, Halargyreus, Lepidion, Mora, Paralaemonema, and *Pseudophycis* possess coniform teeth arranged in multiple rows on the premaxilla and dentary (Iwamoto 1975). *Auchenoceros* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Paulin 1983). *Gadella* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary; caniniform teeth are interspersed among the coniform teeth of *G. maraldi* (Risso) (Long & McCosker 1998). *Laemonema* possesses coniform teeth arranged in one to four rows on the premaxilla and dentary with the labialmost row containing the largest teeth (Paulin 1983). *Lotella* possesses caniniform teeth in the labialmost row followed lingually by several rows of coniform teeth on the premaxilla; the dentary has either a single row of caniniform teeth or several rows of coniform teeth (Cohen 1979; Paulin 1983). *Physiculus* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Paulin 1983). When tooth size variation is present the labialmost row contains the largest teeth (Paulin 1983). *Salilota* possesses coniform teeth arranged in five to six rows on the premaxilla and dentary (Paulin 1989b). *Tripterophycis* possesses coniform teeth arranged in a single row on the premaxilla and dentary. Paulin (1983) described the teeth of *Tripterophycis* as “closely set, truncate, compressed teeth.” Tooth attachment and replacement have not been investigated.

Melanonidae: *Melanomus* (Howes 1993; Henriques et al. 2001).

Melanomus possesses coniform teeth arranged in two rows on the premaxilla and a single row on the dentary (Howes 1993). Some enlarged teeth may be present near the symphysis of both the premaxilla and dentary (Howes 1993). Henriques et al. (2001) examined specimens of two species from multiple localities and reported variation in tooth size. Tooth attachment and replacement have not been investigated.

Merlucciidae:

Merlucciinae: *Merluccius** (Lloris & Matallanas 2003)

Merluccius possesses coniform teeth in the labial row and depressiform teeth in the lingual row on the premaxilla and dentary (Lloris & Matallanas 2003). Tooth attachment is Type 1 for coniform teeth and Type 4 for depressiform teeth in *Merluccius sp.* (Fink 1981). Tooth replacement is extraosseous in *M. productus* (Ayres) (Trapani 2001).

Macruroninae: *Lyconnus** and *Macruronus** (Cohen et al. 1990).

Lyconnus possesses coniform teeth arranged in a single row and a symphyseal caniniform tooth on the premaxilla and dentary; the caninform teeth of the dentary are larger than those of the premaxilla (Cohen et al. 1990). *Macruronus* possesses coniform teeth arranged in a one or two rows with a symphyseal caniniform tooth present on the premaxilla depending upon the species; the dentary has coniform teeth arranged in a single row (Cohen et al. 1990). *Macruronus capensis* does not have symphyseal caniniform teeth (Cohen et al. 1990). Tooth attachment and replacement have not been investigated.

Steindachneriinae: *Steindachneria**(Cohen et al. 1990).

Steindachneria possesses coniform teeth arranged in two rows on the premaxilla with the labilamost row containing the largest teeth; the dentary has a single row of coniform teeth (Cohen et al. 1990). Tooth attachment and replacement have not been investigated.

Phycidae:

Gaidropsarinae: *Gaidropsarus**, and *Ciliata* (Cohen & Russo 1979).

Gaidropsarus possesses caniniform teeth in the labialmost row and coniform teeth in several lingual rows on the premaxilla; the dentary has coniform teeth arranged in multiple rows with the lingualmost row containing the largest teeth (Machida 1991). *Ciliata* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary; the coniform teeth are enlarged in the labialmost row of the premaxilla and the lingualmost row of the dentary in *C. septentrionalis* (Collett) (Cohen & Russo 1979). Tooth attachment and replacement have not been investigated.

Gadidae:

Lotinae: *Brosme* (Mujib 1969).

Brosme possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Mujib 1969). Tooth attachment and replacement have not been investigated.

Gadinae: *Arctogadus* (Jordan et al. 2003), *Boreogadus* (Gill 1863b), and *Gadus* (Holmbakken & Fosse 1973).

Arctogadus possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Jordan et al. 2003). *Boreogadus* possesses coniform teeth in multiple rows on the premaxilla and dentary; the labialmost row on the premaxilla contains the largest teeth (Gill 1863b). *Gadus* possesses coniform teeth arranged in two to five rows on the premaxilla with the labialmost row containing the largest teeth; the dentary has coniform teeth arranged in two rows with the lingualmost row containing the largest teeth (Holmbakken & Fosse 1973). Tooth replacement is extrosseous in *Gadus morhua* Linnaeus 1758 and *Lota lota* (Linnaeus) (Trapani 2001). Replacement is extraosseous *Lotella rhacina* (Forster)(Holmbakken & Fosse 1973).

OPHIDIIFORMES

The maxilla is edentulous in all Ophidiiformes.

Carapidae:

Pyramodontinae: *Pyramodon** and *Snyderidia** (Robins & Nielsen 1970; Williams 1983).

Pyramodon possesses a symphyseal coniform tooth followed posteriorly by symphyseal caniniform tooth, posterior to these teeth is a labial row (irregularly two rows) of coniform teeth and lingual row of depressiform teeth on the premaxilla; the dentary has large paired depressiform teeth followed posteriorly by coniform teeth arranged a single row (Williams 1983). *Snyderidia* possesses several coniform teeth at the symphysis followed posteriorly by a caniniform tooth, two to three rows of coniform teeth, and a lingual row of depressiform on the premaxilla. The dentary has a symphseal caniniform tooth also followed posteriorly by a single row of coniform teeth(Robins & Nielsen 1970). Tooth attachment and replacement have not been investigated.

Carapinae: *Carapus*, Echiodon*, Echeliophis*,* and *Onuxodon** (Williams 1984).

Carapus possesses severely recurved coniform teeth (originally described as "cardiform") in single row on the labial face of the premaxilla and coniform teeth arranged in multiple rows lingually. Anterior caniniform teeth may also be present on each premaxilla; the dentary has coniform teeth arranged in multiple rows and some caniniform teeth in the labialmost row (Williams 1984). *Echiodon* possesses two to six caniniform teeth near the symphysis and followed posteriorly by multiple rows of coniform teeth on the premaxilla and dentary. *Echeliophis* possesses severely recurved coniform teeth in single row on the labial face of the premaxilla and coniform teeth arranged in a single row lingually (Williams 1984). The dentary has a coniform teeth arranged in a single row. *Onuxodon* possesses two to four caniniform teeth near the symphysis distinctly separated from posterior coniform teeth arranged in multiple rows on the premaxilla and dentary (Williams 1984). Tooth attachment and tooth replacement have not been investigated.

Ophidiidae:

Brotulinae: *Brotula* (Hubbs 1944; Greenfield 2005a).

Brotula possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Hubbs 1944).

Brotulotaeniinae: *Brotulaenia* (Machida et al. 1997b).

Brotulaenia possess coniform teeth arranged in a single row on the premaxilla and dentary (Machida et al. 1997b). Tooth attachment and replacement have not been investigated.

Ophidiinae: *Genypterus** (Smith & Paulin 2003), *Lepophidium* (Robins 1958), *Ophidion* (Matallanas & Brito 1999), and *Otophidium* (Hubbs 1916).

Genypterus possesses caniniform teeth in the labialmost row and coniform teeth arranged in multiple lingually positioned rows on the premaxilla and dentary (Smith & Paulin 2003). *Lepophidium* and *Ophidion* possess coniform teeth arranged in a single row on the premaxilla and dentary with the labialmost row containing the largest teeth. *Otophidium* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Hubbs 1916). Tooth attachment and replacement have not been investigated.

Neobythitinae: *Abyssobrotula* (Machida 1989b), *Acanthonus* (Nielsen 1965), *Bassogigas* (Nielsen & Møller 2011), *Bassozetus* (Machida 1989a), *Glyptophidium* (Kurup et al. 2009), *Homostolus* (Machida & Okamura 1992), *Lamprogrammus* (Cohen & Rohr 1993), *Monomitopus* (Carter & Cohen 1985), *Neobythites* (Nielsen 1999), *Porogadus* (Carter & Sulak 1984), *Sirembo* (Prokofiev 2008a), and *Spectrunculus* (Uiblein et al. 2008).

Abyssobrotula, Acanthonus, Bassogigas, Bassozetus, Glyptophidium, Homostolus, *Lamprogrammus, Monomitopus, Neobythites, Porogadus, and Sirembo* possess coniform teeth arranged in multiple rows on the premaxilla and dentary

Spectrunculus possesses coniform teeth arranged in nine to ten rows on the premaxilla and dentary (Uiblein et al. 2008). Tooth attachment and replacement have not been investigated. *Sirembo* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Prokofiev 2008a). Tooth attachment and replacement have not been investigated.

Bythitidae:

Bythitinae: *Bellottia* (Nielsen et al. 2009), *Bythites* (Arai 1969), *Cataetyx* (Bañón 2001), *Grammonus* (Nielsen 2007), *Lucifuga* (Møller et al. 2006), *Saccogaster* (Cohen 1981), and *Tuamotuichthys** (Møller et al. 2006).

Bellottia possesses coniform teeth in one to five rows on the premaxilla and two to five rows on the dentary with the lingual most row containing the largest teeth (Nielsen et al. 2009). *Bythites, Cataetyx,* and *Grammonus* possess coniform teeth arranged in multiple rows on the premaxilla and dentary. *Lucifuga* possesses coniform teeth arranged in three to nine rows on the premaxilla and three to fourteen rows on the dentary (Møller et al. 2006). *Saccogaster* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary with the lingualmost row containing the largest teeth (Cohen 1981). *Tuamotuichthys* possesses coniform teeth arranged in eight rows on the premaxilla with the labialmost rows enlarged and four caniniform teeth present at the symphysis. The dentary has coniform teeth arranged in five rows with the lingualmost row containing the caniniform teeth. Tooth attachment and replacement have not been investigated.

Brosmophycinae: *Bidenichthys* (Paulin 1995), *Dinematichthys* (Machida 1994), *Gunterichthys* (Dawson 1966).

Bidenichthys possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Paulin 1995). *Dinematichthys* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary with the lingualmost row containing the largest teeth (Machida 1994). *Gunterichthys* possesses coniform teeth arranged in multiple anterior rows with the lingualmost row containing enlarged depressiform teeth on the premaxilla and dentary (Dawson 1966). Tooth attachment and replacement have not been investigated.

Aphyonidae: *Barathronus* (Nielsen 1984b) and *Parasciadonus* (Nielsen 1984a).

Barathronus and *Parasciadonus* possess coniform teeth arranged in two to three rows on the premaxilla and dentary. Tooth attachment and replacement have not been investigated.

Parabrotulidae: *Parabrotula* (Miya & Nielsen 1991) and *Leucobrotula* (Koefoed 1952).

Parabrotula possesses coniform teeth arranged in a single row on the premaxilla and dentary (Miya & Nielsen 1991). The premaxilla and dentary may be edentulous below 22 mm SL and 43.5mm SL respectively in some specimens (Miya & Nielsen 1991). *Leucobrotula* possesses coniform teeth arranged in a single row on the premaxilla and dentary. Koefoed (1952) hypothesized *Leucobrotula adipatus* (Koefoed) might be a gynandric heterodont. Tooth attachment and replacement have not been reported.

BATRCHOIDIFORMES

The maxilla is edentulous in all Batrachoidiformes.

Batrachoididae:

Batrachoidinae: *Allenbatrachus* (Greenfield 1997), *Batrachoides* (Collette & Russo 1981), *Batrachomoeus* (Hutchins 1976), *Halophryne* (Hutchins 1976), *Opsanus* (Schultz & Reid 1937), *Perulibatrachus* (Greenfield 2005b), *Sanopus* (Collette 1983), and *Triathalassothia* (Greenfield & Greenfield 1973).

Allenbatrachus possesses coniform teeth arranged in one to two rows on the premaxilla and dentary. The coniform teeth of *A. reticulatus* (Steindachner) are notably blunter. (Greenfield 1997). *Batrachoides* possesses coniform teeth on the premaxilla and dentary (Collette & Russo 1981). *Batrachomoeus* possesses coniform teeth arranged in two to three rows on the premaxilla and dentary (Hutchins 1976). *Halophryne* possesses coniform teeth arranged in two to four rows on the premaxilla and dentary (Hutchins 1976). *Opsanus* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Schultz & Reid 1937). *Perulibatrachus, Sanopus,* and *Triathalassothia* possess coniform teeth arranged in one to two rows on the premaxilla and dentary (Greenfield 2005b). Tooth attachment and replacement have not been investigated.

Porichthyinae: *Porichthys* (Hubbs & Schultz 1939).

Porichthys possesses coniform teeth arranged in a single row on the premaxilla and dentary. The dentary has coniform teeth anteriorly and caniniform teeth posteriorly in *P. analis* (Hubbs & Schultz 1939). Tooth attachment and replacement have not been investigated.

LOPHIIFORMES

Lophiidae: *Lophoides* (Ho et al. 2009c), *Lophiomus* (Higashi et al. 1983), *Lophius* (Kerebel et al. 1979), and *Sladenia* (Caruso & Bullis 1976).

Lophoides possesses coniform teeth arranged in three rows on the premaxilla and dentary with the largest teeth contained in the lingualmost row. Ho et al. (2009c) also described a single row of teeth present on the maxilla of *L. triradiatus* (Lloyd), but this is unlikely given that maxilla of lophiiformes is excluded from the gape. *Lophius* possesses coniform teeth in the labial row and both depressiform and coniform teeth on the lingual row on the premaxilla; the dentary has coniform teeth in the labialmost row, depressiform teeth are in the middle row and the largest depressiform teeth are present in the lingualmost row. "The more lingually located are the more depressible they are," observed Kerebel et al. (1979). *Sladenia* possesses coniform teeth on the premaxilla and dentary (Caruso & Bullis 1976). Tooth attachment is Type 4 based on the observations in *Lophiomus setigerus* (Vahl) *by* Higashi et al. (1983). Tooth replacement is extraosseus in *Lophius piscatorius* Linnaeus (Trapani 2001).

Antennariidae: *Antennarius* (Allen 1970), *Antennatus* (Randall & Holcom 2001), *Histiophryne* (Arnold & Pietsch 2011), and *Rycherus* (Ogilby 1907)

Antennarius and *Rycherus* possess depressiform teeth arranged in multiple rows on the premaxilla and dentary. *Antennatus* possesses depressiform teeth arranged in one to two rows on the premaxilla and three rows on the dentary with the lingualmost row containing the largest teeth (Randall & Holcom 2001). *Histiophryne* possesses coniform teeth arranged in two to four rows on the premaxilla and dentary (Arnold & Pietsch 2011). Tooth attachment has not been investigated. Tooth replacement is extraosseus in *Antennarius hispidius* (Bloch & Schneider).

Tetrabrachiidae: *Tetrabrachium* (Pietsch 1981).

Tetrabrachium possesses depressiform teeth arranged in a single row on the premaxilla and two rows on the dentary. Tooth attachment and replacement have not been investigated.

Lophichthyidae: *Lophichthys* (Boeseman 1964).

Lophichthys possesses coniform teeth arranged in two to three rows on the premaxilla and two rows on the dentary. Tooth attachment and replacement have not been investigated.

Brachionichthyidae: *Brachionichthys* (Last et al. 2007).

Brachionichthys possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Last et al. 2007). Tooth attachment and replacement have not been investigated.

Chaunacidae: *Bathychaunax* and *Chaunax* (Caruso 1989).

Caruso (1989) did not give a written description of the dentition of either *Bathychaunax* or *Chaunax*, but coniform teeth were illustrated (Fig. 2) on the premaxilla and dentary of both genera. Tooth attachment and replacement have not been investigated.

Ogcocephalidae: *Coelophrys* (Endo & Shinohara 1999), *Dibranchus* (Bradbury 1999), *Halieutopsis* (Ho & Shao 2007), *Halieutaea* (Powell 1937), *Halicmetus* (Ho et al. 2008), *Malthopsis* (Ho et al. 2009b), *Ogcocephalus* (Bradbury 1980), *Solocisquama* (Bradbury 1999) and *Zalieutes* (Bradbury 1967).

Coelophrys possesses sparse coniform teeth on the premaxilla and dentary (may be edentulous) (Bradbury 1967; Endo & Shinohara 1999). *Dibranchus* possesses depressiform teeth arranged in multiple rows on the premaxilla and dentary (Bradbury 1999). *Halieutopsis, Halieutaea, Halicmetus, Malthopsis, Ogcocephalus,* and *Zalieutes* possess coniform teeth arranged in multiple rows on the premaxilla and dentary. *Solocisquama* possesses depressiform teeth arranged in multiple rows on the premaxilla and dentary (Bradbury 1999). Tooth attachment is Type 4 in *D. hystrix* Garman (Fink 1981; Bradbury 1999). Tooth replacement was suggested to be extraosseus in *O. nasutus* (Cuvier) (Trapani 2001).

Ceratoidea: This superfamily contains families of anglerfishes, which have severe sexual dimorphism. In some cases only one of the two sexes is known and because of the parasitic or non-feeding nature of mature males, oral jaws and the dentition is very reduced and often edentulous, except in some genera of Linophryniidae (Pietsch 2009). This presents a severe case of gynandric heterodonty and unless otherwise noted dentition descriptions are limited to females.

Caulophrynidae: *Caulophryne* and *Robia* (Pietsch 1979).

Caulophryne and *Robia* possesses depressiform teeth arranged in a single row on the premaxilla and dentary (Pietsch 1979). Tooth attachment and replacement have not been investigated.

Neoceratiidae: *Neoceratias*.

No information on the dentition of this family could be located.

Himantolophidae: *Himantolophus* (Kharin 2006a)

Himantolophus possesses coniform teeth arranged in three rows on the premaxilla and dentary (Kharin 2006a). Tooth attachment and replacement have not been investigated.

Diceratiidae: *Diceratias* (Pietsch & Randall 1987) and *Bufoceratias* (Pietsch et al. 2004a).

Diceratias and *Bufoceratias* possess depressiform teeth arranged in multiple rows on the premaxilla and dentary. Tooth attachment and replacement have not been investigated.

Oneirodidae: *Bertella* (Pietsch 1973), Ctenochirichthys (Pietsch 1978b), *Dermatias* (Pietsch et al. 2004b), *Dolopichthys* (Leipertz & Pietsch 1987), *Oneirodes* (Grey 1956), *Puck* (Pietsch 1978b) and *Spiniphryne** (Pietsch et al. 2006).

Bertella possesses depressiform teeth arranged in a single row on the premaxilla and dentary usually grouped in separate sets of two to six posteriorly (Pietsch 1973). *Ctenochirichthys* and *Puck* possess depressiform teeth arranged in a single row on the premaxilla and dentary (Pietsch 1978b). *Dermatias* possesses depressiform teeth on the premaxilla and dentary (Pietsch et al. 2004b). *Dolopichthys* possesses depressiform teeth arranged in two rows on the premaxilla and dentary with the lingualmost row containing the largest teeth (Leipertz & Pietsch 1987). *Oneirodes* possesses depressiform teeth on the premaxilla and dentary (Grey 1956). *Spiniphryne* possesses two to three coniform teeth in the anteriormost positions on each premaxilla followed posteriorly by depressiform teeth arranged in a single row. The dentary has only depressiform teeth arranged in a single row. Pietsch et al. (2006) observed that the coniform teeth are only present in very well preserved specimens because these teeth are often lost or damaged. Tooth attachment is Type 4 *Oneirodes kreffti* Pietsch (Fink 1981). Tooth replacement has not been investigated.

Thaumatichthyidae: *Lasiognathus* (Bertelsen & Pietsch 1996) and *Thaumatichthys* (Bertelsen & Struhsaker 1977).

Lasiognathus possesses severely recurved caniniform teeth described as "hooked teeth" in multiple rows on the premaxilla and dentary (Bertelsen & Pietsch 1996). *Thaumatichthys* females possess severely recurved caniniform teeth described as "hooked teeth" in about six rows on the premaxilla. The dentary has smaller and less severely recurved teeth than premaxilla teeth and are arranged in about two to four rows. Tooth size and number of rows increases with size of individual (Bertelsen & Struhsaker 1977). Tooth attachment has not been investigated. Tooth replacement is extraosseous and ontogenetic changes in arrangement were examined by Bertelsen and Struhsaker (1977).

Centrophrynidae: *Centrophryne* (Pietsch 1972)

Centrophryne possesses depressiform teeth on the premaxilla and dentary with more teeth present on the premaxilla. Tooth size is variable throughout the jaws. Tooth attachment and replacement have not been investigated.

Ceratiidae: *Ceratias* and *Cryptopsaras* (Pietsch 1986).

Ceratiidae contains gyndric heterodonts. Free-living male ceratids have two pairs of "denticular teeth" on labial face of the upper and lower jaws. No teeth are present on the lingual side of the premaxilla and dentary. Parasitic males have degenerate jaws. Female ceratiids possess depressiform teeth on the premaxilla and dentary with the largest teeth on the dentary (Pietsch 1986). Tooth attachment and replacement have not been investigated.

Gigantactinidae: *Gigantactis* (Bertelsen & Pietsch 2002) and *Rhynchactis* (Bertelsen & Pietsch 1998).

Gigantactis contains gyndric heterodonts. Free-living male *Gigantactis* have "denticular teeth" on labial face of the upper and lower jaws. No teeth are present on the lingual side of the premaxilla and dentary. Parasitic males have degenerate jaws. Female *Gigantactis* possess depressiform teeth on the premaxilla and dentary with the largest teeth on the dentary (Bertelsen & Pietsch 2002). *Rhynchactis* are edentulous or bear very few teeth on the premaxilla and dentary as adults. Maxilla is present only in larvae (Bertelsen & Pietsch 1998). Tooth attachment and replacement have not been investigated.

Linophrynidae: *Acentrophryne* (Pietsch et al. 2005), *Halophryne*(Pietsch 2009), *Linophryne* (Bañón et al. 2006), and *Photocorynus* (Pietsch 2009).

Acentrophryne possesses caniniform teeth arranged in two to three rows on the premaxilla and dentary (Pietsch et al. 2005). *Linophryne* possesses caniniform teeth in a single row on the premaxilla and dentary with variation in size noted by Bañón et al. (2006). Male *Halophryne* and *Photocorynus* maintain coniform teeth as adults (Fig. 50 and 54)(Pietsch 2009). Tooth attachment and replacement have not been investigated.

MUGILIFORMES

The maxilla of all Mugiliformes is edentulous.

Mugilidae: *Agonostomus**(Schultz 1946), *Aldrichetta* (Thomson 1954), *Cestraeus* (Schultz 1946), *Chaenomugil* (Ebeling 1957), *Chelon* (Schultz 1946), *Crenimugil* (Thomson 1954), *Joturus* (Schultz 1946), *Liza* (Schultz 1946), *Mugil**(Ebeling 1957), *Myxus*, *Neomyxus*, *Rhinomugil* (Schultz 1946), *Valamugil* (Thomson 1954), and *Xenomugil* (Ebeling 1957).

Schultz (1946) described the teeth of several mugilids as ciliiform and setiform with out clear differences between the two designations. It seems likely that ciliform and setiform separate the two sizes of teeth seen in most mugilids. However, it was Ebeling (1957) that designated the enlarged teeth of the labialmost row on the premaxilla and dentary as primary teeth (often multicuspid) and all rows positioned ligually to primary teeth as secondary teeth. While dentition has been a common character used to distinguish mugilids, a lack of information on tooth attachment in many genera prevents conclusive categorization of tooth type and in many cases below cannot be further designated then coniform.

Agonostomus possesses coniform teeth in the labial most row followed by several lingual rows of bifidiform teeth; the dentary has coniform teeth arranged in multiple rows and only occasional bifidiform teeth (Schultz 1946). *Aldrichetta* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Thomson 1954). *Cestraeus* possesses coniform teeth arranged in multiple rows on the premaxilla; the dentary is edentulous (Schultz 1946). *Chaenomugil* possesses bicuspid suspensiform teeth arranged in about seven rows on the premaxilla and dentary. The tooth base has a long labial extension deep into the "fibrous band" unlike any other mugilid examined by Ebeling (1957). *Chelon* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary. Schultz (1946) originally described these teeth as "setiform" and "ciliiform." *Crenimugil* is edentulous in the oral jaws (Thomson 1954). *Joturus* possesses incisiform teeth arranged in multiple rows on the premaxilla. The dentary has "multicuspid" teeth arranged in multiple rows (Schultz 1946). *Liza* possesses tricuspid or bicuspid incisiform teeth arranged in a single row on the premaxilla; the dentary has coniform teeth (Schultz 1946). *Mugil* possesses either unicuspid or bicuspid suspensiform teeth with the labialmost row containing the largest teeth followed lingually by several rows of smaller unicuspid or bicuspid suspensiform teeth on the premaxilla and dentary (Ebeling 1957). *Myxus* possesses incisiform teeth arranged in a single row on the premaxilla and dentary (Schultz 1946). *Neomyxus* possesses tricuspid teeth arranged in two or three rows on the premaxilla and dentary (Schultz 1946). *Rhinomugil* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary. Schultz (1946) originally described these teeth as “setiform” and “ciliform.” *Valamugil* possesses a single sparse row of coniform teeth on the premaxilla and dentary (Thomson 1954). *Xenomugil* possesses unicuspid suspensiform teeth with the labialmost row containing the largest teeth followed by several lingual rows of unicuspid suspensiform teeth on the premaxilla and dentary (Ebeling 1957).

Tooth attachment is unique in the mugilid species examined previously, but tooth attachment has not been examined in most of the family. Tooth attachment in *Mugil* is hypothesized to be the least derived form and consists of unicuspid suspensiform teeth attached by a short “fibrous band” to the premaxilla and dentary in *M. hospes* Jordan & Culver. Among different species of *Mugil* the size of this band is highly variable with *M. cephalus* Linneaus representing the long variant of the band. While in *Chaenomugil,* this band is very long and a progenic serial replacement series is present for each functional tooth (Ebeling 1957). Tooth replacement is extraosseous with the replacement teeth of lingualmost row (primary) developing on the labial face of the premaxilla and dentary. Lingual rows (secondary) are also replaced extraosseously, but replacement teeth form in the tissue below functional teeth in *M. curema* Valenciennes, *M. cephalus, M. setosus* Gilbert, and *M. hospes*. In *Chaenomugil,* individual teeth are replaced by a progenic serial replacement series on labio-lingual face of the premaxilla and dentary. Each tooth series includes about 30 replacement teeth for each functional tooth series. The seven or so terminal teeth have emergent crowns and constitute the functional tooth rows (Ebeling 1957).

ATHERINIFORMES

The maxilla is edentulous in all Atheriniformes.

Atherinopsidae:

Atherinopsinae: *Atherinops, Atherinopsis* (Fowler 1903a; Dyer 1997), *Austromenidia* (Dyer 1997), *Basilichthys* (Fowler 1903a), *Colpichthys* (Crabtree 1989; Dyer 1997), *Leuresthes* and *Odontesthes* (Dyer 1997).

Atherinops possesses bifidiform teeth arranged in a two rows on the premaxilla and dentary with cusps of equal in size (Dyer 1997). Murphy (1947) found that specimens under 39.6 mm did not possess bifidiform teeth, and that bifidiform teeth first develop on the dentary. Additionally southern populations in California develop bifidiform teeth approximately 6mm before northern populations (Murphy 1947). *Atherinopsis* possesses coniform teeth arranged in three rows on the premaxilla and dentary (Fowler 1903a; Dyer 1997). *Austromenidia* possesses coniform teeth arranged in two rows on the premaxilla and dentary (Dyer 1997). *Basilichthys* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Fowler 1903a; Dyer 1997). *Colpichthys* possesses bifidiform teeth arranged in a two rows on the premaxilla and dentary. The lateral cusp is usually enlarged (Crabtree 1989; Dyer 1997). *Leuresthes* possesses coniform teeth arranged in three rows on the premaxilla and dentary (Dyer 1997). *Odontesthes* possesses coniform teeth arranged in two rows on the premaxilla and dentary. *O. hatcheri* (Eigenmann) has more then three rows of teeth (Dyer 1997). Tooth attachment and replacement have not been investigated.

Menidiinae: *Atherinella* (Chernoff 1986).

Atherinella possesses coniform teeth arranged in two to four irregular rows on the premaxilla and two to three rows on the dentary with the labialmost tooth rows containing the largest teeth. Tooth attachment and replacement have not been investigated.

Notocheiridae: *Iso* (Saeed et al. 1993) and *Notocheirus* (Clark 1937).

Iso and *Notocheirus* possess coniform teeth on the premaxilla and dentary (Clark 1937; Saeed et al. 1993). Tooth attachment and replacement have not been investigated.

Melanotaeniidae:

Allen (1980) described the dentition of Melanotaeniidae as “conical to caniniform,” however it is unclear what size or arrangement differences distinguish these two tooth designations. In response to this limitation and in examination of the figures provided (Fig. 9 & 23) I have classified these teeth as only coniform.

Bedotiinae: *Bedotia* (Sparks & Schaefer 2001) and *Rheocles* (Stiassny et al. 2002).

Bedotia possesses coniform teeth arranged in three to four rows on the premaxilla and dentary (Sparks & Schaefer 2001). *Rheocles* possesses coniform teeth arranged in four to six rows on the premaxilla and denary (Stiassny et al. 2002). Tooth attachment and replacement have not been investigated.

Melanotaeniinae: *Cairnsichthys, Chilantherina, Glossolepis, Iriatherina, Melanotaenia*, *Pelangia* (Allen 1998a), and *Rhadinocentrus* (Allen 1980).

Cairnsichthys possesses coniform teeth arranged in multiple rows on the premaxilla and dentary with several rows extending onto the labial face of premaxilla (Allen 1980). *Chilantherina, Iriatherina, Melanotaenia* and *Rhadinocentrus* possess coniform teeth arranged in multiple rows on the premaxilla and dentary with several rows extending onto the labial face of premaxilla. *Glossolepis* and *Pelangia* possess coniform teeth arranged in multiple rows on the premaxilla and dentary with several rows extending onto the labial face of premaxilla. The labialmost row on the premaxilla notably enlarged. Tooth attachment and replacement have not been investigated.

Pseudomugilinae: *Kiunga* (Allen 1983) and *Pseudomugil* (Saeed et al. 1989).

Kiunga possesses coniform teeth arranged in two to four rows on the premaxilla and dentary with the labial most row containing the largest teeth (Allen 1983). *Pseudomugil* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary. Some species have enlarged teeth posteriorly on the premaxilla as in *P. signifier* Kner (Saeed et al. 1989). Tooth attachment and replacement have not been investigated.

Telmatherinidae: *Kalyptatherina* (Saeed & Ivantsoff 1991) and *Marosatherina* (Aarn et al. 1998).

Kalyptatherina possesses coniform teeth on the premaxilla and dentary (Saeed & Ivantsoff 1991). *Marosatherina* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Aarn et al. 1998). Tooth attachment and replacement have not been investigated.

Antherionidae: *Atherion* (Smith 1965a; Sire & Allizard 2001).

Atherion possesses coniform teeth arranged in a single row on the premaxilla and dentary (Smith 1965a). Sire and Allizard (2001) found that the “extraoral denticles” of *A.*

elymus Jordan & Starks are structurally very similar to the teeth present on the oral jaws. Tooth attachment and replacement have not been investigated.

Phallostethidae:

Phallostetiids possesses a unique paradentary bone positioned on the labial side of the dentary. The paradentary may or may not bear a single row of coniform teeth (Parenti 1984).

Dentatherininae: *Dentatherina* (Patten & Ivantsoff 1983; Parenti 1984).

Dentatherina possesses coniform teeth arranged in a single row on the premaxilla. The dentary is edentulous or bares very few coniform teeth. The paradentary has single row of coniform teeth (Patten & Ivantsoff 1983; Parenti 1984). Tooth attachment and replacement have not been investigated.

Phallostethinae: *Gulaphallus* (Villadolid & Manacop 1934), *Neostethus* (Parenti & Louie 1998), *Phallostethus* (Parenti 1996) and Phenacostethus (Bailey 1936).

Gulaphallus possesses coniform teeth arranged in two rows on the premaxilla and dentary with the labial row of the premaxilla containing the largest teeth. Paradentary dentition was not described by Villadolid and Manacop (1934). *Neostethus* possesses coniform teeth arranged in one or more irregular rows on the premaxilla and dentary. The paradentary is edentulous. (Parenti & Louie 1998). *Phallostethus* possesses coniform teeth arranged in one or more irregular rows on the premaxilla and dentary. The paradentary has single row of coniform teeth (Parenti 1996). *Phenacostethus* possesses coniform teeth arranged in a single row on the premaxilla; the dentary has very sparse coniform teeth near the symphysis. Paradentary dentition was not described by Bailey (1936). Tooth attachment and replacement have not been investigated.

Atherinidae:

Atherinomorinae: *Atherinomorus* (Prince et al. 1982; Ivantsoff & Crowley 1991), *Hypoatherina* (Ivantsoff & Kottelat 1988), and *Teramulus* (Smith 1965a).

Atherinomorus possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Prince et al. 1982; Ivantsoff & Crowley 1991). *Hypoatherina* possesses coniform teeth arranged in multiple rows on the premaxilla. The dentary has sparse coniform teeth (Ivantsoff & Kottelat 1988). *Teramulus* possesses coniform teeth on the premaxilla and dentary (Smith 1965a). Tooth attachment and replacement have not been investigated.

Craterocephalinae: *Craterocephalus* (Backhouse et al. 2008).

Craterocephalus possesses coniform teeth arranged in a single row on the premaxilla and dentary (Backhouse et al. 2008). Tooth attachment and replacement have not been investigated.

Atherininae: *Atherinason* (Pavlov et al. 1988), *Atherinosoma* (Prince et al. 1982), *Kestratherina* (Pavlov et al. 1988), and *Leptatherina* (Pavlov et al. 1988).

Atherinason is edentulous on the oral jaws (Pavlov et al. 1988). *Atherinosoma, Kestratherina,* and *Leptatherina* possess coniform teeth on the premaxilla and dentary. Tooth attachment and replacement have not been investigated.

BELONIFORMES

Adrianichthyidae:

Oryziinae: *Oryzias**.

Parenti (2008) described the teeth of *Oryzias* as "caniniform" and the large teeth present posteriorly on the jaws as "enlarged." In response to the Parenti (1987) illustration of the dentition of *Oryzias latipes* jaws (Fig. 1&2) I have designated the “enlarged teeth” as caniniform based on tooth size and the specific arrangement on the premaxilla and dentary. All other teeth are designated as coniform.

Oryzias contains gynandric heterodonts. Females usually possess coniform teeth arranged in one to three irregular rows on the premaxilla and dentary depending upon the species. Males usually possess coniform teeth anteriorly with several caniniform teeth present in the posteriormost tooth positions on the premaxilla and dentary. However depending upon the species these caniniform teeth may only be present on the premaxilla and may be present on the premaxilla of females in some species. *O. matanensis* (Aurich) females have caniniform teeth on only the dentary while both male and female *O. minutillus* Smith have no caniniform teeth. See Parenti (2008) for detailed descriptions of the dentition in *Oryzias* species.

Adrianichthyinae: *Adrianichthys* (Parenti 2008).

Adrianichthys possesses coniform teeth arranged in two to five rows on the premaxilla and dentary depending upon the species (Parenti 2008). Tooth attachment and replacement have not been investigated.

Exocoetidae:

Fodiatorinae: *Fodiator* (Parin & Belyanina 2002).

Fodiator possesses coniform teeth on the premaxilla and dentary (Parin & Belyanina 2002). Tooth attachment and replacement have not been investigated.

Exocoetinae: *Cheilopogon** (Shakhovskoy 2007), *Cypselurus** (Parin & Bogorodskiy 2011), *Hirundichthys* (Kharin & Saveliev 2011), and *Prognichthys* (Kharin et al. 2007).

Cheilopogon possesses primarily coniform teeth arranged in two to three rows on the premaxilla and dentary. Occasionally weakly tridentiform teeth develop (Shakhovskoy 2007). *Cypselurus* possesses coniform, weakly bifidiform or tridentiform teeth arranged in two to three rows on the premaxilla and dentary. *C. hexazona* (Bleeker) is exceptional in having coniform teeth arranged a single row on the premaxilla and dentary (Parin & Bogorodskiy 2011). Breder and Nichols (1930) examined the variation in tooth shape among species of *Cypselurus* and found that similar tooth shapes reflected the relationships among species. *Hirundichthys* and *Prognichthys* possess coniform teeth on the premaxilla and dentary. Tooth attachment and replacement have not been investigated.

Hemiramphidae:

Hemiramphinae: *Arrhampus* (Tibbetts & Carseldine 2003), *Chriodorus* (Goode & Bean 1882), and *Hyporhamphus** (Collette & Su 1986).

Arrhampus possesses tridentiform teeth arranged in multiple rows on the premaxilla and dentary (Tibbetts & Carseldine 2003). *Chriodorus* possesses tridentiform teeth arranged in two rows on the premaxilla and dentary with the labial row containing the largest teeth (Goode & Bean 1882). *Hyporhamphus* possesses coniform and tridentiform with a few species possessing only tridentiform teeth arranged in two to five (four to eight in *H. limbatus*) rows on the premaxilla and dentary with the labialmost row containing the largest teeth. Collette and Su (1986) illustrated (Fig. 4) the variation seen between species in the tridentiform teeth as well a giving detailed descriptions of dentition. Tooth attachment and replacement have not been investigated.

Zenarchopterinae: *Dermogenys* (Clemen et al. 1997; Greven et al. 1997; Shakhovskoy 2002), *Nomorhampus* (Huylebrouck et al. 2012), *Tondanichthys* (Meisner 2001), and *Zenarchopterus* (Collette & Su 1986).

Dermogenys and *Tondanichthys* possesses coniform teeth arranged in three to four rows on the premaxilla and dentary with the labialmost row containing the largest teeth. *Nomorhampus* possesses coniform teeth arranged in two to three rows on the premaxilla and dentary (Huylebrouck et al. 2012). *Zenarchopterus* possesses coniform teeth on the premaxilla and dentary (Collette & Su 1986). Tooth attachment is Type 2 in *Hemiramphus balao* (Fink 1981). Based on observations by Greven et al. (1997) tooth attachment in *D. pusillus* Kuhl & van Hasselt (Fig. 6) is Type 2, but the authors also noted that the collaged attachment was expanded on the lingual face of some teeth. Tooth development was examined in *D. pusillus* by Clemen et al. (1997).

Belonidae: *Ablennes*, *Belone* (Mees 1962), *Petalichthys* (Regan 1904; Mees 1962), *Potamorrhaphis* (Sant'Anna et al. 2012), *Stronglyura*, *Tylosurus* (Mees 1962) and *Xenentodon* (Foster 1973).

Ablennes possesses coniform teeth on the premaxilla and dentary (Mees 1962). *Belone* possesses coniform teeth on in at least two rows the premaxilla and dentary. Mees (1962) observed teeth on the maxilla of *B. belone*, but I suspect this to be a nomenclatural error since the maxilla is excluded from the gape in beloniforms. Mees (1962) also observed tooth size increased with specimen size. *Petalichthys, Stronglyura, Tylosurus,* and *Xenentondon* possess coniform teeth on the premaxilla and dentary. *Potamorrhaphis* possesses coniform teeth arranged in four to five rows on the premaxilla and dentary with the lingualmost row containing the largest teeth (Sant'Anna et al. 2012). Tooth attachment is Type 2 in *S. leiura* (Fink 1981). Tooth replacement was extraosseus in *S. notata* (Poey)*,* *S. timucu* (Walbaum)*,* and *Tylosurus raphidoma* (Péron & Lesueur) (Trapani 2001).

Scomberesocidae: *Cololabis* (Chapman 1943; Böhlke 1951).

Cololabis possesses coniform teeth arranged in a single row on the premaxilla and dentary (Böhlke 1951). The dentary is edentulous in *C. saira* (Chapman 1943). Tooth attachment is Type 2 in *Scomberesox* sp. (Fink 1981). Tooth replacement has not been investigated.

CYPRINODONTIFORMES

The maxilla is edentulous in cyprinodotiforms.

Aplocheilidae: *Aplocheilus* (Kulkarni 1948) and *Pachypanchax* (Loiselle 2006).

Aplocheilus posseses coniform teeth arranged in two to three rows on the premaxilla and dentary with the labialmost row containing the largest teeth (Kulkarni 1948). *Pachypanchax* possesses coniform teeth arranged in a single row on the premaxilla and dentary (Loiselle 2006). Tooth attachment and replacement has not been investigated.

Nothobranchiidae: *Aphyosemion* (Van der Zee & Sonnenberg 2010; Van der Zee & Sonnenberg 2011), *Callopanchax* (Costa 2009a), *Fenerbahce* (Sonnenberg et al. 2011), and *Nothobranchius* (Chambers 1984).

Aphyosemion, Callopanchax, Fenerbahce possesses coniform teeth arranged in multiple rows with enlarged teeth in the labialmost row of the premaxilla and dentary. *Nothobranchius* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary with the labialmost row containing coniform teeth of "one-and-a-half times to twice as long as the rest in both jaws" (Chambers 1984). Tooth attachment and replacement has not been investigated.

Rivulidae: *Austrofundulus* (Weitzman & Wourms 1967), *Austrolebias* (Costa 2009b), *Cynolebias* (Loureiro & De Sá 1998), *Cynopoecilus* (Costa 1995), *Moema* (Costa 2003), *Nematolebias* (Costa 2006), *Pterolebias* (Costa 2005), Rachovia, *Simpsonichthys* (Costa 2006), and Trigonectes.

Austrofundulus possesses coniform teeth arranged in three irregular rows on premaxilla and dentary with the labialmost row containing the largest teeth (Weitzman & Wourms 1967). *Austrolebias* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary with the labialmost row containing the largest teeth(Costa 2009b). Costa (2009b) illustrates the jaws of several species with enlarged teeth but only describes the teeth as "distinctly larger." *Cynolebias* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary with the labialmost row containing a several (usually four) enlarged teeth (Loureiro & De Sá 1998). *Cynopoecilus, Nematolebias,* and *Pterolebias* possess coniform teeth arranged in multiple rows on the premaxilla and dentary with the labialmost row containing the largest teeth. *Moema* and *Rachovia* possess coniform teeth arranged in multiple rows on the premaxilla and dentary. *Simpsonichthys* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary with labialmost row containing the largest teeth. In some species the enlarged teeth are recurved anteriorly (Costa 2006). *Trigonectes* possesses coniform teeth on the premaxilla and dentary (Fig. 2) (Costa 1990). Tooth attachment has not been investigated. Tooth replacement was suggested to be extraosseous in *R. santensis* by Trapani (2001).

Profundulidae: *Profundulus* (Miller 1955).

Profundulus possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Miller 1955). Tooth attachment and replacement have not been investigated.

Goodeidae:

Empertrichthyinae: *Crenichthys,** and *Empetrichthys* (Uyeno & Miller 1962).

Crenichthys possesses large bifidiform teeth in the labialmost row followed lingually by rows of smaller coniform teeth on the premaxilla and dentary(Uyeno & Miller 1962). *Empetrichthys* possesses coniform teeth arranged in two to three rows on the premaxilla and dentary with the largest teeth contained in the labialmost row (Uyeno & Miller 1962). Tooth attachment and replacement has not been investigated.

Goodeinae: *Allodontichthys* (Turner 1946), *Allotoca* (Smith & Miller 1987), *Ameca* (Miller & Fitzsimons 1971), *Chapalichthys* (Meek 1902; Miller & Fitzsimons 1971), *Characodon** (Miller & Fitzsimons 1971), *Girardinichthys* (Sedeño-Díaz & López-López 2009), *Goodea** (Hubbs & Turner 1939), *Skiffia** (Kingston 1978), *Xenoophorus** (Miller & Fitzsimons 1971), *Xenotaenia** (Turner 1946), *Xenotoca** (Fitzsimons 1972) and *Zoogoneticus* (Webb & Miller 1998).

Allodontichthys possesses weakly tridentiform with very small lateral cusps arranged in two rows on the premaxilla and dentary with the largest teeth contained in the labialmost row (Turner 1946). However *A. hubbsi* (Miller & Uyeno), has strongly tridentiform teeth rather then the weak lateral cusps of other species (Rauchenberger 1988). *Allotoca* possesses coniform teeth arranged in two rows on the premaxilla and dentary with the largest teeth contained in the labialmost row (Smith & Miller 1987). *Ameca* possesses large bifidiform teeth in the labialmost row followed lingually by rows of smaller bifidiform teeth on the premaxilla and dentary. The lingual rows may be coniform in small juveniles (Miller & Fitzsimons 1971). *Chapalichthys* possesses bifidform teeth arranged in two rows on the premaxilla and dentary with the largest teeth contained in the labialmost row (Meek 1902). Labialmost tooth row will be coniform in juvenile *C. encaustus* (Jordan & Snyder) (less than 20mm SL)(Miller & Fitzsimons 1971). *Characodon* possesses bifidiform or tridentiform (in largest individuals) teeth arranged in two rows on the premaxilla and dentary with the largest teeth contained in the labialmost row. The lingual row contains coniform teeth (Smith & Miller 1986). Juveniles my have all coniform teeth (11-18mm SL) then develop coniform on the premaxilla and bifidiform on the dentary (22-36mm SL) with only bifidiform teeth in adults (36-50mm SL)(Miller & Fitzsimons 1971). *Girardinichthys* possesses coniform teeth on the premaxilla and dentary (Sedeño-Díaz & López-López 2009). *Goodea* possesses large bifidiform teeth in the labialmost row followed lingually by rows of smaller coniform teeth on the premaxilla and dentary (Hubbs & Turner 1939). *Skiffia* possesses large bifidiform teeth in the labialmost row followed lingually by rows of smaller bifidiform and coniform teeth on the premaxilla and dentary (Kingston 1978). *Xenoophorus* possesses large bifidiform teeth in the labialmost row followed lingually by rows of smaller bifidiform and coniform teeth on the premaxilla and dentary (Miller & Fitzsimons 1971). *Xenotaenia* possesses large bifidiform teeth in the labialmost row followed lingually by rows of smaller bifidiform and coniform teeth on the premaxilla and dentary (Turner 1946). *Xenotoca* possesses large bifidiform teeth in the labialmost row followed by several lingual rows of smaller coniform teeth on the premaxilla and dentary. Juveniles less than 15mm SL have only coniform teeth in labialmost row. Species specific tooth development was examined by Fitzsimons (1972). *Zoogoneticus* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary with the largest teeth contained in the labialmost row (Webb & Miller 1998).

Tooth attachment has not been investigated. Tooth replacement is extraosseous in *G. atripinnis Jordan* and intraosseous in *Alloophorus robustus* (Trapani 2001).

Fundulidae: *Fundulus, Leptolucania,* and *Lucania* (Ghedotti & Davis 2013).

Fundulus possesses coniform teeth arranged in multiple rows on the premaxilla and dentary with the labialmost row containing the largest teeth. *Leptolucania* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary. *Lucania* possesses coniform teeth arranged in a single row on the premaxilla and dentary (Ghedotti & Davis 2013). Tooth attachment is Type 2 in *F. heteroclitus* (Linnaeus) (Fink 1981). Tooth replacement is extraosseous in *F. diaphanus* (Lesueur) and *F. olivaceous* (Storer).

Valenciidae: *Valencia* (Parenti 1981).

Valencia possesses coniform teeth arranged in two to three rows on the premaxilla and dentary (Parenti 1981). Tooth attachment and replacement have not been investigated.

Cyprinodontidae:

Cubanichthyinae: *Cubanichthys* (Parenti 1981).

Cubanichthys possesses coniform teeth arranged in two to three rows on the premaxilla and dentary (Parenti 1981). Tooth attachment and replacement have not been investigated.

Cyprinodontinae: *Aphanius, Cualac, Cyprinodon, Floridichthys, Jordanella, Kosswigichthys, Megupsilon,* and *Onestias* (Parenti 1981).

Aphanius possesses tridentiform teeth arranged in a single row on the premaxilla and dentary (Parenti 1981). Variation in the shape of tridentiform teeth was observed in hybrids between *A. dispar* and *A. mento* (Goren & Rychwalski 1978). *Cualac* possesses coniform teeth arranged in a single row on the premaxilla and dentary (Parenti 1981).

Cyprinodon possesses coniform teeth arranged in a single row on the premaxilla and dentary (Parenti 1981). Subtle insterspecific variations in the shape of tridentiform teeth exist in *Cyprinodon* (Miller 1943) *Floridichthys* and *Jordanella* possesses coniform teeth arranged in a single row on the premaxilla and dentary (Parenti 1981). *Kosswigichthys, Megupsilon,* and *Orestias* possesses tridentiform teeth arranged in a single row on the premaxilla and dentary (Parenti 1981). Tooth attachment has not been investigated. Tooth replacement is extraosseous in *Cyprinodon variegatus* (Trapani 2001).

Anablepidae:

Anablepinae: *Anableps** and <u>*Jenynsia*</u> (Parenti 1981).

Anableps possesses tridentiform teeth with weak lateral cusps in the labialmost row and are followed by several lingual rows of smaller coniform and weakly tridentiform teeth on the premaxilla and dentary. More lateral cusps were observed in juveniles and embryos of *A. dowi* (Parenti 1981). Owen (1866) reported depressible teeth in *Anableps*, but tooth attachment remains unreported. *Jenynsia* possesses tridentiform teeth in the labialmost row and are followed lingually by several rows of smaller tridentiform teeth on the premaxilla and dentary(Parenti 1981). Tooth attachment and replacement have not been investigated.

Oxzygonectinae: *Oxyzygonectes** (Parenti 1981).

Oxyzygonectes possesses coniform teeth in the labialmost row, which are followed lingually by several rows of smaller tridentiform teeth on the premaxilla and dentary. The labialmost row of teeth in juveniles is tridentiform with weak lateral cusps. Tooth attachment and replacement have not been investigated.

Poeciliidae:

The dentition of Poeciliidae is highly diverse and different terminology has been applied to it in several different large reviews, but it remains very difficult to categorize tooth types based on written descriptions teeth. Additional comparisons of dentitions across the family are needed to clarify tooth types further.

Aplocheilichthyinae: *Aplocheilichthys* (Myers 1938).

Aplocheilichthys possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Myers 1938). Tooth attachment and replacement have not been investigated.

Procatopodinae: *Fluviphylax* (Costa & Bail 1999), *Hypsopanchax*, *Lamprichthys* (Ghedotti 2000), *Micropanchax* (Myers 1924), *Platypanchax, Pantanodon, Procatopus* (Ghedotti 2000), *Plataplochilus**(Myers 1938).

Fluviphylax possesses coniform teeth on the premaxilla and dentary (Costa & Bail 1999). *Hypsopanchax, Lamprichthys, Platypanchax, Pantanodon, Procatopus,* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Ghedotti 2000). *Micropanchax* possesses coniform teeth arranged in a single row on the premaxilla and dentary (Myers 1924). *Plataplochilus* possesses coniform teeth arranged in multiple rows on the premaxilla with the labialmost row containing the smallest teeth. The dentary has caniniform teeth in the labialmost row and two lingual rows of coniform teeth (Myers 1938). Tooth attachment and replacement have not been investigated.

Poeciliinae: *Alfaro* (Hubbs 1931), *Belonesox* (Greven & Brenner 2008), *Brachyrhaphis* (Hubbs 1935; Bussing 1988), *Cnesterodon** (Rosa & Wilson 1993; Ghedotti 2000), *Gambusia* (Meyer et al. 2010), Heterandria (Ghedotti 2000), *Limia** (Rodriguez 1997), *Pamphorichthys* (Rodriguez 1997), *Phallichthys, Phalloceros, Phallotorynus* (Ghedotti 2000), *Poecilia** (Rodriguez 1997), *Poeciliopsis** (Schultz 1969; Miller 1975), *Priapella* (Rodriguez 1997), *Quintana* (Hubbs 1934), *Tomeurus* (Ghedotti 2000), and *Xiphophorus** (Rodriguez 1997).

Alfaro possesses coniform teeth arranged in three rows on the premaxilla and dentary with the labialmost row containing the largest teeth (Hubbs 1931; Rodriguez 1997). *Belonesox* possesses depressiform teeth arranged in four to five rows on the premaxilla and two to three rows on the dentary. Greven and Brenner (2008) hypothesized that some of the posterior most teeth might be attached by Type 2 or Type 3 attachment, but admitted this needed further study to be conclusive. *Brachyrhaphis* possesses coniform teeth in three rows on the premaxilla and dentary with the labialmost row containing the largest teeth (Hubbs 1935; Bussing 1988). *Cnesterodon* possesses either incisiform or coniform teeth in the labialmost row followed lingually by several rows of coniform teeth on the premaxilla and dentary. The labialmost rows are caniniform in *C. septentrionalis* Rosa & Costa. Rosa and Wilson (1993) reported usually incisiform teeth in the labialmost row of *C. decemmaculatus* (Jenyns) while Ghedotti (2000) observed only coniform teeth. *Gambusia* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary with the labial most row containing the largest teeth (Meyer et al. 2010). *Heterandria* possesses labiolingually flattened coniform teeth followed lingually by several rows of coniform on the premaxilla and dentary (Ghedotti 2000). *Limia* possesses incisiform teeth in the labialmost row followed lingually by multiple rows of only coniform teeth or both coniform and tridentiform teeth on the premaxilla and dentary (Rodriguez 1997). *Pamphorichthys* possesses incisiform teeth arranged in multiple rows on the premaxilla and dentary with the labialmost row containing the largest teeth (Rodriguez 1997). *Phallichthys, Phalloceros,* and *Phallotorynus* possess labiolinugally flattened coniform teeth followed by several lingual rows of coniform on the premaxilla and dentary. *Poecilia* possesses elongate incisiform teeth in the labialmost row followed by several lingual rows of slightly labio-lingually flattened coniform teeth (lingual rows are tridentiform in five species)(Rodriguez 1997). *Poeciliopsis* possesses either depressiform teeth arranged in a single row (two rows in *P. catemaco*) on the premaxilla and dentary (Miller 1975) or elongate incisiform teeth in the labialmost row followed by one to six lingual rows of either tridentiform or coniform teeth depending upon the species (Schultz 1969). Schultz (1969) found that an intermediate combination of teeth existed in hybrids of *P. lucida* (coniform lingual teeth) and *P. monacha* (tridentiform lingual teeth). *Priapella* possesses coniform teeth arranged in three rows on the premaxilla and dentary with the middle row containing the smallest teeth (Rodriguez 1997). *Quintana* possesses coniform teeth arranged in a single row on the premaxilla and dentary (Hubbs 1934). *Tomeurus* possesses coniform teeth in multiple rows on the premaxilla and dentary (Ghedotti 2000). *Xiphophorus* possesses elongate incisiform teeth in the labialmost row followed lingually by several rows of slightly labio-lingually flattened coniform teeth (Rodriguez 1997).

Tooth attachment seems to be a point of confusion in Poeciliidae. Lucinda and Reis (2005) observed "firmly rooted teeth" in *Alfaro, Brachyraphis, Priapichthys, Priapella, Heterandria, Gambusia, Pseudopoecilia, Neoheterandria, Scolichthys, Cnesterodon brevirostratus* and *C. septentrionalis*. In *Girardinus, Phallichthys, Xenophallus, Poeciliopsis, Phalloptychus, Quintana, Carlhubbsia, Xiphophorus, xenodexia, Poecilia, Limia, Pamphorichthys, Micropoecilia, Cnesterodon* (reversals in *C. brevisotratus and C.*

septenreionalis), *Phallotorynus,* and *Phalloceros tooth attachment was* moveable, but no Type was designated. However, they also list *Belonesox* teeth as firmly rooted, but specimen examination and work by Greven and Brenner (2008) agree that *Belonesox* possess depressiform teeth usually with Type 4 attachment. Tooth replacement was intraosseous in *Poecilia* spp. and extraosseous in *Belonesox belizanus* (Trapani 2001).

STEPHANOBERYCIFORMES

The maxilla is edentulous in stephanoberyciforms.

Melamphaidae: *Melamphaes* (Kotlyar 2011), *Poromitra* (Kotlyar 2008), *Scopeloberyx* (Kotlyar 2004), *Scopelogadus*, and *Sio* (Kotlyar 1991).

Melamphaes possesses coniform teeth arranged in two to three rows on the premaxilla and dentary (Kotlyar 2011). *Poromitra* possesses coniform teeth arranged in a single row on the premaxilla and dentary (Kotlyar 2008). *Scopeloberyx*, *Scopelogadus,* and *Sio* possess coniform teeth premaxilla and dentary (Kotlyar 1991). Tooth attachment and tooth replacement have not been investigated.

Stephanoberycidae: *Abyssoberyx* (Merrett & Moore 2005).

Abyssoberyx possesses coniform teeth arranged in six to ten rows on the premaxilla and dentary. The lingual six rows of coniform teeth are more sharply conical then the labial rows (Merrett & Moore 2005). Tooth attachment and tooth replacement have not been investigated.

Hispodoberycidae: *Hispidoberyx*.

No information on the dentition of this family could be located.

Gibberichthyidae: *Gibberichthys*.

No information on the dentition of this family could be located.

Rondeletiidae: *Rondeletia* (Goode et al. 1894; Kharin 2006b).

Rondeletia possesses coniform teeth in multiple rows on the premaxilla and dentary (Kharin 2006b). Tooth attachment and tooth replacement have not been investigated.

Barbourisiidae: *Barbourisia* (Kotlyar 1995).

Barbourisia possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Kotlyar 1995). Tooth attachment and tooth replacement have not been investigated.

Cetomimidae: *Cetichthys, Cetomimus, Cetostoma, Danacetichthys, Ditropichthys, Gyrinomimus, Notocetichthys, Procetichthys, and Rhamphocetichthys* (Paxton 1989).

Within Cetomimidae the depressiform and coniform teeth vary in shape among genera and this variation was well illustrated by Paxton (1989) (Fig. 2). The information on dentition provided by Paxton (1989) is limited to female cetomimids since recent findings have shown that the families Mirapinnidae and Megalomycteridae are actually immature developmental stages or fully mature males of cetomimids. Within the now invalid Megalomycteridae, Goodyear (1970) found coniform teeth on only the premaxilla of *Ataxolepis henactis* (Goodyear), and Myers and Freihofer (1966) concluded that *Megalomycter teevani* (Myers & Freihofer) possesses coniform teeth arranged in a single row on the premaxilla and two to three rows on the dentary. However, due to the unknown taxanomic status of these genera they have not been included. Once these highly sexually dimorophic cetomimids are further examined it is very likely these species will include gynandric heterodonts.

Cetichthys possesses depressiform teeth arranged in three to six diagonal rows (depending upon species) on the premaxilla and dentary with the lingualmost row containing the largest teeth. Paxton (1989) observed that as the size of specimens increased so did the number of rows and the number of teeth in a single row. *Cetomimus, Ditropichthys,* and *Notocetichthys* possess depressiform teeth arranged in multiple diagonal rows on the premaxilla and dentary. *Cetostoma* possesses depressiform teeth arranged in multiple diagonal rows depending upon species on the premaxilla and dentary (Paxton 1989). *Danacetichthys* possesses depressiform teeth arranged in three to four longitudinal rows on the premaxilla and three to five rows on the dentary (Paxton 1989). *Gyrinomimus* possesses depressiform teeth arranged in longitudinal rows on the premaxilla and dentary. Paxton (1989) observed that as the size of specimens increased so did the number of rows and the number of teeth in a single row. *Procetichthys* possesses coniform teeth arranged in one to two longitudinal rows on the premaxilla and dentary (Paxton 1989). *Rhamphocetichthys* possesses coniform teeth arranged in three to six diagonal rows on the premaxilla and six to nine rows on the dentary (Paxton 1989).

Tooth attachment is Type 4 in *Gyrinomimus grahami* (Richardson & Garrick) and *Cetomimus craneae* (Harry). The coniform teeth of *Procetichthys kreffti* (Paxton) were non-depressible, but no attachement Type was designated. Paxton (1989) made a general observation that teeth are depressible lingually in Cemtomimidae, but admitted difficulty in determining mode of attachment in most specimens. Additionally, it was noted that some teeth in *G. grahami* were not fully ossified.

BERYCIFORMES

The maxilla is edentulous in Beryciformes.

Anoplogastridae: *Anoplogaster* (Moore 2003a).

Anoplogaster possesses caniniform teeth on the premaxilla and dentary. Juveniles possess small coniform teeth arranged in multiple rows (Moore 2003a). Tooth attachment and tooth replacement have not been investigated.

Diretmidae: *Diretmichthys*, *Diretmoides* and *Diretmus* (Moore 2003c).

Diretmichthys, *Diretmoides* and *Diretmus* possess coniform teeth arranged in multiple rows on the premaxilla and dentary (Moore 2003c). Tooth attachment and tooth replacement have not been investigated.

Anomalopidae: *Krytophanaron* (Colin et al. 1979), *Photoblepharon* (Baldwin et al. 1997), and *Parmops* (Rosenblatt & Johnson 1991).

Krytophanaron possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Colin et al. 1979). *Photoblepharon* and *Parmops* possess coniform teeth arranged multiple rows on the premaxilla and dentary with largest teeth at the symphysis. Tooth attachment and tooth replacement have not been investigated.

Monocentridae: *Cleiopus* and *Mononcentris* (Kotlyar 1985).

Cleiopus and *Mononcentris* possess coniform teeth arranged in multiple rows on the premaxilla and dentary (Kotlyar 1985). Tooth attachment and tooth replacement have not been investigated.

Trachichthyidae: *Hoplostethus* (Moore & Dodd 2010), *Optivus* (Paulin 1979; Gomon 2004), and *Paratrachichthys* (Gon 1983; Gon 1987).

Hoplostethus and *Optivus* possess coniform teeth arranged in multiple rows on the premaxilla and dentary with the largest teeth at the symphysis. *Paratrachichthys* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Gon 1987). Tooth attachment and tooth replacement have not been investigated.

Berycidae: *Beryx* (Moore 2003b) and *Centroberyx* (Dinesh et al. 2012).

Beryx possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Moore 2003b). *Centroberyx* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary. Dinesh et al. (2012) describes teeth on the "maxillary," but this is likely an error in terminology since the maxilla is excluded from the gape in *Centroberyx*. Tooth attachment and tooth replacement have not been investigated.

Holocentridae:

Holocentrinae: *Sargocentron* (Randall et al. 1989a).

Sargocentron possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Randall et al. 1989a). Tooth attachment and tooth replacement have not been investigated.

Myripristinae: *Myripristis* (Randall et al. 2003), *Ostichthys* (Randall et al. 1982), and *Pristilepis* (Randall et al. 1982).

Myripristis possesses depressiform teeth arranged in multiple rows on the premaxilla and dentary with the labialmost row containing the largest teeth (Randall et al. 2003). *Ostichthys* and *Pristilepis* possess coniform teeth arranged in multiple rows on the premaxilla and dentary. Tooth attachment and tooth replacement have not been investigated.

ZEIFORMES

The maxilla is edentulous in Zeiformes.

Cyttidae: *Cyttus* (James 1976)

Cyttus possesses coniform teeth arranged in multiple rows on the premaxilla and dentary. Tooth attachment and tooth replacement have not been investigated.

Oreosomatidae: *Allocyttus* (Morris et al. 2011) and *Neocyttus* (Yearsley & Last 1998).

Allocyttus possesses coniform teeth on the premaxilla and dentary (Morris et al. 2011). *Neocyttus* possesses coniform teeth arranged in one or two rows on the premaxilla and dentary (Yearsley & Last 1998). Tooth attachment and tooth replacement have not been investigated.

Parazenidae:

Parazeninae: *Parazen* (Mead 1957).

Parazen possesses coniform teeth arranged in one to two rows on the premaxilla and one row on the dentary (Mead 1957). Tooth attachment and tooth replacement have not been investigated.

Cyttopsinae: *Cyttopsis* (Heemstra 1999c).

Cyttopsis possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Heemstra 1999c). Tooth attachment and tooth replacement have not been investigated.

Zeniontidae: *Zenion* (Heemstra 1999b).

Zenion possesses coniform teeth arranged in a single row on the premaxilla and dentary (Heemstra 1999b). Tooth attachment and tooth replacement have not been investigated.

Grammicolepididae:

Macrurocyttinae: *Macrurocyttus* (Heemstra 1999b)

Macrurocyttus possesses coniform teeth arranged in a single row on the premaxilla and dentary. Tooth attachment and tooth replacement have not been investigated.

Grammicolepidinae: *Grammicolepis* and *Xenolepidichthys* (Heemstra 1999a).

Grammicolepis and *Xenolepidichthys* possess coniform teeth arranged in a single row on the premaxilla and dentary. Tooth attachment and tooth replacement have not been investigated.

Zeidae: *Zenopsis* (Nakabo et al. 2006) and Zeus.

Zenopsis possesses coniform teeth arranged in an anterior and separate posterior band of three rows each on the premaxilla and two rows on the dentary. Nakabo et al. (2006) described these teeth as caniniform, however I have categorized them as coniform based on the illustration of the dentition (Fig. 2b). Tooth attachment and tooth replacement have not been investigated.

GASTEROSTEIFORMES

The maxilla is edentulous in all Gasterosteiformes.

Hypoptychidae: *Hypoptychus* (Gosline 1963; Ida 1976)

Hypoptychus contains gynandric heterodonts. Male *H. dybowskii* Steindachner possesses coniform teeth arranged in a single row on the premaxilla while females have an edentulous premaxilla. The dentary is edentulous in both sexes (Ida 1976). Tooth attachment and tooth replacement have not been investigated.

Aulorhynchidae: *Aulichthys* (Ida 1976).

Aulichthys contains gynandric heterodonts. Male *A. japonicus* Brevoort possesses coniform teeth arranged in a single row on the premaxilla while females have an edentulous premaxilla. The dentary is edentulous in both sexes (Ida 1976). Tooth attachment and tooth replacement have not been investigated.

Gasterosteidae: *Apeltes, Culaea* (Eigenmann 1886), *Gasterosteus* (Caldecutt et al. 2001), *Pungitius* (Keivany & Nelson 2000).

Apeltes and *Culaea* possess coniform teeth arranged in a single row on the premaxilla and dentary (Eigenmann 1886). *Gasterosteus* contains gynandric heterodonts. Both male and female *G. aculeatus* Linnaeus possesses coniform teeth arranged in two to three rows on the premaxilla and dentary, but females have fewer and more irregularly arranged teeth then males. Caldecutt et al. (2001) examined variation and sexual dimorphism in dentition among populations of *G. aculeatus* in detail. *Pungitius* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Keivany & Nelson 2000). Tooth attachment is Type 2 in *G. aculeatus* (Caldecutt et al. 2001). Tooth replacement has not been investigated.

Indostomidae: *Indostomus* (Britz & Johnson 2002).

Indostomus possesses coniform teeth arranged in a single row on the premaxilla and dentary (Pl.1G) (Britz & Johnson 2002). Tooth attachment and replacement have not been investigated.

Pegasidae: *Eurypegasus* and *Pegasus* (Pietsch 1978a; Pietsch & Palsson 1993; Nelson 2006).

Eurypegasus and *Pegasus* are edentulous on the oral jaws (Fig. 3)(Pietsch 1978a; Nelson 2006).

Solenostomidae: *Solenostomus* (Orr & Fritzsche 1993).

Solenostomids are edentulous on the oral jaws (Orr & Fritzsche 1993).

Sygnathidae: *Choeroichthys* and *Sygnathoides* (Dawson & Fritzsche 1975).

Sygnathids are edentulous on the oral jaws. “Odontoid processes” have been observed in *Choeroichthys* and *Sygnathoides*, but were concluded to be “projections of bone” not teeth. (Dawson & Fritzsche 1975).

Aulostomidae: *Aulostomus* (Nelson 2006).

Aulostomus are edentulous on the oral jaws (Nelson 2006).

Fistulariidae: *Fistularia* (Fritzsche 1976; Fritzsche & Thiesfeld 2003).

Fistularia possesses coniform teeth on the premaxilla and dentary (Fritzsche 1976). Tooth attachment and replacement have not been investigated.

Macroramphosidae: *Centriscops, Macroramphosus* and *Notopogon* (Nelson 2006).

Macroramphosids are edentulous on the oral jaws. Kuranaga and Sasaki (2000) did not observe any development of teeth in larval specimens of *M. scolopax*.

Centriscidae: *Aeoliscus* and *Centriscus* (Nelson 2006).

Centriscids are edentulous on the oral jaws (Nelson 2006).

SYNBRANCHIFORMES

The maxilla is edentulous in Synbranchiformes.

Synbranchidae: *Macrotrema, Monopterus, Ophisternon,* and *Synbranchus.*

Macrotrema, Monopterus, Ophisternon, and *Synbranchus* possess coniform teeth arranged in one to two rows on the premaxilla and dentary (Rosen & Greenwood 1976). Tooth attachment and replacement have not been investigated.

Chaudhuriidae: *Bihunichthys, Chaudhuria, Chendol, Garo, Nagaichthys,* and *Pillaia.*

Bihunichthys, Chendol, Nagaoichthys, and *Pillaia* possess coniform teeth on the premaxilla and dentary. *Chaudhuria* possesses coniform teeth arranged in two to three rows on the premaxilla and dentary (Britz 2010). Tooth attachment and replacement have not been investigated.

Mastacembelidae: *Macrognathus* (Tyson 1980; Travers 1984) and *Mastacembelus* (Travers 1984).

Macrognathus possess coniform teeth on the premaxilla and dentary. Additional coniform teeth are present on the "fragmented premaxilla alveolar surface," a series of bones that functionally extend the upper jaw into the rostrum despite the premaxilla being distinctly separate from this series (Tyson 1980; Travers 1984). *Mastacembelus* possesses coniform arranged in one to eight rows on the premaxilla and three rows on the dentary with the labialmost row containing the largest teeth. Travers (1984) originally described the teeth as caniniform, but based on the illustration of dentition (Fig. 4) the teeth are more appropriately described as coniform. Within *Mastacembelus* tooth arrangement is variable among species. Tooth attachment is Type 2 in *Mastacembelus mastacembelus* (Banks & Solander) and *M. armatus* (Lacepède) (Fink 1981; Travers 1984). Tooth replacement has not been investigated.

SCORPAENIFORMES

Dactylopteridae: *Dactyloptena* and *Dactylopterus* (Eschmeyer 1997).

Dactyloptena and *Dactylopterus* possess coniform teeth arranged in multiple rows on the premaxilla and dentary. Tooth attachment and replacement have not been investigated.

Scorpaenidae:

Sebastinae: *Helicolenus* (Paulin 1989a), *Hozukius* (Jordan & Starks 1904d), *Sebastolobus* (Jordan & Starks 1904d), and *Trachyscorpia* (Béarez & Motomura 2009).

Helicolenus, Hozukius, Sebastolobus, and *Trachyscorpia* possess coniform teeth arranged in multiple rows on the premaxilla and dentary.

Tooth attachment and replacement have not been investigated.

Setarchinae: *Ectreposebastes* (Eschmeyer & Collette 1966), *Lioscorpius* (Last et al. 2005) and *Setarches* (Jordan & Starks 1904d).

Ectreposebastes and *Setarches* possess coniform teeth arranged in multiple rows on the premaxilla and dentary (Eschmeyer & Collette 1966). *Lioscorpius* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary with the lingualmost row containing the largest teeth (Last et al. 2005). Tooth attachment and replacement have not been investigated.

Neobastinae: *Maxillicosta* (Motomura et al. 2006b) and *Neosebastes* (Jordan & Starks 1904d).

Maxillicosta possesses coniform teeth arranged in eight to fifteen rows on the premaxilla and dentary (Motomura et al. 2006b). *Neosebastes* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Jordan & Starks 1904d). Tooth attachment is Type 2 in *Helicolenus datylopterus* (Delaroche) (Fink 1981). Tooth replacement has not been investigated.

Scorpaeninae: *Idiastion* (Eschmeyer 1965), *Iracundus* (Jordan & Evermann 1903), *Neomerinthe* (Motomura et al. 2011), *Parascorpaena* (Motomura et al. 2009), *Phenacoscorpius* (Smith 1958a), *Pontinus* (Barnhart & Hubbs 1946), *Rhinopias* (Motomura et al. 2006a), *Scorpaena* (Randall & Greenfield 2004), *Scorpaenodes* (Jordan & Starks 1904d), *Scorpaenopsis* (Randall & Greenfield 2004), and *Sebastapistes** (Motomura 2009).

Idiastion, Neomerinthe, Parascorpaena, Rhinopias, and *Scorpaenodes* possess coniform teeth arranged in multiple rows on the premaxilla and dentary. *Iracundus* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary with the lingualmost row on the premaxilla containing the largest teeth (Jordan & Evermann 1903). *Phenacoscorpius* and *Pontinus* possess coniform teeth arranged in two to three rows on the premaxilla and dentary. *Scorpaena* possesses depressiform teeth arranged in eight rows on the premaxilla and six to seven rows on the dentary (Randall & Greenfield 2004). *Scorpaenopsis* possesses depressiform teeth arranged in six to seven rows on the premaxilla and five to six rows on the dentary (Randall & Greenfield 2004). *Sebastapistes* possesses caniniform teeth in the labialmost row with coniform teeth in all other rows on the premaxilla and dentary (Motomura 2009). Tooth attachment has no been investigated. Tooth replacement was suggested to be intraosseous in *Scorpaena guttata* Girard and *S. plumieri* Bloch (Trapani 2001).

Apistinae: *Apistus* (Jordan & Starks 1904d).

Apistus possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Jordan & Starks 1904d). Tooth attachment and replacement have not been investigated.

Tetragoninae: *Neocentropogon* (Ho et al. 2009a), *Ocosia* (Poss & Eschmeyer 1975). , *Paracentroprogon* (Jordan & Starks 1904d), and *Vespicula* (Smith 1958a).

Neocentropogon and *Paracentropogon* possess coniform teeth arranged in multiple rows on the premaxilla and dentary. *Ocosia* and *Vespicula* possess coniform teeth on the premaxilla and dentary. Tooth attachment and replacement have not been investigated.

Synanceinae: *Choridactylus* (Smith 1958a), *Dampierosa, Erosa(Eschmeyer & Rama-Rao 1973)*, *Inimicus* (Rao & Badrudeen 1973), *Leptosynanceia* (Eschmeyer & Rama-Rao

1973), *Minous* (Jordan & Starks 1904d), *Pseudosynanceia* and *Trachicephalus* (Eschmeyer & Rama-Rao 1973).

Choridactylus possesses coniform teeth arranged in two to three rows on the premaxilla and dentary (Smith 1958a). *Dampierosa, Erosa, Leptosynanceia, Pseudosynanceia,* and *Trachicephalus* possess coniform teeth on the premaxilla and dentary. *Erosa* and *Pseudosynanceia* possess coniform teeth on the premaxilla and dentary. *Inimicus* and *Minous* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Rao & Badrudeen 1973). Tooth attachment and replacement have not been investigated.

Caracanthidae: *Caracanthus* (Smith 1958a; Shinohara & Imamura 2005).

Caracanthus possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Smith 1958a). Shinohara and Imamura (2005) unlike Smith (1958a) described the teeth as “canine-like” in *C. unipinna* (Gray). However, neither paper illustrates the dentition. Tooth attachment and replacement have not been investigated.

Aploactinidae: *Adventor* (Whitley 1952), *Cocotropus* (Johnson 2004), *Karumba* (Whitley 1966), *Paraploactis* (Poss & Eschmeyer 1978), *Peristrominous* (Whitley 1952), *Pseudopataecus* (Johnson 2004), and *Sthenopus* (Prokofiev 2011).

Adventor, Karumba, Paraploactis, Peristrominous, Pseudopataecus, and *Sthenopus* possess coniform teeth arranged in multiple rows on the premaxilla and dentary. *Cocotropus* possesses coniform teeth arranged in at least twelve rows on the premaxilla and dentary (Johnson 2004). Tooth attachment and replacement have not been investigated.

Pataecidae: *Aetopcus* (Scott 1936).

Aetopcus possesses coniform teeth arranged in five to six rows on the premaxilla and dentary (Scott 1936). Tooth attachment and replacement have not been investigated.

Gnathanacanthidae: *Gnathanacanthus* (Scott 1986).

Gnathanacanthus possesses small coniform teeth covered by the flesh of the lips and are often hard to see without close examination. Additionally, Scott (1986) described the confusing descriptions that have previously been published, but all descriptions agree on a conical tooth shape. Tooth attachment and replacement have not been investigated.

Congiopodidae: *Alertichthys* (Moreland 1960), and *Congiopodus* (Ishii & Imamura 2008).

Alertichthys possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Moreland 1960). *Congiopodus* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary, but some specimens have exhibited an edentulous premaxilla and dentary (Ishii & Imamura 2008). Ishii and Imamura (2008) acknowledged teeth are small and loosely attached in *Congiopodus* plus interspecific variation in tooth presence or absence exists between *C. leucopaecilus* (Richardson) and *C. coriaceus* Paulin & Moreland. Tooth attachment and replacement have not been investigated.

Triglidae: *Chelidonichthys* (Chen & Shao 1988), *Lepidotrigla* (Smith 1934) , *Parapterygotrigla* (Chen & Shao 1988), *Pterygotrigla* (Richards et al. 2003).

Chelidonichthys, Lepidotrigla, and *Pterygotrigla* possess coniform teeth on the premaxilla and dentary. *Parapterygotrigla* possesses coniform teeth on the premaxilla and dentary (Chen & Shao 1988). Tooth attachment and replacement have not been investigated.

Peristediidae: *Gargariscus*, *Peristedion* and *Satyrichthys* (Chen & Shao 1988).

Gargariscus possesses coniform teeth arranged in multiple rows on the premaxilla. The dentary is edentulous (Chen & Shao 1988). *Peristedion* and *Satyrichthys* is edentulous on the on the premaxilla and dentary (Chen & Shao 1988). Tooth attachment and replacement have not been investigated.

Bembridae: *Bembradium* (Ho et al. 2009a), *Bembras* (Imamura & Knapp 1998), *Brachybembras* and *Parabembras* (Fowler 1938).

Bembradium possesses coniform teeth on the premaxilla and dentary (Ho et al. 2009a). *Bembras, Brachybembras,* and *Parabembras* possess coniform teeth arranged in multiple rows on the premaxilla and dentary. Tooth attachment and replacement have not been investigated.

Platycephalidae: *Cociella* (Knapp 1996), *Cymbacephalus* (Sakashita & Yoshino 1991), *Grammoplites* (Murty 1975), *Inegocia* (Imamura 2010), *Onigocia* (Imamura & Knapp 2009), *Platycephalus** (Knapp 1991; Imamura 2006; Imamura & Knapp 2009), *Ratabulus** (Gosline 1996; Imamura & Gomon 2010), *Rogadius* (Imamura 2007), *Sorsogona* (Knapp & Heemstra 2011), *Suggrundus*, and *Thysanophrys* (Murty 1975).

Cociella, Cymbacephalus, Grammoplites, Inegocia, Onigocia, Rogadius, Sorsogona, *Suggrundus,* and *Thysanophrys* possess coniform teeth arranged in multiple rows on the premaxilla and dentary. *Platycephalus* possesses anterior rows of caniniform teeth and posterior rows of coniform teeth on the premaxilla; the dentary has coniform teeth arranged in a multiple rows with largest teeth located posteriorly (Knapp 1991; Imamura 2006). *Ratabulus* possesses caniniform anteriorly and coniform teeth posteriorly on the premaxilla; the dentary has coniform teeth in multiple rows with caniniform teeth in the lingualmost row. Gosline (1996) reported depressibility in *R. diversidens* based on personal communication with Knapp, but Imamura and Gomon (2010) did not describe tooth attachment in any *Ratabulus* species examined. Tooth attachment and replacement have not been investigated.

Hoplichthyidae: *Hoplichthys* (Jordan & Starks 1904d).

Hoplichthys possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Jordan & Starks 1904d). Tooth attachment and replacement have not been investigated.

Anoplopomatidae: *Anoplopoma* (Ayres 1859) and *Erilepis* (Thompson 1917).

Anoplopoma possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Ayres 1859). *Erilepis* possesses coniform teeth arranged in six or seven rows on the premaxilla and dentary (Thompson 1917). Tooth attachment and replacement have not been investigated.

Hexagrammidae:

Hexagramminae: *Hexagrammos* (Shinohara 1994).

Hexagrammos possesses coniform teeth arranged in multiple rows on the premaxilla and dentary with the labialmost row containing the largest teeth. The labialmost tooth row of the premaxilla contains the largest teeth (Shinohara 1994). Tooth attachment and replacement have not been investigated.

Pleurogramminae: *Pleurogrammus* (Shinohara 1994).

Pleurogrammus possesses coniform teeth arranged in multiple rows on the premaxilla and dentary with the largest teeth located anteriorly (Shinohara 1994). Tooth attachment and replacement have not been investigated.

Ophiodontinae: *Ophiodon* (Shinohara 1994).

Ophiodon possesses coniform teeth with several caniniform teeth at the symphysis of the premaxilla. The dentary has coniform teeth arranged in multiple rows with the lingualmost containing the largest teeth (Shinohara 1994). Tooth attachment and replacement have not been investigated.

Oxylebiinae: *Oxylebias* (Shinohara 1994).

Oxylebias possesses coniform teeth arranged in multiple rows on the premaxilla and dentary with the largest teeth located anteriorly (Shinohara 1994). Tooth attachment and replacement have not been investigated.

Zaniolepidinae: *Zaniolepis* (Shinohara 1994).

Zaniolepis possesses coniform teeth arranged in multiple rows on the premaxilla and dentary with the largest teeth located anteriorly (Shinohara 1994). Tooth attachment and replacement have not been investigated.

Normanichthyidae: *Normanichthys* (Yabe & Uyeno 1996).

Normanichthys possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Yabe & Uyeno 1996). Tooth attachment and replacement have not been investigated.

Rhamphocottidae: *Rhamphocottus*.

No information on the dentition of this family could be located.

Ereuniidae: *Ereunias* (Jordan & Snyder 1899) and *Marukawichthys* (Yabe 1983).

Ereunias and *Marukawichthys* possess coniform teeth arranged in multiple rows on the premaxilla and dentary. Tooth attachment and replacement have not been investigated.

Cottidae: *Alcicthys*, *Artediellus* (Jordan & Starks 1904b), *Artedius** (Hubbs 1926a; Begle 1989), *Ascelichthys* (Jordan & Gilbert 1880b), *Asemichthys* (Gilbert 1906), *Bero* (Jordan & Starks 1904b), *Chitonotus* (Lockington 1881), *Clinocottus* (Strauss 1993), *Cottiusculus* (Kai & Nakabo 2009), *Cottus (Jordan & Starks 1904b; Neely et al. 2007; Sideleva 2009)*, *Enophrys* (Jordan & Starks 1904b), *Furcina*, *Gymnocanthus*, *Hemilepidotus* (Jordan & Starks 1904b), *Icelinus* (Bolin 1936), *Icelus* (Jordan & Starks 1904b), *Jordania* (Starks 1895), *Myoxocephalus* (Jordan & Starks 1904b), *Pseudoblennius*(Jordan & Starks 1904b), *Ruscarius*(Hubbs 1926a), *Sigmistes* (Yabe et al. 2001), *Synchirus* (Bean 1890a), *Triglops* (Jordan & Starks 1904b), and *Vellitor* (Iwata 1983).

Alcicthys, Artediellus, Ascelichthys, Asemichthys, Bero, Chitonotus, Clinocottus, Enophrys, Furcina, Gymnocanthus, Hemilepidotus, Icelinus, Icelus, Jordania, Myoxocephalus, Ruscarius, Sigmistes, Synchirus, Triglops, and *Vellitor* possess coniform teeth arranged in multiple rows on the premaxilla and dentary. *Artedius* contains gynandric heterodonts. Begle (1989) observed prominent caniniform teeth on the premaxilla and dentary of only mature males of *A. harringtoni* (Starks). Otherwise, *Artedius* possesses coniform teeth arranged in multiple rows on the premaxilla with several caniniform teeth at the symphysis. The dentary has coniform teeth arranged in multiple rows with the labial most row made up of caniniform teeth (Hubbs 1926a). *Cottiusculus* possesses coniform teeth on the premaxilla and dentary (Kai & Nakabo 2009). *Cottus* possesses coniform teeth arranged in multiple rows (eight in *C. sabaidicus* Sideleva) on the premaxilla and dentary (Jordan & Starks 1904b; Sideleva 2009). Depressible teeth were reported in *C. tallapoosae* and *C. chattahoochee* (Neely et al. 2007). *Pseudoblennius* possesses either depressiform or coniform teeth arranged in multiple rows on the premaxilla and dentary depending upon species. Jordan and Starks (1904b) observed depressible teeth in *P. percoides* and *P. cottoides.* Tooth attachment and replacement have not been investigated.

Comephoridae: *Comephorus* (Sideleva 2003)

Comephorus possesses coniform teeth on the premaxilla and dentary (Sideleva 2003). Tooth attachment and replacement have not been investigated.

Abyssocottidae: *Abyssocottus, Asprocottus, Cottinella, Limnocottus, Neocottus, and Procottus* (Sideleva 2003).

Abyssocottus Asprocottus, Cottinella, Limnocottus, Neocottus, and *Procottus* possess coniform teeth arranged in multiple rows (six to seven rows in *Procottus*) on the premaxilla and dentary (Sideleva 2003). Tooth attachment and replacement have not been investigated.

Hemitripteridae: *Blepsias, Hemitripterus,* and *Nautichthys* (Jordan & Starks 1904b).

Blepsias and *Hemitripterus* possess coniform teeth arranged in multiple rows on the premaxilla and dentary. *Nautichthys* possesses coniform teeth on the premaxilla and dentary (Jordan & Starks 1904b). Tooth attachment and replacement have not been investigated

Agonidae:

Hypsagoninae: *Agonomalus* (Jordan & Starks 1904c), *Hypsagonus,* and *Percis* (Kanayama 1991).

Agonomalus and *Percis* possess coniform teeth in multiple rows on the premaxilla and dentary (Jordan & Starks 1904c) *Hypsagonus* possesses coniform teeth on the premaxilla and dentary (Kanayama 1991). Tooth attachment and replacement have not been investigated.

Bathyagoninae: *Bathyagonus, Odontopyxis and Xeneretmus* (Kanayama 1991).

Bathyagonus and *Odontopyxis* possess coniform teeth in multiple rows on the premaxilla and dentary. *Xeneretmus* possesses coniform teeth in multiple rows on the premaxilla and dentary with the labialmost rows containing the largest teeth (Kanayama 1991). Tooth attachment and replacement have not been investigated.

Bothragoninae: *Bothragonus* (Kanayama 1991).

Bothragonus possesses coniform teeth in multiple rows on the premaxilla and dentary (Kanayama 1991). Tooth attachment and replacement have not been investigated.

Anoplagoninae: *Aspidophoroides* (Jordan & Starks 1904c).

Aspidophoroides possesses coniform teeth on the premaxilla and dentary (Jordan & Starks 1904c). Tooth attachment and replacement have not been investigated.

Agoninae: *Agonpsis, Agonus, Freemanichthys, Leptagonus, Podothecus* (Kanayama 1991), and *Sarritor* (Jordan & Starks 1904c).

Agonopsis, Agonus, Freemanichthys, Leptagonus, and *Sarritor* possess coniform teeth on the premaxilla and dentary. *Podothecus* possesses coniform teeth arranged in single row on the premaxilla and multiple rows on the dentary (Kanayama 1991). The premaxilla maybe edentulous or bear very few teeth in some species. Tooth attachment and replacement have not been investigated.

Brachyopsinae: *Brachyopsis, Chesnonia, Occella, Pallasina, Stellerina,* and *Tilesina* (Kanayama 1991).

Brachyopsis possesses coniform teeth on the premaxilla and dentary. *Chesnonia, Occella, Pallasina, Stellerina,* and *Tilesina* possess coniform teeth arranged in multiple rows on the premaxilla and dentary (Kanayama 1991). Tooth attachment and replacement have not been investigated.

Psychrolutidae:

Cottunculinae: *Ambophthalmos* (Jackson & Nelson 1999), *Cottunculus* (Jordan & Starks 1904b), *Dasycottus* (Bean 1890b), *Malacocottus* (Bean 1890b).

Ambophthalmos possesses coniform teeth arranged in about six rows on the premaxilla and five rows on the dentary (Jackson & Nelson 1999). *Cottunculus* and *Dasycottus* possess coniform teeth arranged in multiple rows on the premaxilla and dentary. *Malacocottus* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Bean 1890b). Tooth attachment is Type 2 in *Cottunculus thompsoni* (Günther) (Fink 1981). Tooth replacement has not been investigated.

Psychrolutinae: *Ebinania* (Pequeño 1981; Jackson & Nelson 2006), *Neophrynichthys* (Pequeño 1981) and *Psychrolutes* (Jordan & Starks 1904b).

Ebinania possesses coniform teeth arranged in five to six rows on the premaxilla and dentary (Prokofiev & Kukuev 2009a). *Neophrynichthys* possesses coniform teeth on the premaxilla and dentary (Pequeño 1981). *Psychrolutes* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Jordan & Starks 1904b). Tooth attachment and tooth replacement have not been investigated.

Bathylutichthyidae: *Bathylutichthys* (Balushkin & Voskoboinikova 1990).

Bathylutichthys possesses coniform teeth on the premaxilla and dentary (Balushkin & Voskoboinikova 1990). Tooth attachment and replacement have not been investigated.

Cyclopteridae: *Aptocyclus* (Hubbs & Schultz 1934), *Cyclopterus* (Märss et al. 2010), *Cyclopsis* (Voskoboinikova & Nazarkin 2009), and *Eumicrotremus* (Ueno 1954).

Aptocyclus and *Cyclopterus* possess coniform teeth on the premaxilla and dentary. *Cyclopsis* possess coniform teeth arranged in two to three rows on the premaxilla and dentary (Voskoboinikova & Nazarkin 2009). *Eumicrotremus* possesses coniform teeth in one to two rows on the premaxilla and three to four rows on the dentary (Ueno 1954). Tooth attachment and replacement have not been investigated.

Liparidae: *Acantholiparis* (Grinols 1969), *Careproctus* (Stein et al. 1991), Elassodiscus* (Pitruk & Fedorov 1993), *Liparis* (Smith 1967a), *Lopholiparis* (Orr 2004), *Notoliparis* (Stein 2005), *Paraliparis* (Stein et al. 1991; Stein 2005), *Psednos* (Stein 2005), and *Volodichthys* (Balushkin 2012)

Previous examinations of liparids have counted “oblique tooth rows” and made use of the lingual to labial number of teeth making up each row. In effort to maintain labial to lingual tooth row counts used in this paper the tooth count of theoblique rows has been used for tooth row count.

Acantholiparis possesses coniform teeth arranged in as many as seven rows on the premaxilla and dentary. The premaxilla of *A. caecus* Grinols has an additional group of four to ten caniniform teeth at the symphysis (Grinols 1969). *Careproctus* possesses tridentiform teeth arranged in about seven rows on the premaxilla and dentary (Stein et al. 1991). *Elassodiscus* possesses either only coniform or coniform and tridentiform teeth with weak to prominent lateral cusps arranged in as many as ten rows on the premaxilla and dentary. Pitruk and Fedorov (1993) observed more prominent lateral cusps in *E. tremebundus* Gilbert & Burke and weak lateral cusps when present in *E. obsucurus* Pitruk & Fedorov. *Liparis* possesses tridentiform teeth with strong lateral cusps arranged in eighteen rows on the premaxilla and fifteen rows on the dentary (Smith 1967a). In *L.*

antarctica Putnam and *L. liparis* (Linnaeus) coniform teeth are present in the labialmost tooth row of the jaws (Stein et al. 1991; Märss et al. 2010). *Lopholiparis* possesses tridentiform teeth arranged in eight rows on the premaxilla and dentary (Orr 2004). *Notoliparis* possesses coniform teeth arranged in five to six rows on the premaxilla and four rows on the dentary with the labialmost row containing the largest teeth. Stein (2005) described the teeth of *N. antonbruuni* Stein as canines, but illustrated (Fig. 2a) dentition more appropriately designated coniform. *Paraliparis* possesses coniform arranged in about ten rows or in species with few teeth one or two rows on the premaxilla and dentary with the lingualmost rows containing the largest teeth. Stein (2005) described the teeth of *P. carlbondi* Stein as canines, but illustrations of the dentition (Fig. 2a) show the teeth are more appropriately designated coniform. The premaxilla is edentulous and the dentary has only a single row of coniform teeth in *P. merodontus* Stein, Meléndez C. & Kong U. However, in *P. paucidens* Stein only a few teeth are present on the premaxilla and the dentary is edentulous (Stein et al. 1991). *Psednos* possesses coniform teeth arranged in two to four rows on the premaxilla. The dentary has distinctly larger and more numerous coniform teeth arranged in five rows with the lingualmost row containing the largest teeth (Stein 2005). *Volodichthys* possesses coniform teeth arranged in as many as eight rows on the premaxilla and dentary (Balushkin 2012). Tooth attachment and replacement have not been investigated.

PERCIFORMES

Centropomidae: *Centorpomus* (Fraser 1968; Luczkovich et al. 1995).

Centropomus possesses coniform teeth arranged in multiple rows on the premaxilla (Fraser 1968). Luczkovich et al. (1995) observed no change ontogenetic changes in tooth shape. Fink (1981) observed depressiform teeth in *Centropomus undecimalis* (Bloch). Tooth attachment is Type 4 in *Centropomus undecimalis* (Fink 1981). Tooth replacement has not been investigated.

Ambassidae: *Ambassis* (Anderson & Heemstra 2003), *Chanda* (Grubh & Winemiller 2004), *Gymnochanda* (Tan & Lim 2011), and *Tetracentrum* (Schultz 1945).

Ambassis and *Tetracentrum* possess coniform teeth arranged in multiple rows on the premaxilla and dentary. *Chanda* possesses coniform teeth arranged in multiple rows on the premaxilla and the dentary. Four enlarged teeth present on the dentary near the symphysis. Grubh and Winemiller (2004) also observed bilateral symmetry in the jaws morphology of *C. nama* Hamilton and hypothesized "left and right handed" lepidophagous populations might exist. *Gymnochanda* possesses coniform teeth arranged two rows on the premaxilla. The dentary has coniform teeth arranged in multiple rows (Tan & Lim 2011). Tooth attachment and replacement have not been investigated.

Latidae: *Lates** (Otero 2004; Mathew 2009) and *Psammoperca* (Otero 2004).

Lates possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Mathew 2009). Otero (2004) observed that *L. stappersi* (Boulenger) possesses several caniniform teeth near the symphysis of the premaxilla and dentary in addition to the posterior rows of coniform teeth. *Psammoperca* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Otero 2004). Tooth attachment and replacement have not been investigated.

Moronidae: *Dicentrarchus* (Trunov et al. 2006), and *Lateolabrax* (Jordan & Richardson 1910), and *Morone* (Waldman 1986).

Dicentrarchus, Lateolabrax, and *Morone* possess coniform teeth arranged in multiple rows on the premaxilla and dentary. Tooth attachment is Type 2 in *Morone saxitalis* (Fink 1981). Tooth replacement is extraosseous in *M. saxatilis* Walbaum (Hilton et al. 2005a).

Percichthyidae: *Bostockia* (MacDonald 1978), *Coreoperca* (Jordan & Richardson 1910), *Gadopsis* (Sanger 1984), *Guyu* (Pusey & Kennard 2001), *Maccullochella, Macquaria* (MacDonald 1978), *Nannoperca* (Günther 1861a), *Percalates* (MacDonald 1978), *Percichthys* (Girard 1855), *Plectroplites* (MacDonald 1978).

Bostockia, Coreoperca, Guyu, Maccullochella, Macquaria, Nannoperca, Percalates, and *Plectroplites* possess coniform teeth arranged in multiple rows on the premaxilla and dentary. *Percichthys* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary. Teeth were described as "card-like" by Girard (1855) in *P. melanops* Girard. Tooth attachment and replacement have not been investigated.

Percilidae: *Percilia* (Girard 1855).

Percilia possesses coniform teeth on the premaxilla and dentary (Girard 1855). Tooth attachment and replacement have not been investigated.

Acropomatidae: *Acropoma** (Okamoto & Ida 2002; Yamanoue & Toda 2008), *Apogonops* (Ogilby 1896), *Doederleinia** (Yamanoue & Matsuura 2007), *Malakichthys* (Jordan & Richardson 1910), *Neoscombrops** (Yamanoue & Matsuura 2003), *Synagrops**(Mochizuki & Sano 1984), and *Verilus** (Yamanoue et al. 2009).

Acropoma possesses paired caniniform teeth followed posteriorly by coniform teeth arranged in a single row on the premaxilla and dentary (Okamoto & Ida 2002). *Apogonops* and *Malakichthys* possess coniform teeth arranged in multiple rows on the premaxilla and dentary. *Doederleinia* possesses three caniniform teeth followed posteriorly by coniform teeth arranged in multiple rows on the premaxilla; the dentary has only a single caniniform tooth followed posteriorly by multiple rows of coniform teeth (Yamanoue & Matsuura 2007). *Malakichthys* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Jordan & Richardson 1910). *Neoscombrops* possesses paired caniniform teeth followed posteriorly by coniform teeth arranged in multiple rows on the premaxilla and dentary (Yamanoue & Matsuura 2003).. The dentary teeth are larger then those of the premaxilla (Yamanoue & Matsuura 2003). *Synagrops* possesses several caniniform teeth followed posteriorly by coniform teeth arranged in multiple rows on the premaxilla and dentary (Mochizuki & Sano 1984). *Verilus* possesses paired caniniform teeth followed posteriorly by coniform teeth arranged in multiple rows on the premaxilla and dentary (Yamanoue et al. 2009). Tooth attachment and replacement have not been investigated.

Symphysanodontidae: *Symphysanodon* (Anderson Jr. & Springer 2005).

Symphysanodon possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Anderson Jr. & Springer 2005). Tooth attachment and replacement have not been investigated.

Polyprionidae: *Polyprion* (Sedberry 2003) and *Stereolepis* (Ayres 1859).

Polyprion and *Stereolepis* possess coniform teeth arranged in multiple rows on the premaxilla and dentary. Tooth attachment and replacement have not been investigated.

Serranidae:

Serraninae: *Bulliisichthys* (Rivas 1971), *Centropristis* (Ginsburg 1952), *Chelidoperca** (Jordan & Richardson 1910), *Diplectrum*(Rosenblatt & Johnson 1974), *Hypoplectrus*

(Lobel 2011), *Paralbarax** (Walford 1936), *Paraphyraenops* (Johnson & Smith-Vaniz 1987), and *Serraniculus* (Ginsburg 1952).

Bulliisichthys possesses caniniform teeth on the premaxilla and dentary (Rivas 1971). *Centropristis* possesses coniform teeth arranged in multiple rows on the premaxilla and only two rows on the dentary. Ginsburg (1952) noted none of the teeth were markedly depressible. *Chelidoperca* possesses coniform teeth and some lingual depressiform teeth arranged in multiple rows on the premaxilla; the dentary has only coniform teeth arranged in multiple rows (Jordan & Richardson 1910). *Diplectrum* possesses coniform teeth with the largest teeth in anterior labial row of the premaxilla and dentary (Rosenblatt & Johnson 1974). *Hypoplectrus* possesses caniniform teeth on the premaxilla and dentary, and Lobel (2011) originally described the teeth of *H. maya* Lobel as "small caninines," but no illustration of dentition was provided. *Paralabarax* possesses paired caniniform teeth followed by coniform teeth arranged in multiple rows on the premaxilla; the dentary has coniform teeth arranged in multiple rows (Walford 1936). Walford (1936) observed some mobility in teeth, but stated that none are depressible. Additionally, no caniniform teeth were observed in *P. loro* Walford. *Paraphyraenops* possesses coniform teeth that reduce to a single row of tiny coniform teeth on the premaxilla and dentary and may be edentulous (Johnson & Smith-Vaniz 1987). *Serraniculus* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Ginsburg 1952). Tooth attachment and replacement have not been investigated.

Anthiinae: *Acanthistius** (Heemstra 2010), *Anthias** (Heemstra 1973; Anderson & Heemstra 1980; Katayama & Masuda 1983), *Caprodon* (Jordan & Richardson 1910), *Epinephelides** (Ogilby 1899), *Giganthias* (Katayama 1954), *Holanthias** (Talwar 1976), *Lepidoperca* *(Katayama & Fujii 1982), *Luzonichthys** (Randall & McCosker 1992), *Plectranthias** (Randall 1980), *Pseudanthias** (Katayama 1978; Randall & Hutomo 1988), *Rabaulichthys** (Masuda & Randall 2001), *Serranocirrhitus** (Randall & Heemstra 1978), *Tosana** (Jordan & Richardson 1910), and *Tosanoides* (Katayama & Masuda 1980).

Acanthistius possesses caniniform teeth in the labialmost row and coniform teeth arranged in multiple lingual rows on the premaxilla, the dentary has caniniform teeth in the labialmost row and depressiform teeth arranged in multiple lingual rows (Heemstra 2010). *Anthias* possesses symphyseal caniniform teeth and a second posterior caniniform tooth about midway posteriorly with coniform teeth in multiple lingual rows on the premaxilla; the dentary has a symphyseal caniniform tooth near the symphysis and posterior caniniform tooth in the labialmost row with coniform teeth arranged in multiple lingual rows (Katayama & Masuda 1983). In *A. conspicuus* (Heemstra) the lingual tooth rows were depressiform teeth (Heemstra 1973). *Caprodon* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Jordan & Richardson 1910). *Epinephelides* possesses a symphyseal caniniform tooth followed posteriorly by depressiform arranged in multiple rows on the premaxilla; the dentary has the same arrangement with an additional caniniform tooth (Ogilby 1899). *Giganthias* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary with the anterior portion of the labialmost row containing the largest teeth (Katayama 1954). *Holanthias* possesses coniform teeth arranged in multiple rows on the premaxilla with the labialmost row containing the largest teeth; the dentary has coniform teeth arranged in multiple rows with a caniniform tooth near the symphysis(Talwar 1976). *Lepidoperca* possesses a symphyseal caniniform tooth with the labialmost row consisting of smaller caniniform teeth followed by small coniform teeth in multiple lingual rows on the premaxilla; the dentary has anterior paired caniniform teeth near the symphysis and a few posterior caniniform teeth in the labialmost row with coniform teeth arranged in multiple lingual rows (Katayama & Fujii 1982). *Luzonichthy* possesses a symphyseal caniniform tooth followed posteriorly by a single row of coniform teeth on the premaxilla and dentary (Randall & McCosker 1992). *Plectranthias* possesses a single symphyseal caniniform tooth followed posteriorly by multiple rows (six in *P. alleni* Randall) of depressiform teeth on the premaxilla. The dentary may or may not have caniniform teeth at the symphysis otherwise all teeth are depressiform. For descriptions of arrangement in most species see Randall (1980). *Pseudanthias* possesses a symphyseal caniniform tooth near the symphysis with the labialmost row consisting of smaller caniniform teeth followed by small coniform teeth in multiple lingual rows on the premaxilla; the dentary has anterior a symphyseal caniniform tooth and a posterior (about mid way on the dentary) caniniform tooth with coniform teeth arranged in multiple lingual rows (Randall & Hutomo 1988). *Rabaulichthys* paired caniniform teeth followed posteriorly by a single row of coniform teeth on the premaxilla and dentary (Masuda & Randall 2001). *Serranocirrhitus* possesses coniform teeth arranged in three rows on the premaxilla; the dentary has a symphyseal caniniform tooth near with coniform teeth arranged in two rows posteriorly (Randall & Heemstra 1978). *Tosana* possesses a symphyseal caniniform tooth and two (one on dentary) rows of coniform teeth on the premaxilla and dentary (Jordan & Richardson 1910). *Tosanoides* possesses caniniform teeth in the labialmost row and all lingual rows are coniform on the premaxilla and dentary (Katayama & Masuda 1980). Tooth attachment and replacement have not been investigated.

Epinephelinae:

Tribe Niphonini: *Niphon* (Jordan & Richardson 1910).

Niphon possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Jordan & Richardson 1910).

Epinephelini: *Aethaloperca** (Smith 1954c; Randall & Heemstra 1991), *Alphestes** (Walters 1957), *Anyperodon* *(Randall & Heemstra 1991), *Cephalopholis* (Monkolprasit 1983), *Cromileptes** (Randall & Heemstra 1991), *Dermatolepis** (Smith 1954c; Smith 1955), *Epinephelus**, Gonioplecturs, *Gracilia** (Randall & Heemstra 1991), *Mycteroperca** (Mullaney & Gale 1996), Paranthias, *Plectropomus** (Jordan & Richardson 1910; Randall & Heemstra 1991), *Saloptia** (Smith 1964), *Triso** (Randall et al. 1989b), and *Variola** (Monkolprasit 1983; Randall & Heemstra 1991).

Aethaloperca possesses a symphyseal caniniform tooth with a labial row of coniform teeth and lingual row of larger depressiform teeth on the premaxilla and dentary (Smith 1954c). *Alphestes* possesses scattered caniniform teeth with about four near the symphysis and coniform teeth make up the labilalmost tooth row on the premaxilla and dentary. All other tooth rows on the premaxilla and dentary are depressiform. Teeth arranged in two to four rows on the dentary (Walters 1957). *Anyperodon* possesses caniniform teeth in the labialmost row and coniform teeth arranged in multiple lingual rows (about six) on the premaxilla and dentary (Randall & Heemstra 1991). *Cephalopholis* possesses a few caniniform anteriorly and coniform teeth in the labialmost row with depressiform teeth arranged in multiple lingual rows on the premaxilla and dentary (Randall & Heemstra 1991). *Cromileptes* possesses anterior caniniform teeth on followed posteriorly by coniform teeth arranged in multiple rows on the premaxilla. The dentary has only coniform teeth arranged in multiple rows (Randall & Heemstra 1991). *Dermatolepis* possesses coniform or depressiform teeth depending upon species arranged in five to six rows on the premaxilla and six to seven dentary (Smith 1954c; Smith 1955). *Epinephelus* possesses a few caniniform anteriorly and coniform teeth in the labial most row. The lingual tooth rows contain depressiform teeth arranged in multiple rows on the premaxilla and dentary (Randall & Heemstra 1991). *Gracilia* possesses a few caniniform anteriorly and coniform teeth in the labial most row; the lingual tooth rows contain depressiform teeth arranged in multiple rows on the premaxilla and dentary (Randall & Heemstra 1991). *Mycteroperca* possesses a symphyseal caniniform tooth and coniform teeth in the labialmost row, and lingually four to five rows of depressiform are present on the premaxilla and dentary (Mullaney & Gale 1996). *Plectropomus* possesses posterior caniniform teeth in the labialmost row and depressiform teeth arranged in multiple lingual rows on the premaxilla and dentary Jordan and Richardson (1910). *Saloptia* possesses single or paired caniniform teeth followed posteriorly by a labial row of coniform teeth with lingual rows of depressiform teeth on the premaxilla and dentary (Smith 1964). *Triso* possesses a symphyseal caniniform tooth followed posteriorly by coniform teeth arranged in multiple rows on the premaxilla and dentary (Randall et al. 1989b). *Variola* possesses caniniform teeth anteriorly followed posteriorly by coniform teeth arranged in multiple rows on the premaxilla and dentary (Randall & Heemstra 1991). Tooth attachment is Type 1 for the caniniform and coniform teeth, and attachment for the depressiform teeth is Type 4 in *Mycteroperca microlepis (*Goode & Bean) (Mullaney & Gale 1996). Tooth replacement is intraosseous in *Mycteroperca bonaci* (Poey), *M. microlepis* (Goode & Bean)*,* and *M. interstitialis* (Poey) (Trapani 2001; Hilton et al. 2005a). In *Mycteroperca* *microlepis* depressiform teeth are replaced continuously and additional tooth rows are added throughout ontogeny, but teeth with Type 1 attachment seemed to reach a finite range that is maintained (Mullaney & Gale 1996).

Diploprionini: *Aulacocephalus* (Jordan & Richardson 1910), *Belonoperca** (Smith 1954c), *Diploprion* (Jordan & Richardson 1910).

Aulacocephalus possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Jordan & Richardson 1910). Jordan and Richardson (1910) noted the teeth on the premaxilla were larger then dentary. *Belonoperca* possesses coniform teeth in the labialmost row and two lingual rows near the symphysis contain enlarged depressiform teeth on the premaxilla and dentary (Smith 1954c). *Diploprion* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Jordan & Richardson 1910). Tooth attachment and replacement have not been investigated.

Liopropomini: *Liopropoma* (Robins 1967).

Liopropoma possesses depressiform teeth arranged in multiple rows on the premaxilla and dentary with the lingualmost row containing the largest teeth (Robins 1967). Tooth attachment and replacement have not been investigated.

Gramistini: *Aporops* (Jones & Kumaran 1968), *Jeboehlkia** (Robins 1967), *Pseudogramma**(Randall et al. 2002), and *Rypticus* (Guimaraes 1999).

Aporops possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Jones & Kumaran 1968). *Jeboehlkia* possesses two to three caniniform teeth near the symphysis followed posteriorly by depressiform teeth arranged in multiple rows with the largest teeth present in the lingualmost row. The dentary has depressiform teeth arranged in multiple row with the lingualmost row containing the largest teeth (Robins

1967). *Pseudogramma* possesses a single or paired caniniform tooth near the symphysis of the premaxilla followed posteriorly by about six rows of smaller depressiform teeth with the lingualmost rows containing the largest teeth; the dentary has depressiform teeth arranged in four to five rows (Randall et al. 2002). *Rypticus* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Guimaraes 1999). Tooth attachment and replacement have not been investigated.

Centrogeniidae: *Centrogenys*.

No information on the dentition of this family was found.

Ostracoberycidae: *Ostracoberyx*.

No information on the dentition of this family was found.

Callanthiidae: *Callanthias* (Anderson & Johnson 1984) and *Grammatonotus* (Prokofiev 2006).

Callanthias possesses caniniform teeth anteriorly with posterior coniform teeth arranged in multiple rows on the premaxilla and dentary. The labialmost row on both jaws contains the largest teeth (Anderson & Johnson 1984). *Grammatonotus* possesses coniform teeth arranged in multiple rows on the premaxilla with the labialmost row containing the largest teeth; the dentary has anterior and posterior symphyseal caniniform teeth, which are followed posteriorly by several rows of coniform teeth (Prokofiev 2006). Tooth attachment and replacement have not been investigated.

Pseudochromidae:

Pseudochrominae: *Assiculoides* (Gill & Hutchins 1997), *Assiculus* (Richardson 1846), *Labracinus* (Schultz 1967), *Ogilbyina,* and *Pseudochromis* (McCulloch 1915; Lubbock 1975).

Assiculoides possesses two to four caniniform teeth with coniform teeth arranged in four to six rows posteriorly on the premaxilla. The dentary has one to three pairs of caniniform teeth with coniform teeth arranged in four to five rows (Gill & Hutchins 1997). *Assiculus* possesses anterior caniniform teeth grouped near the symphysis followed posteriorly by coniform teeth arranged in multiple rows on the premaxilla and dentary (Richardson 1846). *Labracinus* possesses caniniform teeth on the premaxilla and dentary (Schultz 1967). *Ogilbyina* possesses one or two symphyseal caniniform teeth followed posteriorly by coniform teeth arranged in multiple rows on the premaxilla and dentary (McCulloch 1915). *Pseudochromis* possesses a group of caniniform teeth near the symphysis followed posteriorly by coniform teeth arranged in multiple rows on the premaxilla and dentary (McCulloch 1915; Lubbock 1975). Tooth attachment and replacement have not been investigated.

Pseudoplesiopinae: *Chlidichthys* (Lubbock 1975; Gill & Edwards 2004), Lubbockichthys, *Pectinochromis* (Gill & Edwards 2004), and *Pseudoplesiops* (Gill & Edwards 2003).

Chlidichthys and *Pectinochromis* possesses one to three of caniniform teeth near the symphysis followed posteriorly by four to five (two to four on dentary) on coniform teeth with the labialmost row containing the largest teeth on the premaxilla and dentary. See Gill and Edwards (2004) for detailed descriptions of variation in species of *Chlidichthys*. *Lubbockichthys* possesses two caniniform teeth near the symphysis and are followed posteriorly by four to five (three to four on dentary) on coniform teeth with the labialmost row containing the largest teeth on the premaxilla and dentary (Gill & Edwards 2006). *Pseudoplesiops* possesses one to 6 (1 to 2 on dentary) of caniniform teeth near the symphysis which are followed posteriorly by several rows on coniform teeth with the labialmost row containing the largest teeth on the premaxilla and dentary (Gill & Edwards 2003). Tooth attachment and replacement have not been investigated.

Anisochrominae: *Anisochromis* (Smith 1954a).

Anisochromis possesses depressiform teeth arranged in multiple rows with the largest teeth present in the labialmost row on the premaxilla and dentary (Smith 1954a). Tooth attachment and replacement have not been investigated.

Congrogadinae: *Blennodesmus* (Godkin & Winterbottom 1985; Winterbottom 1986), *Congrogadus* (Winterbottom 1986), *Halimuraena (Smith 1952)*, *Haliophis* (Smith 1952), *Natalichthys* (Winterbottom 1980), and *Rusichthys* (Winterbottom 1996).

Blennodesmus contains gynandric heterodonts. Males of *B. scapularis* Günther possess a symphyseal caniniform tooth followed posteriorly by two rows of coniform teeth on the dentary and premaxilla. Female *B. scapularis* lack caniniform teeth (Winterbottom 1986). *Congrogadus* possesses coniform teeth arranged in two rows on the premaxilla and dentary (Winterbottom 1986). *Halidesmus* possesses coniform teeth arranged in three rows on the premaxilla and dentary (Rao & Dutt 1965). Smith (1952) observed an enlarged symphyseal caniniform tooth in males of *H. scapularis* Günther, but stated the differences in the sexes was not as distinct as in other members of the subfamily. *Halimuraena* contains gynandric heterodonts. Male *H. hexagonata* Smith possess an anterior caniniform tooth that is surrounded by two rows of coniform teeth on the premaxilla and dentary. Females of *H. hexagonata* lack caniniform teeth (Smith 1952). *Haliophis* contains gynandric heterodonts. Male *H. guttattus* Forsskål possess depressiform teeth in the anteriormost portion of the labialmost row between a symphyseal caniniform tooth that are followed posteriorly by two rows of caniniform teeth on the premaxilla and dentary.

Females of *H. guttattus* lack caniniform teeth (Smith 1952). *Natalichthys* possesses coniform teeth arranged in about multiple rows with the largest teeth present anteriorly on the premaxilla and dentary (Winterbottom 1980). *Rusichthys* possesses coniform teeth arranged in multiple rows with the labialmost rows containing the largest teeth (Winterbottom 1996). Tooth attachment and replacement have not been investigated.

Grammatidae: *Gramma* *(Victor & Randall 2010) and *Liprogramma** (Robins & Colin 1979).

Gramma possesses caniniform teeth in the labialmost row and coniform teeth arranged in multiple lingual rows on the premaxilla and dentary. The largest tooth present on the dentary is located about a third of the length of jaw posteriorly from the symphysis (Victor & Randall 2010). *Liprogramma* possesses coniform teeth in the labialmost row with depressiform teeth present in the two lingual rows (one row in *L. regia* Robins & Colin) on the premaxilla and dentary (Robins & Colin 1979). Tooth attachment and replacement have not been investigated.

Plesiopidae:

Plesiopinae: *Assessor* (Allen & Kuiter 1976), *Paraplesiops* (Hutchins 1987), *Steeneichthys* (Allen & Randall 1985), and *Trachinops* (Allen 1977).

Assessor possesses coniform teeth arranged in multiple rows with the largest teeth present anteriorly on the premaxilla and dentary (Allen & Kuiter 1976). *Paraplesiops* and *Steeneichthys* possess coniform teeth arranged in multiple rows with the largest teeth present in the labialmost row on the premaxilla and dentary. *Trachinops* possesses a group of caniniform teeth near the symphysis and followed posteriorly by several rows of coniform teeth on the premaxilla and dentary (Allen 1977). Tooth attachment and replacement have not been investigated.

Acanthoclininae: *Acanthoplesiops* (Smith-Vaniz & Johnson 1990; Mooi & Gill 2004), *Beliops* (Smith-Vaniz & Johnson 1990), and *Belonepterygion* (McCulloch 1915).

Acanthoplesiops possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Mooi & Gill 2004). Teeth were in three to four rows in *A. echinatus* (Smith-Vaniz & Johnson 1990). *Beliops* and *Belonepterygion* possess coniform teeth arranged in multiple rows on the premaxilla and dentary. Tooth attachment and replacement have not been investigated.

Notograptidae: *Notograpus* (Gill & Mooi 1993).

Notograpus possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Gill & Mooi 1993). Tooth attachment and replacement have not been investigated.

Opistognathidae: *Opistognathus* (Smith-Vaniz 1997), *Lonchopisthis* (Mead 1959; Menezes & Figueiredo 1971), and *Stalix* (Smith-Vaniz 1989).

Opistognathus contains gynandric heterodonts. Males of *O. whitehurstii* (Longley)possess two to four enlarged coniform teeth at the posterior end of the tooth row on the premaxilla, which are not present in females. *Opistognathus* possesses coniform teeth arranged in about two rows with the largest teeth in the labialmost row on the premaxilla and dentary (Smith-Vaniz 1997). *Lonchopisthis* possesses coniform teeth arranged in about one row on the premaxilla and dentary (Menezes & Figueiredo 1971). *Stalix* possesses coniform teeth arranged in three to four rows with the labialmost tooth row containting the largest teeth on the premaxilla and dentary. *S. sheni* Smith-Vaniz possess enlarged posterior teeth on the premaxilla. For additional information on the dentition of individual species see Smith-Vaniz (1989).

Dinopercidae: *Centrarchops* and *Dinoperca** (Heemstra & Hecht 1986).

Centrarchops possesses coniform teeth arranged in multiple rows with the labialmost row containing the largest teeth on the premaxilla and dentary (Heemstra & Hecht 1986). *Dinoperca* possesses coniform teeth in the labialmost row followed posteriorly by smaller depressiform teeth arranged in about 15 rows on the premaxilla and three rows on the dentary (Heemstra & Hecht 1986). Heemstra and Hecht (1986) observed that the number of tooth rows on the premaxilla increased with standard length. Tooth attachment and replacement have not been investigated.

Banjosidae: *Banjos*.

Information on the dentition of this family could not be located.

Centrarchidae:

Centrarchinae: *Ambloplites* (Fowler 1906b), *Archoplites* (Dineen & Stokely 1956), *Micropterus* (Kakizawa et al. 1988), and *Pomoxis* (Rafinesque 1818).

Ambloplites possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Fowler 1906b). *Archoplites* and *Pomoxis* possess coniform teeth on the premaxilla and dentary. *Micropterus* possesses depressiform teeth arranged in multiple rows on the premaxilla and dentary (Kakizawa et al. 1988). Tooth attachment in *Micropterus salmoides* is Type 4 (Kakizawa et al. 1988).

Lepominae: *Lepomis* (Fowler 1906b).

Lepomis possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Fowler 1906b). Tooth attachment has not been investigated. Tooth replacement is intraosseus in *Lepomis gibbosus* (Trapani 2001).

Percidae:

Percinae: *Gymnocephalus* (Collette 1963), *Perca* (Osse 1968), *Percarina* (Collette 1963).

Gymnocephalus, Perca, and *Percarina* possess coniform teeth arranged in multiple rows on the premaxilla and dentary. Tooth attachment and replacement have not been investigated.

Luciopercinae: *Sander, Romanichthys,* and *Zingel* (Collette 1963).

Sander possesses caniniform teeth interspersed with coniform teeth arranged in multiple rows on the premaxilla and dentary. Caniniform teeth are absent in *S. volgense* (Gmelin) (Collette 1963). *Romanichthys* and *Zingel* possess coniform teeth arranged in multiple rows on the premaxilla and dentary (Collette 1963). Tooth attachment has not been investigated. Tooth replacement is intraosseous in *Sander vitreus* (Mitchill) (Hilton et al. 2005a).

Etheostomatinae: *Etheostoma* (Raney & Zorach 1967) and *Percina* (Stevenson 1971).

Etheostoma possesses coniform teeth arranged in four to five rows on the premaxilla and dentary with the largest teeth present anteriorly (Raney & Zorach 1967). *Percina* possesses coniform teeth arranged in multiple rows on the premaxilla and two rows on the dentary (Stevenson 1971). Tooth attachment and replacement have not been investigated.

Priacanthidae: *Cookeolus, Heteropriacanthus, Priacanthus,* and *Pristigenys* (Starnes 1988).

Priacanthids possess coniform teeth arranged in multiple rows on the premaxilla and dentary (Starnes 1988). Tooth attachment and replacement have not been investigated.

Apogonidae:

Apogoninae: *Apogon** (Fraser & Robins 1970; Gon & Randall 2003), *Archamia* (Chen & Shao 1993), *Cercamia* (Gon & Randall 2003), *Cheilodipterus** (Gon & Randall 2003), *Foa* (Fraser & Randall 2011), *Fowleria* (Gon & Randall 2003), *Neamia* (Fraser 2010), *Phaeoptyx* (Baldwin et al. 2009), *Rhabdamia** (Gon & Randall 2003), and *Vincentia* (Gon 1988).

Apogon possesses coniform teeth arrange in multiple rows or coniform teeth with interspersed caniniform teeth depending upon the species (Gon & Randall 2003). Fraser and Robins (1970) illustrated (Fig. 3) anterior caniniform teeth near the symphysis and posterior group of even larger caniniform teeth separated by coniform teeth with the posteriormost teeth again becoming coniform on the dentary in *A. affinis*. *Archamia* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary with the lingualmost row containing the largest teeth (Chen & Shao 1993). *Cercamia, Foa, Fowleria, Neamia,* and *Vincentia* possess coniform teeth arranged in multiple rows on the premaxilla and dentary. *Cheilodipterus* possesses coniform and one to two pairs of caniniform teeth near the symphysis on the premaxilla and dentary (Gon & Randall 2003). *Phaeoptyx* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary. Baldwin et al. (2009) noted enlarged teeth are present in *P. pigmentaria* Poey, but are not present in *P. conklini* Silvester and *P. xenus* Böhlke & Randall. *Rhabdamia* possesses coniform and one symphyseal caniniform tooth on the premaxilla and dentary (Gon & Randall 2003). Tooth development and arrangement were examined in detail by

Fishelson et al. (2004) who observed canines developed later in the ontogeny of *A. cookii*, but tooth attachment type and mode of tooth replacement were not specifically designated. Pseudaminae: *Gymnapogon** (Smith 1954b), *Paxton** (Baldwin & Johnson 1999), *Pseudamia*, Pseudamiops** (Smith 1954b).

Gymnapogon possesses four caniniform teeth near the symphysis followed posteriorly by coniform teeth arranged in about two rows on the premaxilla. The dentary has a posterior group of three to six caniniform separated from an anterior two to four caniniform teeth followed posteriorly by a single row of coniform teeth (Smith 1954b). *Paxton* possesses anterior coniform teeth followed posteriorly by three to five rows on the premaxilla. The dentary has caniniform teeth interspersed with coniform teeth and the largest caniniform teeth are present about midway on the on the jaw (Baldwin & Johnson 1999). *Pseudamia* possesses anterior caniniform teeth amidst coniform teeth arranged in three to four rows on the premaxilla and dentary (Smith 1954b). *Pseudamiops* possesses two pairs of caniniform teeth near the symphysis followed posteriorly by coniform teeth arranged in about two rows on the premaxilla and dentary (Smith 1954b). Tooth attachment and replacement have not been investigated.

Epigonidae: *Epigonus* (Parin et al. 2012) and *Florenciella* (Prokofiev 2007).

Epigonus possesses coniform teeth arranged in two rows on the premaxilla and three to four rows on the dentary (Parin et al. 2012). *Florenciella* possesses coniform teeth arranged in in two rows on the premaxilla and two to three rows on the dentary. Anterior teeth on the premaxilla notably enlarged (Prokofiev 2007). Tooth attachment and replacement have not been investigated.

Sillaginidae: *Sillaginopsis* (Gill 1862d), and *Sillago* (Dutt & Sujatha 1983).

Sillaginopsis possesses coniform teeth arranged in multiple rows on the premaxilla and dentary with the labialmost row containing the largest teeth (Gill 1862d). *Sillago* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Dutt & Sujatha 1983). Tooth attachment and replacement have not been investigated.

Malacanthidae:

Malacanthinae: *Malacanthus** (Smith 1956) and *Hoplolatilus** (Randall & Dooley 1974).

Malacanthus possesses paired caniniform teeth and about two rows of coniform teeth on the premaxilla and dentary(Smith 1956). *Hoplolatilus* possesses caniniform teeth in the labialmost row and coniform teeth arranged in three to five lingual rows on the premaxilla and dentary (Randall & Dooley 1974). Tooth attachment and replacement have not been investigated.

Latilinae: *Caulolatilus* (Lockington 1880b), *Lopholatilus** (Goode & Bean 1879), and *Brachiostegus* (Dooley & Iwatsuki 2012).

Caulolatilus possess coniform teeth arranged in multiple rows on the premaxilla and dentary (Lockington 1880b). *Lopholatilus* possesses caniniform teeth in the labialmost row and coniform teeth arranged in multiple rows on the premaxilla and dentary (Goode & Bean 1879). *Brachiostegus* possesses caniniform teeth arranged in two to three rows on the premaxilla and dentary (Dooley & Iwatsuki 2012). Tooth attachment and replacement have not been investigated. Tooth attachment and replacement have not been investigated.

Lactariidae: *Lactarius*.

No information on the dentition of this family was found.

Dinolestidae: *Dinolestes* (Starks 1899).

Dinolestes possesses caniniform teeth in the labialmost row with coniform teeth arranged in multiple rows on the premaxilla. The dentary has a single row of coniform teeth with three or four posterior caniniform teeth (Starks 1899). Tooth attachment was described as Type 1 based on Starks (1899) observation that the were “ankylosed.”

Scombropidae: *Scombrops* (Yasuda et al. 1971).

Scombrops possesses caniniform teeth arranged in about one row on the premaxilla and dentary (Fig. 6) (Yasuda et al. 1971). Additionally, Yasuda et al. (1971) also observed slightly smaller teeth in *S. gilberti* (Jordan & Snyder). Tooth attachment and replacement have not been investigated.

Pomatidae: *Pomatomus* (Bemis et al. 2005).

Pomatomus possesses caniniform teeth arranged in a single row on the premaxilla and dentary (Bemis et al. 2005). Tooth attachment is Type 1 based on detailed examination by Bemis et al. (2005) who observed fully ankylosed teeth. Tooth replacement is intraosseous and proceeds from the posterior tooth positions to anterior tooth positions. Bemis et al. (2005) hypothesized that once tooth erosion begins, teeth are rapidly lost since most observed teeth were fully functional.

Nematistiidae: *Nematistius* (O'Toole 2002)

Nematistius possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (O'Toole 2002). Tooth attachment and replacement have not been investigated.

Coryphaenidae: *Coryphaena* (O'Toole 2002).

Coryphaena possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (O'Toole 2002). Tooth attachment and replacement have not been investigated.

Rachycentridae: *Rachycentron* (O'Toole 2002)

Rachycentron possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (O'Toole 2002). Tooth attachment and replacement have not been investigated.

Echeneidae: *Echeneis* (Paulin & Habib 1982; O'Toole 2002), *Phtheirichthys, Remora,* and *Remorina* (O'Toole 2002).

Echeneis possesses coniform teeth on the premaxilla. The posterior premaxilla teeth have been described as "comblike." The dentary has coniform teeth arranged in multiple rows (O'Toole 2002). Paulin and Habib (1982) however, describe the dentition of *E. naucrate* as "numerous small, villiform teeth."*Phtheirichthys* possesses coniform teeth arranged in multiple rows on the premaxilla. The dentary has a group of anterior caniniform teeth followed posteriorly by coniform teeth (O'Toole 2002). *Remora* and *Remorina* possesses coniform teeth on the premaxilla. The posterior premaxilla teeth have been described as "comblike." The dentary has coniform teeth arranged in multiple rows with the largest teeth present in the labialmost row (O'Toole 2002). Tooth attachment and replacement have not been investigated.

Carangidae:

Trachinotinae: *Lichia* (Regan 1903b) and *Trachinotus* (Smith 1967b).

Lichia possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Regan 1903b). *Trachinotus* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Lin & Shao 1999). Smith (1967b) observed that the teeth were "obsolete in adults" of all *Trachinotus* species examined.

Scomberoidinae: *Oligoplites, Parona,* and *Scomberoides* (Major 1973; Smith-Vaniz & Staiger 1973; Lucas & Benkert 1983).

Oligoplites possesses coniform teeth arranged in two rows on the premaxilla and dentary in adults. However, juveniles have thin deeply recurved incisiform teeth (Fig.18a) in the labialmost row of the dentary (Smith-Vaniz & Staiger 1973). These incisiform teeth begin to be replaced at about 50 mm SL and will be near fully replaced by 150 mm SL (Major 1973). It was hypothesized that these teeth were for scale feeding and ectoparasite removal (Smith-Vaniz & Staiger 1973; Lucas & Benkert 1983). *Parona* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary. Juveniles possess caniniform teeth near the symphysis (Smith-Vaniz & Staiger 1973). *Scomberoides* possesses caniniform teeth near the symphysis followed by coniform teeth arranged in two rows on the premaxilla and dentary. Juveniles have thin deeply recurved incisiform teeth (Fig.18a) in the labialmost row of the dentary. However, Smith-Vaniz and Staiger (1973) hypothesized that this character was secondarily lost in *S. tol* (Cuvier), which only has coniform teeth and caniniform. These incisiform teeth begin to be replaced at about 50 mm SL and will be nearly replaced by 150 mm SL (Major 1973). It was suggested theses teeth were for scale feeding and ectoparasite removal (Smith-Vaniz & Staiger 1973; Lucas & Benkert 1983). Tooth attachment has not been investigated. Tooth replacement is has no been described in Somberoidinae, but Smith-Vaniz and Staiger (1973) illustrated some crypts and developing teeth on the jaws of *S. commersonianus* Lacepède and *S. tol* (Fig. 14c&d).

Naucratinae: *Campogramma* (Regan 1903b), and *Seriola* (Smith 1959b).

Campogramma possesses coniform teeth arranged in a single row on the premaxilla and dentary (Regan 1903b). *Seriola* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Smith 1959b). Tooth attachment and replacement have not been investigated.

Caranginae: *Alectis* (Lin & Shao 1999), *Carangoides* (Nichols 1922; Balanov & Markevich 2011), *Caranx* (Jordan & Gilbert 1883b), *Decapterus* (Norman 1935a), *Gnathanodon* (Lin & Shao 1999), *Parastromateus* (Hilton et al. 2010), *Selene* (Brevoort 1852), and *Uraspis* (Reuben 1968).

Alectis possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Lin & Shao 1999). *Carangoides* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Nichols 1922). Balanov and Markevich (2011) observed two to three rows in *C. equula* (Temminck & Schlegel) with the labiamost row containing the largest teeth. *Caranx* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Jordan & Gilbert 1883b). , 1999) illustrated (Fig.11) the teeth on the premaxilla of *Caranx* with caniniform teeth in labialmost tooth row with several inner rows of small coniform teeth, but it remains unclear which species possess caniniform teeth. *Decapterus* possesses coniform arranged in a single row on the premaxilla and one to rows on the dentary (Norman 1935a). Lin and Shao (1999) observed only one tooth row on both jaws in *D. akaadsi* Abe, entirely edentulous jaws in *D. macarellus,* and *D. macrosoma* Bleeker has an edentulous premaxilla and only single tooth row on the dentary. *Gnathanodon* is edentulous on the oral jaws (Lin & Shao 1999). *Parastromateus* possesses coniform teeth arranged in a single row on the premaxilla and dentary (Hilton et al. 2010). *Selene* possesses coniform teeth on the premaxilla and dentary (Brevoort 1852). *Uraspis* possesses coniform teeth arranged in a single row on the premaxilla and dentary in adults. Specimens below 150mm usually have two to three rows of coniform teeth. Reuben (1968) also hypothesized it is the inner series of the premaxilla and the outer series of the dentary that are lost with increasing length. Tooth attachment has not been investigated. Tooth replacement is intraosseous in *Caranx hippos* (Linnaeus) (Hilton et al. 2005a).

Menidae: *Mene* (Montilla 1935).

Mene has coniform teeth arranged in multiple rows on the premaxilla and dentary (Montilla 1935). Tooth attachment and replacement have not been investigated.

Leiognathidae: *Gazza** (Kimura et al. 2000; Yamashita & Kimura 2001), *Leiognathus* (Kimura et al. 2003), and *Secutor* (James 1985).

Gazza possesses paired caniniform teeth near the symphysis followed posteriorly a single row of coniform teeth. The dentary has coniform teeth arranged in a single row on the premaxilla (Yamashita & Kimura 2001). *Leiognathus* and *Secutor* possess coniform teeth arranged in single row on the premaxilla and dentary. Tooth attachment and replacement have not been investigated.

Bramidae:

Braminae: *Eumegistus* (Moteki & Mundy 2005), *Taractes* (Wheeler 1962), and *Xenobrama* (Yatsu & Nakamura 1989).

Eumegistus possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Moteki & Mundy 2005). *Taractes* possesses coniform teeth arranged in two rows on the premaxilla and dentary (Wheeler 1962; Moteki & Nagasawa 1998). *Xenobrama* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary with the labial and lingualmost rows enlarged (Yatsu & Nakamura 1989). Tooth attachment and replacement have not been investigated.

Pteraclinae: *Pteraclis* (Prokofiev & Kukuev 2009b).

Pteraclis possesses coniform teeth arranged in four rows on the premaxilla and two rows on the dentary (Prokofiev & Kukuev 2009b). Tooth attachment and replacement have not been investigated.

Caristiidae: *Caristius* and *Platyberyx* (Kukuev et al. 2012).

Caristius possesses coniform teeth arranged sparsely in a single row on the premaxilla and dentary (Kukuev et al. 2012). *Platyberyx* possesses coniform teeth arranged in two rows on the premaxilla and dentary (Kukuev et al. 2012). Tooth attachment and replacement have not been investigated.

Emmelichthyidae: *Emmelichthys*, *Erythrocles* (Jordan & Thompson 1912; Heemstra & Randall 1977), and *Plagiogeneion* (Heemstra & Randall 1977).

Emmelichthys is often edentulous on the premaxilla, but some small coniform teeth may be present. The dentary usually bears a few small coniform teeth, but may be edentulous (Heemstra & Randall 1977). *Erythrocles* possesses coniform teeth on the premaxilla and dentary (Jordan & Thompson 1912). Premaxilla may be edentulous (Heemstra & Randall 1977) *Plagiogeneion* possesses either coniform teeth in multiple rows or an edentulous premaxilla. The dentary has coniform teeth arranged in one to several rows (Heemstra & Randall 1977). Tooth attachment and replacement have not been investigated.

Lutjanidae:

Etelinae: *Aphareus* (Anderson Jr 1987), *Aprion* (Jordan & Gilbert 1883a), *Etelis** (Jordan & Swain 1884), *Pristipomoides** (Anderson Jr 1966), and *Randallichthys** (Anderson Jr et al. 1977).

Aphareus possess coniform teeth on the premaxilla and dentary (Anderson Jr 1987). *Aprion* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary with the labialmost row containing the largest teeth (Jordan & Gilbert 1883a). *Etelis* possesses caniniform teeth and multiple rows of coniform teeth on the premaxilla. The dentary has coniform teeth arranged in multiple rows (Jordan & Swain 1884). *Pristipomoides* possesses several anterior caniniform teeth followed by multiple lingual rows of coniform teeth on the premaxilla and dentary (Anderson Jr 1966). *Randallichthys* possesses caniniform teeth with multiple lingual rows of coniform teeth on the premaxilla and dentary with the largest teeth in the labialmost row (Anderson Jr et al. 1977). Tooth attachment and replacement have not been investigated.

Apsilinae: *Lipocheilus* (Yoshino & Sata 1981), *Paracaesio** (Abe 1960; Raj & Johnson 1983), *Parapristipomoides* (Kami 1973).

Lipocheilus possess coniform teeth arranged in multiple rows with the labialmost teeth notably enlarged (Yoshino & Sata 1981). *Paracaesio* possess caniniform teeth in the labialmost row and multiple lingual rows of coniform teeth (Raj & Johnson 1983). *Parapristipomoides* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Kami 1973). Tooth attachment and replacement have not been investigated.

Paradichtyinae: *Symphorus* (Günther 1872a).

Symphorus possesses caniniform teeth on the premaxilla and dentary (Günther 1872a). Tooth attachment and replacement have not been investigated.

Lutjaninae: *Hoplopagrus* (Jordan & Swain 1884; Anderson Jr 1987), *Lutjanus** (Jordan & Swain 1884), *Macolor* (Kishimoto et al. 1987), Ocyurus(Jordan & Swain 1884), *Pinjalo* (Randall et al. 1987), and *Rhomboplites* (Jordan & Swain 1884).

Hoplopagrus possesses molariform teeth on the premaxilla and dentary (Anderson Jr 1987). Jordan and Swain (1884) observed paired caniniform teeth on the premaxilla in *H. guentherii* Gill. *Lutjanus* possesses four caniniform teeth anteriorly followed by posterior coniform teeth in the labialmost tooth row with several lingual rows of coniform teeth on the premaxilla. The dentary has coniform teeth arranged in multiple rows with the labialmost row being notably enlarged. The caniniform teeth of *L. cubera* (Cuvier) were investigated to be the largest in the genus and were also present on the dentary (Jordan & Swain 1884). *Macolor* possesses coniform teeth on the premaxilla and dentary (Kishimoto et al. 1987). *Ocyurus* and *Rhomboplites* possess coniform teeth arranged in multiple rows on the premaxilla and dentary with the labialmost row containing the largest teeth. *Pinjalo* possesses coniform teeth in the labialmost row with depressiform teeth arranged in several lingual rows on the premaxilla and dentary (Randall et al. 1987). Tooth attachment is Type 2 in *Lutjanus synagris* (Linnaeus). Tooth replacement is intraosseous in *Lutjanus campechanus* (Poey) (Hilton et al. 2005a).

Caesionidae: *Caesio, Dipterygonotus, Gymnocaesio,* and *Pterocaesio* (Carpenter 1990).

Caesio, Dipterygonotus, Gymnocaesio, and *Pterocaesio* possess coniform teeth on the premaxilla and dentary (Fig. 5). Additionally, Carpenter (1990) commented on the variations in arrangement of teeth in Caesionidae and hypothesized that there is a progressive reduction in dentition in Caesionids except in the case *Pterocaesio tessellata* Carpenter which has a reversal to prominent coniform teeth. Tooth attachment and replacement have not been investigated.

Lobotidae: *Datnioides* and *Lobotes* (Hilton et al. 2005a).

Datnioides and *Lobotes* possess coniform teeth arranged in several (about four in *L. surinamensis* (Bloch) based on Fig. 3a in Hilton et al. 2005a). The labialmost tooth row is enlarged on the premaxilla and dentary. The teeth of the labialmost tooth row are also replaced by a modified type of intraosseous replacement unlike the the lingual rows.Tooth attachment is Type 1 based on Hilton et al. (2005a) which describes attachment as "firmly ankylosed." Tooth replacement was examined in detail by Hilton et al. (2005a) where the lingual tooth rows were observed to replaced intraosseously in an alternating pattern in *Lobotes surinamensis*. However, the labialmost tooth row has modified the intraosseous replacement with grouped replacement teeth in multiple separate crypts along the jaws. Hilton et al. (2005a) found a similar, but less develop pattern of replacement in *Datnioides quadrifasciatus*.

Gerreidae: *Diapterus*, *Eugerres* (Deckert & Greenfield 1987), *Gerres* (Montilla 1935), *Parequula* (Ogilby 1888), and Xystaema(Jordan 1907).

Diapterus and *Eugerres* possess coniform teeth on the premaxilla and dentary. Teeth were originally described as "pinniform" by Deckert and Greenfield (1987). *Gerres*, *Parequula,* and *Xystaema* possess coniform teeth arranged in multiple rows on the premaxilla and dentary (Montilla 1935). Tooth attachment and replacement have not been investigated.

Haemulidae:

Haemulinae: Anisotremus (Acero P. & Garzon F. 1982), *Conodon* (Jordan & Gilbert 1882a), *Haemulon* (Rocha & Rosa 1999), *Orthopristis* (Jordan & Fesler 1889), *Pomadasys* (McKay & Satapoomin 1994; Iwatsuki et al. 1995), *Xenichthys* and *Xenistius* (Hildebrand 1946).

Anisotremus possesses coniform teeth arranged in a single row on the premaxilla and dentary (Acero P. & Garzon F. 1982). *Conodon, Orthopristis, Pomadasys, Xenichthys* and *Xenistius* possess coniform teeth arranged in multiple rows on the premaxilla and dentary with the largest teeth in the labialmost tooth row. *Haemulon* possesses coniform teeth on the premaxilla and dentary (Rocha & Rosa 1999). Tooth attachment is Type 2 in *Anisotremus surinamensis* (Bloch). Tooth replacement is extraosseous in *Orthopristis chrysoptera* (Linnaeus) (Hilton et al. 2005a).

Plectrohynchinae: *Diagrama* (Day 1870), *Plectorhincus* (Satapoomin & Randall 2000).

Diagrama possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Day 1870). *Plectorhincus* possesses coniform teeth arranged in five to seven rows on the premaxilla and five to nine rows on the dentary with the largest teeth in the labialmost row (Satapoomin & Randall 2000). Tooth attachment and replacement have not been investigated.

Nemipteridae: *Nemipterus**(Russell 1993), *Parascolopsis** (Russell 1996), *Pentapodus** (Russell 2001; Russell 2002; Allen & Erdmann 2009), and *Scolopis* (Russell 2002).

Nemipterus possesses three paired caniniform teeth in the labialmost row and several lingual rows of coniform teeth on the premaxilla; the dentary has caniniform teeth in the labialmost row and several lingual rows of coniform teeth (Russell 1991). *Parascolopsis* possesses two anterior caniniform teeth on the premaxilla followed by several lingual rows of coniform teeth. The dentary has coniform teeth arranged in multiple rows (Russell 1996). *Pentapodus* possess one to three caniniform teeth anteriorly with posterior lingual rows of coniform teeth on the premaxilla. The dentary has two labial very large recurved caniniform teeth as illustrated (Fig. 21) by Russell (2002). The lingual tooth rows are coniform on the dentary. *Scolopis* possesses coniform teeth arrange in multiple rows on the premaxilla and dentary (Russell 2002). Tooth attachment and replacement have not been investigated.

Lethrinidae: *Gnathodentex*, Gymnocranius*, Lethrinus*, Monotaxis*,* and *Wattsia** (Carpenter & Allen 1989).

Gnathodentex, Gymnocranius, and *Wattsia* possess anterior caniniform teeth followed posteriorly by enlarged coniform teeth on the premaxilla and dentary. Both premaxilla and dentary have much smaller coniform teeth arranged in multiple lingual rows (Carpenter & Allen 1989). *Lethrinus* possesses anterior of caniniform teeth followed posteriorly by a single row of coniform or molariform teeth and present lingually are several rows of smaller coniform teeth on the premaxilla and dentary. Carpenter and Allen (1989) observed a continuum of tooth shape varying from conical to rounded conical to molariform in *Lethrinus* and gave specific details in species accounts. Molariform and rounded conical are both treated as molariform. In *L. lentjan* (Lacepède) and *L. nebulosus* (Forsskål) rounded conical or molariform teeth have a "tubercle," illustrated by Carpenter and Allen (1989) as a small central cusp set in the crown of the tooth (Fig. 18), but it has not been designated as different tooth type here. *Monotaxis* possesses anterior caniniform teeth followed posteriorly by six to seven large molariform teeth in the labialmost tooth row on the premaxilla and dentary. Both premaxilla and dentary also have coniform teeth are arranged in multiple lingual rows posterior to the caniniform teeth (Carpenter & Allen 1989). Tooth attachment and replacement have not been investigated.

Sparidae: *Archosargus*, Boops, Calamus*, Crenidens*, Chrysoblephus*, Dentex, Diplodus*, Gymnocrotaphus*, Lagodon*, Lithognathus*, Pachymetopon, Pagellus*,* *Petrus*, Polyamblyodon*, Polysteganus*, Rhabdosargus*, and Sarpa** (Smith & Smith 1986; Hanel & Sturmbauer 2000; Carpenter 2002b).

The molariform teeth common in sparids appear have tooth crowns from nearly conical to almost fully circular in shape. This variation makes separating the terminology used by previous authors difficult and more work on the ontogenetic changes that may be the source of this variation is needed.

Archosargus, Calamus, Diplodus possesses incisiform teeth in the labialmost row, which are followed by multiple (about three in *Archosargus*) lingual rows of molariform teeth on the premaxilla and dentary (Carpenter 2002b). *Boops* possesses incisiform teeth on the premaxilla and dentary (Hanel & Sturmbauer 2000). *Crenidens* possesses anterior multicuspid (usually 5 cusp) incisiform teeth arranged in two rows (occasionally three on the premaxilla) which are followed posteriorly by molariform teeth arranged in multiple rows on the premaxilla and dentary (Smith & Smith 1986). *Chrysoblephus* possesses anterior caniniform in the labialmost row, which are followed posteriorly by three or more rows of molariform teeth on the premaxilla and dentary (Smith & Smith 1986). *Dentex* possesses caniniform teeth on the premaxilla and dentary (Hanel & Sturmbauer 2000). *Gymnocrotaphus* possesses incisiform teeth in the labialmost row, which are followed by multiple lingual rows of coniform teeth (occasionally a few molariform)(Smith & Smith 1986). *Lagodon* possesses bicuspid incisiform teeth in the labialmost row, which are followed by about three lingual rows of molariform teeth (Carpenter 2002b). Lingual rows of anterior coniform teeth were observed in juvenile specimens with few molariform teeth present. *Lithognathus* possesses incisiform teeth in the labialmost row, which are followed by two to three lingual rows of molariform teeth (Smith & Smith 1986). *Pachymetopon* possesses incisiform teeth arranged in five rows on the premaxilla and dentary (Smith & Smith 1986). *Pagellus* possesses anterior coniform teeth arranged in multiple rows with the lingualmost row containing the smallest teeth. Posterior and lingual to these teeth are two rows of molariform teeth on the premaxilla and dentary (Smith & Smith 1986; Hanel & Sturmbauer 2000). *Petrus* possesses anterior caniniform in the labialmost row, which are followed posteriorly by multiple rows of coniform teeth on the premaxilla and dentary (Smith & Smith 1986). *Polyamblyodon* possesses incisiform teeth in the labialmost tooth row, which are followed lingually by molariform teeth. The molariform teeth of *P. gibbosum* have a central small cusp in the center of each tooth as illustrated (Fig. 183.28) by Smith and Smith (1986). *Pterogymnus* possesses anterior caniniform in the labialmost row, which are followed posteriorly by two or three rows of molariform teeth on the premaxilla and dentary. The outermost pair of caniniform teeth flare labially (Smith & Smith 1986). *Rhabdosargus* possesses anterior incisiform in the labialmost row, which are followed posteriorly by three or more rows of molariform teeth on the premaxilla and dentary. In *R. sarba* (Forsskål) the teeth mid way along the jaw of the labialmost row become more conical than incisiform (Smith & Smith 1986). *Sarpa* possesses bicuspid incisiform arranged in a single row on the premaxilla. The dentary has unicuspid incisiform teeth ("spade shaped") arranged in a single row (Smith & Smith 1986). *Sparodon* possesses four incisiform teeth anteriorly which are followed by molariform teeth arranged in multiple rows on the premaxilla and dentary (Smith & Smith 1986). *Spondyliosoma* possesses elongate coniform or incisiform teeth arranged in four to six rows with posterior smaller coniform or molariform teeth located in a single row on the premaxilla and dentary (Smith & Smith 1986; Hanel & Sturmbauer 2000). Tooth attachment is Type 2 in *Lagodon* *rhomboides* (Fink 1981). Hughes et al. (1994) examined the tissue structure of the "bone of attachment" in great detail and found it consisted of three types of dentine in *Acanthopagrus australis, Pagrus auratus* and *Rhabdosargus sarba*. Tooth replacement is intraosseous in *Sargus sp., Pagrus auratus, Acanthopagrus sarba,* and *Rhabdosargus sarba* (Trapani 2001).

Centracanthidae: Centracanthus and Spicara.

Information on the dentition of this family could not be found.

Polynemidae: *Eleutheronema, Filimanus, Galeoides, Leptomelanosoma, Parapolynemus, Pentanemus, Polydactylus,* and *Polynemus* (Motomura 2004).

Eleutheronema, Filimanus, Galeoides, Leptomelanosoma, Parapolynemus, Pentanemus, Polydactylus, and *Polynemus* possess coniform teeth arranged in multiple rows on premaxilla and dentary (Motomura 2004). Tooth attachment and replacement have not been investigated.

Sciaenidae: *Aplodinotus* (Green 1941), *Atrobucca* *(Talwar & Sathiarajan 1975), *Bairdiella* (Jordan & Thompson 1911), *Cynoscion* (Béarez 2001), *Johnius** (Sasaki & Amaoka 1989), *Leiostomus* (Govoni 1987), *Menticirrhus**(Kobelkowsky & Escobar 2007), *Ophioscion** (Caldwell 1958), *Paranembris* (Chao et al. 2001), *Pogonias* (Blasina et al. 2010), *Sciaena* (Chao & Miller 1975), *Sciaenops** (Topp & Cole 1968), *Seriphus** (Ayres 1860a), and *Stellifer* (Aguilera et al. 1983).

Aplodinotus and *Bairdiella* possess coniform teeth arranged in six rows on the premaxilla and detnary with the largest teeth in the labialmost row. *Atrobucca* possesses caniniform in the labialmost row on the premaxilla with multiple lingual rows of smaller coniform teeth on the premaxilla. The dentary has coniform teeth arranged in multiple rows

(Talwar & Sathiarajan 1975). *Cynoscion* possesses caniniform teeth arranged in two to three rows on the premaxilla and dentary. The premaxilla bears one or two notably enlarged canines at the symphysis while the dentary has enlarged caniniform teeth present posteriorly (Béarez 2001). *Johnius* possesses caniniform in the labialmost row with multiple lingual rows of smaller coniform teeth on both the premaxilla. The dentary possesses caniniform in the lingualmost row with multiple lingual rows of smaller coniform teeth (Sasaki & Amaoka 1989). *Leiostomus* possesses coniform teeth arranged in multiple rows on the premaxilla. The dentary is edentulous by 100 mm SL. Juveniles have reach their maximum number of teeth at 40 mm SL and tooth replacement ceases on the dentary (Govoni 1987). *Menticirrhus* possesses caniniform in the labialmost row on the premaxilla with multiple lingual rows of smaller coniform teeth on the premaxilla based on illustrations (Fig.3) by Kobelkowsky and Escobar (2007). The dentary has coniform teeth arranged in multiple rows. *Ophioscion* possesses caniniform in the labialmost row on the premaxilla with multiple lingual rows of smaller coniform teeth on the premaxilla. The dentary has coniform teeth arranged in multiple rows (Caldwell 1958). *Paranembris, Pogonias, Sciaena,* and *Stellifer* possess coniform teeth arranged in multiple rows on premaxilla and dentary. *Sciaenops* possesses caniniform in the labialmost row on the premaxilla with multiple lingual rows of smaller coniform teeth on both the premaxilla and dentary (Topp & Cole 1968). *Seriphus* possesses caniniform in the labialmost row on the premaxilla with multiple lingual rows of smaller coniform teeth on both the premaxilla and dentary (Ayres 1860a). Tooth attachment is Type 2 in *Menticirrhus ophicephalus* and *Leistomus xanthurus* (Fink 1981; Govoni 1987). Tooth replacement is intraosseous in *Aplodinotus grunniens* and *Cynoscion* sp. (Trapani 2001; Hilton et al. 2005a). Govoni

(1987) described tooth the mnode of replacement in *Leiostomus xanthurus* Lacepède and it was similar to extraosseous. Additionally, Govoni (1987) provided a detailed account of the drastic ontogenetic changes that occur in *L. xanthurus* and hypothesized its cause was dietary changes.

Mullidae: *Mulloidichthys* (Uiblein 2010), *Mullus* (Aguirre 1997), *Parupeneus* (Kim & Amaoka 2001), *Pseudupeneus* (Azzouz et al. 2011), *Upeneichthys* (Hutchins 1990), and *Upeneus* (Uiblein & Heemstra 2010).

Mulloidichthys and *Upeneichthys* possess coniform teeth arranged in one (sometimes two near the symphysis) rows on the premaxilla and dentary (Uiblein 2010). *Mullus* are edentulous on the premaxilla as adults. The dentary has coniform teeth. In juveniles of *M. barbatus* Linnaeus specimens below 50 mm Aguirre (1997) observed with small “freely movable” coniform teeth. In specimens greater then 50 mm the teeth become covered by flesh and then are progressively lost. Aguirre (1997) also found a similar pattern of tooth loss in *M. surmuletus* Linnaeus. *Parupeneus* and *Pseudupeneus* possess coniform teeth on the premaxilla and dentary. *Upeneus* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Uiblein & Heemstra 2010). Tooth attachment and replacement have not been investigated.

Pempheridae: *Parapriacanthus* and *Pempheris* (Tominaga 1968).

Parapriacanthus and *Pempheris* possess coniform teeth arranged in two to three rows on the premaxilla and dentary with the largest teeth in the labialmost row (Tominaga 1968). Tooth attachment and replacement have not been investigated.

Glaucosomatidae: *Glaucosoma* (Macleay 1881).

Glaucosoma possesses coniform teeth arranged in two rows on the premaxilla and dentary (Macleay 1881). Tooth attachment and replacement have not been investigated.

Leptobramidae: *Leptobrama* (Tominaga 1965).

Leptobrama possesses coniform teeth arranged in five to six rows on the premaxilla and eight to ten rows on the dentary (Tominaga 1965). Tooth attachment and replacement have not been investigated.

Bathyclupeidae: *Bathyclupea* (Dick 1962).

Bathyclupea possesses coniform teeth arranged in a single row on the premaxilla and dentary (Dick 1962). Tooth attachment and replacement have not been investigated.

Monodactylidae: *Monodactylus and Schuettea.*

Information on the dentition of this family could not be found.

Toxotidae: *Toxotes* (Allen 2004).

Toxotes possesses coniform teeth arranged in multiple rows on the premaxilla and dentary. Tooth attachment and replacement have not been investigated.

Arripidae: *Arripis* (Paulin 1993).

Arripis possesses coniform teeth arranged in multiple rows on the premaxilla and dentary. Tooth attachment and replacement have not been investigated.

Dichstiidae: *Dichistius* (Smith 1935).

Dichistius possesses incisiform teeth in the labialmost tooth row and two rows of small coniform teeth on the premaxilla and dentary. Tooth attachment and replacement have not been investigated.

Kyphosidae:

Girellinae: *Girella** (Norris & Prescott 1959) and Graus* (Johnson & Fritzsche 1989).

Girella possesses tricuspid incisiform teeth in the labialmost tooth row with one to three lingual rows of tricuspid incisiform on the premaxilla and dentary. The teeth in the labialmost row of *G. nigricans* (Ayres) are highly modified with a hinge in the middle of an extended tooth shaft that is attached to via a connective tissue "sheath" to flanges in the premaxilla and dentary on either size od each tooth (Norris & Prescott 1959). Lingual tooth rows lack this structural modification and are attached by the usual "pedicel" bone of attachment. Yagishita and Nakabo (2003) examined variants in both arrangement and tooth shape among species of *Girella*. They observed four variants in tooth shape based on the prominence of the cusps in different species. *Graus* possesses caniniform anteriorly in the labialmost tooth row with three to four lingual rows of coniform teeth on the premaxilla and dentary. Johnson and Fritzsche (1989) observed that teeth in juveniles were movable and "somewhat flattened" at the tips. I have designated the anterior teeth as caniniform based on SEMs (Fig. 8c) of dentition (Johnson & Fritzsche 1989). Johnson and Fritzsche (1989) also observed that teeth of juveniles of *G. nigra* were movable and "somewhat flattened" at the tips.

Tooth attachment in *Girella nigricans* does not fit described Types proposed by Fink (1981) in the labiamost tooth row (mode of attachment in lingual rows unknown) and further examination of tooth structure is needed to determined if the bone of attachment is present as either the bottom segment of the hinged tooth or is represented by the "porous bone" the develops at the tooth base once it has reached functional position (Norris & Prescott 1959). Tooth attachment is Type 2 in *Graus nigra* (Johnson & Fritzsche 1989). Tooth replacement is extraosseous in *Girella nigricans*, but takes place in an open trough in the labialmost tooth row unlike the lingual rows. A progenic serial replacement series is present for individual teeth in the labialmost tooth row, but not in the lingual rows. Experimental evidence from Norris and Prescott (1959) found that replacement and development occur continuously and the full development, shedding and replacement takes between 22-32 days. Johnson and Fritzsche (1989) found that tooth replacement intraosseous in *Graus nigra,* but it also has progenic serial replacement of individual teeth.

Kyphosinae: *Kyphosus** (Sakai & Nakabo 2006; Knudsen & Clements 2013), and *Neoscorpis* (Knudsen & Clements 2013).

Kyphosus possesses anterior unicuspid (often described as "lanceolate") incisiform teeth and /or multicuspid incisiform teeth posterior to those teeth with coniform teeth in the posteriormost tooth positions in the labialmost row of the premaxilla and dentary (Sakai & Nakabo 2006). Smaller coniform teeth are also present in three to four lingual rows of coniform teeth on the premaxilla and dentary. The number of teeth increases with the size of specimens (Knudsen & Clements 2013). *Neoscorpis* possesses unicuspid incisiform teeth on the premaxilla and dentary (Knudsen & Clements 2013). Tooth attachment has not been investigated. Tooth replacement is intraosseous in *Kyphosus sectatrix* (Trapani 2001). Norris and Prescott (1959) found that tooth replacement was intraosseous in *Kyphosus (Hermosilla) azureus*, but it also has a progenic serial replacement series for each tooth in the labialmost tooth row.

Scorpidinae: Bathystethus, Labracoglossa, *Medialuna** (Chirichigno 1987) and *Scorpis* (Johnson & Fritzsche 1989).

Medialuna possesses either coniform teeth or pointed incisiform teeth in the labialmost row with several lingual rows of coniform teeth on the premaxilla and dentary (Chirichigno 1987). Tooth replacement is intraosseous in *Scorpis chilensis.* Johnson and

Fritzsche (1989) also found that *Scorpis chilensis* has a progenic serial replacement series for each tooth in the labialmost tooth row.

Parascorpidinae: *Parascorpis* (Boulenger 1899).

Parascorpis possesses coniform teeth arranged in multiple rows on the premaxilla and dentary. Tooth attachment and replacement have not been investigated.

Drepaneidae: *Drepane* (Tyler et al. 1989b).

Drepane possesses coniform teeth on the premaxilla and dentary based Tyler et al. (1989b) illustration (Fig. 37). Tooth attachment and replacement have not been investigated.

Chaetodontidae: *Chaetodon* (Motta 1984) *Chelmon, Coradion* (Ferry-Graham et al. 2001), *Forcipiger* (Randall 1961), *Hemitaurichthys, Heniochus, Johnrandallia,* and *Prognathodes* (Ferry-Graham et al. 2001).

Chaetodon possesses coniform teeth arranged in multiple rows on the premaxilla and the dentary. The teeth in the labialmost tooth rows have more expanded tips then teeth in lingual rows (Motta 1984). Motta (1988) reported details of minor variation in tooth shape and arrangement among different species of *Chaetodon*. *Chelmon* and *Coradion* possess coniform teeth arranged in multiple rows on the premaxilla and dentary (Ferry-Graham et al. 2001). *Forcipiger* possess coniform teeth arranged in about five rows (eight in *F. cyrano* Randall) on the premaxilla and dentary (Randall 1961). *Hemitaurichthys* and *Heniochus* possess coniform teeth arranged in about three rows on the premaxilla and dentary. *Johnrandallia* and *Prognathodes* possess coniform teeth arranged in five to ten rows on the premaxilla and dentary. *Prognathodes* possesses coniform teeth arranged in five to ten rows on the premaxilla and dentary (Ferry-Graham et al. 2001). Tooth attachment is a modified Type 2 (Fink 1981). Motta (1984) acknowledged Type 2 attachment, but also observed enlargement of the collagen fibers on the labial side of each tooth allowing movement of the tooth and depressibility labially similar to the modified Type 2 attachment forms observed by Fink. Tooth replacement is extraosseous in *Chaetodon miliaris* Quoy & Gaimard, and was suggested for *C. falcula* Bloch and *C. ocellatus* Bloch (Fink 1981; Motta 1984).Ferric iron was found and quantified in the colored tooth caps of several *Chaetodon* species and two *Forcipiger* species. The greater quantities of ferric iron were found in species that fed on hard prey items and is hypothesized to aid in the prevention of tooth wear on hard surfaces (Motta 1987; Sparks et al. 1990).

Pomacanthidae: *Centropyge* (Schindler & Schneidewind 2004), *Chaetodontoplus* (Randall & Rocha 2009), *Genicanthus* (Randall 1975), Holacanthus (Yasuda & Tominaga 1969), *Pomacanthus* (Golani et al. 2010).

Centropyge possesses tridentiform teeth with enlarged central cusp arranged in multiple rows on the premaxilla and dentary (Schindler & Schneidewind 2004). *Chaetodontoplus* and *Genicanthus* possesses tridentiform teeth with an enlarged central cusp arranged in three to four rows on the premaxilla and dentary with the smallest teeth in the lingualmost row. *Holacanthus* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Yasuda & Tominaga 1969). *Pomacanthus* possesses depressiform teeth arranged in multiple rows on the premaxilla and dentary with the largest teeth in the labialmost tooth row (Golani et al. 2010). Tooth attachment and replacement have not been investigated.

Enoplosidae: *Enoplosus* (Shaw 1794).

Enoplosus possesses coniform teeth arranged in multiple row on the premaxilla and dentary (Shaw 1794). Tooth attachment and replacement have not been investigated.

Pentacerotidae:

Histiopterinae: *Evistias, Histiopterus* and *Zanclistius* (Hardy 1983b).

Evistias possesses coniform teeth arranged in multiple row on the premaxilla and dentary with the largest teeth in the labialmost row (Hardy 1983b). *Histiopterus* and *Zanclistius* possess coniform teeth arrange in multiple rows on the premaxilla and dentary (Hardy 1983b). Tooth attachment and replacement have not been investigated.

Paristiopterinae: *Paristiopterus* and *Pentaceropsis* (Hardy 1983b).

Paristiopterus possesses coniform teeth arranged in multiple row on the premaxilla and dentary (Hardy 1983b). *Pentaceropsis* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary with the largest teeth in the labialmost row (Hardy 1983b). Tooth attachment and replacement have not been investigated.

Pentacerotinae: *Pentaceros* and *Pseudopentaceros* (Hardy 1983b).

Pentaceros and *Pseudopentaceros* possess coniform teeth arranged in multiple row on the premaxilla and dentary (Hardy 1983b). Tooth attachment and replacement have not been investigated.

Nandidae:

Nandinae: *Nandus* (Chakrabarty et al. 2006).

Nandus possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Chakrabarty et al. 2006). Tooth attachment and replacement have not been investigated.

Badinae: *Badis* (Geetakumari & Vishwanath 2010a).

Badis possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Geetakumari & Vishwanath 2010a). Tooth attachment and replacement have not been investigated.

Polycentridae: *Monocirrhus* (Eigenmann & Allen 1921).

Monocirrhus possesses coniform teeth arranged in one row on the premaxilla one to two rows on the dentary (Eigenmann & Allen 1921). Tooth attachment and replacement have not been investigated.

Terapontidae: *Amniataba* (Vari 1985), *Hephaestus* (Vari & Hutchins 1978), *Leipotherapon* (Gehrke 1988), *Mesopristes* (Vari 1985), *Pelates* (Vari 1985), *Pingalla* (Whitley 1955), *Syncomistes* (Vari & Hutchins 1978), *Terapon* (Vari 1985), and *Variichthys* (Allen 1993).

Amniataba, Leipotherapon, Mesopristes, Terapon, and *Variichthys,* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary with the largest teeth in the labialmost row. *Hephaestus* and *Syncomistes* possess coniform teeth arranged in multiple rows on the premaxilla and dentary (Vari & Hutchins 1978). *Pelates* possesses coniform teeth arranged in three or more rows on the premaxilla and two rows on the dentary with the largest teeth in the labialmost row. In *P. sexlineatus* (Quoy & Gaimard) the teeth are tridentiform and arranged in multiple rows on the premaxilla and dentary (Vari 1985). *Pingalla* possesses a single row of incisors arranged in a single row on the premaxilla and dentary. Whitley (1955) observed mobility in the teeth, but provided no other information on attachment. Tooth attachment and replacement have not been investigated.

Kuhliidae: *Kuhlia* (Carpenter 1985).

Kuhlia possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Carpenter 1985). Tooth attachment and replacement have not been investigated.

Oplegnathidae: *Oplegnathus* *(Kakizawa et al. 1980).

Oplegnathus possesses lamelliform teeth in the labialmost row made up of small teeth that form a "jaw-tooth" resembling a beak on the premaxilla and dentary. Lingual to this modified tooth row are several rows of molariform teeth on both the premaxilla and dentary (Kakizawa et al. 1980). Tooth attachment has not been investigated. Tooth replacement is unique, but is not clearly intraosseous or extraosseous. However, Kakizawa et al. (1980) examined the numbers of replacement teeth the ontogentic rate of replacement. A progenic serial replacement series appears to be present for individual teeth of the labialmost tooth row in *Oplegnathus fasciatus*.

Cirrhitidae: Amblycirrhitus, *Cirrhitichys**, *Cirrhitus**, and *Oxycirrhites*(Gill 1862c).

Amblycirrhitus possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Gill 1862c). *Cirrhitichys* possesses coniform teeth arranged in multiple rows on the premaxilla. The dentary has caniniform posteriorly with multiple lingual rows of coniform teeth (Gill 1862c). *Cirrhitus* possesses anterior caniniform teeth followed posteriorly by multiple lingual rows of coniform teeth on the premaxilla. The dentary has caniniform teeth posteriorly followed by multiple lingual rows of coniform teeth (Gill 1862c). *Oxycirrhites* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary with the largest teeth in the labialmost row (Gill 1862c).

Chironemidae: *Chironemus* (Gill 1862c).

Chironemus possesses coniform teeth arranged in multiple rows on the premaxilla and dentary. Teeth arranged in about one row in *C. maculosus* (Gill 1862c). Tooth attachment and replacement have not been investigated.

Aplodactylidae: *Aplodactylus** (Russell 2000).

Aplodactylus possesses either coniform and tridentiform, only tridentiform or coniform, or tricuspid and multicuspid incisiform teeth arranged in three to six rows on the premaxilla and dentary with the largest teeth in the labialmost tooth row (Russell 2000). Tooth attachment and replacement have not been investigated.

Cheilodactylidae: *Acantholatris, Cheilodactylus, Chirodactylus,* and *Nemadactylus* (Gill 1862c).

Acantholatris, Cheilodactylus, and *Chirodactylus* possess coniform teeth arranged in multiple rows on the premaxilla and dentary. *Nemadactylus* possesses coniform teeth arranged in one row on the premaxilla and dentary (Gill 1862c). Tooth attachment and replacement have not been investigated.

Latridae: *Latridopsis, Latris,* and *Mendosoma* (Gill 1862c).

Latridopsis and *Latris* possess coniform teeth arranged in multiple rows on the premaxilla and dentary (Gill 1862c). Tooth attachment and replacement have not been investigated. *Mendosoma* possesses coniform teeth arranged in multiple rows on the premaxilla; the dentary is edentulous (Gill 1862c). Tooth attachment and replacement have not been investigated.

Cepolidae:

Cepolinae: *Acanthocepola* and *Cepola* (Jordan & Fowler 1903).

Acanthocepola and *Cepola* possess coniform teeth arranged in a single row on the premaxilla and dentary. Tooth attachment and replacement have not been investigated.

Owstoniinae: *Owstonia* (Prokofiev 2010).

Owstonia possesses coniform teeth arranged in a single row on the premaxilla and three to four rows on the dentary (Prokofiev 2010). Tooth attachment and replacement have not been investigated.

Elassomatidae: *Elassoma* (Rohde & Arndt 1987).

Elassoma possesses coniform teeth arranged in multiple rows on the premaxilla with some labial teeth enlarged (Rohde & Arndt 1987). Tooth attachment and replacement have not been investigated.

Cichlidae:

Cichlinae: *Acaronia, Aequidens* (Casciotta & Arratia 1993), , *Apistogramma* (Regan 1906b; Casciotta & Arratia 1993), *Astronotus, Bujurquina* (Casciotta & Arratia 1993), *Cichla* (Regan 1906a; Casciotta & Arratia 1993), *Cichlasoma, Crenicichla, Cryptoheros* (Casciotta & Arratia 1993), *Geophagus* (Regan 1906b; Casciotta & Arratia 1993), *Gymnogeophagus* (Casciotta & Arratia 1993), *Herichthys* (Kornfield & Taylor 1983; De la Maza-Benignos et al. 2014), , *Hypsophrys* (Rogers 1981; Casciotta & Arratia 1993), , *Paraneetroplus* (Casciotta & Arratia 1993), , *Retroculus* (Regan 1906b), *Satanoperca* (Regan 1906b), *Thorichthys* (Miller & Taylor 1984), and *Uaru* (Günther 1862).

Acarichthys possesses coniform teeth arranged in five rows on the premaxilla and dentary with the labialmost row containing the largest teeth (Casciotta & Arratia 1993). *Acaronia* possesses coniform teeth arranged in two to four rows on the premaxilla and dentary (Casciotta & Arratia 1993). *Aequidens and Bujurquina* possesses coniform teeth in two to five rows on the premaxilla and dentary. *Apistogramma* possesses coniform teeth arranged in two to three rows on the premaxilla and dentary (Regan 1906b; Casciotta & Arratia 1993). *Astronotus* possesses coniform teeth arranged in two to three rows on the premaxilla and dentary with the labialmost row notably enlarged (Casciotta & Arratia 1993). *Chaetobranchopsis* possesses coniform teeth arranged in three rows on the premaxilla and dentary (Casciotta & Arratia 1993). *Chaetobranchus* possesses coniform teeth arranged in two rows on the premaxilla and two to three rows on the dentary (Casciotta & Arratia 1993). *Cichla* and *Cichlasoma* possesses coniform teeth arranged in two to six rows on the premaxilla and two to four rows on the dentary (Regan 1906a; Casciotta & Arratia 1993). *Crenicichla* possesses coniform teeth two to eight rows (one to four in *C. semifasciata* Heckel) on the premaxilla and dentary (Casciotta & Arratia 1993). *Cryptoheros* possesses coniform teeth arranged in two to six rows on the premaxilla and dentary (Casciotta & Arratia 1993). *Geophagus* possesses coniform teeth arranged in two to five rows on the premaxilla and dentary with the labialmost row enlarged (Regan 1906b; Casciotta & Arratia 1993).

Gymnogeophagus possesses coniform teeth arranged in two to three rows on the premaxilla and dentary (Casciotta & Arratia 1993). *Herichthys* possesses bifidiform (sometimes very weak cusp differentiation) or both blunt coniform and bifidiform teeth depending upon the species and De la Maza-Benignos et al. (2014) provides details in species accounts. *H. minckleyi* Kornfield & Taylor is exceptional in the genus in having only coniform teeth arranged in two to six rows on the premaxilla and dentary. Both jaws bear an additional enlarged pair of anterior coniform teeth (the premaxilla pair is the largest) (Kornfield &

Taylor 1983). *Hypsophrys* possesses incisiform teeth arranged multiple rows on the premaxilla and dentary with the largest teeth in labialmost row (Rogers 1981; Casciotta & Arratia 1993). *Laetacara* and *Papiliochromis* possesses coniform teeth arranged in two to three rows on the premaxilla and dentary (Casciotta & Arratia 1993). *Paraneetroplus* possesses coniform teeth arranged in two to six rows on the premaxilla and dentary (Casciotta & Arratia 1993). *Petenia* possesses coniform teeth in two to five rows on the premaxilla and two to three rows on the dentary (Casciotta & Arratia 1993) *Retroculus* and *Satanoperca* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Regan 1906b). *Thorichthys* possesses coniform teeth arranged in two rows on the premaxilla and dentary with the labialmost tooth row containing the largest teeth (Miller & Taylor 1984). *Uaru* possesses coniform teeth arranged in one to two rows on the premaxilla and single row on the dentary with the largest teeth in the labialmost row (Günther 1862). Tooth attachment has not been investigated. Tooth replacement is intraosseous in neotropical members of Cichlidae (Trapani 2001).

Pseudocrenilabrinae: *Chromidotilapia* (Lamboj 2003), *Eretmodus* (Boulenger 1898b; Vandervennet & Huysseune 2005), *Docimodus* (Eccles & Lewis 1976), *Genyochromis** (Schön & Martens 2004), *Gobiocichla** (Kanazawa 1951), Haplochromis* (Greenwood 1965), *Hemichromis* (Gill 1862b), *Iranocichla** (Coad 1982), *Julidochromis* (Boulenger 1898b), *Lamprologus* (Roberts & Stewart 1976), *Melanochromis* * (Bowers & Stauffer Jr. 1993), *Pelvicachromis* (Lamboj 2004), *Perissodus* (Takahashi et al. 2007), *Petrotilapia* (Schön & Martens 2004), *Plecodus* (Takahashi et al. 2007), *Steatocranus* *(Roberts & Stewart 1976), *Teleogramma* (Takahashi & Nakaya 2002), *Telmatochromis** (Boulenger 1898b; Hanssens & Snoeks 2003), *Tilapia**, Tristamella, *Trematocara* (Takahashi 2002), *Tropheops** (Schön & Martens 2004) *Tylochromis* (Stiassny 1989), and *Xenochromis* (Takahashi et al. 2007).

Chromidotilapia possesses coniform teeth arranged in one to three rows on the premaxilla and two to three rows on the dentary. Only a single coniform tooth row is present on the premaxilla and dentary of *C. nana* (Lamboj 2003). *Eretmodus* possesses incisiform teeth arranged in two to three rows on the premaxilla and dentary (Boulenger 1898b; Vandervennet & Huysseune 2005). *Docimodus* possesses labio-lingually flatten tridentiform teeth with an enlarged central cusp arranged in four to five rows on the premaxilla and dentary. In *D. evelynae* Eccles & Lewis the teeth are coniform and arranged in three to four rows on the premaxilla and four rows on the dentary (Eccles & Lewis 1976). *Genyochromis* possesses bifidiform and smaller stout tricuspid teeth on the premaxilla and dentary (Schön & Martens 2004). *Gobiocichla* possesses bifidiform teeth in the labialmost tooth row and two lingual rows of tridentiform teeth on the premaxilla and dentary (Kanazawa 1951). *Haplochromis* possesses primarily bifidiform teeth (anterior cusp enlarged) in the labialmost tooth row (occasionally coniform or tridentiform) with three to five lingual rows of tridentiform teeth on the premaxilla and two to four rows on the dentary. Greenwood (1965) also noted slight mobility in the outer tooth row. *Haplotaxodon* possesses coniform teeth arranged in a single row on the premaxilla and dentary (Takahashi et al. 2007). *Hemichromis* possesses coniform teeth arranged in two rows on the premaxilla and dentary with the anteriormost pair of teeth enlarged (Gill 1862b). *Iranocichla* possesses bifidiform teeth (enlarged anterior cusp) in the labialmost tooth rows and lingual rows of tridentiform teeth arranged in three to four rows on the premaxilla and dentary (Coad 1982). *Julidochromis* possesses anterior caniniform teeth followed posteriorly by multiple rows on coniform teeth on the premaxilla and dentary (Boulenger 1898b). *Lamprologus* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Roberts & Stewart 1976). *Labeotropheus* possesses elongate tridentiform teeth on the premaxilla and dentary (Schön & Martens 2004). *Melanochromis* possesses anterior bifidiform teeth and posterior coniform teeth in the labialmost tooth row with lingual rows of tridentiform teeth arranged in four to six rows on the premaxilla and dentary (Bowers & Stauffer Jr. 1993). *Pelvicachromis* possesses coniform teeth arranged in one to two rows on the premaxilla and dentary with two to three rows on the dentary of *P. signatus* (Lamboj 2004). *Perissodus* possesses different reduced lepidophagiform tooth shapes in both species, but each is arranged in a single row on both premaxilla and dentary. In *P. microlepis* Boulenger the teeth were described as "the corners of the upper side of each tooth projected vertically, forming a pair of spine-like points," and *P. eccentricus* Liem & Stewart was also described by Takahashi et al. (2007) as having teeth with "one side of each tooth was sharply edged with a blunt point on the tip forming a fist like projection."*Petrotilapia* possesses tridentiform teeth with an extremely elongate recurved shaft on the premaxilla and dentary (Schön & Martens 2004). *Plecodus* possesses severely recurved lepidophagiiform teeth arranged in a single row on the premaxilla and dentary (Takahashi et al. 2007). Tooth stalk very elongated in *P. multidentatus* Poll unlike the short stalks in all other *Plecodus* species. Further details on the interspecific differences in dentition of the tribe Perissodini were examined by Takahashi et al. (2007). *Steatocranus* possesses bifidiform teeth in the labialmost tooth row with one to three lingual tooth rows of tridentiform or coniform teeth. Roberts and Stewart (1976) examined the details of interspecific variation seen in *Steatocranus* dentition such as weak cusps of the teeth in *S.*

gibbiceps Boulenger and *S. glaber* Roberts & Stewart. *Teleogramma* possesses coniform teeth arranged in five rows with an enlarged labialmost row on the premaxilla and dentary (Takahashi & Nakaya 2002). *Telmatochromis* possesses coniform teeth in the labialmost tooth row with multiple lingual rows of tridentiform teeth on the premaxilla and dentary (Boulenger 1898b). Hanssens and Snoeks (2003) examined subtle interspecific variations in the teeth of *Telmatochromis*. *Tilapia* possesses bifidiform teeth (anterior cusp enlarged) in the labialmost tooth row with three to four lingual rows of tridentiform teeth on the premaxilla and dentary (Dunz & Schliewen 2010). *Trematocara* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary. The labialmost row is notably enlarged on the premaxilla in *T. unimaculatum* Boulenger and *T. zebra* De Vos, Nshombo & Thys van den Audenaerde (Takahashi 2002). *Tropheops* possesses large bifidiform and small bifidiform or tricuspid teeth arranged in multiple rows on the premaxilla and dentary (Schön & Martens 2004).*Tylochromis* possesses bifidiform and coniform teeth on the premaxilla and dentary (Stiassny 1989) *Xenochromis* possesses severely recurved lepidophagiform teeth arranged in a single row on the premaxilla and dentary (Takahashi et al. 2007). These lepidophagiform shaped teeth are less stout then those seen in *Plecodus*.

Tooth attachment was examined by Vandervennet and Huysseune (2005) in *Eretmodus cyanostictus* suggests Type 2 attachment. Tooth replacement is intraosseous in *Haplochromis elegans* and *Tilapia mariae* (Trapani 2001). A detailed histological examination of adult tooth replacement in *Eretmodus cyanostictus* was carried out by Vandervennet and Huysseune (2005)

Embiotocidae: *Amphistichus* (Gibbons 1854), *Brachyistius* (Tarp 1952), *Ditrema* (Jordan & Sindo 1902), *Embiotoca* (Gibbons 1854), *Hyperprosopon* (Gibbons 1854), *Hysterocarpus* (Gibbons 1854), *Micrometrus* (Tarp 1952), *Neoditrema* (Jordan & Sindo 1902; Tarp 1952), and *Racochochilus* (Gibbons 1854).

Amphistichus possesses coniform teeth arranged in three rows on the premaxilla and one row on the dentary (Gibbons 1854). *Brachyistius* and *Embiotoca* possess coniform teeth on the premaxilla and dentary (Tarp 1952). *Ditrema, Hyperprosopon, Hysterocarpus,* and *Racochochilus* possess coniform teeth arranged in a single row on the premaxilla and dentary (Jordan & Sindo 1902). *Micrometrus* possesses tridentiform teeth on the premaxilla and dentary, but Tarp (1952) noted that this not always the case. *Neoditrema* contains gynandric heterodonts. Female *N. ransonneti* Steindachner are endentulous. Male *N. ransonneti* possesses a single row of coniform teeth on the premaxilla and few if any teeth on dentary (Jordan & Sindo 1902; Tarp 1952). Tooth attachment and replacement has not been investigated.

Pomacentridae:

Amphiprioninae: *Amphiprion* (Mori 1966).

Amphiprion possesses coniform teeth arranged in a single row on the premaxilla and dentary (Mori 1966). Sound production in *A. clarkii* Bennett results from collisions of jaw teeth (Parmentier et al. 2007). Tooth attachment and replacement has not been investigated.

Chrominae: *Chormis* (Greenfield & Hensley 1970) and *Dascyllus* (Randall & Randall 2001).

Chromis and *Dascyllus* possess coniform teeth arranged in multiple rows on the premaxilla and dentary with the teeth in the labialmost row enlarged. Tooth attachment and replacement has not been investigated.

Lepidozyginae: *Lepidozygus* (Emery 1980).

Lepidozygus possesses coniform teeth arranged in a single row on the premaxilla and dentary (Emery 1980). Tooth attachment and replacement has not been investigated.

Pomacentrinae: *Abudefduf* (Randall & Earle 1999), *Amblypomacentrus** (Allen & Adrim 2000), Chrysiptera (Greenfield & Hensley 1970), *Microspathodon* (Norris & Prescott 1959; Ciardelli 1967), *Neopomacentrus** (Jenkins & Allen 2002), *Plectroglyphidodon* (Randall & Earle 1999), *Pomacentrus* (Kawashima & Mover 1982), *Pristotis* (Kawashima & Mover 1982), and *Similiparma* (Hensley 1986).

Abudefduf possesses incisiform teeth arranged in a single row on the premaxilla and dentary (Randall & Earle 1999). *Amblypomacentrus* possesses anterior incisiform teeth with posterior teeth coniform arranged in a single row on the premaxilla and dentary (Allen & Adrim 2000). *Chrysiptera* possesses coniform teeth arranged in two rows on the premaxilla and dentary. Greenfield and Hensley (1970) noted that teeth in smaller specimens had conical tips, but larged specimens had notably flattened tips. *Microspathodon* possesses incisiform teeth arranged in a single row on the premaxilla and dentary. The mobility observed in the teeth was attributed to a flexible tooth shaft rather then the point of attachment, but the amount of mobility was apparently similar that achieved by the teeth of *Girella nigricans* (Kyphosidae) (Norris & Prescott 1959; Ciardelli 1967). *Neopomacentrus* possesses anterior incisiform (two weakly defined cusps may be present) teeth with posterior coniform teeth arranged in one to two rows on the premaxilla and dentary (Jenkins & Allen 2002). *Plectroglyphidodon* and *Pristotis* possess coniform teeth arranged in a single row on the premaxilla and dentary. *Pomacentrus* possesses incisiform teeth arranged in two rows on the premaxilla and dentary (Kawashima & Mover

1982). *Similiparma* possesses "fixed" incisiform teeth arranged in a single row on the premaxilla and dentary (Hensley 1986). Tooth attachment is Type 2 in *Chromis atrilobata* Gill (Fink 1981). In *Microspathodon chrysurus* (Cuvier) the tooth base is anchored between "flanges" of bone on the premaxilla and dentary, but the exact means of attachment remains unclear. Tooth replacement is extraossesous in *M. chrysurus* and happens in a large open crypt on the anterior face on both jaws (Norris & Prescott 1959; Ciardelli 1967). Tooth replacement is intraosseous in *Hypsypops rubicundus* (Girard) (Trapani 2001).

Labridae: *Anampses* (Randall 1972b), *Bodianus* (Gomon & Lubbock 1979), *Cheilinus**, *Cheilio* (Seale 1901), *Cirrihilabrus**(Randall & Tanaka 2009), *Clepticus* (Heiser et al. 2000), *Coris** (Seale 1901), *Decodon* (Allen & Groce 2001), *Doratonotus* (Evermann & Marsh 1899), Epibulus* (Carlson et al. 2008), *Gomphosus* (Seale 1901), *Halichoeres* *(Seale 1901), *Hemipteronotus** (Randall 1965), *Labroides** (Fowler & Bean 1928), *Macropharyngodon* (Randall 1978), Neolabrus, *Oxyjulis* (Gill 1863a), Paracheilinus, *Pseudodax* (Günther 1861b; Wainwright et al. 2004), *Semicossyphus* (Gomon 1997), *Stethojulis** (Seale 1901), *Tautoga* *(Hayes 1974), and *Xyrichtys* (Randall & Lobel 2003).

Anampses possesses a single of incisiform tooth on the premaxilla and dentary (Randall 1972b). *Bodianus* possesses caniniform teeth arranged in a single row with an enlarged tooth anteriorly and second posteriorly on the premaxilla. The dentary has an enlarged caniniform teeth anteriorly followed posteriorly by a single row of smaller caniniform tooth. The enlarged teeth are less obvious in juveniles (Gomon & Lubbock 1979). *Cheilinus* possesses an anterior caniniform tooth followed posteriorly by coniform teeth arranged in a single row on the premaxilla and dentary (Seale 1901). *Cheilio* possesses coniform teeth arranged in a single row on the premaxilla and dentary with an coniform tooth present on both jaws (Seale 1901). *Cirrihilabrus* possesses three anterior caniniform tooth (a single one on the dentary) followed by a lingual row of coniform teeth on the premaxilla and dentary (Randall & Tanaka 2009). *Clepticus* possesses caniniform teeth arranged in a single row on the premaxilla and dentary with the largest teeth present anteriorly (Heiser et al. 2000). *Coris* and *Epibulus* possess an anterior caniniform tooth followed posteriorly by coniform teeth arranged in a single row on the premaxilla and dentary. *Decodon* possesses caniniform teeth with an enlarged tooth anteriorly on the premaxilla and dentary (Allen & Groce 2001). *Doratonotus* possesses caniniform teeth arranged in two rows on the premaxilla and dentary (Evermann & Marsh 1899). *Gomphosus* possesses coniform teeth on the premaxilla and dentary (Seale 1901). *Halichoeres* possesses four anterior caniniform teeth followed posteriorly by coniform arranged in a single row on the premaxilla and dentary (Seale 1901). *Hemipteronotus* possesses an anterior caniniform tooth followed posteriorly by a single row of smaller caniniform teeth on the premaxilla and dentary. Coniform teeth are present in lingual rows on the premaxilla and dentary (Randall 1965). *Labroides* possesses an anterior caniniform tooth with coniform teeth arranged in multiple rows posteriorly (Fowler & Bean 1928). *Macropharyngodon* possesses caniniform teeth with an enlarged anteriorly and a separate enlarged posteriorly with smaller caniniform teeth completing the single row; the dentary has a single pair of anterior enlarged caniniform teeth followed posteriorly by smaller caniniform teeth (Randall 1978). The teeth of *M. kuiteri* are incisiform anteriorly in place of enlarged caniniform teeth. *Oxyjulis* possesses coniform teeth arranged in a single row on the premaxilla and dentary with the anterior teeth enlarged (Gill 1863a). *Paracheilinus* possesses three anterior caniniform teeth followed posteriorly by coniform teeth on the premaxilla. The dentary has an anterior caniniform tooth followed posteriorly coniform teeth arranged in a single row. Six anterior caniniform teeth and a separate posterior caniniform tooth are present on the premaxilla of *P. angulatus* (Randall & Lubbock 1981). *Pseudodax* possesses a single pair of incisiform teeth on the premaxilla and dentary (Günther 1861b; Wainwright et al. 2004). *Semicossyphus* possesses caniniform teeth with two anterior enlarged teeth and one to two separated posterior enlarged teeth may also be present on the premaxilla; the dentary has an anterior enlarged caniniform tooth with smaller caniniform teeth arranged in one to two rows (Gomon 1997). *Stethojulis* possesses caniniform and coniform teeth arranged in a single row on the premaxilla and dentary (Seale 1901). *Tautoga* possesses anterior incisiform teeth followed posteriorly by stout coniform on the premaxilla and dentary. Hayes (1974) examined the histology of the teeth of *T. onitis* Linnaeus. *Xyrichtys* possesses an anterior enlarged caniniform tooth followed posteriorly by coniform teeth with a second lingual row of coniform teeth on the premaxilla and dentary (Randall & Lobel 2003). Tooth attachment is Type 1 in *T. onitis* based on Hayes (1974) description of tooth attachment. Tooth replacement is intraosseous in *Labrus sp*. (Trapani 2001).

Odacidae: *Haletta, Neodax, Odax,* and *Siphonognathus* (Gomon & Paxton 1985).

Haletta, Neodax, and Siphonognathus possesses fused teeth with recognizably separate cusps on the premaxilla and dentary (Gomon & Paxton 1985). *Odax* possesses fully fused teeth with the appearance of serrations rather then separate cusps on the premaxilla and dentary (Gomon & Paxton 1985). Tooth attachment and replacement have not been investigated.

Scaridae: *Bolbometapon*, *Calotomus**, *Cetoscarus, Chlorurus*, Cryptotomus, Hipposcarus*, Leptoscarus*, Nicholsina*, Scarus*, and Sparisoma** (Bellwood 1994).

Lateral caniniform teeth are present on the premaxilla anteroventrally to the anterior tooth groups in some Scarids. Lateral caniniform teeth are usually enlarged recurved caniniform teeth, but may be blunt in some species (Bellwood 1994).

Bolbometapon possesses fused teeth that form dental plates with a thin white cement covering on the premaxilla and dentary. The cutting edge it forms is crenate with individual teeth forming a mosaic with “distinct nodule basally” (Bellwood 1994). *Calotomus* possesses “flattened” caniniform teeth anteriorly (one to two may be present lingually near symphysis) with coniform teeth present posteriorly with one to four lateral caniniform teeth on the premaxilla. The dentary has three to eight rows of “imbricate” rows of “rounded” incisiform teeth with an additional row of posterior coniform teeth present in some specimens (Bellwood 1994). *Cetoscarus* possesses fused teeth that form dental plates with thin white cement covering on the premaxilla and dentary. The cutting edge it forms is crenate with individual teeth forming a mosaic (Bellwood 1994). *Chlorurus* possesses fused teeth that form dental plates with a thick white, green or blue cement covering on the premaxilla and dentary. The cutting edge it forms is crenate with individual teeth forming a mosaic. Lateral caniniform teeth are also present on the premaxilla (Bellwood 1994). *Cryptotomus* possesses anterior caniniform teeth followed posteriorly by a single row of coniform teeth on the premaxilla with one to three lateral caniniform teeth present. The dentary has caniniform teeth arranged in two labial rows with the linugual most row containing only incisiform teeth. Bellwood (1994) also noted an additional row of coniform teeth may be posteriorly on the dentary in some specimens. *Hipposcarus* possesses fused teeth that form narrow dental plates with white cement covering on the premaxilla and dentary. The cutting edge it forms is even and lateral caniniform teeth are present on the premaxilla (Bellwood 1994). *Leptoscarus* possesses anterior caniniform in adults that are labial to the fused rows of incisiform teeth forming a "shallow dental plate" on the premaxilla. The dentary has fused rows of incisiform teeth forming a "shallow dental plate" (Bellwood 1994). *Nicholsina* possesses anterior caniniform teeth arranged in two to four rows with a single row of coniform teeth posteriorly on the premaxilla. The dentary has incisiform teeth arranged three to five rows. In *N. usta* (Valenciennes) has an additional lingual row of coniform teeth with adults bearing only one to three caniniform teeth on the premaxilla and the labial two rows of the dentary have "flattened" caniniform arranged in two to four rows (Bellwood 1994). *Scarus* possesses fused teeth that form dental plates with white, green, blue-green or blue cement covering on the premaxilla and dentary. The cutting edge it forms is even. Lateral caniniform teeth are also present on the premaxilla in adults and in some species on the dentary as well (Bellwood 1994). Bellwood and Choat (1990) noted that the individual teeth have different shapes in Scarids that feed as scrapers (i.e. *S. frenatus*) and excavators (i.e. *Chlorurus sordidus* (Forsskål)). Scrapers teeth are more rounded and pavement like while excavator teeth are "pear-shaped" with less obvious tooth wear. *Sparisoma* possesses stout coniform teeth with thin cement covering which in larger specimens forms dental plates and lateral caniniform teeth are present in adults on the premaxilla. Bellwood (1994) also noted some species have anterior caniniform teeth on the premaxilla. The dentary has stout coniform teeth with thin cement covering which in larger specimens forms dental plates.

Tooth attachment has not been investigated in Scaridae. However, scarids with fused teeth will not fit into the existing attachment Types. Tooth replacement in scarids without fused teeth is likely intraosseous based on Bellwood (1994) illustrations of crypts on the premaxilla (Fig. 2). In scarids with fused teeth replacement needs further investigation, but Bellwood (1994) made some initial observations. Two patterns, “anterior type” and “posterior type” were observed in which the primary difference was the position and migration pattern of replacement teeth. Posterior type is a flattening and fusion by the cement of the multiple rows of small conical teeth, which are replaced posteriorly and migrate anteriorly (i.e. Leptoscarus). The anterior type forms a “mosaic” from rows large teeth that are replaced on the labial face of the premaxilla and dentary and then migrate to the cutting edge (i.e. Scarus). These two types of fusion are not all inclusive and intermediate forms exist in a number scarids for further details see Bellwood (1994).

Bathymasteridae: *Bathymaster, Rathbunella*,* and *Ronquilus* (Stevenson et al. 2005).

Bathymaster possesses coniform teeth arranged in four to as many as eight rows on the premaxilla and two to as many as five rows on the dentary with the labialmost row enlarged (Stevenson et al. 2005). *Rathbunella* contains gynandric heterodonts. Male *R. alleni* Gilbert possess coniform teeth arranged in about eight rows with the labialmost row enlarged and an additional one or two pairs of large caniniform teeth located posteriorly on the premaxilla. The dentary of male *R. alleni* has coniform teeth arranged in about eight rows with an enlarged outer row and one or two caniniform teeth at about midlength of the dentary. Females of *R. alleni* lack caniniform teeth (Stevenson et al. 2005). No caniniform teeth develop in *R. hypoplecta*. *Ronquilus* possesses coniform teeth arranged in about eight rows on the premaxilla and dentary. The labialmost row is enlarged on the premaxilla. On the dentary near the symphysis and in lingual row the teeth are enlarged (Stevenson et al.

2005). Tooth attachment and replacement have not been investigated.

Zoarcidae:

Gymnelinae: *Andriashevia* (Anderson 1994), *Bilabria** (Anderson & Imamura 2008), *Gymnelus* (McAllister et al. 1981), Melanostigma*(Yarberry 1965)

Andriashevia possesses gynandric heterodonts. Male *A. aptera* Fedorov & Neyelov possesses coniform teeth in the labialmost tooth row twice as large as the inner row. Female *A. aptera* possesses coniform teeth arranged in as many as five rows on the premaxilla and dentary (Anderson 1994). *Bilabria* includes in gynandric heterodonts. Female *B. gigantea* Anderson & Imamura have more teeth then males of comparable size which also loose the lingual row of small coniform teeth. *Bilabria* possesses caniniform teeth in labialmost tooth row with a lingual row of coniform teeth on the premaxilla and dentary (Anderson & Imamura 2008). Anderson (1994) molariform teeth in large adults of *B. ornata* (Soldatov). *Gymnelus* possesses caniniform teeth arranged in two rows on the premaxilla and dentary (McAllister et al. 1981). *Melanostigma* possesses caniniform teeth in the labialmost tooth row with a lingual row of coniform teeth on the premaxilla and dentary (Yarberry 1965). Tooth attachment and replacement have not been investigated.

Lycodinae: *Bothrocara* (Anderson et al. 2009), *Bothrocarina**(Anderson 1994), *Crossotomus* (Gosztonyi 1977), *Derepodichthys** (Anderson & Hubbs 1981), *Dieidolycus**(Anderson & Hubbs 1981), *Dadyanos* (Gosztonyi 1977), *Iluocoetes*, *Lycenchelys* (Gosztonyi 1977), *Lycodapus* (Peden & Anderson 1979), *Lycodes* (McAllister et al. 1981), *Maynea*, *Oidiphorus*, *Ophthalmolycus* (Gosztonyi 1977), *Pachycara* (Anderson & Mincarone 2006), *Phucocoetes** (Gosztonyi 1977), *Rhigophila* (DeWitt 1962b).

Bothrocara includes gynandric heterodonts. Male *B. brunneum* (Bean) possesses coniform teeth arranged in three to five rows on the premaxilla and two to three rows on the dentary. Female *B. brunneum* have three to six rows of coniform teeth on the premaxilla and four to six rows on the dentary. In male *B. pusillum* an enlarged labial row is present with teeth four to five times larger then the lingual tooth row while the labial row in females is only two to three times larger. Anderson et al. (2009) provides detailed descriptions of interspecific and sexual dimorphism variations in *Bothrocara*. *Bothrocarina* includes gynandric heterodonts. Male *B. microcephala* (Schmidt) possesses coniform teeth arranged in two to three rows on the premaxilla. The dentary has a single row of coniform teeth that is interrupted anteriorly by a pair of very large caniniform teeth. Females lack caniniform teeth on the dentary (Anderson 1994). *Crossotomus* possesses coniform teeth in three to four rows on the premaxilla and two rows on the dentary with the largest teeth in the labialmost row (Gosztonyi 1977). *Derepodichthys* includes gynandric heterodonts. Male *D. alepidotus* Gilbert possess caniniform teeth anteriorly in the labialmost row, which are followed posteriorly by coniform teeth on the premaxilla and dentary. Female *D. alepidotus* have fewer caniniform teeth on the premaxilla them males (Anderson & Hubbs 1981). *Dieidolycus* possesses coniform teeth arranged in two rows on the premaxilla and four rows on the dentary (Anderson & Pequeno 1998) *Dadyanos* possesses incisiform teeth arranged in a single row on the premaxilla and dentary. Juveniles possess coniform teeth, which are replaced with incisiform teeth in adults (Gosztonyi 1977). *Iluocoetes* contains gynandric heterodonts. Male *I. fimbriatus* Jenyns possess caniniform teeth interspersed with coniform arranged in two rows on the premaxilla. The dentary has coniform teeth arranged in two rows. Female *I. fimbriatus* possess only coniform teeth arranged in three to four rows. In *I. elongatus* males possesses fewer caniniform teeth and female dentition covers a greater area of the jaws (Gosztonyi 1977). *Lycenchelys* possesses coniform teeth arranged in two rows on the premaxilla and dentary (Gosztonyi 1977). *Lycodapus* include gynandric heterodonts. In male *L. leptus* the labialmost tooth row is enlarged, but is not enlarged in females. Non-gynandric heterodonts *Lycodapus* possesses coniform teeth arranged in three to four rows on the premaxilla and dentary. Peden and Anderson (1981) provides details on interspecific variation and sexual dimorphism in *Lycodapus*. *Lycodes, Ophthalmolycus,* and *Pachycara* possesses coniform teeth arranged in two rows on the premaxilla and dentary (McAllister et al. 1981). *Maynea* and *Oidiphorus* possess coniform teeth arranged in a single row on the premaxilla and dentary (Gosztonyi 1977). *Phucocoetes* includes gynandric heterodonts. Male possesses coniform teeth arranged in two rows on the premaxilla. The dentary of males has caniniform teeth at about the mid point surrounded by coniform teeth arranged in two rows. Females lack caniniform teeth (Gosztonyi 1977). *Rhigophila* possesses coniform teeth arranged in one to two rows on the premaxilla and detnary (DeWitt 1962b). Tooth attachment and replacement have not been investigated.

Lycozoarcinae: *Lycozoarces* (Toyoshima 1981).

Lycozoarces possesses coniform teeth arranged in two rows on the premaxilla and three to four rows on the dentary (Toyoshima 1981). Tooth attachment and replacement have not been investigated.

Zoarcinae: *Zoarces* (Anderson 1994).

Zoarces possesses coniform teeth arranged in multiple rows on the premaxilla and dentary with the labialmost row containing the largest teeth. Anderson (1994) observed that the teeth of *Z. americanus* (Bloch & Schneider) become "broad based and flattened" in large adults. Tooth attachment and replacement have not been investigated.

Stichaeidae: *Acantholumpenus* (Gilbert 1896), *Alectrias** (Balanov et al. 2009), , *Anisarchus* (Matsubara & Ochiai 1952), *Anoplarchus* (Gill 1861), Askoldia (Amaoka & Inada 1977), *Bryozoichthys* (Amaoka et al. 1977), *Chirolophis* (Shiogaki 1981), *Dictysoma* (Ji & Kim 2012), *Ernogrammus* (Follett & Powell 1988), *Esselenia** (Follett & Anderson 1990), *Eulophias* (Yamanaka et al. 2012), *Eumesogrammus* (Schmidt & Andriashev 1935), *Leptostichaeus* (Miki 1985), *Lumpenenlla* (Matsubara & Ochiai 1952), Lumpenopsis (Hastings et al. 2003), *Lumpenus* (Sim 1886), *Neolumpenus* (Miki et al. 1987), *Neozoarces* (Jordan & Snyder 1902), *Ophithocentrus, Pholidapus* (Shiogaki 1984), *Phytichthys** (Jordan & Gilbert 1880d), *Plagiogrammus** (Bean 1894), *Plectrobranchus** (Barraclough 1959), *Poroclinus* (Bean 1890c), *Soldatovia* (Balanov et al. 2006), *Stichaeus* (Pitruk et al. 2011), and *Zoarchias* (Kimura & Jiang 1995).

Acantholumpenus, Bryozoichthys, Lumpenus, and *Neozoarces* possess coniform teeth in multiple rows on the premaxilla and dentary (Gilbert 1896). *Alectrias* possesses caniniform teeth in the labialmost tooth row with lingual rows of coniform teeth on the premaxilla and dentary. Caniniform teeth are two to three times larger the teeth in the lingual tooth rows (Balanov et al. 2009). *Anisarchus* possesses coniform teeth arranged in three to four rows on the premaxilla with an enlarged labialmost row. The dentary has coniform teeth arranged in one to two rows (Matsubara & Ochiai 1952). *Anoplarchus* and *Askoldia* possess coniform teeth arranged in a single row on the premaxilla and dentary with the largest teeth on the lower jaw. *Chirolophis* possesses coniform teeth in alternating positions arranged in two rows that are packed tightly together as illustrated (Fig. 4) by

Shiogaki (1981). *Dictysoma* possesses coniform teeth arranged in two to several rows of premaxilla and two rows on the dentary (Ji & Kim 2012). *Ernogrammus* possesses coniform teeth arranged in five rows on the premaxilla and eight rows on the dentary with the labiamost row enlarged (Follett & Powell 1988). *Esselenia* possesses caniniform teeth in the labialmost tooth rows and lingual rows of coniform teeth on premaxilla and dentary. Caniniform teeth ten times larger then lingual rows in *E. carli* five times larger in *E. laurae* (Follett & Anderson 1990). *Eulophias* possesses a single (two on the dentary) caniniform tooth near the symphysis and followed by coniform teeth posteriorly on the premaxilla and dentary (Yamanaka et al. 2012). *Eumesogrammus* and *Stichaeus* possess coniform teeth on the premaxilla and dentary (Schmidt & Andriashev 1935). *Leptostichaeus* possesses coniform teeth arranged in one to two rows on the premaxilla and dentary (Miki 1985). *Lumpenenlla* possesses coniform teeth arranged in two rows on the premaxilla and dentary (Matsubara & Ochiai 1952). *Lumpenopsis* possesses coniform teeth arranged in about three rows on the premaxilla and dentary. Hastings et al. (2003) originally described teeth as caniniform, but I have described them as coniform based on radiographs their radiographs (Fig. 1a). *Neolumpenus* possesses coniform teeth arranged in one to several rows on the premaxilla and dentary with the labialmost row enlarged (Miki et al. 1987). *Ophithocentrus* possesses coniform teeth arranged in one to six rows on the premaxilla and one to three rows on the dentary (Shiogaki 1984). *Pholidapus* possesses coniform teeth arranged in three to four rows with a pair of posterior caniniform teeth on the premaxilla. The dentary has coniform teeth arranged in three to four rows (Shiogaki 1984). *Phytichthys* possesses caniniform teeth near the symphysis followed posteriorly by multiple rows of coniform teeth on the premaxilla and dentary (Jordan & Gilbert 1880d). *Plagiogrammus* possesses paired caniniform teeth near the symphysis and several caniniform teeth in the labialmost row followed posteriorly by multiple rows of coniform teeth on the premaxilla and dentary (Bean 1894). *Plectrobranchus* possesses paired caniniform teeth near the symphysis and several caniniform teeth in the labialmost row followed posteriorly by multiple rows of coniform teeth on the premaxilla and dentary (Barraclough 1959). *Poroclinus* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary with the labialmost row enlarged (Bean 1890c). *Soldatovia* possesses coniform teeth in alternating positions arranged in two rows that are packed tightly together (Balanov et al. 2006). *Zoarchias* possesses coniform teeth arranged in three rows on the premaxilla and two rows on the dentary (Kimura & Jiang 1995). Tooth attachment and replacement have not been investigated.

Cryptacanthodidae: *Cryptacanthodes* (Gilbert 1896; Hamada 1981).

Crytacanthodes possesses coniform teeth arranged in two rows on the premaxilla and one row on a dentary (Gilbert 1896; Hamada 1981). Tooth attachment and replacement have not been investigated.

Pholidae:

Pholinae: *Pholis* (Rosenblatt 1964).

Pholis possesses coniform teeth arranged in two rows on the premaxilla and dentary (Rosenblatt 1964). Tooth attachment and replacement have not been investigated.

Anarhichadidae: *Anarhichas** and *Anarrhichthys** (Andre et al. 1784; Rountree 2002).

Anarhichas and *Anarrhichthys* possess caniniform teeth anteriorly with posterior rows molariform teeth on the premaxilla and dentary (Andre et al. 1784; Rountree 2002). Tooth attachment has not been investigation. Tooth replacement is intraosseous in

Anarrhichthys ocellatus (Trapani 2001). Teeth are replaced annually in *A. lupus* and *A. minor*. In the Barents Sea *A. minor* looses its teeth in January-February while *A. denticulatus* looses its teeth in February-March and *A. lupus* begins to loose teeth in October peaking in December and January to completion in May. Tooth loss happens during or just post spawning season and females loose teeth prior to males (Rountree 2002).

Ptilichthyidae: *Ptilichthys* (Hilton et al. 2005b).

Ptilichthys possesses coniform teeth arranged in a single row on the premaxilla and dentary. The posterior dentary teeth are more severely recurved then anterior teeth. Tooth attachment and replacement have not been investigated.

Zaporidae: *Zaprora** (Hilton & Stevenson 2013).

Zaprora possesses incisiform teeth arranged in a single row on the anterior half of the premaxilla and dentary which were described by Hilton and Stevenson (2013) as spatulate. The posterior teeth are coniform and also arranged in a single row. In juvenile *Z. silenus* Jordan (<200mm SL) all teeth are coniform and Hilton and Stevenson (2013) unable to observe when all teeth become incisiform. Tooth attachment and replacement have not been investigated.

Scytalinidae: *Scytalina** (Hilton 2009).

Scytalina possesses a symphyseal caniniform tooth followed posteriorly by a single row of coniform teeth on the premaxilla and dentary (Hilton 2009). Tooth attachment and replacement have not been investigated.

Bovichtidae: *Bovichtus, Cottoperca* (Regan 1913), and *Halaphritis* (Last et al. 2002).

Bovichtus, Cottoperca, and Halaphritis possesses coniform teeth arranged in multiple rows on the premaxilla and dentary. Tooth attachment and replacement have not been investigated.

Pseudaphritidae: *Pseudaphritis* (Regan 1913).

Pseudaphritis possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Regan 1913). Tooth attachment and replacement have not been investigated.

Eleginopidae: *Eleginops** (Regan 1913).

Eleginops possess coniform teeth arranged in multiple rows on the premaxilla and dentary (Regan 1913). Tooth attachment and replacement have not been investigated.

Nototheniidae: *Aethotaxis* (DeWitt 1962a), *Cryothenia* (Daniels 1981), *Dissostichus* (Calhaem & Christoffel 1969), Lepidonotothen, *Notothenia* (Regan 1913), *Pagothenia* (Regan 1913), *Patagonotothen* (Thompson 1916), *Pleuragramma** (Boulenger 1902b), *Pseudotrematomus* (Regan 1913), and *Trematomus* (Regan 1913).

Aethotaxis possesses coniform teeth arranged in a single row on the premaxilla and dentary (DeWitt 1962a). *Cryothenia, Pagothenia,* and *Trematomus* possess coniform teeth arranged in multiple rows on the premaxilla and dentary. *Dissostichus* possesses caniniform teeth arranged in two rows on the premaxilla and a single row on the dentary (Calhaem & Christoffel 1969). *Notothenia* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary with the labialmost row enlarged (Regan 1913). *Patagonotothen* possesses coniform teeth arrange in three rows on the premaxilla and two rows on the dentary (Thompson 1916). *Pleuragramma* possesses paired caniniform teeth near the symphysis, which are followed posterior coniform teeth arranged in multiple rows on the premaxilla. The dentary has coniform teeth arranged in multiple rows (Boulenger

1902b). *Pseudotrematomus* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Regan 1913). Kuhn et al. (2009) observed a distinctly enlarged labialmost row of coniform teeth on the premaxilla and dentary in *P. nicolai* (Boulenger). Tooth attachment and replacement have not been investigated.

Harpagiferidae: *Harpagifer* (Neyelov & Prirodina 2006).

Harpagifer possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Neyelov & Prirodina 2006). Tooth attachment and replacement have not been investigated.

Artedidraconidae: *Artedidraco* (Regan 1913), and *Pogonophryne* (Eakin et al. 2009).

Artedidraco possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Regan 1913). *Pogonophryne* possesses coniform teeth arranged in three rows on the premaxilla and dentary (Eakin et al. 2009). Tooth attachment and replacement have not been investigated.

Bathydraconidae: *Acanthodraco* (Voskoboinikova & Skora 1996), *Akarotaxis* (DeWitt & Tyler 1960), *Bathydraco* (Regan 1913), *Gerlachea* (Regan 1913), *Gymnodraco** (DeWitt & Tyler 1960), *Racovitzia* (Regan 1913).

Acanthodraco possesses coniform teeth arranged in single row on the premaxilla and dentary. Several enlarged teeth present anteriorly on the premaxilla and posteriorly on the dentary (Voskoboinikova & Skora 1996). *Akarotaxis, Bathydraco, Gerlachea,* and *Racovitzia* possess coniform teeth arranged in multiple rows on the premaxilla and dentary (DeWitt & Tyler 1960). *Gymnodraco* possesses anterior caniniform teeth near the symphysis followed posteriorly by a single row of coniform teeth on the premaxilla and dentary (DeWitt & Tyler 1960). Tooth attachment and replacement have not been investigated.

Channichthyidae: *Chaenocephalus*, *Champsocephalus*, *Channichthys* (Regan 1913), *Chionobathyscus* (Balushkin & Prut'ko 2006), *Chionodraco* (DeWitt & Tyler 1960), *Cryodraco* (Regan 1913), *Neopagetopsis* (Nybelin 1947), *Pagetopsis* (Regan 1913), and *Pseudochaenichthys* (Norman 1937).

Chaenocephalus, Champsocephalus, Channichthys, Cryodraco, and *Pseudochaenichthys* possess coniform teeth arranged in multiple rows on the premaxilla and dentary. *Chionobathyscus* possesses coniform teeth arranged in three to four rows on the premaxilla and dentary (Balushkin & Prut'ko 2006). *Chionodraco, Neopagetopsis,* and *Pagetopsis* possess coniform teeth arrange in two rows on the premaxilla and dentary (DeWitt & Tyler 1960). Tooth attachment and replacement have not been investigated.

Chiasmodontidae: *Chiasmodon** (Melo 2009), *Dysalotus* (Norman 1929), Kali* and *Pseudoscopelus** (Norman 1929; Prokofiev & Kukuev 2006a).

Chiasmodon possesses a symphyseal caniniform tooth followed posteriorly by a large symphyseal depressiform tooth on the premaxilla. Posterior to these teeth are a labial and lingual row of depressiform teeth. The dentary has a symphyseal caniniform tooth followed posteriorly by a lingual and labial row of depressiform teeth with the anterior teeth severely enlarged in the lingual row. Melo (2009) observed that the depressiform teeth in the labial series are not as depressible as the teeth in the lingual row and it is important to designate specific mode of attachment. Melo (2009) also provides detailed description of the interspecific variation in *Chiasmodon*. *Dysalotus* possesses depressiform teeth arranged in four rows on the premaxilla and dentary. The depressiform teeth of *D.*

macrodon are more robust and arranged in two rows (Norman 1929). *Kali* usually possesses a labial row of "ventrally attached" depressiform teeth and a lingual row of depressiform teeth. The size, number of teeth, and arrangement are highly variable among species. The greatest variations are in *K. macrura* (Parr) ("ventrally attached" depressiform teeth only present anteriorly) and *K. parri* Johnson & Cohen (has only "ventrally attached" depressiform teeth). Melo (2008) provides details of interspecific variation in *Kali*. *Pseudoscopelus* possesses coniform teeth in the labialmost row with two to five lingual rows of depressiform teeth on the premaxilla and dentary (Norman 1929). *P. parini* Prokofiev & Kukuev has four rows of teeth with the lingualmost tooth row containing long "spearlike" teeth (1.5 times longer then teeth in the third row). *P. astronesthidens* Prokofiev & Kukuev and *P. australis* Prokofiev & Kukuev possess a similar dentition, but no mention of depressibility in teeth is made in these three species (Prokofiev & Kukuev 2006b; Prokofiev & Kukuev 2006a). *P. lavenbergi* Melo, Walker & Klepadlo and *P. bothrorrhinos* Melo, Walker & Klepadlo possess a symphyseal caniniform tooth followed posteriorly by three rows of depressiform teeth with the labialmost row containing the largest teeth. The dentary has two rows of depressiform teeth with an enlarge lingual row (Melo 2007b). Tooth attachment is Type 4 in the depressiform teeth and Type 1 in the caniniform teeth of *Chiasmodon* (Melo 2009). Melo (2008) observed a unique mode of attachment in the teeth of *Kali* species that was termed "ventral attachment" which allows "rotation on a reflex angle of up to 270 degrees on its own axis." In *Pseudocopelus lavenbergi* and *P. bothrorrhinos* Type 1 attachment is present in the paired caniniform teeth on the premaxilla and all depressiform teeth have Type 4 attachment (Melo 2007b). Tooth replacement is extraosseous in *Kali* species and replacement is synchronized so all premaxilla and dentary teeth are replaced at the same time (Melo 2008).

Champsodontidae: *Champsodon* (Çiçek & Bilecenoglu 2009).

Champsodon possesses coniform teeth arranged in two rows on the premaxilla and dentary (Çiçek & Bilecenoglu 2009). Tooth attachment and replacement have not been investigated.

Trichodontidae: *Trichodon* (Ayres 1860b).

Trichodon possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Ayres 1860b). Tooth attachment and replacement have not been investigated.

Pinguipedidae: *Parapercis**, *Pinguipes**, *Prolatilus**, *Pseudopercis** (Rosa & Rosa 1997) and *Simipercis** (Johnson & Randall 2006).

Parapercis, Prolatilus, Pseudopercis, and *Simipercis* possess caniniform teeth in the labialmost tooth row with multiple lingual rows of coniform teeth on the premaxilla and dentary. *Pinguipes* possesses caniniform teeth in the labialmost tooth row with three to five lingual rows of coniform teeth on the premaxilla and four to seven rows on the dentary (Rosa & Rosa 1997). Tooth attachment and replacement have not been investigated.

Cheimarrhichthyidae: *Cheimarrichthys* (McDowall 1973).

Cheimarrichthys possesses coniform teeth arranged in multiple rows with the labialmost row distinctly enlarged on the premaxilla and dentary (McDowall 1973). Tooth attachment and replacement have not been investigated.

Trichonotidae: *Trichonotus* (Shimada & Yoshino 1984; Clark & Pohle 1996).

Trichonotus possesses caniniform teeth arranged in one to two rows on the premaxilla and dentary (Clark & Pohle 1996). Tooth attachment and replacement have not been investigated.

Creediidae: *Apodocreedia* (De Beaufort & Van der Horst 1948), *Chalixodytes* (Jones & Kumaran 1967), *Creedia* (Shimada & Yoshino 1987), *Crystallodytes* (Griffin 1933), *Limnichthys* (Yoshino et al. 1999), and *Tewara* (Griffin 1933).

Apodocreedia possesses coniform teeth arranged in two rows on the premaxilla and one row on the dentary (De Beaufort & Van der Horst 1948). *Chalixodytes*, *Crystallodytes* and *Tewara* possess coniform teeth arranged in multiple rows on the premaxilla and dentary. *Creedia* possesses caniniform teeth arranged in a single row on the premaxilla and dentary (Shimada & Yoshino 1987). *Limnichthys* possesses coniform teeth arranged in a single row on the premaxilla and dentary (Yoshino et al. 1999). Tooth attachment and replacement have not been investigated.

Percophidae:

Percophinae: *Percophis* (Matsuura & Suzuki 2000).

Percophis possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Matsuura & Suzuki 2000). Tooth attachment and replacement have not been investigated.

Bembropinae: *Bembrops* (Thompson & Suttkus 2002) and *Chironema* (Armesto et al. 2001).

Bembrops and *Chironema* possess coniform teeth arranged in multiple rows on the premaxilla and dentary. Tooth attachment and replacement have not been investigated.

Hemerocoetinae: *Dactylopsaron* (Landaeta et al. 2003), *Matsubarea* (Senta et al. 1989), *Hemerocoestes* (Nelson 1979), *Osopsaron* (Parin 1985), and *Pteropsaron* (Park et al. 2007).

Dactylopsaron, Matsubarea, Hemerocoestes, Osopsaron, and *Pteropsaron* possess coniform teeth arranged in multiple rows on the premaxilla and dentary. Tooth attachment and replacement have not been investigated.

Leptoscopidae: *Lesueurina* (Fowler 1907).

Lesueurina possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Fowler 1907). Tooth attachment and replacement have not been investigated.

Ammodytidae: *Ammodytes* (Jordan 1906; Pietsch & Zabetian 1990), *Bleekeria* (Pietsch & Zabetian 1990; Joshi et al. 2012), *Embolichthys* (Jordan 1906; Pietsch & Zabetian 1990), and *Hyperoplus* (Pietsch & Zabetian 1990).

Ammodytes and *Hyperoplus* are edentulous on the premaxilla and dentary. *Bleekeria* possesses coniform teeth on the premaxilla and dentary (Pietsch & Zabetian 1990; Joshi et al. 2012). *Embolichthys* possesses coniform teeth arranged in a single row on the premaxilla and dentary (Jordan 1906; Pietsch & Zabetian 1990). Tooth attachment and replacement have not been investigated.

Trachinidae: *Echiichthys* and *Trachinus*.

Information on the dentition of this family could not be found.

Uranoscopidae: *Ichthyscopus** (Pietsch 1989; Gomon & Johnson 1999), *Kathetostoma* (Gomon & Roberts 2011), *Pleuroscopus* (Kishimoto et al. 1988), *Selenoscopus** (Okamura & Kishimoto 1993), and *Uranoscopus** (Kishimoto 1987; Pietsch 1989).

Ichthyscopus possesses coniform teeth arranged in three to four rows on the premaxilla; the dentary has widely spaced caniniform teeth (Gomon & Johnson 1999). Pietsch (1989) reported numerous small coniform teeth in *Ichthyscopus*. *Kathetostoma* possesses large caniniform teeth arranged amidst smaller caniniform teeth on the premaxilla and dentary (Gomon & Roberts 2011). *Pleuroscopus* possesses caniniform teeth arranged in one to two rows on the premaxilla and dentary (Kishimoto et al. 1988). *Selenoscopus* possesses coniform teeth on the premaxilla. The dentary possesses coniform teeth anteriorly and caniniform teeth posteriorly (Okamura & Kishimoto 1993). *Uranoscopus* possesses coniform teeth arrange in multiple rows on the premaxilla. The dentary has caniniform teeth in the labialmost row with lingual rows of coniform teeth (Kishimoto 1987). Pietsch (1989) reported depressiform teeth arranged in two rows in *U. scaber* on the premaxilla. The dentary has coniform teeth on the premaxilla arranged in a single row. Tooth attachment and replacement have not been investigated.

Pholidichthyidae: *Pholidichthys* (Springer & Freihofer 1976).

Pholidichthys possesses coniform teeth arranged in three rows on the premaxilla and dentary with the labialmost row containing the largest teeth. Springer and Freihofer (1976) described the teeth as caniniform, but the dentition has bee recategorized based on illustrations (Fig. 5) by Springer and Freihofer (1976). Tooth attachment and replacement have not been investigated.

Tripterygiidae: *Axoclinus** (Allen & Robertson 1991), *Blennodon** (Hardy 1987a), *Crocodilichthys*, Enneanectes** (Allen & Robertson 1991), *Enneapterygius* (Holleman 2005), *Forsterygion* (Hardy 1989), *Gilloblennius* (Hardy 1986), *Helcogramma* (Holleman

2007), *Lepidoblennius* (Hardy 1987c), *Notoclinus* (Hardy 1987b), *Ruanoho* (Hardy 1986), *Taboguilla** (Allen & Robertson 1991), and *Trianectes* (McCulloch & Waite 1918).

Axoclinus possesses caniniform teeth in the labialmost row with coniform teeth arranged in lingual rows on the premaxilla and dentary (Allen & Robertson 1991). *Blennondon* possesses incisiform teeth in the labialmost row with four lingual rows of coniform teeth on the premaxilla and dentary (Hardy 1987a). *Crocodilichthys, Enneanectes* possesses caniniform teeth in the labialmost row with coniform teeth arranged in lingual rows on the premaxilla and dentary (Allen & Robertson 1991). *Enneapterygius, Forsterygion, Gilloblennius, Lepidoblennius Notoclinus,* and *Ruanoho* possess coniform teeth arranged in multiple rows on the premaxilla and dentary with labialmost teeth enlarged. *Helcogramma* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary with the labialmost teeth occasionally enlarged (Holleman 2007). *Taboguilla* possesses caniniform teeth in the labialmost row with coniform teeth arranged in lingual rows on the premaxilla and dentary (Allen & Robertson 1991). *Trianectes* possesses coniform teeth arranged in three to four rows on the premaxilla and dentary with the largest teeth in the labial most row (McCulloch & Waite 1918). Tooth attachment and replacement have not been investigated.

Dactyloscopidae: *Dactylagnus* (Dawson 1976), *Dactyloscopus* (Dawson 1969a), *Gillellus* (Bohlke & Caldwell 1961), *Leurochilus* (Bohlke & Caldwell 1961), *Myxodagnus* (Bohlke & Caldwell 1961), and *Platygillellus* (Dawson 1974b).

Dactylagnus and *Dactyloscopus* possess coniform teeth arranged in three rows on the premaxilla and dentary (Dawson 1969a). *Gillellus* and *Leurochilus* possess coniform teeth arranged in two rows on the premaxilla and dentary (Bohlke & Caldwell 1961).

Myxodagnus possesses coniform teeth arranged in one to two rows on the premaxilla and dentary (Bohlke & Caldwell 1961). *Platygillellus* possesses coniform teeth arranged in two or three rows on the premaxilla and dentary (Dawson 1974b). Tooth attachment and replacement have not been investigated.

Blenniidae:

Salariinae:

Salariini: *Alloblennius, Alticus, Andamia, Antennablennuis*, Cirripectes** (Smith-Vaniz & Springer 1971), *Chasmodes* (Javonillo & Harold 2010), *Crossosalarias**, *Ecsenius**, *Entomacrodus** (Springer 1968), *Exallias, Glyptoparus*, Hirculops**(Smith-Vaniz & Springer 1971), Hypleurochilus* (Beebe & Tee-Van 1933), *Istiblennius** (Smith-Vaniz & Springer 1971; Nagatomo et al. 2001), *Litohbranchus*, Medusablennius, Mimoblennius*, Nannosalarias*, Ophioblennius*, Pereulixia*, Praealticus*, Rhabdoblennius**(Smith-Vaniz & Springer 1971), *Salarias** (Jordan & Starks 1906; Smith-Vaniz & Springer 1971), *Scartella**(Rangel & Mendes 2009), *Scartichthys** *Stanulus**(Smith-Vaniz & Springer 1971).

Alloblennius, Chasmodes, and *Medusablennius* possess incisiform teeth arranged in a single row on the premaxilla and dentary. *Alticus, Andamia, Astrosalarias,* and *Exallias,* possess suspensiform arranged in a single row on the premaxilla and dentary. *Antennablennius* possesses incisiform teeth arranged in a single row on the premaxilla and dentary; caniniform teeth may or may not be present on the dentary (Smith-Vaniz & Springer 1971). *Cirripectes, Crossosalarias, Entomacrodus,* and *Praealticus* possess suspensiform arranged in a single row on the premaxilla; the dentary has suspensiform arranged in a single row with paired posterior caniniform teeth (Smith-Vaniz & Springer

1971). *Ecsenius* possesses suspensiform arranged in a single row on the premaxilla; the dentary has suspensiform arranged in a single row with anterior and posterior caniniform teeth (Smith-Vaniz & Springer 1971). *Glyptoparus* possesses suspensiform arranged in a single row on the premaxilla; the dentary has suspensiform arranged in a single row with posterior caniniform teeth (usually two or three pairs)(Smith-Vaniz & Springer 1971). Smith-Vaniz and Springer (1971) noted that teeth were not movable and were "fairly rigid". *Hirculops* possesses incisiform teeth arranged in a single row on the premaxilla; the dentary has incisiform teeth arranged in a single row with posterior caniniform teeth (Smith-Vaniz & Springer 1971). Smith-Vaniz and Springer (1971) observed that the anterior incisiform teeth are replaced extraosseously, but posterior replacement teeth are fully enclosed in the crypt *Hypleurochilus* possesses recurved incisiform teeth arranged in single row with paired posterior caniniform teeth on the premaxilla. The dentary has coniform teeth arranged in a single row (Beebe & Tee-Van 1933). *Istiblennius* possesses suspensiform arranged in a single row on the premaxilla; the dentary has suspensiform arranged in a single row with posterior caniniform teeth (not present in some species) (Smith-Vaniz & Springer 1971). *Litobranchus* contains gynandric heterodonts with females often lacking dentary caniniform teeth. *Lithobranchus* possesses incisiform teeth arranged in a single row on the premaxilla; the dentary has incisiform teeth arranged in a single row with posterior caniniform teeth (Smith-Vaniz & Springer 1971). *Mimoblennius* possesses incisiform teeth arranged in a single row on the premaxilla; the dentary has incisiform teeth arranged in a single row with posterior paired caniniform teeth (Smith-Vaniz & Springer 1971). *Nannosalarias* possesses incisiform teeth arranged in a single row on the premaxilla; the dentary has incisiform teeth arranged in a single row with posterior paired caniniform teeth (Smith-Vaniz & Springer 1971). Smith-Vaniz and Springer (1971) noted teeth were movable, but also fairly rigid. *Ophioblennius* possesses suspensiform arranged in a single row on the premaxilla; the dentary has suspensiform arranged in a single row with posterior caniniform teeth (Smith-Vaniz & Springer 1971). *Pereulixia* possesses suspensiform teeth arranged in a single row on the premaxilla; the dentary has suspensiform teeth arranged in a single row with posterior paired caniniform teeth (Smith-Vaniz & Springer 1971). Smith-Vaniz and Springer (1971) noted that the suspensiform teeth were freely movable on the premaxilla, but fairly rigid on the dentary. *Rhabdoblennius* possesses incisiform teeth arranged in a single row on the premaxilla; the dentary has incisiform teeth arranged in a single row with posterior caniniform teeth. In *R. snowi* (Fowler)*,* the anterior teeth are replaced extraosseously while posterior teeth replaced intraosseously (Smith-Vaniz & Springer 1971). *Salarias, Scartella, Scartichthys, and Stanulus* possesses suspensiform teeth arranged in a single row on the premaxilla. The dentary has suspensiform arranged in a single row with posterior caniniform teeth (Smith-Vaniz & Springer 1971).

Tooth attachment in species of Salariini with incisiform teeth are weakly ankylosed to the premaxilla and dentary, but are rigid. In species with suspensiform there is no pedicel attachment to the premaxilla or dentary. Those species with fewer teeth have less connective tissue separating the teeth from the oral jaws. The posterior caniniform teeth present in many species are fully ankylosed to the dentary (Smith-Vaniz & Springer 1971). Tooth replacement in species of Salariini with incisiform teeth is intraosseous. Those species with suspensiform have extasosseous tooth replacement (Smith-Vaniz & Springer 1971). Individual teeth are replaced by progenic serial replacement in *Entomacrodus* *nigricans* with ten teeth in each replacement series on the premaxilla and seven on the dentary. Progenic serial replacement was also observed in the incisiform teeth of *Ophioblennius steindachneri* Jordan & Evermann (Norris & Prescott 1959). The progenic serial replacement series is illustrated (Fig. 12) by Nagatomo et al. (2001) in *Istiblennius edentulus* (Forster & Schneider). Christiansen et al. (2010) found that an incoming replacement tooth is present approximately every seventh tooth in *Salarias fasciatus* (Bloch). They also examined the iron content and wear on incisiform teeth. In *Hypleurochilus multifilis* (Girard), *Hypsoblennius invemar* Smith-Vaniz & Acero P., *H. ionthas* (Jordan & Gilbert), *Parablennius marmoreus* (Poey), and *Scartella cristata* (Linnaeus) initial teeth are coniform (originally described as villiform), which are replaced by “transitional spade shaped teeth.” Then the transitional teeth are replaced by “typical incisiform” teeth before larva settle. Of the aforementioned species, only *P. marmoreus* and *H. multifilis* have caniniform teeth, which appear in early “metamorphs” and just after settlement respectively (Ditty et al. 2005). *Ophioblennius atlanticus* (Valenciennes) experiences similar tooth replacement patterns (Labelle & Nursall 1985). Males of 14 species (including members of *Parablennius, Liophrys,* and *Coryphoblennius*) showed significantly larger caniniform teeth in males, and hypothesized to be linked to predator deterrence and agonistic interactions by Kotrschal and Goldschmid (1992). Lindquist and Dillaman (1986) examined tooth shape variation and its relationship diet in *Hypsoblennius, Hypleurochilus,* and *Parablennius* species.

Blenniinae:

Blenniini: Blennius and Spaniblennius.

Springer (1968) reported that despite firm attachment to the bone, the teeth in blenniini are “slightly movable.”

Omobranchini: *Enchelyurus*, Haptogenys*, Laiphognathus** (Springer 1972), Omobranchus *(Springer & Gomon 1975), *Omox*,* and *Parenchelyurus** (Springer 1972).

Enchelyurus, Haptogenys, Laiphognathus, Omox, and Parenchelyurus possesses incisiform teeth arranged in a single row with posterior paired caniniform teeth on the premaxilla and dentary (Springer 1972). *Omobranchus* contains gynandric heterodonts. Mature female *O. fasciolatoceps* lack caniniform teeth. Male *O. fasciolatoceps* and other species possess incisiform teeth arranged in a single row with posterior paired caniniform teeth on the premaxilla and dentary (Springer & Gomon 1975). Tooth attachment and replacement has not been investigated.

Phenablenniini: *Phenablennius* (Springer & Smith-Vaniz 1972).

Phenablennius possesses incisiform teeth arranged in a single row with paired posterior caniniform teeth on the premaxilla and dentary (Springer & Smith-Vaniz 1972). Tooth attachment and replacement has not been investigated.

Nemophini: *Aspidontus*, Meiacanthus *, Petroscirtes *, Plagiotremus *, and Xiphasia** (Smith-Vaniz 1976).

Aspidontus possesses incisiform teeth arranged in a single row with a posterior pair of caniniform teeth separated by a diastema on the premaxilla. The dentary has very large paired posterior caniniform teeth located lingually to the single row of anterior incisiform teeth. (Smith-Vaniz 1976) observed that *A. taeniatus* lacks caniniform teeth on the premaxilla. In “prejuveniles” the dentary caniniform teeth are severely recurved, but are later replaced by far less recurved teeth (Smith-Vaniz 1976). *Meiacanthus* possesses incisiform teeth arranged in a single row with a posterior pair of caniniform teeth separated by a diastema on the premaxilla. The dentary has very large paired posterior caniniform teeth located lingually to the single row of anterior incisiform teeth. The dentary caniniform teeth have grooves on the labial side of each tooth, which is connected to a toxic buccal gland used for defense against predation (Smith-Vaniz 1976). *Petroscirtes* possesses incisiform teeth arranged in a single row with a posterior pair of caniniform teeth separated by a diastema on the premaxilla; the dentary has very large paired posterior caniniform teeth located lingually to the single row of anterior incisiform teeth (Smith-Vaniz 1976). *Plagiotremus* possesses incisiform teeth arranged in a single row on the premaxilla and the posterior most one or two teeth on the premaxilla are separated by a diastema from the other teeth and are shaped more conically than incisiform, but are not enlarged; the dentary has very large paired posterior caniniform teeth located lingually to the single row of anterior suspensiform teeth. Smith-Vaniz (1976) provides illustrations (fig. 68-72) of the interspecific variation in tooth shape. *Xiphasia* possesses incisiform teeth arranged in a single row with a posterior pair of caniniform teeth separated by a diastema on the premaxilla; the dentary has very large paired posterior caniniform teeth located lingually to the single row of anterior incisiform teeth (Smith-Vaniz 1976).

Tooth attachment was described as firmly ankylosed in Nemophini except in *Plagiotremus*. In *Plagiotremus* the dentary teeth are suspended in connective tissue and attached to the dentary by a ligament attached to a "spur" on the lingual side about midlength on the tooth. Smith-Vaniz (1976) hypothesized that this attachment would allow for movements of individual teeth in response to surface friction. Tooth replacement is intraosseous based on descriptions given by Springer (1968) and Smith-Vaniz (1976).

Individual teeth have a progenic serial replacement series in *Plagiotremus tapeinosoma* (Fig. 73) as illustrated by Smith-Vaniz (1976). The number of teeth increases with standard length for all Nemophini Smith-Vaniz (1976).

Clinidae:

Ophiclinni: *Ophiclinus* (Scott 1935), and *Sticharium* (Hutton 1872).

Ophiclinus possesses coniform teeth arranged in one to two rows on the premaxilla and dentary (Scott 1935). *Sticharium* possesses coniform teeth on the premaxilla and dentary (Hutton 1872). Tooth attachment and replacement has not been investigated.

Clinini: *Clinus* (Shen 1971; Holleman et al. 2012), *Heteroclinus* (Hoese & Rennis 2006), *Pavoclinus* (Smith 1960), *Springeratus* (Shen 1971), and *Xenopoclinus* (Smith 1948).

Clinus possesses coniform teeth arranged in two rows on the premaxilla and dentary (Shen 1971; Holleman et al. 2012). *Heteroclinus* possesses coniform teeth arranged in four to five rows on the premaxilla and three to four rows on the dentary with the labialmost row enlarged (Hoese & Rennis 2006). *Pavoclinus* and *Xenopoclinus* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary with the labialmost row enlarged (Smith 1960). *Springeratus* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Shen 1971). Tooth attachment and replacement has not been investigated.

Myxodini: *Clinitrachus, Gibbonsia, Heterostichus, Myxodes, and Ribeiroclinus* (Springer 1970; Stephens & Springer 1973).

Clinitrachus possesses coniform teeth arranged in two rows on the premaxilla and dentary (Springer 1970). *Gibbonsia* possesses coniform teeth arranged in one to two rows on the premaxilla and dentary (Springer 1970). *Heterostichus* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary with labialmost teeth enlarged (Springer 1970). *Myxodes* possesses coniform teeth arranged in two rows on the premaxilla and dentary with the labialmost row enlarged (Stephens & Springer 1973). *Ribeiroclinus* possesses coniform teeth arranged in a single row on the premaxilla and dentary (Springer 1970).Tooth attachment and replacement have not been investigated.

Labrisomidae: *Cryptotrema* (Hubbs 1954), *Dialommus* (Gilbert 1891), Exerpes, *Haptoclinus* (Böhlke & Robins 1974), *Labrisomus* (Hubbs 1953b), *Malcoctenus* (Smith 1957), *Nemaclinus* (Böhlke & Springer 1975), *Starksia* (Jordan & Starks 1907; Rosenblatt & Taylor Jr 1971), and *Xenomedea* (Rosenblatt & Taylor Jr 1971).

Cryptotrema, Dialommus, Starksia, and *Xenomedea* possess coniform teeth arranged in multiple rows on the premaxilla and dentary with an enlarged labialmost row. *Haptoclinus* possesses coniform teeth arranged in on to two rows on the premaxilla and dentary (Böhlke & Robins 1974). *Labrisomus* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary with the labialmost row enlarged. The posterior caniniform teeth are present in *L. dendricticus* (Reid) (Hubbs 1953b). *Malcoctenus* possesses coniform teeth arranged in two rows on the premaxilla and dentary (Smith 1957). *Nemaclinus* possesses coniform teeth arranged in two rows on the premaxilla and dentary (Böhlke & Springer 1975). Tooth attachment and replacement have not been investigated.

Chaenopsidae: *Chaenopsis* (Böhlke 1957), *Coralliozetus, Ekemblemaria, Emblemaria, Emblemariopsis, Hemiemblemaria* (Stephens 1963), *Lucayayblennius* (Böhlke 1957), *Mccoskerichthys**(Rosenblatt & Stephens 1978), *Protemblemaria* (Stephens 1963), *Stathmonotus* (Hastings & Springer 1994), and *Tannyemblemaria* (Hastings 1992).

Chaenopsis, Ekemblemaria, Emblemaria Emblemariopsis, Hemiemblemaria Lucayayblennius Protemblemaria possesses coniform teeth arranged in multiple rows on the premaxilla and dentary with an enlarged labialmost teeth (Böhlke 1957). *Mccoskerichthys* possesses incisiform teeth in the labialmost row with lingual rows of coniform teeth on the premaxilla and dentary; the dentary has a pair of enlarged coniform teeth behind lingual coniform teeth (Rosenblatt & Stephens 1978). *Stathmonotus* possesses coniform form teeth arranged in multiple rows with and enlarged outer row on the premaxilla and dentary (Hastings & Springer 1994). Teeth were originally described as canines, but were revised based on illustrations of the teeth (Fig. 3). *Tannyemblemaria* possesses coniform form teeth arranged in multiple rows with and enlarged outer row on the premaxilla and dentary (Hastings 1992). Teeth were originally described as canines, but were revised based on photographs of the teeth (Fig. 5). Tooth attachment and replacement have not been investigated.

Icosteidae: *Icosteus* (Lockington 1880a).

Icosteus possesses coniform teeth arranged in a single row on the premaxilla and dentary. The teeth in the premaxilla are smaller then the teeth of dentary (Lockington 1880a). Tooth attachment and replacement have not been investigated.

Gobiesocidae: *Acrytops** (Conway et al. 2014), *Alabes* (Hutchins & Morrison 2004; Hutchins 2006), *Apletodon** (Fricke 2007; Fricke et al. 2010), Aspasmogaster, *Arcos** (Briggs 1969a), *Aspasma* (Jordan & Fowler 1902a), , *Cochleoceps* (Hutchins 1983), *Creocele* (Waite 1906), *Derilissus**(Sparks & Gruber 2012), *Diademichthys* (Herre 1942), *Gobiesox** (Briggs & Miller 1960), *Kopua* (Moore et al. 2012), *Lecanogaster* (Briggs 1957), *Lepadichthys* (Briggs 1969b), *Modicus** (Hardy 1983a), *Parvicrepis* (Waite 1906), *Posidonichthys** (Briggs 1993), *Pherallodus, Pherallodichthys, Propherallodus* (Shiogaki & Dotsu 1983), *Rimicola** (Briggs & Schaefer 2002), and *Tomicodon** (Briggs 1969a; Szelistowski 1990).

Acrytops possesses anterior tricuspid incisiform teeth followed posteriorly by coniform teeth arranged in a single row on the premaxilla and dentary. Conway et al. (2014) noted that the two to three anteriormost coniform teeth were enlarged. *Alabes* possesses coniform teeth arranged in one to two (one in *A. scotti* Hutchins & Morrison) rows on the premaxilla and dentary (Hutchins & Morrison 2004). In *A. springeri* teeth are incisiform and arranged in a single row on both premaxilla and dentary (Hutchins 2006). *Apletodon* possesses anterior incisiform teeth followed posteriorly by caniniform teeth with lingual coniform teeth on the premaxilla and dentary (Fricke et al. 2010). *Aspasmogaster* and *Creocele* possess coniform teeth arranged in multiple rows on the premaxilla and dentary with enlarged labialmost teeth. *Arcos* possesses anterior incisiform teeth followed posteriorly by two to three caniniform teeth with a single lingual row of coniform teeth on the premaxilla and dentary (Briggs 1969a). *Aspasma* possesses coniform teeth arranged in a single row on the premaxilla and dentary (Jordan & Fowler 1902a). *Cochleoceps* possesses coniform teeth arranged in four to six rows on the premaxilla and dentary (Hutchins 1983). *Creocele* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary with an enlarged labialmost row (Waite 1906). *Derilissus* possesses anterior tridentiform and bifidiform teeth followed posteriorly by coniform teeth arranged in two rows. The dentary has anterior tridentiform teeth with posterior bifidiform teeth and coniform teeth in the most posterior tooth positions (Sparks & Gruber 2012). *Diademichthys* possesses bifidiform teeth arranged in a single row on the premaxilla and dentary(Herre 1942). The posterior teeth more widely spaced than anterior teeth (Herre 1942). *Gobiesox* possesses anterior incisiform teeth followed posteriorly by caniniform teeth in the labialmost row with lingual rows coniform on the premaxilla; the dentary has anterior incisiform teeth followed posteriorly by two to four "weakly" caniniform teeth. In *G. mexicanus* one lingual row of coniform teeth are present on the dentary (Briggs & Miller 1960). *Kopua* possesses coniform teeth arranged in one to two rows on the premaxilla and dentary. Some teeth enlarged posteriorly on the dentary (Moore et al. 2012). *Lecanogaster* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Briggs 1957). Lepadichthys possesses incisiform teeth arranged in a single row on the premaxilla and dentary. The premaxilla teeth have "reverse tips" and on the dentary reverse tips are less prominent (Briggs 1969b). *Modicus* possesses coniform teeth arranged in multiple rows anteriorly on the premaxilla followed posteriorly by paired caniniform teeth; the dentary has anterior coniform teeth arranged in multiple rows anteriorly followed posteriorly by one to two pairs of very large caniniform teeth, and a single row of smaller caniniform teeth follows these large caniniform teeth (Hardy 1983a). *Parvicrepis* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Waite 1906). *Posidonichthys* possesses coniform teeth arranged in multiple rows on the premaxilla; the dentary has anterior incisiform teeth followed posteriorly coniform teeth arranged in multiple rows (Briggs 1993). *Pherallodichthys* possesses incisiform teeth arranged in single row on the premaxilla and dentary. Shiogaki and Dotsu (1983) noted that the posterior incisiform teeth become highly compressed and bear "hooked" tooth crowns. *Pherallodus* possesses incisiform teeth arranged in single row on the premaxilla and dentary and Shiogaki and Dotsu (1983) noted that the posterior incisiform teeth become highly compressed and bear “hooked” tooth crowns. On the premaxilla the hooked tooth crown are recurved posteriorly and on the dentary they are recurved anteriorly. *Propherallodus* possesses incisiform teeth arranged in single row on the premaxilla and dentary. Shiogaki and Dotsu (1983) noted that these incisiform teeth had rounded tooth crowns. *Rimicola* contains gynandric heterodonts. Male *R. dimorpha* Briggs and *R. sila* Briggs have incisiform teeth near the symphysis of the dentary (no caniniform teeth present). Male *R. cabrilloi* Briggs possess one or two paired caniniform teeth posterior the incisiform teeth on the dentary. The premaxilla has coniform teeth arranged in multiple rows. Female *Rimicola* possess less smaller and thinner incisiform teeth on the dentary and no caniniform teeth (Briggs & Schaefer 2002). Juvenile *R. brevis* Briggs have incisiform teeth with four cusps, which are reduced to a single minute cusp at the corner of each tooth in adults (Briggs 1969a). *Tomicodon* possesses anterior tricuspid incisiform teeth followed posteriorly by pair caniniform teeth on the premaxilla; the dentary has unicuspid incisiform teeth at the symphysis which are followed posteriorly by bicuspid incisiform teeth then by paired caniniform teeth (Briggs 1969a). Tooth attachment and tooth replacement have not been investigated.

Callionymidae: *Anaora* (Nakabo 1983), *Callionymus* (Jordan 1888), *Dactylopus* (Nakabo 1983), *Diplogrammus* (Nakabo 1983), *Draculo* (Snyder 1911), *Paracallionymus* (Nakabo 1983), and *Protogrammus* (Fricke 1985).

Anaora possesses few “degenerate” coniform teeth on the premaxilla and dentary (Nakabo 1983). *Callionymus, Dactylopus, Diplogrammus, Draculo, Paracallionymus,* and *Protogrammus* possess coniform teeth arranged in multiple rows on the premaxilla and dentary. Tooth attachment and tooth replacement have not been investigated.

Draconettidae: *Centrodraco* (Nakabo & Yamamoto 1980), and *Draconetta* (Nakabo 1982).

Centrodraco and *Draconetta* possess coniform teeth arranged in multiple rows on the premaxilla and dentary. Tooth attachment and tooth replacement have not been investigated.

Rhyacichthyidae: *Rhyacichthys* (Miller 1973).

Rhyacichthys possesses coniform teeth arranged in multiple rows on the premaxilla and dentary. The teeth were originally described as caniniform, but have been recategorized based on the illustrations (Fig. 4C&D) of the dentition (Miller 1973). Tooth attachment and tooth replacement have not been investigated.

Odontobutidae: *Odontobutis* (Iwata et al. 2002) and *Percottus* (Voskoboinikova & Pavlov 2006).

Odontobutis possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Iwata et al. 2002). *Percottus* possesses coniform teeth arranged in up to three rows on the premaxilla and dentary (Voskoboinikova & Pavlov 2006). Tooth attachment and tooth replacement have not been investigated.

Eleotridae:

Butinae: *Butis* (Jordan & Seale 1905).

Butis possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Jordan & Seale 1905). Tooth attachment and tooth replacement have not been investigated.

Eleotrinae: *Eleotris* (Pezold & Cage 2002), *Erotelis* (Eigenman et al. 1885), *Gobiomorphus* (Stokell 1940; Stokell 1941), *Gobiomorus* (Eigenman et al. 1885), *Guavina* (Eigenman et al. 1885), *Hypseleotris* (Hoese & Allen 1983), *Mogurnda* (Nichols 1951), *Philypnodon* (Hoese & Reader 2006), and *Thalasseleotris** (Hoese & Roberts 2005).

Eleotris possesses caniniform teeth in the labialmost row and near the symphysis with multiple lingual rows of coniform teeth(Pezold & Cage 2002). Caniniform teeth not present in *E. picta* (Pezold & Cage 2002). *Erotelis* possesses coniform teeth on the premaxilla and dentary (Eigenman et al. 1885). *Gobiomorphus* possesses coniform teeth arranged in four to five rows on the premaxilla and dentary with the labialmost row containing the largest teeth (Stokell 1940; Stokell 1941). *Gobiomorus, Guavina, Hypseleotris,* and *Mogurnda* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary. *Philypnodon* possesses coniform teeth arranged in two (rarely three) rows on the premaxilla and dentary (Hoese & Reader 2006). *Thalasseleotris* possesses depressiform teeth in the lingual most tooth row with all other teeth coniform arranged in four to five rows on the premaxilla. The dentary has coniform teeth arranged in four to five rows with the largest teeth in the labialmost row (Hoese & Roberts 2005). Tooth attachment and tooth replacement have not been investigated.

Xenistmidae: *Xenisthmus* (Gill & Randall 1994), *Paraxenisthmus* (Winterbottom et al. 2006), and *Rotuma* (Springer 1988).

Xenisthmus possesses coniform teeth arranged in two to three rows on the premaxilla and two rows on the dentary with the largest teeth in the labialmost row (Gill & Randall 1994). *Paraxenisthmus* possesses coniform teeth arranged in two to three rows on the premaxilla and dentary (Winterbottom et al. 2006). *Rotuma* possesses coniform teeth on the premaxilla and dentary as illustrated by Springer (1988). Tooth attachment and tooth replacement have not been investigated.

Kraemeriidae: *Gobitrichinotus* (Fowler 1943).

Gobitrichinotus possesses coniform teeth arranged in a single row on the premaxilla and dentary (Fowler 1943). Tooth attachment and tooth replacement have not been investigated.

Gobiidae:

Oxudercinae: *Boleophthalmus** (Polgar et al. 2013) and *Zappa** (Roberts 1978a).

Boleophthalmus possesses a group of anterior caniniform teeth followed posteriorly by a single row of coniform teeth on the premaxilla; the dentary has only paired caniniform teeth at the symphysis (Polgar et al. 2013). *Zappa* possesses large coniform teeth in the labialmost tooth row with a single lingual row of smaller coniform; the dentary has a single caniniform tooth at the symphysis with a single row of coniform teeth (Roberts 1978a). Tooth attachment and tooth replacement have not been investigated.

Amblyopinae: *Caragobius* (Murdy & Shibukawa 2003), *Karsten* (Murdy & Schaefer 2002), and *Trypauchen** (Shibukawa & Murdy 2012).

Caragobius and *Karsten* possess coniform teeth arranged in two rows on the premaxilla and dentary with an enlarged labialmost row. *Trypauchen* possesses caniniform teeth in the labialmost tooth row with two lingual rows of coniform teeth on the premaxilla and dentary (Shibukawa & Murdy 2012). Tooth attachment and tooth replacement have not been investigated.

Sicydiinae: *Awaous* (Eigenmann 1917; Watson 1994), Cotylopus (Keith et al. 2005), Lentipes (Watson et al. 2002), *Sicydium**(Mochizuki et al. 1991; Bussing 1996), *Sicyopterus** (Mochizuki & Fukui 1983; Kakizawa et al. 1986; Moriyama et al. 2009; Sahara et al. 2013), *Sicyopus* (Keith et al. 2011), and *Stiphodon* (Watson et al. 2005).

Awaous contains gynandric heterodonts. Male *A. acritosus* Watson possess more teeth then females (Watson 1994). *Awaous* possesses coniform teeth arranged in a single row on the premaxilla The dentary has depressiform teeth in the labial row and coniform teeth in the lingual row (Eigenmann 1917). *Cotylopus* possesses tridentiform teeth arranged in a single functional row with replacement teeth present anteriorly on the premaxilla. The dentary has coniform teeth arranged in a single row (Keith et al. 2005). *Lentipes* contains gynandric heterodonts. Male *L. kaaea* possess "slightly flexible" tridentiform teeth anteriorly followed by several caniniform teeth posteriorly on the premaxilla. In females, if these caniniform teeth are present, only a single very small tooth will be present posteriorly. The dentary has caniniform teeth in males, but in females the dentary is either edentulous of bears only a few small teeth. In juveniles, all teeth on the premaxilla are tridentiform and are later replaced with caniniform teeth (Watson et al. 2002). *Sicydium* possesses labio-lingually flattened tridentiform teeth with very short cusps arranged in a single row with a second " half erupted" row visible lingually on the premaxilla. The dentary has depressiform teeth arranged in a single anterior row and distinctly separated from these teeth is a posterior lingual row of caniniform teeth. Mochizuki et al. (1991) also specifically examined the subtle differences between the dentition and feeding of *Sicydium plumieri* and *Sicyopterus japonicus.* The tridentiform premaxilla teeth vary intraspecifically in both cusp size and stoutness of the tooth shaft as illustrated (Fig. 2) by Bussing (1996). *Sicyopterus* possesses labio-lingually flattened tridentiform teeth with long cusps arranged in a single row on the premaxilla. The central cusp is shorter than the two lateral cusps (Mochizuki & Fukui 1983). The dentary has suspensiform teeth arranged in a single row (Kakizawa et al. 1986). *Sicyopus* possesses coniform teeth on the premaxilla and dentary (Keith et al. 2011). *Stiphodon* contains gynandric heterodonts. Males and females possess tridentiform teeth (elongate central cusp) on the premaxilla. In males, the dentary bears zero to four enlarged coniform teeth at the symphysis, which are less robust and fewer in number in females (zero to two) (Watson et al. 2005). In both sexes, the enlarged teeth are followed posteriorly by smaller coniform teeth on the dentary (Watson et al. 2005).

Tooth attachment is in unclear. In *Sicyopterus japonicus* the teeth on the premaxilla does not clearly classify into the attachment Types. Sahara et al. (2013) examined the tooth attachment in detail and found two different points to attachment on the teeth of the premaxilla. The lingual base consists of collagen fiber bundles connected to the dentine shaft (“hinged attachment”) and labial base articulated with a pedicel base (“articulate attachment”). The dentary teeth have not received as much study, but were reported to be depressible (“hinged”), but the attachment Type was not designated by Kakizawa et al. (1986). In *Sicydium plumieri* “half-erupted” and functional teeth are ankylosed to the bone on the premaxilla, but also have an anchor of connective tissue mid length on the tooth shaft. On the dentary the anterior suspensifom (no attachment Type designated), but the posterior caniniform tooth row is ankylosed to the dentary (Mochizuki et al. 1991).Tooth replacement is extraosseous in *Sicyopterus japonicus* on the premaxilla and individual teeth have a progenic serial replacement series with about 35 replacement teeth in each series. Mochizuki and Fukui (1983) found that teeth are replaced every 9.2 days if SL increases at 0.12 mm per day. Additionally, the first teeth erupt in this aphidromous species when juveniles school together to proceed up river at about 3.4 cm. Moriyama et al. (2009) used micro-computed tomography on *S. japonicus* and found similar results about tooth replacement and proposed *S. japonicus* as an ideal system to study consecutive development of replacement teeth in adult fish. Moriyama et al. (2010) examined the unique structure of “plate-like permanent dental laminae” present in *Sicyopterus japonicus* in great detail.In *Sicydium plumieri*, the individual teeth of the premaxilla have a progenic serial replacement series with about 35 replacement teeth present in each series in a 90mm SL specimen. The dentary teeth have several replacement teeth present on the anterior face of the dentary (Fig. 5J), but the posterior paired caniniform teeth are replaced from the posterior side of the tooth.

Gobionellinae: *Acanthogobius* (Shibukawa & Taki 1996), *Brachygobius* (Larson & Vidthayanon 2000), *Clevelandia* (Jordan & Gilbert 1882b), *Ctenogobius* (Herre 1936b), *Eucyclogobius* (Kindermann et al. 2007), *Gillicthys* (Barlow 1961), *Gnatholepis** (Randall & Greenfield 2007), *Gobioides* (Murdy 1998), *Gobionellus* (Ginsburg 1953), *Gobiopterus** (McDowall & David 2008), *Ilypnus* (Eigenmann & Eigenmann 1889), *Lethops* (Hubbs 1926b), *Lophiogobius* (Günther 1873), *Mistichthys* (Te Winkel 1935), *Mugilogobius** (Larson & Kottelat 1992), Paedogobius*(Iwata et al. 2001), Pandaka, *Quietula* (Kindermann et al. 2007), *Rhinogobius* (Chen & Shao 1996), *Stigmatogobius* (Larson 2005), *Tridentiger* (Goren et al. 2009), and *Typhlogobius* (MacGinitie 1939).

Acanthogobius possesses coniform teeth arranged in three to four rows on the premaxilla and two to three rows on the dentary (Shibukawa & Taki 1996). *Brachygobius* possesses coniform teeth arranged in three rows on the premaxilla and dentary (Larson & Vidthayanon 2000). *Clevelandia Ilypnus Lethops Lophiogobius* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary with the labialmost row enlarged (Jordan & Gilbert 1882b). *Ctenogobius Eucyclogobius,* and *Quietula* possess coniform teeth arranged in multiple rows on the premaxilla and dentary. *Gillicthys* possesses coniform teeth arranged in four to five rows on the premaxilla and dentary (Barlow 1961). *Gnatholepis* possesses paired caniniform teeth near the symphysis with two posterior rows of coniform teeth on the premaxilla. The dentary has anterior caniniform teeth followed by two rows of coniform teeth (Randall & Greenfield 2007). *Gobioides* possesses coniform teeth arranged in one to three rows on the premaxilla and dentary depending upon the species. Murdy (1998) provides descriptions of interspecific variation of species examined. *Gobionellus* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary with the labial and lingualmost rows somewhat enlarged (Ginsburg 1953). *Gobiopterus* contains gynandric heterodonts. Male *G. semivestitus* possesses very large caniniform teeth (Fig. 4) with a lingual row of coniform teeth on the premaxilla and dentary (McDowall & David 2008). Females possess only coniform teeth arranged in a single row on the premaxilla and dentary (McDowall & David 2008). *Mistichthys* possesses coniform teeth arranged in a single row on the premaxilla and dentary (Te Winkel 1935). *Mugilogobius* possesses caniniform teeth in the labialmost tooth row with four to five lingual rows of coniform teeth on the premaxilla; the dentary has caniniform teeth in the labialmost and lingualmost tooth rows with two to three lingual rows of coniform teeth (Larson & Kottelat 1992). *Paedogobius* contains a gynandric heterodont. Female *P. kimurai* possess coniform teeth arranged in a single row on the premaxilla and dentary. Male *P. kimurai* are divided into primary and secondary males based on different anatomical features including dentition. Primary males possess five coniform teeth on the premaxilla and a pair of coniform teeth on the dentary. Secondary males possesses six very large caniniform teeth (Fig. 4) arranged in a single row on the premaxilla and five similarly large caniniform teeth arranged in a single row on the premaxilla (Iwata et al. 2001). *Pandaka* possesses coniform teeth arranged in two rows on the premaxilla and dentary (Smith 1959a). *Rhinogobius* and *Stigmatogobius* possesses coniform teeth arranged in three to five rows on the premaxilla and dentary with an enlarged outer row *Tridentiger* possesses tridentiform teeth on the premaxilla and dentary (Goren et al. 2009). Boltachev et al. (2007) reported the tridentiform teeth were in the labialmost tooth rows, but did not described the other tooth rows. *Typhlogobius* possesses coniform teeth on the premaxilla and dentary (MacGinitie 1939). Tooth attachment and replacement have not been investigated.

Gobiinae: *Acentrogobius** (Lee & Ik-Soo 1992), *Amblygobius* (Herre 1936b), *Anatirostum* (Ahnelt et al. 2000), *Asterropteryx* (Shibukawa & Suzuki 2002), *Barbulifer* (Hoese & Larson 1985), *Bathygobius** (Miller & Smith 1989), *Buenia* (Kramer et al. 2012), *Corygalops** (Smith 1958b), *Evermannichthys* (Böhlke & Robins 1969), *Eviota* (Smith 1958b; Larson 1976), *Gobiopsis** (Lachner & McKinney 1978), *Gobiosoma** (Dawson 1969b; Dawson 1971), *Gobius* (Kramer et al. 2012), *Gobulus* (Hoese & Reader 2001), *Hetereleotris* (Shibukawa 2010), *Istiogobius* (Murdy 1985), *Lesueurigobius* (Kramer et al. 2012), *Lythrypnus* (Böhlke & Robins 1960), *Microgobius* (Tornabene et al. 2012), *Nes* (Nichols 1914), *Palatogobius* (Greenfield 2002), *Parkraemeria* (Whitley 1951), *Pomatoschistus* (Kramer et al. 2012), *Priolepis** (Nogawa & Endo 2007), *Thorogobius (Kramer et al. 2012),* *Trimma* (Suzuki & Senou 2007), *Trimmatom** (Winterbottom 1989), *Varicus* (Gilmore 1979) and *Zebrus** (Miller 1977).

Acentrogobius possesses caniniform teeth in the labialmost row with one to three lingual rows of coniform teeth on the premaxilla and dentary (Lee & Ik-Soo 1992).

Amblygobius possesses coniform teeth arranged in three rows on the premaxilla and dentary with the labialmost row enlarged (Herre 1936b). *Anatirostum* possesses coniform teeth arranged in four to five rows on the premaxilla and dentary. Originally described as caniniform teeth, but based on the description that "no large canines developed" made by Ahnelt et al. (2000) it seems more likely that these teeth are coniform. *Asterropteryx* possesses coniform teeth arranged in four rows on the premaxilla and three to four rows on the dentary (Shibukawa & Suzuki 2002). *Barbulifer* possesses coniform teeth arranged in four rows on the premaxilla with the labialmost row enlarged; the dentary has coniform teeth arranged in four rows with the labial and lingualmost rows enlarged (Hoese & Larson 1985). *Bathygobius* possesses caniniform teeth in the labialmost row with coniform teeth arranged in multiple lingual rows on the premaxilla, the dentary has caniniform teeth in the labialmost row and interspersed in the lingual rows of coniform teeth (Miller & Smith 1989). *Buenia* possesses coniform teeth arranged in three to four rows on the premaxilla and three to six rows on the dentary. The lingualmost and labialmost teeth are enlarged on both the premaxilla and dentary (Kramer et al. 2012). *Corygalops* possesses caniniform teeth in the labialmost row with multiple lingual rows of coniform teeth on the premaxilla and dentary (Smith 1958b). *Evermannichthys* contains gynandric heterodonts with male *E. sillus* Böhlke & Robins having much larger teeth in the labialmost row of the premaxilla when compared to female tooth size. In general, *Evermannichthys* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Böhlke & Robins 1969).. Some species having enlarged labialmost row on the premaxilla and an enlarged lingualmost row on the dentary. Occasionally a few of the teeth in the labialmost row are enlarged. In *E. spongicola* (Radcliffe) a row of coniform teeth are present on the labial face of dentary outside of the mouth (only visible under microscopic examination) (Böhlke & Robins 1969). *Eviota* possesses coniform teeth arranged in three rows on the premaxilla and dentary with the labialmost row enlarged (Smith 1958b; Larson 1976). *Gobiopsis* contains gynandric heterodonts. Males of *G. canalis* Lachner & McKinney*, G. pinto* (Smith), and *G. woodsi* Lachner & McKinney possess an additional one to three caniniform teeth in the lingualmost row of the premaxilla. Otherwise, the premaxilla has caniniform teeth in the labialmost row followed posteriorly by three to four lingual rows coniform teeth; the dentary has caniniform teeth in the labialmost row followed posteriorly by three to four lingual rows of coniform teeth. *Gobiosoma* contains gynandric heterodonts. Males possess caniniform teeth in the labialmost and lingualmost rows with multiple lingual rows of coniform teeth on the premaxilla and dentary. Females lack caniniform teeth (Dawson 1969b; Dawson 1971). *Gobius* possesses coniform teeth arranged in about three to five rows on the premaxilla and about three to six rows on the dentary (Kramer et al. 2012). The lingualmost and labialmost rows are enlarged on both the premaxilla and dentary. Kramer et al. (2012) describes interspecific differences of species examined such as a lack of an enlarged lingualmost row on the premaxilla in *G. roueli* de Buen and *G. vitattus* Vinciguerra. *Gobulus* possesses coniform teeth arranged in three to four rows on the premaxilla and dentary with an enlarged labialmost row (Hoese & Reader 2001). *Hetereleotris* possesses coniform teeth arranged in four rows on the premaxilla and dentary with the labialmost teeth enlarged (Shibukawa 2010). *Istiogobius* possesses coniform teeth arranged in four to five rows on the premaxilla and dentary (Murdy 1985). Murdy (1985) reported some species possess caniniform teeth on the dentary. *Lesueurigobius* possesses coniform teeth arranged in one to three rows on the premaxilla and dentary with the labialmost rows are enlarged (Kramer et al. 2012). *Lythrypnus* possesses caniniform teeth in the labialmost row with multiple lingual rows of coniform teeth on the premaxilla and dentary (Böhlke & Robins 1960). *Microgobius* possesses coniform teeth arranged in two to three rows on the premaxilla and dentary (Tornabene et al. 2012). Birdsong (1981) observed caniniform teeth in the labialmost row of *Microgobius* species. *Nes* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary with an enlarged labialmost row (Nichols 1914). *Palatogobius* possesses coniform teeth arranged in two rows on the premaxilla and dentary with the labialmost row enlarged (Greenfield 2002). *Parkraemeria* possesses coniform teeth arranged in a single row on the premaxilla and dentary (Whitley 1951). *Pomatoschistus* possesses coniform teeth arranged in three rows on the premaxilla and the dentary, and the lingualmost and labialmost rows are enlarged on both the premaxilla and dentary (Kramer et al. 2012). *Priolepis* possesses caniniform teeth in the labialmost row with two lingual rows of coniform teeth on the premaxilla. The dentary has caniniform teeth in the labialmost row with lingual rows of coniform teeth arranged in three to four rows (Nogawa & Endo 2007). *Thorogobius* possesses coniform teeth arranged in three rows on the premaxilla and three to four rows on the dentary. The lingualmost and labialmost rows are enlarged on both the premaxilla and dentary (Kramer et al. 2012). *Trimma* possesses coniform teeth arranged in five (three in *T. nomurai*) rows on the premaxilla and dentary with an enlarged labialmost row (Suzuki & Senou 2007). *Trimmatom* possesses caniniform teeth in the labialmost row with lingual rows of coniform teeth on the premaxilla. The dentary has caniniform teeth in the labialmost and lingualmost row with coniform teeth in all other lingual rows (Winterbottom 1989). *Varicus* possesses coniform teeth arranged in three rows on the premaxilla and dentary with enlarged teeth in labialmost row (Gilmore 1979). *Zebrus* possesses caniniform teeth in the labialmost row and at the symphysis with multiple lingual rows of coniform teeth on the premaxilla and dentary as illustrated (Fig. 3C, D, & E) by Miller (1977). Tooth attachment and replacement have not been investigated.

Microdesmidae: *Cerdale*, Clarkichthys** (Dawson 1974a), *Gunnellichthys* (Thacker & Schaefer 2000), *Microdesmus** (Dawson 1968), and *Paragunnellichthys* (Thacker & Schaefer 2000).

Cerdale possesses coniform teeth arranged in two rows on the premaxilla and dentary. Dawson (1974a) observed some incisiform teeth on the dentary of *C. fasciata* Dawson and *C. paludicuola* Dawson and in the lingual row on the premaxilla and dentary of *C. prolata* Dawson. *Clarkichthys* possesses coniform teeth in the labial row and incisiform teeth in the lingual row on premaxilla and dentary (Dawson 1974a). *Gunnellichthys* and *Paragunnellichthys* possess coniform teeth on the premaxilla and dentary (Thacker & Schaefer 2000). *Microdesmus* possesses coniform teeth arranged in two rows on the premaxilla and dentary with the lingual row containing few widespread teeth. In *M. dorsipunctatus* Dawson, caniniform teeth are present in the labialmost row on the premaxilla and dentary (Dawson 1968). Tooth attachment and replacement have not been investigated.

Ptereleotridae: *Aioliops* (Rennis & Hoese 1987), *Nemateleotris** (Randall & Allen 1973), *Oxymetopon* (Chan 1966), *Parioglossus* (Wang 2001), and *Ptereleotris** (Bussing 2001).

Aioliops possesses coniform teeth arranged in one to two rows on the premaxilla and dentary with the labial teeth enlarged (Rennis & Hoese 1987). *Nemateleotris* possesses caniniform teeth in the labialmost row followed posteriorly by two to four lingual rows of coniform teeth on the premaxilla and dentary (Randall & Allen 1973). The dentary also has one to three paired posterior caniniform teeth (Randall & Allen 1973). *Oxymetopon* possesses a symphyseal caniniform tooth followed posteriorly by coniform teeth arranged in two to three rows on the premaxilla and dentary (Chan 1966). *Parioglossus* possesses caniniform teeth arranged in two rows on the premaxilla and dentary with the labial row enlarged (Wang 2001). *Ptereleotris* possesses caniniform teeth in the two labialmost rows (enlarged canines at the symphysis) followed posteriorly by four lingual rows of coniform teeth on the premaxilla. The dentary has coniform teeth arranged in three to four rows with three to four posterior paired caniniform teeth (Bussing 2001). Tooth attachment and replacement have not been investigated.

Schindleriidae: *Schindleria* (Watson & Walker Jr. 2004).

Schindleria praematura possesses coniform teeth on the premaxilla and dentary. However, *S. pietschmanni* (Schindler) develops teeth only on the premaxilla and *S. brevipinguis* is entirely edentulous on the oral jaws (Watson & Walker Jr. 2004). Tooth attachment and replacement have not been investigated.

Kurtidae: *Kurtus* (Berra 2003).

Kurtus possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Berra 2003). Tooth attachment and replacement have not been investigated.

Ephippidae: *Ephippus* (Smith 1936), *Platax* (Heemstra 2001) and *Tripterodon* (Smith 1936).

Ephippus possesses incisiform teeth arranged in multiple rows on the premaxilla and dentary (Smith 1936; Heemstra 2001). *Platax* possesses sharp tridentiform teeth with an enlarged central cusp on the premaxilla and dentary. In *P. batavianus* Cuvier, *P.*

pinnatus (Linnaeus)*,* and *P. obicularis* (Forsskål) the central tooth cusp is enlarged, but in *P. boersii* Bleeker the central cusp is only slightly longer the lateral cusps (Heemstra 2001). *Tripterodon* possesses labio-lingually flattened recurved movable tridentiform teeth arranged in about four rows on the premaxilla and dentary. Lingual tooth rows embedded in fleshy pads according to Smith (1936). Tooth attachment and replacement have not been investigated.

Scatophagidae: *Scatophagus* (Gill 1891).

Scatophagus possesses tridentiform teeth arranged in multiple rows on the premaxilla and dentary (Gill 1891). Tooth attachment and replacement have not been investigated.

Siganidae: *Siganus**(Tyler & Alexander 1997)

Siganus possesses either bifidiform or tridentiform teeth (with some species having tridentiform on the premaxilla and bifidiform teeth on the dentary) arranged in a single row on the premaxilla and dentary (Tyler & Alexander 1997). In species with bifidiform teeth, the posterior cusp of the premaxilla teeth is enlarged, but on the dentary teeth the anterior cusp is enlarged. In species with tricuspid teeth the central cusp is enlarged with the additional lateral cusp being small in size. Tyler and Alexander (1997) provide a detailed illustration (Fig. 18) of the premaxilla and dentary tooth shapes in *Siganus* species. Tooth attachment is Type 2 in *Siganus virgatus* (Valenciennes) (Fink 1981).Tooth replacement is extraosseous in *Siganus* species (Tyler & Alexander 1997).

Luvaridae: *Luvaris* (Tyler et al. 1989a).

Luvaris are endentulous as adults. Juveniles possess coniform teeth arranged in a single row on the premaxilla and dentary, which are lost though ontogeny (Tyler et al. 1989a). Tooth attachment and replacement have not been investigated.

Zanclidae: *Zanclus* (Tyler et al. 1989a).

Zanclus possesses elongate incisiform teeth on the premaxilla and dentary. Tyler et al. (1989a) reported depressibility in the teeth, but not other information on attachment was available. Tooth attachment has not been investigated. Tooth replacement is intraosseous in *Zanclus cornutus* (Linnaeus) (Trapani 2001).

Acanthuridae:

Nasinae: *Naso* (Tyler 1970).

Naso possesses incisiform teeth or very raduliform teeth with minute cusps on the premaxilla and dentary (Tyler 1970). Tooth attachment and replacement have not been investigated.

Acanthurinae: *Acanthurus* (Tyler 1970), *Ctenochaetus* (Tyler 1970; Randall & Clements 2001; Krone et al. 2006), *Paracanthus, Prionurus, Zebrasoma* (Tyler 1970).

Acanthurus possesses a single row of raduliform teeth on the premaxilla and dentary (Tyler 1970). *Ctenochaetus* possesses movable raduliform teeth with an elongate shaft with a recurved crown bearing multiple posterior cusps (Tyler 1970; Krone et al. 2006). Randall and Clements (2001) illustrated (Fig.1) and described the interspecific variation of the tooth cusps among species of *Ctenochaetus*. *Paracanthus, Prionurus,* and *Zebrasoma* possess a single row of raduliform teeth on the premaxilla and dentary (Tyler 1970). Tooth attachment is Type 2 in *Prionurus microlepidotus* Lacepède based on an illustration (Fig.5) and plates (Pl.2) of the tooth provided by Wakita et al. (1977) Tooth replacement is intraosseous in *Acanthurus chirurgus* (Bloch), *Prionurus microlepidotus,* and *Ctenochaetus sp.* (Trapani 2001). Wakita et al. (1977) examined tooth replacement in *P. microlepidotus* and provided observations about the rate and pattern of replacement for both normal tooth replacement as well as mechanical tooth loss caused by feeding.

Scombroidea

Johnson (1986) commented on the difficulties of separating the degree of labio-lingual flattening of coniform teeth in scombroids and hypothesized that flattened teeth is the primitive dentition form. This variation in tooth shape needs further specific examination and labio-lingually flattened coniform teeth have only been included when the author specifically described flattened teeth.

Scombrolabracidae: *Scombrolabrax* (Carvalho-Filo et al. 2010).

Scombrolabrax possesses paired symphysial caniniform teeth (occasionally only one caniniform tooth) followed posteriorly by coniform teeth arranged in a single row on the premaxilla The dentary has coniform teeth arranged in a single row (Carvalho-Filo et al. 2010).

Sphyraenidae: *Sphyraena** (Talwar 1968; Houde 1972; Hilton et al. 2005a).

Sphyraena possesses three anterior pairs of caniniform teeth followed posteriorly by a single row of coniform teeth on the premaxilla. The dentary has anterior paired caniniform teeth followed posteriorly by labiolingually flattened coniform teeth (Talwar 1968).Tooth attachment has not been investigated. Tooth replacement is intraosseous in *S. barracuda* (Hilton et al. 2005a). In *S. borealis* the first teeth to develop are bluntly conical in shape at 5.3mm SL, but are replaced by caniniform teeth at 7.0mm SL on the premaxilla and at 7.4mm SL on the dentary (Houde 1972).

Gemplyidae: *Diplospinus*, Epinnula*, Gempylus*, Lepidocybium*, Nealotus*, Neoepinnula*, Nesiarchus*, Paradiplospinus*, Prometichthys*, Rexea*, Rexichthys*, Ruvettus*, Thyrsites*, Thyrsitoides*, Thyrsitops* and Tongaichthys** (Nakamura & Parin 1993).

Nakamura and Parin (1993) identified fangs as the large anterior teeth in Sphyraenids, and did not separate the depressible teeth from non-depressible "fangs." Below depressible teeth are depressiform and caniniform teeth are non-depressible based on the mobility described Nakamura and Parin (1993). *Diplospinus* possesses three caniniform teeth and three or four depressiform teeth followed posteriorly by a single row of coniform teeth on the premaxilla; the dentary has coniform teeth arranged in a single row (Fig.28P) (Nakamura & Parin 1993). *Epinnula* possesses caniniform teeth and depressiform teeth followed posteriorly by a single row of coniform teeth on the premaxilla; the dentary has paired anterior caniniform followed posteriorly by coniform teeth arranged in a single row (Fig.28A) (Nakamura & Parin 1993). *Gempylus* possesses three caniniform teeth and zero to three depressiform teeth followed posteriorly by a single row of coniform teeth on the premaxilla; the dentary has coniform teeth arranged in a single row (Fig.28N) (Nakamura & Parin 1993). *Lepidocybium* possesses two pairs of caniniform teeth followed posteriorly by a single row of coniform teeth on the premaxilla; the dentary has coniform teeth arranged in a single row (Fig.28H) (Nakamura & Parin 1993). *Nealotus* possesses three caniniform teeth and zero to three depressiform teeth followed posteriorly by a single row of coniform teeth on the premaxilla; the dentary has paired caniniform teeth followed posteriorly by a single row coniform teeth (Fig.28E) (Nakamura & Parin 1993). *Neoepinnula* possesses three to six caniniform teeth followed posteriorly by a single row of labio-lingually compressed coniform teeth on the premaxilla; the dentary has paired caniniform teeth followed posteriorly by a single row coniform teeth (Fig.28E). Nakamura and Parin (1993) observed one to three depressiform teeth on the premaxilla in *N. orientalis* (Gilchrist & von Bonde). *Nesiarchus* possesses three caniniform teeth and zero to three depressiform teeth followed posteriorly by a single row of coniform teeth; the dentary has paired caniniform teeth near the symphysis followed posteriorly by a single row of coniform teeth (Fig. 28 L)(Nakamura & Parin 1993). *Paradiplospinus* possesses three to six caniniform teeth followed posteriorly by a single row of coniform teeth on the premaxilla; the dentary has paired symphyseal caniniform teeth followed posteriorly by a single row of coniform teeth. In *P. gracilis* (Brauer) the premaxilla has three caniniform teeth and one to three movable depressiform (Fig. 28 O) (Nakamura & Parin 1993). *Prometichthys* possesses three to four caniniform teeth and zero to three depressiform teeth followed posteriorly by a single row of coniform teeth on the premaxilla; the dentary has paired symphyseal caniniform teeth followed posteriorly by a single row of labio-lingually compressed coniform teeth (Fig.28F) (Nakamura & Parin 1993). *Rexea* possesses three to five caniniform teeth and one to three depressiform teeth followed posteriorly by a single row of coniform teeth on the premaxilla; the dentary has paired symphyseal caniniform teeth followed posteriorly by a single row of labio-lingually compressed coniform teeth(Nakamura & Parin 1993). Nakamura and Parin (1993) did not report any depressiform teeth in *R. bengalensis* (Alcock) and *R. prometheoides* (Bleeker). *Rexichthys* possesses three caniniform teeth and one to three depressiform teeth followed posteriorly by a single row of coniform teeth on the premaxilla; the dentary has paired symphyseal caniniform teeth followed posteriorly by a single row of labio-lingually compressed coniform teeth (Fig.28D) (Nakamura & Parin 1993). *Ruvettus* possesses coniform teeth arranged in a single row on the premaxilla and dentary. In juveniles, caniniform teeth are present on the premaxilla and dentary (Fig.28F) (Nakamura & Parin 1993). *Thyrsites* possesses anterior caniniform teeth followed posteriorly by a single row of coniform teeth on the premaxilla; the dentary has coniform teeth arranged in a single row on the premaxilla (Nakamura & Parin 1993). *Thyrsitoides* possesses anterior caniniform teeth and three depressiform teeth followed posteriorly by a single row of coniform teeth on the premaxilla; the dentary has paired symphyseal caniniform teeth followed posteriorly by a single row of labio-lingually compressed coniform teeth (Fig.28M) (Nakamura & Parin 1993). *Thyrsitops* possesses anterior caniniform teeth followed posteriorly by a single row on the coniform teeth on the premaxilla; the dentary has coniform teeth arranged in a single row (Fig. 28I) (Nakamura & Parin 1993). *Tongaichthys* possesses anterior one to three caniniform teeth followed posteriorly by a single row of coniform teeth on the premaxilla; the dentary has labio-lingually flattened coniform teeth the dentary with the teeth in the midlength of the jaw enlarged (Fig. 28J)(Nakamura & Parin 1993). Tooth attachment and replacement have not been investigated.

Trichiuridae:

Aphanopodinae: *Aphanopus** and *Benthodesmus** (Nakamura & Parin 1993).

Aphanopus possesses anterior caniniform teeth with several very enlarged, followed posteriorly by a single row labio-lingually flattened coniform teeth on the premaxilla and dentary (Fig. 29A) (Nakamura & Parin 1993). *Benthodesmus* possesses anterior canininiform teeth followed posteriorly by a single row of labio-lingually flattened coniform teeth on the premaxilla; the dentary has labio-lingually flattened coniform teeth arranged in a single row (Fig. 29B) (Nakamura & Parin 1993). Tooth attachment and replacement have not been investigated.

Lepidopodinae: *Assurger**, Eupleurogrammus*, Evoxymetopon*, Lepidopus*, and Tenoriceps* (Nakamura & Parin 1993).

Assurger possesses three anterior caniniform teeth followed posteriorly by a single row of coniform teeth. The dentary has paired symphysial caniniform teeth followed posteriorly by a single row (Fig. 29D) (Nakamura & Parin 1993). *Eupleurogrammus* possesses two to three anterior caniniform teeth (usually without barbs) followed posteriorly by a single row of coniform teeth on the premaxilla; the dentary has paired symphysial caniniform teeth followed posteriorly by labiolingually flattened coniform teeth arranged in a single row (Fig. 29F). In *E. muticus* (Gray) no symphysial caniniform teeth are present on the dentary (Nakamura & Parin 1993). *Evoxymetopon* possesses three pairs of caniniform teeth anteriorly followed posterior by a single row of coniform teeth on the premaxilla; the dentary has paired symphysial caniniform teeth followed posteriorly by a single row of coniform teeth (Fig. 29E) (Nakamura & Parin 1993). *Lepidopus* possesses three to six caniniform teeth anteriorly followed posterior by a single row of coniform teeth on the premaxilla; the dentary has paired symphyseal caniniform teeth followed posteriorly by a single row of coniform teeth (Fig. 29E) (Nakamura & Parin 1993). *Tenoriceps* possesses two to three caniniform teeth anteriorly followed posterior by a single row of labio-lingually flattened coniform teeth on the premaxilla; the dentary has paired symphyseal caniniform teeth followed posteriorly by a single row of coniform teeth (Fig.

29E) (Nakamura & Parin 1993). Tooth attachment and replacement have not been investigated.

Trichiurinae: *Lepturacanthus** and *Trichiurus** (Nakamura & Parin 1993).

Lepturacanthus possesses three to four caniniform teeth with barbs with two smaller caniniform teeth anteriorly which are followed posteriorly by a single row of coniform teeth on the premaxilla; the dentary has pair caniniform teeth followed posteriorly a single row of coniform teeth (Fig. 29H) (Nakamura & Parin 1993). James (1967) observed the development of barbed teeth posteriorly on the dentary in *L. savala* (Cuvier) and provided commentary on intergeneric differences in Trichiurids. *Trichiurus* possesses two or three pairs caniniform teeth with barbs with two smaller caniniform teeth anteriorly which are followed posteriorly by a single row of labio-lingually flattened coniform teeth on the premaxilla, the dentary has paired caniniform teeth followed posteriorly a single row of labio-lingually flattened coniform teeth (Fig. 29H) (Nakamura & Parin 1993). Morgan (1977) reported the development of barbed teeth posteriorly on the dentary in specimens with a dentary length of greater that 35mm in *T. lepturus* Linnaeus and James (1967) observed a similar pattern in *L. savala*. Tooth attachment is Type 1 based on Morgan (1977) which observed attachment by a "cement-like substance" rather than by connective tissue in *Trichiurus lepturus*. Tooth replacement is intraosseous based on observations of Morgan (1977) who examined the position and rate of tooth replacement in *T. lepturus*.

Scombridae:

Gasterochimatinae: *Gasterochisma* (Kohno 1984).

Gasterochisma possesses coniform teeth arranged in a single row on the premaxilla and dentary (Kohno 1984). Tooth attachment and replacement have not been investigated.

Scombrinae: *Acanthocybium* (Conrad & Roman 1938; Rao 1960; Collette & Gillis 1992), *Allothunnus* (Roberts 1989a), *Auxis* (Collette & Aadland 1996), *Cybiosarda* (Collette & Chao 1975), *Euthynnus* (Silas et al. 1976), *Grammatorcynus* (Collette & Gillis 1992), *Gymnosarda* (Collette & Chao 1975), *Katsuwonus* (Jones & Silas 1963), *Orcynopsis* (Collette & Chao 1975), *Rastrelliger* (Gnanamuttu 1966; Matsui 1967), *Sarda* (Collette & Chao 1975), *Scomber* (Matsui 1967), *Scomberomorus* (Morgan & King 1983; Collette & Gillis 1992), and *Thunnus* (de Sylva 1955).

Acanthocybium possesses labio-lingually compressed coniform teeth arranged in a single row on the premaxilla and dentary (Rao 1960; Collette & Gillis 1992). Conrad and Roman (1938) reported serrations on the teeth of *A. solandri*. *Allothunnus, Auxis, Cybiosarda, Euthynnus, Gymnosarda, Orcynopsis,* and *Sarda* possess coniform teeth arranged in a single row on the premaxilla and dentary (Roberts 1989a). *Katsuwonus* possesses coniform teeth on the premaxilla and dentary (Jones & Silas 1963). *Rastrelliger* possesses coniform teeth with out serrations arranged in a single row on the premaxilla and dentary (Gnanamuttu 1966; Matsui 1967). *Scomber* possesses labio-lingually compressed coniform teeth with serrations arranged in a single row on the premaxilla and dentary (Matsui 1967). Matsui (1967) described some interspecific variation in the prominence of serrations. *Scomberomorus* possesses labio-lingually compressed coniform teeth arranged in a single row on the premaxilla and dentary (Collette & Gillis 1992). With teeth reaching peak size at about the midlength of the premaxilla and about two thirds the length of the dentary in *S. cavalla* (Cuvier) (Morgan & King 1983). *Thunnus* possesses coniform teeth arranged in a single row on the premaxilla and dentary (de Sylva 1955). Tooth attachment is Type 1 in all scombrids with the tooth base ankylosed to the walls of the crypt (Johnson

1986). Tooth replacement is intraosseous in scombrids with individual teeth being replaced in an alternating pattern. Johnson (1986) further observed the apparent wide spacing of the teeth is a reflection of the alternating tooth replacement pattern (Fig. 2). Hilton et al. (2005a) also observed this pattern in *Scomberomorus maculatus* (Mitchill). Morgan and King (1983) examined tooth replacement in detail in *S. cavalla* found that tooth replacement operated relatively slowly when they compared it to the rate of *Ctenolucius hujeta* (Ctenoluciidae: Characiformes). Additionally, the teeth of *S. cavalla* exhibited a two point reabsorption of the teeth with absorption occurring at the tooth base (in the crypt) and at the anterior and posterior edged of the tooth just above the crypt (Fig.1). Johnson (1986) also hypothesized that the "reticulate internal structure" visible in the teeth of cleared and double stained specimens is "coarse irregular trabeculae of osteodentine," but this remains unconfirmed by histological study.

Xiphiidae: *Xiphias* (Nakamura et al. 1950).

Adults are edentulous. Juveniles possess coniform teeth on the premaxilla and dentary (Nakamura et al. 1950). Tooth attachment has not been investigated.

Tooth replacement is extraosseous with additional rows being added which are reduced in *Xiphias* unlike the istiophorids (Johnson 1986). Tooth attachment and replacement have not been investigated.

Istiophoridae: *Istiophorus, Maikaira,* and *Tetrapturus* (Nakamura 1983; Johnson 1986).

Istiophorus, Maikaira, and *Tetrapturus* possess coniform teeth arranged in multiple rows on the premaxilla and dentary (Nakamura 1983). Tooth replacement is extraosseous with additional rows being added which are maintained and added to in adult istiophorids (Johnson 1986). Tooth attachment and replacement have not been investigated.

Amarsipidae: *Amarispus* (Haedrich 1969).

Amarispus possesses coniform teeth arranged in a single row on the premaxilla and dentary (Haedrich 1969). Tooth attachment and replacement have not been investigated.

Centrolophidae: *Centrolophus* (Smith 1965c), *Hyperoglyphe* (Ginsburg 1954), *Icichthys* (Haedrich 1966), Psenopsis(Haedrich 1967), *Schedophilus* (Smith 1966; McDowall 1980a), *Seriolella* (McDowall 1980b).

Centrolophus, Hyperoglyphe, Icichthys, Psenopsis, and *Seriolella* possess coniform teeth arranged in a single row on the premaxilla and dentary (Smith 1965c). *Schedophilus* possesses coniform teeth arranged in a single row on the premaxilla and dentary. Originally, the teeth were described as "sub-incisiform" by Smith (1966), which has been interpreted here as coniform teeth with a slight labio-lingual flattening. McDowall (1980a) observed coniform teeth in *S. maculatus*. Tooth attachment and replacement have not been investigated.

Nomeidae: *Cubiceps* (Ginsburg 1954), *Nomeus* (Suda et al. 1986), and *Psenes** (Haedrich 1970; Horn & Haedrich 1973; Fujita 1991).

Cubiceps possesses coniform teeth arranged in a single row on the premaxilla and dentary. Ginsburg (1954) observed some labio-lingual flattening of the teeth. *Nomeus* possesses coniform teeth arranged in a single row on the premaxilla and dentary (Suda et al. 1986). *Psenes* possesses coniform teeth arranged in a single row on the premaxilla. The dentary has raduliform teeth with prominent central cusp and many smaller lateral cusps upon an elongate tooth shaft (Fig.3)(Fujita 1991). The dentary teeth are twice as large as the teeth of the premaxilla (Haedrich 1970). Tooth attachment and replacement have not been investigated.

Ariommatidae: *Ariomma* (Haedrich 1968; Urano & Mochizuki 1984).

Ariomma possesses coniform teeth arranged in a single row on the premaxilla and dentary (Haedrich 1968). Tridentiform teeth are reported on the premaxilla and dentary of *A. indica* with the posterior most teeth having the most prominent cusps (Urano & Mochizuki 1984). Tooth attachment and replacement have not been investigated.

Tetragonuridae: *Tetragonurus**(Janssen & Harbison 1981).

Tetragonurus possesses coniform teeth arranged in a single row on the premaxilla. The dentary has labiolingually flattend coniform teeth, which are severely labio-lingually flattened and tightly arranged creating a distinct saw-like “V” shaped cutting edge across the dentary (Fig.2) These specialized teeth have been associated with feeding on salp stomachs (Janssen & Harbison 1981). Tooth attachment and replacement have not been investigated.

Stromateidae: *Pampus* (Al-Qattan et al. 2000), *Peprilus* (Haedrich 2002), and *Stromateus* (Fowler 1906a).

Pampus possesses a single row of coniform teeth (rarely a few tridentiform teeth) arranged in a single row on the premaxilla. The dentary has tridentiform teeth (rarely unicuspid) arranged in a single row (Al-Qattan et al. 2000). *Peprilus* possesses coniform teeth arranged in a single row on the premaxilla and dentary. In *P. burtoni* and *P. triacanthus* the teeth of the premaxilla are labio-lingually compressed tridentiform teeth arranged in a single row (Haedrich 2002). *Stromateus* possesses coniform teeth arranged in a single row on the premaxilla and dentary (Fowler 1906a). Tooth attachment and replacement have not been investigated.

Anabantidae: *Ctenopoma** (Norris & Teugels 1990; Norris & Douglas 1991; Norris & Douglas 1992), *Microtenopoma* (Norris 1995), *Sandelia* (Cambray 1996).

Ctenopoma possesses coniform teeth on the premaxilla and dentary (Norris & Douglas 1992). In *C. nebulosum* Norris & Teugels the labialmost tooth row is made up of caniniform teeth with multiple lingual rows of coniform teeth on the premaxilla and dentary (Norris & Teugels 1990). *Microtenopoma* and *Sandelia* possess coniform teeth on the premaxilla and dentary. Tooth attachment and replacement have not been investigated.

Helostomatidae: *Helostoma* (Garant 1970).

Helostoma possesses suspensiform teeth arranged in multiple rows on the premaxilla and dentary (Garant 1970). Tooth attachment has not been investigated. Tooth replacement appears to be extraosseous in *H. temminckii* Cuvier based on figures provided in Garant (1970) (Pl.1). Tooth development and composition was examined by Garant (1970).

Osphronemidae:

Ophroneminae: *Osphronemus* (Roberts 1994).

Osphronemus possesses coniform teeth arranged in multiple rows on the premaxilla and dentary. Roberts (1994) observed that unlike other species, in *O. exodon* the labialmost rows of teeth are enlarged and present on the anterior face of the premaxilla and dentary. Tooth attachment and replacement have not been investigated.

Macropodinae: *Betta* (Regan 1910), *Macropodus* (Freyhof & Herder 2002), and *Malpulutta* (Deraniyagala 1937).

Betta possesses coniform teeth on the premaxilla and dentary (Regan 1910). *Macropodus* possesses coniform teeth arranged in two to five rows on the premaxilla and three to four rows on the dentary. Freyhof and Herder (2002) describes the interspecific variations in tooth arrangement. *Malpulutta* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Deraniyagala 1937). Tooth attachment and replacement have not been investigated.

Luciocephalinae: *Colisa* (Moitra & Ray 1977), *Ctenops* (Liem 1965), *Luciocephalus* (Liem 1967), and *Trichogaster* (Togo 1984).

Colisa possesses coniform teeth arranged in two rows on the premaxilla and dentary (Moitra & Ray 1977). *Ctenops* possesses coniform teeth in two to three rows the premaxilla and dentary (Liem 1965). *Luciocephalus* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Liem 1967). *Trichogaster* possesses coniform teeth on the premaxilla and dentary (Togo 1984). Tooth attachment is Type 2 based on histological images (Fig. 4) of *Trichogaster trichopterus* taken by Togo (1984). Tooth replacement appears to be extraosseous in *Trichogaster trichopterus* (Pallas) based on histological images (Fig. 4) taken by Togo (1984).

Channidae: *Channa** (Xiaofan 1987; Geetakumari & Vishwanath 2010b).

Channa possesses coniform teeth in multiple rows on the premaxilla and dentary based on images of *C. asiatica* (Linnaeus) in Xiaofan (1987). *Channa argus* (Cantor) was also examined and possesses additional caniniform teeth at the symphysis of the premaxilla and several widely spaced caniniform teeth in the lingualmost row of the dentary. Geetakumari and Vishwanath (2010b) observed similar caniniform teeth on the dentary in *C. melanostigma* Geetakumari & Vishwanath. Tooth attachment and replacement have not been investigated.

Caproidae:

Antigoninae: *Antigonia* (Zehren 1987).

Antigonia possesses coniform teeth on the premaxilla and dentary (Zehren 1987). Tooth attachment and replacement have not been investigated.

PLEURONECTIFORMES

Some pleuronectiform fishes have asymmetrical jaws and teeth arranged in an asymmetrical pattern. The number of teeth present on the ocular and blind sides of the premaxilla and dentary are often unequal with the ocular side bearing fewer teeth, but the degree of difference on the two sides of jaws is highly variable (Tsuruta & Omori 1976). Available information on asymmetrical dentition will be listed below when available.

Psettodidae: *Psettodes** (Amaoka 1969).

Psettodes possesses caniniform teeth (some barbed) in the labial row and depressiform teeth (some barbed) in the lingual row of the premaxilla and dentary. Amaoka (1969) also illustrated smaller coniform teeth posteriorly on the premaxilla and dentary. Tooth attachment and replacement have not been investigated.

Citharidae: *Brachypleura* (Hoshino 2001), *Citharoides* (Amaoka 1972), *Citharus* (Hoshino 2001), *Lepidoblepharon* (Amaoka 1972), and *Paracitharus* (Hoshino 2001).

Brachypleura possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Hoshino 2001). *Citharoides, Lepidoblepharon, and Paracitharus* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary. Gilchrist (1904) observed only a single tooth row in *C. macrolepis* Hubbs. *Citharus* possesses enlarged coniform teeth anteriorly arranged in one to two rows on the premaxilla and dentary (Hoshino 2001). Tooth attachment and replacement have not been investigated.

Scophthalmidae: *Scophthalmus* (Munroe 2003; Yelnikov & Khanaychenko 2013).

Scophthalmus possesses coniform teeth on the premaxilla and dentary (Munroe 2003; Yelnikov & Khanaychenko 2013). Tooth attachment and replacement have not been investigated.

Paralichthyidae: *Ancylopsetta** (Gutherz 1966), *Citharichthys* (Castillo-Rivera et al. 2000), Cyclopsetta, *Etropus* (Leslie & Stewart 1986), *Gastropsetta* (Gutherz 1966), *Paralichthys** (Amaoka 1969), *Pseudorhombus** (Gilbert 1890; Amaoka 1969; Hensley & Amaoka 1989), *Syacium* (van der Heiden & Mitchell 1998), *Tarphops* (Amaoka 1969), *Tephrinectes* (Hoshino & Amaoka 1998b), and *Xystreurys* (Jordan 1891).

Ancylopsetta possesses anterior caniniform teeth with posterior coniform teeth arranged in a single row on the premaxilla and dentary (Gutherz 1966). *Citharichthys* possesses coniform teeth arranged in two rows on the premaxilla and dentary (Castillo-Rivera et al. 2000). *Cyclopsetta* possesses caniniform teeth with the coniform teeth on the premaxilla; the dentary has coniform teeth (Gunter 1946). *Etropus* possesses coniform teeth arranged in a single row on the premaxilla and dentary with the blind side teeth more pronounced (Leslie & Stewart 1986). Depressiform teeth were observed in *E. ciadi* (van der Heiden & Plascencia González 2005). *Gastropsetta* possesses coniform teeth arranged in a single row on the premaxilla and dentary (Gutherz 1966). *Paralichthys* possesses four pairs of anterior caniniform teeth followed posteriorly by coniform teeth arranged in a single row on the premaxilla. The dentary has coniform teeth arranged in a single row (Amaoka 1969). *Pseudorhombus* possesses coniform teeth arranged in a single row on the premaxilla and dentary with some anterior teeth enlarged (Gilchrist 1904). Hensley and Amaoka (1989) observed four to six widespread caniniform teeth anteriorly with the coniform teeth in *P. megalops* Fowler and Amaoka (1969) observed a similar pattern in *P. arsius* (Hamilton). *Syacium* possesses coniform teeth arranged in two rows on the premaxilla and a single row on the dentary (van der Heiden & Mitchell 1998). *Tarphops* possesses coniform teeth arranged in a single row on the premaxilla and dentary (Amaoka 1969). *Tephrinectes* possesses coniform teeth on the premaxilla and dentary (Hoshino & Amaoka 1998b). *Xystreurys* possesses coniform teeth arranged in one to two rows on the blind side and one on the eyed side of the premaxilla (Jordan 1891). Tooth attachment is Type 2 in *Hippoglossina stomata* Eigenmann & Eigenmann and *Paralichthys albigutta* Jordan & Gilbert (Fink 1981). Tooth replacement is extraosseous in *Pseudorhombus dupliciocellatus* Regan (Trapani 2001).

Pleuronectidae:

Hippoglossinae: *Hippoglossus* (Lockington 1879) and *Reinhardtius* (Westrheim & Pletcher 1966).

Hippoglossus possesses coniform teeth arranged in two rows on the premaxilla and dentary (Lockington 1879). *Reinhardtius* possesses coniform teeth arranged in a single row on the premaxilla and dentary (Westrheim & Pletcher 1966). Tooth attachment and replacement have not been investigated.

Eopsettinae: *Eopsetta* (Lockington 1879).

Eopsetta possesses coniform teeth arranged in two rows on the premaxilla and a single row on the dentary (Lockington 1879). The eyed side has more teeth then blind side (Lockington 1879). Tooth attachment has not been investigated. Tooth replacement is extraosseous in *Eopsetta jordani* (Trapani 2001).

Lyopsettinae: *Lyopsetta* (Jordan & Gilbert 1880a).

Lyopsetta possesses coniform teeth arranged in two rows on the premaxilla with the labial row containing the largest teeth; the dentary has coniform teeth arranged in a single row on the dentary (Jordan & Gilbert 1880a). Tooth attachment has not been investigated. Tooth replacement is extraosseous in *Hippoglossus hippoglossus* (Trapani 2001). Hippoglossoidinae: *Cleisthenes* (Jordan & Starks 1904a), *Hippoglossoides* (Jordan & Gilbert 1880c).

Cleisthenes possesses coniform teeth arranged in a single row on the premaxilla and dentary (Jordan & Starks 1904a). *Hippoglossoides* possesses coniform teeth arranged in a single row on the premaxilla and dentary with the ocular side bearing fewer teeth (Jordan & Gilbert 1880c). Tooth attachment and replacement have not been investigated. Pleuronectinae: *Embassichthys* (Amaoka et al. 1981), *Glyptocephalus* (Goode & Bean 1878), *Lepidopsetta* (Orr & Matarese 2000), *Limanda* (Collie 1987), *Microstomus* (Borets 1983; Harris 1992), Parophrys (Jordan & Gilbert 1880c), *Platichthys* (Girard 1854), *Pleuronectes* (Bean 1879), *Pleuronichthys* (Gibb 2003; Suzuki et al. 2009), *Psettichthys* (Girard 1854), and *Pseudopleuronectes* (Klein-MacPhee 1978).

Embassichthys possesses incisiform teeth arranged in a single row on the premaxilla and dentary (Amaoka et al. 1981). *Glyptocephalus* possesses incisiform teeth arranged in a single row on the premaxilla and dentary with the ocular side bearing far fewer teeth (Goode & Bean 1878).. In juveniles teeth are coniform and fewer in number (Goode & Bean 1878). *Lepidopsetta* possesses coniform teeth on the premaxilla and dentary (Orr & Matarese 2000). *Limanda* and *Platichthys* possess coniform teeth arranged in a single row on the premaxilla and dentary. *Microstomus* possesses incisiform teeth on the premaxilla and dentary with very few teeth on the eyed side. Borets (1983) originally described the teeth as “chisel-like.” Harris (1992) observed that initial teeth are coniform and lost after metamorphosis to be replaced by incisiform teeth in *M. pacificus* (Lockington). *Parophrys* possesses incisiform teeth arranged in single row on the premaxilla and dentary with the ocular side bearing fewer teeth. Jordan and Gilbert (1880c) described the teeth as “incisor-like,” but acknowledged that the teeth were not a prominently shaped as in some flounders. *Pleuronectes* possesses depressiform teeth as adults during the breeding season. In juveniles and non-breeding season adults the teeth are coniform on the premaxilla and dentary (Bean 1879). *Pleuronichthys* possesses coniform teeth arranged in two to three rows on only the blindside of the premaxilla and dentary (Gibb 2003; Suzuki et al. 2009). *Psettichthys* possesses coniform teeth on the premaxilla and dentary (Girard 1854). *Pseudopleuronectes* possesses incisiform teeth arranged in a single row on the premaxilla and dentary with no more than six teeth on the ocular side (Klein-MacPhee 1978). Tooth attachment and replacement have not been investigated.

Bothidae: *Arnoglossus**, Asterorhombus, Bothus* (Amaoka 1969; Kobelkowsky 2004), *Chascanopsetta**, *Crossorhombus, Engyprosopon* (Amaoka 1969), *Grammatobothus* (Amaoka et al. 1992), *Japanolaeops*, *Kamoharia**, *Laeops* (Amaoka 1969), *Monolene* (Anderson & Gutherz 1967), *Neolaeops** (Amaoka 1969), *Parabothus** (Amaoka 1969; Amaoka et al. 1997), *Perissias** (Gilbert 1890), *Psettina*, *Taeniopsetta*, *Tosarhombus** (Amaoka et al. 1997), and *Trichopsetta* (Anderson & Gutherz 1967).

Arnoglossus possesses coniform teeth arranged in a single row on the premaxilla and dentary with the blind side teeth enlarged. In *A. polyspilus* (Günther) blind and ocular side dentition similarly sized, but anterior teeth are caniniform on both premaxilla and dentary (Amaoka 1969). In *A. japonicas* Hubbs and *A. oxyrhynchus* Amaoka (two tooth rows on blind side) possesses more caniniform teeth on the blind side of the jaws (Amaoka 1969). *Asterorhombus* possesses coniform teeth arranged in a single row on the premaxilla and dentary (Amaoka 1969). *Bothus* contains gynandric heterodonts. Male *B. robinsi* Topp & Hoff males possess larger coniform teeth and a complete labial row unlike the incomplete rows in females (Kobelkowsky 2004). Other *Bothus* species possesses coniform teeth arranged in one to two rows on the premaxilla and dentary with the labial row enlarged. In *B. mancus* (Broussonet) only a single tooth row is present (Amaoka 1969). *Chascanopsetta* possesses coniform teeth arranged in a single row on the premaxilla; the dentary has depressiform teeth arranged in a single row (Amaoka 1969). *Crossorhombus* possesses coniform teeth arranged in two rows on the premaxilla with lingual row enlarged; the dentary has coniform teeth arranged in a single row (Amaoka 1969). *Engyprosopon* possesses coniform teeth arranged in two rows on the premaxilla with labial row enlarged; the dentary has coniform teeth arranged in a single row. Amaoka (1969) observed paired symphyseal caniniform teeth on the premaxilla in *E. xystrias* Hubbs and *E. maldivensis* (Regan). *Grammatobothus* possesses coniform teeth arranged in a single row on the premaxilla and dentary (Amaoka et al. 1992). *Japanolaeops* possesses coniform teeth arranged in a single row on the premaxilla with the teeth on the blind side enlarged; the dentary has coniform teeth arranged in about two rows on the ocular side with a labialmost row enlarged; the blind side of the dentary has one to several rows of coniform teeth (Amaoka 1969). *Kamoharia* possesses coniform teeth arranged anteriorly in a single row (a few enlarged) with the posterior half of the premaxilla bearing multiple rows of small coniform teeth; the dentary has three pairs of anterior caniniform teeth followed by a single row of coniform teeth (Amaoka 1969). *Laeops* possesses coniform teeth arranged in a single row on blind side of the premaxilla and dentary; the ocular side of the premaxilla and dentary is edentulous (Amaoka 1969). In *L. kitaharae* (Smith & Pope) the teeth are arranged in multiple rows on the blind side of the jaws (Amaoka 1969). *Monolene* possesses coniform teeth arranged in a single row on the premaxilla and dentary (Amaoka & Imamura 2000). *Neolaeops* possesses anterior caniniform teeth followed posteriorly by coniform teeth arranged in a single row on the premaxilla and dentary (Amaoka 1969). *Parabothus* possesses anterior caniniform teeth followed posteriorly by coniform teeth arranged in a single row on the premaxilla and dentary (Amaoka 1969; Amaoka et al. 1997). *Perissias* possesses caniniform and coniform teeth on the premaxilla and dentary (Gilbert 1890). *Psettina* possesses coniform teeth arranged in a single row on the premaxilla and dentary with fewer teeth on the ocular side of both jaws. In *P. gigantea* Amaoka and *P. tosana* Amaoka teeth are arranged in two rows on the premaxilla with the largest teeth in the lingual row and no difference in ocular side dentition was noted by Amaoka (1969). *Taeniopsetta* possesses coniform teeth arranged in a single row on the premaxilla and dentary (Amaoka 1969). *Tosarhombus* possesses anterior caniniform teeth followed posteriorly by coniform teeth arranged in a single row on the premaxilla and dentary (Amaoka et al. 1997). *Trichopsetta* possesses coniform teeth arranged in a single row on the premaxilla and dentary (Anderson & Gutherz 1967). Tooth attachment and replacement have not been investigated.

Paralichthodidae: *Paralichthodes* (Gilchrist 1902)

Paralichthodes possesses coniform teeth arranged in three or more rows on the premaxilla and dentary (Gilchrist 1902). Tooth attachment and replacement have not been investigated.

Poecilopsettidae: *Nematops* (Amaoka et al. 2006), and *Poecilopsetta* (Kawai et al. 2010).

Nematops possesses coniform teeth arranged in two to three rows on the premaxilla and dentary with the teeth on the blind side enlarged (Amaoka et al. 2006). *Poecilopsetta* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary with the teeth on the blind side more developed (Kawai et al. 2010). Tooth attachment and replacement have not been investigated.

Rhombosoleidae: *Azygopus* (Munroe 2012), *Pelotretis* (Livingston 1987), *Peltorhampus* (Livingston 1987), *Rhombosolea**(Livingston 1987), and *Taratretis* (Last 1978).

Azygopus possesses depressiform teeth arranged in four rows on the premaxilla and two to three rows on the dentary with the blind side teeth more developed (Munroe 2012). *Pelotretis* and *Peltorhampus* possesses coniform teeth arranged in four to five rows only on the blind side of the premaxilla and dentary with the largest teeth in a labialmost row (Livingston 1987). *Rhombosolea* possesses coniform teeth arranged in multiple rows only on the blind side of the premaxilla and dentary and the teeth are more numerous on the premaxilla (Livingston 1987). In *R. leporina* Günther the labialmost tooth row is incisiform (Livingston 1987). *Taratretis* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Last 1978). Tooth attachment and replacement have not been investigated.

Achiropsettidae: *Achiropsetta, Mancopsetta, Neoachiropsetta* (Kotlyar 1978), and *Pseudomacopsetta* (Evseenko 1985).

Achiropsetta, Mancopsetta, and *Neoachiropsetta* possess coniform teeth arranged in one to two rows on the premaxilla and dentary (Kotlyar 1978). *Pseudomacopsetta* possesses coniform teeth arranged in a single row on the premaxilla (the few on the ocular side only visible after clearing and staining) and two rows on the dentary and the teeth on the blind side are more developed (Evseenko 1985). Tooth attachment and replacement have not been investigated.

Samaridae: *Plagiopsetta* (Cooper et al. 1994), *Samaris* (Hoshino & Amaoka 1998a), and *Samariscus* (Ochiai & Amaoka 1962).

Plagiopsetta possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Cooper et al. 1994). *Samaris* possesses coniform teeth on the premaxilla with the ocular side bearing few if any teeth. The dentary has coniform teeth (Hoshino & Amaoka 1998a). *Samariscus* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Ochiai & Amaoka 1962). Tooth attachment and replacement have not been investigated.

Achiridae: *Gymnachirus* (Dawson 1964), and *Trinectes* (Walker & Bollinger 2001).

Gymnachirus possesses coniform teeth arranged in multiple rows on the premaxilla and dentary (Dawson 1964). *Trinectes* possesses coniform teeth arranged in multiple rows on the premaxilla and dentary with few if any teeth on the ocular side (Walker & Bollinger 2001). Tooth attachment and replacement have not been investigated.

Soleidae: *Aseraggodes* (Randall & Allen 2007), *Bathysolea* (Desoutter & Chapleau 1997), *Dagetichthys* (Ende 2007), *Pardachirus* (Randall & Johnson 2007), *Solea* (Lagardère et al. 1993), *Syaptura* (Gonzales et al. 1994), and *Zebrias* (Randall 1995).

Aseraggodes possesses coniform teeth arranged in multiple rows on only the blind side of the premaxilla and dentary (Randall & Allen 2007),. Randall and Allen (2007) observed one to two rows of very small coniform teeth on the ocular side of the premaxilla in *A. dubius* Weber. *Bathysolea, Dagetichthys, Pardachirus, Solea, Syaptura,* and *Zebrias* possess coniform teeth arranged in multiple rows on the blind side of the premaxilla and dentary. Tooth attachment has not been investigated. Tooth replacement is extraosseous in *Solea solea* (Linnaeus) (Trapani 2001).

Cynoglossidae:

Cynoglossinae: *Cynoglossus* (Menon 1977) and *Paraplagusia* (Chapleau et al. 1991).

Cynoglossus and *Paraplagusia* possess coniform teeth arranged in multiple rows only on the blind side of the premaxilla and dentary. Tooth attachment and replacement have not been investigated.

Symphurinae: *Symphurus* (Menon 1977).

Symphurus possesses coniform teeth arranged in multiple rows only on the blind side of the premaxilla; the dentary has coniform teeth arranged in a single row on the ocular side and multiple rows on the blind side (Menon 1977; Munroe & McCosker 2001). Tooth attachment and replacement have not been investigated.

TETRADONTIFORMES

Triachanthodidae:

Hollardinae: *Hollardia* and *Parahollardia* (Fraser-Brunner 1941).

Hollardia possesses coniform teeth arranged in a single row on the premaxilla and dentary (Fraser-Brunner 1941). *Parahollardia* possesses coniform teeth arranged in two rows (inner row contains two teeth) on the premaxilla and dentary (Fraser-Brunner 1941). Tooth attachment and replacement have not been investigated.

Triacanthodinae: *Atrophacanthus* (Fraser-Brunner 1950), Bathyphylax, *Halimochirurgus* (Fowler 1933), Johnsonina, *Macrorhamphosodes* (Fowler 1933), *Mephisto* (Tyler 1966), *Paratriacanthodes, Triacanthodes,* and *Tydemania* (Fraser-Brunner 1941).

Atrophacanthus possesses coniform teeth arranged in a single row on the premaxilla and dentary. The anterior dentary teeth are enlarged (Fraser-Brunner 1950). *Bathyphylax, Halimochirurgus Johnsonina Mephisto Paratriacanthodes* possesses coniform teeth arranged in a single row on the premaxilla and dentary (Fraser-Brunner 1941). *Macrorhamphosodes* possesses coniform teeth arranged in a single row on the premaxilla; the dentary has incisiform teeth arranged in a single row (Stewart & Clark 1988). *Triacanthodes* possesses coniform teeth arranged in a single row on the premaxilla and dentary (Fraser-Brunner 1941). Matsuura (1982) illustrated a second row consisting of a lingual pair of teeth at the symphysis of *T. indicus* Matsuura. *Tydemania* possesses incisiform teeth arranged in a single row on the premaxilla and dentary (Fraser-Brunner 1941). Tooth attachment and replacement have not been investigated.

Triacanthidae: *Pseudotriacanthus** and *Triacanthus** (Regan 1903a).

Pseudotriacanthus and *Triacanthus* possess incisiform teeth in the labial row with an inner row of coniform teeth on the premaxilla and dentary. Regan (1903a) reported six teeth in the lingual row on the premaxilla and two on the dentary. Tooth attachment and replacement have not been investigated.

Balistidae: *Abalistes* (Matsuura & Yoshino 2004), *Balistes* (Moore 1967), *Canthidermis* (Fedoryako 1979), *Melichthys* (Randall & Klausewitz 1973), *Rhinecanthus* (Matsuura & Shiobara 1989), *Xanichthys* (Randall et al. 1978), and *Xenobalistes* (Matsuura 1981).

Abalistes possesses “notched” incisiform teeth arranged in two rows on the premaxilla and single row on the dentary (Matsuura & Yoshino 2004). *Balistes* possesses incisiform teeth arranged in a single row on the premaxilla and dentary (Moore 1967). *Canthidermis* possesses incisiform teeth on the premaxilla and dentary (Fedoryako 1979).

Melichthys, Rhinecanthus, and *Xenobalistes* possess "notched" incisiform teeth arranged in two rows on the premaxilla and single row on the dentary (Randall & Klausewitz 1973). *Xanichthys* possesses incisiform teeth arranged in two rows on the premaxilla and a single row on the dentary (Randall et al. 1978). Tooth attachment was observed in *Balistes bursa*, *B. verres* (Gilbert & Starks), and *B. polylepis* Steindachner and found to be unique having teeth attached in an "alveolar socket, periodontal ligament, and acellular cementum" (Soule 1969). Tooth replacement is intraosseous in *Sufflamen bursa* (Bloch & Schneider), *B. polylepis, B. capriscus* Gmelin and *Canthidermis* sp. (Trapani 2001; Hilton et al. 2005a).

Monacanthidae: *Amanses* (Burton 1835), *Acanthaluteres** (Hutchins 1977), *Brachaluteres** (Hutchins & Swainston 1985), *Cantherhines** (Randall 1964), *Cantheschenia**(Hutchins 1977), *Colurodontis**, *Eubalichthys** (Hutchins 1977), *Monacanthus* (Jordan & Fowler 1902b), *Meuschenia** (Hutchins 1977), *Rudarius* (Matsuura 1989), *Stephanolepis* (Jordan & Fowler 1902b).

Amanses possesses incisiform teeth arranged in two rows on the premaxilla and a single row on the dentary (Burton 1835). *Acanthaluteres* possesses caniniform teeth arranged in two rows on the premaxilla; the dentary has incisiform teeth arranged in a single row (Hutchins 1977). The premaxilla teeth were designated caniniform based on illustrations (Fig. 5a) of the general dentition by Hutchins (1977). *Brachaluteres* possesses caniniform teeth arranged in two rows on the premaxilla; the dentary has incisiform teeth arranged in a single row (Hutchins & Swainston 1985). *Cantherhines, Cantheschenia, Eubalichthys,* and *Meuschenia* possess caniniform teeth arranged in two rows on the premaxilla; the dentary has incisiform teeth arranged in a single row (Randall 1964). *Colurodontis* possesses incisiform teeth in the labial row and molariform teeth in the lingual row of the premaxilla; the dentary has a single row of incisiform teeth. Hutchins (1977) described the lingual tooth row of the premaxilla as “plate-like with no external cutting edges” which were interpreted as molariform teeth. Additionally, a small “tusklike process” on the lingual side of the dentary teeth was observed, but not illustrated. *Monacanthus* possesses incisiform teeth arranged in two rows on the premaxilla and a single row on the dentary (Jordan & Fowler 1902b). *Rudarius* possesses incisiform teeth arranged in two rows on the premaxilla and a single row on the dentary (Matsuura 1989). *Stephanolepis* possesses incisiform teeth arranged in two rows on the premaxilla and a single row on the dentary (Jordan & Fowler 1902b). Uehara and Miyoshi (1987) examined the structure of the tissues of the teeth of *S. cirrhifer* (Temminck & Schlegel). Tooth attachment was unique with “fibrils” connecting the tooth base too connective tissue and the premaxilla and dentary (Uehara & Miyoshi 1987). Tooth replacement has not been investigated.

Ostracidae:

Aracaninae: *Aracana* (Jordan & Fowler 1902b), *Kentrocapros* (Armesto et al. 2003), and *Polyplacapros* (Fujii & Uyeno 1979).

Aracana and *Polyplacapros* possess a single row of coniform teeth arranged in a single row on the premaxilla and dentary. *Kentrocapros* possesses incisiform teeth arranged in a single row on the premaxilla and dentary (Armesto et al. 2003).

Ostraciinae: *Acanthostracion* (Whitley 1965) and *Ostracion* (Randall 1972a).

Acanthostracion and *Ostracion* possess coniform teeth arranged in a single row on the premaxilla and dentary. Tooth attachment has not been investigated. Tooth replacement is intraosseous in *Acanthostracion quadricornis* (Linnaeus) (Trapani 2001).

Triodontidae: *Triodon* (Tyler 1962).

Triodon possesses lamelliform teeth with a median suture on the premaxilla; the dentary has lamelliform teeth that lack a suture at the symphysis (Tyler 1962). Tooth attachment has not been investigated. Tooth replacement is relatively unknown, but Fraser et al. (2012) observed that the beak, unlike tetradontids, forms from separate tooth units which develop in separate small cavities on the lateral surface of the jaw bone.

Tetradontidae:

Tetradontinae: *Auriglobus* (Regan 1902), , *Chonerhinos* (Regan 1902), *Contusus* (Hardy 1981; Su et al. 1986), *Feroxodon* (Su et al. 1986), *Javichthys* (Hardy 1985), *Lagocephalus** (Regan 1902), *Monotrete* (Fraser et al. 2012) *Omegophora* (Hardy & Hutchins 1981), *Pelagocephalus* (Tyler & Paxton 1979), *Sphoeroides** (Andreucci et al. 1982; Su et al. 1986), and *Takifugu** (Horinouchi et al. 1996).

Auriglobus possesses lamelliform teeth forming a beak with a median suture at the symphysis on the premaxilla and the dentary (Regan 1902). *Chonerhinos, Contusus, Feroxodon, and Javichthys* possesses lamelliform teeth forming a beak with a median suture at the symphysis on the premaxilla and the dentary with out trituatiform teeth. *Lagocephalus, Pelagocephalus,* and *Sphoeroides* possess lamelliform teeth forming a beak with a median suture at the symphysis on the premaxilla and the dentary with trituatiform teeth. Tyler and Paxton (1979) reported that all *Lagocephalus* possess trituation teeth on the premaxilla. *Monotrete* possesses laemlliform teeth forming a beak with a median suture at the symphysis of the premaxilla and dentary (Fraser et al. 2012). *Omegophora* possesses lamelliform teeth forming a beak with a median suture at the symphysis on the premaxilla and the dentary with out trituatiform teeth, but Hardy and Hutchins (1981) noted unevenly surfaced plates in the same position. *Takifugu* possesses lamelliform teeth forming a beak with a median suture at the symphysis on the premaxilla and the dentary with trituatiform teeth (Su et al. 1986). Horinouchi et al. (1996) observed incompletely fused teeth in "Class I" juveniles of *Takifugu pardalis* (Temminck & Schlegel). Tooth attachment is Type 1 with a firm ossification to the premaxilla and dentary in *Spheroides testudineus* (Temminck & Schlegel) (Andreucci 1968).Tooth replacement is intraosseous in *Spheroides testudineus* and *Pao abei* (Roberts) in which both replace teeth their teeth by developing single elongate dentine layers with in the jaws. Additionally, the initial patterns of tooth replacement from coniform teeth to lamelliform teeth in *Pao abei* matched previous examinations of other osteichthys (Andreucci 1968; Fraser et al. 2012). The tooth structure of tetradontids has been examined with comments on tissue development (Andreucci 1968; Andreucci et al. 1982).

Canthigastrinae: *Canthigaster* (Regan 1902).

Canthigaster possess lamelliform teeth forming a beak with a median suture at the symphysis on the premaxilla and the dentary (Regan 1902). Tooth attachment and replacement have not been investigated.

Diodontidae: *Chilomycterus** (Leis 2003; Leis 2006), *Cyclichthys, Diodon, Lophodiodon,* and *Tragulichthys* (Leis 2003).

Chilomycterus, Cyclichthys, Diodon, Lophodiodon, and *Tragulichthys* possess llamelliform teeth forming a beak lacking any suture on the premaxilla and dentary with few trituation teeth (Leis 2006). Tooth attachment and replacement have not been investigated.

Molidae: *Mola* and *Ranzania* (Andreucci & Britski 1969).

Mola and *Ranzania* possesses lamelliform teeth forming a beak lacking any suture on the premaxilla and dentary with small conical denticles (originally described as "mamilliform"). Andreucci and Britski (1969) commented on the structure of theses denticles and hypothesized that they lacked the complexity of the trituatiform teeth observed in diodontids and tetradontids. Tooth attachment and replacement have not been investigated.

EVOLUTION OF TOOTH TYPES ACROSS THE ACTINOPTERYGII

Having a homodont dentition comprised of coniform teeth is widespread throughout the Actinopterygii and likely represents a plesiomorphic condition. Homodont dentitions comprised of a tooth type other than coniform are relatively scarce, but examples are found within the Characiformes (e.g., oral dentition comprised solely of incisiform teeth in members of the Anostomidae), Cyprinodontiformes (e.g., oral dentition comprised of incisiform teeth in members of the Poeciliidae), Myctophiformes (e.g., oral dentition comprised solely of depressiform teeth) and Liparidae (e.g., oral dentition comprised of only tridentiform teeth). Though the majority of actinopterygians are homodonts, heterodonty is widespread and is found in 20 out of the 45 orders of actinopterygian fishes (Fig. 2) recognized by Nelson (2006), including Lepisosteiformes, Amiiformes, Anguilliformes, Clupeiformes, Characiformes, Siluriformes, Gymnotiformes, Esociformes, Stomiiformes, Aulopiformes, Gadiformes, Ophidiiformes, Lophiiformes, Mugilliformes, Atheriniformes, Beloniformes, Cyprinodontiformes, Scorpaeniformes, Perciformes, Pleuronectiformes, and Tetraodontiformes. Thirty-nine distinct types of heterodonty (unique combinations of different tooth types, e.g., coniform combined with caniniform teeth) were identified during the course of this investigated. Twenty out of the 39 types of heterodonty that occur within the Actinopterygii include coniform teeth combined with at least one (and in some cases a second) tooth type. The most common form of heterodonty within the Actinopteryii is a combination of coniform and caniniform teeth (found in 17 out of 45 orders, including all of the orders listed above except for Gymnotiformes, Esociformes and Mugiliformes). The second most common form of heterodonty is the combination of coniform and depressiform teeth (found in Anguilliformes, Stomiiformes, Aulopiformes, Gadiformes, Ophidiiformes, Lophiiformes, Scorpaeniformes, Perciformes, Pleuronectiformes). Multiple forms of heterodonty have a restricted distribution, being limited to a single order, including coniform/raduliform, caniniform/lamelliform, caniniform/suspensiform, bifidiform/incisiform, bifidiform/tridentiform, molariform/lamelliform, caniniform/tridentiform, tridentiform/depressiform (found only in the Perciformes) and coniform/palmiform, bifidiform/suspensiform, bifidiform/caniniform, incisiform/palmiform, coniform/tridentiform/caniniform/palmiform, coniform/tridentiform/palmiform, coniform/bifidiform/incisiform/molariform (found only in the Characiformes). The restricted distribution of several of the aforementioned forms of heterodonty is clearly linked to the distribution of certain tooth types, many of which are found only within a single order (e.g., the palmiform tooth type is restricted to the Characiformes). Tooth loss is also widespread across the Actinopterygii and edentulous taxa (teeth absent from all oral jaw bones) are found in 12 out of the 45 orders of actinopterygian fishes, including two orders that are comprised entirely of edentulous taxa (Gonorynchiformes and Cypriniformes).

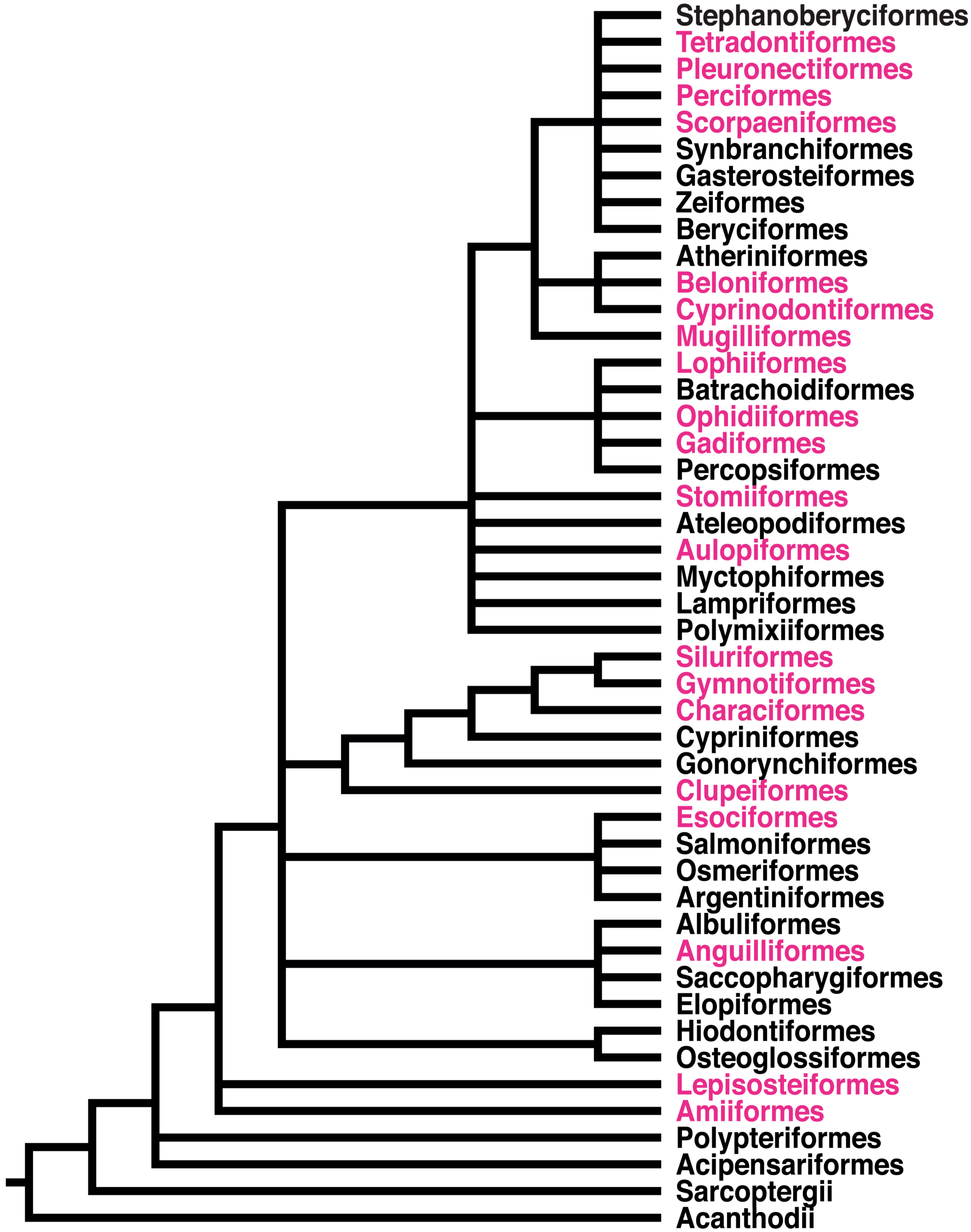

Figure 2. The distribution of heterodonty in Actinopterygii. Orders in purple include at least one heterodont species. Phylogenetic relationships and ordinal names follow Nelson (2006).

Given the widespread distribution (20 out of 45 orders) and diversity of heterodont dentitions (39 unique combinations of different types of teeth) within the Actinopterygii it is clear that heterodonty has evolved multiple times independently throughout the evolutionary history of the group. To test this idea further, I utilized the recently available phylogenetic hypothesis of actinopterygian relationships of Near et al. (2012) to explore the evolution of heterodonty using Ancestral Character State reconstruction analysis. Two characters were investigated, including: character 1 (presence/absence of heterodonty) with two states (absent [0]; present [0]); and character 2 (types of teeth present) with 21 states (see Materials and Methods). The distribution of character 1 across the Near et al. (2012) hypothesis supports the idea that heterodonty has evolved multiple times independently across the Actinopterygii, with 16 independent origins of heterodonty (minimum number of acquisitions 16; maximum number of acquisitions 18). Investigation of the second character (types of teeth present) on the Near et al. (2012) hypothesis (Fig.3) also supports the idea that a homodont dentition comprised of coniform teeth is plesiomorphic at the level of the Actinopterygii and that a heterodont dentition comprised of both coniform and caniniform teeth is the most common form of heterodonty (accounting for 9 out of the 16 independent evolutionary origins of heterodonty inferred from this particular dataset).

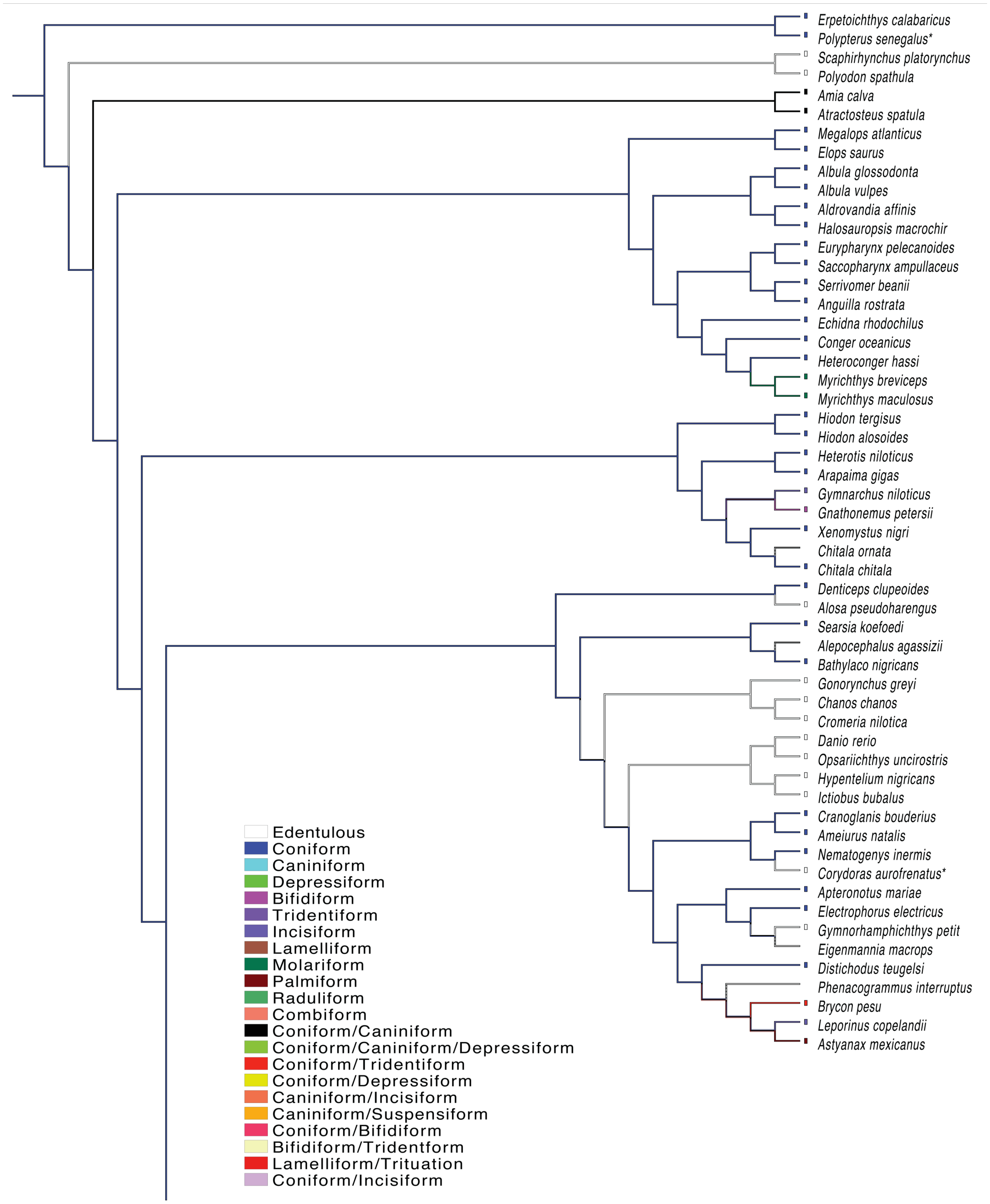

Figure 3. The evolution of homodonty and heterodonty in Actinopterygii. Phylogenetic hypothesis of actinopterygian relationships from Near et al. (2012) showing results of the second ancestral character state reconstruction analysis on tooth type. Branches and terminal taxa are colored according to the type of tooth (or combination of teeth) present. Only 10 of the 39 different forms of heterodonty are represented in the taxa sampled by Near et al (2012). "*" indicates that a particular taxon is a substitute taxon (see materials and methods).

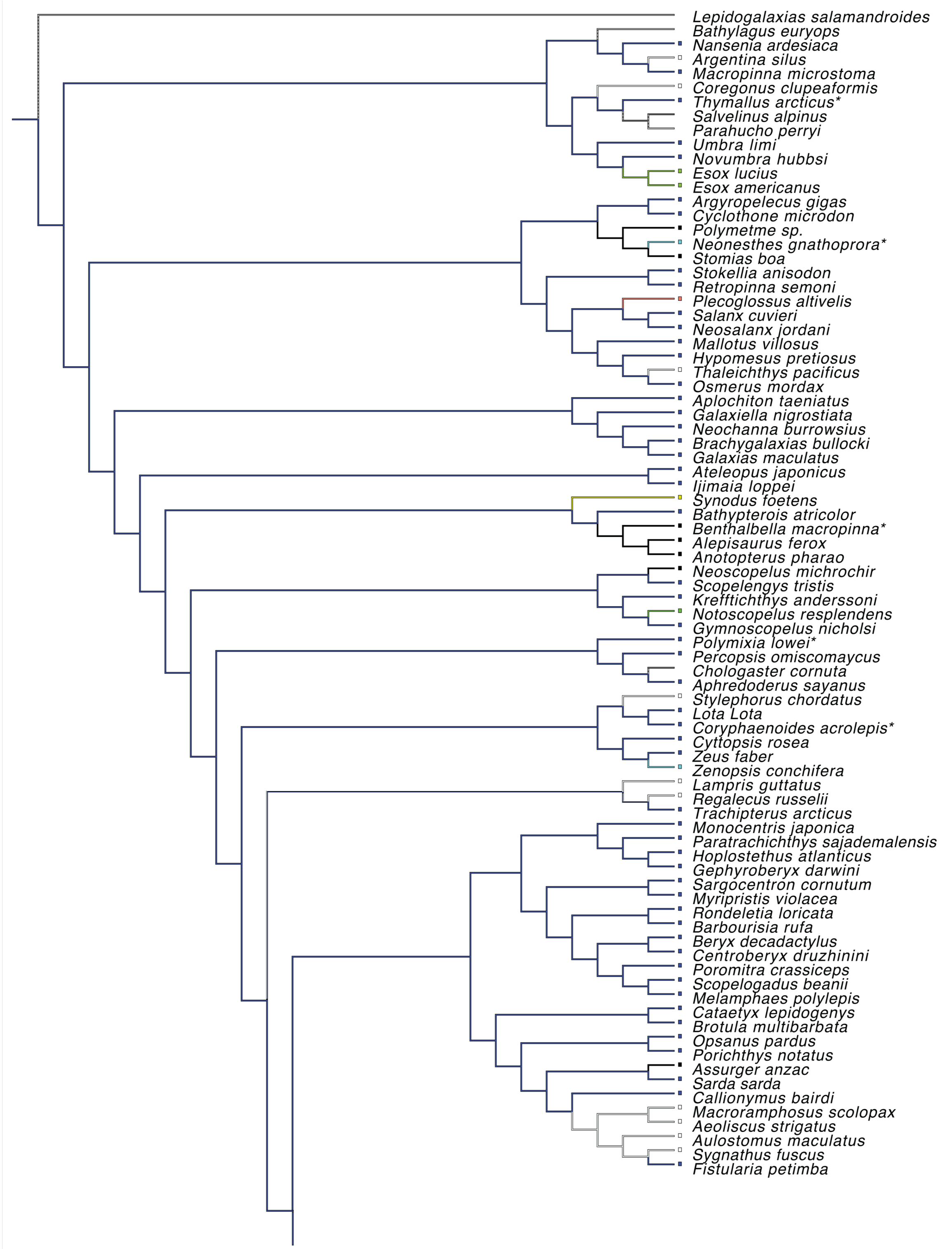

Figure 3. Continued.

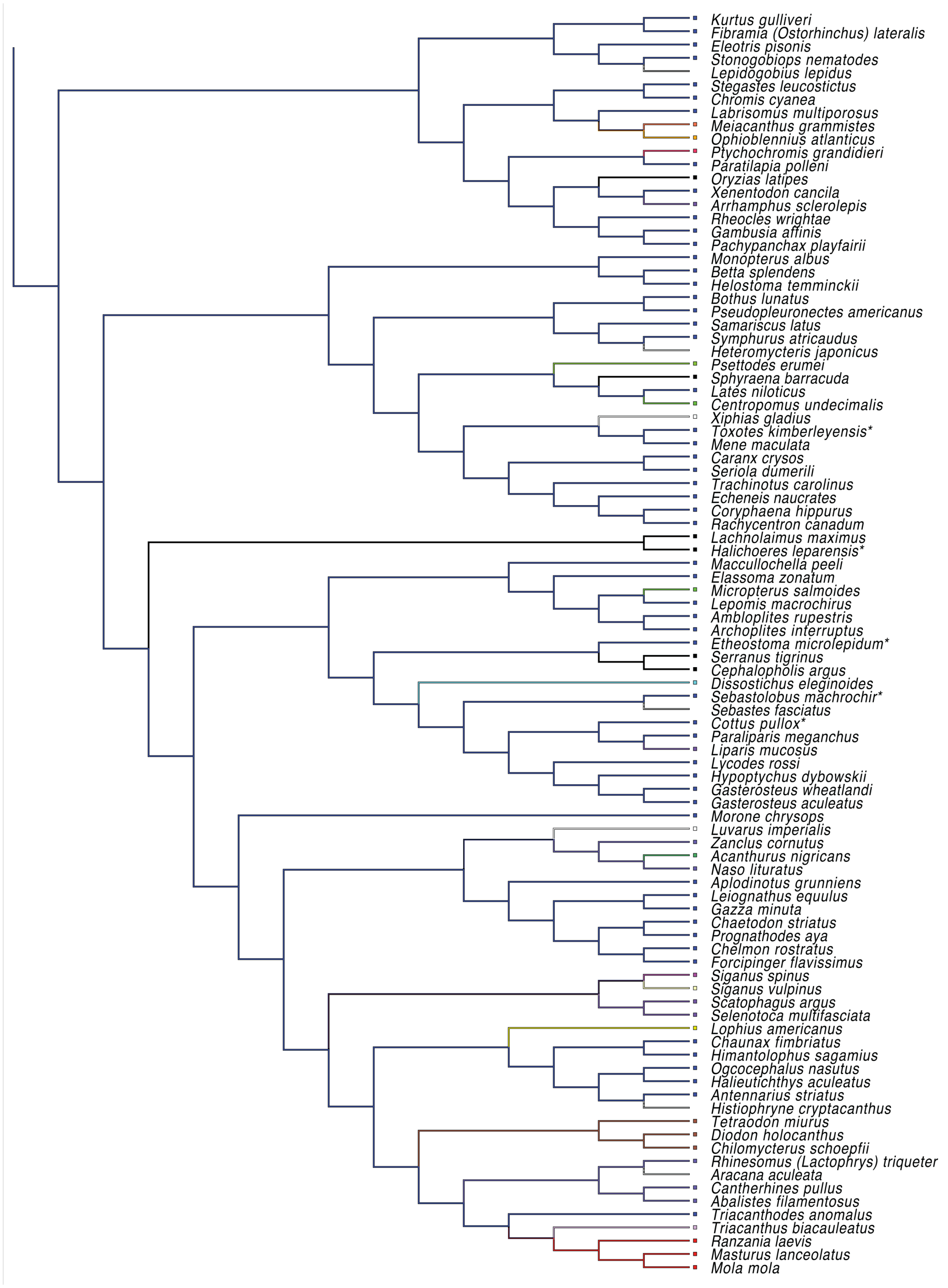

Figure 3. Continued.

DISCUSSION

TERMINOLOGY

Owen (1845) introduced eight terms, derived from four basic shapes, to account for the diversity of tooth shape in actinopterygian fishes. Owen's terms have served as the foundation for the terms used for different types of teeth in actinopterygian fishes by subsequent researchers. Despite the primacy of Owen's terms (many of which are still in use today) to the study of actinopterygian dentition, several are problematic. A number of Owen's terms refer to the arrangement of teeth within the jaws rather than the shape of individual teeth. For example, Owen (1845) used the terms villiform, setiform, and ciliiform to describe the size and arrangement of conical teeth (e.g., villiform refers to small conical teeth arranged in multiple rows). The terms villiform, setiform and ciliiform would thus apply equally as well to other types of teeth that were arranged in multiple rows (e.g., the multiple rows of tridentiform teeth present in members of the Liparidae). In order to overcome this problem, the terminology proposed herein is based entirely on shape without reference to arrangement. A number of Owen's original terms (e.g. incisiform, lamelliform) are retained in this terminology but others (such as villiform, setiform and ciliform) have been discarded. In order to capture the diversity of tooth shape that exists across the Actinopterygii I have also introduced a number of novel terms resulting in a terminology with a total of 15 terms.

Teeth with unique shapes characterize several groups of actinopterygian fishes (e.g., Acanthuridae (Randall & Clements 2001), Loricaridae (Geerinckx et al. 2007), Blenniidae (Bath 2002). In most cases, these novel teeth have been described using the names of the shapes or tools that they most closely resemble (e.g. comb like teeth in Plecoglossidae; Howes & Sanford 1987), but rarely have such teeth received a formal term. Given the potential value of teeth in studies of phylogenetic relationships and life history, I have introduced formal terms for unique types of teeth that are currently unnamed whenever feasible. The largest group of actinopterygian fishes to receive a novel term for the teeth present in its members is the Characiformes. The multicuspid teeth of characiform fishes, referred to herein as palmiform (Figure 1H), are markedly different from the multicuspid teeth present in other groups of actinopterygians. A palmiform tooth typically exhibits a stout column-like shaft with an enlarged central cusp with several smaller lateral cusps arranged on either side (akin to the lengths of the fingers of a human hand). Though palmiform teeth are not present in all members of the Characiformes, they were restricted to this order and are found in members of multiple families of characiform fishes, including the Characidae (9 genera), Alestiidae (9 genera), and Hemiodontidae (1 genus). Given the wide distribution of palmiform teeth within the Characiformes, it is possible that this tooth type may represent an additional synapomorphy for the order. Another novel type of tooth that has received a formal term in this study is the sigmoidiform tooth that is characteristic of the Loricariidae. Unlike palmiform teeth, sigmoidiform teeth are present in all members of the Loricariidae that have been investigated to date. Sigmoidiform teeth exhibit a long tooth shaft that is shaped like an "S" and reminiscent of a sigmoidal curve (Figure 1J). While elongation of the tooth shaft is common theme in actinopterygian oral dentition, curvature of the tooth shaft is not common and has been taken to the extreme in the sigmoidiform teeth of loricariid fishes.

Below the ordinal and family level, several smaller monophyletic groups of fishes are characterized by novel teeth that have been provided with a formal term during the course of this study. For example, the strange multicuspid teeth that are found in several species of surgeon fishes (Acanthuridae) have received the term raduliform (Figure 1G). Raduliform teeth have numerous cusps of equal size distributed around the entire margin of the labiolingually flattened tooth crown that is set atop a thin tooth shaft. The even distribution of the cusps sets raduliform teeth apart from other types of multicuspid incisiform teeth (e.g., palmiform or incisiform), which have cusps located only along the distal margin of the tooth crown. The novel teeth found in members of the scale-eating cichlid genus *Perrisodus* are referred to herein as lepidophagiform. Lepidophagiform teeth have a tooth crown shaped like a lobate leaf (Hickey 1973) laid horizontally over a cyclindrical tooth shaft. Finally, the "comb like" teeth of *Plecoglossus altivelis* are referred to as spiraliform. Howes and Sanford (1987) described the teeth of *P. altivelis* as "comb-like". This description is based upon arrangement not shape. The teeth "combs" of *P. altivelis* comprise multiple closely set teeth. The elongate shaft of each tooth is strait while the crown widens and abruptly spirals to form a wide severely recurved tip (Figure1K). The term spiraliform is reflective of this unique shape.

While novel tooth shapes are not widespread and easy to deal with within the framework of a terminology, many species possess dentitions that exhibit continuous variation in both the size and shape. It is challenging to separate teeth that are of similar shape, but differ in size. Distinguishing between coniform and caniniform teeth provides a straightforward example of the issues caused by variation in size in the absence of shape variation. The terms canine or caniniform are often used in conjunction with another tooth type or to describe an enlarged tooth that usually occurs in specific location in the jaws (e.g., on the posterior edge of the dentary in some members of the Blenniidae; Kotrschal & Goldschmid 1992). However, interpreting caniniform teeth when no other tooth type is present or in the absence of obvious size difference is a practice best adopted at lower taxonomic levels and care should be taken at these lower levels to establish size requirements or consistency in patterns of tooth arrangement (i.e., homology) between closely related taxa (monophyletic groups) as a means to label particular teeth as one type or another. For example, Carpenter and Allen (1989) used the regular arrangement of teeth in the Lethrinidae to restrict the term canine to only the anteriormost teeth in the oral jaws.

The challenges posed by continuums are not limited to size. Even apparently simple features of teeth, such as labio-lingual flattening, can occur within a continuum. At what point does a coniform tooth become labio-lingually flattened enough to be more appropriately referred to as an incisiform tooth? Again, such a challenging question is probably best examined within the limits of a smaller monophyletic group. For example, Smith-Vaniz (1976) provides an excellent overview of the variation that exists in tooth shape within a single tribe of the Blenniidae (Smith-Vaniz (1976) figures 68-72) and Ebeling (1957) documents subtle variation in tooth shape within the Mugillidae as well.

DISTRIBUTION OF TOOTH TYPES ACROSS ACTINOPTERYGII

A homodont dentition comprised of coniform teeth is by far the most common dentition within the Actinopterygii, and was present in 2,130 out of the 3,804 species surveyed as part of this investigation (over 50%). Coniform homodonts are found in as distantly related groups as the Polypteridae (birchers) and Ostracidae (box fishes) and in multiple groups that fall between these two families in the phylogeny of the Actinopterygii.

Recent Evo-Devo research on the teeth of actinopterygians (Tucker & Fraser 2014), as well as the results of the present study, suggest that coniform teeth likely represent a plesiomorphic condition at the level of the Actinopterygii. The second most common homodont dentition that was observed during this study was a dentition comprised only of incisiform teeth, which was found in 155 species (4% of the 3,804 species surveyed). This form of homodonty is common in the characiform genus *Leporinus* (Anostomidae) (Sidlauskas & Vari 2008) and is also found in Balistidae (Moore 1967). The next most common homodont dentition is comprised only of depressiform teeth, which was found in 113 species. This form of homodonty is abundant within the Lophiiformes (Pietsch et al. 2004a) and is also found in Cetomimidae (Paxton 1989).

Heterodonty was identified in 974 species (~25% of 3,804 species surveyed) including species from 20 of the 45 orders of the Actinopterygii recognized by Nelson (2006) (see results section for a list of the 20 orders that contain heterodonts). In contrast to the relatively few distinct forms of homodonty identified during my survey, I encountered 39 distinct combinations of the 15 different tooth types recognized herein. Many of the 39 forms of heterodonty recognized are widely distributed across the Actinopterygii whereas others are restricted to a single order. A heterodont dentition comprised of both coniform and caniniform teeth was the most abundant form of heterodonty and was encountered in 17 out of the 20 orders of actinopterygian fishes that contain heterodonts. Of the 20 orders that contain heterodont taxa, the Gymnotiformes, Escosiformes, and Mugiliformes are the only orders that do not contain heterodonts with coniform/caniniform teeth. A heterodont dentition comprised of both coniform and depressiform teeth was the second most abundant form of heterodonty and was encountered in nine out of the 20 orders of actinopterygian fishes that contain heterodonts, including (listed in phylogenetic order): the Anguilliformes, Stomiiformes, Aulopiformes, Gadiformes, Ophidiformes, Lophiiformes, Scorpaeniformes, Perciformes and Pleuronectiformes. A heterodont dentition comprised of both coniform and incisiform teeth was the next most abundant form of heterodonty and was encountered in six out of the 20 orders, including: Characiformes, Siluriformes, Cyprinodontiformes, Perciformes, Pleuronectiformes and Tetraodontiformes. The following forms of heterodonty were encountered less frequently, including (listed in descending order): coniform/bifidiform (Characiformes, Siluriformes, Mugiliformes, Cyprinodontiformes and Perciformes); coniform/tridentiform (Characiformes, Beloniformes, Cyprinodontiformes, Scorpaeniformes, and Perciformes); canininiform/depressiform (Stomiiformes, Aulopiformes and Perciformes); coniform/molariform (Anguilliformes, Characiformes and Siluriformes); tridentiform/incisiform (Characiformes, Cyprinodontiformes and Perciformes); caniniform/molariform (Anguilliformes and Perciformes); coniform/suspensiform (Siluriformes and Gymnotiformes); caniniform/incisiform, incisiform/molariform (Perciformes and Tetraodontiformes); sigmoidiform/suspensiform (Siluriformes); coniform/raduliform, caniniform/lamelliform, caniniform/suspensiform, bifidiform/incisiform, bifidiform/tridentiform, molariform/lamelliform, caniniform/tridentiform, tridentiform/depressiform (Perciformes); coniform/raduliform, caniniform/lamelliform, caniniform/suspensiform, bifidiform/incisiform, bifidiform/tridentiform, molariform/lamelliform, caniniform/tridentiform, tridentiform/depressiform (Characiformes).

The vast majority of actinopterygian heterodonts exhibit dentitions comprised of only two different types of teeth in the oral jaws (see above) and I encountered relatively few examples of actinopterygian heterodonts that combine more than two types of teeth. The most common form of actinopterygian heterodonty to combine more than two types of teeth represents a combination of coniform, caniniform, and depressiform teeth, which is present in 6 orders (Esociformes, Stomiiformes, Aulopiformes, Ophidiformes, Perciformes and Pleuronectiformes). A heterodont dentition comprised of coniform, bifidiform and tridentiform teeth was the second most abundant form of heterodonty to combine more than two different types of teeth, which is present in four orders (Characiformes, Beloniformes, Cyprinodontiformes, and Perciformes). Additional forms of heterodonty, that combine more than two different types of teeth, are restricted to the Characiformes and Cyprinodontiformes (coniform/tridentiform/incisiform), unique to the Characiformes (coniform/tridentiform/palmiform) or unique to the Perciformes (coniform/caniniform/incisiform, coniform/incisiform/lamelliform, coniform/caniniform/molariform, caniniform/incisiform/suspensiform, caniniform/tridentiform/depressiform). Actinopterygian heterodonts that exhibit more than three different types of teeth in the oral jaws are extremely rare and restricted to two genera of the Characiformes, including *Agoniates* and *Myleus*. Both genera exhibit heterodont dentitions comprised of four different types of teeth, including a combination of coniform, tridentiform, caniniform and palmiform teeth in *Agoniates* (Zarske & Gery 1997) and a combination of coniform, bifidiform, incisiform and molariform teeth in *Myleus* (Jégu & dos Santos 2002). Having four different types of teeth in the oral jaws is exceptional and comparable to the heterodont condition of certain mammals (Ungar 2010).

EVOLUTION OF HETERODONTY WITHIN THE ACTINOPTERYGII

Based on the multiple different types of actinipterygian heterodonty identified during the course of this study, it is very likely that heterodonty has evolved multiple times throughout the evolutionary history of the group. In order to explore this idea further, I investigated the evolution of heterodonty within the framework of a recent molecular phylogenetic hypothesis of actinopterygian relationships based on nine nuclear genes for 232 taxa (Near et al. 2012). Using ancestral character state reconstructions analysis, a minimum of 16 separate transitions from homodonty to heterodonty occurred based upon the Near et al. (2012) hypothesis. Given that several larger groups of actinopterygian fishes that contain multiple heterodonts are underrepresented in Near et al.'s (2012) study (e.g., Anguilliformes, Characiformes, Siluriformes, Gobiidae), these results likely represent a significant underestimate of the number of times that heterodonty has evolved independently within the group. There is evidence to suggest that heterodonty may have evolved multiple times within even relatively small groups of actinopterygian fishes. For example, within the Muraenidae dentitions with molariform teeth have evolved at least twice (Reece et al. 2010a). Within the Sparidae, Hanel and Sturmbauer (2000) found that different forms of heterodonty have evolved independently on multiple different occasions. In contraposition, there is also evidence for the loss of heterodonty (reversion to homodonty) in some actinopterygian taxa. For example, Mirande (2010) found evidence of reversals to back to homodonty in *Aphyocharax* and *Phenacogaster* within the phylogeny of the Characidae.

Despite the limitations of the Near et al. (2012) hypothesis for investigating the evolution of heterodonty within Actinopterygii, the results of the ancestral character state reconstruction analysis provide further support for the hypothesis that a homodont dentition comprised of coniform teeth is a plesiomorphy at the level of the Actinopterygii and further emphasizes the widespread evolution of a heterodont dentition comprised of coniform combined with caniniform teeth (Fig. 3).

GYNANDRIC HETERODONTY IN ACTINOPTERYGII

One unexpected result of this study is that sexually dimorphic dentitions or gynandric heterodonty is relatively widespread throughout the Actinopterygii. Gynandric heterodonts are present in 10 of the 45 orders of actinopterygian fishes, including (listed in phylogenetic order): the Anguilliformes, Characiformes, Siluriformes, Gymnotiformes, Lophiiformes, Beloniformes, Gaterosteiformes, Scorpaeniformes, Perciformes, and Pleuronectiformes. All examples of gynandric heterodonts belong to the Teleostei and there appears to be no record of gynandric heterodonts in the non-teleost actinopterygian groups. Within the Teleostei, gynandric heterodonty ranges from minor differences in tooth numbers between the sexes (e.g., in *Gasterosteus aculeatus;* Caldecutt et al. 2001), to differences in tooth size between the sexes (e.g., large caniniform teeth in males of *Paedogobius* compared to tiny coniform teeth in females; Iwata et al. 2001), to one sex being a heterodont and the other being a homodont (e,g., caniniform and coniform heterodont dentition in male *Kaupichthys atlanticus* compared to the coniform homodont dentition in females; Böhlke 1956). A small number of taxa are also characterized by the absence of teeth in one of the two sexes (e.g., females of *Aulorhyncus flavidus* are edentulous whereas males have coniform teeth on the premaxilla; Ida 1976). Gynandric heterodonty is relatively well documented in chrondrichthyian taxa (Gutteridge & Bennett 2014), but has received only cursory attention in actinopterygian groups. Studies of the sexually dimorphic dentitions in the model organisms *Oryzias* (Parenti 2008) and *Gasterosteus* (Caldecutt et al., 2001) are perhaps the most detailed studies available on gynandric heterodonty in actinopterygian taxa, but additional studies focused on non-model actinopterygian groups are certainly needed and will likely shed more light on the evolution of this phenomenon within the group. It is likely that further investigation will reveal gynandric heterodonty to be more widespread than is currently recognized within the Teleostei.

BEAKS MADE OF TEETH

No review of actinopterygian teeth would be complete without mention of the strange beak-like structures that are present in certain members of the Perciformes (two separate families) and the Tetraodontiformes (gymnodont families). Owen (1845) referred to the teeth that contribute to the beak-like structures of pufferfishes as lamelliform and I have adopted this term herein and extended it to also encompass those teeth that contribute to the beak-like structures in parrotfishes (Scaridae) and cales and weed whitings (Odacidae). Lamelliform teeth as recognized herein are clearly cosmopolitan in nature and given the phylogenetic relationships of "beaked" teleosts, beak-like structures have certainly evolved independently on multiple occasions within the Percomorpha. This is also evident from the shape and arrangement of the teeth that contribute to the beak-like structures between the different groups of "beaked" teleosts, which may be formed from multiple small teeth or from few very large teeth. Fraser et al. (2012) observed variation in the size and arrangement of the teeth that contribute to the "beaks" of gymnodont (beaked) tetraodontiform taxa, which may be formed from a few large teeth that are stacked vertically (as in *Pao abei*) or from multiple smaller teeth that are bounded tightly together (as in the triodontids). Within the Scaridae, Bellwood (1994) observed that “coalesced” teeth may be bound together in two very different ways to form the “beak.” In some parrotfish taxa, a glue-like substance referred to as “cementum” is involved in the binding together of small conical teeth whereas in other parrotfishes the “beak” is formed by a “mosaic” of larger teeth along the jaw. Though recent Evo-Devo research is providing unique insight on the development of the “beak” in groups of tetraodontiforms, Bellwood (1994) call for additional developmental research on the jaws of parrotfishes has yet to be answered.

CONCLUSIONS

A literature based survey of tooth types in actinopterygiian fishes, spanning 3,510 publications and approximately 200 years, has resulted in a novel terminology for actinopterygian teeth in which 15 different types of teeth are recognized, including ten novel terms. My examination of tooth types across actinopterygian groups supports the idea that a homodont dentition composed of coniform teeth is pleisiomorphic at the level of the Actinoptergyii. Heterodonts are widespread throughout the Actinopterygii (the result of multiple independent evolutionary events) and are found in 20 of the 45 orders of actinopterygian fishes recognized by Nelson (2006). Thirty nine distinct combinations of the 15 tooth types recognized herein can be found within the Actinopterygii, the majority comprised of only two different types of teeth. Heterodont dentitions comprised of three different types of teeth were far less common then heterodonts with two tooth types. Heterodont dentitions comprised of four different types of teeth are extremely rare and are restricted to two genera of the Characiformes. While very complex types of heterodonty are admittedly rare, certain forms of heterodonty such as coniform/caniniform have a far wider distribution than other forms. The evidence for my conclusions about the evolution of heterodonty in the Actinopterygii is provided in the family summaries, which makes available a wealth of information on actinopterygian dentition in a concise usable guide for future researchers. Despite summarizing information on the oral dentition of more than 3,000 species of actinopterygian fishes, this paper represents only a ripple in the surface of a vast ocean of potential research on the odontological diversity present in ray-finned fishes.

REFERENCES

Aarn, Ivantsoff, W. & Kottelat, M. (1998) Phylogenetic analysis of Telmatherinidae (Teleostei: Atherinomorpha), with description of *Marosatherina*, a new genus from Sulawesi. *Ichthyological Exploration of Freshwaters,* 9, 311-323.

Abe, T. (1960) Description of a new lutjanid fish of the genus *Paracaesio* from Japan. *Japanese Journal of Ichthyology,* 8, 56-62.

Acero P., A. & Garzon F., J. (1982) Rediscovery of *Anisotremus moricandi* (Perciformes: Haemulidae), including a redescription of the species and comments on its ecology and distribution. *Copeia,* 1982, 613-618.

Aguilera, O., Solano, O. D. & Valdez, J. (1983) A new species of fish of the genus *Stellifer* (Perciformes: Sciaenidae) from the South Caribbean Sea. *Anales del Instituto de Investigaciones Marinas de Punta de Betin,* 13, 5-16.

Aguirre, H. (1997) Presence of dentition in the premaxilla of juvenile *Mullus barbatus* and *M. surmuletus*. *Journal of Fish Biology,* 51, 1186-1191.

Ahlstrom, E. H. & Moser, H. G. (1969) A new gonostomatid fish from the tropical Eastern Pacific. *Copeia,* 1969, 493-500.

Ahnelt, H., Abdoli, A., Naderi, M. & Coad, B. W. (2000) *Anatirostrum profundorum:* a rare deep-water gobiid species from the Caspian Sea. *Cybium,* 24, 139-159.

Aizawa, M. & Sakamoto, K. (1993) First record of an arrow eel *Cyema atrum* (Cyematidae: Saccopharyngiformes) from Japan. *Japanese Journal of Ichthyology,* 39, 398-400.

Al-Qattan, E., Dadzie, S. & Abou-Seedo, F. (2000) Feeding structures in the silver pomfret, *Pampus argenteus* (Euphrasen) as observed by scanning electron microscopy. *Kuwait Journal of Science and Engineering,* 27, 331-341.

Albert, J. S. & Crampton, W. G. R. (2003) Seven new species of the neotropical electric fish *Gymnotus* (Teleostei, Gymnotiformes) with a redescription of *G. carapo. Zootaxa,* 287, 1-54.

Albert, J. S. & Crampton, W. G. R. (2009) A new species of electric knifefish, genus *Compsaraia* (Gymnotiformes: Apteronotidae) from the Amazon River, with extreme sexual dimorphism in snout and jaw length. *Systematics and Biodiversity,* 7, 81-92.

Albert, J. S., Crampton, W. G. R., Thorsen, D. H. & Lovejoy, N. R. (2005) Phylogenetic systematics and historical biogeography of the neotropical electric fish *Gymnotus* (Teleostei: Gymnotidae). *Systematic and Biodiversity,* 2, 375-417.

Albert, J. S. & Fink, W. L. (1996) *Sternopygus xingu*, a new species of electric fish from Brazil (Teleostei: Gymnotoidei), with comments on the phylogenetic position of *Sternopygus*. *Copeia,* 1996, 85-102.

Allen, G. & Adrim, M. (2000) *Amblypomacentrus clarus*, a new species of damselfish (Pomacentridae) from the Banggai Islands, Indonesia. *Records of the Western Australian Museum,* 20, 51-56.

Allen, G. R. (1970) Two new species of frogfishes (Antennariidae) from Easter Island. *Pacific Science,* 24, 517-522.

Allen, G. R. (1977) Revision of the plesiopid fish genus *Trachinops*, with a description of a new species from Western Australia. *Records of the Western Australian Museum,* 5, 59-72.

Allen, G. R. (1980) A generic classification of the rainbowfishes (family Melanotaeniidae). *Records of the Western Australian Museum,* 8, 449-490.

Allen, G. R. (1983) *Kiunga ballochi*, a new genus and species of rainbowfish (Melanotaeniidae) from Papua New Guinea. *Tropical Fish Hobbyist,* 32, 72-77.

Allen, G. R. (1985) Descriptions of two new species of freshwater catfishes (Plotosidae) from Papua New Guinea. *Records of the Western Australian Museum,* 12, 247-256.

Allen, G. R. (1993) *Variichthys*, a replacement name for the terapontid fish genus *Varia* and first record of *V. lacustris* from Australia. *Records of the Western Australian Museum,* 16, 459-460.

Allen, G. R. (1998a) A new genus and species of rainbowfish (Melanotaeniidae) from fresh waters of Irian Jaya, Indonesia. *Revue française d'aquariologie,* 25, 1-2.

Allen, G. R. (1998b) A review of the marine catfish genus *Parapolotus* (Plotosidae) with the description of a new species from North-Western Australia. *The Raffles Bulletin of Zoology,* 46, 123-134.

Allen, G. R. (2004) *Toxotes kimberleyensis*, a new species of archerfish (Pisces: Toxotidae) from fresh waters of Western Australia. *Records of the Australian Museum,* 56, 225-230.

Allen, G. R. & Erdmann, M. V. (2009) *Pentapodus numberii*, a new species of whiptail (Pisces: Nemipteridae) from Eastern Indonesia. *Zoological Studies,* 48, 280-286.

Allen, G. R. & Kuiter, R. (1976) A review of the plesiopid fish genus *Assessor*, with descriptions of two new species. *Records of the Western Australian Museum,* 4, 201-215.

Allen, G. R. & Randall, J. E. (1985) A new genus and species of plesiopid fish from Western Australia and the Central-South Pacific Ocean. *Records of the Western Australian Museum,* 12, 185-191.

Allen, G. R. & Robertson, D. R. (1991) Description of two new genera and four new species of triplefins (Pisces: Tripterygiidae) from the Tropical. *Revue française d'aquariologie,* 18, 3-30.

Allen, M. J. & Groce, A. K. (2001) First occurrence of blackspot wrasse, *Decodon melasma* Gomon 1974 (Pisces: Labridae) in California. *Bulletin of the Southern California Academy of Sciences,* 100, 131-136.

Alt, K. T. (1977) Taxonomy and ecology of in Inconnu, *Stenodus leucichthys* Nelma, in Alaska. *Biological Papers of the University of Alaska,* 12, 1-63.

Amaoka, K. (1969) Studies on the sinistral flounders found in the waters around Japan. taxonomy, anatomy and phylogeny. *Journal of Shimonoseki University Fisheries,* 18, 65-340.

Amaoka, K. (1972) Osteology and relationships of the citharid flatfish *Brachypleura novaezeelandiae*. *Japanese Journal of Ichthyology,* 19, 263-273.

Amaoka, K. & Imamura, H. (2000) A new flounder, *Monolene helenensis* (Pleuronectiformes: Bothidae) from the Eastern tropical Atlantic. *Ichthyological Research,* 47, 243-247.

Amaoka, K., Kawai, T. & Séret, B. (2006) *Nematops nanosquama,* a new species of righteye flounder (Pleuronectiformes: Poecilopsettidae) from off the Marquesas Islands. *Ichthyological Research,* 53, 223-227.

Amaoka, K., M. Toyoshima & Inada, T. (1977) New records of the stichaeid fish *Ascoldia variegata knipowitschi* and the zoarcid fish *Puzanovia rubra* from Japan. *Japanese Journal of Ichthyology,* 24, 91-97.

Amaoka, K., Mihara, E. & Rivaton, J. (1997) Pisces, Pleuronectiformes: flatfishes from the waters around New Caledonia. Six species of the bothid genera *Tosarhombus* and *Parabothus*. *Mémoires du Muséum National d'histoire Naturelle,* 174, 143-172.

Amaoka, K., Okamura, O. & Yoshino, T. (1992) First records of two bothid flounders, *Grammatobothus polyophthalmus* and *Arnoglossus tapeinosoma*, from Japan. *Japanese Journal of Ichthyology,* 39, 259-264.

Amaoka, K., Sakamoto, K. & Abe, K. (1981) First record of the deepsea sole, *Embassichthys bathybius,* from Japan. *Japanese Journal of Ichthyology,* 28, 86-90.

Amaoka, K., Toyoshima, M. & Sasaki, T. (1977) First record of *Bryozoichthys lysimus* from Japan and second record of *B. majorius* from Aleutian Islands and Gulf of Alaska. *Bulletin of the Faculty of Fisheries Hokkaido University,* 28, 175-180.

Anderson Jr, W. D. (1966) A new species of *Pristipomoides* (Pisces: Lutjanidae) from the tropical Western Atlantic. *Bulletin of Marine Science,* 16, 814-826.

Anderson Jr, W. D. (1987) Systematics of the fishes of the family Lutjanidae (Perciformes: Percoidei), the snappers. *In:* J. J. Polovina & S. Ralston (Eds), *Tropical snappers and groupers: biology and fisheries management*, Westveiw Press, Charlottesville pp. 1-31.

Anderson Jr, W. D., Kami, H. T. & Johnson, G. D. (1977) A new genus of Pacific Etelinae (Pisces: Lutjanidae) with redescription of the type-species. *Proceedings of the Biological Society of Washington,* 90, 89-98.

Anderson Jr., W. D. & Springer, V. G. (2005) Review of the perciform fish genus *Symphysanodon* Bleeker (Symphysanodontidae), with descriptions of three new species, *S. mona, S. parini,* and *S. rhax*. *Zootaxa,* 996, 1-44.

Anderson, M. E. (1994) Systematics and osteology of the Zoarcidae (Teleostei: Perciformes). *Ichthyological Bulletin of the J. L. B. Smith Institute of Ichthyology,* 60, 1-120.

Anderson, M. E. & Heemstra, P. C. (2003) Review of the glassfishes (Perciformes: Ambassidae) of the Western Indian Ocean. *Cybium,* 27, 199-209.

Anderson, M. E. & Hubbs, C. L. (1981) Redescription and osteology of the Northeastern Pacific fish *Derepodichthys alepidotus* (Zoarcidae). *Copeia,* 1981, 341-352.

Anderson, M. E. & Imamura, H. (2008) Two new gymneline eelpouts (Perciformes: Zoarcidae) from Hokkaido, Japan. *Bulletin of the National Museum of Nature and Science,* 59-67.

Anderson, M. E. & Mincarone, M. M. (2006) Studies on the Zoarcidae (Teleostei: Perciformes) of the southern hemisphere. IX. A new species of *Pachycara* from the southwestern Atlantic. *Zootaxa,* 1177, 21-26.

Anderson, M. E. & Pequeno, G. (1998) Studies on the Zoarcidae (Teleostei: Perciformes) of the southern hemisphere. VIII. A new species of the genus *Dieidolycus* from Tierra del Fuego. *The J.L.B Smith Institute of Ichthyology Special Publication,* 61, 1-5.

Anderson, M. E., Stevenson, D. & Shinohara, G. (2009) Systematic review of the genus *Bothrocara* Bean 1890 (Teleostei: Zoarcidae). *Ichthyological Research,* 56, 172-194.

Anderson, W. D. & Johnson, G. D. (1984) A new species of *Callanthias* (Pisces: Perciformes: Percoidei: Callanthiidae) from the southeastern Pacific Ocean. *Proceedings of the Biological Society of Washington,* 97, 942-950.

Anderson, W. D., Jr. & Heemstra, P. C. (1980) Two new species of Western Atlantic *Anthias* (Pisces: Serranidae), redescription of *A. asperilinguis* and review of *Holanthias* martinicensis. *Copeia,* 1980, 72-87.

Anderson, W. W. & Gutherz, E. J. (1967) Revision of the flatfish genus *Trichopsetta* (Bothidae) with descriptions of three new species. *Bulletin of Marine Science,* 17, 892-913.

Andre, W., Banks, J. & Herschel, W. (1784) A description of the teeth of the *Anarrhichas lupus* Linnaei, and of those of the *Chaetodon nigricans* of the same author; to which is added, an attempt to prove that the teeth of cartilaginous fishes are perpetually renewed. By Mr. William Andre, surgeon; communicated by Sir Joseph Banks, Bart. P. R. S. *Philosophical Transactions of the Royal Society of London,* 74, 274-282.

Andreucci, R. D. (1968) Macroscopic and microscopic morphology of *Spheroides testudineus* teeth (checkered puffer). *Cells Tissues Organs,* 71, 448-471.

Andreucci, R. D. & Britski, H. A. (1969) Macroscopic and microscopic morphology of the *Mola mola* teeth (sun fish). *Revisitas Brasil Pesquisas Medico Biologia,* 2, 159-162.

Andreucci, R. D., Britski, H. A. & Carneiro, J. (1982) Structure and evolution of tetraodontoid teeth: An autoradiographic study (pisces, Tetraodontiformes). *Journal of Morphology,* 171, 283-292.

Anganthoibi, N. & Vishwanath, W. (2009) A new catfish, *Hara koladynensis* from northeastern India (Siluriformes: Erethistidae). *Journal of Threatened Taxa,* 1, 466-470.

Applegate, S. P. (1965) Tooth terminology and variation in sharks with special reference to the sand shark, *Carcharias taurus*. *Contributions to Science,* 86, 1-18.

Aquino, A. E. & Miquelarena, A. M. (2001) Redescription of *Hypoptopoma inexspectata* (Holmberg,1883), with notes on its anatomy (Siluriformes: Loricariidae). *Physis,* 58, 1-18.

Aquino, A. E., Schaefer, S. A. & Miquelarena, A. M. (2001) A new species of *Hisonotus* (Siluriformes, Loricariidae) of the Upper Río Uruguay Basin. *American Museum Novitates*, 3333, 1-12.

Arai, R. (1969) *Bythites matsubarai*, a new brotulid fish from Japan. *Japanese Journal of Ichthyology,* 16, 74-77.

Armbruster, J. W. (1998) Phylogenetic relationships of the suckermouth armored catfishes of the *Rhinelepis* group (Loricariidae: Hypostominae). *Copeia,* 1998, 620-636.

Armbruster, J. W. (2002) *Hypancistrus inspector*: a new species of suckermouth armored catfish (Loricariidae: Ancistrinae). *Copeia,* 2002, 86-92.

Armbruster, J. W. (2004) *Pseudancistrus sidereus*, a new species from southern Venezuela (Siluriformes: Loricariidae) with a redescription of *Pseudancistrus*. *Zootaxa,* 628, 1-15.

Armbruster, J. W. (2005) The loricariid genus *Lasiancistrus* (Siluriformes) with descriptions of two new species. *Neotropical Ichthyology,* 3, 549-569.

Armbruster, J. W., Tansey, L. A. & Lujan, N. K. (2007) *Hypostomus rhantos* (Siluriformes: Loricariidae), a new species from southern Venezuela. *Zootaxa,* 1553, 59-68.

Armbruster, J. W. & Werneke, D. C. (2005) *Peckoltia cavatica*, a new loricariid catfish from Guyana and a redescription of *P. braueri* (Eigenmann 1912)(Siluriformes). *Zootaxa,* 882, 1-14.

Armesto, Á., Bañón, R., Durán, P. & Garabana, D. (2001) First record of *Chrionema chlorotaenia* (Perciformes, Percophidae) from the Southeastern Atlantic. *Cybium,* 25, 278-280.

Armesto, A., Bañón, R., Garabana, D. & Durán, P. (2003) First record of *Kentrocapros rosapinto* (Tetraodontiformes: Ostraciidae) from Vema Seamount (south-east Atlantic). *Journal of the Marine Biological Association of the UK,* 83, 779-780.

Arnold, R. J. & Pietsch, T. W. (2011) A new species of frogfish of the genus *Histiophryne* (Teleostei: Lophiiformes: Antennariidae) from Queensland, Australia. *Zootaxa,* 2925, 63-68.

Arratia F., G. (1987) Description of the primitive Diplomystidae (Siluriformes, Teleostei), Pisces): morphology, taxonomy and phylogenetic implications. *Bonner Zoologische Monographien,* 24, 5-120.

Arratia F., G., Augusto, C. G., Marque, S. M. & Guido, R. M. (1978) About *Bullockia* gen. nov., *Trichomycterus mendozensis* n. sp. and revision of the family Trichomycteridae (Pisces, Siluriformes). *Studies on Neotropical Fauna and Environment,* 13, 157-194.

Arratia, G. & Marque, S. M. (1984) New catfishes of the genus *Trichomycterus* from the High Andes of South America (Pisces, Siluriformes) with remarks on distribution and ecology. *Zool. Jb. Syst.,* 111, 493-520.

Ayres, W. O. (1859) [Descriptions of fishes.]. *Proceedings of the California Academy of Sciences,* 2, 25-32.

Ayres, W. O. (1860a) Description of fishes. *Proceedings of the California Academy of Sciences,* 2, 77-86.

Ayres, W. O. (1860b) [Descriptions of new species of fishes.]. *Proceedings of the California Academy of Sciences,* 2, 60-64.

Azzouz, K., Diatta, Y., Mansour, S., Boumaiza, M., Amor, B., Mourad, M., et al. (2011) First record of the West African goatfish, *Pseudupeneus prayensis* (Actinopterygii: Perciformes: Mullidae), off the Tunisian coast (central Mediterranean). *Acta Ichthyologica Et Piscatoria,* 41, 133-136.

Backhouse, G., Lyon, J. & Cant, B. (2008) Background and implementation information for the murray hardyhead *Craterocephalus fluviatilis* national recovery plan. Victorian Government Department of Sustainability and Environment (DSE), Melbourne, pp. 1-16.

Badcock, J. (1982) A new species of the deep-sea fish genus *Cyclothone* Goode & Bean (Stomiatoidei, Gonostomatidae) from the tropical Atlantic. *Journal of Fish Biology,* 20, 197-211.

Bailey, R. J. (1936) The osteology and relationships of the phallostethid fishes. *Journal of Morphology,* 59, 453-483.

Bailey, R. M. & Baskin, J. N. (1976) *Scoloplax dicra,* a new amored catfish from the Bolivian Amazon. *Occasional Papers of the Museum of Zoology, University of Michigan,* 674, 1-14.

Balanov, A. A., Antonenko, D. V. & Izmyatinskii, D. V. (2006) New records of rare fish species for Peter the Great Bay, Sea of Japan. *Russian Journal of Marine Biology,* 32, 255-258.

Balanov, A. A., Antonenko, D. V., Kalchugin, P. V. & Tok, K. (2009) The first occurrence of *Alectrias gallinus* (Lindberg, 1938) (fam. Stichaeidae) in the Sea of Japan. *Journal of Ichthyology,* 49, 435-440.

Balanov, A. A. & Markevich, A. I. (2011) First occurrence of *Carangoides equula* (Temminck et Schlegel, 1844) (Carangidae) in Russian waters. *Journal of Ichthyology,* 51, 666-669.

Baldwin, C. C. & Johnson, G. D. (1999) *Paxton concilians*: a new genus and species of pseudamine apogonid (Teleostei: Percoidei) from Northwestern Australia: the sister group of the enigmatic *Gymnapogon*. *Copeia,* 1999, 1050-1071.

Baldwin, C. C., Johnson, G. D. & Paxton, J. R. (1997) *Protoblepharon rosenblatti*, a new genus and species of flashlight fish (Beryciformes: Anomalopidae) from the tropical South Pacific, with comments on anomalopid phylogeny. *Proceedings of the Biological Society of Washington,* 110, 373-383.

Baldwin, C. C., Mounts, J. H., Smith, D. G. & Weigt, L. A. (2009) Genetic identification and color descriptions of early life-history stages of Belizean *Phaeoptyx* and *Astrapogon* (Teleostei: Apogonidae) with comments on identification of adult *Phaeoptyx*. *Zootaxa,* 2008, 1-22.

Balushkin, A. (2012) *Volodichthys* gen. nov. new species of the primitive snailfish (Liparidae: Scorpaeniformes) of the southern hemishpere. Description of new species *V. solovjevae* sp. nov. (Cooperation Sea, the Antarctic). *Journal of Ichthyology,* 52, 1-10.

Balushkin, A. & Prirodina, V. (2007) A new species of eel cods *Muraenolepis kuderski*i sp. nova (fam. Muraenolepididae) from South Georgia (the Scotia Sea). *Journal of Ichthyology,* 47, 683-690.

Balushkin, A. & Prirodina, V. (2010) A new species of Muraenolepididae (Gadiformes) *Muraenolepis evseenkoi* sp. nova from continental seas of Antarctica. *Journal of Ichthyology,* 50, 495-502.

Balushkin, A. & Voskoboinikova, O. (1990) A new cottiod family, Bathylutichthydae fam. n. (Cottoidei, Scorpaeniformes) for a deepsea fish *Bathylutichthyes taranetz*i gen. et sp. n. from South Georgia Island. *Journal of Ichthyology,* 30, 185-191.

Balushkin, A. V. & Prut'ko, V. G. (2006) On occurrences of *Chionobathyscus dewitti* (Notothenioidei Channichthyidae) in the Ross Sea. *Journal of Ichthyology,* 46, 271-273.

Bañón, R. (2001) New record of *Cataetyx laticeps* (Bythitidae) in Northwestern Atlantic. *Cybium,* 25, 93-94.

Bañón, R., Pietsch, T. W. & Piñeiro, C.-G. (2006) New record of *Linophryne coronata* (Lophiiformes, Linophrynidae) from the north-eastern Atlantic Ocean. *Cybium,* 30, 385-386.

Barlow, G. W. (1961) Gobies of the genus *Gillichthys*, with comments on the sensory canals as a taxonomic tool. *Copeia,* 1961, 423-437.

Barnhart, P. S. & Hubbs, C. L. (1946) *Pontinus vaughani*, a new scorpaenid fish from Baja California. *Bulletin of the Scripps Institution of Oceanography,* 5, 371-390.

Barraclough, W. E. (1959) The first record of a Northern blennioid fish, *Plectobranchus evides* Gilbert (family Stichaeidae), in British Columbia waters. *Journal of the Fisheries Board of Canada,* 16, 759-760.

Bath, H. (2002) Dentition of bleniid fishes in the subfamily Salariinae with premaxillaries and dentaries forming a complete shell (Pisces: Blenniidae). *Stuttgarter Beitrge zur Naturkunde,* 635, 1-17.

Bean, T. H. (1879) On the identity of *Euchalarodus putnami*, Gill, with *Pleuronectes glaber*,(Storer) Gill, with notes on the habits of the species. *Proceedings of the United States National Museum,* 2, 345-348.

Bean, T. H. (1890a) Description of a new cottoid fish. *The Annals and Magazine of Natural History,* 6, 118-121.

Bean, T. H. (1890b) New fishes collected off the coast of Alaska and the adjacent region southward. *Proceedings of the United States National Museum,* 13, 37-45.

Bean, T. H. (1890c) Scientific results of explorations by the US Fish Commission steamer Albatross. No, XI. New fishes collected off the coast of Alaska and the adjacent region southward. *Proceedings of the United States National Museum,* 13, 37-45.

Bean, T. H. (1894) Description of a new blennioid fish from California. *Proceedings of the United States National Museum,* 16, 699-701.

Béarez, P. (2001) Description of a new weakfish, *Cynoscion nortoni,* from Ecuador with a note on the distribution of *Umbrina bussingi* (Perciformes: Sciaenidae). *Revista de Biologia Tropical,* 49, 59-66.

Béarez, P. & Motomura, H. (2009) Description of a new scorpionfish (Scorpaenoidei, Sebastolobinae) from the tropical eastern Pacific. *Zootaxa,* 2277, 61-68.

Beebe, W. & Crane, J. (1936) Deep sea fishes of the Bermuda oceanographic expeditions. family Serrivomeridae. *Zoologica,* 20, 53-102.

Beebe, W. & Crane, J. (1937) Deep sea fishes of the bermuda oceanagraphic expedition. family Nemichthyidae. *Zoologica,* 20, 25-51.

Beebe, W. & Tee-Van, J. (1933) Nomenclatural notes on the shore fishes of Bermuda. *Zoologica, Scientific Contributions of the New York Zoological Society,* 13, 133-158.

Begle, D. P. (1989) Phylogenetic analysis of the cottid genus *Artedius* (Teleostei: Scorpaeniformes). *Copeia,* 1989, 642-652.

Begle, D. P. (1992) Monophyly and relationships of the argentinoid fishes. *Copeia,* 1992, 350-366.

Bellwood, D. R. (1994) A phylogenetic study of the parrotfishes family Scaridae (Pisces: Labroidei), with a revision of genera. *Records of the Australian Museum,* 20, 1-86.

Bellwood, D. R. & Choat, J. H. (1990) A functional analysis of grazing in parrotfishes (family Scaridae): the ecological implications. *Environmental Biology of Fishes,* 28, 189-214.

Bemis, W. E., Findeis, E. K. & Grande, L. (1997) An overview of Acipenseriformes. *Environmental Biology of Fishes,* 48, 25-71.

Bemis, W. E., Giuliano, A. & McGuire, B. (2005) Structure, attachment, replacement and growth of teeth in bluefish, *Pomatomus saltatrix* (Linnaeus, 1766), a teleost with deeply socketed teeth. *Zoology,* 108, 317-327.

Ben-Tuvia, A. (1956) Eels of the family Heterenchelidae. *Journal of Natural History (Series 12),* 9, 401-408.

Ben-Tuvia, A. (1993) A review of the Indo-West Pacific congrid fishes of genera *Rhynchoconger* and *Bathycongrus* with the description of three new species. *Israel Journal of Zoology,* 39, 349-370.

Bergot, C. (1975) Morphogenesis and structure of teleost teeth (*Salmo fario L.*). *Journal de Biologie Buccale,* 3, 301-324.

Berkovitz, B. K. B. (1977) The order of tooth development and eruption in the rainbow trout (*Salmo gairdneri*). *Journal of Experimental Zoology,* 201, 221-225.

Berkovitz, B. K. B. (1978) Tooth ontogeny in the upper jaw and tongue of the rainbow trout (*Salmo gairdneri*). *Journal de Biologie Buccale,* 6, 205-215.

Berkovitz, B. K. B. & Moore, M. H. (1974) A longitudinal study of replacement patterns of teeth on the lower jaw and tongue in the rainbow trout *Salmo gairdneri*. *Archives of Oral Biology,* 19, 1111-1119.

Berra, T. M. (2003) Nurseryfish, *Kurtus gulliveri* (Perciformes: Kurtidae), from Northern Australia: redescription, distribution, egg mass, and comparison with *K. indicus* from southeast Asia. *Ichthyological Exploration of Freshwaters,* 14, 295-306.

Berry, F. H. & Barrett, I. (1963) Gillraker analysis and speciation in the thread herring genus *Opisthonema*. *Inter-American Tropical Tuna Commission Bulletin,* 7, 110-190.

Bertaco, V. A. & Cardoso, A. R. (2005) A new species of *Microglanis* (Siluriformes: Pseudopimelodidae) from the rio Uruguay drainage, Brazil. *Neotropical Ichthyology,* 3, 61-67.

Bertaco, V. A. & Carvalho, F. R. (2010) New species of *Hasemania* (Characiformes: Characidae) from Central Brazil, with comments on the endemism of the upper Rio Tocantins basin, Goias State. *Neotropical Ichthyology,* 8, 27-32.

Bertelsen, E. (1958) The argentinoid fish *Xenophthalmichthys danae* Regan 1925. *Dana Report,* 45, 2-10.

Bertelsen, E., Krefft, G. & Marshall, N. B. (1976) The fishes of the family Notosudidae. *Dana Report,* 86, 1-114.

Bertelsen, E. & Nielsen, J. G. (1987) The deep sea eel family Monognathidae (Pisces, Anguilliformes). *Streenstrupia,* 13, 141-198.

Bertelsen, E. & Pietsch, T. W. (1996) Revision of the ceratioid anglerfish genus *Lasiognathus* (Lophiiformes: Thaumatichthyidae), with the description of a new species. *Copeia,* 1996, 401-409.

Bertelsen, E. & Pietsch, T. W. (1998) Revision of the deepsea anglerfish genus *Rhynchactis* Regan (Lophiiformes: Gigantactinidae), with descriptions of two new species. *Copeia,* 1998, 583-590.

Bertelsen, E. & Pietsch, T. W. (2002) New species of deep-sea anglerfish of the genus *Gigantactis* (Lophiiformes: Gigantactinidae) from the Western North Atlantic Ocean. *Copeia,* 2002, 958-961.

Bertelsen, E. & Struhsaker, P. J. (1977) The ceratoid fishes of the genus *Thaumatichthys*: osteology, relationships, distribution and biology. *Galathea Report,* 14, 7-40.

Betancur-R, R. & Acero, P. A. (2006) A new species of *Notarius* (Siluriformes: Ariidae) from the Colombian Pacific. *Zootaxa,* 1249, 47-59.

Bichuette, M. E., de Pinna, M. C. C. & Trajano, E. (2008) A new species of *Glaphyropoma*: the first subterranean copionodontine catfish and first occurende of opercular odontodes in the subfamily (Siluriformes: Trichomycteridae). *Neotropical Ichthyology,* 6, 301-306.

Bichuette, M. E. & Trajano, E. (2004) Three new subterranean species of *Ituglanis* from central Brazil (Siluriformes: Trichomycteridae. *Ichthyological Exploration of Freshwaters,* 15, 243-256.

Bichuette, M. E. & Trajano, E. (2005) A new cave species of *Rhamdia* (Siluriformes: Heptapteridae) from Serra do Ramalho, northeastern Brazil, with notes on ecology and behavior. *Neotropical Ichthyology,* 3, 587-595.

Birdsong, R. S. (1981) A review of the gobiid fish genus *Microgobius* Poey. *Bulletin of Marine Science,* 31, 267-306.

Birindelli, J. L. O., Fayal, D. F. & Wosiacki, W. B. (2011) Taxonomic revision of thorny catfish genus *Hassar* (Siluriformes: Doradidae). *Neotropical Ichthyology,* 9, 515-542.

Birindelli, J. L. O. & Zuanon, J. (2012) Systematics of the Jaguar catfish genus *Liosomadoras* Fowler, 1940 (Auchenipteridae: Siluriformes). *Neotropical Ichthyology,* 10, 1-11.

Blasina, G. E., Barbini, S. A. & Díaz de Astarloa, J. M. (2010) Trophic ecology of the black drum, *Pogonias cromis* (Sciaenidae), in Mar Chiquita coastal lagoon (Argentina). *Journal of Applied Ichthyology,* 26, 528-534.

Bockmann, F. A. & Miquelarena, A. M. (2008) Anatomy and phylogenetic relationships of a new catfish species from northeastern Argentina with comments on the phylogenetic relationships of the genus *Rhamdella* Eigenmann and Eigenmann 1888 (Siluriformes, Heptapteridae). *Zootaxa,* 1780, 1-54.

Boden, G., Teugels, G. G. & Hopkins, C. D. (1997) A systematic revision of the large-scaled *Marcusenius* with description of a new species from Cameroon (Teleostei; Osteoglossomorpha; Mormyridae). *Journal of Natural History,* 31, 1645-1682.

Boeseman, M. (1964) Notes on the fishes of Western New Guinea II. *Lophichthys boschmai*, a new genus and species from the Arafoera Sea. *Zoologische Mededelingen,* 39, 12-18.

Böhlke, E. B. (1997) Notes on the identity of elongate unpatterned Indo-Pacific morays, with description of a new species (Muraenidae, Subfamily Muraninae). *Proceedings of the Academy of Natural Sciences of Philadelphia,* 147, 89-109.

Böhlke, E. B. & McCosker, J. E. (1982) *Monopenchelys*, a new eel genus, and redescription of the type species, *Uropterygius acutus* Parr (Pisces: Muraenidae). *Proceedings of the Academy of Natural Sciences of Philadelphia,* 134, 127-134.

Böhlke, E. B. & McCosker, J. E. (1997) Review of the moray eel genus *Scuticaria* and included species (Pisces: Anguilliformes: Muraenidae: Uropterygiinae). *Proceedings of the Academy of Natural Sciences of Philadelphia,* 148, 171-176.

Böhlke, E. B. & Randall, J. E. (2000) A review of the moray eels (Angulliformes: Muraenidae) of the Hawaiian Islands, with descriptions of two new species. *Proceedings of the Academy of Natural Sciences of Philadelphia,* 150, 203-278.

Böhlke, E. B. & Smith, D. G. (2002) Type catalogue of Indo-Pacific Muraenidae. *Proceedings of the Academy of Natural Sciences of Philadelphia,* 152, 89-172.

Böhlke, J. (1951) A new Pacific saury (genus *Cololabis*) from off the coast of Peru. *Transactions of the Kansas Academy of Science (1903-),* 54, 83-87.

Böhlke, J. (1956) A synopsis of the eels of the family Xenocongridae (including the Chlopsidae and Chilorhinidae). *Proceedings of the Academy of Natural Sciences of Philadelphia,* 108, 61-95.

Böhlke, J. (1957) A review of the blenny genus *Chaenopsis*, and the description of a related new genus from the Bahamas. *Proceedings of the Academy of Natural Sciences of Philadelphia,* 109, 81-103.

Böhlke, J. E. (1960) A new ophichthid eel of the genus *Pseudomyrophis* from the Gulf of Mexico. *Notulae Naturae (Philadelphia),* 329, 1-8.

Böhlke, J. E. (1980) *Gelanoglanis stroudi*: A new catfish from the Rio Meta system in Colombia (Siluriformes, Doradidae, Auchenipterinae). *Proceedings of the Academy of Natural Sciences of Philadelphia,* 132, 150-155.

Böhlke, J. E. & Böhlke, E. B. (1975) The chestnut moray, *Enchelycore carychroa*, a new species from the West Atlantic. *Proceedings of the Academy of Natural Sciences of Philadelphia,* 127, 137-146.

Böhlke, J. E. & Böhlke, E. B. (1980) *Enchelycore kamara*: a new moray from the tropical Pacific Ocean. *Proceedings of the Academy of Natural Sciences of Philadelphia,* 132, 173-175.

Bohlke, J. E. & Caldwell, D. K. (1961) On the occurrence of the dactyloscopid fish genus *Dactylagnus* in the West Atlantic. *Bulletin of Marine Science,* 11, 537-542.

Böhlke, J. E. & Hubbs, C. L. (1951) *Dysommina rugosa*, an apodal fish from the North Atlantic, representing a distinct family. *Stanford Ichthyological Bulletin,* 4, 7-10.

Böhlke, J. E. & McCosker, J. E. (1975) The status of the ophichthid eel genera *Caecula* Vahl and *Sphagebranchus* Bloch, and the description of a new genus and species from fresh waters in Brazil. *Proceedings of the Academy of Natural Sciences of Philadelphia,* 127, 1-11.

Böhlke, J. E. & Robins, C. H. (1974) Description of a new genus and species of clinid fish from the Western Caribbean, with comments on the families of the Blennioidea. *Proceedings of the Academy of Natural Sciences of Philadelphia,* 126, 1-8.

Böhlke, J. E. & Robins, C. R. (1960) Western Atlantic gobioid fishes of the genus *Lythrypnus*, with notes on *Quisquilius hipoliti* and *Garmannia pallens*. *Proceedings of the Academy of Natural Sciences of Philadelphia,* 112, 73-101.

Böhlke, J. E. & Robins, C. R. (1969) Western Atlantic sponge-dwelling gobies of the genus *Evermannichthys*: their taxonomy, habits and relationships. *Proceedings of the Academy of Natural Sciences of Philadelphia,* 121, 1-24.

Böhlke, J. E. & Smith, D. G. (1967) A new xenocongrid eel from the Western Indian and Western Atlantic oceans. *Notulae Naturae (Philadelphia),* 408, 1-6.

Böhlke, J. E. & Smith, D. G. (1968) A new xenocongrid eel from the Bahamas, with notes on other species in the family. *Proceedings of the Academy of Natural Sciences of Philadelphia,* 120, 25-43.

Böhlke, J. E. & Springer, V. G. (1975) A new genus and species of fish (*Nemaclinus atelestos*) from the Western Atlantic (Perciformes: Clinidae). *Proceedings of the Academy of Natural Sciences of Philadelphia,* 127, 57-61.

Bolin, R. L. (1936) A revision of the genus *Icelinus* Jordan. *Copeia,* 1936, 151-159.

Bolin, R. L. (1939) A new stomiatoid fish from California. *Copeia,* 1939, 39-41.

Boltachev, A. R., Vasil'eva, E. D. & Danilyuk, O. N. (2007) The first finding of the striped tripletooth goby *Tridentiger trigonocephalus* (Perciformes, Gobiidae) in the Black Sea (the estuary of the Chernaya River, Sevastopol Bay). *Journal of Ichthyology,* 47, 802-805.

Booke, H. E. (1974) A cytotaxonomic study of the round whitefishes, genus *Prosopium*. *Copeia,* 1974, 115-119.

Bordulina, O. D. (1984) Identification of the remains of predators. Report III. The structure of jaws of common stomiatoid fishes of the families Gonostomatidae, Sternoptychidae and Photichthyidae. *Journal of Ichthyology,* 24, 103-111.

Borets, L. A. (1983) A new species of flounder, *Microstomus shuntovi* sp. n. (Pleuronectidae), and two rare flounder species (Bothidae) from seamounts of the Northwestern and Hawaiian Ridges. *Journal of Ichthyology,* 23, 1-6.

Bornbusch, A. H. (1988) Gill raker morphologies of anchovies (Teleostei: Engraulidae) from the Río Orinoco, Venezuela. *Copeia,* 1988, 174-182.

Bornbusch, A. H. & Lundberg, J. G. (1989) A new species of *Hemisilurus* (Siluriformes, Siluridae) from the Mekong River, with comments on its relationships and historical biogeography. *Copeia,* 1989, 434-444.

Borodin, N. (1934) *Netuma hassleriana*, a new catfish from Panama. *Copeia,* 1934, 33-34.

Boulenger, G. A. (1890) Description of a new species of *Mormyrus*. *The Annals and Magazine of Natural History,* 6, 193.

Boulenger, G. A. (1897) Descriptions of new fishes from the upper Congo.--II. *The Annals and Magazine of Natural History (Series 6),* 20, 422-427.

Boulenger, G. A. (1898a) On a collection of fishes from the Rio Jurua, Brazil. *Transactions of the Zoological Society of London,* 14, 421-428.

Boulenger, G. A. (1898b) Report on the fishes recently obtained by Mr. J. E. S. Moore in Lake Tanganyika. *Proceedings of the Zoological Society of London,* 1889, 494-497.

Boulenger, G. A. (1899) Description of a new genus of perciform fishes from the Cape of Good Hope. *Annals of the South African Museum,* 1, 379-380.

Boulenger, G. A. (1902a) Description of a new characinid fish discovered by Dr. W. J. Ansorge in southern Nigeria. *The Annals and Magazine of Natural History (Series 7),* 9, 144-145.

Boulenger, G. A. (1902b) Pisces. *Report on the collections of natural history made in the Antarctic regions during the voyage of the "Southern Cross."* 5, 174-189.

Boulenger, G. A. (1909a) *Catalogue of the fresh-water fishes of Africa in the British Museum (Natural History).* (Vol. 1), 158-159 pp.

Boulenger, G. A. (1909b) Descriptions of new freshwater fishes discovered by Mr. G. L. Bates in South Cameroon. *The Annals and Magazine of Natural History (Series 8),* 4, 186-188.

Bowers, N. J. & Stauffer Jr., J. R. (1993) New species of rock-dwelling cichlid (Pisces: Cichlidae) from Lake Malaŵi, Africa, with comments on *Melanochromis vermivorus* Trewavas. *Copeia,* 1993, 715-722.

Bradbury, M. G. (1967) The genera of batfishes (family Ogcocephalidae). *Copeia,* 1967, 399-422.

Bradbury, M. G. (1980) A revision of the fish genus *Ogcocephalus* with descriptions of new species from the western Atlantic Ocean (Ogcocephalidae; Lophiiformes). *Proceedings of the California Academy of Sciences,* 42, 229-285.

Bradbury, M. G. (1999) A review of the fish genus *Dibranchus* with descriptions of new species and a new genus, *Solocisquama* (Lophiiformes, Ogcocephalidae). *Proceedings of the California Academy of Sciences,* 51, 259-310.

Breder, C. M. & Nichols, J. T. (1930) West Indian forms of the flying fish, genus *Cypselurus*: with the description of a new species. *American Museum Novitates,* 417, 1-9.

Brevoort, J. C. (1852) Description of the *Selene argentea* of Lacépède, a fish whose existence has been doubted. *Annals of The Lyceum of Natural History of New York,* 5, 68-76.

Briggs, J. C. (1957) A new genus and two new species of Eastern Atlantic clingfishes. *Copeia,* 1957, 204-208.

Briggs, J. C. (1969a) The clingfishes (Gobiesocidae) of Panama. *Copeia,* 1969, 774-778.

Briggs, J. C. (1969b) A new species of *Lepadichthys* (Gobiesocidae) from the Seychelles, Indian Ocean. *Copeia,* 1969, 464-466.

Briggs, J. C. (1993) New genus and species of clingfish (Gobiesocidae) from Southern Australia. *Copeia,* 1993, 196-199.

Briggs, J. C. & Miller, R. R. (1960) Two new freshwater clingfishes of the genus *Gobiesox* from Southern Mexico. *Occasional Papers of the Museum of Zoology, University of Michigan,* 616, 1-11.

Briggs, J. C. & Schaefer, S. A. (2002) New species of *Rimicola* from California. *Copeia,* 2002, 441-444.

Brito, A. (1989) *Nettenchelys dionisi,* a new species of nettastomatid eel (Pisces: Anguilliformes) from the Canary Islands. *Copeia,* 1989, 876-880.

Britski, H. A. & Akama, A. (2011) New species of *Trachycorystes* Bleeker, with comments on other species of the genus (Ostariophysi: Siluriformes: Auchenipteridae). *Neotropical Ichthyology,* 9, 273-279.

Britz, R. (2010) A new earthworm eel of the genus *Chaudhuria* from the Ayeyarwaddy River Drainage, Myanmar (Teleostei: Synbranchiformes: Chaudhuriidae). *Zootaxa,* 2571, 62-68.

Britz, R., Conway, K. W. & Rüber, L. (2009) Spectacular morphological novelty in a minature cyprinid fish, *Danionella dracula* n. sp. *Proceedings of the Royal Society,* 276, 2179-2186.

Britz, R. & Johnson, G. D. (2002) “Paradox lost”: skeletal ontogeny of *Indostomus paradoxus* and its significance for the phylogenetic relationships of Indostomidae (Teleostei, Gasterosteiformes). *American Museum Novitates,* 3383, 1-43.

Britz, R. & Kottelat, M. (1999) *Sundasalanx mekongensis*, a new species of clupeiform fish from the Mekong basin (Teleostei: Sundasalangidae). *Ichthyological Exploration of Freshwaters,* 10, 337-344.

Britz, R. & Moritz, T. (2007) Reinvestigation of the osteology of the miniature African freshwater fishes *Cromeria* and *Grasseichthys* (Teleostei, Gonorynchiformes, Kneriidae), with comments on kneriid relationships. *Zoosystematics and Evolution,* 83, 3-42.

Brook, A. H., Jernvall, J., Smith, R. N., Hughes, T. E. & Townsend, G. C. (2014) The dentition: the outcomes of morphogenesis leading to variations of tooth number, size and shape. *Australian Dental Journal,* 59, 131-142.

Bruwer, E. & van der Bank, F. (2003) A morphological key for the identification of southern African *Synodontis* species Cuvier, 1816 (Teleostei: Mochokidae). *African Journal of Aquatic Science,* 28, 183 - 186.

Bucke, D. (1971) The anatomy and histology of the alimentary tract of the carnivorous fish the pike *Esox lucius*. *Journal of Fish Biology,* 3, 421-431.

Buckup, P. A. (1988) The genus *Heptapterus* (Teleostei, Pimelodidae) in Southern Brazil and Uruguay, with the description of a new species. *Copeia,* 1988, 641-653.

Buckup, P. A. (1993) Review of the characidiin fishes (Teleostei: Characiformes), with descriptions of four new genera and ten new species. *Ichthyological Exploration of Freshwaters,* 4, 97-154

Burton, E. (1835) A specimen was exhibited of a species of *Monacanthus*, Cuv., remarkable for having on each side of the body, about midway between the pectoral and caudal fins, a bundle of long and strong spines directed backwards [*Monacanthus histrix* n. sp.]. *Proceedings of the Zoological Society of London,* 1834, 121-122.

Bussing, W. A. (1988) A new fish, *Brachyrhaphis roseni* (Poeciliidae) from Costa Rica and Panama. *Revista de Biologia Tropical,* 36, 81-87.

Bussing, W. A. (1996) *Sicydium adelum*, a new species of gobiid fish (Pisces: Gobiidae) from Atlantic slope streams of Costa Rica. *Revista de Biologia Tropical,* 44, 819-825.

Bussing, W. A. (2001) *Ptereleotris carinata*, a new species of hovering goby (Perciformes: Microdesmidae) from the tropical eastern Pacific. *Revista de Biologia Tropical,* 49, 133-140.

Bussing, W. A. & Bussing, M. I. B. (1966) Antarctic Scopelarchidae: a new fish of the genus *Benthalbella* and the distribution of *B. elongata* (Norman). *Bulletin of the Southern California Academy of Sciences,* 65, 53-61.

Butler, J. L. & Ahlstrom, E. H. (1976) Review of the deep-sea fish genus *Scopelengys* (Neoscopelidae) with a description of a new species, *Scopelengys clarkei*, from the central Pacific. *Fishery Bulletin,* 74, 142-150.

Butler, P. (1978) The ontogeny of mammalian heterodonty. *Journal de Biologie buccale,* 6, 217.

Byrkjedal, I., Poulsen, J. Y. & Galbraith, J. (2011) *Leptoderma macrophthallmum* n. sp., a new species of smooth-head (Otocephala: Alepocephalidae) from Mid Atlantic Ridge. *Zootaxa,* 2876, 49-56.

Cabuy, E., Adriaens, D., Verraes, W. & Teugels, G. G. (1999) Comparative study on the cranial morphology of *Gymnallabes typus* (Siluriformes: Clariidae) and their less anguilliform relatives, *Clariallabes melas* and *Clarias gariepinus*. *Journal of Morphology,* 240, 169-194.

Cailliet, G. M. & Ebeling, A. W. (1990) The vertical distribution and feeding habits of two common midwater fishes (*Leuroglossuss stilbius* and *Stenobrachius leucopsarus*) off Santa Barbara. *California Cooperative Oceanic Fisheries Investigation Report,* 31, 106-123.

Caldecutt, W. J., Bell, M. A., Buckland-Nicks, J. A. & McEachran, J. D. (2001) Sexual dimorphism and geographic variation in dentition of threespine stickleback, *Gasterosteus aculeatus*. *Copeia,* 2001, 936-944.

Caldwell, D. K. (1958) A new fish of the genus *Ophioscion*, family Sciaenidae, from Caribbean Costa Rica. *Quarterly Journal of the Florida Academy of Sciences,* 21, 117.

Calhaem, I. & Christoffel, D. A. (1969) Some observations of the feeding habits of a Weddell seal, and measurements of its prey, *Dissostichus mawsoni*, at McMurdo Sound, Antarctica. *New Zealand Journal of Marine and Freshwater Research,* 3, 181-190.

Cambray, J. A. (1996) Threatened fishes of the world: *Sandelia bainsii* castelnau, 1861 (Anabantidae). *Environmental Biology of Fishes,* 45, 150-150.

Campos-da-Paz, R. (1995) Revision of the South American freshwater fish genus *Sternarchorhamphus* Eigenmann, 1905 (Ostariophysi: Gymnotiformes: Apteronotidae), with notes on its relationships. *Proceedings of the Biological Society of Washington,* 108, 29-44.

Campos-da-Paz, R. (1999) New species of *Megadontognathus* from the Amazon Basin, with phylogenetic and taxonomic discussions on the genus (Gymnotiformes: Apteronotidae). *Copeia,* 1999, 1041-1049.

Campos-da-Paz, R. (2005) Previously undescribed dental arrangement among electric knifefishes, with comments on the taxonomic and conservation status of *Tembeassua marauna* Triques (Otophysi: Gymnotiformes: Apteronodontidae). *Neotropical Ichthyology,* 3, 395-400.

Cardoso, A. R. & Pezzi da Silva, J. F. (2004) Two new species of the genus *Hemiancistrus* Bleeker (Teleostei: Siluriformes: Loricariidae) from the upper rio Uruguai basin. *Neotropical Ichthyology,* 2, 1-8.

Carlson, B. A., Randall, J. E. & Dawson, M. N. (2008) A new species of *Epibulus* (Perciformes: Labridae) from the West Pacific. *Copeia,* 2008, 476-483.

Carpenter, K. E. (1985) Kuhliidae. *In:* K. E. Carpenter & V. H. Niem (Eds), *Species identification guide for fishery purposes. The living marine resources of the western central Pacific. Bony fishes part 3 (Menidae to Pomacentridae)*. FAO, Rome, pp. 3317-3320.

Carpenter, K. E. (1990) A phylogenetic analysis of the Caesionidae (Perciformes: Lutjanoidea). *Copeia,* 1990, 692-717.

Carpenter, K. E. (2002a) Lethirinidae. *In:* K. E. Carpenter (Ed), *The living marine resources of the Western Central Atlantic. Volume 3: Bony fishes part 2 (Opistognathidae to Molidae). FAO species identification guide for fishery purposes and American Society of Ichthyologist and Herpetologists Special Publication No. 5.* FAO, Rome, pp 1550 -1545.

Carpenter, K. E. (2002b) Sparidae. *In:* K. E. Carpenter (Ed), *The living marine resources of the Western Central Atlantic. Volume 3: Bony fishes part 2 (Opistognathidae to Molidae). FAO species identification guide for fishery purposes and American Society of Ichthyologist and Herpetologists Special Publication No. 5.* FAO, Rome, pp. 1554-1568.

Carpenter, K. E. & Allen, G. R. (1989) Emperor fishes and large-eye breams of the world (family Lethrinidae). An annotated and illustrated catalogue of lethrinid species known to date. *FAO Fisheries Synopsis. No. 125,* 9, 1-118.

Carter, H. J. & Cohen, D. M. (1985) *Monomitopus magnus*, a new species of deep-sea fish (Ophidiidae) from the Western North Atlantic. *Bulletin of Marine Science,* 36, 86-95.

Carter, H. J. & Sulak, K. J. (1984) A new species and and review of the deep-sea fish genus *Porogadus* (Ophidiidae) from the Western North Atlantic. *Bulletin of Marine Science,* 34, 358-379.

Caruso, J. H. (1989) Systematics and distribution of the Atlantic chaunacid anglerfishes (Pisces: Lophiiformes). *Copeia,* 1989, 153-165.

Caruso, J. H. & Bullis, H. R. (1976) A review of the lophiid angler fish genus *Sladenia* with a description of a new species from the Caribbean Sea. *Bulletin of Marine Science,* 26, 59-64.

Carvalho, T. P. & Albert, J. S. (2011) Redescription and phylogenetic position of the enigmatic neotropical electric fish *Iracema caiana* Triques (Gymnotiformes: Rhamphichthyidae) using x-ray computed tomography. *Neotropical Ichthyology,* 9, 457-469.

Carvalho-Filho, A., Marcovaldi, G., Sampaio, C. L. S., Paiva, M. I. G. & Duarte, L. A. (2010) First report of *Aulopus* (Teleostei: Aulopidae) from Southwestern Atlantic, with a review of records and a key to Western Atlantic Aulopoidei species. *Zootaxa,* 2628, 27-42.

Carvalho-Filo, A., Marcovaldi, G. & Sampaio, C. L. S. (2010) Two new records of uncommon deep-sea perciform fishes from the Southwestern Atlantic. *Zootaxa,* 2694, 59-68.

Casciotta, J. R. & Arratia, G. (1993) Jaws and teeth of American cichlids (Pisces: Labroidei). *Journal of Morphology,* 217, 1-36.

Castillo-Rivera, B. M., Kobelkowsky, A. & Chávez, A. M. (2000) Feeding biology of the flatfish *Citharichthys spilopterus* (Bothidae) in a tropical estuary of Mexico. *Journal of Applied Ichthyology,* 16, 73-78.

Castle, P. H. J. (1972) The eel genus *Benthenchelys* (fam. Ophichthidae) in the Indo-Pacific. *Dana Report,* 82, 1-33.

Castle, P. H. J. (1988) Two new species of the previously monotypic congrid eel genera *Poeciloconger* and *Macrocephenchelys* from Eastern Australia. *Records of the Australian Museum,* 42, 119.

Castle, P. H. J. & Bearez, P. (1995) Two new species of *Myroconger* (Anguilliformes, Myrocongridae) from the Pacific Ocean. *Cybium,* 19, 211-222.

Castle, P. H. J. & Paxton, J. R. (1984) A new genus and species of luminescent eel (Pisces: Congridae) from the Arafura Sea, Northern Australia. *Copeia,* 1984, 72-81.

Castle, P. H. J. & Randall, J. E. (1999) Revision of Indo Pacific garden eels (Congridae: Heterocongridae), with desccriptions of five new species. *Indo-Pacific Fishes,* 30, 1-52.

Castle, P. H. J. & Smith, D. G. (1999) A reassessment of the eels of the genus *Bathycongrus* in the Indo-west Pacific. *Journal of Fish Biology,* 54, 973-995.

Castro, R. M. C. & Vari, R. P. (2004) Detritivores of South American fish family Prochilodontidae (Teleostei: Ostariophysi: Characiformes): A phylognetic and revisionary study. *Smithsonian Contributions to Zoology,* 622, 1-189.

Castro, R. M. C., Vari, R. P., Vieira, F., Oliveira, C. & Armbruster, J. W. (2004) Phylogenetic analysis and redescription of the genus *Henochilus* (Characiformes: Characidae). *Copeia,* 2004, 496-506.

Castro-Aguirre, J. L., Ruiz-Campos, G. & Balart, E. F. (2002) A new species of the genus *Lile* (Clupeiformes: Clupeidae) of the Eastern tropical Pacific. *Bulletin of the Southern California Academy of Sciences,* 101, 1-12.

Chakrabarty, P., Oldfield, R. G. & Ng, H. H. (2006) *Nandus prolixus*, a new species of leaf fish from northeastern Borneo (Teleostei: Perciformes: Nandidae). *Zootaxa,* 1328, 51-61.

Chambers, J. (1984) A new *Nothobranchius* species (Teleosti, Cyprinodontiformes, Aplocheilidae) from the Sudan. *Journal of Fish Biology,* 25, 505-513.

Chan, W. (1967) A new species of congrid eel from the South China Sea. *Journal of Natural History,* 1, 97-112.

Chan, W. L. (1966) *Oxymetopon compressus,* a new eleotrid fish from Hong Kong. *Japanese Journal of Ichíhyoiogy,* 4, 1-3.

Chao, L. N. & Miller, R. V. (1975) Two new species of sciaenid fishes (Tribe: Sciaenini) from the Caribbean Sea and adjacent waters. *Bulletin of Marine Science,* 25, 259-271.

Chao, N. L., Béarez, P. & Robertson, D. R. (2001) A new genus and new species of Sciaenidae from the Gulf of Panama (Perciformes: Sciaenidae). *Revista de Biologia Tropical,* 49, 81-88.

Chapleau, F., Renaud, C. & Kailola, P. (1991) *Paraplagusia longirostris*, a new flatfish (Cynoglossidae) from Australia and Papua New Guinea. *Japanese Journal of Ichthyology,* 38, 239-244.

Chapman, W. M. (1942a) The osteology and relationships of the Argentinidae, a family of oceanic fishes. *Journal of the Washington Academy of Science,* 32, 104-117.

Chapman, W. M. (1942b) The osteology and relationships of the bathypelagic fish *Macropinna microstoma*, with notes on its visceral anatomy. *The Annals and Magazine of Natural History (Series 11),* 9, 272-304.

Chapman, W. M. (1943) The osteology of the Pacific saury, *Cololabis saira*. *Copeia,* 1943, 171-182.

Chapman, W. M. (1944) The osteology of the Pacific deep-bodied anchovy, *Anchoa compressa*. *Journal of Morphology,* 74, 311-329.

Chapman, W. M. (1948) The osteology and relationships of the Microstomidae, a family of oceanic fishes. *Proceedings of the California Academy of Sciences,* 26, 1-22.

Chen, H.-M. & Shao, K.-T. (1995) New eel genus, *Cirrimaxilla*, and description of the type species, *Cirrimaxilla formosa* (Pisces: Muraenidae) from Southern Taiwan. *Bulletin of Marine Science,* 57, 328-332.

Chen, I.-S. & Shao, K.-T. (1996) A taxonomic review of the gobiid fish genus *Rhinogobius* Gill, 1859, from Taiwan, with descriptions of three new species. *Zoological Studies,* 35, 200-214.

Chen, J.-P., Ho, H.-C. & Shao, K.-T. (2007) A new lizardfish (Aulopiformes: Synodontidae) from Taiwan with descriptions of three new records. *Zoological Studies,* 46, 148-154.

Chen, J.-P. & Shao, K.-T. (1993) New species of cardinalfish, *Archamia goni* (Pisces: Apogonidae), from Taiwan. *Copeia,* 1993, 781-784.

Chen, M. H. & Shao, K. T. (1988) Fish of Triglidae (Scorpaenoidei) from Taiwan. *Journal of Taiwan Museum,* 41, 127-138.

Chen, X.-Y., Ferraris, C. J., Yang, J.-X. & Buth, D. (2005) A new species of catfish of the genus *Clupisoma* (Siluriformes: Schilbidae) from the Salween River, Yunnan, China. *Copeia,* 2005, 566-570.

Chen, Y.-Y. & Mok, H.-K. (2001) A new synaphobranchid eel, *Dysomma longirostrum* (Anguilliformes: Synaphobranchidae), from the Northern coast of Taiwan. *Zoological Studies,* 40, 79-83.

Cheng, J.-L., Ishihara, H. & Zhang, E. (2008) *Pseudobagrus brachyrhabdion*, a new catfish (Teleostei: Bagridae) from the middle Yangtze River drainage, South China. *Ichthyological Research,* 55, 112-123.

Chereshnev, I. A., Shestakov, A. V. & Frolov, S. V. (2001) On the systematics of species of the genus *Hypomesus* (Osmeridae) of Peter the Great Bay, Sea of Japan. *Russian Journal of Marine Biology,* 27, 296-302.

Chereshnev, I. A. & Skopets, M. B. (1990) *Salvethymus svetovidovi* gen. et sp. nova-a new endemic fish of the subfamily Salmoninae from Lake El'gygytgyn (Central Chukotka). *Journal of Ichthyology,* 30, 87-103.

Chernoff, B. (1986) Systematics of American atherinid fishes of the genus *Atherinella*. I. the subgenus *Atherinella*. *Proceedings of the Academy of Natural Sciences of Philadelphia,* 138, 86-188.

Chinsembu, K. C. (2012) Teeth are bones: signature genes and molecules that underwrite odontogenesis. *Journal of Medical Genetics and Genomics,* 4, 13-24.

Chirichigno, N. (1987) *Medialuna ancietae* nov. sp. Un pez nuevo del mar peruano. *Biologia Lima,* 51, 89-95.

Christiansen, N., Kemp, A. & Tibbetts, I. (2010) Are the oral teeth of combtooth bennies (Salariini: Teleostei) merely combs? *Environmental Biology of Fishes,* 87, 205-216.

Chyi-Yeong, J. (1957) Studies on the skeleton of *Muraenesox cinerevs* (Forskal). *Acta Zoologica*, 110-119.

Ciardelli, A. (1967) The anatomy of the feeding mechanism and the food habits of *Microspathodon chrysurus* (Pisces: Pomacentridae). *Bulletin of Marine Science,* 17, 845-883.

Çiçek, E. & Bilecenoglu, M. (2009) A new alien fish in the Mediterranean Sea: *Champsodon nudivittis* (Actinopterygii: Perciformes: Champsodontidae). *Acta Ichthyologica Et Piscatoria,* 39, 67-69.

Ciotek, L., Giorgis, P., Casciotta, J. & Almirón, A. (2008) Presence of *Pterobunocephalus depressus* (Haseman, 1911) (Siluriformes, Aspredinidae) in freshwaters of Argentina. *Ichthyological Contributions of Peces Criollos,* 9, 1-4.

Claeson, K. M., Bemis, W. E. & Hagadorn, J. W. (2007) New interpretations of the skull of a primitive bony fish *Erpetoichthys calabaricus* (Actinopterygii: Cladistia). *Journal of Morphology,* 268, 1021-1039.

Claeson, K. M., Hagadorn, J. W., Luckenbill, K. & Lundberg, J. G. (2008) Anatomy of the very tiny: first description of the head skeleton of the rare South American catfish *Sarcoglanis simplex* (Siluriformes: Trichomycteridae). *Palaeontologia Electronica,* 11, 1-11.

Clark, E. & Pohle, M. (1996) *Trichonotus halstead*, a new sand-diving fish from Papua New Guinea. *Environmental Biology of Fishes,* 45, 1-11.

Clark, H. W. (1937) New fishes from the Templeton Crocker Expedition of 1934-35. *Copeia,* 1937, 88-91.

Claudino, M. C., Corrêa, F., Bastos, R. F. & Garcia, A. M. (2010) Pisces, gymnotiformes, Hypopomidae, *Brachyhypopomus draco* (Giora, Malabarba and Crampton, 2008): new species record at Lagoa do Peixe National Park, state of Rio Grande do Sul, Brazil. *Check List,* 6, 358-359.

Clemen, G., Bartsch, P. & Wacker, K. (1998) Dentition and dentigerous bones in juveniles and adults of *Polypterus senegalus*. *Annals of Anatomy - Anatomischer Anzeiger,* 180, 211-221.

Clemen, G., Wanninger, A.C. & Greven, H. (1997) The development of the dentigerous bones and teeth in the hemiramphid fish *Dermogenys pusillus* (Atheriniformes, Teleostei). *Annals of Anatomy,* 179, 165-174.

Coad, B. W. (1982) A new genus and species of cichlid endemic to Southern Iran. *Copeia,* 1982, 28-37.

Coad, B. W. (1987) The scaleless dragonfish, *Melanostomias valdiviae*, Brauer, 1902, new to the fish fauna of Atlantic Canada. *Proceedings of the Nova Scotian Institute of Science,* 37, 89-91.

Cohen, D. M. (1956) *Neonesthes gnathoprora*, a new species of astronesthid fish from the Atlantic Ocean. *Zoologica: Scientific Contributions of the New York Zoological Society,* 41, 81-83.

Cohen, D. M. (1958) *Bathylychnops exilis*, a new genus and species of argentinoid fish from the North Pacific. *Stanford Ichthyological Bulletin,* 7, 47-52.

Cohen, D. M. (1979) Notes on the morid fish genera *Lotella* and *Physiculus* in Japanese waters. *Japanese Journal of Ichthyology,* 26, 225-230.

Cohen, D. M. (1981) *Saccogaster melanomycter* (Ophidiiformes: Bythitidae), a new fish species from the Caribbean. *Proceedings of the Biological Society of Washington,* 94, 374-377.

Cohen, D. M., Inada.T., Iwamoto, T. & Scialabba, N. (1990) *Vol. 10. Gadiform fishes of the world (Order Gadiformes). An annotated and illustrated catalogue of cods, hakes, grenadiers and other gadiform fishes known to date. FAO Fisheries Synopsis. No. 125*. United Nations Development Progamme Food and Agriculture Organization of the United States, Rome, 442 pp.

Cohen, D. M. & Rohr, B. A. (1993) Description of a giant circumglobal *Lamprogrammus* species (Pisces: Ophidiidae). *Copeia,* 1993, 470-475.

Cohen, D. M. & Russo, J. L. (1979) Variation in the fourbeard rockling, *Enchelyopus cimbrius*, a North Atlantic gadid fish, with comments on the genera of rocklings. *United States National Marine Fisheries Service Fishery Bulletin,* 77, 91-104.

Colin, P. L., Arneson, D. W. & Smith-Vaniz, W. F. (1979) Rediscovery and redescription of the Caribbean anomalopid fish *Kryptophanaron alfredi* Silvester and Fowler (Pisces: Anomalopidae). *Bulletin of Marine Science,* 29, 312-319.

Collette, B. B. (1962) *Astroblepus pholeter*, a new species of cave-dwelling catfish from eastern Ecuador. *Proceedings of the Biological Society of Washington,* 75, 311-314.

Collette, B. B. (1963) The subfamilies, tribes, and genera of the Percidae (Teleostei). *Copeia,* 1963, 615-623.

Collette, B. B. (1983) Two new species of coral toadfishes, family Batrachoididae, genus *Sanopus*, from Yucatan, Mexico, and Belize. *Proceedings of the Biological Society of Washington,* 96, 719-724.

Collette, B. B. & Aadland, C. R. (1996) Revision of the frigate tunas (Scombridae, *Auxis*), with descriptions of two new subspecies from the eastern Pacific. *Fishery Bulletin,* 94, 423-441.

Collette, B. B. & Chao, L. N. (1975) Systematics and morphology of the bonitos (*Sarda*) and their relatives (Scombridae, Sardini). *United States National Marine Fisheries Service Fishery Bulletin,* 73, 516-625.

Collette, B. B. & Gillis, G. B. (1992) Morphology, systematics, and biology of the double-lined mackerels (*Grammatorcynus*, Scombridae). *Fishery Bulletin,* 90, 13-53.

Collette, B. B. & Russo, J. L. (1981) A revision of the scaly toadfishes, genus *Batrachoides*, with descriptions of two new species from the Eastern Pacific. *Bulletin of Marine Science,* 31, 197-233.

Collette, B. B. & Su, J. (1986) The halfbeaks (Pisces, Beloniformes, Hemiramphidae) of the far east. *Proceedings of the Academy of Natural Sciences of Philadelphia,* 138, 250-302.

Collie, J. S. (1987) Food selection by yellowtail flounder (*Limanda ferruginea*) on Georges Bank. *Canadian Journal of Fisheries and Aquatic Sciences,* 44, 357-367.

Conrad, G. M. & Roman, E. (1938) The osteology and relationships of the wahoo (*Acanthocybium solandri*), a scombroid fish. *American Museum Novitates,* 1000, 1-32.

Conway, K. W., Baldwin, C. & White, M. D. (2014) Cryptic diversity and venom glands in Western Atlantic clingfishes of the genus *Acyrtus* (Teleostei: Gobiesocidae). *PLoS ONE,* 9, e97664.

Cooper, J. A., Graham, K. & Chapleau, F. (1994) New record of the tongue flatfish, *Plagiopsetta glossa* (Samaridae, Pleuronectiformes) from Australia. *Japanese Journal of Ichthyology,* 41, 215-218.

Cope, E. D. (1870) Contribution to the ichthyology of the Marañon. *Proceedings of the American Philosophical Society,* 11, 559-570.

Correa da Silva, P., Nagamachi, C. Y., dos Santos Silva, D., Milhomem, S. S. R., Cardoso, A. L., Alves de Oliveira, J., et al. (2013) Karyotypic similarities between two species of *Rhamphichthys* (Rhamphichthyidae, Gymnotiformes) from the Amazon basin. *Comparative Cytogenetics,* 7, 279-291.

Costa, W. J. E. M. (1990) Systematics and distribution of the neotropical annual fish genus *Trigonectes* (Cyprinodontiformes, Rivulidae), with description of two new species. *Ichthyological Exploration of Freshwaters,* 1, 135-150.

Costa, W. J. E. M. (1995) Revision of the neotropical annual fish genus *Cynopoecilus* (Cyprinodontiformes: Rivulidae). *Copeia,* 1995, 456-465.

Costa, W. J. E. M. (2003) *Moema heterostigma,* a new annual fish (Cyprinodontiformes: Rivulidae) from the Brazilian Pantanal, Rio Paraguay basin. *Ichthyological Exploration of Freshwaters,* 14, 289-294.

Costa, W. J. E. M. (2005) The neotropical annual killifish genus *Pterolebias* Garman (Teleostei: Cyprinodontiformes: Rivulidae): phylogenetic relationships, descriptive morphology, and taxonomic revision. *Zootaxa,* 1067, 1-36.

Costa, W. J. E. M. (2006) Descriptive morphology and phylogenetic relationships among species of the Neotropical annual killifish genera *Nematolebias* and *Simpsonichthys* (Cyprinodontiformes: Aplocheiloidei: Rivulidae). *Neotropical Ichthyology,* 4, 1-26.

Costa, W. J. E. M. (2009a) Osteology of the African annual killifish genus *Callopanchax* (Teleostei: Cyprinodontiformes: Nothobranchidae) and phylogenetic implications. *Vertebrate Zoology,* 59, 31-40.

Costa, W. J. E. M. (2009b) Trophic radiation in the South American annual killifish genus *Austrolebias* (Cyprinodontiformes: Rivulidae). *Ichthyological Exploration of Freshwaters,* 20, 179-191.

Costa, W. J. E. M. & Bail, P.-Y. L. (1999) *Fluviphylax palikur*: A new poeciliid from the Rio Oiapoque Basin, Northern Brazil (Cyprinodontiformes: Cyprinodontoidei), with comments on miniaturization in *Fluviphylax* and other neotropical freshwater fishes. *Copeia,* 1999, 1027-1034.

Costa, W. J. E. M. & Bockmann, F. A. (1994) A new genus and species of Sarcoglanidinae (Siluriformes: Trichomycteridae) from Southeastern Brazil, with a re-examination of subfamilial phylogeny. *Journal of Natural History,* 28, 715-730.

Cox, U. O. (1905) A revision of the cave fishes of North America. *Report of the Bureau of Fisheries (United States) (for 1904)*, 377-393.

Crabtree, C. B. (1989) A new silverside of the genus *Colpichthys* (Atheriniformes: Atherinidae) from the Gulf of California, Mexico. *Copeia,* 1989, 558-568.

Crampton, W. G. R., Thorsen, D. H., Albert, J. S. & Armbruster, J. W. (2004) *Steatogenys ocellatus*: a new species of neotropical electric fish (Gymnotiformes: Hypopomidae) from the lowland Amazon Basin. *Copeia,* 2004, 78-91.

Cuvier, G. & Valenciennes, A. (1847) *Histoire naturelle des poissons. Tome dix-neuvième. Suite du livre dix-neuvième. Brochets ou Lucioïdes. Livre vingtième. De quelques familles de Malacoptérygiens, intermédiaires entre les Brochets et les Clupes. P. Bertrand, Paris,* 19, 388-401.

da Graça, W. J., Pavanelli, C. S. & Buckup, P. A. (2008) Two new species of *Characidium* (Characiformes: Crenuchidae) from Paraguay and Xingu River Basins, state of Mato Grosso, Brazil. *Copeia,* 2008, 326-332.

Dahl, G. (1960) New fresh-water fishes from western Colombia. *Caldasia,* 8, 451-484.

Daniels, R. A. (1981) *Cryothenia peninsulae*, a new genus and species of nototheniid fish from the Antarctic Peninsula. *Copeia,* 1981, 558-562.

Datovo, A. & Bockmann, F. A. (2010) Dorsolateral head muscles of the catfish families Nematogenyidae and Trichmycteridae (Siluriformes:Loricaroidei): comparative anantomy and phylogenetic analysis. *Neotropical Ichthyology,* 8, 193-246.

Dawson, C. E. (1964) A revision of the Western Atlantic flatfish genus *Gymnachirus* (the naked soles). *Copeia,* 1964, 646-665.

Dawson, C. E. (1966) *Gunterichthys longipenis*, a new genus and species of ophidioid fish from the Northern Gulf of Mexico. *Proceedings of the Biological Society of Washington,* 79, 205-214.

Dawson, C. E. (1968) Eastern Pacific wormfishes, *Microdesmus dipus* Günther and *Microdesmus dorsipunctatus* sp. nov. *Copeia,* 1968, 512-531.

Dawson, C. E. (1969a) A new Eastern Pacific sand stargazer, *Dactyloscopus byersi* (Pisces: Dactyloscopidae). *Copeia,* 1969, 44-51.

Dawson, C. E. (1969b) A new seven-spined goby, *Gobiosoma (Austrogobius) polyporosum*, from the Pacific coast of Panamá. *Copeia,* 1969, 510-514.

Dawson, C. E. (1971) *Gobiosoma (Garmannia) yucatanum,* a new seven-spined Atlantic goby from México. *Copeia,* 1971, 432-439.

Dawson, C. E. (1974a) A review of the Microdesmidae (Pisces: Gobioidea) 1. *Cerdale* and *Clarkichthys* with descriptions of three new species. *Copeia,* 1974, 409-448.

Dawson, C. E. (1974b) Studies on Eastern Pacific sand stargazers (Pisces: Dactyloscopidae) 1. *Platygillellus* new genus, with descriptions of new species. *Copeia,* 1974, 39-55.

Dawson, C. E. (1976) Studies on Eastern Pacific sand stargazers 3. *Dactylagnus* and *Myxodagnus*, with description of a new species and subspecies. *Copeia,* 1976, 13-43.

Dawson, C. E. & Fritzsche, R. A. (1975) Odontoid processes in pipefish jaws. *Nature,* 257, 390-390.

Day, F. (1870) Remarks on some of the fishes in the Calcutta Museum.--Part I. *Proceedings of the Zoological Society of London,* 1869, 511-527.

Daylan, C. & Eryilmaz, L. (2008) A new deepwater fish, *Chauliodus slaoni* Bloch & Schneider, 1801 (Osteichthyes: Stomiidae), from the Turkish waters of Levant Sea (Eastern Mediterranean). *Journal of the Black Sea/Mediterranean Enviorment,* 14, 33-37.

De Beaufort, L. & Van der Horst, C. (1948) On a new genus of fishes of the family Creediidae from South Africa, with remarks on its geographical distribution. *Transactions of the Royal Society of South Africa,* 31, 475-478.

De la Maza-Benignos, M., Ornelas-García, C., Lozano-Vilano, M. L., García-Ramírez, M. & Doadrio, I. (2014) Phylogeographic analysis of genus *Herichthys* (Perciformes: Cichlidae), with descriptions of *Nosferatu* new genus and *H. tepehua* n. sp. *Hydrobiologia*, 1-31.

de Oliveira Martins, F. & Langeani, F. (2011) *Microlepidogaster dimorpha*, a new species of Hypoptopomatinae (Siluriformes: Loricarridae) from the upper ro Parana System. *Neotropical Ichthyology,* 9, 79-86.

de Pinna, M. C. & Kirovsky, A. L. (2011) A new species of sand-dwelling catfish, with a phylogenetic diagnosis of *Pygidianops* Myers (Siluriformes: Trichomycteridae: Glanapteryginae). *Neotropical Ichthyology,* 9, 493-504.

de Pinna, M. C. C. (1989a) A new scarcoglanidine catfish, phylogeny of its subfamily, and an appraisal of the phyletic status of the Trichomycterinae (Teleostei, Trichomycteridae). *American Museum Novitates,* 2950, 1-39.

de Pinna, M. C. C. (1989b) Redescription of *Glanapteryx anguilla*, with notes on the phylogeny of Glanapteryginae (Siluriformes, Trichomycteridae). *Proceedings of the Academy of Natural Sciences of Philadelphia,* 141, 361-374.

de Pinna, M. C. C., Ferraris, C. J. & Vari, R. P. (2007) A phylogenetic study of the neotropical catfish family Cetopsidae (Osteichthyes, Ostariophysi, Siluriformes), with a new classification. *Zoological Journal of the Linnean Society,* 150, 755-813.

de Pinna, M. C. C. & Winemiller, K. O. (2000) A new species of *Ammoglanis* (Siluriformes: Trichomycteridae) from Venezuela. *Ichthyological Exploration of Freshwaters,* 11, 255-264.

de Pinna, M. C. C. & Zuanon, J. (2013) The genus *Typhlobelus*: monophyly and taxonomy, with description of a new species with a unique pseudotympanic structure (Teleostei: Trichomycteridae). *Copeia,* 2013, 441-453.

de Santana, C. D. (2003) *Apteronotus caudimaculosus* n. sp. (Gymnotiformes: Apteronotidae), a sexually dimorphic black ghost knifefish from the Pantanal, Western Brazil, with a note on the monophyly of *A. albifrons* species complex. *Zootaxa,* 252, 1-11.

de Santana, C. D. & Crampton, W. G. R. (2006) *Sternarchorhynchus curumim* (Gymnotiformes: Apteronotidae), a new species of tube-snouted ghost electric knifefish from the lowland Amazon basin, Brazil. *Zootaxa,* 1166, 57-68.

de Santana, C. D. & Crampton, W. G. R. (2007) Revision of the deep-channel electric fish genus *Sternarchogiton* (Gymnotiformes: Apteronotidae). *Copeia,* 2007, 387-402.

de Santana, C. D. & Crampton, W. G. R. (2010) A review of the South American electric fish genus *Porotergus* (Gymnotiformes: Apteronotidae) with the description of a new species. *Copeia,* 2010, 165-175.

de Santana, C. D. & Maldonado-Ocampo, J. A. (2004) Redescription of *Apternotus mariae* (Eigenmann & Fisher, 1914) and the taxonomic status of *Apteronotus jurubidae* (Fowler,1944) (Gymnotiformes: Apteronotidae). *Zootaxa,* 632, 1-14.

de Santana, C. D. & Vari, R. P. (2009) The South American electric fish genus *Platyurosternarchus* (Gymnotiformes: Apteronotidae). *Copeia,* 2009, 233-244.

De Schepper, N., Adriaens, D. & De Kegel, B. (2005) *Moringua edwardsi* (Moringuidae: Anguilliformes): Cranial specialization for head-first burrowing? *Journal of Morphology,* 266, 356-368.

De Schepper, N., De Kegel, B. & Adriaens, D. (2007) Morphological specializations in heterocongrinae (Anguilliformes: Congridae) related to burrowing and feeding. *Journal of Morphology,* 268, 343-356.

de Sylva, D. P. (1955) The osteology and phylogenetic Relationships of the blackfin tuna, *Thunnus atlanticus* (Lesson). *Bulletin of Marine Science,* 5, 1-41.

Deckert, G. D. & Greenfield, D. W. (1987) A review of the Western Atlantic species of the genera *Diapterus* and *Eugerres* (Pisces: Gerreidae). *Copeia,* 1987, 182-194.

Decru, E., Vreven, E. & Snoeks, J. (2012) A revision of the West African *Hepsetus* (Characiformes: Hepsetidae) with a description of *Hepsetus akawo* sp. nov. and a redescription of *Hepsetus odoe* (Bloch, 1794). *Journal of Natural History,* 46, 1-23.

Delariva, R. L. & Agostinho, A. A. (2001) Relationship between morphology and diets of six neotropical loricariids. *Journal of Fish Biology,* 58, 832-847.

Deraniyagala, P. E. P. (1929) Ceylon sardines. *Spolia Zeylanica (The Ceylon Journal of Science, Section B.--Zoology & Geology),* 15, 31-47.

Deraniyagala, P. E. P. (1937) *Malpulutta kretseri*--a new genus and species of fish from Ceylon. *The Ceylon Journal of Science,* 20, 351-353.

Desoutter, M. & Chapleau, F. (1997) Taxonomic status of *Bathysolea profundicola* and *B. polli* (Soleidae; Pleuronectiformes) with notes on the genus. *Ichthyological Research,* 44, 399-412.

Devaere, S., Adriaens, D., Teugels, G. & Verraes, W. (2006) Morphology of the cranial system of *Platyclarias machadoi*: interdependencies of skull flattening and suspensorial structure in Clariidae. *Zoomorphology,* 125, 69-85.

Devaere, S., Adriaens, D., Teugels, G. G. & Verraes, W. (2005) Morphology and spatial constraints in a dorso-ventrally flattened skull, with a revised species description of *Platyallabes tihoni* (Poll, 1944). *Journal of Natural History,* 39, 1653-1673.

Devaere, S., Adriaens, D., Verraes, W. & Teugels, G. T. (2001) Cranial morphology of the anguilliform clariid *Channallabes apus* (Günther, 1873) (Teleostei: Siluriformes): are adaptations related to powerful biting? *Journal of Zoology,* 255, 235-250.

Devaere, S., Teugels, G. G., Adriaens, D., Huysentruyt, F., Verraes, W. & Armbruster, J. W. (2004) Redescription of *Dolichallabes microphthalmus* (Poll, 1942) (Siluriformes, Clariidae). *Copeia,* 2004, 108-115.

DeWitt, H. H. (1962a) A new antarctic nototheniid fish with notes on two recently described nototheniiforms. *Copeia,* 1962, 826-833.

DeWitt, H. H. (1962b) A new genus and species of zoarcid fish from McMurdo Sound, Antarctica. *Copeia*, 819-826.

DeWitt, H. H. & Tyler, J. C. (1960) Fishes of the Stanford Antarctic biological research program, 1958-1959. *Stanford Ichthyological Bulletin,* 7, 162-199.

Di Dario, F. (2009) Chirocentrids as engrauloids: evidence from suspensorium, branchial arches, and infraorbital bones (Clupeomorpha, Teleostei). *Zoological Journal of the Linnean Society,* 156, 363-383.

Dick, M. M. (1962) *Bathyclupea schroederi*: A new bathyclupeid fish from the western tropical Atlantic. *Breviora,* 167, 1-4.

Dineen, C. F. & Stokely, P. S. (1956) The osteology of the Sacramento perch, *Archoplites interruptus* (Girard). *Copeia,* 1956, 217-230.

Dinesh, K. S., Nair, R. J. & Kuriakose, S. (2012) First record of *Centroberyx rubricaudus* (Liu and Shen, 1985) (Beryciforms: Berycidae) from Indian waters (Andaman Islands). *Indian Journal of Geo-Marine Sciences,* 42, 871-875.

Diogo, R. & Bills, R. (2006) Osteology and myology of the cephalic region and pectoral girdle of the South American catfish *Austroglanis gilli*, with comments on the autapomorphis and phylogenetic relationships of the Austroglanididae. *Animal Biology,* 56, 39-62.

Diogo, R., Chardon, M. & Vandewalle, P. (2001) Osteology and myology of the cephalic region and pectoral girdle of *Bunocephalus knerii*, and a discussion on the phylogenetic relationships of the Aspredinidae (Teleostei: Siluriformes). *Netherlands Journal of Zoology,* 51, 457-481.

Diogo, R., Chardon, M. & Vandewalle, P. (2003a) On the osteology and myology of the cephalic region and pectoral girdle of *Heteropneustes fossilis* (Siluriformes: Heteropneustidae), with comments on the phlyogenetic relationships between *Heteropneustes* and the clariid catfishes. *Animal Biology,* 53, 379-396.

Diogo, R., Chardon, M. & Vandewalle, P. (2003b) Osteology and myology of the cephalic region and pectoral girdle of *Centromochlus heckelii,* comparison with other auchenipterids, and comments on the synapomorphies and phylogenetic relationships of the Auchenipteridae (Teleostei: Siluriformes). *Animal Biology,* 53, 397-416.

Diogo, R., Chardon, M. & Vandewalle, P. (2004) Osteology and myology of the cephalic region and pectoral girdle of *Batrochoglanis raninus*, with a discussion on the synapomorphies and phylogenetic relationships of the Pseudopimelodinae and Pimelodidae (Teleostei: Siluriformes). *Animal Biology,* 54, 261-280.

Diogo, R., Vandewalle, P. & Chardon, M. (1999) Morphological description of the cephalic region of *Bagrus docmac*, with a reflection on Bagridae (Teleostei: Siluriformes) autapomorphies. *Netherlands Journal of Zoology,* 49, 207-232.

Ditty, J. G., Shaw, R. F. & Fuiman, L. A. (2005) Larval development of five species of blenny (Teleostei: Blenniidae) from the Western central North Atlantic, with a synopsis of blennioid family characters. *Journal of Fish Biology,* 66, 1261-1284.

DoNascimiento, C. & Milani, N. (2008) The Venezuelan species of *Phenacorhamdia* (Siluriformes: Heptapteridae), with the description of two new species and a remarkable new tooth morphology for siluriforms. *Proceedings of the Academy of Natural Sciences of Philadelphia,* 157, 163-180.

DoNascimiento, C. & Provenzano, F. (2006) The genus *Henonemus* (siluriformes: Trichomycteridae) with a description of a new species from Venezuela. *Copeia,* 2006, 198-205.

Dooley, J. K. & Iwatsuki, Y. (2012) A new species of deepwater tilefish (Percoidea: Branchiostegidae) from the Philippines, with a brief discussion of the status of tilefish systematics. *Zootaxa,* 3249, 31-38.

Dulcic, J. & Ahnelt, H. (2007) How many species of the crested oarfish, *Lophotus lacepede* Giorna, 1809 (Pisces:Lophotidae), were caught in the Adriatic sea? *Acta Adriatica,* 48, 39-43.

Dunz, A. R. & Schliewen, U. K. (2010) Description of a new species of *Tilapia* Smith, 1840 (Teleostei: Cichlidae) from Ghana. *Zootaxa,* 2548, 1-21.

Dutt, S. & Sujatha, K. (1983) On a new species of *Sillago* Cuvier, 1817 (Teleostei: Sillaginidae) from India. *Proceedings of the Indian National Science Academy Part B Biological Sciences,* 48, 611-614.

Dyer, B. S. (1997) Phylogenetic revision of Atherinopsinae (Teleostei, Atherinopsidae), with comments on the systematics of the South American freshwater fish genus *Basilichthys* Girard. *Miscellaneous Publication Museum Zoology, University of Michigan,* 185, 1-64.

Eagderi, S. & Adriaens, D. (2010) Head morphology of the duckbill eel, *Hoplunnis punctata* (Regan, 1915; Nettastomatidae: Anguilliformes) in relation to jaw elongation. *Zoology,* 113, 148-157.

Eakin, R. R., Eastman, J. T. & Near, T. J. (2009) A new species and a molecular phylogenetic analysis of the Antarctic fish genus *Pogonophryne* (Notothenioidei: Artedidraconidae). *Copeia,* 2009, 705-713.

Eaton, T. H., Jr. (1935) The teeth of *Plecostomus*, an armored catfish. *Copeia,* 1935, 161-163.

Ebeling, A. W. (1957) The dentition of Eastern Pacific mullets, with special reference to adaptation and taxonomy. *Copeia,* 1957, 173-185.

Eccles, D. H. & Lewis, D. S. C. (1976) A revision of the genus *Docimodus* Boulenger (Pisces: Cichlidae), a group of fishes with unusual feeding habits from Lake Malawi. *Zoological Journal of the Linnean Society,* 58, 165-172.

Egge, J. J. D. & Simons, A. M. (2006) The challenge of truly cryptic diversity: diagnosis and description of a new madtom catfish (Ictaluridae: *Noturus*). *Zoologica Scripta,* 35, 581-595.

Eigenman, C. H., Morton, W. F. & Eigenmann, C. H. (1885) A review of the American Eleotridinæ. *Proceedings of the Academy of Natural Sciences of Philadelphia,* 37, 66-80.

Eigenmann, C. H. (1886) A review of the American Gasterosteidæ. *Proceedings of the Academy of Natural Sciences of Philadelphia,* 38, 233-252.

Eigenmann, C. H. (1909) Reports on the expedition to British Guiana of the Indiana University and the Carnegie Museum, 1908. Report no. 1. Some new genera and species of fishes from British Guiana. *Annals of the Carnegie Museum,* 6 4-54.

Eigenmann, C. H. (1917) Eighteen new species of fishes from Northwestern South America. *Proceedings of the American Philosophical Society,* 56, 673-689.

Eigenmann, C. H. & Allen, W. R. (1921) A leaf mimicking fish. *Biological Bulletin,* 41, 301-305.

Eigenmann, C. H. & Eigenmann, R. S. (1889) Notes on some California fishes, with descriptions of two new species. *Proceedings of the United States National Museum,* 11, 463-466.

Emery, A. R. (1980) The osteology of *Lepidozygus tapeinosoma* (Pisces: Pomacentridae). *Bulletin of Marine Science,* 30, 213-236.

Ende, S. S. W. (2007) Cranial ontogeny of the sole, *Dagetichthys marginatus* (soleidae), with considerations on the feeding ability of larvae and early juveniles. Rhodes University, Grahamstown, pp. 67.

Endo, H. & Shinohara, G. (1999) A new batfish, *Coelophrys bradburyae* (Lophiiformes: Ogcocephalidae) from Japan, with comments on the evolutionary relationships of the genus. *Ichthyological Research,* 46, 359-365.

Eschmeyer, W. N. (1965) Three new scorpionfishes of the genera *Pontinus*, *Phenacoscorpius* and *Idiastion* from the western Atlantic Ocean. *Bulletin of Marine Science,* 15, 521-534.

Eschmeyer, W. N. (1997) A new species of Dactylopteridae (Pisces) from the Philippines and Australia, with a brief synopsis of the family. *Bulletin of Marine Science,* 60, 727-738.

Eschmeyer, W. N. & Collette, B. B. (1966) The scorpionfish subfamily Setarchinae, including the genus *Ectreposebastes*. *Bulletin of Marine Science,* 16, 349-375.

Eschmeyer, W. N. & Rama-Rao, K. V. (1973) Two new stonefishes (Pisces, Scorpaenidae) from the Indo-West Pacific: with a synopsis of the subfamily Synanceiinae. *Proceedings of the California Academy of Sciences,* 39, 337-382.

Evans, A. R. & Sanson, G. D. (2003) The tooth of perfection: functional and spatial constraints on mammalian tooth shape. *Biological Journal of the Linnean Society,* 78, 173-191.

Evermann, B. W. & Marsh, M. C. (1899) Descriptions of new genera and species of fishes from Puerto Rico. *United States Commission of Fish and Fisheries, Report of the Commissioner,* 25, 351-362.

Evseenko, S. (1985) A new genus and species of lefteye flounder, *Pseudomancopsetta andriashevi,* and their position in the suborder Pleuronectoidei. *Journal of Ichthyology,* 25, 1-10.

Fedoryako, B. I. (1979) Triggerfishes of the genera *Canthidermis* and *Xanthichthys* (Balistidae, Tetraodontiformes) from the Indian and Pacific Oceans. *Journal of Ichthyology,* 19, 19-30.

Fernández, L., de Pinna, M. C. C. & Armbruster, J. W. (2005) Phreatic catfish of the genus *Silvinichthys* from southern South America (Teleostei, Siluriformes, Trichomycteridae). *Copeia,* 2005, 100-108.

Ferraris, C. J. & Vari, R. P. (1999) The South American catfish genus *Auchenipterus* Valenciennes, 1840 (Ostariophysi: Siluriformes: Auchenipteridae): monophyly and relationships, with a revisionary study. *Zoological Journal of the Linnean Society,* 126, 387-450.

Ferraris, C. J. & Vari, R. P. (2007) Revision of catfishes of the genus *Eutropiichthys*, with the description of two new species (Siluriformes: Schilbidae). *Copeia,* 2007, 866-885.

Ferry-Graham, L. A., Wainwright, P. C., Hulsey, C. D. & Bellwood, D. R. (2001) Evolution and mechanics of long jaws in butterflyfishes (family Chaetodontidae). *Journal of Morphology,* 248, 120-143.

Fink, S. V. & Fink, W. L. (1981) Interrelationships of the ostariophysan fishes (Teleostei). *Zoological Journal of the Linnean Society,* 72, 297-353.

Fink, W. L. (1981) Ontogeny and phylogeny of tooth attachment modes in actinopterygian fishes. *Journal of Morphology,* 167, 167-184.

Fink, W. L. (1993) Revision of the piranha genus *Pygocentrus* (Teleostei, Characiformes). *Copeia,* 1993, 665-687.

Fink, W. L. & Machado-Allison, A. (1992) Three new species of piranhas from Brazil and Venezuela (Teleostei: Characiformes). *Ichthyological Exploration of Freshwaters,* 3, 55-71.

Fink, W. L. & Machado-Allison, A. (2001) *Serrasalmus hastatus*, a new species of piranha from Brazil, with comments on *Serrasalmus compressus* (Teleostei: Characiformes). *Occasional Papers of the Museum of Zoology, University of Michigan,* 730, 1-18.

Fink, W. L. & Weitzman, S. H. (1974) The so-called cheirodontin fishes of Central America with descriptions of two new species (Pisces: Characidae). *Smithsonian Contribution to Zoology,* 172, 1-46.

Fisch-Muller, S., Cardoso, A. R., Silva, J. F. d. & Bertaco, V. A. (2005) Two new Amazonian species of armored catfishes (Siluriformes: Loricariidae): *Ancistrus verecundus* and *Ancistrus parecis*. *Neotropical Ichthyology,* 3, 525-532.

Fishelson, L., Delarea, Y. & Zverdling, A. (2004) Taste bud form and distribution on lips and in the oropharyngeal cavity of cardinal fish species (Apogonidae, Teleostei), with remarks on their dentition. *Journal of Morphology,* 259, 316-327.

Fitzsimons, J. M. (1972) A revision of two genera of goodeid fishes (Cyprinodontiformes, Osteichthyes) from the Mexican plateau. *Copeia,* 1972, 728-756.

Follett, W. I. & Anderson, M. E. (1990) *Esselenia,* a new genus of pricklebacks (Teleostei: Stichaeidae), with two new species from California and Baja California Norte. *Copeia,* 1990, 147-163.

Follett, W. I. & Powell, D. C. (1988) *Ernogrammus walkeri,* a new species of prickleback (Pisces: Stichaeidae) from South-central California. *Copeia,* 1988, 135-152.

Foster, N. R. (1973) Behavior, development, and early life history of the asian needlefish, *Xenentodon cancila*. *Proceedings of the Academy of Natural Sciences of Philadelphia,* 125, 77-88.

Fowler, H. W. (1903a) Descriptions of new, little known, and typical Atherinidæ. *Proceedings of the Academy of Natural Sciences of Philadelphia,* 55, 727-742.

Fowler, H. W. (1903b) New and little known Mugilidæ and Sphyrænidæ. *Proceedings of the Academy of Natural Sciences of Philadelphia,* 55, 743-752.

Fowler, H. W. (1906a) New, rare or little known scombroids. No. 3. *Proceedings of the Academy of Natural Sciences of Philadelphia,* 58, 114-122.

Fowler, H. W. (1906b) Some new and little-known percoid fishes. *Proceedings of the Academy of Natural Sciences of Philadelphia,* 58, 510-528.

Fowler, H. W. (1907) A collection of fishes from Victoria Australia. *Proceedings of the Academy of Natural Sciences of Philadelphia,* 59, 419-444.

Fowler, H. W. (1911) New fresh-water fishes from western Ecuador. *Proceedings of the Academy of Natural Sciences of Philadelphia,* 63, 493-520.

Fowler, H. W. (1933) Descriptions of new fishes obtained 1907 to 1910, chiefly in the Philippine Islands and adjacent seas. *Proceedings of the Academy of Natural Sciences of Philadelphia,* 85, 233-367.

Fowler, H. W. (1938) Descriptions of new fishes obtained by the United States Bureau of Fisheries steamer "Albatross", chiefly in Philippine seas and adjacent waters. *Proceedings of the United States National Museum,* 85, 31-135.

Fowler, H. W. (1943) Contributions to the biology of the Philippine Archipelago and adjacent regions. Descriptions and figures of new fishes obtained in Philippine seas and adjacent waters by the United States Bureau of Fisheries steamer "Albatross.". *Bulletin of the United States National Museum,* 100, 53-91.

Fowler, H. W. (1949) Results of the two Carpenter African expeditions, 1946-1948. Part II: the fishes. *Proceedings of the Academy of Natural Sciences of Philadelphia,* 101, 233-275.

Fowler, H. W. & Bean, B. A. (1928) The fishes of the families Pomacentridae, Labridae, and Callyodontidae: collected by the United States Bureau of fisheries steamer" Albatross", chiefly in Philippine seas and adjacent waters. *Bulletin of the United States National Museum,* 100, 1-525.

Frable, B. J., Baldwin, C. C., Luther, B. M. & Weigt, L. A. (2013) A new species of Western Atlantic lizardfish (Teleostei: Synodontidae: *Synodus*) and resurrection of *Synodus* bondi Fowler, 1939, as a valid species from the Caribbean with redescriptions of *S. bondi*, *S. foetens* (Linnaeus, 1766), and *S. intermedius* (Agassiz, 1829). *Fishery Bulletin,* 111, 121-146.

Fraser, G. J., Berkovitz, B. K., Graham, A. & Smith, M. M. (2006) Gene deployment for tooth replacement in the rainbow trout (*Oncorhynchus mykiss*): a developmental model for evolution of the osteichthyan dentition. *Evolution & Development,* 8, 446-457.

Fraser, G. J., Britz, R., Hall, A., Johanson, Z. & Smith, M. M. (2012) Replacing the first-generation dentition in pufferfish with a unique beak. *Proceedings of the National Academy of Sciences,* 109, 8179-8184.

Fraser, T. H. (1968) Comparative osteology of the Atlantic snooks (Pisces, Centropomus). *Copeia,* 1968, 433-460.

Fraser, T. H. (2010) A new deep-water cardinalfish (*Neamia*: Apogonidae) from Kiritimati Atoll, Kiribati. *Proceedings of the Biological Society of Washington,* 123, 153-158.

Fraser, T. H. & Randall, J. E. (2011) Two new species of *Foa* (Apogonidae) from the Pacific Plate, with redescriptions of *Foa brachygramma* and *Foa fo*. *Zootaxa,* 2988, 1-27.

Fraser, T. H. & Robins, C. R. (1970) The R/V Pillsbury deep sea biological expedition to the Gulf of Guinea, 1964–65. 18. A new Atlantic genus of cardinal fishes with comments on some species from the Gulf of Guinea. *Studies in Tropical Oceanography,* 4, 302-315.

Fraser-Brunner, A. (1941) Notes on the plectognath fishes.— V. The families of triacanthiform fishes, with a synopsis of the genera and description of a new species. *Journal of Natural History (Series 11),* 7, 420-430.

Fraser-Brunner, A. (1950) Studies in plectognath fishes from the "Dana"-Expeditions. I. An interesting new genus of triacanthodid fishes from the Celebes Sea. *Dana Report,* 35, 1-8.

Freyhof, J. & Herder, F. (2002) Review of the paradise fishes of the genus *Macropodus* in Vietnam, with description of two new species from Vietnam and Southern China (Perciformes: Osphronemidae). *Ichthyological Exploration of Freshwaters,* 13, 147-168.

Fricke, R. (1985) *Protogrammus*, a new genus of callionymid fishes, with a redescription of *P. sousai* from the eastern Atlantic. *Japanese Journal of Ichthyology,* 32, 294-298.

Fricke, R. (2007) A new species of the clingfish genus *Apletodon* (Teleostei: Gobiesocidae) from Sao Tome and Principe, Eastern central Atlantic. *Ichthyological Research,* 54, 68-73.

Fricke, R., Wirtz, P. & Brito, A. (2010) A new species of the clingfish genus *Apletodon* (Teleostei: Gobiesocidae) from the Cape Verde Islands, Eastern central Atlantic. *Ichthyological Research,* 57, 91-97.

Friel, J. P. (1995) *Acanthobunocephalus nicoi*, a new genus and species of miniature banjo-catfish from the upper Orinoco and Casiquiare rivers, Venezuela (Siluriformes: Aspredinidae). *Ichthyological Exploration of Freshwaters* 6, 89-95.

Friel, J. P. & Lundberg, J. G. (1996) *Micromyzon akamai*, gen. et sp. nov., a small and eyeless banjo catfish (Siluriformes: Aspredinidae) from the river channels of the Lower Amazon Basin. *Copeia,* 1996, 641-648.

Fritzsche, R. A. (1976) A review of the cornetfishes, genus *Fistularia* (Fistulariidae), with a discussion of intrageneric relationships and zoogeography. *Bulletin of Marine Science,* 26, 196-204.

Fritzsche, R. A. & Thiesfeld, K. G. (2003) Fistulariidae. *In:* K. E. Carpenter & V. E. Niem (Eds), *Species identification guide for fisheries purposes. The living marine resources of the western central Pacific. Bony fishes part 2 (Mugilidae to Carangidae)*. FAO, Rome, pp. 2278-2279.

Fujii, E. & Uyeno, T. (1979) *Polyplacapros tyleri*, a new genus and species of ostraciid trunkfish from off Eastern Australia and Norfolk Ridge. *Japanese Journal of Ichthyology,* 26, 1-10.

Fujita, K. (1991) Notes on the nomeid fish *Psenes sio* from the Eastern Pacific. *Japanese Journal of Ichthyology,* 38, 323-327.

Fukui, A. & Kitagawa, Y. (2006a) *Dolichopteryx minuscula*, a new species of spookfish (Argentinoidei: Opisthoproctidae) from the Indo-West Pacific. *Ichthyological Research,* 53, 113-120.

Fukui, A. & Kitagawa, Y. (2006b) *Dolichopteryx rostrata*, a new species of spookfish (Argentinoidea: Opisthoproctidae) from the Eastern North Atlantic Ocean. *Ichthyological Research,* 53, 7-12.

Fukui, A. & Ozawa, T. (2004) *Uncisudis posteropelvis*, a new species of barracudina (Aulopiformes: Paralepididae) from the Western North Pacific Ocean. *Ichthyological Research,* 51, 289-294.

Gagiano, C., Steyn, G. & Du Preez, H. (1996) Tooth replacement of tigerfish *Hydrocynus vittatus* from the Kruger National Park. *Koedoe-African Protected Area Conservation and Science,* 39, 117-122.

Garant, P. R. (1970) Observations on the ultrastructure of the ectodermal component during odontogenesis in *Helostoma temmincki*. *The Anatomical Record,* 166, 167-187.

Garavello, J. C., Britski, H. A. & Schaefer, S. A. (1998) Systematics of the genus *Otothyris* Myers 1927, with comments on geographic distribution (Siluriformes, Loricariidae, Hypoptopomatinae). *American Museum Novitates,* 3222, 1-19.

Geerinckx, T., De Poorter, J. & Adriaens, D. (2007) Morphology and development of teeth and epidermal brushes in loricariid catfishes. *Journal of Morphology,* 268, 805-814.

Geerinckx, T., Huysseune, A., Boone, M., Claeys, M., Couvreur, M., Kegel, B. D., et al. (2012) Soft dentin results in unique flexible teeth in scraping catfishes. *Physiological and Biochemical Zoology,* 85, 481-490.

Geerinckx, T., Vreven, E., Dierick, M., van Hoorebeke, L. & Adriaens, D. (2013) Revision of *Notoglanidium* and related gerera (Siluriformes: Clarotidae) based on morphology and osteology. *Zootaxa* 3691, 165-191.

Geetakumari, K. & Vishwanath, W. (2010a) *Badis dibruensis,* a new species (Teleostei: Badidae) from northeastern India. *Journal of Threatened Taxa,* 2, 644-647.

Geetakumari, K. & Vishwanath, W. (2010b) *Channa melanostigma*, a new species of freshwater snakehead from North-East India (Teleostei: Channidae). *Journal of the Bombay Natural History Society,* 107, 231.

Gehrke, P. C. (1988) Influence of gut morphology, sensory cues and hunger on feeding behaviour of spangled perch, *Leiopotherapon unicolor* (Günther, 1859), (Percoidei, Teraponidae). *Journal of Fish Biology,* 33, 189-201.

Georgi, T. A. & Brady, D. R. (1999) The teeth of the paddlefish, *Polyodon spathula*. *Journal of Applied Ichthyology,* 15, 279-280.

Géry, J. (1965) Poissons characoïdes sud-américains du Senckenberg Muséum, II. Characidae et Crenuchidae de l'Igarapé Préto (Haute Amazonie). *Senckenbergiana Biologica,* 46, 195-218.

Géry, J. (1968) *Ladigesia roloffi*, a new genus and species of African characoid fishes. *Tropical Fish Hobbyist,* 16, 78-87.

Géry, J. (1970) Le genre *Iguanodectes* Cope (Pisces, Characoidei). *Amazoniana,* 2, 417-133.

Géry, J. (1995) Description of new or poorly known Alestinae (Teleostei: Characiformes: Alestidae) from Africa, with a note on the generic concept in the Alestinae. *Aqua, Journal of Ichthyology and Aquatic Biology,* 1, 37-64.

Géry, J. & Rham, P. d. (1981) Un nouveau Poisson characidé endémique du bassin du Rio Tumbès au nord du Pérou, *Chilobrycon deuterodon* n. g. sp. (Characoidei). *Revue française d'Aquariologie Herpétologie,* 8, 7-12.

Ghazzi, M. S. A. (2005) *Sturisoma kneri,* new species, a name for an old yet poorly-known catfish (Siluriformes: Loricariidae). *Copeia,* 2005, 559-565.

Ghedotti, M. J. (2000) Phylogenetic analysis and taxonomy of the poecilioid fishes (Teleostei: Cyprinodontiformes). *Zoological Journal of the Linnean Society,* 130, 1-53.

Ghedotti, M. J. & Davis, M. P. (2013) Phylogeny, classification, and evolution of salinity tolerance of the North American topminnows and killifishes, family Fundulidae (Teleostei: Cyprinodontiformes). *Fieldiana Life and Earth Sciences*, 7, 1-65.

Gibb, A. C. (2003) Modeling the jaw mechanism of *Pleuronichthys verticalis*: The morphological basis of asymmetrical jaw movements in a flatfish. *Journal of Morphology,* 256, 1-12.

Gibbons, W. P. (1854) July 25th; Description of new species of viviparous marine and fresh-water fishes, from the bay of San Francisco, and from the river and lagoons of the Sacramento. *Proceedings of the Academy of Natural Sciences of Philadelphia,* 7, 121-126.

Gibbs Jr, R. H., Amaoka, K. & Haruta, C. (1984) *Astronesthes trifibulatus*, a new Indo-Pacific stomioid fish (family Astronesthidae) related to the Atlantic *A. similis*. *Japanese Journal of Ichthyology,* 31, 5-14.

Gibbs, R. H. (1960a) *Alepisaurus brevirostris,* a news species of lancetfish from the Western North Atlantic. *Breviora,* 123, 1-14.

Gibbs, R. H., Jr. (1960b) The stomiatoid fish genera *Eustomias* and *Melanostomias* in the Pacific, with descriptions of two new species. *Copeia,* 1960, 200-203.

Gilbert, C. H. (1890) A preliminary report on the fishes collected by the steamer Albatross on the Pacific coast of North America during the year 1889, with descriptions of twelve new genera and ninety-two new species. *Proceedings of the United States National Museum,* 13, 49-126.

Gilbert, C. H. (1891) A supplementary list of fishes collected at the Galapagos Islands and Panama, with descriptions of one new genus and three new species. Scientific results of explorations by the U. S. Fish Commission steamer Albatross. *Proceedings of the United States National Museum,* 13, 449-455.

Gilbert, C. H. (1896) The ichthyological collections of the steamer Albatross during the years 1890 and 1891. *United States Commission of Fish and Fisheries, Report of the Commissioner,* 19, 393-476.

Gilbert, C. H. (1905) II. The deep-sea fishes of the Hawaiian Islands. In: The aquatic resources of the Hawaiian Islands. *Bulletin of the U. S. Fish Commission,* 23, 577-713.

Gilbert, C. H. (1906) A new genus and species of cottoid fish from Departure Bay, Vancouver Island. *Contributions to Canadian Biology (Being studies from the Marine Biological Stations of Canada),* 1906-1910, 215-216.

Gilbert, C. H. & Hubbs, C. L. (1916) Report on the Japanese macrouroid fishes collected by the United States Fisheries steamer "Albatross" in 1906, with a synopsis of the genera. *Proceedings of the United States National Museum,* 51, 135-214.

Gilchrist, J. D. F. (1902) South African fishes. *Marine Investigations in South Africa,* 2, 101-113.

Gilchrist, J. D. F. (1904) Descriptions of new South African fishes. *Marine investigations in South Africa,* 2, 203-211.

Gill, A. & Hutchins, J. (1997) *Assiculoides desmonotus*, new genus and species of dottyback from the Kimberley Coast of Western Australia (Teleostei: Perciformes: Pseudochromidae). *Revue française d'aquariologie,* 24, 43-48.

Gill, A. C. & Edwards, A. J. (2003) *Pseudoplesiops wassi,* a new species of dottyback fish (Teleostei: Pseudochromidae: Pseudoplesiopinae) from the West Pacific. *Zootaxa,* 291, 1-7.

Gill, A. C. & Edwards, A. J. (2004) Revision of the Indian Ocean dottyback fish genera *Chlidichthys* and *Pectinochromis* (Perciformes: Pseudochromidae: Pseudoplesiopinae). *Smithiana. Publications in Aquatic Biodiversity,* 3, 1-46.

Gill, A. C. & Edwards, A. J. (2006) *Lubbockichthys myersi,* a new species of dottyback fish from Guam (Pseudochromidae: Pseudoplesiopinae). *Zootaxa,* 1320, 43-48.

Gill, A. C. & Mooi, R. D. (1993) Monophyly of the Grammatidae and of the Notograptidae, with evidence for their phylogenetic positions among perciforms. *Bulletin of Marine Science,* 52, 327-350.

Gill, A. C. & Randall, J. E. (1994) *Xenisthmus balius*, a new species of fish from the Persian Gulf (Gobioidei: Xenisthmidae). *Proceedings of the Biological Society of Washington,* 107, 445-445.

Gill, T. (1862a) Description of a new generic type of Mormyroids and note on the arrangement of the genus. *Proceedings of the Academy of Natural Sciences of Philadelphia,* 14, 443-445.

Gill, T. (1862b) On the West African genus *Hemichromis* and descriptions of new species in the museums of the Academy and Smithsonian Institution. *Proceedings of the Academy of Natural Sciences of Philadelphia,* 14, 134-139.

Gill, T. (1862c) Synopsis of the family of cirrhitoids. *Proceedings of the Academy of Natural Sciences of Philadelphia,* 14, 102-122.

Gill, T. (1863a) Description of the genus *Oxyjulis* Gill. *Proceedings of the Academy of Natural Sciences of Philadelphia,* 15, 330-331.

Gill, T. (1863b) Synopsis of the North American gadoid fishes. *Proceedings of the Academy of Natural Sciences of Philadelphia,* 15, 229-242.

Gill, T. (1891) The characteristics of the family of scatophagoid fishes. *Proceedings of the United States National Museum,* 13, 355-360.

Gill, T. N. (1858) Synopsis of the fresh water fishes of the Western portion of the island of Trinidad, W. I. *Annals of The Lyceum of Natural History of New York,* 6, 363-430.

Gill, T. N. (1861) Description of a new generic type of blennioids. *Proceedings of the Academy of Natural Sciences of Philadelphia,* 13, 261-263.

Gill, T. N. (1862d) Synopsis of the sillaginoids. *Proceedings of the Academy of Natural Sciences of Philadelphia,* 13, 501-505.

Gill, T. N. & Ryder, J. A. (1883) On the anatomy and relations of the Eurypharyngidae. *Proceedings of the United States National Museum,* 6, 262-273.

Gilmore, R. G. (1979) *Varicus marilynae,* a new gobiid fish from Florida. *Copeia,* 1979, 126-128.

Giltay, L. (1929) Un Characide nouveau du Congo belge (*Belonophago hutsebouti,* n. g., n. sp.) de la sous-famille des Ichthyoborinae. *Revue de Zoologie et de Botanique Africaines,* 18, 271-276.

Ginsburg, I. (1952) Eight new fishes from the Gulf Coast of the United States, with two new genera and notes on geographic distribution. *Journal of the Washington Academy of Sciences,* 42, 84-101.

Ginsburg, I. (1953) Ten new American gobioid fishes in the United States National Museum, including additions to a revision of *Gobionellus*. *Journal of the Washington Academy of Science,* 43, 18-26.

Ginsburg, I. (1954) Four new fishes and one little known species from the East coast of the United States including the Gulf of Mexico. *Journal of the Washington Academy of Sciences,* 44, 256-264.

Girard, C. (1854) Descriptions of new fishes, collected by Dr. A. L. Heermann, naturalist attached to the survey of the Pacific railroad route, under Lieut. R. S. Williamson,

U. S. A. *Proceedings of the Academy of Natural Sciences of Philadelphia* 7, 129-140.

Girard, C. F. (1855) Abstract of a report to Lieut. Jas. M. Gilliss, U. S. N., upon the fishes collected during the U. S. N. Astronomical Expedition to Chili. *Proceedings of the Academy of Natural Sciences of Philadelphia* 7, 197-199.

Gnanamuttu, J. C. (1966) Osteology of the Indian mackerel, *Rastrelliger kanagurta* (Cuvier). *Indian Journal of Fisheries,* 13, 1-26.

Godkin, C. M. & Winterbottom, R. (1985) Phylogeny of the family Congrogadidae (Pisces; Perciformes) and its placement as a subfamily of the Pseudochromidae. *Bulletin of Marine Science,* 36, 633-671.

Golani, D., Salameh, P. & Sonin, O. (2010) First record of the emperor angelfish, *Pomacanthus imperator* (Teleostei: Pomacanthidae) and the second record of the spotbase burrfish *Cyclichthys spilostylus* (Teleostei: Diodontidae) in the Mediterranean. *Aquatic Invasions,* 5, S41-S43.

Golubtsov, A. S., Moots, K. A. & Dzerjinskii, K. F. (2004) Dentition in the African catfishes *Andersonia* (Amphiliidae) and *Siluranodon* (Schilbeidae) previously considered toothless. *Journal of Fish Biology,* 64, 146-158.

Gomon, J. R. & Taylor, W. R. (1969) *Plotosus nkunga*, a new species of catfish from South Africa, with a redescription of *Plotosus limbatus* Valenciennes and key to the species of *Plotosus* (Siluriformes: Plotosidae). *Special Publication, J.L.B. Smith Institute of Ichthyology,* 22, 1-16.

Gomon, M. & Lubbock, R. (1979) A new hogfish of the genus *Bodianus* (Teleostei, Labridae) from islands of the mid-Atlantic ridge. *Northeast Gulf Science,* 3, 101-111.

Gomon, M. F. (1997) Relationships of fishes of the labrid tribe Hypsigenyini. *Bulletin of Marine Science,* 60, 789-871.

Gomon, M. F. (2004) Two new species of roughy (Trachichthyidae: *Optivus*) from coastal waters of Southern Australia. *Records of the Australian Museum,* 56, 173-178.

Gomon, M. F. & Johnson, J. W. (1999) A new fringed stargazer (Uranoscopidae: *Ichthyscopus*) with descriptions of the other Australian species of the genus. *Memoirs of the Queensland Museum,* 43, 597-619.

Gomon, M. F. & Paxton, J. R. (1985) A revision of the Odacidae: a temperate Australian-New Zealand labroid fish family. *Indo-Pacific Fishes,* 8, 1-57.

Gomon, M. F. & Roberts, C. D. (2011) A second New Zealand species of the stargazer genus *Kathetostoma* (Trachinoidei: Uranoscopidae). *Zootaxa,* 2776, 1-12.

Gon, O. (1983) *Paratrachichthys heptalepis,* a new roughie (Pisces, Trachichthyidae) from the Hawaiian Islands. *Pacific Science,* 37, 293-299.

Gon, O. (1987) New records of three fish species from Hawaii. *Japanese Journal of Ichthyology,* 34, 100-104.

Gon, O. (1988) Redescription of the holotypes of *Vincentia conspersa* (Klunzinger, 1872) and *Apogon punctatus* (Klunzinger, 1879)(Pisces, Apogonidae). *Records of the Western Australian Museum,* 14, 7-14.

Gon, O. & Randall, J. E. (2003) A review of the cardinalfishes (Perciformes: Apogonidae) of the Rea Sea. *Smithiana Publications in Aquatic Biodiversity,* 1, 1-48.

Gonzales, B. J., Okamura, O., Nakamura, K. & Miyahara, H. (1994) New record of the annular sole, *Synaptura annularis* (Soleidae, Pleuronectiformes) from Japan. *Japanese Journal of Ichthyology,* 40, 491-494.

Goode, G. B. & Bean, T. H. (1878) The craig flounder of Europe, *Glyptocephalus cynoglossus*, on the coast of North America. *Proceedings of the United States National Museum,* 1, 19-23.

Goode, G. B. & Bean, T. H. (1879) Description of a new genus and species of fish, *Lopholatilus chamaeleonticeps*, from the South coast of New England. *Proceedings of the United States National Museum,* 2, 205-209.

Goode, G. B. & Bean, T. H. (1882) Descriptions of twenty-five new species of fish from the Southern United States, and three new genera, *Letharcus, Ioglossus,* and *Chriodorus*. *Proceedings of the United States National Museum,* 5, 412-437.

Goode, G. B., Bean, T. H. & Albatross (1894) On Cetomimidae and Rondeletiidae, two new families of bathybial fishes from the Northwestern Atlantic. *Scientific results of explorations by the U. S. Fish Commission steamer Albatross. Proceedings of the United States National Museum,* 17, 45-451.

Goodyear, R. H. (1970) A new species of *Ataxolepis*, a bathypelagic fish from the Gulf of Panama (Pisces, Lampridiformes, Megalomycteridae). *Streenstrupia,* 1, 17-20.

Goren, M., Gayer, K. & Lazarus, N. (2009) First record of the far East chameleon goby *Tridentiger trigonocephalus* (Gill, 1859) in the Mediterranean Sea. *Aquatic Invasions,* 4, 413-415.

Goren, M. & Rychwalski, E. M. (1978) Hybrids of *Aphanius dispar* and *Aphanius mento* (Cyprinodontidae: Pisces). *Zoological Journal of the Linnean Society,* 63, 259-264.

Gosline, W. A. (1951a) *Chilorhinus brocki*, a new echelid eel from Hawaii, with notes on the classification of the order Anguillida. *Copeia,* 1951, 195-202.

Gosline, W. A. (1951b) Notes on the characid fishes of the subfamily Serrasalminae. *Proceedings of the California Academy of Sciences (Series 4),* 27, 17-64.

Gosline, W. A. (1963) Notes on the osteology and systematic position of *Hypoptychus dybowskii* Steindachner and other elongate perciform fishes. *Pacific Science,* 27, 90-101.

Gosline, W. A. (1996) Structures associated with feeding in three broad-mouthed, benthic fish groups. *Environmental Biology of Fishes,* 47, 399-405.

Gosztonyi, A. E. (1977) Results of the research cruises of FRV "Walther Herwig" to South America. XLVIII, revision of the South American Zoarcidae (Osteichthyes: Blennioidei), with the description of three new genera and five new species. *Archiv für Fischereiwissenschaft,* 27, 191-249.

Gourène, G. & Teugels, G. (1988) A new species of herring-like fish *Microthrissa* (Pisces, Clupeidae, Pellonulinae) from the Zaire basin, Central Africa. *Cybium,* 12, 357-363.

Gourène, G. & Teugels, G. G. (1993) Position taxinomique de *Limnothrissa strappersii*, un clupéidé lacustre d'Afrique centrale. *Ichthyological Exploration of Freshwaters,* 4, 367-374.

Govoni, J. J. (1987) The ontogeny of dentition in *Leiostomus xanthurus*. *Copeia,* 1987, 1041-1046.

Grande, L. (2010) *An empirical synthetic pattern study of gars (Lepisosteiformes) and closely related species, based mostly on skeletal anatomy. The resurection of*

Holostei. American Society of Ichthyologists and Herpetologists Special Publication 6, 1-871 pp.

Grande, L. & Bemis, W. E. (1998) A comprehensive pohylogenetic study of amiid fishes (Amiidae) based on comparative skeletal anatomy. An empirical Search for interconnected patterns of natural history. *Memoir (Society of Vertebrate Paleontology),* 4, 1-690.

Grande, T., Laten, H. & López, J. A. (2004) Phylogenetic relationships of extant esocid species (Teleostei: Salmoniformes) based on morphological and molecular characters. *Copeia,* 2004, 743-757.

Green, M. (1941) The cranial and appendicular osteology of *Aplodinotus grunniens* Rafinesque. *Transactions of the Kansas Academy of Science (1903),* 44, 400-413.

Greenfield, D. W. (1997) *Allenbatrachus*, a new genus of Indo-Pacific toadfish (Batrachoididae). *Pacific Science,* 51, 306-313.

Greenfield, D. W. (2002) *Palatogobius grandoculus:* a new deep-water western Caribbean goby (Teleostei: Gobiidae). *Copeia,* 2002, 716-718.

Greenfield, D. W. (2005a) *Brotula flaviviridis*, a new species of Brotula from Fiji (Teleostei: Ophidiidae: Brotulinae). *Proceedings of the California Academy of Sciences,* 56, 80-85.

Greenfield, D. W. (2005b) *Perulibatrachus aquilonarius*, a new toadfish species from India (Teleostei: Batrachoididae). *Proceedings of the California Academy Sciences,* 56, 76-79.

Greenfield, D. W. & Greenfield, T. (1973) *Triathalassothia gloverensis*, a new species of toadfish from Belize (=British Honduras) with remarks on the genus. *Copeia,* 1973, 560-565.

Greenfield, D. W. & Hensley, D. A. (1970) Damselfishes (Pomacentridae) of Easter Island, with descriptions of two new species. *Copeia,* 1970, 689-695.

Greenwood, P. H. (1961) A revision of the genus *Dinotopterus* Blgr. (Pisces, Clariidae) with notes on the comparative anatomy of the suprabranchial organs in the Clariidae. *Bulletin of the British Museum (Natural History) Zoology,* 7, 215-241.

Greenwood, P. H. (1965) Two new species of *Haplochromis* (Pisces, Cichlidae) from Lake Victoria. *The Annals and Magazine of Natural History,* 8, 303-318.

Greven, H. & Brenner, M. (2008) Further notes on dentition and prey capture of the pike killifish *Belonesox belizanus* (Poeciliidae). *Bulletin of Fish Biology Volume,* 10, 97-103.

Greven, H., Walker, Y. & Zanger, K. (2009) On the structure of teeth in the viperfish *Chauliodus sloani* Bloch & Schneider, 1801 (Stomiidae). *Bulletin of Fish Biology,* 11, 87-98.

Greven, H., Wanninger, A.-C. & Clemen, G. (1997) Dentigerous bones and dentition in the hemiramphid fish *Dermogenys pusillus* (Atheriniformes, Teleostei). *Annals of Anatomy - Anatomischer Anzeiger,* 179, 21-32.

Grey, M. (1956) New records of deep-sea fishes, including a new species, *Oneirodes bradburyae*, from the Gulf of Mexico. *Copeia,* 1956, 242-246.

Grey, M. (1959) Deep-sea fishes from the Gulf of Mexico with the description of a new species *Squalogadus intermedius* (Macrouroididae). *Fieldiana Zoology,* 39, 323-346.

Griffin, L. T. (1933) Descriptions of New Zealand fishes. *Transactions New Zealand Institute,* 63, 171-177.

Grinols, R. B. (1969) A new species of *Acantholiparis* (Pisces: Liparidae) from the Eastern Subarctic Pacific region, with distribution notes for the genus. *Journal of the Fisheries Research Board of Canada,* 26, 1237-1242.

Grubh, A. R. & Winemiller, K. O. (2004) Ontogeny of scale feeding in the Asian glassfish, *Chanda nama* (Ambassidae). *Copeia,* 2004, 903-907.

Guimaraes, R. Z. P. (1999) Revision, phylogeny and comments on biogeography of soapfishes of the genus *Rypticus* (Teleostei: Serranidae). *Bulletin of Marine Science,* 65, 337-379.

Guimarães-Cruz, R. J., Santos, J. E., Sato, Y. & Veloso-Júnior, V. C. (2009) Early development stages of the catfish *Lophiosilurus alexandri* Steindachner, 1877 (Pisces: Pseudopimelodidae) from the São Francisco River basin, Brazil. *Journal of Applied Ichthyology,* 25, 321-327.

Gunter, G. (1946) A new species of flatfish, *Cyclopsetta decussata* (Pleuronectidae), from the Texas coast. *Copeia,* 1946, 27-28.

Günther, A. (1861a) On a new genus of Australian freshwater fishes. *The Annals and Magazine of Natural History,* 7, 490-491.

Günther, A. (1862) Catalogue of the fishes in the British Museum. *Catalogue of the Acanthopterygii, Pharyngognathi, and Anacanthini in the collection of the British Muesum,* 4, 1-534.

Günther, A. (1863) On new species of fishes from the Essequibo. *The Annals and Magazine of Natural History (Series 3)* 12, 441-443.

Günther, A. (1865) Description of a new characinoid genus of fish from West Africa. *Journal of Natural History (Series 3),* 15, 209-210.

Günther, A. (1867) New fishes from the Gaboon and Gold Coast. *The Annals and Magazine of Natural History (Series 3),* 20, 110-117.

Günther, A. (1868) *Catalogue of the Physostomi, containing the families Heteropygii, Cyprinidae, Gonorhynchidae, Hyodontidae, Osteoglossidae, Clupeidae, Chirocentridae, Alepocephalidae, Notopteridae, Halosauridae in the collection of the British Museum*. Taylor and Francis, London, 481 pp.

Günther, A. (1872a) Notice of two new fishes from Celebes. *Journal of Natural History (Series 4),* 9, 438-440.

Günther, A. (1872b) Report on several collections of fishes recently obtained for the British Museum. *Proceedings of the Zoological Society of London,* 1871, 652-675.

Günther, A. (1873) Report on a collection of fishes from China. *Journal of Natural History (Series 4),* 12, 239-250.

Günther, A. (1878) Preliminary notices of deep-sea fishes collected during the voyage of H. M. S. `Challenger'. *The Annals and Magazine of Natural History (Series 5),* 2, 248-251.

Günther, D. A. (1861b) A preliminary synopsis of the labroid genera. *The Annals and Magazine of Natural History,* 8, 382-389.

Guo-Qing, L., Wilson, M. V. H. & Grande, L. (1997) Review of *Eohiodon* (Teleostei: Osteoglossomorpha) from Western North America, with a phylogenetic reassessment of Hiodontidae. *Journal of Paleontology,* 71, 1109-1124.

Gutherz, E. J. (1966) Revision of the flounder genus *Ancylopsetta* (Heterosomata: Bothidae) with descriptions of two new species from the Antilles and the Caribbean Sea. *Bulletin of Marine Science,* 16, 445-479.

Gutteridge, A. N. & Bennett, M. B. (2014) Functional implications of ontogenetically and sexually dimorphic dentition in the eastern shovelnose ray, *Aptychotrema rostrata*. *The Journal of Experimental Biology,* 217, 192-200.

Haedrich, R. L. (1966) The stromateoid fish genus *Icichthys*: notes and a new species. *Videnskabelige Meddelelser Dansk Naturhistorisk Forening,* 129, 199-213.

Haedrich, R. L. (1967) A new species of *Psenopsis* (Stromateoidei, Centrolophidae) from Indo-Malayan Seas. *Japanese Journal of Ichthyogy,* 14, 187-196.

Haedrich, R. L. (1968) First record of *Ariomma* (Pisces, Stromateoidei) from the South Pacific, and comments on the elongate species of the genus. *Bulletin of Marine Science,* 18, 249-260.

Haedrich, R. L. (1969) A new family of aberrant stromateoid fishes from the equatorial Indo-Pacific. *Dana Report,* 76, 1-14.

Haedrich, R. L. (1970) A new species in the nomeid fish genus *Psenes* from the equatorial Eastern Pacific. *Breviora,* 351, 1-7.

Haedrich, R. L. (2002) Stromateidae *In:* K. E. Carpenter (Ed), *The living marine resources of the Western Central Atlantic. Volume 3: Bony fishes part 2 (Opistognathidae to Molidae), sea turtles and marine mammals.FAO Species Identification Guide for Fishery Purposes and American Society of Ichthyologists and Herpetologists Special Publication No. 5.* FAO, Rome, 1879-1884 pp.

Hamada, K. (1981) The red devil, *Lyconectes aleutensis* Gilbert, taken in the Gulf of Alaska by a shrimp trawler. *Bulletin of the Faculty of Fisheries Hokkaido University,* 32, 7-9.

Hanel, R. & Sturmbauer, C. (2000) Multiple recurrent evolution of trophic types in Northeastern Atlantic and Mediterranean seabreams (Sparidae, Percoidei). *Journal of Molecular Evolution,* 50, 276-283.

Hanke, G. F. & Roias, S. M. (2013) First specimens of the marine eels *Venefica ocella* and *V. tentaculata* (Nettastomatidae) from British Columbia. *The Canadian Field-Naturalist,* 126, 210-216.

Hanssens, M. & Snoeks, J. (2003) A new species and geographical variation in the *Telmatochromis temporalis* complex (Teleostei, Cichlidae) from Lake Tanganyika. *Journal of Fish Biology,* 63, 593-616.

Hardman, M. (2008) A new species of *Chrysichthys* (Siluriformes: Claroteidae) from Lake Turkana, Kenya. *Proceedings of the Academy of Natural Sciences of Philadelphia,* 157, 25-36.

Hardy, G. S. (1981) A redescription of the pufferfish *Contusus richei* (Tetraodontiformes: Tetraodontidae), and description of a second species of *Contusus*. *New Zealand Journal of Zoology,* 8, 11-23.

Hardy, G. S. (1983a) A new genus and two new species of clingfishes (Gobiesocidae) from New Zealand. *Copeia,* 1983, 863-868.

Hardy, G. S. (1983b) A revision of the fishes of the family Pentacerotidae (Perciformes). *New Zealand Journal of Zoology,* 10, 177-220.

Hardy, G. S. (1985) A new genus and species of pufferfish (Tetraodontidae) from Java. *Bulletin of Marine Science,* 36, 145-149.

Hardy, G. S. (1986) Redescription of *Gilloblennius* Whitley and Phillipps, 1939 (Pisces: Tripterygiidae), and description of a new genus and two new species from New Zealand. *Journal of the Royal Society of New Zealand,* 16, 145-168.

Hardy, G. S. (1987a) A new genus for *Trypterigium dorsalis* Clarke, 1879, an unusual tripiefin (Pisces: Tripterygiidae) from New Zealand. *Journal of the Royal Society of New Zealand,* 17, 157-164.

Hardy, G. S. (1987b) Revision of *Notoclinops* Whitley, 1930 (Pisces: Tripterygiidae), and description of a new species from New Zealand. *Journal of the Royal Society of New Zealand,* 17, 165-176.

Hardy, G. S. (1987c) Revision of some triplefins (Pisces: Tripterygiidae) from New Zealand and Australia, with descriptions of two new genera and two new species. *Journal of the Royal Society of New Zealand,* 17, 253-274.

Hardy, G. S. (1989) The genus *Forsterygion* Whitley & Phillipps, 1939 (Pisces: Tripterygiidae) in New Zealand and Australia, with descriptions of two new species. *Journal of Natural History,* 23, 491-512.

Hardy, G. S. & Hutchins, J. B. (1981) On the validity of the pufferfish genus *Omegophora* Whitley (Tetraodontiformes: Tetraodontidae) with the description of a new species. *Records of the Western Australian Museum,* 9, 187-201.

Harold, A. S. (1998) Phylogentic relationships of the Gonostomatidae (Teleostei: Stomiiformes). *Bulletin of Marine Science,* 62, 715-741.

Harris, P. M. (1992) Ontogeny and metamorphosis in the Dover sole (*Microstomus pacificus*): a description of the early life history stages, with comments on the sister-group relationship between *Microstomus* and *Embassichthys*. *In: Wildlife and Fisheries*. Oregon State University, Corvallis, pp. 1-114.

Harrison, I. J. (2002) Mugiliformes. *In:* K. E. Carpenter (Ed), *The living marine resources of the Western Central Atlantic. Volume 3: Bony fishes part 2 (Opistognathidae to Molidae). FAO species identification guide for fishery purposes and American Society of Ichthyologist and Herpetologists Special Publication No. 5.* FAO, Rome, pp. 1554-1568.

Harry, R. R. (1953) Studies on the bathypelagic fishes of the family Paralepididae. 1. survey of the genera. *Pacific Science,* 7, 219-249.

Hastings, P. A. (1992) Phylogenetic relationships of *Tanyemblemaria alleni*, a new genus and species of Chaenopsid (Pisces: Blennioidei) from the Gulf of Panama. *Bulletin of Marine Science,* 51, 147-160.

Hastings, P. A. & Springer, V. G. (1994) Review of *Stathmonotus*, with redefinition and phylogenetic analysis of the Chaenopsidae (Teleostei: Blennioidei). *Smithsonian Contributions to Zoology,* 558, 1-48.

Hastings, P. A., Walker, H. J. & Buth, D. G. (2003) *Lumpenopsis clitella*: a new species of prickleback (Teleostei: Stichaeidae) from Southern California, with comments on *Lumpenopsis* Soldatov. *Copeia,* 2003, 803-809.

Hatooka, K. (1986) Sexual dimorphism found in teeth of three species of moray eels. *Ichthyological Research,* 32, 379-386.

Hatooka, K. & Yoshino, T. (1998) Two rare ophichthid species of the genus *Lamnostoma* (Pisces: Anguilliformes) from the Western Pacific. *Bulletin of the Osaka Museum of Natural History,* 52, 21-30.

Hayes, R. L. (1974) Histological study of the dentition of *Tautoga onitis*. *Journal of Dental Research,* 53, 1235-1239.

He, S., Gayet, M. & Meunier, F. J. (1999) Phylogeny of the Amphiliidae (Teleostei: Siluriformes). *Annales des Sciences Naturelles,* 20, 117-146.

Heemstra, P. C. (1973) *Anthias conspicuus* sp. nova (Perciformes: Serranidae) from the Indian Ocean, with comments on related species. *Copeia,* 1973, 200-210.

Heemstra, P. C. (1999a) Grammicolepididae. *In:* K. E. Carpenter & V. E. Niem (Eds), *Species identification guide for fisheries purposes. The living marine resources of the western central Pacific. Bony fishes part 2 (Mugilidae to Carangidae).* FAO, Rome, p. 2257.

Heemstra, P. C. (1999b) Macrurocyttidae. *In:* K. E. Carpenter & V. E. Niem (Eds), *Species identification guide for fisheries purposes. The living marine resources of the western central Pacific. Bony fishes part 2 (Mugilidae to Carangidae).* FAO, Rome, p. 2257.

Heemstra, P. C. (1999c) Zeidae. *In:* K. E. Carpenter & V. E. Niem (Eds), *Species identification guide for fisheries purposes. The living marine resources of the western central Pacific. Bony fishes part 2 (Mugilidae to Carangidae).* FAO, Rome, p. 2257.

Heemstra, P. C. (2001) Family Ephippidae. *In:* K. E. Carpenter & V. H. Niem (Eds), *Species identification guide for fishery purposes. The living marine resources of the western central Pacific. Bony fishes part 4 (Labridae to Latimeriidae), estuarine crocodiles, sea turtles, sea snakes and marine mammals*. FAO, Rome, pp. 3611-3622.

Heemstra, P. C. (2010) Taxonomic review of the perciform fish genus *Acanthistius* from the east coast of Southern Africa, with description of a new species and designation of a neotype for *Serranus sebastoides* Castelnau, 1861. *Zootaxa,* 2352, 59-68.

Heemstra, P. C. & Hecht, T. (1986) Dinopercidae, a new family for the percoid marine fish genera *Dinoperca* Boulenger and *Centrarchops* Fowler (Pisces: Perciformes). *Ichthyological Bulletin of the J. L. B. Smith Institute of Ichthyology,* 51, 1-20.

Heemstra, P. C. & Randall, J. E. (1977) A revision of the Emmelichthyidae (Pisces : Perciformes). *Marine and Freshwater Research,* 28, 361-396.

Heiser, J. B., Moura, R. L. & Robertson, D. R. (2000) Two new species of creole wrasse (Labridae: *Clepticus*) from opposite sides of the Atlantic. *Aqua, Journal of Ichthyology and Aquatic Biology,* 4, 67-76.

Henriques, M., Murta, A. & Cabral, H. (2001) *Melanonus zugmayeri* Norman, 1930, captured off Portugal. A review of the current knowledge on this species. *Scientia Marina,* 65, 43-46.

Hensley, D. A. (1986) A new damselfish genus from the Cape Verde Archipelago based on *Glyphidodon (Parma) hermani* Steindachner, 1887 (Pisces: Pomacentridae). *Copeia,* 1986, 857-863.

Hensley, D. A. & Amaoka, K. (1989) A redescription of *Pseudorhombus megalops*, *Cephalopsetta ventrocellata* (Osteichthyes: Pleuronectiformes: Paralichthyidae). *Proceedings of the Biological Society of Washington,* 102, 577-585.

Hensley, D. A. & Buth, D. (2005) Revision of the genus *asterorhombus* (Pleuronectiformes: Bothidae). *Copeia,* 2005, 445-460.

Herold, R. C. (1971) The development and mature structure of dentine in the pike, *Esox lucius*, analysed by microradiography. *Archives of Oral Biology,* 16, 29-40.

Herold, R. C. B. (1974) Ultrastructure of odontogenesis in the pike (*Esox lucius*). Role of dental epithelium and formation of enameloid layer. *Journal of Ultrastructure Research,* 48, 435-454.

Herold, R. C. B. (1975) Scanning electron microscopy of enameloid and dentine in fish teeth. *Archives of Oral Biology,* 20, 635-640.

Herre, A. W. (1942) A new genus and species of Gobiesocidae from the Philippines. *Stanford Ichthyological Bulletin,* 2, 120-122.

Herre, A. W. C. T. (1936a) A new cyprinid genus and species and a new characin from Portuguese East Africa. *Proceedings of the Biological Society of Washington,* 49, 99-101.

Herre, A. W. C. T. (1936b) Two new gobies from Hong Kong. *Hong Kong Naturalist,* 7, 184-185.

Hickey, L. J. (1973) Classification of the architecture of Dicotyledonous leaves. *American Journal of Botany,* 60, 17-33.

Higashi, Y., Iwai, Y. L., Takagi, M., Yasuda, Y., Nagatani, T. & Oda, M. (1983) Tooth attachment in anglerfish (*Lophiomus setigerus* Vahl). *Journal of Osaka Dental University,* 17, 40-49.

Hildebrand, S. F. (1946) A descriptive catalog of the shore fishes of Peru. *Bulletin of the United States National Museum,* 189, 232-236.

Hildebrand, S. F. (1948a) A new genus and five new species of American fishes. *Smithsonian Miscellaneous Collections,* 110, 1-15.

Hildebrand, S. F. (1948b) A review of the American menhaden, genus *Brevoortia*, with a description of a new species. *Smithsonian Miscellaneous Collections,* 107, 1-39.

Hilton, E. J. (2002) Osteology of the extant North American fishes of the genus *Hiodon* Lesueur, 1818 (Teleostei: Osteoglossomorpha: Hiodontiformes). *Fieldiana Zoology,* 100, 1-142.

Hilton, E. J. (2003) Comparative osteology and phylogenetic systematics of fossil and living bony-tongue fishes (Actinopterygii, Teleostei, Osteoglossomorpha). *Zoological Journal of the Linnean Society,* 137, 1-100.

Hilton, E. J. (2009) Osteology of the graveldiver *Scytalina cerdale* (Perciformes: Zoarcoidei: Scytalinidae). *Journal of Morphology,* 270, 1475-1491.

Hilton, E. J., Bemis, W. E. & Buth, D. (2005a) Grouped tooth replacement in the oral jaws of the tripletail, *Lobotes surinamensis* (Perciformes: Lobotidae), with a discussion of its proposed relationship to *Datnioides*. *Copeia,* 2005, 665-672.

Hilton, E. J., Fernandes, C. C., Sullivan, J. P., Lundberg, J. G. & Campos-da-Paz, R. (2007) Redescription of *Orthosternarchus tamandua* (Boulenger, 1898) (Gymnotiformes, Apteronotidae), with reviews of its ecology, electric organ discharges, external morphology, osteology, and phylogenetic affinities. *Proceedings of the Academy of Natural Sciences of Philadelphia,* 156, 1-25.

Hilton, E. J., Grande, L. & Bemis, W. E. (2011) Skeletal anatomy of the shortnose sturgeon, *Acipenser brevirostrum* Lesueur, 1818, and the systematics of sturgeons (Acipenseriformes, Acipenseridae). *Fieldiana Life and Earth Sciences*, 3, 1-168.

Hilton, E. J., Johnson, G. D. & Smith-Vaniz, W. F. (2010) Osteology and systematics of *Parastromateus niger* (Perciformes: Carangidae), with comments on the carangid dorsal gill-arch skeleton. *Copeia,* 2010, 312-333.

Hilton, E. J., Kley, N. J. & Buth, D. (2005b) Osteology of the quillfish, *Ptilichthys goodei* (Perciformes: Zoarcoidei: Ptilichthyidae). *Copeia,* 2005, 571-585.

Hilton, E. J. & Stevenson, D. E. (2013) Osteology of the prowfish, *Zaprora silenus* (Cottiformes: Zoarcoidei: Zaproridae). *Journal of Morphology,* 274, 1143-1163.

Ho, H.-C., Heemstra, P. C. & Imamura, H. (2014) A new species of the sandperch genus *Parapercis* from the Western Indian Ocean (Perciformes: Pinguipedidae). *Zootaxa,* 3802, 335-345.

Ho, H.-C., Shao, K.-T. & Chang, C.-W. (2009a) Three new records of the scorpaeniform fishes in Taiwan. *Platax,* 6, 27-34.

Ho, H. C., Endo, H. & Sakamaki, K. (2008) A new species of *Halicmetus* (Lophiiformes: Ogcocephalidae) from the Western Pacific, with comments on congeners. *Zoological Studies,* 47, 767-773.

Ho, H. C., Prokofiev, A. M. & Shao, K. T. (2009b) A new species of the batfish genus *Malthopsis* (Lophiiformes: Ogcocephalidae) from the Northwestern Indian Ocean. *Zoological Studies,* 48, 394-401.

Ho, H. C., Seret, B. & Shao, K. T. (2009c) Redescription of *Lophiodes infrabrunneus* Smith and Radcliffe, 1912, a senior synonym of *L. abdituspinus* Ni, Wu and Li, 1990 (Lophiiformes: Lophiidae). *Zootaxa,* 2326, 62-68.

Ho, H. C. & Shao, K. T. (2007) A new species of *Halieutopsis* (Lophiiformes: Ogcocephalidae) from Western North and Eastern central Pacific Ocean. *The Raffles Bulletin of Zoology,* 14, 87–92.

Hoese, D. F. & Allen, G. R. (1983) A review of the gudgeon genus *Hypseleotris* (Pisces: Eleotridae) of Western Australia, with descriptions of three new species. *Records of the Western Australian Museum,* 10, 243-261.

Hoese, D. F. & Larson, H. K. (1985) Revision of the Eastern Pacific species of the genus *Barbulifer* (Pisces: Gobiidae). *Copeia,* 1985, 333-339.

Hoese, D. F. & Reader, S. (2001) Revision of the eastern Pacific species of *Gobulus* (Perciformes: Gobiidae), with description of a new species. *Revista de Biologia Tropical,* 49, 169-176.

Hoese, D. F. & Reader, S. (2006) Description of a new species of dwarf *Philypnodon* (Teleostei: Gobioidei: Eleotridae) from Southeastern Australia. *Memoirs of Museum Victoria,* 63, 15-19.

Hoese, D. F. & Rennis, D. S. (2006) Description of a new species of *Heteroclinus* (Blennoidei: Clinidae) from southern Australia. *Memoirs of Museum Victoria,* 63, 21-24.

Hoese, D. F. & Roberts, C. D. (2005) A new species of the eleotrid genus *Thalasseleotris* (Teleostei: Gobioidei) from New Zealand coastal waters. *Journal of the Royal Society of New Zealand,* 35, 417-431.

Holčík, J. (1995) Threatened fishes of the world: *Hucho hucho* (Linnaeus, 1758) (Salmonidae). *Environmental Biology of Fishes,* 43, 105-106.

Holleman, W. (2005) A review of the triplefin fish genus *Enneapterygius* (Blennioidei: Tripterygiidae) in the Western Indian Ocean, with descriptions of four new species. *Smithiana Publications in Aquatic Biodiversity,* 5, 1-25.

Holleman, W. (2007) Fishes of the genus *Helcogramma* (Blennioidei: Tripterygiidae) in the Western Indian Ocean, including Sri Lanka, with descriptions of four new species. *Smithiana Publications in Aquatic Biodiversity,* 7, 51-81.

Holleman, W., Von Der Heyden, S. & Zsilavecz, G. (2012) Delineating the fishes of the *Clinus superciliosus* species complex in Southern African waters (Blennioidei: Clinidae: Clinini), with the validation of *Clinus arborescens* Gilchrist & Thompson, 1908 and *Clinus ornatus* Gilchrist & Thompson, 1908, and with descriptions of two new species. *Zoological Journal of the Linnean Society,* 166, 827-853.

Holmbakken, N. & Fosse, G. (1973) Tooth replacement in *Gadus callarias*. *Zeitschrift für Anatomie und Entwicklungsgeschichte,* 143, 65-79.

Holt, E. W. L. & Byrne, L. W. (1910) Preliminary diagnosis of a new stomiatid fish from South-west of Ireland. *Journal of Natural History,* 6, 294-297.

Hopkins, C. D. (1991) *Hypopomus pinnicaudatus* (Hypopomidae), a new species of gymnotiform fish from French Guiana. *Copeia,* 1991, 151-161.

Hora, S. L. & Silas, E. G. (1952) Evolution and distribution of glyptosternoid fishes of the family Sisoridae (Order: Siluroidea). *Proceedings of the National Institute of Sciences of India,* 18, 309-321.

Horinouchi, M., Sano, M., Taniuchi, T. & Shimizu, M. (1996) Stomach contents of the tetraodontid fish,*Takifugu pardalis*, in Zostera beds at Aburatsubo, central Japan. *Ichthyological Research,* 43, 455-458.

Horn, M. H. & Haedrich, R. L. (1973) Systematic and distributional status of *Psenes sio* and *Psenes pellucidus* (Pisces, Stromateoidei) in the Eastern Pacific. *Copeia,* 1973, 167-169.

Hoshino, K. (2001) Monophyly of the Citharidae (Pleuronectoidei: Pleuronectiformes: Teleostei) with considerations of pleuronectoid phylogeny. *Ichthyological Research,* 48, 391-404.

Hoshino, K. & Amaoka, K. (1998a) Description of a juvenile specimen of the rarely-caught *Samaris macrolepis* (Pleuronectiformes, Samaridae), from off Northwest Australia. *Ichthyological Research,* 45, 401-403.

Hoshino, K. & Amaoka, K. (1998b) Osteology of the flounder, *Tephrinectes sinensis* (lacepède) (teleostei: pleuronectiformes), with comments on its relationships. *Ichthyological Research,* 45, 69-77.

Houde, E. D. (1972) Development and early life history of the Northern Sennet, *Sphyraena borealis* DeKay (Pisces, Sphyraenidae) reared in the laboratory. *Fishery Bulletin,* 70, 185-195.

Howes, G. J. (1982) Review of the genus *Brycon* (Teleostei: Characoidei). *Bulletin of the British Museum (Natural History) Zoology,* 43, 1-47.

Howes, G. J. (1993) Anatomy of the Melanonidae (Teleostei: Gadiformes), with comments on its phylogenetic relationships. *Bulletin of the Natural History Museum,* 59, 11-31.

Howes, G. J. & Sanford, C. P. (1987) Oral ontogeny of the Ayu, *Plecoglossus altivelis* and comparisons with the jaws of other salmoniform fishes. *Zoological Journal of the Linnean Society,* 89, 133-269.

Hubbs, C. (1954) Additional records of clinid fishes, with the description of a new species of *Cryptotrema* from the Gulf of California. *Copeia,* 1954, 17-19.

Hubbs, C. L. (1916) Notes on the marine fishes of California. *University of California Publications in Zoology,* 16, 153-169.

Hubbs, C. L. (1925) A revision of the osmerid fishes of the North Pacific. *Proceedings of the Biological Society of Washington,* 38, 49-56.

Hubbs, C. L. (1926a) Descriptions of new genera of cottoid fishes related to *Artedius*. *Occasional Papers of the Museum of Zoology, University of Michigan,* 170, 1-16.

Hubbs, C. L. (1926b) Notes on the gobioid fishes of California, with descriptions of two new genera. *Occasional Papers of the Museum of Zoology University of Michigan,* 169, 1-6.

Hubbs, C. L. (1931) Studies of the fishes of the order Cyprinodontes, IX: A new and primitive genus of Poeciliidae from Central America. *Occasional Papers of the Museum of Zoology, University of Michigan,* 230, 1-3.

Hubbs, C. L. (1934) Studies of the fishes of the order Cyprinodontes, XIII: *Quintana atrizona*, a new poeciliid. *Occasional Papers of the Museum of Zoology, University of Michigan,* 301, 1-8.

Hubbs, C. L. (1935) Studies of the fishes of the order Cyprinodontes. XIV. *Plectrophallus* regarded as a distinct genus. *Occasional Papers of the Museum of Zoology, University of Michigan,* 302, 1-3.

Hubbs, C. L. (1944) Species of the circumtropical fish genus *Brotula*. *Copeia,* 1944, 162-178.

Hubbs, C. L. (1953a) Fish genus *Rhynchohyalus*, family Argentinidae. *Copeia,* 1953, 96-97.

Hubbs, C. L. (1953b) Revision of the Eastern Pacific fishes of the clinid genus *Labrisomus*. *Zoologica, Scientific Contributions of the New York Zoological Society,* 38, 113-136.

Hubbs, C. L. & Miller, R. R. (1960) *Potamarius*, a new genus of ariid catfishes from the freshwaters of Middle America. *Copeia,* 1960, 101-112.

Hubbs, C. L. & Schultz, L. P. (1934) *Elephantichthys copeianus,* a new cyclopterid fish from Alaska. *Copeia,* 1934, 21-26.

Hubbs, C. L. & Schultz, L. P. (1939) A revision of the toadfishes referred to *Porichthys* and related genera. *Proceedings of the United States National Museum,* 86, 473-496.

Hubbs, C. L. & Turner, C. (1939) Studies of the fishes of the order Cyprinodontes. XVI. A revision of the Goodeidae. *Miscellaneous Publications, Museum of Zoology, University of Michigan,* 42, 1-80.

Hughes, D. R., Bassett, J. R. & Moffat, L. A. (1994) Structure and origin of the tooth pedicel (the so-called bone of attachment) and dental-ridge bone in the mandibles of the sea breams *Acanthopagrus australis*, *Pagrus auratus* and *Rhabdosargus sarba* (Sparidae, Perciformes, Teleostei). *Anatomy and Embryology,* 189, 51-69.

Hutchins, B. (2006) Description of two new species of shore-eels (Gobiesocidae: Cheilobranchinae: *Alabes*) from Southeastern Australia and Norfolk Island. *Memoirs of Museum Victoria,* 63, 25-28.

Hutchins, B. & Morrison, S. (2004) Five new fish species of the genus *Alabes* (Gobiesocidae: Cheilobranchinae). *Records of the Australian Museum,* 56, 147-158.

Hutchins, J. (1976) A revision of the Australian frogfishes (Batrachoididae). *Records of the Western Australian Museum,* 4, 3-43.

Hutchins, J. B. (1977) Descriptions of three new genera and eight new species of monacanthid fishes from Australia. *Records of the Western Australian Museum,* 5, 3-58.

Hutchins, J. B. (1983) Redescription of the clingfish *Cochleoceps spatula* (Gobiesocidae) from Western Australia and South Australia, with the description of a new species from Victoria and Tasmania. *Records of the Western Australian Museum,* 11, 33-47.

Hutchins, J. B. (1987) Description of a new plesiopid fish from South-western Australia, with a discussion of the zoogeography of *Paraplesiops*. *Records of the Western Australian Museum,* 13, 231-240.

Hutchins, J. B. (1990) Description of a new species of mullid fish from south-western Australia, with comments on *Upeneichthys lineatus*. *Records of the Western Australian Museum,* 14, 483-493.

Hutchins, J. B. & Swainston, R. (1985) Revision of the monacanthid fish genus *Brachaluteres*. *Records of the Western Australian Museum,* 12, 57-78.

Hutton, F. W. (1872) *Fishes of New Zealand. Catalogue with diagnoses of the species*. Colonial Museum and Geological Survey Department, Wellington, 1-93 pp.

Huylebrouck, J., Hadiaty, R. K. & Herder, F. (2012) *Nomorhamphus rex*, a new species of viviparous halfbeak (Atherinomorpha: Beloniformes: Zenarchopteridae) endemic to Sulawesi Selatan, Indonesia. *The Raffles Bulletin of Zoology,* 60, 477-485.

Huysseune, A., Hall, B. K. & Witten, P. E. (2007) Establishment, maintenance and modifications of the lower jaw dentition of wild Atlantic salmon (*Salmo salar* L.) throughout its life cycle. *Journal of Anatomy,* 211, 471-484.

Huysseune, A. & Sire, J. Y. (1997) Structure and development of teeth in three armoured catfish, *Corydoras aeneus*, *C. arcuatus* and *Hoplosternum littorale* (Siluriformes, Callichthyidae). *Acta Zoologica,* 78, 69-84.

Huysseune, A. & Witten, P. E. (2008) An evolutionary view on tooth development and replacement in wild Atlantic salmon (*Salmo salar* L.). *Evolution & Development,* 10, 6-14.

Ida, H. (1976) Removal of the family Hypoptychidae from the suborder Ammodytoidei, order Perciformes, to the suborder Gasterosteoidei, order Syngnathiformes. *Japanese Journal of Ichthyology,* 23, 33-42.

Imamura, H. (2006) Rediagnosis of the marbled flathead, *Platycephalus marmoratus* (Actinopterygii: Teleostei: Platycephalidae), with comments on the composition of the type series. *Species diversity: an international journal for taxonomy,* *systematics, speciation, biogeography, and life history research of animals,* 11, 295-306.

Imamura, H. (2007) *Rogadius mcgroutheri*, a new species of flathead (Teleostei: Platycephalidae) collected from Eastern Australia and New Caledonia. *Ichthyological Research,* 54, 303-307.

Imamura, H. (2010) A new species of the flathead genus *Inegocia* (Teleostei: Platycephalidae) from East Asia. *Bulletin of National Museum of Natural Sciences (Series A),* 4, 21-29.

Imamura, H. & Gomon, M. F. (2010) Taxonomic revision of the genus *Ratabulus* (Teleostei: Platycephalidae), with descriptions of two new species from Australia. *Memoirs of Museum Victoria,* 67, 19-33.

Imamura, H. & Knapp, L. (1998) Review of the genus *Bembras* Cuvier, 1829 (Scorpaeniformes: Bembridae) with description of three new species collected from Australia and Indonesia. *Ichthyological Research,* 45, 165-178.

Imamura, H. & Knapp, L. W. (2009) *Platycephalus orbitalis,* a new species of flathead (Teleostei: Platycephalidae) collected from Western Australia. *Zootaxa,* 2271, 57-63.

Ingenito, L. F. S., Buckup, P. A. & Armbruster, J. W. (2005) A new species of *Parodon* from the Serra da Mantiqueira, Brazil (Teleostei: Characiformes: Parodontidae). *Copeia,* 2005, 765-771.

Isbrücker, I. J. H. (1971) Scientific results of the Peru-Bolivia-expedition Dr. K. H. Lüling 1966: *Pseudohemiodon (Planiloricaria) cryptodon*, a new species and subgenus from Peru (Pisces, Siluriformes, Loricariidae). *Bonner Zoologische Beiträge,* 21, 274-283.

Isbrücker, I. J. H. & Nijssen, H. (1988) Review of the South American characiform fish genus *Chilodus*, with description of a new species, *C. gracilis* (Pisces, Characiformes, Chilodontidae). *Beaufortia,* 38, 47-56.

Ishii, N. & Imamura, H. (2008) Phylogeny of the family Congiopodidae (Perciformes: Scorpaenoidea), with a proposal of new classification. *Ichthyological Research,* 55, 148-161.

Ivantsoff, W. & Crowley, L. (1991) Review of the Australian silverside fishes of the genus *Atherinomorus* (Atherinidae). *Marine and Freshwater Research,* 42, 479-505.

Ivantsoff, W. & Kottelat, M. (1988) Redescription of *Hypoatherina valencienne*i and its relationships to other species of Atherinidae in the Pacific and Indian Oceans. *Ichthyological Research,* 35, 142-149.

Iwamoto, T. (1975) The abyssal fish *Antimora rostrata* (Günther). *Comparative Biochemistry and Physiology Part B: Comparative Biochemistry,* 52, 7-11.

Iwamoto, T., McCosker, J. E. & Barton, O. (1976) Alepocephalid fishes of the genera *Herwigia* and *Bathylaco,* with the first Pacific record of *H. kreffti*. *Japanese Journal of Ichthyology,* 23, 55-59.

Iwata, A. (1983) A revision of the cottid fish genus *Vellitor*. *Japanese Journal of Ichthyology,* 30, 1-9.

Iwata, A., Hosoya, S. & Larson, H. K. (2001) *Paedogobius kimurai*, a new genus and species of goby (Teleostei: Gobioidei: Gobiidae) from the West Pacific. *Records of the Australian Museum,* 53, 103-112.

Iwata, A., Sakai, H. & Schaefer, S. A. (2002) *Odontobutis hikimius* n. sp.: a new freshwater goby from Japan, with a key to species of the genus. *Copeia,* 2002, 104-110.

Iwatsuki, Y., Yoshino, T., Golani, D. & Kanda, T. (1995) The validity of the haemulid fish *Pomadasys quadrilineatus* Shen and Lin, 1984 with the designation of the neotype. *Japanese Journal of Ichthyology,* 41, 455-461.

Jackman, W. R., Davies, S. H., Lyons, D. B., Stauder, C. K., Denton-Schneider, B. R., Jowdry, A., et al. (2013) Manipulation of Fgf and Bmp signaling in teleost fishes suggests potential pathways for the evolutionary origin of multicuspid teeth. *Evolution & Development,* 15, 107-118.

Jackson, K. L. & Nelson, J. S. (1999) *Ambophthalmos eurystigmatephoros*: a new species of fathead sculpin (Scorpaeniformes: Psychrolutidae) from New Zealand. *Copeia,* 1999, 428-433.

Jackson, K. L. & Nelson, J. S. (2006) *Ebinania australiae*, a new species of fathead sculpin from southern Australia (Scorpaeniformes: Psychrolutidae). *Records of the Australian Museum,* 58, 37.

James, G. D. (1976) *Cyttus traversi* Hutton: juvenile form of *C. ventralis* Barnard and Davies (Pisces: Zeidae). *Journal of the Royal Society of New Zealand,* 6, 493-498.

James, P. (1967) The ribbon-fishes of the family Trichiuridae of India. *Marine Biological Association of India Memoir,* 1, 1-226.

James, P. (1985) Comparative osteology of the fishes of the family Leiognathidae Part I: osteology. *Indian Journal of Fisheries,* 32, 309-358.

Janssen, J. & Harbison, G. R. (1981) Fish in salps: the association of squaretails (*Tetragonurus spp*.) with pelagic tunicates. *Journal of the Marine Biological Association of the UK,* 61, 917-927.

Javonillo, R. & Harold, A. S. (2010) A systematic review of the genus *Chasmodes* (Teleostei: Perciformes: Blenniidae). *Zootaxa,* 2558, 1-16.

Jégu, M. & dos Santos, G. M. (2002) Revision du statut de *Myleus setiger* Muller & Troschel, 1844 et de *Myleus knerii* (Steindachner, 1881)(Teleostei: Characidae: Serrasalminae) Avec une descritiption complementaire des deux especies. *Cybium,* 26, 33-57.

Jégu, M., Keith, P. & Belmont-Jégu, E. (2002) Une Nouvelle espece de *Tometes* (Teleostei: Characidae: Serrasalminae) du Bouclier Guyanais, *Tometes lebaili* n. sp. *Bulletin Francais Peche Piscic,* 364, 23-48.

Jenkins, A. & Allen, G. R. (2002) *Neopomacentrus aquadulcis*, a new species of damselfish (Pomacentridae) from eastern Papua New Guinea. *Records of the Western Australian Museum,* 20, 379-382.

Jerep, F. C. & Vari, R. P. (2013) New species of *Hemigrammocharax* (Characiformes: Distichodontidae) from the Northwestern Congo River Basin. *Copeia,* 2013, 31-37.

Ji, H.-S. & Kim, J.-K. (2012) A new species of prickleback, *Dictyosoma tongyeongensis* (Perciformes: Stichaeidae) from the South Sea of Korea. *Zootaxa* 3569, 55-66.

Johnson, G., Baldwin, C., Okiyama, M. & Tominaga, Y. (1996) Osteology and relationships of *Pseudotrichonotus altivelis* (Teleostei: Aulopiformes: Pseudotrichonotidae). *Ichthyological Research,* 43, 17-45.

Johnson, G. D. (1986) Scombroid phylogeny: an alternative hypothesis. *Bulletin of Marine Science,* 39, 1-41.

Johnson, G. D. & Fritzsche, R. A. (1989) *Graus nigra*, an omnivorous girellid, with a comparative osteology and comments on relationships of the Girellidae (Pisces: Perciformes). *Proceedings of the Academy of Natural Sciences of Philadelphia,* 141, 1-27.

Johnson, G. D., Ida, H., Sakaue, J., Sado, T., Asahida, T. & Miya, M. (2012) A 'living fossil' eel (Anguilliformes: Protanguillidae, fam. nov.) from an undersea cave in Palau. *Proceedings of the Royal Society: Biological Sciences,* 279, 934-943.

Johnson, G. D. & Smith-Vaniz, W. F. (1987) Redescription and relationships of *Parasphyraenops atrimanus* Bean (Pisces: Serranidae), with discussion of other Bermudian fishes known only from stomach contents. *Bulletin of Marine Science,* 40, 48-58.

Johnson, J. W. (2004) Two new species and two new records of aploactinid fishes (Pisces: Scorpaeniformes) from Australia. *Records of the Australian Museum,* 56, 179-188.

Johnson, J. W. & Randall, J. E. (2006) *Simipercis trispinosa*, a new genus and species of sandperch (Perciformes: Pinguipedidae) from Eastern Australia. *Memoirs of Museum Victoria,* 63, 57-64.

Johnson, R. K. (1970) A new species of *Diplophos* (Salmoniformes: Gonostomatidae) from the Western Pacific. *Copeia,* 1970, 437-443.

Johnson, R. K. & Glodek, G. S. (1975) Two new species of *Evermannella* from the Pacific Ocean, with notes on other midwater species endemic to the Pacific central or the Pacific equatorial water masses. *Copeia,* 1975, 715-730.

Jones, S. & Kumaran, M. (1967) New records of fishes from the seas around India-Part V. *Journal of the Marine Biological Association of India,* 9, 1-12.

Jones, S. & Kumaran, M. (1968) New records of fishes from the seas around India-Part VI. *Journal of the Marine Biological Association of India,* 10, 321-331.

Jones, S. & Silas, E. (1963) Synopsis of biological data on skipjack *Katsuwonus pelamis* (Linnaeus) 1758 (Indian Ocean). *FAO Fisheries Biology Synopsis No. 64 Species Synopsis No. 21*, 663-694.

Jordan, A. D., Møller, P. R. & Nielsen, J. G. (2003) Revision of the arctic cod genus *Arctogadus*. *Journal of Fish Biology,* 62, 1339-1352.

Jordan, D. S. (1884) List of fishes from Egmont Key, Florida, in the museum of Yale College, with description of two new species. *Proceedings of the Academy of Natural Sciences of Philadelphia,* 36, 42-46.

Jordan, D. S. (1888) Description of a new species of *Callionymus* (*Callionymus bairdi*) from the Gulf of Mexico. *Proceedings of the United States National Museum,* 10, 501-502.

Jordan, D. S. (1891) List of fishes obtained in the harbor of Bahia, Brazil, and in adjacent waters. In: Scientific results of explorations by the U. S. Fish Commission steamer Albatross. *Proceedings of the United States National Museum,* 13, 313-336.

Jordan, D. S. (1906) A review of the sand lances or Ammodytidae of the waters of Japan. *Proceedings of the United States National Museum,* 30, 715-719.

Jordan, D. S. (1907) A review of the fishes of the family Gerridae found in the waters of Japan. *Proceedings of the United States National Museum,* 32, 245-248.

Jordan, D. S. & Evermann, B. W. (1903) Description of a new genus and two new species of fishes from Hawaiian Islands. *Bulletin of the United States Fish Commission,* 22, 209-210.

Jordan, D. S. & Fesler, B. (1889) Description of a new species of *Orthopristis* from the Galapagos Islands. *Proceedings of the Academy of Natural Sciences of Philadelphia,* 41, 36-37.

Jordan, D. S. & Fowler, H. W. (1902a) A review of the cling-fishes (Gobiesocidae) of the waters of Japan. *Proceedings of the United States National Museum,* 25, 413-416.

Jordan, D. S. & Fowler, H. W. (1902b) A review of the trigger-fishes, file-fishes, and trunk-fishes of Japan. *Proceedings of the United States National Museum,* 25, 251-286.

Jordan, D. S. & Fowler, H. W. (1903) A review of the Cepolidae or band-fishes of Japan. *Proceedings of the United States National Museum,* 26, 699-702.

Jordan, D. S. & Gilbert, C. H. (1880a) Description of a new flounder (*Hippoglossoides exilis)*, from the coast of California. *Proceedings of the United States National Museum,* 3, 264-268.

Jordan, D. S. & Gilbert, C. H. (1880b) Description of two new species of fishes, *Ascelichthys rhodorus* and *Scytalina cerdale,* from Neah Bay, Washington Territory. *Proceedings of the United States National Museum,* 3, 264-268.

Jordan, D. S. & Gilbert, C. H. (1880c) Description of two new species of flounders (*Parophrys ischyrus* and *Hippoglossoides elassodon*), from Puget's Sound. *Proceedings of the United States National Museum,* 3, 276-279.

Jordan, D. S. & Gilbert, C. H. (1880d) Descriptions of new species of *Xiphister* and *Apodichthys*, from Monterey, California. *Proceedings of the United States National Museum,* 3, 135-140.

Jordan, D. S. & Gilbert, C. H. (1882a) Description of a new species of *Conodon* (*Conodon serrifer*), from Boca Soledad, Lower California. *Proceedings of the United States National Museum,* 5, 351-352.

Jordan, D. S. & Gilbert, C. H. (1882b) Description of a new species of goby (*Gobiosoma ios*) from Vancouver's Island. *Proceedings of the United States National Museum,* 5, 437-438.

Jordan, D. S. & Gilbert , C. H. (1882c) Descriptions of thirty-three new species of fishes from Mazatlan, Mexico. *Proceedings of the United States National Museum,* 4, 338-365.

Jordan, D. S. & Gilbert, C. H. (1883a) Description of two new species of fishes (*Aprion ariommus* and *Ophidium beani*) from Pensacola, Florida. *Proceedings of the United States National Museum,* 6, 142-144.

Jordan, D. S. & Gilbert, C. H. (1883b) A review of the American Caranginae. *Proceedings of the United States National Museum,* 6, 188-207.

Jordan, D. S. & Richardson, R. E. (1910) A review of the Serranidae or sea bass of Japan. *Proceedings of the United States National Museum,* 37, 421-474.

Jordan, D. S. & Seale, A. (1905) List of fishes collected by Dr. Bashford Dean on the island of Negros, Philippines. *Proceedings of the United States National Museum,* 28, 769-803.

Jordan, D. S. & Sindo, M. (1902) A review of the Japanese species of surf-fishes or Embiotocidae. *Proceedings of the United States National Museum,* 24, 353-359.

Jordan, D. S. & Snyder, J. O. (1899) Description of two new genera of fishes (*Ereunias* and *Drasicus*) from Japan. *Proceedings of the California Academy of Sciences,* 2, 377-379.

Jordan, D. S. & Snyder, J. O. (1902) A review of the blennoid fishes of Japan. *Proceedings of the United States National Museum,* 25, 441-504.

Jordan, D. S. & Starks, E. C. (1904a) List of fishes dredged by the steamer Albatross off the coast of Japan in the summer of 1900, with descriptions of new species and a review of the Japanese Macrouridae. *Bulletin of the U. S. Fish Commission,* 22, 577-630.

Jordan, D. S. & Starks, E. C. (1904b) A review of the Cottidae or sculpins found in the waters of Japan. *Proceedings of the United States National Museum,* 27, 231-335.

Jordan, D. S. & Starks, E. C. (1904c) A review of the Japanese fishes of the family of Agonidae. *Proceedings of the United States National Museum,* 27, 575-599.

Jordan, D. S. & Starks, E. C. (1904d) A review of the scorpaenoid fishes of Japan. *Proceedings of the United States National Museum,* 27, 91-175.

Jordan, D. S. & Starks, E. C. (1906) List of fishes collected on Tanega and Yaku, offshore islands of Southern Japan, by Robert Van Vleck Anderson, with descriptions of seven new species. *Proceedings of the United States National Museum,* 30, 695-706.

Jordan, D. S. & Starks, E. C. (1907) Notes on fishes from the island of Santa Catalina, Southern California. *Proceedings of the United States National Museum,* 32, 67-77.

Jordan, D. S. & Swain, J. (1884) A review of the species of Lutjaninae and Hoplopagrinae found in American waters. *Proceedings of the United States National Museum,* 7, 427-474.

Jordan, D. S. & Thompson, W. F. (1911) A review of the sciaenoid fishes of Japan. *Proceedings of the United States National Museum,* 39, 241-261.

Jordan, D. S. & Thompson, W. F. (1912) A review of the Sparidae and related families of perch-like fishes found in the waters of Japan. *Proceedings of the United States National Museum,* 41, 521-601.

Joshi, K., Zachariah, P. & Kanthan, P. (2012) Description of a new sand lance species, *Bleekeria murtii* (Perciformes: Ammodytidae) from India. *Indian Journal of Fisheries,* 59, 101-107.

Kai, Y. & Nakabo, T. (2009) Taxonomic review of the genus *Cottiusculus* (Cottoidei: Cottidae) with description of a new species from the Sea of Japan. *Ichthyological Research,* 56, 213-226.

Kakizawa, Y., Kajiyama, N., Nagai, K., Kado, K., Fujita, M., Kashiwaya, Y., et al. (1986) The histological structure of the upper and lower jaw teeth in the gobiid fish, *Sicyopterus japonicus*. *The Journal of Nihon University School of Dentistry,* 28, 175.

Kakizawa, Y., Kamishikiryo, K., Shirato, M., Maehara, S., Fujii, H. & Iesato, S. (1980) The tooth development of the parrot perch, *Oplegnathus fasciatus*, (family Oplegnathidae, Teleostei). *The Journal of Nihon University School of Dentistry,* 22, 211.

Kakizawa, Y., Koide, S., Takagi, J., Akama, H., Hirai, J., Hirama, M., et al. (1988) The hinged attachment of teeth in the black bass, *Micropterus salmoides*. *The Journal of Nihon University School of Dentistry,* 30, 128.

Kakizawa, Y. & Meenakarn, W. (2003) Histogenesis and disappearance of the teeth of the Mekong giant catfish, *Pangasianodon gigas* (Teleostei). *Journal of Oral Science,* 45, 213-222.

Kami, H. T. (1973) A new subgenus and species of *Pristipomoides* (family Lutjanidae) from Easter Island and Rapa. *Copeia,* 1973, 557-559.

Kamohara, T. (1952) Revised descriptions of the offshore bottom-fishes of Prov. Tosa, Shikoku, Japan. *Research Reports of the Kôchi University, Natural Science,* 3, 1-122.

Kamohara, T. (1953) A review of the fishes of the family Chlorophthalmidae found in the waters of Japan. *Japanese Journal of Ichthyology,* 3, 1-6.

Kanayama, T. (1991) Taxonomy and phylogeny of the family Agonidae (Pisces: Scorpaeniformes). *Memoirs of the Faculty of Fisheries Hokkaido University,* 38, 1-199.

Kanazawa, R. H. (1951) Description of a new genus of cichlid fish, *Gobiocichla*, from the French Sudan. *The Annals and Magazine of Natural History,* 4, 378-381.

Kanazawa, R. H. (1952) More new species and new records of fishes from Bermuda. *Fieldiana Zoology,* 34, 71-100.

Kanazawa, R. H. (1957) A new species of eel, *Coloconger meadi*, and new records for the ateleopid fish, *Ijimaia antellarum* Howell Rivero, both from the Gulf of Mexico. *Copeia,* 3, 234-235.

Kanazawa, R. H. (1958) A revision of the eels of the genus *Conger* with descriptions of four new species. *Proceedings of the United States National Museum,* 108, 219-267.

Kanazawa, R. H. (1961) *Paraconger*, a new genus with three new species of eels (family Congridae). *Proceedings of the United States National Museum,* 113, 1-14.

Karmovskaya, E. (1994a) *Nettenchelys erroriensis* sp. nova (Nettastomattidae, Anguilliformes), a new species from Error Seamount in the Northwestern Indian Ocean. *Journal of Ichthyology,* 34, 121-125.

Karmovskaya, E. (1994b) Systematics and distribution of the eel genus *Gavialiceps* (Congridae) in the Indo-West Pacific. *Journal of Ichthyology,* 34, 73-89.

Karmovskaya, E. (2004) Benthopelagic bathyal conger eels of the families Congridae and Nettastomatidae from the Western tropical Pacific, with description of ten new species. *Journal of Ichthyology,* 44, 1-32.

Karmovskaya, E. (2006) New species of the genus *Myroconger*, *M. seychellensis* (Myrocongridae, Anguilliformes) from the Western equatorial part of the Indian Ocean. *Journal of Ichthyology,* 46, 563-565.

Karmovskaya, E. S. & Merrett, N. R. (1998) Taxonomy of the deep-sea eel genus, *Histiobranchus* (Synaphobranchidae, Anguilliformes), with notes on the ecology of *H. bathybius* in the Eastern North Atlantic. *Journal of Fish Biology,* 53, 1015-1037.

Katayama, M. (1954) A new serranid fish found in Japan. *Japanese Journal of Ichthyology,* 3, 56-61.

Katayama, M. (1978) The anthiine fish, *Pseudanthias taeniatus,* from Hachijo Island and the coast of Izu, Japan. *Japanese Journal of Ichthyology,* 25, 216-218.

Katayama, M. & Fujii, E. (1982) Two new species of the anthiine genus *Lepidoperca* from Australia and New Zealand. *Japanese Journal of Ichthyology,* 29, 241-252.

Katayama, M. & Masuda, H. (1980) *Tosanoides flavofasciatus*, a new anthiine fish from Sagami Bay, Japan, and the Tonga Ridge, Melanesia. *Japanese Journal of Ichthyology,* 27, 51-55.

Katayama, M. & Masuda, H. (1983) A new anthiine fish, *Anthias truncatus*, from the Kerama Islands, Okinawa. *Japanese Journal of Ichthyology,* 30, 142-145.

Katayama, M. & Takai, T. (1954) A new conger-like eel, *Muraenesox yamaguchiensis,* from the Inland Sea of Japan. 4, 97-101.

Kaunda, E. K. W. H. (2001) Feeding ecology of *Bathyclarias nyasensis* (Siluroidei: Claridae) from Lake Malawi. *In: Department of Ichthyology & Fisheries Science*. Rhodes University, Grahamstown, p. 219.

Kawai, T., Amaoka, K. & Séret, B. (2010) A new righteye flounder, *Poecilopsetta multiradiata* (Teleostei: Pleuronectiformes: Poecilopsettidae), from New Zealand and New Caledonia (South-West Pacific). *Ichthyological Research,* 57, 193-198.

Kawashima, N. & Mover, J. T. (1982) Two pomacentrid fishes, *Pristotis jerdoni* and *Pomacentrus vaiuli*, from the Ryukyu Islands. *Japanese Journal of Ichthyology,* 29, 260-266.

Keith, P., Hoareau, T. & Bosc, P. (2005) The genus *Cotylopus* (Teleostei: Gobioidei) endemic to the rivers of islands of the Indian Ocean with description of a new species from Mayotte (Comoros). *Journal of Natural History,* 39, 1395-1406.

Keith, P., Marquet, G. & Taillebois, L. (2011) Discovery of the freshwater genus *Sicyopus* (Teleostei: Gobioidei: Sicydiinae) in Madagascar, with a description of a new species and comments on regional dispersal. *Journal of Natural History,* 45, 2725-2746.

Keivany, Y. & Nelson, J. S. (2000) Taxonomic review of the genus *Pungitius*, ninespine sticklebacks (Gasterosteidae). *Cybium,* 24, 107-122.

Kenaley, C. P. (2007) Revision of the stoplight loosejaw genus *Malacosteus* (Teleostei: Stomiidae: Malacosteinae), with description of a new species from the temperate southern hemisphere and Indian Ocean. *Copeia,* 2007, 886-900.

Kenaley, C. P. (2009) Revision of Indo-Pacific species of the loosejaw dragonfish genus *Photostomias* (Teleostei: Stomiidae: Malacosteinae). *Copeia,* 2009, 175-189.

Kerebel, L.-M., Cabellec, M.-T. L. & Geistdoerfer, P. (1979) The attachment of teeth in *Lophius*. *Canadian Journal of Zoology,* 57, 711-718.

Khan, M. S., Ambak, M. A. & Mohsin, A. K. M. (2011) Food and feeding biology of a tropical freshwater catfish, *Mystus nemurus* C. & V. with reference to its functional morphology. *Indian Journal of Fisheries,* 35, 78-84.

Kharin, V. (2006a) *Himantolophus sagamius* (Himantolophidae), a new fish species for fauna of Russia. *Journal of Ichthyology,* 46, 274-275.

Kharin, V. (2006b) Rondeletiidae—a new family of fish of the Russian fauna. *Journal of Ichthyology,* 46, 545-546.

Kharin, V., Zemnukhov, V. & Tolokonnikov, A. (2007) *Prognichthys sealei* (Exocoetidae)—a species of flying fish new for the Russian fauna. *Journal of Ichthyology,* 47, 110-111.

Kharin, V. E. & Saveliev, P. A. (2011) First occurrence of the bony flying fish *Hirundichthys oxycephalus* (Exocoetidae) in waters of Russia. *Journal of Ichthyology,* 51, 551-555.

Kieser, J. A., Klapsidis, C., Law, L. & Marion, M. (1993) Heterodonty and patterns of tooth replacement in *Crocodylus niloticus*. *Journal of Morphology,* 218, 195-201.

Kim, B.-J. & Amaoka, K. (2001) A new species, *Parupeneus procerigena*, from the Saya de Malha Bank in the Western Indian Ocean (Perciformes: Mullidae). *Ichthyological Research,* 48, 45-50.

Kim, Y. U., Kim, Y. S., Kang, C.-B. & Kim, J. K. (1997) New record of the genus *Chlorophthalmus* (Pisces: Chlorophthalmidae) from Korea. *Korean Journal of Ichthyology,* 9, 163-168.

Kimura, S., Dunlap, P. V., Peristiwady, T. & Lavilla-Pitogo, C. R. (2003) The *Leiognathus aureus* complex (Perciformes: Leiognathidae) with the description of a new species. *Ichthyological Research,* 50, 221-232.

Kimura, S. & Jiang, Z. Q. (1995) *Zoarchias microstomus*, a new stichaeid fish from Northeastern China. *Japanese Journal of Ichthyology,* 42, 115-119.

Kimura, S. & Suzuki, K. (1990) First record of an evermannellid fish, *Coccorella atrata*, from Japan. *Ichthyological Research,* 37, 187-190.

Kimura, S., Yamashita, T. & Iwatsuki, Y. (2000) A new species, *Gazza rhombea*, from the Indo-West Pacific, with a redescription of *G. achlamys* Jordan & Starks, 1917 (Perciformes: Leiognathidae). *Ichthyological Research,* 47, 1-12.

Kindermann, G., Miljkovic, N., Ahnelt, H. & Stevenson, D. (2007) The osteology of *Eucyclogobius newberryi* and *Quietula guaymasiae* (Teleostei: Gobiidae), two closely related Gobionellines from the East Pacific. *Annalen des Naturhistorischen Museums in Wien: Für Botanik und Zoologie,* 108, 13-56.

King, R. (1989) Distribution, abundance, size and feeding habits of *Brienomyrus brachyistius* (Gill, 1862) (Teleostei: Mormyridae) in a Nigerian rainforest stream. *Cybium,* 13, 25-36.

Kingston, D. I. (1978) *Skiffia francesae*, a new species of goodeid fish from Western México. *Copeia,* 1978, 503-508.

Kishimoto, H. (1987) A new stargazer, *Uranoscopus flavipinnis*, from Japan and Taiwan with redescription and neotype designation of *U. japonicus*. *Japanese Journal of Ichthyology,* 34, 1-14.

Kishimoto, H., Amaoka, K., Kohno, H. & Hamaguchi, T. (1987) A revision of the black-and-white snappers, genus *Macolor* (Perciformes: Lutjanidae). *Ichthyological Research,* 34, 146-156.

Kishimoto, H., Last, P., Fujii, E. & Gomon, M. (1988) Revision of a deep-sea stargazer genus *Pleuroscopus*. *Japanese Journal of Ichthyology,* 35, 150-158.

Klausewitz, W. (1994) Fishes of the family Nettastomatidae (Osteichthyes, Anguilliformes) from the deep-sea of the Red Sea. *Proceedings, Fourth Indo-Pacific Fish Conference, Bangkok, Thailand, 28 November-December 1993 : systematics and evolution of Indo-Pacific fishes.,* 4th, 444-447.

Klausewitz, W. (1995) Tiefenwasser- und Tiefseefische aus dem Roten Meer. XIX. Description of a new species of the deep-sea eel genus *Facciolella* (Pisces: Osteichthyes: Anguilliformes: Nettastomatidae). *Senckenbergiana Maritima,* 26, 45-50.

Klein-MacPhee, G. (1978) Synopsis of biological data for the winter flounder *Pseudopleuronectes americanus* (Walbaum). *FAO Fisheries Synopsis,* 117, 1-43.

Knapp, L. W. (1991) *Platycephalus chauliodous*, a new flathead fish from the eastern Indian Ocean (Teleostei: Platycephalidae). *Proceedings of the Biological Society of Washington,* 104, 23-29.

Knapp, L. W. (1996) Review of the genus *Cociella* Whitley (Telesostei: Platycephalidae) with the description of three species. *Proceedings of the Biological Society of Washington,* 109, 17-33.

Knapp, L. W. & Heemstra, P. C. (2011) *Sorsogona humerosa*, a new flathead fish (Scorpaeniformes: Platycephalidae) from the Western Indian Ocean. *Smithiana Bulletin*, 75-78.

Knizhin, I. B. & S. J., W. (2009) A new species of grayling *Thymallus svetovidovi* sp. nova (Thymallidae) from the Yenisei basin and its position in the genus *Thymallus*. *Journal of Ichthyology,* 49, 1-9.

Knudsen, S. W. & Clements, K. D. (2013) Revision of the fish family Kyphosidae (Teleostei: Perciformes). *Zootaxa,* 3751, 1–101.

Kobelkowsky, A. (2004) Sexual dimorphism of the flounder *Bothus robinsi* (Pisces: Bothidae). *Journal of Morphology,* 260, 165-171.

Kobelkowsky, A. & Escobar, O. P. (2007) Morfología del sistema digestivo de la berrugata *Menticirrhus saxatilis* (Teleostei: Sciaenidae). *Hydrobiologica,* 17, 159-168.

Koch, W. R. (2002) Revisão taxonômica do gênero *Homodiaetus* (Teleostei, Siluriformes, Trichomycteridae). *Iheringia, Série Zoologia (Porto Alegre),* 92, 33-46.

Koefoed, E. (1952) Zeomorphi, Percomorphi, Plectognathi from the "Michael Sars" North Atlantic deep-sea expedition 1910. *Scientific Results of the Michael Sars North Atlantic Deep-Sea Expedition,* 4, 1-27.

Kohno, H. (1984) Osteology and systematic position of the butterfly mackerel, *Gasterochisma melampus*. *Japanese Journal of Ichthyology,* 31, 268-286.

Komada, N. (1986) Teeth of Actinopterygii. *In:* M. G. M. & N. Ohtani (Eds), *Comparative Odontology - Morphology, function and Evolution of Tooth in Vertebrates.* Ishiyaku Publishers Inc., Tokyo, pp. 64-81.

Komada, N., Kumiko, Y., Yasko, N. & Yumiko, O. (2002) Growth of teeth in the juvenile smelt, *Hypomesus transpacificus nipponensis*. *Journal of Growth,* 41, 19-25.

Kornfield, I. & Taylor, J. N. (1983) A new species of polymorphic fish, *Cichlasoma minckleyi*, from Cuatro Cienegas, Mexico (Teleostei: Cichlidae). *Proceedings of the Biological Society of Washington,* 96, 253-269.

Kotlyar, A. (1978) A contribution to the systematics of "armless" flounders (Pisces, Bothidae) from the South-Western Atlantic. *Journal of Ichthyology,* 18, 708-721.

Kotlyar, A. N. (1985) Taxonomy and distribution of Monocentridae (Beryciformes). *Journal of Ichthyology,* 25, 91-106.

Kotlyar, A. N. (1991) The osteology of fish of the suborder Stephanoberycoidei. 2. Melamphaidae. *Journal of Ichthyology,* 31, 100-116.

Kotlyar, A. N. (1995) Osteology and distribution of *Barbourisia rufa* (Barbourisiidae). *Journal of Ichthyology,* 35, 140-140.

Kotlyar, A. N. (2004) Revision of the genus *Scopeloberyx* (Melamphaidae): Part 1. multirakered species of the group *S. robustus*. *Journal of Ichthyology,* 44, 537-554.

Kotlyar, A. N. (2008) Revision of the genus *Poromitra* (Melamphaidae): Part 1. Species of group *P. crassiceps*. *Journal of Ichthyology,* 48, 479-492.

Kotlyar, A. N. (2011) Revision of genus *Melamphaes* (Melamphaidae). II. multi-raker species: *M. polylepis, M. falsidicus* sp. nova, *M. pachystomus* sp. nova, *M. macrocephalus, M. leprus*. *Journal of Ichthyology,* 51, 569-580.

Kotrschal, K. & Goldschmid, A. (1992) Morphological evidence for the biological role of caniniform teeth in combtooth blennies (Blenniidae, Teleostei). *Journal of Fish Biology,* 41, 983-991.

Kottelat, M. (1983) A new species of *Erethistes* Müller & Troschel from Thailand and Burma (Osteichthyes: Siluriformes: Sisoridae). *Hydrobiologia,* 107, 71-74.

Kottelat, M. & Ng, H. H. (1999) *Belodontichthys truncatus*, a new species of silurid catfish from Indochina (Teleostei: Siluridae). *Ichthyological Exploration of Freshwaters,* 10, 387-391.

Kramer, A., Kovačić, M. & Patzner, R. A. (2012) Dentition of eight species of Mediterranean Sea Gobiidae: do dentition characters of gobies reflect phylogenetic relationships? *Journal of Fish Biology,* 80, 29-48.

Kramer, B. & Swartz, E. R. (2010) A new species of slender stonebasher within the *Hippopotamyrus ansorgii* complex from the Cunene River in Southern Africa (Teleostei: Mormyriformes). *Journal of Natural History,* 44, 2213-2242.

Krone, R., Treeck, P., Schuhmacher, H., Nebel, H. & Epple, M. (2006) A special palate structure of *Ctenochaetus striatus*—a hidden tool for bioerosion. *Coral Reefs,* 25, 645-645.

Krumme, U., Keuthen, H., Barletta, M., Villwock, W. & Saint-Paul, U. (2005) Contribution to the feeding ecology of the predatory wingfin anchovy *Pterengraulis atherinoides* (L.) in North Brazilian mangrove creeks. *Journal of Applied Ichthyology,* 21, 469-477.

Kuhn, K. L., Near, T. J., Jones, C. D. & Eastman, J. T. (2009) Aspects of the biology and population genetics of the antarctic nototheniid fish *Trematomus nicolai*. *Copeia,* 2009, 320-327.

Kukuev, E., Parin, N. & Trunov, I. (2012) Materials for the revision of the family Caristiidae (Perciformes). 2. Manefishes from the East Atlantic (Redescription of *Platyberyx opalescens* Zugmayer and description of two new species *Platyberyx mauli* sp. n. and *Caristius andriashevi* sp. n.). *Journal of Ichthyology,* 52, 185-199.

Kulkarni, C. V. (1948) The osteology of Indian cyprinodonts *Records of the Indian Museum,* 48, 65-119.

Kuranaga, I. & Sasaki, K. (2000) Larval development in a snipefish (*Macroramphosus scoplopax*) from Japan with notes on Eastern Pacific and Mediterranean *Macroramphosus* larvae (Gasterosteiformes, Macroramphosidae). *Ichthyological Research,* 47, 101-106.

Kurup, B. M., Cubelio, S. S., Joseph, G., Venu, S. & Deepu, A. V. (2009) First documented record and redescription of *Glyptophidium oceanium* (Ophidiiformes: Ophidiidae) from the Indian Ocean. *Marine Biodiversity Records,* 2, 1-4.

Kwun, H. J., Kim, Y. H., Kim, J. B., Jeong, C.-H. & Kim, J. K. (2010) One unusual species, *Coilia sp.* (Engraulidae, Pisces) from the Yellow Sea. *Animal Cells and Systems,* 14, 137-145.

Labelle, M. & Nursall, J. R. (1985) Some aspects of the early life history of the redlip blenny, *Ophioblennius atlanticus* (Teleostei: Blenniidae). *Copeia,* 1985, 39-49.

Lachner, E. A. & McKinney, J. F. (1978) A revision of the Indo-Pacific fish genus *Gobiopsis* with descriptions of four new species (Pisces: Gobiidae). *Smithsonian Contributions to Zoology,* 262, 1-52.

Lagardère, F., Boulhic, M. & Bürgin, T. (1993) Anomalies in the cephalic area of laboratory-reared larvae and juveniles of the common sole, *Solea solea*: oral jaw apparatus, dermal papillae and pigmentation. *Environmental Biology of Fishes,* 36, 35-46.

Lamboj, A. (2003) *Chromidotilapia melaniae* and *C. nana,* two new cichlid species (Perciformes, Cichlidae) from Gabon, Central Africa. *Zootaxa,* 143, 1-15.

Lamboj, A. (2004) *Pelvicachromis signatus* and *Pelvicachromis rubrolabiatus*, two new cichlid species (Teleostei, Perciformes) from Guinea, West Africa. *Zootaxa,* 454, 1-12.

Landaeta, M. F., Neira, F. J. & Castro, L. R. (2003) Larvae of *Dactylopsaron dimorphicum* (Perciformes: Percophidae) from oceanic islands in the Southeast Pacific. *Fishery Bulletin* 101, 693-697.

Landim, M. I., Costa, W. J. E. M. & Schaefer, S. A. (2002) *Listrura tetraradiata* (Siluriformes: Trichomycteridae): a new glanapterygine catfish from the Southeastern Brazilian coastal plains. *Copeia,* 2002, 152-156.

Langeani, F., Oyakawa, O. T., Montoya-Burgos, J. I. & Schaefer, S. A. (2001) New species of *Harttia* (Loricariidae, Loricariinae) from the Rio São Francisco Basin. *Copeia,* 2001, 136-142.

Larson, H. & Vidthayanon, C. (2000) A new species of the bumble-bee goby genus *Brachygobius* (Teleostei: Gobiidae), from the Mekong River system. *Ichthyological Exploration of Freshwaters,* 11, 1-6.

Larson, H. K. (1976) A new species of *Eviota* with discussion of the nominal genera *Eviota* and *Eviotops*. *Copeia,* 1976, 498-502.

Larson, H. K. (2005) A revision of the gobiid genus *Stigmatogobius* (Teleostei: Gobiidae), with descriptions of two new species. *Ichthyological Exploration of Freshwaters,* 16, 347.

Larson, H. K. & Kottelat, M. (1992) A new species of *Mugilogobius* (Pisces: Gobiidae) from Lake Matano, central Sulawesi, Indonesia. *Ichthyological Exploration of Freshwaters,* 3, 225-234.

Last, P. (1978) A new genus and species of flounder (F. Pleuronectidae) with notes on other Tasmanian species. *Papers and Proceedings of the Royal Society of Tasmania,* 112, 21-28.

Last, P. R., Balushkin, A. V., Hutchins, J. B. & Schaefer, S. A. (2002) *Halaphritis platycephala* (Notothenioidei: Bovichtidae): a new genus and species of temperate icefish from Southeastern Australia. *Copeia,* 2002, 433-440.

Last, P. R., Gledhill, D. C. & Holmes, B. H. (2007) A new handfish, *Brachionichthys australis* sp. nov. (Lophiiformes: Brachionichthyidae), with a redescription of the critically endangered spotted handfish, *B. hirsutus* (Lacepède). *Zootaxa,* 1666, 53-68.

Last, P. R., Yearsley, G. K. & Motomura, H. (2005) *Lioscorpius trifasciatus*, a new scorpionfish (Scorpaeniformes: Setarchidae) from the South-west Pacific Ocean. *Zootaxa,* 1038, 11-22.

Lee, M.-Y., Chen, H.-M. & Shao, K.-T. (2009) A new Species of deep-water tonguefish genus *Symphurus* (Pleuronectiformes: Cynoglossidae) from Taiwan. *Copeia,* 2009, 342-347.

Lee, Y.-J. & Ik-Soo, K. (1992) *Acentrogobius pellidebilis* a new species of gobiid fish from Korea. *Korean Journal of Ichthyology,* 4, 14-19.

Leiby, M. M. (1979) Morphological development of the eel *Myrophis punctatus* (Ophichthidae) from hatching to metamorphosis, with emphasis on the developing head skeleton. *Bulletin of Marine Science,* 29, 509-521.

Leiby, M. M. & Yerger, R. W. (1980) The genus *Bascanichthys* (Pisces: Ophichthidae) in the Gulf of Mexico. *Copeia,* 1980, 402-408.

Leipertz, S. L. & Pietsch, T. W. (1987) A new species of ceratioid anglerfish of the genus *Dolopichthys* (Pisces: Lophiiformes) from the Western North Atlantic Ocean. *Copeia,* 1987, 406-409.

Leis, J. M. (2003) Diodontidae. *In:* K. E. Carpenter (Ed), *The living marine resources of the Western Central Atlantic. Volume 3: Bony fishes part 2 (Opistognathidae to Molidae), sea turtles and marine mammals. FAO species identification guide for fishery purposes and American Society of Ichthyologist and Herpetologists Special Publication No. 5*. FAO, Rome, pp. 953-964.

Leis, J. M. (2006) Nomenclature and distribution of the species of the porcupinefish family Diodontidae (Pisces, Teleostei). *Memoirs of Museum Victoria,* 63, 77-90.

Leslie, A. J., Jr. & Stewart, D. J. (1986) Systematics and distributional ecology of *Etropus* (Pisces, Bothidae) on the Atlantic coast of the United States with description of a new species. *Copeia,* 1986, 140-156.

Liem, K. F. (1965) The status of the anabantoid fish genera *Ctenops* and *Trichopsis*. *Copeia,* 1965, 206-213.

Liem, K. F. (1967) A morphological study of *Luciocephalus pulcher,* with notes on gular elements in other recent teleosts. *Journal of Morphology,* 121, 103-133.

Lin, P.-L. & Shao, K.-T. (1999) A review of the carangid fishes (family Carangidae) from Taiwan with descriptions of four new records. *Zoological Studies,* 38, 33-68.

Lindquist, D. G. & Dillaman, R. M. (1986) Trophic morphology of four Western Atlantic blennies (Pisces: Blenniidae). *Copeia,* 1986, 207-213.

Lithoingambi, I. & Vishwanath, W. (2011) *Oreoglanis majusculus*, a new glyptosternine catfish from Arunachal Pradesh, India (Teleostei: Sisoride). *Zootaxa,* 2754, 06-66.

Livingston, M. E. (1987) Morphological and sensory specializations of five New Zealand flatfish species, in relation to feeding behaviour. *Journal of Fish Biology,* 31, 775-795.

Lloris, D. & Matallanas, J. (2003) Description of a new species of hake: *Merluccius patagonicus* sp. nov. (Gadiformes, Merlucciidae) from the waters of Argentina. *Scientia Marina,* 67, 323-326.

Lobel, P. S. (2011) A review of the Caribbean hamlets (Serranidae, *Hypoplectrus*) with description of two new species. *Zootaxa,* 3096, 1-17.

Lockington, W. N. (1879) Review of the Pleuronectidae of San Francisco. *Proceedings of the United States National Museum,* 2, 69-108.

Lockington, W. N. (1880a) Description of a new genus and some new species of California fishes (*Icosteus aenigmaticus* and *Osmerus attenuatus*). *Proceedings of the United States National Museum,* 3, 63-68.

Lockington, W. N. (1880b) On the Pacific species of *Caulolatilus*. *Proceedings of the Academy of Natural Sciences of Philadelphia,* 32, 13-19.

Lockington, W. N. (1881) Description of a new genus and species of Cottidae. *Proceedings of the United States National Museum,* 4, 141-144.

Loeb, M. V. (2012) A new species of *Anchoviella* Fowler, 1911 (Clupeiformes: Engraulidae) from the Amazon basin, Brazil. *Neotropical Ichthyology,* 10, 13-18.

Loeb, M. V. & Alcantara, A. V. (2013) A new species of *Lycengraulis* Günther, 1868 (Clupeiformes: Engraulinae) from the Amazon basin, Brazil, with comments on *Lycengraulis batesii* (Günther, 1868). *Zootaxa,* 3693, 200–206.

Loiselle, P. V. (2006) A review of the Malagasy *Pachypanchax* (Teleostei: Cyprinodontiformes, Aplocheilidae), with descriptions of four new species. *Zootaxa,* 1366, 1-44.

Long, D. J. & McCosker, J. E. (1998) A new species of the morid genus *Gadella* (Teleostei: Gadiformes) from the Galápagos Islands. *Ichthyological Research,* 45, 1-5.

Loureiro, M. & De Sá, R. O. (1998) Osteological analysis of the killifish genus *Cynolebias* (Cyprinodontiformes: Rivulidae). *Journal of Morphology,* 238, 245-262.

Lubbock, R. (1975) Fishes of the family Pseudochromidae (Perciformes) in the northwest Indian Ocean and Red Sea. *Journal of Zoology,* 176, 115-157.

Lucas, J. & Benkert, K. (1983) Variable foraging and cleaning behavior by juvenile leatherjackets, *Oligoplites saurus* (Carangidae). *Estuaries and Coasts,* 6, 247-250.

Lucena, C. A. S., Malabarba, L. R. & Reis, R. E. (1992) Resurrection of the neotropical pimelodid catfish *Parapimelodus nigribarbis* (Boulenger), with a phylogenetic diagnosis of the genus *Parapimelodus* (Teleostei: Siluriformes). *Copeia,* 1992, 138-146.

Lucena, C. A. S. (1998) Relações filogenéticas e definição do género *Roeboides*, Günther (Ostariophysi; Characiformes; Characidae). *Comunicações do Museu de Ciências e Tecnologia da PUCRS, Sér. Zoologia,* 11, 19-59.

Lucena, Z. M. S. & Gama, C. S. (2007) *Phenacogaster apletostigma*, nova espécie de Peixe do Estado do Amapá, Brasil (Characiformes, Characidae). *Revista Brasileira de Zoologia,* 24, 151-156.

Lucinda, P. H. F. & Reis, R. E. (2005) Systematics of the subfamily Poeciliinae Bonaparte (Cyprinodontiformes: Poeciliidae), with an emphasis on the tribe Cnesterodontini Hubbs. *Neotropical Ichthyology,* 3, 1-60.

Luczkovich, J. J., Norton, S. R. & Gilmore, R. G. (1995) The influence of oral anatomy on prey selection during the ontogeny of two percoid fishes, *Lagodon rhomboides* and *Centropomus undecimalis*. *Environmental Biology of Fishes,* 44, 79-95.

Lujan, N. K. (2008) Description of a new *Lithoxus* (Siluriformes: Loricariidae) from the Guayana highlands with a discussion of Guiana Shield biogeography. *Neotropical Ichthyology,* 6, 413-418.

Lujan, N. K., Hidalgo, M. & Stewart, D. J. (2010) Revision of *Panaque* (*Panaque*), with descriptions of three new species from the Amazon Basin (Siluriformes, Loricariidae). *Copeia,* 2010, 676-704.

Lundberg, J. G. (1982) The comparative anatomy of the toothless blindcat, *Trogloglanis patteroni* Eigenmann, with a phylogenetic analysis of ictalurid catfishes. *Miscellaneous Publication Museum Zoology, University of Michigan,* 163, 1-85.

Lundberg, J. G., Akama, A. & Buth, D. (2005) *Brachyplatystoma capapretum*: a new species of goliath catfish from the Amazon Basin, with a reclassification of allied catfishes (Siluriformes: Pimelodidae). *Copeia,* 2005, 492-516.

Lundberg, J. G. & Fernandes, C. C. (2007) A new species of South American ghost knifefish (Apteronotidae: *Adontosternarchus*) from the Amazon Basin. *Proceedings of the Academy of Natural Sciences of Philadelphia,* 156, 27-37.

Lundberg, J. G., Fernandes, C. C., Albert, J. S. & Garcia, M. (1996) *Magosternarchus*, a new genus with two new species of electric fishes (Gymnotiformes: Apteronotidae) from the Amazon River Basin, South America. *Copeia,* 1996, 657-670.

Lundberg, J. G., Fernandes, C. C., Campos-Da-Paz, R. & Sullivan, J. P. (2013) *Sternarchella calhamazon* n. sp., the Amazon's most abundant species of apteronotid electric fish, with a note on the taxonomic status of *sternarchus capanemae* Steindachner, 1868 (Gymnotiformes, Apteronotidae). *Proceedings of the Academy of Natural Sciences of Philadelphia,* 162, 157-173.

Lundberg, J. G. & Mago-Leccia, F. (1986) A review of *Rhabdolichops* (Gymnotiformes, Sternopygidae), a genus of South American freshwater fishes, with descriptions of four new species. *Proceedings of the Academy of Natural Sciences of Philadelphia,* 138, 53-85.

Lundberg, J. G., Nass, P. & Mago-Leccia, F. (1989) *Pteroglanis manni* Eigenmann and Pearson, a juvenile of *Sorubimichthys planiceps* (Agassiz), with a review of the nominal species of *Sorubimichthys* (Pisces: Pimelodidae). *Copeia,* 1989, 332-344.

Lundberg, J. G. & Py-Daniel, L. R. (1994) *Bathycetopsis oliveirai*, gen. et sp. nov., a blind and depigmented catfish (Siluriformes: Cetopsidae) from the Brazilian Amazon. *Copeia,* 1994, 381-390.

MacDonald, C. M. (1978) Morphological and biochemical systematics of Australian freshwater and estuarine percichthyid fishes. *Marine and Freshwater Research,* 29, 667-698.

MacGinitie, G. E. (1939) The natural history of the blind goby, *Typhlogobius californiensis* Steindac. *American Midland Naturalist,* 21, 489-505.

Machida, Y. (1989a) A new deep-sea ophidiid fish, *Bassozetus levistomatus*, from the Izu-Bonin Trench, Japan. *Japanese Journal of Ichthyology,* 36, 187-189.

Machida, Y. (1989b) Record of *Abyssobrotula galatheae* (Ophidiidae: Ophidiiformes) from the Izu-Bonin Trench, Japan. *Bulletin of Marine Sciences and Fisheries, Kochi University,* 11, 23-25.

Machida, Y. (1991) *Gaidropsarus pacificus* (Temminck & Schlegel), a junior synonym of *Rhinonemus cimbrius* (Linaeus) (Pisces: Gadiformes: Gadidae). *Zoologische Mededelingen,* 65, 327-331.

Machida, Y. (1994) Descriptions of three new and one resurrected species of the bythitid genus *Dinematichthys* (Ophidiiformes). *Japanese Journal of Ichthyology,* 40, 451-464.

Machida, Y., Hashimoto, H. & Yamakawa, T. (1997a) *Apterichtus keramanus*, a new snake-eel from Okinawa, Southern Japan (Ophichthinae, Ophichthidae). *Ichthyological Research,* 44, 27-33.

Machida, Y. & Ohta, S. (1994) A new snake-eel, *Apterichtus orientalis,* from the Pacific coast of Western Japan (Ophichthinae, Ophichthidae). *Japanese Journal of Ichthyology,* 41, 1-5.

Machida, Y. & Okamura, O. (1992) Revision of the bathyal fish genus *Homostolus* (Ophidiiformes, Ophidiidae). *Japanese Journal of Ichthyology,* 38, 341-347.

Machida, Y. & Shiogaki, M. (1988) *Leptochilichthys microlepis*, a new species of the family Leptochilichthyidae, Salmoniformes, from Aomori, northern Japan. *Japanese Journal of Ichthyology,* 35, 1-6.

Machida, Y., Wu, H., Zhong, J. & Endo, H. (1997b) Notes on a specimen of the deep-sea pelagic fish *Brotulotaenia nielseni* from the South China Sea (Ophidiidae). *Ichthyological Research,* 44, 421-424.

Macleay, W. (1881) Descriptive catalogue of the fishes of Australia. Part I. *Proceedings of the Linnean Society of New South Wales,* 5, 302-444.

Maddison, W. P. & Maddison, D. R. (2011) Mesquite: a modular system for evolutionary analysis.Version 3.0 http://mesquiteproject.org

Maisey, J. G., Turner, S., Naylor, G. J. P. & Miller, R. F. (2014) Dental patterning in the earliest sharks: implications for tooth evolution. *Journal of Morphology,* 275, 586-596.

Major, P. F. (1973) Scale feeding behavior of the leatherjacket, *Scomberoides* Lysan and two species of the genus *Oligoplites* (Pisces: Carangidae). *Copeia,* 1973, 151-154.

Malabarba, L. R. & Jerep, F. C. (2012) A new genus and species of Cheirodontine fish from South America (Teleostei: Characidae). *Copeia,* 2012, 243-250.

Malabarba, L. R. & Weitzman, S. H. (2000) A new genus and species of inseminating fish (Teleostei: Characidae: Cheirodontinae: Compsurini) from South America with uniquely derived caudal-fin dermal papillae. *Proceedings of the Biological Society of Washington,* 113, 269-283.

Mamonekene, V. & Vreven, E. (2008) *Distichodus teugelsi* a new distichodontid from the middle Congo River basin, Africa (Characiformes: Distichodontidae). *Ichthyological Exploration of Freshwaters,* 19, 97-98.

Marceniuk, A. P. & Betancur-R, R. (2008) Revision of the species of the genus *Cathorops* (Siluriformes: Ariidae) from Mesoamerica and the Central American Caribbean, with description of three new species. *Neotropical Ichthyology,* 6, 25-44.

Marceniuk, A. P. & Menezes, N. A. (2007) Systematics of the family Ariidae (Ostariophysi, Siluriformes), with a redefinition of the genera. *Zootaxa,* 1416, 1-126.

Markle, D. F. (1980) A new species and a review of the deep-sea fish genus *Asquamiceps* (Salmoniformes: Alepocephalidae). *Bulletin of Marine Science,* 301, 54-53.

Markle, D. F. & Krefft, G. (1985) A new species and review of *Bajacalifornia* (Pisces: Alepocephalidae) with comments on the hook jaw of *Narcetes stomias*. *Copeia,* 1985, 345-356.

Markle, D. F. & Merrett, N. R. (1980) The abyssal alepocephalid, *Rinoctes nasutus* (Pisces: Salmoniformes), a redescription and an evaluation of its systematic position. *Journal of Zoology (London),* 190, 225-239.

Markle, D. F. & Sazonov, Y. I. (1996) Review of the rare deep-sea genus, *Aulastomatomorpha (*Teleostei: Salmoniformes), with a discussion of relationships. *Copeia,* 1996, 497-500.

Marshall, N. B. (1966) *Bathyprion danae* a new genus and species of alepocephaliform fishes. *Dana Report,* 68, 1-10.

Märss, T., Lees, J., Wilson, M. V. H., Saat, T. & Špilev, H. (2010) The morphology and sculpture of ossicles in the Cyclopteridae and Liparidae (Teleostei) of the Baltic Sea. *Estonian Journal of Earth Sciences,* 59, 263-276.

Masuda, H. & Randall, J. E. (2001) *Rabaulichthys suzukii*, a new anthiine fish from Japan. *Ichthyological Research,* 48, 77-81.

Matallanas, J. & Brito, A. (1999) Description of *Ophidion saldanhai* sp. nov. from the Cabo Verde Islands. *Journal of Fish Biology,* 55, 931-936.

Matamoros, W. A., Chakrabarty, P., Angulo, A., Garita-Alvarado, C. A. & McMahan, C. D. (2013) A new species of *Roeboides* (Teleostei: Characidae) from Costa Rica and Panama, with a key to the middle American species of the genus. *Neotropical Ichthyology,* 11, 285-290.

Mathew, G. (2009) Taxonomy, identification and biology of Seabass (*Lates calcarifer*). *National Training on the "Cage Culture of Seabass" held at CMFRI, Kochi*, 38-43.

Matsubara, K. & Ochiai, A. (1952) Two new blennioid fishes from Japan *Japanese Journal of Ichthyology,* 2, 206-213.

Matsui, T. (1967) Review of the mackerel genera *Scomber* and *Rastrelliger* with description of a new species of *Rastrelliger*. *Copeia,* 1967, 71-83.

Matsui, T. & Rosenblatt, R. H. (1987) Review of the deep-sea fish family Platytroctidae (Pisces: Salmoniformes). *Bulletin of the Scripps Institution of Oceanography,* 26, 1-158.

Matsuura, K. (1981) *Xenobalistes tumidipectoris*, a new genus and species of triggerfish (Tetraodontiformes, Balistidae) from the Marianas Islands. *Bulletin of the National Science Museum (Series A),* 7, 191-200.

Matsuura, K. (1982) A new triacanthodid fish, *Triacanthodes indicus*, from the Indian Ocean. *Japanese Journal of Ichthyology,* 28, 385-392.

Matsuura, K. (1989) First record of an extremely small filefish *Rudarius excelsus* from the North Pacific. *Japanese Journal of Ichthyology,* 35, 482-483.

Matsuura, K. & Shiobara, Y. (1989) A new triggerfish, *Rhinecanthus abyssus,* from the Ryukyu Islands. *Japanese Journal of Ichthyology,* 36, 315-317.

Matsuura, K. & Yoshino, T. (2004) A new triggerfish of the genus *Abalistes* (Tetraodontiformes: Balistidae) from the Western Pacific. *Records of the Australian Museum,* 56, 189-194.

Matsuura, Y. & Suzuki, K. (2000) Early development of the flathead, *Percophis brasiliensis* (Teleostei: Percophididae), from Southeastern Brazil. *Ichthyological Research,* 47, 81-87.

Mattos, J. L. O. & Lima, S. M. Q. (2010) *Microcambeva draco*, a new species from Northeastern Brazil (Siluriformes: Trichomycteridae). *Ichthyological Exploration of Freshwaters,* 21, 233-238.

McAllister, D. E., Anderson, M. E. & Hunter, J. (1981) Deep-water eelpouts, Zoarcidae, from Arctic Canada and Alaska. *Canadian Journal of Fisheries and Aquatic Sciences,* 38, 821-839.

McCosker, J., Hatooka, K., Ohnishi, N. & Endo, H. (2011) Redescription and designation of a neotype for *Aphthalmichthys kuro* Kuroda 1947, and its placement in *Callechelys* (Anguilliformes: Ophichthidae). *Ichthyological Research,* 58, 272-277.

McCosker, J. E. (1974) A revision of the ophichthid eel genus *Letharchus*. *Copeia,* 1974, 619-629.

McCosker, J. E. (1977) The osteology, classification, and relationships of the Eel Family Ophichthidae. *Proceedings of the California Academy of Sciences,* 41, 1-123.

McCosker, J. E. (1982) A new genus and two new species of remarkable Pacific worm eels (Ophichthidae, subfamily Myrophinae). *Proceedings of the California Academy of Sciences,* 43, 59-66.

McCosker, J. E. (1985) Two new genera and two new species of deepwater Western Atlantic worm eels (Pisces, Ophichthidae). *Proceedings of the California Academy of Sciences,* 44, 9-15.

McCosker, J. E. (2011) Two new Indo-Pacific species of the sand-eel genus *Yirrkala* (Anguilliformes: Ophichthidae). *Smithiana Bulletin*, 45-50.

McCosker, J. E. & Böhlke, J. E. (1984) A review of the snake eel genera *Gordiichthys* and *Ethadophis*, with descriptions of new species and comments on related Atlantic *Bascanichthyins* (Pisces: Ophichthidae). *Proceedings of the Academy of Natural Sciences of Philadelphia,* 136, 32-44.

McCosker, J. E. & Parin, N. V. (1995) A new species of deepwater worm-eel, *Muraenichthys profundorum* (Anguilliformes: Ophichthidae), from the Nazca Ridge. *Japanese Journal of Ichthyology,* 42, 231-235.

McCosker, J. E. & Rosenblatt, R. H. (1993) A revision of the snake eel genus *Myrichthys* (Anguilliformes: Ophichthidae) withthe description of a new Eastern Pacific species. *Proceedings of the California Academy of Sciences,* 78, 153-169.

McCosker, J. E. & Ross, S. W. (2007) A new deepwater species of the snake eel genus *Ophichthus* (Anguilliformes: Ophichthidae) from North Carolina. *Copeia,* 2007, 783-787.

McCulloch, A. R. (1915) Notes and illustrations of Queensland fishes. *Memoirs of the Queensland Museum,* 3, 47-56.

McCulloch, A. R. (1917) Studies in Australian fishes No. 4. *Records of the Australian Museum,* 11, 163-188.

McCulloch, A. R. & Waite, E. R. (1918) Some new and little-known fishes from South Australia. *Records of the South Australian Museum (Adelaide),* 1, 39-78.

McDowall, R. & Pusey, B. (1983) *Lepidogalaxias salamandroides* Mees - a rediscription, with natural history notes. *Records of the Western Australian Museum,* 11, 11-23.

McDowall, R. M. (1973) Relationships and taxonomy of the New Zealand torrent fish, *Cheimarrichthys fosteri* Haast (Pisces: Mugiloididae). *Journal of the Royal Society of New Zealand,* 3, 199-217.

McDowall, R. M. (1974) Specialization in the dentition of the southern graylings—genus *Prototroctes* (Galaxioidei: Prototroctidae). *Journal of Fish Biology,* 6, 209-213.

McDowall, R. M. (1980a) First adults of *Schedophilus maculatus* Günther, 1860 (Stromateoidei: Centrolophidae). *Journal of the Royal Society of New Zealand,* 10, 145-151.

McDowall, R. M. (1980b) *Seriolella caerulea* Guichenot, 1848 in New Zealand Waters (Stromateoidei: Centrolophidae). *Journal of the Royal Society of New Zealand,* 10, 65-74.

McDowall, R. M. & Burridge, C. P. (2011) Osteology and relationships of the Southern freshwater lower euteleostean fishes. *Zoosystematics and Evolution,* 87, 7-185.

McDowall, R. M. & David, B. O. (2008) *Gobiopterus* in New Zealand (Teleostei: Gobiidae), with observations on sexual dimorphism. *New Zealand Journal of Marine and Freshwater Research,* 42, 325-331.

McDowell, S. B. (1973) Notacanthidae. *In:* D. Cohen, J. Atz, F. Berry, J. Böhlke, R. Gibbs, E. Lachner, G. Mead & D. Merriman (Eds), *Fishes of the Western North Atlantic*. Memoirs of the Sears Foundation for Marine Research, New Haven, pp. 1–228.

McKay, R. J. & Satapoomin, U. (1994) *Pomadasys andamanensis*, a new species of haemulid fish from Thailand. *Phuket Marine Biological Center Research Bulletin,* 59, 1-4.

McMillan, P. J. (1995) Review of trachyrincine grenadier fishes (Pisces: Macrouridae) from New Zealand, with a description of a new species of *Trachyrincus*. *New Zealand Journal of Marine and Freshwater Research,* 29, 83-91.

Mead, G. W. (1957) An Atlantic record of the zeoid fish *Parazen pacificus*. *Copeia,* 1957, 235-237.

Mead, G. W. (1959) The Western Atlantic jawfishes of the opisthognathid genus *Lonchopisthus*. *Natuurwetenschappelijke Studiekring voor Surinam,* 2, 104-112.

Mead, G. W. (1966a) Family Chlorophthalmidae. *In: Fishes of the Western North Atlantic*. Memoirs of the Sears Foundation for Marine Science, New Haven, pp. 162-189.

Mead, G. W. (1966b) Family Ipnopidae. *In: Fishes of the Western North Atlantic*. Memoirs of the Sears Foundation for Marine Science, New Haven, pp. 147-160.

Mead, G. W. & Bohlke, J. (1953) *Scopelarchus linguidens,* a new bathypelagic fish from off Northern Japan. *Japanese Journal of Ichthyology,* 2, 241-245.

Mead, G. W. & Earle, S. A. (1970) Notes on the natural history of snipe eels. *Proceedings of the California Academy of Sciences,* 38, 99-103.

Meek, S. E. (1902) A contribution to the ichthyology of Mexico. *Field Columbian Museum, Zoological Series,* 3, 63-128.

Meek, S. E. & Hildebrand, S. F. (1923) The marine fishes of Panama. *Part I. Field Museum of Natural History, Publications, Zoölogical Series,* 15, 1-330.

Mees, G. F. (1962) A preliminary revision of Belonidae. *Zoologische Mededelingen,* 54, 1-92.

Meisner, A. D. (2001) Phylogenetic systematics of the viviparous halfbeak genera *Dermogenys* and *Nomorhamphus* (Teleostei: Hemiramphidae: Zenarchopterinae). *Zoological Journal of the Linnean Society,* 133, 199-283.

Melo, M. R. S. (2007a) A new synaphobranchid eel (Anguilliformes: Synaphobranchidae) from Brazil, with comments on the species from the Western South Atlantic. *Copeia,* 2007, 315-323.

Melo, M. R. S. (2008) The genus *Kali* Lloyd (Chiasmodontidae: Teleostei) with description of new two species, and the revalidation of *K. kerberti* Weber. *Zootaxa,* 1747, 1-33.

Melo, M. R. S. (2009) Revision of the genus *Chiasmodon* (Acanthomorpha: Chiasmodontidae), with the description of two new species. *Copeia,* 2009, 583-608.

Melo, M. R. S., Walker, H. J., Jr. and C. Klepadlo (2007b) Two new species of *Pseudoscopelus* (Teleostei: Chiasmodontidae), with a new diagnosis for the genus. *Zootaxa,* 1605, 33-46.

Menezes, N. & de Pinna, M. (2000) A new species of *Pristigaster*, with comments on the genus and redescription of *P. cayana* (Teleostei: Clupeomorpha: Pristigasteridae). *Proceedings of the Biological Society of Washington,* 113, 238-248.

Menezes, N. A. (2006) Description of five new species of *Acestrocephalus* Eigenmann and redescription of *A. sardina* and *A. boehlkei* (Characiformes: Characidae). *Neotropical Ichthyology,* 4, 385-400.

Menezes, N. A. (2007) A new species of *Cynopotamus* Valenciennes, 1849 (Characiformes: Characidae) with a key to species of the genus. *Zootaxa,* 1635, 55-61.

Menezes, N. A. & Figueiredo, J. L. (1971) *Lonchopisthus meadi*, a new jawfish from the coast of Rio Grande do Sul, Brasil (Pisces, Opistognathidae). *Papéis Avulsos de Zoologia, São Paulo,* 24, 197-205.

Menezes, N. A. & Lucena, C. A. S. (1998) Revision of the subfamily Roestinae (Ostariophysi: Characiformes: Cynodontidae). *Ichthyological Exploration of Freshwaters,* 9, 279-291.

Menezes, N. A. & Weitzman, S. H. (2011) A systematic review of *Diapoma* (Telostei: Characiformes: Characidae: Stevardiinae: Diapomini) with descritpions of two new species from southern Brazil. *Papeis Avulsos de Zoologia,* 51, 59-82.

Menon, A. G. K. (1977) A systematic monograph of the tongue soles of the genus *Cynoglossus* Hamilton-Buchanan (Pisces, Cynoglossidae). *Smithsonian Contributions to Zoology,* 238, 1-129.

Mercy, T. V. A. & Pillai, N. K. (1985) The anatomy and histology of the alimentary tract of the blind catfish *Horaglanis krishnai* Menon. *International Journal of Speleology,* 14, 69-85.

Merrett, N. R. & Moore, J. A. (2005) A new genus and species of deep demersal fish (Teleostei: Stephanoberycidae) from the tropical Eastern North Atlantic. *Journal of Fish Biology,* 67, 1699-1710.

Merrett, N. R. & Nielsen, J. G. (1987) A new genus and species of the family Ipnopidae (Pisces, Teleostei) from the Eastern North Atlantic, with notes on its ecology. *Journal of Fish Biology,* 31, 451-464.

Merrett, N. R. & Saldanha, L. (1985) Aspects of the morphology and ecology of some unusual deep-sea eels (Synaphobranchidae, Derichthyidae and Nettastomatidae) from the eastern North Atlantic. *Journal of Fish Biology,* 27, 719-747.

Meyer, M. K., Schories, S. & Schartl, M. (2010) Description of *Gambusia zarskei* sp. n.–a new poeciliid fish from the upper Rio Conchos system, Chihuahua, Mexico (Teleostei: Cyprinodontiformes: Poeciliidae). *Vertebrate Zoology,* 60, 11-18.

Miki, T. (1985) New genus and species of the family stichaeidae from Hokkaido, Japan. *Japanese Journal of Ichthyology,* 32, 137-142.

Miki, T., Kanamaru, S.-i. & Amaoka, K. (1987) *Neolumpenus unocellatus*, a new genus and species of stichaeid fish from Japan. *Japanese Journal of Ichthyology,* 34, 128-134.

Mikuriya, B. A. (1972) The gross anatomy and microscopic anatomy of the tongue and lower jaw of *Gnathonemus petersii* (Gthr. 1862) (Mormyridae, Teleostei). *Zoomorphology,* 73, 195-208.

Miller, P. (1977) Gobies from Rhodes and the systematic features of *Zebrus zebrus* (Teleostei: Gobiidae). *Zoological Journal of the Linnean Society,* 60, 339-362.

Miller, P. J. (1973) The osteology and adaptive features of *Rhyacichthys aspro* (Teleostei: Gobioidei) and the classification of gobioid fishes. *Journal of Zoology,* 171, 397-434.

Miller, P. J. & Smith, R. (1989) The West African species of *Bathygobius* (Teleostei: Gobiidae) and their affinities. *Journal of Zoology,* 218, 277-318.

Miller, R. R. (1943) *Cyprinodon salinus*, a new species of fish from Death Valley, California. *Copeia,* 1943, 69-78.

Miller, R. R. (1947) A new genus and specie of deep-sea fish of the Myctophidae from the Phillipine Islands. *Proceedings of the United States National Museum,* 97, 81-90.

Miller, R. R. (1955) A systematic review of the middle American fishes of the genus *Profundulus*. *Miscellaneous Publication Museum Zoology, University of Michigan,* 92, 1-64.

Miller, R. R. (1975) Five new species of Mexican poeciliid fishes of the genera *Poecilia, Gambusia,* and *Poeciliopsis*. *Occasional Papers of the Museum of Zoology, University of Michigan,* 672, 1-44.

Miller, R. R. & Fitzsimons, J. M. (1971) *Ameca splendens*, a new genus and species of goodeid fish from Western México, with remarks on the classification of the Goodeidae. *Copeia,* 1971, 1-13.

Miller, R. R. & Taylor, J. N. (1984) *Cichlasoma socolofi*, a new species of cichlid fish of the *Thorichthys* group from Northern Chiapas, Mexico. *Copeia,* 1984, 933-940.

Miller, W. A. & Radnor, C. J. P. (1973) Tooth replacement in the bowfin (*Amia calva* — Holostei). *Journal of Morphology,* 140, 381-395.

Mims, S., Georgi, T. A. & Liu., C. H. (1993) The Chinese paddlefish, *Psephurus gladius*: biology, life history, and potential for cultivation. *World Aquaculture,* 24, 46-48.

Miquelarena, A. M. & Casciotta, J. R. (1982) Presencia en La Argentina de *Clupeacharax anchoveoides* (Pearson, 1924). *Limnobios,* 2, 333-335.

Mirande, J. M. (2010) Phylogeny of the family Characidae (Teleostei: Characiformes): from characters to taxonomy. *Neotropical Ichthyology,* 8, 385-568.

Mitchill, S. L. (1818) Description of three species of fish. *Journal of the Academy of Natural Sciences Philadelphia,* 1, 407-412.

Miya, M. & Nielsen, J. (1991) A new species of the deep-sea fish genus *Parabrotula* (Parabrotulidae) from Sagami Bay with notes on its ecology. *Ichthyological Research,* 38, 1-5.

Mochizuki, K. & Fukui, S. (1983) Development and replacement of upper jaw teeth in gobiid fish, *Sicyopterus japonicus*. *Japanese Journal of Ichthyology,* 30, 27-36.

Mochizuki, K., Fukui, S. & Gultneh, S. (1991) Development and replacement of teeth on jaws and pharynx in a gobiid fish *Sicydium plumieri* from Puerto Rico, with comments on resorption of upper jaw teeth. *Natural History Research,* 1, 41-52.

Mochizuki, K. & Sano, M. (1984) A new percichthyid fish *Synagrops trispinosus* from the Caribbean Sea and its adjacent waters. *Japanese Journal of Ichthyology,* 31, 1-4.

Moitra, S. K. & Ray, A. K. (1977) Morpho-histology of the alimentary canal of an Indian fresh-water perch, *Colisa fasciata* (Bloch) in relation to food and feeding habits. *Anatomischer Anzeiger,* 141, 37-58.

Mok, H. K., Lee, C. Y. & Chan, H. J. (1991) *Meadia roseni*, a new synaphobranchid eel from the coast of Taiwan (Anguilloidea: Synaphobranchidae). *Bulletin of Marine Science,* 48, 39-45.

Møller, P. R., Schwarzhans, W., Iliffe, T. M. & Nielsen, J. G. (2006) Revision of the Bahamian cave-fishes of the genus *Lucifuga* (Ophidiiformes, Bythitidae), with description of a new species from islands on the Little Bahama Bank. *Zootaxa,* 1223, 23-46.

Monkolprasit, S. (1983) Systematic studies of coral-cods (Serranidae) from the Andaman Sea (Phuket Province) Thailand. *Kasetsart University Fisheries Research Bulletin,* 14, 1-12.

Montilla, J. R. (1935) A review of Philippine Menidae and Gerridae. *Philippine Journal of Science,* 58, 281-297.

Mooi, R. D. & Gill, A. C. (2004) Description of a new species of the fish genus *Acanthoplesiops* Regan (Teleostei: Plesiopidae: Acanthoclininae) from Tonga. *Zootaxa,* 432, 1-10.

Moore, D. (1967) Triggerfishes (Balistidae) of the Western Atlantic. *Bulletin of Marine Science,* 17, 689-722.

Moore, G. I., Hutchins, J. B. & Okamoto, M. (2012) A new species of the deepwater clingfish genus *Kopua* (Gobiesociformes: Gobiesocidae) from the East China Sea—an example of antitropicality? *Zootaxa,* 3380, 34-38.

Moore, J. A. (2003a) Anomalopidae. *In:* K. E. Carpenter (Ed), *The living marine resources of the Western Central Atlantic. Volume 2: Bony fishes part 1 (Acipenseridae to Grammatidae). FAO species identification guide for fishery purposes and American Society of Ichthyologist and Herpetologists Special Publication No. 5*. FAO, Rome, pp. 1182-1183.

Moore, J. A. (2003b) Berycidae. *In:* K. E. Carpenter (Ed), *The living marine resources of the Western Central Atlantic. Volume 2: Bony fishes part 1 (Acipenseridae to Grammatidae). FAO species identification guide for fishery purposes and American Society of Ichthyologist and Herpetologists Special Publication No. 5*. FAO, Rome, pp. 1189-1191.

Moore, J. A. (2003c) Diretmidae. *In:* K. E. Carpenter (Ed), *The living marine resources of the Western Central Atlantic. Volume 2: Bony fishes part 1 (Acipenseridae to Grammatidae). FAO species identification guide for fishery purposes and American*

Society of Ichthyologist and Herpetologists Special Publication No. 5. FAO, Rome, pp. 1178-1179.

Moore, J. A. (2003d) Polymixiidae. *In:* K. E. Carpenter (Ed), *The living marine resources of the Western Central Atlantic. Volume 2: Bony fishes part 1 (Acipenseridae to Grammatidae). FAO species identification guide for fishery purposes and American Society of Ichthyologist and Herpetologists Special Publication No. 5*. FAO, Rome, pp. 953-964.

Moore, J. A. & Dodd, K. A. (2010) A new species of the roughy genus *Hoplostethus* (Teleostei: Trachichthyidae) from the Philippines. *Bulletin of the Peabody Museum of Natural History,* 51, 137-144.

Moreira, C. R. (2005) *Xenurobrycon coracoralinae*, a new glandulocaudine fish (Ostariophysi: Characiformes: Characidae) from central Brazil. *Proceedings of the Biological Society of Washington,* 118, 855-862.

Moreland, J. M. (1960) A new genus and species of congiopodid fish from Southern New Zealand. *Record of the Dominion Museum,* 3, 241-246.

Moresco, A. & Bemvenuti, M. d. A. (2005) Morphologic features and feeding analysis of the black catfish *Trachelyopterus lucenai* Bertoletti, Pezzi da Silva & Pereira (Siluriformes, Auchenipteridae). *Acta Limnologia Brasil,* 17, 37-44.

Morgan, E. C. (1977) Dentitional phenomena and tooth replacement in the scabbard fish *Trichiurus lepturus* Linnaeus (Pisces: Trichiuridae). *Texas Journal of Science,* 29, 71-77.

Morgan, E. C. & King, W. K. (1983) Tooth Replacement in king mackerel, *Scomberomorus cavalla* (Pisces: Scombridae). *The Southwestern Naturalist,* 28, 261-269.

Mori, H. & Shibatta, O. A. (2006) A new species of *Microglanis* Eigenmann, 1929 (Siluriformes: Pseudopimelodidae) from rio Sao Francisco basin, Brazil. *Zootaxa,* 1302, 31-42.

Mori, K. (1966) A new anemone fish, *Amphiprion amamiensis,* n. sp. from Japan. *Report of Faculty of Fisheries Prefectural University of Mie,* 5, 469-472.

Moriyama, K., Watanabe, S., Iida, M., Fukui, S. & Sahara, N. (2009) Morphological characteristics of upper jaw dentition in a gobiid fish (*Sicyopterus japonicus*): a micro-computed tomography study. *Journal of Oral Biosciences,* 51, 81-90.

Moriyama, K., Watanabe, S., Iida, M. & Sahara, N. (2010) Plate-like permanent dental laminae of upper jaw dentition in adult gobiid fish, *Sicyopterus japonicus*. *Cell and Tissue Research,* 340, 189-200.

Morris, C. J., Coad, B. W. & Fisher, G. (2011) The warty dory, *Allocyttus verrucosus*, new to the fish fauna of Canada. *The Canadian Field-Naturalist,* 125, 74-75.

Moteki, M. & Mundy, B. C. (2005) Notes on the morphology of the early stage of the rare bramid genus *Eumegistus*. *Ichthyological Research,* 52, 401-405.

Moteki, M. & Nagasawa, K. (1998) Distribution of the rough pomfret, *Taractes asper* (Bramidae), in the central North Pacific Ocean. *Ichthyological Research,* 45, 419-423.

Motomura, H. (2004) *Threadfins of the world. an annotated and illustrated catalogue of polynemid species known to date. Family Polynemidae. FAO Species Catalogue for Fishery Purposes. No. 3* FAO, Rome, pp. 1-117.

Motomura, H. (2009) *Sebastapistes taeniophrys* (Fowler 1943): a valid scorpionfish (Scorpaenidae) from the Philippines. *Ichthyological Research,* 56, 62-68.

Motomura, H., Béarez, P. & Causse, R. (2011) Review of Indo-Pacific specimens of the subfamily Scorpaeninae (Scorpaenidae), deposited in the museum national d'Histoire naturelle, Paris, with description of a new species of *Neomerinthe*. *Cybium,* 35, 55-73.

Motomura, H., Johnson, J. W. & Buth, D. (2006a) Validity of the poorly known scorpionfish, *Rhinopias eschmeyeri,* with redescriptions of *R. frondosa* and *R. aphanes* (Scorpaeniformes: Scorpaenidae). *Copeia,* 2006, 500-515.

Motomura, H., Last, P. R., Gomon, M. F. & Buth, D. (2006b) A new species of the scorpionfish genus *Maxillicosta* from the Southeast coast of Australia, with a redescription of *M. whitleyi* (Scorpaeniformes: Neosebastidae). *Copeia,* 2006, 445-459.

Motomura, H., Last, P. R. & Yearsley, G. K. (2007) *Scopelarchoides kreffti* (Actinopterygii: Aulopiformes: Scopelarchidae) from off Tasmania, Australia: first records from outside the South Atlantic Ocean. *Species Diversity,* 12, 9-15.

Motomura, H., Sakurai, Y., Senou, H. & Ho, H. C. (2009) Morphological comparisons of the Indo-West Pacific scorpionfish, *Parascorpaena aurita*, with a closely related species, *P. picta,* with first records of *P. aurita* from East Asia (Scorpaeniformes: Scorpaenidae). *Zootaxa,* 2191, 41-57.

Motta, P. J. (1984) Tooth attachment, replacement, and growth in the butterfly fish, *Chaetodon miliaris* (Chaetodontidae, Perciformes). *Canadian Journal of Zoology,* 62, 183-189.

Motta, P. J. (1987) A quantitative analysis of ferric iron in butterflyfish teeth (Chaetodontidae, Perciformes) and the relationship to feeding ecology. *Canadian Journal of Zoology,* 65, 106-112.

Motta, P. J. (1988) Functional morphology of the feeding apparatus of ten species of Pacific butterflyfishes (Perciformes, Chaetodontidae): an ecomorphological approach. *Environmental Biology of Fishes,* 22, 39-67.

Mujib, K. A. (1969) Cranial osteology of *Brosme brosme* with notes on its position within the subfamily Lotinae (Gadidae). *Journal of the Fisheries Board of Canada,* 26, 421-432.

Mukhacheva, V. (1980) A review of the genus *Ichthyococcus* Bonaparte (Photochthyidae). *Journal of Ichthyology,* 20, 1-14.

Mullaney, M. D., Jr. & Gale, L. D. (1996) Ecomorphological relationships in ontogeny: anatomy and diet in gag, *Mycteroperca microlepis* (Pisces: Serranidae). *Copeia,* 1996, 167-180.

Mundy, B., Cole, K., Chave, E. & Moffitt, R. (2011) Two deep-sea spiny eels, *Notacanthus abbotti* and *Lipogenys gillii* (Albuliformes: Notacanthidae), from the Hawaiian Archipelago and Emperor Seamounts with notes on their identification and biogeography. *Ichthyological Research,* 58, 263-271.

Munene, J. & Stiassny, M. L. (2012) A new *Alestopetersius* (Characiformes: Alestidae) from the Kwilu River (Kasai basin) of central Africa; with a phytogeny for the genus and synonymy of *Duboisialestes*. *Zootaxa,* 3166, 59-68.

Munro, I. S. R. (1964) Additions to the fish fauna of New Guinea. *Papua New Guinea Agricultural Journal,* 16, 170-171.

Munroe, T. A. (2003) Scophthalmidae. *In:* K. Carpenter (Ed), *The living marine resources of the Western Central Atlantic. Volume 3: Bony fishes part 2 (Opistognathidae to Molidae), sea turtles and marine mammals. FAO Species Identification Guide for Fishery Purposes and American Society of Ichthyologists and Herpetologists Special Publication No. 5*. FAO, Rome, pp. 1896-1897.

Munroe, T. A. (2012) The spotted flounder, *Azygopus flemingi* Nielsen 1961 (Pisces: Pleuronectiformes: Rhombosoleidae), from deep waters off New Zealand: a second valid species of *Azygopus* Norman 1926, with notes on distribution, size, maturity, and ecology. *Zootaxa,* 3297, 1-33.

Munroe, T. A. & McCosker, J. E. (2001) Redescription of *Symphurus diabolicus* a poorly-known, deep-sea tonguefish (Pleuronectiformes: Cynoglossidae) from the Galapagos Archipelago. *Revista de Biologia Tropical,* 49, 187-198.

Murdy, E. O. (1985) Osteology of *Istigobius ornatus*. *Bulletin of Marine Science,* 36, 124-138.

Murdy, E. O. (1998) A review of the gobioid fish genus *Gobioides*. *Ichthyological Research,* 45, 121-133.

Murdy, E. O. & Ferraris Jr., C. J. (2006) A revision of the marine eel-tailed catfish genus *Euristhmus* (Teleostei: Siluriformes: Plotosidae). *The Beagle, Records of the Museums and Art Galleries of the Northern Territory,* 22, 77-90.

Murdy, E. O. & Schaefer, S. A. (2002) *Karsten*: a new genus of eel goby (Gobiidae: Amblyopinae) with a key to "Trypauchen" group genera. *Copeia,* 2002, 787-791.

Murdy, E. O. & Shibukawa, K. (2003) A revision of the Indo-Pacific fish genus *Caragobius* (Gobiidae: Amblyopinae). *Zootaxa,* 301, 1-12.

Murphy, G. I. (1947) Development of teeth in the California fish *Atherinops affinis*. *Copeia,* 1947, 197-198.

Murray, A. M. (2004) Osteology and morphology of the characiform fish *Alestes stuhlmannii* Pfeffer, 1896 (Alestidae) from the Rufiji River basin, East Africa. *Journal of Fish Biology,* 65, 1412-1430.

Murty, V. S. (1975) On the fishes of the family Platycephalidae of the seas around India. *Journal of the Marine Biological Association of India,* 17, 679-694.

Myers, G. & Freihofer, W. (1966) Megalomycteridae, a previously unrecognized family of deep-sea cetomimiform fishes based on two new genera from the North Atlantic. *Stanford Ichthyological Bulletin,* 8, 193-206.

Myers, G. S. (1924) New genera of African poeciliid fishes. *Copeia*, 41-45.

Myers, G. S. (1938) Studies on the genera of cyprinodont fishes. XIV. *Aplocheilichthys* and its relatives in Africa. *Copeia,* 1938, 136-143.

Myers, G. S. (1956) The name of the South American clupeid fish, *Pristigaster*. *Copeia,* 1956, 63-64.

Myers, G. S. (1960) The mormyrid genera *Hippopotamyrus* and *Cyphomyrus*. *Stanford Ichthyological Bulletin,* 7, 123-125.

Nafpaktitis, B. G. (1966) Two new fishes of the myctophid genus *Diaphus* from the Atlantic Ocean. *Bulletin of the Museum of Comparative Zoology,* 133, 401-424.

Nagatomo, S., Machida, Y. & Endo, H. (2001) Growth-related changes in morphology and food habit of a blenny, *Istiblennius edentulus,* inhabiting rock pools at Shiranohana on Yokonami Peninsula, Kochi Prefecture. *Bulletin of Marine Sciences and Fisheries, Kochi University,* 21, 23-33.

Nair, P. (1999) Artificial spawning by stripping in *Dussumieria acuta*, a marine pelagic fish and studies on its early development. *Journal of the Marine Biological Association of India,* 41, 46-55.

Nakabo, T. (1982) Revision of the family Draconettidae. *Japanese Journal of Ichthyology,* 28, 355-367.

Nakabo, T. (1983) Comparative osteology and phylogenetic relationships of the dragonets (Pisces: Callionymidae) with some thoughts of their evolutionary history. *Publications of the Seto Marine Biological Laboratory,* 28, 1-73.

Nakabo, T., Bray, D. J. & Yamada, U. (2006) A new species of *Zenopsis* (Zeiformes: Zeidae) from the South China Sea, East China Sea and off Western Australia. *Memoirs of Museum Victoria,* 63, 91-96.

Nakabo, T. & Yamamoto, E. (1980) A new draconettid, *Centrodraco otohime*, from the Kyushu-Palau Ridge. *Japanese Journal of Ichthyology,* 26, 325-328.

Nakamura, H., Kamimura, T., Yabuta, Y., Suda, A., Ueyanagi, S., Kikawa, S., et al. (1950) Notes on the life-history of the sword-fish, *Xiphias gladius* Linnaeus. *Notes,* 434, 264-271.

Nakamura, I. (1983) Systematics of the billfishes (Xiphiidae and Istiophoridae). *Publications of the Seto Marine Biological Laboratory,* 28, 255-396.

Nakamura, I. & Parin, N. V. (1993) *Snake mackerels and cutlassfishes of the world (Families Gempylidae and Trichiuridae). An annotated and illustrated catalogue of the snake mackerels, snoeks, escolars, gemfishes, sackfishes, domine, oilfish, cutlassfishes, scabbardfishes, hairtails, and frostfishes known to date*. FAO Fisheries Synopsis No. 125, pp. 1-136.

Nakaya, K., Amaoka, K. & Abe, K. (1980) A review of the genus *Lepidion* (Gadiformes, Moridae) from the Northwestern Pacific. *Japanese Journal of Ichthyology,* 27, 41-47.

Near, T. J., Eytan, R. I., Dornburg, A., Kuhn, K. L., Moore, J. A., Davis, M. P., et al. (2012) Resolution of ray-finned fish phylogeny and timing of diversification. *Proceedings of the National Academy of Sciences,* 109, 13698-13703.

Neely, D. A., Williams, J. D. & Mayden, R. L. (2007) Two new sculpins of the genus *Cottus* (Teleostei: Cottidae) from rivers of Eastern North America. *Copeia,* 2007, 641-655.

Nelson, G. J. (1966) Osteology and relationships of the eel, *Neenchelys buitendijki*. *Copeia,* 1966, 321-324.

Nelson, J. S. (1979) Revision of the fishes of the New Zealand genus *Hemerocoetes* (Perciformes: Percophididae), with descriptions of two new species. *New Zealand Journal of Zoology,* 6, 587-599.

Nelson, J. S. (2006) *Fishes of the World* (4th ed.). John Wiley & Sons, Inc., Edmonton, pp.1-601.

Netto-Ferreira, A. L. (2012) Three new species of *Lebiasina* (Characiformes: Lebiasinidae) from the Brazilian shield border at Serra do Cachimbo, Pará, Brazil. *Neotropical Ichthyology,* 10, 487-498.

Netto-Ferreira, A. L. & Marinho, M. M. F. (2013) New species of *Pyrrhulina* (Osteichthys: Characiformes: Lebiasinidae) from the Brazilian Shield, with comments on a putative monophyletic group of species in the genus. *Zootaxa,* 3664, 369-376.

Neyelov, A. V. & Prirodina, V. P. (2006) Description of *Harpagifer permitini* sp. nova (Harpagiferidae) from the sublittoral zone of South Georgia and redescription of the littoral *H. georgianus* Nybelin. *Journal of Ichthyology,* 46, 1-12.

Ng, H. H. (1999) A review of the southeast Asian catfish genus *Ceratoglanis* (Siluriformes: Siluridae), with the description of a new species from Thailand. *Proceedings of the California Academy of Sciences,* 51, 385-395.

Ng, H. H. (2002) *Bagrichthys majusculus*, a new catfish from Indochina (Teleostei, Bagridae). *Folia Zoologica,* 51, 49-54.

Ng, H. H. (2003) *Kryptotopterus geminus,* a new species of silurid catfish (Teleostei: Siluridae) from mainland Southeast Asia. *Zootaxa,* 305, 1-11.

Ng, H. H. (2004a) *Kryptopterus platypogon*, a new silurid catfish (Teleostei: Siluridae) from Borneo. *Zootaxa,* 398, 1-8.

Ng, H. H. (2004b) The *Microsynodontis* (Teleostei: Siluriformes: Mochokidae) of the lower Guinea region, west central Africa, with the description of eight new species. *Zootaxa,* 531, 1-52.

Ng, H. H. (2004c) *Oreoglanis macronemus*, a new species of glyptosternine catfish (Teleostei: Siluriformes: Sisoridae) From Norther Laos. *Zootaxa,* 52, 209-213.

Ng, H. H. (2004d) *Rita macracanthus*, a new riverine catfish (Teleostei: Bagridae) from South Asia. *Zootaxa,* 568, 1-12.

Ng, H. H. (2005a) *Amblyceps carniatum*, a new species of hillstream catfish from Myanmar (Teleostei: Amblycipitidae). *The Raffles Bulletin of Zoology,* 53, 243-249.

Ng, H. H. (2005b) *Glyptothorax botius* (Hamilton, 1822) a valid species of catfish (Teleostei: Siluriformes) from northeast India, with notes on the identity of *G. telchitta* (Hamilton, 1822). *Zootaxa,* 930, 1-19.

Ng, H. H. (2005c) *Gogangra laevis,* a new species of riverin catfish from Bangladesh (Teleostei: Sisoridae). *Ichthyological Exploration of Freshwaters,* 16, 279-286.

Ng, H. H. (2005d) Two new species of *Psedolaguvia* (Teleostei: Erithistidae) from Bangladesh. *Zootaxa,* 1044, 35-47.

Ng, H. H. (2006a) *Akysis longifilis*, a new species of catfish (Teleostei: Akysidae) from Myanmar. *Zootaxa,* 1150, 19-30.

Ng, H. H. (2006b) *Erithistidoides infuscatus*, a new species of catfish (Teleostei: Erithistidae) from south Asia. *Ichthyological Exploration of Freshwaters,* 17, 281-287.

Ng, H. H. (2008) A new species of *Nanobagrus* (Teleostei: Bagridae) from Southern Borneo. *Copeia,* 2008, 93-98.

Ng, H. H. & Bailey, R. M. (2006) *Chilooglanis productus*, a new species of suckermouth catfish (Siluriformes: Mochokidae) from Zambia. *Occasional Papers of the Museum of Zoology, University of Michigan,* 738, 1-13.

Ng, H. H. & Buth, D. G. (2004) *Wallago micropogon*: A new species of silurid catfish (Teleostei: Siluridae) from Mainland Southeast Asia. *Copeia,* 2004, 92-97.

Ng, H. H. & Edds, D. R. (2005) Two new species of *Pseudecheneis,* reophilic catfishes (Teleostei: Sisoridae) from Nepal. *Zootaxa,* 1047, 1-19.

Ng, H. H. & Freyhof, J. (2001) A review of the catfish genus *Pterocryptis* (Siluridae) in Vietnam, with the description of two new species. *Journal of Fish Biology,* 59, 624-644.

Ng, H. H. & Freyhof, J. (2005) A new species of *Pseudomystus* (Teleostei: Bagridae) from Central Vietnam. *Copeia,* 2005, 745-750.

Ng, H. H. & Hadiaty, R. K. (2011) *Clarias microspilus*, a new walking catfish (Telesostei: Clariidae) from northern Sumatra, Indonesia. *Journal of Threatened Taxa,* 3, 1577-1584.

Ng, H. H., Hong, D. K. & Tu, N. V. (2011) *Clarius gracilentus*, new walking catfish (Teleostei: Clariidae) from Vietnam and Cambodia. *Zootaxa,* 2823, 61-68.

Ng, H. H. & Kottelat, M. (2000) *Cranoglanis henrici* (Vaillant, 1893), a valid species of cranoglanidid catfish from Indochina (Teleostei, Cranoglanididae). *Zoosystema,* 22, 847-852.

Ng, H. H. & Kottelat, M. (2005) *Caelatoglanis zonatus*, a new genus and species of the Erethistidae (Teleostei: Siluriformes) from Myanmar, with comments on the nomenclature of the *Laguvia* and *Hara* species. *Ichthyological Exploration of Freshwaters,* 16, 13-22.

Ng, H. H. & Lim, K. K. P. (2000) *Hemileiocassis panjang*, a new genus and new species of bagrid catfish from Java (Teleostei, Siluriformes). *Beaufortia,* 50, 191-195.

Ng, H. H. & Lim, K. K. P. (2006) Two new species of *Leiocassis* (Teleostei: Bagridae), riverine catfishes from Northeast Borneo. *Ichthyological Exploration of Freshwaters,* 17, 165-172.

Ng, H. H. & Sparks, J. S. (2002) *Plotosus fisadoha*, a new species of marine catfish (Teleostei: Siluriformes: Plotosidae) from Madagascar. *Proceedings of the Biological Society of Washington,* 115, 564-569.

Ng, H. H. & Sparks, J. S. (2003) The arrid catfishes (Teleostei: Siluriformes: Ariidae) of Madagascar, with the description of two new species. *Occasional Papers of the Museum of Zoology, University of Michigan,* 735, 1-21.

Ng, H. H. & Tan, H.-H. (2004) *Ompok platyrhynchus*, a new silurid catfish (Teleostei: Siluridae) from Borneo. *Zootaxa,* 580, 1-11.

Ng, H. H. & Tan, H.-H. (2011) *Silurichthys ligneolus*, a new catfish (Teleostei: Siluridae) from southern Borneo, Indonesia. *Zootaxa,* 2793, 56-62.

Ng, H. H. & Vidthayanon, C. (2011) *Pseudeutropius indigens*, a new species of schilbeid catfish (Teleostei: Siluriformes) from peninsular Thailand. *Zootaxa,* 3037, 45-50.

Ng, P. K. L. & Lim, K. K. P. (1993) The Southeast Asian catfish genus *Encheloclarias* (Teleostei: Clariidae), with descriptions of four new species. *Ichthyological Exploration of Freshwaters,* 4, 21-37.

Nichols, J. T. (1914) *Gobiosoma longum* and *Rivulus heyei*, new fishes from the West Indian fauna. *Bulletin of the American Museum of Natural History,* 33, 143-144.

Nichols, J. T. (1922) *Carangoides jordani* from the Hawaiian Islands with notes on related fishes. *American Museum Novitates,* 50, 1-3.

Nichols, J. T. (1951) Four new gobies from New Guinea. *American Museum Novitates,* 1539, 1-8.

Nichols, J. T. & Griscom, L. (1917) Fresh-water fishes of the Congo basin obtained by the American Museum Congo expedition, 1909-1915. *Bulletin of the American Museum of Natural History,* 37, 653-756.

Nielsen, J. (1965) On the genera *Acanthonus* and *Typhlonus* (Pisces, Brotulidae). *Galathea Report,* 8, 33-47.

Nielsen, J. & Bertelsen, E. (1985) The gulper eel family Saccopharyngidae (Pisces, Anguilliformes). *Streenstrupia,* 1, 157-206.

Nielsen, J., Bertelsen, E. & Jespersen, A. (1989) The biology of *Eurypharynx pelecanoides* (Pisces, Eurypharyngidae). *Acta Zoologica,* 70, 187-197.

Nielsen, J. & Hartel, K. (1996) *Monognathus berteli* sp. nov. from the Indian Ocean (Pisces, Monognathidae). *Ichthyological Research,* 43, 113-115.

Nielsen, J. & Smith, D. G. (1978) The eel family Nemichthyidae. *In: The Carlsberg Foundation's Oceanographical Expedition Round the World 1928-30, and Previous 'Dana"-Expeditions*. The Carlsberg Foundation, Copenhagen, pp. 1-71.

Nielsen, J. G. (1984a) *Parasciadonus brevibrachium* n. gen. et sp.-an abyssal aphyonid from the central Atlantic (Pisces, Ophidiiformes). *Cybium* 8, 39-44.

Nielsen, J. G. (1984b) Two new, abyssal *Barathronus* spp. from the North Atlantic (Pisces: Aphyonidae). *Copeia,* 1984, 579-584.

Nielsen, J. G. (1999) A review of the genus *Neobythites* (Pisces, Ophidiidae) in the Atlantic, with three new species. *Bulletin of Marine Science,* 64, 335-372.

Nielsen, J. G. (2007) *Grammonus yunokawai* (Ophidiiformes: Bythitidae), a new marine cavefish from the Ryukyu Islands. *Ichthyological Research,* 54, 374-379.

Nielsen, J. G. & Larsen, V. (1968) Synopsis of the Bathylaconidae (Pisces, with a new eastern Pacific species. *Galathea Report,* 9, 221-238.

Nielsen, J. G. & Møller, P. R. (2011) Revision of the bathyal cusk-eels of the genus *Bassogigas* (Ophidiidae) with description of a new species from off Guam, West Pacific Ocean. *Journal of Fish Biology,* 78, 783-795.

Nielsen, J. G., Ross, S. W. & Cohen, D. M. (2009) Atlantic occurrence of the genus *Bellottia* (Teleostei, Bythitidae) with two new species from the Western North Atlantic. *Zootaxa,* 2018, 45-57.

Nijssen, H. & Isbrücker, I. J. H. (1972) On *Hypopygus lepturus*, a little known dwarf gymnotid fish from South America (Pisces, Cypriniformes, Gymnotoidei). *Zologische Mededelingen,* 47, 160-176.

Nogawa, Y. & Endo, H. (2007) A new species of the genus *Priolepis* (Perciformes: Gobiidae) from Tosa Bay, Japan. *Bulletin of the National Museum of Nature and Science (Series A),* 1, 153-161.

Norden, C. R. (1961) Comparative osteology of representative salmonid fishes, with particular reference to the grayling (*Thymallus arcticus*) and its phylogeny. *Journal of the Fisheries Research Board of Canada,* 18, 679-791.

Norman, J. (1935a) The carangid fishes of the genus *Decapterus* Bleeker. *The Annals and Magazine of Natural History,* 16, 252-264.

Norman, J. (1935b) A collection of fishes from the Ashanti forest, Gold Coast. *The Annals and Magazine of Natural History,* 15, 215-221.

Norman, J. R. (1925) Two new fishes from Tonkin, with notes on the siluroid genera *Glyptosternum*, *Exostoma*, etc. *The Annals and Magazine of Natural History (Series 9),* 15, 570-575.

Norman, J. R. (1928) Two new fishes from Lake Victoria. *The Annals and Magazine of Natural History,* 2, 104-106.

Norman, J. R. (1929) The teleostean fishes of the family Chiasmodontidæ. *Journal of Natural History (Series 10),* 3, 529-544.

Norman, J. R. (1935c) A revision of the lizard-fishes of the genera *Synodus, Trachinocephalus, and Saurida. Journal of Zoology: Proceedings of the Zoological Society of London,* 105, 99-135.

Norman, J. R. (1937) Diagnoses of new nototheniiform fishes collected by the 'Discovery'Expedition. *Journal of Natural History (Series 10),* 20, 475-476.

Norris, K. S. & Prescott, J. H. (1959) Jaw structure and tooth replacement in the opaleye, *Girella nigricans* (Ayres) with notes on other species. *Copeia,* 1959, 275-283.

Norris, S. M. (1995) *Microctenopoma uelense* and *M. nigricans,* a new genus and two new species of anabantid fishes from Africa. *Ichthyological Exploration of Freshwaters,* 6, 357-376.

Norris, S. M. & Douglas, M. E. (1991) A new species of nest building *Ctenopoma* (Teleostei, Anabantidae) from Zaïre, with a redescription of *Ctenopoma lineatum* (Nichols). *Copeia,* 1991, 166-178.

Norris, S. M. & Douglas, M. E. (1992) Geographic variation, taxonomic status, and biogeography of two widely distributed African freshwater fishes: *Ctenopoma petherici* and *C. kingsleyae* (Teleostei: Anabantidae). *Copeia,* 1992, 709-724.

Norris, S. M. & Teugels, G. G. (1990) A new species of *Ctenopoma* (Teleostei: Anabantidae) from Southeastern Nigeria. *Copeia,* 1990, 492-499.

Nybelin, O. (1947) Antarctic fishes. *Scientific Results of the Norwegian Antarctic Expeditions (1927-1931)* 2, 1-76.

Nybelin, O. (1968) The dentition of the mouth cavity of *Elops*. *Current problems of lower Vertebrate Phylogeny. Proceedings of the Fourth Nobel Symposium, 439-443.*

Nybelin, O. (1976) Note of the osteology of the lower jaw in *Albula vulpes* (L.). (Pisces, Teleostei). *Zoologica Scripta,* 5, 235-237.

O'Toole, B. (2002) Phylogeny of the species of the superfamily Echeneoidea (Perciformes: Carangoidei: Echeneidae, Rachycentridae, and Coryphaenidae), with an interpretation of echeneid hitchhiking behaviour. *Canadian Journal of Zoology,* 80, 596-623.

Ochiai, A. & Amaoka, K. (1962) Review of the Japanese flatfishes of the genus *Samariscus*, with the description of a new species from Tonking Bay. *The Annals and Magazine of Natural History,* 5, 83-91.

Ogilby, J. (1896) On a new genus and species of fishes from Maroubra Bay. *Proceedings of the Linnean Society of New South Wales,* 21, 23-25.

Ogilby, J. (1899) Contribution to Australian ichthyology. *Proceedings of the Linnean Society of New South Wales,* 24, 154-186.

Ogilby, J. (1907) Some new pediculate fishes. *Proceedings of the Royal Society of Queensland,* 20, 17-25.

Ogilby, J. D. (1888) On a new genus Percidae. *Proceedings of the Zoological Society of London,* 1887, 616-618.

Ohazama, A., Haworth, K. E., Ota, M. S., Khonsari, R. H. & Sharpe, P. T. (2010) Ectoderm, endoderm, and the evolution of heterodont dentitions. *Genesis,* 48, 382-389.

Okamoto, M. & Ida, H. (2002) *Acropoma argentistigma*, a new species from the Andaman Sea, off southern Thailand (Perciformes: Acropomatidae). *Ichthyological Research,* 49, 281-285.

Okamura, O. & Kishimoto, H. (1993) *Selenoscopus turbisquamatus*, a new genus and species of uranoscopid fish from Japan and the Norfolk Ridge. *Japanese Journal of Ichthyology,* 39, 311-317.

Okiyama, M. & Johnson, R. (1986) *Rosenblattichthys nemoto*i, a new species of scopelarchidae, from the south Indian Ocean subtropical convergence zone. *Ichthyological Research,* 32, 409-412.

Olney, J. E. (2003) Stylephoridae, Lophotidae, Radiidephalidae, Trachipteridae, and Regalecidae. *In:* K. E. Carpenter (Ed), *The living marine resources of the Western Central Atlantic. Volume 2: Bony fishes part 1 (Acipenseridae to Grammatidae). FAO species identification guide for fishery purposes and American Society of Ichthyologist and Herpetologists Special Publication No. 5*. FAO, Rome, pp. 953-964.

Olney, J. E., Johnson, G. D. & Baldwin, C. C. (1993) Phylogeny of lampridiform fishes. *Bulletin of Marine Science,* 52, 137-169.

Orr, J. W. (2004) *Lopholiparis flerxi:* a new genus and species of snailfish (Scorpaeniformes: Liparidae) from the Aleutian Islands, Alaska. *Copeia,* 2004, 551-555.

Orr, J. W. & Fritzsche, R. A. (1993) Revision of the ghost pipefishes, family Solenostomidae (Teleostei: Syngnathoidei). *Copeia*, 168-182.

Orr, J. W. & Matarese, A. C. (2000) Revision of the genus *Lepidopsetta* Gill, 1862 (Teleostei: Pleuronectidae) based on larval and adult morphology, with a description of a new species from the North Pacific Ocean and Bering Sea. *Fishery Bulletin,* 98, 539-582.

Ortega-Lara, A., Milani, N., DoNascimiento, C., Villa-Navarro, F. & Maldonado-Ocampo, J. A. (2011) Two new trans-Andean species of *Imparfinis* Eigenmann & Norris, 1900 (Siluriformes: Heptapteridae) from Colombia. *Neotropical Ichthyology,* 9, 777-793.

Osse, J. W. M. (1968) Functional morphology of the head of the perch (*Perca fluviatilis L.*): an electromyographic study. *Netherlands Journal of Zoology,* 19, 289-392.

Otero, O. (2004) Anatomy, systematics and phylogeny of both recent and fossil latid fishes (Teleostei, Perciformes, Latidae). *Zoological Journal of the Linnean Society,* 141, 81-133.

Owen, R. (1845) *Odontography or, a treatise on the comparative anatomy of the teeth: their physiological relatios, mode of development, and micrsocopic structure in the vertebrate animals* (Vol. 1). Hippolite Bailliere, London, 1-655 pp.

Owen, R. (1866) *On the anatomy of vertebrates.* (Vol. 1). Longmans, Green and Co., London, 1-592 pp.

Oyakawa, O. T. & Mattox, G. M. T. (2009) Revision of the neotrpical trahiras of the *Hoplias lacerdae* species-group (Ostariophysi: Characiformes: Errythrinidae) with descriptions of two new species. *Neotropical Ichthyology,* 7, 117-140.

Ozawa, T., Oda, K. & Ida, T. (1990) Systematics and distribution of the *Diplophos taenia* species complex (Gonostomatidae), with a description of a new species. *Ichthyological Research,* 37, 98-115.

Palmer, G. (1970) New records, and one new species, of teleost fishes from the Gilbert Islands. *Bulletin of the British Museum (Natural History) Zoology,* 19, 213-234.

Parenti, L. R. (1981) A phylogenetic and biogeographic analysis of cyprinodontiform fishes (Teleostei, Atherinomorpha). *Bulletin of the American Museum of Natural History,* 168, 335-557.

Parenti, L. R. (1984) On the relationships of phallostethid fishes (Atherinomorpha): with notes on the anatomy of *Phallostethus dunckeri* Regan, 1913. *American Museum Novitates,* 2779, 1-12.

Parenti, L. R. (1987) Phylogenetic aspects of tooth and jaw structure of the medaka, *Oryzias latipes*, and other beloniform fishes. *Journal of Zoology,* 211, 561-572.

Parenti, L. R. (1996) Phylogenetic systematics and biogeography of phallostethid fishes (Atherinomorpha, Phallostethidae) of Northwestern Borneo, with description of a new species. *Copeia,* 1996, 703-712.

Parenti, L. R. (2008) A phylogenetic analysis and taxonomic revision of ricefishes, *Oryzias* and relatives (Beloniformes, Adrianichthyidae). *Zoological Journal of the Linnean Society,* 154, 494-610.

Parenti, L. R. & Louie, K. D. (1998) *Neostethus djajaorum*, new species, from Sulawesi, Indonesia, the first phallostethid fish (Teleostei: Atherinomorpha) known from East of Wallace's Line. *The Raffles Bulletin of Zoology,* 46, 139-150.

Parin, N. & Belyanina, T. (2002) Flying fishes of the genus *Fodiator* (Exocoetidae): systematics and distribution. *Journal of Ichthyology,* 42, 357-367.

Parin, N. & Bogorodskiy, S. (2011) Distribution and morphology of flying fish *Cypselurus hexazona* placed into a separate subgenus *Zonocypselurus subgen. nov*. *Journal of Ichthyology,* 51, 658-661.

Parin, N. & Kotlyar, A. (1989) A new aulopodid species, *Hime microps*, from the eastern South Pacific, with comments on geographic variations of *H. japonica*. *Ichthyological Research,* 35, 407-413.

Parin, N. V. (1985) A new hemerocoetine fish, *Osopsaron karlik* (Percophidae, Trachinoidei) from the Nazca Submarine Ridge. *Japanese Journal of Ichthyology,* 31, 358-361.

Parin, N. V. (1992) *Argyripnus electronus*, a new sternoptychid fish from the Sala y Gomez submarine ridge. *Japanese Journal of Ichthyology,* 39, 135-137.

Parin, N. V. & Borodulina, O. D. (1993) A new mesobenthic fish, *Eupogonesthes xenicus* (Astronesthidae), from the eastern Indian Ocean. *Journal of Ichthyology,* 33, 111-116.

Parin, N. V. & Borodulina, O. D. (2003) Phylogeny, systematics, and zoogeography of the mesopelagic genus *Astronesthes* (Astronesthidae, Stomiiformes). *Journal of Ichthyology,* 43, 557-576.

Parin, N. V., Prokofiev, A. M. & Bussarawit, S. (2012) Two new species of the genus *Epigonus* (Perciformes: Epigonidae) from the Atlantic and Indian Oceans. *Journal of Ichthyology,* 52, 239-243.

Parin, N. V. & Shcherbachev, Y. N. (1982) Two new argentinine fishes of the genus *Glossanodon* from the Eastern South Pacific. *Japanese Journal of Ichthyology,* 28, 381-384.

Park, J. H., Kim, J. K., Yoon, Y. S. & Heo, O. S. (2007) First record of two perciform fishes, *Pteropsaron evolans* (Percophidae) and *Xyrichtys verrens* (Labridae) from Korea. *Integrative Biosciences,* 11, 135-139.

Parmentier, E., Colleye, O., Fine, M. L., Frédérich, B., Vandewalle, P. & Herrel, A. (2007) Sound production in the clownfish *Amphiprion clarkii*. *Science,* 316, 1006.

Parr, A. E. (1952) Revision of the genus *Talismania*, with description of a new species from the Gulf of Mexico. *Journal of the Washington Academy of Sciences,* 42, 268-271.

Parr, A. E. (1954) Review of the deep-sea fishes of the genus *Asquamiceps* Zugmayer, with descriptions of two new species. *American Museum Novitates* 1655, 1-8.

Patten, J. & Ivantsoff, W. (1983) A new genus and species of atherinid fish, *Dentatherina merceri* from the Western Pacific. *Japanese Journal of Ichthyology,* 29, 329-339.

Paulin, C. (1989a) Redescription of *Helicolenus percoides* (Richardson) and *H. barathri* (Hector) from New Zealand (Pisces, Scorpaenidae). *Journal of the Royal Society of New Zealand,* 19, 319-325.

Paulin, C. (1993) Review of the Australian fish family Arripididae (Percomorpha), with the description of a new species. *Marine and Freshwater Research,* 44, 459-471.

Paulin, C. (1995) Description of a new genus and two new species of bythitid fishes, and a redescription of *Bidenichthys consobrinus* (Hutton) from New Zealand. *Journal of Natural History,* 29, 249-258.

Paulin, C. D. (1979) New Zealand roughies (Pisces: Berycomorphii: Trachichthyidae). *New Zealand Journal of Zoology*.

Paulin, C. D. (1983) A revision of the family Moridae (Pisces: Anacathini) within the New Zealand region. *National Museum of New Zealand Records,* 2, 81-126.

Paulin, C. D. (1989b) Review of the morid genera *Gadella*, *Physiculus*, and *Salilota* (Teleostei: Gadiformes) with descriptions of seven new species. *New Zealand Journal of Zoology,* 16, 93-133.

Paulin, C. D. & Habib, G. (1982) Remoras (Pisces: Echeneidae) from New Zealand. *New Zealand Journal of Zoology,* 9, 33-36.

Pavanelli, C. S. (2006) New species of *Apareiodon* (teleostei: Characiformes: Parodontidae) from the Rio Piquiri, upper Rio Paraná Basin, Brazil. *Copeia,* 2006, 89-95.

Pavanelli, C. S., Britski, H. A. & Schaefer, S. A. (2003) *Apareiodon* Eigenmann, 1916 (Teleostei, Characiformes), from the Tocantins-Araguaia Basin, with description of three new species. *Copeia,* 2003, 337-348.

Pavanelli, C. S., Ota, R. P. & Petry, P. (2009) New species of *Metynnis* Cope,1887 (Characiformes: Characidae) fromt the rio Paraguay basin, Mato Grosso State, Brazil. *Neotropical Ichthyology,* 7, 141-146.

Pavlov, A., Ivantsoff, W., Last, P. & Crowley, L. (1988) *Kestratherina brevirostris*, a new genus and species of silverside (Pisces: Atherinidae) with a review of atherinid marine and estuarine genera of Southern Australia. *Marine and Freshwater Research,* 39, 385-397.

Paxton, J. R. (1972) Osteology and relationships of the lanternfishes (family Myctophidae). *Bulletin of the Natural History Museum of Los Angeles County,* 13, 1-81.

Paxton, J. R. (1989) Synopsis of the whalefishes (family Cetomimidae) with descriptions of four new genera. *Records of the Australian Museum,* 41, 135-206.

Peden, A. E. (1972) Redescription and distribuiton of the rare deep-sea eel *Xenomystax atrarius* in the Eastern Pacific ocean. *Journal of Fisheries Research Board of Canada,* 29, 1-12.

Peden, A. E. & Anderson, M. E. (1979) A systematic review of the fish genus *Lycodapus* (Zoarcidae) with descriptions of two new species. *Canadian Journal of Zoology,* 56, 1925-1961.

Peden, A. E. & Anderson, M. E. (1981) *Lycodapus* (Pisces: Zoarcidae) of Eastern Bering Sea and nearby Pacific Ocean, with three new species and a revised key to the species. *Canadian Journal of Zoology,* 59, 667-678.

Pellegrin, J. (1919) Poissons du Gribingui recueillis par M. Baudon. Description de sept espèces nouvelles. *Bulletin de la Société Zoologique de France,* 44, 201-214.

Pellegrin, J. (1922) Poissons de l'Oubanghi-Chari recueillis par M. Baudon. Description d'un genre, de cinq espèces et d'une variété. *Bulletin de la Société Zoologique de France,* 47, 64-76.

Pellegrin, J. (1924) Description de *Mormyridés* nouveaux. Récoltés au Congo Belge par le Dr. Schouteden. *Revue Zoologique Africaine,* 12, 1-8.

Pellegrin, J. (1926) Description de Characinidés nouveaux récoltés au Congo Belge par le Dr. Schouteden. *Revue Zoologique Africaine,* 13, 157-164.

Pequeño, R. G. (1981) The rare fish *Neophrynichthys marmoratus* Regan 1913, in the southern slope of Chile (Teleostomi, Psychrolutidae). *Journal of Natural History,* 15, 965-970.

Peyer, B. (1968) *Comparative Odontology*. The University of Chicago Press, Chicago, 1-347 pp.

Pezold, F. & Cage, B. (2002) A review of the spinycheek sleepers, genus *Eleotris* (Teleostei: Eleotridae), of the western hemisphere, with comparison to the West African species. *Tulane Studies in Zoology and Botany,* 31, 19-63.

Pietsch, T. & Randall, J. (1987) First Indo-Pacific occurrence of the deepsea ceratioid anglerfish, *Diceratias pileatus* (Lophiiformes: Diceratiidae). *Ichthyological Research,* 33, 419-421.

Pietsch, T. W. (1972) A review of the monotypic deep-sea anglerfish family Centrophrynidae: taxonomy, distribution and osteology. *Copeia,* 1972, 17-47.

Pietsch, T. W. (1973) A new genus and species of deep-sea anglerfish (Pisces: Oneirodidae) from the Northern Pacific Ocean. *Copeia,* 1973, 193-199.

Pietsch, T. W. (1978a) Evolutionary relationships of the sea moths (Teleostei: Pegasidae) with a classification of gasterosteiform families. *Copeia,* 1978, 517-529.

Pietsch, T. W. (1978b) A new genus and species of ceratioid anglerfish from the North Pacific Ocean with a review of the allied genera *Ctenochrichthys*, *Chirophryne* and *Leptacanthichthys*. *Natural History Museum of Los Angeles County Contributions in Science,* 297, 1-25.

Pietsch, T. W. (1979) Systematics and distribution of ceratioid anglerfishes of the family Caulophrynidae with the description of a new genus and species from the Banda Sea. *Natural History Museum of Los Angeles County Contributions in Science,* 310, 1-25.

Pietsch, T. W. (1981) The osteology and relationships of the anglerfish genus *Tetrabrachium* with comments on lophiiform classification. *United States National Marine Fisheries Service Fishery Bulletin,* 79, 387-419.

Pietsch, T. W. (1986) Systematics and distribution of bathypelagic anglerfishes of the family Ceratiidae (order: Lophiiformes). *Copeia,* 1986, 479-493.

Pietsch, T. W. (1989) Phylogenetic relationships of trachinoid fishes of the family Uranoscopidae. *Copeia,* 1989, 253-303.

Pietsch, T. W. (2009) *Oceanic anglerfishes: extraordinary diversity in the deep sea*. University of California Press, Oakland, 1-567 pp.

Pietsch, T. W., Baldwin, Z. H. & Buth, D. (2006) A revision of the deep-sea anglerfish genus *Spiniphryne* Bertelsen (Lophiiformes: Ceratioidei: Oneirodidae), with description of a new species from the Central and Eastern North Pacific Ocean. *Copeia,* 2006, 404-411.

Pietsch, T. W., Hsuan-ching, H., Hong-ming, C. & Buth, D. G. (2004a) Revision of the deep-sea anglerfish genus *Bufoceratias* Whitley (Lophiiformes: Ceratioidei: Diceratiidae), with description of a new species from the Indo-West Pacific Ocean. *Copeia,* 2004, 98-107.

Pietsch, T. W., Kharin, V. E. & Guyer, C. (2004b) *Pietschichthys horridus* Kharin, 1989: a junior synonym of *Dermatias platynogaster* Smith and Radcliffe, in Radcliffe, 1912 (Lophiiformes: Oneirodidae), with a revised key to oneirodid genera. *Copeia,* 2004, 122-127.

Pietsch, T. W. & Palsson, W. A. (1993) Pegasidae. *In:* K. E. Carpenter & V. E. Niem (Eds), *Species identification guide for fisheries purposes. The living marine resources of the Western central Pacific. Bony fishes part 2 (Mugilidae to Carangidae)*. FAO, Rome, p. 2262.

Pietsch, T. W., Shimazaki, M. & Buth, D. (2005) Revision of the deep-sea anglerfish genus *Acentrophryne* Regan (Lophiiformes: Ceratioidei: Linophrynidae), with the description of a new species from off Peru. *Copeia,* 2005, 246-251.

Pietsch, T. W. & Zabetian, C. P. (1990) Osteology and interrelationships of the sand lances (Teleostei: Ammodytidae). *Copeia,* 1990, 78-100.

Piorski, N. M., Garavello, J. C., Arce, M. & Pérez, M. S. (2008) *Platydoras brachylecis*, a new species of thorny catfish (Siluriformes: Doradidae) from Northeastern Brazil. *Neotropical Ichthyology,* 6, 481-494.

Pitruk, D. L. & Fedorov, V. V. (1993) The validity of the genus *Elassodiscus* Gilbert and Burke, 1912 (Scorpaeniformes, Liparidae) with a description of a new species from the Sea of Okhotsk. *Journal of Ichthyology,* 33, 68-68.

Pitruk, D. L., Lavrova, T. V. & Zemnukhov, V. V. (2011) A morphological description of the brown shanny *Stichaeus fuscus* Miki et Maruyama, 1986 (Perciformes: Stichaeidae). *Russian Journal of Marine Biology,* 37, 458-463.

Polgar, G., Jaafar, Z. & Konstantinidis, P. (2013) A new species of mudskipper, *Boleophthalmus poti* (Teleostei: Gobiidae: Oxudercinae) from the Gulf of Papua, Papua New Guinea, and a key to the genus. *The Raffles Bulletin of Zoology,* 61, 311-321.

Poll, M. & Daget, J. (1968) Description d'*Hemistichodus lootens*i (Pisces, Citharinidae). *Bulletin du Muséum National d'Histoire Naturelle (Série 2),* 39, 1060-1065.

Poss, S. G. & Eschmeyer, W. N. (1975) The Indo-West pacific scorpionfish genus *Ocosia* Jordan and Starks (Scorpaenidae, Tetraroginae), with description of three new species. *Matsya,* 1, 1-18.

Poss, S. G. & Eschmeyer, W. N. (1978) Two new Australian velvetfishes, genus *Paraploactis* (Scorpaeniformes Aploactinidae): with a revision of the genus and comments on the genera and species of the Aploactinidae. *Proceedings of the California Academy of Sciences,* 41, 401-426.

Powell, A. (1937) Marine fishes new to New Zealand; including the description of a new species of *Halieutaea*. *Transactions and Proceedings of the Royal Society of New Zealand,* 67, 80-82.

Powles, H. (1977) Description of larval *Jenkinsia lamprotaenia* (Clupeidae, Dussumieriinae) and their distribution off Barbados, West Indies. *Bulletin of Marine Science,* 27, 788-801.

Presswell, B., Weitzman, S. H. & Bergquist, T. (2000) *Skiotocharax meizon*, a new genus and species of fish from Guyana with a discussion of its relationships (Characiformes: Crenuchidae). *Ichthyological Exploration of Freshwaters,* 11, 175-192.

Prince, J., Ivantsoff, W. & Potter, I. (1982) *Atherinosoma wallacei,* a new species of estuarine and inland water silverside (Teleostei: Atherinidae) from the Swan-Avon and Murray Rivers, Western Australia. *Australian Zoology,* 21, 63-74.

Prokofiev, A. (2006) *Grammatonotus ambiortus* sp. nova: a new species of callanthiids (perciformes) from the Western Tropical Pacific. *Journal of Ichthyology,* 46, 13-17.

Prokofiev, A. (2008a) Moridae, Neobythitidae, and Bythitidae (Gadiformes: Moridae, Ophidiiformes) of Nha Trang Bay, South China Sea, central Vietnam. *Journal of Ichthyology,* 48, 860-875.

Prokofiev, A. (2008b) A new species of genus *Aulopus* from waters of Vietnam (Myctophiformes s. lato: Aulopidae). *Journal of Ichthyology,* 48, 134-137.

Prokofiev, A. (2010) On a new finding of the rare species *Owstonia pectinifer* (Perciformes: Cepolidae). *Journal of Ichthyology,* 50, 408-412.

Prokofiev, A. & Kukuev, E. (2009a) New findings of rare fish species from families Mitsukurinidae (Chondrichthyes), Muraenidae, Lophiidae, Macrouridae, and Psychrolutidae (Teleostei) on raises of the atlantic ocean with the description of *Gymnothorax walvisensis* sp. nova. *Journal of Ichthyology,* 49, 215-227.

Prokofiev, A. & Kukuev, E. (2009b) Status of fanfishes of the genus *Pteraclis* from the South-Eastern Pacific Ocean (Perciformes: Bramidae). *Journal of Ichthyology,* 49, 688-692.

Prokofiev, A. M. (2007) Osteology of *Florenciella lugubris* (Percoidei: Epigonidae). *Journal of Ichthyology,* 47, 715-725.

Prokofiev, A. M. (2011) First finding of *Sthenopus mollis* (Aploactinidae) in the waters of Vietnam (the Gulf of Siam). *Journal of Ichthyology,* 51, 670-674.

Prokofiev, A. M. & Kukuev, E. I. (2006a) *Pseudoscopelus parini* sp. nova. a new species of linebellies (Perciformes: Chiasmodontidae) from the Western Pacific Ocean. *Journal of Ichthyology,* 46, 481-484.

Prokofiev, A. M. & Kukuev, E. I. (2006b) Two new species of linebellies (genus *Pseudoscopelus*) with a revised key of species (Perciformes: Chiasmodontidae). *Journal of Ichthyology,* 46, S21-S37.

Provenzano R, F., Machado-Allison, A., Chernoff, B., Willink, P. & Petry, P. (2005) *Harttia merevari,* a new species of catfish (Siluriformes: Loricariidae) from Venezuela. *Neotropical Ichthyology,* 3, 519-524.

Pusey, B. J. & Kennard, M. J. (2001) *Guyu wujalwujalensis*, a new genus and species (Pisces: Percichthyidae) from Northeastern Queensland, Australia. *Ichthyological Exploration of Freshwaters,* 12, 17-28.

Quevedo, R., Reis, R. E. & Schaefer, S. A. (2002) *Pogonopoma obscurum*: a new species of loricariid catfish (Siluriformes: Loricariidae) from Southern Brazil, with comments on the genus *Pogonopoma*. *Copeia,* 2002, 402-410.

Radcliffe, L. (1912) Descriptions of a new family, two new genera, and twenty-nine new species of anacanthine fishes from the Philippine Islands and contiguous waters. [Scientific results of the Philippine cruise of the Fisheries steamer "Albatross," 1907-1910.--No. 21.]. *Proceedings of the United States National Museum,* 43, 105-140.

Rafinesque, C. S. (1818) Description of three new genera of fluviatile fish, *Pomoxis*, *Sarchirus*, and *Exoglossum*. *Journal of the Academy of Natural Sciences of Philadelphia,* 1, 417-422.

Raj, U. & Johnson, S. (1983) A new species of *Paracaesio* (Pisces: Lutjanidae) from the Fiji Islands. *Copeia,* 1983, 450-453.

Randall, J. & Allen, G. (1973) A revision of the gobiid fish genus *Nemateleotris*, with descriptions of two new species. *Quarterly Journal of the Taiwan Museum,* 26, 347-367.

Randall, J. & Greenfield, D. (2007) Redescription of *Gnatholepis cauerensis* (Bleeker, 1853), with discussion of the validity of the species. *Zoologische Mededelingen,* 81, 303-308.

Randall, J. E. (1961) Two new butterflyfishes (family Chaetodontidae) of the Indo-Pacific genus *Forcipiger*. *Copeia,* 1961, 53-62.

Randall, J. E. (1964) A revision of the filefish genera *Amanses* and *Cantherhines*. *Copeia,* 1964, 331-361.

Randall, J. E. (1965) A review of the razorfish genus *Hemipteronotus* (Labridae) of the Atlantic Ocean. *Copeia,* 1965, 487-501.

Randall, J. E. (1972a) The Hawaiian trunkfishes of the genus *Ostracion*. *Copeia,* 1972, 756-768.

Randall, J. E. (1972b) A revision of the labrid fish genus *Anampses*. *Micronesica,* 8, 151-195.

Randall, J. E. (1975) A revision of the Indo-Pacific angelfish genus *Genicanthus*, with descriptions of three new species. *Bulletin of Marine Science,* 25, 393-421.

Randall, J. E. (1978) A revision of the Indo-Pacific labrid fish genus *Macropharyngodon*, with descriptions of five new species. *Bulletin of Marine Science,* 28, 742-770.

Randall, J. E. (1980) Revision of the fish genus *Plectranthias* (Serrandidae: Anthiinae) with descriptions of 13 new species. *Micronesica,* 16, 101-187.

Randall, J. E. (1995) *Zebrias captivus*, a new species of sole (Pleuronectiformes: Soleidae) from the Persian Gulf. *Journal South Asian Natural History,* 1, 241-246.

Randall, J. E. & Allen, G. R. (2007) *Aseraggodes crypticus*, a new Sole (Pleuronectiformes: Soleidae) from Christmas Island, Indian Ocean. *Records of the Western Australian Museum,* 24, 109-112.

Randall, J. E., Allen, G. R. & Anderson, W. D. (1987) Revision of the Indo-Pacific lutjanid genus *Pinjalo*, with description of a new species. *Indo-Pacific Fishes,* 14, 1-17.

Randall, J. E., Allen, G. R. & Robertson, D. R. (2003) *Myripristis earlei*, a new soldierfish (Beryciformes: Holocentridae) from the Marquesas and Phoenix Islands. *Zooloical Studies,* 42, 405-410.

Randall, J. E., Baldwin, C. C. & Williams, J. T. (2002) *Pseudogramma xanthum,* a new replacement name for a serranid fish from the subtropical South Pacific Ocean with description of the species. *Zootaxa,* 40, 1-8.

Randall, J. E. & Clements, K. D. (2001) Second revision of the surgeonfish genus *Ctenochaetus* (Perciformes: Acanthuridae), with descriptions of two new species. *Indo-Pacific Fishes,* 32, 1-33.

Randall, J. E. & Dooley, J. K. (1974) Revision of the Indo-Pacific branchiostegid fish genus *Hoplolatilus*, with descriptions of two new species. *Copeia,* 1974, 457-471.

Randall, J. E. & Earle, J. L. (1999) *Abudefduf conformis* and *Plectroglyphidodon sagmarius*, two new damselfishes (Pomacentridae) from the Marquesas Islands. *Cybium,* 23, 333-343.

Randall, J. E., Golani, D. & Diamant, A. (1989a) *Sargocentron marisrubri* a new squirrelfish (Beryciformes: Holocentridae) from the Red Sea. *Israel Journal of Zoology* 35, 187-198.

Randall, J. E. & Greenfield, D. W. (2004) Two new scorpionfishes (Scorpaenidae) from the South Pacific. *Proceedings of the California Academy of Sciences,* 55, 384-394.

Randall, J. E. & Heemstra, P. C. (1978) Reclassification of the Japanese cirrhitid fishes *Serranocirrhitus latus* and *Isobuna japonica* to the Anthiinae. *Japanese Journal of Ichthyology,* 25, 165-172.

Randall, J. E. & Heemstra, P. C. (1991) Revision of Indo-Pacific groupers: (Perciformes: Serranidae: Epinephelinae): with descriptions of five new species. *Indo-Pacific Fishes,* 20, 1-332.

Randall, J. E. & Holcom, R. R. (2001) *Antennatus linearis*, a new Indo-Pacific species of frogfish (Lophiiformes: Antennariidae). *Pacific Science,* 55, 137-144.

Randall, J. E. & Hutomo, M. (1988) Redescription of the Indo-Pacific serranid fish *Pseudanthias bimaculatus* (Smith). *Copeia,* 1988, 669-674.

Randall, J. E., Johnson, G. & Lowe, G. R. (1989b) *Triso*, a new generic name for the serranid fish previously known as *Trisotropis dermopterus*, with comments on its relationships. *Ichthyological Research,* 35, 414-420.

Randall, J. E. & Johnson, J. W. (2007) Revision of the soleid fish genus *Pardachirus*. *Indo-Pacific Fishes,* 39, 1-22.

Randall, J. E. & Klausewitz, W. (1973) A review of the triggerfish genus *Melichthys*, with description of a new species from the Indian Ocean. *Senckenbergiana biologica,* 54, 57-69.

Randall, J. E. & Lobel, P. S. (2003) *Xyrichtys halsteadi*, a new labrid fish from the central and western Pacific. *Bulletin of Marine Science,* 72, 971-977.

Randall, J. E. & Lubbock, R. (1981) Labrid fishes of the genus *Paracheilinus*, with descriptions of three new species from the Philippines. *Japanese Journal of Ichthyology,* 28, 19-30.

Randall, J. E., Matsuura, K. & Zama, A. (1978) A revision of the triggerfish genus *Xanthichthys*, with description of a new species. *Bulletin of Marine Science,* 28, 688-706.

Randall, J. E. & McCosker, J. E. (1992) Revision of the fish genus *Luzonichthys* (Perciformes: Serranidae: Anthiinae): with descriptions of two new species. *Indo-Pacific Fishes,* 21, 1-21.

Randall, J. E. & Randall, H. A. (2001) *Dascyllus auripinnis*, a new pomacentrid fish from atolls of the central Pacific Ocean. *Zoological Studies,* 40, 61-67.

Randall, J. E. & Rocha, L. A. (2009) *Chaetodontoplus poliourus*, a new angelfish (Percirformes: Pomacanthidae) from the tropical Western Pacific. *Raffles Bulletin of Zoology,* 57, 511-520.

Randall, J. E., Shimizu, T. & Yamakawa, T. (1982) A revision of the holocentrid fish genus *Ostichthys*, with descriptions of four new species and a related new genus. *Japanese Journal of Ichthyology,* 29, 1-26.

Randall, J. E. & Tanaka, H. (2009) *Cirrhilabrus naokoae*, a new labrid fish from Indonesia. *Aqua, International Journal of Ichthyology,* 15, 29-36.

Raney, E. C. & Zorach, T. (1967) *Etheostoma microlepidum*, a new percid fish of the subgenus *Nothonotus* from the Cumberland and Tennessee River systems. *American Midland Naturalist,* 77, 93-103.

Rangel, B., Rodrigues, S., Malavasi-Bruno, E., Will, S., Favaron, P., Amorim, A., et al. (2014) 3-D Aspects of the dentition in rays of genus: *Atlantoraja, Rhinobatos* and *Zapteryx* from Southeastern and South of Brazil. *Microscopy*, 1-9.

Rangel, C. A. & Mendes, L. F. (2009) Review of blenniid fishes from Fernando de Noronha Archipelago, Brazil, with description of a new species of *Scartella* (Teleostei: Blenniidae). *Zootaxa,* 2006*,* 51-61.

Rao, B. V. S. (1973) Redescription of the clupeid fishes, *Ilisha megaloptera* and *I. melastoma*. *Copeia,* 1973, 735-739.

Rao, B. V. S. (1976) Notes on the Indo-West Pacific species of the clupeid fish genus *Ilisha*, with a key to their identification. *Copeia,* 1976, 503-509.

Rao, K. N. (1960) A short account of the wahoo, *Acanthocybium solandri* (Cuvier & Valenciennes). *Journal of the Marine Biological Association of India,* 2, 132-135.

Rao, K. R. & Badrudeen, M. (1973) *Inimicus sinense* (Valenciennes) (Synanceiidae: Pisces) a new record from India and Ceylon. *Journal of the Marine Biological Association of India,* 15, 417-420.

Rao, K. V. S. (1977) Systematics and comparitive osteology of Indian lizard fishes (*Saurida* spp.). *Indian Journal of Fisheries,* 24, 143-171.

Rao, M. B. (1971) A new anchovy, *Thryssa gautamiensis* n. sp. (Pisces: Engraulidae), from the Godavari Estuary, India. *Copeia,* 1971, 479-483.

Rao, V. V. & Dutt, S. (1965) A new fish *Tentaculus waltairiensis* gen. et sp. nov. (family: Haliophidae) from Indian waters. *The Annals and Magazine of Natural History,* 8, 455-459.

Rauchenberger, M. (1988) A new species of *Allodontichthys* (Cyprinodontiformes: Goodeidae), with comparative morphometrics for the genus. *Copeia,* 1988, 433-441.

Reece, J. S., Bowen, B. W., Smith, D. G. & Larson, A. (2010a) Molecular phylogenetics of moray eels (Muraenidae) demonstrates multiple origins of a shell-crushing jaw (Gymnomuraena, Echidna) and multiple colonizations of the Atlantic Ocean. *Molecular Phylogenetics and Evolution,* 57, 829-835.

Reece, J. S., Smith, D. G. & Holm, E. (2010b) The moray eels of the *Anarchias cantonensis* group (Anguilliformes: Muraenidae), with description of two new species. *Copeia,* 2010, 421-430.

Regan, C. (1903a) A revision of the fishes of the genus *Triacanthus*. *Proceedings of the Zoological Society of London,* 73, 180-185.

Regan, C. (1904) Descriptions of three new marine fishes from South Africa. *The Annals and Magazine of Natural History,* 14, 128-130.

Regan, C. T. (1902) On the classification of the fishes of the suborder Plectognathi; with notes and descriptions of new species from specimens in the British Museum collection. *Proceedings of the Zoological Society of London,* 2, 284-303.

Regan, C. T. (1903b) On the genus *Lichia* of Cuvier. *The Annals and Magazine of Natural History,* 12, 348-350.

Regan, C. T. (1906a) A revision of the fishes of the South-American cichlid genera *Cichla*, *Chætobranchus*, and *Chætobranchopsis*, with notes on the genera of American Cichlidae. *Journal of Natural History (Series 7),* 17, 230-239.

Regan, C. T. (1906b) A revision of the South-American cichlid genera *Retroculus*, *Geophagus*, *Heterogramma*, and *Biotoecus*. *Journal of Natural History (Series 7),* 17, 49-66.

Regan, C. T. (1907) Descriptions of two new characinid fishes from South America. *The Annals and Magazine of Natural History,* 20, 402-403.

Regan, C. T. (1909) A revision of the fishes of the genus *Elops*. *The Annals and Magazine of Natural History,* 3, 37-40.

Regan, C. T. (1910) The Asiatic fishes of the family Anabantidae. *Proceedings of the Zoological Society of London,* 1909, 767-787.

Regan, C. T. (1912) A revision of the South American characid fishes of the genera *Chalceus, Pyrrhulina, Copeina*, and *Pogonocharax*. *The Annals and Magazine of Natural History,* 10, 387-395.

Regan, C. T. (1913) The Antarctic fishes of the Scottish National Antarctic Expedition. *Earth and Environmental Science Transactions of the Royal Society of Edinburgh,* 49, 229-292.

Regan, C. T. (1917) A revision of the clupeid fishes of the genus *Pellonula* and of related genera in the rivers of Africa. *Journal of Natural History (Series 8),* 19, 198-207.

Regan, C. T. (1922) Fishes of the Clupeid genera *Clupeoides* and *Potamalosa*, and allied genera. *The Annals and Magazine of Natural History,* 10, 587-590.

Reis, R. E. & Lehmann A, P. (2009) Two new species of *Acestridium* Haseman, 1911 (Loricariidae: Hypoptopomatinae) from the Rio Madeira Basin, Brazil. *Copeia,* 2009, 446-452.

Reis, R. E., Pereira, E. H. L. & Armbruster, J. W. (2006) Delturinae, a new loricariid catfish subfamily (Teleostei, Siluriformes), with revisions of *Delturus* and *Hemipsilichthys*. *Zoological Journal of the Linnean Society,* 147, 277-299.

Reis, R. E., Pereira, E. H. L. & Schaefer, S. A. (2000) Three new species of the loricariid catfish genus *Loricariichthys* (Teleostei: Siluriformes) from Southern South America. *Copeia,* 2000, 1029-1047.

Rennis, D. S. & Hoese, D. F. (1987) *Aioliops*, a new genus of ptereleotrine fish (Pisces: Gobioidei) from the tropical Indo-Pacific with descriptions of four new species. *Records of the Australian Museum,* 39, 67-84.

Repenning, C. A. (1987) Biochronology of the microtine rodents of the United States. *In:* M. O. Woodburne (Ed), *Cenozoic Mammals of North America: Geochronology and Biostratigraphy.* University of California Press, Berkeley, pp. 236-265.

Retzer, M. E. (2010) Taxonomy of *Auchenoglanis* Günther 1865 (Siluriformes: Auchenoglanididae). *Zootaxa,* 265, 25-51.

Reuben, S. (1968) *Uraspis helvola* (Forster)(Carangidae: Pisces) a detailed description with remarks on the species of the genus *Uraspis* Bleeker. *Journal of the Marine Biological Association of India,* 10, 133-151.

Richards, W. J., Yato, T. & Last, P. (2003) Revision of the gurnard fish subgenus *Otohime* (Triglidae: *Pterygotrigla*). *Smithiana Publications in Aquatic Biodiversity,* 2, 1-18.

Richardson, J. (1846) Descriptions of six fish. *In:* J. L. Stokes (Ed), *vol. 1, Appendix. Discoveries in Australia with an account of the coasts and rivers explored and surveyed during the voyage of H. M. S. Beagle, in the years 1837-38-39-40-41-41-42-43. By command of the Lords Commissioners of the Admirality. Also a narrative ... islands in the Arafura Sea.* T. and W. Boone, London, pp. 484-497.

Richardson, J. (1848) Ichthyology of the voyage of H. M. S. Erebus & Terror,... *In:* J. Richardson & J. E. Gray (Eds), *The zoology of the voyage of H. H. S. "Erebus & Terror," under the command of Captain Sir J. C. Ross ... during ... 1839-43.* London, pp. 97-107.

Ridewood, W. G. (1904a) On the cranial osteology of Clupeoid fishes. *Proceedings of the General Meetings For Scientific Business of the Zoological Society of London,* 74, 448-493.

Ridewood, W. G. (1904b) On the cranial osteology of the families Mormyridae, Notopteridae and Hyodontidae. *Journal of the Linnean Society of London, Zoology,* 29, 188-217.

Ridewood, W. G. (1905) On the cranial osteology of the fishes of the families Osteoglossidae, Pantodontidae, and Phractolaemidae. *Journal of the Linnean Society of London,* 29, 252-281.

Rivas, L. R. (1971) A new genus and species of Western Atlantic serranoid fishes, with anterior vent. *Copeia,* 1971, 718-721.

Roberts, C. D. (1989a) Redescription of the slender tuna, *Allothunnus fallai* Serventy, and deletion of the scombrid *Scomberomorus* (= *Cybium*) *guttatus* (Bloch and Schneider) from the New Zealand fauna. *Journal of the Royal Society of New Zealand,* 19, 399-403.

Roberts, T. R. (1967) Tooth formation and replacement in characoid fishes. *Stanford Ichthyological Bulletin,* 8, 231-247.

Roberts, T. R. (1971) *Micromischodus sugillatus*, a new hemiodontid characin fish from Brazil, and its relationship to the Chilodontidae. *Breviora,* 367, 1-25.

Roberts, T. R. (1973) Osteology and relationships of the Prochilodontidae, a South American family of characoid fishes. *Bulletin of the Museum of Comparative Zoology,* 145, 213-235.

Roberts, T. R. (1974a) Dental polymorphism and systematics in *Saccodon*, a neotropical genus of freshwater fishes (Parodontidae, Characoidei). *Journal of Zoology,* 173, 303-321.

Roberts, T. R. (1974b) Osteology and classification of the neotropical characoid fishes of the families Hemiodontidae (Including Anodontidae) and Parodontidae. *Bulletin of the Museum of Comparative Zoology,* 146, 411-472.

Roberts, T. R. (1978) An ichthyological survey of the Fly River in Papua New Guinea with descriptions of new species. *Smithsonian Contributions to Zoology* 281, 1-72.

Roberts, T. R. (1982) A revision of the South and Southeast Asian angler-catfishes (Chacidae). *Copeia,* 1982, 895-901.

Roberts, T. R. (1983) Revision of the South and Southeast Asian sisorid catfish genus *Bagarius*, with description of a new species from the Mekong. *Copeia,* 1983, 435-445.

Roberts, T. R. (1989b) The freshwater fishes of western Borneo (Kalimantan Barat, Indonesia). *Memoirs of the California Academy of Sciences,* 14, 1-210.

Roberts, T. R. (1994) *Osphronemus exodon*, a new species of giant gouramy with extraordinary dentition from the Mekong. *National History Bulletin of Siam Society,* 42, 67-77.

Roberts, T. R. (2000) A review of the African electric catfish family Malapteruridae, with descriptions of new species. *Occasional Papers in Ichthyology,* 1, 1-15.

Roberts, T. R. (2003) Systematics and osteology of Leptoglaninae a new subfamily of the African catfish family Amphiliidae, with descriptions of three new genera and six new species. *Proceedings of the California Academy of Sciences,* 54, 81-132.

Roberts, T. R. & Stewart, D. J. (1976) An ecological and systematic survey of fishes in the rapids of the lower Zaire or Congo River. *Bulletin of the Museum of Comparative Zoology,* 147, 239-317.

Roberts, T. R. & Vidthayanon, C. (1991) Systematic revision of the Asian catfish family Pangasiidae, with biological observations and descriptions of three new species. *Proceedings of the Academy of Natural Sciences of Philadelphia,* 142, 97-143.

Robins, C. H. & Robins, C. R. (1970) The eel family Dysommidae (Including the Dysomminidae and Nettodaridae). Its osteology and composition, including a new genus and species. *Proceedings of the Academy of Natural Sciences of Philadelphia,* 122, 293-335.

Robins, C. H. & Robins, C. R. (1971) Osteology and relationships of the eel family Macrocephenchelyidae. *Proceedings of the Academy of Natural Sciences of Philadelphia,* 123, 127-150.

Robins, C. H. & Robins, C. R. (1975) New genera and species of Dysommine and Synaphobranchine eels (Synaphobranchidae) with an analysis of the Dysomminae. *Proceedings of the Academy of Natural Sciences of Philadelphia,* 127, 249-280.

Robins, C. R. (1958) Studies on the fishes of the family Ophidiidae. -I. A new species of *Lepophidium* from the Caribbean Sea. *Bulletin of Marine Science,* 8, 360-369.

Robins, C. R. (1967) The status of the serranid fish *Liopropoma aberrans*, with the description of a new, apparently related genus. *Copeia,* 1967, 591-595.

Robins, C. R. & Nielsen, J. G. (1970) The R/V Pillsbury deep-sea biological expedition to the Gulf of Guinea, 1964-65. *Snyderidia bothrops* a new tropical, amphi-Atlantic species (Pisces, Carapidae). *Studies in Tropical Oceanography (Miami),* 4, 285-293.

Robins, R. C. & Colin, P. L. (1979) Three new grammid fishes from the Caribbean Sea. *Bulletin of Marine Science,* 29, 41-52.

Robison, B. H. & Lancraft, T. M. (1984) *Gorgasia barnesi* (Congridae: Heterocongrinae), a new garden eel from the Banda Sea. *Copeia,* 1984, 404-409.

Rocha, L. A. & Rosa, I. L. (1999) New species of *Haemulon* (Teleostei: Haemulidae) from the Northeastern Brazilian Coast. *Copeia,* 1999, 447-452.

Rocha, M. S., Ribeiro de Oliveira, R. & Py-Daniel, L. H. R. (2008) A new species of *Gladioglanis* Ferraris & Mago-Leccia from rio Aripuana Amazonas, Brazil (Siluriformes: Heptapteridae). *Neotropical Ichthyology,* 6, 433-438.

Rocha, M. S. & Ribeiro, F. R. V. (2010) A new speces of *Pimelodus* LaCepede, 1803 (Siluriformes: Pimelodidae) from rio Itacaiunas, rio Tocantins basin, Brazil. *Zootaxa,* 2343, 57-67.

Rodriguez, C. M. (1997) Phylogenetic analysis of the tribe Poeciliini (Cyprinodontiformes: Poeciliidae). *Copeia,* 1997, 663-679.

Rodriguez, M. S. & Miquelarena, A. M. (2005) A new species of *Rineloricaria* (Siluriformes: Loricariidae) from the Parana and Uruguay River Basins, Misiones, Argentina. *Zootaxa,* 945, 1-15.

Rogers, W. (1981) Taxonomic status of cichlid fishes of the Central American genus *Neetroplus*. *Copeia,* 1981, 286-296.

Rohde, F. C. & Arndt, R. G. (1987) Two new species of pygmy sunfishes (Elassomatidae, *Elassoma*) from the Carolinas. *Proceedings of the Academy of Natural Sciences of Philadelphia,* 139, 65-85.

Román-Valencia, C., García-Alzate, C. A., Ruiz-C, R. I., Donald, C. & Taphorn, B. (2012) A new species of *Tyttocharax* (Characiformes: Characidae: Stevardiinae) from the Güejar river, Orinoco river Basin, Colombia. *Neotropical Ichthyology,* 10, 519-525.

Romero, A. & Conner, M. (2007) Status report for the southern cavefish, *Typhlichthys subterraneus* in Arkansas. Arkansas State University, Jonesboro, p. 2010.

Rosa, I. L. & Rosa, R. S. (1997) Systematic revision of the South American species of Pinguipedidae (teleostei, trachinoidei). *Revista Brasileira de Zoologia,* 14, 845-865.

Rosa, R. S. & Wilson, J. E. M. C. (1993) Systematic revision of the genus *Cnesterodon* (Cyprinodontiformes: Poeciliidae) with the description of two new species from Brazil. *Copeia,* 1993, 696-708.

Rosen, D. E. & Greenwood, P. H. (1976) A fourth neotropical species of synbranchid eel and the phylogeny and systematics of synbranchiform fishes. *Bulletin of the American Museum of Natural History,* 157, 1-69.

Rosenblatt, R. H. (1964) A new gunnel, *Pholis clemensi*, from the coast of Western North America. *Journal of the Fisheries Research Board of Canada,* 21, 933-939.

Rosenblatt, R. H. & Johnson, G. D. (1974) Two new species of sea basses of the genus *Diplectrum*, with a key to the Pacific species. *California Fish and Game,* 60, 178-191.

Rosenblatt, R. H. & Johnson, G. D. (1991) *Parmops coruscans*, a new genus and species of flashlight fish (Beryciformes: Anomalopidae) from the South Pacific. *Proceedings of the Biological Society of Washington,* 104, 328-334.

Rosenblatt, R. H. & Rubinoff, I. (1972) *Pythonichthys asodes*, a new heterenchelyid eel from the Gulf of Panama. *Bulletin of Marine Science,* 22, 355-364.

Rosenblatt, R. H. & Stephens, J. S. (1978) *Mccoskerichthys sandae*, a new and unusual chaenopsid blenny from the Pacific coast of Panama and Costa Rica. *Contributions to Science,* 293, 1-22.

Rosenblatt, R. H. & Taylor Jr, L. R. (1971) The Pacific species of the clinid fish tribe Starksiini. *Pacific Science,* 25, 436-463.

Rossi, L. M. (1992) Evolucion morfologica del aparato digestivo de postlarvas y prejuveniles de *Prochilodus lineatus* (Val., 1847) (Pisces, Cutimatidae) y su relation con la dieta (1). *Revue de Hydrobiologie Tropicale,* 25, 159-167.

Rountree, R. A. (2002) Wolffishes. family Anarhichadidae. *In:* B. B. Collette & G. Klein-MacPhee (Eds), *Bigelow and Schroeder's fishes of the Gulf of Maine*. Smithsonian Institution Press, Washington D.C., pp. 485-496.

Russell, B. C. (1991) Description of a new species of *Nemipterus* (Pisces: Perciformes; Nemipteridae) from the western Pacific, with re-descriptions of *Nemipterus marginatus* (Valenciennes), *N. mesoprion* (Bleeker) and *N. nematopus* (Bleeker). *Journal of Natural History,* 25, 1379-1389.

Russell, B. C. (1993) A review of the threadfin breams of the genus *Nemipterus* (Nemipteridae) from Japan and Taiwan, with description of a new species. *Ichthyological Research,* 39, 295-310.

Russell, B. C. (1996) *Parascolopsis capitinis,* a new species of nemipterid fish from Sri Lanka. *Journal of South Asian Natural History,* 2, 63-66.

Russell, B. C. (2000) Review of the southern temperate fish family Aplodactylidae (Pisces: Perciformes). *Journal of Natural History,* 34, 2157-2171.

Russell, B. C. (2001) A new species of *Pentapodus* (Teleostei: Nemipteridae) from the Western Pacific. *The Beagle (Occasional Papers of the Northern Territory Museum of Arts and Sciences),* 17, 53-56.

Russell, B. C. (2002) Nemipteridae. *In:* K. E. Carpenter (Ed), *The living marine resources of the Western Central Atlantic. Volume 3: Bony fishes part 2 (Opistognathidae to Molidae). FAO species identification guide for fishery purposes and American Society of Ichthyologist and Herpetologists Special Publication No. 5*. FAO, Rome, pp. 3051-3061.

Sabaj, M. H. (2005) Taxonomic assessment of *Leptodoras* (Siluriformes: Doradidae) with descriptions of three new species. *Neotropical Ichthyology,* 3, 637-678.

Sabaj Pérez, M. H. & Birindelli, J. L. O. (2008) Taxonomic revision of extant *Doras* Lacepède, 1803 (Siluriformes: Doradidae) with descriptions of three new species. *Proceedings of the Academy of Natural Sciences of Philadelphia,* 157, 189-233.

Saeed, B. & Ivantsoff, W. (1991) *Kalyptatherina*, the first telmatherinid genus known outside of Sulawesi. *Ichthyological Exploration of Freshwaters,* 2, 227-238.

Saeed, B., Ivantsoff, W. & Allen, G. (1989) Taxonomic revision of the family Pseudomugilidae (order Atheriniformes). *Marine and Freshwater Research,* 40, 719-787.

Saeed, B., Ivantsoff, W. & Crowley, L. E. L. M. (1993) A new species of the surf-inhabiting atheriniform *Iso* (Pisces: Isonidae). *Records of the Western Australian Museum,* 16, 337-346.

Sagua, V. O. (1986) Studies on the biology of *Gymnarchus niloticus* in Lake Chad: Age determination and growth; meristic and morphometric characters. *In: Proceedings of the Annual Conference of the Fisheries Society og Nigeria (FISON)*. Kainji lake Research Institute, New Bussa, pp. 179-190.

Sahara, N., Moriyama, K., Iida, M. & Watanabe, S. (2013) Unique features of pedicellate attachment of the upper jaw teeth in the adult gobiid fish *Sicyopterus japonicus* (Teleostei, Gobiidiae): Morphological and structural characteristics and development. *Journal of Morphology,* 274, 512-524.

Sakai, K. & Nakabo, T. (2006) Taxonomic reviews of two Indo-Pacific sea chubs, *Kyphosus cinerascens* (Forsskål, 1775) and *Kyphosus sydneyanus* (Günther, 1886). *Ichthyological Research,* 53, 337-356.

Sakashita, M. & Yoshino, T. (1991) First records of two flatheads, *Rogadius patriciae* and *Cymbacephalus beauforti* (Pisces: Platycephalidae) from the Ryukyu Islands. *Bulletin of the College of Science, University of the Ryukyus,* 52, 31-35.

Salcedo, N. J. & Armbruster, J. W. (2006) New species of *Chaetostoma* (Siluriformes: Loricariidae) from central Peru. *Copeia,* 2006, 60-67.

Saldanha, L. & Merrett, N. R. (1982) A new species of the deep-sea eel genus *Ilyophis* Gilbert (Synaphobranchidae) from the eastern North Atlantic, with comments on its ecology and intrafamilial relationships. *Journal of Fish Biology,* 21, 623-636.

Saldanha, L. & Merrett, N. R. (1987) The osteology of *Ilyophis blanchei* and its contribution to a diagnosis of the Synaphobranchidae (Pisces, Anguilliformes). *Zoological Journal of the Linnean Society,* 91, 343-356.

Sanford, C. P. & Lauder, G. V. (1989) Functional morphology of the “tongue-bite” in the osteoglossomorph fish *Notopterus*. *Journal of Morphology,* 202, 379-408.

Sanger, A. (1984) Description of a new species of *Gadopsis* (Pisces: Gadopsidae) from Victoria. *Proceedings of the Royal Society of Victoria,* 96, 93-97.

Sant'Anna, V. B., Delapieve, M. L. S. & Reis, R. E. (2012) A new species of *Potamorrhaphis* (Beloniformes: Belonidae) from the Amazon basin. *Copeia,* 2012, 663-669.

Sarmento-Soares, L. M., Martins-Pinheiro, R. F., Aranda, A. T. & Chamon, C. C. (2006) *Microglanis pataxo*, a new catfish from southern Bahia coastal rivers, northeastern Brazil (Siluriformes: Pseudopimelodidae). *Neotropical Ichthyology,* 4, 157-166.

Sasagawa, I., Ishiyama, M., Yokosuka, H., Mikami, M. & Uchida, T. (2009) Tooth enamel and enameloid in actinopterygian fish. *Frontiers of Materials Science in China,* 3, 174-182.

Sasaki, K. & Amaoka, K. (1989) *Johnius distinctus* (Tanaka, 1916), a senior synonym of *J. tingi* (Tang, 1937) (Perciformes, Sciaenidae). *Ichthyological Research,* 35, 466-468.

Sasaki, K., Tanaka, Y. & Takata, Y. (2006) Cranial morphology of *Ateleopus japonicus* (Ateleopodidae: Ateleopodiformes), with a discussion on metamorphic mouth migration and lampridiform affinities. *Ichthyological Research,* 53, 254-263.

Satapoomin, U. & Randall, J. E. (2000) *Plectorhinchus macrospilus*, a new species of thicklip (Perciformes: Haemulidae) from the Andaman Sea off southestern Thailand. *Phuket Marine Biological Center Research Bulletin,* 63, 9-16.

Sato, T. & Nakabo, T. (2002) Paraulopidae and *Paraulopus*, a new family and genus of aulopiform fishes with revised relationships within the order. *Ichthyological Research,* 49, 25-46.

Sato, T. & Nakabo, T. (2003) A revision of the *Paraulopus oblongus* group (Aulopiformes: Paraulopidae) with description of a new species. *Ichthyological Research,* 50, 164-177.

Sazima, C., Moura, R. L. & Sazima, I. (2004) *Chirocentrodon bleekerianus* (Teleostei: Clupeiformes: Pristigasteridae), a small predaceous herring with folded and distinctively oriented prey in stomach. *Brazilian Journal of Biology,* 64, 165-168.

Sazonov, Y., Williams, A. & Kobyliansky, S. (2009) Review of fish of the genus *Conocara* (Alepocephalidae) from the continental slope of Australia and description of a new species *C. paxtoni* sp. nova. *Journal of Ichthyology,* 49, 852-860.

Sazonov, Y. I. (1998) A brief review of the genus *Narcetes* (Alepocephalidae) with a description of the genus type *N. erimelas*. *Journal of Ichthyology,* 38, 491-500.

Sazonov, Y. I. (1999) On the revision of the genus *Bathytroctes* Günther (Alepocephalidae): A review of the abyssobenthopelagic forms (previously referred to the genus *Nomoctes*), with a description of two new species. *Journal of Ichthyology,* 39, 699-712.

Schaefer, S. A. (1997) The neotropical cascudinhos: systematics and biogeography of the *Otocinclus* catfishes (Siluriformes: Loricariidae). *Proceedings of the Academy of Natural Sciences of Philadelphia,* 148, 1-120.

Schaefer, S. A. (2003) Relationships of *Lithogenes villosus* Eigenmann, 1909 (Siluriformes, Loricariidae): evidence from high-resolution computed microtomography. *American Museum Novitates*, 3401, 1-55.

Schaefer, S. A. & Fernández, L. (2009) Redescription of the pez graso, *Rhizosomichthys totae* (Trichomycteridae), of Lago de Tota, Colombia, and aspects of cranial osteology revealed by microtomography. *Copeia,* 2009, 510-522.

Scharcansky, A. & Lucena, C. (2007) *Caenotropus schizodon*, a new chilodontid fish from the Rio Tapajos drainage, Brazil (Ostariophysi: Characiformes: Chilodontidae). *Zootaxa,* 1557, 59-66.

Schindler, I. & Schneidewind, F. (2004) Revision of *Centropyge fisheri* (Snyder, 1904) (Teleostei, Pomacanthidae). *Zeitschrift für Fischkunde,* 7, 31-42.

Schmidt, P. J. & Andriashev, A. P. (1935) A Greenland fish in the Okhotsk Sea. *Copeia,* 1935, 57-60.

Schmidt, R. E. (1987) Redescription of *Vandellia beccarii* (Siluriformes: Trichomycteridae) from Guyana. *Copeia,* 1987, 234-237.

Schön, I. & Martens, K. (2004) Adaptive, pre-adaptive and non-adaptive components of radiations in ancient lakes: a review. *Organisms Diversity & Evolution,* 4, 137-156.

Schultz, L. (1967) A review of the fish genus *Labracinus* Schlegel, family Pseudochromidae, with notes on and illustrations of some related serranoid fishes. *Ichthyologica/The Aquarium Journal,* 39, 19-40.

Schultz, L. P. (1945) A new genus and two new species of percoid fishes from New Guinea, family Centropomidae. *Proceedings of the United States National Museum,* 96, 115-121.

Schultz, L. P. (1946) A revision of the genera of mullets, fishes of the family Mugilidae, with descriptions of three new genera. *Proceedings of the United States National Museum,* 96, 377-395.

Schultz, L. P. (1949) A further contribution to the ichthyology of Venezuela. *Proceedings of the United States National Museum,* 99, 1-211.

Schultz, L. P. & Reid, E. D. (1937) The American Atlantic toadfishes of the genus *Opsanus*. *Copeia,* 1937, 211-212.

Schultz, R. J. (1969) Hybridization, Unisexuality, and polyploidy in the teleost *Poeciliopsis* (Poeciliidae) and other vertebrates. *The American Naturalist,* 103, 605-619.

Schwassmann, H. O. (1989) *Gymnorhamphichthys rosamariae*, a new species of knifefish (Rhamphichthyidae, Gymnotiformes) from the upper Rio Negro, Brazil. *Studies on Neotropical Fauna and Environment,* 24, 157 - 167.

Scott, E. O. G. (1935) Observations on some Tasmanian fishes: Part III. *Papers and Proceedings of the Royal Society of Tasmania (for 1934)*, 63-73.

Scott, E. O. G. (1936) Observations on some Tasmanian fishes. Part III *Papers and Proceedings of the Royal Society of Tasmania,* 1935, 113-129.

Scott, E. O. G. (1986) Observations on some Tasmanian fishes: part XXXI - review of Gnathanacathidae. *Papers and Proceedings of the Royal Society of Tasmania,* 120, 51-75.

Seale, A. (1901) Report of a mission to Guam. Part 2 -- Fishes. *Occasional Papers of the Bernice Pauahi Bishop Museum of Polnesian Ethnology and Natural History,* 1, 61-128.

Sedberry, G. R. (2003) Polyprionidae. *In:* K. E. Carpenter (Ed), *The living marine resources of the Western Central Atlantic. Volume 2: Bony fishes part 1 (Acipenseridae to Grammatidae). FAO species identification guide for fishery purposes and American Society of Ichthyologist and Herpetologists Special Publication No. 5*. FAO, Rome, pp. 1297-1298.

Sedeño-Díaz, J. & López-López, E. (2009) Threatened fishes of the world: *Girardinichthys viviparus* (Bustamante 1837) (Cyprinodontiformes: Goodeidae). *Environmental Biology of Fishes,* 84, 11-12.

Sekavec, G. (1971) Gross morphology of the digestive tract of the ladyfish, *Elops saurus*. *Chesapeake Science,* 12, 275-276.

Senou, H., Kuwayama, S. & Hirate, K. (2008) A new species of the genus *Guentherus* (Alteleopodiformes: Ateleopodidae) from Japan. *Bulletin of the National Museum of Nature and Science,* 2, 13-19.

Senta, T., Noichi, T. & Shigemitsu, K. (1989) The percophidid *Matsubaraea setouchiensis* from the Fukiagehama Beach, South-western Kyushu. *Bulletin of the Faculty of Fisheries Nagasaki University,* 65, 1-8.

Shakhovskoy, I. (2002) Cranial morphology of a freshwater halfbeak *Dermogenys siamensis* (Hemiramphidae). *Journal of Ichthyology,* 42, 565-574.

Shakhovskoy, I. (2007) Skull structure of the flying fish *Cheilopogon pinnatibarbatus* (Beloniformes, Exocoetidae). *Journal of Ichthyology,* 47, 259-266.

Shaw, G. (1794) *Zoology of New Holland* (Vol. 1). J. Sowerby, London, 1-33 pp.

Shelyagin, D. I. (2010) Osteology of Halosauridae (Notacanthiformes). *Journal of Ichthyology,* 50, 512-528.

Shen, S.-C. (1971) A new genus of clinid fishes from the Indo-West-Pacific, with a redescription of *Clinus nematopterus*. *Copeia,* 1971, 697-707.

Shen, S.-C. (1998) A review of congrid eels of the genus *Ariosoma* from Taiwan, with description of a new species. *Zoological Studies,* 37, 7-12.

Shibatta, O. A. & Benine, R. C. (2005) A new species of *Microglanis* (Siluriformes: Pseudopimelodidae) from the upper Rio Parana basin, Brazil. *Neotropical Ichthyology,* 3, 579-585.

Shibukawa, K. (2010) *Hetereleotris exilis*, a new goby (Teleostei, Perciformes, Gobiidae) from the Ryukyu Islands, Japan. *Bulletin of the National Museum of Nature and Science,* 4, 89-95.

Shibukawa, K. & Murdy, E. O. (2012) A redescription of the eel goby *Trypauchenopsis* (Gobiidae: Amblyopinae) with comments on relationships. *Copeia,* 2012, 527-534.

Shibukawa, K. & Suzuki, T. (2002) *Asterropteryx atripes,* a new gobiid fish from the Western Pacific Ocean (Perciformes: Gobioidei). *Ichthyological Research,* 49, 274-280.

Shibukawa, K. & Taki, Y. (1996) A new gobiid fish, *Acanthogobius insularis*, from the Ryukyu Islands, Japan. *Ichthyological Research,* 43, 79-85.

Shimada, K. & Yoshino, T. (1984) A new trichonotid fish from the Yaeyama Islands, Okinawa prefecture, Japan. *Gyoruigaku Zasshi,* 31, 15-19.

Shimada, K. & Yoshino, T. (1987) A new creediid fish *Creedia bilineatus* from the Yaeyama Islands, Japan. *Japanese Journal of Ichthyology,* 34, 123-127.

Shinohara, G. (1994) Comparative morphology and phylogeny of the suborder Hexagrammoidei and related taxa (Pisces: Scorpaeniformes). *Memoirs of the Faculty of Fisheries Hokkaido University,* 41, 1-97.

Shinohara, G. & Imamura, H. (2005) Anatomical description and phylogenetic classification of the orbicular velvetfishes (Scorpaenoidea: *Caracanthus*). *Ichthyological Research,* 52, 64-76.

Shiogaki, M. (1981) Redescription of the stichaeid fish *Chirolophis saitone*. *Japanese Journal of Ichthyology,* 28, 129-134.

Shiogaki, M. (1984) A review of the genera *Pholidapus* and *Opisthocentrus* (Stichaeidae). *Japanese Journal of Ichthyology,* 31, 213-224.

Shiogaki, M. & Dotsu, Y. (1983) Two new genera and two new species of clingfishes from Japan, with comments on head sensory canals of the Gobiesocidae. *Japanese Journal of Ichthyology,* 30.

Shuozeng, D. & Dagang, C. (1994) Taxonomy, biology and abundance of icefishes, or noodlefishes (Salangidae), in the Yellow River estuary of the Bohai Sea, China. *Journal of Fish Biology,* 45, 737-748.

Sibert, E. C., Hull, P. M. & Norris, R. D. (2014) Resilience of Pacific pelagic fish across the Cretaceous/Palaeogene mass extinction. *Nature Geoscience,* 7, 667-670.

Sideleva, V. (2009) A new sculpin species *Cottus sabaudicus* sp. nova (Scorpaeniformes: Cottidae) from the Savoy district, France. *Journal of Ichthyology,* 49, 209-214.

Sideleva, V. G. (2003) *The endemic fishes of Lake Baikal.* Backhuys Publishers, Leiden, 1-270 pp.

Sidlauskas, B. L. & Vari, R. P. (2008) Phylogenetic relationships within the South American fish family Anostomidae (Teleostei, Ostariophysi, Characiformes). *Zoological Journal of the Linnean Society,* 154, 70-210.

Siebert, D. J. (1997) Notes on the anatomy and relationships of *Sundasalanx* Roberts (Teleostei, Clupeidae), with descriptions of four new species from Borneo. *Bulletin of the Natural History Museum Zoology,* 63, 13-26.

Silas, E. G., Pillai, P. P. & Muthiah, C. (1976) *Euthynnus* sp. nov? or an inter-generic hybrid of tuna: an enigma. *Journal of the Marine Biological Association of India,* 18, 411-420.

Silva, G. S. C., Melo, B. F., Oliveira, C. & Benine, R. C. (2013) Morphological and molecular evidence for two new species of *Tetragonopterus* (Characiformes: Characidae) from central Brazil. *Journal of Fish Biology,* 82, 1613-1631.

Sim, G. (1886) Occurrence of *Lumpenus lampetriformis* on the North Coast of Scotland; with notes on its habits, food, and the ground it frequents. *Journal of the Linnean Society of London, Zoology,* 20, 38-48.

Sire, J.-Y. & Allizard, F. (2001) A fourth teleost lineage possessing extra-oral teeth: the genus *Atherion* (Teleostei; Atheriniformes). *European Journal of morphology,* 39, 295-305.

Sire, J.-Y., Marin, S. & Allizard, F. (1998) Comparison of teeth and dermal denticles (odontodes) in the teleost *Denticeps clupeoides* (Clupeomorpha). *Journal of Morphology,* 237, 237-255.

Skelton, P. H. (1981) The description and osteology of a new species of *Gephyroglanis* (Siluriformes, Bagridae) from the Olifants River, South West Cape, South Africa. *Annals of the Cape Provincial Museums (Natural History) at the Albany Museum,* 13, 217-250.

Skelton, P. H. (2007) New species of the amphiliid catfish genera *Amphilius, Doumea*, and *Phractura* and the taxonomy of *Paramphilius* from West Africa (Siluriformes, Amphiliidae). *Zootaxa,* 1578, 41-68.

Smith, C. L. (1957) Two new clinid blennies (*Malacoctenus*) from Puerto Rico. *Occasional Papers of the Museum of Zoology, University of Michigan,* 585, 1-15.

Smith, D., Bohlke, J. & Castle, P. (1981) A revision of the nettastomatid eel genera *Nettastoma* and *Nettenchelys* (Pisces: Anguilliformes) with descriptions of six new species. *Proceedings of the Biological Society of Washington,* 94, 535-560.

Smith, D. G. (1984) A redescription of the rare eel *Myroconger compressus* (Pisces: Myrocongridae), with notes on its osteology, relationships and distribution. *Copeia,* 1984, 585-594.

Smith, D. G. (1989) Family Cyematidae. *In:* E. B. Böhlke (Ed), *Volume One: Orders Anguilliformes and Saccopharyngiformes. Volume Two: Leptocephali. Fishes of the Western North Atlantic. Memoirs of the Sears Foundation of Marine Research*, New Haven, pp. 630-635.

Smith, D. G. (2002a) Elopidae. *In:* K. E. Carpenter (Ed), *The living marine resources of the Western Central Atlantic. Volume 2: Bony fishes part 2 (Acipenseridae to Grammatidae). FAO species identification guide for fishery purposes and American Society of Ichthyologist and Herpetologists Special Publication No. 5*. FAO, Rome, p. 679.

Smith, D. G. (2002b) *Enchelycore nycturanus*, a new moray eel from South Africa (Teleostei: Anguilliformes: Muraenidae). *Zootaxa,* 104, 1-6.

Smith, D. G. (2002c) Halosauridae. *In:* K. E. Carpenter (Ed), *The living marine resources of the Western Central Atlantic. Volume 2: Bony fishes part 2 (Acipenseridae to Grammatidae). FAO species identification guide for fishery purposes and American*

Society of Ichthyologist and Herpetologists Special Publication No. 5. FAO, Rome, pp. 1625-1626.

Smith, D. G. & Böhlke, E. B. (1997) A review of the Indo-Pacific banded morays of the *Gymnothorax reticularis* group, with descriptions of three new species (Pisces, Anguilliformes, Muraenidae). *Proceedings of the Academy of Natural Sciences of Philadelphia,* 148, 177-188.

Smith, D. G. & Böhlke, J. E. (1983) *Neenchelys retropinna*: a new worm eel (Pisces: Ophichthidae) from the Indian Ocean. *Proceedings of the Academy of Natural Sciences of Philadelphia,* 135, 80-84.

Smith, D. G., Brokovich, E. & Einbinder, S. (2008) *Gymnothorax baranesi*, a new moray eel (Anguilliformes: Muraenidae) from the Red Sea. *Zootaxa,* 1678, 63-68.

Smith, D. G. & Castle, P. H. J. (1972) Biological results of the University of Miami deep-sea expeditions. 88. The eel genus *Neoconger* Girard: systematics, osteology, and life history. *Bulletin of Marine Science,* 22, 196-249.

Smith, D. G., Irmak, E. & Özen, Ö. (2012) A Redescription of the eel *Panturichthys fowleri* (Anguilliformes: Heterenchelyidae), with a synopsis of the Heterenchelyidae. *Copeia,* 2012, 484-493.

Smith, D. G. & Kanazawa, R. H. (1977) Eight new species and a new genus of congrid eels from the Western North Atlantic with redescriptions of *Ariosoma analis*, *Hildebrandia guppyi,* and *Rhechias vicinalis*. *Bulletin of Marine Science,* 27, 530-543.

Smith, D. G. & Karmovskaya, E. S. (2003) A new genus and two new species of congrid eels (Teleostei: Anguilliformes: Congridae) from the Indo-West Pacific, with a redescription and osteology of *Chiloconger dentatus*. *Zootaxa,* 343, 1-19.

Smith, D. G. & Nielsen, J. G. (1989) Family Nemichthyidae *In:* E. B. Böhlke (Ed), *Volume One: Orders Anguilliformes and Saccopharyngiformes. Volume Two: Leptocephali. Fishes of the western North Atlantic. Memoirs of the Sears Foundation of Marine Research*, New Haven, pp. 441-459.

Smith, D. G. & Randall, J. E. (2002) Albulidae. *In:* K. E. Carpenter (Ed), *The living marine resources of the Western Central Atlantic. Volume 2: Bony fishes part 2 (Acipenseridae to Grammatidae). FAO species identification guide for fishery purposes and American Society of Ichthyologist and Herpetologists Special Publication No. 5*. FAO, Rome, pp. 1623-1624.

Smith, J. (1935) The "galjoen" fishes of South Africa. *Transactions of the Royal Society of South Africa,* 23, 265-276.

Smith, J. (1952) The fishes of the family Haliophidae. *The Annals and Magazine of Natural History,* 12, 85-101.

Smith, J. (1954a) The Anisochromidae, a new family of fishes from East Africa. *The Annals and Magazine of Natural History (Series 12),* 7, 298-302.

Smith, J. B. (2005) Heterodonty in Tyrannosaurus rex: implications for the taxonomic and systematic utility of theropod dentitions. *Journal of Vertebrate Paleontology,* 25, 865-887.

Smith, J. L. B. (1934) The Triglidae of South Africa. *Transactions of the Royal Society of South Africa,* 22, 321-336.

Smith, J. L. B. (1936) The genus *Tripterodon* Playfair. *Transactions of the Royal Society of South Africa,* 23, 303-310.

Smith, J. L. B. (1948) New clinid fishes from the Southwestern Cape, with notes on other fishes. *The Annals and Magazine of Natural History (Series 11),* 14, 732-736.

Smith, J. L. B. (1954b) Apogonid fishes of the subfamily Pseudamiinae from South-east Africa. *The Annals and Magazine of Natural History (Series 12),* 7, 775-795.

Smith, J. L. B. (1954c) Four rare serraniform fishes from East Africa. *Journal of Natural History (Series 12),* 7, 925-933.

Smith, J. L. B. (1955) The fishes of Aldabra.--Part I. *The Annals and Magazine of Natural History (Series 12),* 8, 304-312.

Smith, J. L. B. (1956) An extraordinary fish from South Africa. *The Annals and Magazine of Natural History (Series 12),* 9, 54-57.

Smith, J. L. B. (1958a) Fishes of the families Tetrarogidae, Caracanthidae and Synanciidae, from the Western Indian Ocean, with further notes on scorpaenid fishes. *Ichthyological Bulletin, Department of Ichthyology, Rhodes University,* 12, 167-181.

Smith, J. L. B. (1958b) The fishes of the family Eleotridae in the Western Indian Ocean. *Ichthyological Bulletin, Department of Ichthyology, Rhodes University,* 11, 137-163.

Smith, J. L. B. (1959a) Goboid fishes of the families Gobiidae, Periophthalmidae, Trypauchenidae, Taeniodidae and Kraemeriidae of the Western Indian ocean. *Ichthyological Bulletin, Department of Ichthyology, Rhodes University,* 13, 185-225.

Smith, J. L. B. (1959b) Serioline fishes (yellowtails: amberjacks) from the Western Indian Ocean. *Ichthyological Bulletin, Department of Ichthyology, Rhodes University,* 15, 255-261.

Smith, J. L. B. (1960) A new clinid fish from South Africa. *Journal of Natural History (Series 13),* 3, 689-691.

Smith, J. L. B. (1962) Sand-dwelling eels of the Western Indian Ocean and the Red Sea. *Ichthyological Bulletin,* 24, 447-466.

Smith, J. L. B. (1964) A new serranid fish from deep water off Cook Island, Pacific. *The Annals and Magazine of Natural History (Series 13),* 6, 719-720.

Smith, J. L. B. (1965a) Fishes of the family Atherinidae of the Red Sea and the Western Indian Ocean: with a new freshwater genus and species from Madagascar. *Ichthyological Bulletin, Department of Ichthyology, Rhodes University,* 31, 601-632.

Smith, J. L. B. (1965b) An interesting new eel of the family Xenocongridae from Cook Island, Pacific. *Journal of Natural History (Series 13),* 8, 297-301.

Smith, J. L. B. (1965c) The rare Northeastern Atlantic fish, *Centrolophus britannicus*, in South Africa. *The Annals and Magazine of Natural History,* 8, 505-509.

Smith, J. L. B. (1966) A new stromateid fish from south africa with illustration of the unique rare *Centrolophus huttoni* Waite, 1910. *The Annals and Magazine of Natural History,* 9, 1-3.

Smith, J. L. B. (1967a) A new liparine fish from the Red Sea. *Journal of Natural History,* 2, 105-109.

Smith, J. L. B. (1967b) Studies on the carangid fishes. No. 3 The genus *Trachinotus*, Lacepede, in the Western Indian Ocean. *Occasional Papers of the Department of Ichthyology, Rhodes University,* 14, 157-166.

Smith, J. L. B. & Smith, M. M. (1986) Family No. 183: Sparidae. *In:* M. M. Smith & P. C. Heemstra (Eds), *Smiths' Sea Fishes*. Macmillan South Africa, Johannesburg, pp. 580-594.

Smith, M. L. & Miller, R. R. (1986) Mexican goodeid fishes of the genus *Characodon* with description of a new species. *American Museum Novitates,* 2851, 1-14.

Smith, M. L. & Miller, R. R. (1987) *Allotoca goslinei*, a new species of goodeid fish from Jalisco, Mexico. *Copeia,* 1987, 610-616.

Smith, P. J. & Paulin, C. D. (2003) Genetic and morphological evidence for a single species of pink ling (*Genypterus blacodes*) in New Zealand waters. *New Zealand Journal of Marine and Freshwater Research,* 37, 183-194.

Smith-Vaniz, W. F. (1976) The saber-toothed blennies, tribe Nemophini (Pisces: Blenniidae). *Monographs of the Academy of Natural Sciences of Philadelphia,* 19, 1-196.

Smith-Vaniz, W. F. (1989) Revision of the jawfish genus *Stalix* (Pisces: Opistognathidae), with descriptions of four new species. *Proceedings of the Academy of Natural Sciences of Philadelphia,* 141, 375-407.

Smith-Vaniz, W. F. (1997) Five new species of jawfishes (*Opistognathus*: Opistognathidae) from the Western Atlantic Ocean. *Bulletin of Marine Science,* 60, 1074-1128.

Smith-Vaniz, W. F. (1999) Carangidae. *In:* K. E. Carpenter & V. E. Niem (Eds), *Species identification guide for fisheries purposes. The living marine resources of the Western central Pacific. Bony fishes part 2 (Mugilidae to Carangidae)*. FAO, Rome, pp. 2659-2678.

Smith-Vaniz, W. F. & Johnson, G. D. (1990) Two new species of Acanthoclininae (Pisces: Plesiopidae) with a synopsis and phylogeny of the subfamily. *Proceedings of the Academy of Natural Sciences of Philadelphia,* 142, 211-260.

Smith-Vaniz, W. F. & Springer, V. G. (1971) Synopsis of the tribe Salariini, with description of five new genera and three new species (Pisces: Blenniidae). *Smithsonian Contributions to Zoology,* 73, 1-72.

Smith-Vaniz, W. F. & Staiger, J. C. (1973) Comparative revision of *Scomberoides*, *Oligoplites*, *Parona*, and *Hypacanthus* with comments on the phylogenetic position of *Campogramma* (Pisces: Carangidae). *Proceedings of the California Academy of Sciences,* 39, 185-256.

Snyder, J. O. (1911) Descriptions of new genera and species of fishes from Japan and the Riu Kiu Islands. *Proceedings of the United States National Museum,* 40, 525-549.

Sonnenberg, R., Woeltjes, T. & Van der Zee, J. R. (2011) Description of *Fenerbahce devosi* (Cyprinodontiformes: Nothobranchiidae), a new species of dwarf killifish from the eastern Congo Basin in the Democratic Republic of Congo. *Zootaxa,* 2966, 1-12.

Soule, J. D. (1969) Tooth attachment by means of a periodontium in the trigger-fish (Balistidae). *Journal of Morphology,* 127, 1-5.

Sousa, L. M. & Birindelli, J. L. O. (2011) Taxonomic revision of the genus *Scorpiodoras* (Siluriformes: Doradidae) with resurrection of *Scorpiodoras calderonensis* and description of a new species. *Copeia,* 2011, 121-140.

Sparks, J. S. & Gruber, D. F. (2012) A new mesophotic clingfish (Teleostei: Gobiesocidae) from the Bahamas. *Copeia,* 2012, 251-256.

Sparks, J. S. & Schaefer, S. A. (2001) *Bedotia masoala*: A new species of atherinoid rainbowfish (Teleostei: Bedotiidae) from the Masoala Peninsula, Northeastern Madagascar. *Copeia,* 2001, 482-489.

Sparks, N. H. C., Motta, P. J., Shellis, R. P., Wade, V. J. & Mann, S. (1990) An analytical electron microscopy study of iron-rich teeth from the butterflyfish (*Chaetodon ornatissimus*). *Journal of Experimental Biology,* 151, 371-385.

Springer, V. G. (1968) Osteology and classification of the fishes of the family Blenniidae. *Bulletin of the United States National Museum,* 284, 1-85.

Springer, V. G. (1970) The Western South Atlantic clinid fish *Ribeiroclinus eigenmanni*, with discussion of the intrarelationships and zoogeography of the Clinidae. *Copeia,* 1970, 430-436.

Springer, V. G. (1972) Synopsis of the tribe Omobranchini with descriptions of three new genera and two new species (Pisces: Blenniidae). *Smithsonian Contributions to Zoology,* 130, 1-31.

Springer, V. G. (1988) *Rotuma lewisi,* new genus and species of fish from the Southwest Pacific (Gobioidei, Xenisthmidae). *Proceedings of the Biological Society of Washington,* 101, 530-539.

Springer, V. G. & Freihofer, W. C. (1976) Study of the monotypic fish family Pholidichthyidae (Perciformes). *Smithsonian Contributions to Zoology,* 216, 1-43.

Springer, V. G. & Gomon, M. F. (1975) Revision of the blenniid fish genus *Omobranchus*: with descriptions of three new species and notes on other species of the tribe Omobranchini. *Smithsonian Contributions to Zoology,* 177, 1-135.

Springer, V. G. & Smith-Vaniz, W. F. (1972) A new tribe (Phenablenniini) and genus (Phenablennius) of blenniid fishes based on *Petroscirtes heyligeri* Bleeker. *Copeia,* 1972, 64-71.

Srivastava, G. J. (1968) *Fishes of Eastern Uttar Pradesh.* Vishwavidyalaya Prakashan, Varanasi, India, 1-163 pp.

Starks, E. C. (1895) Description of a new genus and species of cottoid fishes from Puget Sound. *Proceedings of the Academy of Natural Sciences of Philadelphia,* 47, 410-412.

Starks, E. C. (1899) The osteology and relationship of the percoidean fish, *Dinolestes lewini*. *Proceedings of the United States National Museum,* 22, 113-119.

Starnes, W. C. (1988) Revision, phylogeny and biogeographic comments on the circumtropical marine percoid fish family Priacanthidae. *Bulletin of Marine Science,* 43, 117-203.

Stein, D. & Bond, C. (1985) Observations on the morphology, ecology, and behaviour of *Bathylychnops exilis* Cohen. *Journal of Fish Biology,* 27, 215-228.

Stein, D. L. (2005) Descriptions of four new species, redescription of *Paraliparis membranaceus*, and additional data on species of the fish family Liparidae (Pisces, Scorpaeniformes) from the West coast of South America and the Indian Ocean. *Zootaxa,* 1019, 1-25.

Stein, D. L., Meléndez C., R. & Kong U., I. (1991) A review of Chilean snailfishes (Liparididae, Scorpaeniformes) with descriptions of a new genus and three new species. *Copeia,* 1991, 358-373.

Steindachner, F. (1875) Die Süsswasserfische des südöstlichen Brasilien (II). Sitzungsberichte der Kaiserlichen Akademie der Wissenschaften. *Mathematisch-Naturwissenschaftliche Classe,* 71, 211-245.

Stephens, J. S., Jr. (1963) A revised classification of the blennioid fishes of the American family Chaenopsidae. *University of California Publications in Zoology,* 68, 1-165.

Stephens, J. S. & Springer, V. G. (1973) Clinid fishes of Chile and Peru, with description of a new species, *Myxodes ornatus*, from Chile. *Smithsonian Contributions to Zoology,* 159, 1-24.

Stevenson, D. E., Matarese, A. C. & Murdy, E. O. (2005) The ronquils: a review of the North Pacific fish family Bathymasteridae (Actinopterygii: Perciformes: Zoarcoidei). *Proceedings of the Biological Society of Washington,* 118, 367-406.

Stevenson, M. M. (1971) *Percina macrolepida* (Pisces, Percidae, Etheostomatinea), a new percid fish of the subgenus *Percina* from Texas. *The Southwestern Naturalist,* 16, 65-83.

Stewart, A. L. & Clark, M. R. (1988) Records of three families and four species of fish new to the New Zealand fauna. *New Zealand Journal of Zoology,* 15, 577-583.

Stewart, D. J. (2013) Re-description of *Arapaima agassizii* (Valenciennes), a rare fish from Brazil (Osteoglossomorpha: Osteoglossidae). *Copeia,* 2013, 38-51.

Stiassny, M. L. (1989) A taxonomic revision of the African genus *Tylochromis* (Labroidei, Cichlidae); with notes on the anatomy and relationships of the group. *Annales du Musee Royal de l'Afrique Centrale, Série Sciences Zoologiques,* 258, 1-161.

Stiassny, M. L. & Mamonekene, V. (2007) *Micralestes* (Characiformes, Alestidae) of the lower Congo River, with a description of a new species endemic to the lower Congo River rapids in the Democratic Republic of Congo. *Zootaxa,* 1614, 17-29.

Stiassny, M. L. J. (2002) Revision of *Sauvagella* Bertin (Clupeidae; Pellonulinae; Ehiravini) with a description of a new species from the freshwaters of Madagascar and diagnosis of the Ehiravini. *Copeia,* 2002, 67-76.

Stiassny, M. L. J., Denton, J. S. S. & Iyaba, R. J. C. M. (2013) A new ectoparasitic distichodontid of the genus *Eugnathichthys* (Characiformes: Citharinoidei) from the Congo basin of central Africa, with a molecular phylogeny for the genus. *Zootaxa,* 3693, 479-490.

Stiassny, M. L. J., Rodriguez, D. M. & Loiselle, P. V. (2002) *Rheocles vatosoa*, a new species of freshwater rainbowfish (Atherinomorpha: Bedotiidae) from the Lokoho River basin in Northeastern Madagascar. *Cybium,* 26, 71-77.

Stiassny, M. L. J. & Schaefer, S. A. (2005) *Rhabdalestes aeratis*, a new species (Characiformes: Alestidae): first occurrence of the genus from the Middle Congo River. *Ichthyological Exploration of Freshwaters,* 16, 271-278.

Stiassny, M. L. J., Schelly, R. C. & Mamonekene, V. (2009) A new *Alestes* (Characiformes, Alestidae) from the Mpozo River in the Democratic Republic of Congo. *Copeia,* 2009, 110-116.

Stock, D. W. (2007) Zebrafish dentition in comparative context. *Journal of Experimental Zoology Part B: Molecular and Developmental Evolution,* 308B, 523-549.

Stokell, G. (1940) A new freshwater fish of the genus *Philypnodon*. *Transactions of the Royal Society of New Zealand,* 69, 129-133.

Stokell, G. (1941) A revision of the genus *Gobiomorphus*. *Transactions of the Royal Society of New Zealand,* 70, 361-372.

Strauss, R. E. (1993) Relationships among the cottid genera *Artedius*, *Clinocottus*, and *Oligocottus* (Teleostei: Scorpaeniformes). *Copeia,* 1993, 518-522.

Streelman, J. T., Webb, J. F., Albertson, R. C. & Kocher, T. D. (2003) The cusp of evolution and development: a model of cichlid tooth shape diversity. *Evolution & Development,* 5, 600-608.

Su, J., Hardy, G. & Tyler, J. (1986) A new generic name for *Anchisomus multistriatus* Richardson, 1854 (Tetraodontidae), with notes on its toxicity and pufferfish biting behaviour. *Records of the Western Australian Museum,* 13, 101-129.

Suda, Y., Tachikawa, H. & Baba, O. (1986) Adult form of the stromateoid fish, *Nomeus gronovii*, from the North Pacific. *Japanese Journal of Ichthyology,* 33, 319-322.

Sulak, K. J. (1977) The systematics and biology of *Bathypterois* (Pisces, Chlorophthalmidae) with a revised classification of benthic myctophiform fishes. *Galathea Report,* 14, 49-108.

Sulak, K. J., Wenner, C. A., Sedberry, G. R. & Guelpen, L. V. (1985) The life history and systematics of deep-sea lizard fishes, genus *Bathysaurus* (Synodontidae). *Canadian Journal of Zoology,* 63, 623-642.

Sullivan, J. P. & Hopkins, C. D. (2004) A new *Stomatorhinus* (Osteoglossomorpha: Mormyridae) from the Ivindo River, Gabon, West Central Africa. *Zootaxa,* 847, 1-23.

Sullivan, J. P., Zuanon, J. & Fernandes, C. C. (2013) Two new species and a new subgenus of toothed *Brachyhypopomus* electric knifefishes (Gymnotiformes, Hypopomidae) from the central Amazon and considerations pertaining to the evolution of a monophasic electric organ discharge. *ZooKeys,* 327, 1-34.

Sutton, T. T., Hartel, K. E. & Buth, D. G. (2004) New species of *Eustomias* (Teleostei: Stomiidae) from the western North Atlantic, with a review of the subgenus *Neostomias*. *Copeia,* 2004, 116-121.

Suzuki, S., Kawashima, T. & Nakabo, T. (2009) Taxonomic review of East Asian *Pleuronichthys* (Pleuronectiformes: Pleuronectidae), with description of a new species. *Ichthyological Research,* 56, 276-291.

Suzuki, T. & Senou, H. (2007) Two new species of the gobiid fish genus *Trimma* (Perciformes: Gobioidei) from Southern Japan. *Bulletin of the National Museum of Nature and Science (Series A),* 1, 175-184.

Svetovidov, A. N. (1964) Systematics of the North American anadromous clupeoid fishes of the genera *Alosa*, *Caspialosa,* and *Pomolobus*. *Copeia,* 1964, 118-130.

Świdnicki, J. (1991) New data on the osteology of some species of *Bregmaceros* (Teleostei, Gadiformes). *Journal of Morphology,* 208, 129-160.

Szelistowski, W. A. (1990) A new clingfish (Teleostei: Gobiesocidae) from the mangroves of Costa Rica, with notes on its ecology and early development. *Copeia,* 1990, 500-507.

Takahashi, R., Watanabe, K., Nishida, M. & Hori, M. (2007) Evolution of feeding specialization in Tanganyikan scale-eating cichlids: a molecular phylogenetic approach. *BMC Evolutionary Biology,* 7, 195.

Takahashi, T. (2002) Systematics of the tribe Trematocarini (Perciformes: Cichlidae) from Lake Tanganyika, Africa. *Ichthyological Research,* 49, 253-259.

Takahashi, T. & Nakaya, K. (2002) Description and familial allocation of the African fluvial genus *Teleogramma* to the Cichlidae. *Ichthyological Research,* 49, 171-180.

Talwar, P. K. (1968) Taxonomic status of *Sphyraena acutipinnis* Day, 1876 (Sphyraenidae—Pisces). *Journal of Natural History,* 2, 197-200.

Talwar, P. K. (1976) On a new bathypelagic fish, *Holanthias perumali* from the Arabian Sea, with a record of *Holanthias rhodopeplus* (Günther) from Indian Seas. *Journal of Natural History,* 10, 361-365.

Talwar, P. K. (1977) Identity of the deep-sea eel, *Sauromuraenesox vorax* Alcock (Anguilliformes: Muraenesocidae). *Proceedings of the Zoological Society of Calcutta,* 30, 51-55.

Talwar, P. K. & Sathiarajan, R. (1975) A new bathyal fish, *Atrobucca trewavasae* (Pisces: Sciaenidae) from the Bay of Bengal. *Journal of Natural History,* 9, 575-580.

Tan, H. H. & Lim, K. K. P. (2011) A new species of glass-perch from Belitung Island, Indonesia (Teleostei: Ambassidae: Gymnochanda). *Zootaxa,* 3085, 55-62.

Taphorn, D. C. & Lilyestrom, C. G. (1980) *Piabucina pleurotaenia* Regan, a synonym of *P. erythrinoides* Valenciennes (Pisces: Lebiasinidae); its distribution, diet and habitat in Lake Maracaibo Basin, Venezuela. *Copeia,* 1980, 335-340.

Tarp, F. H. (1952) A revision of the family Embiotocidae (the surfperches). *Fish Bulletin of the Division of Fish and Game of California,* 88, 1-99.

Taverne, L. (1971) Ostéologie des genres *Marcusenius* Gill, *Hippopotamyrus*, Pappenheim, *Cyphomyrus* Myers, *Pollimyrus*, Taverne et *Brienomyrus* Taverne (Pisces Mormyriformes). *Annales du Musée Royal de l'Afrique Centrale, serie in - 8°, Sciences Zoologiques,* 188, 144.

Te Winkel, L. E. (1935) A study of *Mistichthys luzonensis* with special reference to conditions correlated with reduced size. *Journal of Morphology,* 58, 463-535.

Tereshenkov, I. I. (1972) Replacement of teeth in the pike (*Esox lucius L.*). *Journal of Ichthyology,* 12, 807-812.

Teugels, G. G., Denayer, B. & Legendre, M. (1990) A systematic revision of the African catfish genus *Heterobranchus* Geoffroy-Saint-Hilaire, 1809 (Pisces: Clariidae). *Zoological Journal of the Linnean Society*, 98, 237-257.

Teugels, G. G., Diogo, R., Pouyard, L. & Legendre, M. (1999) Redescription of *Clarias macrocephalus* (Siluriformes: Clariidae) from South-east Asia. *Cybium,* 23, 285-295.

Thacker, C. & Schaefer, S. A. (2000) Phylogeny of the wormfishes (Teleostei: Gobioidei: Microdesmidae). *Copeia,* 2000, 940-957.

Thomas, M. R. & Pérez, M. H. S. (2010) A new species of whiptail catfish, genus *Loricaria* (Siluriformes: Loricariidae), from the Rio Curuá (Xingu Basin), Brazil. *Copeia,* 2010, 274-283.

Thompson, B. A. & Suttkus, R. D. (2002) A revision of Indo-Pacific *Bembrops*, family Percophidae (suborder Trachinoidei). *Marine and Freshwater Research,* 53, 283-295.

Thompson, W. F. (1916) Fishes collected by the United States bureau of fisheries steamer" Albatross" during 1888, between Montevideo, Uruguay, and Tome, Chile, on the voyage through the Straits of Magellan. *Proceedings of the United States National Museum* 50, 401-476.

Thompson, W. F. (1917) Further notes on *Erilepis*, the giant bass-like fish of the North Pacific. *Copeia,* 40, 9-13.

Thomson, A. W. (2007) Taxonomic revision of the *Amphilius uranoscopus* group of East-central Africa (Teleostei: Amphiliidae). *In: Zoology*. University of Florida, Gainesville, pp. 1-73.

Thomson, J. (1954) The Mugilidae of Australia and adjacent seas. *Marine and Freshwater Research,* 5, 70-131.

Tibbetts, I. R. & Carseldine, L. (2003) Anatomy of a hemiramphid pharyngeal mill with reference to *Arrhamphus sclerolepis krefftii* (steindachner) (teleostei: hemiramphidae). *Journal of Morphology,* 255, 228-243.

Tighe, K. (1992) *Boehlkenchelys longidentata,* a new genus and species of chlopsid eel (Teleostei: Anguilliformes) from the Indo-West Pacific region. *Proceedings of the Biological Society of Washington,* 105, 19-22.

Tighe, K. & Nielsen, J. (2000) *Saccopharynx berteli*, a new gulper eel from the Pacific Ocean (Teleostei, Saccopharyngidae). *Ichthyological Research,* 47, 39-41.

Tilak, R. (1970) A new sisorid catfish of the genus *Gagata* Bleeker from India. *Zoologische Mededelingen,* 44, 207 - 215.

Togo, Y. (1984) Histogenetic studies on the teeth of the marble gourami. *(Trichogaster trichopterus)*. *Kōkūbyō Gakkai zasshi. The Journal of the Stomatological Society, Japan,* 51, 493-524.

Toledo-Piza, M. (2000) The neotropical fish subfamily Cynodontinae (Teleostei: Ostariophysi: Characiformes): a phylogenetic study and a revision of *Cynodon* and *Rhaphiodon*. *American Museum Novitates,* 3286, 1-88.

Toledo-Piza, M. (2007) Phylogentic relationships among *Acestrorhynchus* species (Ostariophysi: Characiformes: Acestrorhychidae). *Zoological Journal of the Linnean Society,* 151, 691-757.

Tomes, C. S. (1874) Studies upon the attachment of teeth. *Transactions of the New York Odontological Society,* 7, 41-56.

Tominaga, Y. (1965) The internal morphology and systematic position of Leptobrama mulleri, formerly included in the family Pempheridae. *Japanese Journal of Ichthyology,* 12, 33-56.

Tominaga, Y. (1968) Internal morphology, mutual relationships, and systematic position of the fishes belonging to the family Pempheridae. *Japanese Journal of Ichthyology,* 15, 43-95.

Topp, R. W. & Cole, C. F. (1968) An osteological study of the sciaenid genus, *Sciaenops* Gill (Teleostei, Sciaenidae). *Bulletin of Marine Science,* 18, 902-945.

Torii, A., Javonillo, R. & Ozawa, T. (2004) Reexamination of *Bregmaceros lanceolatus* Shen, 1960 with description of a new species *Bregmaceros pseudolanceolatus* (Gadiformes: Bregmacerotidae). *Ichthyological Research,* 51, 106-112.

Tornabene, L., Van Tassell, J. L. & Robertson, D. R. (2012) *Microgobius urraca* (Teleostei: Gobiidae), a new species of goby from the tropical Eastern Pacific. *Zootaxa,* 3447, 41-55.

Toyoshima, M. (1981) Redescription of the zoarcid fish *Lycozoarces regani*. *Japanese Journal of Ichthyology,* 27, 296-300.

Trapani, J. (2001) Position of developing replacement teeth in teleosts. *Copeia,* 2001, 35-51.

Trapani, J., Yamamoto, Y. & Stock, D. W. (2005) Ontogenetic transition from unicuspid to multicuspid oral dentition in a teleost fish: *Astyanax mexicanus*, the Mexican tetra (Ostariophysi: Characidae). *Zoological Journal of the Linnean Society,* 145, 523-538.

Traquair, R. H. (1870) The cranial osteology of *Polypterus*. *Journal of Anatomy and Physiology,* 5, 166-183.

Travers, R. A. (1984) A review of the Mastacembeloidei, a suborder of synbranchiform teleost fishes. Part I: Anatomical descriptions. *Bulletin of the British Museum (Natural History),* 46, 1-133.

Trewavas, E. (1932) A contribution of the classification of the fishes of the order Apodes, based on the osteology of some rare eels. *Proceedings of the Zoological Society of London,* 102, 639-660.

Triques, M. L. (1997) *Stegostenopos cryptogenes*, new genus and species of Hypopomidae electrogenic neotropical fish from the Rio Negro system, Brazil (Actinopterygii: Ostariophysi: Gymnotiformes). *Revue française d'Aquariologie Herpétologie,* 24, 31-36.

Trunov, I., Kukuev, E. & Sukhorukova, V. (2006) A finding in the Pregolya River (Kaliningrad oblast) of the black-spotted bass *Decentrarchus punctatus* (Moronidae). *Journal of Ichthyology,* 46, 345-346.

Trunov, I. A. (1990) Fishes of the family Moridae from the Southeast Atlantic (*Paralaemonema* gen et spp. n.). *Journal of Ichthyology,* 30, 76-86.

Tsukamoto, Y., Aizawa, M. & Okiyama, M. (1992) First record of the alepocephalid fish, *Photostylus pycnopterus*, from Japan. *Japanese Journal of Ichthyology,* 39, 255-258.

Tsuruta, Y. & Omori, M. (1976) Morphological characters of the oral organs of several flatfish species and their feeding behavior. *Tohoku Journal of Agricultural Research,* 27, 92-114.

Tucker, A. S. & Fraser, G. J. (2014) Evolution and developmental diversity of tooth regeneration. *Seminars in Cell & Developmental Biology,* 25–26, 71-80.

Turner, C. (1946) A contribution to the taxonomy and zoogeography of the goodeid fishes. *Occasional Papers of the Museum of Zoology University of Michigan,* 495, 1-13.

Tyler, J. C. (1962) *Triodon bursarius*, a plectognath fish connecting the Sclerodermi and Gymnodontes. *Copeia,* 1962, 793-801.

Tyler, J. C. (1966) A new genus and species of triacanthodid fish (Plectognathi) from the Indian Ocean. *Notulae Naturae (Philadelphia)* 385, 1-5.

Tyler, J. C. (1970) Osteological aspects of interrelationships of surgeon fish genera (Acanthuridae). *Proceedings of the Academy of Natural Sciences of Philadelphia,* 122, 87-124.

Tyler, J. C. & Alexander, F. B. (1997) Relationships of the fossil and recent genera of rabbitfishes (Acanthuroidei: Siganidae). *Smithsonian Contribution to Paleobiology,* 84, 1-35.

Tyler, J. C., Johnson, G. D., Nakamura, I. & Collette, B. B. (1989a) Morphology of *Luvarus imperialis* (Luvaridae), with a phylogenetic analysis of the Acanthuroidei (Pisces). *Smithsonian Contributions to Zoology,* 485, 1-78.

Tyler, J. C., Johnson, G. D., Nakamura, I. & Collette, B. B. (1989b) Morphology of Luvarus imperialis (Luvaridae), with a phylogenetic analysis of the Acanthuroidei (Pisces). *Smithsonian Contribution to Zoology,* 485, 1-78.

Tyler, J. C. & Paxton, J. R. (1979) New genus and species of pufferfish (Tetraodontidae) from Norfolk Island, Southwest Pacific. *Bulletin of Marine Science,* 29, 202-215.

Tyson, R. R. (1980) A revision of the Asian mastacembelid fish genus *Macrognathus*. *Copeia,* 1980, 385-391.

Uehara, K. & Miyoshi, S. (1987) Structure of the upper teeth of the filefish, *Stephanolepis cirrhifer*. *The Anatomical Record,* 217, 16-22.

Uehara, K. & Miyoshi, S. (1993) Structure of comblike teeth of the ayu sweetfish, *Plecoglossus altivelis* (Teleostei: Isospondyli): I. Denticles and tooth attachment. *Journal of Morphology,* 217, 229-238.

Ueno, T. (1954) Studies on the cyclopterid fishes from Northern Japan and adjacent regions: remarks on two genera, *Cyclolumpus* and *Eumicrotremus*. *Bulletin of the Faculty of Fisheries Hokkaido University,* 4, 273-295.

Uiblein, F. (2010) Taxonomic review of Western Indian Ocean goatfishes of the genus *Mulloidichthys* (Family Mullidae), with description of a new species and remarks on colour and body form variation in Indo-West Pacific species. *Smithiana Bulletin,* 13, 51-73.

Uiblein, F. & Heemstra, P. C. (2010) A taxonomic review of the Western Indian Ocean goatfishes of the genus *Upeneus* (family Mullidae), with descriptions of four new species. *Smithiana Publications in Aquatic Biodiversity,* 11, 35-71.

Uiblein, F., Nielsen, J. G. & Møller, P. R. (2008) Systematics of the ophidiid genus *Spectrunculus* (Teleostei: Ophidiiformes) with resurrection of *S. crassus*. *Copeia,* 2008, 542-551.

Ungar, P. S. (2010) *Mammal Teeth Origin, Evolution, and Diversity*. The Johns Hopkins University Press, Baltimore, 1-304 pp.

Urano, T. & Mochizuki, K. (1984) A record of an ariommid fish, *Ariomma indica*, from Japan. *Japanese Journal of Ichthyology,* 31, 205-208.

Uyeno, T. (1977) The second specimen of the alepocephalid fish, *Rouleina tanakae*, collected off Kyushu, Japan. *Japanese Journal of Ichthyology,* 24, 141-143.

Uyeno, T. & Miller, R. R. (1962) Relationships of *Empetrichthys erdisi*, a Pliocene cyprinodontid fish from California, with remarks on the Fundulinae and Cyprinodontinae. *Copeia,* 1962, 520-532.

Van den Bergh, E. C., Teugels, G. G., Coenen, E. J. & Ollevier, F. (1995) *Nannocharax rubrolabiatus*, a new species of distichodont fish from the Sanaga River Basin in Cameroon, Africa (Teleostei: Distichodontidae). *Ichthyological Exploration of Freshwaters,* 6, 349-356.

van der Heiden, A. M. & Mitchell, R. (1998) Rediscovery and description of the flounder *Syacium maculiferum* (Garman, 1899): an endemic species of Cocos Island, Costa Rica (Pleuronectiformes: Paralichthyidae). *Copeia,* 1998, 753-758.

van der Heiden, A. M. & Plascencia González, H. G. (2005) *Etropus ciadi*, a new endemic flatfish from the Gulf of California, Mexico (Pleuronectiformes: Paralichthyidae). *Copeia,* 2005, 470-478.

Van der Stigchel, J. W. R. (1964) A new species of pimelodid catfish from Eastern Brazil, *Pimelodella boschmai* nov. spec. *Zoologische Mededelingen (Leiden),* 39, 327-330.

Van der Zee, J. R. & Sonnenberg, R. (2010) *Aphyosemion teugels*i (Cyprinodontiformes: Nothobranchiidae), a new species from a remote locality in the southern Democratic Republic of the Congo. *Zootaxa,* 2724, 58-68.

Van der Zee, J. R. & Sonnenberg, R. (2011) *Aphyosemion musafirii* (Cyprinodontiformes: Nothobranchiidae), a new species from the Tshopo Province in the Democratic Republic of Congo, with some notes on the *Aphyosemion* of the Congo Basin. *Bonn Zoological Bulletin,* 60, 73-87.

Vandervennet, E. & Huysseune, A. (2005) Histological description of tooth formation in adult *Eretmodus cf. cyanostictus* (Teleostei, Cichlidae). *Archives of Oral Biology,* 50, 635-643.

Vari, R. P. (1977) Notes on the characoid subfamily Iguanodectinae with a descritpion of a new species. *American Museum Novitates,* 2612, 1-6.

Vari, R. P. (1979) Anatomy, relationships and classification of the families Citharinidae and Distichodontidae (Pisces, Characoidea). *Bulletin of the British Museum (Natural History) Zoology,* 36, 261-344.

Vari, R. P. (1983) Phylognenetic relationships of the Curimatidae, Prochilodonitdae, Anostomidae, Chilodontidae (Pisces: Characiformes). *Smithsonian Contributions to Zoology,* 378, 1-60.

Vari, R. P. (1985) Terapontidae. *In:* K. E. Carpenter & V. H. Niem (Eds), *Species identification guide for fishery purposes. The living marine resources of the western central Pacific. Bony fishes part 3 (Menidae to Pomacentridae)*. FAO, Rome, pp. 3305-3316.

Vari, R. P. (1989) A phylogenetic study of the neotropical characiform family Curimatidae (Pisces: Ostariophysi). *Smithsonian Contributions to Zoology* 471, 1-71.

Vari, R. P. (1995) The neotropical fish family Ctenoluciidae (Teleostei: Ostariophysi: Characiformes): supra and intrafamilial phylogenetic relationships, with a revisionary study. *Smithsonian Contributions to Zoology,* 564, 1-97.

Vari, R. P. & C. J., J. F. (1998) The neotropical catfish genus *Epapterus* Cope (Siluriformes: Auchenipteridae): a reappraisal. *Proceedings of the Biological Society of Washington* 111, 992-1007.

Vari, R. P., Castro, R. M. C. & Raredon, S. J. (1995) The neotropical fish family Chilodontidae (Teleostei: Characiformes): a phylogenetic study and revision of *Caenotropus* Gunther. *Smithsonian Contributions to Zoology,* 577, 1-32.

Vari, R. P., De Santana, C. D. & Wosiacki, W. B. (2012) South American electric knifefishes of the genus *Archolaemus* (Ostariophysi, Gymnotiformes): undetected diversity in a clade of rheophiles. *Zoological Journal of the Linnean Society,* 165, 670-699.

Vari, R. P. & Ferraris, C. J. (2006) The catfish genus *Tetranematichthys* (Auchenipteridae). *Copeia,* 2006, 168-180.

Vari, R. P., Ferraris, C. J. & de Pinna, M. C. C. (2005) The neotropical whale catfishes (Siluriformes: Cetopsidae: Cetopsinae), a revisionary studys. *Neotropical Ichthyology,* 3, 127-238.

Vari, R. P. & Géry, J. (1981) *Nannocharax maculicauda*, a new species of African characoid fish (Characoidea, Distichodontidae) with comments on the genus *Hemigrammocharax*. *Proceedings of the Biological Society of Washington,* 94, 1076-1084.

Vari, R. P. & Hutchins, B. (1978) New species of terapon perches (Percoidei, Teraponidae) from Australia. *American Museum Novitates,* 2654, 1-8.

Vari, R. P. & Ortega, H. (1986) The catfishes of the neotropical family Helogenidae (Ostariophysi: Siluroidei). *Smithsonian Contributions to Zoology,* 442, 1-20.

Vera Alcaraz, H. S., Pavanelli, C. S. & Bertaco, V. A. (2009) *Astyanax jordanensis* (Ostariophysi:Characidae), a new species from the Rio Iguacu basin Parana, Brazil. *Neotropical Ichthyology,* 7, 185-190.

Victor, B. C. & Randall, J. E. (2010) *Gramma dejongi*, a new basslet (Perciformes: Grammatidae) from Cuba, a sympatric sibling species of *G. loreto*. *Zoological Studies,* 49, 865-871.

Villadolid, D. V. & Manacop, P. R. (1934) The Philippine Phallostethidae, a description of a new species and a report on the biology of *Gulaphallus mirabilis* Herre. *Philippine Journal of Science,* 55, 193-217.

Vishwanath, W. & Darshan, A. (2006) A new species of the genus *Batasio* Blyth (Teleostei: Bagridae) from Manipur, India. *Zoos' Print Journal,* 21, 2160-2163.

Voskoboinikova, O. S. & Nazarkin, M. V. (2009) Comparative osteology of *Cyclopsis tentacularis* (Cyclopteridae, Scorpaeniformes). *Journal of Ichthyology,* 49, 39-46.

Voskoboinikova, O. S. & Pavlov, D. A. (2006) Larval development of the Amur sleeper *Perccottus glenii* (Perciformes, Gobioidei, Odontobutidae) and the origin of fish of the suborder Gobioidei. *Journal of Ichthyology,* 46, 788-802.

Voskoboinikova, O. S. & Skora, K. E. (1996) Comparative osteology of *Acanthodraco dewitti* and relationships within the gymnodraconins (Pisces: Bathydraconidae). *Zoosystematica Rossica,* 5, 203-208.

Wacker, K., Bartsch, P. & Clemen, G. (2001) The development of the tooth pattern and dentigerous bones in *Polypterus senegalus* (Cladistia, Actinopterygii). *Annals of Anatomy - Anatomischer Anzeiger,* 183, 37-52.

Wainwright, P. C., Bellwood, D. R., Westneat, M. W., Grubich, J. R. & Hoey, A. S. (2004) A functional morphospace for the skull of labrid fishes: patterns of diversity in a complex biomechanical system. *Biological Journal of the Linnean Society,* 82, 1-25.

Waite, E. R. (1906) Descriptions of and notes on some Australian and Tasmanian fishes. *Records of the Australian Museum,* 6, 194-210.

Wakita, M., Itoh, K. & Kobayashi, S. (1977) Tooth replacement in the teleost fish *Prionurus microlepidotus* Lacépède. *Journal of Morphology,* 153, 129-141.

Waldman, J. R. (1986) Diagnostic value of *Morone* dentition. *Transactions of the American Fisheries Society,* 115, 900-907.

Walford, L. A. (1936) Contributions from the Fleischmann expedition along the west coast of Mexico. [with three subtitles]. *Occasional papers of the Santa Barbara Museum,* 4, 1-10.

Walker, H. & Bollinger, J. (2001) A new species of *Trinectes* (Pleuronectiformes: Achiridae), with comments on the other eastern Pacific species of the genus. *Revista de Biologia Tropical,* 49, 177-186.

Walsh, S. J. & Gilbert, C. R. (1995) New species of troglobitic catfish of the genus *Prietella* (Siluriformes: Ictaluridae) from Northeastern México. *Copeia,* 1995, 850-861.

Walters, V. (1957) *Alphestes scholanderi,* a new sea bass from the West Indies. *Copeia,* 1957, 283-286.

Walters, V. (1961) A contribution to the biology of the Giganturidae with description of a new genus and species. *Bulletin of the Museum of Comparative Zoology,* 125, 295-319.

Wamuini Lunkayilaki, S. & Vreven, E. J. (2008) *Nannopetersius mutambuei* (Characiformes: Alestidae), a new species from the Inkisi River basin, Democratic Republic of Congo. *Ichthyological Exploration of Freshwaters,* 19, 367-376.

Wang, R. (2001) Osteology, phylogeny and biogeography of *Parioglossus* (Perciformes, Gobioidei). *In: Department fo Zoology*. University of Toronto, Toronto p. 135.

Watanabe, S., Aoyama, J. & Tsukamoto, K. (2004) Reexamination of Eges (1939) use of taxonomic characters of the genus *Anguilla*. *Bulletin of Marine Science,* 74, 337-351.

Watanabe, S., Aoyama, J. & Tsukamoto, K. (2009) A new species of freshwater eel *Anguilla luzonensis (*Teleostei: Anguillidae) from Luzon Island of the Philippines. *Fisheries Science,* 75, 387-392.

Watson, R., E., Keith, P. & Marquet, G. (2002) *Lentipes kaaea*, a new species of freshwayer goby (Teleostei: Goioidei: Sicydiinae) from New Caledonia. *Bulletin of the French Pêche Piscicatoria,* 364, 173-185.

Watson, R. E. (1994) *Awaous* (*Awaous*) *acritosus* a new species of freshwater goby from Southern New Guinea and Northeastern Australia (Teleostei: Gobiidae). *Ichthyological Exploration of Freshwaters,* 5, 371-376.

Watson, R. E., Keith, P. & Marquet, G. (2005) *Stiphodon sapphirinus,* a new species of freshwater goby from New Caledonia (Gobioidei: Sicydiinae). *Cybium,* 29, 339-345.

Watson, W. & Walker Jr., H. J. (2004) The world's smallest vertebrate, *Schindleria brevipinguis*, a new paedomorphic species in the family Schindleriidae (Perciformes: Gobioidei). *Records of the Australian Museum,* 56, 139-142.

Webb, S. A. & Miller, R. R. (1998) *Zoogoneticus tequila,* a new goodeid fish (Cyprinodontiformes) from the Ameca drainage of Mexico, and a rediagnosis of the genus. *Occasional Papers of the Museum of Zoology, University of Michigan,* 725, 1-24.

Weitzman, S. H. (1954) The osteology and the relationships of the South American characid fishes of the subfamily Gasteropelecinae. *The Stanford Ichthyological Bulletin,* 4, 213-263.

Weitzman, S. H. (1960) Further notes on the relationships and classification of the South American Characid fishes of the subfamily Gasteropelecinae. *Stanford Ichthyological Bulletin,* 7, 217-239.

Weitzman, S. H. (1962) The osteology of *Brycon meeki*: A generalized characid fish, with an osteological definition of the family. *Stanford Ichthyological Bulletin,* 8, 1-77.

Weitzman, S. H. (1974) Osteology and evolutionary relationships of the Sternoptychidae, with a new classification of stomiatid families. *Bulletin of the American Museum of Natural History,* 153, 331-477.

Weitzman, S. H. (1978) Three new species of fishes of the genus *Nannostomus* from the Brazilian states of Para and Amazonas (Teleostei, Lebiasinidae). *Smithsonian Contributions to Zoology,* 263, 1-14.

Weitzman, S. H. & Fink, S. V. (1985) Xenurobryconin phylogeny and putative pheromone pumps in Glandulocaudine fishes (Teleostei: Characidae). *Smithsonian Contribution to Zoology,* 421, 1-121.

Weitzman, S. H. & Kanazawa, R. H. (1976) *Ammocryptocharax elegans*, a new genus and species of riffle-inhabiting characoid fish (Teleostei: Characidae) from South America. *Proceedings of the Biological Society of Washington,* 89, 325-346.

Weitzman, S. H. & Kanazawa, R. H. (1977) A new species of pygmy characoid fish from the Rio Negro and Rio Amazonas, South America (Teleostei: Characidae). *Proceedings of the Biological Society of Washington,* 90, 149-160.

Weitzman, S. H. & Kanazawa, R. H. (1978) The South American fish genus *Elachocharax* Myers with a description of a new species (Teleostei: Characidae). *Proceedings of the Biological Society of Washington,* 91, 158-183.

Weitzman, S. H. & Malabarba, L. R. (1999) Systematics of *Spintherobolus* (Teleostei: Characidae: Cheirodontinae) from Eastern Brazil. *Ichthyological Exploration of Freshwaters,* 10, 1-43.

Weitzman, S. H. & Vari, R. P. (1987) Two new species and a new genus of miniature characid fishes (Teleostei: Characiformes) from Northern South America. *Proceedings of the Biological Society of Washington,* 100, 640-652.

Weitzman, S. H. & Wourms, J. P. (1967) South American cyprinodont fishes allied to *Cynolebias* with the description of a new species of *Austrofundulus* from Venezuela. *Copeia,* 1967, 89-100.

Westrheim, S. J. & Pletcher, F. T. (1966) First records of the twoline eelpout, *Bothrocara brunneum*, Greenland halibut, *Reinhardtius hippoglossoides*, and shortbelly rockfish, *Sebastodes jordani*, in British Columbia waters. *Journal of the Fisheries Board of Canada,* 23, 309-312.

Wheeler, A. (1962) A rare British fish, *Taractes* (*Taractichthys*) *longipinnis* (Lowe). *The Annals and Magazine of Natural History,* 5, 257-260.

Whitehead, P. J. P. (1967) The West African shad, *Ethmalosa fimbriata* (Bowdich, 1825): synonymy, neotype. *Journal of Natural History,* 1, 585-593.

Whitehead, P. J. P. (1963) A revision of the recent round herrings (Pisces: Dussumieriidae). *Bulletin of the British Museum (Natural History) Zoology,* 10, 305-380.

Whitehead, P. J. P. (1985) *Vol.7. Clupeoid fishes of the world (suborder Clupeoidei) an annotated and illustrated catalogue of the herrings, sardines, pilchards, sprats, shads, anchovies and wolf-herrings. part 1. Chirocentridae, Clupeidae and Pristigasteridae*. FAO, Rome, 1-303 pp.

Whithead, P. J. P., Nelson, G. J. & Wongratana, T. (1988) *Vol.7. Clupeoid fishes of the world (Suborder Clupeoidei) An annotated and illustrated catalogue of the herrings, sardines, pilchards, sprats, shads, anchovies and wolf-herrings. Part 2. Engrualidae*. FAO, Rome, 304-475 pp.

Whitley, G. (1966) Notes on some Queensland fishes. *Australian Zoologist,* 8, 235-243.

Whitley, G. P. (1951) Studies in ichthyology. No. 15. *Records of the Australian Museum,* 22, 389-408.

Whitley, G. P. (1952) Two new scorpion fishes from Queensland. *Records of the Australian Museum,* 23, 25-28.

Whitley, G. P. (1955) Taxonomic notes on fishes. *Proceedings of the Royal Zoological Society of New South Wales,* 1953, 44-57.

Whitley, G. P. (1965) Illustrations and records of fishes. *Australian Zoologist,* 13, 103-120.

Williams, J. T. (1983) Synopsis of the pearlfish subfamily Pyramodontinae (Pisces: Carapidae). *Bulletin of Marine Science,* 33, 846-854.

Williams, J. T. (1984) Synopsis and phylogenetic analysis of the pearlfish subfamily Carapinae (Pisces: Carapidae). *Bulletin of Marine Science,* 34, 386-397.

Willink, P. W., Chernoff, B., Machado-Allison, A., Provenzano, F. & Petry, P. (2003) *Aphyocharax yekwanae*, a new species of bloodfin tetra (Teleostei: Characiformes:

Characidae) from the Guyana Shield of Venezuela. *Ichthyological Exploration of Freshwaters,* 14, 1-8.

Wilson, M. V. H. & Veilleux, P. (1982) Comparative osteology and relationships of the Umbridae (Pisces: Salmoniformes). *Zoological Journal of the Linnean Society,* 76, 321-352.

Winemiller, K. O. & Kelso-Winemiller, L. C. (1993) Description of a new *Neolebias* (Characiformes; Distichodontidae) from the Upper Zambezi Drainage of Zambia. *Copeia,* 1993, 112-116.

Winterbottom, R. (1980) A new genus and three new species of the family Congrogadidae (Pisces, Perciformes) from Natal, South Africa. *Annals of the South African Museum,* 83, 1-12.

Winterbottom, R. (1986) Revision and vicariance biogeography of the subfamily Congrogadinae (Pisces: Perciformes: Pseudochromidae). *Indo-Pacific Fishes,* 9, 1-34.

Winterbottom, R. (1989) A revision of the *Trimmatom nanus* species complex (Pisces, Gobiidae), with descriptions of three new species and redefinition of *Trimmatom*. *Canadian Journal of Zoology,* 67, 2403-2410.

Winterbottom, R. (1996) A new species of the congrogadin genus *Rusichthys* from Southern Oman (Perciformes; Pseudochromidae), with notes on its osteology. *Canadian Journal of Zoology,* 74, 581-584.

Winterbottom, R., Gill, A. C. & Buth, D. (2006) *Paraxenisthmus cerberusi*, a new species of Xenisthmid fish from Palau (Percomorpha: Gobioidei). *Copeia,* 2006, 10-13.

Wisner, R. L. (1971) Descriptions of eight new species of myctophid fishes from the Eastern Pacific Ocean. *Copeia,* 1971, 39-54.

Wongratana, T. (1983) Diagnoses of 24 new species and proposal of a new name for a species of Indo-Pacific clupeoid fishes. *Japanese Journal of Ichthyology,* 29, 385-407.

Wongratana, T. (1987) Two new species of anchovies of the genus *Stolephorus* (Engraulidae): with a key to species of *Engraulis*, *Encrasicholina*, and *Stolephorus*. *American Museum Novitates,* 2876, 1-8.

Woods, C. S. (1968) Variation and taxonomic changes in the family Retropinnidae (Salmonoidea). *New Zealand Journal of Marine and Freshwater Research,* 2, 398-425.

Wright, J. J. & Bailey, R. M. (2012) Systematic revision of the formerly monotypic genus *Tanganikallabes* (Siluriformes: Clariidae). *Zoological Journal of the Linnean Society,* 165, 121-142.

Wright, J. J. & Page, L. M. (2008) A new species of *Synodontis* (Siluriformes: Mochokidae) from Tributaries of the Kasai River in Northern Angola. *Copeia,* 2008, 294-300.

Xiaofan, Z. C. W. J. Z. (1987) Comparative study on the skeletal system of *Ophicephalus argus* Cantor and *Channa asiatica (*Linnaeus) (family Channidae). *Journal of Shandong University (Natural Science),* 1, 126-142.

Xu, L., Zhou, W., Thomson, A. W., Zhang, Q. & Yang, Y. (2007) A review of the genus *Pareuchiloglanis* (Sisoridae) from the Lancangjiang (upper Mekong River), with descriptions of two new species from Yunnan, China. *Zootaxa,* 1140, 1-19.

Yabe, M. (1983) A new cottoid fish of the family Ereuniidae, *Marukawichthys* pacificus, from the Central North Pacific. *Japanese Journal of Ichthyology,* 30, 18-26.

Yabe, M., Soma, A. & Amaoka, K. (2001) *Icelinus pietschi* sp. nov. and a rare species, *Sigmistes smithi*, from the southern Kuril Archipelago (Scorpaeniformes: Cottidae). *Ichthyological Research,* 48, 65-70.

Yabe, M. & Uyeno, T. (1996) Anatomical description of *Normanichthys crockeri* (Scorpaeniformes, *incertae sedis*: family Normanichthyidae). *Bulletin of Marine Science,* 58, 494-510.

Yagishita, N. & Nakabo, T. (2003) Evolutionary trend in feeding habits of *Girella* (Perciformes: Girellidae). *Ichthyological Research,* 50, 358-366.

Yamanaka, T., Imamura, H., Itoh, M. & Yabe, M. (2012) Synonymy of a rare stichaeid fish, *Eulophias tanneri* Smith 1902, and its redescription (Teleostei: Cottiformes). *Ichthyological Research,* 59, 365-372.

Yamanoue, Y., Johnson, G. & Starnes, W. (2009) Redescription of a poorly known acropomatid, *Verilus sordidus* Poey 1860, and comparison with *Neoscombrops atlanticus* Mochizuki and Sano 1984 (Teleostei: Perciformes). *Ichthyological Research,* 56, 400-406.

Yamanoue, Y. & Matsuura, K. (2003) Redescription of *Neoscombrops cynodon* (Regan, 1921), a senior synonym of *Neoscombrops annectens* Gilchrist, 1922 (Perciformes: Acropomatidae). *Ichthyological Research,* 50, 288-292.

Yamanoue, Y. & Matsuura, K. (2007) *Doederleinia gracilispinis* (Fowler, 1943), a junior synonym of *Doederleinia berycoides* (Hilgendorf, 1879), with review of the genus. *Ichthyological Research,* 54, 404-411.

Yamanoue, Y. & Toda, M. (2008) Redescription of *Acropoma lecorneti* Fourmanoir 1988 (Perciformes: Acropomatidae) with the first record from the North Pacific. *Ichthyological Research,* 55, 198-201.

Yamashita, T. & Kimura, S. (2001) A new species, *Gazza squamiventralis* , from the East Coast of Africa (Perciformes: Leiognathidae). *Ichthyological Research,* 48, 161-166.

Yarberry, E. L. (1965) Osteology of the zoarcid fish *Melanostigma pammelas*. *Copeia,* 1965, 442-462.

Yasuda, F., Mochizuki, K., Kawajiri, M. & Nose, Y. (1971) On the meristic and morphometric differences between *Scombrops boops* and *S. gilberti*. *Japanese Journal of Ichthyology,* 18, 118-124.

Yasuda, F. & Tominaga, Y. (1969) A new pomacanthine fish, *Holacanthus venustus,* from the Pacific coast of Japan, with notes on the young of *H. sexstriatus* and *H. septentrionalis*. *Japanese Journal of Ichthyology,* 16, 143-151.

Yatsu, A. & Nakamura, I. (1989) *Xenobrama microlepis*, a new genus and species of bramid fish, from subantarctic waters of the South Pacific. *Ichthyological Research,* 36, 190-195.

Yearsley, G. K. & Last, P. R. (1998) *Neocyttus psilorhynchus*, a new oreosomatid (Pisces, Zeiformes) from southern Australia and New Zealand, with redescriptions of its congeners. *New Zealand Journal of Marine and Freshwater Research,* 32, 555-579.

Yelnikov, D. V. & Khanaychenko, A. N. (2013) Morphological features of cephalic skeleton of the adult black sea turbot (Kalkan) *Scophthalmatus maximus* var. *maeotica* (Pleuronectiformes, Scophthalmidae). *Vestnik Zoologii,* 47, 42-51.

Yoshino, T., Kon, T. & Obake, S. (1999) Review of the genus *Limnichthys* (Perciformes: Creediidae) from Japan, with description of a new species. *Ichthyological Research,* 46, 73-83.

Yoshino, T. & Sata, T. (1981) Records of rare snapper, *Lipocheilus carnolabrum* (Chan), from the Ryukyu Islands. *Bulletin of the College of Science, University of the Ryukyus,* 31, 71-74.

Zahuranec, B. J. (2000) Zoogeography and systematics of the lanternfishes of the genus *Nannobrachium* (Myctophidae: Lampanyctini). *Smithsonian Contributions to Zoology,* 607, 1-69.

Zamba, A., Boeck, G., Mamonekene, V. & Vreven, E. (2007) Rehabilitation of *Bryconaethiops yseuxi* Boulenger, 1899 (Characiformes: Alestidae) from the Congo River basin, Africa. *Journal of Natural History,* 41, 1213-1226.

Zamba, A. I. & Vreven, E. (2008) *Rhabdalestes yokai* Characidormes: Alestidae), a new species from the Lefini and Sangha River Basins (Congo River Basin), Africa. *Ichthyological Exploration of Freshwaters,* 19, 377-384.

Zanata, A. M. & Primitivo, C. (2013) Natural history of *Copionodon pecten*, an endemic trichomycterid catfish from Chapada Diamantina in Northeastern Brazil. *Journal of Natural History*, 1-26.

Zanata, A. M. & Vari, R. P. (2005) The family Alestidae (Ostariophysi, Characiformes): a phylogenetic analysis of a trans-Atlantic clade. *Zoological Journal of the Linnean Society,* 145, 1-144.

Zarske, A. (1997) *Geryichthys sterbai* gen. et spec. nov. and *Microcharacidium geryi* spec. nov.: Beschreibung einer neuen Gattung und zweier neuer Arten von

Bodensalmlern aus dem Einzugsgebiet des Rio Ucayali in Peru (Teleostei: Ostariophysi: Characiformes: Characidiidae). *Zoologische Abhandlungen,* 49, 157-172.

Zarske, A. & Gery, J. (1997) Rediscovery of *Agoniates halecinus* Muller & Troschel, 1845, with a supplementary description of *Agoniates anchovia* Eigenmann,1914, and a definition of the genus (Teleostei: Ostaryiophysi: Characiformes: Characidae). *Zoologische Abhandlungen,* 49, 173-184.

Zawadzki, C. H., Pavanelli, C. S. & Langeani, F. (2008) *Neoplecostomus* (Teleostei: Loricariidae) fromt the Upper Rio Parana basin Braxil, with descriptions of three new species. *Zootaxa,* 1757, 31-48.

Zehren, S. J. (1987) Osteology and evolutionary relationships of the boarfish genus *Antigonia* (Teleostei: Caproidae). *Copeia,* 1987, 564-592.

Zhao, Y., Lan, J. & Zhang, C. (2004) A new species of amblycipitid catfish, *Xiurenbagrus gigas* (Teleostei: Siluriformes), from Guangxi, China. *Ichthyological Research,* 51, 228-232.

Zhou, W. (2007) A review of the cafish genus *Pseudexostoma* (Siluriformes: Sisoridae) with description of a new species from the Upper Salween (Nujiang) basin of China. *The Raffles Bulletin of Zoology,* 55, 147-155.

Zuanon, J. & Sazima, I. (2004) Natural history of *Stauroglanis gouldingi* (Siluriformes: Trichomycteridae), a miniature sand-dwelling candiru from central Amazonian streamlets. *Ichthyological Exploration of Freshwaters,* 15, 201-208.