

A Review of the Carangid Fishes (Family Carangidae) from Taiwan with Descriptions of Four New Records

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Pai-Lei Lin and Kwang-Tsao Shao (1999) A review of the carangid fishes (Family Carangidae) from Taiwan with descriptions of four new records. *Zoological Studies* 38(1): 33-68. This paper reports on 54 species belonging to 22 genera and 4 subfamilies of the family Carangidae collected from waters around Taiwan. The following 4 species are new records for Taiwan: *Carangoides gymnostethus*, *C. talamparoides*, *Caranx bucculentus*, and *Trachinotus anak*. Literature records of *Trachurus declivis* from Taiwan were based solely on misidentifications of *T. japonicus*. The following additional 8 carangids are valid species previously reported from Taiwan, but we have examined no museum specimens to confirm these records. To facilitate identification of these species, we include them in our keys but do not otherwise treat them here. They are *Carangoides bajad*, *C. plagiotaenia*, *Decapterus muroadsi*, *Alepes melanoptera*, "*A.*" *kleinii*, *Selar boops*, *Seriola quinqueradiatas*, and *S. lalandi*. Although we have examined fish market specimens of *Carangoides humerosus* and *Ulva aurochs*, they were probably caught from some far-sea fishing port and not in waters around Taiwan. Therefore we provisionally exclude them from our final list. Previous literature records of carangids based on misidentifications or improper use of junior synonyms are corrected in the paper. Keys, diagnoses, remarks, and color photographs of each species are given in this paper.

Key words: Carangid fishes, Scads, Jacks, Fish fauna, Taiwan.

The carangid fishes, also called jacks, trevallies, scads, or amberjacks, etc., are widely distributed in all tropical and subtropical seas. They are among the most economically important coastal pelagic fishes of the world. According to Laroche et al. (1984), this family contains about 30 genera and 140 species worldwide.

In one of the earliest reports on carangids from Taiwan, Jordan and Evermann (1902) recognized 12 species and 6 genera. But most of these species were synonyms. Jordan and Snyder (1908) reported another 3 invalid new species and 1 valid new genus. Subsequently, Jordan and Richardson (1909) listed 24 species and 9 genera based on collections made by Dr. Hans Sauter; Fowler and Bean (1922) reviewed the Carangidae of Taiwan and recognized a total of 27 species and 10 genera. However, the 1st actual revision of carangids of Taiwan was made by Oshima (1923),

with 38 species and 17 genera. Wakiya (1924) reported 74 species from Japan and Formosa, which were allocated to 9 subgenera and 14 genera under 4 subfamilies. Gushiken (1983) reviewed the 2 previous reports, correcting many synonyms and misidentifications. His paper is a very important reference on the taxonomic history of the carangids. Two Taiwanese taxonomists reported slightly different numbers of carangids from the region: Shen (1984) listed 20 genera and 60 species; Chen and Yu (1986) listed 23 genera and 58 species, belonging to 4 subfamilies. In the recent synopsis of Shen et al. (1993) a total of 21 genera and 48 species of carangids were listed, most of them compiled directly from the early literature. Thus, problems of improper use of junior synonyms, misidentifications, or lack of specimens still remain. Table 1 summarizes the taxonomic history and corrects the identifications of carangid

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Table 1. Taxonomic history of all species of carangid fishes in Taiwan with the corrections of some species names which were used mistakenly in several major taxonomic literature from Taiwan. Species names in parentheses are valid and are used in the present study

Species name	Chinese name	Oshima 1925	Shen 1984	Chen and Yu 1986	Shen et al. 1993	Other publications
◆ <i>Alectis ciliaris</i>	絲鯆	+	+	+	+	+Jordan and Evermann 1902
<i>Alectis gallus</i>	白鬚鯆	* (<i>A. indica</i>)				
◆ <i>Alectis indica</i>	印度絲鯆		+			
<i>Alectis indicus</i>	印度絲鯆			* (<i>A. indica</i>)	* (<i>A. indica</i>)	
<i>Alectis major</i>	大鬚鯆	* (<i>A. indica</i>)				*Jordan and Richardson 1909
◆ <i>Alepes djedaba</i>	吉打鯆			+	+	
<i>Alepes helvolus</i>	沖鯆	* (<i>Uraspis usaspis</i>)				
<i>Alepes melanopterus</i>	黑鰭鯆			- (<i>A. melanoptera</i>)		
<i>Alepes para</i>	麗葉鯆			- ("A." <i>kleinii</i>)	#	
◆ <i>Alepes vari</i>	大尾鯆			+	* (<i>A. djedaba</i>)	
<i>Apolectus niger</i>	烏鯧		* (<i>Parastromatus niger</i>)			
<i>Atropus atropus</i>	溝鯆		* (<i>A. atropus</i>)	*	*	
◆ <i>Atropus atropus</i>	溝鯆					*Jordan and Richardson 1909
<i>Atule djeddaba</i>	吉打鯆		* (<i>Alepes djedaba</i>)			
◆ <i>Atule mate</i>	游鱗葉鯆		+	+	+	
<i>Atule melanopterus</i>	黑鰭鯆		-* (<i>Alepes melanoptera</i>)			
<i>Atule miyakamii</i>	宮上氏鯆		-* (" <i>Alepes</i> " <i>kleinii</i>)			
<i>Carangichthys dinema</i>	曳絲平鯆			* (<i>Carangoides dinema</i>)		
<i>Carangichthys oblongus</i>	長鎧鯆			* (<i>Carangoides oblongus</i>)		
<i>Carangoides aramta</i>	鎧鯆		* (<i>C. armatus</i>)			
◆ <i>Carangoides armatus</i>	甲若鯆			+	+	
<i>Carangoides bajad</i>	金點平鯆			-		
◆ <i>Carangoides caeruleopinnatus</i>	青羽若鯆			+	+	
◆ <i>Carangoides chrysophrys</i>	長吻若鯆		+	+	+	
<i>Carangoides coeruleopinnatus</i>	青羽鯆		* (<i>C. caeruleopinnatus</i>)			
◆ <i>Carangoides dinema</i>	雙線若鯆				+	
◆ <i>Carangoides equula</i>	高體若鯆	+	+		+	
◆ <i>Carangoides ferdau</i>	平線若鯆		+		+	
◆ <i>Carangoides fulvoguttatus</i>	星點若鯆			+		
n◆ <i>Carangoides gymnostethus</i>	裸胸若鯆					
◆ <i>Carangoides hedlandensis</i>	海德蘭若鯆			+	+	
<i>Carangoides hemigymnostethus</i>	半裸胸鯆	* (<i>C. orthogrammus</i>)				
△ <i>Carangoides humerosus</i>	肩斑若鯆					
◆ <i>Carangoides malabaricus</i>	馬拉巴若鯆	* (<i>C. caeruleopinnatus</i>)	* (<i>C. caeruleopinnatus</i>)	+	+	
◆ <i>Carangoides oblongus</i>	長圓若鯆		+		+	
◆ <i>Carangoides orthogrammus</i>	直線若鯆			+	+	
<i>Carangoides plagiotaenia</i>	橫紋平鯆		-	-	* (<i>C. equula</i>)	
<i>Carangoides schlegeli</i>	薛氏鎧鯆		* (<i>C. armatus</i>)			

Species name	Chinese name	Oshima 1925	Shen 1984	Chen and Yu 1986	Shen et al. 1993	Other publications
n◆ <i>Carangoides talamparoides</i>	白舌若鯮					
<i>Carangus armatus</i>	鰺鯮					* (<i>Carangoides armatus</i>) Jordan and Evermann 1902
<i>Carangus jarra</i>	傑拉鯮					* (<i>Caranx papuensis</i>) Jordan and Evermann 1902
<i>Carangus leptolepis</i>	木葉鯮					* (<i>Selaroides leptolepis</i>) Jordan and Evermann 1902
<i>Carangus malabaricus</i>	馬拉巴鯮					* (<i>Carangoides malabaricus</i>) Jordan and Evermann 1902
◆ <i>Carangus sexfasciatus</i>	六帶鯮					* (<i>Caranx sexfasciatus</i>) Jordan and Evermann 1902
<i>Carangus</i> sp.	鯮					? Jordan and Evermann 1902
<i>Caranx affinis</i>	瘦平鯮					* (<i>Atule mate</i>) Jordan and Richardson 1909
n◆ <i>Caranx bucculentus</i>	藍點鯮		※ (<i>C. ignobilis</i>)			
<i>Caranx carangus</i>	金輝鯮		?			
<i>Caranx cynodon</i>	犬齒鯮	* (<i>C. tille</i>)	*			
<i>Caranx djeddaba</i>	吉打鯮					* (<i>Alepes djedaba</i>) Jordan and Richardson 1909
<i>Caranx formosanus</i>	台灣鯮	* (<i>C. papuensis</i>)				* (<i>Carangoides caeruleopinnatus</i>) Jordan and Snyder 1908 ; Jordan and Richardson 1909
<i>Caranx forsteri</i>	福氏鯮	* (<i>C. sexfasciatus</i>)				
◆ <i>Caranx ignobilis</i>	浪人鯮		+	+	+	Jordan and Evermann 1902
<i>Caranx ishikawai</i>	石川氏鯮		* (<i>C. lugubris</i>)			
<i>Caranx jarra</i>	傑拉鯮	* (<i>C. papuensis</i>)				* Jordan and Evermann 1902
<i>Caranx hippos</i>	馬鯮	* (<i>C. ignobilis</i>)				
<i>Caranx leptolepis</i>	木葉鯮					* (<i>Selaroides leptolepis</i>) Jordan and Richardson 1909
<i>Caranx lessonii</i>	來生氏鯮		* (<i>C. sexfasciatus</i>)			
◆ <i>Caranx lugubris</i>	闊步鯮			+	+	
<i>Caranx malabaricus</i>	馬拉巴鯮					* (<i>Carangoides malabaricus</i>) Jordan and Richardson 1909
◆ <i>Caranx melampygus</i>	藍鰭鯮		+	+	+	
<i>Caranx oshimai</i>	大島氏鯮		* (<i>C. sexfasciatus</i>)			
◆ <i>Caranx papuensis</i>	巴布亞鯮			+	+	
<i>Caranx plumbeus</i>	鉛灰鯮					* (<i>Carangoides hedlandensis</i>) Jordan and Richardson 1909
<i>Caranx rastrosus</i>	縱條鯮					* (<i>Carangoides armatus</i>) Jordan and Snyder 1908 ; Jordan and Richardson 1909

Species name	Chinese name	Oshima 1925	Shen 1984	Chen and Yu 1986	Shen et al. 1993	Other publications
<i>Caranx sansun</i>	瘦浪人鯮		* (<i>C. papuensis</i>)			
◆ <i>Caranx sexfasciatus</i>	六帶鯮		+	+	+	+
<i>Caranx speciosus</i>	無齒鯮					* (<i>Gnathanodon speciosus</i>) Jordan and Richardson 1909
◆ <i>Caranx tille</i>	泰利鯮			+	+	
<i>Citula armata</i>	甲裸胸鯮	* (<i>Carangoides armata</i>)				
<i>Citula psecadorensis</i>	澎湖裸胸鯮	* (<i>Carangoides hedlandensis</i>)				
<i>Citula rastrosus</i>	縱條裸胸鯮	* (<i>Carangoides armata</i>)				
<i>Decapterus akaadsi</i>	紅扁鯮			* (<i>D. kurroides</i>)		
<i>Decapterus dayi</i>	台氏鯮		* (<i>D. russelli</i>)			
<i>Decapterus kurra</i>	紅爪鯮	* (<i>D. russelli</i>)				
◆ <i>Decapterus kurroides</i>	紅尾圓鯮	+	+		+	
<i>Decapterus lajang</i>	拉強鯮		* (<i>D. macrosoma</i>)			
◆ <i>Decapterus macarellus</i>	領圓鯮			+	+	
◆ <i>Decapterus macrosoma</i>	長體圓鯮	* (<i>D. macraellus</i>)	※ (<i>D. macarellus</i>)	+	+	+ Jordan and Evermann 1902
◆ <i>Decapterus maruadsi</i>	藍圓鯮	+	+	+	+	
<i>Decapterus muroadsi</i>	紅帶鯮	?	-	-	-	? Jordan and Evermann 1902 ; Jordan and Snyder 1908
<i>Decapterus russellii</i>	紅爪鯮		※ (<i>D. tabl</i>)			
◆ <i>Decapterus russelli</i>	羅氏圓鯮			+	+	
◆ <i>Decapterus tabl</i>	泰勃圓鯮			+	+	
◆ <i>Elagatis bipinnulata</i>	雙帶鯮	+	+		+	
◆ <i>Gnathanodon speciosus</i>	無齒鯮	+	+		+	
<i>Kaiwarinus equula</i>	平鯮			* (<i>Carangoides eguula</i>)		
<i>Leptaspis leptolepis</i>	木葉鯮	* (<i>Selaroides leptolepis</i>)				
<i>Longirostrum delicatissimus</i>	條紋鯮		* (<i>Pseudocaranx dentex</i>)			
<i>Longirostrum mertensii</i>	梅頓氏鯮		* (<i>Pseudocaranx dentex</i>)			
◆ <i>Megalaspis cordyla</i>	大甲鯮	+	+	+	+	+ Jordan and Evermann 1902 ; Jordan and Snyder 1908
◆ <i>Naucrates ductor</i>	黑帶鯮		+	+	+	
◆ <i>Parastromateus niger</i>	烏鯧				+	
◆ <i>Pseudocaranx dentex</i>	縱帶鯮			+	+	
◆ <i>Scomberoides commersonianus</i>	大口逆鈎鯮			+	+	
<i>Scomberoides formosanus</i>	台灣逆鈎鯮	* (<i>S. lysan</i>)				
◆ <i>Scomberoides lysan</i>	逆鈎鯮		+	+		
<i>Scomberoides orientalis</i>	逆鈎鯮		* (<i>S. lysan</i>)			* Jordan and Evermann 1902
<i>Scomberoides santipetri</i>	聖彼得逆鈎鯮	* (<i>S. tol</i>)	*			* Jordan and Richardson 1909
◆ <i>Scomberoides tol</i>	托爾逆鈎鯮	+	+	+	+	* (<i>S. lysan</i>) Jordan and Richardson 1909
<i>Scomberoides tolooparah</i>	南方逆鈎鯮		* (<i>S. lysan</i>)			
<i>Selar affinis</i>	瘦平鯮	* (<i>Atule mate</i>)				

Species name	Chinese name	Oshima 1925	Shen 1984	Chen and Yu 1986	Shen et al. 1993	Other publications
<i>Selar boops</i>	牛眼鱈			-		
◆ <i>Selar crumenophthalmus</i>	脂眼凹肩鱈		+	+	+	
<i>Selar djeddaba</i>	吉打鱈	* (<i>Alepes djeddaba</i>)				
<i>Selar ignobilis</i>	浪人鱈	* (<i>Caranx ignobilis</i>)				
<i>Selar sexfasciatus</i>	六帶鱈	* (<i>Caranx sexfasciatus</i>)				
◆ <i>Selariodes leptolepis</i>	金帶細鱈		+	+	+	
<i>Seriola aureovittata</i>	金邊鱈		? (<i>S. lalandi</i>)			
<i>Seriola bonariensis</i>	黃尾鱈		* (<i>S. rivolana</i>)			
◆ <i>Seriola dumerili</i>	紅甘鱈		+	+	+	
<i>Seriola lalandi</i>	金帶鱈			-		
<i>Seriola purpurascens</i>	紅甘鱈	* (<i>S. dumerili</i>)				
<i>Seriola quinqueradiata</i>	青甘鱈		-	-		
◆ <i>Seriola rivolana</i>	黃尾鱈			+		
◆ <i>Seriolina nigrofasciatus</i>	小甘鱈		+	+	+	
n◆ <i>Trachinotus anak</i>	鯧鱈					
◆ <i>Trachinotus baillonii</i>	小斑鯧鱈	+	+	+	+	+Jordan and Richardson 1909
◆ <i>Trachinotus blochii</i>	布氏鯧鱈			+	+	
<i>Trachinotus botla</i>	大斑鯧鱈		* (<i>T. baillonii</i>)			
<i>Trachinotus ovatus</i>	黃臘鱈	* (<i>T. blochii</i>)	*			*Jordan and Richardson 1909
<i>Trachinotus russelli</i>	羅氏黃臘鱈	* (<i>T. baillonii</i>)		*		*Jordan and Richardson 1909
<i>Trachurops crumenophthalmus</i>	脂眼鱈	* (<i>Selar crumenophthalmus</i>)				*Jordan and Richardson 1909
<i>Trachurops torva</i>	脂眼鱈					* (<i>Selar crumenophthalmus</i>) Jordan and Evermann 1902
<i>Trachurus argenteus</i>	銀鱈		* (<i>T. japonicus</i>)			
<i>Trachurus declivis</i>	綠真鱈		※ (<i>T. japonicus</i>)	※		
◆ <i>Trachurus japonicus</i>	真鱈		+	+	+	
<i>Trachurus trachurus</i>	真鱈	※ (<i>T. japonicus</i>)				
△ <i>Ulua aurochs</i>	黑冠羽鰷鱈					
<i>Ulua mandibularis</i>	烏魯鱈		* (<i>U. mentalis</i>)			
◆ <i>Ulua mentalis</i>	羽鰷鱈			+	+	
<i>Ulua richardsoni</i>	理查生氏鱈	* (<i>Ulua mentalis</i>)				*Jordan and Snyder 1908 ; Jordan and Richardson 1909
◆ <i>Uraspis helvola</i>	白舌尾甲鱈		+	+	+	
◆ <i>Uraspis uraspis</i>	白口尾甲鱈			+	+	

◆: the present writers.

+ : species name valid. ※ : misidentified. ? : doubtful species.

△ : possible new record species but we finally exclude from our list, see discussion in abstract.

- : without specimens or locality.

: specimen lost. * : synonym. n : new record in the present work.

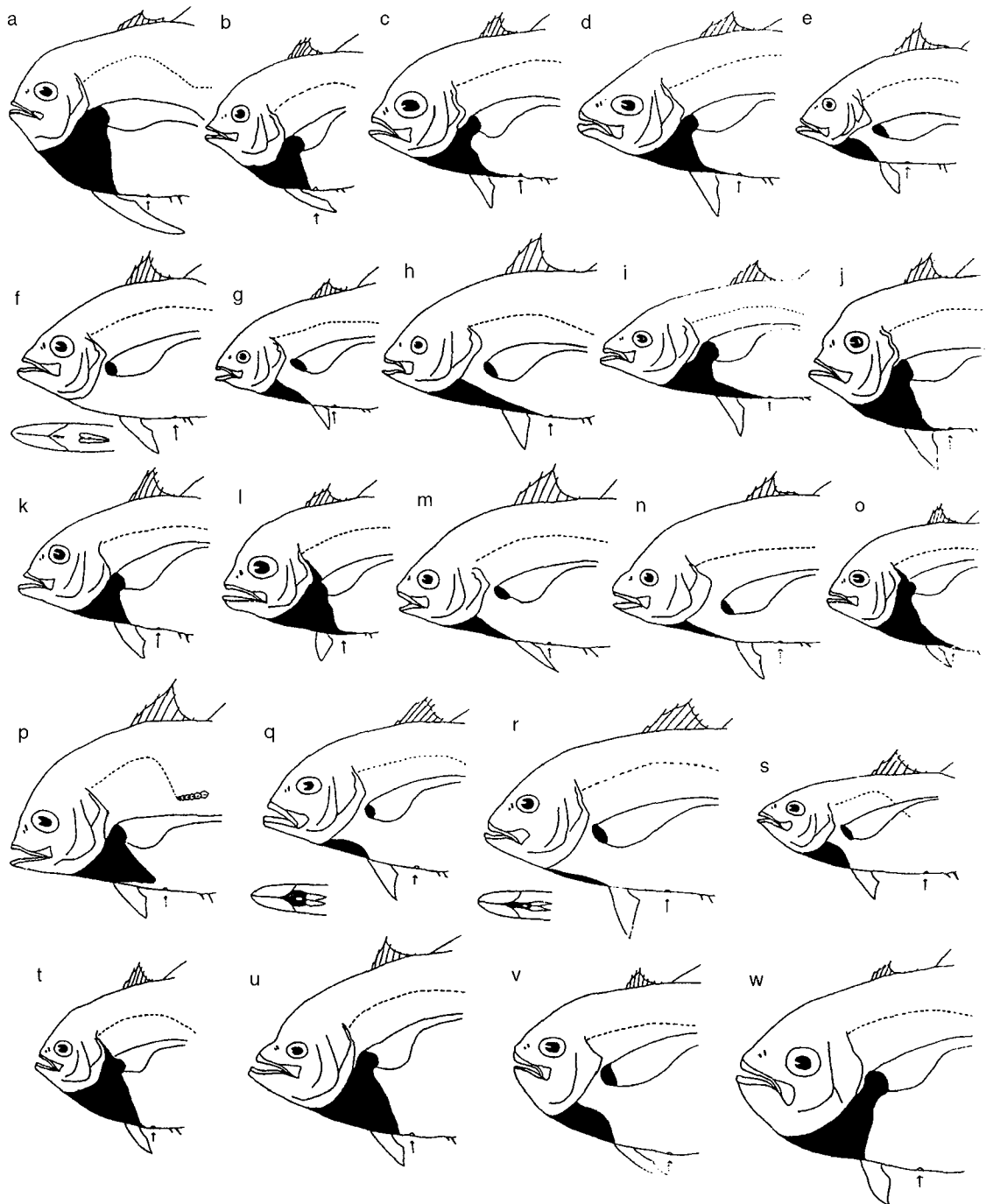


Fig. 1. Extent of naked area of breast in 23 species of Carangidae.

a: *Atopus atopos*, 221 mm FL;

c: *Carangoides caeruleopinnatus*, 200 mm FL;

e: *Carangoides dinema*, 172 mm FL;

g: *Carangoides ferdau*, 177 mm FL;

i: *Carangoides gymnosterbus*, 332 mm FL;

k: *Carangoides humerosus*, 219 mm FL;

m: *Carangoides oblongus*, 205 mm FL;

o: *Carangoides talamparoides*, 162 mm FL;

q: *Caranx ignobilis*, 221 mm FL;

s: *Megalaspis cordyla*, 236 mm FL;

u: *Ulua mentalis*, 229 mm FL;

w: *Uraspis uraspis*, 292 mm FL;

b: *Carangoides armatus*, 102 mm FL;

d: *Carangoides chrysophrys*, 206 mm FL;

f: *Carangoides equula*, 209 mm FL;

h: *Carangoides fulvoguttatus*, 250 mm FL;

j: *Carangoides hedlandensis*, 184 mm FL;

l: *Carangoides malabaricus*, 249 mm FL;

n: *Carangoides orthogrammus*, 249 mm FL;

p: *Caranx bucculentus*, 252 mm FL;

r: *Caranx papuensis*, 286 mm FL;

t: *Ulua aurochs*, 176 mm FL;

v: *Uraspis helvola*, 233 mm FL;

names used in several local publications.

In the present work, we record a total number of 54 species, 22 genera, and 4 carangid subfamilies from Taiwan. Included are 4 species (*Carangoides gymnostethus*, *C. talamparoides*, *Caranx bucculentus*, and *Trachinotus anak*) not previously reported from Taiwan. Another 2 possible new record species of *Carangoides humerosus* and *Ulua aurochs*, although their specimens were obtained from bottom trawler fishery harvest, were not included in the Taiwanese fish list because they were collected from far-sea fishing ports and could have been caught in the South China Sea or North Indian Ocean.

MATERIALS AND METHODS

Specimens were mostly collected by gill net, set net, rodnet, bottom trawling, long-lining, and hand-lining from waters around Taiwan; several specimens were collected while scuba diving. A few specimens were collected by impingement at the 1st nuclear power plant at Ginshan, northern coast of Taiwan.

Specimens were photographed when fresh, and then preserved in 10% formalin for further observations. Following Smith-Vaniz and Staiger (1973) and Gushiken (1983), fork length (FL) was used as the standard measure of body length. Gill rakers were counted on both the upper and lower limbs of the 1st left gill arch; rudimentary rakers were included in all counts. Curved lateral line scales (CLS) were counted on a chord of the arch extending from the upper edge of the opercle to its junction with the straight part; straight lateral line scales (SLS) were counted on the straight part from its junction with the curved part to its termination on the caudal fin base. All of our

specimens are deposited at the Institute of Zoology, Academia Sinica (ASIZP) or in the National Museum of Marine Science and Technology (NMSMP).

Additional carangid specimens examined during the present study are deposited in the Museum of the Department of Zoology, National Taiwan University (NTUM), the Museum of the Department of Biology, Tunghai University (THUP), the Department of Marine Biology, National Sun Yat-sen University (NSYSU), the Taiwan Fisheries Research Institute, Taitung Branch (TFRIT), and Field Museum of Natural History, Chicago (FMNH).

Family Carangidae

Key to subfamilies of Carangidae in waters around Taiwan

- 1a. Lateral line armed with weak to strong scutes; pectoral fin of adults usually longer than head and falcate *Caranginae*
- 1b. Lateral line not armed with scutes; pectoral fin shorter than head and not falcate 2
- 2a. Adults with a cutaneous keel on caudal peduncle; caudal peduncle with dorsal and ventral grooves; anal-fin base much shorter than 2nd dorsal-fin base *Naucratinae*
- 2b. No cutaneous keel on caudal peduncle in any stage; no caudal peduncle grooves; anal-fin base subequal in length to 2nd dorsal-fin base 3
- 3a. Premaxilla not protractile; anterior rays of 2nd dorsal and anal fins not falcate; posterior rays of dorsal and anal fins consisting of semidetached finlets *Scomberoidinae*
- 3b. Premaxilla protractile; anterior rays of 2nd dorsal and anal fins strongly falcate; posterior rays of dorsal and anal fins not consisting of semidetached finlets *Trachinotinae*

Subfamily Caranginae

This subfamily includes a total of 20 genera (Laroche et al. 1984), 16 of which occur in Taiwan.

Key to genera of the subfamily Caranginae in waters around Taiwan

- 1a. Pelvic fin, if present, positioned distinctly anterior to a



Fig. 2. *Alectis ciliaris*, yg., 123 mm FL.

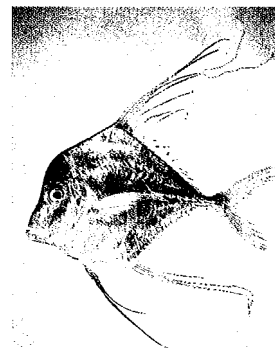


Fig. 3. *Alectis indica*, yg., 155 mm FL.

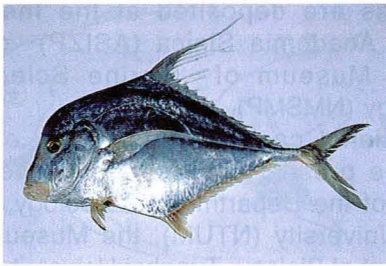


Fig. 4. *Alectis indica*, yg-ad., 423 mm FL.

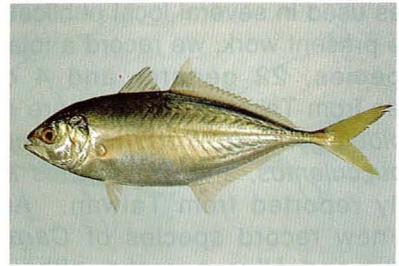


Fig. 5. *Alepes djedaba*, 248 mm FL.

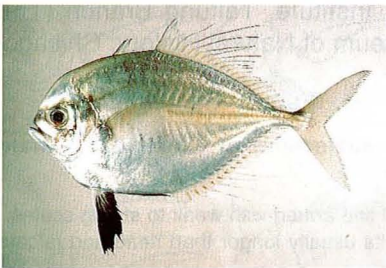


Fig. 6. *Atropus atropus*, ♂, 221 mm FL.



Fig. 7. *Atropus atropus*, ♀, 163 mm FL.

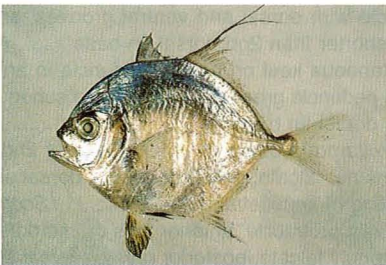


Fig. 8. *Carangoides armatus*, yg., 55 mm FL.

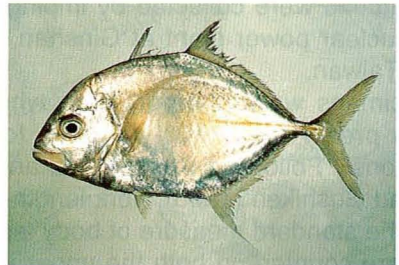


Fig. 9. *Carangoides caeruleopinnatus*, yg-ad., 170 mm FL.

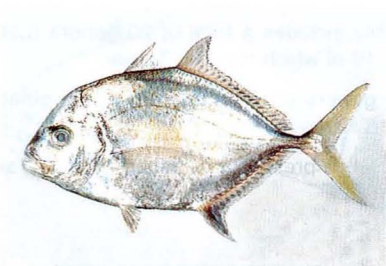


Fig. 10. *Carangoides caeruleopinnatus*, ad., 313 mm FL.

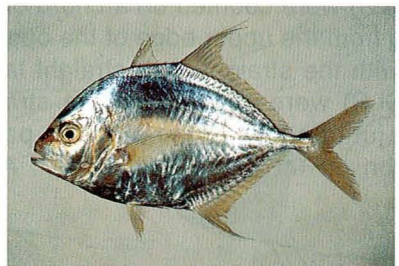


Fig. 11. *Carangoides chrysophrys*, yg., 144 mm FL.

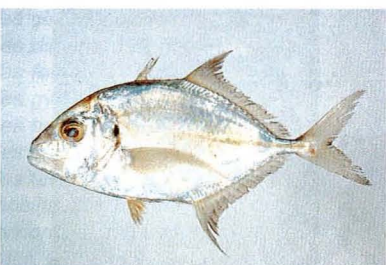


Fig. 12. *Carangoides chrysophrys*, yg-ad., 201 mm FL.

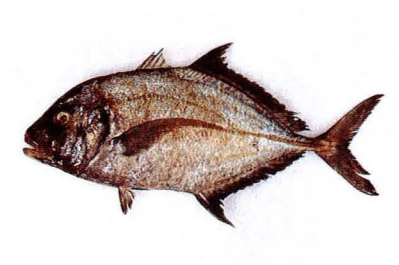


Fig. 13. *Carangoides chrysophrys*, ad., 410 mm FL.



Fig. 14. *Carangoides dinema*, yg-ad., 173 mm FL.

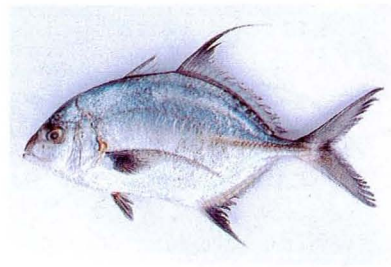


Fig. 15. *Carangoides dinema*, ad., 300 mm FL.

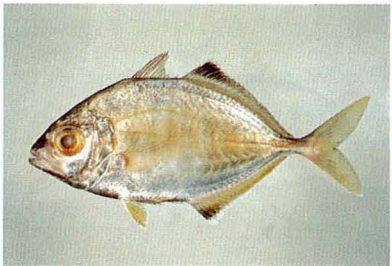


Fig. 16. *Carangoides equula*, 209 mm FL.

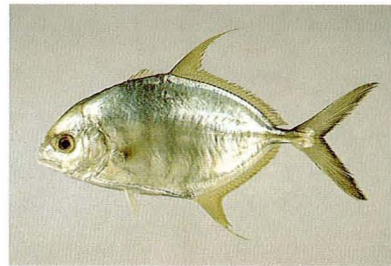


Fig. 17. *Carangoides ferdau*, 177 mm FL.

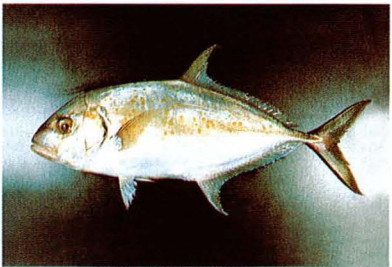


Fig. 18. *Carangoides fulvoguttatus*, 390 mm FL.

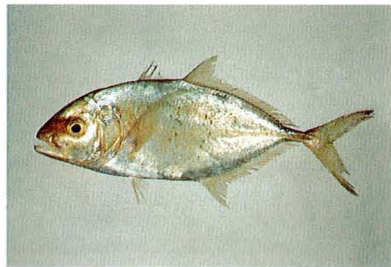


Fig. 19. *Carangoides gymnostethus*, 250 mm FL.

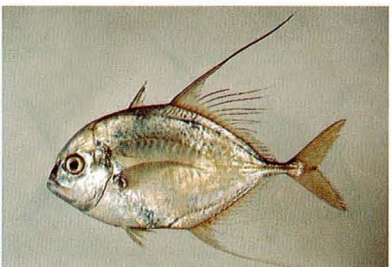


Fig. 20. *Carangoides hedlandensis*, ♂, 294 mm FL.

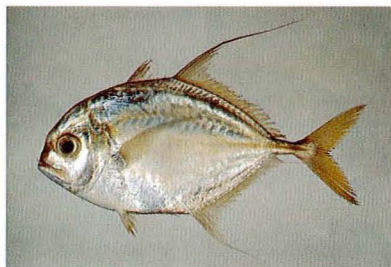


Fig. 21. *Carangoides hedlandensis*, ♀, 192 mm FL.



Fig. 22. *Carangoides humerosus*, 260 mm FL.

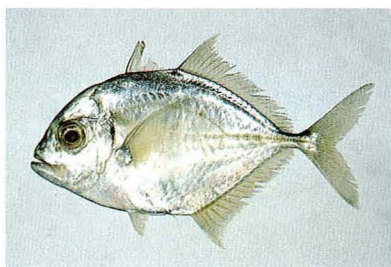


Fig. 23. *Carangoides malabaricus*, 169 mm FL.

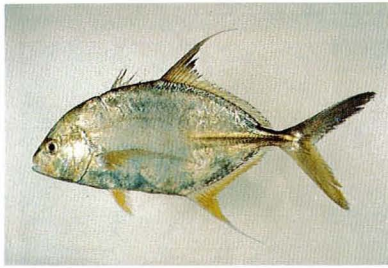


Fig. 24. *Carangoides oblongus*, 205 mm FL.

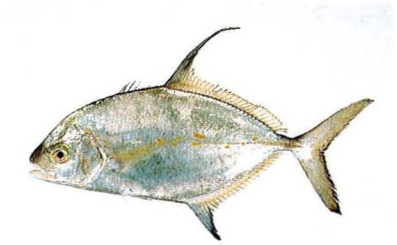


Fig. 25. *Carangoides orthogrammus*, 249 mm FL.

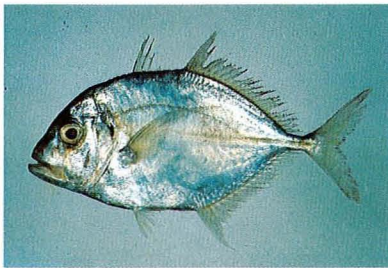


Fig. 26. *Carangoides talamparoides*, 162 mm FL.

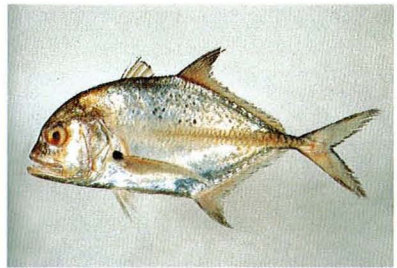


Fig. 27. *Caranx bucculentus*, yg-ad., 250 mm FL.

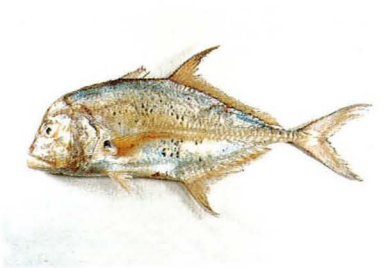


Fig. 28. *Caranx bucculentus*, ad., 452 mm FL.

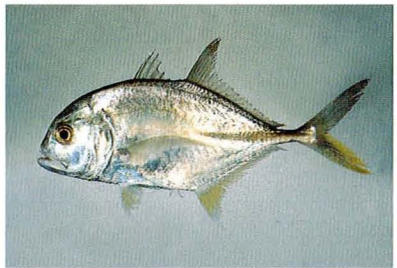


Fig. 29. *Caranx ignobilis*, yg., 196 mm FL.



Fig. 30. *Caranx ignobilis*, yg-ad., 369 mm FL.

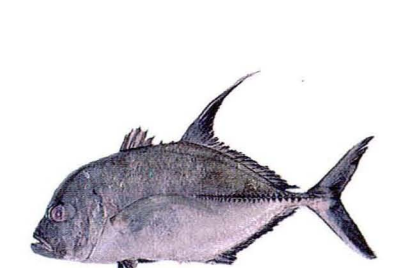


Fig. 31. *Caranx lugubris*, 338 mm FL.

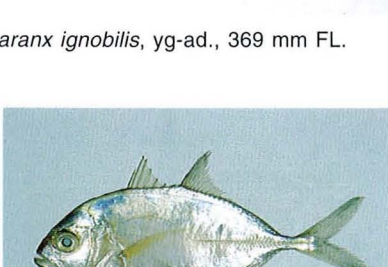


Fig. 32. *Caranx melampygus*, yg., 38 mm FL.

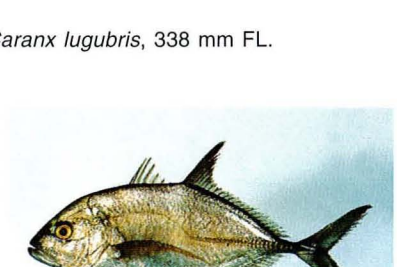


Fig. 33. *Caranx melampygus*, yg-ad., 211 mm FL.

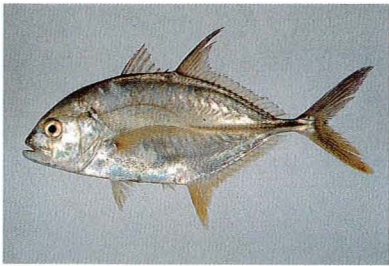


Fig. 34. *Caranx papuensis*, yg-ad., 186 mm FL.

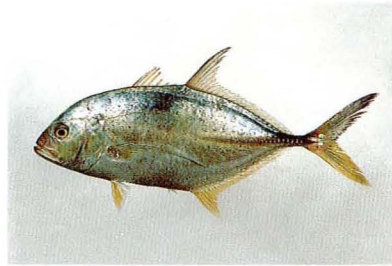


Fig. 35. *Caranx papuensis*, yg-ad., 288 mm FL.

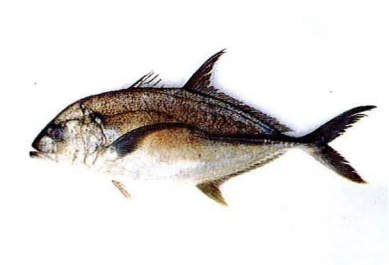


Fig. 36. *Caranx papuensis*, ad., 426 mm FL.



Fig. 37. *Caranx sexfasciatus*, yg., 43 mm FL.



Fig. 38. *Caranx sexfasciatus*, yg-ad., 199 mm FL.

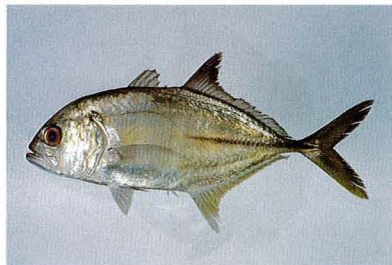


Fig. 39. *Caranx sexfasciatus*, yg-ad., 256 mm FL.

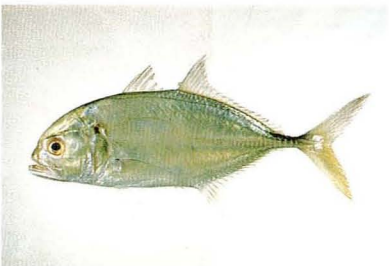


Fig. 40. *Caranx tille*, yg-ad., 221 mm FL.



Fig. 41. *Decapterus kurroides*, 312 mm FL.



Fig. 42. *Decapterus macarellus*, 315 mm FL.

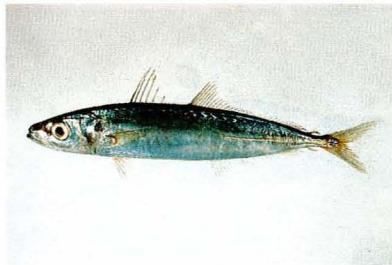


Fig. 43. *Decapterus macrosoma*, 231 mm FL.

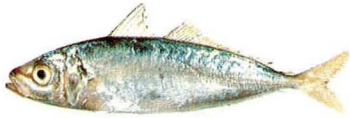


Fig. 44. *Decapterus maruadsi*, 109 mm FL.

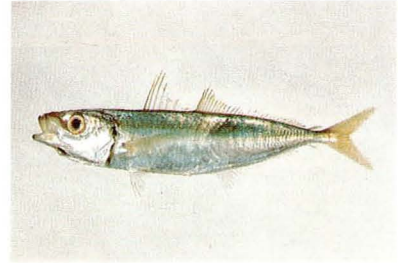


Fig. 45. *Decapterus russelli*, 173 mm FL.



Fig. 46. *Gnathanodon speciosus*, 383 mm FL.



Fig. 47. *Megalaspis cordyla*, 343 mm FL.



Fig. 48. *Parastromateus niger*, yg., 92 mm FL.

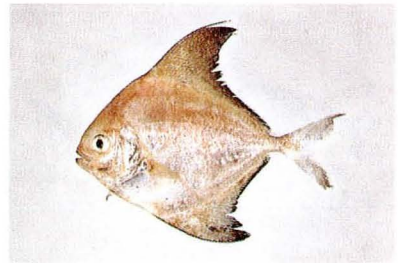


Fig. 49. *Parastromateus niger*, yg-ad., 126 mm FL.

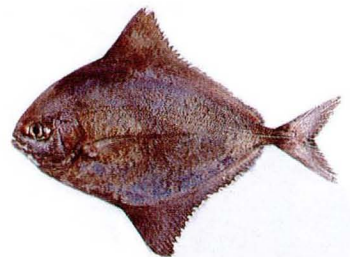


Fig. 50. *Parastromateus niger*, ad., 285 mm FL.

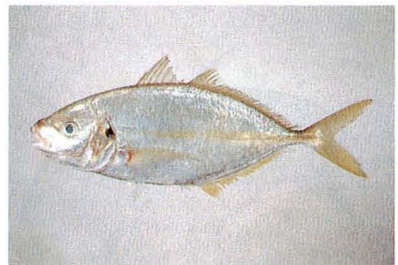


Fig. 51. *Pseudocaranx dentex*, 246 mm FL.



Fig. 52. *Selar crumenophthalmus*, 212 mm FL.

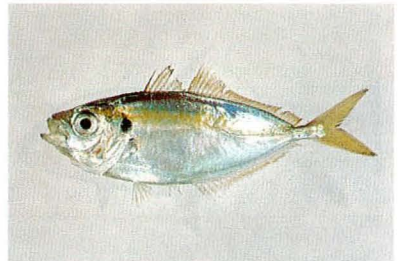


Fig. 53. *Selariodes leptolepis*, 84 mm FL.

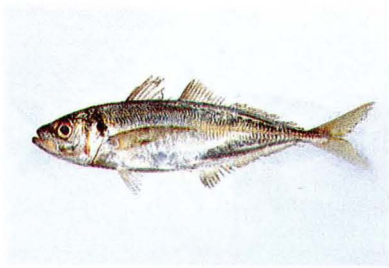


Fig. 54. *Trachurus japonicus*, 265 mm FL.

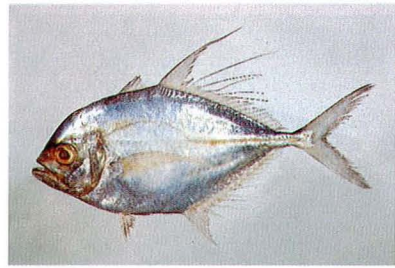


Fig. 55. *Ulua aurochs*, ♂, 226 mm FL.

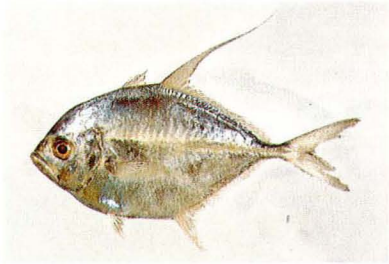


Fig. 56. *Ulua aurochs*, ♀, 196 mm FL.

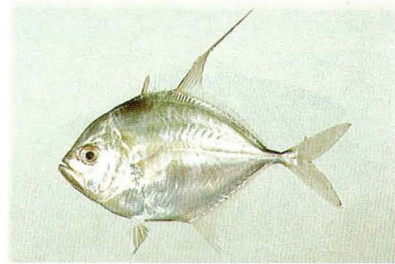


Fig. 57. *Ulua mentalis*, yg., 124 mm FL.

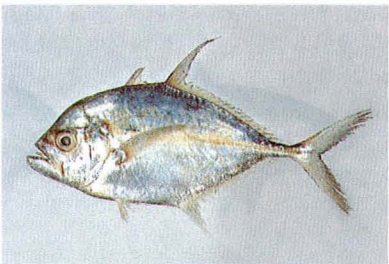


Fig. 58. *Ulua mentalis*, ad., 268 mm FL.

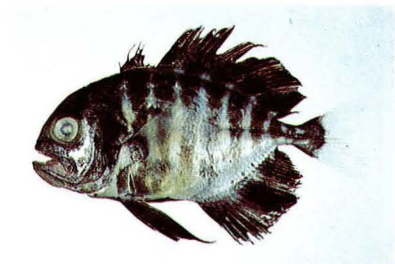


Fig. 59. *Uraspis helvola*, yg., 82 mm FL.

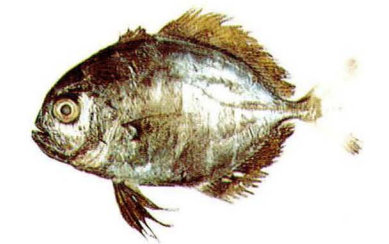


Fig. 60. *Uraspis helvola*, yg-ad., 115 mm FL.

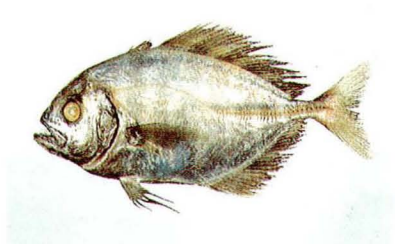


Fig. 61. *Uraspis helvola*, ad., 193 mm FL.



Fig. 62. *Uraspis uraspis*, 269 mm FL.



Fig. 63. *Elagatis bipinnulata*, yg., 186 mm FL.



Fig. 64. *Elagatis bipinnulata*, ad., 442 mm FL.

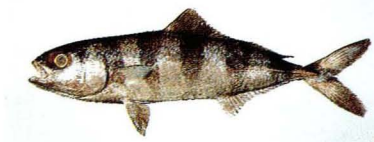


Fig. 65. *Naucrates ductor*, 237 mm FL.

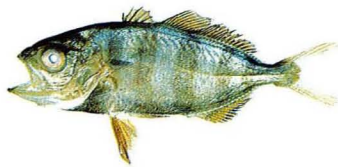


Fig. 66. *Seriola dumerili*, yg., 48 mm FL.

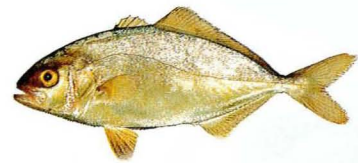


Fig. 67. *Seriola dumerili*, yg-ad., 142 mm FL.

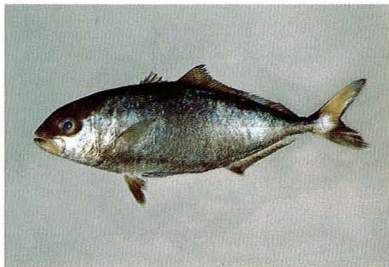


Fig. 68. *Seriola dumerili*, ad., 299 mm FL.



Fig. 69. *Seriola dumerili*, ad., 376 mm FL.

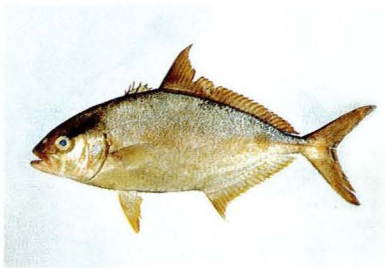


Fig. 70. *Seriola rivoliana*, yg-ad., 285 mm FL.



Fig. 71. *Seriolina nigrofasciata*, juv., 21 mm FL.



Fig. 72. *Seriolina nigrofasciata*, yg-ad., 265 mm FL.

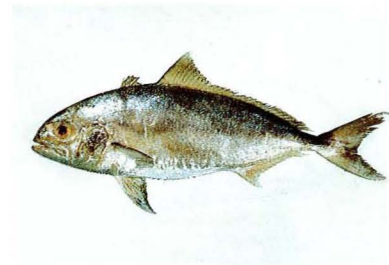


Fig. 73. *Seriolina nigrofasciata*, ad., 311 mm FL.

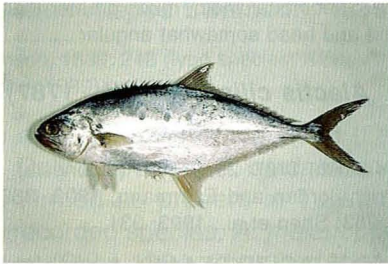


Fig. 74. *Scomberoides commersonianus*, 317 mm FL.

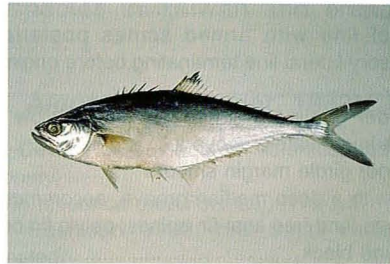


Fig. 75. *Scomberoides lysan*, yg., 184 mm FL.

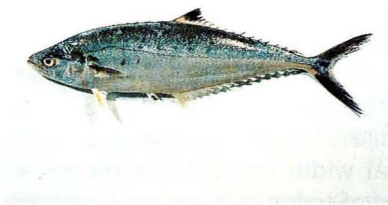


Fig. 76. *Scomberoides lysan*, ad., 431 mm FL.

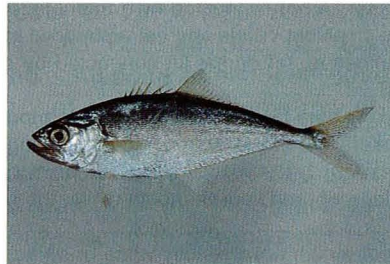


Fig. 77. *Scomberoides tol*, yg., 158 mm FL.

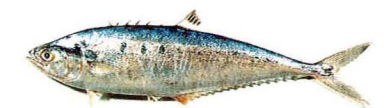


Fig. 78. *Scomberoides tol*, ad., 300 mm FL.

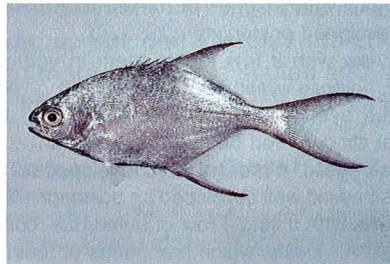


Fig. 79. *Trachinotus baillonii*, yg., 116 mm FL.

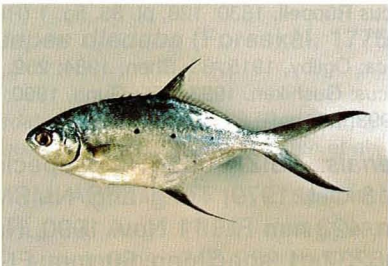


Fig. 80. *Trachinotus baillonii*, ad., 255 mm FL.

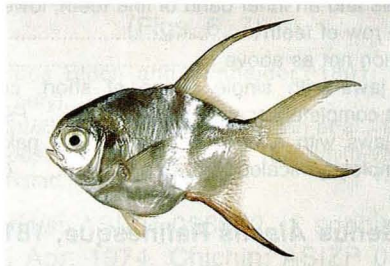


Fig. 81. *Trachinotus blochii*, yg., 85 mm FL.



Fig. 82. *Trachinotus blochii*, ad., 250 mm FL.

- vertical line through pectoral-fin base, absent in adults *Parastromateus*
- 1b. Pelvic fin always present and positioned posterior to a vertical through pectoral-fin base 2
- 2a. 2nd dorsal and anal fins with 1 or more distinct finlets 3
- 2b. 2nd dorsal and anal fins without finlets 4
- 3a. A single detached terminal finlet behind dorsal and anal fins *Decapterus*
- 3b. Several finlets after dorsal and anal fins *Megalaspis*
- 4a. Lateral line consisting entirely of armed scutes; dorsal accessory lateral line extending posteriorly to below 3rd

- dorsal spine *Trachurus*
- 4b. Lateral line with armed scutes posteriorly; dorsal accessory lateral line terminating before origin of dorsal fin 5
- 5a. Shoulder girdle margin with a deep furrow and a large papilla immediately above it *Selar*
- 5b. Shoulder girdle margin smooth 6
- 6a. Belly with a deep median groove, accommodating pelvic fin, anus, and free anal-fin spines; pelvic fin conspicuously long and black *Atropus*
- 6b. Belly without median groove; pelvic fin not conspicuously long and not black 7
- 7a. Scales minute and embedded in skin; adults with spines of 1st dorsal fin not connected by a membrane *Alectis*
- 7b. Scales small but visible and not embedded in skin; adults with spines of 1st dorsal fin connected by a membrane 8
- 8a. Gill rakers very long and projecting into mouth *Ulua*
- 8b. Gill rakers normal in shape, not projecting into mouth 9
- 9a. Tongue, roof, and floor of mouth white, the rest of mouth dark *Uraspis*
- 9b. Lining of mouth not distinctly white or dark 10
- 10a. Upper jaw without teeth 11
- 10b. Upper jaw with 1 or 2 rows or a band of minute teeth 12
- 11a. Lower jaw with a series of minute teeth; adipose eyelid well developed posteriorly *Selaroides*
- 11b. Lower jaw with a few feeble teeth in young, absent in adults; adipose eyelid poorly developed *Gnathanodon*
- 12a. Adipose eyelid completely covering eye except for a vertical slit centered on pupil *Atule*
- 12b. Adipose eyelid, if present, not developed as above ... 13
- 13a. Adipose eyelid well developed on posterior 1/2 of eye only; both jaws with a single row of numerous, comb-like teeth (except "*A. kleinii*", which has bands of teeth) *Alepes*
- 13b. Adipose eyelid not well developed; jaw dentition not as above 14
- 14a. Upper jaw with an outer series of moderate to strong canines and an inner band of fine teeth; lower jaw with a single row of teeth *Caranx*
- 14b. Dentition not as above 15
- 15a. Both jaws with single series of short, conical teeth; breast completely scaled *Pseudocaranx*
- 15b. Both jaws with a band of teeth; breast naked ventrally to completely scaled *Carangoides*

Genus *Alectis* Rafinesque, 1815

Gallus Lacépède, 1802: 583 (type species: *Gallus virescens* Lacépède, 1802 = *Zeus ciliaris* Bloch, 1788).

Alectis Rafinesque, 1815: 84 (not seen) (Substitute name for *Gallus* Lacépède, 1802).

Three species of this genus are known in the world; 2 are in Taiwan.

Key to species of the genus *Alectis* in waters around Taiwan

- 1a. Gill rakers (including rudiments) on lower limb of 1st arch 12 to 17; suborbital width equal to or narrower than eye; profile of nape and head broadly rounded *A. ciliaris*
- 1b. Gill rakers (including rudiments) on lower limb of 1st arch

21 to 26; suborbital width, much greater than eye; profile of nape and head somewhat angular *A. indica*

Alectis ciliaris (Bloch, 1787)

(Fig. 2)

Zeus ciliaris Bloch, 1787: 29, pl. 191 (Indonesia).

Alectis ciliaris: Jordan and Evermann, 1902: 338; Gushiken, 1983: 253; Shen et al., 1993: 331.

Materials: ASIZP 054440, 1 specimen, 37 mm FL, 18 Aug. 1969, Nanfangao; ASIZP 054935, 1 specimen, 219 mm FL, 16 Oct. 1977, Shihman; NTUM 06238, 1 specimen, 111 mm FL, 24 July 1978, Tungkang.

Diagnosis: D. VII (embedded and not apparent with growth), I + 18; A. II (embedded and not apparent with growth), I + 15-16; P. i + 17-18; G.R. 4-6 + 14-15; scutes feeble, 12-25; vertebrae 10 + 14. Profile of nape and head broadly rounded. Suborbital width equal to or narrower than eye diameter. Scales minute and embedded, body superficially naked; scutes weak. Villiform teeth on bands in both jaws. Anterior rays of 2nd dorsal and of anal fins produced into filaments in young, becoming shorter with growth. Lateral line strongly arched, becoming straight below 11th-12th rays of 2nd dorsal fin; arched portion longer than straight part. No finlet.

Distribution: Widely distributed in tropical and subtropical marine waters. It is common in waters around Taiwan.

Alectis indica (Rüppell, 1830)

(Figs. 3, 4)

Scyris indicus Rüppell, 1830: 128, pl. 33, fig. 1 (Red Sea) (not seen).

Alectis indica: Ogilby, 1915: 83; Shen, 1984: 252.

Alectis indicus: Gushiken, 1983: 255; Gunn, 1990: 10; Shen et al., 1993: 332.

Materials: ASIZP 055418, 1 specimen, 170 mm FL, 18 Oct. 1979, Tungkang; NMSMP 443, 1 specimen, 423 mm FL, 11 Nov. 1990, Nanfangao; NTUM 06237, 1 specimen 50 mm FL, 8 Sept. 1981, Wanlitung.

Diagnosis: D. VII (embedded and not apparent with growth), I + 18-19; A. II (embedded and not apparent with growth), I + 16; P. i + 17-18; G.R. 8-9 + 22-23; scutes feeble, 13 - 15; vertebrae 10 + 14. This species is similar to *A. ciliaris*, but can be distinguished by its angularly curved profile of nape and head, and more numerous gill rakers. Suborbital width much greater than eye diameter.

Distribution: Widely distributed in tropical and subtropical waters of the Indo-Pacific. It is common in waters around Taiwan.

Genus *Alepes* Swainson, 1839

Alepes Swainson, 1839: 248 (type species: *Alepes melanoptera* Swainson, 1839) (not seen).

There are 4 species in the world (Laroche et al. 1984). Only 2 species, *A. djedaba* and *A. vari*, were reconfirmed as present in Taiwan. The 2 previously recorded species, *A. melanopterus* (= *A. melanoptera*) (Shen 1984, Chen and Yu 1986) and *A. para* (= "A." *kleinii*) (Chen and Yu 1986, Shen et al. 1993), are excluded here because no Taiwan specimens were available. However, both species have been reliably reported from Okinawa and from tropical waters of the central western Pacific Ocean, so it is almost certain that they actually occur in Taiwanese coastal waters, and we included them to the key. See Iwatsuki and Kimura (1996) for a discussion of these species.

Key to species of the genus *Alepes* in waters around Taiwan

- 1a. Both jaws with a single row of numerous, comblike teeth 2
- 1b. Teeth on upper or both jaws pluriserial or in bands of fine teeth ("A." *kleinii*)
- 2a. Total gill rakers on 1st arch 24-30; upper jaw with supramaxilla relatively small and without an anterior spine-like extension (*A. melanoptera*)
- 2b. Total gill rakers on 1st arch 32-47; upper jaw with supramaxilla relatively large and with an anterior spine-like projection 3
- 3a. Gill rakers on 1st gill arch 38-47; lateral line with 39-51 scutes *A. djedaba*
- 3b. Gill rakers on 1st gill arch 32-38; lateral line with 48-69 scutes *A. vari*

Alepes djedaba (Forsskål, 1775)

(Fig. 5)

Scomber djedaba Forsskål, 1775: 56 (Red Sea).

Alepes djedaba: Gushiken, 1983: 200; Shen et al., 1993: 332.

Materials: ASIZP 056710, 2 specimens, 128-133 mm FL, 14 Aug. 1990, Fangyuan; ASIZP 056735, 2 specimens, 240-252 mm FL, 26 Apr. 1993, Tanshui; NMSMP 1030, 1 specimen, 265 mm FL, 2 Feb. 1993, Tungkang.

Diagnosis: D. VIII, I + 23-35; A. II, I + 19-20; P. i + 19-20; G.R. 11 + 26-27; CLS. 33-38 scales, 0-2 scutes; SLS. 43-49 all scutes; vertebrae 10 + 14. Body elongate oval, strongly compressed. Adipose eyelid developed, leaving anterior 1/2 of eye. Shoulder girdle margin smooth, without papillae. Uniserial minute teeth on jaws; minute villiform teeth also on palatines, vomer, and tongue.

Distribution: Distributed in tropical and subtropical waters of the Indo-Pacific. It is a very

common species in Taiwan and present in all coastal waters.

Alepes vari (Cuvier, 1833)

Caranx vari Cuvier, in Cuvier and Valenciennes, 1833: 48 (Pondichery).

Caranx (Atule) djeddaba (nec Forsskål): Wakiya, 1924: 199.

Alepes vari: Gushiken, 1983: 198; Smith-Vaniz, 1984a: unpaginated.

Material: FMNH 59493, 1 specimen, 163 mm FL, no date, Taiwan (collected by Y. Wakiya).

Diagnosis: D. VIII, I + 25; A. II, I + 22; P. i + 19; G.R. 11 + 25; CLS. 44; SLS. 52. Body oblong, compressed. Adipose eyelid well developed on posterior 1/2 of eye only. Single row of premaxillary teeth.

Distribution: Widely distributed in tropical and subtropical waters of the Indo-Pacific. It is very rare and only found in southwestern Taiwanese waters so far.

Remarks: Counting data is Smith-Vaniz's examination record on 11 Feb. 1981 and was kindly provided by him. This species is very similar to *A. djedaba*, but can be distinguished by its smaller and more numerous scutes and by its less numerous total gill rakers on the 1st arch.

Genus *Atropus* Cuvier, 1817

Atropus Cuvier, 1817: 324, "Les Atropus" Latinized by Oken (type species: *Brama atropos* Bloch and Schneider, 1801).

A monotypic genus.

Atropus atropos (Bloch and Schneider, 1801)

(Figs. 6, 7)

Brama atropos Bloch and Schneider, 1801: 98, pl. 23 (Pondichery).

Atropus atropus: Wakiya, 1924: 211; Shen et al., 1993: 333.

Atropus atropos: Masuda et al., 1984: 157; Smith-Vaniz, 1984a: unpaginated.

Materials: ASIZP 056692, 1 specimen, 230 mm FL, 5 Apr. 1974, Chichin; ASIZP 056707, 1 specimen, 170 mm FL, 1 Oct. 1979, Kaohsiung; ASIZP 056871, 1 specimen, 221 mm FL, 3 Dec. 1993, Taichung.

Diagnosis: D. VIII, I + 21-22; A. II, I + 18; P. i + 18; G.R. 9-10 + 20-23; CLS. 44-47; SLS. 0-8 scales, 33-40 scutes; vertebrae 10 + 14. Breast broadly naked from behind base of pelvic fin to pectoral fin base (Fig. 1a). Belly with a deep median groove, accommodating pelvic fins, anus, and anal-fin spines. Middle rays of dorsal and anal fins produced into filaments in adult males (absent in young and females), particularly dorsal-fin rays.

Pelvic fin long, tip of fin extending almost to anal fin origin in adults. Finlets absent.

Distribution: Commonly distributed in tropical and subtropical waters of the Indo-Pacific. It is common from the southwestern to southern parts of Taiwan.

Genus *Atule* Jordan and Jordan, 1922

Atule Jordan and Jordan, 1922: 38 (type species: *Decapterus lundini* Jordan and Seale, 1906: *Caranx mate* Cuvier, 1833).

A monotypic genus.

Atule mate (Cuvier, 1833)

Caranx mate Cuvier in Cuvier and Valenciennes, 1833: 54 (Pondichery).

Atule mate: Herre, 1953: 263; Smith-Vaniz, 1984(a): unpaginated; Shen, et al., 1993: 333.

Materials: NSYSU 3425, 1 specimen, 209 mm FL, 10 July 1984, Makung.

Diagnosis: D. VIII, I + 24; A. II, I + 20; P. i + 21; G.R. 11-12 + 27; CLS. 56; SLS. 0-10 scales, 36-49 scutes (this part of body is broken, data is from Smith-Vaniz 1984a); vertebrae 10 + 14. Adipose eyelid well developed and completely covering eye except for a vertical slit centred on pupil. Shoulder girdle margin smooth, without papillae. The terminal dorsal and anal-fin rays finlet-like in adults, about twice length of adjacent rays and a little more separated but joined by interradiation membrane.

Distribution: Widely distributed in tropical waters of the Indo-Pacific, but it is quite rare in Taiwan and only found in the southwestern part.

Remarks: The morphology of *Atule* is similar to species of *Decapterus*, *Alepes*, and *Selar crumenophthalmus*. However, species of *Decapterus* have a shoulder girdle margin with 2 papillae, the lower 1 larger, and a distinctly detached terminal finlet in the dorsal and anal fins; species of *Alepes* can be distinguished by a well-developed adipose eyelid which is developed only on the posterior 1/2 of eye; *Selar crumenophthalmus* differs in having a deep furrow on its shoulder girdle, a large papilla immediately above it, and a smaller papilla near the upper edge.

Genus *Carangoides* Bleeker, 1851

Olistus Cuvier, 1829: 209 (type species: *Olistus malabaricus* Cuvier, 1833 = *Olistus hedlandensis* Whitley, 1934).

Carangoides Bleeker, 1851: 352 (type species: *Caranx praeustus* Bennett, 1830).

There are 22 species in the world (Laroche et

al. 1984). Previous records of *C. bajad* (Chen and Yu 1986) and *C. plagiotenia* (Shen 1984, Chen and Yu 1986, Shen et al. 1993) were based on misidentified specimens deposited at National Taiwan University and National Sun Yat-sen University. The specimen of the former species should be *C. equula*, the latter species which actually includes 2 specimens are *C. orthogrammus* and *Caranx ignobilis*, respectively. A total of 13 species of *Carangoides* are reported in this paper. Two species: *C. gymnostethus* and *C. talamparoides* are documented from Taiwan for the first time. *C. humerosus* is another one possible new record but was not counted here because its specimens were obtained from Kaoshiung, a far-sea fishing port. No specimens of *C. bajad* and *C. plagiotenia* were examined by us. However, because they have been reliably reported from Okinawa and from tropical waters of the central western Pacific Ocean, they could be distributed to Taiwan, and we included them in the key.

Key to species of the genus *Carangoides* in waters around Taiwan

- 1a. Breast almost completely scaled, except a small median naked area on the breast ventrally (Fig. 1f) 2
- 1b. Breast partially to completely naked (Fig. 1b-e, g-o) 4
- 2a. 2nd dorsal fin with a conspicuous black blotch or submarginal band; vomerine tooth patch anchor shaped, with a long posteromedian extension *C. equula*
- 2b. 2nd dorsal fin without a conspicuous black blotch or submarginal band; vomerine tooth patch without a distinct posteromedian extension 3
- 3a. Soft anal-fin rays 18-20; scutes 11-18 .. (*C. plagiotenia*)
- 3b. Soft anal-fin rays 21-24; scutes 20-30 (*C. bajad*)
- 4a. Naked area of breast separated from naked base of pectoral fin by a broad band of scales 5
- 4b. Naked area of breast uninterrupted to naked base of pectoral fins 9
- 5a. Dorsal-fin rays 25-34; anal-fin rays 21-26 6
- 5b. Dorsal-fin rays 17-23; anal-fin rays 15-19 8
- 6a. Naked area of breast extends posteriorly well beyond the origin of pelvic fins (Fig. 1h) *C. fulvoguttatus*
- 6b. Naked area of breast only extends to the origin of pelvic fins 7
- 7a. Lower gill rakers fewer than 20 (including rudiments); 5 or 6 distinct dusky bands on body sides; yellow spots on sides, if present, small, numerous and mostly above lateral line *C. ferdau*
- 7b. Lower gill rakers more than 20 (including rudiments). Dark band usually absent on body sides; several relatively large, elliptical yellow spots present mostly below lateral line *C. orthogrammus*
- 8a. Straight lateral line slightly longer than curved part; scutes 37-42 *C. oblongus*
- 8b. Straight lateral line slightly shorter than curved part; scutes 27-33 *C. dinema*
- 9a. Naked area of breast extends to above pectoral fin base (Fig. 1l and 1o) 10

- 9b. Naked area of breast only extends to pectoral fin base 11
- 10a. Total gill rakers (including rudiments) on 1st arch 33-37; tongue grayish brown to brown *C. malabaricus*
- 10b. Total gill rakers (including rudiments) on 1st arch 27-30; tongue white to pale gray *C. talamparoides*
- 11a. Soft dorsal-fin rays 30-31; soft anal-fin rays 25-27 *C. gymnostethus*
- 11b. Soft dorsal-fin rays 17-23; soft anal-fin ray 15-19 12
- 12a. Total gill rakers (including rudiments) on 1st arch 33-37 *C. armatus*
- 12b. Total gill rakers (including rudiments) on 1st arch 20-27 13
- 13a. Head profile with a break or "bump" in front of eye in adults; central soft rays of dorsal and anal fins elongated in mature males; snout length equal to, or smaller than eye diameter *C. hedlandensis*
- 13b. Head profile without a break in front of eye in adults; central soft rays of dorsal and anal fins not elongated in mature males; snout length much longer than eye diameter 14
- 14a. Base of 2nd dorsal fin with a row of small dark blotches (*C. humerosus*)
- 14b. Base of 2nd dorsal fin without small dark blotches 15
- 15a. Soft dorsal-fin rays 21-23; soft anal-fin rays 17-19; dorsal profile of snout smoothly curved *C. caeruleopinnatus*
- 15b. Soft dorsal-fin rays 19-20; soft anal-fin rays 15-16; dorsal profile of snout gently sloped, then abruptly vertical just above mouth cleft *C. chrysophrys*

***Carangoides armatus* (Rüppell, 1830)**

(Fig. 8)

Citula armata Rüppell, 1830: 103 (Red Sea) (not seen).

Carangoides armatus: Williams et al., 1980: 14; Gushiken, 1983: 239; Shen et al., 1993: 333.

Materials: ASIZP 055420, 1 specimen, 102 mm FL, 18 Oct. 1979, Tung kang; ASIZP 056716, 1 specimen, 121 mm FL, 5 Apr. 1991, Tunghsiao; THUP 0327, 1 specimen, 227 mm FL, 3 Apr. 1960, Tung kang.

Diagnosis: D. VIII, I + 20; A. II, I + 17; P. i + 18-19; G.R. 11-13 + 22-24; CLS. 65-70; SLS. 10-16 scales, 19-23 scutes; vertebrae 10 + 14. Breast naked ventrally to behind origin of pelvic fin and extending up to naked base of pectoral fin (Fig. 1b). Middle rays of dorsal and anal fins produced into filaments in adult males, absent in young and females.

Distribution: Widely distributed in tropical and subtropical waters of the Indo-Pacific, but rare and only found in western to southeastern parts of Taiwan.

***Carangoides caeruleopinnatus* (Rüppell, 1830)**

(Figs. 9, 10)

Caranx caeruleopinnatus Rüppell, 1830: 100 (Red Sea) (not seen).

Carangoides caeruleopinnatus: Gushiken, 1983: 245; Shen et al., 1993: 333.

Materials: ASIZP 056706, 1 specimen, 228 mm FL, 1 Oct. 1973, Kaohsiung; ASIZP 056730, 1 specimen, 226 mm FL, 20 May 1993 Kaohsiung; NTUM 06240, 1 specimen, 132 mm FL, 24 Oct. 1981, Tahsi.

Diagnosis: D. VIII, I + 21-23; A. II, I + 17-19; P. i + 18-20; G.R. 6-7 + 15-18; CLS. 80-99; SLS. 9-19 scales, 21-34 scutes; vertebrae 10 + 14. Breast naked ventrally to behind origin of pelvic fin and extending up to naked base of pectoral fin (Fig. 1c). Lobe of 2nd dorsal fin filamentous in young, becoming shorter with age.

Distribution: Widely distributed in tropical and subtropical waters of the Indo-West Pacific. It is common in the waters around Taiwan.

Remarks: *Carangoides caeruleopinnatus* has been often misidentified as *C. malabaricus* in previous reports from Taiwan. *C. malabaricus* differs by having a small area naked of scales anteriorly just above pectoral fin base and more gill rakers on lower limb of 1st arch, with 24 to 27. Some specimens of *C. caeruleopinnatus* from the western Indian Ocean were reported by Smith-Vaniz (1984a) to have the naked areas of breast and pectoral fin base interrupted laterally by a narrow band of scales. We have not yet found that pattern of breast squamation in specimens from Taiwan. Juveniles with elongate dorsal-fin lobes were identified by Gushiken (1983) as *Carangoides uii* (Wakiya), a junior synonym of *C. caeruleopinnatus* (Smith-Vaniz, per. comm., Feb. 1997).

***Carangoides chrysophrys* (Cuvier, 1833)**

(Figs. 11, 12, 13)

Citula chrysophrys Cuvier, in Cuvier and Valenciennes, 1833: 77, pl. 247 (Seychelles).

Carangoides chrysophrys: Gushiken, 1983: 243; Shen et al., 1993: 334.

Materials: ASIZP 056740, 1 specimen, 292 mm FL, 10 July 1993, Kaohsiung; NMSMP 338, 1 specimen, 264 mm FL, 9 Mar. 1990, Tahsi; NTUM 02198, 1 specimen, 205 mm FL, 1961, Ilan.

Diagnosis: D. VIII, I + 19-20; A. II, I + 16-19; P. i + 18-20; G.R. 6 + 17-18; CLS. 86-93; SLS. 5-14 scales, 26-27 scutes; vertebrae 10 + 14. Dorsal profile of snout gently sloped, then abruptly vertical just above mouth cleft. Naked area of breast ventrally to behind origin of pelvic fin; laterally, naked area of breast extends diagonally to naked base of pectoral fin (Fig. 1d).

Distribution: Widely distributed in tropical and subtropical waters of the Indo-west Pacific. It is common in eastern and southern Taiwan, but rare in western Taiwan.

***Carangoides dinema* Bleeker, 1851**
(Figs. 14, 15)

Carangoides dinema Bleeker, 1851: 365 (Java); Shen et al., 1993: 334.

Materials: ASIZP 056879, 2 specimens, 224-227 mm FL, 3 Dec. 1993, Taichung; ASIZP 056925, 1 specimen, 172 mm FL, 1 Sep. 1993, Tahsi; NTUM 06251, 1 specimen, 328 mm FL, 20 Aug. 1985, Nanfangao.

Diagnosis: D. VIII, I + 17-19; A. II, I + 15-17; P. i + 18-20; G.R. 7-8 + 18-19; CLS. 60-63; SLS. 27-33 all scutes; vertebrae 10 + 14. Breast naked ventrally to origin of pelvic fin; laterally, naked area of breast usually separated from naked base of pectoral fin by a moderate to narrow band of scales (Fig. 1e). Lateral line becoming straight below 11th-12th rays of 2nd dorsal fin; curved part slightly longer than straight part.

Distribution: Widely distributed in tropical and subtropical waters of the Indo-Pacific. It is common in all Taiwanese waters except northern Taiwan.

Carangoides equula
(Temminck and Schlegel, 1844)
(Fig. 16)

Caranx equula Temminck and Schlegel, 1844: 111, pl. 60, fig. 1 (Japan).

Carangoides equula: Oshima, 1925: 391; Gunn, 1990: 20.

Materials: ASIZP 054814, 1 specimen, 220 mm FL, 1 Aug. 1973, Kaohsiung; ASIZP 056711, 1 specimen, 164 mm FL, 1 Oct. 1973, Kaohsiung; NTUM 06939, 1 specimen 140 mm FL, 30 June 1987, Nanfangao.

Diagnosis: D. VIII, I + 23-26; A. II, I + 22-24; P. i + 18-19; G.R. 7-9 + 20-22; CLS. 63-67; SLS. 0-4 scales, 28-30 scutes; vertebrae 10 + 14. Snout slightly pointed, longer than eye diameter. Breast completely scaled or with a very small naked area before the base of pelvic fin (Fig. 1f). Anterior rays of 2nd dorsal and anal fins not elevated.

Distribution: Distributed in South Africa, Indonesia, South and East China Seas, Japan, Australia, Hawaii, and Taiwan. It is very common in all Taiwanese coastal waters.

***Carangoides ferdau* (Forsskål, 1775)**
(Fig. 17)

Scomber ferdau Forsskål, 1775: 55 (Red Sea).

Carangoides ferdau: Shen et al., 1993: 334.

Materials: ASIZP 054641, 1 specimen, 238 mm FL, 1 Oct. 1993, Chichin; ASIZP 056872, 1

specimen, 178 mm FL, 3 Dec. 1993, Taichung.

Diagnosis: D. VIII, I + 31-34; A. II, I + 22-26; P. i + 20-21; G.R. 7-8 + 17-19; CLS. 82-90; SLS. 12-17 scales, 26-31 scutes; vertebrae 10 + 14. Snout bluntly rounded. Breast naked ventrally to origin of pelvic fins; laterally, naked area of breast separated from naked base of pectoral fin by a moderate band of scales (Fig. 1g).

Distribution: Widely distributed in tropical and subtropical waters of the Indo-Pacific. It is occasionally found in waters from the western to southern parts of Taiwan, rarely in northern Taiwan.

***Carangoides fulvoguttatus* (Forsskål, 1775)**
(Fig. 18)

Scomber fulvoguttatus Forsskål, 1775: 56 (Red Sea).

Carangoides fulvoguttatus: Gunn, 1990: 24.

Materials: ASIZP 056876, 1 specimen, 250 mm FL, 13 Dec. 1993, Sanshientai.

Diagnosis: D. VIII, I + 27-28; A. II, I + 23; P. i + 18-19; G.R. 7-8 + 17-18; CLS. 80-88; SLS. 24-25 scales, 14-15 scutes; vertebrae 10 + 14. In adults, mouth cleft distinctly below level of eye. Breast naked ventrally to distinctly behind origin of pelvic fins; laterally, naked area of breast separated from naked base of pectoral fin by a narrow band of scales (Fig. 1h).

Distribution: Broadly distributed through the Indian and western Pacific Oceans. It is rare and only found in eastern Taiwanese waters.

Remarks: According to Smith-Vaniz (1984a), the breast area on some specimens collected from the western Indian Ocean extends to naked base of pectoral fin. We have not yet found any specimens with this pattern of breast squamation in the waters of Taiwan.

***Carangoides gymnostethus* (Cuvier, 1833)**
(Fig. 19)

Caranx gymnostethus Cuvier, in Cuvier and Valenciennes, 1833: 73 (Seychelles).

Carangoides gymnostethus: Gushiken, 1983: 236; Gunn, 1990: 26.

Materials: ASIZP 055741, 1 specimen, 259 mm FL, 14 Nov. 1981, Hengchun; ASIZP 056738, 1 specimen, 239 mm FL, 10 July 1993, Kaohsiung; ASIZP 056931, 2 specimens, 328-338 mm FL, 19 Sept. 1993, Kaohsiung.

Diagnosis: D. VIII, I + 30-31; A. II, I + 25-27; P. i + 18-20; G.R. 8 + 21; CLS. 78-80; SLS. 15-19 scales, 21-27 scutes; vertebrae 10 + 15. Body elongate-ovate. Dorsal profile more convex than ventral. Snout blunt, longer than eye diameter.

Villiform teeth in an angular patch, without a posteromedian extension on vomer. Breast naked ventrally to distinctly behind origin of pelvic fin; laterally, naked area of breast extending to naked base of pectoral fin (Fig. 1i). Color in life, olive green above, silvery white below; sometimes with a few dark spots on sides. Opercular spot absent or inconspicuous. Dorsal, anal, and caudal fins pale olive green on slightly dark background leading edge and distal margin of anal fin white.

Distribution: Widely distributed in tropical and subtropical waters of the Indo-Pacific. It is rare and only found in southern Taiwanese waters.

Remarks: The present species resembles *C. fulvoguttatus* in body shape, but can be clearly distinguished by the mouth cleft located at the level with the lower margin of the eye, and total gill rakers (including rudiments) on the 1st arch being 27-30 (24-27 in *C. fulvoguttatus*).

***Carangoides hedlandensis* (Whitley, 1934)**

(Figs. 20, 21)

Olistus hedlandensis Whitley, 1934: 156, fig. 2 (W. Australia).

Carangoides hedlandensis: Williams et al., 1980: 17; Gunn, 1990: 26; Shen et al., 1993: 334.

Materials: ASIZP 056697, 2 specimens, 215-237 mm FL, 5 Apr. 1974, Chichin; ASIZP 056717, 2 specimens, 124-140 mm FL, 5 Apr. 1991, Tunghsiao; NTUM 06601, 1 specimen, 258 mm FL, 27 June 1986, Nanfangao.

Diagnosis: D. VIII, I + 20-21; A. II, I + 17; P. i + 18; G.R. 7-9 + 16-19; CLS. 63-70; SLS. 8-14 scales, 21-27 scutes; vertebrae 10 + 14. Head profile extremely steep, adults with a distinct break or "bump" in the interorbital region. Snout blunt, equal to eye diameter in young or smaller in adults. Breast naked ventrally to behind origin of pelvic fins; laterally, naked area of breast extends diagonally to naked base of pectoral fin (Fig. 1j). Middle rays of dorsal and anal fins elongated in adult males.

Distribution: Widely distributed in tropical and subtropical waters of the Indo-Pacific. It can be widely found in Taiwan but mainly in the southern part.

Remarks: *Carangoides hedlandensis* is easily distinguished from other congeneric species by its head profile which in adults has a distinct break or "bump" in the interorbital region.

***Carangoides humerosus* (McCulloch, 1915)**

(Fig. 22)

Caranx humerosus McCulloch, 1915: 137, pl. 25 (Bustard Head,

Queensland).

Carangoides humerosus: Gloerfelt-Tarp and Kailola, 1984: 159; Gunn, 1990: 31.

Materials: ASIZP 056733, 3 specimens, 205-260 mm FL, 10 June 1993, Kaohsiung; 3 specimens, 227-269 mm FL, 18 June 1993, Kaohsiung.

Diagnosis: D. VIII, I + 20-22; A. II, I + 18-19; P. i + 19; G.R. 6-10 + 17-19; CLS. 62-72; SLS. 3-8 scales, 24-32 scutes; vertebrae 10 + 14. Body elongate oval. Dorsal profile more convex than ventral. Snout slightly pointed. Villiform teeth in a wedge shape without a posteromedian extension patch on vomer. Breast naked ventrally to behind origin of pelvic fins; laterally, naked area of breast extends diagonally to naked base of pectoral fin (Fig. 1k). Color in life, greenish blue above, silvery white below. Dark bands on sides in young, indistinct with growth. 2nd dorsal, anal, and caudal fins pale to slightly dark; pectoral and pelvic fins white or hyaline. A row of blackish-blue spots on the base of 2nd dorsal fin, indistinct posteriorly.

Remarks: The occurrence of *Carangoides humerosus* in Taiwan waters requires additional confirmation, see discussion in abstract.

Distribution: Distributed in Indonesia, New Guinea, and Australia.

***Carangoides malabaricus* (Bloch and Schneider, 1801)**

(Fig. 23)

Scomber malabaricus Bloch and Schneider, 1801: 31 (Pondichery).

Carangoides malabaricus: Williams and Venkataramani, 1978: 504; Gushiken, 1983: 237; Shen et al., 1993: 335.

Materials: ASIZP 056732, 3 specimens, 184-190 mm FL, 3 June 1993, Kaohsiung; NTUM 0225, 1 specimen, 295 mm FL, 1960, Taipei market; NTUM 06817, 1 specimen, 165 mm FL, 15 Feb. 1987, Penghu.

Diagnosis: D. VIII, I + 20-22; A. II, I + 18; P. i + 18; G.R. 9-11 + 24-27; CLS. 60-65; SLS. 7-11 scales, 20-25 scutes; vertebrae 10 + 14. Breast naked ventrally to distinctly behind pelvic fin often to origin of 2nd anal fin; laterally, naked area of breast extends diagonally to naked base of pectoral fin, including small area anteriorly just above pectoral fin base (Fig. 1l).

Distribution: Widely distributed in tropical and subtropical waters of the Indo-West Pacific. It is rare, only found from western to southern Taiwanese waters.

***Carangoides oblongus* (Cuvier, 1833)**
(Fig. 24)

Caranx oblongus Cuvier in Cuvier and Valenciennes, 1833: 128 (Vaniclo, New Guinea).

Carangoides oblongus: Gushiken, 1983: 223; Shen et al., 1993: 335.

Materials: ASIZP 056734, 1 specimen, 144 mm FL, 1 Aug. 1979, Kueho; ASIZP 056874, 1 specimen, 250 mm FL, 13 Dec. 1993, Hopingtao.

Diagnosis: D. VIII, I + 21; A. II, I + 18-19; P. i + 19-20; G.R. 8-9 + 18; CLS. 60-69; SLS. 0-2 scales, 37-42 scutes; vertebrae 10 + 14. Breast naked ventrally to origin of pelvic fins; laterally, naked area of breast separated from naked base of pectoral fin by a moderate to narrow band of scales (Fig. 1m). Lateral line becoming straight below 8th-9th rays of 2nd dorsal fin; curved part shorter than straight part.

Distribution: Distributed in the Indo-West Pacific Ocean. It is only found in northern Taiwan as a rare species.

Remarks: *Carangoides oblongus* resembles *C. dinema*, but is distinguished by having 37-42 lateral line scutes, curved lateral line shorter than straight part, and 20-22 soft dorsal-fin rays.

Carangoides orthogrammus
(Jordan and Gilbert, 1882)
(Fig. 25)

Caranx orthogrammus Jordan and Gilbert, 1882: 226 (Revillagigedo Is., E. Pacific).

Carangoides orthogrammus: Gushiken, 1983: 230, Shen et al., 1993: 335.

Materials: ASIZP 056704, 1 specimen, 184 mm FL, 1 Oct. 1973, Kaohsiung; ASIZP 056735, 1 specimen, 269 mm FL, 25 Sept. 1993, Hopingtao; THUP 01652, 1 specimen, 362 mm FL, 13 Feb. 1962, Tungkang.

Diagnosis: D. VIII, I + 29-31; A. II, I + 25-26; P. i + 21-22; G.R. 9 + 21-22; CLS. 96-106; SLS. 20-30 scales, 21-28 scutes; vertebrae 10 + 14. Breast naked ventrally to origin of pelvic fin; laterally, naked area of breast separated from naked base of pectoral fin by a moderate band of scales (Fig. 1n).

Distribution: Widely distributed in tropical and subtropical waters of the Indo-Pacific. It can be occasional found in southern Taiwan.

Remarks: *C. orthogrammus* is similar to *C. ferdau*, but adults differ in having several relatively large oblong yellow spots, including some below lateral line; no dark bands on sides; lower gill rakers on the 1st arch (including rudiments) more than 20.

***Canangoides talamparoides* Bleeker, 1852**
(Fig. 26)

Carangoides talamparoides Bleeker, 1852: 91 (Sumatra); Williams and Venkataramani, 1978: 507; Gloerfelt-Tarp and Kailola, 1984: 161; Smith-Vaniz, 1984a: unpaginated; Gunn, 1990: 36.

Materials: ASIZP 056731, 1 specimen, 214 mm FL, 3 June 1993, Kaohsiung; ASIZP 056986, 2 specimens, 165-166 mm FL, 7 Mar. 1994, Kaohsiung.

Diagnosis: D. VIII, I + 21-22; A. II, I + 17-18; P. i + 18-19; G.R. 7-8 + 21; CLS. 72-78; SLS. 4-5 scales, 23-27 scutes; vertebrae 10 + 14. Body ovate; dorsal profile of head strongly elevated to nape. Snout blunt, longer than eye diameter. Villiform teeth in a roughly triangular patch on vomer. Breast naked ventrally to distinctly behind pelvic fins, often to origin of soft anal fin; laterally, naked area of breast extends diagonally to naked base of pectoral fin, including small area anteriorly just above pectoral-fin base (Fig. 1o). Color in life, bluish gray above; silvery white below; opercle with a small black spot on upper margin. Tongue white to pale gray. 2nd dorsal and anal fins dusky; caudal fin dusky yellow with black distal margin.

Distribution: Widely distributed in the Indo-West Pacific Ocean. It is rare and only found in southern Taiwanese waters.

Remarks: *C. talamparoides* is very similar to *C. malabarius*, but differs in having tongue white to pale gray in fresh specimens and fewer lower gill rakers (including rudiments), with only 21 in our specimens. However, Williams and Venkataramani (1978) reported 19-22 lower and 27-31 total gill rakers in *C. talamparoides*, versus 21-27 lower and 32-38 total in *C. malabaricus*.

Genus *Caranx* Lacépède, 1801

Caranx Lacépède, 1801: 57 (type species: *Scomber carangus* Bloch, 1793 = *Scomber hippos* Linnaeus, 1758).

There are 14 species in the world; 8 species in the Indo-Pacific (Laroche et al.); 7 species in Taiwan, including 1 new record species *C. bucculentus*.

Key to species of the genus *Caranx* in waters around Taiwan

- 1a. Anterior lateral line strongly curved, becoming straight below 1st dorsal fin; breast naked ventrally behind origin of pelvic fin and extending to naked base of pectoral fin ...
..... *C. bucculentus*
- 1b. Anterior lateral line moderately curved, becoming straight below 2nd dorsal fin; breast completely scaly or breast ventrally naked with a small patch of minute scales 2

- 2a. Breast completely scaly 3
 2b. Breast ventrally naked with a small patch of minute scales 6
 3a. Maxilla extending to posterior edge of eye or pupil 4
 3b. Maxilla extending beyond middle of eye 5
 4a. Dorsal profile of head strongly curved; in adults, dorsal-fin lobe without a white tip; a black spot on upper margin of opercle, in adults, at least 1/2 the diameter of pupil; upper lobe of caudal fin with black edge; vertebrae 10 + 14 *C. tille*
 4b. Dorsal profile of head gently curved; in adults, dorsal-fin lobe with a white tip; a black spot on upper margin of opercle, in adults, no longer than 1/2 the diameter of pupil; both lobes of caudal fin all with black edges; vertebrae 10 + 15 *C. sexfasciatus*
 5a. Dorsal profile of head relatively steep and angular; color of body uniform dusky gray to brown; no spots on sides *C. lugubris*
 5b. Dorsal profile of head moderately curved; color of body silvery gray in young and bluish green in adults; adults with many dark spots scattered on head and body *C. melampyus*
 6a. Total gill rakers (including rudiments) 26-30; dorsal profile gently curved; adults with many black spots scattered on head and body, and lower lobe of caudal fin with a distinct narrow white margin *C. papuensis*
 6b. Total gill rakers (including rudiments) 20-24; dorsal profile steeply curved; adults without black spots, and lower lobe of caudal fin without a distinct narrow white margin *C. ignobilis*

***Caranx bucculentus* Alleyne and Macleay, 1877**
(Figs. 27, 28)

Caranx bucculentus Alleyne and Macleay, 1877: 326, pl. 11, fig. 1 (New South Wales); Gloerfelt-Tarp and Kailola, 1984: 161.

Materials: ASIZP 056686, 1 specimen, 159 mm FL, 1 Aug. 1984, Kaohsiung; ASIZP 056935, 1 specimen, 252 mm FL, 20 July 1993, Kaohsiung; NMSMP 1027, 2 specimens, 300-354 mm FL; 16 Apr. 1993, Kaohsiung.

Diagnosis: D. VIII, I + 18; A. II, I + 15-16; P. i + 18; G.R. 5-6 + 20-21; CLS. 40-50; SLS. 35-40 all scales; vertebrae 10 + 14. Body ovate; dorsal profile of head steep. Snout blunt. Lower jaw slightly prominent. Breast naked ventrally to distinctly behind origin of pelvic fin; laterally, naked area of breast extends diagonally to naked base of pectoral fin (Fig. 1p). Lateral line strongly curved, becoming straight below 1st dorsal fin. Color in life, olive green above, silvery white below; with numerous dark blue spots on sides. Fins pale; dorsal and caudal fins with black edge.

Distribution: Distributed in Australia, Indonesia, New Guinea, and the South China Sea. It is occasionally found in southern Taiwanese waters.

Remarks: The species described by Shen (1984) as *C. bucculentus* is actually *C. ignobilis* because it has the lateral line becoming straight

below the 6th-7th rays of the 2nd dorsal fin, in contrast to *C. bucculentus* which has the lateral line becoming straight below the 5th-6th spines of the 1st dorsal fin.

***Caranx ignobilis* (Forsskål, 1775)**
(Figs. 29, 30)

Scomber ignobilis Forsskål, 1775: 55 (Red Sea).

Caranx ignobilis: Jordan and Richardson, 1909: 179; Shen et al., 1993: 336.

Materials: ASIZP 056702, 1 specimen, 188 mm FL, 15 Dec. 1979, Keelung; ASIZP 056705, 1 specimen, 474 mm FL, 8 Apr. 1992, Chengkung; ASIZP 056851, 2 specimens, 195-223 mm FL, 18 Feb. 1993, Tungkang.

Diagnosis: D. VIII, I + 19-20; A. II, I + 15-16; P. i + 19-20; G.R. 5-6 + 16-17; CLS. 58-64; SLS. 0-3 scales, 30-35 scutes; vertebrae 10 + 14. Breast ventrally naked with a small patch of minute scales (Fig. 1q). The anterior lateral line strongly curved, becoming straight below the 6th-7th rays of the 2nd dorsal fin. Color in life, body bluish green above, silvery white below; dusky with growth. No spot on either side. Fins yellowish to dark. Opercular spot absent.

Distribution: Widely distributed in tropical and subtropical waters of the Indo-Pacific. It is frequently found in all Taiwanese coastal waters.

***Caranx lugubris* Poey, 1860**
(Fig. 31)

Caranx lugubris Poey, 1860: 222 (Cuba) (not seen); Shen et al., 1993: 336; Smith-Vaniz and Randall, 1994: 323.

Material: ASIZP 056738, 1 specimen, 338 mm FL, 14 Mar. 1990, Hengchun.

Diagnosis: D. VIII, I + 21; A. II, I + 16; P. i + 21; G.R. 7 + 21; CLS. 50; SLS. 34 all scales; vertebrae 10 + 14. Predorsal profile steep and in large specimens with a concavity in front of nostrils, angularly curved at occipital. Snout obtuse, longer than eye diameter. Anterior lateral line strongly curved, becoming straight below 3rd-4th rays of 2nd dorsal fin. Breast completely scaly. Color in life, body and fins uniform gray to black. A small opercular spot present.

Distribution: Widely distributed in tropical and subtropical waters of the Indo-Pacific. But it is rare and only found in southern Taiwanese waters.

***Caranx melampyus* Cuvier, 1833**
(Figs. 32, 33)

Caranx melampyus Cuvier, in Cuvier and Valenciennes, 1833: 116 (New Guinea); Shen et al., 1993: 336.

Materials: ASIZP 055440, 1 specimen, 355 mm FL, 4 Dec. 1979, Keelung; ASIZP 055465, 1 specimen, 327 mm FL, 12 Dec. 1979, Keelung.

Diagnosis: D. VIII, I + 22-24; A. II, I + 19-20; P. i + 20; G.R. 7-8 + 18-20; CLS. 55-70; SLS. 0-4 scales, 36-42 scutes; vertebrae 10 + 14. The anterior lateral line moderately curved, becoming straight below 5th-6th rays of 2nd fin. Breast completely scaly. Color in life, in young, head and body silvery gray. In adults, head and dorsal half of body brassy, suffused with blue, and covered with bluish-black spots. Opercular spot absent.

Distribution: Widely distributed in tropical and subtropical waters of the Indo-Pacific. It is common in southern Taiwanese waters, occasionally in the north and east.

***Caranx papuensis* Alleyne and Macleay, 1877**

(Figs. 34, 35, 36)

Caranx papuensis Alleyne and Macleay, 1877: 325 (Hall Sound, New Guinea); Shen et al., 1993: 336.

Materials: ASIZP 056701, 1 specimen, 178 mm FL, 15 Dec. 1979, Keelung; ASIZP 056848, 1 specimen, 475 mm FL, 14 Aug. 1993, Chengkung.

Diagnosis: D. VIII, I + 21-22; A. II, I + 17-18; P. i + 19-20; G.R. 7-9 + 19; CLS. 53-61; SLS. 34-37 all scales; vertebrae 10 + 14. Breast naked ventrally, usually with a small patch of prepelvic scales (Fig. 1r). Lateral line moderately arched, becoming straight below 6th-7th rays of 2nd dorsal fin. Color in life, in young, head and body silvery white; dusky with growth. In adults, head and body above lateral line with scattered small black spots, becoming more numerous with growth. A conspicuous pale silvery-white spot with black margins on upper margin of opercle.

Distribution: Widely distributed in tropical and subtropical waters of the Indo-Pacific. It is common in all Taiwanese waters, but mainly in the south.

***Caranx sexfasciatus* Quoy and Gaimard, 1825**

(Figs. 37, 38, 39)

Caranx sexfasciatus Quoy and Gaimard, 1825: 358, pl. 65, fig. 4 (Waigeo, New Guinea) (not seen); Shen et al., 1993: 336.

Materials: ASIZP 055468, 1 specimen, 193 mm FL, 15 Dec. 1979, Keelung; ASIZP 055469, 5 specimens, 125-174 mm FL, 19 Dec. 1979, Tungking; ASIZP 055471, 6 specimens, 52-66 mm FL, 5 July 1979, Shimen.

Diagnosis: D. VIII, I + 20-21; A. II, I + 16-17; P. i + 17-18; G.R. 6-8 + 16-17; CLS. 49-50; SLS. 0-

2 scales, 32-35 scutes; vertebrae 10 + 15. Head profile gradually curved from snout tip to 2nd dorsal origin. Snout slightly pointed, longer than eye diameter. Breast completely scaly. Lateral line moderately curved, becoming straight below 4th-5th rays of 2nd dorsal fin. Color in life, in juveniles, body yellow to pale brown, with 5-6 dark bands on sides. In young adults, blue above, silvery white below, with dark bands indistinct or absent. In adults, olive green to bluish green above, silvery white or dusky below. The lobe of 2nd dorsal fin with a white tip. Opercular spot present.

Distribution: Widely distributed in tropical and temperate waters of the Indo-Pacific. It is very common in all Taiwanese waters.

***Caranx tille* Cuvier, 1833**

(Fig. 40)

Caranx tille Cuvier, in Cuvier and Valenciennes, 1833: 124 (Pondichery); Shen et al., 1993: 336.

Materials: ASIZP 056870, 1 specimen, 221 mm FL, 3 Dec. 1993, Taichung; THUP 01657, 1 specimen, 238 mm FL, 13 Feb. 1962, Tungking.

Diagnosis: D. VIII, I + 21; A. II, I + 17; P. i + 18; G.R. 6-7 + 16-17; CLS. 53-54; SLS. 36-39 all scales; vertebrae 10 + 14. Head profile steep, and at occipital strongly curved. Snout obtuse, subequal to eye diameter. Breast completely scaly. Lateral line moderately curved, becoming straight below 5th-6th rays of 2nd dorsal fin. Color in life, in juveniles and young adults, body silvery gray to pale olive green. In adults, olive green to bluish gray above, silvery white below.

Distribution: Widely distributed in tropical and subtropical waters of the Indo-Pacific. It is rare, and found in western to southern Taiwanese waters.

Remarks: The present species is very similar to *C. sexfasciatus* in many respects, but differs from it in the lobe of 2nd dorsal fin without a white tip; having a much larger opercular spot; lateral line scutes gray except dark in caudal peduncle region, and vertebrae 10 + 14.

Genus *Decapterus* Bleeker, 1851

Decapterus Bleeker, 1851: 358 (type species: *Caranx kurra* Curier, 1833 = *Caranx russelli* Rüppell, 1830).

According to previous authors, there are 9 species in the world (Smith-Vaniz 1986a) and 7 species in Taiwan (Shen et al. 1993). *Decapterus muroadsi* was not recorded from Taiwan by Oshima (1925); his account of the species was based on Günther (1860) who reported it from the

“Seas of Japan and China”. Because we have no confirmed records of *Decapterus muroadsi* from the Taiwan region, we do not give a description of the species here, but we included it in the key. Only 6 species of *Decapterus* have been reliably documented from Taiwan.

Key to species of the genus *Decapterus* in waters around Taiwan

- 1a. Predorsal scales not extending beyond middle of pupil .
..... *D. macrosoma*
- 1b. Predorsal scales extending to or beyond middle of pupil
..... 2
- 2a. Gill rakers on the lower limb of 1st arch (including rudiments) 32-39; in life, caudal fin pale, yellowish green or dusky brown, sometimes tinged with red (due to collection injury) 3
- 2b. Gill rakers on the lower limb of 1st arch (including rudiments) 28-32; in life, caudal fin distinctly red 6
- 3a. Maxilla not extending to below anterior margin of eye; tip of appressed pectoral fin falling considerably short of a vertical line from 2nd dorsal-fin origin *D. macarellus*
- 3b. Maxilla extending to below anterior margin of eye; tip of appressed pectoral fin extending to or nearly to a vertical line from 2nd dorsal-fin origin 4
- 4a. Scutes present on posterior 3/4 of straight lateral line ...
..... (*D. muroadsi*)
- 4b. Scutes present on nearly whole length of straight lateral line 5
- 5a. Pectoral fin slightly shorter than head; body depth 5.1~5.5 in fork length; in life, caudal fin pale but sometimes tinged with reddish *D. russelli*
- 5b. Pectoral fin subequal to head; body depth 4.1~4.8 of fork length; in life, caudal fin pale yellow to greenish yellow *D. muroadsi*
- 6a. Scutes relatively large; only scutes present on straight lateral line; hind margin of opercular membrane smooth in adults *D. kurroides*
- 6b. Scutes relatively small; straight lateral line with 4-10 anterior scales; hind margin of opercular membrane minutely serrate in large adults *D. tabi*

***Decapterus kurroides* Bleeker, 1855**

(Fig. 41)

Decapterus kurroides Bleeker, 1855: 420 (Amboina); Oshima, 1925: 361; Shen et al., 1993: 337.

Materials: ASIZP 054439, 1 specimen, 201 mm FL, 7 Nov. 1969, Nanfangao; ASIZP 054529, 1 specimen, 236 mm FL, 1 Dec. 1970, Hengchun; NTUM 03965, 1 specimen, 265 mm FL, 26 Jan. 1981, Aoti.

Diagnosis: D. VIII, I + 30 + 1 (finlet); A. II, I + 24-25 + 1 (finlet); P. i + 20-21; G.R. 10-12 + 28-30; CLS. 50-58; SLS. 34-36 all scales; vertebrae 10 + 14. Minute teeth in a very narrow band on upper jaw, in a single irregular series on lower jaw, in an arrow-shaped patch on vomer, in a long and slender band on palatines and tongue. Opercular membrane smooth. Pectoral fin long, its tip

extending to behind origin of 2nd dorsal fin.

Distribution: Widely distributed in tropical and subtropical waters of the Indo-West Pacific. It is very common in all Taiwanese waters.

***Decapterus macarellus* (Cuvier, 1833)**

(Fig. 42)

Caranx macarellus Cuvier, in Cuvier and Valenciennes, 1833: 40 (Martinique).

Decapterus macarellus: Berry, 1968: 161; Shen et al., 1993: 337.

Materials: ASIZP 054530, 4 specimens, 213-273 mm FL, 1 Dec. 1970, Hengchun; ASIZP 056694, 1 specimen, 272 mm FL, 23 Aug. 1981, Nanfangao; NTUM 03967, 1 specimen, 265 mm FL, 3 Feb. 1981, Aoti.

Diagnosis: D. VIII, I + 31-33 + 1 (finlet); A. II, I + 26-28 + 1 (finlet); P. i + 20-21; G.R. 10-12 + 37-38; CLS. 68-74; SLS. 28-31 scales, 24-29 scutes; vertebrae 10 + 14. Posterior end of maxilla straight slanting and extending below to between nostril and eye. Jaws, vomer, and palatines toothless; only tongue toothed in a narrow band on its posterior half. Opercular membrane finely and partly serrated in adults. Pectoral fin short, its tip extending only to terminal base of 1st dorsal fin.

Distribution: A circumtropical species. It is very common in all Taiwanese waters.

Remarks: The present species has been often misidentified as *D. macrosoma* in previous reports from Taiwan. *D. macrosoma* differs in the posterior end of maxilla being a little concave above, rounded and produced below; predorsal scales do not extend forward to beyond posterior margin of pupil.

***Decapterus macrosoma* Bleeker, 1851**

(Fig. 43)

Decapterus macrosoma Bleeker, 1851: 358 (Java); Shen et al., 1993: 337; Smith-Vaniz, 1995: 964.

Materials: ASIZP 054498, 1 specimen, 257 mm FL, 5 Sept. 1969, Nanfangao; ASIZP 056877, 4 specimens, 176-234 mm FL, 13 Dec. 1993, Chengkung.

Diagnosis: D. VIII, I + 34-35 + 1 (finlet); A. II, I + 29-30 + 1 (finlet); P. i + 20-21; G.R. 9-10 + 35-37; CLS. 64-69; SLS. 15-27 scales, 33-40 scutes; vertebrae 10 + 14. Posterior end of maxilla a little concave above, rounded and produced below, and extending to below vertical from between nostril and eye. Toothless on upper jaw; minute teeth in a single series on lower jaw, in a band on palatines and tongue, in a pair of small bands on head of

vomer, and in a median line on vomerine shaft. Opercular membrane smooth. Pectoral fin short, its tip extending to behind 1st dorsal fin.

Distribution: Widely distributed in tropical and temperate waters of the Indo-West Pacific. It is common in all Taiwanese waters.

Decapterus maruadsi
(Temminck and Schlegel, 1844)
(Fig. 44)

Caranx maruadsi Temminck and Schlegel, 1844: 109, pl. 58, fig. 2 (Japan).

Decapterus maruadsi: Wakiya, 1924: 156; Shen et al., 1993: 337.

Materials: ASIZP 054526, 3 specimens, 209-227 mm FL, 15 May. 1970, Taiwan Bank; ASIZP 056712, 3 specimens, 239-240 mm FL, 20 June 1993, Tung kang; NTUM 03966, 1 specimen, 218 mm FL, 26 Jan. 1981, Aoti.

Diagnosis: D. VIII, I + 32-33 + 1 (finlet); A. II, I + 28-30 + 1 (finlet); P. i + 20-21; G.R. 13-14 + 36-39; CLS. 51-62; SLS. 0-1 scales, 32-39 scutes; vertebrae 10 + 14. Maxilla extending to below anterior margin of eye. Minute teeth in a series on both jaws, an arrow-shaped patch on vomer, and in a narrow band on palatines and tongue. Opercular membrane smooth. Pectoral fin long, its tip extending to behind origin of 2nd dorsal fin.

Distribution: Confined to the coasts of China and Japan. It is very common in all Taiwanese waters.

Remarks: The present species has been often misidentified as *D. russelli* in the previous reports from Taiwan. It is distinguished by the latter having predorsal scales extending to beyond posterior margin of pupil.

***Decapterus russelli* (Rüppell, 1830)**
(Fig. 45)

Caranx russelli Rüppell, 1830: 90 (Red Sea) (not seen).

Decapterus russelli: Ogilby, 1915: 59; Shen et al., 1993: 337.

Materials: ASIZP 056878, 1 specimen, 173 mm FL, 7 Dec. 1993, Yehliu; NTUM 06239, 1 specimen, 168 mm FL, 26 Oct. 1981, Nanfangao.

Diagnosis: D. VIII, I + 32 + 1 (finlet); A. II, I + 25-27 + 1 (finlet); P. i + 19-20; G.R. 10-13 + 35-38; CLS. 48-57; SLS. 0-2 scales, 37-38 scutes; vertebrae 10 + 14. Maxilla extending to below anterior margin of eye. Minute teeth in a single series on jaws, in an arrow-shaped patch on vomer, and in a long band on palatines and tongue. Opercular membrane smooth. Pectoral fin long, tip extending to below origin of 2nd dorsal fin.

Distribution: Widely distributed in tropical and

subtropical waters in the Indo-Pacific. It is rare and only found in northern and eastern Taiwan.

Remarks: One should use caution when using morphometric characters to distinguish *D. russelli* and *D. maruadsi*, because some proportional characters of the former species might change when body size increases. The specimens we examined here were 2 smaller individuals.

***Decapterus tabl* Berry, 1968**

Decapterus tabl Berry, 1968: 145, fig. 1 (W. Atlantic); Gushiken, 1983: 183; Shen et al., 1993: 337.

Materials: ASIZP 054437, 1 specimen, 319 mm FL, 7 June 1969, Nanfangao; ASIZP 054497, 1 specimen 286 mm FL, 5 Sept. 1969, Nanfangao.

Diagnosis: D. VIII, I + 29-30 + 1 (finlet); A. II, I + 24 + 1 (finlet); P. i + 21; G.R. 10-11 + 32; CLS. 69; SLS. 6-9 scales, 36 scutes; vertebrae 10 + 14. Maxilla scarcely extending to anterior margin of eye. Minute teeth in a single series on jaws, in an arrow-shaped patch on vomer, and in a long band on palatines and tongue, but may be reduced or absent in larger specimens. Opercular membrane sharply serrate in large adults. Pectoral fin short, tip extending only to below 1st dorsal fin.

Distribution: Widely distributed in warm waters of the Indo-Pacific and of the Atlantic. It is rare and only found in eastern Taiwanese waters.

Genus *Gnathanodon* Bleeker, 1851

Gnathanodon Bleeker, 1851: 352 (type species: *Scomber speciosus* Forsskål, 1775).

A monotypic genus.

***Gnathanodon speciosus* (Forsskål, 1775)**
(Fig. 46)

Scomber speciosus Forsskål, 1775: 54 (Red Sea).

Gnathanodon speciosus: Bleeker, 1852: 57; Shen et al., 1993: 338.

Materials: ASIZP 055599, 1 specimen, 196 mm FL, 26 July 1980, Nanfangao; ASIZP 056850, 2 specimens, 208-245 mm FL, 18 June 1993, Kaohsiung; NTUM 06824, 1 specimen, 130 mm FL, 15 Feb. 1987, Penghu.

Diagnosis: D. VIII, I + 19-20; A. II, I + 16-17; P. i + 19-20; G.R. 7-8 + 18-21; CLS. 62-73; SLS. 15-27 scales, 18-25 scutes; vertebrae 10 + 14. Adipose eyelid feebly developed. Maxilla extending to below anterior margin of eye. No teeth on jaws, vomer, palatines, or tongue, and only a few feeble teeth on low jaw in smaller specimens (none in adults). Breast completely

scaly. Finlets none. Body silvery white to yellow; with 7-11 black bands on sides, which fade in large adults and are replaced by a few black blotches or spots.

Distribution: Widely distributed in tropical and subtropical waters of the Indo-Pacific. It is occasional in all Taiwanese waters but mainly in the south.

Genus *Megalaspis* Bleeker, 1851

Megalaspis Bleeker, 1851: 342 (type species: *Megalaspis rottleri* Bleeker, 1852 = *Scomber cordyla* Linnaeus, 1758).

A monotypic genus.

Megalaspis cordyla (Linnaeus, 1758)

(Fig. 47)

Scomber cordyla Linnaeus, 1758: 298 (America).

Megalaspis cordyla: Jordan and Richardson, 1909: 178; Suzuki, 1962: 227; Shen et al., 1993: 338.

Materials: ASIZP 054441, 6 specimens, 78-113 mm FL, 8 Aug. 1969, Nanfangao; ASIZP 055739, 1 specimen, 298 mm FL, 15 Nov. 1981, Hengchun; NTUM 06829, 2 specimens, 265-325 mm FL, 15 Feb. 1987, Penghu.

Diagnosis: D. VIII, I + 11-12 + 7-8 (finlets); A. II, I + 9 + 7 (finlets); P. i + 20-21; G.R. 9 + 20; CLS. 25-29; SLS. 48-52 all scales. Caudal peduncle strongly compressed with a marked medial keel. Adipose eyelid well developed, leaving a slit at middle of eye. Scales on straight lateral line totally developed into extremely deep scutes. Breast naked ventrally halfway up to pectoral base (Fig. 1s).

Distribution: Widely distributed in warm seas of the Indo-Pacific. It is very common in all Taiwanese waters, especially in the west.

Genus *Parastromateus* Bleeker, 1865

Apolectus Cuvier, in Cuvier and Valenciennes, 1832: 438 (type species: *Apolectus stromateus* Cuvier, in Cuvier and Valenciennes, 1832).

Parastromateus Bleeker, 1865: 174 (type species: *Stromateus niger* Bloch, 1786).

A monotypic genus.

Parastromateus niger (Bloch, 1795)

(Figs. 48, 49, 50)

Stromateus niger Bloch, 1795: 93, pl. 422.

Apolectus niger: Jordan and Evermann, 1902: 338; Witzell, 1977: 72.

Parastromateus niger: Bleeker, 1865: 174; Masuda et al., 1984: 157; Yamada and Nakabo, 1986: 1; Shen et al., 1993: 339.

Materials: ASIZP 056853, 1 specimen, 203 mm FL, 20 May 1993, Kaohsiung; ASIZP 056936, 1 specimen, 239 mm FL, 6 Dec. 1992, Tahsi.

Diagnosis: D. I + 40-43; A. I + 34-37; P. i + 20; G.R. 6 + 13-14; CLS. 57-68; SLS. 4-6 scales, 19 scutes; vertebrae 10 + 14. Adipose eyelid feebly developed. Scales small and deciduous, and almost completely covering dorsal and anal fins. Lateral line very weakly arched anteriorly; straight part of lateral line with 19 weak scutes, forming a slight keel on caudal peduncle. 1st dorsal- and free anal-fin spines weak, embedded and not apparent in adults; pelvic fins long in young, absent in adults.

Distribution: Widely distributed in the Indo-Pacific. It is an abundant species of carangid fishes in Taiwanese waters, especially in the west.

Genus *Pseudocaranx* Bleeker, 1863

Pseudocaranx Bleeker, 1863: 82 (type species: *Scomber dentex* Bloch and Schneider, 1801).

There are 3 species in the world (Laroche et al. 1984); only 1 species is found in Taiwan.

Pseudocaranx dentex (Bloch and Schneider, 1801)

(Fig. 51)

Scomber dentex Bloch and Schneider, 1801: 30 (Brazil).

Pseudocaranx dentex: Gushiken, 1983: 192; Smith-Vaniz, 1986(b): 833; Chen and Yu, 1986: 521; Smith-Vaniz and Randall, 1994: 323.

Materials: ASIZP 056927, 1 specimen, 244 mm FL, 17 Sept. 1993, Tahsi; ASIZP 056929, 1 specimen, 266 mm FL, 21 Nov. 1983, Checheng.

Diagnosis: D. VIII, I + 25; A. II, I + 21-22; P. i + 20; G.R. 12-13 + 25-26; CLS. 85-86; SLS. 10-13 scales, 23-28 scutes; vertebrae 10 + 15. Villiform teeth in a triangular patch on vomer and in a band on palatines and tongue; but in adults, vomer toothless. Breast completely scaly except for a small naked patch on anterior of belly. Anterior rays of 2nd dorsal and anal fins not elevated, and terminal ray of each fin enlarged and a little separated from adjacent rays, but not detached.

Distribution: Widely distributed in subtropical and temperate waters of the Indo-Pacific and Atlantic. It is occasionally in eastern Taiwanese waters.

Genus *Selar* Bleeker, 1851

Selar Bleeker, 1851: 352 (type species: *Caranx boops* Cuvier, 1833).

Trachurops Gill, 1862: 431 (type species: *Scomber plumieri* Bloch, 1797 = *Scomber crumenophthalmus* Bloch, 1793).

There are 2 species in the world, but only 1 species has been found in Taiwan. *Selar boops* has been reliably reported from Okinawa and tropical western Pacific Ocean, so it could be found in Taiwanese coastal waters, and we included it in the key.

Key to species of the genus *Selar* in waters around Taiwan

- 1a. Scutes strong, 43-46; curved lateral line short, strongly arched prior to junction with straight lateral line below origin of soft dorsal fin (*S. boops*)
- 1b. Scutes moderate, 31-40; curved and straight lateral line approximately equal in length, curved lateral line declining gently to junction with straight lateral line below 10th-12th soft dorsal fin ray *S. crumenophthalmus*

***Selar crumenophthalmus* (Bloch, 1793)**
(Fig. 52)

Scomber crumenophthalmus Bloch, 1793: 77, pl. 343 (Acara, Guinea).

Selar crumenophthalmus: Fowler, 1928: 144; Smith-Vaniz, 1986a: 656; Shen et al., 1993: 340; Smith-Vaniz, 1995: 973.

Materials: ASIZP 054458, 2 specimens, 188-248 mm FL, 6 Jan. 1990, Nanfangao; ASIZP 056719, 2 specimens, 170-203 mm FL, 17 Feb. 1993, Tung kang; NTUM 06242, 2 specimens, 60-90 mm FL, 24 July 1978, Tung kang.

Diagnosis: D. VIII, I + 24-26; A. II, I + 21-23; P. i + 19-20; G.R. 10-12 + 27-28; CLS. 54-58; SLS. 3-10 scales, 31-36 scutes; vertebrae 10 + 14. Adipose eyelid well developed, leaving a vertical slit centered on pupil. Pectoral girdle margin with a deep furrow, a large papilla immediately above it, and a smaller papilla near upper edge. Lateral line with slight arch, becoming straight below 10th-12th rays of 2nd dorsal fin. No finlets. Breast completely scaly.

Distribution: A circumtropical species. It is very common in all Taiwanese waters, especially from the west to the south.

Genus *Selaroides* Bleeker, 1851

Selaroides Bleeker, 1851: 352 (type species: *Caranx leptolepis* Cuvier, 1833 by monotype).

A monotypic genus.

***Selaroides leptolepis* (Cuvier, 1833)**
(Fig. 53)

Caranx leptolepis Cuvier, in Cuvier and Valenciennes, 1833: 63 (Java).

Selaroides leptolepis Bleeker, 1851: 343; Suzuki, 1962: 188; Shen et al., 1993: 340, pl. 93-1.

Materials: ASIZP 056691, 2 specimens, 142-147 mm FL, 5 Apr. 1974, Chungchou; ASIZP 056933, 3 specimens, 119-154 mm FL, Tung kang; NTUM 04366, 1 specimen, 160 mm FL, 29 Aug. 1983, Makung.

Diagnosis: D. VIII, I + 24-26; A. II, I + 20-22; P. i + 18-19; G.R. 12 + 27-30; CLS. 45-48; SLS. 14-18 scales, 26-29 scutes; vertebrae 10 + 14. Adipose eyelid fairly developed, leaving on anterior half of eye. Minute teeth in anterior portion of lower jaw, none in upper jaw, palatines, or vomer; rudimentary on tongue. Breast scaly. Pectoral girdle without groove. Finlets absent.

Distribution: Widely distributed in tropical and subtropical waters of the Indo-West Pacific. It is common in all Taiwanese waters, mainly in the southwestern part of Taiwan.

Genus *Trachurus* Rafinesque, 1810

Trachurus Rafinesque, 1810: 41 (type species: *Caranx suareus* Risso, 1833 = *Seriola picturata* Bowdich, 1825) (not seen).

There are 12 species in the world (Laroche et al. 1984), but only 1 species found in Taiwan.

Trachurus japonicus
(Temminck and Schlegel, 1844)
(Fig. 54)

Caranx trachurus japonicus Temminck and Schlegel, 1844: 109, fig. 1 (Japan).

Trachurus japonicus: Jordan et al., 1913: 128; Shen et al., 1993: 341.

Materials: ASIZP 054421, 2 specimens, 246-254 mm FL, 10 Nov. 1969, Nanfangao; ASIZP 054436, 2 specimens, 240-242 mm FL, 17 June 1969, Nanfangao; ASIZP 055467, 2 specimens, 269-270 mm FL, 6 Dec. 1979, Keelung.

Diagnosis: D. VIII, I + 31-33; A. II, I + 27-29; P. i + 18-19; G.R. 14-15 + 38-39; CLS. 38-39 all scutes; SLS. 34-36 all scutes; vertebrae 10 + 14. Adipose eyelid well developed, usually covering most of eye except for a vertical oval centered on pupil. Shoulder girdle margin with a small furrow at upper end, but no papillae present. Breast scaly. Scales on lateral line totally enlarged into deep scutes. Finlets absent.

Distribution: Confined to the western North Pacific. It is very common in Taiwanese waters, especially in the north and east.

Genus *Ulua* Jordan and Snyder, 1908

Ulua Jordan and Snyder, 1908: 39 (type species: *Ulua richardsoni* Jordan and Snyder, 1908 = *Caranx mentalis* Cuvier, 1833).

There are 2 species in the world. *Ulua aurochs* has previously been reported only from Australia and Southern Papua New Guinea, and its occurrence in Taiwan still needs to be reconfirmed because the specimens were collected from far-sea bottom trawler fishery harvest.

Key to species of the genus *Ulua* in waters around Taiwan

- 1a. Total gill rakers on 1st arch 19-20 + 38-41 = 57-61; scutes 36-41; tongue with central band of villiform teeth (*U. aurochs*)
- 1b. Total gill rakers on 1st arch 25-26 + 55-57 = 80-83; scutes 28-36; tongue without central band of villiform teeth *U. mentalis*

***Ulua aurochs* (Ogilby, 1915)**
(Figs. 55, 56)

Citula aurochs Ogilby, 1915: 79, pl. 25 (Edgecumbe Bay, Queensland).

Ulua aurochs: Gunn, 1990: 51.

Materials: ASIZP 056729, 2 specimens, 193-226 mm FL, 26 Aug. 1993, Kaohsiung; ASIZP 056849, 2 specimens, 176-271 mm FL, 20 Aug. 1993, Kaohsiung.

Diagnosis: D. VIII, I + 21; A. II, I + 17; P. i + 18-19; G.R. 19-20 + 38-41; CLS. 49-59 scales, 0-2 scutes; SLS. 0-1 scales, 36-41 scutes; vertebrae 10 + 14. Gill rakers numerous, extremely long and feather-like. Breast naked ventrally to behind pelvic fins; laterally naked area of breast extends to naked base of pectoral fin, including small area anteriorly just above pectoral-fin base (Fig. 1t). The 5th-8th rays of 2nd dorsal fin elongate and filamentous in male adults (absent in young and females). Lateral line becoming straight below 8th-9th rays of 2nd fin. Finlets absent.

Distribution: Previously reported only from north Australian and Gulf of Papua waters.

Remarks: The occurrence of *Ulua aurochs* in Taiwan waters requires additional confirmation; see discussion in abstract.

***Ulua mentalis* (Cuvier, 1833)**
(Figs. 57, 58)

Caranx mentalis Cuvier, in Cuvier and Valenciennes, 1833: 124 (Red Sea).

Ulua richardsoni Jordan and Snyder, 1908: 39.

Ulua mentalis: Gushiken, 1983: 250; Shen et al., 1993: 341.

Materials: ASIZP 056737, 1 specimen, 165 mm FL, 13 Nov. 1989, Hengchun; ASIZP 056852, 1 specimen, 230 mm FL, 18 Feb. 1993, Tungkang.

Diagnosis: D. VIII, I + 20-21; A. II, I + 17-18; P. i + 18-20; G.R. 25-26 + 55-57; CLS. 55-

63; SLS. 3-6 scales, 28-36 scutes; vertebrae 10 + 14. Lower jaw much longer than upper in adults. Breast naked ventrally to behind pelvic fins; laterally, naked area of breast extends to naked base of pectoral fin (Fig. 1u). Lateral line becoming straight below 10th-12th rays of 2nd dorsal fin. Middle rays of 2nd fin not extending to filament.

Distribution: Widely distributed in tropical waters of the Indo-West Pacific. It is occasionally found in eastern and southern Taiwanese waters.

Genus *Uraspis* Bleeker, 1855

Uraspis Bleeker, 1855: 418 (type species: *Uraspis carangoides* Bleeker, 1855 = *Caranx uraspis* Gunther, 1860).

Zamora Whitley, 1931: 108 (type species *Caranx hullianus* McCulloch, 1909 = *Caranx secundus* Poey, 1860 by original designation).

There are 3 species in the world (Laroche et al. 1984), 2 species are found in Taiwan.

Key to species of the genus *Uraspis* in waters around Taiwan

- 1a. Breast naked halfway up to pectoral-fin base (Fig. 1v) *U. helvola*
- 1b. Breast totally naked up to pectoral-fin base (Fig. 1w) *U. uraspis*

***Uraspis helvola* (Forster, 1801)**
(Figs. 59, 60, 61)

Scomber helvolus Forster, in Bloch and Schneider, 1801: 38 (probably Tahiti) (not seen).

Uraspis helvola: Shen et al., 1993: 342; Smith-Vaniz: 1995, 986.

Materials: ASIZP 056695, 2 specimens, 235-296 mm FL, 4 Apr. 1974, Chichin; NMSMP 483, 1 specimen, 193 mm FL, 7 July 1990, Tungkang.

Diagnosis: D. VII-VIII (posterior 1 embedded and not apparent), I + 28-29; A. 0 (detached spines embedded and not apparent), I + 21-22; P. i + 20-21; G.R. 5-6 + 14-15; CLS. 54-66 scutes; SLS. 33-37 all scutes; vertebrae 10 + 14. Adipose eyelid rudimentary. Breast naked ventrally to origin of pelvic fins; laterally, naked area of breast separated from naked base of pectoral fin by a broad band of scales (Fig. 1v). Lateral line running to below 12th-13th rays of 2nd dorsal fin. Posterior 1-3 spines of 1st dorsal fin embedded and not apparent with growth; free anal spines only existing in juveniles.

Distribution: Widely distributed in warm waters of the Indo-Pacific. It is occasionally in southern Taiwanese waters.

***Uraspis uraspis* (Günther, 1860)**
(Fig. 62)

Caranx uraspis Günther, 1860: 444.

Uraspis uraspis: Gushiken, 1983: 206; Shen et al., 1993: 342.

Materials: ASIZP 055463, 1 specimen, 204 mm FL, 19 Dec. 1979, Tung kang; ASIZP 055464, 2 specimens, 239-252 mm FL, 15 Dec. 1979, Tali; NTUM 07283, 1 specimen, 240 mm FL, 10 Aug. 1987, Nanfangao.

Diagnosis: D. VII-VIII (posterior 1 or 2 embedded and not apparent), I + 25-27; A. 0 (detached spines embedded and not apparent), I + 20; P. i + 20-21; G.R. 5-6 + 13-16; CLS. 73-80 scales, 0-4 scutes; SLS. 36-39 all scutes; vertebrae 10 + 14. Breast naked ventrally to origin of pelvic fin; laterally, naked area of breast extending to naked base of pectoral fin (Fig. 1w). Lateral line with slight arch becoming straight below 15th-16th rays of 2nd dorsal fin.

Distribution: Distributed in tropical waters of the Indo-West Pacific. It is occasionally found in eastern to southern Taiwanese waters.

Subfamily Naucratine

There are 4 genera, and 13 species in the world (Laroche et al. 1984), of which 4 genera, and 5 species have been confirmed in Taiwan.

Key to genera of the subfamily Naucratine in waters around Taiwan

- 1a. A terminal 2-rayed finlet present in dorsal and anal fins *Elagatis*
- 1b. No finlets in dorsal and anal fins 2
- 2a. Upper jaw broadly rounded at end and maxilla extending to below posterior margin of eye; gill rakers on 1st arch consisting of rudiments *Seriolina*
- 2b. Upper jaw truncate or slightly rounded at end and maxilla extending to below anterior margin of eye to middle of eye; gill rakers normal 3
- 3a. First dorsal-fin spines 4 or 5; anal-fin rays 15 to 17; cutaneous keel laterally on caudal peduncle well developed *Naucrates*
- 3b. First dorsal-fin spines 7 or 8; anal-fin rays 18 to 22; cutaneous keel on caudal peduncle absent or moderately developed *Seriola*

Genus *Elagatis* Bennett, 1840

Elagatis Bennett, 1840: 283 (type species: *Elagatis bipinnulatus* Bennett, 1840 = *Seriola bipinnulata* Quoy and Gaimard, 1824).

A monotypic genus.

Elagatis bipinnulata
(Quoy and Gaimard, 1825)
(Figs. 63, 64)

Seriola bipinnulata Quoy and Gaimard, 1825: 363, pl. 61, fig. 3 (Keeling Is., New Guinea) (not seen).

Elagatis bipinnulatus: Jordan et al., 1913: 127; Shen et al., 1993: 338.

Elagatis bipinnulata: Wakiya, 1924: 233; Smith-Vaniz, 1986b: 830.

Materials: ASIZP 054648, 1 specimen, 315 mm FL, 1 Oct. 1973, Chichin; ASIZP 056420, 1 specimen, 99 mm FL, 31 May 1979, Wanlitung; ASIZP 056926, 1 specimen, 240 mm FL, 17 Sept. 1993, Tahsi.

Diagnosis: D. VI, I + 25-27 (including finlet); A. I, I + 18-19 (including finlet); P. i + 18-19; G.R. 9 + 26; vertebrae 10 + 14. Maxilla not extending to anterior border of eye. A cutaneous keel on each side of caudal peduncle developed in adults, but not developed in young. A 2-rayed terminal finlet present in 2nd dorsal and anal fins.

Distribution: A circumtropical marine species, commonly found in Taiwanese waters, especially in eastern Taiwan.

Genus *Naucrates* Rafinesque, 1810

Naucrates Rafinesque, 1810: 44 (type species: *Naucrates fanfarus* Rafinesque, 1810 = *Gasterosteus ductor* Linnaeus, 1758).

Naucratus Valenciennes, in Cuvier and Valenciennes, 1833: 247 (type species: *Nauclerus compressus* Valenciennes, 1833 = *Gasterosteus ductor* Linnaeus, 1758).

A monotypic genus.

***Naucrates ductor* (Linnaeus, 1758)**
(Fig. 65)

Gasterosteus ductor Linnaeus, 1758: 295.

Naucrates ductor Cuvier, in Cuvier and Valenciennes, 1832: 312; Gushiken, 1983: 142; Shen et al., 1993: 339; Smith-Vaniz, 1995: 969.

Materials: ASIZP 054624, 1 specimen, 180 mm FL, 5 Apr. 1974, Kaohsiung; ASIZP 056728, 1 specimen, 204 mm FL, 26 May 1991, Tunghsiao; NMSMP 485, 1 specimen, 238 mm FL, 9 July 1990, Tunghsiao.

Diagnosis: D. IV-V, I + 26-28; A. II (rudimentary with growth), I + 17; P. i + 18; G.R. 6 + 16; vertebrae 10 + 15. A cutaneous keel on each side of caudal peduncle well developed even in a relatively young stage. 1st dorsal-fin spines not connected by membranes, except in very young. Finlet absent.

Distribution: A circumtropical marine species. It is rare and only found in southwestern Taiwanese waters.

Genus *Seriola* Cuvier, 1817

Seriola Cuvier, 1817: 315 (type species: *Caranx dumerili* Risso, 1810).

There are 9 species in the world (Laroche et al. 1984); only 2 species are found in Taiwan. *Seriola lalandi* has an antitropical distribution, occurring in Okinawa and Australia, so its occurrence in Taiwan at least on occasion is highly likely. *S. quinqueradiata* is endemic to Japan, Okinawa, and the northern Hawaiian Islands; whether it occasionally extends southward to Taiwanese waters is uncertain, but it is possible. We included them in the key.

Key to species of the genus *Seriola* in waters around Taiwan

- 1a. Snout pointed; maxilla not extending beyond anterior border of pupil; precaudal vertebrae 11 2
- 1b. Snout blunt; maxilla extending beyond anterior border of pupil; precaudal vertebrae 10 3
- 2a. Maxilla with acute dorso-posterior corner; pectoral fin subequal to pelvic fin; caudal vertebrae 13
..... (*S. quinqueradiata*)
- 2b. Maxilla with round dorso-posterior corner; pectoral fin shorter than pelvic fin; caudal vertebrae 14 .. (*S. lalandi*)
- 3a. Anterior rays of 2nd dorsal fin barely falcate, lower than length of pectoral fin; gill rakers on lower limb of 1st arch (including rudiments) 11-19 *S. dumerili*
- 3b. Anterior rays of 2nd dorsal fin falcate, higher than length of pectoral fin; gill rakers on lower limb of 1st arch (including rudiments) 22-26 *S. rivoliانا*

***Seriola dumerili* (Risso, 1810)**

(Figs. 66, 67, 68, 69)

Caranx dumerili Risso, 1810: 175, pl. 6, fig. 20 (Nice) (not seen).
Seriola dumerili Valenciennes, in Cuvier and Valenciennes, 1833: 201; Gushiken, 1983: 149; Shen et al., 1993: 340.
Seriola purpurascens Temminck and Schlegel, 1845: 113, pl. 61 (Japan); Oshima, 1925: 355 (Formosa).

Materials: ASIZP 055472, 1 specimen, 412 mm FL, 8 Dec. 1979, Keelung; NTUM 06628, 1 specimen, 298 mm FL, 1 Oct. 1985, Nanfangao.

Diagnosis: D. VII, I + 30-33; A. II, I + 19-21; P. i + 19-20; G.R. 3-7 + 11-16; vertebrae; 10 + 14. Maxilla extending to middle of eye, with round dorsal posterior corner. A cutaneous keel on each side of caudal peduncle developed in adults, but not developed in young. 1st dorsal fin composed of 5 to 7 spines connected by a membrane. Anterior rays of 2nd dorsal and of anal fins elevated, but shorter than length of pectoral fin. Finlet absent.

Distribution: Widely distributed in tropical and subtropical waters of the Indo-Pacific and Atlantic. It is very common in Taiwanese waters, especially in the east.

***Seriola rivoliانا* Valenciennes, 1833**

(Fig. 70)

Seriola Rivoliانا Valenciennes, in Cuvier and Valenciennes, 1833: 207 (Greek Archipelago).

Seriola bonariensis: Günther, 1860: 464; Shen, 1984: 259.

Seriola rivoliانا: Gushiken, 1983: 152; Chen and Yu, 1986: 522; Smith-Vaniz, 1995: 979.

Materials: ASIZP 054647, 2 specimens, 224-257 mm FL, 1 Oct. 1973, Chichin; ASIZP 056703, 1 specimen, 229 mm FL, 1 Oct. 1973, Kaohsiung; THUP 0123, 1 specimen, 367 mm FL, 11 Nov. 1960, Keelung.

Diagnosis: D. VII, I + 28-29; A. II, I + 19-20; P. i + 19-20; G.R. 7-8 + 18-19; vertebrae 10 + 14. The characters are very similar to *S. dumerili*, but anterior rays of 2nd dorsal and of anal fins falcate, and longer than the length of pectoral fin.

Distribution: A circumtropical marine species. It is rare and only found in northern and southern Taiwanese waters.

Genus *Seriolina* Wakiya, 1924

Seriolina Wakiya, 1924: 230 (type species: *Seriola intermedia* Temminck and Schlegel, 1845 = *Nomeus nigrofasciatus* Rüppell, 1829).

A monotypic genus.

***Seriolina nigrofasciata* (Rüppell, 1829)**

(Figs. 71, 72, 73)

Nomeus nigrofasciatus Rüppell, 1829: 82, pl. 24, fig. 1 (Red Sea) (not seen).

Seriolina intermedia: Wakiya, 1924: 230.

Seriolina nigrofasciata: Smith, 1959: 260; Shen et al., 1993: 340.

Materials: ASIZP 055347, 1 specimen, 139 mm FL, 25 July 1979, Kaohsiung; NTUM 0392, 1 specimen, 192 mm FL, 25 July 1983, Tahsi.

Diagnosis: D. VI-VII, I + 29-35; A. 0-I, I + 14-16; P. i + 17-19; G.R. 1-2 + 6-8; vertebrae 11 + 13. Maxilla extending to beyond posterior border of pupil and not dilated posteriorly. Gill rakers consisting of knob-like masses. A cutaneous keel on each side of caudal peduncle developed in adults but not developed in young. 1st dorsal fin composed of 5 to 7 spines connected by a membrane. Finlets absent.

Distribution: Widely distributed in tropical and subtropical waters of the Indo-West Pacific. It is common in all Taiwanese waters.

Subfamily Scomberoidinae

There are 3 genera in the world (Smith-Vaniz

and Staiger 1973), but only 1 genus is found in Taiwan.

Genus *Scomberoides* Lacépède, 1801

Scomberoides Lacépède, 1801: 50 (type species: *Scomberoides commersonnianus* Lacépède, 1801).

Chorinemus Cuvier, in Cuvier and Valenciennes, 1832: 367 (type species: *Scomberoides commersonnianus* Lacépède, 1801).

There are 4 recent and 1 fossil species in the world (Smith-Vaniz and Staiger 1973); 3 recent species are found in Taiwan.

Key to species of the genus *Scomberoides* in waters around Taiwan

- 1a. Lobe of dorsal fin uniformly dark; total gill rakers on 1st arch 8-15; maxilla extending far beyond posterior border of eye; scales on middle of body rhombic *S. commersonnianus*
- 1b. Distal half of dorsal-fin lobe dark; total gill rakers on 1st arch 21-27; maxilla not extending to beyond posterior border of eye 2
- 2a. Scales on middle of body lanceolate; in adults, maxilla extending to or slightly beyond posterior border of eye; in life, adults with a double series of dusky and roundish blotches above and below lateral line *S. lysan*
- 2b. Scales on middle of body slender; in adults, maxilla not extending to posterior border of eye; in life, adults with a single series of oval dark blotches on sides, the first 4 or 5 intersecting lateral line *S. tol*

Scomberoides commersonnianus Lacépède, 1801 (Fig. 74)

Scomberoides commersonnianus Lacépède, 1801: 50 (Madagascar); Smith-Vaniz and Staiger, 1973: 194; Shen et al., 1993: 339.

Materials: ASIZP 056725, 1 specimen, 220 mm FL, 12 Sept. 1993, Budai; NTUM 06654, 215 mm FL, 16 Nov. 1986, Tungkang.

Diagnosis: D. VII, I + 20; A. II, I + 17-18; P. i + 18; G.R. 2-4 + 11-13; vertebrae 10 + 16. Adipose eyelid feebly developed. Maxilla extending well beyond posterior border of eye. Scales on middle of body lanceolate. No scutes. No caudal peduncle grooves. Posterior soft dorsal-and anal-fin rays consisting of semidetached finlets.

Distribution: Widely distributed in tropical and subtropical waters of the Indo-West Pacific. It is common in all Taiwanese waters, especially in western Taiwan.

Scomberoides lysan (Forsskål, 1775) (Figs. 75, 76)

Scomber lysan Forsskål, 1775: 54 (Red Sea).

Scomberoides lysan: Smith-Vaniz and Staiger, 1973: 205; Chen and Yu, 1986: 523.

Materials: ASIZP 056422, 1 specimen, 174 mm FL, 13 Dec. 1984, Nanwan; ASIZP 056726, 1 specimen, 265 mm FL, 12 Sept. 1993, Budai.

Diagnosis: D. VII, I + 19-20; A. II, I + 17-18; P. i + 17-18; G.R. 7-9 + 17-18; vertebrae 10 + 16. Maxilla extending to posterior border of eye. Scales on middle of body lanceolate. Lateral line a little angulated above pectoral fin.

Distribution: Widely distributed in tropical and subtropical waters of the Indo-West Pacific. It is common in all Taiwanese waters, especially in western Taiwan.

Scomberoides tol (Cuvier, 1832) (Figs. 77, 78)

Chorinemus tol Cuvier, in Cuvier and Valenciennes, 1832: 385 (Pondichery, etc.).

Scomberoides tol: Jordan and Richardson, 1909: 178; Smith-Vaniz and Staiger 1973: 209; Shen et al., 1993: 339.

Materials: ASIZP 055417, 1 specimen, 218 mm FL, 18 Oct. 1979, Tungkang; ASIZP 056690, 1 specimen, 269 mm FL, 31 Mar. 1977, Chichin; NTUM 06830, 3 specimens, 265-275 mm FL, 15 Feb. 1987, Penghu.

Diagnosis: D. VII, I + 19-20; A. II, I + 18-19; P. i + 16-17; G.R. 6-7 + 17-18; vertebrae 10 + 16. Maxilla extending to posterior border of pupil. Scales on middle of body slender and needle-like. Lateral line slightly arched above pectoral fin.

Distribution: Widely distributed in tropical and subtropical waters. It is common in all Taiwanese waters, especially in the west.

Subfamily Trachinotinae

Smith-Vaniz and Staiger (1973) concluded that the phylogenetic relationship of *Hypacanthus* (= *Lichia*) was uncertain and that it might require its own subfamily if the family classification then in use for the Carangidae was adopted. In a subsequent study of carangid relationships, Smith-Vaniz (1984b) assigned this genus plus *Trachinotus* to the Tribe Trachinotini (which we here recognize as the subfamily Trachinotinae). Only the genus *Trachinotus* occurs in Taiwan.

Genus *Trachinotus* Lacépède, 1801

Genus *Trachinotus* Lacépède, 1801: 78 (type species: *Scomber falcatus* Forsskål, 1775 = *Caesiomorus blochii* Lacépède, 1801).

There are 20 species in the world (Laroche et

al. 1984); only 3 species are found in Taiwan, including 1 new record of the species *T. anak*.

Key to the species of the genus *Trachinotus* in waters around Taiwan.

- 1a. Depth of body higher than 1/2 length of body; gill rakers of lower limb on 1st arch (including rudiments) 7-10; no spots on body at any stage 2
 1b. Depth of body lower than 1/2 length of body; gill rakers of lower limb on 1st arch (including rudiments) 16-17; spots on sides in adults, absent on small specimens
 *T. baillonii*
 2a. 1st supraneural bone (predorsal) shaped like an inverted teardrop or oval-shaped or round; lobe of anal fin brown or orange *T. blochii*
 2b. 1st supraneural bone shaped like an inverted "L" with the arm projecting forward; lobe of anal fin yellow... *T. anak*

***Trachinotus anak* (Ogilby, 1909)**

Trachinotus anak Ogilby, 1909: 19 (Queensland).

Material: FMNH 55290, 1 specimen, 596 mm FL, 1906, Takao (Collected by Dr. Hans Sauter).

Diagnosis: D. VI, I + 19; A. II, I + 17; P. i + 18; G.R. 6 + 10; vertebrae 10 + 14 (data from the personal letter of Dr. Smith-Vaniz 1997). Body ovate-elliptical, the dorsal profile more arched than the ventral. Head deeper than long; snout obtusely rounded and slightly prominent; maxillary extends to below the middle of eye. Lateral line curving slightly upward above the pectoral, the anterior half undulous, the posterior straight (Ogilby 1909). No teeth in mouth. No scutes. No finlets. 1st predorsal bone (supraneural) shaped like an inverted "L" with the arm projecting anteriorly; supraoccipital bone of skull thin and bladelikey in adults; preorbital and nasal bones hyperossified in specimens larger than ca. 30 cm FL (Smith-Vaniz in prep.). Color in life, dark blue above, silvery white below; no spots on sides. 2nd dorsal and caudal fins dusky orange to nearly black, leading edges and fin tips darkest; anal fin bright to dirty yellow, lobe without a brownish anterior margin (Smith-Vaniz in prep.).

Distribution: Probably an antitropical species since it has been recorded only from Australia and eastern Taiwan. It is quite rare in Taiwan.

Remarks: The occurrence of this species in Taiwan was reconfirmed by Smith-Vaniz. He also kindly provided his counting data of the Taiwanese specimen and added diagnostic characters of the hyperostosis and color pattern of this species.

***Trachinotus baillonii* (Lacépède, 1801)**
(Figs. 79, 80)

Caesiomorus baillonii Lacépède, 1801: 39, pl. 3, fig. 1 (Madagascar).

Trachinotus baillonii: Oshima, 1925: 407; Gushiken, 1983: 164; Shen et al., 1993: 341.

Materials: ASIZP 056875, 1 specimen, 255 mm FL, 13 Dec. 1993, Chengkung; THUP 01981, 1 specimen, 225 mm FL, 2 Apr. 1963, Tainan; NMSMP 660, 1 specimen, 117 mm FL, 25 Jan. 1991, Wuchi, by gill net.

Diagnosis: D. VI, I + 22-24; A. II, I + 21-22; P. i + 17-18; G.R. 9 + 16; vertebrae 10 + 14. Body oblong. Head small, snout pointed. Maxilla extending beyond anterior border of pupil. Villiform teeth in bands on jaws, in a triangular patch on vomer, and in a band on palatines; none on tongue. No scutes. No finlets. Caudal fin deeply forked with long and pointed lobes.

Distribution: Widely distributed in tropical and temperate waters of the Indo-Pacific. It is an occasional species, mainly found in eastern Taiwanese waters.

***Trachinotus blochii* (Lacépède, 1801)**
(Figs. 81, 82)

Caesiomorus blochii Lacépède, 1801: 95, pl. 3, fig. 2 (Madagascar).

Trachinotus blochii: Cuvier, in Cuvier and Valenciennes 1832: 425; Gushiken, 1983: 162; Shen et al., 1993: 341.

Materials: ASIZP 056736, 1 specimen, 263 mm FL, 18 Apr. 1990, Tungkang; ASIZP 056930, 1 specimen, 249 mm FL, 20 Aug. 1993, Kaohsiung, by aquaculture.

Diagnosis: D. V-VI, I + 18-19; A. II, I + 16-17; P. i + 17-18; G.R. 6-7 + 8-9; vertebrae 10 + 14. Body deep, ovate and compressed. Snout blunt. Maxilla extending beyond anterior border of pupil. Villiform teeth on jaws, vomer, and palatines, but rudimentary with growth; toothless on tongue. Lateral line slightly arched. 1st predorsal (supraneural) bone like an inverted teardrop or oval shaped; supraoccipital bone of skull thin and bladelikey in adults. Color in life, head and body silvery, blue gray above, paler below. 2nd dorsal fin dark, lobe of fin dusky orange; anal fin dusky to dirty orange, lobe with a brownish anterior margin; caudal fin dark to dirty orange, leading edges of fin darkest (Smith-Vaniz in prep.).

Distribution: Widely distributed in tropical waters of the Indo-West Pacific from southern Japan to northern Australia and eastward to the Marshall Islands. It is very common in all Taiwanese waters.

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臺灣附近海域之鰺科魚類兼記四種新記錄種

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本研究報導臺灣產的鰺科魚類，共計 4 亞科 22 屬 54 種。其中裸胸若鰺(*Carangoides gymnostethus*)、白舌若鰺(*C. talamparoides*)、藍點鰺(*Caranx bucculentus*)及鯧鰺(*Trachinotus anak*)等共四種為臺灣之新記錄種。過去文獻記錄之綠真鰺(*Trachurus declivis*)應為真鰺(*T. japonicus*)之誤鑑，下列八種過去臺灣文獻曾記載過之鰺：金點平鰺(*Carangoides bajad*)、橫紋平鰺(*C. plagiotaenia*)、紅帶鰺(*Decapterus muroadsi*)、麗葉鰺(*Alepes para* = "*A. kleinii*")、黑鰭鰺(*A. melanoptera*)、牛眼鰺(*Selar boops*)、青甘鰺(*Seriola quinqueradiata*)及金帶鰺(*S. lalandi*)等雖為有效種，但因標本迄今尚未採獲，因此在本文中並未描述及計入其種數，但仍將其鑑別特徵列入檢索表中，以利讀者未來鑑定之參考。又肩斑若鰺(*C. humerosus*)及黑冠羽鰹鰺(*Ulua aurochs*)兩種雖在漁市場有採獲標本，但因它們係採自遠洋漁船之漁獲，可能並不產於臺灣附近水域，故此二種暫不計入臺灣魚種名錄之中。此外在過去文獻中同種異名或種名誤用之情形，在文中亦予訂正。本文中除備檢索表、特徵、描述、備註外，並附有彩色標本照以利學者參考。

關鍵詞：鰺，魚類相，臺灣，新記錄，地理分布。

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