

SNAPPING SHRIMPS (CRUSTACEA: DECAPODA: ALPHEIDAE) OF TAIWAN

MING-SHIOU JENG AND KUN-HSIUNG CHANG

Institute of Zoology, Academia Sinica,
Taipei, Taiwan, Republic of China

(Received March 22, 1985)

Ming-Shiou Jeng and Kun-Hsiung Chang (1985) Snapping Shrimps (Crustacea: Decapoda: Alpheidae) of Taiwan. *Bull. Inst. Zool., Academia Sinica* 24(2): 241-256. Twenty-two alpheid species belonging to four genera were recorded from the surrounding waters of Taiwan and the Peng-Hu (Pescadores) Islands. They are *Betaeus granulimanus* Yokoya, *Synalpheus stimpsoni* (De Man), *Metalpheus paragracilis* (Coutière), *Alpheus lottini* Guérin, *A. gracilis* Heller, *A. splendidus* Coutière, *A. collumianus* Stimpson, *A. obesomanus* Dana, *A. paracrinitus* Miers, *A. mitis* Dana, *A. sulcatus* Kingsley, *A. bidens* (Olivier), *A. diadema* Dana, *A. distinguendus* De Man, *A. brevicristatus* De Haan, *A. savuensis* De Man, *A. pacificus* Dana, *A. euphrosyne* De Man, *A. leviusculus* Dana, *A. lobidens* De Haan, *A. bisincisus* De Haan, *A. edwardsii* (Audouin). Among them, nineteen species are first records in Taiwan, only *A. lobidens*, *A. distinguendus*, and *A. brevicristatus* have been reported previously. The habitat, distribution and diagnostic characters of each species were briefly described in the text with the color photos for each species. A diagnostic key to identify these species is also provided.

Except Banner and Banner (1984) who reported *Alpheus brevicristatus* De Haan, *A. lobidens* De Haan, and *A. distinguendus* De Man which were collected by H. Sauter at Takao, Formosa (Kaohsiung, Taiwan) in 1907 and deposited in the Zoologisches Museum (East Berlin), there are no other systematic or distributal studies on the alpheid shrimps in Taiwan.

This paper is the first report of our recent investigation on the alpheid shrimps from the waters around Taiwan and Peng-Hu. Most of these twenty-two identifiable species were collected from the intertidal zone. Two species of *A. distinguendus* De Man and *A. brevicristatus* De Haan were bought from the fish market. The *Synalpheus stimpsoni* (De Man) is associated with sea-lilies (crinoids); and several other species living in the coral head were collected from the

subtidal zone. *A. lobidens* De Haan and *A. euphrosyne* De Man, were the only two species collected from the estuary of Tam-shui river.

The snapping or pistol shrimp were included in a single family, Alpheidae. They are the most abundant organism in the infraorder of marine Caridea in the Indo-Pacific region. Nevertheless, the family needs a thorough revision since the identification of each species is difficult and sometime impossible. Banner and Banner (1973, 1975, 1982) is the only one who has provided the keys, descriptions, illustration, and references of most important species in the world. Their publications are very useful to us since many of our specimens can be identified to species according to their detail descriptions.

MATERIALS AND METHODS

All specimens were collected from both

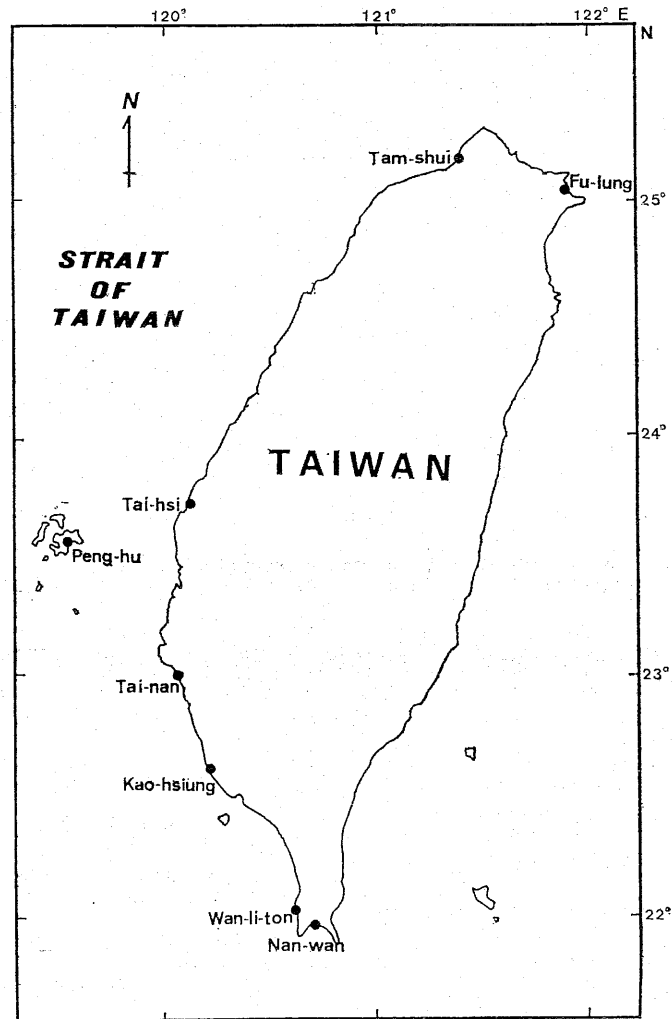


Fig. 1. Map of Taiwan showing collecting stations.

of the intertidal and subtidal zone from Taiwan and Peng-Hu (Pescadores). The collecting sites are indicated on Fig. 1.

The sampling methods are various. For the specimens in the subtidal zone, most of them were collected indirectly from broken live or dead coral heads, which was collected by using SCUBA diving technique. A few specimen which living associate with other marine invertebrate were collected along with their symbionts. For the specimens in the intertidal zone, they were collected by hand net or by using rotenone. If the bottom has sandy patch, we rolled over the rocks or by digging method. For the shrimp grass or eel

grass bed, we used the small shrimp trawl.

The colour slides of the above collected specimens were taken firstly to record their color pattern. Their body lengths were measured from the tip of the rostrum to the end of the telson with the specimen laid as straight as possible. Specimens were preserved in a solution of 70:10:20 ratio of ethanol-glycerine-water, and deposited in the laboratory of marine biology, Institute of Zoology, Academia Sinica.

Systematic accounts

Key to Species of the Alpheidae of Taiwan.

1. Rostrum absent, extended front of carapace rounded in dorsal view.....
.....*Betaeus granulimanus*
Rostrum present, of various developments..... 2
2. With pterygostomial margin rounded, never angular; usually with anal tubercles..... 3
With pterygostomial margin usually produced; without anal tubercles.....
.....*Synalpheus stimpsoni*
3. Third maxilliped with basal article expanded and flattened.....
.....*Metalpheus paragracilis*
Third maxilliped with trigonal, not flattened, basal article..... 4
4. Large chela with at most a depressed area on lower margin, never with a shoulder..... 5
Large chela with definite shoulder on inferior margin proximal to base of fixed finger..... 17
5. With acute teeth on a anterior portions of orbital hoods or margins between hoods and rostrum..... 6
Neither anterior orbital hoods nor orbitorostral margins with teeth, but orbital hoods may bear anterior keels or posterior teeth..... 8
6. Rostral base between eyes abruptly set off from orbitorostral grooves, at times overhanging them..... *A. lottini*
Rostral base between eyes gradually curving into orbitorostral grooves 7
7. Orbital teeth arising from margin of hoods.....*A. gracilis*
Orbital teeth arising from anterodorsal surface of hoods, not margins.....
..... *A. splendidus*
8. With heavy, acute teeth flanking dactylar articulation of large chela.....
..... *A. collumianus*
Without acute teeth flanking dactylar articulation or large chela..... 9
9. Large chela rounded or at most slightly compressed in section, entire or with slight sculpturing..... 10
Large chela, if rounded in section, with definite grooves; otherwise, laterally compressed, with or without sculpturing..... 12
10. Dactylus of large chela either tapering to tip, or heavy and rounded, but not in shape of a double headed hammer... 11
Dactylus of large chela in form of a rounded double headed hammer.....
..... *A. obesomanus*
11. Merus of large cheliped with heavy, acute subterminal tooth on inferior internal margin.....*A. paracrinatus*
Merus of large cheliped with or without terminal tooth on inferior margin, never with tooth located subterminally.....*A. mites*
12. Large chela oval to rounded compressed in section..... 13
Large chela compressed, quadrangular in section..... 15
13. Large chela with dense and conspicuous setae, especially on inner face.....
.....*A. sulcatus*
Large chela bearing at most scattered setae on inner face..... 14
14. With conspicuous flattened teeth mesad of posterior portions of orbital hood.....
..... *A. bidens*
Dorsal surface of carapace not bearing teeth..... *A. diadema*
15. Large chela marked with a transverse groove near the base of movable finger..... 16
Large chela without a transverse groove near the base of movable finger.....
.....*A. distinguendus*
16. In small chela of both sexes fingers gaping..... *A. brevicristatus*
In small chela of both sexes fingers not gaping..... *A. savuensis*
17. Neither male nor females with balaeniceps crests of hairs on dactylus of small chela..... *A. pacificus*
With male only or with both sexes bearing balaeniceps crests of hair on dactylus of small chela....., 18

18. Proximal shoulder of superior saddle of large chela rounded to abrupt, not overhanging groove19
 Proximal shoulder of superior saddle of large chela rounded to acute and overhanging floor of groove..... 21
19. Dactylus of third leg somewhat flattened to definitely subspatulate
 *A. euphrosyne*
 Dactylus of third leg simple and conical.
20
20. Superior saddle of large chela extending into lateral face as narrow U-shaped groove..... *A. leviusculus*
 Superior saddle of large chela extending into a well marked triangular depression
 *A. lobidens*
21. Rostrum and rostral triangle on carapace flattened dorsally..... *A. bisincisus*
 Rostrum and rostral triangle rounded dorsally.....*A. edwardsii*

Genus *Betaeus* Stimpson, 1852

1. *Betaeus granulimanus* Yokoya, 1927

Fig. 2

Betaeus granulimanus Yokoya, 1927: 173; Miya, 1972: 30.

Betaeus yokoyai Kubo, 1936: 50.

Materials: 1 male, 29 mm TL; Nov. 18, 1981, Nan-wan.

Diagnosis: Upper frontal margin not projecting into rostrum, but with a notch which is followed by a shallow groove. Orital hoods slightly projecting and forming both sides of the notch. The pterygostomial angle of the carapace is round. The first pereopods very robust and granulated, and have chela of the inverted type.

Remarks: Specimen collected from lower tidal zone of rocky shore.

Genus *Synalpheus* Bate, 1888

2. *Synalpheus stimpsoni* (De Man, 1888)

Fig. 3

Synalpheus stimpsoni Banner and Banner, 1966b: 46; 1968: 274; 1975: 292.

Synalpheus amboinae De Man, 1911: 203.

Synalpheus striatus Kubo, 1938: 89; Miya, 1972: 47.

Materials: 1 female, 34 mm TL, 2 male, 27 and 23 mm TL, Feb. 13, 1985, Wan-li-ton.

Diagnosis: Rostrum broadly triangular, slender acute tip reaching beyond the second antennular article, with slight rounded carina reaching from tip to level of eyes. Large chela is slightly compressed and smooth, bearing acute tooth above dactylar articulation. Third leg slender and covered with moderately thick setae on all articles save the ischium.

Remarks: Three specimens collected from two individuals of black crinoids a depth of 12 meters off Wan-li-ton. The colour of this species occurring on crinoids varies with the colour of the host (Banner and Banner, 1975). Thus, our specimens are black in colour.

Genus *Metalpheus* Coutière, 1908

3. *Metalpheus paragracilis* (Coutière, 1897)

Fig. 4

Metalpheus pagracilis Banner and Banner and Banner, 1982: 282.

Crangon paragracilis Banner, 1953: 96.

Materials: 16 specimens, 5-14 mm TL, Jan. 10, 1985, Wan-li-ton.

Diagnosis: Rostrum acute, reaching to the end of first antennular article, with slightly rounded carina; lateral margins with a few setae. Large chela compressed, fingers occupying distal third. Small chela without sexual dimorphism. Ischium of third leg unarmed, distally armed with an acute tooth on inferodistal angle. Second pleopod of male with elongate appendix masculina. Propodactylar articulation bearing small extra sclerite.

Remarks: Specimens came from a dead coral head at the depth of 5 meters off Wan-li-ton.

Genus *Alpheus* Fabricius, 17984. *Alpheus lottini* Guérin, 1829

Fig. 5

Alpheus lottini Banner and Banner, 1966b: 91; 1982: 65.

Crangon ventrosa Banner, 1953: 83.

Materials: 4 specimens, 20–36 mm TL, Sept. 1984 to Jan. 1985, Nan-wan; 4 specimens, 24–32 mm TL, Jan. 10, 1985, Wan-li-ton.

Diagnosis: Rostral base broad, flattened, not carinate dorsally, continuing to well behind eyes and separated from carapace by deep and narrow groove on each side. Superior margins of third maxilliped bearing coarse setae distally. Dactylus heavy, blunt, laterally compressed with thick longitudinal ridge on inner face continuing around the tip as a transparent flange; inferior surface of tip of soft chitin. Body bright orange red, darker on dorsal surface, and usually in the form of stripes or spots.

Remarks: This species is a common species and conspicuous associate of the Pocilloporidae. It is found in pairs in the species between the coral branches (Castro, 1971). Eight specimens collected from the coral heads of *Pocillopora damicornis* (Linnaeus), and ten specimens from *Seriatopora hystris* Dana.

5. *Alpheus gracilis* Heller, 1861

Fig. 6

Alpheus gracilis Banner and Banner, 1982: 60.

Alpheus gracilis luciparensis De Man, 1911: 337.

Alpheus gracilis simplex Banner, 1966b: 97; 1968: 280.

Materials: 12 specimens, 15–24 mm TL, Sept. 1981 to March 1982, Tam-shui.

Diagnosis: Orbital teeth acute, short, not reaching beyond middle of rostrum. Palm of small chela with well-developed tooth above articulation of dactylus. Inner side of articulation of dactylus of large chela flanked by acute tooth. Propodus of third leg bearing 7 movable spines on inferior margin.

Remarks: Specimens collected under

rocks on beaches of gravel at Tam-shui. Banner and Banner (1982) reported that the appearance of reddish brown bands in this species is a typical colour pattern, but we have not found such color pattern in our specimens.

6. *Alpheus splendidus* Coutière, 1897

Fig. 7

Alpheus splendidus Banner and Banner, 1982: 56.

Alpheus pomatoceros Banner and Banner, 1966b: 93.

Materials: 10 specimens, 19–30 mm TL, Sept. 1981 to March 1982, Tam-shui; 4 specimens, 26–34 mm TL, Jan. 22, 1985, Tam-shui.

Diagnosis: Anterior lateral margins of orbital hoods armed with narrow acute teeth, not from margins, and curved somewhat medially. Small chela not sexually dimorphic, tips of fingers hooded and crossing. Propodus of third leg bearing on its inferior margin 6–8 movable spines and a pair distally.

Remarks: Specimens collected from lower tidal zone of gravel shore.

7. *Alpheus collumianus* Stimpson, 1861

Fig. 8

Alpheus collumianus Banner, 1953: 67; 1956: 338;

Banner and Banner, 1982: 45.

Alpheus collumianus medius Banner, 1956: 340.

Alpheus collumianus inermis Banner, 1956: 342.

Materials: 1 females, 11 mm TL, Jan. 10, 1985, Wan-li-ton.

Diagnosis: Orbital hoods inflated, rounded, not bearing any teeth. Palm of large chela marked distally by three crests. Propodus of third leg bearing spine are smaller; dactylus with inferior unguis strongly reduced. Distal portion of inner uropod beset of telson with spines.

Remarks: Specimens collected from a dead coral head as depth as 5 meters off Wan-li-ton. Body and appendages is transparent-pale yellow in colour. This species have great morphological variations, but our specimen was similar to the subspecies *A. collumianus inermis* described by Banner, 1956.

8. *Alpheus obesomanus* Dana, 1985

Fig. 9.

Alpheus obesomanus Banner and Banner, 1966a: 168; 1966b: 101; 1982: 89.

Materials: 2 specimens, 8 and 10 mm TL, Dec. 13, 1984, Nan-wan; 4 specimens, 5-17 mm TL, Jan. 10, 1985, Wan-li-ton.

Diagnosis: Rostrum short, triangular, never reaching beyond first antennular article. Scaphocerite with strong lateral spine reaching or beyond end of antennular peduncle. Large chela around, larger in diameter proximally, narrowing distally; movable finger short, hammer-shaped, and closing over distal end of fixed finger.

Remarks: Specimens collected from a dead coral head as deep as 5 meters off Wan-li-ton.

9. *Alpheus paracrinitus* Miers, 1881

Fig. 10

Alpheus paracrinitus Miya, 1974: 157. Banner and Banner, 1982: 129.

Alpheus bengalensis Holthuis, 1958: 25.

Crangon paracrinita bengalensis Banner, 1953: 110.

Materials: 2 specimens, each 14 mm TL, Jan. 13, 1982, Hou-liao, Pen-Hu.

Diagnosis: The orbital hoods are slightly inflated and weakly rounded anteriorly. The merus of large cheliped is slender, armed with strong tooth on inferoventral margin slightly distal to middle. The small chela shows sexual dimorphism, meri in both sexes with spine on inferoventral margin similar to that of large chela.

Remarks: Only one pair collected from a dead coral head at lower tidal zone,

10. *Alpheus mitis* Dana, 1852

Fig. 11

Alpheus mitis Banner and Banner, 1982: 134.

Materials: 1 female, 9 mm TL, Jan. 10, 1985, Wan-li-ton.

Diagnosis: Rostrum acute, almost twice as long as broad at base with a rounded

carina. Large chela smooth, and the merus bearing a small acute tooth distally on inferoventral margin. Propodus of third leg bearing 5-6 spines and one distally.

Remarks: Only one specimen collected from a dead coral head as deep as 13 meters, off Wan-li-ton. The abdominal segment was transparent with transverse brown red bands.

11. *Alpheus sulcatus* Kingsley, 1878

Fig. 12

Alpheus sulcatus Banner and Banner, 1982: 79.

Materials: 10 specimens, 16-32 mm TL. Oct. 1980 to Jan. 1981, Tam-shui.

Diagnosis: Sides of rostrum bearing moderately long stiff-setae. Orbitorostral grooves deep. Lateral face of large chela glabrous, and bearing longitudinal groove arising near middle of palm and running to dactylar articulation. Small chela is not sexually dimorphic. Dactylus of third leg bearing a definite secondary unguis.

Remarks: Specimens collected under rocks from lower tidal zone. Pair specimens are easily found in each collection. Body and appendages is black in colour, with pale white spots on the surface of the large and small chela.

12. *Alpheus bidens* (Olivier), 1811

Fig. 13

Alpheus bidens De Man, 1911: 371; Banner, 1957: 203; Banner and Banner, 1982: 136.

Materials: 1 female, 23 mm TL, Jan. 10, 1985, Wan-li-ton.

Diagnosis: The rostrum reaches to or beyond the end of first antennular article, the tooth on the post-rostral carina is small and subscute. Superior margin of palm, with narrow deep transverse groove curving on lateral face toward articulation. Propodus of third leg bearing on its margin 7 spines with a pair distally, and may randomly placed smaller spines.

Remarks: Specimen collected from a dead coral head at the depth of 13 meters, off wan-li-ton.

13. *Alpheus diadema* Dana, 1852

Fig. 14, 15

Alpheus diadema Banner and Banner, 1982: 140.
Crangon diadema Banner, 1953: 118.

Materials: 8 specimens, 16–24 mm TL, Oct. 12, 1981, Nan-wan; 5 specimens, 15–25 mm TL, Jan. 9, 1985, Wan-li-ton.

Diagnosis: Margins of rostrum and base anteriorly slightly concave and tapering, almost parallel in middle, posteriorly slightly concave and spreading. The surface of large chela without sculpture except for transverse groove proximal of articulation of dactylus. Dactylus of third leg variable, from simple to carrying small secondary unguis.

Remarks: 13 specimens have been collected, 8 from reef flats in tidal pools at Nan-wan, and 5 from dead coral head in a depth of 8 meters off Wan-li-ton. Body colour various from dark to pale white.

14. *Alpheus distinguendus* De Man, 1909

Fig. 16

Alpheus distinguendus Banner and Smalley, 1969: 47;
 Banner and Banner, 1982: 157.

Materials: 15 specimens, 49–60 mm TL, Feb. 12, 1983, Kaohsiung; 8 specimens, 51–71 mm TL, Dec. 14, 1984, Kaohsiung.

Diagnosis: Rostrum awl-shaped, reaching near the end of first antennular article. Dorsal carina knife-like, extending into carapace beyond orbits. Eye hoods inflated forming broad deep grooves between eye hoods and dorsal carina. Entire large chela bearing fine bosses. Palm of small chela covered with fine bosses, fingers crossing at tip. Propodus of third leg bearing only sparse hairs on its inferior margin.

Remarks: All of our specimens were bought from the fish market at Kaohsiung. These specimens were caught by using the prawn trawls net at the depth of more than 10 meters. In life, the shrimp is green to brown dorsally, colourless to pale blue laterally. Telson have white spot around each spine obviously.

15. *Alpheus brevicristatus* De Haan, 1850

Fig. 17

Alpheus brevicristatus Banner and Banner, 1984: 37.

Materials: 187 specimens, 18–70 mm TL, Oct. 1980 to April 1983, Peng-Hu.

Diagnosis: Anteriorly of rostrum is knife-like, posteriorly carina rounded. Orbitorostal grooves deep with flattened bottom. Large chela marked with a transverse groove near the base of movable finger. Movable finger of small chela of both sexes simple, not balaeniceps-shaped, and more than twice as long as palm. Propodus of third leg bearing on its margin 5–6 spines with a pair distally.

Remarks: This species is the dominant species in the seagrass meadow at Chi-to Bay, Peng-Hu. The characteristics of its digging behavior, territor, and pairing behavior, were studied by Chang (1983). Our specimens were collected by prawn trawls during low tide after dark. Two specimen were identified by Mrs. D. M. Banner on Jan. 11, 1982.

16. *Alpheus savuensis* De Man, 1908

Fig. 18, 19

Alpheus savuensis De Man, 1911: 260.

Materials: 32 specimens, 16–30 mm TL, Oct. 1980 to April 1983, Peng-Hu.

Diagnosis: Rostrum acute, in the male just as long as broad at its base, in the female a little longer than broad. The rostral carina in the female appears rather sharp between the orbits, from which it is separated by deep and broad grooves. Upper border with a transverse groove near the the dactylus of large chela. Movable finger of small chela of male sub-balaeniceps-shaped, that of female simple. Propodus of third leg bearing on posterior margin with 5 pairs of spinules.

Remarks: This species commonly collected from seagrass meadow at Chi-to Bay, Peng-hu. Their habitats are similar to *A. brevicristatus*, but the size is smaller than it.

Body and appendages is tannish-brown and white striped in colour.

17. *Alpheus pacificus* Dana, 1852

Fig. 20, 21, 22

Alpheus pacificus Banner and Banner 1966b: 143; 1982: 217.

Crangon pacifica Banner, 1953: 138.

Materials: 86 specimens, 12–30 mm TL, August 1980 to March 1982, Tam-shui; 2 specimens, 16 and 20 mm TL, Nov. 20, 1982, Fu-lung; 189 specimens, 13–33 mm TL, Jan. 1983 to April 1983; 10 specimens, 18–28 mm TL, Dec. 14, 1984, Nan-wan.

Diagnosis: The rostrum bearing a few short setae on lateral margins. Superior margin of palm of large chela projecting and overhanging deep transverse groove, distal margin abrupt but rounded, and groove contained on outer face as roughly quadrangular, on inner face groove continuous. Propodus of third leg bearing on its inferior margin 6–8 spines.

Remarks: This species always found living under rocks in the tidal zone. Only two specimens have been collected from sandy bottom by prawn trawls at the depth of 10 meters, off Fu-lung. In Tam-shui, we have found the variations of colour patterns and the biomass of this species from the same locality.

18. *Alpheus euphrosyne* De Man, 1897

Fig. 23

Alpheus euphrosyne euphrosyne Banner and Banner, 1982: 232.

Alpheus euphrosyne Banner and Banner, 1966b: 130.

Materials: 1 female, 20 mm TL, Nov. 16, 1981, Tam-shui.

Diagnosis: Stylocerite broad, leaf-like, usually with short stiff setae on its lateral margins. Stylocerite with outer margins slightly convex, lateral spine usually equal to length of broad squame which is a little longer than antennular peduncle. Transverse groove of superior margin of large chela with both

margins. Propodus of third leg bearing 3 movable spinules.

Remarks: Only one specimen collected under rock in a muddy estuarine condition.

19. *Alpheus leviusculus* Dana, 1852

Fig. 24

Alpheus leviusculus leviusculus Banner and Banner, 1982: 246.

Alpheus leviusculus De Man, 1911: 411; Banner and Banner, 1964: 92.

Materials: 24 specimens, 15–22 mm TL, August 1980 to March 1982, Tam-shui.

Diagnosis: Lateral margins slightly concave with curve continuous with orbito-rostral front, and in lateral view, tip somewhat depressed. Large chela with outer palmar face bearing triangular depressed, depressed area arising from transverse groove. Fingers of small chela without balaeniceps-shaped. Propodus of third leg bearing 9 movable spines on inferior margin.

Remarks: Specimens collected under rocks on the beaches of gravel in intertidal zone at Tam-shui. All of our specimens were captured in pairs from their nests in the field.

20. *Alpheus lobidens* De Haan, 1850

Fig. 25, 26, 27, 28

Alpheus lobidens lobidens Banner and Banner, 1974: 429; 1981: 29; 1982: 252.

Alpheus crassimanus Banner, 1959: 147; Banner and Banner, 1966b: 138.

Crangon crassimanus Banner, 1953: 134.

Materials: 168 specimens, 10–32 mm TL, August, 1980 to Jan. 1985, Tam-shui; 289 specimens, 18–33 mm TL, Jan. 1983 to April 1983, Peng-Hu; 4 specimens, 26–30 mm TL, May 10, 1984, Tai-hsi; 4 specimens, 33–43 mm TL, Jan. 24, 1985.

Diagnosis: Medial palmar of large chela depression a well-marked, narrow triangle with apex reaching half distance from saddle to proximal end of palm, and lateral palmar depression quadrangular. Small chela sexually dimorphic in the male chela balaeniceps, but

not in the female. propodus of third leg with 9 or 10 spines on inferior margin and two distally.

Remarks: Most of our specimens were collected intertidally, but we do have some specimens captured by a prawn trawl from the area of shrimpgrass (*Halophila ovalis*) and eelgrass (*Thalassia hemprichii*) at Chi-to Bay, Peng-Hu. As far as we know, there are many color patterns in this species, and we show four patterns in this report.

21. *Alpheus bisincisus* De Haan, 1850

Fig. 29

Alpheus bisincisus Banner and Banner, 1982: 263.
Alpheus bisincisus variabilis De Man, 1911: 406.

Materials: 10 specimens, 20–36 mm TL, Sept. 1981 to March 1982, Peng-Hu.

Diagnosis: The furrows between the rostrum and the orbital hoods are moderately deep, their outer margins are indistinct, rounded. Small chela in the male balaeniceps-shaped, but not in the female. Propodus of third leg bearing 7 spines with a pair distally on inferior margin.

Remarks: Specimens collected under rocks at lower tidal zone. Body and appendages is bright red in colour.

22. *Alpheus edwardsii* (Audouin), 1827

Fig. 30

Alpheus edwardsii Banner and Banner, 1973: 1142.
Alpheus edwardsii Banner and Banner, 1982: 270.

Materials: 324 specimens, 8–36 mm TL, August 1980 to Jan. 1985, Tam-shui; 291 specimens, 12–34 mm TL, Jan. to April 1983, Peng-Hu; 23 specimens, 18–30 mm TL, Dec. 14, 1984, Nan-wan.

Diagnosis: Rostrum is broad, moderately deep orbitorostral grooves. Superior margin of large chela bearing transverse groove proximal to dactylus; Proximal edge of groove obtuse, never acute, overhanging floor of groove. Small chela sexually dimorphic. Propodus of third leg bearing 6 spines on inferior margin and two distal spines.

Remarks: This species is largely intertidal, living under rocks on the gravel or coral debris bottom. The ecology of this species in the intertidal area at Tam-shui had been studied by the senior author (1982)

Acknowledgements: The authors are grateful to Dr. K. T. Shao and Dr. S. C. Lee for reading the manuscript. Our sincere thanks are extended to Dr. Y. Miya, Dr. S. H. Chuang, Dr. S. Irimura and Mr. H. Y. Yan for offering us available reprints. We also wish to express the deepest appreciation to Prof. and Mrs. A. H. Banner for identifying some of our specimens as well as valuable suggestions on the taxonomy of snapping shrimps in 1982.

REFERENCES

- BANNER, A. H. (1953) The Crangonidae or snapping shrimp of Hawaii. *Pacific Sci.* 7(1): 1–147, 50 figs.
- BANNER, A. H. (1956) Contributions to the knowledge of the alpheid shrimp of the Pacific Ocean. Part I. Collections from the Mariana Archipelago. *Pacific Sci.* 10(3): 318–373, 23 figs.
- BANNER, A. H. (1957) Contributions to the knowledge of the alpheid shrimp of the Pacific Ocean. Part II. Collection from Arno Atoll, Marshall Islands. *Pacific Sci.* 11(2): 190–206, 5 figs.
- BANNER, A. H. (1959) Contributions to the knowledge of the alpheid shrimp of the Pacific Ocean. Part IV. Various small collection from the central Pacific area, including supplementary notes on alpheids from Hawaii. *Pacific Sci.* 13(2): 130–155, 13 figs.
- BANNER, A. H. and D. M. BANNER (1964) Contributions to the knowledge of the alpheid shrimp of the Pacific Ocean. Part IX. Collections from the Phoenix and Line Islands. *Pacific Sci.* 18(1): 83–100, 5 figs.
- BANNER, A. H. and D. M. BANNER (1966a) Contributions to the knowledge of the alpheid shrimp of the Pacific Ocean. Part X. Collections from Fiji, Tonga, and Samoa. *Pacific Sci.* 20(2): 145–188, 20 figs.
- BANNER, A. H. and D. M. BANNER (1966b) The alpheid shrimp of Thailand. *Siam Soc. Mono.* No. 3, pp. v+168, 62 figs.

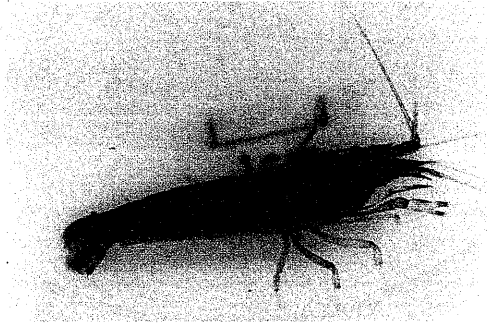


Fig. 2. *Betaeus granulimanus*, 29 mm TL.

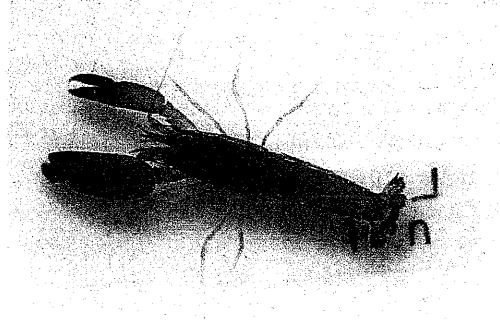


Fig. 6. *Alpheus gracilis*, 22 mm TL.

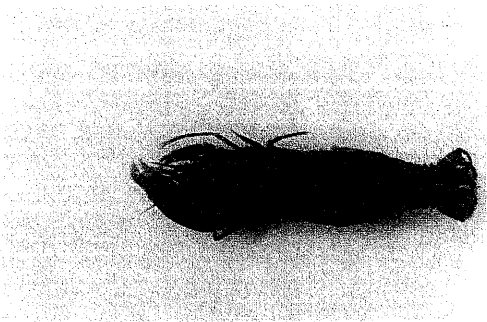


Fig. 3. *Synalpheus stimpsoni*, 34 mm TL.

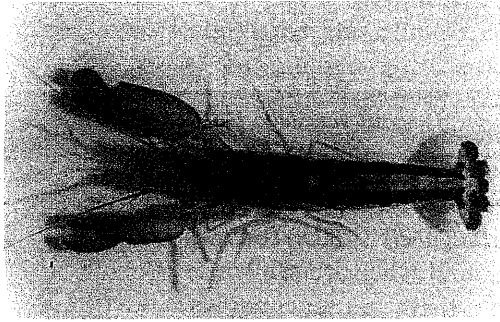


Fig. 7. *Alpheus splendidus*, 30 mm TL.

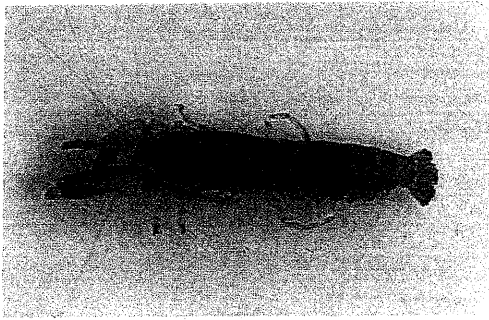


Fig. 4. *Metalpheus paragracilis*, 14 mm TL.

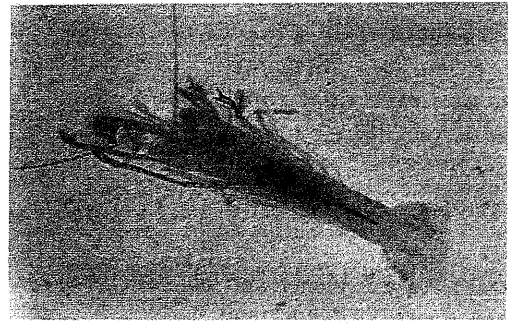


Fig. 8. *Alpheus collumianus*, 11 mm TL.

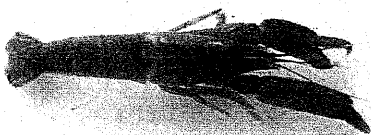


Fig. 5. *Alpheus lottini*, 21 mm TL.

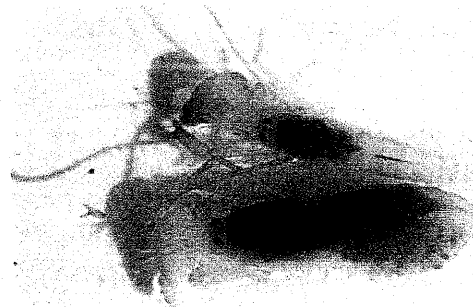


Fig. 9. *Alpheus obesomanus*, 13; 17 mm TL.

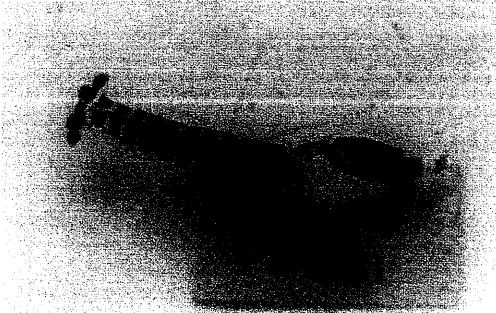


Fig. 10. *Alpheus paracrinitus*, 15 mm TL.

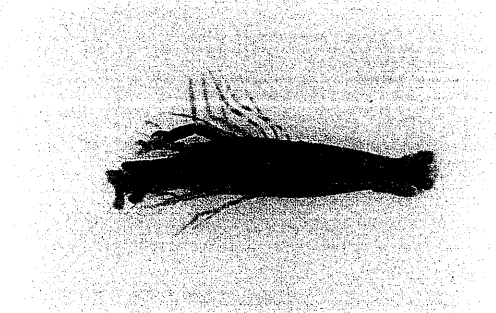


Fig. 13. *Alpheus bidens*, 23 mm TL.



Fig. 11. *Alpheus mitis*, 9 mm TL.

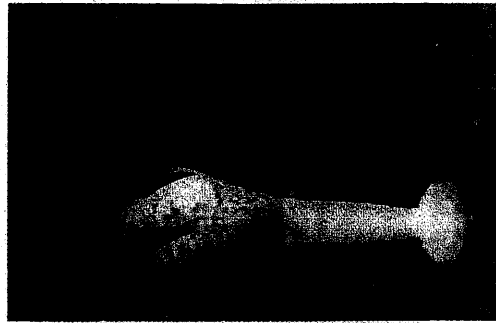


Fig. 14. *Alpheus diadema*, 20 mm TL.

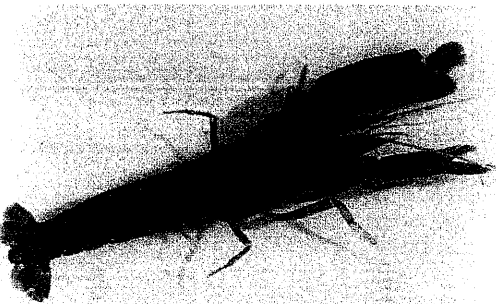


Fig. 12. *Alpheus sulcatus*, 35 mm TL.

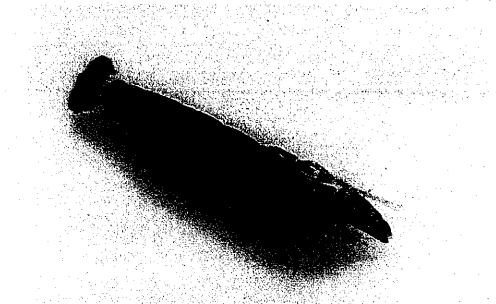


Fig. 15. *Alpheus diadema*, 17 mm TL.

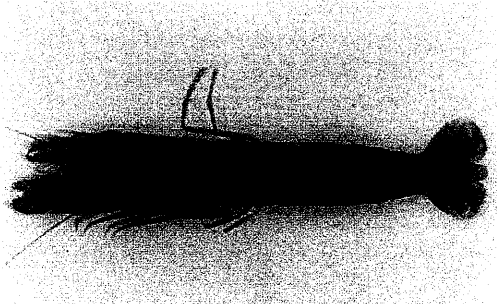


Fig. 16. *Alpheus distinguendus*, 75 mm TL.

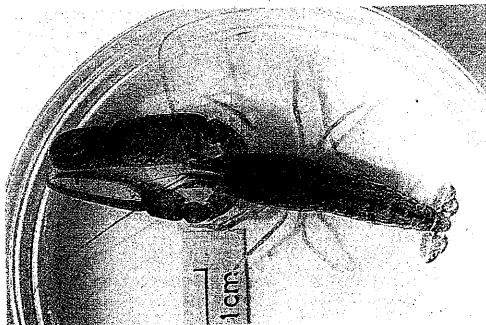


Fig. 17. *Alpheus brevicristatus*, 56 mm TL.

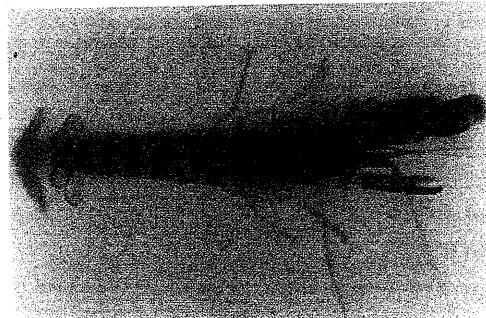


Fig. 20. *Alpheus pacificus*, 23 mm TL.

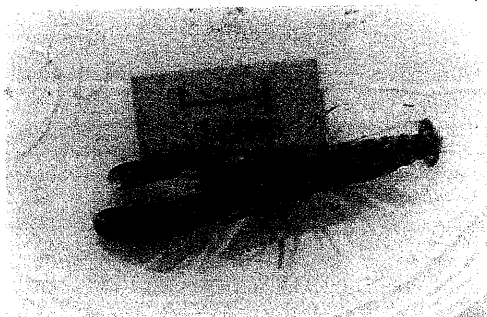


Fig. 18. *Alpheus savuensis*, 30 mm TL.

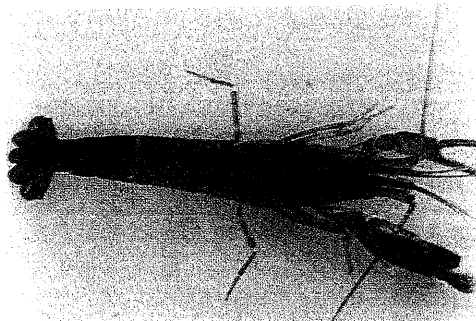


Fig. 21. *Alpheus pacificus*, 38 mm TL.

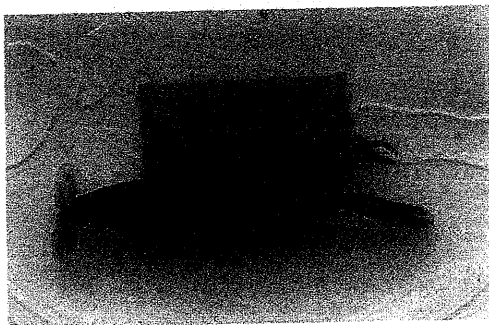


Fig. 19. *Alpheus savuensis*, 30 mm TL.



Fig. 22. *Alpheus pacificus*, 30 mm TL.

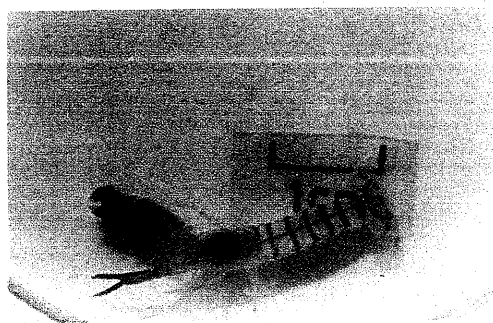


Fig. 23. *Alpheus euphrosyne*, 20 mm TL.

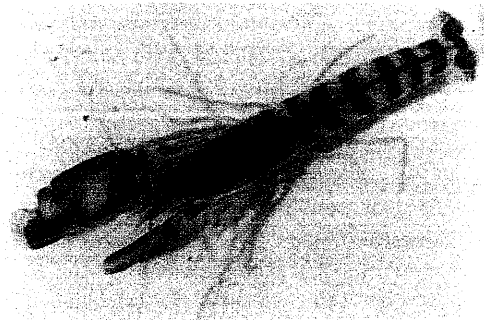


Fig. 24. *Alpheus leviusculus*, 22 mm TL.

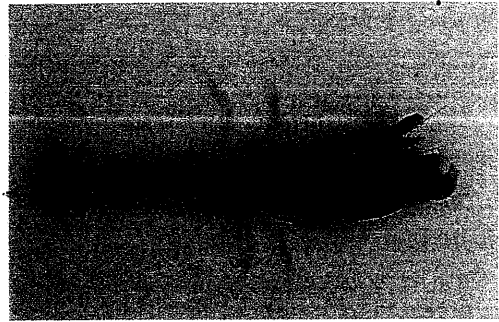


Fig. 27. *Alpheus lobidens*, 28 mm TL.



Fig. 25. *Alpheus lobidens*, 31 mm TL.



Fig. 28. *Alpheus lobidens*, 27 mm TL.



Fig. 26. *Alpheus lobidens*, 29 mm TL.

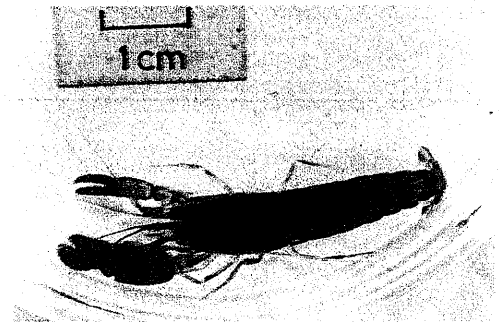


Fig. 29. *Alpheus bisincisus*, 35 mm TL.



Fig. 30. *Alpheus edwardsii*, 35 mm TL.

- BANNER, A. H. and D. M. BANNER (1968) Contributions to the knowledge of the alpheid shrimp of the Pacific Ocean. Part XII. Collections from the Marshall and Caroline Islands. *Micronesica* 4(2): 261-294, 1 fig.
- BANNER, A. H. and D. M. BANNER (1973) The establishment of a neotype for *Alpheus edwardsi* (Audouin). *Bull. Mus. natn. Hist. nat.*, Paris, III, 67(88): 1141-1146, 1 fig.
- BANNER, A. H. and D. M. BANNER (1974) Contributions to the knowledge of the alpheid shrimp of the Pacific Ocean. Part XVII. Additional notes on the Hawaiian alpheids: new species, subspecies, and some nomenclatorial changes. *Pacific Sci.* 28(4): 423-437, 5 figs.
- BANNER, A. H. and D. M. BANNER (1984) Old and unreported collections of alpheid shrimp from Zoologisches Museum, Berlin, Principally from Melanesia. *Pacific Sci.* 38(1): 34-50.
- BANNER, D. M. and A. H. BANNER (1973) The alpheid shrimp of Australia. Part I. The lower genera. *Rec. Aust. Mus.* 28(15): 291-382, 19 figs.
- BANNER, D. M. and A. H. BANNER (1975) The alpheid shrimp of Australia. Part II. The genus *Synalpheus*. *Rec. Aust. Mus.* 29(12): 267-389, 29 figs.
- BANNER, D. M. and A. H. BANNER (1981) Annotated checklist of the alpheid shrimp of the Red Sea and Gulf of Aden. *Zool. verh., Leiden* No. 190: 1-99, 12 figs.
- BANNER, D. M. and A. H. BANNER (1982) The alpheid shrimp of Australia. Part III. The remaining alpheids principally the genus *Alpheus* and the family Ogyrididae. *Rec. Aust. Mus.* 34(1): 1-357, 95 figs.
- BANNER, D. M. and C. R. SMALLEY (1969) Contributions to the knowledge of the alpheid shrimp of the Pacific Ocean. Part XIII. Two species of alpheid shrimp, one new, common in the prawn trawls of Moreton Bay, Queensland, Australia. *Proc. R. Soc. Qd.* 81(3): 43-50, 3 figs.
- CASTRO, P. (1971) The natantian shrimps (Crustacea, Decapoda) associated with invertebrates in Hawaii. *Pacific Sci.* 25(3): 395-403.
- CHANG, S. H. (1983) The ecology and behavior of snapping shrimps *Alpheus brevicristatus* De Haan and *Alpheus lobidens* De Haan. Master thesis, University of Sun Yat-Sen, Kaohsiung, Taiwan (In Chinese).
- HOLTHUIS, L. B. (1958) Contribution to the knowledge of the Red Sea. No. 8. Crustacea Decapoda from the northern Red Sea (Gulf on Aqaba and Sinai Peninsula). I. Macrura. *Bull. Sea Fish. Res. Stn., Israel* No. 17, pp. 1-40, 15 figs.
- KUBO, I. (1936) A description of a new alpheid shrimp from Japan. *J. Imp. Fish. Inst., Tokyo.* 31(2): 43-46, pl. 13.
- JENG, M. S. (1982) An ecological study on the snapping shrimp *Alpheus edwardsii* (Audouin) in the intertidal area of Tam-shui, Taiwan. Master thesis, University of Taiwan, Taipei, Taiwan (In Chinese).
- MAN, J. G. de (1911) The Decapoda of the Siboga Expedition. Part II. Family Alpheidae. *Siboga-Expeditie 39a'(2)*: 133-465. (Livre 60). 1915. Op. cit. Supplement... Explanation of plates of Alpheidae. *Siboga-Expeditie 39a'(2)*: 23 pls. (Livre 74). E. J. Brill, Leiden.
- MIYA, Y. (1972) The Alpheidae (Crustacea, Decapoda) of Japan and its adjacent waters. Part I. *Publ. Amakusa mar. biol. Lab., Kyushu Univ.* 3(1): 23-101, pls. 1-14.
- MIYA, Y. (1974) The Alpheidae (Crustacea, Decapoda) of Japan and its adjacent waters. Part II. *Publ. Amakusa mar. biol. Lab., Kyushu Univ.* 3(2): 103-195, pls. 15-31.
- YOKOYA, Y. (1927) Notes on two alpheid shrimps from Japan. *J. Coll. Agric. Imp. Univ., Tokyo.* 9(3): 171-175, pl. 7.

臺灣海域產的槍蝦

鄭明修 張崑雄

本文報導棲息於臺灣海域的槍蝦，共計4屬22種，分別是：*Betaeus granulimanus* Yokoya, *Synalpheus stimpsoni* (De Man), *Metalpheus paragracilis* (Coutière), *Alpheus lottini* Guérin, *A. gracilis* Heller, *A. splendidus* Coutière, *A. collumianus* Stimpson, *A. obesomanus* Dana, *A. paracrinitus* Miers, *A. mitis* Dana, *A. sulcatus* Kingsley, *A. bidens* (Olivier), *A. diadema* Dana, *A. distinguendus* De Man, *A. brevicristatus* De Haan, *A. savuensis* De Man, *A. pacificus* Dana, *A. euphrosyne* De Man, *A. leviusculus* Dana, *A. lobidens* De Haan, *A. bisincisus* De Haan, *A. edwardsii* (Audouin)。其中除了 *A. lobidens*, *A. distinguendus*, and *A. brevicristatus* 等三種外，其餘均為新紀錄種。文中除了對各種形態等特徵予以簡述之外，並附以各種彩色圖片以及檢索表以供學者參考。

