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An updated checklist of the cephalopods of the South China Sea

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Abstract. Despite the high fisheries profile and value of octopuses, squids, cuttlefishes and their relatives throughout the South China Sea, there is still relatively little known or published on the cephalopod fauna of this region. This unfortunate situation is a product of few regional revisions, the large number of species being treated under single or inappropriate names, key families with poorly-resolved taxonomies and inadequate diagnostic characters, as well as limited support for (and development of) regional expertise. An updated checklist of 32 families and 153 species of cephalopods are reported here from the South China Sea. Three families and 46 species are additional to the original list published in 2000. They are Family Brachioteuthidae, Family Joubiniteuthidae, Family Bathypolypodidae, *Uroteuthis* (*Photololigo*) *reesi*, *Uroteuthis* (*Photololigo*) *vossi*, *Abralia armata*, *Abraliopsis hoylei*, *Enoploteuthis chuni*, *Taningia danae*, *Pholidoteuthis massyae*, *Brachioteuthis riisei*, *Brachioteuthis picta*, *Callimachus rancureli*, *Walvisteuthis virilis*, *Joubiniteuthis portieri*, *Chiroteuthis veranyi*, *Grimalditeuthis bonplandi*, *Leachia cyclura*, *Leachia pacifica*, *Egea inermis*, *Helicocranchia pfefferi*, *Liguriella podophthalma*, *Sandalops melancholicus*, *Sepia filibrachia*, *Sepia vietnamica*, *Euprymna hoylei*, *Euprymna hyllebergi*, *Euprymna morsei*, *Idiosepius biserialis*, *Luteuthis shuishi*, *Opisthoteuthis dongshaensis*, *Abdopus aculeatus*, *Abdopus abaculus*, *Amphioctopus kagoshimensis*, *Amphioctopus neglectus*, *Amphioctopus rex*, *Amphioctopus siamensis*, *Callistoctopus nocturnus*, *Cistopus chinensis*, *Cistopus taiwanicus*, *Octopus* cf *vulgaris*, *Thaumoctopus mimicus*, *Wunderpus photogenicus*, '*Octopus*' *conispadiceus*, '*Octopus*' *berenice*, '*Octopus*' *favonius*, '*Octopus*' *minor*, '*Octopus*' *pumilus*, and *Benthoctopus* sp. Recent molecular research has demoted two families to subfamily rank (Bolitaeninae, Vitreledonellinae). This list is generated from a review of the available literature, material examined in museum collections and unpublished data of the authors. A number of taxonomic revisions and recent updates of the UN Food and Agriculture Organisations (FAO) catalogues on world cephalopods provide critical assistance in redressing the historically poor knowledge of the cephalopods of this region. There is an urgent need for comprehensive revision of this group throughout the region, including primary field surveys, reviews of subsistence and commercial fisheries catches, and support for development of regional expertise and resources.

Key words. South China Sea, squid, octopus, cephalopods, fisheries, Singapore, checklist

INTRODUCTION

This paper presents an updated checklist of the cephalopod fauna of the South China Sea. In this treatment, this sea is considered as being bound by Taiwan Strait in the north, Borneo and western Philippines to the east, and the equator to the south.

Despite the high profile of cephalopods in the fisheries, cuisine and cultures of countries bordering the South China Sea, there is surprisingly little known and/or available of many aspects of these animals, from taxonomy to biology, geographical distribution, fisheries composition or catch statistics. Most published catch statistics list multiple species under generic terms such as "squid" or "octopuses", or use inappropriate scientific names for individual species harvested on a large scale. This situation is the direct product of three factors: i) poor taxonomy for many groups, ii) scarcity of regional revisions or field guides, and iii) limited communication between adjacent countries in pooling data on biology, distribution and fisheries.

A number of cephalopod researchers have reviewed cephalopods of the world, indirectly providing information on species found in the South China Sea region (e.g., Roper et al., 1984; Nesis, 1987; Okutani, 1995, 2005, 2015; Young et al., 1996). In 1998, the Food and Agriculture Organisation of the United Nations has supported the production of a field guide to marine life of commercial value or potential in the Western Central Pacific region, including treatments of key cephalopod taxa (Dunning et al., 1998). More recently, FAO published the three volume *Cephalopods of the World* (=FAO Catalogues) (Jereb & Roper, 2005, 2010; Jereb et al., 2014).

The following studies have provided preliminary revisions of all cephalopods or particular groups from countries within the

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South China Sea region: Philippines (Voss, 1963; Norman & Sweeney, 1997), Hong Kong (Voss & Williamson, 1972; Norman & Hochberg, 1994), Thailand (Chikuni, 1987; Isarangkura & Davivongs, 1987; Chotiyaputta et al., 1992; Chotiyaputta, 1993; Chaitiamvong, 1993, Nateewathana, 1997), China (Dong, 1963, 1978, 1979, 1987, 1988; Li, 1983; Li & Chen, 1989) and Vietnam (Duc, 1978, 1993, 1997; Hylleberg, 2000; Khromov, 1987a, b, 1990, 1996; Kaneko et al., 2008).

As the majority of the cephalopod species found in the South China Sea also occur elsewhere, regional revisions in waters adjacent to this sea also provide valuable information on its cephalopod fauna. Sasaki (1929) reviewed the fauna of Japanese and adjacent waters with records extending into the northern end of the South China Sea. Okutani et al. (1987) also treated the Japanese cephalopod fauna, including many species recorded from the South China Sea. They have provided helpful and valuable information for our compilation. In this work we also singled out the fauna of Singapore due to its geographical location at the junction of the South China Sea and the southern end of the Andaman Sea.

With respect to the cephalopod fauna of Singapore, Robson (1932a) listed 16 entries: some were identified to species, others were identified to genus, some identifications were made with question marks added, and many of them were samples obtained from fish markets which were lacking in accurate locality information. Of these 16 entries, six species can be recognised with some certainty: *Octopus smedleyi* (=*A. aegina*), *Sepia singaporensis* (=*S. recurvirostra*), *Sepia esculenta*, *Sepia latimanus*, *Loligo duvaucelii*, and *Sepioteuthis indica* (=*S. lessoniana*). Recently, Tan & Woo (2010) compiled a checklist of the molluscs of Singapore and listed 24 species in seven families of cephalopods. Because of their unusual presence outside of their established distributional ranges, or because of their uncertain taxonomic status, some of the species listed, i.e., *Euprymna morsei*, *Sepiola birostrata*, *Cistopus indicus*, *Octopus filamentosus* and *Hapalochlaena maculosa* require further assessment. We have, however, attempted to present an up-to-date list of cephalopods from Singapore in this report.

The following checklist is based on primary field collection by the authors, examination of museum and fisheries research collections, and reviews of the available literature. Distributional records are based on material examined in the collections of the Museum Victoria, Melbourne; National Museum of Natural Science, Taichung; British Museum (Natural History), London; Muséum National d'Histoire Naturelle, Paris; Australian Museum, Sydney; National Museum of Natural History, Smithsonian Institution, Washington, DC; Zoological Reference Centre, National University of Singapore (incorporating the collections of the Raffles Museum); Californian Academy of Sciences, San Francisco; Yale Peabody Museum, Newhaven; Academy of Natural Sciences, Philadelphia; and Musée Royal d'Histoire Naturelle de Belgique, Brussells.

Where information on fisheries value is available, species are designated as being of minor or major importance. Sources for this information, however, may be relatively dated and may not reflect current fishery practices. For example, octopus pot fisheries reported off Hong Kong in Voss & Williamson (1972) no longer appear to be active.

A number of species are listed as anticipated to occur in the region on the basis of their cosmopolitan distributions elsewhere in the world, but for each there is no confirmed record to date. Total distributions provided for species should also be considered preliminary, as comprehensive surveys are yet to be undertaken throughout much of the Indo-Pacific region.

CHECKLIST OF THE CEPHALOPODS OF THE SOUTH CHINA SEA

The following order and family diagnoses were constructed on the basis of reviews in Roper, Sweeney & Nauen (1984), Nesis (1987), Young, Vecchione & Mangold (1996), Boletzky (1999), Jereb & Roper (2005, 2010) and Strugnell et al. (2013). Size measurements are presented as mantle length (ML), following Roper & Voss (1983). Technical terms are defined in Jereb & Roper (2005, 2010) and Jereb et al. (available at the FAO website: http://www.fao.org/docrep/009/ac479e/ac479e00.htm). Where information is available, species forming the basis of at least minor fisheries (*) and major fisheries (**) are indicated. (#) and (+) denote the families and species (respectively) that are additional to those listed in the previous checklist (Norman & Lu, 2000).

Subclass Nautiloidea

A primitive group of cephalopods with chambered shells and four gills (tetrabranchiate). This group were much more diverse and widespread in the past, dominating the world's oceans prior to the arrival of the fishes. The only representatives of this subclass still alive today are a single family, two genera and seven species, restricted to tropical latitudes of the Indo-West Pacific region (Jereb, 2005).

Family Nautilidae

The "chambered or pearly nautiluses" of the tropical and subtropical waters of the Indo-West Pacific region consists of two genera and seven species. At least one species occurs in the South China Sea. These primitive animals are largely unchanged over 500 million years. They have approximately 100 sucker-less tentacles, a simple eye lacking a lens and thick rigid hood used to protect the animal when retracted within the shell. The taxonomy of the group is well resolved although several (nominal) species are only known from the shell. Species typically occur in deeper waters off reefs (200–800 m), rising to shallower waters at night to feed primarily on crustaceans and carrion. Chambered nautiluses are harvested in many regions in trap pots to service the shell trade. See Jereb (2005).

***Nautilus pompilius* Linnaeus, 1758**
(Figure: Dunning, 1998a; Jereb, 2005)

Synonyms. ?*Nautilus ambiguus* Sowerby, 1848; *Nautilus alumnus* Iredale, 1944.

Distribution. Widespread in tropical Indo-Pacific waters. Deep water (>200 m) adjacent to coral/rocky substrates.

Subclass Coleoidea

This subclass contains all living cephalopods other than chambered nautiluses and includes the cuttlefishes, squids and octopuses. Key diagnostic characters are two gills (dibranchiate), eight arms with suckers or hooks, and two retractile tentacles in certain groups.

Order Teuthida

Squids are characterised by eight arms and two retractile tentacles (latter tentacle pair lost in the family Octopoteuthidae, Lepidoteuthidae and the genus *Gonatopsis* of the family Gonatidae), fins on the mantle and stalked suckers with horny rings and constricted necks. In some squids, the suckers have become modified into chitinous hooks.

Suborder Myopsida

Myopsid squids (or "cover-eyed squids") are muscular animals characterised by eyes entirely covered by a transparent cornea that is fused with the orbit. The eye cavity communicates with the exterior through a tiny hole (the lacrimal pore). Arms and tentacles have suckers only, no hooks. Mantle locking apparatus is simple (linear) and the gladius is pen-like. This suborder contains two families one of them is represented in the South China Sea region.

Family Loliginidae

Known as "inshore, pencil, reef or calamari squids", the loliginids are muscular squids ranging in size from 30 to 500 mm ML. They occur in all temperate and tropical oceans. There are seven genera and around 50 species. At least 13 species occur in the South China Sea. The taxonomy of this group is poor with many important commercial species being treated under catch-all names. There is a high potential for cryptic species. Species of *Uroteuthis* (*Photololigo*) possess bacterial light organs within the mantle cavity, presumably used for counter illumination to reduce silhouettes against ambient down light. This family of squids is extremely important in both subsistence and large-scale commercial trawl fisheries. Members of this family are the most common cephalopod found in local and commercial fish markets throughout the region. See Vecchione et al. (1998), Vecchione et al. (2005) and Jereb et al. (2010).

***Loliolus* (*Loliolus*) *affinis* Steenstrup, 1856**
(Figure: Lu et al., 1985; Dunning, 1998b; Jereb et al., 2010)

Distribution. Sri Lanka to Java, Indonesia, Singapore.

***Loliolus* (*Loliolus*) *hardwickei* (Gray, 1849)**
(Figure: Lu et al., 1985; Jereb et al., 2010)

Synonyms. *L. typus* Steenstrup, 1856; *L. investigatoris* Goodrich, 1896.

Distribution. India, Indonesia, Singapore and Indo-China.

***Loliolus* (*Nipponololigo*) *sumatrensis* (d'Orbigny, 1835)**
(Figure: Nesis, 1987; Dunning, 1998b; Jereb et al., 2010)

Synonyms. *L. kobiensis* Hoyle, 1885; *L. yokoyae* Ishikawa, 1926; *L. rhomboidalis* Burgess, 1967.

Distribution. Japan to Philippines, Gulf of Thailand to Maldives.

***Loliolus* (*Nipponololigo*) *beka* (Sasaki, 1929)**
(Figure: Nesis, 1987; Dunning, 1998b; Jereb et al., 2010)

Distribution. East China Sea, South China Sea, Gulf of Tonkin, Gulf of Thailand, and Singapore.

***Loliolus* (*Nipponololigo*) *uyii* (Wakiya & Ishikawa, 1921)**
(Figure: Nesis, 1987; Jereb et al., 2010)

Synonyms. *L. tagoi* Sasaki, 1929; *L. gotoi* Sasaki, 1929.

Distribution. Japan to Gulf of Thailand.

***Loliolus* (*Nipponololigo*) *japonica* (Hoyle, 1885)**
(Figure: Nesis, 1987; Jereb et al., 2010)

Distribution. Japan to Gulf of Thailand.

****Sepioteuthis lessoniana* Férussac in Lesson, 1831**
(Figure: Nesis, 1987; Dunning, 1998b; Jereb et al., 2010)

Distribution. Tropical Indo-West Pacific region.

Note. Likely to include a number of cryptic species, as suggested by research of Segawa et al. (1993) and Cheng et al. (2014). It was recorded from Singapore by Robson (1932a) as *Sepioteuthis indica* Goodrich.

****Uroteuthis* (*Photololigo*) *chinensis* (Gray, 1849)**
(Figure: Nesis, 1987, Dunning, 1998b; Jereb et al., 2010)

Synonyms. *L. etheridgei* Berry, 1918; *L. formosana* Sasaki, 1929.

Distribution. Ryukyu Island, southern China and Taiwan, Gulf of Thailand to New South Wales, Australia, Singapore.

Note. Likely to include a number of cryptic species, as suggested by the findings of Yeatman & Benzie (1993).

*****Uroteuthis* (*Photololigo*) *duvaucelii* (d'Orbigny, 1835)**
(Figure: Nesis, 1987; Dunning, 1998b; Jereb et al., 2010)

Synonyms. *L. indica* Pfeffer, 1884; *L. galatheae* Steenstrup in Hoyle, 1885; *L. oshimai* Sasaki, 1929.

Distribution. Indian Ocean and Western Pacific Ocean, Singapore.

*****Uroteuthis* (*Photololigo*) *edulis* (Hoyle, 1885)**
(Figure: Nesis, 1987; Dunning, 1998b; Jereb et al., 2010)

Distribution. Western Pacific Ocean to Red Sea.

Note. Likely to include a number of cryptic species, as suggested by the findings of Yeatman & Benzie (1993).

***+Uroteuthis* (*Photololigo*) *reesi* (Voss, 1962)**
(Figure: Voss, 1963; Nesis, 1987; Jereb et al., 2010)

Distribution. Philippines.

Note. First described as *Doryteuthis reesi* from southern Luzon and northern Mindoro of the Philippines, in the South China Sea side. Jereb et al., (2010) considered its subgeneric placement undetermined although Okutani (2005, 2015) placed it in the subgenus *Photololigo*. No report of the presence of photophores has been found.

****Uroteuthis* (*Photololigo*) *sibogae* (Adam, 1954)**
(Figure: Nesis, 1987; Jereb et al., 2010)

Distribution. Taiwan to Singapore and Indian Ocean.

Note. *Uroteuthis* (*Photololigo*) *sibogae* was synonymised with *Uroteuthis* (*Photololigo*) *singhalensis* by Korzun & Alekseyev (1991). However, no general consensus on this synonymy was reached in the Phuket CIAC Workshop on the Systematics of Indo-West Pacific Loliginids (Vecchione et al., 2005; Jereb et al., 2010). We list it here until the species status is resolved.

*****Uroteuthis* (*Photololigo*) *singhalensis* (Ortmann, 1891)**
(Figure: Nesis, 1987; Dunning, 1998b; Jereb et al., 2010)

Distribution. South China Sea to Gulf of Aden.

***+Uroteuthis* (*Photololigo*) *vossi* (Nesis, 1982)**
(Figure: Voss, 1963; Nesis, 1987; Jereb et al., 2010)

Distribution. Philippines, Sri Lanka to the Arabian Sea.

Note. First described as *Loligo* species A by Voss (1963) from Pinas Islands, Palawan Island, Samar, and Manila of the Philippines. Nesis (1982) named it *Loligo* (*Loligo*) *vossi*. Okutani (2005, 2015) and Jereb et al. (2010) all placed it in the subgenus *Photololigo*. No report of the presence of photophores has been found.

***Uroteuthis* (*Uroteuthis*) *bartschi* Rehder, 1945**
(Figure: Nesis, 1987; Dunning, 1998b; Jereb et al., 2010)

Distribution. Eastern Indonesia, Philippines, Mozambique.

Suborder Oegopsida

Oegopsid squids (or "open-eyed squids") are muscular to gelatinous animals characterised by the anterior chamber of the eye being widely open and communicating with the exterior seawater. Arms and tentacles bear suckers and/or hooks. Mantle locking apparatus ranges from simple to complex to fused. This suborder contains more than 20 families and 200 species, of which 15 families occur within the South China Sea region. Many are the subjects of important fisheries.

Family Ancistrocheiridae

Moderate-sized squids (to 250 mm ML) with large triangular fins, hooks on the arms and tentacles, and photophores on fins, mantle, head, arms and tentacles. The single species in this family occurs throughout tropical and subtropical seas including the South China Sea. No known fisheries value. Taxonomy requires revision with Young et al. (1996) suggesting different species in the Atlantic and Pacific oceans. See Young et al.(1998) and Roper & Jereb (2010a) for review of this family.

***Ancistrocheirus lesueuri* (d'Orbigny, 1842)**
(Figure: Roper et al., 1984; Roper & Jereb, 2010a)

Synonyms. Possible senior synonym of *Thelidioteuthis alessandrinii* (Vérany, 1851)

Distribution. Tropical and subtropical waters.

Note. No confirmed record from the South China Sea but anticipated to occur in the region.

Family Enoploteuthidae

"Firefly or enope squids" are small (30 to 130 mm ML) and characterised by hooks on all arms and tentacles, photophores restricted to mantle, head, eyes and arms (not on tentacles or viscera) and a broad tail containing vesicles. There are four genera and around 40 species of which at least six are found in the South China Sea. It appears that most (and possibly all) members of this family undergo extensive daily vertical migrations. No species are targeted for fisheries in the South China Sea, although some appear in markets as bycatch. See Tsuchiya & Okutani (1988), Tsuchiya (1993),

Young et al. (1998) and Roper & Jereb (2010f) for reviews of this family.

***Abralia andamanica* Goodrich, 1896**
(Figure: Nesis, 1987)

Distribution. Tropical waters: Arabian Sea to Japan, Gulf of Thailand, Australia and Hawaii.

+*Abralia armata* (Quoy & Gaimard, 1832)
(Figure: Nesis, 1987)

Distribution. Tropical waters: Philippines to Indonesia.

****Abralia multihamata* Sasaki, 1929**
(Figure: Nesis, 1987)

Distribution. Taiwan & mainland China.

+*Abraliopsis hoylei* (Pfeffer, 1884)
(Figure: Nesis, 1987)

Distribution. Macarene Islands, Indian Ocean. Tropical and subtropical Indo-West Pacific Ocean from Hokkaido to the Tasman Sea and from eastern Africa to Hawaii. Absent in Arabian Sea and Bay of Bengal.

***Abraliopsis lineata* (Goodrich, 1896)**
(Figure: Tsuchiya & Okutani, 1988)

Distribution. East Africa to Taiwan and Polynesia.

+*Enoploteuthis chuni* Ichikawa, 1914
(Figure: Nesis, 1987)

Distribution. Off the Philippines, East China Sea, South China Sea, Japan Sea to near Hawaii.

***Enoploteuthis jonesi* Burgess, 1982**
(Figure: original description)

Distribution. East Africa to Hawaii.

Note. No confirmed record from the South China Sea but anticipated to occur in the region.

***Enoploteuthis leptura* (Leach, 1817)**
(Figure: Tsuchiya, 1993; Roper & Jereb, 2010f)

Distribution. Tropical western and central Pacific, predominantly equatorial.

Note. No confirmed record from the South China Sea but anticipated to occur in the region.

***Enoploteuthis reticulata* Rancurel, 1970**
(Figure: Nesis, 1987)

Distribution. Western Indian Ocean to Hawaii.

Note. No confirmed record from the South China Sea but anticipated to occur in the region.

Family Pyroteuthidae

Small muscular squids (23–50 mm ML) with sharply pointed tail, oval-shaped fins, hooks on at least arms I–III and photophores on the viscera, eyes and tentacles, but not on the mantle. The family occurs in tropical and temperate waters world-wide and contains two genera and six species. At least two species are present in the South China Sea. No known fisheries value. See Young et al. (1998), Young & Harman (1998), and Roper & Jereb (2010) for reviews of this family.

***Pterygioteuthis giardi* Fischer, 1896**
(Figure: Nesis, 1987; Roper & Jereb, 2010)

Distribution. Cosmopolitan in tropical and subtropical waters.

***Pyroteuthis margaritifera* (Rüppell, 1844)**
(Figure: Nesis, 1987; Roper & Jereb, 2010)

Distribution. Tropical to subtropical Atlantic Ocean and Indo-West Pacific region.

Family Octopoteuthidae

"Octopus squids" are medium to large squids (to 2000 mm ML) which receive their name from the reduction or loss of the tentacles from early growth stages, leaving eight arms. The fins are very large and rhomboidal extending along most of the length of the mantle. Arms with two rows of hooks replaced at the tips by suckers and photophores. The family is found in tropical and temperate waters and is represented by two genera and seven species. At least one species is represented in the South China Sea. No known fisheries value. See Nesis (1987) and Roper & Jereb (2010j) for key to genera and species.

***Octopoteuthis sicula* (Rüppell, 1844)**
(Figure: Nesis, 1987; Roper & Jereb, 2010j)

Distribution. Tropical to subtropical Atlantic Ocean and Indo-West Pacific region, mid-Philippines.

+*Taningia danae* Joubin, 1931
(Figure: Nesis, 1987; Roper & Jereb, 2010j)

Distribution. Tropical to temperate regions of all oceans and boreal waters of North Atlantic.

Family Pholidoteuthidae

Medium-sized squids (to 800 mm ML) covered in dermal pads or tubercles. Suckers in two rows on arms and four rows on tentacular clubs. Family consists of one genus and two species found throughout tropical and temperate seas. One species has been recorded from the South China

Sea. No known fisheries value. See treatment in Roper & Jereb (2010m). Treated in Nesis (1987) under the family Lepidoteuthidae.

+*Pholidoteuthis massyae* (Pfeffer, 1912)
(Figure: Nesis, 1987; Roper & Jereb, 2010m)

Distribution. Taiwan, Flores Sea, Indonesia. Reports off Australia, Africa and eastern Pacific Ocean.

Note. First record for South China Sea from off Tung-Sha Island in the Pratas Islands (Lu, 2000, as *Pholidoteuthis boshmai* Adam, 1950).

Family Chtenopterygidae

"Comb-finned squids" of medium size (to 90 mm ML), characterised by unusual ribbed fin as a series of soft rays, ventral arms broad at base with two rows of suckers, all other arms with six rows at some point along length. Large oval photophore on viscera and as large patch on eye. Family consists of one genus and two species in tropical to subtropical waters. Resident in deep water during the day (at 500–1000 m), rising at night to surface waters. One species represented in the South China Sea. No known fisheries value. Family treated in Nesis (1987) and Roper & Jereb (2010d).

***Chtenopteryx sicula* (Vérany, 1851)**
(Figure: Nesis, 1987; Roper & Jereb, 2010d)

Distribution. Cosmopolitan in tropical and subtropical waters.

Note. First record for South China Sea from off Tung-Sha Island (Pratas Islands) (Lu, 2000).

Family Bathyteuthidae

Small squids (to 80 mm ML), deep red-brown in colour with short kidney-shaped posterior fins and short arms, wide at their bases. All but ventral arms with single photophore at aboral base. Family found throughout temperate and tropical waters and consists of a single genus and three species. One species recorded from South China Sea. Bathypelagic and meso-bathypelagic squids without conspicuous vertical migrations. No known fisheries value. See Roper (1969) for extensive review. See also Roper & Jereb, 2010).

***Bathyteuthis abyssicola* Hoyle, 1885**
(Figure: Roper, 1969; Nesis, 1987; Roper & Jereb, 2010)

Synonyms. *B. megalops* Verrill, 1885

Distribution. Cosmopolitan, rarer in tropical latitudes.

Note. First record for South China Sea from off Tung-Sha Island (Pratas Islands) (Lu, 2000).

#Family Brachioteuthidae

Small to medium sized squids (to 200 mm ML), adults are characterised by the presence of numerous small suckers in numerous series on the proximal portion of the tentacular clubs, a pattern become well established by 10 mm ML in paralarvae, the fins are rhomboidal. The fins in paralarvae are separate, paddle-shaped. Paralarvae possess a distinctive long neck. The family consists of two genera and seven nominal speces. At least two nominal species are considered to be present in the South China Sea. See review in Roper & Jereb (2010b).

+*Brachioteuthis riisei* (Steenstrup, 1882)
(Figure: Roper & Jereb, 2010b)

Distribution. Cosmopolitan.

Note. No confirmed record from the South China Sea but anticipated to occur in the region.

+*Brachioteuthis picta* Chun, 1910)
(Figure: Roper & Jereb, 2010b)

Distribution. Circumglobal from about 30°N to 45°S.

Note. No confirmed record from the South China Sea but anticipated to occur in the region.

Family Onychoteuthidae

"Hooked squids" are small to very large squids (to 1500 mm ML), typically muscular with elongate mantles. Arms are equipped with two rows of smooth-ringed suckers and the tentacular clubs have two rows of hooks. The fin is in the posterior part of the mantle. Mantle locking apparatus linear and simple. The family contains six genera and around 16 species which occur throughout all oceans. Some species are of minor fisheries value. At least two occur in the South China Sea. See review in Kubodera et al. (1998) and Roper & Jereb (2010k).

***Onykia carriboea* Lesueur, 1821**
(Figure: Nesis, 1987; Roper & Jereb, 2010k)

Distribution. Circumglobal distribution throughout tropical, subtropical and warm temperate oceans.

Note. Known with certainty only from small juveniles, no mature adult specimen has been described. It may represent the growth stage of other onychoteuthids.

***Onykia loennbergii* (Ishikawa & Wakiya, 1914)**
(Figure: Nesis, 1987; Roper & Jereb, 2010k)

Distribution. Japan to Saya-de-Malha Bank, Indian Ocean.

+*Callimachus rancureli* (Okutani, 1981)
(Figure: Okutani, 2005)

Distribution. Worldwide in tropical to temperate seas.

Note. First described as *Onykia rancureli*, the species was transferred to her new genus *Callimachus* by Bolstad in 2010. No confirmed record from the South China Sea, but anticipated to occur in the region.

***Onychoteuthis* cf. *banksii* (Leach, 1817)**
(Figure: Nesis, 1987; Roper & Jereb, 2010k)

Distribution. Cosmopolitan in warmer waters.

Note. Potential cryptic species. Bolstad et al. (2010) restricted *Onychoteuthis banksii* to the Atlantic Ocean. Species from the South China Sea may be referable to *O. aequimanus* Gabb, 1868, *O. borealijaponica* Okada, 1927, or *O. perolata* Bolstad, Vecchione & Young in Bolstad, 2008.

+*Walvisteuthis virilis* Nesis & Nikitina, 1986
(Figure: Roper & Jereb, 2010k)

Distribution. Worldwide in tropical to temperate seas.

Note. First described from one specimen taken in the South Atlantic Ocean. Some authors consider it to be conspecific with *Onykia rancureli* (now *Callimachus rancureli*) and considered its generic position to be distinct from *Onykia*, thus, with a new combination *Walvisteuthis rancureli*. We prefer to treat them as distinct until a thorough revision is available. No confirmed record from the South China Sea but anticipated to occur in the region.

Family Histioteuthidae

"Jewel squids" are weakly muscled moderate-sized squids (to 300 mm ML) characterised by many small anteriorly-directed photophores over all ventral surfaces of the mantle, head and arms. The mantle is short with small rounded fins and the arms are very long and thick. The eyes are different in shape and orientation with the left eye much larger than the right, and semi-tubular in shape. Representatives of this family are found in all non-polar waters of the world. The family contains one genus and at least 15 species of which at least four are represented in the South China Sea. No known fisheries value. See Voss (1969), Voss et al. (1998) and Roper & Jereb (2010g) for reviews of this family.

***Histioteuthis celetaria pacifica* (Voss, 1962)**
(Figure: original description, Nesis, 1987)

Synonyms. *Calliteuthis japonica* Massy, 1916.

Distribution. Southern Japan to Madagascar, northern Australia and Hawaii.

***Histioteuthis hoylei* (Goodrich, 1896)**
(Figure: Voss, 1962; Nesis, 1987; Roper & Jereb, 2010g)

Synonyms. *H. dofleini* (Pfeffer, 1912)

Distribution. Widely distributed in the Pacific Ocean between 45°N and 45°S, and in the Indian Ocean between ~10°N and the Southern Subtropical Convergence.

Note. First record for South China Sea from off Tung-Sha Island (Pratas Islands) (Lu, 2000).

***Histioteuthis meleagroteuthis* (Chun, 1910)**
(Figure: Voss, 1962; Nesis, 1987)

Synonyms. *Meleagroteuthis hoylei* Pfeffer, 1908; *H. bruuni* Voss, 1969.

Distribution. Cosmopolitan in tropical and subtropical waters.

Note. First record for South China Sea from off Tung-Sha Island (Pratas Islands) (Lu, 2000).

***Histioteuthis miranda* (Berry, 1918)**
(Figure: Voss, 1962; Nesis, 1987; Roper & Jereb, 2010g)

Distribution. Philippines to Australia, New Zealand, South Africa and Hawaii.

Note. First record for South China Sea from off Tung-Sha Island (Pratas Islands) (Lu, 2000).

#Family Joubiniteuthidae

"Joubin's squid" are weakly muscled small-sized squid (to 105 mm ML) characterised by the extremely long dorsal three pairs of arms that are greater than two times the mantle length and bearing six transverse series of small suckers, the long, needle-like tail which is longer that mantle, and the small ovoid fins. The family is monotypic and is found in the tropical, subtropical and even temperate waters in all three major oceans. See Young & Roper (1969b) and Roper & Jereb (2010h) for review of this family.

+*Joubiniteuthis portieri* (Joubin, 1916)
(Figure: Young & Roper, 1969)

Distribution. Cosmopolitan in tropical to temperate waters.

Note. No confirmed record from the South China Sea but anticipated to occur in the region.

Family Thysanoteuthidae

"Diamond squids" are large muscular squids (to 1000 mm ML) with large triangular fins which extend along the length of the mantle. Suckers in two rows on arms and in four rows on the tentacular clubs. This family contains a single species which occurs in tropical and subtropical waters throughout

the world including the South China Sea. Minor object of fisheries in Japan. See treatment in Nesis (1987) and Roper & Jereb (2010n).

***Thysanoteuthis rhombus* Troschel, 1857**
(Figure: Nesis, 1987; Dunning, 1998d; Roper & Jereb, 2010n)

Distribution. Cosmopolitan in tropical and subtropical waters.

Family Ommastrephidae

"Arrow squids" are medium to large muscular squids (to 1000 mm ML) characterised by a distinctive mantle locking apparatus in the shape of an inverted "T" and a paralarval stage (rhychteuthion stage) where the tentacles are fused into a long proboscis. Suckers in two rows on arms and four on tentacular clubs (eight in dactylus of *Illex*). The family contains eleven genera and 22 species represented in all oceans. Many species are harvested, forming major commercial fisheries, particularly in cooler waters. Eight species are recorded from the South China Sea. See Wormuth (1976), Nesis (1987) and Roper et al. (2010) for treatments of this family.

***Eucloteuthis luminosa* (Sasaki, 1915)**
(Figure: Nesis, 1987; Roper et al., 2010)

Distribution. Subtropical and higher latitudes in all oceans.

***Hyaloteuthis pelagica* (Bosc, 1802)**
(Figure: Nesis, 1987; Roper et al., 2010)

Distribution. At least Pacific and Atlantic Oceans, probably Indian Ocean.

Note. No confirmed record from the South China Sea but anticipated to occur in the region.

****Nototodarus hawaiiensis* (Berry, 1912)**
(Figure: Nesis, 1987; Dunning, 1998c; Roper et al., 2010)

Synonyms. *N. sloani philippensis* and *N. philippensis* Voss, 1962; *N. nipponicus* Okutani & Uemera, 1973.

Distribution. Hawaii to China Seas, Gulf of Thailand, Japan and northern Australia.

***Ornithoteuthis volatilis* (Sasaki, 1915)**
(Figure: Nesis, 1987; Roper et al., 2010)

Distribution. Japan and Taiwan to Line Islands, Africa and Arabian Sea.

****Ommastrephes bartramii* (Lesueur, 1821)**
(Figure: Nesis, 1987; Dunning, 1998c; Roper et al., 2010)

Synonyms. *O. caroli* Furtado, 1887.

Distribution. From Taiwan northward to East China Sea.

Note. No confirmed record from the South China Sea, but anticipated to occur in the region.

****Sthenoteuthis oualaniensis* (Lesson, 1830)**
(Figure: Nesis, 1987; Dunning, 1998c; Roper et al., 2010)

Synonyms. As *Symplectoteuthis oualaniensis* in earlier works.

Distribution. Tropical Indo-Pacific region: Red Sea to Japan, Australia and Hawaii.

Note. A distinct species which lacks a photophore on the dorsal mantle is also treated under this name. Commercial in Taiwan and Japan.

****Todarodes pacificus* (Steenstrup, 1880)**
(Figure: Nesis, 1987; Dunning, 1998c; Roper et al., 2010)

Synonyms. As *Ommastrephes sloani pacificus* in earlier works.

Distribution. NW Pacific to northern part of South China Sea.

****Todaropsis eblanae* (Ball, 1841)**
(Figure: Nesis, 1987; Dunning, 1998c; Roper et al., 2010)

Distribution. Northern Australia to at least South China Sea, as well as Indian and Atlantic Oceans.

Note. First record for South China Sea from off Tung-Sha Island (Pratas Islands) (Lu, 2000). Minor fishery in NE Atlantic.

Family Mastigoteuthidae

Medium to large (to 1000 mm ML) weakly muscled squids from deep waters, characterised by red colouration (the majority not expressed as chromatophores) and elongate fourth arms. Tentacles are long and whip-like but frequently are lost during capture. Fins are large and in posterior portion of mantle. The family contains two genera and around 16 species, found in all oceans except the Arctic. No known fisheries value. At least two species occur in the South China Sea. See Nesis (1987), Salcedo-Vargas & Okutani (1994), and Roper & Jereb (2010i) for treatments of this family.

***Idioteuthis cordiformis* (Chun, 1908)**
(Figure: Nesis, 1987)

Distribution. Southern Japan, South China Sea from off Tung-Sha Island (Pratas Islands), Philippines, Indonesia and Australia. Associated with the bottom in deep water.

Mastigoteuthis* cf *grimaldi

Distribution. South China Sea.

Note. A species with many similarities to the Atlantic species, *M. grimaldi* (Joubin, 1895). First record for South China Sea from off Tung-Sha Island (Pratas Islands) (Lu, 2000).

Family Cycloteuthidae

"Discus squids" are medium-sized semigelatinous squids (to 600 mm ML) with a widely conical mantle and a large round fin. The mantle locking apparatus is sub-triangular. Suckers in two rows on arms and four rows on the tentacle clubs. The family contains two genera and four species found in tropical and subtropical waters of all oceans. No known fisheries value. Two species occur in the South China Sea. See Young & Roper (1969), Nesis (1987) and Roper & Jereb (2010) for treatment of this family.

***Discoteuthis discus* Young & Roper, 1969**
(Figure: Nesis, 1987; Roper & Jereb, 2010)

Distribution. Nesis (1987) lists distribution as "tropical and subtropical Atlantic, probably Indian and Pacific Oceans". This record confirms the presence of this species in the Pacific Ocean.

Note. First record for South China Sea from off Tung-Sha Island (Pratas Islands) (Lu, 2000).

***Cycloteuthis sirventi* Joubin, 1919**
(Figure: Nesis, 1987; Roper & Jereb, 2010)

Distribution. Tropical and subtropical waters of the Atlantic and Indo-West Pacific region.

Note. Based on Khromov (1990, 1996) record from Vietnam.

Family Chiroteuthidae

Medium to large gelatinous squids (to 800 mm ML) characterised by elongate necks, fluid (ammonium chloride) filled chambers and vesicles for buoyancy control. Most species have very long tentacles. The paralarval stage (doratopsis stage) has a chambered neck and a gladius which extends well beyond the fins to support "ornamentation" (flotation devices). The family contains four genera and around 14 species, represented in all oceans from the sub-arctic to the sub-antarctic. No known fisheries value. At least two species occur in the South China Sea. See Nesis (1987) and Roper & Jereb (2010c) for treatment of this family and Young (1991) and Vecchione et al. (1992) for treatment of the paralarval stages.

***Chiroteuthis picteti* Joubin, 1894**
(Figure: Nesis, 1987)

Distribution. Tropical waters from the Red Sea to Japan, Indonesia and Hawaii.

Note. Nesis (1987) and Roper & Young (2011) consider *C. imperator* and *C. macrosoma* as synonyms.

+*Chiroteuthis veranyi* (Férussac, 1835 in Férussac & d'Orbigny, 1834-1848)
(Figure: Roper & Jereb, 2010c)

Distribution. Circumglobal, from Tropical, subtropical to subantarctic waters.

Note. No confirmed record from the South China Sea but anticipated to occur in the region.

***Asperoteuthis acanthoderma* (Lu, 1977)**
(Figure: Lu, 1977; Roper & Jereb, 2010c)

Distribution. Central North Pacific. Types from the Celebes Sea.

Note. No confirmed record from the South China Sea but anticipated to occur in the region.

+*Grimalditeuthis bonplandi* (Verany, 1851)
(Figure: Roper & Jereb, 2010c)

Distribution. Circumglobal, from Tropical, subtropical to temperate waters.

Note. Has been captured in Taiwan (Lu unpublished data). No confirmed record from the South China Sea but anticipated to occur in the region.

Family Cranchiidae

"Cranch, bathyscaphoid or cockatoo squids" are small to large (to 2000 mm ML) often transparent squids characterised by a large fluid-filled body containing ammonium ions for buoyancy. They typically appear bloated with short arms. The head and funnel are fused to the mantle and the arms possess two rows of suckers and/or hooks. The family contains 13 genera and around 30 species, which are typically planktonic to bathypelagic in all oceans except the Arctic. No known fisheries value. At least six species are represented in the South China Sea with four more species anticipated to occur. See Nesis (1987), N. Voss (1988) and Roper & Jereb (2010) for treatments of this family.

***Cranchia scabra* Leach, 1817**
(Figure: Nesis, 1987; Lu & Dunning, 1998; Roper & Jereb, 2010)

Distribution. Cosmopolitan in tropical and subtropical waters.

+*Leachia cyclura* Lesueur, 1821
(Figure: Nesis, 1987; Roper & Jereb, 2010)

Distribution. Tropical and southern subtropical Indo-West Pacific oceanic waters.

Note. No confirmed record from the South China Sea but anticipated to occur in the region.

+*Leachia pacifica* (Issel, 1908)
(Figure: Nesis, 1987; Roper & Jereb, 2010)

Distribution. Tropical waters of North Pacific and Indo-Pacific oceans, equatorial waters of the Indian Ocean.

Note. No confirmed record from the South China Sea but anticipated to occur in the region.

***Liocranchia reinhardti* (Steenstrup, 1856)**
(Figure: Nesis, 1987; Lu & Dunning, 1998; Roper &Jereb, 2010)

Synonyms. *L. intermedia* Robson, 1924; *Fusocranchia alpha* Joubin, 1920.

Distribution. Cosmopolitan in tropical and subtropical waters.

+*Egea inermis* Joubin, 1933
(Figure: Nesis, 1987; Roper & Jereb, 2010)

Synonyms. *Phasmoctopsis lucifer* G. Voss, 1963.

Distribution. Circumglobal in tropical and subtropical waters.

Note. At least one record from the South China Sea (Voss, 1974).

+*Helicocranchia pfefferi* Massy, 1907
(Nesis, 1987; Lu & Dunning, 1998; Roper & Jereb, 2010)

Distribution. Circumglobal in tropical and subtropical waters and North Atlantic temperate zones.

Note. According to Roper & Jereb (2010) the name may represent a species complex. No confirmed record from the South China Sea but anticipated to occur in the region.

+*Liguriella podophthalma* Issel, 1908
(Figure: Nesis, 1987; Roper & Jereb, 2010)

Distribution. Circumglobal in tropical and subtropical waters and northern sub-Antarctic waters.

Note. No confirmed record from the South China Sea but anticipated to occur in the region.

***Megalocranchia* sp.**
(Figure: N. Voss, 1980)

Distribution. South China Sea.

Note. First recorded for South China Sea from off Tung-Sha Island (Pratas Islands) under the name *Megalocranchia abyssicola* (Lu, 2000). The taxonomy of the genus is unresolved.

+*Sandalops melancholicus* Chun, 1906
(Figure: Nesis, 1987; Lu & Dunning, 1998; Roper & Jereb, 2010)

Distribution. Tropical and subtropical Atlantic and Indo-West Pacific, Taiwan and Si-Sha Is. (Paracel Is.)

***Taonius pavo* (Lesueur, 1821)**
(Figure: Nesis, 1987; Roper & Jereb, 2010)

Distribution. Wide distribution but rare in tropical-subtropical waters. Has been reported from off Tung-Sha Island (Pratas Islands), South China Sea (Lu, 2000).

Note. Roper & Jereb (2010) considered *Taonius pavo* is only distributed in the Atlantic Ocean. They applied the name *Taonius belone* (Chun, 1906) to the Pacific form. Okutani (2015) listed both species from all three major oceans. We retain the name *Taonius pavo* for the South China Sea form here until a thorough revision of the genus is available.

Order Spirulida

This order contains a single family and a single species, the anomalous squid, *Spirula spirula*. It is found in mesopelagic waters of the tropical open ocean. It carries an unusual internal shell that is used as a buoyancy device. The shell is calcareous and has the shape of a horn coiled in a single plane without the coils touching one another. The posterior position of the shell causes the animal to generally orient vertically with the head downward. Both ventral arms are hectocotylised.

Family Spirulidae

"Ramshorn Squid" is a small mesopelagic squid (to 45 mm ML) recognised by the internal coiled and chambered shell embedded in the posterior end of the mantle. Small fins are positioned on the posterior tip of the mantle, almost perpendicular to the longitudinal axis of the mantle. A large circular photophore is situated on the posterior tip of the mantle between the fins. The family contains a single species, represented in the South China Sea. No known fisheries value. See Clarke (1970) for treatment of this family.

***Spirula spirula* (Linnaeus, 1758)**
(Figure: Nesis, 1987; Dunning, 1998e; Lu & Dunning, 1998)

Distribution. Tropical and subtropical oceanic waters worldwide.

Note. No confirmed record from the South China Sea but anticipated to occur in the region.

Order Sepiida

This order contains the cuttlefishes, characterised by an oval body, flattened dorsoventrally and bordered along both sides of the body by narrow fins that do not connect at the

posterior end. The calcareous internal shell (i.e., sepion or cuttlebone) lies dorsally in the body beneath the skin. The shell is a thick, oval, lanceolate or rhomboidal structure containing numerous stacked gas and/or water filled chambers in layers. The shell is used for buoyancy control. The arms bear suckers in 2 to 4 series. The tentacles are completely retractile into pockets.

Family Sepiidae

"Cuttlefishes" are muscular, small to medium-sized animals (to 500 mm ML) easily recognised by their internal layered "cuttlebone", which acts as a buoyancy control organ. This family contains three genera and at least 100 species, of which at least 20 species occur within the South China Sea. There are a number of problems with the taxonomy of this group. Many species are known solely on the basis of the cuttlebone, some species from a single bone. The morphology of the soft body parts is described for a small proportion of the nominal species. Many species are harvested throughout the region in both subsistence and commercial fisheries. Various methods are used to collect these animals, ranging from spear, line and traps, to large-scale trawl operations. See Adam & Rees (1966), Adam (1979), Reid (1998), Khromov et al. (1998), Lu (1998a, b), and Jereb & Roper (2005) for reviews of this family.

***Metasepia tullbergi* (Appellöf, 1886)**
(Figure: Reid et al., 2005)

Distribution. Japan to Taiwan, Hong Kong and Philippines. Gulf of Thailand (Nateewathana, 1998).

****Sepia aculeata* Van Hasselt in Férussac & d'Orbigny, 1835 [in Férusac & d'Orbigny, 1834–1848]**
(Figure: Reid et al., 2005)

Distribution. Arabian Sea to Indonesia, Singapore, China and Ryukyu Islands.

Note. Significant fisheries in India, Sri Lanka, Thailand, southern China and Taiwan.

***Sepia brevimana* Steenstrup, 1875**
(Figure: Reid et al., 2005)

Synonyms. *S. winckworthi* Adam, 1939.

Distribution. Maldives to Western Indonesia, Gulf of Thailand and southern China.

***Sepia carinata* Sasaki, 1920**
(Figure: Sasaki, 1929)

Distribution. Sagami Bay, Japan (source: Nesis, 1987)

Note. Recorded from South China Sea on basis of Khromov (1990, 1996) record from Vietnam.

****Sepia esculenta* Hoyle, 1885**
(Figure: Reid et al., 2005)

Synonyms. *S. hoylei* Ortmann, 1888.

Distribution. Japan to Vietnam, Singapore and Philippines.

Note. Significant fisheries in Japan, South Korea and China. Focus of aquaculture in northern China.

+*Sepia filibrachia* Reid & Lu, 2005
(Figure: Reid & Lu, 2005)

Synonyms. *Sepia mestus* Gray, 1849 (in part)

Distribution. Taiwan, South China Sea

***Sepia kobiensis* Hoyle, 1885**
(Figure: Reid et al., 2005)

Synonyms. *S. andreanoides* Hoyle, 1885.

Distribution. Japan to Arabian Sea, Gulf of Thailand.

Note. Plus potential cryptic species. May be Voss & Williamson's (1972) *S. andreana* record from Hong Kong. Object of fisheries in southern Japan and China.

****Sepia latimanus* Quoy & Gaimard, 1832**
(Figure: Reid et al., 2005)

Synonyms. *S. hercules* Pilsbry, 1894; *Ponderisepia eclogaria* Iredale, 1926; *S. harmeri* Robson, 1928.

Distribution. Japan to Australia and central tropical Pacific Ocean, Singapore.

Note. Collected in local harvests throughout its range.

***Sepia lorigera* Wülker, 1910**
(Figure: Okutani et al., 1987; Reid et al., 2005)

Distribution. Japan and East China Sea.

Note. Recorded from South China Sea on basis of Khromov (1990, 1996) record from Vietnam. Object of minor fishery.

****Sepia lycidas* Gray, 1849**
(Figure: Reid et al., 2005)

Synonyms. *S. subaculeata* Sasaki, 1914.

Distribution. Japan to Vietnam, Sarawak and Singapore.

Note. Significant fisheries in Japan, South Korea, Taiwan and China.

***Sepia madokai* Adam, 1939**
(Figure: Reid et al., 2005)

Synonyms. *S. robsoni* Sasaki, 1929 (name "*robsoni*" was pre-occupied by Massy, 1927 for a South African species of *Sepia*).

Distribution. Japan to East and South China Seas.

Note. Minor fisheries in southern Japan, Taiwan and China.

***Sepia papuensis* Hoyle, 1885**
(Figure: Reid et al., 2005)

Synonyms. ?*S. galei* Meyer, 1909; *S. prionata* Voss, 1962; *Solitosepia submestus* Iredale, 1926; *S. occidua* Cotton, 1929; *S. lana* Iredale, 1954; *S. genista* Iredale, 1954.

Distribution. Philippines, Indonesia, Australia and Coral Sea.

****Sepia pharaonis* Ehrenberg, 1831**
(Figure: Reid et al., 2005)

Synonyms. *S. torosa* Ortmann, 1888; *S. rouxii* d'Orbigny, 1839–1842 [in Férussac & d'Orbigny, 1834–1848]; *S. formosana* Berry, 1912; *Crumenasepia hulliana* Iredale, 1926; *C. ursulae* Cotton, 1929; *S. tigris* Sasaki, 1929.

Distribution. Indian Ocean and Southeast Asia.

Note. Important fishery species throughout Indian Ocean and south-east Asia including northern Australia. May consists of a number of cryptic species (Anderson et al., 2007, 2011).

***Sepia recurvirostra* Steenstrup, 1875**
(Figure: Reid et al., 2005)

Synonyms. *S. singaporensis* Pfeffer, 1884.

Distribution. Burma to Philippines, Singapore, including East and South China Seas.

Note. Object of minor fisheries in South China Sea and adjacent waters.

***Sepia stellifera* Homenko & Khromov, 1984**
(Figure: Reid et al., 2005)

Distribution. Gulf of Thailand, Arabian Sea and west coast of India to Cape Comorin, Bay of Bengal, Andaman Sea, Singapore.

+*Sepia vietnamica* Khromov, 1987
(Figure: Reid et al., 2005)

Synonyms. *S. nanshiensis* Li & Chen, 1989 is a junior synonym (Lu et al., 2012).

Distribution. North West South China Sea, Southern Taiwan.

***Sepia vossi* Khromov, 1996**
(Figure: Reid et al., 2005)

Synonyms. Treated under *S. omani* in Voss & Williamson (1972) and *S. rex* in Khromov (1988).

Distribution. Taiwan, Hong Kong to South Vietnam, Singapore.

****Sepiella japonica* Sasaki, 1929**
(Figure: Reid et al., 2005)

Synonyms. Sasaki renamed *S. maindroni* Hoyle, 1886 as it was pre-occupied (Rochebrune, 1884).

Distribution. Japan to Guangzhou, Philippines.

Note. Significant fisheries in Japan, South Korea, Taiwan and China. Focus of emerging fishery and aquaculture in East China Sea.

****Sepiella inermis* (Van Hasselt in Férussac & d'Orbigny, 1835)**
(Figure: Reid et al., 2005)

Distribution. Red Sea to Indonesia, Singapore, Gulf of Thailand and Gulf of Tonkin.

Note. Significant fisheries in the Arabian Sea, India and Indochina.

***Sepiella weberi* Adam, 1939**
(Figure: Reid et al., 2005)

Distribution. Eastern Indonesia (Sumba, Timor), source Nesis (1987).

Note. Recorded from South China Sea on basis of Khromov (1990, 1996) record from Vietnam.

Order Sepiolida

This order contains small to tiny squids (10–100 mm ML) which range in shape from the spherical bobtail and bottle squids, to the elongate pygmy squids. Most species are benthic or bentho-pelagic. The fins are kidney-shaped to round and do not extend along the full length of the mantle. The fins have both anterior and posterior lobes free, the posterior lobes being broadly separated. Photophores, when present, have small separate oval lenses or fused lenses forming either a large medial round organ or a pair of bean-shaped lenses.

Family Sepiolidae

"Bobtail squids" are small benthic or pelagic squids (to 100 mm ML) characterised by short rounded mantles with large semicircular fins, large eyes (covered with corneal membranes) and short arms. One or both dorsal arms are modified in males. Mantle locking apparatus simple and linear. The family contains 14 genera and over 50 species

represented in tropical, temperate and sub-polar waters of all oceans. The taxonomy of certain genera is poor, particularly *Euprymna* (Norman & Lu, 1997) and *Sepiola* for which most species can only be identified on the basis of mature male secondary sexual characteristics. Several species are the basis of very minor fisheries, which can be locally popular. At least 12 species are likely to occur in the South China Sea. See Reid & Norman (1998) and Reid & Jereb (2005) for treatments of members of this family.

***Austrorossia bipapillata* (Sasaki, 1920)**
(Figure: Reid & Jereb, 2005)

Distribution. Japan to the Philippines.

****Euprymna berryi* Sasaki, 1929**
(Figure: Reid & Jereb, 2005)

Distribution. Japan to East China Sea, South China Sea, Gulf of Thailand.

Note. Occasionally available in fish markets in Taiwan, also reported to be consumed locally in China (Roper et al., 1984).

***+Euprymna hoylei* Adam, 1986**
(Figure: Adam, 1986)

Distribution. Tropical Indo-West Pacific.

Note. No confirmed record from the South China Sea but anticipated to occur in the region.

***+Euprymna hyllebergi* Nateewathana, 1997**
(Figure: Nateewathana, 1997; Nateewathana et al., 2001)

Distribution. Gulf of Thailand, Andaman Sea, Singapore.

Note. Past records in the region may have been misidentified as other members of *Euprymna*.

***+Euprymna morsei* (Verrill, 1881)**
(Figure: Reid & Jereb, 2005)

Distribution. Southern Japan, East China Sea, possibly Philippines.

Note. No confirmed record from the South China Sea but anticipated to occur in the region.

***Heteroteuthis* sp.**

Distribution. First record for South China Sea from off Tung-Sha Island (Pratas Islands) (Lu, 2000).

***Inioteuthis maculosa* Goodrich, 1896**
(Figure: Nesis, 1987)

Distribution. Persian Gulf to Indonesia, Gulf of Thailand and Philippines.

***Neorossia* sp.**

Distribution. First record for South China Sea from off Tung-Sha Island (Pratas Islands) (Lu, 2000).

***Sepiola birostrata* Sasaki, 1918**
(Figure: Reid & Jereb, 2005)

Distribution. Russia to North and South Korea, China.

***Sepiola trirostrata* Voss, 1962**
(Figure: Reid & Jereb, 2005)

Distribution. Gulf of Thailand, Philippines, Singapore.

***Sepiolina nipponensis* (Berry, 1911)**
(Figure: Reid & Jereb, 2005)

Distribution. Southern Japan, Taiwan and Philippines to southern Australia.

***Stoloteuthis* sp.**

Distribution. First record for South China Sea from off Tung-Sha Island (Pratas Islands) (Lu, 2000).

Family Sepiadariidae

"Bottletail squids" are small benthic squids (to 100 mm ML) characterised by short rounded mantles with large kidney-shaped to semi-circular fins, and short arms. Left ventral arm modified in males. Mantle locking apparatus with two components in *Sepioloidea* or permanently fused in *Sepiadarium*. Two genera and eight species are currently recognised in this family, however the taxonomy of this group requires revision. This family is restricted to the tropical and temperate waters of the Indo-West Pacific. No known fisheries value. Two species occur in the South China Sea. See Reid (2005a) for treatment of this family.

***Sepiadarium gracilis* Voss, 1962**
(Figure: Nesis, 1987)

Distribution. Northern Mindoro, western Philippines.

***Sepiadarium kochi* Steenstrup, 1881**
(Figure: Reid, 2005a)

Distribution. Northern Indian Ocean, Indonesia, Australia and South China Sea including Taiwan.

Family Idiosepiidae

"Pygmy squids" are tiny elongate squids (to 25 mm ML, some species mature at 8 mm ML) characterised by small and separate posterior fins and a dorsal mantle adhesive organ used to attach to the underside of seagrasses or algae. The family contains one genus and at least six species, restricted to the tropical and temperate waters of the Indo-West Pacific. The taxonomy of this group is poor with few

characters separating several of the described species. The group requires a thorough revision. No known fisheries value. Two to three species occur in the South China Sea region. See treatments in Nesis (1987), Hylleberg & Nateewathana (1991a, b), Chotiyaputta, Okutani & Chaitiamvong (1991) and Reid (2005b).

+*Idiosepius biserialis* Voss, 1962
(Figure: Nesis, 1987)

Synonyms. *I. thailandicus* Chotiyaputta, Okutani & Chaitiamvong, 1991.

Distribution. Philippines, Gulf of Thailand, Andaman Sea, Singapore.

Note. Nabhitabhata & Suwanmala (2008) stated that *I. biserialis* and *I. thailandicus* are not reproductively isolated. Recent studies on morphological, molecular characters, and reproductive behaviour of *I. biserialis* and *I. thailandicus* also reveal that the two species are similar (Byern & Klepal, 2010; Byern et al., 2010).

***Idiosepius pygmaeus* Steenstrup, 1881**
(Figure: Nesis, 1987)

Synonyms. *I. pygmaeus hebereri* Grimpe, 1931.

Distribution. Southern Japan to northern Australia, Singapore.

***Idiosepius paradoxus* (Ortmann, 1888)**
(Figure: Nesis, 1987)

Distribution. Southern Japan to northern Australia.

Order Octopoda

This order contains all octopuses, characterised by eight arms with one or two rows of suckers. Most species possess web sectors between the arms. This order contains benthic, benthopelagic and pelagic representatives.

Suborder Cirrata

"Cirrate or finned octopods" are semi-gelatinous deep-sea octopuses which occur at bathyal and abyssal depths throughout the world's oceans. They possess eight arms and are characterised by round to paddle- or tongue-like fins on the mantle and a single row of suckers interspersed by cirri (finger-like projections considered to be chemo- or electro-sensory). The webs are typically deep and the mantle aperture is very narrow restricted to a slit around the funnel base. Only the left oviduct is developed. Eggs are large in a coriaceous envelope, laid singly on the bottom.

Family Opisthoteuthidae

"Flapjack or pancake devilfishes" are small to large (potentially to 1.2 m total length) semi-gelatinous octopuses found associated with the bottom in deep water. They possess a pair of paddle-shaped fins supported by a U- or V-shaped internal cartilagenous shell at the posterior tip of the mantle. They lack the secondary web of other cirrate octopods. As these soft-bodied animals are frequently damaged when hauled to the surface from deep water, material on which most descriptions have been based is typically in poor condition. Collins & Villanueva (2006) provided a revision of all cirrates and considered the family Opisthoteuthidae as monotypic, containing only the genus *Opisthoteuthis*. In the present work, we follow the scheme used in Jereb, Roper, Norman & Finn (2014) in which the family Opisthoteuthidae contains four genera, *Opisthoteuthis* Verrill, 1883, *Grimpoteuthis* Robson, 1932b, *Luteuthis* O'Shea, 1999 and *Cryptoteuthis* Collins, 2004, with at least 20 ill-defined species having been named. Rarely encountered and of no known fisheries value. At least four species appear to occur in the deeper waters of the South China Sea. See Nesis (1987), G. Voss (1988) and Collins & Villanueva (2006) for treatments of this family.

***Grimpoteuthis* sp.**

Distribution. First record for South China Sea from off Tung-Sha Island (Pratas Islands) (Lu, unpublished data).

+*Luteuthis shuishi* O'Shea & Lu, 2002
(Figure: O'Shea & Lu, 2002)

Distribution. Known only from the type locality, off Pratas Islands, 19°30'N, 114°10'E.

+*Opisthoteuthis dongshaensis* Lu, 2010
(Figure: Lu, 2010)

Distribution. Known only from vicinity of type locality, off Tung- Sha Island (Pratas Islands), 19°25'N, 114°02'E, South China Sea.

***Opisthoteuthis japonica* Taki, 1962**
(Figure: Nesis, 1987)

Distribution. Pacific coast of southern Honshu, Japan.

Note. South China Sea record based on Khromov (1990, 1996) record from Vietnam.

Suborder Incirrata

"Incirrate octopods" are a diverse group of octopuses ranging in size from tiny (mature under 1 g, <10 mm ML) to very large (to 600 mm ML, 5 m total length). They lack fins and have one to two rows of suckers and no cirri on the arms. The females of all members of this suborder appear to brood eggs until hatching. They are semi-gelatinous to muscular with pelagic, benthopelagic and benthic representatives in all oceans and at all depths (from intertidal and surface waters to more than 5000 m deep).

Family Argonautidae

"Argonauts or paper nautiluses" are muscular pelagic octopuses, the females of which attain moderate sizes (to 150 mm ML) secrete an external shell. This calcareous brittle shell is white with fine corrugations. It is secreted from early growth stages by membranous extensions on the dorsal arms. It acts as a brood chamber in which egg strands are laid. The male is much smaller (to 15 mm ML), lacks the shell of the female and possesses a large modified third left arm which is detached during courtship and transferred to the female's mantle cavity as a sperm storage organ. The family contains a single genus and at least four species. Shells are occasionally sold through the shell trade. Two species occur in the South China Sea. See Finn (2014b) for treatment of this family.

Argonauta argo Linneaus, 1758
(Figure: Finn, 2014b).

Distribution. Cosmopolitan in tropical and subtropical waters.

Argonauta hians Lightfoot, 1786
(Figure: Finn, 2014b).

Distribution. Cosmopolitan in tropical and subtropical waters except eastern Pacific Ocean.

Family Alloposidae

Medium to large (to 400 mm ML, total length to 2 m) semi-gelatinous octopuses, pelagic to benthic in open ocean and deep water. The mantle is short with the head as wide as the mantle. The arms are short with deep webs. The male is smaller than the female but can still attain total lengths of 300 mm. The modified arm in the male is contained within a sac in front of the eyes, giving the appearance of only seven arms. The female broods the eggs on the arm bases around the mouth. The family contains a single species represented in the South China Sea. Rarely encountered and of no known fisheries value. See Finn (2014b) for treatment of this family.

Haliphron atlanticus Steenstrup, 1861
(Figure: Finn, 2014a).

Synonyms. *Alloposus mollis* Verrill, 1880.

Distribution. Cosmopolitan in tropical to temperate waters.

Note. Recorded from the South China Sea by Lu (2000) from off off Tung- Sha Island (Pratas Islands).

Family Ocythoidae

"Football octopuses" are muscular pelagic octopuses found in subtropical and temperate surface waters of all oceans, the females of which reach large sizes (to 300 mm ML). The female possesses a network of raised ridges on the ventral surface of the large ovoid mantle and a gas-filled swimbladder. The small male (to 30 mm ML) has a modified third right arm, which is detached in mating and passed to the female as a sperm storage organ. The family contains a single species, which is represented in the South China Sea. Rarely encountered and of no known fisheries value. See Finn (2014c) for treatment of this family.

Ocythoe tuberculata Rafinesque, 1814
(Figure: Finn, 2014c).

Distribution. Cosmopolitan in subtropical waters of all oceans (bi-subtropical).

Note. According to Finn (2014c), this species does not occur in the tropical waters. This record from the northern South China Sea originated from Shojima (1970). This record requires further investigation.

Family Tremoctopodidae

"Blanket octopuses" are distinctive muscular pelagic octopuses, the females of which attain large sizes (to 500 mm ML) and have longer dorsal arms bearing long membranous webs that can display regular iridescent ocelli. Sections of web can be autotomised along visible fracture lines, presumably as decoys to predators. The tiny males (to 15 mm ML) have a modified third right arm, which is detached during mating and passed to the female as a sperm storage organ. This family contains one genus and four species found in all tropical and subtropical waters, one species of which is represented in the South China Sea. Rarely encountered and of no known fisheries value. See Finn (2014d) for treatment of this family.

Tremoctopus gracilis (Eydoux & Souleyet, 1852)
(Figure: Voss & Williamson, 1972; Thomas, 1977)

Distribution. Tropical and subtropical waters of the Indian and Pacific Oceans.

Note. This species was described as *Tremoctopus violaceu*s by Voss & Williamson (1972) and as *Tremoctopus violaceus gracilis* by Thomas (1977).

Family Amphitretidae

Recent phylogenetic revision by Strugnell et al. (2013) recognised a single family of gelatinous pelagic octopuses containing three subfamilies that had previously been recognised at the familial rank. The new subfamily names are Amphitretinae, Bolitaeninae and Vitreledonellinae. Members of this family are residents of midwater, possessing transparent flesh and few large or no chromatophores.

Subfamily Amphitretinae

Semi-transparent gelatinous pelagic octopuses of small to moderate size (to 90 mm ML), characterised by a funnel which is fused to the mantle resulting in two mantle apertures. The eyes are tubular and the digestive gland is

always oriented vertically, making the stomach dorsal to the digestive gland. The third right arm of males is modified. The subfamily contains a single species, which occurs throughout tropical and subtropical waters of the world and is present in the South China Sea. Rarely encountered and of no known fisheries value. See Young et al. (1996) and Norman & Finn (2014a) for treatments of this subfamily.

***Amphitretus pelagicus* Hoyle, 1885**
(Figure: Norman & Finn, 2014a)

Distribution. Tropical and subtropical waters of Indo-Pacific region.

Subfamily Bolitaeninae

Meso- to bathypelagic semi-gelatinous octopuses of small to moderate size (to 200 mm ML) characterised by short arms with a single row of suckers and a wide mantle opening. The radula is comb-like with many cusps on all teeth and the females possess a circular light organ around the mouth. The subfamily is represented in all subtropical and tropical waters and contains two genera each with a single species. Rarely encountered and of no known fisheries value. Both species occur in the South China Sea. See Young et al. (1996) and Norman & Finn (2014c) for treatments of this subfamily.

***Bolitaena pygmaea* (Verrill, 1884)**
(Figure: Norman & Finn, 2014c)

Distribution. Cosmopolitan in tropical and subtropical waters.

***Japetella diaphana* Hoyle, 1885**
(Figure: Norman & Finn, 2014c)

Distribution. Cosmopolitan in tropical and subtropical waters.

Subfamily Vitreledonellinae

Semi-transparent gelatinous bathypelagic octopuses of moderate size (to 110 mm ML), characterised by a rectangular shaped eye, a single wide mantle aperture, a single row of suckers, and a radula with a multi-cuspid rhachidian tooth but few cusps on the first and second lateral teeth. Gills with only outer demibranch present and digestive gland cigar-shaped with pointed end. One species is recognised in this subfamily, which occurs throughout tropical and subtropical waters including the South China Sea. Rarely encountered and of no known fisheries value. See Young et al. (1996) and Norman & Finn (2014b) for treatments of this subfamily.

***Vitreledonella richardi* Joubin, 1918**
(Figure: Norman & Finn, 2014b)

Distribution. Cosmopolitan in tropical, subtropical and temperate waters.

Family Octopodidae

"Benthic octopuses" are tiny to very large (to 600 mm ML) bottom-dwelling octopuses characterised by a muscular form (never gelatinous or semi-transparent), one or two rows of sessile suckers on the arms and a modified third right or left arm in males. The taxonomy of this family is under review and many new genera are likely to be raised. The family as it is currently considered contains 36 genera and over 350 species names have been coined. The taxonomy of this family requires extensive research with more than 100 undescribed species recognised within Indo-West Pacific waters alone (Norman & Hochberg, unpublished data). Over 50 species occur in the South China Sea (M. Norman, unpublished data), with 28 having been formally described and are treated here. 20 undescribed/unresolved species are also recognised but not treated here. Many species form the basis of fisheries from small-scale subsistence harvests to large-scale commercial fisheries. Many of the species collected and exported in the largest quantities from the region are being incorrectly treated in the literature, particularly under the names "*Octopus membranaceus*" and "*Octopus minor*". See Norman et al. (2014) for an overview of the family.

+*Abdopus aculeatus* (d'Orbigny, 1834 [in Ferrusac & d'Orbigny, 1834-1848])
(Figure: Norman et al., 2014)

Synonyms. *Octopus harmandi* Rochebrune, 1882.

Distribution. Throughout South China Sea and Philippines.

+*Abdopus abaculus* (Norman & Sweeney, 1997)
(Figure: Norman & Sweeney, 1997)

Distribution. At least Philippines.

****Amphioctopus aegina* (Gray, 1849)**
(Figure: Norman et al., 2014)

Synonyms. *Octopus hardwickei* Gray, 1849; *Octopus dollfusi* Robson, 1928.

Distribution. India to South China Sea, Singapore, Taiwan and Philippines.

Note. Harvested in commercial quantities in at least Taiwan, Gulf of Thailand and India.

***Amphioctopus exannulatus* (Norman, 1993)**
(Figure: Norman, 1993b, 1998)

Distribution. Australia to Philippines, Gulf of Thailand.

Note. Minor bycatch trawl species in Australia.

***Amphioctopus fangsiao* (d'Orbigny, 1839-41)**
(Figure: Norman et al., 2014)

Synonyms. *Octopus areolatus* de Haan, 1839-1841 [in: Férussac & d'Orbigny, 1834-1848]; *Octopus ocellatus* Gray, 1849.

Distribution. Japan to South China Sea.

Note. Harvested in Japan and South China Sea, including Taiwan. Probably represents a species complex. Focus of aquaculture in northern China.

+*Amphioctopus kagoshimensis* (Ortmann, 1888)
(Figure: Norman et al., 2014)

Distribution. Japan to South China Sea.

****Amphioctopus marginatus* (Taki, 1964)**
(Figure: Norman, 1998)

Synonyms. *Octopus striolatus* Dong, 1976.

Distribution. Indian Ocean and continental Western Pacific Ocean including Taiwan.

Note. Large harvests in at least Hong Kong and Taiwan. There are at least two species being treated under this species name.

+*Amphioctopus neglectus* (Nateewathana & Norman, 1999)**
(Figure: Norman et al., 2014)

Distribution. India to Taiwan.

Note. Major trawl fishery in Gulf of Thailand.

+*Amphioctopus rex* (Nateewathana & Norman, 1999)**
(Figure: Norman et al., 2014)

Distribution. India to Gulf of Thailand, Indonesia and northern Australia.

Note. Major trawl fishery in Gulf of Thailand.

+Amphioctopus siamensis* (Nateewathana & Norman, 1999)**
(Figure: Norman et al., 2014)

Distribution. Andaman Sea and Gulf of Thailand, Singapore.

Note. Minor catch in trawl fishery in Gulf of Thailand.

***Callistoctopus luteus* (Sasaki, 1929)**
(Figure: Norman et al., 2014)

Distribution. Taiwan, South China Sea, Thailand, Philippines and Indonesia.

Note. May represent more than one species.

+Callistoctopus nocturnus* (Norman & Sweeney, 1997)**
(Figure: Norman et al., 2014)

Distribution. Only known from Philippines.

***Callistoctopus ornatus* (Gould, 1852)**
(Figure: Norman et al., 2014)

Distribution. Tropical Indo-West Pacific region, in association with coral reefs.

***Cistopus indicus* (Rapp, 1835 [in Férussac & d'Orbigny, 1834-1848])**
(Figure: Norman et al., 2014)

Distribution. At least Philippines.

Note. This species name requires resolution; prior reports are predominantly other recently-described species, *C. taiwanicus* and *C. chinensis*.

+**Cistopus chinensis* Zheng, Lin, Lu, & Ma, 2012**
(Figure: Norman et al., 2014)

Distribution. East China Sea and South China Sea.

Note. Focus of emerging fishery and aquaculture.

+**Cistopus taiwanicus* Liao & Lu, 2009**
(Figure: Norman et al., 2014)

Distribution. Taiwan Strait to Beibu Gulf.

***Hapalochlaena lunulata* (Quoy & Gaimard, 1832)**
(Figure: Norman et al., 2014)

Distribution. At least Philippines, Indonesia and Papua New Guinea.

Note. At least two other unresolved species of *Hapalochlaena* are present in the South China Sea.

+**Octopus* cf *vulgaris***
(Figure: Voss & Williamson, 1972)

Distribution. East China Sea, South China Sea, Gulf of Thailand.

Note. The name *vulgaris* is likely to represent a species complex worldwide. Focus of aquaculture in China.

+*Thaumoctopus mimicus* Norman & Hochberg, 2005
(Figure: Norman et al., 2014)

Distribution. Red Sea to South China Sea, and northern Australia. Recorded from Gulf of Thailand by Nabhitabhata & Sukhasangchan (2007).

+*Wunderpus photogenicus* Hochberg, Norman & Finn, 2006
(Figure: Norman et al., 2014)

Distribution. Indo-Malayan Archipelago from Philippines to Vanuatu.

Species provisionally placed in the genus 'Octopus'.

+'*Octopus' conispadiceus* (Sasaki, 1917)**
(Figure: Norman et al., 2014)

Distribution. Japan to Taiwan.

***'*Octopus' cyanea* Gray, 1849**
(Figure: Norman et al., 2014)

Distribution. Tropical Indo-West Pacific region, on coral reefs (Norman, 1992).

+ '*Octopus' berenice* Gray, 1849
(Figure: None known)

Distribution. Recorded from Singapore, broader distribution unknown.

Note. Poorly known species.

'*Octopus' bocki* Adam, 1941
(Figure: Norman & Sweeney, 1997)

Distribution. Western Pacific Ocean including Philippines.

+ '*Octopus' favonius* Gray, 1849
(Figure: None known)

Distribution. Only known from Singapore.

'*Octopus' microphthalmus* Goodrich, 1896
(Figure: None known)

Distribution. Singapore to Andaman Islands.

+'*Octopus' minor* (Sasaki, 1920)**
(Figure: Norman et al., 2014)

Distribution. Japan to South China Sea.

Note. Likely to represent at least four species. Focus of aquaculture in China.

+ '*Octopus' pumilus* Norman & Sweeney, 1997
(Figure: Norman & Sweeney, 1997)

Distribution. Only known from Philippines.

'*Octopus' wolfi* (Wülker, 1913)
(Figure: Norman & Sweeney, 1997)

Distribution. Indo-Pacific from Red Sea to Tahiti. Record from Hong Kong.

#Family Bathypolypodidae

+*Benthoctopus* sp. (Figure: None known)

Distribution. In deeper waters of at least the South China Sea.

Note. Species identification unresolved. South China Sea record based on MN unpublished data.

DISCUSSION

The South China Sea contains a high diversity of cephalopods, many of which are of significant economic value. A total of 153 species or species level taxa in 32 families are reported here as occurring within this sea, of which 20 species were deduced from the FAO Catalogues and their presence in the area require confirmation. Despite it being 15 years since the publication of the preliminary checklist (Norman & Lu, 2000), factors driving the comprehensiveness of this checklist remain largely unchanged, namely: 1) the poor taxonomy of key families, and 2) lack of comprehensive regional surveys.

The taxonomy of a number of cephalopod families requires considerable revision, particularly the benthic octopuses (family Octopodidae) and pencil squids (family Loliginidae). The former family contains numerous undescribed species (>100 in Indo-Pacific waters, Norman & Hochberg, unpublished data), many of which have been incorrectly treated under the names of species restricted to European or Atlantic waters (e.g., *Octopus vulgaris* or *O. macropus*). Molecular studies of members of the genus *Uroteuthis* (family Loliginidae) have found that supposedly single species proved to be complexes of up to four cryptic species, at this stage indistinguishable on the basis of gross external morphology (e.g., Yeatman & Benzie, 1993). Segawa et al. (1993) also proposed that *Sepioteuthis lessoniana* in Okinawa represents three distinct cryptic species.

Perhaps as a product of these poor taxonomies, many erroneous records have arisen in publications dealing with the cephalopods of this region, with these errors often becoming entrenched in the subsequent literature. This large number of questionable records may reflect both the scale of undescribed cephalopods in these waters and the lack of comprehensive regional revisions.

Many of the taxonomic problems continue to stem from the scarcity of well-preserved reference material collected from this region. There have been no comprehensive surveys undertaken in the South China Sea that have specifically targeted cephalopods. There are few reference collections in the countries bordering this sea and most of the well-preserved material available is scattered through the historical collections of European and American museums.

Standardised preservation and fixation techniques (as presented in Roper & Sweeney, 1983) make development of the necessary reference collections relatively easy.

The scale of subsistence and commercial harvests of cephalopods in the South China Sea is high. Cephalopod catch statistics for the countries bordering the South China Sea in 2013 was around 600,000 metric tonnes (FAO, 2015). Even with conservative estimates of the value of this catch at $US4 per kilogram, exports alone from this region were worth more than $US 2 billion per year. Individual species are worth considerably more per kilogram both in local consumption and as exports throughout the world: some species fetch more than $US30 per kilogram in certain markets. At this stage, it is not possible to assess the fisheries or conservation status of the majority of these cephalopod species. Poor taxonomy, a scarcity of distributional information and the absence of data for most species on standing stocks, migratory behaviour, life histories and fisheries catches prevent such assessments. Three processes need to be ramped up in order to redress this situation:

- `Extensive alpha taxonomy is still required to describe (and produce an inventory of) all taxa present in this region, including development of detailed and "user-friendly" keys to this fauna.
- Inter-country collaboration on both initial surveys and ongoing monitoring.
- Support for, and development of, regional expertise.

Without support for such activities, it continues to be impossible to effectively manage or protect these valuable marine resources.

In recent years, active mariculture activities, both in research and commercial production, are taking place, particularly in China (see Iglesias et al., 2014). The species involved are *Amphioctopus fangsiao*, *Cistopus chinensis*, *Octopus minor*, *Octopus "vulgaris"*, *Sepia esculenta*, *Sepia pharaonis*, and *Sepiella japonica*. Considerable advances have been achieved, e.g., commercial production of *Cistopus chinensis* and production and release of young *Sepiella japonica* to the field have been achieved.

Study of the cephalopod fauna in the South China Sea area has progressed slightly since the publication of the earlier version of the checklist (Norman & Lu, 2000). In the 15 years since that publication, seven new taxa have been described from the region (O'Shea & Lu, 2002; Reid & Lu, 2005; Ho & Lu, 2005; Liao & Lu, 2009; Lu, 2010; Zheng et al., 2012). Some efforts have been made to synthesize scattered reports into regional checklists, e.g., Lu (2000) for Pratas Island in the South China Sea, Lu (2008) and Lu & Hsueh (2010) for Taiwan as well as Huang (2008), Xu (2008), Dong et al. (2012) and Lu et al. (2012a, b) for China and Taiwan. These last three references (Dong et al., 2012; Lu et al., 2012a, b) must be used with caution as the records were compiled from several published lists without verification of accuracy of original identifications. They also contain many errors introduced during editorial processes, including the insertion of figures and a table that contain errors without the authors' knowledge, e.g., species from outside the area inadvertently included: e.g., *Luteuthis dentatus* from New Zealand was added to the list without authors' knowledge and a figure was used twice under different species names. The publication of the three-volume FAO Catalogues (Jereb & Roper, 2005, 2010; Jereb et al., 2014) certainly has increased our knowledge of the cephalopods from the region.

The original South China Sea checklist (Norman & Lu, 2000) listed 120 species of cephalopods in 31 families. In this updated checklist, 46 species level taxa are added, three families added and two families subsumed (see Strugnell et al., 2013), raising the family tally to 32 and species tally to 153. This is due to the discovery of new taxa, new reference information, new reviews and syntheses of regional fauna inventories, and the synonymisation of some species.

Much remains to be studied with respect to the cephalopod fauna of Singapore. Brief examination of the collections in the Raffles Museum by the authors and the new information contained in the FAO Catalogues have increased the number of species recorded from Singapore to 31 in seven families. They are:

1. Family Nautilidae:
   Nautilus pompilius Linnaeus, 1758

2. Family Loliginidae:
   Loliolus (*Loliolus*) *affinis* Steenstrup, 1856; *Loliolus* (*Loliolus*) *hardwickei* (Gray, 1849); *Loliolus* (*Nipponololigo*) *sumatrensis* (d'Orbigny, 1835); *Loliolus* (*Nipponololigo*) *beka* (Sasaki, 1929); *Sepioteuthis lessoniana* Férussac in Lesson, 1831; *Uroteuthis* (*Photololigo*) *chinensis* (Gray, 1849); *Uroteuthis* (*Photololigo*) *duvaucelii* d'Orbigny, 1835); *Uroteuthis* (*Photololigo*) *sibogae* (Adam, 1954)

3. Family Sepiidae:
   Sepia aculeate Van Hasselt in Férussac & d'Orbigny, 1835; *Sepia brevimana* Steenstrup, 1875; *Sepia esculenta* Hoyle, 1885; *Sepia latimanus* Quoy & Gaimard, 1832; *Sepia lycidas* Gray, 1849; *Sepia pharaonic* Ehrenberg, 1831; *Sepia recurvirostra* Steenstrup, 1875; *Sepia stellifera* Homenko & Khromov, 1984; *Sepia vossi* Khromov, 1996; *Sepiella inermis* (Van Hasselt in Férussac & d'Orbigny, 1835)

4. Family Sepiolidae:
   Sepiola trirostrata Voss, 1962; *Euprymna hyllebergi* Nateewathana, 1997

5. Family Idiosepiidae:
   Idiosepius biserialis Voss, 1962; *Idiosepius pygmaeus* Steenstrup, 1881

6. Family Sepiadariidae:
   Sepiadarium kochi Steenstrup, 1881

7. Family Octopodidae:
   Amphioctopus aegina (Gray, 1849); *Amphioctopus siamensis* (Nateewathana & Norman, 1999); *Octopus* cf *vulgaris*; '*Octopus*' *berenice* Gray, 1849; '*Octopus*' *favonius* Gray, 1849; '*Octopus*' *microphthalmus* Goodrich, 1896; *Hapalochlaena nierstraszi* Adam, 1938)

Further studies of both existing collections and new material are required.

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