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The Marine Algal Research in Korea - Past, Present and Future in Relation to Japan and Asian Pacific -

In Kyu Lee

(Prof. Emeritus, School of Biological Sciences, Seoul National University, Seoul 151-742, Korea)

Abstract

So far on taxonomy and ecology, the phycological researches on marine algae of Korea have a history over a hundred years. However, actual academic activities by Koreans can be said to have been only some thirty years or so. During the time about 1,200 papers have been published by more than 50 Ph.D.s and ca. 300 graduate students and research fellows. About 820 taxa of marine algae from South Korea were currently listed up. Ecological studies were begun since 1970. The research trends are from simple floristic studies in the 1970's to broad analyses of community structures adopting various advanced ecological techniques. Phylogentic and taxonomic studies are initiated mostly by Ph.D. theses starting from morphotaxonomy and life history to molecular phylogenetics. Even though the floristic and distributional aspects of Korean marine algae are much similar to Japan, its species compositions are very unique, occurring many endemic taxa to study further. Studies on Korean marine algae are so much indebted to Japanese phycological progress. The brilliant jubilee of Japanese Society of Phycology demonstrates us how the pioneer spirit and enthusiasm for academic achievement by so many famous frontier phycologists in the last century was fruitful. Seeing this achievement, we also have a dream for our younger phycologists to create a new phycological paradigm of Asian-Pacific in this 21th century.

Introduction

The phycological research on marine algae of Korea has the history over a hundred years. However, actual academic activities by Koreans can be estimated to start since 1966 when the paper 'On the geographic distribution of marine algae in Korea' was published by Prof. Kang, Jae Won and after 20 years on going to organize the Korean Phycological Society in 1986. The first paper dealing with the Korean marine algae was published in 1892 by Dr. Okamura, Kintaro, the founder of Japanese phycology. However, J. Agardh (1889) previously reported a new species, *Sargassum coreanum*, mentioning its locality as 'ad oras Coreae'. Thus we can presume this new species would come from the Korean coast, although he did not mention the locality in detail.

The paper by Okamura(1892) was 'The marine algae of Fusanho, Chosen' with 17 species collected from Pusan. A graduate student of Tokyo Imperial University, Y. Kaneda collected these samples on the way of geological field trip from Tokyo to Wonsan, staying

one day at Pusan. Thereafter until 1945 only a few Japanese and European phycologists have published papers dealing with the Korean marine algae (Okamura 1913, 1914, 1915a,b,c, 1917; Cotton 1906; Grubb 1932; Yamamoto and Kawamoto 1942).

Especially Dr. Okamura visited Korea twice in 1911 and 1912 to see the *Porphyra* farming on the southern to western coast, and then reported the characteristics of Korean flora in 1913, mentioning its similarity to the flora of Japan. In his masterpiece 'Nippon Kaisoshi (1936)' he cited lots of Korean localities in geographic distribution, some of which were confirmed through these field trips. Because of this notice that Korean flora was very similar to Japan, many Japanese phycologists felt no attraction to study the Korean flora. That was one of the reasons why the Korean marine algae were not opened earlier (Prof. Yamada, Yukio, pers. comm.).

The first paper published by Korean was 'A catalogue of the marine algae from Pusan' by J. Rho(1954). He(1958) extended this work to 'A preliminary survey of the marine algae of Korea' as a M.S. thesis at Duke University, listing up 19 forms, 7 varieties and 300 species with their geographical distribution. However, his paper included many errors and could not be referred further. After this, a milestone work by Prof. Kang(1966) of Pusan Fisheries University was published as a thesis for Ph.D. at Seoul National University (SNU). He described all the taxa reported until then as well as his own collections for more than 10 years, citing their localities, and divided Korean coasts into 5 sections according to the hydrographical characteristics.

On the other hand, coming back from Hokkaido University I. Lee and his students began to study taxonomy and ecology of benthic marine algae, and published many papers since 1970 to support two main schools of marine algal studies, Pusan Fisheries University (= Bukyung National University) and Seoul National University. Therefore, a real academic history of the studies on benthic marine algae in Korea can be said so young as to be only some thirty years or so. During the time more than 1,200 papers were published on this field by ca. 50 doctorates and 300 graduate students and research fellows.

Floristic Studies

In floristic studies, Okamura(1892) firstly listed up 17 species, 11 reds, 3 browns, and 3 greens, and mentioned that a few *Sargassums* could not identify due to fragmentary collections. The second paper

was by Cotton(1906) on 'Marine algae from Corea'. He listed 26 taxa from Wonsan and Pusan, including two new species, *Ceramium hamatum* and *Dumontia simplex*. The former however was identified as *Campylaephora hypnaeoides*. He wrote this paper with the specimens collected by Wakefield and by Hooker deposited in Kew Herbarium.

Okamura(1913) listed 102 taxa in total, 8 green, 30 brown, 63 red, and 1 blue green algae, introducing a new species *Ecklonia stolonifera* from Pusan. He included his previous list as well as Cotton (1906), and all the other collections by K. Kimura in 1900, Y. Wakitani in 1911 and Y. Seki in 1912. After that Okamura(1915a,b,c, 1917) enumerated again 172 taxa and reviewed the characteristic of Korean flora that the eastern and southern coasts were much similar in geographic distribution to Pacific Japan and also the Japan Sea coast of Honshu represented mostly by temperate and some sub-boreal but no real boreal taxa in Korea. Grubb(1932) mentioned 31 species of Korean algae, including the list by Cotton(1906), and divided the Korean coasts into the eastern (Duman-river to Wonsan), the east-southern (Wonsan to Pusan), and the western (Pusan to Kunsan) coasts.

Okamura(1936) in 'Nippon Kaisoshi' listed Korean localities for a total 164 taxa of marine algae, 12 green, 46 brown, 105 red, and 1 blue-green algae. After this only one paper by Yamamoto and Kawamoto(1942) listing 158 taxa was published before 1945.

As mentioned the first paper by the Korean was by J. Rho(1954). The same year, J. Kang and B.D. Lee reported 'A check list of Korean marine algae' as an oral presentation at the annual meeting of Korean Biological Society. And then, J. Kang(1956, 1958) reported 'Unrecorded marine algae in Korea I and II', adding taxonomic notes on them for the first time. He(1960) published summer algal flora of Cheju Island, including 13 unrecorded taxa, and in 1962 gave them the Korean names, listing up 303 taxa.

Two Japanese phycologists, Okamoto(1963, 1964) and Noda (1966) published a checklist and flora respectively. The former was a list by Azuma's collection during 1924-45 to include 31 taxa, while the latter was dealing with 182 Korean taxa and Chinese flora collected during 1935-43. Noda described a new species *Pelvetia minor*, formerly known as *P. wrightii* f. *japonica*. However, it was named already as *P. siliquosa* by Tseng and Chang(1953).

J. Kang's milestone work (1966) was published under such a historical background. His list includes a total 414 taxa, 11 blue-greens, 61 greens, 95 browns, and 247 reds. His division of Korean coasts into 5 sections was (1) the North-East Coast, from upper eastern down to Wonsan, (2) the South-East Coast, down to Wolgi of Youngil Bay, (3) the South Coast, the whole southern coast to western before Baekryeongdo Island, including Ulrungdo Island, (4) the West Coast, from Baekryeongdo Island to upper north, and (5) the Cheju Island.

Following this work, J. Kang and C. Park(1969) reported the summer algal flora of Dockdo Island with 50 taxa, and I. Lee(1973) published a flora of Baekryeongdo Island on the mid-western coast, adding taxonomic notes on 77 taxa. Some remarkable papers dealing with the flora were published later on, e.g., of Kwang-Yang Bay on the southern coast (I. Lee and Y.H. Kim 1977), Dockjeokdo Island on the western coast (I. Lee 1980), Kyeonggi Bay on the western coast (H.B. Lee and I. Lee 1981), etc. These are the floristic papers investigated for four seasons through the year and added lots of unrecorded taxa to Korean waters. Many other floristic works were however mostly investigated during summer season in connection to field surveys for natural conservation activities (I. Lee and S. Yoo 1978; S. Yoo and I. Lee 1979; J. Kang and C.W. Lee 1979; J. Kang et al. 1980, 1981; I. Lee and S. Boo 1981, 1982, 1984, 1988; I. Lee and H.B. Lee 1982; I. Lee et al. 1983, 1986a,b, 1987; H.B. Lee and Y. Oh 1986; Y.H. Kim et al. 1996, etc), or simply for flora studies (S. Boo 1987; B. Oh and H.B. Lee 1989, etc.). Through these floristic studies the first new genus, *Gloeophycus koreanum* by I. Lee and S. Yoo(1979), was found from Gyeongryeolbi-Islands on the western coast of Korea. Some intensive floristic studies or reviews on the flora of the eastern coast were carried out (J.W. Lee and H.B. Lee 1997; I. Lee and Y.H. Kim 1999, etc.). T. Cho and S. Boo(1998a,b,c) published the flora of Oeyondo Island on the western coasts giving a detailed remarkable morphological description of the species.

On the other hand, I. Lee(1972) reported unrecorded marine algae with description. Such papers on unrecorded taxa to Korean waters have been continued (C. Sohn and J. Kang 1980; C. Song and C. Sohn 1983; I. Lee et al. 1988, 1989; Y.P. Lee and I. Lee 1988, Y.P. Lee and S. Yoon 1996, etc.). By these efforts the benthic marine algae of South Korea were understood somewhat broadly. I. Lee and J. Kang(1986) listed up all these taxa known up to then as 620 in total, 48 blue-greens, 81 greens, 135 browns, and 356 reds in the first volume of the Korean Journal of Phycology, giving the revised Korean name to all of them. In this year Y.P. Lee and S. Kang(2002) published a catalogue of Korean marine algae (excluding blue-greens) as a book enumerating 753 taxa in total, 98 greens, 166 browns, and 489 reds, and S. Yoo(2002) listed a total 67 taxa of blue-greens. Thus, the Korean marine algae so far listed up to now are 820 taxa in total. This data is from South Korea, including partial North Korean algae known before 1945 and by Noda(1966).

Ecological Studies

The ecological studies on benthic marine algae in Korea were first attempted by S. Song et al.(1970). They adopted quadrat method by Saito and Atobe(1970) to analyse the algal vegetation in intertidal zone and interpreted the result according to Taniguti(1961). This became a standard method for ecological studies in Korea later on. For instance, K.W. Lee(1973) investigated algal vegetation of

Dongbaeksum, Pusan and reported that about 77 species (66%) among 116 investigated were luxuriant during September, while all these taxa were prosperous during January and May, showing *Hizikia fusiformis* - *Ishige okamurae* association in sheltered place, and *Gloiopeltis furcata* - *Myelophycus caespitosus* - *Hizikia fusiformis* - *Eisenia bicyclis* association in open area facing wave action. C. Sohn(1975) analysed the vegetation on southern coast by the same method and mentioned that they were *Myelophycus* alliance including *Gigartina intermedia* - *Sargassum sagamianum* association.

Phenological survey through the year was first investigated in Kwang-Yang Bay of the southern coast by I. Lee et al.(1975). They reported that the representative dominant species was *Sargassum thunbergii* in January, *Chondria crassicaulis* in March, *Ulva pertusa* in May to July, *U. pertusa* and *Gigartina intermedia* in September, and *Gelidium pusillum* in November, while the algal vegetation estimated by dry weight was most prosperous in May and poorer in July.

Y.P. Lee and I. Lee(1976, 1982) analysed the coverage, frequency, dominance and species consolation diagram based on chi-square value of the vegetation in Cheju Island through the year, and mentioned that they were characterized by *Ishige okamurae*, *Hizikia fusiformis*, *Sargassum thunbergii*, and *Caulacanthus okamurae* in the upper, *Ulva pertusa*, *Corallina pilulifera* and *Colpomenia sinuosa* in the middle, and *Sargassum hemiphyllum* in the lower tidal zone, respectively. The algal vegetation of Cheju Island was reinvestigated by S. Park(1992) for Ph.D. thesis, and mentioned that *Ulva pertusa*, *Colpomenia sinuosa*, *Hizikia fusiformis*, and *Corallina pilulifera* were the most dominant group in intertidal zone through the year.

S. Yoo and I. Lee(1980) summarized the character of summer algal vegetation on the southern coast of Korea, using Sørensen's similarity index for 14 algal communities reported previously, and concluded that it was distinguished by *Myelophycus simplex* alliance, which were divided into *Ishige okamurae* - *I. sinicola* association on the western coast part, and *Colpomenia sinuosa* - *Ecklonia cava* association on mid- to eastern coast part. S. Yoo(1982), the first Ph.D. in phycology at SNU, analysed the marine ecosystem of Incheon artificial dock on the western coast, adopting species diversity, evenness, and similarity indices for benthic algal community. This work was reinvestigated at the same place by J. Yoo(1994) to examine the change of ecosystem after 10 years.

A new approach for quantitative and qualitative analyses of the algal communities was first attempted by Y.H. Kim(1983) in his Ph.D. thesis. He selected one site each from the eastern, southern, western, and Cheju Island coasts of intertidal zone to compare the community structures, adopting the principal component analysis through analyses of reciprocal average, species relationship and species diversity for classification, clustering and ordination. He concluded that the vegetation of the coasts becomes different

according to the localities not by the seasonality but by the environmental characteristics such as light, temperature, etc. This was the first actual ecological paper dealing with the intertidal benthic algae in Korea.

The subtidal vegetation of benthic marine algae was first investigated by C. Sohn et al.(1982, 1983), adopting association analysis of the species. According to them at Dolsando Island on the southern coast, the intertidal vegetation was characterized by *Sargassum thunbergii*, *Ulva pertusa*, *Hizikia fusiformis* and *Chondria crassicaulis* in the upper, and *S. thunbergii*, *Leathesia difformis*, *Polysiphonia urceolata* and *Melobesia* in the lower zone, while the subtidal zone was characterized by *U. pertusa*, *Codium fragile*, *C. crassicaulis* and *Gigartina tenella* in the upper, *Myagropsis myagroides* and *Sargassum tortile* in the middle, and *Sargassum sagamianum*, *Undaria pinnatifida*, *S. thunbergii* and *Gelidium divaricatum* in the lower zone. According to cluster analysis by similarity indices, the algal vegetation in Korea can be divided into inner and outer bay groups, representing the area by *Colpomenia sinuosa* - *Ecklonia cava* association subordinated by *Myelophycus simplex* alliance. C. Sohn(1987) characterizing Korean benthic algal communities in his Ph.D. thesis mentioned that among 447 species encountering commonly on the Korean coasts the most popular species were *Gymnogongrus flabelliformis* (97.1%), *Enteromorpha compressa* (94.3%), *Gloiopeltis furcata* (94.2%), *Ulva pertusa* (91.4%), *Codium fragile* (91.4%), and *Carpopeltis affinis* (91.4%), whereas the algal communities could be classified into *Gelidium divaricatum* - *Corallina pilulifera* association, *Gloiopeltis furcata* - *Chondria crassicaulis* association, *Scytosiphon lomentaria* - *Polysiphonia morrowii* association, and *Ishige sinicola* - *Hizikia fusiformis* association subordinated by *Ulva pertusa* alliance among different localities. He introduced the functional group concept for the first time in Korea.

Such ecological studies were followed by some investigators for their Ph.D. theses. J.W. Lee(1991) dealt with the community structure and the geographic distribution of intertidal zone on the eastern coast by importance value, biomass, and Rhodophyta/Phaeophyta ratio. S. Park(1992) analysed algal vegetation of Cheju Island by importance value, biomass, and functional form. W.J. Lee(1994) similarly studied on subtidal community of Ulrungdo Island. J. Yoo (1994) investigated primary and secondary production of marine ecosystem in Incheon artificial dock. B. Oh(1998) analysed flora and community structure of the western coast of Korea, etc.

On the other hand, H.S. Kim et al.(1983) published a paper on algal vegetation in association with the invertebrate fauna. They used the line transect and quadrat method to analyse the vertical distribution of flora and fauna from intertidal to subtidal zones at Aninjin of the eastern coast. This work was continued on the east-southern coast (I. Lee et al. 1984) and on the mid-western coast (I.

Lee et al. 1985).

C.W. Lee and J. Kang(1977) first published an autecological paper on *Myagropsis myagroides* near Pusan, and then C. Koh and N. Sung (1983) and C. Koh(1983) dealing with population of *Sargassum confusum* from Juckdo Island of the eastern coast. The latter investigated phenology and productivity of this alga through the year, and concluded that it showed an annual life cycle, giving a maximum weight in May, a maximum length and biomass in June, and a fertility from June to August, so that it began to grow at 15°C, became maximum at 15-18°C, and decreased at 23-24°C. C. Koh et al.(1989) extended such studies mentioning the algal zonation and seasonality in subtidal area of Ohori on the eastern coast.

Adopting correspondence analysis, Y. Park and Y.H. Kim(1990) investigated phytogeographical characteristic of marine algae on the western coast, and concluded that the distribution of marine algae was divided into coastal zone and outer islands, as well as upper, middle and lower zones according to the latitude. K. Nam et al.(1996) investigated algal community in Youngil Bay of the eastern coast by line transect method and concluded that the seasonality of the vertical distribution was affected primarily by water temperature and tidal level as well as light intensity.

Y.H. Kim and I. Lee(1986), and Y.H. Kim(1987) studied algal succession for the first time. They used artificial substrata at intake and discharge canals of the power plant to examine the colonization and succession of marine benthic algae for years. This was continued at Incheon artificial dock on the western coast to observe recolonization of the benthic algal community after disturbance by water pollution (J. Yoo et al. 1991), and on structure and succession of algal community at artificial substrata in intertidal zone of Cheju Island (C.J. Kim 1998). Since 1990 several papers dealing with succession on permanent quadrat were also published (Y.H. Kim et al. 1992; Y.H. Kim and J. Yoo 1994; Y.H. Kim 1994; Y.H. Kim and S. Park 1997). Among them Y.H. Kim and J. Yoo(1994) investigated algal succession for 3 years to place permanent quadrat at *Sargassum thunbergii* dominant area, and found that the alga reappeared in 6 months at intertidal zone, and in 2 years at subtidal zone.

Lastly, the vegetation analyses of benthic marine algae near thermal effluents of large power plant were conducted by Y.H. Kim and his coworkers (Y.H. Kim 1986; H.K. Kim and Y.H. Kim 1991; H.G. Kim et al. 1992; Y.H. Kim and S. Huh 1998). Their works were classified into two aspects, qualitative and quantitative analyses of warm-tolerant species at discharge canal, and effects of thermal pollution to algal population near the power plant areas.

Apart from these field works, K.Y. Kim attempted experimental ecology by laboratory culture for his Ph. thesis (K.Y. Kim et al. 1990, 1992; K.Y. Kim 1991; K.Y. Kim and I. Lee 1994). He investigated combined effects of irradiance-salinity, temperature-salinity, etc. on germination and zoosporogenesis, and the growth

of vegetative thallus of *Enteromorpha* species.

Recently, J.H. Kim from University of British Columbia established a phycological family at Sungkyungwan University since 1997, and vigorously opening a new field on community ecology.

By such efforts, the main research trends in ecology of the benthic marine algae in Korea can be summarized as ones from simple floristic studies in the 1970's to broaden analyses of community structure adopting various advanced ecological techniques, so that the temporal and spatial distribution, and qualitative and quantitative analyses of the structure of benthic algal communities among the eastern, western, southern, and Cheju Island coasts are under clarification.

Phylogenetic and Taxonomic Studies

After the descriptions of new species by J. Agardh(1889), Cotton (1906) and Okamura(1913), a monographic study on the Protofloridae including the Korean benthic marine algae was carried out by Ueda(1932). He described 9 *Porphyra* taxa from Korea including a new species, *P. crassa* from Kyeonggi Bay of the western coast and a new form *P. yezoense* f. *coreana* from Kwangwondo Province of the eastern coast. These were only publications before 1945.

The first phylogenetic paper by Koreans was a chemotaxonomic study by M.J. Lee et al.(1961) to analyse amino acids of benthic brown algae on phylogenetic point of view. They(1962a,b) continued this work on red and green algae, and one of the authors, S. Hong (1964) summarized the works in his Ph.D. thesis. The morphotaxonomic paper was first published by I. Lee(1969) on a phylogenetic relationship among male organs of Rhodymeniales, and by J. Kang(1970) on 5 taxa of cultivated *Porphyra*.

Monographic studies on specific taxa were carried out mostly for M.S. or Ph.D. theses at Seoul National University and Pusan Fisheries University. The first M.S. paper was on the genus *Elachista* by Y.P. Lee(1974), which was revised recently by him(2000), and then Fucales (S. Yoo 1975) revised later by I. Lee and S. Yoo(1992), *Codium* of Cheju Island (Y. Oh 1983) revised by Y. Oh et al. (1987), *Laurencia* (K. Nam and J. Kang 1984), *Symphocladia* (D. Choi 1986), *Gloiopeltis* (B. Oh 1990), *Hypoglossum* (J. Oak 1992), *Chondria* of Cheju Island (M.R. Kim, 1992), *Dictyota* (S. Yoon 1994), *Corallina* (J.H. Kim 1994), *Champia* (M. Park and I. Lee 1998), *Ishige* (E. Lee 1998), *Gelidium* of Cheju Island (B.S. Kim 2001), etc.

The monographic studies for Ph.D. were firstly on the Melobesidoideae (C. Park 1976), which was however reinvestigated including both articulated and non-articulated corallines (J.H. Kim 2000), and then on the Ceramiaceae (S. Boo 1985; H.-S. Kim 1988; G.H. Kim 1990), and *Polysiphonia* (H. Yoon 1986), which was also

revised (M.S. Kim 1995), Halymeniaceae (H.B. Lee 1987), *Amphiroa* (D. Choi 1989), Cladophorales (Y. Oh 1990), *Porphyra* (M. Hwang 1994), Dasyaceae (H.-G. Choi 1996), Sphacelariales (Y. Keum 1997), *Sargassum* (J. Oak 1999), Alariaceae and Laminariaceae (W. Yoon 1999), *Ceramium* from northern Pacific (T. Cho 2001), Gelidiales (J.I. Kim 2001), Elachistaceae (E.Y. Lee 2001), and Ulvales (E. Bae 2001), so on.

Besides of these works, lots of morphotaxonomic/phylogenetic papers dealing with Korean algae were published by many investigators. For instance, I. Lee and his coworkers published papers on *Rhodochorton* (I. Lee and Y.P. Lee 1974), *Anotrichium*, *Griffithsia*, *Pleonosporium*, *Monosporus*, *Platythamnion*, and Ectocarpaceae (H.-S. Kim and I. Lee 1986, 1987, 1988, 1989a,b, 1991, 1992a,b, 1994), *Herpochondria* (Y. Keum and I. Lee 1993), *Porphyra* including a new species (M. Hwang and I. Lee 1994), *Erythrogloussum* and *Sorella* (G.H. Kim et al. 1994), *Polysiphonia* (M.S. Kim et al. 1994, 1999; M.S. Kim and I. Lee 1996, 1997), *Sphacelaria* (Y. Keum et al. 1999, 2001), *Neosiphonia flavimarina* (n. gen. et sp., M.S. Kim and I. Lee 1999), and *Neoleptonema yongpili* (n. gen. et sp., E.Y. Lee et al. 2001), so on. Some morphotaxonomic papers dealing with the marine algae of Ulrundo Island were on *Bryopsis*, Scytosiphonaceae, and Corallinaceae (W.J. Lee et al. 1991, 1992, 1994), and the genus *Ceramium* and Dictyotaceae (W.J. Lee and I. Lee 1995, 1996).

S. Boo and his coworkers published morphotaxonomic papers on *Antithamnionella* and *Spyridia* (S. Boo and I. Lee 1985a,b), *Endarachne* (K. Rhew and S. Boo 1991), *Aglaothamnion* (S. Boo et al. 1991), *Hypnea* (W. Shin and S. Boo 1994), *Campylaephora* (S. Boo 1992), *Griffithsia* (S. Boo and T. Cho 2001), etc. H.B. Lee and his coworkers published morphotaxonomic papers on *Gelidium* (J.W. Lee et al. 1992), Gelidiales (H.B. Lee and J.I. Kim 1995), *Pachymeniopsis* (H.B. Lee and I. Lee 1993), *Gloiopeltis* (J.W. Lee et al. 1995, 1996; B. Oh and H.B. Lee 1996), and a new genus *Sinkoraena* (H.B. Lee et al. 1997; H.B. Lee 1997), so on.

Coming back from Hokkaido University, Y.P. Lee and his coworkers published many papers dealing with the algae of Cheju Island, e.g., on Rhodochortaceae (Y.P. Lee 1987), *Galaxaura* (Y.P. Lee and I. Lee 1989), Elachistaceae (Y.P. Lee 1989), *Cladophora* (Y. Oh et al. 1991), *Chondria* (Y.P. Lee and S. Yoon 1996), *Undaria* (Y.P. Lee and J. Yoon 1998), a new genus *Proselachista* (Y.P. Lee and Garbary 1999), *Elachista* (Y.P. Lee 2000), and *Halothrix* (Y.P. Lee 2001), so on. Similarly, K. Nam and his coworkers published several taxonomic papers on *Laurencia* and related taxa, e.g., *Laurencia kangjaewonii* (n. sp., K. Nam and C. Sohn 1994), vegetative structure and reproduction of *Laurencia* (K. Nam et al. 2000; K. Nam and H.G. Choi 2001), etc., and some other papers on a newly recording genus *Haraldiophyllum* (K. Nam and Y.S. Kim 1996), or species of *Acrosorium* (Y.S. Kim et al. 2001), and

Caulacanthus (H.G. Choi and K. Nam 2001), so on.

Since the late 1970's a laboratory culture was attempted in biosystematic point of view, especially among students of Seoul National University. Through this culture study many papers dealing with life history were published on specific taxa as well as for monographic studies. The first paper was a life history and mixed-phases reproduction of *Dasysiphonia chejuensis* (n. gen. et sp.) by I. Lee and West(1979). They(1980a,b) also reported life histories of *Antithamnion nipponicum* and *Lomentaria hakodatensis*. After these works, the life history and mixed-phases and/or bisexuality in course of the typical dioecious life history among members of floridean algae were noticed in various Korean taxa, e.g., on *Symphyocladia pennata* (D. Choi and I. Lee 1987), *Callithamnion callophyllidicola* (S. Boo et al. 1989), *Platythamnion yezoense*, *Antithamnion secundum* (n. sp.), and *A. sparsum* (G.H. Kim and I. Lee 1989, 1992, 2000), *Polysiphonia morrowii* (W.J. Lee and I. Lee 1991), *Campylaephora crassa* (S. Boo et al. 1991a), *Halopteris filicina* (Y. Keum et al. 1995), and again on *Dasysiphonia chejuensis* (H.-G. Choi and I. Lee 1996). I. Lee and G.H. Kim(1991) published a short review on life history and mixed-phases reproduction of the Ceramiales.

S. Boo and I. Lee(1983) attempted an interspecific cross between *Antithamnion sparsum* in Korea and *A. defectum* in the Pacific North America, and obtained a result that the both species were partially fertile to show the speciation is on going. In his Ph.D. thesis S. Boo (1985) first attempted to adopt biosystematic species concept on his monographic study of the Ceramiales in laboratory culture. Such culture studies were followed by H.-S. Kim(1988), G.H. Kim(1990), H.-G. Choi(1996) on the Ceramiales, Rhodophyta for their Ph.D. theses. During the studies they found many new genera and species, especially from subtidal zone of Cheju Island.

H.-S. Kim(1984) attempted to clarify the mechanism of sex expression through somatic cell fusion of *Griffithsia japonica* using the wound-healing process. H.-S. Kim et al.(1988) obtained some characteristic patterns on wound-healing among filamentous red algae, and M. Hwang(1989) and M. Hwang et al.(1991, 1994) investigated nuclear migration and sex differentiation during the wound-healing process through somatic cell fusion of the filamentous Ceramiales. These works were extended by G.H. Kim et al.(1995) to investigate wound-healing responses of *Antithamnion* and *Griffithsia* monitoring by the lectins. Chromosome data or DNA content were also used to study life history, to identify sexuality, or to distinguish closely related taxa (H.-G. Choi et al. 1994; O. Chah and G.H. Kim 1998; M.S. Kim et al. 1999). Y.K. Lee et al.(1995) investigated nuclear ploidy level of the mixed-phase alga in sex differentiation view point, and found a heat-shock protein 90 to involve in sex determination of a red alga, *Griffithsia japonica* (Y.K. Lee et al. 1998).

In red algae, fertilization is achieved by the union of a non-flagellated male gamete, a spermatium, with the receptive cell of the female gametophyte, the trichogyne. Although a complete fertilization involves a complex series of events, it always begins with gamete-gamete contact between membranes or cell walls (G.H. Kim 1997). G.H. Kim and Fritz (1993a,b) first showed that the gamete recognition in red alga *Antithamnion nipponicum* was mediated by a lectin-carbohydrate complementary system. Such a system has also been found in some other group of red algae, such as *Aglaothamnion oosumiense*, etc., substantiating their hypothesis (G.H. Kim et al. 1996; G.H. Kim and S.H. Kim 1999a,b). Similar signal glycoprotein was involved in wound-healing response of *Antithamnion* spp. (G.H. Kim and Fritz 1993c; G.H. Kim et al. 1995). Cytoskeletons involved in red algal reproduction have been studied in some Korean *Aglaothamnion* species (G.H. Kim and S.H. Kim 1999b; G.H. Kim et al. 2001a).

Such a cytotaxonomic work was extended to the evolution of cell membranes using some coenocytic green alga. G.H. Kim et al. (2001b,c) first reported that the initial membrane surrounding the regenerated protoplast formed from extruded cytoplasm of *Bryopsis plumosa* was composed of polysaccharide-lipid complex. Recently, G.H. Kim et al. (2002) suggest that the protoplast regeneration from extruded cytoplasm may be evolved as a dispersal mechanism in some coenocytic green algae. Thus, the biosystematic studies in Korea encompass from sex determination mechanism to gamete recognition and evolution of cell membranes, using some Korean algae as an excellent experimental system.

Finally, the molecular systematic study has rather a shorter history in Korea. The first papers by M. Hwang (1994), and M. Hwang et al. (1998) were the isoenzyme studies on phylogenetic relationship among *Porphyra* species, and by W.J. Lee and King (1996) to compare the genetic information by ITS of Dictyotaceae. After these studies, the molecular phylogeny became more popular among younger researchers. For instance, on red algae H.-G. Choi et al. (2000, 2001) published papers on Balliales (n. ord.), Balliaceae (n. fam.), *Inkyuleea* (n. gen.), and *Ballia nana* (n. sp.) based on rDNA data. The phylogeny of *Polysiphonia* and *Neosiphonia* (n. gen.) indicated clearly a distinct lineage to support the latter new genus (H.-G. Choi et al. 2001), the same was between Dasyaceae and Delesseriaceae (H.-G. Choi et al. 2002). S.R. Lee (2001) and S.R. Lee et al. (2001) analysed rbcS of *Antithamnion*, Ceramiales, mentioning that it would be a useful marker for analysis of red algal phylogeny. Some other molecular taxonomies were on a comparison of the variation among varieties of *Gelidium amansii* (J.I. Kim et al. 2000), on *Caulacanthus okamurai* (H.B. Lee et al. 2001), and on *Porphyra pseudolinearis* (L. Jin et al. 2001).

On brown algae the phylogeny of Laminariales was intensively investigated by S. Boo and his coworkers (S. Boo et al. 1999; W.

Yoon and S. Boo 1999; S. Boo and W. Yoon 2000). With these data W. Yoon et al. (2001) summarized a total 44 species of advanced Laminariales into 8 families rather than currently adopting 3 families of Alariaceae, Laminariaceae and Lessoniaceae. Some others, such as *Pelvetia* and *Pelvetiopsis* (W.J. Lee et al. 1998), Scytosiphonaceae (G. Cho et al. 2001), and Dictyotaceae (W.J. Lee and K. Bae 2002) were investigated a phylogenetic point of view.

So far on green algae however only a few papers dealing with the molecular phylogeny are available, e.g., E. Bae and I. Lee (2001) published three species under a new genus *Umbraulva* based on SSU and ITS data, which were belonged to *Ulva* previously.

Conclusion

The studies on benthic marine algae in Korea were so much indebted to Japan. The pioneer phycologists started to study with Japanese books and references to identify and analyse the species and their distribution, because there were so many common taxa and similarities in distribution between the two countries. Okamura's Nippon Kaisoshi and Icones of Japanese algae, Segawa's Illustration Book of Japanese algae, etc. were our text guide-books for beginners to study this field. I. Lee, Y.P. Lee and K. Nam studied at Hokkaido University for their thesis, and established respective research families after coming back to Korea. Our first generation was grown under such circumstances.

The Korean Society of Phycology was organized in 1986 to celebrate the 60th anniversary of Prof. Kang, Jae Won, the founder of Korean marine phycology. The first volume of the Korean Journal of Phycology was dedicated to him for the celebration. Through this Journal (the name of the Journal was changed as Algae since 1996, volume 11) lots of papers were introduced by younger phycologists of the 2nd and 3rd generations. As results, during these 16 years until 2001 a total papers published through the journal (including several fresh-water algae and phytoplankton) were counted as 423, grouping as 31 papers on geographic distribution, 90 on ecology and phenology, 153 on morphology and taxonomy, 26 on culture and life history, 110 on physiology, ultrastructure and molecular phylogeny, and 13 on others else. The number of papers increased every 5 years as 103 during 1986-1991, 135 during 1992-1996, and 185 during 1997-2001.

The first academic exchange was expressed as an official international symposium between Korea and Japan, held in November, 1989 at Seoul by the courtesy of Prof. Aruga, Yusho, the president of Japanese Society of Phycology at the time, and the second was in September, 1994 at Tsukuba University. During the second symposium we agreed to extend the meeting among Asian Pacific countries. This wish was fruitful in September, 1993 to prepare an international symposium at Seoul National University. The Asian-Pacific Phycological Association (APPA) was organized

there, and has Prof. Aruga as the first president of the organization. Thus, the 1st Asian-Pacific Phycological Forum (APPF) was held at Sidney in 1996, the 2nd at Hong Kong in 1999, and the 3rd at Tsukuba University in 2002 as a joint Meeting with the 50th anniversary of Japanese Society of Phycology.

The phycology over the world was organized into regional associations among continents, the European, the American, and the Asian-Pacific. Most of the Asian countries have still younger histories and short of man powers for academic activities compared with the others. Japan is the only country to stand in front of us, showing a leading power for achievement of the phycological progress over the world. However, such a younger vitality among the Asian-Pacific countries promises us a vision of the growth in future. During the 1st and 2nd symposia we could see the Asian dream for the 21st century by these younger phycologists. Such a vitality and enthusiasm continued to extend more in the 3rd APPF at Tsukuba University. The brilliant jubilee of Japanese Society of Phycology demonstrates us how the pioneer spirit and enthusiasm for academic achievement by so many famous frontier phycologists in the last century was fruitful in this country.

We have a dream for our younger Asian-Pacific phycologists to stand at the center of the phycological world to achieve their mission for creation of new paradigm opening the 21st century. We wish our dream becomes true in near future. God bless the Japanese Society of Phycology and all the Pacific-Asian phycological families!

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References

- Agardh, J.G. 1889. Species *Sargassum* australiae descriptae et dispositae. Kong. Sven. Vet.-Akad. Handl. 23: 1-133.
- Bae, E.H. 2001. Taxonomy of the Ulvophyceae *sensu stricto* (Chlorophyta) in Korea. Ph.D. thesis, Seoul National University (SNU). 192 pp.
- Bae, E.H. and Lee, I.K. 2001. *Umbraulva*, a new genus based on *Ulva japonica* (Holmes) Papenfuss (Ulvaceae, Chlorophyta). *Algae* 16: 217-231.
- Boo, S.M. 1985. A systematic study on six tribes of Ceramiaceae (Rhodophyta, Ceramiales) in Korea. Ph.D. thesis, SNU. 449 pp.
- Boo, S.M. 1987. Distribution of marine algae from shore area of Kangwon Province. *Korean J. Phycol.* 2: 223-235.
- Boo, S.M. 1992. A taxonomic appraisal on *Campylaeophora crassa* (Ceramiaceae, Rhodophyta). *Korean J. Phycol.* 7: 7-12.
- Boo, S.M. and Cho, T.O. 2001. The morphology of *Griffithsia tomo-yamadae* Okamura (Ceramiaceae, Rhodophyta): a little known species from the northeast Pacific. *Bot. Mar.* 44: 109-118.
- Boo, S.M., Fredriksen, S., Rueness, J. and Lee, I.K.. 1991a. Field and culture studies on the life history of *Campylaeophora crassa* (Okamura) Nakamura (Ceramiaceae, Rhodophyta). *Bot. Mar.* 34: 437-445.
- Boo, S.M. and Lee, I.K. 1983. A life history and hybridization of *Antithamnion sparsum* Tokida (Rhodophyta, Ceramiaceae) in culture. *Korean J. Bot.* 26: 141-150.
- Boo, S.M. and Lee, I.K. 1985a. A life history and taxonomic reappraisal of *Antithamnionella miharae* (Tokida) Itono (Rhodophyta, Ceramiaceae) in Korea. *Korean J. Bot.* 28: 199-206.
- Boo, S.M. and Lee, I.K. 1985b. Two Korean species of *Spyridia* J. Agardh (Rhodophyta, Ceramiaceae). *Korean J. Environ. Biol.* 2: 59-64.
- Boo, S.M., Lee, I.K., Rueness, J. and Yoshida, T. 1991b. *Aglaothamnion callophyllidicola* comb. nov. (Ceramiaceae, Rhodophyta). *Jpn. J. Phycol.* 39: 301-306.
- Boo, S.M., Lee, W.J., Yoon, W.S., Tato, A. and Kawai, H. 1999. Molecular phylogeny of the Laminariales (Phaeophyceae) inferred from small subunit ribosomal DNA sequences. *Phycol. Res.* 47: 109-114.
- Boo, S.M., Rueness, J. and Lee, I.K. 1989. Life history and taxonomy of *Callithamnion callophyllidicola* Yamada (Ceramiaceae, Rhodophyta). *Jpn. J. Phycol.* 38: 284-290.
- Boo, S.M. and Yoon, W.S. 2000. Molecular relationships of giant kelp (Phaeophyceae). *Algae* 15: 13-16.
- Chah, O.K. and Kim, G.H. 1998. Life history and taxonomy of *Aglaothamnion oosumiense* Itono (Ceramiaceae, Rhodophyta). *Algae* 13: 199-206.
- Cho, G.Y., Yoon, W.S., Choi, H.-G., Kogame, K. and Boo, S.M. 2001. Phylogeny of the family Scytosiphonaceae (Phaeophyta) based on sequences of plastid-encoded RuBisCo spacer region. *Algae* 16: 145-150.
- Cho, T.O. 2001. Phylogeny of *Ceramium* (Rhodophyta) in North Pacific based on morphological and 18S ribosomal DNA evidence. Ph.D. thesis, Chungnam Natl Univ. 239 pp.
- Cho, T.O. and Boo, S.M. 1998a. Marine flora of Oeyondo islands on the Yellow Sea, Korea: I. Green algae and seagrasses. *Algae* 13: 1-11.
- Cho, T.O. and Boo, S.M. 1998b. Marine flora of Oeyondo islands on the Yellow Sea, Korea: II. Brown algae. *Algae* 13: 13-27.
- Cho, T.O. and Boo, S.M. 1998c. Marine flora of Oeyondo islands on the Yellow Sea, Korea: III. Red algae. *Algae* 13: 29-67.
- Choi, D.S. 1986. A taxonomic study on the genus *Symphyclocladia* (Rhodophyta) in Korea. M.S. thesis, SNU. 72 pp.
- Choi, D.S. 1989. A taxonomic study of *Amphiroa* (Rhodophyta, Corallinaceae) in Korea. Ph.D. thesis, SNU. 320 pp.
- Choi, D.S. and Lee, I.K. 1987. *Symphyclocladia pennata* Okamura (Rhodophyta, Rhodomelaceae) in Korea. *Korean J. Phycol.* 2: 173-183.
- Choi, H.-G. 1996. A systematic study of Dasyaceae (Ceramiales, Rhodophyta). Ph.D. thesis, SNU. 328 pp.
- Choi, H.-G., Kim, M.S., Guiry, M.D. and Saunders, G.W. 2001. Phylogenetic relationships of *Polysiphonia* (Rhodomelaceae, Rhodophyta) and its relatives based on anatomical and nuclear small-subunit rDNA sequence data. *Can. J. Bot.* 39: 1465-1476.
- Choi, H.-G., Kraft, G.T., Lee, I.K. and Saunders, G.W. 2002. Phylogenetic analyses of anatomical and nuclear SSU rDNA sequence data indicate that the Dasyaceae and Delesseriaceae (Ceramiales, Rhodophyta) are polyphyletic. *Eur. J. Phycol.* 37: (in press).
- Choi, H.-G., Kraft, G.T. and Saunders, G.W. 2000. Nuclear small-subunit rDNA sequences from *Ballia* spp. (Rhodophyta): proposal of the Balliales

- ord. nov., Balliaceae fam. nov., *Ballia nana* sp. nov. and *Inkyuleea* gen. nov. (Ceramiaceae). Phycologia 39: 272-287.
- Choi, H.-G. and Lee, I.K. 1996. Mixed-phase reproduction of *Dasyisiphonia chejuensis* (Rhodophyta) from Korea. Phycologia 35: 9-18.
- Choi, H.-G., Lee, Y.K. and Lee, I.K. 1994. Measurement of DAPI-stained DNA in *Dasyisiphonia chejuensis* Lee et West (Rhodophyta) by a video interfaced digital image processor. Korean J. Phycol. 9: 21-28.
- Choi, H.G. and Nam, K.W. 2001. Growth, tetrasporogenesis, and life history in culture of *Caulacanthus okamurae* (Gigartinales, Rhodophyta) from Korea. Bot. Mar. 44: 315-320.
- Cotton, A.D. 1906. Marine algae from Corea. Bull. Misc. Inform., Royal Bot. Gard., Kew 1906: 366-373.
- Grubb, V.M. 1932. Marine algae of Korea and China, with notes on the distribution of Chinese marine algae. Jour. Bot. 70: 213-219, 245-251.
- Hong, S.W. 1964. Studies on amino acid patterns and their phylogenetic relationships of marine algae. Comm. Pap., Dr. W.J. Lee's 60th anniversary, pp. 1-21.
- Hwang, M.S. 1989. Regeneration and sexual differentiation of *Griffithsia japonica* Okamura (Ceramiaceae, Rhodophyta) through somatic cell fusion. M.S. thesis, SNU. 31 pp.
- Hwang, M.S. 1994. A taxonomic study on the genus *Porphyra* (Bangiales, Rhodophyta) in Korea. Ph.D. thesis, SNU. 277 pp.
- Hwang, M.S., Han, M. and Lee, I.K. 1998. Allozyme variation and species relationships in the genus *Porphyra* (Bangiales, Rhodophyta) from Korea. Algae 13: 447-459.
- Hwang, M.S., Kim, G.H., Fritz, L. and Lee, I.K. 1994. Nuclear migration during wound-healing process in three ceramiacean species: *Antithamnion nipponicum*, *Aglaothamnion oosumiense* and *Platythamnion yezeense* (Rhodophyta). Jpn. J. Phycol. 42: 385-391.
- Hwang, M.S., Kim, H.-S. and Lee, I.K. 1991. Regeneration and sexual differentiation of *Griffithsia japonica* (Ceramiaceae, Rhodophyta) through somatic cell fusion. J. Phycol. 27: 441-447.
- Hwang, M.S. and Lee, I.K. 1994. Two species of *Porphyra* (Bangiales, Rhodophyta), *P. koreana* sp. nov. and *P. lacerata* Miura from Korea. Korean J. Phycol. 9: 169-177.
- Jin, L.G., Kim, M.S., Kim, Y.D., Kim, H.G. and Hong, Y.K. 2001. Sequence analysis of nuclear 18S rDNA from *Porphyra pseudolinearis* (Rhodophyta) in Korea. Algae 16: 379-386.
- Kang, J.W. 1956. Unrecorded species of marine algae in Korea. Bull. Pusan Fish. Coll. 1: 33-45.
- Kang, J.W. 1958. Unrecorded species of marine algae in Korea (II). Bull. Pusan Fish. Coll. 2: 7-13.
- Kang, J.W. 1960. The summer algal flora of Cheju Island (Quelpart Island). Bull. Pusan Fish. Coll. 3: 17-24.
- Kang, J.W. 1962. Korean names for marine algae in Korea. Bull. Fish. Coll., Pusan Natl Univ. 4: 69-81.
- Kang, J.W. 1966. On the geographic distribution of marine algae in Korea. Bull. Pusan Fish. Coll. 7: 1-125.
- Kang, J.W. 1970. Species of cultivated *Porphyra* in Korea. Bull. Korean Fish. Soc. 3: 77-92.
- Kang, J.W. and Lee, C.W. 1979. Marine algal flora of Keojaedo and adjacent region. Rep. KACN No. 14, pp. 93-101.
- Kang, J.W. and Park, C.H. 1969. Marine algae of Dok-do (Liancourt rocks) in the sea of Japan. Bull. Pusan Fish. Coll. 9: 53-62.
- Kang, J.W., Sohn, C.H. and Lee, C.W. 1980. The summer marine algal flora of Uido and Maeseom, southwestern coast of Korea. Rep. KACN No. 16, pp. 95-107.
- Kang, J.W., Sohn, C.H. and Lee, C.W. 1981. Summer flora of marine algae in Kogunsan Islands, western coast of Korea. Rep. KACN No. 18, pp. 103-107.
- Keum, Y.S. 1997. Systematics of Sphacelariales, Phaeophyta. Ph.D. thesis, SNU. 294 pp.
- Keum, Y.S. and Lee, I.K. 1993. Vegetative and reproductive morphology of *Herpochondria corallinae* (Martens) Falkenberg and *H. elegans* (Okamura) Itono (Ceramiaceae, Rhodophyta) from Korea. Hydrobiologia 260/261: 97-104.
- Keum, Y.S., Oak, J.H., Boo, S.M., Prud'homme van Reine, W.F. and Lee, I.K. 1999. *Sphacelaria californica* and *S. novae-hollandicae*, two related species of the genus *Sphacelaria* (Sphacelariales, Phaeophyta). Algae 14: 23-35.
- Keum, Y.S., Oak, J.H., Prud'homme van Reine, W.F. and Lee, I.K. 2001. Two species of *Sphacelaria* (Sphacelariales, Phaeophyta), *S. solitaria* (Pringsheim) Kylin and *S. recurva* sp. nov. from Korea. Bot. Mar. 44: 267-275.
- Keum, Y.S., Oh, Y.S. and Lee, I.K. 1995. Morphology and life history of *Halopteris filicina* (Sphacelariales, Phaeophyta) from Korea. Phycol. Res. 43: 137-144.
- Kim, B.S. 2001. Morphotaxonomical studies on the Gelidiaceae (Gelidiales, Rhodophyta) of Jeju Island, Korea. M.S. thesis, Cheju Natl Univ. 87 pp.
- Kim, C.J. 1998. Intertidal benthic algal community structure and successional pattern at the vicinity of Pukcheju fire power plant. Ph.D. thesis, Cheju Natl Univ. 212 pp.
- Kim, G.H. 1990. A biosystematic study on fourteen species of Ceramiaceae (Rhodophyta) in Korea. Ph.D. thesis, SNU. 359 pp.
- Kim, G.H. 1997. Gamete recognition and signal transduction during fertilization in red algae. Algae 12: 263-268.
- Kim, G.H. and Fritz, L. 1993a. Ultrastructure and cytochemistry of early spermatangial development in *Antithamnion nipponicum* (Ceramiaceae, Rhodophyta). J. Phycol. 29: 797-805.
- Kim, G.H. and Fritz, L. 1993b. Gamete recognition during fertilization in a red alga, *Antithamnion nipponicum*. Protoplasma 174: 69-73.
- Kim, G.H. and Fritz, L. 1993c. A signal glycoprotein with α -D-mannosyl residues is involved in the wound-healing response of *Antithamnion sparsum* (Ceramiaceae, Rhodophyta). J. Phycol. 29: 85-90.
- Kim, G.H., Fritz, L. and Lee, I.K. 1996. Cell-cell recognition during fertilization in a red alga, *Antithamnion sparsum* (Ceramiaceae, Rhodophyta). Plant Cell & Physiol. 37: 621-628.
- Kim, G.H., Hwang, M.S., Fritz, L. and Lee, I.K. 1995. The wound healing response of *Antithamnion nipponicum* and *Griffithsia pacifica* (Ceramiaceae, Rhodophyta) monitoring by lectins. Phycol. Res. 43: 161-166.
- Kim, G.H. and Kim, S.H. 1999a. The role of actin during the fertilization of a red alga, *Aglaothamnion oosumiense* (Ceramiaceae, Rhodophyta). J. Phycology 35: 806-814.
- Kim, G.H. and Kim, S.H. 1999b. Cell-cell recognition during the fertilization in a red alga, *Aglaothamnion oosumiense* (Ceramiaceae, Rhodophyta). Hydrobiologia 398/399: 81-89.
- Kim, G.H., Klotchkova, T.A., and Kang, Y.-M. 2001b. Life without cell

- membrane: regeneration of protoplasts from disintegrated cells of a green alga *Bryopsis plumosa*. J. Cell Sci. 114: 2009-2014.
- Kim, G.H., Klotchkova, T.A., and Kang, Y.-M. 2001c. Life after life. (ed) G. Chin in Editor's Choice. Science 292: 1799.
- Kim, G.H., Klotchkova, T.A., Lee, B.-C. and Kim, S.-H. 2001a. FITC-phalloidin staining of F-actin in *Aglaothamnion oosumiense* and *Griffithsia japonica* (Rhodophyta). Bot. Mar. 44: 501-508.
- Kim, G.H., Klotchkova, T.A. and West, J.A. 2002. From protoplasts to swimmers: protoplasts regeneration from disintegrated cells of the multicellular marine green alga, *Microdictyon umbilicatum*. J. Phycol. 38: 174-183.
- Kim, G.H. and Lee, I.K. 1989. Mixed phases reproduction of *Platythamnion yezoense* Inagaki in culture. Korean J. Phycol. 4: 111-119.
- Kim, G.H. and Lee, I.K. 1992. Reproduction and life history of *Antithamnion secundum* Itono (Ceramiaceae, Rhodophyta). Korean J. Phycol. 7: 1-6.
- Kim, G.H. and Lee, I.K. 2000. Mixed-phase reproduction in *Antithamnion sparsum* Tokida (Ceramiaceae, Rhodophyta) from Korea. Algae 15: 183-193.
- Kim, G.H., Oak, J.H. and Lee, I.K. 1994. Taxonomic investigation of *ErythroGLOSSUM minimum* Okamura and *Sorella repens* (Okamura) Hollenberg (Delesseriaceae, Rhodophyta) J. Plant Biol. 37: 403-410.
- Kim, H.G., Kang, R.S. and Sohn, C.H. 1992. Effect of thermal effluents on the marine algal community at the coast of Kori nuclear power plant. Korean J. Phycol. 7: 269-279.
- Kim, H.K. and Kim, Y.H. 1991. Marine algal communities around three nuclear power plants in Korea. Korean J. Phycol. 6: 157-192.
- Kim, H.S., Lee, I.K., Koh, C.H., Kim, I.H., Suh, Y.B. and Sung, N. 1983. Studies on the marine benthic communities in inter- and subtidal zones. I. Analysis of benthic community structures at Aninjin, eastern coast of Korea. Proc. Coll. Natur. Sci., SNU 8: 71-108.
- Kim, H.-S. 1984. A life history and somatic cell fusion of *Griffithsia japonica* (Rhodophyta, Ceramiales) in culture. M.S. thesis, SNU. 27 pp.
- Kim, H.-S. 1988. A taxonomic study of four tribes (Griffithsiaceae, Compsothamnieae, Spermothamnieae and Dohmielleae) of Ceramiaceae, Rhodophyta in Korea. Ph.D. thesis, SNU. 395 pp.
- Kim, H.-S., Kim, G.H. and Lee, I.K. 1988. Wound-healing in several filamentous red algae, Ceramiales. Korean J. Phycol. 3: 15-27.
- Kim H.-S. and Lee, I.K. 1986. Morphology and reproduction of *Anotrichium yagii* (Okam.) Baldock (Ceramiaceae, Rhodophyta). Korean J. Phycol. 1: 87-94.
- Kim H.-S. and Lee, I.K. 1987. Morphology and reproduction of *Griffithsia venusta* Yamada (Ceramiaceae, Rhodophyta). Korean J. Phycol. 2: 51-60.
- Kim H.-S. and Lee, I.K. 1988. Morphology and reproduction of two species of *Pleonosporium* Naegeli (Ceramiaceae, Rhodophyta) in Korea. Korean J. Phycol. 3: 95-109.
- Kim H.-S. and Lee, I.K. 1989a. Morphology and asexual reproduction of *Monosporus indicus* Boergesen (Rhodophyta, Ceramiaceae) in Korea. Korean J. Phycol. 4: 11-17.
- Kim H.-S. and Lee, I.K. 1989b. Mixed phases reproduction of *Platythamnion yezoense* Inagaki in culture. Korean J. Phycol. 4: 111-119.
- Kim H.-S. and Lee, I.K. 1991. Two species of *Anotrichium* Naegeli (Ceramiaceae, Rhodophyta) in Korea, specially referred to the subgeneric groups. Korean J. Phycol. 6: 13-22.
- Kim H.-S. and Lee, I.K. 1992a. Morphotaxonomic studies on the Korean Ectocarpaceae (Phaeophyta) I. Genus *Ectocarpus* Lyngbye. Korean J. Phycol. 7: 225-242.
- Kim H.-S. and Lee, I.K. 1992b. Morphotaxonomic studies on the Korean Ectocarpaceae (Phaeophyta) II. Genus *Hincksia* J.E. Gray. Korean J. Phycol. 7: 243-256.
- Kim H.-S. and Lee, I.K. 1994. Morphotaxonomic studies on the Korean Ectocarpaceae (Phaeophyta) III. Genus *Feldmania* Hamel, specially referred to morphogenesis and phylogenetic relationship among related genera. Korean J. Phycol. 9: 153-168.
- Kim, J.H. 1994. A taxonomic study on the genus *Corallina* (Corallinaceae, Rhodophyta) in Korea. M.S. thesis, SNU. 73 pp.
- Kim, J.H. 2000. Taxonomy of the Corallinales, Rhodophyta in Korea. Ph.D. thesis, SNU. 349 pp.
- Kim, J.I. 2001. A taxonomic study of Gelidiales (Rhodophyta) in Korea. Ph.D. thesis, Chongju Univ. 267 pp.
- Kim, J.I., Lee, J.W. and Lee, H.B. 2000. ITS2 sequences of *Gelidium amansii* populations from Korea. Algae 15: 125-132.
- Kim, K.Y. 1991. Effects of selected environmental factors on germination, growth and morphological variation of the four species of marine *Enteromorpha* (Chlorophyta). Ph.D. thesis, SNU. 288 pp.
- Kim, K.Y. and Lee, I.K. 1994. Morphological differences among the populations of *Enteromorpha compressa* (L.) Greville (Chlorophyceae) due to environmental factors. Korean J. Phycol. 9: 29-35.
- Kim, K.Y., Lee, I.K. and Choi, C.I. 1990. Effects of temperature and salinity on germination and vegetative growth of *Enteromorpha multiramosa* Bliding (Chlorophyceae, Ulvales). Korean J. Bot. 33: 141-146.
- Kim, K.Y., Lee, I.K. and Choi, C.I. 1992. Morphological variation of marine *Enteromorpha linza* (L.) J. Agardh (Ulvaes, Chlorophyceae). Korean J. Bot. 35: 61-67.
- Kim, M.R. 1992. A morphotaxonomic study on *Chondria* (Ceramiaceae, Rhodophyta) in Cheju Island. M.S. thesis, Cheju Natl Univ. 95 pp.
- Kim, M.S. 1995. A taxonomic revision of *Polysiphonia* (Rhodomelaceae, Rhodophyta) in Korea. Ph.D. thesis, SNU. 361 pp.
- Kim, M.S., Keum, Y.S. and Lee, I.K. 1999. Chromosome counts in three species of *Polysiphonia* (Ceramiales, Rhodophyta). Phycologia 38: 66-69.
- Kim, M.S. and Lee, I.K. 1996. Two species of *Polysiphonia*, *P. scopulorum* Harvey and *P. flaccidissima* Hollenberg (Rhodomelaceae, Rhodophyta) new to Korea. Algae 11: 141-148.
- Kim, M.S. and Lee, I.K. 1997. Morphology and reproduction of *Polysiphonia yendoii* Segi (Rhodomelaceae, Rhodophyta) in Korea. Algae 12: 73-81.
- Kim, M.S. and Lee, I.K. 1999. *Neosiphonia flavimarina* gen. et sp. nov. with a taxonomic reassessment of the genus *Polysiphonia* (Rhodomelaceae, Rhodophyta). Phycol. Res. 47: 271-281.
- Kim, M.S., Lee, I.K. and Boo, S.M. 1994. Morphological studies of the red alga *Polysiphonia morrowii* Harvey on the Korean coast. Korean J. Phycol. 9: 185-192.
- Kim, Y.H. 1983. An ecological study of algal communities in intertidal zone of Korea. Ph.D. thesis, SNU. 175 pp.
- Kim, Y.H. 1986. A study on the marine algae at the coast of Kori nuclear power plant 2. Marine algal vegetation in 1983. Korean J. Phycol. 1: 241-249.
- Kim, Y.H. 1987. A study on colonization and succession of marine algae

- using an artificial substratum. Korean J. Phycol. 2: 73-91.
- Kim, Y.H. 1994. Experimental observation of algal successions in a rocky intertidal community. Proc. Korea-Japan Sem. Biol. Sci. 2: 159-174.
- Kim, Y.H. and Huh, S.H. 1998. Species composition and biomass of marine algal community in the vicinity of Yonggwang nuclear power plant on the west coast of Korea. J. Kor. Fish. Soc. 31: 186-194.
- Kim, Y.H., Kim, H.-S., Kim, G.H., Lee, W.J., Oak, J.H. and Lee, I.K. 1996. Summer marine benthic algal flora of Ullungdo and Dogdo islands. Rep. Surv. Nat. Environ. Korea 10: 275-320.
- Kim, Y.H. and Lee, I.K. 1986. Ecological studies on adhesive living organisms found in intake and discharge of power plant. Proc. Chungbuk Natl Univ. 31: 71-84.
- Kim, Y.H. and Park, S.H. 1997. Succession pattern of intertidal benthic algal communities in Cheju Island. Algae 12: 23-30.
- Kim, Y.H. and Yoo, J.S. 1994. Patterns of algal succession in a *Sargassum thunbergii* (Phaeophyta) dominated rocky intertidal community. Korean J. Phycol. 9: 59-65.
- Kim, Y.H., Yoo, J.S. and Kim, J.H. 1992. Marine algal succession in a perturbed intertidal community. Korean J. Phycol. 7: 131-137.
- Kim, Y.S., Choi, H.G. and Nam, K.W. 2001. Taxonomic notes on *Acrosorium flabellatum* and *A. venulosum* (Delesseriaceae, Rhodophyta) in Korea. J. Fish. Sci. & Tech. 4: 93-97.
- Koh, C.H. 1983. Community structure and productivity of phytobenthos in Juckdo (eastern coast of Korea) II. Seasonal changes of algal vegetation in relation to annual growth of large brown algae. Korean J. Bot. 26: 181-190.
- Koh, C.H., Oh, S.H., Sung, N., Ahn, I.Y. and Kang, Y.C. 1989. Algal zonation and seasonality in subtidal area of a wave-exposed coast at Ohori, east coast of Korea. Korean J. Phycol. 4: 171-182.
- Koh, C.H. and Sung, N.G. 1983. Community structure and productivity of phytobenthos in Juckdo (eastern coast of Korea) I. Algal vegetation and environment. Korean J. Bot. 26: 119-130.
- Lee, C.W. and Kang, J.W. 1977. Ecological studies on *Myagropsis myagroides* (Phaeophyta) in the coastal waters of Haeundae. Publ. Inst. Mar. Sci., Natl Fish. Univ. Busan 10: 33-40.
- Lee, E.Y. 1998. A taxonomic study on the genus *Ishige* Yendo (Chordariales, Phaeophyta) in Korea. M.S. thesis, SNU. 68 pp.
- Lee, E.Y. 2001. Morphology and molecular systematics of the Chordariales (Phaeophyta) in Korea. Ph.D. thesis, SNU. 179 pp.
- Lee, E.Y., Pedersen, P.M. and Lee, I.K. 2001. *Neoleptonema yongpili* gen. et sp. nov. based on morphological characters and RuBisCo spacer sequences. Eur. J. Phycol. 37: 237-245.
- Lee, H.B. 1987. A systematic study of Halymeniaceae (Rhodophyta, Cryptonemiales) in Korea. Ph.D. thesis, SNU. 412 pp.
- Lee, H.B. 1997. *Sinkoraena lancifolia* (Harvey) H.-B. Lee, Lewis, J.A. Kraft, G.T. & Lee, I.K. amended from *Sinkoraena okamurae* (Yamada) H.-B. Lee et al. (Halymeniaceae, Rhodophyta). Algae 12: 145-146.
- Lee, H.B. and Kim, J.I. 1995. Notes on Gelidiales species from Korea. In, Abbott, I.A. ed., Taxonomy of economic seaweeds. 5: 161-174.
- Lee, H.B. and Lee, I.K. 1981. Flora of benthic marine algae in Gyeonggi Bay, western coast of Korea. Korean J. Bot. 24: 107-138.
- Lee, H.B. and Lee, I.K. 1993. A taxonomic study on the genus *Pachymeniopsis* (Halymeniaceae, Rhodophyta) in Korea. Korean J. Phycol. 8: 55-65.
- Lee, H.B., Lee, J.W., Choi, H.-G., Lee, W.J. and Kim, J.I. 2001. Morphology and rbcL sequences of *Caulacanthus okamurae* Yamada (Gigartinales, Rhodophyta) from Korea. Algae 16: 25-34.
- Lee, H.B., Lewis, J.A., Kraft, G.T. and Lee, I.K. 1997. *Sinkoraena* gen. nov. (Halymeniaceae, Rhodophyta) from Korea, Japan, and southern Australia. Phycologia 36: 103-113.
- Lee, H.B. and Oh, Y.S. 1986. Summer algal vegetation in Youngil Bay, eastern coast of Korea. Korean J. Phycol. 1: 225-240.
- Lee, I.K. 1969. On the male organs of Rhodymeniales. Korean J. Bot. 12: 144-150.
- Lee, I.K. 1972. Notes on marine algae from Korea (I). Korean J. Bot. 15: 13-22.
- Lee, I.K. 1973. A check list of marine algae in summer of Baekryeong Island. Bull. Coll. Lib. Arts & Sci., SNU 19: 437-448.
- Lee, I.K. 1980. On the marine algae of Deokjeok Island, western coast of Korea. J. Nat. Acad. Sci., ROK, Nat. Sci. Ser. 19: 135-160.
- Lee, I.K. and Boo, S.M. 1981. Marine algal flora of Ulreung and Dogdo Islands. Rep. KACN, no. 19, pp. 201-214.
- Lee, I.K. and Boo, S.M. 1982. A summer marine algal flora of Islands in Wando-Kun. Rep. Surv. Nat. Environ. Korea, No. 2, pp. 209-232.
- Lee, I.K. and Boo, S.M. 1984. A summer marine algal flora in Keomundo Islands, southern coast of Korea. Rep. Surv. Nat. Environ. Korea, No. 4, pp. 207-230.
- Lee, I.K. and Boo, S.M. 1988. A summer marine algal flora of Oeyon Islands. Rep. Surv. Nat. Environ. Korea, No. 8, pp. 233-256.
- Lee, I.K., Choi, D.S., Lee, J.W., Kim, G.H. and Oh, Y.S. 1989. Notes on marine algae from Korea (III). Korean J. Bot. 32: 351-362.
- Lee, I.K. and Kang, J.W. 1986. A check list of marine algae in Korea. Korean J. Phycol. 1: 311-325.
- Lee, I.K. and Kim, G.H. 1991. Life history of Ceramiales specially referring to the mixed-phase reproduction. Jpn J. Phycol. 39: 400-401.
- Lee, I.K., Kim, H.S., Choi, B.R. and Lee, H.B. 1985. Studies on the marine benthic communities in inter- and subtidal zones III. Qualitative and quantitative analyses of the community structure on western coast of Korea. Proc. Coll. Natur. Sci., SNU 10: 57-100.
- Lee, I.K., Kim, H.-S. and Chung, H.S. 1986a. A summer marine algal flora of Huksan Islands, south-western coast of Korea. Rep. Surv. Nat. Environ. Korea. No. 6, pp. 257-284.
- Lee, I.K., Kim, H.S., Koh, C.H., Kang, J.W., Hong, S.Y., Boo, S.M., Kim, I.H. and Kang, Y.C. 1984. Studies on the marine benthic communities in inter- and subtidal zones II. Qualitative and quantitative analyses of the community structure on south-eastern coast of Korea. Proc. Coll. Natur. Sci., SNU 9: 71-126.
- Lee, I.K. and Kim, Y.H. 1977. A study on the marine algae in the Kwang Yang Bay 3. The marine algal flora. Proc. Coll. Nat. Sci., SNU 2: 113-153.
- Lee, I.K. and Kim, Y.H. 1999. Biodiversity and distribution of marine benthic organisms and uses of algal resources in the coastal zone of Korea and Japan. I. Benthic marine algae in the east coast of Korea. Algae 14: 91-110.
- Lee, I.K., Kim, Y.H., Lee, J.H. and Hong, S.W. 1975. A study on the marine algae in the Kwang Yang Bay 1. The seasonal variation of algal community. Korean J. Bot. 18: 109-121.
- Lee, I.K. and Lee, H.B. 1982. A study on the algal vegetation in Garolim

- Bay, western coast of Korea. Bull. KACN, no. 4, pp. 325-337.
- Lee, I.K., Lee, H.B. and Boo, S.M. 1983. A summer marine algal flora of islands in Jindo-gun. Rep. Surv. Nat. Environ. Korea. No. 3, pp. 291-312.
- Lee, I.K. and Lee, Y.P. 1974. Some members of *Rhodochorton* (Rhodophyta) in Korea. Korean J. Bot. 17: 36-52.
- Lee, I.K., Lee, Y.P. and Ahn, Y.S. 1986b. Flora of marine algae in Cheju Island I. Ulvaceae. Korean J. Phycol. 1: 157-167.
- Lee, I.K., Oh, Y.S., Choi, D.S. and Kim, H.-S. 1988. Notes on marine algae from Korea (II). Korean J. Bot. 31: 101-112.
- Lee, I.K., Oh, Y.S. and Chung, H.S. 1987. A marine algal flora of Taechongdo Islets, western coast of Korea. Rep. Surv. Nat. Environ. Korea. No. 7, pp. 329-354.
- Lee, I.K. and West, J.A. 1979. *Dasysiphonia chejuensis* gen. et sp. nov. (Rhodophyta, Dasycyathaceae) from Korea. Syst. Bot. 4: 115-129.
- Lee, I.K. and West, J.A. 1980a. A life history of *Lomentaria hakodatensis* (Rhodophyta, Lomentariaceae) in culture. Bot. Mar. 23: 419-423.
- Lee, I.K. and West, J.A. 1980b. *Antithamnion nipponicum* Yamada et Inagaki (Rhodophyta, Ceramiales) in culture. Jpn J. Phycol. 28: 19-27.
- Lee, I.K. and Yoo, S.A. 1978. On the summer marine algal flora of Gyeongyeolbi-Islands, western coast of Korea. Rep. KACN, no. 12, pp. 103-120.
- Lee, I.K. and Yoo, S.A. 1979. *Gloeoptychus koreanum* gen. et sp. nov. (Rhodophyta, Gloiosiphoniaceae) from Korea. Phycologia 18: 347-354.
- Lee, I.K. and Yoo, S.A. 1992. Korean species of *Sargassum* subgenus *Bactrophyucus* J. Agardh (Sargassaceae, Fucales). In, Taxonomy of economic seaweeds with reference to some Pacific species. Vol. III, pp. 139-147.
- Lee, J.W. 1991. Community structure and geographic distribution of intertidal benthic algae in the east coast of Korea. Ph.D. thesis, SNU. 210 pp.
- Lee, J.W. and Lee, H.B. 1997. Marine benthic algal flora of Youngil Bay and its adjacent areas, the east coast of Korea. Algae 12: 303-311.
- Lee, J.W., Lee, H.B. and Lee, I.K. 1992. Vegetative and reproductive structure of *Gelidium vagum* Okamura (Gelidiales, Rhodophyta) in Korea. J. Ind. Sci. Res., Chongju Univ. 10: 209-217.
- Lee, J.W., Oh, B.G. and Lee, H.B. 1995. A taxonomic and ecological study of *Gloiopeltis furcata* J. Agardh (Rhodophyta) in Korea. J. Plant Biol. 38: 165-171.
- Lee, J.W., Oh, B.G. and Lee, H.B. 1996. Morphology of three species of *Gloiopeltis* (Endocladiaceae, Rhodophyta) in Korea. Algae 11: 81-90.
- Lee, K.W. 1973. Observation of algal community near Dongbaeksum, Haeundae. Jeju Univ. Jour. 5: 319-331.
- Lee, M.J., Hong, S.W. and Lee, I.K. 1961. On the studies of chemical components and its relationship to the phylogeny of algae (I). An analytical studies of free amino acids and its relationship among the main groups of brown algae. Seoul Univ. J.(D). 10: 1-9.
- Lee, M.J., Hong, S.W. and Lee, I.K. 1962a. On the studies of chemical components and its relationship to the phylogeny of algae (II). An analytical studies of free amino acids and its relationship among the main groups of red algae. Seoul Univ. J.(D). 11: 1-9.
- Lee, M.J., Hong, S.W. and Lee, I.K. 1962b. On the studies of chemical components and its relationship to the phylogeny of algae (III). An analytical studies of free amino acids and its relationship among the main groups of green algae. Korean J. Bot. 5(3): 25-29.
- Lee, S.R. 2001. Phylogenetic implications of *rbcS* sequences in the Ceramiales (Rhodophyta). Ph.D. thesis, SNU. 113 pp.
- Lee, S.R., Oak, J.H., Suh, Y.B. and Lee, I.K. 2001. Phylogenetic utility of *rbcS* sequences: An example from *Antithamnion* and related genera (Ceramiales, Rhodophyta). J. Phycol. 37: 1083-1090.
- Lee, W.J. 1994. Flora and subtidal community structures of benthic marine algae in Ullungdo Island, Korea. Ph.D. thesis, SNU. 290 pp.
- Lee, W.J. and Bae, K.S. 2002. Phylogenetic relationship among several genera of Dictyotaceae (Dictyotales, Phaeophyceae) based on 18S rRNA and partial *rbcL* gene sequences. Mar. Biol. 140: 1107-1115.
- Lee, W.J., Boo, S.M. and Lee, I.K. 1991. Notes on the genus *Bryopsis* (Bryopsidaceae, Chlorophyta) from Ullungdo Island, Korea. Korean J. Phycol. 6: 23-29.
- Lee, W.J., Choi, D.S. and Lee, I.K. 1994. Taxonomic accounts on four species of Corallinaceae from Ullungdo Island, Korea. J. Plant Biol. 37: 453-458.
- Lee, W.J. and King, R.J. 1996. The molecular characteristics of five genera of Dictyotaceae (Phaeophyta) from Australia: based on DNA sequences of nuclear rDNA internal transcribed spacer (ITS) and 5.8S. Algae 11: 381-388.
- Lee, W.J. and Lee, I.K. 1991. Mixed phases reproduction of *Polysiphonia morrowii* Harvey (Rhodomelaceae, Rhodophyta) in culture. Jpn J. Phycol. 39: 115-121.
- Lee, W.J. and Lee, I.K. 1995. Notes on the species of *Ceramium* (Ceramiales, Rhodophyta) from Ullungdo Island, Korea. J. Plant Biol. 38: 159-164.
- Lee, W.J. and Lee, I.K. 1996. Notes on the Dictyotaceae (Phaeophyta) from Ullungdo Island, Korea. Algae 11: 59-64.
- Lee, W.J., Lee, I.K. and Boo, S.M. 1992. Taxonomic accounts on the Scytosiphonaceae (Phaeophyta) from Ullungdo Island, Korea. Korean J. Bot. 35: 125-134.
- Lee, W.J., Yoon, H.S. and Boo, S.M. 1998. Phylogenetic relationships of *Pelvetia* and *Pelvetiopsis* (Phaeophyceae) based on small subunit ribosomal DNA sequences. J. Plant Biol. 41: 103-109.
- Lee, Y.K., Choi, H.-G., Hong, J.B. and Lee, I.K. 1995. Sexual differentiation of *Griffithsia* (Ceramiales, Rhodophyta): Nuclear ploidy level of mixed-phase plants in *G. japonica*. J. Phycol. 31: 668-673.
- Lee, Y.K., Kim, S.H., Hong, J.B., Chah, O.-K. and Lee, I.K. 1998. Heat-shock protein 90 may be involved in differentiation of the female gametophytes in *Griffithsia japonica* (Ceramiales, Rhodophyta). J. Phycol. 34: 1017-1023.
- Lee, Y.P. 1974. Studies on some members of *Elachista* in Korea. M.S. thesis, SNU. 55 pp.
- Lee, Y.P. 1987. Taxonomy of the Rhodochortonaceae (Rhodophyta) in Korea. Korean J. Phycol. 2: 1-50.
- Lee, Y.P. 1989. Taxonomy on the Elachistaceae (Chordariales, Phaeophyta) with special reference to Korean plants. Korean J. Phycol. 4: 97-106.
- Lee, Y.P. 2000. Taxonomic account of *Elachista* (Elachistaceae, Phaeophyta) in Korea. Korean J. Biol. Sci. 4: 9-21.
- Lee, Y.P. 2001. The circumscription of the genus *Halothrix* Reinke (Chordariales, Phaeophyceae). Algae 16: 35-43.
- Lee, Y.P. and Garbary, D.J. 1999. *Proselachista* gen. nov. and *P. taeniaformis* (Chordariales, Phaeophyta). Algae 14: 213-218.
- Lee, Y.P. and Kang, S.Y. 2002. A Catalogue of the Seaweeds in Korea.

- Cheju Natl. Univ. Press. 662 pp.
- Lee, Y.P. and Lee, I.K. 1976. On the algal community in the intertidal belt of Jeju Island I. Algal community of spring season. Korean J. Bot. 19: 111-118.
- Lee, Y.P. and Lee, I.K. 1982. Vegetation analysis of marine algae in Jeju Island. Proc. Coll. Natur. Sci., SNU 7: 73-91.
- Lee, Y.P. and Lee, I.K. 1988. Marine algae of Cheju Island -The Leathesiaceae-. Korean J. Bot. 31: 317-332.
- Lee, Y.P. and Lee, I.K. 1989. Notes on *Galaxaura* (Rhodophyta) from Cheju Island. Korean J. Phycol. 4: 1-9.
- Lee, Y.P. and Yoon, J.T. 1998. Taxonomy and morphology of *Undaria* (Alariaceae, Phaeophyta) in Korea. Algae 13: 427-446.
- Lee, Y.P. and Yoon, S.Y. 1996. Taxonomy of *Chondria* (Rhodophyta) in Korea. Algae 11: 107-139.
- Nam, K.W. and Choi, H.G. 2001. Morphology of *Laurencia clavata* and *L. elata* (Ceramiales, Rhodophyta) in relation to generic circumscription in the *Laurencia* complex. Eur. J. Phycol. 36: 353-358.
- Nam, K.W., Choi, H.G., Lee, S., Park, E.J., Kang, K.H. and Kim, Y.S. 2000. Vegetative and reproductive development of *Laurencia venusta* (Ceramiales, Rhodophyta). Crypt. Algol. 21: 97-110.
- Nam, K.W. and Kang, J.W. 1984. Taxonomy of *Laurencia* (Rhodophyta) in Korea. Bull. Pusan Fish. Coll. 24: 23-68.
- Nam, K.W. and Kim, Y.S. 1996. *Haraldiophyllum* (Rhodophyta): a delesseriaceous genus newly recorded in Korea. Algae 11: 101-106.
- Nam, K.W., Kim, Y.S., Kim, Y.H. and Sohn, C.H. 1996. Benthic marine algae in the eastern coast of Korea: Flora, distribution and community structure. J. Kor. Fish. Soc. 29: 727-743.
- Nam, K.W. and Sohn, C.H. 1994. *Laurencia kangjaewonii* sp. nov. (Ceramiales, Rhodophyta) from Korea. Phycologia 33: 397-403.
- Noda, M. 1966. Marine algae of north-eastern China and Korea. Sci. Rep. Niigata Univ. Ser. (D) 3: 19-85.
- Oak, J.H. 1992. Morphotaxonomic studies on the genus *Hypoglossum* (Delesseriaceae, Rhodophyta) in Korea. M.S. thesis, SNU. 65 pp.
- Oak, J.H. 1999. Systematic studies on the genus *Sargassum* (Fucales, Phaeophyta) in Korea. Ph.D. thesis, SNU. 215 pp.
- Oh, B.G. 1998. Flora and community of intertidal marine algae, west coast of Korea. Ph.D. thesis, Chongju Univ. 199 pp.
- Oh, B.G. 1990. A taxonomic study on the genus *Gloiopeltis* (Rhodophyta) in Korea. M.S. thesis, Chongju Univ. 84 pp.
- Oh, B.G. and Lee, H.B. 1989. A summer marine algal flora of Hatae Islands, southwestern coast of Korea. J. Ind. Sci. Res., Chongju Univ. 7: 163-172.
- Oh, B.G. and Lee, H.B. 1996. Morphology of three species of *Gloiopeltis* (Endocladaceae, Rhodophyta) in Korea. Algae: 11: 81-90.
- Oh, Y.S. 1983. A taxonomic study of the genus *Codium* (Chlorophyta) in Jeju Island. M.S. thesis, Jeju Natl. Univ. 33 pp.
- Oh, Y.S. 1990. A morphotaxonomic study of marine Cladophorales (Chlorophyta) in Korea. Ph.D. thesis, SNU. 331 pp.
- Oh, Y.S., Lee, I.K. and Lee, Y.P. 1991. Taxonomic remarks on three marine species of *Cladophora* (Cladophoraceae, Chlorophyta) from Cheju Island. Korean J. Bot. 33: 127-134.
- Oh, Y.S., Lee, Y.P. and Lee, I.K. 1987. A taxonomic study on the genus *Codium*, Chlorophyta, in Cheju Island. Korean J. Phycol. 2: 61-72.
- Okamoto, K. 1963. List of marine algae collected by M. Higashi I. Bull. Jap. Soc. Phycol. 11: 118-125.
- Okamoto, K. 1964. List of marine algae collected by M. Higashi II. Bull. Jap. Soc. Phycol. 12: 51-58.
- Okamura, K. 1892. On the marine algae of Fusanho, Chosen. Bot. Mag. Tokyo 6(61): 117-119.
- Okamura, K. 1913. On the marine algae of Chosen. Rep. Imp. Bur. Fish. Sci. 3: 114-127.
- Okamura, K. 1914. On the marine algae of west coast of Chosen. Bot. Mag. Tokyo 28: 183-185.
- Okamura, K. 1915a. On the marine algae of east coast of Chosen I. Bot. Mag. Tokyo 29(337): 28-29.
- Okamura, K. 1915b. On the marine algae of east coast of Chosen II. Bot. Mag. Tokyo 29(342): 205-207.
- Okamura, K. 1915c. *Undaria* and its species. Bot. Mag. Tokyo 29: 266-278.
- Okamura, K. 1917. On the marine algae of east coast of Chosen III. Bot. Mag. Tokyo 31(363): 76-78.
- Okamura, K. 1936. Nippon Kaisoshi. Tokyo. 964 pp.
- Park, C.H. 1976. A study on non-articulate corallines in Korea (I). Bull. Pusan Fish. Coll. 16: 49-54.
- Park, M.R. and Lee, I.K. 1998. Morphology and phenology of *Champia expansa* Yendo and *C. compressa* Harvey (Rhodymeniales, Rhodophyta) from Korea. Algae 13: 85-99.
- Park, S.H. 1992. Qualitative and quantitative analyses of intertidal benthic algal community in Cheju Island. Ph.D. thesis, Cheju Natl Univ. 176 pp.
- Park, Y.S. and Kim, Y.H. 1990. Phytogeographical study on the summer marine algal distribution in western coast of Korea. Korean J. Phycol. 5: 39-50.
- Rhew, K.S. and Boo, S.M. 1991. Morphological variability in *Endarachne binghamiae* J. Agardh (Phaeophyta) from the east coast of Korea. Korean J. Bot. 34: 45-51.
- Rho, J.H. 1954. Marine algae of Pusan and adjacent waters. Biol. Research 1: 30-35.
- Rho, J.H. 1958. A preliminary survey of the marine algae in Korea. Rep. Coll. Univ. SKK. 3: 41-143.
- Saito, Y. and Atobe, S. 1970. Phytosociological study of intertidal marine algae. I. Usujiri Benten-jima, Hokkaido. Bull. Fac. Fish., Hokkaido Univ. 21: 37-69.
- Shin, W.G. and Boo, S.M. 1994. A systematic study on the genus *Hypnea* (Gigartinales, Rhodophyta). Korean J. Phycol. 9: 7-20.
- Sohn, C.H. 1975. Marine algal community of Ochon-ri and Singum-ri. Bull. Yeosu Fish. Junior Coll. (Natur. Sci.) 9: 1-5.
- Sohn, C.H. 1987. Phytosociological characterization and quantitative analysis of algal communities in Korea. Ph.D. thesis, Chonnam Natl Univ. 111 pp.
- Sohn, C.H. and Kang, J.W. 1980. Some crustose red algae in Korea. Bull. Nat. Fish. Univ., Busan 20: 71-78.
- Sohn, C.H., Lee, I.K. and Kang, J.W. 1982. Benthic marine algae of Dolsan Island in the southern coast of Korea I. Publ. Inst. Mar. Sci., Nat. Fish. Univ., Busan 14: 37-50.
- Sohn, C.H., Lee, I.K. and Kang, J.W. 1983. Benthic marine algae of Dolsan Island in the southern coast of Korea II. Structure of algal communities of subtidal zone. Bull. Kor. Fish. Soc. 16: 379-388.
- Song, C.B. and Sohn, C.H. 1983. Notes on some marine algae in Korea.

- Bull. Nat. Fish. Univ. Busan 20: 71-78.
- Song, S.H., Choi, J.S. and Son, C.H. 1970. Algal flora of summer Odongdo Island. Bull. Yeosu Fish. Junior Coll. (Natur. Sci.) 4: 18-28.
- Taniguti, M. 1961. Phytosociological study of marine algae in Japan. Tokyo. 130 pp.
- Tseng, C.K. and Chang, C.F. 1953. On a new species of *Pelvetia* and its distribution. Acta Bot. Sinica 2: 280-197.
- Ueda, S. 1932. Taxonomic studies on the Japanese *Porphyra*. Jour. Imp. Fish. Inst. 28: 1-45.
- Yamamoto, T and Kawamoto, T. 1942. A catalogue of the marine algae of Korea. J. Chosen Nat. Hist. Soc. 9: 61-66.
- Yoo, J.S. 1994. Benthic community structure, productivity and carbon flux in dock marine ecosystem of Incheon harbor. Ph.D. thesis, SNU. 255 pp.
- Yoo, J.S., Kim, Y.H. and Lee, I.K. 1991. Recolonization of the disturbed benthic algal community in Incheon dock. Korean J. Bot. 34: 165-173.
- Yoo, S.A. 1975. On the taxonomic characters of Korean Fucales (Phaeophyta). M.S. thesis, SNU. 145 pp. 26 pls.
- Yoo, S.A. 1982. An ecological study on marine algae of Incheon dock. Ph.D. thesis, SNU. 168 pp.
- Yoo, S.A. 2002. Introduction to the blue-green algae. 1st Int. Sym. Appl. Cyanobacteria Agri. Prod. Pp. 1-35.
- Yoo, S.A. and Lee, I.K. 1979. Summer algal flora of Gojeong-ri, west coast of Korea. J. Nat. Acad. Sci. ROK, Nat. Sci. Ser. 19: 135-160.
- Yoo, S.A. and Lee, I.K. 1980. A study on the algal communities in the south coast of Korea. Proc. Coll. Nat. Sci., SNU 5: 109-138.
- Yoon, W.S. 1999. Molecular phylogenetic relationships of the Alariaceae and Laminariaceae (Phaeophyta). Ph.D. thesis, Chungnam Natl Univ. 146 pp.
- Yoon, W.S. and Boo, S.M. 1999. Molecular phylogeny of Alariaceae based on RuBisCo spacer region. Hydrobiologia 398/399: 47-55.
- Yoon, W.S., Lee, J.Y., Boo, S.M. and Bhattacharya, D. 2001. Phylogeny of Alariaceae, Laminariaceae and Lessoniaceae (Phaeophyceae) based on plastid-encoded RuBisCo spacer and nuclear-encoded ITS sequence comparison. Mol. Phylogen. Evol. 21: 231-243.
- Yoon, H.Y. 1986. A taxonomic study of genus *Polysiphonia* (Rhodophyta) from Korea. Korean J. Phycol. 1: 3-86.
- Yoon, S.Y. 1994. A taxonomic study on *Dictyota* (Dictyotales, Phaeophyta) in Korea. M.S. theses, Cheju Natl Univ. 64 pp.