

# Marine algal flora of Oho-ri, Gosung-gun, Gangwon-do, Korea

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It was found that a total of 94 species of marine algae, 13 green algae, 24 brown algae, and 57 red algae, are living at the seashore of Oho-ri in this study. 739 voucher specimens for 94 species were made based on plants from March to September 2010 at the 3 islets, including Heukdo, Goraebawi, and Juckdo. Voucher specimens were catalogued and deposited in the herbarium of the National Institute of Biological Resources (KB) of Korea.

Keywords: marine algal flora, Oho-ri, species list, voucher specimens

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## INTRODUCTION

We report the marine algal flora at the seashore of Oho-ri, Gosung-gun, Gangwon-do in this note. The seashore of Gosung-gun has predominantly sandy substrate with some rocky outcrops. The algal habitat of the eastern coast of Korea is generally restricted because of the steep slope and small tidal range.

The survey on flora was performed at 3 islets (the sea surface-protruding rocky outcrops), including Heukdo, Goraebawi, and Juckdo. The marine algal vegetation of Juckdo had reported (Koh, 1983; Koh and Sung, 1983). It had mentioned 42 species in the community research on marine algae from July 1982 to June 1983.

This study aimed to establish an inventory of algal species inhabiting Oho-ri coast nearby the eastern NLL (the Northern Limit Line), Gangwon-do, Korea. This area was a selected region for the project "The Survey on Species Diversity of Strategic Regions (2010)" in National Institute of Biological Resources (NIBR).

## MATERIALS AND METHODS

The field collections were conducted bimonthly from March to September in 2010. We selected three survey sites, Heukdo, Goraebawi, and Juckdo, which has abundant growth of marine algae (Fig. 1). The details of the SCUBA diving stations for collection are shown in

Table 1.

The collected samples were immediately preserved as dried specimen at the site or moved to the laboratory in cooled ice box. Standardized specimen preservation was used, according to the NIBR manual (NIBR, 2009). Specimens were identified on the basis of description by Kang (1968), Lee (2008) and Yoshida (1998) and were registered at the NIBR Biological Resources Management System by serial number. The specimens were stored at the herbarium of plant storage center of the NIBR International Standards Herbarium (KB).

## RESULTS AND DISCUSSION

### Habitat Description

The deepest depths at which algae grow was -24 m in Heukdo (St. 1-2) and -20.6 m in Goraebawi (St. 3), -13.3 m in Juckdo (St. 4-7), respectively. The seawater temperature was 8-10°C in May, 8-18°C in July, and 12-22°C in September (Table 1). The year in which the surveys were conducted recorded lower temperatures than those in the previous year.

### Marine algal flora

A total of 94 species belonging to the 21 orders, 35 families, and 67 genera were identified in this study. In all, 739 voucher specimens were obtained, and their inventory is as follows.



**Fig. 1.** Map denoting 3 islets and its diving stations where the survey was conducted.

**Table 1.** Details of marine algae survey station of Oho-ri coast, Gosung-gun.

| Locality  | Station                           | GPS                               | Collection date | Max. of depth (m) | Seawater temperature (°C) |
|-----------|-----------------------------------|-----------------------------------|-----------------|-------------------|---------------------------|
| Heukdo    | St. 1                             | N 38° 19'09.3"<br>E 128° 32'42.4" | 30-Mar-10       | 23                | –                         |
|           |                                   |                                   | 18-May-10       | 23.2              | 8                         |
|           |                                   |                                   | 22-Jul-10       | 23.4              | 8                         |
|           |                                   |                                   | 14-Sep-10       | 24                | 12                        |
|           | St. 2                             | N 38° 19'05.8"<br>E 128° 32'37.5" | 30-Mar-10       | 15                | –                         |
|           |                                   |                                   | 18-May-10       | 14.8              | 10                        |
|           |                                   |                                   | 22-Jul-10       | 14.9              | 11                        |
| Goraebawi | St. 3                             | N 38° 19'12.8"<br>E 128° 32'46.8" | 14-Sep-10       | 15                | 19                        |
|           |                                   |                                   | 30-Mar-10       | 18                | –                         |
|           |                                   |                                   | 18-May-10       | 20.6              | 9                         |
|           |                                   |                                   | 21-Jul-10       | 18.7              | 10                        |
| Juckdo    | St. 4                             | N 38° 20'03.5"<br>E 128° 32'05.9" | 14-Sep-10       | 20                | 12                        |
|           |                                   |                                   | 19-May-10       | 12.7              | 10                        |
|           |                                   |                                   | 21-Jul-10       | 13.3              | 16                        |
|           | St. 5                             | N 38° 20'14.2"<br>E 128° 31'53.9" | 15-Sep-10       | 13                | 17                        |
|           |                                   |                                   | 31-Mar-10       | 11                | –                         |
| St. 6     | N 38° 20'11.2"<br>E 128° 31'48.6" | 19-May-10                         | 10.1            | 10                |                           |
|           |                                   | 21-Jul-10                         | 10.8            | 18                |                           |
| St. 7     | N 38° 20'12.6"<br>E 128° 31'45.1" | 15-Sep-10                         | 8               | 22                |                           |
|           |                                   |                                   | 31-Mar-10       | 6                 | –                         |

Phylum Chlorophyta  
Class Bryopsidophyceae  
Order Bryopsidales  
Family Bryopsidaceae

### 1. *Bryopsis hypnoides* Lamouroux

Examined specimens: St. 5; NIBRAL0000117289 (19 May 2010).

### 2. *Bryopsis plumosa* (Hudson) C.Agardh

Examined specimens: St. 3; NIBRAL0000121553 (14 Sep. 2010).

Family Codiaceae

### 3. *Codium arabicum* Kützting

Examined specimens: St. 1; NIBRAL0000117567 (22 Jul. 2010), NIBRAL0000121642 (14 Sep. 2010), NIBRAL0000121643 (14 Sep. 2010). St. 2; NIBRAL0000117124 (30 Mar. 2010), NIBRAL0000117626 (22 Jul. 2010), NIBRAL0000121644 (14 Sep. 2010), NIBRAL0000121645 (14 Sep. 2010). St. 3; NIBRAL0000117281 (18 May 2010), NIBRAL0000121646 (14 Sep. 2010).

### 4. *Codium fragile* (Suringar) Hariot

Examined specimens: St. 1; NIBRAL0000117446 (18 May 2010). St. 2; NIBRAL0000117624 (22 Jul. 2010), NIBRAL0000121625 (14 Sep. 2010). St. 4; NIBRAL0000121628 (15 Sep. 2010), NIBRAL0000121629 (15 Sep. 2010). St. 5; NIBRAL0000117444 (19 May 2010), NIBRAL0000117445 (19 May 2010). St. 6; NIBRAL0000117625 (21 Jul. 2010), NIBRAL0000121626 (15 Sep. 2010), NIBRAL0000121627 (15 Sep. 2010).

Class Ulvophyceae  
Order Cladophorales  
Family Cladophoraceae

### 5. *Chaetomorpha moniligera* Kjellman

Examined specimens: St. 4; NIBRAL0000117285 (19 May 2010).

### 6. *Cladophora japonica* Yamada

Examined specimens: St. 1; NIBRAL0000117652 (22 Jul. 2010). St. 2; NIBRAL0000117651 (22 Jul. 2010). St. 3; NIBRAL0000117649 (21 Jul. 2010), NIBRAL0000117650 (21 Jul. 2010).

### 7. *Cladophora sakaii* Abbott

Examined specimens: St. 2; NIBRAL0000117642 (22 Jul. 2010), NIBRAL0000117643 (22 Jul. 2010). St. 3; NIBRAL0000117641 (21 Jul. 2010). St. 5; NIBRAL0000117782 (19 May 2010). St. 6; NIBRAL0000117639 (21 Jul. 2010), NIBRAL0000117640 (21 Jul. 2010).

### 8. *Cladophora stimpsonii* Harvey

Examined specimens: St. 5; NIBRAL0000117316 (19 May 2010), NIBRAL0000117317 (19 May 2010), NIBRAL0000117318 (19 May 2010).

Order Ulotrichales  
Family Monostromataceae

### 9. *Monostroma grevillei* (Thuret) Wittrock

Examined specimens: St. 2; NIBRAL0000117119 (30 Mar. 2010), NIBRAL0000117120 (30 Mar. 2010). St. 3; NIBRAL0000117118 (30 Mar. 2010), NIBRAL0000117192 (30 Mar. 2010). St. 5; NIBRAL0000117117 (31 Mar. 2010).

Order Ulvales  
Family Ulvaceae

### 10. *Ulva compressa* Linnaeus

Examined specimens: St. 2; NIBRAL0000117113 (30 Mar. 2010).

### 11. *Ulva linza* Linnaeus

Examined specimens: St. 2; NIBRAL0000117102 (30 Mar. 2010).

### 12. *Ulva pertusa* Kjellman

Examined specimens: St. 1; NIBRAL0000117736 (22 Jul. 2010). St. 2; NIBRAL0000117109 (30 Mar. 2010), NIBRAL0000117110 (30 Mar. 2010), NIBRAL0000117111 (30 Mar. 2010), NIBRAL0000117377 (18 May 2010); NIBRAL0000117381 (18 May 2010), NIBRAL0000117384 (18 May 2010), NIBRAL0000117737 (22 Jul. 2010), NIBRAL0000117741 (22 Jul. 2010), NIBRAL0000117742 (22 Jul. 2010), NIBRAL0000117763 (22 Jul. 2010), NIBRAL0000121531 (14 Sep. 2010), NIBRAL0000121532 (14 Sep. 2010), NIBRAL0000121533 (14 Sep. 2010). St. 3; NIBRAL0000117375 (18 May 2010), NIBRAL0000117738 (21 Jul. 2010), NIBRAL0000117739 (21 Jul. 2010), NIBRAL0000117740 (21 Jul. 2010). St. 4; NIBRAL0000117369 (19 May 2010), NIBRAL0000117373

(19 May 2010), NIBRAL0000117743 (21 Jul. 2010), NIBRAL0000121537 (15 Sep. 2010). St. 5; NIBRAL0000117112 (31 Mar. 2010), NIBRAL0000117246 (31 Mar. 2010), NIBRAL0000117367 (19 May 2010), NIBRAL0000117371 (19 May 2010). St. 6; NIBRAL0000117735 (21 Jul. 2010), NIBRAL0000121534 (15 Sep. 2010), NIBRAL0000121535 (15 Sep. 2010), NIBRAL0000121536 (15 Sep. 2010).

### 13. *Ulvaria obscura* var. *blyttii* (Areschoug) Bliding

Examined specimens: St. 1; NIBRAL0000117359 (18 May 2010). St. 2; NIBRAL0000117114 (30 Mar. 2010), NIBRAL0000117733 (22 Jul. 2010), NIBRAL0000117734 (22 Jul. 2010). St. 3; NIBRAL0000117115 (30 Mar. 2010). St. 4; NIBRAL0000117362 (19 May 2010), NIBRAL0000117731 (21 Jul. 2010). St. 5; NIBRAL0000117274 (19 May 2010), NIBRAL0000117349 (19 May 2010), NIBRAL0000117352 (19 May 2010), NIBRAL0000117354 (19 May 2010), NIBRAL0000117357 (19 May 2010). St. 6; NIBRAL0000117729 (21 Jul. 2010), NIBRAL0000117730 (21 Jul. 2010), NIBRAL0000117732 (21 Jul. 2010). St. 7; NIBRAL0000117116 (31 Mar. 2010).

Phylum Phaeophyta  
Class Phaeophyceae  
Order Desmarestiales  
Family Desmarestiaceae

### 14. *Desmarestia viridis* (O.F.Müller) J.V.Lamouroux

Examined specimens: St. 1; NIBRAL0000117228 (30 Mar. 2010), NIBRAL0000117432 (18 May 2010), NIBRAL0000117433 (18 May 2010), NIBRAL0000117435 (18 May 2010), NIBRAL0000117629 (22 Jul. 2010), NIBRAL0000117630 (22 Jul. 2010), NIBRAL0000117631 (22 Jul. 2010), NIBRAL0000117796 (18 May 2010), NIBRAL0000121560 (14 Sep. 2010). St. 2; NIBRAL0000117226 (30 Mar. 2010), NIBRAL0000117227 (30 Mar. 2010), NIBRAL0000117420 (18 May 2010), NIBRAL0000117421 (18 May 2010), NIBRAL0000117422 (18 May 2010), NIBRAL0000117627 (22 Jul. 2010), NIBRAL0000117628 (22 Jul. 2010), NIBRAL0000117795 (18 May 2010). St. 3; NIBRAL0000117180 (30 Mar. 2010), NIBRAL0000117408 (18 May 2010), NIBRAL0000117409 (18 May 2010), NIBRAL0000117410 (18 May 2010), NIBRAL0000117632 (21 Jul. 2010), NIBRAL0000117633 (21 Jul. 2010), NIBRAL0000117634 (21 Jul. 2010), NIBRAL0000121562 (14 Sep. 2010), NIBRAL0000121563 (14 Sep. 2010). St. 4; NIBRAL0000117405 (19 May 2010), NIBRAL0000117406 (19 May 2010), NIBRAL0000117637 (21 Jul. 2010), NIBRAL0000117638 (21 Jul. 2010), NIBRAL0000121564 (15 Sep. 2010). St. 5; NIBRAL0000117225 (31 Mar. 2010), NIBRAL0000117400

(19 May 2010), NIBRAL0000117402 (19 May 2010), NIBRAL0000117403 (19 May 2010). St. 6; NIBRAL0000117635 (21 Jul. 2010), NIBRAL0000117636 (21 Jul. 2010).

Order Dictyotales  
Family Dictyotaceae

### 15. *Dictyopteris divaricata* (Okamura) Okamura

Examined specimens: St. 1; NIBRAL0000117385 (18 May 2010). St. 2; NIBRAL0000117380 (18 May 2010), NIBRAL0000117382 (18 May 2010), NIBRAL0000117383 (18 May 2010), NIBRAL0000117724 (22 Jul. 2010), NIBRAL0000117725 (22 Jul. 2010), NIBRAL0000121550 (14 Sep. 2010), NIBRAL0000117183 (30 Mar. 2010). St. 3; NIBRAL0000117378 (18 May 2010), NIBRAL0000117379 (18 May 2010), NIBRAL0000117722 (21 Jul. 2010), NIBRAL0000117723 (21 Jul. 2010), NIBRAL0000121551 (14 Sep. 2010). St. 4; NIBRAL0000117372 (19 May 2010), NIBRAL0000117374 (19 May 2010), NIBRAL0000117376 (19 May 2010), NIBRAL0000117727 (21 Jul. 2010), NIBRAL0000117728 (21 Jul. 2010), NIBRAL0000121552 (15 Sep. 2010). St. 5; NIBRAL0000117275 (19 May 2010), NIBRAL0000117368 (19 May 2010), NIBRAL0000117370 (19 May 2010), NIBRAL0000117185 (31 Mar. 2010), NIBRAL0000117186 (31 Mar. 2010). St. 6; NIBRAL0000117726 (21 Jul. 2010). St. 7; NIBRAL0000117184 (31 Mar. 2010).

### 16. *Dictyota dichotoma* (Hudson) J.V.Lamouroux

Examined specimens: St. 2; NIBRAL0000117562 (22 Jul. 2010), NIBRAL0000121540 (14 Sep. 2010). St. 3; NIBRAL0000117282 (18 May 2010), NIBRAL0000117561 (21 Jul. 2010). St. 6; NIBRAL0000117563 (21 Jul. 2010).

### 17. *Spatoglossum crassum* J.Tanaka

Examined specimens: St. 4; NIBRAL0000117744 (21 Jul. 2010), NIBRAL0000117745 (21 Jul. 2010).

### 18. *Spatoglossum pacificum* Yendo

Examined specimens: St. 1; NIBRAL0000117564 (22 Jul. 2010).

### 19. *Zonaria diesingiana* J.Agardh

Examined specimens: St. 1; NIBRAL0000121565 (14 Sep. 2010).

Order Ectocarpales  
Family Chordariaceae

**20. *Leathesia difformis* Areschoug**

Examined specimens: St. 2; NIBRAL0000117243 (18 May 2010), NIBRAL0000117552 (22 Jul. 2010), NIBRAL0000117553 (22 Jul. 2010) NIBRAL0000117554 (22 Jul. 2010). St. 4; NIBRAL0000117555 (21 Jul. 2010).

**21. *Papenfussiella kuromo* (Yendo) Inagaki**

Examined specimens: St. 4; NIBRAL0000117284 (19 May 2010).

Order Fucales  
Family Sargassaceae

**22. *Myagropsis myagroides* (Mertens ex Turner) Fensholt**

Examined specimens: St. 2; NIBRAL0000117280 (18 May 2010). St. 4; NIBRAL0000117283 (19 May 2010). St. 5; NIBRAL0000117254 (31 Mar. 2010).

**23. *Sargassum confusum* C.Agardh**

Examined specimens: St. 1; NIBRAL0000117590 (22 Jul. 2010), NIBRAL0000117591 (22 Jul. 2010), NIBRAL0000117592 (22 Jul. 2010), NIBRAL0000117596 (22 Jul. 2010), NIBRAL0000121583 (14 Sep. 2010). St. 2; NIBRAL0000117595 (22 Jul. 2010). St. 3; NIBRAL0000117593 (21 Jul. 2010), NIBRAL0000117594 (21 Jul. 2010), NIBRAL0000121674 (14 Sep. 2010), NIBRAL0000121675 (14 Sep. 2010). St. 4; NIBRAL0000117597 (21 Jul. 2010), NIBRAL0000117598 (21 Jul. 2010).

**24. *Sargassum hemiphyllum* (Turner) C.Agardh**

Examined specimens: St. 1; NIBRAL0000121584 (14 Sep. 2010), NIBRAL0000121585 (14 Sep. 2010), NIBRAL0000121586 (14 Sep. 2010). St. 2; NIBRAL0000121587 (14 Sep. 2010). St. 3; NIBRAL0000121588 (14 Sep. 2010). St. 4; NIBRAL0000117588 (21 Jul. 2010), NIBRAL0000117589 (21 Jul. 2010), NIBRAL0000121591 (15 Sep. 2010). St. 6; NIBRAL0000121589 (15 Sep. 2010), NIBRAL0000121590 (15 Sep. 2010).

**25. *Sargassum horneri* (Turner) C.Agardh**

Examined specimens: St. 2; NIBRAL0000117568 (22 Jul. 2010), NIBRAL0000117764 (22 Jul. 2010), NIBRAL0000121597 (14 Sep. 2010). St. 3; NIBRAL0000121598 (14 Sep. 2010). St. 4; NIBRAL0000121599 (15 Sep. 2010). St. 6; NIBRAL0000117586 (21 Jul. 2010), NIBRAL0000117587 (21 Jul. 2010).

**26. *Sargassum micracanthum* (Kützting) Endlicher**

Examined specimens: St. 6; NIBRAL0000121592 (15 Sep. 2010), NIBRAL0000121593 (15 Sep. 2010).

**27. *Sargassum miyabei* Yendo**

Examined specimens: St. 1; NIBRAL0000121582 (14 Sep. 2010). St. 6; NIBRAL0000117528 (21 Jul. 2010).

**28. *Sargassum yezoense* (Yamada) Yoshida and T. Konno**

Examined specimens: St. 6; NIBRAL0000117529 (21 Jul. 2010).

Order Laminariales  
Family Alariaceae

**29. *Undaria pinnatifida* (Harvey) Suringar**

Examined specimens: St. 1; NIBRAL0000117693 (22 Jul. 2010), NIBRAL0000117765 (22 Jul. 2010), NIBRAL0000121538 (14 Sep. 2010). St. 2; NIBRAL0000117199 (30 Mar. 2010), NIBRAL0000117245 (30 Mar. 2010), NIBRAL0000117691 (22 Jul. 2010), NIBRAL0000117692 (22 Jul. 2010), NIBRAL0000117766 (22 Jul. 2010), NIBRAL0000117783 (18 May 2010), NIBRAL0000117807 (22 Jul. 2010), NIBRAL0000117814 (18 May 2010), NIBRAL0000117815 (18 May 2010), NIBRAL0000121539 (14 Sep. 2010). St. 3; NIBRAL0000117689 (21 Jul. 2010), NIBRAL0000117690 (21 Jul. 2010), NIBRAL0000117808 (21 Jul. 2010). St. 4; NIBRAL0000117694 (21 Jul. 2010). St. 5; NIBRAL0000117805 (19 May 2010), NIBRAL0000117810 (31 Mar. 2010).

Family Costariaceae

**30. *Agarum clathratum* Dumortier**

Examined specimens: St. 1; NIBRAL0000117223 (30 Mar. 2010), NIBRAL0000117224 (30 Mar. 2010), NIBRAL0000117425 (18 May 2010), NIBRAL0000117697 (22 Jul. 2010), NIBRAL0000117698 (22 Jul. 2010), NIBRAL0000117776 (22 Jul. 2010), NIBRAL0000117777 (22 Jul. 2010), NIBRAL0000117794 (18 May 2010), NIBRAL0000117797 (30 Mar. 2010), NIBRAL0000121600 (14 Sep. 2010), NIBRAL0000121601 (14 Sep. 2010). St. 2; NIBRAL0000117222 (30 Mar. 2010), NIBRAL0000117241 (30 Mar. 2010), NIBRAL0000117778 (22 Jul. 2010), NIBRAL0000117793 (18 May 2010), NIBRAL0000117799 (30 Mar. 2010), NIBRAL0000117806 (22 Jul. 2010), NIBRAL0000121602 (14 Sep. 2010), NIBRAL0000121676 (14 Sep. 2010). St. 3; NIBRAL0000117219

(30 Mar. 2010), NIBRAL0000117220 (30 Mar. 2010), NIBRAL0000117242 (30 Mar. 2010), NIBRAL0000117423 (18 May 2010), NIBRAL0000117424 (18 May 2010), NIBRAL0000117695 (21 Jul. 2010), NIBRAL0000117696 (21 Jul. 2010), NIBRAL0000117775 (21 Jul. 2010), NIBRAL0000121603 (14 Sep. 2010), NIBRAL0000121604 (14 Sep. 2010). St. 4; NIBRAL0000117699 (21 Jul. 2010), NIBRAL0000121605 (15 Sep. 2010). St. 5; NIBRAL0000117218 (31 Mar. 2010).

### 31. *Costaria costata* (C.Agardh) De A.Saunders

Examined specimens: St. 1; NIBRAL0000117350 (18 May 2010), NIBRAL0000117682 (22 Jul. 2010), NIBRAL0000117683 (22 Jul. 2010), NIBRAL0000117781 (22 Jul. 2010), NIBRAL0000117788 (18 May 2010), NIBRAL0000117789 (18 May 2010), NIBRAL0000117800 (30 Mar. 2010), NIBRAL0000117813 (30 Mar. 2010). St. 2; NIBRAL0000117104 (30 Mar. 2010), NIBRAL0000117202 (30 Mar. 2010), NIBRAL0000117221 (30 Mar. 2010), NIBRAL0000117347 (18 May 2010), NIBRAL0000117348 (18 May 2010), NIBRAL0000117787 (18 May 2010), NIBRAL0000117809 (30 Mar. 2010), NIBRAL0000117816 (18 May 2010). St. 3; NIBRAL0000117106 (30 Mar. 2010), NIBRAL0000117107 (30 Mar. 2010), NIBRAL0000117108 (30 Mar. 2010), NIBRAL0000117346 (18 May 2010), NIBRAL0000117679 (21 Jul. 2010), NIBRAL0000117680 (21 Jul. 2010), NIBRAL0000117681 (21 Jul. 2010), NIBRAL0000117779 (21 Jul. 2010), NIBRAL0000117780 (21 Jul. 2010), NIBRAL0000117786 (18 May 2010), NIBRAL0000117801 (30 Mar. 2010), NIBRAL0000117811 (30 Mar. 2010). St. 4; NIBRAL0000117344 (19 May 2010), NIBRAL0000117686 (21 Jul. 2010), NIBRAL0000117784 (19 May 2010), NIBRAL0000117785 (19 May 2010), NIBRAL0000117817 (19 May 2010). St. 5; NIBRAL0000117201 (31 Mar. 2010), NIBRAL0000117341 (19 May 2010), NIBRAL0000117343 (19 May 2010), NIBRAL0000117812 (31 Mar. 2010). St. 6; NIBRAL0000117684 (21 Jul. 2010), NIBRAL0000117685 (21 Jul. 2010). St. 7; NIBRAL0000117105 (31 Mar. 2010).

Family Laminariaceae

### 32. *Saccharina japonica* (Areschoug) C.E.Lane, C.Mayes, Druehl and G.W.Saunders

Examined specimens: St. 1; NIBRAL0000117342 (18 May 2010), NIBRAL0000117675 (22 Jul. 2010), NIBRAL0000117676 (22 Jul. 2010), NIBRAL0000117769 (22 Jul. 2010), NIBRAL0000117770 (22 Jul. 2010), NIBRAL0000117792 (18 May 2010), NIBRAL0000121620 (14 Sep. 2010). St. 2; NIBRAL0000117332 (18 May 2010),

NIBRAL0000117333 (18 May 2010), NIBRAL0000117335 (18 May 2010), NIBRAL0000117339 (18 May 2010), NIBRAL0000117345 (18 May 2010), NIBRAL0000117672 (22 Jul. 2010), NIBRAL0000117673 (22 Jul. 2010), NIBRAL0000117674 (22 Jul. 2010), NIBRAL000011771 (22 Jul. 2010), NIBRAL0000117772 (22 Jul. 2010), NIBRAL0000117773 (22 Jul. 2010), NIBRAL000011774 (22 Jul. 2010), NIBRAL0000117791 (18 May 2010), NIBRAL0000121621 (14 Sep. 2010), NIBRAL0000121622 (14 Sep. 2010). St. 3; NIBRAL0000117670 (21 Jul. 2010), NIBRAL0000117671 (21 Jul. 2010), NIBRAL0000117676 (21 Jul. 2010), NIBRAL0000117678 (21 Jul. 2010), NIBRAL0000121623 (14 Sep. 2010), NIBRAL0000121624 (14 Sep. 2010). St. 4; NIBRAL0000117324 (19 May 2010), NIBRAL0000117325 (19 May 2010), NIBRAL0000117327 (19 May 2010), NIBRAL0000117790 (19 May 2010). St. 5; NIBRAL0000117320 (19 May 2010), NIBRAL0000117321 (19 May 2010). St. 6; NIBRAL0000117677 (21 Jul. 2010), NIBRAL0000117678 (21 Jul. 2010).

Order Scytosiphonales

Family Scytosiphonaceae

### 33. *Colpomenia bullosa* (De A.Saunders) Yamada

Examined specimens: St. 2; NIBRAL0000117244 (30 Mar. 2010).

### 34. *Colpomenia sinuosa* (Mertens ex Roth) Derbès and Solier in Castagne

Examined specimens: St. 1; NIBRAL0000117366 (18 May 2010). St. 2; NIBRAL0000117197 (30 Mar. 2010), NIBRAL0000117198 (30 Mar. 2010), NIBRAL0000117361 (18 May 2010), NIBRAL0000117363 (18 May 2010), NIBRAL0000117364 (18 May 2010), NIBRAL0000117365 (18 May 2010), NIBRAL0000117560 (22 Jul. 2010). St. 3; NIBRAL0000117358 (18 May 2010), NIBRAL0000117360 (18 May 2010), NIBRAL0000117556 (21 Jul. 2010), NIBRAL0000117558 (21 Jul. 2010). St. 4; NIBRAL0000117355 (19 May 2010), NIBRAL0000117356 (19 May 2010), NIBRAL0000117558 (21 Jul. 2010), NIBRAL0000117559 (21 Jul. 2010). St. 5; NIBRAL0000117195 (31 Mar. 2010), NIBRAL0000117196 (31 Mar. 2010), NIBRAL0000117351 (19 May 2010), NIBRAL0000117353 (19 May 2010).

### 35. *Hydroclathrus clathratus* (C.Agardh) M.A.Howe in N.L. Britton and C.F. Millspaugh

Examined specimens: St. 2; NIBRAL0000117279 (18 May 2010).

**36. *Scytosiphon lomentaria* (Lyngbye) Link**

Examined specimens: St. 2; NIBRAL0000117278 (18 May 2010).

Order Sporochneales  
Family Sporochneaceae

**37. *Sporochnus radiformis* (R.Brown ex Turner) C.Agardh**

Examined specimens: St. 1; NIBRAL0000117125 (30 Mar. 2010).

Phylum Rhodophyta  
Class Bangiophyceae  
Order Bangiales  
Family Bangiaceae

**38. *Pyropia tenera* (Kjellman) N.Kikuchi & M.Miyata, M.S. Hwang & H.G.Choi (as *Porphyra tenera* Kjellman)**

Examined specimens: St. 4; NIBRAL0000117300 (19 May 2010), NIBRAL0000117301 (19 May 2010). St. 5; NIBRAL0000117190 (31 Mar. 2010), NIBRAL0000117290 (19 May 2010), NIBRAL0000117299 (19 May 2010). St. 7; NIBRAL0000117189 (31 Mar. 2010).

Class Florideophyceae  
Order Bonnemaisoniales  
Family Bonnemaisoniaceae

**39. *Bonnemaisonia hamifera* Hariot**

Examined specimens: St. 1; NIBRAL0000117251 (30 Mar. 2010), NIBRAL0000117454 (18 May 2010), NIBRAL0000117455 (18 May 2010), NIBRAL0000117456 (18 May 2010), NIBRAL0000117601 (22 Jul. 2010), NIBRAL0000117602 (22 Jul. 2010), NIBRAL0000121639 (14 Sep. 2010). St. 2; NIBRAL0000117452 (18 May 2010), NIBRAL0000117453 (18 May 2010), NIBRAL0000117600 (22 Jul. 2010). St. 3; NIBRAL0000117248 (30 Mar. 2010), NIBRAL0000117288 (18 May 2010), NIBRAL0000117451 (19 May 2010), NIBRAL0000117599 (21 Jul. 2010), NIBRAL0000121640 (14 Sep. 2010), NIBRAL0000121641 (14 Sep. 2010). St. 4; NIBRAL0000117449 (19 May 2010), NIBRAL0000117450 (19 May 2010). St. 5; NIBRAL0000117249 (31 Mar. 2010), NIBRAL0000117250 (31 Mar. 2010), NIBRAL0000117441 (19 May 2010), NIBRAL0000117447 (19 May 2010), NIBRAL0000117448 (19 May 2010). St. 6; NIBRAL0000117603 (21 Jul. 2010).

**40. *Delisea pulchra* (Greville) Montagne**

Examined specimens: St. 2; NIBRAL0000117313 (18 May 2010). St. 3; NIBRAL0000117194 (30 Mar. 2010). St. 5; NIBRAL0000117193 (31 Mar. 2010), NIBRAL0000117312 (19 May 2010).

Order Ceramiales  
Family Callithamniaceae

**41. *Aglaothamnion oosumiense* Itono**

Examined specimens: St. 3; NIBRAL0000121549 (14 Sep. 2010). St. 4; NIBRAL0000117340 (19 May 2010), NIBRAL0000117531 (21 Jul. 2010). St. 5; NIBRAL0000117338 (19 May 2010).

Family Ceramiaceae

**42. *Ceramium boydenii* E.S.Gepp**

Examined specimens: St. 6; NIBRAL0000117687 (21 Jul. 2010), NIBRAL0000117688 (21 Jul. 2010).

**43. *Herpochondria elegans* (Okamura) Itono**

Examined specimens: St. 4; NIBRAL0000117322 (18 May 2010). St. 5; NIBRAL0000117101 (31 Mar. 2010).

**44. *Pterothamnion yezoense* (Inagaki) Athanasiadis and Kraft**

Examined specimens: St. 2; NIBRAL0000117323 (18 May 2010). St. 5; NIBRAL0000117182 (31 Mar. 2010), NIBRAL0000117273 (19 May 2010), NIBRAL0000117287 (19 May 2010).

Family Dasyaceae

**45. *Dasya collabens* J.D.Hooker and Harvey**

Examined specimens: St. 7; NIBRAL0000117187 (31 Mar. 2010).

**46. *Dasya villosa* Harvey**

Examined specimens: St. 4; NIBRAL0000117314 (19 May 2010), NIBRAL0000117315 (19 May 2010).

**47. *Heterosiphonia japonica* Yendo**

Examined specimens: St. 1; NIBRAL0000117618 (22 Jul. 2010), NIBRAL0000117619 (22 Jul. 2010). St. 2; NIBRAL0000117616 (22 Jul. 2010), NIBRAL0000117617

(22 Jul. 2010), NIBRAL0000121638 (14 Sep. 2010). St. 3; NIBRAL0000117188 (30 Mar. 2010), NIBRAL0000117336 (18 May 2010), NIBRAL0000117337 (18 May 2010), NIBRAL0000117614 (21 Jul. 2010), NIBRAL0000117615 (21 Jul. 2010). St. 4; NIBRAL0000117622 (21 Jul. 2010), NIBRAL0000117623 (21 Jul. 2010). St. 5; NIBRAL0000117276 (19 May 2010). St. 6; NIBRAL0000117620 (21 Jul. 2010), NIBRAL0000117621 (21 Jul. 2010).

#### 48. *Heterosiphonia pulchra* (Okamura) Falkenberg

Examined specimens: St. 1; NIBRAL0000117252 (30 Mar. 2010), NIBRAL0000117613 (22 Jul. 2010). St. 2; NIBRAL0000117181 (30 Mar. 2010), NIBRAL000011727 (18 May 2010), NIBRAL0000121595 (14 Sep. 2010). St. 3; NIBRAL0000117271 (18 May 2010), NIBRAL0000117664 (21 Jul. 2010), NIBRAL0000121548 (14 Sep. 2010). St. 4; NIBRAL0000121596 (15 Sep. 2010). St. 5; NIBRAL0000117270 (19 May 2010). St. 6; NIBRAL0000117612 (21 Jul. 2010).

Family Delesseriaceae

#### 49. *Acrosorium yendoi* Yamada

Examined specimens: St. 1; NIBRAL0000121570 (14 Sep. 2010), NIBRAL0000121571 (14 Sep. 2010). St. 3; NIBRAL0000117667 (21 Jul. 2010), NIBRAL0000117668 (21 Jul. 2010), NIBRAL0000121572 (14 Sep. 2010). St. 6; NIBRAL0000121573 (15 Sep. 2010).

#### 50. *Delesseria serrulata* Harvey

Examined specimens: St. 1; NIBRAL0000117217 (30 Mar. 2010). St. 2; NIBRAL0000117214 (30 Mar. 2010), NIBRAL0000117215 (30 Mar. 2010), NIBRAL0000117216 (30 Mar. 2010), NIBRAL0000117297 (18 May 2010), NIBRAL0000117298 (18 May 2010), NIBRAL0000117798 (30 Mar. 2010). St. 3; NIBRAL0000117213 (30 Mar. 2010). St. 4; NIBRAL0000117294 (19 May 2010), NIBRAL0000117296 (19 May 2010), NIBRAL0000117803 (19 May 2010). St. 5; NIBRAL0000117212 (31 Mar. 2010), NIBRAL0000117293 (19 May 2010), NIBRAL0000117295 (19 May 2010), NIBRAL0000117802 (19 May 2010). St. 7; NIBRAL0000117211 (31 Mar. 2010).

#### 51. *Erythrogloussum minimum* Okamura

Examined specimens: St. 1; NIBRAL0000117329 (18 May 2010), NIBRAL0000117661 (22 Jul. 2010). St. 2; NIBRAL0000117328 (18 May 2010), NIBRAL0000121574 (14 Sep. 2010). St. 3; NIBRAL0000117191 (30 Mar.

2010), NIBRAL0000117191 (30 Mar. 2010).

#### 52. *Neoholmesia japonica* (Okamura) Mikami

Examined specimens: St. 1; NIBRAL0000117238 (30 Mar. 2010), NIBRAL0000117239 (30 Mar. 2010), NIBRAL0000117240 (30 Mar. 2010), NIBRAL0000117401 (18 May 2010), NIBRAL0000117404 (18 May 2010), NIBRAL0000117705 (22 Jul. 2010), NIBRAL0000117706 (22 Jul. 2010), NIBRAL0000121633 (14 Sep. 2010), NIBRAL0000121634 (14 Sep. 2010). St. 2; NIBRAL0000117236 (30 Mar. 2010), NIBRAL0000117237 (30 Mar. 2010), NIBRAL0000117393 (18 May 2010), NIBRAL0000117396 (18 May 2010), NIBRAL0000117399 (18 May 2010), NIBRAL0000117703 (22 Jul. 2010), NIBRAL0000117704 (22 Jul. 2010), NIBRAL0000121635 (14 Sep. 2010). St. 3; NIBRAL0000117233 (30 Mar. 2010), NIBRAL0000117234 (30 Mar. 2010), NIBRAL0000117235 (30 Mar. 2010), NIBRAL0000117386 (18 May 2010), NIBRAL0000117389 (18 May 2010), NIBRAL0000117390 (18 May 2010), NIBRAL0000117700 (21 Jul. 2010), NIBRAL0000117701 (21 Jul. 2010), NIBRAL0000117702 (21 Jul. 2010), NIBRAL0000121636 (14 Sep. 2010), NIBRAL0000121637 (14 Sep. 2010).

#### 53. *Sorella repens* (Okamura) Hollenberg

Examined specimens: St. 3; NIBRAL0000117663 (21 Jul. 2010).

Family Rhodomelaceae

#### 54. *Chondria crassicaulis* Harvey

Examined specimens: St. 1; NIBRAL0000117103 (30 Mar. 2010), NIBRAL0000117538 (22 Jul. 2010), NIBRAL0000117539 (22 Jul. 2010). St. 3; NIBRAL0000121580 (14 Sep. 2010). St. 4; NIBRAL0000117277 (19 May 2010), NIBRAL0000117611 (21 Jul. 2010), NIBRAL0000121581 (15 Sep. 2010).

#### 55. *Laurencia intricata* J.V.Lamouroux

Examined specimens: St. 4; NIBRAL0000117540 (21 Jul. 2010), NIBRAL0000117604 (21 Jul. 2010).

#### 56. *Laurencia nipponica* Yamada

Examined specimens: St. 6; NIBRAL0000117579 (21 Jul. 2010).

#### 57. *Laurencia okamurae* Yamada

Examined specimens: St. 1; NIBRAL0000117607 (22 Jul.



2010), NIBRAL0000117608 (22 Jul. 2010), NIBRAL0000121554 (14 Sep. 2010). St. 2; NIBRAL0000117606 (22 Jul. 2010). St. 3; NIBRAL0000117605 (21 Jul. 2010). St. 4; NIBRAL0000117311 (19 May 2010), NIBRAL0000117609 (21 Jul. 2010), NIBRAL0000117610 (21 Jul. 2010), NIBRAL0000121566 (15 Sep. 2010). St. 5; NIBRAL0000117258 (31 Mar. 2010), NIBRAL0000117259 (31 Mar. 2010), NIBRAL0000117310 (19 May 2010).

### 58. *Laurencia pinnata* Yamada

Examined specimens: St. 1; NIBRAL0000117572 (22 Jul. 2010), NIBRAL0000117573 (22 Jul. 2010), NIBRAL0000121555 (14 Sep. 2010). St. 2; NIBRAL0000117571 (22 Jul. 2010). St. 4; NIBRAL0000117570 (21 Jul. 2010). St. 5; NIBRAL0000117292 (19 May 2010).

### 59. *Laurencia venusta* Yamada

Examined specimens: St. 1; NIBRAL0000121556 (14 Sep. 2010), St. 2; NIBRAL0000121559 (14 Sep. 2010). St. 3; NIBRAL0000117537 (21 Jul. 2010), NIBRAL0000121558 (14 Sep. 2010). St. 4; NIBRAL0000117536 (21 Jul. 2010). St. 6; NIBRAL0000121557 (15 Sep. 2010).

### 60. *Neorhodomela munita* (L.P.Perestenko) Masuda

Examined specimens: St. 3; NIBRAL0000117530 (21 Jul. 2010). St. 5; NIBRAL0000117434 (19 May 2010), NIBRAL0000117436 (19 May 2010), NIBRAL0000117437 (19 May 2010). St. 6; NIBRAL0000117550 (21 Jul. 2010), NIBRAL0000117551 (21 Jul. 2010).

### 61. *Neosiphonia elongella* (Harvey) M.S.Kim and I.K.Lee

Examined specimens: St. 1; NIBRAL0000117122 (30 Mar. 2010). St. 2; NIBRAL0000117443 (18 May 2010). St. 4; NIBRAL0000117440 (19 May 2010), NIBRAL0000117442 (19 May 2010). St. 5; NIBRAL0000117123 (31 Mar. 2010), NIBRAL0000117438 (19 May 2010), NIBRAL0000117439 (19 May 2010).

### 62. *Odonthalia corymbifera* (S.G.Gmelin) Greville

Examined specimens: St. 1; NIBRAL0000117207 (30 Mar. 2010), NIBRAL0000117208 (30 Mar. 2010), NIBRAL0000117209 (30 Mar. 2010), NIBRAL0000117418 (18 May 2010), NIBRAL0000117419 (18 May 2010), NIBRAL0000117711 (22 Jul. 2010), NIBRAL0000121575 (14 Sep. 2010), NIBRAL0000121576 (14 Sep. 2010). St. 2; NIBRAL0000117205 (30 Mar. 2010), NIBRAL0000117414 (18 May 2010), NIBRAL0000117415 (18 May 2010), NIBRAL0000117416 (18 May 2010), NIBRAL0000117417 (18 May 2010), NIBRAL0000117709 (22 Jul. 2010), NIBRAL0000117710 (22 Jul. 2010), NIBRAL0000117762 (22 Jul. 2010), NIBRAL0000121577 (14 Sep. 2010). St. 3; NIBRAL0000117204 (30 Mar. 2010), NIBRAL0000117206 (30 Mar. 2010), NIBRAL0000117411 (18 May 2010), NIBRAL0000117412 (18 May 2010), NIBRAL0000117413 (18 May 2010), NIBRAL0000117707 (21 Jul. 2010), NIBRAL0000117708 (21 Jul. 2010), NIBRAL0000121578 (14 Sep. 2010), NIBRAL0000121579 (14 Sep. 2010). St. 5; NIBRAL0000117210 (31 Mar. 2010), NIBRAL0000117407 (19 May 2010).

Examined specimens: St. 1; NIBRAL0000117175 (30 Mar. 2010). St. 2; NIBRAL0000117179 (30 Mar. 2010). St. 5; NIBRAL0000117177 (31 Mar. 2010), NIBRAL0000117178 (31 Mar. 2010). St. 7; NIBRAL0000117176 (31 Mar. 2010).

### 63. *Polysiphonia morrowii* Harvey

Examined specimens: St. 1; NIBRAL0000117121 (30 Mar. 2010), NIBRAL0000117717 (22 Jul. 2010), NIBRAL0000117718 (22 Jul. 2010), NIBRAL0000117719 (22 Jul. 2010), NIBRAL0000121610 (14 Sep. 2010), NIBRAL0000121611 (14 Sep. 2010), NIBRAL0000121612 (14 Sep. 2010), NIBRAL0000121613 (14 Sep. 2010). St. 2; NIBRAL0000117715 (22 Jul. 2010), NIBRAL0000117716 (22 Jul. 2010), NIBRAL0000121614 (14 Sep. 2010), NIBRAL0000121615 (14 Sep. 2010). St. 3; NIBRAL0000117665 (21 Jul. 2010), NIBRAL0000117712 (21 Jul. 2010), NIBRAL0000117713 (21 Jul. 2010), NIBRAL0000117714 (21 Jul. 2010), NIBRAL0000121616 (14 Sep. 2010), NIBRAL0000121617 (14 Sep. 2010). St. 4; NIBRAL0000117721 (21 Jul. 2010). St. 5; NIBRAL0000117330 (19 May 2010), NIBRAL0000117331 (19 May 2010). St. 6; NIBRAL0000117720 (21 Jul. 2010), NIBRAL0000121618 (15 Sep. 2010), NIBRAL0000121619 (15 Sep. 2010).

### 64. *Symphyocladia latiuscula* (Harvey) Yamada

Order Corallinales  
Family Corallinaceae

### 65. *Amphiroa ephedraea* (Lamarck) Decaisne

Examined specimens: St. 3; NIBRAL0000117203 (30 Mar. 2010).

### 66. *Bossiella cretacea* (Postels and Ruprecht) H.W.Johansen

Examined specimens: St. 1; NIBRAL0000117461 (18 May 2010), NIBRAL0000117462 (18 May 2010), NIBRAL0000117463 (18 May 2010), NIBRAL0000117464 (18 May 2010), NIBRAL0000117465 (18 May 2010), NIBRAL0000117466 (18 May 2010), NIBRAL0000117467 (18 May 2010), NIBRAL0000117468 (18 May 2010), NIBRAL0000117469 (18 May 2010), NIBRAL0000117470 (18 May 2010), NIBRAL0000117471 (18 May 2010), NIBRAL0000117472 (18 May 2010), NIBRAL0000117473 (18 May 2010), NIBRAL0000117474 (18 May 2010), NIBRAL0000117475 (18 May 2010), NIBRAL0000117476 (18 May 2010), NIBRAL0000117477 (18 May 2010), NIBRAL0000117478 (18 May 2010), NIBRAL0000117479 (18 May 2010), NIBRAL0000117480 (18 May 2010), NIBRAL0000117481 (18 May 2010), NIBRAL0000117482 (18 May 2010), NIBRAL0000117483 (18 May 2010), NIBRAL0000117484 (18 May 2010), NIBRAL0000117485 (18 May 2010), NIBRAL0000117486 (18 May 2010), NIBRAL0000117487 (18 May 2010), NIBRAL0000117488 (18 May 2010), NIBRAL0000117489 (18 May 2010), NIBRAL0000117490 (18 May 2010), NIBRAL0000117491 (18 May 2010), NIBRAL0000117492 (18 May 2010), NIBRAL0000117493 (18 May 2010), NIBRAL0000117494 (18 May 2010), NIBRAL0000117495 (18 May 2010), NIBRAL0000117496 (18 May 2010), NIBRAL0000117497 (18 May 2010), NIBRAL0000117498 (18 May 2010), NIBRAL0000117499 (18 May 2010), NIBRAL0000117500 (18 May 2010).

RAL0000121654 (14 Sep. 2010). St. 2; NIBRAL0000117269 (30 Mar. 2010), NIBRAL0000117466 (18 May 2010), NIBRAL0000117469 (18 May 2010), NIBRAL0000117756 (22 Jul. 2010), NIBRAL0000121652 (14 Sep. 2010). St. 3; NIBRAL0000117264 (30 Mar. 2010), NIBRAL0000117265 (30 Mar. 2010), NIBRAL0000117457 (18 May 2010), NIBRAL0000117459 (18 May 2010), NIBRAL0000117460 (18 May 2010), NIBRAL0000117747 (21 Jul. 2010), NIBRAL0000121648 (14 Sep. 2010), NIBRAL0000121653 (14 Sep. 2010). St. 4; NIBRAL0000117470 (19 May 2010), NIBRAL0000117471 (19 May 2010), NIBRAL0000117751 (21 Jul. 2010), NIBRAL0000117752 (21 Jul. 2010), NIBRAL0000121649 (15 Sep. 2010), NIBRAL0000121650 (15 Sep. 2010), NIBRAL0000121651 (15 Sep. 2010). St. 5; NIBRAL0000117260 (31 Mar. 2010), NIBRAL0000117261 (31 Mar. 2010). St. 6; NIBRAL0000117749 (21 Jul. 2010), NIBRAL0000117750 (21 Jul. 2010), NIBRAL0000121655 (15 Sep. 2010).

#### 67. *Corallina pilulifera* Postels and Ruprecht

Examined specimens: St. 1; NIBRAL0000117463 (18 May 2010), NIBRAL0000117464 (18 May 2010), NIBRAL0000117757 (22 Jul. 2010), NIBRAL0000117758 (22 Jul. 2010), NIBRAL0000117759 (22 Jul. 2010). St. 2; NIBRAL0000117467 (18 May 2010), NIBRAL0000117468 (18 May 2010), NIBRAL0000117754 (22 Jul. 2010), NIBRAL0000117755 (22 Jul. 2010), NIBRAL0000121659 (14 Sep. 2010), NIBRAL0000121660 (14 Sep. 2010). St. 3; NIBRAL0000117263 (30 Mar. 2010), NIBRAL0000117458 (18 May 2010), NIBRAL0000117746 (21 Jul. 2010), NIBRAL0000117748 (21 Jul. 2010), NIBRAL0000121656 (14 Sep. 2010). St. 4; NIBRAL0000117753 (21 Jul. 2010), NIBRAL0000121657 (15 Sep. 2010). St. 6; NIBRAL0000121658 (15 Sep. 2010). St. 7; NIBRAL0000117267 (31 Mar. 2010).

Family Hapalidiaceae

#### 68. *Lithothamnion lemoineae* Adey

Examined specimens: St. 7; NIBRAL0000117268 (31 Mar. 2010).

#### 69. *Synarthrophyton chejuensis* J.H.Kim, H.Chung, D.S.Choi and I.K.Lee

Examined specimens: St. 1; NIBRAL0000117465 (18 May 2010). St. 3; NIBRAL0000117262 (30 Mar. 2010), NIBRAL0000117760 (21 Jul. 2010), NIBRAL0000121664 (14 Sep. 2010).

Order Halymeniales

Family Halymeniaceae

#### 70. *Grateloupia filicina* (J.V.Lamouroux) C.Agardh

Examined specimens: St. 2; NIBRAL0000121606 (14 Sep. 2010). St. 4; NIBRAL0000117549 (21 Jul. 2010), NIBRAL0000121607 (15 Sep. 2010), NIBRAL0000121609 (15 Sep. 2010). St. 6; NIBRAL0000121608 (15 Sep. 2010).

#### 71. *Grateloupia lanceolata* (Okamura) Kawaguchi

Examined specimens: St. 4; NIBRAL0000117656 (21 Jul. 2010). St. 5; NIBRAL0000117200 (31 Mar. 2010).

#### 72. *Grateloupia sparsa* (Okamura) Chiang

Examined specimens: St. 5; NIBRAL0000117247 (31 Mar. 2010).

#### 73. *Polyopes lancifolius* (Harvey) Kawaguchi and Wang

Examined specimens: St. 4; NIBRAL0000117535 (21 Jul. 2010). St. 6; NIBRAL0000121647 (15 Sep. 2010).

Order Gigartinales

Family Gigartinaceae

#### 74. *Chondracanthus intermedius* (Suringar) Hommersand in Hommersand, Guiry, Fredericq and Leister

Examined specimens: St. 2; NIBRAL0000117319 (18 May 2010).

#### 75. *Chondracanthus tenellus* (Harvey) Hommersand in Hommersand, Guiry, Fredericq and Leister

Examined specimens: St. 1; NIBRAL0000117544 (22 Jul. 2010), NIBRAL0000117545 (22 Jul. 2010), NIBRAL0000117546 (22 Jul. 2010). St. 2; NIBRAL0000117580 (22 Jul. 2010). St. 3; NIBRAL0000117542 (21 Jul. 2010), NIBRAL0000117543 (21 Jul. 2010). St. 4; NIBRAL0000117547 (21 Jul. 2010), NIBRAL0000121567 (15 Sep. 2010), NIBRAL0000121568 (15 Sep. 2010). St. 5; NIBRAL0000117174 (31 Mar. 2010). St. 6; NIBRAL0000117581 (21 Jul. 2010), NIBRAL0000117582 (21 Jul. 2010), NIBRAL0000117583 (21 Jul. 2010).

#### 76. *Chondrus ocellatus* Holmes

Examined specimens: St. 1; NIBRAL0000121545 (14 Sep. 2010). St. 2; NIBRAL0000121546 (14 Sep. 2010),

NIBRAL0000121547 (14 Sep. 2010). St. 4; NIBRAL0000117658 (21 Jul. 2010), NIBRAL0000117659 (21 Jul. 2010).

**77. *Chondrus pinnulatus* (Harvey) Okamura**

Examined specimens: St. 5; NIBRAL0000117307 (19 May 2010), NIBRAL0000117308 (19 May 2010), NIBRAL0000117309 (19 May 2010).

Family Kallymeniaceae

**78. *Kallymenia crassiuscula* Okamura**

Examined specimens: St. 2; NIBRAL0000117303 (18 May 2010), NIBRAL0000117304 (18 May 2010), NIBRAL0000117653 (22 Jul. 2010), NIBRAL0000117654 (22 Jul. 2010), NIBRAL0000117761 (22 Jul. 2010). St. 5; NIBRAL0000117302 (19 May 2010). St. 6; NIBRAL0000117655 (21 Jul. 2010).

Family Phacelocarpaceae

**79. *Phacelocarpus japonicus* Okamura**

Examined specimens: St. 2; NIBRAL0000121541 (14 Sep. 2010). St. 4; NIBRAL0000121594 (15 Sep. 2010).

Family Phylloporaceae

**80. *Ahnfeltiopsis flabelliformis* (Harvey) Masuda**

Examined specimens: St. 3; NIBRAL0000121544 (14 Sep. 2010). St. 5; NIBRAL0000117256 (31 Mar. 2010), NIBRAL0000117257 (31 Mar. 2010). St. 6; NIBRAL0000117565 (21 Jul. 2010), NIBRAL0000117566 (21 Jul. 2010), NIBRAL0000121542 (15 Sep. 2010), NIBRAL0000121543 (15 Sep. 2010).

**81. *Ahnfeltiopsis paradoxus* (Suringar) Masuda**

Examined specimens: St. 5; NIBRAL0000117305 (19 May 2010), NIBRAL0000117306 (19 May 2010).

Family Tichocarpaceae

**82. *Tichocarpus crinitus* (S.G.Gmelin) Ruprecht**

Examined specimens: St. 6; NIBRAL0000117548 (21 Jul. 2010).

Order Gelidiales  
Family Gelidiaceae

**83. *Gelidium amansii* (J.V.Lamouroux) J.V.Lamouroux**

Examined specimens: St. 5; NIBRAL0000117255 (31 Mar. 2010).

**84. *Gelidium vagum* Okamura**

Examined specimens: St. 2; NIBRAL0000121569 (14 Sep. 2010).

Order Gracilariales  
Family Gracilariaceae

**85. *Gracilaria textorii* (Suringar) De Toni**

Examined specimens: St. 4; NIBRAL0000117534 (21 Jul. 2010). St. 6; NIBRAL0000117533 (21 Jul. 2010).

**86. *Gracilaria verrucosa* (Hudson) Papenfuss**

Examined specimens: St. 2; NIBRAL0000117585 (22 Jul. 2010). St. 6; NIBRAL0000117584 (21 Jul. 2010).

Order Nemaliales  
Family Liagoraceae

**87. *Nemalion vermiculare* Suringar**

Examined specimens, St. 1; NIBRAL0000117541 (22 Jul. 2010).

Order Rhodymeniales  
Family Champiaceae

**88. *Champia parvula* (C.Agardh) Harvey**

Examined specimens: St. 3; NIBRAL0000117669 (21 Jul. 2010).

Family Lomentariaceae

**89. *Gelidiopsis variabilis* (Greville ex J.Agardh) Schmitz**

Examined specimens: St. 1; NIBRAL0000117576 (22 Jul. 2010), NIBRAL0000117577 (22 Jul. 2010). St. 3; NIBRAL0000117574 (21 Jul. 2010). St. 4; NIBRAL0000117575 (21 Jul. 2010).

**90. *Lomentaria catenata* Harvey**

Examined specimens: St. 3; NIBRAL0000117578 (21 Jul. 2010).

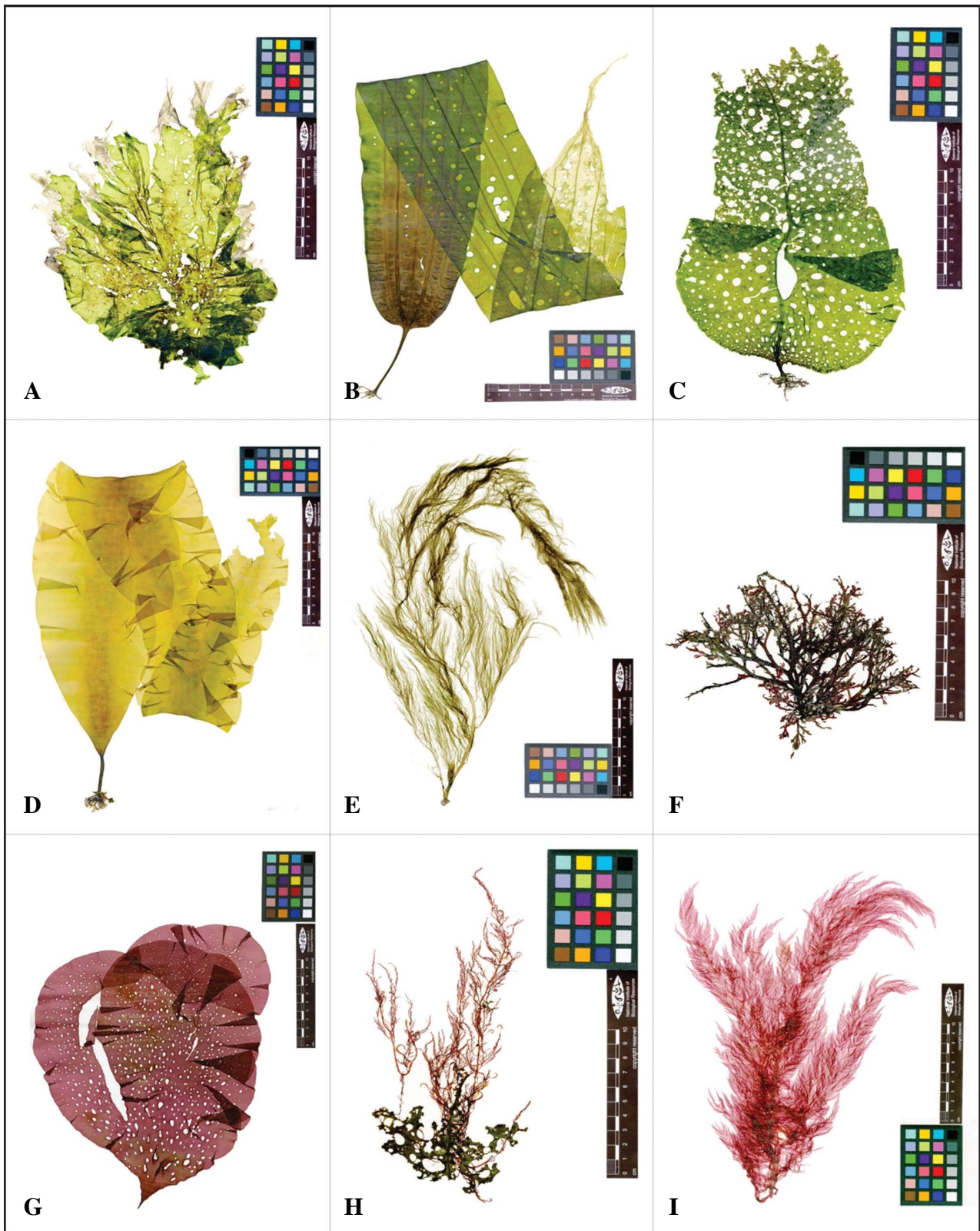
**Table 2.** Species occurrence according to collection from Oho-ri.

|             | Mar. | May | Jul. | Sep. | Total      |
|-------------|------|-----|------|------|------------|
| Chlorophyta | 6    | 8   | 6    | 4    | 13 (13.8%) |
| Phaeophyta  | 9    | 13  | 16   | 12   | 24 (25.5%) |
| Rhodophyta  | 29   | 29  | 38   | 24   | 57 (60.6%) |
| Total       | 44   | 50  | 60   | 40   | 94 (100%)  |

**Table 3.** Inventory of marine algae of Oho-ri (species names were listed by alphabetical order under each phylum).

| Species                                 | Heukdo |     |      |      | Goraebawi |     |      |      | Juckdo |     |      |      |
|---|--------|-----|------|------|-----------|-----|------|------|--------|-----|------|------|
|   | Mar.   | May | Jul. | Sep. | Mar.      | May | Jul. | Sep. | Mar.   | May | Jul. | Sep. |
| <b>Chlorophyta</b>                      |        |     |      |      |           |     |      |      |        |     |      |      |
| <i>Bryopsis hypnoides</i>               |        |     |      |      |           |     |      |      |        | +   |      |      |
| <i>Bryopsis plumosa</i>                 |        |     |      |      |           |     |      | +    |        |     |      |      |
| <i>Chaetomorpha moniligera</i>          |        |     |      |      |           |     |      |      |        | +   |      |      |
| <i>Cladophora japonica</i>              |        |     | +    |      |           |     | +    |      |        |     |      |      |
| <i>Cladophora sakaii</i>                |        |     | +    |      |           |     | +    |      |        | +   | +    |      |
| <i>Cladophora stimpsonii</i>            |        |     |      |      |           |     |      |      |        | +   |      |      |
| <i>Codium arabicum</i>                  | +      |     | +    | +    |           | +   |      | +    |        |     |      |      |
| <i>Codium fragile</i>                   |        | +   | +    | +    |           |     |      |      |        | +   | +    | +    |
| <i>Monostroma grevillei</i>             | +      |     |      |      | +         |     |      |      | +      |     |      |      |
| <i>Ulva compressa</i>                   | +      |     |      |      |           |     |      |      |        |     |      |      |
| <i>Ulva linza</i>                       | +      |     |      |      |           |     |      |      |        |     |      |      |
| <i>Ulva pertusa</i>                     | +      | +   | +    | +    |           | +   | +    |      | +      | +   | +    | +    |
| <i>Ulva obscura</i> var. <i>blyttii</i> | +      | +   | +    |      | +         |     |      |      | +      | +   | +    |      |
| <b>Phaeophyta</b>                       |        |     |      |      |           |     |      |      |        |     |      |      |
| <i>Agarum clathratum</i>                | +      | +   | +    | +    | +         | +   | +    | +    |        |     | +    | +    |
| <i>Colpomenia bullosa</i>               | +      |     |      |      |           |     |      |      |        |     |      |      |
| <i>Colpomenia sinuosa</i>               | +      | +   | +    |      |           | +   | +    |      | +      | +   | +    |      |
| <i>Costaria costata</i>                 | +      | +   | +    |      | +         | +   | +    |      | +      | +   | +    |      |
| <i>Desmarestia viridis</i>              | +      | +   | +    | +    | +         | +   | +    | +    | +      | +   | +    | +    |
| <i>Dictyopteris divaricata</i>          | +      | +   | +    | +    |           | +   | +    | +    | +      | +   | +    |      |
| <i>Dictyota dichotoma</i>               |        |     | +    | +    |           | +   | +    |      |        |     | +    |      |
| <i>Hydroclathrus clathratus</i>         |        | +   |      |      |           |     |      |      |        |     |      |      |
| <i>Leathesia difformis</i>              |        | +   | +    |      |           |     |      |      |        |     | +    |      |
| <i>Myagropsis myagroides</i>            |        | +   |      |      |           |     |      |      | +      | +   |      |      |
| <i>Papenfussiella kuromo</i>            |        |     |      |      |           |     |      |      |        | +   |      |      |
| <i>Saccharina japonica</i>              |        | +   | +    | +    |           |     | +    | +    |        | +   | +    |      |
| <i>Sargassum confusum</i>               |        |     | +    | +    |           |     | +    | +    |        |     | +    |      |
| <i>Sargassum hemiphylum</i>             |        |     |      | +    |           |     |      | +    |        |     | +    | +    |
| <i>Sargassum horneri</i>                |        |     | +    | +    |           |     |      | +    |        |     | +    | +    |
| <i>Sargassum micracanthum</i>           |        |     |      |      |           |     |      |      |        |     |      | +    |
| <i>Sargassum miyabei</i>                |        |     |      | +    |           |     |      |      |        |     | +    |      |
| <i>Sargassum yezoense</i>               |        |     |      |      |           |     |      |      |        |     | +    |      |
| <i>Scytosiphon lomentaria</i>           |        | +   |      |      |           |     |      |      |        |     |      |      |
| <i>Spatoglossum crassum</i>             |        |     |      |      |           |     |      |      |        |     | +    |      |
| <i>Spatoglossum pacificum</i>           |        |     | +    |      |           |     |      |      |        |     |      |      |
| <i>Sporochmus radiciformis</i>          | +      |     |      |      |           |     |      |      |        |     |      |      |
| <i>Undaria pinnatifida</i>              | +      | +   | +    | +    |           |     | +    |      | +      | +   | +    |      |
| <i>Zonaria diesingiana</i>              |        |     |      | +    |           |     |      |      |        |     |      |      |
| <b>Rhodophyta</b>                       |        |     |      |      |           |     |      |      |        |     |      |      |
| <i>Acrosorium yendoi</i>                |        |     |      | +    |           |     | +    | +    |        |     |      | +    |
| <i>Aglaothamnion oosumiense</i>         |        |     |      |      |           |     |      | +    |        | +   | +    |      |
| <i>Ahnfeltiopsis flabelliformis</i>     |        |     |      |      |           |     |      | +    | +      |     | +    | +    |
| <i>Ahnfeltiopsis paradoxus</i>          |        |     |      |      |           |     |      |      |        | +   |      |      |





**Fig. 2.** Some selected marine algal specimens at Oho-ri in 2010. A. *Ulvaria obscura* var. *blyttii* from Juckdo in May. B. *Costaria costata* from Heukdo in May. C. *Agarum clathratum* from Heukdo in March. D. *Saccharina japonica* from Heukdo in May. E. *Desmarestia viridis* from Heukdo in March. F. *Odonthalia corymbifera* from Heukdo in March. G. *Sparlingia pertusa* from Heukdo in March. H. *Bonnemaisonia hamifera* from Heukdo in May. I. *Delesseria serrulata* from Juckdo in March.

**91. *Lomentaria hakodatensis* Yendo**

Examined specimens: St. 4; NIBRAL0000117286 (19 May 2010).

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**92. *Chrysiomenia wrightii* (Harvey) Yamada**

Examined specimens: St. 1; NIBRAL0000117647 (22 Jul. 2010), NIBRAL0000117648 (22 Jul. 2010). St. 2; NIBRAL0000117646 (22 Jul. 2010), NIBRAL0000121630 (14 Sep. 2010), NIBRAL0000121631 (14 Sep. 2010). St. 3; NIBRAL0000117644 (21 Jul. 2010), NIBRAL0000117645 (21 Jul. 2010), NIBRAL0000121632 (14 Sep. 2010). St. 4; NIBRAL0000117430 (19 May 2010), NIBRAL0000117431 (19 May 2010), NIBRAL0000117569 (21 Jul. 2010). St. 5; NIBRAL0000117426 (19 May 2010), NIBRAL0000117427 (19 May 2010), NIBRAL0000117428 (19 May 2010), NIBRAL0000117429 (19 May 2010). St. 7; NIBRAL0000117253 (31 Mar. 2010).

**93. *Rhodymenia intricata* (Okamura) Okamura**

Examined specimens: St. 1; NIBRAL0000117660 (22 Jul. 2010).

**94. *Sparlingia pertusa* (Postels and Ruprecht) G.W.Saunders, I.M.Strachan and Kraft**

Examined specimens: St. 1; NIBRAL0000117397 (18 May 2010), NIBRAL0000117398 (18 May 2010). St. 2; NIBRAL0000117232 (30 Mar. 2010), NIBRAL0000117392 (18 May 2010), NIBRAL0000117394 (18 May 2010), NIBRAL0000117395 (18 May 2010). St. 3; NIBRAL0000117231 (30 Mar. 2010), NIBRAL0000117391 (18 May 2010), NIBRAL0000117657 (21 Jul. 2010). St. 5; NIBRAL0000117229 (31 Mar. 2010), NIBRAL0000117230 (31 Mar. 2010), NIBRAL0000117387 (19 May 2010), NIBRAL0000117388 (19 May 2010).

The total species composition was as follows: green algae, 13 species (13.1%); brown algae, 24 species (24.2%); and red algae, 62 species (62.6%). The species diversity was the highest in June (63 species), followed by that in May (52), March (45), and September (43) (Table 2). The occurrence of species according to the survey sites and month was shown in Table 3. During the survey, 12 housekeeping species were identified; *Ulva pertusa*, *Desmarestia viridis*, *Bonnemaisonia hamifera*, *Bossiella cretacea*, *Chrysiomenia wrightii*, *Corallina pilulifera*, *Heterosiphonia japonica*, *Heterosiphonia pulchra*, *Laurencia okamurae*, *Neoholmesia japonica*, *Odonthalia corymbifera*, and *Symphocladia latiuscula*. Some selected

specimens of marine algae were presented in Fig. 2.

Marine algal flora of the northern coast of the East Sea have been reported at the several sites, 39 species at Gonghyunjin (Lee, 1991), 100 species in Juckdo, Bongpori (Nam, 1986), 114 species at Sokcho (Boo and Lee, 1986; Lee, 1991; Lee *et al.*, 1993), and 110 species at Anin in Kangneung (Kim *et al.*, 1983; Boo, 1985; Lee, 1991). Koh (1983) stated that *Sargassum* species among brown algae, including *S. confusum* and *S. horneri* had occurred in Juckdo throughout survey period of the year 1982 to 1983. However, this survey showed that their occurrences were observed only in July and September of 2010.

In this study, 94 species of marine algae were collected from Oho-ri. The species list and its voucher specimens would be clue of the marine algae diversity changes to the spatio-temporal climate change.

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