



# THE ASIAN NETWORK FOR USING ALGAE AS A CO<sub>2</sub> SINK THE ASIAN PACIFIC PHYCOLOGICAL ASSOCIATION



MLTM  
Ministry of Land, Transport and Maritime Affairs

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## Newsletter

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### *The 5th Workshop of the Working Group for the Asian Network for Using Algae as a CO<sub>2</sub> Sink*

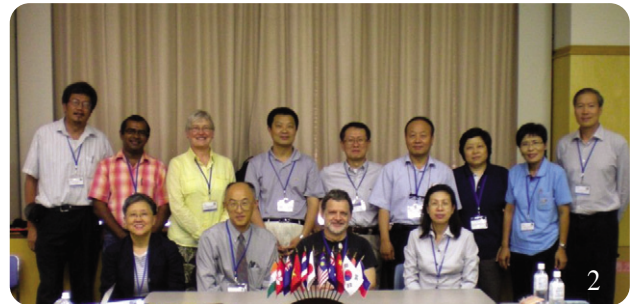
The 5th workshop meeting of the Asian Network for Using Algae as a CO<sub>2</sub> Sink was held at the National Olympic Memorial Youth Center, Tokyo, Japan on the 4th of August 2009 during the 9th International Phycological Congress.

A total of 13 members from 10 countries were in attendance: John Beardall (Australia), Zhengyu Hu (China), Put O. Ang Jr. (Hong Kong), Hiroshi Kawai (Japan), Sung Min Boo (Korea), Ik Kyo Chung (Korea), Jin Ae Lee (Korea), Siew Moi Phang (Malaysia), Charles S. Vairappan (Malaysia), Wendy Nelson (New Zealand) and Dang Diem Hong (Vietnam). Two new participants, Prof. Anong Chirapart representing Thailand and Prof. Lawrence Liao representing the Philippines, participated in the meeting.

The workshop agenda was as follows: 1) to review and endorse the meeting report of the 4th workshop of the working group, 2) to present the interim report of the network on publication, R&D, and network activities,

3) to discuss the convening of follow-up meetings.


Prof. John Beardall informed the group about the progress of a review paper, "Using marine algae for carbon sequestration, a critical appraisal," by Ik Kyo Chung, John Beardall, Smita Mehta, Dinabandhu Sahoo and Slobodanka Stojkovic. Prof. Ik Kyo Chung provided an update on the progress of the Korean project. Since June 2009, the Korean Project on Algae and Global Warming, "Greenhouse gas emissions reduction using seaweeds", has been shifted into the implementation stage of CDM/PDD business, mainly dealing with launching an on-site pilot seaweed CDM management project, development of a seaweed CDM/PDD proposal and the application of seaweed paper CDM. The project also should investigate the feasibility of the formation of a special task force for the development and implementation of protocols for the assessment of carbon sequestration (sinks) for the seaweed CDM/PDD. Prof. Jin Ae Lee reported on the



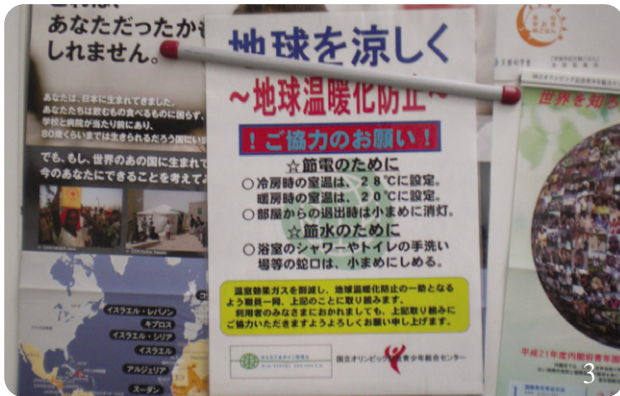
1. The 5th Workshop meeting of the Asian Network for Using Algae as a CO<sub>2</sub> Sink was convened at the National Olympic Memorial Youth Center, Tokyo, Japan during the 9th International Phycological Congress, August 2-8, 2009.
2. Group photograph of the members of the Network at the 5th Workshop of the Asian Network for Using Algae as a CO<sub>2</sub> Sink on the 4th of August 2009.

network activities since December 2008, namely the activities at the United Nations Climate Change Conference, Poznan, Poland, 1-12 December 2008, and the activity at the World Ocean Conference, Manado, Indonesia, 11-15 May 2009. Every WG members took time reporting the progress of research and development related to the algae for carbon sequestration in the own country.

Follow-up meetings as a part of the network activities were discussed. Profs. Ik Kyo Chung and Hiroshi Kawai would co-convene the session on the role of submerged vegetation in

the context of climate change at the PICES 2009 Annual Meeting, Jeju, Korea, 23 October - 1 November, 2009. Specially the network activities at the United Nations Climate Change Conference, 7-18 December 2009, Bella Center, Copenhagen, Denmark, were discussed in detail. The organization of a practical training session / workshop on CO<sub>2</sub> sequestration in the year 2010 or 2011 was strongly recommended and Prof. Hiroshi Kawai mentioned the feasibility of opening a practical workshop in conjunction with the PICES meeting in Japan. 

*The 9th International Phycological Congress, 2-8 August, Tokyo, Japan*



3. One of the major concerns of the 9th IPC was global warming.

The 9th International Phycological Congress was successfully held at the National Olympic Memorial Youth Center, Tokyo, Japan, August 2-8, 2009. The congress was hosted by Japanese Society of Phycology under the auspices of the International Phycological Association. About 500 delegates from all over the world participated in the congress. There were 2 workshops and 12 mini-symposia deliberating various topics in phycology. The mini-symposium, “Algae, bio-fuel and CO<sub>2</sub> sequestration”, co-convened by Ik Kyo Chung and Yoshihiro Shiraiwa included the presentations of the invited speakers as followings.

1. Makoto M. Watanabe: Biofuel production by *Botryococcus*
2. Kunimitsu Kaya: Hydrocarbons produced by Japanese *Botryococcus*

3. Hee-Mock Oh: Physiological study on the increased lipid production of *Botryococcus braunii*
4. Qiang Hu: Pathways and regulation for photosynthetic carbon partitioning into lipids in microalgae
5. Norihide Kurano: CO<sub>2</sub> removal by microalgae

Also in the contributed papers of the session, 6 papers were presented as followings:

1. John Beardall: Effects of temperature on calcite production by the oceanic coccolithophorid, *Gephyrocapsa oceanica*
2. Susan I. Blackburn: Australian strain selection and enhancement for biodiesel from algae
3. Ik Kyo Chung: The conceptual coastal CO<sub>2</sub> removal belt and estimation of carbon sequestration by seaweeds
4. Niyom Kamlangdee: Growth and fatty acids production of tropical marine thraustochytrids isolated from mangrove in Thailand
5. Todd W. Lane: Digital transcriptomic analysis of silicate starvation induced triacylglycerol formation in the marine diatom *Thalassiosira pseudonana*
6. Guillermo García-Blairsy Reina: A simple new vertical-tubular-double vortex-venturi-photobioreactor

## The other presentations by the Network members at IPC9

### Oral papers

1. Siew Moi Phang: Phylogeny of *Chlorella* strains isolated from different latitudes from the North to the South Pole
2. Charles S. Vairappan: Effects of epiphyte infection on the quantity and quality of carrageenan produced by carrageenophytes, *Kappaphycus alvarezii* (Gigartinales, Rhodophyta)

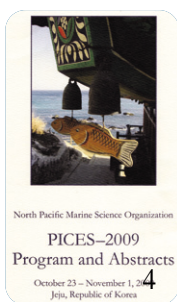
2. Sung Min Boo: Phylogenetic relationships of the genus *Hypnea* (Gigartinales, Rhodophyta), with the recognition of two new species
3. Put O. Ang Jr: Phylogeographical distribution of *Sargassum horneri* in Northwestern Pacific, a preliminary analysis
4. Zhengyu Hu: Diel vertical distribution pattern of *Peridiniopsis niei* sp. nov. in Xiangxi Bay of the Three Gorges Reservoir
5. Dang Diem Hong: Study on *Schizochytrium* for functional food, medicine in Vietnam

### Poster session

1. Wendy A. Nelson: Marine macroalgae of the Balleny Islands (66-67° S)



## The Annual Meeting of PICES 2009



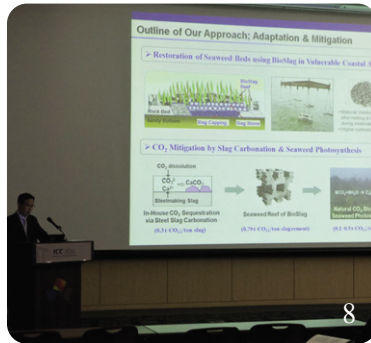
4. The Annual Meeting of PICES 2009 was held under the theme of "Understanding ecosystem dynamics and pursuing ecosystem approaches to management" October 23 - November 1, 2009, Jeju, Korea.

5. The poster on the Asian Network for Using Algae as a CO<sub>2</sub> Sink was presented in the MEQ Session 5, titled 'The role of submerged aquatic vegetation in the context of climate change' at the Annual Meeting of PICES 2009.

6. The Annual Meeting of PICES was held under the theme of "Understanding ecosystem dynamics and pursuing ecosystem approaches to management" October 23 - November 1, 2009, Jeju, Korea.

7. Profs. Ik Kyo Chung and Hiroshi Kawai co-chaired an MEQ Session 5 entitled "The role of submerged aquatic vegetation in the context of climate change" at the Annual Meeting of PICES 2009.

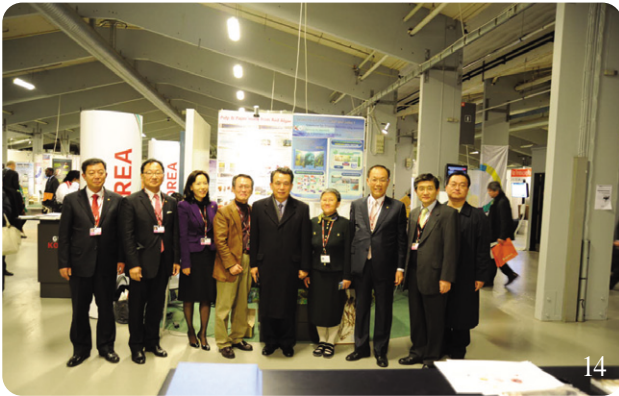
8. Mr. Kwang-Seok Park of Research Institute of Industrial Science and Technology (RIST) presented a report entitled "Climate change adaptation using seaweed bed of BioSlag in marine environment".



The Annual Meeting of PICES 2009 was held under the theme of "Understanding ecosystem dynamics and pursuing ecosystem approaches to management" October 23 - November 1, 2009, Jeju, Korea. Ik Kyo Chung (Korea) and Hiroshi Kawai (Japan) co-chaired an MEQ Session 5, titled 'The role of submerged aquatic vegetation in the context of climate change' on the 28th October. Total 8 oral papers and 6 posters were presented in the session.

### Oral papers

1. Xuelei Zhang: Restoration of seagrass/algal beds as a measure to abate climate change
2. Kwang-Seok Park: Climate change adaptation using seaweed bed of BioSlag in marine environment
3. I. Nyoman Radiarta: The impact of climate change on the development of marine aquaculture: a case study on Japanese scallop aquaculture in Funka Bay, Hokkaido, Japan
4. Seokjin Yoon: Estimation of the role of



14. High level government officials of Korea such as the former Prime Minister Seung Soo Han, the Climate Change Ambassador Rae Kwon Chung and several Assemblymen encouraged the activities of the Asian Network for Using Algae as a CO<sub>2</sub> Sink.




15. Group photograph of the participants at the Main Hall of COP 15, UNCCC in Copenhagen.

Many professionals as well as government officials and NGOs showed their strong interest in the exhibition. The following is a

list of the professionals who made comments on the exhibition.

- Yongsung Cho, Dept. Food & Resource Economics, Korea University, Korea
- Moon Jung Choi, Environmental Section Office of the Climate Change, Korea
- Chin Seung Chung, Senior Advisor for Climate Change, Korea International Cooperation Agency, Korea
- Rae Kwon Chung, Climate Change Ambassador, Korea
- Jeonghan Ham, Ministry of Foreign Affairs and Trade, Korea
- Wha Jin Han, Secretary to the President for Environment, Korea
- Gi Man Hong, Climate Policy Division, Korea Meteorological Administration, Korea
- Jin Hwan Hwang, Dept. of Civil & Environmental Engineering, Dongguk University, Korea
- Eui Chan Jeon, Dept. Earth & Environmental Sciences, Sejong University, Korea
- Chan Soo Kang, Journalist, Joongang Daily, Korea
- Leejin Kim, Climate Change Research Division, Korea Environment Institute, Korea
- Seung Kyu Kim, Ministry of Land, Transport and Maritime Affairs, Korea
- Chanyeol Lee, Lawmaker, National Assembly, Korea
- Chang Soo Lee, Deputy Secretary to the President for National Future and Vision, Korea
- Doo Ah Lee, Lawmaker, National Assembly, Korea
- Jeong Kyu Lee, Assistant Secretary to the President for Foreign Affairs, Korea
- Wonjoo Lee, Journalist, Dong-A Ilbo, Korea
- Soyoung Lim, Office of the Climate Change, Korea International Cooperation Agency, Korea
- Tae Joo Park, The President, Korea Environment


- Institute, Korea
- Myung Pil Shim, Ministry of Land, Transport and Maritime Affairs, Korea
- Ho Shin Dong, Planning Committee, Korea Green Foundation, Korea
- Yim Su Jin, Green Citizens' Committee of Seoul, Korea
- Beom Sik Yoo, Presidential Committee on Green Growth, Korea
- Il Ho Yoo, Lawmaker, National Assembly, Korea
- Nikhil Agrawal, Trias Advisory Company, India
- Eduardo Athayde, World Watch Institute, USA
- Martin Bertram, PELUM Association, Zambia
- Laura Beyers, Voyage for Cleaner Energy, USA
- Bernard Hallermann, Caritas Company, Germany
- Eva Hallstrom, Gronakvinor company, Sweden
- Antonio Jose Laranjeira, Energy Research Center of the Netherlands, Netherland
- Cedric A. Lombardo, Department of Environment, Côte d'Ivoire
- Marisa Lopez, Journalist, Tierra Grande, Spain
- Anders Riel Muller, Climate Action Map, USA
- Laura Garcia Oviedo, Science Journalist, Argentina
- Leonardas Rinkevicius, Kaunas University of Technology, Lithuania
- Caitlin K. Snyder, Global Forum, USA
- Hamish Stewart, BAYER Company, Germany
- Denia Aulia Syam, Pelangi Research Institute, Indonesia
- Per Tunell, Wallenius Marine Company, Sweden
- Sam Burcher, Journalist, ISIS, Great Britain
- Saskia Versteeg, University of Texas at Dallas, USA
- Tony St. Clair, MBD Energy Limited company, Australia 

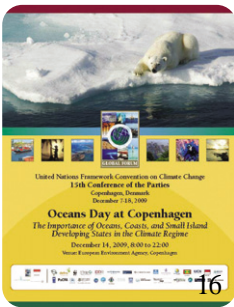
## *Oceans Day at Copenhagen:*

### *The Importance of Oceans, Coasts, and Small Island Developing States in the Climate Regime*

December 14, 2009, European Environment Agency, Copenhagen  
(during the UNFCCC 15th Conference of the Parties) <http://www.oceansday.org/>

Oceans Day, co-organized by the International Coastal and Ocean Organization (Secretariat of the Global Forum on Oceans, Coasts, and Islands), the Government of Indonesia, the European Environment Agency, together with a number of governments, NGOs, and IGOs, provided an opportunity for Parties and Observer States, intergovernmental organizations, non-government organizations, and members of civil society to discuss the implications of the emerging Copenhagen agreement for oceans, coasts, and coastal communities around the globe, especially in small island developing States. Oceans Day highlighted the direct link between climate change, the health of the oceans, and human

well-being, as well as highlight the need for sufficient funding to support bold mitigation and adaptation actions that would minimize climate change impacts on coastal communities and ocean resources. Oceans Day at Copenhagen also underscored the latest scientific understanding about the impacts of climate change and increased concentration of atmospheric carbon on the oceans. This enhanced knowledge, in addition to the Manado Oceans Declaration, underpinned the strong need to focus on oceans, coasts, and coastal communities in the climate negotiations and provided the context for charting the way forward. 



16. The leaflet of Oceans Day at COP 15, Copenhagen on December 14, 2009.

17. Oceans Day at Copenhagen was co-organized by the International Coastal and Ocean Organization, the Government of Indonesia, the European Environment Agency, together with a number of governments, NGOs, and IGOs during the UNFCCC 15th Conference of the Parties.

### *The 6th Workshop of the Working Group for the Asian Network for Using Algae as a CO<sub>2</sub> Sink*

The 6th Workshop for the Asian Network for using Algae as a CO<sub>2</sub> sink was held during the International Symposium (Jan 29-30, 2010), “Climate change, seaweed and CO<sub>2</sub> sequestration” at the Sangnam International Conference Building in the Pusan National University, Busan, Korea. There was a total of 11 members from 9 countries in attendance:

Shao Jun Pang (China), Put O. Ang Jr. (Hong Kong), Greve S. Gerung (Indonesia), Sung Min Boo (Korea), Ik Kyo Chung (Korea), Jin Ae Lee (Korea), Siew-Moi Phang (Malaysia), Wendy Nelson (New Zealand), Danilo Largo (Philippine), Anong Chirapart (Thailand), and Dang Diem Hong (Vietnam).

#### **International Symposium “Climate change, seaweed and CO<sub>2</sub> sequestration”**

Session 1: Current topics on the climate change related with algae in participating nations of APPA WG

Session 1-1: Co-Chair (Prof. Siew-Moi Phang/ Prof. Ik Kyo Chung)


10:00-10:25 Investigating carbon reduction through seaweed cultivation in Malaysia (Prof. Siew-Moi Phang, Malaysia)

10:25-10:50 Current climate change related activities focusing on algae in New

- eelgrass and associated epiphytic algae on the carbon cycle in Akkeshi Lake, Japan
5. Taehee Na: Estimation of carbon sequestration by seaweed beds
  6. Hack-Churl You: Red-algae pulp and paper, bio-ethanol
  7. Sang Yong Lee: Seasonal variation in  $\delta^{13}\text{C}$  and  $\delta^{15}\text{N}$  values for the temperate seagrass *Zostera marina* and its relation to leaf production
  8. Tatyana N. Krupnova: Resource management of sea urchins *Strongylocentrotus intermedius* on the basis of its biotic relations with brown alga *Laminaria japonica*


Poster session

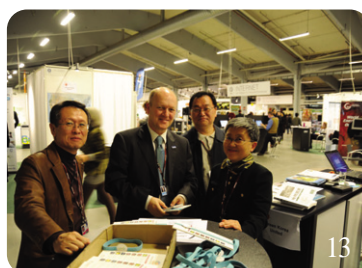
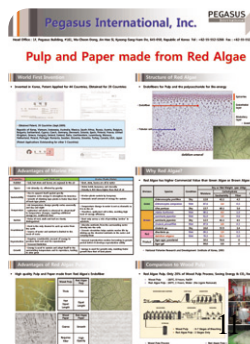
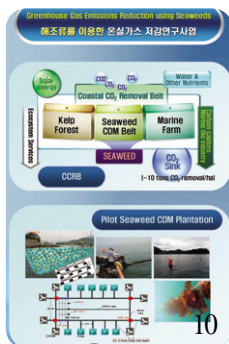
1. Jin Ae Lee: The Asian Network for Using Algae as a CO<sub>2</sub> Sink of the Asian Pacific Phycological Association

2. Sang Rul Park: Growth and photosynthetic characteristics of three *Zostera* spp. (*Z. japonica*, *Z. marina* and *Z. caespitosa*) along vertical gradient: implications for seagrass zonation
3. Kwang-Seok Park: Research and development roadmap for climate change adaptation and CO<sub>2</sub> mitigation in the Korean maritime and fisheries sector
4. Miryang Kim: Subtidal macroalgal species diversity during wintertime in Jeju Island, Korea
5. Seong Cheol Kim: Management of artificial coastal CO<sub>2</sub> removal belt in Korea
6. Yoon Seok Choi: The effect of geochemical characteristics and environmental factors on the growth of cultured ark shell *Scapharca broughtonii* at several shellfish-farming bays on the south coast of Korea 

**The Side Event of the Asian Network for Using Algae as a CO<sub>2</sub> Sink as Part of UNCCC**

The Asian Network for Using Algae as a CO<sub>2</sub> Sink of the Asia Pacific Phycological Association, Marine Research Institute, Pusan National University, Korea, and Pegasus International Inc. held an exhibition, entitled “Seaweed Solution - Sink & Swim” at the Hall H of the Conference Venue, Copenhagen, Denmark, in the form of a United Nations Climate Change Conference (UNCCC) side event of the 15th session of the Conference of

the Parties (COP 15), December 7-18, 2009. The exhibition was convened by Prof. Ik Kyo Chung (the side event organizer) and Jin Ae Lee (the secretary, the Asian Network for Using Algae as a CO<sub>2</sub> Sink), Mr. Hack Churl You, CEO of Pegasus International, Inc., Korea, and Dr. Jong Kyu Kim, Team Leader of RCC Inc. The three categories of the exhibition was as followings; 1) Red algae paper, 2) Seaweed biofuel, (3) Seaweed sink. 



9-11. The posters presented by the Asian Network for Using Algae as a CO<sub>2</sub> Sink, Marine Research Institute, Pusan National University, Korea, and Pegasus International Inc. at the exhibition of side event held in COP15.

12-13. The exhibition booth of the Asian Network for Using Algae as a CO<sub>2</sub> Sink, Marine Research Institute, Pusan National University, Korea, and Pegasus International Inc. at the exhibition of side event held in COP15.


<p>Zealand - including policy and case studies (Dr. Wendy A. Nelson, New Zealand)</p> <p>11:30-11:50 Opening Ceremony (Prof. Jin Ae Lee)</p> <p>12:00-13:00 Lunch (Sangnam International House)</p> <p>Session 1-2: Co-Chair (Dr. Dang Diem Hong/ Prof. Choon-Hwan Lee)</p> <p>13:00-13:25 Effects of high temperature, salinity, alkalinity and hardness on growth of the red seaweed <i>Gracilaria fisheri</i> (Prof. Anong Chirapast, Thailand)</p> <p>13:25-13:50 Indonesia between Pacific and Indian Ocean: Prospect for field study on algae as a CO<sub>2</sub> sink (Prof. Grevo S. Gerung, Indonesia)</p> <p>13:50-14:15 Climate change, sea level rise scenarios for Vietnam and contribution of algae mass cultivation (Dr. Dang Diem Hong, Vietnam)</p> <p>Session 1-3: Co-Chair (Prof. Put O. Ang/ Prof. Nam</p>	<p>Gil Kim)</p> <p>14:30-14:55 Seaweed aquaculture in China: issues related with global climate change (Dr. Shao Jun Pang, China)</p> <p>14:55-15:20 Algae and policies related to climate change in the Philippines (Prof. Danilo B. Largo, Philippines)</p> <p>15:20-15:45 Current climate change related activities in Hong Kong (Prof. Put O. Ang, Hong Kong)</p> <p>Session 2: Results and the objective of the project “Algae and Global Warming-Greenhouse Gas Removal by Seaweeds”</p> <p>16:00-16:40 process and results from the Project's step 1 (2006-2008)</p> <p>16:40-17:20 Objective of project's step 2 (2009-2011) and results of the year 2009</p> <p>17:30-18:30 Panel discussion (Chair; Prof. Ik Kyo Chung)</p> <p>18:30-20:00 Banquet (Sangnam International House)</p>
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18. Working Group members having an informal get-together at the Biological Oceanography Laboratory, Pusan National University on Jan 28, 2010.
19. International symposium on “Climate change, seaweed and CO<sub>2</sub> sequestration” was held at the Sangnam International Conference Building on Jan 29, 2010.
20. Group photograph of the participants in the international symposium at Pusan National University.
21. APPA working Group members having a discussion on the network activities at the 6th Workshop on Jan 30, 2010.
22. Group photograph of the Working Group members of the Asian Network for Using Algae as a CO<sub>2</sub> Sink at the 6th Workshop at Pusan National University, Korea

The workshop agenda was as follows: 1) to review and endorse the meeting report of the 5th workshop of the working group, 2) to present the interim report of the network on publication, R&D, and network activities, 3) to discuss the convening of follow-up meetings.

The publications on the comprehensive summary and critical analysis of the magnitude of current CO<sub>2</sub> sequestration by marine algae,

removal/sequestration of carbon through algal photosynthesis or the CO<sub>2</sub> absorption capacity of various algal species are strongly recommended to be published by the middle of 2011 for the submission to the Working Group of AR5. The network activity of the working group members at PICES-2009, the East Asian Seas Congress, United Nations Climate Change Conference were reported chronically. 

## UPCOMING EVENTS

The meetings as a part of the network activities were discussed as followings.

- 1) The 20<sup>th</sup> International Seaweed Symposium, 22-26 February 2010, Ensenada, Mexico
- 2) Aquaculture 2010, 1-5 March 2010, San Diego, USA
- 3) The 5<sup>th</sup> Global Conference on Oceans, Coasts and Islands: Ensuring Survival, Preserving Life, and Improving Governance, 3-7 May 2010, Paris, France
- 4) United Nations Climate Change Conference, 29 November - 10 December 2010, Mexico
- 5) The organization of a practical training session/workshop on CO<sub>2</sub> sequestration in the year 2010 or 2011

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