Vol. 17, No. 2 April-June 2009 1SSN 0117-6161

UNIVERSITY CONSORTIUM

A quarterly newsletter for the Southeast Asian University Consortium for Graduate Education in Agriculture and Natural Resources

UBC study first to show evolution's impact on ecosystems

Scientists have come to agree that different environments impact the evolution of new species. Now experiments conducted at the University of British Columbia (UBC) are showing for the first time that the reverse is also true.

Researchers from the UBC Biodiversity Research Centre created mini-ecosystems in large aquatic tanks using different species of three-spine stickleback fish and saw substantial differences in the ecosystems in as little as 11 weeks.

Their findings are published in today's Advanced Online Publication of the journal Nature.

Stickleback fish originated in the ocean but began populating freshwater lakes and streams following the last ice age. Over the past 10,000 years–a relatively short time span in evolutionary terms–different species with distinct physical traits have emerged in some freshwater lakes.

The UBC study involved new species found in British Columbia lakes that have evolved distinct physical traits: limnetic sticklebacks (smaller open water dwellers with narrow mouths), benthic sticklebacks (larger bottom dwellers with a wide gape) and a generalist species to represent the probable ancestor of the two species.

"Simply by what they eat and how they live, even young species that have 'recently' diversified can have a major impact on their food web," says study lead author **Luke Harmon**, who conducted the study while a postdoctoral fellow at UBC. He is now an assistant professor at the University of Idaho.

Male limnetic three-spine stickleback from Enos Lake, British Columbia, Canada. (Photo by E. Cooper, courtesy of University of British Columbia)

"This study adds to a broader body of literature showing that species diversity matters in important ways," Dr. Harmon said."

Further analysis showed the tanks with the two newest species had larger molecules of dissolved organic carbon, or bits of decaying plants and animals. This prevented sunlight from penetrating the water and inhibited plant growth. "Our study shows that through evolution, sticklebacks can engineer the light environment of their own ecosystems," says co-author **Blake Matthews**, a UBC postdoctoral fellow who is now a researcher at Eawag, the Swiss Federal Institute of Aquatic Science and Technology.

"It also demonstrates how speciation of a predator might alter the evolutionary course of other organisms in the food web," Dr. Matthews said.

"As new species arise from a common ancestor and evolve new ways of exploiting the environment, each inadvertently reshapes the dynamics of the ecosystem around it," says co-author UBC Professor **Dolph Schluter**. "We are just beginning to understand how."

(Source: UBC Media Release, 1 April 2009, contact Brian Lin, UBC Public Affairs)

UQ branches out into pea fuel

The discovery of a hormone that controls how plants form branches and the use of a legume tree in biodiesel production are just two of the major scientific breakthroughs to come out of the University of Queensland (UQ) ARC Centre of Excellence in Integrative Legume Research (CILR) this year.

Established with a $10 million Australian Research Council (ARC) grant in 2003, the Centre is a partnership that brings together leading plant research scientists located at UQ, the Australian National University, the University of Melbourne, and the University of Newcastle.

Awarded a further $6.9 million for the period 2008 to 2010, and with cash contributions from partner universities and state governments, the CILR will spend a total of $38 million on research.

The money has been well spent with the Centre now firmly established as one of the world's leading legume research centres.

Perhaps the most significant development was the discovery of a new plant hormone that inhibits shoot branching in plants, as featured on the cover of the journal *Nature*, by Associate Professor **Christine Beveridge** and her colleagues.

These hormones, called strigolactones, were discovered by analysing the branching behaviour of garden peas and could be of significant potential to the horticultural and forestry industries.

The Centre, primarily through work at the UQ Node, also achieved a number of successes in its biofuel program focussing on the legume tree Pongamia pinnata.

Significant industry interest has stimulated funding for the program with a major plantation established in central Queensland with a commercial partner, and an experimental plot evaluating the legume's carbon sequestration and nitrogen gain established at UQ's Gatton campus.

In the case of carbon sequestration, the legume removes CO2 from the atmosphere and stores it in soil; nitrogen gain refers to the legume's ability to return nitrogen to the soil they grow in, acting like a fertiliser.

More information about the ARC Centre of Excellence for Integrative Legume Research and its contributions to the community through research and teaching can be found in the Centre's 2008 Annual Report.

(Source: *UQ News Online*, 22 April 2009)

A growing bud in the leaf axil of an increased branching mutant of pea (*Pisum sativum*) on the cover of the journal *Nature*, which featured said UQ scientific discovery. (Photo courtesy of *Nature*)

Biofuels: beating the heat from changing climate

"Scientists project that if global temperature rises by two degrees, our biodiversity would be wiped out by 30%. Biofuels do have a role to play," says Dr. **Rodel Lasco**, Professor, College of Forestry and Natural Resources, University of the Philippines Los Baños (UPLB), during the biofuels workshop with the Philippine media practitioners.

Biofuels can reduce an estimated 1B ton of greenhouse gas (GHG) emissions (the cause of global heat) up to year 2030. However, land-use change issues and lifecycle analysis have to be incorporated as there is an accompanying debate that says that conversion of forest and grass lands in favor of biofuels increases GHG emissions twice.

Mr. **Rafael L. Coscolluela**, head of the Philippine Sugar Regulatory Administration, says that in promoting areas for biofuels production, particularly jatropha, land-related issues have already been thought of. For example, investors planning to go into jatropha production will have to secure an approved environmental compliance certificate (ECC) which will factor biodiversity, land and water resources use. Basically, implementers of the biofuels program have

See Biofuels, p. 3

UPLB researchers to produce bioethanol from grass, wood and agri by-products

Lignocellulosic materials such as (top to bottom) rice straw, rice hull, sugarcane bagasse, corn stover, corn cobs,dried wood, and dried cogon grass may be used to produce ethanol fuel.

The University of the Philippines Los Baños (UPLB) has recently organized a group of biotechnologists and chemical engineers to conduct scientific investigations in a bid to produce ethanol from so-called third generation biofuel feedstocks.

Leading this group is Dr. **Fidel Rey P. Nayve, Jr.** of the National Institute of Molecular Biology and Biotechnology under the auspices of UPLB. He has set eyes on producing fuel ethanol from lignocellulosic materials readily available in the Philippines—grass, wood and agricultural by-products.

Rice straw, rice hull, sugarcane bagasse, corn stover, corn cobs, and even dried wood, cogon and talahib are jam-packed with lignocellulose, which is composed of cellulose, hemicellulose, and lignin.

Lignocellulose can be fermented to produce ethanol fuel. Meanwhile, dimethyl ether, another by-product of lignocellulose fermentation, is a promising fuel source for diesel and petroleum engines and even gas-powered turbines.

According to Dr. Nayve, the Department of Science and Technology (DOST) through its Philippine Council for Advanced Science and Technology Research and Development (DOST-PCASTRD) will be granting the UPLB scientists P10 M in research funds to develop technologies for cellulosic fuel ethanol production.

Dr. Nayve said there is a good prospect of having a mature technology within the next five to 10 years. The UPLB-BIOTECH has already in its care several microorganisms which can be used to process grass, wood and agricultural by-products into ethanol.

It is just a matter of identifying which materials can be suitable for ethanol production and developing and optimizing the organisms' capability to ferment the materials into ethanol.

(Article by F. Cruz in UPLB RDE News, 28 May 2009, posted at http://rdenews.uplb.edu.ph)

Biofuels, from p. 2

agreed that only idle lands be dedicated to jatropha and other potential biofuel crops so as not to threaten food security.

Dr. **Virgilio Villancio**, University Researcher, Agricultural Systems Cluster and UPLB's program leader of the integrated research and development program on jatropha for biodiesel, cites that his group is doing research for three years now to generate new knowledge on jatropha as a biofuel source. Philippines has three years of jatropha research generating new knowledge on its positive and negative features as alternative fuel. To date, the group is also studying on the toxicity of jatropha. LMCalumpang, *SEARCA News Updates*, 27 March 2009)

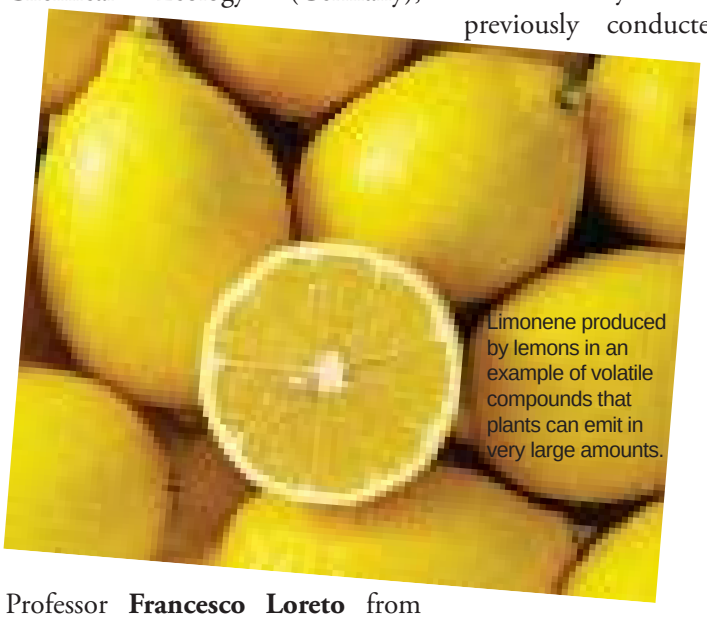
In the Philippines, jatropha and other potential biofuels crops are to be planted only in idle lands so as not to threaten food security.

New theory to understand plant stress

A University of Queensland (UQ) researcher has co-authored a new theory that can help predict how different plant species might respond to climate change, and may enable the production of better stress-resistant crops in the future.

The researcher is Dr. **Claudia Vickers** of UQ's Australian Institute for Bioengineering and Nanotechnology (AIBN), who is first author on a new paper in the prestigious international journal *Nature Chemical Biology*.

Working in collaboration with Professor **Jonathan Gershenzon** from the Max Planck Institute for Chemical Ecology (Germany), Professor **Francesco Loreto** from the National Research Council Institute of Agro-environmental and Forest Biology (Italy) and Professor **Manuel Lerdau** from the University of Virginia (USA), Dr. Vickers proposed a new unified mechanism of action for volatile isoprenoids in plant abiotic stress responses.



Limonene produced by lemons in an example of volatile compounds that plants can emit in very large amounts.

"Plants produce many different volatile compounds such as limonene, which gives lemons their distinctive smell and isoprene, which can be emitted in very large amounts," Dr Vickers said.

"We believe that they use some of these volatiles to help protect themselves against damage from adverse environmental conditions, like too much light, high temperature and air pollution.

"It is reasonable to assume that various species of plants will respond differently to climate change depending on whether or not they produce these volatiles.

"This knowledge can then be used to help develop crop plants which will perform better in stressful environments."

This theory is based on research previously conducted while Dr. Vickers worked at Essex University in England.

Wanting to move into more applied area of research, Dr. Vickers joined the laboratory of AIBN's Professor **Lars Nielsen** who recognised the applicability of her molecular biology expertise to understanding metabolic pathways in bacteria.

Dr. Vickers is currently using sucrose as a carbon source to develop novel methods of producing chemicals in bacteria. This approach can replace fossil fuels as chemical sources and will eventually tranform chemical production into an environmentally sustainable process.

(Source: *UQ News Online*, 16 April 2009)

UPM, Ministry of Science study carbon storage in Malaysian forests

Institute of Tropical Forestry and Forest Products (INTROP) of Universiti Putra Malaysia (UPM) join hands in collaboration with the Ministry of Science, Technology and Innovation Malaysia (MOSTI) in a program called Brain Gain Malaysia, with its project entitled, 'Control of Diversity and the Carbon Balance of Tropical Forest'.

Director of INTROP, Assoc. Prof. Dr. Jalaluddin Harun said the project was endowed with RM477, 000 and was aimed to assess the future carbon storage in Malaysian forests.

The project is set in motion until October 2010 under the supervision of Laboratory of Sustainable Bioresource Management, INTROP.

"The collaborative effort will see to strengthen the mutual alliance of research in agriculture biotechnology between UPM and the Rutgers University, USA, Forest Department of West Malaysia (JPSM) and Forest Research Institute Malaysia (FRIM).

"The research is expected to produce at least five high impact journal publications with technical reports," he added.

He expained that the R&D alliance has placed INTROP as an institute of reference in sustainable forest management especially in the exploration of carbon and the dynamic of tropical forest biodiversity as well as the global climate change.

A memorandum of agreement (MoA) was signed by UPM and MOSTI officials .

(By Media and Publicity Section, Corporate Communication Division, UPM posted on the UPM website)

UBC researcher releases first-ever estimate of climate change impact on fisheries

A University of British Columbia (UBC) researcher put a number to the impact of climate change on world fisheries at the Annual Meeting of the American Association for the Advancement of Science (AAAS) held on 12 February 2009 in Chicago, USA.

A team of researchers from UBC's Sea Around Us Project and Princeton University used computer models to simulate changes in ocean temperature and current patterns caused by various climate change scenarios–and how they affect 1,066 commercially important fish and shellfish species from around the world, including cod, herring, sharks, groupers, and prawns.

CHEUNG

"We found that on average, the animals may shift their distribution towards the poles by 40 kilometres per decade," says Dr. William Cheung, who led the project while a postdoctoral fellow with UBC Fisheries Centre, under the guidance of Professor Daniel Pauly.

"Atlantic cod on the east coast of the U.S. may shift their distribution towards the Canadian coast by more than 30 kilometres per decade, resulting in a 50 percent reduction in some cod populations in the area by 2050," says Dr. Cheung, now a lecturer at the University of East Anglia in the United Kingdom.

Dr. Cheung released the findings at an AAAS news briefing in Chicago on 12 February 2009. The study, published in the journal *Fish and Fisheries*, also projects some Atlantic herring populations to decrease more than 20 percent, while other species already living near the poles–such as the stripped rockcod and the St. Paul rock lobster–may face extinction due to a lack of habitat.

Fishers in the tropics may take the brunt of these changes, especially since many are from developing countries and are ill-equipped to deal with the loss in catch. Nordic countries like Norway, on the other hand, may see a gain in potential catch.

Scientists have made projections of climate change impact on land species but this is the first such study on marine species ever published. The Sea Around Us Project is now looking at conservation and economic solutions to climate change impacts.

(Source: UBC Media Advisory, 12 February 2009)

UBC scientist discovers new jumping spider species

A University of British Columbia (UBC) researcher has discovered dozens of species of jumping spiders that are new to science, giving scientists a peek into a section of the evolutionary tree previously thought to be sparse.

Jumping spiders are found in every part of the world except Antarctica. Capable of jumping 30 times their body length, some of the 5,000 documented species are common in households. They come in many shapes and sizes, some resembling ants or beetles.

"Instead of sitting at the centre of a web, jumping spiders found a new way to make a living by wandering around their habitat and pouncing-like cats-on their prey," says Dr. Wayne Maddison, professor of zoology and botany and director of the Beaty Biodiversity Museum at UBC.

Two of the jumping spiders' eight eyes have evolved to be large with high-resolution vision to spot prey. Female jumping spiders also use this heightened visual sense to watch males, who show off their colorful bodies during courtship dances.

Dr. Maddison collected more than 500 individual spiders during an expedition with Conservation International (CI) last summer in the Kaijende Uplands, one of Papua New Guinea's largest undeveloped areas. Preliminary studies show as many as 130 species, including 30 to 50 never-before-identified species, may have been found on the trip.

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UQ research finds mangroves being fed to death

New University of Queensland (UQ) research found the increase in nutrients coming out of our river systems is putting pressure on our mangrove forests and making them far more susceptible to environmental variability and climate change.

Originally thought to benefit mangrove growth, the research of Dr. Catherine Lovelock, Associate Professor, Centre for Marine Studies, UQ, shows the man-made rise in available nutrients from runoff or urban and industrial processes, actually decreases their resilience.

She said this increase in nutrients could be responsible for the death of formerly healthy mangroves.

"While this increase in available nutrients initially favours mangrove growth, you get an increase in the growth of shoots relative to roots, and that's the wrong kind of growth," Dr Lovelock said.

"This higher ratio of shoots to roots means the mangroves are much more susceptible to high salinity and drought."

She said under such conditions, the plant needs to have as many roots as possible so that it can provide water for its shoots, however nutrient enrichment causes the exact opposite.

"Our results show that mangroves exposed to high nutrient availability suffer greater mortality during drought, and that nutrient-induced mortality is greater in sites subject to periods of low rainfall, low humidity and high salinity," she said.

"It's particularly important in terms of climate change because droughts may become more extreme, or at least more frequent, and we could see mangrove populations collapse.

"This paints nutrient enrichment as one of the greatest threats to near shore coastal ecosystems, bringing increased mangrove mortality on top of algal blooms, coral reef degradation and loss of biodiversity and ecosystem resilience."

Increase in available nutrients promotes shoots growth rather than roots growth, and this the wrong kind of growth. *(Photo courtesy of UQ)*

Dr. Lovelock and her team added either nitrogen or phosphorous based fertilisers to mangrove trees at 12 study sites around the world including Australia, New Zealand, Florida in the USA, and the Caribbean.

The team then measured the growth and mortality rates for the mangroves at these sites over a period of more than three years.

The study showed a marked difference in tree mortality between sea fringing mangroves – that are flushed out by the tide – and further inland 'scrub' mangroves.

Dr. Lovelock said while the increase in nutrients had little effect on the sea fringing mangroves, there was a massive increase in mortality for the 'scrub' mangrove forests.

"Scrub forests are less frequently inundated by tides, so in times of low rainfall the surrounding soil can become extremely saline and the plant cannot survive," Dr. Lovelock said.

"So nutrient enrichment could have a particularly disastrous impact on ecosystem function in drier areas where scrub forests account for the majority of mangrove forest cover."

The new research, titled Nutrient enrichment increases mortality of mangroves, was published in the international journal PLoS ONE.

(Source: *UQ News Online*, 19 May 2009)

UBC scientist, from p. 5

Some of the species discovered are highly distinctive, occupying "lonely" branches on the evolutionary tree of jumping spiders. Further research on these new specimens will shed light on how jumping spiders evolved their unique feature, a question that continues to puzzle scientists.

"Our finding shows that the great age of discovery isn't over by far," says Dr. Maddison, who estimates there may be at least 5,000 more species of unidentified jumping spiders in the world.

The CI expedition also identified two new plants, three frogs and a gecko that are believed to be new to science. Dr. Maddison says the smaller animals-like insects and spiders-and plants may hold the secret to many of the world's unknown chemicals.

"Spider venom has evolved for millions of years to affect the neurological systems of the spider's insect prey, and each species of spider gives us another opportunity to find medically useful chemicals," says Dr. Maddison. "

Jumping spiders with their remarkably miniaturized yet acute eyes could help us understand how to push the limits of vision.

In addition to filling in the gaps in our planet's natural history, exploring spider biodiversity and evolution could potentially inform fields as diverse as medicine and robotics."

For more information on the newly discovered spiders, Dr. Maddison's field notes, photo and videos, visit http://www.beatymuseum.ubc.ca/spiders.

(Source: UBC Media Release, 25 March 2009)

The University Consortium

The Southeast Asian University Consortium for Graduate Education in Agriculture and Natural Resources is a program launched on 19 September 1989 by SEARCA.

The idea of having such a program was formed in August 1988 when SEARCA, with convened a meeting of deans of five leading agricultural graduate schools in the region. The deans noted a rising demand for graduate education across all agricultural disciplines and related fields, strong agricultural and demographic pressures, and tremendous growth in education, and agreed to the idea of establishing a University Consortium.

The objectives of the Consortium are:

1. To provide highly trained personnel in agriculture and natural resources for national development of Southeast Asian countries.

2. To promote mutually beneficial cooperation among agricultural universities in the region.

3. To utilize more fully and efficiently the scarce resources and expertise available in each country in the region for top-quality graduate education and research.

4. To stimulate freer sharing and exchange of information, facilities, and expertise among agricultural universities in the region.

SEARCA has served as the Consortium's Secretariat since 1989. Its founding members are Universitas Gadjah Mada (UGM) and Institut Pertanian Bogor (IPB), both in Indonesia; Universiti Putra Malaysia (UPM) in Malaysia; University of the Philippines Los Baños (UPLB) in the Philippines; and Kasetsart University (KU) in Thailand. Four associate members have been admitted, namely: University of British Columbia (UBC) in Canada, University of Queensland (UQ) in Australia, Georg-August University of Göttingen in Germany, and Tokyo University of Agriculture in Japan.

"To be a leader in implementing collaborative strategies for excellent graduate education and cutting-edge research in agriculture, environment, and natural resources for the benefit of Southeast Asia" - this is the vision of the revitalized University Consortium.

The Consortium has five components, namely: faculty visits, research fellowships, professorial chairs, and thesis grants.

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University Consortium is a newsletter published by the Southeast Asian Regional Center for Graduate Study and Research in Agriculture (SEARCA) for the Southeast Asian University Consortium for Graduate Education in Agriculture and Natural Resources (UC). It can be downloaded from the UC website at http://www.uc.searca.org

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SEARCA Knowledge Center on Climate Change launched

SEARCA launched its Knowledge Center on Climate Change, or KC3 for short, in Makati City, Philippines on 29 May 2009.

The Center will serve the knowledge and information needs of Southeast Asians in adapting to or mitigating the negative impacts of changing climate in the agriculture and natural resource sectors. KC3 will feature regional climate change-related research and development works, news, a database of experts, learning events, photo gallery, and multimedia knowledge products.

Generally, KC3 will communicate and educate policymakers, donors, researchers, media, farmer-leaders, NGOs and other interested clients on issues, concerns, and positive actions about Climate Change Risk Management. KC3 aspires to nurture a culture of knowledge creation, sharing, use, and feedback among clients. Specifically, this Center hopes to achieve the following:

- Serve as a knowledge solutions hub of the regional network for current science-based information on natural resource management (NRM)-climate change;
- Support regional programs on NRM-climate change by providing strategic information related to adaptation and mitigation for decision-making purposes;
- Coordinate with regional and national network nodes on the exchange, processing, packaging, and distribution of NRM-climate change; and
- Synthesize and package science-based information using appropriate formats for various stakeholders.

Finalist at Clean Energy Marketplace

KC3 was one of the 13 poster competition finalists chosen from around the globe at the Clean Energy Marketplace sponsored by the Asian Development Bank (ADB) and United States Agency for International Development (USAID). The Clean Energy Marketplace was a feature of the High Profile Dialogue on Climate Change that was held back-to-back with the 4th Asia Clean Energy Forum 2009 on 15-19 June 2009.

The Clean Energy Marketplace Poster Competition featured innovative technologies, business projects, and models and programs in the light of clean energy as a means to mitigate climate change and its impacts.

The High Profile Dialogue on Climate Change and 4th Asia Clean Energy Forum convened about 800 participants from various groups: policymakers, private institutions, and non-governmental organizations. The forum provided the opportunity for stakeholders to share best practices and form partnerships in response to climate change.

SEARCA enjoins all concerned sectors to subscribe and actively participate in the KC3 activities, online or otherwise.

The virtual home of SEARCA's KC3 is at http://searcahub.objectis.net/. (BPJoven)

KU, JICA ink agreement on adaptation to climate change program

Signatories and witnesses to the agreement on the Integrated Project on Hydro-Meteorological Prediction and Adaptation to Climate Change in Thailand. *(Photo courtesy of KU)*

Kasetsart University (KU) signed on 25 March 2009 a memorandum of agreement on the "Integrated Project on Hydro-Meteorological Prediction and Adaptation to Climate Change in Thailand," or IMPACT-T Program for short. KU was represented by its President, Associate Professor Vudtechai Kapilakanchana.

The IMPACT-T Program is supported by the Japan International Cooperation Agency (JICA). The cooperating agencies in the implementation of the program are KU, Thai Meteorological Department, and the Royal Irrigation Department. (LLDDomingo, with report from KU website)