

LAYMAN'S ABSTRACTS

Low-Complexity Physical Layer Security Scheme for Heterogeneous Cellular Networks based on Coordinated Precoding Design and Artificial Noise Generation

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Heterogeneous Network (HetNet) deployment is a cellular system design approach in which multiple low power access nodes are underlaid in a traditional macro-cellular network. HetNets are able to provide substantial increase in cellular capacity and energy efficiency thus making it a viable solution to meet the demands in the next generation of cellular system, also known as 5G. In this study, we investigated how security can be incorporated into the downlink transmission (i.e. from telecommunications network to mobile phones) of HetNets while still maintaining their high cellular capacity and high energy efficiency properties. Our approach is to integrate information security, user data rate requirement, and power consumption of the HetNet's downlink transmission into a computationally-tractable convex optimization model. From the formulated model, we propose a security technique with suboptimal performance but with a computational complexity that is feasible for real-time implementation.

Feeding Habits of *Mobula japonica* (*Chondrichthyes*, *Mobulidae*) in Butuan Bay, Mindanao Island, Philippines

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We studied the feeding habits of the Spinetail Devil Ray *Mobula japonica*, locally known as Pantihan, from Butuan Bay, Eastern Bohol Sea from January to May 2016 using data on its stomach contents, and carbon and nitrogen stable isotope analyses. Small shrimp-like krill *Pseudeuphausia latifrons*, known locally as Alamang, contributed almost 100% to the devil ray's ingested food. Stable isotope analysis confirmed the specialized feeding and assimilation of the krill food. This study is the first to identify the swarming krill *P. latifrons* as the major food of the Spinetail Devil Ray in Butuan Bay.

Fucoidan Content in Philippine Brown Seaweeds

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The Philippines is home to hundreds of seaweed species that serve as sources of high-value natural products, such as fucoidan. Fucoidan is a sulfated polysaccharide that can be extracted from the cell walls of brown seaweeds and is reported to have a wide range of bioactivities for possible medicinal applications. In this study, we assessed Philippine brown seaweeds as sources of fucoidan by determining which species or genera among local brown algae has the highest content of partially purified fucoidan and where these species can be found within the country. Fucoidan content from different species of brown seaweeds were determined in fifty sites across fourteen provinces in Northern Luzon (Cagayan, Ilocos), West Luzon (Pangasinan), the Eastern seaboard of Luzon (Quezon Province, Camarines, Sorsogon), Central and Eastern Visayas (Bohol, Cebu, Negros Oriental, Negros Occidental), and Northern Mindanao (Camiguin, Lanao del Norte, Misamis Oriental, Misamis Occidental). *Sargassum* spp., the most abundant in all sites, and *Turbinaria ornata*, found only in 11 sites, both have significantly higher content compared to the other samples. Similarly, higher content of semi-pure fucoidan were observed in brown seaweeds from Bohol, Cebu, Pangasinan, Quezon Province, Camiguin, and Cagayan.

***Staphylococcus aureus* and Methicillin-resistant *S. aureus* (MRSA) carriage in Public Computer Service Providers and Utility Jeepneys in UP Diliman**

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Staphylococcus aureus is a bacterium that can cause serious infections. It is often found in solid objects, such as computer peripherals of computer service providers (CSPs) and handrails of public utility jeepneys (PUJs). *S. aureus* infections are often treated without complications, except

in cases where a particular strain called methicillin-resistant *S. aureus* (MRSA) is involved. In this study, the prevalence of *S. aureus* and MRSA in CSPs, computer peripherals, and handrails of PUJs inside UP Diliman, and associated risk factors for contamination were determined. *S. aureus* and MRSA were identified using morphological, biochemical, and molecular methods from 162 computer peripherals from 27 CSPs, and 196 PUJ handrails. *S. aureus* was identified in 92.6% of CSPs, 36.4% of computer peripherals, and 7.1% of PUJs, whereas MRSA was present in 3.1% of CSPs and 2% of PUJs. No significant associations between *S. aureus*/MRSA and the assessed risk factors were observed ($p > 0.05$). Results indicate that, while *S. aureus* prevalence is relatively high, MRSA carriage is low in CSPs and PUJs in UP Diliman.

Population Structure of the Krill Prey of the Spinetail Devil Ray *Mobula japonica* (Chondrichthyes, Mobulidae) from Southeastern Bohol Sea, Philippines

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While investigating the feeding habits of the Spinetail Devil Ray *Mobula japonica* in Butuan Bay, we found true krill (known locally as Alamang) as the main, often the only food item in the stomach of the ray. We identified the krill species as *Pseudeuphausia latifrons*. Information about the population of this krill species is very limited, thus this study was aimed at analyzing the size-composition of individuals collected from the stomach of the ray from January to May 2016. The total lengths of intact krill ranged between 4.0–6.9 mm for juveniles and 7.0–10.9 mm for adults. In general, males were larger than females. Juveniles were dominant until late March, and adults dominated by April and May. The largest male and egg-carrying female individuals also appeared during the warm months of April and May, indicating spawning during these months. This study provides evidence that individuals of the krill *P. latifrons* eaten by rays grow from juveniles to adults from January to May in Butuan Bay.