



# Monthly variation of chemical hydrography, chlorophyll *a*, and primary production around Keelung Islet

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## Introduction

Keelung Islet is an area located in East China Sea which is known as the most productive fishing ground in Taiwan. Mackerel and squid are dominant fishery catches in this area that located in the northeastern part of Taiwan. Seasonal catches of squid was reported and the highest abundance was found in summer.

The phenomenon of seasonal abundance of squid is likely induced by an increasing of phytoplankton activity by converting the sunlight and consuming the available nutrient such as nitrate, phosphate, and silicate. The process of converting light and nutrient by phytoplankton is referred as photosynthesis or also known as primary production. Nevertheless, the periodical variation of primary production around Keelung Islet has rarely investigated.

Therefore, this study presents the monthly variation of chemical hydrography, chlorophyll *a* concentration, and primary production around Keelung Islet during 2011.

## Method

### Site

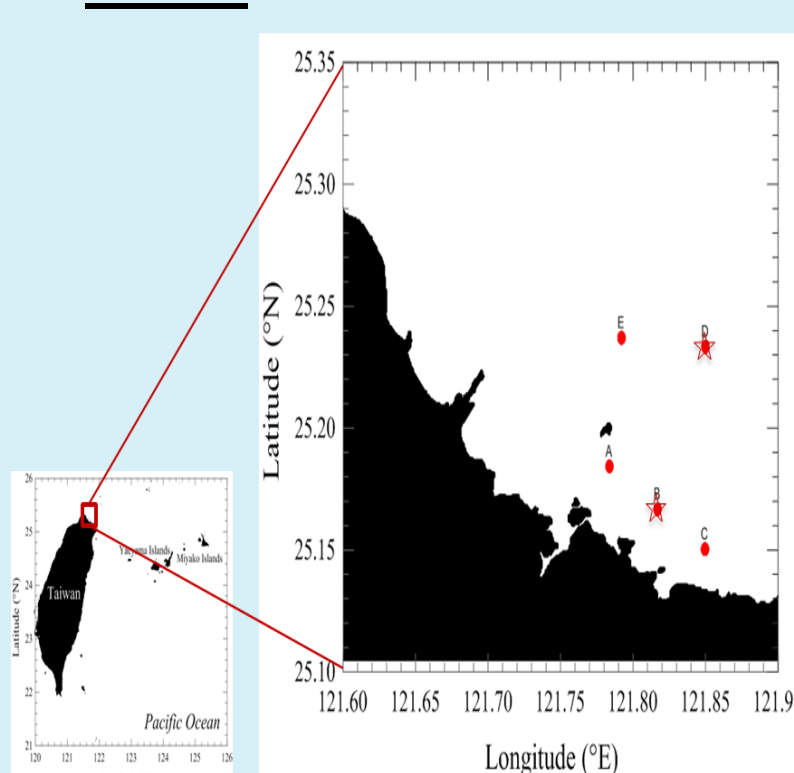


Fig 1. Map of sampling site. A, B, C represent the inshore station (35 – 70 m depth) while D and E represent the offshore station (100 – 150 m depth). ( ) symbol indicates primary production carried out by PB-E curve method

### Time and parameters

Cruise No	Date	Season	Parameters	Instruments/methods
OR2_1781	2011-04-21	spring	Incident PAR	Biospherical quantum scalar irradiance system
OR2_1788	2011-05-16	spring		
OR2_1796B	2011-06-10	summer	Temperature	Seabird CTD (SBE 9/11 plus)
OR2_1808	2011-07-29	summer	Nutrient (NO <sub>3</sub> , PO <sub>4</sub> , SiO <sub>4</sub> )	Spectrophotometry
OR2_1816B	2011-09-06	fall		
OR2_1829A	2011-10-19	fall	Chlorophyll <i>a</i>	Fluorometry
OR2_1838A	2011-11-17	fall	Primary production	PB-E curve
OR2_1845	2011-12-20	winter		

## Result

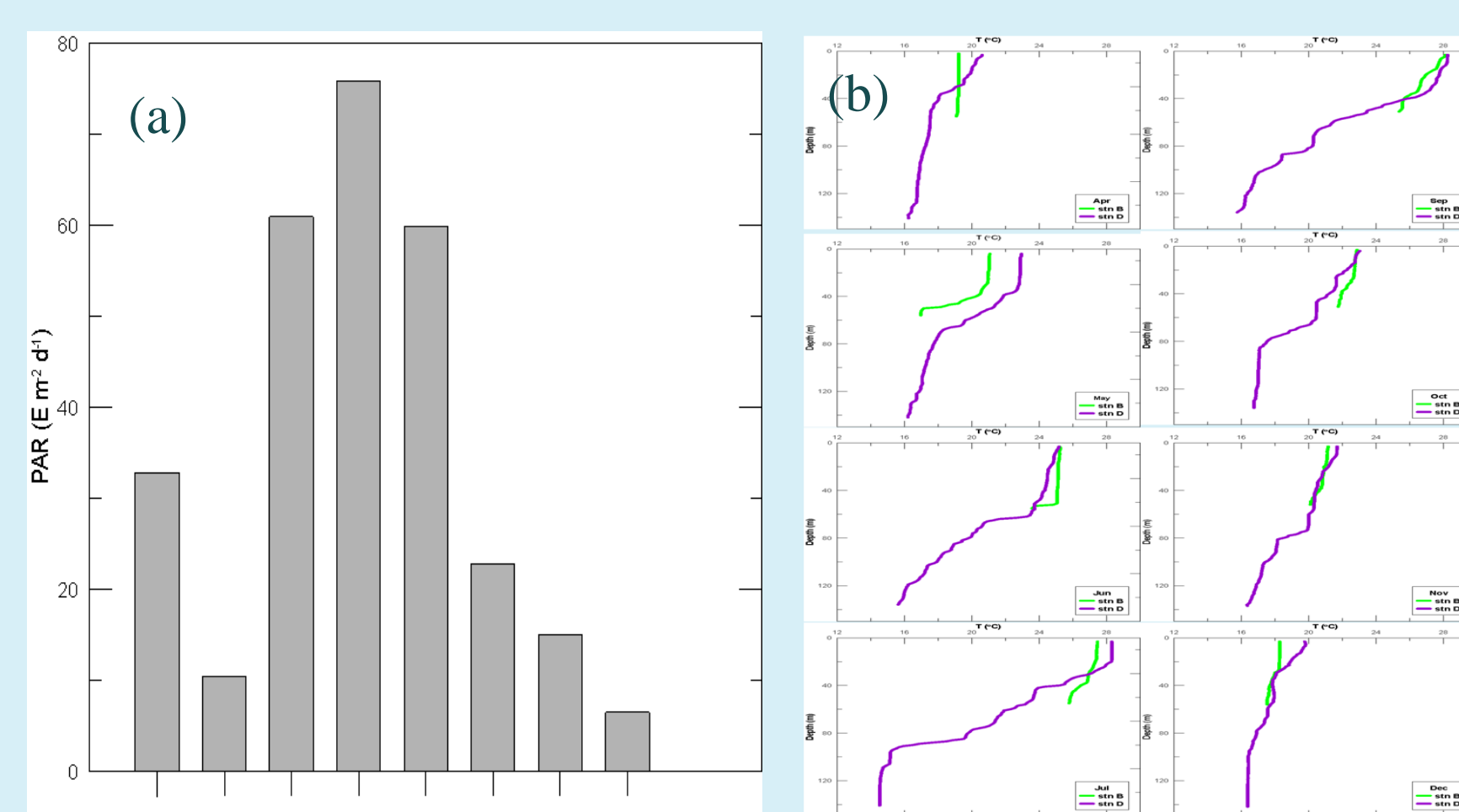


Fig 2. (a) Monthly photosynthetically active radiation (PAR) and (b) monthly temperature profile between station B and D in Keelung Islet

Monthly PAR around Keelung Islet during 2011 showed an increasing from April until high intensity in July. After reaching the peak, PAR intensity decreased until December.

The temperature profile showed the pattern between B and D station is generally different, except on May and September. Strong stratification was more intensively occurred in D station than B station.

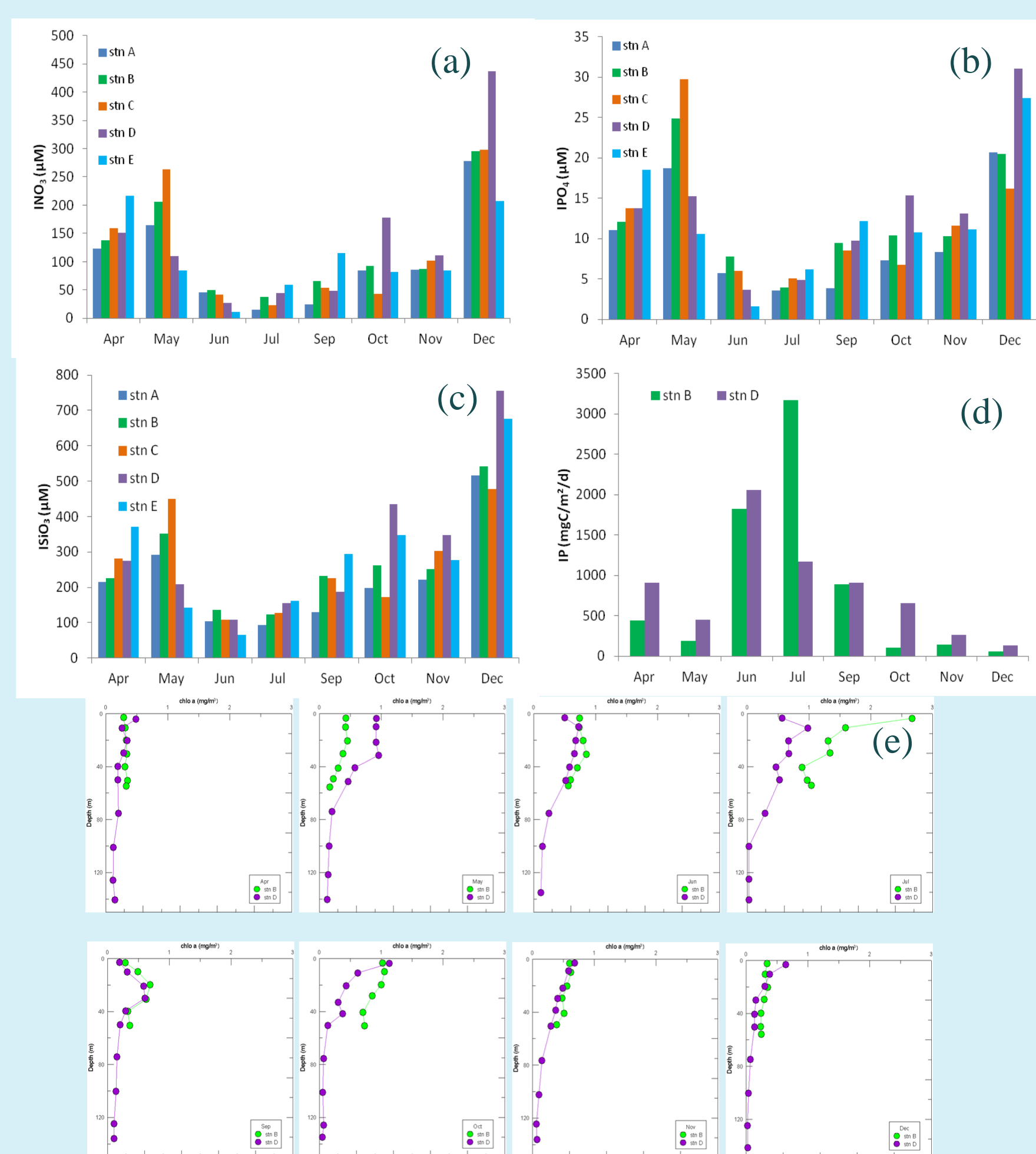


Fig 3. Monthly integrated nutrient in euphotic zone for INO<sub>3</sub> (a), IPO<sub>4</sub> (b), and ISiO<sub>4</sub> (c) for all stations, and monthly integrated primary production in euphotic zone (d) and chlorophyll *a* profile (e) for station B and D.

The euphotic zone enriched nutrient related to the low value of concentration of surface chlorophyll *a* and primary production. The elevated of primary production and surface chlorophyll *a* was taken place on July when integrated of nitrate, phosphate, and silicate was depleted. The depleted nitrate on September also induced the highest concentration of chlorophyll *a* was found at subsurface.

## Discussion

The elevated primary prouduction around Keelung Islet was regulated by two factors, light and nutrient. The good performance of primary production to convert light and nutrient was found at June for station D and July for station B when the PAR is high enough and nutrient availability is also enough.

The nitrate limiting system was occurred on September for station B and July until September for station D. At these time, both station have enough PAR intensity with relatively high value compared to other month. Conversely, the availability of nitrate at surface for these station is limited although the phosphate and silicate concentration were exist (Fig 4).

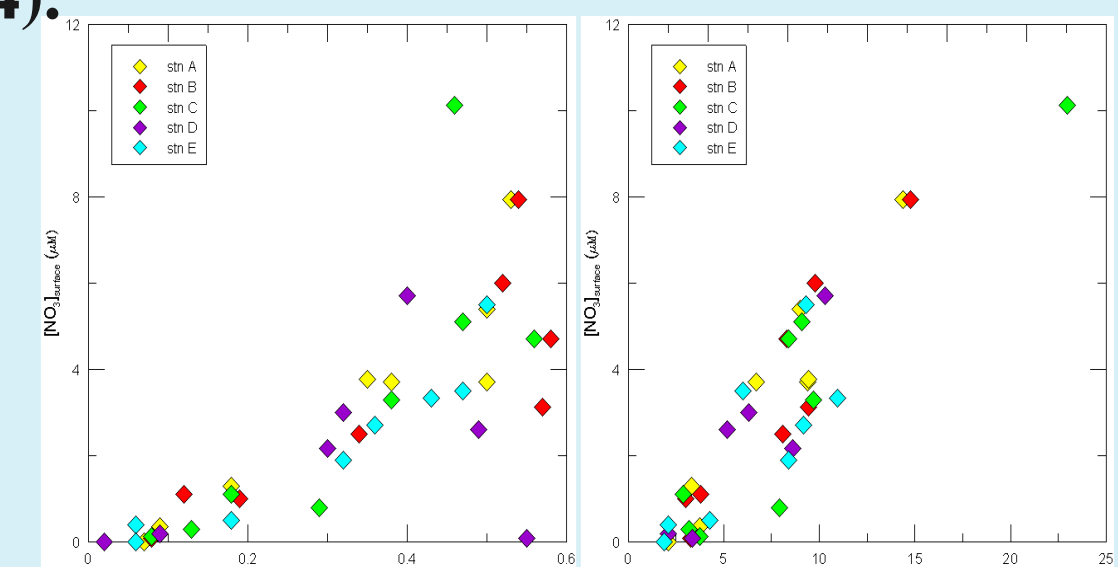


Fig 4. The relationship between nitrate concentration with phosphate and silicate concentration at surface water for all station.

One another factor that also induced the primary production is summer stratification. The high PAR intensity in summer induced the temperature distinction between surface and deeper water column and then created stratification. The stratification would block the nutrient transportation from enriched nutrient layer to the depleted layer. Thus, the primary production at station D on July was found lower than previous month. Although the integrated of nutrient was present, the strong stratification induced the depleted nutrient at surface.

## Conclusion

Keelung Islet has been known as famous fishing ground in northeastern Taiwan. The high fishery productivity is likely powered by phytoplankton activity and environmental condition. The monthly variation of primary production was mostly influenced by PAR except July and September which was controlled by nitrate limitation. Another factor regulating primary production around Keelung during 2011 was summer stratification. Eventhough, PAR was observed highest on July, primary production in the station D was found lower than station B that was caused by strong stratification induced by deeper depth.