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Improving the production of giant tiger prawn using an unidentified species of *Chaetomorpha* having euryhaline nature

For three decades, giant tiger prawn (*Penaeus monodon* Fabricius) has been an important aquatic export product of Southeast Asian countries, providing income support to shrimp aquaculturists. However, giant tiger prawn production has recently been decreasing due to pond eutrophication and/or shrimp diseases caused by high-density and intensive aquaculture systems. We have been developing a closed co-culture system incorporating giant tiger prawn and unexploited benthos, *Chaetomorpha* sp., under an international collaboration project between King Mongkut's Institute of Technology Ladkrabang (KMITL) and Japan International Research Center for Agricultural Sciences (JIRCAS).

Chaetomorpha species (Fig. 1) found at the coast of central Thailand is considered to be an unidentified species from the results of morphological observation, ecological monitoring, and phylogenetic molecular sequencing analysis. Field surveys revealed this alga to be abundant throughout the year in stagnant coastal ponds and irrigation channels with salinity of 3.4–90 psu. Its highest mean specific growth rate of approximately 60% day^{-1} (2 mm particle became 20 cm within one week) was observed in laboratory experimental trials at salinities of 20–30 psu at 30 °C (Fig. 2). This seaweed contained 20.4% protein and 64.8% carbohydrates, and giant tiger prawn preferably grazed this alga even when provided artificial feed pellets. When giant tiger prawn was co-cultured with *Chaetomorpha* sp., shrimp growth and feed conversion ratio (FCR*) improved by approximately 57% and 39%, respectively, compared with monocultured prawn (Table 1).

It is expected that this alga can be easily applied to intensive shrimp aquaculture ponds worldwide due to its wide tolerance to salinity. However, experimental data at earthen pond level is needed for practical use of this co-culture system. An analysis of consumers' preferences, such as shrimp color, taste, etc., also needs to be undertaken in anticipation of product distribution.

* An index indicating the feed quantity necessary to increase the specific weight of fisheries animals. Lower value shows greater efficiency.

FCR = feed given (dry weight) / weight increase in fisheries animals (wet weight)

(I. Tsutsui, D. Aue-mneoy [King Mongkut's Institute of Technology Ladkrabang])

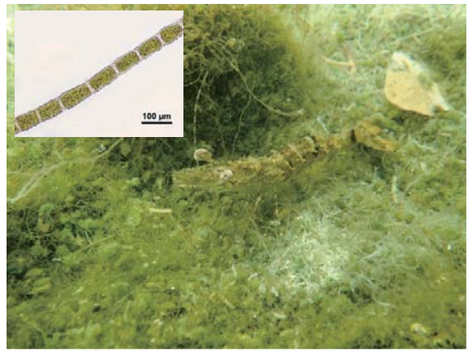

Fig. 1. *Chaetomorpha* sp. and giant tiger prawn. Inset photo (upper left corner) shows microscopic photograph of *Chaetomorpha* sp.

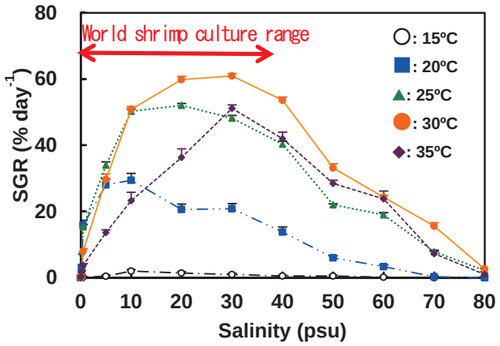

Fig. 2. Mean specific growth rates (SGR) of *Chaetomorpha* sp. under different salinities and water temperatures

Table 1. Growth performance, SGR, and FCR of giant tiger prawn juveniles in a monoculture and in co-culture with *Chaetomorpha* sp.

	Monoculture	Co-culture
Mean initial weight of individual shrimp (g)	0.39 ± 0.03 ^{a}	0.39 ± 0.03 ^{a}
Mean terminal weight of individual shrimp (g)	7.15 ± 1.28 ^{a}	11.20 ± 0.65 ^{b}
Final weight difference compared with control (%)	100	157
SGR of shrimp (% day^{-1})	4.14 ± 0.27 ^{a}	4.79 ± 0.08 ^{b}
FCR of shrimp	2.39 ± 0.28 ^{a}	1.46 ± 0.62 ^{b}
FCR reduction rate compared with control (%)	100	61

Values are shown as mean ± standard deviation from triplicate data. Different superscript labels within the same row indicate significant difference between means (Tukey-Kramer HSD test, $p < 0.05$).