*Biodiversity Journal*, 2014, 5 (4): 453–458

# New records of sea stars (Echinodermata Asteroidea) from Malaysia with notes on their association with seagrass beds

Woo Sau Pinn[1*], Amelia Ng Phei Fang[2], Norhanis Mohd Razalli[2], Nithiyaa Nilamani[2], Teh Chiew Peng[2], Zulfigar Yasin[2], Tan Shau Hwai[2] & Toshihiko Fujita[3]

[1]Department of Biological Science, Graduate School of Science, The University of Tokyo 7-3-1 Hongo, Bunkyo-ku, Tokyo 113-0033 Japan.
[2]Universiti Sains Malaysia, School of Biological Sciences, Marine Science Lab, 11800 Minden, Penang, Malaysia
[3]Department of Zoology, National Museum of Nature and Science, 4-1-1 Amakubo, Tsukuba, Ibaraki 305-0005 Japan
[*]Corresponding author, e-mail: abe_woo@hotmail.com

**ABSTRACT** A survey of sea stars (Echinodermata Asteroidea) was done on a seagrass habitat at the southern coast of Peninsular Malaysia. A total of five species of sea stars from four families (Luidiidae, Archasteridae, Goniasteridae and Oreasteridae) and two orders (Paxillosida and Valvatida) were observed where three of the species were first records for Malaysia. The sea stars do not exhibit specific preference to the species of seagrass as substrate, but they were more frequently found in the area of seagrass that have low canopy heights.

**KEY WORDS** Biodiversity; seagrass; sea stars; Straits of Malacca.

Received 15.09.2014; accepted 02.12.2014; printed 30.12.2014

## INTRODUCTION

The knowledge of diversity and distribution of asteroids in Malaysia is very limited. There are only three accounts of sea stars (Echinodermata Asteroidea) previously reported in Malaysia where all of the surveys are mainly done in shallow coral reefs (George & George, 1987; Zulfigar et al., 2008; Sim et al., 2009).

Seagrass beds are another important marine environment in Malaysian waters. There are a total of 14 species of seagrasses recorded (Bujang et al., 2006), and apart from the common inshore lagoons, seagrass meadows are also found in the offshore islands with fringing reefs (Bujangand & Zakaria, 2003). This study presents the first record of asteroids associated with a seagrass bed in Malaysia.

## MATERIAL AND METHODS

A survey of sea stars was done in the seagrass bed of Merambong shoal (N 1º19'58.01"; E 103º 36' 08.30") southern tip of Peninsular Malaysia (Fig.1). Wandering transect was done by walking at seagrass bed when it was exposed extensively during the best low spring tide of the year from 25th to 27th of May 2013 (07:30-09:30 h). The exposure of the seagrass bed only allowed a window of two hours of sampling per day for three days. Asteroids were collected using labelled sampling bags and brought to the laboratory for further identifications. Asteroid specimens were anaesthetized using seawater mixed with menthol crystals. Colour photographs of live specimens were taken before being fixed using 70% ethanol. All specimens were preserved by drying and deposited in Marine

Science Lab, Universiti Sains Malaysia, Penang, Malaysia (MSL/MS).

## RESULTS AND DISCUSSION

Five species of asteroids from four families and two orders were found in the Merambong shoal seagrass bed: *Luidia maculata* of the family Luidiidae (Fig. 9, voucher specimen MSL/MS/AST001), *Archaster typicus* of Archasteridae (Figs. 2, 3 - voucher specimen MSL/MS/AST002), *Stellaster equestris* from the family Goniasteridae (Figs. 4, 5 - voucher specimen MSL/MS/AST003) and two from family Oreasteridae: *Protoreaster nodosus* (Fig. 8, voucher speciemen MSL/MS/AST004), *Goniodiscaster scaber* (Figs. 6, 7 - voucher specimen MSL/MS/AST005).

All species of asteroids occurring in Malaysian waters are listed in Table 1. Previous records were based on George & George (1987), Zulfigar et al. (2008), and Sim et al. (2009). The areas surveyed and covered by these three previous publications were larger and centered at coral reefs which contribute to the higher number of species of asteroids. Zulfigar et al. (2008) and Sim et al. (2009) listed asteroids found in shallow reefs throughout the entire coast of Malaysia and George & George (1987) at the lagoons and coral reefs of east coast of Sabah. All five species were widely distributed in Indo-West Pacific region (Clark & Rowe, 1971). Besides their wide distribution, the present records of *Stellaster equestris*, *Luidia maculata* and *Goniodiscaster scaber* were new state records in Malaysian waters filling the gap in the species distribution along the transition waters of Straits of Malacca and South China Sea, consequently increasing the total number of asteroids recorded in Malaysian waters to 34 species. The recurring species were *Archaster typicus* and *Protoreaster nodosus*, which had been both recorded in the central of South China Sea and the East Coast of Sabah.

*Protoreaster nodosus* is known to prefer substrates of seagrass and sand (Zulfigar et al., 2008) even though it has been rarely found on corals and rocks (Bos et al., 2008). *Archaster typicus* is found in a wide range of sediment types which include seagrass beds (Huang et al., 2006), and Mukai et al. (1986) noted that the distribution of *A. typicus* was independent of the specific grain size. Other species *S. equestris*, *L. maculata* and *G. scaber* were commonly reported throughout the Indo-Pacific region but were not specifically mentioned to be associated with the seagrass except *L. maculata* on the seagrass of the western Arabian Gulf (Price, 1981).

Seagrass plays many important ecological functions in the marine environment such as food,

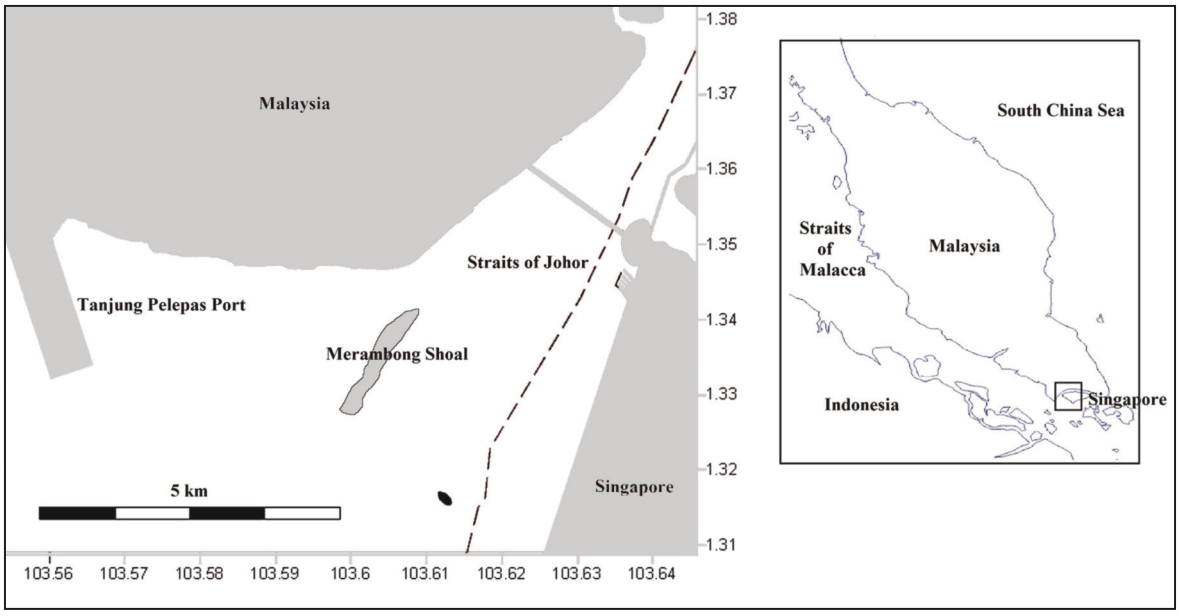
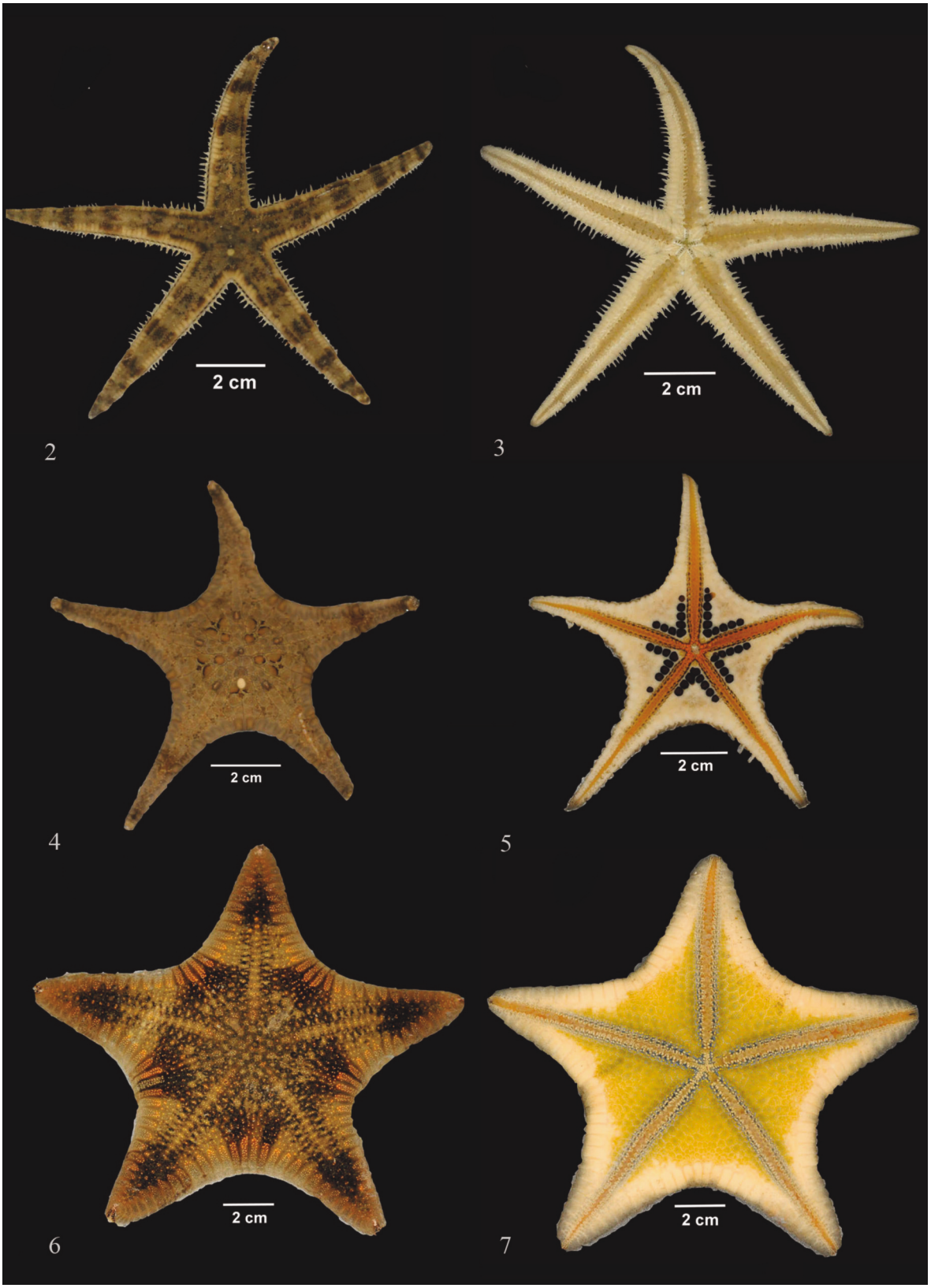



Figure 1. Study area in Merambong shoal, southern tip of Peninsular Malaysia in the Straits of Johor.




Figures 2, 3. *Archaester typicus*: dorsal view (Fig. 2) and ventral view (Fig. 3). Figures 4, 5. *Stellaster equestris*: dorsal view (Fig. 4) and ventral view (Fig. 5). Figures 6, 7. *Goniodiscaster scaber*: dorsal view (fig. 6) and ventral view (Fig. 7).

| List of Species | George & George, 1987 | Zulfigar et al., 2008 | Sim et al., 2009 | This study |
|---|---|---|---|---|
| ACANTHASTERIDAE | | | | |
| *Acanthaster planci* (Linnaeus, 1758) | # | # | # | |
| ARHCASTERIDAE | | | | |
| *Archasterty picus* Müller et Troschel, 1840 | # | | | # |
| ASTEROPSEIDAE | | | | |
| *Asteropsis carinifera* (Lamarck, 1816) | | # | # | |
| ECHINASTERIDAE | | | | |
| *Echinaster callosus* Marenzeller, 1895 | # | # | # | |
| *Echinaster luzonicus* (Gray, 1840) | # | # | # | |
| *Echinaster* sp. | | # | | |
| *Metrodira subulata* Gray, 1840 | # | | | |
| GONIASTERIDAE | | | | |
| *Stellaster equestris* (Retzius, 1805) | | | | #* |
| LUIDIIDAE | | | | |
| *Luidia maculata* Müller et Troschel, 1840 | | | | #* |
| MITHORODIIDAE | | | | |
| *Mithorodia fisheri* Holly, 1932 | | # | # | |
| OPHIDIASTERIDAE | | | | |
| *Celerina heffernani* (Livingstone, 1936) | # | | | |
| *Fromia elegans* H.L. Clark, 1921 | # | | | |
| *Fromia milleporella* (Lamarck, 1816) | # | | | |
| *Fromia monilis* (Perrier, 1869) | # | # | # | |
| *Fromia indica* (Perrier, 1869) | | # | # | |
| *Fromia* sp. | | # | | |
| *Linckia guildingi* Gray, 1840 | | # | # | |
| *Linckia laevigata* (Linnaeus, 1758) | # | # | # | |
| *Linkia* cf. *multifora* (Lamarck, 1816) | # | # | # | |
| *Linckia multifora* (Lamarck, 1816) | | # | # | |
| *Nardoa* cf. *gomophia* (Perrier, 1875) | | # | # | |
| *Nardoa galathea* (Lütken, 1865) | # | | | |
| *Nardoa gomophia* (Perrier, 1875) | # | | | |
| *Nardoa tuberculata* (Gray, 1840) | # | | | |
| *Nardoa novaecaledoniae* (Perrier, 1875) | # | | | |
| *Leiaster speciosus* von Martens, 1866 | | # | # | |
| *Leiaster* sp. | | # | | |
| *Ophidia sterhemprichi* Müller et Troschel, 1842 | | # | # | |
| OREASTERIDAE | | | | |
| *Choriaster granulatus* Lütken, 1869 | # | # | # | |
| *Culcita novaeguineae* Müller et Troschel, 1842 | # | # | # | |
| *Culcita* cf. *coriacea* Müller et Troschel, 1842 | | | # | |
| *Goniodiscaster scaber* (Moebius, 1859) | | | | #* |
| *Neoferdina offreti* (Koehler, 1910) | | # | # | |
| *Protoreaster nodosus* (Linnaeus, 1758) | # | | # | # |
| *Pentaster obtusatus* (Bory de St. Vincent, 1827) | # | | | |
| **Total number of species** | **19** | **20** | **19** | **5** |

Table 1. Records of asteroids in Malaysian (* new records found in Malaysian waters).

refuge and habitat for numerous other associated organisms, improving water quality and as natural barrier for protection of coasts against wave actions, and sea stars are one important organism associated to the seagrass bed (Gullström et al., 2002). The seagrass of Merambong shoal is composed of ten different species of seagrasses: *Enhalus acroides*, *Halodule uninervis*, *Halodule pinifolia*, *Cymodocea serrulata*, *Cymodocea rotundata*, *Thalassia hemprichii*, *Halophila spinulosa*, *Halophila ovalis*, *Halophila minor* and S*yringodium isoetifolium* (Bujang et al., 2006).

Field observation did not reveal any particular association of these asteroids to any specific species of seagrass nor percentage area coverage of seagrass as they were observed throughout the seagrass area. In terms of canopy heights of seagrass and abundance of asteroids, areas with lower canopy heights (in particular from the genera *Halodule*, *Cymodocea* and *Halophila*) have higher abundance in composition of asteroids compared to areas dominated by high canopy of seagrass (*Enhalus acroides*) no asteroids where observed.

Vonk et al. (2010) proposed that macrobenthic organisms including *P. nodosus* generally prefer area with high seagrass biomass due to increased habitat complexity and shelter from predation. Scheibling (1980) and Scheibling & Metaxes (2008) found that *Oreaster reticulatus* and *Protoreaster nodosus* on seagrass bed feed on microbial and microalgal films, detritus on the surface of seagrass and macroalgae. Scheibling & Metaxes (2008) also noted the presence of detritus mainly made out of decomposing seagrass blades and also epiphytes on the seagrass in the stomach contents of *P. nodosus* in Palau. Some sea stars also utilize the seagrass as a transition habitat in juvenile period as exhibited by *A. typicus* (Bos et al., 2011), where the juveniles migrate from mangrove to sandy and seagrass areas before proceeding to shores. This indicates that seagrass beds are important habitats that are closely linked to asteroids.

The present study suggests the association of asteroids to sea grass habiat. There are many other seagrass beds in the Peninsular Malaysia, yet to be surveyed, that possibly harbor other species of sea stars. Future studies in this region should be done to reveal new records of species and to fill in the gap of species list as well as geographical distribution of sea stars.

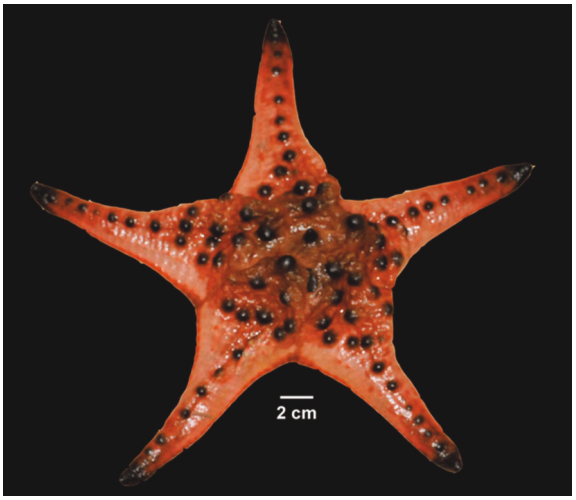



Figure 8. Dorsal view of *Protoreaster nodosus*.


Figure 3. Field photograph of *Luidia maculata*.

## ACKNOWLEDGEMENTS

We are especially grateful to members of the Marine Science Lab, Universiti Sains Malaysia and Dr. Yuji Ise from University of Tokyo for their kind assistance during the field and laboratory work. We also want to mention the contribution from University Putra Malaysia for sampling and logistic arrangements. This study was in collaboration with the Japan Society for the Promotion of Science for the Asian CORE Program (Coastal Marine Science in Southeast Asia: COMSEA). We are also grateful for the financial support from the Ministry of

Higher Education Malaysia (MOHE) provided through the grant: 304/PB/650630/U137.

## REFERENCES

Bos A.R., Gumanao G.S., Alipoyo J.C.E. & Cardona L.T., 2008. Population dynamics reproduction and growth of the Indo-Pacific horned sea star, *Protoreaster nodosus* (Echinodermata: Asteroidea). Marine Biology, 156: 55–63.

Bos A.R., Gumanao G.S., van Katwigk M.M., Mueller B., Saceda M.M. & Tejada L.P., 2011. Ontogenetic habitat shift, population growth and burrowing behaviour of the Indo-Pacific beach star, *Archaster typicus* (Echinodermata; Asteroidea). Marine Biology, 158: 639–648.

Bujang J.S. & Zakaria M.H., 2003. The Seagrasses of Malaysia. In: Short F.T. & Spalding M.D., (Eds.). World Atlas of Seagrasses, California University Press, pp.152–160.

Bujang J.S., Zakaria M.H. & Aziz A., 2006. Distribution and significance of seagrass ecosystems in Malaysia. Aquatic Ecosystem Health & Management, 9: 203–214.

Clark A.M. & Rowe F.W.E., 1971. Monograph of shallow-water Indo-West Pacific Echinoderms. Trustees of the British Museum (Natural History), London, pp. 27–74.

George J.D. & George J., 1987. The Coral Reefs of the Bodgaya Islands (Sabah: Malaysia) and Pulau Sipadan. 4. Macroinvertebrates. Malayan Nature Journal, 40: 225–260.

Gullström M., Castro M.T.C., Bandeira S.O., Björk M., Dahlberg M., Kautsky N., Rönnäck P. & Öhman M.C., 2002. Seagrass Ecosystems in the Western Indian Ocean. Ambio, 31: 588–596.

Huang X., Huang L., Li Y., Xu Z., Fong C.W., Huang D., Han Q., Huang H., Tan Y. & Liu S., 2006. Main seagrass beds and threats to their habitats in the coastal sea of South China. Chinese Science Bulletin, 51: 136–142.

Mukai H., Nishihira M., Kamisato H. & Fujimoto Y., 1986. Distribution and abundance of the sea-star *Archaster typicus* in Kabira Cove, Ishigaki Island, Okinawa. Bulletin of Marine Science, 38: 366–383.

Price A.R.G., 1981. Studies on the Echinoderm fauna of the western Arabian Gulf. Journal of Natural History, 15: 1–15.

Scheibling R.E., 1980. Abundance, spatial distribution, and size structure of populations of *Oreaster reticulatus* (Echinodermata: Asteroidea) in seagrass beds. Marine Biology, 57: 95–105.

Scheibling R.E. & Metaxas A., 2008. Abundance, spatial distribution and size structure of the sea star *Portoreaster nodosus* in Palau, with notes on feeding and reproduction. Bulletin of Marine Science, 82: 221–235.

Sim Y.K., Aileen Tan S.H. & Zulfigar Y., 2009. The diversity and abundance of the sea stars (Echinodermata: Asteroidea) from coral reefs of the Central South China Sea. Selected Papers of The NaGISA Westpac Congress 2008, 9: 25–36.

Vandenspiegel D., Lane D.J.W., Stampanato S. & Jangoux M., 1998. The asteroid fauna (Echinodermata) of Singapore, with distribution table and an illustrated identification of species. The Raffles Bulletin of Zoology, 46: 431–470.

Vonk J.A., Christianen M.J.A., & Stapel J., 2010. Abundance, edge effect, and seasonality of fauna in mixed-species seagrass meadows in southwest Sulawesi, Indonesia. Marine Biology Research, 6: 282–291.

Zulfigar Y., Sim Y.K., Tan S.H. & Shirayama Y., 2008. Field Guide to the Echinoderms (Sea Cucumbers and Sea Stars) of Malaysia. Kyoto University Press, Japan.