Multi-species sea cucumber spawning at Limellon Island, New Ireland Province, Papua New Guinea

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On 11 and 12 November 2015, synchronised multi-species sea cucumber spawning events were observed at Limellon Island (2°40.557'S and 150° 46.231'E, Fig. 1), near Kavieng, New Ireland Province, Papua New Guinea (PNG). The observations were made during transect surveys conducted as part of an Australian Centre for International Agricultural Research (ACIAR) and PNG National Fisheries Authority (NFA) study investigating the potential for community-based sea cucumber mariculture in New Ireland. Limellon is the site of a proposed trial sea ranching site for the commercially valuable holothurian sandfish, *Holothuria scabra*. The 7 ha sea ranch is characterised by seagrass and bare sand habitats, with a maximum depth of around 2 m at high tide. The spawning events described here occurred in shallow seagrass meadows (predominantly *Enhalus acoroides*, *Thalassia hemiramppi*, *Cymodocea rotundata*) where depth varied from 0.01 m to 1.5 m when surveys were being undertaken. All surveys were carried out after 12:00 on a rising tide in order to maximise the number of sandfish counted because most sandfish remain buried during the early part of the day (Mercier et al. 2000) and are also more abundant on the surface at high tide (Wolkenhauer 2008.). Around 3,360 m^2 of the seagrass meadow was surveyed over the two days.

On 11 November, a few individuals of six sea cucumber species were observed spawning on the afternoon high tide: curryfish (*Stichopus herrmanni*), snakefish (*H. coluber, H. flavomaculata* and *H. leucospilota*), chalkfish (*Bohadschia marmorata*), hairy blackfish (*Actinopyga miliaris*), deepwater red fish (*A. echinites*) and an unidentified non-commercial species (possibly *H. percax*). However, a much larger event was observed on 12 November, the afternoon prior to the new moon, when nine species (out of 12 recorded in surveys) were observed spawning simultaneously. Small numbers of *H. percax*, curryfish, snakefish, hairy blackfish, brown sandfish (*B. vitiensis),* stonefish (*A. lecanora*) and deepwater red fish spawned alongside much greater numbers of chalkfish and sandfish (Figs. 2, 3, 4). Chalkfish and sandfish were the most common species recorded in transects, with counts of 846 and 230 individuals, respectively, on the two survey days. The spawning event was intense but relatively brief, commencing sometime before 13:00 (time of first observations), peaking at around 14:00 and ceasing at around 15:00. At its peak, hundreds of adult chalkfish and large numbers of small to medium size sandfish were observed in spawning

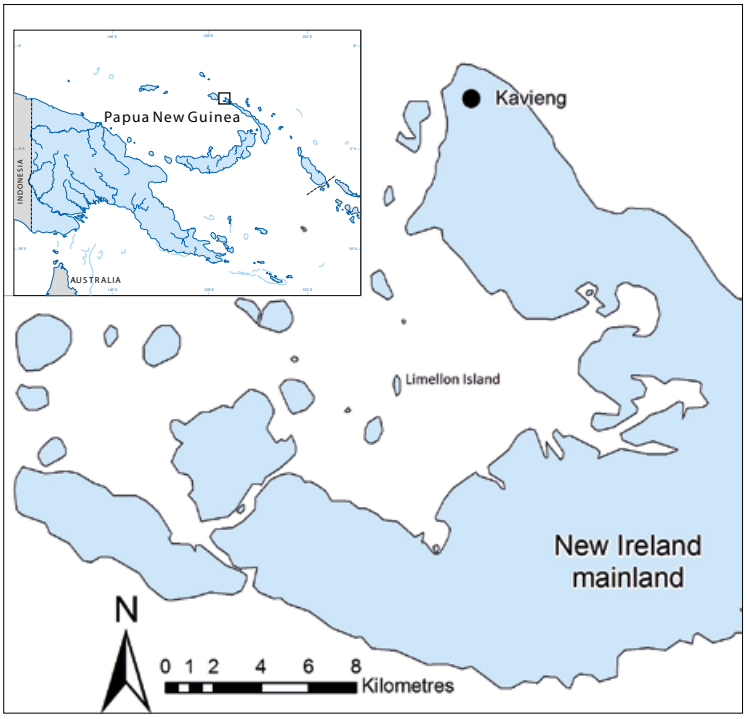

Figure 1.
The northern tip of New Ireland, PNG, showing the location of Limellon Island.

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attitudes with their anterior sections raised and waving around, or releasing gametes. According to available tide tables, there was a high tide of 1.38 m at 14:20, a barely discernable low tide of 1.36 m at 15:33 hours, followed by another high tide of 1.37 m at 16:22.

Of the 12 sea cucumbers recorded over the two-day period, only 3 species – golden sandfish (*H. lessoni*), leopardfish (*B. argus*) and lollyfish (*H. atra*) – were not observed spawning. However, these species were uncommon on transects (e.g. in the 3,360 m^2 surveyed, only 3 golden sandfish, 4 leopard fish and 11 lollyfish were counted). Moreover, the survey team was restricted to observations in proximity to the transect lines, and were not able to report on other parts of the site. No spawning of any holothurian species was observed during earlier survey days of 9–10 November.

Figure 2. Brown sandfish (*Bohadschia vitiensis*) exhibiting spawning behaviour.
(Image: E. Leini)

Relatively small sandfish were spawning in short, sparse seagrass in shallow, nearshore areas where the water was very warm. Some spawning sandfish were less than 12 cm in length and estimated to be less than 130 g in weight (based on length and width measurements, see Purcell and Simutoga 2008). This is less than the published length at first maturity of 16 cm and weight of 184 g (Conand 1990). This could be due to fishing-induced selection for early maturing individuals (Law 2000) or possibly due to the different geographical location (cf. New Caledonia, Conand 1990). Small hatchery-bred sandfish have been observed spawning in sea ranches in the Philippines (Olavides et al. 2011) and experimental sea pens in Fiji (Hair 2012).

Due to reported low stocks of commercial sea cucumbers, NFA imposed a moratorium on sea cucumber harvesting in 2009 (Carleton et al. 2013) and the fishery remains closed at the current time. Although spawning events such as the one reported here do not guarantee successful recruitment of juveniles, it is nonetheless a positive sign for the

Figure 3. Female snakefish (*Holothuria flavomaculata*) releasing eggs.
(Image: P. Bitalen)

Figure 4. Sandfish (*Holothuria scabra*) and chalkfish (*Bohadschia marmorata*) exhibiting spawning behaviour, side by side. (Image: E. Leini)

future of this valuable industry. Ongoing monitoring of sea cucumber stocks is required in order to determine whether recruitment is occurring and populations are increasing.

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