

Linking Recordings of Fish Vocalization with Observations of Spawning Behavior on a Multi-species Fish Spawning Aggregation

Vinculación de las Grabaciones de Vocalizaciones de Pescado con las Observaciones del Comportamiento de Desove en una Agregación de Desove de Varias Especies

Lier Enregistrements de Vocalisation de Poisson avec les Observations du Comportement Reproducteur sur une Agrégation de Frai des Poissons Multi-espèces

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EXTENDED ABSTRACT

Over the last decade, researchers have increasingly used passive acoustics to discover and monitor fish spawning aggregations (FSAs) in terms of both species presence and relative abundance (Appeldoorn et al. 2013, Mann et al. 2010, Nelson et al. 2011, Rowell et al. 2011, Rowell et al. 2012, Schärer et al. 2012a, 2012b, 2014). A growing library of species-specific vocalizations made on spawning sites has aided these survey efforts. However, because most Caribbean reef FSAs occur at remote locations and in deep (> 40 m) water, coupled visual and acoustic observations during spawning have proven difficult to collect. Since 2002, scientists and volunteers from the Reef Environmental Education Foundation (REEF) and the Cayman Islands Department of Environment (CIDOE) have been studying a shallow (30 m) and easily accessible multi-species FSA on the west end of Little Cayman, Cayman Islands, through the Grouper Moon Program (GMP; www.reef.org/groupermoonproject). In January 2013, GMP personnel deployed a continuously recording passive acoustic hydrophone at the FSA site, and subsequently monitored nightly spawning behaviors of aggregating species through both visual surveys and underwater video over a 5-day period. During this period the hydrophone recorded vocalizations from Nassau grouper (*Epinephelus striatus*), red hind (*Epinephelus guttatus*), black grouper (*Mycteroperca bonaci*) and yellowfin grouper (*Mycteroperca venenosa*).

Nassau grouper spawned over 4 consecutive nights starting January 30th. The number of Nassau grouper vocalizations per unit time during the evenings increased on nights leading up to the full moon, and were highest on the first 3 nights of spawning (Figure 1). This strong correlation between the number of days prior to spawning and vocalization rates suggests that this relationship could be used to predict and/or infer spawning activities at locations where conditions preclude direct observations. Interestingly, vocalization rates remained high several hours after sunset on all nights. It is unclear if these vocalizations are associated with ongoing spawning after dark; diver observations suggest spawning stops approximately 30 minutes after sunset.

While no spawning activity for any of the other species was directly observed by divers, their vocalization rates (and presumably spawning activity) all peaked earlier in the month than Nassau grouper. Red hind vocalizations peaked in the evening on January 30th, while both black grouper and yellowfin grouper vocalizations peaked on the evening of January 31st (Figure 2).

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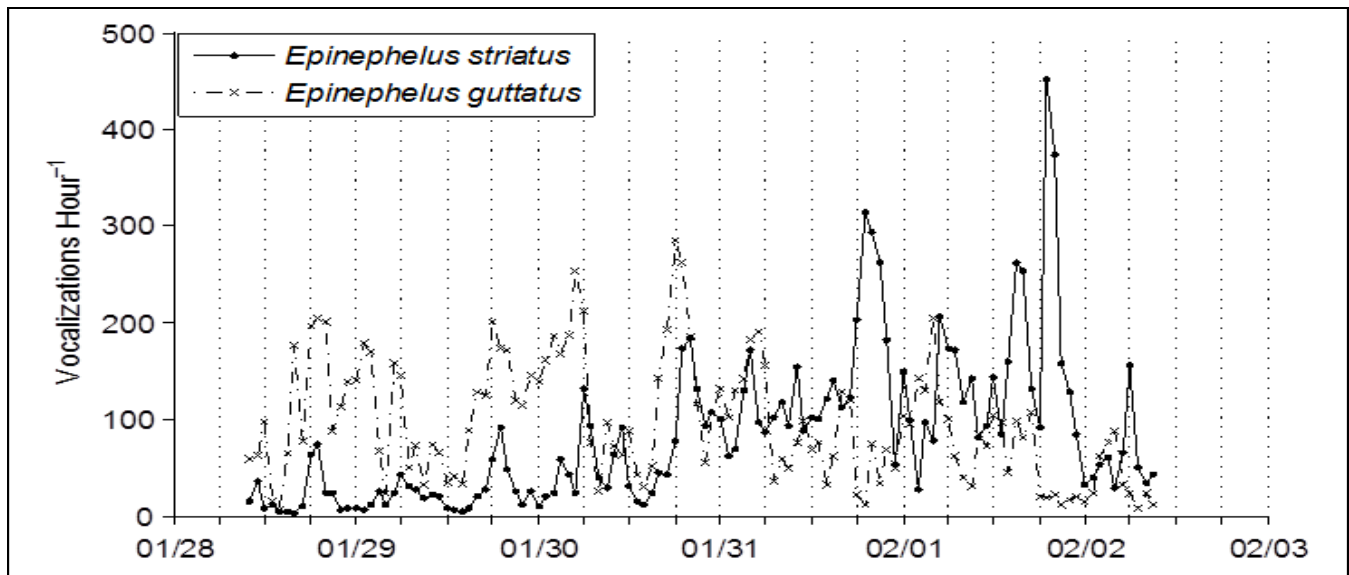


Figure 1. Number of Nassau grouper (*Epinephelus striatus*) and red hind (*Epinephelus guttatus*) vocalizations detected per hour at the Little Cayman west-end spawning site over a 5.5 day period in January/February 2013.

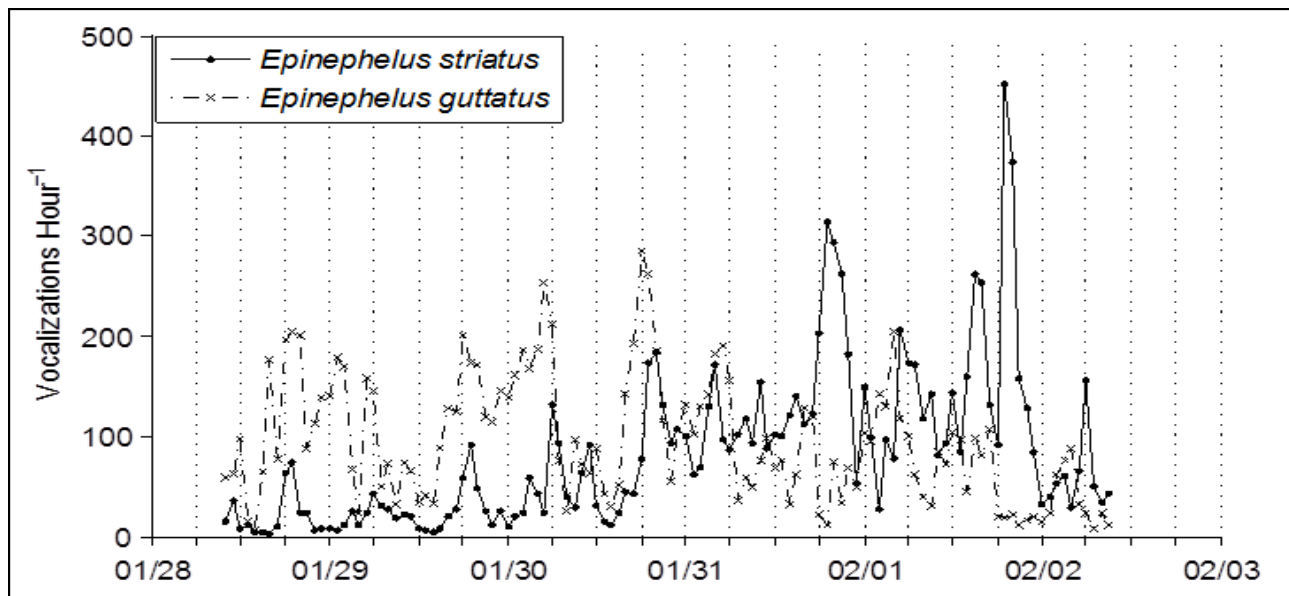


Figure 2. Number of black grouper (*Mycteroperca bonaci*) and yellowfin grouper (*Mycteroperca venenosa*) vocalizations detected per hour at the Little Cayman west-end spawning site over a 5.5 day period in January/February 2013.