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Unique Annual Aggregation of Longnose Parrotfish (Hipposcarus harid) at Farasan Island (Saudi Arabia, Red Sea)

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Many species of animals inhabiting coral reefs aggregate to spawn at specific locations and times of the year, and these aggregations are often exploited in traditional fishing events (Phillips Dales, 1967; Johannes, 1981). Such harvesting episodes illustrate the depth of knowledge about the marine environment possessed by traditional societies, and for this reason, these events are of great cultural significance. In this note, I describe annual aggregations of the longnose parrotfish, Hipposcarus harid, in the Farasan Islands (16°40'N, 42°00'E) of the southern Red Sea of
Background.—*Hipposcarus harid* occurs in the Red Sea and the Indian Ocean, reaching a maximum size of 75 cm (Randall, 1986). It is common throughout the Farasan Islands, especially in protected lagoons and back-reef waters (pers. obs.). I observed the aggregation and harvesting in April 1994 at Kharij As Sailah, Farasan Island. I had also observed *H. harid* on many occasions in the same area prior to the aggregations, at different times of the day and at all stages of the tides. This species was always common in the area and appeared to spend most time feeding on the reef crest (water depth 1–2 m) and reef slope (3–6 m depth). I never observed schools or individuals leaving the reef crest and swimming over shallower water toward the shore, except on the days of the aggregations. The area where aggregations occurred is a partially enclosed bay with a shallow, fringing coral reef backed by a wide, sand-covered reef flat. The shoreline of the bay is a 2–4 m high coral cliff interrupted by small beaches.

Aggregations.—Aggregations began on the first day after the full moon (27 April) and lasted for five days. The tide was falling during the aggregations and harvesting. The behavior of the aggregations was similar on each day, but the location and numbers of fish changed over the five days. Each morning a large, tightly packed school of longnose parrotfish (appearing to consist of several hundred fish) swam over the reef crest onto the reef flat then moved slowly toward the shore. A number of other, separate schools followed the same behavior at different times of the day. Each school remained together and was clearly visible from the coral cliffs on the shore. The first school of each day moved over the reef crest between 0615 h and 1000 h. On the first day, only one school appeared; on the second day, there were five; on the third day, there were four; and on the fourth and fifth days, there was only one school each day. On the first day, the school swam into shallow water at the northern end of the bay. On successive days, the schools appeared progressively further south so that, on the final two days, schools were appearing approximately 1.5 km away from where schools appeared on the first day.

The aggregation does not consistently occur in the same month each year. Fishers reported that the aggregations occur in March for three years; then in the next year, they occur in April; and then for the following three years, they aggregate again in March. This appears to be a consistent pattern since the same phenomenon was described by fishers in 1989 (R. E. Johannes, pers. comm.). Interestingly, similar corrections for differences in the lunar and solar calendars have been reported (Johannes, 1981) in the timing of spawning of Palauan food fishes and in the rising of Palolo worms in Samoa and Fiji.

The fishers of the Farasan Islands believe the aggregations are part of an annual migration. They described it to me in the following ways. Each year the longnose parrotfish migrate from the entrance of the Red Sea to the Saudi coastline, somewhere north of Jeddah. Their route takes them through the Farasan Islands; however, as the migration passes between the two largest islands of Farasan and Saqid, some of the fish take the wrong direction and become trapped in the semienclosed bay of Kharij As Sailah. It is here they aggregate and are able to be harvested. Those not trapped and harvested continue the migration, arriving on the coastline near Jizan about one week after the aggregation finishes at Farasan Island. An annual migration to Jeddah over this distance (approximately 1200 km each way) would be unique among fishes that are normally resident on coral reefs. The fishers believe the parrotfish do not normally live in the area where they are harvested. However, I dived regularly in the area for six months before the aggregations and harvesting and found them to be abundant, as this species is on most reefs of the Farasan Islands, indicating that the fishers’ explanation for this phenomenon is probably incorrect.

Although I did not observe it, spawning is a likely reason for these aggregations. I dissected 10 females between 15 and 25 cm in length and all possessed large and ripe ovaries. The fish also appeared to be in good condition (based on their livers appearing to be large and well colored), which would be unlikely if they had migrated over a large distance in a short space of time. A short migration followed by aggregation at a spawning site is a common tactic among fishes of coral reefs, including parrotfishes (Johannes, 1978; Robertson and Warner, 1978; Thresher, 1984). Particular spawning sites are used by some species because they might be facilitating offspring dispersal away from the reef (Johannes, 1978, Gladstone, 1994). This does not appear to apply to the site where *H. harid* aggregated: it is shallow, away from the
Harvesting.—The aggregating parrotfish were
reef edge, with minimal water movement at all
stages of the tide.

The fishers relied on a specific and unique
signal each year which indicated the aggrega-
tions were imminent—the smell of the annual
coral spawn, which the fishers believed was the
“smell of the harid.” They knew that the long-
nose parrotfish would begin aggregating the
morning after they first smelled them around
sunrise. Many fishers gathered for the schooling
in March 1994, near the time of the full moon,
when there was a strong fishlike smell over the
whole island. On this occasion, however, the
fish came in the following month. I investigated
the smell and found that it originated from fresh
slicks of coral spawn. The corals appeared to
have spawned on the first evening after the full
moon. Interestingly, fishers in Samoa and Fiji
rely on the smell of coral spawn to indicate that
the palolo worms will rise within three days;
they believe the smell originates from the worms
(L. Zann, pers. comm.), and Johannes (1981)
reported that Palauan fishers were sometimes
one month early in predicting the time of
spawning of some reef fishes.

Harvesting.—The aggregating parrotfish were
easily harvested. People watched for the schools
from the tops of the coral cliffs from before
sunrise, beginning a few days before the full
moon. On each morning, there were from 300–
500 men and boys waiting on the cliffs; how-
ever, not all participated in the harvesting. As
each school came over the reef crest and into
shallow water, up to 20 men, carrying mono-
filament gill nets, ran over the shallow reef flat
toward the school. Most schools were easily ap-
proached and did not appear to be disturbed
by the approaching people nor by the nets which
enclosed them. This apparent ease with which
the longnose parrotfish were approached and
captured is often observed among schools of
food fishes that are preparing to spawn (Joh-
nanes, 1981). At least one school on each day
escaped and was not harvested. I have no in-
formation on what happened to those schools
that escaped on the day of harvesting because
the fishers were reluctant to allow me to enter
the water. When I dived in the same area one
week later, however, there were still consider-
able numbers of H. harid feeding on the reef
crest and reef slope, just as there were before
the aggregations and harvesting.

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Predation on Bufo terrestris Tadpoles:
Effects of Cover and Predator Identity

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Predation is a major source of mortality in
anuran tadpoles (Calef, 1973; Heyer et al., 1975;
Smith, 1983) and can have a significant effect
on assemblage structure through differential
predation on competitively dominant species
(Morin, 1981, 1983; Wilbur, 1980). Several
mechanisms can function to reduce predation
pressure on tadpoles, including crypsis (Cald-
well, 1982), unpalatability (Formanowicz and
Brodie, 1982), and several behavioral responses
involving alteration of the timing, amount, or
location of activity (Semlitsch, 1987; Stangel
and Semlitsch, 1987; Lawler, 1989). Finally, be-
cause many predators of tadpoles are gape-lim-