



Contents lists available at ScienceDirect

Marine Pollution Bulletin

journal homepage: www.elsevier.com/locate/marpolbul

Coral reef fish assemblages along a disturbance gradient in the northern Persian Gulf: A seasonal perspective

Amir Ghazilou^a, Mohammad Reza Shokri^{a,*}, William Gladstone^b

^a Faculty of Biological Sciences, Shahid Beheshti University, G.C. Evin, Tehran, Islamic Republic of Iran

^b School of Life Sciences, University of Technology Sydney, PO Box 123, Broadway, NSW 2007, Australia

ARTICLE INFO

Article history:

Received 1 July 2015

Received in revised form 15 October 2015

Accepted 22 October 2015

Available online xxx

Keywords:

Anthropogenic disturbance

Seasonality

Assemblage composition

ABSTRACT

Seasonal dynamics of coral reef fish assemblages were assessed along a gradient of potential anthropogenic disturbance in the Northern Persian Gulf. Overall, the attributes of coral reef fish assemblages showed seasonality at two different levels: seasonal changes irrespective of the magnitude of disturbance level (e.g. species richness), and seasonal changes in response to disturbance level (e.g. total abundance and assemblage composition). The examined parameters mostly belonged to the second group, but the interpretation of the relationship between patterns of seasonal changes and the disturbance level was not straightforward. The abundance of carnivorous fishes did not vary among seasons. SIMPER identified the family Nemipteridae as the major contributor to the observed spatiotemporal variations in the composition of coral reef fish assemblages in the study area.

© 2015 Published by Elsevier Ltd.

1. Introduction

The Persian Gulf is a geologically young subset of the Indian Ocean, which is characterized by its depauperate fauna (Sheppard et al., 1992). The Gulf ecosystems are being increasingly impacted by a wide variety of disturbing natural (Price et al., 1993a; Sheppard, 1993) and anthropogenic processes (Price, 1993b; Sale et al., 2011). Coral reefs of the Gulf typically represent a good example of such perturbed ecosystems, suffering from loss of corals and their associated fauna (e.g., fish) (Sheppard et al., 2010).

Disturbing agents may directly impair health, growth, and reproduction in coral reef fishes (Donelson et al., 2014; Kokita and Nakazono, 2001; Loya and Rinkevitch, 1980; Munday et al., 2008; Pratchett et al., 2004; Reopanichkul et al., 2009; Wilson et al., 2006) or may exert indirect effects on recruitment, abundance, diversity, behavior of fish species through habitat degradation (Bellwood et al., 2006; Coker et al., 2009; Graham et al., 2006, 2007; Pratchett et al., 2008, 2009, 2011; Wen et al., 2010; Wilson et al., 2006, 2008). The extent to which coral reef fishes are impacted by disturbance depends on the magnitude of disturbance, physiological limits of the organism, the degree of its reliance on live coral, and its interaction with others, which may vary between species (Pratchett et al., 2008; Wilson et al., 2006). Consequently, variable assemblage of coral reef fish communities may develop at different levels of disturbance (Jones and Syms, 1998; Pratchett et al., 2008). As such, considering the increasing trend in severity of disturbances, understanding how a coral reef fish community changes in

time and space along a disturbance gradient is critical to determine the consequences of ongoing disturbances.

Research of coral reef fish community structure in the Gulf has been mainly limited to its southern parts. Gulf coral reef fishes were originally thought to be irregularly distributed along the Arabian region (Krupp and Muller, 1994), but later examinations indicated that natural coral reefs contain distinct assemblages of reef fishes when compared with artificial structures (Burt et al., 2009, 2013). Burt et al. (2011) has also found substantial dissimilarities in species composition of coral reef fish assemblages between the southern Persian Gulf and nearby Gulf of Oman or western Arabian Sea. Yet, studies on the effects of disturbance on the structure of these communities yielded variable results. For example, Usseglio et al. (2008) concluded that live coral losses associated with coastal development would cause significant changes in species composition of coral reef fish communities. Similarly, Bauman et al. (2010) detected significant changes in assemblage composition of coral reef fish communities subjected to harmful algal bloom events, while Riegl (2002) failed to detect such differences after the 1998 bleaching event.

With respect to the structure of reef fish assemblages on the northern Persian Gulf coral reefs, Rezai and Savari (2004) recorded three types of coral reef fish assemblages along Iranian islands but also concluded that the exact effects of coral degradation on coral reef fishes are unknown in the region. Further studies attempted to assess the impacts of disturbance of coral reef fish, which were generally performed on the sub-community level rather than the whole assemblage. For example, Shokri et al. (2005) used a univariate approach to determine the degree of association between live coral cover and butterflyfishes, and Valavi et al. (2010) performed a multivariate redundancy analysis to investigate the effects of multiple stressors on the abundance of Reef

* Corresponding author at: Marine Biology Department, Faculty of Biological Sciences, Shahid Beheshti University, Daneshju Blvd., 1983963113 Tehran, Islamic Republic of Iran.
E-mail address: M.Shokri@sbu.ac.ir (M.R. Shokri).

Check indicator species and concluded that only a subset of the proposed species can be effectively used as indicators for multiple stressors.

Reef fish communities of the southern Gulf have also been found to be seasonally regulated in the southern Gulf (Grandcourt, 2012). For example, Burt et al. (2009, 2013) found distinct fish assemblages on coral reefs of Dubai during cool and warm seasons but also demonstrated that the degree of seasonality in natural coral reef fish communities could be higher and lower than those communities inhabiting artificial structures. On the other hand, there has also been relatively little research dealing with seasonal changes in reef fish assemblages in the northern Gulf area, most of which is limited to artificial reefs and larval stages of fish. For example, Rabbaniha et al. (2013) observed consistent seasonal trends in the ratio of pelagic/demersal reef fish larvae and linked this to changes in water column chlorophyll concentration during warm and cool seasons. However, Pourjomeh et al. (2013) failed to detect such trends in the composition of adult coral reef fish communities attracted to artificial reefs over the first two years of establishment and concluded that seasonal variability of reef fish assemblages may be less pronounced on younger artificial reefs. Yet, to our knowledge, there is no published data on the possible effects of disturbance on the seasonality of coral reef fish assemblages on natural reefs in the northern Gulf. The aim of the present study was to investigate seasonal patterns in assemblage structure coral reef fish along a potential human perturbation gradient in the northern Gulf region. The major question asked was whether the degree of seasonality in general attributes of coral reef fish assemblage structure varies along a gradient of disturbance.

2. Materials and methods

2.1. Study area and data collection

Mid-season baited remote under water video (BRUV) surveys were conducted from November 2013 to December 2014 on three nearshore coral patch reefs at an increasing along-shore distance from a petrochemical industry (a potential anthropogenic disturbance source location) established in 1998. The three sampling sites included the Assaluyeh port (near site; NS) located in the vicinity of industry,

Southern Nayband Bay (far site; FS), 7 km from the Assaluyeh port and Zahedeh Bay (farthest site; FSS), 13 km further away from the Assaluyeh port (Fig. 1). The coral fauna of the study area was dominated by *Platygyra* and *Porites* corals at ca. 5 m depth. Mean live hard coral cover was 65%, 23%, and 17% at the Zahedeh Bay, Southern Nayband Bay and the Assaluyeh port, respectively. Prior to the study, a pilot experiment was conducted in the study area to optimize soak time and replicate numbers of BRUV surveys (Appendix A). Point intercept transect surveys were then performed on study sites to ensure that hard coral cover is homogenous within each site, since differences in coral cover can affect natural reef fish communities (Bell and Galzin, 1984). During the study, total of four replicate BRUV surveys were conducted at each study site (i.e., at a depth of ca. 5 m) in each season. At each site, replicate BRUV deployments were done at randomly chosen stations which were at least 250 m apart from each other (Langlois et al., 2010). This was done to ensure independency of replicate deployments and to avoid seasonal autocorrelation. Each survey included 65 min of front-view video recording from the boat using full-HD (1080 pixel) mode and wide-viewing angle (170°). Approximately, 200 g of fresh frigate tuna (*Auxis thazard thazard*) was used as bait for each survey (Hardinge et al., 2013). Sampling surveys were done during daylight hours (08:30 to 16:00 h) to avoid contributions of the crepuscular or nocturnal species to the sampling. Consecutive replicate surveys were conducted in 20-min intervals (Harvey et al., 2007). Water current velocities and vertical visibility were checked before each cast to ensure the constant dispersion rates of odor plume as well as equal chances of visual reinforcement of fish to the apparatus across the study. Recorded videos were observed on the computer screen by a single observer using GoPro Studio 2.0.0.285 player software. Analysis of each video started 3 min after settlement of the filming apparatus on the seabed and continued for 60 min. For each video, the number of sighted fish species and relative abundance of each species (MaxN; Willis and Babcock, 2000) were recorded by counting all the fish occupying near-field distances (i.e., the distance between the camera lens and end of the bait arm = 3 m). Fish species were identified using illustrated fish catalogs (Al-Abdessalaam, 1995). Recorded fish species were then assigned to one of three trophic guilds (herbivore, planktivore/

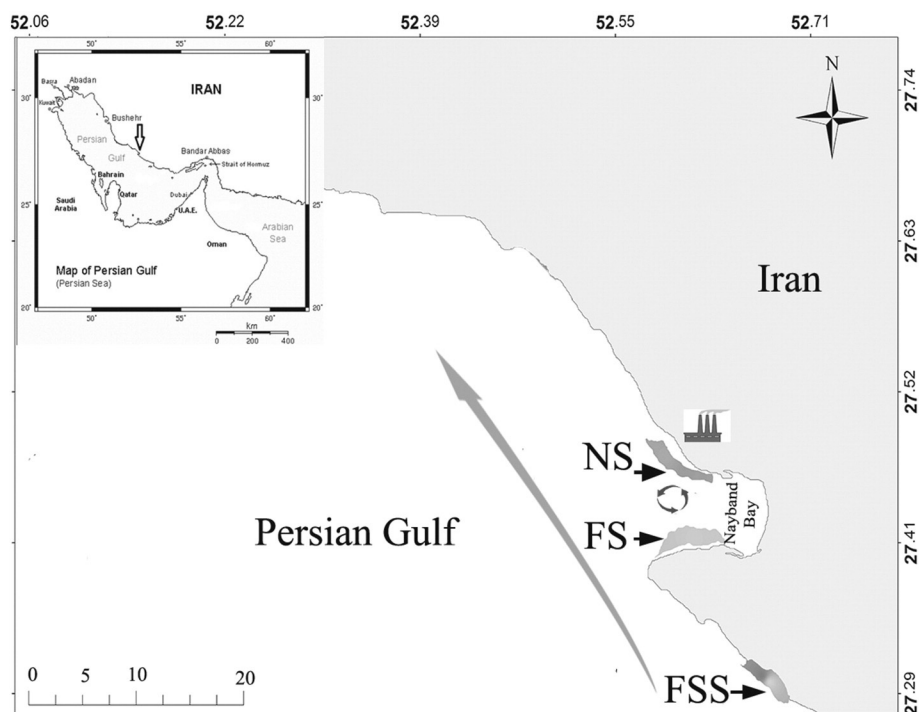


Fig. 1. Map of the northern Persian Gulf showing the three sampling sites. Arrows indicate direction of main water currents.

Download English Version:

<https://daneshyari.com/en/article/6356043>

Download Persian Version:

<https://daneshyari.com/article/6356043>

[Daneshyari.com](https://daneshyari.com)