

The Role of Oil and Gas Platforms in Providing Habitat for Northern Gulf of Mexico Red Snapper, *Lutjanus campechanus*

CHARLES A. WILSON^{1,2} and DAVID L. NIELAND¹

¹*Coastal Fisheries Institute*

²*Department of Oceanography and Coastal Sciences*

Louisiana State University

Baton Rouge, Louisiana 70803 USA

ABSTRACT

The northern Gulf of Mexico (GOM) off Louisiana and Texas currently produces significant portions of the commercial and recreational harvests of red snapper *Lutjanus campechanus*; however, this has not always been the case. Annual commercial landings in the five states bordering the GOM indicate a shift in the fishery from the eastern to the more western GOM since 1970 concomitant with the placement of several thousand oil and gas platforms into the area. Although the addition of considerable complex steel structure to the environment and the shift of the red snapper fishery to Louisiana and Texas may be coincidental, there is still a need to better understand the role of oil and gas platforms in red snapper life history.

Quantitative estimates of red snapper associated with platforms have been derived both from assessments of the effects of platform removal via explosives and from hydroacoustic surveys of selected platforms. Based both on these estimates and on the numbers of platforms sited at depth, we estimate from 1.2 to 7.2 million red snapper live around platforms placed at depths of 20 - 100 m. Many of these are relatively young individuals of ages 2 - 4 years. These numbers suggest a range of red snapper abundances reflecting the ubiquitous presence of red snapper at oil and gas platforms. We intend to continue this line of investigation to determine if platforms have become "essential" to the persistence of a large population of red snapper in the northern GOM.

KEY WORDS: Red snapper, *Lutjanus campechanus*, habitats, oil and gas platforms

El Papel de las Plataformas Petroleras y de Gas de Prover Habitat para el Pargo Rojo *Lutjanus campechanus* en el Golfo de México

El norte del Golfo de Mexico en la parte correspondiente a Luisiana y Texas actualmente produce una porcion significativa de las cosechas comerciales y recreativas de la pesca del huachinango (*Lutjanus campechanus*). Sin embargo, esto no siempre ha sido el caso. Las capturas comerciales de los cinco Estados que bordean el Golfo de Mexico indican una migracion en la pesqueria de la parte Este al Oeste a partir de 1970, concomitantemente con la instalacion de varios miles de plataformas de gas y petroleo en el area. Aunque la aparicion de estructuras

metálicas complejas en el ambiente y la migración de la pesquería de huachinango en Luisiana y Texas sea coincidente, existe todavía la necesidad de ampliar el conocimiento del papel que juegan estas estructuras en el ciclo de vida del huachinango.

Estimaciones cuantitativas de huachinangos asociados a las plataformas fueron derivadas a partir de evaluaciones de los efectos de la remoción de plataformas usando explosivos y conteos hidroacústicos en sitios selectos. Basados en ambas estimaciones y en el número de plataformas situadas en profundidad, nuestros resultados indican entre 1.2 a 7.2 millones de huachinangos utilizando estos hábitats en profundidades de 20 a 100 m. La mayoría de estos individuos son de edades de 2 a 4 años. Estas densidades sugieren una abundancia que justifica el notable componente de huachinangos en la comunidad de peces que usan las plataformas de explotación petrolera. Seguiremos esta línea de investigación para determinar si la presencia de plataformas se ha hecho "esencial" para mantener a la gran población de huachinangos en el norte del Golfo de México.

PALABRAS CLAVES: Huachinango, *Lutjanus campechanus*, plataformas de gas y petróleo

INTRODUCTION

The management of the red snapper *Lutjanus campechanus* in the Gulf of Mexico (GOM) remains among the more problematic issues facing fishery managers of the region. Commercial landings increased from 1950 to 1965 and subsequently exhibited a constant decline until regulations were imposed in the 1990s. Both the commercial and recreational red snapper fisheries are now constrained by size limits, creel or trip limits, seasonal closures, and quotas as formulated by the Gulf of Mexico Fisheries Management Council in response to reports of overfishing (Schirripa and Legault 1999). Shrimp trawlers have also been required to install bycatch reduction devices in their nets to curtail mortality among juvenile red snapper.

Both qualitative and quantitative assessments of fish populations have shown that oil and gas platforms situated in the northern GOM can hold large and diverse populations of fish species. Among these the red snapper repeatedly has been identified as a major component of the platform-associated fauna. In visual surveys conducted by SCUBA divers at platforms off central Louisiana, the species was characterized as common by Sonnier et al. (1976) and as numerous by Bull and Kendall (1994); Putt (1982), using video cameras, found red snapper to constitute 2 - 4% of the total fishes inhabiting platforms off Texas. The recent fusion of hydroacoustic and visual (either with divers or with camera-equipped remotely operated vehicles) survey methods has produced estimates not only of total numbers of fishes around platforms, but also of species composition and their numerical or proportional representation within the total population (Stanley 1994, Stanley and Wilson 1996, 1997).

The benefit of oil and gas platforms to commercial and recreational fishing interests has been questioned as recently as the mid 1970s (Sonnier et al. 1976). Also, the question of whether platforms simply aggregate existing fish biomass or serve to increase limited habitat and thus produce additional fish biomass remains to be resolved. In either case, a significant portion of the recent and current red snapper commercial and recreational harvests has come from the north central GOM and at or near oil and gas platforms. Indeed, among 44,465 and 16,762 fishes caught at oil and gas platforms off Louisiana in 1987 and 1988, respectively, 35% and 41% were red snapper (Stanley and Wilson 1990). The addition of considerable complex steel structure to the environment in the western GOM off Louisiana and Texas undoubtedly has had a tremendous impact on fishes, especially reef-associated species such as the red snapper. However, there is still a need to better understand the role of oil and gas platforms in red snapper life history.

MATERIALS AND METHODS

A variety of data sources were accessed in the preparation of this contribution. Commercial (NMFS 2002a) and recreational (NMFS 2002b) landings of red snapper were located at websites operated by the United States National Marine Fisheries Service (NMFS). Numbers of operating oil and gas platforms in the northern GOM were obtained from the United States Minerals Management Service (MMS), Gulf of Mexico Region (MMS 2002). Fishery independent estimates of red snapper populations around oil and gas platforms come from two sources:

- i) Counts of mortalities produced subsequent to explosive removal of obsolete oil and gas platforms (Gitschlag et al. 2002, Nieland and Wilson 2002), and
- ii) *In situ* hydroacoustic and video assessments of fish populations inhabiting the areas around and beneath oil and gas platforms (Stanley 1994, Stanley and Wilson 1996, 1997, 1998, 2000, unpublished data).

RESULTS

The growth and subsequent decline of commercial red snapper landings (Figure 1) was concurrent with the development of the offshore oil and gas industry in the northern GOM. Commercial landings by state indicate that the fishery has shifted from the eastern to the western GOM since 1970. Florida, Alabama, and Mississippi all have experienced declines in landings since 1965, but Louisiana and Texas have realized increases since the 1970s; this shift is coincident with the rapid expansion of offshore oil and gas development and the placement of increasing numbers of platforms (Figure 2).

Quantitative estimates of the inhabitation of platforms by red snapper are provided by the National Marine Fisheries Service, which has conducted periodic assessment of the effects of explosive platform removal on resident fish populations. Gitschlag et al. (2001) collected fish mortalities subsequent to explosive detonations

at nine platforms off Louisiana and Texas (15 - 32 m water depth) and found that red snapper constituted an average of 15.4 % (range = 1.1 - 25.6%) of the total fish population per site (Figure 3). Fully 37% (n = 373) of the fish mortalities recovered subsequent to the explosive detonation and removal of the relatively small obsolete platform located in the Ship Shoal (SS) 209 lease block were red snapper (Nieland and Wilson 2001). Gitschlag et al. (2001), upon further analysis of the numbers of mortalities gathered from the SS 209 detonation, reported 24% (n = 418) of the fish population to be red snapper.

The hydroacoustic surveys of fish populations around oil and gas platforms of Stanley (1994) and Stanley and Wilson (1996, 1997) showed red snapper numbers to vary from 521 to 8,202 individuals at a platform off western Louisiana. Similarly, among estimated total fish populations of ~29,000 and ~13,000 individuals at two platforms off central Louisiana, 4.4% and 19.2%, respectively, were red snapper (Stanley and Wilson 2000). Red snapper numbers at ten additional platforms (22-110 m depth, 38 total hydroacoustic surveys) averaged 2,100 individuals or approximately 21% of the fish populations (Figure 3) at these sites (Stanley and Wilson unpublished data).

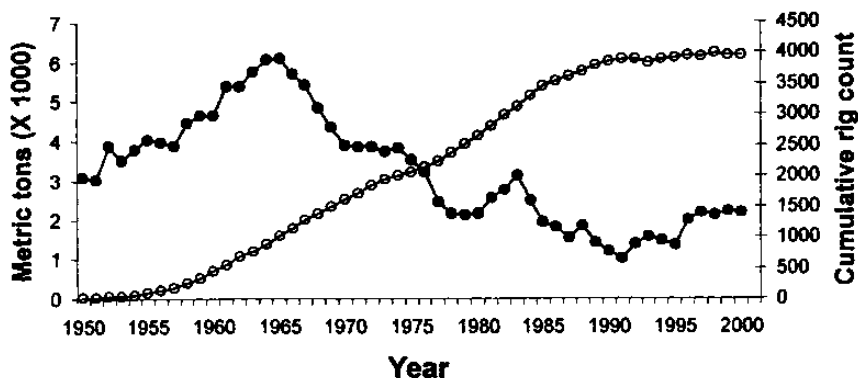


Figure 1. Commercial landings (closed circles) of red snapper *Lutjanus campechanus* from 1950 to 2000 (NMFS 2002a) and cumulative number of oil and gas platforms (open circles, MMS 2002) in the northern Gulf of Mexico.

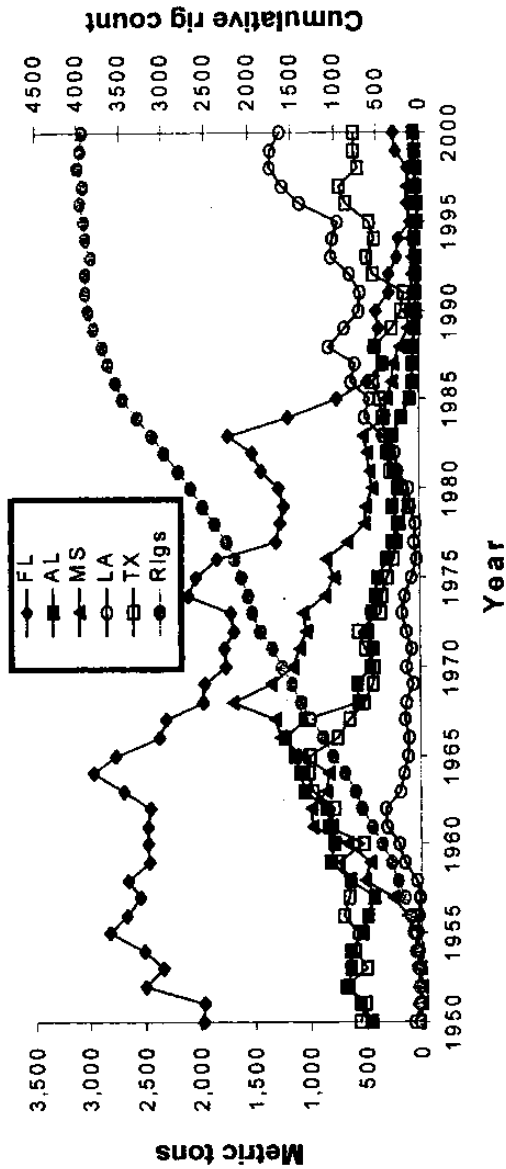


Figure 2. Commercial landings of red snapper *Lutjanus campechanus* by state from 1950 to 2000 (NMFS 2002a) and cumulative number of oil and gas platforms (MMS 2002) in the northern Gulf of Mexico.

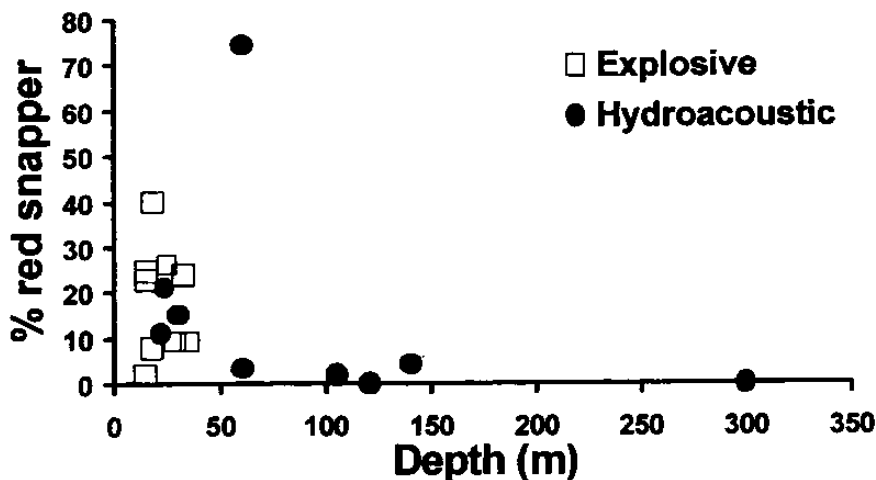


Figure 3. Percent of total fish populations represented by red snapper *Lutjanus campechanus* at oil and gas platforms at various depths in the northern Gulf of Mexico. Percentages estimated either from fish mortalities recovered following explosive platform removal (open squares) or from hydroacoustic surveys (closed circles).

DISCUSSION

Juvenile red snapper are known to inhabit hard bottom areas of low relief and shell rubble where they are vulnerable to capture in trawls (Workman and Foster 1994, Szedlmayer and Howe 1997, Szedlmayer and Conti 1999). This behavior is illustrated in fishery independent trawl data from the GOM, specifically the Fall Groundfish Survey and the Summer SEAMAP Survey, in which the great majority of red snapper captured are age 0 and 1 (Schirripa and Legault 1999). It has been hypothesized that the disappearance of age 1 red snapper from the trawl data represents migration to high relief structures such as natural reefs, wrecks, and platforms which presumably provide refuge from large predators (Render 1995). It might also be postulated that platforms, in the absence of other preferred habitats, are essential habitat for young red snapper.

Estimates of red snapper numbers around oil and gas platforms, regardless of their source, must be recognized for what they indeed are — chronological “snapshots” of the resident populations (Nieland and Wilson 2002). Previous research efforts have shown conclusively that red snapper numbers can vary significantly among seasons (Putt 1982, Stanley 1994, Stanley and Wilson 1997,

2000) and among platforms at different depths (Stanley and Wilson 1998, 2000). Red snapper are also known to stratify by size at different depths around platforms; further, larger individuals are less obligate in their association to platforms than are smaller individuals (Render 1995).

MMS reports that there are approximately 2500 platforms in the northern GOM at depths ranging from 20 m to 100 m. Based on the estimated numbers of red snapper given above, we may estimate that from 1.2 to 7.2 million red snapper live around platforms placed in this depth range. Many of these may be relatively young individuals as Nieland and Wilson (2001) reported that the red snapper around the SS 209 platform were predominantly 2 - 4 year olds. These estimates are based on a limited number of surveys, but they suggest a range of red snapper abundances that reflect the ubiquitous presence of red snapper at oil and gas platforms. We should continue this line of investigation to determine if platforms have become "essential" to the persistence of a large population of red snapper in the northern GOM.

LITERATURE CITED

- Bull, A.S. and J.J. Kendall, Jr. 1994. An indication of the process: Offshore platforms as artificial reefs in the Gulf of Mexico. *Bulletin of Marine Science* 55:1086-1098.
- Gitschlag, G. R., M. J. Schirripa, and J. E. Powers. 2001. Fisheries impacts of underwater explosives used in platform salvage in the Gulf of Mexico. Pages 357-371 in: M. McKay, J. Nides, and D. Vigil, (eds.) *Proceedings: Gulf of Mexico Fish and Fisheries: Bringing Together New and Recent Research*. United State Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA, USA. October 2000.
- MMS. 2002. Minerals Management Service, Gulf of Mexico Region. Available: <http://www.gomr.mms.gov>. (October 2002).
- NMFS. 2002a. Annual commercial landings statistics. National Marine Fisheries Service, Fisheries Statistics and Economics Division. Available: <http://www.st.nmfs.gov>. (October 2002).
- NMFS. 2002b. Marine recreational fisheries statistics survey. National Marine Fisheries Service, Fisheries Statistics and Economics Division. Available: <http://www.st.nmfs.gov>. (October 2002).
- Nieland, D.L. and C.A. Wilson. 2002. Red snapper recruitment to and disappearance from oil and gas platforms in the northern Gulf of Mexico. Pages 270-279 in: M. McKay, J. Nides, and D. Vigil, (eds.) *Proceedings: Gulf of Mexico Fish and Fisheries: Bringing Together New and Recent Research*. United State Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, Louisiana USA. October 2000.
- Putt, R.E., Jr. 1982. A quantitative study of fish populations associated with a platform within Buccaneer oil field, northwestern Gulf of Mexico. M.S. Thesis. Texas A&M University, College Station, Texas USA. 116 pp.

- Render, J.H. 1995. *The Life History (Age, Growth, and Reproduction) of Red Snapper (Lutjanus Campechanus) and its Affinity for Oil and Gas Platforms*. Ph.D. Dissertation. Louisiana State University, Baton Rouge. 76 pp.
- Schirripa, M.J. and C.M. Legault. 1999. Status of the red snapper in U.S. waters of the Gulf of Mexico: Updated through 1998. National Marine Fisheries Service, Southeast Fisheries Center, Sustainable Fisheries Division, Contribution SFD-99/00-75, Miami, Florida USA.
- Sonnier, F., J. Teerling, and H.D. Hoese. 1976. Observations on the offshore reef and platform fish fauna of Louisiana. *Copeia* 1976:105-111.
- Stanley, D.R. 1994. *Seasonal and Spatial Abundance and Size Distribution of Fishes Associated with a Petroleum Platform in the Northern Gulf of Mexico*. Ph.D. Dissertation. Louisiana State University, Baton Rouge, Louisiana USA. 136 pp.
- Stanley, D.R. and C.A. Wilson. 1990. A fishery-dependent based study of fish species composition and associated catch rates around oil and gas structures off Louisiana. *Fishery Bulletin* 88:719-730.
- Stanley, D.R. and C.A. Wilson. 1996. Abundance of fishes associated with a petroleum platform as measured with dual-beam hydroacoustics. *ICES Journal of Marine Science* 53:473-475.
- Stanley, D.R. and C.A. Wilson. 1997. Seasonal and spatial variation in the abundance and size distribution of fishes associated with a petroleum platform in the northern Gulf of Mexico. *Canadian Journal of Fisheries and Aquatic Sciences* 54:1166-1176.
- Stanley, D.R. and C.A. Wilson. 1998. Spatial variation in fish density at three petroleum platforms as measured with dual-beam hydroacoustics. *Gulf of Mexico Science* 1998:73-82.
- Stanley, D.R. and C.A. Wilson. 2000. Variation in the density and species composition of fishes associated with three petroleum platforms using dual beam hydroacoustics. *Fisheries Research* 47:161-172.
- Szedlmayer, S.T. and J. Conti. 1999. Nursery habitats, growth rates, and seasonality of age-0 red snapper, *Lutjanus campechanus*, in the northeast Gulf of Mexico. *Fishery Bulletin* 97:626-635.
- Szedlmayer, S.T. and J.C. Howe. 1997. Substrate preference in age-0 red snapper, *Lutjanus campechanus*. *Environmental Biology of Fishes* 50:203-207.
- Workman, I.K. and D.G. Foster. 1994. Occurrence and behavior of juvenile red snapper, *Lutjanus campechanus*, on commercial shrimp fishing grounds in the northeastern Gulf of Mexico. *Marine Fisheries Review* 56:9-11.