Trophodynamic Ecology of *Polydactylus octonemus* (Atlantic thread fin) and *Lutjanus synagris* (Lane snapper) in Terminos Lagoon inlets, Campeche Sound: Estuarine-Shelf Interactions

Ecología trofadinámica de Polydactylus octonemus y Lutjanus synagris en las bocas de Laguna de Términos, Sonda de Campeche: interacciónes estuario-plataforma

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RESUMEN

La comúnidad de peces de las bocas de la Laguna de Términos está compuesta de al menos 125 especies. Dos de estas, están consideradas como especies típicas o dominantes y fueron elegidas para el presente estudio: *Polydactylus octonemus* (Ratón o siete barbas) *y Lutjanus synagris* (Rubia o biajaiba). Ambas son especies componentes de la comunidad demerso-pelágica, *Lutjanus synagris* es estenohalina y *Polydactylus octonemus* es eurihalina. *P. octonemus* presenta un espectro trófico amplio con al menos 11 grupos, es considerada como un consumidor de segundo orden. *L. synagris* tiene un espectro trófico de 9 grupos y es considerada como un consumidor de tercer orden. El espectro trófico de ambos peces fue analizado utilizando los métodos de frecuencia, número y peso húmedo; además de que se aplicaron dos índices de importancia relativa IIR e IRI. Además se hizo un análisis de la relación longitud-dieta y su variación durante el año y en cada una de las bocas de conexión de la Laguna de Términos. El análisis trófico en los diferentes habitats trató de demostrar cual es el papel ecológico de cada una de las bocas de conexión durante el año.

Palabras clave: trofodinámica, alimentación, sureste del Golfo de México

ABSTRACT

The fish community in the Terminos Lagoon inlets presents no less than 125 species. Two of them are typical or dominant species and were chosen for this study: *Polydactylus octonemus* (Atlantic thread fin) and *Lutjanus synagris* (Lane snapper). Both species are demersal-pelagic components of the community, *L. synagris* is stenohaline and *P. octonemus* is eurihaline. *P. octonemus* has a wide trophic spectrum with at least 11 items. It is considered second order consumer. *L. synagris* has a trophic spectrum of 9 items, and is conside second-third order consumer. The trophic spectrum of both fishes was analyzed using the frequency, numeric, and weight methods, and also with two relative importance index IIR and IRI. Besides, it was made an analysis of the length-diet relationship, and its variation through the year and in each one of the Terminos Lagoon inlets. The trophic habits analysis tried to show the trophic paper of each one of the inlets during the year.

Key Words: trophodynamic, feeding, ecology, southem Gulf of Mexico

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Introduction

In the southern Gulf of México, Terminos Lagoon has an important connection with the Campeche Sound through El Carmen inlet in the West and Puerto Real inlet which is east of El Carmen Island (Figura 1). Through these inlets occurs an active interchange of water, nutrients, organic matter and sediments; which conditions the structure and function of the biotic communities. The organism exchange between the lagoon and the adjacent continental shelf is the result of these processes, which are reflected in the juvenile and adult fishes that cross through the inlets in regular migration patterns (Yáñez-Arancibia *et al*., 1988a; Yánez-Arancibia and Sánchez-Gil, 1986; Yáñez-Arancibia and Pauly, 1994), and in particular behavioral patterns associated with their trophic activity.

The objectives for this study were: (1) Determine the trophic spectrum and habits of *P. octonemus* and *L. synagris;* 2) Analyze in a spatial-temporal scale the trophic pattern of these species; and 3) Determine the ecological function of Terminos Lagoon inlets for these species.

Materials and Methods

In the southern Gulf of Mexico, in the Campeche Sound, the Terminos Lagoon is located at 18°30' N, 91°40'W. Its surface is 1567 km^2, and 3.5 m mean depth, with 933 km^2 of wetlands and small lagoons surrounding it (Figure 1). The lagoon presents a seasonal pulse of temperature and light; and the area has a semi-permanent physical-chemical gradient as well as a diverse estuarine habitat. Prevailing winds and littoral currents, and the river discharge cause a net inflow at the east inlet (Puerto Real), and net outflow through the west inlet (El Carmen). There are two deltas, an inner delta of calcareous sediment formed at the eastern inlet, and another one of terrigenous sediments formed off the lagoon at the western inlet (Yáñez-Arancibia *et al.,* 1991).

Due to the water circulation pattern, the two inlets are ecologically different from each other. El Carmen inlet, located at the western of the lagoon, has estuarine influence (salinity <25 %**o** , temperature 22 to 27°C, sediments 10 to 30% of $CaC0_3$), and is the main water flood the lagoon to the sea. Puerto Real inlet is located at the eastern of the lagoon, has marine characteristics (30 to 37 %**o** , 24 to 28°C, 60 to 90% of $CaC0_3$); here there is a net flood from the sea into the lagoon. This tropical ecosystem has low temperature variations. Detailed weather descriptions for the area had been discussed by Yáñez-Arancibia and Day (1982); Yáñez-Arancibia and

Sánchez-Gil (1983 1986); and Yáñez-Arancibia *et al*. (1988a, 1988b, 1991).

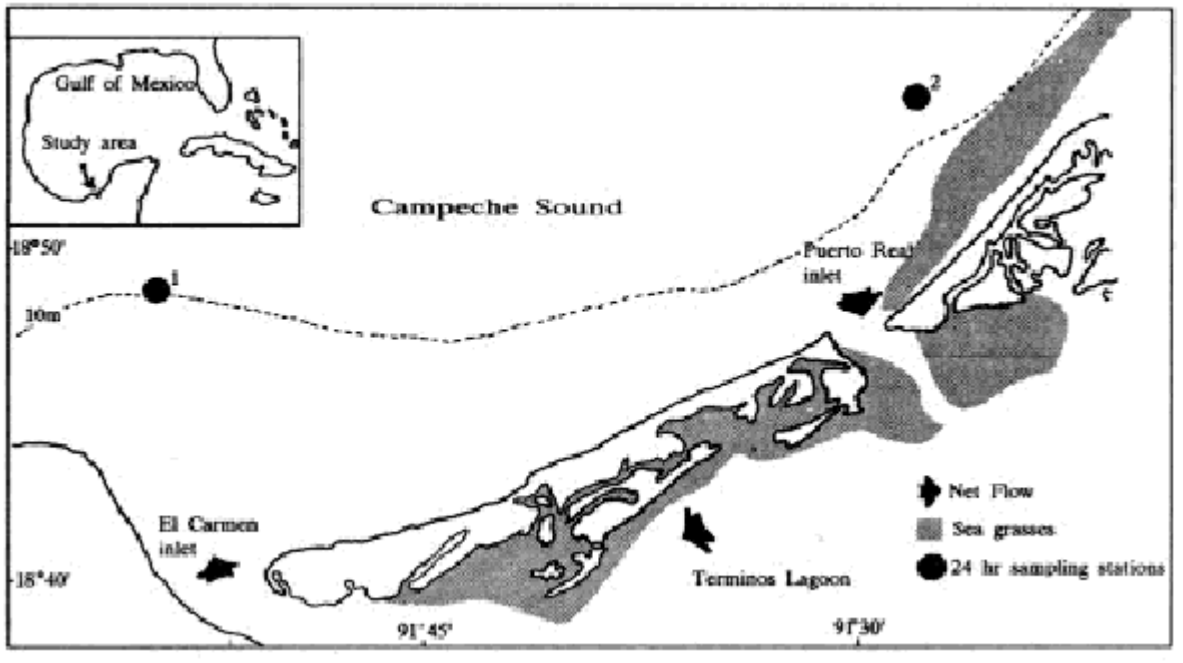


Figura 1. Study area in front of the Terminos Lagoon inlets, El Carmen and Puerto Real.

The sample points are stablished on the 10m isobath.

Biological material was collected in 1984 and 1985, with one sample for each climatic season (Dry, Rains and "Nortes" or north winds season according to Yáñez-Arancibia and Day, 1982). The sample points were established in front of Terminos Lagoon inlets on the 10 m isobath (Figura 1). The collection of fishes was made every four hours throughout a diurnal cycle. The captures were made with a commercial shrimp trawl (18 m long, 9 m mouth and a 1 1/3 inch for the web). Each trawl lasted 1/2 hr with a mean speed of 2 knots. The samples were processed on-board according to Sánchez-Gil and Yáñez-Arancibia (1985).

A total of 798 fishes of both species were capturad and analyzed, 354 of P. *octonemus* and 444 of *L. synagris* distributed as follows: 78% of *P. octonemus* were found in El Carmen inlet and 22% in Puerto Real inlet. For *L. synagris* 19% were found in El Carmen inlet and 81 % in Puerto Real inlet.

The trophic spectrum of both species was analyzed following Windell and Bowen (1978), Hyslop (1980), and Yáñez-Arancibia et al. (1986), for frequency of ingestion, numerical and weight methods:

1. Frequency method. Shows the períodicity and/or preference to ingest some items:

$f=ns/Ns(100)$ …(1)

where f is the percent frequency of each item, ns is the amount of stomachs with one type item, Ns is the total amount of stomachs with food.

2. Weight method. Is the measure of the wet weight of the items using a balance according to Glenn and Ward (1968):

$W = ws / Ws (100)$ ...(2)

where W is the percent wet weight of each item, ws is the total weight of this type item in the stomachs, Ws is the total weight of the food content in all the stomachs.

3. Numeric method. Is the number of organisrns of each item in each stomach:

$N = nss / Nss (100)$ ... (3)

where N is the numeric percent of an item, nss is the total amount of organisms of an item in the stomach, Nss is the total amount of items in all the stomachs.

4. Relative importance index. Two indices were used Pinkas *et al*. (1971) and Yañez-Arancibia *et al.* (1976):

a) Pinkas *et al*. index (1971) relate the numerical percent (N), weight (W) and frequency (f) in the following formula

IRI=(%N+%W)%f …(4)

b) Yáñez-Arancibia *et al*. index (1976) relate the frequency (f) and weight (W) in this formula

IIR = (%f * %W) /100 …(5)

This index does not consider the numerical percent to avoid mistakes, taking with the same importance both small and big items. This index was plotted as a combined trophic diagram which ranks the items of the trophic spectrum:

Quadrant 1 (ABCD). Occasional items area It is defined according to a rate of 0-20% of frequency and weight.

Quadrant 2 (DEFG). Secondary items area. It is definead according to a rate of 20-40% of frequency and weight.

Quadrant 3. (HIJK). Preferent items área. It is defined with a rate of 40-100% of frequency and weight.

Gut content was used to defina feeding areas for each specie, using the criteria suggested by Laevastu (1971), and modified for this study, in three steps for populations in the field:

Step 1. The stomach content has been recently ingested and all items are easily characterized. For this study, it is considered that if the majority of the fish population is in this step of food digestion, the population is in the feeding area.

Step 2. The stomach content is partially digested, making difficult to characterize the items. It is considered that if the majority of the fish population is classified in this step, the population is near the feeding area.

Step 3. The stomach content is completely digested and it is impossible to recognize any item. If the majority of the fish population is in this step of digestion, the population is far from the feeding area.

Results

TROPHIC SPECTRUM

Polydactylus octonemus has a wide diet, which includes at least 11 items, and it is considered a second order consumer. The results of the different methods to analyzed the trophic spectrum are showed in Table 1.

For the frequency analysis, the highest values during the year and in both places were for shrimp, carideans, and other crustacean; except in Puerto Real inlet during rainy and dry seasons, where fishes and polychaetes were more frequent respectively. The weight analysis considered shrimp as the most important item in both sites and during the year. Besides, during the whole year, in El Carmen inlet fishes, polychaetes and other crustacean had high values, meanwhile in Puerto Real carideans were important during dry season. Considering numeric analysis shrimps and carideans were the most abundant items during the year in both inlets, followed by invertebrate larvae in Puerto Real inlet during dry and nortes seasons, and amphipods in El Carmen during rainy.

The relative importance index IIR and IRI show seasonally, habitat differences and diet preferences (Tabla 2). According to the IIR Figura 2, the items considered in the quadrant 3 were shrimp and other crustacean during rainy in both inlets. And shrimp in El Carmen for dry season, and in Puerto Real for nortes. The rest of the items are in the quadrant 1. Besides, the IRI analysis shows that the most important items were shrimp, invertebrate eggs, and carideans in both inlets and during the year. The secondary items were carideans, Polychaetes, fish and shrimp. The other items had small values.

TROPHIC PATTERN IN

A SPATIAL TEMPORAL SCALE

P. octonemus was more abundant in El Carmen inlet through the year, but during rainy season it was also present in Puerto Real. The preference on its diet changed according to the length distribution, the climatic season and even on the inlets as Table 3 shows:

According to the digestion analysis, *P. octonemus uses* El Carmen inlet as a feeding area during nortes and dry seasons, and Puerto Real during rainy. And at the same time, Puerto Real inlet function as a corridor during nortes and dry season, and El Carmen during rainy (Table 4).

TROPHIC SPECTRUM

Lutjanus synagris has a wide diet, which includes at least 9 items, and it is considered a secondthird order consumer. The results of the different methods to analyzed the trophic spectrum are showed in Table 5.

For the frequency analysis, the highest values during the year and in both places were for shrimp, crabs, carideans, and other crustacean; fishes were also frequent in both inlets during rainy seasons, and invertebrate eggs in Puerto Real during dry season. The weight analysis considered fishes and shrimp as the most important items in both sites and during the year. The numeric analysis showed that the most abundant items during the year and in both inlets were invertebrate eggs in Puerto Real inlet during dry and rainy seasons, fishes were númerous in El Carmen inlet during rainy and in Puerto Real during nortes season, and polychaetes in El Carmen during nortes.

The analysis of the relative importance index IIR and IRI show seasonally, habitat differences and diet preferences (Table 6). According to the IIR Figure 3, there are in the diet only items considered as secondary ones as fish in El Carmen during nortes, and shrimp and other crustacean in Puerto Real during dry and rainy respectively.

Table 1. Percent frequency, weight and number of each food item in the trophic spectrum of *Polydactylus octonemus,* by each climatic season and Terminos lagoon inlet. CA= El Carmen inlet. PR= Puerto Real inlet.

Item	Frequency (%)		Weight (%)		Number (%)	
DDY	**CA**	**PR**	**CA**	**PR**	**CA**	**PR**
Shrimp	**62.5**	**0**	**40.0**	**0**	**90.0**	**0**
Carideans	**0**	**17.0**	**0**	**86.5**	**0**	**0.3**
Invertebrate larvae	**0**	**0**	**0**	**0**	**0**	**99.6**
Invertebrate eggs	**0**	**17.0**	**0**	**7.4**	**0**	**0**
Othercrustacea	62.5	19.0	5.4	1.7	0	0
Amphipods	0	17.0	0	4.1	0	0.06
Polychaetes	0	33.3	0	0	0	0
Fishes	25.0	17.0	55.0	0.2	10.0	0.03
Bivalva	0	17.0	0	0.05	0	0
NORTHWINDS						
Shrimp	36.4	90.5	29.2	40.0	32.2	15.0
Carideans	29.2	52.4	13.0	17.4	49.0	44.1
InvertebrateLar	21.5	38.1	1.4	0	13.0	36.5
Crabs	24.6	38.1	2.0	3.0	5.1	2.0
Othercrustacea	37.0	86.0	13.4	22.2	0	0
Amphipods	0	0	0	0.14	0	0

Isopods	0	9.5	0	0	0.1	0.3
Polychaetes	48.0		39.0	0	0.8	0
Fishes	6.2	52.4	2.1	17.0	0.3	2.5
RAINS						
Shrimp	33.0	68.0	46.05	75.1	19.2	35.5
Carideans	33.0	65.0	4.0	14.5	35.5	54.5
Invertebrate eggs	1.3	0	0.01	0	17.0	0
Crabs	18.4	16.2	2.0	0.15	8.4	2.0
Othercrustacea	62.0	22.0	48.0	5.4	0	0
Amphipods	12.0	0	0.11	0	19.0	0
Isopods	4.0	0	0.01	0	0.22	0
Polychaetes	1.3	0	0.5	0	0.22	0
Fishes	8.0	49.0	0.05	5.0	1.0	8.0
Bivalves	0	1.0	0	0.15	0	0.2

Besides, the IRI analysis shows that the most important items were fish in both sites during nortes and shrimp, in Puerto Real during dry and rainy. The secondary items were invertebrate eggs and crabs for dry and rainy, and shrimp in Puerto Real during nortes. The other items had small values.

TROPHIC PATTERN

IN A SPATIAL-TEMPORAL SCALE

L synagris was more abundant during Rainy and less abundant during Nortes season. It was frequently capturad in Puerto Real inlet, and only during Rainy season was capturad in El Carmen inlet. The preference (in weight) on its diet changed according to the length distribution, the climatic season and even in each inlet as follows (Table 7):

According to the digestion analysis, L. *synagris* Puerto Real inlet is used by this fish *as a* corridor, except during rainy season, whan this species feeds in this inlet. El Carmen mlet is a corridor during rainy (Table 8).

Tabla 2. Values of the IIR index (Yáñez-Arancibia et aL, 1976), and the IRI index (Pinkas et al., 1971), for the items of the trophic spectrum of *Polydactylus octonemus,* in each climatic season and Terminos lagoon inlet. CA= El Carmen inlet, PR= Puerto Real inlet.

Items	**NORTH**		**DRY**		**RAINS**	
IIR index	**CA**	**PR**	**CA**	**PR**	**CA**	**PR**

Shrimp	**11.0**	**35.0**	**25.0**		**1.3**	**50.4**
Carideans	**4.0**	**9.0**		**14.0**	**1.5**	**9.3**
InvertebrateLar	**0.3**	**1.5**				
Invertebrateegg				**1.2**	**0.01**	
Crabs	0.5	1.03			0.1	0.03
OtherCrustacea	5.0	19.0	3.3	1.0	56.0	1.2
Amphipods				0.4	0.02	
Isopods		0.01			0,01	
Polychaetes	18.5			0.1	0,01	
Fishes	0.1	8.3	14.0	0.03	0.01	2.3
Bivalva				0.01		0.01
IRI index						
Shrimp	2238.1	4800.4	8113.0		761.4	7431.0
Carideans	188.2	3182.4		1401.0	1321.0	4469.0
InvertebrateLar	303.0	1543.8				
Invertebrateegg				1779.5	22.1	
Crabs	173.0	174.0			163.3	38.2
Amphipods				43.0	226.3	
Isopods		3.4			1.0	
Polychaetes	1887.5				1.2	
Fishes	15.1	961.1	1621.4	3.5	6.0	100.0
Bivalva				1.0		1.0

Discussion

TROPHIC SPECTRUM

Polydactylus octonemus is a second order consumer and frequently found in shallow and brackish water of El Carmen inlet. *Lutjanus synagris* is a second-third order consumer and prefers both deep and clear marine water from Puerto Real inlet. Even though each fish species has preferences on certain type of item. The results of this study shows that there are differences in the trophic habits, and the preferences and variation on the diet, were depending on the length of the fish, the climatic season and even the inlet (with marine or estuarine influence). The availability of the different items were related to their own life cycle, and to the primary productivity processes in this coastal system (Yáñez-Arancibia *et al*., 1994).

P. *octonemus* is a bottom feeder which uses its pectoral fin rays to remove the mud and clay in order to get food. As this happens, every organism of the macrobenthos is caught, and this could be an explanation for the wide trophic spectrum of this fish. It seems to be that it is a second order consumer with tendency to be an omnivorous fish.

Few papers have described P. *octonemus* biology, e.g. Gunter (1945); Chittcuden and McEachran (1976); and on its feeding behavior, e.g. Fischer (1978), for the Gulf of Mexico, the Caribbean and Brazil; Yáñez-Arancibia et al. (1985), and Yáñez-Arancibia and Sánchez-Gil (1986), for the Campeche Sound and Veracruz; and Aburto and Santes (1987) for Veracruz. Nevertheless, there are some other authors for other species of this genus who report that this species eats macrobenthos; in the Bombay coast (Suseelan and Somasekharan, 1969), and in Sierra Leona, Africa (Longhurst, 1975).

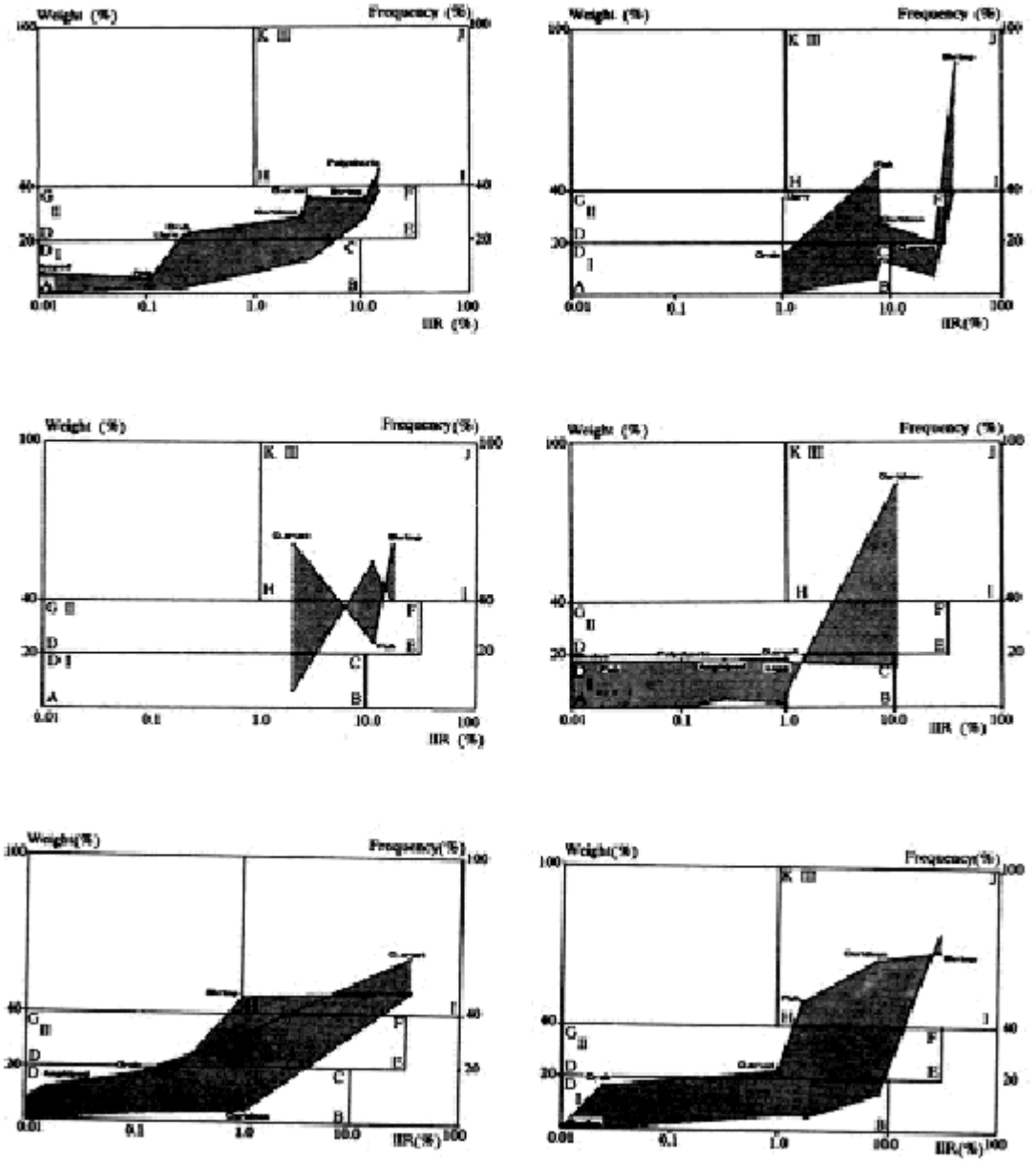


Figura 2. Values of the relative imortance index (IIR) according to Yáñez-Arancibia *et al. (1976) for* Polydactylus octonemus *in each climatic season and Terminos Lagoon inlets.*

Table 3. Trophic preference (total weight percent) of *Polydactylus octonemus* according to the length distribution in each season and Terminos Laggon inlets

Inlets/Season	North winds	Dry	Rains

El Carmen	Diet: Polychaetes (39%)Shrimp (29%)Length: 14-13 cm	Diet: Shrimp (40%)Length: 16-22 cm	Diet: Other crustacean(90.5 9-22 cm
Puerto Real	Diet: Shrimp (40%)Other crustacean (28.5%)Length: 17-25 cm	Diet: Carideans (86%)Length: 18-24 cm	Diet: Shrimp (75%)Length: 17-26 cm

Table 4. Distribution of the percentage of the digestion steps of *Polydactylus octonemus*_according to Laevastu (1971), in each climatic season and Terminos Lagoon inlet. CA = El Carmen,PR = Puerto Real

	Step 1 (%)		Step 2 (%)		Step 3 (%)	
	CA	**PR**	**CA**	**PR**	**CA**	**PR**
North winds	**68**	**42**	**1.05**	**42**	**30.5**	**17**
Dry	**47**	**15**	**41**	**54**	**12**	**31**
Rains	**38**	**55**	**20**	**33**	**42**	**12**

Table 5. Percent grequency, weight ans number of each food item in the trophic spectrum of *Lutjanus synagris,* by each climatic season and Terminos lagoon inlet. There were no capture of organisms in El Carmen inlet during Dry season. CA= El Carmen inlet, PR= Puerto Real inlet.

Item	Frequency (%)	Weight (%)	Number (%)
DDY	PR	PR	PR
Shrimp	47	46	0.2
Carideans	26	40	0.15
InvertebrateLarvae	11	0.1	24
InvertebrateEggs	26	7	70
Crabs	15	2.5	5
Othercrustacean	17	2.1	0
Fishes		2	0.02

NORTHWINDS	CA	PR	CA	PR	CA	PR

Shrimp	0	28	0	30	0	22
Carideans	0	4	0	5	0	3
Crabs	0	12	0	10	0	12
Othercrustacean	100	33	20	7	0	0
Polychaetes	0	2	0	2.5	100	2
Fishes	50	41	80	45	0	62
RAINS						
Shrimp	32	29	35	0.001	7	5
Carideans	16	28	3	17	5	9
Invertebratelarvae	11	1.5	1	0.01	14	3.5
Invertebrateeggs	7	5	0.04	1	24	77
Crabs	41	35	9	20	13	3
Othercrustacean	61	78	26	18	0	0
Amphipods	11	0	0.4	0	4	0
Fishes	26	26	26	23	33	3

Table 6.Values of the IIR index (Yañez-Arancibia *et al*.., 1976) and the IRI index (Pinkas *et al.,* 1971), for the items of the trophic spectrum of *lutjanus synagris,* in each climatic season and Terminos lagoon inlet. CA= El Carmen inlet, PR= Puerto real inlet.

Items	NORTH WINDS		DRY	RAINS	
IIR index	CA	PR	PR	CA	PR
Shrimp		8.5	21.4	11.1	6.0
Carideans		0.2	10.4	0.4	4.0
InvertebrateLarvae			0.1	0.1	0.01
Invertebrateeggs			2.0	0.003	0.04
Crabs		1.2	0.4	4.0	4.0
OtherCrustacea	20.4	2.3	0.4	16.2	27.0
Fishes	40.0	20.0	0.1	8.0	5.1

Amphipods				0.04	
IRI index					
Shrimp		1460.0	2082.5	1244.2	656.0
Carideans		32.5	1307.0	122.0	643.0
Invertebratelarvae			265.2	167.0	40.2
Invertebrateeggs		258.2	1981.0	165.2	532.0
Crabs		2705.0	119.3	900.5	568.1
Fishes	8978.2		7.3	448.2	338.1
Amphipods				49.0	

L. synagris is a demersal fish and a quick swimmer that uses the water column to get food. This species also has got a wide trophic spectrum, but prefer fishes and organisms of the macrobenthos. Although it is a second-third consumer, the tendency is that the adults become a third order consumer.

The biology of *L. synagris* have been described for many authors such as Druzhinin (1970); Reshetnikov and Claro (1975); Dumas *et al*. (1979); Claro (1981, 1983); Yáñez-Arancibia *et al*. (1985). The feeding habits for this specie, mostly macrobenthos and fishes, has been reported by Fischer (1978) for the Gulf of Mexico, Caribbean and Brazil; and Ayala-Pérez (1984) for Veracruz, Mexico.

TROPHIC PATTERN
IN A SPATIAL-TEMPORAL SCALE

Both fish species have been reported by Yáñez-Arancibia et al. (1985) as occasional or cyclic visitors of Terminos Lagoon. This lagoon and the two inlets have an important ecological roll as a shelter, for reproduction and as a nursery place for many species. Both inlets are passages that allow the transit inside or off the lagoon to shallow waters in the Campeche Sound.

The trophic pattern varies according to: a) the fish length, this is related to the mouth size, and also with the ability or experience for predate certain prey; b) prey distribution (El Carmen or Puerto Real inlet), and relative abundance, this is related also with the availability of the prey; c) prey's own life story; and d) predator trophic habits, this related to the chronology and to the gut fullness.

The distribution of *Polydactylus octonemus* shows a preference for shallow waters, associated with estuarine influenced zones and soft bottoms with high organic matter contents; and varies in time and in location (Fig. 4). The juveniles (9-14 cm) were found m El Carmen inlet during rainy season; preadults (14-20 cm) were found mainly during nortes and dry seasons in the same inlet. Meanwhile, adults (20-26 cm) were caught in Puerto Real inlet mainly during rainy and dry seasons. Juveniles and preadults eat juvenile shrimp and other crustacean, while adults prefer adult shrimp, Carideans and polychaetes.

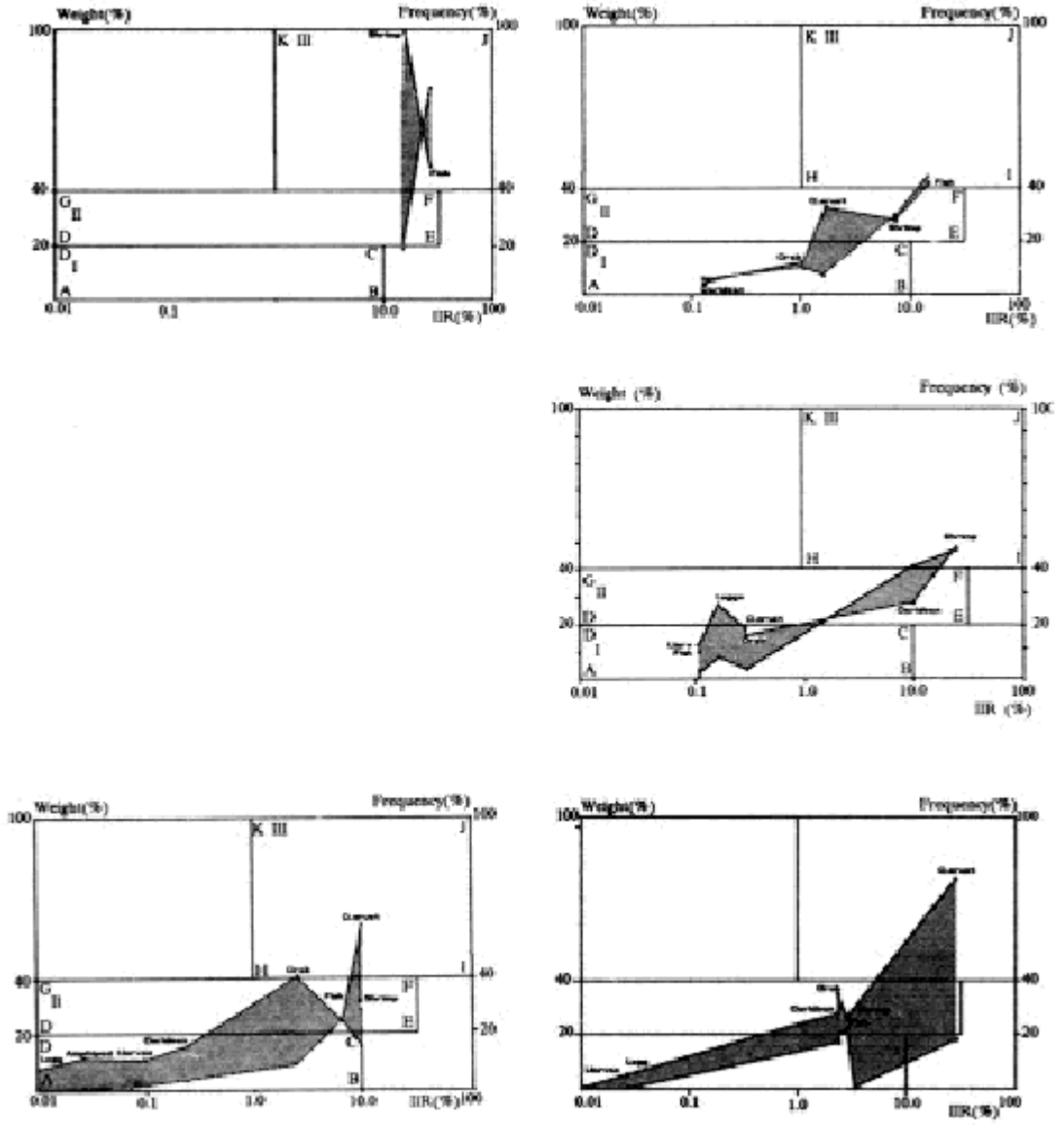


Figura 3. Values of the relative importance index (IIR) according to Yáñez-Arancibia *et al.* (1976) for *Lutjanus synagris* in each climatics and Terminos Lagoon inlets.

Tabla 7. Trophic preferences (weight percent) of *Lutjanus synagris* according to the length distribution in each climatic season and Terminos Lagoon inlets

Inlets/Season	Dry	North winds	Rains

El Carmen	--------	Diet: Fish (80%)Length: 10-17 cm	Diet: Shrimp (35%)Other Crustacean (27%)Fish (26%)Length: 5-11 cm
Puerto Real	Diet: Shrimp (46%)Carideans: (40%)Length: 7-20 cm	Diet: Fish (48%)Shrimp (30%)Length: 5-25 cm	Diet: Other Crustaceans (48%), Shrimp (20%)Length: 10 and 23 cm

Tabla 8. Distribution of the percentage of the digestion steps of *Lutjanus synagris* according to Laevastu (1971), in each climatic season and Terminos Lagoon inlet. CA = El Carmen, PR = Puerto Real

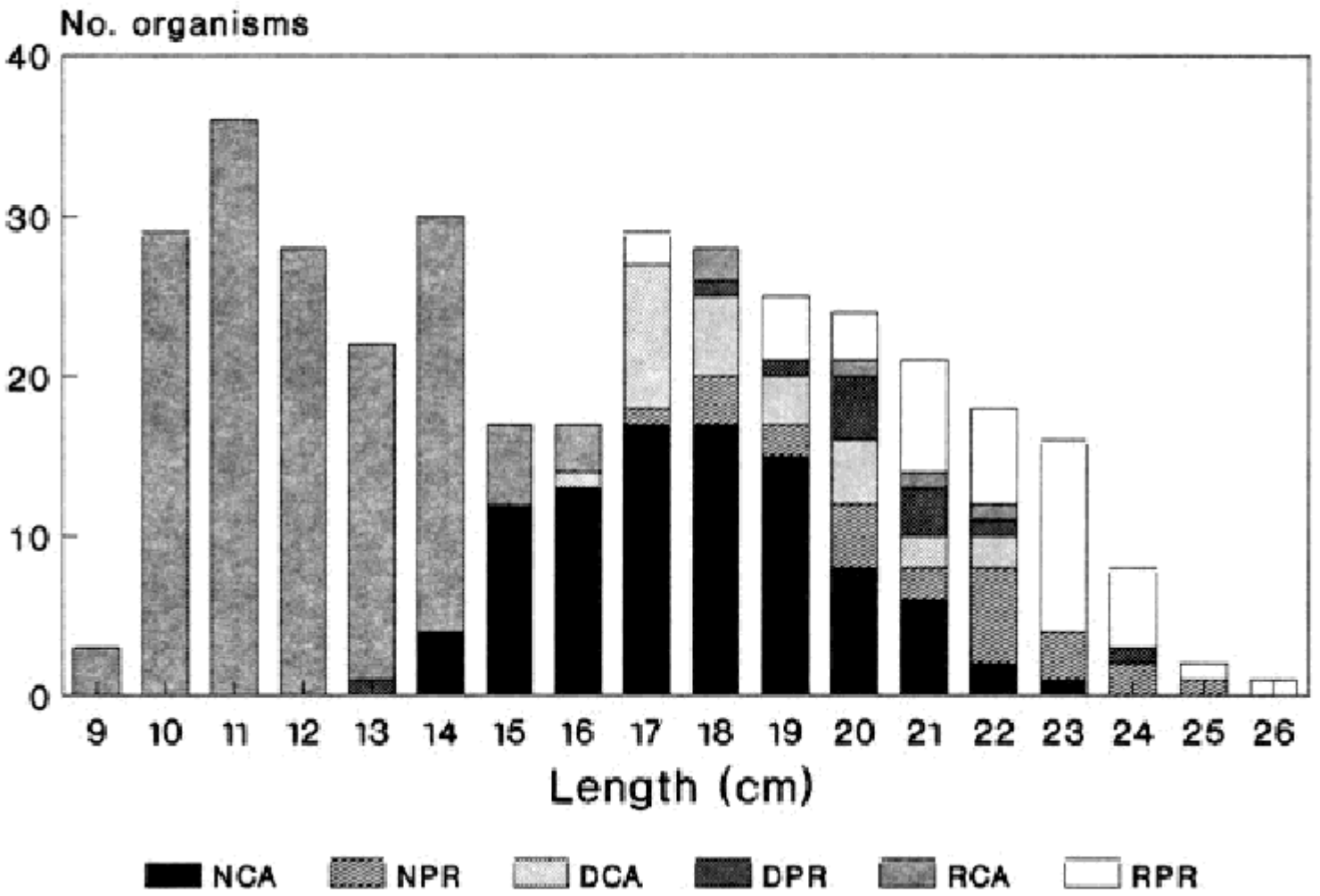
	Step 1 (%)		Step 2 (%)		Step (%)	
	CA	PR	CA	PR	CA	PR
North winds	100	15		31		54
Dry		24		16		59
Rains	25	50	29	23	46	27

Besides, the distribution of *Lutjanus synagris* occurs in deep waters, associated with marine influenced zones, sandy bottoms with sea grasses beds, and shows variation in time and location (Fig. 5). This fish species was caught mainly in Puerto Real inlet in the three climatic seasons. But in El Carmen inlet this fish species was not present in the catches during nortes nor dry seasons. The juveniles (5-11 cm) were found in El Carmen inlet mainly during rainy season; preadults (11-18 cm) were caught in Puerto Real during dry and rainy seasons. There was a wide length distribution during nortes in Puerto Real inlet. Adults of this species (18-25 cm) were caught mainly during nortes in Puerto Real, but in a small number. Juveniles feed upon fish larvae and juvenile shrimp, preadults eat crustacean, mainly shrimp and carideans, and adults prefer fish juveniles and adult shrimp.

ECOLOGICAL FUNCTION OF TERMINOS LAGOON INLETS

The ecological role of the estuarine inlets is a key in the active relationship and self-dependence of the biotic communities of the Sound of Campeche and Terminos Lagoon. According with the results of this study, both inlets have also trophic importance. Nevertheless, the trophic habits of both fish species, as other tropical coastal fishes, change according to the age, and their horizontal and vertical distribution and migration behavior.

The trophic strategies of *P. octonemus* and *L. synagris* are based in the spatial-temporal share of the feeding areas. The trophic behavior of these species depends on the abundance and item availability. The same occurs wilh the item preference and the sequentially predation of both fish species on a specific item, such as shrimps, e.g., *P. octonemus* in Nortes season; and *L. synagris* in Rainy season in both inlets.



Fugure 4. Distribution and relative abundance of *Polydactylus octonemus* im each climatic season and Terminos Lagoon inlets.

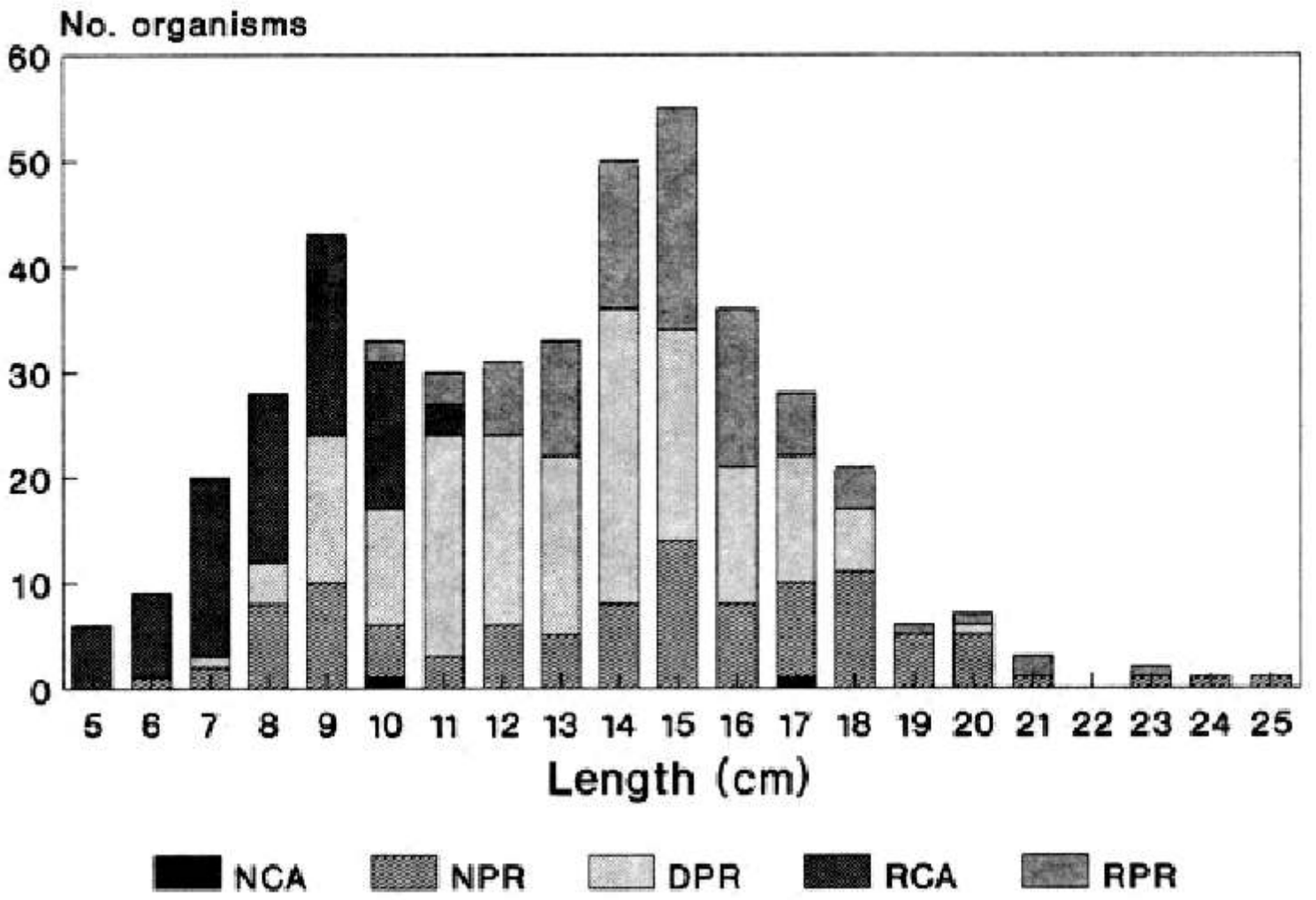


Figure 5. Distribution and relative abundance of *Lutjanus synagris* in each climatic season and Terminos Lagoon inlets.

Besides, the biological and ecological strategies of both fish species are annually programmed according to each climatic season and the physico-chemical charactenstics of each inlet. For the preadults and adults of P. *octonemus* in nortes and dry seasons, the Puerto Real inlet is a corridor, this means that they eat in a place far from the inlet; and in nortes the adults used this inlet to predate on other crustacean, mainly shrimp. During nortes and dry seasons in El Carmen inlet, preadults used it as a feeding area, eating shrimp and polychaetes. Dunug rainy season, the juveniles of this fish species utilized El Carmen as a corridor, while Puerto Real inlet is a feeding area for adults that predate on shrimp. Besides, L. *synagris*_in nortes and dry seasons, used Puerto Real as a corridor, and they were absent in El Carmen inlet's catches. But during rainy, juveniles used El Carmen as a corridor, while Puerto Real is a feeding area for preadults that predate fishes and shrimp.

Dedication

Autores wish to dedicate this paper to the memory of Dr. Miss Leonila Vázquez García.

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