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Larval Distribution and Abundance of Carangidae (Pisces), from the Southern Gulf of Mexico, 1983-1984

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LARVAL DISTRIBUTION AND ABUNDANCE OF CARANGIDAE (PISCES), FROM THE SOUTHERN GULF OF MEXICO. 1983–1984.

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ABSTRACT The larval distribution and abundance of several taxa of the carangids from the southern Gulf of Mexico are analyzed, based on data from four oceanographic cruises conducted between 1983 and 1984. The material was collected with a bongo net fished to maximum depths of 200 m. The species collected were *Chloroscombrus chrysurus* (54.2%), *Decapterus punctatus* (15.8%), *Trachurus lathami* (11.8%), *Selene setapinnis* (6.1%), *Selar crumenophthalmus* (6.0), *Caranx hippos/latus* (0.9%), *Caranx crysos* (0.7%) and *Selene* sp. (0.3%). The higher frequency of occurrence and greater abundance of larvae of all species was found over the continental shelf, and in some cases, in the oceanic zone near the slope. Almost all the species were present year-round with highest larval densities in the warm months, except for *T. lathami* which occurred in greatest abundance during winter and early spring.

Introduction

Knowledge of early life history can be applied to fishery resource management and is aimed towards three major goals: (1) to identify the spawning areas and seasons; (2) to measure the relative or absolute abundance of the stocks and; (3) to determine those interactions between species during the larval stages that could possibly affect the future size of a stock (Saville 1975).

The major goal of this work does not lead directly to fisheries management; nevertheless, it provides information that could be useful for management of the various carangid fisheries which comprise a vast majority of species with considerable commercial fishery value, especially in tropical and subtropical areas (Abboussuan 1975).

The Carangidae is one of the most abundant families in the southern Gulf of Mexico, and almost all of its species are exploited to some degree. There have been few published accounts of the early life history of carangids in the Gulf of Mexico. McKenney et al. (1958), Aprieto (1974) and Montolio (1976) described the larval development of some species (*Decapterus punctatus, Elagatis bipinnulata, Selene vomer, Oligoplites saurus, Seriola zonata* and *Caranx crysos*). Aprieto (1974) and Leak (1977, 1981) reported on their distribution and abundance in the northern Gulf of Mexico, while Montolio (1976) described the distribution of *Decapterus punctatus* and *Caranx crysos* throughout the gulf. Larval carangid occurrence has been noted in some general ichthyoplankton surveys from the southern Gulf of Mexico (Sanvicente-Añorve 1985, Pineda-López 1986, Fajardo-Rivera and Rodríguez-Van Lier 1986). However, there have been no specific investigations on carangid larvae. The main objective of the present study is to determine the patterns in distribution and abundance of carangid larvae, so as to define spawning seasons and areas.

Materials and Methods

The study area is located in the southern Gulf of Mexico, below the 21° N parallel and comprises the continental shelf and adjacent oceanic zone of the states of Veracruz, Tabasco and Campeche (Fig. 1).

Geological, physical and biological aspects of the area can be found in Rossov (1967), Villalobos-Figueroa and Zamora-Sánchez (1975) and Gutiérrez-Estrada (1977).

The zooplankton samples analyzed were collected aboard the oceanographic ship JUSTO SIERRA, during four multidisciplinary oceanographic cruises: PROGMEX I (spring), March 31 – April 8, 1983; IMECO (winter), February 15–25, 1984; PROGMEX II (spring), April 25 – May 4, 1984; and PROGMEX III

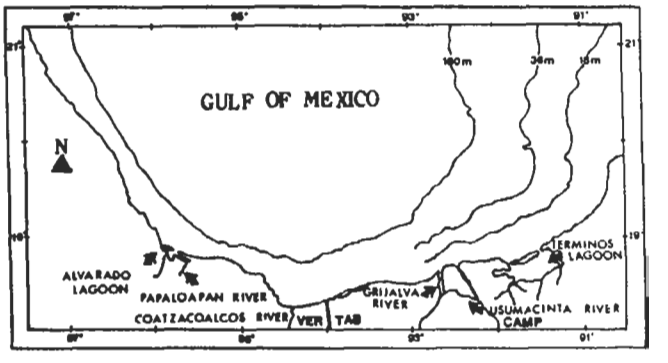

Figure 1. Study area.

(summer), August 7–17, 1984. A total of 172 stations were sampled primarily over the continental shelf zone and, to a lesser extent, the oceanic zone, except for the IMECO cruise which covered a larger portion of the oceanic zone.

Zooplankton sampling consisted of a double oblique plankton tow following a circular course using a bongo net with 333 and 505 µm mesh nets. The water volume filtered was calculated using flowmeters placed in each net. The depth and tow time varied from 10 to 200 m and from 2 to 23 min., respectively, according to the bathymetry.

Larval density (L) was standardized and reported as number of larvae/100 m^3. As two samples were available for each station, resulting from the 333 and 505 µm nets, the highest value of L for the quantitative analysis was always taken, independently of the mesh.

RESULTS

A total of 3,610 carangid larvae were collected. These corresponded to eight (or nine) species, of which *Chloroscombrus chrysurus* was the most abundant (54.2%), followed by *Decapterus punctatus* (15.8%), *Trachurus lathami* (11.8%), *Selene setapinnis* (6.1%), *Selar crumenophthalmus* (6.0%), *Caranx hippos/latus* (0.9%), *Caranx crysos* (0.7%) and *Selene* sp. (0.3%). Data on these species are presented below (Table 1).

Chloroscombrus chrysurus (Linnaeus, 1776) "Atlantic bumper"

This species was distributed throughout the study area. It was the most frequent and abundant species (Table 1). Atlantic bumper was abundant over the eastern continental shelf and virtually absent in the western portion.

Greatest abundance was observed in shallow waters less than 40 m deep, near the fluvial-lagoon systems, with highest larval densities occurring in front of Términos Lagoon (Fig. 2).

Though scarce during winter, the presence of larvae in all four cruises indicates that spawning occurs year-round. Maximum spawning appears to occur especially during summer and the warm months of spring.

Decapterus punctatus (Agassiz, 1829) "Round scad"

Round scad larvae were widely distributed in the study area. They occurred mainly over the continental shelf in areas less than 100 m deep, where greatest abundances were found. In deeper areas, they were scarce and less frequently taken (Fig. 3).

The larvae of this species were taken most frequently in the eastern region of the sampling area. They were scarce and less frequent on the Veracruz shelf except during the March–April cruise in 1983, where the greatest abundance and highest frequency of occurrence were observed at the mouth of the Coatzacoalcos River.

This species also appeared to spawn year-round with the lowest intensity during cold months (winter) and the highest during warm months (spring–summer), particularly during spring.

Trachurus lathami Nichols, 1920 "Rough scad"

The larvae of *T. lathami* were widely distributed throughout the sampled area. The greatest abundance

TABLE 1

Abundance, frequency and size range of carangid larvae, during four cruises in the southern Gulf of Mexico. A. - Percentage of occurrence; B. - Larval density (No. larvae/100 m^3)

	PROGMEX I 48 stations		IMECO 29 stations		PROGMEX II 40 stations		PROGMEX III 55 stations		TOTAL	%	Size range
	A	B	A	B	A	B	A	B	B	B	mm
Chloroscombrus chrysurus	22.9	79.4	10.3	22.1	32.5	305.4	50.9	403.0	809.9	54.2	1.8–13.3
Decapterus punctatus	20.8	56.5	10.3	5.7	37.5	140.7	25.5	33.5	236.4	15.8	1.4–13.8
Trachurus lathami	54.2	125.6	44.8	34.4	12.5	14.6	5.5	1.6	176.2	11.8	2.1–12.4
Selene setapinnis	27.1	29.0	3.4	0.7	25.0	39.7	36.4	21.9	91.3	6.1	1.7–11.4
Selar crumenophthalmus	29.2	37.6	3.4	0.5	30.0	22.3	38.2	29.4	89.8	6.0	2.1–14.3
Caranx hippos/latus	0	0	0	0	10.0	7.4	20.0	6.4	13.8	0.9	3.1–6.3
Caranx crysos	0	0	0	0	5.0	2.3	12.7	8.7	11.0	0.7	3.1–7.8
Selene sp.	0	0	0	0	5.0	2.4	5.5	2.1	4.5	0.3	2.9–5.6
Indeterminate	0	0	0	0	10.0	9.0	41.8	53.8	62.8	4.2	1.6–2.5

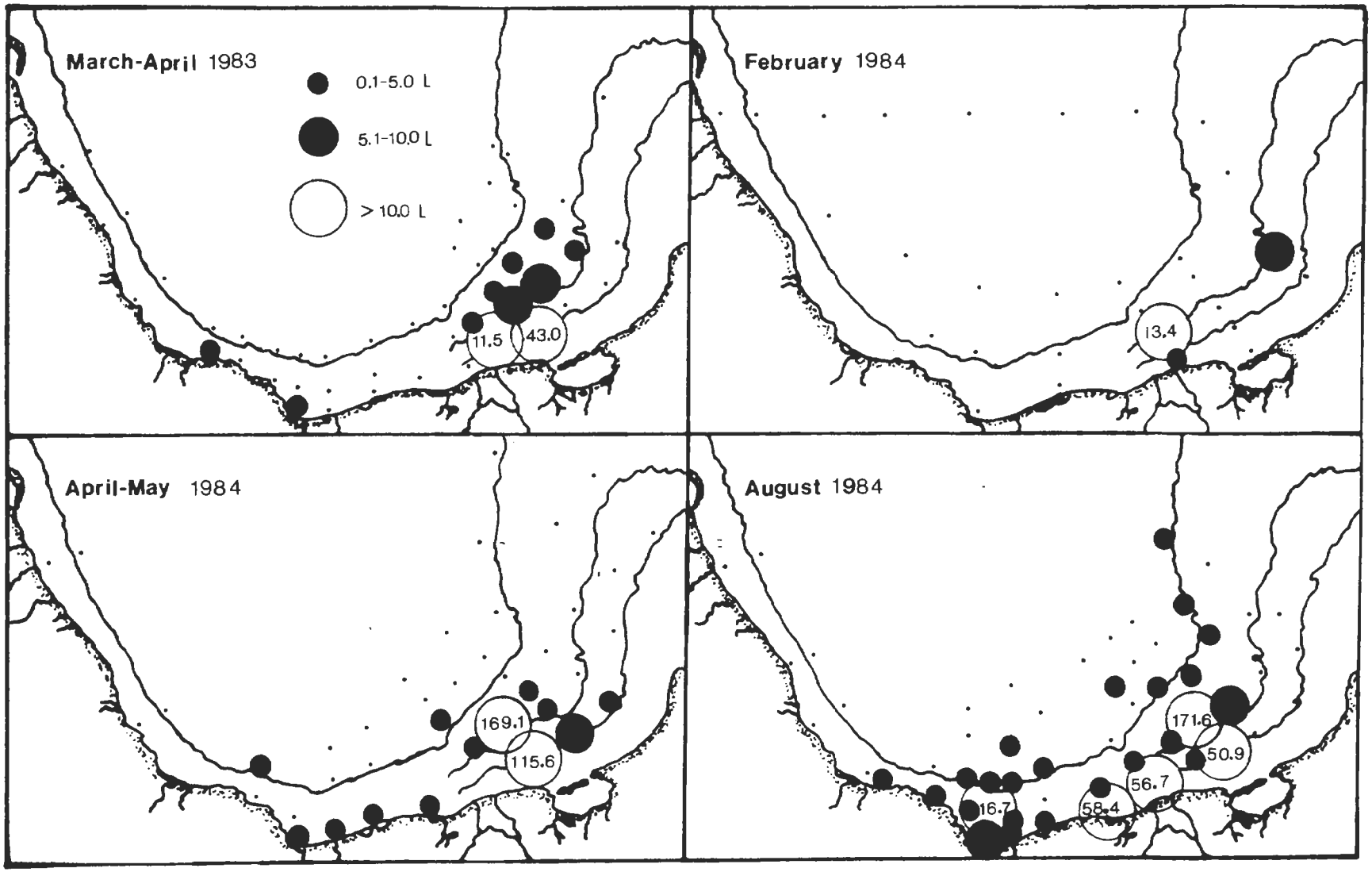

Figure 2. Abundance and distribution of *Chloroscombrus chrysurus*. Southern Gulf of Mexico.

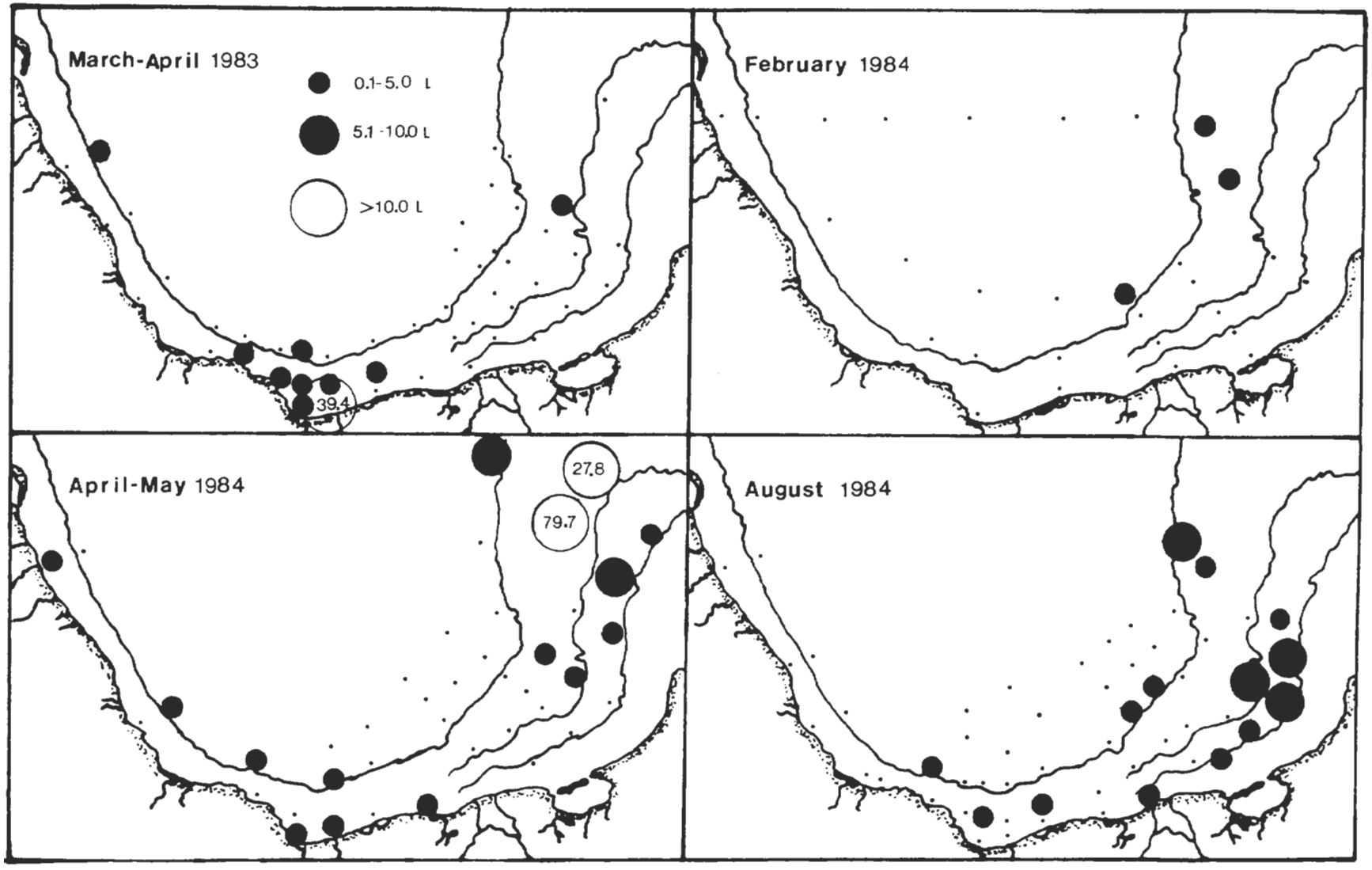

Figure 3. Abundance and distribution of *Decapterus punctatus*. Southern Gulf of Mexico.

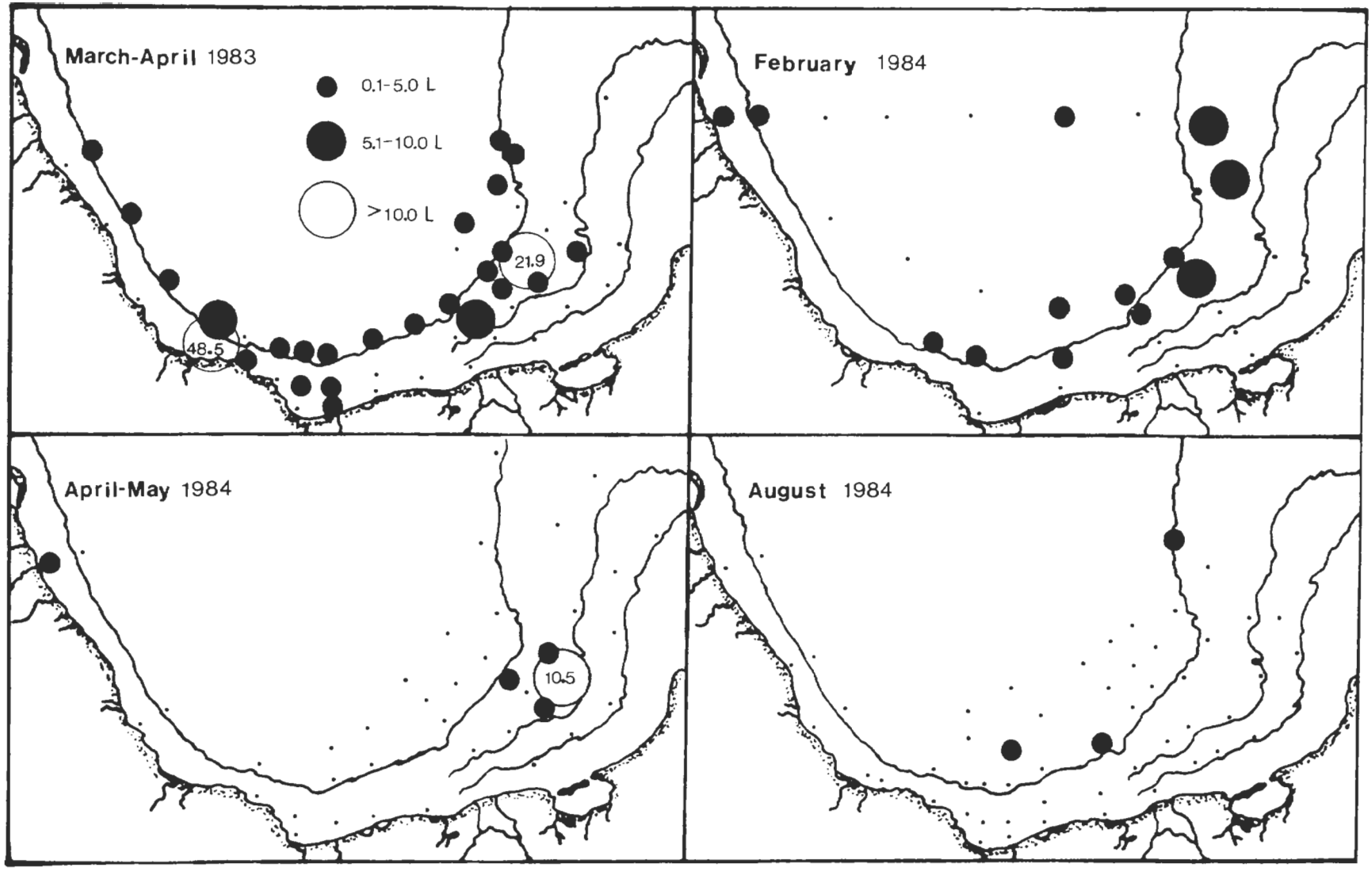

Figure 4. Abundance and distribution of *Trachurus lathami*. Southern Gulf of Mexico.

was found over the continental shelf at depths > 36 m, with the exception of the western region, where the shelf is narrower and where the larvae occurred at stations less than 36 m deep (Fig. 4). Though less abundant, they were frequently taken at the shelf break and were scarce in the oceanic zone.

Larvae were taken on all four cruises, but were least abundant during summer months. This species probably spawns year-round, peaking during the winter–spring seasons, mainly in early spring.

Selene setapinnis (Mitchill, 1815) "Atlantic moonfish"

Atlantic moonfish larvae were widely distributed throughout the eastern portion of the survey area, with the highest frequency of occurrence and greatest abundance observed along the Tabasco and Campeche coasts (Fig. 5). Larvae of this species were most often found in areas over the continental shelf at depths > 40 m, although some larvae were captured in shallower stations as well as in some oceanic areas close to the continental slope.

Larvae were present throughout the year, with the greatest abundance occurring during the warm months of spring and summer.

Selar crumenophthalmus (Bloch, 1793) "Bigeye scad"

The larvae of this species were distributed throughout the study area, mainly over the continental shelf, where major centers of abundance were found at depths > 36 m. A few larvae occurred in the oceanic zone along the shelf break (Fig. 6).

These data indicate that this species spawns over the mid to outer shelf. The presence of larvae within the coastal zone was limited to the western part of the study area, where the shelf is very narrow. This may be a consequence of local currents transporting larvae shoreward.

Bigeye scad larvae were captured on all four cruises; hence, it can be concluded that this species spawns year-round, with a peak in spring-summer months.

Caranx hippos/latus (Linnaeus, 1766) "Jack crevalle"

The larvae of *C. hippos* and *C. latus* cannot be distinguished from each other.

Larvae of this complex had a wide distribution in the study area, present mainly in offshore waters over the shelf. They were least abundant at the Veracruz shelf and in the oceanic zone (Fig. 7A).

Larvae were collected only in spring (April–May) and summer.

Caranx crysos (Mitchill, 1815) "Blue runner"

The larvae of this species occurred in low abundance throughout the survey area, collected more frequently at stations that were > 40 m in depth, including the oceanic ones. The coastal stations where they were captured were all located in the narrow shelf of Veracruz. Occurrence was limited almost exclusively to the summer cruise, with only four specimens captured during spring (Fig. 7B).

It appears that *C. crysos* spawns at the outer shelf and oceanic areas. Its presence in coastal waters of Veracruz can probably be explained by the narrowness of the shelf, allowing the larvae to be easily carried inshore from the oceanic zone by local currents. The spawning season takes place, primarily, in summer.

Selene sp. (Agassiz) "Full moonfish"

Only three species of *Selene (S. vomer, S. setapinnis* and *S. brownii*) have been recorded in the western Atlantic and Gulf of Mexico (Berry and Smith-Vaniz 1978, Laroche et al. 1984).

The larvae referred to in this paper as *Selene* sp. do not correspond to either the *S. vomer* or the *S. setapinnis* described; therefore, they could possibly correspond to *S. brownii*.

Larvae of this species were scarce, present in shelf waters of Tabasco and Campeche from the coastal zone to the slope. They occurred only during spring and summer, with five and three larvae captured, respectively (Fig. 8).

DISCUSSION AND CONCLUSIONS

Larvae of eight (or nine) of the 15 species of carangids recorded as adults in the southern Gulf of Mexico by Castro-Aguirre (1978), Berry and Smith-Vaniz (1978), Reséndez-Medina (1970, 1973, 1981), and Sánchez-Gil et al. (1981) were found in our study area. *Chloroscombrus chrysurus* was the most abundant among the captured species (54.2%); followed by *Decapterus punctatus* (15.8%), *Trachurus lathami* (11.8%), *Selene setapinnis* (6.1%), *Selar crumenophthalmus* (6.0%), *Caranx hippos/latus* (0.9%), *Caranx crysos* (0.7%), and *Selene* sp. (0.3%). Larvae of *Trachinotus falcatus, T. carolinus, Selene vomer, Hemicaranx amblyrhynchus, Caranx bartholomaei* and *Oligoplites saurus* were absent. Larvae of the *O. saurus* have been reported for the Términos Lagoon (Flores-Coto and Alvarez-Cadena 1980, Flores-Coto 1985, Ferreira-González and Acal-Sánchez 1984).

Larval distribution and abundance studies of carangids from the northern Gulf of Mexico found that the most abundant species were *D. punctatus, C. chrysurus* and *T. lathami* (Leak 1977, 1981), which correspond

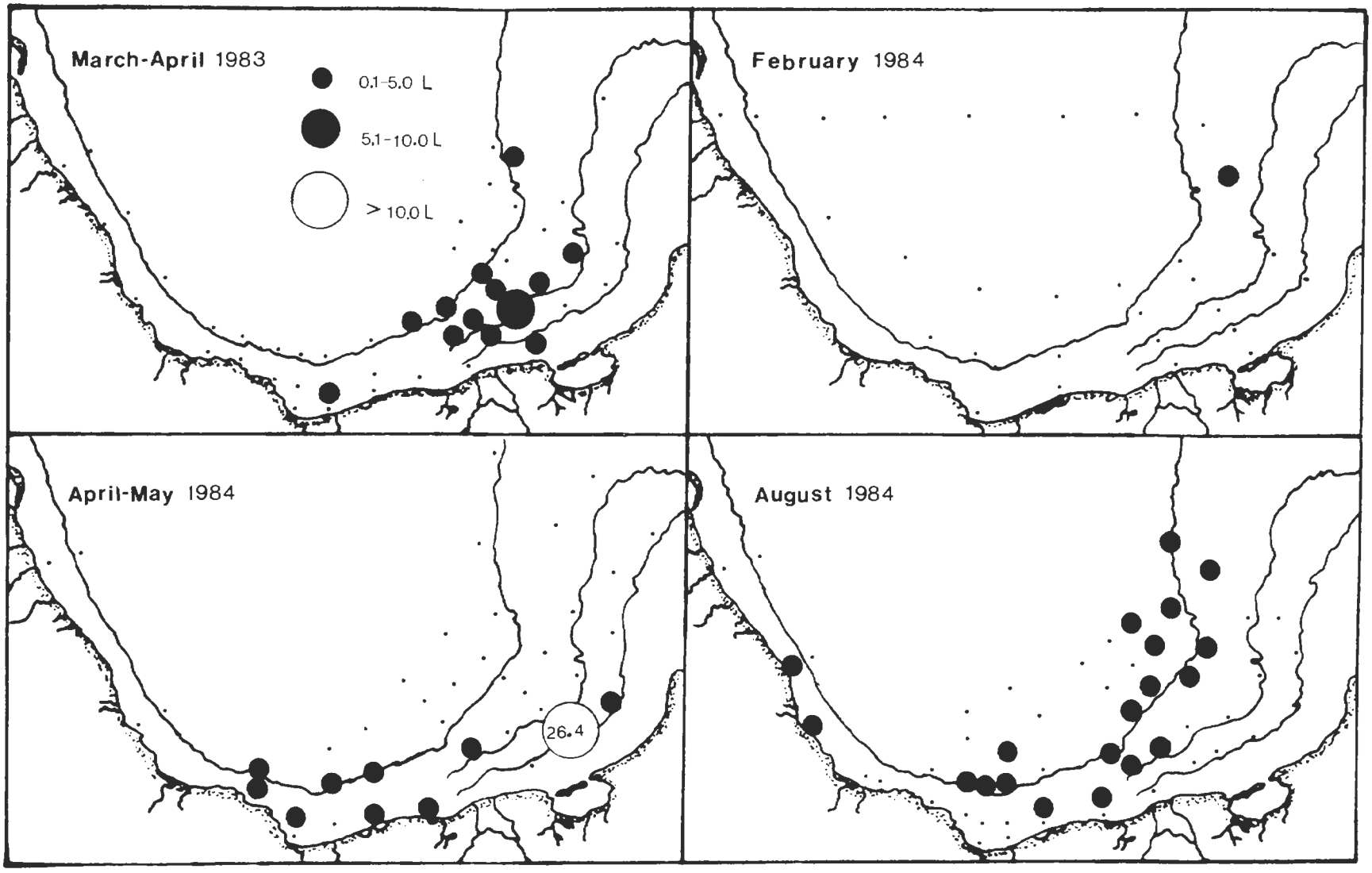

Figure 5. Abundance and distribution of *Selene setapinnis*. Southern Gulf of Mexico.

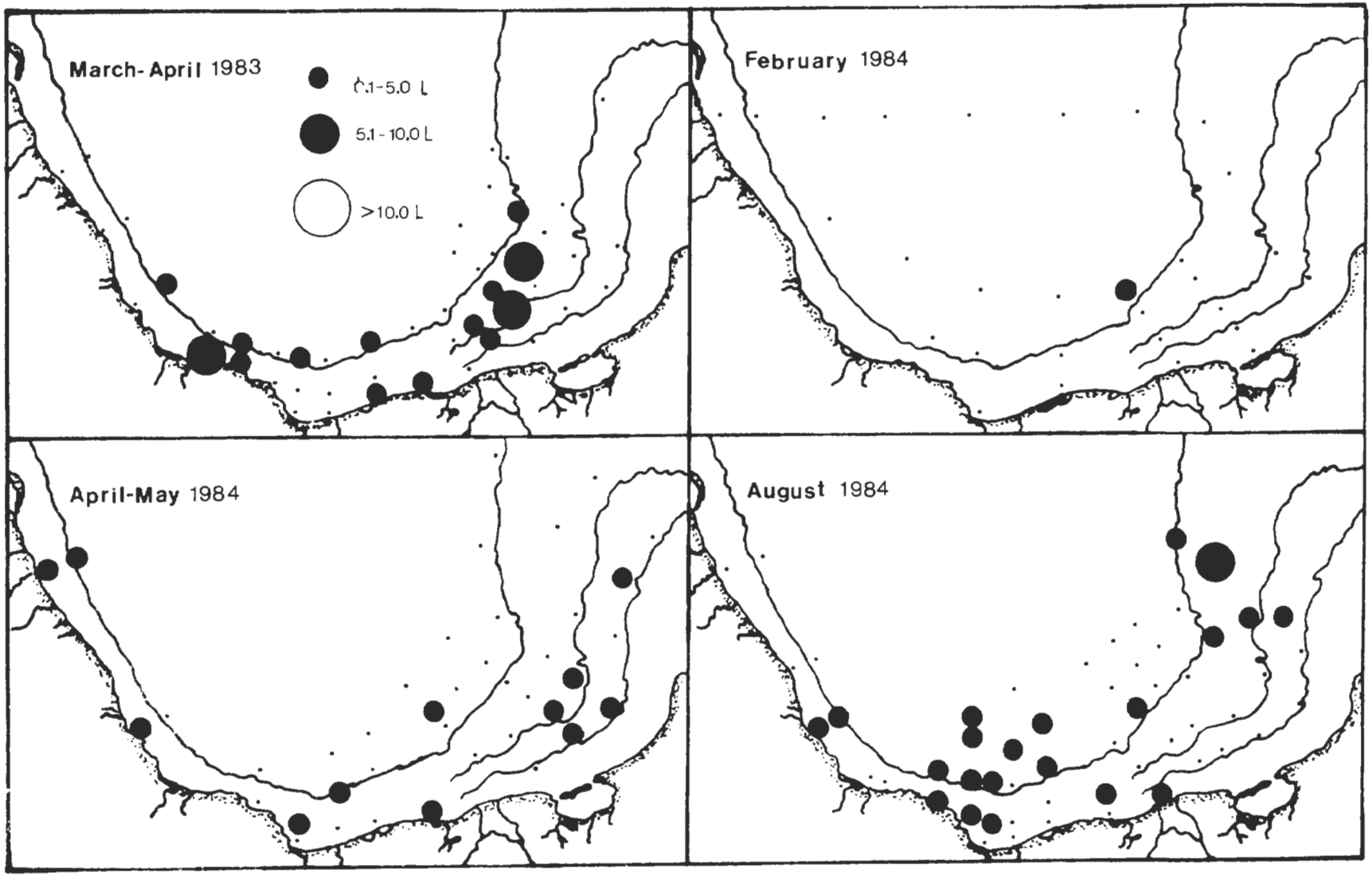

Figure 6. Abundance and distribution of *Selar crumenophthalmus*. Southern Gulf of Mexico.

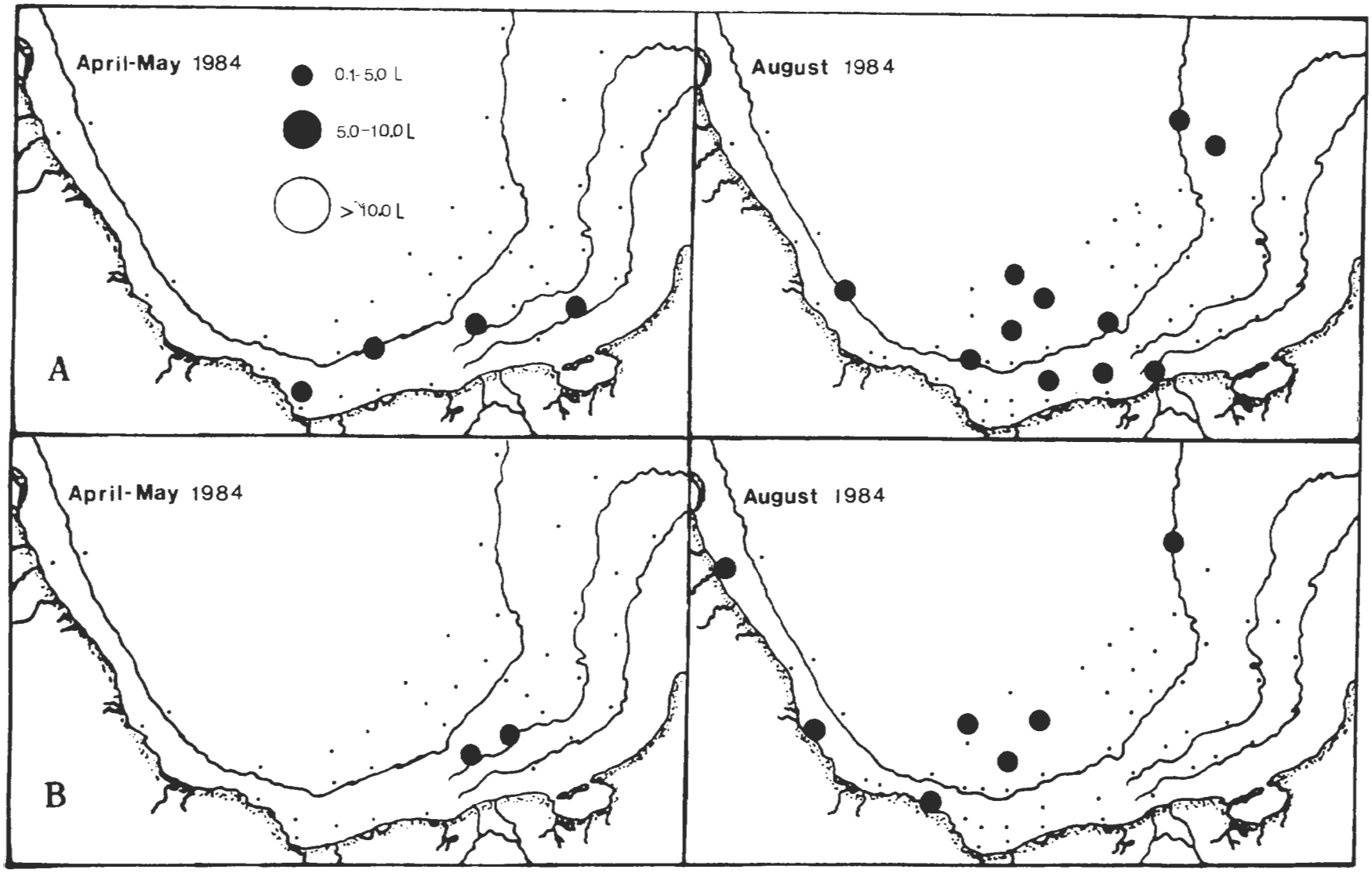

Figure 7. Abundance and distribution of: (A) *Caranx hippos/latus*, (B) Caranx crysos. Southern Gulf of Mexico.

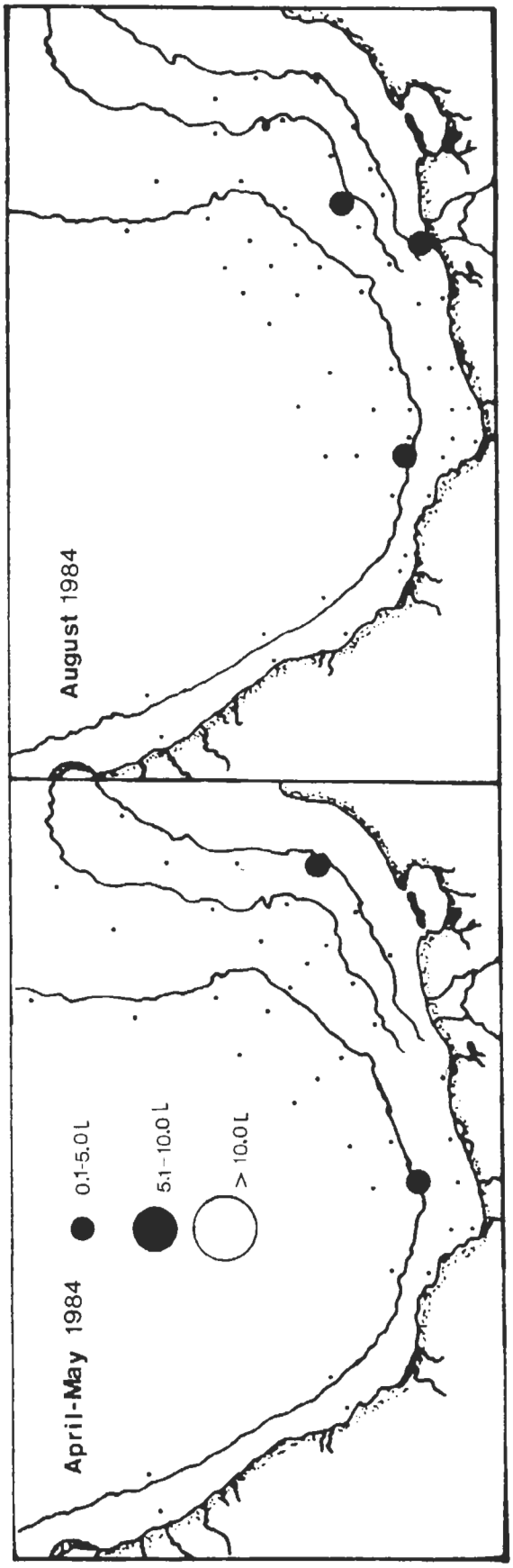

Figure 8. Abundance and distribution of *Selene* sp. Southern Gulf of Mexico.

with those most abundant (80%) in our study area (*C. chrysurus, D. punctatus* and *T. lathami*).

Larvae of *D. punctatus* were reported as the most abundant species in the Gulf of Mexico (Montolio 1976, Aprieto 1974).

There is a partial correspondence of the abundance of larvae and adults in our study area. *Chloroscombrus chrysurus* and *T. lathami* were the first and third most abundant species, and their adults are referred to as the second and first most abundant species respectively (Sánchez-Gil et al. 1981). On the other hand, according to Castro-Aguirre (1978), *C. crysos* is an abundant species in this area; nevertheless, the larvae were rare in our study. This may have resulted from the species spawning in offshore waters (Berry 1959, Montolio 1976, Leak 1977), where the number of stations was limited.

Carangid larvae were most abundant and occurred at high frequencies over the continental shelf, though high frequencies were also observed in the oceanic zone generally near the slope. All the species were shown to spawn in neritic waters, but there were some differences among them in relation to their general distribution and areas of highest concentration. For example, *S. crumenophthalmus, D. punctatus* and *T. lathami* were the best represented on the Veracruz shelf, but like most of the species, their highest abundances were still over the eastern portion of the study area. *Chloroscombrus chrysurus, D. punctatus* and *S. setapinnis* had their highest densities to the east of the Grijalva-Usumacinta system.

None of the species were exclusively coastal in distribution. Only *C. chrysurus* could be considered to be a coastal species, with greatest densities found where water depths were < 40 m, mainly in front of the Términos Lagoon, where their larvae are considered common (Flores-Coto and Alvarez-Cadena 1980, Flores-Coto 1985). The spawning in coastal areas is also referred to by Leak (1977, 1981) and Houde et al. (1979). Also, higher abundance of adults has been recorded in the southern Gulf of Mexico around the 18 m isobath (Sánchez-Gil et al. 1981).

The remaining species had their highest frequency of occurrence and greatest abundance on the mid shelf 40—100 m depth (*D. punctatus* and *S. setapinnis*), or on the outer shelf (*C. hippos/latus* and *C. crysos*), which closely corresponds with reports from the northern Gulf of Mexico and southeast United States (Berry 1959; Aprieto 1974; Montolio 1976; Leak 1977, 1981; and Wang and Kernehan 1979).

The larvae distribution of *S. crumenophthalmus* shows different aspects between west Florida, where they are present in the outer shelf over the 150 m isobath, and the Hawaiian Islands, where they occur at the coastal zone (Leak 1977). In the southern Gulf of Mexico, this species spawns in the inner and outer regions of the shelf.

The majority of the species occurred throughout the year, with highest densities of *S. crumenophthalmus* and *S. setapinnis* during the warm period of spring-summer, *C. chrysurus* was particularly abundant in summer and *D. punctatus* in spring. *Selene* sp., *C. hippos/latus* and *C. crysos*, the least abundant species, were present only in spring and summer.

Our data closely correspond to the spawning seasons of this species in the northern Gulf and southeastern United States (Berry 1959; Aprieto 1974; Montolio 1976; Leak 1977, 1981; Berry and Smith-Vaniz 1978; Houde et al. 1979; and Wang and Kernehan 1979).

Among the carangids collected, *lathami* were the only larvae which were most abundant during winter and at the beginning of spring. In the northern Gulf, larvae of this species, which is considered a winter spawner, have been collected from November through May (Leak 1977, 1981).

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REFERENCES CITED

Aboussouan, A. 1975. Taxonomía de los carángidos. *In:* UNESCO (ed.) *Informe del seminario de las CICAR sobre ictioplancton. Documentos técnicos de la UNESCO sobre ciencias del mar.* 20:21–23.

Aprieto, V.L. 1974. Early development of five carangid fishes of the gulf of Mexico and the south atlantic coast of the United States. *US Natl. Mar. Fish. Serv. Fish. Bull.* 72(2):415–444.

Berry, F.H. 1959. Young jack crevalles (*Caranx* species) off the southeastern Atlantic coast of the United States. *US Fish. Wildl. Serv. Fish. Bull.* 59(152):417–535.

_____ & W.F. Smith-Vaniz. 1978. Carangidae. *In:* W. Fischer (ed.), *FAO species identification sheets for fisheries Western Central Atlantic, Fishing Area 31.* Vol. I–II. FAO, Rome.

Castro-Aguirre, J.L. 1978. Catálogo sistemático de los peces marinos que penetran a las aguas continentales de México con aspectos zoogeográficos y ecológicos. *Dir. Gral. Inst. Nal. Pesca, México, Serie Científica.* 19:78–85.

Fajardo-Rivera, M.M. & M.A. Rodríguez-Van Lier. 1986. Contribución al conocimiento del ictioplancton en el sur del Golfo de México. Primavera-Verano. Tesis Profesional.

E.N.E.P. Iztacala. U.N.A.M. 84 pp.

Ferreira-González, R. & D.E. Acal-Sánchez. 1984. Estudio de la comunidad ictioplantónica en la Laguna de Términos, Campeche. Tesis Profesional. E.N.E.P. Iztacala. U.N.A.M., 93 pp.

Flores-Coto, C. & J. Alvarez-Cadena. 1980. Estudios preliminares sobre abundancia y distribución del ictioplancton en la Laguna de Términos, Campeche. *An. Centro Cienc. del Mar Limnol. Univ. Nal. Auton. México.* 7(2):67–78.

Flores-Coto, C. 1985. Estudio comparativo del ictioplancton de las Lagunas Costeras del Tamiahua, Alvarado y Términos, del Golfo de México. Tesis doctoral. C.C.H. U.N.A.M. 147 pp.

Gutiérrez-Estrada, M. 1977. Sedimentología del área de transición entre las provincias terrígena y carbonatada del Sureste del Golfo de México. Tesis M. en C. Fac. de Ciencias. U.N.A.M. 175 pp.

Houde, E.D., D.C. Leak, C.E. Downd, S.A. Berkeley & W.J. Richards. 1979. Ichthyoplankton abundance and diversity in the Eastern Gulf of Mexico. *Report to U.S. Bur. Land. Mgt.*, Contract No. AA550-CT7-28. 546 pp.

Laroche, W.A., W.F. Smith-Vaniz & S.L. Richardson. 1984. Carangidae: development. Pages 510–522 *in:* H.G. Moser, W.J. Richardson, D.M. Cohen, M.P. Fahay, A.W. Kendall, Jr. & S.L. Richardson (eds.), *Ontogeny and systematics of fishes.* Spec. Publ. No. 1, Amer. Soc. Ichthyol. Herpetol.

Leak, J.C. 1977. Distribution and abundance of Carangidae (Pisces: Perciformes) larvae in the eastern Gulf of Mexico, 1971–1974. University of Miami, Master's Thesis, 83 pp.

_____ . 1981. Distribution and abundance of Carangid fish larvae in eastern Gulf of Mexico, 1971–1974. *Biol. Oceanogr.* 1(1):1–28.

McKenney, T.W., E.C. Alexander & G.L. Voss. 1958. Early development and larval distribution of the carangid fish, *Caranx crysos* (Mitchill). *Bull. Mar. Sci. Gulf. Caribb.* 8(2):167–200.

Montolio, M.A. 1976. Estudio taxonómico y morfométrico de los estadios larvales de dos especies de Carangidae *Decapterus punctatus* (Agassiz, 1819) y *Caranx crysos* (Mitchill, 1815) y su distribución en el Golfo de México. *Rev. Invest. Inst. Nac. Pesca.* 2(2):85–125.

Pineda-López, R. 1986. Contribución al conocimiento del ictioplancton del sur del Golfo de México. Un ciclo anual. I-Invierno. Tesis Profesional. Fac. Ciencias. U.N.A.M. 83 pp.

Reséndez-Medina, A. 1970. Estudio de los peces de la Laguna de Tamiahua, Veracruz, México. *An. Inst. Biol. Univ. Nac. Auton. Méx. Ser. Cienc. Mar Limnol.* 41(1):79–146.

_____ . 1973. Estudio de los peces de la Laguna de Alvarado, Veracruz, México. *Rev. Soc. Mex. Hist. Nat.* 34:183–281.

_____ . 1981. Estudio de los peces de la Laguna de Términos Campeche, México. I. *Biótica.* 6(3):351–356.

Rossov, V.V. 1967. Sobre el sistema de corrientes del Mediterraneo Americano. *Academia de Ciencias de Cuba. Inst. de Oceanol.* 2(1):31–49.

Sánchez-Gil, P.A. A. Yañez-Arancibia & F. Amezcua-Linares. 1981. Diversidad, distribución y abundancia de las especies y poblaciones de peces demersales de la Sonda de Campeche (Verano 1978). *An. Inst. Cienc. del Mar y Limnol. Univ. Nal. Auton. México.* 8(1):209–240.

Sanvicente-Añorve, L.E. 1985. Contribución al conocimiento de la fauna ictioplantónica en el sur del Golfo de México. Primera parte: Primavera. Tesis Profesional. Facultad del Ciencias. U.N.A.M. 86 pp.

Saville, A. 1975. Aplicación de los estudios ictioplantónicos a la ordenación pesquera. *In:* UNESCO (ed.), *Informe del seminario de las CICAR sobre ictioplanton. Documentos Técnicos de la UNESCO sobre Ciencias del Mar.* 20:26–29.

Villalobos-Figueroa, A. & M.E. Zamora-Sánchez. 1975. Importancia Biológica de la Bahía de Campeche. Pages 375–382 *In: Mem. I Simp. Lat. Ocean. Biol.* (México).

Wang, J.C.S. & R.J. Kernehan. 1979. *Fishes of the Delaware estuaries. A guide to the early life histories.* Ecological Analysts, Inc., Towson, Maryland.