

Diet Composition of Fish Species from the Southern Continental Shelf of Colombia

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Abstract

The diet composition of 30 fish species belonging to 16 families from the Pacific Coast of Colombia is described. Benthic crustaceans (37.5%) and bony fishes (23.7%, chiefly demersal) were the most important food items for the fish species analyzed. Data on diet composition of the fish species are presented for the first time which can be a source of information for trophic modeling.

Introduction

The marine communities in the Pacific Coast of Colombia have been poorly investigated and require a comprehensive research program that includes population analysis and marine ecology. This paper provides information about food habits of fishes to provide better understanding of trophic relationships among different species in the continental shelf ecosystem of Colombia.

Information about the food habits of fishes is useful in defining predator-prey relationships. A compilation of different food items consumed by a fish species may eventually result in identification of stable food preferences, and in a preliminary estimate of trophic level (Sa-a et al. 1997). Data on diet composition are useful in the creation of trophic models as a tool to understand complex coastal ecosystems.

In the Pacific Coast of Colombia, Rubio (1987) enumerates 172 families of fish (26 Chondrichthyes and 135 Osteichthyes) with 491 genera and 954 species (84 Chondrichthyes and 870 Osteichthyes). In a more recent paper, Álvarez-León et al. (1999) reported a total of 1 110 species. Stomach content studies on fish fauna in this

region are almost nonexistent and deal mainly with qualitative information.

Materials and Methods

The study area

The Pacific Coast of Colombia has a high socioeconomic importance. Its ecological characteristics are remarkable (Vargas et al. 1969; Andrade 1986; Meindiger 1987; PRC 1989; Urbano and Castillo 1991; Flóres and Rodríguez 1992). For example: 1) it is one of the regions of the world with a substantial amount of rainfall; 2) there is an occurrence of an upwelling during the first months of the year particularly in coastal areas north of Cabo Corrientes; (3) the general area is influenced by El Niño and La Niña events; and (4) there is a large tidal variation (maximum 6 m).

The study area has a mean depth of 60 m covering 6 870 km² located on the Pacific coast of Colombia from 01°56'N to 03°33'N latitude, and to about 12 nm offshore (Fig. 1). The most important fishery banks in the Pacific Coast of Colombia are found in this area. The largest urban centers, the Buenaventura and Tumaco harbors, and Gorgona Island (site of the most important coral reefs in the Pacific Coast of Colombia) are located in this area.

Fish samples and diet composition analysis

Fish samples for analysis of diet composition were collected in December 1997 by means of demersal trawls (30 feet LOA vessels at mean speed of 3.3 knots) in the southern continental shelf of the Pacific Coast of Colombia (Fig. 1).

Diet composition of each species or group of species was defined by the fraction of each prey species consumed to the total consumption following Moreau et al. (1993). The hierarchical structure in FishBase 1997, with the levels of precision for Food I, Food II and Food III, was used to build the diet composition table (Froese and Pauly 1997) to standardize the entries in the food items and related trophic ecology.

Due to conflicting classification of fish species in terms of their habitat, especially for the benthos and demersal species (Rubio 1987; FAO 1992; Froese and Pauly 1997; INPA 1997; Velasco 1998; Velasco and Wolff 1999), FishBase (Froese and Pauly 1997) was used to classify the fish species into their habitat types as follows: pelagic, benthopelagic, demersal, reef-associated, bathypelagic and bathydemersal.

Results and Discussion

A total of 665 fish samples were analyzed, 456 of which had stomach content. However, only 282 (38%) individuals representing 30 species belonging to 16 families were analyzed for stomach content (Table 1 and 2).

Of the 30 fish species, 53% are demersal, 33% are reef-associated, 10% are pelagic and 3% are benthopelagic (Table 1). Except for *Diodon holocanthus*, all other fish species have commercial importance (Fitch and Lavenberg 1971; Hutchins 1984; Leis 1984; FAO 1992; Coppola et al. 1994; Bussing 1995; Hensley 1995; McKay and Schneider 1995; Smith-Vaniz 1995; Sommer 1995; all references are from Froese and Pauly 1997). Some species are by-catches



Fig. 1. The study area located in the southern continental shelf of the Pacific Coast of Colombia.

Table 1. List of fishes sampled from the southern continental shelf of the Pacific Coast of Colombia in December 1997.

| Family | Species | Local name | Habitat ^a | N ^b | TL ^b (cm) | N1 ^b | n ^b | Fisheries importance ^{c, d} |
|-----------------|------------------------------------|---------------------------|----------------------|----------------|----------------------|-----------------|----------------|--------------------------------------|
| Carangidae | <i>Alectis ciliaris</i> | Pámpano de hebra | d | 9 | 23.5 - 55.0 | 6 | 4 | M ⁴ , Z |
| | <i>Carangoides otrynter</i> | Pámpano | d | 17 | 20.3 - 50.0 | 13 | 10 | C ⁵ , A, I |
| | <i>Chloroscombrus orqueta</i> | Arrecha | d | 38 | 13.4 - 0.3 | 38 | 7 | M ⁴ , Z |
| | <i>Oligoplites altus</i> | Trancanil | d | 1 | 33.5 | 1 | 1 | C ⁴ , Y |
| | <i>Selar crumenophthalmus</i> | Ojón | ra | 28 | 13.2 - 22.0 | 23 | 7 | H ⁶ , A, Y |
| | <i>Selene brevoortii</i> | Carecaballo | d | 62 | 16.5 - 44.0 | 38 | 33 | M ⁴ , Y |
| | <i>Selene oerstedii</i> | Jorobado | d | 8 | 20.5 - 39.0 | 2 | 2 | M ⁴ , Y |
| | <i>Selene peruviana</i> | Espejuelo | d | 122 | 13.7 - 41.0 | 89 | 61 | M ⁴ , A, I |
| | Diodontidae | <i>Diodon holocanthus</i> | Pez erizo | ra | 1 | 28.0 | 1 | O ⁷ |
| Ephippidae | <i>Chaetodipterus zonatus</i> | Palma rayada | ra | 12 | 20.5 - 98.0 | 11 | 2 | * |
| Gerreidae | <i>Diapterus aureolus</i> | Mojarra | d | 27 | 7.6 - 13.3 | 8 | 3 | A, I, Z |
| | <i>Diapterus peruvianus</i> | Mojarra | bp | 102 | 15.5 - 0.2 | 88 | 54 | C ⁸ , A, I, X |
| Haemulidae | <i>Eucinostomus gracilis</i> | Palometa | d | 10 | 8.7 - 16.4 | 6 | 4 | M ⁸ , A, I |
| | <i>Pomadasys panamensis</i> | Pargo blanco | d | 21 | 10.5 - 9.2 | 11 | 5 | M ⁹ , X |
| Lutjanidae | <i>Hoplopagrus guntherii</i> | Pargo | ra | 2 | 61.0 - 61.1 | 1 | 1 | S ⁴ , A, B, I |
| | <i>Lutjanus colorado</i> | Pargo liso | ra | 6 | 64.0 - 76.0 | 1 | 1 | C ⁴ , Y |
| | <i>Lutjanus guttatus</i> | Pargo lunarejo | ra | 69 | 16.8 - 8.5 | 48 | 34 | C ⁴ , A, I, X |
| | <i>Lutjanus jordani</i> | Pargo rojo | ra | 11 | 23.0 - 65.0 | 6 | 4 | C ⁴ , A, I, Z |
| Monacantidae | <i>Aluterus monoceros</i> | Chancho | ra | 16 | 33.0 - 48.0 | 11 | 7 | C ¹⁰ |
| Paralichthyidae | <i>Ancylorsetta dendrítica</i> | Lenguado tres puntos | d | 1 | 41.0 | 1 | 1 | M ¹¹ |
| | <i>Hippoglossina tetraphthalma</i> | Lenguado | d | 1 | 36.5 | 1 | 1 | M ¹² , A, I, Z |
| Polydactylidae | <i>Polydactylus approximans</i> | Barbeta blanca | d | 16 | 17.5 - 29.0 | 3 | 3 | C ¹³ , X |
| | <i>Polydactylus opercularis</i> | Barbeta amarilla | d | 2 | 22.0 - 22.3 | 1 | 1 | A, I, X |
| Sciaenidae | <i>Larimus pacificus</i> | Cajero | p | 29 | 16.2 - 0.5 | 12 | 12 | Y |
| Scombridae | <i>Scomberomorus sierra</i> | Sierra | p | 23 | 39.0 - 88.5 | 18 | 12 | C ⁶ , A, I, X |
| Serranidae | <i>Diplactrum eumelum</i> | Cagua | d | 6 | 24.0 - 26.0 | 2 | 2 | O ¹⁴ , Z |
| Sparidae | <i>Calamus brachysomus</i> | Pluma marotilla | ra | 2 | 51.0 - 72.0 | 2 | 2 | C ¹³ , Z |
| Sphyraenidae | <i>Sphyraena ensis</i> | Picuda | p | 17 | 19.2 - 4.5 | 12 | 5 | C ¹⁵ , A, I, X |
| Sphyrnidae | <i>Sphyrna tiburo</i> | Cachuda | ra | 2 | 97.0 - 100.0 | 1 | 1 | C ⁴ , A, I, X |
| Triglidae | <i>Prionotus stephanophrys</i> | Pez gallina | d | 4 | 32.0 | 1 | 1 | C ¹³ |

^{a/} Habitat categories:
 bp = benthopelagic
 d = demersal
 p = pelagic
 ra = reef-associated

^{b/} Sample details:
 N = individuals caught
 N1 = individuals with stomach content
 n = specimens for stomach content analysis
 TL = total length

^{c/} Fisheries importance:
 A = artisanal fisheries
 B = low
 C = commercial
 H = highly commercial
 I = industrial fisheries
 M = minor commercial
 O = no interest

S = subsistence fisheries
 X = observed in more than three market centers
 Y = observed in more than two market centers
 Z = observed in one market center

^{d/} References:
¹ Froese and Pauly (1997)
² Rubio (1988)
³ INPA (1997)
⁴ Coppola et al. (1994)
⁵ Smith-Vaniz (1995)
⁶ FAO (1992)
⁷ Leis (1984)
⁸ Bussing (1995)

⁹ McKay and Schneider (1995)
¹⁰ Hutchins (1984)
¹¹ Hensley (1995)
¹² Without reference
¹³ Fitch and Lavenberg (1971)
¹⁴ Heemstra (1995)
¹⁵ Sommer (1995)
 * = no information

Table 2. Diet composition (in % weight) of fish species from the southern continental shelf of the Pacific coast of Colombia (December 1997).

| Species | n | Stages | % composition | Food type | | | |
|------------------------------------|------------|----------------------|----------------------|-------------|------------------|-----------------------|---|
| | | | | I | II | III | Taxa |
| <i>Alectis ciliaris</i> | 4 | juveniles | 65.23 | Zoobenthos | Benthic crust. | Shrimps | <i>Trachypenaeus</i> Crustacea (Decapoda) |
| | | | 30.77 | Nekton | Finfish | Bony fish | |
| | | | 4.00 | Detritus | Detritus | Debris | |
| <i>Aluterus monoceros</i> | 7 | juveniles/ adults | 41.53 | Zoobenthos | Cnidarians | other polyps | Portunidae, <i>Euphyllax</i> sp. |
| | | | 33.54 | Zooplankton | Other planktonic | other plankt. Invert. | |
| | | | 23.61 | Zoobenthos | Benthic crust. | Crabs | |
| | | | 0.48 | Nekton | Finfish | Bony fish | |
| | | | 0.33 | Zoobenthos | Benthic crust. | Amphipods; astracods | |
| | | | 0.35 | Zoobenthos | Cnidarians | other polyps | |
| | | | 0.14 | Zoobenthos | Mollusks | Gastropods | |
| 0.02 | Zoobenthos | Worms | | | | | |
| <i>Ancylorsetta dendritica</i> | 1 | adults | 100.00 | Nekton | Finfish | Bony fish | <i>Lepophidium</i> (Ophiidiidae) |
| <i>Calamus brachysomus</i> | 7 | adults | 39.68 | Zoobenthos | Mollusks | Gastropods | Anomura |
| | | | 27.78 | Zoobenthos | Worms | Crabs | |
| | | | 27.42 | Zoobenthos | Benthic crust. | Bony fish | |
| | | | 4.68 | Nekton | Finfish | Shrimps | |
| | | | 0.44 | Zoobenthos | Benthic crust. | | |
| <i>Carangoides otrynter</i> | 10 | juveniles/ adults | 27.58 | Nekton | Finfish | Bony fish | <i>Bellator xenisma</i> (Triglidae) <i>Synodus</i> (Synodontidae) <i>Porichthys</i> (Batrachoidae) |
| | | | 25.09 | Nekton | Finfish | Bony fish | |
| | | | 17.76 | Nekton | Finfish | Bony fish | |
| | | | 16.21 | Nekton | Finfish | Bony fish | |
| | | | 6.44 | Nekton | Finfish | Bony fish | |
| | | | 3.81 | Zoobenthos | Benthic crust. | Crabs | |
| | | | 1.89 | Zoobenthos | Benthic crust. | other benthic crust. | |
| | | | 1.14 | Zoobenthos | Benthic crust. | Shrimps | |
| | | | 0.08 | Zoobenthos | Benthic crust. | Shrimps | |
| | | | 52.42 | Nekton | Finfish | | |
| <i>Chaetodipterus zonatus</i> | 2 | juveniles | 47.58 | Plants | Other plants | Benthic algae/weeds | <i>Sicyonia</i> |
| | | | 66.51 | Detritus | Detritus | Debris | |
| <i>Chloroscombrus orqueta</i> | 7 | juveniles/ adults | 20.15 | Zoobenthos | Worms | | |
| | | | 13.04 | Nekton | Finfish | Bony fish | |
| | | | 0.30 | Zooplankton | Other planktonic | other plankt. Invert. | |
| <i>Diapterus aureolus</i> | 3 | juveniles/ adults | 74.46 | Zoobenthos | Benthic crust. | Ostracods | |
| | | | 19.10 | Nekton | Cephalopods | Squid/cuttlefish | |
| | | | 5.95 | Zoobenthos | Mollusks | Gastropods | |
| <i>Diapterus peruvianus</i> | 54 | juveniles/ adults | 0.49 | Zoobenthos | Worms | | Ophiuroidea |
| | | | 29.94 | Zoobenthos | Echinoderms | other echinoderms | |
| | | | 18.59 | Zoobenthos | Mollusks | Bivalves | |
| | | | 17.10 | Nekton | Finfish | Bony fish | |
| | | | 15.78 | Detritus | Detritus | Debris | |
| | | | 7.78 | Zoobenthos | Benthic crust. | Crabs | |
| | | | 7.59 | Zoobenthos | Echinoderms | | |
| | | | 4.76 | Zoobenthos | Worms | | |
| | | | 1.64 | Zooplankton | Other planktonic | other plankt. Invert. | |
| | | | 1.43 | Zoobenthos | Echinoderms | Sea cucumbers | |
| | | | 0.23 | Zoobenthos | Benthic crust. | Stomatopods | |
| | | | 0.08 | Zoobenthos | Benthic crust. | Isopods | |
| | | | 0.06 | Zoobenthos | Benthic crust. | Ostracods | |
| | | | 0.02 | Zoobenthos | Mollusks | other mollusks | |
| 90.09 | Zoobenthos | Mollusks | Gastropods | | | | |
| 6.79 | Zoobenthos | Benthic crust. | Crabs | | | | |
| 2.10 | Zoobenthos | Benthic crust. | other benthic crust. | | | | |
| 1.02 | Zoobenthos | Worms | | | | | |
| <i>Diplectrum eumelum</i> | 2 | juveniles/ adults | 57.43 | Zoobenthos | Worms | Crabs | |
| | | | 21.76 | Zoobenthos | | | |
| <i>Eucinostomus gracilis</i> | 4 | juveniles/ adults | 20.81 | Nekton | Finfish | Bony fish | |
| | | | 100.00 | Zoobenthos | Worms | | |
| <i>Hippoglossina tetraphthalma</i> | 1 | adults | 98.50 | Zoobenthos | Benthic crust. | Shrimps | <i>Penaeus</i> Xanthidae |
| | | | 0.92 | Zoobenthos | Benthic crust. | Crabs | |
| <i>Hoplopagrus guntherii</i> | 1 | adults | 0.58 | Zoobenthos | Mollusks | Gastropods | Majidae |
| | | | 50.55 | Zoobenthos | Echinoderms | sea stars | |
| | | | 23.70 | Zoobenthos | Benthic crust. | Crabs | |
| | | | 25.55 | Zoobenthos | Echinoderms | Sea cucumbers | |
| | | | 2.20 | Zoobenthos | Benthic crust. | Crabs | |
| <i>Larimus pacificus</i> | 12 | juveniles/ adults | 87.13 | Nekton | Finfish | Bony fish | <i>Leiolambrus punctatissimus</i> (Parthenopidae) <i>Anchoa</i> |
| | | | 8.79 | Zoobenthos | Benthic crust. | Stomatopods | |

| Species | n | Stages | % composition | Food type | | | |
|---------------------------------|------------|----------------------|-----------------------|-------------|------------------|-----------------------|--|
| | | | | I | II | III | Taxa |
| <i>Lutjanus colorado</i> | 1 | adults | 4.07 | Nekton | Finfish | Bony fish | Munidae Crustacea <i>Portunus</i> Calappidae |
| | | | 0.01 | Zoobenthos | Benthic crust. | other benthic crust. | |
| <i>Lutjanus guttatus</i> | 34 | juveniles/ adults | 34.70 | Zoobenthos | Benthic crust. | Crabs | Majidae <i>Chloroscombrus orqueta</i> <i>Anchoa</i> <i>Selene peruviana</i> <i>Squilla panamensis</i> Anguilliformes Decapoda <i>Eurysquilla</i> <i>Syconia</i> Solenocera Decapoda Parthenopidae <i>Sicyonia disdorsalis</i> <i>Processa</i> |
| | | | 29.37 | Detritus | Detritus | Debris | |
| | | | 24.65 | Zoobenthos | Benthic crust. | Crabs | |
| | | | 11.28 | Zoobenthos | Benthic crust. | Crabs | |
| | | | 28.99 | Zoobenthos | Echinoderms | sea stars | |
| | | | 11.63 | Nekton | Finfish | Bony fish | |
| | | | 9.98 | Zoobenthos | Benthic crust. | Stomatopods | |
| | | | 9.88 | Zoobenthos | Benthic crust. | Crabs | |
| | | | 8.26 | Nekton | Finfish | Bony fish | |
| | | | 6.63 | Nekton | Finfish | Bony fish | |
| | | | 5.77 | Nekton | Cephalopods | Squid/cuttlefish | |
| | | | 4.81 | Nekton | Finfish | Bony fish | |
| | | | 4.62 | Zoobenthos | Benthic crust. | Shrimps | |
| | | | 4.26 | Zoobenthos | Benthic crust. | Stomatopods | |
| | | | 1.51 | Nekton | Finfish | Bony fish | |
| | | | 0.78 | Detritus | Detritus | Debris | |
| | | | 0.74 | Zoobenthos | Benthic crust. | Stomatopods | |
| | | | 0.53 | Zooplankton | Other planktonic | other plankt. Invert. | |
| | | | 0.50 | Zoobenthos | Benthic crust. | Shrimps | |
| | | | 0.33 | Zoobenthos | Benthic crust. | Shrimps | |
| 0.32 | Zoobenthos | Benthic crust. | other plankt. Invert. | | | | |
| 0.17 | Zoobenthos | Benthic crust. | Crabs | | | | |
| 0.15 | Zoobenthos | Benthic crust. | Shrimps | | | | |
| 0.12 | Zoobenthos | Benthic crust. | Shrimps | | | | |
| 0.02 | Zoobenthos | Benthic crust. | Isopods | | | | |
| <i>Lutjanus jordani</i> | 4 | juveniles/ adults | 96.97 | Nekton | Finfish | Bony fish | <i>Decapterus</i> Crustacea Squillidae Squillidae |
| | | | 1.83 | Detritus | Detritus | Debris | |
| <i>Oligoplites altus</i> | 1 | adults | 1.20 | Zoobenthos | Benthic crust. | Stomatopods | Squillidae Squillidae |
| | | | 65.28 | Zoobenthos | Benthic crust. | Stomatopods | |
| <i>Polydactylus approximans</i> | 3 | juveniles/ adults | 34.72 | Zoobenthos | Benthic crust. | Stomatopods | <i>Trachypeneus</i> |
| | | | 88.50 | Zoobenthos | Benthic crust. | Shrimps | |
| <i>Polydactylus opercularis</i> | 3 | juveniles | 7.00 | Zoobenthos | Benthic crust. | Shrimps | Crustacea (Decapoda) <i>Solenocera</i> <i>Processa</i> Cardiidae |
| | | | 3.70 | Zoobenthos | Benthic crust. | | |
| | | | 0.60 | Detritus | Detritus | Debris | |
| | | | 0.20 | Nekton | Finfish | Bony fish | |
| | | | 41.67 | Nekton | Finfish | Bony fish | |
| <i>Pomadasys panamensis</i> | 5 | juveniles/ adults | 21.10 | Detritus | Detritus | Debris | Hyperiididae Squillidae |
| | | | 18.30 | Zoobenthos | Benthic crust. | Shrimps | |
| | | | 14.72 | Zoobenthos | Benthic crust. | Shrimps | |
| | | | 4.21 | Zoobenthos | Benthic crust. | Bivalves | |
| | | | 42.76 | Nekton | Finfish | Bony fish | |
| <i>Prionotus stephanophrys</i> | 1 | adults | 22.04 | Zoobenthos | Benthic crust. | Amphipods | Majidae |
| | | | 20.91 | Zoobenthos | Benthic crust. | Stomatopods | |
| | | | 14.29 | Detritus | Detritus | Debris | |
| | | | 63.71 | Zoobenthos | Benthic crust. | Crabs | |
| <i>Scomberomorus sierra</i> | 12 | juveniles/ adults | 23.47 | Zoobenthos | Benthic crust. | Crabs | <i>Leiolambrus punctatissimus</i> (Parthenopidae) Ilicantha (Leucosiidae) Xanthidae <i>Selene peruviana</i> <i>Chloroscombrus orqueta</i> <i>Trichiurus lepturus</i> Xanthidae <i>Hemisquilla</i> |
| | | | 9.20 | Zoobenthos | Benthic crust. | Crabs | |
| | | | 3.62 | Zoobenthos | Benthic crust. | Crabs | |
| | | | 81.85 | Nekton | Finfish | Bony fish | |
| | | | 13.15 | Nekton | Finfish | Bony fish | |
| <i>Selar crumenophthalmus</i> | 7 | juveniles/ adults | 2.08 | Nekton | Finfish | Bony fish | Crustacea |
| | | | 1.40 | Nekton | Finfish | Bony fish | |
| | | | 1.28 | Zoobenthos | Benthic crust. | Crabs | |
| | | | 0.07 | Zoobenthos | Benthic crust. | Stomatopods | |
| | | | 0.17 | Zoobenthos | Mollusks | Bivalves | |
| <i>Selene brevoortii</i> | 33 | juveniles/ adults | 74.67 | Nekton | Finfish | Bony fish | <i>Decapoda</i> <i>Euphyllax</i> <i>Trachypeneus</i> <i>Portunus</i> Crustacea (Decapoda) <i>Porichthys</i> <i>Solenocera</i> |
| | | | 22.48 | Zooplankton | Other planktonic | other plankt. Invert. | |
| | | | 2.74 | Detritus | Detritus | Debris | |
| | | | 0.11 | Zoobenthos | Worms | | |
| | | | 30.47 | Nekton | Finfish | Bony fish | |
| | | | 22.83 | Zooplankton | Other planktonic | other plankt. Invert. | |
| | | | 14.86 | Zoobenthos | Benthic crust. | other benthic crust. | |
| | | | 10.13 | Zoobenthos | Benthic crust. | Crabs | |
| | | | 4.47 | Zoobenthos | Benthic crust. | Shrimps | |
| | | | 4.39 | Zoobenthos | Benthic crust. | Crabs | |
| | | | 4.15 | Detritus | Detritus | Debris | |
| | | | 2.91 | Nekton | Finfish | Bony fish | |
| | | | 1.83 | Zoobenthos | Benthic crust. | Shrimps | |
| | | | 1.14 | Zoobenthos | Benthic crust. | Stomatopods | |

| Species | n | Stages | % composition | Food type | | | | | | |
|-------------------------|-------------|----------------------|-------------------------|---------------------------|----------------------|-----------------------|-------------------|-------------|------------------|----------------------------|
| | | | | I | II | III | Taxa | | | |
| <i>Selene oerstedii</i> | 2 | juveniles/ adults | 0.13 | Nekton | Finfish | Bony fish | Pleuronectiformes | | | |
| | | | 1.11 | Zoobenthos | Benthic crust. | Shrimps | <i>Processa</i> | | | |
| | | | 0.76 | Zoobenthos | Benthic crust. | Shrimps | Parthenopidae | | | |
| | | | 0.64 | Zoobenthos | Benthic crust. | Crabs | | | | |
| | | | 0.10 | Zoobenthos | Benthic crust. | Shrimps | <i>Sicyonia</i> | | | |
| | | | 0.04 | Zoobenthos | Benthic crust. | Isopods | Hyperiididae | | | |
| | | | 0.03 | Zoobenthos | Benthic crust. | amphipods | | | | |
| | | | 0.01 | Zoobenthos | Worms | | | | | |
| | | | 89.24 | Zoobenthos | Benthic crust. | Crabs | Calappidae | | | |
| | | | 10.76 | Detritus | Detritus | Debris | Crustacea | | | |
| | | | <i>Selene peruviana</i> | 64 | juveniles/ adults | 35.13 | Nekton | Finfish | Bony fish | Engraulidae |
| | | | | | | 18.51 | Nekton | Cephalopods | Squid/cuttlefish | |
| | | | | | | 13.44 | Nekton | Finfish | Bony fish | |
| | | | | | | 12.31 | Nekton | Finfish | Bony fish | <i>Trichiurus lepturus</i> |
| 5.96 | Zoobenthos | Benthic crust. | | | | Ostracods | | | | |
| 3.69 | Detritus | Detritus | | | | Debris | Decapoda | | | |
| 3.11 | Zoobenthos | Benthic crust. | | | | Shrimps | | | | |
| 2.46 | Zoobenthos | Benthic crust. | | | | | Decapoda | | | |
| 1.85 | Zoobenthos | Benthic crust. | | | | Stomatopods | | | | |
| 1.75 | Zooplankton | Other planktonic | | | | other plankt. Invert. | | | | |
| 0.66 | Zoobenthos | Benthic crust. | | | | Shrimps | <i>Processa</i> | | | |
| 0.66 | Zoobenthos | Benthic crust. | | | | na/other echinoderms | Ophiuroidea | | | |
| 0.34 | Nekton | Finfish | | | | Bony fish | Lutjanidae | | | |
| 0.12 | Plants | Other planktonic | | | | Benthic algae/weeds | | | | |
| 0.01 | Zoobenthos | Benthic crust. | Stomatopods | <i>Squilla panamensis</i> | | | | | | |
| <i>Sphyrna ensis</i> | 5 | | 95.18 | Nekton | Finfish | Bony fish | | | | |
| | | | 4.82 | Zoobenthos | Benthic crust. | other benthic crust. | | | | |
| <i>Sphyrna tiburo</i> | 1 | adults | 61.50 | Zoobenthos | Benthic crust. | Crabs | | | | |
| | | | 38.50 | Nekton | Cephalopods | Squid/cuttlefish | | | | |

in shrimp fisheries (Rubio 1988) and are caught in artisanal and industrial fisheries (INPA 1997).

The diet composition shows that the main food items were benthic crustaceans (crabs 15.1%, shrimps 13.8% and stomatopods 8.6%) and bony fishes (23.7%), mostly demersal species (Table 2).

Amphipods, isopods and ostracods are usually designated as zoobenthos (benthic crustaceans) within the hierarchy of food items table in FishBase (Froese and Pauly 1997), hence in this study they were grouped in the same way for consistency. It can be noted, however, that amphipods belonging to family Hippidae are usually pelagic and those species belonging to Gammaridae are essentially found on the bottom, but most of them are able to swim (Ruppert 1996). In addition, ostracods mainly inhabit near the bottom, even though most of the species are planktonic, while isopods are mainly benthic (bottom-dwelling) animals.

In some fish samples, sand and

mud were found in the stomach contents. However, it was not possible to separate and weigh them. For this reason, they were not included as food items. The food item “worms” included organisms such as annelids, sipunculids and nemertines, and they were collectively measured. Detritus is defined as decomposing organic debris, small pieces of dead and decomposing plants and animals. Hence, organic detritus considered in the diet composition includes debris (carcasses) as in the ecology and food item tables from FishBase (Froese and Pauly 1997).

Information about trophic ecology (food items and/or diet composition) in FishBase exists only for the following species: *Selar crumenophthalmus* (Hiatt and Strasburg 1960; Randall 1967), *Diodon holocanthus* (Randall 1967, 1985), *Polydactylus approximans* (González and Soto 1988), *Scomberomorus sierra* (Collette and Nauen 1983), *Sphyrna tiburo* (Cortés et al. 1996) and *Prionotus stephanophrys* (Mendieta and

Samamé 1984). This paper gives information about diet composition of 24 species (see Table 1) which can be used to supplement FishBase.

Identification of stomach content of fishes is not easy since the food items are usually completely digested or unidentifiable. In addition, most of the fish samples have empty stomachs. In this study, due to the low catches of some species or the relatively low number of fish samples with identifiable stomach contents, the diet composition of several species obtained is not representative and must be considered as preliminary. It is therefore suggested that a vigorous research program should be developed to increase the number of species studied for their natural diets and the results of the studies documented with a series of papers describing the diet composition of a variety of fish species.

It is also interesting to note that fishes that feed on phytoplankton were absent in the samples. Apparently, El Niño events may

indirectly influence the presence of these fishes. The phytoplankton biomass in the study area was low (Medina 1988), compared with the rest of the coastal waters off the Pacific Coast of Colombia. This is also attributed to the great river runoff in the central and southern parts of the continental shelf. During the El Niño event, a decrease in chlorophyll *a* (used as an indirect measure of phytoplankton biomass) has been reported (Arntz and Fahrback 1996). Abiotic parameters and qualitative phytoplankton variation corroborated the occurrence of El Niño event in the Pacific Coast of Colombia in December 1997 (Medina 1988; López-Peralta et al. 1998a, 1998b, 1999). This El Niño episode is considered the strongest of the last century. Positive and negative biological consequences of this event include quantitative and qualitative changes on marine communities, as well as alterations in geographical distribution of some populations (Arntz and Fahrback 1996). This points out the occurrence of changes in finfish food habits as well; therefore it is necessary to analyze diet composition of fishes in other periods in order to establish food consumption variability of fish stocks in the Pacific Coast of Colombia.

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